Fine WoodWorking

Sept./Oct. 1989, No. 78
U.S. $4.95, Canada $5.95

Building a Rocker

Handling Large Jobs

Making a Walnut Chest

A Modern Trestle Table

Natural-Edge Bowls

Tuning-Up a Tablesaw

IMPORTS, INC.

MIRROR, MIRROR ON THE WALL, WHY IS GRIZZLY THE BEST MAIL ORDER HOUSE OF THEM ALL

GLANCE BELOW & SEE WHY!

MINI DUST COLLECTORS

The Lowest Price IN U.S.A.!

This portable dust collector is the answer to the small shop mess. Motor draws 8 amps and unit weighs 77 lbs.

MODEL G1031

ONLY $169⁹⁵ Prepaid To You

15" SCROLL SAWS

Cuts up to 2" thick material. Table tilts 45° and table size is 7⅜"x17".

MODEL G1572

ONLY $99⁹⁵ Prepaid To You

BRAD POINT DRILL SETS

7 Pc. set in pouch or 25 Pc. set in metal case.

7 Pc. set contains ⅛" to ½" by 1/16 increments.
MODEL G1834 **ONLY $6⁹⁵**

25 Pc. set contains ⅛" to ½" by 1/64 increments.
MODEL G1835 **ONLY $27⁵⁰**

Both Sets Prepaid To You!

MULTI-STOP

Precisely position repeat cuts on Radial Arm saws and other machines. MADE IN U.S.A.!

MODEL G1821

ONLY $27⁵⁰ Prepaid To You

CLAMPING MITRE-GAUGE

A very handy device that holds the work-piece in place when cutting.

MODEL G1822

ONLY $29⁹⁵ Prepaid To You

RGT HANDLER

Safely & accurately cut, shape, route and joint pieces as small as 1" with this jig.

Introductory Price

MODEL G1771

$29⁹⁵ Prepaid To You

LATHE CHISELS

This professional 8 Pc. set is made of carbon steel and heat-treated to 60° Rockwell.

Overall length is 15¼" each.

MODEL G1089

ONLY $29⁹⁵ Prepaid To You

INCRA JIG

Make intricate dovetails, finger-joints, etc . . . with this amazing jig.

Introductory Price!

MODEL G1768

$29⁹⁵ Prepaid To You

TEMPLATES FOR INCRA-JIGS

Designed to fit in the auxilliary slot of the Incra-Jig, all calculations on your part are eliminated! Set of 6 templates for making dovetails and finger-joints.

MODEL G1832

ONLY $14⁹⁵ Prepaid To You

WOOD VISES

Heavy duty cast-iron construction with quick setting feature. G1091 opens 8", G1092 opens 10".

G1091 — $42⁵⁰
G1092 — $59⁹⁵

Both prepaid to you

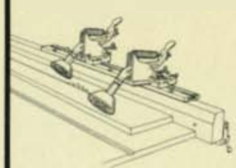
PANTOGRAPH

Enlarge or reduce images right on the wood accurately.Comes with a scribe point & lead. Made in Japan.

MODEL G1731

$18⁵⁰ Prepaid To You

THE INCREDIBLE "SHOPHELPER" ANTI-KICK DEVICE



Sold elsewhere for $89.95

MODEL G1630

$49⁹⁵ Prepaid to you

ALSO AVAILABLE: Model G1578
Green shophelpers for shapers! Used as hold downs, these green shop helpers are very popular with shaper owners.

Only $49.95 Prepaid to you

Price Breakthrough!

DOWELLING JIG

You've read about it, you've heard about it— THIS IS ONE DYNAMITE JIG!

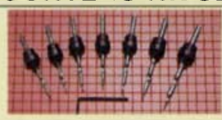
REGULARLY $49.00

MODEL G1662

ONLY $34⁹⁵

Both prepaid to you

7-PC. TAPERED COUNTERSINK SET



Predrill holes for woodscrews easily and correctly the first time! This very high quality set is made in Japan.

MODEL G1728

$39⁹⁵ Prepaid To You

We have the most courteous operators and the fastest shipping crew in the world! You place the order and before you hang up the phone, UPS is knocking on your door — well almost!

CALL TOLL FREE (FOR ORDERS AND CATALOG REQUESTS ONLY)

EAST OF THE MISSISSIPPI:	**1-800-523-GRRR**	← (For Orders & Catalogs Only) →	**WEST OF THE MISSISSIPPI** **1-800-541-5537**
	(717) 326-3806	← (For Inquiries & Customer Service) →	**(206) 647-0801**

89-106

READER SERVICE NO. 1

Fine WoodWorking

September/October 1989

A rocking chair is a wonderful addition to any home. Brian Boggs tells how to build one on p. 40. Cover: Mark Duginske aligns the sawblade and miter gauge as part of his complete tablesaw tune-up (see article on p. 69).

Fine Woodworking is a reader-written magazine. We welcome proposals, manuscripts, photographs and ideas from our readers, amateur or professional. We'll acknowledge all submissions and return those we can't publish. Send your contributions to *Fine Woodworking*, Box 355, Newtown, Conn. 06470.

Fine Woodworking (ISSN 0361-3453) is published bimonthly, January, March, May, July, September and November, by The Taunton Press, Inc., Newtown, CT 06470. Telephone (203) 426-8171. Second-class postage paid at Newtown, CT 06470, and additional mailing offices. **Subscription rates:** United States and possessions, $22 for one year, $40 for two years; Canada and other countries, $26 for one year, $48 for two years (in U.S. dollars, please). Single copy, $4.95. Single copies outside U.S. and possessions, $5.95. Send to Subscription Dept., The Taunton Press, PO Box 355, Newtown, CT 06470. Address all correspondence to the appropriate department (Subscription, Editorial, or Advertising), The Taunton Press, 63 South Main Street, PO Box 355, Newtown, CT 06470. U.S. newsstand distribution by Eastern News Distributors, Inc., 1130 Cleveland Road, Sandusky, OH 44870.

DEPARTMENTS

ARTICLES

Postmaster: Send address changes to The Taunton Press, Inc., PO Box 355, Newtown, CT 06470.

Craft vs. art debate continues—After reading Woody Pistrich's letter in *FWW* #77, p. 4, I was reminded of ceramic art/craft trade journals during the '70s and '80s that were filled with letters debating "funky vs. functional." Pistrich states (I would say erroneously) that contemporary forms of furniture design "emphasize originality, [and] they certainly don't emphasize utility," and that exhibiting contemporary forms at high-end galleries is at the "expense of more traditional work." I'd like to point out that there are many contemporary furniture designers like me who use non-traditional materials and finishes, but who are very concerned with function. When I design and construct a cabinet, it has to function as a cabinet and be durable as well.

This country has a diversity of tastes and markets and Pistrich will not lose the sale of a dovetail, tung-oil oak hope chest because I sell a bisquit-joined, painted plywood chest. As in any business, you have to decide what your market is and gear your work toward that market. *—Richard Kooyman, Benzonia, Mich.*

...In answer to Woody Pistrich's letter, I too have been watching furnituremakers, especially in the past two years, fall off the end of the vast spectrum encompassing functional furniture to produce work of a non-functional character and enter their creations into the realm of objects characterized as art. I do not agree with Pistrich's theory that functional objects cannot be art. Submitted to the test of time, objects are either art or they are not art—regardless of whether or not they are functional. Pistrich's theory, "function negates art," promotes the very condition he complains about: "fine-art objects taking over the place of fine craft at galleries."

I do not understand Pistrich's comments in some ways. In my opinion, most furniture *is* overwhelmingly traditional. In the commercial field, tradition holds sway on the consumer market. Even the "decorative crafts" that he condemns are of a traditional origin because they draw heavily from modern art. The flood of how-to books in the last two years reiterates the continuing fascination with traditional ways of building functional furniture. Experimental woodworkers, on the other hand, are willing to pursue and advance our knowledge of materials, techniques and design concepts of furniture. It requires courage to depart from the familiar and deal with the uncertainty of experimentation, and the furnituremakers that do this are rarely compensated monetarily.

In answer to Pistrich's complaint about galleries, the woodworker/furniture artists I know who have developed superior skills in their work and continue to use conservative techniques with conventional material are all busy and most of them exhibit in "high-end" galleries. *—John Marcoux, Providence, R.I.*

Rethink tropical deforestation—Some of your readers may have taken solace in Lucinda Leech's article on tropical deforestation in *FWW* #70, p. 83. To quote from the article, "Environmentalists often give the impression that tropical forests will be logged out tomorrow. After visiting Guadalcanal in the Solomon Islands, I learned that much of the forested terrain in tropical countries is too steep or swampy to log economically."

Our relief has been short-lived, as it was disturbing to open the June 5, 1989 issue of *Time* magazine and read the following: "Elliott Abrams, former Reagan Administration point man for Latin America, and retired General Paul Gorman are pushing a scheme to use cargo-carrying blimps to extract mahogany logs from otherwise unreachable forests in Honduras. Abrams also arranged a logging deal in Brazil that will expedite timber sales to Japan. Says he: 'I'm making lots of money. It's great.' " Perhaps it would be prudent for those who care about the environment to be a little more vigilant. *—Silas Kopf, Northampton, Mass.*

Bugs and blue stain problems—As an entomologist, I was interested in Jon Arno's response to a question on blue stain in spruce pine in *FWW* #76, p. 20. I'd like to remind Arno that without insects, wood would rot only from the surface or cut ends inward. Blue stain is caused by an early-stage rot fungus, Ceratocystus. Thousands of species of insects, largely beetles, introduce fungal spores deep into the wood as a normal part of their life cycle (as well as the fungus'). In our northern latitudes, the chief insects are the bark and wood miners of the families Scolytidae and Platypodidae. Many of these beetles have evolved special pockets called mycangia in which they carry fungal spores from their tree of birth to their adult host tree. There, the fungal spores are introduced into the cambium or deep into tunnels bored into the tree.

Most of these symbiotic insect-fungus relationships are not incidental and have probably evolved to mutually benefit both parties: The growing fungus "conditions" the wood so the beetles can consume it. In the case of the ambrosia beetles, the adults even harvest fungal material and feed it to their larvae. The fungi introduced by ambrosia and platypodid beetles soon grow throughout the tree's vascular system and, after the wood is processed by the beetle, shows up as blue stain, or spalting.

The best way to prevent blue stain problems is to process lumber quickly or to debark logs immediately after the tree is cut. Most of the insects described above are attracted to recently dead or dying trees and are part of the rich and complex insect community that initiates tree decay.

—Dr. Walter R. Tschinkel, Tallahassee, Fla.

Thinking safety—Regarding Bill Hayman's letter in *FWW* #76 recommending that *Fine Woodworking* devote a regular space to safety: In my estimation, on p. 49 of *FWW* #75, Dunham said a whole lot in just 33 words about safety. I also read into those 33 words the admonition: If *you* don't feel comfortable with an operation, it ain't safe and you shouldn't be doing it. If I were doing the operation pictured, I might use two fences with some method of keeping the edge of the stock from being lifted by the cutter and my maximum cut would be ⅛ in. Dunham apparently felt safe with his single fence and a ¼-in. maximum cut—so for him the operation wasn't any more dangerous than using the molding cutter in a conventional manner. What is dangerous to one person is routine or commonplace to another.

Every operator's manual furnished with every power tool has cautions and warnings in them, as do the multitude of woodworking books written by our compadres, but none of these can

TAUNTON PUBLICATIONS
...by fellow enthusiasts

The Taunton Press: Paul Roman, *publisher*; Janice A. Roman, *associate publisher*; Roger Barnes, *design director*; Carol Gee, *executive secretary*. **Accounting:** Wayne Reynolds, *controller*; Patrick Lamontagne, *manager*; Jeffrey Sherman, *financial analyst*; Mary Sullivan, *accountant*; Carol Diehm, Diana D'Onofrio, Lydia Krikorian, Rachel Yahwak, Elaine Yamin. **Books/Videos:** John Kelsey, *associate publisher*; Eileen Hanson, *administrative secretary*, Deborah Cannarella, *editor*; Paul Bertorelli, Christine Timmons, *senior editors*; Andrew Schultz, *assistant editor*; Maria Angione, *secretary*; Videos: Rick Mastelli, *producer/director*; James Hall, Thomas Menard, *assistant producers*; Art: Deborah Fillion, *manager*; Steven Hunter, Henry Roth, *associate art directors*; Cathy Cassidy, *art assistant*; Iliana Koehler, *production assistant*; Copy/Production: Ruth Dobsevage, *manager*; Pamela Purrone, *copy/production editor*; Marketing: Jon Miller, *manager*; Philip Allard, *senior copywriter*. **Corporate Marketing:** Dale Brown, *director*; Andrea Ondak, *manager*; Donna Pierpont, *public relations manager*; Barbara Buckalew, *marketing secretary*; Diane Patterson, *executive secretary*; Christine Cosacchi, *customer service coordinator*. **Data Processing:** Drew Salisbury, *manager*; Brendan Bowe, Roger Seliga, *senior programmers/analysts*; Susan Partis, *programmer trainee*; Ellen Wolf, *PC coordinator*. **Fulfillment & Operations:** Tom Luxeder, *director*; Jane Torrence, *secretary*; Circulation: Karen Cheh, *coordinator*; Mary Ann Colbert, *circulation assistant*; Customer Servcw0ice: Patricia Malouff, *manager*; Anette Hamerski, *coordinator*; Jane Bojnowski, Nancy Schoch, Marylou Thompson; Distribution: Danny D'Antonio, *manager*; Grace Aumuller, David Blasko, Timothy Harrington, Linnea Ingram, Mary Ann Costagliola, Fred Monnes, Alice Saxton, Robert Weinstein; Purchasing & Facilities: William Schappert, *manager*; Lois Beck, *office-services coordinator*; Donald Hammond, *mail-services clerk*; Chuck Hollis, *office maintenance*; Christopher Myers, *office-operations clerk*; Debra Brown, *chef/manager*; Norma-Jean Taylor, *cafeteria assistant*; Subscription: Carole Ando, *manager*; Patricia Aziere, Connie Barczak, Donna Baxter, Gloria Carson, Dorothy Dreher, Peggy LeBlanc, Denise Pascal. **Manufacturing:** Kathleen Davis, *director*; Austin E. Starbird, *prepress manager*; Robert Marsala, *graphic arts supervisor*; Susan Kahn, *staff photographer*; Peggy Dutton, *production manager/books*; Philip VanKirk, *production manager/magazines*; Diane Flanagan, *print buyer*; Ellen Olmsted, *production coordinator*; Rosemary Pagel, *secretary*; Richard Booth, Monica Bulson, Priscilla Rollins, *production assistants*; Deborah Cooper, Mark Coleman, *scanner operators*; Laurene Jakab, *color proofing operator*; Dinah George, *composition systems manager*; Nancy Knapp, Margot Knorr, Lisa Carlson, *systems operators*. **Personnel:** Carol Marotti, *manager*; Linda Ballerini, *personnel assistant*; Chris Lincoln, *secretary*.

compensate for a lack of common sense. Each and every one of us has the responsibility to determine whether our actions are safe or not. I've been a subscriber since volume #1 and I am willing to bet that there hasn't been one issue out of the 76 that didn't cover some aspect of safety in the Letters, Methods of Work, Questions & Answers or Follow-up departments or in the articles themselves. So let's not devote a section or department in the magazine to shop safety—especially on a recurring basis.
—James E. Gier, Pine, Ariz.

Catches and computer furniture—As Product Manager for The Woodworkers' Store in Rogers, Minn., I would like to point out a potential problem I found in the article on computer furniture in *FWW* #77, p. 32: The use of magnetic catches near electronic equipment. A few years ago, when computer furniture was starting to become popular, our customers often inquired about which fittings were proper for this furniture application. At the time, many woodworkers were using magnetic catches similar to the one used by Franz Klausz in his computer cabinet, shown in the article. After initially discounting how a magnet might affect sensitive electronic equipment, several customers reported minor problems after using magnetic catches on computer stations. There could be disastrous consequences if a floppy disc was brought too near a magnet, which would scramble its files.

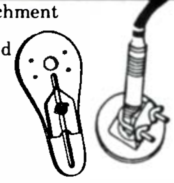
To avoid these problems, I recommend using a nylon roller catch that is totally non-magnetic and keeps cabinet doors closed. Most of us have lost computer files to a "glitch." It would be a shame if something so simple as a magnetic catch would ruin an otherwise handsome piece of furniture.
—Paul M. Thoms, The Woodworkers' Store, Rogers, Minn.

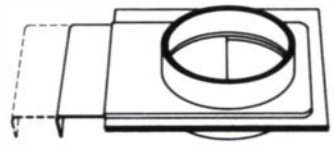
Potential hazard with ebonizing—I read John McAlevey's article, "Ebonizing Wood" in *FWW* #76, p. 47, and decided to try the finish he described. I grabbed a quart bottle of vinegar from the pantry, and I added a few washers and nails along with a wad of steel wool. I recapped the bottle so the vinegar wouldn't smell up the workshop and then left nature to do its work.

When I returned a few days later, I found that the bottle had exploded and had "ebonized" a large area of my workshop.... Fortunately, no one was hurt.... *—Tom Horst, Wyckoff, N.J.*

EDITOR'S NOTE: After consulting with author John McAlevey and finishing expert Michael Dresdner, we've concluded that Mr. Horst's problem was probably caused by the expansion of hydrogen gas inside the tightly sealed vinegar bottle. The gas is released as a natural by-product of the chemical reaction between the acetic acid in the vinegar and the steel wool. The explosion of a glass bottle is clearly possible, especially if the bottle is full and the cap is screwed on tightly. Therefore, we recommend that you prepare and store your ebonizing mixture in a plastic container with a loosely fitting lid to avoid a possible hazard. Generally, because of the potential dangers of glass breakage, it's a good idea to avoid using any glass containers in the workshop.

Angst about ivory—I was dismayed to see the "Egypto-Deco Pharaoh Cabinet" on the back cover of *FWW* #77 because of the use of ivory on the cabinet's handles. Whether the ivory is a "legal, 30-year-old tusk dredged up from a basement" or a tusk that's freshly sawed from the face of an elephant, the point is that *any* use of ivory encourages further slaughter of endangered elephants. Worse yet, *Fine Woodworking* has shown at least three pieces involving ivory in the last few issues. There is plenty of excellent work being done without ivory, and there's no excuse for woodworkers who use it. If you must have that ivory look, use painted wood, ivoroid or





other plastic substitutes, but *do not* use ivory!

—Tracy A. Fiegl, Fillmore, N.Y.

Using a sealer with varnish—In reference to Craig Deller's article "Versatile Varnish" in *FWW* #77, p. 64, nowhere in the article did I find a reference to sealing the wood prior to applying varnish. In my own shop, I find sealing prior to topcoating essential for many reasons. A sealer will prevent the varnish coat from "sitting on top of the wood" and emphasizing the look of the pores on open-grain woods, like oak. A sealer locks into the fibers of the wood and creates a more durable finish that is less likely to chip or peel off. Also, wood that has been sealed is more likely to withstand changes in atmospheric moisture.

When restoring antique furniture, it is much more in keeping with the old ways of finishing to build up two or three light coats of sealer, put on a medium-thick topcoat of varnish and then paste-wax the surface. Subsequent coats of wax over the years will build a patina similar to what is found on old furniture that has survived with its original finish intact. Applying a heavy coat of varnish directly to the wood is not a sound practice today.

Many companies offer sealers compatible with the varnishes they sell. One with a watery consistency is best and I don't recommend the quick-drying type. Unless you wish to spray, brush a generous coat onto the raw, sanded wood and remove the surplus sealer with rags. This process can be repeated several times, followed by two or three light coats of varnish. Some sealers themselves make a very lovely final finish. Contrarily, varnish can be thinned and used as a sealer. Another advantage to using a sealer is that it will often eliminate any problems with fish eye or orange peel.

—Thomas E. Wisshack, Galesburg, Ill.

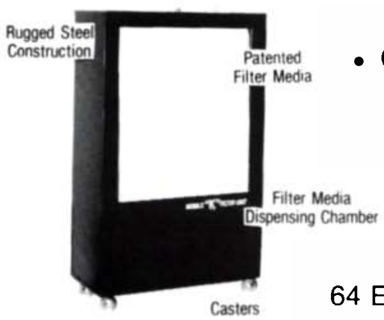
Grinding wheel speed—On p. 22 in *Fine Woodworking* #77, Jerry Glaser states that 2,400 RPM is a reasonable speed at which to run a 10-in. grinding wheel. All 10-in. bench grinders with which I am familiar run at 1,725 RPM. Further, the four different brands of 10-in. grinding wheels that I've used all have maximum recommended RPM ratings of either 2,000 or 2,400. Considering the flimsy nature of some grinding-wheel shrouds, I'd hate to have a 1¼-in.-thick wheel rated for 2,000 RPM blow up at 2,400 RPM. The point is, regardless of formulas, never run a grinding wheel at a higher rotational speed than what it's rated for.

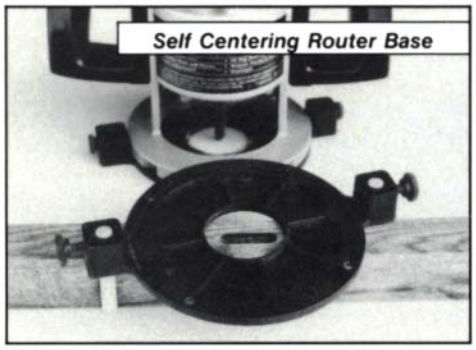
As an added tip, I have found that salvaged diamond-edged masonry sawblades are extremely effective for dressing grinding wheels. Contractors who work on streets that have buried utility lines frequently discard used or broken wheels, rather than recover the expensive diamond bort. If the wheel is large, have a friend torch-cut a small, straight piece for you. I routinely use diamond wheel pieces to shape as well as dress the grinding wheels in my shop.

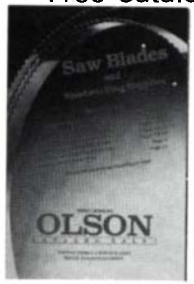
—Vernon Raaen, Oak Ridge, Tenn.

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

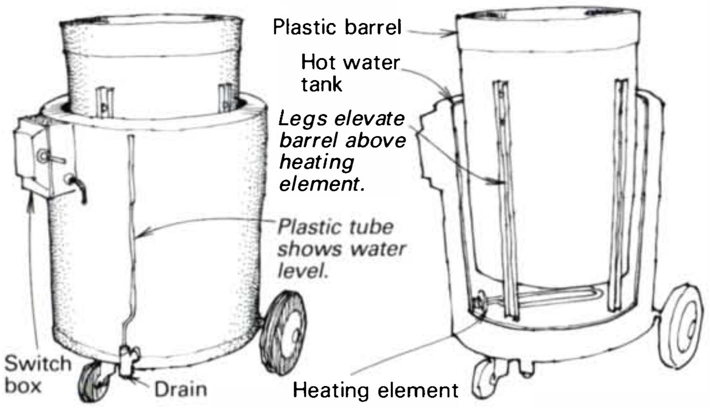
—John Lively, publisher




Self Centering Router Base


Saw Blades
OLSON

Homemade tank for heating PEG



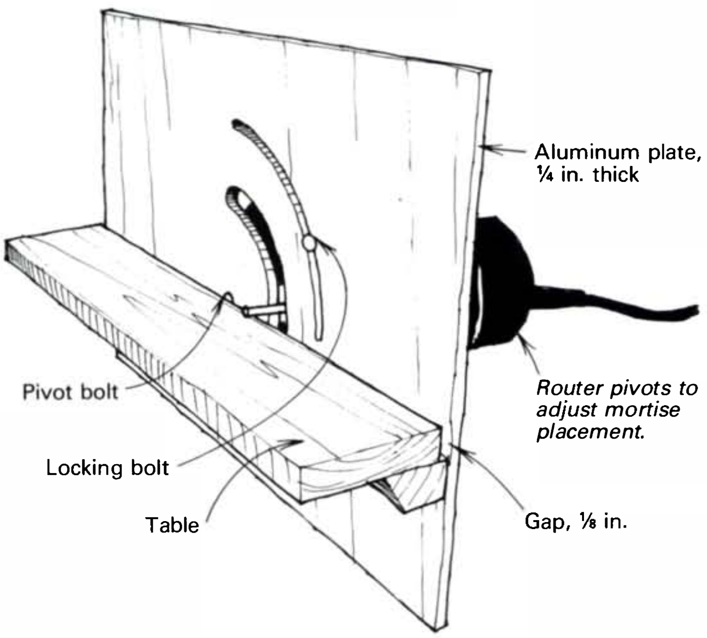
I've found soaking green wood in PEG 1000 helps reduce shrinkage of the stock I use for lathe projects. Heating the PEG shortens the time the wood must be soaked, so I built a makeshift double boiler to do the job. The main components are a salvaged electric hot water heater, a 30-gal. plastic barrel, a couple of lawn mower wheels and an old lever switch box.

The construction is simple. Remove the hot water tank from its jacket and saw both the tank and the jacket in half. Install the portion of the tank with the heating element and thermostat back into one of the half jackets and pack the space between the two cylinders with fiberglass insulation. Bolt four aluminum legs to the plastic barrel to elevate it above the heating element. Mount the switch box to the outside of the heater and wire it to the thermostat. A drain pipe with a T-shape pipe fitting is screwed into the bottom of the tank. The bottom of the T is plugged and the top is connected to a clear plastic tube that acts as a water-level sight glass.

Now, fill the hot water tank with water and the plastic barrel with PEG 1000. Set the thermostat to keep the PEG solution at the manufacturer's recommended temperature.

—Charles Manning, Port Townsend, Wash.

Pivoting router mortising fixture



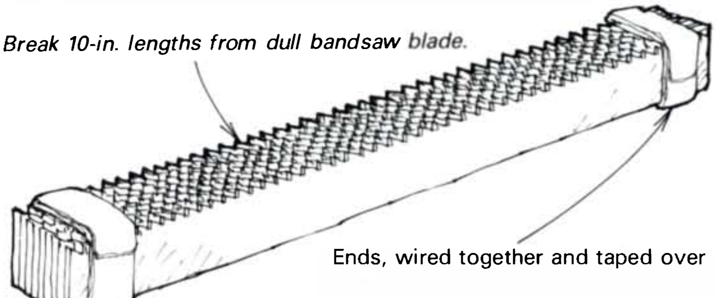
Because I needed to cut more than 400 mortises in a short period of time, I built this pivoting router fixture. With it, I can cut two mortises in about one minute, including the layout time, so the four hours I spent building the jig were quickly repaid.

The router is attached to an aluminum plate with a single bolt so it will pivot to adjust for the position of the mortise in the stock. The plate has two concentric slots centered on the pivot bolt: one for the mortising bit and one for a locking bolt and wing nut. A cleat to support the table is screwed to the plate and a hardwood table is glued and screwed to the cleat with a ⅛-in. gap left between the table and plate for chip and dust clearance. My aluminum plate is ¼x12x20. I recommend 6061 aluminum with a hardness of at least T3. You can mill the curved slots in the plate by building a special pivoting fixture and using a milling cutter in the drill press. Or, if you're patient and careful, you can rout the slots with a router and double-flute carbide bits with a trammel or circle-cutting fixture. Take several light cuts. After the plate is completed, install the fence and attach your router.

To use the mortising jig, bolt or clamp it to the edge of a stout table or workbench. Adjust the router for mortise placement and depth of cut. Then, start the router and push the stock from left to right past the bit. Plunge the stock onto the bit for stopped mortises. Use stop blocks for repetitive cuts or draw layout lines on your stock to show you where to start and stop your mortise in relation to the bit's slot. Don't try to mortise pieces that are too narrow or are shorter than about 12 in. In addition, use the same caution you would with any router-table operation.

—James E. Gier, Pine, Ariz.

Super rasp



My pack-rat instincts paid off one day when I needed a heavy-duty rasp for a sculpture. Retrieving a broken 1-in.-wide bandsaw blade from the junk pile, I snapped off 10-in. lengths in the vise until I had a 1-in.-thick stack. I bound the ends together with wire and taped over the wire with duct tape. In about 10 minutes, I made the fastest-cutting, easiest-cleaning rasp I've ever had my hands on.

With a little more experimentation, I found that wider blades worked better and staggered teeth made a smoother cut. Blades can be added or subtracted to make rasps of specific widths. To release chips, flex the blades in the middle.

If you make a super rasp, please be careful. This monster eats knuckles with the same appetite that it eats wood.

—Greg Connell, Lake Elsinore, Cal.

Quick tip: Cut a length of bicycle inner tube an inch or two long and stretch it over the middle part of your drill chuck. The rubber will make it much easier to spin the chuck open and closed by hand. *—Bill Webster, Chillicothe, Ill.*

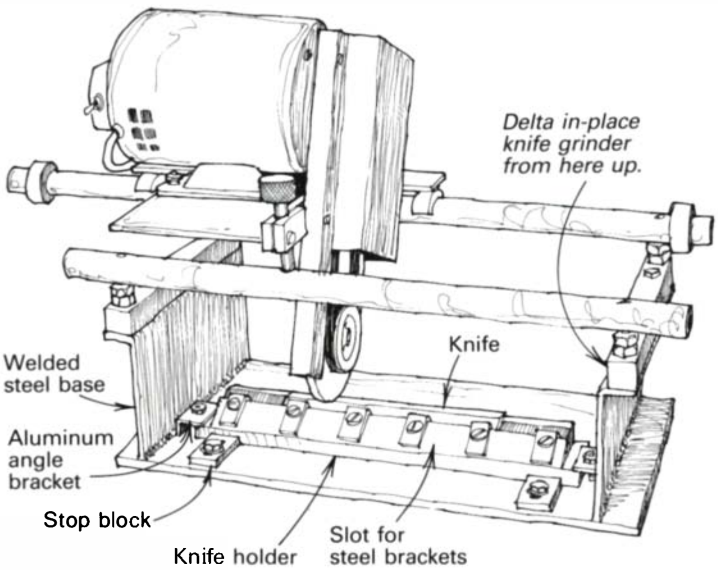
Quick tip: Use wine bottle corks to cover the tips of scratch awls, compass points and the like. The corks keep the points of your tools sharp, and they protect your fingers when you're

READER SERVICE NO. 11

rummaging through the toolbox.

—Tony Konovaloff, Tahoe Paradise, Cal.

Adapting an in-place knife grinder

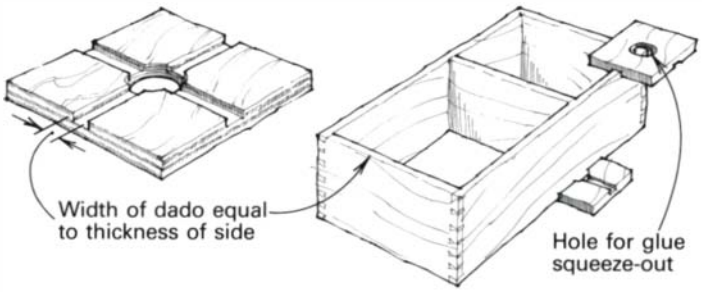


Past issues of *FWW* have presented a number of methods for grinding jointer knives. I've never been satisfied with the in-place knife-grinding attachment from my Rockwell 13-in. planer, so I designed a steel base to adapt the in-place grinder for use off of the planer. This fixture provides excellent and professional results. I can also use it to hone my planer knives and grind my joiner knives.

The fixture consists of the knife grinder, a welded steel base and an aluminum knife holder machined to hold the knives at a 36° grinding angle. I bolted my equipment to the steel base by drilling and tapping holes; this is the same way it's attached to the planer. The knife holder is clamped to the bottom plate of the base with aluminum angle brackets at each end. With steel brackets, clamp the knife to be sharpened to the knife holder. Tighten it in place with bolts threaded into holes drilled and tapped in the angled face of the holder. Adjustable aluminum stop blocks align the knife holder so the knife is centered under the grinding wheel and is parallel to the wheel's travel. The grinder's guide bars are then adjusted so the grinding wheel travels parallel to the knife holder. After making these adjustments, push the stop blocks against the knife holder and bolt them in place. This allows the knife holder to be removed and replaced in the same position for grinding the remaining knives.

—Earl M. Wintermoyer, Niceville, Fla.

Blocks for squaring a carcase



While gluing up and clamping a cabinet case without a back, it was difficult to keep the case square. So, I made the alignment

We'll Stand On Our Heads To Please Our Customers

Another Way to Look at Routers

Input	15 Amps	120 Volts AC
Horsepower		3-1/4
No Load RPM		22,000
Collet Capacity		1/4",3/8", 1/2"
Max. Plunge Depth		2-3/4"
Base Diameter		6-5/8"

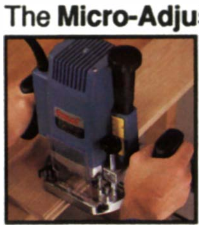
The router has become a work horse in the wood working shop. When mounted under a router table like the Freud FRT2000, the router can take the place of a more expensive spindle shaper.

Freud's new FT2000, 3-1/4 HP Plunge Router with 1/2 inch collet has been engineered with your needs for a versatile and safe tool in mind. The mighty <u>3-1/4 HP</u> motor is the most powerful you can buy!!

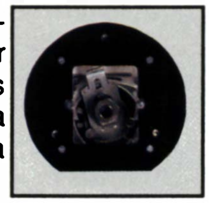
<u>**FOUR major features separate the FT2000 from other routers and make it a pleasure to use!**</u>

The **Long Collet**, 1-3/8 inch, has 6 constricting slots. This feature allows for a longer, more even grip of the bit shank.This decreases run out found on routers with shorter, single slotted collets and increases operating safety.

The **Micro-Adjustment Depth Control** makes accurate vertical settings quick and easy. No more twisting of the router body or "hit & miss" plunging with inaccurate measurements and difficult locking devices. An effortless turn of the knob does the trick! This makes table mounted adjustments a snap!



With the **Sliding Shaft Lock** found on the Freud FT2000, bit changing is simple, safe and easy. Only the one wrench provided is needed. No more busted or bruised nuckles and hands!! This is best appreciated when changing a bit with your router mounted under a table.



Safety was an important factor when the on-off switch and the plunge lock were designed! They would need to be released at the same time in the case of an emergency. Both are designed with a downward stroke to disengage each feature.

The *on-off switch* is located on the side of the router. A simple flick of the left thumb while holding the handle turns the machine on-off.The *plunge lock* is located by the right handle. It can be conveniently operated by the fingers of the right hand.

A 1/4 inch collet reducer and collet wrench are standard with this powerful machine. Optional accessories include micro-adjustment parallel fence and a set of template guides.The FT2000--3-1/4 HP Plunge Router List: $299.90 Call today for the name of your local Freud distributor!

freud®

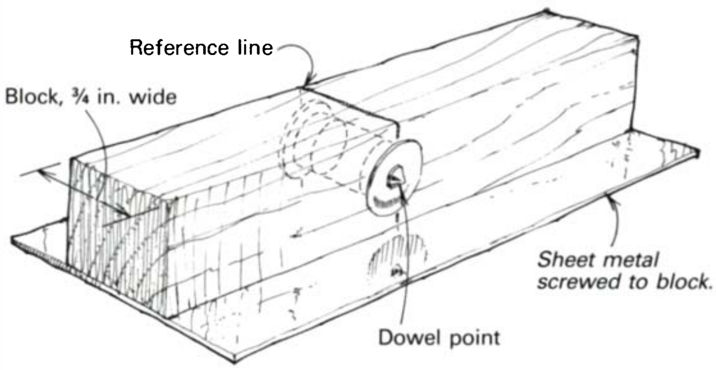
Precisely what you need.

High Point, NC • (919) 434-3171

blocks pictured on the previous page by cross-dadoing an 8-in. square of ¾-in. plywood. The width of the dado is equal to the thickness of the case material. I drilled the center of the block to prevent glue squeeze-out from permanently attaching the blocks to the case. *—Gaylord R. Livingston, Chazy, N.Y.*

Quick tip: To prevent a skin from forming on oil-base paints, carefully pour a little pool of mineral spirits or turpentine on top of the paint. Let the paint can sit for a half hour or so with the lid slightly ajar, and then tap the lid shut. The fumes from the solvent will displace the air in the can, thus preventing oxidation and paint skinning. *—C. Peter Duncan, Walnut Creek, Cal.*

Dowel-center marker



If you use a lot of doweled edge joints, this dowel-center marker will speed up the layout process by marking the mating holes simultaneously. It's made from two steel dowel points, a hardwood block and a small piece of sheet metal. First, countersink for the shoulder of the steel points on opposite sides of the block, and then drill the through hole. If you have access to a drill press, use it to ensure accuracy. Glue the points in place with epoxy, and attach the sheet metal fence with a couple of small flat-head screws.

Lay the two boards, aligned just as they're to be glued, on a clean workbench. With a framing square, draw a line across the two boards where a dowel will be needed. Now, place the dowel-center marker between the boards, matching the reference line on the marker block with the lines drawn on the boards. Tap the boards together, against the points, to mark both boards at the same time.

With long material, I mark and drill the first mating holes on one end and join the pieces dry with a dowel ¾ in. longer than I intend to use. This keeps the boards in registration and holds them far enough apart so I can move the marker to any point along the length of the boards and make accurate marks. *—Harry E. Hunter, Oakville, Conn.*

Quick tip: Here's a quick method for securing hardwood handles to socket chisels when the taper is undersize. Spread some steel wool into a thin, even blanket over the socket and drive the handle home. Adjust the thickness of the blanket until you get a good fit. Then, trim off the excess steel wool with a utility knife. *—Edward Tyderkie, Man., Canada*

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'll return only those contributions that include an SASE.*

ONLY FROM SUCCESS ENGINEERING MANUFACTURING

STOP
BEARING
BURN

USE
Pilot Bearing Saver

A synthetic lubricant specially formulated for the high speeds and temperatures developed in router bearings.

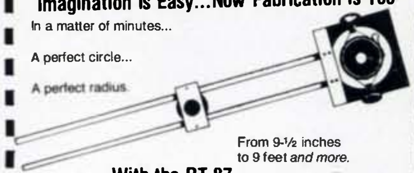
200% + more life from your bearings.

Imagination is Easy...Now Fabrication is Too

In a matter of minutes...

A perfect circle...

A perfect radius.



From 9-½ inches to 9 feet *and more.*

With the RT-87

The Black Knight Stands Alone
NON-STICK
CONQUERS
GLUE BUILD-UP

PLC Plastic Laminate Cleaner. Removes Grease, Grime, Oil most Inks, Pencil Marks, etc.

These exclusive GUARANTEED products And More for the serious craftsman

Reach for the right tool....Reach for SUCCESS

SUCCESS ENGINEERING
& MANUFACTURING
9418 Dorothy Ave., - P.O. Box 25648
Cleveland, Ohio 44125
(216) 883-1200

Call or write *for our free brochure today!*

READER SERVICE NO. 74

America's Finest Clocks

Solid Cherry Desk Clock

SAVE 30%

Reg. $21.90

KIT NOW ONLY $14.95

Includes Everything You Need!

Imagine, for a small fraction of retail cost, you can create this elegant "bracket" style clock. Kit includes pre-cut wood, quartz movement, ivory dial and hardware. Stands 7⅛" tall.

CALL OR WRITE TODAY!

Order #171421 for ONLY $14.95 plus $3.50 for shipping/handling. Wisc. res. add 5½% sales tax. Kit and clock parts catalog $1.00.

(715) 823-5101

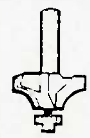
The American CLOCKMAKER

P.O. 326, Dept. FW91, Clintonville, WI 54929

READER SERVICE NO. 156

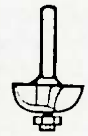
TUNGSTEN CARBIDE ROUTER BITS

- Heavy duty industrial quality
- 1/4 by 1-1/4 inch long shafts
- Enclosed Ball Bearing Guides
- Tools exceed AISI standards



Corner Round-over

Radius	Price
1/4 "	$12.50
3/8 "	$13.75
1/2 "	$14.50



Cove Bits

Radius	Price
1/4 "	$14.50
3/8 "	$15.50
1/2 "	$17.00

45° Chamfer Bits

Diameter	Price
1 "	$12.00
1-1/4 "	$14.00
1-1/2 "	$15.50

100% Money Back Guarantee

Order now - Toll free
1-800 767-4747 Anytime
Visa - Master Charge Ok
Or mail check to:
SKYCROFT TOOLS, INC.
P.O. Box 418F1
Myersville, MD 21773-0418

READER SERVICE NO. 72

HOW WOULD YOU MAKE THESE WITHOUT Incra Jig™

U.S. PATENT #4,793,604

These joints were made using the new ***Incra Templates****, with* ***Incra Jig*** *on the router table.*

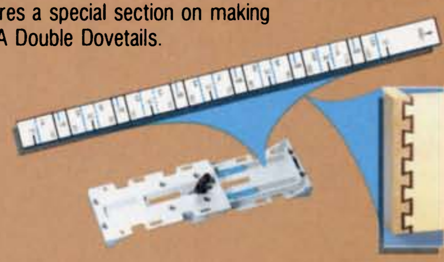
The intricate and beautiful joints shown here are just a small sampling of the flawless work that you can now readily accomplish with the unprecedented performance and accuracy that this remarkable new tool puts in your shop. No other dovetail jig, *regardless of cost*, can even come close to matching INCRA JIG's precision and versatility.

But the **INCRA Universal Precision Positioning Jig** is **much** more than just a dovetail and finger joint jig. It operates in **EXACT** 1/32" steps as a precision fence or stop block on your **router table, drill press, table saw, band saw, radial arm saw**, and more. Over-all error is under 1/500", and you can instantly return to any former position with a repeatability error that is unmeasurable.

Now Available

Set of 17 templates plus full-sized plans for making all of these joints plus hundreds of unique and beautiful variations. Just set INCRA JIG to the color-coded reference marks, and then rely on the precision of INCRA JIG's sawtooth positioning racks to lock each cut exactly into place for a perfectly fitting joint.

Handbook has 100 illustrated pages with detailed instructions and tips on getting the most out of your INCRA JIG. Includes expanded sections on making sliding, half-blind, and **THROUGH** dovetails with **ANY** combination of pin and tail spacing, using **ANY** dovetail bit ever manufactured. Features a special section on making INCRA Double Dovetails.



For a free brochure and your nearest dealer, write to:
Taylor Design Group, Inc. P.O. Box 810262 Dallas, TX 75381
INCRA Templates with included handbook are sold separately from INCRA JIG.

Stain bleeding through catalyzed lacquer

I am having a problem with a catalyzed lacquer finish that I sprayed over a dark red penetrating dye stain. The color is coming through the finish even though I used the sealer provided by the lacquer manufacturer. Is there any way to save the finish? —David Goldfarb, Great Barrington, Mass.

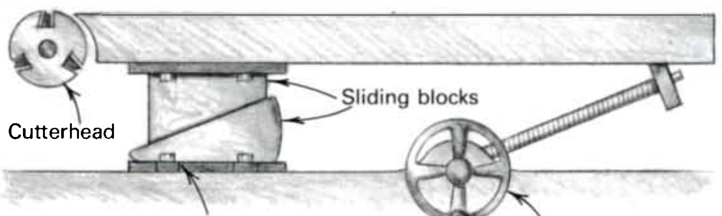
Sandor Nagyszalanczy replies: Catalyzed lacquers present a wealth of improvements over regular lacquers, but one of their big drawbacks is their incompatibility with other finishing materials. Your problem is, unfortunately, a common one: catalyzed lacquers frequently cause severe bleeding of certain aniline dyes. I've seen one case in which an acid-catalyzed lacquer caused a particular dye color to bleed so much that the wood turned from amber to red after the lacquer was sprayed.

There is no quick fix that I know of. Some catalyzed lacquers can be recoated after they are cured, and with these finishes, the curing process sometimes "sets" the dye in the coat. In such a case, you may be able to simply respray the piece with another coat. If not, you will probably have to strip the piece and start over, which is difficult since catalyzed lacquers do not strip easily. Make certain that you test the dyes and lacquers before combining them in the future, and try switching to water-soluble anilines, which are much less susceptible to bleeding problems. Also, contact the lacquer manufacturer to see if any information on the problem is available. If the company that sold you the lacquer refuses to help, it's time to switch suppliers.

[Sandor Nagyszalanczy is Associate Editor for *FWW*.]

Adjusting jointer tables

I have an old 16-in. jointer on which both the infeed and outfeed tables are adjusted parallel by means of sliding blocks, as shown below. The tables themselves are flat, but it takes me hours to adjust the blocks so that the jointer cuts properly. Is there a procedure I can follow that doesn't depend on trial and error? —Gaylord Livingston, Chazy, N.Y.



Elongated holes in the lower block allow back-and-forth adjustment.

Handwheel turns screw to raise and lower table.

Rich Preiss replies: I'm afraid there is no simple method to align your jointer tables. My old 12-in. jointer has the same system for adjusting the tables, and aligning it also requires a fairly tedious trial-and-error process. I have found, however, that once the beds are trued, they do hold their position almost indefinitely.

Begin by making sure the feet of the machine are sitting firmly on the floor. I adjust the plane of the outfeed table to the cutterhead first, and then do the same for the infeed table. The cutterhead end of each table must be set in the same plane as the top of the cutting arc before the outboard ends can be adjusted. The problem with the inclined ways is that one sliding block puts too much force on the other as you near a final adjustment, forcing it out of alignment. You can compensate for this by refraining from tightening the lower block to the base until the final table-height adjustment is made. If this still does not neutralize the tension, you might add a thin shim to raise the blocks as required. Place the shim between the block and the machine base—not between the inclined ways of the mating blocks. This way, further adjustments will not be hindered by a loose shim. The fact that your tables are flat to start with should make this procedure easier.

My jointer has a universal pivoting collar that couples the table-adjusting screw to the base. By adjusting the exact location of this collar, I can control the tension on the feed screw and still maintain the proper line of feed. When this adjustment is incorrect, the table will not go up and down smoothly. As with all machine adjustments, be patient; large machines require great care to set up properly. The payoff comes in precise performance over extended periods of use.

[Rich Preiss is head of the woodworking program at the University of North Carolina at Charlotte and a Contributing Editor to *FWW*.]

Matching rosewood veneers

I am restoring an antique pool table and must replace much of the veneer on the rails and the table legs. The veneer is a variety of Brazilian rosewood called moradella, which is a deep red-brown with contrasting black streaks and a basically straight figure. I cannot find any reference to the name moradella. Is there a more common name for this rosewood, and where can I buy it? —Rodrick Cook, Newark, Ohio

Bob Flexner replies: Moradella or, more correctly, moradillo *(Machaerium acutifolium)*, also called Bolivian or Andes rosewood, is not a true rosewood *(Dalbergia)*, though it is sometimes sold as such by unknowing or dishonest dealers. It does often resemble rosewood, but it varies much more in color and figure and ranges from a near-walnut look-alike to a golden color almost as yellow as satinwood. Moradillo is also generally much less porous than rosewood—it is more like a cross between walnut and maple.

You can buy solid 4/4 and 8/4 moradillo at Paxton Lumber Co., 1815 S. Agnew, Oklahoma City, Okla. 73148; (800) 654-3243. I don't know of any source for the veneer, but you can cut it yourself from the solid stock. You should, however, be very careful with this wood since its sawdust can cause severe rashes and irritation to your lungs. Wear a long-sleeve shirt and particle mask at the very least when working with this wood.

I don't know how you determined that the veneer on your pool table is moradillo. Because of your description and the fact that rosewood was commonly used on high-quality pool tables in the last half of the 19th century, I suspect you would be safe using rosewood as your replacement wood. If the figure and coloring match well, I wouldn't worry too much about species names, especially when dealing with exotic woods that are hard to get and look very much alike. Rosewood veneer is available from The Wood Shed, 1807 Elmwood Ave., Buffalo, N.Y. 14207; (716) 876-4720.

[Bob Flexner is a professional finisher and restorer in Norman, Okla. His videos, *Repairing Furniture* and *Refinishing Furniture*, are available from The Taunton Press, 63 S. Main St., Newtown, Conn. 06470.]

Finishes for outdoor furniture

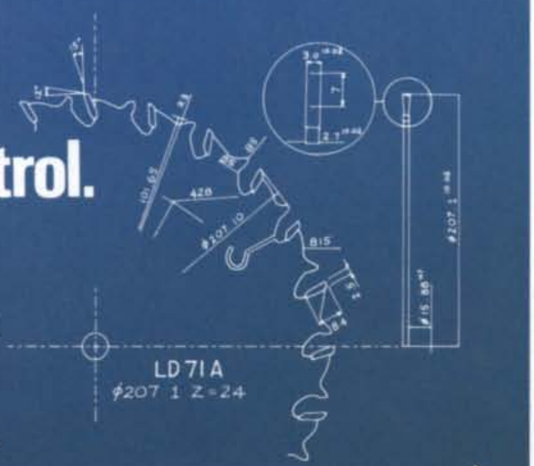
I live on the Gulf Coast and make outdoor furniture from cypress, which is readily available and durable. I'm having a problem finding an acceptable finish. I like linseed and tung oils, but they seem susceptible to mildew problems in this hot and humid area. I've also tried polyurethane and spar varnish, but they deteriorate rapidly in sunlight and require periodic recoating. What's the best clear finish on cypress for outdoor use. —Marland Mendoza, Gonzales, La.

Michael Dresdner replies: Unfortunately, mildew will indeed form on any finished surface under the right conditions, and mildew may even feed on oil. Nevertheless, your best option for a clear exterior finish is a tung-oil and phenolic-resin varnish. The ultraviolet (UV) rays present in sunlight will adversely affect most clear finishes, but a good exterior varnish containing UV "blockers" will resist this degradation considerably longer, though not indefinitely. When the finish does start to deteriorate, if you catch it before it peels or cracks, you can sand it lightly and recoat with more varnish without having to strip the finish entirely.

A widely available tung oil/phenolic varnish is McCloskey's Man-

New Safety Dado

Improved Design. Effective Control.



The Freud Difference

Advanced CAD System. The Computer-Aided Design System simulates actual cutting conditions in three dimensions and records the blade performance. This allows Freud engineers to electronically vary the material being cut and the blade's physical characteristics, developing saw blades that provide optimum cutting performance.

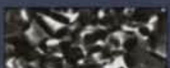
Laser Technology. A computer-controlled, 500-watt laser is used in the production of Freud cutting tools. The concentrated beam of light creates a perfectly round blade, produces shoulders identical in shape and size, and precisely centers the arbor hole. In addition, expansion slots are strategically placed to allow for heat dissipation during brazing and blade body expansion during actual use.

Superior Carbide. The chemicals used to produce and bond materials like composition boards, melamine, MDF and plastic laminates will attack carbide and cause it to corrode. Freud's engineers developed a special mixture of titanium, cobalt and tungsten carbide to significantly reduce this corrosive problem.

Titanium is used to protect the cobalt and tungsten carbide from chemical corrosion, ensuring a longer lasting carbide edge.

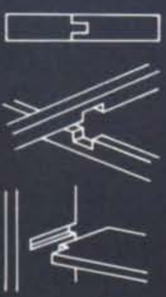
The right degree of hardness is another important property of carbide life. This difficult problem is solved by using carbon and tungsten powders with a grain size of 0.8 microns. Freud carbide is 33% more dense than the standard 1.2 micron size found in the carbide of other manufacturers.

Freud Micrograin Carbide



Standard Carbide

Old shoulder style (behind) compared to new safety shoulder style (front)



Freud Dado Head Puts You in Control.

The secret is the shoulder. It is in front of every tooth and it limits the tooth's bite. Since each tooth removes a very small chip (.2mm), you are in control. There is almost no climbing. Almost no chance of kickback. This is the key to a safer dadoing experience.

Freud's improved dado head does not compromise results either! It cuts a smooth square bottom. The tear-out is virtually non-existent, even when dadoing problem materials. Get control of your work, put Freud's new dado head on your saw!

Stock Number	Diameter	Teeth	Max. Groove	Inside Chippers
SD 306	6 inches	24	13/16"	(4) 1/8" & (1) 1/16"
SD 308	8 inches	24	13/16"	(4) 1/8" & (1) 1/16"
SD 310	10 inches	36	13/16"	(4) 1/8" & (1) 1/16"
SD 312	12 inches	36	13/16"	(4) 1/8" & (1) 1/16"

Call for the name of your local distributor.

Makes radial arm saw dadoing safer

Storage case comes standard

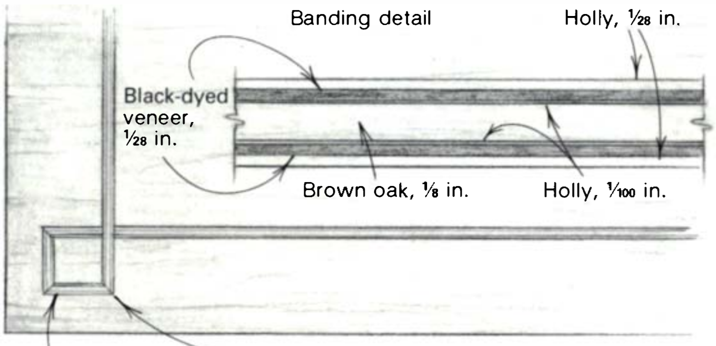
freud®

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

'O-War. Although this does not contain added UV blockers, the phenolic resin contains some natural sun blockers. Although more expensive, McCloskey's Boat Koat is a pure tung oil/phenolic mix with added UV blockers, and it is great for outdoor use. Not all dealers stock Boat Koat, though; if you have trouble finding it, call McCloskey's at (800) 345-4530 for your nearest dealer.
[Michael Dresdner is a Contributing Editor for *Fine Woodworking* and an instrumentmaker and finishing specialist in Zionhill, Pa.]

Strip inlay in a solid-wood top

I'm planning to build a table with a solid walnut top inlaid with wood strips about 1 in. from the edges. However, I'm afraid the movement of the top will crack or buckle the inlay. Do you have any suggestions? *—George Seifert, Shoreview, Minn.*



Cross-over square banding on solid-wood top

Lance Patterson replies: I see no problem with your plan. In traditional work, it is within the realm of good and normal practice to inlay stringing or banding strips across or with the grain as needed. Wood bandings of a reasonably small width and thickness are amazingly accommodating to cross-grain seasonal movement, and I can only suppose that the thin wood inlay is elastic enough to move with the top. This is particularly true when the strips are inlaid away from the edge, as you plan to do.

Although this may seem contrary to theory, I know from experience that thin inlays work in solid wood. At the North Bennet Street School in Boston where I teach, we have a table made by my teacher, George Fullerton, with bandings inlaid into solid mahogany. Each student has to measure this table as part of a drawing exercise, so I know its seasonal dimensions. In the summer, it's 20 in. wide, and in the winter, it shrinks by more than 3/16 in. In spite of this, there's absolutely no sign of failure in any of the banding. On this table, the banding pattern is a cross-over square in the corners, as shown in the drawing at left. The banding is made up of several narrow strips, as shown. I suggest you keep your banding strips thin: 1/8 in. is too thick; 1/16 in. is normal. Non-wood (brass, plastic, etc.) inlay strips are not a good idea, at least not across the grain. Even when inlaid with the grain, they don't stay glued. You can use regular glues (yellow aliphatic resin, PVA or hide glue) for your wood banding.
[Lance Patterson is a furnituremaker and is the director of the furniture-making and cabinetmaking program at the North Bennet Street School in Boston, Mass.]

Air-dried vs. kiln-dried oak

For more than 20 years, the Twin Oaks commune has been making hammocks out of kiln-dried red oak. We're now

As "the" producer of top end industrial woodworking machines since 1921, Powermatic now focuses their engineering expertise and resources for the craftsman, contractor and home hobbyist.

