Fine Woodworking

Mar./Apr. 1985, No. 51, $3.50

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Plans:
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Fine WoodWorking

March/April 1985, No. 51

Cover: A rosewood cabinet inlaid with ivory richly illustrates why woodworkers are taking a new look at 20th-century master Jacques-Emile Ruhlmann. See p. 30. Photo: The Metropolitan Museum of Art, Edward C. Moore Jr. Gift Fund, 1925.

The bowsaw is excellent for joint-cutting or cutoff work. See p. 52 for plans. Photo: Simon Watts.

Chisels may look alike, but do differences in the steel make one cut better than another? Find out on p. 44. Photo: Bill Stankus.

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Articles

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The brief article "Getting a Frame Upholstered" (*FWW* #49, p. 64) was of particular interest to me as a woodworking hobbyist and professional upholsterer. I was delighted that upholstering wasn't treated (as is many times the case) as one of those bothersome extras after the real skill work is finished.

I would add these suggestions: Try bartering between the trades—a footstool kit, say, for spring tying, lathe blanks for padding, wood finishing for trim finishing, and so on. If you're designing your own upholstered furniture, consult an upholsterer in the drawing stage to ensure that you've included all the necessary tack rails and other features. Leave the cutting and sewing of fabric to the skilled and equipped. Close is not good enough here.

For those do-it-yourself jobs, the upholstery shop may be a better source of supply than a wholesale supplier, since purchases can be made in smaller quantities than wholesalers will allow, and with no delivery time or shipping charges. Supplies can also come with valuable how-to information from an experienced upholsterer. There are still upholsterers around who have devoted years to developing excellence in their trade and who would jump at the chance to work with craftsmen of other specialties, like frame builders, carvers and wood finishers. —*Charles A. Spiller, Bridgeport, Tex.*

What a surprise I found in a recent issue. For the past two years I've been digging through the back issues of magazines and reference books and generally making a pest of myself at the local library, trying to come up with some way to make snowshoes. The article entitled "Making Snowshoes" in issue #49 has more information on the subject than all of my research has turned up.

In regard to the color front covers: I'm all for color—let's have more of it. Inside, outside, unfinished, finished, *painted;* wood and anything made from it is beautiful. Color can only help enhance that fact. —*Dexter R. Louvien, Austin, Minn.*

There is one minor flaw in the current issue, #50. On p. 58 (Roger Holmes' article on bookcase joints), you illustrate the highly risky practice of sawing dadoes on a tablesaw, using the rip fence as a guide. This is absolutely unsafe. I've had a few instances of the saw grabbing. . .and chewing panels to shreds before a complete cut could be made. Having been injured, although slightly, in recent months, I perform no operations on my tablesaw using a rip fence without the guard and its anti-kickback pawls. The hazard is even greater if the sawblade is even slightly dulled. —*Tom E. Moore, Springfield, Va.*

ROGER HOLMES REPLIES: I don't agree that dadoing on the tablesaw is absolutely unsafe. Neither is it, or any other machine operation, absolutely safe. Tablesaw-dadoing requires care and alertness. If the end of the board isn't held firmly against the fence as the board is fed, it can slew sideways, causing the dado head to grab the wood and chew it up, and maybe your hand, too. Long, narrow boards are most difficult to keep flush to the fence, so don't tablesaw-dado boards much less than 1 ft. wide. And if you're at all uncomfortable with dadoing on a tablesaw, better do it with a router or by hand.

After using the chatter technique (*FWW* #49) for a number of years, I have made a change in lighting used for this type of turning, to help see the chatter. I have mounted a stroboscopic light above the tailstock. When the light is adjusted to the same RPM as the lathe, it will appear to stop the turning action. As I make my chatterwork, I can actually see what pattern is being made while it's turning. Other woodturners may do the same with bowls, vases, etc. —*Jon Sauer, Daly City, Calif.*

I couldn't agree more with Max Hunsicker's letter in *FWW* #47 (p. 98). I have had some experiences that parallel his that might be of interest to your readers. I am an organbuilder and a practicing musician, so I speak from both fields.

Perhaps our most divine gift as human beings is our infinite capacity never to do the same thing in the same way twice [despite] the strong influences of mass production, whose essence is the production of identical things. That goes for music, too, with its recordings that contain no mistakes!

During the late 18th century, a Benedictine monk wrote an encyclopedia of organbuilding. In it he drew many diagrams indicating the diameters and other dimensions of the many pipes. His scales are highly irregular, one space being narrower, the next wider, the next narrower, and so on. At first we thought it was poor draftsmanship, but now we realize that he was trying to document the purposeful irregularities that produce the unique sound inherent in a fine scale of organ pipes. Tests on fine violins have shown conclusively that mathematical regularity of tone is *not* a characteristic of great work.

—*Joseph Chapline, Newbury, N.H.*

In response to Robert Deason's comments in the November/December issue, I would like to commend the staff of *FWW* on the recent changes in format. I think it is of value to us to realize the diversity in our trade as craftsmen. Professionally, there are many fields in woodworking, each having its own merits and accomplishments. Certainly we can accept the painted chest just as it is, art. Some of the most treasured crafts were done with a brush, only they were done on canvas.

—*Doug Vondrachek, Newberg, Ore.*

A recent catalog I saw listed a material for degumming sawblades at $12.95 per gallon. A box of Arm & Hammer washing soda (six pounds of it) sells for under $3 and will remove any gum I've come across, including rosewood sap and even Plexiglas residue.

Put the blades in the sink, run enough hot water to cover them and sprinkle a little soda over them. The gum almost floats away or can be rubbed off easily in just a few minutes. Not only have you saved $12, but there's plenty of powder left for the laundry. —*Girvan Milligan, Carmel, N.Y.*

In reply to John O. Walter's letter in issue #50, I would like to share my paintbrush-cleaning method and also the results of putting gasoline into the sewer.

I have four tight-lidded, 50-oz. applesauce jars labeled 1, 2, 3 and 4. I put a pint of paint thinner (not gasoline) into each jar. To rinse my brushes, I pour thinner from jar #1 into a tall tin can, rinse the brush, then return the thinner to the jar. I proceed by repeating the process with each jar in order, returning the solvent to the jar it came from each time. When jar #1 gets low, I refill it from #2, then #2 from #3, and so on, finally putting some fresh thinner into jar #4. This system saves brushes from being lost to procrastination, saves thinner because I never discard any, solves the problem of disposing of flammable liquids, and ends the temptation to use gasoline.

The experience with flammable fumes coming into the basement was repeated here last summer, near Washington, D.C. Many houses become vulnerable to this type of accident when the trap in a basement drain dries up. A driver delivered a load of gasoline into a sewer instead of a tank by mistake, and as a result several houses exploded and burned.

—*John L. Ditman, Beltsville, Md.*

My wife says your magazine provides less useful information than before. She's a technical writer/editor, and she knows how to make a publication interesting. I agree with her. There's something big missing from the last few issues. I'm also concerned that the emphasis on color indicates a substantive change in the magazine. Some of what I see is intangible,

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68422	1/2	1	1/2	1-1/4	10.10
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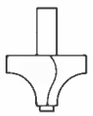

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71002	Cove	1/4"	—	—	3/8	9/16	w/bearing	22.90
71100	Rabbet	1/4"	—	1/2	—	3/8	w/bearing	20.50
71206	Corner Round	1/4"	—	5/8	3/8	—	w/bearing	22.55
71302	Beading	1/4"	—	—	1/4	—	w/bearing	20.80
71402	Roman Ogee	1/4"	—	—	1/4	—	w/bearing	27.65
71500	Chamfer	1/4"	—	7/16	45°	—	w/bearing	20.75
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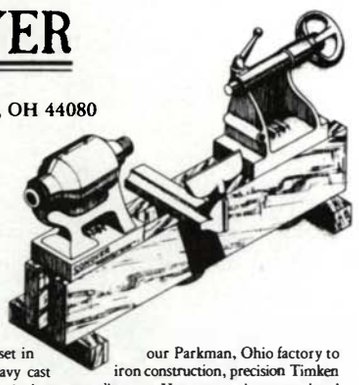

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but I'll offer two examples drawn from an examination of previous issues.

First, compare Roger Holmes' article "Starting Out" in *FWW* #49 with Ian Kirby's "Preparation of Stock" in *FWW* #13. Both articles concern fundamental woodworking skills. Compare the graphics: Kirby's provide useful information and Holmes' provide pretty pictures. Moreover, Holmes' graphics take up more space in the total article, leaving less for textual content. Second, there seems to be less material on the philosophy of craftsmanship, Toshio Odate being a refreshing exception. In 1978 (*FWW* #13), by contrast, there were articles by Tage Frid and Stephen Hogbin that concerned why we are woodworkers.

I am concerned that *Fine Woodworking* simply is not worth what it once was. I think the emphasis on color has something to do with this. You're becoming a pretty picture magazine, with all the superficiality that entails. The items you select for photos will be objects in which color is the predominant characteristic. Therefore, painted boxes are inevitable, as are gaudy easy chairs (*FWW* #49) and vanities made of a phony wood product (*FWW* #48).

Color can be used to provide useful information, and can be used selectively to provide an interesting format. I'm afraid, though, that *FWW* is trying to change its market image. To what end? I am a charter subscriber and I'm not canceling yet. But I want to see real quality maintained and not sacrificed to a glossy image. *—David Hupp, Portland, Ore.*

After years of using wood putty with the old "fill it, dry it, sand it and refill it" process, I have found something that can get the job done in one pass. It is a polyester compound used with a catalyst and it stains out just like wood—a great product called Poxywood. I got it through a local paint store, but it can also be ordered direct from Box 4241, Martinsville, Va. 24115.
—Ronald Watkins, Morganton, N.C.

I enjoyed reading Stewart T. Coffin's article "Wooden Puzzles" in issue #49. In that article he mentions a man up in Toronto who's bought about a thousand rhombic-dodecahedral blocks. "I'm not sure why," Coffin quips.

Some five years ago I purchased some R-D blocks from Coffin, albeit only 390 of them—one-third of that amount preglued by Coffin into all possible ways of joining less than five R-Ds together. It was my intention to use the remaining 260 blocks in an effort to continue that classification scheme and determine how many poly R-Ds of size five exist. Now I reside in a Toronto suburb, which either makes this municipality a hotbed of R-D research activity or means that the man Coffin mentioned and I are one and the same. In which case, your readers may be interested in finding out the reason for my purchase.

By the strangest of coincidences, recently (before I had seen that issue of *Fine Woodworking*) I mailed Coffin a letter in which I tried to acquaint him with the untitled book by Kit Williams (whose article "Marquetry Mystery" also appeared in the same issue). In that letter I confided that I was going to use some of his R-D blocks to fashion *my* creation of what I think is the title of that book.
—Hans Havermann, Weston, Ont.

I felt that Tom Howell's article "Vintage Machines" in the November/December issue was very good. I take exception, however, to his statement that cast iron is difficult to repair. I would hate to see a good machine at a reasonable or better price rejected on the basis of a crack. The crack may be in a non-critical area of the casting and generated from careless handling or a casting flaw that has finally stress-relieved itself. Both of these conditions are easily repairable.

I agree with Howell that grey iron will continue to crack; it is a very notch-sensitive material. Any crack is a stress riser where vibration and fatigue can potentially attack, and will worsen with time. There are, however, many new low-temperature welding techniques that can inexpensively and easily repair a good casting. Many factories have been repairing casting cracks or breaks for years with even traditional brazing techniques and have been very successful.

If you are interested in a machine that is cracked or broken, try to find someone who has experience with welding grey iron. If the crack is repairable, you end up with leverage on the price. My experience in industry is that very few cracks or breaks are unrepairable and often the repair is stronger than the originally cast piece. *—D.B. Riley, Warren, Pa.*

I was surprised and disappointed to see your omission of Parks Woodworking Machine Co. from your list of vintage manufacturers (*FWW* #49, p. 50). Parks has been producing workshop-sized equipment continuously for nearly 100 years.

Parks machines were distributed both under their own name and in great numbers by Sears Roebuck. Because of our continuity of production, we are able to supply production parts for many of our older machines as well as our Craftsman-brand machines. *—Mary L. Reardon, Parks Woodworking Machine Co., Cincinnati, Ohio*

If a man is smart enough, he knows a better way. Of the many ways of stabilizing a candle base or a light turning, few woodworkers know that a common plumbers' material—lead wool used for cast-iron pipe joints—tamped into a hole will anchor tons and is available at any plumbing supply store. Also, it has a thousand other uses. *—Ford Green, San Antonio, Tex.*

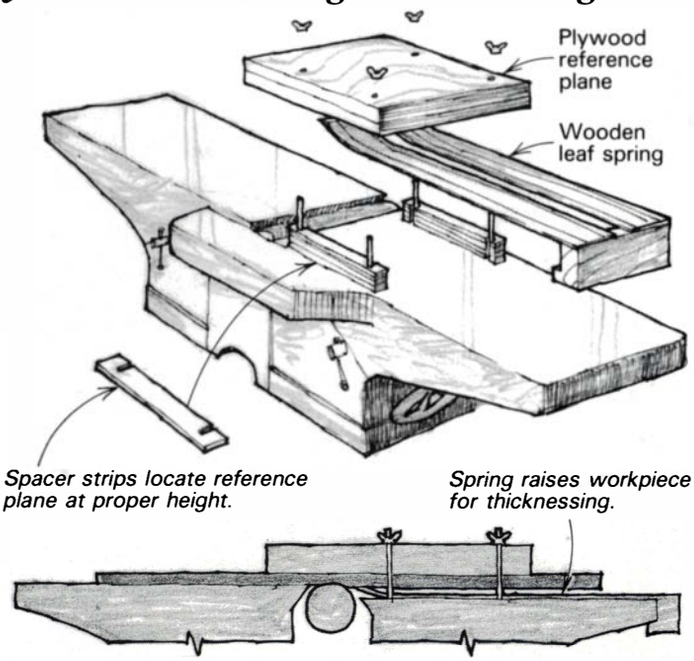
I was surprised by Gregory Landrey's article in the November/December issue on restoring cracked finishes on antique furniture. Basically, he recommends cleaning, followed by sanding down and waxing the old spirit varnish. He also states that he has rarely seen an old finish reamalgamated successfully.

Amalgamation is the name of the game, however, among professional restorers who use French-polishing techniques. Indeed, near miracles can be worked on surfaces worse than Landrey's sample piece using the traditional ingredients of shellac, alcohol, oil and pumice. The process can be done without changing the color and without disturbing the patina, and for an experienced polisher, it gives the maximum flexibility and control in handling all the elements of a facelift that preserves "the whispered history of days gone by."
—Thomas W. Newman, Hoboken, N.J.

Re Harold Lewis' question about a shaper that can use router bits (*FWW* #49, p. 18). He can take a spindle from the shaper and a collet and nut from a router to a machinist and have a new spindle turned with a recess and threads for the collet and nut. Make the new shaper spindle as short as possible so the router bit will be approximately the same height off the shaper table as a shaper bit would be. The main problem with this arrangement is speed. The shaper turns a cutter at 9,000 RPM for a cutting speed of 3,562 FPM, while it turns a ¼-in. router bit with a ⅞-in. cutter at 2,061 FPM. The slower speed will cause a washboard effect on the workpiece. One solution is to mount a router on the back side of your shaper so you can use either the shaper or the router. This arrangement allows you to perform all of the shaping/routing in one location and use one power feed to service two machines. If you can't afford a spare router, buy an extra router base to mount permanently on the shaper table. *—Thomas J. Wilder, Chico, Calif.*

edited and drawn by Jim Richey

Jointer thicknessing—another design



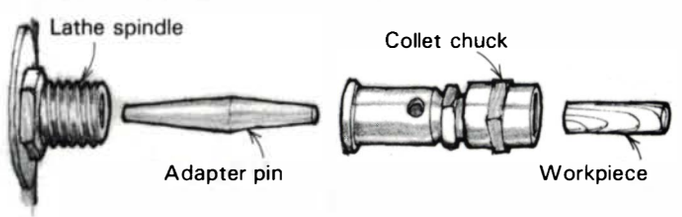
The design presented here converts a jointer to a true thickness planer, and it takes just a couple of minutes to make the conversion. On a regular thickness planer, the work is fed between the cutterhead and a flat bed. My method's principle, if you imagine a regular planer turned upside down, is the same: the workpiece is raised by wooden springs and pressed against a rigid overhead reference plane above the cutterhead.

My reference plane is laminated from two pieces of ¾-in., 9-ply birch plywood. It is held above the cutterhead by an assembly of aluminum spacers, threaded rods tapped into the feed table, and wing nuts. Another necessary component is a flat leaf spring, which presses the workpiece against the reference plane until it begins to ride the outfeed table. I made the spring from two 2½-in. wide, ⅛-in. thick strips of oak by steam-bending the last 4 in. of the strips. A simple cleat that hooks onto the end of the jointer table holds the spring in place.

The dimensions of the reference plane are not critical—an 8-in. square is about right for a 6-in. jointer. Wax the underside of the plane to reduce friction. I made the spacer strips by epoxying layers of ⅛-in. thick aluminum strips together to form pairs of ¾-in., ½-in., ¼-in. and ⅛-in. spacers. The spacers are notched so they can slip onto the threaded rods with the reference plane in place.

To use, joint one face of all the pieces you are going to plane. Select spacers equal to the thickest piece plus another ¼ in. for the spring. Bolt the assembly in place, position the spring, and back the infeed table down until the thickest piece starts to cut. Plane all the pieces at this setting before lowering the infeed table for the next cut. Continue until the final thickness is reached. *—J.E. Keister, Cincinnati, Ohio*

Collet chuck for turning miniatures



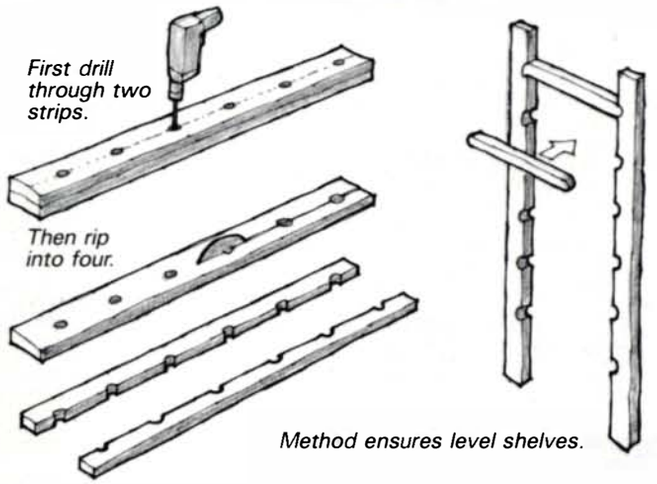
This collet chuck, adapted from a drill-press attachment, is inexpensive but effective for turning miniatures on the lathe. To make the chuck, purchase a drill-press attachment called a collet chuck with heavy collar (Sears part No. 9-24672). The holding collar that fastens the device to the drill press is not needed on the lathe. You'll also need an adapter pin with a male No. 33 Jacobs taper on one end and a Morse taper on the other end to fit your lathe spindle.

Fit the chuck to the lathe, then tighten the collet on a short length of ½-in. dowel, and you're ready to turn. A set of bushings that comes with the chuck will let you turn ¼-in. and ⅜-in. dowels in addition to the nominal ½-in.

—R.E. Hollenbach, Livermore, Calif.

Quick tip: I prevent joints from sliding around during glue-up by driving two ½-in. brads halfway into one inside face of the joint, then clipping off the heads so about 1/32 in. protrudes. When the joint is assembled for clamping, the two little spikes bite and hold firm. *—David G. Mensing, Tucson, Ariz.*

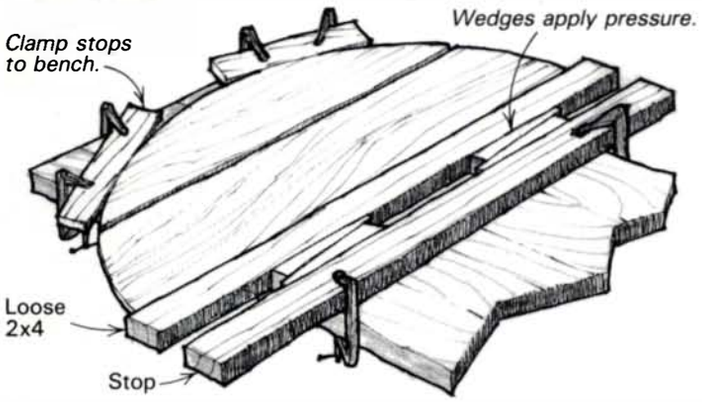
All-wood adjustable shelf bracket



This easy-to-make shelf bracket ensures accuracy because both pairs of shelf-height notches are established with one hole. To make the bracket, clamp two 1x2 strips together and drill a series of holes down the centerline through both strips. The holes will set the spacing between shelf locations. Now rip each 1x2 on its centerline to produce two matching brackets for each end of the shelf unit. Install the brackets in the carcase and cut several ¾-in. square shelf supports to fit in the notches. Round the ends of the shelf supports to match the half-round notches in the brackets.

—Rollie Johnson, Sauk Rapids, Minn.

Clamping round tabletops revisited



Here's an alternative to Jim Small's clamp-perch idea (*FWW* #47) for gluing circular tabletops. First place the tabletop on the bench and clamp three stops as shown in the sketch. Place a free-floating 2x4 against the workpiece and drive paired wedges between the clamped and floating 2x4s to apply pres-

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Running the length of the top is a series of holes which house bench "dogs" that you can push below the top for an unobstructed work surface, or raise as little as 1/4" to grip workpieces up to 50¼" long for full-length planing or sanding. For gripping extra large pieces, the slotted deadman leg next to the tail vise accommodates an optional clamp, which also fits in the hold down hole for benchtop gripping. A 5¾" wide tool trough runs the length of the bench. Overall width is 17⅛", with a 10⅜" wide working surface.

33¼" high
50¼" long
Tail vise capacity between dogs: 50¼".

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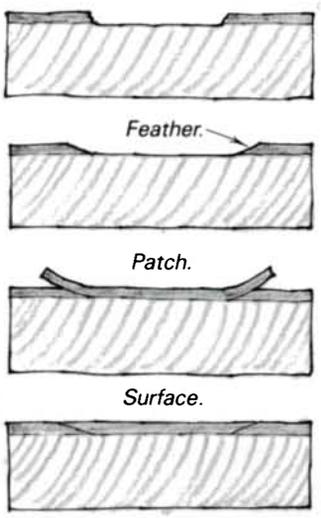
sure to the glue joint. Here are some additional tips: Place newspaper on the bench to catch the glue that will squeeze out, and dowel the edge joint to keep the pieces from shifting. It's best to raise the tabletop up with a few thin scraps of wood—this centers the clamping pressure and allows glue to drip out without smearing. I put weights on top of the work if necessary to keep it flat while the glue sets. And as with any glue-up, it's a good idea to make a dry run first.

—Ken Jones, Lisle, Ill.

Patching veneer

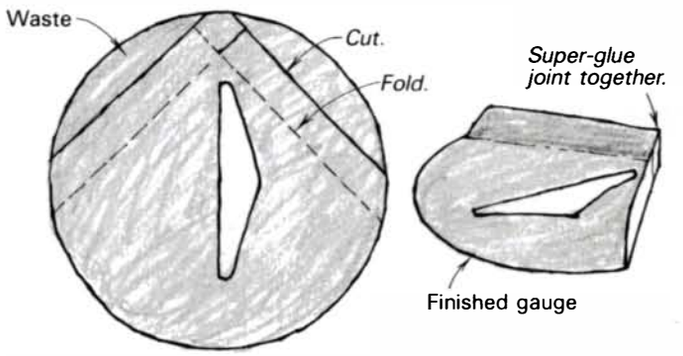
This veneer-patching technique is not only easier than the "cut and fit" approach, it also results in a virtually invisible repair if the color and grain of the patch is matched carefully to the original veneer. First feather the edges of the missing veneer defect so that they taper, as shown at right. Select a piece of veneer for the patch slightly larger than the defect area and glue it into the recess. Then just scrape and sand the raised edges of the patch flush with the surrounding surface.

—Rollie Johnson, Sauk Rapids, Minn.



Quick tip: To maintain cast-iron machine tables, clean the table, then apply ground talc (Johnson's baby powder) with a felt blackboard eraser. The talc will fill the pores in the cast iron, providing a moisture barrier and a lubricant. Apply the talc twice a week for a couple of months, then about once a month thereafter. *—William D. Turner, Brookfield, Wis.*

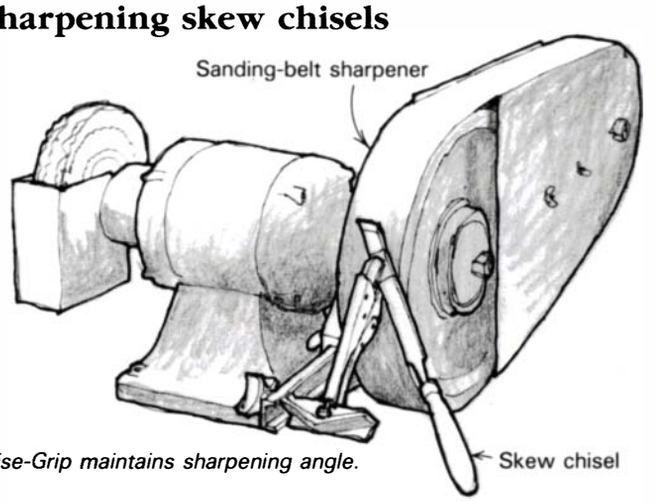
Center finder from a corn-chip can



This simple, handy tool for spindle turners pinpoints the headstock and tailstock centers on round, square or octagonal blanks. To make the gauge, first tear off the circular aluminum top from a 15-oz. can of corn chips or other snack food. The thin aluminum disc is the right size and can be cut with scissors or, if backed up with a hardwood block, by a sharp wood chisel. Scribe, cut and bend the disc as shown in the sketch to produce an L-shaped lip and a diagonal marking opening. To ensure an accurate center, mark at least four diagonals on the end of the spindle and pick the point where the most lines cross. *—Eliot Birnbaum, Syracuse, N.Y.*

Quick tip: To remove sanding discs applied with gummy adhesive, heat the back of the plate with a propane torch until it gets warm (but not hot), then simply ease the disc off with a dull chisel. *—George Kasdorf, Ft. Wayne, Ind.*

Sharpening skew chisels



Vise-Grip maintains sharpening angle.

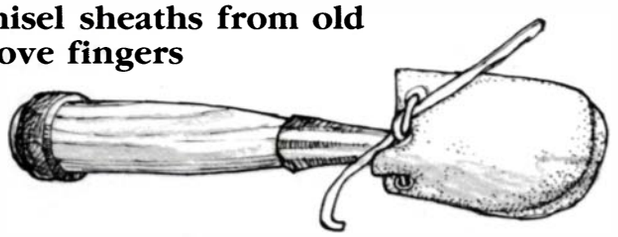
Some sharpening setups have a special tool rest to support the butt of the tool's handle, which keeps the cutting edge at the proper sharpening angle. The idea works great for straight plane irons and chisels, but presents problems for skewed tools. To put the skewed tool at the proper angle on the sharpening belt, the handle must be pulled to the side and held in midair, unsupported.

To solve the problem, I clamp a pair of Vise-Grips to the tool as shown in the sketch. I protect the chisel blade with a wrap of duct tape. If I have to disconnect the Vise-Grips during the grinding process, the imprint on the tape allows me to place the grips in the exact position again to complete the job.

—Norman Vandal, Roxbury, Vt.

Quick tip: When I'm driving wood screws, I put a drop of linseed oil in the pilot hole. It makes the screw go in with one-quarter the driving torque, allows easy assembly/disassembly during the course of the project, and offers some adhesiveness when it finally dries, unlike paraffin-covered screws. It also helps prevent rust (important in the humid Mississippi valley where I live). *—Robert E. Schuster, Geneseo, Ill.*

Chisel sheaths from old glove fingers



To prevent my chisels, knives and auger bits from damaging each other, I use the thumbs and fingers cut from old pairs of leather work gloves. I punch holes around the opening, and then add eyelets and a length of leather thong to tie the protector on the tool. I'm told that some leathers contain acids that encourage rust, so check your tools once in a while if you plan to try this method for long-term storage. With my everyday tools I've had no problems.

—Craig S. Walters, Forest Ranch, Calif.

Quick tip: I save my wife's old pantyhose for paint straining, and have found another use, too: I stretch a leg over the paper filter on my shop vacuum. This keeps a lot of the shavings and larger stuff from coating the paper. The filter cleans easier and lasts longer. *—C.S. Manning, Port Townsend, Wash.*

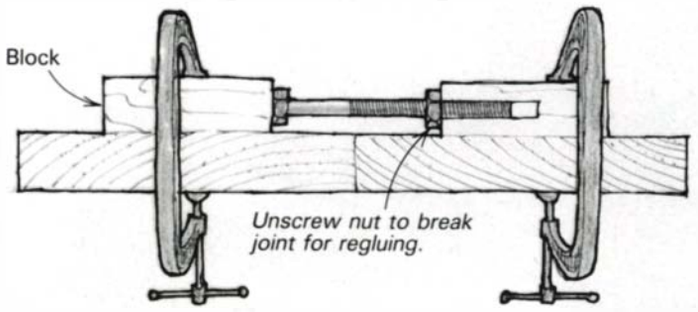
Smoothing turned goods with cloth

Years ago I watched craftsmen at a Virginia shop put the final finish on lathe turnings by holding a piece of cloth against the work after sanding. Later I read that textile companies have

started using ceramic yarn guides because synthetic yarns are abrasive and cut into steel guides quickly. Putting the two observations together, I tried finishing turned chair parts by first sanding with 000 garnet paper, then holding a scrap of synthetic-fiber drapery material against the spinning work. The cloth picked up grit left on the wood, and in less than a minute did indeed give the pieces a smoother look and feel.

—Carlyle Lynch, Broadway, Va.

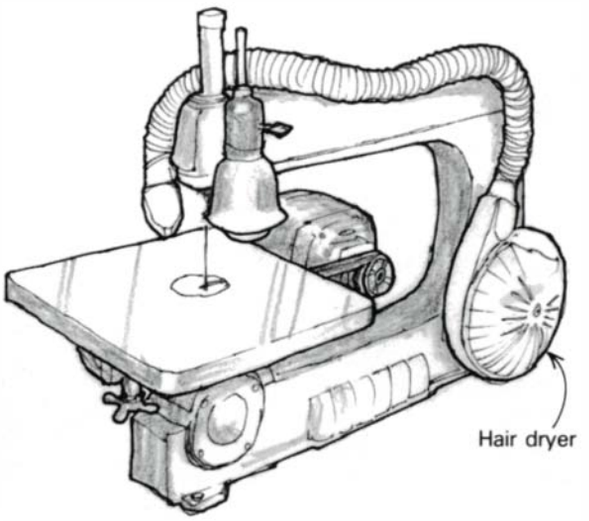
Disassembling old tabletops



This technique is quite effective for disassembling old tabletops for regluing. It requires two scraps of hardwood, one of which is drilled to accept a hex-head machine bolt and nut, as shown in the sketch. When you unscrew the nut, it exerts pressure against the clamped blocks, forcing them, and the glue joint, apart. As pressure builds, place a piece of scrap over the joint and hammer the scrap to jolt the glue joint. This technique puts tremendous declamping pressure in just the right spot without damage to the tabletop.

—Frank D. Hart, Plainfield, Ind.

Jigsaw blower from recycled hair dryer



This sawdust blower is simply an old hair dryer, with its heating element disconnected, and a length of plastic hose. Wire the switch so it turns on with the saw. This system works fine—much better, in fact, than the blower that came with the jigsaw.

—Dud Brown, Birmingham, Mich.

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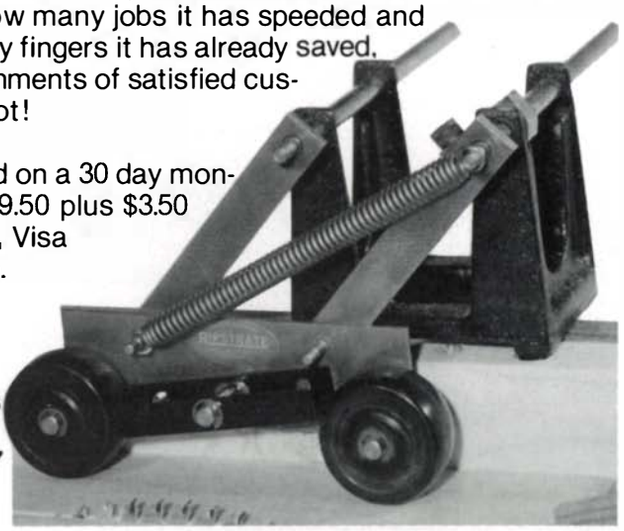

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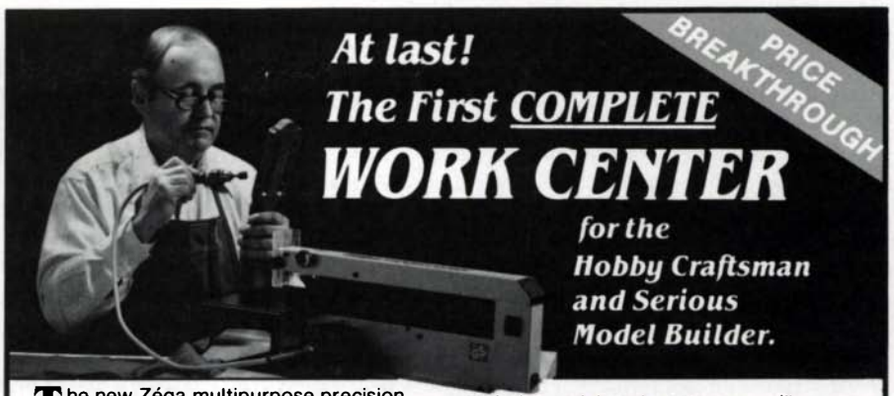

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Nontoxic toy finishes

Small children put everything in their mouths—including wooden toys. I'm concerned that most paints, varnishes and oil finishes might contain chemicals that are harmful when ingested. Are there any finishes that would be safe to use on wooden toys? ***—Emma Wynn, Stroudsburg, Pa.***

George Mustoe replies: The safest finish is, of course, no finish at all. But if you want to use one, the safest choice is a finish that's labeled "nontoxic." Behlen's Salad Bowl Finish (available from Garrett Wade, 161 Avenue of the Americas, New York, N.Y. 10013) is a clear sealer that contains only ingredients approved by the FDA for use in contact with food. Orr-Lac spray enamel (made by Spray Products Corp., PO Box 737, Norristown, Pa. 19404) is nontoxic when dry. Woodpecker's Tools, Inc. (614 Agua Fria, Santa Fe, N.Mex. 87501) sells a line of nontoxic, "organic" wood-finishing materials under the Livos brand. Clear nitrocellulose lacquer, shellac, mineral oil, vegetable oil and beeswax are also acceptable finishes.

To determine if other commercial finishes are safe for toys, read the label. If the product contains a metal such as lead, zinc, chromium, cobalt, antimony, selenium, barium, arsenic, mercury or cadmium, it isn't safe to chew. Many commercial oil finishes—even tung oil or boiled linseed oil—fall into this category because they often contain toxic metal driers. All exterior finishes should be considered unsafe, because most have mercury compounds to inhibit mildew. Paints and primers sold for use on metal often contain poisonous zinc chromate as a rust inhibitor. Pigments such as titanium dioxide, iron oxide and carbon black, and ingredients such as silica and silicates are often present in black, white or earth-tone paints. They're harmless if ingested in small amounts.

Even if a finish passes the label test, you might also write to the manufacturer. Ask for a product-safety sheet, and ask if their finish is safe to use on infants' toys—just to be sure.

[George Mustoe is a geochemistry research technician at the University of Washington in Bellingham.]

Cedar as a moth repellent

Is there any evidence that aromatic cedar is an effective moth repellent? ***—M. Felix Marti, Monroe, Ore.***

R. Bruce Hoadley replies: There seems to be a mix of opinion over the moth repellency of the aromatic cedars such as eastern red cedar (*Juniperus virginia*). The popular traditional notion is that the wood repels or even kills moths. Most reference sources I've checked imply as much, but carefully hedge their statements. To my knowledge, no one has been able to clearly demonstrate any toxicity. Frankly, my feeling is that the main attraction of this wood is the fragrance that a cedar chest or closet imparts to the clothing stored inside. Any tightly made wooden chest can keep out non-boring insects.

[R. Bruce Hoadley is professor of wood science at the University of Massachusetts at Amherst.]

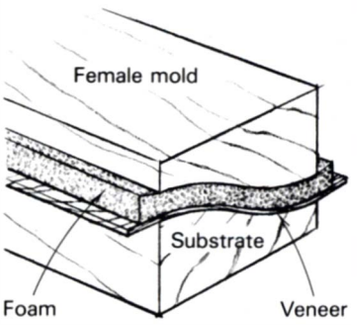
Veneering an ogee curve

I'd like to reproduce an old clock that has a veneered ogee molding with the grain of the veneer running across the width of the molding—at right angles to the substrate grain. How was this done? Why hasn't the veneer cracked from movement of the substrate?

—Raymond R. Smith, Shippensburg, Pa.

Ian Kirby replies: It's not surprising that the veneer hasn't cracked even though the veneer grain is at right angles to the substrate. Because the substrate is so narrow, the amount of movement is insignificant.

There are many techniques that could have been used to veneer the ogee. Chances are, the veneer was laid with hot hide glue and a hot iron—heat helps make veneer pliable. Another technique was to dampen the veneer and press it between matching male and female forms until dry.



Here's how I'd do it: Make an accurate female mold of the ogee from scrap pine. One way is to rough out the shape on the tablesaw and finish with hand tools and sandpaper. Soften and heat the veneer by dampening and ironing. Apply white glue to the substrate, and when the veneer is pliable, clamp it down with a piece of ½-in. thick high-density foam rubber between the female mold and the veneer. The foam will take up any inaccuracies in the female mold.

[Ian Kirby is a designer, educator and furnituremaker in Cumming, Ga.]

High-speed steel

I've heard that a tool made from high-speed steel holds an edge much longer than a high-carbon-steel tool. Is this true? ***—Allen B. Carstensen, Alfred Station, N.Y.***

Jerry Glaser replies: Yes, high-speed steel will hold an edge longer than high-carbon tool steel. That's why it's used to make cutters for power woodworking machines. But there's a tradeoff: high-speed steel won't take as keen an edge as high-carbon tool steel.

About 30 different high-speed steels—all high-carbon steels alloyed with tungsten, molybdenum or cobalt—have been developed for cutting tools that must resist abrasion and the high edge temperatures caused by friction. The edges of high-carbon-steel tools subjected to these conditions will soften and dull very quickly. The new steels were designated "high-speed" because they didn't lose their temper in high-speed machining operations.

Lathe tools are the only hand tools that are subject to high abrasion and high temperature at the same time. Cutting an abrasive wood at high speed concentrates a lot of wear at one small spot on the tool's cutting edge and the edge can get very hot. A lathe tool made from high-speed steel will stand up to this punishment better than one made of high-carbon tool steel. This means that you won't have to regrind as often.

Since plane irons, chisels and carving tools are never subjected to this kind of wear and heat, there's no need to make them from high-speed steel. High-carbon tool steel is the better choice because it takes the very keen edge that these cutting tools require.

[Jerry Glaser is a manufacturing engineer who lives in Playa del Rey, Calif.]

Ripping on the radial-arm saw

I've had some nasty kickbacks while ripping boards on my radial-arm saw and I've heard of people being badly hurt. Is there a safe way to rip on this saw?

—John Walter, Regina, Sask.

Curtis Erpelding replies: Ripping on the radial-arm saw is reasonably safe if you're careful, but it isn't the best machine for the job. There was a time when I ripped on my radial-arm saw, but I discovered long ago that bandsaws and tablesaws are safer, more effective ripping machines.

The correct way to feed stock into a radial-arm saw—or any power tool—is against the rotation of the blade. To attempt to feed the stock with the rotation always results in the blade trying to "climb" the work, tearing it out of your grasp and flinging it across the room or into your body, depending on where

Drawings: Lee Hov

you are standing. The main difference between ripping on a radial-arm saw and on a tablesaw is that the tablesaw blade tends to push the work down on the table, while the radial-arm-saw blade tends to lift the work off the table.

Always use a push stick when you rip on a radial-arm saw. To minimize the chance of kickback when ripping, set the adjustable blade guard so that its front edge is just barely above the surface of the work. This will also prevent the blade from throwing chips and dust back at you. Position the anti-kickback pawls so they drag freely on the work as it's pushed into the blade but lock tight against the work should the blade try to push it back.

[Curtis Erpelding is a furnituremaker in Seattle, Wash. He wrote about cutting joints on a radial-arm saw in *FWW* #32.]

Drying olive wood

About six months ago I was given some 10-in. dia. olive logs. I immediately ripped them into 3-in. thick boards, painted the ends, and placed them under cover with stickers between the boards to allow air to circulate. Last month I checked the boards and was horrified to see deep cracks throughout. This beautiful wood is now good for nothing but firewood. What did I do wrong? —Eric Schramm, Los Gatos, Calif.

Eugene Wengert replies: The best way to dry a species you aren't familiar with is to handle it as though it were extremely prone to checking and cracking. This means sawing it into 1-in. boards and drying it at a very slow rate. Relative humidity should be about 70% to 90%, temperature under 100°F, and strong air currents eliminated. Cover the pile with burlap if the weather is too dry, hot or windy. This may be overkill for some woods, but it is safe for all.

Drying difficulty increases greatly with thicker wood. Even in the commercial drying industry, it's rare to find anyone successfully drying 3-in. thick oak. If you want thick stock, saw 1-in. boards, number them in the order they come off the log, then glue the boards back together when they're dry.

[Eugene Wengert is extension specialist in wood technology at Virginia Tech in Blacksburg, Va.]

Airless sprayers

I'd like to start spraying lacquer in my small one-man shop, but I don't have room for a big compressor. In the 1950s I had a little electric spray gun that worked just fine. Are any of the airless sprayers such as the Campbell-Hausfeld or the Wagner adequate for occasional non-production work? I make only one piece at a time. —Arthur Kay, Tucson, Ariz.

George Morris replies: For occasional use, either of the airless sprayers you mentioned would be adequate. There are three major disadvantages with airless sprayers: they don't atomize as finely or spray as fast as an air gun and they can spit. A fast-drying finish such as lacquer aggravates these problems, and the extremely low humidity in southern Arizona will make things even worse. Part of your project will be dry before you've finished spraying. This will result in gritty overspray and an "orange-peel" texture.

There are several ways to deal with these problems. You can add reducer or a drying retarder to the lacquer. Either of these, however, will reduce the lacquer's already meager solids content and force you to spray extra coats, which will increase the likelihood of drips and runs. The better remedy is to spray brushing lacquer with its appropriate thinner (available from Mohawk Finishing Products, Inc., Rt. 30 North, Amsterdam, N.Y. 12010). It's designed to dry more slowly than spraying lacquer, so overspray, texture and droplets have time to level out before the finish sets.

Words of caution: Your small shop will need a specially ventilated spray booth for spraying lacquer. The vapors are toxic, so wear a cartridge-type respirator.

[George Morris makes guitars in Post Mills, Vt. He wrote about lacquer finishes in *FWW* #31.]

Grub-infested wood

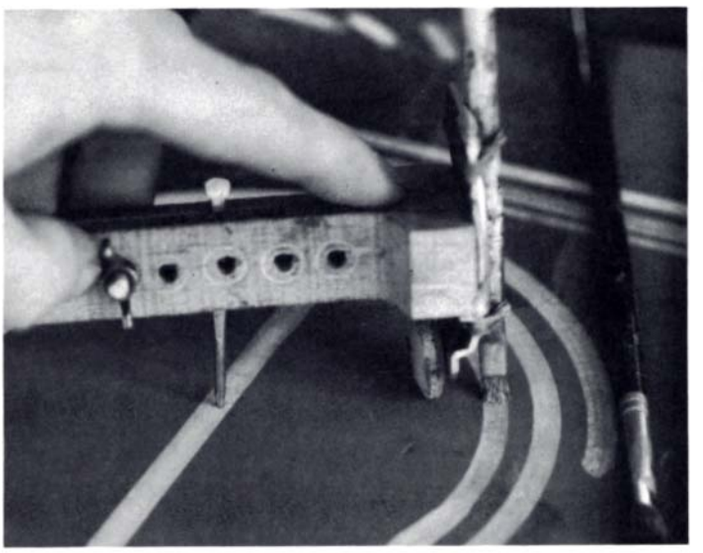
I often pick up carving wood from building sites. Sometimes I find that the wood has been invaded by white worms that dig deep tunnels. Occasionally I've found the same tunnels and worms in well-dried wood bought from a dealer. Some of the worms are as long as 2 in. and as thick as a pencil, while others are the size of a little pin. Is there any way to destroy these worms and prevent them from reinvading my 2-ft. to 3-ft. long sculptures? —Paul E. Yarden, Jericho, N.Y.

Daniel Cassens replies: Your wood is probably infested with long-horned bores or powderpost beetles—two general groups of insects that cause damage to wood. These pests can infest logs, stored wood or wooden items already in service. You can usually detect their presence from the holes that they bore in the wood or from the flour-like powder that they push out of the holes. Long-horned bore larvae can be as long as 1¼ in. and bore a ¼-in. dia. hole. Powderpost beetles are usual-

Follow-up

Re circles on painted chests (*FWW* #48, pp. 64-67). Here's a photo of the gizmo I use for painting circles. The essential ingredient is the wheel, which keeps the splay of the brush constant. I used a wheel and bracket from a rolling closet door. The flattened nail slides in a bandsawn slot and is fixed by tightening the thumb screw. The brush is held on with rubber bands, which are very convenient because they adapt to different-size brushes and allow for precise adjustment of brush length. Note that about ¾ in. of brush and ferrule extends beyond the brush holder, so the brush can be loaded from a shallow tin. Artists' bristle brushes in a shape called "filbert" seem to work well with my device. Brushes may also be trimmed to give the right spring and shape.

This compass is useful for circles from 1-in. to 6-in. radius. The circles shown in the photo (the brush is dry) were done with a very fluid paint that made it possible to complete a circle in one stroke. Some old chests have painted arcs with raised edges that you can feel. To obtain this raised edge, use thicker paint. You'll have to stop in the middle of the arc and reload the brush. ***—Ric Hanisch, Quakertown, Pa.***



A paintbrush compass makes accurate circles and arcs.

Photo: Ric Hanisch

ly only 1/32 in. to 1/8 in. long. Their holes are tiny and concentrated in one area, so the wood appears to have been hit with a shotgun blast.

In general, the adult beetle lays eggs either in the bark or in the wood pores. The eggs hatch into grubs that eat the wood. The grubs emerge into beetles and the cycle repeats. Depending on conditions, a few months to several years may be required to complete one generation.

There are several steps you can take to limit damage by these insects. First, freshly cut trees should be sawn and dried as soon as possible. Old infested wood harbors the borers and should be destroyed.

Heating infested wood to 130°-140°F for several hours will kill the grubs, eggs and beetles, but it won't prevent reinfestation. Even the center of the piece must be thoroughly heated. Unfortunately, it's difficult to avoid damaging green or thick stock at these temperatures.

Pesticides such as lindane (0.5% concentration) are another alternative. Follow the directions provided on the product label. For long-horned bores, when only limited damage is present, you can inject the pesticide directly into the holes. For powderpost beetles you can spray or brush it on. It kills the beetles when they emerge and prevents reinfestation. The availability of pesticides varies from state to state, and changes constantly. Therefore, be sure to check any such restrictions by contacting the state chemists' office.

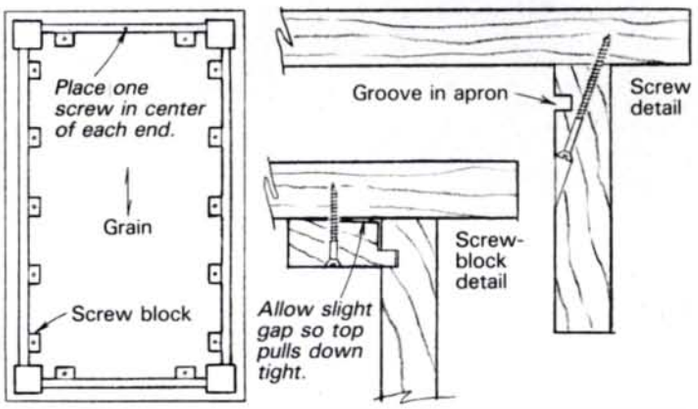
[Daniel Cassens is associate professor of wood products at Purdue University in West Lafayette, Ind.]

Fastening tabletops

I plan to make a writing table with a 3/4-in. thick solid-walnut top. How should I fasten the 26-in. by 42-in. top to the 1-in. by 5-in. apron to allow for cross-grain movement of the top?

—Gary Van Rheenen, Hawarden, Iowa

Tage Frid replies: The best way to fasten a solid top to the apron is to use wooden blocks that can slide in a groove cut in the apron. These are often called buttons. When you screw on



the blocks, they should pull the top down firmly. You'll need a block at each corner and three blocks evenly along each long side. Don't put the corner blocks right up against the legs. Fasten the top permanently in the center of each end by putting a screw at an angle through the apron into the top. The top will move the same amount on each side of the screw.

[Tage Frid is a retired cabinetmaker and professor emeritus at the Rhode Island School of Design.]

