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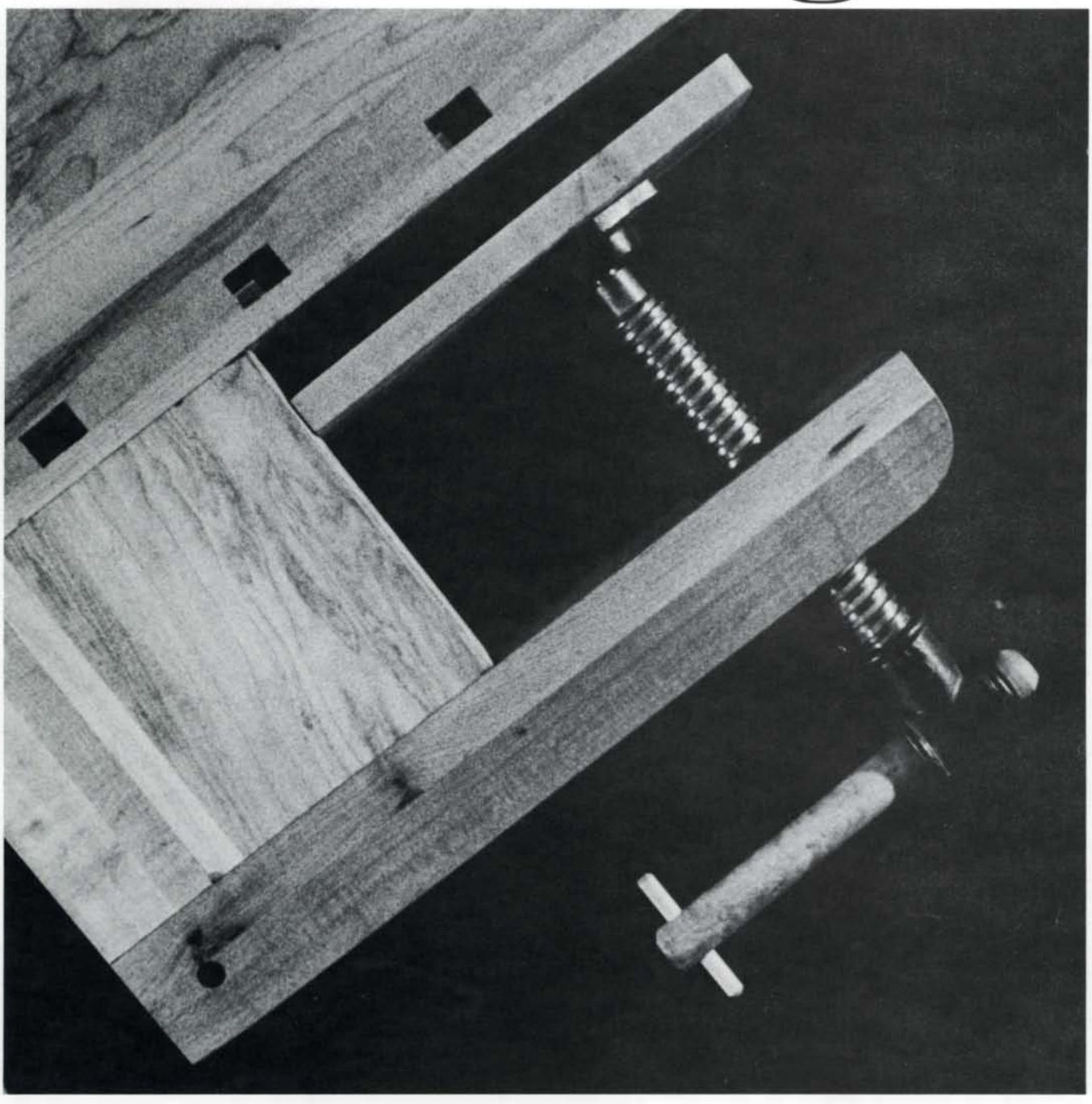

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Fine WoodWorking

Fall 1976, Volume 1, Number 4

CONTENTS

4 **News**

5 **Letters**

10 **Books**

13 **Authors**

14 **Cabinetmaker/Writer** by John Kelsey: A pioneer still going strong

16 **Cabinetmaker's Notebook** by James Krenov: Thoughts on woodworking

20 **Water and Wood** by R. Bruce Hoadley: The problems of a difficult pair

24 **Hidden Beds** by David Landen: Two ways to get more sleeping space

28 **Exotic Woods** by Bob Stocksdale: Observations of a master turner

33 **Veneer** by Lee S. Jacobs: The commercial facts of life

35 **Tackling Carving** by Robert L. Butler: No need for a 'carving set'

37 **Market Talk** by Robert Sutter: There's a new generation of buyers

38 **Abstract Sculptures from Found Wood** by Theodore Gochenour

40 **Workbench** by Tage Frid: A professional design for holding the work

46 **Ornamental Turning** by John Kelsey: An intricate, exacting pastime

50 **Heat Treating** by Gordon S. Harrison: Making your own tools

53 **Mosaic Rosettes** by A. Thomas Walsh: Making a basic guitar element

54 **Shaped Tambours** by Mark Sfirri: Some design considerations

56 **Buckeye Carvings** by Rudolf Schubert: Highlights of a summer show

57 **Hardwood Sources:** A first listing for the craftsman

60 **Of Bugs and Things**

Cover: Vise from cabinetmaker's workbench described on page 40. With this single-screw guideless vise, work can be held deeply and down to the floor. This type of vise can also hold irregularly shaped objects more readily, as clamping board is free to move with the shape of the work.

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Biennial Design Book Due

Fine Woodworking will publish in the spring of 1977 its first Biennial Design Book, a photographic compilation of 300 to 500 pieces of fine woodwork. Emphasis will be on both design and craftsmanship, and the book will represent the state of the art of fine woodworking today. It should serve as both a record and a source of inspiration.

Amateur and professional woodworkers are invited to enter photographs of the best pieces they have done during 1975 and 1976. A panel of woodworkers and designers will choose the 300-500 best, the number to be determined by the overall quality of the entries.

Any type of work is eligible—furniture, objects large and small, sculpture and carving, toys, cabinetry and chairs, musical instruments, marquetry pictures, even boats, airplanes, and architectural woodwork, as long as the primary material is wood. There are no restrictions on technique. Although each piece must be of original design, a designer and a craftsman may submit a joint entry. Period furniture may be "after the style of" or derived from antiques. Reproductions of existing pieces, museum drawings or books are not eligible.

The Biennial Design Book will be sold through bookstores for $5, but *Fine Woodworking* subscribers will be able to obtain it for $4 postpaid.

The key to a viable entry will be a good 8 x 10 black and white photograph of reproducible quality. The background must be plain, but grass, sand, or the like is acceptable. Color slides will be accepted for judging as long as entrants are prepared to provide black and white photographs on request. Entry deadline will be January 31, 1977. Along with the photograph, entries must include name or function of piece, type of wood, overall dimensions, and price (if for sale). This information will be published, along with identification of the woodworker. There are no entry blanks as such. Mail entries to Biennial Design Book Editor, *Fine Woodworking*, Box 355, Newtown, CT 06470. If you want your material returned, send a stamped self-addressed envelope.

EAIA Meeting Set

The Early American Industries Association will meet October 7-9 at the Farm Museum of Landis Valley near Lancaster, Pa. The EAIA is a group of 2,000 people interested in antique tools and processes. The most recent issue of EAIA's quarterly *Chronicle* discusses the bucksaw and the sawbuck, the dating of old anvils and how they were made, the Morris plane, and the circular chamfering plane. EAIA also publishes a *Shavings* newsletter and maintains a mail-order book service and library for members. It has two categories of membership: subscription at $8 a year, and active at $14. Only active members may attend the semi-annual meetings which feature lectures, demonstrations and tool exchanges. Membership information may be had from John Watson, Office of State History, Building 8, Rotterdam Industrial Park, Schenectady, NY 12306.

Stanley Names Student Winners

Twenty winners of the eleventh annual Stanley Tools Scholarship Contest included Joseph D. Escobar, 15, of Saratoga, Calif., whose Italian provincial desk design (above) earned him a $1,000 grand prize in the 9th and 10th grade division. The 11th and 12th grade grand prize winner was James M. Bush, 18, from Winchester, Ky., who built a cannonball bed.

To enter the contest, students must submit plans, a list of materials and a photo of the project. Cost of wood may not exceed $100. Plans of the winning projects are reproduced by Stanley and sent out to all the schools in the country.

LETTERS

I have just received the Summer 1976 issue of *Fine Woodworking*. I haven't commented on this before because I figured the thing would have to shake down a bit first. Now that a trend seems to be discernible, I have a few comments.

To begin with, I am happy to see the article on Queen Anne in the current issue, and especially the diagram "Bad Queen Anne" on page 42. While some may say these are matters of taste, yet it is generally agreed there are some things which are good taste, some bad, some debatable.

It seems to me that most of the readers of your magazine are probably pretty good woodworkers to begin with, and some of them outstanding. This being the case, it seems that maybe the focus of your policy should be on matters of design and form, rather than on techniques of construction.

For instance, it is all too evident that there are a lot of craftsmen who are fine woodworkers indeed, but they seem to lack knowledge of the esthetics of woodworking. Esthetics simply means that not only must a piece not *be* topheavy, it must not *look* topheavy. Take Volume 1, No. 1, page 15—that desk is a fine piece of workmanship, but if you rest your elbows on the extended leaf, you will probably have the whole desk in your lap. It may well be that it has been loaded with lead or something to prevent this, but it still *looks* unstable, and therefore, I think, esthetically wrong. The same thing can be said of the hickory wine locker on page 47 of Volume 1, No. 2. On the other hand, the marquetry clock on page 15 of this same issue has no problem of stability—it is just hideous, that's all. A lot of fine workmanship and patience gone to produce something that even Grand Rapids

LETTERS (continued)

at its worst would have eschewed.

Artists have another criterion of equal importance: A design must not violate the material. That is, wood has a grain and a structure which must be taken into account when designing a piece. The spiral steps on page 42 of Vol. 1, No. 2 are a case in point. There is no question of the beauty of this design. But wood is the wrong material—this piece could not possibly have been made of a single piece, and the complicated lamination that was done means that we do not really have a wood piece; we have a piece made of wood and glue, and it will last only as long as the glue does. Yet—this would be a magnificent object if cast in aluminum or bronze and polished to the same sleek curves. It is simply not right in wood.

John S. Carroll, Emlenton, Pa.

I have appreciated the articles concerning hand tools and traditional methods of cutting joints. A point in the area of chisels and planes that may be of interest is the back, or flat side of chisels and plane irons. When purchased, the back is rather coarsely finished, even on high quality tools. We hone the beveled side and bring up a seemingly sharp edge, but it is never the same as, say, a woodturning skew chisel that is honed with a double bevel. The reason is that the coarser finish on the flat side enters the apex of the edge, thereby defeating the finely honed bevel. The solution is to hone the back side to the same finish as the bevel when the tool is first put into service. During subsequent sharpenings one only has to lightly touch the back to remove the burr caused by honing the bevel.

As many craftsmen who have experimented know, the hard Arkansas is almost a necessity for bringing up a fine edge. Although expensive, they are an excellent addition to a workshop's sharpening equipment.

Brent K. Morris, Ripley, N.Y.

....A friend is in the "thinking" process for a stroke-sander project. (Vol. 1, No. 3)....I have one comment about the machine—that upper pulley *especially* needs a guard. It could scalp someone by having his hair caught in it (not me, unfortunately, due to the ravages of time!). Protection of the head is almost totally neglected by home workshop nuts. I've battered my old bald noggin many times, and extremely painfully. Usually I wear a hard hat for protection. It would appear, also, that the angle-iron rolling-table supports ought to be guarded against the possibility of other severe injury.

What's wrong with safety?

Tom E. Moore, Springfield, Va.

....about checkered bowls—they are very beautiful, but the age-old problem of the coefficient of expansion and contraction of different woods must be faced. After gluing up and rough turning, I put my bowls in the hottest place I can find—at this time most of the warping, distortion, etc. takes place, and then after clean up, you should have a stable piece, provided it is well finished. Also, teak and other oily woods will not glue and hold with the powdered resin glues. The only glue that will hold these woods is an aliphatic naptha base—Titebond. The polyvinyl acetates will move (Elmer, etc.) and are not recommended. I am surprised someone didn't catch this before now!

About the dowel joints versus mortise and tenon—I do not

fully agree with the writer (Spring 1976)—in the final analysis a dowel joint cannot be any stronger than its *cross section* (this assuming it has been properly glued). I maintain you cannot get a properly glued dowel joint apart without breaking the wood! I have made lots of chairs, and if properly glue-blocked and braced, I don't see any reason why a chair won't stay together for 100 years or more! I much prefer a well made dowel joint to a poorly made mortise and tenon.

Carl W. Kempf, Smyrna, Ga.

In regard to the finishing of wood, I refer to C. T. Bargeron's letter about the use of potassium bichromate (dichromate) to dye wood. As I have recently paneled my basement in solid oak, I am familiar with the process. The chemical is mixed one teaspoon per quart of warm water (to help solubility). A stronger solution or repetitive applications darken the wood more than I want. The solution is applied liberally via saturated rag, spray, pouring or whatever, to wood which is as smooth as desired. When dry, the boards are scuff sanded to remove the raised grain. One grit finer than the final sanding grit is used. A photo-chemical action takes place in mahogany, red or white oak, or any other acid wood. With oak, the results of the staining can scarcely be seen until a finish is applied.

I lean totally away from surface coatings. I have used US Plywood's Deep Finish Firzite, Watco Danish Oil, Pratt and Lambert's Okene, and a Waterlox penetrating product. My favorites on the paneling were the Firzite and Okene. Waterlox wanted to bleed back out of the wood during drying

LETTERS (continued)

and required much more wiping to remove all the residue. Watco Danish Oil penetrated so deeply that at least 2 coats would've been required, and when you're talking about almost 1000 board feet to finish, the required labor becomes meaningful. On the other hand, the additional penetration means improved protection, and on furniture Watco is my choice. The final result with the dyed oak and a penetrating finish is a beautiful warm brown, not unlike undyed, unstained teak. Potassium permanganate, mentioned by Richard Convey, gives a cooler darker brown, i.e., more of a chocolate hue.

Jon L. Steenson, Butler, Pa.

In response to the question regarding potassium dichromate and potassium permanganate as posed by Charles Bargeron and a possible helping hand to Robert Convery (Spring, 1976), I have a possible solution.

Many years ago a cabinetmaker showed me how to kill off the strange color overtones which we get in using the above on mahogany or pine. After steeling the treated surface, he flooded on a solution of Alkanet root in linseed oil. The Alkanet root is a granular material which has a rich red dye in the fibers. This material is soluble in oil, but not in water. I put about a handful in a one-quart mayonnaise jar, and then filled it almost full with linseed oil. After this sets for a few days, with an occasional shaking, it can be flooded on the dry treated wood and then the surplus wiped off in an hour.

All of the fibers lifted by the water in the oxidizing solution should be removed by steel wooling.

LETTERS (continued)

The general effect is to highlight the grain and give a deep look to any subsequent finish, but the best part is the elimination of the unwanted color.

Robert H. Deering, Harrison, Me.

....in regard to Mr. Babula's query on a filler for stained pieces. What I generally do is to sand the piece first and save the sawdust. Then I stain the dust with the same stain as is to be used on the piece and let the stained dust sit for a week or two. Then I stain the piece. After the stain has dried, I mix the stained dust with white glue and use it as a filler. After the filler has dried, I sand the piece in the filled areas and restain, and then put on whatever finish is desired. If the stain must or might be changed, I would hold off on staining the sawdust until the final stain color for the piece is selected. Finally, as you noted in your reply, I too know of no type of filler that takes stain in the same manner as the wood in the piece.

Michael Voolich, Somerville, Mass.

....An alternative is to use glazing liquid colored to the desired shade with oil paint pigments. The glazing liquid is a clear varnish-like material which provides a fine finish coat with or without coloration. It will cover any previous stain and can be shaded while wet with pigment over defects or nail holes, if necessary. It does not end up like varnish stain.

....I have a suggestion for a regular feature. It has to do with tricks amateurs and professionals learn by trial and error, or by sharing successes and failures of others, or by accident. I suspect your readership would respond with a multitude of suggestions. Selection of two or three items per issue should develop into a unique library of information over a period of time.

R. P. Gwinn, Golf, Ill.

Editor's note: A good suggestion; we're working on it. Tips and tricks anybody?

....Hoping you can solve my wood finishing problem I have had for about 15 years. It is in properly finishing cherry wood. I have mixed stains until I am blue in the face and could never get the nice brown on it that I see in furniture stores. I am familiar with all stains, but like to use the non-grain raising stains put out by Behlen and Constantine. I could never find any finishing schedules in the many books I have. I have been doing it for many years, but I'm not satisfied with the results. I usually do get a fair finish, but get it by using pigment over the wash coat. I see in furniture stores cherry done with an aniline stain which are perfectly clear. I would appreciate any information on any schedules or books that you can recommend. My idea of a nice finish besides being clear is a dark, deep brown with only a hint of red in it.

John Selock, Whitehall, Pa.

....I have a question that I hope you can answer. I understand that the Danish furniture makers bleach their teak to achieve the very blonde appearance that it has. I would like to achieve this finish. Can you please tell me the process? Can it be done after gluing, or do individual boards have to be treated?

Dale R. Leisy, Los Alamitos, Calif.

BOOKS

Windsor Chairmaking by Michael Dunbar. *Hastings House Publishers, 10 East 40th Street, New York, N.Y. 10016, 1976, $9.95 hardcover.*

After many years of chairmaking and continuous research as guidelines for quality and authenticity in my work, it was indeed gratifying to find Michael Dunbar's book *Windsor Chairmaking*.

The attention to detail which Dunbar emphasizes is an all-important factor which I'm sure the experienced craftsman would appreciate and an inexperienced person interested in acquiring the knowledge of chairmaking would find priceless. This book, although basically not for novices, describes chairmaking using original methods of wood preparation and follows through with complete details right down to the painted finish. Although most originals were painted, a patiently applied oil and wax finish exposes the rich wood tones for the world to see.

His sculptor's description of seat carving and the details in the turning process which can give a Windsor a Pennsylvania or New England origin are superbly described and illustrated. The chair back's two more prominent uprights, more commonly referred to as posts, must be kept in proportion to the rest of the chair, or the finished product will appear clumsy.

Rarely do you find description or emphasis of any kind placed on bending wood by steam. Mr. Dunbar fully covers this fascinating part of chairmaking and meshes it nicely with his complete adherence to authenticity throughout the entire book.

It would be rewarding, to say the least, to see anyone follow in Dunbar's footsteps and continue chairmaking in its original way. Machines have made short cuts too tempting and the finished product too exact which takes away the warmth and quality displayed in a piece made by a true craftsman.

I have made many Windsor chairs over the years and regard Michael Dunbar's book not only a rewarding, detailed experience in chairmaking, but also a tribute to the work and skill of craftsmen in the past.

—Ernest E. Schaible

Woodworking and Furniture Making for the Home by G. W. Endacott. *Drake Publishers, Inc., 801 Second Ave., New York, N.Y. 10017, 1972, revised 1976, $4.95 paper.*

The Complete Book of Woodwork by Charles H. Hayward. *Drake Publishers, Inc. 801 Second Ave., New York, N.Y. 10017, 1959, revised 1974, $9.95 hardcover, $4.95 paper.*

Woodwork, A Basic Manual by Raphael Teller. *Little, Brown & Co., 34 Beacon Street, Boston, Mass. 02106, 1974, $3.95 paper, $7.95 hardcover.*

How often have you encountered the question, How do I do it? If you are like me, it is a never-ending question. Often you don't have the resources to solve the problems you might face in your woodworking. It has been my experience that an understanding of the basics often brings a quick solution to an otherwise perplexing problem. The basics of sawing, planing and using a chisel are at the heart of all woodworking problems.

No single book I have read would

BOOKS (continued)

completely meet the requirements of all woodworkers at their varying levels of understanding. Some books deal with elementary aspects, and some try to cover all aspects of woodworking. Of all the books I have read, however, one stands out: *Woodworking and Furniture Making for the Home* by G.W. Endacott. It is quite comprehensive and would be very helpful to someone just beginning woodworking. Endacott does a wonderful job of covering those areas that seem to give woodworkers the most problems. Although there is very little about electric power tools, all of the handtools and processes are delved into. A beginning woodworker would be well advised to concentrate on these areas because his results will be most rewarding. Also in this book I found the best explanation of how to use a hand saw. It is essential to all woodworkers to be able to handle a saw in order to cut joints with accuracy and control.

Not only is Endacott's chapter on sharpening complete, but he gives very good descriptions of how to tell when a tool is dull and also when it has been sharpened correctly. These two points are among the biggest obstacles facing beginning students of wood. Endacott also discusses the growth and development of trees, going into detail about the tree as it travels from forest to the lumber shed. He also deals with the many forms the wood is converted into for the craftsman's use. For those who are looking for some design inspiration Endacott also includes several good projects that can be tackled by beginners.

Another equally good book for beginners is by Charles Hayward, *The Complete Book of Woodworking.* This is one of many books by Hayward, and it covers a broader range of topics than Endacott does. These include the use of veneer, woodcarving and turning on the lathe. The illustrations are excellent, and Hayward also includes a selection of challenging designs that are still within reach of beginning woodworkers. On all counts Hayward's book is excellent and would be inspiring to any woodworker, amateur or professional.

Another fine book to introduce someone to woodworking is by Raphael Teller, *Woodwork, a Basic Manual.* In an attempt to keep the book simple

and to the point, Teller has listed the tools and processes in alphabetic order, much like a dictionary. The advantage is that the beginner can read it at one sitting and will have been exposed to all of woodworking's basic elements. This is valuable because in order to be able to work with wood a person almost has to start everywhere at once, so many different things must be understood. Along with an explanation of the tools, equipment and techniques, Teller offers several projects and discusses design considerations.

Although no book fits all requirements, I think a combination of the Endacott and Hayward books would be most helpful. Both books have information essential to the beginner, with Hayward somewhat superior because of his excellent illustrations, and Endacott ahead on account of his thorough explanations.

One drawback common to all of the books I have ever read on woodworking is the lack of concern for expansion and contraction of wood due to moisture and temperature changes. The movement of wood just can't be ignored.

—Robert Meadow

Creating Small Wooden Objects as Functional Sculpture, by Dona Z. Meilach, *Illustrated, 248 pages, Crown Publishers, Inc., 419 Park Avenue South, New York, N.Y. 10016, 1976, $5.95 paper.*

Dona Z. Meilach's latest book, *Creating Small Wooden Objects* is a fine collection of photographs of contemporary functional sculpture. And it suffers the same flaws as Meilach's earlier books.

This 248 page volume, containing 588 photographs and 26 color plates, follows the same style and format as her *Creating Modern Furniture* of last year, and appears to be a sequel. Most of the introductory material on wood and basic methods of work has simply been reprinted.

After a sketchy historical introduction, Meilach devotes a long chapter to turning which features an excellent photo sequence on Milon Hutchinson's methods of decorative pegging. Hutchinson turns a form, drills equally spaced holes in it, and insets pegs of contrasting wood. Then he re-turns the object to its finished shape, achieving some startling and novel decorative effects.

The book contains similar photo sequences on turning a bowl, spinning a small brass cup, the rudiments of laminating a complex form, carving including hollowing with a chain saw, inlay and marquetry, and joined construction.

The best part of this book is the photographs of finished works. She has included an extremely wide variety of excellent and non-mediocre works. And as with her previous books, the worst part is the text. Her technical sequences in particular suffer badly from vagueness, oversimplification and plain error. When Meilach tells us how to turn, she says the only way to hollow a bowl is with scraping tools. About wood, she says, "working on green wood is a waste of time." When she instructs about lamination, she would allow crisscrossing the grain from layer to layer with nary a thought for expansion and contraction—and certain failure of the glue lines.

The problem is, Meilach isn't a

BOOKS (continued)

woodworker. She's a writer with an impressive list of craft books in print. She would be wise to forget about technical documentation and instruction, and stick to what she does well. This would be a much better book if it contained only reportage and photographs of current woodworking trends, for then it would not mislead.

—John Kelsey

AUTHORS

Ernest Schaible (Windsor Chairmaking book) has been making chairs and other furniture professionally for 50 years...**Robert Meadow** (beginners' books) is both a student and teacher of woodworking...**James Krenov** (''Cabinetmaker's Notebook'') is an American designer/craftsman/teacher who has been living in Sweden for many years...**Bruce Hoadley** (''Water and Wood'') carves and teaches wood technology at the University of Massachusetts...**David Landen** (''Hidden Beds'') is a North Carolina designer/craftsman...**Bob Stocksdale** (''Exotic Woods'') has been turning bowls professionally for over 30 years...**Lee Jacobs** (''Veneer'') is a Buffalo veneer merchant with large furniture manufacturers for clients...**Robert Butler** (''Tackling Carving'') is a biologist at Penn State when he isn't carving...**Robert Sutter** (''Market Talk'') is a cabinetmaker always looking for new sources of tools...**Theodore Gochenour** (''Abstract Sculptures'') is a Vermonter who also farms and carves...**Tage Frid** (''Work Bench'') is Professor of Industrial Design at the Rhode Island School of Design...**Gordon Harrison** (''Heat Treating'') has been blacksmithing as a hobby for several years...**A. Thomas Walsh** (''Mosaic Rosettes'') is an instrument and cabinetmaker...**Mark Sfirri** (''Shaped Tambours'') is an instructor and shop manager at Rhode Island School of Design...**Rudolf Schubert** (''Buckeye Carvings'') is a Bell Labs physicist and a carver.

Art Credits: 22, 53, 55, Loren McGurk; 25, 27, John Black; 41, 43, 45, Stanley Tkaczuk.

Picture Credits: 5, Meyers Studio; 14, Bruce Mervine; 25, David Nichols; 26, Eduardo Nunez; 56 Rose Ann Tomkins.

Cabinetmaker/Writer

An early pioneer still going strong

by John Kelsey

Andy Marlow chuckles and says a lot of people think that's him standing there grinning on the cover of his book *Good Furniture You Can Make Yourself*. The large man on the cover is wearing a neat, pin-striped apron and would have you think he has just made a Colonial-style rocking chair with a plane and a box of screws.

Marlow is a short, wiry man of 72 who wears old clothes and a peaked cap when he works in his shop out behind the house, and dons a necktie when he quits for dinner. Not only is the cover guy not Marlow, the chair isn't in the book. It looks as if it came from an unpainted furniture warehouse. The chairs that are in the book are much finer.

Although the work was all done by Marlow, the book has gone through so many changes that he stops just short of disowning it. For one thing, he never met his co-author, F. E. Hoard. For another, it was a nicer book when it was first published in 1952 (in hardcover) under the title *The Cabinetmaker's Treasury*. For a third, the co-author and the later resale for its current paperback reincarnation have chipped the royalties away.

That's what can happen when a fine cabinetmaker, desiring only to pass along a little of what he has so painstakingly learned, turns his hand to writing. Another sort of man would have given up on books and stayed with what he knew, but that man wouldn't have been able to master the difficult and exacting art of cabinetry, either. Marlow says he was so dissatisfied that he promptly started on his second book, *Fine Furniture for the Amateur Cabinetmaker*, a tour-de-force on the art of carving in furniture. Published in 1955, it remains the only step-by-step treatment available on how to carve piecrust tables, ball-and-claw feet and the like. Marlow wrote it all himself, took all the pictures, and made all the drawings, besides making all the furniture in the first place. He followed with *The Early American Furnituremaker's Manual* in 1973 and finished with a book on inlaying, to be published next year. Marlow has great talent; his wife calls it "a God-given art."

Recall also that 25 years ago, when Marlow started writing about how to make fine furniture, there were no other books on the subject. There was little in print but Popular Mechanics, Home Craftsman magazine and treasuries (like Wallace Nutting's) on antique furniture for the collector.

It began with a checkerboard

Marlow got his start during the depression in York, Pa., where he has lived ever since. One day when he didn't have a job, but had picked up a couple of pieces of walnut, he decided he'd like to make a little checkerboard table to pass the time.

"I went to this old fellow who had a shop, an old man I'd known all my life. He had a small shop like I have now and he made pedestal lamps with wooden posts that were all the rage then, and every once in a while he'd do a piece of furniture.

"I asked him, 'Sam, could I make this checkerboard table in your shop?' and he said, 'Sure, you can't use the machines, but you can do anything else you like.' I made the table and he offered me a job.

"I wasn't there long," Marlow recalls, "before I realized what he was doing: Somebody would give him a picture of a piece of furniture they wanted, and he couldn't get to first base. He had no design ability at all, he could only copy from an existing piece. So I wasn't there long before he came over to me with some pictures in his hand and a sheepish look on his face and asked me if I could make this. And I did.

"And about a year later I opened my own shop. Sam was a good carver and he taught me that, but I was on my own afterward. As I tell everybody, it's a natural ability to understand design and proportion."

His first shop was in the garage of his brother-in-law, rent-free. Those first jobs, well, "when you start you'll take anything." Later on, when his reputation had spread a bit and people knew Marlow could and would make what he promised, it got a little easier. "But it was tough and competitive right up until it was time to think about semi-retirement," he says. "You always have to convince the customer you can make a nice piece he'll like, sight unseen. That means a reputation and that takes a long time, years of work....and you have to be a good salesman; you're selling yourself as well as your work."

Today, Marlow lives on a busy thoroughfare on the west side of York, in Pennsylvania Dutch country. His showroom is the enclosed sunporch of his house and his living room. All of the furniture in the house was made by Marlow, and much of it, although in daily use, has a little tag with its price. If you want it, he'll move his stuff out of the drawers, polish it up and it's yours.

Even after all these years, most of Marlow's customers don't come from York itself, but from Philadelphia, Washington and New England.

"When prospective customers want to know right away how much a chest will cost, that's when I turn them off. They're bargain shoppers," Marlow says. "I don't take a deposit and I never build anything I don't like myself and

couldn't live with, but it never has happened that a person didn't pick up furniture he had ordered."

Marlow's shop is small; about as wide and a little longer than the garage with which it shares a wall. He doesn't have elaborate machinery: a large band saw, a table saw with small jointer, a lathe, a shaper, a jig saw and a variety of sanders including a panel sander with wooden drive wheels that he cobbled together himself. He buys his wood thickness-planed and proceeds from there. The day I visited, he was fitting narrow drawers in a medium-sized chest being made for a collector for storing his treasures. Marlow said he would spend about a week on it, the dovetails taking the longest. He shoots the drawer sides before fitting the bottoms.

Most of Marlow's work is reproduction of period pieces or work in a classic style. But he understands design so well that a photograph in a book is all he needs. "You soon get so you can take a good photo and reproduce a piece without ever seeing it," he says. This is not to be confused with following mechanical drawings. To make an antique reproduction from only a photograph and an idea of overall size, the maker has to understand the design thoroughly. He must redesign those elements that are hidden, which he may never have seen, and every proportion must work as well as the original piece worked.

For example, Marlow has an enormous highboy, a replica of one made in 1760 that now sits in the John Brown House in Newport, R. I. It has the same proportions and the same difficult carving as the original—but it's a foot shorter. The original stood almost nine feet high, and wouldn't fit in a modern house.

Says Marlow, "Chairs are the hardest, no doubt about that. If you can make a good chair, you can make anything. But if one of the elements in a carved chair back, a Hepplewhite or a Sheraton, is just an eighth of an inch off, it's a dud."

In such work the ball-and-claw foot is the signature of the carver. "Every man makes them his own way, and the cuts I make are just the natural way for me to do it. It's so hard to make cuts that aren't natural for you. . . . I can try some other way, but I will succeed only more or less."

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Editor's note: A survey of past advertisers in the Wood and Tool Exchange indicates that though small in number, the responses were in most cases productive. Thus, the column will be continued in future issues at the same rate of $1.00 per line, three line minimum. Please submit entries six weeks before first-of-the-month publication date. Commercial buyers and sellers excluded.

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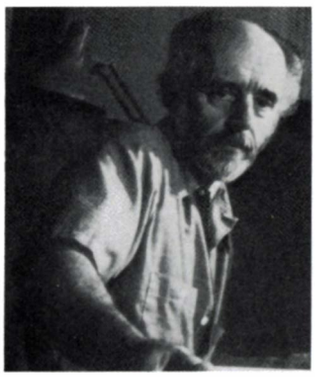
Cabinetmaker's Notebook

Some thoughts on working with wood

by James Krenov



It's always a little difficult for me to begin talking about wood because it is usually a matter of looking at it in one of two ways. One way is a generality, as just a material that we make things of—and that for me, is too wide, shallow, and impersonal. But there are people for whom wood and working with wood is not simply a profession but a very intimate thing: the relationship between the person and the material, and *how* they are doing it. I mean how they are doing it in the most intimate detailed sense; the relationship between wood and the tools that they use, between their feelings, their intuitions, and their dreams. Wood, considered that way, is to me *alive*.

I always think of wood as being alive. I grew up in primitive places, in the North where there were many legends and the supposition that some objects were animated and alive with a spirit of their own. Sometimes, when I work, this creeps into the atmosphere: the sense that maybe the wood and the tools are doing, and want to do, something which is beyond me, a part of me, but more than I am. And I don't want to ask too many questions about this. I note it as a curiosity, perhaps a bit exaggerated, but there is always this element of discovery, the sense of something happening which is more than you expect.

Wood, thought of that way, very personal and elusive, is almost a way of living. Various people have asked me about this, and in talking about it one or another would say, "You know, you have a love affair with wood." Perhaps this is true; it is a kind of lifelong love affair with wood and everything that is around it.

* * *

A long time ago, I spent some time in a school for cabinetmakers in Sweden. . . . Our teacher used to tell us about the old-timers and how they made their own tools, planes among them, and I began to think of the plane as being the cabinetmaker's violin; the instrument that sets the tone of the music in an orchestra. For me, now, it is *the* tool, in the sense that I enjoy planing the wood with a true plane more perhaps than any other aspect of working. Well, I also like to carve with a knife, and I enjoy working with sharp chisels or a nicely shaped spokeshave, but planing is something special—like the music of the violin.

When I think about a plane, I am thinking about the fine points. That is, how well it is made, how much work it will do for you, and how much enjoyment it will give. I know very well that a boatbuilder or a carpenter doing very large, rough work needn't be affected by this because the final sensitivity that I am talking about in planes is for the person who wants them and needs them and will appreciate them when doing smallish, sensitive things. I make my own planes—of fine wood and fine steel—not out of nostalgia for bygone days, but because I think that if you have the finest planes, if you have succeeded in making yourself some really fine tools, it does prompt you to work more carefully. Such tools spare energy, they save time for you, and I believe that they allow you to work more joyfully to exceed the performances that you have done before.

