May/June 1985, No. 52, $3.50

Fine WoodWorking

Planer Test

Low-Cost Dust Collection

Making Marionettes

Adirondack Chair

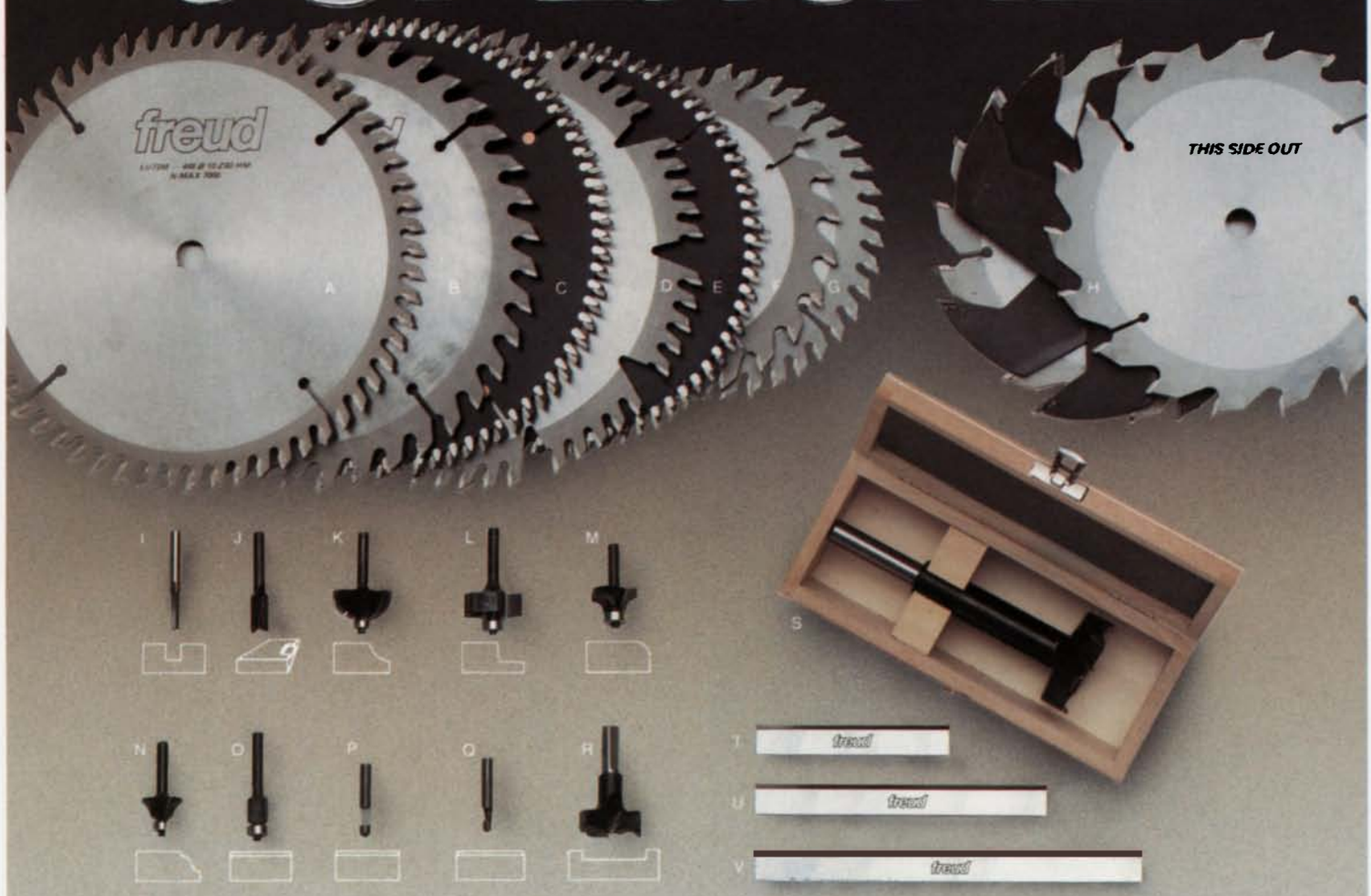
Using a Spokeshave

Corner Drop-Leaf Plans

Tage Frid

0 73361 64797 06

SUPERSALE



	ITEM	DESCRIPTION	LIST	SALE
A	LU73M010	10" x 60 Teeth Gen. Purpose ATB	$ 79.65	$ 44.90
B	LU72M010	10"x 40 Teeth Gen. Purpose ATB	68.58	39.90
C	LU85M010	10" x 80 Teeth Super Saw ATB	110.88	73.90
D	LU84M011	10" x 50 Teeth Combination 4 & R	74.51	44.90
E	LU85M009	9" x 72 Teeth Super Saw ATB	101.98	64.90
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

	ITEM	DESCRIPTION	LIST	SALE
L	32-100	1¼" Diam. Rabbeting Bit C.T.	$ 27.62	$ 22.10
M	34-110	¼" Radius Rounding Bit C.T.	27.62	22.10
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
S	06218	2⅛" Diam. ½" Shank Boring Bit	89.00	69.80
T	C310	Set of 3 4" x 5/8" x ⅛" Jointer Knives	18.29	13.40
U	C350	Set of 3 6" x 5/8" x ⅛" Jointer Knives	27.45	19.90
V	C441	Set of 3 8" x 5/8" x ⅛" Jointer Knives	36.58	28.90

Sale Extended Until Dec. 31, 1985

Note: All Saws & Dado have 5/8" Bore
All Router Bits have ¼" Shank
ATB = Alternate Top Bevel

4 & R = 4 Teeth & 1 Raker Tooth
C.T. = Carbide Tipped

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Fine WoodWorking

May/June 1985, No. 52

Cover: Tage Frid, woodworking's favorite Danish import, celebrated his retirement from teaching last year with an exhibition in New York City. We show some of the show pieces and talk with the man on p. 66. Photo: Dick Swift.

Bruno Frascone carved and strung-up his first wooden marionette about ten years ago while he was working with a puppet theater in France. On p. 30, he outlines how to put character in the carving and life in the limbs of these wooden miniatures. Photo: Bruno Frascone

Jigs and fixtures are the secret of producing a modern version of the traditional Adirondack chair. Here author Jeff Parsons shapes one of the chair's arms. For more, see p. 46.

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Departments

Articles

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John Marcoux's article "Triangular Sensibility" (*FWW* #48) deserved more and certainly better qualified criticism than it got in that single letter from Lyle Erman (Letters, *FWW* #49). He characterized Mr. Marcoux's work as dogmatic and useless, and said in an oblique way that it was cheap (as opposed to inexpensive). When Erman went on to say: "I would be hard pressed to allow one of these pieces to occupy valuable floor space in my home" one wondered if he was passing judgment on the pieces or was he telling us how much he paid for his house.

The important issue raised by Mr. Marcoux's work seems to be one of aesthetics. Are things like intricate joints, marquetry, rare materials or arcane finishes necessary components of good design? Certainly not. Frank Lloyd Wright, who knew a couple of things about the subject, characterized good design by the words "simplicity and repose". I find myself wanting to add the word "elegance" but must admit that elegance is probably more of a bonus than an essential element. At any rate, by this or any other acceptable definition, Mr. Marcoux's two tables—the red one on p. 37 and the yellow one on p. 40—are of good design and are elegant. They also represent a refreshing departure from the heavy hand laid on by some in the name of craftsmanship. *—Robert K. Billings, Ada, Okla.*

Re David Hupp's criticism in *FWW* #51: He writes that his wife is a technical writer/editor and knows how to make publications interesting. Does she know where it's at with woodworkers? Does she know there are many woodworkers at different levels of skill and experience who subscribe to *FWW*? His wife should know you can't please everybody all the time.

Why would anyone compare Roger Holmes with Ian Kirby? Each has his own style of writing. As an amateur woodworker, I like the articles by Roger Holmes along with the illustrations.

I, too, am a charter subscriber, and find your magazine better than ever. As a marquetarian, I appreciate seeing marquetry in color. Wood, like nature, is not black and white. If we are not for change then everyone would still have a horse and buggy. *—Peter L. Rose, Saddle Brook, N.J.*

This past year, a friend and I acquired a pair of Tennessee Walking Horses—about 16 hands and 1,250 pounds each. As a result, I am trying to gather any and all information about buggies, sleighs, surreys and anything else that could be drawn by single-hitch or a two-horse team. In particular, I'm interested in building a sleigh and a single-axle buggy to use with either one or both of the horses.

—Don E. Lohr, Wellsburg, W. Va.

This note to express my thanks for the mention of *Scale Woodcraft* magazine in your handsome March/April issue. This note also expresses my disappointment that someone got the title wrong. We are listed as *Scale Woodworking* on page 112.

—Richard C. West, Scale Woodcraft, *Georgetown, Conn.*

After reading several articles in *FWW* regarding wood-dust hazards, I decided that I had better take some precautions too. I came across a plastic mask that fits over the chin, mouth and nose the same way that paper filters do (*FWW* #43, p. 66). A small squirrel-cage fan blows fresh air in from the outside through a 2½-in. pipe to the lathe bench. Then the air goes through a 6 ft. length of ¾-in. flexible plastic pipe that connects to the mask in front of the chin. After passing the nose, the air exits out holes at the sides of the mask. I have used this setup for some time, and it cuts down tremendously on the amount of dust inhaled. In my opinion, the plastic mask does not impair vision any more than the paper-filter types do. For $14.98 prepaid, the plastic mask and 6-ft. of flexible hose are available (without the fan) from Daby's General Store, Brant Lake, N.Y. 12815. They also sell a quiet-running squirrel-cage fan rated at approximately 60 cu.ft./min., but a fan from a hair dryer might do just as well if the asbestos and the heating unit are removed. *—Allen F. Girvin, Brant Lake, N.Y.*

Richard Layman's otherwise informative note on lumber pricing (*FWW* #50, p. 112) contains one error commonly made in any production setting. The 25% lumber loss due to drying defects (think of this as X% loss of any product due to any reason) does not increase total cost, but does increase unit cost because of the smaller remaining volume. If the total cost of processing and drying 1000 bd. ft. is $950 but only 750 bd.ft. remain usable, then the unit cost is $950 divided by 0.75, which equals $1,267 per thousand. Layman adds 25% of $950 ($237.50 plus $950) for an incorrect total of $1,187.50 per thousand. *—David Callow, Arcata, Calif.*

I appreciated your most recent back-cover whimsy, a fine example of woodworking indeed, complete, one assumes, with a resident woodpecker. Downy? Hairy? Red-headed? Probably Pileated, which would explain the inscrutable expression on the fellow's face as he stands there like someone waiting for a *Turdus migratorius* to move in upstairs. It's kind of hard to know what the chap had in mind: perhaps an ambition to be the first telephone Pole. I've heard it said of a lot of people that his bark was worse than his bite and this is surely the case with this guy. Actually, I figure that the man is merely a Harvard Business School graduate who should have gone to the Yale School of Forestry. He may have become a member of middle management and lumbered around the same job too long (probably as a Branch Manager). Well, you can't blame him for hoping to wind up in the chips, but I'd guess he's just headed to be another slab of particleboard, unless he can get himself out of the woods before he gets the axe.

—Henry T. Kramer, Somerville, N.J.

Re 110-volt vs. 220-volt motors (*FWW* #51, p. 18): I am disappointed in Professor Rekoff's reply. He did not err, but told only half the story. I am an electrical engineer by profession and an avid woodworker. I can attest by both fact and experience that a motor running at 220 volts will work much better than one at 110 volts, especially when motors are over 1 HP and connected to lines that run longer than 25 ft. This is because of resistance in the wire, and Ohm's law: When the voltage is doubled, the current is cut in half. The resistance loss in the power line is cut to one-fourth (I^2R). This is why most large motors are run at 440 volts or higher and transmission lines many thousands of volts.

We woodworkers are often working on remote sites with long power lines, or have minimum-size wire in our shops, so anything that delivers more power to the blade, increases motor life (low voltage causes motors to heat up, and many burn out) and saves money (it costs less to wire for 220 volts because smaller wire can be used) should be encouraged. Optimum motor performance will be obtained by using the largest wire, the shortest runs, and the highest voltage available.

—Gene Thompson, Madison, Ala.

I would appreciate some official clarification regarding the sale and availability of back issues of *Fine Woodworking*. The Nov./Dec. issue has a notice of a back-issue sale with price reductions for volume purchases. The main point of contention regards the sold-out indicators over various issues.

FWW has always had, as a general policy, a full supply of back issues going back to the very first issue. A phone call placed to Taunton Press resulted in information contrary to

that long-standing policy. I was informed that back issues are suddenly being sold with no provision for additional availabilty in the future. If you wanted to eliminate back issues, why didn't you notify your subscribers of the policy change? And why didn't you set a time limit so no one would be left out in the cold? I hope someone will give some sound thought to this matter. I'm sure I'm not the only one who's desire for a full library of *Fine Woodworking* has been unceremoniously terminated. —*James Egan, Scotch Plains, N.J.*

PUBLISHER'S NOTE: The ever-lessening demand for back issues plummeted sharply in 1984, meaning that any further reprinting of back issues (and we were running out of a number of them) would have been at such small volume that printing costs would have been exhorbitant.

We could see no practical way of notifying readers of this turn of events but we believe the new *Fine Woodworking on...* topic books, plus the periodic *Techniques* books will keep the significant material in the back issues in print. And we will continue to overprint each new issue so that back issues are generally available for a year or two, sometimes longer. We can just no longer afford to go back on press.

I missed phone calls in my shop because I couldn't hear the phone. A good solution was the "Fone Flasher" sold by Radio Shack (catalog item 43-177) for $18. It's a solenoid switch that connects to your phone and, using house current, can turn on up to three 100-watt bulbs when the phone rings. By placing the bulbs strategically in my shop I can always see at least one of them flash as the phone rings.

—*Bob Maxwell, Washington, D.C.*

With reference to Jim Rome's comments (*FWW* #50), you can use a plunge router on a router table with extreme accuracy. My Makita model 3600B plunge router is equipped with a depth adjustment knob to control the amount of travel. When the router is inverted, this knob can be used to move the router body and cutter upward into the work. One full turn raises the cutter 1.5mm. —*William Speed, Brooklyn, N.S.*

Your article on kerf-bent chair seats left me a bit bemused. All that work and still there are gluelines in the top of the seat (or conversely, there are gluelines in the top of the seat and he didn't use them in order to make the curve). Ah, well. . . each to his own. What struck me, however, was the continuing tendency of many contemporary chairmakers to leave out structural members such as stretchers, in what can only be a bit of over-enthusiastic modernist intoxication. It reminds me of a story about a big-city interior decorator who was brought aboard one of those floating Xanadus that frequent our waters in the summer. He was to spruce up the furnishings. As he descended into the main salon, his eyes fell upon the beautifully crafted, but all too prominent centerboard case, right in the middle of the cabin: "Oh my *dear*...that has *got* to go!"

—*Michael Podmaniczky, Thomaston, Me.*

I was disappointed to read in *FWW* #51 that David Sloan has never owned a Buck Bros. chisel. He has missed something. Twenty-five and more years ago wood turners, patternmakers, wood carvers and general woodworkers all owned at least one Buck chisel or gouge. Thirty-five years ago I made my first carving with a Buck ¾-in. socket butt chisel. Over the years I have acquired new and old Buck chisels and gouges. My favorites are a 1-in. paring chisel and a 1¾-in. woodturning roughing gouge. In the days when Buck hand tools were deservedly famous, a good cutting edge was taken for granted. The quality of the tool was in its "feel". The characteristics of balance, weight, length, finish and handle size set one tool apart from another. In these days when woodworking is in a renaissance I am sorry that the original Buck brothers are not around to enjoy the fruits of their contribution. —*William R. Fox, Branford, Conn.*

In regard to Hap Davis' question about a curved handrail (Q&A, *FWW* #50), I have some suggestions for those who may be bending a handrailing for the first or maybe the only time. I visited Roseland Stair Company of Orland Park, Ill., who were quite helpful. Here is what they do, as I did: First, build a bending silo as Boudreaux suggests, but use 2x6s rather than 2x4s to handle the tension. Build your staircase before the railing, or if not, bend the stringer on the same silo as intended for the handrail to ensure a close if not a perfect match in bend. Make the laminates from a 1¾-in. to 2½-in. wide solid board (edge-join, rip, then thickness-plane) and keep them in order to match the grain lines.

My railing has a 30-in. radius, and ¼-in. thick laminations worked fine. Glue (with yellow glue) and clamp as Boudreaux states, but do not preshape; use handscrews to keep laminates flat on top and bottom edges. I used about 40 clamps in all and left them overnight. I used a sharp paint scraper to clean off glue and kept it sharp to plane the rail flat on all sides. Then, rather than attempt to feed the rail through a shaper, I used a router to shape the design, as Roseland Stair does. It helps to make a practice rail out of pine, and to have two helpers instead of one. —*Keith W. Gansel, Chicago, Ill.*

Here are some additional tips about preparing bone for inlay (*FWW* #49, p. 16): After the marrow is cleaned from the bone it should be boiled in a solution of ¼ cup baking soda and ¼ cup liquid detergent in 10 gallons of water. This will help remove any marrow that remains and help to clean the bone before bleaching. Sun-bleaching of bone often causes yellowing and severe weathering. I would use a bleach mixture of magnesium carbonate and hydrogen peroxide 35%, both obtainable from chemical suppliers. A 2-oz. block of magnesium carbonate should be ground to a powder into a plastic pan with high sides. Add enough hydrogen peroxide to form a good paste. Place the bone in the pan and brush the paste on (being careful not to contact your skin), and let set for about 10 minutes. Then wash off with water. Repeat if necessary.

—*Bill Robinson, Jackson, Miss.*

I haven't gotten around to writing before this but I had to give my comments on vintage machines by Tom Howell (*FWW* #49). I think this was a very good article. I have two old Dunlap tablesaws, a Boice Crane wood lathe with 17-in. swing, a Boice Crane wood shaper with solid cast-iron stand and top, and a 600-lb. Walker Turner drill press. There is no way I could buy this quality today. I enjoy these old machines. They are always accurate and they don't dance over the floor when you run them. I bought a new Sears radial-arm saw and a belt sander three years ago. I wouldn't go back to Sears for anything. I forgot to mention my old Delta bandsaw which is great too. Also, I like the new color format.

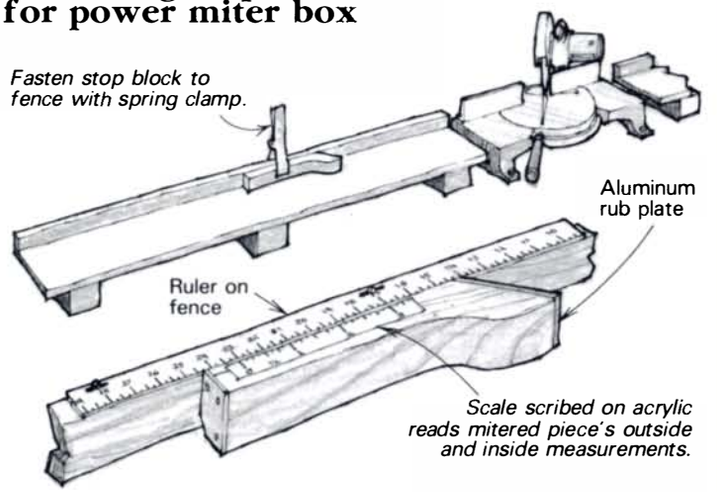
—*Willard F. Funk, Rochester, Mich.*

I was going to write a serious response to D. Mayerson's lathe technique, as explained on p. 14 of *FWW* #50, concerning the inherent dangers of trying to push the underpinnings of your home apart with a vibrating cast-iron lathe and horizontal hydraulic jack, while standing in front of an extra long workpiece spinning between two remotely related non-rigid points, but no, why bother? Nobody would do something like that. I will share an inscrutable adage passed on to me by an old friend who repairs RVs: "No insurance can replace a charmed life."

—*Don Fritz, Anchorage, Alaska*

edited and drawn by Jim Richey

Measuring stop block for power miter box



If you cut lots of 45° miters on a power miter box, this device will save you hours of measuring. The scale on the stop block lets you set up quickly for either inside or outside measurements on a mitered frame.

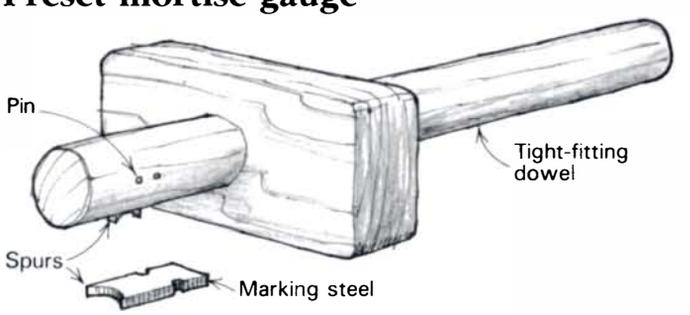
To make the stop block, carefully miter a hardwood 1x2 and bandsaw to the shape shown. For a touch of class, install a ⅛-in. thick aluminum rub plate to the face of the block. Screw a 6-in. length of acrylic to the top of the block and carefully scribe a measurement scale into the plastic. The measurement scale should be laid out in inches, but the numbering halved so that 1-in. is marked ½ and 2-in. is marked 1, etc. This scale will be used to set inside measurements as explained below.

If your saw doesn't have an inch scale along the fence, mount a metal yardstick to the top of the fence. Use slotted holes so you can fine-tune the position of the scale to reflect exact measurements.

To use the stop block for outside measurement miter cuts simply align the zero mark on the stop block with the appropriate outside measure on the fence scale. To use the block for inside measurements first measure the width of your molding. Find the mark on the stop block that corresponds to the width and align that mark with the inside measure on the fence scale. For example, if your molding is 2-in. wide and the desired inside measure is 19-in. then find 2 on the stop block and align it with 19 on the fence side.

For added convenience, construct the stop block with a square end so it can be flipped and used for cutting pieces with square ends. Scribe a mark on another side of the stop block to align the square end with the fence scale. In use, fasten the stop block to the fence with a spring clamp or a small C-clamp. *—Dean French, Kapaa, Kauai, Hawaii*

Preset mortise gauge

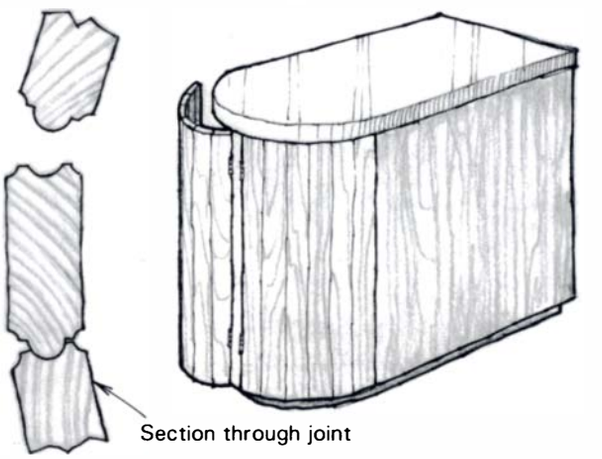


I specialize in making chairs, and realized after a few years that my mortise-and-tenon joints were all just about the same thickness, ⅜ in. To save the time spent setting up my adjustable mortise gauge, I made one with a fixed ⅜-in. setting. The most important component is a piece of 1/16-in. thick steel ground exactly ⅜ in. wide and shaped as shown, which provides two marking spurs. The steel should always be sharpened on the inside hollow so the outside dimension is not altered.

Fasten the marking steel into a slot in the dowel with rivets or a small wedge. The dowel should be a hard, stiff piece of wood such as oak. I made the body of the gauge from hornbeam, a dense but non-brittle wood. I omitted the usual wedge for locking the gauge at its setting because the dowel fit so tightly into the body. To adjust the gauge, I tap the dowel with a small hammer. *—Stefan During, Texel, Holland*

Quick tip: To protect glues and finishing supplies from freezing when I don't have the heat on in my barn shop, I keep them in a foam picnic cooler, in which I mounted a 15-watt light bulb. The cooler stays about 40° warmer than the shop. *—Richard Porter, Groton, Mass.*

Swivel joint for coopered doors



I recently built solid-wood cupboards for our kitchen, and planned to have one counter stand out from the wall like a peninsula. In order to avoid sharp (and potentially painful) corners, I rashly decided that it should have a semicircular end with curved doors. The problem then became how to make two coopered doors of the correct radius. I didn't want to try tapered-brick construction, because any slight error in the taper angle multiplies—in my doors, even ½° of error would have thrown the radius off by about an inch.

I eventually hit on the idea of the swivel joint shown in the sketch. This joint, which I made with a router, allows the pieces to be shifted and glued up at the exact radius needed. Note that the male part of the joint is a full half circle, while the female part is of a matching radius but shallower.

I made a temporary gluing jig from chipboard to hold the boards at the proper radius while the glue was drying. I incorporated end stops as well, at the correct width of the door, so that as the pieces were clamped to the radius they would also be pressed tightly together at the joints. During dry-assembly, I fitted the pieces into the jig and carefully planed the outer edges of the door to a perfect tight fit, then glued and clamped the assembly with two web clamps wrapped around both jig and door. *—G.L. Degg, Alsager, Stoke-on-Trent, England*

Quick tip: The simplest way to "resilver" a beveled-edge mirror is to scrape off all the old silver and mount a new mirror behind the old glass. *John Sillick, Gasport, N.Y.*

Cleaning sawblades, two ways

Saw blades will stay clean longer and clean up faster next time if sprayed with a kitchen non-stick product such as PAM. After spraying, hold a piece of cardboard over the blade to catch the

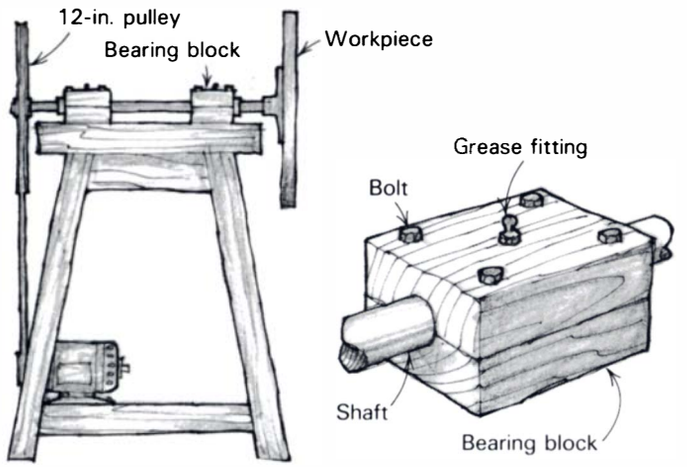
mist thrown off, while sawing a scrap or two to clear the excess oil from the blade before you use it on good stock.

—David L. Wiseley, Waters, Mich.

To clean the gummy buildup on saw blades, spray the blade with oven cleaner. I use the foaming type that contains 4% lye. Let the sprayed blade stand a while until the gummy deposit lifts, then rinse under the tap. Oven cleaner is powerful, caustic stuff, so observe the warnings on the label. Do not use on aluminum tools.

—G.V. Mumford, Ventura, Calif.

Wooden bearings for outboard lathe



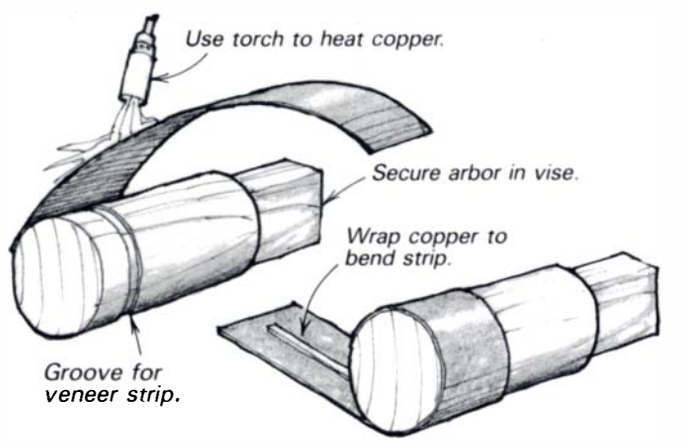
Several years ago, I needed an outboard faceplate lathe for turning large plates. While considering ways to home-build the lathe, I remembered that as a young fellow I had helped my wife's dad as an oiler on a threshing machine. The contraption had a number of low-RPM shafts, which turned in hard-maple pillow blocks.

Adapting the idea to the project at hand, I purchased a 20-in. long, 1-in. thick shaft, fitted a 12-in. pulley (reclaimed from a clothes dryer) to one end, and threaded the other to accept standard faceplates. The shaft runs in two hard-maple pillow blocks, which are lubricated through grease fittings installed in the top.

The whole arrangement is bolted to a sturdy bench, and is run by a motor and belt from below.

—Vic Johnson, Lincoln, Neb.

Heat-bending veneer strips



With this simple-to-build device you can bend strips of veneer for inlaying or edging. The chances of cracking or breaking the veneer are greatly reduced.

First turn or saw a wood arbor to a slightly smaller diameter than the bend needed. This tighter radius allows for a little spring back after the veneer has been bent. Cut a square end on the arbor so it can be clamped in a vise. Fit the arbor with a thick (0.025-in. or thicker), wide copper strap that will retain plenty of heat. You can anchor the strap with tacks or by simply forcing it into a groove. Extend the strap a foot or more so the end will stay cool enough to handle without gloves.

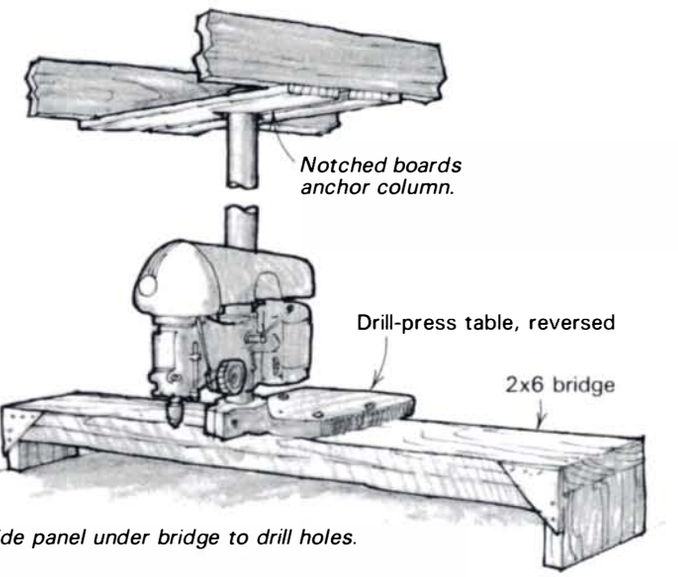
Hold the copper strip away from the arbor and apply the torch, heating the strip well beyond the part that will touch the veneer to reduce the rate at which heat dissipates from the working area. When the strap is as hot as it can be without scorching the veneer, push one end of the veneer under the strap, pull the strap tight and wrap it around the arbor. Hold the strap in place for a minute while it cools.

—Howard C. Lawrence, Cherry Hill, N.J.

Quick tip: When spraying furniture runs are a fact of life, and trying to wipe them only makes a bigger mess. After years of spraying both lacquer and varnish, I finally discovered just last week that you can let them dry and scrape them flush with a razor blade. Then recoat, or simply rub out the finish with pumice and oil.

—Jon Gullet, Washington, Ill.

Drilling accurate holes in large panels



Slide panel under bridge to drill holes.

This idea evolved after I contracted to drill a series of precise holes in a pile of large panels. To support the drill press over the panels I built a 2x6 bridge as shown, and pipe-clamped it to a sturdy workbench. I removed the base of the drill press and used the drill table (reversed and rotated 180°) as an anchor to the bridge. I secured the top of the drill column by installing two V-notched boards on my shop's ceiling joists. Fences and stops fastened to the workbench position the panels for accurately spaced holes.

—John D. Todd, No. Falmouth, Mass.

Quick tip: Our boatshop had to drill two hundred square holes in a board that proved too wide to fit under our floor-model drill press's mortising attachment—the column prevented us from reaching the center of the board. So we remounted the drill-press head upside down on the column, inverted the whole press and bolted its base to the beams in the ceiling. With the board on a bench beneath the press head, we easily drilled the holes.

Jim Beer, Manset, Maine.

Removing rust with vinegar

I have used this method for removing and preventing rust in my old-tool shop for several years. Disassemble the tool and soak it in full-strength natural vinegar. Store-bought vinegar is

RYOBI TOOLS

		List	Sale
S500A	3x5½ Finish Sander	70	41
SU6200	Finishing Sand. ½ Sheet	142	88
B7075	3x21" dustless Belt Sand.	179	116
B7100	3x24" dustless Belt Sand.	208	140
B7200A	4x24" dustless Belt Sand.	269	165
D100VR	3/8"VSR 0-1200 rpm drill	91	49
W640	7¼" 13 amp circular saw	158	99
W740	8¼" 13 amp circular saw	171	109
JS60	Jig Saw-Single Speed	172	99
JSE60	Jig Saw-electronic v/speed	198	123
R150	1 H.P. Plunge Router	138	86
R330	2 H.P. Router	220	138
R500	3 H.P. Router	265	163
E3800	Drywall screwdriver 0-4000	126	79
L120U	3 5/8" Planer	142	89
BD1020R	3/8" 2-spd Cordless Drill w/free holster Xtra special buy	148	95
TS251U	10" Mitre Box	300	185
SG1150C	4½" H.D. Mini-Grinder	99	59

MILWAUKEE TOOLS

		List	Sale
0224-1	3/8 drill 4.5A magnum	154	109
0234-1	1/2 drill 4.5A magnum	159	115
0244-1	1/2 drill 4.5A magnum	159	115
0222-1	3/8 drill 3.3A 0-100 rpm	139	99
0228-1	3/8 drill 3.3A 0-1000 rpm	129	95
0375-1	3/8 close quarter drill – NEW – 3.5 amp.	168	118
0210-1	3/8 cordless drill – NEW – 2 speed.	154	114
6539-1	cordless screwdriver – NEW – 190 RPM.	84	64
1007-1	½" drill 4.5A D-Hdle	194	145
1107-1	½" drill 4.5A D-Hdle	199	145
3300-1	magnum rt angle drive kit	239	170
3102-1	Plmbrs rt angle drill kit	253	180
1676-1	HD Hole Hawg w/case 2 sp	323	235
5395	3/8 sgle sp hammer drill kt	203	150
5397	3/8 var s p hammer drill kit	208	155
5371-1	HD mag. hammer drill ½"	287	207
5373	HD mag. ham. drill 3/8"	240	175
6507	TSC Sawzall w/case	184	125
6511	2 speed Sawzall w/case	172	123
6226	por1band saw 2 sp w/case	382	280
6234	TSC band sawport w/case	382	280
6365	7¼" circ. saw 13 amp.	159	109
6405	8¼" circ. saw 13 amp	179	127
6460	10¼ " " 15 amp w/case	349	245
6377	7¼ HD worm saw 13 amp	235	155
6378	8¼ HD worm saw 13 amp	249	165
6165	12" Chop Saw 15 amp 4200 R.P.M.	267	189
6170	14" Chop Saw 15 amp 3600 R.P.M.	289	209
6255	v/sp Jig Saw 3.8 amp	199	140
6245	sgle sp Jig Saw 3.8 amp	175	125
6287	HD v/sp Jig Saw w/case 2.3	312	225
6012	⅓ sheet HD Orb. sander.	149	110
6014	½ sheet HD Orb. sander.	159	115
5935	4" by 24" belt sander w/bag 10 amp	299	215
5900	3" by 24" belt sander 9.5 amp.	355	255
5660	1½ HP router 10 amp	256	185
5680	2 HP router 12 amp	314	220
8950	Wet/Dry 8 gal vac 6 amp	136	110

BENCH GRINDERS

4901	¼ HP 2.6 amp 24#	149	110
4921	⅓ HP 4 amp 26#	169	130
4891	½ HP 4 amp 41#	269	195
5041	¾ HP 8.2 amp 58#	369	270

DRYWALL SHOOTERS

6753-1	3.5 amp 0-4000 rpm new	115	85
6747-1	4.5 amp 2500 rpm	144	100
6750-1	4.5 amp 0-4000 rpm	144	100
6751	4.5 amp 4000 rpm	144	100

FREUD SAW BLADES

Univ. Bore — Professional Series
CARBIDE TIPPED SAWBLADES

Item No.	Description	Diam.	Teeth	List	Sale
PS203	Gen'l Purp.	7¼"	24	27.24	17.50
PS303	fine cutting	7¼"	40	32.97	20.50

5/8" Bore — Industrial Grade
CARBIDE TIPPED SAWBLADES

Item No.	Description	Diam.	Teeth	List	Sale
LU72M010	Gen'l Purp.	10"	40	68.58	35
LU81M010	Gen'l Purp.	10"	40	69.30	36
LU73M010	Cut-Off	10"	60	79.65	39
LU82M010	Cut-Off	10"	60	86.40	45
LU84M010	Combination	10"	40	70.99	36
LU84M011	Combination	10"	50	74.51	40
LU85M010	Super Cut-Off	10"	80	110.88	68
LM72M010	Ripping	10"	24	64.85	37
DS 306	6" Dado			139.00	95
DS 308	8" Dado			170.00	115
TR 100	3 blades & Dado set			399.00	255

RECORD PLANES

Model	Type	Length	Width	List	Sale
03	Smooth	9½"	1¾"	37	31
04	Smooth	9¾"	2"	38	32
04½	Smooth	10¼"	2-3/8"	38	32
05	Jack	14"	2"	48	37
05½	Jack	15"	2-3/8"	56	41
06	Jointer	18"	2-3/8"	70	54
07	Jointer	22"	2-3/8"	80	60

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Go Cordless with MILWAUKEE

#6305 – 6¼" Cordless Circular Saw
12 volt — 1 Hour Charge
Cuts (80) 2x4's (Pine)

List Price 195.00 ★ SALE PRICE 135.00

DREMEL TOOLS

		List	Sale
3801	v/sp b/bearings. 35 acces.	98	61
572	Deluxe Moto-shop compl.	134	85
332	v/sp Moto-flex tool	113	71
580	4" tilt arbor table saw	133	85
290	electric engraver	21	15
1500	Woodburn/Solder. Iron Kit	22	15

MAKITA TOOLS

		List	Sale
B04510	Sander	79	43
9900B	3"x 21" belt sander	198	124
9924B	3"x 24" belt sander	204	135
9924DB	3"x 24" b/sand. w/bag	214	140
9035	⅓ sheet finish sander	79	48
9045B	½ sheet finish sander	156	100
9045N	½ " " " w/bag	170	110
4200N	4-3/8 circ. saw 7.5 amp	152	95
5008NB	8¼ circ. saw 13 amp	178	110
5201NA	10¼ circ. saw 12 amp	348	225
5402A	16-5/16 " " 12 amp	468	375
4300BV	v/sp jig saw 3.5 amp	192	120
4301BV	orb v/sp jig saw 3.5 amp	208	130
2401BW	10" mitre saw	319	185
2400BW	10" mitre saw (for vice)	359	249
JR3000WL	2 sp recip saw w/case	168	120
JR3000V	vs recip saw w/case	178	125
6010DWK	3/8 cordless drill w/case	152	89
5081DW	3-3/8 cordless saw kit	165	109
1900BW	3¼" planer w/case	154	95
1100HD	3¼" planer w/case	278	165
1805B	6-1/8 planer w/case	416	265
3608BK	¾ hp router w/case	132	85
3601B	1-3/8 hp router	198	120
3700B	½ hp trimmer 28.000 rpm	124	85
DA3000	3/8" angle drill	158	105
DP4700	½ v/sp w/rev 4.8 amp	154	96
HP1030W	3/8 v.s.r. hammer drill w/case	145	98
6300LR	½" angle drill w/rev	229	152
84198B 2W	½" 2 sp. hammer drill w/case	238	150

DRYWALL SHOOTERS

6800DB	2500 rpm 3.5 amp	123	79
6800DBV	0-2500 rpm 3.5 amp	133	89
6801DB	4000 rpm 3.5 amp	123	79
6801DBV	0-4000 rpm 3.5	133	89
2030	12" planer/jointer	1980	1350
2040	5/8" planer	1780	1195

NEW *from* MAKITA

9207SPC	7" Electronic Sand/Polish	209	130
2708	8" Table Saw	336	229
122251-6	Table Saw Stand	48	40
8400DW	3/8 c/less hammer drill	188	120
DK1001	drill (6010D) charger/vac	178	125
6010SDW	3/8 cordless drill, rev.	82	49
DA3000DW	3/8 angle drill, cordless 700 7.2 volt	172	105

DELTA *(formerly* Rockwell)

		List	Sale
33-890	12" Radial Saw featuring "Turret-Arm" Action	1280	975
33-990	Deluxe 10" Radial saw	589	475
33-150	Sawbuck frame/trim saw	686	519
34-621	9" contr. saw w/o motor	500	395
34-410	10" contr. saw w/o motor	871	650
34-710	super 10" motorized saw	579	450
34-010	motorized mitre box 9"	231	169
15-091	15" floor model D/press	467	375
15-090	15" bench model	467	375
28-283	14" wood cutting Band Saw	897	695
28-243	14" " " " w/o motor	594	450
37-207	Saw/Jointer Combination	1018	810
37-609	6" Motorized Jointer	413	335
37-290	4" deluxe Joiner w/o motor	346	275
22-651	RC-33 — 13" Planer	1943	1450
43-122	Wood Shaper w/stand and 1 HP Motor	669	495
46-140	11" lathe, gap bed model w/stand w/o motor	407	335
52-493	1 hp motor for #34-621	170	130
62-042	1½ hp motor for #34-410	230	170
62-144	½ hp motor for #37-290	136	105
62-142	½ hp motor for #28-243 and #46-140	121	85

SKIL TOOLS

		List	Sale
551	5½" Circ. Saw 65A	99	75
77	7¼" Worm Saw	240	139
367	6½" Worm Saw	239	149
825	8¼" Worm Saw	270	185
807	7¼" Skilsaw 13A-Super	153	100
808	8¼" Skilsaw 13A-Super	172	110
2016-02	3/8" Cordless Drill complete W/Charger Case & 2 batteries	199	99
3104	10" Band saw 4.2 amp vs	195	159
3102	8¼ Table saw 2hp 10amp	190	155

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"DOWL-IT" Dowel Jigs

		List	Sale
1000	Self-centering	33.95	24.95
2000	Self-centering	42.95	32.95

MARPLES WOOD CHISELS

Walleted Set of 5 (1/4" - 3/8" - 1/2" -3/4" -1")

Model	*(all with bevel edge)*	List	Sale
MR222/S5	Ash handle	22.70	15.95
M 444/S5	Polypropylene handle	33.50	21.95
M 373/S5	Splitproof handle	40.85	26.95
M 377/S5	Boxwood handle	51.40	33.95

★ *X-TRA SPECIALS* ★

MAKITA TOOLS

		List	Sale
6010DL	C/less Drill w/flashlight charger & case	162	90
DP3720	3/8 drill Rev. 0-1800 rpm	88	50
6510LVR	3/8 drill Rev. 0-1050 rpm	114	67
6013BR	1/2" Drill Rev. 6 amp.	174	100
9501B	4" Sander-Grinder Kit	119	59
5007NB	7¼" Saw Circ. 13 amp	158	99
3612BR	3 HP Plunge Router	286	180
9401	4x24 belt Sander w/bag	279	165

PORTER-CABLE

		List	Sale
630	1 HP Router	135	95
691	1½ HP Router D/handle	210	145
696	H.D. Shaper Table	150	105
695	H.D. 1½ hp Router/Shaper	278	190
514	2½ HP Router 12 amp	435	315
399	Drywall Cut-Out Unit	100	70
736	V/Speed *Speedtronic* Band Saw	450	330
7564	½ " X.H.D. Drill 8 amp	205	145

BOSCH TOOLS

		List	Sale
1581VS	Top Handle Jig Saw	225	130
1582VS	Barrel Grip Jig Saw	209	120
1604	1¾ H.P. Router.	199	110
90900	Heat Gun 650° — 900°	99	65
1272	3x24" Belt Sander	259	179
1272D	3x24" Belt Sander w/bag	274	189
1273	4x24" Belt Sander	274	189
1273D	4x24" belt sander w/bag	289	199

ROCKWELL *(now DELTA)*

		List	Sale
34-010	Motorized Mitre Box	231	149

★ NEW LOW PRICES ★

PONY CLAMP FIXTURES

Model		List	Sale	Lots of 12
#50	for ¾" Black Pipe	11.23	7.40	80.00
#52	for ½" Black Pipe	9.36	6.10	67.50

JORGENSEN HAND SCREWS

Model	Jaw Length	Open Cap.	List	Sale	Box of 6
#5/0	4"	2"	11.59	7.25	39.15
#4/0	5"	2½"	12.45	8.10	43.75
#3/0	6"	3"	13.35	8.50	45.95
#2/0	7"	3½"	14.35	8.95	48.35
#0	8"	4½"	15.97	9.95	53.75
#1	10"	6"	18.25	11.35	61.25
#2	12"	8½"	20.94	13.50	72.95
#3	14"	10"	26.56	16.75	91.35
#4	16"	12"	34.55	23.75	128.25

JORGENSEN BAR CLAMPS

STYLE 37 — 2½" Throat 1/4" x 3/4"

Model	Jaw Length	List	Sale	Lots of 6
#3706	6"	7.88	5.50	29.70
#3712	12"	8.73	5.95	32.13
#3718	18"	9.64	6.95	37.53
#3724	24"	10.54	7.35	39.69
#3730	30"	11.76	8.25	44.55
#3736	36"	12.85	8.95	48.33

STYLE 39 — 3½" Throat 5/16" x 1"

#3906	6"	18.89	12.95	69.95
#3908	8"	19.45	13.50	72.95
#3912	12"	20.69	14.50	78.00
#3918	18"	22.55	15.85	85.50
#3924	24"	24.45	17.25	93.00
#3930	30"	26.16	18.35	99.00

STYLE 45 — 5" Throat 5/16" x 1 3/8"

#4506	6"	22.49	15.95	86.15
#4508	8"	23.04	16.50	89.10
#4512	12"	23.85	17.50	94.50
#4518	18"	25.16	18.95	102.35
#4524	24"	26.61	20.95	113.15
#4530	30"	28.06	21.95	118.50
#4536	36"	29.54	22.95	123.95

STYLE 72 — I-BAR CLAMPS

		List	Sale
#7224	24"	23.45	16.50
#7230	30"	24.38	17.50
#7236	36"	25.16	18.50
#7248	48"	27.62	21.50
#7260	60"	30.77	24.50
#7272	72"	33.26	26.50

FREE FREIGHT ON EVERY ITEM!

HAMMER DRILL SPECIALS

PORTER-CABLE

		List	Sale
97650	½" dual range var/speed hammer/drill kit w/case	201	130
9614	½" D-handle hammer/drill kit w/case 8 amp 1500 rpm	254	165
97638	3/8" var/speed rev. hammer/drill kit w/case.	171	120

Fastener Favorites at Fast Moving Prices

622	Fastner/drill var. speed 4 amp-2 *Tools in One* hvy dty 3/8" drill or twist collar to convert to a positive clutch Screw-driver 0-1000 RPM-Rev.	165	110
7541	Xtra hvy. duty tek driver 5.2 amp — 2000 rpm	159	105
7542VR	Xtra hvy/dty rev. tek driver variable speed — 5.2 amp — 0-2000 rpm	165	110

PORTER-CABLE

		List	Sale
314	4½" Trim Saw 4.5 amp	180	115
587	7¼" circ. saw 14.5 amp	199	130
315-1	7¼" circ. saw 13 amp	159	104
368-1	8¼" circ. saw 13 amp	169	119
9548	HD v/s bayonet saw w/case	255	179
648	H.D. single speed bayonet saw 3 amp	255	169
9627	2 sp. tiger saw kit 8 amp	183	120
336	3" x 21" belt sander	164	115
337	3" x 21" belt sander w/bag	174	115
361	3" x 24" belt sander	249	175
360	3" x 24" belt sander w/bag	269	180
363	4" x 24" belt sander	269	180
362	4" x 24" belt sander w/bag	284	190
505	H.D. ½ sheet finish/sander	155	105
330	spd bloc sander ¼ sheet sz	85	56
304	Professional 7" disc sander	150	105
305	Professional 7" polisher	150	105
7511	3/8"xtra hvy v/s drill 5.2 amp	149	100
7554	½" xtra heavy drill 8 amp	195	135
309	3.8 amp laminate trimmer	115	80
310	3.8 amp laminate trimmer	180	130
312	offset base laminate trim.	195	135
319	tilt base laminate trimmer	205	140
167	block plane 2.5 amp	129	86
9652	Versa-Plane Kit	419	285
9118	Porta Plane Kit	289	195
518	NEW 3 hp speedtronic 5 spd microprocessor prod/router 10-13-16-19-22,000 rpm	475	325
520	NEW 3 hp production router	435	275
100	7/8 H.P. router	124	88
690	1½ H.P. router	179	130
536	1½ H.P. speedmatic router	295	210
537	1½ H.P. D-Hdle router	310	218

DRYWALL SHOOTERS

7544	5.2 amp — 2500 r.p.m.	145	100
7545	5.2 amp — 0-2500 r.p.m.	149	100
7546	5.2 amp — 4000 r.p.m.	149	100

BLACK & DECKER

		List	Sale
3050	6½ worm/drv saw 12 amp	247	160
3051	7¼ worm/drv saw 13 amp	232	149
3052	8¼ worm/drv saw 13 amp	247	160
3030	7¼ circ saw 13 amp NEW	155	100
3047-09	7¼" super Sawcat circular saw	226	150
3048-09	8¼" super Sawcat circular saw	240	160
3157-10	v/sp orb. jig saw 4.5 amp	174	115
3153-10	v/speed jig saw 4.5 amp	158	105
3934	14" chop saw 13 amp 3800 rpm	279	169
4300	drill bit sharpener 1/8-1/2"	275	215
1321	½ rev spade hdle drill 6 a.	175	115
4010	sander palm grip w/bag	80	49
4015	finish sander ½ sheet 10,000 orbits	160	110
2037	drywall 0-4000 rpm 4.5 amp	139	89
2034	drywall 0-4000 rpm 3.5 amp	121	69
1940	3/8 cordless drill kit 800 rpm	157	100
1920	3/8" cordless drill kit 1850 r.p.m.	157	100

RECORD VICES

QUICK RELEASE · FRONT DOG TYPE

Model	Jaw Width	Jaw Open.	List	Sale
52D	7"	8"	69	49
52½D	9"	13"	93	65

..NEW! FREUD TOOLS NEW!..