Responding to **your** expressed needs, the **Artisan's Line** of woodworking machinery was developed. Leading the industry in quality, features, and exceptional value. Available now for little or no more than you'd pay for run-of-the-mill machinery.

- **10" Artisan's Saw** — setting the standard for accuracy, ruggedness and portability with industrial quality Vega fence, built-in dust shroud, T-slot miter gauge and more
- **15" Scroll Saw** — ideal for every shop, with clamp blade holder for ease of blade mount, and chip blower standard
- **14" Drill Press, Bench and Floor Models** — with front mounted switch with removable key; 12 spindle speeds; and a table that elevates by crank, tilts, and rotates
- **Shaper** — with ¾" solid and ½" interchangeable spindle cartridges, exclusive fence with integral dust shroud, and spindle reversing switch

Call your **Powermatic Artisan's Line** distributor today for assistance in selecting the right machines for you.

The Artisan's Choice
POWERMATIC

A Division of Stanwich Industries, Inc.
McMinnville, Tennessee 37110
800/248-0144 □ 615/473-5551
TELEX - 554455
FAX # 615/473-7819

READER SERVICE NO. 64

considering switching to air-dried oak with a 12% to 15% moisture content (MC). Because we package our hammocks in semi-sealed plastic bags, we're worried that the air-dried wood will continue to lose moisture when stored in plastic and possibly mildew. *—Denis Paul Doyon, Louisa, Va.*

Jon Arno replies: There is nothing wrong with using air-dried red oak in most woodworking applications. In fact, because the pores are generally free of tyloses, the foam-like substance that clogs the pores of white oak and makes it far more difficult to dry, red oak air dries quickly and predictably. However, in the application you describe, it is questionable if a moisture content of 12% to 15% is low enough or consistent enough to ensure product quality. The packaging issue you raise is certainly of concern, but another concern is the wood's in-use stability.

In the controlled kiln-drying process, the wood is taken down to somewhere between 5% to 7% MC and then allowed to recover just a bit of moisture to perhaps 8% or 9% MC. Over time it will seek equilibrium with the atmosphere and gradually take on or lose another couple of percent moisture content, depending on the climate. In fact, the moisture content of kiln-dried oak will eventually become the same as air-dried oak stored in the same environment. Therefore, why does it matter whether you use air-dried or kiln-dried wood? The point is, kiln-dried wood tends to arrive at the manufacturer a little on the thirsty side. This has two important benefits for the application you describe. First, joints will remain tighter with the eventual swelling of the wood and, second, because the wood will absorb a small amount of moisture, it will function as a desiccant (like a calcium chloride packet) in your plastic packaging. Air-dried stock, on the other hand, will virtually always be at equilibrium moisture content or higher, and it will tend to both shrink and give off moisture. The air-dried stock will doubtless be a little less expensive, but then your product only requires 1 bd. ft. or so. I know, in high-volume manufacturing operations, a few cents' difference in material costs has a lot of impact on profit, but this is one cost-cutting opportunity I would approach with extreme caution. There's no quick fix for a mildewed market image.

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

Reader Exchange

...I just inherited a Craftsman model No. 110.27760 vibrating-type scroll saw that's in mint condition. I'd like to find a copy of the owner's manual.

—Matt Olsson, Box 120B, Parkers Prairie, Minn. 56361

...The American Society of Furniture Artists, based in Houston, Tex., is reviewing applications for national membership. For an application form and prospectus, send a SASE to A.S.O.F.A., Attn: Membership, Box 270188, Houston, Tex. 77277-0188.

...I'm looking for a source of stainless-steel letter-opener blades suitable for installing into laminated wooden handles.*—Allan Tosh 1785 Elford Road, Shawnigan Lake, B.C., Canada V0R 2W0*

...I would like to get in touch with and possibly correspond with other coffin makers in the United States, Canada or Europe.

—L.R. Pastukiw, Route 1 #119, Eldson, Tenn.

Send queries, comments and sources of supply to Q&A, Fine Woodworking, *Box 355, Newtown, Conn. 06470. We attempt to answer all questions, but due to the great number of requests received, the process can take several months.*

JET

A World Of Value.

Take A Close Look...

"at a real deal"

At these special prices you can complete your workshop. When you buy a JET machine from your local distributor you get a quality machine at a reasonable price, a full one-year warranty, parts availability and local technical assistance by your distributor!

The 10″ table saw features a 27″ × 40″ table, 10″ blade capacity, and a 1 1/2 HP motor. The 14″ bandsaw has a full 1 HP motor with three speeds for wood or non-ferrous metal cutting, and a 45° tilting 14″ square table. The shaper has an 18″ long table and 1/2″ spindle capacity. The 6″ jointer has a long 28″ fence and 42 1/2″ table and a three-knife cutter. The powerful 15″ planer has a 3 HP, 1 Ph motor which allows a maximum 1/8″ full width cut. The portable dust collector may attach to a variety of machines and has a 2.12 C.F. capacity collector bag and a very quiet 55 D.B. noise level.

For full details, see your local JET Distributor today.

Prices are effective while supplies last.

	User Special		User Special
JTS-10 Table Saw	$ 482.00	JJ-6 Jointer	$ 405.00
JBS-14MW Bandsaw	$ 419.00	JWP-15H Planer	$1,150.00
JWS-18 Shaper	$ 417.00	DC-610 Dust Collector	$ 310.00

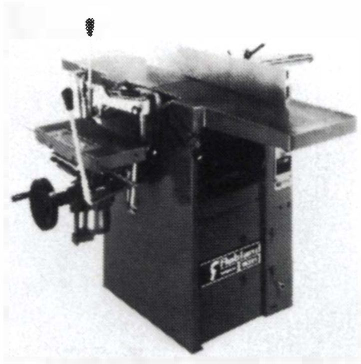
READER SERVICE NO. 48

WOODWORKING

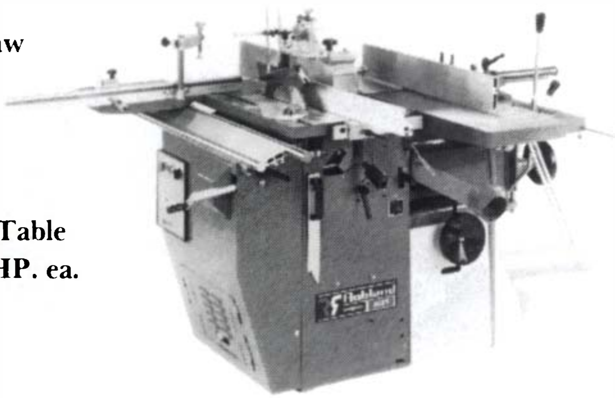
ROBLAND

The Intelligent One Man Shop

- 12″ Jointer
- 12″ Planer
- 550 LBS.
- 3 HP. motor
- Mortiser Optional

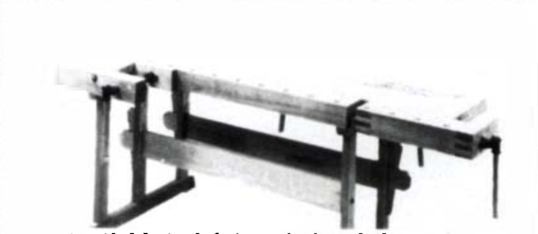


- 10″ Table Saw
- 12″ Jointer
- 12″ Planer
- Shaper
- Mortiser
- 50″ Sliding Table
- 3 motors 3 HP. ea.



Video: Send $4 (refundable) + $2 S+H to Laguna Tools to receive a 40 min. video presentation, and learn why Robland X31 is the most popular one man shop in Europe.

CLASSIC WORKBENCH



Available in left & right handed versions.

Also available from Laguna Tools, sliding table to attach to any saw.

For Information and your nearest dealer call

LAGUNA TOOLS

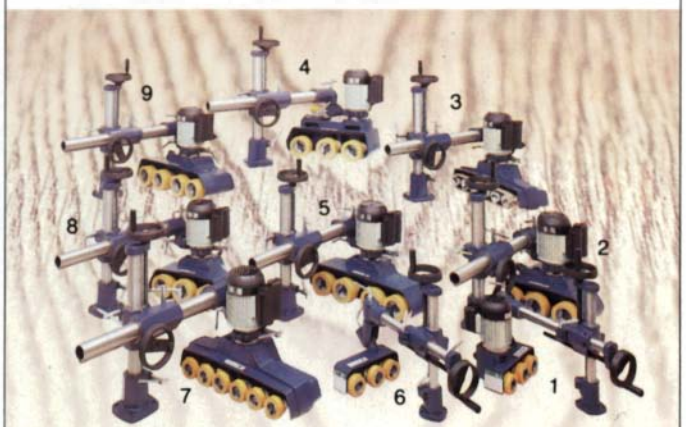
2081 Laguna Canyon Rd., Laguna Beach, CA 92651

1-(800) 234-1976

READER SERVICE NO. 162

CO-MATIC

INCREASE PRODUCTION & **SAVE FINGERS** WITH **CO-MATIC FEEDERS**



1. ¼HP 3 Roller 4 Speed
2. 1HP 3 Roller 8 Speed
3. 1HP Belt Drive 4 Speed
4. 1HP 3 Roller Variable Speed
5. 1HP 4 Roller 4 Speed
7. 1HP 6 Roller 4 Speed
8. 1HP 3 Roller 4 Speed
9. 1HP 4 Roller 8 Speed

- 1HP 4 Roller Variable Speed
- Band Saw Feeder

Distributed by: **SUNHILL**

1000 Andover Park E.
SEATTLE WA 98188

For more information and a **FREE CATALOG**
Please call **TOLL FREE 1-800-544-1361**

READER SERVICE NO. 76

IF YOU VALUE YOUR FINGERS..... YOU NEED A RIPSTRATE®

The RIPSTRATE holds the work tight against the fence with no hands near the blade. Makes perfect, straight cuts. Wheels lock to prevent kickbacks. *Requires no adjustment for stock width or thickness.*

Over 25,000 now in use in amateur, professional, school, government, military, and corporate maintenance shops.

One year guarantee, 30 day money back trial. Only $69 delivered. Check, M.O., Visa or M.C. Free Brochure.

Write or call our toll free number: 800-421-0256.

Fisher Hill Products 1 Fisher Hill Fitzwilliam, NH 03447

Dealer inquiries invited.

READER SERVICE NO. 35

READER SERVICE NO. 161

The Speed Varies So The Results Won't.

The new 3.25 H.P. Bosch electronic variable speed plunge router lets you make perfect plunge cuts time after time, no matter what the material or bit size. That's because it puts *you* in total control of speed, cutting depth, and the router itself, due to an excellent ergonomic design.

The Advantages Of Variable Speed.

Select any speed, from 12,000 to 18,000 RPM, to match your material and bit size—and get far better cutting results.

1611EVS electronics give you two more big advantages, too. "Soft start" when you press the trigger—no jarring "torque twist" means better control. And by monitoring RPM and feeding power as needed, it keeps you from bogging down, even in the toughest cuts.

Master Of Ergonomics.

From the first moment you get your hands on the variable speed model 1611EVS or the single speed model 1611, you'll know what separates it from other plunge routers. The handle grips feel like they were molded especially to fit your hands. The trigger switch, built into the right handle, and the plunge lock mechanism by your left thumb, let you reach these controls without taking your hands off the router.

Then press the trigger and take the plunge. Feel the housing glide down, and the ample power at your command as the bit slices effortlessly into your workpiece. Release the spring-loaded plunge lever and the housing locks firmly into position. And you can use the multiple-step depth-stop to make progressively deeper cuts with precision.

Both models accept the full array of ½", ⅜" or ¼" shank bits. And with their built-in, spring-loaded shaft lock, changing bits is fast and simple.

The Bosch models 1611EVS and 1611 are available in cooler running, higher horsepower 220V models, too. Ask about them and the complete line of fine Bosch power tools for woodworkers, at your nearest Bosch power tool distributor. He's listed in the Yellow Pages under "Tools—Electric."

BOSCH

"Quality You Can Hold On To."™

READER SERVICE NO. 24

CASCADE TOOL CO.

BUY ANY 10 ITEMS AND DEDUCT 10%

BUY ANY 10 ITEMS AND DEDUCT 10%

Box 3110, Bellingham, WA 98227

QUALITY CARBIDE-TIPPED SY BRAND ROUTER BITS AND SHAPER CUTTERS!

FOR THE ROUTER!

Double-Fluted

Straight

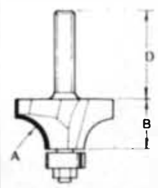
PART NO.	D	PRICE
SY4-6	1/4	$6
SY4-8	5/16	$6
SY4-10	3/8	$6
SY4-12	1/2	$8
SY4-1 6	5/8	$10
SY4-19	3/4	$10
SY4-25	1	$12

SY4 = 1/4" SHANK
SY8 = 1/2" SHANK

PART NO.	D	PRICE
SY8-6	1/4	$6
SY8-8	5/16	$6
SY8-10	3/8	$6
SY8-12	1/2	$8
*SY8-12 (2")	1/2	$15
SY8-16	5/8	$10
*SY8-16 (2-1/2")	5/8	$15
SY8-19	3/4	$10
*SY8-19 (2")	3/4	$15
SY8-25	1	$12
SY8-30	1-1/4	$12
SY8-35	1-3/8	$15
SY9-40	1-5/8	$18

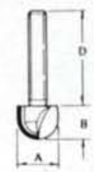
* LONGER CUTTING EDGE

Roundover



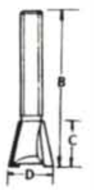
PART NO.	A	PRICE
S502Y	1/16R	$11
S504Y	1/8R	$11
S506Y	3/16R	$11
S508Y	1/4R	$12
S510Y	5/16R	$13
S512Y	3/8R	$15
S516Y	1/RR	$16
*S516Y-1/2	1/2R	$16
*S520Y-1/2	5/8R	$16
*S524Y-1/2	3/4R	$20
*S528Y-1/2	7/8R	$34
*S523Y-1/2	1R	$34
*S536Y-1/2	1-1/4R	$40

Core Box



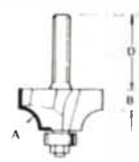
PART NO.	A	PRICE
S408	1/4	$10
S412	3/8	$10
S416	1/2	$12
S420	5/8	$14
S424	3/4	$15
*S424-1/2	3/4	$15
*S423-1/2	1	$18
*S450-1/2	1-1/2	$30

Dovetail



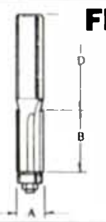
PART NO.	D	PRICE
802	3/8	$7
804	1/2	$7
*804-1/2	1/2	$7
806	9/16	$8
810	3/4	$9
*810-1/2	3/4	$9
*812-1/2	1	$12

Beading



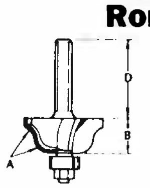
PART NO.	A	PRICE
S602Y	1/16R	$11
S604Y	1/8R	$11
S606Y	3/16R	$11
S608Y	1/4R	$12
S610Y	5/16	$13
S612Y	3/8R	$15
S616Y	1/2R	$16
*S616Y-1/2	1/2R	$16
*S624Y-1/2	3/4R	$20

Flush Trimming



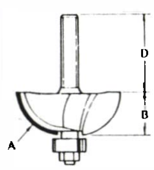
PART NO.	A	PRICE
S8012Y	3/8	$7
S8016Y	1/2	$8
*S8016Y-1/2	1/2	$8
S8020	5/8	$10
*S8020-1/2	5/8	$10

Roman Ogee



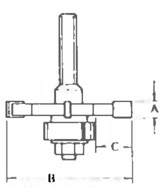
PART NO.	A	PRICE
S5705Y	5/23	$16
*S5705Y-1/2	5/32	$16
S5708Y	1/4	$18
*S5708Y-1/2	1/4	$18

Cove Bits



PART NO.	A	PRICE
S702Y	1/16	$12
S704Y	1/8	$12
S706Y	3/16	$12
S708Y	1/4	$13
S710Y	5/16	$14
S712Y	3/8	$15
S716Y	1/2	$16
*S716Y-1/2	1/2	$16
*S724Y-1/2	3/4	$28

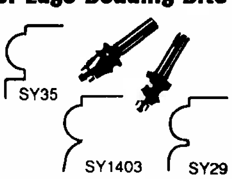
Slot Cutter – 4 Flutes



PART NO.	A	PRICE
SY7002	1/8	$20
*SY7002-1/2	1/8	$20
SY7004	5/32 (4mm)	$22
*SY7004-1/2	5/32 (4mm)	$22
SY7006	3/16	$22
*SY7006-1/2	3/16	$22
SY7008	1/4	$24
*SY7008-1/2	1/4	$24

A Choice of Edge Beading Bits

$16 each



NEW Concept In Router Bit Cabinet Door Construction!! $59.95

SY brand. Complete with bearing. Now time spent adjusting the bit to achieve a perfect 1/4" tongue has been eliminated – and your rail & stiles and center panels can all be the same height with this incredible cutter – and it's only $59.95 in any of our five raised panel profiles.

FOR THE SHAPER!

3mm thick C-2 carbide, 3/4" bore with 1/2" bushing

Straight

SY-1212-1 1/4" $24.95
SY-1212-2 3/8" $26.95
SY-1212-3 1/2" $28.95
SY-1212-4 3/4" $32.95
SY-1212-5 1" $35.95
SY1212-6 1-1/2" $36.95
SY-1212-8 2" $59.95

Bead

SY-1224-1 1/4" $24.95
SY-1224-2 3/8" $26.95
SY-1224-3 1/2" $28.95
SY-1224-4 3/4" $32.95
SY-1224-5 1" $35.95

Flute

SY-1223-1 1/4" $24.95
SY-1223-2 3/8" $26.95
SY-1223-3 1/2" $28.95
SY-1223-4 3/4" $32.95
SY-1223-5 1" $35.95

Corner Round

SY-1225-1 1/4" R $24.95
SY-1225-2 3/8" R $26.95
SY-1225-3 1/2" R $28.95
SY-1225-4 3/4" R $32.95
SY-1225-5 1" R $35.95
SY-1225-6 1-1/4" R $49.95

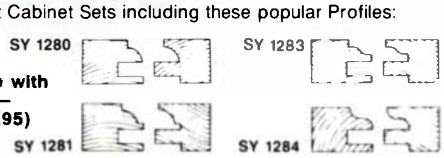
CARBIDE TIPPED SHAPER CUTTER PANEL RAISER –
3 WING, 5 PROFILES, 3MM THICK CARBIDE
$69.95
- 4-5/8" O.D. with 3/4" BORE (1/2" BUSHING)
- 5-1/2" O.D. with 1-1/4" BORE (1" BUSHING)

6 PC CARBIDE TIPPED CABINET SETS
- 3 mm CARBIDE
- 3/4" BORE W/ 1/2" BUSHING

ONLY $179.95

13 Great Cabinet Sets including these popular Profiles:

(1-1/4" Bore with 1" Bushing— ONLY $249.95)



THE ROUTER HANDBOOK

A definitive guide demonstrating how your router can be used to carve, drill, cut, as well as perform an array of other tasks more quickly and accurately than any other tool in the workshop.

$7.95

CALL TOLL FREE: 1-800-235-0272

7 am - 5 pm Pacific Time/Monday-Friday

MasterCard. VISA

READER SERVICE NO. 16

STEVE WALL LUMBER CO.

Quality Hardwoods and Woodworking Machinery For The Craftsmen and Educational Institutions

				UPS Specials
Ash	4/4	Select	1.90	$ 53.00
Basswood	4/4	Select	1.30	$ 43.00
Birch	4/4	Select	1.60	$ 49.00
Butternut	4/4	Select	1.60	$ 49.00
Cherry	4/4	Select	2.25	$ 60.00
Hickory	4/4	Select	1.20	$ 41.00
Mahogany (Genuine)	4/4	Select	2.50	$ 67.00
Maple (Hard)	4/4	Select	1.45	$ 46.00
Maple (Soft)	4/4	1C+Btr.	.90	$ 37.00
Pecan	4/4	Select	1.20	$ 41.00
Poplar	4/4	Select	1.10	$ 37.00
White & Red Oak	4/4	Select	1.80	$ 35.00
Walnut	4/4	Select	2.35	$ 62.00
Cedar (Aromatic Red)	4/4	1C+Btr.	1.25	$ 40.00
White Pine	4/4	F.G.	.90	$ 35.00

Above prices are for 100' quantities of kilndried rough lumber sold by the Bd. Ft. FOB Mayodan, NC.
Call for quantity discounts. Other sizes and grades available.

Above prices are 20 bd. ft. bundles of clear kilndried lumber 3"-10" wide • 3'-7' long (Random widths & lengths) Surfaced 2 sides or rough. Delivered UPS prepaid in the Continental U.S.

Send $1.00 For Lumber and Machinery Catalog

Call For Best Prices On
RBI - DELTA - MiniMax

STEVE H. WALL LUMBER CO.
BOX 287 • MAYODAN, N.C. 27027
919-427-0637 • 1-800-633-4062 • FAX 919-427-7588

READER SERVICE NO. 84

The Accu-Miter™

Shot-pin accuracy for your table saw.

The above photo shows saw blade guard removed; please note that we do not recommend operating without the guard.

Even the most demanding craftsman will appreciate this professional miter gauge. Built to last through years of wood-working projects, the Accu-Miter™ is a precision instrument that assures accuracy and time savings.

- Shot-pin accuracy for 90°, 45°, 30°, 22½° and 15° angles
- Precise protractor scale
- Rigid, front fence with telescopic extension
- Durable non-metallic wear surface for reduced sliding friction
- Easily retrofitted to your existing miter bar or to our optional ⅜" x ¾" bar
- Adjustable drop stops and end stop
- Optional manual or pneumatic clamp

Table saw not included.

$149.
VISA MasterCard

Call or write for a free brochure!

1-800-382-2637

JDS COMPANY
800 Dutch Square Blvd./Suite 200
Columbia, South Carolina 29210
IN SC 803-798-1600

READER SERVICE NO. 95

Mini Max Lets You Make Short Work Of Tall Orders

With dependable Mini Max machinery, you can tackle a wider range of projects than ever before. Our rugged lineup delivers industrial caliber performance and outstanding quality at attractive prices.

- L55 Stroke Sander: cuts an 8 hour hand sanding job down to 1 hour
- T124 Copy Lathe: the simple essence of much more expensive copy lathes
- S45 18" Bandsaw: big bandsaw performance at half the cost
- FS35 13½" Jointer Planer: change over in seconds to do all four board sides
- T3T Sliding Table Shaper: a compact heavyweight for superior surfaces

Call today for the name of your nearby distributor. We'll help you take your ideas all the way.

5933 Peachtree Industrial Blvd.
Suite A, Norcross, GA 30092
(404) 448-1120 FAX (404) 448-6041

Mini Max

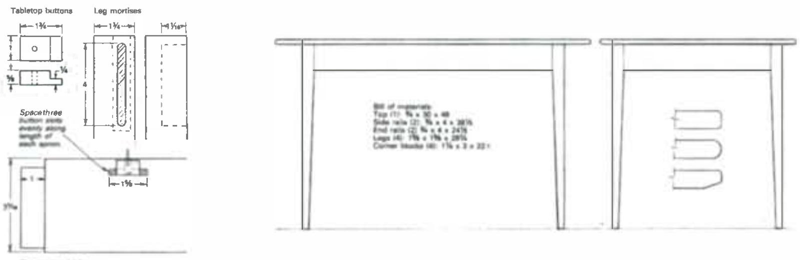
A Division of scmi

READER SERVICE NO. 58

ANNOUNCING OUR FIRST PROJECT VIDEO...

A great project

starts with plans.



(But we don't stop there.)

Want to build your own Shaker-style dining table? You can—once you've watched how professional furniture maker Kelly Mehler handles the task.

Here, in our first project video, you'll learn the entire process of making a leg-and-apron table, from stock preparation to final scraping and sanding. Emphasizing easy-to-follow small-shop production techniques, Mehler walks you through all the steps, and even shows design variations, like adding drop leaves and drawers.

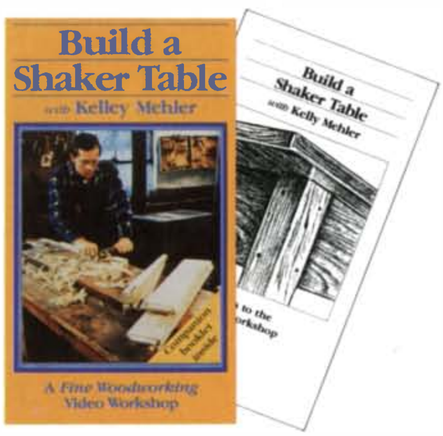
But you'll learn much more than how to build a dining table of lasting value. You'll also get good, solid information you'll use on furniture projects time and time again.

An illustrated booklet provides a clear step-by-step outline of Mehler's procedures. It also includes measured drawings, a materials list and tips on setting up a shop for furniture making.

By watching Mehler, you'll learn how to:

- choose, mill and glue up boards according to grain configuration for an attractive tabletop
- taper legs on the jointer
- rout mortises and tenons for sturdy leg-and-apron joints
- tune and use a cabinet scraper to smooth large tabletops with minimal sanding

60 minutes, includes an illustrated booklet, $29.95
#060041 (VHS), #060042 (Beta)



Now you can rent this video for 10 days for only $9.95

(See the order form for details.)

To order from The Taunton Press, use the attached insert or call 1-800-888-8286.

HEAVY MA
HEAVY RE

For a limited time, we're offering rebates of up to $1,000 on our Heavy Woodworking Machinery.* It's your perfect opportunity to own a precision woodworking machine built with famous Delta quality and performance—for less.

So check out these beauties. Then hurry on over to your nearest participating Delta Distributor and cut the best deal you can. Delta will send your rebate check directly to you.

Building a Bent-Back Rocker

Soft rock from hardwoods

by Brian Boggs

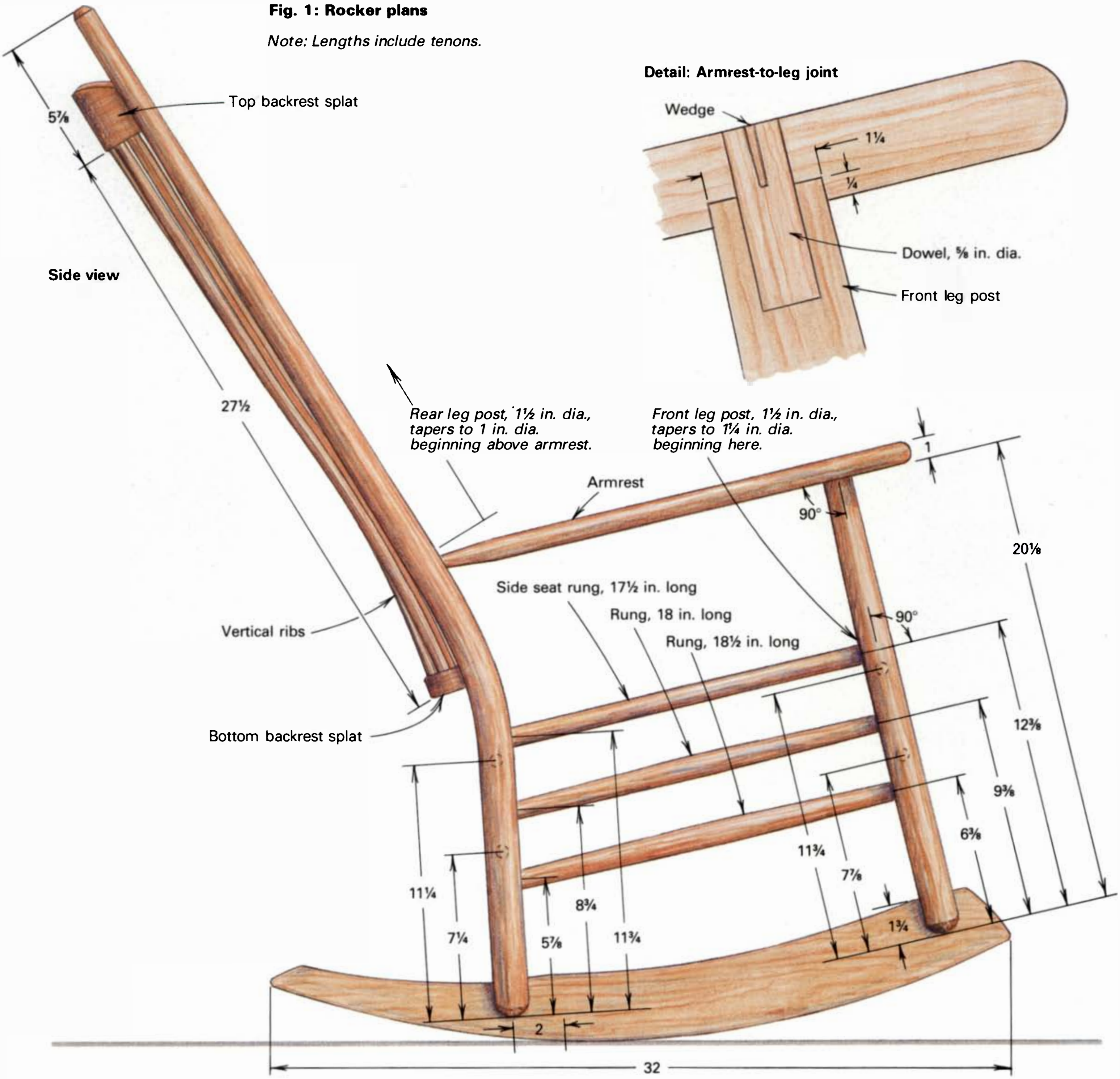


Fig. 1: Rocker plans

Note: Lengths include tenons.

Drawings: Lee Hov

After building more than 100 rocking chairs, I've developed a rather non-scientific approach for designing and constructing attractive, strong and comfortable rockers from green hardwoods. My first rocking chair was a straight ladderback chair fit on runners copied from an old chair I liked. Although I was able to construct the chair fairly quickly, I didn't like the piece's visual balance. After more carefully studying how chairs worked, I subsequently altered seat shapes, leg angles, rocker radii and other details to improve the chair's appearance, comfort and my construction methods. The result is the bent-back rocker, shown on p. 45 in the photo at right, which I'll tell you how to build in this article.

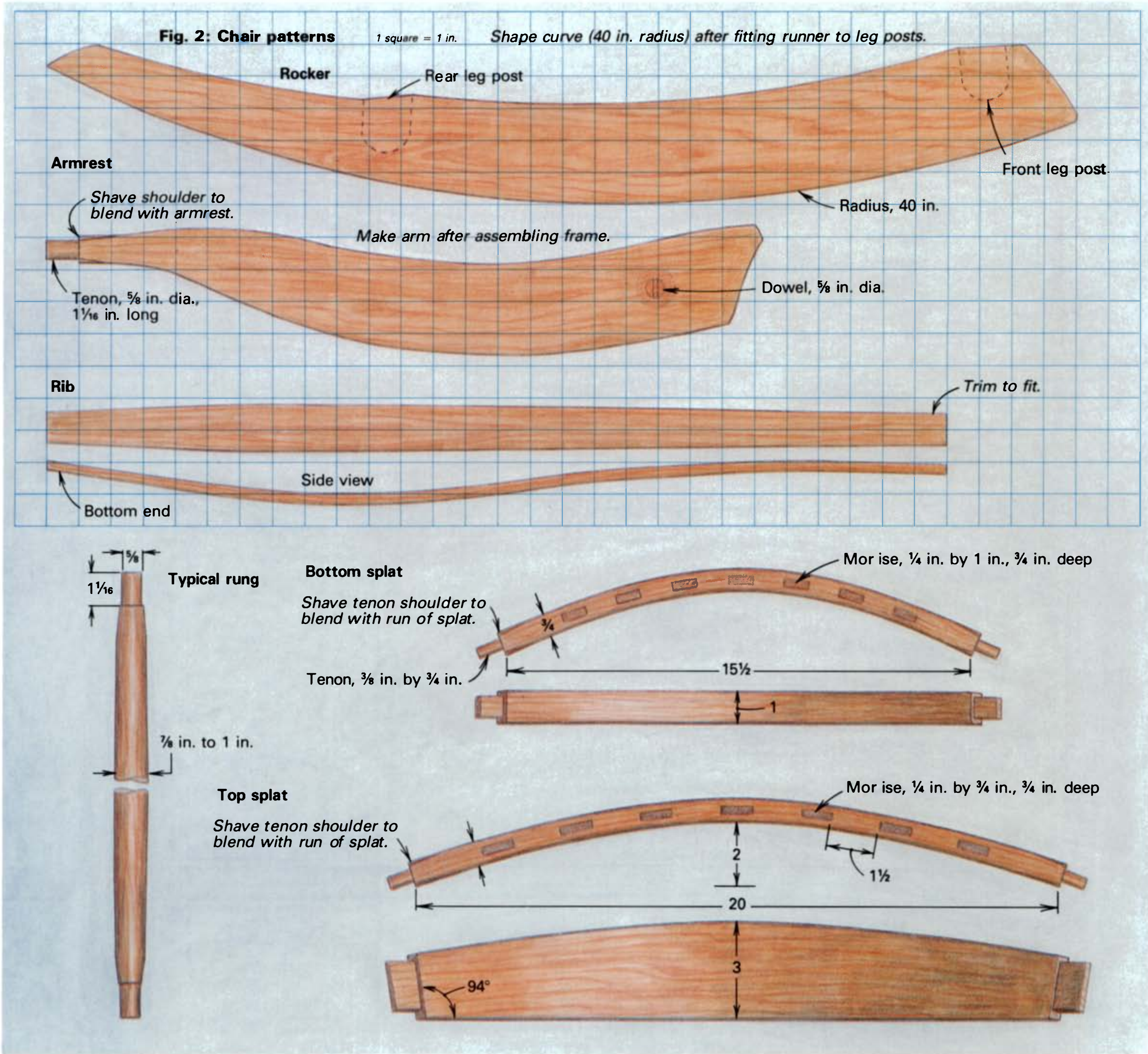
Evolution of my rocker design—All rockers, regardless of style—Windsor, ladderback or sculpted—are basically alike. As with any chair, the frame and seat must comfortably support a sitting person's weight. All chairs must withstand everyday use and abuse, such as the sitter moving in the chair, sliding the chair around and leaning back. These destructive forces, working to pull the joints apart, are intensified with a rocker because of the repetitive, dynamic stresses produced by its rocking motion. The character and speed of the rocking motion is controlled by the shape of the runners. By subtly modifying the runners' curve and by adjusting the length of the legs to change how the frame sits on the runners, you can construct a balanced chair that's both easy to get in and out of and is comfortable. These subtle changes will also smooth the rocking motion so the chair won't awkwardly pitch forward or backward, and won't creep or walk across the floor as you rock. And because an optimumly designed frame is consistent with a visually well-balanced chair, your rocker will be attractive. Finally, if you follow the simple rules for working with green wood, you can expect your chairs to survive hard use; you'll be building heirlooms.

The problem with my first straight ladderback rockers was that they were too upright and boxy. They were not exceptionally comfortable, and they provided insufficient lower-back support, which consequently induced sitting in a slouched position. Increasing the angle between the seat and the backrest eliminated the boxy appearance and provided the needed back support. I found that most people were comfortable in chairs with a 105° to 110° angle between the seat and backrest; increasing the angle more than this reduces the amount of head and neck support provided by the back and makes the chair uncomfortable. Curving the backrest to fit a person's shape also increases comfort, but it shifts body weight farther back in the chair. Because of this, I design chairs with curved backrests, like my bent-back rocker, with the minimum recommended angle of 105°.

Since I angled the backrest, I also had to angle the lower, rear leg posts or else the chair appeared to lean back precariously. Even though these unangled rear legs were safe enough, they no longer directly supported most of the weight. Instead, the stresses were concentrated at the points where the lower side rungs joined the rear leg posts and this arrangement would eventually

Front view

Back view

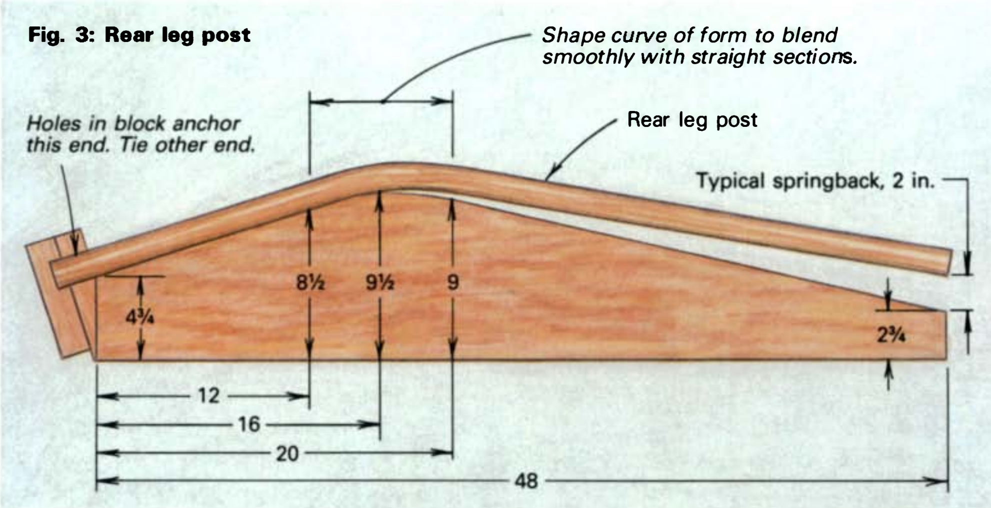


weaken the joints and cause them to fail prematurely. While it didn't eliminate the problem, angling the lower leg backward to match the backrest made the rocker appear more stable and repositioned the weight more directly over the leg, thus reducing the forces on the joints.

Changes in the backrest had the greatest influence on my rocker's design because they altered the chair's appearance, structure and comfort. Other less-significant changes generally involved customizing the chair's size or shape for a particular individual or simplifying construction methods. For example, the armrest looks best to me when it is parallel to the seat; fortunately, the strongest joints result when both the armrest and seat connect to the front leg post at 90°, and it's easy to come up with efficient methods to cut these right-angle joints. To my eye the most attractive and comfortable chairs have seats that taper gently toward the back and have slightly splayed runners. For a smooth ride that's neither too fast nor too slow with this configuration, I eventually settled on runners that have a 40-in. radius.

The dimensions for my standard bent-back rocker, shown in figure 1 on p. 40, work well for most average-size adults. To custom-fit a rocker, I scale the standard dimensions up or down as needed, but I maintain the proportions of the original. The simplest approach to customizing is to have the person sit in a standard chair and see how it "fits." Some things are obvious; short, stocky folks need lower, wider chairs than tall, thin people. But I also look closely for the more subtle, telltale clues: Is the person long legged and in need of a deeper seat? Are the person's knees scrunched up awkwardly, necessitating a change in the seat height? Are the person's shoulders relaxed? Do the forearms rest comfortably on the armrests? With experience, customizing a chair becomes second nature.

Wood selection and joinery—Good joinery methods and wood with proper moisture-content levels are essential for constructing a strong rocker. I split and shave all my chair parts (except for the runners) from green logs. While I prefer oak and hickory, I occa-



The author is shown working at a shaving horse, rough-shaping a green-wood armrest. The job goes quickly because green wood is easy to carve. Boggs removes wood efficiently with a drawknife.

sionally use maple or ash. Select straight-grain logs so the rived parts won't split when they are steam-bent. Although riving wood is hard work, all of the chair parts can be split in about one-half hour. Parts to be tenoned, like the rungs and the armrests, are air dried to about 15% moisture content (MC) and then dried to less than 5% MC in a closed, insulated box, which is heated to about 150° with a 100-w. light bulb. The mortises and tenons are cut to fit together snugly when assembled, but the joints become really tight when the wood reaches its equilibrium moisture content (about 7% in the northeast). This tightening action occurs when the dry tenons absorb moisture and expand, while the wet mortised pieces dry and shrink. For more information on working with green wood, see *Make a Chair from a Tree: An Introduction to Working with Green Wood* by John Alexander, The Taunton Press, 63 S. Main St., Newtown, Conn. 06470, and *FWW* #77, pp. 60-63. I prefer green wood because it can be shaped more easily and more quickly than dried stock. You can build the chair with air-dried stock, however, if you super-dry the tenons. The difference in moisture content between the mortise and tenon is what ensures the tight joinery.

All of the riven parts are shaped with a spokeshave and drawknife. Since it's much better to replace a fouled part than to repair one, I make extra slats, posts and rungs in case something goes wrong. The rungs are kiln dried for a few days before I cut them to length, tenon the ends and shape them. While the rungs are drying, I fire up the steamer and bend the rear leg posts, back splats and vertical ribs. Steamers don't have to be fancy: I simply boil water on a Coleman stove and funnel the steam through a plastic pipe into the closed box that holds the parts. The splats and ribs are steamed for only 10 or 15 minutes, but the thicker leg posts take one hour to two hours. The form used in bending the posts is described in figure 3 above. The rule of thumb for kiln-dried wood is to steam one hour per inch thickness; for green wood, 30 minutes per inch thickness. By preflexing the thin ribs in both directions over an 8-in. radius drum before clamping them in their bent forms, you'll stretch the wood fibers, which will result in a more uniform bend and minimize springback when the pieces are unclamped. Work quickly so you can clamp the pieces before they cool. I leave the parts in the forms to dry overnight or until they're needed.

Building the rocker—The sequence for assembling the chair is pretty straightforward. I begin with the backrest and rear frame, which involves shaping the rear leg posts, splats, rear rungs and vertical ribs as well as cutting the necessary mortises and tenons. I shape the parts on a shaving horse with a drawknife and spokeshave, as shown in the photo above. Mortises are bored with a ⅝-in. Forstner bit in the drill, but all other joinery is done with hand tools. Next, I build the front frame. Aligning the front frame to the backrest/rear frame assembly and marking out the mortises for the rungs is a bit tricky, but the rest is easy. The armrests are shaped and joined to the front and rear leg posts, the assembled frame is squared up and the runners are installed. All of the tenoned joints are pinned and glued for extra strength. After finishing the frame with boiled linseed oil, I weave a hickory or oak splint seat.

Since the back is the visual focal point of the chair and all other parts must align with it, the backrest/rear frame must be assembled symmetrically and twist-free. To ensure this, chop the mortises for the two back panel splats while the back posts are still square, then round the posts with a drawknife. I cut the splats oversize to allow a ⅞-in. tenon on each end. The tenons are cut with a backsaw and chisel, then the shoulders are shaved off to blend with the run of the splat. This prevents an unattractive gap from developing between the leg post and the shoulder when the leg post dries and shrinks. After shaping the splats freehand, I dry-fit them to the leg posts. Since the top splat is wider than the bottom splat, fitting both splats in the posts gives the backrest its tapered appearance. Installing the curved splats also rotates the leg posts about 8° to 10°, which produces the outward splay of the legs at the bottom.

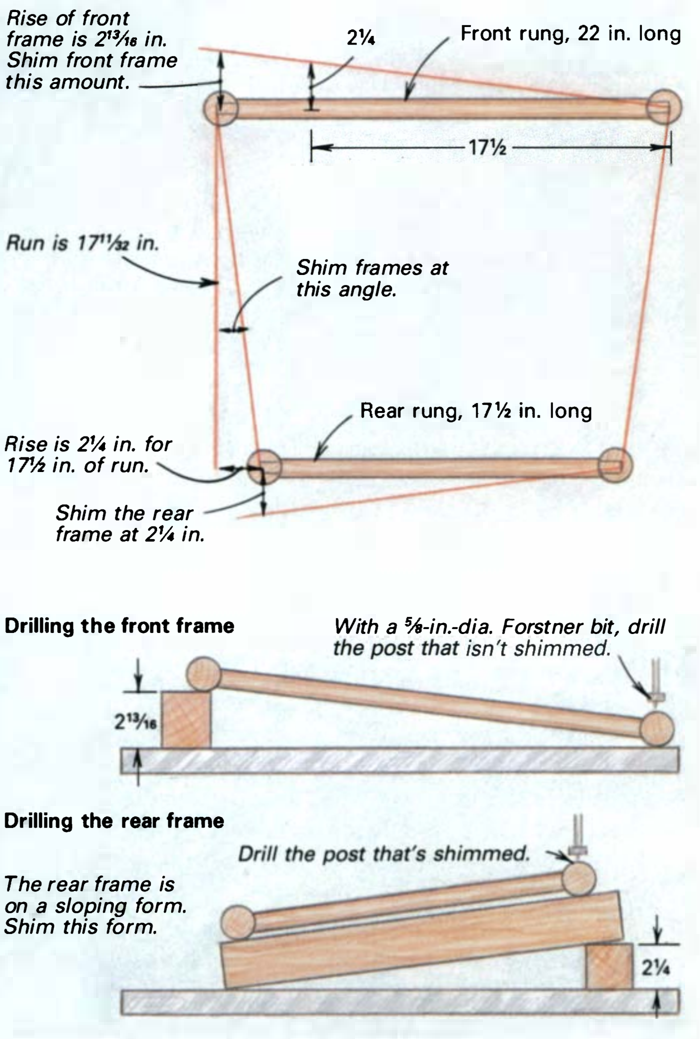
Next, I mark out and chop the mortises in the splats for the vertical ribs. The ends of the vertical ribs, like the splats, are straight, so chop the mortises perpendicular to the long edges of the splats. I fit the center rib first, and then, alternating sides, fit each rib individually. The tenons on the ribs are not shouldered; if the rib is a bit tight, it's thinned on the back side with a chisel or scraper until it's just snug. Fitting the ribs and contouring their shape is all done by eye. I make a final check by dry-fitting the ribs and slats together. If everything looks right, I glue up the back panel and dry-fit it to the leg posts to hold it in position, making sure the centerline of the middle rib is perpendicular to the splats.

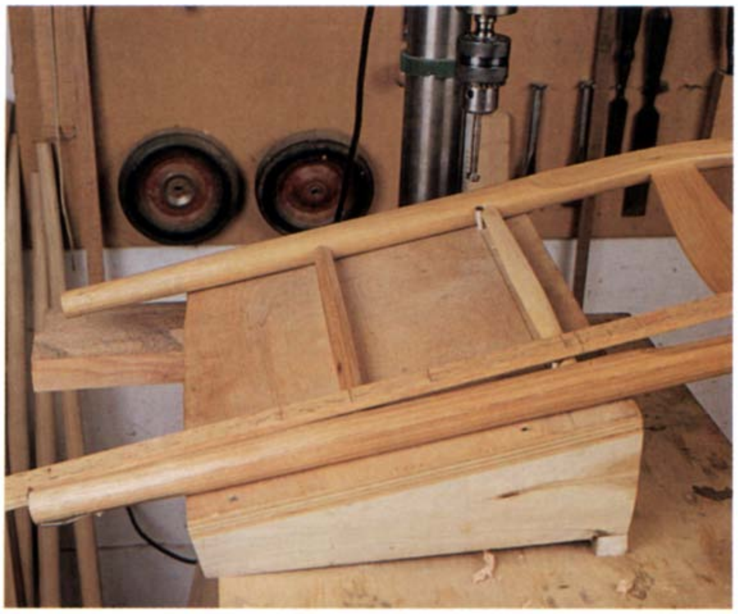
Fitting the two back rungs to the leg posts, which are still dry clamped to the back panel, is straightforward. First, line up the mortises by eye between the leg posts, mark them and bore them with a power drill. I shape the rung tenons and, as before, shave off the shoulders to blend with the contour shape of the rung before gluing the rungs and back panel to the leg posts. Next, drill the ⅝-in.-dia. mortises for the front rungs in the front leg posts. I do this on the drill press after drawknifing them round. Then, I fit and glue the rungs to the leg posts to form the front frame.

Because the seat width tapers toward the back, the front frame is

Fig. 4: Setup for drilling side-rung mortises

The side rungs attach to the front and rear frames at an angle that's not 90°. The diagram below shows how to determine the amount to shim the front and rear frames when drilling the mortises.





The rear frame is being set up on the drill-press table for boring the mortises for the side rungs. The frame sits on a form shaped like the bent rear leg post. This form and the shim under its far side, which raises the post being drilled, ensure that the mortises are drilled at the correct angle. Later, the front leg posts will be mortised in a similar way.

wider than the back frame. For this reason, the three parallel rungs on each side of the chair join the leg posts at an odd angle. Aligning the front and rear frames without twisting them is tricky, but not all that difficult if you lay out and cut the mortises correctly. You must first mark the vertical position of the mortises: Measure up from the bottom of the leg post to locate the three mortises, as shown in figure 1 on p. 40. All of the measurements for the rungs on the front leg are also made from the bottom of the post.

Locating the angular position of the mortises is a bit like laying out rafters for a pitched roof. The difference between the rear and front seat width, divided by two, represents the "rise"; the seat depth, the "run." I use this "rise-over-run" ratio to set up the front and rear frames on my drill-press table to drill the mortises. The procedure for doing this is more fully explained in figure 4 at left. A special support for the rear frame is needed to bore the mortises, as shown in the photo below. This support is angled to accommodate the bend in the rear leg post and allow the mortises to be bored at the correct angle on the drill press. Since the length of the rear seat rung is the same as the run, I shim the post being drilled up by an amount equal to the corresponding rise and bore the mortises for all three rungs. The same procedure is used to bore the other rear leg post.

Boring the front posts is less complicated. The frame is flat and sits directly on the drill-press table. The front seat rung is longer than the run, so the rise, equal to the shim thickness, must be proportionately greater. Unlike the rear frame, the shim is placed under the front leg post not being bored.

The rest of the chair is assembled the same way as the front and rear frames. After tenoning and shaping the side rungs, I glue up everything, making sure the frame is symmetrical and sits without rocking on a flat surface. It's usually necessary to wrestle with the frame a bit to remove any twist that would prevent it from sitting flat. I also make sure the side rungs are parallel and join the front leg posts at 90°.

Armrests—The armrests are roughed out on the bandsaw and refined with a drawknife and spokeshave. The armrests are curved along their length, and I sculpt away much of the wood along their top inside surfaces to provide a comfortable hollow for a person's forearm. With a power drill, bore mortises into the rear leg posts while sighting horizontally along the top of the front leg posts for alignment, as shown on the facing page in the photo at left.

It's difficult to install the armrests because two things must happen simultaneously: The tenoned ends must fit into the rear leg posts and the mortises on the underside of the front section must fit over the tops of the leg posts. Loose-fitting tenons provide enough play to do this, but they also produce a weak joint. My solution is to bore the 1¼-in.-dia. mortises for the front leg posts only ¼ in. deep. Then, I seal the armrests in a plastic bag, so only the ends to be tenoned are exposed, and place them in the kiln. When the ends are dry, I form the joint with a tenon cutter chucked in a power drill or hand brace; you could also cut the tenon by hand. The shallow mortise slips easily over the top of the post, which provides sufficient play for the dry, tenoned end to be fit snugly into the rear post. Finally, I bore a ⅝-in.-dia., 1½-in.-deep hole through each armrest into the posts and install dry dowels. The snug-fitting dowels don't split the wood and they can be safely wedged for a tight fit that will become tighter as the armrests and leg posts dry out and shrink.

Runners—I use 38-in.-long runners glued and pinned into 1¾-in.-deep slots in the bottom of the legs. By making small changes in the depth of the slots, I'm able to alter the chair's tilt to improve its

Photo: Albert R. Mooney

Above: Boggs' bent-back rocker design evolved as he experimented with changes in early chair models. Left: With a Forstner bit in a power drill, the author bores the armrest mortise in the rear leg post. The front leg post serves as a guide as he eyeballs the mortise position.

appearance and comfort. Each chair I make is tested and adjusted this way before the runners are permanently secured.

If the chair is not entirely twist-free or doesn't sit squarely on all four legs, now's the time to level the chair and adjust the runners to work in unison. I first set the chair on a level bench and check if all four legs are touching or if the chair leans to one side. Shims placed under one or more legs level the chair. Then, measuring up from the top of the bench, each leg is marked and trimmed with a backsaw. After a final check, lay out the slots for the runners.

With the chair upside down, take a long scrap piece, which is the same thickness as the runners, and place it on edge to span the centers of the front and back legs. Mark the runner positions on the bottom of each leg and with the chair upright again, use a square to extend the lines 1¾ in. vertically up the legs. The slots are cut with a backsaw and coping saw and then pared clean with a sharp chisel.

At this point, I'm ready to make the runners. Stock is planed flat, thicknessed to ¾ in. and scraped smooth. Then, I trace the runner pattern on one of the boards, screw the two pieces together and bandsaw both runners. With the runners clamped together, their edges can be block-planed smooth. I plane in both directions to avoid tearout where the grain changes direction. Sanding blocks, made from curved scraps salvaged from bandsawing the runners, are also good for smoothing the curves. I don't fuss with the straight runs along the top edges until the runners have been fit to the slots.

The sides of the runners are scraped until they can be slid into the slots easily. Don't force them or you'll risk splitting the legs. The flat on the top edge of the runners should extend ½ in. from the front leg posts. After temporarily clamping the runners in position, I place the chair upright on a wood floor and go for a test ride. A ¼-in.-thick piece of plywood has some give to it and works well as a temporary seat. Once the chair is going, I put my feet on the front rung and close my eyes to concentrate on the chair's motion. It should feel smooth, like a swing, and both runners should reach the end of their forward and backward swing at the same time. If one runner stops before the other, the chair will veer toward the stopped side. You can compensate by moving the stopped-side runner forward a bit (or the other runner back) until the two work together.