* * *

The public does not always know, almost never knows, the difference between the surface which can be produced in sensitive hands and with a sensitive eye, and the surface that you have run off the jointer and belt-sanded. It is, I think in some instances, as bad as that. Not always, of course; I don't want to seem prejudiced in any way, but there is often a tremendous lack of understanding. The more sensitive work you do, the more afraid you will be in the first stages of your life as a craftsman, because you will always be wondering, "Will anyone ever come who will appreciate this? Here I am working, making these tools. Here I am listening to this old man telling about the difference between one surface and another, one edge and another. Will it ever mean anything in my own work and my own existence?" And I am perfectly aware that in many instances it won't; not because you are insensitive, but because of the climate, the craft climate, the attitude towards wood. The fact that for years and years there hasn't been that much work done which is delicate and sensitive in this medium. There has been fine work done on a larger scale, heavier things a bit sculptured and large, yes. But small delicate things—an exquisite little jewelry box, a graceful little table, or a cabinet which is intended for lovely things and is itself a complement to them—this kind of work is rare, almost extinct. There is a true need to create a climate in which it can be done and appreciated. . . .

Around originality there is no doubt a law of diminishing returns; nowadays there has to be. Though maybe we are drowning not so much in the original as in the imitation, in just things. For many of us originality is a pressure; we are being pushed around by people wanting something new, different. Then there's the other pressure of doing the new without borrowing too much of the old, or at least without

getting caught at it. Students are forever running to libraries to get various books—on peasant art, Scandinavian modern, Shaker, Colonial, Indian—one this and one that. They fill their heads with all these images, and then frantically try to come up with something of their own. As though you put these ingredients in a kettle, add water, stir, and cook for two hours. What do you get? Pottage. Pea soup.

* * *

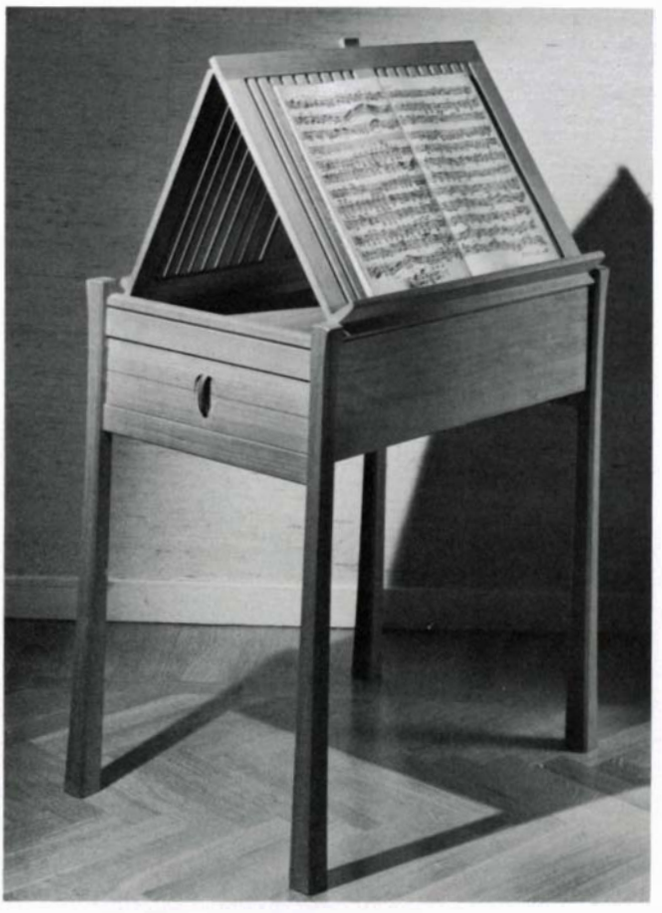
Our machines are treacherous. And I don't just mean they bite; they do. But the real treachery is more elusive. On the one hand they help the cabinetmaker greatly; on the other, they corrupt him. Somewhere between these two ways there is a sensible and sensitive balance which our craftsman must try to find before it is too late.

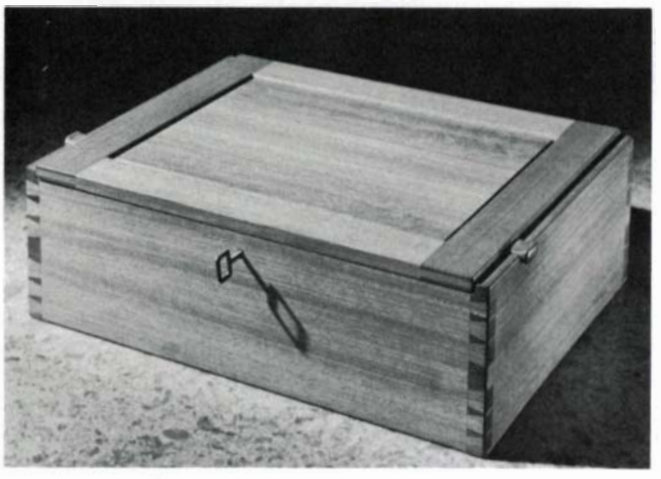
My machines are not many and not large, but they are adequate in relation to the work we do together. I rely on them and pamper them: they in turn cut clean and straight. By now we know exactly where we stand, they and I.

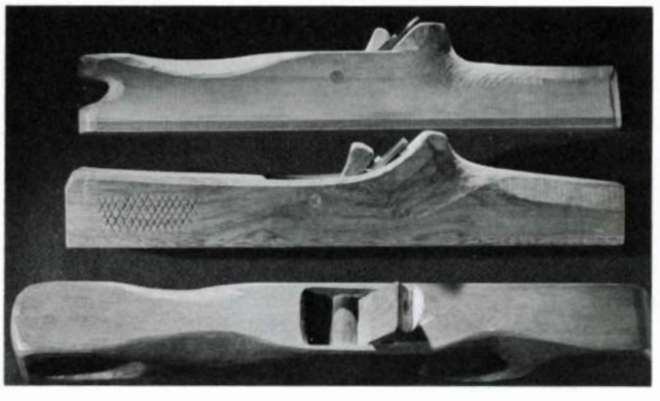
A visitor the other day expressed surprise over these machines—they collided with his impression of the romantic craftsman. He was from England, and I think he brought a bit of a William Morris attitude with him. Here now was this man about whom he had heard, and no doubt the fellow did everything by hand and had a very picturesque and primitive workshop. As he came in and saw my modest but fine equipment he exclaimed, "Oh, so you do have machines!" And I said "Why, of course. How else?" And indeed, what would be the purpose of ripping up the rough stock by hand, doing a vast amount of preparatory work with much effort and little accuracy, and then charging someone for a day or two or three of extra labor. That would be ridiculous, not only from the point of view of cost, but also because of the nature of the work involved. The task of getting the wood to the stage where you can begin to foresee a result and the so-called creative work with fine hand tools is exhausting. If you use up all your energy needlessly doing the hard labor by hand, then usually you won't have the strength and the clarity of purpose to do that fine part later on—when it really counts.

This was not evident to me when I started. Or maybe, simply not having the means to buy them, I minimized the importance of certain machines. Anyway, I did buy a good little bandsaw. For a while I was alone with this saw, a few odd planes, and the first pieces of wood I had gathered. I had to hand-plane everything right from each rough plank. I'd take a running start and then throw myself along that plank on the workbench, trying to get one side and one edge squared up so I could start bandsawing the rest. Oh yes, I did learn something doing it. But I almost killed myself in the bargain. With a jointer I would have been spared half the torture.

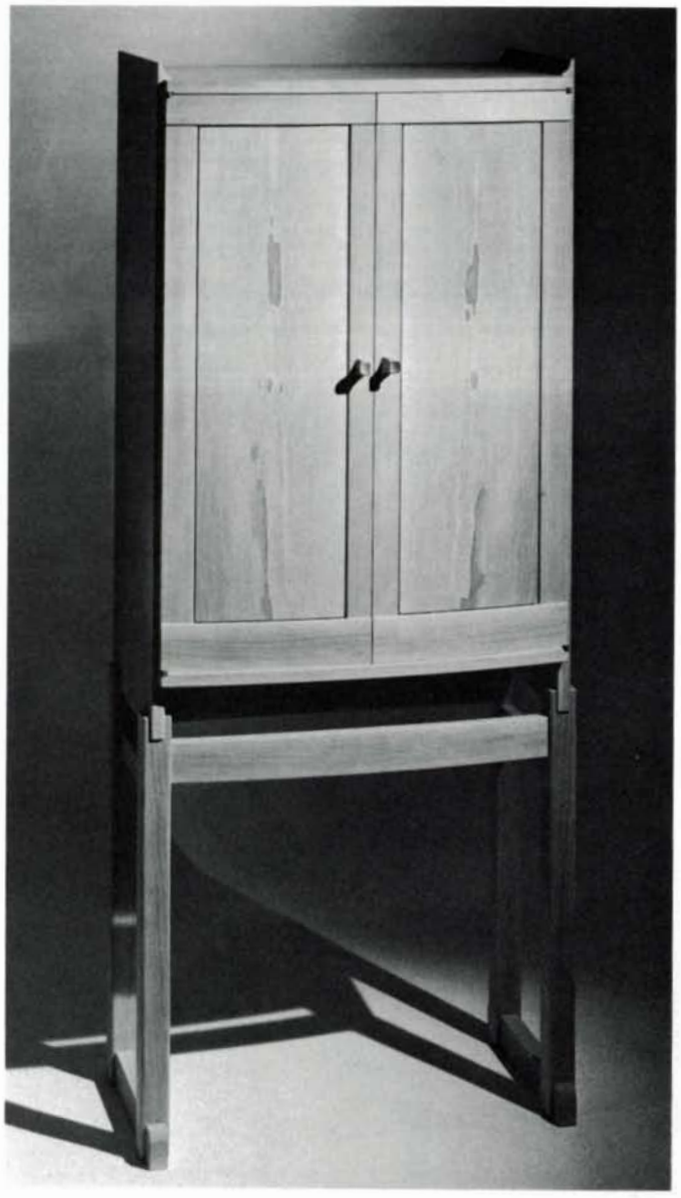
On the other hand, in schools where you begin learning at a time when most of us are very vulnerable, there is an overabundance of woodworking machinery. All these temptations! You watch your friends using them. You have an idea about the shape and nature of a certain detail, maybe you even sense that there should be a way for your hands to interpret it. A sound instinct makes you doubt any other way. But there is no clear sight of the tool you need, only the vague notion that it should be there. While here are all these machines which everyone is using, even for such small details. So you leave your impulse and go along with reason. And that

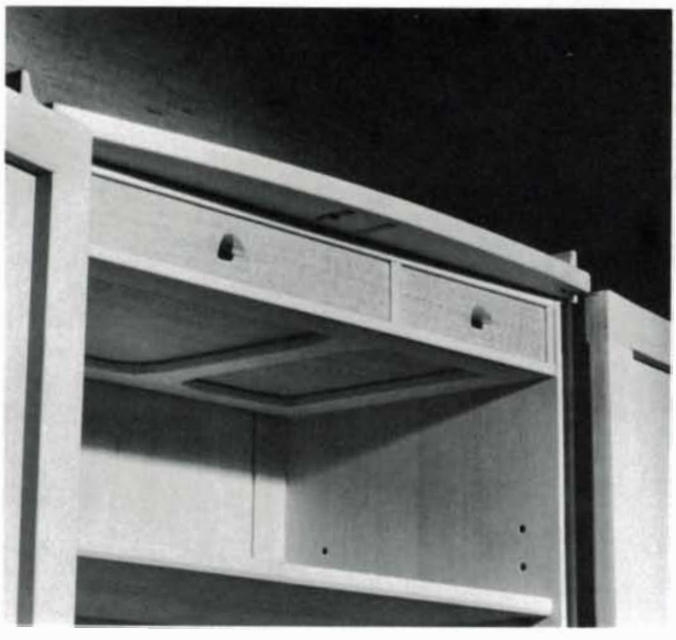






Some examples of the author's work: music stand in lemonwood, jewelry box of Andaman padauk, and planes of boxwood, Indian laurel and Andaman padauk (longest is about 15 inches).





Pearwood cabinet (about 51 inches high). Author's attention to design detail (bottom) includes smaller drawer on right that can open when left door is closed.

shape, those curves, edges—what might have been your expression—becomes the product not so much of enthusiasm and adventure as of efficiency.

* * *

I think there is another way of looking at work, namely, that people who buy objects made by persons like myself don't just want a table because they need a table or a cabinet because they need to keep certain things in it. They can get mass-produced or semi-mass-produced products that will solve those furnishing problems. They are looking for something more. I don't like to think that they are looking for art: certainly I am not thinking of art when I am working and I don't enjoy the aura, the atmosphere, of arty people and arty conversation. What the people who are attracted to my work enjoy is that when they are at home in the evening, and perhaps have friends visiting, they can approach one of these objects and make small discoveries: they can pull a drawer all the way out and turn it around and look at the back of it, and it is consistent and neat and honestly done, and they will note that the bottom is solid wood, and it is fitted in a particular way and it has a nice little profile running along the edges, and that the back of the cabinet is a frame and panel and solid wood, never veneer, and they will be able to experience a handle or a console that supports the shelves or run their fingers along the front edge of a shelf or even the underside of a shelf and find a meaning there. Whatever detail strikes them or appeals to them will be consistent. They, and their friends too, will perhaps be amused by all of this and they will say, "Look, you see this—see this little thing—now look at this other detail; I didn't notice this before myself, although I have had this piece for quite a while. . . . Look at the underside of this table: the fellow who made this really cared."

* * *

Next is a cabinet in pear wood. Now, right from the start I want to remind you that ordinarily pear wood—the classical pear wood we associate with furniture—is steamed pear wood, reddish in color. That is because they take the log and they saturate it with steam, which gives it a homogeneous pinkish color. The reason is that pear wood, when used in production of furniture, more than one-of-a-kind, varies so much in color that it causes a great deal of extra labor and time, which people working in furniture production are not interested in. So they steam it to make it an even color. That way they can just use it as *a* wood.

But here, now, is natural, unsteamed pear wood as it grows and as you cut it. It varies in color from log to log, and within the same plank there is a change, too. So getting this cabinet to be intentional in its tone, with the shadings the way I want them, entailed a great deal of labor. . . .

This cabinet, too, was not drawn up or really planned. It wasn't designed in the sense that I knew from the start how it would look. Details came to me along the way. I made changes from an original rough little sketch that I had. I guessed. I worked by different stages. Try. Change. Look again.

I often make the doors of my cabinets first because it's much more difficult to find the wood and the inspiration for making one door or a pair of doors than it is to make the case of a cabinet. The doors are often decisive for me. If they are

promising, then I have reason to continue with the cabinet. So I made these doors, and then, with their help, I decided what depth the cabinet should be. I began to wonder how the legs and underpart would be. I made up a curved leg and tried it, and it didn't fit. It just didn't belong to this cabinet.

Then I made a straight leg, and it seemed better. I changed the proportions, and gradually it began to belong more to the cabinet. And so I guessed my way along and composed the piece by stages.

The panels in the door—I didn't know from the start that I would even use them. I had imagined that I would have some other pear wood with the grain going in waves or swirls, and this would accentuate the curve of the door. I thought that this blotchy red pattern would sort of crease the door, would make it seem angular for the eye. But finally, after sawing up and trying other pear-wood panels, I sawed this wood with a great deal of worry and fear, because I didn't have any more. I made these panels and I think they are good. I was lucky.

The lighter edge being toward the middle of the cabinet is not just a guess. I did turn the panel both ways, and it turned out that with the lighter part toward the middle of the cabinet, you also accentuate the curve of its front. Whereas, if the darker part were in the middle, you would, perhaps, get a concave or a flatter effect. All these things are, you might say, a chain reaction—one event leading to the other—one discovery leading to another.

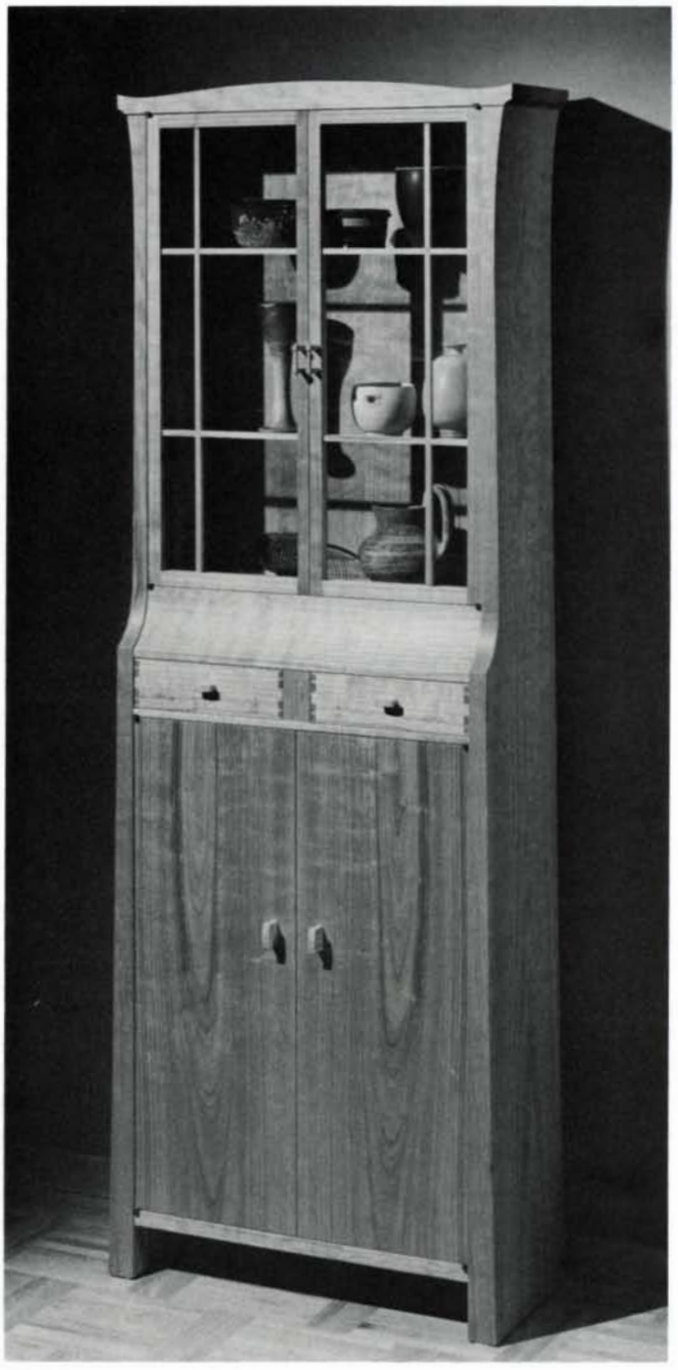
As you open the doors, you have the little drawers inside. The handles may seem too small at first. But remember: you don't want to take your whole hand and go in there and grip something large, because you probably will bump into the top piece of the cabinet. It will disturb you. It seems to me that the natural motion is to come from underneath with one or two fingers and just "pick" out the drawer. Sort of lift it a little bit and draw it out with a finger from underneath. It seems right and it feels good.

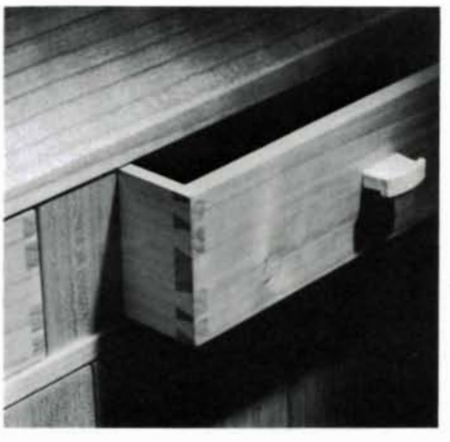
The drawer on the right side is smaller so it can be pulled out with only the right-hand door open. You don't have to open both doors to get at the first drawer. The larger drawer, on the left, is accessible when the cabinet is fully open.

* * *

The students and I talk about wood. There will be the beginning of a piece of furniture not yet glued up—maybe the first idea, pieces of wood yet to be given a final meaning. We play with these, move them this way and that to discover what happens as we shift the colors, lines, textures. What happens if the lighter part of a cabinet side is against the wall, or the dark? How does a shape or proportion change as we move past it in a room? Certain shadings and lines add to the pleasant curve of a convex door; others are equally important to a concave one. Observe the graphics of wood; develop the habit of being aware almost without thinking.

These are some facts of wood. For the most part we deliberately ignore them; truly, wood is an exploited and maltreated material. How else can one explain the piling up of wood into weird or slick forms, the often unbeautiful bending, the smearing on of chemicals to "protect," or prevent from drying, or to give a "deeper color." So much of our contemporary work lacks the essence of wood, as it does the essence of an understanding person. Most of what we get is in the current idiom of wood: the arty sculptural or the intricately engineered. . . .





"Pagoda" cabinet in cherry (about 64-in. high). Upper door handles of hornbeam have color and texture of ivory. Unusual spacing and use of through dovetails on drawers enhance decorative effect.

Water and Wood

The problems of a difficult pair

by R. Bruce Hoadley

What is the relative humidity in your workshop? Or in your garage where you are "seasoning" those carving blocks? Or in the spare room where you store your precious cabinet woods? Or for that matter, in any other room in your house or shop?

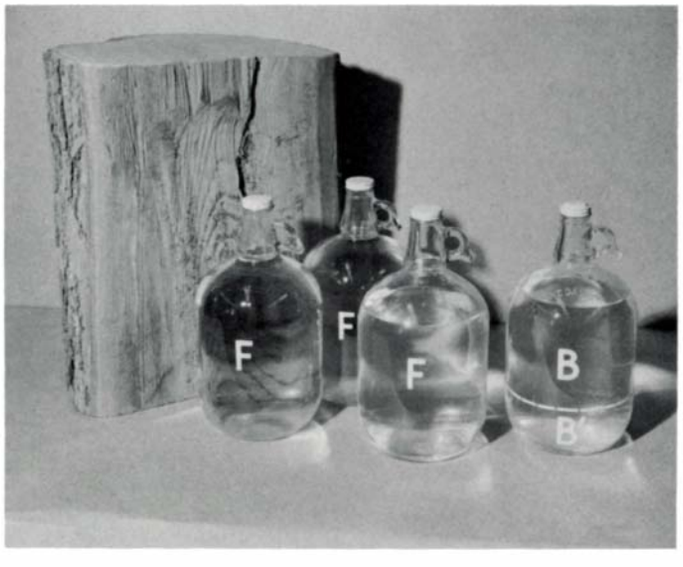
If you're not sure, you may be having problems such as warp, checking, unsuccessful glue joints, or even stain and mold. For just as these problems are closely related to moisture content, so is moisture content a direct response to relative humidity. Water is always present in wood so an understanding of the interrelationships between water and wood is fundamental to fine woodworking. In this article we'll take a look at water or moisture content in wood and its relationship to relative humidity, and also its most important consequence to the woodworker—shrinkage and swelling.

Remember that wood is a cellulosic material consisting of countless cells, each having an outer cell wall surrounding an interior cell cavity (see *Fine Woodworking*, Summer 1976). A good analogy for now is the familiar synthetic sponge commonly used in the kitchen or for washing the car. A sopping wet sponge, just pulled from a pail of water, is analogous to wood in a living tree to the extent that the cell walls are fully saturated and swollen and cell cavities are partially to completely filled with water. If we squeeze the sopping wet sponge, liquid water pours forth. Similarly, the water in wood cell cavities, called free water, can likewise be squeezed out if we place a block of freshly cut pine sapwood in a vise and squeeze it; or we may see water spurt out of green lumber when hit with a hammer. In a tree, the sap is mostly water and for the purposes of wood physics, can be considered simply as water, the dissolved nutrients and minerals being ignored.

Now imagine thoroughly wringing out a wet sponge until no further liquid water is evident. The sponge remains full size, fully flexible and damp to the touch. In wood, the comparable condition is called the fiber saturation point (fsp), wherein, although the cell cavities are emptied of water, the cell walls are fully saturated and therefore fully swollen and in their weakest condition. The water remaining in the cell walls is called bound water. Just as a sponge would have to be left to dry—and shrink and harden—so will the bound water slowly leave a piece of wood if placed in a relatively dry atmosphere. How much bound water is lost (in either the sponge or the board), and therefore how much shrinkage takes place, will depend on the relative humidity of the atmosphere.

A dry sponge can be partially swollen by placing it in a damp location, or quickly saturated and fully swollen by plunging it into a bucket of water. Likewise a piece of dry wood will regain moisture and swell in response to high relative humidity and can indeed be resaturated to its fully

This block of catalpa had a moisture content of 114% and weighed almost 60 pounds when cut. It has been dried to 8% moisture content for carving and now weighs only 30 pounds. The gallon jugs show the actual amount of free water (F) and bound water (B) which were lost in drying. Some bound water, equivalent to B', still remains in the wood.



Average Moisture Content (Percent) of Green Wood

	HEARTWOOD	SAPWOOD
Ash, white	46	44
Beech	55	72
Birch, yellow	74	72
Maple, sugar	65	72
Oak, northern red	80	69
Oak, white	64	78
Walnut, black	90	73
Douglas fir	37	115
Pine, white	62	148
Pine, sugar	98	219
Pine, red	32	134
Redwood	86	210
Spruce, eastern	41	172

swollen condition. Some people erroneously believe that kiln drying is permanent, but lumber so dried will readsorb moisture. There is a certain amount of despair in the sight of rain falling on a pile of lumber stamped "certified kiln dried"!

It is standard practice to refer to water in wood as a certain percent moisture content. The weight of the water is expressed as a percent of the oven dry wood (determined by placing wood in an oven at 212-221°F until all water is driven off and a constant weight is reached). Thus if a plank weighed 115 pounds originally, but reached a dry weight of 100 pounds in an oven this would indicate 15 pounds of water had been present and the original moisture content would have been 15 ÷ 100 or 15%.

The fiber saturation point averages around 30% moisture content (higher in some species, lower in others). Living trees always have moisture content in excess of this level, although the moisture content (MC) may vary widely. Hardwoods commonly have original moisture contents ranging from 50 to 100%. In softwoods there is usually a noticeable difference between sapwood and heartwood; heartwood moisture content being just over the fiber saturation point whereas the sapwood commonly exceeds 100% moisture content—that is, the sapwood may be more than half water by weight.

When wood dries, all the free water is eventually lost as well as some of the bound water, depending on the relative humidity. When the bound water moisture content is in balance with the atmospheric relative humidity, the wood is said to be at its equilibrium moisture content (emc).

When lumber is left out-of-doors in well-stickered piles, protected from soaking rain and direct sun, it eventually becomes "air-dry". In central New England, the relative humidity (RH) averages around 77%, so air dry lumber will have a moisture content of 13 to 14%.

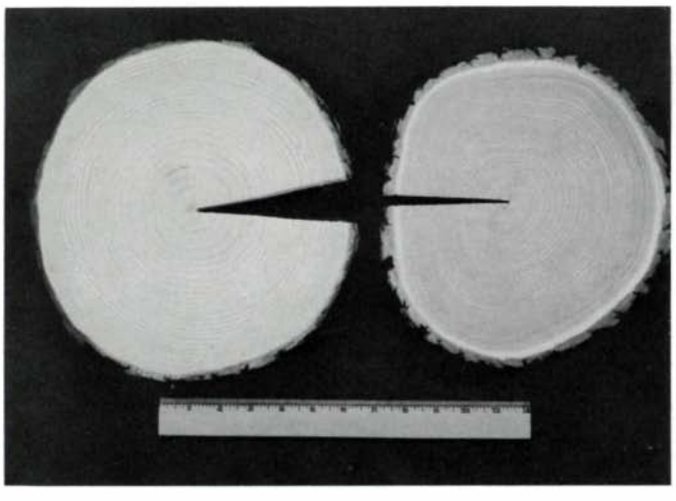
In heated buildings, in coldest winter weather, the relative humidity may drop quite low. The actual moisture content of thin pieces of wood or unprotected wood surfaces may be as low as 2 to 3%, only to return to 10 to 12% in muggy August weather. Therefore, for indoor uses, average moisture content should be attained to begin with. A moisture content of 6 to 8% is usually recommended for furniture manufacture in most northern and central regions of the United States. In the more humid southern and coastal regions the appropriate average equilibrium moisture content might be somewhat higher; in the arid southwest, somewhat lower. The only way commercially to get lumber this dry (that is, below air dry) is to dry it in a kiln; hence "kiln dried" lumber suggests this sufficient degree of drying. The drying can also be accomplished by simply leaving wood exposed indoors until it assumes the proper emc—remembering, of course, that it fluctuates as indoor relative humidity does.

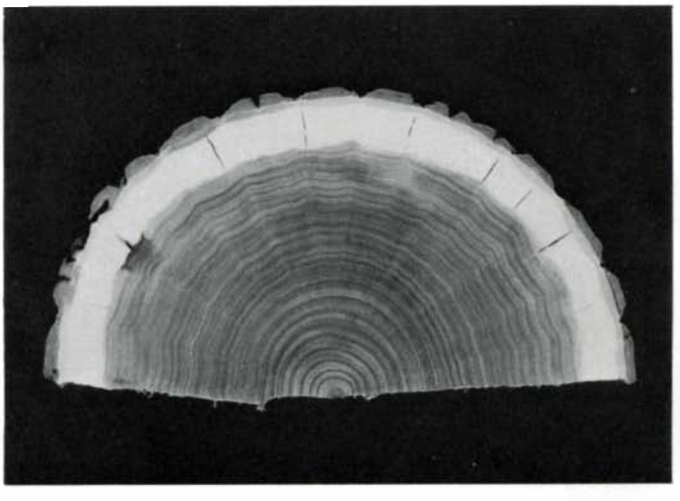
Certain common terms which have been associated with drying are unfortunately misleading. "Curing" lumber suggests the involvement of some chemical reaction as in the

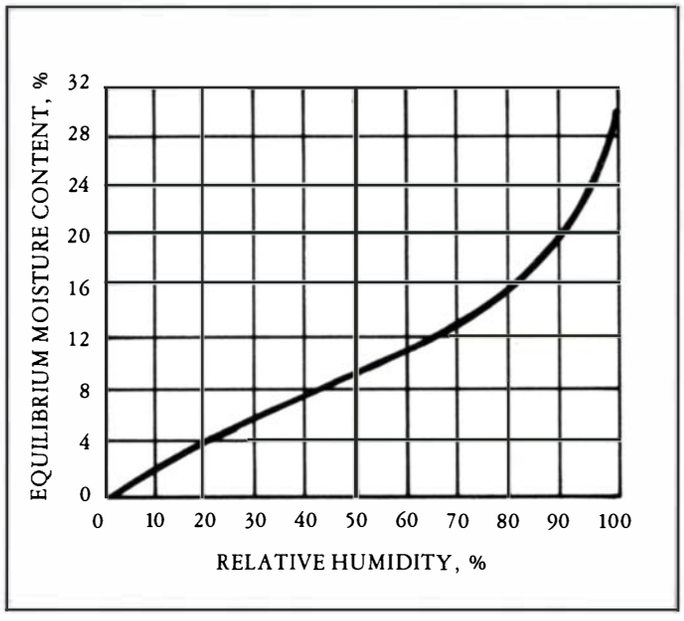
Approximate Shrinkage
(as percent of green dimension)
from green to oven-dry moisture content

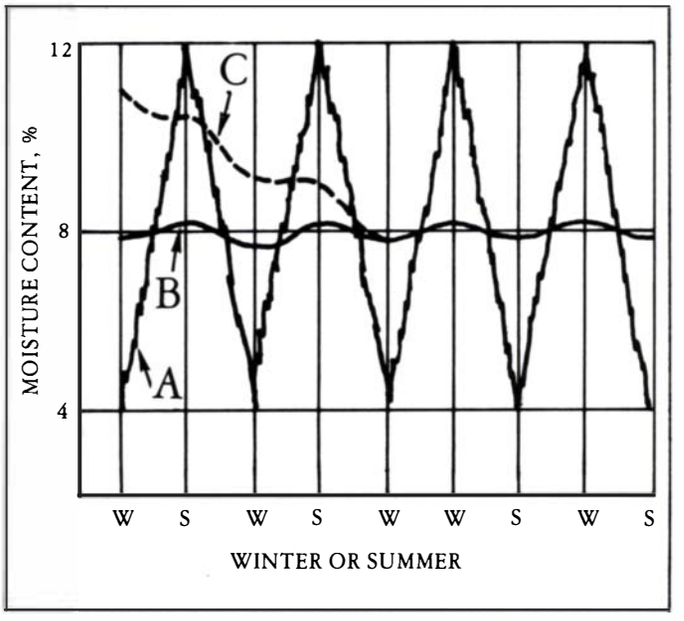
	TANGENTIAL	RADIAL	T/R
HARDWOODS			
Ash, white	7.8	4.9	1.6
Basswood	9.3	6.6	1.4
Beech, American	11.9	5.5	2.2
Birch, yellow	9.5	7.3	1.3
Butternut	6.4	3.4	1.9
Catalpa	4.9	2.5	2.0
Cherry, black	7.1	3.7	1.9
Hickory	11.5	7.2	1.6
Maple, sugar	9.9	4.8	2.0
Oak, northern red	8.6	4.0	2.2
Oak, white	10.5	5.6	1.9
Sycamore	8.4	5.0	1.7
Walnut, black	7.8	5.5	1.4
Mahogany	5.1	3.7	1.4
Teak	4.0	2.2	1.8
SOFTWOODS			
Cedar, northern white	4.9	2.2	2.2
Douglas fir	7.6	4.8	1.6
Hemlock, eastern	6.8	3.0	2.3
Pine, eastern white	6.0	2.3	2.6
Pine, sugar	5.6	2.9	1.9
Pine, red	7.2	3.8	1.9
Redwood	4.4	2.6	1.7
Spruce, red	7.8	3.8	2.1

Cross sectional discs of red pine (left) and catalpa (right) after drying to 6% moisture content. Radial slits were sawn into green discs; width of cracks indicates the relative instability of the two species. At right, the seasoning checks in a butternut half-log illustrates that shrinkage is sometimes greater in sapwood than in heartwood.









Curve at left shows the approximate relationship between relative humidity and equilibrium moisture content for most woods. At right, the curves show the seasonal indoor variation of moisture content in wood. A is unfinished thin veneers or wood surfaces, B is furniture of kiln-dried lumber and well coated with finish, and C is furniture of air-dried lumber and well coated with finish.

CALCULATING WOOD SHRINKAGE OR SWELLING

The approximate dimensional change expected in a piece of wood can be estimated by application of the following formula:

$$\Delta D = D_o \times S \times \Delta MC \div fsp$$

where ΔD = Change in dimension
D_o = Original dimension
S = Shrinkage percentage (from tables)
ΔMC = Change in moisture content
fsp = Average value for fiber saturation point, approximately 30%

Example: How much will a 14-inch wide, unfinished colonial door panel attempt to "move" (shrink and swell) if made from flat-sawed Eastern white pine?

Solution: Original dimension (width), D_o is 14 inches.
S (from tables) is 6.0% = 6/100 = 0.06
Assuming the humidity may fluctuate such that moisture content will vary from 4% in winter to 12% in summer, then ΔMC = 8%.

$$\Delta D = (14 \text{ inches})(0.06)(8\% \div 30\%) = 0.224 \text{ inches}$$

The door panel will thus attempt to change width by nearly a quarter-inch during seasonal humidity changes. Loose framing to allow the panel to move, or finishing with a moisture-impervious finish are therefore recommended.