Model	Tool Sets	List	Sale
CM 100	Carvers Mallet	9.90	7.95
CS 106	6 Pc. Carving Set	74.90	59.95
CS 112	12 Pc. Carving Set	139.90	111.95
TT 108	8 Pc. Turning Set	67.90	54.35
WC 104	4 Pc. Chisel Set.	29.90	23.95
WC 106	6 Pc. Chisel Set	39.90	31.95
WC 110	10 Pc. Chisel Set	66.90	53.60

• *All Cased In Beautiful Wooden Chest* •

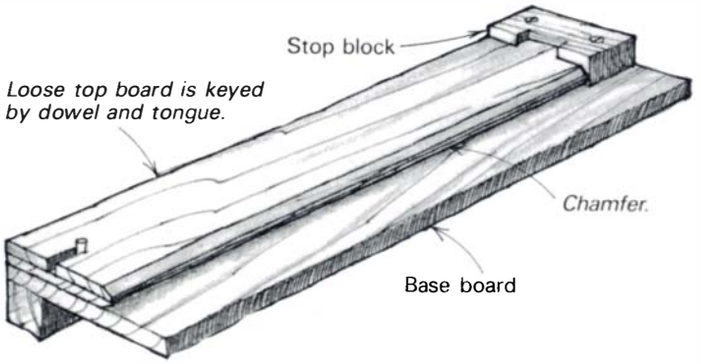
★ X-TRA SPECIAL ★

		List	Sale
7715	9" Dewalt Power Mitre Box	198.	125.

standardized at 4% and is not strong enough. Find apple cider with no preservatives, add some "mother" from old vinegar (the cobweb-like stuff) and, in time, the cider will turn to vinegar. After soaking the tool overnight, rinse it under the tap to remove most of the rust. Lightly dress with a wire brush. When dry, spray the tool with transparent aerosol shoe polish to seal the metal and prevent further rusting.

—Charles W. Whitney, Mt. Liberty, Ohio

Improved veneer-shooting board



Ian Kirby's design for a veneer-shooting board (*FWW* #47) reminded me of the modifications I have made to mine. Initially I wanted to make the device easier for school children to use, but I soon preferred the new model, too.

One of the difficulties with the original was lining up the loose top board with the baseboard without moving the veneer. My modifications hold the ends of the top board so that it remains aligned with the base. This makes it easy to slip veneers between the two boards into the correct position for planing. You could construct the shooting board with dowels at both ends instead of the keyed stop, but I use mine for shooting small panels, too—I simply remove the top board and square the panel against the stop for planing the edges.

—Ernie Ives, Ipswich, England

Quick tip: To ensure perfectly sized tenons on turned pieces I turn the tenon slightly oversize and then force an open-end wrench on the tenon to compress it to size. The tenon will fit perfectly then expand later in the hole for a tight joint. *—David Brigham, Mouth of Keswick, N.B.*

Homemade lock screws

Nylon-insert lock screws are quite effective when you need a bolt that won't loosen in vibrating machinery. But the commercial versions are not available in every size and are expensive. To make your own, simply drill a hole through the bolt near the end and insert a short length of heavy-gauge nylon cord of the type used in grass trimmers. Trim the cord flush with the threads and screw the bolt into the hole. The nylon will crush into a form fit of the threads and will hold beautifully. *—Gordie Mulholland, Streator, Ill.*

Methods of Work buys readers' tips, jigs and tricks. Send details, sketches (we'll redraw them) and photos to Methods, Fine Woodworking, *Box 355, Newtown, Conn. 06470. We can acknowledge contributions only when the final decision has been made. We'll return those that include an SASE.*

Felt writing surface

I need to replace the felt writing surface on an antique desk. What materials should I use and how should I prepare the surface? ***—Robert J. Atwell, Columbus, Ohio***

Franklin H. Gottshall replies: Felt, sold in fabric or department stores, is made in a variety of weights and thicknesses. The felt I'd recommend for re-covering the writing surface on your desk is the heaviest generally available—about 70% wool and 30% rayon. In the old days, felt was applied with hot animal glue, but unless its consistency is just right, hot glue can bleed through and discolor the felt. Instead, I recommend one of the tacky fabric glues sold by most fabric stores. I've had good results with Aleene's Original Tacky All-Purpose Glue (made by Artis, Inc., Box 407, Solvang, Calif. 93463).

Remove all the old felt and scrape off the old glue with a properly sharpened and burnished hand scraper (see *FWW* #6, pp. 29-31). Sandpaper the surface thoroughly, then apply masking tape to any adjacent wood to protect it from the glue. If the new felt is wrinkled, smooth it out with a steam iron before cutting it to size.

Brush the glue over the wooden surface, but don't apply any to the felt. Lay down the felt and apply pressure with a veneer roller. Where feasible, clamp a flat board over the felt to press it firmly against the glued surface until the glue has dried.

[Franklin H. Gottshall lives in Boyertown, Pa. He is a retired industrial-arts teacher and the author of twelve books on period furniture.]

Coloring shellac

I've tried coloring shellac with different dyes and pigments but I always end up with streaks. Do you have any suggestions? ***—John Viarengo, Downington, Pa.***

Beau Belajonas replies: You're probably adding too much dye or pigment to the shellac, but the streaks could also be caused by your application technique.

Mix about ½ oz. of alcohol-soluble aniline dye in a quart of denatured alcohol to make a base solution. Then make a dilute dye by adding 1 part base solution to 3 parts denatured alcohol. Mix this diluted dye with an equal amount of 3 lb.-cut shellac (I prefer Zinsser brand shellac). I like to add a pinch of raw umber or burnt umber pigment, such as Benjamin Moore Universal Tinting Colors, to tone down the dye. Mix the shellac well.

Apply the colored shellac with a 2½-in. or 3-in. natural-bristle brush. Fill one third of the brush with colored shellac and tap off the excess against the side of the container. Lay on a thin coat by simply pulling the brush across the surface from one end to the other (left to right). Don't brush back and forth. You can go back over the stroke to even it off but remember to always brush in the same direction. Continue across the piece going from left to right, evening off as you go. Remember that shellac sets up quickly and you must not hesitate. Allow each coat to dry thoroughly before applying the next. Two to three coats of colored shellac will give you a nice translucent finish. If you've stained the piece prior to applying the shellac, be sure that the stain has had ample time to dry.

[Beau Belajonas is a professional wood finisher who lives in Camden, Me.]

Filler from sanding dust

What's the best way to make a low-cost wood putty from fine sanding dust? I'd like something with a long shelf life. ***—Kenneth Copp, Philadelphia, N.Y.***

Tage Frid replies: How you mix filler depends on the finish you plan to use. For a shellac or oil finish, mix the sanding dust with enough 2 lb.-cut shellac to give you the consistency of putty. If your piece will have a lacquer finish, mix the sanding dust with thinned lacquer. Both the shellac and lacquer putties can be stored in a sealed container, but I prefer to keep pre-mixed liquid on hand and make the putty as I need it with dust from the piece I'm working on.

The shellac and lacquer filler won't take stain so if you plan to stain your project, mix the sanding dust instead with either thin hot hide glue or yellow glue diluted 50% with water. Mix this as you need it because it won't keep for long.

Your homemade filler will be a little dark in the beginning but will eventually lighten. Apply enough filler so you can sand it flush after it dries.

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

Finish for cypress paneling

I've just finished a den in tongue-and-groove pecky cypress and need some suggestions on how to seal and finish the wood. I would like to end up with a warm and natural looking finish. ***—Kenneth E. Behnke, Edgewater, Md.***

George Frank replies: Once I had a living room paneled in pecky cypress. I considered the finish warm and natural looking. Here is how I finished mine. First I mixed half and half white and ivory water-based acrylic paint. Then I stirred approximately one part of it into 8 to 10 parts of water and painted all the paneling with it. When dry, I sandpapered off all the paint that I could, leaving some in the "pecks" of the wood, in the frame-corners and in the moldings. After a thorough dusting, I sprayed on a wash coat of orange shellac, followed by two or three coats of clear lacquer (not the water-white, but the amber-clear), sanding between coats. I steelwooled, waxed my finish and was pleased.

[George Frank, a retired master European wood finisher, lives in South Venice, Fla.]

Correcting planer snipes

I recently bought a Makita 2040 planer, and I've been having problems. No matter what I do, I get a 5 in. snipe on the front end of the board and a slightly shorter snipe on the rear end. What gives? ***—Lazlo Spectrum, Tucson, Ariz.***

Graham L. Campbell replies: Makita says that sniping on the front end of a board is generally caused by the stock being lifted slightly above the planer-bed surface by the infeed bed roller. The sniping continues until the stock reaches the outfeed feed roller, which forces the wood back down on the bed. For the bed rollers to do their job of reducing friction between the board and the bed, they must be adjusted to protrude slightly above the bed level. However, the greater this protrusion, the greater the potential for sniping. The Model 2040 instruction manual specifies a bed roller height of 0.1mm to 0.3mm above the bed. This setting allows slightly warped or very rough stock to be planed without dragging excessively on the bed, but does contribute to some noticeable sniping. If you can't tolerate this "normal" sniping, I'd suggest lowering the bed rollers slightly. Using the leveler block provided with the planer, adjust the height of the infeed and outfeed bed rollers using a piece of notebook paper for a feeler gauge rather than the postcard suggested in the instruction manual. This will indicate a height of approximately 0.05mm to 0.1mm. To further check the adjustment, first joint and then plane a scrap 2x4 while observing the bed rollers. If the rollers turn intermittently or not at all, they are too low.

With this lower roller height, it's important that the bed and rollers be free from pitch buildup, clean and waxed with paste wax. Otherwise, bed friction could cause a workpiece to jam, resulting in damage to feed rollers, motor and chain drive.

Tail end sniping occurs as the stock is exiting the planer and has passed beyond the infeed feed rollers. The loss of down-

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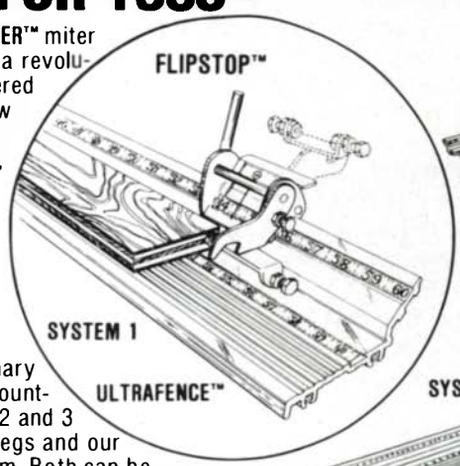

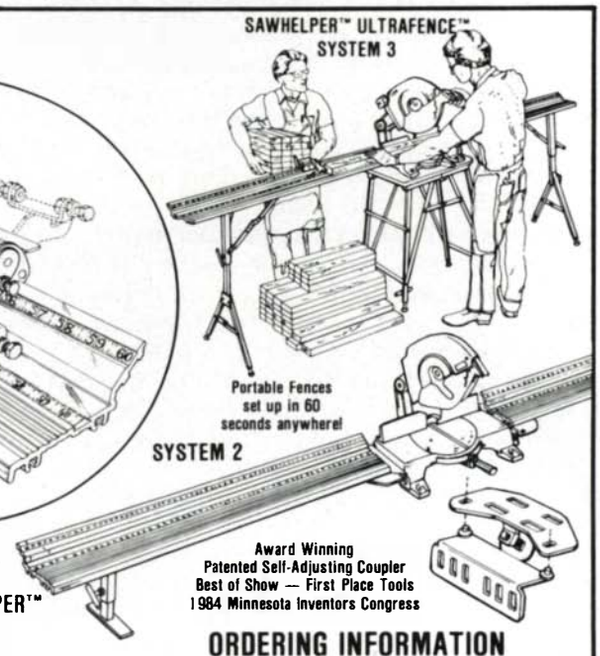

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ward pressure provided by the infeed roller and the weight of the stock on the outfeed side causes the tail end of the stock to be levered up slightly into the cutterhead. Careful adjustment of bed rollers is important here also, but more important, the outboard (auxiliary) rollers should be adjusted up to the same relative height as the bed rollers. With very heavy or long stock, outboard roller stands may be necessary.

Another tip to eliminate sniping is to feed boards into the planer butted end to end. This method is best for a final pass when boards have already been planed to the same thickness.

Makita no longer recommends that users attempt to adjust the feed roller height or pressure as we feel that these adjustments have little to do with sniping. If feed roller adjustments seem necessary, consult an authorized Makita service center.

[Graham L. Campbell is Technical Department Supervisor at Makita, U.S.A., Inc.]

Boulle work

Old piano fall boards were often decorated with the company name and an elaborate design inlayed in brass. How was this work done and how can it be repaired?

—Bill Zopf, Huntington Beach, Calif.

Silas Kopf replies: The technique used for these elaborate brass inlays is called boulle work, after a 17th-century French cabinetmaker. Sheet brass and veneer of the same thickness are laid on top of one another and the design is sawn out with a fine-bladed fret saw or jewelers' saw. Then the brass "positive" is inserted into the hole in the veneer. The veneer sheet, with the brass taped in place, is then glued with hot hide glue to a thicker groundwork, as in regular veneering.

Repairing boulle work usually involves replacing loose or missing pieces of brass or veneer. If the brass is loose, remove it, clean the hole and epoxy the brass back in place. If brass or veneer is missing, use tracing paper to get an exact shape of the missing part. If you're replacing brass, remember that the epoxy has an appreciable thickness. Since you can't easily sand the brass flush with the veneer without damaging the original finish, get brass a little thinner than the veneer.

[Silas Kopf is a professional woodworker in Northampton, Mass., specializing in marquetry.]

Books on furniture restoration

What books would you recommend for a beginner who wants to learn about restoring and conserving antique furniture? *—William N. Bell, Hayward, Calif.*

Greg Landrey replies: There are several helpful books for developing a "how to" knowledge of furniture conservation/restoration. The following three books would be a good start:

The Restorer's Handbook of Furniture by Daniel Alcouffe (1977, Van Nostrand, New York).

Antique Furniture Repairs by Charles H. Hayward (1976, Evans Brothers Ltd., London).

Furniture Care and Conservation by Robert F. McGiffin, Jr. (1983, The American Association for State and Local History, Nashville, Tenn.).

[Greg Landrey is associate furniture conservator at the Winterthur Museum in Winterthur, Del.]

Mahogany

I've heard of Brazilian mahogany and Bolivian mahogany, and there must be other types too. Which mahogany matches that used in 18th-century furniture?

—Thomas Heller, Philadelphia, Pa.

Paul McClure replies: The mahogany used from the 16th through the 19th centuries was either *Swietenia mahagoni* from the Caribbean Islands or *Swietenia macrophylla* from Honduras. In the 16th century, Spanish explorers returning from the New World brought *Swietenia mahagoni* to Europe but it didn't become a staple cabinet wood until the latter part of the 17th century, when supplies were more consistent.

Most of the mahogany, or cedar as it was called then, came from the coastal regions of Jamaica and Cuba. The timber logged from the coast was inferior to the timber farther inland but it was easier to get. As these coastal stands were depleted in the late 18th century, it became more economical to exploit the coastal stands of *Swietenia macrophylla* in Honduras. This wood was lighter in weight and darker in color, with more figure and fewer dark blotches than *Swietenia mahagoni*.

Today, West Indian mahogany is virtually nonexistent and the timber from Cuba is banned in the U.S. Logging in Honduras is sporadically interrupted by local problems.

Most of the "mahogany" in the U.S. and Europe today comes from Brazil, Bolivia, Columbia and Venezuela. The various timbers being marketed as mahogany are really Jequitiba (*Cariniana pyriformis*). Though they are a good substitute for true mahogany, they lack the same consistent color and the grain is more well defined. These woods can be used in period furniture restoration only if great care is taken in selecting lumber and finishing is painstakingly done to match.

[Paul McClure is a wood technologist and lumber dealer in Tempe, Ariz.]

Lacquer on teak

I've made a bed out of solid teak and teak plywood. I want a finish that seals the surface rather than a penetrating oil. I'd like to finish it with lacquer, but I wonder if the extractive oils in teak will prevent the lacquer from adhering. Would polyurethane be a better choice?

—Kevin Mayer, River Vale, N.J.

George Morris replies: Lacquer and teak don't mix. Oils in woods such as teak prevent penetration by anything except other oils and their solvents. Lacquer is low-wetting anyway, and to expect it to adhere to teak is like asking wax to stick to water. The slightest bump will blister the finish leaving a frequently-used item like a bed battle scarred within days. For a film finish on teak, polyurethane is the better choice.

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

Follow up:

Re inlaying metal into wood (*FWW* #50, p. 20). When combining metal and wood, set the metal slightly below the wood surface and sand the wood down to the metal. Sanding metal down to wood concentrates the sanding in one small spot and may cause a slight depression in the wood around the inlay work. *—Jim Woods, Washington Island, Wis.*

Readers can't find:

. . .parts for an Atlas 10-in. bandsaw #9360.

—Greg Furey, Camden, Me.

. . .a manual and parts for a Craftsman 4 in. jointer model 103.21821. *—Meryl Zelda Kolevzon, San Francisco, Calif.*

Sources of supply:

—Xylamon HWT Woodworm Killer for brush-on application or injecting into the holes of wood-boring insects is available from Conservation Materials Ltd., Box 2884, 340 Freeport Blvd., Sparks, Nev. 89431. Caution: This insecticide is poisonous and may damage finishes.

—Gold leaf and tools for embossing gold on leather are available from Antonio's, 701 Bryant, San Francisco, Calif. 94107.

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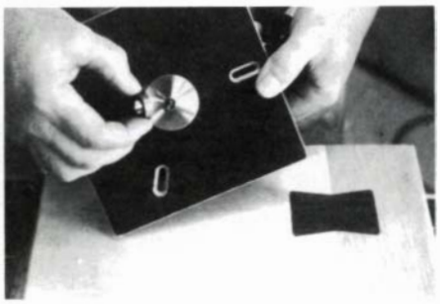

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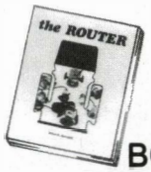

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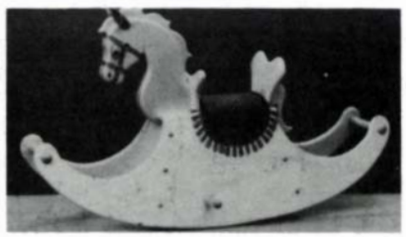

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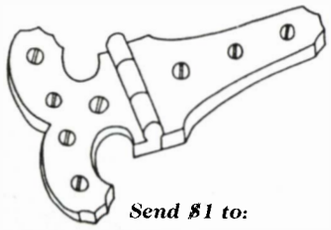

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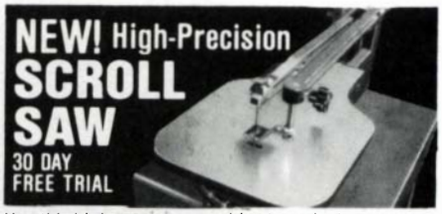

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New England Furniture, The Colonial Era by Brock Jobe and Myrna Kaye. *Houghton Mifflin Co., 2 Park St., Boston, Mass. 02108; 1984. $40.00, hardcover; 494 pp.*

The Society for the Preservation of New England Antiquities (141 Cambridge St., Boston, Mass. 02114) maintains 41 Historic House Museums, which contain upwards of 50,000 antiques. With access to the entire collection, Jobe and Kaye had a rich grazing ground from which to select the furniture shown in this book—148 wonderful pieces of early furniture. The dust jacket claims that this is the first book in nearly a century to concentrate strictly on New England furniture, and that proves to be both its great strength and its minor weakness. With 450 photographs (a few in color), the authors are able to compare and contrast related pieces very well.

This is not a how-to book, but the text is all a woodworker could ask for. All dimensions are given to the nearest sixteenth, woods are accurately identified (many times by laboratory analysis), and interesting construction details are either photographed or pulled out as small drawings in the margins.

The book begins with three essays, one on "Urban Craftsmen and Design" by Jobe, the other two ("Rural Craftsmen," and "Construction Methods and Materials") by Philip Zea. They provide 100 pages of good reading, and set the tone for the book, which is always cognizant of the differences between the ways of the joiner, who used mortise-and-tenon joints, and the cabinetmaker, who made case furniture with dovetails.

Similar distinctions are made between the chairs made by a turner (round joints) and a cabinetmaker. All this is typical of the logical structure that allows the authors to speak with accuracy and expertise. It's as if they follow an either/or key that leads them, detail by detail, to conclusions that in a less well-written book might seem to be merely presumptions. This short quote about a bombé chest will give you some idea of what I mean. The authors, trying to determine in whose shop it was made, compare it with several others then go on to say: "The small chest was thought to be the clue to the origin of the group. It came from the Northey family of Salem and was reportedly marked 'Boston' on the bottom board. Alas, it was really inscribed in chalk (as craftsmen were wont to do) 'Bottom.'"

The only flaw I found with the book was its limited field. When the authors observe that such-and-such a piece was made only in Salem, they are making the distinction that it was not made in Boston, but whether that means the style was never made in Charleston or Baltimore I don't know. I'm sure that my uncertainty would not be shared by antiques collectors, because they *would* know, but humble woodworkers may find themselves confused at times.

I often recommend in book reviews that you take the book out of the local library instead of buying it. Not so with this one, at least for anybody with an interest in period furniture. If you take this one out, you'll never bring it back, and the fines will eventually bankrupt you. Buy it right away. —***Jim Cummins***

Ventilation: A Practical Guide by Nancy Clark, Thomas Cutter and Jean-Ann McGrane. *Center for Occupational Hazards, Inc., 5 Beekman St., New York, N.Y. 10038; 1984. $7.50, paperback; 117 pp.*

Adequate workshop ventilation is essential to minimize exposure to toxic substances, both natural and synthetic. The authors have aimed this book at meeting the demands of small operations: individual artists and workers, school and museum shops, and small commercial shops. Woodworkers will find good material on designing systems to handle dust and chips from machines, and solvent vapors from finishing operations.

The section on work practices properly emphasizes the role of good housekeeping in reducing risk of fire and health hazards. In addition to recommending not allowing smoking or eating in work areas, I would have reminded readers that protective equipment should be kept as clean, or cleaner, than clothing. I am also a firm believer in a minimum of hardened safety glasses for eye protection wherever mechanical work is being done or chemicals are being handled. Don't breathe them! Don't get them on you! Don't eat them!

Too much ventilation can't hurt, but it would cost you in higher heating and equipment bills. The authors, for example, recommend ten times the airflow required to attain threshold limit value—the maximum time-weighted average concentration your exposure should not exceed over a 5-day, 40-hour week. This TLV already has a large safety factor built into it and a dilution system designed to never exceed the TLV is conservatively safe. Providing ten times the air volume needed requires larger ventilating equipment and heating and filtering ten times as much make-up air to keep warm and to maintain a dust-free finishing operation.

The sections on fan or blower selection and duct and collector design are well written and easily understood. The examples cover all common types of problems likely to be encountered in small shops. Many of the potential users of the book operate on tight budgets and could have been helped by discussion of low-cost equipment alternatives. Portable fans, attic ventilation fans, used heating and air conditioning blowers can be adapted to shop ventilation and are much cheaper than commerical equipment. Ducts and collectors can be made of plywood, hardboard, or even corrugated cardboard. I would rather see a woodworker protect himself with an improvised system than do nothing because he thought he could not afford it.

There are so many variables in ventilating systems that the real proof is performance. As *Ventilation* points out, you can see what happens to dust, chips and shavings. Smoke can demonstrate where the air currents are carrying invisible vapors. The authors recommend cigarette or incense smoke or smoke tubes, which are not easy to find, even at $50. The smoke tubes contain either silicon tetrachloride or tin tetrachloride; when you break them and expose the contents to air, reaction with water vapor produces hydrochloric acid and silicon dioxide or tin dioxide smoke, respectively. You're supposed to watch your well-designed ventilation system suck up the smoke, not to inhale it yourself. The use of soap bubbles suggested by the authors is a neat solution.

Be sure to follow the recommendations to check system performance before using it and to test its effectiveness periodically. Motors stop, fan belts break, filters plug, as do ducts. Murphy's Law prevails. —***David W. Carnell***

Fairs and Festivals in the Northeast 1985, *Arts Extension Service, University of Massachusetts, Amherst, MA 01003. $5.00, softcover; 160 pp.*

Covering the six New England states plus New York, New Jersey, Delaware, Pennsylvania and Maryland, this directory is a great source of information for craftspeople and fair-goers alike. Included in the directory, in date order, are over 450 fairs and festivals, an index of application deadlines, tips on festival marketing, and just about everything you need to know about marketing your craft items at a show. —***Nancy Knapp***

Jim Cummins is an associate editor of Fine Woodworking *magazine. David W. Carnell, who wrote about small-shop ventilation in* FWW #47, *lives in Wilmington, N.C. Nancy Knapp is copy editor of* FWW.

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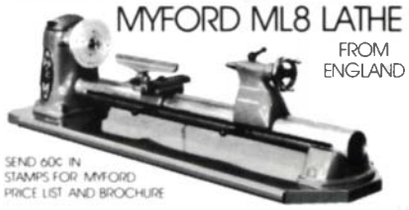

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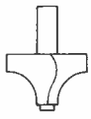

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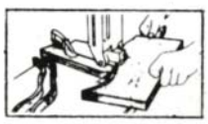
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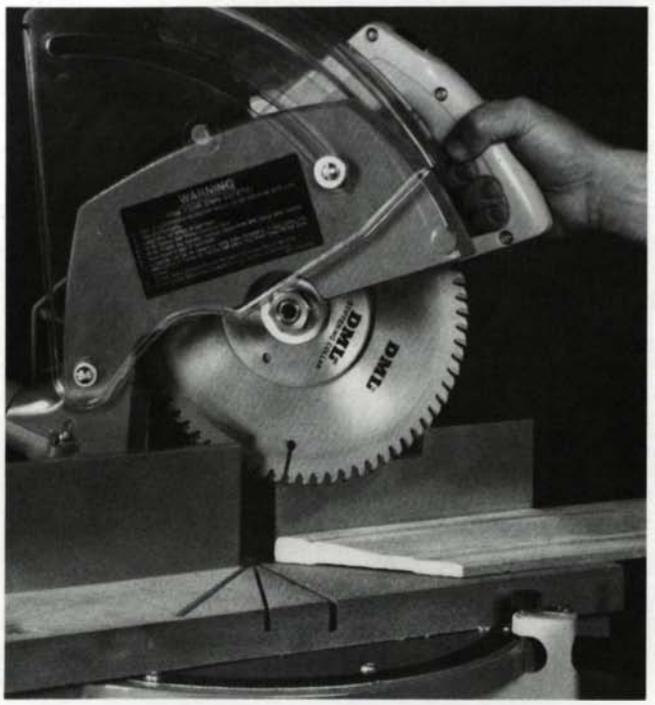

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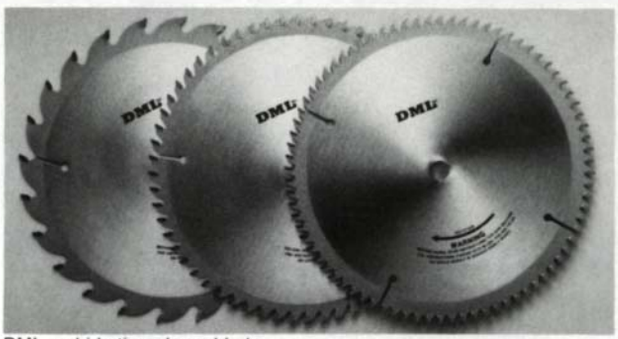

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Making Marionettes

Carved figures bring life to wood

by Bruno Frascone

Wood has been important to us since the beginning of time. Even today when so many objects and gadgets employ man-made materials, wood is a precious gift that can play all sorts of roles—anything from a box to a home, and sometimes it can dance, talk and entertain.

I began to understand this miracle about 12 years ago while working with a marionette theater in France. I had fallen in love with the fascinating little people, jointed dolls that hang from the strings that control their movements, and I began making them, first with papier-mâché and wire, later from wood. My wooden marionettes worked best, but I knew they needed more sophisticated bodies if I was ever going to eliminate the false or "too-loose" movements that destroy their magical human-like behavior. Thus began my search for the perfect marionette.

By the time I moved to the United States in 1976, I had carved two all-wood marionettes that performed well, but I still was not happy with the way they moved. Then six months later, on my first Christmas in America, my quest ended when my wife gave me a book called *The Dwiggins Marionettes: A Complete Experimental Theater in Miniature* (by Dorothy Abbe, Harry N. Abrams Inc., New York, 1969). William A. Dwiggins, who worked his marionette magic from the '30s through the early '50s, was a remarkable artist who never received enough exposure to become well known (because the actors are seldom more than 20-in. tall and the stage is proportionally tiny, 30 to 40 persons is the maximum audience for a live marionette show). He was not only a good woodcarver, but he had learned how to balance each part of a marionette's body (figure 1) so that the control strings working against the pull of gravity produced what he called "almost automatic human motions." I had found the system that would give life to my designs, like Father Time (photo at left). Even though Dwiggins showed me the secret of lifelike movement, he did not limit me to copying his work. I still could create my own individual world of marionettes: in terms of human anatomy, an old man doesn't have the same type of body as a ballerina or a juggler, so you could say their designs are not the same, even though the basic systems that give them life and movement are identical.

Father Time hobbles along in an endless march. His clothes conceal a variety of lever-like limbs and hinged joints custom-carved to duplicate the movements of the human body.

With the Dwiggins system, though, you don't have to create a perfect replica of the human body to make a good marionette. Since the body will be clothed, its appearance is not too important. Strings hook the body parts together (figure 2) and regulate posture, so you don't have to carve realistic knees or elbows, but these joints must be cut accurately for the marionette to move properly. Since the hands and head are painted, you can create many details with a brush instead of a carving knife.

Sketching and shaping—I first draw the front and side view of the figure I want to do, usually making it 14 in. to 20 in. tall. (Very small or very large marionettes behave erratically on the control strings.) Once you've got your basic sketch, try to visualize how the figure is broken down into its basic components according to the Dwiggins system, as shown in figure 3 on p. 32. Sketch these parts on both views of your figure, if you like. For a start, just use the Dwiggins pattern for a generic male (figure 4) to make cardboard patterns for both views of each piece. If the dimensions shown on the grid are respected, the marionette won't fail. With experience, you'll probably want to modify some of the

The Dwiggins system

A marionette hangs from its head. So much of its natural action depends on accurately locating all points of support from the neck to the feet in a single plane perpendicular to the ground, as represented by the line through figure 1A. In this way, gravity does all the work—the strings simply control the motions that result from the pull of gravity.

The body parts themselves are simple levers that move in circular tracks about fixed points or fulcrums. The shapes of the parts, the mechanical design of the joints and the tension of the strings used to connect them limit the motion of the levers to certain planes and arcs of travel. The limits (what Dwiggins called stops) for these arcs and the slants of the planes are determined by watching a human being move, then carved into wood by a trial-and-fitting process. Dwiggins' goal was to make the action of every single articulation or joint as close as possible to its counterpart on the human body, although he used the same system for both males and females.

The torso is divided into three individually shaped cones representing the shoulders, waist and hips. The pieces are held together by a string that acts like a spinal cord from shoulders to hips. A loop called a side string, extending through the three pieces, in conjunction with the beveled center piece, controls how much the figure can bend from side to side and front to back. —*B.F.*

Fig. 2: Stringing a marionette

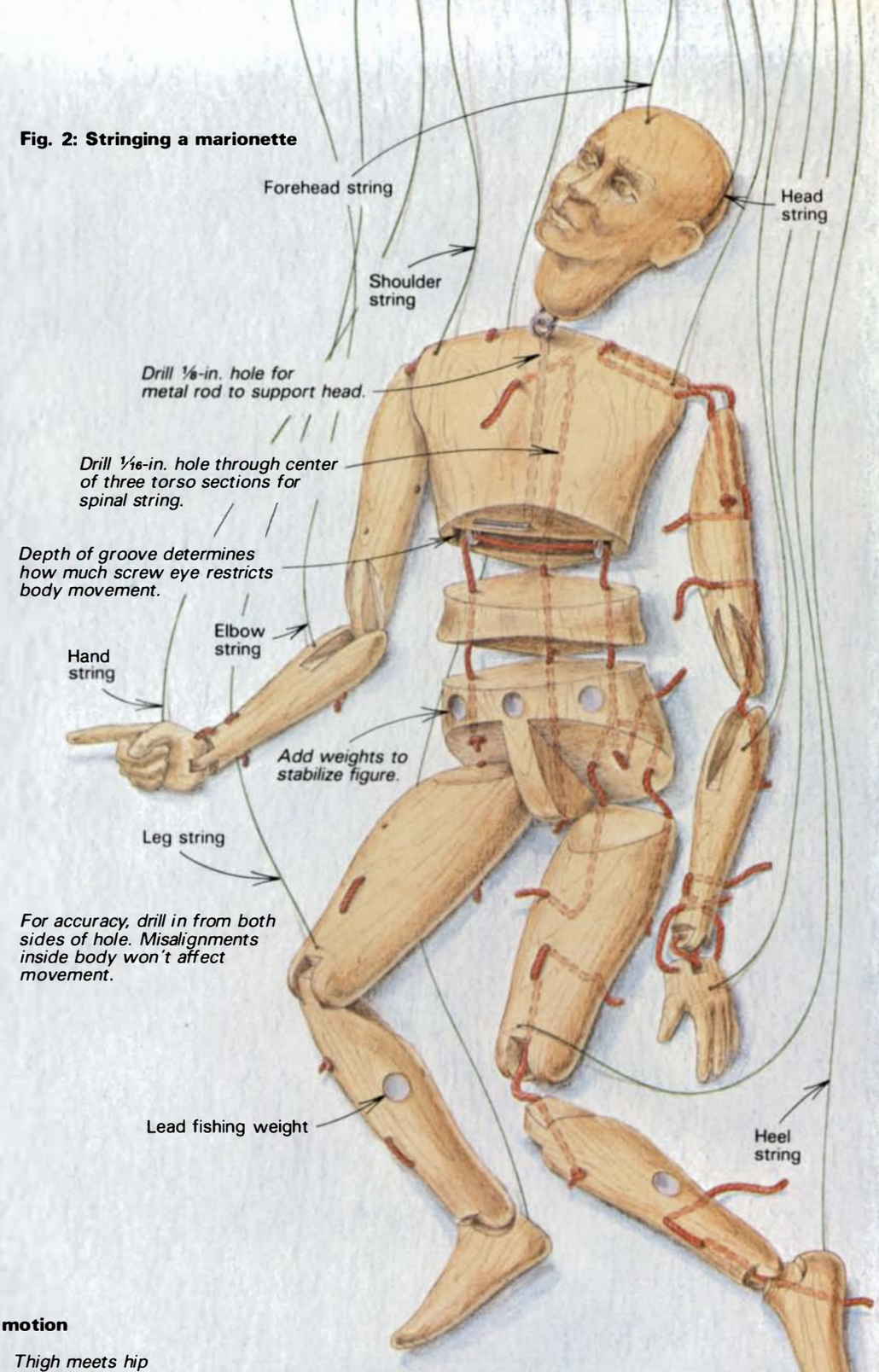
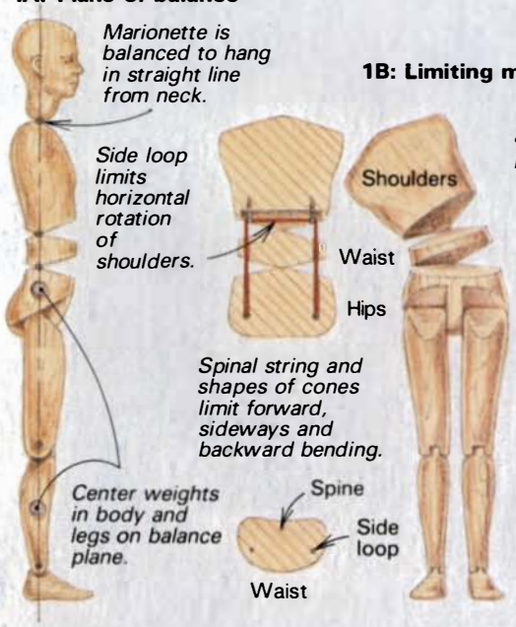
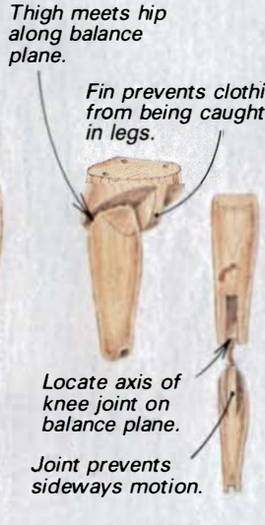


Fig. 1: Marionette geometry

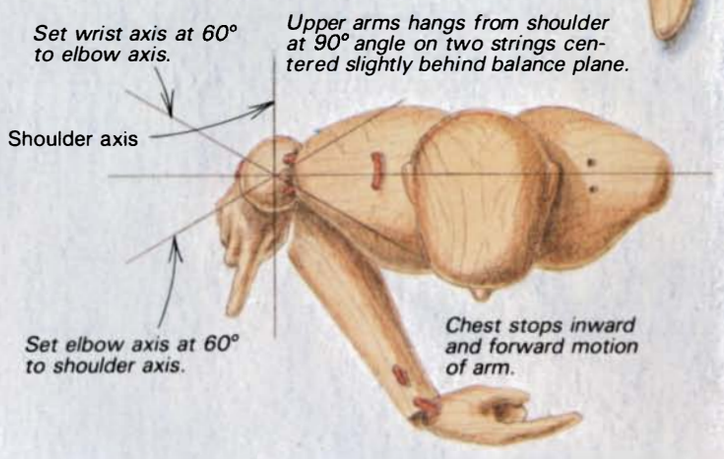
1A: Plane of balance



1B: Limiting motion



1C: Imitating human arms



Drawing adapted from *Marionette in Motion* by W.A. Dwiggins, Boston Public Library, 1976

Fig. 3: Father Time

These are the author's working drawings for the marionette pictured on the previous page. The outline of the body parts used in the Dwiggins system can be seen under the clothes. A thin wire run like a control string from the figure to the control paddle lets the author turn the lantern on and off during performances.

Author photo

A pensive ballerina relaxes among the spring blossoms, her body parts delicately shaped to give her the flexibility and grace of a prima donna. Makeup paint conceals the joints in her limbs.

parts, perhaps increase the angles of the cones forming the shoulders, waist and hips to create a limber ballerina (photo, above), or make the knee joints smaller and tighter to imitate the restricted gait of an elderly person.

For now, you'd be wise to limit your customizing to the proportions and characteristics of the feet, hands and head—details that are so important in conveying the personality of a marionette. The clown always wears big shoes, and the hands of the maestro are always large and delicate. A marionette head looks best if it equals one-quarter to one-fifth of the full height of the figure. Since marionettes are usually viewed from a distance, it's better to make the head too big than too small.

Once you've prepared all your patterns, trace them onto blocks of wood. Red cedar, white pine or some other soft wood is fine for the body parts, but hardwoods like mahogany, beech and birch are better for the more intricately carved head, hands and feet. So you'll be able to carve symmetrically, mark accurate centerlines on each face of every piece. If you have to cut off one of the centerlines in one operation, you can reestablish it using the remaining lines for reference. I carefully bandsaw one view of each piece, then tape the waste on so I'm working with a square block to cut the second view. Work by pairs—upper arm with upper arm, upper leg with upper leg, and so on—so you can remember to maintain the left and right mirror effect of each pair. Beginners should make two sets of pieces, just in case the first set isn't good enough or something breaks. Leave the edges of each piece square for now. You don't want to shape anything until after you've cut the tenons and notches that will form the joints. These joints, what Dwiggins called articulations, must be cut carefully because they determine how well the marionette will move.

Bandsaw the torso pieces to shape, but don't try to carve away any sharp ridges. Be very careful when cutting the hip joint, basically two notches flanking a center ridge, into the lower torso. For the marionette to walk straight, the two notches must be identical—cuts on one side of the torso must be exactly parallel and in the same plane as cuts on the other side. I use a flexible plastic ruler to lay out the joint lines, then bandsaw the waste, cleaning up with a chisel or knife as needed. With a small gouge, cut a ¼-in. groove under the top part of the torso for the side string.

The mechanism of the leg works in a straight line, and each leg is parallel to the other. I notch the bottom of the knee joint by making two parallel bandsaw cuts, then clearing the waste with a ¼-in. chisel. You can bandsaw freehand, since the gently curved parts have not been shaped yet, but you might want to reattach the waste you previously cut from the back of the leg to help in cutting nice, parallel articulations. To cut the tenons for the knee notch, I angle the piece on end and make two cuts parallel to the length of the piece to establish the ¼-in. wide tongue, then I carve away the sides until the tenon fits into the

Drawings: David Dann

notch and the upper and lower knee work nicely together. The farther back the tenon shoulders are, the more movement the joint will have, so be sure to leave enough of a shoulder to prevent excessive, unnatural movements. Cut the ankle joint the same way—bandsawing and chiseling a notch in the lower leg and carving the tenon on top of the foot to fit.

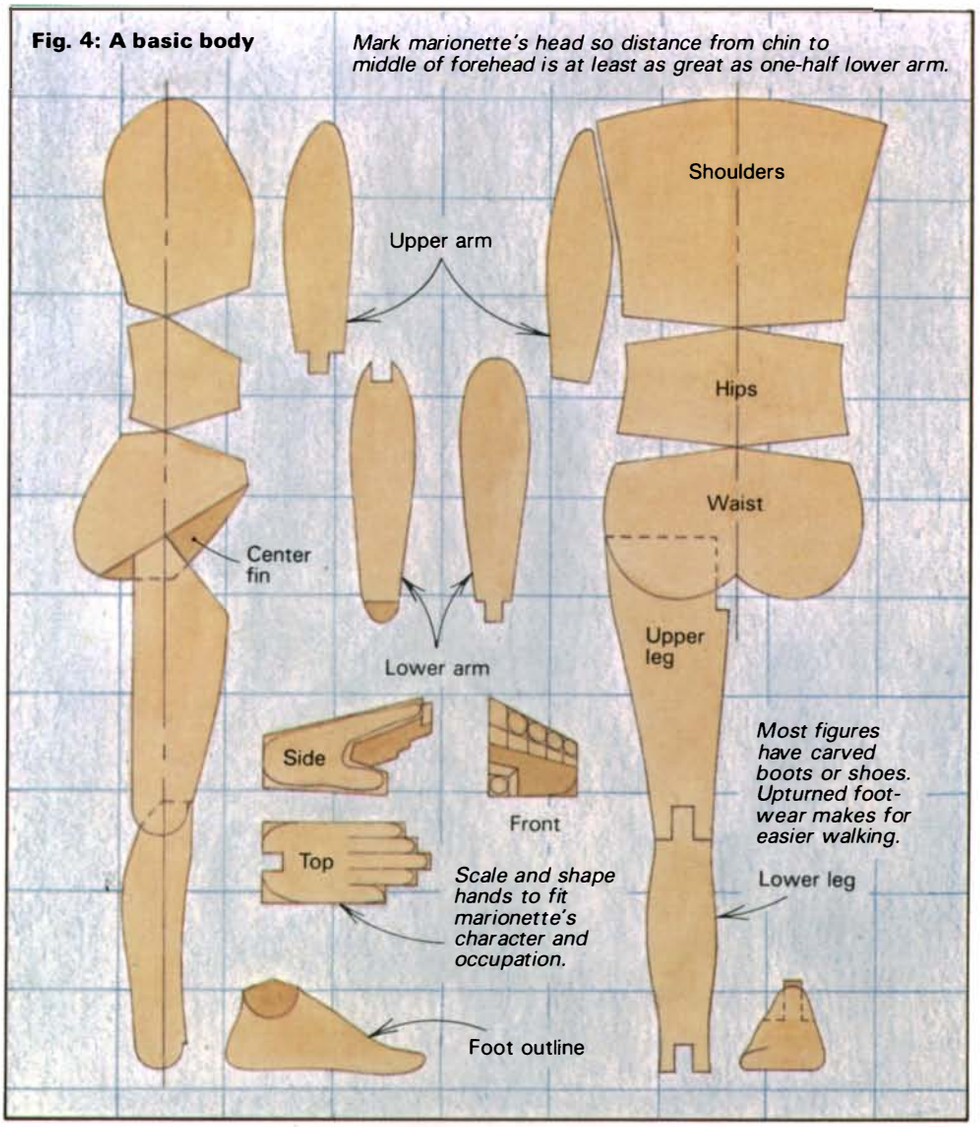
The mechanism of the arms is far more complex than that of the legs, and can be best understood by looking at your own body. If you let your arm hang naturally from your shoulder, you'll notice that the axis of the elbow joint points slightly inside of the straight-ahead mechanism of the knee. The wrist also works on another axis, pointing out this time, relative to the axis of the elbow. Dwiggins calculated that the difference between the axes of the shoulder and elbow and between those of the elbow and wrist was 60° in each case. You can use this 60° figure as a general guideline and work from your own body. Cut the elbow notch and tenon straight, just as you did for the knee joint. Establish the elbow angle by carving away the top of the arm where it hangs against the upper torso. Shape the upper arm until the marionette's arm hangs the same way yours does. Again work in pairs so the joints on the left side mirror those on the right side. After doing the elbow, use your body as a guide to approximate the wrist angle and carve out this articulation.

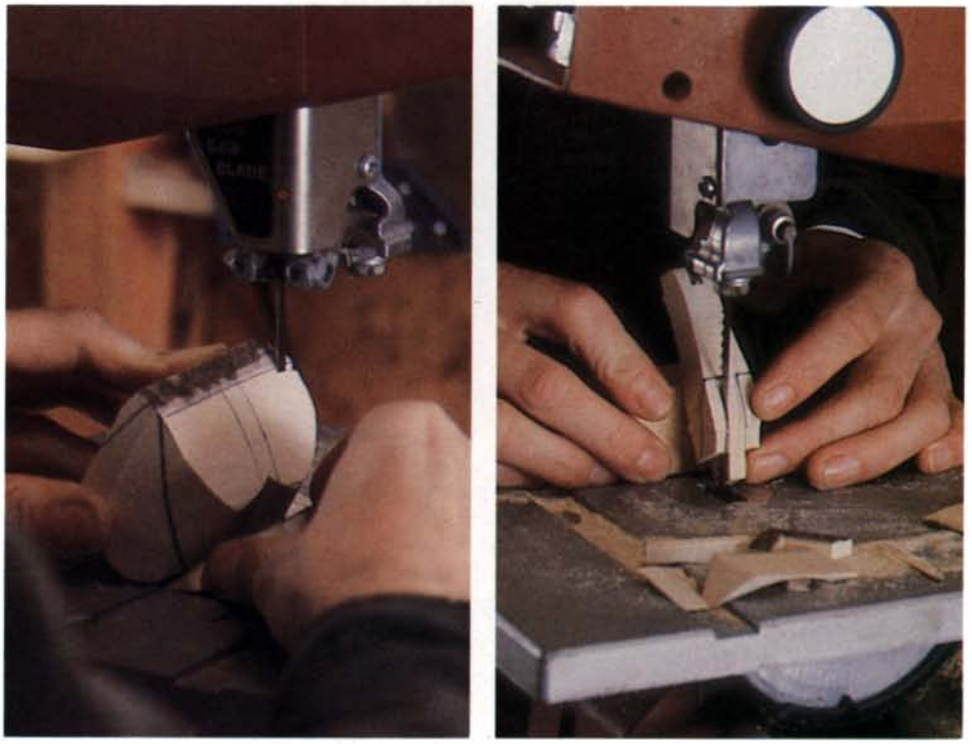
Now you're ready to shape all the body parts with a sharp knife. Use the centerline of each piece as a guideline and work the pieces in pairs to ensure symmetry. Your carving should accentuate the twist you've created in both the upper and lower arm. Proceed slowly, carving away the sharp corners left by the bandsaw. Remember, the pieces need not be perfectly shaped, since the body will most likely be clothed and viewed only from a distance.