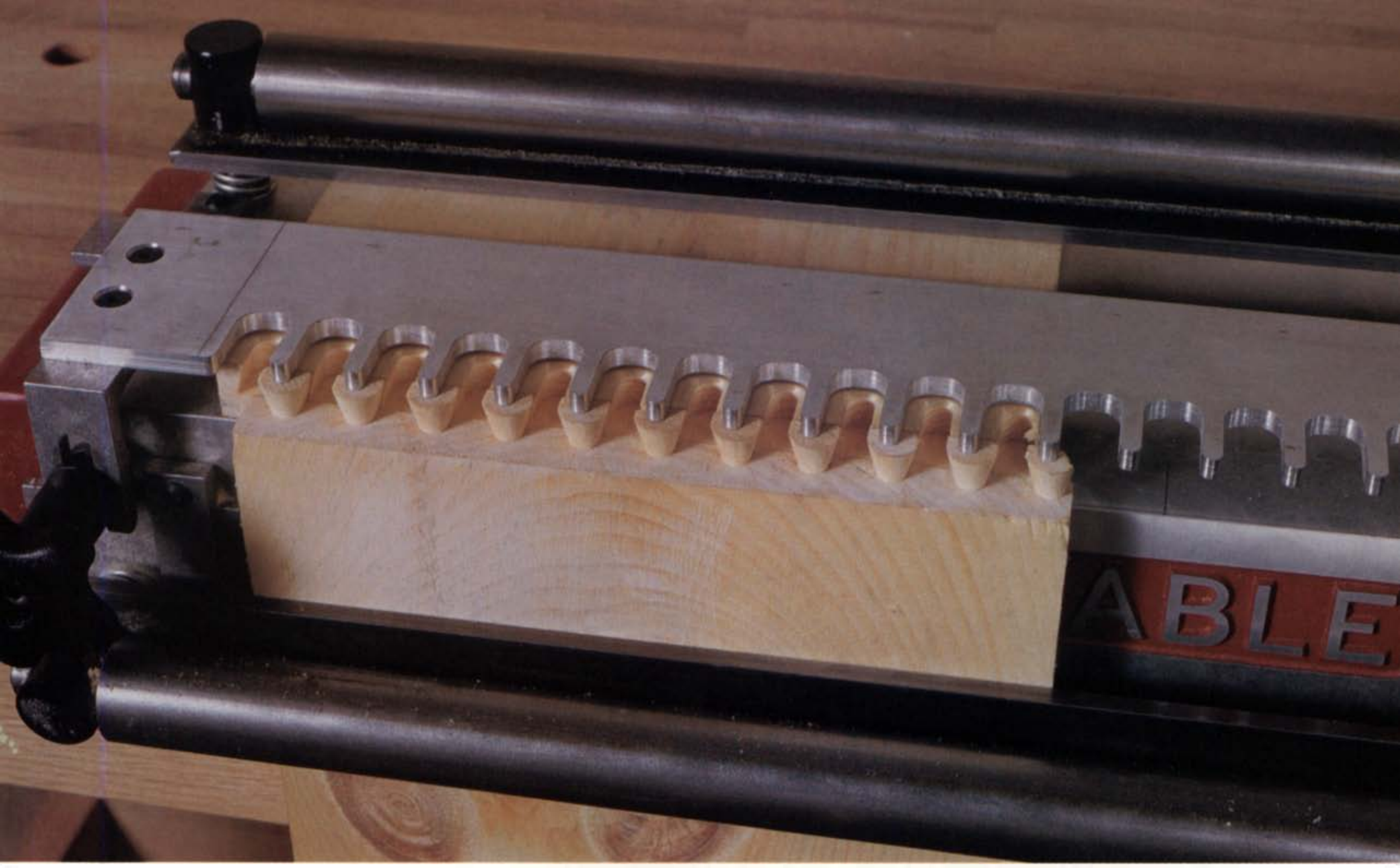
Next, I completely relax with my feet flat on the floor. You shouldn't have to push back in the chair to get comfortable. If you do, the frame is pitched too far forward on the runners. I shave up to ½ in. from the straight portion of the runners in the rear leg slots to correct this. If the frame tilts back too much, I trim the runners under the front leg slots. If the correction needed is greater than ½ in., I trim the leg posts too.

When the adjustments are complete, mark the leg post positions on the runners. After fairing the curve along each runner's top edge and shaping the ends of the leg posts with a chisel, I glue and clamp the runners in the slots. The runners are secured with ¼-in. square pins once the glue has dried. The tenoned armrest and splat joints are also pinned now. Then, I scrape the parts smooth before applying four to five coats of boiled linseed oil. I don't sand the chair because sanding would eliminate the facets created when the pieces were drawknifed and shaved.

Seats—I use hickory bark for my seats because it wears well and develops a beautiful patina as it ages. This natural fiber is also easy to weave. You can harvest hickory bark yourself in many parts of the country, and it is also commercially available, although supplies are limited. To order hickory bark, contact Unfinished Universe, 525 W. Short St., Lexington, Ky. 40508; (606) 252-3289, or The Caning Shop, 926 Gilman St., Berkeley, Cal. 94710; (415) 527-5010. Oak splints and Shaker tapes also make good seats.

To prevent the seat from sagging, I make a pillow to fit between the woven layers. The pillow is filled with fine wood shavings and is about 1 in. thick when compressed. Hold it in place by tying it to the rungs before weaving the seat. For more on making split-bark seats, see *FWW* #62, pp. 82-87. □

Brian Boggs is a professional chairmaker in Berea, Ky.



Like most dovetail jigs, Porter-Cable's Omnijig makes milling half-blind dovetails easy. The pins and tails have been cut simultaneously with a ½-in. dovetail bit. Side stops orient the pin board and tailboard to ensure correct alignment when the boards are assembled.

Comparing Dovetail Jigs

Versatile fixtures for cutting classic joints

by Alan Platt

I'm fond of sawing and chopping dovetail joints by hand for drawers and carcases. I like the personal touch that these joints, with their minor variations and, yes, small imperfections, give a piece. Cutting pins and tails is relaxing for me because I don't have to pump out lots of drawers or meet production schedules. If I did, I'd be looking for a jig that would cut the joints quickly and economically, without sacrificing that distinctive dovetail look. You could come up with your own jigs and fixtures to do the job, but fortunately there are many dovetail jigs on the market that offer a variety of desirable features, and for a good price.

For an investment of less than $100, you can purchase a jig and templates that will reliably turn out tight-fitting, half-blind, rabbeted or flush dovetails or box joints. These systems are fast, but don't allow the design variations possible with hand-cut joints. Pins and tails will have fixed, uniform spacings and the shape of the joint components must match the stock router bit used to cut them. The photo above shows a typical router-based commercial jig for cutting half-blind dovetails. Joints resembling hand-cut dovetails, complete with variable-size and/or variable-space pins, can be cut on some models fitted with special templates. However, these inexpensive models generally cannot mill through dovetails, and you'll have to invest at least $300 to buy a more versatile jig.

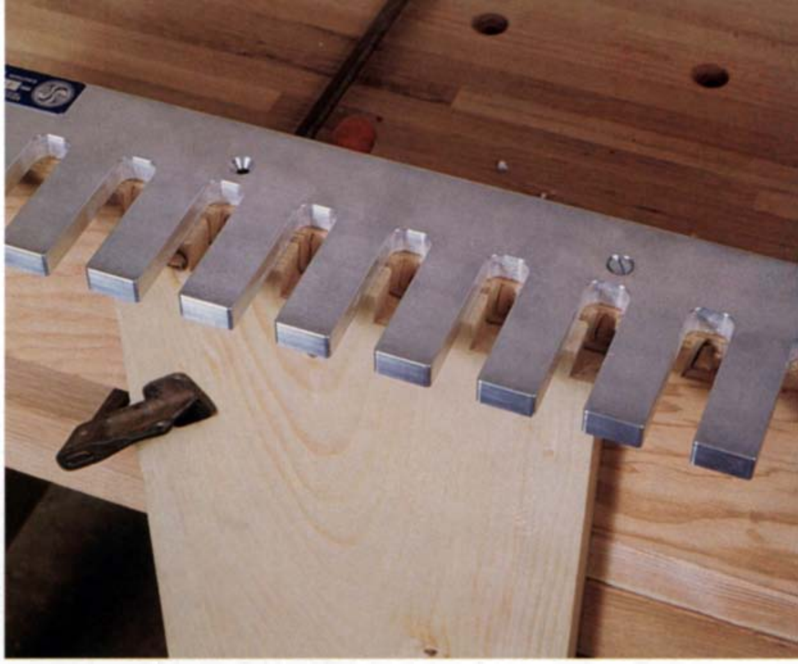
All of the dovetail jigs I examined are based on the same idea: The pins and tails are milled with a router guided by a template. Construction of the fixtures ranges from extensive use of plastic and phenolic parts in the least-expensive models to heftier aluminum castings and steel components in the more-expensive models. In evaluating the jigs, I assembled, fine-tuned and tried them out according to the manufacturers' instruction manuals, which were generally clearly written. A typical assembly requires no special tools and takes just a few moments. With each jig, I joined enough pine boards to fine-tune the performance of each jig and produce several tight-fitting joints. I was surprised to discover that the inexpensive jigs performed as well as the costlier models. All of the fixtures I evaluated, once they had been adjusted properly, turned out quality joints quickly, but some models were much easier and faster to use. Therefore, apart from cost, your choice of jig should be based on the particular variety of joints you make and the amount of work you do. The chart on p. 49 lists information about the jigs that will help you compare them, and it explains the types of joints possible with each jig. You should check these details carefully, especially if your prime interest is through dovetails because not many of the jigs will cut this joint.

How jigs work—Most of the inexpensive jigs work the same way: A template guides a bushing on the router base and a dovetail-shape router bit cuts the tails and pins at the same time. Half-blind, flush or offset dovetails can be cut this way. The pin board is clamped, inside surface up, to the top of the jig's base so it butts perpendicular to the end of the tailboard, which is clamped vertically to the front of the jig. In turn, the jig is clamped to the edge of the workbench. The template overlays the pin board and tailboard and clamps to the base of the fixture.

Adjustable stops are used to align the edges of the boards to each other and to the template fingers. The fit of the tails in their sockets is adjusted by making small changes in the router bit depth. Increasing the depth of cut widens the tails and tightens their fit with the pins. Conversely, when the tails fit too tightly, the bit depth is decreased. The template can be independently adjusted to control the length of the sockets in the pin board and to make sure that they mate perfectly with the tails. If the sockets are too shallow, the template is moved back; if they're too deep, the template is moved forward until the fit is perfect. A few trial cuts on scrap pieces are sufficient to fine-tune the fixture and router. The major drawback of this type of jig is its inability to cut through dovetails. Jigs that cut through dovetails are more elaborate and use two templates, one for the pins and one for the tails. In addition to the usual dovetail-shape bit for the tails, a straight bit must be used to cut the pins.

Router requirements—For joint cutting, most jig manufacturers recommend at least a ¾-HP or 1-HP router. That's good advice, particularly if you work with hardwoods, such as oak or cherry. Because dovetails have tapered sides and are wider at one end than at the other, there is no way they can be milled in stages; the cut must be made in a single pass. Even relatively small, ¼-in. dovetails require a hefty cut, which can load down routers with less power; larger dovetails require even more power. Some of the manufacturers, such as Leigh and Keller, supply bits with ⅜-in.- or ½-in.-dia. shafts that fit only one-plus horsepower routers.

Except for the Keller and Wolfcraft models, the jigs I evaluated rely on a guide bushing attached to the router baseplate to guide the router. The bushing follows the edge of the template and prevents the router bit, centered in the bore of the bushing, from contacting the template. Unfortunately, the lack of standardization in router bases means that the available guide bushings won't fit every router. For example, Sears' guide bushings fit only Sears' routers. Porter-Cable's guide bushings, on the other hand, are compatible with several domestic- and foreign-made routers. Before investing in one of the dovetail jigs, determine if your router can be equipped with guide bushings that will be compatible with the fixture's templates. It's also a good idea to purchase the router

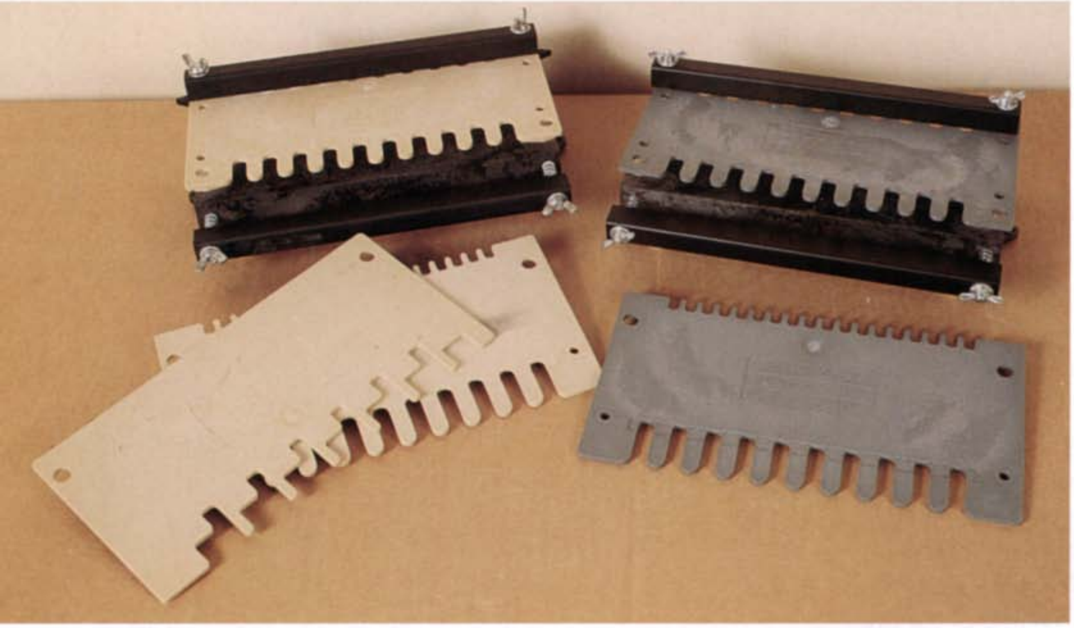


Cutting through dovetails requires using two templates. In the photo above, the Keller #2400 template has been used to mill the tails with a dovetail-shape bit, and in the photo below, the pins have been milled with a straight bit. The text describes the procedure in more detail. Note the templates are fastened to backing blocks, which align the stock to the templates and prevent tearout as the router exits the stock. Keller makes three models for cutting through dovetails in ¼-in.- to 1¼-in.-thick wood.

bits recommended by the jig manufacturer. These will have longer-than-usual shafts, which are necessary for the bit to extend through the bore of the guide bushing and clear its shoulder.

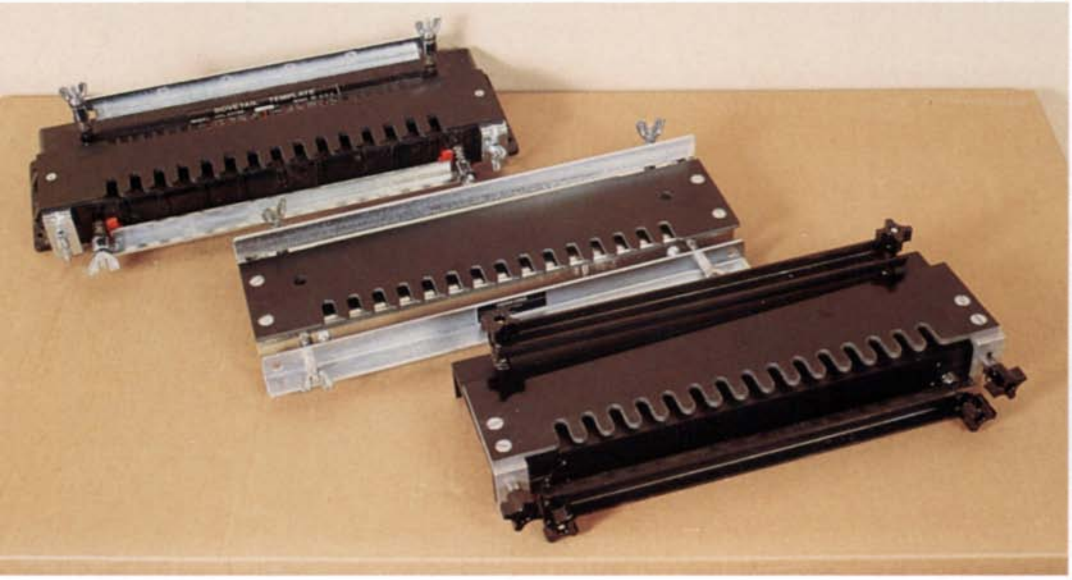
Jigs that cut uniformly spaced pins and tails—The lowest-price jigs are look-alike models, one of which is supplied by Sears, Roebuck & Co. (Chicago, Ill. 60684; 312-875-2500; catalog #2570) and the other by Vermont American (Lincolnton, N.C. 28092; 704-735-7464; model #23460), shown in the top, left photo on the next page. They handle boards up to 1$\frac{1}{16}$ in. thick and 8 in. wide. U-shape clamps, made from steel channel stock, hold the work firmly to each jig's base, but everything else is plastic. The jigs are furnished with two templates for milling ¼-in. and ½-in. flush or rabbeted, half-blind dovetails.

Sears and Vermont American also sell an additional template for



Left: The Sears jig (catalog #2570), left, and Vermont American jig (model #23460), right, are virtually the same. Capable of handling pieces up to 8 in. wide, these are the smallest jigs available; their light construction is more than adequate for dovetailing small drawers and boxes. Sears sells an optional template for milling hand-cut style dovetails.

Below: Wolfcraft's fixture is unique. Its specially designed baseplate attaches to the router and has a built-in adjustable stop to control the depth of the pin sockets. The pins and tails are cut using the pattern milled into the top and front side of the template, which clamps to the work. A small guide is used to align the jig with previously cut pin sockets so the jig can be indexed along workpieces of any width.



From top to bottom, the Sears model #2579, Porter-Cable model #5008 and Black & Decker model #C52331 can mill half-blind dovetails in pieces up to 12 in. wide.

cutting ½-in., widely spaced, hand-cut style dovetails. Molded into each template are directions for setting up the jig; although they're a little hard to read, they eliminate the need to keep the instruction manual handy. The templates are held in place by clamp bolts at the back of each jig's base. Small tabs, which are seated in the template, can be rotated to adjust the template's position, in or out, to set the depth of the tail sockets. Four-position stop blocks at each end of the base eliminate guesswork in aligning the pin board and tailboard. Although I didn't find any difficulty in producing snug-fitting joints, these lightly constructed jigs might not stand up well if subjected to heavy use.

Sears also supplies a larger fixture (catalog #2579), shown in the bottom, left photo above, that can handle 12-in. wide boards. This jig is also plastic, but more solid than the company's smaller model. This jig's two clamping bars are L-shape steel sections fastened with wing nuts. The standard two-sided template allows you to mill ¼-in. and ½-in. flush or rabbeted, half-blind dovetails. Instead of using tabs, the template position is adjusted by moving the template-bracket stop nuts, located at the front of the jig's base, in or out. Different settings for the side alignment stops are available, depending on whether flush or rabbeted joints are being cut.

The Porter-Cable jig (Box 2468, Jackson, Tenn. 38302; 901-668-8600; model #5008) and the Black & Decker jig (626 Hanover Pike, Hampstead, Md. 21074; 301-239-5000; model #C52331), both shown in the bottom, left photo above, offer the same 12-in.-wide capacity as the Sears #2579, but instead of being plastic, the jigs are all metal with phenolic templates. These two jigs differ from each other in minor ways, but performed equivalently. I like the large knobs on the Black & Decker jig, which are quicker and easier to use than the wing nuts on the Porter-Cable jig, but I prefer the built-in side alignment stops on the Porter-Cable jig as opposed to the removable stops on the Black & Decker jig; these small parts could easily be lost.

The jig made by Wolfcraft (1520 W. Ardmore Ave., Itasca, Ill. 60143; 312-773-4777; model #4250) operates differently than the ones I have already discussed, but it too produces excellent dovetail and box joints. As shown in the bottom, right photo above, the Wolfcraft's L-shape template is an aluminum casting with built-in screw clamps that secure the pin board and tailboard to a flat work surface. To use this jig, the tail sockets are routed first using the pattern in the template's vertical leg. Then, the jig is used to cut the tails, following the pattern cast in the template's horizontal

Dovetail jigs							
Manufacturer and model number	**List price**	**Maximum wood thickness (in inches)**	**Maximum wood width (in inches)**	**Guide bushings (diameter in inches)**	**Straight bits (diameter in inches)**	**Dovetail bits (diameter in inches)**	**Templates (see key below)**
Black & Decker #C52331	$232	1	12	S-7/16 A-5/16	***	S-½, ¼	S-#1 A-#2
Keller #1600	$169	¾	6*	not required**	S-½	S-7/16	S-#9
Keller #2400	$269	1⅛	24*	not required**	S-¾	S-⅝	S-#9
Keller #3600	$365	1¼	36*	not required**	S-¾	S-1	S-#10
Leigh #D-1258R	$339	1¼	24	7/16, ⅝ (available from router manufacturer)	S-5/16 A-7/16, ½	S-½ A-⅜, 7/16, 13/16	S-Adjustable template cuts joints 1 thru 10
Porter-Cable #5008	$ 95	1	12	S-⅝ A-5/16	***	S-½ A-¼	S-#1 A-#2
Porter-Cable Omnijig #5116	$299	1	16	S-⅝ A-5/16	A-½, ¼, ¾	S-½ A-¼, ¾	S-#1 A-#2, 3, 4, 5 6, 7, 8, 9
Sears #2579	$ 49	1 1/16	12	A-5/16, 7/16, ⅝	A-½, ¼	A-½, ¼	S-#1, 2 A-#5, 6
Sears #2570	$ 39	1 1/16	8	A-5/16, 7/16, ⅝	***	A-½, ¼	S-#1, 2 A-#7
Vermont American 23460	$ 29	1 1/16	8	A-5/16, 7/16, ⅝	***	A-½, ¼	S-#1, 2 A-#7
Wolfcraft #4250	$ 50	1	6*	not required**	A-1½	A-½	S-#1, 6

S = Standard, A = Accessory
* = Jig can be repositioned to eliminate width restriction
** = Bearing-mounted bit, bushing not required
*** = Not applicable

Templates:
1. ½-in. half-blind, flush or rabbeted dovetail
2. ¼-in. half-blind, flush or rabbeted dovetail
3. ½-in. sliding dovetail
4. Adjustable through dovetail
5. ½-in. box joint
6. ¼-in. box joint
7. ½-in. "hand-cut" dovetail
8. ¼-in. through dovetail
9. ½-in. through dovetail
10. ¾-in. through dovetail

leg to guide the router. A scrap piece, underlying the work, prevents tearout. In both cases, the depth of cut is controlled by an adjustable stop block built into the special router baseplate that is supplied with the jig. While the baseplate is drilled to fit many routers, check if it fits yours before you purchase this jig. The joint tightness is controlled by adjusting the router bit depth, as with the jigs already discussed. Although this template is only 6 in. wide, it will work on wider boards by moving the template and using the spacing guide to align the first slot in the template with the last cut of the previous setup.

Jigs for through dovetails—Keller (Keller & Co., 1327 I St., Petaluma, Cal. 94952; 707-763-9336; model #1600, #2400, #3600) is the only manufacturer I know that makes jigs specifically for routing through dovetails. The Keller templates, shown in the photo at right, are designed solely for through dovetails, and I found them uncomplicated and easy to use. The ruggedly constructed, ½-in.-thick, machined aluminum templates aren't inexpensive, but you may want all three models to work on a full range of wood thicknesses (see chart above).

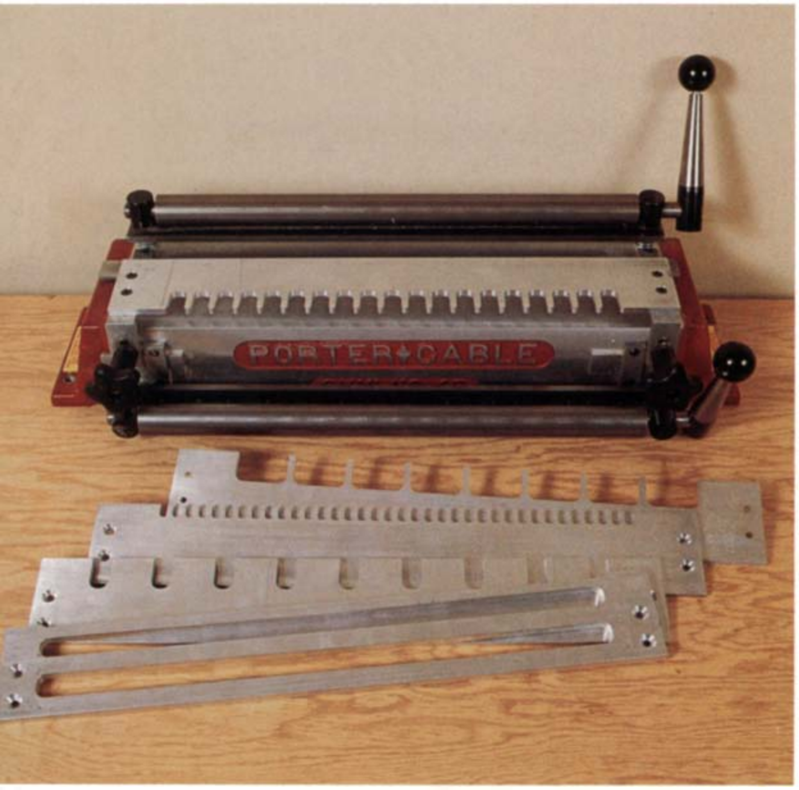
Each model comes with two templates, one for cutting pins

The Keller jigs are the only ones designed specifically for cutting through dovetails. The templates are simple to use and there is no limitation to the width of wood that can be milled. Shown are the pin and tail templates for model #1600, bottom, and #2400, top.

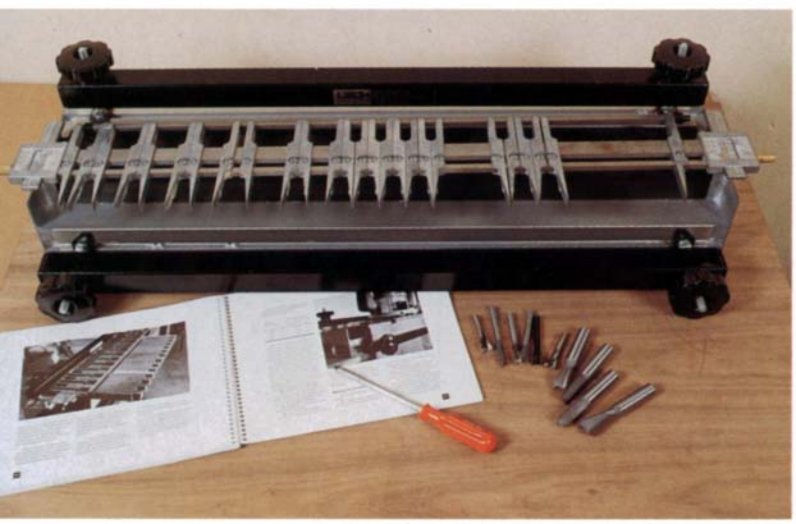
and the other for cutting tails, as well as router bits that have pilot bearings mounted on the shanks above the cutters, eliminating the need for guide bushings. The smallest bits have ¼-in.-dia. shanks; the largest, ½-in.-dia. shanks. Each template is screwed to wooden backing blocks (not supplied), and then the workpiece is clamped to the backing blocks, which prevent wood tearout as the router bit exits the cut.

Working with the templates is straightforward. The tails are cut first using the dovetail bit. Then, one or two of the tail locations are transferred to the pin board in the same manner as if you were making hand-cut dovetails. During production runs, stop blocks can be clamped to the backing blocks to eliminate any need for transferring marks, and to make it even simpler to align the pin board to the pin template. After the pin board is clamped, the pins are cut with the straight bit. The photos on p. 47 show the Keller model #2400 set up to cut the pins and tails. There's no restriction on the width of the wood: You just have to reposition the template and continue routing. If you're setting up the templates for the first time, cut a trial joint in scrap pieces to check the fit. You can adjust the fit of the joint in either of two ways: by changing the router bit depth or adjusting the pin template location. The pin template has slots for the mounting screws to allow this adjustment.

Shortly after I evaluated these jigs, Keller introduced revised versions of its templates for both the #1600 and #2400 models, which are now models #1601 and #2401. Keller is also supplying additional router bits with these templates, as well as for the unchanged model #3600 template, which increases the range of wood thickness these templates can accommodate.



The well-built Omnijig owes its versatility to the several templates available for cutting fixed-space dovetails, finger joints, sliding dovetails and variable-spaced dovetails (not shown).



The Leigh jig employs a single template for all dovetailing operations. Pin width and spacing is set by adjusting each of the template's 12 elements; the corresponding tails, cut using the opposite side of the template, are set at the same time. Flipping the template end for end allows box joints to be similarly milled.

Versatile hybrids—The Porter-Cable Omnijig #5116 and the model #D-1258R jig from Leigh Industries Ltd. (Box 357, Port Coquitlam, B.C., Canada V3C 4K6; 604-464-2700) offer a versatility that goes well beyond any of the other fixtures on the market. Porter-Cable's Omnijig, shown in the top photo at left, is adjusted and used the same way as the company's model #5008 described earlier, but it has a lot more going for it. For starters, its base is a heavy, ⅝-in.-thick aluminum casting, and all of the templates are machined from rigid, ¼-in.-thick aluminum stock. The Omnijig is also bigger than the #5008 and can accommodate boards up to 16 in. wide. An even larger model that can accommodate 24-in.-wide boards is also available. Best of all, I like the Omnijig's fast-action, lever-operated clamping system, which rotates eccentrically mounted 1¼-in.-dia. steel bars that uniformly clamp the width of the workpieces.

The Omnijig comes with a template for cutting ½-in. half-blind dovetails; but what really makes the jig versatile, are the many templates available as accessories, including ¼-in. half-blind dovetails, ½-in. rabbeted or flush box joints, ½-in. hand-cut style dovetails (varying sizes of pins and tails), ¼-in. and ½-in. tapered sliding dovetails, and adjustable-position, ½-in. and ¾-in. through dovetails. The half-blind dovetails are made with a single bit that cuts the pin board and tailboard at the same time, as described earlier. Hand-cut style and sliding dovetails each require two templates, and the pins and tails are milled in separate passes, but with the same dovetail bit. This is a well-made tool that will withstand heavy use; I found it easy to set up and simple to use.

The Leigh jig comes with a single, 12-element, adjustable template. I was amazed that this jig, shown in the bottom photo at left, could make so many joints. You can arrange the template elements in any pattern you like to cut through dovetails, end-on-end joints, box joints, angled dovetails, sliding dovetails, and half-blind, flush or rabbeted dovetails. It's the only jig capable of making both variable-width and variable-spaced dovetails. However, it is time-consuming to set up the jig because you must position and fasten each of the 12 elements individually. But that, of course, is the price to be paid for the jig's versatility. Like the Omnijig, this jig has a heavy, cast-aluminum base and the template elements are precision-machined aluminum castings. Although it worked well, I didn't care for the way the Leigh clamped the workpiece in place: You must tighten or loosen up to six knobs, two each on the top clamp, front clamp and template, each time the jig is used. Leigh's instruction manual is exceptionally well written and the company sells an instructional video for $29.95. □

Alan Platt is an Assistant Editor at FWW.

Photos middle and right: Gustavo Gonzalez

Flat, interior latex house paints tinted with artist's acrylics give the author all the leeway he needs to achieve a variety of surface effects. The cabinet hanging below the table, left, was painted and then shaded with graphite before being sealed with several clear coats of Wood Armor for durability. On the table itself and the small stand, center, succeeding coats of paint were sanded through to reveal the color from the previous coat. At right, latex-base putty was used to texture the cabinet's doors.

Painting Furniture

Protecting brushed latex colors with a clear spray topcoat

by Douglas Redmond

Have you ever heard of a lacquer hangover? I hadn't when I started painting my furniture a few years ago. My designs demanded color, so I did some reading and discovered that the professional way to color wood was to spray lacquer. But after working with colored lacquer finishes for three years, I started to get lacquer hangovers, 24-hour headaches that just about made me blind. This is not to say that I didn't wear a respirator and take proper precautions; I did. But by the time I'd reached my early twenties, I had become sensitized or allergic to lacquer. I needed to approach furniture painting from a safer, less-toxic direction.

My choice for a colored finish was latex-base paint: interior, flat latex house paint to be exact. House paint has the characteristics I was looking for. It is safe and easy to apply, it comes in a wide variety of colors at a reasonable price ($4 to $6 per quart) and it can be found at any paint store. But latex paint had two major problems: the colors weren't robust and the painted surface was fairly fragile. A good friend and fellow woodworker showed me how to overcome the fragile nature of the paint with Wood Armor, a clear latex-base wood finish made by Deft Inc. (17451 Von Karman Ave., Irvine, Cal. 92714) and available at most paint-supply stores in gloss or satin finish. Applying a few clear coats of Wood Armor protects the painted surface and provides a hard, durable finish.

With the fragility problem solved, I began to experiment with the paint, trying to expand the range of colors. Because it took only 6 ozs. per coat for a small stand, like the one in the center photo above, I found I could easily increase my color range and intensity by adding a few dabs of artist's acrylic paint to it. Tubes of artist's acrylics are available at art-supply stores in an array of vibrant colors. It's impractical to use them exclusively for painting large pieces of furniture because a few ounces cost as much as a quart of house paint. Besides, the vinyl in the acrylics makes them more apt to roll up or clog sandpaper when sanding between coats, just as the additives in satin or gloss paints do. In addition, their "slippery" finish causes adhesion problems for the Wood Armor. If you want a gloss finish for the final coat, simply use gloss-formula Wood Armor.

Through the years, I've experimented with different surface effects, as you can see from the pieces in the three photos above. I've painted over textured surfaces, sanded through one coat to let the previous coat show through, shaded with colored pencils and powdered graphite, and applied gold leaf, and I've locked all these coatings beneath clear coats of Wood Armor. When people ask me about the durability of this finish, I show them a set of screwdrivers, the wooden handles of which were among the first objects I painted using this method. They've been knocking around in a toolbox tray with pliers and wrenches for about seven years. Although the screwdrivers show some normal wear and some hard-won nicks, their color is still bright and the finish is still strong. I've been happy with this method for adding color to my furniture, but I'm even happier knowing I'm using a finish that's not detrimental to my health.

Construction and surface preparation—Long before starting the finishing process, and even before beginning the building process, you must consider the wood surface you'll be painting. If you want a smooth finish without having to fill the wood's pores, maple, poplar, birch and birch plywood work well. If you have to fill open pores, you may find yourself spending more time finishing the piece than building it. However, if necessary, you can fill the pores after the piece is built with a thin coat of spackling paste applied with a 4-in.- or 6-in.-wide drywall knife. Remove as much of the excess spackling as possible to cut down on the amount of sanding you'll have to do later. Of course, you could also leave the pores unfilled so they show through the paint and give the final finish a textured effect.

Contrary to popular belief, using paint as a finish does not let you cheat on your construction techniques or your surface preparation. I use traditional joinery and I don't rely on Bondo or putty to hide poor craftsmanship. Wood movement caused by seasonal changes in humidity will eventually expose any joints that were repaired with large amounts of putty. A good rule of thumb for painted furniture is to approach the finishing process the same way you would for a clear finish: The piece must be as perfect as possible.

After the piece is built, I first scrape all the surfaces that will be painted. The scraping eliminates most small defects in the surface and gives me a chance to locate any others that need to be filled. I use latex-base wood putty, such as Elmer's Wood Filler. If you prefer sanding to scraping, work up to about 120-grit. The idea here is to get the piece smooth; there's no need to overwork it. I almost always break the sharp edges by block-planing a small bevel. This has two advantages. First, a beveled edge on the finished piece is less likely to get dinged up, and second, the bevel reduces the amount of excess paint that's left on the adjacent side (rollover) when the brush is dragged over a sharp edge.

Redmond sands the first coat thoroughly to smooth any raised grain. Even the beveled edges get a once-over. You can see by the paint dust on the cabinet's top that flat latex paint can be sanded without clogging the paper.

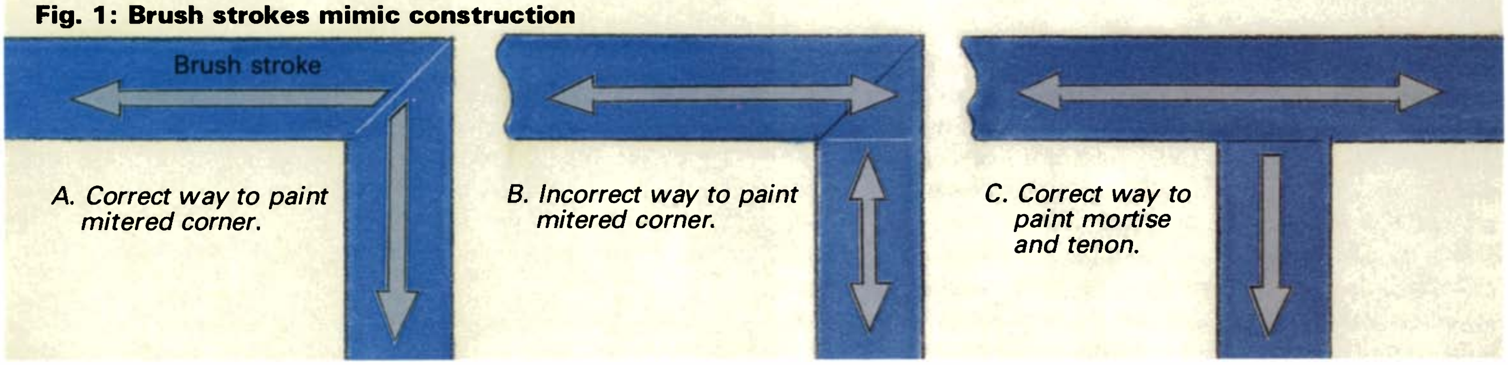
Applying the paint—Manufacturers generally recommend applying oil-base primer as a foundation for interior latex house paint. The oil-base primer is meant to penetrate the wood or wall surface to help create a better bond for subsequent coats of paint. However, I prefer to start with the water-base latex. The first coat seems to adhere well enough for my purposes and also lets me see how the piece will look in color. This is a major consideration if you have never worked with color. An unpainted birch table makes an entirely different impression than the same table painted in mixed hues of blue. I approach color intuitively; I often start with a base color that is quite different from the desired final color, steering each coat a little closer to the desired hue. It's not a question of progressing from light to dark or vice versa; in fact, I often use entirely different colors and sand through one coat to see the previous one.

The painting process is easy and straightforward. It isn't necessary to thin the paint with water unless the paint is old and thick. The best way to apply the paint is also one of the cheapest—foam brushes. They come in a number of sizes, give almost a strokeless finish and are easily cleaned. With the money saved on foam brushes, I bought a couple of expensive nylon brushes for detail work.

The paint should always be applied in the direction of the wood grain. If you brush across the grain, sooner or later the grain will stand out as running perpendicular to the brush strokes. When dealing with mitered corners and other intersections where grain direction changes, always apply the paint so it mimics the construction, as shown in figure 1 below. Miters should be painted so you're left with a mitered brush stroke. Running the brush across a miter is a mistake that will eventually show up. With mortise-and-tenon joints, or any joint that results in one surface butting into the other, the brush stroke on the mortised piece should cut off the brush stroke on the tenoned piece.

In 30 to 60 minutes, the first coat will be dry. The painted areas will have sections of raised grain and may show small imperfections that were not filled. Lightly sand all the painted areas to cut

Fig. 1: Brush strokes mimic construction



Drawing: Roland Wolf

Before sealing the painted surface of this small cabinet with Wood Armor, powdered graphite is brushed on (above) to give the beveled siding a weathered look (below).

After the first three coats of Wood Armor have dried, the author uses a cabinet scraper to smooth out any dust particles. He then applies two final coats of the clear finish.

the raised grain, and then fill and sand any remaining small defects with wood filler. Use 120-grit paper throughout the painting process. Finer sanding may even retard the adhesion of the next coat; besides, with a brushed-on finish, any finer sanding is really just overkill. After the first coat dries, I sand the large, flat areas with a small orbital sander. However, for succeeding coats, I lightly hand-sand (see the photo on the facing page), partly to avoid sanding through to the color below and partly because each coat usually requires less sanding to achieve a smooth surface. Before moving on to the second coat of paint, run your hand over the entire surface to be sure you've sanded every inch, and then wipe down the piece with a damp rag to remove paint dust.

The additional coats of paint are applied with a foam brush in the same way as the first coat. If you begin each coat on the bottom of the furniture or on some other obscure area, it gives you a chance to look at the color and make adjustments before you paint the crucial areas. Three coats is the minimum to ensure good coverage, although I apply five coats on the average piece. Any more than five coats and you've probably gone beyond the point of diminishing returns; the extra buildup doesn't have any real advantage and the thick paint is more likely to chip. I don't sand the last coat of paint unless I intend to sand through to the previous coat. The painted finish is now at its most fragile stage; any scratch will cause a burnished area in the paint, which will result in discoloration when the clear coat is applied. Avoid touching the painted surface; the oils left by your fingerprints will sometimes cause dull spots in the clear coat.

Special effects and final finish–Before applying the first coat of Wood Armor, I apply colored pencil, graphite or charcoal if I want a shaded or mottled effect. The photos above, left, show how I used powdered graphite to achieve a weathered look on the small cabinet that hangs below the table in the left photo on p. 51. With the cabinet in a horizontal position, I use a brush to apply the graphite below the overlap of each course of the beveled siding. Then, I tip the cabinet so the graphite runs across the siding, and I lightly brush off the excess, shown in the top photo above at left. When overhead light strikes the cabinet, the shading adds depth, exaggerating the actual shadow line of the siding; straight-on light fools you into thinking that the overlap is just an illusion created by the shading. In either case, the clapboard siding and the graphite shading combine to create a familiar picture of a weathered building, shown in the bottom photo above at left.

I usually let the paint dry overnight before spraying on the clear coats of Wood Armor. There's nothing tricky about this; follow the tips given in the article on spray finishing in *FWW* #62, pp. 67-74, and clean your spray gun with soap and water when you're done. There is no reason you can't brush on the clear coats. Although spraying gives you a slightly smoother final finish, I have used both methods. I start with three light coats of Wood Armor, and let each coat dry completely (one to two hours depending on the temperature and humidity) before applying the next coat. I then scrape the piece to remove any dust particles that may be trapped in the finish, as in the photo above, right. Caution must be used here. If you wear through the clear coat to the painted surface during scraping, the next clear coat will cause discoloration in that area. This type of wear-through problem can only be solved by repainting the whole area. Take heart though: A sharp scraper is a trusty tool to use on finishes. Apply light pressure and don't bow the scraper as you might when scraping bare wood. If the idea of scraping a clear finish makes you uneasy, you can sand with 220-grit wet/dry paper wrapped around a block of wood and lubricated with water and a little soap. After the scraping or sanding is complete, I apply two more coats of Wood Armor and rub the last coat with rottenstone and water. □

Douglas Redmond is professor of wood design at The City University of New York, Covenent Avenue at 138th Street, New York, N.Y. 10031.

A Contemporary Trestle Table

Building with laminated mortises and tenons

by David Lloyd Murphy

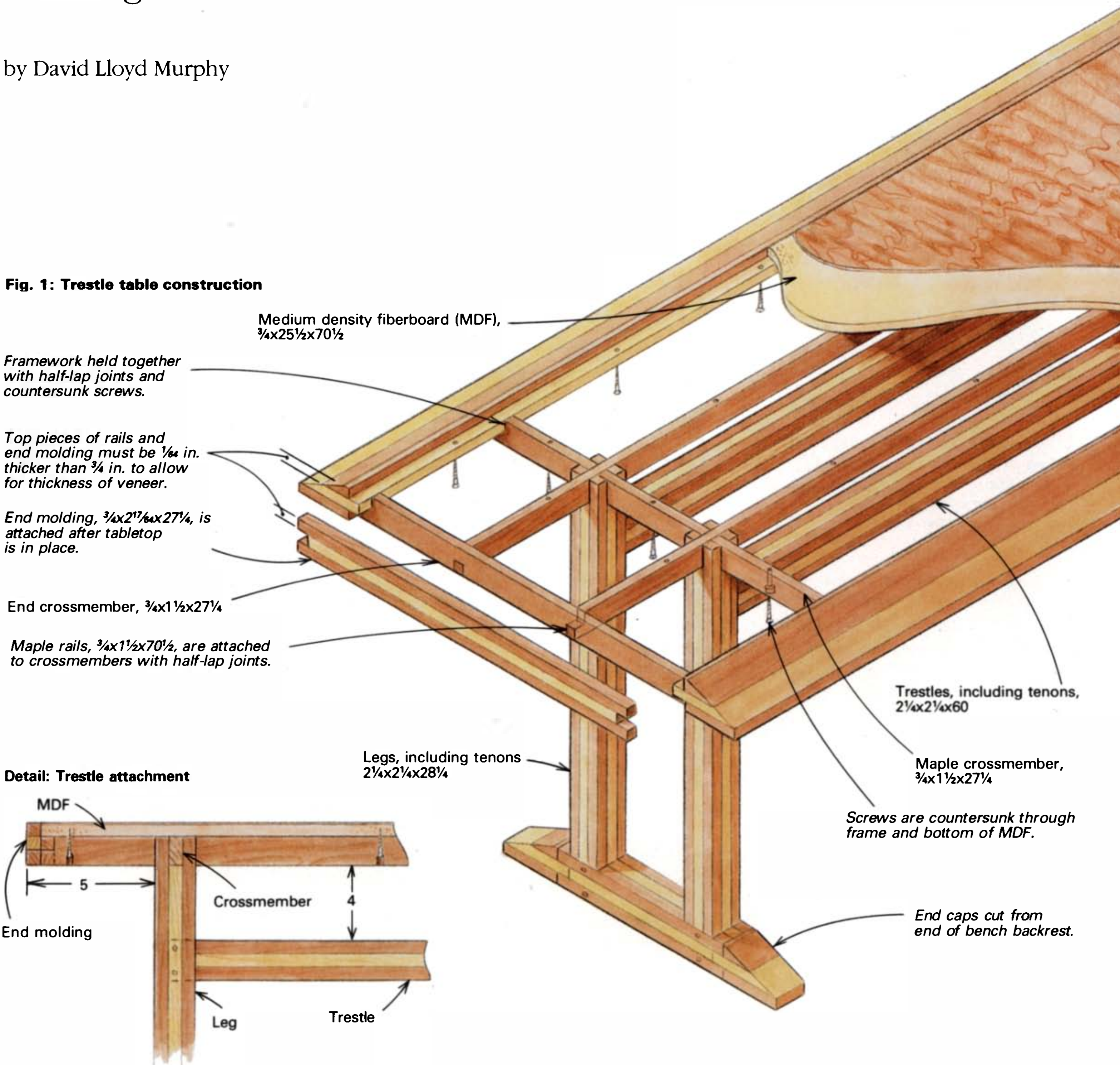
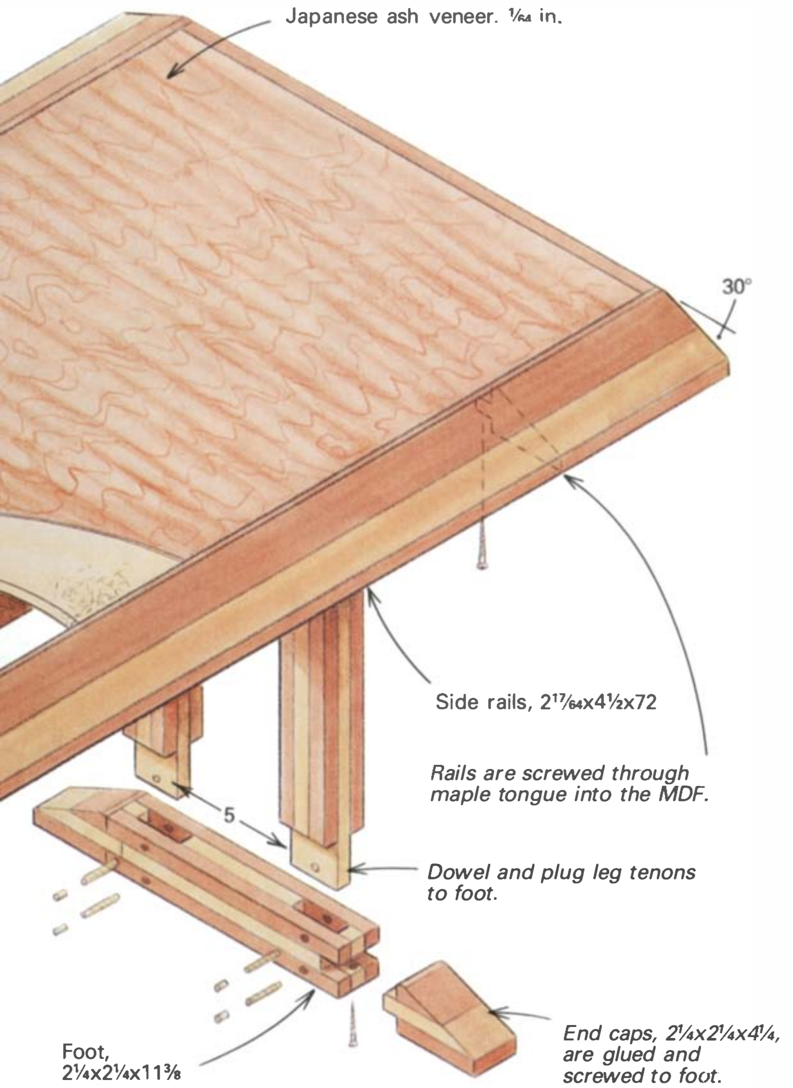


Fig. 1: Trestle table construction

I believe the elaborate old railroad trestles that fascinated me as a boy have substantially influenced the character of my designs. It has always amazed me how a series of posts and cross braces could withstand the great weight and vibration of a thundering steam train. And I've tried to incorporate the engineering and strength of these structures in my work.

When friends asked me to build a table for their new conference room, I jumped at the chance to do my own trestle. They wanted a simple design; I wanted something new; not rustic or traditional, but something more contemporary that would let me try my ideas for improved construction techniques. At the same time, the table had to be within the limitations of my equipment: a 6-in. jointer, a 12-in. thickness planer, a 9-in. radial-arm saw and a 12-in. disc sander.

Size limitations were also important. The table had to fit in a small room designed to serve as a combination dining area and conference room. I decided that benches would be the most efficient seating, but they would have to be durable to withstand lengthy client meetings and elaborate lunches. After numerous sketches, I felt comfortable with a design that involved a construction method I call the nine-piece joinery system. Instead of cutting mortises and tenons, you can use this system to create the joint components by strategically arranging the nine pieces that make up each leg and foot, as shown in figure 1 above. Spaces left between



The author's nine-piece system results in very accurate mortise-and-tenon joints in this contemporary mahogany, maple and Japanese ash veneer trestle table.

pieces form mortises, and protruding members form tenons.

Bridle joints formed at the tops of the legs firmly hold the table surface and its supporting framework without screws. This makes it very easy to lift the top off the legs whenever the table must be moved. The double-leg design provides ample support for the wide top, and it echoes the configuration of the benches. The feet on the benches act as skids so the benches slide easily, and they visually extend the accent line of the table base. As shown in the photo above, right, the table's framework is maple and mahogany, and the contrasting colors of these woods create a pleasing, contemporary look. The removable tabletop and the benchtops are medium-density fiberboard (MDF) veneered with Japanese ash.

The nine-piece joinery system–The advantage of this system is the ease with which accurate mortises and tenons can be formed by cutting components and gluing them up in a predetermined order. It takes far less time than cutting traditional mortise-and-tenon joints, which always seem to loosen with age due to poor fit. Each of the components must be square, both for a strong joint and an accurate fit; check pieces frequently with a good try square. It's best to build one section at a time, rather than cut all the pieces at once. After completing one section, such as the table legs, you can more accurately fit adjoining pieces. Also, if you make a mistake, you won't waste a lot of expensive wood.

Gluing up the component parts from ¾-in. squares yielded the dimensions I wanted, provided versatility for laying out mortises and tenons and created visual impact by contrasting the light maple with the darker mahogany. I've found it easiest to glue up the nine-piece legs in stages. By making three separate units of three pieces each and gluing these units together to form the leg, for example, you handle fewer pieces at one time and greatly simplify joint formation.

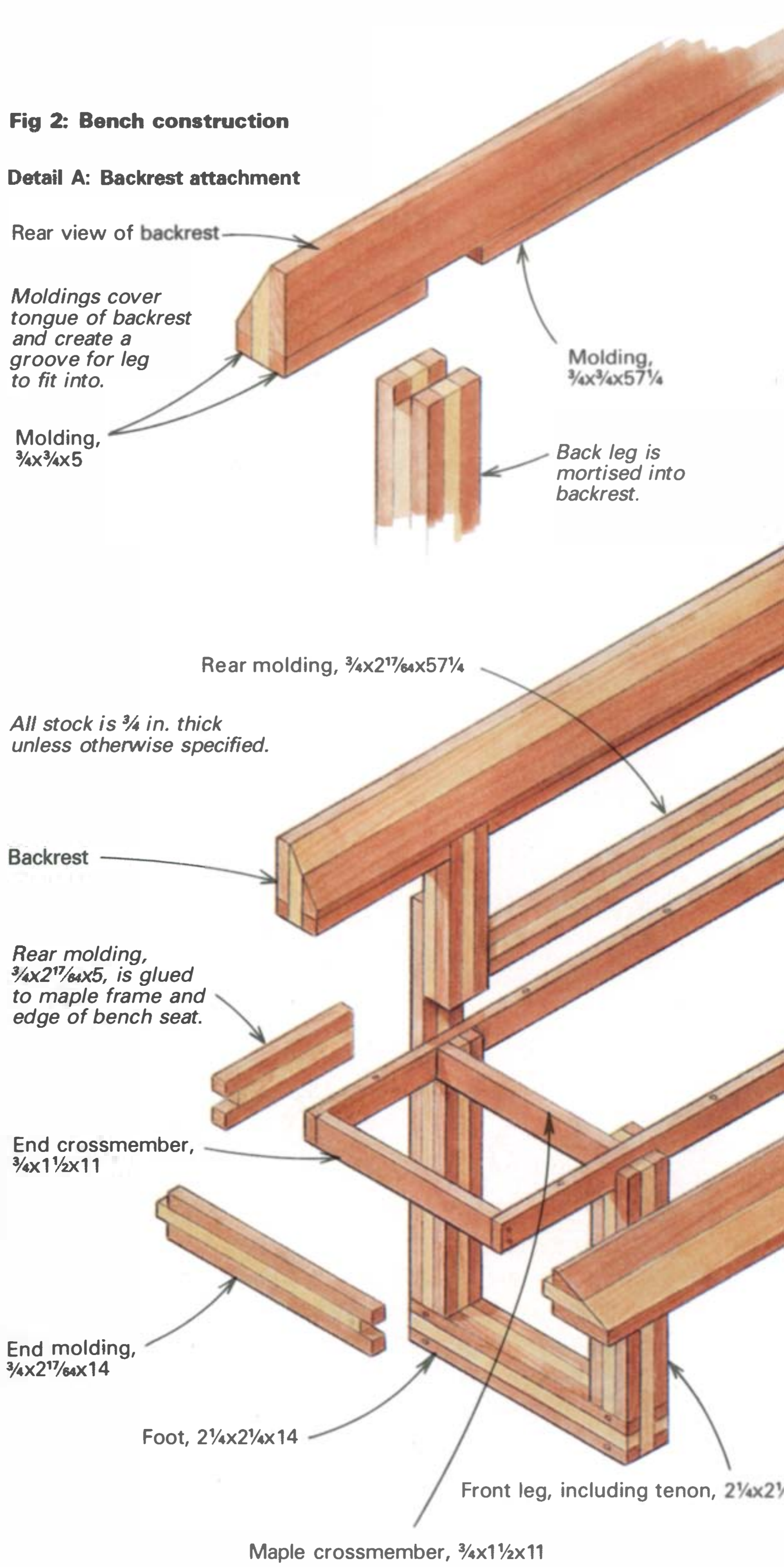
Figure 1 at left shows how to assemble the leg components to form the mortises for the trestles, the upper bridle joints and the tenon that fits into the foot. Careful positioning of the pieces will ensure accurate joints and eliminate much handwork later. You may want to cut scrap blocks to match the dimensions of each mortise and insert these spacers during glue-up to ensure the mortises will be the correct size. Wax the spacers to prevent them from sticking and remove them as soon as the pieces are clamped together. After clamping the three-piece units that will combine to make the legs, I immediately wipe off any glue squeeze-out with a damp rag. When the glue dries, I lightly thickness-plane the mating surfaces and glue up the leg as shown, again wiping off any glue squeeze-out. Let the glue dry and then clean up the nine-piece assembly by running it through the planer.

The feet of the table are made the same way as the legs. For through tenons, such as the leg-to-foot joint, I make the tenon slightly long, dry-assemble the joints and mark the exact tenon length. I then disc-sand the end of the tenon until it fits exactly. This is much easier than hand-sanding the rock-hard maple end-grain after the piece is assembled. Next, I glue and clamp the legs to the feet, so everything is square and perpendicular. To further reinforce the joint, I drill ¼-in. holes through the feet and tenon and then countersink fluted dowels, which I cap with plugs cut from long-grain maple. The completed leg units are now joined together with two 2¼x2¼x60 maple trestles. The trestles are secured with glue and dowels, which are covered with long-grain plugs as described earlier.