Filler on burl veneer

I veneered a bed headboard with birch veneer that has a swirly grain accented by flash figures and iridescent blisters. Because of the different hardnesses of the blisters, figures and the rest of the wood, I can't sand this surface perfectly smooth. Is there a neutral-colored filler that will level the surface and also take the stain and finish I want to use for the rest of the birch-plywood bedroom set?

—Fred W. Breheim, Arlington Heights, Ill.

Don Newell replies: A filler would level the surface, but it will look terrible when you apply stain. You'll end up with stain-blotched patches of filler in the low spots that will hide the fancy figure you paid for in the first place. You might as well try to level the veneer with plaster of paris.

Sand the veneer by hand, backing up your sandpaper with a hardwood block. Smooth out the rough spots as much as possible. For the smoothest finish, apply several coats of a film-building material such as lacquer or varnish; with lacquer, the more coats the better. Sand by hand (with the block) between coats. Eventually, you'll build up a film that will smooth out any remaining surface irregularities.

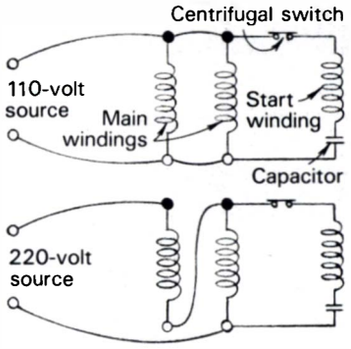
[Don Newell is a finishes chemist and consultant in Farmington, Mich.]

Converting 110V to 220V

I've been told that a single-phase electric motor designed to be run on either 110 volts or 220 volts has a distinct power advantage when set up to run on 220 volts. From another source I've heard that the advantage is small and hardly noticeable. Who's correct and is it worthwhile to rewire a 1-HP tablesaw motor to 220 volts?

—Keven Rabenaldt, Midland, Tex.

Michael Rekoff Jr. replies: There is no advantage in making the conversion. A dual-voltage motor has two identical windings with, say, *N* turns each. The connections for 110 volts and 220 volts are shown in the drawing at right. The torque that's produced by both connections is identical. Motor speed will also be identical, therefore power will be the same no matter which voltage you use. Motor power is the torque in foot pounds times the speed in RPM. The only way you can get more power from an induction motor without shortening its expected life is to immerse the motor in a low-temperature environment or force-cool the motor with an auxiliary blower.



[Michael Rekoff Jr. is professor of electrical engineering at the University of Alabama at Birmingham.]

Readers can't find:

. . . an owners' manual for a Sears Craftsman 6-in. planer model No. 103.1801. *—Robert G. Swanson, Manchester, Mo.*

. . . information about an Egan 24-in. thickness planer.

—Gary J. Moore, Marianna, Pa.

. . . a wholesale source for bone and horn.

—Abe Weinberg, Brooklyn, N.Y.

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—Adapters for using router bits with 1/2-in. dia. shanks in Delta or Powermatic shapers are available from Rudolf Bass, Inc., 45 Halladay St., Jersey City, N.J. 07304.

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Handbook of Building Crafts in Conservation by Jack Bowyer. *Van Nostrand Reinhold Co., 135 W. 50th St., New York, N.Y. 10020, 1981. $46.00, hardcover; 375 pp.*

In 1823 honored English architect/engineer Peter Nicholson published *The New Practical Builder and Workman's Companion,* which presented an enormous amount of somewhat superficial information about the various trades involved with the construction of Georgian and Regency buildings in the 18th and 19th centuries. This new volume reprints most of Nicholson's book, but in an effort to make it pertinent to today's restoration and conservation work, architect Jack Bowyer assembled a group of outstanding craftsmen to comment on Nicholson's treatise, chapter by chapter, trade by trade.

The quality of Nicholson's original remarks naturally varies with his familiarity with the trade under discussion. For instance, his presentation of the house painter's trade is described by painting essayist Ian Bristow as being not only deficient, but in large measure plagiarized. On the other hand, pages and pages of accurate geometrical analysis of all manner of architectural shapes by masons and carpenters attest to the young Nicholson's early interest in mathematics, and his later training as an engineer. The quality of modern commentary also varies. A specialist in historic-building repair, Bristow clearly enjoys and is suited to his discussion of painting. On the other hand, Peter Winter's training as a brickmaker seems to leave him with less scholarly enthusiasm and writing ability, resulting in a very weak essay. With few exceptions, the commentaries drift along, loosely describing what each trade is like today, and leaving the job of comparing the two worlds up to the reader. Unchanged techniques and designs are often painfully redescribed in the modern text. I did not find much "heart" in the work.

The format of this new folio-size presentation of the *Handbook* also leaves much to be desired. Nicholson's words appear as reproductions of what seem to be the original pages, bordered in gray to further set them off from the commentaries, which are printed in modern block lettering on plain white. Each essay is randomly shuffled into the pages of original text, making a sort of side-by-side "annotated" reading very difficult. I ended up first reading Nicholson's chapter, then going back to hunt for the pages of the usually shorter commentary. True annotation would have been much more valuable and instructive.

The information is nonetheless interesting to the layman familiar with only one or two of the crafts. I found myself particularly absorbed by the chapters on stone cutting, slating, and plain or decorative plastering. The woodworker has two hefty chapters to enjoy: Carpentry and Joinery ("...a carpenter fixes [in place] what a joiner constructs"), the former discussed by master joiner and builder/conservator Giles Munby, and the latter by Harry Munn and David Wallis, both of the firm G.E. Wallis & Sons, who have twice won national awards for the treatment of historic sites in Britain. These two chapters are fairly solid how-to descriptions of various aspects of the crafts, but do not really speak to the point of conservation, merely restoration, a distinction I shall discuss in the review that follows. Care to frame out an elliptical domed roof? See page 190. How about laying out the flutings of a column or pilaster? Turn to page 222.

Though interesting almost as novelty, Bowyer's "overview" of Nicholson's text does not have a clear focus, and because of the diversity of topics, it lacks the substance available only in source books concentrating on a single subject.

So cheerfully accept this rather expensive book as a birthday present, but save your own money for a few Audel™ books on the subject of your choice. —***Michael Sandor Podmaniczky***

Furniture Care and Conservation by Robert F. McGiffin, Jr. *The American Association for State and Local History, 708 Berry Rd., Nashville, Tenn. 37204, 1983. $16.00 for AASLH members, $17.95 for nonmembers, hardcover; 233 pp.*

While Bowyer's *Handbook,* contrary to its title, really is not about conservation, *Furniture Care and Conservation* is one of the few books available that treats the subject directly. It would be nearly impossible, however, to write a textbook on the profession of furniture conservation, since the conservator is required to be proficient in fields as diverse as organic chemistry, metallurgy and wood joinery. So what McGiffin does is not so much give us a how-to, but rather tell what conservation is: a science, distinct from restoration. Before proceeding, I want to make it clear that I'll use and define the terms "conservation" and "restoration" very carefully in order to make an important point, and that I intend no offense to the many skilled craftsmen who repair and restore damaged furniture of no historical significance.

In simplest terms, restoration addresses the status of an object only in the present, with little or no regard for how the restorative treatment will react over time, or how this treatment will affect the historical significance of the object. In restoration, if it looks right, it is right. In conservation, however, the conservator approaches every object as an artifact that exists in a cultural continuum and is merely passing through the present on its way to the future. Conservation is the science of making this journey comfortable without compromising the historical integrity of the piece. Appreciation of this idea gives meaning to the tenets of conservation as expressed by McGiffin and by the code of ethics of the American Institute for Conservation of Historic and Artistic Works (AIC): restraint and reversibility. This means that a conservator is primarily concerned with doing what is necessary to stabilize the degeneration of an object in such a way that his work can be undone in the future when further work may be needed or when technology makes better treatment possible. Though a conservator will often tone down blemishes, or enhance a worn or faded finish, the appearance of age is considered an historical record of the artifact's journey. Total regeneration is not sought because it could cause irreparable harm to this record; rather, preservation is the goal.

McGiffin has written this book for non-conservators who deal with old furniture: collectors, curators and craftsmen. His major accomplishment is in making the reader appreciate the weighty responsibility of stabilization, preservation and maintenance of artifacts. Yet he also describes procedures that can be carried out by the amateur to assist the conservator with his task.

Though it is a trite expression, *tour de force* keeps coming to mind as I continue to reread this book. McGiffin covers, albeit briefly, every phase of the conservator's job, from preliminary inspection, through cleaning and repairing, to post-treatment care or storage. Whatever the subject, he makes it clear that there is a line between what can or should be attempted by the talented amateur and what properly requires the skills of a conservator.

I see this book as a backfire set to control the uninformed and, in many cases, destructive treatment of period furniture by well-intentioned but untrained hands. It therefore becomes a guide for the partially trained, not so much for what to do when conserving a piece, but where to stop—a gentle but firm lecture on where to draw the line. Every conservator will find something to disagree with, but the profession owes McGiffin a tip of the hat for the larger service he provides. As for useful information, the appendix is loaded: sources of supply, read-

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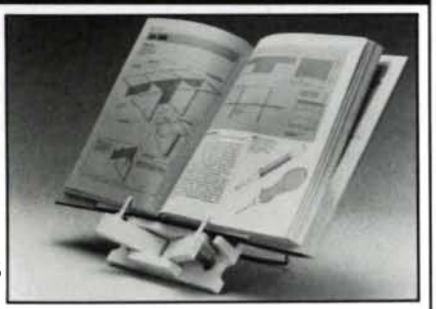

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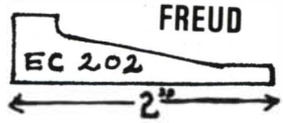

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ing material, glossary, even addresses of conservators and conservation centers. But the most valuable item is the complete code of ethics and standards of practice of the AIC. It says it all.

My main complaint with this book is its poor photography. Fortunately the very descriptive text allows you to avoid puzzling over confusing black-and-white plates. The book is well worth the price, and is a must for anyone concerned with the philosophy of historical preservation, and who cares about the physical integrity of our cultural heritage.

—Michael Sandor Podmaniczky

How to Carve Wildfowl by Roger Schroeder. *Stackpole Books, Cameron & Kelker Sts., PO Box 1831, Harrisburg, Pa. 17105, 1984. $39.95, hardcover; 255 pp.*

With 800 black-and-white photos and 16 pages in color, this book is a tour of the workshops, methods and work of nine of the leading decorative-wildfowl carvers of the day, practically every major carver who enters competitions and hasn't yet written a book of his own. Author Schroeder compares and contrasts the work of Eldridge Arnold, Larry Barth, Lynn Forehand, Larry Hayden, Ernest Muehlmatt, Anthony Rudisill, John Scheeler, James Sprankle, and Gary Yoder, who between them have won an estimated 700-plus ribbons, at least 80 of which are for the coveted Best-in-Show.

Although these men have some techniques in common, the main lesson of the book is how different their approaches often are. An aspiring carver will get the idea right away: There is no one right way to achieve quality; what *is* required is the urge to do excellent work, by whatever means the imagination provides. Schroeder's text, although rich in practical ideas, is not merely a how-to. It is also an inspiration in the way that it illuminates the prime motive in decorative carving today: It is no longer enough to carve a pretty replica of a bird; the masters are aiming to capture the bird's living essence, and the flavor of its environment, too.

—Jim Cummins

Waterfowl Carving, Blue Ribbon Techniques by William Veasey with Cary Schuler Hull. *Schiffer Publishing, Box E, Exton, Pa. 19341, 1982. $35.00, hardcover; 272 pp.*

Bill Veasey gave a series of carving seminars to 20 beginning students two years ago, then encouraged them to enter their work in six Eastern competitions. The result was a total of 97 ribbons, more than a few of them blue. There is no such thing as the last word in the snowballing world of wildlife art, but Veasey's book, which proceeds through 11 projects by means of 500 black-and-white photographs, nearly 300 drawings and 65 color plates, will certainly get anybody well on their way. Perhaps on their way to a ribbon or two of their own—the book has a chapter on how to enter competitions, and even lists addresses for the major ones.

Companion volumes are Veasey's book on waterfowl painting, and his daughter Tricia Veasey's photographic reference book of wildfowl in typical poses, which also has many detail shots of live birds and stuffed ones. These volumes are available from the same publisher.

—Jim Cummins

Michael Sandor Podmaniczky is a boatbuilder and furnituremaker in Thomaston, Maine. Jim Cummins is an associate editor of this magazine.

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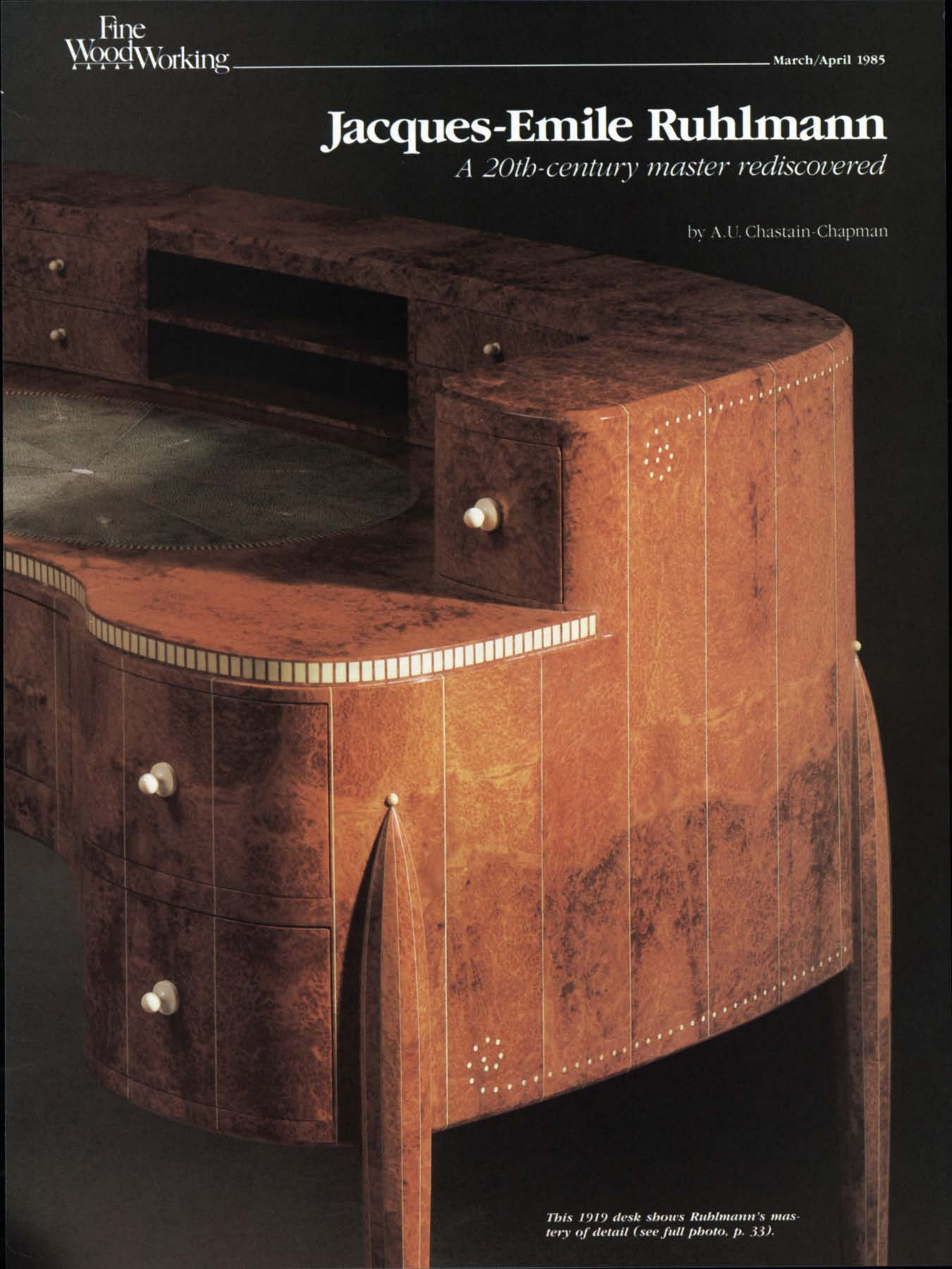
Fine WoodWorking March/April 1985

Jacques-Emile Ruhlmann

A 20th-century master rediscovered

by A.U. Chastain-Chapman



This 1919 desk shows Ruhlmann's mastery of detail (see full photo, p. 33).

Sixty years ago, Jacques-Emile Ruhlmann's furniture was the star attraction at the Exposition Internationale des Arts Décoratifs in Paris. A World's-Fair-size show, the 1925 Expo popularized the group of styles we now collectively call Art Deco after the exhibition. Today, after years of neglect, designers and furnituremakers are taking a fresh look at Art Deco and particularly at the work of Ruhlmann, which is inspiring for both its elegant lines and its masterly craftsmanship.

From his success at the Expo, Ruhlmann became known as *the* Art Deco designer. But the label is questionable. The thrust of Art Deco design was toward novelty, exoticism and color, while Ruhlmann looked back to the French neoclassical tradition and was notably restrained in his use of color, almost always confining himself to the palette offered by wood veneers, and ivory and silver embellishments. Compared to Ruhlmann's mature work, the polychromatic, jazzy furniture of other major designers of the period appears bizarre in form and garish in color.

Ruhlmann attacked as "puritanical" the simple, solid-wood Arts and Crafts furniture popular around the turn of the century. He had little sympathy for the socialist dreams of William Morris and the utopian program of his Modern Movement contemporaries. He stated his case succinctly in a magazine interview in 1920: "A clientele of artists, intellectuals and connoisseurs of modest means is very congenial, but they are not in a position to pay for all the research, the experimentation, the testing that is needed to develop a new design. . . . Only the very rich can pay for what is new and they alone can make it fashionable. . . . Fashions don't start among the common people. Along with satisfying a desire for change, fashion's real purpose is to display wealth."

Accordingly, Ruhlmann set out to woo the wealthy away from costly, veneered antiques, and toward costly, veneered modern furniture. He succeeded spectacularly, ushering in the only era in modern times during which the most expensive new furniture was more highly priced than the costliest antiques. Ruhlmann became a style-setter, a celebrity moving in wealthy circles.

Ruhlmann was not a trained cabinetmaker. He grew up in his family's flourishing painting and decorating business, and apprenticed as a decorator with other firms. Soon after 1900, he designed his first pieces of furniture, in the Art Nouveau style, for himself, family and friends. He first publicly exhibited furniture in 1910, at the age of 31. By 1913 his work showed the influence of the Wiener Werkstätte (innovative architects and designers working in Vienna at the turn of the century), from whom he seems to have taken what would become two of his favorite decorative devices: rows of marquetry dots, and edgings of inlaid squares that create a mock dentil effect. A 1914 sketch by Ruhlmann shows plain, chunky, Arts and Crafts furniture, but by 1916 he had assimilated the formality and elegance of French neoclassical furniture of the late 18th century and was designing in the mature style for which he is best known.

Ruhlmann had taken over the family business when his father died in 1907. After World War I, he left the operation of the highly successful house-painting division, which employed 500 people, to a partner. He established himself, at a new address, as an *ensemblier,* a designer of interiors and all they contain: paneling, wallpaper, light fixtures, furniture, fabrics, rugs.

Though Ruhlmann was famous in the 1920s for his furniture, he ran a design studio and interior-decorating workshop, not a cabinet shop. Records from the Ruhlmann archives recently published in France (see box, p. 32) show that until 1923 he depended on custom-cabinetmaking shops in Paris to execute his designs. The legend was, and is, that he was a great wood craftsman; the fact may be that he never made a piece of furniture in his life. In 1923, near the height of his fame, he set up his own workshop, with six or eight cabinetmakers and the most up-to-date woodworking machinery, including spraying equipment for the recently developed nitrocellulose lacquers. About machine production, Ruhlmann remarked that "nothing that can be made by machine should be made by hand," and noted that modern furniture relied for its decorative effects not on carving but on the veneering of plain carcases most easily built using machinery. By 1927, Ruhlmann's in-house furnituremaking had been divided between two workshops employing a total of three machinists, twenty-seven cabinetmakers (who spent the bulk of their time cutting and applying veneers and marquetry), four finishers, a dozen upholsterers and a couple of apprentice cabinetmakers. During the same period, he was employing about twenty-five designers and draftsmen, most of whose work must, clearly, have been in areas other than furniture design. Meanwhile, those five hundred housepainters labored on, providing the income that allowed the furniture and interior-design business to continue. The sad fact is that although Ruhlmann's furniture commanded extraordinarily high prices, it was not profitable and he sometimes sold pieces below cost rather than forgo the opportunity of making them.

How Ruhlmann and his men produced furniture can be glimpsed from drawings that survive today. A good example is the David-Weil desk (shown on the facing page and on p. 33), a masterpiece made in 1918-19 for David David-Weil, a renowned French collector of 18th-century art. David-Weil was accustomed to working at a kidney-shaped 18th-century writing table with a superstructure of drawers and pigeonholes characteristic of the type called Carlton House tables. From Ruhlmann he wanted a writing table of modern design that would both fit in with his 18th-century collection and allow him to arrange his papers in his habitual way. Ruhlmann's preliminary sketch (drawing, bottom left, p. 33) shows the retention of the kidney shape and four of Ruhlmann's characteristic torpedo-shaped legs, and it suggests the main features of the decoration.

In developing a design, Ruhlmann usually drew plan, elevation and cross-section studies based on his rough sketch, then a $\frac{1}{10}$-scale drawing. Although small and drawn freehand, the scale drawing contained nearly all the information needed by his draftsmen to make full-scale working drawings, which might be further modified before going to the cabinet shops.

The most striking transformation of form that Ruhlmann made in designing the David-Weil desk was the marrying of table to superstructure. In 18th-century designs, the separateness of these parts was emphasized by moldings and, often, by setting the superstructure back from the edge of the table. But Ruhlmann made the sides of the table and superstructure continuous, and streamlined the front of the superstructure so that it echoes the table's kidney shape, flowing the curve of the front seamlessly into the sides. More subtly, Ruhlmann used ornament to help unify the design. The ivory mock-dentil edge of the writing surface stops at the junction of table and superstructure rather than continuing along the sides and around the back as on an 18th-century desk. The horizontal rhythm established by the even spacing of vertical ivory inlay lines across the front of the desk isn't broken by the superstructure, but continues along the sides and around the back. Moreover, these lines continue across the chamfering at the top and bottom edges of the desk, tricking the eye into perceiving the veneered casework as made

Color photos, except where noted: The Metropolitan Museum of Art, Purchase, Edgar Kaufmann Jr. Gift, Bequest of Collis P. Huntington, Bequest of Mr. and Mrs. Graham F. Blandy, Bequest of Jeanne King de Rham, in memory of her father, David King, and Gift of Vera Bloom, in memory of her father, Congressman Sol Bloom, by exchange, 1973.

Ruhlmann in the shop

EDITOR'S NOTE: In her book, *Ruhlmann: Master of Art Deco,* Florence Camard recounts talks with two cabinetmakers who worked in Ruhlmann's shops. (Available for $52.50 ppd. from Harry N. Abrams, Inc., Special Sales Dept. 10, 100 Fifth Ave., New York, N.Y. 10011.)

Ruhlmann, c. 1928.

When the large-scale drawing revealed technical difficulties, Ruhlmann was rarely willing to abandon refinements. . . . He loved perfection and to him the chamfering of a hidden rail did not seem superfluous. He would not let himself be limited by his lack of understanding of the craft, and he became interested in practical solutions and enjoyed the workshop. However, if he called Jules Deroubaix, one of his best cabinetmakers, over from the rue d'Ouessant where the shops were, it wasn't to get technical advice but to make sure the execution of a piece was conforming exactly to his designs. "Your craft is holding you back!" Ruhlmann replied to every objection. Many years later Deroubaix admitted that, "Almost always it was he who was right. His being a perfectionist who did not know how to work with his hands forced us to innovate, challenged us to find workable solutions."

. . . "We might work at the same elaboration, the same detail, for days and weeks," cabinetmaker Raymond Lautelin recalled. . . . "Until we got exactly the desired effect, we kept starting over again! And then, suddenly, he said to us: 'Don't touch a thing, it's perfect!' His eye was infallible, his judgement supreme." □

of solid, coopered boards. Finally, the eye passes easily along a diagonal between two spirals of ivory dots, one on the superstructure, one on the table, further binding together the parts.

Comparing the initial sketch and the completed desk, two important changes can be seen. First, the sketch shows inlaid shagreen (polished sharkskin) on top of the superstructure as well as on the writing surface, which would have given a less solid appearance to the superstructure and reduced the visual unity of the whole. Second, there are no spirals of dots in the sketch. The two horizontal inlay lines shown in the sketch run around the fronts of the superstructure and the table in a way that suggests two separate masses rather than one.

A table bounded by a continuous curve presents the problem of how to attach the legs. The typical late-18th-century solution was to mount tapered legs of square section with their outer faces tangent to the curved surfaces and slightly proud of the apron, their top ends abutting the underside of an overhanging tabletop. Ruhlmann's desk does not have an overhanging top and, moreover, is so thoroughly curvilinear that square legs would have looked out of place. His solution was faceted torpedo legs, a form he seems to have invented. Round enough in section and curved enough in profile to harmonize with the design, they are sufficiently narrow that they do not disrupt the rhythm of the vertical ivory lines. Like Gothic arches, they force the eye upward, coming to a full stop with a small ivory sphere, which also sets the height of the drawer pulls. It is all very rational.

Thoughtful contemporary critics praised Ruhlmann's furniture for this kind of purity and simplicity of form. The general public seems to have been impressed primarily by the richness of the materials—exotic veneers, shagreen, ivory, silvered bronze—and by the high quality of the craftsmanship. Given Ruhlmann's flair for self-publicity, there was, no doubt, a certain amount of hype behind the talk of "costly materials, consummate workmanship" that appears repeatedly in published descriptions of his furniture during the 1920s. Present-day woodworkers also know that it is easier to sell a piece of furniture by talking about its unusual wood, neatly executed joinery and hand-rubbed finishes than it is to sell it as good design. Ruhlmann's furniture, however, lived up to the claims. The materials were indeed costly, and the workmanship is superb.

To Ruhlmann, the artisan's task was to build what the designer had drawn, nothing more and nothing less, and he paid daily visits to the workshops to make sure his designs were being executed accurately. He did not fully trust his draftsmen, and constantly checked work in progress against his original sketches. He was demanding. This approach raises questions about the details of his work. Did he or one of his artisans decide the precise thickness of the ivory bands in the David-Weil desk? Should the subtle shading achieved along the desk's sides by the careful selection of the amboyna (the name given to padauk burl) veneer, an effect unlikely to have been suggested in even a detailed working drawing, be credited to Ruhlmann or to his veneerers?

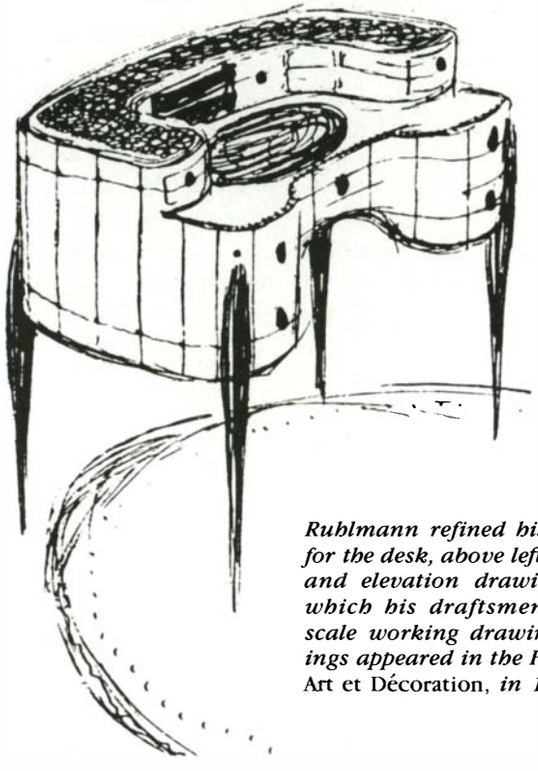
Finely made furniture was not uncommon in the Paris of Ruhlmann's day, where there were still plenty of cabinet shops in which high-grade handwork was produced. What was it, then, that set the craftsmanship of Ruhlmann's pieces apart? It wasn't the construction (standard joinery seems to have been the rule—see p. 35), but rather the fineness of the furniture's ornamentation. Each facet of each leg of the David-Weil desk, for example, is separated from its neighbor by an ivory fillet no more than 1/32 in. wide. Each of these ivory hairlines is accurately cut and set, not onto a surface as with most marquetry embellishments, but into the arris where the facets meet. And to compound the difficulty, the arris is not a straight line but an accelerating curve. The marquetry vase of flowers on the door of the cabinet shown on the cover is made of ivory perfectly matched for grain and color, and flawlessly fitted together. Such elaborate exercises were not unknown in the 19th century, but were seldom attempted as late as the 1920s. In Ruhlmann's work, they were commonplace. Handwork this highly regulated and complicated was immensely time-consuming and, consequently, expensive. A Ruhlmann bed made in 1924 took 2,000 hours to make and was priced at 79,000 francs—enough to buy a decent-size house.

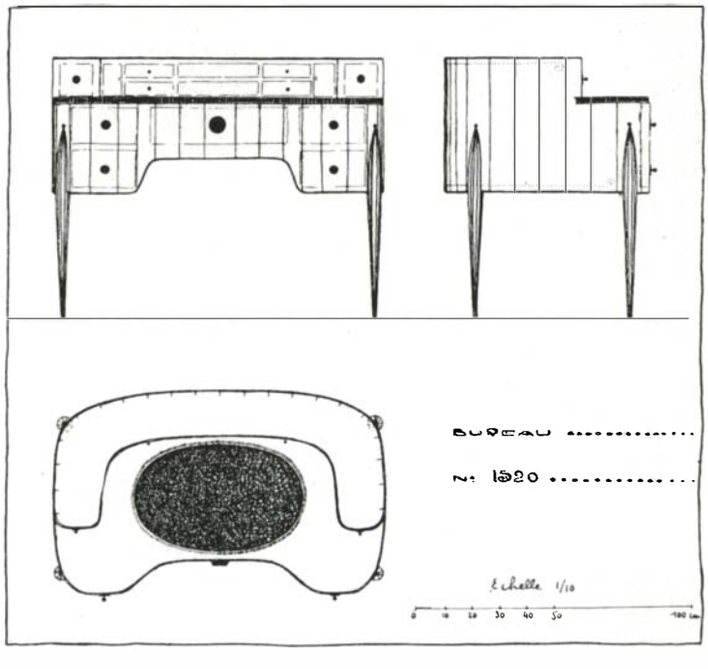
Ruhlmann's work is equally noteworthy for its complicated veneering. He believed that solid-wood construction restricted the imagination of the designer, whereas veneering allowed him to create whatever he liked. After all, as he said, "there is no luxury without fantasy."

In his choice of veneers, Ruhlmann was careful not to allow the figure of the wood to vie for attention with the form of the furniture. His two favorite veneer woods were Macassar ebony, which is evenly marked with straight, parallel stripes, and amboyna, which is remarkable for its small, evenly spaced rings and swirls. Both woods create a strong, decorative, overall background pattern; neither has a figure that focuses attention on itself. Ruhlmann wanted the veneers to give color and texture to the forms he created, nothing more.

In spite of its roots in the 18th century, Ruhlmann furniture

With its spectacular amboyna veneer, ivory pulls and inlay, and torpedo legs, the David-Weil desk is quintessential Ruhlmann. The chair design, where the back rail, arms and legs are combined in one sweeping and surprisingly sturdy curve, also appeared in numerous versions throughout Ruhlmann's career.





Ruhlmann refined his original sketch for the desk, above left, in 1/10-scale plan and elevation drawings, right, from which his draftsmen produced full-scale working drawings. These drawings appeared in the French magazine, Art et Décoration, *in 1920.*

Christie's, New York

This amboyna armoire of the mid 1920s is one of a series of such pieces made over a number of years. Fine ivory lines are inlaid in the doors and sides, and the doors curve gracefully across their width. The inside of the armoire is lined with oak, and a short stack of oak drawers is slipped into about the bottom quarter of the carcase.

designed between World War I and the mid 1920s is distinctive, idiosyncratic even. A collection of Ruhlmann's preliminary sketches published in the 1920s shows an astonishing number of individual pieces, all very much in the characteristic Ruhlmann manner. Ruhlmann's trick, if that is the right word, for producing so many one-of-a-kind designs was to combine the elements of his personal design vocabulary in fresh ways for each new piece. Legs, for example, are usually slender (sometimes to the point of emaciation), tapered and curvilinear. Sometimes they're torpedo-shaped, sometimes they're of a simplified cabriole form. At the top they stand proud of the casework; at the bottom they're shod with silvered-bronze or ivory slippers. Tabletops are conceived as shallow, slablike boxes that contain drawers. Armchairs sometimes take the 18th-century gondola form, in which the back curves down to form the arms. Ruhlmann developed the gondola form further by running the arms seamlessly into the front legs. An exhaustive list of Ruhlmann's design elements of the early 1920s would not be very long, and it seems to be possible, starting from any Ruhlmann design of the period, to trace a rich variety of ancestors, collateral relatives, and progeny.

By 1924, Ruhlmann was talking about serial production in which each piece within a series would be slightly different from its predecessors and nearer to the ideal. Although he presented this as a new departure, he had in fact been working in this fashion on a limited scale since 1920. One series that Ruhlmann developed was composed of small armoires. The armoire at left, made in the mid 1920s, is a slightly stripped-down version of earlier pieces that featured more elaborate inlay. It seems likely that, far from seeking the ideal version of his basic armoire design, Ruhlmann was making furniture to a price, and found it economical to standardize the casework and simplify the embellishments. As the decade wore on, Ruhlmann seems to have evolved from designing one-of-a-kind showpieces for the immensely rich to providing furnishings for the merely wealthy. An entry in the journal of one of Ruhlmann's cabinetmakers mentions the abandoning of the famous torpedo-shaped legs—they were too costly, each taking more than sixty hours to make. Masterpieces such as the David-Weil desk and the flower-vase cabinet all date from 1916 to 1920. It can be argued that by 1925 and the height of his fame, Ruhlmann the designer was well past his peak.

Ruhlmann had also to contend with the Modern Movement and its contention that luxury and decoration were, somehow, sinful. Though the light, airy, Modern Movement style was largely reviled in 1925, by the late 1920s it was the coming thing in progressive circles. Ever conscious of fashion, Ruhlmann now became an uneasy adapter of others' styles. Almost as if in mockery of the Modern Movement, Ruhlmann also purveyed simplicity, but on a massive, and therefore expensive, scale. His furniture of this period is rectangular and strongly horizontal. Sideboards, vitrines and bookcases stand on big, solid plinths, tables on heavy, lyre-shaped pedestals or heavy and undecorated legs. The effect is often of misplaced luxury and therefore of vulgarity. Macassar ebony, delicately relieved with ivory and applied with sensitivity to a small cabinet could be, in Ruhlmann's hands, exquisite. Wallpapered over a 9-ft. long, boxy sideboard, the same material becomes both tasteless and boring.

With the ascendancy of the Modern Movement in Europe in the 1930s and in America after World War II, Ruhlmann's work was deprecated. An authoritative book published as recently as 1977 says that "Ruhlmann was astonishingly quick in exploiting (and debasing) the cubist International Modern style for the luxury market." The opposite, as we have seen, is nearer the truth. Ruhlmann was slow to adopt the Modern style and, when he did, it debased him rather than he it.

Interest in Ruhlmann has grown steadily since the 1960s, and his reputation is being restored along with his furniture. For many contemporary furnituremakers, brought up on a combination of Arts and Crafts and Modern Movement ideas (designer as craftsman, truth to materials, less is more, and so on), the decorativeness, the extravagance, the sheer unabashed luxury of Ruhlmann's work presents a barrier to its appreciation. Overcoming this, we may begin to enjoy the combination of inventiveness, rationality and sobriety that characterizes his best designs, as well as the superior execution, and (this is easily forgotten) the furniture's practicality. Ruhlmann built furniture to be used, not just to be looked at. Beyond all of this it may be instructive to ponder Ruhlmann the businessman. He was able to cultivate a clientele willing to pay the highest prices, not for art masquerading as furniture, but for furniture itself. □

Tony Chastain-Chapman designs and builds furniture in Northfield, Mass.

Restoring Ruhlmann

Getting under the veneer

by Nick Monjardo and David Parson

We have restored furniture by most of the major 20th-century designers, but Jacques-Emile Ruhlmann's work stands apart from the rest. The first Ruhlmann pieces started trickling into our shop about six years ago; now Ruhlmann takes up more than half our time. By restoring dozens of his pieces, we've gotten to know Ruhlmann in a way that not many people do—from the inside out. And we've found the furniture to be as soundly made as it is superbly designed.

Unlike the Arts and Crafts designers, Ruhlmann saw no virtue in expressing structure, so it's not readily apparent what's beneath those subtly curved, seamless surfaces. It takes prodding and poking to discover these secrets—activities not encouraged by galleries or museums. Each restoration, however, requires that we examine the piece closely; occasionally a piece will require major work, but even a minor repair can reveal something new.

Ruhlmann was an innovative designer, not a technician. He knew what he wanted and insisted that it be produced. Technical innovation, therefore, was called for only where the methods familiar to the craftsmen wouldn't produce the desired effect. We've found that for the most part the furniture is constructed with traditional joinery.

Though the joinery might be straightforward, Ruhlmann's carcase pieces are among his most spectacular works. Large carcases frequently have oak frames top and bottom, with separate tops and plinths attached. Carcase sides, tops or plinths are veneered over lumbercore (most often pine or poplar with ⅛-in. mahogany crossbandings) or directly onto solid wood, usually oak. Curved carcase parts and doors are either lumbercore with a coopered core, or veneer over shaped solid oak. (The curved carcase of the David-Weil desk on p. 33, for example, is most likely constructed of lumbercore.) Legs are solid show wood or veneer over oak; drawers are standard hand-cut dovetail construction.

Not all Ruhlmann is exceptional. We recently worked on pieces built at the beginning and at the end of Ruhlmann's career, and they don't stand comparison to his best work. In fact, the early pieces, a pair of night tables dating from about 1910, look like they were among the first pieces produced (perhaps built by Ruhlmann himself). Each table is an oval-shaped cylinder that rotates on a rectangular, scrolled plinth. The curved, form-laminated, 11-ply sides, veneered on both faces with 1/16-in. thick ebony, are the only structural use of plywood we've seen in Ruhlmann furniture. The sides are splined to a false stack of drawers. The stack is actually a solid block of oak, 2 in. at its thickest, shaped to a tight curve; the ebony veneers are glued at right angles to the oak grain. The oak has checked severely, but the ebony is intact. The real drawers are startling—the fronts, sawn to an 8-in. or 9-in. radius from solid ebony, were face-veneered, then rabbeted to take solid-ebony drawer sides, which are nailed in place. The drawer backs and bottoms are rosewood.

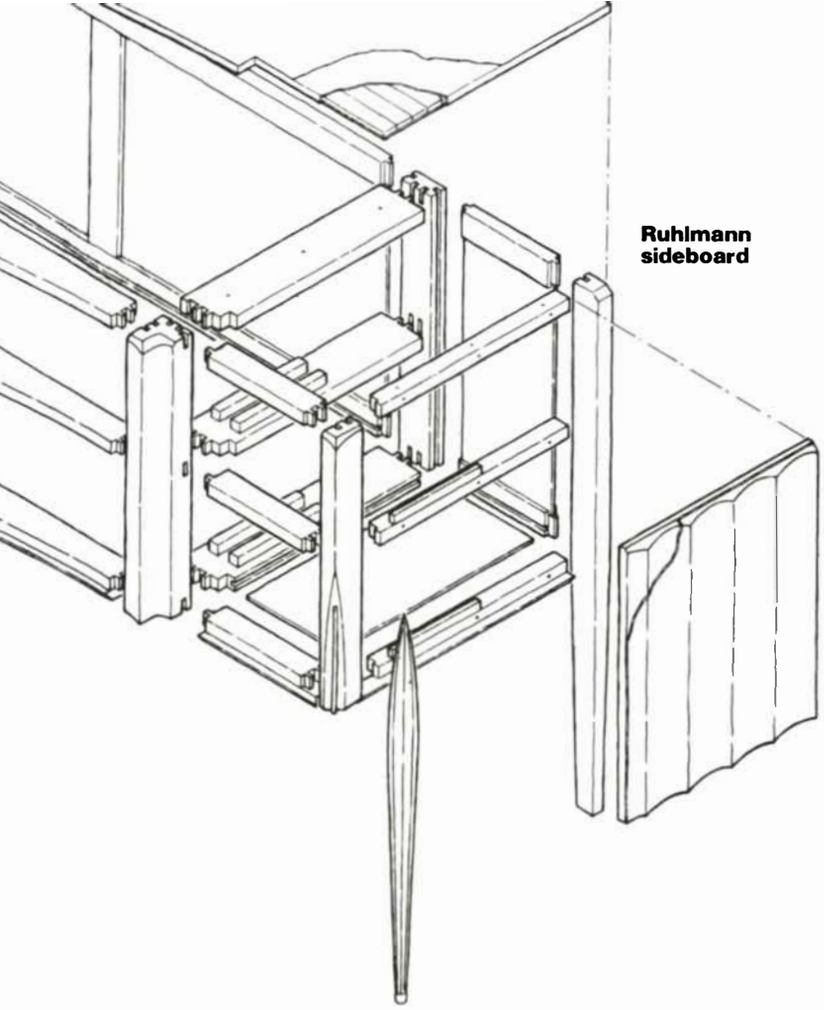
While the night tables are exuberant but crude, a desk built just before Ruhlmann's death seems plain and structurally straightforward. The two drawer pedestals are linked by a common back and a center drawer. This carcase rests on a plinth and supports an overhanging top. The carcase sides are ¾-in. lumbercore, face-veneered with ebony on the outside only, not balanced. The sides are splined into solid-ebony corner pieces, shaped to a tight radius. Rails separating the drawers are oak, with vertical ebony veneer on their outside edges; the drawer runners are oak, about ¾ in. on a side, and are nailed to the carcase sides.

The desk is of much lighter construction than earlier, similar pieces. As Ruhlmann progressed, he reduced the sizes of the components, and used more machine joinery. An earlier piece, made during the height of his career, would have had thicker carcase sides and top; the runners would have been part of a frame, probably dadoed into the sides; the sides would have been doweled rather than splined to the corner pieces; and so on. It's like looking at a 1950s Rolls Royce and a 1980s Rolls Royce—it's the same people making the same product, but the weight and the quality are in the earlier model.

It's the early pieces we like best, particularly the ones before 1920. These are the most experimental and innovative. They have an off-the-sketchboard, prototype look. Ruhlmann was searching for a form and he took chances, so there's a flaw here or there, and the tolerances aren't as fine as on later work. By the early 1920s, the forms were established, the pieces were slicker. Ruhlmann and his cabinetmakers had gotten it down pat.

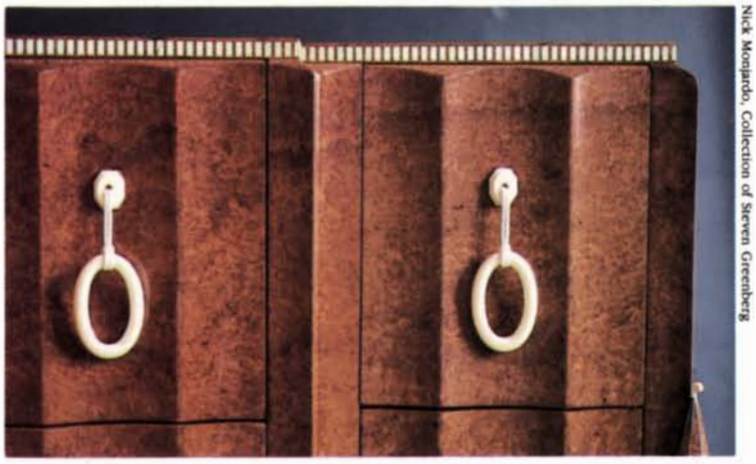
An excellent example of early Ruhlmann is the sideboard shown on the following page. Made in about 1914, this is one of the first, if not the first, of a number of similar sideboards. Other models are veneered in ebony and rosewood; very late ones have chrome handles and a stainless-steel band instead of dentils. The construction is characteristic of many large Ruhlmann carcase pieces. The sides are solid oak, more than 1 in. thick, fluted and then veneered with amboyna—the top ends of the flutes are veneered right over the oak end grain. The grain of each side runs vertically, and a thick stile and the back leg are glued onto the edges. The show faces of the back leg are veneered with amboyna. The torpedo leg (oak, shaped and veneered with amboyna, with arrises inlaid with ivory) is probably doweled or loose-tenoned to the shaped recess in the front stile.

The drawer fronts are also thick quartersawn oak; the flutes are



Ruhlmann sideboard

Ruhlmann's 1914 sideboard is amboyna veneer over a solid-oak carcase. No single member runs from end to end of the cabinet, yet the construction is rigid. The drawing above is based on close inspection of the piece, but some joinery had to be guessed.



Nick Monjardo, Collection of Steven Greenberg

Brian Gulick, Collection of Steven Greenberg

Brian Gulick, Collection of Steven Greenberg

Ruhlmann designed numerous versions of the dressing table. This one is amboyna veneer over solid oak. The trompe l'oeil doily is ebony and ivory, the lines and dots are ivory.

Nick Monjardo prepares a late Ruhlmann desk for polishing after the last coat of finish has cured.

Drawing: Lee Hov

worked across the grain and veneered with amboyna. Drawer sides, backs and bottoms are mahogany. The top is amboyna over ½-in. lumbercore, doweled and screwed to a top frame of oak rails and stiles that is itself mortise-and-tenoned into the ends, as is a similar bottom frame.

These frames, which connect the two ends, are unusual—no single member runs the cabinet's entire length. The center section containing the large drawers is one unit, almost a carcase unto itself. Long rails are double-tenoned into substantial oak posts at each corner of the section; short rails connect the posts front-to-back. The ends of the carcase are connected to the center section by rails mortised into the corner posts. When we got it, the cabinet was sagging about ⅜ in. in the middle, and at first we blamed the eccentric construction. Then we discovered that after the piece was built, someone had glued all the loose panels in place, and the resultant stresses had caused the buckling. After we got everything to be as it should, the carcase was rock-solid.

As accomplished or unusual as the structure of a cabinet may be, it was surface and line that most concerned Ruhlmann. The veneer selection and matching on all of Ruhlmann's furniture is superb. The figure is subdued, the patterns subtle. When we were working on the top of the sideboard, for example, we couldn't discern the pattern on the top until we laid the cabinet on its back and stood at a distance. All the Ruhlmann veneer work that we've seen is hide-glued, probably hammered, caul- or bag-pressed according to need. The veneer has held up amazingly well; even veneers laid directly on the end grain of a substrate seldom need repair.

Some of the veneer work is amazing. On the sideboard, for example, the cabinetmaker butted the veneer spanning each flute against 1/16-in. wide strips of amboyna veneer laid on top of the arrises, rather than have the seam fall on the arris. On several other pieces, tiny quarter-round moldings of about ¼-in. radius are veneered with amboyna. These might have been bent on a hot pipe, then glued with cauls, but we have no way of knowing for sure. The photos on pp. 30 and 33 show how fussy the veneer work on torpedo legs (amboyna over oak) must have been—we don't doubt that each leg took at least a week to make, probably longer. Ruhlmann repeatedly used a stretched cabriole leg, which was often veneer over oak, as in the armoire on p. 34. On the small dressing table shown on the facing page, the columnar front legs are amboyna over oak. A seam runs vertically up the back, but the final couple of inches of veneer at the top is spiraled around, possibly a way of handling the reduced diameter.

The ivory work is no less painstaking. The arrises on the faceted torpedo legs are often inlaid with ivory, thin strips extending into the oak. Two other characteristic Ruhlmann ivory details appear on the sideboard: inlaid dots, and ivory and amboyna mock dentils. Each ivory dot is a different size, each was scribed and fitted individually. Likewise, each ivory tooth in the dentil is different, and every dentil we've seen is different from every other. It seems likely that a strip of dentil, alternating amboyna and ivory, would have been laid up on tape, then applied to the cabinet.

Perhaps Ruhlmann's most impressive use of ivory is on three large cabinets where amboyna veneer is inlaid with overlapping, irregular circles of ivory. Each circle is an outline made of thin ivory strips. On one of the cabinets, the ivory is uniformly thin, so the grooves may have been cut with a double-knife tool with the knives set a fixed distance apart. The ivory was bent to fit by chemical softening, not by heat. On the other two cabinets, however, the ivory lines themselves are irregular, as though transverse sections had been cut from ridged, hollow tusk, so each of the hundreds of circles had to be scribed and fitted individually.

One of the important elements of Ruhlmann's style is the finish. Some of the designs are so well articulated with subtle decorative embellishments that if the finish didn't complement the form and the veneer, the piece would go unnoticed. Unfortunately, so much of Ruhlmann's work has been repolished that it's hard to tell what the original finish was. It seems likely that it was primarily shellac-based French polish, though we've seen an early Ruhlmann piece with an original oil-based varnish finish. Ruhlmann is also reported to have sprayed nitrocellulose lacquer from at least the mid 1920s. The sprayed lacquers were applied over opaque colored finishes, not over natural-wood finishes. (Some of the most important pieces of Ruhlmann furniture are those finished in collaboration with the master lacquerist Jean Dunand.) The problem with shellacs and lacquers is that they tend to dehydrate the wood, and bleach it over time. We will frequently get a piece that at a glance looks like walnut, only to realize on closer inspection that it's rosewood. So when we refinish, we use oil-based varnish finishes, which amber slightly with age, looking like perfectly preserved original finishes within about a year.