Hands are the hardest part of the figure. Think how much you use your hands to express yourself—if you mess up the hands, you may kill the expressive effect of the marionette. One nice thing about creating little people, however, is that you always have a model with you. Use your own hands and other body features (keep a mirror handy) to answer any questions on shapes and gesture that might come up as you carve.

I begin by drawing the hands directly onto a small block of wood, arranging the block so the grain follows the fingers for maximum strength in these delicate areas. The fingers will also be stronger if you

Fig. 4: A basic body





Steady the cone-shaped hip section with a scrap wedge while bandsawing the notches that accept the thighs, above left. Hold the leg piece on end and bandsaw parallel cuts to establish ¼-in. tenons, above right. Carve the shoulders with a knife.

Flexible wrist joints give the ballerina, left, such a repertoire of gestures that her wooden hands seem real. Study your own body to determine how each hand should be formed. Use a small file, below, to shape delicate areas of the palm and fingers where a knife might be too large or where there is danger of breakage.

During carving, Frascone frequently checks the marionette's emerging face from below. The change in perspective makes it easier to spot flaws and to visualize what the finished character really will look like.

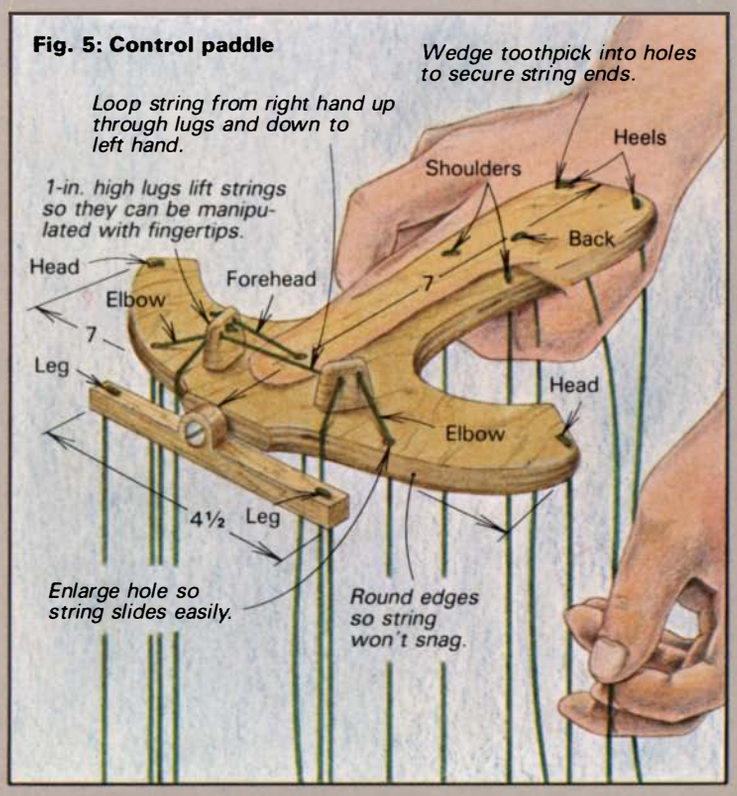
carve them joined together, rather than as five individual units. I clamp the block in a small vise and carve the fingers with a ¼-in. chisel, the chisel width setting the width of individual fingers. Small jewelers' files are very useful for fine details on hands, as well as on feet and heads.

Being aware of the centerline is especially important in carving the face and head. Take a block of wood large enough for the head, trace the outline of the head, and mark its centerline on front, back, top and bottom. I cut the main angles of the face with a bandsaw. If you make a cut on one side of the centerline, you must make a similar cut on the other side; if you curve one edge, curve the other. Never try to finish one side or a detail of one side before roughing out the other. I do most of my carving with ¼-in. and ½-in. shallow gouges, a small skew-shaped knife and a spade-foot knife, but the tools really don't matter as long as you never lose sight of the centerlines, or forget that you are working on two profiles—the front and the side. When you carve the eyes, make sure they are on the same level and square. As I carve, I look at the face from underneath, side and top, not just from the front. I also like to use a small mirror to view the emerging face—I always discover a totally different view there.

All pieces of the body are joined with and supported by string—30-lb. test braided nylon fishing line for controls and waxed string used in leathercraft for the joints. A 1/16-in. dia. metal pin supports the ankle, but string permits more supple movements in the other joints. Also, if you should accidentally drop the marionette, the string is likely to break or pull out, whereas metal pins tend to break the wood.

Stringing the body—To assemble the body, drill 1/16-in. holes at the locations shown in the plan. It's normal to have to do some final trimming as you string the pieces together. First, run the spine string through the three sections of the torso, leaving it loose, then add the side string. The side string runs from the lower front of one side, up the side hole of the center part, through the screw eye located in the groove of the upper part, over to the other screw eye, down through the other side hole of the center piece and to a lock hole in the lower section. You'll have to adjust both the side and spine strings to allow the right amount of motion, then secure the ends of each by driving sections of round toothpicks into the lock holes. Drill the holes for the knees and elbow and string these joints together. The shoulder

Marionette motivation



A balanced, well-made marionette comes to life with a series of strings using the control mechanisms Dwiggins developed. His controls are comfortable and fun to use, and comparable to a musical instrument that lets you discover chords, rhythm and melody.

The control is basically a smooth, paddle-shaped piece of ⅜-in. plywood, along with an auxiliary bar, that holds and separates the strings. The two lugs on top of the paddle make it easy to reach the strings most important to the marionette's expressions—they control the arms and hands, and move the head up and down. The strings should slide through the holes without resistance.

I suggest using about 4 ft. to 4½ ft. of string to connect the marionette to its control. Since the entire marionette hangs by strings in the head, these must be inserted first. Attach them just over and slightly forward of the ears. When you set these strings, the control must stand perfectly horizontal. As before, drill 1/16-in. holes for the strings, then wedge the ends in place with toothpicks.

You'll need at least 11 strings to control the figure. The hand-to-hand string loops from one hand through the holes of the two lugs, then down to the other hand. This string should be slightly taut and support both hands naturally. The elbow strings are attached to the forearm right below the elbow articulation. They should be taut without carrying any weight. The knee strings, attached right above the knee articulation, are similarly taut and set on the pivoting bar in the very front of the control. The shoulder and back strings should be set so they support and control the body when the head is lowered.

Now you should be ready to experience the true magic of a marionette. With your thumb and middle finger, grasp the narrow part of the paddle handle from above, roughly parallel to an imaginary line connecting the head strings. Use your forefinger to manipulate the head string. Curl your remaining two fingers under the paddle to reach the shoulder and back strings. Use your other hand to manipulate strings to make the figure walk and move its hands and legs. You'll develop your own methods, but here are some guides to get you started.

Head: **Tilting the control paddle down and forward will bow the head. Keeping the control in this down position as you alternately roll the paddle from right to left along its axis will produce a shaking-my-head "NO" movement. Holding the control horizontal while lifting the forehead string with your index finger will lift the head. Pulling and releasing the forehead string with the control slightly bent down will give a "YES" nod. You can make the marionette bend or twist by using one of the fingers holding the control to manipulate the back and shoulder strings from below the control.**

Arms: **Use your second hand to manipulate the hands and arms. Pulling the hand string in combination with the elbow strings will give a variety of movements and expressions.**

Legs: **Make the legs walk by rhythmically moving the control forward and pivoting the bar carrying the knee strings. When the control is tilted backward, allowing the back, shoulder and head strings to drop, the marionette will sit.**

After you learn to control these basic strings, you may want to add others. Just remember—every additional string increases the chance of tangling. Despite that danger, you can create some interesting results by attaching strings to the bottom of the marionette's heels. The strings should hang very loosely so they don't interfere with normal walking, but when pulled they should lift the back of the feet, allowing the marionette to get on its knee, or fly like Superman, or dance on one leg. ***—B.F.***

and the hip each hang by two strings which are adjusted to allow a natural looseness to the hips and shoulder. Drill the holes of the wrist and ankle and join them together.

Now that your marionette is all together, check its body mechanism. Hold the marionette by its head and lift the knee by the upper leg, watching the body and the lower legs—if they swing too much, add lead fishing weights to the lower legs until the movement seems natural. Check all articulations to make sure they are not too tight or too loose. This takes practice, but you'll soon see how to work the strings and weights to balance the marionette.

I paint the marionette's hands, legs and face with two coats of gouache water paint (available at any art supply shop). I use fine wool or yarn for hair, drilling into the skull, inserting strands of fiber and pinching them in place with a toothpick. Now the marionette must be dressed. Generally, the clothes are simple designs, made of lightweight fabrics or leather, and baggy enough to allow free movement. I'm not a tailor, so you're on your own. When the marionette has finally found something to wear, it is complete, although asleep, waiting only for control strings and your skills to give it full life. □

Bruno Frascone is a professional marionette maker who teaches marionette making and produces miniature theater programs in Charlotte, N.C.

Langton's Wooden People

Character is in the details

by Dick Burrows

Anyone who has ever slept on the ground knows how hard it is to straighten up after a long, cold night. You ache as you slowly stretch each stiff joint. The cowboy pictured below makes you feel that pain, but he can't complain about his backache because he's made of wood.

The cowboy, named Gene, is one of 46 dolls created by Michael Langton of Alton, N.H. Even though the carvings are small, about 20 in. high, the details of their features are overwhelming—veins and wrinkles, fingernails, tendons, warts. To see more on a living body you would have to use a magnifying glass.

Langton says that the details are what grab people, letting them sense the power that enables humans to love and strive and hate, and the cares of the world that abrade and twist their flesh and minds. To him, the best carvings are those that best show life's scars—like David, a spunky paraplegic whose eyes follow you around the room, and Josh, a Bible-reading farmer (photos, facing page).

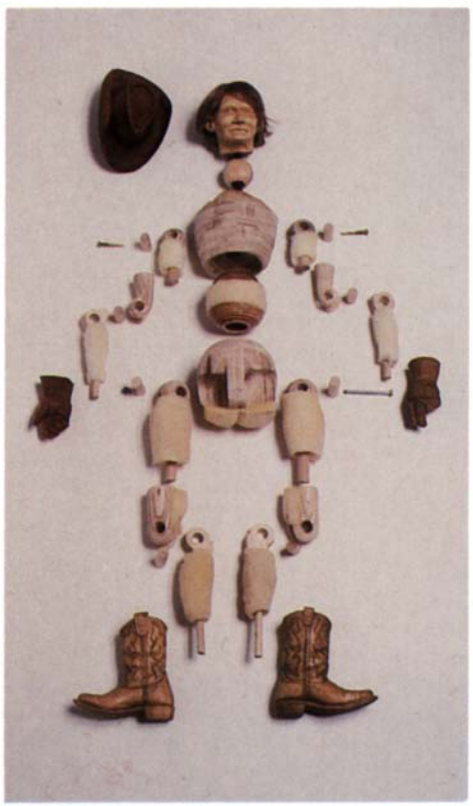
Langton claims to have no secret methods for his carving—just hard work, concentration and about 200 hours per doll. He uses ordinary carving gouges, attic-sale knives and 5X-7X-12X power magnification goggles. Usually he works directly from life, often taking a series of photographs that illustrate an attitude he wants.

Tung oil is his only finish, except for the eyes, which are colored with pencil crayon. Langton says that the way to get distinctive, natural-looking details is to oil the nearly completed figure two or three times, carve in the finest details, then oil again to soften the delicate lines.

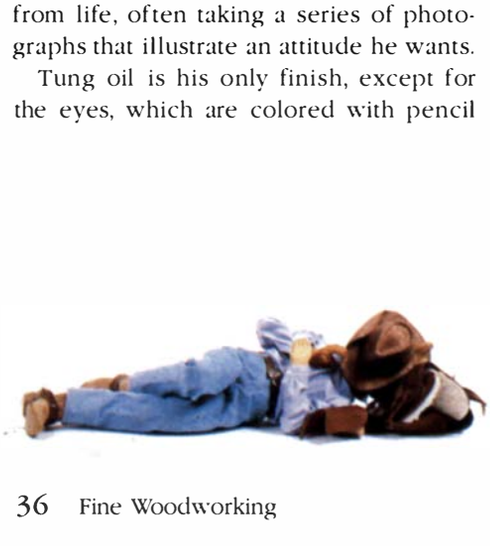
The mobility that Langton's dolls exhibit is as impressive as the detailed carving. Posture and movement can tell as much about a person as facial features, and Langton's realistic figures shrug their shoulders, put on their shoes, sit or walk, cross their legs, even cast a fishing fly. On some figures you can tell whether the person is left-handed or right-handed. The elaborate system of carved body parts and wood-and-metal ball-and-socket joints that makes all this possible is camouflaged by perfectly tailored clothing created by fellow craftsperson Barbara Itchkawich, handmade buttons, even custom-made eyeglasses.

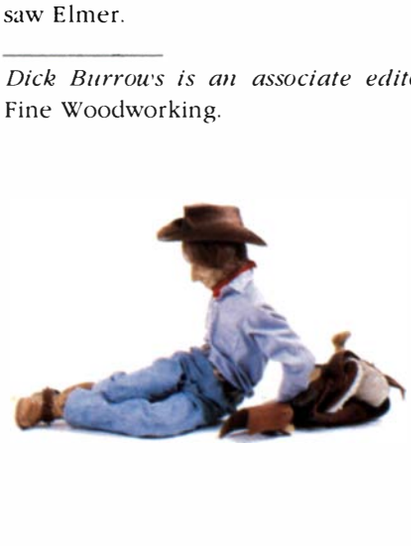
Langton's first doll, a sailor boy named Elmer, was Katherine Hepburn's alter ego in the movie *On Golden Pond*. The producers had rejected about 300 dolls before they found Elmer in New Hampshire where the movie was filmed in 1980. At the time, Langton was carving signs while trying to combine his interest in wood and his art-school background into something more meaningful. "Now, that's not half bad," said Ms. Hepburn when she saw Elmer. □

Dick Burrows is an associate editor at Fine Woodworking.

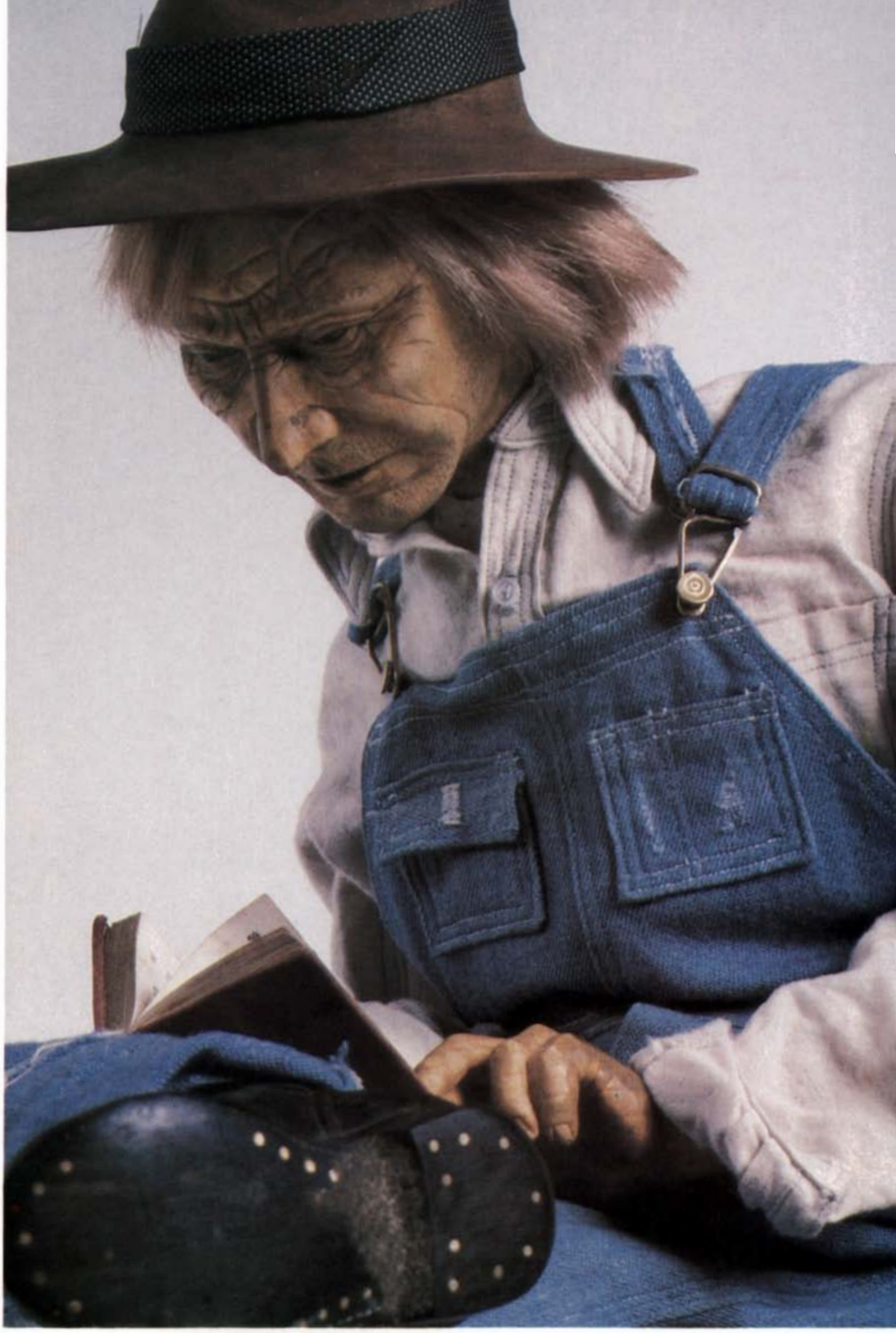


About 60 parts made of plywood, metal, and carved maple and pine let Langton's dolls imitate human movements.





Photos: Deborah Fillion



Furrowed face, calloused hands and old boots create a lifelike illusion—until you see that Josh is sitting on two human-size books.

Queen Anne Handkerchief Table

Building a three-cornered masterpiece

by Eugene Landon

Landon's reproduction of a rare 18th-century handkerchief table is a study in pure Queen Anne lines.

In the middle of a very busy workday about four years ago, the phone rang. It was an elderly acquaintance who lived in a nearby town, calling to inquire whether I would be willing to repair a piece of furniture for her. "It's a handkerchief table," she said.

I couldn't leave what I was working on for a week or so, but agreed to go and look at the table when things slowed down a little. Secretly, I had my doubts about the piece—the handkerchief table is one of the rarest American furniture forms. Perhaps what she had was the larger version, usually called a breakfast table, or perhaps something else entirely. I mused about it for a moment, but almost as soon as I returned to what I had been doing, the table went completely from my mind.

Two years later, out of the blue, I heard the same voice over the phone again: "Mr. Landon, aren't you interested in my table?" The earlier conversation came back to me instantly, along with a considerable flush of embarrassment. "I'll be right over," I said.

When I entered her home, I saw that she knew what she had all right.

The little table took my breath away. Even though it was missing the leaf, the hinged leg and all its knee blocks, it had a presence that epitomized pure Queen Anne, before cabinetmakers under the Chippendale influence began to add shells and gingerbread. I have nothing against Chippendale, but while such decoration may sometimes enhance a piece, it may also serve to disguise basic flaws in design. The little table was so stylistically pure that any such shortcomings would have stood out immediately. As I walked around the piece, I gradually realized that it had no flaws at all; it was perfect.

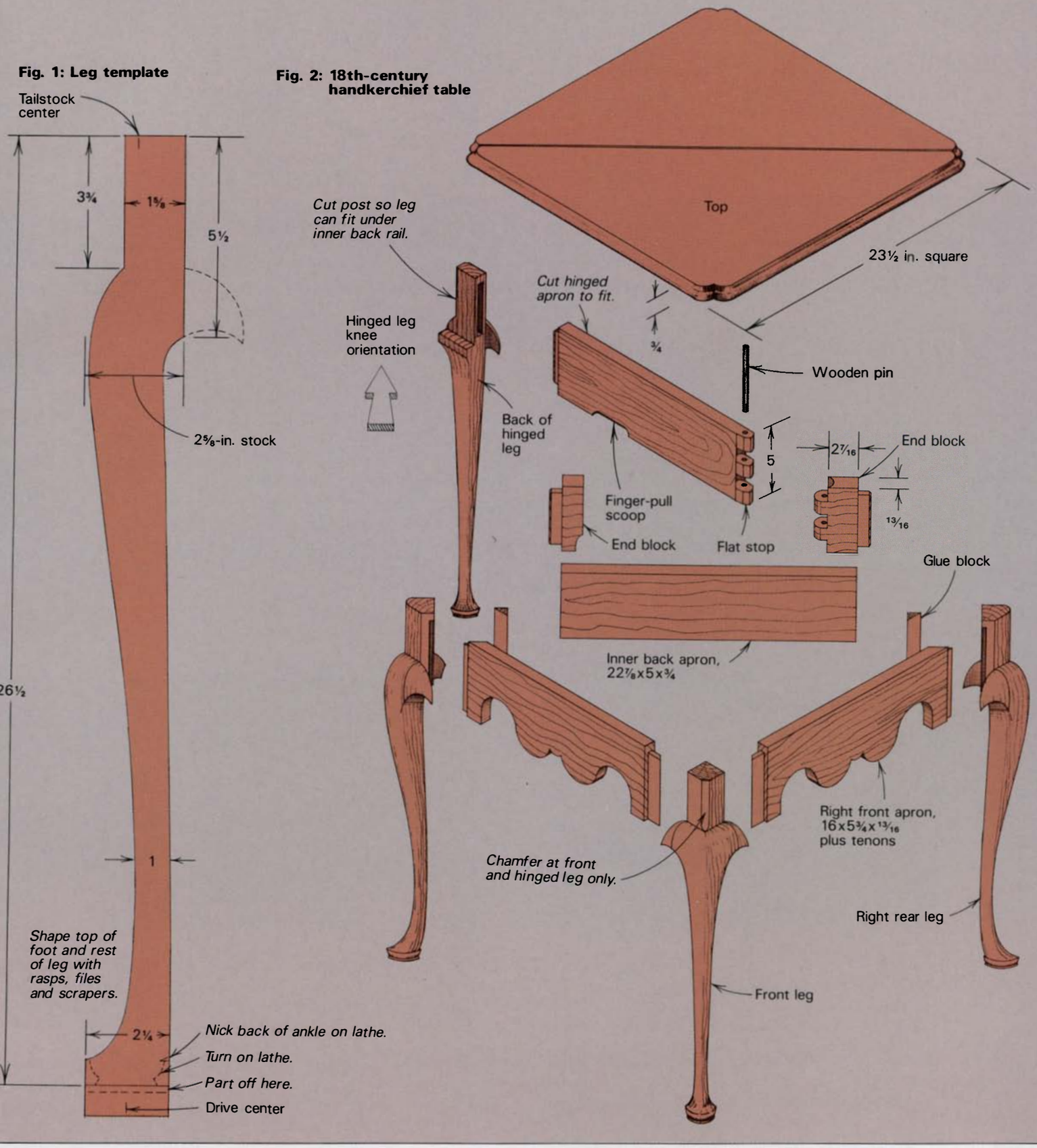
Much as I dislike extravagant claims, I believe that this handkerchief table is not only excellent Queen Anne, but that it is one of the finest pieces of furniture ever made in any time or place. You simply will not find a shaplier leg, nor one more perfectly proportioned to the rest of the table. The genius of the maker is evident everywhere: The four notched corners of the open top serve to restrain the eye's travel, yet when the leaf is down, the opened notches blend into a lovely curve. The back of the ankle is undercut just the right amount, the merest touch, to give the entire table poise and an irresistible uplifted energy. Even the chamfer on the front corner post strikes just the right balance—it defines the corner elegantly, yet is neither too sharp nor too weak.

It turned out that the table had been made in Boston, circa 1740, and that it had been in my client's family ever since the day it was made. The owner agreed to let me make a copy for myself, and I was so convinced of the rarity and authenticity of the find that I took photos of it to Israel Sack, the antiques experts, in New York City. Robert Sack told me that the firm, in 32 years of business, had handled only one or two similar tables. My client's was truly as rare as I had thought.

I made my copy by following plans that I traced from the original. Figure 3 on p. 41, in fact, was adapted from a rubbing of the original table, which I made when I had the top off. The joinery has been added, and also the outline of the legs to show their orientation. I would advise you to redraw this top view full-size, and to add the joinery and wooden-hinge details as well. This step will immediately clarify the project and will also allow you to cut pieces to fit the sizes and angles on the drawing, rather than trying to measure them.

My table—my wife's table, as Jane would remind me—stands with its folded leaf against a wall in our living room. This shows the decorative apron on both sides. The table could also go in a corner, with the leaf folded down in front, or it could stand next to an armchair or a sofa, being just about the right height to hold a reading lamp. Because my table stands with its 90° corner facing forward, I'm calling that leg the front one; the folded leaf and the hinged leg are at the back of the table. The table also has a left leg and a right leg, both at the rear. The legs all end up different, so it is important to know which one is which.

The front leg is made like a regular Queen Anne leg, following the template shown in figure 1. Indeed, all the other legs *start* the same way, but then each must be modified. The rear legs, for example, are glued to the aprons, then their corner posts and the tops of their knees are reshaped to blend into the acute angle, as shown in the photo on p. 40. As also shown, the knee block of the left rear



leg must be modified so that the knee of the hinged leg can nest behind it. These and other modifications will be considered as they arise.

The first step is to bandsaw all four legs to the curves shown on the template. Notice that the back of the foot is not undercut at this time—to do so is a common mistake that affects the visual balance of the leg and leaves the foot without sufficient body for good looks. Center the bandsawn blanks on the lathe and turn the bottoms of the feet. Then just nick the back of the ankle to define the top of the foot. Do not remove too much wood—the nick at the back of the ankle should be no more than ⅛ in. deep, and your chisel should barely graze the top of the foot at the front. These marks will be faired into a gentle curve as the leg is being shaped. I use rasps, files and scrapers, repeating each step on all the legs with one tool before moving on to the next. When the legs are shaped and smoothed, set them aside. The knee blocks will be sawn and added after glue-up, then shaped on the table.

Cut the front aprons to length, but don't bandsaw the curves yet—that step comes just before glue-up. At the front end of both aprons, cut the tenons that will go

Drawings: Figures 2 and 4. Louis M. Bassler

into the front leg. Then cut the mortises in the front leg. There is a ½-in. shoulder at the top of the tenon—which leaves some wood at the top of the corner post for strength—but there is no shoulder at the bottom. I begin with an undersized bit in my drill press, being careful not to get too close to the lines, and not to go so deep that the brad-point will leave marks at the bottom of the finished mortise. (I don't like to leave any machine marks on my reproductions, even when they will be hidden.) I complete the mortise with chisels prior to mitering the front tenons on the aprons, which I cut a little short so they don't touch inside the mortises. As a final touch, I undercut the shoulders a little so that the face of the apron will draw up snug to the post.

Now we come to the interesting part, the joinery at the back legs, which is shown both in figure 3 and in the exploded drawing. The two front aprons are mortised to the back legs at 45°. There are two back aprons, one of which carries the hinged leg.

Cut the inner back apron to length (notice that this piece has no tenons). Then cut the hinged apron, leaving it about 8 in. overlong for the time being, and make the hinge. It is much like the card-table hinge I described in *FWW* #47, but there are a few noteworthy differences. It has a built-in stop at 64½°, and to make this work, the hinge pin must be offset more than half the board's thickness from the end. This leaves some extra wood to bear against the inner apron, as shown in the hinge details in figure 3. Final fitting of the stop is done by trial and error before the hinge strip is glued to the inner back apron.

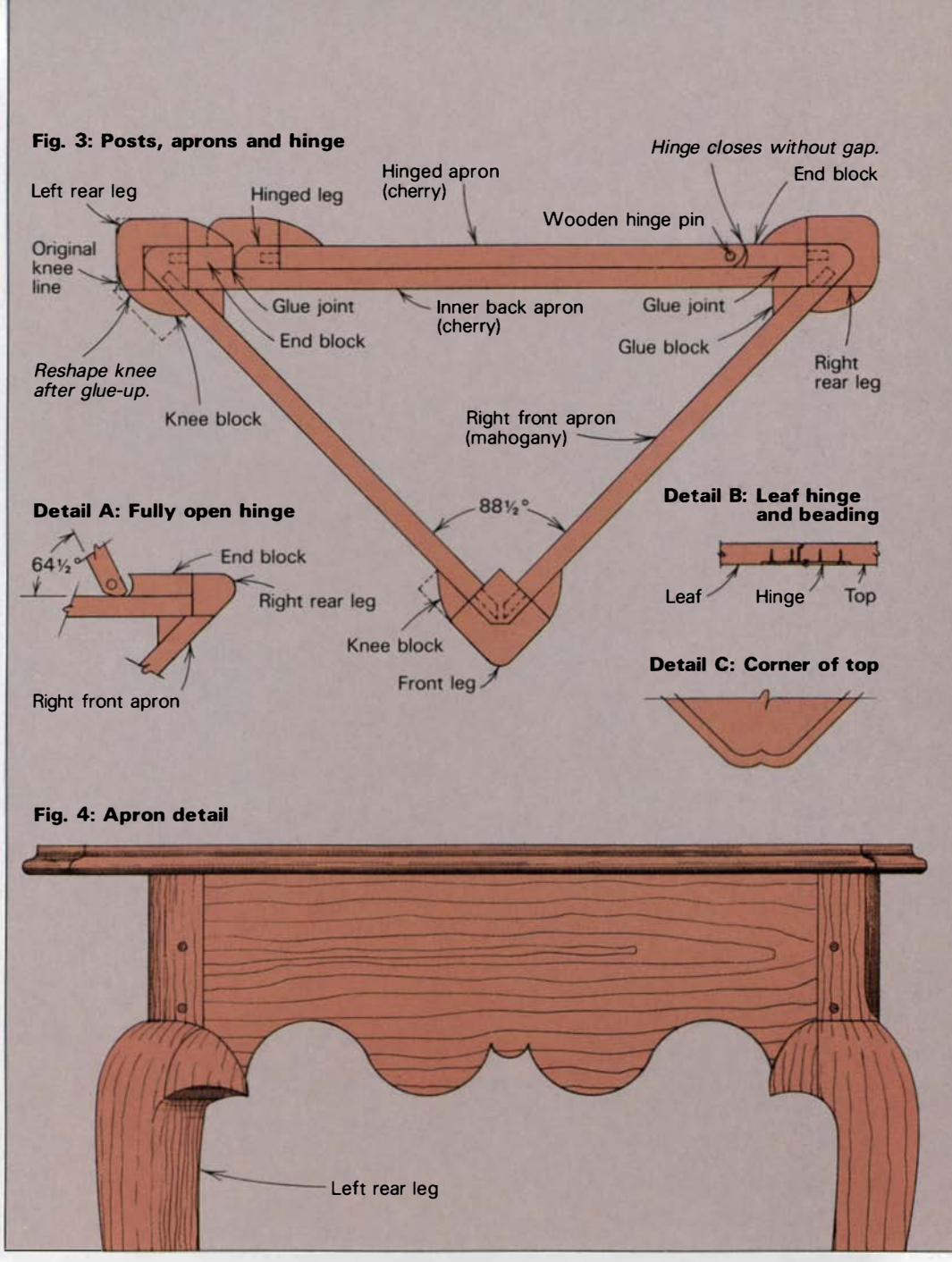
As also shown in figures 2 and 3, there is an end block at each end of the hinged apron. One of these blocks is the fixed part of the wooden hinge, and the other can be made from the excess length of the hinged apron. It is by means of the end blocks that the back-apron assembly is tenoned to the legs. There is some careful fitting to be done before gluing up this assembly. First mortise the back legs and cut the tenons on the end blocks, then fit the hinge together. Next bandsaw the left-hand end block so the hinged leg can nest into it (see the photo below if this sounds confusing). You can use the leg template to determine the profile of the curve.

Now glue the end blocks to the inner back apron, but don't glue on any legs yet. As you can see in figure 2, the hinged leg's corner post must first be half cut away so the leg can swing under the inner back apron. Work on the mortise-and-tenon joint at the hinged leg until everything fits, paring back the shoulders on the hinged apron's tenon so that the leg ends up in exactly the right nesting position. Finally, glue up the back-apron assembly, including the hinged leg but not the others.

Now on to the angled mortise-and-tenon, which is not nearly so difficult to make as it may look. First the tenon: I set a sliding bevel to the angle shown on the plans, then transfer it to the top and bottom edges of the apron blank—I always mark such lines with a knife, since pencil lines are too fat to be accurate. Then I simply bandsaw close to the lines and pare down to them with a chisel, as shown in the photo below.

The mortise is a little trickier, but not

A look at the table's back corner (left) shows how the knee and post have been shaped to conform to the 45° angle. The hinged back leg nests as shown at right; note in the drawing on the facing page that both legs are oriented in the same direction. Below, Landon demonstrates the setup for starting an angled mortise. He supports the corner post in a V-block, and presses the leg against his forearm for extra control. Paring the tenon's angled shoulders is shown at right below. The first step is to bandsaw close to scribed layout lines. Then finish up with a chisel and a 45° guide block.



really difficult. You can pre-drill most of the waste by supporting the corner post in a V-block as shown. Using the drilled holes as a guide, pare the mortise to full width with chisels. You can protect the very thin area at the inside corner from splitting off by using the 45° guide block, just as when cutting the tenons.

With the joinery cut, it is time to bandsaw the curves on the aprons. The pattern is centered on the apron and extends as far as the tips of the knee blocks, as shown in figure 4. After bandsawing the curves, remove the sawmarks with a rasp and chamfer the inner edges with a knife or chisel. The original table shows rasp marks clearly, and the ⅜-in. wide chamfering is a series of very bold cuts.

Glue the table together upside down on a flat surface, and when it is dry, rub on the interior glue blocks. The front angle on the original table was 88½° instead of 90°. I am not sure whether this was deliberate, so that the table would fit into a corner even if the room were slightly off-square, or whether it was just one of those things that happens. My table is also 88½°, and if you choose to follow the plans exactly, yours will be, too.

Now bandsaw the knee blocks and glue them on—but notice that the back knee block on the left rear leg must be relieved, as was done with the end block, so that the hinged leg can nest inside it. Bandsaw the relief cut before gluing on that knee block. Also notice that the forward-facing knee blocks at the back legs are larger than the others so they can meet the posts at a 45° angle. They must also be cut from slightly thicker stock, but these differences will be obvious when it comes time to make the blocks.

Reshape the tops of the knees on the back legs as well as the knee blocks to fair them back to the apron. Finish shaping the outsides of the back corner posts at the same time. Next chamfer the outside corners of the front leg and the hinged leg, then go ahead and make the top.

I cut the top's molded edge with an ogee plane and a hollow plane, but if you don't have these you can begin by cutting a shallow rabbet and then finish up with files. The notches are cut with bandsaw and chisels.

There is a curious joint where the leaf folds. It is not quite a rule joint, nor the tongue-and-groove that might have been found 50 years earlier, but rather a more delicate nesting rabbet-and-bead that does not conflict visually with the notched corners, whether the leaf is up or down. I made mine with old planes, but any method will work. Pay particular attention to the location of the hinge pin, which determines how the leaf will align with the top in both the hanging and upright positions.

I attached the top with rubbed glue blocks and nails, the same method used on the original. This allows no provision for seasonal wood movement, and you could fasten your top differently if you'd like. Some old pieces eventually split, and some did not. My table, in fact, has a nice small split already, which I welcome as a sign of age. The original's top, ironically, is still fine after more than two hundred years.

I don't like to think of it as faking, but you could say that my table aged a little faster than the original. I added some wear marks where the original table had them, then eased the edges with a Scotch-Brite pad. I smoothed the bottoms of the feet by rubbing them with a brick, duplicating the moving around that the original must have experienced in its lifetime. For the finish, I applied a home brew of green walnut husks steeped for a month or so in water. This helps darken Brazilian mahogany so that it looks more like the Cuban variety used by 18th-century cabinetmakers. I sealed this with a brushed coat of thin shellac. Five or six subsequent shellac coats were padded on, with some dry pigments mixed in to achieve a semitransparent patina. I took off the gloss with some 0000 steel wool, and everything came together at once. Suddenly there were two old tables side by side, a gathering of the rarest of the rare. □

Gene Landon restores antiques and makes period reproductions in Montoursville, Pa.

Photos: Terry Wild Studio

Low-Cost Dust Collection

Cleans out your shop, not your wallet

by William S. Harrison III

I used to snicker every time some new fangled safety device hit the market. I'd give up woodworking, I told my wife, before strapping myself into gear more appropriate for moonwalking than woodworking. Then two years ago, I found myself cutting up redwood for hours each day in a closed, two-car garage. I began to feel a bit choked up, but that was only the beginning. I contracted a sore throat (from other causes) and kept on working. Despite all kinds of prescribed medicine, my throat got worse.

When my condition improved after five days away from the shop, it finally hit me that the fine sawdust was doing a number on my throat—and probably on my lungs, too. Donning a paint spray mask in the shop cleared my throat and confirmed my suspicions, so I immediately started work on a dust-collection system.

How serious is any sawdust problem? My gut feeling is that if you machine wood in an enclosed area more than one hour per day, you could be in trouble. The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) and the National Institute for Occupational Safety and Health (NIOSH) have standards for dust concentration, but what exposure is unsafe depends on the wood, particle size and so on (*FWW* #39, p. 36). The ASHRAE *Handbooks* (which you can find in major-city libraries, or ask an engineer friend) are crammed with information on dust control. If you're still uncertain about your dust-collection needs, ask an industrial-ventilation specialist or a sheet-metal contractor, many of whom fabricate exhaust systems.

I had eight machines that needed dust collecton: radial-arm saw, planer, jointer, tablesaw, bandsaw, stationary belt sander, drill press and shaper. I do quite a bit of industrial fume-collection design, so I dabbled with the thought of hooking all the machines up to a cyclone system with a bag on the outlet. (A cyclone separator creates two concentric helical air currents inside a cone-shaped collector. Centrifugal force separates dust and shavings from the airstream, and these settle out into a bin.) But a commercial cyclone system can cost $1500 and up, so I continued dabbling.

I surveyed my shop layout and my salvage collection, and decided that a single system would require too much piping and a larger blower than I had. So my best bet was to build three collectors: one for the planer, one for the radial-arm saw (these two machines share a separate room) and a multiple-port system for the rest of the machines. The multiple-port system (facing page) is the most complicated, so I'll describe it first.

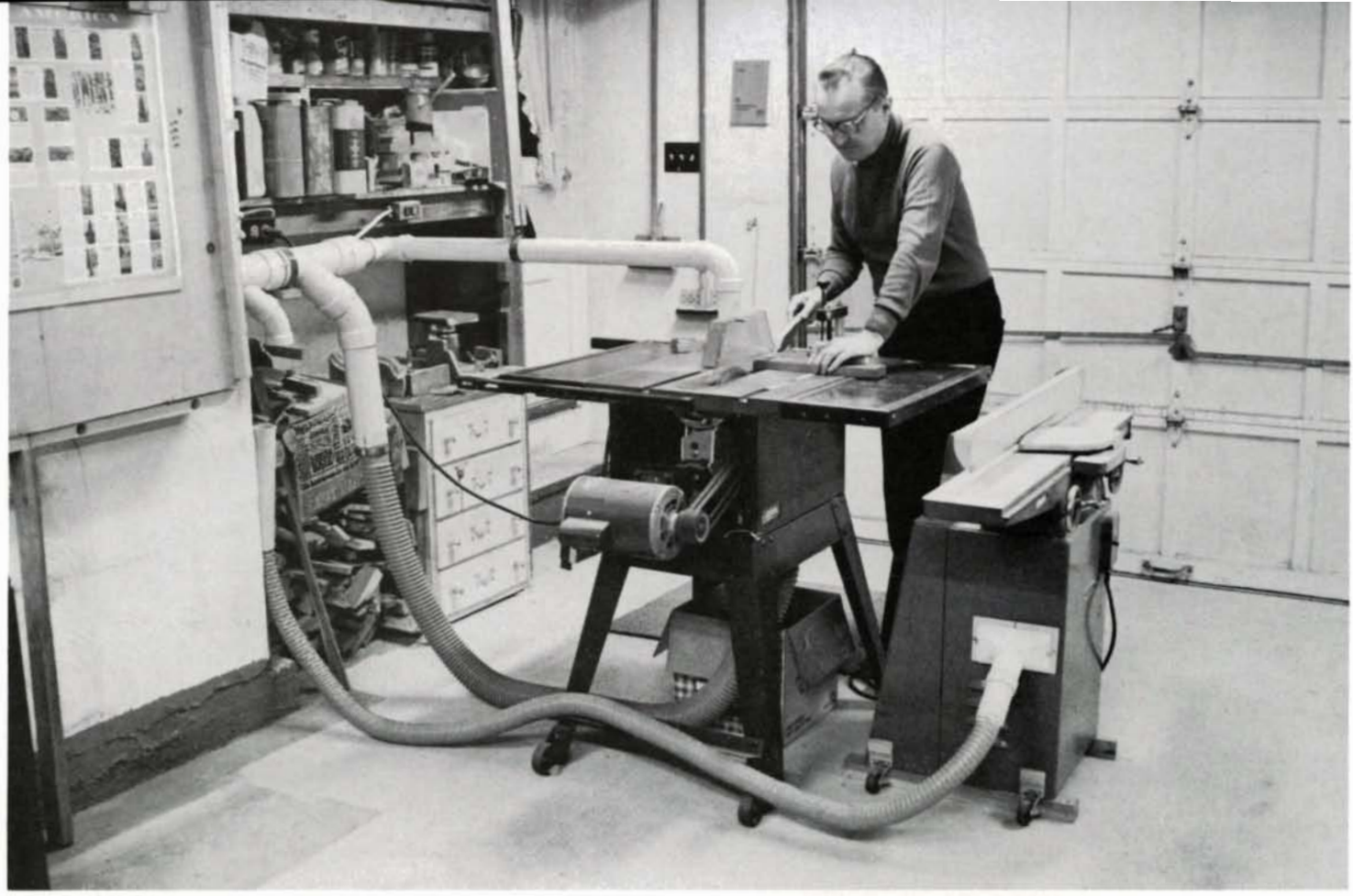
Doyle Johnson's dust-collection system (*FWW* #12, pp. 76-78), comprising PVC drainage pipe, a ½-HP industrial collector and a 55-gal. drum, was my model. My system had to move enough air to handle two ports on the tablesaw at once, and I wanted to be able to hook up a machine quickly. A used 1-HP Cincinnati Fan #10 (a centrifugal fan) that I bought for $40 fit the bill for a blower. I replaced its three-phase motor with a single-phase (a $65 unclaimed rebuild at my friendly motor-rebuilding shop) and mounted it on a 55-gal. drum. I reinforced the thin metal drum lid with ¾-in. plywood to support the ductwork, which enters on the perimeter at an angle, creating a cyclone effect inside the drum. The heavier particles drop into the drum; lighter dust is caught by a bag on the blower's exhaust.

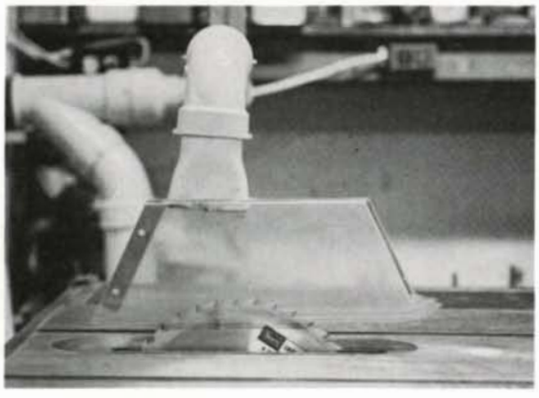
For the ductwork, I used Schedule 40 PVC pipe. (The name designates wall thickness—the higher the number, the greater the thickness. S-40 walls are about ⅛-in. thick.) S-40 pipe is readily available and isn't too expensive, and its inherent rigidity makes suspension easy. S-30 pipe is cheaper, but harder to find and the fitting selection isn't as great. (The box on p. 45 will help you figure the size blower and diameter and length of pipe you'll need.) PVC pipe glues together easily, and joints used for changing connections may be left unglued since they fit tightly. Where a machine joins the main pipe, I used an angled fitting called a sanitary-T (which is actually Y-shaped). These fittings restrict the airflow by friction losses less than right-angle fittings. You'll have to shape the pipe ends to fit some of the nozzles. PVC molds nicely when heated carefully over a gas burner, but be sure to clamp it while it cools.

Flexible tube is required for difficult connections under and around machines, but it's quite expensive, so I tried to use as little as possible. Industrial-grade runs about $1 per foot per inch of diameter in the 2-in. to 5-in. diameter range (2-in. pipe costs $2/ft. and so on). An adequate flexible tube called Ductall Vinyl costs about half as much and may be obtained from U.S. Plastics, 1390 Neubrecht Rd., Lima, Ohio 45801. It comes in sizes that fit snugly inside S-40 pipe of the same nominal diameter. You force the hose in the pipe with a screwing action, assisted by any vinyl tub-and-tile sealer to lubricate and seal the interface. I didn't bother with shutoffs or "blastgates" to block off machines not in use. I simply plugged the unused ports with bandsawn wooden plugs—cheap and effective.

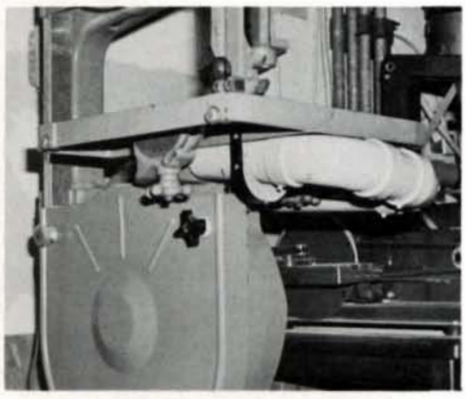
Each machine required a different sort of nozzle. I made a few experimental nozzles before I reverted to my trusty *Industrial Ventilation, A Manual of Practice* for its tried and true solutions. (The book is published by the Committee on Industrial Ventilation, Box 16153, Lansing, Mich. 48902, and costs about $15.)

Two tablesaw nozzles—one above, one below the blade—may seem like overkill, but they do a super job. Depending on the number of blade teeth, depth of cut and so on, at least half the

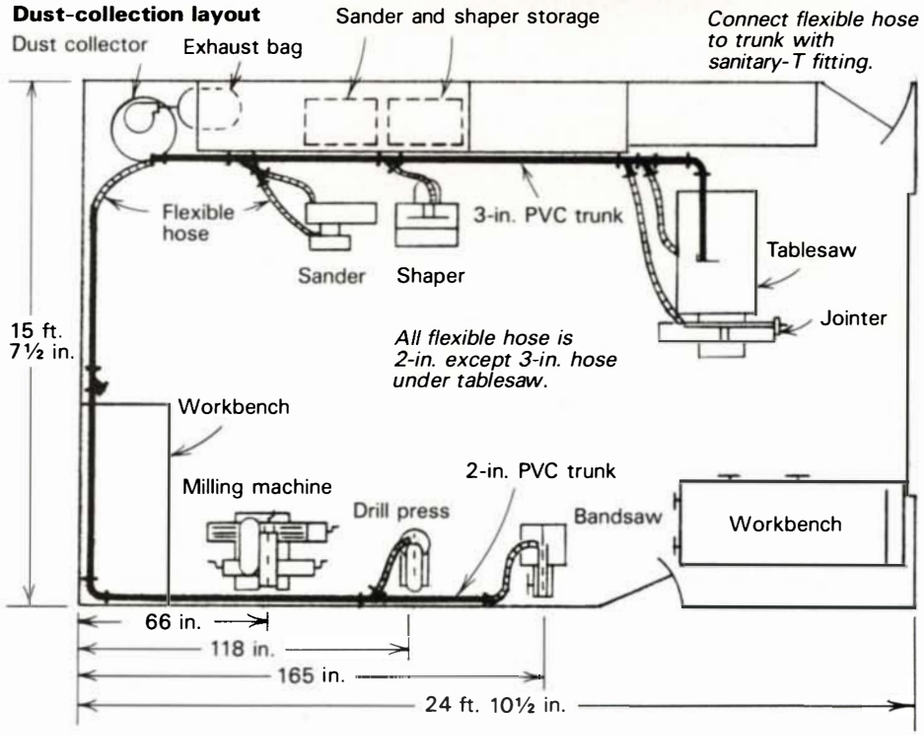


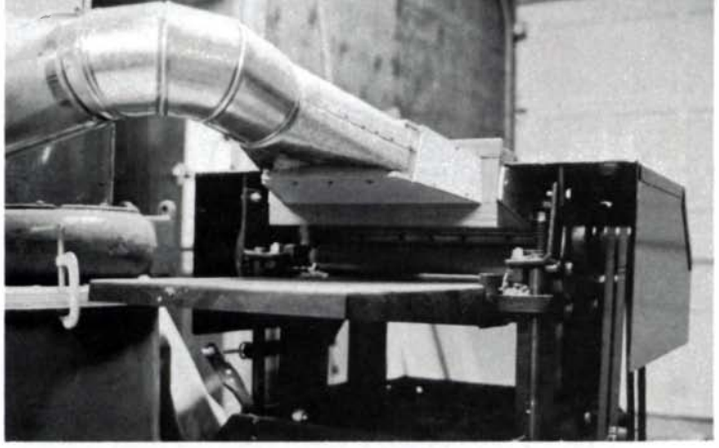


Harrison made his home-shop dust-collection system with PVC pipe, salvaged blowers and some ingenuity. The tablesaw (top) has nozzles above and below the blade. A modified vacuum-cleaner nozzle serves the jointer. The top tablesaw nozzle (middle left) is 2-in. PVC pipe shaped and bolted to a stock blade guard. The bandsaw nozzle (middle right) is PVC cut around the bottom blade guides. At the 55-gal. drum collector (bottom left), 3-in. and 2-in. trunk lines join a 4-in. PVC fitting, angled to create a cyclone in the drum.