The base is topped by a ¾-in. by 1½-in. maple framework that supports the veneered MDF top. The framework is constructed with half-lap joints and later fastened to the top with countersunk screws. Rabbet the ends of the crossmembers to ¾ in. by ¾ in. to accept the tongue of the side rails when the assembled top is attached. Then, cut and fit the end crossmembers, but don't attach them until after the top is attached to the framework, which will fit neatly into the bridle joints on the legs. Although the framework drops easily into place, the bridle joints prevent any sideways

This simple planer jig makes it easy to bevel the backrests and rails for the benches and table. A stop keeps the rail from slipping in the jig, while the pressure from the feed rollers holds the rail down.

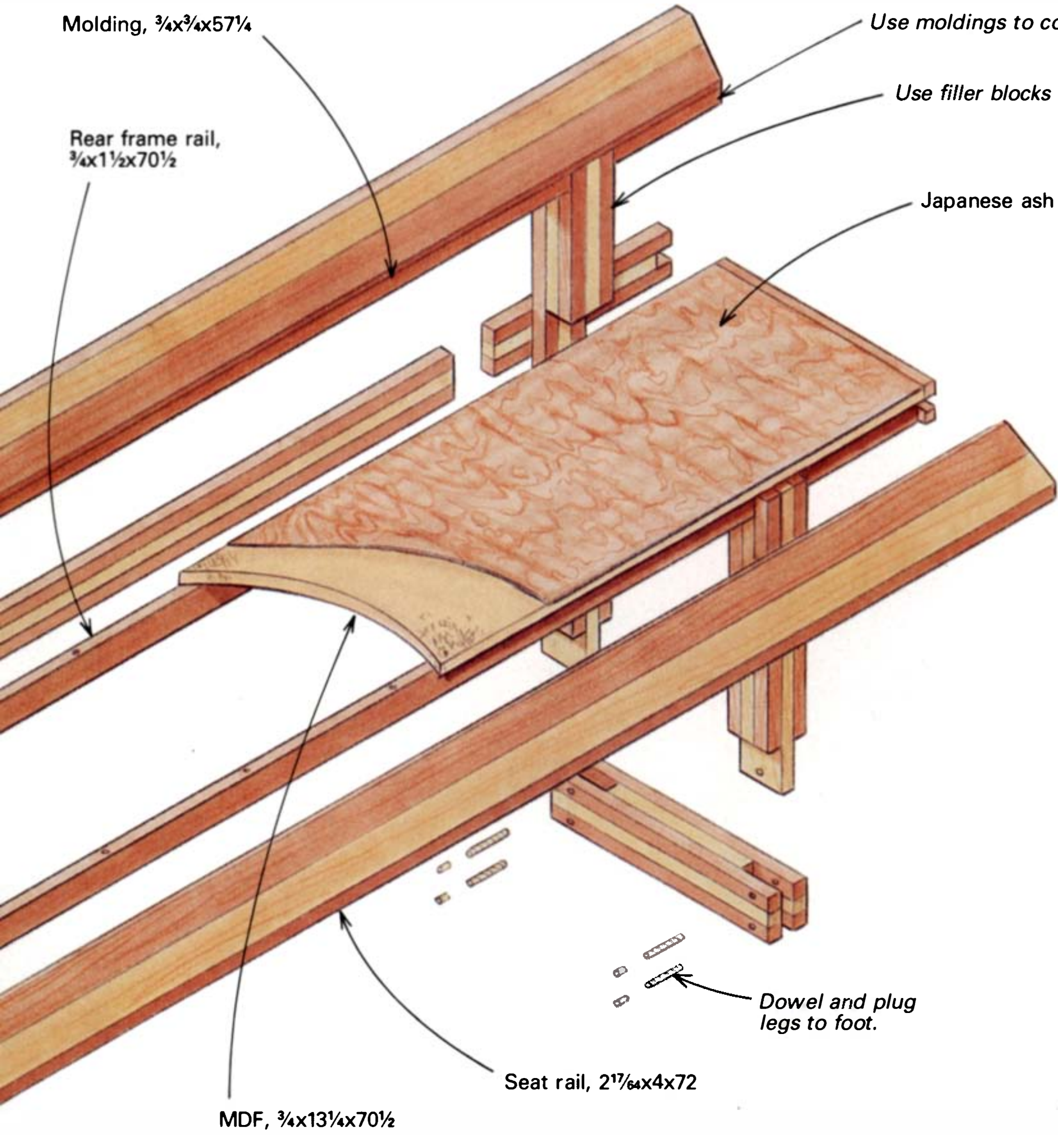
Using the bench assembly as an example, Murphy shows the simple but very accurate leg-and-frame joinery that is possible during glue-up with the nine-piece system.



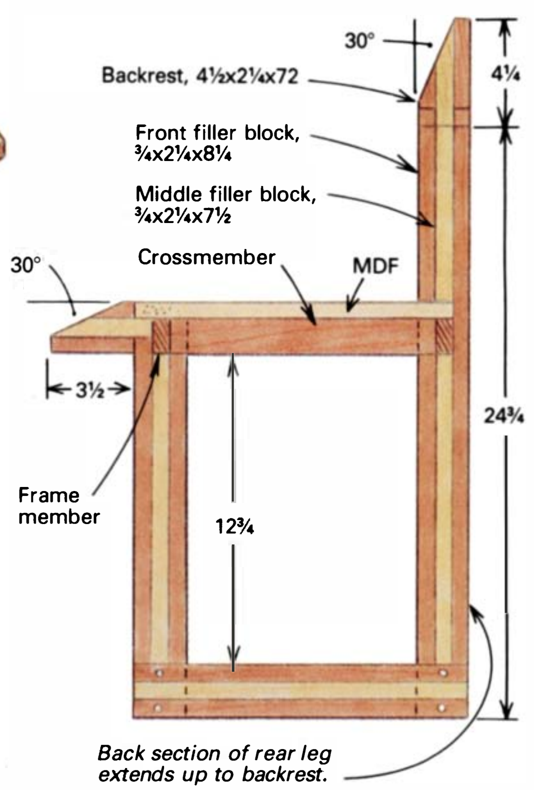
movement of the top; weight will hold the top unit down.

The MDF top offers a dimensionally stable subsurface for the flexible foil-and-paper backed Japanese ash veneer, which I bought from Atlantic Plywood, S. Windsor, Conn. 06074; (203) 291-8020. You can also order it from Constantine's, 2050 Eastchester Road, Bronx, N.Y. 10461; (212) 792-1600. Although I had access to a vacuum press for veneering, you can veneer by hand. (See "Hammer Veneering" by Christopher Faulkner, *FWW* #61, pp. 86-91.) You could also make the top with preveneered plywood. The MDF top is fairly heavy and this helps hold the top in place. If you substitute the lighter plywood, you might consider running pins through the bridle joints into the top frame.

Making the tapered rails—Because I find sharp table edges uncomfortable, I designed a 30° bevel-edged side rail to serve as an armrest. Although their dimensions vary, as shown in the drawings, all the rails for the top, the bench seat rails and backrests are made in the same way. To make the side rails, glue a ¾-in. by 4¼-in. maple piece between two pieces of 3½-in.-wide mahogany, as shown in figure 2 above, to create a rail with one square edge and a ¾-in. maple tongue. Screws driven through this tongue into the MDF top secure the side rails. The bottom piece of mahogany should be ¾ in. thick, with the top piece slightly thicker to compensate for the thickness of the veneered MDF. I glue all the rails up at this time and then form the 30° beveled edges by running each piece through the planer with the jig shown in the top photo above. The beveled side rails can now be fitted to the veneered tabletop and benchtops glued and screwed in place. After fitting the support frame into the bridle joints on the legs, place the top in position. The frame and top can now be joined with countersunk screws run up through the frame into the under-



Detail B: Section of bench at crossmember



side of the top and through the ends of the crossmembers into the maple tongue of the side rails.

The ends of the table are finished with end molding that is glued up like the rails, with ¾-in.-thick stock on the bottom and middle and slightly thicker stock on the top. The dadoes in the ends that fit the tongues of the side rails are formed by making the middle piece of the lamination 1½ in. shorter than the top and bottom layers. The end crossmembers of the tabletop frame are now glued to the end moldings. This crossmember/molding unit is then fitted to the end of the table between the side rails and is glued and screwed through the crossmember into the bottom of the tabletop.

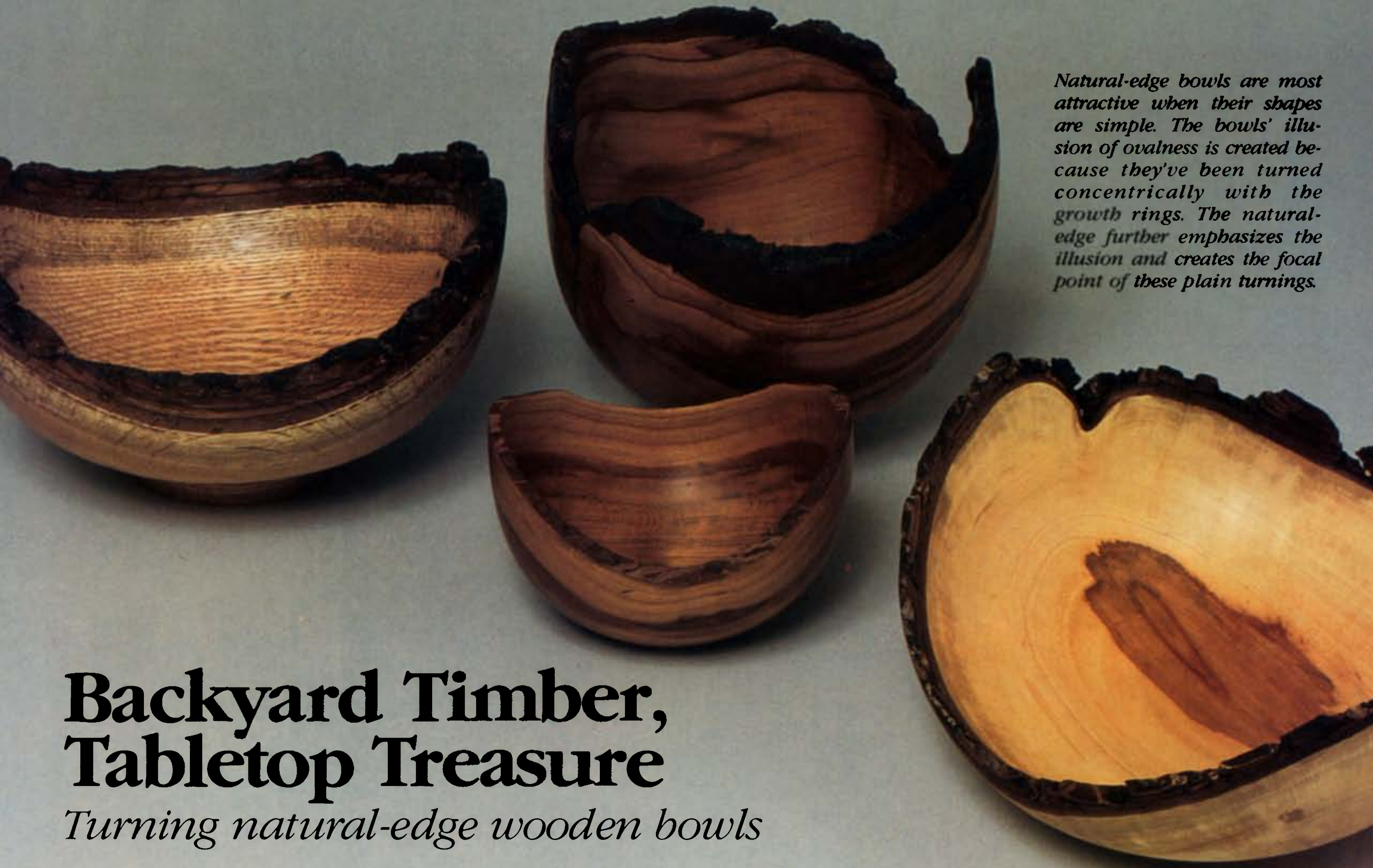
To complete the table, cut two end caps for the feet from the ends of the backrest rails. After fitting the tongue of the end caps to the mortises in the feet, glue and clamp the caps in place and screw through the mortise and tongue from the bottom of the foot.

Building the benches–The construction techniques for the benches are basically the same as for the table. Using my nine-piece joinery system, I constructed the U-shape leg units shown in figure 2 above. Again, attention to detail and fit at this point will yield tight-fitting joints that will require little handwork later. The leg-to-foot joints of the benches are doweled and plugged in the same manner as the table. Having constructed both leg units, I join them to the front and rear frame rails, which run the length of the bench minus the end moldings, as shown in the bottom photo on the facing page. The crossmembers are installed between the front and rear frame rails at the legs and at the ends of the rails with glue and screws. I attached the seat rail by screwing through the tongue of the rail into the bottom of the veneered MDF seat. The seat and rail butt against the back legs and are held in place with screws running through the frame members into the MDF. Glue mahogany moldings onto the tongue of the backrest before gluing the backrest in place on top of the legs. Applying the filler blocks to the rear legs and gluing the moldings to the back and ends completes the benches.

Before applying any finish to the table, I hand-sand the joints as needed to level tenons or clean up glue squeeze-out. Also, I check the rails surrounding the veneered surfaces to be sure they are even, and I sand the rails to eliminate any high spots. Avoid sanding the veneer or you'll risk cutting through it. I hand-sand the entire piece, except the veneer, working from 120-grit up to 250-grit sandpaper. Then, I lightly sand the veneer with 250-grit.

For a hard, durable finish, I spray on four coats of clear satin lacquer, sanding between coats with 250-grit paper to remove orange peel or overspray. Don't apply more than four coats; the additional coats will darken the color of the wood. After sanding the final coat with 400-grit paper, I rub out the finish with fine steel wool and polish it with Butcher's Wax. □

Dave Murphy is a serious amateur woodworker and a creative director with an advertising agency in Farmington, Conn.



Natural-edge bowls are most attractive when their shapes are simple. The bowls' illusion of ovalness is created because they've been turned concentrically with the growth rings. The natural-edge further emphasizes the illusion and creates the focal point of these plain turnings.

Backyard Timber, Tabletop Treasure

Turning natural-edge wooden bowls

by Joseph M. Herrmann

When I turn wooden bowls, I avoid designs that are perfectly round and look lathe-turned. I create an illusion by turning bowls green and letting them dry to an oval shape. Natural edges, with the bark still on the rim of the bowl, further add to the effect.

Burls allow more exotic illusions because of their wavy figure, but they are usually difficult for most turners to obtain. On the other hand, ordinary logs from the backyard or the firewood pile offer an inexpensive way to produce pleasing, natural-edge, oval-shape bowls. Whatever the source, I've found that the greener the wood, the better the bark will adhere. It also is important to work quickly when turning a green bowl because the bowl quickly becomes distorted as the wood dries. I try to turn each bowl in 45 to 60 minutes. If the bowl cannot be completed in one session, it's filled with the wet shavings produced during turning, and then put in a plastic bag to prevent rapid moisture evaporation.

To turn the bowl, I check the blank on the lathe three different ways before I'm finished. First, the green-wood blank, with bark on, is mounted between centers to turn the outside profile. This is a much safer procedure than faceplate mounting, particularly since the initial blank may be out of balance. Also, I can precisely align the grain so that the growth rings are centered about the axis between the tailstock and headstock. The result is a symmetrical turning with on-center growth rings that greatly enhance the illusion of ovalness in the finished piece. Then, I remount the blank to a lathe-turned faceplate that maintains the same central axis for turning the inside. Using a shopmade mandrel, I remount the bowl again, and turn the base for a more finished appearance.

Wood selection and layout—I prefer locust, cherry and ash because these woods have three distinct attributes: pleasing, concentric growth rings that contribute to an oval appearance, sapwood that contrasts with the heartwood and snug-fitting bark that doesn't break off easily. With care, walnut can also be used, but its rough bark tends to break off when turned.

Once you've chosen a log, measure its diameter and then chainsaw or bandsaw a length of it equal to its diameter plus an inch or two. The fresh end cuts reveal the true colors of the wood, checks and other defects. Keep the cuts as square as possible. When working green wood, the greatest chances for radial cracks are at the pith, so I generally avoid this area in my designs. While there is no right way to determine where the bowl should be in the log, I find it helpful to draw bowl shapes on the end of the log with a lumber crayon or chalk. Based on your experience, preferences and inspection of the endgrain, select the side of the log you think will produce the biggest or the most colorful bowl blank and draw a line directly through the pith. Now draw another line parallel to the first, but 1 in. deeper in the waste side of the log, as shown in the left photo below, and cut along this line with a bandsaw or chainsaw. The extra material at what will be the foot of the bowl gets turned into a tenon that will fit into an auxiliary faceplate. Matching this tenon to a mortise that has been turned into the auxiliary faceplate ensures the bowl will be centered when you reverse it to turn the inside.

Using a framing square, I draw a line perpendicular to the bandsawn surface directly through the pith on both ends of the blank, as shown in the middle photo below. Draw a centerline the length of the blank and locate the center point on that line. Using a compass, dividers, trammel points or a circular pattern, outline the bowl shape on the bark and bandsaw a round blank as shown in the right photo below.

Mounting the blank on the lathe—A center-finding tool (available from Craft Supplies USA, 1287 E. 1120 South, Provo, Utah 84606; 801-373-0917), although not totally accurate on these irregular surfaces, helps me locate the center on the flat pith side of the blank. Then, using a mallet, I drive the spur center deep into the center mark on the bark side of the blank. With thick-bark wood, such as walnut or butternut, it might be necessary to remove a portion of the bark to allow the spur center to penetrate the solid sapwood. A revolving cup center in the tailstock works best for making the adjustments for centering the blank on the growth rings, which I'll discuss later, because a cone center makes a hole in the stock that could interfere with making a critical adjustment. Move the tailstock into position, centering it on the mark previously made on the pith side of the blank, and you're ready to start.

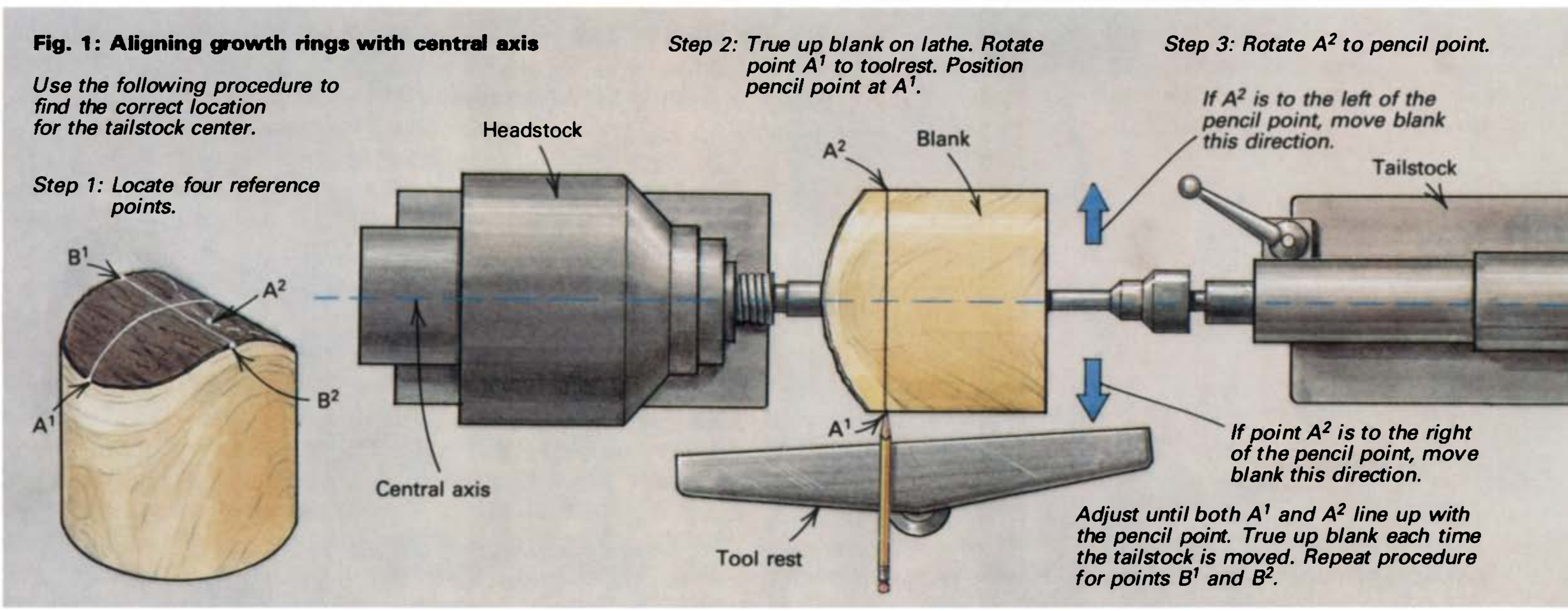
Because the blank will be out of balance, put the lathe on its slowest speed before turning it on and stand to the side because it may throw some bark. A full-face shield is absolutely necessary for this kind of work because it protects your eyes and face from serious injury if a piece of bark comes loose or the blank itself comes off the lathe. Now I true-up the blank with a bowl gouge, which cuts much more quickly than a scraper and reduces the chances of the blank being thrown off the lathe.

Once the blank has been trued, adjust it on the lathe so that the central axis is in alignment with the center of the blank's growth rings. This is a trial-and-error procedure. Because changing the tailstock position will throw the blank off balance again, I true it up after each adjustment before I check the alignment. I begin by locating the four reference points indicated in figure 1 below in the area where the bark meets the sapwood. With my pencil on

After selecting the section of log for your bowl, mark it off by drawing A-A' through the pith. The cutting line, B-B', is laid out 1 in. to the waste side of the first line.

Connecting lines drawn perpendicular to the base on each end of the blank provide reference points to mark off the bowl blank centered on the growth rings.

The curving profile of the bowl's lip is clear after bandsawing the circular blank. The more round the blank, the better balanced it will be when mounted on the lathe.



the tool rest and the pencil point at reference A^1, I rotate the blank by hand to check the relationship of A^2 to A^1. An adjustment must be made if A^1 and A^2 do not align with the pencil point. Loosen the tailstock and relocate the cup center on the blank, as shown in figure 1. By keeping the center on the same horizontal plane while moving it forward or backward on the lathe, you can bring points A^1 and A^2 into alignment with the pointer. When A^1 and A^2 are in alignment, repeat the procedure with the B points. This will usually go much quicker than the first setting.

Turning and shaping the blank—I prefer the ½-in. Superflute bowl gouge, available from Craft Supplies USA, for turning my bowls. To avoid tearing the endgrain, turn from the smaller diameter to the larger diameter, contrary to the common rule of always cutting downhill. I've ground back the sides of my gouge so I can make this cut, which would be difficult with a square-end gouge. Although the appropriate speed of the lathe will depend on the size of the blank, a good rule of thumb is the larger the blank, the slower the speed. I usually turn around 1,000 RPM for a 6-in. bowl. Don't forget to turn a tenon on the bottom of the bowl, which will be needed for faceplate-mounting the stock, before removing the piece from the lathe.

While there are no specific rules, I've found that woods with a lot of figure or natural-edge bowls look best when simply shaped. I prefer shapes that flare at the rim and curve gently to a smaller-diameter foot, as shown in the photo on p. 58. Experiment to find pleasing shapes that work well with the wood being used.

I make a special faceplate-mounting chuck that recenters the blank to turn the inside of the bowl. The chuck is a circular hardwood block, ¾ in. to 1 in. larger than the diameter of the foot of the bowl and thick enough so the screws used to attach it to the faceplate do not protrude through the wood. Mount the chuck to the faceplate and true-up the wooden circle. Next, carefully turn a ¼-in.- to ⅜-in.-deep mortise in the wood to accept the tenon on the base of the bowl. The tenon should fit snugly without being forced into the mortise. I super-glue the tenon into the mortise, producing a fillet of glue around the base of the bowl for additional strength. Hot Stuff, a cyanoacrylate adhesive available in three different consistencies, works very well. I use Hot Stuff-Super T for faceplate mounting because of its good gap-filling capability, and use the thinner Hot Stuff-Original for gluing bark, a procedure I'll describe later. Hot Stuff is available from almost any hobby shop and several mail-order sources. I order mine from Sheldon's Hobby Shop, 2135 Old Oakland Road, San Jose, Cal. 95131; (408) 943-0220.

When used with the accelerator, cyanoacrylate glue cures almost immediately, but I usually allow an additional five minutes of drying time before turning on the lathe. Then I true-up the outside of the bowl and rough-sand to remove any tool marks before beginning on the inside. Drilling out the center serves as a depth guide and removes the slow-turning center, which is difficult to cut with a gouge. Using a 1¼-in. to 1⅓-in. multi-spur bit, I drill to about ½ in. less than the maximum depth; be sure to measure from the point of the drill. Rough-out the inside with a bowl gouge to a wall thickness of approximately ½ in.

A uniformly thick wall helps to eliminate uneven drying and cracking, although the bowl will probably distort. You should, therefore, continually measure the wall thickness with double-ended calipers to ensure uniformity. Final wall thickness should be about ¼ in. to ⅜ in., depending on the integrity of the wood. Some spalted woods and pieces with large voids will need to be on the thicker side to prevent them from being torn apart by the centrifugal force of turning.

To provide a secure atttachment once the bowl has dried, I glue the bark with Hot Stuff-Original super glue because its water-thin consistency gives deep penetration and an invisible glueline. The glue is applied to both sides of the bowl where the bark joins the sapwood. With the lathe running, I power-sand the inside and outside of the bowl using a foam-backed abrasive disc, available from Craft Supplies USA, in my ¼-in. electric drill. I start with 120-grit and work up to 400-grit. When sanding the bowl's interior, avoid touching the rim because it can give you a bad cut. The path the drill takes must be either from five o'clock or seven o'clock to center to avoid the drill being caught up inside the bowl. The next phase involves hand-sanding, with the lathe stopped, until all imperfections are removed. Over-sanding can result in a wavy surface as the softer earlywood is removed more quickly than the more-dense latewood. Further damage can result if you overheat the wood while sanding, causing heat checks. The fruit woods, such as cherry, are more susceptible to this kind of damage than the nut woods.


A bottom-turning mandrel is made by stapling a foam pad to a turned 4x4x6. The foam pad serves as a friction drive for the bowl that is held to the mandrel by the tailstock.

Finishing and turning the foot—I like a natural finish so I use a simple procedure that is quick, yet seals the wood and provides a soft glow. While the bowl is still on the lathe, and without the lathe running, I liberally brush on a coat of Deft lacquer, which I immediately wipe off with paper towels. After the lacquer dries for 30 to 60 minutes, I pad on a coat of Minwax Antique Oil Finish with a piece of fine steel wool or, especially on light woods, with a Scotchbrite light-duty cleansing pad, available at the local supermarket. The Scotchbrite doesn't cause lighter woods to turn gray or black. Wipe off the excess oil immediately, and then let the finish dry thoroughly. Sometimes I add a light coat of wax to renew the shine. This finish is good for decorative bowls, but for food vessels I would use plain mineral oil.

A bowl with a turned foot has greater appeal than a bowl right off the faceplate. The foot should elevate the bowl from the surface on which it is sitting, but it should not interfere with the visual flow from one side of the piece to the other. A turned

Turning bottoms

by Betty J. Scarpino

The bottom of a bowl, though usually not seen, has a great effect on the way the bowl sits on a flat surface and on how potential customers react to the piece.

After several years of simply sanding the bottoms of my bowls flat, I decided to finish them as professionally as the rest of the bowl, so I came up with a way to tape the bowl to a lathe-turned jig and turn the bottom to follow the bowl's inside contour.

Bottom-shaping: Make the jig from a ¾-in.-thick piece of pine or plywood, the diameter of which is slightly larger than the rim of your bowl. The only additional materials needed are some masking tape and strapping tape. Bandsaw the jig round, center and attach it to the faceplate on your lathe and then true-up the rim with a gouge or scraper. Next, I turn a ⅛-in.-deep groove until it's the diameter of the bowl's outside rim. After measuring the thickness of the bottom of the bowl so I'll know how much material I can safely remove, I masking-tape the bowl to the jig as shown in the top photo at right; for extra security I add a few pieces of strapping tape.

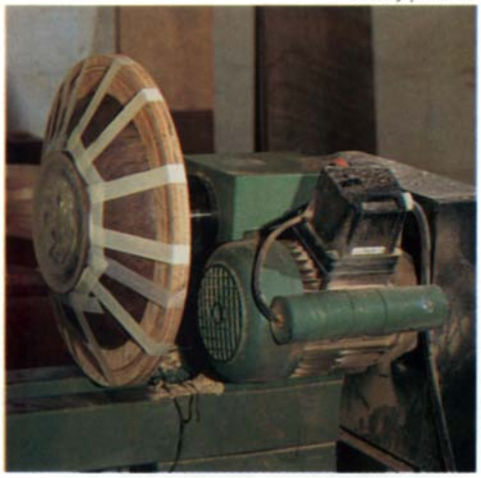
The bottom of the bowl is now ready to finish. Because best results are achieved with sharp tools and light pressure, I remove most of the waste with a round-nose scraper and then finish up with a small skew. The lathe is set at the same speed I would use for bowl turning. Working carefully not to remove too much material and cut through the bowl, I shape the bottom to match the bowl's interior contour. Because the bowl is automatically recentered on the jig, it is easy to untape the bowl and check your progress.

When sanding my pieces, I usually start with 80-grit sandpaper and work up to 400-grit for finish-sanding. Pieces of abrasive from the current grit can cause unsightly scratches, however, if they are left on the piece when you move to the next level of abrasive. To avoid this, I frequently wipe away loose grit and dust with a cloth. Also, after I've sanded up to 100-grit paper, I use a sharp tool to touch up fine details that tend to become muted and rounded. Although the sand grits embedded in the wood grain will dull the tool, the result is worth a little extra sharpening.

Removing the bowl from the jig is merely a matter of removing the tape. I've never had a problem with tape residue, but if you run into this problem, try scraping away as much as possible with your fingernail and then lightly sanding. If you are using an oil finish, any remaining residue should be removed by the oil. You should wipe the bowl with mineral spirits, however, if you will be using a lacquer or varnish finish. □

Betty Scarpino, a seven-year professional woodturner, lives in Indianapolis, Ind.

Photo: Jay Williams



A simple plywood disc screwed to a faceplate makes a jig for turning bowl bottoms, as shown above. The bowls shown below demonstrate the variety of bottoms and professional results obtainable using this simple jig.

bottom creates a more professional piece, provides a stable base and makes a perfect place to add your signature. Usually waiting several days before turning the base will give the bowl time to do whatever warping it is going to do. Your turned bottom should then remain flat and true.

Using a parting tool, I mark off the bottom of the bowl, leaving enough material to square up the base, and then cut the bowl free from the mounting chuck with a backsaw or on the bandsaw. The bowl is then remounted using a type of pressure chuck, which holds the bowl between the shopmade mandrel, shown in the photo on the facing page, and the tailstock. To make the mandrel, turn a seasoned 6-in.- to 8-in.-long 4x4 to make a cone with a depression. The depression eliminates the point of the cone, which could mark the bowl's interior. The turned end is covered with a piece of foam pad, which protects the inside surface of the bowl, and creates sufficient friction to secure the bowl while the bottom is turned to shape.

I mark the center of the bottom with a center finder, place the bowl over the mandrel and position the cup center of the tailstock on the center of the bottom. Advance the cup center into the bottom of the bowl to force the bowl tight against the foam pad on the mandrel until the bowl is stable. With the bowl firmly held, I true-up and shape the bottom, cutting a recess and forming a rim on which the bowl will sit. The small spud that is left under the cup center is chiseled off and sanded smooth when the bowl is removed from the lathe. Sign the bowl, apply the finish and you're done. □

Joe Herrmann is an industrial-arts teacher and semi-professional woodworker in Jefferson, Ohio.

All-Purpose Joinery With the Router

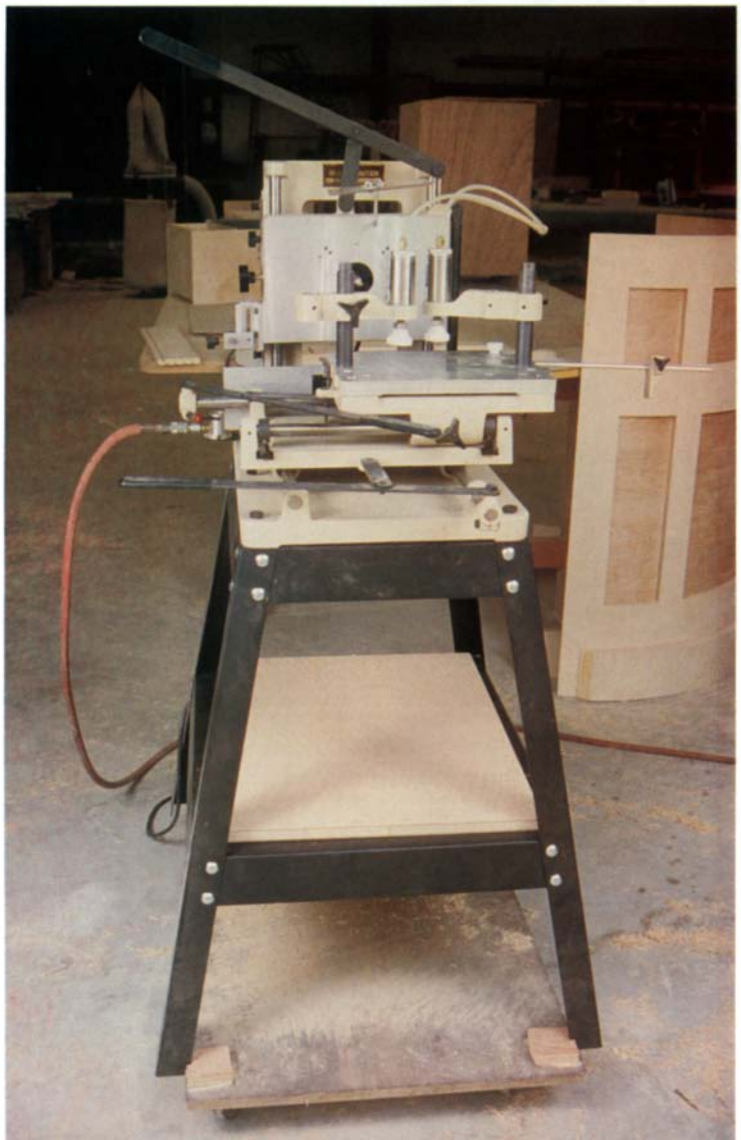
A joint-cutting fixture that operates in three planes

by Claude E. Graham III

Back when King Tut's craftsmen were dulling their bronze chisels chopping out mortises in solid ebony, I imagine they dreamed of gadgets that would make joint cutting easier. Three millenia later, woodworkers are still seeking the all-purpose joinery device, and their quest seems to have spawned one-half dozen, do-everything router machines. One of these is the Multi-Router (see photo below), the invention of South Carolina industrialist and woodworker John Ducate, who borrowed a few tricks from metalworking machinery to expand his router's repertoire.

I first saw the machine while browsing at Highland Hardware in Atlanta, Ga. Even on first examination, it was easy to tell that the Multi-Router is a cleverly designed, well-made machine that addresses the router's fundamental weakness: how to hold the work (or, conversely, move the machine) precisely enough to cut accurate joints. Ducate's solution was to adapt to woodworking the kind of X-Y-Z axis milling system found on metalworking milling machinery. Here's how it works. The wood is clamped to a horizontal table that moves in and out (X-axis) and side to side (Y-axis) in relation to the bit. The router of your choice is mounted to a vertical table that moves up and down in relation to the horizontal table, providing a Z-axis. Although this movement seems complicated, it's kept under precise control by a pantograph-like ball-bearing stylus that follows a template fastened to the horizontal table. There's a series of templates for the various-type joints the machine is capable of cutting.

Below: Like the metalworking machinery that inspired its design, the Multi-Router's joint-cutting accuracy comes from a two-axis worktable that slides on Thomson linear-motion bearings.

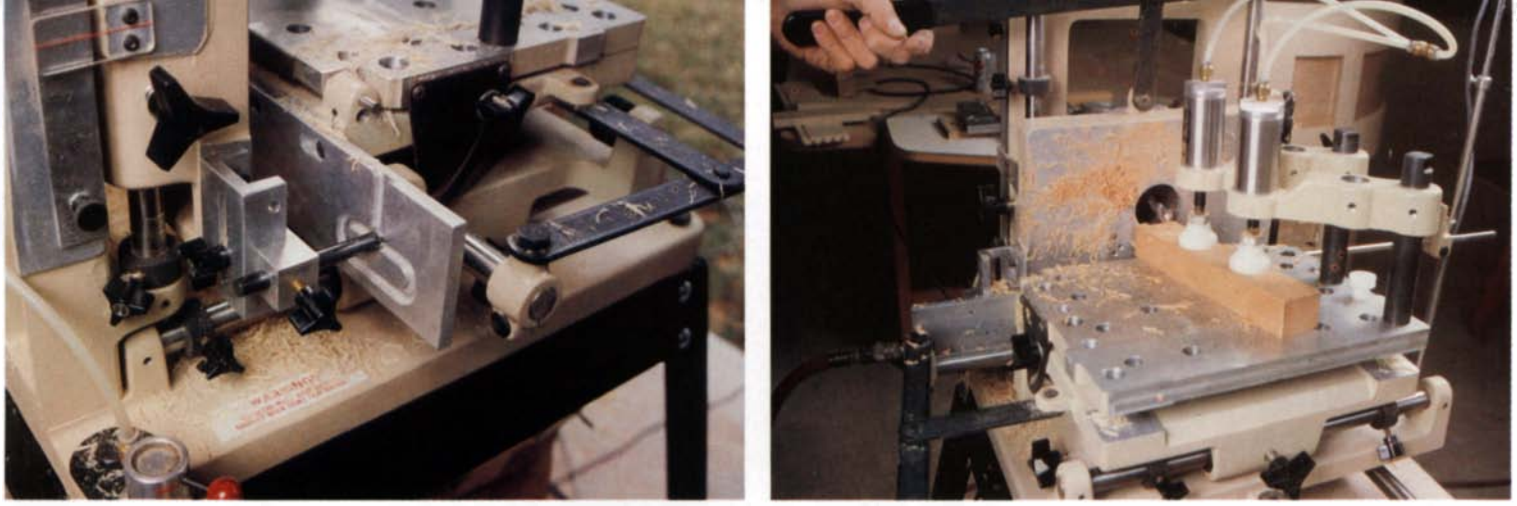


In its sales literature, JDS Co., which Ducate founded to make and market his machine, claims the Multi-Router will quickly cut mortises and tenons, box joints, dovetails and more. Since I wanted to explore all of the Multi-Router's capabilities, I ordered the basic machine ($1,495), the optional air-clamp hold-downs ($255), a metal stand ($88) and a collection of over a dozen templates (ranging in price from $13.50 to $18.50 each), for a total price of over $2,000, not including truck shipping or the router.

Setting up—Assembling the machine with basic hand tools is straightforward. The Multi-Router's X-Y- and Z-tables, which slide easily on hardened-steel rods, come factory mounted and have Thomson linear-motion bearings, which, as far as I can tell, won't clog with sawdust. The heart of this contraption is the router. For this, says JDS, you're on your own. The Z-axis plate is factory drilled for a range of router bases or it can be custom drilled as necessary. A gas cylinder connected to the plate counterbalances the weight of the router. I decided to go whole hog and slap in my 3-HP Porter-Cable Speedtronic, but it was too big to fit. An old Rockwell #6902 router worked fine. Given a choice of any router, I'd recommend one with at least 1¾ HP and ½-in. shank capacity. Unless you have a spare router, buy an extra router base to leave on the Multi-Router so you can alternate the router between bases.

The Multi-Router's operating instructions are, to put it kindly, vague. They consist mostly of photographs with numbered captions and labels for the machine's various parts. JDS says a better manual is in the works. Most of the Multi-Router's setups begin with a pencil line marked on the stock in the center of the joint to be cut. This mark should align with a fine index line scribed on the Z-axis table, providing a point of reference for all cuts. Simple enough. Unfortunately, the Multi-Router I received had the line machined ⅛ in. off center. I sent the machine back and JDS fixed it in short order, without cost or complaint.

Five days later, I tried my first joint: a mortise, which the Multi-



Left: To make a tenon, the wood is first clamped to the worktable, and then moved past the bit by a ball-bearing-tipped stylus that traces the template's profile, transferring its shape to the work. Right: A pair of optional air-actuated clamps holds the work firmly to the sliding table.

Router excels at making. The instructions included a long-winded photo essay on mortising; instead of reading them, I simply marked the mortise length on the stock, and then used my marks to set up the stops that control the cuts in all three axes. A pair of hand-screw hold-downs on the stock machine secure the work to the horizontal table, which is riddled with mounting holes for the hold-downs. While the optional air-powered clamps mount like the standard ones, their clamping action is powered by an air compressor and controlled by a foot pedal that allows the workpiece to be clamped and unclamped effortlessly. Once everything is adjusted and ready, the workpiece is plunged into the spinning bit using the X-axis lever, while the Y-axis lever simultaneously moves the table side to side to clear the waste. It's a very precise, controlled operation that takes less time to do than it takes to read about.

Tenon templates–To make tenons and all other joints except mortises, the Multi-Router requires an array of milled aluminum templates, each of which precisely matches the joint's shape. All together there are 14 conventional tenons and four round tenon templates. The first step is to select the template closest to the size tenon you want and mount it, along with the proper-diameter bit, on the machine. The bit size you'll need is stamped on the template. A steel rule on the operator's side of the machine indicates how deep the Z-axis cut will be and thus aids in centering the tenon in the stock thickness. A couple of thumbscrews set the ball-bearing stylus so it will accurately follow a template's profile. As with mortising, setting stops on the X-axis rails controls the depth of the cut and thus the length of the tenon (see the photos above). This is a four- or five-minute task that gets easier with practice.

When all this is done, the actual tenon cutting is over in no time. With the Z-handle, you insert the stylus into the template then move the Y-handle back and forth, and presto, the bit faithfully follows the template and produces a perfect tenon. Duplicate tenons can be cut by positioning the stock against a shopmade fence or by using the provided plastic locator pins that fit into holes bored in the table. Round tenons, on the ends of either square or round stock, are just as easily made. One of the Multi-Router's strongest features is that the worktable tilts between 0° and 45°, which means making angled tenons is a snap. This would be very welcome in a chair shop where oddball joinery is more the rule than the exception.

As a tenoner, the Multi-Router has a few drawbacks, but careful setup is required for good results. Also, because the stylus is trapped by the template, the router may fail to clear the waste if the stock is much larger than the tenon. In this case, you can retract the stylus and use the Y- and Z-axis control to freehand the waste, or you can just trim it off on the tablesaw. Some of the tenon templates I received were slightly undersize, but a little bit of filing cured the problem. If the bits are slightly oversize from the factory or undersize from repeated sharpening, the tenon will be too loose or too tight. To compensate for inaccurate bits, JDS sells a special, adjustable tenon template that has three inserts of minutely different sizes, which allow for fine-tuning the tenon.

Box joints and dovetails–Making box joints and dovetails requires separate templates. The setup is not quite as involved for box joints as for tenons because the cut needn't be centered in the stock thickness. I cut a few practice joints in oak and found that, exclusive of set-up time, it took about 30 seconds to cut a clean, tight box joint in 5-in.-wide boards. The Multi-Router will box-join parts up to 8 in. wide; by relocating the stock on the table, however, infinite widths are possible, provided boards that extend beyond the table are supported. One limiting factor is that the width of the box-joined parts has to be an even increment of the bit diameter; otherwise you'll end up with odd-looking, fractional fingers.

Dovetailing on the Multi-Router is limited to either ½-in.- or ¾-in.-thick stock; to cut the tails, you need a 14° dovetail bit for each thickness. Two templates are required, one for the pins and one for tails, and as with the box joints, the stock widths are limited to even increments of the bit width and template spacing. You fine-tune the fit by changing the position of the stylus holder; this is a tedious process, but it's worth it for a stack of dovetails. In addition, a set of templates is available for making mitered dovetails.

Conclusions–I think the Multi-Router is a demanding machine to use. It requires much eyeball-alignment for such things as bit clearances and depth settings, and it requires a lot of knob-twirling (it has 12 separate adjustments) to set it up. Dealing with its various quirks sometimes made me feel more like a machinist's mate third class than a woodworker. But then quirks go with the territory when a single machine is expected to perform so many functions. JDS has put much effort into a machine that is surely useful to both weekend amateurs and small production shops. Still, at a base price of $1,495, some thought should be given to the Multi-Router's cost versus your anticipated use. Personally, the box-joint and dovetail capacities of the Multi-Router are too limited for my furniture-building needs, especially given the lengthy set-up time. But any woodworker in need of a slot mortiser and tenoner will find the Multi-Router up to the job; its additional capabilities–especially making compound-angle tenons–might be considered a no-cost bonus. □

Claude Graham III manages furniture production at Arc International Inc. in Jacksonville, Fla. The Multi-Router can be purchased directly from JDS Co., 800 Dutch Square Blvd., Suite 200, Columbia, S.C. 29210; (800) 382-2637.

Form in Furniture

Six rules for creating better designs

by Seth Stem

Below: The form of the Egg Desk by David Powell of East Hampton, Mass., is top-heavy and lacks depth. However, the interior's curvature and drawer-and-cubbyhole composition are pleasing. (Photo by Robert Aude.) Right: Rosanne Somerson of Westport, Mass., created an interesting interaction between this bench's armrests and legs. The curved tops of the wooden legs relate to the curved forms of the upholstered armrests. In addition, the legs overlap the upholstery so that the inside top corners of the legs fall precisely on a radius line that would bisect the central division of the curve in the armrests. (Photo by George Erml, courtesy of the American Craft Museum.)

Form is often the thing we notice first in furniture; it is the perceived geometry of the volume and mass of any object. All furniture has some sort of form, even if it appears relatively shapeless. A designer creates a piece of furniture by manipulating any combination of elements chosen from a vast menu of design possibilities. This menu is the "visual vocabulary" of design elements that gives a designer the means to express ideas clearly and eloquently in three-dimensional form.

The form of a piece of furniture should provide three levels of information. The first level lets the viewer recognize the piece as a chair, table or whatever. More subtly, form can also distinguish objects that look similar but have different functions. For instance, a viewer might be able to tell a backless bench from a coffee table only because of the slight concave form of the benchtop or the delicate form of the coffee table's understructure. Form at this level also establishes overall character—whether the piece is organic, elegant or attention grabbing.

The second level of form gives visual information on how to interact with a piece. For example, chairs have a myriad of forms, but all are for sitting; the forms of cabinets suggest storage or display. On this level, form tells the viewer where to open a cabinet door, where to grab an armrest or how to work an extension table.

The third level of form is more intimate and concerns fine detailing, such as carving, hardware, molding and inlays. This is the level of information that closely holds our interest when we

interact with the piece, and it prevents boredom with the visual information presented on the first two levels.

Whether natural or man-made, forms are composed primarily of combinations of basic geometric shapes or their variations. Individually or in combination, cubes, spheres, cones, pyramids and cylinders can create a furniture form. Although a form can take shape spontaneously, uninspired designers also use conventional exercises to develop them.

Too often woodworkers rely on craftsmanship, joinery or materials to carry a design. These matters are important, of course, but no single element should dominate the others. Evaluate form in furniture under design by mentally painting it gray and asking the following questions: Does the form stand by itself? Is it suitable for its intended use? Is it interesting and visually dynamic? Does it achieve these things without material richness and structural or joinery information? If you can answer yes to these questions, the form has credibility and the design is proceeding in the right direction. By adding detail, high-quality craftsmanship, gorgeous materials, color and any other necessary elements to a successful form, a well-designed piece of furniture will almost certainly result.

Designers usually deal with the piece's overall form first, and use detail either to complement it or contrast with it. This is not a hard-and-fast rule, however, and many designs are developed by concentrating on details first. But much of what's true about overall form also applies to detail form.

Six principles of form—The designer has an incredible amount of latitude in creating a furniture form, even when the piece must fulfill a narrow function. For example, a dining-room table traditionally has a flat surface atop an understructure that is arranged to accommodate diners' feet and legs. Once these requirements have been met, there are still many options. The table base may have four legs or a trestle or central pedestal. Each of these options could be executed in a way that's angular or curvilinear, massive or delicate, traditional or avant-garde. Which alternative is best? It's up to the designer.

The first principle in form development is that the form must satisfactorily express the piece's concept. A table intended to blend with a suite of traditional hardwood furniture would probably not work with an outlandish base, nor would a chair designed to appear soft and comfortable warrant a strongly rectilinear or geometric form.

Subtle variations of a form can dramatically affect its visual message. Imagine a sphere attached to a wall. If the sphere is designed with consistent curvature, it will look static, perhaps machined. If it is distorted to a slight pear shape, with most of its volume below the equator, it will look organic, as though it is responding to gravity (see the desk on the facing page). By contrast, if most of the sphere's volume is above the equator, the form will appear lightweight, as though it's on the brink of ascension. While all of these forms are fine, the choice of one over another should reflect goals specific to the concept.

The second principle of form development is that a form should have balance, either within itself or with another element. This does not mean that a form must be symmetrical, but any variations should be counterbalanced. Forms shouldn't appear top-heavy or bottom heavy without good reason. A designer must be able to "feel" when a form is balanced, rather than just engineer a physically balanced form, because the latter may be boring. Therefore, it is wise to be concerned with visual interest when exploring balance. While a balanced form often automatically yields a balanced composition, make sure the piece is interesting as well.

Third, emphasis on one or more parts is also important when considering form. When there is variation within a form, there will be dynamism; forms that are too consistent are likely to appear bland. Emphasis in form design is analogous to emphasis in a spoken sentence. Every sentence has a beginning, a middle section in which the thought is developed and ultimately an end; but at any point emphasis may be given through the choice of words or the ways the words are spoken. Similarly, emphasis can be added to any part of a form. The drawing below, left, shows one treatment of emphasis. The top table is rather indifferent because the legs have unvarying curvature and consistent thickness. Emphasizing the legs adds dynamism to the entire form. The legs of the bottom table have a well-defined beginning and end, a tighter radius toward the foot of the curve and a variation in width.

Consider the three lamps at the bottom of the drawing below, left, as another example. The base and glass reflector of the first lamp are similarly sized; without emphasis of color or texture they are about equal in importance. Enlarging the reflector and reducing the base, as in the second lamp, creates emphasis through a difference in scale. The third lamp uses the scale of the first lamp, but adds emphasis through the active shape of the reflector. As you can see, emphasis in form is closely tied to emphasis in composition. However, form emphasis deals with contour and scale relationships, while composition concentrates primarily on placement.

The fourth principle of form design is that for maximum visual interest a form should create relationships either within itself or with surrounding elements. In other words, forms should interact. Using forms sensitively creates a harmonious design, as shown in the photo of the upholstered bench, pp. 64-65, while juxtaposing dissimilar forms in a disorderly or haphazard manner gives a chaotic feeling.

Depending on their location and proximity to each other, forms can be used to create a particular mood by suggesting tension, aggression and serenity, among other qualities. For example, the point of a triangular form directed at an adjacent rectangle feels aggressive; if a side of the same triangle is adjacent to the rectangle, the feeling changes because of the compatibility of the two adjacent straight edges. Here again, the issues of form overlap those of composition.

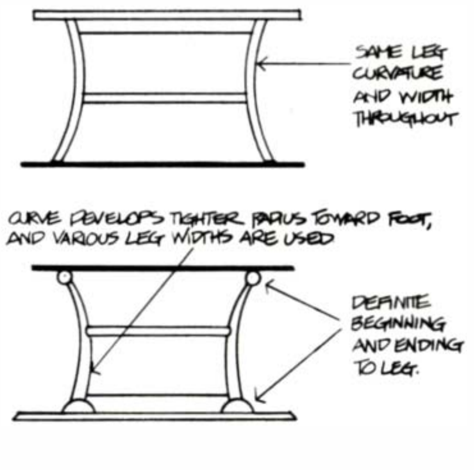
Fifth, a piece of furniture's form must be sensitive to the materials used. Seek the most appropriate material for the form under design. If you want to use veneer, don't design a form with fragile edges or the piece will be at risk of damage. Consider, too, that the eye perceives certain weights for common materials; a form attractive in wood might look unattractive if made the same size in steel.

Last, when designing the overall form of a piece, try to consider all viewing angles. Much too often designers study only one view, usually the front view of a cabinet and the side view of a chair. In Cory Burr's chair in the photos on the left side of the facing page, it's clear that the side view was the main focus; the front view is less effective.

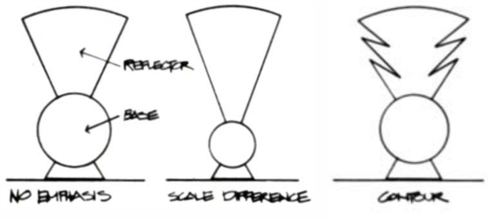
By contrast, the overall form of Arata Isozaki's chair in the photo on the right side of the facing page is more successful. The side of the chair has a more active form than the front, but front-view interest is generated by the long slats. Where it's not possible to strengthen an uninteresting form, the designer can use other elements of the visual vocabulary (such as texture or color) to compensate.