Our finish-preparation procedures are probably much like those used by Ruhlmann's finishers. After sanding the raw wood with 120-, 220- and 320-grit papers (220-grit and finer on veneers), we apply an oil paste filler—though Ruhlmann did not use fillers. Once the filler has cured, we pad on the first coats of finish with a sponge pad. Each of some 10 coats is allowed to dry a minimum of 48 hours (the longer the better), then is sanded before the next coat. Final coats are sprayed and lightly sanded. Then hand-polishing begins. We use an oil- and water-based ready-mixed polishing compound that's finer than any pumice we've found. We know we've polished enough when we can read the printing on the reflection of a light bulb on the polished surface. We like to repolish after six months or a year, when the finish has matured and absorbed as much as it's going to. We want our finishes to appear as though the piece's original condition were preserved.

Though Ruhlmann's pieces are for the most part beautifully made, perhaps the most impressive aspect of Ruhlmann for us is his mastery of form and line. The furniture is often very large, and yet it almost always appears light and graceful. Ruhlmann worked and reworked the same shapes, perhaps none so frequently as a stretched ogee or French curve, seen repeatedly in the legs and carcase curves. Ruhlmann takes this curve to the extreme; stretch it another fraction and you lose it. It's that fraction that makes the difference—his imitators never mastered it.

To carry off such designs, Ruhlmann demanded and got meticulous execution. There are no ripples under the veneers of even the most tightly curved doors or carcases; though hand-shaped, the delicate curves of legs in the same piece are strikingly uniform. Joinery is well executed, but not fussy; if a surface is meant to show, it is immaculate; if not, it is clean and neat, but not overworked. And Ruhlmann's furniture works—we've yet to find a drawer or door that didn't open, regardless of how close the fitting tolerances. Ruhlmann wanted to build the best furniture in the world. As far as we're concerned, he did. □

Nick Monjardo and David Parson work at Decorative Arts Restoration near Great Barrington, Mass. Monjardo, who started the firm in 1976, trained in metals and finishes with Porsche-Mercedes in New York. Parson is a third-generation cabinetmaker; he designed furniture before coming to Decorative Arts in 1979.

Flip-Top Table

Double-duty design

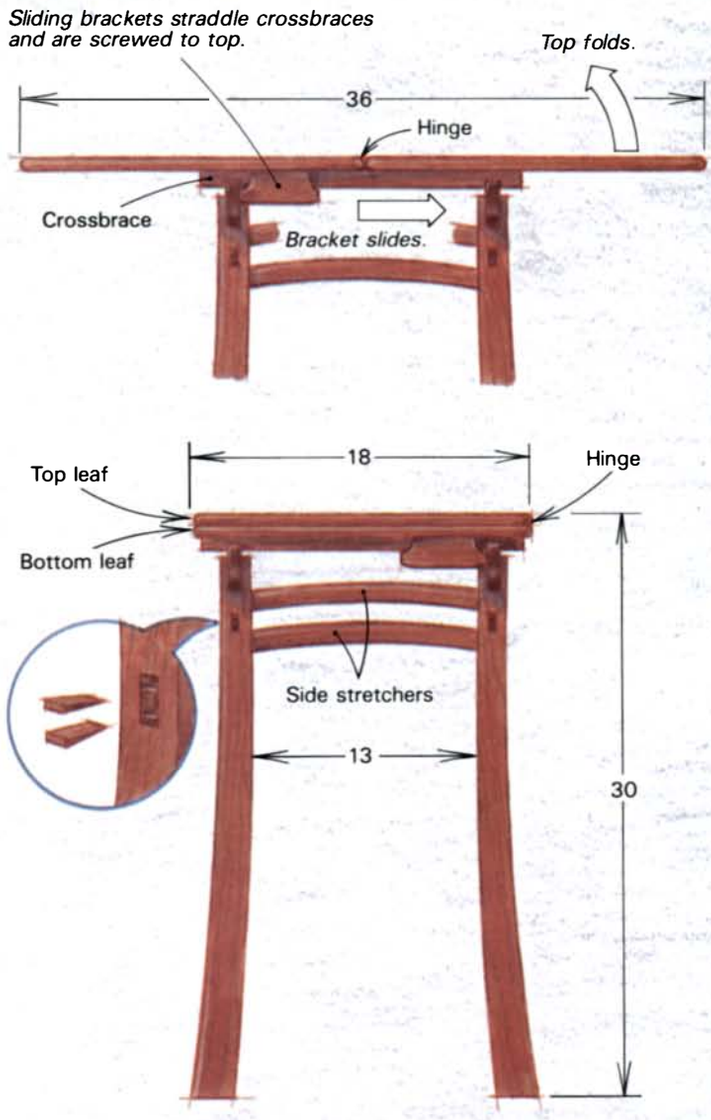
by Robert March

Ebony wedges accent the exposed mortise-and-tenon joints where the rosewood legs intersect with the front and back stretchers and the dual side stretchers. A bridle notch carries the top stretcher out to braces under the double-leaf top.

Like many contemporary woodworkers, I've been inspired by the simple elegance of Chinese furniture of the Ming dynasty (mid 14th to mid 17th century). I especially like the splayed-leg altars of the period and decided to design a multipurpose table based on this traditional form. The rosewood table I developed has a definitely Oriental flavor, but it has more exposed joinery and more curved components than the Chinese pieces. The open-up top adds a dash of versatility, allowing the table to convert from an 18-in. deep sideboard/buffet to a 36-in. deep desk or dining table.

All the exposed joints are through mortise-and-tenon or bridle joints. Visually these joints are most important where the legs intersect with the long front and back stretchers and the dual side stretchers. Three stretchers tenon into each leg, while the uppermost long stretchers run through the notched legs out to braces under the overhanging top. To give the table a light, graceful feeling, I left open space between the stretchers and the top, and stopped the legs short of the upper edges of the front and back stretchers. This space also showcases the shaped brackets connecting the base to the top—two mitered frame-and-panel leaves joined with butler-tray hinges. The back leaf is stacked upon the front leaf when the table is closed. When you open the top, the brackets let you slide the top forward so that it always remains centered over its base and is unlikely to tip.

Fig. 1: Chinese flip-top table

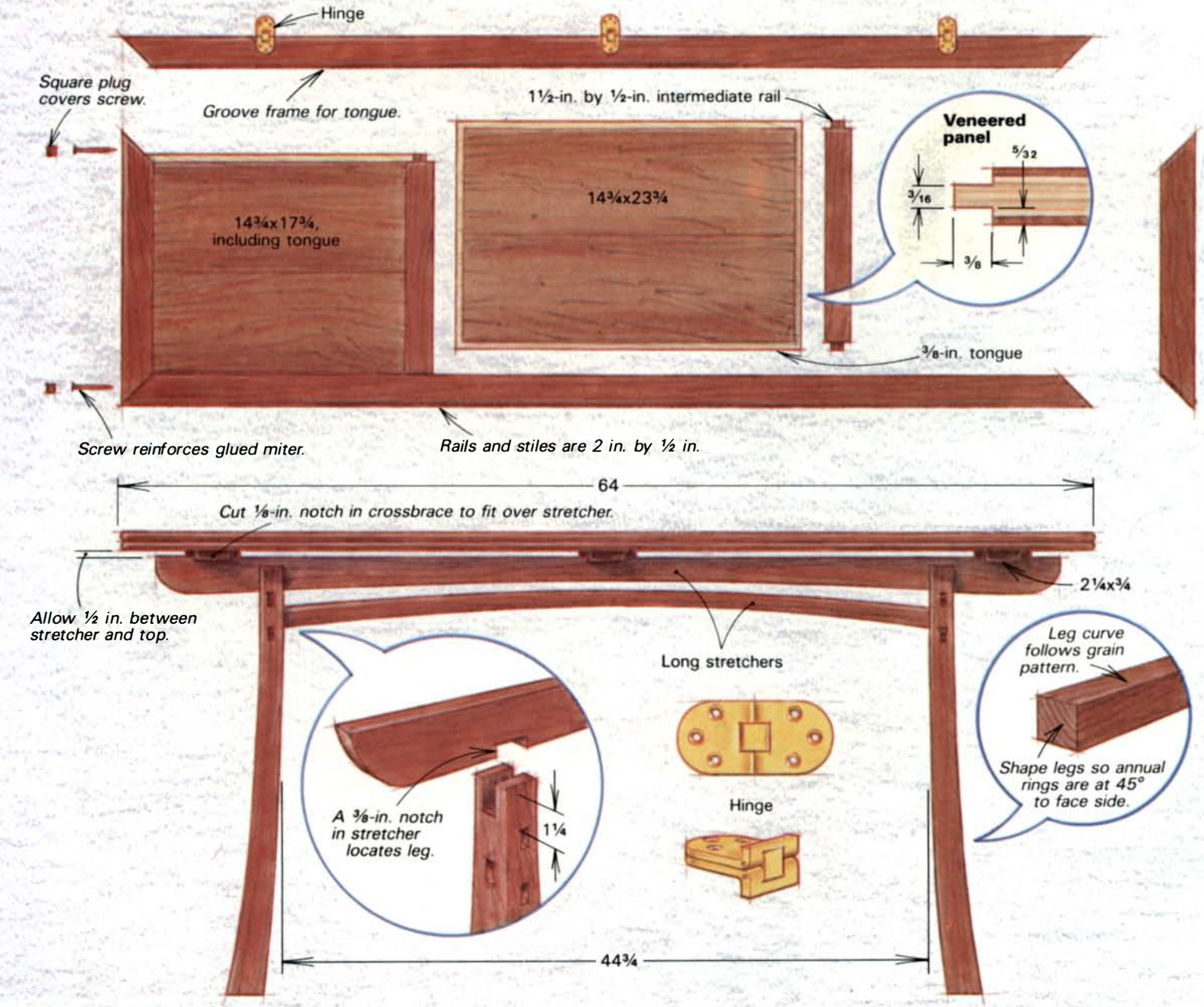


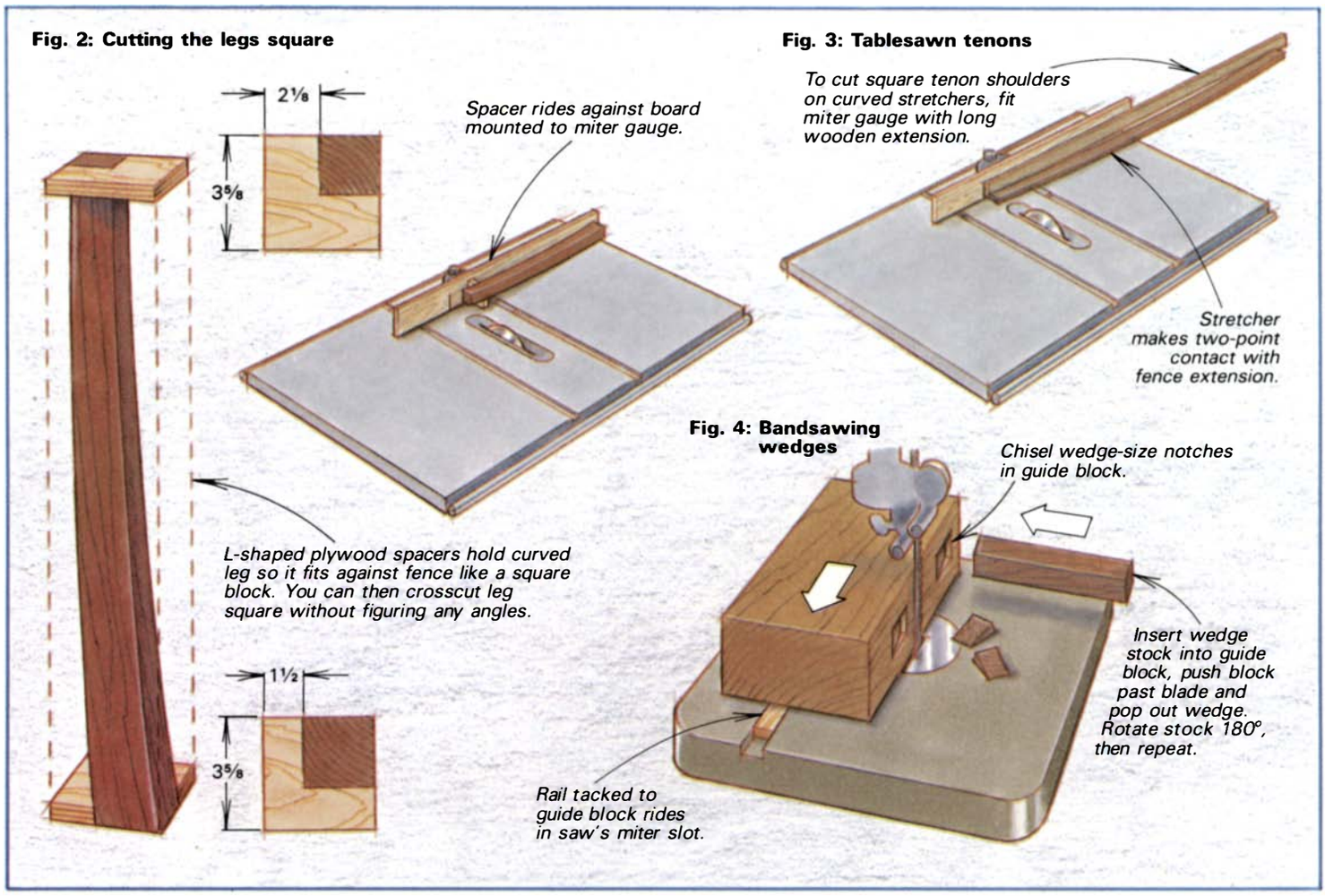
I build the base of the table first, then veneer the top while the glued-up base cures. Begin by making full-size ¼-in. Masonite templates for the legs and stretchers. Since rosewood is expensive, I save wood by tracing the templates directly onto the rough boards, rather than squaring up pieces, cutting joints and then bandsawing the curves. Generally I cut the legs from 8/4 stock and the stretchers and frame pieces from 4/4 or 5/4.

Place the leg templates so that the wood grain will follow the curve of each piece. Ideally, you should shape the pieces so the annual rings in the wood run diagonally across the ends, as shown in figure 1. To cut the legs, bandsaw the front face, then trace the template over the adjacent, now-curved face, and bandsaw that side. The final shaping is done by hand. Square up the top 4 in. to 6 in. of each piece with a smoothing plane and refine the curves with a compass plane. Next trace the stretcher templates onto the rough stock and bandsaw these pieces before surfacing their flat faces with a jointer and a thickness planer. After compass-planing their curved edges, I cut them to size on the tablesaw. At this time I also cut the crossbraces to size and surface them.

Before mortising the legs, I cut them to length on the table-

March's table folds open from 18 in. to 36 in. Sliding brackets allow the top—a Honduras rosewood frame holding panels veneered with lighter-colored Santos palisander rosewood—to be centered over its base in both the closed (right) and open positions (above).





saw, using two homemade L-shaped spacers (figure 2) that hold the end of the leg against the miter gauge and parallel to the saw table so the leg can be crosscut. I cut the ⅜-in. by 1-in. mortises with a hollow-chisel attachment for a drill press (see pp. 42-43). The mortises must be cut from the outside face of the leg because that's the only way the piece will lie flat on the drill-press table. If you don't have a hollow-chisel mortiser, chop the mortises by hand. Next notch the bridle joint in the top of the legs by standing the leg upright in a tenoning jig and clearing the ⅝-in. by 1¼-in. slot with a dado cutter. Even though the stretchers are curved, you can cut the tenon shoulders on the tablesaw. Mount a long wooden extension on the saw's miter gauge (or use a large sliding table) and hold the piece face-down with the concave curve facing the extension to cut the first shoulder (figure 3). Then flip the piece to the other side of the blade to cut the second shoulder. Cut the tenons 1/16 in. to ⅛ in. too long—you'll trim them flush after assembly. After cutting the shoulders, stand the stretcher in a tenoning jig and cut the cheeks.

The narrow top and bottom tenon cheeks and their shoulders are bandsawn. I cut the shoulders about 1/16 in. shy of the line, then use a chisel to pare them flush with the shoulders I previously cut on the tablesaw. While I'm at the bandsaw, I cut two slots, each the width of the bandsaw blade, into the tenons for the ebony wedges, which taper from ⅛ in. to 1/32 in. (figure 4).

After scraping and sanding the base parts, assemble the two ends. You can use bar clamps to pull the joints together, but place them so you can drive wedges into the tenons before the glue hardens. Because yellow glue dries slowly on oily rosewood, I leave the clamps on overnight before trimming the tenons flush. To complete the base, glue and clamp the tenons of the lower front and back stretchers into the mortises of the two ends. Be careful not to overtighten the clamps, or you'll bow the stretchers. The base is now rigid enough that you can position the top stretcher over the legs and scribe where the stretchers must be notched to fit into the leg. After cutting the ⅜-in. deep notch, I glue the pieces together and attach the cross supports as shown in figure 1.

I begin the top while the base is clamped and drying. Even though each leaf is really three separate panels held in a frame, I press one large sheet for each leaf, then cut it apart to ensure that the grain pattern will match on all three. I usually bookmatch two long, wide sheets of rosewood veneer for each side of the leaves. Since both sides are so visible, I use show veneers on both, with the flatter, "swirly" grain in the center and the more striped grain to the outside.

To joint the veneer, clamp two sheets between two heavy squared-up boards. Set the sheets so the mating edges protrude 1/16 in. to ⅛ in., then hand-plane the edges flush to the boards with a jack plane or a jointer plane. Next remove the veneer from the boards and tape the mating edges in two stages, first stretching 3-in. strips of masking tape across the seam on the inside face to pull the joint tight, then flipping the veneer sheet over and securing the face-side seam with veneer tape. Remove the masking tape before pressing the veneer. After preparing veneer for each face of the leaves, select a smooth, flat sheet of ½-in. thick Baltic birch or other high-quality plywood for the substrate. Cut these sheets 1 in. oversize all around and with the grain running across

Color photos: Jack Russell; drawings: David Dann

the short dimension. This makes the panel more stable, since the veneer grain continues the plywood's crossbanding, with the grain of each layer at 90° to the next layer.

I press the veneer with 16-in. 2x4 battens over four ½-in. thick chipboard cauls cut the same size as the plywood. Set two cauls on a pair of sawhorses and cover them with waxed paper to prevent the veneer from sticking to the chipboard. Put the veneer face-down on the waxed paper, roll a coat of urea-formaldehyde glue onto one side of the plywood panel and put the glued face onto the veneer. After rolling glue onto the top side of the plywood, put the second veneer sheet, this time face-up, on the plywood. Add another sheet of waxed paper and two more cauls to complete the package. Place the 2x4s in pairs, one on top of the package and another directly below it underneath the panel, and lightly clamp the sandwich together. Tighten the clamps, beginning in the middle of the leaf to squeeze out excess glue. The next day, unclamp the panels and use a handscraper to remove the dry veneer tape and to smooth both faces.

A tongue-and-groove joint holds the panels in the frames. Mill the frame pieces about 1/16 in. thicker than the veneered plywood and slightly longer than their finished dimensions. Then, on the tablesaw, cut a 5/16-in. groove into the inside edge of each piece. After cutting the intermediate rails to length, leaving enough for a tenon on each end, saw the veneered plywood to width, then into the three panels. Rout a centered tongue on the four edges of each panel and on the ends of the intermediate rails.

To assemble the top, arrange the pieces on your bench the way they will be clamped. For the outer frame (two rails, two long stiles), begin at one corner, cut the miter joint and clamp it up to mark the next corner for cutting. Once the second miter is cut, repeat the process for the third corner, and so on. I reinforce each miter with a screw. Before gluing the pieces together, I mortise a shallow 5/16-in. square hole in the outside edges of each miter, then drill through the mortise for the screw. This allows me to cover the screws with square plugs that complement the table's angular look. If you've accurately cut the three plywood panels, you shouldn't have any problem clamping the leaf into a perfect rectangle. Then screw the miters together and plug the holes.

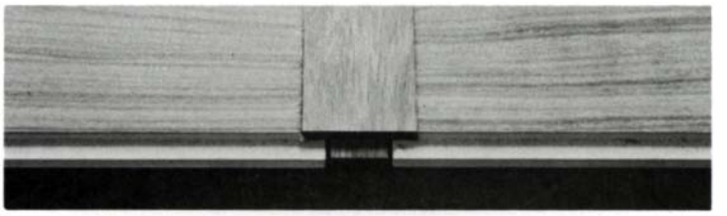
Planing the frame pieces flush to the veneer is difficult, especially at the corners—it's easy to tear the edge of a rail or stile or to nick the veneer. I plane in from the outside edges with a jack plane or a smoothing plane, using the veneered surface as a register for the nose of the plane to ensure that the frame pieces remain flat. I partially round the outside edges with a ½-in. quarter-round router bit set so that only the lower half of the bit cuts. Then I scrape the entire top and sand with 220-grit. I rout the mortises for the hinges with a template, and hinge the two leaves together. Before attaching the top to the base, I finish the table with at least six coats of clear Waterlox oil.

The three U-shaped brackets holding the top to the base (figure 5) should fit tightly around the crossbraces but still allow the top to slide. If the brackets are too loose, the center of the open table will pop up when someone leans on an edge. Properly installed, the brackets hit the back stretcher when the top is closed and the front stretcher when the top is open. Work out the adjustment by first clamping the brackets in place when the top is closed and moving them around as needed. When you're satisfied, fasten the brackets with round-head brass screws. □

Robert March is a woodworker/designer and head of the woodworking program at the Worcester (Mass.) Crafts Center. Black-and-white photos by the author.

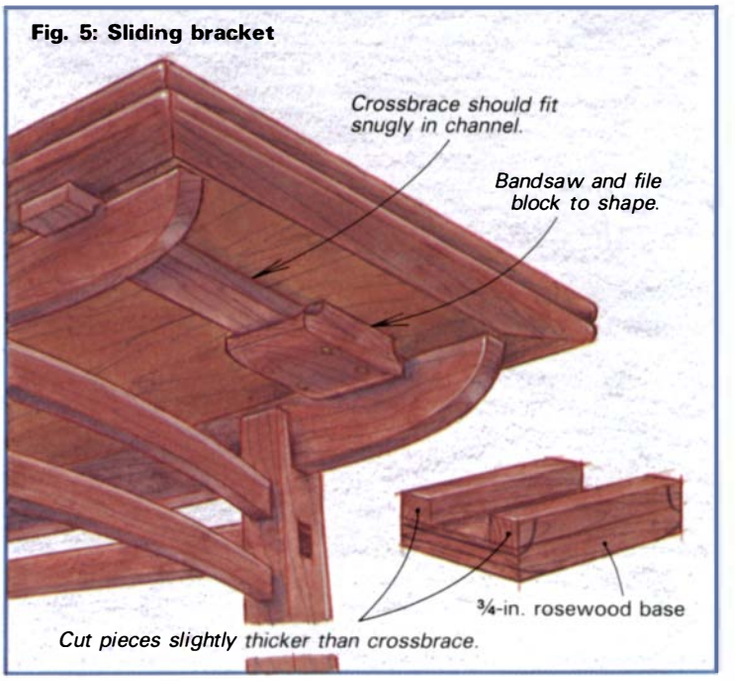
With the veneer sheets clamped between boards so that the matched edges stand proud, March hand-planes the edges.

After joining the veneers with masking tape, March flips the sheet over and props a plank under one leaf to pinch the veneer seam tight. The seam is then secured with veneer tape before the masking tape is pulled off.



Each of the top's two intermediate rails is tenoned into the stiles. Tongues on the three panels slip into matching grooves cut in the table frame.

Fig. 5: Sliding bracket



Hollow-Chisel Mortising

Strategies for boring accurate square holes

by John Leeke

If you have to chop more than four mortises at a time, a hollow-chisel mortiser is faster than the traditional hand methods of chopping directly or of drilling out most of the waste, then using a chisel to square up the hole. When I started using my mortiser, I found it quick and easy to cut clean mortises, but they were often out of square and the bits burned. After a while, I realized the problem was the way I was using and maintaining the tool, not a defect of the tool itself.

My mortiser consists of a cylindrical cast-iron bracket that bolts to the quill of my drill press. The chisel itself—actually a hollow, square tube held in the bracket by a setscrew—encloses a specially designed auger. When the chisel is plunged into the wood, the auger bores away most of the waste and the chisel's four sharp bevels square off the hole's round corners. Boring several square holes side-by-side produces a mortise.

Getting a hollow chisel to work as advertised is a lot like coaxing the most out of a hand plane—you need to sharpen and set it up correctly. To me this means grinding away the rough outside surfaces of the chisel to reduce friction, enlarging the notches and grooves inside the chisel for more efficient waste removal, and honing the chisel and the auger until they are razor-sharp.

Modifying the chisel to eject chips freely is important because the chips dissipate heat. If they jam in the corners or on the auger spirals, the added friction will quickly overheat the mortiser. Use a *fine* triangular file to deepen and smooth the notches and grooves on each inside corner, as shown in figure 1, but be careful—if you cut them too deep, you'll weaken the corner. Next polish the chisel's coarse, outside surfaces with a flat, hard Arkansas oilstone. Keep the chisel flat on the stone and don't dub over the cutting edge. This polishing will make it easier to plunge the chisel into the wood and to produce a sharper edge, since the cutting edge is the intersection of the outside walls and the inside bevels. I grind the bevels with a mounted stone chucked in the drill press and hone them by hand with a cylindrical slipstone. When you're satisfied with the chisel, use a fine triangular file to sharpen the auger, as shown in figure 2. I do most of the sharpening on the top surface.

Now mount the chisel on the drill press and insert the auger through the chisel into the drill chuck. The hard part here is setting the bit so it doesn't rub too hard inside the chisel, causing excessive heat and wear. I have a Jacob's chuck on my press, and I push the bit right against the end of the chisel. Tightening the chuck drops the auger down just enough to clear the chisel. With another chuck, you may have to drop the bit slightly before tightening it. You'll hear a very high-pitched squeaking if the auger and chisel rub too much. If this is the case, loosen the chuck and lower the bit slightly. A rattling sound is okay—even a properly adjusted auger rubs slightly against the curved bevels, wearing them away and turning slight burrs on the outside of the chisel. As long as you hone off the burrs, this wear is helpful since it lengthens the corner points, giving you more steel for sharpening the cutting edges.

Once the bit is chucked, you're ready to start mortising. You can make either a full cut, where the chisel is surrounded by wood, or a side cut, where at least one side of the chisel is open and unsupported, as when you cut right next to an existing hole. A full cut goes straight because the chisel is supported on all four sides, but a side cut will likely drift toward the open side and not be square. This is no problem if you're wasting away the middle of a mortise, but it could throw a joint out of alignment if the out-of-square cut is on an outside wall of the mortise. Also, the drift can damage the mortiser.

To overcome both of these problems, I make a series of full cuts, leaving a section of wood slightly narrower than the width of the chisel between each cut, then I go back and clear out the waste with open cuts. You can expand this method to mortises that are wider than your chisel.

Regardless of your cutting strategy, push the chisel through the work at a constant rate, with as few pauses as possible, to produce a steady steam of chips and a continuous cooling effect. Never stop the chisel inside a mortise where heat will be trapped. If you have a compressed-air setup or a vacuum system, rig it up to cool the bit and to help remove the chips.

If you do clog the chisel, the pressure of the chips from the next cut may clear the chips. If it doesn't, quickly shut down the machine, pull out the auger, and cool it and the chisel in a cup of water. I clear the clog with a narrow, bristled brush sold by kitchen-supply houses for cleaning coffee-percolator stems. Most of my clogging problems involve ¼-in. chisels.

When cutting through-mortises, remember to back up the bottom edge of the workpiece, or the chisel will tear the wood as it passes out through the wood. You could use a wooden block, but I prefer to make a ¼-in. thick aluminum backup plate that can be attached to the press table before the workpiece is clamped down. Drill the plate and file a square hole slightly smaller than the chisel, then lower the chisel through the soft metal to cut the final opening. Also, once you've tuned up your chisel, don't neglect it. Keep it sharp and don't put it away filled with soggy chips that can cause rust. Rusty chisels clog easily. □

John Leeke makes furniture in Sanford, Maine. Photos by the author.

Drawings: Christopher Clapp

Fig. 1: Chisel tune-up

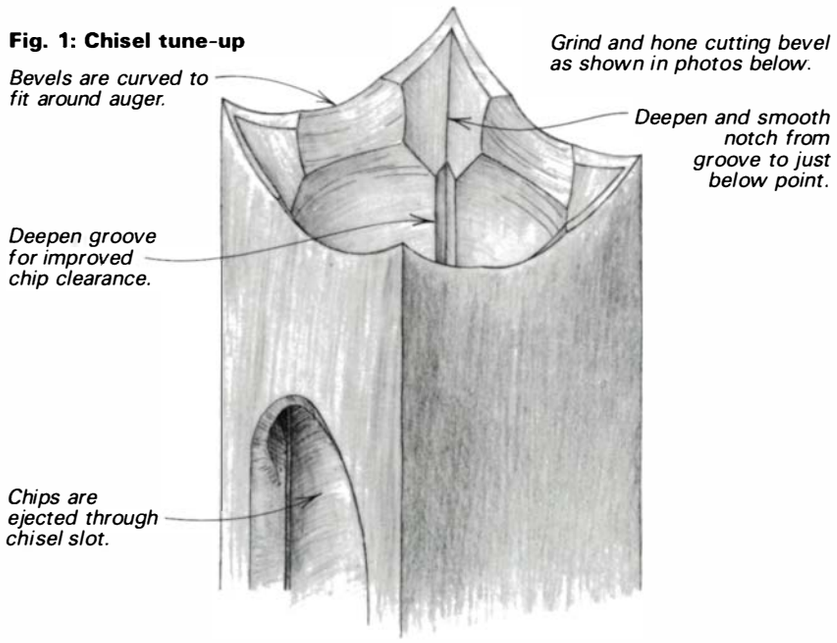
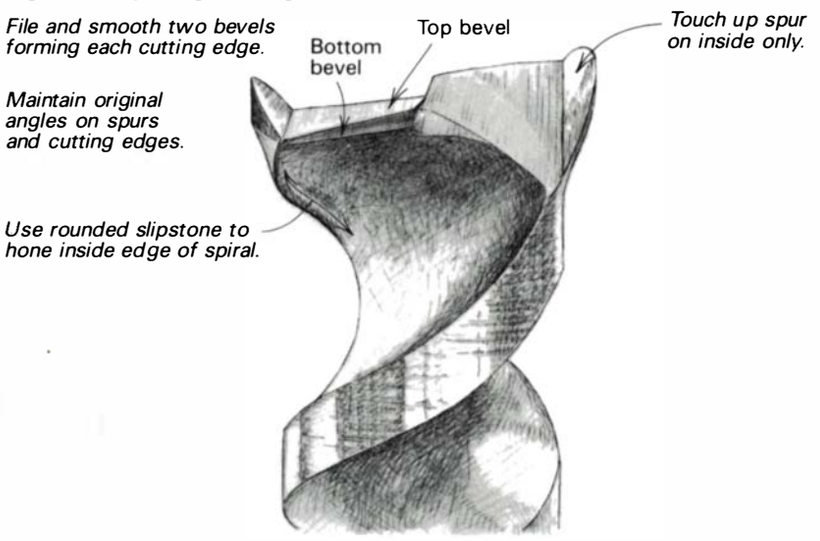
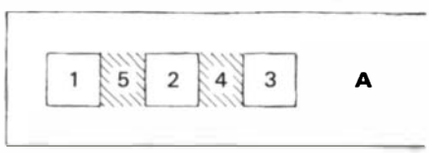
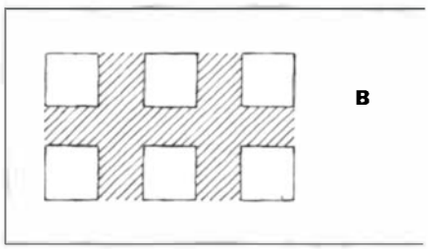


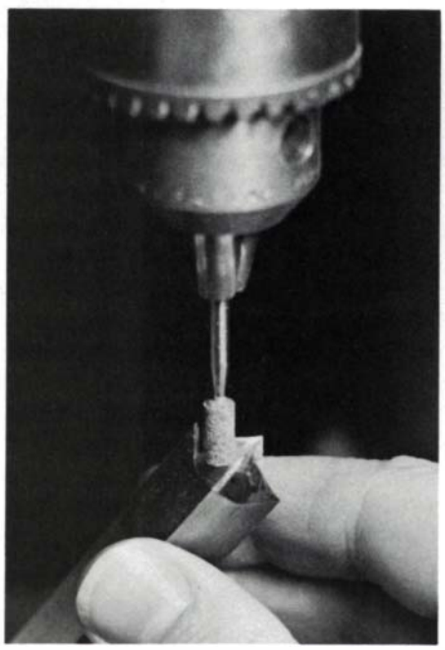
Fig. 2: Sharpening the auger



Plunge the chisel into the wood for a series of full cuts, outlining the mortise as in **A**, *then clear out the waste. Using full cuts to outline large mortises (***B***) ensures square walls. A mortiser clamp holds the wood on the table. Use horizontal clamps or your hand to hold the piece against the fence.*







To sharpen the chisel, chuck a $\frac{3}{16}$*-in. dia. stone, and set the chisel so its bevel meets the stone at 40° (left). Grind the first bevel freehand at low speed, align the next side and repeat. With the chisel supported by a notched dowel set into a hole bored into the bench (above), twirl a round slipstone to hone the bevels. Polish the outside surfaces with a fine stone.*

Testing Wood Chisels

Lab finds no secrets in the steel

by Bill Stankus

A wood chisel is a very simple tool, but there are so many brands to choose from, and such a wide range of prices, that deciding which one to buy is anything but simple. It helps if you can examine a chisel, try the edge with your thumb, and heft the tool to feel how well the handle fits your hand. It's important that a chisel *feel* right. But what about the most important part—the steel? Are the more expensive chisels made of better steel? Just by looking, there's no way to tell how a chisel will sharpen or hold an edge. Advertising copy isn't any help either. Some tool-sellers' claims notwithstanding, there hasn't been a magic blade forged since Excalibur.

As a tool consultant and woodworker I've used many chisels over the years, and I've noticed that they don't all perform in the same way. Determined to find out why, I enlisted the help of Paul Horgan, a metals quality-control manager and amateur woodworker. We decided to run a series of metallurgical tests on chisel blades to see if steel quality differs between brands and, if so, what effect this has on sharpening and edge-holding properties. *Fine Woodworking* agreed to pay for the tests, which were conducted by Anderson Laboratories, Inc. in Greendale, Wisconsin, and confirmed by another Wisconsin lab. We don't claim our tests to be the last scientific word on tool-steel metallurgy, but the results do shed some light on a confusing subject.

We couldn't test every chisel on the market, so we chose 11 popular brands: Craftsman and Stanley (United States); Footprint, Marples and Sorby (England); Hirsch and Spannsage (West Germany); Iyoroi, Oiichi and Sentora (Japan); and Mifer (Spain). So we wouldn't base our findings on a chance bad chisel, we tested two of each brand bought from mail-order and retail outlets around the country. To correlate the lab analysis with performance, I sharpened the chisels on waterstones (800-, 1200-, 4,000- and 8,000-grits) and worked with them at the bench.

Interestingly, despite the wide range in price ($7.60 for the Footprint to $31.95 for the Oiichi), the tests showed that 8 of the 11 chisels tested are made of very similar water-hardening tool steels. The lab tests did show some variations in carbon content and alloys, but no significant differences except for the Sorby, which was a different type of tool steel, and the Sears Craftsman, which was a plain carbon steel with a low carbon content. The other U.S.-made chisel, the Stanley, was made of a plain high-carbon steel. Differences that directly affect how the tool sharpens and holds an edge—hardness and grain size—were more pronounced and quite noticeable during sharpening and use, suggesting that the type of steel probably has less to do with how well a chisel works than does how carefully the factory forges, grinds, and, most importantly, hardens and tempers the tool.

To make sense of the lab tests, it's helpful to understand a little about tool metallurgy. To cut well, a wood chisel needs steel hard enough to hold an edge for a reasonable time but soft enough to be sharpened on benchstones. It also has to be tough enough to resist chipping when hammered through dense wood such as maple. Mild steel, the stuff found in angle iron and I-beams, won't do the job because there's no practical way to make it hard enough.

Adding carbon to steel—anywhere from 0.45% to 1.40%—makes steel hardenable. Plunged red-hot into water, brine or oil, carbon steel's crystalline structure changes to a brittle, harder form. A cutting edge made from this brittle steel would fracture, so the hardness is reduced slightly by reheating the steel to a lower temperature. This is called tempering and makes the steel much tougher. Tool steels, which were actually developed not for hand tools but for industrial applications such as stamping dies and metal cutters, are a type of high-carbon steel that has been alloyed with metals such as chromium, manganese and vanadium to improve hardenability and wear resistance. The main difference between plain high-carbon steels and the tool steels commonly used for chisels is in the quality control. Tool steel is manufactured to a more rigorous set of quality standards than is ordinary high-carbon steel. Its chemical makeup is constantly tested, and each batch is routinely inspected for microstructure, cleanness, hardenability, and surface and internal flaws. This consistency means that the consumer is less likely to get a bum tool, but it also makes things easier for the manufacturer since, theoretically, each batch of steel will react about the same way when it's forged and hardened, thus producing tools of identical quality.

We had the labs perform three basic kinds of tests on the chisels: chemical analysis, hardness testing and inspection of the steel's microstructure. First, they mounted the $300 worth of new chisels on an abrasive cut-off wheel and sawed them up into small chunks in order to get at the steel inside. A spectrographic analysis of the pieces revealed their chemical makeup to be very similar. It's worth noting that steel standards vary from country to country, but all of the foreign-made chisels closely matched the U.S. definition of a family of tool steels called W-type water-hardening, except for the Sorby, which is a shock-resistant S-type tool steel. Both U.S. chisels were non-tool-steel grades of carbon steel. Carbon content of the 11 tools varied widely, from a barely hardenable 0.50% in the Sears to 1.24% in the Footprint.

Hardness, the quality most discernible at the bench and that which most governs a tool's edge-taking and edge-holding properties, was measured with a tool called a Tukon tester. Here's

The test chisels had a wide range of handle styles and blade lengths—both important factors to consider when selecting a chisel. From left: Stanley, Craftsman, Mifer, Sentora, Oiichi, Iyoroi, Hirsch, Spannsage, Footprint, Marples and Sorby.

To measure hardness, two slices from each chisel were cast in plastic and polished, then they were mounted on the Tukon tester (above right), which calculates hardness by measuring the penetration of a diamond stylus.

how the test works: One longitudinal and one transverse slice of each chisel's blade are cast into a small disc of thermosetting plastic. The sample is polished and mounted under the tester's microscope. A tool with a tiny, diamond-tipped stylus called a Knoop indenter is next placed on the steel. Weighed down by a 500-gram weight, the indenter penetrates minutely into the steel; the deeper it goes, the softer the steel. The depth of the nick is measured and converted to a hardness number on the Rockwell C scale. The microscope allows the technician to place the indenter away from soft spots or contaminants that might give a false reading. For our tests, three separate readings were taken near the cutting edge on each sample and the results averaged.

As the chart on p. 46 shows, the chisels varied in hardness by as much as 7 points on the Rockwell C scale (RC), which ranges from 20 to 70. At 52 RC, the Sears Craftsman was the softest of the test chisels—too soft to hold an edge. The three Japanese chisels were the hardest at more than 60 RC.

Hardness tells only part of a tool's metallurgical story. Peering through a microscope, a metallurgist can learn a lot about a steel's properties just by looking at it, reading its texture just as a wood technologist might study pores to identify a wood sam-

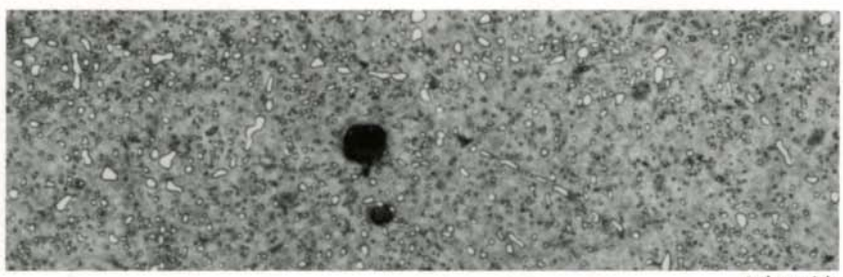
Photos this page: Bill Stankus

Chisel Characteristics

	Brand name	Price (1-in. chisel)	Steel	Average hardness at cutting edge*	Carbon content	Grain size	Blade thickness at top of bevel	Handle	Edge-retention rating
United States	Stanley	$10.25	High-carbon (AISI 1095), trace of carbides	59.5 RC	0.94%	#11	9/64 in.	Plastic, round	Very good
	Sears Craftsman	$ 7.99	Plain-carbon (AISI 1050), no carbides	56.0 RC	0.50%	# 9	5/32 in.	Plastic, round	Poor
England	Footprint	$ 7.60	W-type tool steel	59.0 RC	1.24%	**	9/64 in.	Beech, oval	Very good
	Marples	$13.15	W-type tool steel	60.0 RC	1.18%	# 6	1/8 in.	Boxwood, round	Fair (edge breaks down when dull)
	Sorby	$11.75	S-type tool steel, no carbides	57.5 RC	0.57%	#10	11/64 in.	Boxwood, round	Very good
West Germany	Hirsch	$14.95	W-type tool steel, no carbides	58.5 RC	0.80%	#11	3/32 in.	Ash, octagonal	Very good
	Spannsage	$ 9.25	W-type tool steel, no carbides	59.5 RC 62.0 RC	0.81%	#11	9/64 in.	Ash, round-flats	Very good
Japan	Iyoroi	$27.95	W-type tool steel, mild steel back	61.5 RC	1.04%	# 8	7/32 in.	Boxwood, round	Excellent
	Oiichi	$31.95	W-type tool steel, mild steel back	63.5 RC	1.09%	# 9	11/64 in.	Red oak, round	Excellent
	Sentora	$ 9.95	W-type tool steel, mild steel back	60.5 RC	0.81%	#10	3/16 in.	Red oak, round	Excellent
Spain	Mifer	$ 8.10	W-type tool steel	59.5 RC	1.10%	# 8	9/64 in.	Boxwood, round	Fair (edge breaks down when dull)

* *Knoop indenter, 500-gram load. Average of three readings.*
** *Not determined.*

The chart above lists significant chisel characteristics. The prices given are the retail prices paid for the test chisels; current prices may vary. The edge-retention rating is based on the results of the bench test. The micrograph at right (magnified 100X) of a section of the Marples chisel shows the steel's microstructure. The small white particles are primary carbides, a hard-wearing combination of carbon and iron that improves edge retention. The large dark island is an oxide inclusion.



Anderson Labs

ple. The lab tests sought two important microstructures in our chisels: carbides and grain. Carbides are a compound of carbon and iron present in the steel as it comes from the mill. Ideally, when the chisel is heated and quenched, some of these very hard carbide particles will disperse throughout the crystalline structure of the steel. The higher the initial carbon content of the steel, the more likely it is that the heat-treated chisel will contain carbides. Carbides are desirable because they greatly increase the wear resistance of the steel. In theory, a blade with fine and evenly distributed carbides will hold an edge longer than will a blade of the same hardness with no carbides.

Grain refers to the crystalline particles that make up the steel. The size of the grain is a measure of the "fineness" of the steel. A fine grain is important for edge retention and, in combination with evenly distributed carbides, will give the longest edge life. Grain is measured on a numerical scale: #1 is extremely coarse, #10 or above is extremely fine. Any steel with a grain size of 8 or higher can be considered a fine-grain steel.

Again, the results of the laboratory tests more or less agreed with my findings at the bench. But the really interesting thing that the microstructure analysis showed is that hardness alone doesn't necessarily mean the best edge retention. After sharpening each chisel, I pared away at a variety of hardwoods and pine until the edge dulled, then I resharpened. I noticed a considerable difference in edge retention between brands. The six chisels that contained carbides (Footprint, Marples, Mifer, Oiichi, Iyoroi and Sentora) seemed to take an excellent edge from the waterstones. With their hard edge and evenly distributed carbides, the Japanese chisels held keen edges longer than any of the Western chisels. The Hirsch, Spannsage, Sorby and Stanley—all fine-grained but slightly softer than the Japanese chisels—took and held very good edges. The Mifer and Marples are almost as hard as the Japanese chisels, yet when dull their edges seemed to fragment and become ragged. It took longer to get them sharp again because more steel had to be removed during the sharpening process. This is due, I suspect, to their relatively coarse grain. The Sears Craftsman chisel fragmented badly as it dulled.

A common complaint about Japanese chisels is that they're brittle, and tend to chip. I experienced this once when I cut a mortise with a new Japanese chisel without first sharpening it. Perhaps because I removed a fair amount of steel at the initial sharpening, however, chipping wasn't a problem with any of the Japanese chisels in the test.

The lab examined each steel sample for impurities such as slag. These are called inclusions (photo, above). From a metal-

A visit to a chisel factory

by David Sloan

Buck Bros. has been making woodworking tools in Millbury, Mass., since 1853, when Charles and Richard Buck picked out a spot with good water power. Water and steam turned the wheels at Buck Bros. until the 1940s, but today wood chisels are produced on modern machines. The factory also makes carving and turning tools, screwdrivers, scrapers, crowbars, spade bits, hatchets, and pitching horseshoes.

Last summer I visited the firm to see how wood chisels are made. According to the company manager, J.C. Cort, Buck Bros. manufactures all their chisels from plain high-carbon steel (AISI 1095) with manganese added to improve hardenability. They specify carbon and manganese content (each about 1%), and rely on their steel supplier for quality control. Buck Bros. does not test the steel.

Chisels are rough-formed by forging, but any romantic notions I might have had about wheezing bellows and ringing anvils were soon put to rest by what I saw. Hand-forging—at least for production tools made in the United States—is a thing of the past. Today, chisels are drop-forged in two-part dies.

The blacksmith's modern counterpart is the hammerman. He works in semidarkness as his predecessor did, but instead of a hammer and anvil, he presides over a hulking drop hammer that packs a 1600-lb. punch. Judging the temperature of the steel by the color, the hammerman seizes one of the long steel rods from the gas furnace at his side. With the timing and speed of a juggler, he brushes off scale on a wire wheel, then places the glowing end of the rod in the bottom half of a two-part die. Quick as thought, the hammer slams down, rises and slams down again, bringing the die halves together. The first blow rough-forms the blank, the second finishes it. A good hammerman handles two rods at once and can forge as many as 2400 chisels in an eight-hour shift.

Turning to a press, the hammerman separates the chisel from the rod and flash, the excess steel that squeezed out of the die. The still-glowing chisel travels down a conveyor and drops into a wheelbarrow.

When cool, the chisel is ready for heat-treating. First, the front, back and edges are ground by machine to remove surface imperfections. The chisels are heated in a device called a high-frequency induction heater coil. Twelve chisels are placed on end in a fixture. In a few seconds they're heated to a temperature of 1800°F. After 24 seconds at this temperature, the chisels automatically drop into a tank of quenching oil. A circular conveyor lifts out the hardened chisels and drops them into a soda wash to remove the oil. At this point, the steel has a hardness of about 64 to 65 RC. The clean, hardened chisels are then loaded into gas-fired air draw furnaces for tempering at 440°F. When the chisels come out, they have a hardness of 59 to 60 RC throughout.

Before 1950, one highly skilled man ground the entire chisel by hand. Today, it's done by machine in five separate steps: edges, front and back, side bevels, barrel, and cutting bevel. There's a separate automatic watercooled grinding machine for each operation. The loading and unloading of the machines was the only handwork I saw.

The machine that grinds the front and back holds forty-five 1-in. chisels in a circular fixture called a spider. The spider spins horizontally under an abrasive wheel. When one chisel face is finished, the chisels are manually turned over and ground on the other face.

After grinding, each finished blade is inspected by eye, and any rejects are cast aside. The ones that pass inspection are hand-wiped with oil to prevent rust. Then the blades are ready for handles.

Most of the chisels get plastic handles. These plastic-handled tools are intended for mass-market sales, so the blades get dipped in lacquer to prevent rust. Many of these chisels are packaged on cardboard cards, others go as sets in plastic pouches. A small percentage of the blades get wooden handles, but none were being fitted the day I visited.

I was surprised to learn that only about 15% of the total chisel production carries the Buck Bros. trademark. Some of the remaining 85% might carry the Great Neck brand (Buck Bros.' parent company). Others will carry the brand of the hardware or discount-store chain that ordered them (not Sears, however—Craftsman-brand chisels are made by Western Forge in Colorado Springs, Colo.). There's no difference in steel, manufacturing process or quality control—just a different name on the plastic handle and, most likely, a different price, too. Funny, before my visit I equated the name Buck Bros. with high quality, but who ever heard of Great Neck? I would have turned up my nose at the discount-store chisel, thinking that it was inferior.

