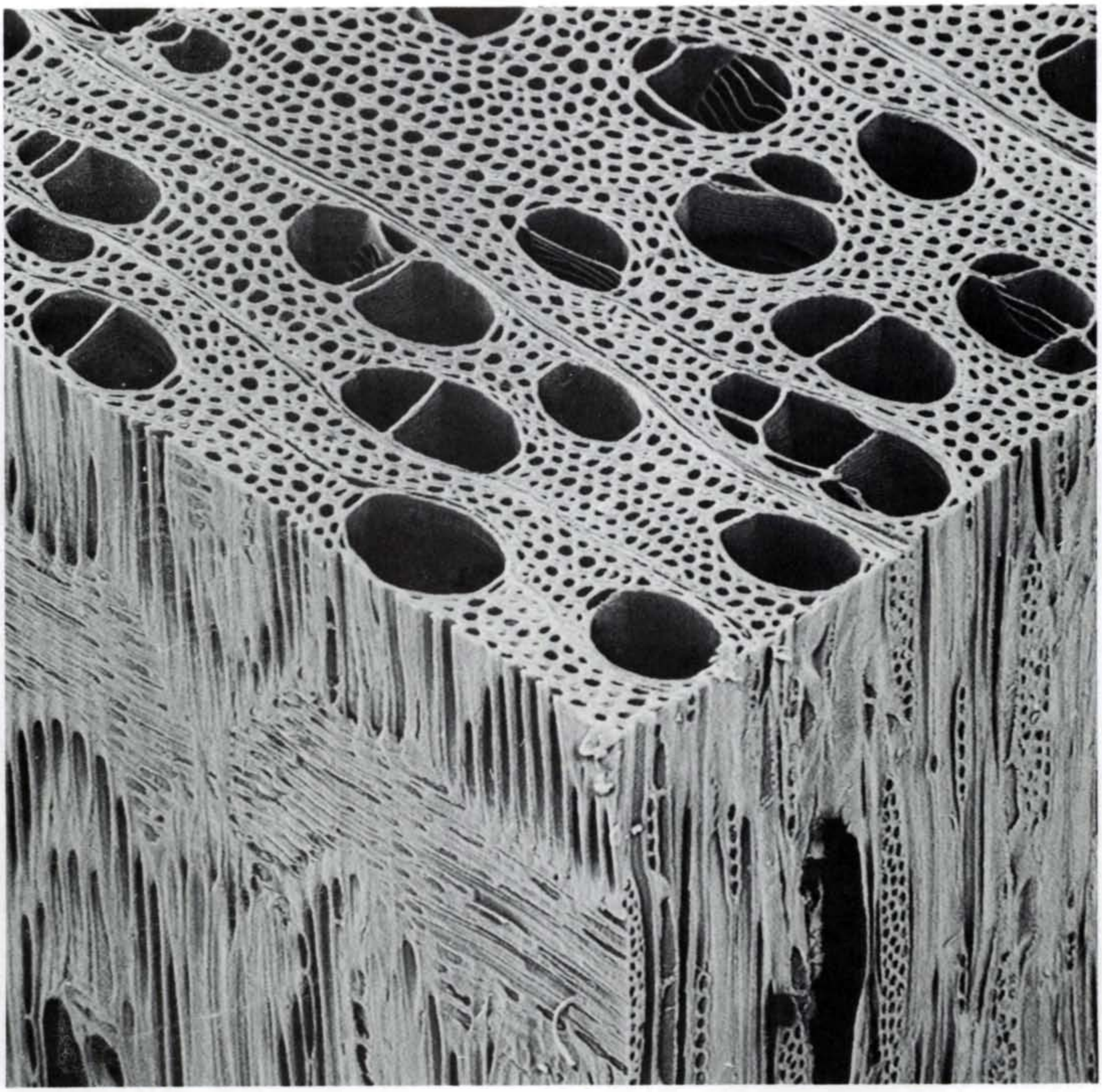
Fine WoodWorking



Wood

Summer 1976, $2.50

Fine WoodWorking

Summer 1976, Volume 1, Number 3

CONTENTS

Cover: Scanning electron microscope photograph shows structure of yellow birch. Large vertical cells are vessels, the smaller ones mostly fibers. The ladder-like structures in the large vessels are the diagonal endwalls through which sap travels. Radial ray cells and rays are clearly visible in all surfaces. Center of tree would be toward lower right. Photo from the Center for Ultrastructures Studies, SUNY, College of Environmental Science and Forestry.

Fine Woodworking is published quarterly, March, June, September and December, by The Taunton Press, Inc., Taunton Lake Road, 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, $8.00 for one year, $15.00 for two years; foreign rate, $9.00 for one year. Single copy $2.50. *Postmaster:* Send notice of undelivered copies on form 3579 to: The Taunton Press, PO Box 355, Newtown, CT 06470. Forwarding and return postage guaranteed. Please address all subscription, editorial and advertising correspondence to The Taunton Press, PO Box 355, Newtown, CT 06470.

. . . . As Mr. Mattia states, there are many ways to make dovetails. Some of my peculiarities may be of some benefit to some readers.

To begin with, most dovetail sawing is ripping; conventional dovetail saws are ground with cross-cutting teeth and have a round "pistol" grip. This makes for unnecessary strain and wobble for those of us not hugely muscled nor intensely dedicated. Great comfort, peace of mind, and accuracy can be obtained by having two dove-tail saws, both with conventional hand-saw handles, one ground for ripping, one for cross-cutting, the latter of which I make noticeable by chiseling an "X" on the handle. Any good professional saw sharpener can convert cross-cut to "raker teeth" for ripping.

If one has a good number of dovetails to cut, e.g. 36 inches of dovetails on each corner of assorted drawers for a chest, it makes for considerable convenience to have a template of brass or aluminum on hand. Time making accurate templates will be repaid ten-fold in time saved. Scribing for pins thru tails can be frustrating if the stock is thick, the pins narrow.

The labor saved by using a jig saw or tight band saw to cut tails to me is as reasonable as using a table saw to cut stock. Sawing pins is simpler by hand.

If marks are scribed rather than penciled, it should not be necessary to raise a light chip to preserve the mark so the chisel is placed precisely. A sharp chisel of the correct width can always find and hold a scribed line. I prefer to scribe depth lines with the material used, because sides of drawers are thinner than fronts or backs, etc.

I do not denigrate the use of a file; a fine flat file has helped to thin many a slightly recalcitrant tail or pin. After all, it is known as the "cabinetmaker's friend." Fine dovetails in thin wood can sometimes use a fine triangular file.

Life has been simpler since I routinely dado'd all the sides of a drawer before dove-tailing — the slot is a constant point of reference for the inside of the board.

Paul W. Carney, DeKalb, Ill.

I am writing in regard to your Spring '76 issue of *Fine Woodworking*. In the article "Textbook Mistakes," Tage Frid talked about how it was better to glue boards with the end grain in the same direction because it is easier to hold down one big warp than smaller warps. It seems to me than if what he says is true, it wouldn't make any difference whether you use one wide board or many small ones because they will both warp the same.

Myself, being in the custom furniture and repair business, I see that in antique furniture where larger pieces of wood are used, there are obvious warps in those pieces. Whereas there seems to be no warp when glued up in narrower widths, with the end grain alternated. The method Tage Frid recommends seems very risky, especially on table leaves without skirts.

I also question what he says about dowel joints as compared to mortise and tenon, especially if you want your furniture to last longer than yourself. The mortise and tenon joint is good, but people like driving nails through them to hold them tight, which only leaves the furniture repair man one choice of chiseling the wood away from the nail to pull it. Then when the joint is apart, the glue must be scraped or sanded off which in many cases leaves the joint sloppy and requires wedges to make it tight again. As with dowels people don't nail them nearly as often, and are easily replaced if broken or sanded too small. The dowel may not be as good in theory, but to me seems superior in repairing, and in giving the original tightness that old loose chairs once had.

Jim Surgent, Missoula, Montana

. . . . With respect to Tage Frid's article in the March issue. I certainly agree, dowels are not necessary for strength, but how do you keep all these boards lined up when joining an eight-foot table top? We all would love to work with perfect lumber, but it is not often you come across an eight-foot board of walnut that doesn't have a crook or two! By the time you plane and joint this wood it's better, but when you go to edge glue—let's say your boards are six inches wide—it would be very difficult to clamp these boards accurately at the edges without some type of guide.

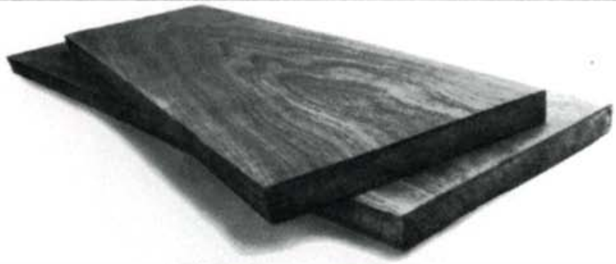
Donald Van Sinderen, Pembroke, Maine

. . . . The article by Tage Frid was great, and I agree with everything he said except one. I can't imagine anyone who thinks so clearly would suggest gluing up table tops and not alternating the grain. He was correct in what would happen if you do not alternate grain, but the hold down screw can also cause a split. The sketch showing an alternate grain panel was very much exaggerated and never happens to dry wood.

H.C. Conkling, Jr., South Dartmouth, Mass.

Tage Frid replies: "Responding to Mr. Van Sinderen, in the type of furniture I do, I am usually gluing up planed boards of the same or nearly the same thickness. I temporarily clamp battens (such as 2 by 4's) top and bottom across the boards to align them. I remove the battens once the boards are clamped."

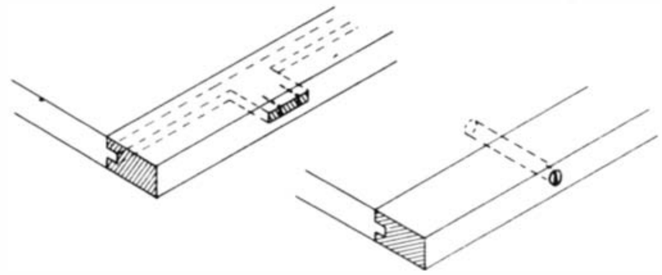
"Responding to Mr. Conkling, the drawing of the grain directions was exaggerated for clarity. Whenever I screw a top to a base, I always provide for the top's movement. One method



is to use fixed holes for screws down the center line, and slots for screws on either side."

"In response to Mr. Surgent's points, in much old furniture, the underside of tables and leaves were not finished as well as the top surfaces. I always finish top and bottom equally, which helps prevent warpage. The reason for gluing up many narrow boards is usually lack of availability of wide stock. The glued top will act as a unit, as you say, but as Mr. Alan L. Sweet of Kentucky has written me, 'I can clearly understand now why my newly built solid walnut coffee table has a slight wave in its top.'"

Tage Frid discusses breadboard ends for table tops, and he makes his point. But the idea of pinning the cap through the tongue has weaknesses. The pin engages the tongue for a short distance and there is only short grain between the pin hole and the end of the tongue. That pin should break out very easily. The best joint for a breadboard end is to continue a tenon on the end of the tongue, in the center of the board. This tenon should pass through the endboard and be anchored with two wedges. The advantages of this joint can be approximated by drilling a hole in the cap, into the end grain of the board. Glue a dowel in the hole and wedge the exposed end in the cap. Use only one dowel in the center of the cap. This is a simple joint, but it works. Note that the dowel in the board is parallel to the grain so gluing is



effective. Where the dowel crosses the grain of the cap, the wedge makes a good mechanical joint.

Richard Starr, Hanover, N.H.

. . . . I was pleased to see the statements by Jack Heath on "Bench Stones" and wasn't surprised by the objection from Mr. Hathaway. Why do we never see the simple solution to stone wear?

A piece of one-fourth inch plate glass about a foot square, and a tablespoon of 60/90 grit silicon carbide (used by us desert rock hounds for the rough tumbling of rocks and available at rock shops anywhere) is the answer to an uneven stone. Assuming oil is normally used on the stone, I use water for the lubricant on the plate glass. Spread the wet grit on the glass and put the bench stone face down on the grit. Move the stone in an irregular figure eight. Hold it evenly to avoid a rocking motion and only press lightly.

Lift the stone off frequently and wipe it clean to assess the progress. Since you are grinding with a water mix, it is easy to see where the low spots in the oily surface have not been reached. Stop when the level of the surface has been brought down to the lowest wear spot. Fine checking can be done with a steel straight-edge. When finished, wash the stone thoroughly with soap and water to remove all of the coarse grit, and then let it dry before oiling.

The stone will temporarily exhibit a coarse surface pattern, but if all the loose grit has been removed, it will behave as a normal fine stone.

One precaution: Don't use the same piece of glass long enough for it to become concave.

W. Earl Stewart, Earp, Calif.

. . . . In Spring 1976 Charles Bargeron requests help for a problem with coloring mahogany. He states that he has been using potassium dichromate which reacts with the wood.

In all probability, the dichromate is oxidizing the wood pigments. When dichromate reacts, it leaves a green residue. The dichromate itself has a yellow to orange color. The colored materials from the dichromate may be coloring the wood. I suggest that he try another oxidizing chemical, potassium permanganate. Potassium permanganate has an intense purple color. When it reacts, it leaves a brown to black residue. This latter coloring might give Mr. Bargeron the color he wants. If the color is too dark, a wiping with a diluted laundry bleach (chlorine type) will decrease the intensity of the color.

Robert Convery, Steubenville, Ohio

Creative Woodturning by Dale L. Nish. *Illustrated, 248 pages, Brigham Young University Press, Provo, Utah 84602, 1975, $6.95, paperback.*

Of the dozen or so books devoted to the lathe, Dale L. Nish's *Creative Woodturning* is easily the best. Turning is a devilishly difficult art to describe in words, and learning to turn from a book, as most of us must do, is frustrating if not impossible.

Nish solves the problem with 587 step-by-step photographs, ranked three to a page. The pictures are closely cropped, sharp and clear and the detailed instructions are right alongside — no maddening flipping from photo to text and back again.

He breaks the subject into its component parts and devotes a chapter to each: equipment, sharpening, stock selection, smoothing a cylinder, beads and coves, and so forth. The test for such a book has to be its sections on using the skew chisel, that most difficult but most useful tool. Nish unravels the confusion in excellent, detailed sequences.

In general, he tells us, he prefers to use cutting tools because they produce the best work and the most satisfaction, while allowing that scraping is easier to learn. The between-centers chapters give both methods. But bowl turning is another matter. Although a long-and-strong deep gouge for faceplate work graces the book's cover, the tool never appears in the text. In every other respect the book is comprehensive. But all the bowls are scraped. One who would learn to use the bowl gouge must still rely upon Peter Child's authoritative, difficult and expensive book, *The Craftsman Woodturner.*

Nish goes light on detailed plans for making pepper mills and lamp bases — a good thing. Instead he displays 111 photos, some in color, of finished work. Most of it is by Nish himself and by his technical adviser, the venerable E.N. Pearson. Robert Stocksdale and Robert G. Trout are also represented. All of this work is lovely; none of it ventures beyond the usual spindle and bowl.

In sum, the book is a rare bargain at $6.95. Nish succeeds where the others fail: by following his directions and with diligent practice, one could actually learn to turn wood.

—*John Kelsey*

The Art and Practice of Marquetry by William Alexander Lincoln. *Illustrated. 303 pp., American edition available from Constantine's, 2050 Eastchester Road, Bronx, N.Y. 10461. Hardcover edition, $7.95; paperback, $4.95.*

The October 1975 exhibit of the Marquetry Society of America at the Metropolitan Museum of Art has certainly sparked a revival of interest in the ancient art of marquetry.

Mr. Lincoln, who is president of the Marquetry Society in England, has written the definitive contemporary manual on marquetry. Anyone who is seriously interested in pursuing the subject further should have this volume in his library.

After a brief summary of the history of the craft, the author gets solidly into the nitty-gritty mechanics of cutting marquetry pictures. He discusses knife and saw cutting in substantial detail, giving experienced attention to the pro's and con's of each technique. Sections on fragmentation and artificial shading, among others, will be of interest to both the beginner and the advanced marquetarian.

Leaving pictorial marquetry at this point, Mr. Lincoln offers a detailed section on applied marquetry. An old technique of engraved veneer inlays is described, and is then followed by a discussion of how this same old technique is transferable to modern materials such as lacquers and plastics. Boulle work, metal inlays, wirework inlays, Bombay mosaic and other lesser-known techniques are discussed and illustrated in sufficient detail to tempt the craftsman to try one or more on his next project.

One of the most valuable sections of this book is its appendix. Here is included for the marquetarian a description of over 100 types of wood veneers. Detailed are such factors as color, grain and figure, "cut"-ability, availability and average widths. A final section lists the special pictorial marquetry uses for each wood, i.e., sky effects, field, bodies of water, etc.

All in all this book is highly recommended. It will be an eye-opener for the beginner, for it is beautifully illustrated, and it will be a constant reference manual for the experienced woodworker.

—*Lionel Kay*

Craftsman's Gallery

Shop/gallery combination works

by John Kelsey

You turn onto Philadelphia's South Street, a thriving boutique row near Society Hill, and there's a movie theater with a line stretching right by the window of Richard Kagan's Studio and Gallery (and home) — believed to be the only gallery in the country exclusively devoted to fine woodworking. A busy street of interesting shops in a big city: hundreds of weekend movie patrons, shoppers and strollers. A good percentage of them, drawn perhaps by Wendell Castle's music stand, Bob Stocksdale's bowls or Igor Givotovsky's amazing carved spider — all on display in Kagan's window — stop in to look around and touch the furniture.

Some of them, perhaps hoping for Sears prices, snort and stroll on. Others stay to ask questions and talk. Some come back again and again and end up buying a piece of fine furniture. Kagan sells 90 to 95 percent of the pieces he shows.

Even so, the gallery isn't ever likely to pay its own way. Kagan subsidizes it from his workshop. But it does what it was meant to do: "It represents my work and it represents the work of craftsmen I respect. This gives me the freedom to make what I want. Otherwise you're uncertain of selling, and in the meantime you have to teach or make kitchen cabinets, which is not what I want. The gallery gives me visibility I wouldn't have if I lived tucked away in the country somewhere."

Kagan fell into woodworking 10 years ago while studying in New York "when a friend made a piece of furniture for my teacher. It was the most beautiful thing I'd ever seen because of its honesty and simplicity. I started to think about working with my hands as my life work instead of as a hobby."

He did what everybody in that situation does, look for a cabinetmaker to work for. "And I found, as everybody does, that there isn't anybody. So I rolled up the living room rug in my apartment to make room for a table saw." During the next few years Kagan did find several craftsmen to work for and learn from, sometimes pestering the man he wanted until hiring Kagan was easier then fending him off.

In college Kagan studied psychology, poetry and Oriental religion, and practiced Zen for three years. These influences produced a craftsman who strives for simplicity, harmony, restraint and a kind of elegance. Kagan says he thinks about wood in the manner of a Japanese craftsman, as "not just something you use. It has a force of its own, wood is alive. The tree and I try to work together, I don't violate the wood. I accentuate the quality of the wood."

Kagan has been in business three years and he figures he has been paying for the privilege of working. "This year is the first I'll be making a living above welfare standards." He believes a woodworker starting out has to accept such a situation. "Anybody who does it for less than 10 years is on a road making a pilgrimage . . . You can't think about the economics of it, but life has a way of pressing realities. So you subsidize your work, you teach at night and do carpentry, your wife holds a job. While you build up a reputation and a way of making things, the joy of working in wood has to be the payment."

He started with an investment of $8000. By borrowing and plowing his earnings back into the enterprise, he figures he has accumulated $10,000 worth of machinery and the same amount in his lumber stash. He has recently hired his second shop assistant and currently produces about 30 pieces of furniture a year. He has orders a year to 18 months ahead.

Kagan rarely goes out to sell his own work — the gallery brings customers to him. Rather than working through architects and interior designers, he prefers to deal directly with the buyer, "who is likely to have been in the shop a half-dozen times before he starts talking seriously." He doesn't like to deal with people "who want a cabinet to fill a given space in the dining room, and want it soon. I like to deal with somebody who'll love having it as much as I love building it."

This sort of attitude isn't likely to make millions, but that isn't the idea of the shop anyway. He runs the gallery the same way. Kagan doesn't want to try to represent "modern woodworking in America" or to be far-reaching. He deals with about a dozen craftsmen and wants to show only "work that I'm responsive to. Everybody in the gallery is someone I know. I have to know how they work, see their shops, really be able to work with them."

He tries to mount three gallery shows a year, each to run about two months. In between shows, unsold pieces fill in the gap. "The pieces are here because I believe in them," he says. '"If they don't sell in a month I'll keep them six months; I've had some for a year."

Usually when a piece is sold, Kagan takes a 25 percent cut and the craftsman gets the rest. He has to absorb shipping costs, insurance bills, gallery maintenance and electricity, publicity and the headache of being there all the time, especially on the weekends, when the door buzzer zaps constantly and the sound drives him crazy.

Frequently a person wants him to make something he doesn't think is in his line. So he puts the potential buyer in touch with a craftsman who can do the work. He takes a cut ranging from 10 percent down to nothing, if a deal is made.

He muses for a moment. "It gets very personal; the gallery is my living room. The nicest thing about it is, it gives me all this fine furniture to play with."

AUTHORS

R. Bruce Hoadley ("Wood") is Associate Professor of Wood Science and Technology at the University of Massachusetts . . .**Tage Frid** ("Mortise and Tenon") is Professor of Industrial Design at the Rhode Island School of Design . . . **Francis J. Newton** ("The Christian Tradition") retired recently after serving for 15 years as director of the Portland Art Museum . . . **Daniel Jackson** ("Hand Shaping") teaches wood and furniture design at the Philadelphia College of Art . . . **Jere Osgood** ("Yankee Diversity") teaches wood and furniture design at Boston University . . . **Robert Sutter** ("Plane Speaking") is a professional cabinetmaker who's never without his planes . . . **Thomas A. Simons IV** ("Desert Cabinetry") is a Santa Fe lawyer and former professional cabinetmaker . . . **Alastair A. Stair** ("Hidden Drawers") is a New York antique dealer who's had quite a few guineas pop out of secret drawers in his time . . . **Alan Stirt** ("Green Bowls") is a professional wood turner in northern Vermont . . . **Franklin H. Gottshall** ("Queen Anne") is a cabinetmaker and teacher, with many books to his credit . . . **Paul Buckley** ("Gate-Leg Table") is a New Hampshire cabinetmaker and designer. . . **M.G. Rekoff, Jr.** ("Stroke Sander") is an Alabama systems engineer.

Art and Picture Credits:

12-15, Bruce Hoadley; 30-33, Steve McDowell; 34-36, Stanley Tkaczuk; 40-42, Franklin H. Gottshall/Stanley Tkaczuk; 43, Chip Hendrickson; 44-45, John Kelsey; 46-51, David Downs.

Renwick Tour Dates

The Renwick "Craft Multiples" Exhibition (*FW*, Winter 1975) is now on tour. After a spring show in Cleveland, the exhibit will be at the Paul Sargent Gallery, Eastern Illinois U. in Charleston, July 10 to Aug. 8; the Chippewa Valley Museum in Eau Claire, Wis., Sept. 4 to Oct. 3; the University Art Gallery, U. of N. Dakota in Grand Forks, Oct. 30 to Nov. 28; the Octagon Art Center in Ames, Iowa, Dec. 25, 1976 to Jan. 23, 1977; N.W. Missouri State U. in Maryville, Feb. 19 to Mar. 20; and Barton County Community College in Great Bend, Kan., April 16 to May 15. There is no word yet on the remaining schedule.

CLASSIFIED

Low cost THICKNESS PLANER SANDER PLANS, $2.00, satisfaction or refund. Rego, 47 Downing, Fall River, Mass. 02723.

POLYETHYLENE GLYCOL - wood stabilizing chemical. Treat green wood, then dry without cracking or checking. Also PEG stabilized cross section table tops to 36-inch diameter, kiln dried and planed to constant thickness, no cracks, unfinished. For free information, write: Earthwood Co., 4560 Linwood Lane, Excelsior, Minn. 55331.

FINE ANTIQUE TOOLS for the craftsman. Write: Tools for Craftsmen, Box 3145, New Haven, Conn. 06515.

"WHITTLE AWHILE" 35 cents. Animal, bird blanks $1.75, $3.25 each with directions. AC, F2, Cherokee, NC 28719.

WOOD AND TOOL EXCHANGE

Wanted to Buy

Used jointer 6 inches or less; also used hand tools. S.G. Weiss, Locust Road, Harwinton, CT 06790.

A Forstner wood bit, 11/16-inch size in good condition. Justin F. Weber, 183 Parkway North, Brewer, ME 04412.

Old tool catalogs, Stanley, etc. Will buy or trade for old tools. Warren Wilson, 28416 Thackeray Ave., Hayward, CA 94544.

Violinmaker's plane(s) and clamps, new or used. Max Krauss, 670 W. Bel Air Avenue, Aberdeen, MD 21001.

24-inch Delta Scroll saw. O.C. Carlson, 8407 E. Valley Vista Dr., Scottsdale, AZ 85253.

10-inch Rockwell Unisaw or equivalent. 12-inch or 16-inch thickness plane, Rockwell or equivalent. Mortising machine. State price and condition. Bill Bigelow, 1 Park Lane, Madison, NJ 07940.

Books: *Forty Pieces of Fine Furniture,* Herman Hjorth, or other books by same author. Bill Bigelow, 1 Park Lane, Madison, NJ 07940.

1-1/8 and 1-1/4-inch corner chisels, 1/2 and 1-3/4 and 2-inch square rabbet planes, Stanley 104 and 105 and 135 liberty bell side rabbet planes, right side. C.G. Rainey, Route 1, Box 183, Weyers Cave, VA 24486.

Antique woodworking tools, cabinetmakers chests and work benches. Highest prices paid. Send description and price to Bill Durow, 405 Razorback Dr., Mtn. Home, AR 72653.

Stanley 55 plane, also wood hollow and round planes or moulding planes — working condition. W. Zeman 2430 Hainsworth, North Riverside, IL 60546.

Wanted - carpenter, cabinetmakers, woodworking handtools. Stanley and Sargent planes, new, old, very old. Price, describe. I.E. Bixler, 6943 Cozaddale Road, Goshen, OH 45122.

Pre-cut marquetry kits including description and cost. Allen N. Keith, 1628 Bolton St., Baltimore, MD 21217.

Will Swap

Pieces of figured walnut, chestnut, osage orange, others for figured hardwood pieces. Halfred Wertz, 28 DeWalt Drive, Mechanicsburg, PA 17055.

Wood

A look at this fundamental material

by R. Bruce Hoadley

Wood comes from trees. Not forgetting this obvious statement will help us work with wood as it really is, not as we wish it were. For wood has evolved as a functional tissue of plants, not as a material to satisfy the needs of woodworkers.

For example, we all know that most of the wood we use comes from the trunk, bole, or stem, as it is sometimes called, not from the unseen root system below or the crown of limbs, branches and twigs that support the foliage. Some of the most prized wood does come from crotches and irregularities, such as burls or knees, but for the most part we prefer the regular grain found in straight trunks.

But sometimes we come across a board that is different from other boards. It warps severely, or pinches our saw blade as we rip it, or doesn't take a finish quite like the other boards. What we're working with is a piece of reaction wood — wood taken from a trunk that is leaning or from a branch that doesn't grow straight up (by definition most branches are made of reaction wood).

This is an extreme case, but it does illustrate why it's important to remember where wood comes from and also to know something about its anatomical structure. As woodworkers, we usually know far more about our tools than we do about our materials. But as the architect Frank Lloyd Wright once said, "We may use wood with intelligence only if we understand it."

Understanding the difference between sapwood and heartwood, between earlywood and latewood, between "hardwoods" and "softwoods," between ray cells and longitudinal cells, between ring-porous woods and diffuse-porous woods, between vessels and fibers, and so on, may give us a better understanding of why wood behaves as it does, especially when we're trying to shape it, finish it, or preserve it.

Perhaps the best place to start is at the molecular level. Wood is a cellulose material, as is cotton. And because it's cellulosic, it is hygroscopic — it absorbs water readily and swells and shrinks accordingly (therein much of the problem of the "movement of wood").

The cellulose material that wood is composed of is pretty much the same for all species. It's not until we start looking at wood at the cellular level that different woods start to look "different." (And even here this is not necessarily the case. The sapwood of many species can look very much alike. Then it's not until the sapwood turns into dead heartwood that differences among some species really become apparent).

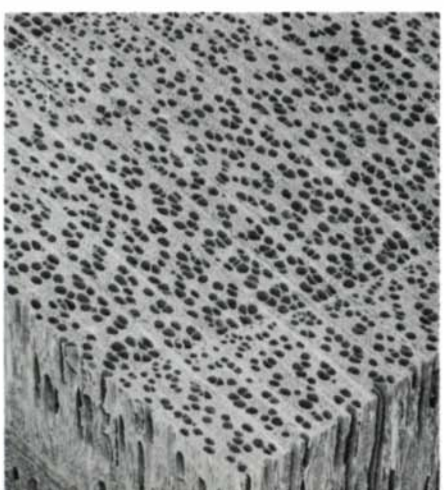
In any event, the cellulosic material is arranged into tubular cells that run longitudinally along the length of the trunk or branch. There are three varieties of such cells — vessels, tracheids, and fibers. Vessels have a large diameter, thin walls, and are very short (but they stack together like drainage tiles). At the other extreme are fibers — narrow diameter, thick walls, and long. In between are tracheids — moderate diameter, moderate thickness, and also very long.

Because they're so large in diameter, vessels are good for conducting sap up the tree, but their thin walls don't contribute much to mechanical support. On the other hand, the thick walls of fibers make them good for support, but their narrow diameter doesn't do much for sap conduction.

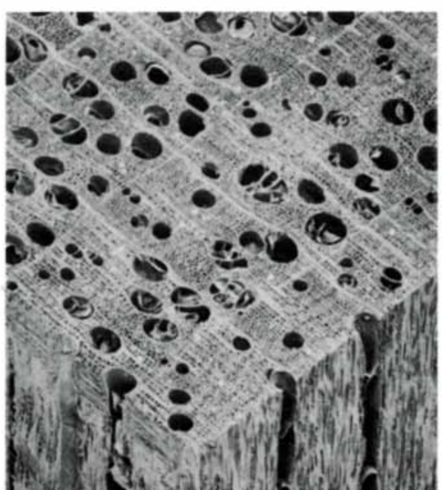
In between are the all-purpose tracheids, which can provide both sap conduction and physical support moderately well. In fact, one distinction between the so-called hardwoods and softwoods is this difference in cell structure. Softwoods, or conifers, are composed mainly of all-purpose tracheids. They are believed to have evolved earlier than hardwoods. Hence their more primitive structure, with no cell specialization. On the other hand hardwoods, or deciduous trees, do have cell specialization — vessels for sap conduction, fibers for support, and tracheids for both.

The tracheids of conifers are about 100 times as long as they are wide. Thus their excellent paper-making qualities. Among

Cherry (diffuse porous)



Black walnut (semi-ring porous)



Red oak (ring porous)

Variations in porosity between earlywood and latewood can create problems in staining. Conifers such as Douglas fir (left) have earlywood that is lighter but more porous than the latewood. Therefore, stain reverses the grain effect, as in a photographic negative. With hardwoods like red oak (right), the earlywood pores are already darker. Lines in the light latewood are rays.

conifer species, however, there can be a three-fold range of diameters, from fine red cedar to coarse redwood. This texture range due to tracheid diameter also affects the smoothness of surface or evenness of staining that can be achieved in woodworking.