Details of form—When function and structure have been considered in the overall form, there is freedom in developing the details. Designs are most often successful if the detail shapes are

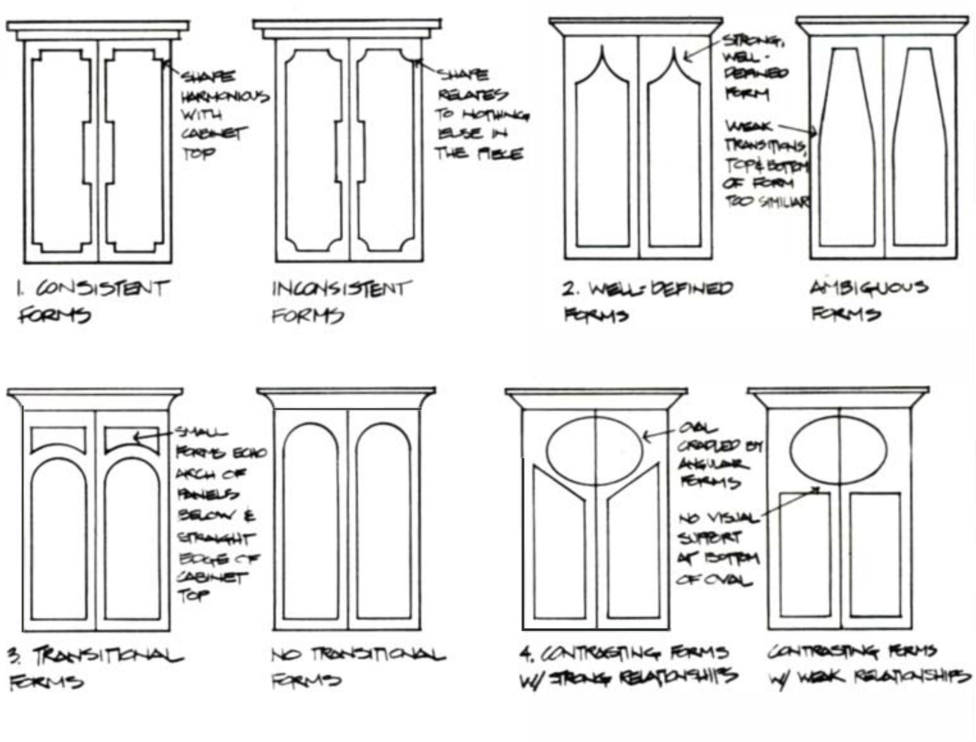
ADDING EMPHASIS TO ENLIVEN A TABLE FORM



ADDING EMPHASIS TO A LAMP

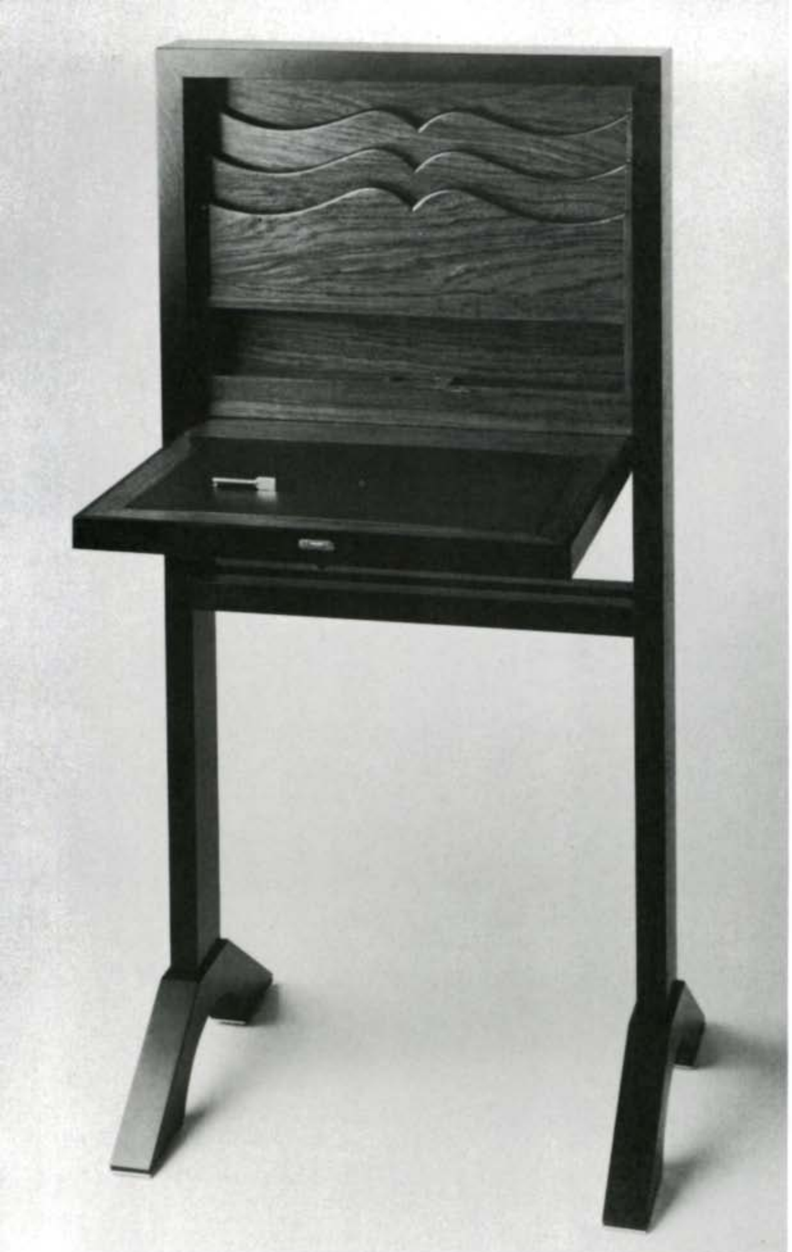


VARIOUS DETAIL FORMS IN A CHEST



This chair by Cory Burr of Providence, R.I., looks as though it was designed primarily from the side view. The curves introduced into the front view (above), through the edges of the seat and back, don't have the same command and character as those in the side view (below). (Photos by Seth Stem.)

The side view of the "Marilyn Chair" by Arata Isozaki of Tokyo, Japan, is more active than the front, but the backrest slats in the front view also provide the viewer with visual interest. (Photo courtesy of MIT Hayden Gallery.)



Above: The curved forms of the file dividers in this fall-front desk by Louis Goodman of New York, N.Y., contrast with the straightforward construction of the frame, and they become the desk's focal point. (Photo courtesy of the Gallery of Applied Arts.) Below: The blue ring acts as a transitional form between the mahogany ball and the black leg in this Roscoe-Award-winning table, which was designed by Jack Larimore of Philadelphia, Pa. (Photo by Rick Echelmeyer.)

consistent throughout a piece; for example, on the legs, armrests, back support and seat of a chair. (Of course, the scale of the detailing has to change depending on its location in the piece.) But not all details must relate closely. Contrast and variety are needed to keep a piece visually alive. Rounded-over edges on curvilinear framework create a sculptural feeling, whereas crisp edges add definition by creating shadow lines that visually separate planes and edges. The bottom, right, drawings on p. 66 illustrate how a variety of details might work in a simple rectangular chest. In the first example, a strong relationship between forms is established in the consistent detailing of the doors and cabinet top. However, rounding the door-panel corners weakens this relationship.

In the second example, the form of the panels on the left is well defined, but the panels on the right are weak. Here you can see that too much balance is a bad thing. The top of the form is too similar to the bottom, and the transition from the straight sides to the tapers is muddy and uninteresting.

The third example demonstrates how a piece can benefit from a transitional element. The smaller forms above the archs in the cabinet on the left pick up both the shape of the door panels and the horizontal line of the cabinet top, softening the contrast between the two.

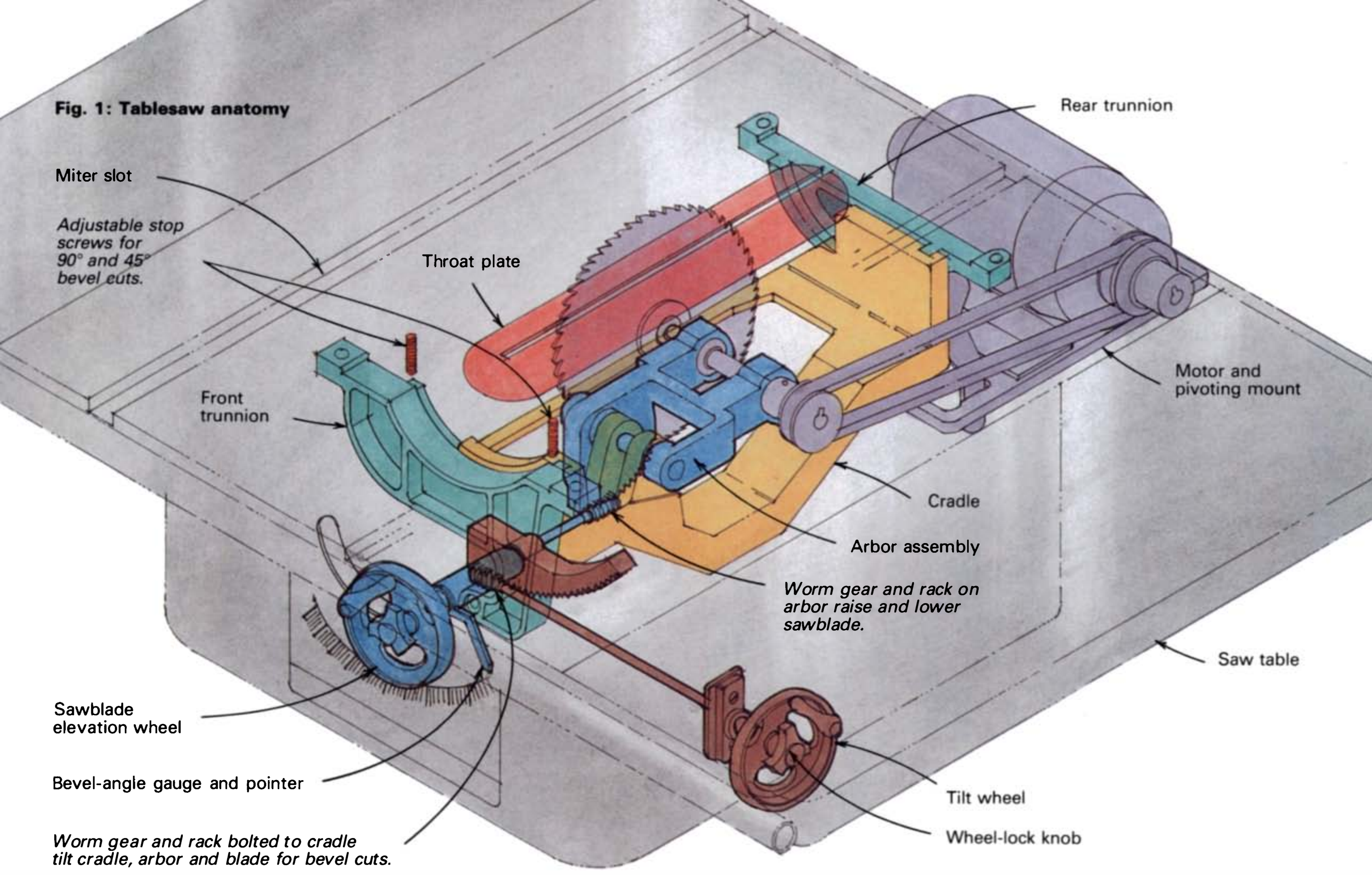
The last example illustrates the importance of relationships between contrasting forms. In the cabinet on the left, the trapezoids seem to cradle the oval. This is a much stronger relationship than that of the cabinet shown on the right, in which the panels fail to interact with the oval. Here, the oval is also surrounded by too much negative space; it could use some visual support, especially on the underside.

Ideally, you should use detail form systematically. For example, the framework of a chair may be based on certain shapes, but if you think of the backrest as a complementary element framed by the chair structure, you can detail it entirely differently. The well-developed curvilinear profiles of the filing dividers in the writing desk, shown in the top photo at left, contrast very nicely with the straightforward lines of the rest of the piece.

While you are designing the piece of furniture, consider adding transitions between detail forms so the jump from one form to another doesn't appear awkward or abrupt, especially when there is a change in materials. Introducing a small, third detail between two existing forms is a good way to create a transition. This is evident in the table shown in the bottom photo at left, which features a small ring where the top of the cylindrical table leg ends in a ball to effect a smooth transition. The form of a transitional element need not closely relate to the forms on either side, but scale is important. The transitional element is usually a lot smaller than the forms it separates; if it becomes too large, it becomes less of a transition and more of a form in its own right.

When designing detail forms, more is not necessarily better; there really is only so much information a viewer can digest before a piece becomes visually confusing. A good rule in evaluating whether a piece is fully developed is to subtract or add information; if doing either makes the piece less attractive, confuses the visual message or clouds the concept, it's a good bet the design is complete. □

Seth Stem teaches at the Rhode Island School of Design and designs and makes furniture in Marblehead, Mass. This article has been adapted with permission from the new Taunton Press book, Designing Furniture, *©1989, The Taunton Press, 63 S. Main St., Newtown, Conn. 06470.*



Tuning-Up Your Tablesaw

Basic adjustments for accuracy and safety

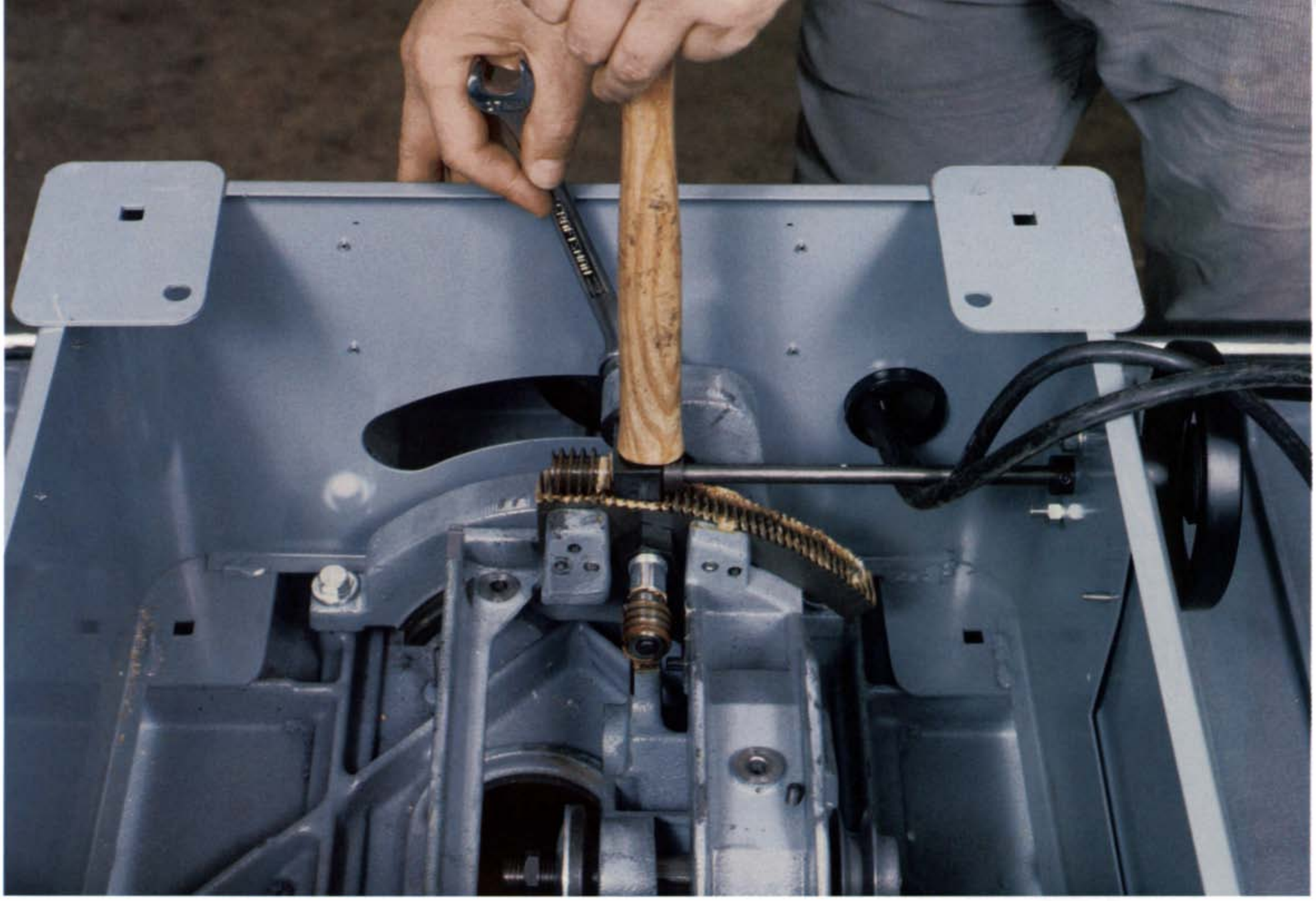
by Mark Duginske

Of all the machine tools in a woodworking shop, the tablesaw is the workhorse. But whether you own an 8-in. hobbyist's saw or a 12-in. production model, you won't get maximum accuracy and efficiency from your saw unless it's tuned up. This means that its working parts, including the trunnions, bevel stops, miter gauge and rip fence, must be properly adjusted and aligned. Safety is also a major concern; many woodworking accidents, especially those caused by kickback, can often be traced directly to poor saw setup.

Fortunately, tuning up your saw is fairly simple. It doesn't take any special tools or require either esoteric knowledge or brute strength. Even a cheap saw can be tuned to perform admirably. And the small amount of time that must be invested in a tune-up is more than repaid in workpieces that are cut accurately the *first* time. In this article, I'll show you a simple step-by-step procedure for testing and tuning up your tablesaw, including how to adjust the tilt mechanism, the miter gauge and rip fence; how to square the blade to the table; and how to align the blade parallel to the miter slots. But before we delve into the tune-up, let's get better acquainted with the different internal parts of a tablesaw.

Tablesaw anatomy—Figure 1 above illustrates the internal components of a typical tablesaw; this example is similar to saws made by Delta, Powermatic, Sears and Taiwanese manufacturers. Bolted to the underside of the saw table is the saw cradle (or carriage) and trunnion assembly. The cradle supports the saw arbor, which is basically a shaft held by either sleeve or ball bearings. The arbor has a sheave on one end for the V-belt, and the sawblade is secured by a flange and nut on the other end. There are two trunnions, one at each end of the assembly, that support and align the cradle, as well as the motor on most saws. Because the trunnions are semicircular, they make it possible for the cradle to be tilted

Drawing: Joel Katzowitz



Removing backlash between the gears of a tablesaw's tilt mechanism is crucial to eliminating the play in the cradle that supports and aligns the arbor and sawblade for accurate cuts. Here, the backlash between the worm gear and rack on a Delta 10-in. Tilting Arbor Bench Saw is taken up by using the handle of a hammer to press down on the block that supports the worm gear.

for bevel cuts. The tilt mechanism itself generally has a worm gear that engages a semicircular rack on the front trunnion; when the saw's tilt wheel is rotated, the angle of the cradle, and in turn the angle of the blade, changes. Two adjustable screw stops set the limits of trunnion travel, usually at 90°- and 45°-blade positions. Another wheel-driven system similar to the tilt mechanism pivots the arbor to raise and lower the blade.

While many of the tune-up steps I'll describe involve adjustments atop the saw table, the first step in the tune-up procedure takes place inside the saw: adjusting the trunnions and tilt mechanism. It's important that you follow the tune-up procedure in the same order as the steps are presented here because the accuracy of subsequent adjustments is often dependent on previous steps.

Adjusting the tilt mechanism–As we have seen, the trunnions and cradle are ultimately responsible for keeping the sawblade running straight and true during both square and bevel cutting. But excess play in the tilt mechanism can make the whole cradle shift, causing the blade's angle to shift during the cut. This not only decreases the accuracy of the cut, but it increases the tendency for the blade to bind or pinch, which can cause a dangerous kickback. You can detect excessive tilt-mechanism play by making trial crosscuts with the miter gauge. You have a problem if the cut is square at the beginning of each cut, but not at the end. This problem shows up even more with beveled cuts in thick stock.

There are several ways to adjust the tilt mechanism depending on the particular design of your saw. Unless your tablesaw is an industrial behemoth, you'll want to flip it upside down to make the adjustment. First, remove the motor assembly to reduce the weight of the saw, then flip it over on a low table or blocks. If you leave the motor in place, be sure to unplug the saw; you'll want to leave it unplugged for most of the tune-up. Now, grab the cradle by the motor-mounting plate and wiggle it back and forth to determine the amount of play.

The most common tilt mechanism on many Taiwanese saws and Delta and Powermatic models relies on the worm gear and rack mechanism illustrated in figure 1 on the previous page. With this design, the solidity of the cradle depends on having a close fit between the worm gear on the tilt mechanism and the rack on the front trunnion. Tightening the lock knob at the center of the tilt wheel only locks the position of the tilt mechanism–it doesn't tighten anything inside the saw. While the basic design of the tilt mechanism is shared by many saws, manufacturers provide several ways to snug up the fit between the worm and rack gear, and get rid of any play, known as backlash. On the Delta 10-in. Tilting Arbor Bench Saw, a locknut secures the position of the block that houses the worm gear shaft. By loosening the locknut and pressing down on the block, as shown in the photo above, backlash is reduced. On Powermatic's Artisan saw and on some Sears models, reducing backlash is a matter of pivoting the tilt-adjustment wheel's shaft. Loosen the two screws that hold the tilt wheel's mounting plate to the outside of the saw housing, and shift the wheel opposite the direction the worm gear moves. Once you make the adjustment, tilt the blade a couple of times to make sure the tilt mechanism operates smoothly. If it doesn't, the gears may fit too snugly, which can cause premature wear. In this case, loosen the backlash adjustment a bit.

In addition to the tilt mechanism, some tablesaws, such as the Boice-Crane and some Sears models, employ a separate tilt lock that clamps the front trunnion and the cradle together. Once the angle of the blade has been set with the tilt wheel, a spring-loaded handle on the front of the saw locks the setting. On these saws, gear mesh isn't crucial and requires no adjustment because the handle secures the cradle. But remember to use the lock whenever you change the blade angle. Also, tightening the lock can change the blade angle slightly, so recheck the blade angle after the lock is tightened. On Shopsmith saws, some Inca saws and most older saws, the table tilts instead of the blade for angle cuts. If your saw isn't based on one of the tilt systems described here, consult your saw's manual or contact the manufacturer for instructions.

You can reduce wear on the trunnions and tilt mechanism parts by lubricating the trunnions, cradle and gears. First, blow sawdust out of the gears with compressed air, and then lubricate the gears with a dry spray lubricant, which is usually based on Teflon or silicone. Be sure to lubricate the gears' hard-to-reach areas using the long applicator nozzle included with the spray can. You should avoid using machine oil or grease because they will attract sawdust, which will gum up the gears.

The saw cradle may still have play after the gear mesh has been set and/or the tilt lock has been tightened. In this case, a small clamp can be used as a homemade trunnion lock to secure the cradle to the rear trunnion, as in the top photo on pg. 73. A word of caution: *Because vibration may loosen the clamp, make sure it's impossible for the clamp to fall into the running sawblade.* After adding the clamp, you should recheck the blade angle to ensure that the locking action didn't change it.

After you've made these adjustments and are satisfied with the firmness of the cradle, you're ready to flip the saw back over and perform the remaining adjustments from atop the saw.

Squaring the blade–The next steps are to adjust the level of the saw's throat plate, square the blade and set the stops for 90° and 45°. You've probably made these adjustments on your saw in the past, but even so, do them again now because they are important prerequisites for the steps that follow.

The saw's throat plate, or table insert, should be adjusted so that it's a couple of thousandths of an inch lower than the saw table in front, and about the same amount higher than the saw table in back. This prevents the workpiece from hitting the plate before the cut or binding on the table after the cut. Throat plates on some Delta and Powermatic saws provide Allen screws for adjusting throat-plate height. On saws without screws, you may have to do some filing or use tape or cardboard shims to change the level of the plate.

The next step is to square the blade. Release the saw's tilt lock and remove the rear trunnion clamp, if you're using one, and raise the blade as high as it will go. Optionally, you can remove the throat plate so that the body of a try square will sit flat on the saw table. To check blade squareness, use a high-quality try square that's dead on 90°. My favorite is an all-steel Starrett square, available from the L.S. Starret Co., 121 Crescent St., Athol, Mass. 01331; (508) 249-3551. Place the blade of the square against the sawblade, making sure you're not on a tooth, and look for a gap between the square and blade. Fiddle with the saw's tilt adjustment until the gap of light disappears. If the blade won't tilt far enough, you may have to loosen the stop screw (see figure 1 on pg. 69). Next, secure the cradle with the trunnion lock or clamp, as previously described, and recheck the blade for squareness.

Now that the blade is square, adjust the stop for 90°. On the Delta 10-in. Tilting Arbor Bench Saw, the tilt stops are screws that are accessible through the saw top. But on most saws, you'll have to reach up under the saw to loosen the locknut and screw the stop in or out. Once again, make sure the saw is unplugged and consult your saw's manual. Ideally, the blade should reach 90° just as you start to feel resistance at the tilt wheel, which is a sign that the trunnion is hitting the stop. Never apply excess pressure to square the blade; if the blade goes past 90°, the stop should be reset. Also, don't depend on the stop to square the blade perfectly every time: For critical cuts recheck using a try square. You can follow the same procedure for setting the 45° stop, but use a plastic drafting triangle for checking the angle. Finally, realign the bevel gauge by zeroing the pointer on the front of the saw. This will make the gauge a rough yet fairly accurate indicator for quickly setting odd-angle bevel cuts.

A snug fit between the miter gauge bar and the table slot is key to making accurate crosscuts on the tablesaw. Here, the author peens the bar, which causes the metal around each indentation to expand, and increases the width of the bar for a tighter fit in the slot.

Adjusting the miter gauge–The miter gauge bar usually fits too loosely in the slot in the saw table to yield accurate crosscuts. Since it's easier to rework the bar rather than remachine the slot, the first step is to adjust the bar to fit more snugly. The best way to do this is to peen the side of the bar, as shown in the photo above, using a pin punch to make small, dimple-like indentations. The peening expands the metal around each indentation, effectively making the bar wider. Peen only on the side of the bar nearest the blade and dimple every inch or so. Stagger the dimples width wise on the bar so they won't wear a groove in the side of the slot. When you're finished, the bar should slide smoothly along the length of the slot without hanging up, and there should be a minimal amount of side-to-side play. Check the fit in the table slot you use most often; most right-handed people use the left slot for crosscutting. Unless the slots on your saw are identical, the bar probably won't fit as well in both slots. If the dimples in any one area cause the bar to stick in the slot, smooth them with a flat mill file. Use a non-silicone wax to lubricate the table slot and the bar; silicone wax may transfer to the workpiece and later cause finishing problems.

Next, use your square to set the head of the miter gauge perpendicular to its bar. Although you may be tempted to square the head to the sawblade, don't do it; that won't produce good crosscuts unless the miter slot and the blade are parallel to one another. This isn't always the case though, and we'll be checking and adjusting this alignment later in the article. After squaring the head and tightening the gauge's lock screw/handle, set the adjustment screw on the 90° stop if your miter gauge has one. Don't trust these stops for fine work though. Like the tilt stops, they're not perfectly accurate.

Aligning the blade to the miter slots–For the miter gauge to crosscut accurately, the blade has to be perfectly parallel to the

Parallelism of the sawblade with the saw table's miter slot is essential for smooth, accurate crosscuts. To test for parallelism, the author rotates the blade by pulling on the motor's V-belt, and he listens to the sound of the sawblade rubbing against a test piece, which is clamped to the miter gauge, to determine whether the slot is parallel to, closer to or farther from the slot at the back of the blade.

path the workpiece travels during the cut. This means the miter slot has to be parallel to the blade. When the blade and slot aren't parallel, the sawblade is heeling and has a tendency to recut the workpiece at the back of the blade. This double cut is not only inaccurate, but also dangerous because the back of the blade can lift the binding workpiece and kick it back.

The first step is to test the saw's alignment. Raise the blade as high as it will go and clamp a piece of wood to the miter gauge; a ¾x2x12 piece is big enough. Crosscut the test piece and unplug the saw. Now, slide the miter gauge with the test piece still clamped to it next to the front of the sawblade, and rotate the blade by hand-turning the belt or using a motor pulley. Don't grab the blade because your hand may deflect it. As you rotate, one or two teeth will rub against the wood the hardest, making the loudest sound. Mark those teeth and slide the test piece to the back of the blade (see the photo above). The same teeth that rubbed against the workpiece at the front should rub against it at the back, making the same sound. You may have to move the piece to the front and the back several times to test the sound. If the sound is the same, the table slot and the blade are in alignment and you will not have to make any adjustments. If you get a louder or softer sound at the front than at the back, the distance between the blade and the slot will have to be increased or decreased accordingly.

Realigning the blade parallel to the miter slot is fairly straightforward and involves rotating the trunnion relative to the table. Most contractors' saws have four bolts, two in front and two in back, that secure the trunnions to the underside of the table. On cabinetmakers' saws, such as the Delta Unisaw, the saw table is usually secured directly to the saw's shell or frame rather than the trunnions. In either case, the bolts must be loosened, with one of the front bolts left a bit snug to act as a pivot point for the top—the right front bolt if the top must be rotated clockwise and the left front bolt for counterclockwise. Also, the trunnion lock (if your saw has one) should be tightened and the back trunnion should be clamped, as described earlier, to keep the two trunnions in alignment during the operation.

To rotate the trunnion assembly, a wooden wedge is driven between the trunnion and the table casting at the back of the saw, as shown in the top photo on the facing page. This is the most civilized method, but if there isn't room for a wedge, you can use a pry bar or a rubber mallet to move the trunnion. If the mallet isn't effective, use a hammer. Put a piece of wood on the trunnion and pound the wood; don't hammer directly on the saw or you could crack the castings. Make a slight adjustment and slide the test piece by the blade as you did earlier. Keep rotating the trunnions until the sawblade bears against the test piece and sounds the same at the front and back. When you're satisfied, tighten the bolts, plug in the saw and make another test cut to make sure the saw isn't double cutting. It may take several attempts, but stay calm and take your time. Once the slot in the top is aligned with the blade, you should, theoretically, be able to crosscut with the miter gauge in either slot. Unfortunately, it's my experience that the slots in many saws aren't perfectly parallel to each other. For this reason, you should employ the slot you use most often to make the final test cut.

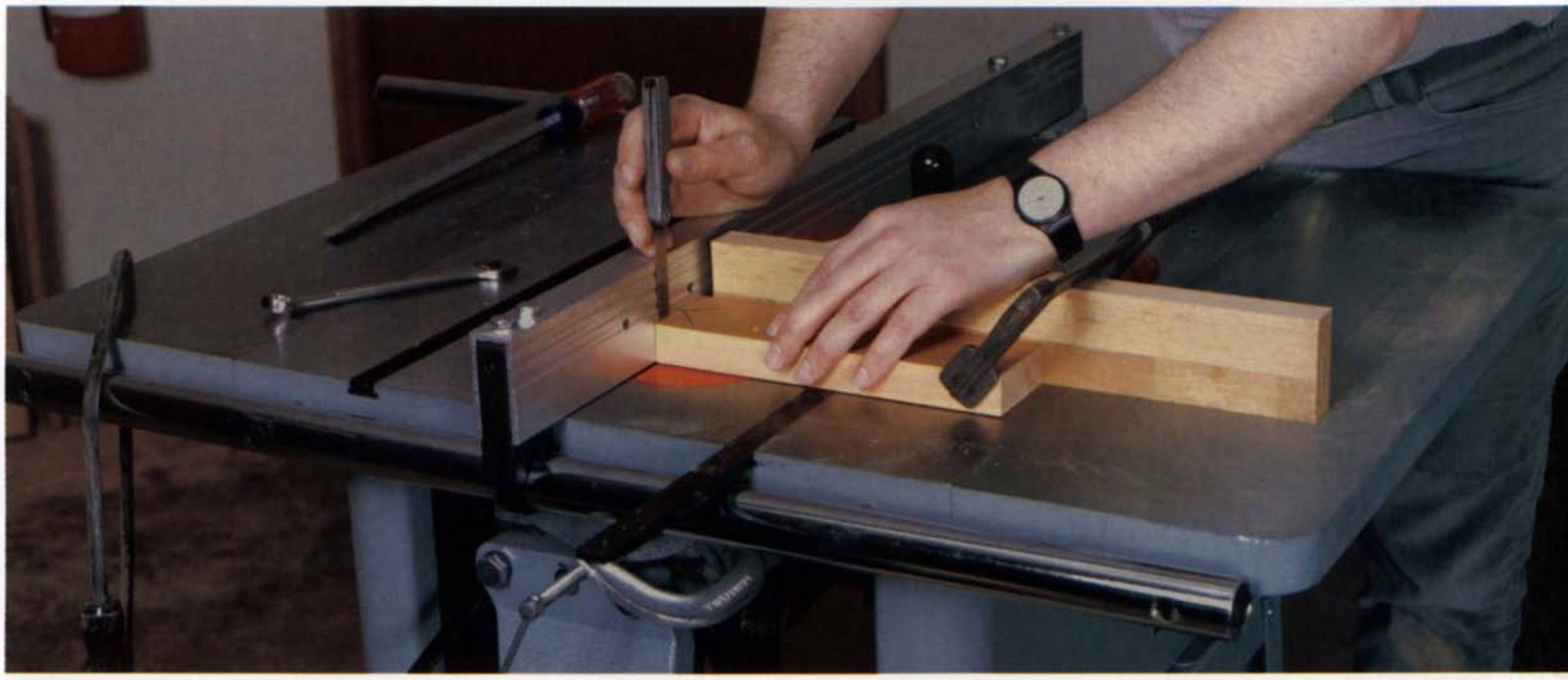
Rip fence alignment—In theory, the rip fence should be aligned so that it's perfectly parallel to the blade. But in practice, it works best if the fence is slightly farther from the back of the blade than from the front. This prevents the wood from binding between the blade and the fence if the workpiece warps as it's being ripped.

By lowering the sawblade below the table, you can use the same test piece used for crosscut alignment to set the rip fence. After loosening the bolts that lock your fence's angle relative to the guide rail, set the miter gauge with the test piece at the front of the saw and lock the rip fence against it. Then, slide the test piece until it's over the back of the saw's throat plate. There should be about 0.015 in. (about 1/64 in.) clearance between the test piece and the fence. To gauge the amount of clearance, use a feeler gauge, as shown in the middle photo on the facing page, or a dollar bill folded over twice. Finally, tighten the fence's bolts and make a test cut.

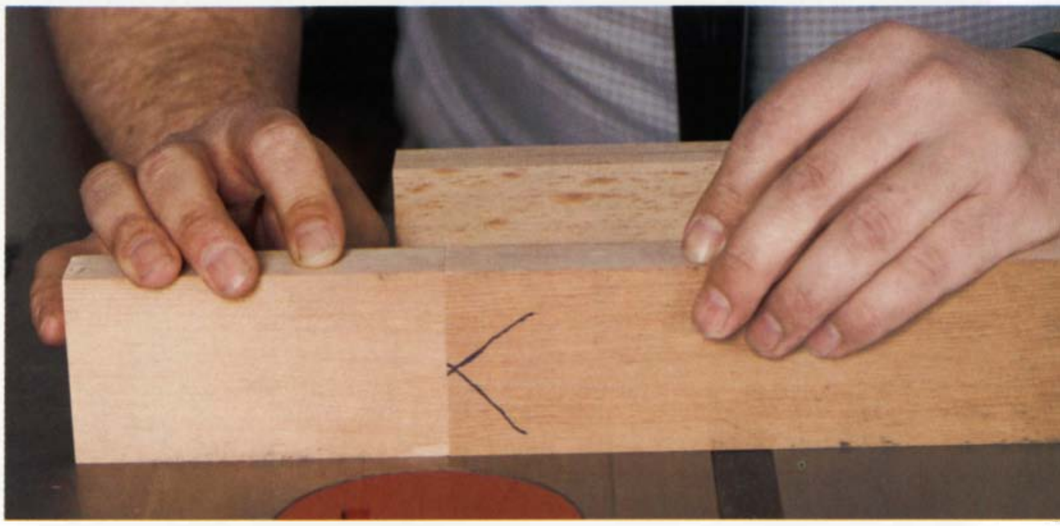
Feedback from the workpiece—Once you've tuned up your tablesaw, it's worthwhile to get into the habit of checking its accuracy often, especially if you have an important job that requires great precision or if the saw has been moved. This accuracy check takes only a few minutes and a single cut on a scrap of wood. Just clamp a test piece, like the one used to check blade-to-slot alignment earlier, to the miter gauge and cut it in half. Unclamp the piece, put the two halves back together the way they were before the cut and mark both with an X through the saw cut. Now, flip one piece so that the X faces the opposite direction and match the two pieces back together, as shown in the bottom photo on the facing page. With the pieces either on edge or lying flat, the saw cut should match as well as it did before one piece was reversed. Any error that is present will be doubled and a glance at the test piece will show you which adjustments are still good and which must be redone. For instance, if the test cut is off with the pieces lying flat, only the squareness of the blade to the table is off and needs adjustment. The test piece also shows the direction in which you'll need to make corrections, as well as how much of an adjustment is needed. □

Mark Duginske is a woodworker and author in Wausau, Wis. His new book, Bandsaw Handbook, *is available from Sterling Publishing Co. Inc., 2 Park Ave., New York, N.Y. 10016; (212) 532-7160.*

To realign the table's miter slot with the blade, Duginske hammers on a wooden wedge set between the rear trunnion and the flanges cast in the underside of the saw table. The wedging gently rotates the trunnion. A small C-clamp is applied to the saw's rear trunnion, which keeps the trunnion and cradle in the same relationship as the assembly is rotated.



The author uses a 0.015-in. feeler gauge to set the rip fence at the back of the throat plate slightly farther from the blade than it is at the front of the throat plate. This prevents the workpiece from binding and kicking back if it warps as it's being ripped.



Cutting and examining a test piece is an easy way to check the squareness of your saw cuts, both miter and bevel, and to tell when it's time to do another saw tune-up. By reversing the halves of the test piece set on edge and seeing how well the cuts match, the author confirms that his saw is crosscutting exactly at 90°.

Building a mahogany breakfront like the one in the photo at left is a big job for most small shops. But Doug Schroeder, left, along with Jon Schmalenberger and one other helper, invested nearly 3,000 hours to build four of them in Schroeder's shop. The slender dovetail pins and impeccably detailed fronts for the 40 drawers (above) were accomplished with the aid of some low-tech production methods.

Handling Large Commissions

Overcoming the limitations of a small shop

by Douglas Schroeder

Sometimes the small-shop operator shies away from that big job because it seems to be too much of a good thing. But with careful attention to details and a prudent awareness of the pitfalls, you can turn that major commission into the boost that will raise your work to a whole new level.

In January, 1986, I was one of four staff conservators at the Society for the Preservation of New England Antiquities (SPNEA). Three days a week I worked on some of the finest 17th- and 18th-century furniture at the SPNEA Furniture Conservation Center near Boston, Mass. The rest of the week I struggled with my own start-up business designing and building custom furniture and kitchen cabinets and doing odd repair jobs. One day, the head conservator, Robert Mussey, asked me if I would be interested in building some bookcases in my shop for one of SPNEA's private clients. Because I had a sizable opening in my schedule, I looked into the job.

The bookcases turned out to be four matching mahogany breakfronts, one of which is shown in the photos above. Each of the four breakfronts is 9 ft. wide, 8 ft. 8 in. tall and 20 in. deep. They were designed by one of the nation's premier architects, Robert A. M. Stern of New York, N.Y., specifically for one room of a 20,000-sq.-ft. Stern-designed home being built in eastern Massachusetts.

I was familiar with Robert Stern and the quality of his work primarily through his PBS television series, *Pride of Place: Building the American Dream*. But the opportunity to build furniture of uncompromised quality was on a collision course with my inadequate shop space and meager tooling. Ever the optimist, my fears of economic ruin, starvation, debtor's prison or worse were scattered before the hurricane-force winds of "the job of a lifetime." With Robert Mussey's offer of an open-ended leave of absence, I bid on the project and got it.

The job of a lifetime or a lifetime job?—From the day I started this project to the last, sweaty, 13-hour day nearly 18 months later,

Photos this page: J. David Bohl, SPNEA

the horizon always seemed mountainous. I am still amazed at what my two helpers and I accomplished.

We milled, joined and sanded 2,600 bd. ft. of lumber to make:

- 24 separate dovetailed cases,
- 32 frame-and-panel backs, half mahogany and half poplar,
- 16 upper-case doors with 15 lights each,
- 320 separate pieces of upper-case door muntin and mullion stock,
- 40 drawers, dovetailed front and back with solid wood bottoms,
- 72 shelves with beaded edges,
- 144 mahogany horizontal shelf supports,
- 64 mahogany vertical shelf standards with bird's-mouth notches.

On top of that, there were:

- 1,384 ft. of moldings to set up, run and sand twice,
- 240 panes of glass to be installed and glazed,
- 192 mortises for hinges and locks,
- 64 brass key escutcheons to be individually fit,
- 6 coats of oil-varnish finish wiped on and wiped off.

We put in a total of 2,746 hours. The total labor charge was $63,600 and the total materials charge was $10,400.

The sheer volume of work was often very demoralizing. There were sustaining moments along the way whenever one particular phase of the project was completed, but the day when the four completed breakfronts could be set up in my shop as they would stand in the house always seemed a long way off. However, the wait for that moment was worth it, and if given the opportunity, I would do it all again. Here then are some thoughts on the process, the problems and the solutions encountered along the way.

The estimate—Before I could be considered for the job, I met with architect Edward R. Mudd who was supervising the construction of both the house and its interior furnishings. The purpose of the meeting was twofold: For me to become familiar with the specifications of the job and the expectations of the clients; and for the architects to evaluate my qualifications for meeting those expectations.

The scale drawings indicated that the clients not only wanted the breakfronts in the style of the late-18th-century Georgian period, but they also wanted them built using period construction techniques and tools. This discussion necessitated my first sales pitch. Building these cabinets was going to be time-consuming enough *with* the aid of power tools; using only hand tools would make the price of the job astronomical. Besides, I believe that 18th-century craftsmen would not have hesitated to use power tools had they been available. In support of this assertion, I gave a brief demonstration to show how much more quickly a jointer and thickness planer could dimension rough stock as opposed to a handplane. Then, to assuage any doubts about my devotion to traditional woodworking practices, I also demonstrated how cleanly and efficiently a handplane and cabinet scraper could prepare surfaces for a final finish, relative to a thickness planer, belt sander or pad sander. The economic implications of a totally handmade piece versus a combination of modern horsepower and hand-tool finesse were obvious. In addition, I explained that many period construction techniques (especially cross-grain construction) fail the test of seasonal temperature and humidity changes. As a staff conservator with SPNEA, the experience of literally taking apart (when necessary), repairing and conserving some of New England's finest period furniture taught me traditional construction from the inside out, including its failings.

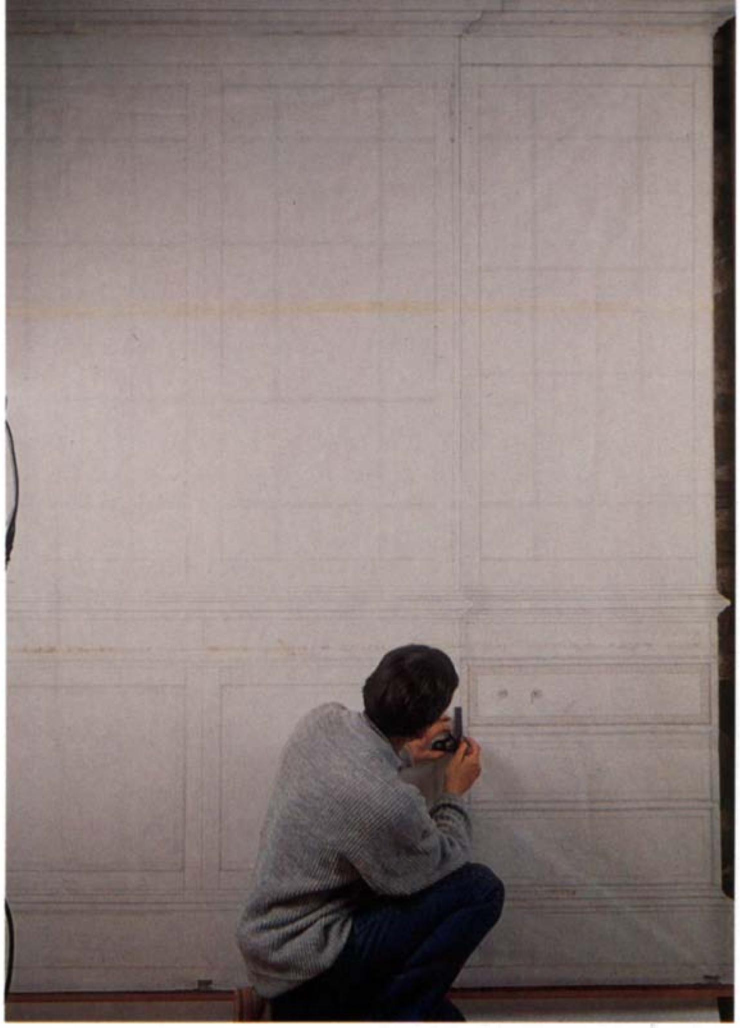
At the end of this meeting, it was clear that the historical period, dimensions, proportions and styling of the breakfronts were already established. But there were myriad other details that still needed to be worked out, such as molding profiles, drawer and door decoration (crossbanding and cock bead, for example) and choice of hardware, as well as the engineering of the actual construction of the breakfronts. With these considerations in mind, I was invited to submit an estimate for approval.

Because of the unknowns, I prepared a "range" estimate, from a very plain, stripped-down model to the top-of-the-line model with all the extras. After a lot of figuring and head-scratching, I finally arrived at a range of $12,000 to $15,000 as the cost in labor and materials to build *one* breakfront. Normally I would add a margin of profit to the estimated cost to arrive at my final estimate, but I didn't do that. I assumed that by building four identical breakfronts simultaneously, I would gain a rate of efficiency over the entire project roughly equal to what I wanted for a profit margin. Yes, very sound reasoning if one is building hundreds of wooden widgets; somewhat sound reasoning even if one is building only four wooden widgets; but very poor reasoning when one is building four huge, highly detailed, structurally complex and labor-intensive period reproductions. The extensive amount of handwork required to produce these four breakfronts more than negated the advantage I'd expected to gain through the principles of building multiples. It's important to remember that the first time you build any piece of furniture, you're making a prototype; production doesn't begin until after the prototype is built and the construction and processes are evaluated. On top of that, the logistical nightmare of having four large pieces in my shop for 18 months and having to move, stack, work under, around, between and through them was something I didn't foresee. The amount of time spent just moving parts around was enormous. To my credit, I did have the sense to avoid some potential problems. I let the architects take care of hiring professional movers to transport these behemoths from my shop to their new home. And I also charged separately and on a time-and-materials basis for installation.

It was quite apparent that I needed to enlarge my 800-sq.-ft. shop so I would have room to set up the cabinets as they took shape. I also needed to buy a good thickness planer, drill press and jointer. I figured I'd need some extra carbide sawblades and an extra set of knives for both the jointer and the planer to avoid downtime while items were out for sharpening. Of course, I didn't figure the cost of the shop expansion or the major tools directly into the estimate since their service to me would obviously extend far beyond the duration of this one job. However, one advantage of a large job is the excuse and opportunity to add tools to your shop. Because this was a big investment for me, I wrote into my estimate a system for receiving partial payments based on regular inspection periods, along with a sizable down payment upon acceptance of my estimate. In hindsight, it would have been prudent to add in a factor to cover the time involved in setting up and taking down the breakfronts for the purpose of these inspections.

My high-end estimate got me the job, covered wages and expenses and provided a steady income for 18 months. However, there was no real profit because I really didn't take the dark side of building multiples seriously enough. Small mistakes become large mistakes; large mistakes go off the scale.

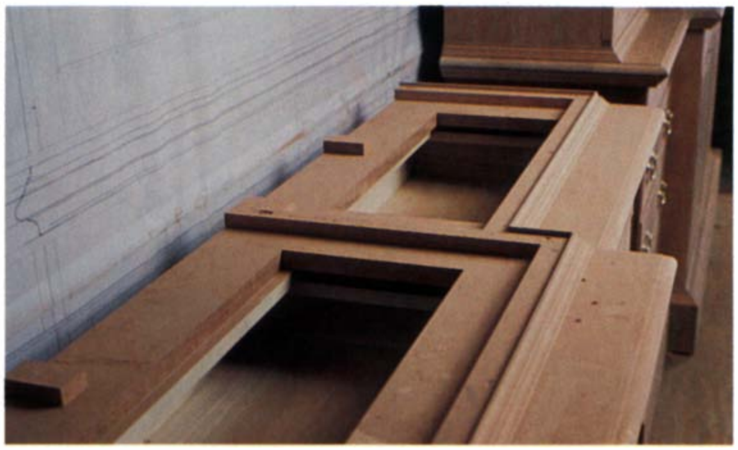
Help!—Upon receiving word that I'd been awarded the job, I immediately began expanding my shop by building an 11-ft. by 20-ft. addition, a space roughly equal to the size of the room for which the cabinets were designed. Because my shop is contained in one section of a large barn, I was able to add the extra square footage within the already-covered space in the barn. So I now had the job and the space. But this was more of a job than



Above: The author worked out all the details, including molding profiles, on a full-scale drawing for approval by the architect and clients to ensure there would be no surprises at the end of the job.

Below: The waist assembly frame, shown sitting atop the lower cabinets, is glued up with the endgrain continuous across its ends. To allow for the frame's expansion and contraction, the upper-case retainer molding is attached at the back with screws through slots.

Photo: Paul Bertorelli



I could handle alone, either physically or emotionally; I needed help, and very good help at that.

I was extremely fortunate to find the two people I hired. As a graduate of the North Bennett Street School in Boston, Mass., Jon Schmalenberger was well trained in period furniture construction. The combination of this training and the first-hand, practical experience gained by running his own business made him the ideal candidate for this job. He agreed to temporarily put aside his own shop activities and commit himself fully to 10 months of very intense work. Jon needed virtually no supervision, and he single-handedly did all the milling, gluing up, dimensioning and carcase dovetailing for the breakfronts.

My other assistant, Kirsten Mong, worked for a luthier and had built her own guitar. Although her furniture-making experience was limited, the work she had done showed great skill and attention to detail. Most of the jobs requiring patience and stamina fell to Kirsten throughout the five months she worked on the breakfronts. She planed, scraped, sanded and resanded miles of mahogany and yellow poplar, and she fine-tuned the surfaces and joints, a step necessary to create a beautiful piece of furniture.

Plan of attack–Good communication with the architect and the client was vitally important. To ensure the customers would be satisfied, I began a full-scale drawing on drafting vellum pinned to a wall, shown in the top photo at left. With this medium for creating and exchanging ideas, together with ¼-scale working drawings, models of some components and various types of displays, all the details were worked out in advance and approved by all parties. This process, although very time-consuming, was invaluable in avoiding ugly surprises at the end of the project.

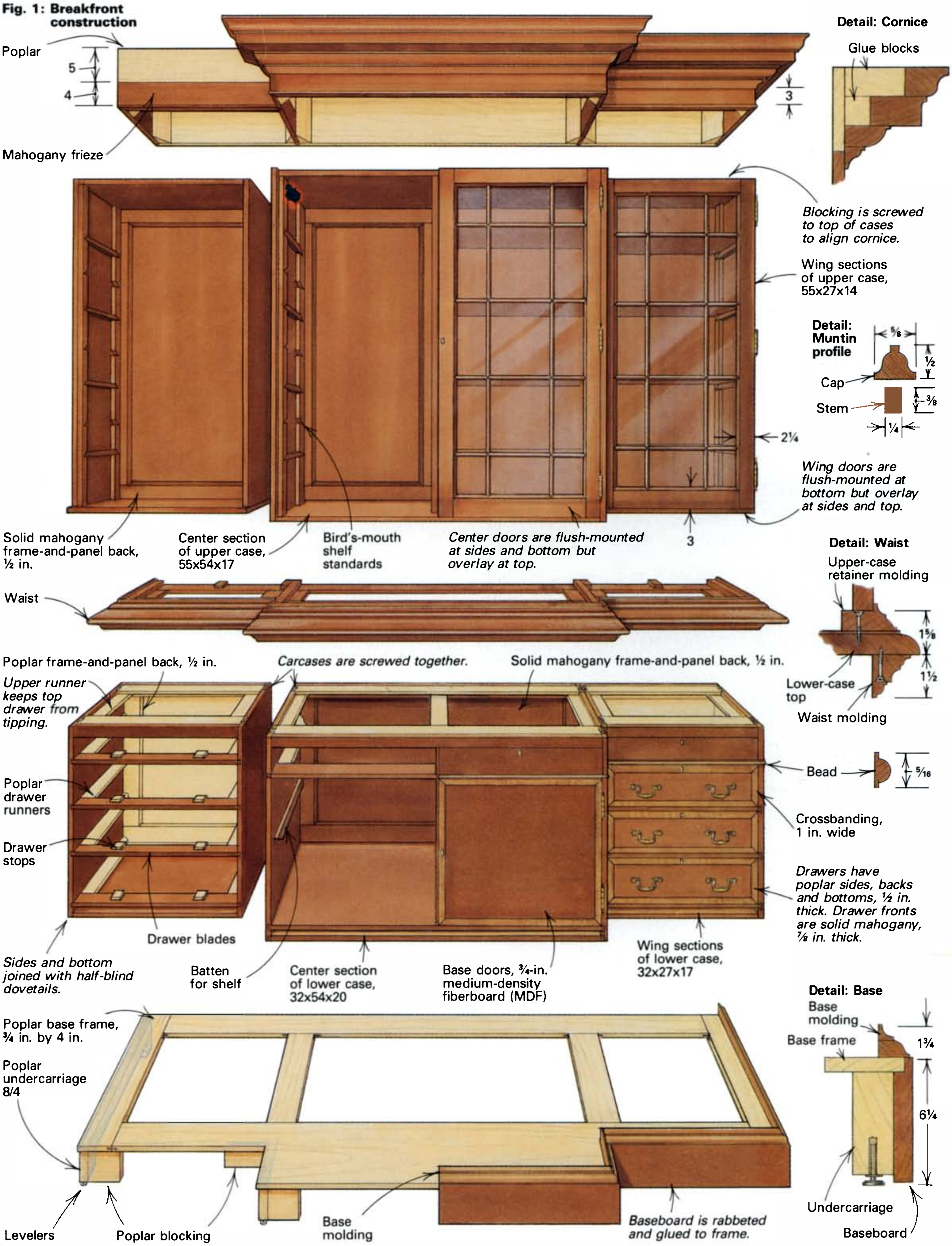
Figure 1 on the facing page shows how the pieces were constructed. Each breakfront consists of six separate dovetailed carcases and a separate base, waist and cornice section. This makes it possible to disassemble these huge pieces for moving them through doorways, around corners and up flights of stairs. Each base section is equipped with eight, heavy-duty leveling guides so it can be put in position and leveled. After leveling the base, the three lower cases are set in place. They fit inside the base molding and are joined with screws inserted from inside the two drawer cases.

As you can see in the bottom photo at left, the ends of the mahogany frame of the waist assembly are edge-glued to the front and back members so the endgrain shows, giving the appearance of a solid top. Because the waist molding and the upper-case retainer molding run cross-grain to the frame along the case's sides (including where the sides of the center cabinet section protrude forward), the molding couldn't be glued down without restricting the frame's expansion and contraction: an accident waiting to happen. Instead, the front 3 in. are glued and screwed to the frame while the rear ends of the moldings are held snugly with screws in slots, as shown in the bottom photo. The moldings along the front edge of the frame can be glued and screwed to the frame because the grain orientation of all the pieces is the same. The completed waist assembly then just drops onto the lower-case assembly, and the upper cases are set on top of the waist and screwed together side to side.

The cornice is actually made up of two architectural elements: the 3-in.-high frieze and the cornice or pediment. The frieze board is glued up from mahogany and poplar and assembled to make a mitered frame that fits perfectly on the upper cases. Then, moldings are glued and screwed to the poplar portion of the frame to create the massive cornice. Like the base and waist assemblies, the completed cornice simply drops into place. Perhaps I use the word simply a little too freely. Getting the cornice into place requires considerable muscle power, two stepladders and two fools perched on those parts of the stepladders that warn: *not a step*. The cornice is held in position by locater blocks glued to the top of the upper case and secured with screws through a cleat glued to each end of the cornice.

