

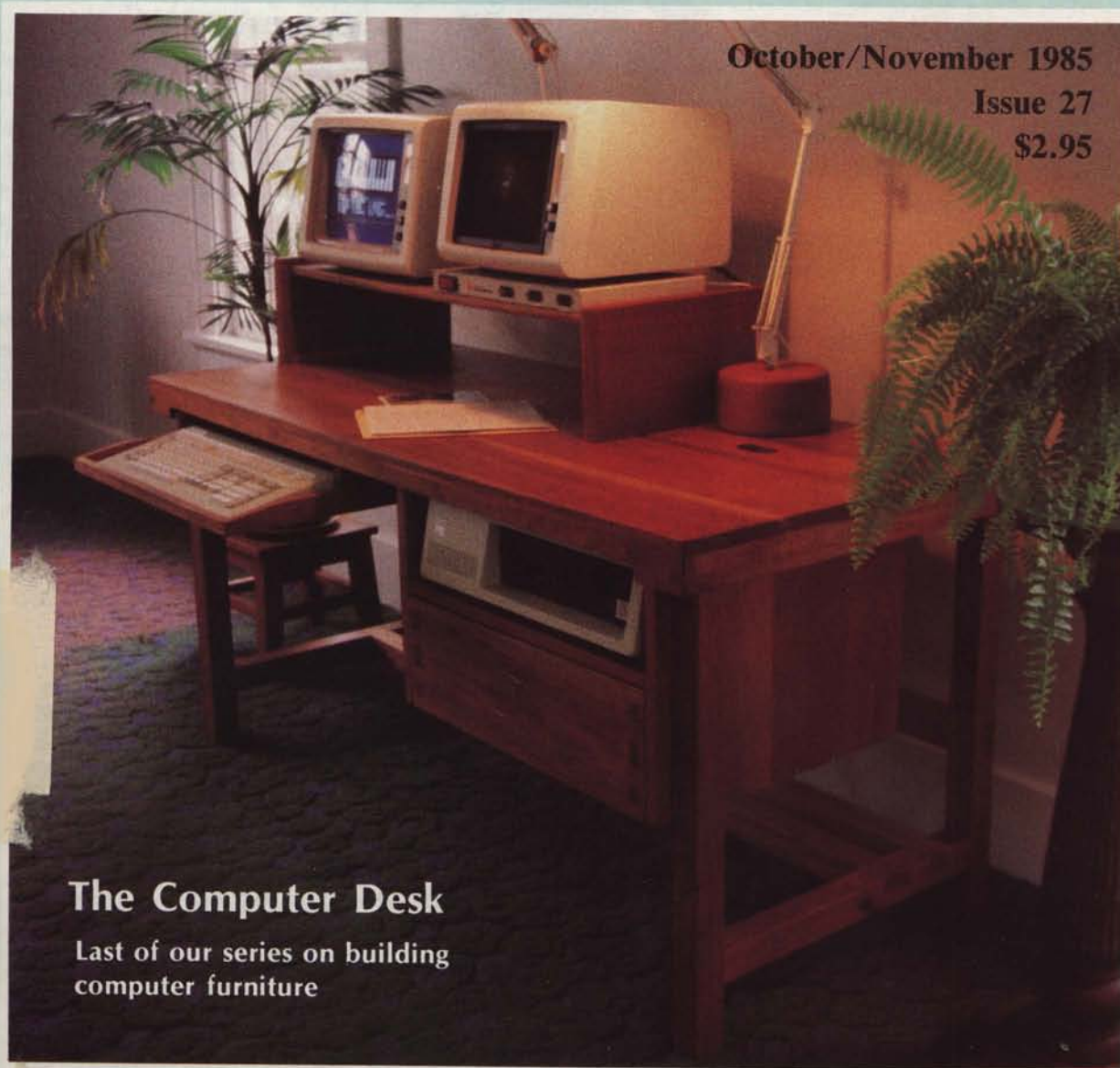


Popular Woodworking

October/November 1985

Issue 27

\$2.95



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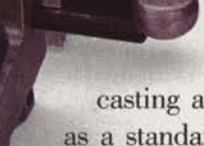
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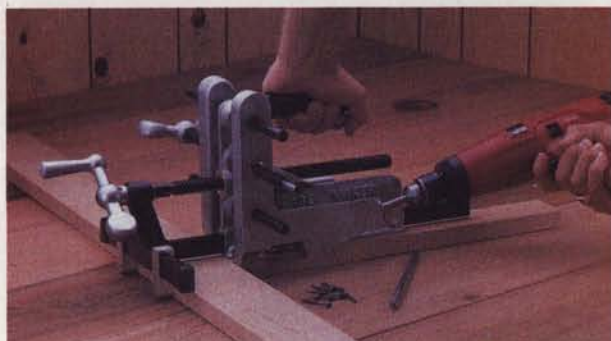
Conventional method



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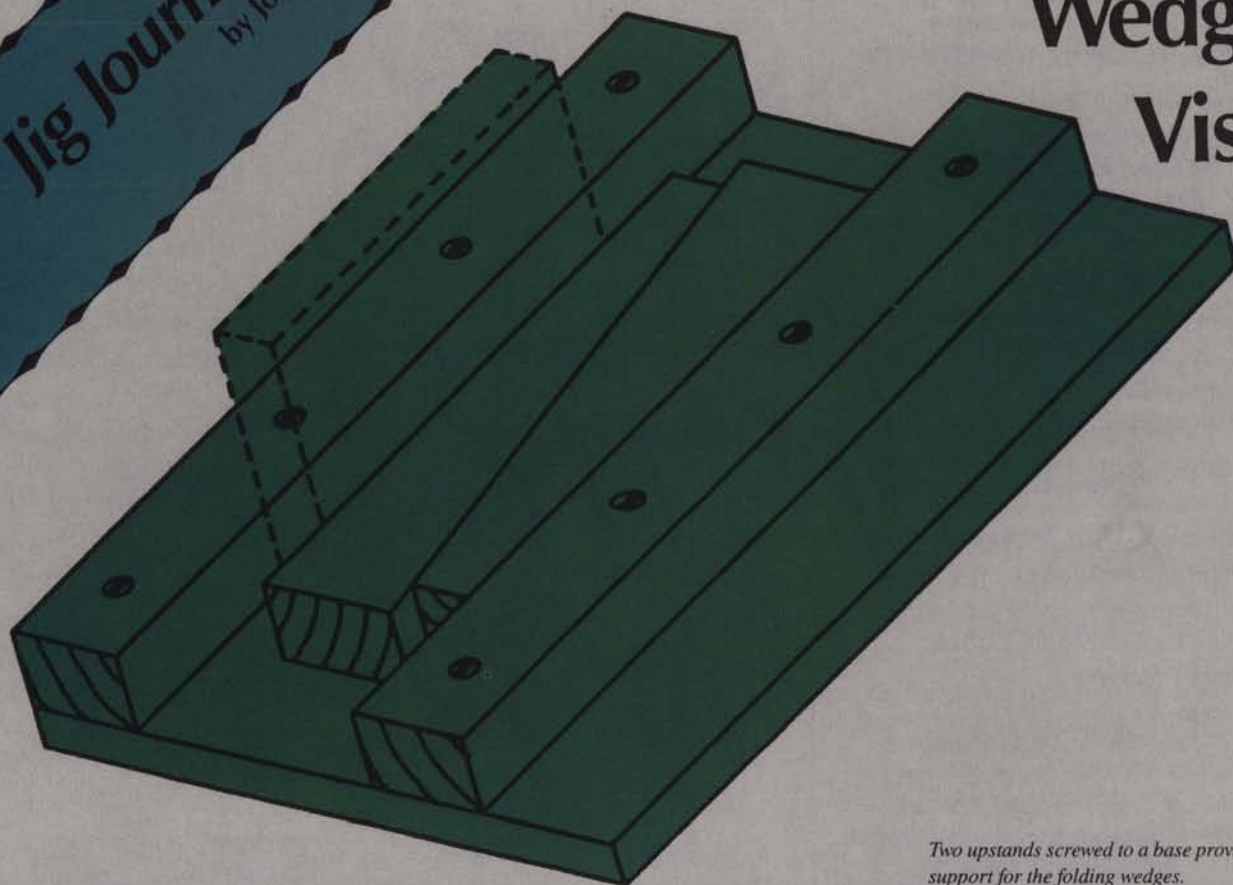


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Folding Wedge Vise



Two upstands screwed to a base provide the support for the folding wedges.

Without bench dogs, holding a workpiece steady for carving or routing a surface can be difficult. Clamps just get in the way and constantly need to be moved to new positions. And how often have we had an argument with the bench vise when it comes to holding small work or peculiarly shaped pieces? Even when we fit them in, there is always the danger of cutting bench tops or harming fingers.

My solution is to build a number of folding wedge vises. This is a simple idea, consisting of a flat board to which are glued and screwed two strips of wood to serve as upstands, or stops. The work is placed between these and held securely in place with a pair of folding (opposing) wedges.

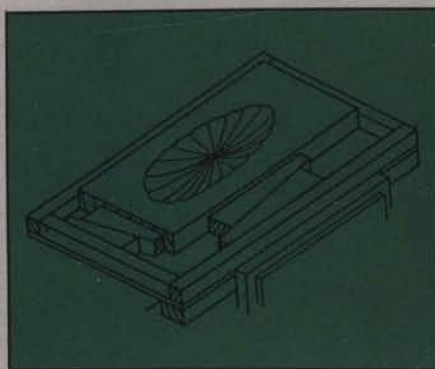
Four wedges secure a panel into the corner of a boxlike arrangement of upstands. A strip of wood glued to the underside of the jig is then clamped in the bench vise.

"V" cuts in the upstands will assist in gripping curved work and locating the corners of a piece. At the same time, the work will not be gripped in such a way as to harm the surfaces.

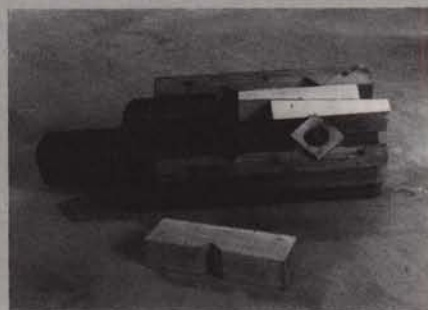
A similar vise can be built for a drill press. Such a vise will eventually be found to be indispensable, since the work will not

be marked nor will the drill bit be harmed—as with a metal vise should it accidentally strike the jaws. A large one could again have a strip on the bottom to hold in the vise, or you could make a smaller paddle-shaped one to hold by hand.

Put a few vises in your life! ■

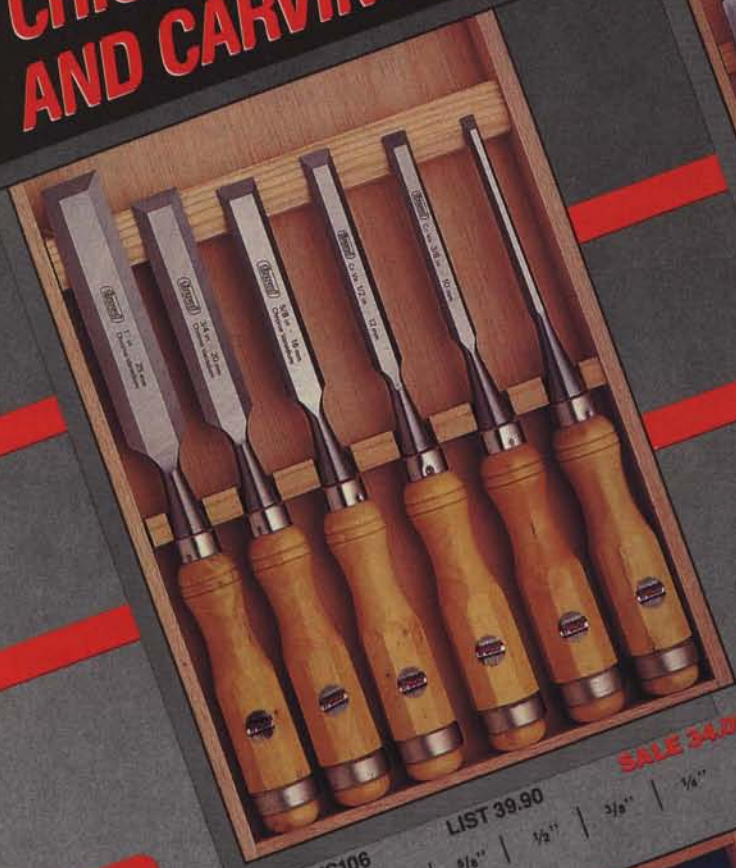


A board glued along the bottom of this box makes it easy to clamp in a bench vise. Four folding wedges hold a panel in place for carving.



"V" cuts in the upstands help hold round or irregularly shaped pieces. The paddle-shaped base can be hand-held or clamped to a table.

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The range of ideas from you, our readers, is so expansive and impressive that we have decided to add a new feature: **INFORMATION EXCHANGE**. It's a place to exchange ideas, ask questions and discuss techniques. Think of it as a giant woodpile and feel free to toss in *your* fuel—everything from twigs to branches to logs.

Do you have a clever procedure to share, or are you looking for a solution? Have you found a source for hard-to-find items, or are you seeking an out-of-print owner's manual? This is the place to get in touch with thousands of woodworkers just like *you*. With everyone contributing, this Information Exchange woodpile is sure to grow and glow.

Three Handy Tools You Can Make

- An old-time Coleman lantern air pump, with a short length of small diameter copper tubing soldered to the point, is a handy tool when you need to fit glue into a narrow or tight place. Just place some glue near the place where you want it to be and blow air into the narrow opening.

- When taking furniture apart, as in antique restoration, it is sometimes difficult to reach certain screws or nails for removal. I wrap masking tape around one end of a hack saw blade to make a handle, then use this handy tool to get into tight places. I just pry the boards apart a little and saw the metal fastener in two.

- In boring holes in some of the new plastics, some nearly as hard as glass, I have had good luck using a short piece of thin-walled brass tubing. The tube will make a hole the size of its outside diameter. Make sure the tube is cut off square at the business end. Speed up your drill and do not press too hard. Keep the end well-oiled

with thin oil and larded with some cutting agent, such as valve-grinding compound or powdered emery. As you go along, keep lifting the drill up and down a little. A drill press is necessary for this kind of drilling. I have even bored into glass with this device, but it takes longer.

Vollie Tripp San Jacinto, California

Spiral Jig Saw Blade?

In the mid-to-late 1950's there was available a round, wire-like blade with spiral teeth so cuts with a coping or jig saw could be made in any direction.

I would appreciate any information concerning who still makes these blades.

Bill Kaline Whittier, California

Delta Safety Retrofit Program For Early Model Rockwell 12" Radial Saws

Delta International Machinery Corp., formerly the Rockwell International Power Tool Division, in its continuous product quality and safety program, is undertaking a Safety Retrofit Program to supply a user-installable Track Arm Retrofit Kit for early production units of Rockwell 12" Radial Saws manufactured from December, 1976 through December, 1982.

Although there have been **no** reports of any accidents or injuries to date, Delta's continual testing indicates that, over a period of time, the possibility exists that one or more of the four bearings which support the saw on the track arm could fail and cause the saw to drop off its track onto the saw table, creating a potential for injury to the user.

The Retrofit Program applies to the following early production 12" Radial Saw model numbers: 33-790, 33-791, 33-792 and 33-793. These saws were manufactured by Rockwell International and bear serial numbers IM-7800 through LJ-1273. The program also includes successor models: 33-890, 33-891, 33-892 and 33-893 12" Radial Saws bearing serial numbers LJ-1274 to MC-6923 and 82K04650 and 83C04616. Any 12" Radial

Saws manufactured prior to December 1976 and subsequent to December 1982 are **not** involved in this retrofit.

If the model and serial numbers of your 12" Radial Saw falls within the above identified series, you will receive a **FREE** Track Arm Retrofit Kit #424-02-628-0011 by writing to: Rockwell Radial Saw Retrofit Program, Delta International Machinery Corp., 4290 Raines Road, Memphis, TN 38118.

Please include identification of the model number and serial number of your radial saw. Delta will supply you with a Retrofit Kit Assembly, complete with instructions for easy installation.

Eugene Sliga

Delta International Machinery Corp.
Pittsburgh, Pennsylvania

Cleaning Saw Blades

Editor's Note: What follows has been edited from correspondence between a reader and our Technical Editor. We present it here for your consideration.

When circular saw blades are used to cut green lumber or particularly resinous woods, these gums and resins can accumulate on the blade surfaces. This can cause rough cutting and dull the blade more quickly because of unnecessary overheating.

A quick remedy for this condition, which can be performed easily by any woodworker, is as follows:

Dissolve common household lye in water according to the manufacturer's instructions. Soak gummed-up blades for about 20-30 minutes. Then rinse thoroughly in clear running water, using a stiff-bristled brush to help remove the gums and resins.

Caution: Lye is very caustic! Be sure to follow the manufacturer's precautions carefully—and think about those youngsters around the house who "don't know any better." Think **FOR** them.

Bob Loeffler

Oroville, California

I have found that instead of soaking blades for 20-30 minutes in a lye solution, it is much easier to dip an old toothbrush into a can of lacquer thinner and scrub the resins off with that. It's faster, and lacquer thinner is less caustic and more likely to be on hand than lye.

David Camp

David, with no criticism to your blade-cleaning method, let me make just a few more comments. First, the use of lacquer thinner does have some inherent dangers that home woodworkers need to be aware of. The vapors from the thinner are harmful if used in unventilated areas, let alone the fire hazard presented when an "unthinking" woodworker starts cleaning blades near his water heater in the garage. In some cases, it may even be necessary to have a special permit from the Fire Marshal to use lacquer or lacquer thinner.

Second, your toothbrush method is fine for one or two blades, but a large shop may have several blades that must be cleaned. I sharpened saws professionally for a time, and would have needed to hire someone just to clean blades all day long with a toothbrush. My method (learned from an old-timer) was much more productive. I used ordinary household drain opener and diluted it to a weak solution. No fire hazard, no fume problem. Of course, I had to wear rubber gloves to handle the blades during this procedure.

The diluted solution was used in an old, circular auto oil-drain pan and stored in a gallon glass jug until I deemed it too dirty and made a new solution. No disposal problem either, since it helped clean out our household drains at the same time. A 20-30 minute wait was no problem because it enabled me to get on with other jobs while I was waiting for the pitch to soften. Then, a quick rinse and brushing with a stiff-bristled brush gave me 10-12 nice, shining blades ready for the sharpener. In the diluted formula, you could even leave the saw blades in the solution for days without adverse effects. In fact—they just become more shiny.

Bob Loeffler

Correction

In "Guide to Circular Saw Blades—Part II" (*Popular Woodworker* June/July 1985) we inadvertently listed Delta International Machinery Corporation as manufacturers of "professional" blades. They are, in fact, manufacturers of "industrial" blades and should have been listed as such. ■

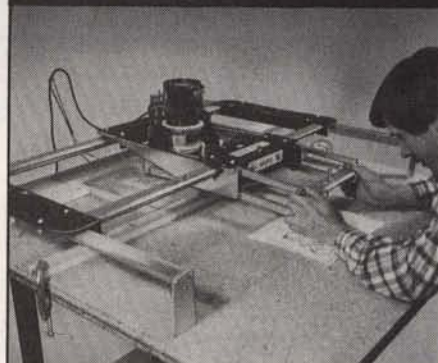
Letter from Staff of EGW Publishing Company

Autumn beckons. Our beloved trees exalt in glorious color. Nature is especially sweet this time of year, bittersweet when we consider the coming winter. So we thought a series on the basics of boatbuilding—and we mean fore to aft—would be just the thing to keep your spyglasses focused on that time when you do set out to tame the waves. When this series by maritime master Dave Gerr rows into shore, you'll be building your best boats EVER.

The computer desk featured on the front cover is the final character in Hugh Foster's series "Building Computer Furniture." With diskette organizer and cabinet, printer stands, and now this desk, you're all set to interface with the crisp autumn days ahead.

Heard about the Merle Adjustable Corner Clamp? You haven't heard it all till you read "Tests and Comments." And if you're in the market for a stationary belt or disc sander, don't miss "Comparative Product Review." Has upright veneer got you down? Flatten it! Learn this and so much more within this issue. We wish you a forge-ahead fall and, as you noticed on the cover, proud and *Popular Woodworking*.

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Wood Types

Wenge

by S. Reed Poverny

Wenge is as hard to bend as it is to pronounce. I pronounce it "When-gay," but have heard it called "When-gee" (with both a hard and soft "g" sound) as well as "Whenj." All have found acceptance in the trade.