The formula clearly suggests ways of reducing the consequences of shrinkage and swelling. For example, reducing the dimensions (D_o) of the members: Narrow flooring will surely develop smaller cracks between boards than wide flooring. Choosing a species with a small shrinkage percent (S) can obviously help; e.g. catalpa is obviously more stable than hickory. Reducing the moisture variation is best accomplished by starting with wood of the correct moisture content and giving the completed item a coat of moisture-impervious finish.

setting of resin, or the curing of hides or meat. To some persons, the term "seasoning" suggests the addition of an appropriate chemical or some special aging process to others; it probably originated in connection with certain seasons of the year when natural drying was optimum for efficiency and quality of drying. But in reality, the drying of lumber is basically a water removal operation that must be regulated to control the shrinkage stresses that occur.

The claim that lumber is kiln dried can probably assure only that the lumber has been in and out of a kiln; it does not assure that the lumber has been dried properly (to avoid stresses), that is has been dried to the desired moisture content, or that subsequent moisture regain has not taken place. On the other hand, lumber which has been kiln dried *properly* is unsurpassed for woodworking.

The woodworker's success in dealing with moisture problems depends on being able to measure or monitor either the moisture in the wood directly, or the relative humidity of the atmosphere, or both. Direct measurement of moisture content is traditionally done by placing a sample of known initial weight into an oven (212-221°F) until constant weight is reached (usually about 24 hours for 1-inch cross-sectional wafer). Reweighing to obtain oven-dry weight enables determination of moisture loss and calculation of moisture content (moisture loss ÷ oven-dry weight). By so determining the moisture content of wafers taken from the ends of a sample board, the board moisture content can be closely approximated. Simply monitoring the sample board weight in the future will then indicate changes in moisture content.

An interesting application of this idea is to suspend a wood sample of known (or approximated) moisture content from one end of a rod, horizontally suspended on a string at its balance point. As the wood looses or gains moisture, the inclination of the rod will give a constant picture of changing moisture content. Such an improvisation can be calibrated (by adding known weights) to make a "moisture meter". Of course, there are also commercially made moisture meters,

which are surprisingly accurate and simple to operate and will take the guesswork out of measuring moisture content.

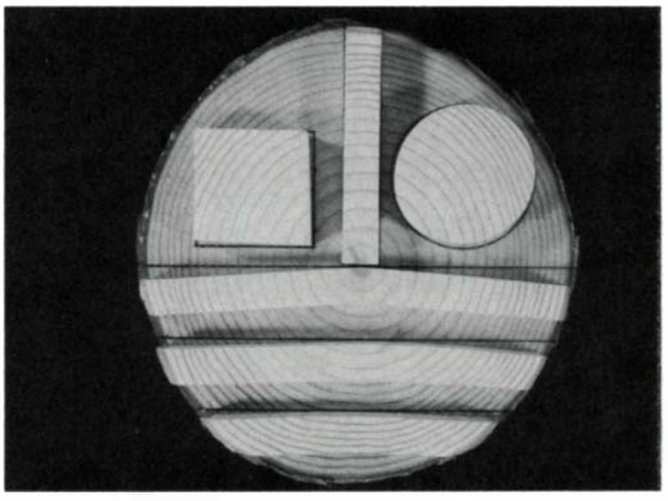
Measuring and controlling relative humidity in the shop can be equally important. Simple and inexpensive wet and dry bulb hygrometers give accurate readings. Common sense will indicate where humidifiers or dehumidifiers (or some improvised means) are necessary to control humidity. One summer I suspected the humidity in my cellar workshop was high. I distributed 1/8-inch thick spruce wafers around and after several days determined their moisture content by the oven-dry technique. To my horror it was up to 21%! I immediately installed a dehumidifier and within a few weeks the emc was lowered to about 9%.

For the woodworker, then it is important either to obtain lumber of proper dryness or to be able to dry it properly (a subject we must leave to the next issue). Further, once having dried wood to the proper moisture content and built something out of it, some consideration must be given to future moisture exchange with the atmosphere. To some extent, design should allow for lumber movement, but usually the principal measure should be that of sealing the finished piece to *prevent* exchange of moisture and avoid the highs and lows of seasonal humidity fluctuation by holding close to the original average. Somehow the notion has prevailed that "wood has to breathe". Unfortunately, the term "breathe" suggests something positive or even necessary for the well being of the wood, but in reality, depriving wood of its tendency to adsorb and desorb moisture in response to humidity fluctuation is the best course of action.

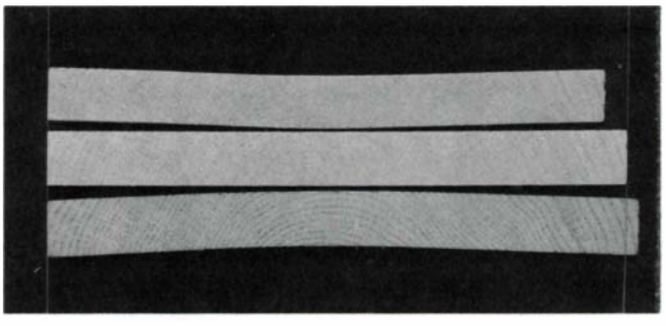
Finishing materials vary widely in their ability to seal off wood surfaces and prevent moisture exchange with the atmosphere. Among the least effective is linseed oil. So-called penetrating oil finishes vary from low to moderate in moisture excluding capability depending on resin content and, as with linseed oil, give improved results when many coats are applied. Shellac is also relatively permeable to moisture. Lacquers are even better, but modern varnishes, such as the urea alkyd or urethane types, offer the best clear-finish protection against moisture adsorption. For end sealing lumber during drying or storage, aluminum paint or paraffin provide the ultimate in moisture barriers, as do commercial end sealing compounds.

Moisture extremes—either too high or too low—sometimes give rise to problems in chemical bonding of adhesives and finishes or high moisture (above 20%) may invite mold, stain or decay. But clearly the most common trouble-maker is the dimensional change—shrinkage and swelling—which accompanies moisture variation over the range below fiber saturation point.

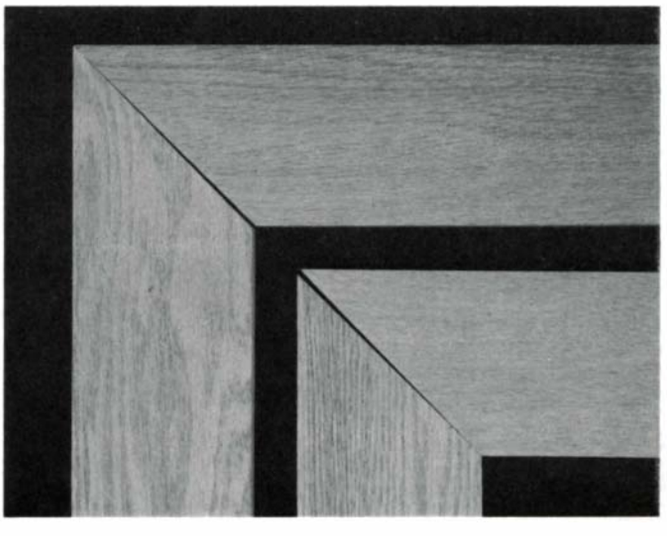
As we begin to unravel the subject of shrinkage, three considerations should be taken into stride: *when* (over what moisture content range), *where* (in what direction relative to cell structure) and *how much* (quantitively in terms of actual dimensions). In the first consideration, as with a sponge, wood shrinks (or swells) as bound water escapes (or is picked up) in seeking its balance with the atmosphere. So only moisture change below fiber saturation point (about 30% MC) results in dimensional change, which is directly proportional to the amount of moisture lost. In considering *where* and *how much*, we must leave our sponge analogy, because a sponge has similar structure and properties in all directions; wood on the other hand, has oriented structure related to the "grain



Various shapes of red pine are shown, after drying, superimposed over their original positions on an adjacent log section. The greater tangential than radial shrinkage causes squares to become diamond shaped, cylinders to become oval. Quarter sawn boards seldom warp but flat-sawn boards cup away from the pith. Camera perspective does not show full extent of shrinkage that occurred.



These three strips of wood were cut in sequence from the end of an air-dry red oak board. As shown by the middle strip, it measured 9-1/2-inch wide at a moisture content of 14 percent. The top strip has been dried to below 4 percent moisture content, the lower strip has been allowed to readsorb to over 20 percent moisture content and thus warps in an opposite direction.



These two red oak frame corners were tightly mitered when originally assembled. The upper one was dried, the lower one dampened. Since wood is stable along the grain, but shrinks and swells across the grain, joints open as shown.

direction'' (predominant longitudinal cells) and to the growth rings. Longitudinal shrinkage (i.e., along the grain) is drastically different from shrinkage across the grain; shrinkage across the grain in turn is variable from the radial direction (perpendicular to growth rings) to tangential (parallel to growth rings).

Shrinkage in wood is commonly expressed as a percentage loss in dimension due to loss of bound water, that is, in drying from the fiber saturation point to the oven dry condition. Parallel to the grain, shrinkage is only about 1/10 of one percent, and in most cases can be neglected. However, in juvenile wood (near the pith) or in reaction wood (in limbs and leaning stems) longitudinal shrinkage may be up to ten times the normal amount, and variable—resulting in extreme warp.

The greatest concern is transverse (across-the grain) shrinkage, which averages about 4% radially and 8% tangentially. However, there is considerable variation among species, ranging from 2% to about 12% (see chart).

These values indicate the degree to which some species are apparently ''more stable'' than others. However, the greatest cause of trouble arises from the difference between radial and tangential shrinkage. As a result, cylinders of wood may become oval, squares may become diamond shaped, and flat sawn boards cup. This shrinkage difference also accounts for wood containing the pith cracking open, as anyone who has tried to dry cross-sectional discs of wood well knows. For it is impossible for wood to shrink more *around* the growth rings than *across* them without the development of stress. We also realize why edge-grain (quarter sawn) boards remain flat and shrink less across the width and are therefore preferable for many uses such as flooring.

Shrinkage in wood tissue results when water molecules leave the microstructure of the cell walls and the cellulosic structure is drawn more closely together. As sapwood transforms into heartwood, molecules of extractives (which usually give heartwood its darker color) may occupy this space and thus reduce total shrinkage. For this reason, woods with high extractive content may tend to be more stable (e.g. redwood, mahogany). At the same time, in a particular piece of wood there may be a troublesome difference between shrinkage of heartwood and sapwood, resulting in noticeable difference in shrinkage or even checking of sapwood.

The woodworker has several options and approaches, which can be applied singly or in combination, for dealing with the instability of wood. First, the wood can be preshrunk, i.e., properly dried to optimum moisture content. And secondly, the subsequent dimensional response to the atmosphere can be reduced or virtually eliminated by proper finishing. Third, sensible design can allow for dimensional change to occur without consequence; the classic example being the traditional feather-edge paneling allowed to move freely within each frame. Fourth, shrinkage and swelling can be overpowered or restrained, as the veneers making up a plywood sheet mutually do, or as the battens on a cabinet door will do. Fifth, chemical treatments may stabilize wood, although this approach is probably least convenient.

Controlling moisture content—and therefore dimensional change—involves an awareness of relative humidity and also the dimensional properties of wood. Understanding and mastering wood/moisture relationships should be looked upon as an integral part of woodworking expertise.

Hidden Beds

Two ways to get more sleeping space

by David Landen

Beds for which there is little space or which are used only occasionally pose interesting problems for a furnituremaker. They should not only be comfortable to sleep on and take up a minimum of space when not in use, but also should work reasonably well as another piece of furniture. Of the two pieces discussed in this article, the couch works better as another piece of furniture while the settle, with its full-sized mattress already made up, is the most useful as a bed.

Neither one is a particularly original design (couches with sliding seats probably originated in Denmark or Sweden, and settles have been around for a long time), but each had to be worked out to fit a client's specifications. The couch was made of red oak and the settle of cherry. Almost any strong hardwood will work for the couch and the settle could be made from almost anything, including plywood for the carcase. Cherry was used because of the client's preference and because eight-foot sections of clear stock in reasonable widths are still available.

The Couch. Overall dimensions are not critical. It must be long enough for someone to lie on, and the seat deep and high enough to be comfortable. The depth of the seat determines to some extent the width of the slide-out bed. In this couch, the extended width is something over 40 inches, which is wide enough for two people to sleep on occasionally. Aligning the slats in the back of the couch with the stationary slats in the seat would have made it possible to extend the sliding slats through the back and thus gain several inches of bed width. But this wasn't done because it would have kept the couch out too far from the wall or would have made it unsightly when positioned with the back exposed.

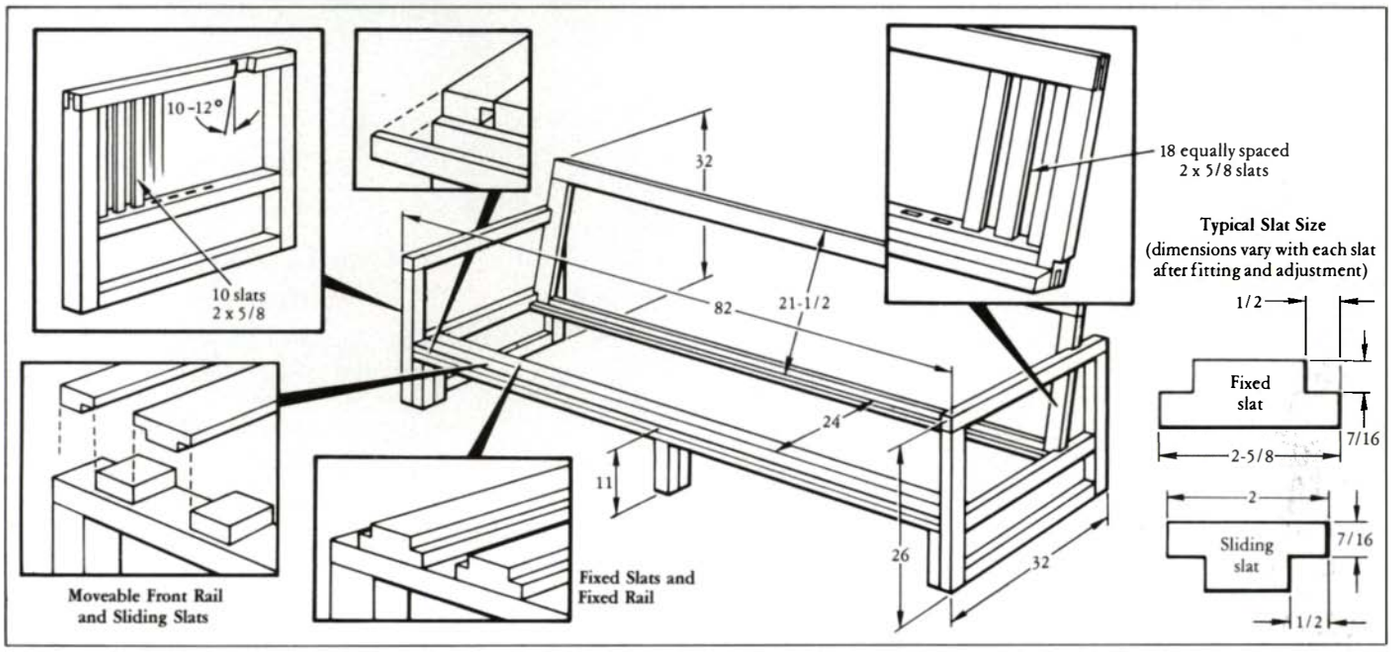
Construction of the couch is relatively straightforward once the basic dimensions are determined and a layout sheet drawn up. I used 8/4 stock for the frame. The two end pieces and the back are joined with open mortise and tenon joints. The end cross pieces and the slats are mortised into the frame. A dado about 1/2-inch deep cut into the inside of the top piece of the end frame at the appropriate angle for the slant of the back and a rabbet the same depth and corresponding angle at the bottom end of the vertical piece on the back hold the back and ends together. The front rail rests on two legs glued to the end pieces. A third leg is added in the center.

Slats milled from 4/4 stock, with a rabbet cut on each side, cut square on the front end and beveled to match the angle of the back on the back end, are spaced evenly and screwed and glued to the top side of the front rail and to a cleat fastened to the bottom piece of the back. The sliding part of the seat consists of three legs supporting a front rail into which has been cut a series of dadoes to hold the sliding slats which are

Author used mostly 8/4 stock for the couch because it was readily available. Drawing below gives general dimensions and an idea of how it was put together. Owners use a foam-rubber mattress for sleeping rather than the cushions shown.

first fastened with screws to allow for adjusting the fit, and later marked and glued. These slats can be left a little short of the edge of the front rail and a facing strip attached later to cover the end grain and the gap left by the rabbets.

Because the large number of pieces compounds any tendency to bind, about 1/4-inch of play per slat was initially allowed, and the rough spots later cleaned up. I briefly considered tongue and groove slats for the sliding mechanism. They are probably esthetically superior, but less likely to



maintain a flat surface for the seat, difficult to fit and nearly impossible to keep working smoothly.

The Settle. Dimensions were determined from the size of the mattress and the room into which the piece has to fit. The mattress should be measured for length, width, thickness, and the amount of compression which results when one sits on the edge. After some allowance has been made for bedding, these measurements are used to lay out the box which holds the mattress. The sides of the box were cut from 6/4 stock and dovetailed together. Dovetails are somewhat awkward to cut on long pieces, but, if done accurately, they prevent winding and make assembly much easier.

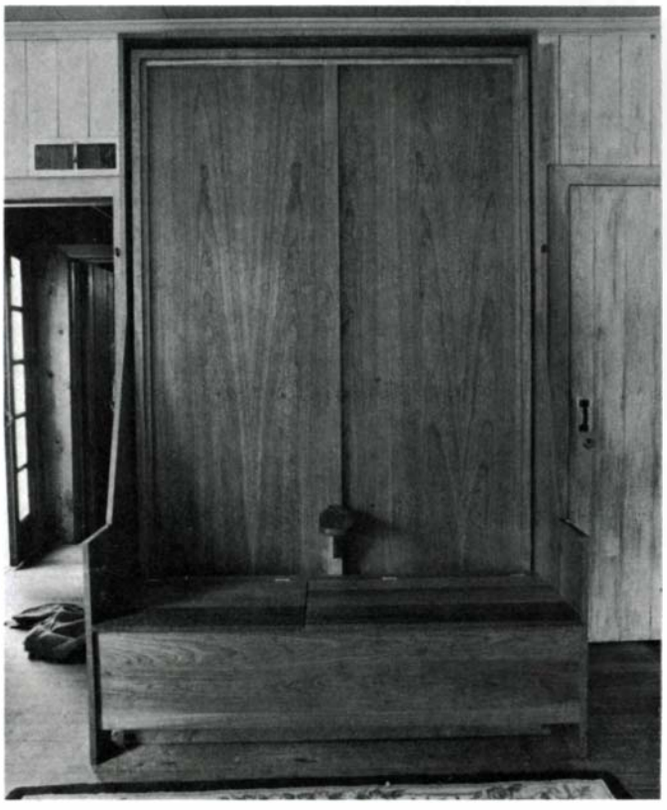
To support the mattress, strips about 1-1/4 x 1 inch were glued to the inside of the box on all four sides. A center strip, with 1/2-inch rabbets on each side and 1/2-inch thicker than the side strips are wide (so the top of the strip will be flush with the plywood bottom set into the rabbets), was set into dadoes cut into the strips around the inside edge. The strips supporting the plywood bottom should all stop about an inch short of the bottom of the box in the same plane so a support for the center arm can be added later and so the foot can support the entire bottom of the bed, not just the two sides.

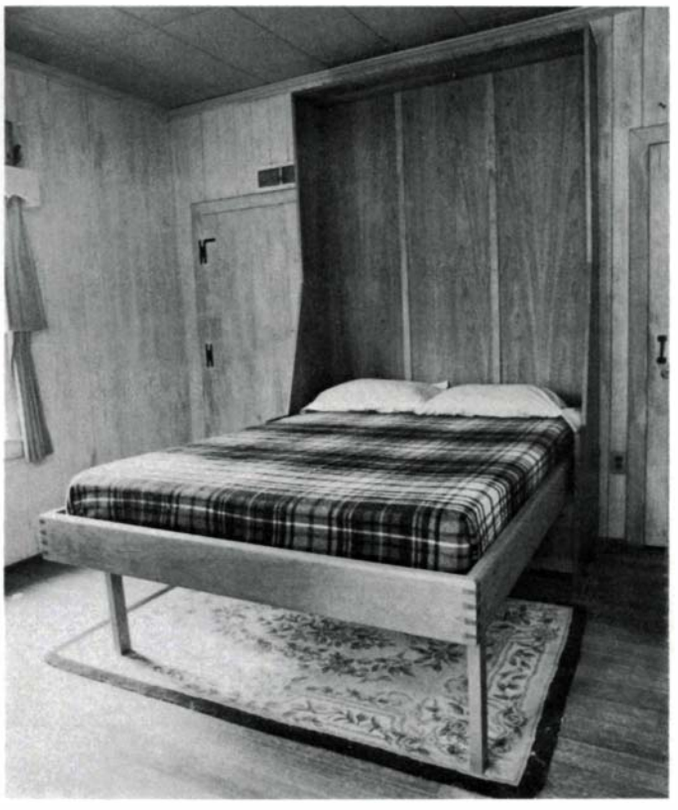
Because they form the back of the settle when the bed is raised, the two pieces of plywood are placed good face down in the box. They should be selected for color and figure match with the wood in the settle and the plywood for the back of the carcase. One-half inch plywood is probably the thinnest one can use for the bottom. Three-quarter inch would be more secure, but it makes the bed rather heavy to lift up and down, particularly if the mattress is anything other than a light foam rubber.

Once the box is complete, the layout for the rest of the piece can be drawn up. The width of the bed plus an inch or so clearance becomes the inside dimension of the carcase. Both the height and the depth of the carcase are determined by the location of the pivot point. Perhaps the easiest method for working out this detail is to make a cardboard cutout the same size and shape as the side of the bed with the mattress in place and to use a pin as an easily movable pivot. Assuming one centers the pivot in the side of the bed, trial and error shows that as the pivot moves toward the foot of the bed, the carcase becomes deeper and shorter, and that, if the bottom of the bed rests on the seat, the distance the center of the pivot is above the seat has to equal the distance the pivot is behind the seat. The seating height, plus one-half the width of the bed side, plus the distance from the pivot point center to the top corner of the bed or the top corner of the mattress, whichever is greater, becomes the minimum inside height of the carcase. The seating depth, plus one-half the width of the bed side plus the distance from the pivot center to the top corner of the head of the bed or the top corner of the mattress becomes the minimum inside depth of the carcase interior. The overall dimension of the carcase should be checked against the dimensions of the room into which the settle is to go to make sure it will fit through the doorway and can be tipped upright once inside.

When the layout has been drawn up from these dimensions, the carcase sides are glued up from 4/4 stock, the profile cut, and the top and sides dovetailed. Again, the dovetails are hard to cut, but well worth the trouble saved during assembly. The seat, which gets put together at this time, is simply a box with a hinged lid. The front and back of the box are set into slots cut in the carcase sides and reinforced with glue blocks and screws, and the bottom set into rabbets cut in the front and back of the box and supported on the ends by cleats attached to the carcase with screws in slotted holes. The front of the box should be set back one-half to three-quarters of an inch from the front edge of the carcase to

General dimensions and some details of settle are shown in drawing opposite. Those wishing to make their own should first design around the mattress they get and the room it will be in. In photos, removable legs can barely be seen stored under the closed settle.





allow for overhang of the hinged seat lid. Attached to the top of the back piece of the box is a piece of 8/4 stock with a rabbet the thickness of the seat lid cut in the top front. This piece will support the seat when the hinges begin to sag, which they will inevitably do.

After the carcase has been assembled and the seat fixed in place, rabbets can be cut to receive the carcase back. In this case, three pieces of 1/2-inch plywood were used, each being separated by a strip similar to the one used down the center of the bottom of the bed. Three pieces help break up the space and also yield better cuts from 4 x 8 sheets. The dividing strips are fastened into the rabbet at the top of the carcase and into a rabbet cut in a cross piece installed near the bottom of the back of the carcase.

Once the carcase has been squared up with the back, it should be carefully leveled in every direction, using shims, clamps, props, or whatever is necessary, because pieces this size tend to shift alignment whenever they are moved or rest on an uneven surface, even though every effort is made to avoid winding and lopsidedness during assembly. After leveling, the seat lid can be mounted on the hinges. Remember to keep them far enough away from the sides of the carcase to avoid being hit by the descending bed. The seat is cut into two pieces three or four inches off center so that the box can be gotten into without removing the center arm rest.

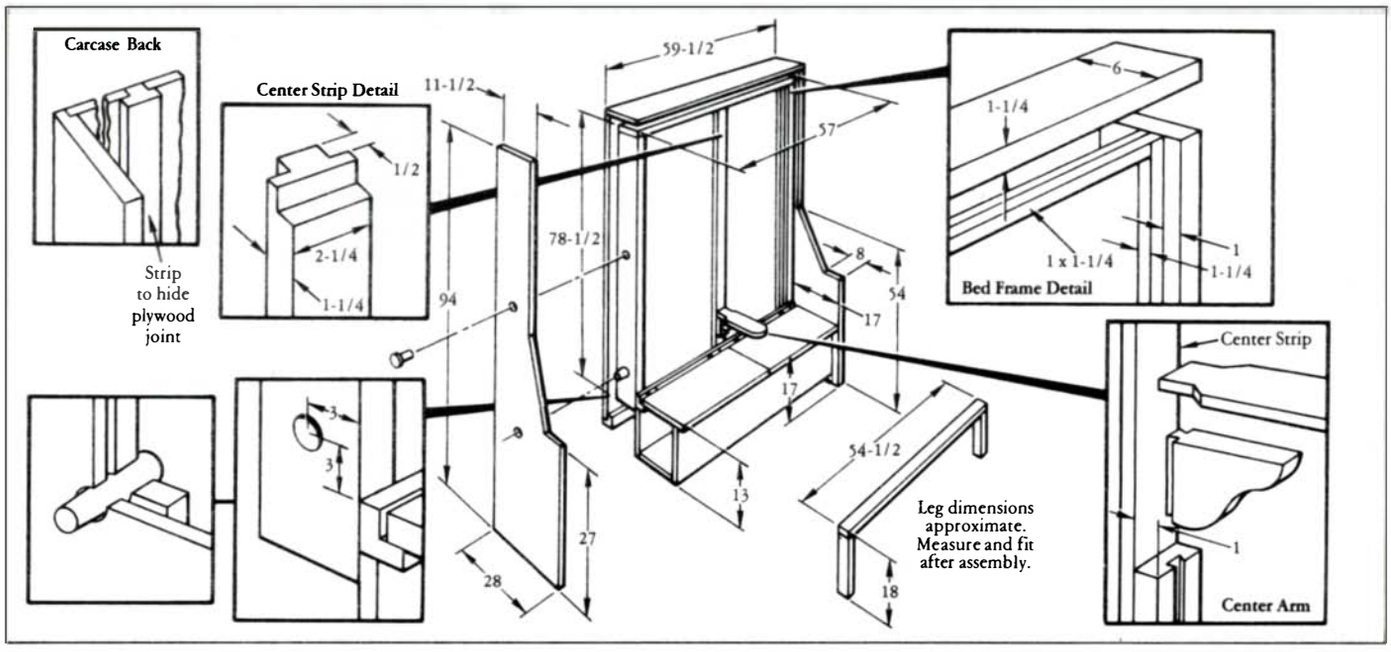
While the carcase is still level and the seat lids are in place, the bed can be tried in the open position to check for alignment of the pivot points. If these have been carefully laid out on both the carcase and the bed, 1/16-inch holes drilled through the carcase and partway into the bed should line up when a piece of stiff wire is stuck through the carcase hole. With the bed resting squarely on the seat, there shouldn't be much trouble in readjusting the pivot point one way or another to allow the bed to close squarely. Once the alignment is as close as possible, holes about 2 inches in diameter can be drilled through the carcase and through the sides of the bed. Pins about eight inches long were turned with a slight taper so they could be driven tightly into the inside of the bed frame and still turn freely in the same sized hole in the carcase. The pivot pins can be fastened with wedges or some other device, but whatever is used should permit easy disassembly since the carcase is heavy to move around even without the bed. With the bed raised and clamped in the closed position, two more holes drilled through the carcase and partway into the bed frame about five feet above the floor and fitted with turned pins will hold the bed in place when it is not being used.

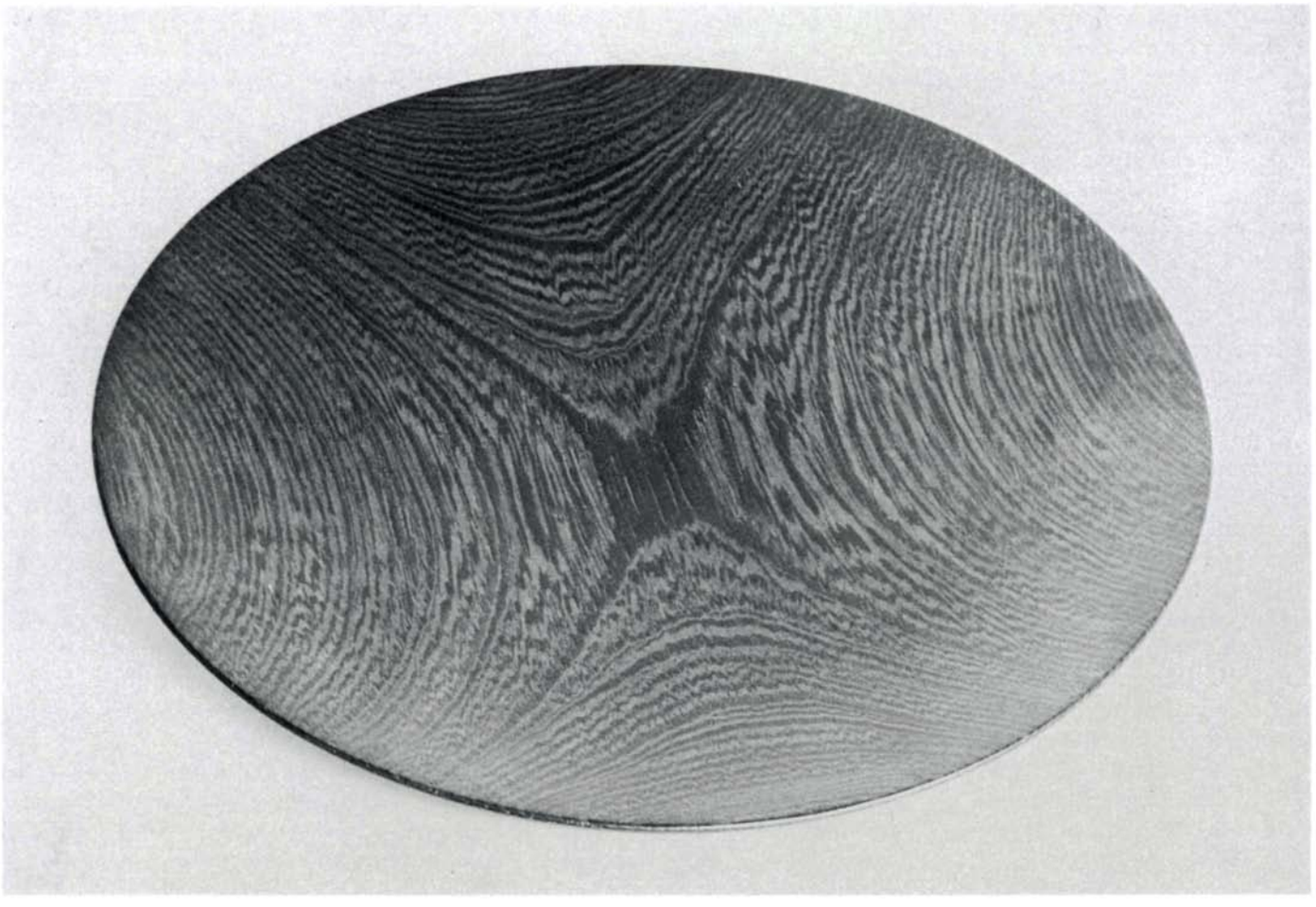
The center arm rest is mounted onto the center strip of the bottom of the bed. A slot dovetail was cut into a piece of stock the same width as the center strip and the same thickness as the distance between the strip and the bottom of the bed frame (it rests on the seat and helps support the bottom of the bed). A corresponding pin on the edge of a board supporting the arm fits into the dovetail slot snugly and permits the arm to rest squarely on the slotted piece and tightly against the center strip. The pinned piece can be removed easily to let the bed come down.

The legs to support the foot of the bed are joined together with a crosspiece using open mortise and tenon joints. The leg assembly is a separate, detached piece, trimmed for a friction fit inside the bed frame against the strips holding the plywood bottom. The cross piece at the top supports the plywood bottom in the center where it is the weakest, and it does this especially well if the legs are positioned 12 to 16 inches from the end of the bed when it is let down. The legs are stored under the seat when not in use.

The seats in both the settle and the couch are completely horizontal rather than sloped slightly toward the back. In the couch, cushions help alleviate this comfort problem somewhat. But in the settle, the problem is compounded by the back not being slanted either. Cushions on the seat or on the back might help. The deeper than usual seat helps some as does the tendency to sit in the corners.

The variations possible with either of these designs are almost unlimited. With the couch, any sort of end piece and back design is possible, and the slats for the seat could be replaced with two pieces of plywood, or possibly three to make the seat slide out to full double-bed size. With the settle, changes in the profile of the sides, edge treatment, facing strips and so on can change its appearance considerably. One could even eliminate the carcase and mount the bed in a hole cut in a wall.





Wenge, Africa
dark brown and black
11-in., $35

Exotic Woods

Observations of a master turner

by Bob Stocksdale

[*Editor's note:* Early this summer, veteran woodturner Bob Stocksdale had an exhibit of some 120 bowls at Richard Kagan's gallery in Philadelphia. We were so taken by his extensive use of exotic woods that we asked him to tell us a little about some of those woods, as well as how he works. The bowls speak for themselves.]

I have three lathes—two Delta 12-inchers and a homemade big one that is built of steel I-beams and swings 31 inches inside the headstock. One of the Deltas has the headstock blocked up 3 inches so I can turn up to an 18-inch diameter inside. I do 90 percent of my turning on it as I have an exhaust fan just back of it to solve the dust problem. All three lathes have jackshafts for better speed selection. They also have reversing switches to aid in sanding.

Almost all of the decorative bowls, trays and smaller salad bowls are started on a single center screw or 6-inch faceplate. I use several different methods to do the inside job, sometimes even the single center screw, but more usually, for footed bowls, the three-jaw geared chuck. Trays usually have a block glued on the bottom, with newsprint between for easy removal.

I do most of my turning with two gouges, 1-inch and 1/2-inch standard tools of the kind also used for spindle work. The corners are ground back a long way so the tip is really a half-oval shape. I use a shearing cut. I never use the deep, long-and-strong style of gouge, because I don't need all that metal, and there's very little strain on the tool. In fact, I'd like to get some gouges made of steel that is only 1/8-inch thick, the ones I have are about 3/16.