I've never owned a Buck Bros. chisel, so I don't know how the blade stacks up to the German and Japanese chisels I use for fine work, or the 15-year-old Sears chisels I carry in my carpenters' toolbox. From what I saw, Buck Bros. makes a chisel carefully and efficiently. The manager is well versed in metallurgy and knows what a woodworker expects from a tool. His dilemma is to try to satisfy the skilled user and at the same time avoid injuring the chap who grabs a chisel to pry open a paint can. This dichotomy dictates the tool he makes. When asked how his chisels would be different if serious woodworkers were his only customers, Cort replied, "We'd increase the hardness. The edge would be brittler, but much keener." □

At Buck Bros., chisels are drop-forged in two-part dies. The monstrous drop hammer above slams the die halves together with a force of 1600 lb., squeezing the hot plastic steel between them. Two quick blows forge a chisel.

David Sloan is an assistant editor at Fine Woodworking.

lurgical viewpoint, inclusions are a red flag because they often indicate sloppy quality control in the steel-making. The Sears Craftsman was the only chisel we tested that had a metallurgically unacceptable level of inclusions. The tests turned up some slag in the Iyoroi and Sentora chisels, but in the welds, not in the steel itself. Adhering to tradition, the Japanese make their chisels by forge-welding (often by hand, with a power hammer substituting for a sledge-wielding apprentice) a hardenable tool-steel blank to a mild-steel billet that forms the tool's front face. Chemical segregation was another steelmaking quality-control problem that turned up in the Mifer, Spannsage, Sentora and Iyoroi chisels. This means that elements in the steel that should be thoroughly mixed weren't.

Apart from the metal quality and hardness, we noticed some other things about the chisels that shed some light on how carefully they are manufactured. The Japanese chisels were carefully prepared at the factory. They came accurately ground to the 30° bevel recommended by the manufacturers. Setting the steel ring on the handle was the only "tune-up" that these chisels required. The Western chisels, however, were less carefully prepared. Some were ground to a bevel that was way off the 25° most woodworkers aim for, and this required quite a few minutes at the benchstone to correct. The Stanley had a double-bevel knife-edge grind, so the back had to be ground down to remove the extra bevel. I found the Hirsch to be buffed so heavily that the edges were rounded, making it difficult to see if the cutting edge was square to the body or shank.

I always hand-sharpen chisels, and to me it's important for a chisel to have a perfectly flat back, especially in the area immediately behind the cutting edge. Stoning the bevel leaves a wire edge that must be removed by lapping the back of the chisel. If the back isn't flat, part of the wire edge won't contact the stone and may not be completely removed. A flat back rests solidly on the benchstone and eliminates the possibility that you might unintentionally lift the handle and stone a slight second bevel on the back of the chisel. A flat back also provides a bearing surface when you're using a chisel for paring. Except for the Sorby and the Japanese chisels, which came from the factory with flat backs, all of the chisels failed the flatness test—some miserably. The backs of the Craftsman and Stanley chisels were so wavy that it was very difficult to remove enough steel by hand to get them flat. In contrast, the Japanese chisels all have hollow-ground backs, which makes deburring easy.

Having read the lab reports after actually using the tools, I came away with some very definite ideas about chisel buying. The main thing to consider, I think, is your attitude toward sharpening. With one exception, the Sears Craftsman, any of these chisels properly tuned and sharpened will work adequately. If you're satisfied with your sharpening skills but aren't really fussy about getting the best possible edge, any of the Western chisels, except the Craftsman, should do fine. The steel is so similar in five of the eight Western chisels that only a very skilled sharpener could consistently tell the difference between them. That said, you might just as well let tactile factors such as the tool's weight and balance, blade length and handle shape govern your decision. Or the price.

If you're adept at sharpening and strive for the keenest edge, the Japanese chisels may be for you. As the tests showed, they are harder and made of fine-grained steel with evenly distributed carbides. But as with all Japanese blades, they require careful hand-sharpening and they won't tolerate being bashed around loose inside a toolbox.

So which would I buy? My favorite Western chisels were the Footprint and the Hirsch. Both had very comfortable handles and good edge retention, and at $7.60, the Footprint is an excellent value. For the very sharpest edge and the best retention, my favorite was the Oiichi, although at $31.95 it was the most expensive of our test chisels. □

Bill Stankus is a tool consultant, lecturer and woodworker in Bayside, Wis. John Boyzych of Kelsey Hayes Labs and Ralph Mayer of Anderson Labs assisted in the preparation of this article. For more on tool steels, see Tool Steel Simplified *by Palmer, Luerssen and Pendleton, Chilton Company; and* Tool Steels, *from the American Iron and Steel Institute, Washington, D.C.*

A second opinion

by Paul Horgan

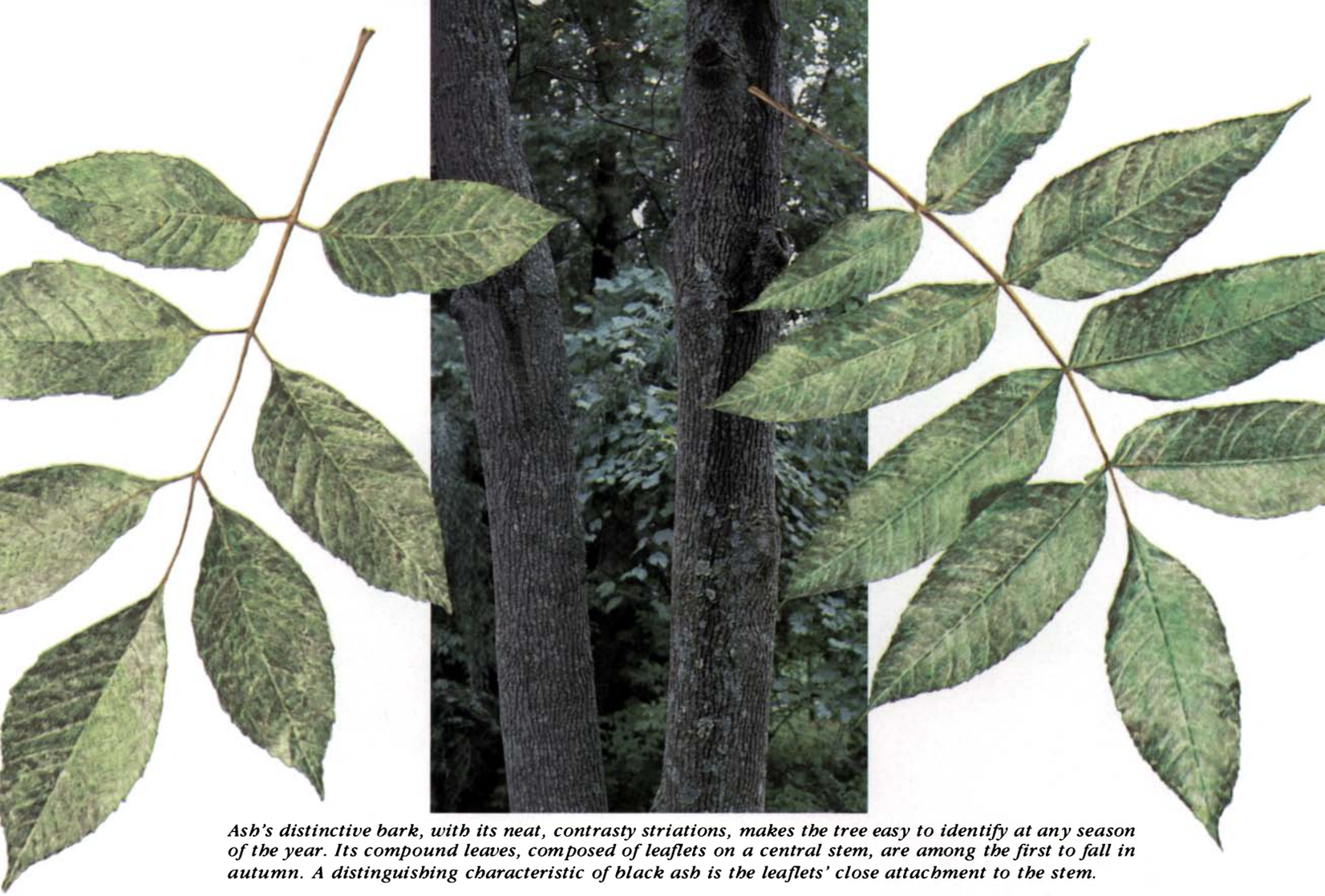
My initial interest in this article was as a technician. My background is in metals quality control, so I was suspicious of the high-flown claims in some tool catalogs. My intent in researching this article was to determine if the large differences in chisel prices were due to some measurable, physical difference in the tools. In my view, there is no measurable difference. The materials are all similar and the methods of manufacture aren't different enough to justify any substantial difference in price.

The lab rejected all tools softer than 59 RC, but I feel that this judgment is excessively harsh in the case of the Hirsch and Sorby chisels. The softer steel may require frequent sharpening, but in my view this is a minor consideration. Besides, differences of up to four points on the Rockwell C scale are not necessarily significant because of variables in hardness testing.

The laminated Japanese chisels we tested were made in a style once found in Virginia in the 18th century. Steel was scarce then, so only a small piece was used for the cutting edge of the chisel. Iron was used for the body because it was less expensive. The Japanese continue their traditional practice of laminating blades for what I see as two reasons. First, the Japanese respect and revere tradition. Second, they understand the interest we in the United States have for the Orient, and for very good business reasons they are exploiting the differences between our tool-making traditions. In selling laminated tools they are selling something different. These chisels are very well made, but their initial expense and the time required to maintain them makes them inappropriate for the beginner or the production professional, in my opinion.

My advice? Don't let the steel determine which chisel to buy. Pick any chisel that's reasonably priced and feels nice. Sharpen it as well as you know how. Any differences in the steel are so subtle that most woodworkers won't notice the difference. □

Paul Horgan lives in Torrance, Calif.



Ash's distinctive bark, with its neat, contrasty striations, makes the tree easy to identify at any season of the year. Its compound leaves, composed of leaflets on a central stem, are among the first to fall in autumn. A distinguishing characteristic of black ash is the leaflets' close attachment to the stem.

Ash

Counterfeit oak or quality cabinetwood?

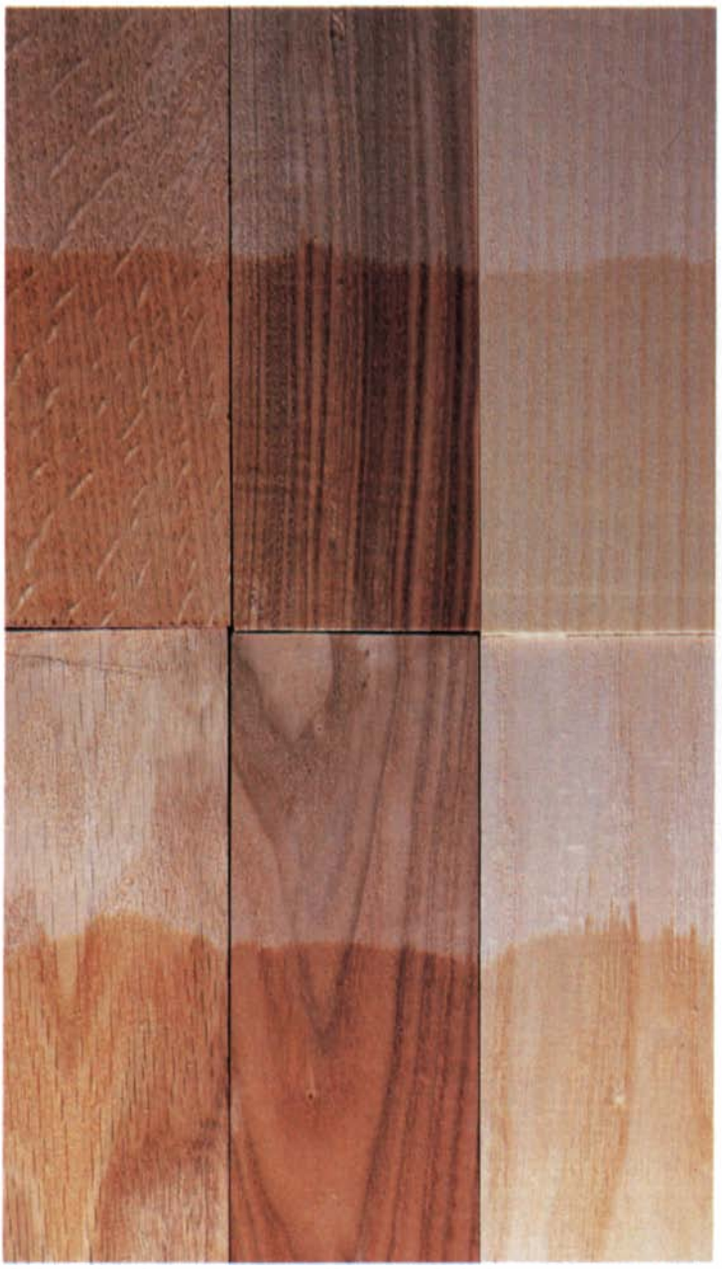
by Jon W. Arno

At a recent antiques show, I found a dozen or so turn-of-the-century commodes labeled "oak." The general public and a lot of antiques dealers seem happy enough to identify every light-colored, open-grained wood as oak at a glance. The oak label serves as a convenience for pricing and dating such pieces, but it isn't always accurate. Two of the commodes at the show were of mixed wood construction (predominantly elm); the three nicest were unquestionably ash.

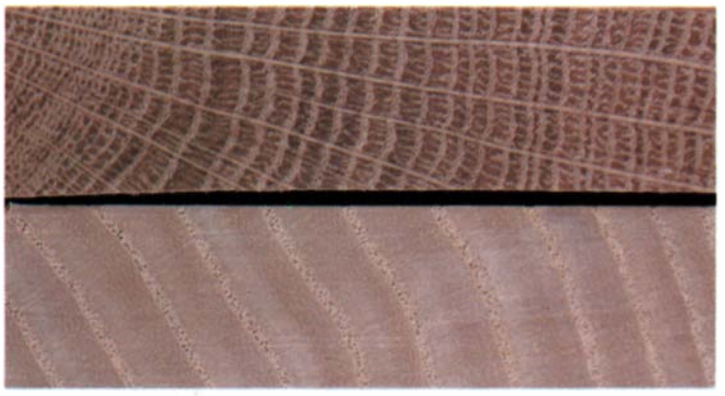
Most people may not have much reason to care. Ash and oak are both open-grained woods, with similarly attractive and somewhat racy figures. Furniture made from either wood has a look of solid quality. Yet I think ash outclasses oak in several important ways, at least from a cabinetmaker's viewpoint—the two woods have decidedly different characteristics. For starters, oak is a member of the beech family, *Fagaceae,* which includes the oaks, the beeches and the chestnuts. Ash belongs to the olive family, *Oleaceae,* and is related to lilac and forsythia.

You don't have to be a botanist to quickly separate oak from ash. Oak has prominent rays that are easily visible on the flat-sawn surface, where they appear as bold lines called ray flecks. In some species of white oak, these flecks may be more than $\frac{1}{16}$ in. wide and well over 1 in. long, while in the red oaks they are generally smaller and darker. In fact, the rays are such a dominant feature in white oak that it's often specially quartersawn to expose them as broad bands or ribbons. These are extremely hard and dense, and in stained wood you could call their appearance either fantastic or outrageous, depending on your taste. I person-

Drawing: Christopher Clapp



Oak and ash are easy to tell apart. Oak has prominent rays, most pronounced when it's cut radially (top left), but also visible as a needlelike pattern on the tangential surface (bottom left). Ash's rays are hardly visible, allowing both radially and tangentially cut lumber to be mixed in the same piece of furniture. Brown ash is in the center, white ash on the right. The lower half of all samples has been oiled.



The rays, lines of cells extending from the pith to the bark, are much more prominent in oak (top) than they are in ash. Both woods are ring-porous: large cells produced in early spring are followed by more solid growth in summer.

ally don't like the effect, but if you do, score one point for oak, because no matter how you cut ash, it will not produce this pattern. Like all woods, ash has rays, but they are almost undetectable with the naked eye. As a cabinetmaker, I view this as one of ash's great virtues, because flatsawn and radially sawn boards can be used in the same piece with no surprises when the stain goes on.

Oak contains tannic acid. If you expose the wood to strong ammonia vapor, a chemical reaction will turn it dark brown. This staining process is known as fuming, and it won't work on ash. Personally, I use ammonia only on windows, but if fuming sounds like a good idea to you, score another point for oak.

Oak's acid content is a mixed blessing at best. A friend of mine once left a green piece of oak on his tablesaw overnight, and by morning it had permanently etched its shape as a black rust mark, which is still there after four years.

Ash's biggest advantage is that it is generally less dense than oak. If we cabinetmakers accept our two premier domestic hardwoods as having nearly ideal density—black cherry with a specific gravity of 0.47 (green to oven-dry) and black walnut at 0.51—we find that the various species of ash straddle this range, while the oaks are all somewhat denser. Ashes run from 0.45 to 0.55, oaks from 0.52 to 0.80. Ash is by no means a soft wood in comparison to pine, basswood, butternut, poplar or aspen, but it is relatively soft when you consider its ability to withstand pounding and stress. Ash yields an end product with great strength relative to both its weight and the amount of energy expended to shape or fashion it. And what could be nearer and dearer to a cabinetmaker's heart?

Because of these advantages, ash was one of several favored woods in Grand Rapids factories during the so-called "Golden Oak" era. Oak got all the publicity, but ash often was the dominant species in those utilitarian and now quaintly obsolete mixed-wood pieces: the dry sinks, commodes, cupboards and wardrobes that were cranked out by the thousands in the late 19th century for America's growing middle class. I'm grateful that nobody thought to call the stuff "Golden Ash"—the lack of publicity helps keep ash at a reasonable price.

While keeping a low profile in cabinetry, ash has established a worldwide reputation as the wood for baseball bats and as one of nature's most perfect materials for tool handles. For these purposes, second-growth trees with straight, evenly spaced grain are selected and specially graded. The white-ash sample shown on this page was cut from a friend's woodlot and wouldn't make a bad bat. Such ash has great strength-to-weight ratio and rigidity. Also, once the surface is smoothed, ash polishes well. Whether this is achieved by constant contact with human hands, as in the case of a tool handle, or by the deliberate effort of a woodworker, the end result is a definite plus.

Within each annual ring, ash has a honeycomb of porous earlywood followed by a layer of dense latewood, making it a sort of natural laminate. The American Indians discovered that they could separate the layers by soaking the quartered log and pounding it vigorously. As the earlywood broke down, thin strips of strong, highly flexible latewood peeled off, which the Indians used for basket splints and ribs in their canoes.

There are over a dozen species of ash native to North America, but only a few of them reach timber size. Those that do all produce ring-porous woods. There are, however, some subtle differences that relate not only to the species of ash, but also to the environment in which the tree grew. Generally speaking, the

strong, straight-grained wood resulting from second-growth timber, which is so desirable for tool handles and sports equipment, is not the best for cabinetmaking. First-growth ash, or ash that has grown slowly for whatever reason, produces the nicest furniture lumber. For one thing, the ratio of heartwood to sapwood is greater in slow-growing trees. For another, these trees produce relatively more earlywood than latewood each season, which means that their wood is lighter in weight, more porous, and far more interesting in figure.

In the lumber trade, most of the wood marketed as "white ash" comes from two species: white ash (*Fraxinus americana*) and green ash (*F. pennsylvanica*), both of which are plentiful throughout the eastern United States. Although on the average white ash might be a little denser and tougher than green ash, variations in growing conditions make the two overlap considerably. Another species, blue ash (*F. quadrangulata*), is of little consequence in the lumber trade because of its limited and sporadic range (around the Ohio and Mississippi River basins). It produces a wood that is almost identical to green ash, and it too is marketed as white ash. Blue ash gets its name from a blue dye extracted from the bark, which was once used for dyeing cloth.

The so-called "white" ashes make nice cabinetwoods once the project is complete, but three other species of ash are noticeably softer and easier to work: black ash (*F. nigra*), pumpkin ash (*F. profunda*) and Oregon ash (*F. latifolia*). To my way of thinking, black ash is the connoisseur's choice. Native to the Great Lakes states, New England and Canada, its environment is a harsh one, which forces slow growth that results in a lighter, less dense wood with exceptionally pretty flatsawn figure. The heartwood is a beautiful soft brown in color (in some parts of its range, black ash is referred to as "brown ash" by lumber dealers) and produces a natural "fruitwood" tone with nothing more than a coat of clear varnish. Because of its narrow annual rings, black ash was the preferred species for basketweaving, and like all the ashes, its stratified nature makes it one of the better woods for steambending.

Pumpkin ash, a similar species, is found in the South. It's less dense than the white ash species and extremely variable as a result of environmental conditions. Pumpkin ash growing in swampy areas will produce a buttress-like base that yields light, soft wood, tending to brittleness. On the West Coast, Oregon ash produces a reasonably good cabinetwood. Its specific gravity of 0.50 makes it somewhat softer than any of the white ashes.

Price and availability of the ashes depend a little on how creative you are. Like the old saying "Water, water everywhere, nor any drop to drink," ash is abundant, but my favorite grades for furniture usually end up as shipping crates and pallets, not in retail lumberyards.

Until recently, local lumberyards didn't have much reason to stock ash. Customers always seemed to be asking for maple, cherry, walnut and oak—and if not these, then some exotic timber. Today, at least in my area of Wisconsin, times are changing. Without much trouble, I can get select, kiln-dried ash at between $1.40 and $2.00 a board foot. The problem is, the mills aren't always careful to identify the species, and lumberyards therefore don't always know what they have. Most of the time it's white ash, and of such high quality that it lacks character.

To find my favorite, black ash, I look around at the beginning of the distribution chain, either buying direct from a mill or going to a pallet manufacturer. The last time I did this, about a year

Michael D. Durante

Turn-of-the-century pieces from the 'Golden Oak' era—like the author's commode above—often are not oak at all, but ash.

ago, I got lucky. The pallet manufacturer said: "Yeah, I got some ash, but it's just that soft brown stuff from up near Rhinelander; you can have it for forty-five cents a board foot. . . ." "Well, maybe I can make it work," I muttered. I took all he had, about 200 bd. ft., stickered and air-dried it for a few months (with its low stump moisture content, ash dries well and easily), then had it planed for 10¢ a foot. Sure enough, it's a cabinetmaker's dream: beautiful, slow-grown northern black ash, at 55¢ a board foot. How sweet it is!

To conclude from all of this that ash is somehow an undiscovered, world-class cabinetwood to be ranked with walnut, cherry, rosewood and teak would be driving a point beyond its credible limits. Ash is nice in comparison to many woods, but it also has its faults. After praising ash for its laminate qualities, I should point out that the flip side of this feature is that the wood splits easily, as anyone who has spent much time chopping firewood knows (and appreciates). Ash is also very splintery, and unless your hands are callused from constant shopwork, you may pick up some slivers when cutting and coarse-sanding it. Once shaped, however, it smooths out nicely. Given its extremely open grain, ash must be filled before you can finish it to the kind of glass-smooth surface required for some surfaces, such as tabletops. And, finally, ash does not weather well when exposed to moist, outdoor conditions. Powderpost beetles and other wood-eating bugs absolutely love the stuff. If resistance to the elements is important to your project, score one last point for oak, white oak in particular. It weathers well. Especially in antiques shops. □

Jon Arno is an amateur woodworker in Brookfield, Wis. He wrote about other domestic woods in FWW *#25, #41 and #46.*

Shopmade Bowsaw

Tailor its size to suit the job

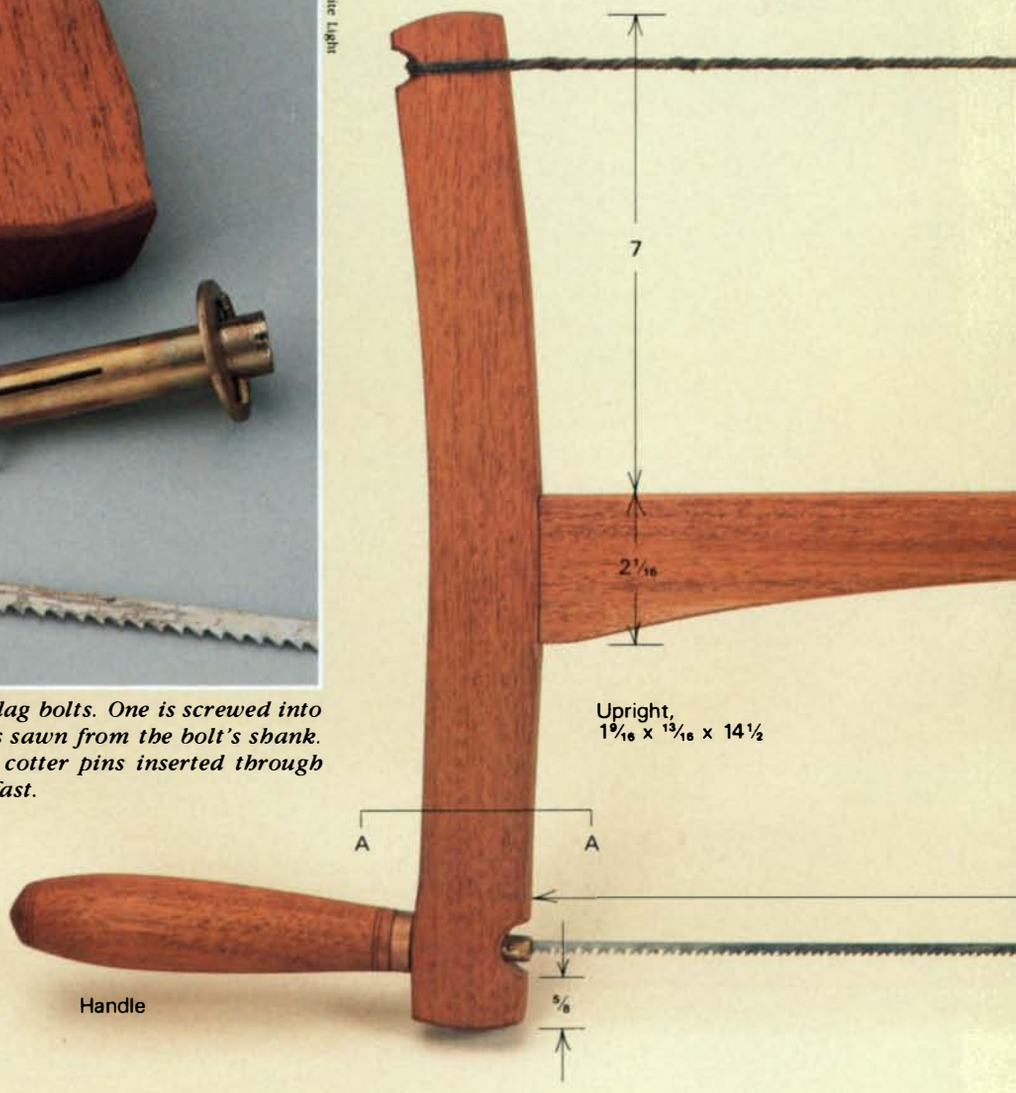
by Simon Watts

Although an ancient tool—they've been used at least since Roman times—bowsaws still have some distinct advantages over either powered bandsaws or saber saws. They need no electric power, are light and portable, and take up little space when dismantled. Also, they can be fitted with different-width blades—narrow ones for sawing tight curves, wider ones for more general work. Bowsaws are especially useful when you have to saw a curve with a changing bevel. I find my saw an excellent tool for cutting the curved transoms and sculling notches in the lapstrake boats I build.

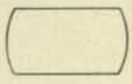
You can tailor the bowsaw described here to your specific needs. For example, you might want a deeper throat, more or less blade length, a handle at each end or no handle at all. You could also make different-size stretchers to accommodate several lengths of blade. I've found the saw shown here to be a convenient size, well-balanced and not too heavy. The blade is 20¼ in. from pin to pin, one of several standard sizes available. Blades can be bought, or you can make them from broken bandsaw blades, just as long as they're sharp and still have some set. To cut the blade, just touch it to the corner of a grinder and snap it

White Light

The saw's blade holders are made from bronze lag bolts. One is screwed into the handle and its head ground off; the other is sawn from the bolt's shank. Hacksawn slots accept the blade, and pins or cotter pins inserted through holes drilled perpendicular to the slots hold it fast.



A–A



Typical section; uprights taper in thickness from ⅞ in. at bottom to ½ in. at top.

Photo: White Light

off. Drill 3/32-in. holes at each end, but as a kindness to your twist bits, soften the spring steel first—heat the ends red-hot with a torch, then let them cool slowly.

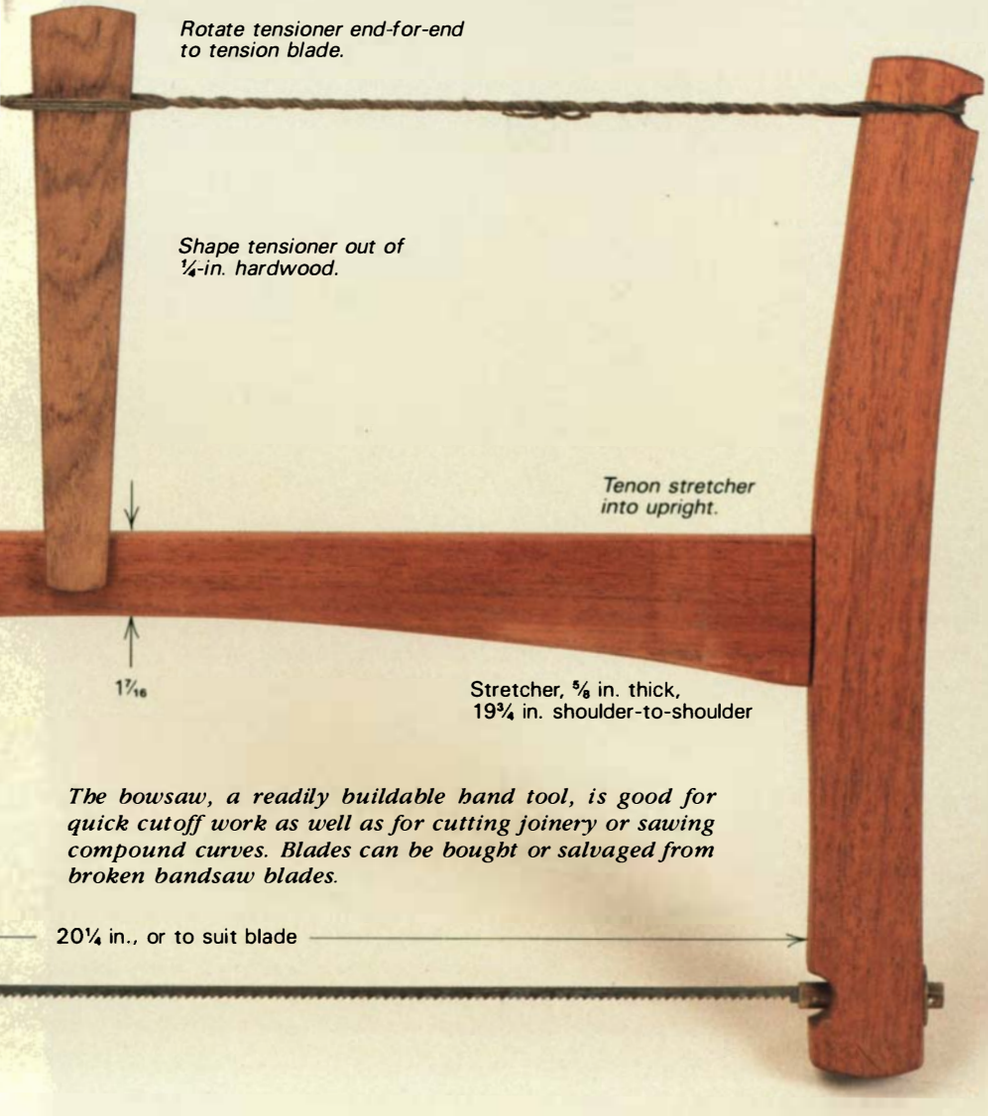
Use any strong, straight-grained hardwood for the frame. Mahogany is my first choice because it looks good with copper and bronze, and I like the way the color gets richer as the wood matures. First make patterns in cardboard for the curved uprights and stretcher, then cut out rectangular blanks for these parts. Mark out and cut the mortises before doing any shaping. To form the notches for the blade holders and tensioning cord, clamp the uprights together edge-to-edge and drill a 7/8-in. dia. hole with a sharp Powerbore or machine spur bit centered on the crack. Inevitably, half the hole will be in each upright, neatly forming the notch. Drill 3/8-in. holes for the blade holders, shape the uprights, and cut the tenons on the stretcher, which should fit without forcing. For looks and lightness, I tapered the uprights in thickness from 7/8 in. at the bottom to about 1/2 in. at the top.

I turned the handle on a lathe, but you could equally well carve it by hand—an octagonal section might give a better grip than the more usual round. Without a metal collar, called a ferrule, the handle would eventually split, so I made a ferrule by cutting a 1/2-in. long section off a piece of 3/4-in. thin-walled copper pipe. I tapped the ferrule into the end grain of the handle's rough blank, then used a heavy vise to press it into the end grain, flush with the surface. I then turned the blank to the shape shown. If you have a chuck center for the tailstock, drill the handle for the blade holder while it's still in the lathe; if not, you would do best to drill it before turning.

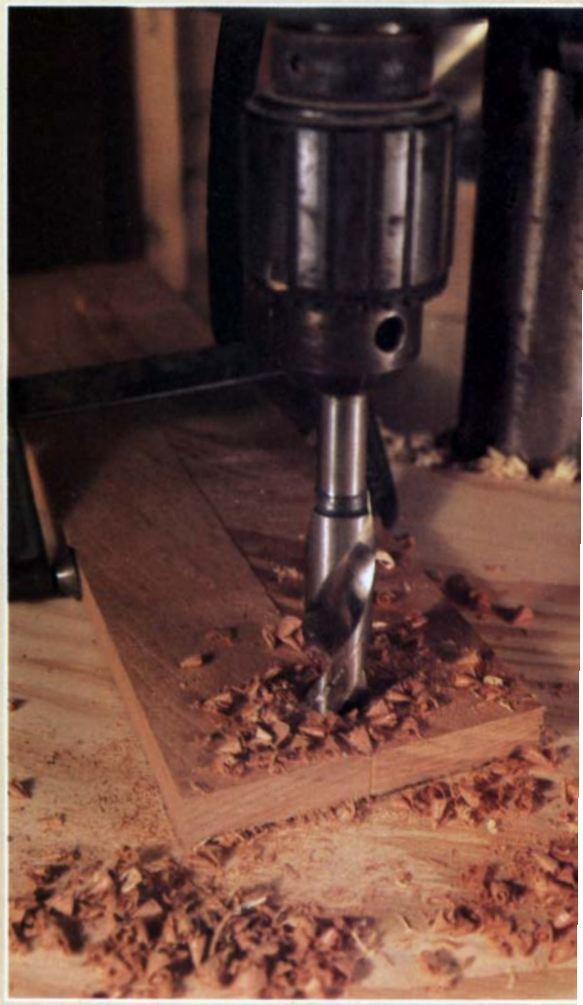
For the hardware, you'll need two 3/8-in. by 4-in. bronze lag screws and a 3/8-in. bronze washer. I use bronze only for the looks and because it doesn't rust. You can get bronze hardware from Jamestown Distributors, 22 Narragansett Ave., Jamestown, R.I. 02825. You could perfectly well use cheaper and more easily obtainable steel lags, however. For this saw, I pinned the blade in the holder with brass escutcheon pins I happened to have around, but they bent when I tensioned the frame. Stainless-steel cotter pins would do better. Make the blade holders as shown in the photo on the facing page. Mount the blade and tension it by looping nylon cord—1/16-in. to 1/8-in. dia.—loosely three or four times around the notches in the upper end of the uprights and then twisting it with a tapered piece of hardwood. You'll find that thinner blades need more tension than thicker ones.

Bowsaws can be used with the teeth pointing either way—you can cut on the push stroke or the pull. There's no need to reverse the blade—just turn the saw around and grasp it by the upright. I usually use bowsaws two-handed, especially when cutting tight curves with a thin blade. Speed and assurance come only with practice, but it's well worth persevering. □

Simon Watts is an FWW *contributing editor who spends his summers in Nova Scotia and his winters in California teaching boatbuilding.*



The bowsaw, a readily buildable hand tool, is good for quick cutoff work as well as for cutting joinery or sawing compound curves. Blades can be bought or salvaged from broken bandsaw blades.



To bore notches for the blade holders and tensioning cord, clamp the uprights together and center the bit line between the parts.

Eighteen coats of clear lacquer produced the deep, glossy finish on this tray carved from sen, *an elm-like wood.*

Japanese Lacquer

Urushi, *a traditional thousand-coat finish*

by Charles Roche

漆

When I began my apprenticeship in Japan, my teacher showed me one of his beautiful lacquered pieces. "How many coats does it take to achieve a finish like this?" I asked. When he didn't answer with a number, I thought it odd that a man who had spent most of his life doing this work couldn't, or wouldn't, directly reply to a simple question. That was not the last time I received a less than satisfactory answer. Gradually, through my own work with lacquer, I realized that part of the problem was my approach: I was trying to learn about lacquer the way I would learn about a commercial finish—by reading the can!

Lacquer, called ***urushi*** in Japan, must be approached differently. Craftsmen have been working for more than 2,000 years to learn how to use this viscous, brown sap produced by the Urushi tree (***Rhus vernificera***). They developed techniques to conform to its properties instead of modifying the natural substance to meet their demands, as can often be done with synthetic materials. Thus, a lacquer finish always has been as difficult to achieve as it is beautiful to admire.

Lacquer is not just a pretty finish, though. Its strength makes it perfect for frequently used bowls and trays, and for tables, chairs and cabinets. It is nontoxic and unaffected by hot liquids, food, oil, salt or mild acid. In fact, its durability is the stuff of legends. Some pieces reportedly have come through shipwrecks and months in the ocean as bright as if they were fresh from the maker's hands. I've seen a museum exhibit of ancient lacquerware bowls that had been unearthed in China—over the centuries the wood had completely rotted away, leaving only the thin red and black lacquer shell. Once I accidentally dropped a finished piece of lacquerware. The surface wasn't marred, but the wood underneath was dented, so I pierced the ***urushi*** film with a pin and steamed the wood back into shape with a wet cloth and hot iron. Except for the pinholes, the lacquer was unharmed.

Although lacquer finishes may be clear or colored, the materials for the opaque colored finishes are difficult to obtain outside of Japan. Also, a finish that enhances rather than covers wood grain seems to suit Western tastes best, so here I'll deal only with raw lacquer, which produces a deep brown, translucent stain. Ex-

Photos: Tsuyoshi Ito, Studio do-do

cept for the lacquer, which is sold in large tubes like toothpaste, the needed tools and materials are easy to buy or make.

I'll start with *fuki urushi,* the most complete method of lacquering and the process I used on the tray shown on the facing page. The term means "wiped lacquer" (excess lacquer is wiped off with a cloth), but it's usually translated into English as "clear lacquer" because the finish is translucent. My favorite colloquial name is *sen ben nuri,* which means "thousand-coat finish." Although this is a gross exaggeration, I've sometimes felt that I had at least approached that number before completing a piece.

I applied 18 coats of lacquer to the tray, sanding between coats with silicon carbide paper or charcoal powder. In addition, I sealed the wood pores with several coats of a paste filler made from pulverized Japanese waterstones, water and lacquer. The actual color and gloss of a finish depend on the number of coats of lacquer, the amount of sanding between coats, and the way the paste filler is used. Almost any species of wood can be lacquered. Generally the final color of a lacquered piece ranges from a dark-walnut matte to a high-gloss, translucent reddish-orange.

Before you begin working with lacquer, there are a few things to keep in mind. First of all, *be careful* (see box below). Second, because lacquer hardens by a chemical reaction, not just by the evaporation of moisture or solvents, you'll have to build a "wet box"—a sort of humid incubator that encourages this chemical change. You can fashion any type of box, but just make sure it's big enough to hold what you plan to finish. To maintain the required 80% to 85% relative humidity range, I hang towels on the box's inside walls, dampening them daily with water from a plant sprayer. On cooler days I put one or two electric lights on the box floor to keep the temperature between 25°C and 30°C (77°F to 86°F). For objects too large to fit into my regular wet box, I build a simple frame and cover it with plastic. Inside the enclosure, I bend a gooseneck lamp over a pan of water to maintain the desired temperature and humidity.

If the temperature and humidity are too low, the *urushi* may not harden; if too high, the lacquer may harden too quickly and take on a milky cast or "burn." High heat and humidity may also make a thick coat of lacquer shrink and wrinkle. Fortunately, though, the required heat and humidity ranges are quite broad and not that difficult to maintain, at least not in a humid country like Japan. *Urushi* can be fickle, though, no matter what you do. Even under perfect conditions, I've had pieces remain tacky for days.

Conditions in your workroom are important, too. It must be as free of dust as possible, especially during the final coats, which magnify even the smallest trapped particles. Oil, even the oil from your fingerprints, can be more damaging than dust—it may keep lacquer from hardening. The room must also be warm and dry to keep the lacquer fluid and easy to spread.

You begin the actual finishing process by squeezing a small amount of *urushi* onto a lacquered work table called a *joban* or onto a sheet of glass. The lacquer is then taken from the smooth surface and applied with a short-bristled brush. Never squeeze it directly onto the workpiece. Lacquer is expensive and thus used conservatively—you don't want to expose large amounts to the danger of dust contamination or premature hardening. The *joban*'s sealed surface is easy to clean and does not absorb lacquer.

There's no formula for determining how much lacquer to squeeze out at one time, but you'll want enough to cover the piece you're doing. For the 15-in. tray used in this demonstration, a daub the size of a walnut would be enough for a generous first coat of lacquer. I use brushes made from a combination of human hair and horsehair, but any firm brush that does not shed bristles will do. Leave the first coat on for a few minutes, allowing the wood to absorb it freely. Then remove excess lacquer with a wooden spatula (called a *hera* in Japan), and thoroughly wipe the surface with a clean, dry, lint-free cotton cloth. Next place the piece on the smooth wooden slats inside the wet box until the lacquer has hardened, which may take as long as three days for the first coat. Until the stone-paste filler is applied, both sides of the piece are worked at once. After adding the filler, I

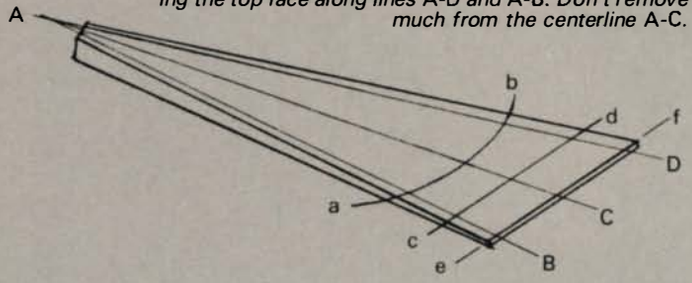
CAUTION: *Urushi* can cause a skin rash, which can be severe with susceptible individuals. The tree that produces *urushi* is akin to poison sumac. Some people are never affected, but others cannot even enter a room where it is being used without breaking out. It's best to assume you are allergic. Try not to get any on your skin. If you do get it on you, wash the spot immediately with alcohol. Although *urushi* has a pungent smell, it's nontoxic, so you don't have to wear a respirator.

This typical wet box, shown with its door removed, is a rough container equipped with a wet/dry thermometer to monitor humidity and temperature. Towels dampened with a plant sprayer provide moisture. Lamps supply heat when the box is sealed.

Apply the urushi *with a short-bristled brush. The first, soaking coat creates a dramatic color contrast between the raw wood and the finished area. The glove keeps oily fingerprints off the wood.*

To make a wood filler, use a hera *(wooden spatula) to mix pulverized stone powder with water, then work in a small amount of lacquer until the paste can be smeared easily.*

Cut hera *from any clear, straight-grained wood. Their exact size, flexibility and shape depend on the job, but for a start split out a blank 27cm long by 6cm wide and plane it to a thickness of 6mm to 7mm. Cut the blank diagonally to yield two* hera. *Mark the top—all further shaping will be done to this face. Taper the blank thickness from 6mm at the handle to 1mm at the edge. Continue to thin the handle by planing the top face along lines* A-D *and* A-B. *Don't remove much from the centerline* A-C.



Next feather the area from arch a-b *to edge* e-f *so that there are no abrupt changes in thickness. To ensure uniform thickness at the edge, make the final taper from line* c-d *to the edge with one slice of a sharp knife. Finally, cut off the edge* e-f *at any angle that suits you.*

Holding one end of a nylon cloth filled with stone paste in his teeth, Roche twists the other end with one hand and uses the hera *to pick up the paste as it is filtered through the cloth. Then he uses the spatula, right, to smear stone-paste filler over the wood and into its open pores.*

Removing hardened stone paste is tedious. Wet-sand the layer to create a mud-like slurry, above, then wipe the area with a wet cloth. Wood grain is visible through the semi-transparent areas. Sandpaper is too rough for final coats, which must be polished with powdered charcoal dust and a cloth wrapped around a cotton pad, right. The polishing motion resembles that associated with French polishing.

work on one side of the piece at a time. At this point, I wrap the slats with soft paper so the finish won't be scratched.

When the first coat has hardened, wet-sand the surface with 240- to 280-grit wet-or-dry silicon carbide paper over a sanding block. Always use water as the lubricant. As you sand, you'll see the high spots become lighter in color as the lacquer is removed, while the low spots remain dark. These spots usually are so slight that you can't feel them with your fingers, but they would be obvious in the glass-like surface of the finished piece, so you must eliminate them. Don't try to remove all the irregularities in one step. After sanding with 240-grit, apply another coat of lacquer as before, allow it to dry, then wet-sand with 320-grit. Then add a third coat of lacquer and wet-sand with 360-grit paper. Be careful not to sand through the lacquer completely, or you'll damage the wood cells and they'll absorb lacquer differently than will the undamaged areas. When your sanding lightens the entire surface evenly, all the surface irregularities have been removed. Apply a final coat of lacquer to finish the smoothing process.

Next seal the surface with stone-paste filler. To make the filler, place roughly equal parts of stone powder and *urushi* on your work surface. Add a small amount of water to the powder and mix thoroughly with a sturdy spatula until you have a barely damp paste. Now gradually work the *urushi* in with a kneading, smearing motion. Before using newly prepared stone paste, mix it with some left over from a previous project. If you don't have any old stone paste, don't use the new stuff for a day or two to ensure that the ingredients have settled into one another.

You must strain the paste before using it. Put a gob of it on a piece of fine mesh nylon (used for silk-screening), then twist the nylon. With a wooden spatula, skim off the paste that squeezes through the mesh and smear a thin coat over the entire project. Press firmly to force it into the open pores and fibers of the wood. When the piece is covered, place it in the wet box until it has hardened. Usually this takes from three days to a week or more. The piece is ready to work when you can make whitish scratches by running your fingernails back and forth across the surface.

Removing the dried paste from the surface is one of the more difficult parts of lacquering. Attach 400-grit wet-or-dry paper to blocks shaped to fit the object and wet-sand until you can't see any paste on the surface. Don't remove any of the underlying coat of lacquer, or the finished piece will have an uneven color and gloss. With a wet cotton cloth, remove the thick mud created by the wet-sanding. Wash the surface with water and apply a coat of lacquer before repeating the stone-paste process and sanding with 500-grit. On the second coat, you have to apply the paste only to patches you missed on the first application—these spots will be easy to see because they'll be dull compared to the rest of the surface. Usually two coats of stone paste are sufficient, but you might need a third coat on a broad-grained wood like oak.

After you've removed all of the hardened stone paste, thoroughly wash the entire surface with fresh water. Since the wood is, or should be, completely sealed by now, there's no danger of warpage. If the stone paste washes out of the grain, however, you probably didn't put enough lacquer in the paste mixture. Make a new batch and repeat the sealing process.

Now you are ready to begin laying up coats of lacquer to achieve the depth and brilliance typical of the finest work. These coats should be extremely thin—apply just enough lacquer to moisten the surface without building up any perceptible thickness. Brush on the lacquer, then spread it over the entire surface with a soft linen cloth wrapped around a piece of absorbant cotton. Move the cloth in a circular motion at first to ensure even application, then run down the grain in long, even strokes. For hard-to-reach places, wrap the linen over a spatula. After lacquering, put the piece in the wet box again until it has hardened.

Sand the hardened coat lightly with 600-grit paper, just enough to remove any dust that may have settled on the surface and to ensure good bite for the next coat. Apply six to eight thin coats, allowing each to harden and sanding between coats with progressively finer paper—600-, 800-, 1,000- and 1200-grits.

After the eighth coat of lacquer, even the finest wet-or-dry paper would be too rough, so you must buff the surface with charcoal powder and water on a wad of absorbant cotton. Use a tight circular motion over the entire surface, then wash off the powder with clear water. The surface should show up evenly dull.

Now apply a thin coat of lacquer, using linen wrapped over absorbant cotton instead of a brush. Let the lacquer harden as before, but do *not* buff the surface with charcoal powder. Simply apply the final coat of lacquer directly over the previous one.

If everything has gone well, the piece should have a very high-gloss finish that is durable and extremely easy to care for. If for some reason the finish is uneven or you wish to refinish a piece, you must go back to the point where 400-grit paper was used and repeat the process.

To clean up, remove excess lacquer from your brush by "prying" it out with a hard wooden spatula. Then dip the brush in vegetable oil. Work the oil into the brush and squeeze it out with a spatula. Repeat until the oil comes out clean. Leave a little oil in the brush to prevent any residual lacquer from hardening. Before using the brush, you must reverse the cleaning process, using lacquer to remove all of the oil. Work tables are also cleaned with oil, then washed with alcohol. Excess lacquer and stone paste can be saved in a bowl covered with plastic wrap.