If wood were composed strictly of these longitudinal cells, whether vessels, tracheids, or fibers, it would be much less complex than it really is, and really much different, for consider how and where a tree grows.

Growth occurs in the thin layer of reproductive tissues, called the cambium, that separates the wood from the bark. This tubular reproductive sheath, several cells thick, migrates ever outward, leaving behind layers of newly formed wood (which remain fixed in place forever), and also forms new bark in front of it (which will eventually be crowded out by the newer bark cells, and by the ever-expanding girth).

The cambial cells vary in content with the growing seasons. During growth the content is quite fluid; during dormancy there is a thickening. As a result, wood cut in summer usually loses its bark upon drying, while winter-cut wood does not, an important fact for those wishing to incorporate bark into their woodworking projects.

In addition to vertical movement through the sapwood, there must be provision for horizontal sap movement. That's where the ray cells come in. They are oriented radially outward from the center or pith and are stacked vertically in groups called rays to form flattened bands of tissue. The rays not only carry the nutrients horizontally through the sapwood, but also store carbohydrates during the winter.

The rays are not great in number — typically they represent less than 10 percent of the wood volume — but they are significant for more than food conduction and storage. Their size — ranging from microscopically small in all softwoods to visibly big in many hardwoods — helps in wood identification. (For example, in red oak rays are less than one inch high; in white oak, they're one to four inches.) And structurally they influence the shrinkage of wood and the formation of checks.

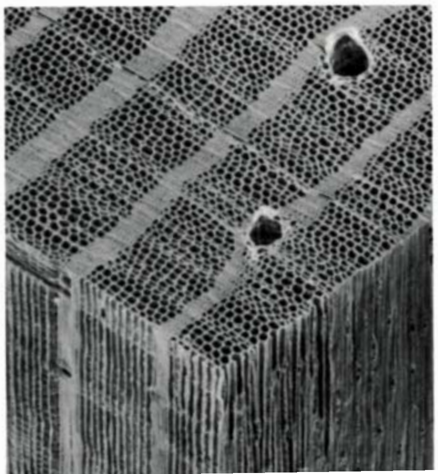
Wood cells shrink and expand mainly across their girth, not their length, as they give off or take on moisture. That's why wood moves across the grain, not with the grain. But because ray cells are aligned across the grain (radially) they inhibit the longitudinal cells from expanding as much in a radial direction (towards or away from the center) as in a tangential direction (around the circumference). In effect, the radial cells act as restraining rods imbedded in the wood. That's why wood contracts or expands only half as much radially as tangentially.

The rays also form planes of weakness in hardwoods. End and surface checks, as well as internal honeycombing, will regularly develop through the rays in woods like oak.

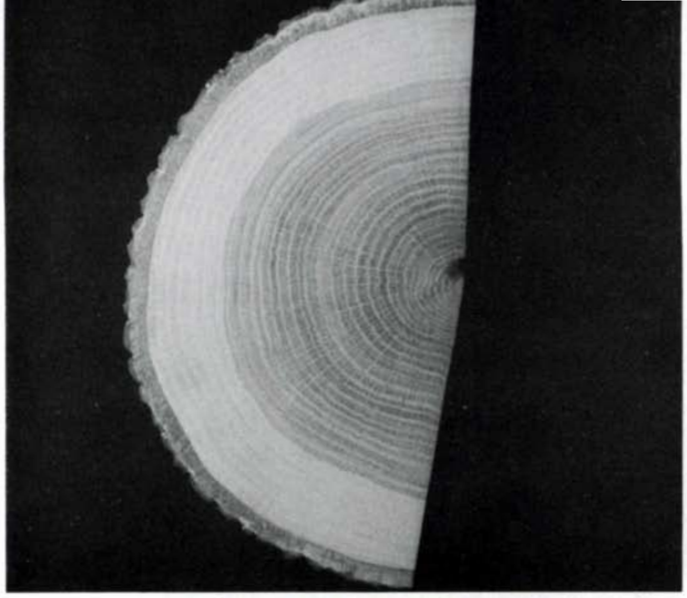
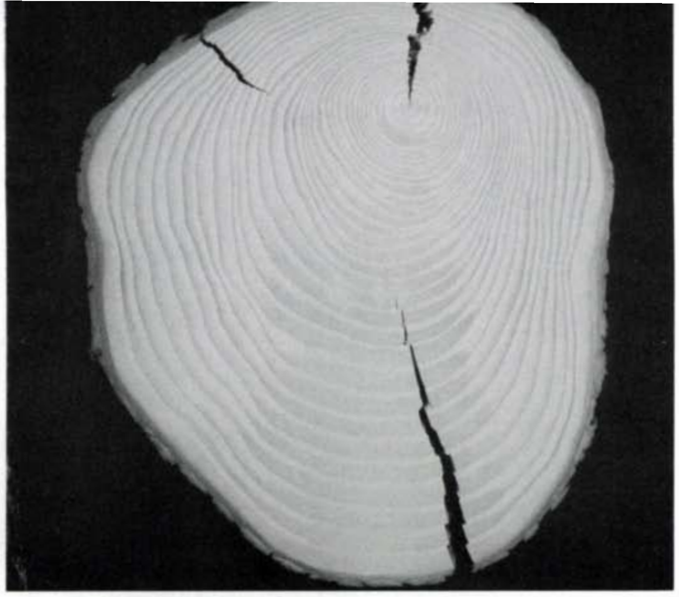
So far we've discussed mainly the shape of wood cells, not

Eastern white pine (even grain)

Southern yellow pine (uneven grain)



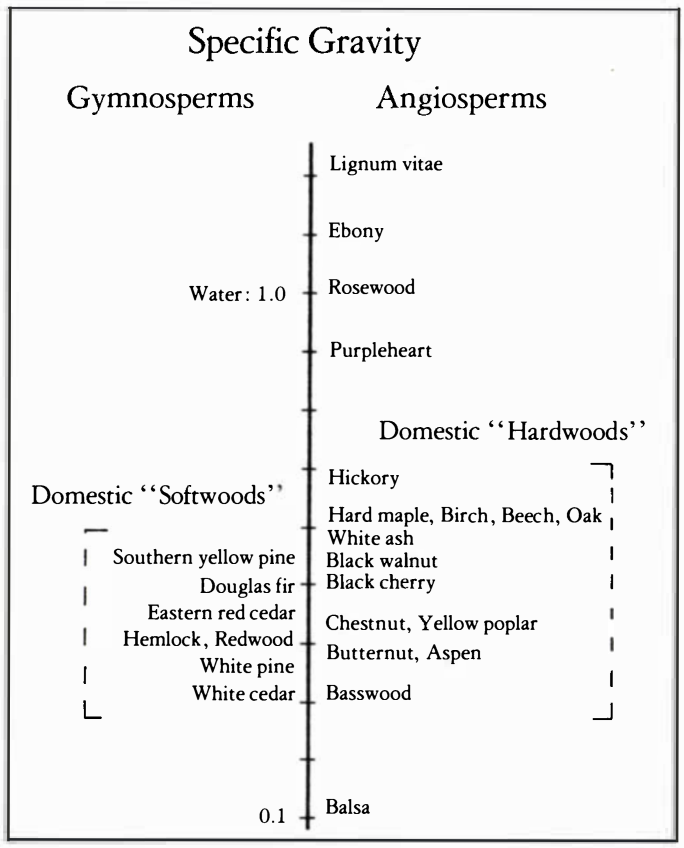
Earlywood/latewood variations are clearly visible in scanning electron microscope photographs. All the samples are oriented the same way, with the growth rings parallel to the right-hand face. Large "holes" in the pines are resin canals that help in sealing over injuries in the living trees. Pictures are from Structure and Identification of Wood, *by Core, Cote, and Day, a book to be published by the Syracuse University Press.*

Red oak half-cross-section (before shrinkage) shows pith dot at center, dark heartwood, light sapwood, and cambium sheath where bark and sapwood meet. Rays are clearly visible in the heartwood radiating outward. At right is the section from a leaning hemlock tree. Reaction wood appears as abnormally wide latewood on lower side of rings.

whether they're alive or dead. Live cells, called parenchyma, contain living protoplasm and are capable of assimilating and storing carbohydrates. In softwoods or conifers, the parenchyma are generally limited to the ray cells, but in hardwoods, longitudinal vessels and tracheids, as well as ray cells, can be parenchyma. It differs from species to species.

But in general, most longitudinal cells lose their protoplasm soon after development by the cambium and become non-living prosenchyma useful for sap conduction or mechanical support, but not for food storage. (When such a change takes place, the cell wall structure remains unchanged. Only the protoplasm in the center cavity of the cell disappears.)



Differences in the specific gravity (the density relative to water) shows that the range of densities of domestic "hardwoods" and "softwoods" overlaps.

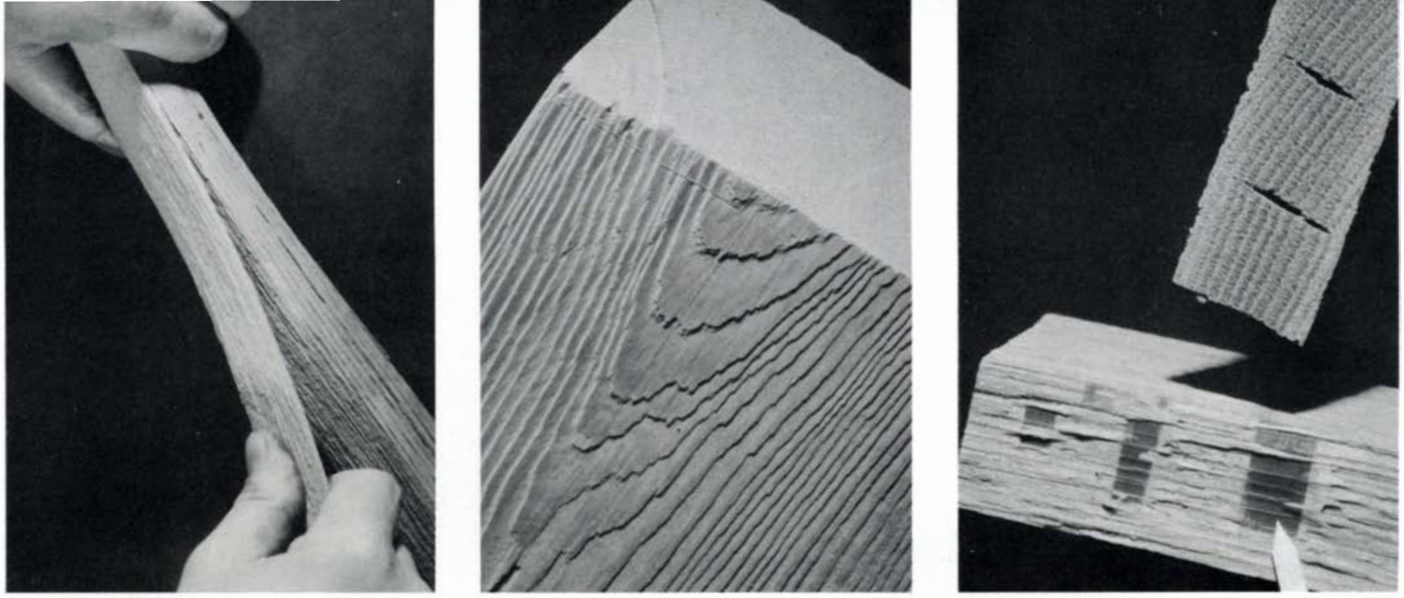
Thus the wood nearest the cambium, where sap conduction and food storage can take place, is called sapwood. As the tree grows and the oldest sapwood is no longer needed for water conduction, a gradual transition to heartwood occurs. This transition is accompanied by the death of parenchyma and loss of both food storage and conductive functions, with the heartwood serving the tree only as a supporting column.

Heartwood formation is accompanied by the deposition in the cell walls of chemical additives called extractives which can change the color of the wood. Whereas most sapwood is a cream to light yellow or light tan color, extractives are responsible for any rich browns, reddish or other contrasting dark colors the heartwood may have, as is characteristic of species like walnut, cherry, or red cedar. In some woods, such as spruce or basswood, the extractives may be insignificant or colorless so that there is little color difference between heartwood and sapwood.

Heartwood extractives can make changes other than color. Some extractives may be toxic to decay fungi and thus impart decay resistance to heartwood, as in redwood. Sapwood not only lacks decay resistance, but is attractive to stain fungi and certain powder post beetles because of the stored carbohydrates in the parenchyma cells.

In some species the original sapwood moisture content is remarkably higher, but the permeability of sapwood is usually greater, so that it loses moisture faster, but also absorbs preservatives or stains better. On the other hand, because of the bulking effect of extractives — they occupy molecular space within the cell wall — the shrinkage of heartwood may be less than that of sapwood.

For the woodworker, the heartwood-sapwood distinction is important. But what about the more general "hardwood-softwood" distinction? The names themselves are misleading because balsa wood is really a "hardwood" and hard southern pine is really a "softwood." While softwoods are generally evergreens, and hardwoods are generally deciduous, this is not always the case. The precise distinction is that the seeds of softwoods (gymnosperms — all conifers plus the familiar ginkgo tree) are naked (as in a pine seed), while for



Basketmakers take advantage of weak earlywood (after pounding) of quarter-sawed ash to separate it into strips (left). Severely raised grain on pith side of flat-sawed hemlock (center) results from harder latewood being compressed into softer earlywood during planing, then springing back later. Honeycomb checks in red oak (right) can cause failure along large ray.

hardwoods (angiosperms), they are encapsulated (as in a walnut or acorn).

The hardness and softness of wood does come into play when we consider earlywood and latewood. Earlywood is that grown early in the season, when the moisture needed for rapid growth is present. In conifers, this means those longitudinal tracheid cells have thinner walls and larger cavities to favor conduction of sap. As latewood develops later in the growing season, the tracheids develop thicker walls (and in effect, denser wood). In other words, there is less airspace in latewood.

To a woodworker, what is also important is how this transition between latewood and earlywood occurs. Soft pines (e.g. eastern white, western white, and sugar) are characterized by fairly even grain, with gradual transition from earlywood to latewood. The result is fairly low average density with pleasing uniformity of wearing and working properties. By contrast, species such as the hard pines (e.g. southern yellow pine, pitch pine, red pine) Douglas fir, larch and hemlock are notably uneven-grained. In southern yellow pine there is a three-to-one ratio in the densities of the latewood versus earlywood. Thus the difficulty of machining it and the woodcarver's preference for the soft pines.

The latewood-earlywood differentiation can also present problems in staining — especially in conifers. In natural wood the latewood appears dark, the earlywood light. But earlywood is more porous, so that it absorbs stain more readily and thus stains darker than the latewood. The effect is to reverse the grain pattern, giving us the grain that would appear in a photographic negative. We've probably all seen this happen in the conifers such as pine or Douglas fir. However, in certain hardwoods, the large vessel size found in early wood makes it appear darker. Therefore, stain merely accentuates this darkness, rather than reversing it.

Hardwoods have a wider variety of longitudinal cells so there is less consistency in the differentiation between early wood and latewood. Rather than a change in the size of the tracheids, there is a change in the distribution of the larger vessels and smaller fibers. In some woods, the large vessels appear only during early growth, the fibers mainly during late growth (along with smaller vessels). This results in sharply defined rings of growth and the classification "ring-porous hardwoods" (such as oak, elm, ash, chestnut, catalpa). As in southern yellow pine, there is a sharp difference in the densities of the earlywood and latewood.

By contrast, there are also the "diffuse-porous hardwoods" (where the pores or vessels are evenly distributed throughout the growth ring). The relative pore size, or "texture," may vary from the finest (or invisible) pores in gum, maple or aspen, to medium (or barely visible) in birch, and to coarse (or conspicuous) in mahogany. Although the vessels remain open in many species (e.g. red oak), in other species (e.g. white oak, locust) the vessels of the heartwood become blocked by bubble-like obstructions called tyloses that occur as sapwood changes to heartwood. These tyloses have a profound effect on the liquid permeability of the wood. That's why white oak is good for casks, but red oak is not.

The last distinction of interest to woodworkers is that of "reaction wood" found in leaning trees and in branches. The usual symptoms are eccentricity of ring shape and abnormally high longitudinal shrinkage, causing severe warpage in drying, as well as unexpected hidden stresses. In softwoods, the reaction wood is found on the underside and is called compression wood. It's also brittle. In hardwoods, it's found on the upper side, and is called tension wood, which machines with a microscopic wooliness resulting in a blotchiness when stained.

Perhaps all this shows that wood is no simple subject to talk about. Take the word "grain" for example. Normally, we mean the alignment of the longitudinal cells, because wood splits "along the grain." In the same context we have such terms as spiral grain, cross grain, wavy grain and interlocked grain. But grain can also refer to the uniformity of the growth ring structure. Douglas fir is an "uneven-grained" wood while basswood is "even-grained." Sometimes grain refers to the ray cell structure, as in the "silver grain" of white oak cut radially — slicing along the rays, in effect. And sometimes we refer to the "open grain" of oak and the "closed grain" of cherry when we're really talking about the texture caused by the presence or absence of large vessels. Finally, there is the "grain" of rosewood — not really grain, but figure, caused by the extractives in the heartwood.

So the word "grain" is not so clearcut and simple as it seems. Neither is the study of wood.

Mortise and Tenon

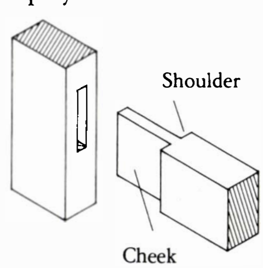
Choosing and making this basic joint

by Tage Frid

Furniture construction is broken down into two categories — frame and casegood. Casegood construction uses joints such as dovetails, finger joints, spline miters, rabbets and the like. Frame construction depends on the mortise and tenon joint and is usually used in tables, chairs, paneled doors, windows, etc. There are a great many variations of the mortise and tenon joint, and the task of the cabinetmaker is to know which variation to choose for a particular application, and why, and then how to make it quickly and well.

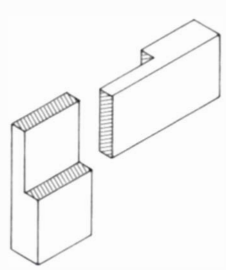
The mortise and tenon is probably the oldest and certainly the most essential joint in woodworking. An Egyptian sarcophagus now in the British Museum was framed with mortise and tenon joints at least five thousand years ago. During the Middle Ages, the development of the mortise and tenon permitted the framing of chests. The elaborate variations of paneling led finally to a distinction between the two crafts of carpentry and cabinetmaking. In house construction the use of the mortise and tenon has quite disappeared. We no longer have the skill or the patience, nor can we afford the mortise and tenon for the framing of a house. Perhaps we do not expect our houses to endure for much more than a few generations. But we do still find esthetic and practical satisfaction in a well-constructed piece of furniture.

The strength of the mortise and tenon joint depends entirely on the interplay between the cheek and shoulder of

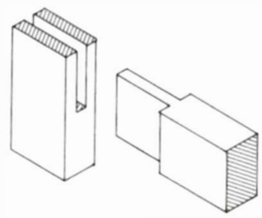


the tenon, which is the projecting part of the joint. One can imagine two crossed boards glued together. Despite the holding power of the glue, they can be twisted apart relatively easily.

But connect them as a lap joint, and the strength is in-



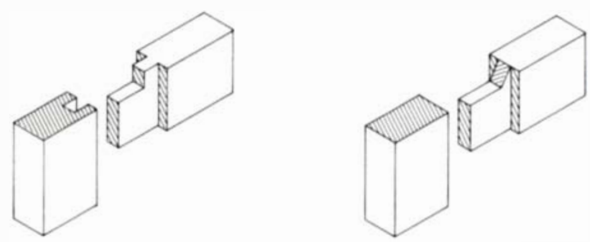
creased greatly because of the stop-action of the shoulders. Now double the surface area of the glue by making a slip joint



— a form of mortise and tenon — and we have an extremely strong joint that is easy to make and requires minimum tools.

The disadvantage of the slip joint is that not only do we have to clamp the tenon shoulder tightly against the mortise, (as in all mortise and tenon assembly), but we must use a second clamp to make sure the cheeks are glued to the mortise sides. Moreover, the tenon is completely exposed.

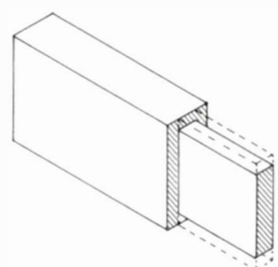
We get around these drawbacks by changing the slip to a



haunched mortise, or to a mitered haunched mortise where the tenon is completely hidden.

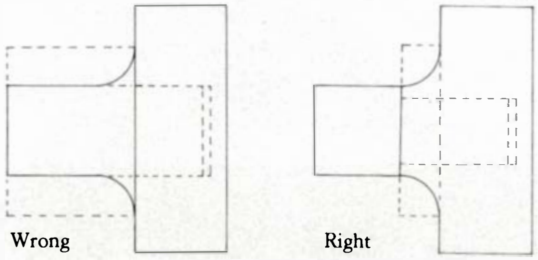
When designing a mortise and tenon joint, one should aim for the maximum glue surface. A tenon of about one-third the thickness of the stock is usually the best choice. If the tenon is thicker, the mortise sides become too thin; if the tenon is thinner, it becomes too weak. (But sometimes in table construction, where the leg is much thicker than the aprons, the aprons may have tenons half or more the apron thickness.)

Four shoulders should never be used unless absolutely necessary. The joint becomes more difficult to fit because all



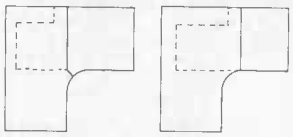
four shoulders must be precisely located in the same plane. Also, glue surface is lost. On the other hand, if the design calls for carving and material will be removed around the joint, four shoulders ensure that the joint will not be revealed.

If the design calls for round corners it is advisable to glue a block on, or to have the mortise stock wider. These provisions



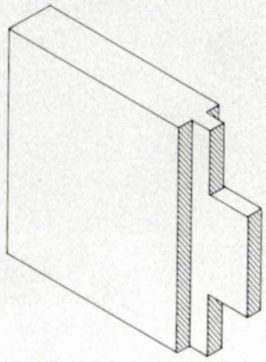
prevent problems with the end grain which will break and crumble, especially if carved.

There are two different ways to make a round corner in a frame. The left one is used if the inside corner is going to be



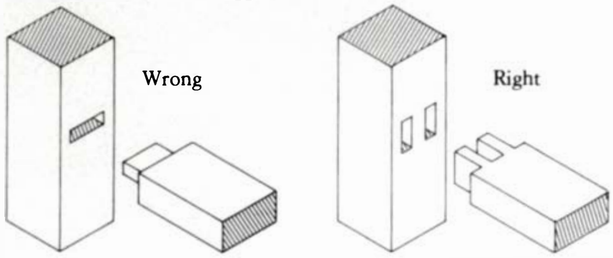
carved or shaped for a molding, and the right one is fine if the edge will be left straight, because then you don't have to worry about carving into the joint.

When a tenon is very wide, haunches should be put in at either end. A wide tenon is more difficult to glue as it



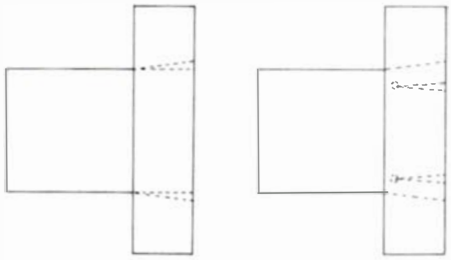
requires extra clamps for gluing the cheeks. But the haunches are necessary to keep the wood from twisting.

When a tenon is very narrow, the temptation is to run the tenon across the grain. But this should never be done because



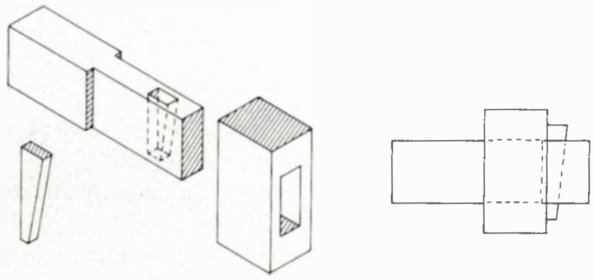
then the cheeks glue into end grain which is not a glue surface. The way to fasten narrow tenons is to use double (or triple) tenons, running the mortises in the direction of the long grain to provide good glue surface.

Wedges are used to strengthen the joint. When the tenon is cut to receive the wedge be sure to drill a small hole at the



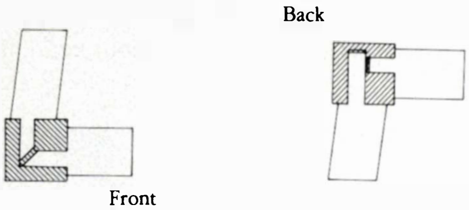
base of the saw cut to prevent cracking. When hammering in wedges in a through tenon, be sure to hammer evenly on each wedge so as not to force one half or the other too far which could result in splitting. If the tenon is to be hidden, use this method.

If a mortise and tenon is to be disassembled, a loose wedge is used. The wedge could be substituted with a wedged dowel



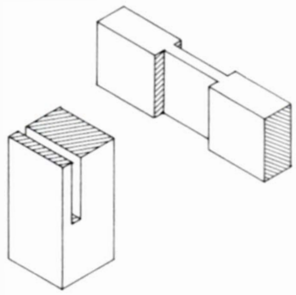
for the same effect. If the piece which receives the wedge is too thin, the two shoulders could be placed on the top and bottom instead of the sides.

In a chair, the back is usually one to two inches narrower than the front. This is done more for appearance than for any other reason. This requires the sides to angle into the back.



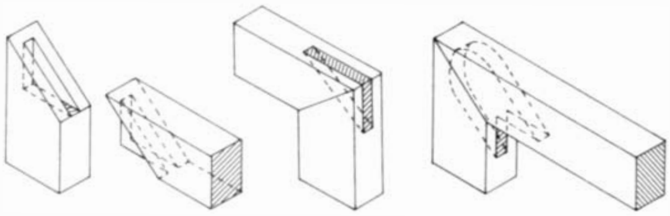
Usually the angle is made in the tenon, because it is easier than angling the mortise. Of course there is a limit to how much the tenon can be angled, but as long as some long grain reaches the full length of the tenon, it is safe.

A variation of the slip joint is used where a third or fourth leg is necessary, as in a sofa. This is also used where a table



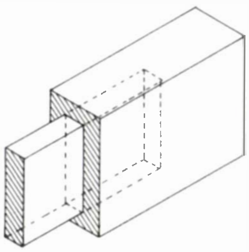
apron is joined to the legs if the table apron is bricklayed round or oval as in a Hepplewhite table.

There are several ways to make a mitered mortise and tenon. Often a spline is used, as it is easier to cut. Sometimes



a spline is used purely for visual effect. The spline can also be hidden.

If a tenon should break, a spline can be inserted. The same method is often substituted for a mortise and tenon.

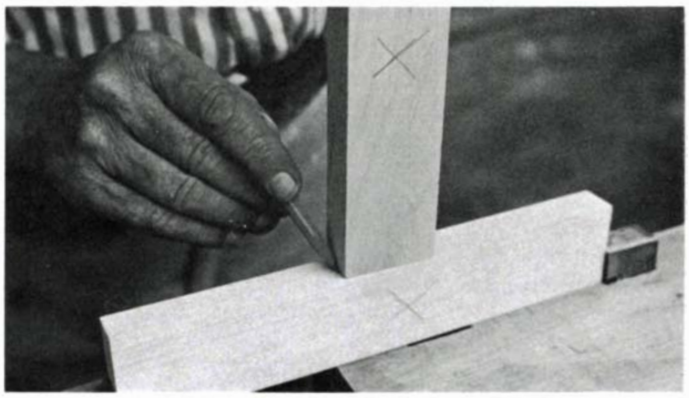


Although it is not as strong, the spline is in most cases sufficient, and is again much easier to make.

There are many other variations of the mortise and tenon joint but virtually all depend on the cheek and shoulder action for their strength. Similarly, the technique used in making these joints is basically the same.

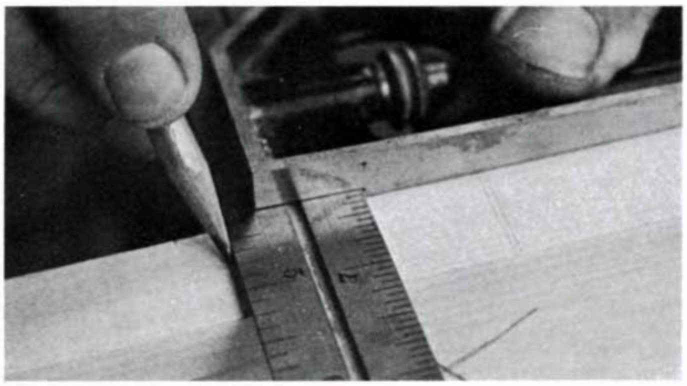
In making mortise and tenon joints, I find it easier and quicker to use hand tools, unless there are so many joints that power tools turn out to be quicker. But this is rarely the case because power tools — whether I'm using a saw, or a router or a drill press with a mortising bit — do take time to set up for the particular job. But even if you plan to use power tools, it's best to learn to do them by hand, so that you understand what you're trying to do with the power tools.

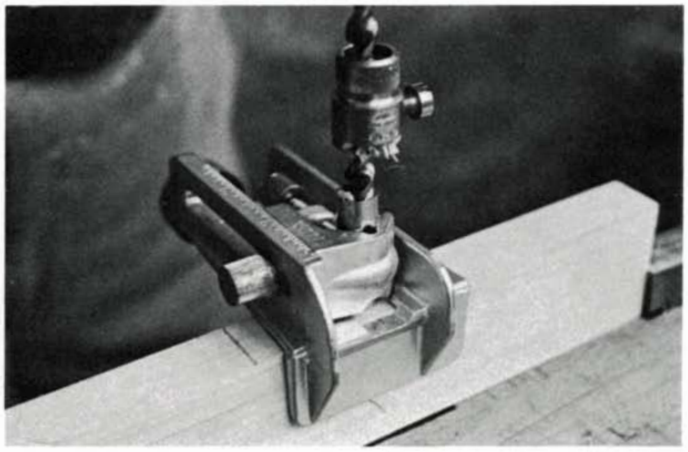
The first step in making the basic two-shoulder joint is to mark both pieces to keep the orientation right. Then I outline

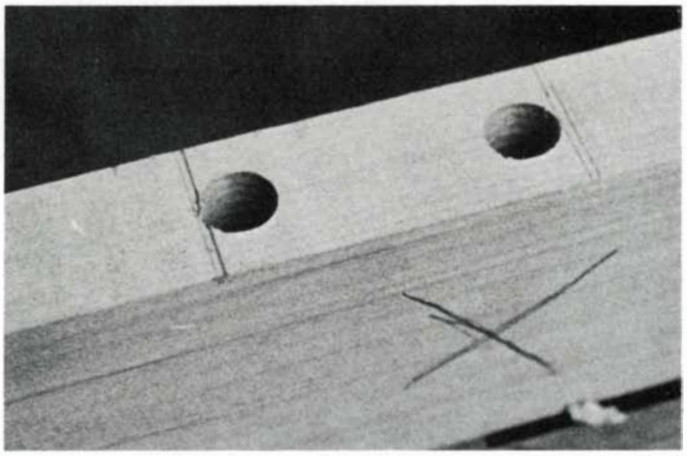


the tenon piece on the mortise piece, but I use a square to put lines just inside (less than 1/16-inch) those marks, because the mortise should be made slightly smaller to allow for subsequent sanding of the tenon.