Construction details–The first step in building any piece of furniture should be careful wood selection. Figure and grain are as important as any other design element, and they often make the difference between a good piece and a great piece. With four matching pieces in the same room, judicious wood selection takes on an entirely new dimension. As an image of the four breakfronts formed in my mind, I began to know where I wanted a highly

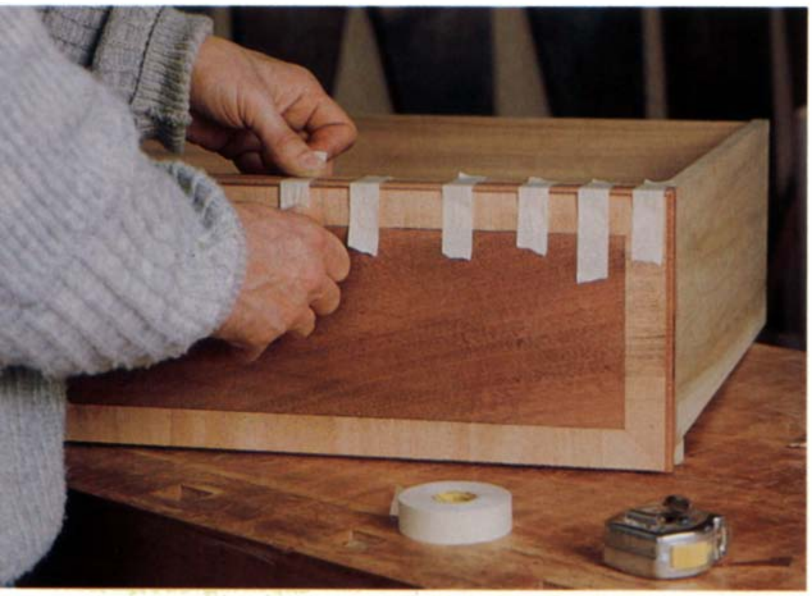
Fig. 1: Breakfront construction



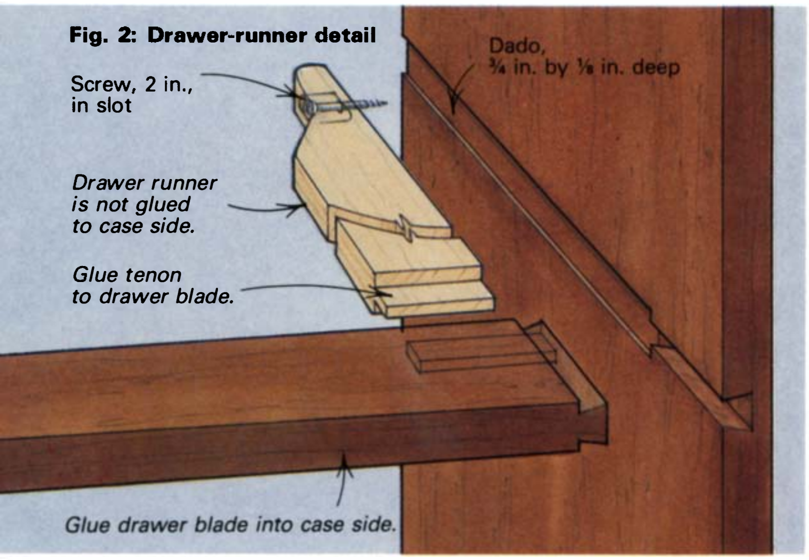
Drawings: Kathleen Creston

figured board to provide a focal point, where I wanted a pale, straight-grain board to provide a static field and how the eye should travel across the whole piece. The challenge was previewing the nearly 2,000 bd. ft. of rough-cut Honduras mahogany I had in my shop and barn. After a few frustrating attempts with a handplane, I realized that one lifetime would not be enough; I needed an alternate method. In an especially illuminated moment, I ran down to the local hardware store and bought a small Skil portable power-planer for $29.99. With it I was able to preview mahogany planks, 16 ft. long by 30 in. wide, in a matter of minutes.

After all the boards were marked for their intended use, they were crosscut, ripped, milled and, where necessary, glued up to make the parts for the four breakfronts. Figure 2 below shows how we avoided one of the most typical problems of period furniture: case sides that have split because the drawer runners were glued and/or nailed cross-grain to the wide panels. On our cabinets, the drawer runners are fitted, but not glued, into ⅛-in.-deep dadoes in the case sides. The front end of each runner is tenoned and glued into a ¼-in.- by 1-in.-deep mortise in the back edge of the drawer blade (horizontal dividers between drawers). The back end of the drawer runner is screwed to the case through a slotted hole to allow for expansion or contraction of the case side. An S-curve bandsawn on the runner reduces the width of the piece so I can use a 2-in. screw rather than a 4-in. screw to secure it to the case side.



Clamping the cock bead with masking tape, while gluing it to the doors and drawer fronts, eliminates the need for clamps and cauls.



Perhaps the greatest challenge in creative jigging was producing dovetails for 40 drawers in four different sizes using slender, fine pins typical of the 18th century. Fortunately, Robert Mussey had told me about a shopmade dovetailing jig devised by Mario Genevesse, a master cabinetmaker in Natick, Mass. The jig lets you quickly rout out the sockets for either half-blind or through dovetails, thereby creating the pins. Even though the tails are then sawn and chiseled out as in normal hand-cut dovetails, a great deal of time is saved in laying out and executing the pins. For details on making this jig, see my article in *FWW* #68, p. 56.

Of the 40 drawers, 24 have cock bead and crossbanding. The other 16 are the top-most drawers, and they're left unadorned to make up the lower-case frieze. We didn't come up with any shortcuts for applying the crossbanding to the drawer fronts. A shallow rabbet was machined in the solid-mahogany drawer fronts and the veneer was mitered and glued in place, strip by strip, using cam clamps and cauls. However, we found that clamping with masking tape, a trick I'd used in small-scale repair work, worked beautifully for applying the cock bead (see photo at left). Once I learned how to maneuver the tape to vary the pressure, I had no trouble gluing in the bead, quickly and evenly. Not having to wrestle with clamps and cauls was well worth the cost of a few rolls of masking tape.

The lower-case doors provided another arena for creative woodworking. We chose to use mahogany-veneered medium-density fiberboard (MDF) for the door panels because it's considerably more stable than plywood or hardwood. However, because the edges are weak and they can't hold hinge screws, it was necessary to edge the doors in solid mahogany. Knowing how time-consuming it had been to cross-band the solid drawer fronts, we looked for a way to save time. We planed and ripped the solid edge stock to size and then glued the crossbanding to it. It wasn't necessary for the veneer to fit perfectly. Therefore, we cut it so we could hold it in about ¹⁄₁₆ in. from each side of the edge stock. As we machined the veneered edging stock, first for the tongue to mate with the groove in the edges of the MDF door blanks, and then for the cock bead rabbet, these cuts simultaneously trimmed the crossbanding. Then, all we had to do was miter the crossbanded edging stock and glue it to the door panels.

When it came time to think about building the 16 upper-case doors, I immediately realized that I needed an alternative to the labor-intensive, traditional, hand-coped muntin detail. The obvious alternative of using cope-and-pattern shaper cutters didn't seem like the solution, considering the fine and fragile muntin profile I wanted and the limited machinery I had. So necessity once more reared her motherly head. A cutaway section of muntin stock looks like a mushroom with a long stem. It's easy to imagine it as a two-part affair: The stem or rabbeted part that actually divides the panes of glass is one part, while the top or molded cap becomes the second part. We used this two-part construction to our advantage.

After the door stiles and rails were mortised and tenoned and the rabbet was cut for the glass, the ogee detail was run on these parts and mitered at the corners, as shown in the top photo on the facing page. The mortises for the muntin stems and the V-miters for the muntin caps were laid out and cut into the ogee molding on the door frame. I then assembled the door frame with the horizontal and vertical stems half-lapped and glued to each other at their junctures and tenoned and glued into the door frame. The half-lap joints of the stems were installed so the horizontals (mullions) ran through on the outside face. To complete the doors, the muntins and mullions needed the double ogee molding detail, or cap as I call it. I ran the vertical cap pieces (muntins) full length so they overlapped and strengthened the stem's lap joints. I carefully fit the ends of the muntin caps into the V-miters on the door rails and then marked the locations where the V-miters intersected the mullion caps. Then, I removed the muntins, sawed the V-miters into them and glued them back in place. All of the horizontal cap pieces were then cut slightly long and individually mitered and glued to the stem frame, as shown in the bottom photo at right. I mitered all the ends with my Lion Miter-Trimmer, which is available from Pootatuck Corp., Box 24, Windsor, Vt. 05089; (802) 674-5984, and a number of mail-order houses. All the V-mitering was done on my tablesaw with a miter gauge and a simple system of stops, often running as many as four parts at once. Making muntins using this two-part process may sound difficult, but it is easier, quicker and stronger than traditional methods if you mark accurately and take care in making your setups. Mac Campbell describes a similar method in *FWW* #72, p. 48.

Lessons learned—As I mentioned earlier, there was no real profit margin in this job. The additional $27,000 in work that I've done for the same clients has helped considerably to soothe the sting; and perhaps the lessons that I've learned have compensated for the lack of profit. But, of course, this logic is only valid if I don't make the same mistakes twice. Aside from being overly optimistic about the economic advantages of building four identical pieces, unforeseen details probably caused me the most trouble.

One of the details that hurt me the most, glazing the upper-case doors (a period detail), was the only work I planned to subcontract. I based my estimate on the very rough estimate I got from a local glazier. When the doors were built and finished, I took four of them down to the glazier for a trial run. The completed work would have looked bad in the top floor of a 10-story building viewed from the back seat of a speeding taxi cab in a heavy fog. The hours it took to clean the brown-putty fingerprints and gobs of silicone from both sides of 60 panes of glass (not to mention from my million-dollar oil-varnish finish) convinced me to glaze the remaining 12 doors myself. Even without the cleanup time, the original estimate came up short and cost us some money.

When I submitted my estimate, there were still many unknowns about the job. One was the cost of the shaper cutters I'd need to cut the molding profiles that I was working out with the architect. Unfortunately, I didn't delve deeply enough into this aspect before submitting my estimate, and so I was surprised to find that I was unable to use *any* off-the-shelf cutters. I had to have them all custom-made, which added a few hundred dollars to the cost of the job. Making assumptions like this during the estimating stage, especially on large projects, is asking for trouble.

Finish-sanding was another area I underestimated. I had more than ¼ mile of moldings and who knows how many acres of case surface area to sand, dampen and sand again. I just didn't allow enough time.

Although making multiples didn't work out the way I hoped it would, in any large job there are repetitive machining operations that you can treat as "production" runs. Here are some ideas that can help your repetitive operations go smoothly. Pay attention to accuracy; the smallest error can multiply to create a cumulative error factor that can put you out of business. Double-check your setups often as you work; it's much easier than redoing a whole run because something moved after the first pass. Make up plenty of extra stock before you start the operation; anything can go wrong from a slip on the saw to a flaw in the wood, and besides, you'll need spare parts to test succeeding setups. Finally, don't skimp when making jigs and fixtures; if you make them accurately and to last, you'll probably use them again.

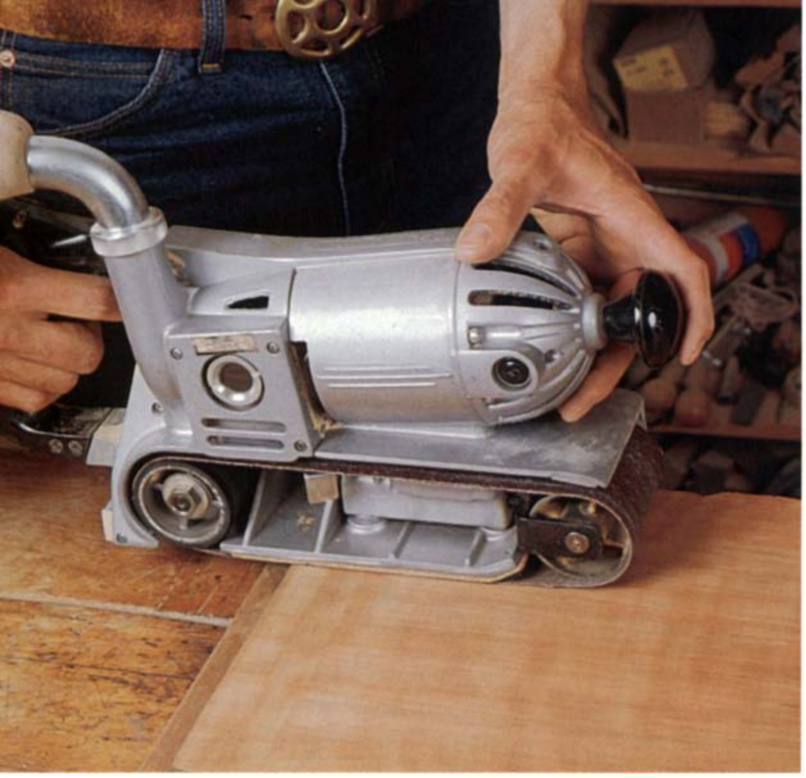
Photos below: Paul Bertorelli

The photo above shows the detailing and joinery for the upper door frames. The muntins and mullions are assembled in two parts (see photo below). The "stems" are crosslapped and mortised into the door frame, and the molded "caps" are glued to the stems after being notched where they intersect.

Documentation and photography—Part of growing and prospering as a woodworker is learning the importance of documenting your work. Throughout the course of this project, I kept a comprehensive file of literally every bit of information that passed through my hands: all my scale drawings, sketches, molding profiles (some of which were taken from tracings I had previously made from period pieces), lists of sources and copies of written communications with the architect and client. It was a pain to keep up with it all, but this information will always be useful in future work.

It's also very helpful to have photographic documentation of the job through each phase of its construction. Take these photos yourself from time to time as work progresses to record joinery details and unusual jigs or setups. Sometimes a finished piece warrants professional photography, and sometimes it doesn't; quite often you can get by on your own. Inexpensive cameras, tripods and lighting equipment will do, but there's really no substitute for photo background paper, which is sold at most photo-supply stores in rolls of various widths. A bright, unbroken background dramatically sets off a piece of furniture, and a great photograph will help make that big job continue to pay off in the future by testifying to the quality of your work and the seriousness of your endeavors. □

Douglas Schroeder builds custom furniture and reproductions and does restoration work in Hudson, Mass.



To avoid gouging the wood, the author keeps the sander's platen flat on the board at the beginning and end of each stroke. He guides the sander, but lets the machine's weight provide the sanding pressure.

Flat or curved edges can be smoothed with a belt sander. Here, Becksvoort sands a table's edge and frequently checks the edge with a try square to make sure it remains square with the top.

Using a Portable Belt Sander

An abrasive approach to flat surfaces and smooth curves

by C.H. Becksvoort

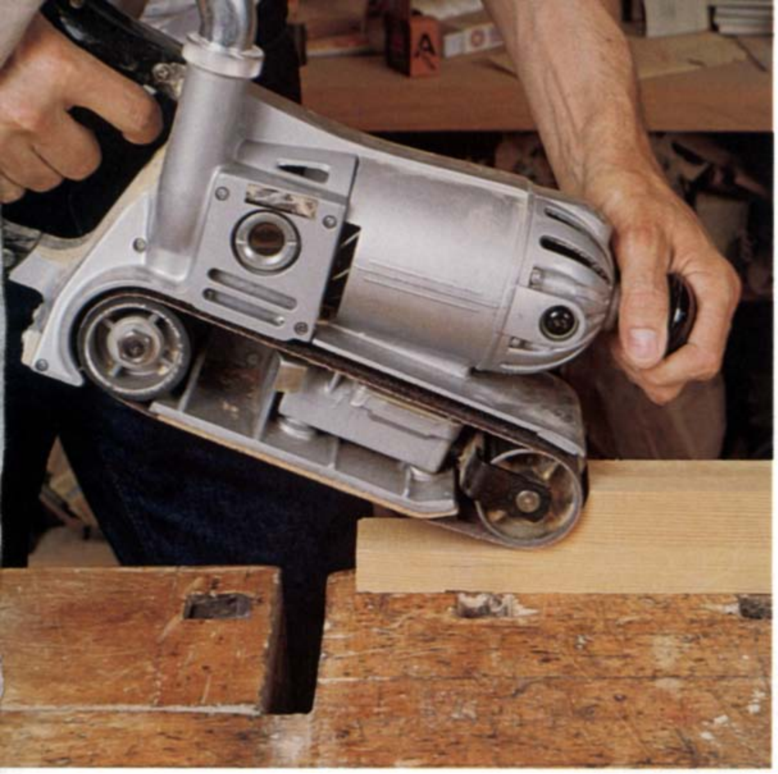
The portable belt sander is a real workhorse in my shop. It grinds down humps and bumps, levels large surfaces in a fraction of the time it would take to plane and scrape them, and it smooths even highly figured woods like bird's-eye maple. It's a versatile tool for everything from removing paint to shaping cabriole legs. But a belt sander can also be a recalcitrant tool and difficult to live with. At its worst, it refuses to track correctly, and it gouges the wood, sputters and coughs while spewing clouds of fine dust. Over the years, I've come to terms with the tool and in this article, I'll show you how to handle the most common sanding problems and get good performance from your machine.

Belt-sander anatomy–All portable belt sanders work pretty much in the same way. The sander's motor powers the rear drive roller through a gear reduction drive. Most sanders are belt driven, but the better, heavy-duty sanders are chain driven. The front roller, which rotates freely, is spring-loaded to tension the sanding belt. A lever releases the tension whenever the belt must be installed or removed. Turning an adjustment knob swivels the curved front roller slightly and coaxes the belt to track correctly and ride dead center on the rollers. A rigid platen between the two rollers provides a flat sanding area. The belt itself is backed by a replaceable steel wear plate that rests on a cork cushion that is attached to the platen. Sacrificial steel or ceramic strike bars prevent the edge of the rotating belt from damaging the sander's housing.

Using the belt sander–A belt sander is a relatively safe machine, but there are a few common-sense precautions that you should observe while operating one. Belt sanders typically weigh from 8 lbs. to 15 lbs. and most require two hands to operate safely. Although a dust bag is a valuable accessory, it won't pick up all of the dust, so wearing a mask is a must. Always wear safety glasses. Most belt sanders are noisy and high pitched; if you expect a lengthy session, it's also a good idea to use ear protection.

Before beginning to sand, unplug the machine and clean the dust intake chute of any clogged dust and chips. Then, make sure the belt is installed properly. The arrows on the belt's cloth or paper backing should point in the direction of roller rotation. This ensures that the belt's bonded seam won't catch on the work and tear the belt. After you adjust the belt to track correctly, you're ready to sand.

Sanding belts are available in grit sizes from 36 through 180, but I only use 80- through 150-grit for sanding hardwood furniture. The coarse grits, from 36 to 60, are for removing paint, gross leveling and sculpting. Because grits above 150 tend to burn the wood,



It takes practice to handle a belt sander with enough precision to smooth small-radius, curved surfaces with the front roller, as Becksvoort is doing here.

I use an orbital sander or I hand-sand with finer grits for final smoothing. I'm partial to cloth belts, even though they are more expensive than paper, because they wear longer and tear less. I've also found that alumina oxide abrasive will out-last garnet, which sands aggressively but fractures easily and wears out rapidly. Deciding when to change belts is a trade-off between the cost of a new belt and the additional time required to sand with a well-worn belt. My rule of thumb is to change the belt when its surface feels like the next higher grit. I don't throw the used belts away; they're great for hand-sanding on the lathe. If you are working with a glued-up piece, it's important to scrape off residual glue that could gum up and ruin the sanding belt.

As with hand tools, the best way to develop skill and competence with a belt sander is to practice. With time, you'll develop confidence in the tool and discover that it is a real time-saver for a wide variety of sanding tasks. But don't start off by practicing on furniture; instead, use scrapwood. Here are some techniques to practice for smoothing large, flat panels and narrow frames, leveling irregular surfaces and shaping curved surfaces.

Smoothing panels–To smooth large, flat surfaces, it's necessary to keep the sander level, move the machine at a uniform speed and apply uniform pressure. As with most sanding operations, you should avoid sanding across the grain.

Be sure the workpiece is firmly anchored on a flat, horizontal surface, and positioned at a comfortable height. I usually secure the piece to my bench with the end vise and dogs, but alternative clamping schemes could be developed for each job. Next, place the sander flat on the panel and sand along one edge, parallel with the grain. The weight of the belt sander alone provides sufficient sanding pressure, so it isn't necessary to bear down. Besides, applying pressure is tiring and makes it difficult to maintain the consistency necessary to produce a uniformly sanded surface. It's more important to concentrate on guiding the sander in long strokes at a constant speed. I drape the sander's electrical cord over my shoulder to keep it out of the way as I move with the sander along the full length of the workpiece. I let the sander run no more than half its length over the end of the work; keeping at least one half of the platen flat on the stock, as shown in the left photo on the facing page, helps prevent gouges in the wood. Then, I pull the sander back in the opposite direction, overlapping the previous pass by one half of the width of the sanding belt. The process is repeated until the surface is completely sanded. If the surface is free of U-shape tracks at each end of the workpiece, you probably have the hang of it. Avoid any tendency to move the sander more slowly at the ends of the workpiece or you'll risk gouging or beveling the surface.

Leveling surfaces–The belt sander also can be used like a jack plane to remove bumps and high spots and to level a surface. My procedure is fairly simple. I start by holding a straight edge at one end of the board so it's perpendicular to the grain. Then, I put a pencil mark wherever the straight edge touches the wood's surface. I repeat this procedure every 2 in. along the full length of the board. The sander is used in the same way as described for smoothing surfaces, except that I concentrate on removing the high spots indicated by the pencil marks. To blend smoothly, I allow the sander to overlap a short distance into the adjacent "valleys." The whole process is then repeated, usually three or four times, until the board's surface is perfectly flat.

Edges and frames–Once you've gotten the hang of handling a belt sander and mastered the technique of smoothing large, flat surfaces, you're ready to tackle edge sanding. Like jointing an edge with a plane, the trick is to keep the sander stable on the center of the edge and to sand along the full length of the board. One thing that makes a sander different from a plane is that the sander continues to remove material on the backstroke, so be careful as you pull the sander back. Check the edge with a try square frequently to make sure the sander has not tilted up or down. It's important to keep the sander level and maintain that position as you sand. Even a curved edge, like the one shown in the right photo on the facing page, can be sanded this way.

Belt sanders are also useful for smoothing frame-and-panel doors. The panels, whether flat or raised, are most easily sanded before they are assembled into the frames. The frames also require special treatment because the grain directions of the stiles and rails run perpendicular to each other. I sand the rails first, but I'm careful to let the sander travel across the joint onto the stile only enough to flatten the joint. After the rails have been smoothed, the stiles can be sanded. It's important that the belt is tracking to the extreme edge of the platen: In this way, I can smooth the stile and remove any cross-grain scratches introduced when the rails were sanded, without crossing the joint and spoiling the already-smoothed rail. Here again, sand in long, even strokes; resist the temptation to slow down in the critical corner areas. Mitered corners, of course, will have to be smoothed with a pad sander.

The sanding techniques for frames can also be used to smooth the face frame of a chest of drawers or other furniture piece. It's more difficult because the frame members are usually shorter and narrower. Lay the carcase on its back so you can sand horizontally. A steady hand and control of the belt sander are required to keep the narrow surfaces flat and not introduce cross-grain scratches where the rails join the vertical stiles. When you are confident enough to take on a challenge, like sanding the face of a walnut dresser with an 80-grit belt, or using the front roller to sand curved surfaces as shown in the photo above, left, you'll be well on your way toward taming the beast in the belt sander. □

Christian Becksvoort, a professional furnituremaker in New Gloucester, Maine, is a Contributing Editor to FWW.

Making Shoji by Machine

Traditional joinery with drill press and tablesaw

by Ben Erickson

Traditional Japanese shoji panels adapt beautifully to Western architecture and interior decors ranging from ultramodern to traditional, as in my home, shown in the photo below. I installed shoji in front of the windows, and they take the place of curtains or blinds. In the day, they produce a stunning effect as the light filtered through the translucent shoji paper bathes the room in a stunning warm glow; at night, they provide the same privacy as curtains. Shoji also help keep the house cooler in the summer by reflecting sunlight, and warmer in the winter by reducing heat loss through windows.

Despite their intricate look, shoji aren't difficult to build. In this article, I'll tell you how I build shoji in my workshop in Eutaw, Ala., including how to glue on the paper, make the track and install a set of sliding panels. While shoji screens are traditionally made with only hand tools, as described by Toshio Odate in *FWW* #34, pp. 50-58 (also in *FWW Techniques 6*, pp. 160-168), they are well suited to the machine setups I use, due to the number of repetitive operations involved—such as cutting mortises, tenons and dadoes—that must be performed without deviation.

Shoji anatomy—A shoji panel consists of a through mortise-and-tenon frame that holds a lattice of lap-jointed muntins or "kumiko," as shown in the drawing on the facing page. These muntins are woven together for strength and to prevent the individual kumiko from bowing. Both the vertical (long) and horizontal (short) kumiko have stub tenons on their ends that fit into square mortises chopped in the inside edges of the frame. The kumiko and frame are flush on the side facing away from the room. Shoji paper (a modern synthetic-paper blend that doesn't yellow as traditional shoji rice paper does) is glued to this side.

While a shoji panel can be 4 ft. or more wide, and the dimensions of the individual components can deviate from the ones given in the article, the spacing of the short kumiko should be 5⅜ in. center to center, to accommodate the width of the shoji paper covering, which comes in a 28-cm-wide roll (about 11$\frac{1}{16}$ in.). One piece of glued-on paper spans two short kumiko, overlapping at the seams by the thickness of one kumiko (⅜ in.). The paper also overlaps the inside edges of the frame by the same amount. While height requirements will dictate how many short kumiko are used in a panel, a typical 3-ft.-wide shoji traditionally has three long kumiko. However, I use two in my shoji, as I prefer the look of the longer horizontal rectangles that result.

For use in front of a window (or door), two, three or four shoji may be held in a two-lane track attached to the casing around the opening. The grooved track holds the shoji at top and bottom and allows them to slide past one another.

Japanese shoji screens can blend harmoniously with practically any interior, like this three-shoji arrangement in the author's antebellum home. Installed in front of an existing window, the translucent shoji-paper screens provide the privacy of curtains, yet allow a warm light to come through during the day.

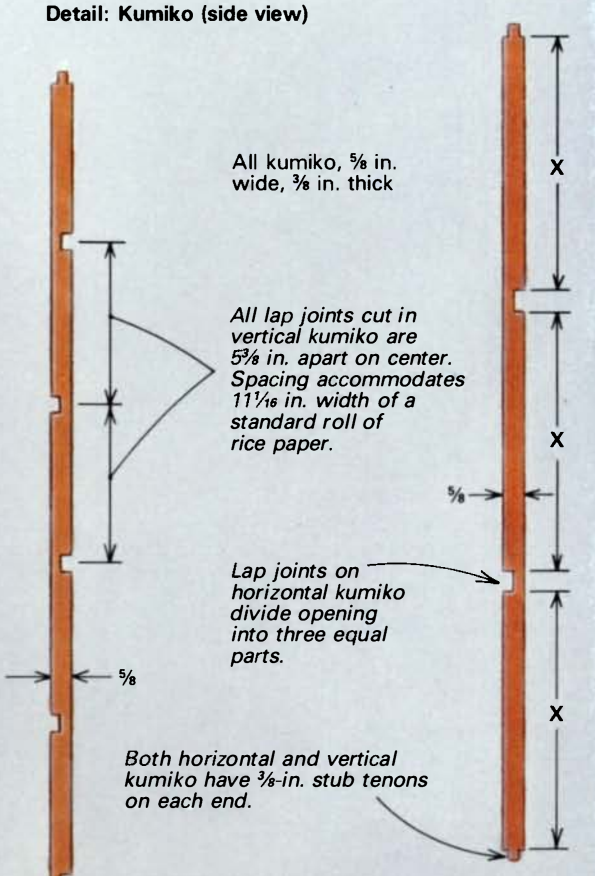
Building the frames—To ensure frame parts will fit together properly, the shoji stock must be uniform in thickness, with square and straight edges. To guarantee this, I first cut the rough frame stock oversize, and then lean it against a wall for a couple of days until it adjusts to the shop's humidity. Frames are traditionally made from lightweight softwoods, but I use Honduras mahogany; any easily worked stock will do. I plane the stock until its thickness is 1¼ in., taking the final pass on all the frame stock with the thickness planer at one setting, pushing the pieces over the same part of the bed, in case the planer knives aren't exactly parallel. Next, I joint the edges of the frame members to dress them to final width: 1¼ in. for stiles, 3½ in. for rails. Rail width may be varied to fine-tune overall height of shoji.

The stiles are crosscut 2 in. to 4 in. longer than their final length to allow for horns on the ends. The horns keep the stiles from splitting while the tenons are driven and can be trimmed off afterwards. Cut the rails so their length equals the final width of the shoji plus $\frac{1}{16}$ in. to ⅛ in. for trimming the ends of the through tenons.

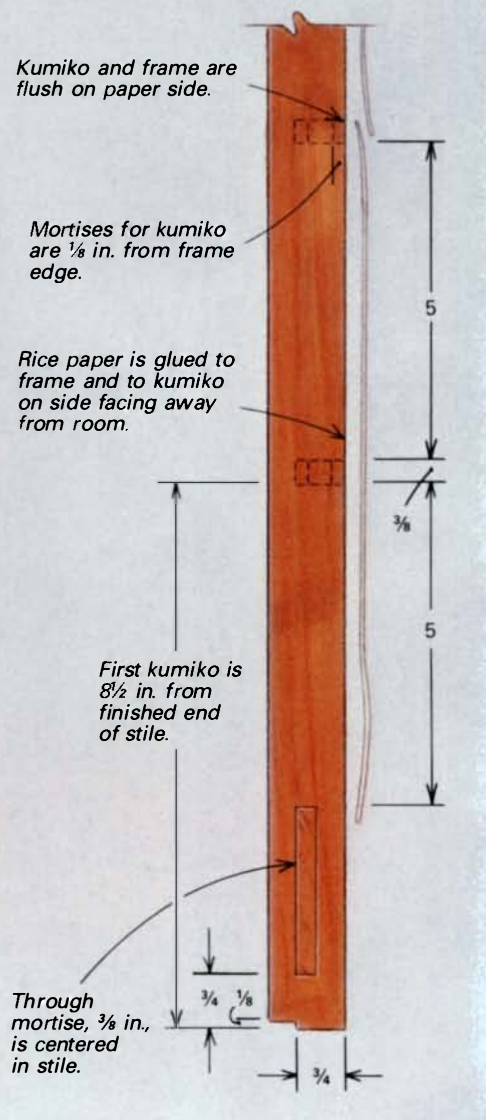
Next, chop the through mortises in the stiles with a ⅜-in., hollow-chisel mortiser in the drill press. Their shoulders stop ¾ in. short of the final length of the stile. An extra-long fence and table are attached to the drill press to support the long stock. The mor-

Fig. 1: Shoji screen anatomy

Detail: Kumiko (side view)



Detail: Side view of frame



The author uses a hollow-chisel mortiser on the drill press to chop mortises in the shoji frame for the kumiko. By referencing the end of the frame against a line of blocks laid end to end (the block on the far end clamped to the fence), mortises can be accurately spaced, removing one block after each mortise.

Erickson weaves the horizontal and vertical kumiko together, alternating the direction of the lap joints of each horizontal layer. A squeeze bottle is used to apply glue to each lap before it's assembled and pounded home with a hammer.

The shoji-paper covering is glued to the flush surface of the shoji frame and kumiko on the side that will face away from the room. A pair of clamping blocks helps the author keep the paper taut as it's lowered onto the shoji members that have been precoated with wallpaper glue.

tises are centered in the thickness of the stiles, so mortising can be done on both ends without having to change the fence setting. To prevent tearout, start by mortising a little over halfway through the stile. Make the two end cuts first, remove the waste in between, then flip the stile and complete the through mortise. Next, cut the ⅜-in.-wide tenons on the frame rails by whichever method you prefer; I use a tenoning attachment on the tablesaw.

The mortises for the kumiko are done next. These square mortises are the same size as the kumiko's thickness (⅜ in.) and are located so the assembled lattice will be flush on one side. Set the drill-press fence so the mortises are ⅛ in. (the width of a kumiko shoulder) from the outside-facing edge of the frame. Chop the two kumiko mortises in each rail first, dividing the distance between tenon shoulders evenly in thirds to locate the mortises. To cut the kumiko mortises on the stiles accurately, you'll need to make the same number of spacer blocks as short kumiko from 2x2 scraps. Using a stop block on the radial-arm saw, cut each spacer block 5⅜ in. long—the spacing of the short kumiko. Keeping the same fence setting as for the frame mortises, locate the first mortise 8½ in. from the finish end of the stile (see the detail in figure 1 on the previous page). Lay the spacer blocks along the fence end to end, with the first block against the stile and the last one clamped to the fence, as shown in the top photo at left. Remove a block after making each mortise until they're all done.

Making the kumiko—I thickness-plane the kumiko stock to ⅝ in., and then rough-cut it and allow it to adjust to the shop's humidity. Instead of cutting the lap joints, where the long and short kumiko intersect, on all the thin kumiko separately, I cut one wide board for all the long kumiko and one or two for all the short kumiko. By adding enough extra width for sawkerfs and trimming, I can slice off individual kumiko after cutting the laps. This ensures identical joints, prevents tearout and saves time. First, trial-assemble the shoji frame to determine exact kumiko length, which equals the inside frame measurements plus ¾ in., for stub tenons on each end. After trimming the boards to length, I cut the lap joints on the radial-arm saw, using a ⅜-in.-wide dado blade set for a ⅜-in.-deep cut. Make trial cuts first, to check the fit and squareness of cut, then use the set of spacer blocks to locate the joints on the long kumiko just as you used them for making the mortises earlier. Flip the kumiko stock over after each cut, so the laps alternate sides. The lap joints for the short kumiko are cut using a regular stop block.

The radial-arm saw also cuts the stub tenons on the ends of the kumiko boards. By taking passes from both sides of the stock, the ⅜-in.-thick tenons are automatically centered. Set a stop block so the blade cuts ⅜ in. into the end of each board—the correct length of the tenons. After these cuts are taken on each board, the individual kumiko are bandsawn apart. Set the bandsaw's rip fence for a little over ⅜ in., and rip the kumiko off one at a time. Joint the edge of the stock before bandsawing and after each cut, and thickness-plane the kumiko so the lap joints fit tight.

Assembly—I assemble the kumiko lattice first, then the frame around it. I start by laying the two long kumiko parallel on the bench. After applying a drop of yellow glue to the lap joints on a short kumiko, I fit it onto the long kumiko, tapping the joints home with a hammer protected by a block of softwood. This process is repeated, weaving the kumiko together (shown in the middle photo at left), until the lattice is complete. Friction holds most joints tight, but I secure any loose ones with a small clamp until the glue dries. Using a $\frac{1}{16}$-in.-radius roundover bit in the router, I round the edges on the non-paper side of the lattice, as well as the inside edges of the frame on the non-paper side, stopping short of the corner joints.

For final assembly, I insert the long kumiko tenons into the top and bottom rails, driving the joints home with a rubber mallet. Next, I coat all the frame mortises and tenons with yellow glue and also dab a drop on the inside of each kumiko mortise. I fit one stile on the rails, starting the short kumiko stub tenons into their mortises as I work from one end to the other. When the tenons are all partially inserted, I drive the stile on with the rubber mallet, stopping when the rail-to-stile joints are home. Working quickly before the glue dries, I repeat this process with the other stile, and then apply pipe clamps and pull the frame joints home. Finally, I check the frame's diagonals for squareness.

After the glue dries overnight, I plane down any irregularities in the frame and trim the through tenons flush. I cut off the horns on the ends of the stiles and round the outside edges of the stiles with a ⅛-in. roundover bit in the router. If the shoji will be used in a track, a tongue needs to be rabbeted in the top and bottom frame edges, to fit the track grooves. Using either a router or a shoulder plane, cut a ⅛-in.-deep rabbet on the bottom rail and a ⅝-in.-deep rabbet on the top.

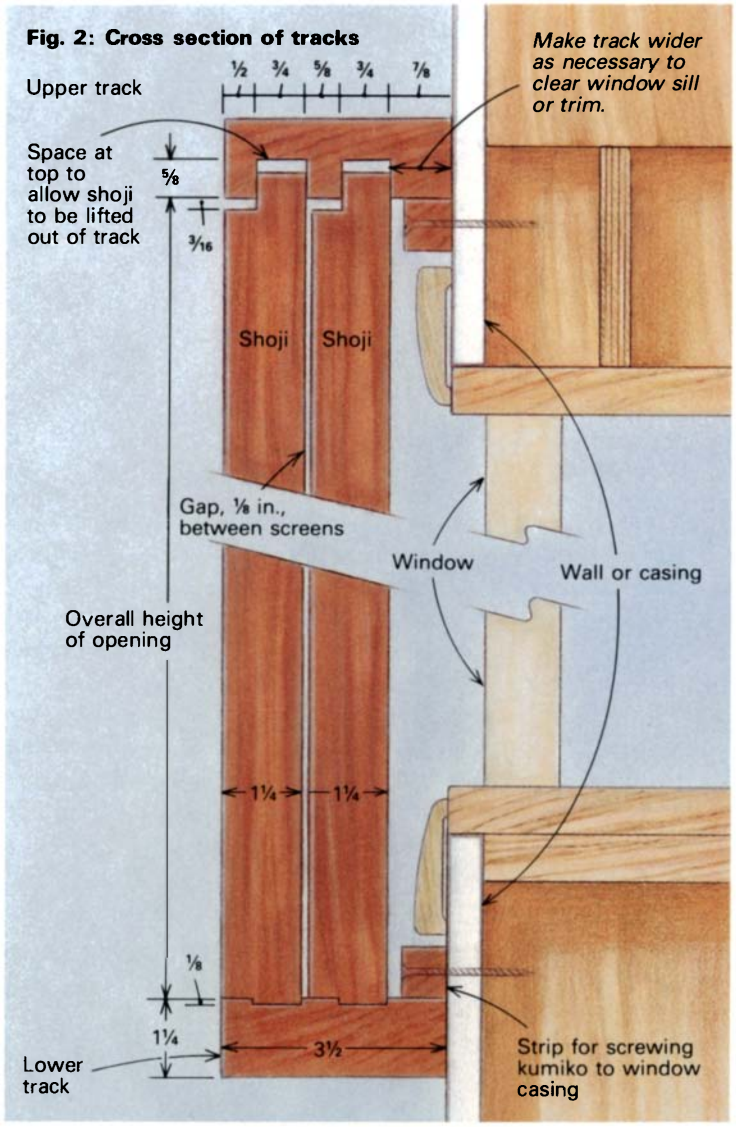
Although Japanese customarily leave the shoji unfinished, I prefer to finish with three coats of tung oil, sanding lightly between coats. Do not apply finish to the paper side of any kumiko or within ⅜ in. of the frame's inside face, as the glue used to attach the shoji paper sticks better to unfinished wood.

Making the track—The track the shoji panels slide in can be made before or after the shoji themselves. I usually make the track first and size the shoji to fit. The shoji track consists of upper and lower grooved rails that are joined on the ends into a four-sided frame with the corners rabbeted and screwed together. The frame is made from stock that's 1¼ in. thick and 3½ in. wide. You may need to make it wider, to clear door or window casings. The height of the opening in the assembled track frame should be 9/16 in. less than the overall height of the shoji. Track length equals the total width of all shoji plus 2½ in. (the thickness of the track's side frames) minus one shoji stile width wherever shoji will overlap in the track. The tongues on the shoji panels ride in grooves in the tracks: The lower track has two shallow grooves and the upper has two deeper grooves that allow the shoji to be lifted in or out. These are all cut on the tablesaw with a dado blade. The track dimensions, shown in figure 2 at right, provide a ⅛-in. gap for clearance between shoji as they slide past each other.

After the track frame is assembled at the work site, it may be screwed to the wall studs or casings. The track frame should completely cover the door or window casing and should screw into the edge of this casing, if it protrudes enough from the wall's surface; if not, a 1-in. by 2-in. strip can be screwed to the tracks as a fastening strip. Check the frame's diagonals for squareness as you attach them.

Applying the paper—Shoji paper is best applied on humid days, because the paper expands and contracts with changes in moisture. If I have to put the paper on in dry weather, I create my own humidity by running a vaporizer for several hours before applying the paper. Working on a clean surface, I first cut the paper pieces to the width of the shoji plus a couple of inches, using a square and sharp utility knife. Special shoji glue comes with the paper. (Shoji paper is available from Highland Hardware, 1045 N. Highland Ave. N.E., Atlanta, Ga. 30306; 404-872-4466. For orders, call 800-241-6748.) While you can substitute a clear cellulose wallpaper adhesive, such as "Shur-Stik" (available from a wallpaper and paint store), I find the

Fig. 2: Cross section of tracks



shoji glue has a smoother consistency that brushes out better. The directions for the special glue, in case you don't read Japanese, are as follows: Slowly add the packet of glue to 400cc (1⅝ cup) of water, stir well and let it sit for 10 minutes before using.

With the shoji panel lying flush side up on the bench, I start the papering at the bottom of the frame and work my way up. The glue is applied to the short and long kumiko and within ⅜ in. around the inside edge of the frame using a small plastic squeeze bottle. To hold the paper evenly for application, I made two paper holders by hinging together two pieces of 12-in.-long scrap with duct tape. It helps if the halves of each holder bow slightly away from each other in the center, so finger pressure in the center firmly grips both edges of the paper. Grip each end of the paper in a holder and pass the paper once or twice over the vaporizer. Carefully align it with the kumiko and set it into the glue, as shown in the bottom photo on the facing page. Run your fingertip down the kumiko and the edge of the frame to press the paper into the glue and to carefully pull out any wrinkles. Then repeat the process, lapping the next paper over the previous one by the width of a kumiko. If the paper is still not tight enough after the glue is dry, it may be lightly wetted with a spray bottle to further shrink the paper. Damaged or misaligned paper may be removed by dampening the glued areas and peeling it off. □

Ben Erickson is a woodworker in Eutaw, Ala.

Constructing a Walnut Chest

A "keep-all" scaled down to fit any room

by Ronald Layport

All you need to build complex pieces of furniture is persistence and a command of basic joinery techniques. For me, learning woodworking has been a matter of reading, studying antique cabinetry and, most of all, lots of practice. My first and only woodworking class was in the fifth grade, when I learned to use basic hand tools and a bandsaw to make cutting boards and other simple objects. It wasn't until a few years ago that I began to build, in a serious way, on those elementary skills. So even if your woodworking experience is as limited as mine, I encourage you to tackle the projects that appeal to you. Most are more manageable than they might appear at first glance.

The project shown in the photo below and on the top of p. 89 is what I call a "keeping chest." It appears to be massive, yet it's barely 5 ft. high, less than 2 ft. wide, and only 14 in. deep. The chest is small enough to be slipped comfortably into tight spaces, yet it is distinctive enough to provide a startling contrast to the large, high-ceiling rooms of my turn-of-the-century home. When the doors are closed, the paneled, dark walnut exterior of the chest contributes to the piece's unassuming character. The simple brass hardware on the doors and drawers also enhances this understated quality. When the doors are opened, however, the strong, contrasting colors of the figured cherry and curly maple drawers in the removable secretaire are revealed. In addition, the panel in the pull-out writing surface is a piece of highly figured walnut with strongly contrasting heartwood and sapwood. The back of the chest is attractively paneled and finished, so the piece can stand away from the wall, if desired. As you can see from the photo on the bottom of p. 89, I've also designed the top of the chest to include a secret cash compartment, which challenges the truly curious individual to discover how to open it.

Although the keeping chest looks huge, it's barely 5 ft. tall, less than 2 ft. wide and 14 in. deep. The secretaire's light, curly maple drawer fronts and cherry framework contrast with the dark walnut chest.

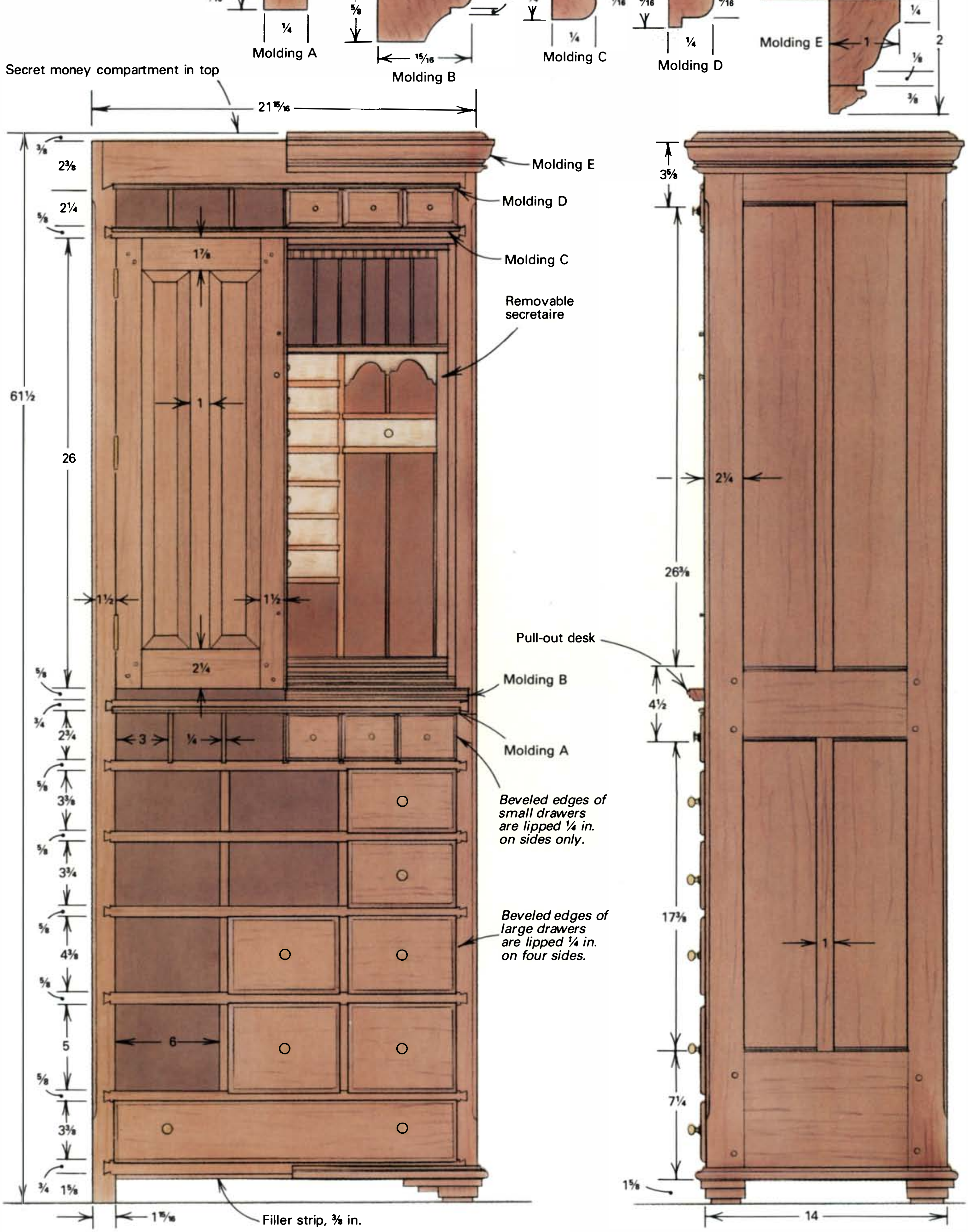
I work out of a small shop in the basement of my home. By any standards, it is modestly equipped. For a long time, a 10-in. tablesaw and 14-in. drill press were my only power tools. Working almost exclusively with hand tools is slow in terms of output, but I find handwork is an enjoyable aspect of woodworking. Shaping wood and solving joinery problems with only handsaws, planes, chisels and scrapers has taught me more about the craft than I would have ever learned working only with power tools.

I'm not a "hand-tool purist" however; as my skills have developed, I've added machines to expand my capabilities and make my work go more quickly. About the time I came up with the idea for this keeping chest, I added a jointer and thickness planer to my shop. These tools broaden my design possibilities, making it easier for me to include thin stock and tighter tolerances in my designs.

My power tools are legitimate members of my design staff, waiting patiently to rough out parts, flatten stock and perform other routine and, at times, tiresome operations I used to do with hand tools. Most of all, the machines free up my time so I can concentrate on the things I like to do best: developing ideas, working out design problems, and cutting dovetails, mortises and decorative moldings with hand tools. The time spent making a tool for shaping the bead on a door stile or sweetening a tiny molding is its own reward.

Although all of my pieces are original designs, they are influenced by my fascination with the work of the itinerant cabinetmakers of the mid-1800s. These builders understood the limitations of their tools and materials; their design solutions reflected these limitations, resulting in many one-of-a-kind pieces. The honesty of their work,

Fig. 1: Keeping chest construction



including its flaws, reveals their humanness and teaches me to be patient with myself while I strive to reach their level of excellence.

Designing the chest—Each of my pieces is designed to satisfy a particular need for a specific person. This ensures that the piece will be put to practical use and not just idly admired. This chest was designed for my son, who is the family collector, record keeper and banker; thus, it needed lots of drawers to stash keys, newspaper clippings, small tools, telephone numbers and whatever else might strike his fancy. I thought a pull-out writing surface and secret cash compartment would facilitate his loan business with family members. And so the idea of a keeping chest evolved in my mind as a way of satisfying my son's needs, as well as my desire to pass on something of lasting value to him.

I usually work from very rough, conceptual sketches. Once I'm satisfied with the overall design, I concentrate on detail sketches to resolve construction problems and to develop a strategy for building the piece that is within the range of my skills and tools. Because of the complexity of the chest, I also made full-scale drawings so I could better visualize each detail. These full-scale drawings also helped me work out a unique interlocking framework, which allows for wood movement while providing support for the chest's many drawers.

Constructing the chest—Building this chest isn't difficult, despite the complexity of its design. I'd recommend that you begin by carefully studying the drawing on the previous page and those on the following three pages. I work on one section at a time. As I rough-cut the pieces for each section, I label all the parts clearly. This organized approach makes for greater accuracy and speeds construction. After rough-milling all the parts, I plane them to their final width and thickness, but leave the pieces a little long until I'm ready to cut the joints.

I built the side panels and drawer frames first, and then added the back corner stiles to the side panels, before gluing up the carcase. The drawer frames slide into dadoes in the side and back stiles, which simplifies alignment and ensures carcase squareness. After adding the back panels, I installed the face frame, moldings and feet. One of my objectives in building this piece was to hone my drawermaking skills; making the 34 drawers gave me experience akin to an apprenticeship. After completing the drawers, I turned my attention to making the paneled writing shelf, hidden cash compartment, doors and the removable secretaire. To finish the chest, I scraped and sanded all the components, and then applied three coats of warm linseed oil with a pad of 0000 steel wool, followed by a coat of low-luster tung oil, also rubbed out with 0000 steel wool. Finally, I installed the hardware and applied a coat of wax.

Making the panels and assembling the carcase—The pinned mortise-and-tenon frames for the side panels are made from 1$\frac{5}{16}$-in.-thick stock. The $\frac{1}{4}$-in.-thick flat panels, float in $\frac{5}{16}$-in.-deep grooves. Dadoes are also routed across the inside surface of the stiles for each of the 10 drawer frames. To eliminate alignment errors when the drawer frames are installed, I place the side panels together, front edge to front edge, when routing these dadoes. The molding on the rails is milled before the panels are assembled. I make a $\frac{3}{4}$-in.-wide by $\frac{9}{16}$-in.-deep rabbet on the back inside edge of each side panel where the rear panel stiles will be glued and clamped to the side panels. The rear panel stiles are rabbeted along their length for the back panel and dadoed for the drawer frames.

The maple drawer frames are assembled with pinned mortise-and-tenon joints. I cut $\frac{1}{8}$-in.-deep dadoes into each frame's top and bottom crossmembers to house the drawer guides and vertical separators. I rout adjacent drawer frames together for accurate alignment. Because the frames are not all alike, it's a good idea to check the dimensions and other details, shown in figure 1 on the previous page, frequently as the work progresses.

The next step is to install the drawer frames and construct the back panel. Because of the dadoes already cut in the side panels and back stiles, aligning the 10 drawer frames is fairly simple. After a trial dry fit, I glue and clamp the drawer frames to the side panels, usually making only minor adjustments to keep everything square and aligned.

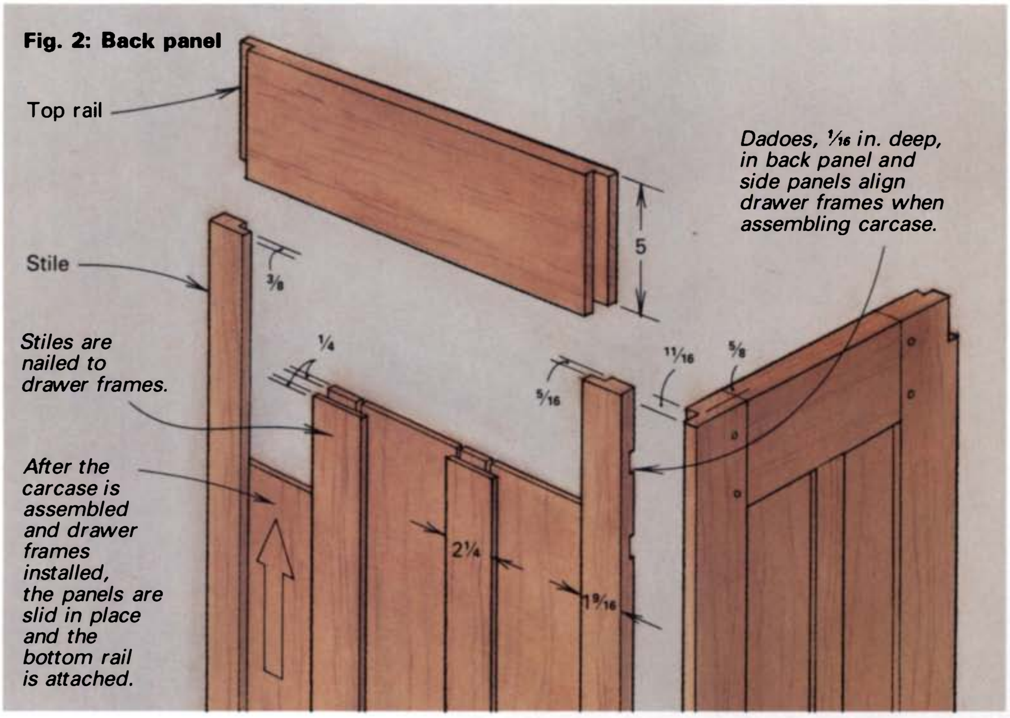
The back panel construction details are shown in figure 2 on the facing page. I place the carcase face down on the floor and fit the back panel's top rail to the stiles. The two middle stiles can then be shaped, as shown in figure 2, and installed. I resaw and plane the three flat panels to $\frac{1}{4}$ in. thickness and thread them between the backs of the drawer frames and under the rabbeted edges of the stiles and top rail. Next, I fit the bottom rail in position. Finish nails, run through the stiles into the drawer frames, secure the stiles and allow the panels to float free.