If you happen to be making your way through the Belgian or French Congo in Africa, you will come upon Wenge. Otherwise, it can be found in most hardwood stores and yards. Logs average anywhere from 2'3" in diameter, with generally a 2" layer of white sapwood. Usual lengths range from 14'16'.

Like oak, Wenge is porous and rough-textured. However, seasoned Wenge is harder, heavier and considerably stronger

than white oak. Its overall color is burnt umber, though a closer examination reveals a slightly lighter background color. The wood that comes closest to Wenge's dark color is Indian rosewood, of which Wenge is half the price.

Another prime feature of this wood is its intricate grain pattern with a jagged, almost scaly appearance. The darker grain is extremely dense—something like ebony—while the lighter grain is much softer and can be dented with a fingernail.

Working Properties

When first resawn or planed, Wenge often displays streaks of golden yellow. Though dramatic, the effect is short-lived as exposure to air soon causes the streaks

to darken and disappear.

Being an extremely abrasive wood, Wenge quickly dulls chisels, plane irons and turning tools. This is due to the hard fibers in the wood which, incidentally, tear easily unless tools are kept sharp. (A word of caution about Wenge splinters: They are actually lengths of the hard fiber that have broken off. Like sea urchin spines, they are barbed.)

Wenge is an extremely strong and rigid wood. It is also brittle and does not lend itself to bending, though this can be done. One craftsman I know prefers this wood for the thin, tapered legs of stools. It is also a remarkably resonant wood, especially when flat-sawn. For this reason, it makes

This bar top was made from a solid piece of Wenge containing both heartwood and sapwood.

an excellent choice for wooden drums.

Some find the fine dust produced when cutting or sanding Wenge irritating to breathe. This dust can also cause skin and eye irritation, and can stain your skin, clothing, and whatever work you have around you. Needless to say, it's a good idea to wear a respirator when working this wood.

Due to the hard *and* soft texture of the material, a "hill and dale" effect is difficult to avoid when sanding. Scraping can bring better results. Or, this relieved quality can be turned to advantage—and emphasized—by sandblasting or wire-brushing the surface.

Being porous, Wenge glues very well with an aliphatic resin glue. No surface preparation is necessary.

Finishing

A simple paste wax is my choice for finishing Wenge. While wax does not offer much protection, it changes the color of the wood so little that the subtle contrast between the hard and soft grains is maintained. The hard grain will glow after fine sanding or scraping. Unfortunately, shellac, varnish, oil, and lacquer finishes darken the wood, nearly killing the con-

Though something of a rarity, Wenge can be found in the form of slabs cut the full width of the tree. Professional craftsman Han-Ulrich Rau took these two matched boards (seen in a "before" view) and transformed them into front and rear bar surfaces in a client's home.



trast. The result resembles porous Indian rosewood which has been oiled. (Perhaps that is why some manufacturers use it in their brass and "rosewood" tools.)

Of course, prior to applying a surface finish, the wood must be filled. Some craftsmen have been successful at this stage in restoring a degree of contrast by using white or black fillers. (Clear or colored fillers can also be used.) Bleaching the wood is another alternative. I have found ordinary laundry bleach to be effective in bleeding the color from the softer, lighter-colored wood. It becomes nearly white, while the dark and denser wood is not affected. Two-part wood bleach seems to be too strong. Not only does it turn the soft wood a bright white, it fades the dark wood to tan. One craftsman described the appearance as "fish bones against a dark background."

Availability

Kiln-dried Wenge is regularly available in 4/4 and 8/4 thicknesses. Lengths usually range from 12'-14'. 10"x12" wide boards are common. This species tends to have little degrade, so expect boards to be clear and straight. And the price is reasonable—about what you would pay for black walnut.

Given the strength, the intricate figure, and the dark rich color of Wenge, the only question that remains is, "When are you going to begin your next project?" ■

Out of the Woodwork

Wanted: Boardstretcher

by Richard Rollf

Dear *Popular Woodworker*:

Does anyone know where I can get a new or slightly used boardstretcher? I need one that can stretch a board up to one inch in width or length.

Of course, I would prefer a top-of-the-line industrial model. It should also be portable and compact in size so I can take

it with me into lumberyards and hardware stores without causing a lot of commotion. The one I need must be capable of the single stretch, double stretch and super-stretch on everything from veneer to 4" × 12" oak planks.

I also want all the accessories for stretching dowels, finger joints, dovetails, chair legs, glue, screws, plastic laminates, clamps, imagination and my paycheck.

Since I've never used a boardstretcher, I'll need the complete operations and maintenance manual including the name and address of the inventor. No doubt he's living in the South Pacific somewhere drinking champagne from a glass slipper.

Anyway, I've heard that with each stretch, the thickness of the material

changes according to some obscure table of elasticity. Fortunately, most of my shortcuts are at the beginning of a project, so if I have to stop and stretch all the lumber to the same thickness, it won't take much more time.

There's been a wild rumor going around that certain species of wood must soak in vinegar for three weeks before stretching. Frankly, I think someone is trying to stretch the truth. Still, if it's valid, I'll most likely stay away from using those woods even though I do have several vinegar batches of wine left. Short boards are driving me to drink. I'll need to see the B.S. before buying it, so please send clear photos with a complete description and I'll make an offer. ■

Marketing Basics

by Edward F. Salyers

"Wanna buy a duck?" With a live duck under his arm, old-time comedian Joe Penner would approach any passerby and make his pitch. His comedic talents notwithstanding, Joe did not know how to market ducks. As I recall, he never made a sale.

Marketing is a complex field. Large companies pay large staffs of marketing experts large amounts of money to make sure their advertising and products reach the people who will buy them. By understanding the elementary concepts of marketing, you can reach your public, too.

Define Your Objective

Borrowing a technique from the journalism trade, test your capabilities for the market you are considering by answering these basic questions:

What Do You Do? Do you provide a service, produce a product, or both? Define this exactly, even if you make more than one item or have multiple services to offer. Are you a cabinet-making company or a specialist? Are you producing a product masses of people will want, or an elbow rest for left-handed blonde bird-watchers who live at the North Pole? It makes a difference.

Who Will Buy It? What kind of people will pay for what you do? What income level? Lifestyle? How do they see themselves? Are they numerous in your area or in the country at large? Target your customer.

Why Will They Buy It? Is your product or service unique? Does it make someone feel good and successful to have what you

are offering? Do others of their social level have or use it?

Is there a fad or trend involved? Is your product or service necessary?

When Will They Buy It? Does your product or service have year-round use or appeal, or is it just seasonal? When would you have to meet peak demand?

Where Will They Buy It? Should you retail it yourself? From your home? Door to door? How about a specialty shop, large discount store, supermarket? Determine the best distribution channel(s) to reach the most people.

How Will They Buy It? Is the item priced for direct over-the-counter sales, or will buying on credit be the norm? What about packaging? Will you accept special orders only? Give discounts to large groups who purchase a great quantity at one time? Will you wholesale to stores or consign to shops? In essence, how can you make it easiest for the customer to buy what you're selling?

Developing a Marketing Strategy

This can be as simple or as complicated as you wish to make it, but be specific and write it down. First determine your true production capacity relative to time, availability of materials, number of units to be built, and your financial capability to obtain what you will need. Add 20% to this cost figure to cover what you forgot to include. Set target dates—short and long term—to complete particular phases of

work. I repeat: Even though you have an absolutely marvelous memory, write out the details of the plan. This forces you to deal in numbers and amounts. Change portions of the plan if necessary, but do work out a plan.

Once you have done this, you will better understand how realistic and/or achievable your overall objective is. By defining the overall situation and ruthlessly whittling away the fantasy, you will know if your basic idea is workable. **These few hours of work can either save you a lot of pain and money, or support your gut instinct that you CAN do it.**

Statistical Maneuvers

How exactly do you plan to accomplish your objective? Can you do it all, or just parts? Which ones? *Write it out.*

What contacts do you have who can help you? Do you know of any organizations that would be willing to promote what you're doing? Will you want to hire salespeople or enlist the aid of friends? Will you put posters in local stores, or advertise in national print media? What about lectures to groups interested in what you do? Is your craft unusual enough to get TV or radio attention? Any or all of these may be needed to carry out your plan.

Following the suggestions offered here may not make you a marketing expert, but they will help you to control your business instead of the other way around. Had Joe Penner been a better marketer, he may have sold his duck. ■

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Maximum width of cut-off (1" stock)	14 $\frac{1}{2}$ "
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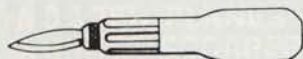
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Book Reviews

by Alan Marks

Antique Furniture Reproduction—15 Advanced Projects by John A. Nelson, Van Nostrand Reinhold, 135 West 50th Street, New York, NY, 10020, 1984, \$19.50, hardbound, 144 pp.

It's not fair, but I always leaf through a book for general impression before reading it more thoroughly; and more often than not, my general impression holds up under fire. The fifteen advanced projects, as introduced by the author, may well be the gems of Early American antiquity, but

the scratchy drawings represent them in a way that bored me to exasperation. Common sense dictates that to entice the reader through the difficulty of making something, that something should be presented in an appetizing way. (I should mention that the classification "advanced" doesn't seem to fit in all cases.)

Each project is described in dimensioned drawings, and a drawing entitled "assembly" shows how the various pieces abut one another. There is a materials list for each, a section of instructions, and a paragraph on "finishing," the instructions for which seem fairly uniform and repetitious from project to project: tung oil and

then more tung oil. Other instructions seem spotty and incomplete and I found the assembly drawings next to worthless. It would take quite an experienced woodworker to fill in the gaps with the regard to joinery and techniques. Might make a good book to have on hand in a secondary school woodshop, but I could hardly call the material either seductive or well presented.

Techniques of Creative Woodcarving by Ian Norbury, Charles Scribner's Sons, 597 Park Avenue, New York, NY 10017, 1984, \$19.95, hardbound, 152 pp.

This one comes to us from England and does a good job of introducing its subject. It is informative, interestingly written, and the projects, of which there are twelve, are described with adequate detail and information. Good, inspiring step-by-step photos of work in progress extend throughout. A section at the end of each project lists tools used in its completion.

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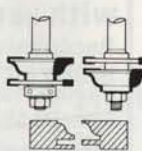
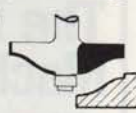
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I particularly liked the opening chapters on design, wood, equipment, sharpening, and polish and mounting. It is always a joy to read a book by an author like Norbury who writes about his subject with integrity and authority. He acknowledges that his approaches are not the only possible ones, draws from his broad experience to explain his technique, and gives generously of his enthusiasm and personal observations.

Practical and Decorative Woodworking Joints by John E. N. Bairstow, Sterling Publishing Co., Inc., Two Park Avenue, New York, NY 10016, \$11.95 softcover, 119 pp.

This book was written in typical textbook style. The British author leaves his own personality somewhere on the sidelines while he deals with the facts, ma'am, just the facts. We aren't told who he is and what qualifies him to compile this collec-

tion. Somehow, an anonymously written book of this sort causes my hackles to raise. Enough tasteless furniture has been done utilizing decorative joinery with the result that the joints and the various styles of the pieces are at odds with one another. Why present this kind of information in a book like this without prescriptions for its use? Is a little knowledge a dangerous thing? Perhaps in this case it is. Many of the joints illustrated do not provide optimum strength nor do they enhance, in my opinion, the grain of the wood.

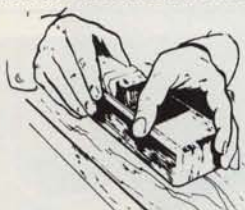
If you want to really get philosophical about beauty, you might ask yourself whether or not a joint which lacks any apparent practical purpose can actually possess that much-desired quality or not.

The author classifies the joints he describes into five types: framing joints, carcass joints, splicing joints, joints allowing for expansion and contraction, and edge-jointing. He presents a far from exhaustive selection based possibly on his

personal tastes and preferences. Some are new to me and I would want to try them out, but the majority appear gaudy and inappropriate. Directions for making dovetails are included; but of all the various methods prescribed for doing dovetails I have read, I'd rank this one as being among the most complicated and the least adequately described. Directions for making all joints depicted can be found. Some readers may be at a loss to understand what is meant by "under-squinted shoulders" and pieces of joinery described as "slips" and "clamps." I know it bothered me, though your average British woodworker could presumably cope with such terminology.

In summing up, it would be difficult to predict whether this book would do an unsuspecting reader more harm than good, or more good than harm. Read it with a pinch of skepticism and you may walk away from the encounter unscathed. ■

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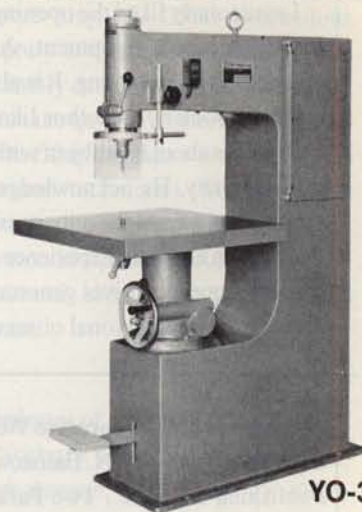


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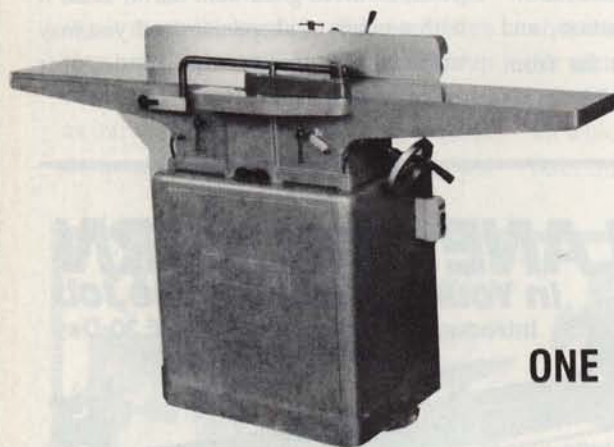
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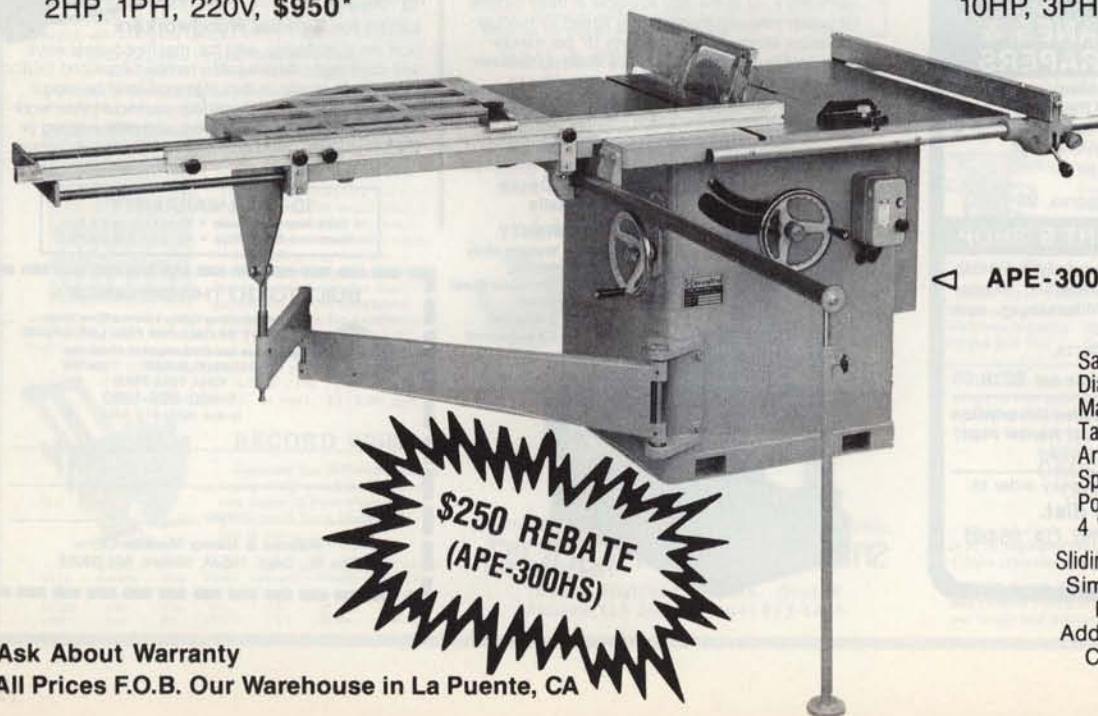
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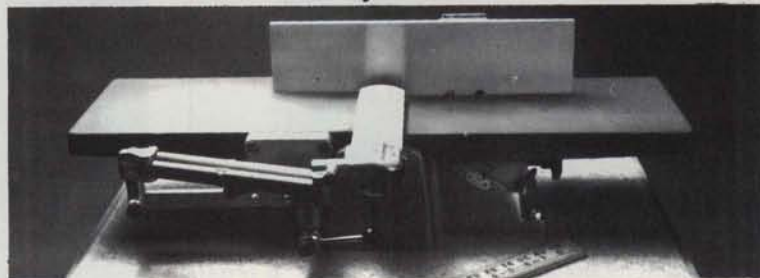
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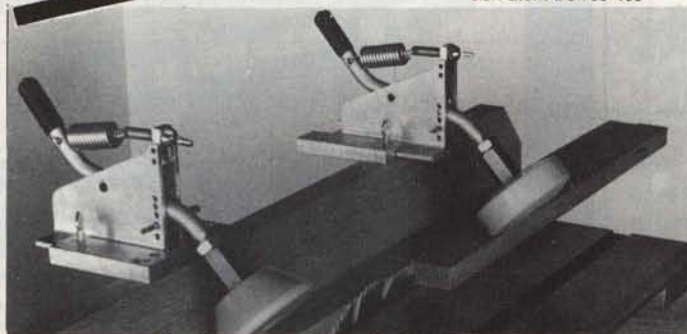
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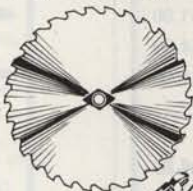
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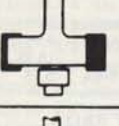

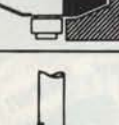
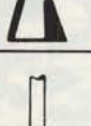
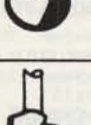


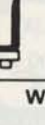



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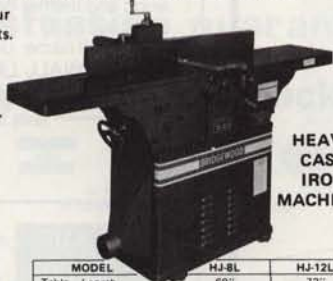
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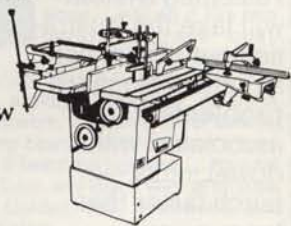
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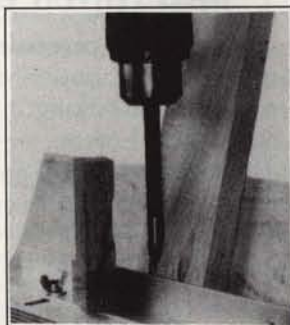
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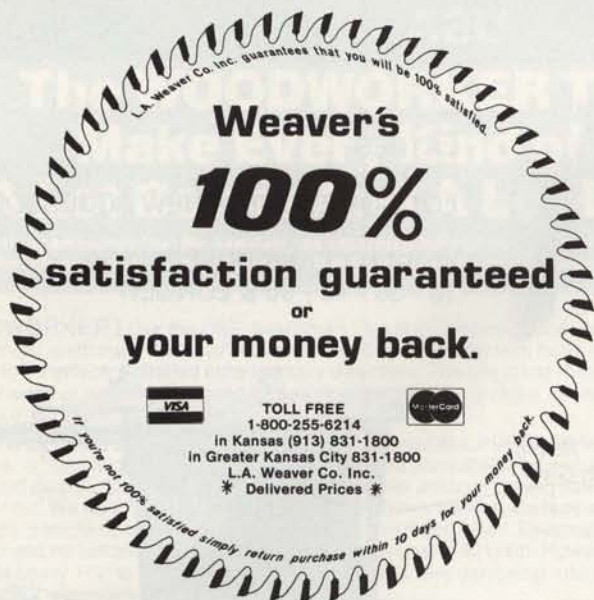
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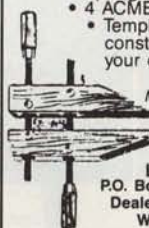
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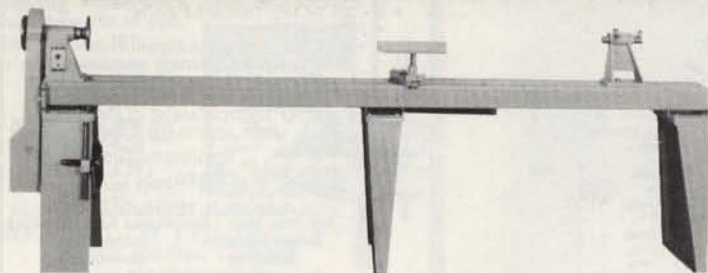
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Sharpening Woodcarving Gouges—Part II



by William H. McMaster

Shape of the Cutting Edge

There is more to sharpening a cutting tool than just producing a sharp edge. The edge must also be shaped properly to efficiently cut the wood. Thus, not all sharp tools will cut easily. This is very apparent when using woodcarving gouges. We must first know our goal in the sharpening process.