I pick a drill or bit about 1/3 the thickness of the tenon board. If this size is between bit sizes, I use the next larger one. Although it isn't absolutely necessary, I recommend using a doweling jig to guide your bit while boring the mortise. You'll end up with straight and even sides. Make the



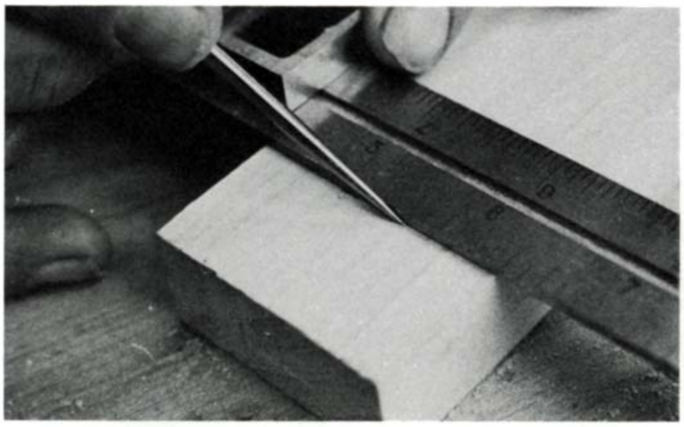




two outside holes first, then the holes in between.

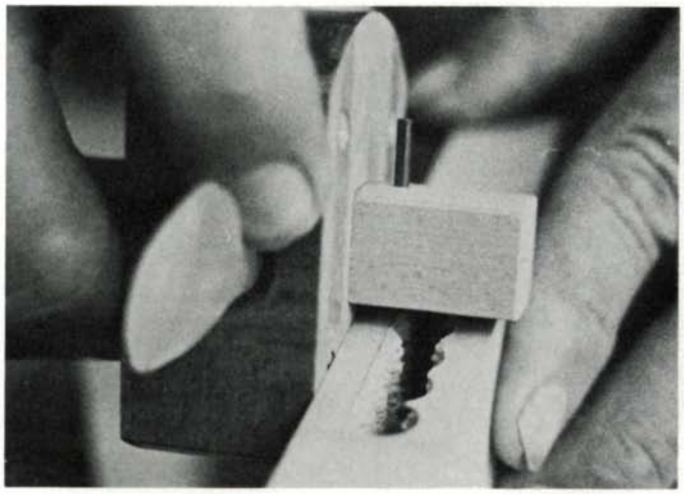
Stop work on the mortise at this point and transfer its dimensions to the tenon board. First measure the depth of the mortise with a rule and make the tenon 1/8-inch shorter

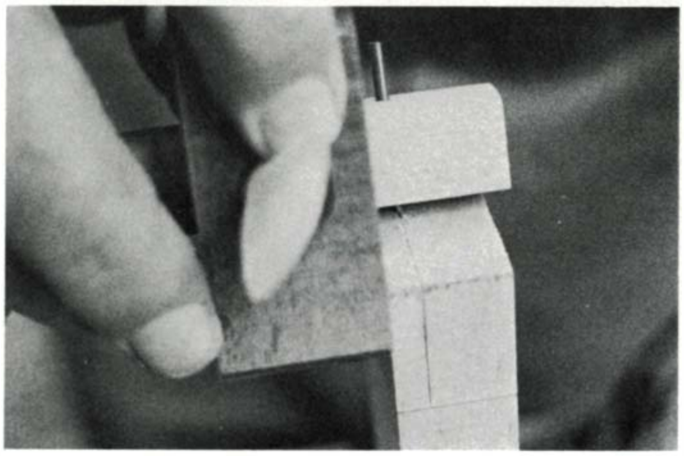
to allow for excess glue. I use a square and a scribe to draw this depth line around all four sides of the tenon board. This marks where the shoulders will go. Don't use a pencil be-



cause its line is too wide and the shoulder must be cut with great accuracy.

Then take a marking gauge and adjust it so its point just touches the nearer side of the holes bored for the mortise. Transfer this measurement to the ends and two sides of the

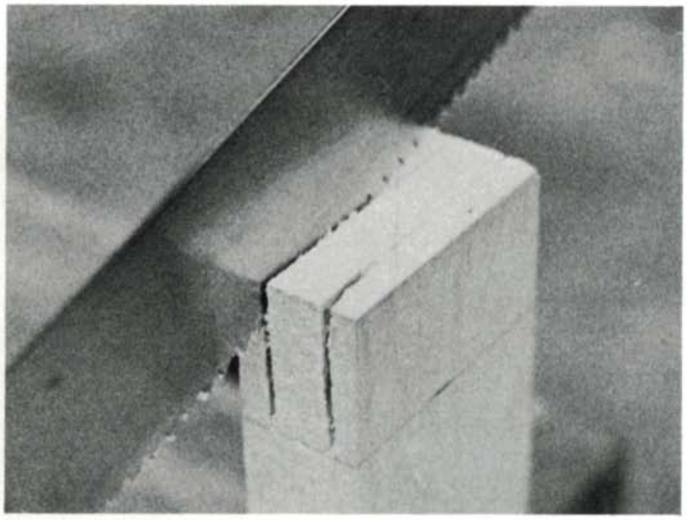


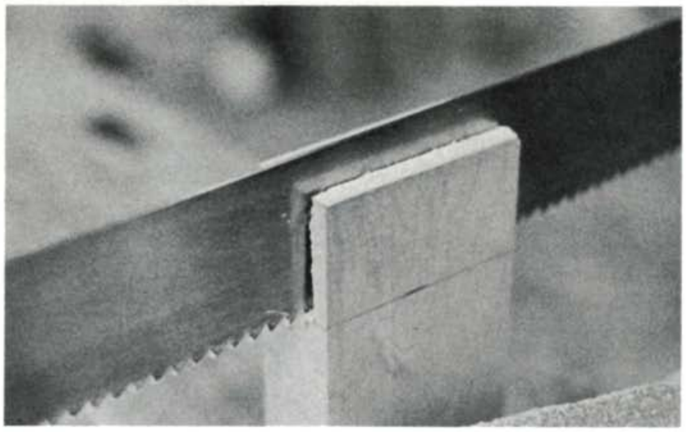


tenon. Then do the same for the other side of the mortise (but continue using the same reference surfaces).

You are now ready to cut the cheeks of the tenon. I use a frame saw for this (as I use for almost all hand sawing because it's the fastest and best saw there is) but if you don't have one, use a dovetail or back saw. The thinner the blade, the easier it will be to make accurate cuts.

The trick to cutting accurate cheeks is to cut the back line and part of the top first; then turn the board around and cut the rest of the top and the front lines. That way you don't have to worry about following two lines at once. When cutting the front line, the saw blade will be automatically

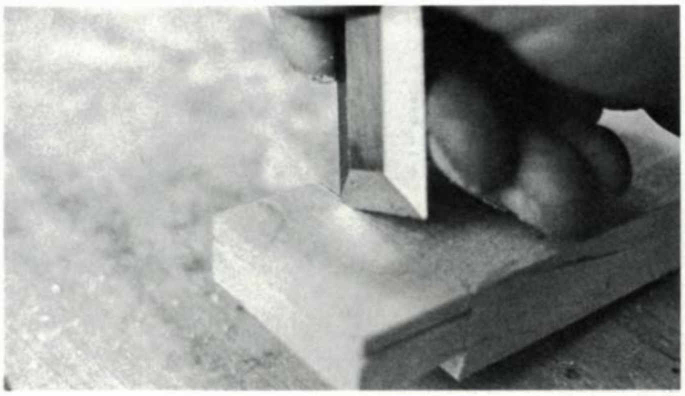




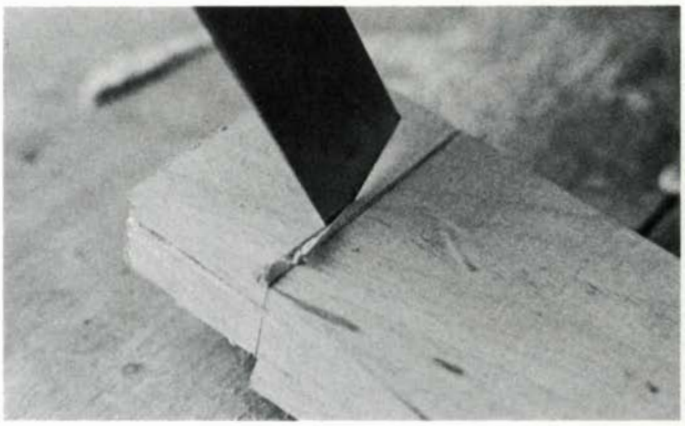
guided at the back by the kerf you made before. You'll also get a little more accuracy in this guiding process if you use a slightly thinner blade for cutting the back lines than you do for cutting the front.

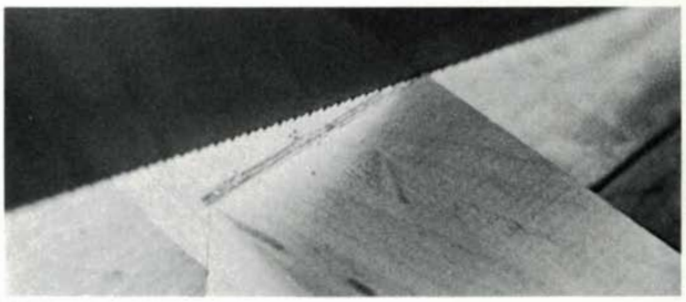
In any event, when sawing the cheeks, "split" the line on the waste side. The tenon cheeks must fit just right. If they're too tight they may split the mortise piece; if too loose, the glue joint may come apart under strain. Furthermore, the surface over a mortise that holds a loose tenon will in time become concave as the wood dries.

After the cheeks are sawed, it's time to saw the shoulders. One trick I've found helpful to improve the accuracy (since the shoulders must be perfectly aligned) is to make in effect a small or mini-shoulder for the saw to lean against. Take one corner of a flat chisel and deepen the shoulder line by

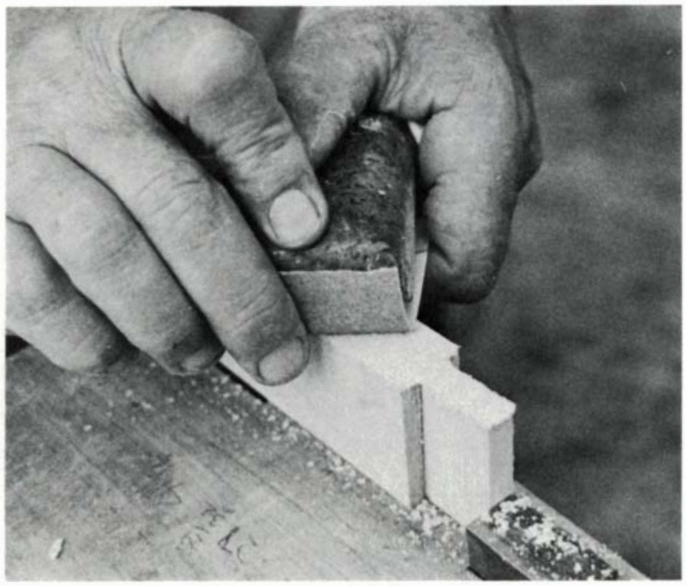


drawing the chisel along it. Then take a second cut at an angle to create half a "vee". You can then use this notch as a guide for your dovetail or frame saw. Finish sawing the shoulders and use a flat chisel to clean up the cheeks, and then round

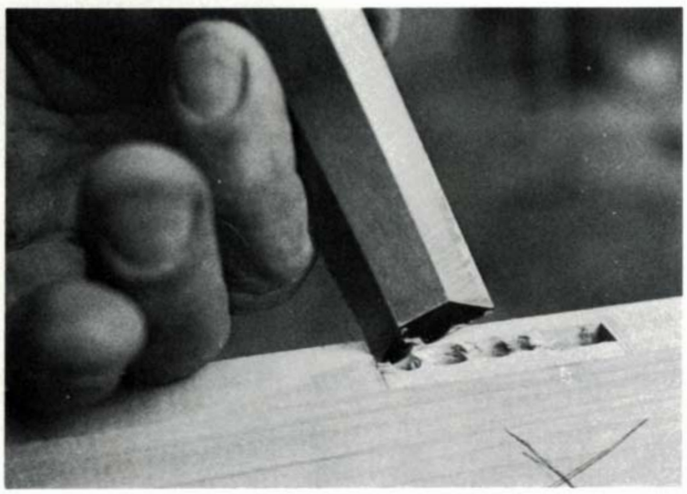




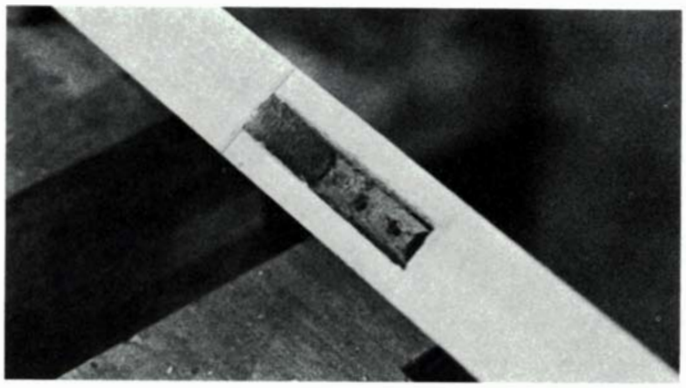
off the tenon corners slightly for easy insertion. Then sand the edge of the tenon so it will fit into the slightly shorter mortise.



Now finish making your mortise. Take a small chisel and mallet to square off the corners, and a wide chisel (but no mallet) to flatten out the sides. Sand the outside edge of the

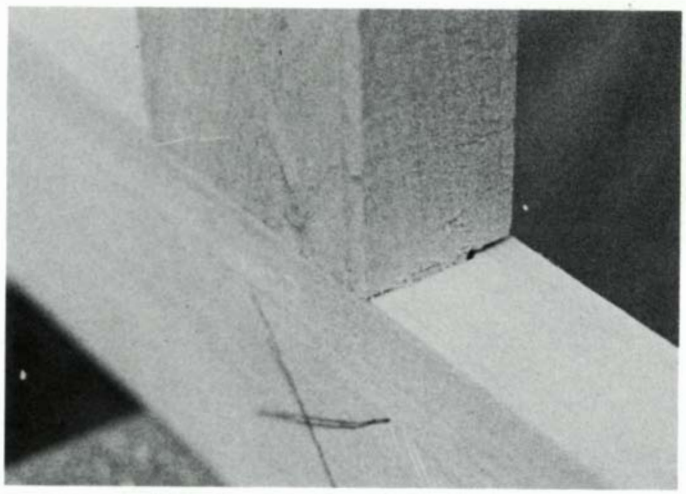


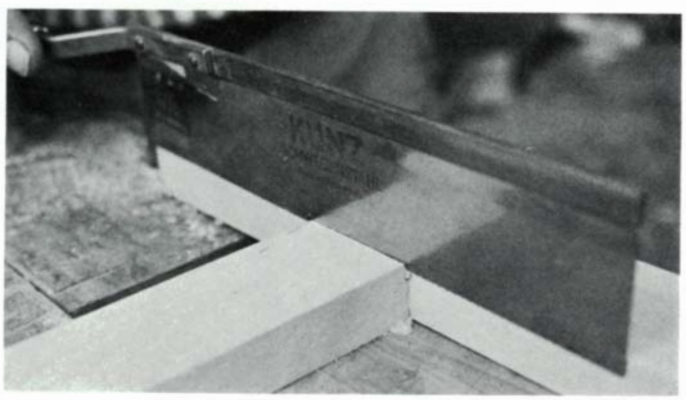
mortise piece as you did the tenon sides and you're ready to try the fit. You should be able to push it in by hand with the weight of your body. If you need to hammer it in, it's too tight and you should shave some material off the tenon



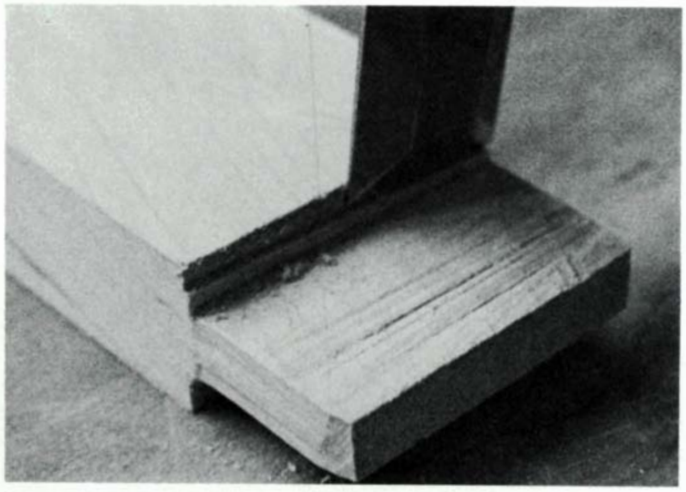
cheeks because that's the easier piece to correct. If the tenon is too loose, you can glue strips of veneer to the cheeks.

If after fitting, the shoulders are slightly off as illustrated here, there's a trick you can use to align them. With the joint

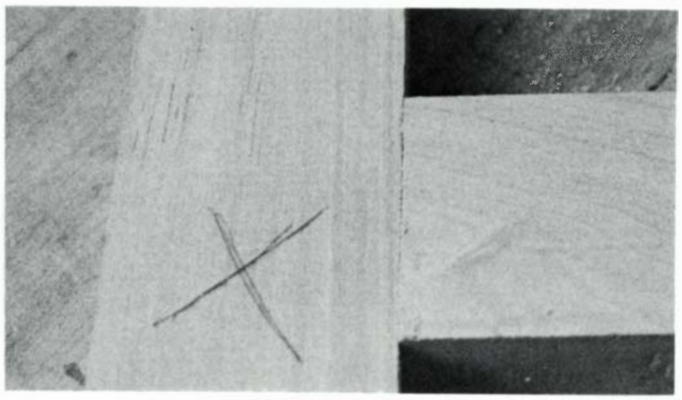




assembled, make a clean saw cut along the shoulder line, making sure not to cut into the mortised piece at all. Do the same for the other shoulder. Don't saw quite completely to the tenon. Instead, finish the cuts with a chisel after the joint is disassembled. If you're making a frame and notice one of



the shoulders is off after you've dry clamped it, make the shoulder correction cuts to all the shoulders on the same side of the frame, so that after correction, the frame stays square (but one blade width shorter). Of course, if a shoulder is really off, you may need to go through the correction process twice.



On complicated pieces where the joints may come in at odd angles, I sometimes don't worry about precise fitting of the shoulders during the initial cutting process, but rely instead on the correction cuts to get the fit I want.

When gluing a mortise and tenon joint, it is very important to put a moderate amount of glue in the mouth of the mortise, and just a little on the beginning of the tenon cheeks and on the shoulders (as insurance).

There should not be so much glue that the glue runs out over the work and the bench and all over the craftsman. Anyway, a tight joint does not allow room for too much glue.

When gluing up a table or chair it is much better to glue up two opposite sections first and later glue them together. If everything is glued up at once, too many clamps are used, and it is more difficult to square the whole piece up at once.

Regardless of the variation of mortise and tenon joint you are making, or whether you are using power tools, the construction process is the same. Make the mortise first and transfer it's dimensions to the tenon piece. But don't try to make the mortise and tenon independently.

The Christian Tradition

Portland Museum mounts exquisite show

by Francis J. Newton

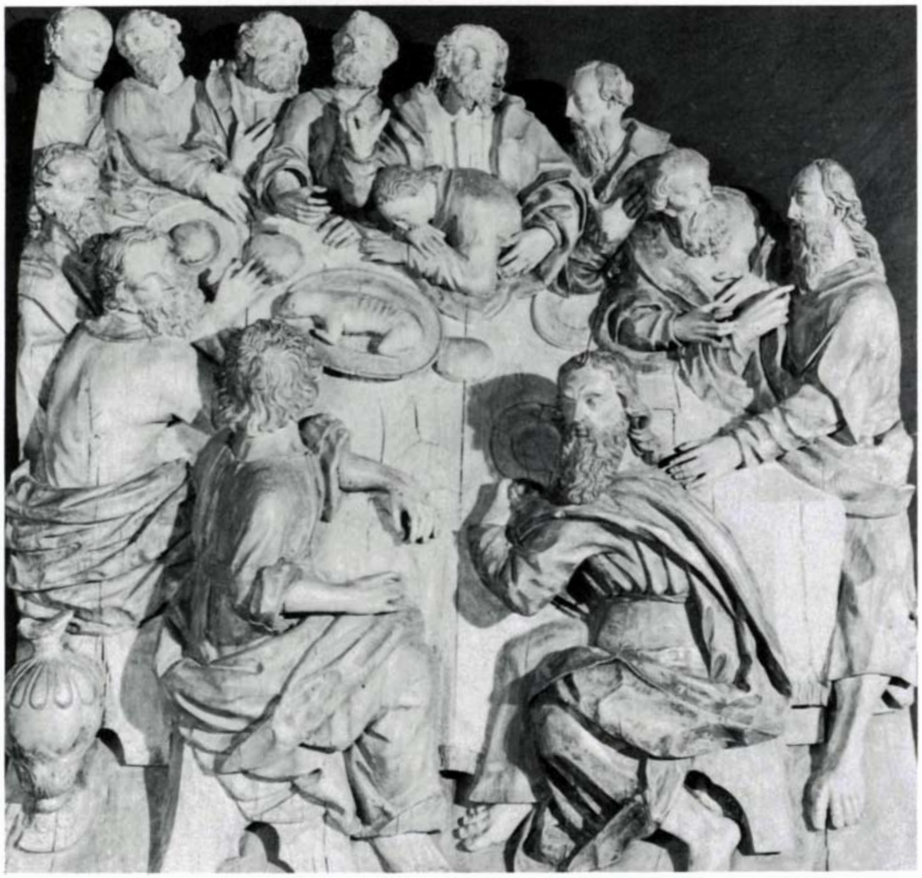
The Portland Museum recently held an exhibition of Christian wood sculpture from the 12th to the 19th century. The show included 51 works, featuring a wide variety of carving styles and religious themes. The project was supported by grants from the National Endowment for the Arts and from the American Revolution Bicentennial Commission of Oregon.

The works in this exhibition were limited to those fashioned from wood in order to accentuate the statement that the medium, in this case wood, often carries much of the message in a work of art. Wood, by virtue of its numerous properties and associations, was held in particular esteem by the Christians. The wood of the Cross was Christ's greatest tangible legacy to the Church. The wood of the Cross was reputed to have accomplished miracles and, through association, to have endowed many other woods with great symbolic and religious meaning.

Other cultures before our own have shown a reverence for wood which we have not grasped or have lost. We no longer look at wood with eyes that comprehend the preciousness of the natural forms and designs visible in wood in its unworked state. The majority of people in the United States today do not perceive the magical or representational qualities each type of wood holds. On the other hand, a 12th-century people from the Black Forest in Germany knew that the wood of the holly tree could best be used for wooden nails and hammer and axe handles. In addition, they recognized that the yew and the beech grew slowly and had delicate growth periods. Cypress has been associated with death because it has such dark foliage and, once cut, it will never grow again from its roots. As a result of this connection, the cypress is often planted near cemeteries, especially in England and France.

The artist-craftsman — carpenter if you will — working with sundry types of woods which carried varying symbolic associations surely would have responded to the wood's physical and aesthetic properties: its strength, its weight, the beauty of its grain and its color, its response to surface treatment and its workability with the simplest of tools. While many of the works in the show have been painted or gilded, the intention was not to conceal the wood texture, but rather to enhance the spirit resident in the wood. The inspiration to create, partially drawn from the artisan's faith, was supplemented by

Carvings from the show include The Last Supper, *by Hans Waldburger (17th century); 54 by 51-1/4 by 16 in.; lent by Bob Jones University, Greenville, S.C.* Virgin of the Annunciation, *German (late 15th or early 16th century); walnut, 15-5/8 in.; lent by the Metropolitan Museum of Art.*



(*right*) Saint Christopher, *German* (*c. 1400*)*; 30 in.; lent by the Fine Art Museums of San Francisco.* (*above right*) Bishop, *probably Saint Ambrose, German* (*c. 1500*)*; oak, 28-1/2 in.; lent by the Metropolitan Museum of Art.* (*above*) Mourning Virgin, *German* (*c. 1525*)*; lindenwood, 14 in.; lent by the Metropolitan Museum of Art.*

his respect for the material itself.

One should try to imagine the artist swept up in the rhythm of the Church year as he works on his images — art historians make a great point of Michelangelo attending daily Mass on his way to work on a sculpture or painting. Whether sophisticated and versed in his materials or uninitiated and awkward in his rendering, the artist communicates his involvement with the guiding spirit behind his work through manipulation of the material. An idea and the embodiment of an idea became synonymous in a creation of wood carved by an inspired artist.

* * *

[Catalogs of the exhibit "The Christian Tradition" are available at a cost of $6.50, including postage, from The Portland Museum, 1219 SW Park, Portland, Oregon 97205.]

Hand Shaping

A simple approach to sculpturing wood

by Daniel Jackson

While my primary concern is with good design, my special pleasure is the process of carving and otherwise removing material from the wood. My designs tend to be highly sculptural; therefore, the removal of wood is an important part of my work. But I do not rely on special techniques or gimmicks, and the tools I use are neither overly simple nor overly complex. I don't insist on doing everything by hand, nor do I insist on doing everything by machine.

But I do rely on a band saw to remove as much wood as possible and on a horizontal slot mortiser to make most mortises for either conventional or spline-tenon joints.

Once the piece is rough bandsawed out and the spline tenon joints made, the fun really begins. First, I use a 1-1/4-inch diameter ball-mill bit in a router to remove freehand the bulk of the material. For safety, I recommend a ball mill with a 1/2-inch shank, if your router has that capacity. I would use pneumatic tools if I could afford them because they are much safer and more efficient, but I don't do enough specialized work to justify the investment. If the wood is not extremely dense or figured, it might be more efficient to do the roughing out with gouges, chisels, spokeshaves or other hand tools; but in the case of a wood like purple heart or tiger maple, the ball-mill gives the advantage of not needing to pay attention to grain direction. No splitting or tear-outs occur.

Having done what I can with the ball-mill, I then remove most of the ball-mill marks with either a half-round or fully-round Surform rasp. (A flat-blade Surform is useful only on convex surfaces, so I do not even own one.) Much more careful control is possible with a Surform than with a ball-mill, and I am usually able to remove all lumps and other irregularities.

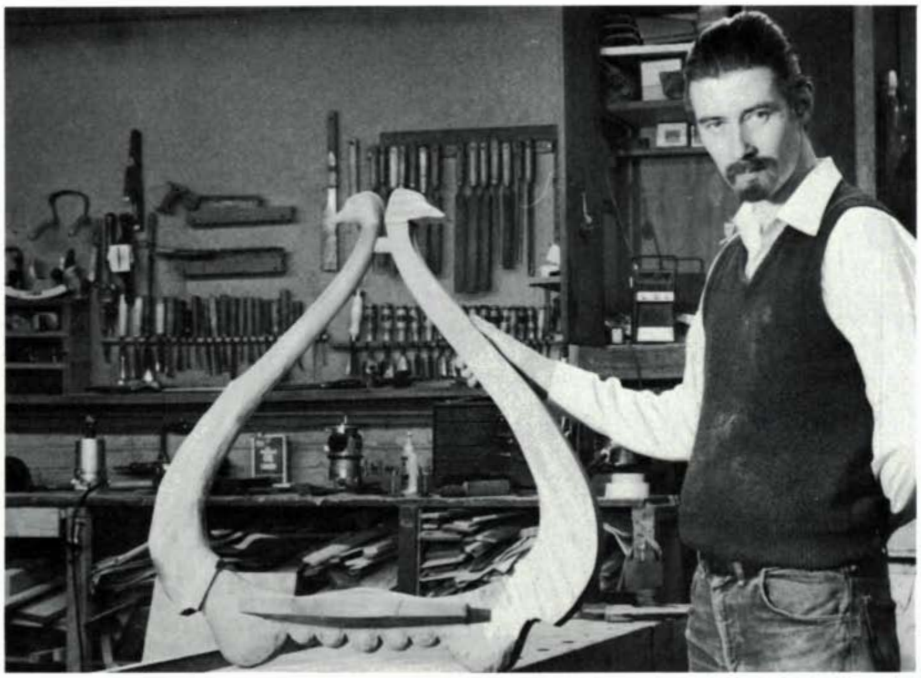
To remove Surform marks and do finer shaping, I turn to a selection of round and half-round pattern-maker rasps and rifflers. My favorite is a #50 10-inch Nicholson. It is far superior to most other rasps I have used due to its "staggered" teeth and fine cut. With the rasp and riffler (for hard-to-get-at places) I am able to smooth the piece even more.

Prior to final hand sanding, I use a flexible rubber disk sander held in a high-speed portable drill. Surform and rasp marks can be removed very quickly. I own, but seldom use, a pneumatic drum sander — because the shapes of the forms I deal with just don't lend themselves to that tool.

Usually I can "smell the oil" at this stage, so I quite enjoy final scraping (using a cabinet scraper) and hand sanding. My preference is garnet paper, beginning at either 50 or 80 grit and going through 120 and 220. I find more sanding to be excessive, but the use of 320 wet-or-dry during oiling produces very fine results.

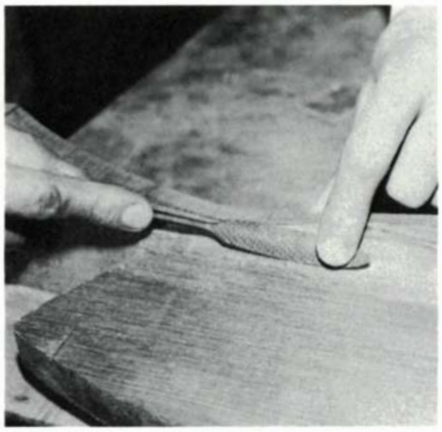
Another sanding option is to dampen the sanded 220 surface (thus raising the grain), re-sand with used

Tools author uses are grouped into rough, medium and smooth categories. Rough includes gouges, chisel and ball mill. Medium consists of rasps, Surforms, and riffler. Fine includes disc sander, cabinet scraper and sandpaper.