Time is the true test of the quality of any finish. If the process I've described seems too difficult and time-consuming, take another look at the results. A good lacquer finish will not dull, and it's easy to maintain—it can be cleaned with a soft, moist cloth and polished with a dry, cotton cloth. Even if you don't want to use the complete method, don't give up on *urushi*. You can cut the work in half by omitting the stone paste, and only have to give up some gloss. You can create a dark matte finish, much like a dark walnut stain, by letting the first coat soak in, removing the excess with a cloth and allowing the lacquer to harden. I especially like the soft, semigloss sheen achieved by applying three coats. Apply a heavy first coat as previously described, let it harden, then lightly dry-sand with 400-grit. Repeat the process for the second coat, then apply a final coat.

Working with *urushi* has been a source of both satisfaction and discouragement for me. New problems arise with every piece. But among the romantic ideals my teacher, Kuroda Kenkichi, has about craftsmanship is the belief that something made from a 300-year-old tree should last for at least 300 years. Some might call that philosophy and some might call it common sense. In any case, *urushi* is a step in the right direction. □

Charles Roche operated a small furniture shop in Lexington, Ky., before going to Japan in 1978 to study woodworking and lacquering. He worked with Kuroda Kenkichi for three years before opening his own studio in Kyoto. For a price list and information on ordering urushi *and stone powder, write to the author at Kamigyo-Ku, Muromachi Dori, Kamedachiuri Sagaru, Uratsukiji-Cho 81, Kyoto 602, Japan.* Urushi *can also be obtained from Woodfinishing Enterprises, 1729 N. 68th St., Wauwatosa, Wis. 53213.*

Starting Out

Build and fit a basic drawer

by Roger Holmes

I have always been fond of cabinets filled with row upon row of little drawers, each cleanly dovetailed and snugly fitted in its opening. Drawers seem full of promise and mystery. When they're closed, that is; an open drawer usually reveals much more junk than treasure. But there is pleasure in sliding open a well-made and well-fitted drawer, even if it's filled with shoelaces and paper clips.

Making drawers can be fun, too, if you don't let your ambition outstrip your ability. I'll never forget the sight of my first attempt, a little drawer barely three inches deep, buried beneath a network of pipe clamps attached in a vain attempt to pull its ill-fitting dovetails tight and its corners square. The drawer joinery shown here is more modest, but perfectly adequate. Using it will allow you to get the hang of making a drawer square and fitting it to a cabinet before you stir dovetails into the mix. And if you need lots of drawers, these are quick to make. Drawers are also well suited for mass production—if you're making more than one, do the same operation on all the pieces at the same time.

The fit of a drawer in a cabinet can be as important as the construction of the drawer itself. I always make the carcase first and then the drawers to fit it. The ideal is a snug fit, with drawer sides and carcase sides sliding against each other like the walls of a piston and its cylinder (well, as much like a piston and cylinder as your patience and the material allow). But the drawer will work even if it is looser, so fitting a drawer really well is a challenge more than a necessity—a distinction worth remembering after you've fiddled around for an unsuccessful hour trying to do it. I use the method described below when I'm trying for that ideal fit; for a less refined and much quicker method, see the box on p. 62.

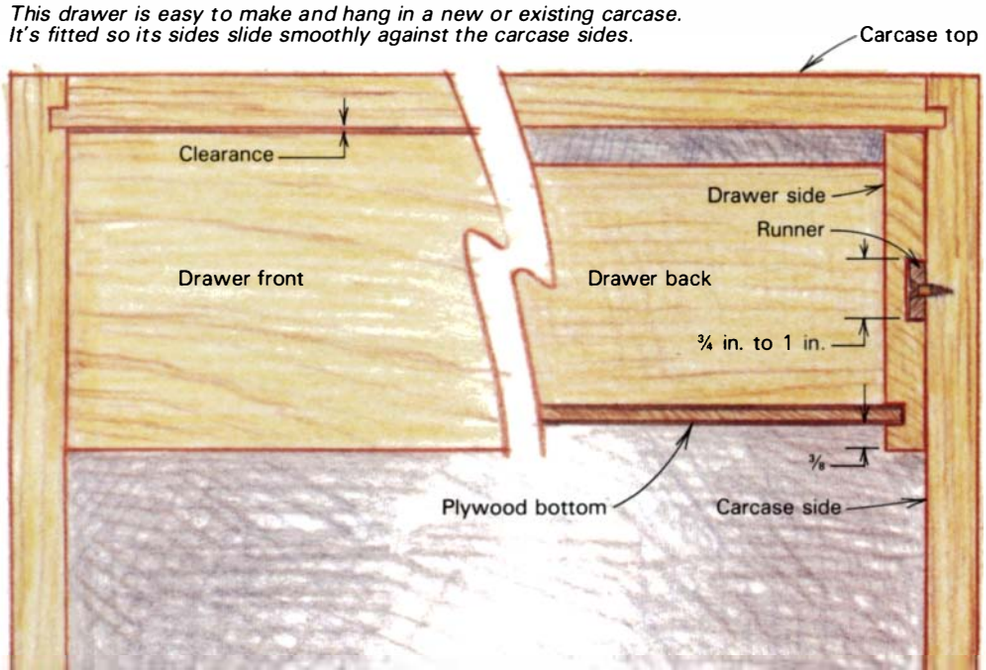
The drawer joinery—locking tongue-and-groove at the front corners, dadoes for the back and sides—is a variation on the carcase joinery described in the last "Starting Out" article (*FWW* #50, pp. 54-59). I've hung the drawer on runners housed in its sides, which is less traditional than resting the drawer on a frame (a rail under the drawer front, runners under the sides). Frames can stiffen a carcase, and I use at least one or two in tall stacks of wide drawers. Side-hanging the drawers saves time (no frames to make) as well as the space taken up by the frames, which can be as much as 3 in. on a four-drawer cabinet. The method below, however, can be used to fit either type of drawer.

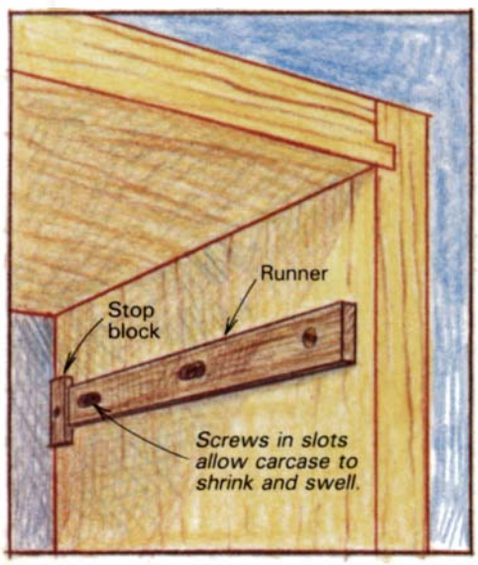
I made the drawers of pine, but it's not the best-wearing wood for drawer sides—a hard wood would be better. Boards with growth rings more or less parallel to the edges when viewed on the end grain (called quartersawn or riftsawn) are least likely to cup and shrink, and are worth culling out of your lumber pile for use as drawer sides.

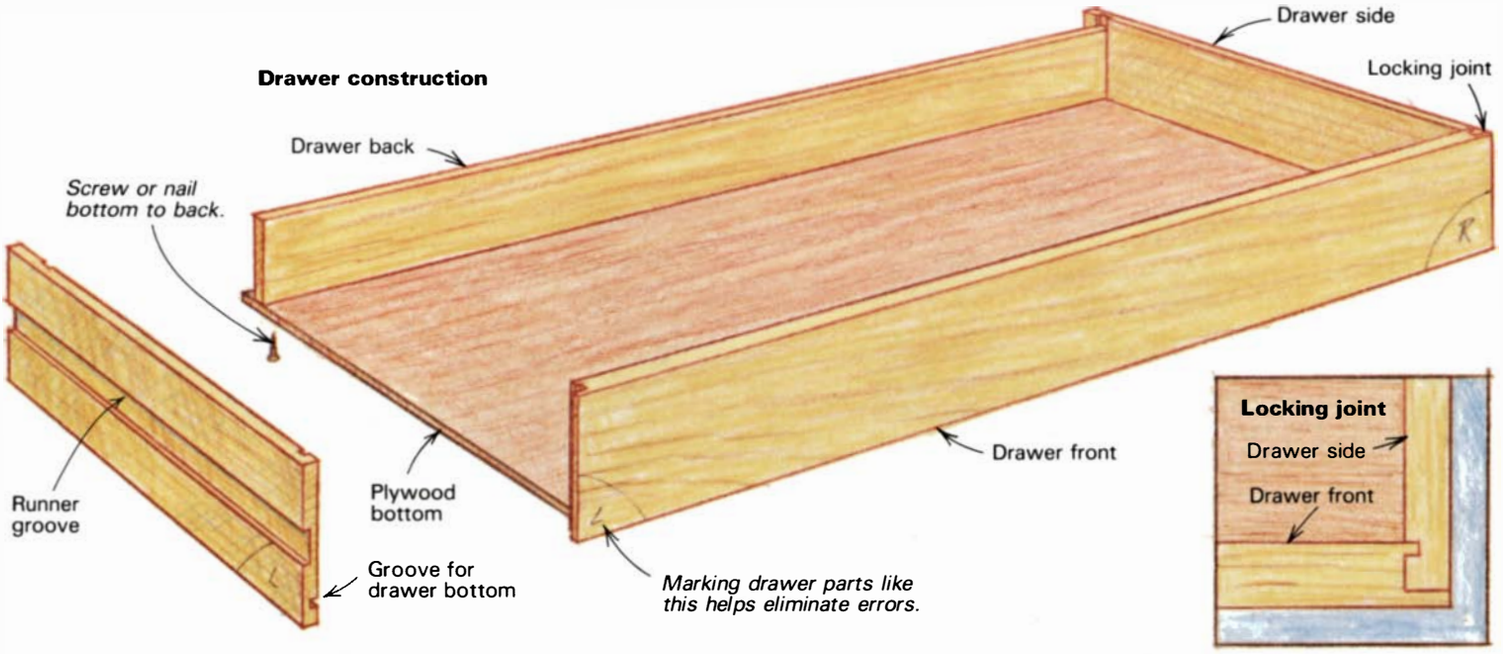
Accurate stock preparation is the key to successful drawermaking. If the parts aren't square, the drawer won't be either. Cut all the fronts, backs and sides roughly to size: front and back about 1/32 in. longer than the distance between the carcase sides; drawer sides about 1 in. less than the width of the carcase sides. I make the fronts 3/4 in. thick; the backs and sides

A side-hung drawer

This drawer is easy to make and hang in a new or existing carcase. It's fitted so its sides slide smoothly against the carcase sides.







about ½ in. thick. Take care when flattening the pieces—twisted parts make twisted drawers. The back is dadoed to the sides, so match its thickness to a standard plow-plane blade or router bit.

Mark the good faces, then plane and mark the good edges on all the boards, checking them with a straightedge. I put the good edges on the bottom of the drawer. (A simple way to keep the pieces straight is shown above.) The ends of the pieces *must* be square to the good edges. If they're not, the drawer will certainly be twisted, and probably not be square. I usually do this planing freehand, holding the piece end-up in the vise and checking squareness with a try square or a framing square.

A shooting board, shown in the drawing at right, is a good jig for doing the same thing, particularly if you're making lots of drawers. There's not much to a shooting board, but it must be made accurately; obviously the stop must be dead square to the guiding edge, and the sole of your plane perpendicular to the plane's sides. Use whatever plane is most comfortable for you. I use my jointer plane because of its weight and long bearing surface. (No, you won't plane the guiding edge as well as the workpiece.) Fool around squaring up scrapwood until you get the hang of the shooting board.

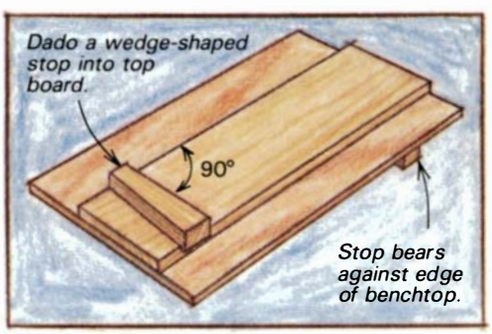
Square the ends of the drawer front first, planing enough off so that the front will just about, but not quite, fit between the carcase sides. Only the front end of each drawer side need be square for this construction; if you're corner-jointing the back to the sides as well, square up both ends. Unless you're sure of the dado depths now, plane the back to exact length after you dado the sides.

Next groove the inside faces of the sides and front for the drawer bottom (it passes under the back). You can plow the grooves with a plow plane, rout them, or cut them on the tablesaw with a dado head. They shouldn't be deeper than half the thickness of the pieces. I locate them ⅜ in. above the bottom edges, which leaves enough wood for strength without stealing too much depth from the drawer. Remember to run the bottom, good edge against the fence of whatever tool you use for grooving.

The locking joints at the front corners are a little more complicated than those for the carcase. (If you used the simple car-

Shooting board

You can square an end to an edge quickly and accurately with a shooting board, one of the simplest of jigs.



case joint shown on p. 58 for the drawers, either the end grain of the sides would show, or the tongue would have to be on the sides, running in the direction of most stress—the front would easily pull away from the sides.) This joint is fairly easy to cut on the tablesaw or with a plow plane, but I think it's too much trouble to rout. Regardless of how you cut the joint, do it accurately, because its strength depends on a close mating of the parts.

The drawings at right show proportions and the sequence of cuts on the tablesaw. I use a single blade that cuts a kerf about 5/32 in. wide, which is sufficient width for the groove. Make the groove depth (cut **1**) about one-third the thickness of the side. Make cut **2** using the same fence setting as for cut **1** to ensure that the end of the drawer side will fit tight against the drawer-front rabbet. Cut the front and several pieces of scrap the same thickness as the front, then use the scrap to reset the fence for cut **3** to make a snug-fitting tongue. I make the final cut just shy of the groove bottom, so the tongue won't bottom out and hold the joint apart.

Though this is essentially a machine joint, it can be cut by hand with a plow plane as shown. I use a ¼-in. cutter to groove the side (**B**) and a 5/16-in. cutter for the end of the front (**A**). Plow the groove in the side first, setting the fence using the wider cutter as a gauge. Plug the drawer-bottom groove with a tight-fitting scrap to prevent breaking it out, and remember to chisel ramps at the ends of the cuts to prevent tearout. To make the tongue, set the plow-plane fence using the groove cutter as a gauge. Plowing in end grain, at least in soft woods, isn't much more difficult than plowing with the grain, but practice on some scrap first.

Dado the sides for the drawer back with tablesaw and dado head, router, or plow plane. I place the dado about ½ in. to 1 in. from the end of the side, so there's plenty of wood on both sides of the dado for strength. One-third the thickness of the side is sufficient depth.

Next groove the outside faces of the drawer sides for the runners. The width of the runners isn't critical; I find that ¾-in. to 1-in. wide runners are easier to work with than narrower runners, and probably stiffer. I make the runner grooves 3/16 in. to ¼ in. deep, and plow them from end to end—the drawer front will cover the groove at the front end. For drawers up to 6 in. deep, center the grooves; for deeper drawers, locate them nearer the top edge.

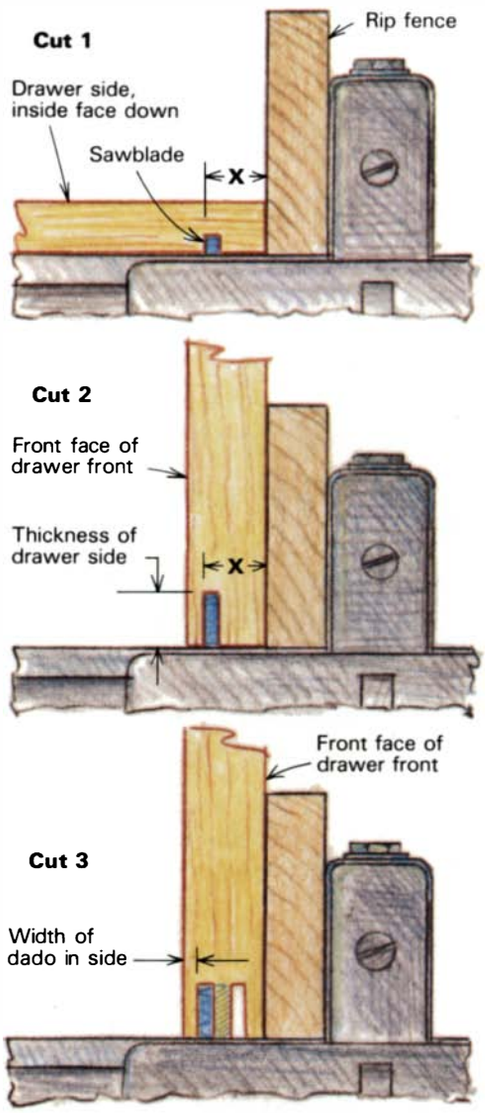
I think that solid-wood bottoms give a drawer a nice heft, and raise it a notch or two in quality, but they're sure a lot more work than plywood bottoms. When I make solid bottoms, I plane them about 5/16 in. or ⅜ in. thick, then thin them at the edges with a bevel or a rabbet to fit the grooves. Whether the bottom is solid wood or plywood, trim it square and fit it snugly from side to side, and so it runs beneath the drawer back. The grain of a solid-wood bottom should parallel the drawer front so it won't shrink out of the side grooves, or push the sides apart when it expands. Grain direction doesn't matter for plywood bottoms, but I run it parallel to the front anyway.

All the parts should be ready for assembly now, but first I clean up the inside faces of everything and wax them, taking care not to get wax on a surface to be glued. It's a lot easier to do this now than later. If you want more protection than wax but not a full-blown finish, brush on a coat of sanding sealer, rub it down with steel wool, then wax it.

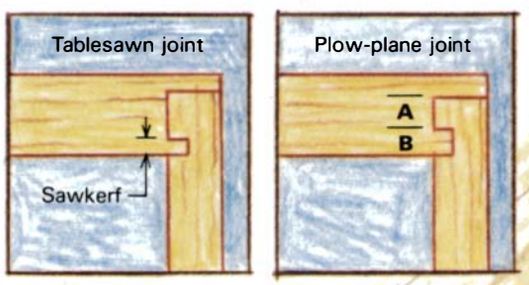
Assembly is straightforward, but it's not a bad idea to make a dry run just to see that everything fits, and that you've got all the clamps and paraphernalia you'll need. Then spread glue in the groove and dado of one side, and insert the front and back, aligning the grooves for the bottom. Slide in the bottom and add the second side. (You can glue plywood in place, but a

Tablesawn locking joint

The locking joint can be cut quickly and accurately by following this sequence of cuts.

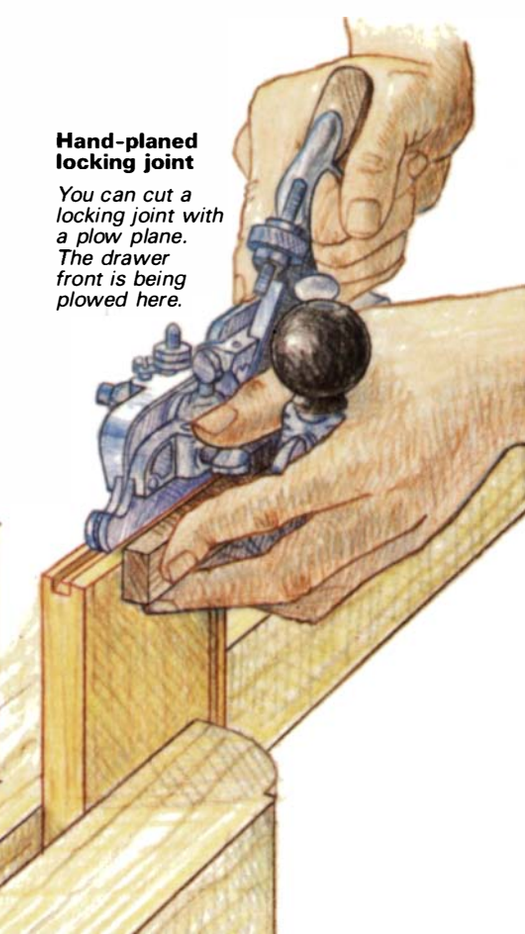


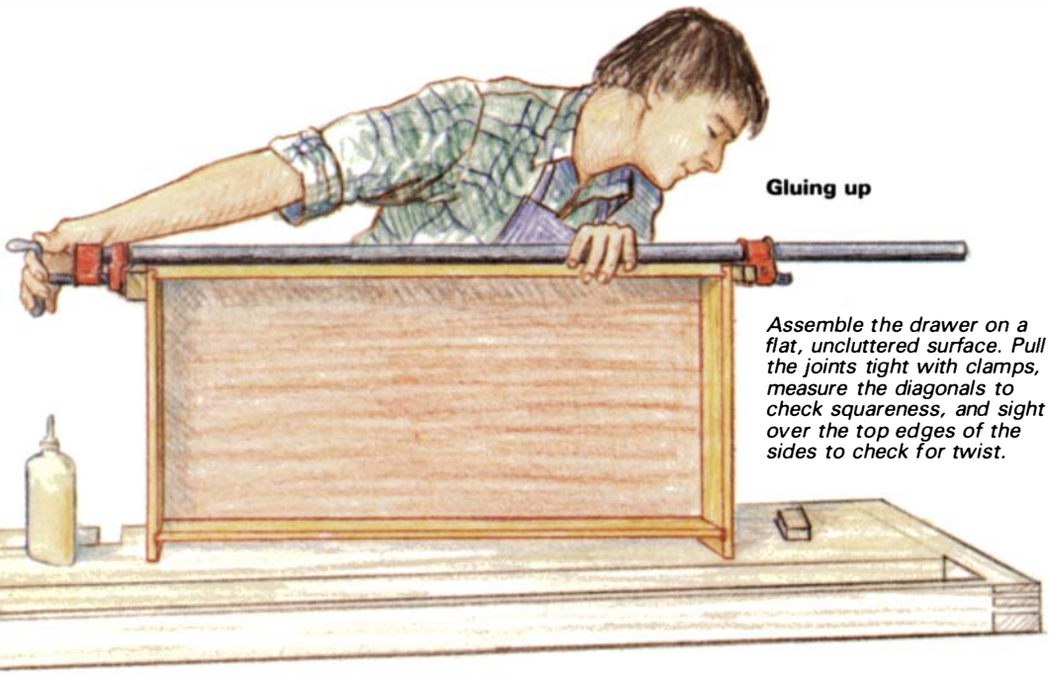
*Lay out a tablesawn joint according to the sawblade thickness, as shown at left below. Lay out a plow-plane joint to match standard cutters (**A** and **B**).*



Hand-planed locking joint

You can cut a locking joint with a plow plane. The drawer front is being plowed here.





Gluing up

Assemble the drawer on a flat, uncluttered surface. Pull the joints tight with clamps, measure the diagonals to check squareness, and sight over the top edges of the sides to check for twist.

solid bottom should just be nailed or screwed to the back.) Assembling with the drawer bottom in place helps keep the drawer square. Pull the joints tight with pipe clamps, placing hardwood blocks between the jaws and the sides to protect the surfaces and distribute the clamping pressure. You can leave the clamps on while the glue sets, or drive a couple of nails in each joint and take them off.

Measure the diagonals to check for squareness. Sight over the edges of the sides or try to rock the drawer on the benchtop to see if it is twisted. If it is, you can weight the high corners; too much counter-twisting can break the joints. If the twist isn't too bad, you can plane it out when fitting the drawer to the carcase. If you find yourself planing off most of the drawer side, make another drawer. Leave the drawer on a flat surface while the glue dries.

The runners for the drawers are best made of a hard wood such as maple, cherry or oak. The easiest way to make them is to thickness a wide board to a sliding fit in the runner grooves and rip the runners off the edge. Plane the edge of the wide board after each cut so each runner will have one smooth face. I make the runners just slightly thinner than the depth of the runner grooves and about ¾ in. shorter than the drawer sides.

The runners are slot-screwed to the carcase sides to allow the sides to shrink and expand with changes in humidity. In better-quality work, the runners are housed in dadoes in the carcase sides, then screwed down. I think three #6 screws are sufficient to fasten a 15-in. runner. The screw near the front end is fixed through a single hole so it won't move in relation to the front edge of the carcase. I make each slot by boring two holes ½ in. apart and chiseling out the waste in between. (Save a little time by boring the holes in the edge of the wide board before ripping off the individual runners.) Countersink the holes and slots so the screwheads will be beneath the runner's surface.

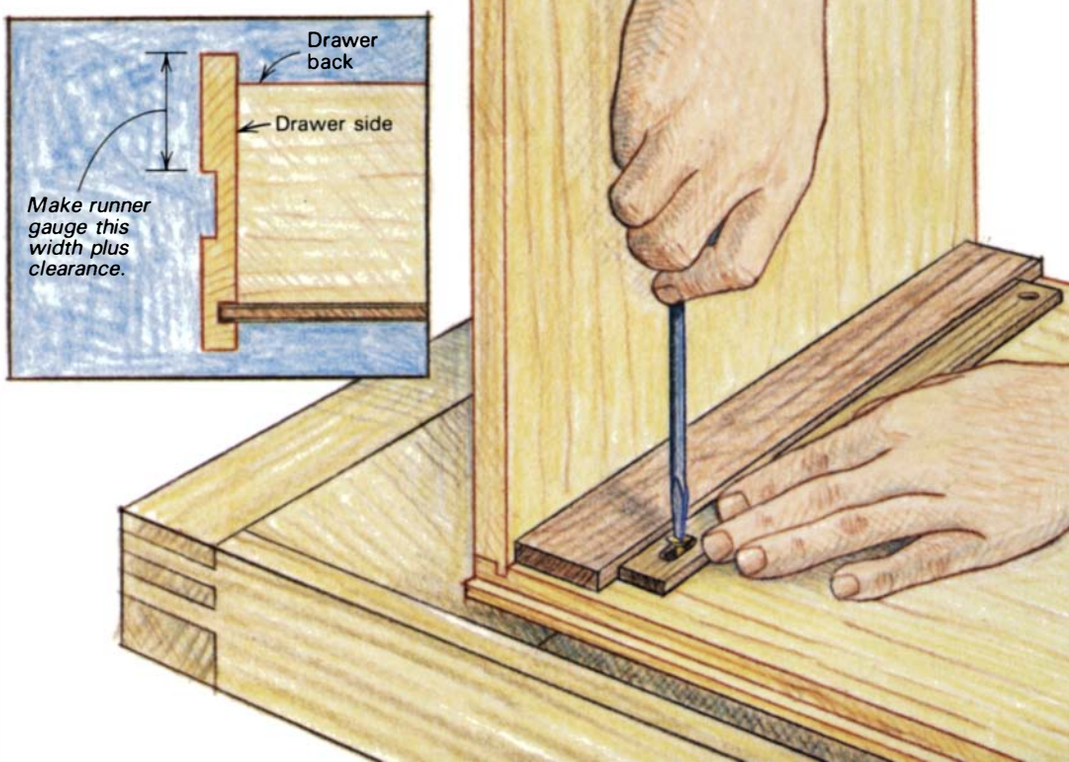
To install the runners, make a gauge block equal in width to the distance from the top of the runner groove to the top edge of the drawer side, as shown in the drawing below. This distance should be the same for each pair of sides on a drawer. The block should be about as long as the carcase is deep. Lay the carcase on its side, butt the gauge into the upper corner, position the runner against the gauge about ½ in. back from the carcase's front edge, and screw the runner in place. (You'll need to bore pilot holes for the screws in hardwood carcase sides.)

The drawer sides and front will expand and contract across their width with changes in humidity. You can allow for this in the gauge, or by adding a spacer between the gauge and the carcase top, or by planing the sides down when fitting. The size of the gap will vary according to the wood used and the conditions where you live. In England, we used to fit drawers in fine work very closely because the humidity was fairly constant year round. On my first job after returning to Nebraska, I fitted the drawers tightly, only to have to plane the height of the sides later to accommodate the extreme variation in humidity from summer to winter—4-in. deep riftsawn oak sides moved more than ⅛ in. across their width. Play it safe on your first drawers.

Now you're ready to fit the drawer to the carcase. With luck, this will require only a couple of fine shavings off each drawer side and just a touch from a sanding block on the bottom edge of the runners. An assembled drawer is difficult to hold in a vise, so I clamp a piece of ¾-in. plywood to the benchtop to support the drawer for planing. The width of the ply should fit easily inside the drawer, and the

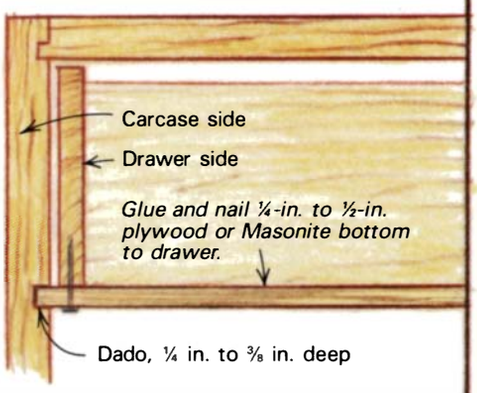
Attaching the runners

Make a runner gauge as shown below, then butt the gauge against the carcase top to position the runner while you screw it in place.

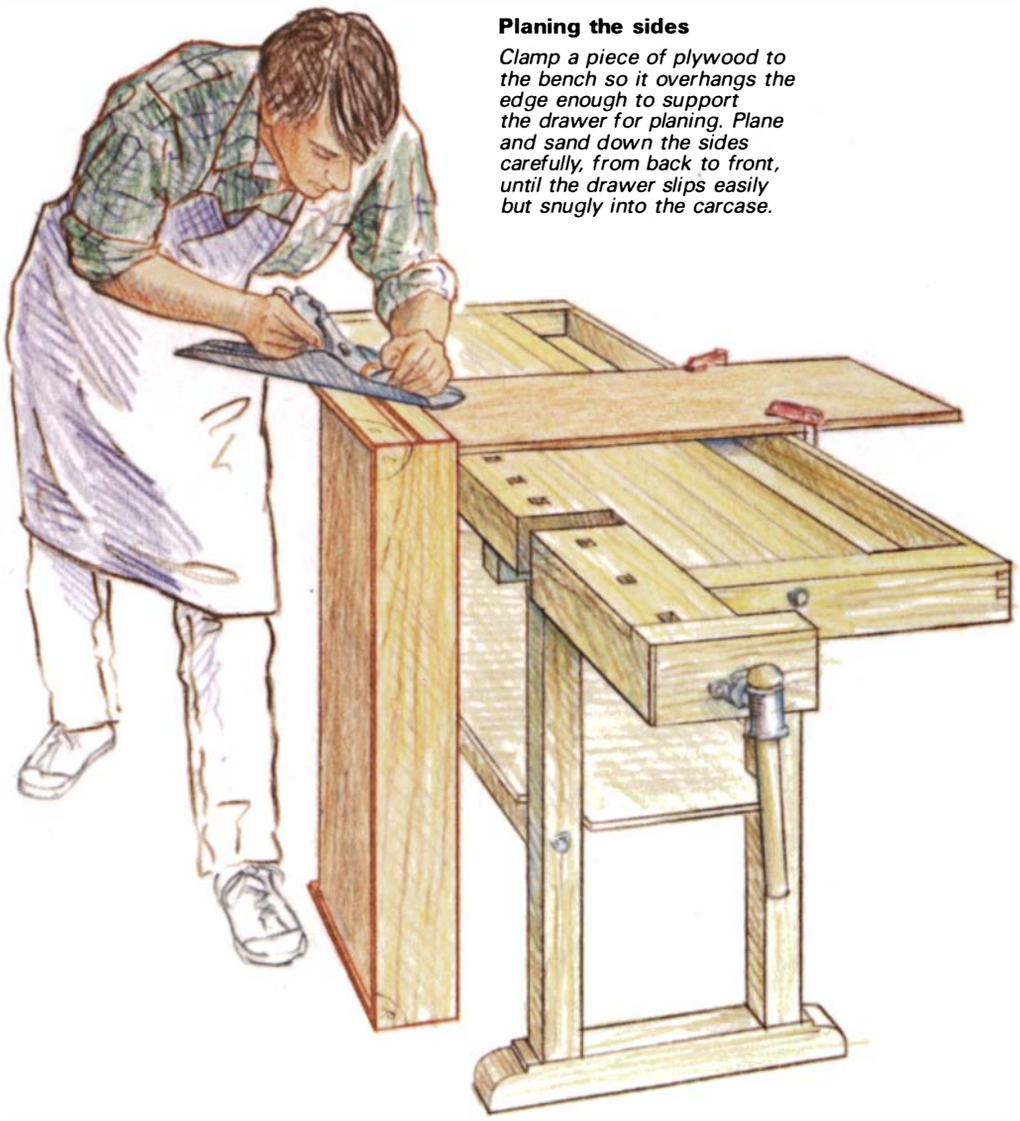


A simple slider

If you're not too bothered by how a drawer looks, or not quite so compulsive about how it fits, try this method. The sides, front and back are joined exactly the same as for the drawer on p. 58, but you don't need to groove for the bottom and the runners. Make the drawer bottom of ¼-in. or ⅜-in. plywood—Baltic birch if you can afford it, or an interior grade that permits few voids if you can't; ¼-in. tempered Masonite will work, too. The width of the drawer isn't terribly important. I leave a ⅛-in. gap between the carcase sides and the drawer sides. (A large gap like this, uniform on both sides, announces itself as deliberate, and shouldn't raise any eyebrows.) I assemble the sides, back and front, then glue and nail the bottom in place after making sure it slides easily in the carcase dadoes.



You can dado the carcase sides to accept the drawer bottom before assembling the carcase or after. If you do it after, dado before attaching the back. Either way, you'll need to fix a fence to the carcase side to guide the router or plow plane. A good trick is to make the top drawer as deep as the distance from the edge of the router base to the bit—just run the base against the carcase top to cut the dadoes. ***—R.H.***



Planing the sides

Clamp a piece of plywood to the bench so it overhangs the edge enough to support the drawer for planing. Plane and sand down the sides carefully, from back to front, until the drawer slips easily but snugly into the carcase.

piece should overhang the edge of the bench by about the drawer's depth.

The initial goal when fitting is to get the drawer to slide completely into the carcase, as tight to the sides as possible. Using a sharp plane, first take a thin shaving off the back half of both drawer sides, then try the drawer in the opening. If it fits halfway, plane farther forward until it fits all the way; if it doesn't fit halfway, take more off the back. If the drawer gets hung up, remember to check the runners, too. More than once, I've planed too much off a drawer side before discovering a sticky spot on a runner. You can trim the runners with a sharp, finely set shoulder plane, or with sandpaper wrapped tightly around a square-edged block of hardwood.

When the drawer slides completely into the carcase, work the sides and runners with planes or sandpaper until it slides sweetly. Colored chalk rubbed on the carcase sides will show up high spots on the drawer sides. Finally, paste-wax all the mating surfaces. You should be able to open and shut a well-fitted drawer with only your little finger, and when the drawer is halfway out, there should be very little movement either up and down or side to side.

When the drawer fits, screw stop blocks at the back of the carcase to fix its position when closed. If the drawer front is allowed to strike the end of the runners to stop the drawer, the front will soon be popped off. (The runners are acceptable drawer stops if you stop the runner grooves about 1 in. short of the drawer front.) I like the drawer front to sit about ⅛ in. back from the edge of the carcase. To add another drawer, or a stack of drawers, just repeat the process, gauging from the drawer above to place the runners.

This all sounds like a lot of trouble, you might say, for a simple pine drawer. True, there's no need to fit this drawer with anything like the precision I've described. For that matter, there's no need to fit any drawer like this. I have drawers in my house that you can practically throw into their openings from across the room, and they still do a fine job of corralling my socks and shirts. But if your dream is to someday build one of those exquisite cabinets with lots of piston-fit little drawers, then the more practice you have, even with humble pine drawers, the more likely you are to succeed when it really matters to you. □

Roger Holmes is an associate editor at Fine Woodworking.

Bandsaw Your Own Veneer

All it takes is patience and a sharp blade

by Brad Walters and Richard Barsky

Anyone who has worked with commercially cut veneer knows that it can be tricky stuff to handle. Because it's so thin, sliced veneer doesn't gracefully suffer the dings and dents of hard use, and the margin for error—especially where two veneered panels adjoin—is quite small. One alternative worth trying is bandsawing your own thick veneer, a method that has several advantages over buying thinner stuff. Prepared veneers usually come in thicknesses between 1/28 in. and 1/32 in., but when you saw your own, you decide the thickness—in our shop, we usually aim for a 1/8-in. finished thickness.

Because sawn veneers are thicker, they work and feel more like solid wood, yet still retain the stability of veneer. Gluing the veneer to the substrate is easier, too—none of that curling, bubbling, splitting and the like to contend with. You'll also have more material to scrape, plane and sand when flushing up adjacent surfaces, so you won't have to worry about going through the face veneer and exposing the substrate.

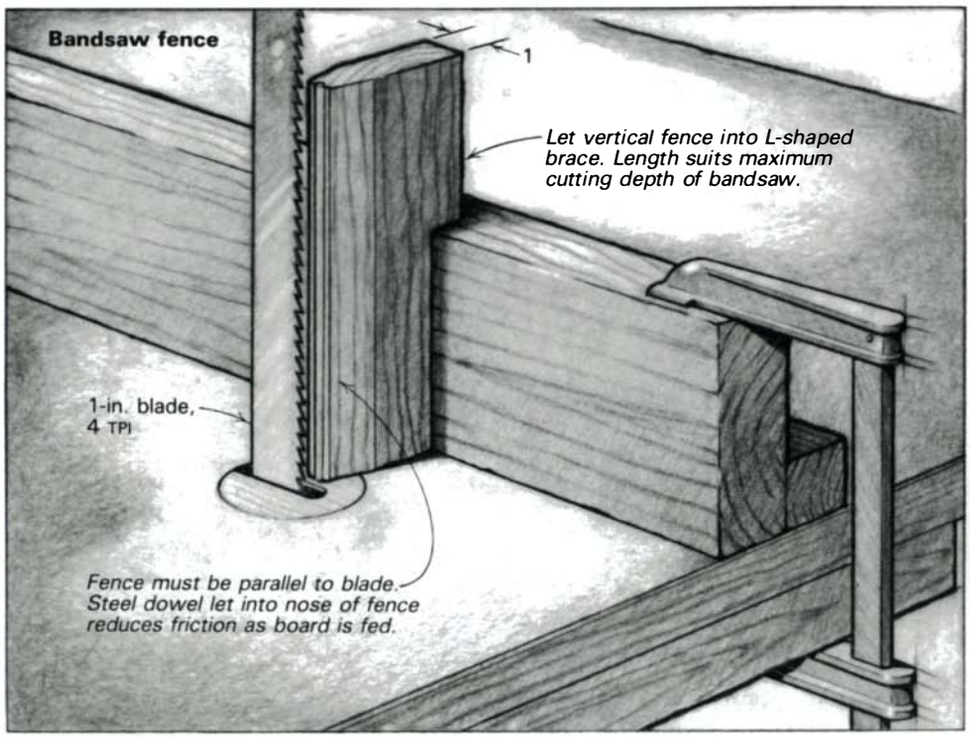
Sawn veneers are cut by resawing (standing a board on its edge and bandsawing through its thickness), in this case into a number of thin slices. To resaw veneer, you'll need a bandsaw of adequate size and power. We use an old 26-in. cast-iron Silver bandsaw with a 5-HP motor. With a sharp 1-in. wide blade, it will handle anything we feed it, up to its 10¾-in. depth of cut. While a big bandsaw makes this job easier, don't be discouraged if you own a smaller machine. All bandsaws have limitations, but if you work at it, you might discover that your little saw will do just fine with narrower boards. Experimentation is the rule; try some scraps to find out just how wide your saw can go.

Before doing any cutting, check over your saw—there are some things you can do to improve its performance. The drive belt(s) should be tight and in good condition. The blade must be sharp and well-tensioned (¼ in. of flex with light finger pressure is good), and it should track smoothly. Make sure the bandsaw's tires are in good shape, and if they are glossed over with pitch from sawing softwoods, remove the blade and clean the rubber with lacquer thinner. Adjust ball-bearing thrust guides so they barely touch the back of the blade as it's running with no cutting load. Set fiber (or steel) guide blocks to bear lightly on the blade just behind the bottom of each tooth's gullet.

For resawing, we've found that a wide blade with a lot of set works best. We use a 1-in. skiptooth blade with four teeth per inch. If your machine won't accommodate this width, you can use a narrower blade; the wider the better, though, as the stiffness of the wider band makes for straighter cuts. Go ahead and experiment with other tooth patterns and sizes, but keep in mind that a coarse blade will cut more aggressively and may take a

With a sharp blade, well-adjusted guides and a stout fence, any bandsaw can cut veneers. Guided by a shopmade single-point fence, the authors' 26-in., 5-HP machine will saw boards up to 10¾ in. wide.

Photos: John Barkin



With the trailing edge of the fence positioned ⅛ in. in front of the blade, begin the cut by pressing the board against the fence just ahead of the blade. Follow the marking-gauge line (pencil-darkened for clarity) by pivoting the board on the fence.

wider kerf. A finer blade will yield a smoother if slower cut, but it will dull more quickly.

Once your bandsaw is ready, you need a fence to steady the wood so you can resaw veneer of uniform thickness. There are two kinds of fences: single-point and straight. We use the single-point, but each type has its own merits and drawbacks. As the drawing above shows, our single-point fence consists of a 10¾-in. high vertical member attached to an L-shaped brace that we clamp to the saw's table. Where the fence's pointed nose bears against the stock, we epoxied a ⅛-in. steel dowel into a groove, which reduces friction as the board is fed. This allows the stock to be "steered" as it's cut, which is helpful because the angle of feed can change slightly as the blade gets duller, and with variations in the hardness of the wood. Also, even a sharp blade will often have "lead," a condition where the teeth on one side of the blade are sharper than those on the other side, causing the cut to drift off toward the sharper side. You'll need to adjust the feed angle to compensate.

The straight fence is similar to a tablesaw rip fence, and because it supports the board along its length as well as across its width, cutting can proceed more quickly—if your stock is flat and straight. If the board is at all irregular, you won't have room to steer it to make corrections as the cut proceeds. Also, you can't make the steering adjustments for blade lead.

Before you set up the fence, decide what thickness to cut your veneer. This will vary, depending on the board you begin with and how many veneers you want out of it. We usually plan on one veneer leaf per ¼ in. of original thickness. This is generous and may seem wasteful, but it assures us of getting finished leaves of 3/32-in. to ⅛-in. thickness. If we want more mileage out of a board, we may try for more leaves—four out of a ¾-in. board, for instance. With smooth, straight cuts we can still get a good finished thickness, but with bowed, warped or wide lumber this is risky. Experience will teach you the limitations.

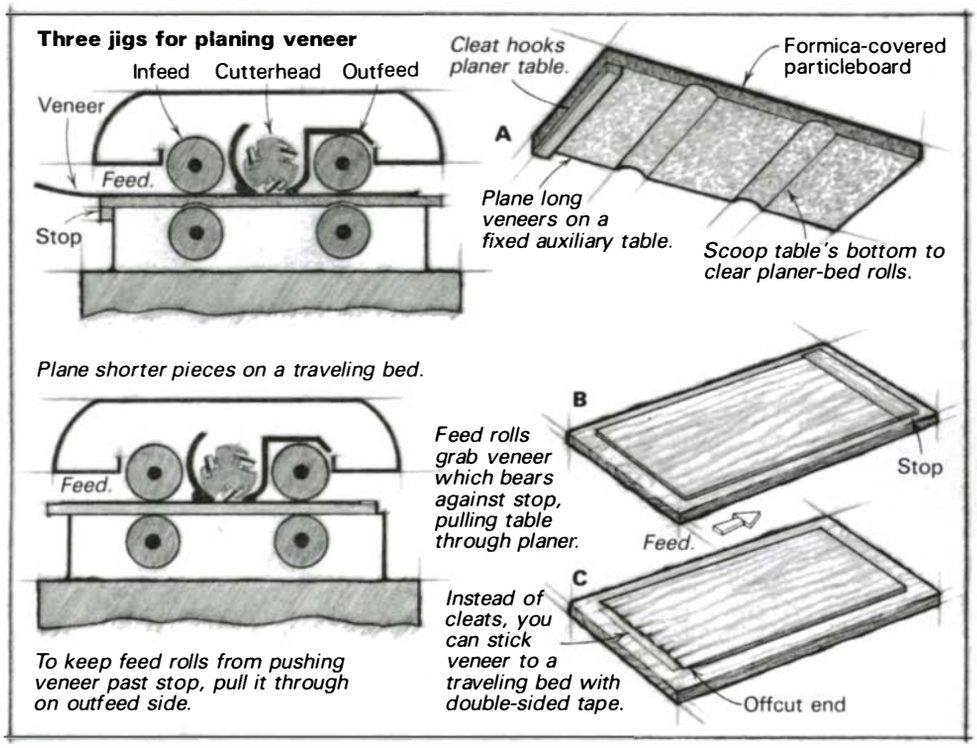
Rather than set your fence for a standard thickness, look at your board and decide how many veneers you want from it, then divide the thickness into that many sections. Since the saw takes a kerf each time you slice off a veneer, you have to account for this loss in your figuring. Multiply the kerf size times the number of cuts (one less than the number of veneers you want) and subtract that from the total thickness. Divide the remainder by the number of veneers you're going for, and you'll arrive at the actual thickness of each leaf. For instance, if we had a 15/16-in. board and decided to get four veneers out of it, it would take three cuts to do it. Our saw takes a 1/16-in. kerf, so the total loss would be 3/16 in., leaving 12/16 in. to divide between the four veneers, or 3/16 in. per veneer. If this is cutting it too close, you can go for one less veneer so you'll be less likely to wind up with a useless cutoff.

To set up, position the single-point fence so that the board contacts the fence about ⅛ in. before the cut begins. Use a steel rule to measure from the fence to the *inside* (closest to the fence) set of the blade, and measure from the top and the bottom of the fence to be sure it's parallel to the blade. This is important and should be accurate to within 1/64 in., otherwise you will cut wedges. Clamp both ends of the fence securely and check the measurement again. Usually you will need to loosen the clamps and make slight adjustments, or, if your saw has one, adjust the tilting table. If all else fails, place a small shim where the fence meets the bandsaw table to bring it parallel to the blade. Simply shifting the position of the clamp may also do it.

To prepare your board for sawing, surface it so the faces are flat, then joint and rip both edges square to the face and parallel to each other. If you plan to bookmatch, leave the length generous (especially if the grain is a cathedral pattern) because you'll often have to shift the veneers quite a bit to get them to line up. To give yourself an accurate reference for measuring the cut's progress, scribe a line along the top edge of the board with a marking gauge set to the thickness of cut. Also mark the butt end of each board with a bold V as a reference mark for matching later on. Now you're ready to go.

In sawing veneers, it's important to hold the face of the board firmly against the fence at the cutting point. You do this by pressing on the outside face of the board, just in front of the blade. Feed with one hand, and apply a steady but gentle pressure with

Drawings: Gary Theriault



Thick veneers are stiff enough to be glued up just like boards. Flush up the show surfaces, and alternate clamps top and bottom so the leaves won't buckle.

the other. As you saw, make sure you maintain this contact, but focus most of your attention on the top edge of the board, where the blade should be cutting just outside your scribed line. Go slowly at first. If the cut wanders, make gentle steering corrections. It's better to drift over the line a little and correct gradually than to over-correct larger wanderings. Once you've established a good cut, feed the board steadily, using a push stick to finish. The key is concentration, and with practice, it's not difficult.

If your first cut is good, mark another line on the top edge and make the second cut with the bandsawn surface against the fence. You'll get the most mileage out of your board and the best grain matchup if you resist the urge to resurface between cuts. If you are taking just three veneers out of a board, make the first cut, then flip the board and make the second with the other surfaced face against the fence.

Don't be discouraged if things go badly at first. It takes practice to get the hang of it. Here are a couple of pitfalls to watch out for. If you have to force the board, the blade is probably dull. If you push hard enough, the blade can heat up and twist as it passes through the wood, and may exit the board's face—which is a good reason to always keep your pressure hand in front of the blade. Also, the blade is liable to break under such stress. It's not worth ruining your composure and your veneer by trying to squeeze a little more life out of a blade. Save yourself time and grief by changing it. If your saw bogs down with a new blade, it may be underpowered. Try reducing the width of stock you're resawing, or switch to a coarser blade. Aside from a lack of experience, inaccuracies in the cut will likely be due to your setup. Shut the machine off and try to analyze what is happening. Patience and precision will pay off.

After the cutting is done, you have the pleasure of working with what James Krenov calls "real veneer." If you've gotten smooth, true cuts, you can use the veneer as is, gluing the bandsawn surface to your ground material, then sanding, planing or scraping the top. We find it worthwhile, however, to take our veneers to a neighboring shop where they are passed through a wide-belt abrasive planer. Local millwork or cabinet shops sometimes have these machines and will usually rent time on them. You can expect to lose about 1/16 in. to the sander, depending on the regularity of your bandsaw cut. Using an auxiliary feed table as shown in the drawing, you may be able to pass veneers through a thickness planer. But be very careful, particularly with figured wood. It's dismaying to see a beautifully figured veneer come out of the planer in pieces.