Figure 1 explains the terms we will be using. The cutting angle is the angle measured from the vertical the wood chip rides until it is broken off. The larger the angle, the easier it is to carve. This angle determines the way the wood falls and how the chip is formed.

The bevel angle is also known as the sharpness angle. The smaller this angle, the sharper the tool can be. However, because of the strength of the steel, there is a practical limit. On my small-detailing #3 gouges, I use an angle between 11° - 15° . This means a slope of between four and five to one.

The reverse bevel angle is put on the inside of the gouge. This strengthens the cutting edge without changing the cutting angle that determines the chip formation. The reverse bevel also allows use of the

gouge upside-down without digging into the wood. This is especially important with the shallow gouges, such as the #3 used for forming convex surfaces. The length of this reverse bevel is quite small and is typically about equal to the thickness of the chip being formed.

When carving, the downward force on the cutting edge of the gouge slightly depresses the wood. The clearance angle allows the wood fibers to rebound after the cutting edge passes, thus reducing friction and making it easier to cut the wood. A slight hollow ground, in addition to making it easier to hone, also provides an increased clearance angle.

Edge Formation

Edge formation consists of shaping the bevel down to the cutting edge as well as in establishing its correct shape. To correct the end shape of a gouge, use a 3" sanding/polishing wheel as in Figure 2. It consists of aluminum oxide particles embedded in a rubber-like compound. Made by Black and Decker, it is sold in hardware stores as a drill accessory.

This wheel is also used to shape the V-tool. In Figure 3, the critical features of the V-tool are shown in the side views (A)-(C)

- A. cutting angle
- B. bevel angle
- C. reverse bevel angle
- D. clearance angle

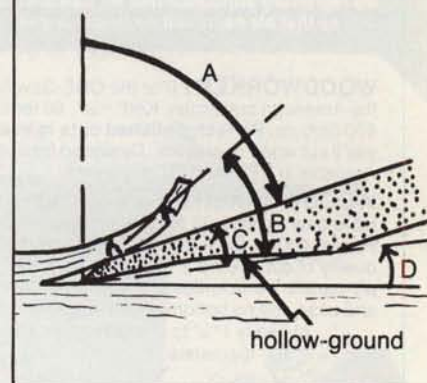


Figure 1. The cutting shape of a woodcarving gouge.

and the end view (D) and (E). Most carvers prefer the perpendicular shape (A) and the rounded edge of (D). While the forward slope of (B) will cut more easily, it will not fit into corners. Avoid the backward slope of (C) since it prevents the wings from cutting first to relieve the pressure on the bottom of the cut. The rounded edge of (D) cuts more easily than the sharp edge of (E). This sharp edge is only desired if you want a sharp V-cut, such as in lettering. In sharpening the V-tool, consider it as three blades—two chisels joined together by a curved gouge—and sharpen each section accordingly.

When the correct end shape has been established, continue the beveling down to the cutting edge. The first step is to rotate the gouge on the upper half of the sanding/polishing wheel. Be careful not to use excessive pressure; this will overheat the steel. The second step is to fine-shape the edge with a 800-grit waterstone.

Sharpening

Sharpening is the establishment of a sharp cutting edge. In hand sharpening, use a 1200-grit waterstone; for power sharpening, use a Cratex abrasive wheel. This wheel consists of silicon carbide

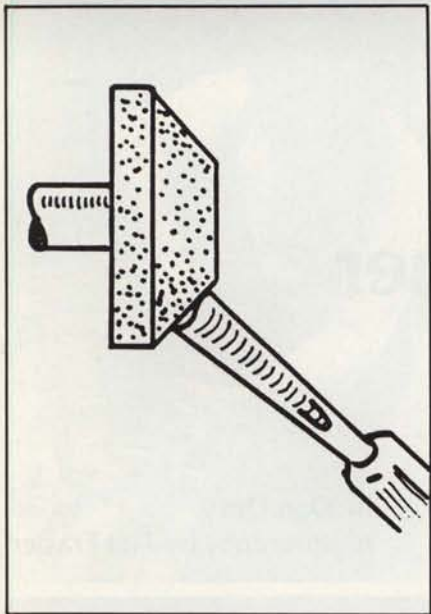


Figure 2. Squaring a gouge on the sanding/polishing wheel.

embedded in neoprene rubber. The square corners of this wheel should be rounded into a semi-circle with a dressing stick so that the wheel can be used to establish the reverse bevel. The sides of this wheel are used for sharpening the gouges.

When you have finished this step you should have a sharp tool, correctly beveled, which can be used to carve wood. For an even sharper edge, proceed to the next step: honing.

Honing

Honing puts an extremely sharp edge on your gouge and keeps it that way while you carve. When doing detail work, I find I am constantly honing my gouges. For hand honing, use either the Japanese gold stone or a Belgium waterstone. Because of its smaller size, I use the Belgium for the smaller gouges.

For power honing, a muslin buffing wheel loaded with Simichrome polish as the abrasive is effective. Made in Germany, this compound comes in a toothpaste-like tube and is available in auto supply stores. Because of its flexibility, the muslin wheel must be held rigidly. This is done by sandwiching the wheel on the arbor between two circular pieces of masonite as shown in Figure 4. These

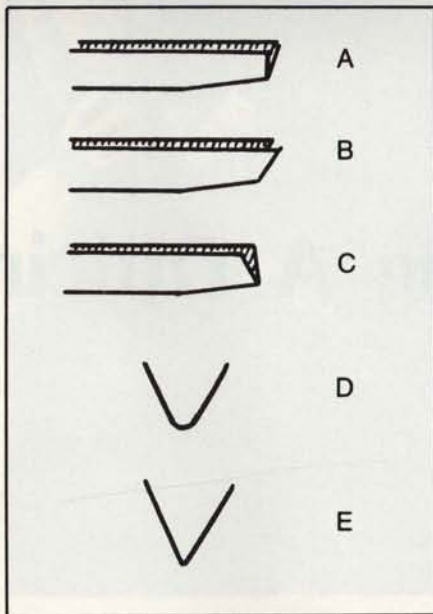


Figure 3. Shapes of the V-tool

round disks should be about 1/8" smaller in diameter than the muslin wheel. When using this buffing wheel, it is important that the gouge not be pushed down into the fabric—this will cause the fibers to curl over the edge and actually dull the tool instead of sharpening it. I find this power method works best with the larger gouges, and that the smaller ones are best honed with a stone.

Honing can produce a fine wire edge on the reverse bevel. This can easily be detected by drawing your thumb or finger across the edge. To remove this wire edge and hone the reverse bevel, a small Cratex stick works well. Using a knife, this stick should be reshaped to look like a small slip so that it is a V-edge on one side and a variable curvature on the other. This way it can be used on the inside of both gouges and V-tools.

Many times a beginning carver will ask me, "Why doesn't this sharp tool cut wood?" The inevitable answer is that, although the edge is sharp, the bevel is wrong. What has happened is that during the sharpening or honing, the bevel became slightly rounded (see Figure 5). When held in a bright light, this rounded bevel shows up as a reflection indicating a

Figure 4. The muslin buffing wheel in use honing a gouge.

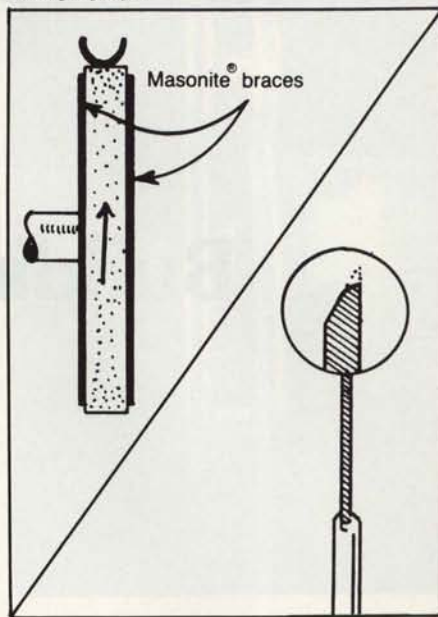


Figure 5. Magnified view showing a rounded edge on a gouge.

change of surface. This rounded edge results in a negative clearance angle, making it difficult to carve, and this rounding must be removed. Since it is usually quite small, this can be accomplished by rubbing the gouge sideways on a 1200-grit waterstone.

Testing for Sharpness

Begin testing for sharpness by using the thumbnail test. Rest the gouge's cutting edge vertically on your thumbnail. If it slides off, it is dull. Since the tool may be dull in just one small region, rotate the gouge to test different sections of the edge. The next test is to make a cut on a scrap piece of pine and then observe the wood surface. If the cut has opened the pores, the gouge is tearing and collapsing the wood fibers rather than cutting them. This is highly evident when cutting end grain. Of course, the final test is the ease of cutting the wood on your carving. You will find it is a process of repetition until you get your gouges tuned to your particular style of carving.

In these two articles we have discussed the equipment and methods of sharpening your woodcarving gouges to a fine edge. Carving with sharp tools is a pure joy. Be sure yours are truly sharp. ■

Building A Dulcimer

by Dan Doty
photography by Tim Frasier

Among instrument makers in America, the Appalachian or mountain dulcimer is one of the most favored stringed instruments to build. There are more people making dulcimers than there are making classical guitars. This is probably because dulcimers are easier to learn to play and, more important for the woodworker, somewhat easier to build.



The pattern is drawn from a template onto the resawn stock. The elongated cutouts in the center are there to allow the sound to reverberate in the hollowed-out fret board.

These were the reasons that led me into the dulcimer business. I began by building three crude models, rented a space in a local crafts show, and in two days took 18 orders for dulcimers.

This cataclysmic success caught me unprepared; I soon recruited my family to help with the business. We had few tools and were working from the kitchen table. We realized the need for new tools as we improved the construction of the instruments. We realized the need for a better place to work when, during dinner one night, I reached for the mustard and poured white glue on my hamburger.

The Right Stuff

So much time and effort go into building a dulcimer that both are wasted if a poor grade of wood is used. Mostly we use black walnut and southern wild cherry; but for the tops (soundboards) spruce, sassafras, mulberry and cedar also work well. Each wood produces its own distinct sound. At first it's best to buy from specialist suppliers of instrument woods, though now I hand-select my own. To minimize against shrinkage and warping, I buy kiln-dried, quarter-sawn wood. Straight-grained wood is good for fret boards, and figured grain makes decorative backs and sides. In hand-selecting each piece, I pur-

chase in short lengths in order to get straight pieces.

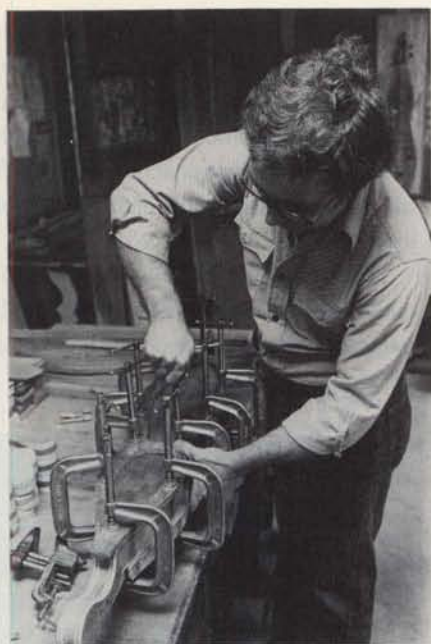
With few exceptions I buy wood that has been dried and planed. That way I can see the grain, color and condition—hence no surprises when I cut into a piece. I prefer 5/4 or thinner stock, 8" wide and in lengths of 3'-6'.

In retrospect I see why those first dulcimers were so crude—quality materials make all the difference.

Because we began this venture so spontaneously, we did not have a good selection of tools. We acquired them as we went along. They now include: a table saw, band saw, drill press, sander/finisher, hand planes and knives. Rasps, assorted files, a spokeshave, chisel and Xacto knives help in shaping.

For gluing the dulcimer, I use a special jig made of a two-piece jig shaped to the outside dimensions of the dulcimer. It is used when the sides are glued onto the top and when the back is attached.

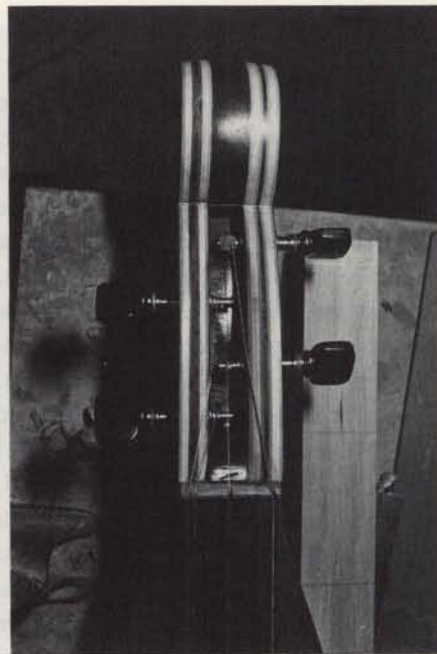
Two other "tools" useful in building musical instruments are a good musical ear and the ability to play the instrument. A good ear is beneficial when making tuning adjustments. Without knowing what the instrument should sound like, it is difficult to make those adjustments. Being able to play is important too, especially if



After installing braces and sound posts, the back is glued in place and a caul protects it during clamping. Inside is the label that is numbered, dated and signed.



The author preparing the edges for filing and hand-sanding.



Finished headstock showing laminations of walnut and poplar.

you are selling your instrument. When all else fails, the ability to demonstrate how truly easy it is to learn to play the dulcimer can close a sale.

Construction

Begin construction by milling the material for the sound box. Resaw solid wood on the band saw into slices that are slightly over 1/8" thick. With a stationary belt sander, sand each piece smooth to 1/8". The same machine is used to get even glue edges on each piece.

Cut the stock for the sides to width and glue together pairs of book-matched pieces for the soundboard and back. I like to insert a 3/32" strip of contrasting wood between the pieces I glue up for the back. This gives a nice inlay effect.

There are different ways to bend the sides to the desired curve. You can soak the wood in very hot water, or you can steam it; but I prefer to cut shallow kerfs on the back (inside) of each piece until it will flex the desired amount.

Sound hole design is one aspect of the process where there is room for creativity. Uniquely shaped holes can be used to identify the work of individual craftsmen. Trace the holes onto the soundboard and

cut them out with a jig saw. Use small files and sandpaper for the final shaping.

Designing for Sound

In addition to the sound holes, I make three other cutouts on the top that aren't visible on the finished product. These are located under the fret board and are designed to allow the sound to resonate up into the fret board, which is also hollow.

Next cut the fret board to size and lay out

the fret positions. Using a fret saw, cut kerfs at these positions and insert the frets. File the ends smooth to a slight bevel. Next sink small holes in the fret board for mother-of-pearl position dots. Now you are ready to make the hollow in the fret board with a table saw, using a dado blade set.

Another design element that contributes to the quality of the sound is the use of "sound posts" inside the dulcimer. These



Each completed dulcimer is checked, adjusted and played before it leaves the shop.

are small posts attached between the top and bottom of the instrument to "tighten" the sound box in certain areas, while allowing other areas to vibrate more freely.

Bracing (struts) keeps the top of the instrument from cracking due to the resonating sounds. For this I use spruce wood because it is lightweight, resonant, strong, and glues well. All this culminates in a dulcimer with excellent tone and volume, each note sustaining well in length.

The headstock is the final piece to build before assembly. The type of headstock I make is patterned after the fiddle scroll, though I do not carve it like that. My headstock is made by laminating three pieces: two sides and a centerpiece, or core. The pieces are cut to shape; the peg holes are drilled and reamed; the three pieces are assembled. After the glue has dried, the headstock is trimmed on a band saw and shaped on a belt sander. The final shaping is done with a wood rasp. At times I will use a cherry centerpiece along with walnut sides, or vice versa.

For assembling the dulcimer, I use only a white wood glue since it dries clearly and cleans up easily with water. Also, if some replacement or correction is needed, this makes it easier to take the instrument apart by using heat to separate the pieces.

The final step before finishing is to glue the fret board onto the soundboard using a caul to protect it from the clamps. Two cauls shaped to the outside dimensions of the dulcimer are utilized when gluing the soundboard to the sides. Install the sound posts and the headstock piece just before attaching the back, and sandwich the instrument between the same two cauls when clamping.

Finishing

After a final sanding with 150-grit and 180-grit sandpaper, wipe each dulcimer with Danish oil that has a tung oil base. Allow it to dry overnight, then wipe or rub out the wood with a crocus cloth (jeweler's polishing cloth) and oil. This removes the scratches and gives a smooth finish.

Once the finish is dry, spray with a light coat of lacquer. To get the finish you like, it is sometimes necessary to apply several coats of lacquer and use the crocus cloth and oil between each coat. Myself, I don't use stain, preferring the natural color of the woods.

That's it! And so emerges another dulcimer, one of the sweetest-sounding of all musical instruments...and sounding all the sweeter because you built it yourself. ■

A good source for plans, strings, special hardware and materials is: Jean's Dulcimer Shop, P.O. Box 8, Highway 32 South, Cosby, TN 37722, (615) 487-5543.

Shop Tip

Flattening Unruly Veneer

by Martin R. Zschoche

Have you ever ordered wood for veneer which arrived flat and uniform but, after exposure to *your* environment and humidity, ended up looking like the Atlantic Seaboard during a hurricane?

Burls, swirls and crotches, as well as veneers cut in larger sections like Kevan-zinga, are particularly prone to twisting out of shape due to differential moisture absorption. This frequently occurs when a shipment arrives from the distributor in

one climatic zone to the customer in another. Since the piece was originally cut flat, we can assume that, with some work, it can be returned to its original shape.

To do so, prepare two sheets of brown porous wrapping paper (not newspaper) larger in size than your piece of veneer. With a whisk broom dipped in water (or preferably a 75/25 water/glycerin mixture) dampen both sides of the veneer by flicking the broom briskly with your wrist. Do

not brush the broom over the wood, as this may damage it.

On a flat table or veneer press, place the veneer between the two layers of paper. If the table top would suffer from the moisture, protect it first with waxed paper. Now cover this paper-and-veneer sandwich with a piece of flat 3/4" plywood for weight. Over the next 15-30 minutes, gradually and evenly add more weight over the surface of the plywood with brick, stones, lead, etc. Allow this to set for at least 24 hours. The following day, remove the veneer from the press and place it between two new sheets of paper. Again weight lightly and let the veneer finish drying. By the third day, it should be completely flat and ready for use.

For storage I recommend continuous light weighting for those veneers whose nature it is to warp. Taking this precaution from the start will prevent repeating this process later. And your veneer will not look as if it had been through a hurricane—or "twister." ■

Alternate Bowl-Turning Techniques

by W. K. Alexander

To many woodworkers, the idea of turning a large bowl suggests the need for a massive and usually expensive block of wood. But before you mortgage the homestead to raise the needed funds, consider the following alternatives. These methods will allow you to make a beautiful and functional bowl requiring less wood at a fraction of the cost, and will also facilitate the actual turning.

B. William Bigelow discussed one technique in his article "Split Ring Bowl Construction" (*Popular Woodworker*, Aug./Sept. 1985, Issue 26). I would like to mention two other ways to make bowl blanks that offer similar benefits and also open up new possibilities.

The two techniques I would like to discuss involve stacked rings cut from a glued-up octagon, and stacked/segmented octagonal rings. These procedures are similar in that they both use octagonal construction which allows only edge grain to show around the entire circumference of the bowl.