Many, perhaps most of the deeper bowls have been roughed out first, dried in a heated room for about a month, then finished. The room is about 90 degrees, and I usually put a bowl on the floor for a week and then move it up onto the shelves for three weeks and it's dry. I have very little cracking and checking. When cracking does occur, I rough-sand the bowl and then repair it with a mixture of liquid epoxy and sawdust, as much sawdust as the epoxy will take. It sets overnight and you can turn right through it.

Stocksdale

When the bowl is dry and back on the lathe, I finish the turning inside and out and then sand. I use a rubber disc sander on the outside with the lathe at its slowest speed, around 500 or 600 rpm. I start with 16-grit and move up through 36, 50, 100, 150 and 220. I go to a finer grit on some very hard woods, and occasionally use intermediate grits. The insides are sanded with the same grit sequence, after a final shearing cut with the small gouge from the rim as far as possible toward the bottom, a very light cut of 1/16-inch or less. This leaves the wood smooth. That disc sander is a real time-saver. On a large bowl, I sometimes use it with the lathe stationary to take all the tool marks off the inside.

Sometimes I oil bowls; some woods, like boxwood are better with no finish at all. But most of the decorative bowls have three coats of DuPont bar-top nitrocellulose lacquer, two coats of gloss, and after a little sanding, a flat satin coat.

I have a one-man shop and expect to keep it that way. I average about five bowls a day, fewer with difficult woods, up to 12 in walnut. It depends on the wood. My efficiency drops to about 50 percent when someone else is in the shop. I work a 35-hour week, 10 months a year.

I have about 20 tons of wood on hand to select from so I seldom make more than one or two of any particular wood at one time. I have many sources of supply. A lot of the exotic woods I get in log form from suppliers in London. I get teak from a source in Bangkok. When I get a new wood, I rough out a bowl and sit it on the bench and watch it. If it cracks, I put it in a plastic bag to slow it down for a few days then take it out again. I get to know what it will do by leaving it on the bench as long as I need to. I'm in no big rush to finish a bowl.

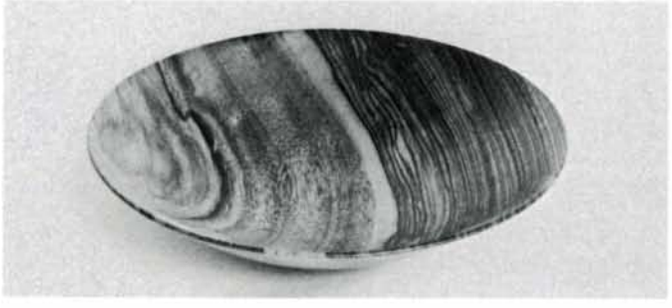
Canafistoula, Brazil, pinkish brown, 14-in. dia., $35

Canafistoula—I purchased several boards of this wood at White Bros. in Oakland. Unfortunately the boards were only 1 inch thick. It makes nice trays but I think it would look nice in a bowl too.

Wenge—This wood (photo opposite page) is fairly common in Europe. I know of two hotels that used it in their lobbies. Very little comes to this country. I got this from Penberthy. Rather hard to turn as the very coarse grain tears easily. The unusual grain pattern is so nice in some pieces that I do not use any finish as it would tend to kill the contrast.

Olivewood, Italy, cream and brown, 7-1/2-in., $50

Olivewood—Another log from a dealer in London. Mediterranean olive is far superior to California olive for grain and workability. I enjoy the odor of the wood as I work it and it turns and sands very easily. The log is badly cracked but large enough to get some final bowls anyhow.



Paldoa, Philippines, brown and black, 8-in., $40

Paldoa—One of the more beautiful woods to come from the Philippines. It is a little harder than walnut but in sanding it gets unusually smooth and silky to the touch. It must have silica in it.

Shedua, Africa, olive green, 15-1/2-in., $50

Shedua—I got this wood from Penberthy and have had pieces much larger. The plank was 16 inches wide and 16 feet long. I have had some 30 inches wide and 24 feet long. It is harder than walnut and tends to tear a bit, but is very stable so I have no warping problem on large trays. It makes a good furniture wood and is readily available here.

Para Kingwood, Brazil, purple, 6-in., $85

Para Kingwood—A friend found this wood in London for me and I think it the most beautiful wood I have worked. I promptly ordered the rest of the supply—five logs about eight feet long. Forest Products Lab says it is no different from regular kingwood but the grain and color are far superior. Being in the rosewood family, it turns beautifully and is so easy to finish.

Cortezwood, Guatemala, olive green, 7-in., $50

Cortezwood—This is the hardest wood I have come across, with the possible exception of African blackwood. I feel sure it would turn the edge of any carbon steel gouge. It is sometimes sold to novices as lignum. It is sometimes called "bastard lignum vitae". It is easy to sand but hard to turn smooth as it tends to chip and tear.

Desert Ironwood, Arizona, red-black, 6-1/2-in., $60

Desert Ironwood—Some hippies got me almost a ton of this wood from the Arizona desert. There are great quantities of scraps and trimmings because the logs are so irregular and full of flaws. These have been dead for years and many cracks are full of sand, so it is not a wood to make a big profit on. It is almost as hard as lignum but sands well as it is not stringy or oily.

Pernambuco, Brazil, red, 9-in., $100

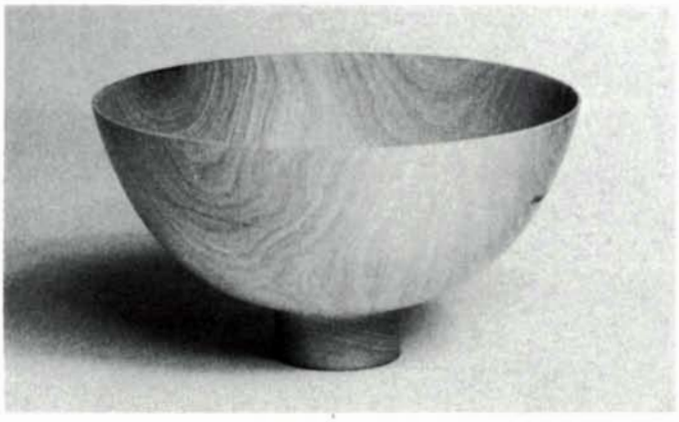
Pernambuco—I got the wood for this piece from a log purchased in London. It is the wood used for violin bows and the shavings make a brilliant red dye for wool. I spend extra time collecting the shavings and sell them for $3.00 a pound. It is not an easy wood to work because it takes care to get all the sanding marks out.

Black Yokewood, Africa, brown, 6-in., $40

Black Yokewood—This is from another huge log that I bought on speculation in London. The dealer said it was quite similar to African blackwood but he does not know his woods very well. Forest Products Lab says it is related to shedua, which is available at several dealers here. I am fascinated by the black line between the sap and heartwood. I am afraid this is another one that will darken quickly. This was the first bowl off the log so I don't know.

Padauk, Africa, red, 8-1/2-in., $40

Padauk—Padauk is another dye wood but I do not work it very much because of the rapid change of color that most pieces go through. I bought several pieces in London but this one came from a wood collector in Louisiana. Easy to work, but like rosewood it should not be oiled as oiling hastens the darkening.



Boxwood, Cambodia, white, 6-in., $40

Boxwood—Penberthy Lumber Co. supplies me with boxwood. It is one of the nicest woods to work because it cuts so cleanly and has a sheen from the tools before it is sanded. It reminds me of an eggshell and I have not found a finish for it that doesn't kill the beauty of the wood so I leave it bare, knowing that people with oily hands and peanuts will leave marks on it.

Silkwood, Australia, light brown, 11-1/2-in., $100

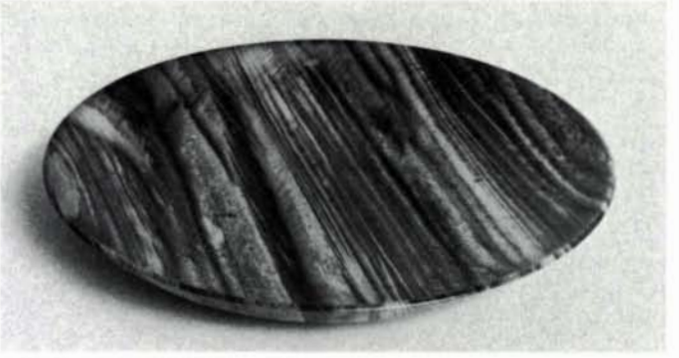
Silkwood—A wood collector in Australia sent me this piece of wood. It is the most lustrous wood I have had. It is in the maple family but is not very common. This piece is from near the stump. It works nicely but the highly figured area does not cut smoothly so my gouges have to be sharpened several times.

Canalete, Venezuela, brown, 8-1/2-in., $45

Canalete—This is a very oily wood of the cordia family and is quite common in Mexico. It goes by many different names. For some reason it is very hard to get. I got this piece from a wood collector. It is easy to work, does not clog up sandpaper, and has a strong, pleasant odor.

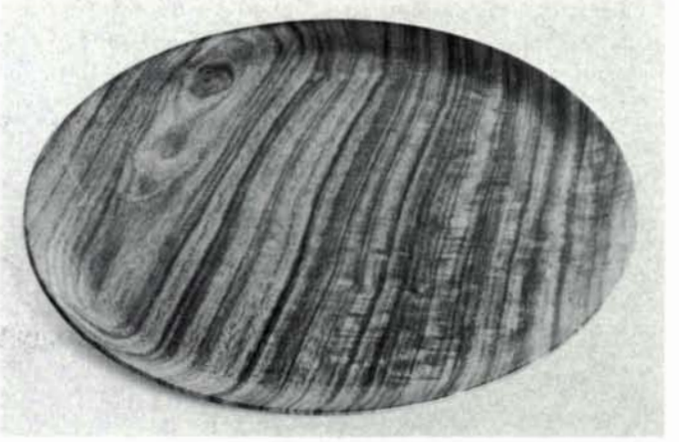
Tulipwood, Brazil, red, 6-1/2-in., $50

Tulipwood—Here is another wood used by the French in their old furniture for decorative bandings and veneers. It is another member of the rosewood family and not available in this country. It's easy to work but the logs are badly checked so a lot of repairs are necessary to get a good bowl.



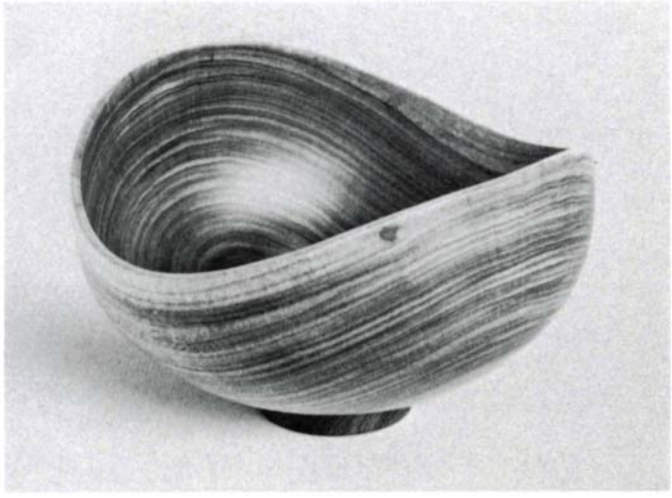
Goncalo Alves, Brazil, reddish tan and deep brown, 11-1/4-in., $50

Goncalo Alves—This fine turning wood is another that has an unusual silky feel as it is sanded. Very easy to turn but many of the planks and boards twist and contort in the dry kiln and many surface checks show up. Recently I was offered a huge log that is in Le Havre, France. It weighs a couple of tons and would cost around 50 cents a pound. Too much to buy sight unseen.



Laurel, India, brown, black, 12-1/2-in., $37.50

Laurel—Most Indian Laurel that I have is not exciting enough to work but this is a dog board from a veneer company and it has almost a bee's wing pattern. So I had to make a tray from it even though it was only 5/8-inch thick when I got it.



Blackwood Acacia, California, light brown, 7-1/2-in., $75

Blackwood Acacia—This bowl is made of local acacia and did not cost me anything. It is a difficult wood to work because the sanding and tool marks are hard to remove. This shape is a hard one to do too. When I roughed it out the top of the bowl followed the curvature of the log, as it does now. I enjoy the final result because the wood has so much luster and depth.

Coralline, India, red, 11-1/2-in., $100

Coralline—I bought this log (15 inches in diameter, 17 feet long) on pure speculation. It grew in India and I selected it in London, but had never heard of the wood and the dealer was no help at all and charged extra because I would not take four logs. It is very difficult to work and takes a long time to sand as it is tough and stringy. The end result is worth the effort and after I had used 80% of the log I found it a very good dye wood—now I save all the shavings.

Ebony, Nigeria, black, 10-in., $200

Ebony—This exceptional piece of Nigerian ebony came to me from Penberthy Lumber Co. in Los Angeles. It is not easy to come by such a fine example of this wood as much of it has lots of flaws. The log was sort of diamond-shaped on cross section so I cut it in two with a big bandsaw and got two bowls out of each section. This one was near the center of the tree and had much nicer grain than the other. This ebony is not real hard and it turns and sands without problems. Any cracks that might be in the wood can be repaired with epoxy and lampblack and they will not show at all.

Kingwood, Brazil, purple, 5-in., $60

Kingwood—This is the only bowl in those photographed that is turned on end grain so the center of the log is in the bottom of the bowl. The logs of this wood are quite small and round so it lends itself nicely to this shape and style. This wood was used for inlay bandings on old French Provincial furniture.

Cocobolo, Nicaragua, orange, red, black, brown, cream, 10-in., $350

Cocobolo—This ranks among the top five pieces that I have made. It must be a freak piece of cocobolo because it does not change color like all the other cocobolo I have had. Most of it will change overnight and gradually darken until the grain patterns disappear. This piece did not change with two months exposure near a window. I designed it to get a few touches of sapwood and as much as possible of the fantastic grain patterns that appeared just under the sapwood. An easy wood to work in spite of its hardness. Many people are allergic to it but luckily I am not one of them.

Veneer

The commercial facts of life

by Lee S. Jacobs

The log opens, the sawyer smiles, the mill owner nods his approval and the log buyer sighs with relief. Whether the log is from a steaming jungle, a distant forest, a local woods or someone's front lawn, uncertainty exists until this crucial moment. If no interior defects develop in cutting and the manufacturing technique is flawless, this log will produce fine veneer.

Only prime logs of each species are used for veneers. Trees large in diameter, tall, straight and healthy are sought. The challenge for veneer-mill operators is always to find the finest logs, anywhere in the world. Veneer logs command a premium that ranges from double or triple the value of lumber logs to many times this value, depending on the species and the circumstances in the market at the time of purchase.

The cost of veneer logs makes it important to extract the most from every one. Sawing these logs into lumber is extremely wasteful because each saw kerf might destroy the equivalent of five or six sheets of veneer—or even more. One board 12 inches wide and 10 feet long produces 10 board feet, or 10 square feet of lumber. But if it had been cut into veneer, there would have been 300 square feet, all beautifully matched.

Today, as in centuries past, veneer men seek the beauty, warmth and versatility found only in hardwoods, the deciduous or broad-leaved trees that are the prime source of outstanding wood. Out of 90,000 known varieties of hardwoods, no more than 200 are available in commercial quantities. At any one time perhaps 50 species are in vogue in North America. In the past year, plain white oak, plain red oak, pecan, walnut and knotty pine have been popular. Twenty years ago walnut, cherry, mahogany, pecan and oak (in that order) were the prominent species. Demand for a species depends on the design: French provincial usually suggests cherry; colonial furniture demands maple, birch or knotty pine; traditional generally requires mahogany or walnut; modern design might use rosewood or teak. Designers and manufacturers constantly search for something new and interesting and as a consequence the popularity of various species constantly changes.

Veneering dates back to 2000 B. C. Veneer was prized through the Egyptian, Greek and Roman eras. During the 18th and 19th centuries, the furniture masters used veneer extensively, although their veneered furniture was available to only a select few. Originally, users of veneer sawed wood into thin sheets by hand to obtain more of a particular grain pattern and to gain more control of the wood. These sheets were then applied to a thick piece of wood, using animal glue and hot sandbags for heat and pressure, to become an outer layer or face.

Veneering has developed into a refined art and modern veneer mills are geared to serve the furniture and construction businesses, much as steel mills serve the automobile industry. The veneer industry developed parallel to the development of glues—the synthetic resin glues of the 1930's and 40's which revolutionized panel making.

Veneer is made, bought and sold by the flitch. This term applies both to the uncut segment of a log and to the stack of veneers cut from it. A flitch can be half a log, a quarter or a sixth, depending on the size of the tree. A mahogany tree, for example, might consist of three or four large logs. Each log might be sawed into six flitches. Such a giant tree of 18 to 24 flitches could yield 80,000 to 90,000 square feet of veneer. Generally a tree yields one veneer log which would be divided into two or perhaps four flitches. The yield would vary from several thousand square feet to a maximum of ten thousand, depending on the log size. Walnut logs usually produce two flitches of 1,500 to 3,500 square feet each.

There are three basic ways of cutting veneers: sawing, slicing and rotary peeling. Sawing, the oldest method, is rarely done today. It is slow, wasteful and cumbersome. Still, saws can produce veneer in longer pieces than a slicer or rotary veneer lathe can make. Saws are also used to cut heavy thicknesses of dense woods that would put undue strain on slicers or lathes during extended production. But veneer saws produce a thick kerf, and not only is valuable wood lost as sawdust but also a close match of veneers is impossible. Veneer sawing is extremely slow compared to the high speeds of slicers and rotary lathes. Yet in certain very specialized uses, sawed veneer is preferred for it is claimed that this process less severely ruptures the wood fibers.

The vertical slicer is a modern engineering masterpiece. Developed in the early 1900's, the oldest slicer is as modern as the newest, due to the genius of its inventor. Every improvement since its inception is only an adaptation of the basic slicer. Face woods for cabinetry—commonly walnut, cherry, oak, mahogany, teak and rosewood—are sliced. The flitch is cleaned and then mounted almost horizontally between dogs on the slicer bed. The machine swings the entire flitch up and down against a horizontal knife, which moves incrementally inward as each slice is sheared away. The sight and sound of a thousand pounds of wood hitting a razor-sharp knife at a rate of 60 to 90 times a minute is impressive indeed.

The vertical slicer makes no kerf and thus the leaves are almost perfectly matched. It can cut veneers from 1/120 to

3/32 inch in thickness and up to 225 inches long. It is critical to keep the veneers assembled in the order they come from the flitch, one sheet on top of another, in order to book match, slip match and accomplish all the ingenious patterns of veneering.

The thinner the veneer, the more accurate the match, but the more fragile. The limit of practical thinness is the skill of the panel-maker. Veneer 1/85 inch or thinner is difficult to joint, splice, fabricate, sand and finish. Consequently most veneer is cut to 1/30 inch, which presents practically no trouble. Other thicknesses, particularly 1/20, 1/16 and 1/8 inch, are used in limited quantities for special purposes such as edge banding table and desk tops.

Horizontal slicers are used in various parts of the world to cut both face and core woods. On these machines the wood is stationary, mounted in a pit, and a knife is drawn across the wood horizontally. Generally this process is slower and more costly, though it has advantages in cutting wide flitches.

The interior and back components of a veneered panel are cut on a true rotary lathe. These machines are generally 36 to 150 inches long and can swing logs up to 78 inches in diameter. A log is chucked at both ends and the veneer unwinds like a roll of paper. Veneers thus peeled from logs of poplar, gum, basswood and many tropical woods are inexpensive, relatively stable and easy to cut. The usual thickness is 1/24 inch for crossbanding and backs. Heavier thicknesses are also cut to build up veneered panels. Rotary-cut woods are generally nondescript, used to impart strength and balance to panels. Birch, maple, red oak, elm and mahogany are rotary-cut to produce a less expensive face for stock panel and door production.

A variation of rotary cutting is known as "half-rounding." Face woods produced by this method are similar in appearance to sliced woods. A flitch is prepared in the same manner as for slicing, attached to a metal stay-log and rotated against the knife. The veneer produced by each revolution of the lathe is between the classic sliced or true cathedral figure made by a slicer, and the undulating figure of the rotary lathe. In a single species, flitches half-rounded will yield wider widths and wilder grain patterns than sliced flitches.

Softwood veneers for the construction plywood industry are always cut on a rotary lathe. The hardwood and softwood industries are different from each other in almost every aspect, from logging to final use. With the one exception of hardwood faces on pine and fir cores, the two industries have very little in common.

Veneer is sold by resident representatives of veneer mills located in furniture manufacturing centers. The mills usually have sample rooms for the convenience of large veneer buyers, architects and designers. Samples of veneer are also taken to woodworking plants for selection.

Large furniture plants require a truckload or more of veneer per day. Veneer buying for such a plant is a full-time job, the buyer inspecting millions of feet of veneer daily. Generally, veneer is purchased for "cutting of a suite" and the amount bought depends on the number of suites in a cutting. A large factory might, for example, plan a run of 500 bedroom suites—bed, bureau and dressing table—and the buyer would have to amass enough veneer, perhaps from a number of mills, to do the entire job. Thus the amount of veneer he would purchase might range from a truckload up to 250,000 feet or even more, depending on the price range of the furniture, the plant size, the method of construction and the current market. Smaller plants usually designate one person a veneer buyer, most often the plant owner, plant manager, veneer-room foreman or purchasing agent. The job is always considered very responsible because of the large amount of money involved and the judgment required to buy the exact veneer necessary for the furniture to be made.

The modern veneer industry started in the early 1900's. Face mills were located primarily in the Midwest, in Indiana and Kentucky where oak and walnut were plentiful. There were coastal mills located at major ports in New Jersey and Virginia to cut imported woods. Today, there are more than 40 face veneer mills and almost 200 rotary mills. Rotary mills are found from the Gulf of Mexico to northern Canada and from the Atlantic Ocean to the Mississippi River. Most veneer mills are small and many are still family-owned. A small operation cutting 40 million to 150 million feet per year seems to be optimum. Such a mill might, in a single day, ship 15 to 20 truckloads, each of 250,000 square feet of veneer, into the giant furniture center in the Carolinas, called the "Furniture South." Other furniture centers, using considerably smaller quantities, are located in Grand Rapids, Memphis, Los Angeles and eastern Canada. Face veneer industry produces five to ten billion feet of veneer per year. Rotary mills produce 20 billion feet, although the amount of rotary-cut wood used for crossbanding has decreased in recent years due to increased use of particleboard. Imported veneers, both face and center stock, might total another three to five billion feet a year in North America.

The export demand for veneer logs has changed the market in the last dozen years. Domestic mills generally buy veneer logs along with saw logs, but export buyers buy only veneer logs and are able to pay top dollar for them. Also, European mills usually slice the veneer thinner than American mills do—so a given log of top quality is worth more to them. When walnut was hot a few years ago they would go up to $7 a board foot. As a result good-quality logs became quite scarce. Now the fashion overseas has changed and the price is down to $1 or $2. The supply hasn't really changed, though, and since the export price has dropped, the domestic market will probably turn again to walnut in the next year or so.

Domestic mills have only recently become aware of the huge export market; they now cut veneer for export as well as for U. S. production. The Japanese furniture industry in particular has an enormous effect on the world market, because it is very large and has no domestic forests to exploit. Complicating matters is the recent trend among Third World countries to follow the lead of the oil producers and embargo log exports, forcing the price up.

Against all this, the craftsman may require 100 or 200 square feet of veneer for one commissioned piece of furniture. Fortunately for him, there are veneer merchants who specialize in small quantities of high-quality woods. Such companies generally buy unusual and outstanding flitches, the best available, directly from the mills. They are willing to sell one flitch or to break a flitch and sell books of several sheets.

The veneer industry, having as its basic raw material one of nature's true marvels—trees—is a healthy, growing industry. For as long as trees continue to grow and renew themselves, the cutters of veneer will search the world for logs to find the beauty, warmth and variety that nature has concealed.

Tackling Carving

No need for a 'carving set'

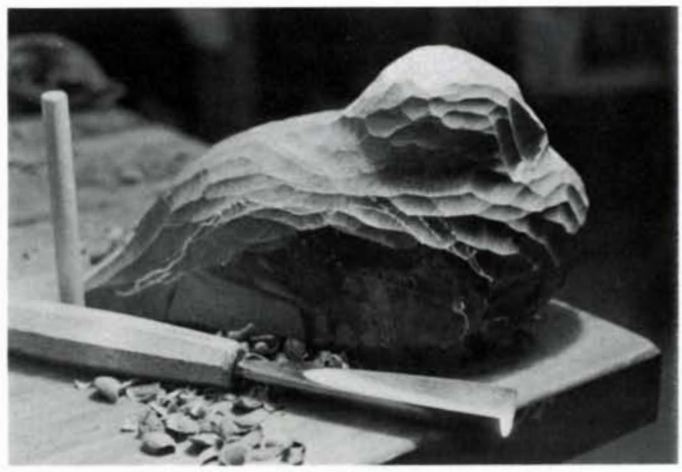
by Robert L. Butler

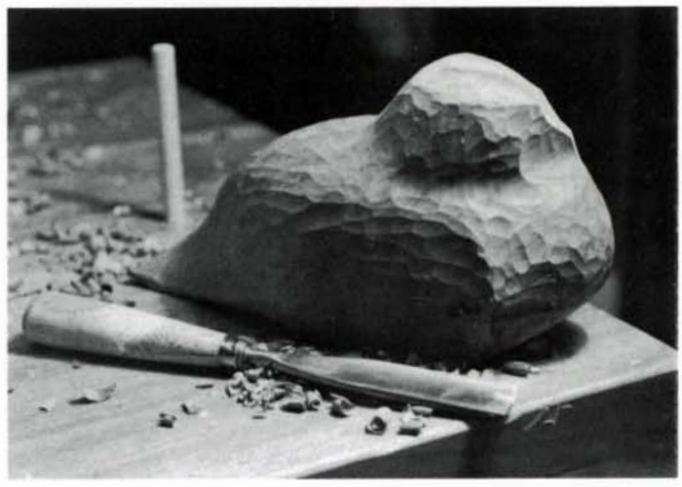
Furniture makers have recently become aware of the role of sculpturing in fine woodworking. The sculptured furniture pioneered by Wharton Esherick and recently developed by Robert C. Whitley and others uses carving as a design essential to accent light and shadow, and to form such functional elements as handles and pulls. Some craftsmen have branched out into wood sculpture as art. They start with a background and feeling for wood that trained artists often lack. But for whatever reason, a craftsman who develops an interest in carving is faced with the problem of acquiring suitable tools.

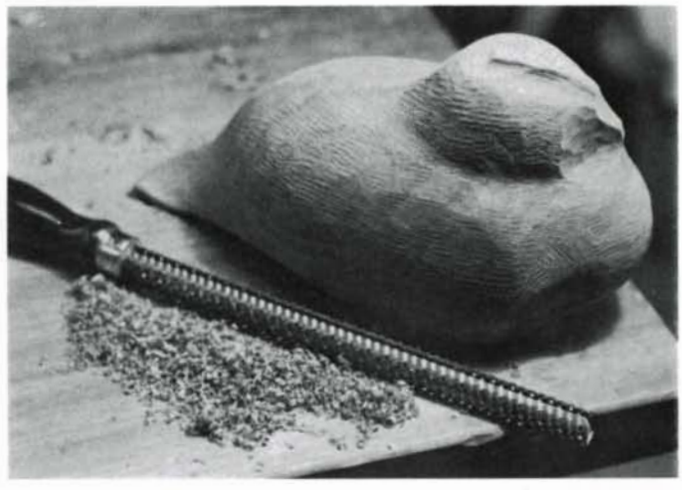
Too frequently, the craftsman new to wood sculpture buys a set of carving tools that does not meet his needs. He should be guided by the principle he followed in equipping his shop: buy a rudimentary set and add to it as experience and knowledge increase. Since most suppliers of woodcarving tools carry at least 100 shapes and sizes, it is impossible to make specific recommendations without knowing the type, style and scale of carving he plans to do.

But without some guidance, the novice may not know where to begin. I feel that sculpture of moderate size provides a realistic starting point for beginners, especially for craftsmen who intend to sculpture furniture. I have arrived at this opinion through some early false starts and later during five years of teaching woodcarving and sculpture in local adult education courses. Small, intricate carvings do not provide the experience in line, movement and form that can be transferred to sculptured furniture.

For moderate-sized sculpture, I recommend five basic tools, plus a hard Arkansas slip stone to sharpen them. They are (1) a straight gouge with a cross-section curvature of #9, #10, or #11 and 25 to 30 mm. wide, (2) a smaller straight gouge, #5, #6, or #7 and 20 to 25 mm. wide, (3) a cylindrical Surform tool, (4) a fine-cutting wood rasp, and (5) a mallet. The first four will total about $30, and the mallet can be turned from any heavy hardwood such as maple or osage orange. A mallet could instead be cut from a branch and the handle roughed out on the band saw. The carver's mallet is preferable to the carpenter's mallet which is used to make mortises, because it carries more weight in the head and be-







Photos show what can be accomplished with four tools. Rough hosting out was done with a #11 30-mm straight gouge (top), followed by #5 25-mm straight gouge, which produced a smoother form (and smaller chips). Cylindrical Surform goes even further, while a fine, half-round wood rasp just about completes it (bottom). Area around the bird's beak will be finished with sandpaper of 80 garnet prior to the usual series of sandings and finishing as desired.

cause its cylindrical form gives the hand only a glancing blow when it misses the handle of the carving tool. There is much less damage to the knuckles.

The photos show what these tools can do. I began with a #11 gouge for bosting out the rough form of an abstract bird, after band-sawing a top and bottom view. This gouge makes deep cuts and removes excess wood rapidly. At this stage, the form has many valleys and humps. Next, I reduced the extremes of these humps and valleys with a gouge of flatter curvature, the #5. I then smoothed the piece with the Surform tool, which eliminated ridges and valleys left by the gouges and enabled me to make slight changes in the overall form. Before sandpapering, I used a fine rasp lightly so as not to pull any of the wood fibers. Sculptures may be left unsanded, with the texture and finish of the gouge, or rasped and sanded with garnet paper in the grit series 80, 120, 200 and polished with 400 or 500-weight wet-dry paper.

By now, it should be evident that sculpturing of moderate-sized pieces can be done well with this set of tools. I am sure that in my own carving, 95% of my time is spent with these five basic tools.

A craftsman who has mastered these tools may discover that he is more interested in smaller carvings. He can then buy tools of smaller sizes and different curvatures, and various types of hand-held knives and rifflers. With these, he can do small animal carvings, caricatures of cowboys and goldminers, or small religious items such as creches.

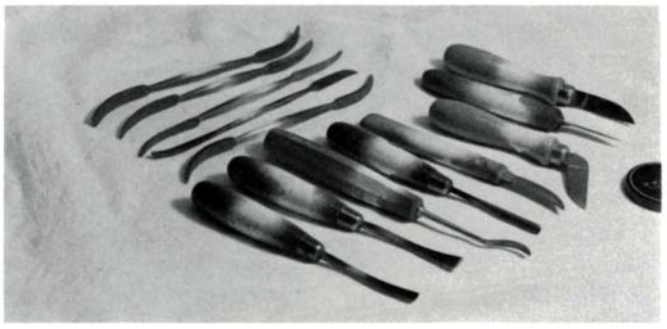
On the other hand, one may wish to carve much larger objects for the yard, foyer or a large room. Such carving is done with larger gouges and hand adzes. These tools, along with the basic five-piece set, can be used for carvings as large as totem poles or full-scale sculptures of human form. Some carvers are adept at using the chain saw for oversize and bold pieces.

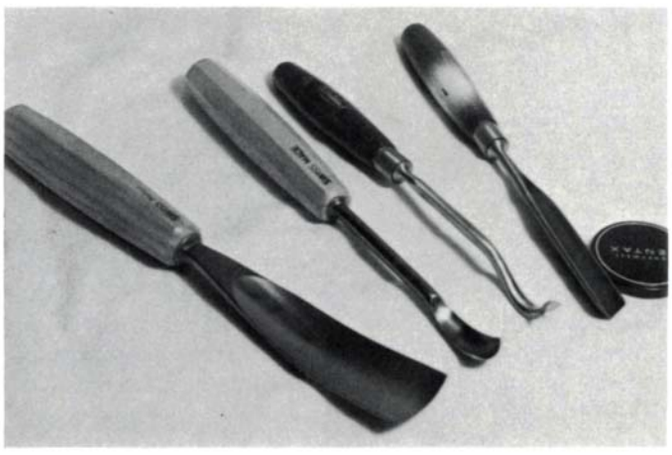
As in all tool buying and usage, the limit is set only by the person and the work he contemplates. Other available tools include bent gouges, fluters, veiners, short-bent gouges, back-bent gouges and parting tools. The bent gouge is used extensively in free-form bowl carving. Fluters are semicircular in cross section. Veiners have u-shaped cross sections and make deep, continuous-cut lines. Spoons, front or short-bent gouges—they go by various names—are used for "spooning" wood, making deep, abrupt incisions. The back-bent gouge is the reverse of the short-bent, with the sharpened surface on the opposite edge. It is used to carve intricate flowers, leaves, etc. Parting tools make a v-shaped cut of various depths and angles.

Musical instrument makers use other specialized tools. The macaroni, fluteroni and backeroni gouges are designed for carving violin, viola and cello necks, backs and bellies. Like all carving tools, these may be short-bent, bent, etc. Some experienced woodcarvers even forge, grind and temper their own tools.

As in all craftsmanship, the ultimate is never achieved. A serious craftsman continues to improve his work and extend his horizons as he creates. Start with the simple set of tools and add to it as you find need and outgrow the limits of those you have already purchased.

Author's basic carving set (right) includes wooden mallet, hard Arkansas slip stone, #11 30-mm gouge, #5 25-mm gouge, fine rasp and cylindrical Surform. For smaller, more intricate work (below), add gouges, knives, chip carving tools and rifflers. For bigger work (far below), there are from bottom to top a #7 35-mm bent or long bent gouge, a #7 50-mm straight gouge, a #7 50-mm fishtail gouge, and an adze with two cutting faces—a gouge and a small ax. Carving tools other than straight gouges include (below right) a long bent gouge for deep carving, a front bent for deep incisive cutting, a back bent for carving leaves or petals, and a parting tool for deep angled and continuous cuts. Round lens cap shows relative size.





COMMENTARY

Market Talk

There's a new generation of buyers

by Robert Sutter

"Stanley—The Tool Box of America." Plain block letters spelling these words on a label recall a time when almost any hardware store had at least one shelf stocked with the familiar yellow metal-cornered boxes imprinted with the Stanley trademark. The contents of those boxes, planes and spokeshaves and chisels and all the other sturdy shiny precise woodworking tools made in New Britain, Connecticut were available in profusion to help the craftsman do the best work he knew how.

The Stanley Rule and Level Company was formed in 1857 when the Hall and Knapp Corporation and A. Stanley and Company, founded seven years earlier, were merged. In 1869 Bailey Chany and Company and its metal plane patents were purchased by Stanley as a means of entering the plane market, which heretofore had been monopolized by wooden planes. By 1874 Stanley Rule and Level Company was making metal planes in quantity which were winning medals for excellence at local trade expositions. It was about this time that the company began to concentrate on producing carpenters' tools. As Alvin Sellens points out in his excellent book, *The Stanley Plane* (published by the Early American Industries Association), "Carpenters sent in their needs and ideas for special tools and Stanley responded with more and better products."