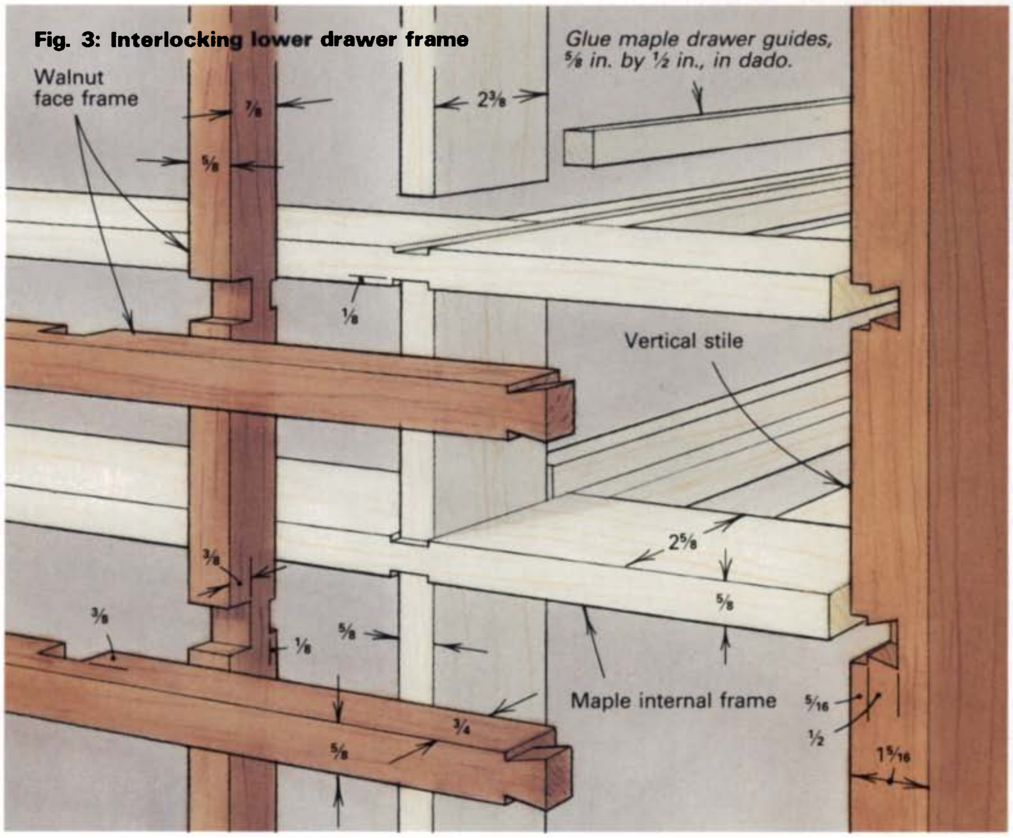
Completing the internal framework—Once the dadoed drawer frames that make up the horizontal members of the framework have been installed, all that remains to be added are the vertical members and the face frame. If the dadoes were cut accurately and the carcase assembled squarely, this stage of the work proceeds very smoothly. I always feel I am handsomely rewarded for the care I invested in the early stages of the project.

The framework for the three-by-four array of drawers is assembled in three steps. First, I cut and slide the maple vertical supports into the back end of all dadoes. Then, the $\frac{5}{8}$-in. by $\frac{1}{2}$-in. drawer guides are cut and glued into the dadoed slots. Finally, the front vertical supports are inserted. As you can see in the construction details shown in figure 3 on the facing page, the frame components are sized and matched so the whole assembly locks together mechanically. Glue isn't necessary, but I do put some in the bottom dadoes as added insurance. This same method is used for attaching the face frame. The vertical members are notched in the back to mesh with the internal framework and also are notched in the front where they crosslap with the face frame's horizontal members. The dovetailed ends of the horizontal pieces fit into the dadoed side panels, as shown in figure 3. Both vertical and horizontal face frames are glued along their entire length to the internal framework.

Making the framework for the two sets of small drawers is less complex. Here, after installing the face frames, I simply insert $\frac{1}{4}$-in.-thick scrap cherry pieces, with the grain oriented vertically, into the dadoes. They should fit loosely to allow for wood movement, so no glue is used. These dividers are faced with walnut strips, which are glued flush to the face frame in the bottom dadoes only.

Drawers and doors—I use standard construction methods as described in *FWW on Boxes, Cases and Drawers* (The Taunton Press, 1985), building the main chest drawers first and the nine secretaire drawers later. Through dovetails connect the cherry sides to the back; half-blind dovetails join the sides to lipped walnut drawer fronts. The small drawers are lipped on the sides only. I shaped the edges of the larger drawer fronts with a molding plane and scrapers; they can also be shaped with a router. I beveled the front edges on the small drawers with a handplane. The dovetails, all 358 of them, are cut by hand. Paneled bottoms for the larger drawers are made from $\frac{1}{4}$-in.-thick stock. The panels' bottom edges are beveled with a handplane and float in $\frac{3}{16}$-in. dadoes cut into the front and sides; for the small drawers, I use $\frac{3}{16}$-in.-thick scrap pieces. Brads, nailed up through the bottom into the back of each





Above: The back of the chest is finished so it can stand away from the wall. Below: The lid of the secret cash compartment, built into the top of the chest, is opened by pushing up on a dowel hidden in one of the underlying drawers. The compartment's cherry dividers are dadoed to fit but are not glued, so they can be easily removed for cleaning.

drawer, holds the bottoms in place. Because I dimension the drawers for an exact fit, trimming isn't necessary after they are assembled.

The chest is fitted with frame-and-panel doors. I added a vertical center stile, tenoned to the rails, to visually enhance the vertical look of the chest. To keep them lightweight, the pinned, mortise-and-tenon frames were made from 9/16-in.-thick stock. The raised panels were roughed out on the tablesaw, finish-shaped with a handplane and allowed to float in the frames. After the doors are assembled, the mating edges are rabbeted so the doors will overlap when they are closed. Finally, I use a shopmade scraper to form a vertical 1/16-in.-dia. bead along the vertical mating edges of the doors.

Adding the frills—A variety of molding styles add interest and visual balance to the chest. I take my time in making moldings and improvise as I proceed. You can shape your moldings with a router, but I enjoy roughing them out on the tablesaw, and then using molding planes, shop-built scrapers and gouges to complete the job. The tiny moldings, above and below the small drawers at the top of the chest, are secured with glue and tiny brads; larger moldings are just spot-glued on.

The molding at the top of the chest is assembled from three separate pieces, and it frames the secret cash compartment, as shown in the bottom photo above. The compartment's frame-and-panel lid rests on the chest's carcase, flush with the top molding,

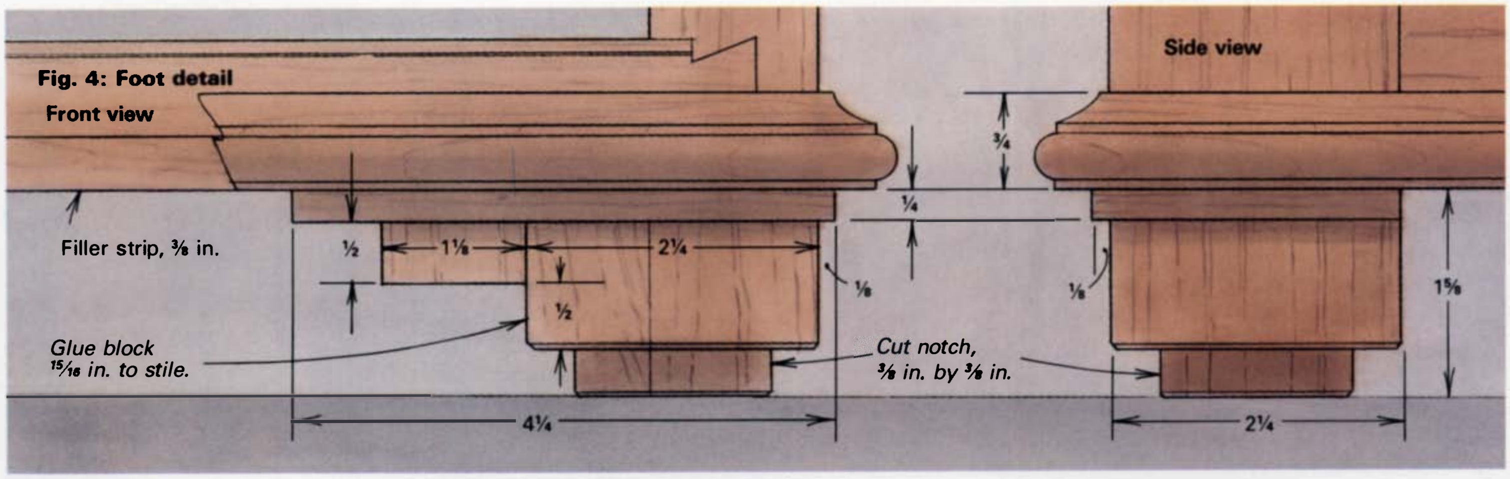


Fig. 4: Foot detail
Front view
Side view
Filler strip, ⅜ in.
Glue block
15/16 in. to stile.
Cut notch,
⅜ in. by ⅜ in.
½
1⅛
2¼
½
⅛
4¼
¾
¼
⅛
1⅝
2¼

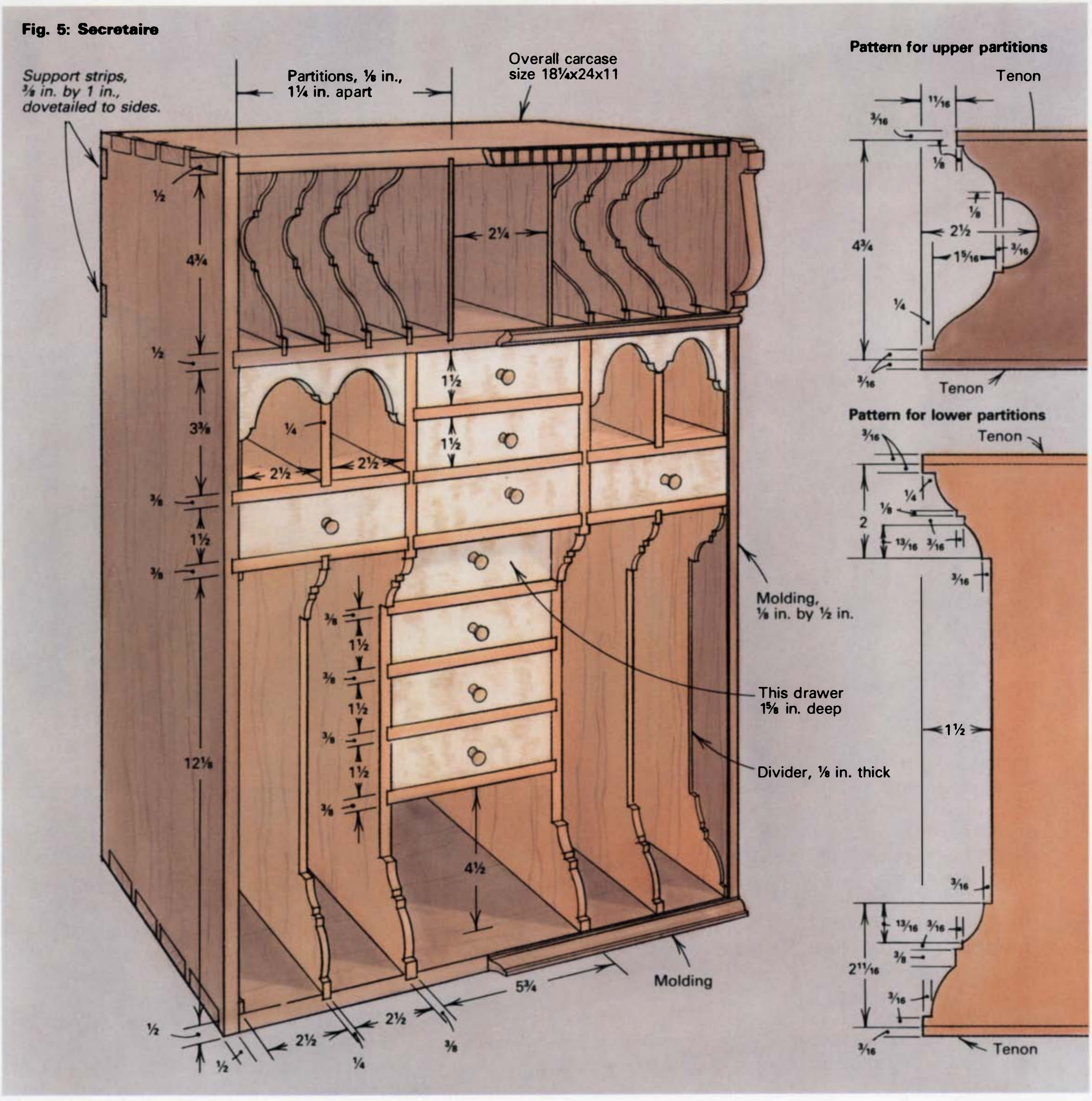
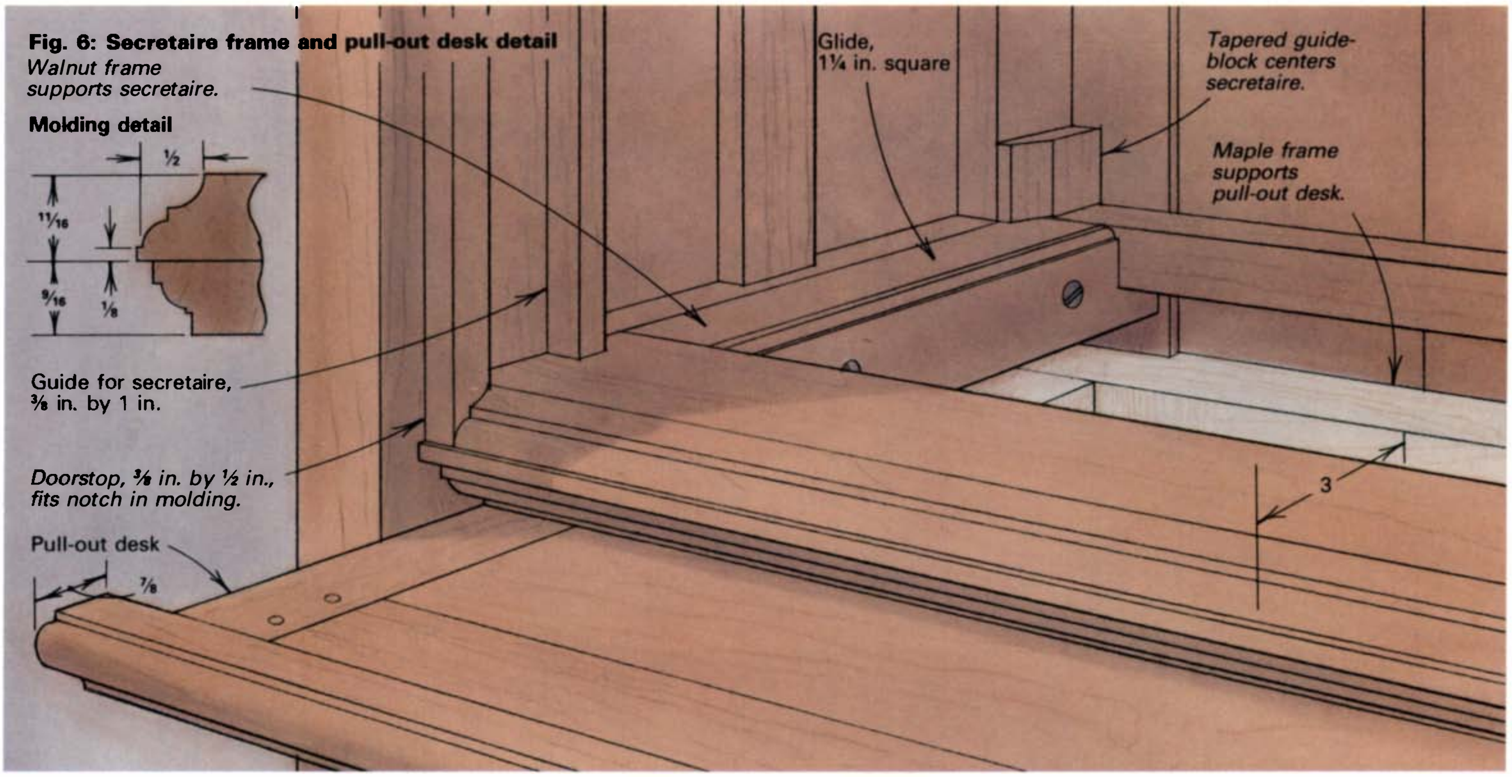


Fig. 5: Secretaire
Support strips,
⅜ in. by 1 in.,
dovetailed to sides.
Partitions, ⅛ in.,
1¼ in. apart
Overall carcase
size 18¼x24x11
Pattern for upper partitions
Tenon
11/16
3/16
⅛
⅛
2½
1⁵/16
3/16
4¾
¼
3/16
Tenon
Pattern for lower partitions
3/16
Tenon
¼
⅛
2
13/16
3/16
3/16
Molding,
⅛ in. by ½ in.
This drawer
1⅝ in. deep
1½
Divider, ⅛ in. thick
3/16
13/16
3/16
⅜
2¹¹/16
3/16
3/16
Tenon
Molding
5¾
½
4¾
½
3⅜
⅜
1½
⅜
12⅛
2¼
1½
1½
¼
2½
2½
⅜
1½
⅜
1½
⅜
1½
⅜
4½
½
½
2½
2½
¼
⅜



and it is hinged at the back and held in a raised position with a 6-in. forged-brass chest stay. I bought mine from Garrett Wade Co. Inc., 161 Ave. of the Americas, New York, N.Y. 10013; (212) 807-1757; catalog #A101.01. I installed a vertical dowel, with a small knob on each end, through a hole in the bottom of the cash compartment, so that it extends into one of the underlying small drawers; to open the lid, reach in the small drawer with your finger and push up on the dowel.

The top of the frame for the six small drawers also serves as the bottom of the cash compartment. The separators, made from $^{3}/_{16}$-in.- and ⅛-in.-thick cherry stock, are dadoed together but not glued, so they can be removed easily for cleaning. I added another small walnut molding to hide the top outside edges of the cherry separator structure.

This chest looked best to me with its bottom slightly off the floor. Therefore, I laminated walnut scrap pieces, as shown in figure 4 on the facing page, to form feet and provide this visual "lift." Like the rest of the chest, the feet are intricate but not fussy.

I used walnut sapwood and heartwood for the panel, which is flush-fit in the mortise-and-tenon frame of the pull-out writing shelf. Molding, fastened to the frame's front edge, serves as a stop when the shelf is not being used, and it visually separates the upper and lower sections of the chest. A dowel installed at the back edge of the shelf rides in a stopped dado in the underlying frame and acts as a pull-out stop.

As a final touch in dressing up the chest, I used a molding plane and gouge to relieve the sharp edges along the length of the carcase stiles.

Removable secretaire–There are two reasons for making the secretaire section separately: it's more easily constructed and it's heavy enough that you'll want to remove it when you move the chest. The case is dovetailed, as you can see in figure 5 on the facing page, and it has no back. I used walnut to visually tie it to the chest. The walnut mail slot dividers float freely in stopped dadoes. The framework below the mail slots is cherry, which softens the color transition from the dark walnut chest to the light tiger maple drawers, which are dovetailed and flush fitted.

Figure 6 above shows how the secretaire is supported in the chest by a walnut frame fastened to the carcase with screws. This frame also holds the writing surface in place. Tapered blocks attached to the carcase ensure that the secretaire is properly centered. Additional trim and moldings around the secretaire and attached to the carcase were installed to give it a built-in appearance.

Finishing up–I don't do much sanding; I prefer scrapers, which leave subtle traces of my handwork, such as scribe lines and molding imperfections, yet flatten and smooth the wood to my satisfaction. Three coats of boiled linseed oil is enough to seal and protect the wood and to develop a low sheen to complement the wood's color and grain. I heat the oil almost to its boiling point before each application. Linseed oil is flammable and should not be heated over an open flame; I also wear heavy rubber gloves when working with it. I rub out the oil with 0000 steel wool and allow it to sit for about 30 minutes before I wipe it dry. I let the chest sit for a day or so and then apply a coat of Sutherland Wells Low Luster Tung Oil, available from Garrett Wade Co., catalog #99RO2.01, which is also rubbed out with 0000 steel wool. For this piece, I applied a thin coat of water-soluble Solar Lux (NGR) Aniline Dye Stain (available from Behlen & Brothers, Route 30 N., Amsterdam, N.Y. 12010; 518-843-1380, and Garrett Wade Co.), which I like because it highlights the red and yellow tints in the walnut. Again, I use steel wool to remove the dye until I have the effect I want. A final coat of linseed oil, rubbed dry, restores a soft patina, and one or two coats of paste wax, applied a couple of days later, completes the job.

The final steps are to install the doors, the lid to the cash compartment, the drawer pulls and the door latch. All of the hardware is solid brass; I ordered it from Horton Brasses, Nooks Hill Road, Box 120F, Cromwell, Conn. 06416; (203) 635-4400. □

Ron Layport is an amateur woodworker and lives in Pittsburgh, Pa. He is currently building a curley maple sideboard, his first commissioned piece.

ORDER TOLL FREE 1-800-328-0457 – MAIL ORDER HOURS 7:00-5:30 C.S.T. MONDAY-FRIDAY

DELTA BENCH TOP TOOLS

Model		List	Sale
23-700	Wet/dry grinder	201	159
23-680	6" bench grinder ¼ H.P.	81	66
23-880	8" bench grinder ½ H.P.	136	105
23-980	10" bench grinder 1 H.P.	246	235
11-950	8" drill press	164	135
14-040	14" drill press	313	309
40-150	15" hobby scroll saw	178	135
28-160	10" hobby band saw	189	144
31-050	1" belt sander 2.0 amp.	93	75
31-460	4" belt/6" disc sander	178	135
31-340	"NEW" 1" belt/8" disc sander	226	169

DELTA STATIONARY

34-761	10" unisaw 1½ H.P.	1715	1339
34-740	Super 10" motorized table saw	690	439
34-429	10" tilting arbor bench saw 1½ H.P.	1479	1049
33-990	10" radial arm saw	727	555
11-072	32" radial drill press	487	399
37-280	6" motorized jointer	440	375
50-179	¾ H.P. 2 stage dust collector	435	339
50-180	1 H.P. dust collector	535	425
50-181	2 H.P. dust collector	760	615
37-154	Deluxe DJ-15 6" jointer w/¾ H.P. motor	1288	999
33-050	"NEW" 8¼" Sawbuck	742	559
34-330	"NEW" 8¼" Table Saw 13A	321	245
34-670	10" motorized table saw	437	325
34-985	⅙ H.P. stock feeder	698	545
28-560	16" 3 wheel band saw	546	379

MILWAUKEE TOOLS

0395-1	9.6V cdlss. drill w/cse	264	159
0219-1	9.6V cdlss. drill w/cse	277	165
0385-1	7.2V cdlss. drill w/cse	174	115
0224-1	⅜" drill 4.5A magnum	179	109
0234-1	½" drill4.5Amag0-850rpm	189	107
0244-1	½" drill4.5Amag0-600rpm	189	107
0222-1	⅜" drill 3.5A 0-1000 rpm	169	97
0228-1	⅜" drill 3.5A 0-1000 rpm	154	90
0375-1	⅜" close quarter drill	208	119
0379-1	½" close quarter drill	243	139
6539-1	Cordless screwdriver 190 rpm	108	65
6540-1	Cdlss. screwdriver w/bits & cse	137	89
6546-1	Cdlss screwdriver 200 & 400 rpm	120	75
3102-1	Plmbrs rt angle drill kit	295	175
3002-1	Electricians rt angle drill	290	175
5399	½" D-hdle ham drill kit	299	179
1676-1	H.D. Hole Hawg w/cs	395	225
6511	2 sp SawZall w/cs	209	119
6405	8¼" circle saw	209	120
6750-1	Drywall gun 0-4000 4.5A	149	89
6798-1	Tek screwdriver	173	105
6507	TSC SawZall w/case	219	129
6170	14" chop saw	430	259
6012	Orbital sander 3⅝"x7⅜"	179	105
6014	Orbital sander 4½"x9¼"	189	110
6305	6¼" cordless circle saw	284	165
6753-1	Drywall gun 0-4000 3.5A	129	83
8977	Var. temp heat gun	109	70
5397-1	⅜" v. spd. hammer drill kit	227	135
5371-1	½" v. spd. hammer drill kit	313	179
3107-1	½" v. spd. rt angle drill kit	305	179
6754-1	Drywall gun 0-4000 4.5A	179	110
6747-1	Drywall driver-0-2500	149	89
0230-1	⅜" drill 0-1700 rpm	169	99
3300-1	½" v. spd. magnum rt angle kit	289	179
5660	Router 1½ H.P.—10 amp	299	179
5680	Router 2 H.P.—12 amp	350	205
5455	⅞" polisher 1750 rpm	199	125
6215	16" chain saw	280	189
8975	Heat gun	85	55
6365	7¼" circular saw	189	107
6366	7¼" circsaw w/fence & bld	198	112
6368	7¼" circ saw w/fence, bld & cse	226	129
0216-1	2 spd cordless drill Hi-torque	222	145
0235-1	½" drill keyless chuck mag	199	115
6016	¼ sheet pad sander	75	48
6145	4½" grinder 10,000 rpm	149	95
6142	4½" grinder 10,000 rpm w/cse & access.	182	114
6141	5" grinder 10,000 rpm	159	99
0239-1	½" drill keyless chuck	189	114
6749-1	Drywall gun 0-2500 4.5A	189	115
6377	7¼" worm drive saw	275	159

FREUD SAW BLADES
⅝" Bore—Industrial Grade
CARBIDE TIPPED SAW BLADES

Item No.	Description	Diam.	Teeth	List	Sale
LU72M010	Gen. Purp. ATB.	10"	40	58	39
LU81M010	Gen. Purp. Tr.Ch	10"	40	65	39
LU82M010	Cut-off	10"	60	77	48
LU84M011	Combination	10"	50	65	40
LU85M010	Super Cut-off	10"	80	96	57
LM72M010	Ripping	10"	24	57	38
LU73M010	Cut off	10"	60	70	42
LU87M010	Thin kerf	10"	24	60	40
LU88M010	Thin kerf	10"	60	74	49
LU98M010	Ultimate	10"	80	107	79
LU89M010	Non-ferrous metal	10"	72	87	65
PS203	Gen'l Purp.	7¼"	24	25	18
PS303	Plywood	7¼"	40	36	25
DS306	6" Dado - Carbide			184	109
DS308	8" Dado - Carbide			196	119
F0	1¾"x⅝" Biscuits 1000-Qty			32	25
F10	2⅛"x¾" Biscuits 1000-Qty.			32	25
F20	2⅜"x1" Biscuits 1000-Qty			34	28
FA	Assorts Biscuits 1000-Qty			34	28
WC104	4 pce. chisel set w/cse ¼"-1"			54	38
WC106	6 pce. chisel set w/cse ¼"-1"			73	54
WC110	10pce chisel set w/cse ¼"-1½"			119	74
F8100	16 pce forstner bit set ¼"-2⅛"			284	159
94-100	5 pce router bil door system			288	159
JS100	Biscuit Jointer w/case			300	154
EB100	"NEW" edge banding machine			350	275

MAKITA CORDLESS

Model		List	Sale
6070DW	⅜" var. spd. rev. drill, 7.2v	123	75
6071DWK	⅜" var. spd. rev. drill w/removable batt, 7.2v	190	105
5090DW	3⅜" saw kit, 9.6v	243	129
5600DW	6¼" circular saw, 10.8v	317	175
6010DWK	⅜" cordless drill kit, 7.2v	155	89
6010SDW	⅜" cordless drill, 7.2v	103	65
DA3000DW	⅜" angle drill, 7.2v	238	130
4390DW	9.6 volt cdls. recip saw kit	218	124
4300DW	Jig saw kit comp., 9.6v	220	125
6010DL	⅜" drill w/flashlight, 7.2v	198	113
6710DW	Cordless screwdvr kit, 7.2v	186	103
6012HDW	2 spd. driver drill w/clutch & case, 9.6v	224	115
6092DW	V/spd. drill, kit complete	237	120
6093DW	V/spd. drill w/clutch—complete	248	125
6891DW	Drywall gun 0-1400, 9.6v	225	119
632007-4	9.6 volt battery	49	30
632002-4	7.2 volt ballery	42	28
5007NBA	7¼" saw w/elec. brake	228	125
5008NBA	8¼" saw w/elec. brake	276	149
804510	¼ sheet pad sander	80	50
9900B	3"x21" belt sander w/bag	254	145
9924DB	3"x24" belt sander w/bag	268	155
9035	⅓ sheet finish sander	106	68
9045B	½ sheet finish sander	216	125
9045N	½ sht fin. sand. w/bag	219	127
4200N	4⅜" circ. saw 7.5 amp	213	119
5201NA	10¼" circ. saw 12 amp	560	290
4301BV	Orb. v/sp jig saw 3.5 amp	274	149
JR3000WL	2 sp recip saw w/cse	220	122
JR3000V	Vs. recip saw w/case	224	125
LS1020	New 10" mitre saw	440	235
9820-2	Blade sharpener	354	199
410	Dust collection unit	480	279
3705	Offset trimmer	255	145
1900BW	3¼" planer w/case	198	115
1100	3¼" planer w/case	381	219
9207SPC	7" sander-polisher	262	149
3601B	1⅜ H.P. router	242	139
3700B	½ H.P. trimmer	180	105
9501B	4" grinder, 3.5 amp	137	69
804530	6" round sander	95	60
804550	¼" sheet pad sander w/bag	85	55
DA3000R	⅜" angle drill	256	145
DP4700	½" v/sp w/rev. 4.8 amp	198	119
HP2010N	¾" v/sp hammer drill w/cse	285	165
2708W	8¼" table saw	474	259
2711	10" table saw w/brake	800	469
GV5000	Disc sander 5"	109	69
6800DB	2500 rpm 3.5 amp, drywall	140	89
6800DBV	0-2500 rpm 3.5 amp, drywall	154	95
6801DB	4000 rpm 3.5 amp, drywall	140	89
6801DBV	0-4000 rpm 3.5 amp, drywall	154	95
2030N	12" planer/jointer	2970	1699
2040	15⅝" planer	2470	1449
1805B	6⅛" planer kit w/case	646	359
JV1600	var. speed jig saw	220	125
JV2000	var. speed orb. jig saw	242	138
5005BA	5½" circular saw	211	119
9503BH	4½" sander-grinder	153	89
6404	⅜" drill 0-2100 rpm, 2 amp.	102	65
6510LVR	⅜" drill rev. 0-1050 rpm	137	79
6013BR	½" drill rev. 6 amp	240	135
5402A	16" circular saw - 12 amp	605	339
36128R	3 H.P. plunge router	376	199
9401	4"x24" belt sander w/bag	302	169
3620	1¼ H.P. plunge routerw/cse	182	105
4302C	V/spd. orb. jig saw	287	149
50778	7⅛" Hypoid saw	248	139
LS1440	14" Mitre saw	624	409
2414	14" cut-off saw AC/DC	350	199
5007NB	7¼" circ saw 13 amp	209	119
36128	3 HP plunge router sq/b	376	199

SKIL SIZZLERS

Model		List	Sale
5510	(551) 5½" circ saw	112	92
5625	(552) 6½" circ saw	175	115
5656	(553) 7¼" circ saw	132	105
5665	(554) 8¼" circ saw	204	129
5750	(807) 7¼" circ - drop foot	198	125
5765	(808) 8¼" circ - drop foot	216	135
5790	(810) 10¼" circ - drop foot	400	245
5825	(367) 6½" worm saw	229	139
5865	(825) 8¼" worm saw	250	155
4580	Vari - orbit jig saw w/cse.	144	98
3810	10" Mitre saw	263	195
595	3"x21" sander w/bag 5.5A	197	125
7565	¼" palm sander	52	42
7313	3x18 belt sander 4.5A	72	58
77	7¼" worm drive saw	230	139
5350	2⅓ HP circ. saw	80.99	69
5250	2¼ HP circ. saw	68.99	59

XTRA SPECIAL BY SKIL

2735-04	12v V.Spd. Cordless Drill comp. w/cse & 2 Batt.	210	128

LEIGH DOVETAIL JIGS
D1258-12—List 314.00—Sale 265.00
D1258-24—List 375.00—Sale 305.00
LEIGH INSTRUCTIONAL VIDEO—SALE 29.00!!

HITACHI TOOLS

Model		List	Sale
TR6	Trimmer	177	95
TR8	Plunge router, 1½ H.P.	219	119
TR12	Plunge router, 3 H.P.	354	175
C10FA	10" dlxe mitre saw	490	275
C8F8	8½" slide compound saw	859	479
FREUD LU91M008	8½" c/bld 48 tooth	58	45
C15FB	15" mitre saw	745	405
FREUD LU85M015	15" c/bld 108 tooth	181	115

1989 TOOL CATALOG AVAILABLE
Call Toll-Free 1-800-328-0457 – In Minnesota Call (612) 224-4859
FAX: (612) 224-8263
CHECK • MONEY ORDER • VISA • MASTERCARD • DISCOVER
SEVEN CORNERS ACE HDW. Inc.
216 West 7th St. • St. Paul, MN 55102 • Est. 1933

DELTA TOOLS

34-444 Table Saw Complete w/1½ H.P. motor & stand 599.00

33-150 8¼"Saw Buck 549.00

33-890 12" Radial Arm Saw 1½ H.P. complete w/legs 1179.00

28-283F 14" Band Saw w/enclosed stand & ¾ H.P. motor 685.00

22-661 NEW 13" Planer 1095.00

17-900 16½" Floor Drill Press 385.00

40-601 18" Scroll Saw w/stand and blades 699.00

DELTA #34-080 10" MITRE BOX XTRA SPECIAL 189.00 List 289.00

TOOLS ON SALE™
AMERICA'S LOWEST PRICED TOOLS
FREE FREIGHT TO THE 48 CONTINENTAL STATES ON EVERY ITEM.
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

JET TOOLS

Model	Description	List	Sale
JBS-14MW	14" band saw, 1 H.P.	482	375
JTS-10	10" table saw w/stand, 1½ H.P.	554	435
JTS-12	12" tablesaw w/stand, 1½ H.P.	630	495
JWS-18	½" spindle shaper w/stand, 1 H.P.	479	365
JJ-4	4" jointer, ½ H.P.	310	269
JJ-6	6" jointer, ¾ H.P.	465	369
JWP12	12½" bench planer, 2 H.P.	569	385
JSG-6	6" x 48" belt & 12" disc sander, 1½ H.P.	634	485
DR1012	10" bench drill press, ⅓ H.P.	179	175
DR1458	14" bench drill press, ½ H.P.	279	259
DR1758	17" bench drill press, ½ H.P.	319	289
DR1458F	14" floor drill press, ¾ H.P.	369	339
DR1758F	17" floor drill press, ¾ H.P.	395	349
DR2501F	20½" floor drill press, 1 H.P.	655	529

JORGENSEN STEEL I-BAR CLAMPS

Model	Size	List	Sale
7224	24"	25.82	15.99
7236	36"	27.71	16.99
7248	48"	30.44	18.99
7260	60"	33.90	20.99

ADJUSTABLE HANDSCREWS BY JORGENSEN

Item No.	Jaw Length	Open Cap	List	Sale	Box of 6
#5/0	4"	2"	12.88	7.75	43.00
#4/0	5"	2½"	13.83	7.95	45.30
#3/0	6"	3"	14.83	8.35	47.60
#2/0	7"	3½"	15.94	8.95	51.00
#0	8"	4½"	17.74	10.25	58.40
#1	10"	6"	20.29	11.95	68.10
#2	12"	8½"	23.29	13.75	78.00
#3	14"	10"	29.53	17.85	101.75
#4	16"	12"	38.38	23.00	139.95

STYLE 37 2½" Throat ¼"x¾" JORGENSEN

Item No.	Jaw Length	List	Sale	Box of 6
3706	6"	8.86	5.75	32.50
3712	12"	9.81	6.25	35.00
3718	18"	10.83	6.85	37.50
3724	24"	11.83	7.35	40.00
3730	30"	13.19	8.25	45.00
3736	36"	14.43	8.95	49.00

PONY CLAMP FIXTURES

Model		List	Sale	Lots of 12
50	¾" black pipe clamps	12.48	7.50	80
52	½" black pipe clamps	10.41	6.00	65

STYLE J. ADJUSTABLE HANDSCREW KITS

Model	Length Jaws	List	Sale
J04	4	7.10	4.99
J06	6	8.13	5.29
J08	8	9.12	5.89
J10	10	10.66	6.39
J12	12	13.21	7.69

BOSCH

Model		List	Sale
1581VS	Top hdle. jig saw	239	129
1582VS	Barrell grip jig saw	225	123
	Bosch metal case for above jig saws	34	26
	Bosch blade assortment for jig saws 30 of Bosch's best selling blades		23.99
1942	Heat gun 650°-900°	99	69
3268	Heat gun 600° & 1000°	89	59
1272	3"x24" belt sander	279	159
1272D	3"x24" B.S. w/bag	299	168
1273	4"x24" belt sander	295	169
12730	4"x24" B.S. w/bag	315	178
11-212	Bulldog ¾" SDS rotary	339	189
1196VSRK	⅜" v/spd hammer drill	215	110
1198VSR	½" v/spd hammer drill	229	129
1608	5.6 amp lam trimmer	140	87
1608L	Same as above w/trimguide	145	89
1608T	5.6 amp tilt base trimmer	159	99
1609	5.6 amp offset base trimmer	205	122
1609K	Lam installers kit w/1609 Offset base, trimmer tilt base, trimguide, ¼" collet, collet nut, wrenches, hex keys and case	295	169
1601	1 H.P. Router 25,500 rpm	165	105
1602	1½ H.P. Router 25,000 rpm	199	125
1603	1½ H.P. D handle router	223	135
1604	1¾ H.P. 2 hdle. router	219	119
1604K	Same as above w/cse & access.	269	165
1606	1¾ H.P. D hdle. Router	243	145
3258	3¼" planer w/blade guard	210	129
3270D	3"x21" belt sander w/bag 5A	225	139
1273DVS	V/spd. 4x24 belt sander	339	189
1611	3 H.P. plunge router	349	198
1611EVS	"NEW" 3 H.P. elec. v/spd. plunge router	410	255
1651	7¼ circ. saw drop foot	179	99
1654	7¼ circ. saw pivot base	179	99
1922K	Cdlss. jig saw w/cse.	239	165
1632VSRK	Recip. saw 8.4A orb. v/spd.	225	135
11-304	"The Brute" breaker hammer	1950	1185

BOSTITCH AIR NAILERS

Model		List	Sale
N80C-1	Utility coil nailer	730	399
N80S-1	Stick nailer	760	409
T36-50	Sheathing & decking stapler	550	309
N12B-1	Coil roofing nailer	725	405
N60FN-2	Finishing nailer	595	349
T31	Brad nailer	245	149

DAVID WHITE
LP6-20 LEVEL PACKAGE
INCLUDING LEVEL, TRIPOD, ROD & CASE
LIST 290.00 SPECIAL SALE 205.00!

SENCO AIR NAILERS

Model		List	Sale
SFN1	Finishing nailer 1" - 2"	377	268
SFN2	Finishing nailer 1½" - 2½"	571	398
SN2	General purpose 1⅞" - 3"	621	445
M2	General purpose 1⅜" - 2"	475	349
SN4	General purpose 2" - 3½"	685	475
LS2	Pinner ⅝" - 1"	351	255
SKS	Stapler ⅝" - 1½"	351	245
LS5	Pinner, 1"-1½"	399	289
PW-RFR	Rooler, ½"-1¼"	351	249

WORKMATES By Black & Decker

79-029	#85, 18#	63.00	44.00
79-032	#200, 23#	103.00	69.00
79-033	#300, 28#	117.00	75.00
79-034	#400, 35#	152.00	99.00

BLACK & DECKER DEALS

1707	8½" crosscut mitre saw	813	469
1166	⅜" drill, 4A, 0-2500 rpm	96	55
2037	0-4000 5 amp drywall gun	160	92
1703	10" mitresaw w/73-700 blade	313	169
2660	0-4000 4.5 amp drywall gun	138	87
4015	½ sheet sander 3 amp	190	109
2600	⅜" 0-1200 4.5 amp drill	125	79
3047-09	7¼" super saw cat w/brake	282	168
3048-09	8¼" super saw cat w/brake	297	175
3157	Orb v/spd. jig saw	202	125
3153	V/spd. jig saw	195	120

BLACK AND DECKER
"NEW" 29 pce. Bullet Drill Bit Set
Model 14769 Black Oxide Bits
LIST 168.00 SPECIAL SALE 84.95

RYOBI SPECIALS

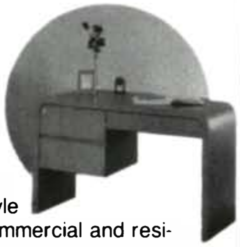
Model	Description	List	Sale
JP155	"NEW" portable 6" jointer/planer	545	329
R500	2¼ H.P. plunge router	326	159
TS25IU	10" mitre saw	392	179
TS25IUS	10" mitre w/acc. kit & 60 tooth carbide blade	435	219
AP10	10" surface planer 13 amp	820	358
RA200	8¼" radial arm saw	515	245
RE600	3 H.P. plunge router	398	199
R150K	1 H.P. plunge router w/cse	206	99
BE321	3"x21" v/spd. belt sander	259	125
BD1020ARK	7.2v cdls. drill w/cse	193	79

PORTER CABLE

630	1 H.P. router 6.8 amp	170	110
690	1½ H.P. router 8 amp	215	122
691	1½ H.P. router D hdle	235	133
536	1½ H.P. speedmatic router	310	195
518	3 H.P. 5 speed router	560	339
520	3 H.P. 15 amp router	510	319
309	3.8 amp lam trimmer	135	85
695	1½ H.P. router/shaper	299	195
696	H.D. shaper table	165	119
351	3"x21" belt sander w/o bag	215	125
352	3"x21" belt sander w/bag	225	129
360	3"x24" belt sander w/bag	310	179
361	3"x24" belt sander w/o bag	290	175
362	4"x24" belt sander w/bag	325	185
363	4"x24" belt sander w/o bag	310	179
7556	½" right angle drill	295	175
315-1	7¼" top hdle 13 amp circ saw	195	115
9315-1	315-1 comp. w/cse. & carb. bld.	225	129
617	7¼" pushhandle 13 amp	195	115
9617	617 comp. w/cse. & carb. bld.	225	129
368-1	8¼" top handle 13 amp	205	135
314	4½" trim saw 4.5 amp	205	119
548	X HD bayonet saw	255	165
9548	X HD bayonet saw w/case	275	175
9629	Recip saw v/sp 8 amp	230	135
9627	Recip saw 2 speed 8 amp	220	125
666	⅜" H.D. vsp drill 0-1200rpm	185	122
621	⅜" H.D. v spd. 0-1000 rpm	155	95
320	Abrasive plane 3 amp	150	99
9118	Porta plane 7 amp kit	325	189
9652	Versa plane 10 amp kit	430	275
7545	0-2500 drywall gun 5.2 A	169	105
7540	0-4000 5.2 amp gun	165	99
505	½ sheet pad sander	195	109
7511	⅜" v spd. drill 5.2 amp	185	105
7514	½" v spd. drill 0-750	195	114
303	Paint remover	230	149
304	7" disc sander 4000 rpm	195	125
305	7" disc polisher 2000 rpm	195	125
367	3¼" planer 6.5 amp	225	148
537	1½ H.P. D hdle router	325	205
7548	Top hdl jig saw 4.8 amp	215	125
7648	Barrel grip jig saw 4.8 amp	210	133
330	Speed block sander ¼ sht	97	58
555	Plate biscuit jointer w/cse.	280	165
345	6" saw boss 9 amp	160	99
5060	"Stair Ease" stair templet	194	129
5061	"Stair Ease" hard wood	204	139
659	0-4000 drywall gun 4 amp	130	79
100	⅞ H.P. router	160	99
5008	Dovetail template kit	99.50	75
5009	Mortise & Tenon jig	54.95	45
7308	laminate slitter	189	139
5116	omni-jig	395	269
9647	TIGER CUB recipro saw	185	119
9850	12 volt cordless drill w/cse.	210	129
8500	Extra 12v battery	48	33
	NEW Tools By Porter Cable!		
7399	5.6 amp drywall cutout unit	120	79
7310	5.6 amp lam trimmer	145	95
7312	5.6 amp offset base lam trimmer	209	125
7319	5.6 amp tilt base lam trimmer	165	105
97310	LAM TRIM KIT W/STD. BASE, TILT BASE, OFFSET BASE, SLITTERBASE, GUIDE & CSE	330	189
7334	37 amp 5" random orbit sander 6000 rpm	205	129
693	1½ H.P. plunge router	280	169
97750	½" v/spd hammer drill w/cse	260	169

FREE FREIGHT TO THE 48 CONTINENTAL STATES ON EVERY ITEM • GIFT CERTIFICATES NOW AVAILABLE

READER SERVICE NO. 68



16″ Motorized Bandsaw
16½″ Floor Drill Press
Super 10 Motorized Saw
6″ Motorized Jointer

CLASSIFIED

The CLASSIFIED rate is $5.75 per word, minimum ad 15 words. All payments must accompany orders; all are noncommissionable. The WOOD & TOOL EXCHANGE and SITUATIONS WANTED are for private use by individuals only; the rate is $8.00 per line. Minimum 3 lines, maximum 6 lines, limit 2 insertions per year. DISPLAY CLASSIFIED rates on request. Send to: *Fine Woodworking*, Advertising Dept., Box 355, Newtown, CT 06470. Deadline for the *November/December* issue is August 25.

Business Opportunities

FURNITURE FACTORY FOR SALE IN BELIZE. Solid cash flow from ten years export business. $85,000. Terms available. Direct dial 011-501-922188.

STUDIO/SHOP SPACE FOR LEASE. GENOA now leasing space to professional furniture designer/makers, craftspersons, artists. Each studio resident enjoys full access to GENOA's comprehensive machine rooms, spray painting facilities and promotion through on-site gallery. To receive a copy of our catalog and more information, please contact: GENOA, Box 250, Academy St., Genoa, NY 13071. (315) 497-3000 or 889-7291.

INVENTORS! Call IMPAC. We submit ideas to manufacturers! For FREE information package call toll free in U.S. & Canada. 1 (800) 537-7984.

HAVE 5,000 SQUARE FEET FULLY-EQUIPPED SHOP with finish room, to share. Rural Maine (two hours from Boston, MA), $400/mo. Call (207) 452-2378.

DEALER INQUIRIES INVITED

We are a direct importer stocking all quality hand tools needed for a woodworking tool store or specialty department. Resale only—no enduser sales.

Robert Larson Company, Inc.
33 Dorman Avenue
San Francisco, CA 94124 (415) 821-1021

Help Wanted

CABINETMAKER/FURNITUREMAKER. Excellent opportunity for experienced woodworker in well-equipped shop located in central New Jersey. Must be able to produce extremely high-end work. Salary commensurate with abilities. Call (201) 442-4023.

APPRENTICE VIOLIN MAKERS and restorers: Positions available with finest rare violin shop in the country. Good salary and benefits, excellent training program. Professional woodworking experience required. Must be willing and able to learn. Bein & Fushi Inc., 410 S. Michigan Ave., Chicago, IL 60605.

CABINETMAKER REQUIRES FAMILIARITY with hand and power tools, shop specializes in fine wooden furniture and architectural woodwork. Kramer and Eiland Woodworking, PO Box 221, Washington, VA 22747. (703) 675-3882.

CUSTOM CABINET SHOP doing extremely high-end work looking for experienced finisher. Brooklyn, NY. (718) 237-2592.

APPRENTICESHIP: PRESTIGIOUS, HIGH-END FURNITURE STUDIO. Work with all hand and machine techniques. Some experience in basic power tools necessary. No tuition and no salary. Exchange 4 days of shop work for 1 day of own learning project with help in technique and design. Write, David Orth, 1107 Chicago Ave., Oak Park, IL 60302.

WORLD CLASS CONCEPTUAL SCULPTOR seeks nonpareil contemporary Renaissance person to supervise the technical design/fabrication/international installation of advanced/complex/exquisite/craft objects/constructions. Flexible salary/benefits/housing package. A unique opportunity for a uniquely talented individual. NYC. (718) 782-2319.

MASTER CARVER—high-quality manufacturer of antique reproduction picture frames seeking individual versed in European and American period styles for model making and production carving. Call (800) 847-4026.

EXPERIENCED CABINETMAKER custom furniture, salary negotiable, located Mt. Kisco, NY. Designs For Leisure, Ltd., 41 Kensico Dr, Mt. Kisco, NY 10549. (914) 241-4500.

CABINETMAKER WITH EXPERIENCE making 18th-century furniture. Top quality custom shop. Box 663, Paoli, PA 19301.

SMALL, CUSTOM, CABINET SHOP IN YONKERS, NY seeks experienced cabinet maker. Salary, medical insurance. EOE. Call Phillip Meskin: (914) 963-9292.

Situations Wanted

Self-disciplined, highly-motivated 29-yr.-old seeking apprenticeship with master craftsman in low production, high-end furniture/woodworking shop. (703) 698-6821. Rural location preferred.

Instruction

INDIVIDUAL INSTRUCTION learning milling, solar kilning, designing and making custom furniture. Student product development. Geoffrey Noden, Trenton, NJ. (609) 890-8152 or (609) 895-0511, graduate Parnham House, Dorset, England.

LEARN WOODEN BOAT BUILDING AND DESIGN. Two full-time residential programs that offer intensive training in a creative but disciplined environment. V.A. approved. Accredited member, NATTS. Financial aid available. Equal opportunity enrollment. The Landing School, Box 1490F, Kennebunkport, ME 04046. (207) 985-7976.

WOODWORKING & LUTHIERY SCHOOL. One-year intensive woodworking program. Four-month guitar-building course. Financial aid. Accredited member NATTS. Free brochure. Roberto-Venn School of Luthiery, 4011 S. 16th St., Phoenix, AZ 85040. (602) 243-1179.

APPRENTICESHIP IN PROFESSIONAL FINE FURNITURE MAKING with the prominent Jeffrey Greene Design Studio—realistic preparation for an uncompromisingly vital career as an independent artisan designing, making, marketing the very finest furniture in solid walnut/rosewoods. Tuition. Write for brochure. 94 New St., New Hope, PA 18938.

RUSS ZIMMERMAN'S
HOUSE OF WOODTURNING
Turner's Workshops and Supplies. Call or write for free brochure.
RFD 3, BOX 242
PUTNEY, VERMONT 05346
802-387-4337

THE HYMILLER SCHOOL OF FINE FINISHING/REPAIR AND HAND JOINERY. One two-week intensive in-shop training will give you all the necessary knowledge to start your own business. Send $5 for complete info package. 3rd generation master craftsman. 912 Lakeshire Dr., Fairfield Glade, TN 38555. (615) 484-9309.

MIDWEST WINDSOR CHAIRMAKING. Five-day live-in classes with Peter Cullum. October 9-13, or November 1-5. Other dates available. For brochure, contact The Dovetail Joint, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677.

GILDING WORKSHOPS. Intensive courses in applying gold leaf embellishment to carving, frames, furniture, glass, and interior and exterior ornament. Individualized instruction in traditional methods by leading British gilder: Frances Binnington. Courses held in both the U.S. and London, England. For details write Peter & Frances Binnington Inc, c/o Kelly Ingram, 7 Belmont Circle, Trenton NJ 08618. Tel. (609) 392-5252, or P & F Binnington, 65 St. John's Hill, London SW11 1SX, England. Tel. (011.44.1) 223-9192.

CHICAGO SCHOOL OF VIOLIN MAKING. Full-time, 3½-year program under direction of master violin maker. Traditional methods of violin construction and repair taught; applications being accepted for 1990. Write C.S.V.M., 3446 N. Albany, Chicago, IL 60618. (312) 478-0505.

LEARN TO TURN WOOD. Precision lathe work for fun and fine products taught by JAMES L. COX WOODWORKING SCHOOL. Free brochure. Rd 2, Box 126, Honey Brook, PA 19344. (215) 273-3840.

PENLAND FALL '89
WOOD
9/18 – Bob Ingram
10/16 – Jim Kirkpatrick
11/16
PENLAND NC 28765
704•765•2359

For a catalogue describing our two year educational program in the fine art of furniture making, contact:
GENOA
Box 250F
Academy Street
Genoa, NY 13071
Furniture Making Education, Studios and Gallery
315•497•3000
315•889•7291
GENOA does not discriminate with regard to race, religion, color, creed, national origin, sex, sexual orientation, marital status, age or handicap.
GeNOA

Finishes

LOC—LAMIN WOODFINISHING PRODUCTS. Best of both worlds. Protection of a urethane varnish and the looks of a hand-rubbed finish. VAR-TUNG, PO Box 1299, APX-NC 27502. (919) 362-0323.

SPRAY-ON-SUEDE LINING. Finish any project with a soft touch. Free brochure (sample enclosed). Donjer Products, Ilene Court—Bldg. 8F, Belle Mead, NJ 08502. (800) 336-6537.

POLYESTER WOOD FINISH. A complete line of professional products for producing the ultimate piano/high tech finish. Clears, custom colors. Catalog $2. Donald M. Steinert, Dept. FW, 800 Messinger Rd., Grants Pass, OR 97527. (503) 846-6835.

FORMULATED OIL FINISHES. Your specifications or mine. For professional use. 55 gal. drums or less. Frank Welles (800) 322-1245.

THE FINE GOLD LEAF PEOPLE ™
Genuine, Imitation and Variegated Sheets & Rolls
Brushes, Supplies & Technical Books
IN USA: *Three Cross Street Suffern, NY 10901-4601 1-800-283-5323*
IN CANADA: *508 Douglas Avenue Toronto, Ontario, M5M 1H5 416-787-7331*
"WORK WITH THE BEST IN THE BUSINESS"

Swedish Wood Dyes *Beautiful, brilliant colors. **Imported and unique.** Inexpensive, non-toxic. Professionally used. **$3 for sample and brochure.***
Thore Henningson, P.O. Box 6004, Dept. FW, Rockford, IL 61125

Glues/Adhesives

HIDE GLUE—ALL GRADES, 5# AND UP. Bjorn Industries, Inc., Box 1280, Matthews, NC 28106. (704) 845-2288.

Building? Restoring? Repairing?
use **CHEM-TECH T-88** the epoxy professionals use! Strength and reliability proven in boats and aircraft over 15 years. Introductory offer 1/2 pt. of T-88 $9.95. Technical staff on call to answer your questions. Call or write.
4469-F Lander Rd
Chagrin Falls
OH 44022
(216) 248-0770

Musical Supplies

GUITAR SUPPLIES, KITS AND REPAIR TOOLS. Hot Stuff™ super glues, finishing supplies. Free 96-page catalog. Stewart-MacDonald, Box 900F, Athens, OH 45701. (800) 848-2273.

VIOLIN, GUITAR, banjo, mandolin-making materials, accessories, books. Catalog, $1. International Luthiers Supply, Box 580397, Tulsa, OK 74158.

HAMMERED DULCIMER PLANS! By noted builder Charlie Alm. Best book on subject. $19.95. Woodworks, Box 428, Dept. FW, Brookston, IN 47923. (317) 563-3504.

LUTHIERS' SUPPLIES: Imported tonewood, tools, varnishes, books, plans, parts, accessories, strings, cases, for violins, violas, cellos, basses and guitars. Assemble-yourself violin and guitar kits. Catalog, $50, includes 10% discount certificate. International Violin Company, Ltd., Dept. WZ, 4026 W. Belvedere Ave., Baltimore, MD 21215.

Services

ROUTER BITS AND SHAPER CUTTERS CUSTOM BUILT to your specifications. For info call or write: True Cut Tool Corp, 1074 Hwy 93 South, Victor, MT 59875. 1-800-262-2487.

BRANDING IRONS. Names, signatures, logos, any size, design. Norcraft Custom Brands, Box 277F, So. Easton, MA 02375. Telephone (508) 238-2163 anytime.