The wood used for making bowls by the following techniques **must** be completely dry and well-seasoned before use. If improperly dried material is used and the

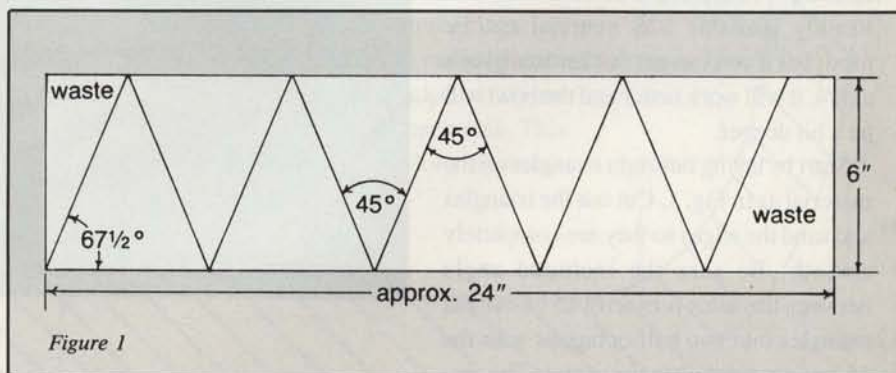
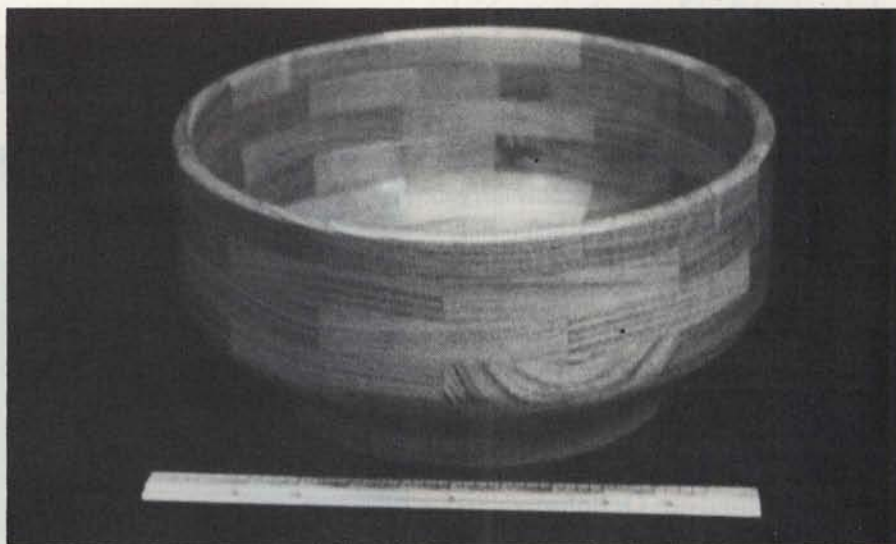
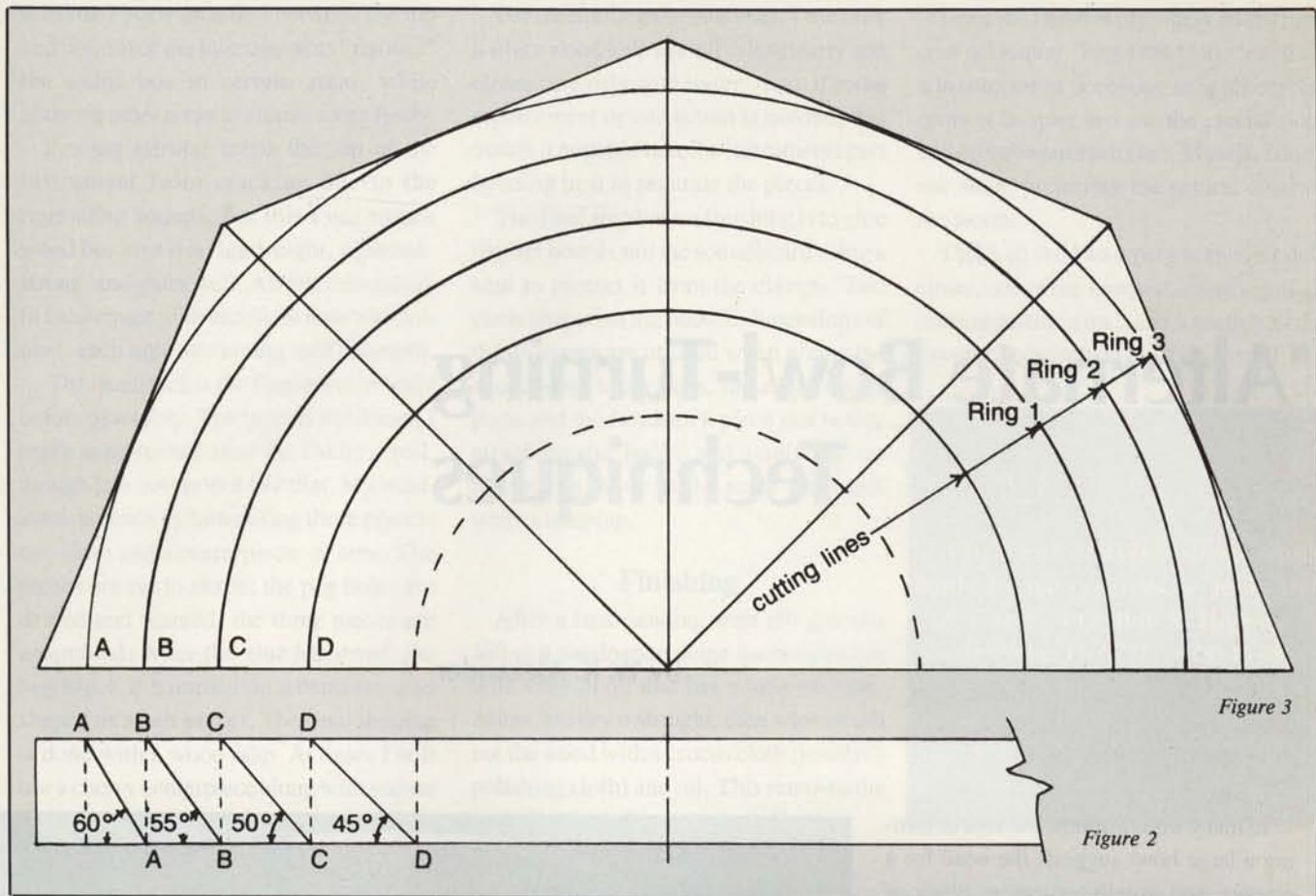


Figure 1



finished bowl is stored in a warm, dry place, the glue joints in the bottom of large bowls may fail when the wood completely dries out. If there is any question about the wood being dry, it is advisable to cut the triangles and store them in a warm, dry place for a week or so before gluing them together.

Stacked Rings Cut from a Glued-up Octagon

Believe it or not, it is possible to make a bowl about 12" in diameter and 4" deep from a 24" long piece of 6" wide 4/4 stock. Readily available S2S material can be used; but if you can get thicker stock such as 5/4, it will work better and the bowl will be a bit deeper.

Start by laying out eight triangles on the material as in Fig. 1. Cut out the triangles and sand the edges so they are completely smooth. Be sure the included angle between the sides is exactly 45°. Glue the triangles into two half-octagons with the 45° points meeting in the center. The eas-



Cutting half-rings from a glued-up half-octagon on a homemade band saw.

iest way to do this is to use a quick-setting glue such as Franklin "Hi-Tac" and simply hold the pieces together for two or three minutes, rather than trying to clamp this unusual arrangement.

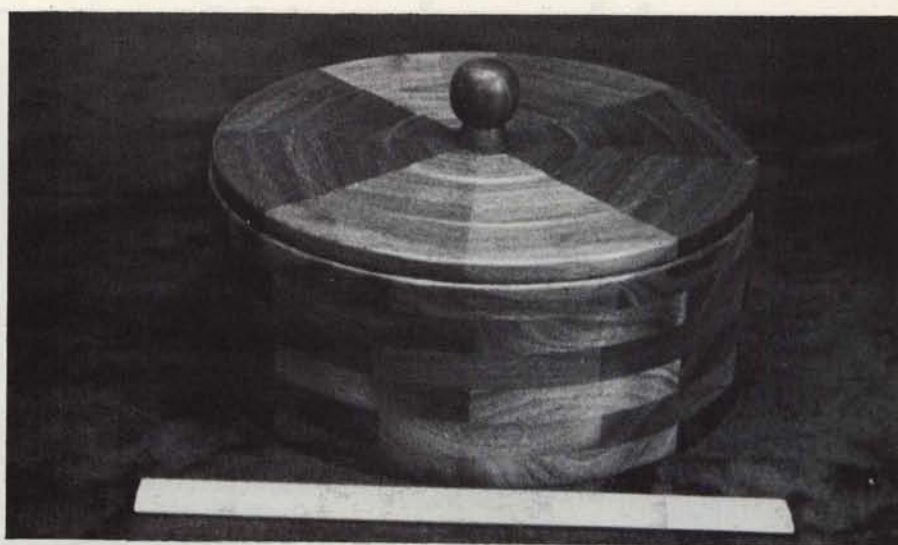
When the pieces are dry, make sure the long edge of each half (where they are to be joined to complete the octagon) is straight and true. You may need to do a bit of sanding on a disc sander if your angles or gluing are off.

Next, mark the angles on the long edges as shown in Fig. 2 and lay out the cutting lines on the top of the material as in Fig. 3. With the band saw table tilted at the proper angle, cut the three half-rings and the half-disc from each piece. The matching halves can now be glued and band-clamped to give full rings of three graduated sizes.

When the rings and the disc are dry, they should be checked to make sure they are flat and smooth on both sides; if not, they may need sanding. Then glue the bottom of the smallest ring to the top of the disc. In this step you will need to apply pressure to attain a tight glue joint. I use my drill press for this purpose by bringing down the quill firmly and locking it. Since there is no tendency for one piece to slide on the other as is usually the case with C-clamps, this method works very well.

Once it has dried, mount this assembly on a faceplate and shape the inside bottom of the bowl to the desired contour. I normally do no shaping of the outside of the bowl until the inside is complete. This leaves more wood on the assembly, which makes it less likely to chatter. Glue on the second ring with the center line rotated 90° so the glue joints are staggered. This makes for a stronger final assembly.

Next, attach the third ring and finish shaping the inside. The outside of the bowl can now be finished to give the final contour. The only drawback to this procedure is that it limits the overall shape of the bowl to some extent and the sides will slope close to 45°.



Popcorn box 12" x 5" made by the stacked/segmented ring method. Black walnut 4/4 stock. There is almost no limit to the size and shape of bowls that can be made by this method.

Stacked/Segmented Octagonal Rings

This procedure uses a little more wood than the previous one, but there are virtually no limitations on the size or shape of the final product. Even globe-shaped bowls and tall, slender vases are possible.

First draw a sketch of the bowl you wish to make. This is best done on cross-ruled paper. You should show at least half the bowl in cross-section as in Fig. 4. The sketch should display the dimensions of the base and each of the rings to be used.

The base can be made from either a solid disc or a glued-up octagonal assembly. In most cases I prefer the latter since it is more compatible with the remainder of the bowl.

From the sketch it is quite easy to determine both the inside and outside dimensions of the required octagonal rings.

The octagonal rings are made by end-gluing eight strips, or blocks, which are cut at exactly 22-1/2° on each end. This gluing operation can be done by hand-

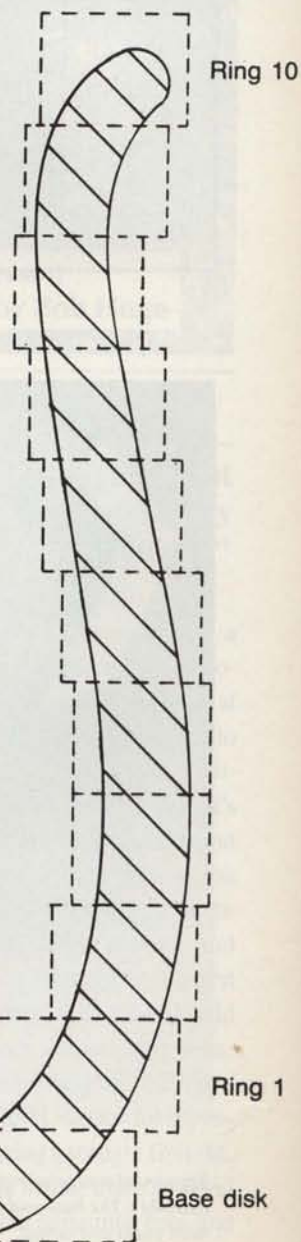


Figure 4

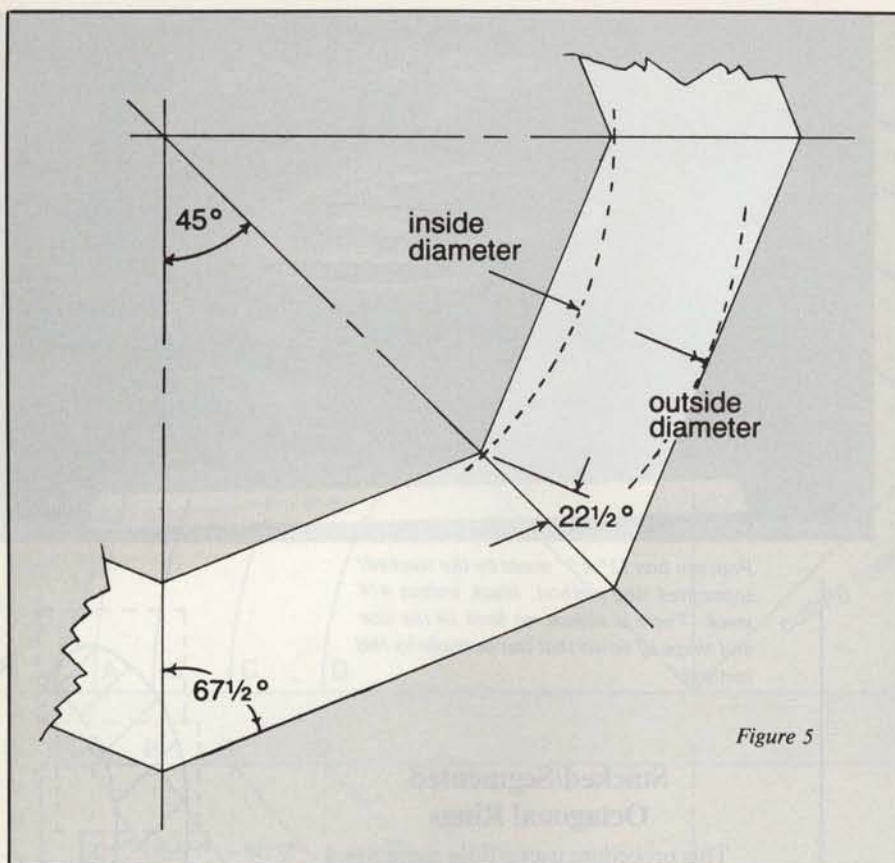
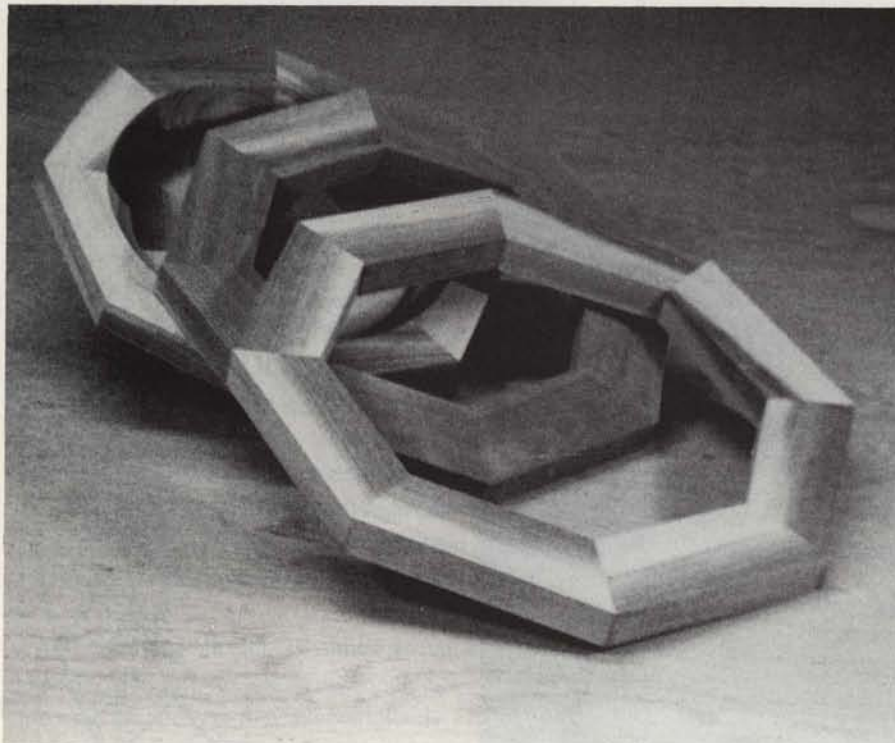


Figure 5



Segmented octagonal rings ready for final assembly. The base and first ring have been glued and turned.

clamping as previously mentioned. It is best to glue-up half-rings first and then check to see how well the two halves fit together. If the blocks were cut with exactly $22\frac{1}{2}^\circ$ end angles, there will be no problem. If you are off, however, the error can now be corrected on the disc sander.

Although the half-rings can be successfully hand-clamped, this technique works better if a nylon band clamp is used to apply a little more pressure to the joints. When the rings are done and the glue is dry, they should be sanded on both sides so they will be perfectly true and flat.

Now glue the first ring to the base and turn the inside as before. Succeeding rings are glued to the one below and turned on the inside. All joints on the rings are staggered $22\frac{1}{2}^\circ$. This produces an interlocking effect which strengthens and enhances the appearance of the finished bowl. As before, turn the outside after the shaping of the inside is complete.

Sand both sides of the bowl with three or four grits of sandpaper, but be sure all the shaping is done first. Never go back with a cutting tool after sanding, as the imbedded abrasive particles are very hard on cutting tools. After the final sanding is completed, I normally burnish the surface with a big wad of turnings produced earlier.

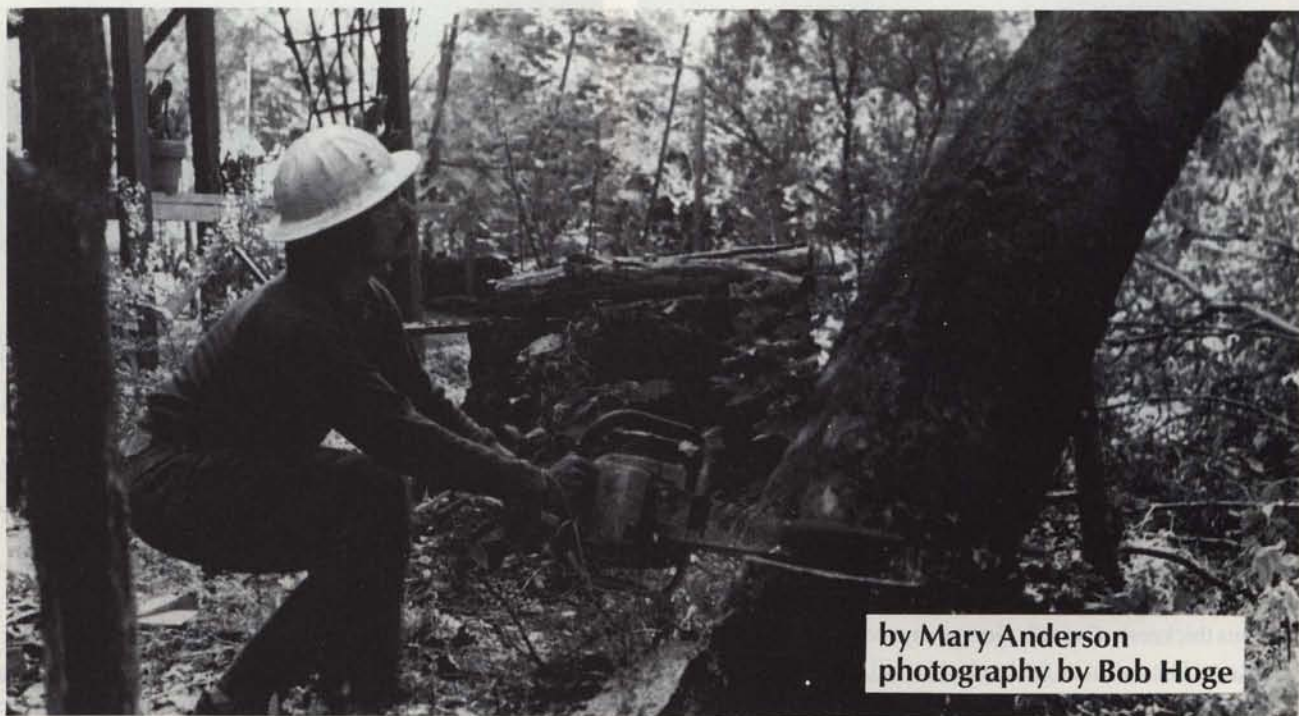
The finish to be applied is your choice. For bowls that will be used for food, I simply soak both sides with cooking oil and burnish with a rag on the lathe till almost smoking hot.