A growing company

By 1900 Stanley had grown to be one of the largest producers of woodworking tools in the world. The company continued to expand by purchasing other companies with the knowledge and skill to make the carpenters' and mechanics' tools necessary to expand the line. In 1920 Stanley Rule and Level was purchased by the giant Stanley Works, manufacturers of a wide range of industrial and builders' products. As Stanley Tool Division of the Stanley Works, they continued to do business much as they had before the merger.

In 1922, 144 planes were being offered, less than the 200-odd offered seven years before but still sufficient to satisfy the requirements of even the most finicky workman. Twenty-two numbers were assigned to the famous Bailey iron bench planes, the other numbers to various specialty planes.

The number of planes offered is not important except as an indicator of Stanley's recognition of the diversified work which comes the woodworker's way and the personal quirks each individual exercises in carrying out these tasks. However, the introduction of portable power tools in the 1920's made many items obsolete; for example, the #444 dovetail tongue and groove plane was replaced by the electric router.

The latest Stanley Broadline Catalog lists smoother, jack, fore and jointer planes in fourteen sizes in two price ranges. Six block planes, four special planes, a spokeshave and a cabinet scraper also remain in production. To be sure, there are screwdrivers and hammers, braces and bits, chisels and knives and plenty of other well-made, useful items still for sale. But for any special item such as a combination plane, a hand router, a side rabbet or a shoulder plane we must now seek further than the company which originated and perfected these tools.

As a professional cabinetmaker, I still use a wide variety of such hand tools in my daily work. Visitors to my shop often ask me where they can obtain a tool they see me using. I am forced to say, "Stanley used to make this but I don't know where you can get one now." I believe that modern marketing has done in the old fashioned notion of a tool for every purpose. Choice seems to have suffered at the hands of merchandisers who subscribe to the concept of selling only those items which move off the shelf with little trouble rather than selling those which may be more useful but need a great deal more salesmanship to promote.

But it's not only marketing which has cut down on the variety of tools available. The once straight-forward operation of producing a plane or a chisel has changed from a handcraft operation to a production line. Chisels are still heat-treated one at a time but the hand that holds them is now an automated steel one. All the complex interrelationships of production technologies have combined to restrict the wonderful variety of another era. I mourn its passing and hope that some way of broadening the Stanley line can be found so that it once again includes the old standbys.

'The tool box of the World'

Furthermore Stanley, which has earned its motto "The Toolbox of the World" ought to be at least as tuned in to the craftsman as it is to the hardware dealers, both retail and wholesale. I do not think such is the case. Should one ask Stanley why the #79 side rabbet plane is no longer made, the most likely answer would be that there is not sufficient demand for this tool to justify manufacturing large enough quantities to be profitable.

I have seen the #79 offered in a catalog for about $24. Assuming a markup of 100%, the wholesale price will be $12. If the #79 can be made for this sum, sales of 1500 a year would gross around $18,000, only a tiny fraction of the hundreds of millions in annual Stanley tool sales. But is that fraction beneath the notice of a company which has traditionally solicited the requirements of the crafts-

man-woodworker as a part of its business procedures? I think not.

The side rabbet plane is not a lone example. Let me also cite the #45 combination plane. A used one will bring nearly $100 on the market. These planes are common enough to discount the collector as a factor so that it is safe to assume that the demand craftsmen make for them is responsible for their value. The fact that the English Multi-Plane with all 40 cutters sells for almost $150 (back-ordered with delivery given in months) also contributes to the demand for the #45 plane.

Stanley tools are marketed through a system of distributors who sell to retailers. No one in the chain wants to handle slow-moving items. Tools of the sort I have been writing about in this article are not in constant demand and therefore taboo. Consider this "which-came-first" dilemma. Have a large variety of once-common tools gone the way of the dinosaur because no one wants them or because not many craftsmen, professional or amateur, know how useful they can be? Hardware dealers who have never seen some of these tools obviously can't recommend them. Those whose memories go back 20 years or so can't be expected to sell what they can't obtain from the manufacturer.

Education and communication may be a problem. Stanley maintains a staff of representatives who call on wholesalers, retailers and schools. These men should be the mechanism by which the needs of the marketplace are transmitted to management, but perhaps they also suffer from the "chicken-or-the-egg" problem.

A company that has survived for over 120 years and has paid dividends to its stockholders for 100 of those years consecutively is obviously a success. However, I wonder, does the spirit still prevail that led the small Stanley Rule and Level Company to invest in the manufacture of metal planes at a time when such tools were practically unknown? I think so, but I also think the company is overlooking a special market which is not presently reachable through its normal channels of distribution and which perhaps doesn't show up on market surveys geared to sample only those channels.

A growing specialized market

There is a large and growing market of woodworkers who possess the sophisticated skills which demand specialized tools. Witness the existence of at least four or five thriving mail-order tool suppliers, flourishing magazines for woodworkers, and woodworking schools springing up throughout the land as proof that this market exists in some magnitude beyond a few sawdust-covered nuts scavenging hardware stores and flea markets for tools of a bygone era. One need only demonstrate joinery techniques to a couple of groups eager to learn to build beautiful and well-made things of wood to realize the surge of interest in traditional craftsmanship. Go to any craft show and see for yourself the crowds on both sides of the counter.

After many such experiences, I feel confident in predicting a return to an artisan-craftsman-dominated market in which all the traditional hand-woodworking tools will again be available to those who have the skill to use them well.

So dust off those old drawings, Stanley, and start up those production lines, and who knows, perhaps your designers may also come up with even better answers to the old Stanley tools that still serve many of us so well.

Abstract Sculptures From Found Wood

by Theodore Gochenour

For the past ten years, at the cost of a few splinters and cut thumbs, I've enjoyed making abstract sculpture from pieces of wood which otherwise might be kindling. There is a special pleasure in using found wood, letting myself be directed by whatever natural shape I can discover in it. One source, which I wish I had not depleted for kindling, is the old pine sheathing boards I replaced on my house a few years ago, well-dried through many Vermont winters before insulation was thought of. There is something special about working a piece of wood from a house 180 years old, knowing it comes from a tree that started growing perhaps a century even earlier, when the trees in the virgin forest were enormous.

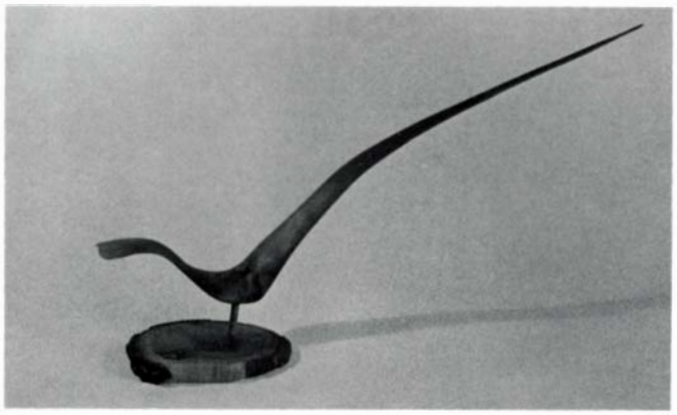
I usually work with pieces simply split out of an old board, or sometimes from a larger block, such as a fireplace log. Pine works well for me, because I enjoy the effect of its knots and grain. The grain is especially important: I try to shape the sculpture so as to preserve not only the general course of its growth, which is easy enough, but also particular layers or lines of grain. This is where knots play a part, because a clear piece of wood with straight grain lacks variety. Removing the knot itself leaves an interesting curve of grain, which is strong by virtue of its curve and the compression of fibers.

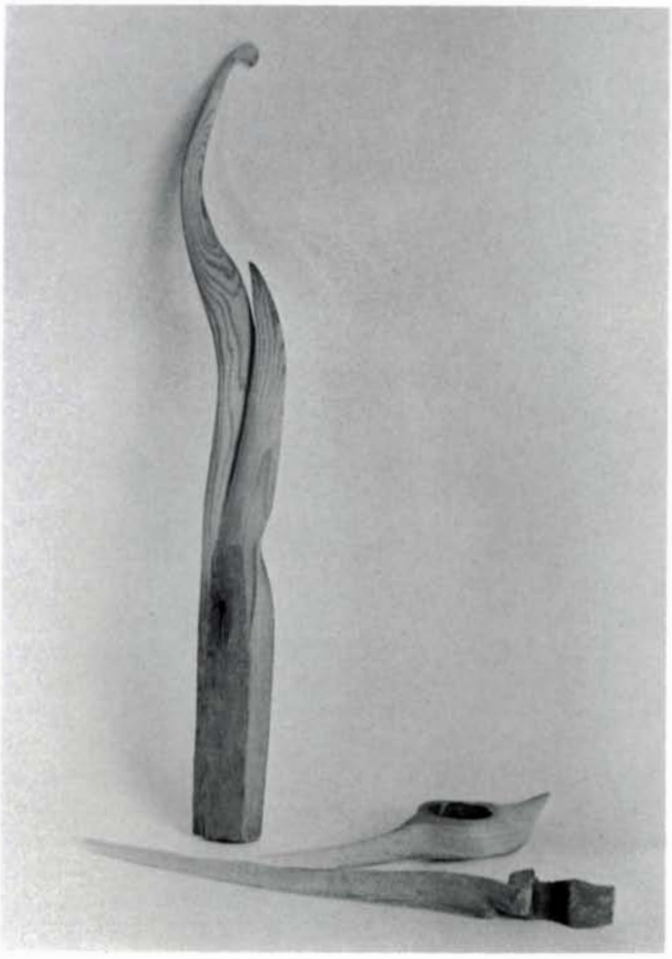
As a piece takes shape, a fine mixture of curving lines emerges. There is real beauty in compound curves, the line of the wood moving against the lines of its grain. What about an old nail hole? Leave it, why not? Incorporate it into the design, perhaps minimizing it, perhaps making it a prominent feature.

As always in working with wood, the sharper the knife the better. I generally use a pocket knife on the rough stretches, then switch to various X-acto knives, depending on the need of the moment. I have tried machine-sanding instead of using knives to bring out a shape, but prefer doing it with hand tools the whole way. It is not only more satisfying to work with knives and hand-sanding, but there is less risk of disrupting the grain pattern.

Generally I prefer an oil finish. But this is delicate sculpture and liable to having a thin part damaged in handling. On some pieces I feel safer with a hardening finish. It can bring out a glow in the wood and also strengthen the whole piece. Some day, I plan to try larger pieces which might stand on the floor, but so far I have stuck to sculpture for table or mantle. Placement depends not only on esthetics, but also on some judicious protection from children and pets.

Any sculpture created by taking away unwanted material is a discovery of a shape hidden in the original mass. The lines, flaws or special characteristics of any natural substance will affect the outcome. With a material like stone, though, one





can make the desired shape with less concern for variations or imperfections. With wood, the lines of growth are ever present, and one can allow reverence to enter in and the processes of perhaps a century to determine the main lines.

In this kind of sculpture, it would be impossible to create something exactly to order. It would miss the point. The idea here is to let happen, to discover, to do your part in bringing out what you sense is already latent in the wood. Anyone working with wood must often feel a delight in seeing a particularly beautiful pattern of grain emerge, realizing that if he had taken away a sixteenth-inch less, he would never have known it was there.

The edges of long pieces require a decision. Smooth them, accentuate them, or leave them rough just as they split out of the piece? It is the sculptor's choice, and depends on the character of the piece, or the theme of the sculpture, if he has one in mind. And what is a "mistake" in this kind of work? Mistakes can happen: the knife can slip, or a part may splinter where you wish it would not. Often, though, such mishaps can be accommodated. With care, it is rare that a piece breaks in such a way that it is no longer interesting. For me, the process is one of trying to let an "accidental" quality emerge in the wood, while taking great care to enhance or vary the main character and finish of the piece.

The fun is in not knowing at first what may emerge, as if that particular piece of wood conceals a secret for me to find. My part is to whittle away, carefully removing this or that, keeping watch for the lines of strength, coaxing a shape that is partly my choice and partly the wood's. But once that is done, what to do with it? A single, interesting piece of wood mounted on an appropriate base can be beautiful. Or two or more pieces can be put together. Perhaps the piece or pieces suggest a figure, a concept, an impossible but distinguishable bird, or flame, or whatever one wants to say it is. One has to choose the base to match the idea or mood. I usually make a restrained, regularly shaped base from butternut or cherry, to contrast with the flowing, changing lines of the sculpture. Sometimes a piece might look equally well in a number of positions—upright, on its side, grouped in an unexpected way. The sculptor's choice.

This may sound careless, as if you can just take a piece of wood and set it on a stand. On the contrary, there is a definite and pleasurable artistic role to play—to emphasize, vary, redesign a little, smooth and polish the piece so that its natural beauty of grain becomes striking. It requires a steady hand, good tools and imagination. What was once a rough scrap of wood begins to speak. One of the thousand possible shapes that nature created in it reveals itself cleanly.

Work Bench

A design for holding the work

by Tage Frid

There are many workbenches available on the market today. Aside from obvious reasons of economics, why make my bench? I can convince my students and myself easily enough, but to convince you I should explain the benefits of this design and how I arrived at these specifics.

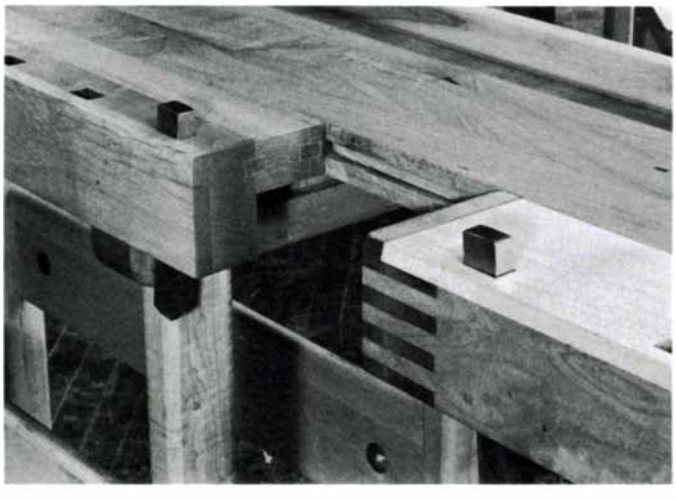
When I came to this country in 1948 I was given a tour of the school where I was to teach. I was guided to a large room and introduced to the teacher with whom I was to work. We talked for a while, or rather he did the talking because my vocabulary didn't go much beyond yes and no. By using arms and legs I finally conveyed to him that I wanted to see the woodshop. When I was told I was standing in it I just about passed out. In the room was a huge thickness planer I think Columbus' father must have brought over, and a few small power tools. I was really flabbergasted when I saw the student "workbenches." These were large tables for two persons with a vise in each end. Most of the time the students were holding down their work with one hand and working with the other. Some had taken much time to make special contraptions to hold their work so they could use both hands, which I'm sure was the Lord's intention when he designed us with two. (Of course the Japanese use their feet to secure their work, leaving both hands free.)

After being in school for a few months I realized that the bench I wanted did not, to my knowledge, exist in this country. So I designed my first workbench, which was quite similar to the one I was taught on. Later we made one for each student. Since then we have been making workbenches every two or three years so that the students have their own when they graduate. I find it a good exercise in which they learn how to set up the machines for mass production and work together as a production team. It takes us three days from rough lumber to have all the parts ready to fit and assemble, and to have the bench top glued up. This year each bench cost us about $100, half for wood and half for hardware.

Over the years, having made the bench so many times and having had numerous people using and criticizing them, I have arrived at this design and these dimensions as best suited for a cabinetmaker. With its two vises and accessory side clamps there are five possibilities for holding the work—two in the right vise, one in the left vise, one between the bench dogs and one between the side clamps. Both vises are the type with only one screw and no guide pins to interfere with the work. A piece can be clamped all the way to the floor if necessary, and the vise can hold irregularly shaped objects. With only six bolts, the bench is easy to assemble and disassemble, and takes minimum storage space. The only glued parts are the bench top, the right vise and the leg sections. Everything else bolts together so that any damaged pieces are easy to replace.

This bench is almost six feet long, but if you wish to lengthen the bench you can easily do so by extending the bench top at the center and the two leg crosspieces (#18 on the plan) the same amount. You can shorten it in the same way. I would advise keeping all dimensional changes in five-inch increments so that the distance between the bench dogs remains the same. The bench is designed as a right-handed bench but could be converted to a left-handed one by reversing the plans. If additional storage space is needed, I suggest attaching a piece of plywood between the

Vise closeup shows top spline construction. Dowel jig helps support long boards in other vise.

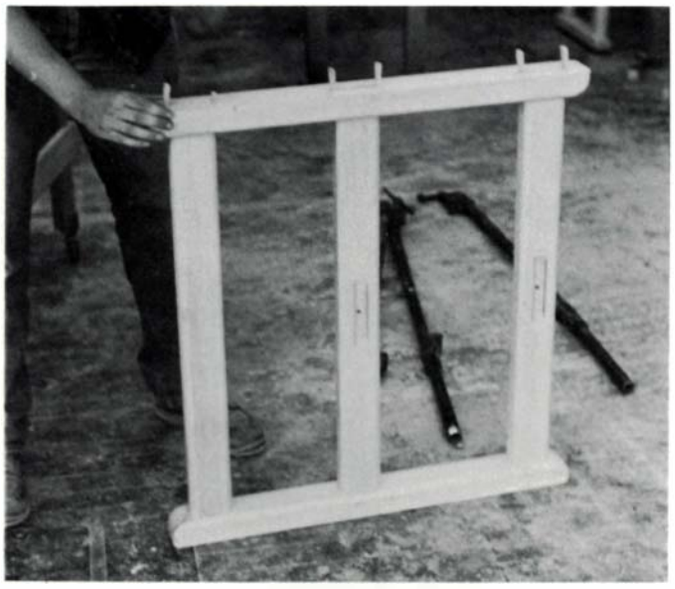


leg crosspieces and inserting two end pieces to form a large storage compartment. If you wish you can add a piece behind the bench to hold gouges, chisels, screwdrivers, etc. But I find it more a bother than a help because if you are working on pieces larger than the bench top surface you have to remove the tools so that they don't interfere.

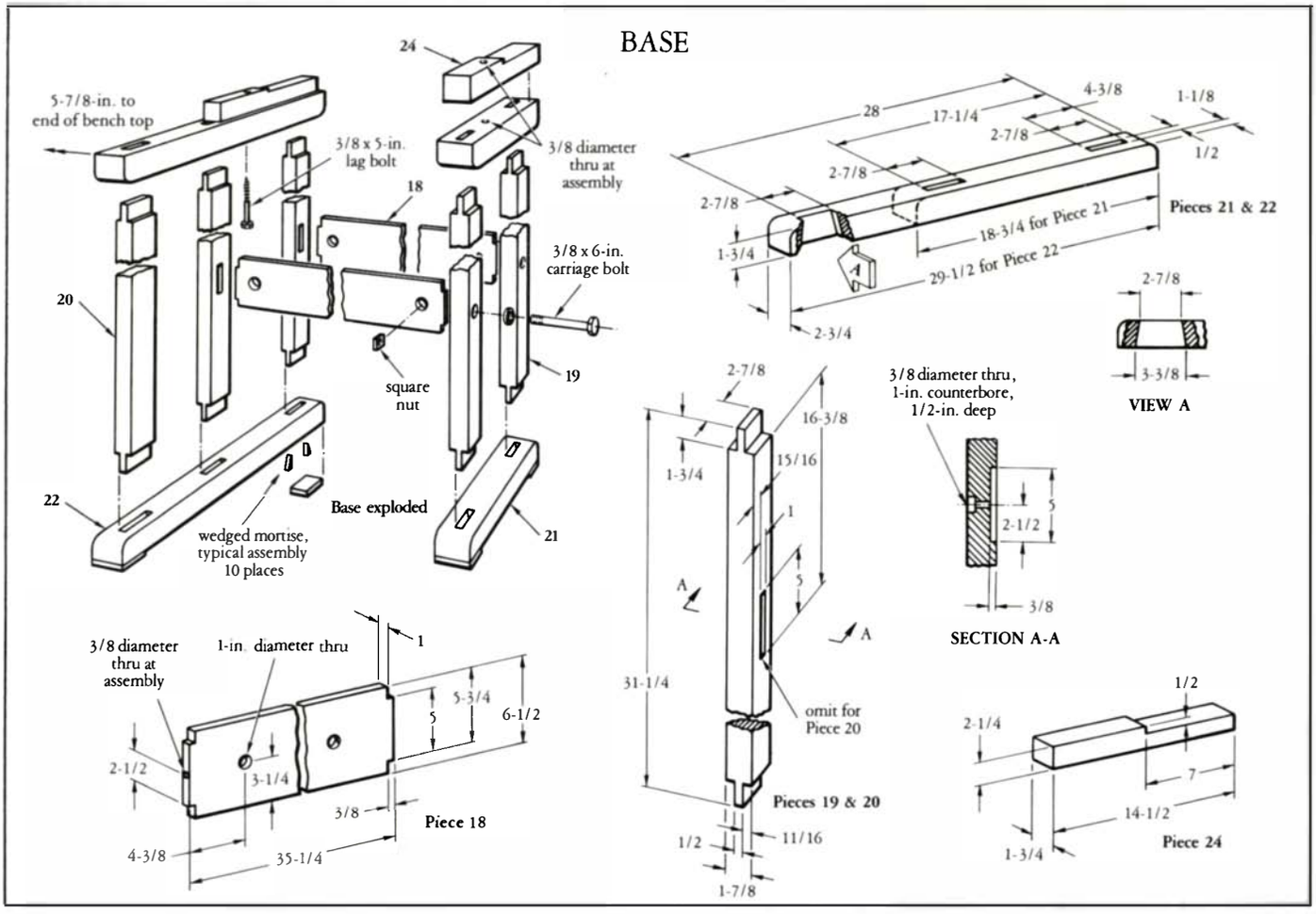
If you are working on long boards or panels you can make a simple device to support the weight of the board. Take a good heavy piece of wood (a 2x4 or 4x4 will do), and drill holes of at least 1/2-inch diameter in a straight line down the length of the piece about one inch apart. By clamping this into the right vise and moving a dowel to the hole just under the work you can easily add support to a long piece.

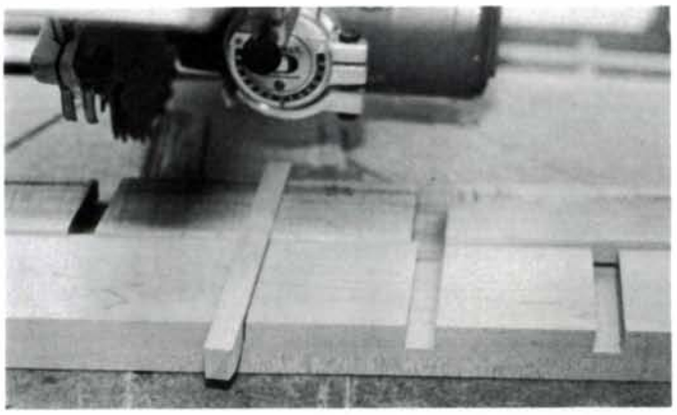
Before beginning, get your hardware. That way, if you wish to make a substitution or if something isn't readily available, you can make all your dimensional changes before any wood is cut. We could not find a 14-inch bolt so we make our own by brazing a nut to the end of some 3/8-inch threaded rod which we have cut to the right length. We got bench screws and dogs at Woodcraft Supply in Woburn, Mass., but I understand Garrett Wade in New York and others also may have them.

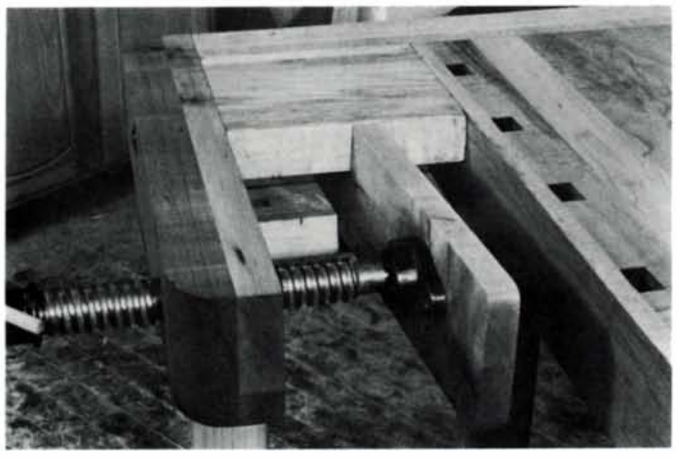
When choosing the wood, make sure you select a dense hardwood and be sure the wood is properly dried. We use maple because it is extremely hard and durable and is the least expensive in this area (it takes about 60 board feet). When cutting up the stock be sure to cut the longest pieces first. Cut them all one inch longer than the final dimension. It is best to purchase rough lumber, joint and thickness-plane it rough, and then final thickness-plane the whole top together after it is glued. If a thickness planer isn't available, buy the lumber planed and align carefully during gluing. I suggest not using pieces wider than four inches in the top because of possible warpage problems. We use 8/4 stock for everything except pieces #18 and #8, which are 5/4 stock. For the heavier pieces which finish 2-3/4 by 4 inches, we glue-up two pieces of 8/4 because in this area it is just about impossible to find properly dried lumber of that thickness. If necessary, you can bricklay or stack these pieces if you are short on lumber. We use Titebond yellow glue for all the glued sections.



Base parts are wedged and glued.







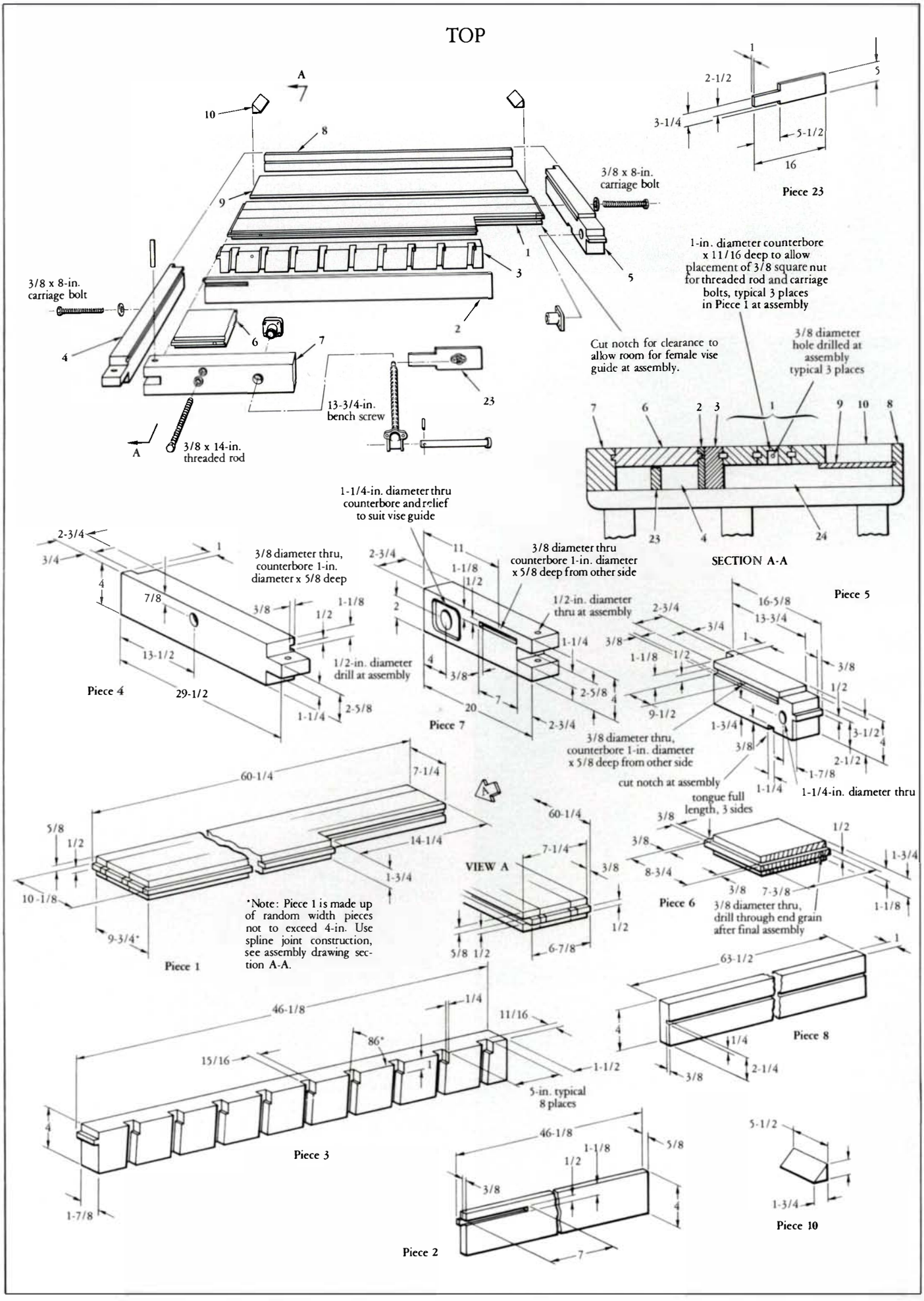
Many students have found it best to start assembly with the base, as it goes together very easily. Assembling the base first eliminates many pieces, making things less confusing when the vise is to go together. If you wish, you may round over the edges of the base pieces and radius the ends of the feet. These details, along with your vise corners and handles, will give your bench a personal touch. Sand all pieces before gluing. Be sure to hammer evenly on both wedges and don't over-hammer or the wood will split. After the wedges are in, check the sections for squareness. At this point you can remove the clamps because the wedges will hold everything in place. Clean off all the excess glue while it is still wet and you will have little finishing work. After the glue dries, saw off the excess of the wedges and plane the tops even and flat. Clamp the base together to drill the hardware holes.

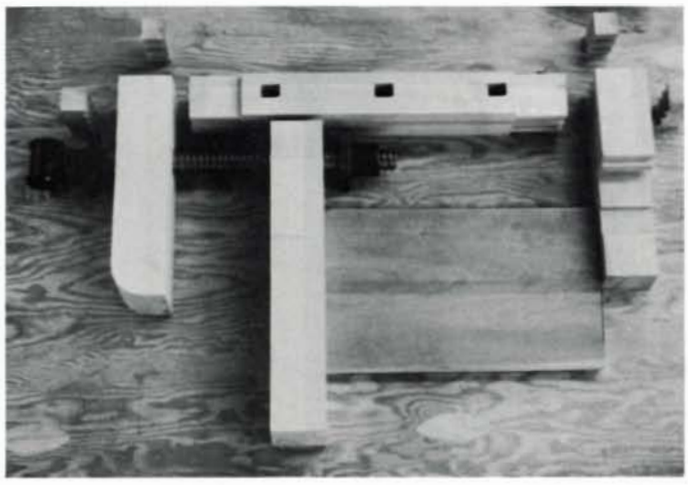
In making the bench top, we use splines between the pieces to make gluing up easier. It isn't a bad idea for strength either, because of all the hammering that will take place on the top surface. A spline should definitely be used between pieces #1 and #3 to help align the front piece flush with the rest of the top. We use a dado head to cut the grooves for the splines but it could be done with a shaper, a hand router or a plough plane. The bench top is glued and planed before piece #3 with the bench dog slots is added. We use the dado head on the radial arm saw to cut the bench dog slots with a stop set to keep the spacing and the angle consistent. It could be done instead with a router, a saw and chisel, or a router plane. The top step of the slot is chiseled out by hand at the very end. Cap piece #2 is added afterwards and a brad is used in each end to prevent the piece from sliding over the length during gluing. Don't use too much glue or it will be necessary to do a tedious clean-up inside each bench dog slot. After the front piece is attached, the top is cut in length and width. The tongues are made at each end with a shaper, circular saw, hand router or rabbet plane.

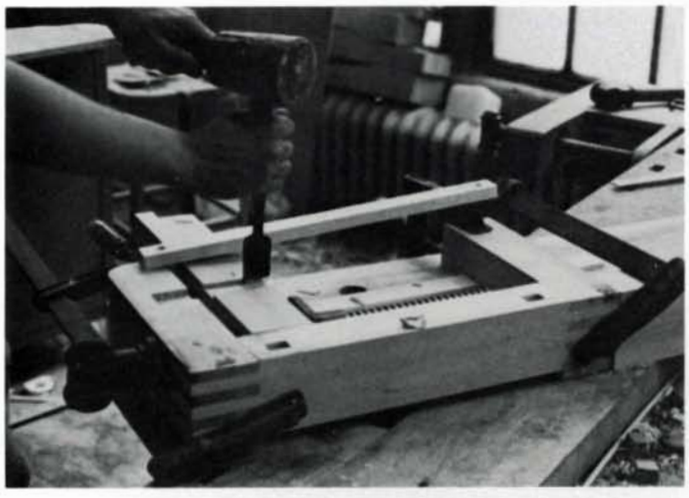
The lengthwise cut for the right-hand vise must be parallel to the front of the bench top, and the crosswise cut precisely square to it. This can be done on a band saw, or with a circular saw or hand saw. For making the groove for the right-hand vise to ride in, you can use a hand router or chisel it out. The accuracy of this groove is very important because it will determine how smoothly your vise works.

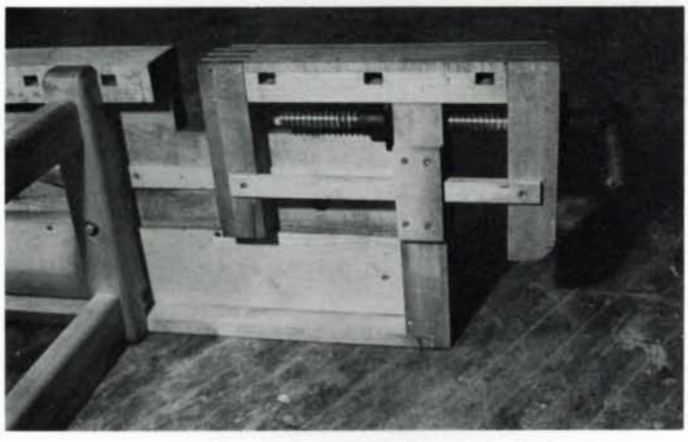
As mentioned previously, none of the end cap pieces is glued. For this reason it is essential that the holes for the bolts are drilled very accurately or the bolts will not go in square. Therefore I suggest drilling the holes in pieces #4, 5, and 7 on a drill press or with a doweling jig. At the same time, drill the hole for the vise in piece #7. After the holes are drilled, the end cap pieces are clamped in place with filler #6 inserted. The holes are then continued into the bench top. The best way to do this is to use an extra-long drill bit, or a bit on an extension. If you don't wish to invest in the bit, you can cut a dado and let the bolt ride in that. The same procedure should be followed on piece #18. If you do use a dado and wish to close up the groove, you can add a piece to conceal the bolt. However, this isn't necessary because the nut will nestle in the

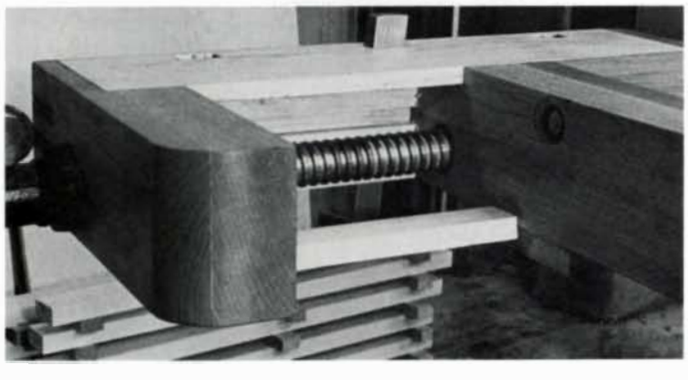
At top, radial arm-saw jig helps cut out bench-dog slots of consistent spacing using dado blades. Student uses chisel to clean saw cuts made to shape bench-top corner for vise. Below, Piece 3 is planed to align with Piece 1. Bottom photo shows vise.