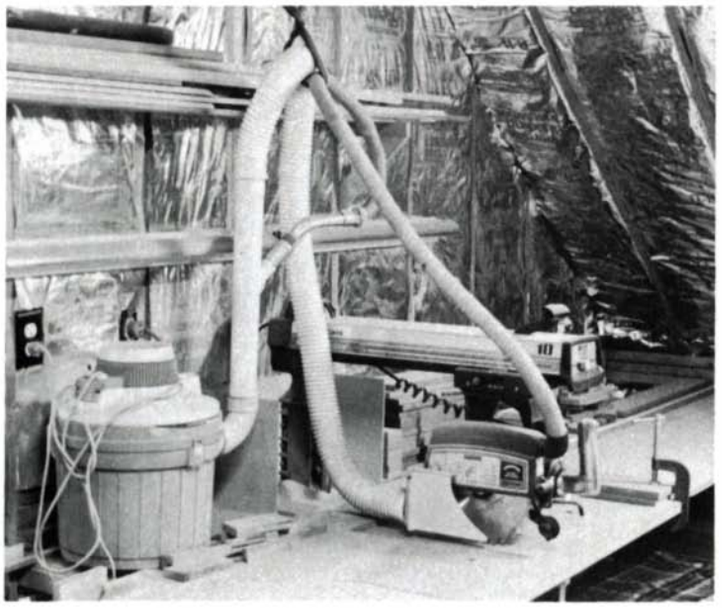


Dust-collection layout





Four-inch metal duct, a 30-gal. drum and blower service Harrison's planer (above and left). The metal nozzle is extended under the planer's cover with ¼-in. plywood. A powerful vacuum cleaner collects from the two nozzles attached to the radial-arm saw's blade guard (below). An inner tube suspends the flexible hose from the ceiling, permitting the saw to travel easily.



sawdust is thrown down, the remainder up—and in your face if you don't have a top nozzle. Mine fits into a plastic Sears saw guard, which I shortened behind the blade to reduce the volume of air exhausted. The pipe is suspended from the garage-door track (the ceiling would do, too, of course) and the height of the guard can be easily adjusted by sliding the hanger along the pipe; the joints swivel since they aren't glued.

The bottom tablesaw nozzle consists of various bits of plywood and redwood fastened to each other and to the casting around the blade. Your saw, like mine, will probably require a trial-and-error nozzle design. The important thing is to make the nozzle as compact and leakproof as possible, otherwise your blower will be doing extra duty. Remember that the nozzle shouldn't interfere with tilting the arbor or changing the blade.

Nozzles for the remaining machines on the multiple-port system were fairly simple. My 6-in. Delta jointer has an outlet in the base to which I adapted an old vacuum-cleaner nozzle. The die casting on my Sears shaper fence has a hole right behind the spindle, into which I jammed the flattened end of some 2-in. PVC pipe. Some chips escape upward, so I intend to alter the fence to accept a larger nozzle. The Sears belt and disc sanders come with nozzle attachments which work well. For the drill press, I used 2-in. PVC pipe held in place by a magnet bolted through the pipe. For the bandsaw, I cut 2-in. PVC to fit tightly around the bottom blade guides, then connected this pipe nozzle to the trunk with 2-in. flexible tube and a sanitary-T fitting.

As you can see, I kept my nozzles simple. Your machines may require different configurations. Just remember a couple of things. Try to take the shortest route from nozzle to dust storage. Make the nozzle as leakproof as possible, and position it to take advantage of the velocity of the particles imparted by the cutterhead or blade. At a distance of only one diameter from the intake pipe, the capture velocity (suction as measured by the velocity imparted to the particles by the exhaust system) drops to only 10% of its value at the intake mouth.

When you operate a multiple-port system, remember that blowers work best at their rated capacity. It is possible to starve the blower of air and make it work much harder than it needs to. My 1-HP Cincinnati Fan #10 simultaneously captures dust very nicely from the 2-in. and 3-in. inlets on the tablesaw and the 2-in. inlet on the bandsaw. If I'm working on any of the smaller machines, I still leave both tablesaw ports open to feed air to the blower. An air-starved blower will whine about its problem; if your blower sounds shrill, try opening another port.

For my Sears (Belsaw) thickness planer, I mounted an old ⅓-HP Brown and Sharpe blower on a used 30-gal. drum. A piece of S-40 PVC pressed into the ¾-in. plywood lid with tub sealer connects with 4-in. metal elbows and clothes-dryer duct. I enlarged and extended an 8-in. metal Cincinnati nozzle with ¼-in. thick birch plywood. The conventional top location didn't work well because the blower isn't quite powerful enough. Mounted behind the cutterhead, the system picks up about 80% of the particles—abysmal by industry standards, but okay for my purposes.

Serving the radial-arm saw is an old Douglas (Scott and Fetzer) wet-and-dry vacuum cleaner, well made and powerful. I made the bin-type collector suggested by Sears, but it didn't work out, so I cribbed the rig shown in the bottom photo at left from the Industrial Ventilation manual, and it works great. For ductwork to the plywood nozzle, I used the vacuum cleaner's original 2½-in. rigid wand and flexible hose. An old Electrolux hose connects the nozzle on the front of the guard to a brush nozzle (without the bristles) carefully cut into the wand. Here, the shortest route from nozzle to dust storage isn't the best. You need the suspended loop and slack for minimum drag on the saw movement. The hose is hung from an old bicycle inner tube.

How much did it all cost? Forty-plus feet of S-40 pipe with a couple dozen fittings ran about $175; add flex at $40, motor, blower and drum at $120, a dustbag for $35 and miscellaneous stuff at $25, and that totals about $395. A commercial installation using 22-gauge metal duct with the same blower capacity would run about $2,000. I had most of the components for the radial-arm-saw unit, but a good estimate is about $110. The planer unit cost me about $120.

How efficient are these systems? Because of OSHA and NIOSH regulation, industry would strive for 99% capture of all airborne particles. The system shown here captures, on average, about 90% of all particles. This is sufficient to yield a very livable atmosphere in my two-car garage shop. When I plan a multi-hour ripping session, I add my face mask for insurance. □

Bill Harrison is an engineering director for a major company and has been an off-and-on serious woodworker for 30 years.

Of pipe runs and pressure drops

Adequate dust-collection design depends essentially on matching your needs to a blower and correctly dimensioned pipe. Though expensive industrial-standard systems require elaborate calculations to achieve this, an effective small-shop setup needn't strain your wallet or your mathematics. The information here is simplified, but coupled with common sense and some trial and error in the shop, it should get you on the right track.

Start with a shop layout (like the one on p. 43), showing the position of the dust storage, blower and machines. Note which machines need one nozzle and which need two, and determine how many machines you want to collect from at one time. Check the chart at right for the cubic-feet-per-minute (CFM) extraction requirements for each machine.

The most important variables in the system are the blower capacity, the pipe diameter and length, and the losses to the system caused by friction in the pipe and other factors. A blower is generally rated by the volume of air in CFM it will move at a certain static pressure (SP), measured in inches of water. Pressure of 1 lb./sq. in. will raise water in a tube 27.5 in., and so on. (If the CFM and SP ratings aren't given on the blower, ask the manufacturer for them.) You can determine whether a blower is powerful enough by comparing its SP rating with the system losses, which are explained below. If the total losses don't exceed the blower's rated SP, it will move its rated CFM.

Velocity is as important as volume for our purposes. The recommended velocity for wood dust and chips is 3500 feet per minute (FPM). Too much below this speed and chips will settle out in the pipes. Knowing velocity and volume, you can calculate the pipe diameter you need using the formula $Q = AV$, where Q is volume in CFM, A is the square-foot area of a cross section of pipe, and V is the velocity in FPM. Reducing the pipe diameter raises velocity, but also raises friction losses in the pipe. (Obviously, the formula can also be used to determine blower capacity for given diameters of pipe.)

Let's figure a simple system with a two-nozzle tablesaw and a one-nozzle bandsaw hooked up to a blower rated 700 CFM at 4½ in. SP. Fourteen feet of 3-in. PVC pipe will run from the collector to a sanitary-T; a 3-in. flexible hose connects the T to the bottom tablesaw nozzle. The bandsaw will be hooked into the 3-in. PVC somewhere along the 14-ft. run.

First, pipe diameters. Plugging in the CFM figure from the chart for the top tablesaw nozzle and the recommended velocity gives $150 = A \times 3500$; $A = 0.0428$ sq. ft., or about 2¾-in. dia. pipe. I would push the lower limit and save some money by using 2-in. pipe. For the bottom nozzle, $200 = A(3500)$; $A = 0.0571$ sq. ft., about 3½-in. pipe. I'd use 3-in. The bandsaw calculation also yields 3½ in., but the bandsaw is a long way from the blower and big pipe is costly, so I'll settle for 2-in. pipe and live with its high friction losses. Adding the airflow requirements for each machine, you get a collection system total of 550 CFM (150 + 200 + 200 = 550).

Knowing the pipe diameters and run, let's estimate the system losses and see if the blower is up to the job. Friction losses for straight pipe and fittings are shown in the chart, expressed as a loss in inches per foot of water SP. Losses for fittings are rated by equivalent losses for run of straight pipe of the same diameter. The figures are acceptable for a small shop, but they wouldn't meet industry standards.

Industrial-system designers figure losses for every component of a system—a terrifically complicated task. You can get a good idea of a small system's capacity, however, by calculating only the branch with the highest losses, which is usually the branch with a large nozzle located farthest from the collector; in this instance, the bottom tablesaw nozzle. Using friction loss figures from the chart, and given nozzle and collector losses, you get this simplified calculation of losses in inches of water:

Bottom nozzle	(given)	1.20 in.
Bottom hose, 6 ft.	6(0.16 in./ft.)	0.96 in.
3x3 sanitary-T outlet	6(0.16 in./ft.)	0.96 in.
3-in. main pipe, 14 ft.	14(0.16 in./ft.)	2.20 in.
Collector	(given)	1.30 in.
	Total	6.62 in.

Determining nozzle and collector losses is complicated. The figures above are rough approximations for my own bottom tablesaw nozzle—a tight, 2-in. by 12-in. plywood funnel—and my collector—a 55-gal. drum, 4-in. intake fitting and blower. A smaller drum would lose less. If your nozzle and collector are different, a sheet-metal contractor might be able to help you with the calculations.

As it turns out, the blower's 4.5-in. SP rating is lower than the estimated losses. But because we're not aiming for high efficiency and the blower is rated 200 CFM greater than the load, I think it will be adequate. At worst, some dust will settle in the pipes, and the blower won't operate at peak efficiency. Increasing the pipe size will bring the system losses down. I use 4-in. pipe on my planer, but only a ⅓-HP motor, so the tradeoff there is the other way around. (The chart also gives some rough rules of thumb for matching pipe diameter and blower capacity.)

A final example will demonstrate the tradeoffs between blower capacity, system losses and expediency. My 1-HP Cincinnati Fan #10 is rated at 700 CFM at 4½-in. SP. It captures dust nicely from two 2-in. and one 3-in. inlet simultaneously. These openings correspond to a velocity of 7551 FPM, much in excess of the 3500 FPM recommended for wood dust. But numbers are deceiving. The actual velocity is much lower due to the numerous losses in the system. My sanitary-T inlets, for example, are far from ideal. Good practice would increase pipe size at every inlet and would assume how many inlets would be in use or just open drawing air only. But then, everything in life represents a compromise. —*W.S.H.*

Friction losses at 3500 FPM:

Straight pipe

4-in. pipe at 700 CFM will lose 0.14 in./ft. SP
3-in. pipe at 400 CFM will lose 0.16 in./ft. SP
2-in. pipe at 200 CFM will lose 0.16 in./ft. SP

Fittings

(SP loss equivalents in linear feet of straight pipe)
2-in. S-40 elbow = 4 ft. of pipe
3-in. S-40 elbow = 5 ft. of pipe
4-in. S-40 elbow = 6 ft. of pipe
2-in. or 3-in. sanitary-T outlet with 3-in. run (2x3 or 3x3) = 6 ft. of pipe
2-in. or 3-in. sanitary-T outlet with 4-in. run (2x4 or 3x4) = 8 ft. of pipe

Pipe and blower matchups:

2-HP blower, 1200 CFM at 6 in. to 7 in. SP—5-in. to 6-in. main pipe
1-HP blower, 700 CFM at 4 in. to 5 in. SP—4-in. to 5-in. main pipe
½-HP blower, 400 CFM at 5 in. to 6 in. SP—3-in to 4-in. main pipe
⅓-HP blower, 250 CFM at 4 in. to 5 in. SP—3-in. main pipe

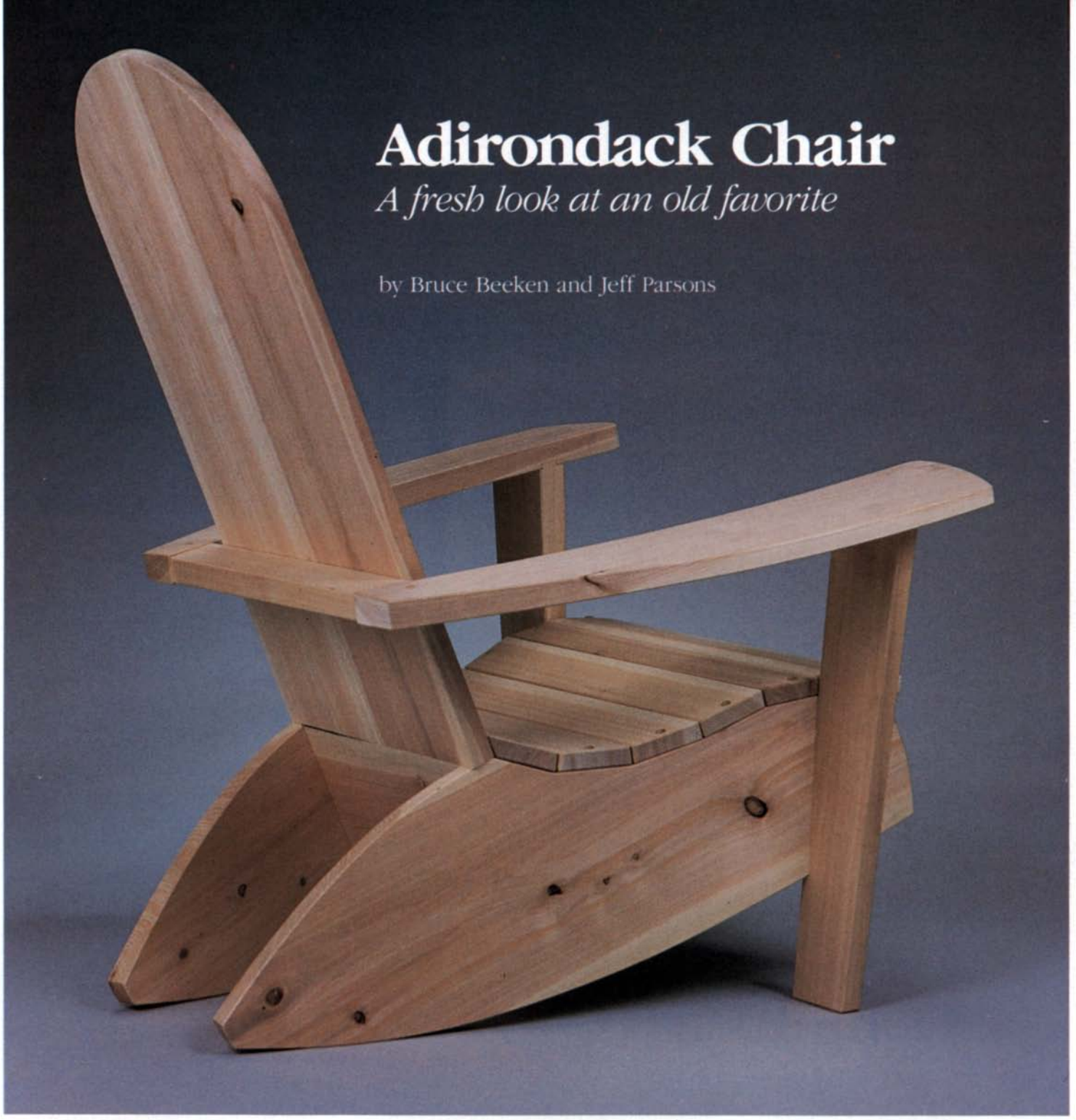
Typical exhaust volumes, CFM

Machine	Recommended industrial std.	Home-shop compromise
Tablesaw, top	300	150
Tablesaw, bottom	350-400	200
Radial-arm saw, blade guard	75-100	50
Radial-arm saw, blade back	350-400	150-200
Bandsaw, under table	350	150-200
Disc sander, to 12 in.	300	150
Belt sander, to 8 in.	400	200
Jointer planer, to 8 in.	400	200
Planer, to 18 in.	750	350
Shaper, small, ½-in. spindle	400	250
Shaper, large, 1-in. spindle	800-1,000	400-500
Drill press	300	150

Adirondack Chair

A fresh look at an old favorite

by Bruce Beeken and Jeff Parsons



Inspired by Vermont artist Janet Fredericks' painting of two old Adirondack chairs (top left photo, facing page), the authors designed their own updated version of this popular outdoor chair. Its straightforward construction lends itself to short-run production.

For nearly a century, the familiar Adirondack chair has been a part of the north-country landscape. The classic version of these carpenter-cobbled chairs consisted of nailed-together pine boards that were usually given a coat of leftover house paint. Owing to joinery that didn't accommodate wood movement, many Adirondacks soon worked themselves into kindling. Nonetheless, the chair's simple and pleasing form has ensured its popularity as an outdoor chair.

Our interest in the Adirondack chair began several years ago, at a time when we were identifying our shop's emerging goals. We were interested in designing a functional, solid-wood object suitable for short production runs. An exhibit by Janet Fredericks, a local artist whose paintings of rural Vermont life include images of Adirondacks, catalyzed the project. The chair was ideal. It satisfied our requirements and provided us with an opportunity to improve an already appealing design. The north country had contributed to our aesthetic sensibilities; by building an improved Adirondack chair, we could reciprocate and enjoy that landscape in comfort.

The first Adirondack was built by a Westport, N.Y., man in the early 1900s. It is said that he gathered his family on their lakeside lawn, where he mocked up chairs to test both seat and back angles, searching for a combination that would make the chair's flat boards comfortable. Shortly thereafter he patented the "Westport Chair," which, though popular, was notoriously uncomfortable. Despite this shortcoming and the chair's vulnerability to the weather, the design has proved to be aesthetically durable.

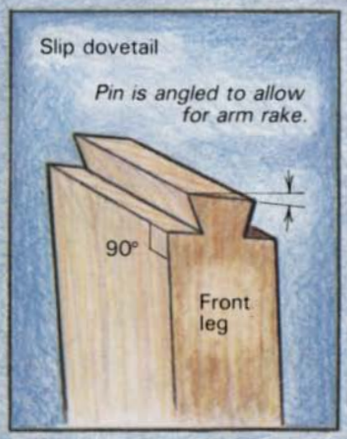
Our chair began at the drawing board. Using the comfort lines described in *Basic Design Measurements for Sitting* (Agricultural Experiment Station, Univ. of Arkansas, Fayetteville, Ark. 72701,

Photo this page: Didier Delmas

Janet Fredericks

Old Adirondack chairs were fastened with rust-prone nails, a shortcoming the authors improved with mechanically sound joints and shipbuilders' trenails.

Fig. 1: Updated Adirondack



Drawings: Lee Hov

A jig sampler

Jig making, which comprised a large part of our Adirondack chair project, underlies the success of most production runs. The chief function of a production jig is to orient the wood blank so that the part can be reproduced precisely and safely. For efficiency's sake, a jig must suit the movement of both operator and machine. Orientation of joints means that many parts must be made as lefts and rights, thus left and right jigs are often required.

We designed three basic kinds of jigs to make the 16 wooden parts for our chair: jigs for profiling, tapering and joint-cutting. The photos and drawing offer a glimpse into our approach to jig making.

The chair's curved parts—the arms, side pieces and back—were made with a series of shaper profiling jigs. Two of the arm jigs are pictured in the photos at the top of the page. The jigs themselves mimic the specific part's shape. After the blank is bandsawn to within ⅛ in. of the finished profile, the part is mounted and both jig and part are passed through the shaper. The jig's edge guides against a bearing that is part of the shaper's knife collar, and the knives crisply cut the profile in much the same way that a router flush-trim bit works with a template.

Versatility can reduce the number of jigs needed. The six seat slats, for example, were all beveled on the shaper using one jig adjusted to each slat's different bevel angle by a plywood template. Often, though, clamping and machine limitations make one jig impractical. A single jig wouldn't do the arms for us because grain direction and anchor points for the

The chair's curved parts were produced with shaper profiling jigs such as the two shown for the arms, above left. Two were needed for each arm because clamp anchor points keep the jig from being fed past the knives in one continuous motion. Parsons, above right, has bandsawn a rough arm blank and is shaping it to the final profile with the first jig. He'll mount the part in the other jig to finish the job.

Bruce Beeken

By tapering its arms and legs, the authors gave their Adirondack a lighter, more refined personality, while leaving enough wood for strong joints. Above, Parsons feeds the arm-tapering jig through the planer. The arm is tapered in three passes by raising the bed after each cut.

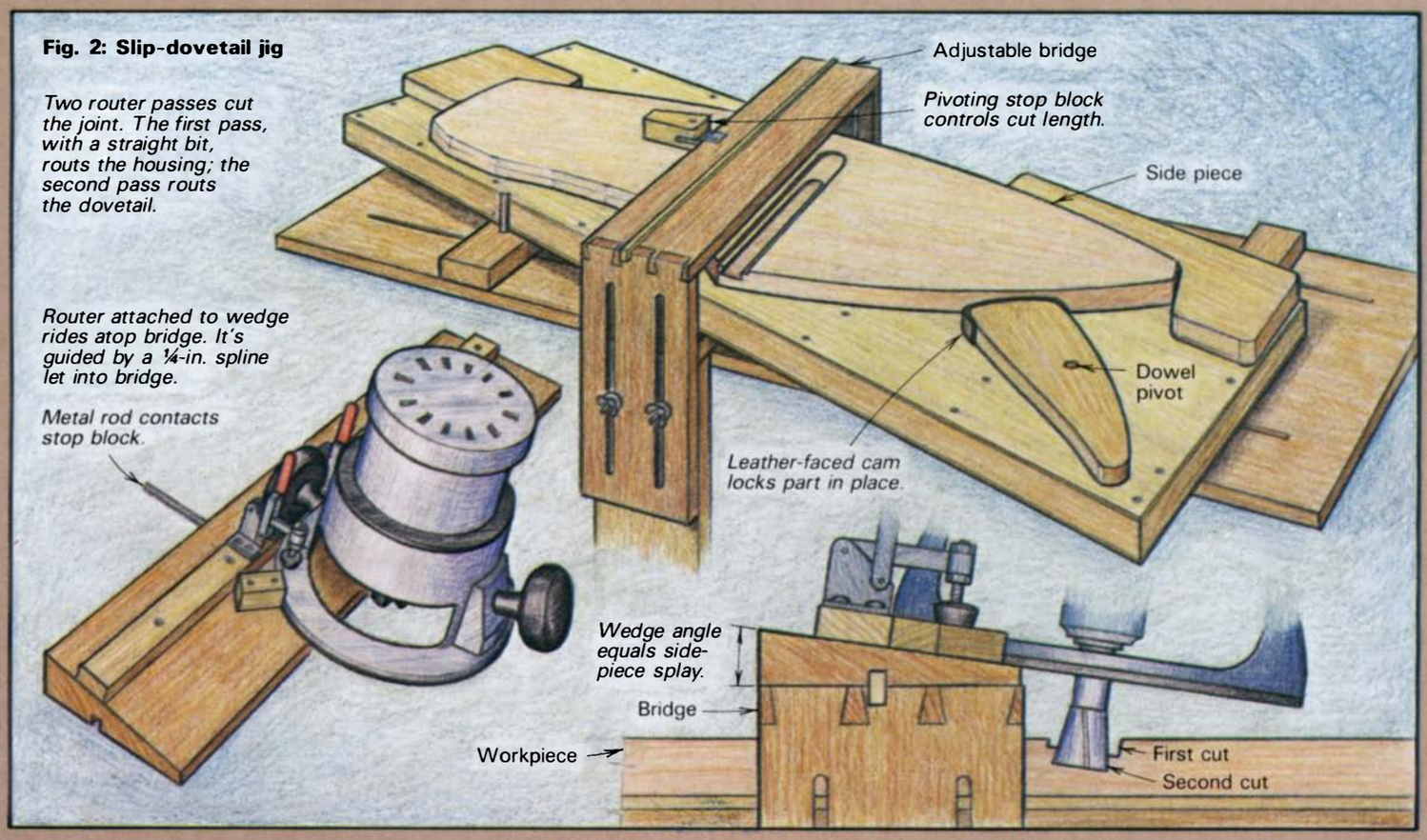
The authors' tablesaw doubles as router table, and the fence shown also does double duty. Above, Beeken uses one side of it to mill an angled dovetail pin for the chair's front-leg-to-arm joint. By reversing the fence, he can rout the straight pin for the lower back.

bulletin 616), we developed overall proportions and the shapes and appropriate cross sections of the joined parts, at the same time considering how each part could be jigged for production. At this stage, it was important to introduce design changes without compromising the character that had first drawn us to the chair.

Functionally, an outdoor chair must be comfortable for extended periods of lounging. The sitter must have enough room to stretch, shift position, or curl up with a blanket. The original Adirondack had a fairly narrow seat and wide, horizontal armrests that tended to be unsympathetic to the elbows. We solved this problem by introducing a wider seat, sweeping curves on the inside edges of the arms, and a sloping arm. The original chair's back-to-seat angle was harsh, and the low-slung seat (6 in. off the ground) made getting out difficult. Seat height should make exiting the chair a simple affair, so we raised it slightly and applied a reverse curve for comfort. The curve also keeps the occupant's back from being jammed into the back/seat intersection and the knees from being clipped by the seat's front edge.

Traditionally, Adirondack chairs were nailed together, sometimes with galvanized fasteners. The problems that such fasteners present when exposed to water are well known to boatmakers. Water wicking along the fastener into the wood causes rapid deterioration. Moisture also swells the wood, and when the wood shrinks with drying, the fasteners become loose, turning the chair wobbly. White cedar's ability to resist rot made this preferred boat material an obvious choice for our chair.

We eliminated metal fasteners entirely, substituting interlocking joints with good mechanical strength at each stress point (figure 1), pg. 47. The seasonal stress and movement about the yard to which an outdoor chair is subjected call for stout joinery at key locations, namely where the arms join the front legs and where the lower back joins the upper back and the side pieces, so we used mortise-and-tenons and slip dovetails here. To provide enough material for sound joinery, we made these components out of 6/4 stock. Where possible, we tapered the thick parts—in both length and width—to avoid visual clumsiness.



clamps prevent it from being passed by the spindle in one continuous motion. Double-spindle shapers and different mounting techniques can solve this problem. We have a single-spindle shaper, however, which spins counterclockwise. This requires jigs sympathetic to grain direction, and shaping must be done from both faces.

To give our chair a lighter, more refined look, we tapered the arms and legs in both width and length. This leaves wood where it's needed for strength and joint making, while removing it where it isn't. The bottom left photo on the facing page shows the taper jig we built to mill the compound tapers. The jig bases are torsion boxes, which are lighter and more stable than solid wood or plywood and much easier to build compound angles into.

Probably the most involved jig is the one for the angled, housed slip dovetail that joins the lower back to the side pieces. (figure 1). In tapering the side pieces, material is removed from one side only, which encourages them to warp. By housing the dovetail (which is canted to match the angle of the side pieces), we avoided a lot of exasperation in fitting.

Routing the pins for the slip dovetail was simpler. By having the bottom of one of our tablesaw's extension wings machined flat and parallel to the top, we are able to bolt a router under the wing so the saw doubles as a router table. The bit projects through a hole bored in the wing. We clamped an angled fence to the wing, then milled the pins by feeding the stock vertically past a dovetail bit. —*B.B., J.P*

Where strength wasn't as important, we pinned the parts with trenails (pronounced "trunnels"), traditional shipbuilding fasteners that are really large wooden nails. Trenails are easily turned on the lathe, but we needed two dozen per chair in two sizes, so we found it more economical to buy them from Kisly Systems Inc. (18 Pearce Ave., Manasquan, N.J. 08736). After dipping the rot-resistant locust trenails in marine epoxy, we drove them into tapered, counterbored holes in the joined parts. Shipbuilders leave their trenails proud, flushing them up later with a sharp slick. To avoid cleanup on the finished chairs, we turned a domed head on our trenails and let them project slightly.

After drawings were completed (and the jigs shown on the facing page were designed), we made a prototype, which allowed us to figure production time and provided us with a sales tool. By multiplying the prototype production time by our hourly shop rate, we were able to establish a basis for pricing the chair. To test our business acumen, we presold enough chairs to comprise a run, printed a spec sheet and included a photograph of the prototype, then sent about 30 flyers to prospective clients, architects and gallery representitives. This resulted in enough sales to proceed with the first run of 18 chairs, a number sufficient to test our economics yet small enough to minimize potential losses. When the last chair was delivered, a review of our figures revealed that a modest 5.5% profit remained after materials, overhead, labor and sales commission.

The chair project proved rewarding in several ways. We delighted in transforming large stacks of live-edged white cedar into symmetrical piles of parts. Learning new production methods introduced us to briskly paced teamwork, and the accurate record-keeping we devised advanced us into realistic business practices. The chair's success was all the more satisfying because we managed to improve a traditional design while producing a piece appropriate to our shop and its surroundings. □

Bruce Beeken and Jeff Parsons are graduates of Boston University's Program in Artisanry. Their shop is in Shelburne, Vt.

The Spokeshave

How to choose and use one

by Michael Sandor Podmaniczky

The spokeshave is a marvelous tool. Compact and comfortable to use, it can, with care, perform admirable service in a diversity of jobs. I find myself using one nearly every day for cleaning up drawknifed chair spindles, shaping and fairing curved parts, chamfering anything. . .and on and on. The spokeshave isn't without its quirks, though, and unless you learn to live with them, it's hard to get the tool working just right.

First of all, you've got to decide which spokeshave to use for which job or, if you don't have any spokeshave at all, which to buy. A glance at the spokeshave section in my favorite wishbooks reveals an armload of choices priced between $4 and $24. You could buy them all, but the collection would leave too little room in your toolkit and too much room in your wallet. Most mail-order catalogs offer several sizes of metal spokeshaves in two generic types: flat-soled and curved-soled.

As its name implies, the working face of a flat-soled spokeshave is machined flat, and apart from its extended handles, it looks and works like a plane with a very short, narrow sole. A round-soled spokeshave has a straight blade, like a plane, and when viewed from the front its sole appears flat. Viewed from the side, however, the sole is curved to a radius of about 1½ in. A half-round spokeshave is different altogether. It shows a concave sole from the front and has a blade curved along its width. A convex spokeshave is similar, but as the name implies, the sole is curved in the other direction.

Bought from a mail-order catalog or at a fortuitous yard sale, there's a spokeshave for every purpose. Reading counterclockwise from lower right: flat-soled wooden shave; shopmade convex for shaping chair seats; cooper's spokeshave; flat-soled metal with dual screw adjusters; author's favorite 9-in. Kunz (painted black); metal shave with single adjuster.

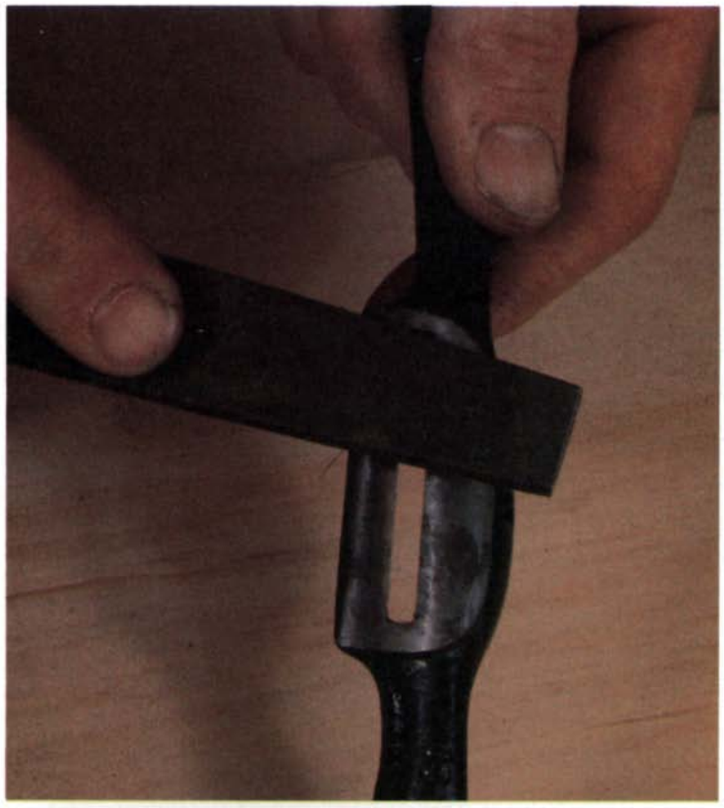
Which you buy depends more on how much you want to squeeze out of your tool dollar than it does on the kind of woodworking you do. I whittle the selection down to manageable size by first deciding what I can do without. The half-round spokeshave, meant for shaping cylindrical parts like banister rails, is useless on work whose radius is larger than that of the tool's sole. On work of lesser radius, you'll do just as well with a smooth or block plane or a flat-soled spokeshave—after all, tangent is tangent and there's no point cluttering up your toolbox with a single-purpose tool when a more versatile one will do. Combination spokeshaves are round- and flat-soled shaves married by a single handle—good in theory, not so good in practice.

A cooper's spokeshave is big and beefy, and some boatbuilders like it for wearing down the inside surfaces of heavy, sawn ship frames. I've learned to work close and accurately with the bandsaw or drawknife, then touch up with a flat- or round-soled spokeshave. Another sucker-born-a-minute tool is the adjustable-mouth spokeshave. I rarely need this capability, but if I do, I slide one or two bits of shimstock or aluminum flashing behind the blade to close the mouth down, and I'm all set. Infinitely variable settings I don't need. Fine and rank will do nicely. A chamfering spokeshave—a flat shave with two adjustable fences mounted on the sole—is as specialized as an overbred show dog and I'm happy to do without both. One word about handle styles: those gull-winged spokeshaves which look like a 1960 Chevy in retreat are not proper. Having your hands up in the air, away from the line defined by the blade edge makes it very difficult to control the tool.

So it all boils down to this: Equip yourself with two simple straight-handled spokeshaves—a flat-soled for general-purpose smoothing or shaping of flat and convex or shallow and concave surfaces, and a round-soled for working tight inside radii. If you can find one, I'd recommend an old wooden-bodied type of flat-soled shave—and I don't mean the adjustable rosewood models you see in the catalogs these days. I'm talking about one of those dime-a-dozen beechwood jobs (sometimes fitted with a brass foresole) that always turn up in junk shops and yard sales. These are light, well-balanced and compact; the only tool for getting into that hard-to-shape curve on a Windsor chair seat, just forward of the arm post. Make sure the blade has a little life left to it and that the blade tangs fit tightly enough into the wooden body to hold the depth setting.

If you can't find a wooden shave, the best metal ones also happen to be the simplest. I like the 9-in. flat- and round-soled models made by Kunz (Garrett Wade's #19P02.01 and 3.01). Besides being inexpensive, these tools have another important advantage: you adjust the blade by loosening a single screw that holds the cap iron in place, instead of by the cumbersome thumbscrews found on more expensive spokeshaves, like the Record. Screw adjusters just get in the way and, worse, they rattle. There's something evil about anything loose on a hand tool, and unless I can stop the rattle with, say, beeswax to clog the threads, I just won't use the thing. For me, using a fancy Record spokeshave is like hopping into a Delta 88 after years of driving a Rabbit. No thanks, I'd rather soup up the Rabbit.

Being an inexpensive tool, the Kunz needs some tuning. The frog, the surface against which the back of the blade bears, should be filed flat to minimize chattering. Hollow-grind the inside edge of the cap iron so it bears against the blade only along its leading edge, and set it about ⅛ in. back from the blade's cutting edge. True an out-of-flat or poorly curved sole with a file

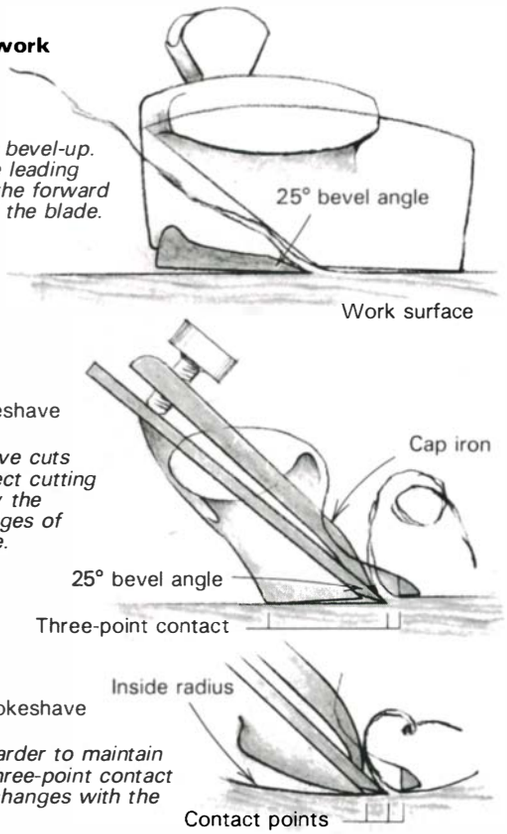


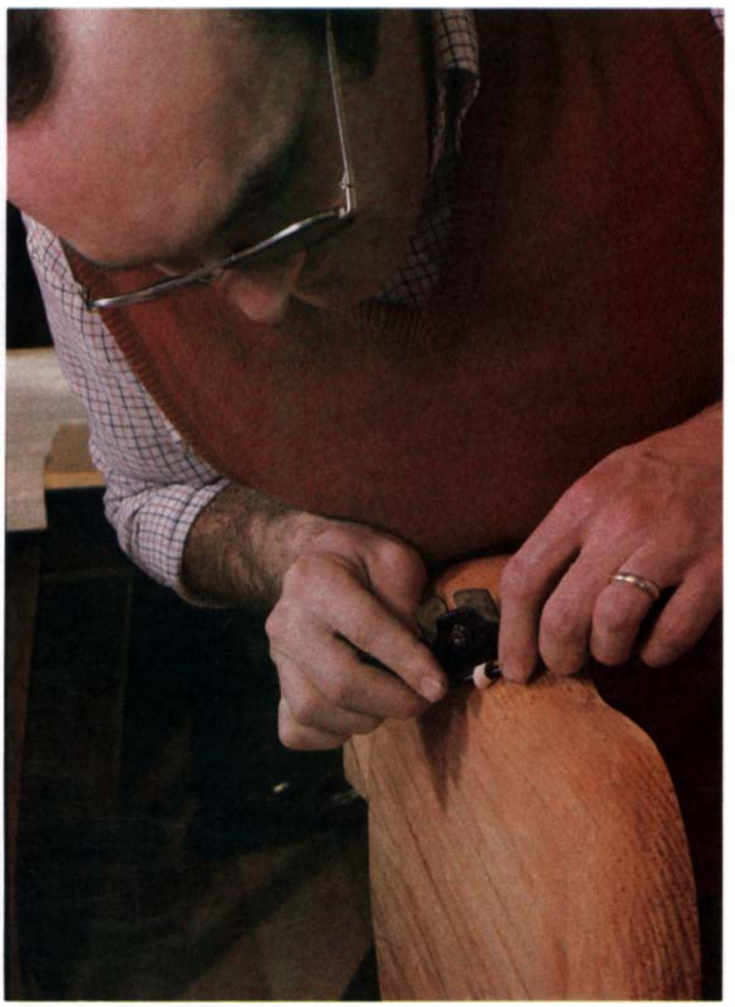
Dressing a metal spokeshave's sole with a file improves its performance. To keep it from rocking, file the sole flat across its width. The Kunz, above, has no adjusters so author ground pockets on either side of the frog. A screwdriver inserted into both the pockets and the corresponding notches filed in the blade edge aids depth-setting.

as well, as shown in the photo above. Remember, since the spokeshave rides on the leading and following edges of the sole, you'll want to file these edges straight across so the shave won't rock from side to side. To make blade setting a little easier, I ground small pockets in the casting adjacent to the blade with a Dremel tool. By inserting a screwdriver blade, which bears against nicks I filed in the blade, I can finesse the cutting depth I want.

Sharpen a metal spokeshave blade as you would a plane iron. Using an aluminum-oxide wheel, grind the bevel to about 25° or so—you don't need to get your protractor out, just eyeball it close. Next hone a bevel with a fine India stone, following that with a touchup on a hard Arkansas. A wooden spokeshave usually won't need grinding. But if it does, the metal, like a drawknife

How spokeshaves work





The spokeshave's short sole makes it perfect for shaping and smoothing curved wooden parts, such as the Windsor chair seat Podmaniczky is making here. Best results come when the blade is kept at the correct angle to the work; control achieved by pushing rather than pulling the tool.

blade, is often soft enough to file. Keep in mind that the blade pushes rather than slices through the work. This means that the blade should not have the micro-serrations left by a fine India but the polished microbevel produced by a hard Arkansas or comparable stone.

To get a spokeshave to do what you want it to, it's helpful to understand what makes it tick. Although it works like a plane, a spokeshave is really just a jig, a holder for a chisel blade. You could conceivably "plane" a surface dead-flat with a chisel, but the job would require a personality most unwelcome at an intimate evening over dinner. That's where the sole of a plane comes in. It orients the blade to the wood surface, allowing the plane to smooth a board by removing material and flatten it by bridging the peaks and valleys of the wood surface. Thanks to the plane's frog, the cutting bevel is always positioned at just the right angle.

It's not so straightforward with a spokeshave. While a plane both smooths by removing material and flattens by virtue of its long sole, the spokeshave is primarily a material remover. The sole is far too short to bridge surface irregularities of any size and is not as self-jigging, so you, the operator, have to keep the blade at the right cutting angle by holding the spokeshave correctly. As you work away with the spokeshave, you must deftly check your progress, shave some more and check again until the surface is just right. To get a consistent cut, position the tool to contact the work at three points—the sole's leading edge, the cutting bevel, and (just barely) the trailing edge of the sole. The drawing at left gives some idea of the angles involved. If you rock fore or aft on the sole, the cutting angle will be wrong and the spokeshave will skid over the wood instead of cutting. A wooden spokeshave works a little differently: since it cuts bevel-up, the forward portion of the back of the blade, rather than the sole, serves as the reference surface. To get the right feel of either type, you'll have to sharpen the blade and try it.

I sometimes pull my spokeshave for various reasons, like grain direction or body position (I ***hate*** standing on my head while working at the bench), so I'd never say don't pull, but these tools are designed to be pushed. And with just a little practice, you'll get far greater control by pushing. A nice feature on some spokeshaves are the cozy little thumb rests on either side of the frog. Fingers need not be wrapped around the tool handles. If the surface being worked is quite broad and one or both handles don't hang out over the edge, grab whatever is comfortable around the frog and cap iron with thumb and forefinger and push on the handles with the palm of your hand. Since ***proper*** handles are straight in line with the blade edge (***not*** gull-winged, up and away), even without a firm hand grip, there is no tendency to roll or trip up. This grip is really helpful with round-soled spokeshaves, as they can be friskier than the flat ones.

If, no matter how you hold it, the spokeshave skids without cutting, either the blade is dull or it isn't set far enough below the sole to pull a shaving. Raise the blade a little if your spokeshave digs in and stops cold. Don't give up in frustration if the tool misbehaves at first. Starting off with the right tool, setup and procedures for use will eliminate most of the hangups that could discourage you from using it. As time goes by, you'll develop quite an affection for that versatile little fellow who lurks down in the corner of your toolbox. □

M.S. Podmaniczky is a professional woodworker and boatbuilder who lives in Thomaston, Maine.

Drawing: Kathleen Creston

An Oil and Varnish Finish

by Lothar Baumann

I mill a lot of my lumber from walnut logs and crotches, and can control the figure in the wood according to how I cut it. When I've uncovered a really fine feather figure, I go to the trouble of stretching it; I resaw the block several times, bookmatch the grain, and veneer the best looking wood over solid walnut for wall-cabinet doors and other furniture. When I've finally gotten a piece made, I aim for a finish that brings out the hard-won feather to best advantage.

Oil is my favorite. It penetrates the wood and makes the most of the wood's ability to reflect and bend light, creating depth and allowing the figure to shimmer. But a lot of my customers don't want pure oil—they grew up with durable polyurethane, and won't settle for anything else. Combining oil with polyurethane gives some of the benefits of both. The idea isn't new, and lots of people have different ways of mixing and applying the blend. I've settled on a system that takes more work than a lot of people seem willing to go to, but the results are worth it.

First, I sand the raw wood smooth, working up through progressively finer grits until I reach 220- or 240-grit garnet paper. In theory, each grit scratches the surface efficiently and uniformly, and the next grit size removes the first set of scratches, replacing them with slightly finer ones. You use one grit, say 100- or 120-grit, to remove major machine marks, fuzzy grain and other irregularities. (I use a 4-in. by 24-in. Makita belt sander, but occasionally turn to a hand plane or scraper.) You sand until the wood is completely even, then move up to the next finer paper, 150-grit, and sand until the first set of scratches is gone and the surface looks even. Work through the remaining grits in the same manner. If you skip grit sizes or start with too fine a paper, you'll waste a lot of time. Even worse, flaws you thought you'd sanded away will reappear in the finish. This whole initial-preparation process shouldn't take more than half an hour for a pair of cabinet doors.

Sandpaper is a precision tool and deserves to be taken seriously. Each piece of grit is bedded in a layer of adhesive that holds it to the paper backing and exposes just so much cutting edge. If you tear or fold the paper, you'll break into the layer of adhesive and expose more cutting surface than was intended on the grit particles along the edges, putting yourself back a grade or two if the edges hit the work. Grit can also become dislodged from the paper, and if you don't dust the wood between grits you can end up with wrong-size scratches that will mar the pattern. If this happens, it's best to resand with the previous grit. People who use power sanders often complain about swirl marks on the wood. These may not be the machine's fault, but the result of loose grit left on the work.

Beware of buying cheap stuff. I got a bargain on some paper not too long ago and bought hundreds of sheets, but I discovered that the 220-grit is full of larger particles that make the paper useless; it's too fine for coarse work, and too scratchy for finish-sanding.

I don't usually stain the wood because it already looks the way I want it to, nor do I apply fillers—the finishing process fills the pores as much as necessary. When the surface has been taken to 220-grit dry, I apply clear Watco oil as a primer coat, rubbing it in with 220- or 280-grit wet/dry paper wrapped over a block of Celotex. The Celotex distributes the pressure just as a cork block would, but it's cheaper. When saturated with the oil mixture, Celotex becomes spongy and may disintegrate. If you set aside damp blocks and allow them to dry, they will become harder and more durable. When I feel the sandpaper begin to slip on the wood instead of biting, I know that it's almost finished its job and that most of the 280-grit scratches are gone. I switch up to 320-grit and sand again, then repeat the process with 400-grit and 600-grit.