The advantages of these techniques will become apparent when you start turning. Your tool will be cutting nearly parallel to the fibers of the wood at all times. Even a scraping tool will produce great clouds of long turnings; surfaces will be very smooth; and finishing will be greatly enhanced. You can even mix different species of wood to produce a large array of color combinations and patterns—I recently finished a project where I made each of the eight pieces from a different wood.

Have fun and let your imagination soar! You'll probably never want to use a solid block to make a bowl again. ■

Woodworking Begins With The Tree

Monroe is shown felling a madrone tree that was shading a neighbor's garden.



by Mary Anderson
photography by Bob Hoge

George Monroe Dries His Own Wood

Why would anyone take the time to fell, mill and cure his own wood? All you have to do these days is get in your car and drive to the lumberyard, right? Not if you're George Monroe.

"Felling, milling, curing and drying your own wood is a different feeling from buying a piece of lumber that has come from a thousand miles away, and you don't know what has happened to it," attests George. "I don't profess to be an expert. The more I learn, the more there is to learn. Sometimes we want to do something but fear we lack the ability. But if you just start, are willing to learn, and are not afraid of making mistakes, you find you can do it."

What to Look for in Selecting a Tree

Says George, "I look for a tree that doesn't have any major defects. Preferably

it should be straight. A tree that is leaning a lot has both tension wood and compression wood in it, so you want one that's growing as straight as possible. Also, there are a lot of insects that love to eat hardwoods, so I look for a tree free of eggs and burrowings." He adds, "Usually in a crotch where there's a limb or a fork, the grain gets very involved and is more intricate and beautiful. The more interesting grain patterns will be in those places. Also, sometimes if the bark is peeled away, you can see the patterns or swirls on the sapwood outside, and that gives you an idea of how the grain will be inside." Though George contends, "You can make a straight tree fall almost any way you choose," that kind of precision comes with experience. Felling trees is an art in itself, something George learned when working as a logger, watching the experienced loggers fell trees.

"Milling is something you've got to do a lot of, and it definitely has its trials and tribulations," says George.

George uses a chain saw mill with a motor at either end. Operating it is a two-person job. Some trees need to be milled at the site. Others he brings home as logs to be milled there. Either way, he says, "Setting up the mill is tedious and no fun. It's just not a pleasant chore with dirt and sawdust blowing in your face. I guess you don't get something for nothing, and the payoff is when you begin slicing and discovering the grain." Setting up the first cut is critical. George uses a hand-held chain saw to smooth the working area, then nails an aluminum ladder to the top of the log to provide a level surface for mounting the saw and making a straight first cut. Once the first cut is made, there's a level surface for making the remaining cuts, and



Using the chain saw to smooth the top surface of the log before milling.

the mill can be adjusted to make slabs of various thickness. Overall, George says he has found live oak to be the hardest to mill.

Curing is the next step, and one open to mistakes.

Since moisture leaves the wood most quickly through the ends, it's important to paint the ends of the boards soon after milling to prevent the rapid escape of moisture that leads to cracking and checking. Paraffin is the sealer of choice, but George claims any enamel or latex paint will do.

Wood drying. Monroe uses a meter to test the moisture content.



After the first cut, the mill is used to slice slabs of various thicknesses.

Drying the Wood

George air-dries his wood in an open-sided shed he constructed for that purpose. Each kind of wood has its own special drying requirements, something this do-it-yourselfer learned the hard way. Because of its remarkable range of color, madrone is one of George's favorite woods, but it is very difficult to dry properly.

"Madrone tends to warp quite a bit, and you really have to keep it weighted down and dry it very slowly. If you should happen to mill it in summer (which, believe me, is not a good idea) you can throw it in a pond and let it soak and then take it out in winter to dry. That way it won't be exposed to a dramatic change from green log to hot dry air, which can do a lot of damage. And you have to remember that until it's down to 6% moisture, it will just continue to change and warp and shrink." Tan oak also checks and cracks in drying. "It has really beautiful grain, but when it's dried there will be places that shrink more than others, so you have to plane it down a lot. Pepperwood remains fairly stable in the drying process, but you have to work it very carefully or it tears out at the grain."

George has made his worst mistakes working wood that wasn't completely dry.

George uses a meter to test for moisture

content. The meter measures electrical resistance. It's important to remember that various woods have different levels of conductivity at different temperatures.

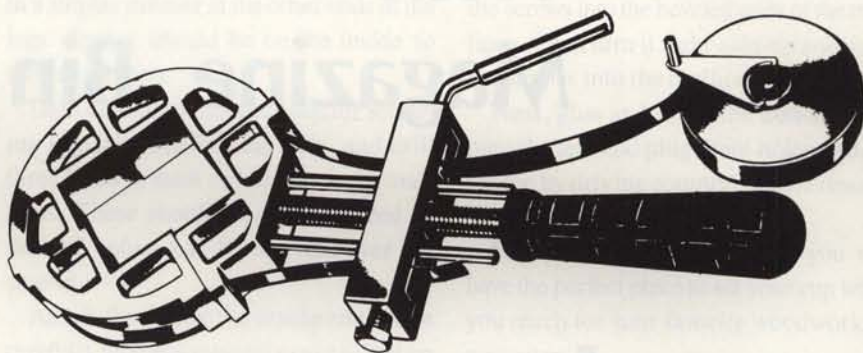
You can't be in a hurry with the curing process. Wood which George milled four or five years ago is only now ready for working. Depending on the thickness of the slab, the length of drying time can vary.

The use of planes is something he picked up from a demonstration of Japanese woodworking techniques. He started out buying planes, but now has begun making his own. He also prefers Japanese techniques for tool sharpening. "It's much superior to others I've used," he says. "I use Japanese tools exclusively for sharpening. It was really a revelation to me when I realized how much difference sharp tools can make." Is it more economical to fell, mill and cure your own wood? "There are some savings," claims George. "The cost averages out to around 90 cents a board foot. But the real reason for it," he continues, "is the satisfaction of being involved in the whole process." For one who begins with the tree itself, George Monroe finds much satisfaction. ■

Tests & Comments

by David M. Camp

The Merle Adjustable Corner Clamp



I met a woodworker once who claimed to have too many clamps. Not only that—his measurements were always too accurate; he was far too good-looking; and he always had much too much money.

If you don't already have too many clamps, you might be interested in the Merle Adjustable Corner Clamp available from MLCS, Ltd., P.O. Box 53, Rydal, PA 19046.

This clamp is a hybrid between a four-way frame clamp and a band clamp. Like the frame clamp, it has four cast aluminum corner blocks; but instead of threaded rods and four nuts that must be tightened, the corner blocks are strung together on a length of steel banding. One corner block is attached to a pressure assembly, through which the slack end of the banding passes to be locked in place with the crank of a

lever. A few quick twists of the pressure assembly handle produce powerful, even tension on all four corners.

This tool comes with enough steel banding to clamp an object that is 12' around, and is conveniently mounted on a reel so it can be easily wound up for storage. For \$7.00, the company offers a 40' roll of extra banding to use when clamping larger objects. Unfortunately it doesn't come on a reel. You could just as easily buy standard 3/8" steel banding from an industrial supply house in whatever length preferred.

The most significant claim made about this clamp is that it forces the work into the square; I found this to be true. A properly mitered picture frame will be instantly squared when cinched up in the Merle clamp. It even worked with miters that

were a smidgen off—which might be appreciated by those who don't have my friend's problem of overaccuracy. Of course, if the sides are of different lengths, nothing is going to make the frame square.

At a price of \$34.95, you could probably purchase several band clamps or four-way frame clamps instead of a Merle clamp. However, I like to use one to start the assembly of my projects because it quickly brings together and squares the four sides. Then I can add band clamps and bar clamps for additional pressure, without the panic of shifting and adjusting things while the glue sets. Unfortunately, I still don't have my friend's problem of too many clamps.

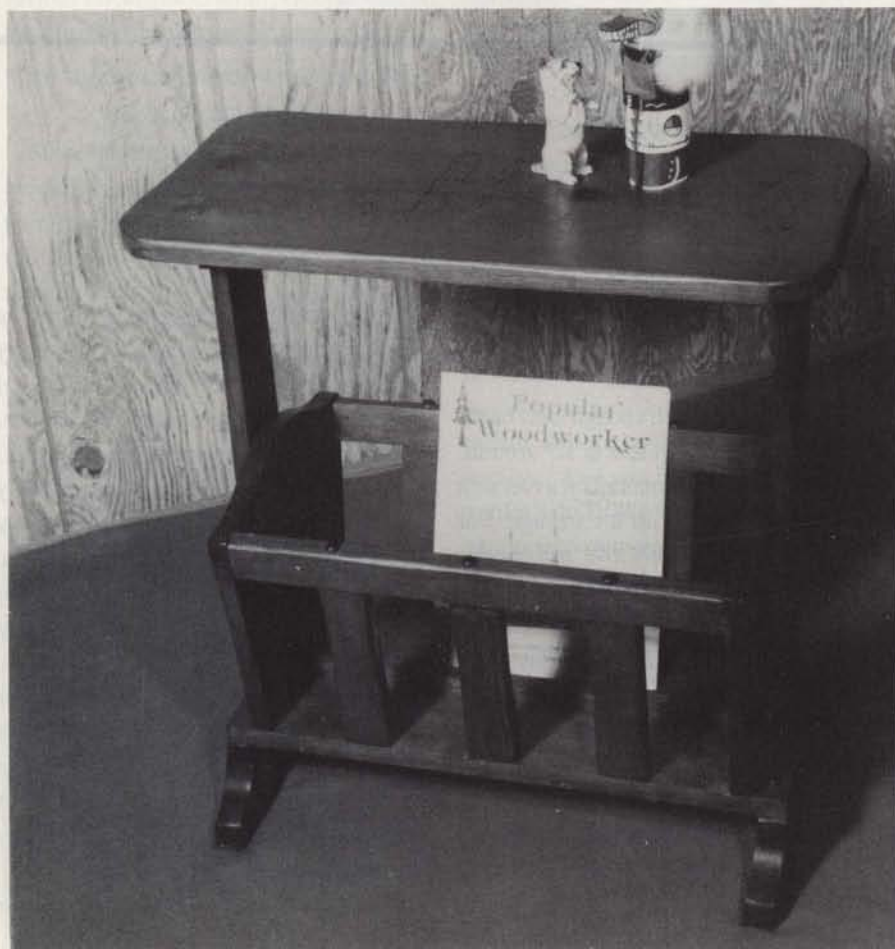
And I can't tell you how to get his other problems, either. ■

Small Project

Cradle Table With Magazine Bin

*A One-of-a-Kind
Home Furnishing*

by William G. Glenn



If you enjoy reading in a reclining chair, this cradle table with built-in magazine bin is for you.

The table top is even with most chair arm heights, and the bin has a stop rail screwed lengthwise to the inside of the bottom to keep magazines and last week's newspapers in some upright order. The top is purposely kept small to prevent the stacks of unread papers from piling high before gravity wins the waiting game.

The table in the photo was made from easily obtainable pine shelving, with standard 2 × 4's used for the feet. To achieve the Western look, the edges were saddled (rounded in areas) with a rasp, and a cactus design burned into the top with a soldering iron. The edges of your table could be routed or left square, and of course hardwood could be used instead of pine.

If you are using narrow stock, begin by gluing up panels for the larger pieces like the top (A), bottom (B) and cradle ends

This table is simple to build and makes a perfect place to keep magazines handy next to an easy chair.

Cradle Table with Magazine Bin

Cutting List

Qty.	Part	Finished Size			Piece
		T	W	L	
1	A	3/4"	11"	22"	top
1	B	3/4"	8"	20"	bottom
2	C	3/4"	11"	9 1/2"	cradle end
2	D	3/4"	2 3/4"	18 1/2"	legs
2	E	3/4"	1 1/2"	16 1/4"	rails
1	F	3/4"	3/4"	16 1/4"	stop rail
2	G	1 1/2"	3 1/4"	16"	feet
2	H	3/4"	2 1/4"	7"	top supports
6	J	3/4"	2 1/4"	7"	mullions

Supplies

34	1 1/4" x #8 flat head wood screws
18	1/2" screw hole plugs

(C). Cut the top and bottom to size and, if you like, round the corners of the top. Cut the material to size for the legs (D), rails (E) and stop rail (F), and cut two 16"

lengths of 2 x 4's for the feet (G). Because the two top supports (H) start from the same size stock as the mullions (J), cut them with the same set-up. Then cut an 80° bevel on one end of each mullion.

Next cut the curved shapes on the top supports, feet and cradle ends with a band saw or jig saw.

Begin assembly by gluing and screwing the cradle ends to the legs so that the bottom ends are flush. Attach the top supports in a similar manner at the other ends of the legs. Screws should be on the inside so they don't show.

Drill holes in the cradle ends for screwing into the center of the rails, and drill three holes in each rail to attach the mullions. These should be counterbored so that 1/2" plugs can be inserted over the screws.

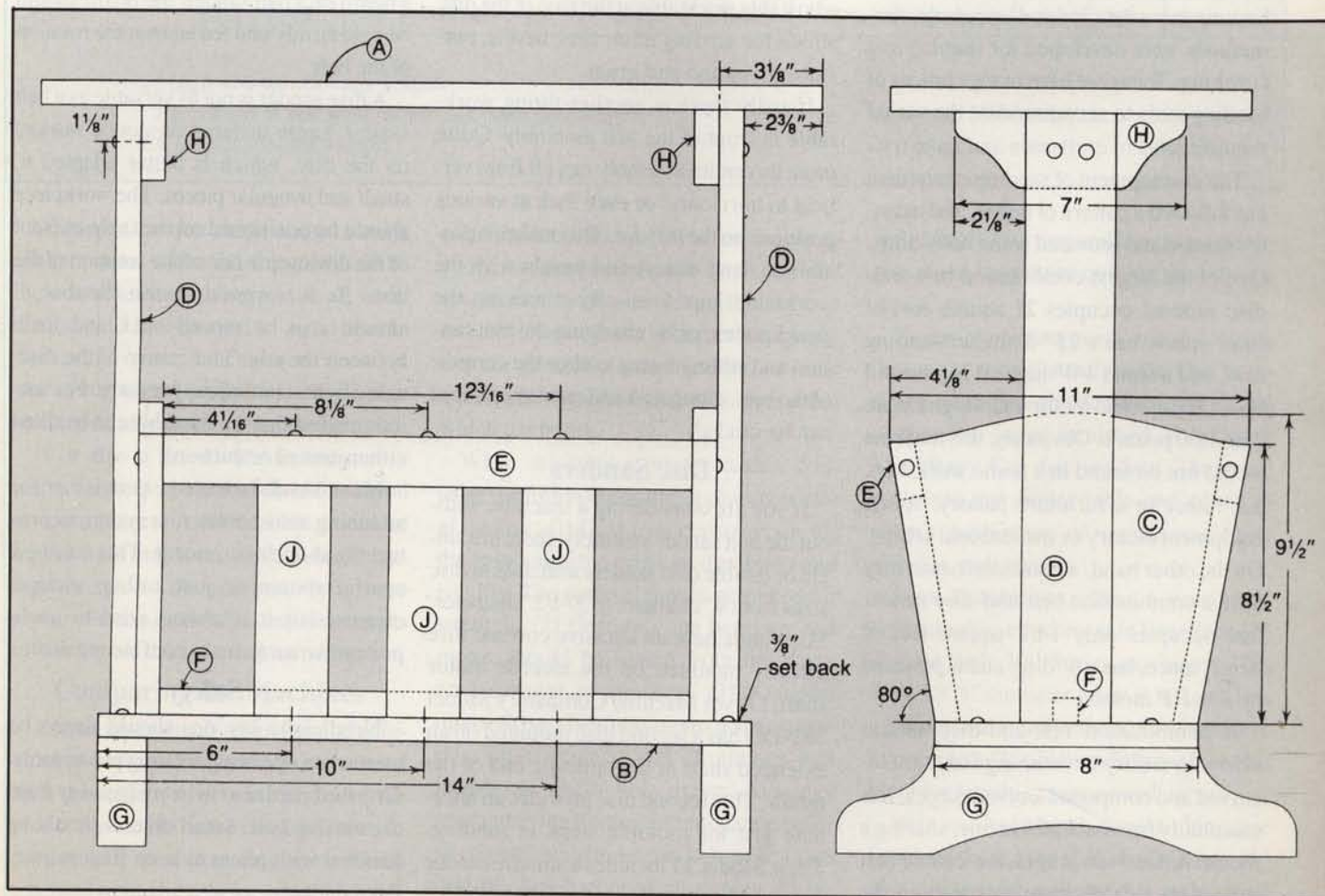
Attach the rails to the cradle ends, then carefully turn this assembly over to rest on

the top supports while you attach the bottom. (You will need someone to hold it steady.) I found that it was easiest to have the stop rail (F) glued centered to the bottom beforehand to help locate the position for attaching the cradle ends. Place a bead of glue on the bottom edge of the ends, position the bottom, and drive counter-sunk screws into the ends.

As long as it's upside-down, this would be a good time to drill the holes and drive the screws into the beveled ends of the mullions. Then turn it right-side-up and drive the screws into the mullions' tops.

Next, glue and screw the bottom down onto the feet and plug these holes. Attach the top by driving counterbored screws up through the top supports.

Sand, stain and finish—and you will have the perfect place to set your cup while you reach for your favorite woodworking magazine. ■



Comparative Product Review

Stationary Belt and Disc Sanders

by Ray Ternstrom

The ingenuity of man has given us some incredible tools! Through the years, tools have become more sophisticated to meet the needs of the age. The first sanding was done with a rock. As the finished product became more detailed and less crude, new methods were developed for shaping and finishing. Today we have many choices of sanding tools to accommodate the varied requirements of craftsmen and industry.

The development of sanding equipment has followed a pattern of needs, and industry needed and provided some hefty units. One of the largest combination belt-and-disc sanders occupies 27 square feet of floor space, has a 25" diameter sanding disc, and a stand 4'4" high. It is powered by a 5 HP electric motor and weighs more than 1100 pounds. Obviously, this machine would not be found in a home workshop, but rather in a furniture factory, sports equipment factory or institutional setting. On the other hand, a home craftsman may have a combination belt-and-disc sander that occupies only 1-1/2 square feet of bench space, has a 6" disc, and is powered by a 1/2 HP motor.

A combination belt-and-disc sander offers versatility in finishing flat, simple-curved and compound-curved pieces. It is essentially two machines in one, sharing a motor. A continuous abrasive-coated belt rotates on a drive drum mounted on the

motor shaft, then over an idler drum at the outer end. The disc sander is a metal plate attached to the motor shaft extending opposite the belt sander. An abrasive-coated sheet is attached to the plate, and an adjustable worktable at the face of the disc allows for sanding miter cuts, bevels, outside curves and end grain.

Usually there is another tilting worktable in front of the belt assembly. Quite often this entire assembly can tilt from vertical to horizontal or even lock at various positions on the 90° arc. This makes it possible to sand miters and bevels with the worktable kept level. By removing the guard plates, or by changing the belt tension and adding forms to alter the contour of the belt, elongated and curved surfaces can be sanded.

Disc Sanders

If you are considering a machine without the belt sander assembly, there are single or double disc sanders available in disc sizes from 9" diameter to 37-1/2" diameter. Most units have an abrasive covered disc directly mounted on the electric motor shaft. Oliver Machine Company's Model 382-DD has a second disc mounted on an extended shaft at the opposite end of the motor. This second disc provides an alternate grit for multiple steps in sanding. Their Model 34 includes a spindle sander as an alternate to the second disc.

Using a Sander

Power sanding removes a great amount of wood in a short time. You can therefore get into trouble if the workpiece is left in one place for more than a moment. To sand a board on a belt sander, the board should be held firmly and fed against the rotation of the belt.