TOP
A
10
8
9
1
3
5
2
6
7
4
3/8 x 8-in. carriage bolt
3/8 x 8-in. carriage bolt
13-3/4-in. bench screw
23
3/8 x 14-in. threaded rod
A
Piece 23
1-in. diameter counterbore x 11/16 deep to allow placement of 3/8 square nut for threaded rod and carriage bolts, typical 3 places in Piece 1 at assembly
Cut notch for clearance to allow room for female vise guide at assembly.
3/8 diameter hole drilled at assembly typical 3 places
SECTION A-A
1-1/4-in. diameter thru counterbore and relief to suit vise guide
3/8 diameter thru counterbore 1-in. diameter x 5/8 deep from other side
3/8 diameter thru, counterbore 1-in. diameter x 5/8 deep
1/2-in. diameter drill at assembly
1/2-in. diameter thru at assembly
Piece 4
Piece 7
Piece 5
3/8 diameter thru, counterbore 1-in. diameter x 5/8 deep from other side
cut notch at assembly
1-1/4-in. diameter thru
tongue full length, 3 sides
Piece 6
3/8 diameter thru, drill through end grain after final assembly
60-1/4
7-1/4
14-1/4
1-3/4
10-1/8
9-3/4*
Piece 1
*Note: Piece 1 is made up of random width pieces not to exceed 4-in. Use spline joint construction, see assembly drawing section A-A.
VIEW A
6-7/8
46-1/8
11/16
86°
15/16
1-1/2
5-in. typical 8 places
Piece 3
63-1/2
Piece 8
1-7/8
46-1/8
Piece 2
Piece 10









At top, plywood board is used to square three vise parts when gluing them together. Middle vertical board is bench-top end (Piece 5). After gluing, other parts of vise are fitted together with the vise in place on the top. Other photos show bottom and rear views of vise.

shoulder of the right-angled hole, pulling the bolt in tight. In our benches we insert the vise hardware brackets flush, but this certainly isn't crucial.

Now comes the most difficult part of assembly—the right-hand vise. It is advisable to make the tongues on the pieces all slightly oversized and carefully fit them with their grooves. It is essential that every part of the vise be completely square. We use finger joints in the corners but dovetails would probably be faster if you are only making one bench. In gluing the vise pieces together it is helpful to cut a piece of plywood to the exact dimension of the inside rectangle of the vise. If you clamp the vise pieces around this piece, the vise will have to end up square. The plywood also provides an edge to clamp against on the open side.

The vise should be glued and fitted and all the holes drilled for the hardware before cover piece #14 is added. The hole for the vise is drilled in piece #11, and from there guided into piece #5, with #5 bolted in place. It might be necessary to chisel a little notch into the bench top to make room for the vise bracket, but such a notch is invisible. The bench is flipped upside down for the fitting of the guides. The notches should be scribed off the runner pieces and carefully routed or chiseled out by hand. Countersink all the screws so that they don't interfere with the vise travel. Piece #17 should be screwed down first and then the other guides set in place. Take the time to make all of these fit right. Fitting the vise will drive you crazy at times, but be patient and worry about one section at a time and eventually it will all fit just right. When the vise is working properly, piece #14 is added. It is set into pieces #11 and 12 so these pieces must be chiseled out. If you want to get a little fancy you can undercut the edges so that the effect is almost like one large dovetail. A complimentary angle is cut on the edges of #14 and the piece is glued. You must glue only to the moving parts of the vise and not to any of the stationary parts of the bench top. Drill up from the bottom through the bench dog slots to locate the tops of the slots and finish chiseling them out.

Piece #8 is screwed onto the back of the bench after it receives a groove to support the plywood for the tool trough. The plywood is screwed directly to the underside of the bench top and is further supported by the filler pieces which secure the top to the legs. The filler pieces #24 stabilize the top and connect it to the base. The two corner blocks are screwed in from the bottom. Their only function is to make the trough easy to sweep out. Piece #23 is used to prevent direct clamping onto the work you are holding. A piece of plywood would function equally well here.

After the bench is completed, the top should be hand planed and belt sanded level. All the edges should be eased off slightly, or "broken," to minimize chipping out when something hits against an edge.

All of the places on the underside of the right-hand vise where wood is running against wood should be coated with melted paraffin thinned slightly with turpentine—say a tablespoon or two to a block of paraffin. The paraffin is first melted in a can or pot, and the turpentine is added with the container removed from the heat source. The mixture is liberally painted on in its liquid state to protect the pieces and help them to function smoothly. No oil is used on any of these pieces.

At completion, the rest of the bench and especially the work surface should be completely penetrated with raw

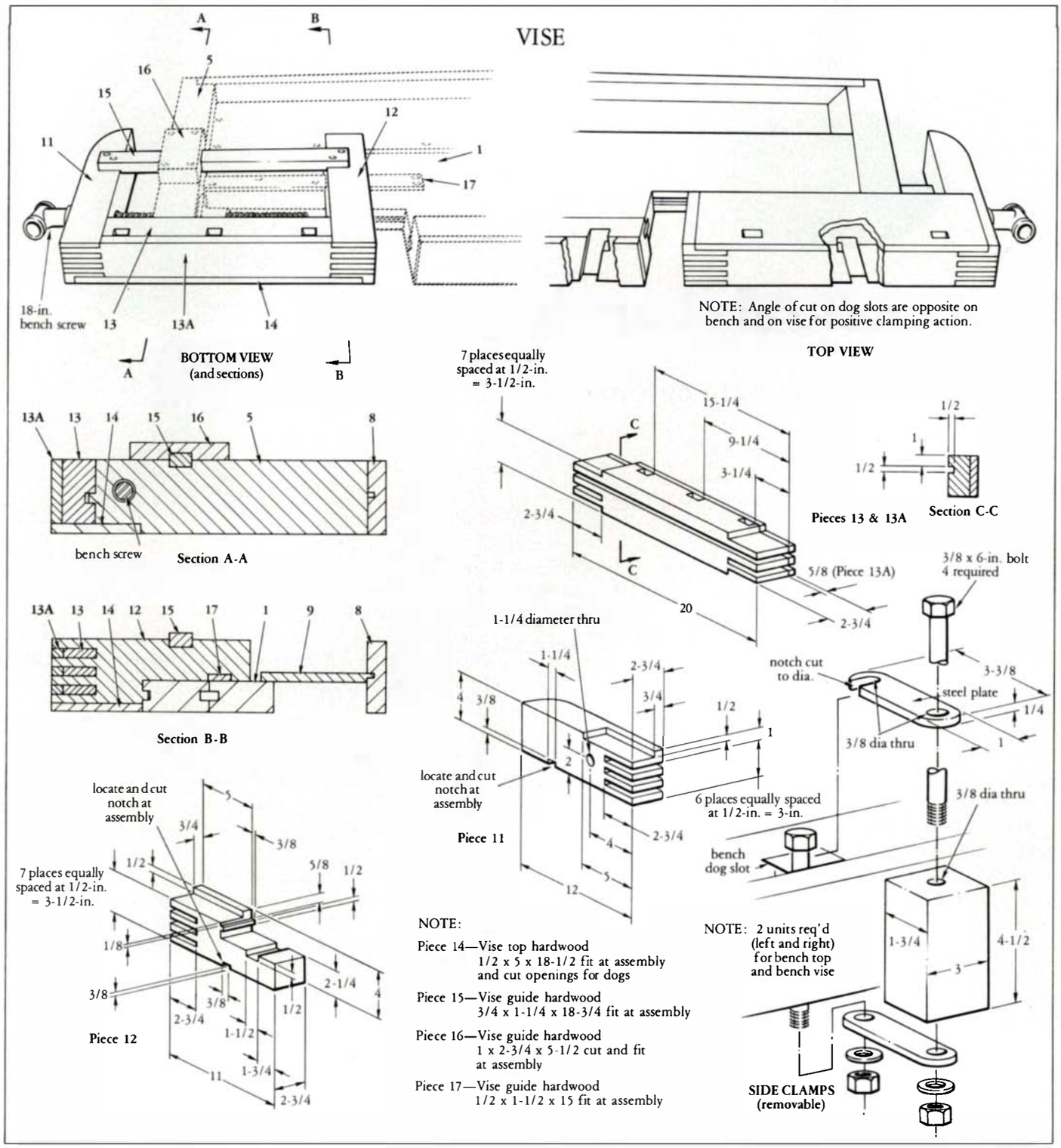
linseed oil. This will take several hearty coats. At least once a year the bench top should be resurfaced. This is done by scraping it down, releveling it, and again penetrating it with oil.

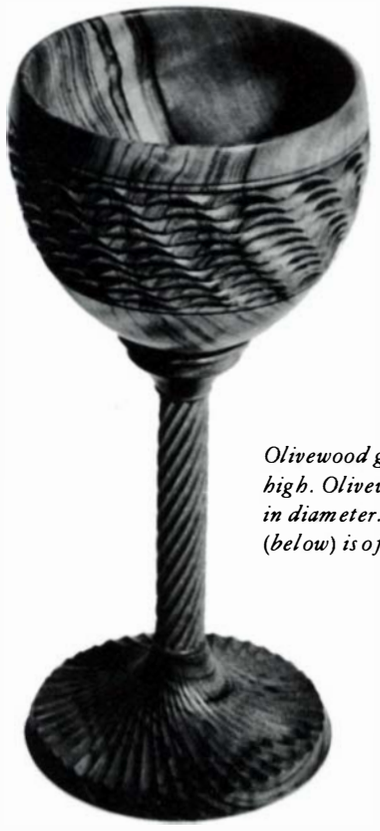
Four small pieces should be added under the legs so that the bench rests on four points. The thickness of these pieces can serve as an adjustment for the final bench height.

Now your bench is completely finished and looks so beautiful you hate to use it. If you take good care of it, working *on* it and not *into* it, it should stay like that for years and years.

[*Author's note:* Material for this bench includes 50 board feet of 8/4 maple; 10 board feet of 5/4 maple; one piece of 1/2-in. Baltic birch plywood 8 x 60; two 1-1/4-in. diameter bench screws, one 18-in. overall length, the other 13-3/4 long with a swivel end; 1 pair 7-in. bench dogs with heavy spring, 1 x 5/8 knurled face, 7/8 x 5/8 shank (we used Ulmias); two 3/8 x 8 bolts; four 3/8 x 6 bolts; one 3/8 x 14 bolt (or threaded rod); two 3/8 x 5 lag screws.

[*Editor's note:* Blueprints of this bench are available for $6. The prints do not give any additional information, but some readers may find the orthographic projections drawn to a scale of 1-1/2 and 3 inches to the foot convenient to work with. Send check to The Taunton Press, Box 355, Newtown, CT 06470. Connecticut residents add 7% sales tax.]





Olivewood goblet (left) is 9 inches high. Olivewood bowl is 10 inches in diameter. 12-inch chalice (below) is of kingwood.

Ornamental Turning

An intricate and exacting pastime

by John Kelsey

Frank Knox leans against a well-worn stool at his gleaming lathe, a Victorian-era relic of dark mahogany, machined steel and polished brass. There are fewer than 100 of these Holtzapffel ornamental turning lathes in the world, a half-dozen in America, and this is one of the finest and most complete.

Mounted between centers is a solid vase-shape of hard, East Indian rosewood, perhaps eight inches long and two in diameter. The lathe has a foot treadle underneath and great, grooved drive wheels but these are disconnected. Electric motors will do the work.

Knox selects a tiny, polished cutting bit from among several hundred precisely arranged tools he keeps in a wooden chest that John Jacob Holtzapffel himself made, 125 years ago. The lathe has an intricate compound slide rest, like the ones metalturners use. This carries the cutting frame, a tool post with a chuck for the little fly cutter, and pulleys that will whirl it around in a high-speed circle. This particular frame, the vertical cutting frame, whirls the bit like a single-toothed circular saw: vertical, with its axis parallel to the axis of the lathe itself.

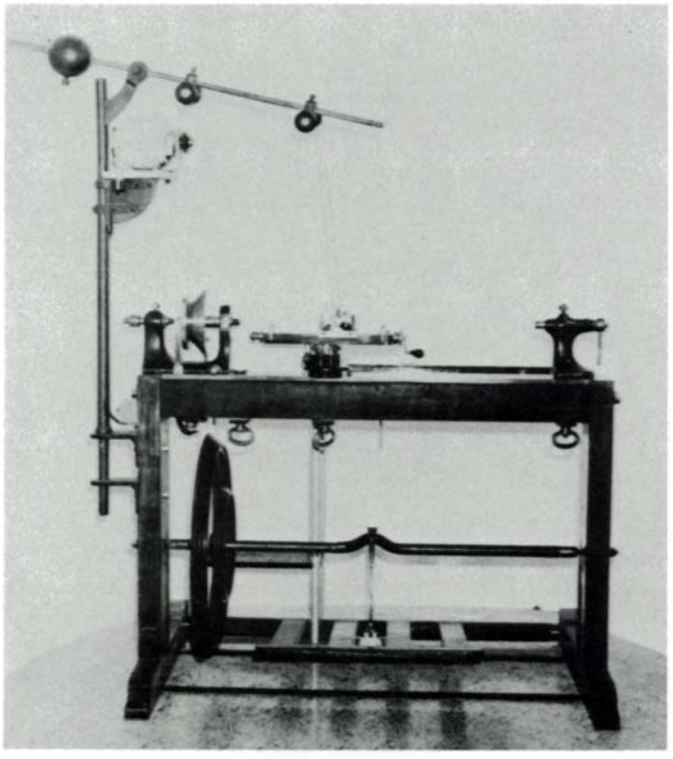
He makes a number of adjustments and sets some stops but does not turn on the lathe itself; the work remains stationary. The whirling tool slides in, snicks a little facet in the side of the vase, and slides out again. Knox rotates the work a few degrees and snicks off another tiny facet just touching the first. Soon there are 16 facets making a band, perhaps a tenth of an inch wide, all around the vase.

Should he choose to decorate the entire surface of the vase in this manner, he will have to make a thousand or more little cuts. Knox would be here all afternoon, winding the cutter in and out, counting the holes in the index plate that rotates the work.

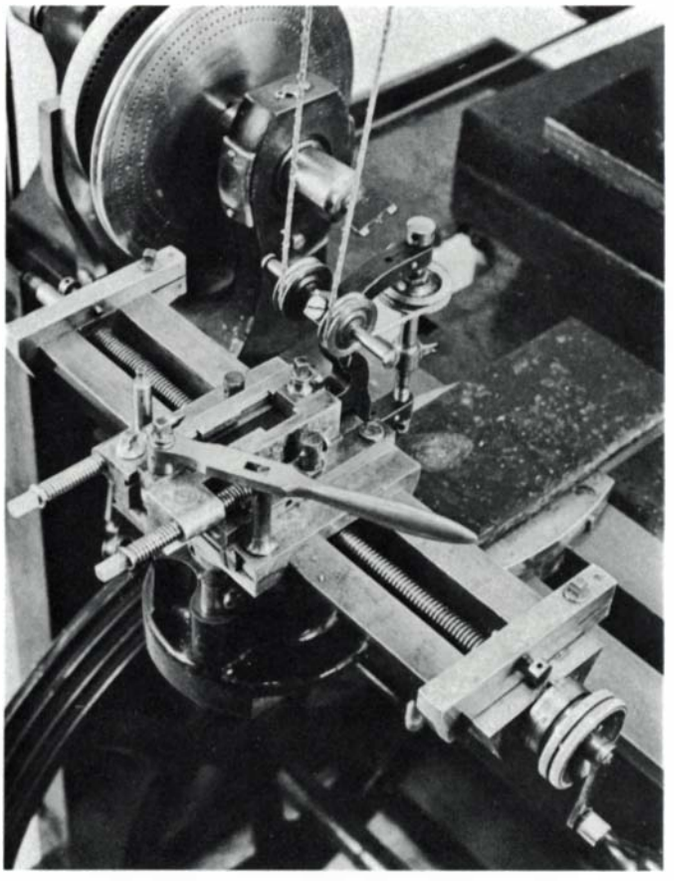
If he puts the pin in the wrong hole just once, the piece will not be perfect. If he catches the error right away he will be able to fudge it. Or else he will have to start over, making the whole vase just a little smaller, counting the holes, setting the pin and winding the cutter in and out.

This is complex and ornamental turnery, an intricate and most exacting method of turning forms with more than one axis of revolution, and of decorating the surface of turned forms. In its heyday it was the hobby of kings, princes and the very wealthy. Nobody else could afford the machine, the ivory that is considered the best material, or the time.

Knox is a semi-retired management consultant who, at 70, can afford to be aristocratic in his tastes and his manner. He is an authority on the design of business forms, on controlling paperwork in a bureaucracy, and on integrated cost control. He's written a couple of books about it. He likes precision and order. There is a similarity between gaining an overview



Knox's Holtzapffel lathe, made in 1853, has machined iron ways mounted on mahogany uprights and feet. Overhead arm carries pulley drive for cutting frame; weighted pivot arrangement maintains power as sliderest moves. Wooden pulley and treadle, originally connected to brass headstock pulleys, required leg thrust of 45 pounds and is replaced by two motors, one not shown for lathe itself and one on arm for cutters. At right, horizontal cutting frame is mounted on compound slide rest, which is set parallel to ways for between-center turning. Cords and pulleys bring power from



overhead motor. Tiny cutter at center of vertical shaft would cut reeding about 1/5-in. wide. Slide rest mainscrew has 10 threads to an inch and crank is calibrated to 1/200-in. Stops can be set to control horizontal and cross feed; shaped handle atop tool box propels cutter to workpiece and out again.

of business paperwork and keeping track of all those little facets.

The earliest ornamental turning lathes were made around 1700 and consisted mainly of thread-cutting lathes with devices for holding the work off-center. The independently driven cutting frame—the basis of the art today—was introduced around 1800, and no lathes were made after 1900.

The machine was perfected during the 19th century by the Holtzapffel family, toolmakers in London, who also compiled a five-volume treatise titled *Turning and Mechanical Manipulation*. The fifth volume is back in print, by Dover Publications, and is devoted exclusively to complex and ornamental turning.

Most of the lathes that still exist belong to members of the Society of Ornamental Turners. This group thought it knew the whereabouts or ultimate fate of every Holtzapffel machine until 12 years ago when its secretary, Wilfred Osborne, turned up a beautiful, disused specimen in an English schoolteacher's attic. Osborne got it for what Knox admits was a song and shipped it overseas with this advice: "Retire, and teach your wife to sharpen tools."

The machine arrived at Knox's midtown Manhattan apartment in a single 3,600-pound crate, and had to be unpacked on the truck to be toted inside. The next few years were spent with Holtzapffel's cryptic book, figuring out some of the things it could do. Knox keeps the machine, along with his Shopsmith and hundreds of blocks of rare hardwoods, in a room down the hall from his elegant apartment.

The key to the lathe is its division plate, a heavy brass disc that is part of the headstock. It has four circles of tiny holes drilled in its face: 360 holes in the outermost ring, then 144, 120 and 96. A little arm with a pin catches the holes, allowing the work to be rotated in increments as fine as a degree and locking it in place. To make a round turning into a 24-sided polygon, one would use the 96-hole circle and put the pin into every fourth hole. For 16 facets, use every sixth hole. Recall that the end of the cutter is perhaps 1/10-inch wide. When the first band has been cut right around the vase, Knox can use, instead of the first and fourth hole, the second and fifth. The stacked 24-gons will then be one hole out of phase, and so will step their way around the form. When the entire smooth surface has been turned into tiny, precise facets, the vase will appear to twist in a spiral.

Of course, Knox is not likely to wreck a pretty little vase by cutting a thousand facets on it. But he has been known to use an even smaller bit to put that many minute facets on the stem of a drinking goblet, or on a candleholder, or a pepper-mill. When the cutter is very small the facets disappear, creating a strange, knurled texture superimposed on the grain of the wood that the eye can't quite resolve but the hand can feel.

It is not possible to sand this kind of work, and so a razor-sharp cutter is essential. So too is a material that will not tear. Ivory is said to be the best but it is too expensive to consider these days. Blackwood is good, although large pieces are often flawed and must be patched with epoxy. Many of the tropical

These are the cutting frames which mount on the compound slide rest and carry the tools. They are driven by an overhead belt. The difference between them is the orientation of the whirling or revolving tool. The top left is the universal cutting frame, which has a pivot at its elbow and may be set at almost any orientation. Top right is the horizontal frame; a reeding cutter is visible on the vertical shaft below the single pulley. At center left is the vertical cutting frame—the tool fits into the slot at the end of the shaft and whirls parallel to the pulley. This is the frame Knox uses to cut a 24-gon band around a vase. Center, the eccentric cutting frame, which allows the bit to describe circles of varying sizes on a moveable axis. Center right is an original drilling frame, and at bottom is a modern drilling frame with a conventional Jacobs chuck. Photo at right shows some plain turning tools that came with the Holtzapffel.

hardwoods work well, particularly lignum, snakewood, cocobolo, rosewood, kingwood, camwood and amaranth.

The Holtzapffel tool box contains perhaps 400 cutters. Knox says he uses a dozen for most of his work, half of the rest once in a while, and the other half he hasn't ever used.

The lathe operates in three basic modes: (1) the work revolves with the tool stationary, as in ordinary turning; (2) the work is stationary and the tool is on the fly, like a milling machine; and (3) both the work and tool move in concert, as in cutting threads.

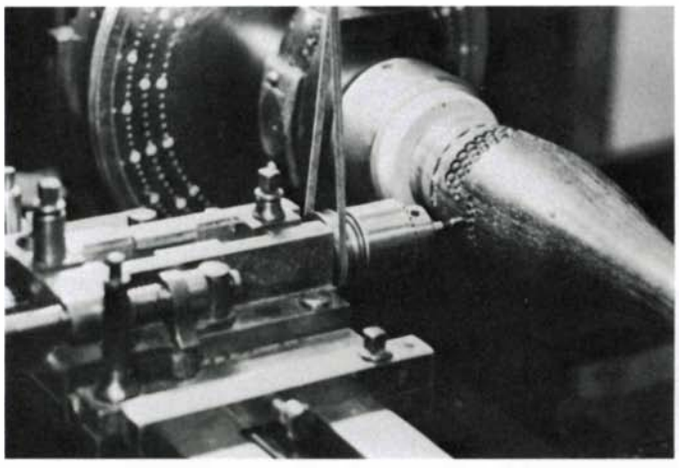
The various cutting frames orient the axis of the circle described by the whirling tool: parallel to the axis of the lathe, at right angles to it, or at an angle in between. Some of the tools are made to revolve like a drill and fit a standard chuck, although their tips may be shaped to cut pearls or stepped holes. The work itself, whether between centers or on a faceplate, can rotate on center, or off-center in a precisely controlled way, or it can be made to describe an ellipse rather than a circle. There is even a dome chuck on which to mount the work vertically, for cutting flutes on a hemisphere.

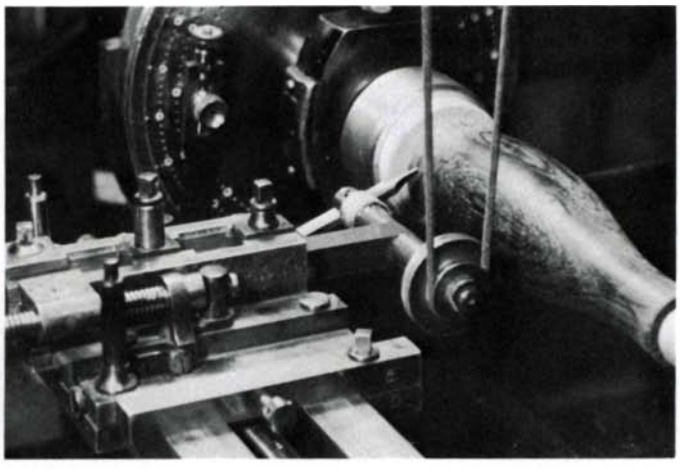
One begins to see some of the possibilities of such a machine. Consider a small bit with a semicircular notch cut in its end. Set in the horizontal cutting frame and allowed to traverse a straight-sided cylinder, it would cut nice, clean reeding. The machine comes with 16 brass gears that can be used in various combinations to connect the slide rest to the spindle itself, thereby cutting spirals ranging from 40 turns to an inch up to one turn in seven inches. Now the nice, clean reeds wind around the cylinder. Finally substitute a curvy vase for the cylinder, and make a template the shape of the vase. The slide rest will follow the template, and the reeds will wind their way around the curvy vase.

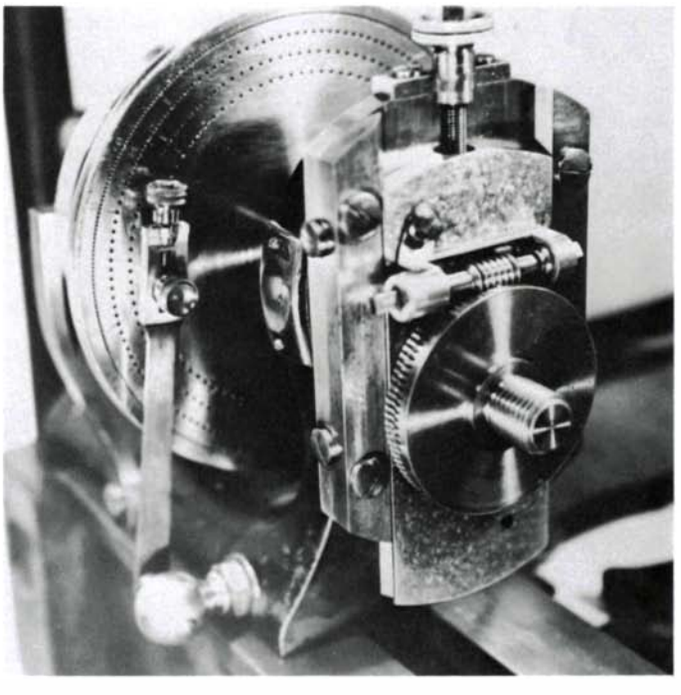
A similar bit with a round shank, chucked in a drilling frame, would make a little hemisphere, a half-buried pearl. Put them in a ring about the base of a chalice, or along it in a row. The toolbox contains bits for pearls of all sizes, and for their corresponding dimples. Some of the bits are stepped, to cut a stack of tiny discs of decreasing size, or inversely, a round, stair-stepped pit. Some cut a full reed or flute. Others cut half of a reed and half of the reed adjacent. Sharpening is a major chore and the toolbox contains two goniostats for holding the bits on the stone at the proper angle, one for flat cutters and the other for curved. Concave curves are honed on a series of little brass cones, spinning on a shaft and charged with abrasive powders.

An exercise in Holtzapffel's book is a series of what appear to be ivory spirals. In fact, each amounts to a stack of discs, the center of each disc offset slightly from the ones above and below. When the ivory is center-bored before turning the discs that form the spiral, and the hole plugged with a core of wood that is later removed, the result is an intricate ivory spring. The "celestial spheres" originally hand-carved in the Orient—an ivory sphere within a sphere within a sphere—were occasionally made by Victorian ornamental turners to demonstrate the capabilities of their lathes. The Science Museum in London has a square Gothic church tower made by Holtzapffel in ivory, 21 inches high, that appears to be a replica of Chartres or Westminster, complete with classical arched windows, delicate tracery and all the ornate trimmings. It was made entirely on the lathe.

Of all the strange attachments devised for ornamental lathes, the wierdest must be the geometric chuck. Originally developed in France as an instrument for drawing the curves arising from the planetary motions of two circles, it was adapted to the lathe about the middle of the 18th century. One end of the device screws onto the lathe spindle and the other carries a duplicate spindle, on which to mount the work, usually a flat plate or disc. Modern plastics work quite well. The two spindles are connected by an intricate arrangement of planetary gearing. The workpiece may be set off-center and geared to rotate either faster or slower than the spindle. Thus a stationary tool will inscribe an epicycloidal curve on the work, rather like the curve made by a child's Spirograph toy. Such a device may be made in more than one stage, as if several were mounted one atop the other. The resulting curves are fantastically interlooped rosettes. Holtzapffel made three of these geometric chucks with four stages, and one with seven stages. Even with the simplest of settings,







Above, a drilling frame holds a cutter that is making pearls on a vase surface. At right, a vertical cutting frame holds a straight cutter that is making tiny facets of polygonal bands about the East Indian rosewood vase shape. Below, Knox holds an example of spiral turning, while bottom photo shows eccentric chuck. This substitutes a spindle that can be set off-center for the lathe's own spindle. The chuck holding the work screws onto the eccentric nose. Now the entire chuck and the off-center workpiece can rotate on the axis of the lathe, or the work alone can rotate on the axis of the eccentric nose. In the background is the division plate with its rows of holes. The arm at left carries a pin to index the holes. The screw atop the arm allows for fine adjustment.

a great deal of work is involved in getting it to produce a symmetrical figure, since as many as 75 gears may be in mesh at once. The seven-stage horror could be set to give an ultimate ratio of 30 million to one—and at a spindle speed of 1 rpm it would take about 60 years to go through its cycle.

After all this the proper question is, can a woodworker dabble here by modifying his own machinery? Knox doesn't think so. But Tubal Cain, writing several years ago in the British magazine Woodworker, suggests otherwise.

A metal-working lathe is more appropriate than a woodworking lathe because it already has a compound slide rest, a more suitable speed range, and is more rigid. Cain suggests first adding a division plate with which to index the work, recommending rings of 144, 120 and 96 holes. The 360-hole ring is too fine to be of much use.

A drilling frame to fit the tool post could be made by end-drilling a bar of the appropriate size and inserting a shaft with bearings and a pulley on one end and a Jacobs chuck on the other. It could be driven by a separate motor and small belt, or by a flexible shaft and router or Dremel.

A cutting frame would require more difficult machining, but Cain supplies a drawing. The key things are good bearings and absolutely no slop. Cutters should be made of silver steel, tempered to straw, and from 1/4 and 3/16-in. drill rod.

The most-used special chuck is the eccentric chuck. One could contrive to attach a lathe topslide to a faceplate, providing there is enought clearance over the ways.

In the 12 years since he acquired his obsession, Knox has completed 102 objects. Some contain as many as 13 different pieces of wood. He says some of his 275 fellows in the Society of Ornamental Turners are fascinated by the intricacy of the machine, while others, like himself, enjoy doing the work and the final result.

"I look at myself only as an instrument for bringing out the beauty of the wood," he says. "The surface decoration must be complimentary to the wood—one hopes the applied decoration enhances the wood itself. You have to be clear about what you are going to do when you start, but often you don't end up with what you thought. The machine has its limitations, but nobody has yet explored those limitations and probably never will."

Heat Treating

Making (or fixing) your tools

by Gordon S. Harrison

Cutting edges made of unalloyed, high-carbon steel are essential to the woodworker's craft. Chisels, plane irons, axes, adzes, gouges, saws, knives, shaves, scrapers, rasps, and bits are simply different configurations of a sharpened, carbon steel blade. The cutting edges of steel woodworking tools must be heat treated to give them the proper combination of hardness and toughness. It may become necessary for you to heat treat a cutting edge in your own shop. You may have spoiled the temper of a chisel by grinding; the factory temper of a gouge may not suit you because the cutting edge is either too soft or too hard; you may want to dress the edge of a large tool such as an ax or adze that is too hard to grind, in which case you must soften the steel by annealing to work it, and then re-harden it; or you may want to make a tool from an old file or leaf spring. Even if you have no occasion to heat treat a tool yourself, you should know how to tell if a cutting edge has been spoiled by overheating. In sum, a knowledge of heat treating is important to a self-reliant woodworker.

There are three steps to heat treating an unalloyed carbon steel cutting tool: annealing, hardening and tempering. Annealing is done by heating the steel to full cherry red and then cooling it very slowly by burying it in an insulating bed of lime or ashes. This softens the steel and prepares its grain structure for hardening. Hardening is done by heating the piece of annealed steel to a full cherry red and then quenching it suddenly in an oil, brine, or water bath. This makes the steel extremely hard and also extremely brittle. Tempering is done by heating the hardened steel to about 500° F. This reduces somewhat the hardness of the steel so it can be hand honed, as well as the brittleness so the tool will not break in use.

The photographs show the hardening and tempering of a drawknife I recently forged from a salvaged automobile leaf spring. First I annealed the entire forging blank overnight in the ashes of a dying fire in my woodburning shop stove.

Annealing eliminates the effects of previous heat treatment on the internal crystalline structure of the steel. Annealed steel has a fine grain structure and is soft, tough, ductile, and easily worked cold with files, hacksaws and abrasives.

A good portion of your tool, from the tip of the cutting edge back toward the handle, should be annealed. Even though it will only be necessary to harden and temper the tip of the tool, you want as much as possible of the remainder of the steel to be soft and tough so that it will not break in service. If you are working with a gouge, anneal at least 4 inches up from the cutting edge. If the gouge is a commercial product, the stem and tang are probably well softened already, but you should anneal the 4 inches anyway because you do not know how much of the tool was hardened at the factory. If you are starting to fashion a file or piece of spring steel into a tool, anneal the entire piece of stock.

To anneal a piece of high-carbon steel, you must thoroughly heat it to between 50°F and 75°F above its critical temperature and then cool it very slowly. When the critical temperature of a piece of carbon steel is reached, its crystalline structure is fundamentally transformed. The critical temperature, also known as the transformation point, depends upon the precise carbon content of the steel. However, the critical temperatures (or the transformation range) of the carbon steels you are likely to be working with are in a narrow range, from about 1350°F to 1400°F. Thus, 1450°F is hot enough to anneal carbon steel, and also to harden it.

There are several precautions to observe as you heat the steel to 1450° F. Heat it slowly so that the temperature rises gradually and evenly over the entire section to be annealed. Heat it thoroughly so the heat penetrates uniformly through its entire thickness. Do not greatly overheat the steel, for even if you do not destroy the steel by burning it (around 2200° F) you may seriously coarsen the grain, which will impair subsequent hardening and tempering. Most carbon steels will go to

Once forged and ground, the draw knife is heated with an oxyacetylene torch to a bright cherry red, or about 1,450 degrees. As soon as the steel is heated to cherry red, it is hardened by quenching rapidly in a bath of used crankcase oil (5-30 SAE).