The wet-sanding produces a slurry of wood dust and oil, which is forced down into the pores. I wipe the slurry off the surface before beginning each new grit, but leave the 600-grit slurry on the surface until it begins to thicken. Then I wipe the wood across the grain until it's almost dry and set it aside for the oil in the remaining slurry to dry completely. This takes about three days in hot weather and up to a week and a half in the winter, when it's cool and damp. One test for dryness is to put the work briefly in the sun or near a heat source; if it bleeds oil, it's not ready yet.

When the oil is dry, remove the slurry film with steel wool, working in the direction of the grain. Polish the wood to remove any oil residue from the surface. If the surface quality is uneven, with dull spots where the oil has been absorbed, apply another coat. Work it in with 600-grit paper, sanding with the grain. Wipe off the excess with paper towels and let this coat dry. If you are determined to completely fill the pores, you can sand again to build up a slurry and let it dry again on the wood, repeating until the surface is flawless. I don't mind a few open pores because they keep the wood looking like wood.

I complete the process by applying an oil-and-varnish mix. The mix is 3 parts polyurethane, 2 parts boiled linseed oil and 2 parts mineral spirits, applied with a rag. I usually sand-in the first coat with 600-grit paper, just a little—too much sanding at this stage will only open up new pores. I apply two or three coats, although I have used up to eight, wiping each coat clean and almost dry, and allowing drying time between coats. I don't sand after the first coat unless there's an imperfection that I overlooked earlier. I have used several commercially prepared tung-oil mixtures, such as Hope's, Gillespie's and Formby's, instead of my oil-varnish mix, and they work equally well. The sanding of the finish into the wood seems to be the critical factor to obtain the results I want. Applying the top coats of finish takes time, but you can't call it much work. It's more like a reward for all the preparation that went into getting the wood ready for it. □

Lothar Baumann is a woodworker in Berea, Ky. He uses the same finish when he works on the lathe.

As you turn a hollow log into a bowl, the open sides become a blur through which you can watch the tool at work.

Turning Mostly Air

Finding the hidden shapes in rotted logs

by G.A. Goff

Did you ever find a piece of wood with just the right color and spalting pattern, only to be disappointed because it was rotten through the center or sides? Me, too. I just couldn't bring myself to throw these chunks away or burn them, so I eventually ended up with a lot of them lying around. Finally, I figured out a way to turn them on the lathe.

I had been turning hollow vessels for years, making just enough of a top opening to work the tool through and get the sawdust out. One day, while turning a block that had a hole in its side, I noticed that the sawdust flew out the side, which kept the cavity clean. I could also look through the hole as the wood was spinning to watch the tool work. I became curious as to how large a hole or combination of holes a turning could contain and still hold together. After breaking a few and learning from my mistakes, I soon found that I could relatively easily turn shapes that were 50% air around their circumference. I was soon pushing some turnings toward 80% air and 20% wood.

I never intended these vessels to have any functional use, or even be a recognizable anything. I just wanted to see how far I could go. And yet, the wood is beautiful. It has character: spalting, hole patterns caused by termites, ants and grubs, and other discolorations and holes from insects, fungi and bacteria. To me, such wood is unsurpassed for natural beauty.

The turned shape is very much determined by the piece of wood you begin with. To turn one of these blocks, I first look for an area solid enough to attach to a faceplate, then I try to visualize what will result when the block is turned. Will it hold together? Will it stand without tipping over? Many details of the final turning will only be revealed along the way, but you have to consider structural soundness from the beginning.

This 11-in. dia., 4-poster bowl was turned from a hollow cherry log. The process is shown in the photos on p. 56.

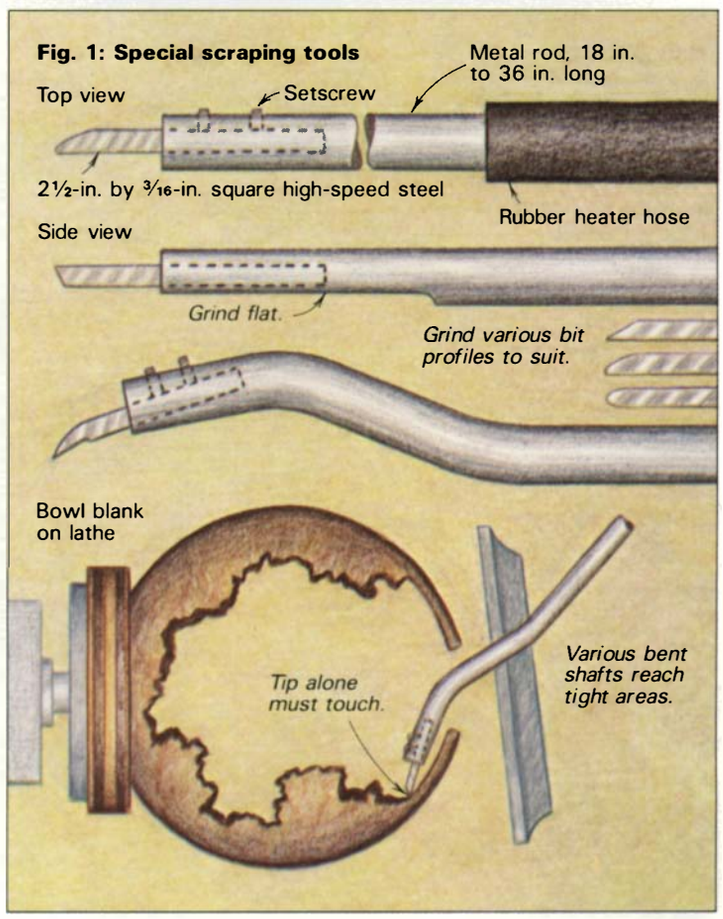
The job calls for special tools. Conventional gouges and chisels work with the bevel riding on the wood, acting as a fulcrum to control the depth of the cut. With open turnings, however, if the heel of the tool rides the wood, as soon as a hole comes by, the tool falls in, and the piece breaks. Some of my early turnings broke at ½ in. thick. To get around this problem, I've made the scraping tools shown in figure 1.

I call one bowl style, shown in the photo above, a 4-poster. The one pictured was turned from a hollow cherry log, in the same manner as the chinaberry one shown on p. 56. The log was 8½ in. in diameter, and the finished bowl is 11 in. in diameter. The bowl has a 34½-in. circumference, and the four posts contain a total of 6¼ in. of wood. That's about 18% wood, 82% air.

To mount a 4-poster block, I make a flat side on the chunk and epoxy-glue a ¾-in. plywood block, which I then screw to a faceplate. I turn between 430 RPM and 575 RPM. If the speed is too slow, the tool must wait too long before the wood comes back around; if it's too fast, the centrifugal force will move the wood out of the way or, worse, cause it to fly apart. Don't try this work without face and head protection.

Experience is important, so be prepared to break a few blanks. With each failure you will learn what speed is too fast or too slow, the best shape for the tools, and how much open space to try for. You will also develop the right touch. By sound and feel, you will know when to back off and change something.

Turning the outside is straightforward and relatively easy. Sometimes I lose a blank at this stage because of some hidden

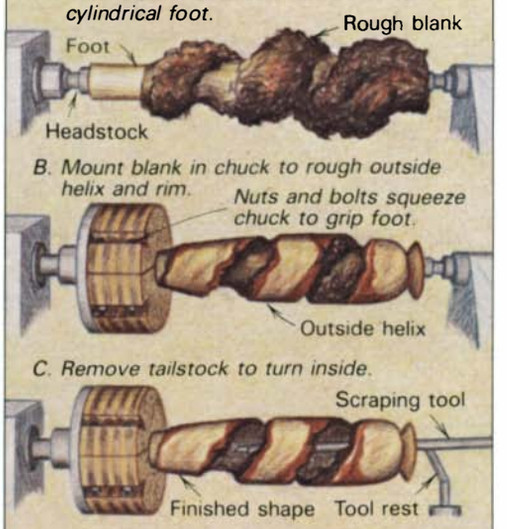


Drawings: Lee Hov

Turning a 4-poster

A 4-poster begins as a hollow log mounted on a faceplate (above). When the ends of the log have been roughed round (top right), they show the curves that will become the four posts as the inside is turned. To stabilize the wood for inside turning, Goff runs nylon filament tape up the posts and around the blank (left). Notice that the mouth opening has been scribed but not yet cut. The photo on p. 54 shows inside turning in progress, and the photo below shows the result. The wood is chinaberry.

Fig. 2: Turning a twistee



A helix from vine-choked hickory.

defect, but mostly it is just like the early stages of roughing down any irregular blank. As I gradually make the log round, I check that the four posts are symmetrical. If they're not, I shift the blank a little on the faceplate until things are working out right.

When it comes time to turn the inside, I reinforce doubtful wood with nylon filament tape—for a 4-poster I run strips up each post. Then I make a complete circle around the middle of the four posts. This causes the other three posts to add some support to the one being cut. I reposition the tape as the turning progresses. It's important not to distort the flexible posts when first applying the tape, or when repositioning it. Otherwise when you restart the lathe, the posts won't be in the same relative positions, and therefore won't be cut uniformly.

To start the inside, I either drill a hole or just cut through to the rotted inside with the cutting tools. The opening in the 4-poster on the facing page is 1⅜ in. in diameter. I then work down in shallow increments of ¼ in. to ½ in. at a time. As in other turnings, this allows the lower material to support the portion being cut. It's important to get the post thickness right before moving lower, as there will be no support if you try to move back up to touch up a thick spot. I find it necessary to turn the inside in one sitting. If the work is left overnight, even the least amount of warping will cause enough distortion to throw the posts out of line.

Another shape, which I call a twistee, is a helix. The lower right photo on the facing page shows one of the first I made. The stock isn't from rotted wood, but from a branch or small tree trunk with a vine wrapped around it. Over the years, the shape gets more and more pronounced until the tree finally grows back over the top of the vine. Finding trees with the most pronounced helical bulges is the first step in turning a twistee. I look for sections about 5 in. in diameter and 14 in. long.

I mount the wood between centers, as shown in figure 2, and reduce the headstock end to 2 in. in diameter, forming a round tenon that fits a shopmade plywood chuck. With the blank in the chuck, I support the other end with the tailstock so I can reduce the outside with the scraping tools until I have a clean band of wood spiraling from the base to the rim.

After the outside is done, the fun begins. I remove the tailstock and position the tool rest at the top of the vase. Then I turn through the top opening as before, but without the reinforcing tape—there's nothing to attach it to.

One problem is gauging the thickness. When I first began turning air, I liked being able to see the tool on the inside. But as I got to pieces with less and less wood, it became difficult to see exactly where the wood was. The effect is similar to watching a ceiling fan, where as the speed increases, the blades become a blur. Once—when turning the twistee shown in the photo—I had the uncanny experience of having the wood seem to disappear. I could see the top of the vase, with the tool shank entering it, and I could see the tool tip itself perfectly well, but the middle of the turning was completely gone. It seems that I had reached the point where 90% of the circumference was air; I *very* carefully finished it.

Sanding on both the 4-poster and twistee is done with the piece stationary. I begin with a grinder, then a drill. Next I hand-sand, using the sandpaper to work oil into the wood. This helps to seal the pores with the sawdust and to penetrate and toughen the wood, adding strength that is greatly appreciated by those who handle these delicate turnings. I have tried many oils, but the thickest and stickiest I've found—and the toughest when dry—is called Val-Oil, made by the Val-Spar Company in Stone Mountain, Georgia. The oil, usually four to six coats, is sanded in with wet-or-dry paper, from 100-grit up to 320-grit. The outside surface gains a fine luster, but I frequently leave the tool marks on the inside. Skeptics sometimes need to see them before they will believe that the piece was turned.

This 7-in. dia. birch bowl was turned from an asymmetric hollow log with one open side. The author frequently prowls the woods in search of such potential gems. The trick is to imagine what curious shape lies hidden in a rotten log.

A 4-poster bowl from spalted apple, about 11-in. dia.

All the wood I use is found, and part of the adventure is hunting through the woods with a hatchet, gently using it to probe the downed logs, looking for something that seems substantial. I have used about 35 different native southern species. Sometimes the logs are so far gone that it is difficult to tell exactly what wood I have in my hand.

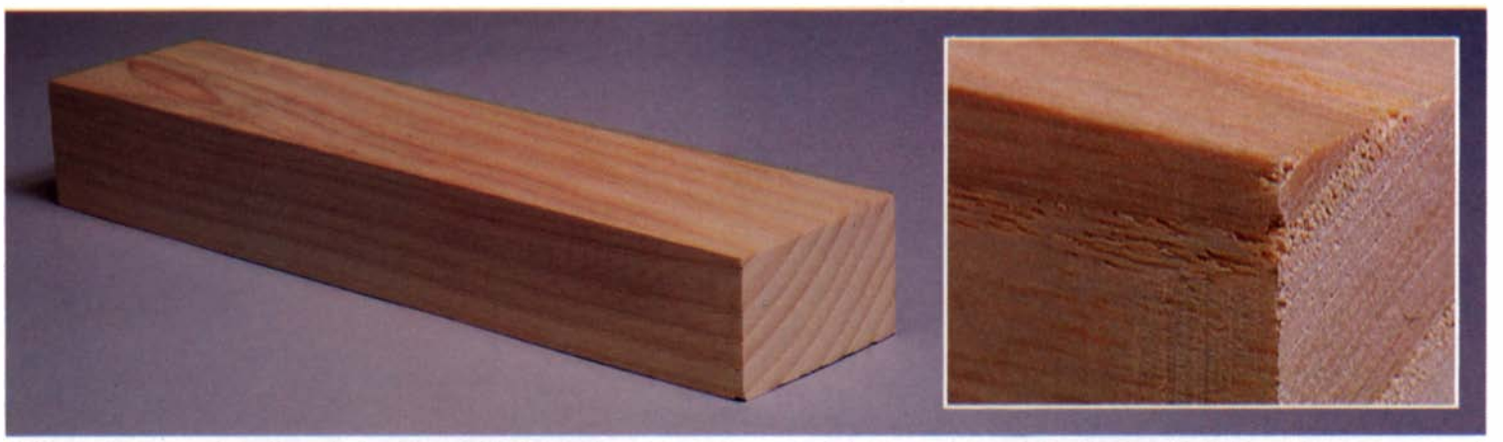
Be forewarned that this sort of turning can have its unnerving aspects: Once, I stopped the lathe to reposition the tool rest, an operation I'd done five or six times already, and a scorpion jumped out and took off across the table. I was so stunned that I simply stood there and watched him scamper away. Scorpions, centipedes and black widow spiders all seem to like this sort of wood as much as I do. □

Gil Goff's shop is in Athens, Ga. Photos by the author.

What Does "Grain" Really Mean?

Some seventy meanings clarified

by R. Bruce Hoadley



What we commonly call grain is the result of exposing the tree's annual rings on the surface of a board. With a ring-porous hardwood such as ash, the large earlywood cells are sliced lengthwise, resulting in bands of distinct lines.

Seldom can a discussion about wood get far without the use of the word "grain." Yet grain is such a versatile word that its many accepted meanings are often confusing, and sometimes even contradictory. A woodworker who says "I don't like the grain of that board" could be talking about any number of things. Most likely, he means the board's *figure,* the visual pattern on the board, but he could also be talking about the *slope of the grain* (too much slope weakens a board), or about the way the board grew in the tree—a luthier, for example, senses that an *edge-grained* piece of spruce is stiff enough for a guitar top, a *flat-grained* piece isn't.

Here are some seventy phrases involving specific meanings of the word grain. They are all the result of two variables: the way the tree grew and the way it was sawn.

Planes, surfaces and direction—"Grain," first and foremost, commonly designates the alignment of the longitudinal cells that comprise the bulk of wood tissue, as shown above. ***Grain direction*** is a better term when used in this sense. We speak of wood splitting ***along the grain*** or ***with the grain,*** meaning parallel to the fibers; ***across the grain*** means generally perpendicular to the fibers. Surfaces cut parallel to the grain direction are called ***longitudinal grain*** or simply ***long grain,*** as opposed to ***end grain,*** which is the surface perpendicular to the fiber direction.

Grain can also refer to the position of the growth rings with respect to both the plane of cut and the appearance produced. For example, a tangential surface—parallel to the growth rings—is said to have ***tangential grain.*** This term is also applied to boards whose widest surface has this orientation. Synonymous with tangential grain are ***flat grain, plain grain*** and ***slash grain.*** If the surface is perpendicular to the growth rings, it is said to have ***radial grain,*** that is, the wide face of the board was oriented on a radius of the tree stem. ***Edge grain, vertical grain*** and ***quarter grain*** are flexible terms, but they all represent grain that is more radial than tangential.

Obviously, boards can be cut with varying degrees of grain orientation. In commercial lumber, ***flat grain*** includes boards with growth rings oriented at angles of 0° to 45° to the wide face; ***edge grain,*** 45° to 90°. ***Bastard grain*** indicates that the growth-ring placement is clearly neither flat grain nor edge grain, but somewhere in the 30° to 60° range. ***Mixed grain*** refers to a quantity of lumber that includes assorted edge, flat and bastard grain in any combination. ***Side grain,*** as the opposite of end grain, can mean any of the above long-grain surfaces, and it sometimes indicates, confusingly, flat grain only. In boards or panels, the better of the two surfaces is sometimes referred to as ***face grain.***

It is generally assumed and expected that the grain direction is parallel to the long axis in boards, dowels and turnings. Such pieces are said to be ***straight-grained.*** Deviation from this ideal is termed ***cross grain.*** The degree of cross grain is expressed as ***slope-of-grain.*** A slope-of-grain of 1 in 12 indicates that grain direction deviates 1 in. away from the board's axis for every 12 in. along the surface. Severe cross grain is called ***steep grain,*** and pronounced deviation from the surface plane, especially in veneer, is called ***short grain.*** When the axis of a board is not parallel to the growth rings, the result is called ***diagonal grain. Dip grain*** indicates an undulation in the grain direction, as typically occurs in the vicinity of a knot.

A board may be cut straight along the axis of a tree, but grain direction in trees is not always straight up and down. For example, within a straight stem, the fibers may have a helical alignment, referred to as ***spiral grain.*** Any board sawn parallel to the stem (or log) axis will likewise have spiral grain. In some species the stemwood has spiral grain that alternates cyclically from right to left, producing ***interlocked grain.***

Various other characteristic patterns of distortion in grain direction can develop in the tree. These result in distinctive patterns on machined surfaces. For example, ***curly*** or ***wavy grain*** produces a washboard surface when split radially, and the barred visual effect produced when the wood is machined smooth is also called curly or wavy grain. In maple it is sometimes called ***tiger grain,*** or ***fiddleback grain*** because of the traditional choice of such wood for the backs of violins.

Grain and figure—If we are speaking primarily of fiber orientation, as we have been, "grain" is the word to use; if we are referring to the wood's surface appearance, it is more meaningful to use the word "figure." The following grain patterns produce characteristic figures when the wood is surfaced.

Intergrown cell structure in the crotches of forked trees is called ***crotch grain.*** In certain species, such as black walnut, if the crotch is sawn down the middle into two Ys, the pattern is aptly called ***feather grain.***

Bulged or bumpy growth layers are called ***blister grain,*** and produce blister figure when sawn tangentially. If the blisters grow elongated rather than round, the grain is called ***quilted. Leaf grain*** and ***flame grain*** are somewhat showy tangential cuts resembling their namesakes.

Sometimes wood grows in localized tight swirls and dimples. In maple, ***bird's-eye grain*** results. When a piece of bird's-eye maple is split tangentially, one surface will have numerous little peaks, and the other will have corresponding craters. When surfaced, the figure resembles lustrous, deep eyes. ***Dimpled grain,*** characteristic of lodgepole pine, splits similarly. Another spot-like figure occurs in burls, a result of dormant-bud proliferation.

Interlocked grain, surfaced radially, results in bands of light and dark that shift back and forth with changes in light direction. The resulting figure may be called ***ribbon*** or ***stripe grain.*** Roe figure is similar, and the grain, also interlocked, may be called ***roey.***

More properly called "figure," some "grain" depends on the characteristic patterns produced by the rays when the tree is cut radially. When the ray flecks are conspicuous or particularly lustrous, the wood is called ***silver grain. Rift grain,*** occasionally called ***needle-point grain,*** is produced on a longitudinal surface oriented 30° to 45° to the rays, the term being used especially for white oak with its large rays; the term ***comb grain*** is used where the vessel lines are parallel to the board's edge and produce a uniform pencil stripe.

Grain and surfacing—When wood is being planed, it tends to split ahead of the cutting edge. On a board with cross grain, the splitting will follow the direction of the fibers, either running harmlessly up and away from the surface or running troublesomely into it. Thus we prefer to plane ***with the grain*** rather than ***against the grain.*** If we go wrong, ***chipped*** or ***torn grain*** results. In most wood with a pronounced figure, wood fibers are intergrown in various directions or at steep angles. This is why figured wood is more difficult to work.

When flat-grain surfaces at a high moisture content are machine-planed, or when knives are dull, denser latewood may rise above adjacent earlywood. This surface unevenness (which is most pronounced on the pith side of flatsawn boards of uneven-grained softwoods) is called ***raised grain.*** If the growth rings actually separate, ***loosened*** or ***shelled grain*** results. When we saw or plane wet wood, or hardwoods with reaction wood (tension wood), the fibers may not cut cleanly, and the frayed, fibrous surface that results is called ***fuzzy*** or ***woolly grain.***

Earlywood and latewood—Visual contrast between earlywood and latewood is expressed as evenness of grain. Southern yellow pine and Douglas fir thus have ***uneven grain*** because of their distinct growth rings, while basswood has ***even grain,*** because its growth rings are barely discernible. In softwoods, visual contrast parallels workability—an uneven-grained carving block usually means jumpy cuts.

In describing growth-ring width (rate of growth), as in structural grading of lumber, narrow rings are termed ***narrow grain, close grain, fine grain*** or ***dense grain.*** Wide rings are described as ***wide grain, open grain*** or ***coarse grain.*** To add to the confusion, similar terms are often used to indicate relative cell size or permeability. We hear the terms "open-grained" and "coarse-grained" used to describe woods that have large cells and absorb finish readily, but the term "texture" is preferable in reference to relative cell size. Woods with large cells should be called ***coarse-textured;*** woods with small cells, ***fine-textured.*** Much of the confusion about grain can be avoided by using clarifying adjectives or by substituting a more appropriate term such as texture, figure, or growth-ring placement. For example, following popular usage, one might be tempted to describe a given piece of ash as being both close-grained (if growth rings were narrow) and open-grained (because of its large pores). It would be better to describe such wood as "slow-grown" and "coarse-textured."

Other miscellaneous uses of the word grain appear from time to time. Some are doubtless local in origin or use. ***Short-in-the-grain,*** for example, has been used in Britain to describe wood prone to brittle fractures. When an individual is lacking a specific term to describe a particular aspect of wood, the word grain is readily pressed into service to fit the situation at hand. An ambiguous term such as ***tight grain*** might be used by the cooper in reference to white oak (whose "water tightness" is due to tylosis-filled vessels), by the ébeniste in reference to maple (based on its fine texture), or by the violinmaker to describe fiddleback figure (where the bars are closely spaced). Various other uses seem to have been coined to fit the situation at hand—one reads of clear grain, wild grain, swirly grain, variegated grain, or grain character; these terms have little specific meaning to me. I've also heard people say, "The grain runs a bit," and "The grain is heavy." I'm not sure what these statements mean, either.

Getting to the end of my list, there is ***graining,*** which is the texturing or painting of surfaces to imitate natural texture or figure. At its best, graining is a fine art; on the other hand, the plastic cabinet on my TV set warns of "simulated wood-grain design," and I suppose this is part of the category, too. Other meanings of grain get us away from wood, and concern themselves with cereals, weight tables, and beaches. I suppose I've missed a few, but for now the thought of inventing any more uses for this overworked word sort of . . . well . . . goes against *my* grain. □

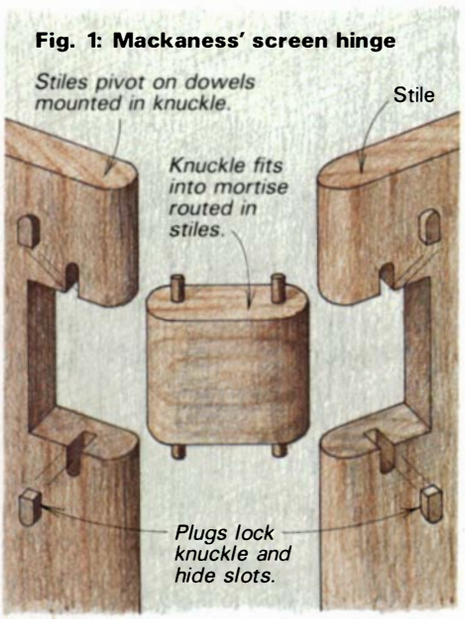
R. Bruce Hoadley is a contributing editor to FWW. *An excellent pamphlet,* Figure in Wood: An Illustrated Review, *is available from Research Information, 101 Comer Hall, Auburn University, Ala. 36849 ($2.00 ppd.).*

Making Room Screens

A wooden hinge for every purpose

by Steven Mackintosh

Fig. 1: Mackaness' screen hinge



Mackintosh's first screen, left, has a no-show back because slots routed into the frames for the knuckle hinge (drawing above) are visible from the rear.

I don't really know why I got interested in making room screens, since they seem to be the antithesis of the kind of woodworking I'd been doing for several years. I had resolutely tried to design furniture that people would want to *use* every day, not just look at, and a screen is something you can't sit on, store things in or eat dinner at. But after I had made one screen, I found myself making another, and another, and another. Each was an attempt to solve a design problem whose dimensions kept growing with each apparent solution.

Before describing the design dilemmas I found so irresistible, I'd better correct the impression that screens have no practical purpose. They do, although it's not always the reason people buy them nowadays. Before central heating, screens were used to minimize drafts. Today many screens—especially the more highly embellished variety—are purchased only for decoration. Yet they can have functional uses as well, such as shrinking large spaces to more intimate dimensions, providing privacy, hiding clutter, or keeping the cat out of the baby's room without having to close the door. The best use to which I've put my screens is in my booth at craft fairs. A big screen is a real eye-catcher, and it doubles as a backdrop for some of my smaller pieces, such as a tea cart or a group of music stands.

The spark that ignited the screen-building boom in my shop was an article by Tim Mackaness in *FWW* #10 on making a wooden screen hinge. This hinge, shown in figure 1, answered the only design problem that had occurred to me at the time: what to do about ugly metal hinges. I had admired Chinese lacquered screens pictured in antiques magazines, but I was puzzled as to why someone would go to all the work of building one, only to limit its aesthetic impact and functional flexibility by installing obtrusive butt hinges. I designed and built my first screen around Mackaness' wooden hinge, using a frame-and-panel arrangement.

I was pretty pleased with that first screen. The overall effect was just what I

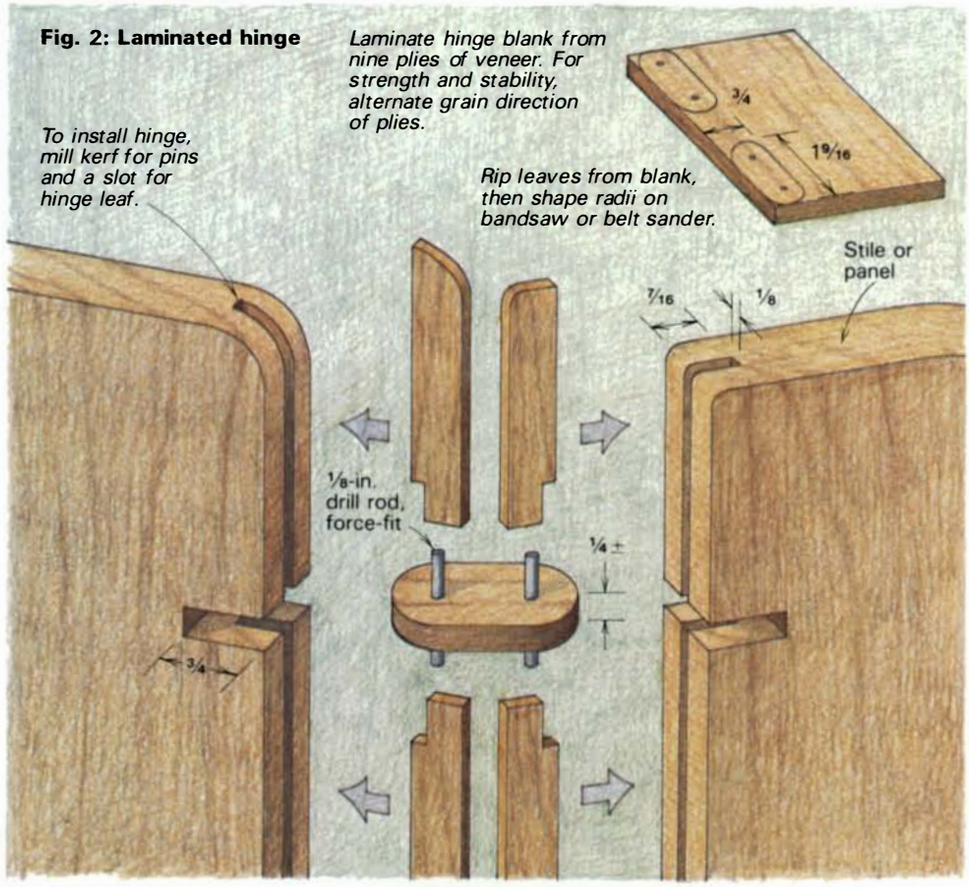
Drawings: Frances Ashforth

had hoped for, and the wooden hinges enhanced the design rather than detracted from it, as metal hinges certainly would have done. But the solution to my first design problem instantly revealed three more. The first of these was the issue of "one front and one back side versus two front sides." I had mounted the panels with quarter-round molding, giving the screen a definite front and back. This effect was further emphasized by the hinges, whose pins were let into router-cut slots in the back of the frames. I had carefully filled the slots with matching pieces of wood, but a close look revealed their presence. How much more pleasing and functional, I thought, to have a screen with two presentable sides.

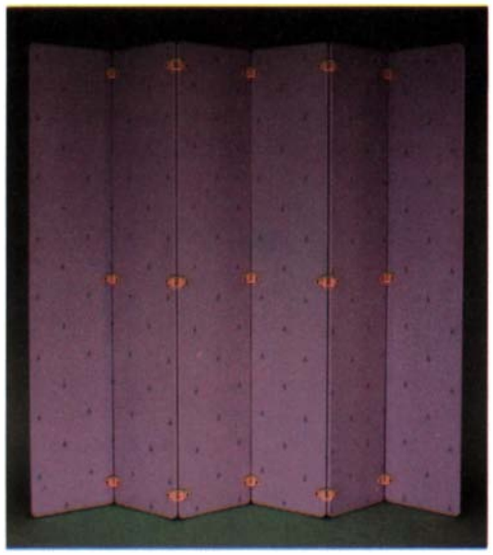
Next was the question of how many panels the ideal screen should have. A screen with two panels is nearly useless, and a three-panel screen is only a little less static. My five-panel original model could assume a couple of interesting shapes, but how about more panels to allow more variety? Finally, there was the matter of price, which I always consider as much a design problem as anything else. The frame-and-panel screen had been pretty expensive, and since hardly anybody *needs* a screen, a lower price figured to be more of an inducement to an impulse purchase.

So, to cut down on construction time, I decided to make the next screen out of solid wood. The result was a nine-panel structure of ¾-in. maple whose design dictated two changes in the hinges. First, I made them much thinner, about ¼ in. rather than 1 in. as on the previous screen. At the same time, I actually increased their strength by making them out of nine plies of veneer. Second, instead of using ¼-in. hardware-store dowels for the hinge pins, I used drill rod sized exactly to the width of the routed slot. To eliminate the screen's "back" side, I let the pins into slots in the edges of the panels, as shown in figure 2. It seemed faster to cut a groove the whole length of the panel's edge with the tablesaw rather than cut individual slots for each pin with the router. Also, the sawblade makes a very unobtrusive ⅛-in. groove in a place that's impossible to see when the screen is unfolded. I filled the grooves with splines, which had to be notched accurately to hold the pins snugly and to keep them from sliding out of their holes in the hinges.

Standing back from the finished product, I was pretty proud of the way I had resolved my first screen's shortcomings. The



Solid-wood panels and a thinner hinge made of built-up veneers let into slots in the panel edges produced a screen equally attractive from front or back.

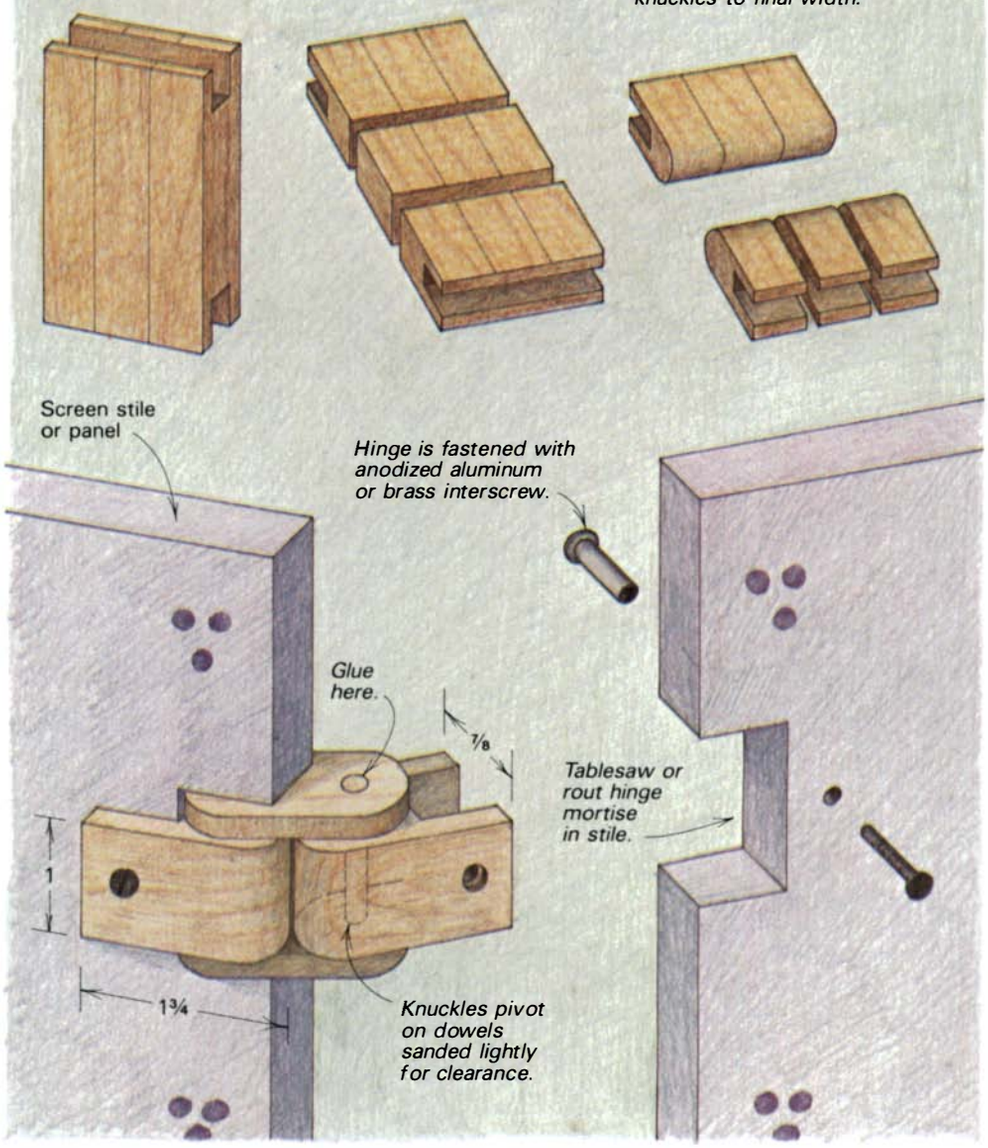


A lighter screen with plywood panels called for a new hinge, so Mackintosh designed a knuckle hinge that pivots on dowels (drawing at right). Maple knuckles are let into mortises routed in the panels, then fastened with anodized aluminum interscrews.

Fig. 3: A wooden knuckle hinge

Construction sequence

1. *Mill groove in end grain. For safety, block should be at least 5 in. long.*
2. *Crosscut to final knuckle length.*
3. *Mount knuckle strip in vise, and radius edge with router. Cut off knuckles to final width.*



nine-panel screen allowed many interesting configurations, and it had no visually inferior back side. It had also taken a lot less time to make. As a bonus, it seemed much bigger than the first one, even though it was the same height and only about 10 in. wider. Its apparent size, I decided, had more to do with the somewhat monolithic nature of the design. At any rate, it was an imposing presence in my booth, able to catch the eye of even the most jaded craft-show regular.

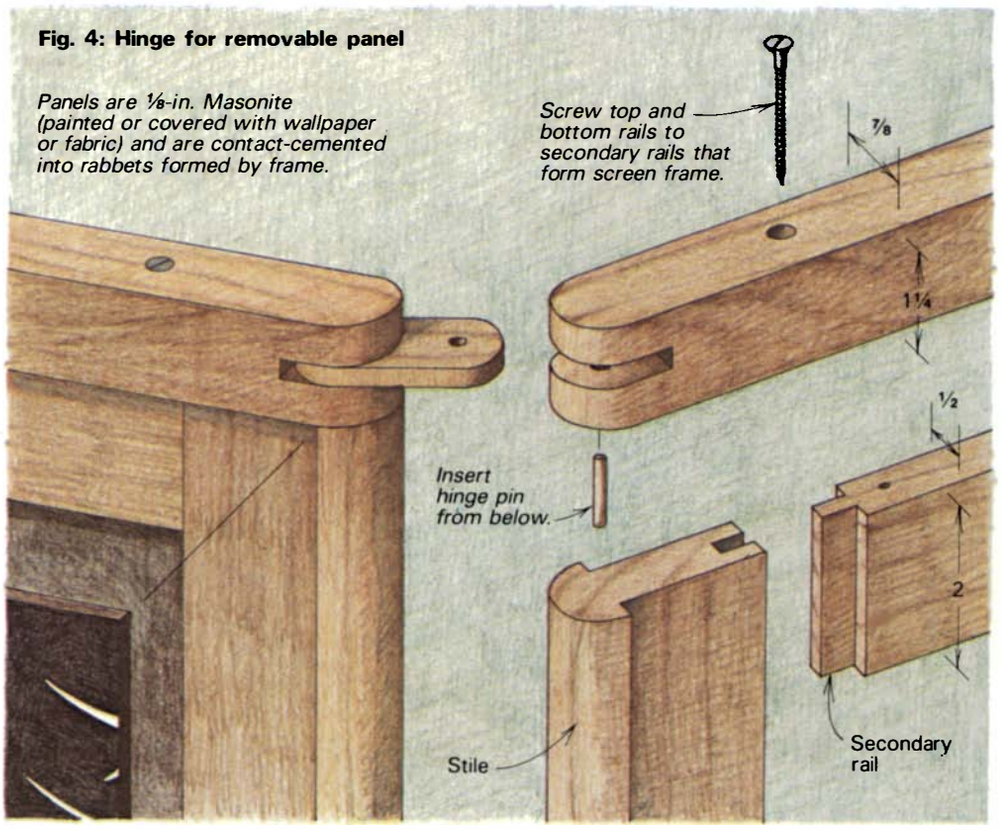
Almost immediately, however, I began to have product-liability nightmares. Imagine the damage a falling 100-lb. maple wall could do to houseplants, furniture, pets and children, not to mention adults with ambitious lawyers. What I needed was a panel material lighter than solid wood that could hold its shape in 72-in. lengths. There may be some wonderful substance on the market out there somewhere, but the best I could come up with was premium-grade, ½-in. Philippine mahogany plywood, which weighs only half as much per square foot as maple does. The only problem was the untidy look of the edges, which I could solve by painting the screen.

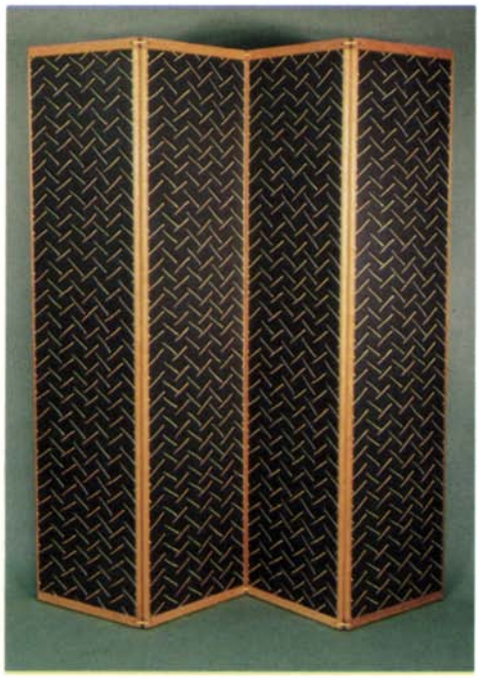
These decisions led me to two more hinge-design variations. First, it wouldn't hurt if the hinges were visually interesting and rather prominent, since the panels were to be fairly plain-looking painted rectangles. Second, the hinges had to be removable so the panels could be repainted. The final version of the hinge, shown in figure 3, can be made quickly using the tablesaw, router and drill press, and fit into notches cut into each panel's edge with a router, rub collar and template. I secured the hinges to the panels with aluminum interscrews—two-part fasteners consisting of a machine screw that fits into a threaded socket with a slot on its other end. They're sold by stationery suppliers as post-binding screws. To tone down the aluminum, I had the interscrews anodized black at a local plating shop.

As with the previous two screens, when I stepped back to assess what I had done, I had mixed feelings. This one passed several of my tests for screen success. It was nice and lightweight. The hinges, while more obvious than on either of the other screens I had done, still enhanced the overall design. Best of all, the price was the lowest by far, as long as I didn't get carried away with the painting. But, as before, there was a major drawback I just couldn't get around—the ragged edges of the plywood. I'd thought that painting would hide them, but it didn't really work very well (and I'm not much of a painter anyway). I realized that what I was really after was a system that would allow many readily interchangeable panel treatments—paint, wallpaper, fabric, plain wood grain, wood with inlay.

This called for frames with easily removable panels, and hinges whose attachment method wouldn't interfere with panel removal. To achieve this, I devised the frame method shown in figure 4. I incor-

Fig. 4: Hinge for removable panel





Author's lightest screen consists of wallpapered or fabric-covered panels contact-cemented into a cherry frame. The top and bottom rails (drawing at left) are permanently hinged but removable, so the panels can be pried out for re-covering.

porated the hinges into show rails that screw into the top and bottom of each panel frame. The frame's structural rails—which are ultimately hidden by the panel and top and bottom rails—are tenoned into the stiles, each of which has a ⅛-in. deep rabbet into which a Masonite panel fits. The Masonite can be covered with wallpaper or fabric, then glued into the frame with contact cement. If you want to change panels, you need only unscrew the hinge rails from one end and work a knife between the frame and the panel. Besides being light, this arrangement has one other important advantage: one side of the screen can have an entirely different treatment from the other.

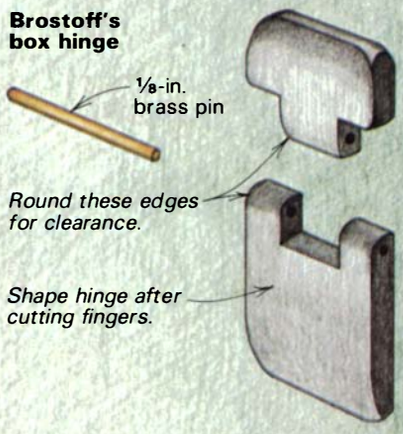
After all my experimenting with fabric-covered, airbrushed and wallpapered panels, the final incarnation of this screen has ⅛-in. birch plywood panels decorated with colored epoxy inlays. We're using it to cover a door in our living room that we never use. It's doing such a fine job that I don't think I'll try to sell it. Almost a year has passed since I made it, and looking at it every day has made me think a lot about screens. I don't have to justify them to myself anymore, which is a good thing, since I have lots of new ideas I'm going to try. □

Besides designing screens, Steven Mackintosh builds furniture in Deansboro, N.Y. Photos by the author.

A wooden box hinge

by Eric Brostoff

For this pink ivorywood box, Brostoff sculpted the hinges out of ebony.



Two years ago I acquired a nearly perfect piece of pink ivorywood, a hard, dense material said to be one of the rarest woods. Native to South Africa, it was once the royal wood of the Zulus. As legend has it, the chief's son had to fashion a spear from ivorywood as part of a ritual signifying his manhood. With such a special piece of wood, I didn't want to make just any ordinary box, so I raided my stash of exotic woods and designed the ebony hinges shown here.

I made the hinges with a box-joint jig on a Shopsmith, cutting a series of fingers, then slicing off sections the width of each hinge. Before I shaped the hinge parts with belt and flap sanders, I assembled the two halves and drilled for the ⅛-in. brass hinge pin, which is held fast with a dab of superglue. You could sand or carve any shape you like, but if the hinge is to work smoothly, the sharp edges of the fingers have to be rounded over a little to provide clearance. The box carcase is African blackwood, which doesn't glue well, so I attached the hinges with epoxy. □

Eric Brostoff operates Mountain Top Box Works in Lake Oswego, Ore. Photo by the author.

Adjustable Drafting Table

A prize from palletwood

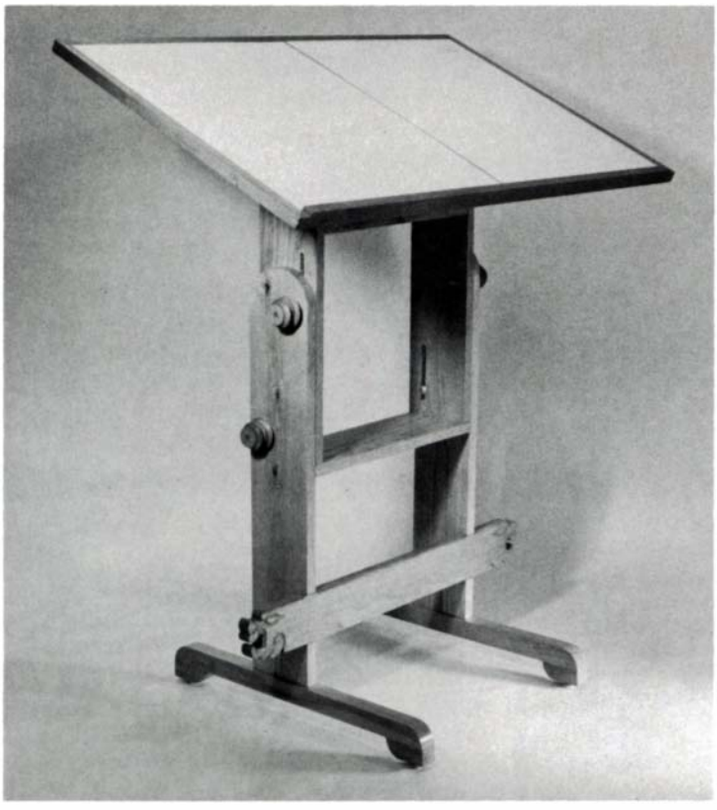
by Roger Sherman

Lumber prices getting you down? Did you know that those ragged-looking shipping pallets piled up down at your local machinery dealer are made from a wide variety of hardwoods from around the world? I made the drafting table shown here from pallets and other discarded odds and ends. It sits in my shop, demonstrating to potential clients that skill and imagination can turn even the humblest materials into something worthwhile.

The table's dimensions are flexible; make it larger or smaller according to your requirements and available materials. Though the thickness of the parts isn't critical, make paired parts (the two trestle uprights, for example) the same thickness.

To make the top, I butted together two sink cutouts from Formica kitchen countertops and glued them to a ¾-in. plywood backing. I beveled the joint between the Formica pieces before assembly, then filled it with automobile body putty. A single piece of countertop or plywood might cost more but be less work.

From shipping pallet to trestled frame, the red oak of Sherman's drafting table now supports a Formica top, not freight.



The top trim and the stand are red oak, and the knobs on the adjustment bolts are waste circles from holes I'd cut out for a wine rack. To prevent the prongs on the T-nuts from splitting the wood, I hammered them over and epoxied the nuts in place. The slide's bottom crossbrace is through-dovetailed to the slide uprights; the upper brace is attached with a stopped, sliding dovetail. The trestle uprights are haunch mortise-and-tenoned into the feet, while the trestle brace, which serves as a footrest, is lap-joined to the trestle uprights. The dragon is the symbol for adversity, so I carved dragon heads on the ends of the brace, enabling me to keep my foot on adversity while working.