A disc sander is not as versatile as a belt sander. Large surfaces cannot be worked on the disc, which is better adapted to small and irregular pieces. The workpiece should be positioned on the table in front of the downward side of the rotation of the disc. As it is moved against the disc, it should also be moved back and forth between the edge and center of the disc, using light, continuous pressure. For various angled shapes, the table can be tilted either inward or outward.

Most sanders have a provision for attaching a dust collection system to protect the shop environment. This may be a central system or just a shop vacuum cleaner, but it is always wise to use a preventive measure to confine the dust.

Safety

Needless to say, one should always be alert when operating rotating power tools. Grip the board near the top edge away from the moving belt. Small objects should be handled with pliers to keep fingers away from danger.

COMBINATION BELT & DISC SANDERS

MANUFACTURER	MODEL NUMBER	MOTOR					BELT			DISC		
		H.P.	AMPS	VOLTS	PHASE	RPM	SIZE	SPEED FT. PM	TABLE SIZE	DIA.	RPM	TABLE SIZE
ADVANTAGE	8270*	2	12	208/230	1	3360	6" x 67½"	4500	4¾" x 7¼"	13¾"	3360	7¾" x 14"
	SAME	1.75/2.5	12	208/230	1	1680/3360	(with optional 2 speed motor)					
CHIEH MING	DF-14	1	6.8	110	1	1720	6" x 60"	800	6" x 28"	14"	1720	6" x 28"
	DF-406	½	3.3	110	1	1720	4" x 36"	800	4" x 16¾"	6"	1720	5" x 7½"
CRAFTSMAN	22594	¾	13.8	115	1	3450	6" x 48"	2100	N/A	9"	2700	6¼" x 12"
	22642	⅓	7.2	115	1	3450	4" x 36"	2000	N/A	6"	3200	6¼" x 8⅞"
	22612	⅓	7.2	115	1	1725	1" x 42"	3000	7" x 9"	8"	1725	5" x 12¼"
	2476	N/A	2	115	1	4400	1" x 30"	2700	4¼" x 6"	5"	4400	3¼" x 7¾"
DELTA	31-730*†	1½	20	115/230	1	3450	6" x 48"	3030	7⅝" x 14¾"	12"	2100	9¾" x 6¼"
DESIGN TOOL & EQUIPMENT	8142	½	6	115/230	1	1725	1" x 42"	3450	N/A	8"	1725	N/A
JET	JSG-6	1½	20	115/230	1	1740	6" x 48"	2450	7" x 12⅞"	12"	3500	7" x 16⅞"
	JSG-96	¾	13.8	115/230	1	3500	6" x 48"	3500	N/A	9"	7000	6¼" x 12"
	JSG-1	½	9.8	115/230	1	N/A	1" x 42"	4000	6½" x 7⅞"	8"	N/A	4½" x 12¼"
OLIVER	182-DB	1	3.6	230/460	3	1800	6" x 60"	3300	7" x 11"	15"	1800	9¼" x 21½"
POWERMATIC	30-B*†	1½	20	115/230	1	1800	6" x 48"	2850	7" x 17¼"	12"	2400	7" x 17¼"
UNITRONEX	DZXA	5	15	230/460	3	1720	6" x 128"	3460	12" x 32"	25"	1000	12" x 32"
VEGA	300*†	¾	10	115/230	1	3450	6" x 48"	2675	7⅝" x 14¾"	12"	2044	10⅝" x 16⅝"

* 3 phase 230/460 volt motor available

† also available as belt sander without disc (same specifications)

N/A = information not available

A word of caution about using a sander for both metal and wood objects should be included: Before sanding metal, all wood dust should be removed to avoid sparks that could ignite it. This may occur in places that are not easily visible and cause serious damage before it is discovered.

It is also a good idea to frequently inspect abrasive belts and discs for frayed or loose places. A frayed belt should be replaced—it may break while in use, creating a hazard to the operator. Too, loose abrasive sheets on the disc may cause parts of it to fly off the spinning metal base.

Comparing the Machines

A chart reviewing disc sanders and combination belt-and-disc sanders is included with this article so you can compare the products available on the market. This article does not attempt to determine which machine would be best for you, but rather

offer the facts and data you can apply to your own needs. Belt and disc sizes and speeds can be considered in this way, as can table size. Motor voltage characteristics are generally quite flexible, as most manufacturers offer several motors from which to choose.

When selecting a power sander, consider the following features characteristic of quality: (1) Cast iron construction for the base and table provides durability and rigidity. The castings should be ribbed for strength. (2) Certainly the bearings and motor should be sealed from the dusty environment of sanding. (3) A direct motor drive gives maximum power transmission efficiency and eliminates belt problems. With belt drive, you may encounter tensioning maintenance, misalignment, whip noise and belt wear. (4) A disc of alloy-hardened aluminum allows

faster initial starting and dissipates work-generated heat more quickly than does a steel disc.

Some manufacturers offer unique designs or special attachments. One interesting example is the circular sanding and duplicating gauge furnished with Oliver Machinery Co. disc sanders. These are built into the sander table and adjust to permit duplication of various angled or circular workpieces.

Vega Enterprises offers a pneumatic drum sanding attachment in lieu of the 12" disc on their 300 Series machines. This 3-1/2" x 5" diameter drum is inflated like a balloon and fitted with an abrasive sleeve to provide a flexible sanding surface. It's ideal for finishing compound curves.

Vega also has what they call a tilting disc finisher, their Model #148. This is a 14" disc sander with a tilting disc rather than

a tilting table. The worktable always remains flat. This feature, along with allowing more accurate work, affords an element of safety. The motor-disc assembly is tilted by means of a locking hand-wheel which gives accurate and precise control.

One of the combination belt-and-disc sanders is uniquely different in construction. Design Tool and Equipment Company's Multisander Model #8142 has an 8" disc mounted on the motor shaft. The disc itself has a drive surface at the perimeter so that it serves as an 8" drive drum for a 1" x 42" belt. An idler mounted above the motor and disc carries the belt in a vertical path.

If your shop has an available power source (like the shaft at the end of a lathe) or if you have an available motor, you could use the Jet Equipment and Tools Model JDS-99. This is a heavy-duty cast iron double disc sander equipped with pul-

ley and belt only, ready for your own power.

When we compare stationary sanders, we find a wide variety of models and sizes. Some are designed with limited applica-

tion while others are quite versatile. All sanders are useful for removing or shaping wood, but it is the ingenious craftsman who develops the methods to get the most from each tool.

Manufacturers' Addresses For Further Information

Advantage Machinery Co., Inc. 40 Whites Path, South Yarmouth, MA 02664 (617) 394-0940

Chieh Ming Machine Co., Ltd. 124 Thai Yuan Road Taipei, Taiwan, Republic of China

Craftsman Tools, Sears Roebuck & Co. Sears Tower Chicago, IL 60686

Delta International Machinery Corp. 246 Alpha Dr. Pittsburgh, PA 15238 (412) 963-2400

Design Tool & Equipment Co., Inc. Box 1098, Aurora, UT 84620 (801) 529-3565

Jet Equipment & Tools, 1901 Jefferson Ave., Box 1477, Tacoma, WA 98401 (206) 572-5000

Oliver Machinery Co. 1025 Clancy St. Grand Rapids, MI 49503 (616) 451-8333
Powermatic Houdaille, Morrison Rd. McMinnville, TN 37110 (615) 473-5551

Sprunger Corp. Box 1621 Elkhart, IN 46515 (219) 293-2561

Unitronex Corp. 1171 Landmeier Rd. Elk Grove Village, IL 60007 (312) 437-9700

Vega Enterprises, Inc. RR3, Box 193 Decatur, IL 62526 (217) 963-2232 ■

DISC SANDERS

MANUFACTURER	MODEL NUMBER	MOTOR					DISC SIZE	TABLE SIZE	TABLE TILT
		HP	AMPS	VOLTS	PHASE	RPM			
ADVANTAGE	8240*	3	14.5	208/230	1	1680	24"	13¾" x 27½"	+45° -45°
DELTA	31-125*	1	16	115/230	1	1725	12"	9¾" x 16¼"	+45° -20°
JET	JDS-99‡	(motor not included)					9"	N/A	+45°
OLIVER	182-D	1	3.6	230/460	3	1800	15"	9¼" x 21½"	+45° -25°
OLIVER	382-DD††	2	6.8	230/460	3	1800	20"	12" x 25"	+45° -25°
OLIVER	34¹	5	15.2	230/460	3	1200	30"	15" x 40"	+45° -10°
OLIVER	41	7½	22	230/460	3	900	37½"	20" x 46"	+45° -45°
POWERMATIC	35-B*	¾	16	115/230	1	1800	12"	7" x 17¼"	+45° -15°
SPRUNGER	DSF-21	½	7	115/230	1	1725	12"	9" x 16"	+45° -5°
VEGA	148²	¾	10.8	115/230	1	1750	14"	9½" x 20¾"	+45° -15°

* 3 phase 230/460 volt motor available

‡ double disc

† available as single disc (same specifications)

¹ includes a spindle sander

² tilting disc

Table Tilt

+ down

- up

Computer Furniture Series—Part IV

by Hugh Foster

Computer Desk

Now that you have outfitted your computer room with important accessories like a Diskette Organizer Cabinet (*Popular Woodworker* June/July 1985) and a Printer Stand (*Popular Woodworker* August/September 1985), it's time to get to work on the centerpiece for the room: the Computer Desk.

Before you take saw to wood, consider your specific needs: your size, the size of your room, and the size of your computer. The desk discussed here was built for a very small work area and made specifically for an IBM-PC. If you are building it for another computer, check dimensions very carefully. The conclusion of this article will offer some suggestions toward modification.

The Basic Unit

The first thing to make is the frame. After the 2 × 2's have been milled and cut to rough size, cut 4 legs (A) and 4 cross braces (B) to size. The cross braces can be joined to the legs with either through-mortise and tenons or lap dovetails, but

you may want to use bridle joints as outlined in the Printer Stand article to match the desk to the stand. The braces go at the top of the legs and 6" from the floor.

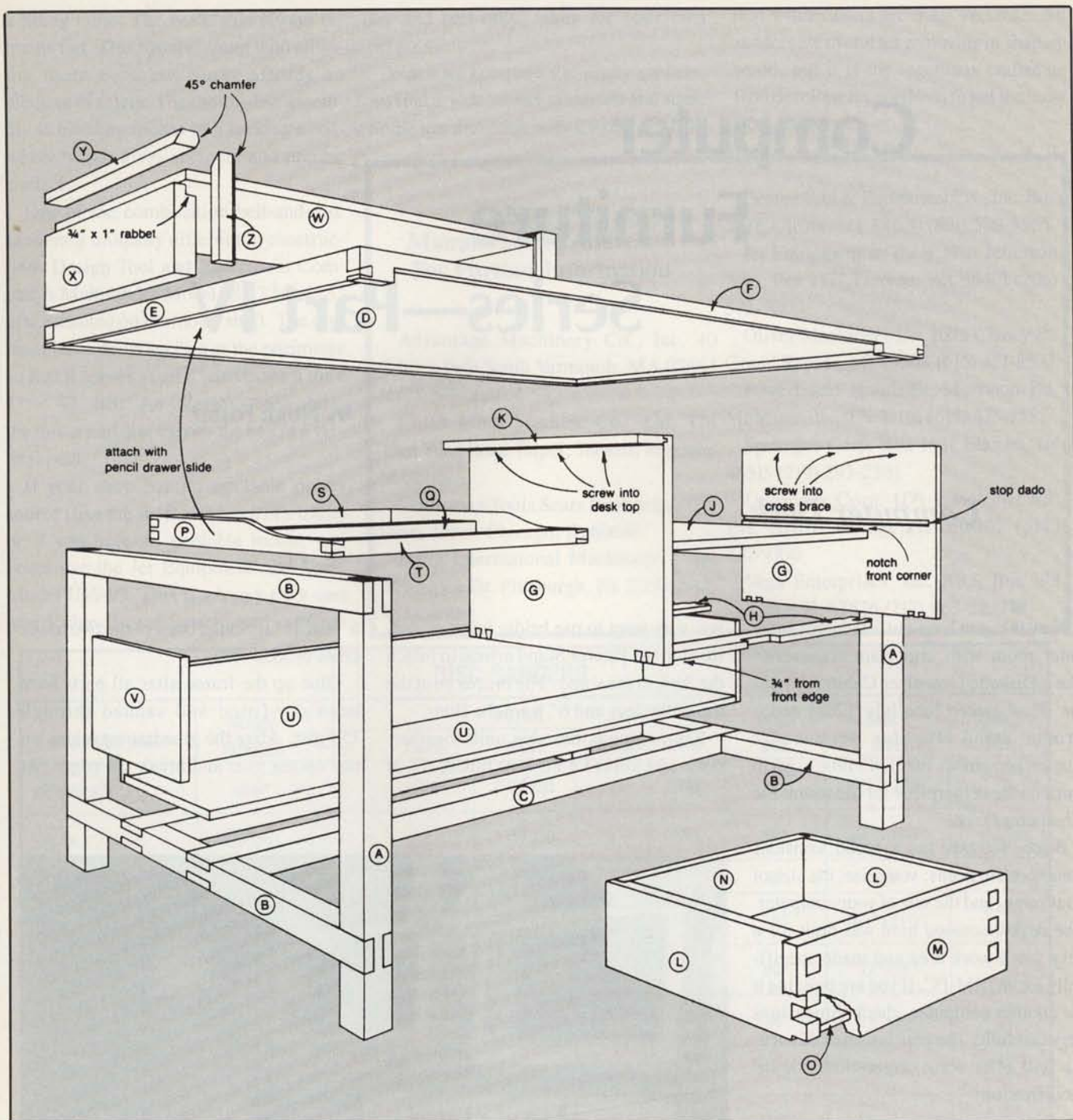
Before gluing these leg units together, cut bridle joints for the long braces (C) at

6" and 11" from the back of the two lower cross braces.

Glue up the frame after all parts have been dry-fitted and sanded through 150-grit. After the glue has set, clean up any excess glue and break the edges. At



This computer desk features a sliding keyboard tray and a bridge to raise the monitors to eye level, keeping the work surface clear.



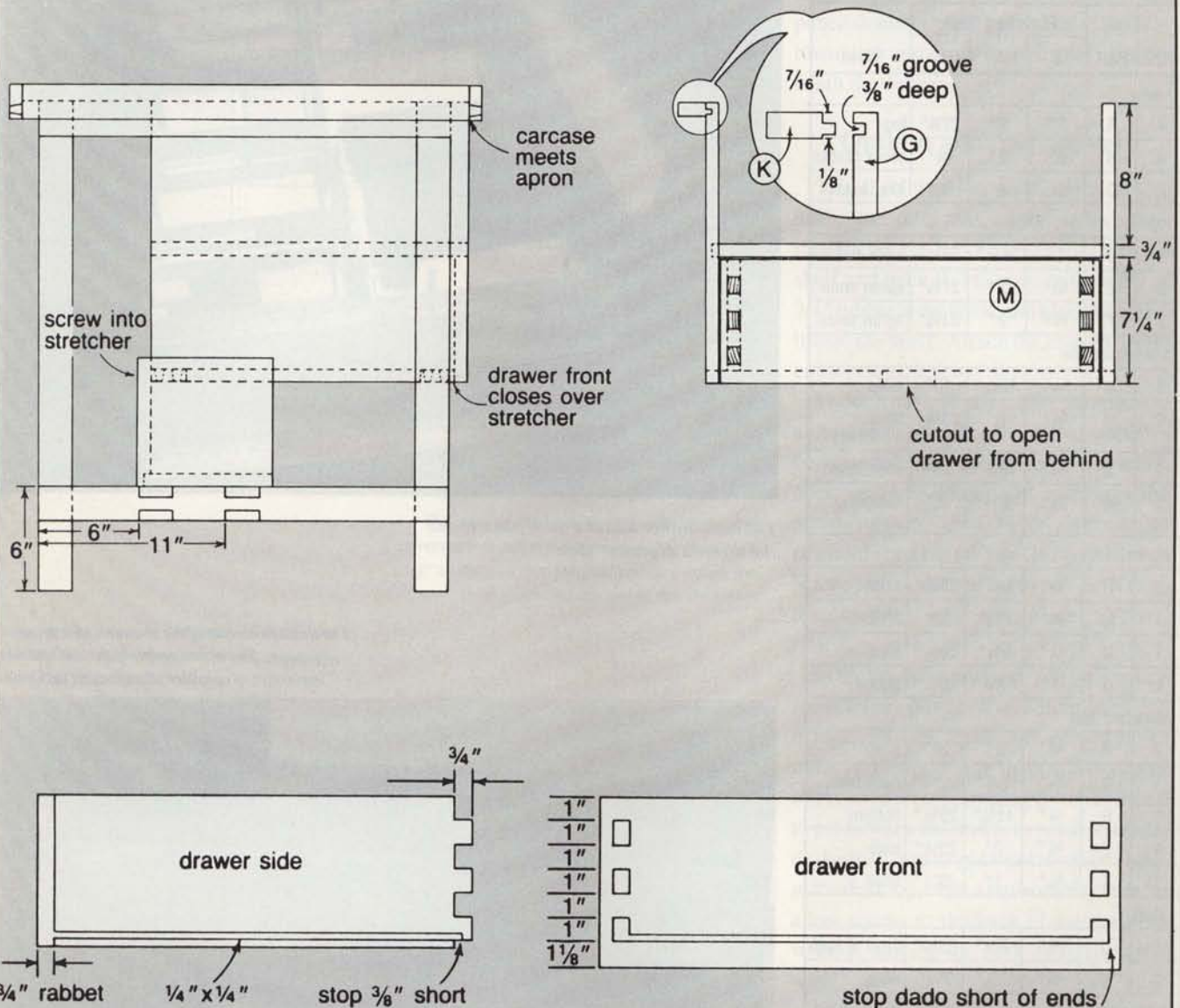
this time, apply the feet (see Supply List) to prevent possible damage while sliding the base around in your workshop. Because I failed to do this, I had to glue in a nasty repair chip.

Now that your base is ready, prepare the top. Glue up your hardwood (or cut plywood) to $26\text{-}3/4" \times 60\text{-}3/4"$ to make the work surface (D), and cut the apron ends (E) and sides (F) to length. Rabbet the top

edge of the apron pieces $3/8"$ deep by 1" wide to accept the work surface, and cut dovetails to join the ends together. You may choose to miter the apron together instead of cutting dovetails. This is just a question of style you will have to answer for yourself when you reach this step. Then, before you glue the top and the apron together, cut a 1" strip from the front side of the apron that is 54" centered. This will ensure access to

the computer in its shelf and to the keyboard which will be on a sliding tray attached beneath the top.

Once the top has been glued to the apron, it can be affixed to the stand. I covered the top of the stand with $1/4"$ cork to absorb shock, and screwed the top to the legs from the underside. (I don't know that the cork actually accomplishes anything, but its being there pleases me.)



The Drawer Carcase

The next step is to assemble the unit which will house the computer and the drawer. Cut the two sides (G), the bottom stretchers (H) and the shelf insert (J). Dovetail the stretchers to the carcase sides, placing the front one 3/4" back from the edge to allow the drawer front to close over it. Then make a small cut-out in this stretcher so that the drawer can be opened

from here rather than having to use some sort of hardware on the front.

Rout stop-dados in the carcase sides for the shelf at 7-1/4" from the bottom, and notch the corners of the shelf to fit flush with the front edge.

This unit will be attached to the desk on one side by screwing through to the frame with 2" x #10 flathead wood screws, and by dading a piece into the other side and

screwing that piece through to the desk top with 1-1/4" x #10 flathead screws. This special piece (K) will need to be cut in such a way that the grain goes across the 2" width—so the tongue which fits into the carcase side will have short grain instead of weaker long grain.