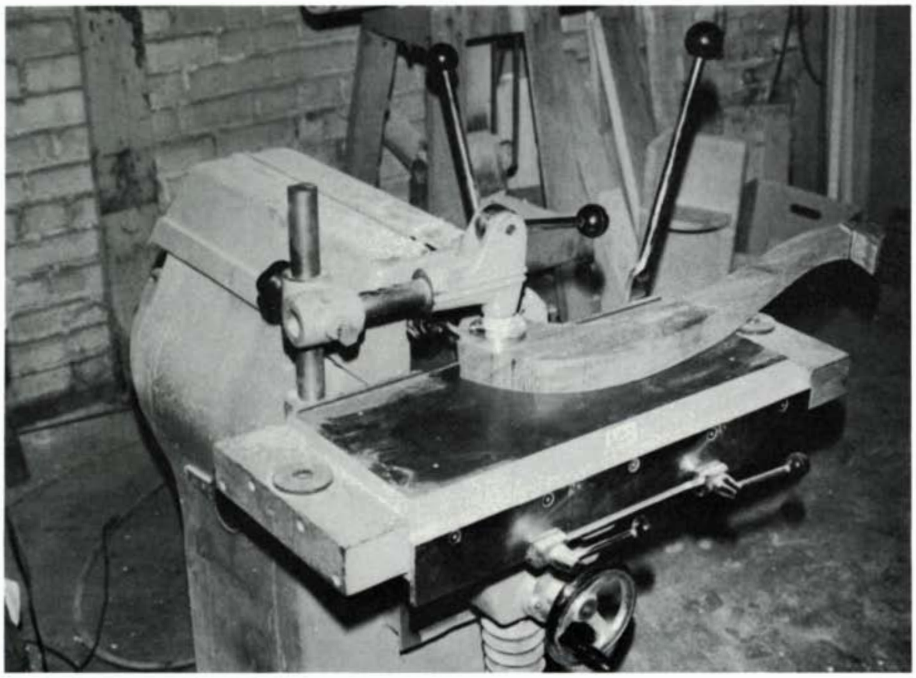


paper, and burnish the finished surface with hand plane shavings, especially teak and rosewood shavings which have natural oils. This produces a very rich patina and may require no further finishing if you are not dealing with a surface that gets hard use.

Because I use mortise and tenon joints, glue up can occur at several points. I don't glue until I absolutely have to, so that I can work on the pieces unassembled. Of course, I do assemble dry occasionally to check my progress.



Chair and partially finished peacock mirror held by the author require hand shaping. Ball mill in a router and a riffler (above) come in handy, as does the horizontal slot-mortising machine for helping make spline-tenon joints.



Yankee Diversity

by Jere Osgood

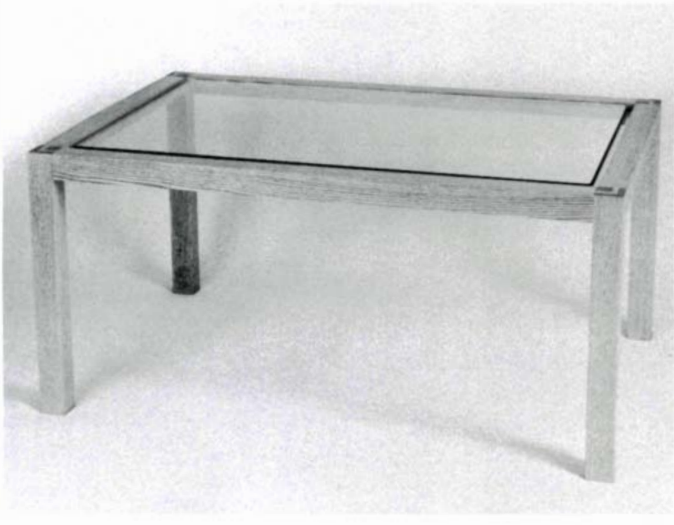
Gerald Curry's mahogany lowboy is 30 in. high and sells for $1000.

The Society of Arts and Crafts in Boston recently had an exhibition of woodwork by contemporary craftsmen. I was impressed with the show. The design level appeared to be very good. The pieces were very well displayed, though a little confined.

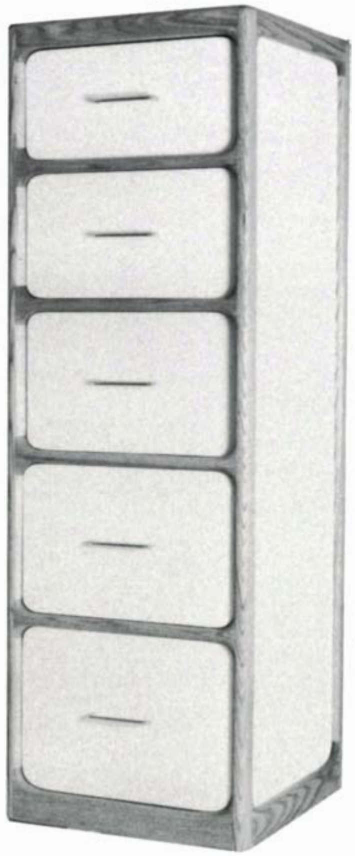
I have two general comments on the show (and not all the pieces are shown here). Although the furniture is generally well designed, I don't feel that some of the craftsmen have come to grips with a major technical problem — the expansion and contraction of wood across the grain. This lack may or may not hurt these pieces after a few years, but in one extreme case, splits were already occurring. The other thing that stands out is the generally low prices. While a low price tag may ensure fast turnover, I wonder whether the woodworkers will get enough return.

Gerald Curry's mahogany lowboy is a derivative piece, definitely in the vein of reproduction with its sensitive articulation of period detail, particularly in the carving of the claw and ball feet. Yet I felt a little more attention to technical detail would have made it a really fine piece. The end panels are fastened tightly all around, with no allowance for the problem of shrinkage. I think this must have been a problem for early craftsmen too. They may have used very dry or well-balanced wood, but I doubt whether wood of such dryness or quality ever existed.

Stephen Nutting's collapsible dining table is a very nicely designed piece. The walnut and willow go well together. The proportions are good between the thickness and size of the top and its relationship to the legs, but I would question the construction of the top, with no provision to counteract warping. Nutting could have set a batten back slightly from the edge with screws through slots to allow for move-



Wade's coffee table, 36 in. long, $250. Nutting's dining table top is 36 by 48 in., $280.

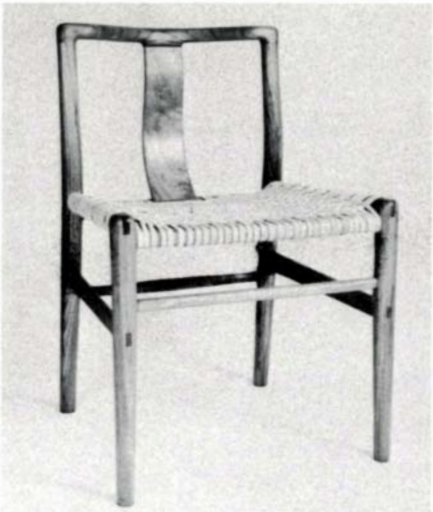


Gagnon's mirror, 32 by 37 in., $600. Franklin's chest, 61 by 20 by 20 in., $800.

ment, or a narrow rail at the top of the legs. It's another case of achieving a good clean design and not paying enough attention to a technical problem.

Wyatt Wade has an excellent design in his oak coffee table. The leg and rail proportions are what we normally find in a Parsons table. I enjoy seeing the joints done this way, with the mitered tenons exposed. The glass top, which is seemingly "floating" (on a piece of Plexiglass), may give some difficulties because dust or cigarette ashes could get in the groove around the glass or under the glass and be difficult to clean.

There is a child's corner chair in walnut by William Doub. While I question whether it is to a child's scale or not, there is a real sense of humor in the back detailing which makes it a very interesting piece.

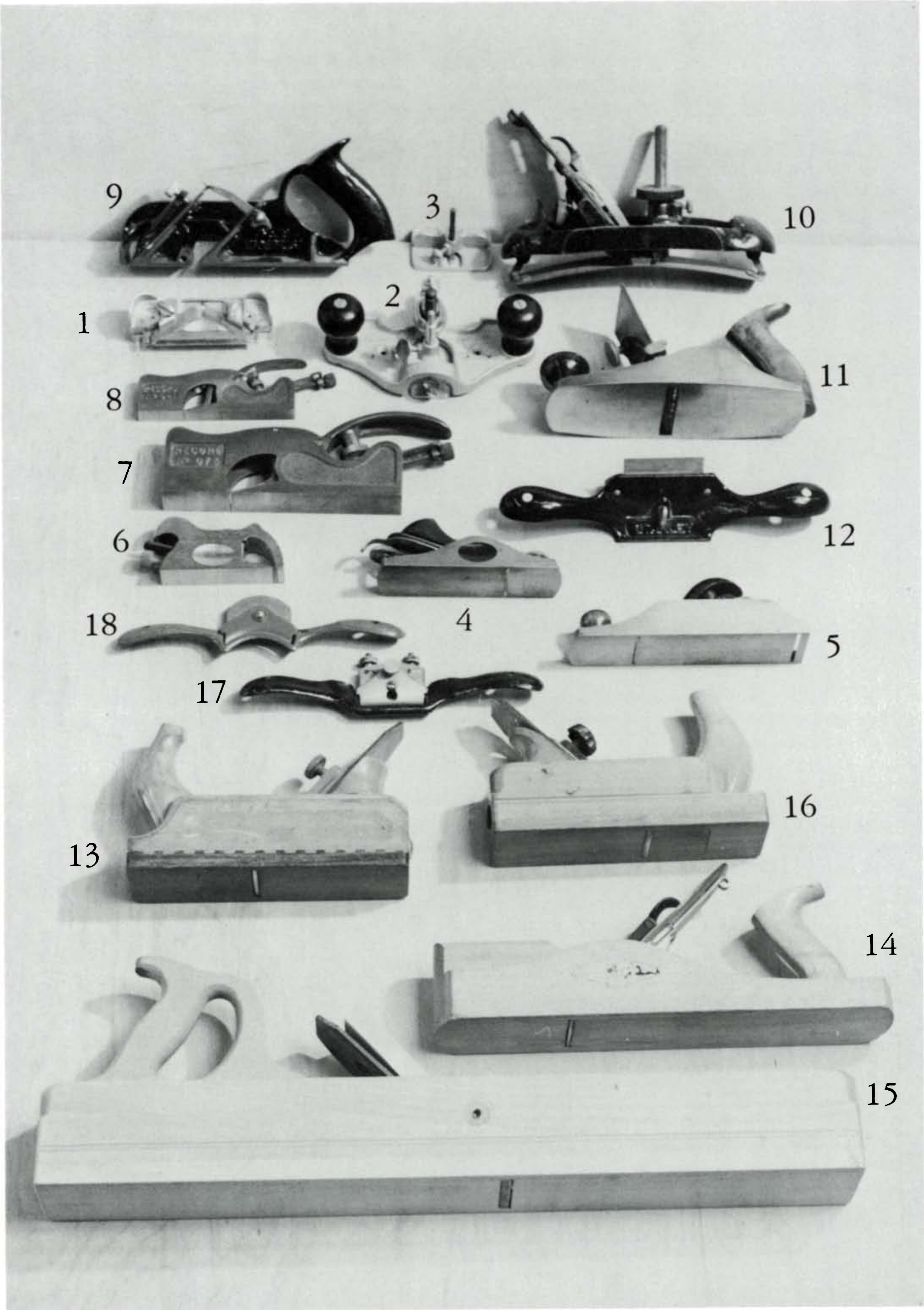


Doub's corner chair, 28 in. high, $400. Sabin's chair, 29 in. high, $150.

Theodore Franklin's five-drawer chest of red oak and white Formica is a very fine contemporary piece. It has uncluttered lines and the oak is shaped well around the drawer fronts. The Baltic birch plywood used for the drawer fronts and panels, with Formica applied to its face, is a particularly good material for pieces such as this, and Franklin has used it to advantage.

The mirror by Priscilla Gagnon is fantastic because of the looseness of her carving and the bold use of simple plant forms and a variety of woods — mahogany, walnut, maple and obeche. It's an amazing piece.

Christopher Sabin had one of the better pieces at the show. His well-constructed teak and reed chair is reminiscent of the Danish and Chinese. The back is quite uncomfortable, but I'm willing to accept it as is because he shows a good understanding of the structure and joinery needed in a chair. (However, the chair back, while low for the average person, would fit a shorter person very well.)


9
3
10
2
1
11
8
7
12
6
18
4
5
17
16
13
14
15

Plane Speaking

One man's guide

by Robert Sutter

Nowadays, when everything in a woodworking shop tends to go buzz, or whirr, or rat-a-tat-tat, or give off some other harsh and less onomatopoeic sound, it is reassuring to hear the "snick" of a sharp plane slicing long thin curls off a piece of wood. Reassuring? Yes, for to me the sound and feel of handplaning stock to a smooth surface is a link to the craftsmanship of the past.

I agree it is faster and easier to push a chunk of wood through a machine which automatically makes it smooth, true and dimensioned. But what about the shop which hasn't got 1500 pounds of 18-inch planer squatting there waiting to be run, or a 62 by 9-inch jointer to zip off straight smooth edges? How will you handle the wide board which won't go through either? What to do to smooth a figured table top which the machines would tear to bits? Or fit a door, set in a box-bottom when the box is just the least bit cockeyed, widen a groove a little, or fit a tongue snugly? Easy! Just reach up on the shelf behind your bench and pick off the appropriate hand plane. And which one is that, you ask. Well, I'll tell you what I can about hand planes using the 18 different planes (and spokeshaves) in my own shop as examples. I've taken a family photograph so I can tout them one by one according to breeding and track record. You can assume availability unless otherwise specified.

1. Stanley #79 side rabbet is the only plane which will pare the side of a narrow groove or trim a doorstop in place. It may not be readily available, so buy one when you see it for this plane is most useful.

2 and 3. Stanley #71 and its little cousin, the #271 router, are just the ticket for cleaning up the bottom of lock mortises and hinge butts or truing up the bottom of grooves. The #71 can be used to rout out a groove or a stop-dado if the sides are first cut with a saw. The #271 is great for cleaning up flat backgrounds in carving. Both are designed for use in normal and bullnose positions and are adjustable for depth of cut. (Record, in England, used to make a similar router plane but has discontinued it. The two Stanley planes are still available, but I'd advise haste if you decide you must have them for your shop.

4. Record and Stanley block planes have irons angled at about one-half that of a bench plane and are set bevel up in an adjustable mouth, thus allowing a smooth cut on end or figured grain. The same features permit taking fine shavings with little or no chance of tearing side grain. Since the block plane fits nicely in the hand, it is useful where stock is held with one hand and worked with the other. Because of its adjustability, the block plane seems to me to be the easiest plane to use when making chamfers.

5. Stanley #130 is the same as (4) but hard to find. It's worth the hunt because a second bullnose-like blade position allows it to get into tight corners otherwise out of bounds to planes.

6. Stanley #90 is a bullnose plane, but also a dandy shoulder rabbet plane since the sides are machined square to the sole. It can also be used as a chisel plane (with bullnose removed to expose the blade completely). I find the plane digs in unless there is a bearing surface ahead of the blade. It is a low-angle, bevel-up, adjustable-throat plane.

7. Record #073 shoulder rabbet plane, weighing in at a tad over four pounds, is the king of planes for accurate work in any situation. A 1-1/4-inch iron set at a low angle bevel-up, an adjustable throat, a micrometer smooth adjustment for depth of cut, beautiful machining and sufficient heft all combine to make a tool which gets a lot of use in my shop. With it I clean up projecting joints, fit tenons, trim edging, true miters, true joined surfaces and rabbets, and on and on.

8. Record #041 shoulder rabbet is just like #043 but only 5/8-inch wide with a fixed nose, and runs a close second for favorite status. Unfortunately, it is no longer available, having been replaced by the #042 (with a 3/4-inch sole but otherwise the same).

9. Stanley #78 rabbet — a workaday plane that somehow survived the Stanley blitzkrieg and is still in the current catalog. It does a creditable but coarser job of cutting and trimming rabbets than (7). Its built-in fence and depth gauge makes for easy, accurate use.

10. My Victor #20 compass plane with adjustable flexible sole is an antique. With it one can plane curved surfaces. A similar plane is now available.

11 and 12. These are both scrapers. The larger one, with a tote and plane-like sole, is the Stanley #112, now extinct. It has a toothing blade for veneering and working curly stock. The other is a Stanley #80 cabinet scraper. Note: wooden toothing planes are still available.

13, 14, 15. These three form the bench plane triumvirate. The foreplane or scrub plane (13) with convex blade will do a fast job of surface cleanup. The jack (14) eliminates most hills and hollows and prepares the surface for final truing with the try plane or jointer (15). I prefer wood planes, but you can get these three in iron with plain or corrugated soles. All work, so it's your choice.

16. This deluxe smoother comes from Ulmia in West Germany. Its lignum vitae sole glides over a surface, and because of an adjustable mouth, the plane can be set to take the thinnest of shavings. It is a finishing tool which leaves an almost polished surface in its wake. Note: wooden planes are now available with screw adjustments under the "Primus" name.

17 and 18. These spokeshaves are not planes, strictly speaking, yet they alone will produce a contoured surface or form and smooth work in the round. If you realize that they were used in earlier days to make spokes for wheels, then you'll know what they can do for you.

To be sure, there are a gaggle of other good and useful wood-paring tools I've neglected. But to tell the truth, I was abashed to find as many as I have in and around my bench. I feel that I've covered the most common ground and that perhaps this brief Baedeker to plane-land will help sort out some choices for you.

Desert Cabinetry

Coping with six percent moisture

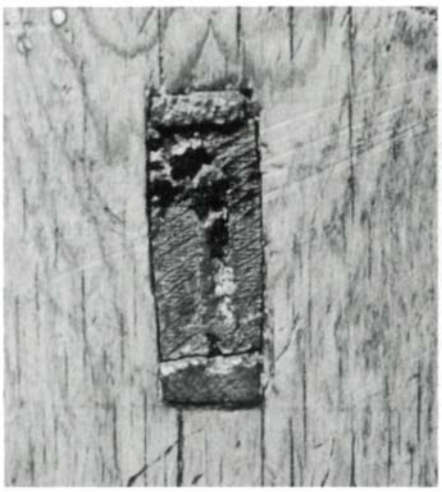
by Thomas A. Simons IV

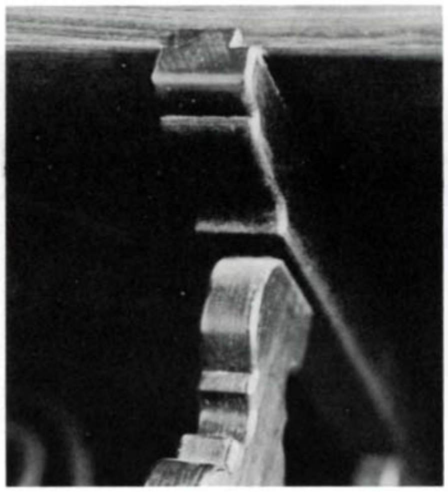
The climate of the desert Southwest can have a devastating effect on furniture. People moving there from the East often watch their antiques, which have survived hundreds of years in a relatively humid climate, break up before their eyes. Cabinetmakers suffer similar discouragement. It is rare to find even experienced cabinetmakers who have not had pieces ruined by cracks or broken joints. As atmospheric conditions change, wood expands or contracts until an equilibrium moisture content is reached. Furniture from the East Coast has an equilibrium moisture content of twelve to fifteen percent. When this furniture is brought to the Southwest, its equilibrium moisture content may decrease to six percent with significant shrinkage resulting. Normal midwestern hardwoods are kiln-dried to approximately twelve percent. When that lumber is shipped to the Southwest, the moisture content will decrease and cause shrinkage. Furthermore, seasonal humidity and temperature changes affect the moisture content of the wood and cause movement, which may result in shrinkage, expansion, distortion (such as cupping, warping, bowing or springing), and even splitting.

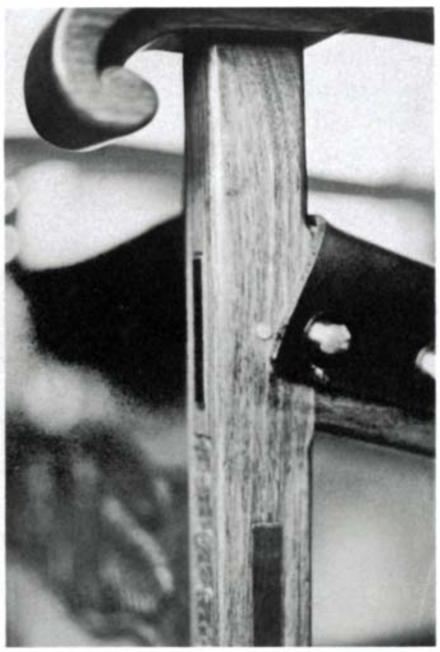
Wood moves different amounts in different directions. Lengthwise movement is negligible. However, radial movement is significant, and circumferential (or tangential) movement is approximately fifty percent greater than radial movement. Therefore, joints between end grain and edge grain, and between plainsawed lumber (with tangential movement across its face) and quartersawed lumber (with radial movement across its face) will be subject to significant stress upon changes in wood moisture content. (The same is also true in the lamination of different types of wood with different movement characteristics.) This stress generates tremendous forces which can break joints and split wood.

Many cabinetmaking techniques used to minimize wood movement can be seen in New Mexican Spanish Colonial furniture (hereafter, Spanish Colonial furniture). Modern Spanish Colonial furniture is the embodiment of a desert cabinetmaking tradition stretching back for centuries. The Arabs from Syria and Egypt and the Berbers from Northwestern Africa (collectively called the Moors) introduced designs and techniques from their homeland during their long occupation of Spain. By the beginning of the 17th century when colonists supplanted Conquistadores in New Mexico, the Spanish-Moorish furniture design confluence had produced the popular mudéjar style. Although most colonists took little or no furniture with them, they did imitate the traditional and mudéjar designs popular in Spain when they left. Their designs and execution were cruder than Spanish renditions and in native pine rather than the traditional Spanish hardwoods (mostly walnut). Nonetheless, they incorporated many

An early Spanish Colonial through tenon (below, left), with irregularly shaped wedges to ensure uniform pressure. Effects of wood shrinkage can be seen in protruding dovetail billet on table (below) and protruding tenon on leg of modern Spanish Colonial chair (right).

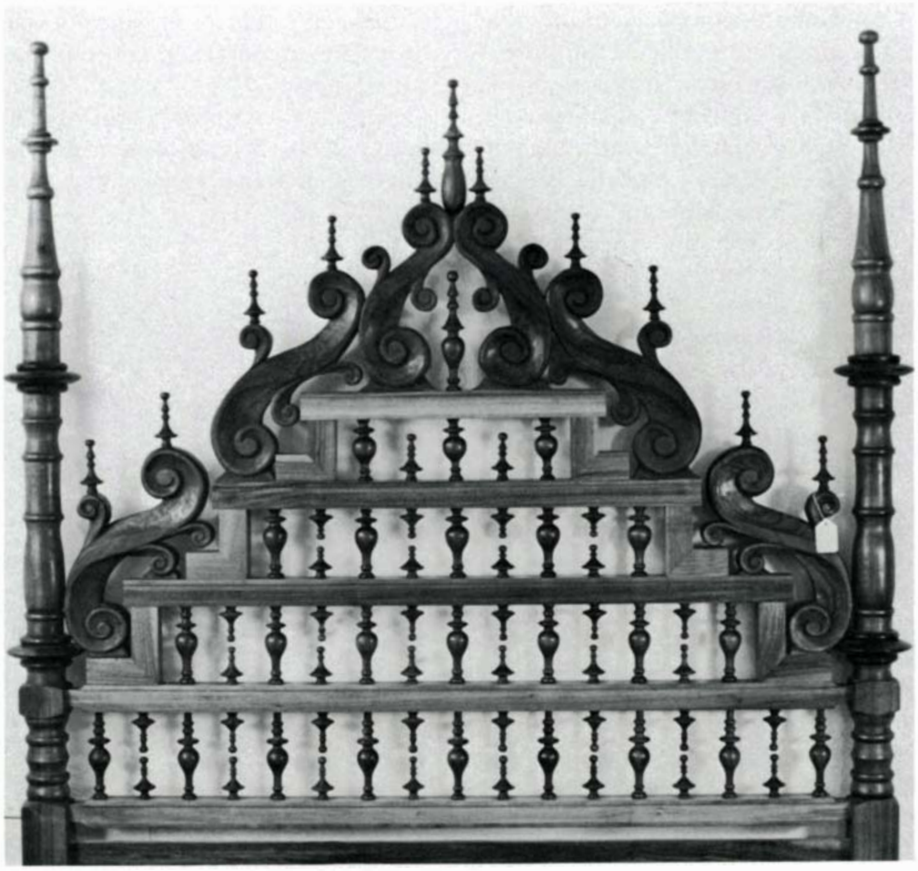






of the cabinetmaking techniques used by the Spanish and Moors before them.

The relative isolation of New Mexico and the fact that the original designs produced simple furniture that held up well under the rigors of frontier life enabled Spanish Colonial furniture design to endure for hundreds of years. Even today, in small villages all over northern New Mexico, local craftsmen use the same furniture designs and techniques as their forefathers. In the larger towns and cities this same basic design and construction, often supplemented with Spanish and Mexican design and modern techniques, is used in commercial production.



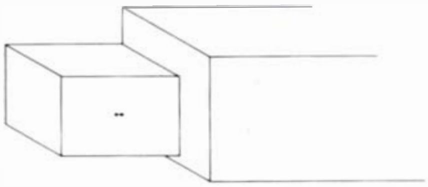
This well executed headboard illustrates the extensive use of spool turnings typical of Spanish Colonial woodworking.

One of the most conspicuous construction techniques in Spanish Colonial furniture is the doweled mortise and tenon joint. Of course, the mortise and tenon were not used merely to accommodate wood movement. Until the development of doweled joints, the mortise and tenon joint was the only one to use in many types of fine joinery. Nor would it be accurate to say that the doweling of the tenon is solely a desert cabinetmaking technique. It was used in fine furniture in many countries and was considered the best insurance against joint breakage from any cause. For whatever reason the doweled mortise and tenon joint was used in other countries, it does appear probable that its almost universal use in Spanish Colonial furniture and its continuation after virtual abandonment elsewhere is at least partly due to its ability to hold tight even when the glue joint is broken by shrinkage. The joining of edge grain to end grain is normally the point of greatest weakness and susceptibility to wood movement damage in furniture construction.

A characteristic feature of the Spanish Colonial doweled mortise and tenon is the almost exclusive use of only one dowel. European and American cabinetmakers often used two dowels at either side of the tenon to increase the strength of the joint. The absence of this extra dowel in most Spanish Colonial furniture is possibly due to the fact that shrinkage across the face of the tenon will cause stress to build up between the two dowels and split the tenoned piece. The use of only one dowel prevents such stress from developing.

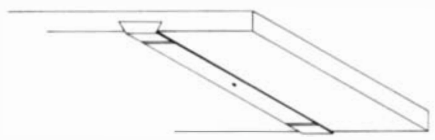
Another characteristic of this joint, although seldom seen today, is the wedged tenon. Traditionally the wedges were driven in at the edge of the tenon. This compression of the pine tenon minimized loosening of the joint through shrinkage. To wedge the tenon with the crude tools they had, the New Mexicans broke with the almost universal Spanish tradition of using blind tenons and began cutting most mortises through. Modern makers of Spanish Colonial furniture have continued to use the through tenon for stylistic reasons even though the main reason for its use, ease of tenon wedging, has been largely abandoned.

Offset tenon doweling is sometimes used in the Spanish Colonial doweled mortise and tenon joint. The dowel hole is bored through the mortised piece (with a waste piece inserted in the mortise to prevent breaking out of the mortise sides). The tenon is inserted, and the mortise dowel hole marked on it. The tenon is then removed, and the dowel hole bored, offset slightly toward the shoulder of the tenon. A tapered dowel is then cut 1/8-inch shorter than the dowel hole. When the dowel is inserted, glue is used only on the final 1/4-inch to prevent the dowel from protruding when the piece shrinks.



When driven home, the tapered dowel wedges the tenon shoulders tightly against the mortised piece, resulting in a joint that will stay extremely tight even if the tenon shrinks away from the mortise sides.

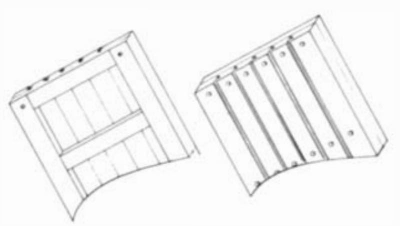
Another movement-accommodating feature in Spanish Colonial furniture is the dovetailed billet. It was a unique Spanish method for attaching trestles to table tops. It was not widely used in colonial New Mexico, probably because the early New Mexicans could not execute it satisfactorily with their crude tools, but has become a standard technique in modern Spanish Colonial furniture. It is made by first cutting female dovetail dadoes the width of the table top at the places on the bottom where the trestles attach. A tight-fitting male dovetail billet is driven into each dado, cut off flush with the sides and often molded. The trestle is usually then attached to the billet by hinges, screws or bolts. Thus the table top is free to float on the billet while the legs are still firmly attached. This system not only prevents splitting but also controls the cupping tendency of plain-sawed table tops. When the table top shrinks, the billet will invariably protrude. An improvement on the technique is to drive in a short billet,



leaving approximately 1-1/2 inch of dado at each end. Then end plugs approximately 1-3/8 inches long are glued into each end, leaving shrinkage joints of 1/8 inch. To prevent all movement from accumulating on one side, a dowel is inserted through the middle of the billet and into the table top.

The next three movement-accommodating techniques can be traced directly to the Moorish influence in Spain. The first is multiple paneling. Also used on furniture, this technique is most common in large door construction. The rationale for multiple paneling is as follows: a wide panel will shrink considerably across its face, thus loosening the panel in the frame and exposing the unfinished panel tongue and even the panel edge. Multiple panels across the same width will each shrink less and cause less tongue exposure and loosening per panel. Moreover, the smaller confinement of the wood gives it less room to distort on the panel face. An additional feature of this frame and panel construction (and an essential feature on any frame and panel) is that the panels are never glued into the frame groove.

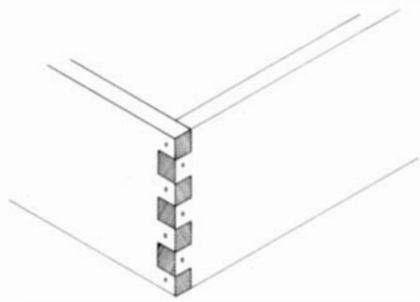
Another Moorish technique is the sheathed door. It is made by sheathing a rigid door frame on one side with



vertical boards. The boards are joined without glue by a shiplap or tongue and groove joint. Each board is then attached to the frame at the top and bottom by a nail, screw or bolt. Thus, each board is held independently and can move freely without affecting the shape or appearance of the door.

The technique of replacing solid panels with a series of turned or shaved spindles is also derived from Moorish woodworking. Shrinkage in the spindles is inconsequential compared to that in a panel, and ordinarily does not affect the appearance of the piece. This device can be seen in cupboards or trasteros, as well as in certain headboard designs.