The top is attached to the slide with heavy, 6-in. strap hinges, brazed open at 90°. Alternatively, you could use 3/16-in. thick strap iron, heated and bent to shape. Each hinge screws to the top and is attached by two bolts to the slide upright. The top bolt is a pivot; the bottom bolt rides in a slot, which permits adjustment of the tabletop's tilt. Slots in each slide allow for adjusting the table's height. I routed the slots, but you could make them on a drill press.

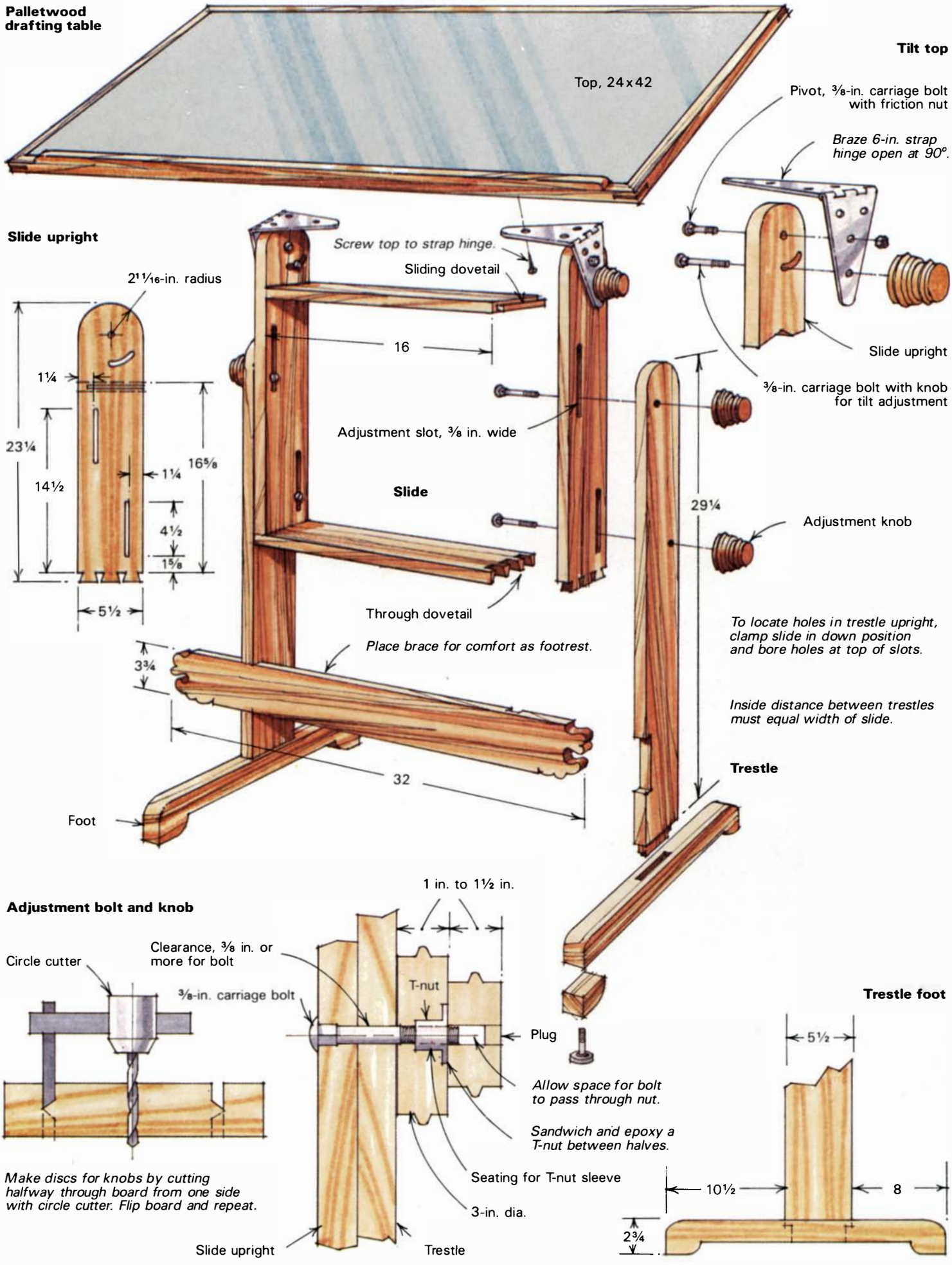
As for pallets, most are made of oak or poplar, but I've also seen willow, ash, beech, locust, hickory, holly, butternut, maple and cherry. Pallets from Asia, Australia and the Orient are generally oak, mahogany or a mishmash of hardwoods. You can get pallets almost anywhere, but avoid those from chemical warehouses, oil refineries, drug companies, insecticide manufacturers, fertilizer plants or any other place where you have no knowledge of what the pallet carried. Chemical residues on a pallet can be very harmful to your health. Department stores, tile outlets (you'll find foreign pallets), automobile and motorcycle distributorships, discount stores, air-cargo terminals, rail yards, piers, ship terminals, fruit and vegetable sellers, and furniture and appliance stores are a few of the safer sources.

You can salvage 90% of a pallet's wood if you're careful taking it apart. First cut the slats from the stringers, then use a prybar with the claw facing you to extract the nails. I've found that only prybars made of flat stock will work; I've had no luck with cat's paws, crowbars or pinch bars. Be sure to wear gloves and eye protection—pallet nails are usually case-hardened and their heads can snap off suddenly. Stubborn nails, or ones with missing heads, can be coaxed out with a pair of carpenters' pincers. Plug the nail holes, and most of the time you won't notice where the nails were.

The pallet, if tamed, is a friendly beast, and the two of you can spend an enjoyable time together with mutual benefit. □

Roger Sherman designs and makes furniture in Baltimore, Md. Photo by the author.

Palletwood drafting table



Slide upright

Slide

Adjustment bolt and knob

Make discs for knobs by cutting halfway through board from one side with circle cutter. Flip board and repeat.

Trestle

Trestle foot

Drawing: Joel Katzowitz

Tage Frid

A talk with the old master

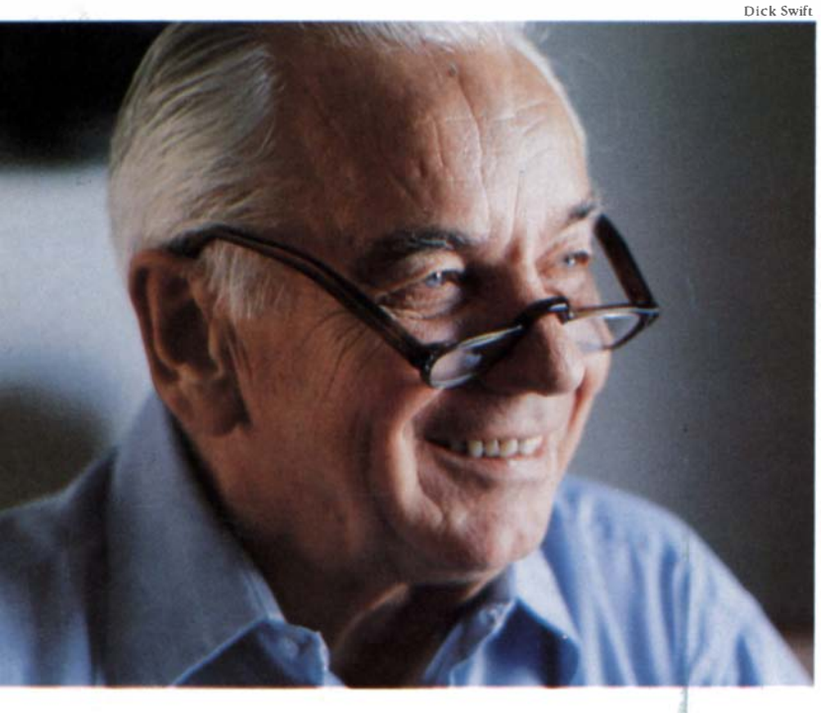
by John Kelsey

EDITOR'S NOTE: Tage Frid is retiring as professor emeritus at the Rhode Island School of Design this spring, after a career that more than any other has shaped contemporary woodworking in this country. The photos shown here were taken during his retirement exhibition held last year at the Gallery at Workbench in New York. Frid's third book, about designing and building furniture, will be available this fall. John Kelsey was formerly editor of *Fine Woodworking*.

I crane to see over the crowd as this short, ruddy and cylindrical man explains, in charmingly fractured English, what he is about to do. He will saw and chisel a dovetailed corner, four copies of which could make a box or drawer. The people seem to find the handcut dovetail a wondrous thing, and this man's method is as intriguing as his results: to saw down a measly inch of wood, he hefts a bowsaw the size of your car door. He doesn't hurry, though this won't take long, talking and joking the whole time. The bits of wood will slither together right off the saw, all please applaud. And if not, he'll segue onto track B: how to repair mistakes using your old claw hammer.

This showman is Tage Frid, Danish for 69 years, cabinetmaker for 50 and teacher for 35. He's done the dovetail act a hundred times, he knows that this crowd of amateur woodworkers loves it, can't get enough. He's what they traveled here this weekend to see and what they hope to carry home again. What they get, what Frid delivers, is a direct line to ancient times, when craftsmen really-by-golly were craftsmen. Those old guys—and there's no doubting Frid is one such—those old guys knew what they were doing, because still older craftsmen had taught them how to work with tools and wood. We can feel the chain unbroken unto antiquity. It's practically religious—we touch the hem of the master's robe, go home fulfilled. Still, I've seen Frid's act a half-dozen times and I'm bored. As I wander away, I wonder how Frid can stand to carry on. Later, I visit Frid at his home and I get the chance to ask:

Dick Swift



Don't you get bored demonstrating the same old dovetail?
Maybe you left too early. I always demonstrate difficult joints and techniques depending on what the audience wants. The dovetail is just the overture, so it doesn't really bother me. What I like about teaching is, I learn something new every day. A student asks me, "Why can't I do it this way?" and I think, "Why not?" Then we figure it out.

That's college students, these are hobbyists.
Oh yeah. A lot of professionals, doctors and engineers. I can't imagine being a dentist, with my hands in people's mouths all day. I would need to do something else, to work with my hands on something that wasn't breathing. I enjoy helping people who really want to do woodworking but never had the chance. Spend a two-week summer workshop with them, all of a sudden they're making furniture. It's like Christmas for them, and that's my payoff. Plus, I meet a lot of nice people.

When a person is learning how to woodwork, does it still make sense for him to practice hand-tool methods?
Absolutely. Because when you know how to do it by hand, you can repeat it on the machine. Then when you go to install something and you have to cut some pieces by hand, you're better able to do it. But I used to plane the top of a table or cabinet. Now I take the belt sander, and that's difficult to do right, too. Either way, you want the top smooth and flat and perfect. If I can do it in half an hour instead of an hour and a half, then I'm not so tired and I have more money in my pocket.

Some people say that besides the design and the well-chosen wood, the hand-tool marks left by the maker are what make a craft object worth having. The dovetail isn't quite perfect, it shows that a human made it.
Well, for example, here is a dovetailed drawer that works right and fits well. Don't you think it would have been stupid to hand-

plane the wood when I have a jointer and a thickness planer and I can do it better and faster by machine? Curly maple, bird's-eye maple, you hand-plane it or put it through the thickness planer and you know what happens—it's all torn up. I've worked out a router jig that cuts it without it tearing up at all. So what is wrong? I can't understand what is so romantic about spending ten times as much time. If it's a hobby and you enjoy it, fine. But a craftsman does have to eat.

Compared to a lot of contemporary work, your pieces aren't expensive. How do you price your furniture?

I have a formula for labor, materials and overhead. The Workbench gallery asked me why I don't charge more for the pieces I showed there, charge something for my name. Those pieces aren't high-priced, but I make money on them. Why charge for the name Tage Frid? I want to make furniture anybody can buy, not only a certain class of people. I'll be happy if a person without much money finds a piece of mine he likes and can afford.

That's a craft attitude rather than an art attitude.

No, I think it's a very human feeling, that I don't want to be snobbish. Do you have to be snobbish to be an artist, can't you just be a good craftsman, do nice clean work with good details? If you know what you're doing, you will make money. There's an

Color photos, except where noted: Steven Sloman

honest price for anything. To make that cabinet over there, it would be the same amount of work for you as for me. Maybe I'm a little faster than you, so I make a little more money.

Is there really any difference between making only one piece at a time and producing a hundred copies?

Some things there'd be no difference. But usually the minute you go for mass production, then you take some of the small, nice details away because they cost too much to do. I can compete price-wise with any of the furniture factories anytime because I don't run with their overhead, sales organization, advertising, dealers, and all of that in between. People come to me after looking at a catalog where there's a six-foot table, they want it six-foot-six. I don't care, I just charge a little more. A factory can't do that. That's why there'll always be a market for mass-produced furniture and a living for the craftsman as well.

Do you think there's more of a market now than when you first came to this country?

Oh, are you kidding? When I came in 1948 it was hard like hell to make a living. I had to do some refinishing just to make money. I hated it, but I did it. Then when we started Shop One [a retail gallery in Rochester, N.Y.] in the early fifties, people were used to furniture that was upholstered right down to the floor. All of a sudden there I was making tables that looked like they were floating, chairs that were so light that people were afraid to sit in them. But then after a while people realized that it was all right for furniture to be nice and light, and soon I had eight people working for me. I found out that that wasn't what I wanted.

Sounds like success to me. What didn't you like?

When I started, I thought I could just sit in the corner designing. Before I knew it I was the salesman, the worrier, the cutting-up man, not quite the sweeper but just about. Finally we were making money, and I quit. The accountant said I was stupid, crazy. But I wasn't happy. I even got an ulcer. Then when I started a one-man shop, sometimes with one helper, I actually cleared more money.

Many of our best woodworkers are trying very hard to make more money by marketing their furniture as art. They strive to give their pieces the art aspect that contemporary ceramics and glass have acquired. Does this make sense to you?

It all depends on what you call art. If you make sculpture, there are no limitations, you can do whatever you want, because it doesn't have to have any specific function. Furniture is more difficult than sculpture because it's got to be usable. A well-designed chair is like a piece of sculpture, you see it in three hundred and sixty degrees, and you handle the wood like wood. At the same time, that chair has to present a person in a setting. Like a piece of jewelry, the minute the person sits in the chair there should be some relation in scale, in feeling. There's nothing more funny than a small man in a big upholstered chair, or a big fat person on a spindly little chair.

Tell me what you think about the Italian, Memphis-style furniture. Do you like it?

I think some of it's very funny, but mainly I think it's a waste of material, effort and time. I'd hate like hell to try to live with it.

I'm not sure you do live with it for long, it's this year's fashion, and it dates really quickly.

Yeah, and in that case I'd feel I had wasted my time and materials. I expect my furniture to stay around a long time after I'm gone. It's okay if you can afford it, but whenever you come in, that furniture is going to yell at you, "Hey, I'm over here."

You really want your furniture to lie down and be quiet.
Sure. Look, I live in a house that's close to two hundred years old. It's cozy, it's warm, it's very comfortable. I work in the shop with the machines and noise and dust, so when I come home I don't want anything that will scream at me every time I look at it. That might be fine in a hotel or a vestibule, but in the home to live with, it gives you a very cold feeling. I think it's not very practical, and some of it is even dangerous.

Dangerous?
Well, some of that furniture is very good, too, and of course you should experiment. But for example, one student I knew made a bench with a harpoon coming right out of the back, just where it could be in a kid's eye. I would hate to have a piece of furniture in my house that I had to put a fence around. Likewise, I don't care for a lot of bentwood furniture, when it looks like the maker is forcing the material to do something it doesn't want to do.

You could argue the other way, though. I mean, people talk about truth to material, and the tree is a branching, curvy, bentwood thing, not flat boards.
Yeah, if you find the curve you want out in the woods someplace. But when you force the wood into curves, right away it looks to me like it doesn't want to do it. And I just like wood, you know, when it is wood. I think if some of those things were

combined with tubular metal that wants to go around, I think they would be much more beautiful.

So you prefer most of the time to have the wood be wood-colored, and finished close to the way it comes off your tools?
Yeah, I like that. One of my students, he's a college professor now, has a fantastic feeling for wood, and a real good sense for form. But I don't like his current furniture, where he is using a lot of paint on the wood, and we had a father-and-son talk about it. I would introduce some other material instead, so it's part wood and part metal and the two would complement each other.

Do you go so far as to say it's wrong to paint wood?
It's not wrong to paint wood, sometimes I do it, too. Though if you do paint, then you have to remember that the wood underneath won't stand still. You have to design so the movement doesn't make cracks and show. Sometimes things people make out of wood should have been made out of plastic.

Some craftsmen make a lot out of choosing a piece of wood, of finding the one right use for its particular color and figure.
That's just their sales pitch. I see a piece of wood, I think it would be nice for such and such, but I don't have to dramatize it. A lot of people get romantic about their tools, too. I don't care about the tools, I use anything that will get the job done. How a thing is made, I don't care about that either. I'll do it the quickest and strongest way I can. The end result is what counts.

I don't believe that you don't care about your tools or about how a thing is made. I suspect you actually care plenty.
Well, of course I use the best tools I can get. What I'm talking about is people who buy a plane just to kiss it every morning and then plane everything. I get a router bit to do the same thing, and I kiss that. That's what I'm talking about.

But you like good tools?
Oh, absolutely. A chisel that keeps sharp and a plane that planes, of course. But these days, most planes, though they cost enough to buy, are usually concave. And the poor person who buys a tool that doesn't work, he thinks there's something wrong with him. I think it's cheating to sell a tool that doesn't work. A jointer plane ought to be really flat or else it's a reject. I really think these companies are cheating the woodworkers.

The manufacturers say the opposite, that their modern steels are more uniform than the old were.
The best tools are imported from Europe, and they're not first-class either. The same thing with flimsy hardware.

And our wood?
Well, the wood we're using today, the squirrels played in it two, three months ago. We don't take the time to let it cure, settle down and relax. If we would store it for a year or two, that would make a big difference. You have to get ahead on your wood, and people don't want to afford that, nor have the space for it.

Mostly you use native woods.
I don't mind exotic woods, but I think you're a pretty lousy furniture designer if you can't design out of wood in your own backyard. I used to buy trees and take them to the mill, direct the cutting, then take the timber home to dry. I've got a lot of wood now, more than I've got time to use. Lately I've started to like

About Frid

A young Tage Frid, circa 1948.

Tage Frid's unusual life connects the old-world apprenticeship system with the new university education for designer/craftsmen that (in America) has replaced it. Although Frid believes that the apprentice of old was a better woodworker, he also believes that today's graduate is better off for his training in art and design. In an ideal world, Frid would have woodworkers bench-apprentice for two years, study wood technology for two years, and finish with two years in design school. "Then," he says, "they'd really know the whole thing."

Frid was born in Copenhagen in 1915, was apprenticed to a cabinetmaker at age 13, and became a journeyman at 18. During his 20s, he continued university studies toward a degree in interior architecture while working in the cabinet shop of a large hospital. It was there that he learned the most about woodworking, "making things for the doctors, like artificial legs, crutches, canes, office furniture, special furniture—we made everything." And it was at this time in his life that Frid realized he would rather make things he had designed, instead of becoming a designer separated from the workshop.

By 1944, Frid was ready to try something different. "A friend told me they needed woodworkers in Iceland, so the next day I took a one-year leave of absence and bought a ticket to go there. I got off the boat, I was standing on the dock with my tools and my bench, when somebody noticed my tools and asked, 'Hey, are you a woodworker?' I had a job and a place to sleep that first night. Three months later I was made foreman." Not long afterward, he and Emma Jacobsen, whom he had met eight days before leaving for Iceland, were married. Up to that point Frid hadn't given any thought to becoming a teacher. In 1948, a magazine for Danish arts and crafts ran an ad for a woodworking teacher at the School for American Craftsmen in Upstate New York. Frid applied, flew to Denmark for an interview with a school representative, and to his surprise got the job. At age 34, this was to be the major turn in his life.

The first few years were very tough. "I'd never taught before the day I walked in," he recalls. "The students kept talking about the freedom of the material, I couldn't wait to find out what they meant, but it turned out they had no control over their material. They were interested in art, not in listening to me talk about construction. And also I had a lot of trouble getting a permanent visa to stay here. It was like three years living with your overcoat on."

In all the turmoil, Frid even lost his tools. "When we first came it was for a short time, so I left my tools in Copenhagen with my mother. She gave them away. She was like that. I remember one day when a beggar came, she fed him. To me he looked familiar, I thought I had met him before. Then I realized he was wearing my suit. She said I'd never used it anyway."

It wasn't long, however, before Frid got his feet planted and began to prosper. By the mid 1950s, in addition to teaching, he was operating an eight-man cabinet shop, was designing on a freelance basis for such firms as George Jensen, and was one of three partners in a retail furniture and accessories gallery. Looking back he says, "I think it's much easier for foreigners to go to a different country and see all the opportunities that the people who live there don't see."

In 1962, following a dispute with the college administration ("they told me I wouldn't get a raise until I began to behave like a professor"), Frid moved from Rochester to the Rhode Island School of Design (RISD) in Providence. Along the way he collected an honorary doctorate, and in 1980 was made a fellow of the American Crafts Council. Characteristically, at the time the honor was awarded, Frid had disagreed with the council's policies and had let his membership lapse.

By starting the country's first college-level program in woodworking and furniture design, Frid became a teacher of teachers, for as the universities filled the void left by the collapse of craft apprenticeships, Frid graduates filled the teaching jobs.

Several years ago, it came time for Frid himself to retire. In searching for his replacement, he decided that RISD would be better with some new blood. He carefully concentrated on people he had not taught, and at the end of an exhaustive search, he hired a talented young craftsman, Seth Stem. It turned out, however, that Stem had been the student of a student of a student of, yup, Frid.

At rock bottom, Frid's teaching can be summarized in a few choice slogans, the distilled essence of 50 years of experience: Wood always moves, always design around the construction, don't murder the wood. I had to wonder how well that lore had weathered transmission unto the fourth generation, during 35 years in the university environment. Not well.

When he arrived at Providence, Stem told me, his master-of-fine-arts degree still new, he'd never bothered about wood movement in widths less than five inches. He didn't design around the construction, but instead, as is the modern way, he'd think up what he wanted to make, then figure out some way to build it. And he loved to bend wood into tortuous curves. As Frid might have predicted, much of the furniture Stem made during graduate school is breaking apart. But now that he's been teaching alongside Frid for several years, Stem has learned his lessons. The old Dane is well pleased. —*J.K.*

mahogany, it comes in nice widths, there's little waste, it's easy to work with. It's not dead-looking, and not overwhelming either.

So now you're a famous author as well as a craftsman and teacher. What did you think back in 1975 when Paul Roman showed up with his idea for Fine Woodworking ***magazine?***
Can I say it? I thought it was nuts.

So why did you get involved?
Emma talked to me, told me, "Why don't you try it?" I felt, "Here I can barely speak English, I can't spell, so how can I write?" But I did try it and people liked the way I wrote, so here I am. I try to present a lot of information without being stiff, at least that's what people say they like.

People appreciate your practical approach.
Well, I also try to explain how to fix mistakes. You know, it's very hard for me now, I'm pushing seventy, to change, but I still like to experiment. I'm still learning how to do woodworking a little differently, a little easier. I like that. □

Small Thickness Planers

We test six machines

by David Sloan

A thickness planer can make life in the small workshop a lot easier. Most woodworking begins with a straight, flat, uniformly thick board, and while it's nice to know how to dimension a board with hand planes, it's also nice to have a machine that can do it for you. A planer can do the job in seconds, and since you can make boards any thickness you want, it frees you from having to design around the standard commercial thicknesses. In a busy production shop, a planer will soon pay for itself because it saves time and expands the range of work your shop can handle.

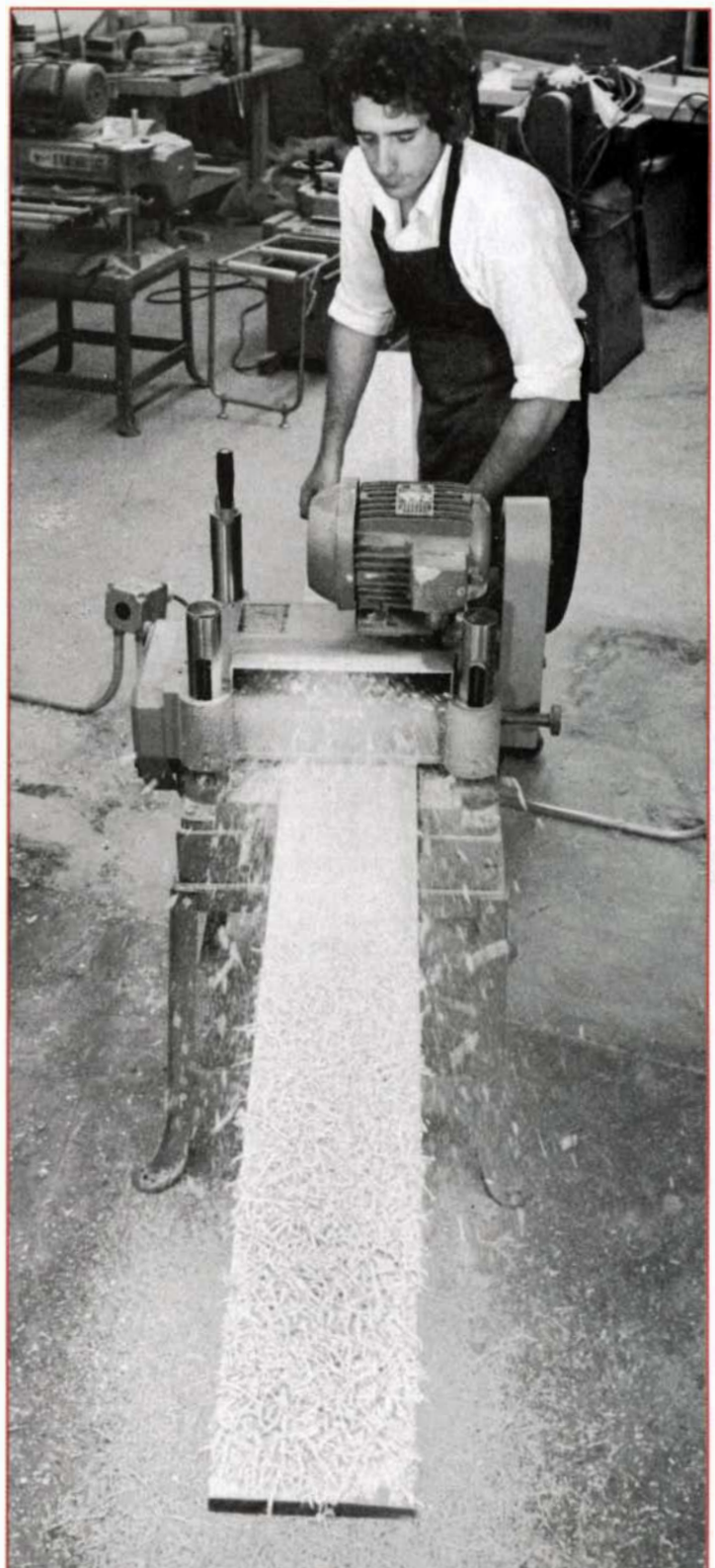
My first choice for a production-shop machine would be a big, heavy planer with an 18-in. to 24-in. wide bed. The massive cast-iron frame damps vibration, and a big heavy-duty machine can stand up to the hardest continuous use. Most important, the wide bed can accommodate glued-up carcase panels. But large production planers can cost and weigh more than a new car. A new 24-in. Powermatic with a 10-HP motor, for example, sells for about $15,000 and weighs in at almost 3,000 lb.

As an alternative, machine manufacturers have come up with much smaller, less expensive planers that are appropriate for the pro and hobbyist alike. There are a dozen or so of these small planers on the market—enough choices to give the potential buyer a headache. Since the average woodworker can't take a new planer out for a pre-purchase spin to see if he likes it, we chose six small machines with price tags under $2,000 and tested them in the *Fine Woodworking* shop. We already owned a 13-in. Delta (formerly Rockwell) RC-33 and a 15-in. Makita 2040. We borrowed the other four—the 12-in. Parks 95, 15-in. Grizzly G1021, 7-in. Williams & Hussey, and 12-in. Foley-Belsaw 985—from the manufacturers, and I put them to work on pine, poplar, red oak and hard maple. The ultimate test was bird's-eye maple, which is notorious for tearout.

Before reading on, take a moment to look at the box on the facing page, which explains the parts of a generic planer. The planer evaluations that follow refer frequently to the parts.

Prior to planing wood, I sharpened the knives of each planer on a Hitachi watercooled 1,000-grit knife grinder and set up the knives and rollers following the instructions in each respective manual. Then I surfaced roughsawn boards of different widths and lengths, taking heavy cuts to see how much the machines could take and light cuts to see how smooth a surface they could produce. I planed a few boards down as far as possible to see how thin each planer could go. To really strain the motors, I surfaced a hard-maple panel the full width of the bed, taking the heaviest cut possible.

Needless to say, none of these small machines has all the fea-



The 12-in. Parks 95 planer, with optional sheet-steel base and magnetic starter, is a comfortable 37½ in. floor to table.

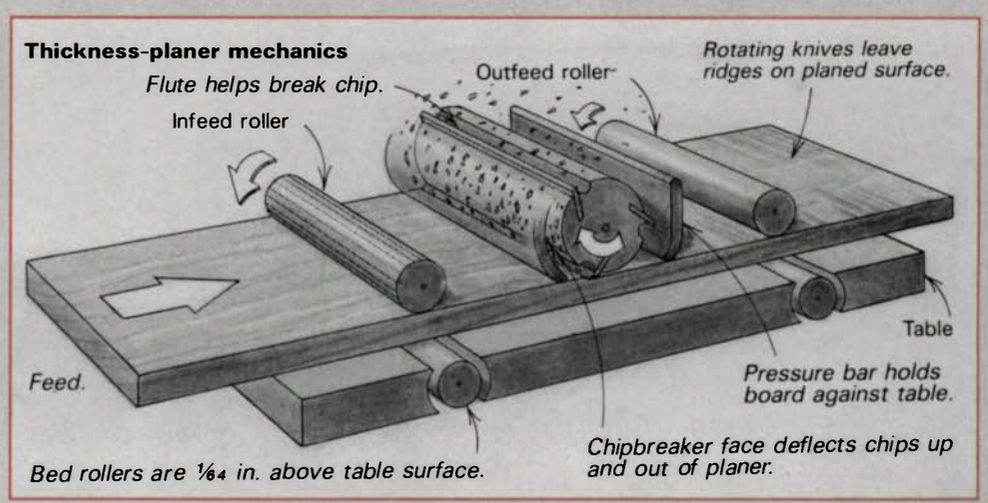
tures of the big production planers. To keep the price down, the manufacturers had to make compromises. None of the small planers is wide enough to be much use surfacing glued-up panels. No machine has variable-speed feed, although optional sprockets will change the feed rates of the Makita and Foley-Belsaw.

All six of the small planers performed adequately. Each was capable of surfacing 10-ft. long, roughsawn 8/4 hard-maple boards, although it isn't practical on the Williams & Hussey machine. All six planers produced a surface ready for hand-planing or sanding on every wood except the bird's-eye maple. Even on the lightest cut, with freshly sharpened knives, all but the Williams & Hussey tore out little chunks of bird's-eye. That said, there were significant differences between the machines in both design and convenience. Some duplicated features found on larger, more expensive machines, while others were designed from scratch to be relatively portable and as inexpensive as possible. In this article I'll describe the planers and mention any noteworthy characteristics—good or bad. Detailed specifications for each machine are given in the chart on p. 78.

Parks 95 12-in.—Cast iron is the first thing you notice about this planer—lots of it. The Parks comes closest to being a scaled-down version of a heavy-duty planer. The 95 was designed in 1935 and hasn't changed since. It's a well-crafted machine, solid and straightforward. The cutterhead, for example, has been carefully drilled for balance. None of the other machines showed any evidence of cutterhead balancing.

Our Parks 95 was mounted on a sheet-steel stand which houses the motor. The cast-iron cutterhead cover functions, in the closed position, as a chipbreaker. Instead of springs, its weight holds it against the board. The steel bed and feed rollers are all adjustable. The infeed roller is corrugated and there's also a pressure bar—standard features on the expensive planers. Rollers and pressure bar are easily adjusted with big nuts right on top

How a thickness planer works

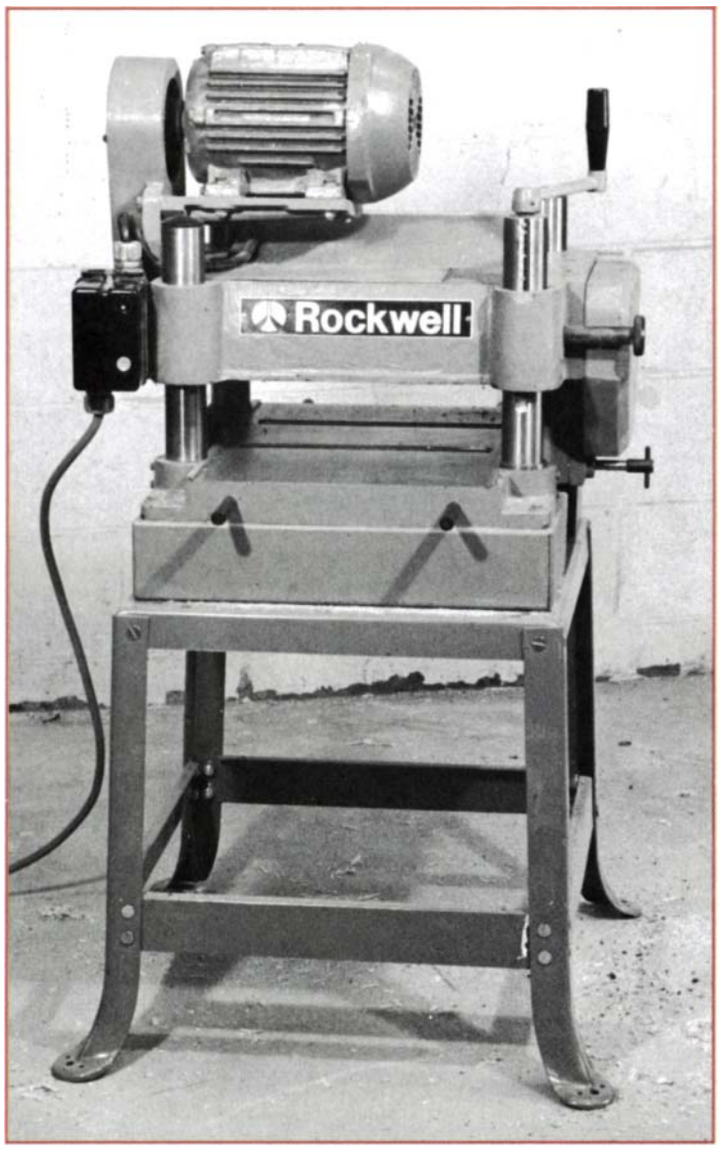


A planer simultaneously reduces the thickness of a board and makes opposite faces parallel. The drawing shows the workings of a standard design. The powered infeed roller grips the board, flattens it down against the planer bed and pushes it into the rotating cutterhead. The spring-loaded chipbreaker helps hold the board flat against the table and minimizes tearout by breaking the chips lifted up by the knives, similar to the action of the cap iron on a hand plane. As the newly planed surface emerges from under the cutterhead, the pressure bar and outfeed roller keep the board flat against the table. The powered outfeed roller propels the board past the cutterhead and out of the machine.

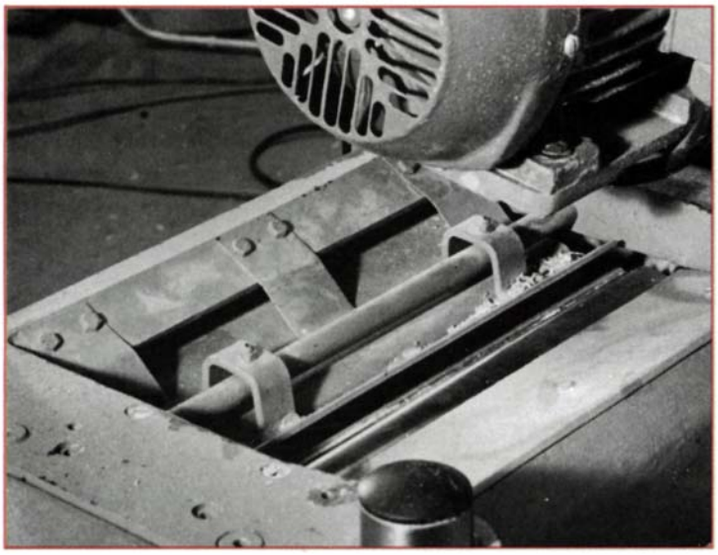
A planer won't remove warp, twist or cup, so one face of a board must first be flattened on a jointer. If you feed a warped or cupped board through a planer, the feed roller will just flatten it out against the table. When the board comes out the other end, it will spring back—thinner, but still warped or cupped.

The surface produced by a planer appears flat, but is actually made up of tiny ridges—although they aren't actually true arcs. The larger the diameter of the cutterhead, the larger the arc that the knives traverse and the shallower these ridges will be. The number of cuts per inch, however, is the most significant factor in producing a smooth surface. The more cuts per inch, the smoother the surface, and this is achieved with a slow feed rate combined with a high cutter RPM. —*D.S.*

Drawing: Kathleen Creston



The only difference between our two-year-old Rockwell and the new Delta RC-33 is the knob that cuts power to the feed rollers. On the older machine (shown), the knob protrudes from the right side; on the new Delta, it's on the top. Table and cutterhead assembly are cast iron. The cutterhead assembly moves up and down on four steel columns.



Three flat steel springs bear down on the Delta chipbreaker to hold it tight against the stock. The chipbreaker adjusts with setscrews that rest on the steel bar shown.

of the machine. The knives were easy to install and adjust. While I could install the knives standing up, I had to squat on the floor to set them accurately. Two V-belts power the cutterhead, which drives the feed rollers through a network of massive gears. A panic lever on the top of the machine can stop power to the feed rollers if necessary.

Because of its height—37½ in. to the table in its highest position—the Parks 95 was the most comfortable to use of all the machines. To change depth-of-cut, the table travels on two vertical screws, one at the center of each long side. The planer's thickness capacity is only 4⅜ in.—the smallest of all the machines.

Except on the very lightest cuts, the Parks I tested didn't feed perfectly. When the infeed roller grabbed a short board, the tail end of the board lifted up in the air, causing the bottom front edge to catch in the bed-roller slot and stop. I had to hold down the tail end to keep the board from hanging up. No adjustment to the infeed roller or the bed roller seemed to help. Perhaps a larger-diameter bed roller would solve the problem. I soon became accustomed to this little quirk, and kept a hand on the tail end of the board until the front end was well under the infeed roller. Other than that, the Parks performed admirably. With a 2-HP motor it had plenty of power and planed both thick and thin stock well.

Delta RC-33 13-in.—The Delta is a well-made, heavy-duty, cast-iron machine. To keep costs down, Delta makes this, its smallest planer, in Brazil. The machine I tested is two years old and carries the Rockwell label, but the Delta planers being sold today are identical, with one exception: a knob that cuts power to the feed rollers has been moved from the side to the top of the planer. In the 16 months that I've worked with this planer, I've never found a need to cut power, so I can't say whether the relocation is an improvement.

The motor is mounted on top, instead of in the base. When you adjust the depth of cut, the cutterhead assembly, not the table, moves up and down on four screws, one in each of the steel columns. There's a lot of cast iron in this assembly, plus the weight of the motor, so it takes some muscle to turn that handle. I like this arrangement. Because the table height doesn't change, you can support long stock with outboard rollers without resetting them for every cut. Three V-belts drive the three-knife cutterhead, which in turn drives a roller chain to power the feed rollers. A phalanx of anti-kickback fingers in front of the infeed roller eliminates any possibility of kickback.

The chipbreaker is a sheet-steel fabrication held down against the stock by three flat springs. There is no pressure bar. Knives are spring-loaded and very easy to set with the new bridge-type gauge supplied with the machine, although my sliced-up fingers can attest to the fact that the edges of the cutterhead are almost as sharp as the knives.

It isn't easy to adjust the height of the feed rollers. First you have to make a beveled wooden gauge block, which you then place under the cutterhead with a feeler gauge between the block and a knife. It's hard to maneuver the block, the feeler gauge, your fingers and your eyes in a very confined space in close proximity to very sharp knives—all this while kneeling on the floor. The adjusting screws themselves are in an awkward place on the underside of the frame.

In use, the Delta atones for the agony of set-up. Feeding was consistently smooth and effortless. The machine hogged through rough stock with ease, yet left a respectable finish on fine cuts. Neither thick nor thin stock posed a problem.

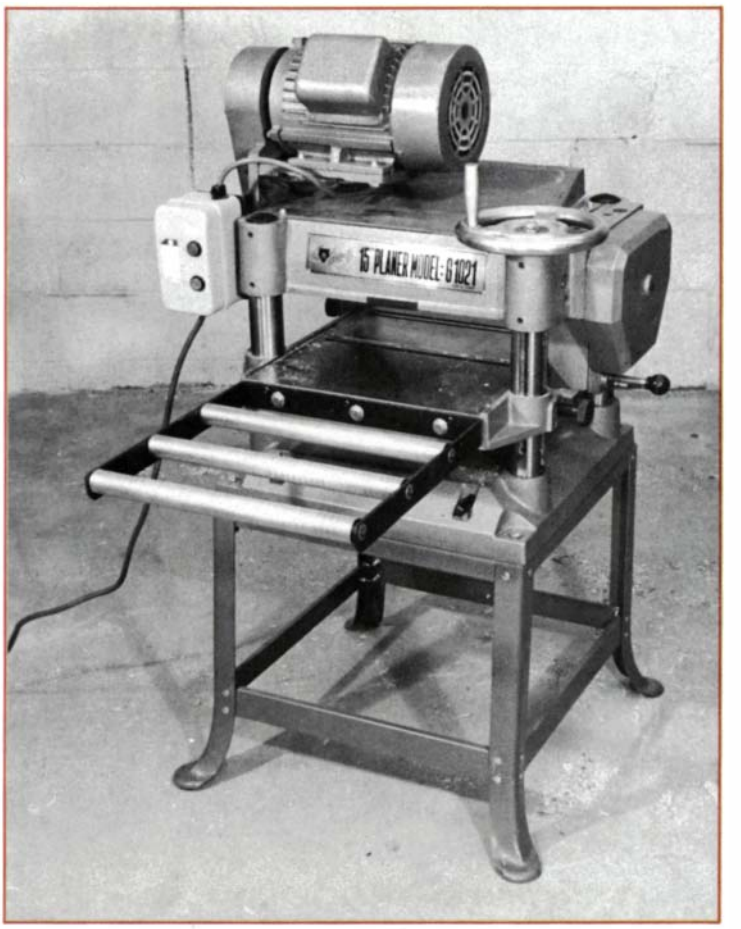
Grizzly G1021 15-in.—The success of the Delta design spawned this Taiwanese knockoff, which sells for about half the list price of the Delta planer. Place these two machines side by side, and the only obvious differences are the elevating wheel and the color: Grizzly green vs. battleship gray. A closer look reveals that the Grizzly isn't quite a carbon copy. Its bed is 15 in. wide instead of 13 in.—a definite improvement. When you turn the wheel, the table, not the head, moves on four screws. The Grizzly also sports extension rollers that bolt onto the cast-iron table. In most other features it duplicates the Delta. Even the pulley covers are interchangeable, though the bolt holes don't quite line up. The amusing similarity was the owners' manual. The Grizzly manual is the Delta manual practically verbatim. The paragraph that refers to the Delta's moving head had just been whited out.

All right, so the Taiwanese copied the Delta, but is it as good? Based on the two days I spent with this machine, I'd say no, but it's close. The castings are excellent. The Grizzly has a cast-iron base assembly that the Delta doesn't have. This machine is heavy—480 lb. with stand and motor, outweighing the complete Delta by nearly 200 lb. Where the Delta has sheet-steel gears to drive the feed rollers, the Grizzly has nicely machined castings—no great improvement functionally, but a nice touch. A dust hood for collection-system hookup is standard. The Grizzly has the same set-up virtues and vices as the Delta since the cutterhead and feed-roller designs are the same. On the other hand, the Grizzly I tested had only one weak, flat spring holding down the chipbreaker, while the Delta has three strong springs.

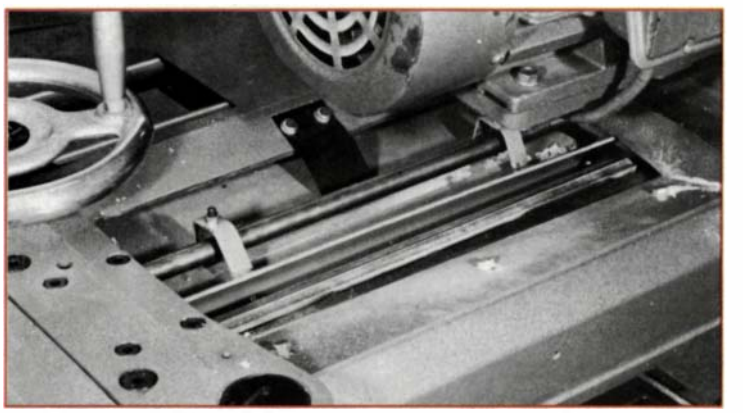
There was a problem. When I was setting up the machine, I found that the chipbreaker couldn't be adjusted anywhere near specifications. Closer examination showed that the fabricated sheet-steel chipbreaker was warped, possibly from the heat of welding. This meant that when the chipbreaker was mounted in the machine, the left side could bear down against a board, but the right side was about 1/16 in. above the surface. Boards would catch on the left side, slew over to the right, and go through the planer at an angle. Boards as thin as 1/4 in. disintegrated because they could lift off the table, but the quality of the cut on thicker stock didn't seem to be affected. I probably could have fixed the chipbreaker with a day's worth of filing, hammering and fiddling, but I ordered a replacement chipbreaker over the phone. It arrived within a few days, and took about 45 minutes to install and adjust. Boards no longer slewed to one side. Thin boards still disintegrated, but only about 40% of the time, with the worst damage occurring to the last few inches of the board. Stronger springs on the chipbreaker would probably solve this problem.

Although the design is the same as the Delta, feeding the Grizzly wasn't as easy. Boards needed a push to get started. The Delta hogged off more wood—3/16 in. vs. 1/8 in. for the Grizzly. The Grizzly is beefy enough that it could probably handle a much heavier cut, but the frame interferes and the stock won't feed if you try to cut more than 1/8 in. This is a major nuisance when you're rough-planing. Several boards that were thicker at the back end than at the front jammed against the frame halfway through. I had to stop and lower the table to finish the cut.

Since I spent only a few days with this planer, durability is something I can't predict. The Grizzly *looks* good and planed adequately on all but thin stock, but it's hard to judge the quality of motors or bearings from only a few hours of use. It's three-month warranty is the shortest of any of the planers. The importer says that replacement parts are available and defective parts will be replaced for the cost of shipping during the warranty period.



The Grizzly as shown weighs in at 480 lb.—the heaviest of all the small planers. Extension bed rollers are standard equipment, front and back. The table moves up and down on the four steel columns. Base, table and cutterhead assembly are cast iron.



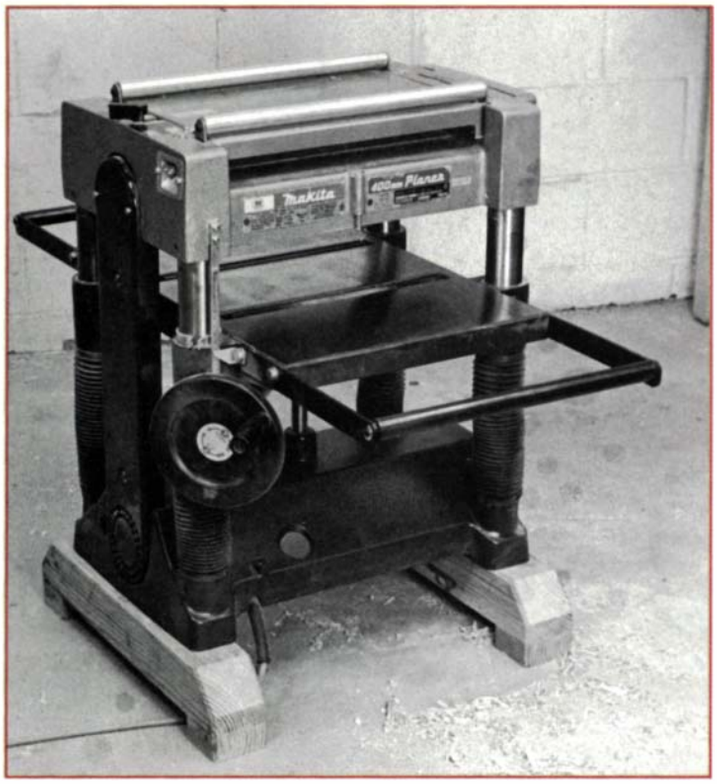
Almost identical to the Delta in design, the Grizzly sports one chipbreaker spring, where as the Delta has three.