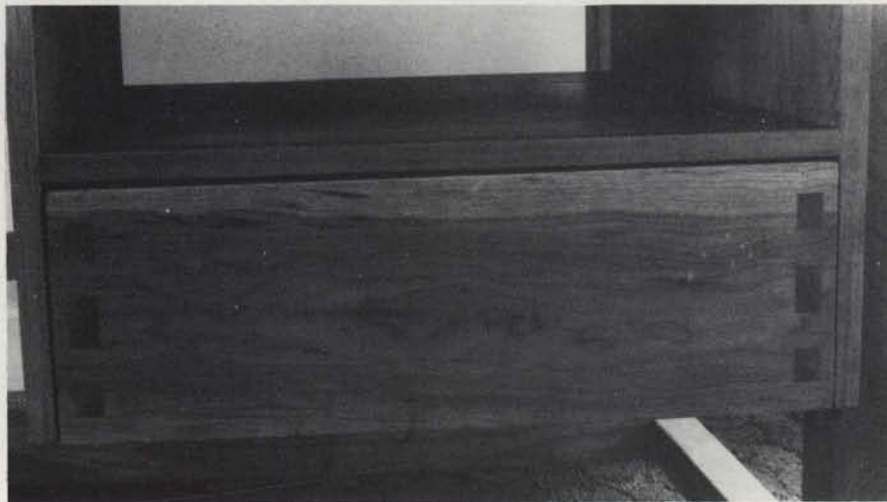
If you didn't make the Three-Drawer Diskette Cabinet discussed in Part II of this series, the desk drawer would be an ideal

Computer Desk					
Cutting List					
Qty.	Part	Finished Size			Piece
		T	W	L	
frame					
4	A	2"	2"	28¼"	legs
4	B	2"	2"	24"	cross braces
2	C	2"	2"	58"	long braces
top					
1	D	1"	26¾"	60¾"	work surface
2	E	¾"	2"	27½"	apron ends
2	F	¾"	2"	61½"	apron sides
drawer carcass					
2	G	¾"	18½"	16"	sides
2	H	¾"	2"	23¾"	bottom stretchers
1	J	¾"	18½"	23"	shelf insert
1	K	¾"	18½"	2"	mounting strip
drawer					
2	L	¾"	6¼"	18½"	sides
1	M	¾"	7⅞"	22"	front
1	N	¾"	6¼"	20¼"	back
1	O	¼"	17¾"	20¼"	bottom
keyboard tray					
2	P	¾"	2"	20"	sides
1	Q	¾"	1½"	22¾"	false back
1	R	¼"	11⅞"	22¾"	bottom
1	S	¾"	2"	23½"	back
1	T	¾"	1"	23½"	front
shelf					
2	U	¾"	7½"	56½"	shelf & back
2	V	¾"	7⅞"	7½"	ends
bridge					
1	W	1"	15"	40"	top
2	X	1½"	7¾"	15"	sides
2	Y	¾"	1½"	15¾"	trim
2	Z	¾"	1½"	8½"	trim
Supplies					
2		¼"	2"	24"	cork
1	pair 18" drawer slide (#D9012) from The Woodworker's Store 21801 Industrial Blvd. Rogers, MN 55374 (612) 428-4101				
1	pair 12" pencil drawer slide (#D7550)				
4	protective feet (#C1704)				
	2" x #10 flat head wood screws				
	1¼" x #10 flat head wood screws				
	2¾" x #10 flat head wood screws				



The desk drawer makes a good place to use the diskette organizer idea.

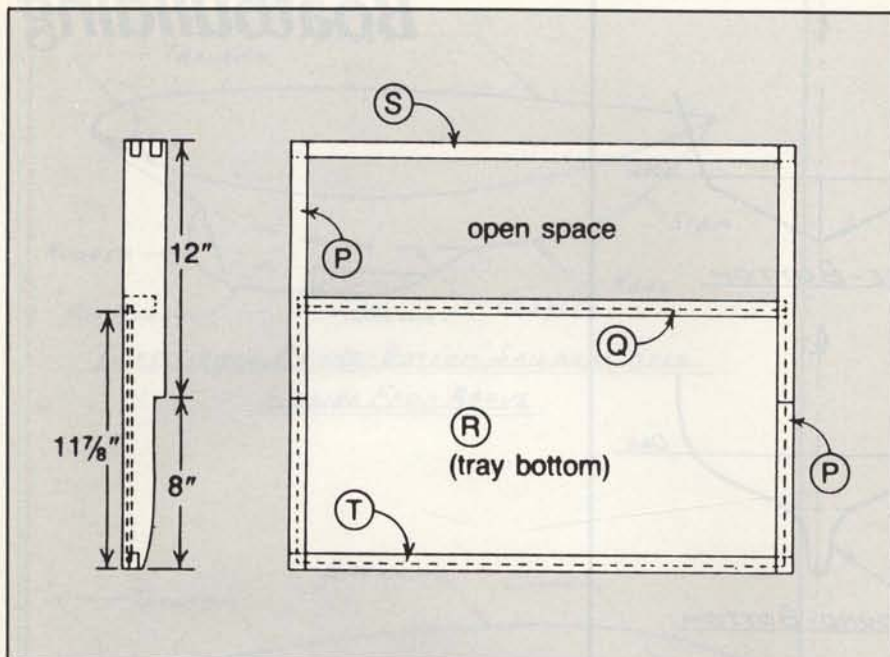
The through-tenons of the drawer add a decorative touch. The arrangement of the end grain is important to consider when cutting this joint.



place to use the Diskette Organizer idea that was the first item in this series (*Popular Woodworker* April/May 1985).

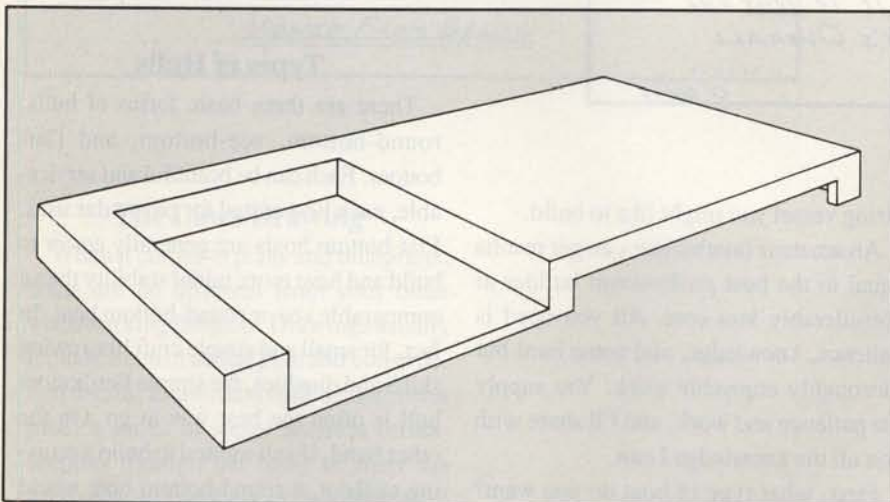
Allow half an inch on either side of the drawer for the glides. I affixed the drawer sides (L) to the front (M) with through-joints; but while the finished product is attractive, making these joints is probably far too time-consuming for a "for sale" desk. Therefore, if you use this joint, be

sure to arrange the end grain that shows through the front in an attractive manner. (Editors note: It might be a good idea to put wedges into the tenons through the front during assembly.) If you do not use this joint, change the length of the sides accordingly. Rabbet the ends of the sides for the drawer back (N) and fit the bottom (O) into a 3/8" deep groove in all four vertical members.



The sides of the keyboard tray are longer than necessary to allow full extension. The false back "Q" is short so that the cord can fit through the open space and connect to the computer.

For an Apple or similar computer, eliminate the keyboard tray, make the apron wider, and fabricate a built-in computer well.



A Place for the Keyboard

The next sub-assembly is the keyboard tray—one of the nicest features of this desk. By lowering the keyboard to just above lap height, I discovered that my net typing speed quickly doubled. Added to the fact that this leaves the desk top free for papers and other clutter, the benefits make it very worthwhile.

The frame for this keyboard tray is tapered toward the front so the typist won't have a feeling of reaching for the keys. The tray sides (P) are longer than necessary to allow full extension of the tray. To that end, cut a stop-dado in each side at 11-7/8" for a false back (Q). Cut a groove for the bottom (R) and then dovetail the actual back (S) and front (T) to the sides.

A certain amount of shaping should be

done to the sides and front of this unit so that the keyboard sits slightly higher than the edges of the tray. Attach a pair of 12" pencil drawer slides to the sides of the keyboard tray and screw them in place underneath the desk top.

Options and Alterations

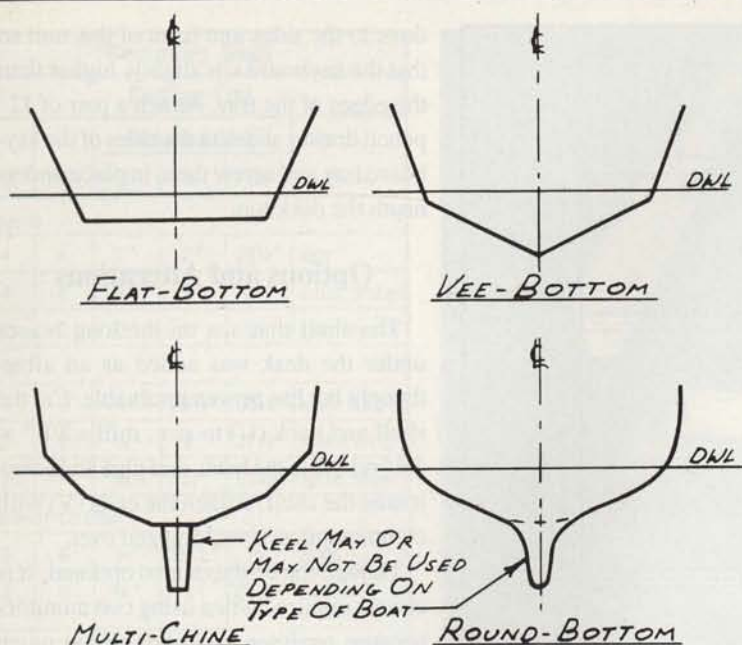
The shelf that sits on the long braces under the desk was added as an afterthought but has proven invaluable. Cut the shelf and back (U) to size, mill a 3/8" × 3/4" rabbet in the back, and glue and screw it onto the shelf. Attach the ends (V) with countersunk screws, plugged over.

Though the bridge is also optional, it is almost required when using two monitors because together they take up too much desk space. Additionally, it brings the screen up to eye level. My bridge consists of a hardwood top (W) that is fastened with screws into rabbets in the two ends (X) and then trimmed over with pieces (Y) and (Z).

In the photo of my desk you will notice an external power unit sitting atop the bridge. This is because most computer manufacturers seem to put the power switch on the back, making it very difficult to get to when the unit is in position on the desk shelf. You might want to make a hole in the desk top, with a replaceable cover, to allow access to the back of the machine without moving the desk away from the wall.

Last, here is the principle for using this desk with an Apple or comparable computer: The shelf which houses the computer in the IBM design could well be used to store several disk drives for the Apple. The keyboard tray feature would be eliminated altogether, and in its place an appropriately sized keyboard well could be built into the desk top.

When considering the time it takes to construct a complicated piece like this (especially with the difficult joinery discussed here) it may seem like an awful lot of work. But to settle for the cardboard and plastic alternatives, when one has the skills to build something better, just does not compute. ■



TYPICAL MIDSHIP SECTIONS

NOTE: THE MIDSHIP SECTION IS THE SECTION OR "SLICE" TRANSVERSELY THROUGH THE HULL THAT IS EXACTLY MIDWAY BETWEEN THE BOW WHERE IT MEETS THE WATERLINE AND THE STERN AT THE WATERLINE. IT IS NOT THE SECTION AT HALF THE BOAT'S OVERALL LENGTH.

D. GERR

by Dave Gerr

There are few woodworking projects more rewarding or challenging than building a wooden boat. I know: I've built, repaired and designed many—ranging in size from 8' to 320'.

In this series of articles I'll discuss the different forms of wooden boatbuilding that are currently used, and help you get a real handle on the type and size of sea-

faring vessel you might like to build.

An amateur boatbuilder can get results equal to the best professional builder at considerably less cost. All you need is patience, knowledge, and some hard but thoroughly enjoyable work. You supply the patience and work, and I'll share with you all the knowledge I can.

First, what type of boat do you want? Sail? Power? Row? Choose the shape of boat that suits your needs, building abilities, time and experience.

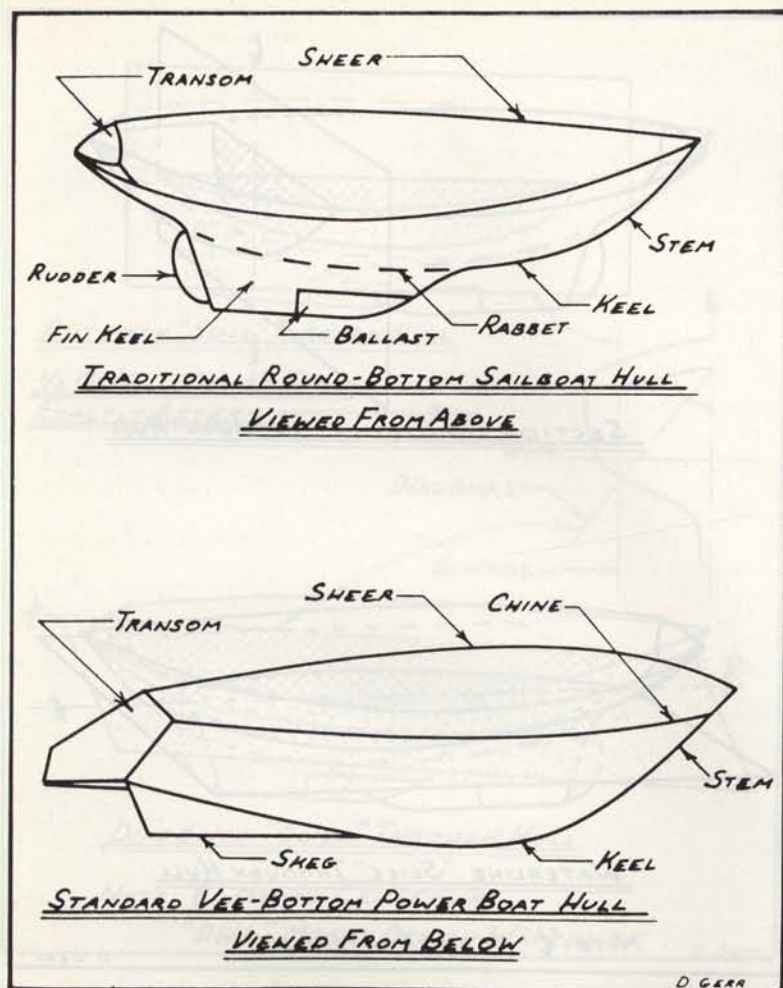
Unlike most other woodworking projects, a boat has virtually no straight lines. Everything is curved—and usually in more than one direction. But don't let this deter you. You *can* build a boat. It's really not that difficult.

Types of Hulls

There are three basic forms of hulls: round-bottom, vee-bottom, and flat-bottom. Each can be beautiful and serviceable, each best suited for particular uses. Flat-bottom boats are generally easier to build and have more initial stability than a comparable vee or round-bottom boat. In fact, for small and simple craft like rowing skiffs and dinghies, the simple flat-bottom hull is often the best way to go. On the other hand, if you wanted to build a cruising sailboat, a round-bottom boat would probably be best, though a vee-bottom would work well, too.

There are also boats that have hull shapes which fall somewhere between the vee-bottom and round-bottom types. These are boats with **multi-chined** hulls. Essentially, such hulls have hard corners like vee-bottoms and flat-bottoms, but more of them.

The Shape of a Boat—Part I



The Lines Drawing

When it comes to plans and blueprints, boats are no different from your other woodworking projects. Drawings usually include a construction plan and construction details, a cabin and deck arrangement plan, a series of joiner sections (cross-sections through the boat) to show the transverse arrangement of the cabin, a sail plan for a sailboat, and an engine installation drawing for a power boat.

All these drawings are fairly straightforward and similar to such drawings for houses or cabinetwork. But there is one quite special drawing required for every boat: **the lines drawing**. This drawing defines and describes the shape of the hull. In many ways this drawing is the heart of your boatbuilding project. All other drawings must fit in the shape described by the lines.

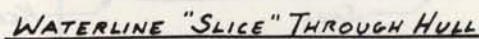
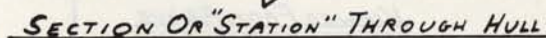
What Comprises the Lines Drawing?

The lines are made up of a series of "slices" taken through the hull of the boat at regular intervals as well at the perimeter or edge lines of the vessel. One of these perimeter lines is the **sheer line**, the line on the boat where the sides meet the deck.

There is also a line or group of lines that determine the bottom of the boat at the centerline. At the bow (front of the boat) this line is called the **stem** and at the bot-

tom it is known as the **keel** line. At the **stern** (back of the boat) this line is called the **sternpost**. Or it may be several lines that make up the back or aft side of the boat, or **transom**. The transom is usually defined by a series of lines that show its outline where it intersects the sides of the hull and deck. In addition to the keel line is the **rabbet** line along which the plank intersects the solid wood keel, sternpost and stem.

All lines drawings show three views of the boat: a side view or **profile**, a top view or **plan**, and a combined front and back view, or **sections**. Once the perimeter lines are drawn in on each view, you can see the outline of the hull shape; but you don't know the nature of the curvature and shape within these lines. To establish this, the boat is cut into imaginary "slices" at right angles to each other and at regular intervals. The curves or contours made by these "slices" clearly establish the curvature of the hull. This is exactly like a contour map in geography.



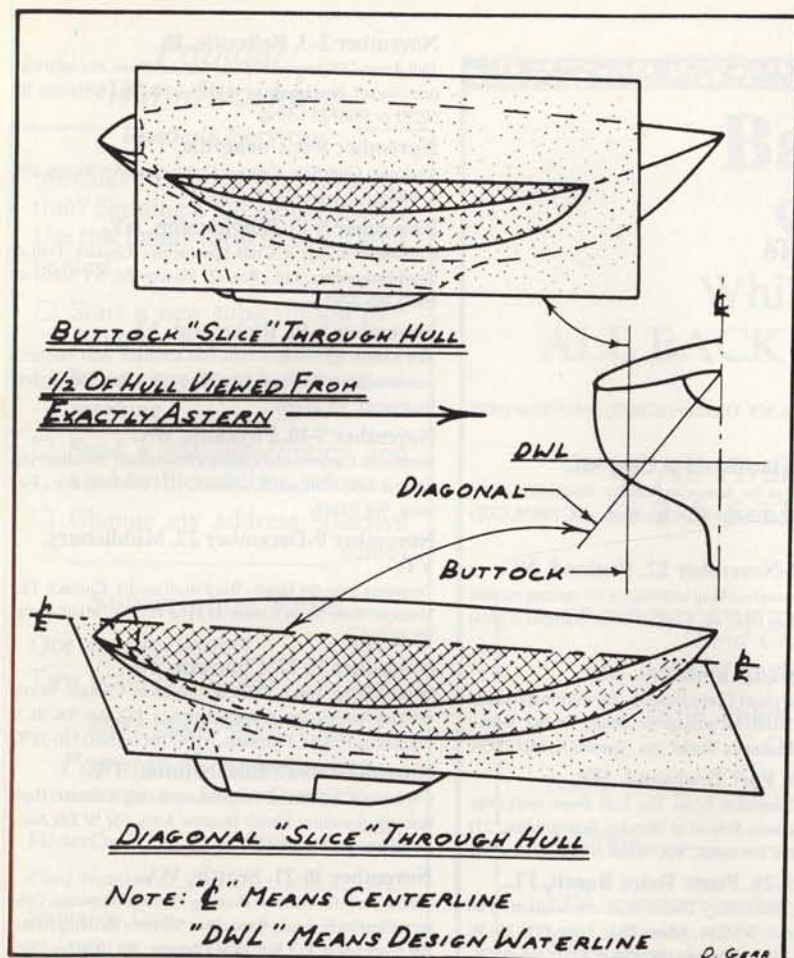
NOTE: "C" MEANS CENTERLINE

D. G. 44A

Waterlines are also curves created by “slicing” the hull, but with the waterlines the hull is cut from side to side and from front to back. This is analogous to “slicing” a loaf of bread along the top from front to back—you probably would have trouble fitting such a slice in your toaster. Usually, one waterline is singled out from all the others and called the **designed water line (DWL)** or **load waterline (LWL)**. This is the line at which the boat is expected to float when normally loaded. (In reality, the boat seldom floats exactly at this line. Sometimes it is more heavily laden and sinks deeper; other times it is nearly empty and so sits higher.) Usually, the DWL is used as a reference line for determining the heights of other lines in the boat.

The section or **station** lines are the shapes or curves caused by cutting the boat from side to side and top to bottom just as you would normally slice a loaf of bread. They are usually at regular intervals to make it easier for you to measure them and lay them out full size. However, where the hull curves markedly as at the bow and stern, extra stations are often placed in-between the regular stations. These extra stations help clarify the shape in areas where there can be surprise changes.