Accessories

CUSTOM BRANDING IRONS
DRILL PRESS or HANDHELD
250 to 800 watts
SEND $1.00 FOR BROCHURE
ENGRAVING ARTS (707) 984-8203
P.O. Box 787 FAX (707) 984-8045
Laytonville, CA 95454

LEATHER AND RELATED SUPPLIES for upholstering, desk tops, straps. 32-page direct mail catalog, $3; upholstery samples, $4. BERMAN Leather, 25WW Melcher St., Boston, MA 02210. (617) 426-0870.

WHITECHAPEL BRASSES LTD.
FINEST HARDWARE
P.O. BOX 136 - 3650 W. HIGHWAY 22
WILSON, WYOMING 83014
(307) 739-9478
LOCKS • HANDLES • DRAWN HINGES • ETC
PROMPT SERVICE
CATALOG $2.00

FILTER BAGS FOR DUST COLLECTION: fine sanderdust replacement and custom bags. Fabric $12/yd. ppd. Free system plans. Barter Enterprises, Box 102B, Prospect Harbor, ME 04669.

FREEBORN SHAPER CUTTERS. Power tools—parts—accessories. Capitol Carbide. Visa/MC, COD, check. Minn. (612) 644-9622. 1-800-328-8152.

BYROM PROFESSIONAL ROUTER BITS. New vertical raised-panel cutters, 25% off list. Over 600 styles available. 1-800-752-0725.

THE BEALL TOOL CO.
NOW WITH LEFT & RIGHT HAND THREADS
The ultimate wood threading device. Attaches to your router & makes perfect ⅜",½",⅝",¾, and 1" threads. For information: Dept. FW 541 Swans Rd., N.E. Newark, OH, 43055. (614) 345-5045; (800) 331-4718

BUY DIRECT!
3" lock-notch shaper collars, ¾"-1-¼" arbors **$54.95.**
Pattern knives for shapers and Belsaw, Sears, RBI, and Woodmaster type planers.
12" planer blades **$19.95.**
Also shaper & molder tool steel bars.
Other patterns available.
WDR SALES
9604 Belmont, Kansas City, MO 64134
1-800-444-2755

Plans & Kits

CARLYLE LYNCH'S MEASURED DRAWINGS of museum-quality antiques. Cat. $2, refundable. 196F Holly Hill, Broadway, VA 22815.

BOOKCASES, ENTERTAINMENT CENTERS, waterbeds, bedroom and children's furniture, etc. Catalog $3.75 (refundable). Over 70 professionally-designed plans! Kraemer Furniture Designs, 1350 Main St., Plain, WI 53577.

PLANS FOR BEAUTIFUL WOOD DISPLAY STEAM LOCOMOTIVES. Send $1 for descriptions and prices. Steamer Plans, Dept. F, 4341 Avon, Independence, MO 64055.

DOVETAIL ROUTER JIG: 24-in THROUGH AND 18-in HALF BLIND. Plans $8.50, or send $1 for info to: Mark Tobias, Box 124 (FW), New Holland, IL 62671.

BUILD BEAUTIFUL GRANDFATHER CLOCKS FROM PLANS OR KITS. Catalog $2. Kuempel Clocks, 21195 Minnetonka Blvd., Excelsior, MN 55331.

MAKE WOODEN TOYS, whirligigs, door harps, doll houses, clocks, music boxes, weather instruments, crafts, furniture without plans, parts, kits, supplies. Catalog $1. (614) 484-4363. Cherry Tree Toys, Belmont, OH 43718-0369.

Publications

INFORMATIVE CATALOG FOR WOODWORKERS, woodcarvers, upholsterers, antique restorers. Many unusual, hard-to-find items. Send $1 to Van Dyke's, Dept. 71, Woonsocket, SD 57385.

THE TOOL CHEST CRAFTSMAN LIBRARY CATALOG . . . for both the professional and amateur.
100's OF BOOKS COVERING
• Woodworking – All Aspects
• Home Remodeling & Maintenance
• Tools & Their Uses
• Projects For Home & Recreation
• Contracting
To order your catalog send $2.00 (refundable with 1st order) To: THE TOOL CHEST Dept. T 45 Emerson Plaza East Emerson, NJ 07630

WOODWORKING BOOKS
LARGE SELECTION, FREE LIST DISCOUNT PRICES
BARK SERVICE CO. P.O. BOX 637FW TROY, NC 28166
CALL TOLL FREE 1-800-999-2275
"We're better than a book club"

ANTIQUE TOOLS

PRICE GUIDE TO OLD TOOLS
5,000 items priced & illus. (1840-1940). Adzes, axes, braces, bitstocks, chisels, coopers tools, compasses, hammers, levels, planes, plumb bobs, routers, rules, saws, spokeshaves, trammels, and wrenches. 9x12 vol., 230 pgs. Rush $12.95 plus 1.05 post.
Windmill Publishing Company
Dept. FW, 2147 Windmill View Rd.
El Cajon, CA 92020

Hand Tools

NEW ENGLAND AREA. Call us about your industrial machinery needs. New, used, rebuilt. Woodshop Machines, Inc., 57 Regional Dr., Concord, NH 03301. (603) 228-2066.

JAPANESE TOOLS SINCE 1888. Free catalog. Tashiro's, 1435 S. Jackson, Seattle, WA 98144. (206) 322-2671.

GERMAN MASTER JOINERS BENCH was $1200. On special, $799. Other benches as low as $399. Professional advice with every purchase. Send $5 for tool catalog and tesimonials. John Hymiller Woodworker, 912 Lakeshire Dr., Fairfield Glade, TN 38555. (615) 484-9309.

TOOLS—ANTIQUE & USED—STANLEY. Quality selection of many, hard-to-find hand tools. Satisfaction guaranteed. Prompt, postpaid service. VISA/MASTERCARD. Current illustrated list $2. Subscription $8./yr., 5 lists. Bob Kaune, 511 W. 11th., Port Angeles, WA 98362. (206) 452-2292.

VISIT: WOODCARVERS STORE—SCHOOL. Thousands of chisels, gouges, patternmakers' tools, drawknives, power carving supplies. Books, machinery. 3056 Excelsior Blvd., Minneapolis, MN 55416. (612) 927-7491.

FLEETWOOD TOOL SUPPLY
A UNIQUE STORE FOR THE WOOD CRAFTSMAN, PROFESSIONAL AND VALUE CONSCIOUS NOVICE.
QUALITY HAND, POWER AND STATIONARY WOODWORKING TOOLS, BOOKS AND ACCESSORIES.
QUALITY • VALUE • HELPFULNESS
3241 KENNEDY RD. UNITS 7 & 8, SCARBOROUGH ONTARIO, CANADA M1V 2J9
(416) 293-8624 FAX (416) 293-2076

CHAIR, STAIR, FURNITURE BUILDERS
Single pass copy lathes, free hand lathes, and a spiral and fluting machine from **KILLINGER** for all your turned pieces. **REED** manganese bronze planes return the joy to hand planing. **ULMIA** workbenches, made-to-order **Bandsaw Blades**, and **Micro-Sharp** planer knife sharpening also available. Send $1.00 to:
Willow Pond Tools, Inc.
PO Box 544, Pembroke, NH 03275
(603) 225-9477

Power Tools

"WOODCARVER'S ATTENTION" Foredom discounted 25% off list. Automach Power Chisels 20% off list. Karbide Kutzall discount. Write or call for FREE catalog: "Andy's Midwest Woodcarvers", Box 346-FW, Bloomingdale, IL 60108. (312) 893-7319.

WOODWORKING Tools
1-800-872-6500
emco • USA MiniMax JET
Plus many other manufacturers

BLUE RIDGE MACHINERY AND TOOLS, INC.
P.O. Box 536-FW • Hurricane WV 25526
Showroom—2806 Putnam Avenue • Catalog $1.00

FLEETWOOD TOOL SUPPLY
YOUR BEST CHOICE FOR GENERAL
WORLD RENOWNED TOP QUALITY WOODWORKING MACHINERY FROM CANADA. FOR THE CRAFTSMAN AND THE NOVICE. CONTACT US AT
3241 KENNEDY RD. UNITS 7 & 8, SCARBOROUGH ONTARIO, CANADA M1V 2J9
(416) 293-8624 FAX (416) 293-2076

WIDEBELT SANDERS

For the small shop, kits or ready to run, 24" capacity, quick change belts, conveyor feed, rugged, accurate + affordable. Free information.
MILLER WOODWORKING MACHINES
1110 E. QUILCENE RD.
QUILCENE, WA 98376
(206) 765-3806

Videos

FINE WOODWORKING "VIDEOLOG"-- Send for your 50-minute sampling of the world's most in-depth woodworking videos. Includes tips on finishing, turning, furniture repair, workshop techniques and other related subjects. Available VHS or Beta. $5 fee is good toward your first order. *Write: The Taunton Press, Attn; Video Dept., 63 South Main St, Box 355F, Newtown, CT 06470. Or call toll-free 1-800-888-8286.*

Wood

TIGER MAPLE, FIGURED CHERRY & OAK. Heavy stock a specialty. Eastwoods Co., RD #1, Hornell, NY 14843. (607) 698-4490.

WIDE WALNUT LUMBER—1⅛ in. & 2⅛ in. Call W. Gerry Grant, Gettysburg, PA. After 6 pm, (717) 528-4496.

QUILTED & CURLY MAPLE 5/4, 8/4. Wide instrument stock available. Mac ebony lumber, boxwood logs, other exotics. Arroyo Hardwoods, 2585 Nina St., Pasadena, CA 91107. (818) 304-0021.

Sandy Pond Hardwoods
Your TIGER and BIRDSEYE Maple Specialist and other Native Figured Hardwoods
CHRIS S. POND
921-A Lancaster Pike, Quarryville, PA 17566
(717) 284-5030

ROSEWOOD FALL SALE. Mill ends, shorts, lumber. Pine Creek Wood Co., PO Box 588, West Linn, OR 97608. (503) 636-6430.

EAST MOUNTAIN HARDWOODS, Rte. 7, Box 31H, Sheffield, MA 01257. Select oak, cherry, maple, ash, butternut, walnut, mahogany, tulip, pine, plank flooring, butcher block, hardwood plywood, custom milling. Toll free: MASS., 1-800-551-5028; Northeast 1-800-521-2019.

MESQUITE LUMBER. SASE for prices. Include $2 for sample. H. Nordmeyer, PO Box 68, Knippa, TX 78870.

WALNUT-CHERRY AND MANY OTHER FINE CABINET WOODS. Widths up to 32 in. NO MIN. Days, nights, weekends, G&H Lumber, 109 Creek Rd., Landenberg, PA 19350. (215) 274-8810 or (717) 548-3834.

HOMESTEAD HARDWOODS, 2111 Messick Rd., N. Bloomfield, OH 44450. (216) 889-3770. Kiln-dried ash, basswood, butternut, cherry, chestnut, curly maple, oak, poplar, sassafras, walnut.

REDWOOD LACE BURL, OTHER WESTERN SPECIES, squares, slabs, whole. Western lumber, figured lumber, rare woods, sample kits. SASE list. Eureka Hardwood Supply, 3346 D St., Eureka, CA 95501. (707) 445-3371.

California Woodworkers-Restorers
Your source for: exotic veneers, hardwoods, inlays, tools, hardware, moldings, craft books, finishes, cane, etc. Exclusive supplier of Constantines of New York, quality products.
Constantines Wood Products, Inc.
5318 W. 144th St., Lawndale, CA. 90260
(L.A. area) 213-643-8484

GILMER WOOD CO.
503-274-1271
Rare & Exotic Woods
• in logs, planks & squares
• over 50 species in stock
• also cutlery, turning & musical instrument woods
2211 NW St. Helens Rd., Portland, OR 97210

VENEER
★ HIGHEST QUALITY ★ FULL LENGTH
★ LARGE SELECTION
★ LOWEST PRICES
"Let us show you why we're North America's fastest growing veneer supplier."
RETAIL OR WHOLESALE

certainly wood
Write for free brochure or call.
11753 Big Tree Road, East Aurora, N.Y. 14052
(716) 655-0206

GUARANTEED CLEAR cocobolo, squares, lumber, cants, bocote, ebony, koa, lignum, cirocote. Custom kiln drying available. Tropical Timber Corporation: (503) 621-3633.

MESQUITE LUMBER. New. Exotic. Direct from sawmill. Rough sawn or custom planed. Random lengths. Also End-Cut and plank FLOORING. Algaroba of Texas, Inc., PO Box 203, Brady TX 76825. Phone (915) 597-2681.

CURLY, BIRD'S-EYE AND QUILTED MAPLE. 4/4 - 12/4. Also myrtle and cherry. Bill Largent, San Luis Obispo, CA. (805) 544-9663.

SELECT & BETTER: Cherry $2.07/bf., hard maple $1.52/bf., red oak $2.32/bf. Additional species. MasterCard—Visa. Catalog $1. Badger Hardwoods, Rt. 1 Box 262, Walworth, WI 53184.

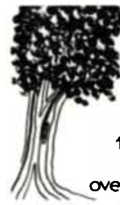
AFRICAN EBONY SUPER PRICE direct from importer. Wholesale/retail. SASE for information. R.S. Newman, 89 Canal St, Rochester, NY 14608. (716) 328-1577.

SAWMILL DIRECT—FAS—PREMIUM QUALITY: Snakewood, cocobolo, bocote, burls, ebony, lignum vitae, ziracote, jelutong. SPECIALS: walnut burl, boxwood $1.25/lb., spalted beech $6.50/bf. LUMBER LOGS, CROTCHES, BOWL, SQUARES, CARVING STOCK. Over 60 species stocked. SASE for list: CUT & DRIED QUALITY HARDWOOD, 143 Cedros Ave., Solana Beach, CA 92075. (619) 481-0442. Wholesale and dealer inquiries: Tropical Exotic Hardwoods of Latin America, PO Box 1806, Carlsbad, CA 92008. (619) 434-3030.

HIGHLAND HARDWOODS Hardwood Distribution Center, Route 125, Brentwood, NH. Kiln-dried red oak, cherry, maple, ash, butternut, walnut, poplar, birch, pine and hardwood plank flooring. Mail: P.O. Box 426, Kingston, NH 03848. (603) 679-1230.

EXOTIC, HIGHLY-FIGURED FLAME BURLS from logger/sawmill. Any size, thickness, dryness, quantity. Bruce Remington, (707) 442-1319.

CURLY MAPLE LUMBER in Cincinnati, Ohio area. Will ship. Wholesale prices. (513) 932-2472.



Purple Heart $2.50
RIVERSIDE *Fine Woods*
New Orleans, La.
1-800-669-6624
over 75 species in stock

UNICORN
UNIVERSAL WOODS ltd
OVER 90 SPECIES IN OUR LARGE INVENTORY OF QUALITY MATERIAL
EXOTICS-DOMESTICS-MILLWORK
VENEER-MAIL ORDER-FREE CATALOG
4190 Steeles Ave. West, Woodbridge Ontario Canada L4L 3S8
CALL US AT (416) 851 2308

ATTENTION:
FLORIDA WOODWORKERS
We have Florida's largest selection of exotic and native hard and soft woods, table slabs, veneers, etc. for the professional and novice. Send $1.00 for list.
HENEGAN'S WOOD SHED
7760 Southern Blvd.(FW), West Palm Beach, Fl 33411
Call (407) 793-1557

WESTERN PENNSYLVANIA WOODWORKERS
50 Domestic & Imported Woods
Veneers • Finishes • Mouldings • Hardware
Carving Stock • Inlays & Bandings
Plans • Books • Magazines • Quality Tools
Call or Visit Our Store
WOODCRAFTERS' SUPPLY
7703 Perry Hwy. (Rt. 19)
Pittsburgh, Pa. 15237 (412)367-4330

Flooring
Oak 21/4 strip No. 2 $.75 BF
Heart Pine, Cherry, Walnut, Maple, Hickory, Pine
Harmony Exchange
Rt.2 Box 843-W Boone NC28607 704-264-2314
Timbers Logs Stress-Skin Panels Paneling Decking Siding

Wood Parts

WOOD & TOOL EXCHANGE

Limited to use by individuals only

For Sale

Rotary Phase Converter. Converts single phase to three phase. $500. (603) 542-5900.

Mahogany flooring left over from 1939 World's Fair. T & G, end matched, 3/4 by 2½ by 12½-inches, 250 sq. ft. $3000, OBO. Call (609) 397-4149, or 397-4837.

12/4 mahogany. Excellent quality. $2.25/b.f. Call evenings (301) 374-6517.

INCA 550 10¼-in. jointer/thickness planer $1100; INCA 259 10-in. cabinetmaker saw with mortise attach. & other access. $1000. Both excel. cond. (612) 879-2512 (w), 476-8473 (h).

20-in. Powermatic bandsaw. Model 81, 2HP, 1PH, magnetic controls. Good condition $1800. (802) 875-3496.

Stern/Vent dust collection system, 7½HP, 3PH, selling with 6 bags, holds 2350 cf., $1400. (603) 542-5900.

Fine Woodworking complete, excellent condition, $225, plus UPS. R. Cushman, Worcester, MA (508) 753-5652.

Complete set of *Fine Woodworking*, issues, 1-77. Also 52 additional issues, all excellent condition. Call Joe (203) 468-0234.

Dowel Machine—German, ½-in. by ¾-in. capacity, 3PH, $2000, plus ship. Will crate for shipping. (609) 267-4785.

Wanted to Buy

Used carving duplicator, prefer 12 spindles or larger. Gruss, 6300 Smithtown Rd., Excelsior, MN 55332. (612) 474-7195.

Desire to purchase Acorn Design (Peter Shapiro) workbench, new or used. Robert Rix, Co. Carpenters and Joiners, PO Box 5155, Arlington, VA 22205. (703) 532-7786.

Willing to trade for *Fine Woodworking*, issue 41, any of the following: 9, 10, 11, 13, 15, 16, 17, 19, 20, 37. (513) 481-1471.

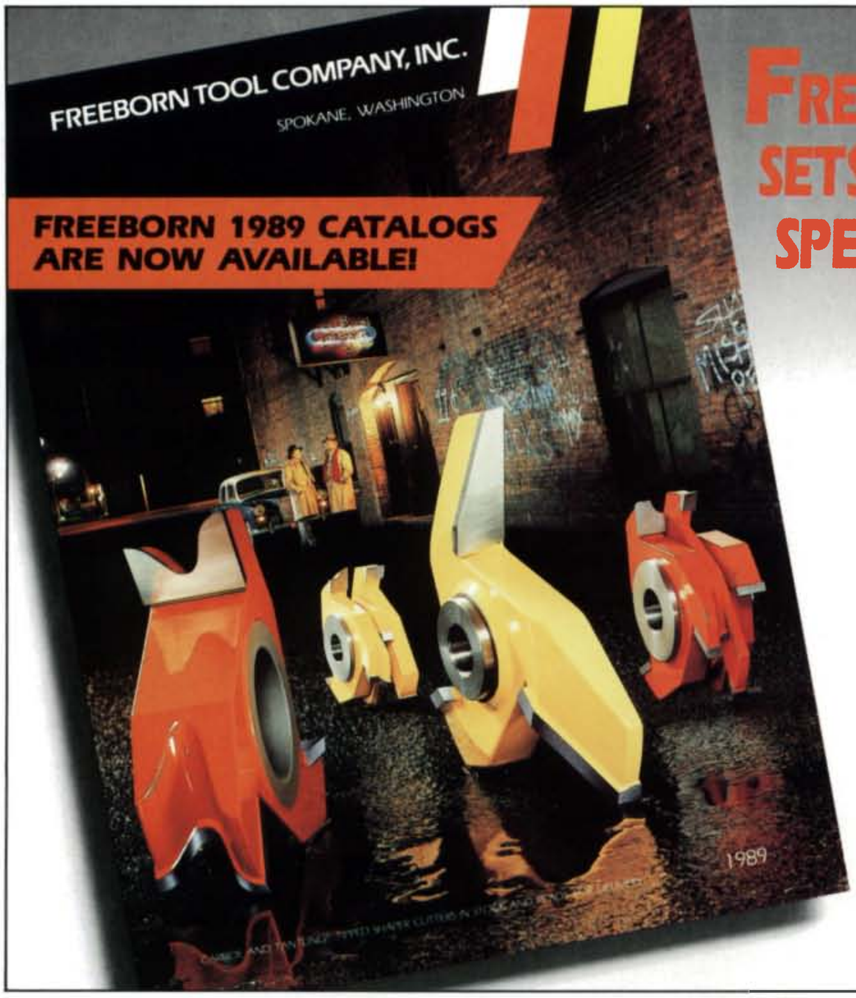
Miscellaneous

SLIPCASES FOR YOUR BACK ISSUES. Bound in dark blue and embossed in gold, these durable cases will protect your back issues of *Fine Woodworking* and help you keep order on your bookshelf, (or your shop). Each case holds 6 issues of the magazine—more of our earlier, thinner issues. The cost is $7.95 each, $21.95 for 3, $39.95 for 6. Add $1.00 for p and h, outside the U.S., add $2.50 each (U.S. currency only, please). PA residents add 6% sales tax. JESSE JONES INDUSTRIES, Dept. FWW, 499 E. Erie Ave., Philadelphia, PA 19134. Charge orders: Min. $15.00 call toll free (800) 972-5858. 7 days, 24 hours.

Fine Woodworking Subscriber List Service

We occasionally make our subscriber list available to companies whose products we think may be of interest to you. If you prefer not to receive this mail, just send your mailing label (or an exact copy) to the address below. We'll take care of the rest.

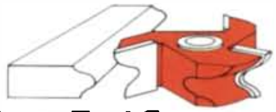
Subscriber Service Dept.
The Taunton Press
Box 355, 63 South Main Street.
Newtown, Connecticut 06470



FREEBORN COPE & PATTERN SETS. TOP QUALITY AT A SPECIAL PRICE.

SAVE ON ALL SIX AND EIGHT PIECE C&P SETS!

Prices Effective Feb. 1 through April 30, 1989	**List Price** Mini-Pro	Pro-Line
6 Piece Carbide	$255	$326
6 Piece Tantung	$275	$346
8 Piece Carbide	$375	$516
8 Piece Tantung	$395	$536
Glass Panel Carbide	$145	$165
Glass Panel Tantung	$165	$185



Freeborn Tool Company, Inc.
3355 E. Trent Avenue • Spokane, WA 99202-4459

CALL FOR THE DEALER NEAREST YOU
1-509-535-3075

The colors yellow and orange are trademarks of Freeborn Tool Company, Inc.
Tantung® is a registered trademark of Fansteel VR/Wesson

READER SERVICE 93

12 SHOWS IN FALL 1989!

Free Workshops ★ 100 Exhibits ★ Win a Jeep 4x4

★ The Woodworking Shows ★

machinery
tools • supplies

SEE THE WIDEST VARIETY OF WOODWORKING PRODUCTS UNDER ONE ROOF
Hundreds of Items
Machinery • Power & Hand Tools • Supplies

Sept. 8-9-10	Greater Cincinnati	Cincinnati Convention Center
Sept. 15-16-17	Twin Cities	St. Paul Civic Center
Sept. 22-23-24	*Metro-Detroit	Cobo Hall, Detroit
Sept. 29 - Oct. 1	Western Washington	Seattle Center
Oct. 6-7-8	*No. California	Cow Palace, San Francisco
Oct. 13-14-15	Baltimore/Washington	Festival Hall, Baltimore
Oct. 20-21-22	Pittsburgh Tri-State	Pittsburgh ExpoMart, Monroeville
Oct. 27-28-29	Central Florida	Curtis Hixon Conv. Ctr., Tampa
Nov. 3-4-5	Oregon	Portland Memorial Coliseum
Nov. 10-11-12	So. California	Los Angeles County Fairgrounds
Nov. 17-18-19	San Diego	Convention & Perf. Arts Center
Dec. 1-2-3	Delaware Valley	Garden State Park, New Jersey

**Special Woodworking/Home Improvement Show*

Seminars by Ian Kirby - Roger Cliffe - Bob Rosendahl
Rude Osolnik - Nick Cook - and other Master Craftsmen

1-800-826-8257 or 213-477-8521
Call for free brochure, 8:30 - 5 Pacific Time

Save $1 off reg. $6 admission with this ad

READER SERVICE NO. 91

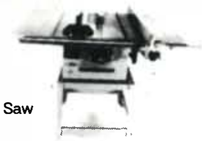
WILLIAMS TOOL & HARDWARE SUPPLY

EST. 1946

Send for FREE Catalog!
(Include area code & phone no. to be used as cust. no.)

1-800-338-6668

Satisfaction Guaranteed. Merch. shipped complete w/ factory standard accessories



DELTA

10" Contractor's Saw
$639⁰⁰
#34-444

34-429	10" Tilt Arbor Bench Saw	1080
34-782	Unisaw	1725
34-740	Super 10" Table Saw	395
34-670	10" Table Saw	330
33-050	Sawbuck Trim Saw	550
34-985	Prod. Stock Feeder	599
34-995	Prod. Stock Feeder 3ph.	839
34-994	Prod. Stock Feeder	899
28-283	14" Band Saw 3/4 hp	699
28-243	14" Band Saw 1/2 hp	519
33-890	12" Radial Saw	1200
33-990	10" Radial Saw	568
37-350	8" Precision Jointer	1460
37-154	6" Jointer DJ-15	1028
37-280	6" Motorized Jointer	350
43-122	Wood Shaper	615
34-080	10" Motor. Miter Box	214
17-900	16-1/2" Drill Press	349
34-330	8-1/4" Bench Saw	239
40-601	18" Elec. Scroll Saw	699
31-340	1x42" Belt/Disc Sander	179

ELU

$266
#3338
2-1/4 hp Elec. Plunge Router

3337	2-1/4 hp Plunge	247
3304	1 hp Electronic Plunge	180
3303	1 hp Plunge	145
4024	3x21 Electrnc Belt Sndr	206
4023	3x21 Belt Sander	192
3375	Universal Planer	195
3380	Jointer/Splinter	325
4029	4"x24" Belt Sander	325
40900	Router Acess. Kit	135

Freight paid on most items
2017 WHITE SETTLEMENT ROAD
FORT WORTH, TX 76107
Limited Quantities-Errors Subject to Correction

BOSCH

1-3/4 hp Router
$122 — #1604

1581VS	VS Orb. Jig Saw	$131
1611	3 hp Plunge Router	201
1198VSR	1/2" VSR Ham. Drill	128
1196VSR	3/8" VSR Ham. Drill	110
1609K	Laminate Kit	159
1582VS	VS Orb. Jig Saw	121

HITACHI

1/2" Super Duty Router
$169
TR12

CB75F	Band Saw	$1795
C15FB	15" Hvy Duty Miter Saw	374
C8FB	8" Compnd Miter Saw	489
TR8	1/4" Hvy Duty Router	124
#F1000A	12" Planer Jointer	1650

RYOBI

10" Surface Planer
$359
#AP10

RE600	3 HP Router	$199
BE321	3x21" VS Belt Sander	123
R500	2-1/4 HP Plunge Router	157

PORTER CABLE

$55
#330
Speed Bloc® Sander

690	Router, 1-1/2 hp	$118
100	Router, 7/8 hp	90
691	D Hndl Router 1-1/2 hp	132
7548	VS Top Hndl Jig Saw	124
555	Plate Joiner	160
	Biscuits pkg	27

READER SERVICE NO. 88

READER SERVICE NO. 157

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

ARIZONA: **Exhibit**–New works in clay, wood and bronze by Christine Federighi, Sept. 11–Oct. 28. The Hand and the Spirit Gallery, 4222 N. Marshall Way, Scottsdale, 85251. (602) 949-1262.

CALIFORNIA: **Juried show**–Artistry In Wood '89, Aug. 25–Oct. 29. Weekends only. The Sonoma County Museum, 425 Seventh St., Santa Rosa. (707) 579-1500.
Juried exhibit–"The Fine Art of Woodworking," Sept. 2–Oct. 29. For info., contact Highlight Gallery, 45052 Main St., Box 1515, Mendocino, 95460. (707) 937-3132.
Show–The Woodworking Show, Oct. 6–8. San Francisco Cow Palace, Geneva Ave. & Santos St., Daly City. Contact Michelle Troop, 1516 S. Pontius Ave., Los Angeles, 90025. (213) 477-8521.
Juried show–"California Woodworking 1990," Jan. 12–Feb. 9. Open to California woodworkers. Entries deadline: Oct. 31. For information and prospectus, contact Bill Docking, 3501 Teton Dr., Fullerton, 92635. (714) 526-7100.

COLORADO: **Juried exhibit**–The 5th annual juried exhibition, Sept. 17–Oct. 29. Colorado Springs Pioneer Museum, Colorado Springs. Entries deadline: Sept. 8–9. Contact The Woodworkers Guild of Colorado Springs, 918 N. Royer St., Colorado Springs, 80903. (719) 632-8548.

CONNECTICUT: **Workshops**–Woodworking workshops in Brookfield, Sept. thru Nov.; in Sono, Oct. 28–29. Contact Brookfield Craft Center, Box 122, Route 25, Brookfield, 06804. (203) 775-4526.
Juried show–11th Annual Holiday Exposition of crafts and fine art, Nov. 4–Dec. 23. Mill Gallery, Guilford. Deadline: Sept. 15. Contact Patricia Seekamp, Guilford Handcrafts Inc., Box 589, Guilford, 06437. (203) 453-5947.

FLORIDA: **Juried show**–27th Annual Coconut Grove Arts Festival, Feb. 17–19. Submission deadline: Sept. 15. Contact Terril Stone-Ketover, C.G.A.F., Box 330757, Coconut Grove, 33233. (305) 447-0401.
Juried show–4th Annual Starke Festival of the Arts, Oct. 28–29. Slide submission deadline: Sept. 30. For application, contact Nancee Clark, Box 1530, Gainesville, 32602. (904) 395-5159.
Show–The Woodworking Show, Oct. 27–29. Curtis Hixon Convention Center, 600 Ashley Dr., Tampa. Contact Helen Fillman, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

GEORGIA: **Show**–Art Buyers Caravan show, Sept. 9–11. Atlanta Merchandise Mart, Atlanta. Contact Paul Karel, ABC, 408 Olive St., St. Louis, MO 63102. (314) 421-5445.
Juried exhibit–36th Arts Festival of Atlanta, Sept. 16–24. Piedmont Park, Atlanta. Contact Arts Festival of Atlanta, 501 Peachtree St. N.E., Atlanta, 30308. (404) 885-1125.
Show–Prater's Mill Country Fair, Oct. 14–15. Prater's Mill, Dalton. For more info., contact Prater's Mill Foundation, 101 Timberland Dr., Dalton, 30720. (404) 259-5765.

HAWAII: **Juried show**–Big Island Woodworker's Guild show, featuring Hawaiian woodworkers, Sept. 1–Oct. 1. Wailoa Center, Hilo. For more info., contact Bob Gleason, 45 Pohaku St., Hilo, 96720. (808) 967-7301.

ILLINOIS: **Juried exhibit**–5th Annual American Craft Exposition, Sept. 7–10. The Henry Crown Sports Pavilion, Lincoln St., Evanston. Contact Christine Robb, American Craft Exposition, 530 Willow Rd., Winnetka, 60093. (312) 441-7964.
Show–Woodworking World Chicago Area show, Oct. 6–8. The Metro Center, Rockford. For more information, contact CDI Productions, Box 796, Plymouth, NH 03264. (603) 536-3768.

INDIANA: **Show**–Chautauqua of the Arts festival, Sept. 23–24. Outdoor show on Vine and Main streets, Madison. Contact Chautauqua of the Arts, 1119 W. Main St., Madison, 47250. (812) 265-5080.

IOWA: **Show**–Wood Workers Fair '89, Oct. 27–29. Iowa State Fair Grounds, Des Moines. For info., contact Tom Bach, Wood Workers Fair, Box 1422, Des Moines, 50305. (515) 278-2126.

LOUISIANA: **Juried show**–Lafayette Art Assoc. annual competition, Oct. 9–Nov. 10. For info., write Sara Parker, Lafayette Art Gallery, 700 Lee Ave., Lafayette, 70501.

MARYLAND: **Juried exhibit**–Gaithersburg Craft Market, Sept. 30–Oct. 1. Summit Hall Farm Park, Gaithersburg. For more info., contact Lipman Designer Productions, Box 164, Dallastown, PA 17313. (717) 244-8438.
Juried exhibit–Sugarloaf's 13th Annual Maryland Crafts Festival, Oct. 13–15. Maryland State Fairgrounds, Timonium. Featuring 365 artists and craftsmen. Contact Deann Verdier, Sugarloaf Mountain Works Inc., 20251 Century Blvd., Germantown, 20874. (301) 540-0900.
Show–The Woodworking Show, Oct. 13–15. Festival Hall, 1 W. Pratt St., Baltimore. Contact Michelle Troop, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

MASSACHUSETTS: **Workshops**–Finish carpentry, Sept. 18–22; cabinetmaking, Oct. 2–6. For info., contact The Heartwood School, Johnson Rd., Washington, 01235. (413) 623-6677.
Juried exhibit–"Woodturners of the Northeast 1990," Feb. 10–March 17. The Worcester Center For Crafts, Worcester. Entry deadline: Sept 22. Contact The Worcester Center For Crafts, 25 Sagamore Road, Worcester, 01605. (508) 753-8183.
Exhibit–Boxed In II, thru Sept. 23. Featuring a variety of media including wood. The Society of Arts and Crafts, 175 Newbury St., Boston, 02116. (617) 266-1810.
Show–Woodworking World New England show, Oct. 20–22. Eastern States Exposition, Springfield. For info., contact CDI Productions, Box 796, Plymouth, NH 03264. (603) 536-3768.

MICHIGAN: **Show**–The Woodworking Show, Sept. 22–24. Cobo Hall, 1 Washington Blvd., Detroit. Contact Michelle Troop, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

MINNESOTA: **Exhibit**–Northern Woods Exhibit, Oct. 5–8. Bandana Square in Energy Park, St. Paul. Submission deadline: Sept. 1. For info., contact Elaine Carney, Orchard Woodworking, 948 Orchard Lane, Roseville, 55113. (612) 483-5647.
Show–The Woodworking Show, Sept. 15–17. St. Paul Convention Center, 143 W. 4th St., St. Paul. Contact Helen Fillman, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

MISSOURI: **Show**–5th Annual St. Louis Handcrafter Woodworking Show & Competition, Sept. 20–24. Cervantes Convention Center. Contact West County Hardwoods, 238 Meacham, Kirkwood, 63122. (314) 966-3238.

NEW JERSEY: **Juried exhibit**–The Super Crafts Star Show, Oct. 20–22. Giants Stadium Club, East Rutherford. Contact Creative Faires Ltd., 134 Fifth Ave., New York, NY 10011. (212) 645-1630.

NEW MEXICO: **Exhibition**–"Bellas Artes 1989," thru Oct. 31. Featuring over 17 artists including woodturners. For more info., contact Bellas Artes, 301 Garcia at Canyon Road, Santa Fe, 87501. (505) 983-2745.

NEW YORK: **Show**–Woodstock-New Paltz art & crafts fair, Sept. 2–4. Ulster County Fairgrounds, New Paltz. Contact Quail Hollow Events, Box 825, Woodstock, 12498. (914) 679-8087.
Workshops–Various woodworking-related classes and workshops with Maurice Fraser, Bill Gundling, Greg Succop, beginning Sept. 18. The Craft Students League, 610 Lexington Ave. at 53rd St., New York, 10022. (212) 735-9732.
Workshops–Hand tool workshops by Robert Meadow, Sept. 23–24, Oct. 14–15. The Luthierie, 2449 W. Saugerties Road, Saugerties, 12477. (914) 246-5207.
Show–Woodworking World New York show, Oct. 27–29. Westchester County Center, White Plains. For info., contact CDI Productions, Box 796, Plymouth, NH 03264. (603) 536-3768.

NORTH CAROLINA: **Workshops**–Furniture Making with Robert Ingram, Sept. 18–Oct. 13; Furniture Design with Jim Kirkpatrick, Oct. 16–Nov. 10. Contact The Penland School, Penland, 28765. (704) 765-2359.
Show–Woodworking World Carolina show, Sept. 22–24. McBenton Convention Center, Winston-Salem. For info., contact CDI Productions, Box 796, Plymouth, NH 03264. (603) 536-3768.
Juried show–11th Annual Indian Summer Art & Craft Show, Oct. 5–8. Asheville Mall. Contact High Country Crafters Inc., 29 Haywood St., Asheville, 28801. (704) 254-0070.
Juried exhibit–International Turned Objets Show, Oct. 7–Dec. 3. South Highland Handicraft Guild, Asheville. For more info., contact Sarah Tanguy, International Sculpture Center, 1050 Potomac St. N.W., Washington, DC 20007. (202) 965-6066.
Fair–42nd Annual Guild Fair, Oct. 20–22. Asheville Civic Center. For info., contact the Southern Highland Handicraft Guild, Box 9545, Asheville, 28815. (704) 298-7928.

OHIO: **Show**–The Woodworking Show, Sept. 8–10. Cincinnati Convention Center, 525 Elm St., Cincinnati. Contact Helen Fillman, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.
Juried exhibit–American Contemporary Works in Wood '89, Sept. 16–Oct. 15. Contact The Dairy Barn Southeastern Ohio Cultural Arts Center, Box 747, Athens, 45701. (614) 592-4981.
Show–Woodworking World Cleveland show, Oct. 13–15. International Exposition Center, Cleveland. For info., contact CDI Productions, Box 796, Plymouth, NH 03264. (603) 536-3768.

OREGON: Juried exhibit–Artquake Artist's Marketplace, Sept. 2–4. In the streets of Portland. Contact AAM, Box 9100, Portland, 97207. (503) 227-2787.
Class–Precision Woodworking on a Small Scale with Ken Altman, Oct. 15. Contact Oregon School of Arts and Crafts, 8245 S.W. Barnes Rd., Portland, 97225. (503) 297-5544.

PENNSYLVANIA: **Exhibit**–"Wood, Water & Light," thru Oct. 9. Philadelphia Maritime Museum, 321 Chestnut St., Philadelphia, 19106. (215) 925-5439.
Juried show–The State Craft Festival, Sept. 22–24. Tyler State Park, Route 332, Richboro. For more info., contact Pennsylvania Designer-Craftsmen, Box 718, Richboro, 18954. (215) 860-0731.
Juried exhibit–Juried exhibition of contemporary crafts, Oct. 7–Nov. 5. Luckenbach Mill Gallery, Historic Bethlehem Inc., 459 Old York Road, Bethlehem, 18018. Contact Janet Goloub, (215) 691-0603.
Juried exhibit–Studio Days/Design '89, Oct. 13–15. 6th annual invitational exhibition of contemporary crafts in all media. Demonstrations throughout two-day show. Chester Springs Studio, Art School Road, Chester Springs, 19425. (215) 827-9111.
Show–The Woodworking Show, Oct. 20–22. Pittsburgh ExpoMart, 105 Mall Blvd., Monroeville. Contact Michelle Troop, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.
Show–Art Buyers Caravan show, Oct. 21–23. Valley Forge Convention Center, King of Prussia. Contact Paul Karel, 408 Olive St., St. Louis, MO 63102. (314) 421-5445.
Juried exhibit–17th Annual Lancaster Designer Craft Market, Oct. 28–29. Millersville Univ., Millersville. Crafts include woodturning and woodcarving. Contact Terri Lipman, 437 Lombard St., Dallastown, 17313. (717) 244-8438.
Show–Woodworking World Central Pennsylvania show, Nov. 17–19. Harrisburg Farm Complex, Harrisburg. For more info., contact CDI Productions, Box 796, Plymouth, NH 03264. (603) 536-3768.

TENNESSEE: **Juried exhibit**–From Here to There: Vehicles for New Forms/New Functions, Feb. 24–May 19, 1990. Deadline: Dec. 30. Contact Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

UTAH: **Workshops**–Rude Osolnik, Sept. 18–22. Contact Craft Supplies USA, 1287 E. 1120 S., Provo, 84601. (801) 373-0917.

VERMONT: **Show**–Wood '89, thru Sept. 10. Handworks on the Green, Box 1867, Manchester Center, 05255. (802) 362-5033.

VIRGINIA: **Exhibit**–"New Art Forms: Virginia II," thru Sept. 29. Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.
Juried exhibit–Virginia crafts festival, Sept. 22–24. Prince William County Fairgrounds, Manassas. Contact Deann Verdier, Sugarloaf Mountain Works Inc., 20251 Century Blvd., Germantown, MD 20874. (301) 540-0900.
Juried show–14th Annual Richmond Craft & Design Show, Nov. 17–19. Contact Barbara Hill, Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.

WASHINGTON: **Show**–The Art of Chairmaking, Sept. 7–Oct. 1. Contact Northwest Gallery, 202 First Ave. S., Seattle, 98104. (206) 625-0542.
Show–The Woodworking Show, Sept. 29–Oct. 1. Seattle Center Coliseum, 305 Harrison St., Seattle. Contact Michelle Troop, 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

WEST VIRGINIA: **Show**–Oglebay Woodcarvers show, Sept. 2–3. Crispin Center, Wheeling. Contact Leonard Subasic, 423 Winter Ave., Wheeling, 26003. (304) 242-1929.

WISCONSIN: **Exhibit**–Woodworker's World, Sept. 30–Oct. 1. Expo Centre, Green Bay. For more info., contact John Van Stechelman, Expo Centre, Box 10566, Green Bay, 54307. (414) 494-9507.

CANADA: **Exhibit**–Expressions in Wood, Sept. 15–Oct. 7. 10th St. Gallery, 328 10th St. N.W., Calgary, Alta. (403) 270-7827.
Workshops–Woodturning with Richard Raffan, Sept. 29 or Sept. 30; hands-on workshop, Oct. 3–5. Contact Tools 'n Space Woodworking, 338 Catherine St., Victoria, B.C. V9A 3S8. (604) 383-9600.
Tour–Art Colony Studio Tour, Oct. 7–8. In the homes of artisans along the Thousand Islands Pkwy. For info., contact Joanne Coljee-Ostler, (613) 923-5382.
Exhibition–Woodworking Machinery & Supply Expo, Oct. 27–29. Exhibition Place, Toronto. For more info., contact Show Manager, WMS '89, 999 Summer St., Stamford, CT 06905. (203) 964-0000.

ENGLAND: **Exhibition**–9th Exhibition of Early Musical Instruments 1989, Sept. 29–Oct. 1. Royal Horticultural New Hall, London. For more info., contact The Early Music Shop, 38 Manningham Lane, Bradford, BD1 3EA. (0274) 393753.

FINLAND: Craft Today USA, Sept. 29–Oct. 29. Taideteollisuusmuseoi, Helsinki. For more info., contact American Craft Museum, 40 W. 53rd St., New York, NY 10019. (212) 956-3535.

Photo courtesy of Christie's New York

This mahogany desk and bookcase, made for Nicholas Brown of Providence, R.I., by John Goddard, Newport cabinetmaker, is one of only nine, six-shell pieces in existence and the last one in private hands. This exquisite piece stands 113Hx42⅝Wx25D.

World-record furniture

The Nicholas Brown desk and bookcase, shown at left, is one of the rarest pieces of American furniture ever auctioned. On June 3, 1989, at Christie's in New York City, it sold for $12,100,000, setting a world record for an auctioned piece of furniture, as well as for any art object other than a painting. Twenty years ago, it would have been unthinkable that a piece of *American* furniture could break such records. The rarity of the piece, inflationary factors and the heightened interest in Americana can only partially explain the price that beat the old record by more than $9 million. The buyer was Harold Sack, president of Israel Sack, Inc. of New York, a leading dealer in American furniture.

The mahogany block-and-shell desk and bookcase is attributed to the renowned cabinetmaking shop of John Goddard in Newport, R.I. This piece is believed to have been built during the second half of the 18th century. Since the 1760s, it has stood in the historic Nightingale-Brown House in Providence, R.I., a Georgian mansion and the ancestral home of the Browns, who are often called Rhode Island's first family.

The bookcase was sold to benefit the John Nicholas Brown Center for the Study of American Civilization, an educational institution housed in the Nightingale-Brown House near Brown University.

Christie's said the previous record price for an auctioned piece of American furniture was held by an upholstered wing chair, which sold for $2.75 million in 1987 in New York. The previous record price for a single piece of furniture was held by Marie Antoinette's console table, which was auctioned for $2.97 million last November in London.

Nakashima's work destroyed

In a tragic irony, a large collection of furniture by George Nakashima was destroyed in a Princeton, N.J., house fire, just as the Pennsylvania woodworker was being honored in an exhibition in New York City. On Tuesday, May 23, 1989, a plumber's torch apparently set off the blaze that razed the house of Dr. Arthur and Evelyn Krosnick.

Lost in the fire were 112 of the 114 pieces of Nakashima's work that the Krosnicks have been collecting since 1955. Although Nakashima was unable to put a value on the loss, he has agreed to try to reproduce the destroyed pieces. Nakashima said the most difficult pieces to replace will be the two-board, book-matched walnut dining table and a set of rosewood chairs. The wood for the rosewood chairs came from southern

INDEX TO ADVERTISERS

India and has since been embargoed by the Indian government.

The two pieces that survived the fire, a 9-ft.-wide, free-edge circular redwood boardroom table and a picture frame, were on loan to the American Craft Museum in Manhattan for the retrospective exhibition of Nakashima's work. The exhibition, curated by Derek Ostergard, showed a range of furniture from Nakashima's beginnings in the mid-1940s through his current work. From tables and chairs to cabinets and lamps, Nakashima feels that each tree has a perfect use and his duty is to find that use. His furniture, unencumbered by fancy joinery, reflects his almost religious attitude that wood offers something beyond man and is "a gift we should treasure and use in the most logical and beautiful way." Unfortunately, 112 fewer pieces of furniture now testify to Nakashima's ability to reveal wood's natural beauty.

Product review

Worthy Screens, *Worthy Products Manufacturing Co., Box 1432, Boca Raton, Fla. 33432.*

Worthy Products Manufacturing Co. makes only one product: in-line strainers for spraying finishes. But as the company's advertising so aptly puts it, "We have only one claim for these strainers, *'They strain while you spray'*—but they do that beautifully."

Indeed they do. I've been using them for more than 15 years and I can't imagine being without them. In-line strainers will save you time and material and improve the quality of your sprayed finishes. Of those on the market, the Worthy barrel screens work the best for me. You merely push the gun stem into the hole in the polyethylene gasket, and pop it back into the cup. The barrel fills up with lacquer that is strained through 5 sq. in. of 50 by 60 brass mesh screening. This screening does not impede delivery of material, and its flat bottom does not interfere with the fit of the cup.

The strainers, which are available in three models, fit every spray gun and most pressure pot stems. The Worthy, which costs $2.75 each, has a clever but unnecessary replaceable gasket, which almost never wears out before the screen. At $1.65 each, the Improved Economy model is identical to the Worthy, except it doesn't have the replaceable gasket. The solid-aluminum-bottom Economy model costs $1.40 each. The latter two have a more-exposed gasket, and they may be a bit better for fitting over large pressure-pot stems. All three models are sold in boxes of 12 and can be purchased from finishing-material suppliers or directly from the company.

—Michael Dresdner, Zion Hill, Pa.

A carousel of canes

The carved spiral handle on West German turner Andreas Kutsche's walnut cane unscrews to reveal a thin brandy flask that teetotaling LeCoff fills with cranberry juice.

When Albert LeCoff opened the door to his brother Alan's house a week after his birthday last January, little could prepare him for the fantastic gift that awaited him inside: the cane collection shown on the back cover. The idea for creating this unique collection of turned wood canes came from Johannes and Wendy Michelsen, Frank E. Cummings, Bruce Mitchell, Skip Johnson and other turners who wanted to thank LeCoff for his contribution to the field, including the creation of the Wood Turning Center, a non-profit resource center, library and museum in Philadelphia, Pa. Besides being an honor, the canes were a practical gift for LeCoff, who must walk with a cane because of nerve damage in his leg.

Wendy Michelsen, who orchestrated much of the project, gave the participants only two criteria: that each cane must be LeCoff's favorite length and should reflect the maker's personal relationship with LeCoff. The resulting canes are as widely ranging in style and technical prowess as the turners who made them.

Bob Stocksdale's cane is made from snakewood, lacewood, amaranth and rosewood—all precious materials often associated with nobility. Frank E. Cumming's sleek rosewood cane, with a sterling silver tip and band under the handle, is the perfect accessory for black-tie affairs. Dale Chase's cane has a screw-off handle that's a threaded container. Instead of signing the cane, Chase put a note inside: "By the time you figure out how this opens, you'll know who made this cane." Woodturner and drummer for rock group Foreigner, Dennis Elliot turned a large drumstick-shape cane from padauk. Skip Johnson's cane is a long walnut flute that plays beautifully.

Almost every cane has a story that goes with it. For instance, Giles Gilson's cane recalls a whimsical moment from the 10th Turning Symposium, organized by LeCoff in 1981. Symposium instructors, including Gilson, were given one bubinga and one poplar turning blank and asked to produce turned objects for comparison and discussion. Gilson's creation came in two deli containers that held the ash remains of the blanks he had torched in his furnace. His cane contains vials of the ashes and bears the inscription: "From ashes to ITOS."

Perhaps the oddest story is about Del Stubbs' cane, which resembles a stylized leg and foot. While Stubbs was turning the cane from scraps of orchard-scrounged walnut, he got sparks off the tool and discovered an embedded bullet. The irony is that LeCoff limps because he was the victim of a shooting.

Unlike most of the canes made for use, David Ellsworth's redwood cane, too thin to support weight, is a showpiece of technical skill. To avoid whipping while turning the softwood to a mere ¼ in. dia., Ellsworth glued the blank's ends to the lathe's head and tailstock and turned the spindle under tension. Although they're also non-functional, the seven miniature canes turned by Bonnie Klien, the Michelsens and Gilson are said to be "for when Albert is feeling low."

The two-tier stand that houses the cane collection was turned by Johannes Michelsen and Giles Gilson. The 36-in.-dia. base and top discs were turned from spalted maple and the cherry center column was constructed from staves and turned. The canes were all shipped to Gilson's shop and fitted into the stand before being trucked to Philadelphia and presented to LeCoff.

As is befitting for a man with a cane for every occasion, LeCoff uses a different cane every day to walk to the Chestnut Hill Academy where he teaches woodworking. Along with daily woodworking lessons, LeCoff keeps his kids wondering: which cane will he bring to school today? *—Sandor Nagyszalanczy*

Notes and Comment

Do you know something we don't about the woodworking scene in your area? Please take a moment to fill us in. Notes and Comment pays for stories, tidbits, commentary and reports on exhibits and events. Send manuscripts and color slides (or, black-and-white photos—preferably with negatives) to Notes and Comment,* Fine Woodworking, *Box 355, Newtown, Conn. 06470.

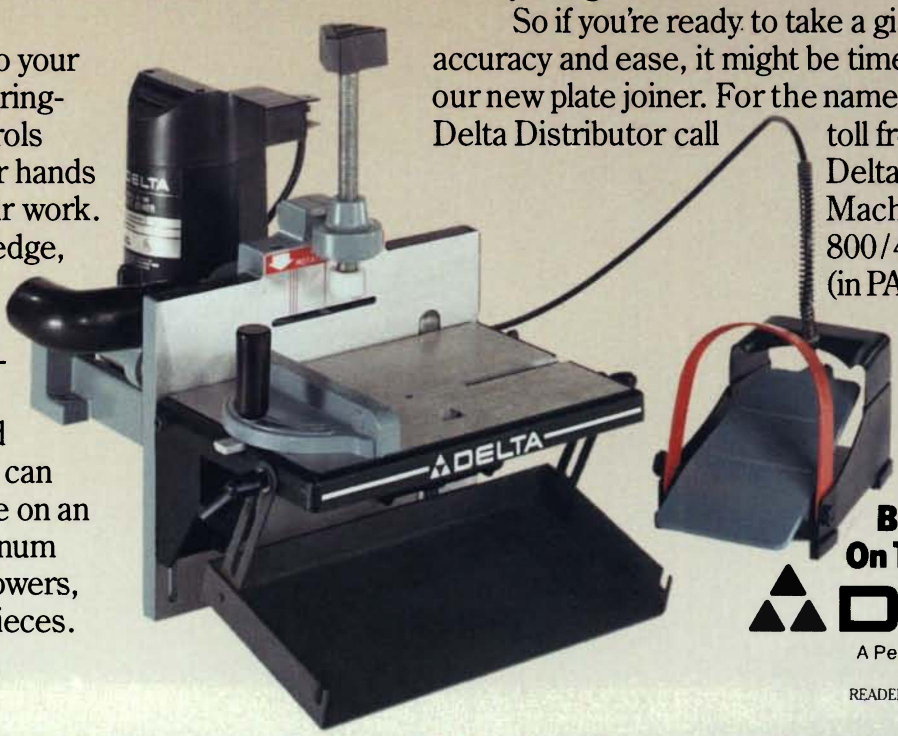
A D D I N G   T O   T H E   T R A D I T I O N

The new Delta Plate Joiner. You'll form a lasting bond with it.

Once you've worked with our new stationary Plate Joiner you'll never want to be without it. Biscuit joinery will put an end to your dowel-joint struggle in cabinet and furniture construction for good. And this one will have you making complex, accurate joints you wouldn't dream of with a portable joiner.

This one bolts to your bench. And since a spring-action foot pedal controls blade movement, your hands are free to control your work.

You can handle edge, face, bevel edge, bevel end and miter joining, as well as Tee-molding operations, with all three standard biscuit sizes. And you can handle them with ease on an 8″ x 12″ die cast aluminum table that raises and lowers, to handle large workpieces.



The table is slotted to accommodate an adjustable stock-stop for edge or miter joining and a quick-set work clamp mounts to the fence or table to secure material for edge or face joining. An auxiliary tilting table swings into place for bevel joining.

So if you're ready to take a giant step in accuracy and ease, it might be time to join up with our new plate joiner. For the name of your nearest Delta Distributor call toll free:
Delta International Machinery Corp., 800/438-2486 (in PA, 800/438-2487).

Building On Tradition

DELTA

A Pentair Company

READER SERVICE NO. 30





A Cane for Every Occasion

Earlier this year, Albert LeCoff, founder of the Wood Turning Center in Philadelphia, Pa., received the spectacular collection of canes, shown in the left photo, as a birthday gift. The canes were made by LeCoff's friends and colleagues–prominent turners from around the world–in appreciation of his contributions to the advancement of woodturning. The collection includes 30 full-size canes, plus seven miniatures housed in a glass dome atop a spalted maple and cherry stand. Vermont woodworker Johannes Michelsen's cane, shown in the bottom, right photo, is fitting for a woodturner: It's a miniature battery-powered bowl lathe. The tip of the ebony, tiger maple and rosewood cane unscrews into a snakewood-handled turning chisel. Woodturner Leo Doyle of San Bernardino, Cal., used the LeCoff-organized International Turned Objects Show (ITOS) as a theme for his "Portable ITOS Gallery" cane, shown in the bottom, middle photo, which is turned from Honduras mahogany and filled with miniature ITOS pieces. ITOS inspired Walter Dexter, of Liberty, N.Y., to create the maple and rosewood cane, shown in the top, right photo. The eagle head has a carved-deer-antler beak and the cane has a carved-ebony ball-and-claw foot. Turner Dan Kvitka of Corvallis, Ore., combined sculpted-and-turned wenge with bands of turned silver and malachite to make the cane shown in the top, middle photo. For more on LeCoff and his canes, see p. 118.