Makita 2040 15-in.—Like the Delta, the Makita I tested is one that we've had for about two years. The 2040 bears little resemblance to an industrial machine, although it does have a pressure bar. Its castings are aluminum instead of iron. The cutterhead has only two knives, and changing them was a snap. A shaft lock holds the cutterhead in position when you're unbolting and setting the knives—a nice feature. A plastic handwheel turns a central screw that elevates the table from underneath, and the table corners ride on four steel columns.

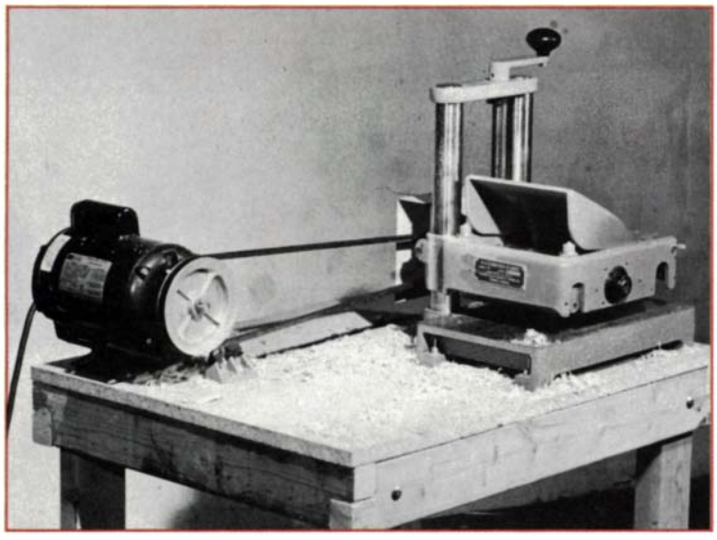
The 2040 is designed to take light cuts. It's the only machine that comes with a 110V motor, which is a small, 2-HP, high-RPM, universal type similar to those found in routers and electric drills. The motor slows noticeably on hardwood, especially

when taking the maximum cut on wide stock. All the other planers have induction motors—the type common on tablesaws and other woodworking machines.

The bed rollers are steel, but the feed rollers are rubber. All are adjustable, but the current owners' manual doesn't explain how to adjust feed-roller height (our old manual did). This omission is due to Makita's concern that misadjustment might overstress the cast-aluminum frame of the machine. Anyone who uses the 2040 seriously will need to know how to adjust the feed rollers. Roller height is set by means of screws on the top of the planer at the ends of each roller, and is adjusted with a slotted, threaded ring that surrounds the spring-tension screw. This arrangement could be improved upon. Trying to turn the large outside ring is impossible with a regular screwdriver, and I finally resorted to using a big cold chisel as a screwdriver.



The Makita 2040 needs a boost. Without blocks, the table is only 20¼ in. from the floor in its highest position. A small, high-RPM, 110-volt, universal-type motor is concealed in the base.



The Williams & Hussey is a benchtop machine. The motor pivots on a special mount and its weight tensions the V-belt. The add-on power-feed kit bolts on the side of the cutterhead assembly.

The Makita has the fastest feed rate of the small machines—25 FPM, which works out to a very low 37 cuts per inch (CPI). According to accepted planer theory, the more cuts per inch, the smoother the planed surface. The Makita, however, with the lowest CPI of all the planers, gave a smoother cut than any of the other power-feed machines. This *shouldn't* be possible, but it is. So much for theory. A feed-speed reduction kit is available, although this couldn't improve much on the smooth finish that our Makita produced, except perhaps on highly figured wood.

There were some things I didn't like about the Makita. It's loud—by far the loudest of the small planers. Ear protection is a must. The table, at its highest, is only 20¼ in. from the floor—far too low for comfort. Our 2040 rests on 4¾-in. wooden runners, but it's still too low. More than once, I found myself kneeling on the floor to view the depth-of-cut gauge. The machine won't take a cut heavier than ⅛ in. on narrow stock or 1/25 in. on wide stock. As with the Grizzly, the frame interferes and prevents stock from feeding if you try to take a heavier cut. A board that's thicker at the tail end will jam against the planer frame halfway through the cut.

In spite of these problems, I liked this machine because of its smooth cut and wide, 15-in. capacity. I also liked the depth-of-cut gauge that lets you preview the amount of stock the planer will remove. The 2040 can't do fast, heavy hogging on roughsawn stock. It can handle big stock, but a little at a time. Its small size makes it a good choice for a cramped shop and it's light enough that you can slide it across the floor without breaking your back.

Williams & Hussey 7-in. molder/planer—This is a small, benchtop machine that doubles as a molder (I didn't test its molding capabilities). The basic machine comes in three models: W-7, which is a hand-feed model; W-7PF, which has a powered infeed roller; and W-7S, which has powered infeed and outfeed rollers like the larger planers. An add-on kit converts the hand-feed machine to either of the power-feed models. For the test, we got the W-7 hand-feed model and converted it to the W-7S.

This is a very nicely made planer. The bed and cutterhead assembly are cast iron, and machining is of the highest quality. Two ¼-in. thick knives, the thickest of any of the machines, are mounted on the square cutterhead. The heavy cast-iron cutterhead cover also serves as a chip deflector. (It's set too far in front of the cutterhead—2½ in.—to function as a chipbreaker.) There is an unpowered steel outfeed roller on the hand-feed model, but no infeed roller of any kind. The W-7S power-feed model has both rubber infeed and outfeed rollers. There are no bed rollers on any of the models.

Stock up to 7½ in. thick will fit through the planer. You have to remove the chip deflector to raise the head past 6 in., however, because the handle bangs into it.

I set up the planer on a table of 2x4s and particleboard. A 3450-RPM, 1½-HP Sears motor provided the power. Williams & Hussey sells an optional motor mount, which I recommend. With this setup, the weight of the motor keeps tension on the V-belt.

The knives don't require adjustment, as the knives on all the other machines do. You simply butt each knife against a shoulder in the cutterhead and tighten the bolts. This always sets the knives to the same height, even after sharpening, because the bevels aren't supposed to be ground unless they're badly nicked. To sharpen, you're supposed to simply stone the flat back of each knife. If you do grind the bevels, it's easy to set the knives

by placing a shim between the knife and the cutterhead shoulder. Don't look for any help from the owners' manual—it's the worst I've ever seen with a woodworking machine. I frequently found myself winging it as I set up and used the W&H.

The hand-feed model is just that—fed by hand. You push the board into the planer with your hands and/or a push stick and pull it out the other end. It takes a little more effort than ripping on a tablesaw. The chip deflector and outfeed roller help hold the board down on the table, but since there's no infeed roller, it's easy to inadvertently lift up the tail end of the board and badly snipe the front end.

One side of the planer is open, so by flipping a board end-for-end and running it through again, you can plane boards up to 14 in. wide on the hand-feed model. Reversing a board means cutting against the grain, which may cause tearout. This method is okay for rough work, but the two cuts never match up and the resulting ridge must be hand-planed. The little machine seems most comfortable with narrower stock. The manufacturer sells optional steel guide bars that clamp to the table and prevent stock from wandering out the open side. I didn't test these, but they're probably a worthwhile investment. For cutting moldings, they're essential. The open side is a boon for molding because you can mold up to 7 in. from the edge of any size board or panel.

The hand-feed model gave the best cut of any of the small planers. Because you can feed the board at a snail's pace, the number of cuts per inch is extremely high. The surface feels as if it's been hand-planed. The Williams & Hussey hand-feed model was the only planer that didn't tear up the bird's-eye, no matter in what direction I fed the board. While the W-7 can plane boards as thin as 3/32 in., I also managed to hog off 3/8 in. in one cut on a 4-in. wide pine board by feeding very slowly—though the machine bucked and groaned in protest.

The power-feed kit takes about 30 minutes to install. Off comes the steel outfeed roller and on go the rubber rollers, roller chains and an oil-bath gearbox. The power-feed model has a 15-FPM feed rate.

The power-feed was disappointing. Roller tension is adjustable, but roller height isn't. The rubber feed roller just didn't bite hard enough. I had to push and cajole, and sometimes the board would just slow down and stop in midcut. No longer could I take a heavy cut—1/8 in. was the maximum on a 4-in. yellow-pine board. I tried taking 3/16 in., but the motor jumped back on its mount, the belt slipped and the planer ground to a halt. The power-feed could handle cuts 1/8 in. or thinner on 7 in. of hard maple, but I no longer got that hand-planed surface and the bird's-eye occasionally misbehaved. For a hefty $340 extra, the power conversion kit raises the price of the W&H almost as high as one of the larger, more powerful planers, but doesn't deliver the same capacity.

The W&H is not well suited for long, wide boards. For small-scale work or highly figured woods, however, the hand-feed model is excellent. The molding capability will appeal to framemakers or contractors who need custom moldings. In addition to carrying stock molding knives, the manufacturer will make custom knives. If you're so inclined, you could also make your own.

Foley-Belsaw 985 12-in. planer/molder—This dual-purpose machine not only planes, but also can make an impressive variety of moldings. A fancier model, 984, even comes with a built-in ripsaw so you can both rip and plane or mold at the same time.

Compared to the Parks, Delta and Grizzly, the 985 is a lightweight, lacking almost all of the features of what I consider to be the ideal planer. While the table is cast iron, the rest of the

The Foley-Belsaw 985 planer/molder has a beefy 3-HP motor tucked under its sheet-steel frame. The top hinges up to expose the working parts.

frame is made of 1/8-in. thick sheet steel. Tension can be adjusted on the rubber feed rollers, but roller height can't. When the rollers wear, they must be replaced, but at less than $20, this is no great expense. The cutterhead turns on ball bearings, while the feed rollers turn in lubricant-impregnated bronze bushings. The three knives are held in the cutterhead by wedge-shaped gibs, and it takes a hefty whack to break the grip of the cast-aluminum gibs. There are no bed rollers or pressure bar, and the chip-breaker is not adjustable. The table elevates on four screws.

Our test planer came with a beefy 3-HP motor that lives down in the sheet-metal base and drives the cutterhead with two V-belts. This monster caused the sheet-metal 985 to rumble and shake like an old flivver when I threw the switch, but on wide maple boards it was nice to have all that power. Foley-Belsaw offers a 5-HP motor as an option, but I don't think the machine's lightweight construction warrants it.

The owners' manual was the best of the lot, and the optional knife-setting gauge is the best design I've ever come across—a real pleasure to use. Another nice feature is the elevation handle: one turn moves the table exactly 1/16 in.

Just by eyeballing, it was hard to judge the depth of cut. With most of the small planers, you can tell roughly how much of a cut you're taking just by glancing at the space between the board and the frame. Not so on the 985. With the cutterhead touching the board, there's still a big gap between board and frame. On the other hand, the frame couldn't interfere with boards that were thicker at the tail end, as it did on the Makita and the Grizzly.

As planers go, this is a no-frills machine. For example, the table had the roughest surface of any of the small planers and the edges of the casting were sharp enough to cut. I can't fault the 985 on short-term performance—it planed well on both thin and

Planer characteristics

	Parks 95 (United States)	Delta RC-33 (Brazil)	Grizzly G1021 (Taiwan)	Makita 2040 (Japan)	Williams & Hussey W-7 and W-7S (United States)	Foley-Belsaw 985 (United States)
List price: Complete as shown; planer only	$1620; $1050	$1802;$1445	$844.95;	$1780;	$470 Hand-feed (W-7)* $740 Power infeed and outfeed (W-7S)	$1095; $825
Weight (pounds): Complete; planer only	410; 244	295; 260	480;	254;	;73	370; 252
Table size (inches)	12⅛ x 20⅛	13 x 19¾	15 x 20⅛	15½ x 23⅝	8½ x 14⅛	12¼ x 27
Minimum stock thickness	3/32 in.	3/16 in.	3/16 in.	3/16 in.	3/32 in.	5/32 in.
Heaviest cut possible: 4-in. board; full width	3/16 in.; 3/16 in.	3/16 in.; 3/16 in.	1/8 in.; 1/8 in.	1/8 in.; 1/25 in.	3/16 in.; 3/16 in. (W-7) 1/8 in.; 1/8 in. (W-7S)	3/8 in.; ¼ in.
Maximum stock width	12 in.	13 in.	14⅞ in.	15⅜ in.	14 in. (W-7)** 7 in. (W-7S)	12¼ in.
1-PH motor included in complete price	1½-HP, 220V ***	2-HP, 220V ***	2-HP, 220V	2-HP, 110V, universal type	None ***	3-HP, 220V ***
Switch included in complete price	Magnetic	Magnetic	Magnetic	Mechanical	None	Magnetic
Cutterhead dia.; no. of knives; RPM	3 in.; 3; 4200	3 in.; 3; 4500	3 in.; 3; 4500	3 5/16 in.; 2; 6500	1⅛ in. square; 2; 7000	3¼ in.; 3; 4500
Feed rollers	1½ in.; steel; corrugated infeed	2 in.; steel; corrugated infeed	2 in.; steel; corrugated infeed	2½ in.; rubber	1½ in.; steel; unpowered outfeed (W-7) 1½ in.; rubber; height not adjustable (W-7S)	1½ in.; rubber; height not adjustable
Bed rollers	1 in.; steel	1 in.; steel	1 in.; steel	1⅛ in.; steel	None	None
Feed rate	16 FPM	11½ FPM	11½ FPM	29½ FPM (reduction kit available)	Infinitely variable (W-7) 15 FPM (W-7S)	12 FPM (optional sprocket increases speed)
Cuts per minute; inch	12,600; 66	13,500; 97	13,500; 97	13,000; 37	14,000; infinitely variable (W-7) 14,000; 78 (W-7S)	13,500; 94
Hood for dust-collection attachment	Optional, $70	Optional, $44	Included	None	None	Optional, $25
Warranty	1 yr. parts & labor	1 yr. parts & labor	3 mo. parts	1 yr. parts & labor	1 yr. parts & labor	1 yr. parts & labor
Miscellaneous	Cast-iron frame; pressure bar	Cast-iron frame; anti-kickback fingers	Cast-iron frame; anti-kickback fingers	Cast-aluminum frame; pressure bar; segmented chipbreaker	Cast-iron frame; doubles as molder; bench-mounted. Power conversion kits available, $235 and $340.	Sheet-steel frame; doubles as molder

* $645 power infeed (W-7PF); ** by reversing board; *** other motors available.

thick stock for the few hours I used it. It can also take a bigger cut than any of the other power-feed machines. The Foley-Belsaw's sheet-metal design, however, cuts too many corners to suit me. For that reason alone, it wouldn't be my choice if I were shopping for a thickness planer. But if you can make use of the machine's extensive molding capabilities, it's definitely worth a closer look. The price is right, and it can do things no spindle shaper can. Foley-Belsaw stocks an impressive number of knife patterns and will make custom knives to order.

Conclusions—No machine was perfect. So, weighing the good against the bad, here's how I'd rate the planers:

My first choice for an all-around planer would be the Delta RC-33. I cursed it every time I had to adjust the rollers, but it's a well-made, smooth-operating, reliable planer for both heavy and light work.

The Parks 95 is a close second. The feeding problem was the only thing that kept the Parks out of a tie for first place. Its ease of adjustment and simple, solid construction were unmatched by the other small machines. It's a heavy, hardworking planer that will probably outlast several owners.

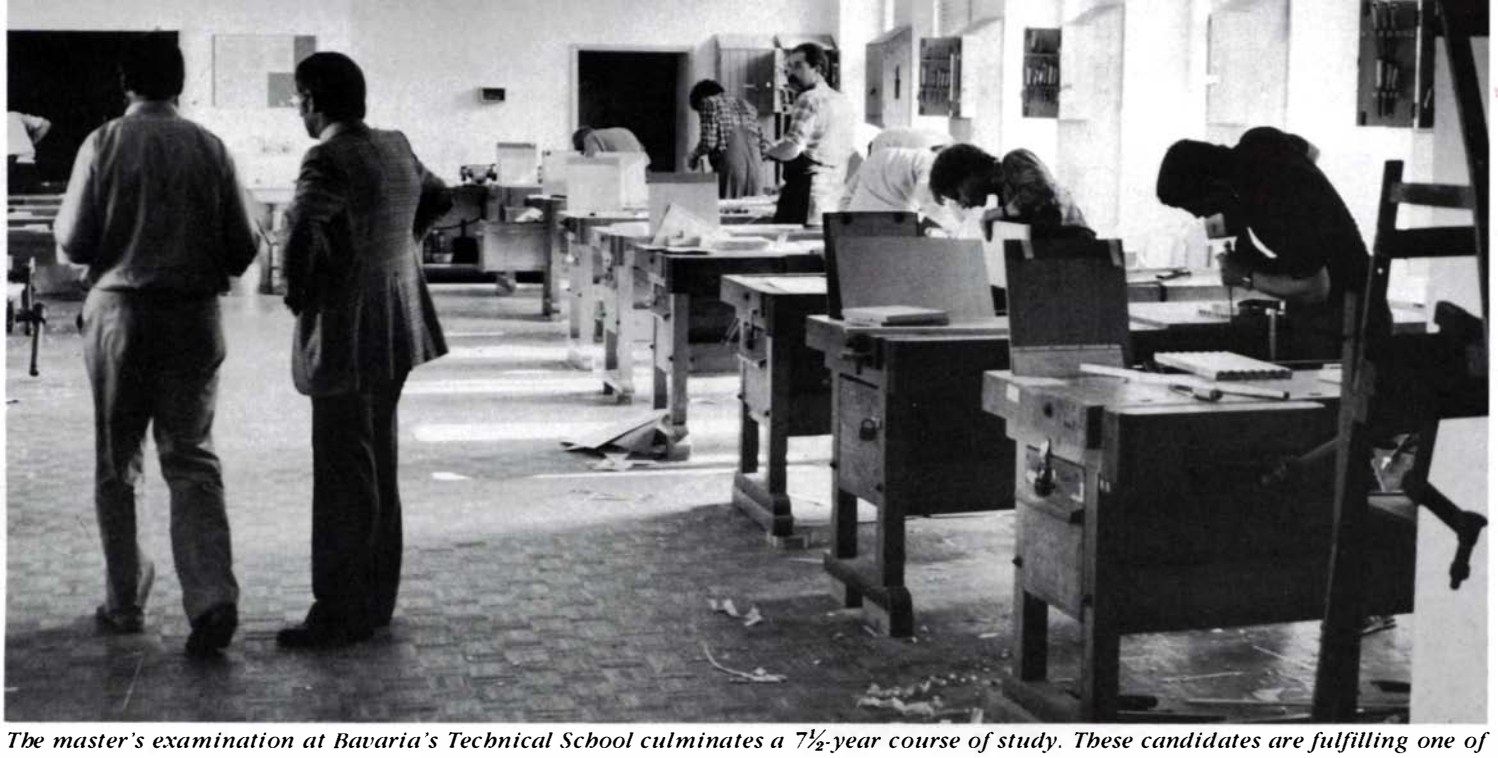
The Makita 2040 isn't built for the ages, but it should give years of service. It isn't fast at removing stock, but if a smooth surface is more important than a heavy cut, the Makita may be for you. Often heavily discounted, it is a good value for the money.

The Williams & Hussey W-7 hand-feed planer would be my choice for small-scale work. It's expensive for its size and weight, but it's very well made. Forget the power-feed models—the cost outweighs the convenience.

The Foley-Belsaw works very well, but I'd consider it only if I wanted the molding capability. Because it skimps on mass and conventional planer design, I wouldn't buy it as a planer alone unless I couldn't afford one of the cast-iron machines.

The Grizzly appears to be made well but assembled without much fine-tuning. It has all the adjustment hassles of the Delta, without the same smooth performance. It is, however, a usable planer at a very low price. Long-term durability is a gamble, but you can wear out two Grizzlys for the price of one Delta. □

David Sloan is an associate editor at Fine Woodworking.



The master's examination at Bavaria's Technical School culminates a 7½-year course of study. These candidates are fulfilling one of the exam requirements, the construction of two projects in 12 hours.

Mastering the Trade

In Germany, it takes books, benchwork and time

by Josh Markel

In Germany, woodworkers function in a very different environment than they do in the United States, primarily because it is illegal to operate a cabinet shop in Germany if you are not a certified master. This guild-like system has at its foundation technical schooling and work experience leading to certification. On a recent trip to Germany, I spent a day at the Technical School for Joiners and Woodcarvers of the District of Bavaria, where I spoke with students and faculty and observed part of a master's examination.

There are two routes to master's certification. The program at the Technical School takes 7½ years. The apprentice goes to school full-time for 3 years, takes journeyman's exams, and then works under a master for 3 years. Another 1½ years of full-time school follows, then comes the master's exam. The other program, offered by all but one other German school, involves more practical work and less schooling, and takes 9 years to complete.

Founded in 1869, the Technical School is located in Garmisch-Partenkirchen, an attractive, well-touristed town in the Alps. In addition to the 7½-year course of study, the school also offers a 3-year apprenticeship program for woodcarvers and a "post-graduate" certificate program for masters. Apprentice courses appear to be largely paid for by the state, but the master's courses cost around 2100 marks (about $700) a semester. In all, there are about 110 students, ranging in age from late teens to early thirties, and 10 faculty members. The school is housed in a long, two-story building, with a woodshed that nearly encloses a pleasant yard in the rear. A glass-walled entrance hall two stories high opens to the yard and gives access to the joinery shops on one side and the carving shops on the other. The machine rooms contain every piece of heavy production equipment you can think of, short of computer-controlled automatic machines.

I first learned of the school through *Modern Cabinetmaking in Solid Wood,* a book based on the work produced at the school, selected by the school's director, Franz Karg. (See *FWW* #29, pp. 59-62. The book is available for £15.45 ppd. from Bell and Hyman, Ltd., Denmark House, 37-39 Queen Elizabeth St., London SE1 2QB, England.) A distinguished-looking, gray-haired man, Karg radiates friendliness and a quiet enthusiasm for his work. Though certified as a master, Karg has made his career in woodworking education, and like any influential teacher, he inspires a definite style of work among his students. Characteristically, the deliberately disproportionate, self-consciously artsy look of much American gallery and art-school woodworking is absent. Post-Modernism has not yet permeated the Bavarian Alps. Purely decorative or historical references are limited to occasional and modest chipcarving and inlay. Textural effects on cabinet doors are often used. Sometimes vertical members are pinned with floating splines to crossed battens. Or doors consisting of

Franz Karg, the school's director, is also a designer and a certified master woodworker.

Master's candidates must produce a master piece, two of which are shown here. Made outside of school, these pieces are closely inspected during the four-day examination.

many crisscrossing rails and stiles will enclose small panels on which repeated patterns have been machined. Joinery is frequently a decorative element, but it isn't flaunted as if to say "see how skilled I am." Above all, the furniture is clean, uncluttered and airy, like the school itself.

Though Karg sees to it that his students have experience veneering, he prefers solid wood. The students are much more interested in using soft woods for custom cabinetmaking than are Americans. Frequently, I saw spruce and Oregon pine used with an obvious concern for grain pattern, and the subtle handling of grain was evident in all the work. Long, nicely figured pieces are cut into lengths suitable for making a series of door panels. Stiles and rails of straight-grained wood pleasingly interrupt the seemingly continuous figure of the panels running "behind" them.

Training runs the gamut from hand techniques to the use of multi-function production molding machines. Students aren't given the freedom sometimes allowed in American art schools. They can't choose any project and work without respect to time. The time limits set on projects made during the journeyman's and master's exams require the ability to execute certain standard procedures quickly and efficiently.

The student body reflects some conditions peculiar to Germany. A high percentage of German businesses have been handed down from father to son, and more than half of Karg's students are preparing to take over family-owned firms. These companies are, in most cases, architectural millwork shops and not the small designer/craftsman operations that seem to be the focus of most American art-school woodworking programs. Other students are headed for careers in interior design or architecture, since in Germany hands-on experience is desirable before entering such fields. It is likely that working-class people would pursue an apprenticeship, which doesn't require so much time out from making a living. The great majority of journeymen will not aspire to

master's certification and will follow a vocational-training track at other schools.

I better understood this high percentage of successors to family businesses in the school population when Karg explained that setting up even a small commercial shop in Germany (where the need for safety equipment such as dust collection and spray booths is more stringently enforced) would cost 200,000 to 300,000 marks (around $100,000 during periods of normal exchange rates). Since a journeyman cabinetmaker earns only 15 marks an hour gross pay, it would take several lifetimes to save the money necessary to set up a shop.

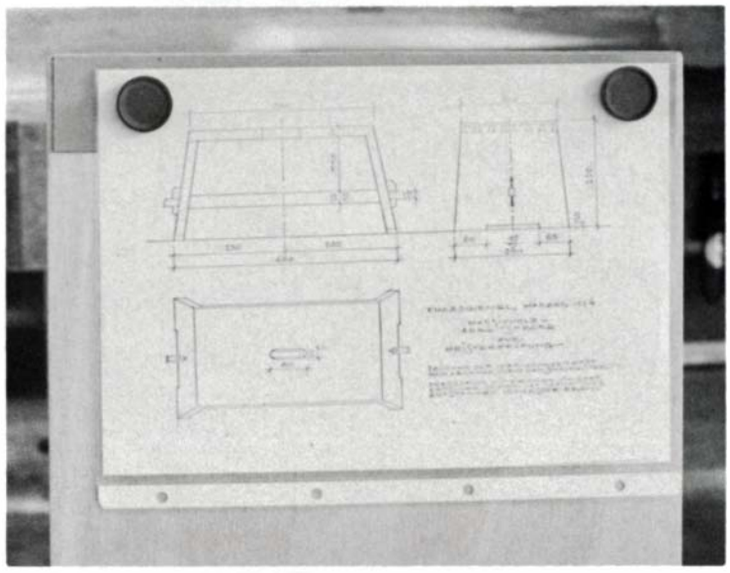
About half the applicants to the school are female, but the student body is only one-quarter female. As Karg explained to me, this reflects the realistic prospects for employment. The German woodworking industry, he said, is still reticent about employing women. They give as reasons the loss of female workers, who have received a great deal of training, due to marriage and pregnancy, and the fear that women will not be up to the physical demands of the work. Karg clearly feels that much of this is a smokescreen for prejudice, but he also feels compelled not to turn out a high percentage of unemployable students. The worst outlook, he said, is for woodcarvers, male or female. The school was training about 15 apprentice woodcarvers when I visited, and, at least in Bavaria, they will be a glut on the market.

Unlike many American art-school woodworking programs, much of the training program in Germany is geared to the practicalities of running a business. Besides such subjects as woodworking technique and technical and freehand drawing, also taught are estimating, bookkeeping, business organization and supervision of apprentices. The school is anxious that its students be prepared to make a go of it in the real world. Concerns with reality aren't restricted to business, however: Herr Werning, a teacher at the school who has had considerable experience teaching woodworking in Third World countries, told me that recently students took time out from their studies to make and sell projects that enabled them to buy 15,000 marks' worth of tools for a woodworkers' cooperative in Bolivia.

Since my visit coincided with a master's examination, I could see first-hand the results of those many years of study and toil. In the four-day testing, the dozen or so candidates were put through their paces. First, they took a written examination and a one-hour oral examination covering technical questions, economic issues associated with the business of woodworking, art history, instruction of apprentices, and so on. Then they produced a solid-wood stool and a veneered chessboard in the school workshops. Both projects were unknown to them until the exams, and each had to be completed within six hours. As might be imagined, there was much rushing around the shop, very little talk, and quick bites on apples between dovetail cuts.

While all this was going on in the workshop, each student's summer project, built outside of school, was examined in an adjoining room. Such a project, from which the term "masterpiece" has clearly derived, must meet several qualifications. First, the design drawing must be approved before work begins. Then the student must execute complete technical drawings detailing all the measurements and specifications, which will be compared to the finished piece. The fabrication usually takes 150 to 180 hours, and must demonstrate proficiency in the construction of drawers, doors and locking hardware. Candidate journeymen go through a similar, if less demanding, ordeal.

The examinations of the practical work and of the students' range of knowledge, incidentally, are given not by the school, but by representatives of the guild of cabinetmakers. The venerable gentlemen I saw microscopically inspecting the summer projects looked like central casting's idea of Bavarian cabinetmakers—one even wore a loden-green jacket characteristically trimmed with dark cording.

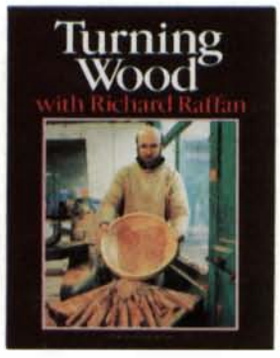


The student above is working on one of the set projects for the 1984 master's examination—a small, dovetailed stool, the plans for which are shown at bottom.

This type of technical education may whet the appetite of American woodworkers. But when I asked Karg about the prospect of an American attending the school, his reply was somewhat discouraging. While in principle there is nothing to prohibit Americans from attending, and some have done so, there are several practical obstacles. Any student must have an excellent knowledge of German and its technical vocabulary, as all instruction is in German. All apprentice applicants must be under 23 years of age. It would be almost impossible to enter as a journeyman, since there is no American equivalent to the master's certification and therefore no certified masters under which to work. In addition, the school receives roughly ten applicants for every opening. The tuition, however, is quite reasonable, and if you can wangle your way in, you'll receive a terrific education. □

Josh Markel designs and builds furniture in Philadelphia. Photos by the author. The address of the school is Fachschule des Bezirks Oberbayern für Schreiner und Holzbildhaur, Haupstrasse 72, 8100 Garmisch-Partenkirchen, Germany.

Explore the graceful art of woodturning



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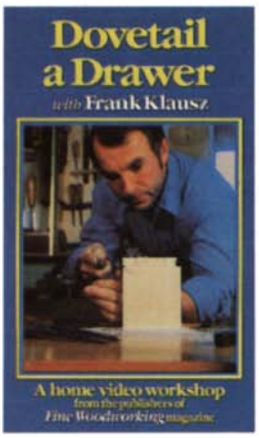

Dovetail a Drawer *with Frank Klausz*

It takes cabinetmaker Frank Klausz twenty minutes to dovetail a drawer by hand. In this video workshop, he slows down to show you all the steps involved in the process. You'll learn how to size the stock, run a groove for the drawer bottom, cut quick, precise dovetails without the use of jigs or templates, and glue up and fit the finished drawer. You'll also learn about tools and techniques that will come in handy in your other woodworking projects—how to use the backsaw, chisel and smoothing plane, and how to rip, cross cut and plow on power machinery.

Here's a chance to learn what a master craftsman with over 20 years experience can teach you about organizing and completing an essential job—and about developing the woodworking skills you need to do your best work.

Approximately 60 minutes, $49.95

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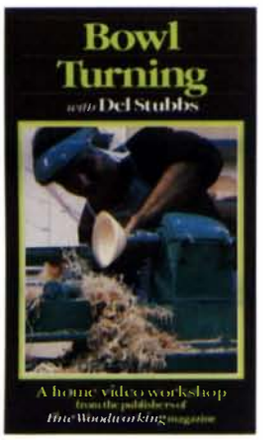


Bowl Turning *with Del Stubbs*

Now you can learn bowl turning from one of the leading woodturners in the country. Del Stubbs shows you how to lay out and mount a bowl blank, how to use different gouges and flat tools to shape the outside and excavate the inside of a bowl, and how to evaluate and sharpen your cutting tools. Whenever you need to, the camera takes you in close to see the careful contact of edge on wood, or lets you step back and study the effect of various tool positions, grips and stances. You'll even learn how to handle special challenges like turning thin-wall, bark-edge and end-grain bowls.

Del Stubbs understands turning as few others do, and his easy, enlightening approach is sure to help you become a better woodturner.

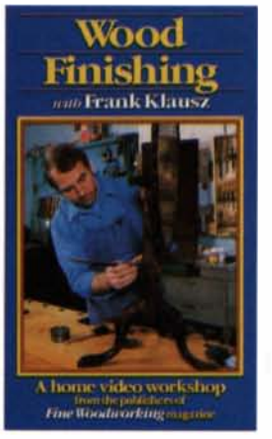
Approximately 120 minutes, ***$59.95***

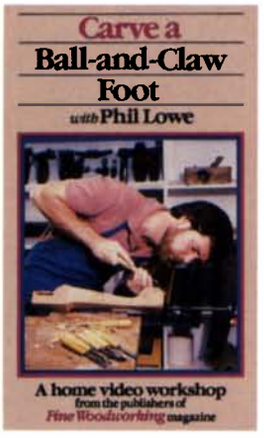
Wood Finishing *with Frank Klausz*

Nothing completes a woodworking project like a fine, durable finish. In this wide-ranging workshop, Frank Klausz brings his twenty years of cabinetmaking and finishing experience before the camera to show you how to create a number of professional-quality finishes. You'll learn how to prepare an ideal surface for finishing, how to choose between oil, alcohol and water stains, and how to apply tung oil or spar varnish for maximum penetration into the wood. You'll discover how to spray lacquer and how to apply French polish for exquisite results. Klausz even tells you what you can do to correct a job that starts to go wrong.

This is the kind of expert demonstration few woodworkers ever get a chance to see. Now you can watch it whenever and as often as you want.

Approximately 110 minutes, ***$59.95***





Carve a Ball-and-Claw Foot *with Phil Lowe*

Woodworking instructor Phil Lowe shows you how to make that hallmark of 18th-century furniture, the cabriole leg with a ball-and-claw foot. While he offers tips on handling a wide range of styles, Lowe focuses on the Colonial Philadelphia version. You'll learn how to scale the piece to your furniture plan and then bandsaw a graceful cabriole ready for carving. At the bench, Lowe shows you how to lay out the form of the ball-and-claw, cut in the ball using a mallet and gouge, and shape the dragon's claw for a vigorous-looking grip.

A specialist in period furniture reproduction and a woodworking instructor at Boston's noted North Bennet Street School, Phil Lowe can help you master the carving tools and techniques you need to do period work.

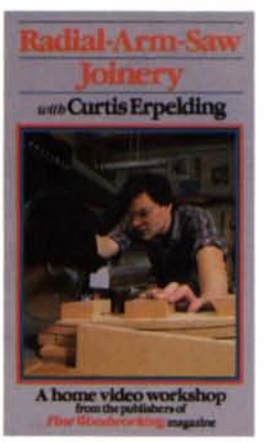
Approximately 115 minutes, ***$59.95***

Radial-Arm-Saw Joinery *with Curtis Erpelding*

Many woodworkers find the radial-arm saw helpful for some jobs, but frustratingly inaccurate for repetitive precision cutting. Now Curtis Erpelding, a craftsman who brought fine joinery to the radial-arm saw, shows you how to make impeccably precise cuts time after time. You'll find out how to set up and fine-tune your machine, how to lay out and cut a series of identical slip-joints, and how to use these same methods to cut increasingly complex joints. Erpelding also shows you how his artful jigging techniques open up a host of new design possibilities.

This is no standard introduction to the radial-arm saw, but a chance to find out about the jigs, fixtures and techniques you need to make the most of this versatile but often misunderstood machine.

Approximately 110 minutes, ***$59.95***



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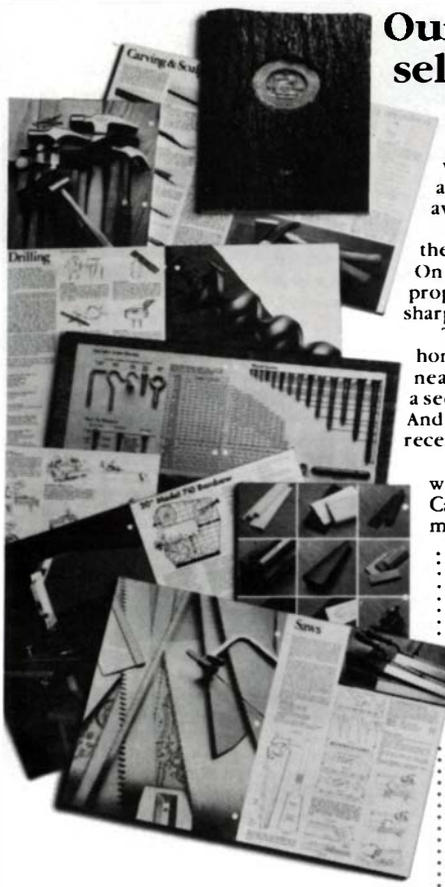

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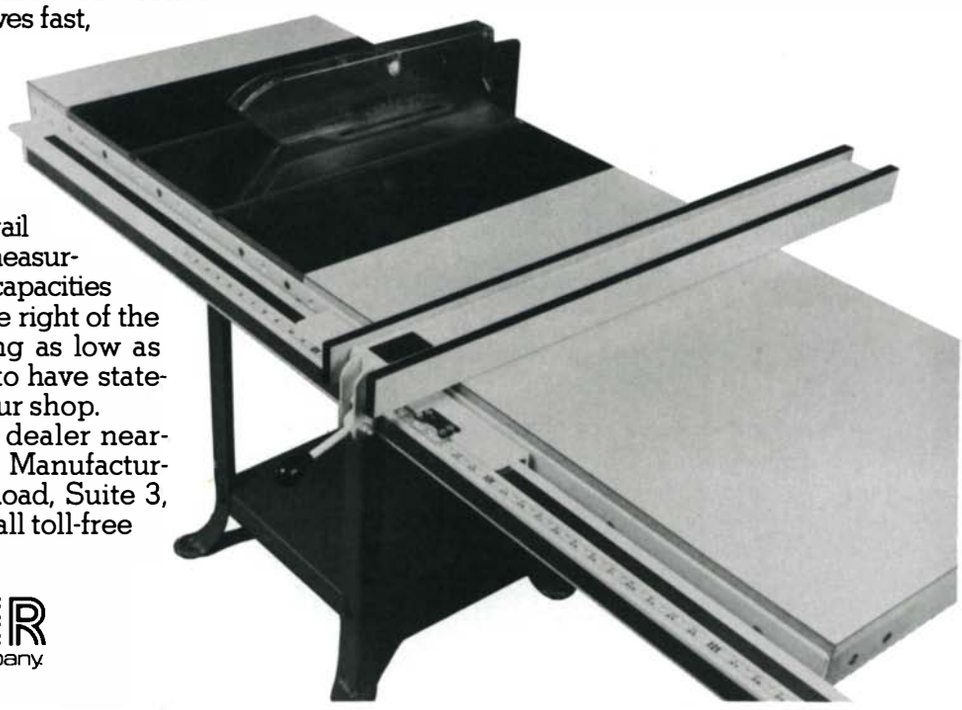

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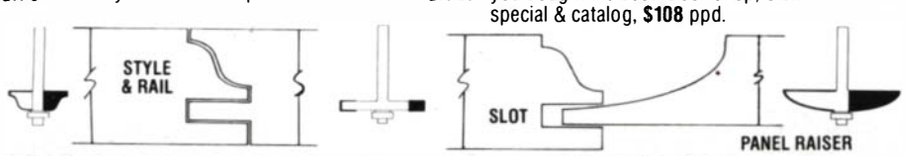

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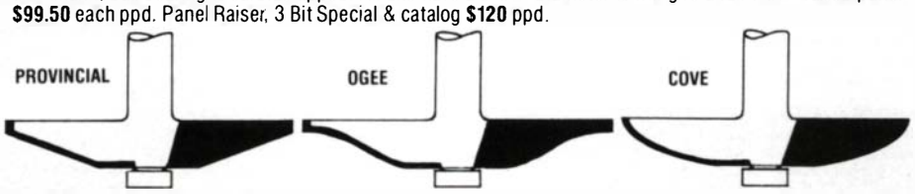

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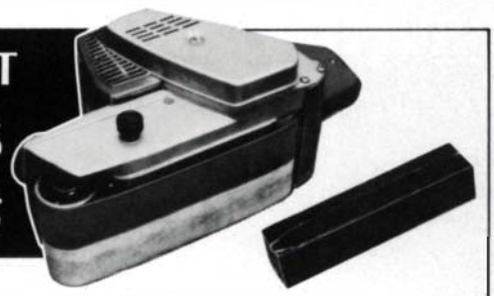

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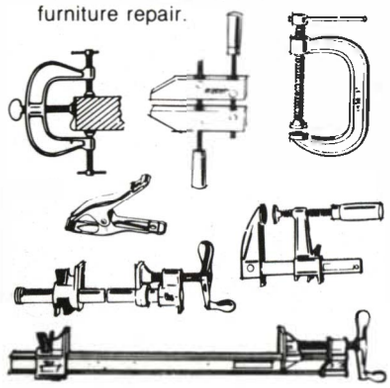

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CALIFORNIA: **Workshops/classes**—Including furniture, carving, boatbuilding, restoration, finishing, home improvements, miniatures. Hands on Wood, Building F, Fort Mason Center, San Francisco. Contact Jon Lopez or Sherilyn Tharp, (415) 567-2205.
Show—American Craft Council Craftfair, May 17–19. Showplace Square, The Concourse (Trade Show Center), San Francisco. Contact American Craft Enterprises, Inc., PO Box 10, 256 Main St., New Paltz, N.Y., 12561. (914) 255-0039.
Juried exhibition—4th Annual Design in Wood, June 20–July 7. Del Mar Fairgrounds, Del Mar. Entry deadline May 15. (619) 297-0338 Ext. 14.
Juried show—Festival Craft Market, May 31–June 2. Lake Craft Market, 1515 Webster St., Oakland, 94612. Contact (415) 528-1066.
Show—First Annual Wooden Boat, Sept. 21. On Main St., Mendocino. Application deadline June 1. Contact Ft. Bragg-Mendocino Coast Chamber of Commerce, PO Box 1141, Ft. Bragg, 95437.
Exhibition—Wood turnings, Del Stubbs, May 4–31; 3rd Annual National Turnings, June 8–30. Artisans Guild Store, 45050 Main, Box 1515, Mendocino, 95460. (707) 937-5300.
Exhibition—School of James Krenov, June 8–30. Highlight Gallery, 45052 Main, Mendocino. (707) 937-3132.

COLORADO: **Workshops**—Numerous programs, June 17–Aug. 23. Anderson Ranch Arts Center, Box 2410, Aspen, 81612. (303) 923-3181.
Show—Wood forms as furniture, accessories, sculpture, Robert Jorgensen, May 11–June 28. Show of Hands, Inc., 2440 East Third Ave., Denver. (303) 399-0201.

CONNECTICUT: **Juried exhibition**—Society of Connecticut Craftsmen 50th Annual Exhibition, Apr. 13–May 19. Museum of Art, Science and Industry, 4450 Park Ave., Bridgeport, CT.
Show—Connecticut Audubon Society's Bird Carvers, decoys, songbirds, May 11–12. CAS Fairfield Ctr., Fairfield. Contact David Emerson, (203) 259-6305.

Classes/juried exhibition—Woodturning: Liam O'Neill, May 11–12; Richard Raffan, June 29–30; various boatbuilding, July 8–Aug. 31; national exhibition of small boats, July 5-14, South Norwalk, July 20-28, Brookfield. Entry deadline May 25. Brookfield Craft Center, Rt. 25, PO Box 122, Brookfield, 06804. (203) 775-4526. Brookfield SoNo, 127 Washington St., South Norwalk, 06854. (203) 853-6155.
Exhibition—Hartford/Handcraft, through May 8. M.S. Gallery, 205-A Sisson Ave, Hartford. Contact Michael Shortell or J. La Motta, (203) 232-2417.
Juried exhibition—Seventeenth Celebration of American Crafts, Nov. 11–Dec. 23. Creative Arts Workshop, 80 Audubon St., New Haven, 06511. Entry deadline July 15. Send SASE and resume to Creative Arts Workshop. Contact Marnie Halsey, (203) 562-4927.
Seminar—Marketing your crafts, May 18. Greater Hartford Community College, 61 Woodland St., Hartford. Contact Annette Holden, Cooperative Extension Service, 1800 Asylum Ave., West Hartford, 06117. (203) 241-4953.

DELAWARE: **Fair**—13th Annual Crafts, June 8. Delaware Art Museum, 3201 Kentmere Parkway, Wilmington. Entry deadline May 24. Contact Lial A. Jones, (302) 571-9594.

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

FLORIDA: **Exhibition**—Inlaid Exotic Woods, Giles Gilson, through Apr. 6. Netsky Gallery, 3107 Grand Ave., Coconut Grove, 33133. (305) 448-6163.

GEORGIA: **Seminar**—Michael Dunbar, Windsor Chair making, Apr. 19–21. Highland Hardware, 1045 N. Highland Ave., NE, Atlanta, 30306. (404) 872-4466.
Fair—Woodworking machinery, furniture, Sept. 6–9. Hall "A" of Georgia World Congress Center, Atlanta. Contact Cherif Moujabber, (203) 964-0000.

IDAHO: **Exhibition**—Contemporary Northwest furniture, Aug. 9–Sept. 15. Boise Gallery of Art, Boise, and subsequent travel in Pacific Northwest. Deadline for slides and resume May 1. Boise Gallery of Art, 670 South Julia Davis Drive, Boise, 83702. Contact David Willard, (208) 345-8330.

ILLINOIS: **Workshops/demonstration**—Workshops, through April; Inca power tools demonstrated, May 11. The Hardwood Connection, 420 Oak St., DeKalb, 60115. Contact (815) 758-6009.
Juried Exhibition—6th Annual Fountain Square Arts Festival, June 29–30. Fountain Square, Evanston. Contact (312)328-1500.
Exhibition—Handmade furniture and accessories, through Apr. 23. Esther Saks Gallery, 311 W. Superior St., Chicago, 60610. (312) 549-4655.
Demonstration/seminar/workshop—Inca tools, Apr. 29, May 22, June 20; Toshio Odate, Japanese tools, Apr. 19–21; using bandsaws, Mar. 20. Omega Workshop, Chicago. (312) 472-4333.
Workshops—Various topics, June 17–28. Campbell Center for Historic Preservation Studies, PO Box 66, Mount Carroll, Ill., 61053. (815) 244-1173.

INDIANA: **Juried fair**—30th Annual Talbot Street Art Fair, June 8–9. Talbot St. from 16th to 18th Sts. between Pennsylvania and Delaware Sts., Indianapolis.
Fair—Founders' Day Celebration, featuring arts and crafts, June 1–2. Fireman's Park, Jefferson and Baughn St. Contact Dixie McDonough, (812) 265-5080.

IOWA: **Show**—10th Annual Craft, Aug. 30-Sept. 2. Grounds of Traditional Country Music Assn. Inc., 106 Navajo, Council Bluffs, Iowa, 51501. (712) 366-1136.

KANSAS: **Juried Exhibition**—Topeka crafts competition, through Apr. 30. Gallery of Fine Arts, Topeka Public Library, 1515 W. 10th, Topeka, 66604. Contact Topeka Library, (913) 233-2040.

KENTUCKY: **Symposiums**—Woodturning and joinery, May 30–June 1, June 13–15. Berea College, Berea. Contact James R. Hall, Industrial Arts Department, CPO 758, Berea College, Berea, 40404. (606) 986-9341, ext. 347.

MAINE: **Workshops**—High-school age, summer. New England Craft Program. J. Sinauer, 374 Old Montague Rd., Amherst. (413) 549-4841.
Workshops—Numerous classes, June 9–Sept. 6. Haystack Mountain School of Crafts, Deer Isle, 04627. (207) 348-6946.
Exhibitions—Designs in wood, William Patrick, Apr. 18–May 12; turned wooden vessels, Todd Hoyer, May 16–June 23. Maple Hill Gallery, 367 Fore St., Portland, 04101. (207) 775-3822.