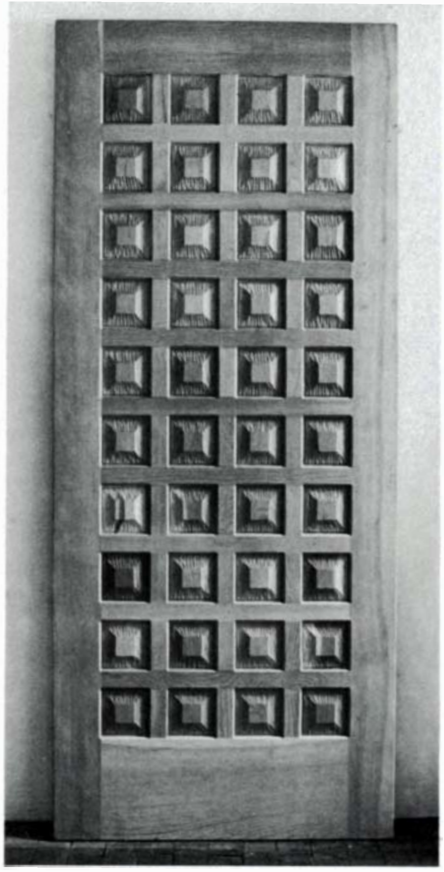
The early New Mexicans sometimes substituted a doweled finger joint for the traditional through dovetail in their chests or arcos. Characteristically they used wide fingers and doweled through only one side. A superior joint was produced, however, in 15th-century Spain where the fingers in each side were doweled. The resulting joint held



even with broken glue lines, as long as the bottom or top remained in place.

The double dovetail or butterfly key across edge joints has come into fairly widespread use in modern Spanish Colonial furniture. Although many times only thin inlaid ornamentation,

A multiple-panel door in pine. The panels were beveled with a gouge. The use of spindles (below, right) in the central section of this trastero door accommodates wood movement and also allows the contents of the cupboard to be viewed.

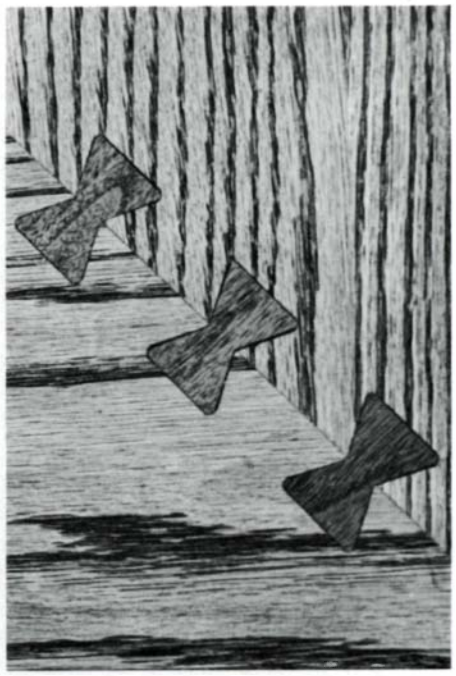


the key can significantly inhibit edge joint breakage due to shrinkage distortion when amply made and carefully inlaid.

Careful edge joint preparation by the Spanish Colonial furniture maker reduces the possibility of joint breakage caused by shrinkage distortion. (Edge joint gluing is a relatively recent phenomenon in New Mexico and Spain. Early cabinetmakers had single pieces of almost any needed width or thickness, or used an unglued tongue and groove joint.) Often a gap in an edge joint must be planed true before gluing even though it can be pulled up with clamps. Further shrinkage may increase the spring and break the joint. Sawed edges are jointed before gluing unless extremely smooth and straight. If possible, prepared edges are glued relatively quickly before further wood movement distorts the edge line. The glue joint is allowed to dry thoroughly before surface planing or sanding. This is to prevent a depression from forming at the glue line when the wood, which swells with the moisture of the glue, shrinks back to its original position. If several plainsawed boards are glued up, the annual ring arc in the end grain is reversed alternately, so that cupping of the individual boards does not cup the entire piece.

Wood selection is another important aspect of the Spanish Colonial furniture maker's wood movement awareness. An extremely popular wood is the very stable Honduras mahogany. Relatively stable black walnut and white pine are also used extensively. The most movement-conscious cabinetmakers try to use relatively straight-grained material. They also try to use quartersawed lumber in preference to the more beautiful but less stable plainsawed material. (Unfortunately, quartersawed lumber is now practically unavailable.) Also, when laminating, the Spanish Colonial cabinetmaker tries to choose material of similar movement characteristics, matching wood types and avoiding a combination of plainsawed and quartersawed stock.

When possible the Spanish Colonial furniture maker chooses lumber that has had time to air-dry to the ambient equilibrium moisture content over lumber recently shipped from the kiln. (The rise of solar-heated kilns may soon allow lumber yards in the Southwest to dry furniture wood down to acceptable moisture levels, thus allowing production shops to use properly dried material.)



Low humidity has caused the wood to shrink to such an extent that the edge of the panel is exposed. At right, butterfly keys on a mitered joint. The middle key was inaccurately laid and required the use of filler.

Some Spanish Colonial furniture makers use relatively "wet" kiln-dried wood to their advantage by making female pieces out of it before it dries and making male pieces out of drier wood. After gluing, the female piece shrinks to hold the joint more tightly.

Many Spanish Colonial cabinetmakers now use synthetic glues, most notably aliphatic resin. However, some continue to use liquid hide glue extensively. The low moisture resistance of the glue is less of a problem in the desert, and its tough elasticity allows it to stand a fair amount of joint movement before breaking.

Movement accommodation considerations have played little part in the choice of finishes. In colonial New Mexico little or no finish was used on furniture. Today relatively low moisture-resistant oil finishes are the most popular. One of the reasons for this could be that the finish on furniture does little to retard seasonal or longer moisture content changes, and shorter changes affect the wood moisture content insignificantly. One rule of furniture finishing almost universally followed by the Spanish Colonial cabinetmaker is to finish both sides of any board liable to cup, and to use a finish with similar moisture-resistant qualities on both sides. A final traditional rule of the Spanish Colonial cabinetmaker is to avoid endbanding of solid stock if at all possible. Not only does it lead to an unsightly overhang of the end band, but it will break the banded plank if secured tightly at more than one point.

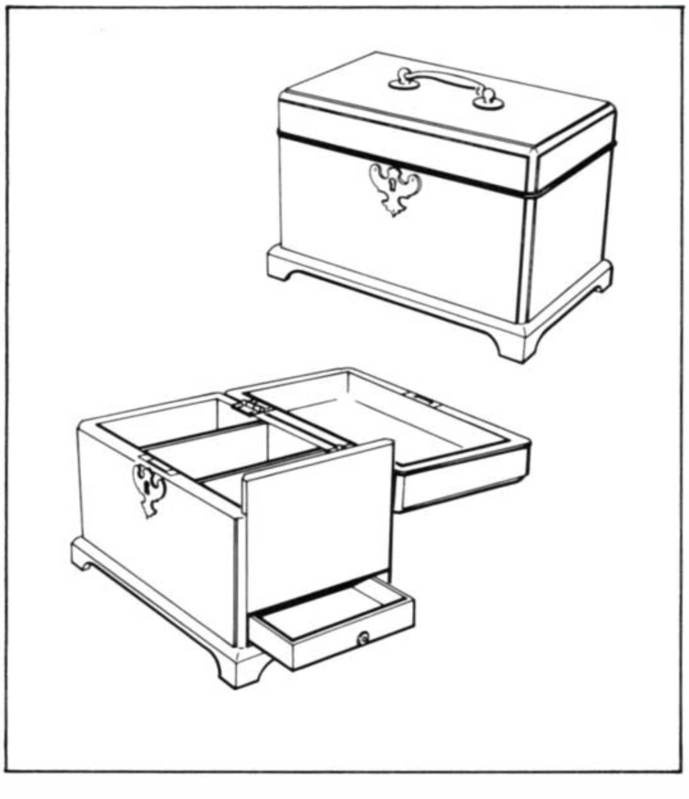
The Spanish Colonial cabinetmaker is in many ways the present embodiment of a long and fascinating tradition of furniture making. However, the movement-accommodating techniques that have developed as part of that tradition should not be of interest solely to the desert cabinetmaker. Wood moves with the temperature and humidity of the air around it. In a New York City apartment which is heated in the winter and open in the summer, wood moisture content may change more than in the desert. Few cabinetmakers know whether the lumber they use is at its equilibrium moisture content, or whether the furniture they build will be moved to a markedly different climate. For these reasons every cabinetmaker, no matter what style of furniture he or she produces, must make design and execution decisions with the possibility of wood movement in mind. The history of Spanish Colonial furniture construction can offer valuable techniques useful in minimizing the effects of that movement.

Hidden Drawers

Some eighteenth-century examples

by Alastair A. Stair

In the George II bureau bookcase above, the columns on either side of small cupboard just above the writing surface push out by spring action to reveal drawers. In the George I box below, the side raises to reveal drawer.



Before the invention of the burglar-alarm system and the combination safe, ladies and gentlemen of means concealed their valuables in all manner of locked boxes and containers. Furniture often contained secret drawers and compartments cleverly hidden by the cabinetmaker. The need for such concealment afforded many opportunities for the English craftsman to exercise his highly developed sense of invention and surprise and his fondness for devices, to the delight of his clients.

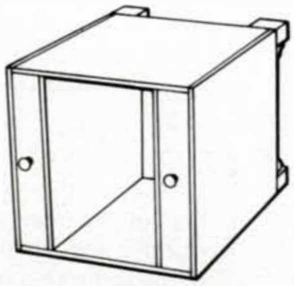
Many items that are readily available today were difficult to obtain in the 17th and 18th centuries due to the slowness of trade, and were therefore very expensive. Tea, sugar and spices were precious enough to be kept under lock and key. Small tea chests, today called "caddies," became popular for carrying tea to the table. They are partitioned or fitted with canisters and often contain hidden compartments. Tea chests and various other boxes and caskets designed as receptacles for coins, jewels and documents were made with locks and sometimes carrying handles, themselves often hidden from view. Some boxes, fitted with padlocks, were used for the dispatch of confidential communications; one key was kept by each correspondent. Boxes of all types were so much in demand that an independent trade guild of box-makers was incorporated in the 17th century.

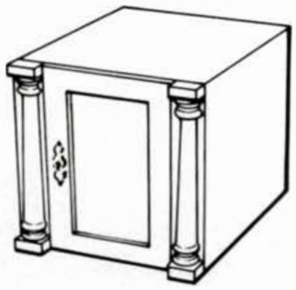
One of the most fascinating pieces I have seen is a small George I rectangular box, inlaid and veneered with walnut. The interior is divided into triple compartments. To the eye, the container is all of a piece. However, when open, one short side cleverly slides up to reveal a shallow drawer which runs the length of the box and can be pulled by a tiny ivory knob.

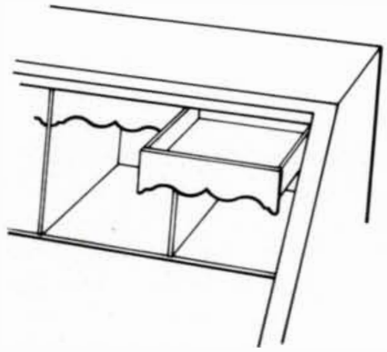
Slope-front desks and secretaire bookcases will almost always reward the seeker of the secret drawer. These are fitted inside the flap with a series of pigeonholes for ledgers, documents and letters and very often a small central cupboard. The pigeonholes often hold one or more secret compartments most cunningly contrived in what appears to be part of the fixed construction. The cupboard often contains a secret compartment hidden under a sliding panel, sometimes operated by a wooden or steel spring.

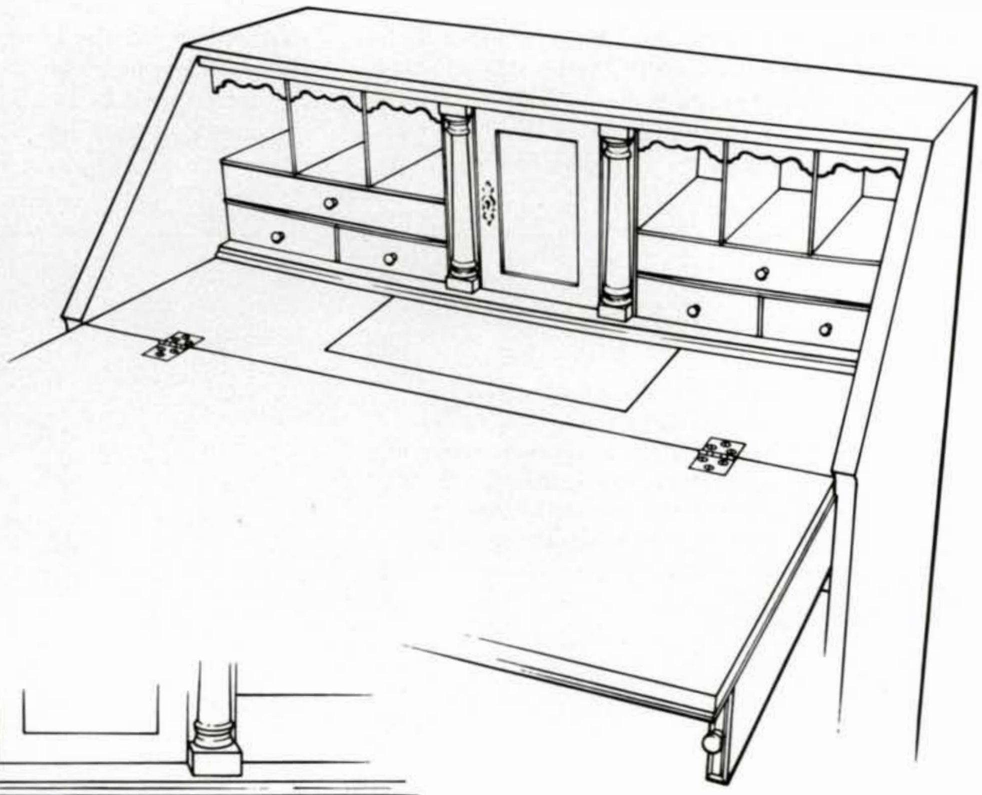
A walnut slope-front desk (c. 1725), currently at Stair and Company, illustrates several ingeniously arranged hiding places. The central cupboard appears to be fixed, but is actually a box in itself which pulls out entirely and when reversed reveals two high, narrow drawers located behind the half columns. In addition, the decorative carving on top of the pigeonholes appears to be one-dimensional. In fact, four of the sections are, but the last pigeonhole at either end has a carved molding which is in reality the end of a very shallow

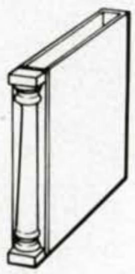
Desks

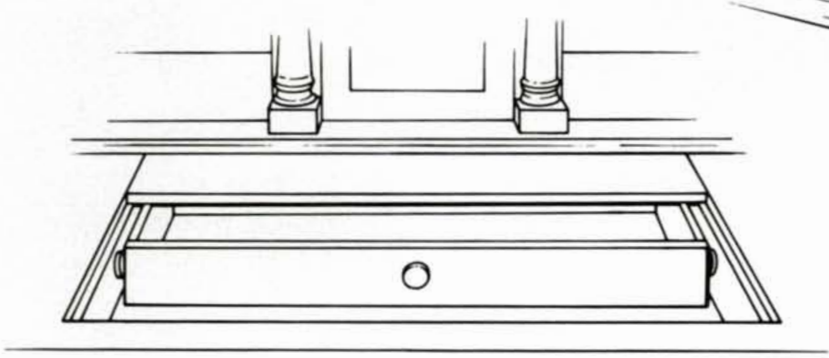


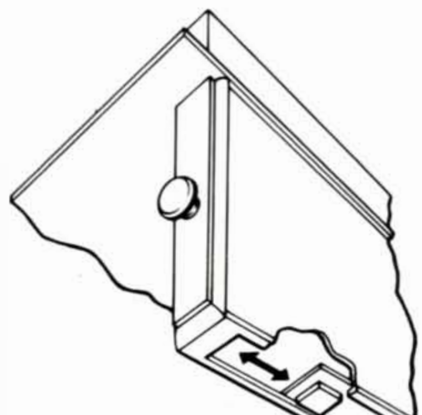












A hidden desk compartment can be located almost anywhere: (clockwise from above) under a sliding panel, behind a spring-action pilaster, on the back of a removable central cupboard, behind a decorative molding or inside the desk-top support arm.

drawer which pulls out by hand. This is a very common device.

There is also a George I walnut bureau bookcase that has a central cupboard flanked by half columns. When one takes hold of the capitals, these columns reveal the fact that they are the short sides of rather deep sections, perfect for the secreting of important papers and currency. And here once again we find the common practice of using a decorative molding on a pigeonhole to hide a shallow drawer. Sometimes the entire pigeonhole or series of pigeonholes will pull out to show smaller, concealed sections behind. I recently sold a George II mahogany bureau bookcase (c. 1740) in which the skilled cabinetmaker had hidden a pair of drawers, the ends of which are disguised as two inlaid pilasters which flank the central cupboard. When slight pressure is applied to them, they pop forward by spring action. Such bureau bookcases sometimes contain wells revealed by panels which slide back or lift up on hinges to show one or more secret drawers.

Probably one of the rarest and most ingenious hiding places contrived by the 18th-century English cabinetmaker is located within the sliding supports that hold the slant top of a bureau open. When purchasing a case piece of this type, I always move my fingers along the underside of these supports in search of a sliding panel. Old guineas will often drop out.

Hidden drawers are found less often in tables than in case pieces. When present, they are rather skillfully camouflaged as in a small Sheraton kidney-shaped writing table (c. 1780). Here a central drawer, marked by a keyhole, is obvious to the eye. But two more drawers are disguised in the frieze, in the shape of wedges which swing out from each side of the table when hand pressure is applied to the underside.

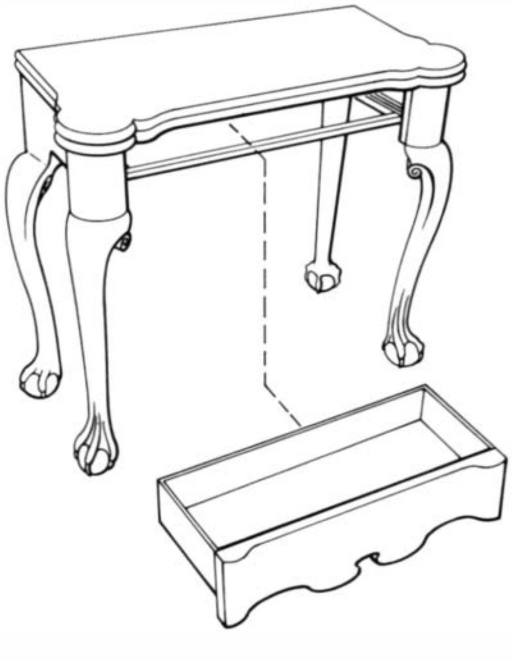
Another very interesting example of a drawer concealed in the frieze of a table is found on a George II mahogany card table. Almost the entire frieze is in fact a rather large drawer, extending for 23 inches. Because it lacks both escutcheon and brass pull, its existence completely eludes the eye.

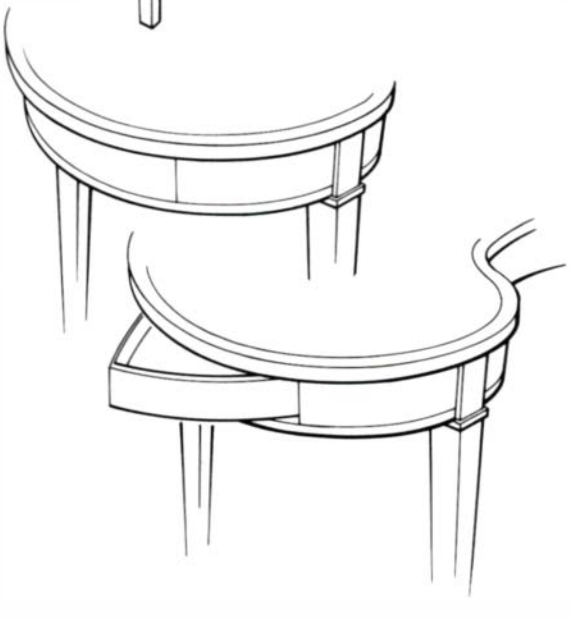
A Chinese Chippendale card table (c. 1760) contains a secret drawer which defies detection due to the screen of open fretwork around three sides. The small drawer is under the table directly behind the gate leg which swings out to support the table when open. It is invisible when the table is closed.

Many secret drawers and hidden compartments are awaiting discovery by the diligent collector of antiques. Even today it might be a wise idea to remove one's valuables from the burglar's eye by tucking them away into devices created two hundred years ago. Or some craftsmen may wish to incorporate hiding places into new pieces.

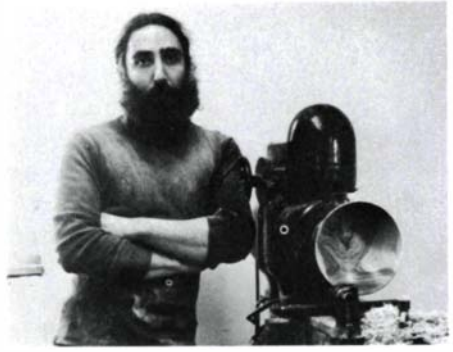
Tables

Some examples of concealed table drawers: Chinese Chippendale card table showing drawer behind gate leg (right); Sheraton kidney-shaped writing table with wedge-shaped drawers disguised in the frieze or apron (below, right); George II card table with the frieze doubling as the drawer front.





Green Bowls



Turn unseasoned wood, dry it, then turn again

by Alan Stirt

A big problem in bowl turning is obtaining thick, wide, dry wood. You might be able to get 4-1/2 or 5-inch thick mahogany or 4-inch teak from an importer. In the Northeast you might find some 3 or 4-inch maple, birch or cherry at local mills. These planks usually contain numerous checks and splits. If they are sound, they will be more expensive than thinner material. If you want to turn a number of bowls, such sources will be quite frustrating in terms of cost and available species.

However, green (unseasoned) wood can readily be found and is often free. Even exotic woods are much cheaper when bought in the log. Working directly from the log gives you an opportunity to fit sizes and grain patterns to your own requirements, rather than accepting material that has been milled to a predetermined size. Green planks also offer advantages over dry wood. You can get larger sizes (the sawyer won't mind cutting extra-thick planks if he knows that *he* won't have to dry them), and the material will be in better condition.

In rural areas, logging waste — often containing the most figured wood — sawmill slabs and storm-damaged trees are usually free or sold cheaply. Firewood piles yield nice chunks of local hardwoods. Small local mills usually are glad to cut logs to whatever dimensions you want. Here in northern Vermont, mills charge $40 to $50 per 1,000 board feet for milling logs that you bring them. If you buy a log from the mill and have it cut, the cost is 20 to 30 cents per board foot. If the log is in good condition, such material is virtually check-free. Even in cities, green wood can be had from local tree-removal services and highway departments.

After you've found a supply of green wood, you have to dry it. One way is in planks or bowl-size blocks, but this is unlikely to produce perfect material. The easiest method is to turn the wood when it's green. Once the wood is in a bowl shape it dries much faster and with fewer defects than a solid chunk. You might start with a slab of lumber 4 or 6 inches thick, but if you turn the walls of the bowl down to an inch, it dries more like 4/4 stock. The analogy isn't exact because the grain orientation of the bowl isn't the same as that of milled lumber, but proper drying procedures minimize the differences. As the bowl dries it will warp and shrink, but once it is dry the walls are thick enough to be turned true again.

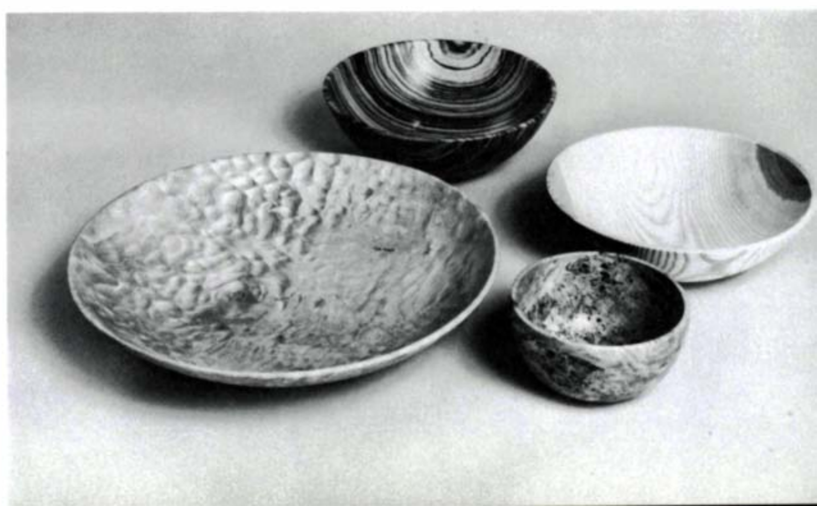
As an example of green turning, I'll show how to get a dry bowl from a green log of lignum vitae about 9 inches in diameter. It had been drying for about two years, but it was still quite wet. Similar procedures can be used for most hardwood species, both native and exotic.

First, cut about an inch off the end of the log to find check-free wood. If the log has been in the sun, it may be necessary to cut a series of thin slices to reach sound material. In some hardwoods small center checks run the whole length of the log, but these will be removed when trimming the block for the lathe. Next cut off a cross section as long as the diameter of the log, and rip this piece along the grain through the center of the log. If there are any center checks, make this second cut parallel to them and the saw kerf will often obliterate them. It is important to make sure the center of the tree —the pith—does not end up in your bowl as it will almost certainly split. Note any other checks and defects and plan your cuts to eliminate them from the final shape. Next, flatten the outside of each slab. This will be the bottom of the bowl. The flat surface will make the block safe to cut on the band saw. On the lignum vitae I roughly flattened the bottom with a 1-1/2-inch carving gouge, but these cuts can be made with a chain saw or a band saw. To cut down vibration and make turnings easier, I taper the sides of the block. I used the gouge but the easiest way is to saw a tapered circle. My band saw just doesn't have the capacity to make this cut.

The more you refine the shape with hand or power tools, the easier the initial turning will be. How far you go depends upon the size and species of your block of wood, the size and weight of your lathe, and your confidence and skill in using your tools. It's best to start with a balanced shape and discover how much unevenness you and your lathe can take. Even a small, out-of-balance piece can cause a lot of vibration.

First I turn the back of the bowl, with the face that was at the center of the log attached to the faceplate. Use long screws to grip the wet wood since the bowl will be absorbing a

Bowls turned from green wood by the author. Largest, 15 inches across, is of quilted, broad-leaf maple. Others (clockwise) are from zebrawood, white ash and cherry burl.



number of hard knocks in getting it true. Even if you don't usually wear a face shield when turning, it's important to wear one now. In the early stages chips will fly in all directions and some of them will be rather large.

Before turning on the lathe make sure the wood will not hit the ways or the tool rest. I start at a low speed and use a gouge, taking light cuts at first.

Don't try to decide the exact shape until all the rough spots are gone. Once the bowl is true, stop the lathe and carefully examine the wood. Note any defects which have to be removed, and interesting grain patterns to develop. The shape and the grain can be made to work together to create something more than just a bowl. On the lignum vitae bowl, I cut quite a bit off the bottom to ensure an interesting balance and pattern of heartwood and sapwood.

In shaping a bowl, I find the gouge to be the most efficient and enjoyable tool. The wood cuts cleanly and thick, curly shavings usually fly from it. Lignum vitae is an exception, preferring to come off as chips. Some woods, particularly butternut, are so soft and stringy when wet that they are hard to cut with anything but a gouge. A scraper just pushes the fibers around. To cut the straight foot, I use a 1/4-inch gouge with a slightly pointed nose.

When the contour of the bowl is done, flatten the bottom and make a pencil line to help reposition the faceplate.

Before remounting the bowl, I drill down to 1 inch from the bottom using a 1/2 or 1-inch bit. This gauges the depth and makes the gouge work easier. The faceplate can now be mounted on the bottom, using shorter screws because the wood will be running true. If you align two of the screws with the grain direction, the holes will probably remain in line during drying. Jot the screw size on the bowl for remounting later.

First I clean up the front, taking light cuts with the gouge. This can be a great help in reducing vibration, particularly if a chain saw was used to cut the log and the front is uneven. Now the bowl can be hollowed out. Because the wood is wet the tools stay cool and large amounts of wood can be removed before resharpening. I usually start at the center and work out toward the rim.

It's important to keep the thickness uniform throughout, so the bowl will dry evenly with less risk of checking. The thickness is very important in determining drying time, and a bowl turned down to 1/4 inch would dry very quickly with little chance of checking. However, it would distort more than a thicker bowl and when dry would be nearly impossible to turn truly round. For most native woods leave the walls and bottom about an inch thick. I gauge the thickness with calipers as the bowl nears completion, and examine it carefully for checks and knots. Checks present when the bowl is wet will get larger as it dries, and knots will often start checks that spread through the wood.

If you're satisfied with the condition of the wood, start the lathe and coat the bowl with a heavy layer of paste wax. I use Johnson's paste wax because it's cheap and I purchase it by the 12-pound case. Wax the bottom after removing the faceplate.

It's a good idea to rough-turn in an uninterrupted sequence. If you have to stop before the bowl is hollow, wax the wood to keep it from drying. I have had unwaxed pieces start checking in minutes in a heated shop.

Generally, the slower the drying the less risk of severe warping and checking; however, if the drying is too slow the wood may succumb to fungus and decay. And the slower the bowls dry, the more storage space the turner needs.

One controlling factor is the coating on the bowl. If left unsealed, the end grain will dry much faster than the rest. This can result in checking. Wax evens the drying rate and slows the whole process. So far I have used only paste wax. I'm sure any sealer that would adhere to wet wood would work to some extent. If I find that one layer of wax is not preventing checking I'll add more. The more layers of wax, the slower the drying and, up to a point, the less the chance of checking.

Each species of wood dries differently. In general, the higher the density of the wood, the longer it will take. But even within a single species the density can vary greatly. Sapwood will generally dry faster than heartwood and can cause extra distortion in bowls where both are present. Among domestic hardwoods, cherry and apple check easily while elm, walnut and butternut are excellent; in general, fruitwoods are more susceptible to checking than nutwoods. Ash may check within minutes.

This particular variety of lignum vitae proved to be very stable. Although I had to be very careful about checking, hardly any distortions occurred (by using many layers of wax and slow drying conditions I lost only one bowl out of 15 completed ones). These bowls I turned from 1/2-inch to 3/4-inch thick. I dry most native wood bowls, turned 1-inch thick, for about three months. I dried the lignum vitae bowls from six to twelve months, according to size and thickness.

You have great control over the drying environment, and the environment is crucial. Temperature, humidity and air circulation are the important factors. In the winter I never start bowls drying in a heated room. Usually I'll dry them in a spare room which stays around 45 or 50 degrees with moderate air circulation. After some weeks — the exact time depending upon the experience with wood of this species and grain formation — I move the bowls to a heated room.

A room which has good drying conditions during a period of high humidity can become an oven when the humidity drops sharply and stays down. Often the conditions can be changed just by opening a door, for increased circulation and faster drying, or closing it, to retard drying. If you want to be more scientific, you can outfit a room with temperature and humidity controls.

Once I found some 12 by 6-inch cherry bowls had checked during their first few days in my "normal" drying conditions. I dug out the checks with a gouge and rewaxed the bowls. Then I put them in my cellar which has high humidity. The bowls gradually dried without checking. However, they developed an unattractive blue-green stain from a fungus which thrives on high humidity. I completed the drying in a heated room and then finish-turned the bowls. The stain went deep into the end grain and was visible after finishing. I later dried the cherry in conditions that represented a compromise between my spare room and the cellar.