HEAT GLOW TEMPERATURES
(in semi darkness)

Temp. °F	Color
1125	dark red
1300	blood red
1350	low cherry red
1400	medium cherry red
1450	cherry red
1500	bright cherry red
1550	full red
1650	bright red
1750	orange
2100	yellow
2250	white

TEMPERING TEMPERATURES

Temp. °F	Oxide Color on Polished Surface	Woodcutting tool
450	straw	wood engraving tools
475	light orange	gouges, plane irons, drawknives, chisels, center punches, cold chisels, heavy tools that are struck with a hammer
500	bronze	
525	purple	wood borers, reamers, molddding and planing cutters for hardwood, axes, adzes, wood bits, augers, thin or delicate carving knives, chisels, gouges, turning tools
550	full blue	
575	medium blue	molding and planing cutters for softwood, saws
600	pale blue	
625	grey	

1700°F or more before grain coarsening damage begins. Do not direct the flame directly onto the bevel of the cutting edge. Rather, allow heat to penetrate this delicate area of the blade from the thicker adjacent material.

Use a torch for heat. It is possible to bring a small, thin piece of steel to its transformation temperature with a standard propane torch. However, you will have trouble sweeping a propane torch across an object of any size, because there is not enough heat in the flame to evenly raise the temperature of the steel. In this case the heat dissipates too fast, partly because the unheated adjacent steel acts as a heat sink. Thus, a tool about the size of my drawknife, needs an acetylene flame from a Turbo Torch, Prest-O-Lite torch, or oxy-acetylene torch. Use a neutral flame. Make the torch stationary and hold the work in both hands.

How do you determine that the temperature of the steel has reached 1450° F or thereabouts? The traditional method, used by blacksmiths for centuries, is observing the color of the heated steel in semi-darkness. Carbon steel reaches its transformation point when it glows a full cherry red. By the time it has become bright red it is well beyond the transformation point, and when it is orange it is near 1800°F.

Another way to determine temperature is with commercial temperature indicating crayons, such as Tempilsticks. Below its temperature rating, the crayon leaves a dry opaque mark; when its temperature is reached, the mark turns to a liquid smear. I have found Tempilsticks to be invaluable in tempering hardened steel. In the higher heat ranges, 1400°F to 1500°F which we are discussing here, the crayons are more difficult to use, and it is easier to rely on the color of the glowing steel. It is imperative to view the heated steel in a partially darkened room, because brightness will dull the color and you are sure to overheat the work.

When the steel has been heated to a full cherry red, it must be cooled very slowly. Bury it immediately in a bed of dry lime. If lime is not available, dry fine ashes may be used as a

The hardened knife shows oxidation rings, where the curve begins. Temperature-indicating crayon for 500° F is applied to the entire bevel and the blade is ready to temper with a propane torch (right).

The finished drawknife with walnut handles.

substitute. A small piece of steel may take several hours to reach room temperature. A stouter piece may take ten or twelve.

When the steel has cooled it is fully annealed. It is suitable for grinding, filing, and other cold working, and after that you are ready to harden the cutting edge. To harden plain carbon steel, you must heat it slightly above its critical temperature just as you did to anneal it, but instead of cooling it slowly, you must cool it rapidly. Plunge it into a quenching bath of water, brine, or oil. The quench stabilizes the molecular structure of the steel in a condition known to metallurgists as martensite. This particular structure imparts maximum hardness.

Only the portion of the steel that has reached the transformation point will harden when quenched. It is only necessary to harden the cutting bevel and an inch or so back from it. Observe the same precautions as when heating the steel for annealing: heat slowly and evenly; heat thoroughly; do not overheat; let the heat seep into the bevel from adjacent metal.

I prefer, and recommend, used crankcase oil for a quench. It is not as severe as water or brine and the relatively slower quench minimizes the risk of fracturing or distorting the steel. Plunge the heated steel into the bath absolutely vertically, blade first. Distortion will occur if the sides of the blade are quenched differently. There is a danger of igniting the entire bath of quenching oil only if the workpiece is large and contains a great deal of heat and the container of oil is small. This combination should be avoided in any case because it will not properly quench the workpiece.

When withdrawn from the quench, the cutting edge is extremely hard and brittle. It is still not ready to use because it is too difficult to sharpen and is liable to break or crack. The blade must be tempered.

Tempering softens the metal slightly from its state of maximum hardness, restoring a measure of toughness and ductility. To temper a piece of hardened carbon steel you simply heat it to a predetermined temperature below approximately 1000°F. The higher you heat it (below 1000°F), the softer and tougher it becomes. You can temper your tool to the degree of hardness that suits your tastes or needs. The harder the temper, the longer the blade will hold an edge but the more difficult it will be to hone; the softer the temper, the keener an edge the blade will take and the to hone, but the quicker it loses its sharpness.

Most kitchen ovens will heat to 550°F, which makes them a convenient place to temper your hardened workpiece. Let the piece soak thoroughly in the oven heat for 15 or 20 minutes after it has reached the proper temperature. The rate at which it cools after tempering does not alter its properties, so you may quench it or let it air cool.

It is also possible to temper with a torch. The danger is getting the cutting edge too hot before the heat has thoroughly and evenly penetrated the entire hardened portion of the workpiece. Therefore I use propane flame to temper because the steel heats more slowly than it does in an acetylene flame. Also, I use a Tempilstik to tell me when the selected temper has been attained. Apply the crayon to the entire bevel. When the dry crayon material turns liquid across the width of the bevel, quench the heated portion of the tool to prevent more heat from running into the bevel and ruining the temper.

It also is possible to judge the temperature of the steel visually as it is being heated. The clues are not the glow but a spectrum of colors caused by oxides that form on the polished surface. Each color of the spectrum indicates a specific temperature.

As you apply heat well back from the cutting edge, the oxidation colors will begin to run in both directions away from that point. Just as the color that matches the selected temper reaches the cutting edge, quench the tool.

I do not recommend this method of tempering. It is too difficult to control, especially on long blades. Your kitchen oven or a temperature indicating crayon will give a more accurate result. However, you should learn the colors of the oxidation rainbow, for it they suddenly appear on the edge of a chisel that you are grinding, or on the teeth of a table saw blade that overheats in a piece of hardwood, the steel has lost its temper. A pale blue or grey would indicate significant softening of the blade.

Heat treating always leaves a ring of oxidation colors on the surface of the steel. These can be removed with emery cloth or a buffing wheel and emery compound. If they are obstinate, you can pickle the steel in a bath of sulphuric acid. I use battery acid just as it comes from the service station (called electrolyte, it is sulphuric acid that is about 64 percent distilled water by weight). Rinse in cold water and buff.

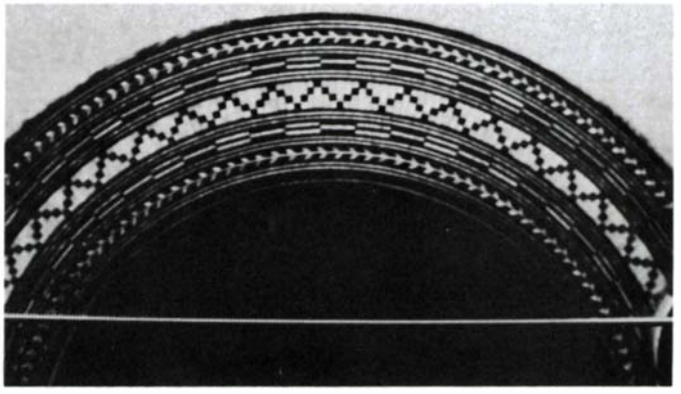
Before you set out to heat treat your favorite tool, practice with an old file or spring. Mild steel, of course, will not harden; you must use an unalloyed, high-carbon steel such as is used in files and springs. Be sure you can recognize the transformation point of the steel from its heat glow. Heat and quench a test piece at various shades of red, and attempt to file the steel after each test. If a file does not cut the steel, hardening occurred, which means the transformation point was reached; if it cuts, hardening did not occur and the transformation point was not reached.

[*Authors' note:* Tempilstiks are made by the Tempil Division, Big Three Industries, Inc., 2901 Hamilton Blvd., South Plainfield, NJ 07080. These crayons are calibrated to melt at systematically spaced temperatures from 100°F to 2500°F. They cost about $3.00 each. Tempilstiks are available in the transformation range of carbon steel at 1350, 1400, 1425, 1450, 1480, and 1500°F, and in the tempering range at 450, 463, 475, 488, 500, 525, 550, and 575°F.]

Mosaic Rosettes

Making a traditional guitar element

by A. Thomas Walsh



One traditional as well as decorative element in guitar construction is the mosaic rosette which adorns the sound hole. The rosette originated in the Middle East, and even today some of the finest handmade ones come from Iran. The marquetry involved in making rosettes may appear complex and difficult, yet is actually quite simple—although time-consuming. Patience is the secret ingredient.

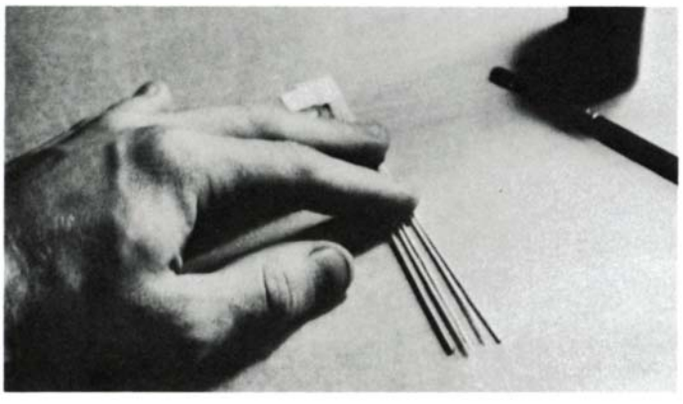
A rosette consists of a number of mosaic tiles sandwiched between strips or bands and arranged to form a pattern. The tiles are cut from a mosaic "log" made up of different-colored strips that have been glued together into "planks." (Square wooden strips are available from certain luthier supply houses, such as H. L. Wild in New York City.) Strips come 1/32, 1/16 and 3/32-inch square and are available in different colors: white (maple), brown (rosewood), red-dyed, blue-dyed and green-dyed. I like using 1/32-inch square strips because of the delicate patterns I'm able to create.

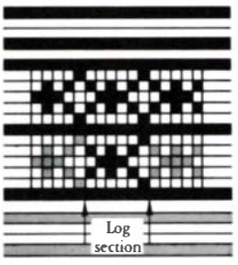
Begin by designing your rosette on a piece of graph paper. Figure out the pattern for the mosaic log and the banding of the rosette. Some complex rosettes require two or more different logs. You will need liquid hide glue, a small brush, a straight-edge and waxed paper. Cut the number of colored strips needed to make the log nine inches long, and group and order them according to their layer in the log. Cover one end of each of the different layers or "planks" with masking tape so as not to confuse the order.

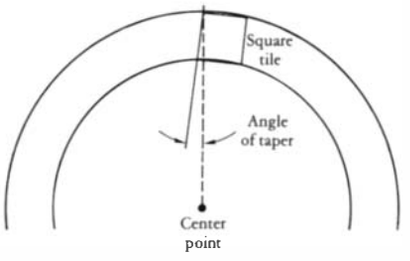
Now put a piece of waxed paper on a flat surface and place the first layer of sticks on it. Fan out the sticks and apply hide glue with the small brush to the area between the sticks. Squeeze the sticks together and remove the tape, forcing glue up through the end. When the glue has set, carefully wipe off the excess and gently lift the sticks to a clean portion of the waxed paper. With a straight-edge, make sure the layer isn't curved. Allow it to dry and proceed in the same manner with the remaining layers.

After all the layers are dry (about one hour), carefully scrape them with a small steel scraper or a razor blade to insure that they are flat. Now stack the layers in order and check the end pattern against your design. Apply a thin layer of hide glue between the layers and press them together with your fingers. Allow them to dry thoroughly.

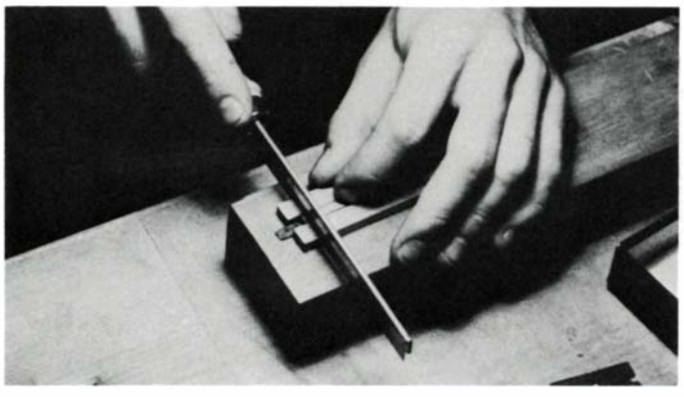
Cover a flat piece of wood around 3/4 by 8 by 12 inches

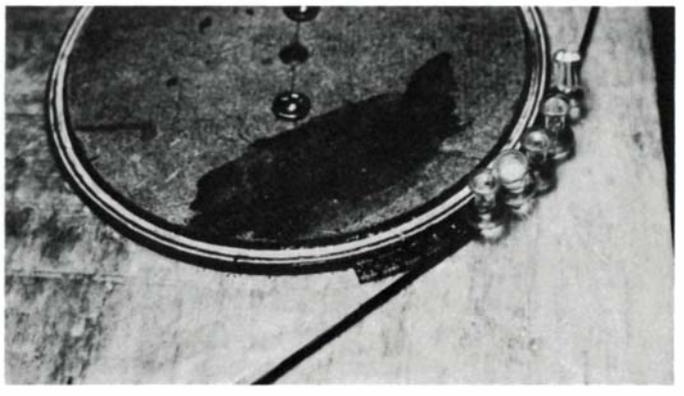






Completed guitar rosette is shown above, with another typical pattern shown in the drawing below. At left the sticks are fanned out before gluing, while below the log is cut into tiles. Taper angle for log is shown in drawing at right. Assembly with push pins is below.





with waxed paper, taping the edges. You will also need a 3-9/16-inch diameter circle, or the size of the sound hole, cut from 1/8-inch Masonite, and fastened to the wood.

Mosaic tiles from the log have to be tapered so that they will fit around the circle. Carefully scrape both sides of the log to a uniform taper. The log must be cut into 1/16-inch thick tiles. I use a small back saw which has 38 teeth per inch. A small miter box must be built to immobilize the log while cutting tiles, so that they don't become dislodged. Saw a slot at one end and glue in a stop, so that the cut tiles will have uniform thickness.

Bandings are cut from purfling strips and should be wood, not plastic. To make a rosette, the longest strip you will need is about 18 inches. Thick wooden strips must be pre-bent to avoid cracking. Soak them in hot water until pliable and bend them into a slightly smaller circle than needed. Then clamp the ends and allow the strips to dry.

For the next step you need glue, tweezers, about 12 long push-pins, a small brush, an X-acto knife and a cup of water.

Work under a good light source and take your time. Place your design within easy sight, and wrap the first band around the Masonite circle, overlapping the ends. Cut through the band so the ends butt and the band is tight around the circle. Apply some glue to the joint and use the push-pins to hold the strip in place against the circle. Gluing the first band to the circle prevents it from moving while you are working. Fit the next band and apply glue to the outside of the first and inside of the second, and wrap snugly around the circle using the push-pins to hold it in place. Allow ample time for the glue to set and repeat the process until the mosaic part is reached. Be sure to keep the bands tight and join each one in a different spot. If one band is loose, the rosette will become out of round.

Assembling the tiles

Now cut three tiles from the log, and using the pair of tweezers, dip them in and out of the water. Water softens the glue in the tiles and aids in tightly fitting them together. Apply glue to part of the last strip and position the tiles against this strip, also gluing where the tiles butt. Now glue the next band to the outside of the tiles, again using push-pins to hold it in place. With the tweezers, push the tiles into an unbroken pattern. If the tiles need more taper, rescrape the log and continue with the process of sandwiching the tiles between the outer band and the circle. If still more taper is needed, scrape until the tiles join well. When the mosaic portion is complete, continue with the rest of the outer bands using the same technique as with the inner bands.

After the rosette is completed and the glue is dry, free the Masonite circle and sand the rosette top until it is flat. Remove the waxed paper from the other side and store the rosette between two flat surfaces until you are ready to inlay the top of the instrument. Any bad defects in the rosette can be hidden by the bottom end of the fingerboard. The ring is inlaid so that it protrudes slightly above the soundboard. I glue it with Titebond glue and carefully sand and scrape it flush with the top.

Fine-quality rosettes may be purchased from luthier supply houses, but then one personal touch is missing from the instrument. I take pride in producing rosettes for my handmade instruments which are as much an expression of myself as is my signature on the label inside.

Shaped Tambours

Some design considerations

by Mark Sfirri

I wanted to design a cabinet with a tamboured front. Since I often feel that traditional tambours read visually as a bundle of sticks, my goal was to design something more imaginative than a simple rounding or beveling over the length of the tambour.

There are two limitations: The backs of the tambours must be flat and the width across their face must be uniform. These considerations insure a smooth, clean travel as the tamboured door "disappears" into the cabinet.

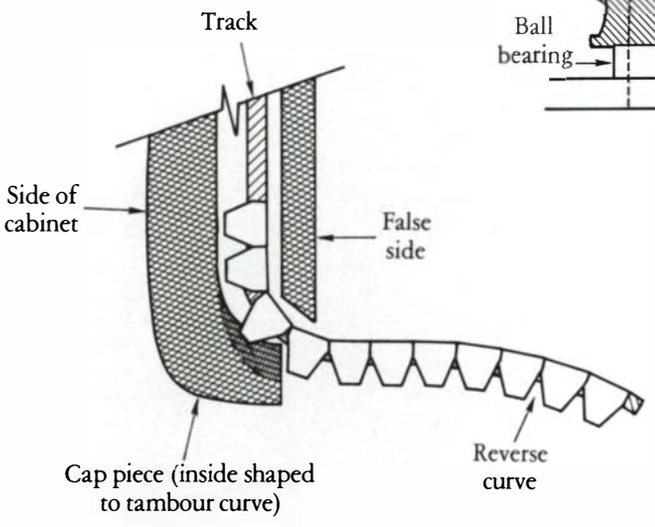
I designed a tambour which gracefully bellies out two-thirds of the way down the length. When determining the curve of the tambour, it is important to draw a plan view of the cabinet showing the track of the tambour, false sides, actual sides and the cap piece. This drawing is needed so that allowances can be made in the carcase for the curve of the tambour. The cap piece will have to be shaped on the inside to accommodate the curve. Because of the curve, more space is needed between the track and the actual side. It is also a good idea to make several tambours and mock them up in the curve of the tracks, paying particular attention to any tight radii. It may be necessary to ease off the radius so that the tambours will not splay open as much.

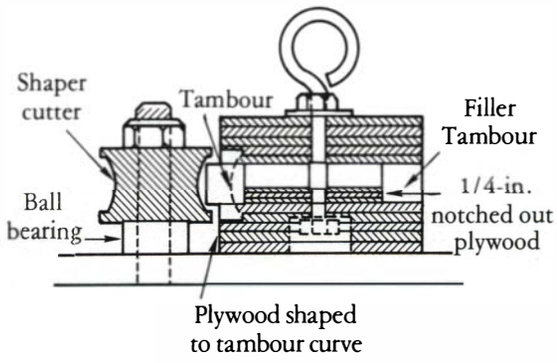
To reproduce the desired shape precisely on each tambour, I made a flush trimming jig for the shaper out of three pieces of plywood. The bottom piece (3/4 inch) has the exact shape of the tambour bandsawed out. The middle piece (1/4 inch) is notched out so that a tambour will fit in snugly. The top piece (3/4 inch) serves as a clamping surface for two eye bolts. The eye bolts also act as handles for the jig. The bottom part of the jig rides against a ball-bearing guide and the cutter shapes the tambour.

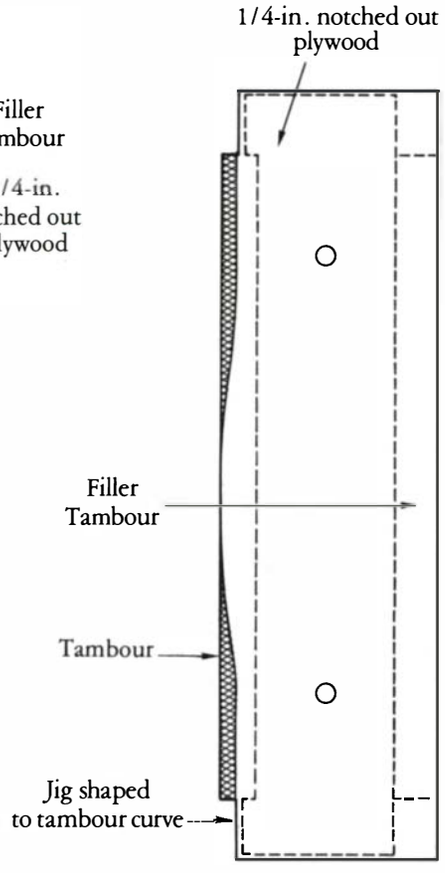
Each tambour was individually shaped in the jig. I then laid them out and realized that they still looked like flat sticks. The only place where the shaping could be seen was where the tambours disappeared behind the cap piece.

At this point I decided to bevel the tambours to bring out the three-dimensional quality of the shaping, for esthetic reasons and also out of necessity. The track that the tambours run in has a reverse curve. If the tambours were not beveled, they would bind at the points where they belly out. The beveling can be done on the table saw but a more effective method is to set up the router with a straight bit on a router table and tilt the router to the desired angle. Using the router leaves a smoother surface which requires less sanding. After beveling, the already shaped tambours are narrowest where they belly out the most and wider at the ends, where they are thinner.

Next I glued the tambours to #10 canvas with animal hide



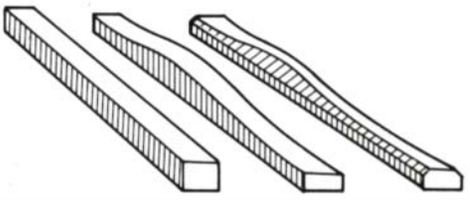




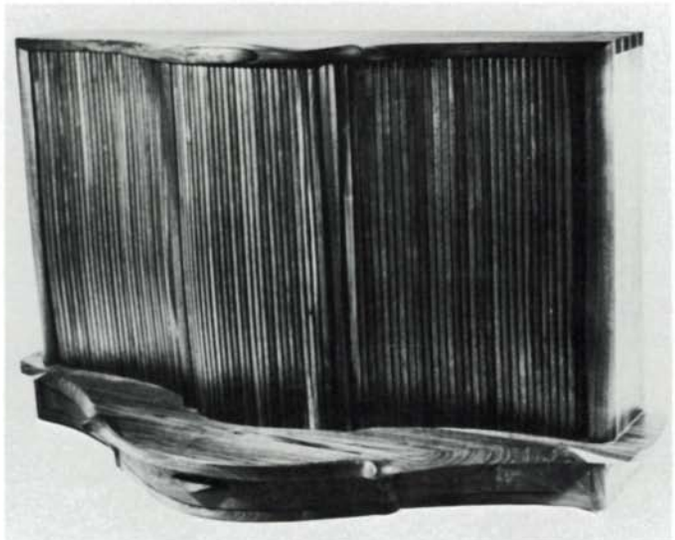
glue (hot glue). Because of the bevel, I couldn't connect the tambours with wire, which would be visible when the tambours went around the curve of the track. After I got the tambours assembled and working in the cabinet, I realized that canvas was visible between the tambours where they turned a tight radius. I stained the canvas black to make it less noticeable behind the dark walnut. Fortunately the animal hide glue also took the stain. Had I used some other type of adhesive, this might not have happened. If you plan to stain the canvas, be sure that the glue you are using will take the stain.

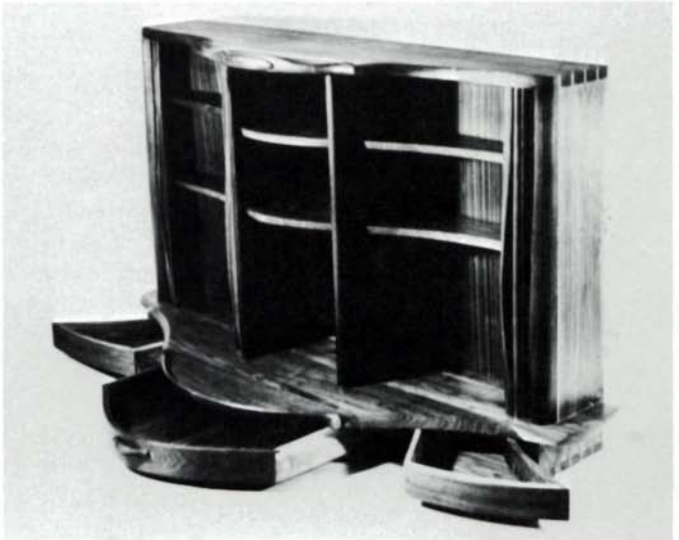
When the shaped tambours are together, the subtle contrast of form and shadow creates an intriguing visual effect. This effect is illustrated in the liquor cabinet I have designed and constructed.

[*Author's note:* For readers interested in pursuing the subject of tambours, I recommend *The Encyclopedia of Furniture Making* by Ernest Joyce as the best source of general information.]

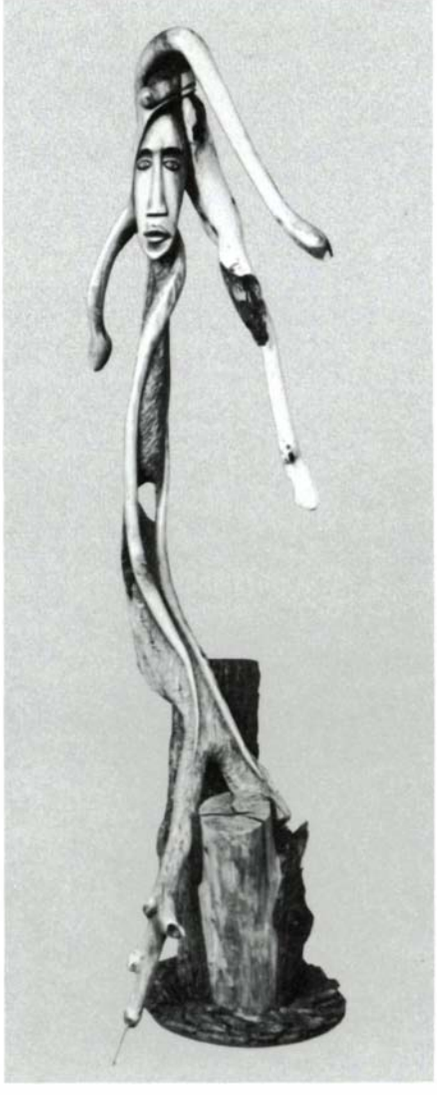


Walnut liquor cabinet by the author is 58 inches wide, 34 high. Plan drawing (upper left) is necessary to determine carcase clearances needed for shaped tambours (above). Flush trimming jig for shaping tambours is at top center and right.





Cassidy's Princess of the Planes (*above*), *12-in. high, $125.*
Bond's Devil Anse Hatfield (*right*), *12-in high, $125.*
Ameredes' Medusa (*below*), *75-in. high, $700.*



Buckeye Carvings

Highlights of a summer show

by Rudolf Schubert

Over a thousand pieces by 95 carvers from eight states were exhibited at the Columbus (Ohio) Chippers' fourth annual wood carving exposition. Works included one-inch miniature reproductions to six-foot abstracts. Styles ranged from fine furniture to highly stylized creative art. Walnut was the predominant wood.

Harry Ameredes' "Medusa" is an excellent example of highly stylized wood sculpture. The monolithic walnut figure and separate walnut base beautifully contrasts light sapwood and dark heartwood. Fine checks in the original log and carved recesses are expertly highlighted with stains to create depth in a very slender piece. Additional texture is created by judicious use of a rasp on some of the previously smooth surfaces. The bark on the base has been removed, dried and glued back on.

John Bond's caricature of "Devil Anse Hatfield" is one of a series of West Virginia folk heroes he is carving. It is sculptured from one piece of wild cherry. The lightly sanded, but still highly textured chisel-cut surface is ideally matched to this ruddy folk hero. However, one wonders if the large, striking piece (finished with boiled linseed oil diluted with turpentine) will withstand checking from the vagaries of the weather.

The difficulty of carving large, solid pieces in the round is well illustrated by Tom Cassidy's bust, "Princess of the Planes." Chiseled from a catalpa log, which is only supposed to shrink by about four percent when green, the piece now shows a thin hair-line check running from the hair down to the nose. Cassidy points out that this occurred when going from a cold vehicle into a warm showroom last February. This is unfortunate as the figure is well executed. Warmth, compassion and life literally radiate from the face. The utilization of grain is superb.

Hardwood Sources

A first listing for the craftsman

Editor's note: This is our first pass at a list of hardwood suppliers in the United States who sell lumber in quantities of 1000 board feet or less or who deal in hardwood plywoods, or veneers in less-than-a-flitch quantities. The listing is the result of the response to a questionnaire we sent out to every hardwood dealer we knew of. We hope readers will let us know of others.

The key to this is:
(1) Dom—Domestic lumber
(2) Imp—Imported lumber
(3) AD/KD—Air dried/Kiln dried
(4) Min—Minimum board foot quantity of lumber sold.
(5) Veneer—if available in less-than-a-flitch quantity
(6) Planks—if available thicker than 8/4 inches
(7) Logs—if available
(8) Plywood—Hardwood plywood if available
(9) Unusual species in stock, or specialties of the firm

Alabama

Buchanan Hardwoods, Inc., PO Box 960, Selma 36701. (205) 872-0491. Dom. & imp. AD/KD, min. 1000. Planks, logs.

Alaska

Hardwoods, Inc. Alaska, 1940 Spar Ave., Anchorage 99501. (907) 278-9546. Dom. & imp. KD, min. 10. Planks, plywood. Koa.

Arizona

Southwest Hardwood Co., 2113 E. Jackson St., Phoenix 85001. (602) 244-0301. Dom. & imp. KD, min. 10. Dom. & imp. veneers; basswood planks, plywood. Ebony, padauk, rosewood, purpleheart, zebrawood.

Spellman Hardwoods, Inc., 2865 Grand Ave., Phoenix 95017. (602) 272-2313. Dom. & imp. KD, no min. Dom. & imp. veneers; planks, plywood.

Visions in Ironwood, 10401 N. Cave Creek Rd. #2, Phoenix 85020. (602) 997-2701. Dom. AD, min. 1. Planks, logs. Ironwood, olive, mesquite, pecan, eucalyptus.

California

Robert M. Albrecht, 8635 Yolanda Ave., Northridge 91324. (213) 349-6500. Dom. KD, Imp. AD/KD, no min. Dom. & imp. veneers; planks, logs. East Indian ebony, elephant ivory.

American Hardwood Co., 1900 E. 15th St., Los Angeles 90021. (213) 749-4235. Dom. AD/KD, imp. AD/KD, min. 50. Planks, plywood. Teak, wormy chestnut, wormy oak.

Baker Hardwood Lumber Co., PO Box 181, San Diego 92112. (714) 239-4181. Dom. & imp. KD, min. 10. Planks, plywood.

Baser & Co., Inc., 1100 Glendon Ave., Los Angeles 90024. (213) 477-7551. All SE Asian hardwood plywood.

Del Valle, Kahman & Co., 215 Market St., San Francisco 94105. Plywood. Lauan, ramin, kapur, birch, oak.

Forsyth Hardwood Co., 355 Bayshore Blvd., San Francisco 94124. Dom. & imp. KD, no min. Planks. Oak, ironbark, oak table slides.

Jordan International Co., 379 Beach Rd., Burlingame 94010. (415) 342-6048. Dom. & imp. KD, min. 10. Dom. veneers; planks, plywood. Dao, lignum vitae.

M & H Wood Products, Inc., PO Box 310, Claremont 91711. (714) 621-3994. Dom. KD, min. 500. Planks, logs. Redwood & walnut burl type slabs & tables.

MacBeath Hardwood Co., 2150 Oakdale Ave., San Francisco 94124. (415) 647-0772. Dom. & imp. AD/KD, no min. Dom. & imp. veneers; planks, logs, plywood. Over 50 species, alder to zebrawood.

North American Plywood Corp., 3333 S. Malt Ave., Los Angeles 90040. (213) 723-3319. Plywood. Finland birch plywood and film-faced concrete shuttering forms.

Pacific Hardwood Sales, 1918 Park St., Alameda 94501. (415) 521-4702. Dom. KD, imp. AD/KD, min. 1000, depending on specie.

Pacific Plywood Co., 5233 Randolph St., Los Angeles 90040. (213) 773-0461. Hardwood plywood.

Pan Asiatic Trading Co., Inc., 2735 E. 11th St., Los Angeles 90023. (213) 268-2721. Hardwood plywood. Doorskins.

Penberthy Lumber Co., 5800 S. Boyle Ave., Los Angeles 90058. (213) 583-4511. Dom. & imp. KD, min. 100. Planks, logs. Rosewood, bubinga, ebony, wenge, padauk, zebrawood, goncalo alves, jelutong, shedua.

Saroyan Lumber Co., 3000 Exposition Blvd., Los Angeles 90018. (213) 292-0366. Dom. & imp. AD/KD, no min. Planks. Teak, walnut.

Sawdust & Shavings, Inc., 3518 Chicago Ave., Riverside 92507. (714) 781-0564. Dom & imp. KD, no min. Dom. & imp. veneers; planks, logs, plywood.

Simmons Hardwood Lumber Co., Inc., PO Box 368, Montebello 90640. (213) 685-5880. Dom. & imp. KD, min. 200. Planks.

Southern Lumber Co., 1402 S. First St., San Jose 95110. (408) 294-1487. Dom. & imp. KD, no min. Dom. & imp. veneers; planks, logs, plywood. Exotic hardwoods.

Stewart Plywood, Inc., 17120 Valley View Ave., La Mirada 90638. (213) 921-3531. Imp. veneers; plywood. Teak, plywood for use in boats.

Taesung Lumber Ind. Co., Ltd., 624 S. Grand Ave., Los Angeles 90017. (213) 627-9357. Imp. AD, no min. Imp. veneer; plywood.

Toal Lumber Co., 16932 B Valley View, La Mirada 90638. (213) 587-2269. Dom. & imp. KD, min. 500. Planks. Hawaiian koa and robusta.

Vance Lumber Co., 14720 Nelson Ave., City of Industry 91744. (213) 968-8353. Dom. & imp. KD, min. 500. Planks, plywood.

White Brothers, 4801 Tidewater Ave., Oakland 94601. (415) 261-1600. Dom. & imp. KD, no min. Planks, plywood. Exotics.

Colorado

Fries Bros. Wood, 3911 Lynda Lane, Fort Collins 80521. (303) 482-6030. Dom. AD, no min. Logs. Applewood.

Hinterreiter & Bailey Hardwood Lumber Co., PO Box 203, Denver 80201. (303) 825-2269. Dom. KD, no min. Planks, plywood.

Sears Trostel Lumber Co., 351 Linden St., Fort Collins 80521. (303) 482-1928. Dom. AD/KD, imp. KD, min. 10. Dom. & imp. veneers; planks, plywood. Rosewood, heavy basswood for carving, zebrawood, koa.

Connecticut

Allied Plywood, Inc., 2882 Main St. Hartford 06101. (203) 522-0214. Dom. & imp. KD, min. 10. Dom. & imp. veneers; planks, plywood. Teak, rosewood, zebrano, ebony.