When we're assembling veneers into larger panels, we do so before taking them to the sander. That way we have a fully prepared, flat panel ready for pressing as one sheet. Veneers at least 1/8 in. thick are thick enough to be jointed and edge-glued just like regular boards. Alternate the clamps top and bottom and use light pressure—just enough to squeeze out a tiny bead of glue. Concentrate on flushing up the show face so irregularities in thickness will be on the back side—usually the sander will flatten them out. One word of caution here: Veneers sawn from thick boards may be relatively moist. To keep them from cracking later, give them a couple of days to reach equilibrium moisture content.

We won't go into the particulars of pressing here. For that, see Ian Kirby's article in *FWW* #47. In veneering the back side of a panel, which you should do for stability, you have a couple of options. The best procedure is to cut additional veneers of the same species (although not of face quality) and of the same thickness. We've gotten good results, though, by using commercial veneers on the back side—usually mahogany veneer, which is available in wide pieces and is reasonably priced. We haven't had problems with the veneers being of different thicknesses.

Once resawing is added to your repertoire of skills, you'll find other uses for it. The technique will allow you to cut bookmatched panels for frame-and-panel work, or to get two matched 3/4-in. boards or three 1/2-in. solid-wood drawer sides out of an 8/4 board. Essentially, you need no longer be restricted to the milled thicknesses available at the lumberyard. □

Brad Walters and Richard Barsky operate Dovetail Woodworks in Boulder, Colo.

Sculptural Inlay

Three-dimensional images in wood

by Nancy H. Bolstad

Allen used bone and natural wood colors, not stains and dyes, to create dragon inlay.

Carved rose picture has bloodwood blossoms, imbuya leaves, maple background and walnut frame.

Two years ago my husband and I were beginning to market our new series of limited-edition jewelry boxes when we saw some eyecatching three-dimensional wood pictures by Tom Allen. Unlike conventional marquetry images created with veneers, these pictures, which Allen calls "sculptural marquetry," were made by combining shaped pieces of wood up to 1 in. thick. We were impressed with the designs and craftsmanship, and knew that these sculptured pictures would look good on our boxes, replacing our frame-and-panel lids. Soon afterward we began working with Allen, and together we have produced a series of boxes featuring floral motifs, such as the rose box shown above.

Basically, to create these inlaid pictures, Allen rubber-cements three or four boards of different species together to create a multicolored stack. Then he bandsaws through the stack following a pattern cemented to the top board and pulls the laminated pieces apart. This produces four copies of his pattern, each of which resembles a monotone jigsaw puzzle. By combining parts from the four puzzles, he can produce a colored version of his original pattern. These colored parts are then carved and drum-sanded until they blend together into a flowing, three-dimensional picture. Each picture develops from one of Allen's own drawings of a real-life object or scene, from a photograph, or from patterns in carving and stained-glass design books. His favorite pictures depict the mountains, forests and other nature scenes around his home in Silverton, Oregon.

Before cutting any wood, Allen refines and simplifies his sketches to make a pattern. Very fine details that cannot be cut without breakage are eliminated. Then the entire picture must be divided into even-sized parts to compensate for wood lost to the bandsaw kerf when the picture is cut out—if the pieces differ markedly in size, the proportion of shrinkage might be too high in one part of the picture, creating an unpleasant distortion. Finally, the curves of each piece must be adjusted so that none is smaller than the ¼-in. radius the blade can cut. When Allen is satisfied with the pattern, he copies it—the copy will be cemented to the laminated blank, the original goes in his design file.

Each of the boards is planed and thicknessed, then it's cut to the overall size of the complete picture, plus ½ in. to ¾ in. all around to allow for shrinkage caused by cutting and carving the pieces. Grain pattern and figure must be carefully considered. Horizontal grain is best for sky, for instance, and some boards suggest clouds or textures like hay. Although the thickness of boards in the stack varies from design to design, the pieces of wood chosen for the background and foreground of a floral picture generally are about ⅛ in. thick; for leaves and stems, about ¼ in. to ⅜ in.; and for blossoms, about ¾ in.

For gluing the boards together, Allen prefers rubber cement because it's strong enough to hold the stack together but yielding enough to allow him to easily pull the cut segments apart later. After attaching his pattern to the top board of the glued-up blank, he saws the stack on a 1940s vintage 12-in. Craftsman

bandsaw with a fine-cut ⅛-in. blade. It's important that the blade be carefully tensioned and aligned, because if it wanders or is not square to the saw table, the pieces from the top of the stack will not fit with the bottom pieces. Allen doesn't have any set order for cutting out the parts, but he works with pieces large enough to be held safely. For a relatively small piece, he'll cut it out together with one of its larger neighbors, then hold the larger piece while sawing the small piece free.

Once the pattern has been bandsawn, Allen separates the pieces, retaining those with the colors he needs for a particular picture and discarding the rest. He rubs off the rubber cement, then fits the picture together as tightly as possible on his workbench, knifing or sanding off any rough spots or projections during this preliminary fitting. The bandsawn edges will be further refined as they are fit into the frame, which is prepared by routing out a ⅛-in. deep rabbet into a box, hand mirror, tabletop, cradle, cabinet or other piece of furniture.

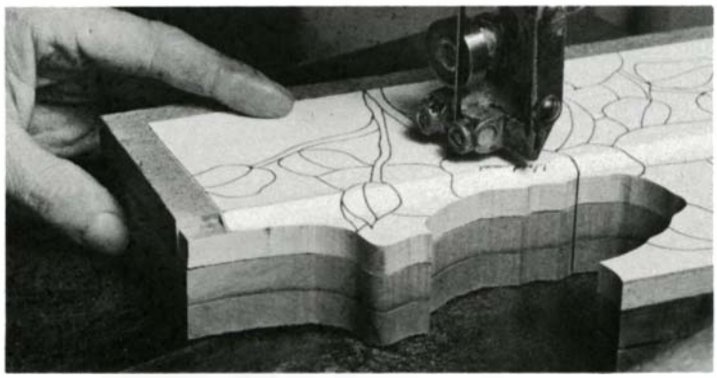
To fit the inlay into the frame, Allen begins with the largest outside piece and trims it to fit against the edge of the rabbet. Then he adds an adjacent piece and some interior pieces, and proceeds around the edge, trimming and sanding the parts to fit in place. If a section has to be drastically altered, he bandsaws it again. Otherwise, he works with X-acto knives and drum sanders. Often the last piece or two needs more trimming than the others.

The picture is complete at this stage, but relatively flat. To create the flowing lines and curves that give the illusion of a real flower or landscape, Allen now shapes each piece by pushing it against motor-driven 80-grit sanding drums. He controls the cutting effect of the drums by varying the way he holds and moves each piece and by using different-size drums. Constantly moving the piece as it's being sanded produces a rounded, soft effect, while holding the wood in one position produces a faceted or scooped-out area. A 2-in. dia. drum is good for shaping large pieces and making shallow facets, and a 1-in. or ¾-in. dia. drum takes care of deep scoops, small facets and tight curves. Needlenose pliers are real finger-savers when sanding small pieces.

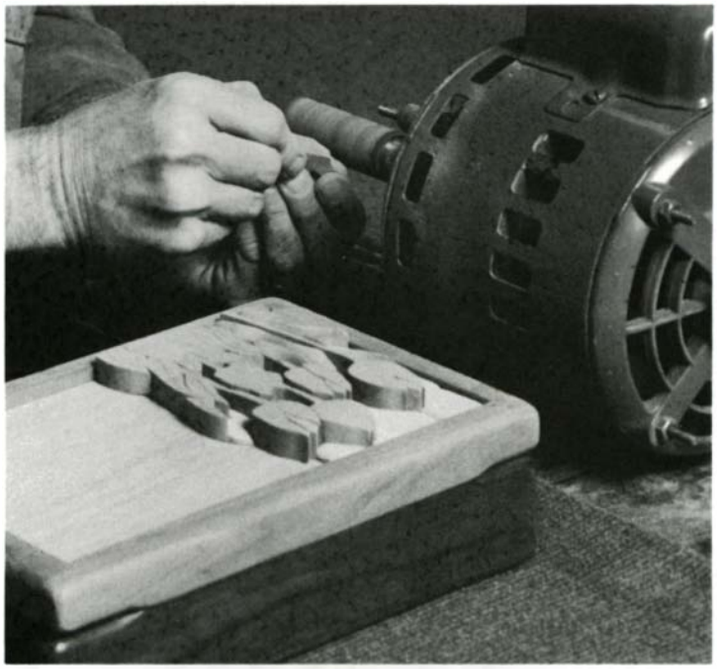
After finish-sanding the shaped pieces with 150-, 220- and 400-grits on the drum sanders, Allen dry-fits the picture once again to make sure all the pieces look right. Then he coats the rabbet with 1-hr. epoxy darkened with a little lampblack to make any slight discrepancies in fit less noticeable. He's careful to make the epoxy layer thick enough to bed the pieces and to ensure a good bond, but not so thick that it squeezes up between the individual pieces. Painstakingly laying each piece in place, he usually does the larger background pieces first, then moves on to the smallest pieces, using tweezers where necessary. After the epoxy has hardened, he brushes two or three coats of tung oil on the picture and the frame to preserve the wood and its colors, wiping off the excess oil between coats. When the tung oil is dry, he applies paste wax and buffs the entire piece with a soft brush.

Allen and his wife, Deborah Warren, produce 400 to 500 inlays each year in their business called "Joy of Doing." In Allen's words, "There is certainly a joy in building something with your hands. And it is exciting to see my drawings brought to life by the woods I choose. It is incredible how much each different wood affects the picture. I can control it a little, but the wood is unpredictable and adds its own surprises." □

Nancy H. Bolstad is co-owner of Bolstad Woodworks in Willamina, Ore.



To make an inlay, rubber-cement naturally colored boards together, then bandsaw around your pattern, pull the stack apart and pick the appropriately colored pieces. Be sure the saw is perfectly aligned, or parts from different boards won't fit together.



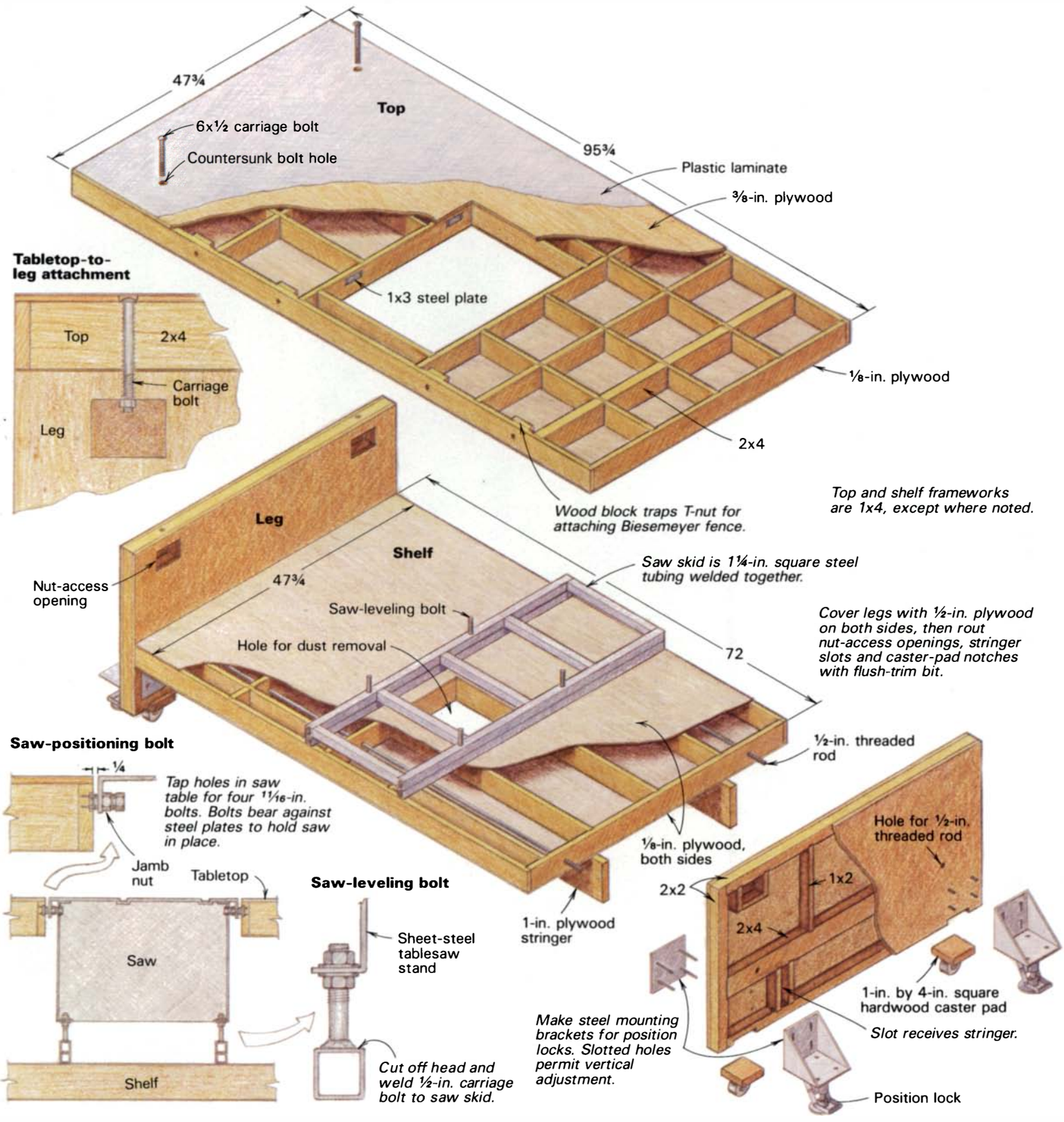
Picture parts are shaped on 80-grit drum sanders before they're inserted into a frame. Cut deep scoops, small facets and tight curves on a small 1-in. dia. drum mounted on a benchtop motor (above). Larger drums create gentler curves and shapes. The mountain forest inlay shown below features stars of silver and a moon cut from bone.

Color photos: Ralph Gabriner; black-and-white photos: Curtis Almquist

Making a Panel Saw

Sears saw serves as the basic machine

by Larry Kellam



In the ten years I've been building furniture, kitchen cabinets and store fixtures, my two biggest problems have always been lack of space and the absence of an additional pair of hands. To deal with the space problem, I've mounted each of my major power tools on casters so I can roll the machine I need to the center of the shop and go right to work.

Finding an extra pair of hands hasn't been as easy. I've always worked alone, which is fine until it comes to tossing around heavy 4x8 sheets of particleboard. You wouldn't believe the pain I used to put up with just to cut that stuff on my little 27-in. by 40-in. tablesaw. I tried some alternative solutions: roughing sheets with a circular saw and straightedge; ripping them on my radial-arm saw with cobbled-up extension tables. Then I got the idea of housing my tablesaw in a big, roll-around worktable. As the photo shows, my saw table is little more than a Sears 12-in. tablesaw, a Biesemeyer T-Square saw fence and a large table. Should the need arise, the saw can be completely dismantled.

While the Sears saw is by no means industrial-quality, I've never had any problems with it, so I couldn't see spending a small fortune on a better one. For about $60, I had the surface of the cast table ground to take out a nasty 1/16-in. warp. The Biesemeyer T-square saw fence is the backbone of my design. The joy of being able to set a fence up to 48 in. from the blade in about two seconds borders on the euphoric. I'm consistently getting truly straight and square carcases, and the reason for this is that I'm getting truly straight and square cuts. Thank you, Mr. Biesemeyer.

Basic construction—The table consists of four large panels: the top, the shelf that supports the saw, and the two legs. Each panel is a torsion box—a light wooden gridwork skinned over with plywood (*FWW* #32, pp. 96-102). I positioned the saw to the right of center because, unlike most people, I rip with the fence on the left side of the blade. But you can suit yourself. Right or left, what's important is that there's enough room to set the fence 48 in. away from the blade. This allows you to cut to the center of a 4-ft. by 8-ft. sheet. I use this saw only for cutting panels and ripping, so I didn't extend the miter-gauge grooves into the table. If you want to extend the grooves, use thicker plywood for the top.

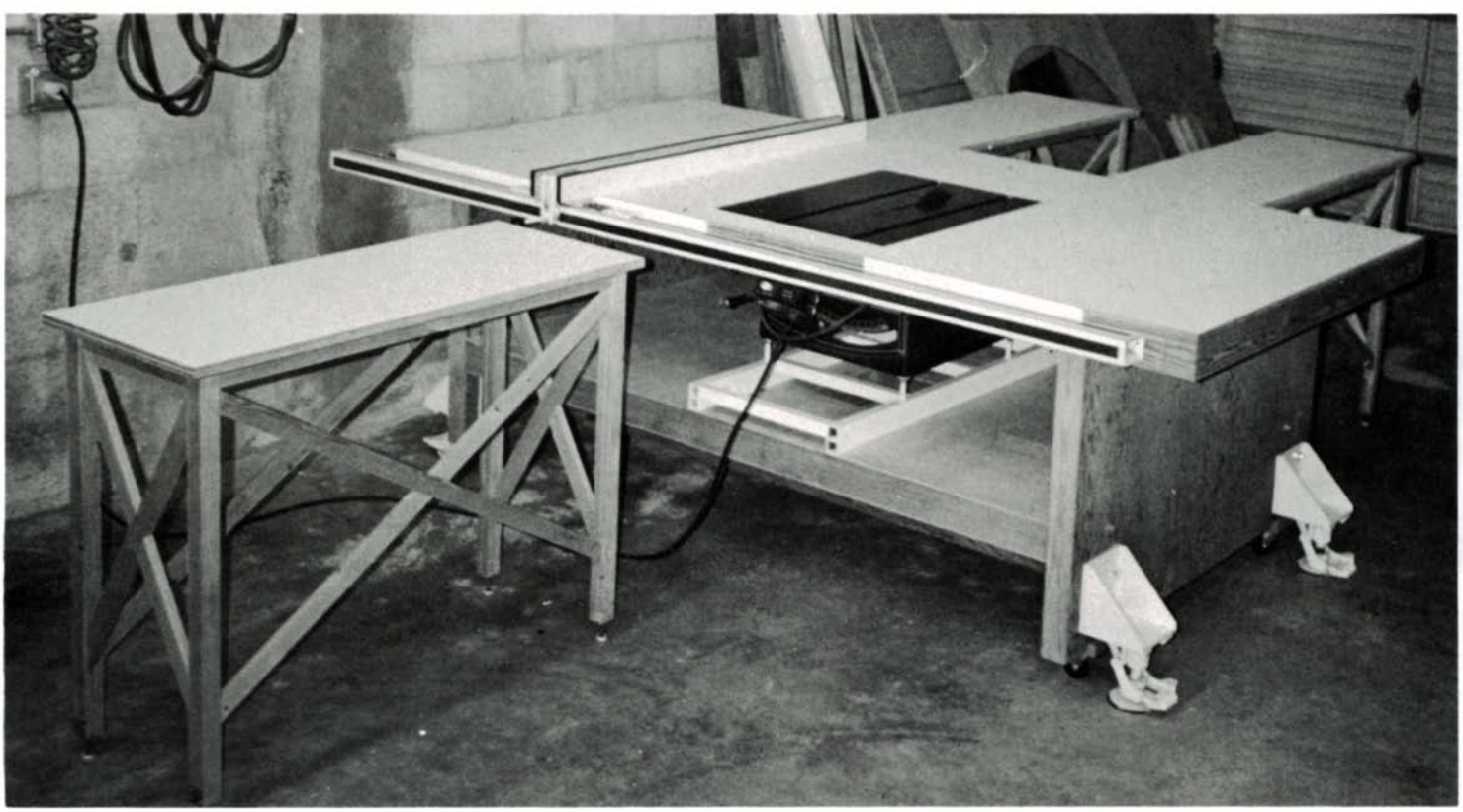
I made the torsion-box frames from clear fir. If I were to do it again, I'd probably use 3½-in. wide pieces of ¾-in. ply, simply because it's straighter. So the grid parts would stay put during glue-up, I assembled them with ⅛-in. deep dadoes.

Before gluing on the plywood skin, I positioned the Biesemeyer fence's angle-iron mount on the front edge of the top. I drilled holes for the mounting bolts and inserted a T-nut on the inside of each hole. I glued a small block of wood over each T-nut to make sure the nut could never come off. Once the plywood is glued down, the T-nuts are inaccessible.

I glued plywood across the entire top and bottom of each grid, and cut the openings later with a router fitted with a flush-trim bit. The top is ¼ in. smaller than a plywood sheet, so I could neatly trim the edges with the router. Contact cement works fine for gluing the ⅛-in. plywood to the grid, and the plastic laminate to the top. You can fasten the thicker plywood with white or yellow glue and screws.

Assembly—The legs are held together by two 76-in. long, ½-in. dia. threaded rods that pass through the shelf. I had these made at a machine shop for about $30, but you could also couple shorter lengths of threaded rod. The two plywood stringers slip into their mortises (don't glue them) and the shelf simply rests on the stringers. The saw goes in place on the shelf, and rests on a frame made from 1¼-in. square steel tube, which a blacksmith made for $100. Oak or maple would also do, and cost less. Four carriage bolts welded to the frame are used to level the saw.

To position the top, I used the bolt holes through the top panel



Four torsion-box panels and a Biesemeyer fence convert a Sears tablesaw to an accurate, versatile panel saw. Outrigger-like position locks extend to hold the rolling table in place. Auxiliary infeed and outfeed tables can be positioned for more panel support.

Photo this page: Larry Kellam; drawings: Lee Hov

Shopbuilt sliding table

by Rick Williams

I made a sliding table for my Sears saw from scrap plywood, and produced the ugliest saw in the world. It rolls on six ball-bearing nylon roller-skate wheels—four ride on top of the track, the other two on the vertical plywood track support. I made the track from a steel clothesline pole, but any sturdy, straight pole about 7 ft. long would do.

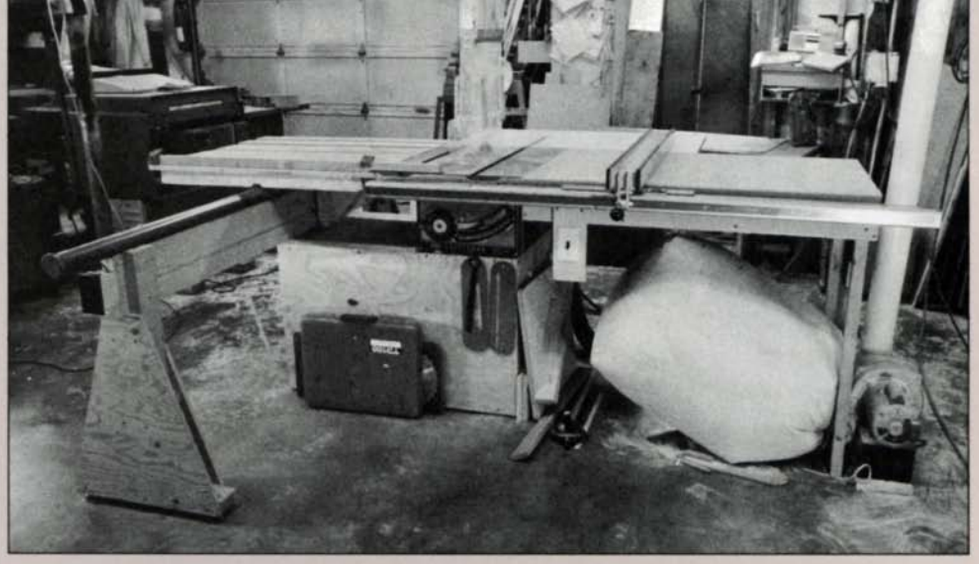
Everyone who sees my sliding table pushes down on the outside corner of the table, and when it moves up and down they ask, "Doesn't this cause any problems?" No. Since the workpiece itself must be on both the saw table and the sliding table at the same time, the workpiece actually holds the table in place.

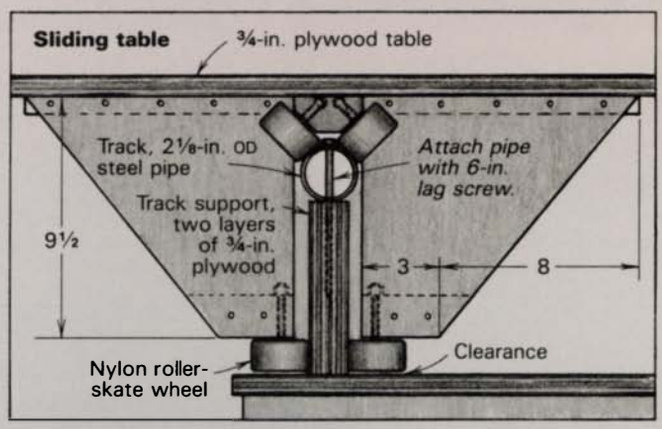
I've made several other modifications to the 10-in. saw, such as replacing the metal legs with a plywood box. The box has a large drawer that wheels in from the end to catch the dust that used to fall on the floor and then rolls out for emptying. I've also made a safety guard that suspends from the ceiling. It combines an anti-kickback device and a dust-collection system.

I replaced the 1-HP motor with a 1.5-HP, 220-volt motor on a 24-volt relay. I've hooked up a three-way switch setup with one switch at the front of the sliding table so I don't have to climb under a 4x8 panel to turn on the saw, and one switch on the front of the saw for when I'm working on smaller pieces.

I'd estimate the total cost of the project (including saw, new motor, and sliding table) at $500. Every time I lay a piece of ¾-in. ply on the thing and slide it through a cut, I'm amazed that anything that looks so strange could cut so well. □

Rick Williams is a cabinetmaker in Stanley, Kans. Photos by the author.





This homely setup is a Sears tablesaw outfitted with a sliding table cobbled from scrap plywood, a metal clothesline pole and six nylon roller-skate wheels. The plywood saw stand contains a wheeled drawer that slides in to collect sawdust and rolls out for emptying. The plywood and acrylic blade guard (below) is connected to a dust-collection vacuum system. The guard swings up and away when not needed.

as a guide and drilled through the top 2x2s in the legs. Then I secured the top to the legs with four ½-in. dia. carriage bolts. Lastly, I fastened the Biesemeyer fence to the top.

The height of the saw is adjusted with the leveling bolts. When the saw is flush with the top, tighten the bolts in the table casting against the steel plates mortised into the saw opening.

To keep the table from rolling around in use, I attached four position locks (made by Bassick Div., Stewart-Warner Corp., 960 Atlantic St., Bridgeport, Conn. 06602) to the legs with steel brackets. The bolt holes in these brackets are slotted, so it's easy to level the table on an irregular floor.

Frankly, I'm a little embarrassed about the amount of money I've channeled into this project. All told, I've invested about $1,000. That includes the $300 I paid 10 years ago for my saw—today the same saw costs more than $600. Was it worth it? Yes. Every nickel. Besides, anything I build for the shop, I build to last a lifetime. I look upon my shop as a reflection of me and my work—a showroom, so to speak—and therefore I feel that everything that goes into it should be efficient, neat and well thought out. It's good for business. □

Larry Kellam is a professional cabinetmaker in Miami, Fla.

Cloak-and-Dagger Furniture

Woodworker finds CIA has eye for sculpture

by Barbara Feinman

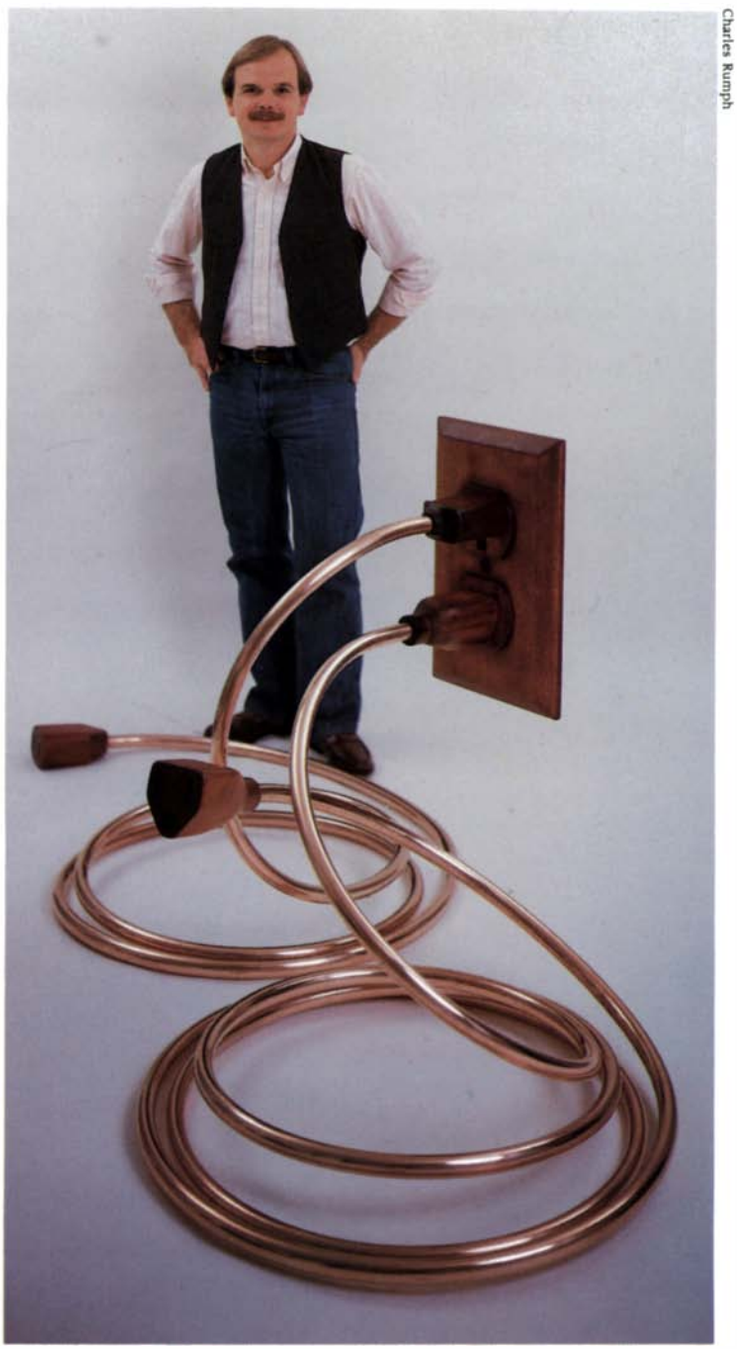
Rick Wall is often identified in the Washington, D.C., area as "the guy who makes the giant wooden pens and cameras." Although he had been struggling for years to develop a distinctly personal, sculptural style of woodworking, ten years ago he accidentally stumbled on the machine-age objects that would become his trademark. A local gallery asked him to enter a sculpture in a show organized around the theme "Gas." With memories of the Arab oil embargo fresh in everyone's mind, a gas pump seemed a natural for Wall's first sculpture. His 6-ft. mahogany-and-oak version, complete with a hidden compartment for liquor bottles, was a hit.

Encouraged by the popularity of his gas pump, Wall (known professionally as F.L. Wall) abandoned his custom-furniture business to concentrate on sculpture. Every object became a potential subject—wooden telephones, wooden lawnmowers, wooden fire extinguishers, and giant extension cords snaking through the air from wooden outlets. Along the way a strange thing happened. A routine call one day in 1979—a woman looking for someone to make some furniture—threw him into the middle of what seemed like a movie script. The woman represented the Central Intelligence Agency. It wasn't clear what she wanted, but Wall knew he didn't want to build shelves for government offices.

What the agency really wanted was "spy furniture"—chairs with cameras, lamps with antennae, tables with microphones. Wall was being recruited to build and install his furniture overseas, under the guise of a false identity. He was just going to forget the whole thing, but his wife, Judy, and their friends were intrigued with the mystery phone voice: "Don't be alarmed, but this is the CIA calling."

When Wall later met with two CIA representatives at a small Naval office in Washington, they asked about chairs with hollow legs, and peasant furniture with state-of-the-art electronics, all the while insisting that the CIA was no James Bond organization. Perhaps they were just saying that because their soft-spoken recruit appeared more suited to the role of young architect or English professor than a swashbuckling, trench-coat type. Looks aside, the agents seemed to really want Wall's services. Salary would be no problem, a job for his wife could be worked out (easy enough when they thought she was a secretary, but trickier when they learned she was an IRS lawyer). Questions about the occupational hazards of cloak-and-dagger work were shrugged off—nothing to worry about, except perhaps an embarrassing moment every five years or so.

Wall turned down the spy-furniture offer because he was uneasy about clandestine overseas work and the disruption of his family life. Besides, he didn't want to lie to his friends about why



Charles Rumph

An eye for detail and a fascination with recreating machines in wood may have been what made Rick Wall attractive to the CIA. Above, Wall poses with his snake-like tangle of electrical cords coiling from a mahogany wall plug.

Wall's work has evolved from startling but useful cabinets, like the human-size walnut and mahogany pen shown at left and the 84-in. high mahogany and copper telephone at right (which has compartments behind the dial and coin slot), to abstract, nonfunctional pieces. The mahogany unicycle shown above is, in Wall's words, 'Neither up nor down.' The 36-in. turned walnut pen on wheels (below) has no function, except perhaps to evoke military images.

'Torture chair' (below), an abstract form that could never be comfortable, is a world apart from Wall's early work reproducing 18th-century classics. Even if you can avoid the sharp spines and sit down, you must then worry about the rosewood ball hitting you on the head.

Charles Rumph

Photos, except where noted: Rick Wall

he was abandoning sculpture to become a "government pattern-maker." Despite published reports on the incident (the CIA didn't ask him to keep the matter confidential), the agency hasn't commented on any recruiting effort. Wall never heard from the agency again or found out if they hired a woodworker.

Wall's sculptures show a level of skill and cleverness—and a fondness for hidden doors and latches—that suggests he could have done the CIA job well. Most of his early work centered on furniture, first in Williamsburg, Va., where he restored antiques and built 18th-century reproductions. He made this work "a kind of self-imposed apprenticeship," learning joinery from long-dead cabinetmakers as he reproduced or repaired their work. As a sculptor, he still relies on this traditional joinery, saying, "A piece that has sculptural validity also usually has structural integrity."

Wall is often asked why he sculpts mechanical objects. He can't answer exactly. "My aim at first was to find interesting forms—things like tools that were personally meaningful to me. I wasn't intentionally trying to make any significant comment on society or the machine age. Of course, as with every artist, there is always the possibility that there is something subconscious going on. Some people have told me that my work has implied references to the human body—many of my sculptures have human-size dimensions, and each of the objects was meant to be used by humans, so it's contoured to fit the human hand or other parts of the anatomy."

His fire extinguisher and fountain pen (which both open up, cabinet-like) are turned, staved cylinders that are indeed almost human-size. Wall beveled the edges of thin boards, then glued up the staves into a large octagonal cylinder. A paper joint between two of the staves was knocked apart later to form the doors, then the doors were hung. Turning isn't one of Wall's favorite chores, but it's hard to avoid when you're reproducing cylindrical metal parts.

His newest pieces, based on sculptural ideas he has only begun to explore, are abstract chair forms. They are non-functional, their proportions are either stretched or compressed, and spike-like appendages often adorn their seats and backs. "Torture chairs," replies a visitor to Wall's shop when asked his reaction.

When choosing subjects for sculpture, Wall first decides if the shape is visually interesting. "If you were an alien from Mars and had no idea what you were looking at, would the shape still be intriguing in an abstract sense?" Next he tries to develop an unusual context to present this shape, usually a familiar object, in a way that will grab people and make them think, such as the stairs supporting the unicycle in the photo on the facing page. "My sculpture should make people examine the object closely. Most mechanical devices have interesting shapes, but people don't see them anymore. By making them large and making them out of wood, I lift them out of the realm of the routine and force people to look at them differently."

Finally, Wall often includes a surprise element in his sculptures, like a cabinet or some unexpected twist. Many of Wall's pieces reflect this humor: fountain pens on wheels, giant mousetraps, and skyscrapers turning into fountain pens. "I think the more successfully I can integrate these three aspects—a visually interesting form, an unusual context, and surprise or humor—the more successful I am." □

Barbara Feinman is a researcher for the Washington Post. *Wall, who lives in Arlington, Va., is represented by the Franz Bader Gallery in Washington, D.C., where he will have a one-man show May 28 to June 9.*

Up-scaled sculpture

by F.L. Wall

An important aspect of developing sculpture based on real-life objects is learning how to see—to look carefully at something and be able to analyze what it is and what it does. I begin by mentally breaking down the object into a front, top and side view, very much as is done in a mechanical drawing. Then I can analyze the specific parts that make up the general shape.

For a literal enlargement, I work directly from the object, using tapes, rulers, vernier calipers and the inside/outside calipers commonly used by woodturners. I take careful measurements and scale up all the dimensions proportionately. I sometimes make a little conversion table showing what a measurement in the actual object would be on the scaled-up sculpture.

It's important to scale up all the elements of a piece, even the ones that at first seem insignificant. I once made a 6-ft. tall can opener (the kind where you hold the handles with one hand and twist with the other), and found that the piece wasn't effective until the thickness of the metal was scaled up as much as the overall dimensions.

Most of my sculptures are at least three times life-size. Below that, the objects are too close to the real thing and seem a bit awkward—they just aren't sufficiently surprising or impressive to make a viewer react as I'd like. For small objects, I've upped the size as much as ten times.

In recent years I've been less concerned with literal interpretations. I do a lot more work just by eye as I develop a better sense of what works and what doesn't. While I still make many objects larger than life, I often distort the proportions, and I'm finding that omitting many details can lead to an even more effective piece.

For this non-literal work, I still start with the straightforward task of measuring—this gives me a framework for guiding experiments with new shapes. Next I make a small model or drawings to help me visualize what the object is going to look like when it's done. After I made a realistic, larger-than-life wooden pencil, for example, I wondered what pencils would look like if they were bending in the wind the way the trees do. Mentally I was trying to visualize how a hexagonal shaft would bend, so I made cardboard models and distorted them to find what side would get shorter and how the shapes would change when bent. This development is always a trial-and-error process.

One of the things I enjoy most about the sculptural pieces, as opposed to commissioned furniture, is that I can allow the overall effect of the piece to develop as I go along and can change my plans halfway through a piece. In "Point Blank" (bottom photo, facing page), the pen is ten times fatter than the real thing, but only five times as long. I like that compressed, boxy feeling. In this case I was also trying to retain the cracks of the walnut limb I was turning and to play up the contrast between the sapwood and the heartwood. The wheels and carriage added an element that appealed to me, perhaps something military. At first I angled the pen like a cannon, but later dropped that in favor of the horizontal look. □

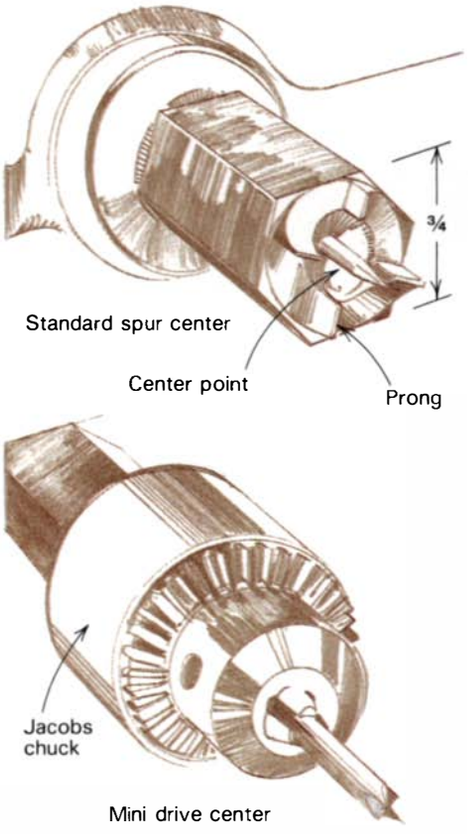
Tips From a Turner

Make your own mini drive centers

by Allan Turner Hedstrand

Ready-made spur centers are oversized, clumsy things if you're turning small work. About eight years ago when I was turning miniature spinning wheels and vases, I devised some mini-centers that don't get in the way. These are made from steel rod and are fitted into a Jacobs chuck at the headstock.

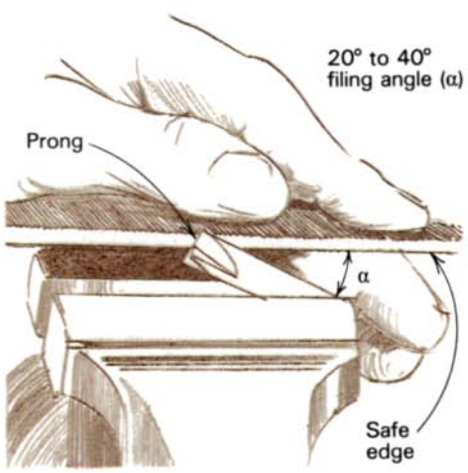
A standard spur center has a center point and four sharp prongs that grip the work. The center point has one main function: if you punch a centerhole into the



Mini drive center

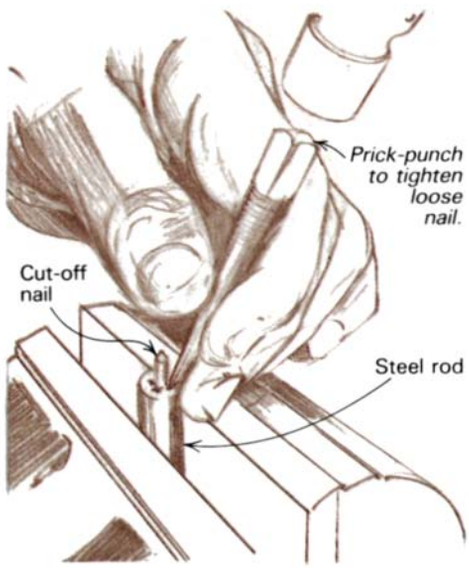
end of a blank, the center point will slide into that hole as you snug up the tailstock and will keep the work centered until the drive prongs seat themselves. Some people think that the center point keeps the blank securely on the lathe as well, a little insurance against the blank flying off and hitting someone. Well, I suppose this is true if you are a heavy-handed turner whose tactics force the prongs to tear loose from time to time. But with miniature work, such insurance isn't necessary. In the first place, cuts are light, and no decent turner is likely to tear the prongs loose. In the second place, the workpiece itself is so light that even if you do knock it off, it won't hurt you. The point of all this, if you will pardon one mild pun, is that you don't really need a point. It's optional.

I made my mini-centers from steel-rod scraps that I had around at the time. These happened to be 3/16-in., ¼-in. and ½-in. diameters. The larger two have no center points. To make a center without a point, cut off a piece of rod about 1¾ in. long and file four cutting prongs as shown in the drawing below. The file alone works fine for the 3/16-in.



rod, but for the larger sizes you can speed the job by hacksawing most of the shape.

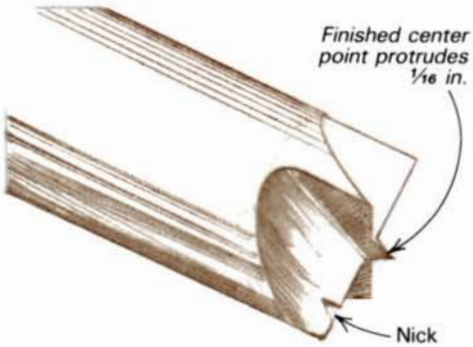
If you do want a center point, make it before you file the prongs. Chuck the rod at the headstock and drill a centerhole in the end. A 1/16-in. bit is large enough for rod sizes smaller than ⅜ in. Don't bother setting up the bit in a chuck in the tailstock—fit it in a spare chuck and handhold it while the rod turns. Next drive a nail into the centerhole until it's tight and you can't pull it out. If you don't have the right-size nail, fit an oversized one in the chuck on the lathe and turn the nail down with a file or a whetstone. If the nail is slightly loose in the centerhole, prick-punch around the hole to tighten it. Then clip it off so it protrudes about ⅛ in.



With the rod turning in the lathe, file or stone the center point until it runs dead true. If you're using a file, make sure it has a safe edge so you don't wear away the end of the steel rod. Then file the prongs, being careful not to mar the point. As a final touch, I mark one of the prongs with a small nick, as an aid in repositioning work that has to be returned to the lathe.

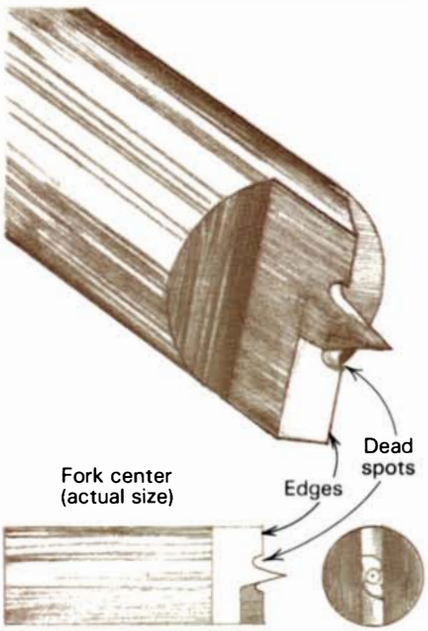
When mounting work, I usually saw two cuts into the end of the blank to seat the prongs, and if I'm using a drive center with a point, I poke a hole with an awl. This extends the life of the center. Mine, even though they're made of mild steel, have lasted a long time.

Drawings: Bruce Bulger

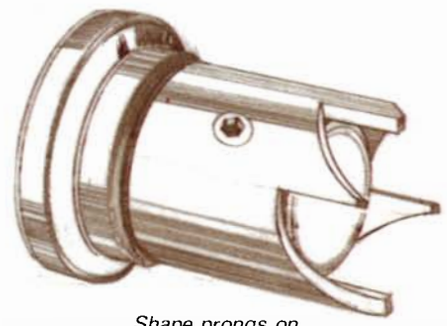


Frank Pain, in his book *The Practical Wood Turner* (Sterling Publishing Co., 1979), says that the production turners in his day had a two-prong spur center (which he calls a fork center). This design would be even easier to make than the four-prong design, but if you want to try one, be sure to include a center point. It's easy for these wedges to slide off center otherwise. And, as Pain points out, file a dead spot on each prong near the center, so the shape doesn't wedge itself too deeply into the work.

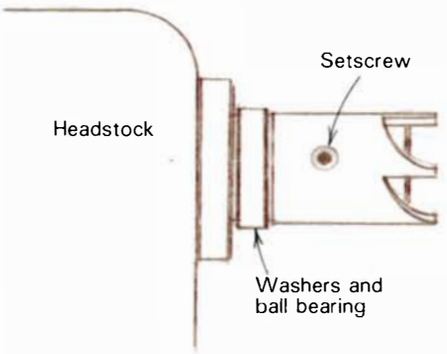
Another drive center that has proved useful in my shop fits over a ½-in. dia. mandrel on a wooden lathe I once made (altogether I've made six or seven). It's simply a ½-in. ID steel tube with four



prongs filed as shown. I drilled and tapped a hole for a setscrew to keep it in place, and slid two washers and a ball-bearing race over the mandrel to take the pressure against the tailstock. I've used this hollow center a lot because it grips well without penetrating deeply, so it minimizes waste when I'm turning tiny vases. Originally, I fitted it with a center point by drilling directly into the end of



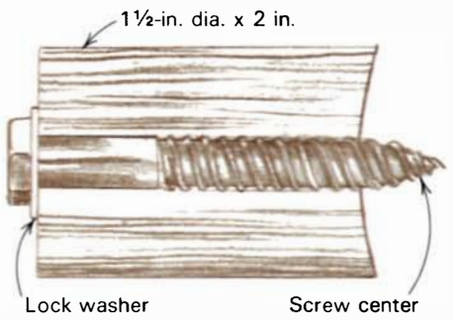
Shape prongs on ½-in. ID tubing.

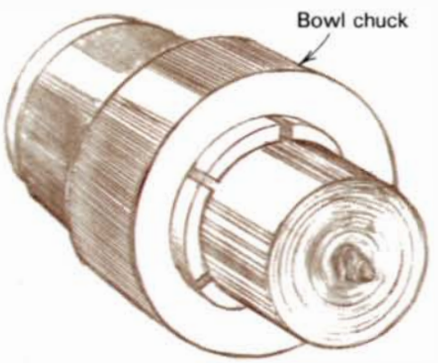


the mandrel and banging in a ⅛-in. dia. steel pin. But I've never found the center point to be necessary.

For regular-size bowls, I bought a lathe chuck designed to grip a 1½-in. foot on a half-turned bowl so that you can turn the inside without having to screw a faceplate to the bottom. Many chucks operate on similar principles—they either grip a projecting foot or extend to lock into a depression. In theory, you turn the outside of the bowl (and the foot) while the blank is mounted on a faceplate or a screw center, then remove the bowl, fit the chuck to the bowl and to the lathe, and turn the inside. Well, I didn't like the idea of all that faceplate-and-chuck changing, and I devised a screw center to fit the chuck, so that I could do the whole job without ever removing the chuck from the lathe.

To make the screw center, I turned a piece of prickly-ash branch to a 1½-in. diameter and bored a 3/16-in. centerhole clear through. Reversing the blank in the chuck, I enlarged the hole to ¼ in. partway to accept a lag-screw shank. With this size hole the wood grips the shank so tightly that usually I can center a bowl blank on the lag screw without even removing the screw chuck from the lathe chuck. A lock washer adds some extra resistance to turning. If the lag screw does turn when I'm screwing on a blank, I simply remove the screw center from the lathe chuck and hold the bolt head with a wrench while I screw the blank. But this seldom happens, not even when I've backed out the lag screw a little to prevent it from





going too deeply into thinner stock.