It pays to experiment with the facilities you have available; such experimentation should be a never-ending process. I have arrested checking by placing bowls in paper bags for a few weeks to choke off air circulation. Once you have an idea of the principles involved there are endless ways to deal with problems.

To determine when the bowls are at equilibrium with the relative humidity and temperature of the surrounding air, weigh them periodically. When they stop losing weight they are dry. Under average conditions, most native woods rough-turned to a thickness of 1 inch will dry in about three months.

I should mention an alternative to the drying procedures I use. The green bowl can be soaked in a heated solution of PEG (polyethylene glycol 1000) before drying. The chemical replaces the water in the cells and prevents them from shrinking. I experimented with PEG a few years ago and was not satisfied with the results. The slight differences in appearance and finishing qualities mentioned by PEG's proponents were real differences to me. Also, I was having success with natural drying and saw no need to continue with PEG. It can be useful, however, because with it you can turn bowls that include the pith of the tree. I know one professional turner who's satisfied with the results and I'm sure there are more. For further information, contact the Forest Products Laboratory and Crane Creek Company, both in Madison, Wisconsin.

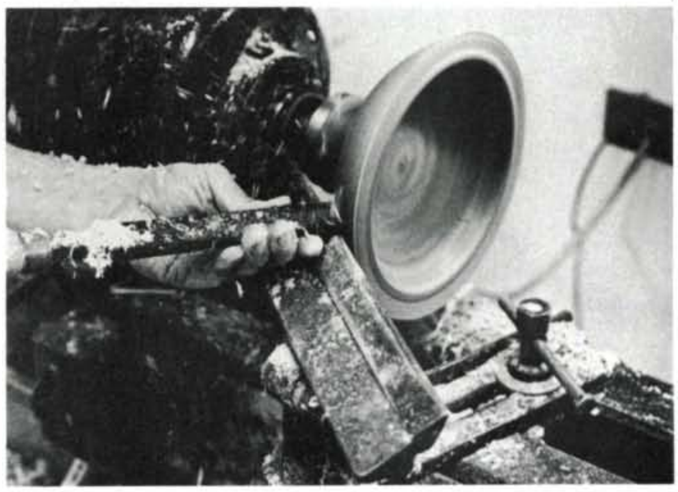
When your bowl is dry it can be finish-turned. First, plane the bottom flat. Before mounting, drill a hole to mark the finished depth. This will prevent turning through to the screws, which penetrate about 3/16 inch. I usually am able to use the same screw holes as in the rough turning, and I use the same length screw. Mount the bowl on the lathe and check to see that it clears the rest and the bed.

I true the outside first, with the lathe at low speed. I usually use a gouge but I found light cuts with a small round-nose scraper ideal for the lignum vitae, which is very hard when dry. A larger tool might have taken too big a bite and forced the bowl off the screws. I finished off the outside shape with a skew scraper.

At this point I usually sand the outside of the bowl. I turn most bowls relatively thin and when I am done hollowing, the walls vibrate. It's much easier to sand before hollowing, with little vibration. I start with 50 or 80 grit and work my way up to 220. I always wear a mask because the fine dust can be quite harmful.

Now I clean up the rim of the bowl with a gouge. Next I get the inside rim true and work my way down to the bottom, using a gouge and scraper. I advise against using the scraper on the sides of deep bowls because it can really make a mess of end grain. When I'm satisfied with the contours and thickness — measuring with calipers — I sand the inside of the bowl using the same grit sequence as on the outside. The bowl can now be hand-sanded, if desired, to remove circular scratches. Finish as you like.

The above procedures are only guidelines and can be adapted for almost any wood you'd care to turn. Exact methods of turning and drying should be worked out individually in one's own particular situation. I've had some failures and will have more in the future, but I've had a high rate of success. It is very satisfying to make a bowl when you control the whole process from log to finished form.



Before turning the back of a bowl cut from a green log (top photo), try to make it as round as possible. With the back turned, the faceplate is then attached to the foot, and the bowl is rough-turned. Then the whole bowl is liberally coated with paste wax (bottom photo) to control drying. When dry, the bowl is remounted and finish-turned.

Queen Anne

Styling elements in table designs

by Franklin H. Gottshall

The Queen Anne style is generally the most popular of all the good English styles of the 18th century and is a good choice for craftsmen wishing to put together their own period design. The style's popularity is due to the fact that in the beginning it was distinguished for its clean lines, beautiful curved elements and restraint in the use of ornament.

Queen Anne's short reign (1702-1714) was not distinguished for any personal influence she gave to the progress of fashion in her day, and so it must be assumed that the craftsmen themselves were largely responsible for the changes and improvements in furniture design during her reign. The happy result was that craftsmen, who understood both the practical possibilities as well as the limitations of their craft, were largely free of the domination by patrons whose wealth and position did not necessarily reflect good taste. Thus, at least in its early stages, the style was relatively free of the excesses in form, embellishment and elaboration so prevalent immediately preceding this style, and in those which followed.

Cupboards, cabinets, chairs and tables became less elaborate and fussy, and were designed with a view to their function rather than to ostentation and display. Technical improvements in both design and construction were made with pleasing results. The changes brought about by these factors, as well as an improvement of the economy in England during this period, made it possible for more people to share in the amenities which had previously been largely reserved for the privileged few.

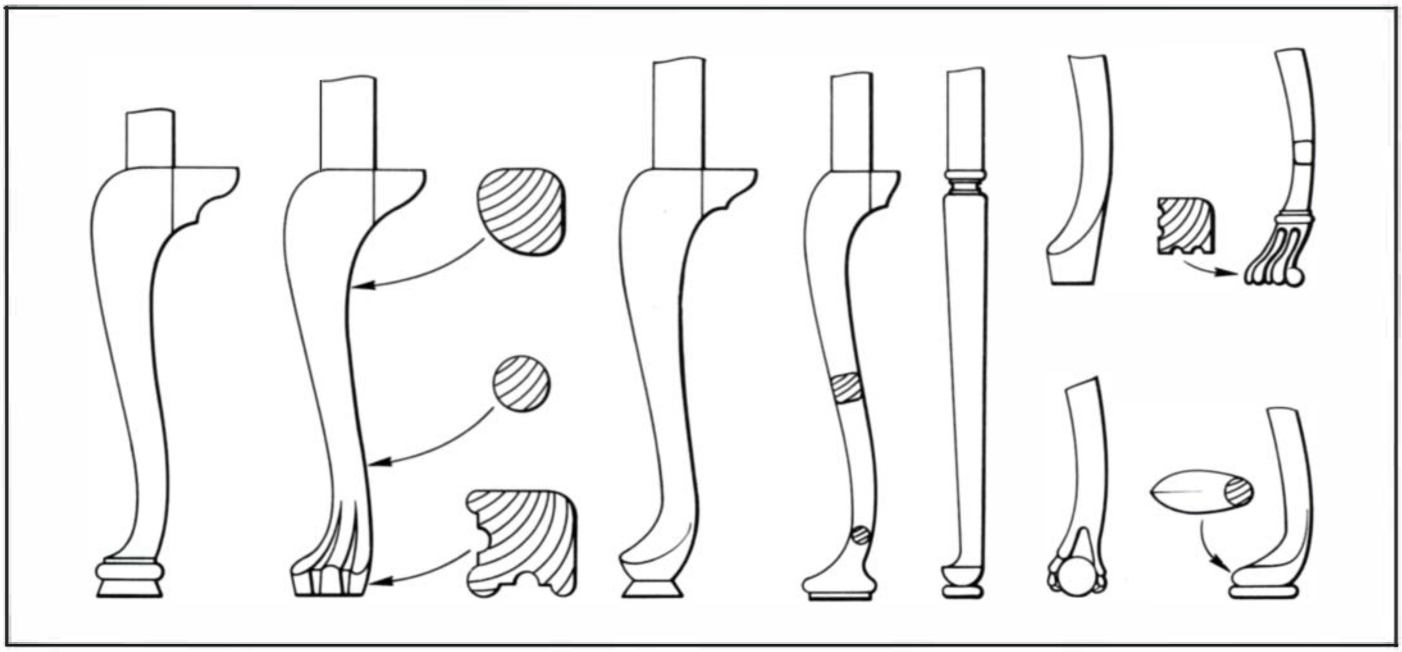
While the Queen Anne style came into being during the very beginning of the 18th century, its influence, once it was well established, continued well into the latter part of the century. Artists like William Hogarth greatly influenced design at this time, especially the employment of the reverse curve, both structurally and decoratively. Also sometimes called the cyma curve, it is used consistently and with good effect in Queen Anne style.

On a portrait of himself, which now hangs in the National Gallery of London, Hogarth painted a palette on which appears a reverse curve with the caption "The line of beauty and grace." This aroused so much discussion that an explanation was demanded of him. He explained it by saying that "a beautiful curve by its serpentine, flamelike waving and winding simultaneously in different directions leads the eye in a pleasing manner from one end to the other." He sought to explain it further by saying that the principles involved were "fitness, variety, uniformity, simplicity, intricacy, and quantity — all of which cooperate in the production of beauty, mutually correcting and restraining each other occasionally.

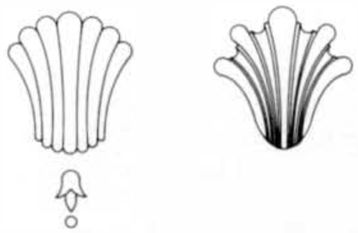
In addition to this, he portrayed Queen Anne furniture in many of his paintings, which enjoyed wide distribution during the first half of the 18th century.

The American colonies not only imported a great deal of furniture, once trade was well established, but they also made reproductions and adapted the styles to their own requirements. Fortunately, in the majority of cases, their adaptions reflected the simple, clean-cut lines and attributes by which we identify the style in America today.

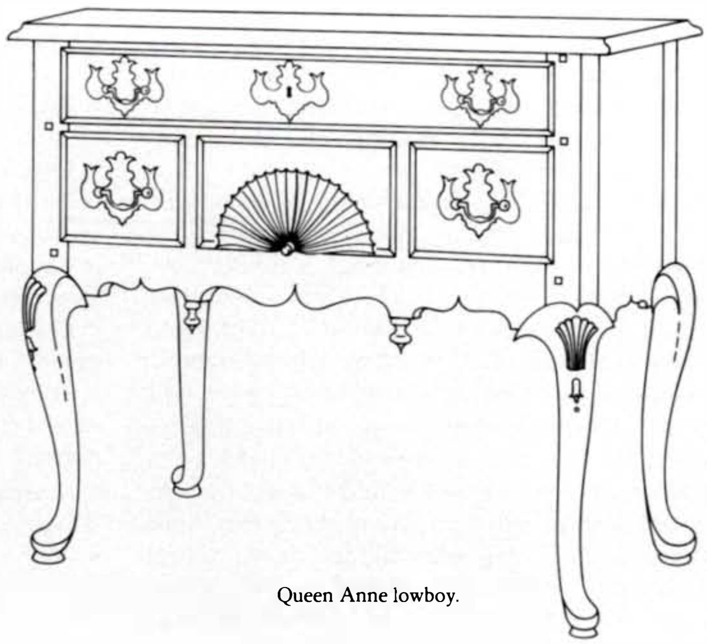
Some styles of legs and feet found on Queen Anne furniture. Among the most widely used were the trifid (three-toed) webbed foot (second from left, also shown in cross section) and the pad foot (third from left). The ball-and-claw (second from right, below) later became a Chippendale hallmark. The Spanish foot is shown at right (above.).



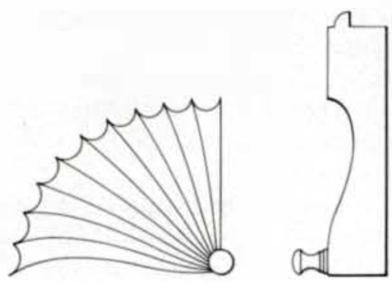
Some Queen Anne Styling Elements



Shell carvings for knees of legs.
Also used for aprons of tables and lowboys.

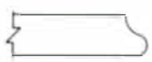


Queen Anne lowboy.

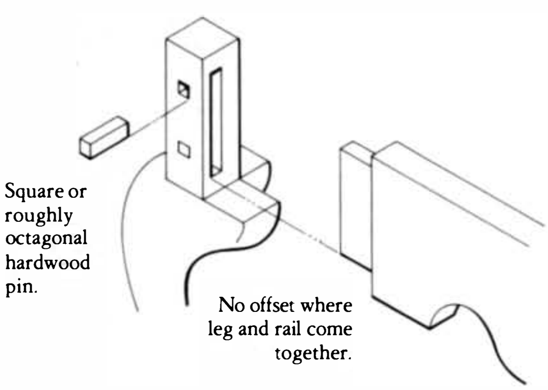


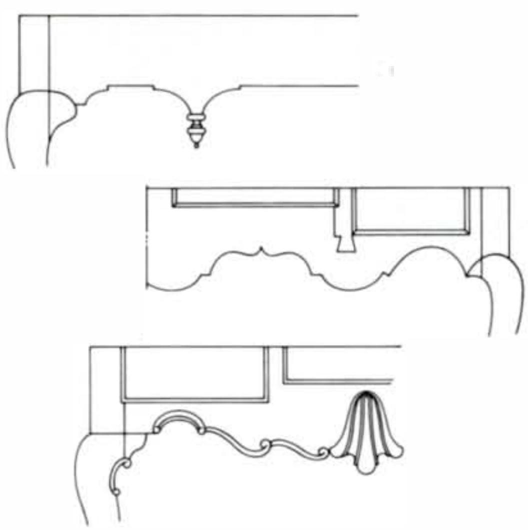
Sunburst carving on drawer.

Brass drawer pulls (good ones always have carefully beveled outlines).



Molding around top of lowboy.





Aprons which may be adapted to lowboys, tables, etc.

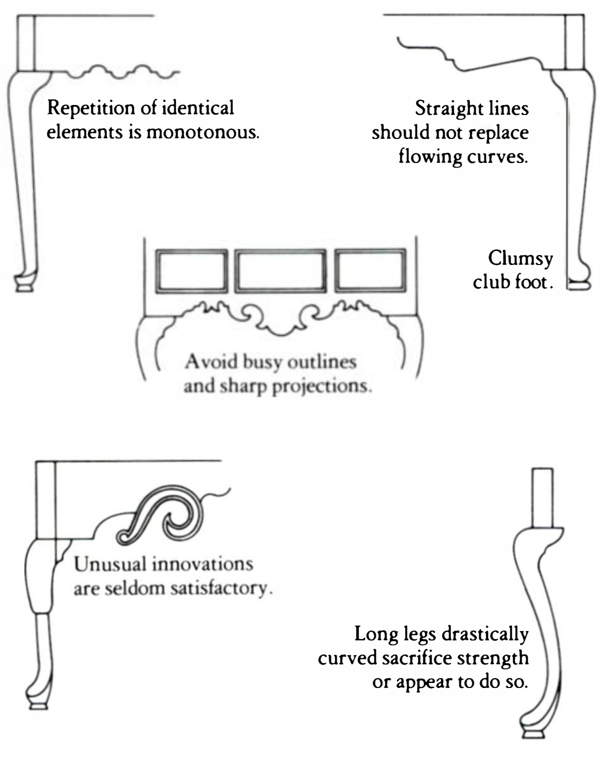
At present, good American Queen Anne furniture is more highly prized by American collectors of antiques than its English counterparts. Among the reasons for this are that skillful cabinetmakers like William Savery and others did notable work in the style, basing their work on the early, simple, clean-cut patterns imported from Europe. They used walnut rather consistently because it was available and plentiful in the areas where they worked. Maple, a wood not native to the mother country, was also used; so was poplar as a secondary wood for drawer sides and like members.

About 1720 and thereafter there was a gradual substitution from walnut to mahogany in England, but this change did not take place in America to any great extent until a long time later, because mahogany was more expensive and no great improvement over the native walnut.

One of the most appealing developments of the Queen Anne style was the small dressing table or "lowboy," so-named to distinguish it from the "highboy," a similar piece with a chest of drawers on top. Lowboys are about table height, rarely exceeding 30 inches. (An antique purporting to be a lowboy which is much taller, or wider than the example shown, is probably a converted highboy and worth a lot less.)

As the Queen Anne style metamorphosed into Chippendale, ornament became more and more elaborate, often featuring quarter columns and other refinements. But the best (and most highly prized) furniture of the Queen Anne style is characterized by the minimal decoration, simple outlines, beautifully formed curves and sound, sturdy construction of the early period. The modern craftsman would do well to adhere to these principles.

Bad Queen Anne
(taken from actual antiques)



Gate-Leg Table

A contemporary version

by Paul Buckley

Gate-leg tables are by no means new. They were popular in colonial America where settlers sometimes ate, slept and lived in one-room homes. Multi-functional furniture which uses space efficiently was highly desirable under such crowded conditions.

Our needs today are typically much different, yet many modern interiors lack usable living space. The increase in apartments, condominiums and smaller homes has again caused multi-functional and folding furniture to become very popular.

Sensing this need for more efficient furniture, I set out to design a table that would belong esthetically in a contemporary environment and be completely functional, yet conveniently small when not in use. After one year of designing and experimenting, I was satisfied that this table fulfilled all my criteria.

In this article I include the methods used to construct the table and solutions to problems inherent in the design. The dimensions are from my table, which was designed specifically for my personal needs and taste. I encourage each craftsman to evaluate this design in the light of his or her own needs, feelings and creative abilities. Changes can be made in any part of the design as long as you realize the table has two natural limitations. The height of the table determines the length of each drop leaf. And the gate legs, to maintain stability, must be at least six inches wide or apart when closed.

Wood selection is no great problem. It is safe to assume that any hardwood is suitable. I used white oak because it is stable and has strong grain pattern, which I felt was desirable in this simple design. Because some shaping is involved, it is also advisable to use a wood you are familiar with.

I have found that the most logical sequence of construction is to build the gate-leg frames, then the table frame and finally the leaves. The entire table is made from 7/8-inch thick stock. In cutting the leg parts, remember to allow 2-1/2 inches extra for tenons for the horizontal crosspieces. Next, lay out and cut 1/2-inch mortise joints, and tenons to fit. Care must be taken in assembling the members to ensure a square leg frame. After clamping, measure the diagonals and re-square if necessary. This step will avoid problems later in the table frame assembly. Before shaping the legs, drill and position the dowels the legs will pivot on. Then shape and sand each leg until you get finished surfaces.

Frame construction begins with cutting all members to length and width. Lay out the dovetails (which I chose because of their strength and simple beauty). First cut the pins on the frame side members, where pressure will be

exerted if wracking of the frame occurs. Then cut the tails on the top and bottom members.

After the jointing is completed, dry-clamp the frame into position. This step will help avoid confusion while laying out the side handles, bottom frame cutouts and the 1/2-inch diameter holes for the gate legs. Also, the hinges have to be routed into position before the frame is assembled. (I found these special drop-leaf hinges, shown in the photograph above right, in the Minnesota Woodworkers Supply and the Craftsman Wood Service catalogs.)

It is easier to sand the interior surfaces before assembly because the legs will interfere with any later attempts.

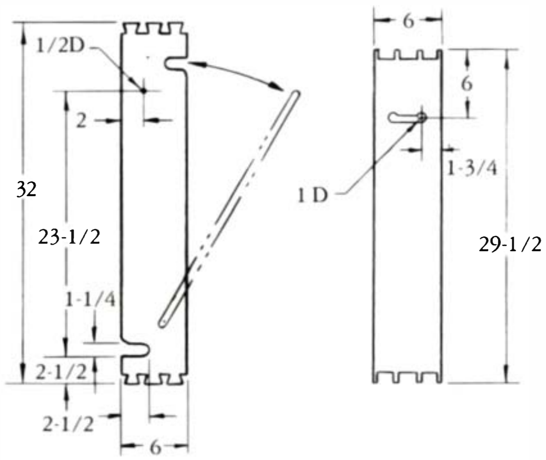
Assembling the frame is simple if your dovetails fit well and the gate legs are square. The legs must be in position before final assembly.

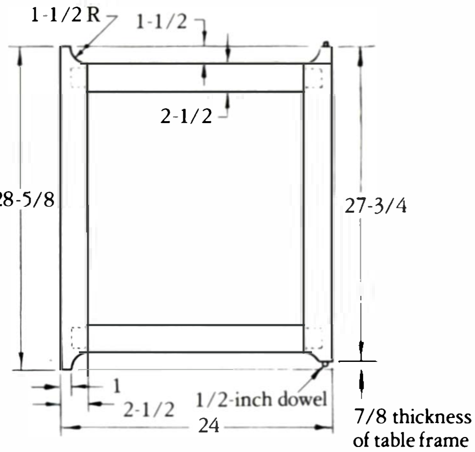
The tops are simple laminations with tongue and groove breadboard ends. A few tips may be helpful. To ensure that the wood of each leaf matches up, laminate one large top and then crosscut into two pieces. Remember that wood expands. The width of the leaves is determined by the season of the year that you fit the top to the frame. Leave a larger gap if you build the table in the winter. You may still have to adjust the leaves for summer humidity. A slight friction fit holds the leaf closed against the bottom of the frame when the table is folded. This fit is accomplished by planing the breadboard end and moving the adjustable hinges until the desired pressure is attained.

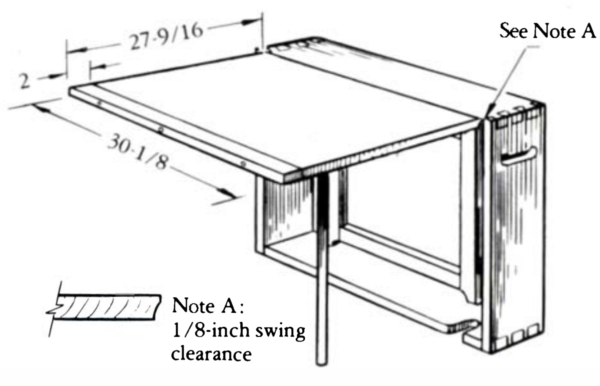
To allow the leaves to expand and contract, I secured each breadboard with three 2-inch #12 roundhead wood screws set into 1/2-inch diameter counterbored holes that were later plugged. When drilling the shank clearance holes, I elongated the outer two holes, creating a slot in which the fixing screws could slide. The pilot holes for all screws were drilled normally. By using this method you can securely fix the tabletop to the breadboard ends, but also allow the outer edges to move freely.

Because I used only one breadboard on each leaf, an additional method to minimize warpage on the hinge end was needed. The method I chose was to alternate the heartwood-sapwood sides of the top's laminations. This created a slight washboard effect, but avoided the large distortions that would have occurred without some hold-down method. Other possible solutions to this warpage problem are using two breadboard ends on each leaf, or using oak plywood for the top, thus avoiding the movement problem.

You can experiment with the finish. I used Watco oil, which is easy to care for, but you may prefer a more durable finish for everyday use.







Turning Conference

Notes and information on a recent gathering

by John Kelsey

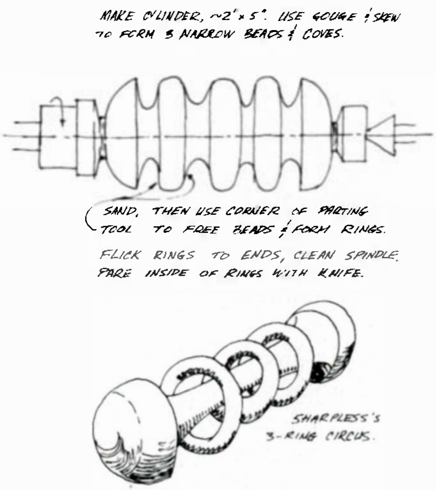
Fifty woodturners from around the Northeastern states rolled into the George School in Newtown, Pa., on the last weekend in March to share lore, reduce squares to mounds of chips, and watch artists like Paul Eshelman do their stuff. They included students, teachers, full-time woodworkers, and hobbyists. Their abilities ranged from novice to master. Some notes:

Albert LeCoff conceived of the conference and was the force that made it happen. His twin brother Alan, a sociologist by trade, volunteered to take on the bureaucratic details. He proved that if 50 woodturners pay $25 each and find their own accommodations with each other and friends in the area, they can enjoy a three-day conference in superb facilities, with lunch, morning doughnuts and a thick portfolio of printed reference material, plus a tour of the Mercer Museum thrown in — and show enough profit to pay the instructors a small honorarium.

Palmer Sharpless rules the woodshop at George School. He offered its facilities to the conference, arranged with friends to bring in more lathes, for a total of 10, and commandeered the time and energy of some of his family to make the weekend a huge success.

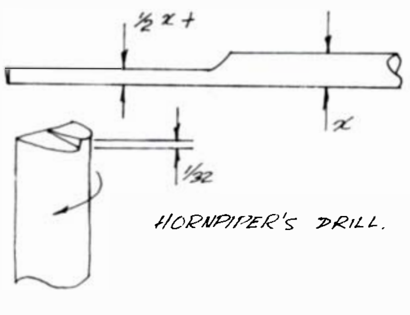
An artful and ingenious turner, Sharpless enjoys demonstrating the finer points on an ancient colonial treadle lathe that is driven by the turner's strong right leg. He points out that the lathe, one of the oldest machines used by men, was for a long time the only power tool the woodworker had. "How much colonial woodworkers leaned on the lathe!" he says. "They used turnings for almost everything."

Wearing his tricorn hat, Sharpless can pump the treadle and sweetly pare out a baby's rattle he calls a three-ring circus, keeping an instructive patter going the whole while.



Michael Hornpiper, of West Philadelphia, makes flutes, fifes and bagpipes. "What makes music in a woodwind instrument," he explains, "is a column of air with holes and tapers. The lathe is ideal for doing that to a column of air."

Hornpiper finds that a piece of drill rod, properly ground, can be made into a shell auger for boring straight holes along the axis of a spindle. First, he grinds the rod to a half-round for a distance of two or three inches from one end. He leaves slightly more than half of the rod so it can't wobble in the hole; one old book specifies .01 inch larger than half for every .1 inch of diameter. Then he grinds a small, sloping step across the half-round end, with the high side of the step at the diameter. Finally, he rolls the rod against the emery wheel from where the half-round stops to the far end.



A standard drill of the appropriate size starts the hole, then the rod is eased in and out of the revolving work by hand, through a steady made from a pipe tee mounted on the lathe ways.

Max Brody, a retired patternmaker, turns wood as a hobby. He agrees that a turner should learn to use the skew and gouge, but insists that really accurate work can be done only with a scraper. Max's current specialty is a set of three gavels: one is built up of 13 blocks of alternating light and dark wood to represent the 13 colonies, one is of 50 blocks to represent the states, and the third has 200 blocks for the bicentennial.

To turn a piece to the exact profile of a template, Max coats the edge of the template with colored crayon. When he holds the template up to the revolving work, the crayon rubs off on the high spots.

Paul Eshelman, at 69, is half-blind from diabetes. He is also among the best woodturners in America. His bowls were shown at the 1958 World's Fair in Belgium. He uses a half-inch roundnose scraper, with a sharp burr, to make shapely vases, bowls and plates, mostly of green wood.

Eshelman is a courtly gentleman, once a music scholar, who recently retired from the industrial arts department at Millersville (Pa.) State College. He takes off his tie, aims his tool at the whirling wood, and attacks it. He grins as shavings fly off in great curls. The bowl is roughed, inside and out, in less time than it takes to tell.

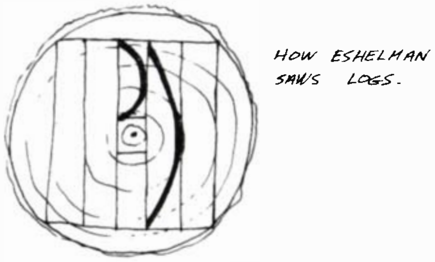
Eshelman turns mostly green wood, which vastly increases the amount of stock available to him and keeps the cost minimal or zero. To avoid checking, the wood must be kept damp until it is turned to rough shape. Eshelman stores disks and planks in an old, very damp pump room under his house. He periodically douses his stash with a bucket of water. One can also wrap the wood in plastic.

Once the bowl is roughed to shape,

with the walls an inch or more thick, he lets it sit around his unheated shop for six months to dry. Some workers coat the end grain with shellac to retard drying; Eshelman doesn't. He wants the wood to dry. He has turned 90 bowls from a single tree without losing one to checking.

If he gets a small log, he simply splits it into quarters or thirds, with a sledge and a wedge, and cuts blocks for turning deep cups and vases in the end grain.

If he gets a large log, he has a sawmill square it and cut it this way:



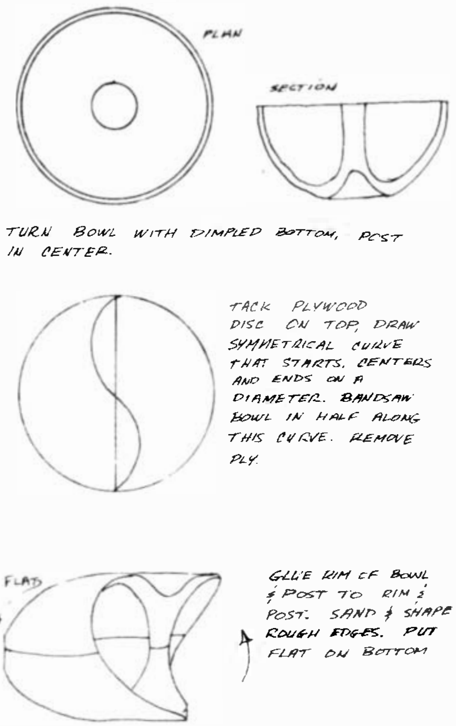
Paul Eshelman (second from left) describing some finer points of wood turning.

The best planks for bandsawing into bowl blanks are the two adjacent to the center plank. The one from the center of the log must be divided so that the pith — the heart of the annual rings, from whence most checking begins — is entirely removed. The outer planks will cup and warp the most. Eshelman turns so the bowl follows the tree's rings, rim toward the heart of the tree. If woods that check easily, like apple, are stored under water for a few months before turning, they will be less liable to check.

Eshelman's ebony finish, which stains the wood a rich black and leaves the figure white, is most suitable for open-grained woods such as ash and oak. Mix together a level teaspoon (100 grams) of potassium chlorate, 1/2 teaspoon (50 grams) of copper sulfate, and 1/2 cup (615 grams) of distilled water. Separately mix 1 teaspoon (100 grams) of aniline hydrochloride, 1/2 teaspoon (40 grams) of ammonium chloride, and 1/2 cup (615 grams) of distilled water. Combine the two solutions and coat the wood. Repeat twice on two successive days. (The solution spoils after three to five days.) Then paint with white enamel, and rub off so the white remains in the pores of the wood. Finish with varnish or oil in the usual way.

Eshelman likes to try different finishes on different woods, but he relies on Waterlox.

The author, a woodworker in Rochester, N.Y., views the lathe as a tool for making parts of almost any shape by cutting and recombining. Here are the steps in making a basket with a handle out of a bowl with a post left in the middle.



The important point is that by working this way, the turner is dealing with the cross section of his bowl — and he can make this section not only round, but any shape he likes.

Similarly, a spindle can be thought of as a solid of revolution. Its cross section can be almost any curve that does not cross itself. The cross section can be obtained from the spindle by sawing it apart. These ideas originate with Stephen Hogbin, a designer and turner working in Toronto.