Florida

Exporting & Purchasing Service, PO Box 146, Hialeah 33011. (305) 592-6905. Imp. AD, no min.

Florida Pacific Lumber Co., PO Box 470334, Miami 33147. (305) 691-9272. Dom. & imp. KD, no min. Planks. Teak, poplar, oak, birch.

Florida Southern Plywood Corp., 2610-50 Phyllis St., Jacksonville 32204. (904) 387-2546. Dom. veneers; plywood.

Tom Gaskins, Palmdale 33944. (813) 675-2951. Cypress knees, no min.

House of Plywood, Inc., PO Box 2614, Tallahassee 32304. (904) 222-0860. Dom. veneers; plywood. Birch, gum, mahogany, walnut, red oak, knotty white pine.

Miami Brokers, Inc., PO Box 470235, Miami 33147. (305) 836-0502. Dom. & imp. KD, min. 1000. Planks, plywood. Furniture dimension-plywood & hardwoods.

Transamerica Lumber Co., Inc., 7078 SW 4th St., Miami 33144. (305) 264-4010. Imp. AD, min. 20,000. Genuine mahogany.

Weis-Fricker International, Inc., PO Box 12358, Pensacola 32582. (904) 455-4581. Imp. AD/KD, min 10. Planks, logs. Banak, mahogany, rosewood, Santa Maria, andiroba.

Georgia

Atlanta Hardwood Corp., PO Box 39038, Atlanta 30318. (404) 799-8305. Dom. & imp. AD/KD, no min. Planks.

Proctor Forest Products, Inc., PO Box 45163, Atlanta 30320. (404) 761-6628. Min. 1000. Planks, plywood.

Illinois

Craftsman Wood Service Company, 2729 S. Mary St., Chicago 60608. (312) 842-0507. Dom. & imp. KD, no min. Dom. & imp. veneers; planks, plywood. Amaranth, cocobolo, dao, ebony, koa, other exotics.

Frog Tool Company, Ltd., 548 N. Wells St., Chicago 60610. (312) 644-5999. Dom. & imp. KD, no min. Planks. American hardwoods and mahogany.

Monarch Hardwood Lumber Co., 3400 W. Lake Ave., Glenview 60025. (312) 273-2630. Dom. & imp. AD/KD, no min. Planks.

Indiana

Gaston Wood Finishes, Inc., 3630 E. 10th St., Bloomington 47401. Dom. veneers.

Hoosier Panel Co., PO Box 499, New Albany 47150. (812) 944-6477. Plywood. Rosewood & teak veneers.

Pierson-Hollowell Co., Inc., 630 N. College Ave., Suite 401, Indianapolis 46206. (317) 632-5537. Dom. AD/KD, min. 10. Planks, logs. Walnut, red & white oak.

Pike Lumber Co., Inc., PO Box 247, Akron 46910. (219) 893-4511. Dom. AD/KD, imp. KD, min 500. Logs. Surfacing 2 sides, straight line rip-1 edge.

John I. Shafer Hardwood Co., Box 568, Logansport 46947. (219) 753-3151. Dom. & imp. KD, no min. Planks.

Iowa

Jack Becker, Route 2, Dyersville 52040. (319) 875-2087. Dom. AD, no min. Planks. American chestnut, walnut, butternut, wild cherry, maple, catalpa.

Loftus Distributing Co., 315 9th Ave., SE, Cedar Rapids 52406. (319) 361-5396. Plywood. Lauan.

Johnson Wood Products, Route 1, Strawberry Point 52076. (319) 933-4930. Dom. AD, no min. Planks. Highly figured woods, gunstocks, carving & turning wood.

Werner Sawmill Co., Route 2, Tama 52339. (515) 484-5021. Dom. AD/KD, no min. Planks. Walnut, red elm, red oak, cherry; turning stock.

Kentucky

Dawson Lumber Co., PO Box 8305, Sta. E., Louisville 40208. (502) 635-5256. Dom. AD/KD, imp. KD, $10 min. Planks.

W. W. Hayes, Route 14, Bowling Green 42101. (502) 781-8649. Dom. KD, no min. Walnut, cherry, elm, cedar.

International Hardwoods, Inc., 7717 National Turnpike, Louisville 40210. (502) 368-6264. Dom. & imp. veneers.

Laminating Services, Inc., 4700 Robards Lane, Louisville 40218. (502) 458-2614. Dom. & imp. veneers.

Larkins Brothers & Yost Co., PO Box 265, La Grange 40031. (502) 222-1441. Dom. & imp. AD/KD, no min. Planks, plywood.

Marwood, Inc., PO Box 515, Louisville 40201. (502) 778-2727. Dom. & imp. veneers. Burls-teaks, rosewood, ebony.

Bob Morgan Woodworking Supplies, 915 E. Kentucky St., Louisville 40204. (502) 636-5000. Dom. & imp. veneers. Inlays, finishes, stains & veneering tools.

Northland Corp., PO Box 265, La Grange 40031. (502) 222-1441. Dom. & imp. AD/KD, no min. Planks, plywood.

Universal Woods, Inc., PO Box 21066, Louisville 40221. (502) 636-1323. Dom. & imp. AD/KD, no min. Imp. veneers; plywood. Central American walnut blanks.

Wood Mosaic, Div. Olinkraft, Inc., PO Box 21159, Louisville 40221. (502) 363-3531. Dom. & imp. AD/KD, no min. Dom. & imp. veneers; planks, logs. Steamed walnut, teak, African & Brazilian mahogany.

Louisiana

Deep South Lumber Industries, Inc., PO Box 70, Hardwood 70742. (504) 635-3848. Dom. AD/KD, min. 500. Planks. Southern white ash & red oak.

Vancouver Plywood Co., Inc., PO Drawer BN, Oakdale 71463.(318) 335-1500. Dom. AD/KD, min. 1000. Planks, logs. Oak, gum lumber; hardwood furniture parts.

Maryland

Hobby Woods, 1305 Eastern Ave., Baltimore 21231. (301) 732-6071. Dom. & imp. KD, no min. Dom. & imp. veneers; planks, logs, plywood.

J. Gibson McIlvain Co., Route 7, White Marsh 21162. (301) 335-9600. Dom. & imp. AD/KD, min. 500. Veneers; planks. Mahogany.

O'Shea Lumber Co., Williamson Lane, Cockeysville 21030. (301) 592-8490. Dom. & imp. AD/KD, min. 500. Planks, logs. Rosewood, zebrawood, bubinga, mansonia, obeche, ramin, banak, Honduras mahogany.

Sieling & Jones, Inc., 1st National Bank Bldg., Parkton 21120. (301) 357-8118. Dom. & imp. KD, no min. Dom. & imp. veneers; plywood. African & tropical American mahogany, American black walnut.

Tidewater Hardwood Lumber Co., P.R.R. Station, Harmans 21077. Dom. & imp. AD/KD, no min. Dom. & imp. veneers; planks, logs.

Woodenware, Inc., PO Box 10B, Brownsville 21715. (301) 432-6131. Dom. KD, min. 200; imp. AD/KD, min. 50. Planks, plywood. Padauk, vermilion, E. Indian rosewood, cocobolo, walnut, maple, cherry, oak.

Massachusetts

Allied Plywood Corp., PO Box 56, Charlestown 02129. (617) 241-9300. Dom. & imp. KD, min. 10. Dom. & imp. veneer; planks, plywood. Teak, rosewood, zebrano, ebony.

Allied Plywood, Inc., PO Box 352, Highland Station, Springfield 01109. (413) 543-2251. Dom. & imp. KD, min. 10. Dom. & imp. veneers; planks, plywood. Teak, rosewood, zebrano, ebony.

Amherst Wood Co., Sunderland Road, N. Amherst 01059. (413) 549-2806. Dom. & imp. KD, no min. Planks, logs, plywood. Cherry, maple, oak, yellow birch, white ash, black walnut, basswood, Honduras mahogany, white oak, butternut, beech.

Holt & Bugbee Co., PO Box 37, Tewksbury 01876. (617) 851-7201. Dom. & imp. AD/KD. Planks. Cherry, teak, Honduras mahogany.

Lawrence R. McCoy & Co., Inc., 120 Front Street, Worcester 01608. (617) 757-8351. Dom. AD/KD, no min. Plywood.

Palmer & Parker Co., PO Box 266, Tewksbury 01876. (617) 851-7337. Dom. & imp. AD/KD, min. 50. Dom. & imp. veneer; planks. African mahogany & other African hardwoods.

Rex Lumber Co., 180 Fawcett St., Cambridge 02138. (617) 864-4484. Dom. AD/KD, imp. KD, min. 100. Planks.

Woodcraft Supply Corp., 313 Montvale Ave., Woburn 01801. (617) 935-5860. Dom. KD, imp. AD/KD, no min. Logs. Rosewood, ebony, basswood, cherry, maple.

Michigan

Gibco Services, 725 S Adams Road, Birmingham 48011. (313) 647-3322. Plywood.

Lake Superior Lumber Co., PO Box 606, Iron Mountain 49801. (906) 774-1511. Dom. AD/KD, no min. Planks. Hard maple, beech, birch, basswood, red oak.

Hugh Rader Lumber Co., 15175 Hamilton, Detroit 48203. (313) 868-7900. Dom. & imp. KD, min. 1000. Planks.

Ted Thompson Sales Co., 1720 Olson NE, Grand Rapids 49503. (616) 459-6235. Plywood. Ash, oak, birch.

Van Keulen & Winchester Lumber Co., 245 54th St. SW, Grand Rapids 49508. (616) 532-3678. Dom. & imp. AD/KD, min. 100. Planks.

Minnesota

Jones/Boucher Lumber Corp., PO Box 882, Minneapolis 55440. (612) 339-0793. Dom. AD/KD, imp. KD, no min. Dom. & imp. veneers; plywood. Western red cedar.

Minnesota Woodworkers Supply Co., Industrial Blvd., Rogers 55374. (612) 428-4101. Dom. & imp. veneers.

Thompson Hardwood Lumber Co., 9925 Logan Ave. South, Minneapolis 55431. (612) 881-5853. Dom. KD, min. 50. Oak & birch plywood.

Wood Carvers Supply Co., 3112-16 W 28th St., Minneapolis 55416. (612) 927-7491. Dom. AD, imp. KD, no min. Planks, logs. Catalpa, zebrawood, beefwood.

Youngblood Lumber Co., 1335 Central Ave., Minneapolis 55413. (612) 789-3521. Dom. & imp. KD, no min. Dom. veneer; planks, plywood. Sitka spruce, zebrawood, padauk, partridgewood, balsa, purpleheart, bubinga.

Mississippi

Anderson-Tully Lumber Co., Box 38, Vicksburg 39180. (601) 638-2622. Dom. AD/KD, no min. Planks, logs. Red oak, ash, poplar, elm, sassafras, willow, cypress.

The Brown Co., PO Box 1697, Natchez 39120. (601) 442-3675. Dom. & imp. AD/KD, min. 1000. Planks, logs, plywood. Cypress; heavy, long timbers.

Clarke Veneers & Plywood, PO Box 4876, Jackson 39216. (601) 366-0331. Dom. & imp. AD/KD, no min. Dom. & imp. veneer; planks. Teak, Honduras mahogany, Spanish cedar.

J. A. LaCour & Co., PO Box 247, Canton 39046. (601) 859-4541. Dom. & imp. AD/KD, no min. Planks, plywood. Mahogany, walnut, teak.

Newman Lumber Co., PO Drawer 2580, Gulfport 39503. (601) 832-1899. Imp. AD/KD, no min. Planks. Honduras mahogany, Spanish cedar.

Pavco Industries, Inc., PO Box 612, Pascagoula 39567. (601) 762-3172. Plywood.

Missouri

Cedar Park Manufacturing Co., Inc., Box 593, Mercer 64661. (816) 382-4912. Dom. KD, no min. Planks. Basswood, cedar.

Gaines Hardwood Lumber Co., 24 Branch St., St. Louis 63147. (314) 231-7026. Dom. & imp. AD/KD, no min. Dom. & imp. veneer; planks, logs, plywood. Ebony, cocobolo, purpleheart, tulipwood, holly, yew.

C. L. Krug Lumber Co., PO Box 12933, St. Louis 63141. (314) 872-8868. Dom. & imp. KD, min. 1000. Planks. Appalachian red & white oak, Norwegian birch.

Schaller Hardwood Lumber Co., 4464 Duncan Ave., St. Louis 63110. (314) 533-9551. Dom. AD/KD, imp. KD, min. 200. Planks, plywood.

Thomas & Proetz Lumber Co., PO Box 5409, Broadway Station, St. Louis 63147. (314) 231-9343. Dom. & imp. KD, dom. AD, min. 1000.

New Jersey

Allied Plywood, Ltd., 40 Highlander Drive, Scotch Plains 07076. (201) 757-6348. Dom. & imp. KD, min. 10. Dom. & imp. veneer; planks, plywood. Rosewood, teak, zebrano, ebony.

Brookside Veneers, Ltd., 107 Trumbull Street, Elizabeth 07206. (201) 351-1990. Dom. & imp. veneer. Burls, teak, mahogany, English brown oak.

Center Lumber Co., 85 Fulton St., Paterson 07509. (201) 742-8300. Dom. & imp. KD, no min. Dom. veneer; planks, plywood. Afara, cypress, African & Honduras mahogany, jelutong, virola.

Thomas F. Dillon Forest Products, 11 Hancock St., Trenton 08604. (609) 695-4300. Plywood.

International Balsa Corp., 502 West Side Ave., Jersey City 07304. (201) 434-2044. Imp. KD, min. 1000. Balsa.

Real Wood Veneers, 107 Trumbull St., Elizabeth 07206. (201) 351-1991. Dom. & imp. KD, no min. Dom. & imp. veneer. Burls, rosewood, teak, ebony, English brown oak.

Reisen-Seidel Hardwood Co., 1080 Morris Ave., Union 07083. (201) 354-7050. Dom. & imp. AD/KD, min. 200. Planks, plywood.

W. F. Sherman & Son., Inc., 84 Broad St., Manasquan 08736. (201) 223-1451. Dom. & imp. KD, no min. Planks, plywood. Sugar pine, poplar, mahogany, oak, birch, maple, cherry, walnut, teak, basswood.

Yonkers Plywood Manufacturing Corp., Box 152, Old Bridge 08857. (201) 727-1200. Dom. & imp. veneer; plywood.

New Mexico

Woodworker's Supply, Inc., 11200 Menaul NE, Albuquerque 87112. (505) 293-8080. Dom. & imp. veneer. Cotton-back veneer, 18 x 24-in. width.

New York

Allied Plywood, Inc., 47 Fuller Road, Albany 12205. (518) 459-2380. Dom. & imp. KD, min. 10. Dom. & imp. veneer; planks, plywood. Teak, rosewood, ebony, zebrano.

Allied Plywood Co., Inc., 1635 Poplar St., Bronx 10461. (212) 824-7100. Dom. & imp. DK, min. 10. Dom. & imp. veneer; planks, plywood. Rosewood, teak, ebony, zebrano.

Ceda Lumber Trading Corp., 200 Pinehurst Ave., New York 10033. (212) 568-9341. Dom. & imp. AD/KD, no min. Planks.

A. Constantine & Son, Inc., 2050 Eastchester Road, New York 10461. (212) 792-1600. Dom. & imp. AD/KD, min. 1 sq. ft. Imp. veneer; planks, plywood. Mahogany, walnut, maple, rosewood.

Cotton-Hanlon, Inc., PO Box 65, Cayuta 14824. (607) 594-3321. Dom. & imp. AD/KD, no min. Planks, logs, plywood.

Fitzpatrick & Weller, Inc., Ellicottville 14731. (716) 699-2393. Dom. AD/KD, min. 1000. Planks, logs. Dimension, rounds & shoe last blocks.

Great Eastern Lumber Co., Inc., PO Box 4, North Creek 12853. (518) 998-2345. Dom. AD/KD, no min. Planks. Hard & soft maple, birch, beech, glued up panels.

Hamlin Sawmill, 1873 Redman Road, Hamlin 14464. (716) 964-3561. Dom. AD, min. 10. Planks. Custom timbers.

Hardwood Centre, Inc., 450 Park Ave. South, New York 10016. (212) 683-1125. Dom. & imp. AD/KD, min. 1000. Planks, logs, plywood. Lignum vitae.

John Harra Wood & Supply Co., Inc., 39 W. 19th St., New York 10011. (212) 741-0290. Dom. & imp. KD, no min. Dom. & imp. veneer; planks, logs, plywood. Ash, bubinga, cherry, wormy chestnut, cocobolo, ebony, ekki, greenheart, padauk, Brazilian tulip, walnut, wenge, zebra.

R. A. Miller Hardwood Co., Inc., 986 Oliver Street, North Tonawanda 14120. (716) 694-0562. Dom. AD/KD, imp. KD, min. 50. Planks. Northern & Appalachian hardwoods.

Monroe Lange Hardwood Imports, 2060 Jericho Turnpike, New Hyde Park 11040. (516) 437-0672. Imp. AD/KD, min. $2000. Planks, logs, plywood. Drawer-sides, turnings, moldings.

Okura & Co., America, Inc., One World Trade Center, Suite 3455, New York 10048. (212) 432-9460. Imp. KD, min. 1000. Imp. veneer; plywood.

Plywood Plastics, Inc., John J. Soble Lumber Div., 279 Burrows St., Rochester 14606. (716) 458-3636. Dom. & imp. veneer. Rosewood.

Rosenzweig Lumber Co., Inc., 801 E. 135th St., Bronx 10454. (212) 585-8050. Dom. & imp. KD, no min. Planks, plywood.

Ernst Seidelmann Corp., 19 Murray St., New York 10007. (212) 962-0020. Dom. AD/KD, min. 1000. Planks, logs. Boxwood, lignum vitae.

Sharoubim International Co., 192-08 90th Ave., Hollis Park Gardens 11423. (212) 479-3011. Imp. AD/KD, min 500. Planks, logs, plywood. Rosewood & exotics.

Thin Woods Supply Co., 8 Oak Terrace, Suffern 10901. (914) 357-0421. Veneer. Cherry, mahogany, walnut veneer.

Timber Operations, Inc., 333 E. 79th St., New York 10021. (212) 988-5630. Planks, logs, plywood. Marine plywood, khaya, gaboon.

Tobin's, 4269 James St., E. Syracuse 13057. (315) 463-9119. Dom. & imp. KD, no min. Dom. veneer; plywood. Chair caning and refinishing supplies.

United States Mahogany Corp., 51 E. 42nd St., New York 10017. (212) 682-7830. Imp. AD/KD. Planks. Teak, mahogany, rosewood, banak, obeche, meranti, ramin, mansonia, andiroba, afrormosia, lauan.

Walker & Zanger, Inc., PO Box 241, Scarsdale 10583. (914) 472-5666. Imp. AD/KD, min. 1000. Imp. veneer; planks, plywood.

Wood Shed, 1807 Elmwood Ave., Buffalo 14207. (716) 876-4719. Dom. & imp. KD, 1 board min. Dom. & imp. veneer; planks. Acacia, bubinga, cocobolo, holly, lignum vitae, macassar ebony, parrotwood, wenge, tulipwood, zebrawood.

North Carolina

Pete Armstrong Veneer, Inc., PO Box 550, High Point 27261. (919) 888-4041. Dom. & imp. veneer.

Bagnal Lumber Co., PO Box 5417, Ardmore Station, Winston-Salem 27103. (919) 722-8115. Dom. & imp. veneer.

Educational Lumber Co., Inc., PO Box 5373, Asheville 28803. (704) 255-8765. Dom. & imp. KD, min. 50. Dom. & imp. veneer; planks, plywood.

Fitco, Inc., PO Box 575, Murphy 28906. (704) 837-2153. Dom. AD, min. 10. Dom. veneer; planks, logs. Hickory, white & red oak.

Gibson Lumber Co., Inc., PO Box 129, Trinity 27370. (919) 431-2127. Dom. & imp. AD/KD, min. 500. Planks.

Hardwood Sales, Inc., PO Box 1035, Conover 28613. (704) 465-0040. Dom. AD/KD, min. 1000. Planks.

Hasty Plywood Co., PO Box 417, Maxton 28364. (919) 844-5267. Plywood. Curved plywood.

Matthews Lumber Co., PO Box 1828, Fayetteville 28302. (919) 323-0791. Dom. & imp. AD/KD, no min. Dom. & imp. veneer; planks, logs, plywood.

Stenersen Sales Corp., Box 851, High Point 27261. Dom. & imp. veneers; logs. Exotic species.

Tramway Veneers, Inc., PO Box 322, Sanford 27330. (919) 776-7606. Dom. & imp. veneer.

Ohio

Hoge Lumber Co., New Knoxville 45871. (419) 753-2263. Dom. & imp. AD/KD, no min. Planks, logs, plywood. Domestic hardwood.

Industrial Wholesale Lumber Co., 6000 Harvard Ave., Cleveland 44105. (216) 429-1500. Dom. & imp. KD, min. 50. Planks, plywood.

Manufacturers Wholesale Lumber Co., 7000 Granger Road, Cleveland 44131. (216) 524-5000. Dom. & imp. KD, min. 500. Planks, plywood.

Willis Lumber Co., 545 Millikan Ave., Washington Court House 43160. (614) 335-2601. Dom. & imp. KD, min. 500 (no min. for pick-up). Planks.

Oregon

Columbia Plywood Corp., 2300 SW First Ave., Portland 97201. (503) 224-5300. Dom. veneer; plywood. Veneer core, flake core, fiber core, lumber core.

Continental Forest Products, Inc., PO Box 159, Lake Oswego 97034. 1-800-547-8465; (503) 635-3681. Dom. & imp. AD/KD, min. 500. Planks, logs, plywood. Almaciga, banak.

Dant & Russell, Inc., 1221 SW Yamhill St., Portland 97205. (800) 547-1943. Imp. AD/KD, no min. Imp. veneer; planks, logs, plywood.

Emerson Hardwood Co., 2279 NW Front Ave., Portland 97209. (503) 227-6414. Dom. & imp. KD, no min. Planks, plywood. E. Indian Rosewood, teak, ebony, areno, iroko, Hawaiian koa.

Evans Products Co., Nicaraguan Operations, PO Box 3295, Portland 97208. (503) 222-5592. Imp. AD/KD, min. 1000. Planks, logs. Nicaraguan walnut, turning squares, red oak.

Fronville Commercial Co., Inc., PO Box 40, Wilsonville 97070. (503) 638-4196. Dom. & imp. veneer. Hardwood veneers: walnut, red & white oak, teak, ash, maple, cherry, elm, birch, mahogany, hickory, rosewoods, zebrawood, caviuna, lacewood, lauro preto.

Lumber Products, 2116 NW 20th, Portland 97209. (503) 223-8171. Dom. & imp. KD, no min. Plywood.

North Pacific Lumber Co., POBox 3915, Portland 97208. (503) 234-8241. Dom. AD/KD. Planks. North Pacific alder, Pacific Coast big leaf soft maple.

Northwest Hardwoods, Inc., First National Bank Tower, 1300 SW Fifth Ave., Suite 2220, Portland 97201. (503) 248-9200. Dom. KD, min. 1000. Planks.

Premier Trading Co., PO Box 4204, Portland 97208. (503) 238-1323. Imp. AD/KD, min. 10. Plywood. Ramin, Philippine mahogany.

Pennsylvania

Allegheny Wood Sales, 310 N. Easton Road, Willow Grove 19090. (215) 657-4627. Dom. & imp. KD, min. 50. Planks, plywood.

Bangkok Industries, Inc., 1900 S. 20th St., Philadelphia 19145. (215) 334-1500. Dom. & imp. KD, no min. Dom. & imp. veneer; plywood. Thai teak, Asian ironwood.

Robert Butler, 341 E. Waring Ave., State College 16801. (814) 238-8863 (after 6 p.m.). Dom. AD, no min. Planks, logs. American chestnut, osage orange, walnut, cherry.

Exotic Woodshed, 65 North York Rd., Warminster 18974. (215) 672-2257. Dom. & imp. AD/KD, no min. Dom. & imp. veneer; planks logs. Allecede, almaciga, apitong, bella rosa, guijo, lovoa, pala maria, talorosa, teak, kalantas, walnut, cherry & redwood free form slabs.

Homecraft Veneer, Box 3, Latrobe 15650. (412) 537-3938. Dom. & imp. veneer. Burls.

Mann & Parker Lumber Co., Box 18, Constitution Ave., New Freedom 17349. (717) 235-4834. Dom. & imp. AD/KD, min. 500. Planks. Teak, obeche, ramin, banak, virola, mahogany.

T. Baird McIlvain Co., 320 S. Henderson Road, King of Prussia 19406. (215) 265-3630. Dom. KD, min. 1000. Planks. Walnut.

Plunkett-Webster Dry Kiln, Inc., Brookville 15825. (814) 849-3011. Dom. & imp. AD/KD. Planks. Tropical species from Brazil, Africa, S. E. Asia.

Thompson Mahogany Co., 7400 Edmund St., Philadelphia 19136. (215) 624-1866. Imp. AD/KD, min. 100. Planks. Mahoganies, teak.

West Elizabeth Lumber Co., 5th St., West Elizabeth 15088. (412) 384-4000. Dom. AD, dom. & imp. KD, no min. Planks, plywood.

Rhode Island

Allied Plywood Co., 1 Washington Ave., Providence 02905. (401) 467-9555. Dom. & imp. KD, min. 10. Dom. & imp. veneer; planks, plywood. Teak, rosewood, zebrano, ebony.

South Carolina

Gable Lumber Co., PO Box 401, Charleston 29402. (803) 766-6632. Dom. & imp. AD/KD, min. 500. Dom. & imp. veneer; planks, plywood. Hardwood dowels.

Tennessee

Cockroft Lumber Co., PO Box 17143, Memphis 33117. (901) 683-4501. Dom. AD/KD, min. 1000. Planks.

Frank A. Conkling Co., 529 North Highland, Memphis 38122. (901) 458-7553. Dom. AD/KD, no min. Dom. veneer; planks, plywood.

Walter M. Fields Lumber Co., Inc., White Station Tower, Suite 320, Memphis 38117. (901) 767-6750. Dom. AD/KD, min. 500. Planks. Southern hardwoods, hardwood squares.

Nickey-Bellante International, Inc., 1255 Lynnfield Road, Memphis 38138. (901) 761-2460. Imp. AD/KD, min. 10.

Shea Forest Products, Inc., 1255 Lynnfield Road, Memphis 38117. (901) 761-2694. Plywood. Baltic birch, woodedge & woodroll.

Russell Stadelman & Co., PO Box 17039, Memphis 38117. (901) 767-1391. Imp. AD/KD, min. 1000. Dom. & imp. veneer; planks, logs, plywood.

Wilson Lumber Co., Inc., PO Box 12526, Memphis 38112. (901) 274-6887. Dom. AD/KD, imp. KD, min. 200. Planks.

Texas

Austin Hardwoods, Inc., 2125 Goodrich, Austin 78704. (512) 442-4001. Dom. & imp. KD, $5 min. Goncala alves, tulipwood, padauk, pecan, zebra, rosewood, macaya, purpleheart, cypress, mansonia.

East Asiatic Co., Inc., 1316 Studemont, Houston 77007. (713) 869-9434. Dom. & imp. KD, min. 100. Planks.

Mission Hardwood Lumber Co., PO Box 41, San Antonio 78291. (512) 534-6107. Dom. & imp. KD, no min. Dom. veneer; planks, plywood. Padauk.

Utah

Intermountain Lumber Co., 1948 SW Temple, Salt Lake City 84115. (801) 486-5411. Dom. KD, no min. Plywood.

Vermont

Green Mountain Cabins, Box 190 FW, Chester 05143. (802)875-2573. Dom. AD, no min. Planks, logs. Butternut, spalt maple, basswood, walnut, cherry, white cedar, pine. Cutting slabs through trees for free-form tables, etc.

Wood Dynamics Corp., P.O. Box 481, 47 Central St., Woodstock, VT 05091. (802) 457-1590. Dom. & imp. veneers; logs, plywood.

Virginia

Dean Hardwoods, Inc., PO Box 7096, Portsmouth 23707. (804) 397-2355. Imp. AD/KD, min. 500. Planks. Mahogany, iroko, teak.

Washington

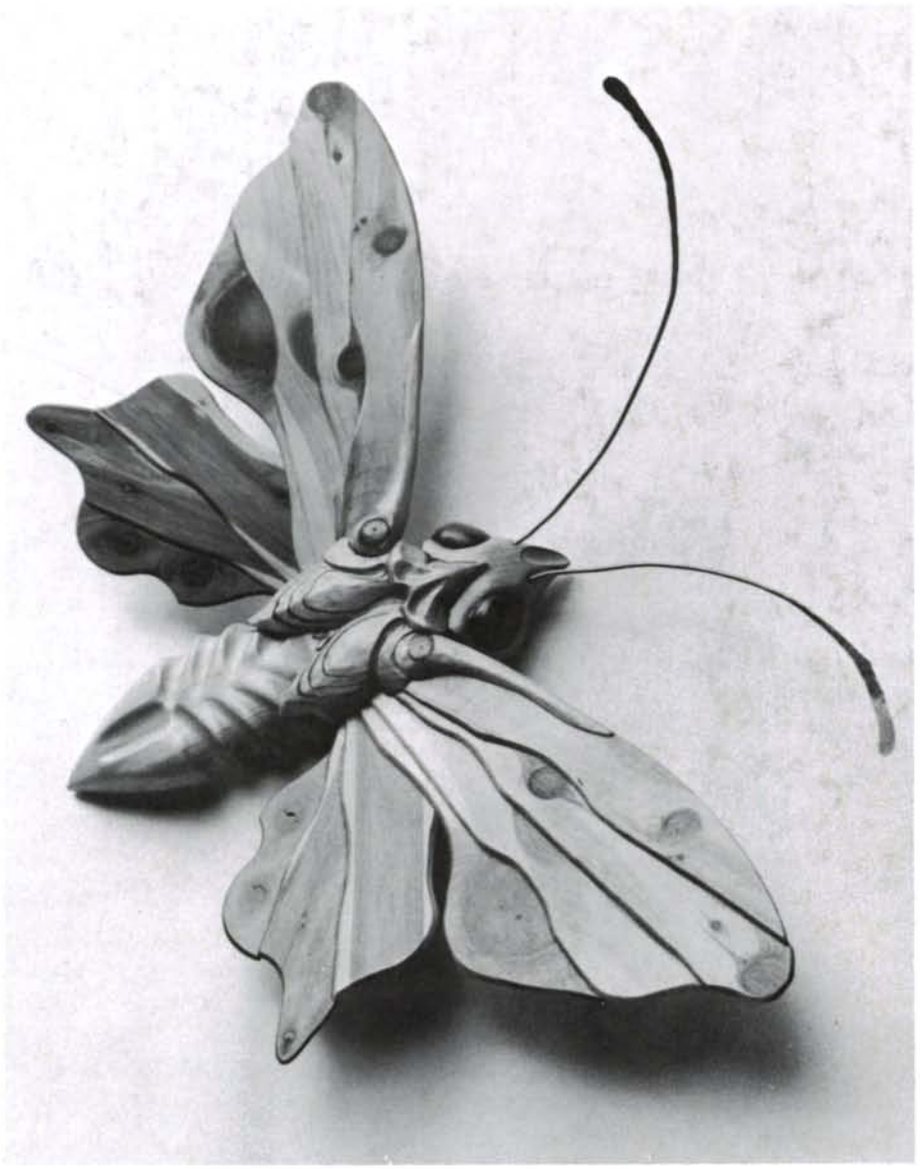
Barnett Pacific, Inc., PO Box 1803, Tacoma 98401. (206) 572-8955. Imp. AD/KD, min. 1000. Planks.

Lance Imports, Inc., PO Box 3183, Seattle 98114. (206) 624-2526. Dom. & imp. AD/KD, no min. Planks.

Stell Sales Corp., 15517 Goodrich Drive NW, Gig Harbor 98335. (206) 857-2672. Min. 1000. Planks, logs, plywood. Walnut, red & white oak.

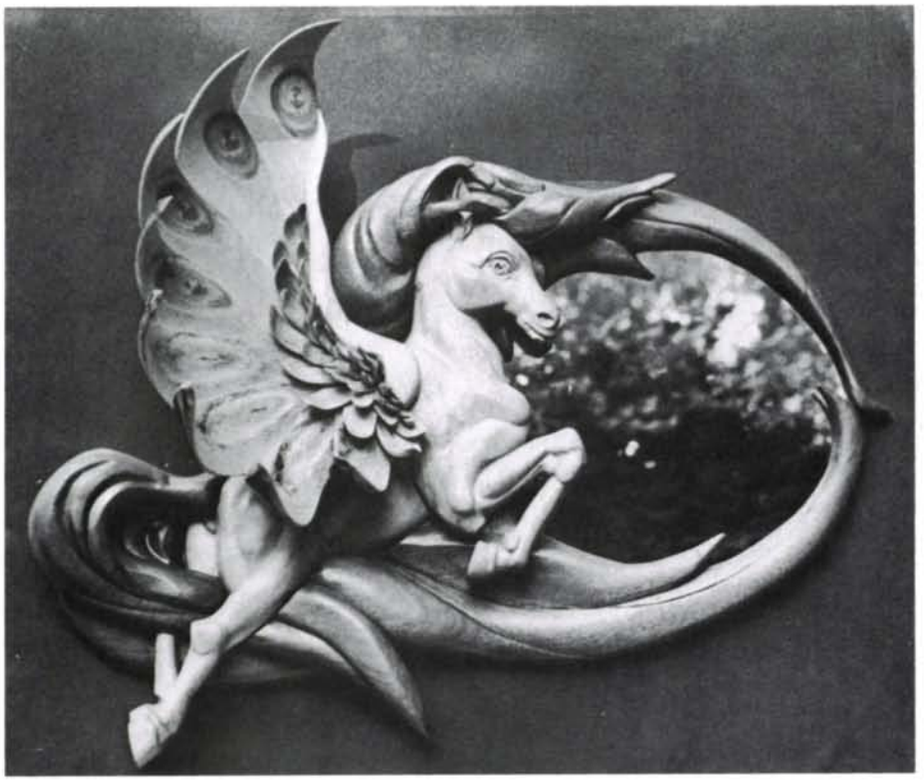
West Virginia

Dean Co., PO Box 1239, Princeton 24740. (304) 425-8701. Logs. Teak, Ebony New Guinea wood.



Of Bugs And Things

Jeffrey and Lindley Briggs have been making wooden sculptures, mirrors, bugs and butterflies for five years. Their inspiration came from a wooden fly Jeffrey had made for a seventh grade science project years earlier. Admirers of this early bug urged him to carve a refined version. Happy with the result, he and his wife began making bugs of all sorts, and finally moved on to butterflies, feeling that people preferred them to bugs. In two years time they were supporting themselves from their butterfly sales. Now they are putting their energy into more complicated commissioned pieces such as the mirror by Jeffrey. Meanwhile, Lindley most enjoys making bandsawed sculptures (below) using a variety of hardwoods. Together they continue to make several types of bugs similar to the sphinx moth pictured above.



Cedar and pine moth is 24-in. across, retails for $150. Mahogany, pine and poplar mirror is 36-in. wide, $2000. Pine and mahogany sculpture below is 20-in. high, $165.