Of course, there are times when you want to reverse and recenter the work on a single faceplate. Here's another trick: Screw the blank to the faceplate and turn the outside of the bowl as usual, flattening what will be the foot. Without removing the blank from the lathe, glue scrapwood to the foot (with paper in the joint so you can split off the wood later) and bring up the tailstock to clamp things until the glue dries. Then recess the face of the scrapwood to the exact diameter of your faceplate. When you screw the faceplate into the recess, it will be exactly centered. This takes for granted that your faceplate runs true. If it doesn't, it's easy enough to true it with a file as it turns.

Here's one last tip that might help you someday. I once combined two lathes, because one had a fine bed and the other had a decent headstock. In the process, I went from a Morse taper #1 to a Morse taper #2, which meant that one of my old drive centers no longer fit. I made an adapter from seasoned persimmon wood by turning it to a taper—testing with chalk as I went along—until it didn't wiggle in the #2 taper swallow. I tapped it into place, then bored a hole in it and tapered that to accept the #1 taper on the old drive center. The adapter still runs perfectly true and doesn't slip, even after four years. □

Allan Hedstrand, 28, is a self-taught turner living in Brooksville, Fla.

A Look at Kit Furniture

Is this really woodworking?

by Jim Cummins

If you want some furniture in a hurry, kits are hard to beat. Everything in the photo above was put together and brought to whatever

Is it cheating to build a piece of furniture from a kit? Maybe it is if you have a complete home workshop, but how about somebody without one, who has no other way to find out what making furniture is like? How about somebody whose main interest is finishing? How about somebody who just wants a hobby, and one that can pay for itself at that? Kits, in their almost bewildering variety, can completely satisfy the woodworking urge for a lot of people, and have whetted the appetites of many novices to go on to more ambitious projects.

Clocks are popular as kits because they have so many difficult-to-make parts, but the clock field is too large to encompass in a magazine article. So I concentrated on kit furniture instead, ordering kits from more than a dozen manufacturers. Frankly, I found a couple of the projects tedious work that resulted in furniture I didn't much like. But others were not only fun, they were a challenge. I was surprised to find that I needed my tablesaw, jointer, bandsaw, lathe, router, and just about every hand tool I owned to get a couple of pieces done the way I wanted.

Kits are a compromise between the manufacturer and the kit builder. The manufacturer invests in the heavy machinery, benefits from bulk lumber prices, and does the trickier operations such as steambending, dovetailing, doweling, shaping and turning. The kit builder provides the hand-fitting and finishing labor, and hopes to reap substantial savings in exchange. The manufacturer governs the level of the first part of the compromise, and must decide what the customer will be satisfied with. American Forest Products, for example, sells a $60 three-drawer-chest kit, and Bartley sells a $990 blockfront bureau. Both of these, as well as the other kit furniture I built, are shown in the photo above. Obviously, it's not enough to say that you get more from Bartley. The real question is, what level do you want to aim for?

I'll concentrate on the pieces I found most interesting to a woodworker, and talk briefly about the others in the box on p. 79. I'll try to discern each manufacturer's concerns and compromises regarding quality, and I'll talk about the amount of work and skill each company expects from the customer. The prices listed are retail, ignoring any seasonal sales the manufacturer may regularly have. Some companies include finishing materials and postage in the price, and some don't—something you'll have to figure out by studying the catalogs.

Shaker Workshops (Box 1028, Concord, Mass. 01742) sells a number of maple rockers, settees and chairs. The $70 youth chair I built is typical. In addition they have woven-seat footstools, candlestands, dining tables and a bed, all notable for their unmistakable Shaker lines. My kit arrived in a long, flat box, and in

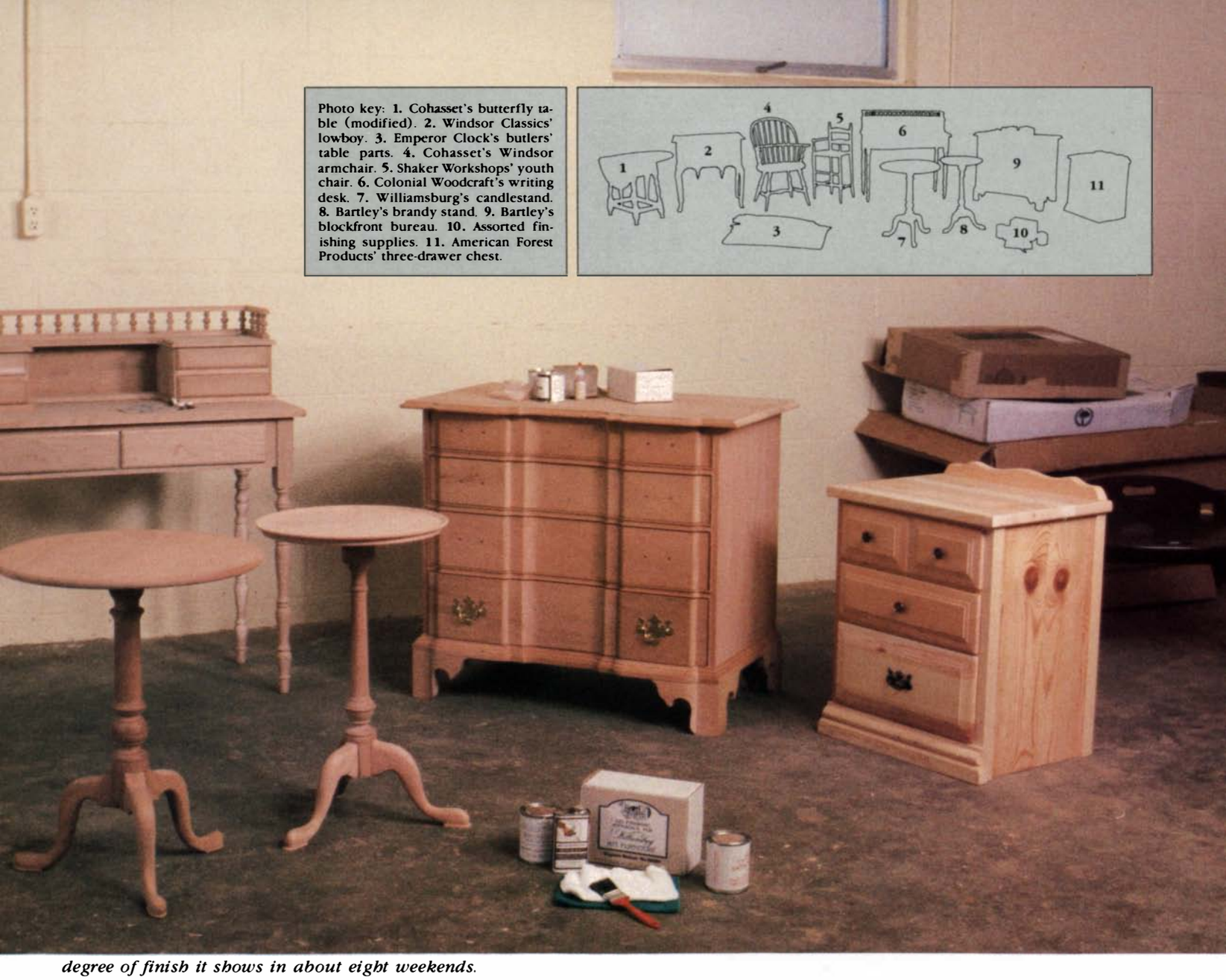


Photo key: **1.** Cohasset's butterfly table (modified). **2.** Windsor Classics' lowboy. **3.** Emperor Clock's butlers' table parts. **4.** Cohasset's Windsor armchair. **5.** Shaker Workshops' youth chair. **6.** Colonial Woodcraft's writing desk. **7.** Williamsburg's candlestand. **8.** Bartley's brandy stand. **9.** Bartley's blockfront bureau. **10.** Assorted finishing supplies. **11.** American Forest Products' three-drawer chest.

degree of finish it shows in about eight weekends.

about fifteen minutes I had it dry-assembled. The back, which must be just right or the other parts won't fit, came preassembled and glued. Putting the rest of the chair together consisted of fitting round tenons into round holes, then adding the arms. A couple of the spindles were pretty snug, but all were within reasonable tolerances for a good joint. Also in the box were seat tape and padding, tacks, sandpaper, and good directions.

The instructions advised that I double-check all the parts before applying any glue, and I'm glad I did. Two of the seat rails were ½ in. too long, which prevented the tenons at the back of the arms from seating fully in their mortises. Shaker Workshops—and every other kit manufacturer—is willing to exchange faulty parts without question, but the expense of doing so and the loss of customer confidence makes such errors a potential nightmare for them. For me, it was no big deal. I just turned new rails and adjusted their length until everything fit.

Such a mishap, however, isn't liable to happen very often, and mine turned out to be a special case. Shaker Workshops' director, Richard Dabrowski, had gone to the warehouse himself to pack up my chair and had inadvertently pulled the seat rails from the wrong rack. His foreman suspected the problem soon after shipment, and had advised his boss to warn me. Dabrowski laughed: "He also told me to please stay out of the warehouse."

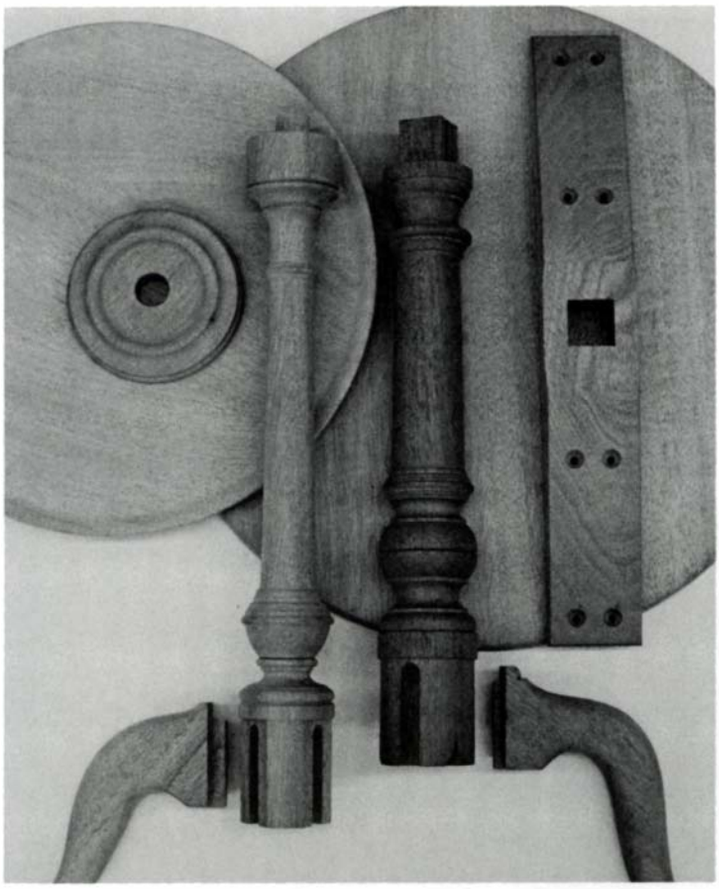
I finished the chair with Shaker Workshops' medium-maple stain. Weaving the herringbone-pattern seat was fun, took about an hour, and has inspired me to redo some old chairs of my own. I'd say the company gives excellent value.

Windsor Classics (15937 Washington St., Gurnee, Ill. 60031) sells full kits, and also separate parts such as cabriole legs in a variety of styles and sizes. Their cherry Queen Anne lowboy provided me with some noteworthy experiences.

All of the tenons were cut oversize, and required about seven strokes of a rabbet plane to make them fit. This, to me, was a definite plus, because I could fit each joint to my own satisfaction. For a non-woodworker, however, it would have meant much tedious work with sandpaper.

Dry-assembling this piece was absolutely necessary. Not only did I find a few places where the machining was off, such as a too-shallow drawer runner and various out-of-line shoulder depths, but they had actually shipped me two left front legs instead of the required left and right. I'd been fixing the minor misfits as I went along, but the leg posed a problem: Should I ask the factory for a replacement, or fix it myself?

I'd already gotten so far along that I didn't want to send the whole kit back. Besides, I'd been enjoying the work. The low-



Some reasons why Williamsburg's candlestand (on the right) costs almost twice the price of Bartley's: a large one-piece top, a heavier pedestal, and more detailed joinery. The stands are shown set up on p. 77.

boy, assembled with its mismatched legs, had a sly charm, as if it were about to tiptoe off my workbench. I grinned, then recut the joints in about an hour. The only part that will show in the end will be a mysterious dovetail on the outside of one corner post, and if anybody ever notices it—and only a woodworker would—I'll use the occasion to share a funny story.

The lowboy had only one serious flaw. There was little understanding of wood movement, and the provisions to allow for it were insufficient. I found this generally true of the other kit manufacturers as well, probably because wood movement wasn't a serious problem in Colonial homes, and the period pieces that many kits copy didn't allow for it. But Windsor compounds the problem with outright bad advice for gluing the long mortise-and-tenon joint between the back and the legs. The instructions said to glue the joint at the top and bottom, which would have prevented the back from shrinking, and would probably have caused it to crack shortly after the heat came on in my living room.

I was growing very fond of my lowboy by this time, and I modified the long cross-grain joint with pegs and slotted the top batten's screw holes to allow the piece to take a 20th-century winter in stride. As a final bit of hand-tool work, I trued up the molding shape on the edge of the top, where the worker at the factory had lifted his router a little too early, and I redrilled the dowel holes where the pendants are attached—they were not only both too small, but the dowels were of different diameters.

The lowboy kit retails for about $600, but with due caution you can end up with a real piece of furniture. I'd recommend the experience to anybody with a sharp plane, a sharp eye, and the ready cash. A sense of humor wouldn't hurt, either.

The Bartley Collection (121 Shelter Rd., Prairie View, Ill. 60069) has an exceptional reputation, and is the company most competitors are chasing. Some of their furniture is adapted from original antiques in the Henry Ford Museum in Dearborn, Mich. Their lowboy, judging from the catalog photos, has crisper turnings than Windsor Classics', a more serpentine leg (though I like Windsor's better), and an honest thumbnail-molded top edge instead of Windsor's stock-router-bit ovolo. Aiming high costs money, and Bartley's lowboy kit sells for $845. They sell the same piece finished for $1690, evidence that their finished pieces can compete with furniture companies like Harden and Kittinger.

I didn't want to build two lowboys, so I ordered Bartley's $990 blockfront bureau instead. It was the last piece I made. Everything went together in about seven hours, and so perfectly that I lost the feeling that I was working with wood. Each drawer front was a single, blemish-free mahogany board. The grain in the top had been carefully matched at the factory. The joints were practically airtight, and required no fitting work. The only modification I made was to slot the screw holes at the back of the drawer runners to allow for seasonal movement.

Bartley's blockfront is the epitome of kit furniture. It is solid and enduring, and there is no way I would ever have been able to make it myself for the price, even if I counted my time at a paltry wage. No doubt somebody in my family will be keeping sweaters in its drawers long after I have gone. Still, it's hard for me to work up much enthusiasm about building it. I guess I'm not a true kit builder at heart—I'd rather run into a little trouble and have the fun of sorting through it. But I would recommend Bartley to those who have never built any furniture on their own.

Colonial Williamsburg (Box CH, Williamsburg, Va. 23187) recently started a line of kits to supplement their selection of finished furniture. Their kits are at the top of the price chart. Their mahogany candlestand is $219, and they sell the same piece finished for a lofty $619. This, presumably, means I would "save" $400 by doing-it-myself. Well, I doubt it.

Williamsburg is out to beat Bartley's similar table, which sells for $125. The photo at left shows some differences in the leg joints and the heftiness of the pedestals. In addition, Bartley's top is made from three edge-joined pieces, while Williamsburg's is from one board, and larger. Williamsburg supports the top with a square tenon and a long batten (with no provision for wood movement), while Bartley uses a round tenon and pad. I can see where the extra cost comes from, though I'm not sure it's worth it. Both tables are shown assembled, but not finished, in the photo on p. 77.

Williamsburg represents the kit as being historically accurate in wood, joinery and finishing materials—a sort of mini history lesson about Colonial times. They even advertise an optional shellac finish to duplicate the original's French polish. This turned out to be mostly hype. The shellac finish did arrive in flake form, with a separate alcohol solvent, but the directions were to brush on three coats, then to follow with steel wool—not French polishing by a long shot. The wood is Honduras mahogany. The joints were machine-cut, and airtight, though there was a little chipout around the edges of the legs.

By placing themselves at the top of the price chart, a place Bartley used to occupy, Williamsburg implicitly claims to set the highest standards. That claim invites no-holds-barred criticism. Their candlestand is truly well made. But one thing going against it is its unambitious design. Compared with many original pieces, its half-round table edge and plain flat top are bland

and undistinguished. The legs, though pleasing, are more upright and perky than the period examples I've seen, which have more sweep and flow. And the pedestal turning, finely finished as it is, misses out on the crisp detail of the originals—it even substitutes a V-groove for the usual delicate raised ring, the master's touch that graces so many period pieces.

Judged for honest value, head-to-head with comparable products from other kit companies, I'd have to say that Williamsburg is too high-priced for me, but keep in mind that that's probably intentional. This is the luxury market—if you have to ask how much it costs, you can't afford it.

Colonial Woodcraft (11229 Reading Rd., Cincinnati, Ohio 45241) is skimpy with instructions, although these did turn out to be adequate. "Emily's writing desk," $300, arrived without even a picture of the piece I was supposed to be building, just a list of parts and sizes and a few hints as to when to glue what where.

Most of the cherry had been glued up from narrow pieces, but the grain matched fairly well throughout. By and large, the pieces were well machined, with minor flaws filled and sanded by the factory, at least on the show sides. But one of the legs had an unfortunate wormhole right on the outside corner near the top, and the factory-drilled dowel holes prevented me from simply turning the defect to the inside.

The manufacturer had kept the price down by making a few compromises, and I'd say the result hit the middle ground squarely. The wood is good, but not great (two of the legs were half sapwood). The machine dovetails were a little off, but did go together—some workman probably saved 15 minutes extra setup time. The larger drawers are supported by nylon glides, which don't demand as much precision as do wooden ones—it's the same system found in most department-store kits. There were similar small savings everywhere, and they added up. This was one of the first pieces I made, and I hadn't yet realized that no kit maker is infallible. I didn't notice that the mortises for the drawer runners had been routed ¼ in. too shallow. My drawer fronts bump the runners and don't quite close. I haven't completely finished the desk yet, and will fix the drawers when I do.

Emperor Clock Company (Industrial Park, Fairhope, Ala. 36532) makes mostly clock kits, but they also make some furniture. I ordered their cherry butlers' table. In contrast to the Shaker Workshops' chair I made, it's not aimed at shopless novices, but it's not as ambitious as Colonial Woodcraft's desk, either. The first paragraph of the instructions told me to go out and buy a can of wood filler.

The apron rail is mortised into the legs with ½-in. long tenons, and reinforced with screwed wooden corner braces. The tenons

KD

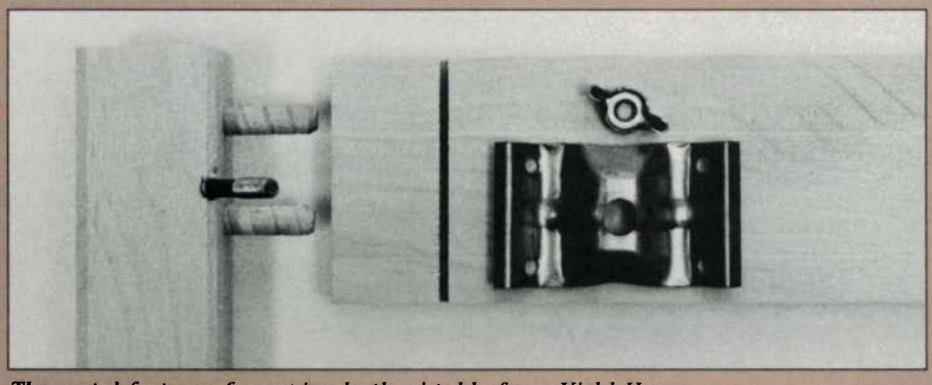
Besides period reproductions, there's a whole other dimension to the kit world, a multimillion-dollar business in knockdown furniture, called KD for short. These pieces require the bare minimum in assembly skills. Here are some of the major manufacturers:

The Bombay Company **(Box 79186, Fort Worth, Tex. 76179) buys Philippine mahogany and ramin at the source, ships it to their Taiwan factories, and boxes up completely finished KD furniture—all the gluing, staining and lacquering is done overseas. They sell by mail, and also have about 30 retail stores.**

Bombay's hardware is excellent, but the furniture itself seems fragile stuff—four or five pieces in the showroom I visited had broken joints and cracked drawer fronts. The heavy, semi-opaque finish didn't conceal that many veneers had checked. Prices are simply incredible, though. A recent sale catalog listed a small Pembroke table for $37 and a candlestand for $15.

American Forest Products **is the largest manufacturer of kits in the country, selling about a half-million last year. They don't sell direct to consumers, but you'll find their products in department stores all over, usually at prices that rival what you'd pay your local lumberyard just for the wood.**

I assembled their all-purpose three-drawer chest, which retails for about $60. The interlocking joints are glued and nailed, and the whole job took about 2½ hours. For the money, you get what you'd expect: randomly knotty pine, hardboard drawer bottoms, nylon drawer guides, minimal hardware and marginal drawer joinery.



The metal fastener for a pine butlers' table from Yield House.

Yield House **(Dept. 9300, North Conway, N.H. 03860) has an extensive line of raw-wood and prefinished pieces, most in pine with a few available in oak as well. In addition to selling by mail-order, they have 14 retail stores in the Northeast. I visited a showroom and I also ordered their $70 butlers' table.**

Well, I'd recently made myself a pine butlers' table from scratch and I didn't find Yield House's much to my liking. The wood was run-of-the-mill white pine, not as nice as what I'd been able to select for my own version. Edges were sharp, even the handgrips, and would have called for a lot of hand-sanding to make them comfortable. The legs were reinforced with unsavory metal plates and screws. Yield House sacrificed considerable quality to save the consumer a few dollars, and in my case they missed the boat. Their prefinished version of the same table, which costs only $20 more, is a better buy.

I'd been tempted by a set of barristers' bookshelves—12 cabinets, either glass-fronted or file-drawer, that nest atop each other in various combinations. At $559, the set seemed a bargain, but after examining it in the showroom, I decided to build my own instead. It will probably cost me more than the kit, but in preparing this article I've come to one overriding, and somewhat surprising, conclusion: There are no tricks. You do get what you pay for. ***—J.C.***

Cohasset Colonial's standard butterfly table has upright legs and a butt leaf-joint. The author's version, which incorporates a few modifications, is shown in the photo on p. 76.

were much too loose for my liking. I could assemble one joint with a 0.031 feeler gauge in it.

As on the Colonial Woodcraft desk, the cherry pieces are glued up from random-width lumber, ranging from 6 in. wide down to about ¾ in. The factory had taken some care to keep any sapwood mostly to the inside, and there were no unsightly knots.

I didn't build this table. But in looking it over, and examining the other designs in the catalog, I'd say that Emperor, like Colonial Woodcraft, is aiming squarely at the middle of the road. A woodworker could assemble a kit from either company and end up with good value for the dollar. My biggest complaint is with the designs themselves. Colonial Woodcraft's are late Victorian, not my favorite, and Emperor's period pieces are unabashedly compromised—there's a standard Queen Anne leg that crops up from piece to piece, for example, whether it looks right or not.

Such compromises add up in "savings" and detract in "quality." The factory takes a gamble as to what balance point the buyer will want. For example, Emperor has a Queen Anne lowboy for $270. Windsor Classics' lowboy looks better, but it sells for more than twice the price.

Oak rolltop desks are popular kits, and I did find two companies that make them, although for various reasons I didn't build a kit from either. **Craftsman's Corner** (4012 NE 14th St., Box AP, Des Moines, Iowa 50302) has a rolltop for $699, and office chairs, bookcases and file cabinets to match. I came upon them too late to order a piece, but I did read a set of their instructions, which were better than average. **The Shop** (Box 311, RD 3, Reading, Pa. 19606) sells oak reproductions of Pennsylvania Dutch and turn-of-the-century pieces—including an antique icebox for $359. They use the same joinery as on the originals, but their more complicated pieces are mostly preassembled at the factory to ensure squareness (the reason I didn't get around to "making" the icebox I ordered). They also sell blueprint plans and authentic hardware for those who want to work from scratch.

Cohasset Colonials (30 Parker Ave., Cohasset, Mass. 02025) was founded in 1947, making it the oldest kit-furniture company in the country (see box, facing page). Cohasset's furniture is clean and simple—some Shaker pieces, handsome Windsor chairs, beds, tables and so on, most of which are modeled after actual antiques that strike owner John Hagerty's fancy. He has an unerring eye for compatible rural designs in pine and maple. I had wanted to build their four-drawer chest, but Hagerty persuaded me otherwise. "It's just a piece of furniture," he said. "Your readers know all about chests of drawers already. Let me show you something they'll get a kick out of instead." He sold me a $165 bowback Windsor armchair.

He told me that it had taken him three years to get the bugs out of bending the tapered bow. Well, he has a little way to go yet. On my chair, there were short bend-cracks at two of the spindle holes, and, as you would expect, the whole bow was extremely fragile because of the many holes through it. During assembly, my bow cracked some more, not along the top radius of the bend, but at the back. Nevertheless, it glued up well, seems sturdy enough, and has become my favorite dining chair. Period Windsors were made of three different woods, each with its advantage for the specific job; a pine seat, maple undercarriage and spindles, and hickory bow were typical. Cohasset's pigmented stain does an excellent job of blending these woods together.

Cohasset's chairs have one particularly ingenious feature—the round tenons are compressed at the factory, which makes it easy to fit the parts without pounding. At glue-up, you briefly dip the tenons in water, which causes them to swell up tight in the joint. It's the factory equivalent of the old chairmakers' dry-rung/wet-post trick. The through tenons are wedged as well, for even more security. The chair is more stylish and nicely made than those I saw in competitors' catalogs. But if I ever make another, I'll soak the bow in a hot bathtub for a while first.

Kit-busting is a modelmaker's term. I first heard it from a young friend who collected model horses. She'd buy a horse kit—a body blank, mane, tail, tack, and horse-colored paint—but she'd make an entirely different horse than the directions suggested. Scale furnituremakers do the same thing, so why not me?

I decided to bust Cohasset's maple-and-pine butterfly table, which is shown in standard version in the photo above. The table has legs that splay out in end view, but they don't splay in front view. I splayed mine, making two new stretchers and aprons from pine. While I was at it, I made a new end apron and put a pine drawer in it, with a little maple knob.

I noticed that somebody at the factory had shipped me rule-joint hinges instead of the flat ones that should have come with the kit, so I busted the kit again by routing a rule joint on some spare maple and splicing it on.

I doubt that Hagerty will take offense at my handiwork, but I don't expect that he'll incorporate any of my changes into his design, either. For one thing, his version matches some good period examples just as it is, and my changes would push the price up without adding significant appeal. In fact, for me, I wouldn't want Cohasset to change a thing. I like sawdust, and thrive on having some room to work things out for myself. □

Jim Cummins is an associate editor at FWW. *For additional reading,* The Kit Furniture Book *by Linda Graham Barber (Pantheon, New York, 1982) is like a master catalog of various companies, with hundreds of photos. Watch out, though—some firms have gone out of business.*

Where it all began. . .

Back in the 1930s, Francis Hagerty used to make racing shells in his small boatyard in Cohasset, Mass. When World War II broke out, Uncle Sam asked him to make plywood PT boats, and tripled the size of his shop to meet the demand.

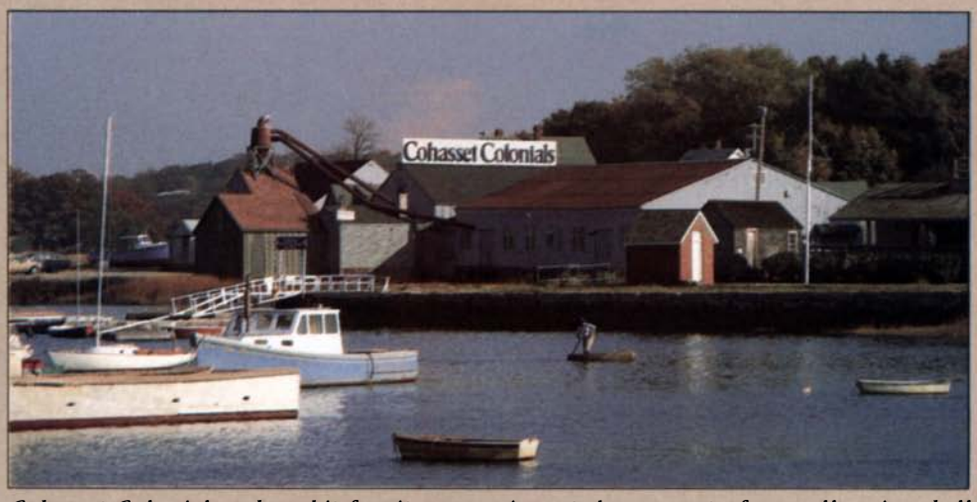
Hagerty had always yearned to make quality furniture, and when the war ended he found himself with the factory to do it in. But Cohasset is a fishing town, half an hour south of Boston. He found that buyers simply wouldn't make the trip.

He decided that his only chance was to sell by mail-order, and so he conceived the idea of kit furniture. By 1949 he had the bugs worked out enough to print his first catalog. As business flourished, Hagerty added many extensions to the core buildings, splicing them together to form a cavernous main shop, interwoven with curious nooks and crannies.

Today Cohasset is run by Hagerty's son John, a Harvard graduate. He has developed the company into a "complete home-decorating service by mail," which will sell you candlesticks, bedspreads, paints, and books for your library shelves. Each year Hagerty adds a few more pieces to the line, for that imaginary devoted customer who might already have built one of everything else.

Hagerty says that he tries not to hire people with a lot of general woodworking experience. He doesn't want them to bring their own habits to work with them. "This is a specialized business, and requires a different outlook, a more careful pace. Our tolerances are extremely fine,

Careful sanding removes 1/64 in. to bring each piece to final dimension.



Cohasset Colonials, where kit furniture was invented, grew out of a small racing-shell boatyard that expanded to supply PT boats during World War II.

and we have to aim for complete interchangeability between the parts of any kit, regardless of when it was built. I get a big kick when an old customer writes us that one of his grandchildren broke a rung, let's say, on a chair that he put together twenty-five years ago. We can go to a bin and ship him one that fits just like the original. How many furniture companies could say that?"

Hagerty showed me what he calls "the heart of the business," a fireproof room with its own separate sprinkler system, filled with racks of jigs and fixtures for the critical parts of the furniture. The old ones were solid wood, the newest are of dimensionally stable plastics, most with built-in quick-action clamps and some with precision guide rods and roller bearings. These jigs and fixtures ensure uniform machining. There are fine-adjustment provisions on all of them to account for resharpened cutting tools and, especially for the older ones, for seasonal wood movement.

"We do everything here except turning and bending," Hagerty told me. "The lumber comes in the main door and we grade it by color and size into different racks. Ten feet from the racks we crosscut it on a big radial-arm saw according to what we're needing." They were starting a run of tabletops during my visit, and each worker was responsible for part of the operation. One, Peggy MacKinnon, was sorting rough pieces for color, grain and width, then running them through a self-feeding Wadkin ripsaw, with an attached conveyor belt that carried the ripped strips back to her for stacking. Each group of edged boards was then piled on top of the next and rolled down the hall another 20 ft. to the glue-up jig. From there they would go on into the main factory building, to run along neat rows of vintage and modern equipment—including a dovetailer, two huge overarm routers, several jointers, a tenoner, two hollow-chisel mortisers, three tablesaws, a sweet old two-blade cutoff saw with a sliding table (it cuts both ends of a board to size in one pass), and many, many more. The far end of the shop houses sophisticated sanding machines and a packing station.

Nobody rushes, but nobody wastes any movement, either. Parts are stacked as meticulously as bees build honeycomb. As Jim Robison, shown in the photo at left, told me: "Sure I stack the parts evenly—if the edges don't all line up exactly, there's something going wrong."

Hagerty is proud of his association with several museums. He has great respect for the old-time craftsmen, and says it isn't easy to gear production so that the original design isn't compromised. To match an offset-turned Dutch leg on a small antique table in a museum, for example, Hagerty made copious drawings, did as much geometry as he could on paper, then invested in a set of full-length knives for his turner's automatic lathe. Hagerty turned about sixty practice blanks before he finally determined the exact offset that would produce the leg's curves.

He submitted his copy to the museum for a rigorous side-by-side comparison test. At one point both tables were upside down. Hagerty looked at the bottom of the foot on the museum piece and saw the two offset tailstock marks from the original turning, spaced exactly as far apart as the ones on his copy.

He laughs: "All the trial-and-error was worked out two hundred years ago, if I had only thought to look for it."— *J.C.*

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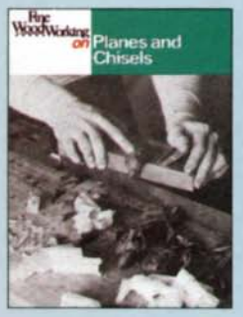

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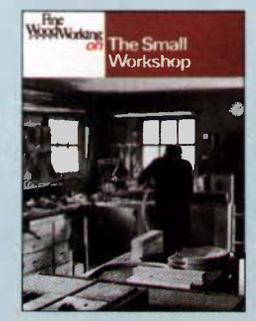

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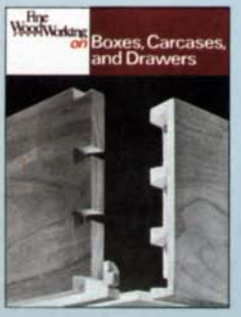

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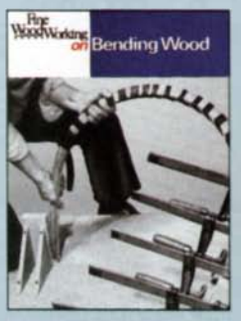

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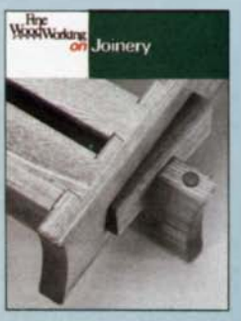

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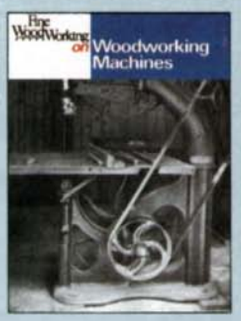

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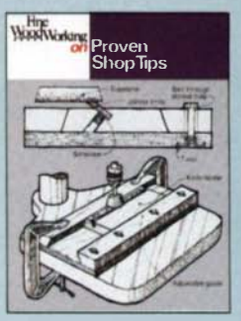

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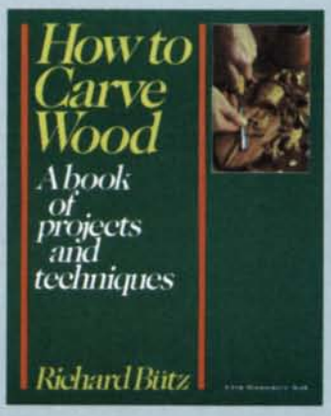

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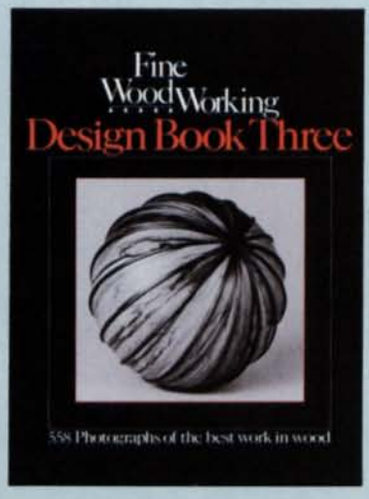

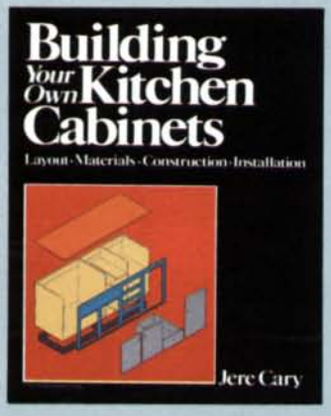

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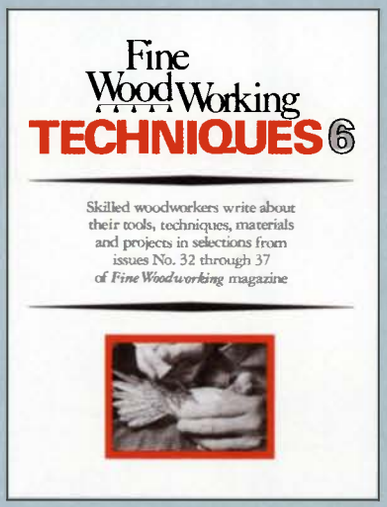

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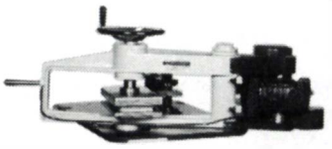

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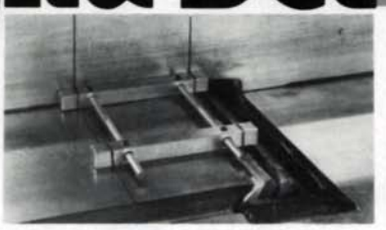

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33-990	Deluxe 10" Radial saw	589	475
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34-710	super 10" motorized saw	579	450
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37-207	Saw/Jointer Combination	1018	810
37-609	6" Motorized Jointer	413	335
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52-493	1 hp motor for #34-621	170	130
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808	8¼" Skilsaw 13A-Super	172	110
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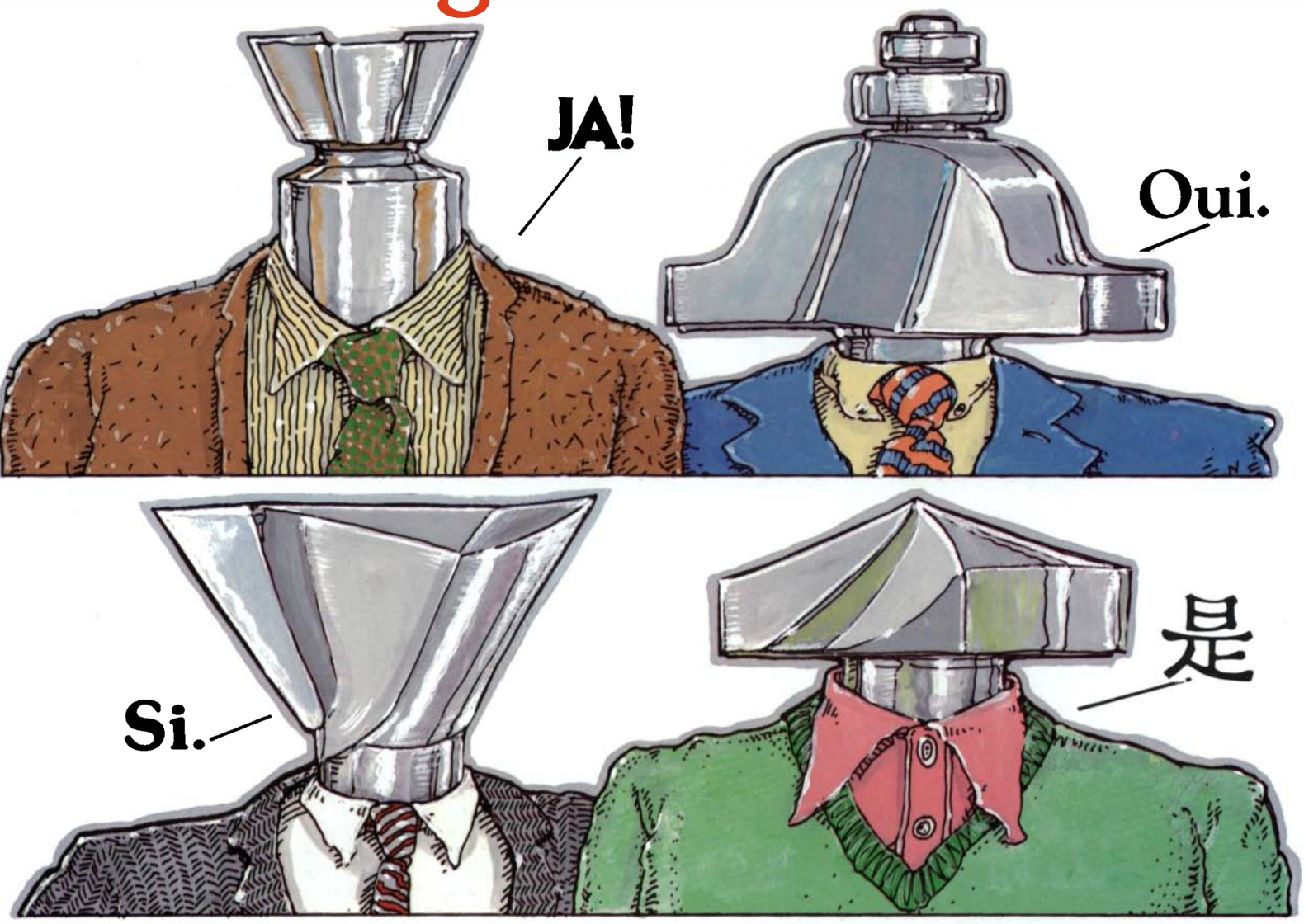

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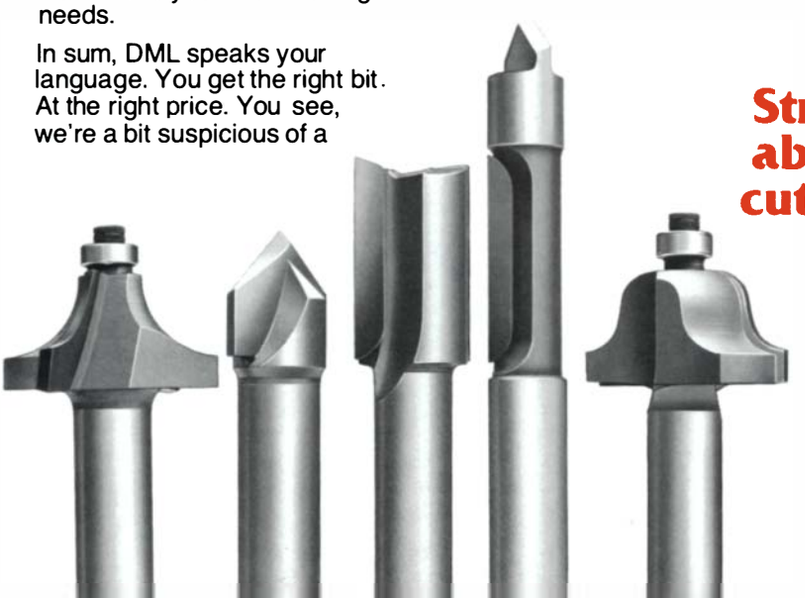

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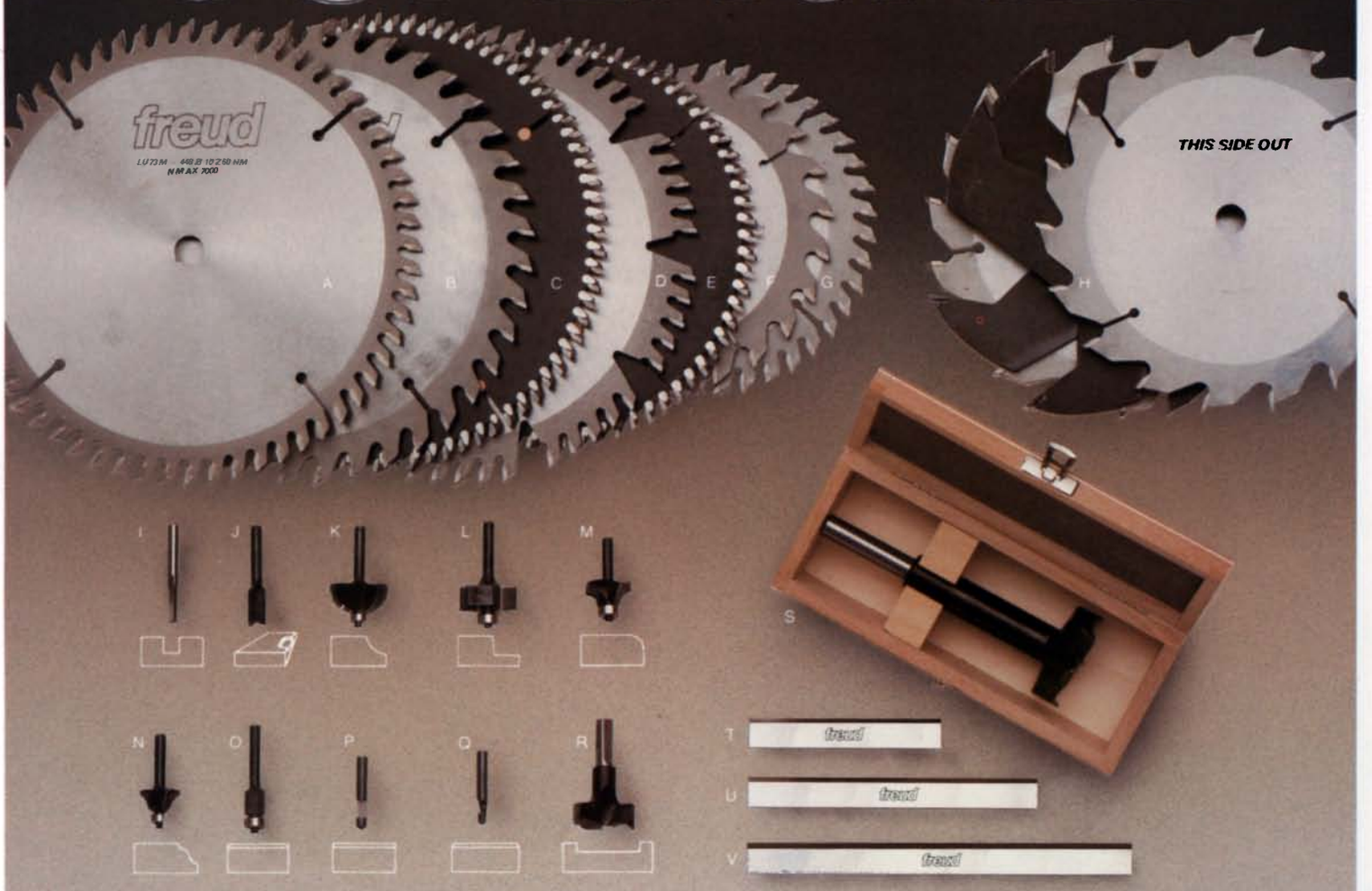

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F	PS203	7¼" x 24 Teeth Gen. Purpose ATB	27.45	18.90
G	PS303	7¼" x 40 Teeth Gen. Purpose ATB	32.97	24.90
H	DS308	#3 Dado 8" Max. Width of Cut 13/16"	170.25	119.50
I	04-106	¼" Diam. ¾" Cut. Length Solid Carbide	11.05	8.80
J	16-100	½" Diam. Mortising Bit C.T.	12.73	10.10
K	30-106	½" Radius Cove Bit C.T.	33.64	25.90

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N	38-100	5/32" Radius Ogee Bit C.T.	32.90	26.30
O	42-106	½" Diam. ½" Cut. Length Flush Trimming Bit	15.62	12.50
P	64-100	Solid Carbide Flush Trim Bit	7.64	6.10
Q	66-100	Solid Carbide 7° Bevel Bit	8.30	6.64
R	3557R	35MM Diam. 10MM Shank Boring Bit	31.90	25.50
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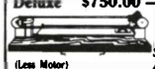

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CALIFORNIA: **Show**—Woodline-East Bay Woodcrafters 4th Annual Woodcarving Show, Mar. 2–3. 1731 Clement Ave., Alameda. Contact Dick Compton, 4351 Whittle Ave., Oakland, 94602. (415) 531-6455.
Show—Craftsmen & Hobbyists, Mar. 1–3. Pasadena Center, 300 E. Green St., Pasadena. Contact Patricia Dillon, (213) 477-8521.
Workshops/classes—Including furniture, carving, boatbuilding, restoration, finishing, miniatures. Hands on Wood, Building F, Fort Mason Center, San Francisco. Contact Jon Lopez or Sherilyn Tharp, (415) 567-2205.
Exhibition/lecture—Sam Maloof, Mar. 21–29 and Apr. 8–12, lecture Mar. 22. Santa Ana College Art Gallery, 17th at Bristol, Santa Ana. Contact Donna Hatchett, (714) 667-3385.

COLORADO: **Juried exhibition**—2nd Art of Crafts Festival, July 25–28. Denver Art Museum. Application deadline Feb. 22. Contact The Art of Crafts, PO Box 38223, Denver, 80238. (303) 592-7238.
Workshops/seminars—Veneering, Feb. 16, 23; European hardware, Mar. 2; carving, Mar. 9; Japanese tools, Mar. 16. The Woodworkers' Store, 3040 South Broadway, Denver. (303) 778-8650.