Manny Erez, 63, learned to turn in Palestine at age 21 in the shop of his father-in-law. He became an extraordinarily swift spindle turner, who during World War II didn't balk at hand-turning an order of 140,000 handles for shaving brushes for the British air force. Albert LeCoff, who apprenticed under him, swears that Manny can bang out 20 newel posts in a day, by eye. Manny doesn't scrape at all. He uses the gouge and skew.

He was old and ill, recently out of the hospital, when he arrived at the conference Friday morning. His hands shook and he hadn't turned in a year.

Perhaps it was the infectious enthusiasm of so many woodturners. By the end of the day, Manny said his hands had steadied and he felt better than he had in ages.

That evening he called LeCoff to say, "Albert, bring my tools tomorrow. I'm going to turn." And he did. With such grace and ease that one could only marvel.

Stroke Sander

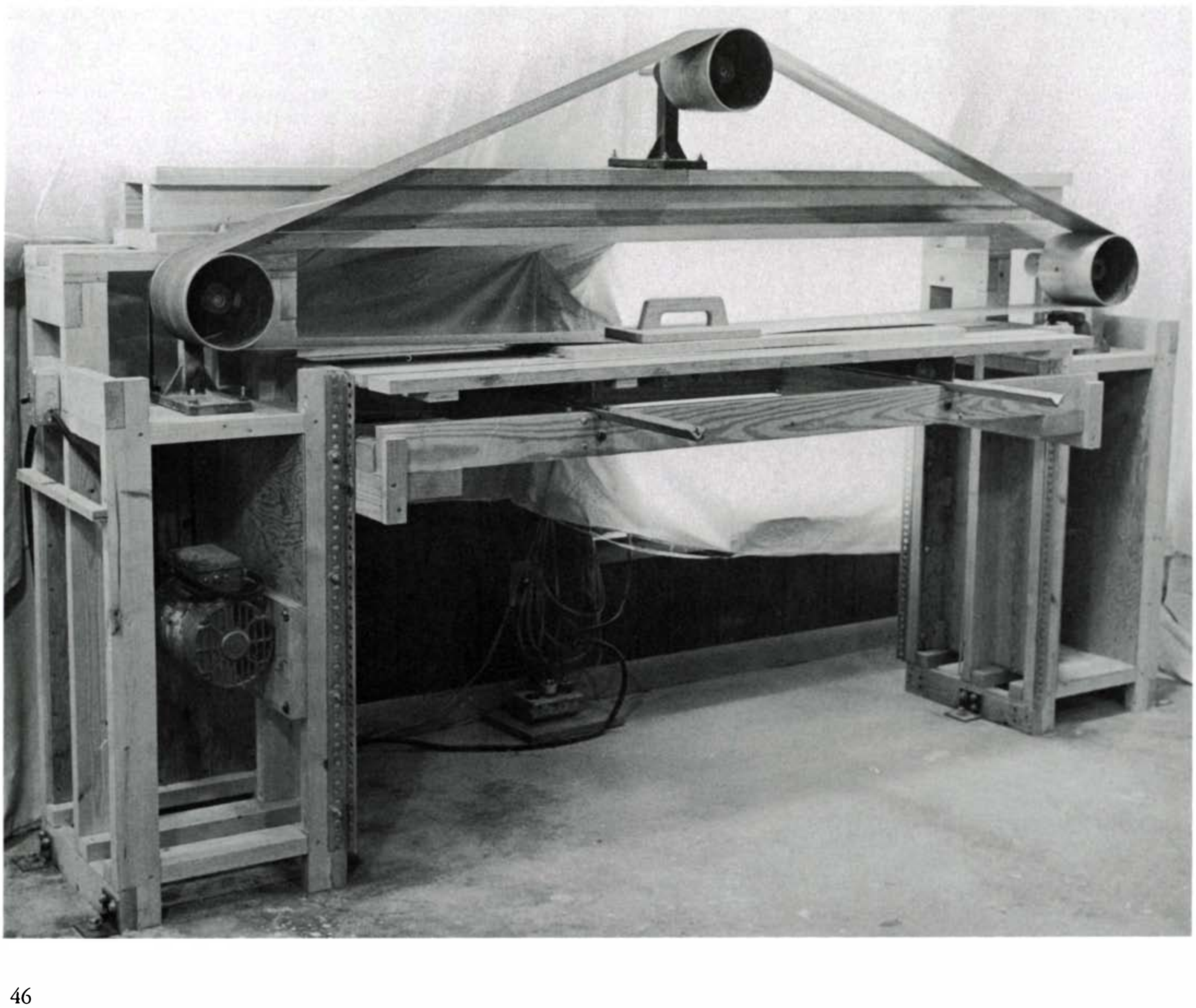
Building a machine to smooth flat panels

by M.G. Rekoff, Jr.

A hand-stroke belt sander is a woodworking power tool used to smooth large, flat surfaces. Both soft and hard woods can be sanded without gouging, a frequent danger when using portable belt sanders. The author was motivated to design and build the stroke sander when faced with making 38 cabinet doors of 3/4-inch birch plywood edged with solid birch. The stroke sander was a convenient way to sand the edging flush with the ply.

When using the stroke sander, the work is placed on the table and positioned under the moving sanding belt. A sanding block is brought to bear on the sanding belt and is moved back and forth along it while the table is simultaneously moved in and out at right angles to the direction of belt travel. The area that can be sanded without repositioning the work is limited only by the table length and the range of its travel. This stroke sander can accommodate a 30 by 73-inch workpiece without repositioning. The design can be altered, within reason, to accommodate work of other dimensions. The distance between the sanding belt and the sliding table is adjustable to accom-

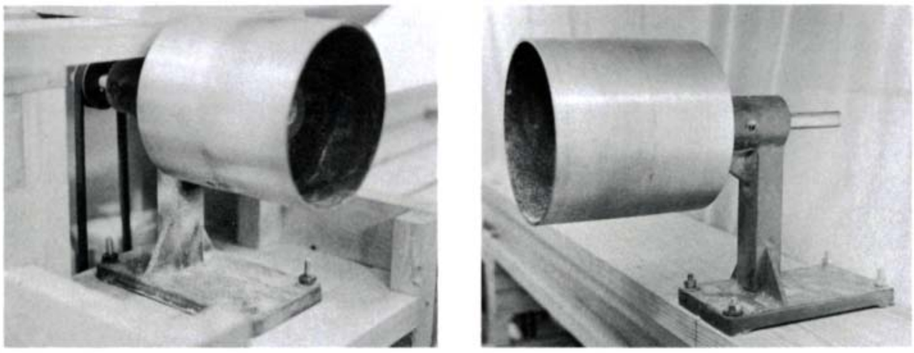
Sander has three drums for greater working room, but middle one could be eliminated. Sanding belt moves clockwise.



modate work of different thickness.

The least expensive commercially available stroke sander costs about $1500 without the drive motor. The stroke sander described here can be built for under $400 using all new material and including a new motor. The costliest items are the sanding belt drums and the motor; the cost can be further reduced if a used motor can be obtained. A three-drum version was constructed because at the outset it was not clear that two drums would provide enough space for the operator's hand. Since the project has been completed, it appears that a two-drum version could be satisfactory, if used with some care and a low-profile sanding block. The two-drum version would, of course, further reduce the cost of construction.

The drums are made by Mooradian Manufacturing Company (1752 E. 23rd St., Los Angeles, Calif. 90058. Telephone 213-747-6348). They are 7 inches in diameter and 7 inches long, to accommodate a standard 6-inch sanding belt. The two drums mounted on the pedestals are stock items; one is a drive drum and one is an idler which has mechanisms for adjusting tension and tracking. If a three-drum sander is to be built, the drum on the beam is a drive drum reversed in its stand, and this reversal must be specified when the order is placed.

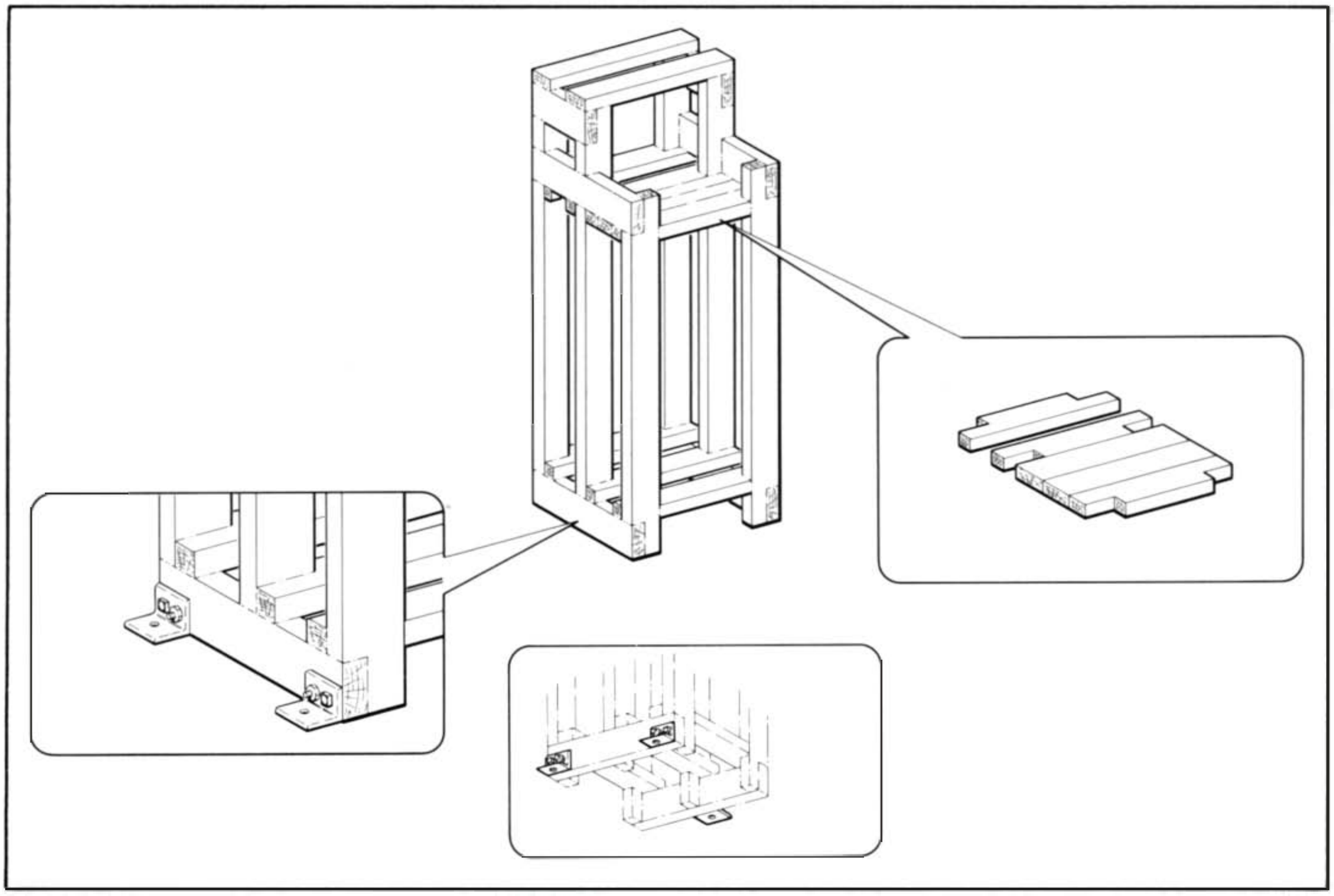


Standard drive drum (left) and reversed (right). Idler drum not shown.

There is hardly anything more frustrating than an underpowered woodworking tool, particularly a sander. The drum manufacturer recommends a minimum 1-horsepower motor. The stroke sander described here is powered by a 1-1/2 horsepower, 1750 rpm, single-phase, 220-volt induction motor. The author has not been able to stall the machine using a 100-grit belt. To reach sanding belt design speeds, a motor pulley of 3-1/4-inch diameter and a drum drive pulley of 2-1/2-inch diameter is recommended. The drive vee belt is 1/2 by 60 inches.

The powered pulley is on the left, and the sanding belt travels over the work table from right to left. This con-

Pedestals are 18 inches square, 48 high overall. Top shelf is 9-1/2 inches deep. Two front columns are 39-1/2 inches high. Upper, middle and lower cross members go from front to back to support shelves. Angle irons in insets fasten to floor.



figuration is dictated by the design of the adjustable idler drum.

The machine has seven major parts: two pedestals, a beam, a table, a table support, and two support arms. These are fabricated from standard-dimension lumber and all joints are screwed and glued. The machine should be built and assembled according to the sequence of the instructions that follow.

Pedestals

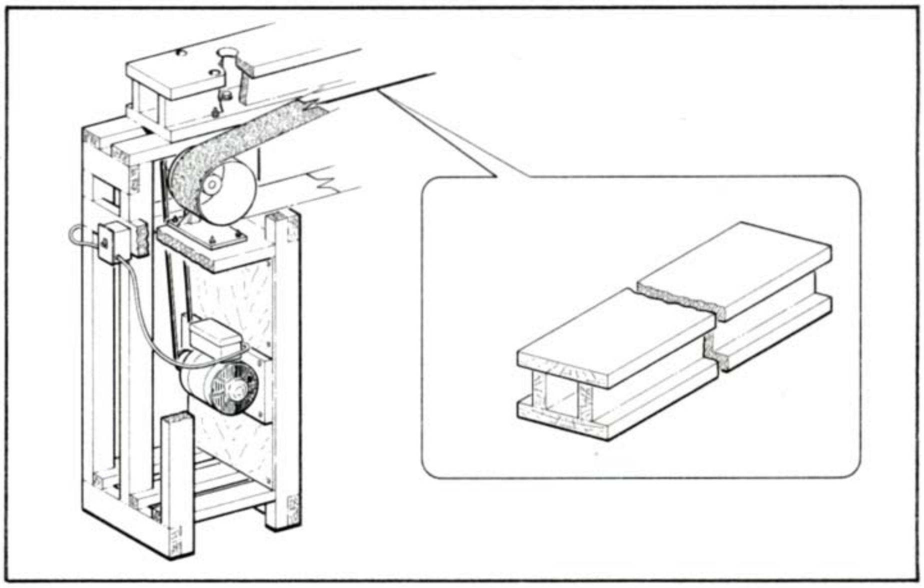
One pedestal supports the drive drum and one the idler drum. The difference between the two, apart from provisions for mounting the motor, is that the drive pedestal has a slot in its shelf for the vee belt. The pedestals are made from stud-grade fir 2 by 4's jointed and planed down to 1-3/8 by 3-1/4 inches to ensure sharp corners and square sides. The shelves are made from a harder wood such as yellow pine or oak to provide a firm surface to which the drum stands can be bolted. The pedestal columns, crossmembers and shelves are fastened together with screws (#10 flat heads used throughout). The inside surface of the back side of each pedestal is covered with 3/8 or 1/2-inch plywood from the drum shelf to the floor, to stiffen the structure against side loads.

The shelves were attached to the underside of the middle crossmembers of the pedestal so that the inboard middle crossmember would act as a dust shield, partially blocking the sanding dust as it comes off the workpiece. The sanding belt clears the upper edge of the middle crossmember by less than one inch.

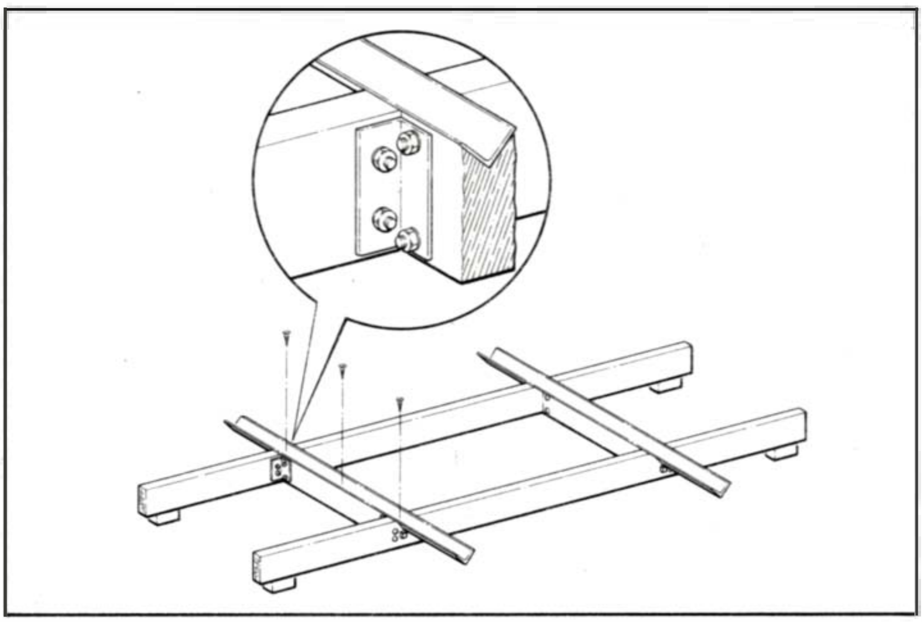
The motor mount pad is an 18-inch long piece of 2 by 10 fastened to the front and middle columns of the pedestal with four lag screws, with 1/4-inch plywood placed above it to act as a dust shield.

The pedestal supporting the idler drum has a solid shelf and is enclosed with 1/4-inch plywood to provide space to store sanding belts.

To ensure proper belt tension and tracking, each pedestal must be bolted to the floor. Three brackets are used, one on each outboard corner and one centered inboard. The brackets are made from 3-inch lengths of 3/16 by 2-1/2-inch square angle iron, drilled with 7/16-inch holes. Each is bolted to the pedestal with both a lag screw and a carriage bolt.



Pedestal (above) holds motor and drive drum. Table support (below) allows table to move at right angles to belt. Longitudinal members are 73 inches long, 22 inches apart. Rails are about 18 inches in from ends.



Beam

The beam supports the third drum and rigidly fixes the top edges of both pedestals with respect to each other. The box construction ensures stiffness for proper belt tension. The beam was made from No. 1 yellow pine to ensure that it would be knot-free. The vertical members are 2 by 4's, and the horizontal members are 2 by 10's. The horizontal members are screwed and glued to the verticals.

In the original design the beam extended over the entire top surface of each pedestal, but lumber of the requisite quality and length was unavailable. The beam on the author's machine is 8 feet long and this provides enough overlap to ensure rigidity.

Table Support

The table support permits the table to move at right angles to the belt. The wooden members are knot-free No. 1 yellow pine 2 by 4's; the wheel rails are 1/8 by 1-1/4-inch square angle iron 48 inches long.

The crossmembers are cut to length, vee-grooved and fastened to the longitudinal members with lag screws. The framework is further stabilized with

1/8 by 1-1/4-inch square angle iron brackets 3-1/4 inches long. This arrangement keeps the bolts from fouling the lag screws and each other. After the frame is assembled, the longitudinal members must be notched with a handsaw to extend the vee-groove all the way across the table support.

The wheel rails are fastened to the framework with screws, (countersunk to clear the wheels). A 1/4-inch machine bolt is installed in drilled and tapped holes at each end of one rail to prevent the table from inadvertently rolling off.

Wooden blocks 2-1/2 inches square by 4 inches are screwed and glued to the underside of each end of each longitudinal member to prevent motion in the direction of belt travel. To ensure a close fit, these blocks are best attached after the pedestal is bolted to the floor, the support arms are attached, and the table support is in place.

Support Arms

Two support arms are required; one is the mirror image of the other. Each is made from a 30-inch piece of No. 1 yellow pine 2 by 4. A 1-1/2 by 7-inch strip of 3/4-inch plywood is screwed and glued to the front end of the arm. A block 1-1/2 by 2 by 5 inches is screwed and glued to the arm's upper surface, flush with the rear end of the arm.

Two 6-inch pieces of 1/8-inch angle iron 1-1/4-inch square are carriage bolted to each arm 1-1/2 inches away from the front plywood strip and from the rear block. The spaces are to receive the ends of the table support.

The support arm is attached to the pierced angle iron on the pedestal with carriage bolts, but the drilling of these holes is best delayed until the machine is finally assembled together.

Table

The stroke-sander table is made from 5/4 by 3-1/2-inch lumber (2x4 stud-grade fir planed down). The cleats are made from 3/4 by 2-1/2-inch plywood scraps screwed and glued to the top.

The wheel brackets are made from 24-inch lengths of 3/16 by 2-inch square angle iron, and the four wheels are 5/8 by 2-inch composition roller skate wheels. Any suitable caster wheels would do. The axles are 1/4-inch machine bolts inserted into threaded holes 3/8-inch from the bottom edge of the angle iron and locked into place with a lockwasher and nut tightened against the angle iron.

The wheel brackets are fitted by first cee-clamping them to the table and then placing the table on the table support. The wheel brackets are then adjusted so the table moves freely back and forth on the tracks. When the desired performance has been achieved, the table top and brackets are drilled for carriage bolts, and the heads are countersunk. A door or window lift handle fastened to the underside of the table is convenient.

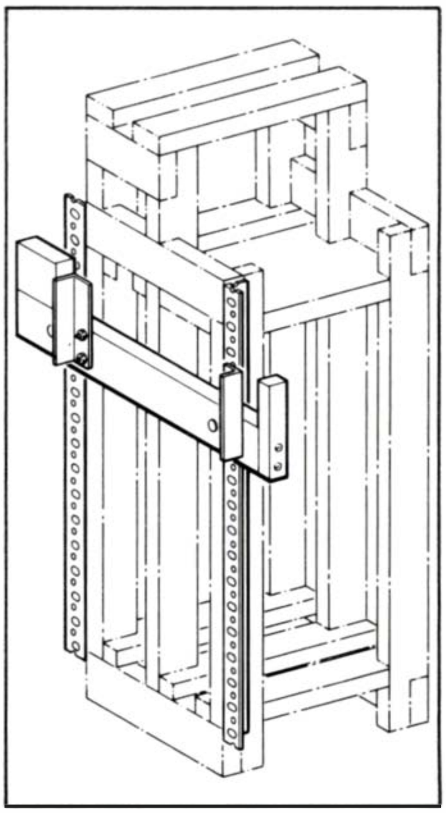
Assembly

When the various components of the stroke sander are constructed to the extent described above, the machine is ready for assembly.

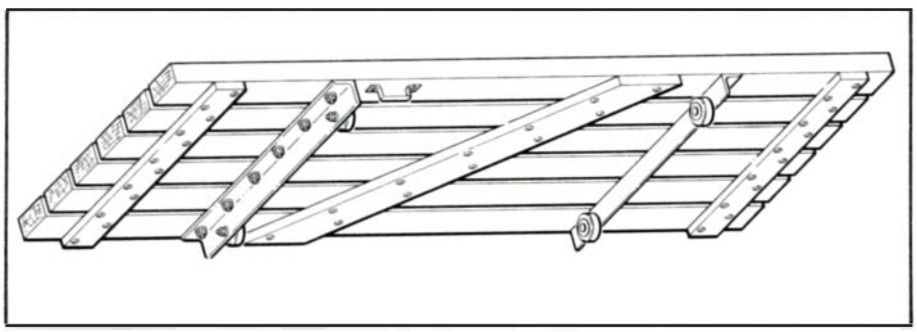
Bolt Pedestals to Floor. A relatively flat and level surface should be chosen for erecting the stroke sander, considering nearby obstacles that might interfere with table travel. A chalk line is placed on the floor to align the front edges of the pedestals. The drive pedestal should be on the left when facing the machine from the operator's position.

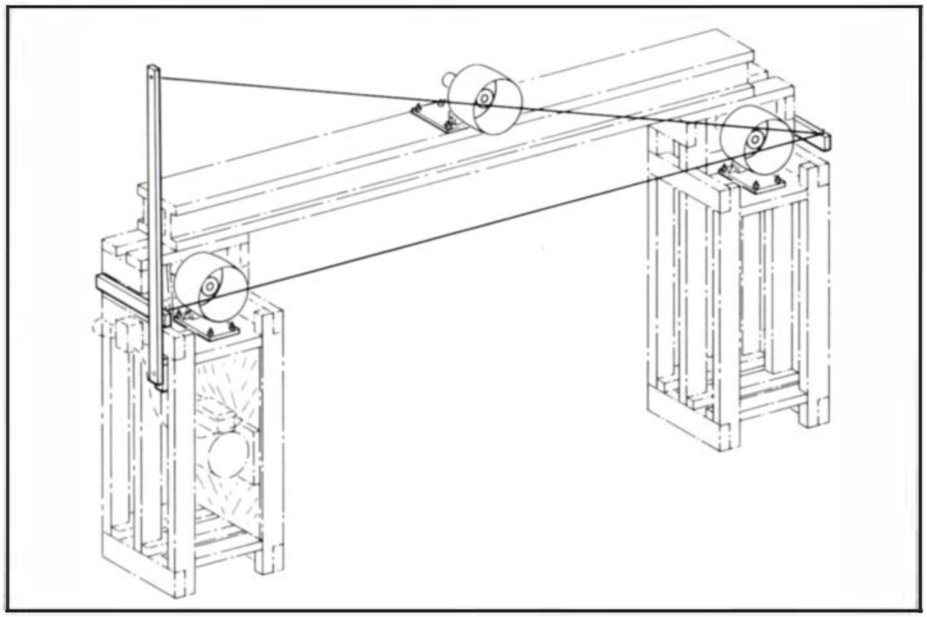
The pedestals are separated by the length of the longitudinal member of the table support, measured both at the bottom and at the shelf levels of the pedestals. If the floor is not perfectly flat, these distances will differ. Position the pedestals so that the shorter of the two distances is the length of the table support plus 1/8-inch. This permits easy removal of the table support when changing table height. Then mark the floor through the bolt-down brackets and fasten the pedestals to the floor, but use slightly oversize holes in the brackets to allow for adjustments. For subsequent alignment work it is prudent to level both pedestals in the front to back direction (at right angles to the sanding belt), using the drum shelves as the reference.

Attach Beam. The beam is positioned atop the pedestals and centered so that it overlaps each by the same amount. A 3/8-inch hole is drilled through the center of the beam in line with the center of the inboard upper crossmember of each pedestal. The hole in the top element of the beam is enlarged to pass a socket wrench. A 3/8 by 6-inch lag screw, with washer, is passed through the holes, driven into the crossmember, and tightened down. Two 3/8-inch holes



Right-hand rail support is shown at right. Pierced angle irons allow adjustment of rail support height. Table (below) is 25 by 72 inches, rides on rails.





Stick and two strings define vertical plane used in aligning drums.

are drilled in each end of the lower flange, and matching holes are drilled in the pedestal top members. Two carriage bolts (3/8 by 3-1/2 inches) then bolt the beam to the pedestal.

Attach the Pierced Angle Iron. The pierced angle iron is 1-5/8 inches square. It comes with 3/8-inch holes drilled on 1-inch centers, and every other hole is oblong (roughly 3/8 by 3/4 inch). Saw through the center of the round holes to cut four 36-inch lengths. The pierced angle iron is attached to the front and the back inboard columns of the pedestals with four equally spaced 3/8 by 1-3/4-inch carriage bolts in each piece. It is best to bolt through the 3/8-inch round holes. Position the pierced angle iron flush with the inboard edge of the pedestal, with its top edge 5/16 inch below the top edge of the front inboard column. The pierced angle is located on the rear inboard column by using a level to extend a line from the top of the front pierced angle iron across the pedestal's inboard face.

It is prudent to locate the bolts attaching the pierced angle iron to the pedestal in exactly the same place on each piece. This facilitates adjustment of table height because these bolts can be used as references.

Determine Support Arm Spacing. Center each pedestal drum on its respective shelf, with 1/2 to 3/4 inch between the back face of the drum and the front edge of the beam. Align the front edge of each drum parallel with the front edge of its pedestal, and cee-clamp each to its shelf. Be certain that the idler drum, with the adjustable base, has been centered in its adjustable range. Loop a string around the drums and tie off tautly. The string marks the future location of the sanding belt.

Set the table support directly on the floor and position the table on it. Measure the distance from the floor to the top of the table, and call this distance D. The distance D depends on wheel diameter, wheel thickness, and location of holes drilled in the wheel bracket for the axles. These will vary from machine to machine.

If the sanding belt is 1-3/4 inches above the table surface, one can readily sand both 3/4 and 1-1/2-inch stock without adjusting the height of the table because the belt is flexible.

Attach Support Arms. Cee-clamp each support arm to its corresponding pierced angle iron to satisfy the following conditions: a) the support arm is level, b) the support arm is located D + 1-3/4 inches below the lower string tied around the drums, and c) the rear longitudinal member of the table support butts against the rear inboard column of each pedestal. Then mark through the 3/8-inch round hole on each pierced angle iron that is nearest to the center line of the support arm, drill 3/8-inch holes and attach each support arm with two 3/8 by 2-inch carriage bolts.

This position for the support arm is likely to be the one most frequently used. By permanently marking these holes in the pierced angle iron, the table can quickly be restored to the normal position after being moved. The marked holes also will facilitate other setups. For example, if one wishes to sand the top and bottom of a box 18 inches high, one need only count down 18 holes (or measure down 18 inches) from the marked hole and put the carriage bolt through.

With the support arms bolted in place, the string can be removed from the drums.

Install the Table Support. Lift the table support onto the support arms and place the longitudinal members into the slots provided for them. Screw and glue the 1-1/2 by 1-1/2 by 4-inch blocks to the underedge of the longitudinal members. Place the blocks against the support arms to ensure a close fit.

Mount Beam Drum. Locate the beam drum in the center of the beam between the pedestals. The beam width has been specified so that the bolt holes for the drum support will be in the flanges of the beam. With the axis of the drum at right angles to the beam axis, mark the mounting holes. Drill for 5/16 by 3-1/2-inch carriage bolts and bolt the drum stand to the beam.

Before aligning the drums, it is necessary to determine the horizontal distance between the edge of the beam and the front edge of the beam drum. Hang a plumb bob over the front side of the beam drum. Measure the distance between the front edge of the lower beam flange and the plumb bob string, and call this distance S.

Align Drums. Thus far, the two pedestal-mounted drums have been clamped close to their correct positions, and the beam drum has been bolted in place. The procedure for aligning and attaching the pedestal drums is relatively simple; unfortunately, the description is quite involved. The basic task is to establish a vertical reference plane and to locate the drums with respect to this plane. This vertical plane will be described by two strings.

Two horizontal sticks are temporarily attached to the outer edge of each pedestal, with their top edges in line with the drum axles. Stretch and fasten a string over the top of the horizontal sticks a distance S + 1 inches away from the beam. Clamp a vertical stick to the outer edge of one of the pedestals. Stretch another string from the opposite horizontal stick to the top of the vertical stick so that the string passes in front of the beam drum axle. The slanting string is tied off at the same point as the horizontal string. The plane formed by the two strings can be made vertical by adjusting the vertical stick. A level can be used to locate the slant string directly over the horizontal string. Or the slant string can be located S + 1 inches away from the beam.

At this point it is prudent to make sure that the rim of the beam drum is one inch away from the slant string at both points on the rim directly opposite the string. If not, loosen the beam drum mounting bolts, twist the drum stand into place and retighten.

With the vertical reference plane established, position each pedestal drum so that each side of its rim is one inch away from the string. Locate and mark the mounting bolt holes.

Only the front two holes for each drum can be drilled because the beam and pedestal top are in the way. The two rear holes can be drilled from the underside of the pedestal shelf by using a sheet metal or Masonite template which matches the drum stand base holes. Attach each pedestal drum with 5/16 by 3-1/2-inch carriage bolts. Recheck the location of the drums with respect to the string before tightening the bolts.