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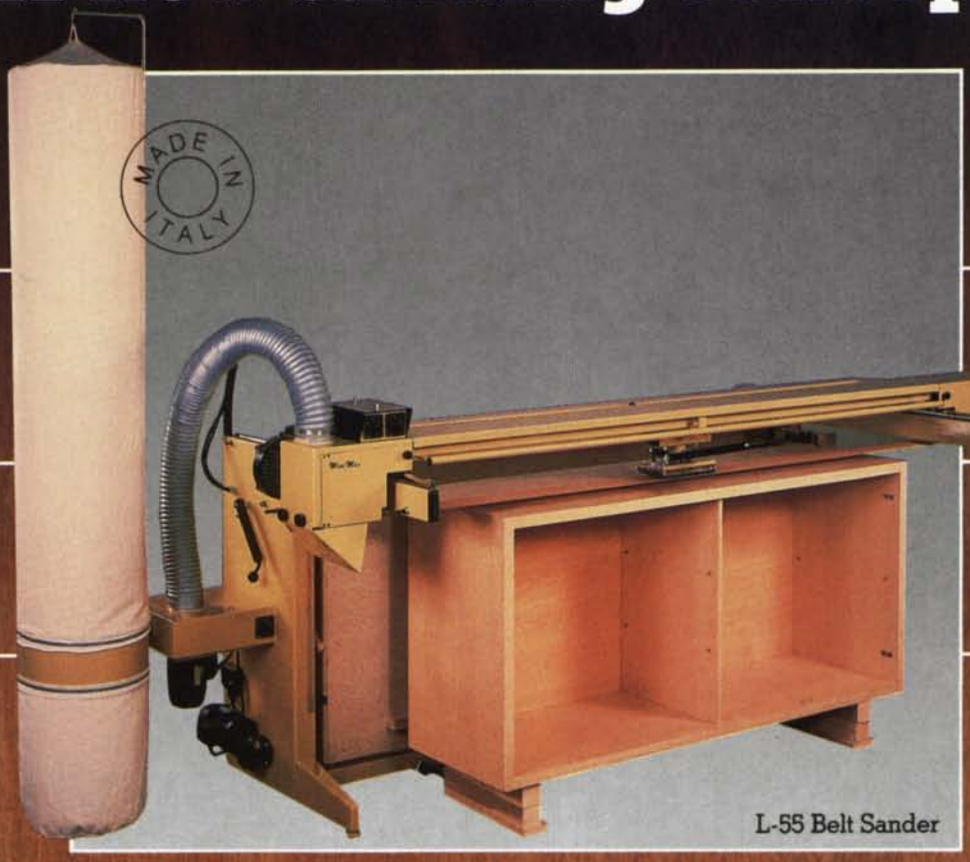

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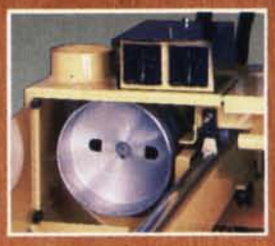
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MARYLAND: **Juried fair**—Spring Craft Fair, May 1–3. University of Maryland, College Park. Contact Mary Shaffer (301) 454-4754.
Juried shows—10th Annual Spring Arts & Crafts Fair, Apr. 19–21. Montgomery County Fairgrounds, Gaithersburg; 8th Annual Spring Crafts Festival, May 3–5. Maryland State Fair Grounds, Timonium. Contact Deann Verdier, Director, Sugarloaf Mountain Works, Inc., Ijamsville, 21754. (301) 831-9191.
Competition—15th Annual Wildfowl Carving, Apr. 26–28. Convention Center, 40th St., Ocean City. $85,000 in prizes. Contact Knute R. Bartrug, (301) 749-5174.
Juried exhibition—20th Anniversary Maryland Crafts Council, Jan. 12–Feb. 28. Courtyard Galleries, Baltimore City Hall, Baltimore. $1,000 in awards. Entry deadline Aug. 1. Contact Nancy Press, Maryland Crafts Council Biennial, 6206 Lincoln Ave., Baltimore, 21209. (301) 358-7743.

MASSACHUSETTS: **Workshops/fair**—Numerous spring workshops; 6th annual traditional crafts fair, Nov. 2–3. Entry deadline June 1. Old Sturbridge Village, Sturbridge, 01566. Contact Frank G. White (617) 347-3362, Ext. 236.
Exhibition—Scent Bottle Invitational, July 5–Aug. 31. Signature galleries in Boston and Hyannis. Signature, Dock Square, North St., Boston, 02109. (617) 227-4885.
Workshops/seminars—Numerous events: joinery, veneering, caning, turning, cabinetmaking, marquetry, finishing. The Woodworkers' Store, 2154 Massachusetts Ave., Cambridge. (617) 497-1136.
Fair—15th Annual Craft Fair, May 17–19. Worcester Craft Center, 25 Sagamore Rd., Worcester, 01605. (617) 753-8183.
Exhibition—New England Colonial Furniture, through June 2. The DeCordova and Dana Museum and Park, Sandy Pond Rd., Lincoln. Contact Ann LeRoyer, (617) 227-3956 or Susan Jaeger, (617) 259-8355.
Exhibition—Early-music instrument makers, June 4–9. Park Plaza Castle and Hotel, Arlington St. and Columbus Ave. Contact Early Music Festival, 25 Huntington Ave., Boston. (617) 262-1240.
Courses—Housebuilding, May 27–Aug. 30; timber framing, July 8–Aug. 9; cabinetmaking, July 8–12; and more. Heartwood Owner Builder School, Johnson Rd., Washington, 01235. (413) 623-6677.

MICHIGAN: **Show**—5th Annual Woodcarving, Apr. 20–21. United Food and Commercial Worker's Hall, 876 Horace Brown Dr., Madison Heights. Contact Fred Bueter, (313) 852-6441 or Don Hindman, (313) 549-1554.

MINNESOTA: **Workshops/seminars**—Numerous events: joinery, marquetry, veneering, and caning. The Woodworkers' Store, 3025 Lyndale Ave. S., Minneapolis. (612) 822-3338.
Workshop—Annual summer woodcarving, July 28–Aug. 3. Villa Maria Retreat Center, Minneapolis. Contact Villa Maria Workshop, PO Box 37051, Minneapolis, 55431.
Classes—Woodcarving, June 3–7, June 10–14. Wood Carving School, 3056 Excelsior Blvd., Minneapolis, 55416. (612) 927-7491.
Exposition—Interior wood products, May 6–7. Radisson South Hotel, Hwys. 494 and 100, Bloomington. Contact Bigelow & Associates, 1421 Park Ave., Minneapolis, 66404. (612) 333-6655.

MISSOURI: **Juried exhibition**—3rd Annual Laclede's Landing Artists' Showcase, June 1–2. First Street Forum, 717 N. First St., St. Louis. Contact (314) 421-3791.
Juried Show—3rd Annual Midwest Wood Furniture, June 8–12. Entry deadline May 1. Contact Midwest Wood Furniture Show, c/o Hibdon Hardwood, Inc., 1539 Chouteau, St. Louis, 63103. (314) 621-7711.
Show—Woodworking World, May 3–4. Market Center, Executive Park, Kansas City. Contact W.A.N.A., 35 Main St., Suite 6, Plymouth, N.H., 03264. (603) 536-3876.

MONTANA: **Workshops**—Hand tool joinery, Steve Voorheis and West Lowe, June 10–16, July 8–14. Primrose Center, 401 West Railroad, Missoula, 59802. Contact Terry Young (406) 728-5911.

NEVADA: **Juried show**—KNPR Craftworks Market, Oct. 26–27. Reed Whipple Center, 821 N. Las Vegas Blvd., Las Vegas. Entry deadline July 1. Contact Craftworks, 5151 Boulder Hwy., Las Vegas, 89122. (702) 456-6695.

NEW HAMPSHIRE: **Workshops**—Violin and bow maker's, June 17–Aug. 23. Univ. of New Hampshire, Durham. Write Violin Craftsmanship Institute, Univ. of N.H., Div. of Continuing Education, Brook House, 24 Rosemary La., Durham, 03824. (603) 862-1088.

NEW JERSEY: **Seminar**—Michael Dresdner, finishing, restoring, repairing, coloring, etc., Apr. 27. Brookdale Community College, Newman Springs Rd., Lincroft, 07738. Contact Dr. Gabriel Longo, (201) 842-1900.
Juried exhibition—6th Annual, June 8–13. Jewish Community Center, 501 North Jerome Ave., Margate.

NEW MEXICO: **Workshops**—Plastic laminates, May 4. 615 Mission N. E., Albuquerque; coopered doors, May 25. 1129 Goff S. W., Albuquerque; tablesaw joinery, June 22. 423 Walter S.E., Albuquerque. Contact William Pike, (505) 265-4077.

NEW YORK: **Juried exhibition**—2nd Autumn Crafts Festival, Aug. 31, Sept. 1–2, Sept. 6–8. Lincoln Center, N.Y.C. Contact Brenda Brigham (201) 798-0220.
Courses—Various classes, Maurice Fraser, through May 15. The Craft Students League, YWCA, 610 Lexington Ave. at 53rd St., N.Y.C., 10022. (212) 755-2700.
Exhibition—Clearwater's 8th Annual Great Hudson River Revival, June 15–16. Croton Point Park, Croton-on-Hudson.
Juried show—Chautauqua Crafts Festival, '85, July 5–7, Aug. 9-11. Bestor Plaza, Chautauqua Institution, Chautauqua. Entry deadline May 1. Contact Gale Svenson, Chautauqua Crafts Festivals, PO Box 89, Mayville, 14757.
Workshops—Numerous, including Japanese hand tools, shoji, through June 14. The Luthierie, 2449 West Saugerties Rd, Saugerties, 12477. Bonnie Robiczek, (914) 246-5207.
Juried show—Woodstock-New Paltz Art & Crafts Fair-Spring Show, May 25–27. Ulster County Fairgrounds, New Paltz. Contact (914) 679-8087.
Exhibition—"Designed and Made for Use", American Craft Museum, 45 W. 45 St., N.Y.C. 10036. Jan. 1986. Deadline June 15. Susan Harkavy, (212) 869-9425.
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.
Juried exhibition—Crafts: National, Oct. 6–Nov. 15. State Univ. of New York College at Buffalo. Entry deadline June 1. Contact Chairperson, Design Department, S.U.C.B., 1300 Elmwood Ave., Buffalo, 14222. (716) 878-6032.
Exhibition—Graduating class of Jamestown Artisan Center, May 13–24. Jamestown Municpal Building, 3rd and Prindergast, Jamestown. Contact Artisan Center, (716) 484-9920.
Exhibition—1985 graduates of R.I.T.'s School for American Craftsmen, Apr. 25–May 9. The Ward Gallery in Sibley's Dept. Store, Main St. East, Rochester. Contact Edgar Brown, (716) 482-2830.

Exhibition—Furniture by Swedish designers, Apr. 9–May 3. American-Scandinavian Foundation Gallery, 127 E. 73rd St., N.Y.C. Contact (212) 751-5900.

NORTH CAROLINA: **Show**—High Country Crafters, Inc., June 28–30. Fairfield Sapphire Valley Resort, Sapphire. Contact Elizabeth Kdan, (704) 254-0070.
Workshops—Greenwood chairmaking, Drew Langsner, July 8–12; toolmaking, Darry Wood, July 22–26; timberframing, Daniel O'Hagan, Aug. 5–9; Japanese woodworking, Carl Swensson, Aug. 19–23. Country Workshops, 90 Mill Creek Rd., Marshall, 28753. (704) 656-2280.
Fair—38th Annual Guild, July 18–21. N. C. Civic Center, Asheville. Contact Southern Highland Handicraft Guild, PO Box 9545, Asheville, 28815. Call Karen Canfield, (704) 298-7928.
Classes—Wood crafts of Southern Appalachia, May–Nov. John C. Campbell Folk School, Brasstown, 28906. (704) 837-2775.

NORTH DAKOTA: **Show**—Souris Valley Woodworkers, Apr. 17–19. Town and Country Ctr., Minot. Contact Robert Kjonaas (701) 838-8045 or 852-0938.

OHIO: **Juried show**—American Contemporary Works in Wood, Sept. 21–Oct. 20. Deadline May 7. Contact The Dairy Barn, PO Box 747, Athens. (614) 592-4981.
Seminars—Numerous, including Windsor chairs, router and hand tools, etc., through May 5. The Univ. of Akron, 44325. (216) 375-7575.
Workshop—Spray finishing, May 13–17. Bowling Green State University, Bowling Green. Contact Judy Jennings, (419) 372-2436.
Exhibition—2nd Annual "Art by the Falls", June 15–16. Riverside Park, Chagrin Falls. Contact Dori Garey, Valley Art Center, 155 Bell St., Chagrin Falls, 44022. (216) 248-4528.
Workshops—Including handtool techniques, joinery, turning, Windsor chairmaking, June 17–28. Conover Workshop, 18125 Madison Rd., Parkman, 44080. Contact Susan Conover (216) 548-3481.

OKLAHOMA: **Show/competitions**—9th Annual National Woodcarving, July 12–14. Southroads Mall, 41st & Yale, Tulsa. Contact Jay Park, 492 W. 36th Place, Tulsa, 74107. (918) 445-0920.

OREGON: **Show**—Guild of Oregon Woodworkers, through Apr. 28. Capitol Gallery, 2215 Jeldon St., NE, Salem, 97303. Contact David Anderson, (503) 363-8426.
Exhibit—Wood sculpture, Bill Moore, through Apr. 27. Blackfish Gallery, 325 NW 6th St., Portland.
Workshops—Woodworking for children, grades 3–6, Craig Rowland, Apr. 9–23. Oregon School of Arts and Crafts, 8245 S.W. Barnes Road, Portland, 97225. (503) 297-5544.

PENNSYLVANIA: **Juried show**—3rd Annual Pennsylvania National Arts & Crafts, May 3–5. State Farm Show Complex, Cameron and McClay St., Harrisburg. Contact (717) 697-3834.
Show/juried exhibition—Sidewalk sale, July 11–14; exhibition, July 1–31. Penn State campus, State College. Contact Lurene Frantz (814) 237-3682.
Workshops—Torsion box construction, veneer surface design, April 20; turning, June 15. George School, Rt. 413, Newtown. Contact Albert LeCoff, (215) 483-5401.
Show—Super Craft Weekend, Sept. 20–22. Valley Forge Convention Center, King of Prussia. Entry deadline May 15. Contact Creative Faires, Ltd., PO Box 1688, Westhampton Beach, N.Y. 11978. (516) 325-1331.
Lectures/workshops/exhibitions—Symposium in American Lutherie, June 27–30. Williams Art Center, Lafayette College, Easton. Contact Dick Boak, Church of Art, 14 South Broad St., Nazareth, 18064. (215) 759-7100.

Classes—10th NHLA Hardwood Lumber Grading, July 15–19. Mann and Parker Lumber Company, Constitution Ave., New Freedom, 17349. Registration deadline July 5. Contact Sharon French, (717) 235-4834.

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

TENNESSEE: **Shop tours**—Tennessee Hardwood Co., daily M–F, 10-4:30. 800 Main St. (Hwy 70-S.), Woodbury, 37190. (615) 563-2223.
Workshops—Furniture making, June 3–7; wood construction, July 1–12; turned bowl, July 15–19; turning and construction, Aug. 5–9; hollow vessels, Aug. 12–16. Arrowmont School of Arts and Crafts, PO Box 567, Gatlinburg, 37738. Clare Verstegen, (615) 436-5860.
Workshops—Chairmaking, box-making, furniture, joinery, turning, June 17—Aug. 2. Appalachian Center for Crafts, Route #3, Smithville, 37166. Contact Wendy Maruyama, (617) 597-6801.

TEXAS: **Exhibition**—Contemporary furniture, through Apr. 27. Carr Gallery, 807 Hawthorne, Houston, 77006. Contact Susan Carr, (717) 520-0187.

UTAH: **Festival**—16th Annual Park City Art, Aug. 3–4. Historic Main St., Park City. Contact the Kimball Art Center, PO Box 1478, Park City, 84060. (801) 649-8882.

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

VIRGINIA: **Juried exhibition/workshop**—ACC Southeast region, Spotlight '85, June 27–July 26. Bedford Gallery, Longwood College, Farmville. Sam Maloof, June 27–29. Campus of Longwood College, Farmville. Contact Mark Baldridge (804) 392-9359.
Workshop—Woodturning, Liam O'Neil, May 4. Washington, D.C. Woodworkers Guild. Contact Sid Stone, (703) 522-8875.
Fair—10th Annual Richmond Craft, Nov. 8-10. Richmond Arena, Richmond. Application deadline June 1. Contact Ann Vazquez, Hand Workshop, 1001 East Clay St., Richmond, 23219. (804) 649-0674.
Seminars—Decoy Carving, June 28–30 and July 26–28. P.C. English Enterprises, Inc., 906 Lafayette Blvd., Fredericksburg, 22404. Contact (703) 371-1306.
Juried show—1985 handcrafts, Oct. 25–27. Radisson Hotel, 601 Main St., Lynchburg. Entry deadline June 1. Contact Lynchburg Fine Arts Center, 1815 Thomson Dr., Lynchburg, 24501. (804) 846-8451.

WASHINGTON: **Workshops/seminars**—Numerous classes: cold molding, oarmaking, sailmaking, lapstrake repair, weekends through June 2. Center for Wooden Boats, 1010 Valley St., Seattle, 98109. (206) 382-2628.
Show—National Working With Wood, demonstrations, woodworking techniques, Apr. 19–21. Seattle Trade Center, Seattle.
Seminar—Kasha design guitarmaker's class, June 30–Aug. 3. Lost Mountain Seminar, 754 Lost Mountain Rd., Sequim. Contact Lost Mountain Seminar, PO Box 304, Sequim, 98382.

WISCONSIN: **Workshop**—Third Annual Festival of Wood, June 28–30. University of Wisconsin-Stout, Menomonie, 54751. In Wisconsin, (800) 277-8686, elsewhere, (800) 457-8686.

BRITISH COLUMBIA: **Exhibition**—Explorations in wood, through Apr. 29. McPherson Playhouse building, Pandora and Government Sts., Victoria. Contact Ken Guenter, (604) 595-2763.

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

ONTARIO: **Show**—Sculpture, furniture, instruments, carving, Aug. 9–11. Over $5,000 in prizes. Contact The Wood Show, Box 920, Durham, Ontario, Canada N0G 1R0. (519) 369-6902.
Exhibition—Summer pleasures/summer treasures, including woodcarvings by Daniel Griffith, June 15–Aug. 31. Heritage Crafts, Sheridan News, King St. West, Brockville, K6V 5W1. (613) 342-2521.

SASKATCHEWAN: **Conference**—Lectures and demonstrations, featuring noted North American woodworkers, contemporary furniture design and technique, Aug. 3–5. Craft Council, Box 7408, Saskatoon, S7K 4J3. Application deadline June 1. Contact Craft Council, Michael Martin, (306) 653-3616.

Connections

In Connections we'll publish membership calls for guilds, authors' queries, and appeals from readers who want to share special interests.

French woodworkers: I'd like to hear from other independent woodworkers who share my interest in contemporary furniture. Elisabeth Beaupere, 4 rue de la Passardiere, Donville 50350, France.

Computers in woodworking: I'm using my new MacIntosh to make detailed drawings of my projects and would like to hear from others similarly inclined. Stan Scheiding, 823 West "O" Ave., Nevada, Iowa 50201.

English Chinese furniture: I'm collecting photos, drawings and essential dimensions with a view to possible publication. I'd be grateful to hear about any examples. Ralph Hampton, Grenestede Farm, Kingston, Hazelbury Bryan, Sturminster Newton, Dorset, England.

Book: Constance Stapleton, 2439A Old National Pike, Middletown, Md. 21769, is looking for craftspeople for a book about crafts that are rooted in particularly American traditions, regional or national.

The Daniel's Planer, a machine from the dawn of the industrial age, was manufactured in Worcester, Mass., in about 1836. The Hagley Museum has one, and they'd like to hear from anyone with another or with any further information about the line. Preston Thayer, Hagley Museum, Greenville, Wilmington, Del. 19807.

Australia and New Zealand woodworkers interested in being in a regional register can write to W. Cyril Brown, 223 Kirk Rd., Point Lonsdale, Victoria, 3225, Australia.

Bay Area Woodworkers Association meets the third Thursday of every month and invites anyone interested. Write BAWA, Box 421195, San Francisco, Calif. 94142.

Shasta Woodworkers Association invites new members. Write Box 205, Shasta, Calif. 96087.

Maine and New Hampshire woodworkers, amateurs and professionals: Want to join our guild? John Leeke, RR 1, Box 847, Sanford, Maine 04073.

BU to close Artisanry Program

Boston University's highly regarded Program in Artisanry may be in its last semester, a victim of declining enrollment and shifting university policy. By the time you read this, BU's Board of Trustees will likely have followed the university administration's recommendation to shut down the program at the end of the 1985 school year. PIA director Bob Cardinale is working to find the program a new home and several Boston-area institutions are interested.

The proposed closing provoked a storm of charge and countercharge between PIA students, faculty and university administrators. Though all describe the program as excellent, there is little agreement about the need for closing it. BU President John Silber, who was instrumental in starting the PIA ten years ago, blames declining enrollment and changing times. Last semester 87 full- and part-time students were enrolled in the PIA's wood, metal, ceramics and fiber programs, down from a high of 133 in 1979 and far from the 300 students Silber expected within two years of opening. "The program has simply withered away," he told me in February. "Evidently there's been a sea change, a decrease in enthusiasm for artisanry as a career."

People at the PIA see it differently. BU, they feel, decided that the PIA was bad business—too few students taking up too much valuable space and returning too little money on the university's investment. Cardinale concedes that enrollment has dropped, but he believes it could be reversed by vigorous recruiting. He says other less-than-profitable programs are sustained by the university for their academic or public relations value. "If they wanted to," says Cardinale, "there is no reason a university of this size couldn't carry the program."

Cardinale believes that support for the PIA has waned as BU has concentrated on science programs. Silber says the program would be healthier had students and faculty not rejected his suggestion to reduce costs by having third- and fourth-year undergrads teach newer students. A proposal to raise money by selling student work was, according to Cardinale, adopted in modified form without much success. Says Silber, "There comes a time when you simply don't tolerate parisitism."

Students who pay $9,000 a year tuition are touchy about being called parasites. Such statements also overshadow the soundness of much of what Silber says, and obscure what appears to be his real anguish over this decision—the PIA was, after all, his baby and he went out on a limb to convince the university that the artisan, no less than the chemist or sculptor, had a place in the university.

A good many PIA students are anguished as well. The PIA student body doesn't fit the usual stereotypes. Its students are older (average age is 25) and likely to be footing their own education bill. Many already have degrees, some have had previous careers. Such students are highly motivated but less mobile than someone fresh out of high school. Closure would put many on the spot. Emmy Howe, a former grade-school teacher, moved from Worcester, Mass., to study woodworking at the PIA. "I own a house and am in the process of adopting a child," she told me. "I can't move again."

Juniors who can move may be able to complete their academic work at BU and their studio work elsewhere. Sophomores and freshmen will have to fend for themselves and some are nervous about transferring to other schools which may be reluctant to accept studio credits earned at BU. A new host institution would solve the problem. Cardinale and Assistant Director Patricia Doran's tireless bushbeating has turned up five interested schools. But there isn't much time, and Cardinale doesn't want to keep the students on the hook any longer than necessary.

It's difficult to determine if PIA's dilemma might have significance beyond BU. Craftwork and craft education do seem to be undergoing a transformation. Working craftsmen and women are beginning to question whether they can continue to accept the work as its own reward—they'd like to take vacations, own decent cars and lie in the sun for a few weeks a year like their contemporaries who are bank managers or heavy-equipment operators. Tuition at BU has doubled since 1979, a BA

Photos by Mark Lawrence

Butte County Show

When the Butte County Woodworkers Association mounted a show in Chico, Calif., last fall, there were just enough pieces to fill the hall, sparing the jury the angst of turning away entrants. Among the work shown: Tim Simonds' bubinga and maple sideboard, above; Mark Lawrence's claro walnut table, lower right and Michael Sterling's Peruvian walnut coffee table, above right.

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Size	Grit	10 Belts	50 Belts
3"x21"	120	$.98 ea	$.84 ea
	100	1.00 ea	.86 ea
	80	1.05 ea	.92 ea
	60	1.07 ea	.94 ea
	50	1.10 ea	.96 ea
	40	1.06 ea	.93 ea
3"x24"	120	1.22 ea	.97 ea
	100	1.26 ea	1.12 ea
	80	1.31 ea	1.15 ea
	60	1.34 ea	1.18 ea
	50	1.68 ea	1.46 ea
	40	1.73 ea	1.51 ea
4"x24"	120	1.78 ea	1.64 ea
	100	1.85 ea	1.70 ea
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167	Block Plane	85.95
309	Laminate Trimmer	79.95
314	4 1/2" Trim Saw	114.95
330	Palm Finish Sander	55.95
337	3x21 Belt Sander w/bag	114.90
360	3x24 Belt Sander w/bag	179.75
362	4x24 Belt Sander w/bag	189.95
505	Finishing Sander	104.75
518	3 H.P. Electronic Router	324.80
690	1 1/2 H.P. Router	129.95
695	1 1/2 H.P. Router/ Shaper	210.50
696	Router/Shaper Table only	109.75
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3103 Cut Saw	167.00	109.95	10.00	99.95
4010 Palm Sander	82.00	48.95	10.00	38.95
4247 Disc Grinder	105.00	69.95	10.00	59.95

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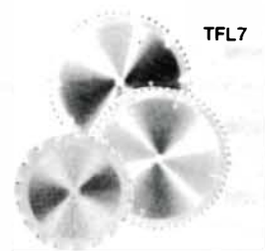


TFL7

there now costs nearly $40,000 and an artisanry student's earning potential is far from rosy. If there is some question as to whether fewer people are interested in the crafts today than ten years ago, it is certain that as the baby boom peters out there are fewer potential students.

But do fewer students necessarily mean fewer craft programs? Four other programs I checked on claim to be doing well. The Rhode Island School of Design and the Rochester Institute of Technology offer programs similar to the PIA. Unlike BU, however, their crafts are contained within larger art and design programs, allowing them to adjust to fluctuating enrollments. The Wendell Castle School in Rochester, and Leeds in Northampton, Mass., both small schools free of university overhead, seem to be doing well.

Back in Boston, Bob Cardinale is putting the best face on things and concentrating on finding the PIA a new home. He's not lacking for support or energy, but the task, he told me, is daunting, "I haven't sold a used school before."

—Roger Holmes

Board-foot bargains

Americans are always looking for bargains. They not only save you money, but give you that feeling of exhilaration at beating the economic system. When I decided to upgrade my standards from pine to hardwood I decided to let my fingers do the walking in search of a supplier, and maybe a bargain. The 50 bd. ft. I needed seemed a lot of wood to me, so I phoned a wholesaler. Laughter on the end of the line. "No sir, I didn't say 5,000 bd. ft. No sir, I didn't say 500 bd. ft. I said 50 bd. ft."

Next I phoned a retail store. Leery, I decided to test the waters. "150 bd. ft.?" No laughter. "100 bd. ft.?" No laughter. "50 bd.ft.; 25?" Still no laughter. "2 bd. ft." Nothing. I'd found my home.

Then the salesman told me about quantity discounts. Praise the Lord! I couldn't pass up a 10% saving, so I bought 100 bd. ft. Taking it unsurfaced and off the top of the stack saved me another 7%.

Out in the barn, the attendant took my ticket and shouted, "Fritz, here's a top-of-the-stack person." The other ten customers moved ten paces away. Was 7% worth this notoriety? Then, while pulling my 100 bd. ft. I noticed a jewel of a board midway down the stack and started to move boards to get to it. From some hidden recess Fritz hollered, "From the top of the stack, just like the ticket says." I slouched away, contemplating how to convince my wife that 100 bd. ft. of rough oak was better than 35 linear feet of pine.

—John Griesser, Berea, Ohio

Signing up

Like other New England states, Maine has recently cleaned up its roadside act by outlawing the ugly billboards that used to blight the major highways. Instead, the state encourages businesses to advertise with tasteful, understated signs put up by the local highway department.

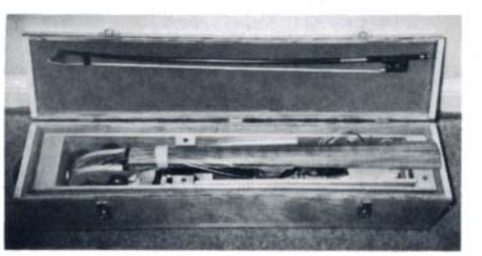
The signs are a good deal for local artisans, many of whom labor in relative anonymity as money-laden tourists troop past their doors. Five bucks a year ($25 for a reflectorized sign) buys a sign permit. You buy your own sign but the highway department erects it for free. Rockport cabinetmaker James Lea has a sign at each of three roads that lead to his shop. He hasn't laid on a second shift to meet the demand but then the price is right. "For $15 a year, if they bring in one customer with a commission a year, they've paid for themselves."

James Lea's roadside attractor.

Travielo, the traveling cello

A cello isn't as easy to travel around with as a piccolo. If you fly, you buy an extra seat. If you drive a subcompact car, you may have to tie your instrument on top. Cello players often forego music on vacations, when deep in their hearts they would love to play with new people and keep in practice. Every cello player has at least one awful tale of traveling—like the poor soul who once fell on his instrument and crushed it—and for most players one such tale is more than enough.

Photo: Patricia E. Pothier



An electronically souped-up spruce soundboard gives Nussbaum's Travielo a rich sound. It folds and stows in box.

In early 1981, Ernest Nussbaum, a civil engineer by profession and a cello player by avocation, decided to do something about it. He'd seen practice cellos, which are instruments without full bodies, designed to allow practicing without waking up the neighborhood. And he wondered whether advances in electronics would allow him to get a full tone from a minimal soundboard. It would have to be good enough that other musicians could stand to play with him, too, nothing raucous, nothing jazzy.

Nussbaum didn't think small, he thought as big as the airlines would let him—most will accept a carry-on box that's under 31 in. long, with a length and girth of 45 in. He wanted battery power for convenience (four *C*-cells), and he knew that the instrument would have to feel exactly like a cello to the hands, arms and knees of the player. If he ever got it right, he would call it a Travielo.

He bought a set-up neck and pegbox, then squeezed himself between the car fender and the wall of his garage and picked up his Skilsaw. The first prototypes were plywood and not much to listen to but then he chanced to make one from spruce and things started to fall into place. After he'd solved the amplification problems with the help of some electrical engineers and found sources for the wooden parts he couldn't make himself, even his wife thought it sounded pretty good.

He decided to make a production run of fifty, jobbing out as much of the work as he could. He got transducers here, rosewood fingerboards there, little electrical pieces everywhere. A cabinetmaker made the bodies and boxes, a neighbor soldered the circuits, but Nussbaum himself set up and fine-tuned each instrument so it worked and felt right.

In the three years since, Nussbaum has sold all but two, and he's showing a small

profit. In order to expand the business, he's now selling plans. For $25, you get drawings, sources of supply and a long list of alternatives to balance woodworking and electrical skills against costs. Nussbaum figures that the electronics will run between $83 and $145; and that the wood (depending on whether it's pre-fab or scratch) will add about $250 to $400 more. This gizmo is no toy, they've been selling for up to $645.

I see ways that a woodworker could cut costs considerably. Nussbaum's shop consists of the original Skilsaw and a new little drill press. That's it. He has to shell out $35 minimum for a maple neck blank from a supplier, while you and I probably have a big enough piece of maple stashed away under the bench already. You can find spruce if you scrounge around, but you could also try cedar instead. Local-lumberyard stuff should do if you can find a piece that's quartersawn.

My wife, Karen, plays bass viol, and I know she could use a travi-viol of her own. With a set of Nussbaum's plans (from Travielo, Box 34464, Bethesda, Md. 20817) she could make one. Why not? She made the viol. —*Jim Cummins*

News bits

Will computer and laser technology make the tablesaw obsolete? According to a report in the *Forest Products Journal* (Jan. 1985), the Southern Forest Experiment Station of the U.S.D.A. Forest Service is developing a system that might do the trick. Here's how it works:

A computer equipped with optical sensors scans lightly-surfaced boards to locate and identify defects. Comparing this information with a programmed cutting bill, the computer guides a CO_2 laser to cut out the parts, scan the pieces for quality and sort them by size.

The laser makes a small kerf and it can start and stop a cut in any location, but the laser-cut surfaces are slightly charred and not as smooth or dimensionally accurate as conventionally-sawn surfaces.

If hauling the Sunday paper off the porch doesn't make you feel guilty enough about depleting the world's forests, John Seed of the Rainforest Information Center would have you pause to ponder before devouring your next Whopper. The RIC, an Australian environmental group, claims that multinational fast-food chains like Burger King are logging off much of the Central American rain forest to raise beef bound for American burgers.

According to a story in the *Mother Earth News*, the RIC and several environmental groups in the US plan fast-food boycotts to save the rain forests—40% of those in Central America are already gone and at present logging rates, the rest will follow by the year 2000. For more information you can contact The Rainforest Information Center, PO Box 368, Lismore 2480, N.S.W., Australia (the center also publishes *World Rainforest Report.*) and Earth First!, PO Box 235, Ely, Nev. 89301.

Delta International Machinery Corp. has won a round in their battle against Taiwanese knock-offs (*FWW* #46, pp. 54-57). In February, International Trade Commission Judge James Timony found that a number of Taiwanese manufacturers and their domestic importers have been violating Delta's trademark and patent rights. The ITC Commissioners have until Mar. 25 to act on the judge's decision and Delta's request that imports of all infringing machines be barred.

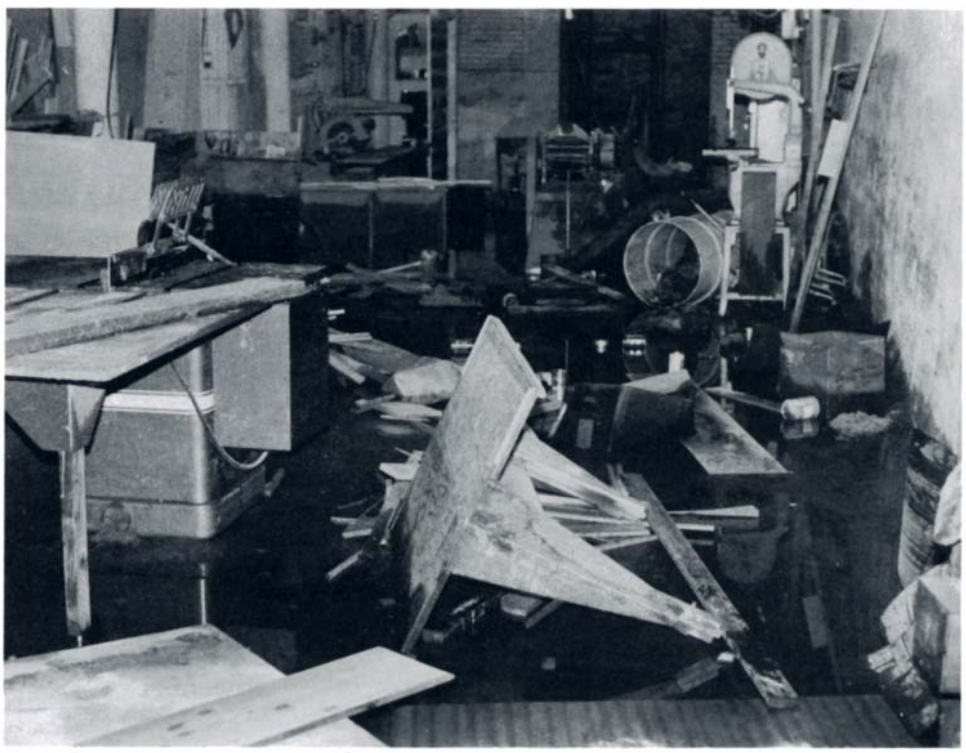
Waterlogged: a workshop disaster

It was sink or swim when our shop flooded last winter. We were on the annual Christmas marathon from St. Louis to Dallas visiting parents when our friend, Ernie, discovered the mess. A sprinkler pipe burst and sprayed 150,000 gallons of water into the basement we rent. It was so cold the landlords didn't dare hesitate or the hoses would slush up as they pumped. Ernie told us the water looked to be four feet deep.

Driving home with our grim imaginings we made our game plan. Insurance money plus enormous amounts of labor would give us a new shop. But the sight of it! Well, it's hard to describe. Only the drill press and mortiser motors stood high enough to stay dry. Those familiar friends Rockwell, Powermatic and DeWalt stood silently with rust etching pits across every surface.

My husband, John, and I took detailed photos of the whole shop before anything was disturbed and had a set printed for the adjuster. We agreed to keep a log of the phone conversations and events as the claim progressed. This was one game we couldn't afford to lose.

Our insurance adjuster was cheery. He told us pipes were bursting all over town, some worse than ours. He offered to pay us to salvage our machinery and hire our friends to help clean up. It sounded pretty fair. While we waited for the freight elevator to be repaired, we arranged for the motors to be kiln dried and all the bearings replaced. We learned a thin coat of WD-40 would stop the rust until we could remove it.



After the flood: waist-deep water left the author's shop in disarray.

The hardest job was calling the clients whose work was ruined. Future business depended on whether they would understand. We were refinishing a friends dining room set that belonged to his grandmother. The value had to be determined by an appraiser. We found out later that if he accepted the money for it he couldn't keep it. Catch-22.

Our accountant heard you could dry out

paperwork using a microwave oven if you remove the staples. We did this successfully every night for weeks until one stack started smelling like smoked manila. It didn't look scorched, so John tossed the pile in a box and set it outside on the porch. A few minutes later we realized the house was on fire. We lost all the receipts from 1981 but only a few pieces of siding.

In six weeks we consumed seven gallons of WD-40, 80 claim sheets and all the energy of five special people who worked to rebuild our shop. All we needed was time, a coffee machine and a radio. Cathy cleaned over 600 hand tools before tackling new fixtures. Pat helped John concentrate on the machines. Jeff and Toby built a new office, working straight through the weekend and into the night. And Verlin tore into the machines while his shop repaired all the power tools.

We braced ourselves for the settlement. Things were tense as we did the arithmetic to see where things stood. Since many items still had some value, we had to determine what we'd offer to buy them back. It was going to be a long day.

When the adjuster arrived, he told us right away that our figure was three times higher than his estimate. So we went down the list and examined piles of damaged goods, negotiating the loss. It made me think of used-car sales. We tried to take our time and kept running totals as we went along to make sure we understood the whole picture. By day's end, the total was just above the figure John and I had hoped for.

It all seemed too easy. Since we'd made a deal on the hourly wages, our claim to be paid for our work seemed pretty straightforward. There were daily time sheets and we worked desperately to get back in business as soon as possible. Over the phone the adjuster gave me quite a shock. He said the claim was for more money than he was cleared for and the "committee" thought we'd taken too long to repair the machines. After days of harsh words over the phone we convinced him that repair shops would be glad to compare prices and estimate times for each job. We were determined to be paid for our hard work. In the end, we were.

So now we're back in business. The lumber we salvaged is air drying and we're trying to find the energy to continue. The reward after all this is a well-organized shop and a good job to start back to work with: a 16-ft. conference table for the Nelson Art Museum. We got a fair deal from the insurance company and they must think we're okay too; they didn't raise our rates. We'll surely remember this time for our good friends and our good fortune.

—Nancy Lindquist, Kansas City, Mo.

Woodworking in a cassette

If you've begun to feel that weekend woodworking workshops are too expensive, too time consuming and too far from home, you may need to look no farther than your living-room TV set for the same kind of instruction and inspiration. Woodworking videos are sprouting up everywhere, offering everything from complete woodworking courses to in-depth looks at specialties like oak-graining or dovetailing.

You won't find the dazzle of Hollywood, but you will find lots of useful information. We have discovered at least 15 companies that are producing or planning to release videos in the near future. The Taunton Press, publisher of *Fine Woodworking*, for example, has just released five videos.

If you're like me, the revelations obtained at weekend workshops fade fast. By Wednesday I'm scratching my head, struggling to remember just how the instructor pulled off this or that neat little trick. With a video, you can watch the workshop all day, every day, over and over, until you have it memorized or your kids recapture the tube to watch MTV. There are drawbacks, though. I've spent so much time in front of the TV recently that I haven't done a lick of woodworking. Of course, I've learned a lot, but only time will tell if any of this video knowledge drifts down to my hands.

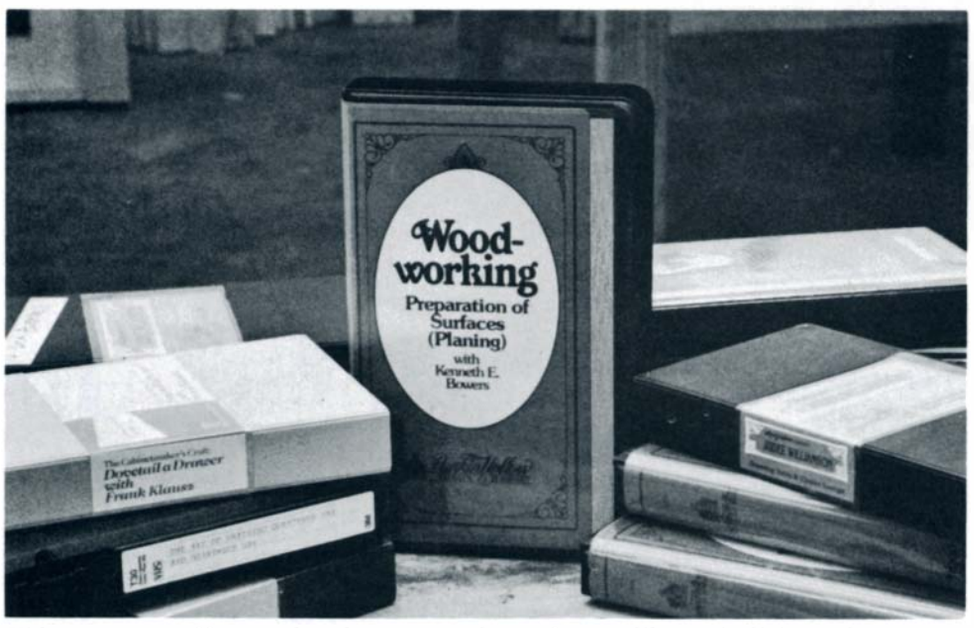
Videos do seem to be good teaching tools, especially for beginners who often can't find good, solid information. Kenneth E. Bowers' Punkin Hollow video series does a good job of giving beginners a sampling of sound techniques to get them going. Bowers' very British presentation might be too staid and slow paced for some, but I wish I had seen his mortise-and-tenon video, which stresses careful measurements and precise chisel work, before I ever tried to cut my first mortise with a hand drill and a sharpened screwdriver.

Instruction in more complex or exotic techniques can benefit from video presentation. Written descriptions of how to cut dovetails can be an intimidating morass, but on the video the joint appears much more manageable than you might have thought—not much more than learning to saw and chisel to a line.

With turning and other techniques where hand movements and tool manipulation are critical, the videos can excel. If you've ever tried turning, you know how much easier it is to understand a technique after you've seen it a few times. With the videos, you can get close enough to the instructor's hands to clearly see every single movement. Then you can try the technique yourself, and, if you have any problems, just go back to the video and quickly review the whole thing again.

I don't think I'll ever do any work on guitars or get into oak-graining, but I did find the videos on these subjects made it easier to understand techniques that I had only read about, like creating grain patterns with paint and your fingernails.

If you're really interested in the topic, you'll probably find most of the tapes at least fairly interesting. But pick your titles carefully. A fly-tying video, for example, was considered a stupifying tangle of string and feathers by everyone in the office but our resident fly fisherman, who was enthralled. Likewise, Louisiana cabinetmaker



Video cassettes offer woodworkers a complete reference library in living color.

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The Taunton Press Box 355, Newtown, CT 06470

George Olivier's tape showed some nice work, but a hand-tool woodworker might find the work done on Olivier's large, industrial equipment of little use.

The tapes I viewed ranged from less than an hour to four hours long. Cost varies from $40 to more than $300, though some companies allow you to rent rather than buy. If I was familiar with the person in the video and really admired his or her work and technique, I think I'd try to come up with the money to buy the tape. Otherwise, I'd try to rent or preview it before investing a lot of money.

If you'd like more information about videos, here are some companies who have sent review copies and samples to us. Most of the prices were tentative, so check with the distributors before ordering.

Woodworking with Kenneth E. Bowers is a seven-tape series on basic tools, stock preparation, mortise-and-tenon and dadoes, dovetails, sharpening, finishing, hardware. Available from Punkin Hollow Video Library, P.O. Box 094965, Milwaukee, Wisc. 53209.

The Taunton Press, Box 355, Newtown, Conn. 06470, offers five *Fine Woodworking* videos: dovetail a drawer, woodfinishing, carving a ball-and-claw foot, bowl turning and radial-arm-saw joinery.

The Art of Graining Quartered Oak and Heartwood Oak is available from S. Sleeper Co., Route 107-A, E. Kingston, N.H. 03827.

The Art of Freehand Turning in Miniature is available from B. J. Miniatures by Borre, 1018 Harrison Ave., Windsor, Ontario, N9C 3J3, Canada.

The National Carvers Museum, Woodcarver Rd., Monument, Colo. 80132, offers eight tapes on a variety of carving techniques, including figure carving, relief carving, bird carving and chip carving.

George Olivier, 117 Second St., Natchitoches, La. 71457, offers 3-hr. and 4-hr. how-to tapes on making a pencil-post bed, dovetailed blanket chest and night stands, farm tables, captain's chair, french doors, kitchen cabinets and bow-top armoire.

For *Dan Erlewine's Guitar Hospital,* an eight-tape series on guitar repair, write 319 So. Michigan Ave., Big Rapids, Mich. 49307.

Basic Guitar Set Up and Repair by Harvey Citron comes from Homespun Video, Box 694, Woodstock, N.Y. 12498.

How to make a canopy bed and *How to make a dressing table & chaise lounge* (both about miniatures) with Judee Williamson. Mini Graphics, 11322 Southland Road, Cincinnati, Ohio 45240.

Crate idea?

Photo: Simon Watts

Blucher's boy readies himself to bust a crate out of this door.

When the wife and I married 30 years ago we didn't have much money, so we made all our own furniture from used orange crates. In those days you could get them for nothing and we combined them in lots of interesting ways to make beds, tables, chairs and one grandfather-clock case.

Nowadays they ship oranges in cardboard boxes so the wooden variety is becoming scarce. In fact, I've already seen them in antique stores. Buying them there means competing with collectors and paying an inflated price, so I thought your readers might like to know how to make their own. We just finished a set of six crates for our daughter-in-law and she just loves them!

To make orange crates out of new lumber is a bit pointless—you might as well make the furniture right off and be done with it. What you need is a supply of cheap, junk furniture that can easily be knocked apart and made into crates. Furniture's all different, some makes good crates and some doesn't. Making a crate out of a chair is pretty difficult because you've hardly got any surface—it's all legs and spindles. Old dining tables are pretty good and doors aren't bad, but what I like best is the big, old-fashioned wardrobes.

First you want to take a good look and see how it's made. You won't need a wrecking bar because if you can't get it apart with a regular hammer, then it's not junk and you ought to leave it be.

In California we always do it outside and the snap shows our boy happily tackling a door. You want to watch out when breaking up a junky piece of upholstered furniture because it's full of corrugated fastners and tacks. One of them got in the lawnmower and gave our Doberman, Adolf, a nasty cut in his you-know-what.

Readers of *Fine Woodworking* shouldn't have any trouble making the actual crate and not to worry if the pieces are different thicknesses—it just makes it more interesting looking. People finish their crates in all sorts of ways. Some paint them, but I prefer a couple of coats of used crankcase oil. It's cheap and the smell soon goes away. One piece of advice, however, if you break up a piece of junk furniture that you got as a wedding or anniversary present, it's best to keep it quiet. Even when you've made it into a fine-looking crate, people can be surprisingly touchy.

Hope this is some help to your readers. The wife says it makes a 'crate' story. Ha, ha. —*Woodley Blucher, Eureka, Calif.*

Doomsday tool kit

On page 106, Nancy Lindquist told of reviving a shop drowned by a flood. But suppose your shop were to be wiped out permanently by a natural or man-made disaster and you could escape with only the tools you could carry in an old-fashioned carpenter's tote box, what would you take. And why?

The thought hadn't occured to us until Don Axt of Peoria, Ill., suggested it. Axt thought it might be fun to ask readers what they would take along. "That kind of discussion would expand a woodworker's knowledge and maybe encourage him to use tools he doesn't ordinarily use. Or to use other tools differently," wrote Axt. If the idea of a doomsday tool kit intrigues you, send us your list and tell us why you chose it.

Notes and Comment

What's new in woodworking in your area? Notes and Comment buys brief articles about interesting events, shows and people and welcomes all manner of commentary. Send manuscript, if possible with color slides or black and white photos (preferably with negatives), to Notes and Comment,* Fine Woodworking, *Box 355, Newtown, Conn. 06470.

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Down the Up Staircase

Stairs and slide change modes at the pull of a cable from either the first or second floor.

Photos: Ross Chapple, Thetford, Vt.

I like to make objects that, as Flaubert said in talking about art, "make you dream." When I work, I reach for the moment when all the parts of a piece will zing together. Bob Ferris, a painter I respect, says that after a painting is started, it talks back to him, tells him where the moves are. In sculpture it's the same.

Ferris commissioned me to make a staircase for his house in Windsor, Vermont. The stringers pivot when you pull a lever and cause the treads to lie flat. This turns the staircase into a slide, then another pull turns it back into a staircase again. Of course, in real life the thing is almost always in the stair position, except when the kids want to play with it. Then the parents have to risk their necks going up and down the slide for a while—the family has figured out that the best way to go up is to put on sneakers and take a run at it. They tell me the staircase is like an old family friend that everyone loves, but who's also a bit of an eccentric. For me, the most exciting part is watching the staircase in transition, when it's neither one thing nor the other. —*Tom Luckey, Branford, Conn.*