CONNECTICUT: **Juried exhibition**—Society of Conn. Craftsmen 50th Annual, Apr. 13–May 19. Museum of Art, Science and Industry, 4450 Park Ave., Bridgeport. Deadline Mar. 11. Contact PO Box 615, Hartford, 06142-0615. (203) 393-1748.
Show—Hartford/Handcraft, Mar. 29–May 8. M.S. Gallery, 205-A Sisson Ave., Hartford. Contact Michael Shortell or J. La Motta, (203) 232-2417.

DELAWARE: **Juried exhibition**—25th Contemporary Crafts, Jan. 18–Mar. 3. Delaware Art Museum, 2301 Kentmere Pky., Wilmington, 19806.

WASHINGTON, D.C.: **Juried exhibition**—1985 Washington Craft Show, Apr. 26–28. Departmental Auditorium, U.S. Dept. of Commerce, 1301 Constitution Ave. Contact Brennan Rash, (202) 387-5266, or Alvin Rosenfeld, (202) 357-2627.

FLORIDA: **Exhibition**—Boynton's G.A.L.A. (Great American Love Affair), Mar. 1–3. 128 E. Ocean Ave., Boynton. Contact Eleanor Wollenweber, (305) 734-8120, ext. 432.
Show—Inlaid exotic wood, Giles Gilson, Mar. 15–Apr. 6. Netsky Gallery, 3107 Grand Ave., Coconut Grove. Contact (305) 662-2453.

GEORGIA: **Seminar**—Windsor chairs, Michael Dunbar, Apr. 19–21. Highland Hardware, 1045 N. Highland Ave. NE, Atlanta, 30306. (404) 872-4466.

IDAHO: **Exhibition**—Contemporary Northwest furniture, Aug. 9–Sept. 15. Boise Gallery of Art, and travel in Northwest. Deadline May 1. Contact the gallery at 670 South Julia Davis Dr., Boise, 83702. (208) 345-8330.

ILLINOIS: **Workshops/demonstration**—Various, Feb.–Apr.; Inca demo, Mar. 30. The Hardwood Connection, 420 Oak St., DeKalb, 60115. (815) 758-6009.
Juried exhibition—6th Annual Fountain Square Arts Festival, June 29–30. Fountain Square, Evanston. Deadline Apr. 12. Contact Chamber of Commerce, 807 Davis St., Evanston, 60201. (312) 328-1500.
Show—Furniture and accessories, Mar. 22–23. Esther Saks Gallery, 311 W. Superior St., Chicago. Contact Carol Spector, (312) 549-4655.

INDIANA: **Exhibition**—Indiana Woodworking, Jan. 18–Mar. 1. Artifacts Gallery, 6327 Guilford Ave., Indianapolis, 46220. (317) 255-1178.
Juried show—Indiana Craft Market 85, Mar. 28–31. Indianapolis Hilton, downtown on the Circle. Contact David Robb, (317) 631-1247.
Exhibition—Founders' Day, period crafts, June 1–2. Vaughn and Jefferson Sts., Madison. Deadline Apr. 15. SASE to Dixie McDonough, 1119 W. Main St., Madison, 47250. (812) 265-5080.
Exhibition—Mid-states crafts, Feb. 24–Mar. 31. Evansville Museum of Arts and Science, 411 SE Riverside Dr., Evansville, 47713. (213) 439-2119.

KANSAS: **Juried show**—Various media, Mar. 31–Apr. 30. Topeka Public Library, 1515 W. 10th, Topeka, 66604. Deadline Mar. 10. Contact (913) 233-2040.

KENTUCKY: **Workshops**—Veneering, machine maintenance, Apr. 12–13. Richmond. Contact Kentucky Woodworkers Assoc., PO Box 22018, Lexington, 40522.

LOUISIANA: **Juried show**—Craftworks Gift Show (wholesale only), Mar. 16–17. Riverside Complex, 175 S. River Rd., Baton Rouge. Contact Jennifer Martin, (504) 673-4002.

MAINE: **Workshops**—High-school age, summer. Kent Hills. Contact New England Craft Program, J. Sinauer, 374 Old Montague Rd., Amherst. (413) 549-4841.

MARYLAND: **Juried fair**—ACC Craftfair. Trade: Feb. 12–14; public: Feb. 15–17. Convention Center, Baltimore. Contact American Craft Enterprises, Inc., PO Box 10, New Paltz, N.Y. 12561. (914) 255-0039.
Juried fair—Spring Craft Fair, May 1–3. Univ. of Maryland, College Park. Deadline Apr. 15. Contact Mary Shaffer, Craft Center, Univ. of Maryland, Stamp Union Room 0232, College Park, 20742. (301) 454-4754.
Juried shows—Spring Arts & Crafts Fair, Apr. 19–21, Montgomery County Fairgrounds, Gaithersburg; Spring Crafts Festival, May 3–5, State Fair Grounds, Timonium. Contact Deann Verdier, (301) 831-9191.
Competition—18th World Championship Wildfowl Carving, Apr. 26–28. $85,000 in prizes. Convention Hall, Ocean City. Contact Knute Bartrug, 707 Eastern Shore Dr., Salisbury, 21801. (301) 749-5174.

MASSACHUSETTS: **Demonstrations**—Chip carving, Wayne Barton, Feb. 16; Tage Frid, Mar. 16. Woodcraft Supply Corp., 41 Atlantic Ave., Box 4000, Woburn, 01888. (617) 935-5860.
Workshops—Extensive winter schedule. For calendar, write Old Sturbridge Village, Sturbridge, 01566.
Exhibition—Scent Bottle Invitational, July 5–Aug. 31. Signature galleries in Boston and Hyannis. Deadline Mar. 1. Contact Signature, Dock Square, North St., Boston, 02109. (617) 227-4885.
Workshops/seminars—Turning, Feb. 27; marquetry, Mar. 6; finishing, Mar. 13. The Woodworkers' Store, 2154 Massachusetts Ave., Cambridge. (617) 497-1136.
Workshop/fair—Wood technology, Bruce Hoadley, Apr. 13; Annual Fair, May 17–19. Worcester Craft Ctr., 25 Sagamore Rd., Worcester, 01605. (617) 753-8183.
Exhibition—Designs in Black and White, Feb. 15–Mar. 15. Society of Arts and Crafts, 175 Newbury

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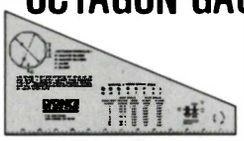

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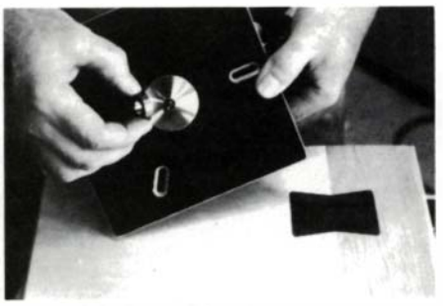

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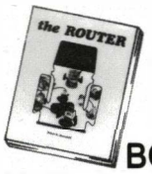

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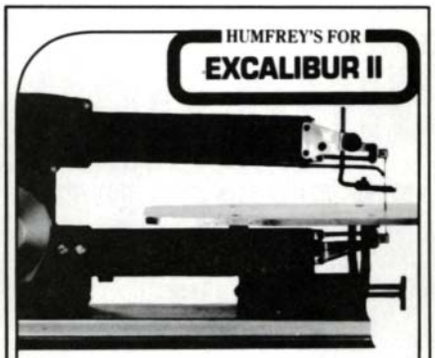

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Show—New England Woodworking World, Apr. 12–14. Springfield Civic Center, Springfield. Contact W.A.N.A., 35 Main St., Suite 6, Plymouth, N.H. 03264. (603) 536-3876.

MINNESOTA: **Workshops/seminars**—Marquetry, Feb. 23; veneering, Mar. 2 and 9; caning, Mar. 16. The Woodworkers' Store, 3025 Lyndale Ave. S., Minneapolis. (612) 822-3338.

MISSISSIPPI: **Conference/exhibition**—ACC SE Region, Feb. 22–23, Itawamba Junior College, Fulton; national furniture exhibition, Feb. 23–Mar. 30, Tupelo Art Center, 211 W. Main, Tupelo. For both, contact Robert Reedy, Art Dept., Itawamba Junior College, Fulton, 38855. (601) 862-3101, ext. 264.

MISSOURI: **Juried show**—3rd Annual Midwest Wood Furniture, June 8–12. Hibdon Hardwood, Inc. Deadline May 1. Contact Hibdon Hardwood, Inc., 1539 Chouteau, St. Louis, 63103. (314) 621-7711.

NEVADA: **Lecture/workshop**—George Frank, Mar. 29–31. Imported European Hardware & Tools, 3820 Schiff Dr., Las Vegas. Contact Christian or Jeri, (702) 871-0722.

NEW HAMPSHIRE: **Workshops**—Various violin and bow making and repair, June 17–Aug. 23. Univ. of New Hampshire, Durham. Contact Violin Craftsmanship Institute, Univ. of N.H., Div. of Continuing Education, Brook House, 24 Rosemary La., Durham, 03824. (603) 862-1088.
Exhibition—Jon Brooks, Feb. 25–Mar. 20. Chapel Art Center, Saint Anselm College, Manchester. Contact Beverly Welber, (603) 669-1030.

NEW JERSEY: **Juried exhibition/sale**—6th Annual, June 8–13. Deadline Mar. 1. Craft Concept's '85, Jewish Community Center, 501 North Jerome Ave., Margate, 08402.
Seminar—Finish repair, coloring, Michael Dresdner, Apr. 27. Brookdale Community College, Newman Springs Rd., Lincroft, 07738. Contact Dr. Gabriel Longo, (201) 842-1900.

NEW YORK: **Juried exhibition**—Crafts Festival at Lincoln Center, Aug. 31, Sept. 1–2, Sept. 6–8. Deadline Mar. 1. Contact Brenda Brigham, American Concern for Artistry and Craftsmanship, PO Box 6221, Hoboken, N.J. 07030. (201) 798-0220.
Courses—Various classes, Maurice Fraser, to May 15. The Craft Students League, YWCA, 610 Lexington Ave. at 53rd St., N.Y.C., 10022. (212) 755-2700.
Exhibition—Clearwater's 8th Great Hudson River Revival, June 15–16. Croton Point Park, Croton-on-Hudson. Deadline Mar. 8. Contact Crafts Committee, c/o Joan Silberberg, RFD 2, Pudding St., Carmel, 10512.
Juried show—Chautauqua Crafts Festival '85, July 5–7, Aug. 9–11. Bestor Plaza, Chautauqua. Deadline May 1. Contact Gale Svenson, Chautauqua Crafts Festival, PO Box 89, Mayville, 14757.
Workshops—Japanese hand tools, Mar. 16–17; shoji making, Apr. 13–14. The Luthierie, 2449 West Saugerties Rd., Saugerties, 12477. Contact Bonnie Robiczek, (914) 246-5207.
Juried show—Woodstock-New Paltz Art & Crafts, May 25–27. Ulster County Fairgrounds, New Paltz. Deadline Mar. 1. Contact Scott Rubinstein, PO Box 825, Woodstock, 12498. (914) 679-8087 or (914) 246-3414.
Exhibition—8th Annual Wood Carver's, May 4–5. Grange Hall Building, Erie County Fairgrounds, Hamburg. Contact Richard E. Reimers, 67 Lyndale Ct., West Seneca, 14224.

NORTH CAROLINA: **Juried exhibition**—"After Her Own Image: Woman's Work 1985," Feb. 22. Salem Academy and College's Fine Arts Center, Winston-Salem. Contact JoAnne Vernon, (919) 724-9523.

NORTH DAKOTA: **Exhibition/competition**—Souris Valley Woodworkers Assoc., Apr. 17–19. Town and Country Center, Minot. Deadline Apr. 1. Contact SVWA, PO Box 3042, Minot, 58702.

OHIO: **Workshops/seminars**—Caning, Feb. 16; finishing, Feb. 23. The Woodworkers' Store, 2500 E. Main St., Columbus. (614) 231-0061.
Juried show—Contemporary works in wood, Sept. 21–Oct. 20. Deadline May 7. Contact Dairy Barn, PO Box 747, Athens, 45701. (614) 592-4981.
Seminars—Windsor chairs, Feb. 9–10; router and hand tools, Mar. 30–31; bandsaw joinery, Apr. 20–21; Japanese tools, Toshio Odate, May 3–5. The Center for Design and Craftsmanship, The University of Akron, Akron, 44325. (216) 375-7575.

OREGON: **Show**—Guild of Oregon Woodworkers, Mar. 30–Apr. 28. Capital Gallery, 2215 Jeldon St. NE, Salem, 97303. (503) 363-8426.

PENNSYLVANIA: **Show/juried exhibition**—Sidewalk sale, July 11–14, deadline Mar. 8; exhibit, July 1–31, slide deadline Apr. 1. Penn State campus, State College. Contact Lurene Frantz, Central Pennsylvania Festival of the Arts, PO Box 1023, State College, 16804. (814) 237-3682.
Workshop—Hardwood lumber grading and inspection, Feb. 25–Mar. 1. Penn State Univ., University Park. Contact Agriculture Conference Coordinator, 410 J.O. Keller Conference Center, University Park, 16802. (814) 865-9547.
Show—Pennsylvania Delaware Valley Wood Carvers, Apr. 13–14. Penn State, Abington campus gym, Abington. Contact Charles Beiderman, (215) 342-4145.
Juried exhibition—Luckenbach Mill Gallery, Sept. 14–Oct. 27. Deadline Mar. 31. Contact Janet Goloub, Historic Bethlehem, Inc., 501 Main St., Bethlehem, 18018. (215) 691-5300.
Juried exhibition—The Woodworker, Sept. 20–22. Philadelphia Armory (Drexel Campus). Deadline Apr. 10. Contact Craftmarket America, Box 30, Sugarloaf, N.Y. 10981. (914) 469-2158.
Show—Supercrafts weekend, Mar. 22–24. Valley Forge Convention Center, King of Prussia. Contact Creative Faires, Ltd., PO Box 1688, Westhampton Beach, N.Y. 11978. (516) 325-1331.
Workshop—Finishing, George Frank, Mar. 2–3. Old Mill Court Shoppe, PO Box 547A, RD #3, Camp Betty Rd., York, 17402. (717) 755-8884.

SOUTH CAROLINA: **Exhibition**—Jim Lewis and Clark Ellefson, Apr. 7–May 26. Upper East Gallery, Senate & Bull Sts., Columbia, 29201. (803) 799-2810.

TENNESSEE: **Workshops**—Wood laminate construction, Ron Dekok, Mar. 11–15; woodturning, Rude Osolnik, Mar. 25–29. Arrowmont School of Arts and Crafts, Gatlinburg. Contact Clare Verstegen, Box 567, Gatlinburg, 37738. (615) 436-5860.
Seminar—Hardwood manufacturing and marketing, Feb. 18–22. National Hardwood Lumber Association, Memphis. Contact NHLA, PO Box 34518, Memphis, 38184. (901) 377-1818.

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6800DBV	Drywall Screwdriver	97.50
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		50	1.07 ea	.94 ea
		40	1.10 ea	.96 ea
3"x24"	120	100	1.20 ea	.93 ea
		80	1.22 ea	.97 ea
Assortment of 10 16.95		60	1.26 ea	1.12 ea
		50	1.31 ea	1.15 ea
		40	1.34 ea	1.18 ea
4"x24"	120	100	1.68 ea	1.46 ea
		80	1.73 ea	1.51 ea
Assortment of 10 21.95		60	1.78 ea	1.64 ea
		50	1.85 ea	1.70 ea
		40	1.89 ea	1.76 ea

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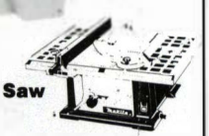

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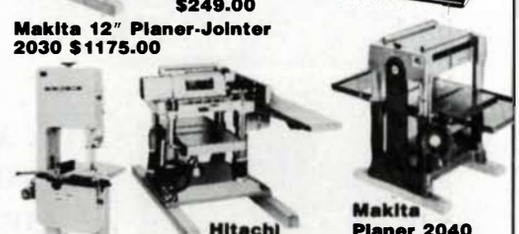

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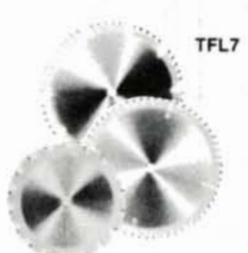


TFL7

TEXAS: **Exhibition**—Contemporary furniture, Mar. 8–Apr. 27. Carr Gallery, 807 Hawthorne, Houston, 77006. Contact Susan Carr, (713) 520-0187.
Juried fair—Houston Festival's Annual Crafts and Arts Exposition, Mar. 23–31. Downtown Houston. Contact (713) 521-0993.
Juried fair—ACC Craftfair. Trade: Mar. 27–28; public: Mar. 29–31. Market Hall, Dallas Market Center, Dallas. Contact American Craft Enterprises, Inc., PO Box 10, New Paltz, N.Y. 12561. (914) 255-0039.
Juried show—Austin Woodworkers Guild, Mar. 4–31. Dougherty Arts, 1110 Barton Springs, Austin. Contact (512) 477-5824.
Show—Woodworking for Craftsmen & Hobbyists, Mar. 29–31. Dallas Market Hall, 2100 Stemmons Freeway, Dallas. Contact Patricia Dillon, (213) 477-8521.

VERMONT: **Exhibition**—Rare tools and machines, ongoing exhibit. The American Precision Museum, Windsor. (802) 674-5781.
Workshops—Series at Vermont State Craft Center at Frog Hollow, Middlebury, 05753. (802) 388-3177.

VIRGINIA: **Festival**—10th Annual Mid-Atlantic Wildfowl, Mar. 1–3. The Pavilion, Virginia Beach. $5,000 in cash prizes. Contact Bill Walsh, (804) 428-8549.
Juried exhibition—ACC SE Region's Spotlight '85, June 25–July 26. Slide deadline Mar. 1. Longwood College, Farmville. Contact Spotlight '85, Art Dept., Longwood College, Farmville, 23901. (804) 392-9359.
Workshop—Woodturning, Liam O'Neill, May 4. 2604 South Oakland St., Arlington. Contact Sid Stone, (703) 522-8875.

WASHINGTON: **Workshops**—Lapstrake, Simon Watts, Mar. 11–23; plywood boats, Rich Kolin, weekends Apr. 13–May 5. The Center for Wooden Boats, 1010 Valley St., Seattle, 98109. (206) 382-2628.
Workshops—Turning, joinery, planes and scrapers, veneering, through Mar.16. The Woodworkers' Store, 3823 Stone Way N., Seattle. (206) 634-3222.

WEST VIRGINIA: **Workshops**—Clockmaking, Feb. 25–Mar. 1; design, Mar. 4–8. Crafts Ctr., Cedar Lakes, Ripley, 25271. Contact Tim Pyles, (304) 372-6263.

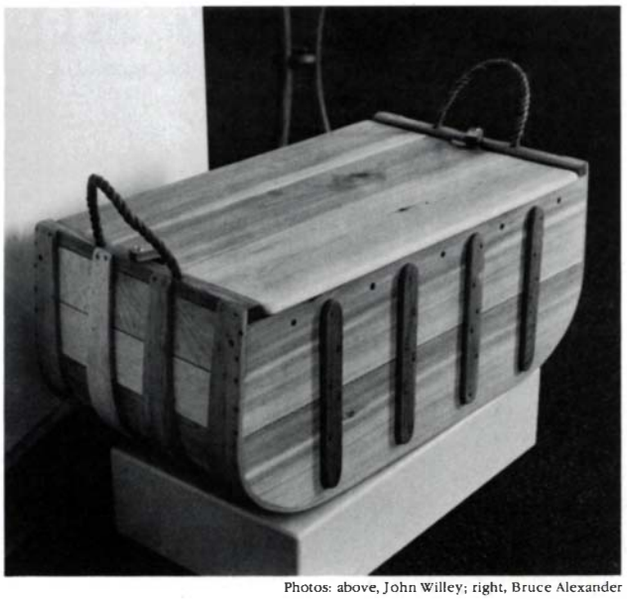
WISCONSIN: **Juried fair**—Festival of Arts, Mar. 24. Fine Arts Building, Univ. of Wisconsin at Stevens Point.

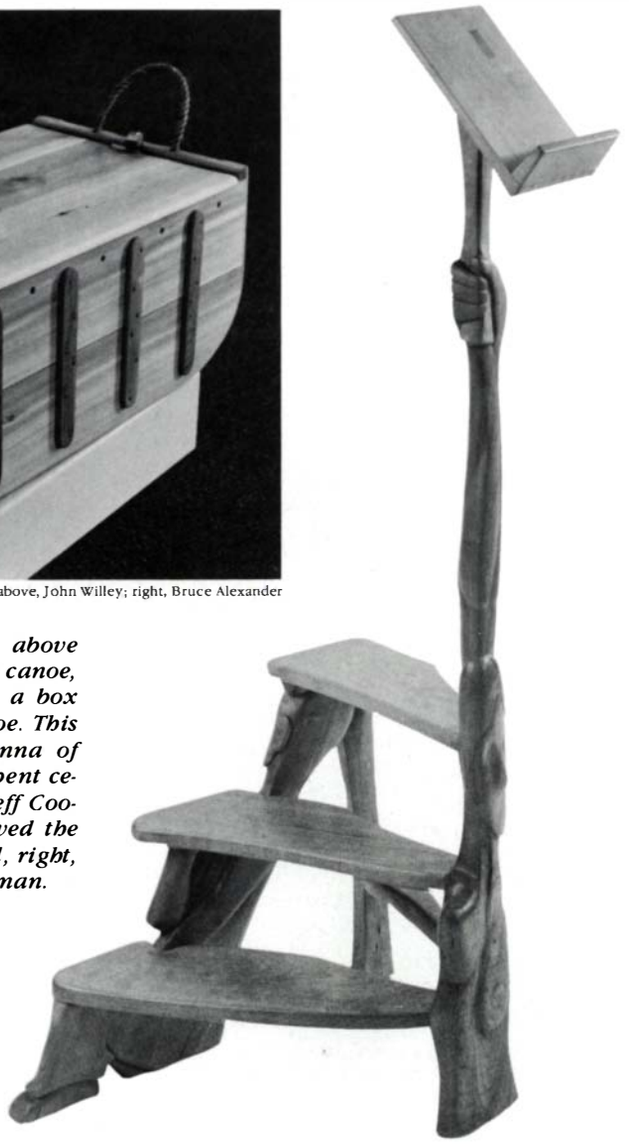
BRITISH COLUMBIA: **Exhibition**—Vancouver Island Woodworkers' Guild, Apr. 1–29. McPherson Playhouse, Pandora and Government Sts., Victoria. Contact PO Box 6584 Station C, Victoria, V8P 5N7, or Ken Guenter, (604) 595-2763.

NOVA SCOTIA: **Workshops**—Lapstrake boatbuilding, Simon Watts, beginning July 15. Halifax. Contact Richard Tyner, #11 Brenton St., Dartmouth, B2Y 1W2. (902) 466-3306.

ONTARIO: **Exhibition**—Including carvings by Daniel Griffith, Mar. 1–30. Heritage Crafts, Sheridan Mews, King St. West, Brockville. (613) 342-2521.

SASKATCHEWAN: **Conference**—Contemporary furniture design and technique, Aug. 3–5. Kelsey Institute, Saskatoon. Deadline June 1. Contact Craft Council, Box 7408, Saskatoon, S7K 4J3. (306) 653-3616.





Photos: above, John Willey; right, Bruce Alexander

If you think the box shown above looks like a cross section of a canoe, you're right. It's a wanigan, a box for carrying gear inside a canoe. This elegant update by James Hanna of Marshfield, Maine, has steambent cedar ribs and cedar planking. Jeff Cooper of Portsmouth, N.H., carved the 54-in. tall ends of his stepstool, right, to resemble a man and a woman.

Woodworking up north

There is honest-to-God good woodworking to be had in Maine, if the first Maine Woodworkers' Exhibition held at the University of Maine's Farmington gallery was any indication. And even members of the sponsoring Kennebunk Valley Woodworkers Association were surprised at how many folks were interested.

About 400 people braved the foulest possible weather to attend the Nov. 9 opening. As far as I could tell, everyone found at least one piece they felt deserved a closer look and a little stroking. I may be a little prejudiced, though, since I helped set up the show and some of my woodwork was displayed.

Sixty pieces by 28 makers from all over the state included a 15-ft. native elm and cedar bateau (oiled, and hand-rubbed by everybody); a gigantic armoire (when you opened its grand oak doors, you could hear Darth Vader breathing); Pennsylvania rifle reproduction (1760s Lancaster style, tiger maple, gloriously carved); a 12-ft. tall, impeccably detailed red-oak spiral staircase (carefully corkscrewed up the gallery's functional/institutional/fire-coded ladder); and more elegant boxes, casework, tables and chairs than I can list.

After closing at the Farmington campus in mid December, the show moved to the Brick Store Museum, 117 Main St., Kennebunk, Maine, where it can be seen until Mar. 15.

• • •

Two New Hampshire woodworkers received top exhibit awards for their carved pieces in the League of New Hampshire Craftsmen's 10th Annual Juried Exhibit at the Currier Gallery of Art in Manchester last November.

Jeffrey Cooper of Portsmouth captured the Brookstone Wood Award for "Library Stool II, Guy and Gal" (above right), a cherry stepstool with carved male and female figures. The North Country Radio Folk Art Award went to Steven McGlone of Alton for his "Dragon Staff," a 52-in. high walking staff with dragon head carved from a maple root.

—John Willey (Maine) and Dick Burrows (New Hampshire)

Black gold?

As I drive throughout central New York peddling Gabon ebony, I find that most woodworkers assume exotic hardwoods are brought to America by large multinational lumber companies. That is, until I pull up and drag out a few billets from the trunk of my beat-up 1973 Plymouth. The truth is, much of the rarest wood is brought here by small companies like mine, Basic Technologies Inc. (Box 1781, Binghamton, N.Y. 13092).

A handful of my high school buddies and I started the company when we went to Africa in search of fame and fortune. We didn't set out to become wood suppliers—we had energy, vision, and a plan to drill water wells throughout West Africa. But we never got that big contract, and after the first year everyone except me had returned to the States. Our company was reduced to a two-man operation: me and an illiterate African helper.

We traveled to remote bush villages, passing the hat for contributions to build community water wells. Only large villages could afford one, and only at great sacrifice, but for them, a well was a wonderful thing. We kept going for two good years, but soon the outside financing needed to keep the company afloat was exhausted. The African money we earned from drilling was all we had, and it was worthless in the United States. Forced to find a way to convert our African money into some kind of hard cash, we decided to barter ebony, which is one of the few marketable products not under strict government control. Because the Africans use ebony only for carving statues, their governments see little value in the wood.

Ebony grows in the western mountain teak forests near the equator, scattered sparsely through hundreds of square miles of Gabon, Cameroon and eastern Nigeria. The trees, which attain heights of 100 ft. and girths of 3 ft., are impossible to reach by vehicle, so you must hike through miles of jungle trails to get them. Like a giant thatched roof, the forest ceiling keeps the light out and the moisture in. High noon seems like dusk and the mist never burns off, even though the temperature climbs past 100° F. On the perimeter of the forest are ebony stumps left by my colonial predecessors, and I feel something tighten in the pit of my stomach when I see an old cross or a native monument to a white man. As you cut deeper and deeper into the forests, less and less of the white man's presence is felt. I keep reminding myself that others have done this before me, and others will follow. As long as there are artists and craftsmen, there will be guys like me.

My work crew consists of 24 half-naked,

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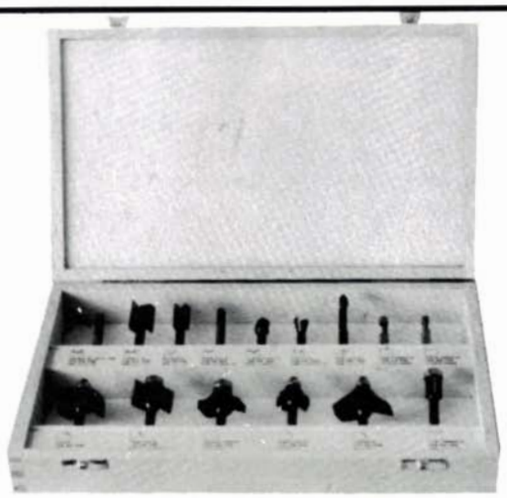

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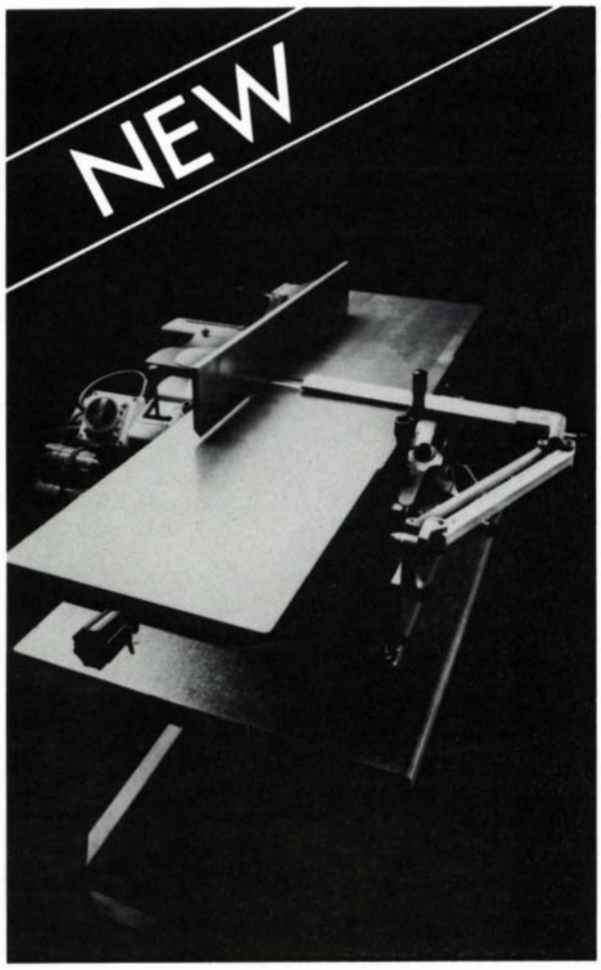

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barefoot bushmen. None of them speak much English, and some can't even understand each other. There are hundreds of dialects throughout the area, and sometimes villages two miles apart speak a different language, and have acute differences in their codes of conduct. Distrust and competition between the men is high. They are also, as one might expect, primitive and fanatical in their beliefs. The men believe that ancestors are protecting them from evil forest demons that are trying to possess their souls. While in the jungle, however, any villager with weak ancestors, or who is on the wrong side of his family, tribe or juju priest, is easy prey for forest demons.

These beliefs are an ongoing problem for me, as the men are always ready to run at the first sign of trouble. If a saw breaks or a man is injured, it's always perceived as a spiritual attack. This neverending tension reduces productivity, causes confusion and lowers morale. The situation is compounded by some inexplicable element in the forest that seems to trigger, in otherwise healthy men, what looks like an epileptic seizure. As soon as this happens, everyone runs for their lives.

Still, apart from these idiosyncrasies, the natives are hard-working men operating under almost unbearable conditions. The only tool that most of them carry is a sharp hoe. Some have axes and chisels, but only two operate chainsaws. The trees are felled and cut into 4-ft. sections by chainsaw, but then the work is entirely manual. First, sapwood is hacked off down to the black heartwood with axes and hoes. Then the heartwood is split into billets that the men carry out of the forest on their heads. A good billet is at least 7 in. wide, 4 in. thick and 4 ft. long, and weighs more than 100 lb. It takes 24 men a full day to cut 6 billets.

At the beginning and end of each day, the crew treks the 9 to 15 miles between the road and the work site. At the end of the day, the men carry the billets as far as they can, but after 10 hours of hard labor in 98% humidity and 100°F heat, they can't reach the road with the billets, so they stash them in the forest. Because they don't get paid until the ebony reaches the road, they are paranoid about thieves, so they cover the wood with underbrush, surrounded by bent twigs that are triggers for deadly poison-tipped darts. Even if a thief avoids the trap, he will be killed if caught.

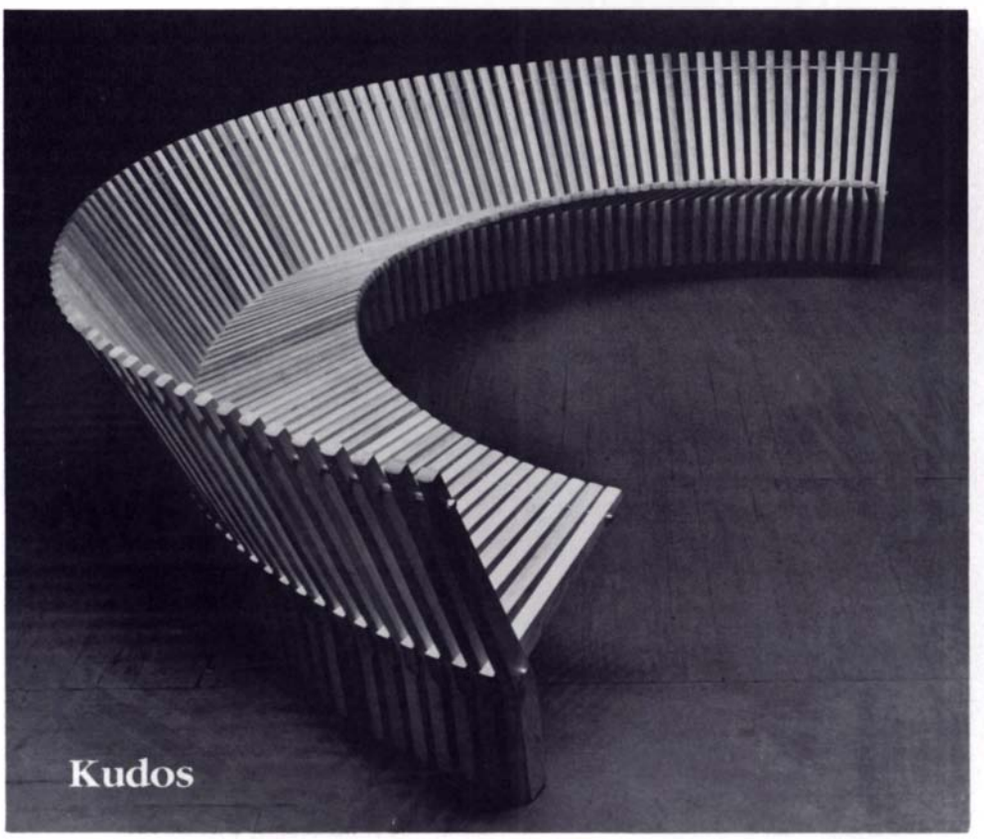
When the billets finally reach the road, I pay the men and load the ebony on a truck. This is a risky moment for me because I carry thousands of dollars—more than enough to tempt robbery. Each truckload must travel hundreds of miles to the warehouse, through more than twenty police and customs checkpoints. We've been arrested and interrogated on numerous occasions for no offense whatsoever, but we've always made it back.

At the warehouse, the billets are graded and weighed. Only the blackest are shipped whole. The rest are cut into pieces with a 10-in. diesel-powered tablesaw, and the blackest pieces are shipped. We pack 360 billets into a standard 20-ft. ocean container. Presently, we are hard pressed to meet commitments to supply our U.S. and European markets a total of eight containers per year.

Although the long-term prospects for the continued supply of ebony are good, there are disturbing short-term threats. There are enough trees to last decades, but Africa's perpetual political instability, changing export policies, efforts to close foreign exchange loopholes and concerns about natural resources could stop the shipments at any time. Meanwhile, I'm still riding around New York with ebony in my trunk for anyone with the money to buy it and the time to hear how it got here.

—*Christopher Catranis*

Brian Vanden Brink



Thomas Moser Cabinetmakers, Inc., of New Gloucester, Maine, received one of the National Hardwood Institute's Daphne awards for the bench shown here. Designed by Per Borre, a Danish architect, and available in teak or cherry (outdoors or in), the 'Astral' bench consists of a series of hardwood beams fastened with stainless-steel tubes and rods. Moser received the award for Limited Production Furniture (fewer than 100 units produced per year) at ceremonies last October in High Point, N.C.

Chainsaw addict

In the country these days, chainsaw addicts outnumber cows (and maybe even real estate agents). I was an addict once myself, hooked like a young pup puffing his first cigarette in spite of the dizzying smoke. I'll never forget the day I first yanked the cord on a brand-new saw. Nothing. I yanked again and again, and went on yanking, with little more than a sputter in reply during most of our relationship. When I did manage to ignite the engine and cut a few twigs, the saw would overheat and die. I'd put it down, run to the truck and fetch my owners' manual. Then I'd have to root through the ferns to find the thing again. I should have suspected that anyone who built a chainsaw and then painted it *green* couldn't have been serious.

Anyway, that year I managed to cut only one cord of firewood. To bring in the four others my stove craved, I had to sell my saw and buy the wood.

You think I learned a lesson? In less than a year I'd moved to a woodlot out beyond the electric grid. To clear the land and build a house would have been a lifetime endeavor without a smoky companion. This time I polled my woodchuck friends about their favorite monster. It turned out to be a bright yellow McCulloch 10-10. Starting the saw was a snap. It

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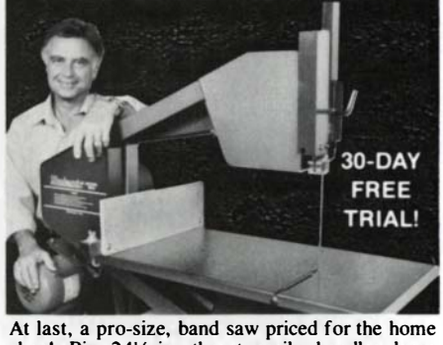

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cut like a kettledrum through a section of woodwinds. The next day I went to the store and bought a pair of earguards.

Together, the 10-10 and I sliced trees and ripped them into the posts and beams for the house. We cut right angles and notches that had visitors convinced I'd hidden a generator and Skil saw out back. We chopped firewood. At night in my sleeping bag I'd vibrate like a tuning fork. I linked that tremor with the pride that I'd really gotten in a good day's work. It wasn't until I laid down with *no* feeling in my hands that I began to worry.

But it was too late. I had the habit, and the love of power was deeply penetrating. After the house I went on to a chicken coop, a studio, even a picnic table. My appetite for clearing grew: here an acre for a garden, there another for a pond, then a field. By now I had a full-fledged homestead and an advanced case of chainsaw elbow, a painful deterioration of the arm joint just like tennis elbow, except that it affects both elbows. Still I couldn't stop. In the evening, after a day buzzing in the woods, I'd sit glassy-eyed on the floor and file the chain until each tooth glistened.

It wasn't until I'd been hooked on the 10-10 for 9 years that I got my break. I was dicing up a bully maple, 27 in. in diameter, for firewood. The tree lay on a steep hillside. Standing downhill, I'd worked the 10-10 to the bottom of another cut when the trunk broke loose. I managed to drop the saw and pivot 180° before the maple rolled up my back. I felt something snap as my left elbow wedged into my ribs. Then, blessedly, the tree paused. I dug in my heels and pushed back. The maple gave and I jumped free.

I escaped with a busted rib and a black-and-blue back. But I didn't feel that until later. What I noticed first was the saw lying crushed under the maple. Just enough obstruction to block the trunk from rolling any farther. The 10-10 had saved me.

Some friends insisted that I should get right back on the horse that threw me before the fear congealed inside me. But I couldn't do anything for eight weeks until my rib set. Then, with a new bar and handle on the saw, I marched off to finish that maple. It wasn't five minutes before the engine blew. Cracked piston.

It's been a couple of years since I swore off chainsaws. The 10-10 sits on a shelf in my shop, a scarred reminder of how hard some habits break.

I hear there's a fancy new saw downtown. With shock absorbers, no less. Your arms don't feel a thing. What do you think they'd give for an old 10-10?

—Tim Matson, Thetford, Vt.

This article first appeared in the New England Farm Bulletin.

Eileen Fahey

Louie Thomas (left) shows his rebuilt logging locomotive cab to an admirer. Thomas spent more than 400 hours reconstructing the Falk No. 1's cab.

New life for a logging locomotive

Louie Thomas has spent most of his 58 years working with wood. He's built bridges, dams and houses, owned a sawmill, and for fun carved grey whales in black walnut. Thomas is also a member of the Northern Counties Logging Interpretive Association, a non-profit group that restores and demonstrates steam-era logging equipment at Fort Humboldt State Historical Park in Eureka, California. When the Association decided to restore a 100-year-old "gypsy-style" steam logging locomotive, they asked Thomas to reconstruct the wooden cab.

Built in 1884, the Falk No. 1 worked for 50 years in and around the small northern California logging town of Falk, now a ghost town. The little engine, only one of 20 ever made, maneuvered giant redwood logs with its built-in steam winch, delivered supplies to remote camps, and hauled dead and injured loggers back to civilization.

Thomas carefully disassembled the battered original cab and used the pieces as patterns for the new one. The frame-and-panel oak cab is anchored by four 4-in. by 6-in. corner posts. The structure is mortise-and-tenoned together, reinforced by 10-in. long bolts, and finished with tung oil. Thomas donated more than 400 hours and spent $600 on tools and materials.

—Jon Humboldt Gates, Trinidad, Calif.

Show business

Numerous complaints about bad checks and unpaid debts prompted San Francisco's KGO TV News to investigate Wayne Inouye, president of Exhibitors' Showcase, Inc., of Redwood City, Calif., which promoted last year's National Working With Wood shows. Following KGO's four-part series in November 1984, Inouye promptly declared bankruptcy.

Just after the KGO broadcasts, Jennifer-Douglas Productions announced plans for four "American Working With Wood Shows" in California, Seattle and Minneapolis. J-D President Douglas A. Hays, a former employee of Exhibitors' Showcase, flatly denies any present connection with Inouye. *—David Sloan*

New publications

A British group, the Tools and Trades History Society (TATHS), has begun publication of an annual journal about the history and development of hand tools and about the people who used them. *Tools and Trades* will complement TATHS' quarterly newsletter, which began publication last year.

The first journal included articles on woods used in making planes, the life and work of 14th- and 15th-century blacksmiths, and the tools of an 18th-century Quebec cooper. The journal sells for £5 and the newsletter for £1.50. For information, write TATHS, Winston Grange, Stowmarket Suffolk, IP14 6LE, U.K.

Scale Woodworking, an American pub-

INDEX TO ADVERTISERS

lication devoted to the art of making exact-scale wooden miniatures, also debuted last autumn. The first issue of the well-illustrated, black-and-white magazine featured articles on Maryland wildlife carvers Lem and Steve Ward, decorative ship carving, and architectural models. Charter subscriptions are $11.95 per year from Box 510, Georgetown, Conn. 06829.

Another new magazine, *The American Woodworker,* will begin publication in March. Announcements for the magazine say it will offer instructional articles on all styles and levels of woodworking. Subscriptions for the quarterly are $10.00 from JM Publications Inc., Dept. FW-1, 13 Walton Mall, P O Box 1408, Hendersonville, Tenn. 37075. □

Product review

The Fractron Calculator, *$7.95 from Graphic Systems, PO Box 881, Melville, N.Y. 11747.*
Jobber II, *$75 from Boyd Calculator, 6620 Lozier St., Houston, Tex. 77021.*

The rest of the world quietly chuckles as America clings tenaciously to the cumbersome old system of feet, inches and fractions of an inch. Why we have balked at adopting the simple, easy-to-use metric system is hard to say, but woodworkers—carpenters especially—are notoriously reluctant to make the change.

Why bother changing, you say? Quick, add these measurements: 1/4, 4 3/32, 7/16, 5/8, 9 5/64. It takes a while, doesn't it? Metrics, a decimal system based on tens and hundreds, has no fractions. But we all know that old habits die hard, if at all. If you're hooked on inches, you may want to investigate two new tools that can take the pain out of calculating fractions.

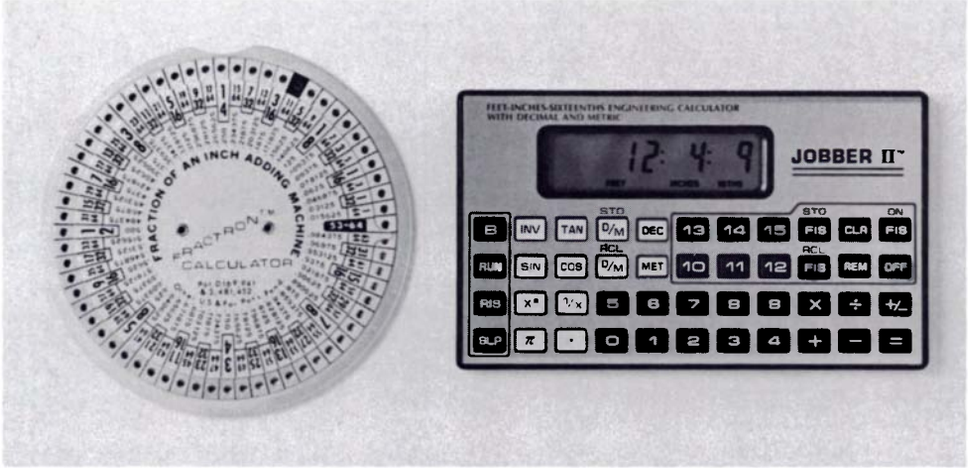
The Fractron Calculator is the low-cost, low-tech solution to the problem of adding and subtracting fractions. Best described as a circular slide rule, this ingenious anodized-aluminum gadget is functional, foolproof and hard to break—things I like a tool to be. It quickly adds and subtracts fractions (or their decimal equivalent) as small as 1/64 in. You simply stick a pencil point in the hole next to the fraction you want, spin the wheel until it stops, and repeat to add another fraction. Reverse the direction to subtract. The total appears in a little window. The device doesn't need batteries, and the black epoxy numbers aren't supposed to wear off. Neat.

Jobber II is a pocket-size electronic calculator designed for people in the building and construction industry. It calculates in three different measurement modes: feet/inches/sixteenths (FIS), decimals and metrics, and can quickly convert one to another. It also works with square roots, degrees, trigonometry functions, circles, arcs, triangles, slopes and rises.

I spent a couple of hours experimenting with Jobber II and found that it does some things better than others. Keying in feet, inches and sixteenths is pretty slow going. Fractions such as 1/4 in. or 1/2 in. must be keyed in as 4/16 and 8/16, respectively. Even more inconvenient, a readout in the FIS mode can be multiplied or divided only by whole feet. For example, you can divide 25 ft. 6 in. by 16 ft., but not by 16 in., so I couldn't calculate the number of 2x4 studs in a wall, for example.

The calculator is best for working with circles and arcs and solving triangle problems in feet and inches. Rise and run, however, can't be calculated in meters unless you first convert meters to feet and then back to meters again.

The Jobber II would be handy to have at the drawing board, but I stop short of giving it a rave review. If you only need to add and subtract fractions at the workbench, the Fractron Calculator is faster, and it's a much better buy. —*David Sloan*



Circular, low-tech Fractron Calculator, left, and pocket-size Jobber II calculator take the pain out of calculating fractions.

An armful of music

Asked for an 'unusual' harp, Hecht made this surreal instrument. The arms can be removed and the harp played.

This is the fifty-seventh harp I've made, and is the smallest (40 in. tall) of several sizes I build. This particular harp was commissioned by Arden Mason, a New York sculptor and trained circus acrobat, who asked that I "do something unique" with the harp.

I strive to make truly modern harps, ones not burdened by associations with a particular place or period. I suspect that the potential of the small harp can be realized only if it becomes attractive to contemporary players and composers. My designs eliminate superfluous detail, and feature honest wood joinery and unstained red oak. With this harp, I wanted to exploit the naturally animate lines of the harp, which have always struck me as being full of barely suppressed motion, by giving the instrument explicitly organic parts, turning it into a creature. The design also seemed to embody the fundamental riddle of self or the creation of the universe: the harp that plays itself.

—*Daniel Hecht, Montpelier, Vt.*

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 355, Newtown, Conn. 06470.*

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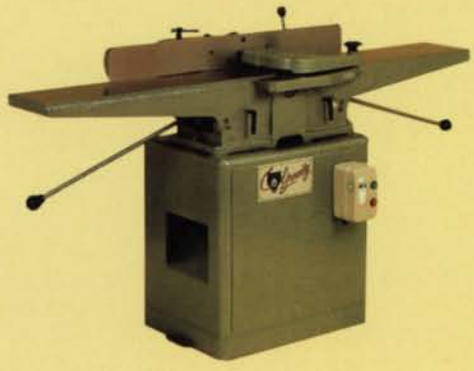

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HAUNTING WOODEN PEOPLE

Czarnopys' druidic bark-men are the stuff of which kids' (and adults') nightmares are made.

Metaphors like "warmth" and "character" describe wood, but they apply just as well to people, thus underscoring the woodworker's identity with his material.

By clothing plaster casts of his own body with pine and birch bark, Chicago sculptor Tom Czarnopys takes this identity a step further than do most of us. An avid hunter, he became intrigued by the sentinel stands of pine and the hollow dead tubes of birch he encountered on a recent trip. Imagining what it would be like to assume the trees' identity, he was struck by the idea of cladding plaster surrogates of himself in the trees' own skin.

When I first saw his bark-men in Chicago's ARC Gallery, the effect was jarring, as if they had suddenly materialized from their deep-woods lair. Or, more accurately, from that part of the mind that has never left those woods.

—Steve Luecking, Chicago, Ill.

Photos: Tom Czarnopys