Determining Sanding Belt Size. Position the idler drum at the center of its adjustable range. With a steel measuring tape, measure the distance around the outside of the drums. The sanding belt for the author's machine is 210 inches in circumference. Do not order sanding belts until after making this measurement. Belts are made to order by most woodworking supply houses.

Install Drive Motor. Bolt the drive motor to the pad. Wire the motor so that the drive drum rotates clockwise when viewed from the operating side of the stroke sander.

Adjust Belt Tracking. When the sanding belt is received, install it on the drums so the motor will drive it in the direction specified by its fabricator, but don't start the motor yet. Tighten the tension adjustment on the idler drum. Move the sanding belt by hand and observe how it tracks. The drums are 7 inches long and the sanding belt is 6 inches wide; thus there can be some leeway in the tracking adjustment. The sanding belt should be more or less centered on the drums. Adjust tracking to the best extent possible while moving the sanding belt by hand.

The author's son at work. Third drum gives plenty of working room.

Belt tracking is further checked by "bumping" the motor, that is, switching it on and quickly off before it reaches full speed. If the sanding belt tracks satisfactorily, turn on the motor for a full-speed test. If not, more adjustment is indicated. It is important to establish proper tracking by working up from low to high speeds because it does not take long to ruin a sanding belt when it rubs against a drum stand. If the drum is misaligned so that the belt comes off toward the operator's side at near full speed, one will have a room full of writhing belt.

The tracking adjustment range provided in the idler drum design may be insufficient, making it necessary to twist the drive drum stand slightly. This is done by loosening three of the bolts, twisting the base in the proper direction, and retightening.

Sanding Block

The 6 by 12-inch sanding block, or trowel, is made from glued-up 3/4-inch oak stock. The oak handle is screwed and glued to the base. For a two-drum machine, a smaller, 2 by 2-inch block screwed and glued to the base would be a more appropriate handle.

Operational Suggestions

Nothing should be stored on the beam while the machine is running. Anything vibrating off the beam onto the belt can be propelled in a random direction with considerable velocity.

When sanding, be sure to hold the sanding block flat. The workpiece will be badly gouged by pressure on the belt with the front or back edge of the sanding block. There is a great temptation to do this to remove a localized blemish, but it will lead to nothing but grief.

The lower part of the idler drum pedestal can be finished off as a storage cabinet for extra sanding belts by adding two shelves and a door.

The selection of sanding belt grit depends upon the intended use of the stroke sander. The author has found that 100 grit (the finest grit available) is the best for most purposes. Since belt sanders in general remove material at a great rate, it is wise to use the finer grits. But for heavier work, such as smoothing edge-glued planks, 60 grit is satisfactory.

Period Furniture Plans

A listing of what's available

in book and sheet form

Editor's Note: Because of the interest in measured drawings of traditional and colonial furniture, and because of the difficulty in locating sources of plans for a particular piece, *Fine Woodworking* has compiled this listing of what we believe are books and individual plans of interest to our readers. Only furniture plans are included, and only those currently available. The degrees of difficulty we've applied are naturally generalizations. Individual pieces in a book may be easier or more difficult than indicated.

The following companies carry plans for individual furniture pieces which range in scope from small accessories with simple butt joints to complex designs for the most skilled craftsman. They are mostly traditional American design. Some of these plans are offered by mail-order houses also.

* * *

Colonial Workshop, P.O. Box 103, Angwin, CA 94508 (new address). 18 series of 10 or more plans, $1.25 per series, five series for $5.00. Simple plans, mostly small pieces for pine. Construction mostly butt and rabbet joints, nails, screws, dowels. For beginner, intermediate.

Series 1. Colonial; 2. Early American; 3. Gun cabinet; 4. Spice cabinet; 5. Wall shelf; 6. Grab bag; 7. Cape Cod; 8. Modern; 9. Outdoor; 10. Wall accessories; 11. Custom wall furniture; 12. Miniature chest; 13. clock; 14. Contemporary; 15. Old Salem; 16. Garden project; 17. Shaker; 18. Country kitchen.

* * *

Craftplan Company, Rogers, Minn. 55374. Full-size plans from $1.70 to $2.20 each. Catalog available for $.25. (Also in Minn. Woodworkers Supply catalog.) For beginner, intermediate.

Eli Terry clock, grandfather clock, 15th c. wooden wheel clock, Pennsylvania Dutch wool spinning wheel, loom for weaving, vertical spinning wheel, colonial spinning wheel, juvenile roll-top desk and swivel chair.

* * *

Furniture Designs, 1425 Sherman Avenue, Evanston, IL 60201. Full-size plans ranging in price from $4.00 to $8.00. Catalog available for $1.00, credited to first purchase. For the intermediate.

Trestle cocktail table, pedestal cocktail table, trestle desk, rush seat side chair, tripod lamp table, cradle end table, side chair, drop-leaf table, bookcase cabinet, early American bed, buffet-cupboard, buffet-hutch, turned trestle table, hanging cabinet, revolving book table, settee, curio cabinet, Chippendale-style mirror, collector's table, rush seat corner chair, hutch top, slant-top desk, dry sink, corner cupboard, what-not cabinet, sawbuck bench, sawbuck dining table, china hutch, Welsh hutch, buffet, cradle, mirror, home bar, swivel stool, chest on chest, chest of drawers, night table, spindle bed, roll-top unit, double pedestal desk, fireside rocker, captain's chair, step-table, tea cart, Boston rocker, Hitchcock-type chair, canopy bed, trestle bench, trestle dining table, wall units, blanket chests, trundle bed, swinging cradle, captain's desk, small roll-top desk, pedestal extension table, bachelor's chest, American colonial-style living room set, accessories, occasional tables, cocktail tables, end table, mirror, tripod table, nest of tables, headboard, night stand, dressing mirror, English stools, chest of drawers, gun cabinets, baby furniture, modern living room, dining room, and bedroom furniture.

* * *

Mason & Sullivan, 39 Bloom Avenue, Osterville, MA 02655. Clock plans with scaled drawings, bill of materials, assembly instruction. Plans $1.00 each, with molding parts, lumber and clock movements also available. Traditional styling; for the intermediate.

Grandfather case, Aaron Willard grandfather, classic-style grandfather; early American grandmother, grandmother cases; Eli Terry clock, Willard banjo clock, octagonal school clock.

* * *

Old South Pattern Company, P.O. Box 11143, Charlotte, N.C. 28209. Full-size shop drawings of early American and colonial designs; price range $1.00 to $16.00; catalog available. For intermediate to advanced.

Storage bench, rush rocker, rush chair, captain's chair, dry sink, blanket chest, scallop-top chest, small chests, school master's desk, dressing mirror, bookcase, candle stand, four-poster bed with tester, cannonball bed, spindle bed, occasional tables, step table, dough box, drop-leaf table, trestle tables, nesting tables, hutch, flax spinning wheel, tea cart, desks, Connecticut lowboy, fireside settle, dining table, corner or roundabout chair, Philadelphia knee-hole desk, mirrors, accessories.

* * *

Woodcraft Supply Corp., 313 Montvale Ave., Woburn, Mass. 01801. Carlyle Lynch's measured drawings in blueprint form; bill of materials, construction notes; for the intermediate to advanced. Some described in Woodcraft catalog. Plan catalog available.

Queene Anne corner table, Chippendale table, Hepplewhite dining table, Hepplewhite dining end table, Chippendale side chair, huntboard, four-poster bed, Queen Anne table, Windsor chair, tavern table, chest of drawers, small Chippendale mirror, Queen Anne lowboy, Queen Anne side chair, tilt-top table, John Marshall's desk, six-board chest, lamp table, inlaid chest of drawers, Queen Anne dining table, side chair, cellaret, small Queen Anne table, Hepplewhite chest, side chair, spool bed, sugar chest, corner cupboard, Eli Terry clock, Eli Terry tall clock, Pembroke table, sideboard table (all $6.00). Windsor kitchen stool ($4.00), Queen Ann highboy, General Lee's clock ($8.00) and Chippendale folding chair ($10.00).

* * *

Joseph W. Daniele, **Building Early American Furniture.** An Early American Society Book, Stackpole Books, Cameron and Kelker Streets, Harrisburg, Pa. 17105, 1974, 255 pp., hardcover, $12.95.

Fifty colonial furnishings with short background information, pictures, exploded-view drawings, bill of materials; for beginning craftsmen; easy construction using simple joints, screws, nails, pre-made turnings and legs.

New England: stool, chair-table, cradle, bellows, pipe box, tavern wall rack, spoon rack, wall clock, end table, hutch table, hooded cradle, desk, mirror, barometer, wash stand, tilt-top end table, commode, tall clock, gate-leg table, captain's desk, apothecary chest. Pennsylvania Dutch: pipe box, bride's box, recipe box, peasant's chair, candle box, wall shelf, hi-lo Jack stand, hi-lo Jack stand lamp and floor lamp, Lancaster rocker, sawbuck table, child's chair, salt box, shelf clock, wagon-seat storage bench, wall cupboard, double cupboard, printer's desk, corner cupboard, rocking horse, Pennsylvania Dutch designs and barn (hex) signs. Shakers: wall shelf, child's bench, candle stand, retiring room stand, sewing table, drawerless chest, storage chest, work stand, blanket chest-desk, shop table, wash stand, chest of drawers, storage desk, tall clock.

Others: wagon seat bench, pine settee, dry sink with top cupboard, trestle table, spinning wheel, hutch cupboard, desk on frame.

* * *

Franklin H. Gottshall, **How to Make Colonial Furniture,** The Bruce Publishing Co., 850 3rd Ave., New York, N.Y. 10022, 1971, 183 pp., hardcover, $9.95.

Forty-five projects with full drawings, bill of materials and pictures of colonial-type furniture for the intermediate woodworker.

Ladder-back chairs, dressing table, splay-legged dressing table with mirror and bench, paneled cedar chest, blanket chest with drawers & till, bed with paneled headboard and footboard, low-post four-poster bed, cottage bed, Pilgrim four-poster bed with spindle headboard, occasional table, bridge lamp, low chest of drawers, tall chest of drawers, knee-hole desk, bedroom dresser, sideboard, sawbuck trestle table, sawbuck tavern table, large knee-hole desk, high-backed settle, small dresser, gun cabinet, corner gun cabinet, small tilt-top table, candlestand, adjustable night-stand, splay-legged card table, tier table, mirror and bracket shelf, drop-leaf trestle table, sawbuck table, splay-legged card table, splay-legged end table, ladder-back armchair, splay-legged side table, floor lamp, large trestle table with drop-leaf ends, long and short benches, drop-leaf table, footstool, suitcase rack or bench, cedar chest, tabouret with octagonal legs, small trestle table.

* * *

Franklin H. Gottshall, **Heirloom Furniture.** Bonanza Books (Crown Publishers, Inc.) 419 Park Avenue South, New York, N.Y. 10016, 1957, 154 pp., hardcover, $5.00.

Thirty-five pieces of heirloom furniture for the advanced cabinetworker, with photographs, drawings, bills of material, carving details; hardware, seat weaving, upholstery instructions.

Hepplewhite: armchair, child's rocker, dining room suite including side and arm chairs, sideboard, table, dining table with end section; also, two corner cupboards, Welsh dresser, Chippendale lowboy, colonial ladder-back chairs, turned trestle table and hanging wall shelf, butterfly table, Sheraton side chair, colonial mirror, Georgian slant-top desk, Winthrop secretary, Duncan Phyfe roll-top desk, spinet desk, early American flat-top office desk, Chippendale wing chair, piecrust table, Sheraton-type grandfather's clock, William and Mary dressing table, mirror, and stool, four-poster beds, Queen Anne highboy, Jacobean chest of drawers, paneled cedar chests.

* * *

Franklin H. Gottshall, **Reproducing Antique Furniture.** Crown Publishers, Inc., 419 Park Avenue South, New York, N.Y. 10016, 1971, 240 pp., hardcover, $10.95.

Forty projects with detailed scale drawings, bill of materials, construction directions, photographs, chapters on fundamentals of cabinetmaking and finishing. Many carved elements and precise turnings make the book a pleasure as a reference book, but only suitable for the advanced cabinetmaker.

Queen Anne: tea table, Pembroke table, handkerchief table, lowboy, chest on frame, corner cupboard, side chair; Sheraton: small table, bench, drop-leaf dining table, coffee table, dressing table and mirror, four-poster bed; Duncan Phyfe: library table, dining table; Chippendale: partner's desk, fretwork mirror frame, ladder-back side chair and armchair, splat-back chair, upholstered wing chair; Hepplewhite: four-poster bed, upholstered armchair; also: nested tables, sets of four and two, tilt-top table, grandfather clock, early American dresser, Dutch cupboard, blockfront chest-on-chest, shell-top corner cupboard, silver chest, spice cabinet, bachelor's chest, Salem chest of drawers, Windsor side chair.

* * *

Franklin H. Gottshall, **Simple Colonial Furniture.** Bonanza Books (Crown Publishers, Inc.), 419 Park Avenue South, New York, N.Y. 10016, reprint of 1931 book, 124 pp., hardcover, $2.90.

Thirty-nine pieces, mostly small, of colonial design for the beginner to intermediate.

Small wall bookshelves, round-top card table, splay-legged footstool, smoking stand, hanging wall bookshelves, joint stool, fireplace bench, six-board pine chest, paneled chest, small two-door cabinet, small boxes, magazine rack, bracket-footed radio cabinet, ball-footed radio cabinet, turned book ends, photograph frame, two colonial mirror frames, lectern, bulletin board, bookcase table, wing chair, banister-back side chair, walnut library table, ladder-back side chair, high-post-four poster bed, low-post twin bed, small turned trestle table, tilt-top table, tavern table, lowboy table, sewing table, four-gate gate-leg table, chest of drawers, slant-top secretary, early American desk, small chest-on-frame, small mantel clock, colonial mantel clock, china cabinet.

* * *

Francis W. Hagerty, **Make Your Own Antiques.** Little, Brown and Company, 34 Beacon Street, Boston, Mass. 02106, 1975, 113 pp., paper, $5.95.

Seventy-two pages of "how-to" for the beginner, twenty-eight pages of plans of colonial design.

Shaker shelf, block stools, doll's cradle, candle stand, water bench, footstool, settle table, tavern table, joined stool, drop-leaf table, Salem cradle, schoolmaster's desk, six-board chest, New Hampshire cupboard.

* * *

Ejner Handberg, **Shop Drawings of Shaker Furniture and Woodenware.** The Berkshire Traveller Press, Stockbridge, Mass. 01262, 1973, 6'' x 9'', paper, in two volumes, each $3.50.

Simple measured drawings of authentic Shaker pieces for the beginner-intermediate.

Volume 1. (1973) Pine cupboard, bed, sewing desk, trestle tables, work tables, drop-leaf tables, stands, towel racks, mirrors, table desks, knobs, pulls and wall pegs, benches, foot stools, stools, chairs, chair catalog, Mt. Lebanon chairs, chair finials, oval boxes, carriers, trays, clamp-on cushions, spool holder, woodenware, candle sconces, candlestand, coat hangers.

Volume 2. (1975) Wall clocks, desks, sewing desks, sewing table, tables, stands, wash stands, blanket chest, wood box, utility chest, benches, loom stool, step stool, revolving stool, stools, chairs, drawer pulls, bed casters, hanging shelf, wall cupboard, boxes, model blanket chest, tray, scoop, mortar and pestle, sewing accessories, Shaker stove, dividers.

* * *

Richard N. Johnson, **Tricks of the Trade: Furniture Finishing for the Home Craftsman.** Worcester Artisans, Inc., Box 366, Back Bay Annex, Boston, Mass., 02117, 1958, 48 pp. paperback, $1.25.

A slim book on finishing which includes a group of New England pine reproductions, with scale drawings, stock lists, instructions for the beginner-intermediate.

Plymouth colony hutch cabinet, Sturbridge cobbler bench, Sturbridge hanging shelf, Bradford harvest table, Stockbridge fiddle-top table, Lancaster commode table.

* * *

Russell Hawes Kettell, **The Pine Furniture of Early New England.** Dover Publications, Inc., 180 Varick Street, New York, N.Y. 10014, 1949 republication of 1929 edition, 477 pp., $12.50.

Good background book for the beginner through intermediate. Over 200 examples of pine furniture of early New England with pictures and descriptions for the collector. Forty drawings for reproduction.

Wall boxes, pipe boxes, hat box, small six-board chest, blanket chest, chest on frame, simple footstools, joined footstools, settle chair and table, child's chair, candle stand, trestle tables, gate-leg tables, tavern table, half-round table, butterfly table, desk box, school desk, spoon rack, corner shelves, shelves with drawers, water benches, scalloped dressers, corner cupboards, mirror frames, candle holders, rocking cradle, swing cradle.

* * *

Lester Margon, A.I.D., **Masterpieces of American Furniture.** Architectural Book Publishing Co., Inc., 10 East 40th

Street, New York, N.Y. 10016, 1965, 256 pp., hardcover, $12.50.
Excellent reference book with descriptive background and pictures of 150 museum pieces from 1640-1840, with 50 measured drawings for the intermediate to advanced woodworker.

Chippendale armchair, tambour desk, chest of drawers with mirror, pole screen, Philadelphia highboy, chest with drawers, curly maple highboy, kitchen dresser, tri-part bookcase, four-poster bed, slant-top desk, press cupboard, wainscot chair, occasional table, Bible boxes, chest of drawers, tulip chest of drawers, banister-back armchairs, Queen Anne side chair, highboy, wing chair, Pennsylvania cradle, Windsor armchair, Southern cellarette, double-back roundabout corner chair, tip-top table, card table, tall clock, console and mirror, kitchen dresser, trestle table, painted chest, bread box, Shaker settee, storage bench, chest of drawers with cupboard, dining table, Duncan Phyfe sofa, "Burro" table, chest of drawers, Sheraton-style sofa, corner cupboard, New Jersey sideboard, Pembroke table, Sheraton side chair, mantel clock, Duncan Phyfe-type side chair, wash stand, miniature tall clock, Sheraton-type side chair.

* * *

Lester Margon, A.I.D., **More American Furniture Treasures 1620-1840.** Architectural Book Publishing Co., 10 East 40th Street, New York, N.Y. 10016, 1971, 256 pp., hardcover, $15.00.
More measured drawings of museum pieces with short background information and photographs of additional examples; good for woodworker and historian alike.

Hepplewhite secretary, eagle-back side chair, tilt-top table, George Washington's desk—New York, desk-chest of drawers, Hepplewhite armchair and chest of drawers, lowboy, block-front chest of drawers, Georgian love seat, tulip chest, bench (Duncan Phyfe), early American dower chest, Pennsylvania Dutch hanging cabinet, kitchen cupboard, slant-top desk with bookcase top, library table, folding card table, dough box, drop-leaf table, tilt-top table, tavern table, pole-screen and candle shelf, four-poster field bed, powder stand, chest on stand, corner cupboard, secretary bookcase, ladder-back armchair, pretzel-back side chair, wing chair, Philadelphia side chair, Georgian wing chair, Connecticut side chair, 18th c. side chair, Duncan Phyfe side chair, Windsor chair, comb-back Windsor chair, Windsor chair with writing arm, Hitchcock rocking chair, Hepplewhite sideboard, Sheraton sideboard, Duncan Phyfe settee, McIntire tilt-top table, Sheraton influence sofa, Philadelphia high chest, chest on chest, breakfront, William and Mary highboy, Queen Ann highboy.

* * *

Lester Margon, A.I.D., **Construction of American Furniture Treasures.** Dover Publications, Inc., 180 Varick Street, New York, N.Y. 10014, 1975 reprint of 1949 edition, 168 pp., paperback, $4.00.
Thirty-eight museum pieces with short background material, full construction details, photographs, scaled drawings, detail drawings. Some repeat of pieces included in his other two books, but more detailed construction guide for the intermediate-advanced.

Pennsylvania provincial dower chest, colonial corner cupboard, drop-front desk, sawbuck dining table, empire arm chair, mantel clock, Dolly Madison table, canopy bed, colonial music stand, Duncan Phyfe drop-leaf table, chest of drawers, Duncan Phyfe lyre-back chair, cradle, George Washington's desk, butterfly table, early American highboy, Duncan Phyfe sofa, gate-leg table, knee-hole desk, wing chair, tip-top table, Pendleton lowboy, Pennsylvania pine table, high-back chair, trumpet-legged highboy, Pennsylvania Dutch bench, cupboard, colonial sewing table, 18th c. breakfront, New England rocker, Hepplewhite sideboard, inlaid chest of drawers, mahogany cellarette, spinning wheel, American whatnot shelves, Pembroke table, fire screen, room paneling.

* * *

A.W. Marlow, **Fine Furniture for the Amateur Cabinetmaker.** Bonanza Books, (Crown Publishers, Inc.), 419 Park Avenue South, New York, N.Y. 10016, 1955, 200 pp., hardcover, $5.00.
Fourteen projects, copies of early American antiques, many with carving details; photographs illustrate construction details, line drawings for dimensions, materials list; for the intermediate to advanced woodworker.

Paper knife, piecrust tray, covered bowl, ribbon and scroll tray, reading glass, cigarette box, portrait frames, rectangular stool, oval stool, candlestand, walnut mirror frame, paw-foot coffee table, small chests of drawers, piecrust table.

* * *

A.W. Marlow, **The Early American Furnituremaker's Manual.** Macmillan Publishing Co., Inc., 866 Third Avenue, New York, N.Y. 10022, 1973, 131 pp., hardcover, $7.95.
Sixteen pieces of early American design for the beginner to intermediate cabinetmaker, with photographs and line drawings, list of materials, detailed instructions.

Spice box, fireside match box, spoon rack, candle stand, dry sink, cove cupboard, late plank-bottom chair, coffee table, trestle table, dining table, occasional table, bedside table, splayed leg table, low-post bed frame, chest of drawers, desk on frame.

* * *

A.W. Marlow and F.E. Hoard, **Good Furniture You Can Make Yourself.** Collier Publishing, order Macmillan Publishing Co., Distribution Center, Riverside, N.J. 08075, 1973 reprint of 1952 book, paperback, $4.95.
Classic book on traditional furniture pieces. Includes construction information, scale drawings for the intermediate to advanced.

Chairs: Queen Anne, Philadelphia drake-foot, Chippendale four-ladder, three ladder, Hepplewhite shield-back, Sheraton lattice-back, wing chair frame, Sheraton Windsor side chair, fan-back Windsor, double-comb back Windsor, slot-back, Hitchcock; stools: joint, Queen Anne, Chippendale, early American fireside bench; tables: Queen Anne coffee table, Chinese Chippendale, Sheraton bedside table, Hepplewhite bedside table, 24- and 30-inch butterfly, small Queen Anne drop-leaf, six-leg drop-leaf, small Hepplewhite drop-leaf, six-leg cabriole drop-leaf, Chinese Chippendale sewing table, Hepplewhite serving tray and table, Hepplewhite card table, Hepplewhite three-part set of tables, Queen Anne tilt-and-turn, oval tilt-top, tavern, candlestand, butler; beds: Chippendale, Hepplewhite, spool, trundle; cupboards: pine corner, mahogany corner, Welsh dresser; chests: pine lift-lid chest, mahogany lift-lid chest, Queen Anne lowboy, highboy, Philadelphia lowboy, highboy, quarter-column chest, serpentine-front, block-front; desks: straight-front, oxbow front; mirrors: Queen Anne Chippendale, wide-frame, Queen Anne dressing glass, Hepplewhite; clock cases: flat-top grandfather, arched-top grandfather, scroll-top grandfather, grandmother clock, banjo clock, Massachusetts shelf clock, Eli Terry pillar and scroll clock, New Hampshire mirror clock.

* * *

James M. O'Neill, **Early American Furniture.** Taplinger Publishing Co., 200 Park Avenue South, New York, N.Y. 10003, $9.96.
Early colonial, late Pilgrim pieces simple to construct, drawings, bill of materials for the intermediate.

Tables, deacon's bench, dry sink, hutch, apothecary chest, magazine rack, foot stool, spoon rack, dough box.

* * *

Burl N. Osburn & Bernice B. Osburn, **Measured Drawings of Early American Furniture.** Dover Publications, Inc., 180 Varick Street, New York, N.Y. 10014, 1975 reprint of 1926 edition, 82 pp., paperback, $3.00.
Measured drawings of 29 museum pieces which range from primitive early American through high design of the 18th century; brief instructions, photographs, elevations and construction expansions; for the intermediate to advanced woodworker.

1810 sideboard, two small tables, banister-back chair, mahogany mirror (early 18th c.), trestle-footed gate-leg table, tripod teakettle stand, bureau with writing leaf, signer's table, pine chest, Sheraton-style sewing table, high chair, small table of curled maple, 18th c. mirror, vase-back maple chair with rush seat, butterfly table, President's desk for Independence Hall, tilt-top table, tavern table, four-poster bed, oval tavern table, mahogany dresser with cabriole legs, miniature tall clock, shield-back chair (Hepplewhite style), maple couch, tilt-top dining table by Duncan Phyfe, highboy of black walnut, wing chair owned by J.Q. Adams, tuckaway tilt-top table, painted desk on frame.

* * *

Verna Cook Salomonsky, **Masterpieces of Furniture in Photographs & Measured Drawings.** Dover Publications, Inc., 180 Varick Street, New York, N.Y. 10014, 1974 republication of revised 1931 book, 212 pp. paperback, $4.00.

Measured drawings of 102 museum pieces, 16th through 19th century. Most have intricate drawings, inlays or construction which make the book suitable for the advanced woodworker. Some European pieces are omitted from the following listing for brevity.

Leather-covered chair, day-bed, banister-back chair, Windsor arm chair, splat-back side chair, easy chair, Chippendale-style chairs and sofa, wing chair; Hepplewhite-style chairs, windowseat and settee; Sheraton-style chairs, settee, arm chair; Duncan Phyfe arm chair, side chair; maple table, tilt-top table, butterfly table, drop-leaf table, card table, chamber dressing table, Chippendale-style card table; Hepplewhite card table, dressing table, "Beau-Brummel" dressing table, Pembroke table, Sheraton-style folding table, breakfast table; Duncan Phyfe drop-leaf table, dining table; Hepplewhite sideboard, small sideboard; Sheraton sideboard, mixing table; Connecticut chest, paneled chest, chest of drawers; desk box on frame, slant-top desk, tambour desk, Sheraton-style desk; Queen Anne secretary, American secretary, block-front secretary, painted highboy, walnut highboy of William and Mary style, lacquered highboy, highboy, bed with tester rails, field bed, Chippendale-style mirror, fire screen, miniature tall clock.

* * *

John G. Shea, **Colonial Furniture Making for Everybody.** Van Nostrand Reinhold Company, New York, N.Y., order through Educational Publishing, Inc., 300 Pike Street, Cincinnati, Ohio 45202, 1964 reprint of 1935 edition, cloth $12.95, paper $7.95.

Scale drawings and photographs of each piece with short background information; some pieces suitable for the beginner, most for the intermediate woodworker.

Butterfly trestle table, instep table, five-board stool, caned stool, oval cricket stool, bench (leg rest), Deerfield stand, early American bookcase, trestle table, pine dresser, love seat, wing chair, bench, candle stand, magazine basket, magazine rack, small butterfly trestle table, tuckaway gate-leg table, arm bench, hutch table, maple side table, trestle-foot gate-leg table, bed, paneled chest, tavern table, gate-leg table, dressing table, rush stool, mirror, split gate-leg table, pine desk on frame, trestle coffee table, cobbler's bench, card table, dressing table and mirror, courting mirror, pipe box, corner light bracket, reading rack, small trestle table, early butterfly trestle table, butterfly table, Plymouth bench, chest of drawers, chest-on-chest, linen chest, dowry chest, Governor Carver chairs, maple chest of drawers, knee-hole desk, wall bookrack, looking glass, smoking stand, paper basket, oval-top tavern table, draw-top coffee table, drop-lid desk, desk, Chippendale mirror, night stand, corner cupboards, bookshelves, drop-leaf table, pine cupboards, joint stool, accessories, sewing table, bed, small tilt-top table, sawbuck table.

* * *

John G. Shea, **American Shakers & Their Furniture.** Van Nostrand Reinhold Company, New York, N.Y., order through Educational Publishing, Inc., 300 Pike Street, Cincinnati, Ohio 45202, 1971, 208 pp., hardcover, $15.95.

Extensive background on the Shakers and their workshops, finishing, tools, construction; with measured drawings of museum pieces, photographs; for all levels.

Sconces, looking glass, wall box, wall cupboard, stools, sewing chests, drying racks, dough bin, butcher block, log bin, hanging shelves, cradle, benches, bonnet box, storage box, kitchen table, dry sink, wall cupboard, kitchen desk-cupboard, flight of shelves, utility pedestal, sorting stand, firewood carrier, sewing table, turned trestle table, dining chair, Harvard trestle table, maple chair, side table, desk box, lap desk, bed, settee, night stand, high chair, blanket chest, drop-leaf table, sewing chest, stretcher table, lidded chest with one drawer, pedestal tables, lidded chest with three drawers, sewing desk, rocking chair, maple table, chest of drawers, table desk, western dresser, small table, portable chest, cupboard and chest.

* * *

SOURCES OF SUPPLY (Continued)

Editor's Note: As an editorial service to our readers, Fine Woodworking will periodically publish some sources of supply. This chart expands and corrects the list of tool dealers that appeared in the Spring issue.

					WOODS					HAND TOOLS				POWER TOOLS						
	Telephone	Catalog?	Mail Order	Retail Store Sales	Veneers	Hardwood Lumber	Hardwood Plywood	Carving Blocks	Turning Blocks	Cabinetmaking	Carving	Turning	Marquetry	Portable	Stationary	Cabinetmaking Hardware	Marquetry Supplies	Finishing Materials	Books	Plans
Craftsman Wood Service Co. 2729 South Mary Street Chicago, IL 60608	(312) 842-0507	50c	Yes	Yes	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Exotic Woodshed 65 North York Road Warminster, PA 18974	(215) 672-2257	No	Yes	Yes	●	●	●	●	●		●							●	●	●
Frank Mittermeier Tools, Inc. 3577 East Tremont Avenue Bronx, NY 10465	(212) 828-3843	Free	Yes	Yes						●	●								●	
National Camera, Inc. 2000 West Union Avenue Englewood, CO 80110	(303) 789-1893	Free	Yes	Yes						●	●	●		●	●			●	●	
Sculpture House 38 East 30th St. New York, NY 10016	(212) 679-7474	$1	Yes	Yes				●			●			●					●	
A. Constantine & Son, Inc. 2050 Eastchester Road Bronx, NY 10461	(212) 792-1600	50c	Yes	Yes	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●

I've Got A Secret

'Little Man' of walnut

Igor Givotovsky has been working in wood only a few years. He was trained as a sculptor (working in the abstract with steel). But then he discovered wood and the jig saw, and he has been doing puzzling carvings ever since.

This one is called "Little Man." It's of walnut, sits about 15 inches high, including steps, and goes for $800.

It's the sixth in a series that have become increasingly complex, too complex in fact to describe here how he does them. Suffice it to say that the head and hands are made from a single piece of wood, and that generally he jig saws before he carves.

As he says about his work, "When you make something that comes apart easily, it also stays together well."