Alternatively, though, the designer or builder may prefer to add an extra line outside of the hull and take measurements from it. This line is parallel to the waterlines and is either above or below the hull. It is termed the **baseline**.



Symmetry in the Hull and Lines

It is important to remember that boat hulls are perfectly symmetrical on either side. Thus, to simplify the lines drawing, only one-half of the hull is drawn (the other side obviously being the same). For this reason, when you look at the sections, one side of the boat centerline (usually the right side) will show the section curves or "slices" of the front half of the hull, and the other side will show the sections of the stern half of the hull. Similarly, when you look at the plan view, you will see waterlines and the sheer line of only one half of the hull. Usually, for convenience, the diagonal lines (curves that result from "slicing" the hull diagonally) are drawn on the opposite side from the waterlines in the plan view. This makes the drawing appear somewhat lopsided until you realize that the other half of the plan and section views are not supposed to correspond. Instead, they show different aspects and parts of the hull.

Once you have your boat plans, you are faced with the problem of building the boat full-size from plans that are only from 1/4 to 1/24 the size of the actual vessel. Unlike other building projects, making a boat is nearly impossible to do without full-scale drawings. **Lofting** is the process of enlarging the lines drawing to full size and will be discussed in detail in the next issue. ■

Diagonals

There is only one other type of "slice" taken through the hull: the **diagonals**. Unfortunately, although they are very useful, they cause much confusion. The reason for this is that the diagonals are not slices through the hull at right angles; instead, they are slices taken—how else?—diagonally. This is very much like slicing your poor loaf of bread from corner to corner lengthwise. However, the diagonal "slices" on a lines drawing start from the middle of the boat and slope down and out.

Buttocks

Another set of "slices" taken through the hull are the **buttocks** lines. These lines are the curves that result from "slicing" the hull from top to bottom and from front to back (like slicing your loaf of bread along the side). Most boats have three buttocks lines, though this is not a hard and fast rule. They help define the underbody of the vessel—an experienced architect can tell much about a boat's potential performance from their shape.

Calendar & Announcements

Events Of Interest To Woodworkers

October '85. Memphis, TN.

Oktoberfest/Fine Arts & Crafts. Contact: Wanda Carruthers, Center City Commission, 147 Jefferson #100, Memphis, TN 38103.

October-November '85. Memphis, TN.

Artists/Craftsmen's 12th Annual Holiday Sale. Contact: Peggy Miller, 3884 Minden, Memphis, TN 38111 or (901) 458-1270.

October-November '85. Brasstown, NC.

Course offerings in wood crafts. For specific classes contact: The Registrar, John Campbell Folk School, Rt. 1, Brasstown, NC 28902.

October-November '85. Berkeley, CA.

Woodworking classes. Contact: Shelley Kaysilow, Rosewood Tool Supply, 1836 Fourth Street, Berkeley, CA 94703 or (415) 540-6247.

October 1-26. Middlebury, VT.

'Along Different Lines.' Handcrafted furniture. Contact: The Vermont State Craft Center at Frog Hollow, Middlebury, VT 05753.

October 3-6. Memphis, TN.

Mid-South Crafts Fair. Contact: Julia Crow, Friends of the Memphis Pink Palace Museum, 4446 Barfield, Memphis, TN 38111 or (901) 682-5280.

October 4-6. San Jose, CA.

The Woodworking/Homebuilding Show. Contact: Patricia Dillion, Exhibit Manager, The Woodworking Show, 1516 South Pontius Avenue, Los Angeles, CA 90025.

October 4-6. Tiptonville, TN.

Arts & Crafts Festival. Contact: Kathleen Downs, Reelfoot Arts & Crafts Association, 122 LeDuke St., Tiptonville, TN 38079.

October 5. Goodlettsville, TN.

Arts & Crafts Festival. Contact: Margaret Wall, Women's Club, Box 884, Goodlettsville, TN 37072 or (615) 859-1917.

October 5-6. Sneedville, TN.

Fall Festival/Fine Arts & Crafts. Contact: Delores Bridges, Secretary, Hancock Co., 31201 Sterling Dr., Sneedville, TN 37969.

October 9-12/Oct. 9-Dec. 7. Gatlinburg, TN.

Arrowmont School of Arts and Crafts: National Conference on Woodturning. Contact: Sandra Blain, P.O. Box 567, Gatlinburg, TN 37738.

October 12-13. Coker Creek, TN.

Coker Creek Autumn Gold Festival. Handmade and crafted items will be featured. Contact: Frank Murphy, Jr., Coker Creek, TN 37314.

October 12-13. Rogersville, TN.

Hawkins County Heritage Days/Fine Arts & Crafts. Contact: Mrs. Buford Street, Rt. 4, Box 25, Rogersville, TN 37857 or (615) 272-3143.

October 12-14. Flemington, NJ.

Crafts Festival. Contact: United Craft Enterprises, Ltd., Box

326, Masonville, NY 13804 or call (607) 265-3792 or (607) 265-3230.

October 13-16. Traverse City, MI.

Annual meeting of the American Forestry Association. Contact Bill Tikkala, 1319-18th St. N.W., Wash., DC 20036, (202) 467-5810.

October 14-November 22. Penland, NC.

Class on fine woodworking techniques on various surface treatments such as inlay, etc. Contact Verne Stanford at (704) 765-2359.

October 18-20. Timonium, MD.

9th Annual Maryland Crafts Festival. For information send three stamps (\$0.60) for postage to: Deann Verdier, Director, Sugarloaf Mountain Works, Inc., Ijamsville, MD 21754.

October 19. Port Townsend, WA.

Transferring Templates From The Loft Floor workshop. Contact: Northwest School of Wooden Boatbuilding, 251 Otto Street, Port Townsend, WA 98368 or (206) 385-4948.

October 23-26. Ponte Vedra Beach, FL.

Woodworking Machinery Distributors Association's Fall Meeting. Contact: WMDA, Adams Bldg. Suite #109-251 W. DeKalb Pike, King of Prussia, PA 19406. (215) 265-6658.

October 25-27. Rosemont, IL.

Woodworking World—The Chicago Show. Contact Woodworking Association of North America, P.O. Box 706, Rt. 3, & Cummings Hill Rd, Plymouth, NH 03264 or (603) 536-3876.

October 26-27. Morristown, TN.

10th Annual Mountain Makin's Festival. Crafts only. Contact: Bill Kornrich, Rose Center, P.O. Box 1976, Morristown, TN 37814.

October 26-27. Las Vegas, NV.

KNPR Craftworks Market. Contact: Evelyn Cook, KNPR, 5151 Boulder Highway, Las Vegas, NV 89122 or call (702) 456-6695.

November '85. Oak Ridge, TN.

Foothills Craft Show. Open only to Tennessee residents. For exact dates and information contact: Foothills Craft Guild, P.O. Box 99, Oak Ridge, TN 37831.

November 1-3. Nashville, TN.

8th Annual Tennessee Fall Crafts Fair. Contact: Alice Merritt, Director, Tennessee Artists Craftmen's Assoc., P.O. Box 120933, Nashville, TN 37212.

November 1-3. Winston-Salem, NC.

Exhibition in wood and other media. Contact Piedmont Craftsmen, Inc., 300 South Main St., Winston-Salem, NC 27101 or call (919) 725-1516.

November 2. Columbia, MO.

3rd Annual Midwest Woodworkers Association "Excellence In Woodworking Show." Contact Gerald Jones, Midwest Woodworkers Association, 311 Cumberland Road, Columbia, MO 65203.

November 2-3. Gallatin, TN.

Harvest Craft Festival. Contact Page Jackson, Gallatin Parks and Recreation, 132 W. Main St., Gallatin, TN 37066 or (615) 452-5400.

November 2-3. Belleville, IL.

15th Annual Midwestern Wood Carvers Show. For information contact: Don Lougeay, 1830 East "D" St., Belleville, IL 62221 or (618) 233-5970.

November 8-9. Cookeville, TN.

Christmas Craft Sale. Contact: Cumberland Art Society, 186 S. Walnut, Cookeville, TN 38501.

November 8-10. Binghamton, NY.

Christmas '85/Art & Craft Spectacular. Contact: United Craft Enterprises, Ltd., Box 32, Masonville, NY 13804 or (607) 265-3792.

November 8-10. Richmond, VA.

10th Annual Richmond Crafts Fair. Contact: Ann Vazquez, Assistant Director, Hand Workshop, 1001 East Clay Street, Richmond, VA 23219.

November 9-10. Puyallup, WA.

Northwest Carvers Association's 5th Annual Woodcarving Show & Sale. Contact: E. Gosnell, 115 Del Monte Ave., Fircrest, WA 98466.

November 9-December 27. Middlebury, VT.

Treasures from the Heart. Work in all media. Contact: The Vermont State Craft Center at Frog Hollow, Middlebury, VT 05753.

November 15-17. Charlotte, NC.

Woodworking World—The Carolina Show. Contact: Woodworking Association of North America, P.O. Box 706, Rt. 3, Cummings Hill Rd, Plymouth, NH 03264 or (603) 536-3876.

November 16-17. Elizabethton, TN.

Christmas Craft Show. Original work only. Contact: Herb Roberts, Sycamore Shoals Historic Area, 651 W. Elk Ave., Elizabethton, TN 37643.

November 16-21. Seattle, WA.

82nd Annual Convention/Building Products Showcase. Contact: Charles E. Link, Exec. Dir., Western Building Material Association, P.O. Box 1699, Olympia, WA 98507 or (206) 943-3054.

November 16-21. Seattle, WA.

69th Annual Convention of the National Lumber & Building Material Dealers Association Convention. Contact Peggy Battle, NLBMDA-40 Ivy St. S.E., Wash., DC 20003 or (202) 547-2230.

November 17. Woburn, MA.

Lecture and slide show of works of Wendell Castle. Contact Woodcraft Supply Corp., 41 Atlantic Ave., P.O. Box 400, Woburn, MA 01888.

November 18-20. Portland, OR.

Forest Products Industries of the Pacific Slope: What Does the Future Hold? Contact Forest Products Research Society, 2801 Marshall Court, Madison, WI 53705.

November 21-23. Memphis, TN.

Mid-South Arts & Crafts Show/Sale. Contact: Virginia Miller, 5618 Fox Meadow Cove, Memphis, TN 38115 or (901) 363-4178.

November 22-24. Rochester, NY.

Rochester Festival of Fine Arts & Crafts. Contact: United Craft Enterprises, Ltd., Box 326, Masonville, NY 13804 or (607) 265-3792.

November 22-24. Gaithersburg, MD.

10th Annual Autumn Crafts Festival. Send three stamps (\$0.60) for postage to: Deann Verdier, Director, Sugarloaf Mountain Works, Inc., Ijamsville, MD 21754.

November 23-24. Dayton, OH.

An all-wood show featuring woodcarving and woodworking. Contact: Ralph Moeller, 22 Temple Dr., Xenia, OH 45385 or (513) 372-7726.

November 29-30/December 1. Harrisburg, PA.

Christmas '85/Art & Craft Spectacular. Contact: United Craft Enterprises, Ltd., Box 326, Masonville, NY 13804.

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Don't Bite Off More Than You Can Chew

by Martin R. Zschoche

We grow in stages. None of us was born knowing how to dovetail a drawer together or how to splice fancy Japanese joinery. Most of us, I suspect, were on our own, pioneering our capabilities by trial and error. We began with simple jobs and progressed to complex ones.

It is here in our growth as craftsmen that we can run into trouble if we are not realistic about our capabilities. Have you *really* mastered the particular joinery which your new customer is asking about? If you haven't but accept the customer's work anyway, thinking there will be time enough to learn, you are setting yourself up for disaster. Big Bucks and High Production will have beaten out Quality and Craftsmanship again.

Know Your Machines

Often a job requires machine accuracy and detail. This is difficult to produce by hand without a great expenditure of time and energy. If you are not tooled up to perform a particular job, plan to subcontract the work or refer the customer elsewhere where he will be satisfied with the results. (Keeping a reference list of other reliable craftsmen who can perform the jobs you cannot will prove invaluable.) In your careful master plan for the shop, you may want to work into the budget the appropriate machinery that will enable you to accept a similar job the next time it is offered.

Know Your Employees

In addition to knowing your equipment, know your employees. Accepting a quantity or type of job that is beyond their capabilities is foolhardy, even if you yourself can do the work. Take time to train them well. Some employees may work better on particular tasks if not pushed by quantity deadlines. Know their limits and work with them to gradually extend their skills. They are your greatest asset, the means by which the job gets done. Invariably, push-

ing too hard exposes the weak links which will show up at the most embarrassing times.

In conclusion, make sure before accepting a job that you have the wherewithal to complete it. Your reputation as a craftsman is at stake. ■

Constructive Criticism

by Patricia Klein

While I was driving a carload of female delegates to a convention recently, the subject of husband-wife arguments arose. Each woman told what happened when she and her mate had words.

"My husband doesn't give me a chance to argue," I said. "Whenever we disagree, he walks out of the house and starts sawing or hammering." At this, one of my friends in the back seat spoke up. "You must have some dillies! I've often wondered how you managed to add a playroom, bedroom, patio and garage to your house in two years." ■

They Call Me Stumpy

by Grover Brinkman

Hi, there! I'm Stumpy.

Not long ago, I was awaiting my fate with the dreaded chain saw when a smart young woodcarver gave me a second look. Then, commandeering the magic of wood-working, he bestowed upon me cosmetic surgery. That's why I'm smiling.

I hope this young woodcarver finds more stumps so he can give me some company. I must admit, I get lonely all by myself. But then, every time I do, it stumps me how just then a sweet child will come along, give me a kiss, and even talk to me. That's how I got the name Stumpy. A little boy gave it to me and it fits very well, don't you think? Here's looking at you, kid! ■



Stumpy stands guard at the Lake of the Woods in Mahomet, Illinois.

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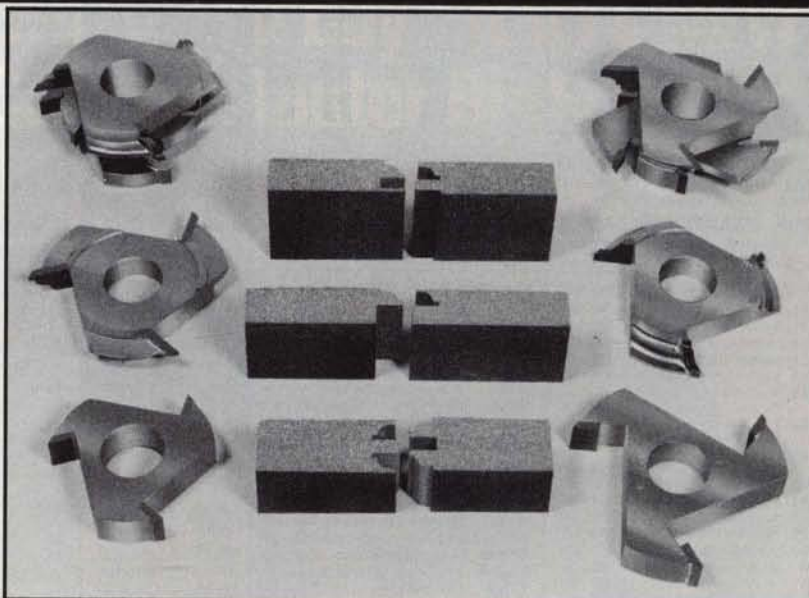
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N.E. White Pine	\$55.00 "
Red Oak	\$90.00 "
White Ash	\$86.00 "

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☐ Pine
☐ Oak
☐ Ash

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SU6200	Finishing Sand. 1/2 Sheet	142	88
B7075	3x21" dustless Belt Sand.	179	116
B7100	3x24" dustless Belt Sand.	208	140
B7200A	4x24" dustless Belt Sand.	289	165
D100VR	3/8" VSR 0-1200 rpm drill	91	49
W640	7 1/4" 13 amp circular saw	158	99
W740	8 1/4" 13 amp circular saw	171	109
J560	Jig Saw - Single Speed	172	99
J560J	Jig Saw - electronic v/speed	198	123
R150	1 H.P. Plunge Router	138	86
R330	2 H.P. Router	220	138
R500	3 H.P. Router	265	163
E3800	Drywall screwdriver 0-4000	126	79
L120U	3 1/8" Planer	142	89
B01020R	3/8" 2-sp Cordless Drill		
w/Free Holster-Xtra special buy		148	95
TS251U	10" Mitre Box	300	169
SG1150C	4 1/2" H.D. Mini-Grinder	99	59

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MILWAUKEE TOOLS		List	Sale
0224-1	3/8 drill 4.5A magnum	159	109
0234-1	1/2 drill 4.5A magnum	159	115
0244-1	1/2 drill 4.5A magnum	159	115
0222-1	3/8 drill 3.3A 0-100 rpm	146	99
0228-1	3/8 drill 3.3A 0-1000 rpm	129	95
0375-1	3/8 close quarter drill		
- NEW - 3.5 amp		175	118
0210-1	3/8 cordless drill		
- NEW - 2 speed		154	114
6539-1	cordless screwdriver		
- NEW - 190 RPM		84	64
1007-1	1/2" drill 4.5A D-Hole	199	145
1107-1	1/2" drill 4.5A D-Hole	204	145
3300-1	magnum rt angle drive kit	249	170
3102-1	Pimbrs rt angle drill kit	283	180
1676-1	HD Hole Hwag wcase 2 sp	333	235
5395	3/8 sgle sp hammer drill	203	150
5397	3/8 var sp hammer drill	207	150
5371-1	HD mag. hammer drill 1/2"	287	207
5373	HD mag. ham. drill 3/8"	240	175
5511	2 speed Sawjag w/case	181	123
6226	port band saw 2 sp w/case	382	280
6234	TSC band saw port w/case	382	280
6365	7 1/4" circ. saw 13 amp	159	109
6405	8 1/4" circ. saw 13 amp	179	127
6460	10 1/4" " 15 amp w/case	349	245
6377	7 1/4" HD worm saw 13 amp	235	155
6378	8 1/4" HD worm saw 13 amp	249	165
6185	12" Chop Saw 15 amp		
4200 R.P.M.		287	189
6170	14" Chop Saw 15 amp		
3600 R.P.M.		289	209
6255	v/spl Jig Saw 3.8 amp	199	140
6245	sple sp Jig Saw 3.8 amp	175	125
6012	1/2" sheet HD Orb. sander	159	110
6014	1/2" sheet HD Orb. sander	169	115
5935	4" by 24" belt sander		
w/bag 10 amp		319	215
5660	1 1/2 HP router 10 amp	256	175
5680	2 HP router 12 amp	314	220
8950	Wet/Dry 8 gal vac 6 amp	145	110

BENCH GRINDERS		List	Sale
4901	1/4 HP 2.6 amp 24"	159	110
4921	1/4 HP 4 amp 26"	179	130
4931	1/4 HP 4 amp 41"	279	195
5041	1/4 HP 8.2 amp 58"	379	270

DRYWALL SHOOTERS		List	Sale
6753-1	3.5 amp 0-4000 rpm new	115	79
6747-1	4.5 amp 2500 rpm	144	100
6750-1	4.5 amp 0-4000 rpm	129	90

MILWAUKEE Super Specials!		List	Sale
Model 6507 Trigger Speed Control Sawjag w/case & blades		List 193	Sale 125.
Go Cordless with MILWAUKEE			
#6305 - 6 1/4" Cordless Circular Saw 12 volt - 1 Hour Charge Cuts (80) 2x4's (Pine)			
List Price 195.00		SALE PRICE 135.00	

FREUD SAW BLADES		List	Sale
Univ. Bore - Professional Series CARBIDE TIPPED SAWBLADES			
Item No.	Description	Diam.	Teeth
PS203	Gen'l Purp.	7 1/4"	24
PS303	fine cutting	7 1/4"	32

5/8" Bore - Industrial Grade CARBIDE TIPPED SAWBLADES		List	Sale
Item No.	Description	Diam.	Teeth
LUT7M010	Gen'l Purp.	10"	40
LUT8M010	Gen'l Purp.	10"	40
LUT7M010	Cut Off	10"	80
LUT8M010	Cut Off	10"	80
LUT8M010	Combination	10"	40
LUT8M011	Combination	10"	50
LUT8M010	Super Cut Off	10"	80
LM72M010	Ripping	10"	24
DS 306	8" Dado		
DS 308	8" Dado		
TR 100	3 blades & Dado set		

FORSTNER BITS (ARCO)		List	Sale
West Germany			
Model	Size	List	Sale
2121	1/4"	6.40	4.00
2122	3/8"	7.90	4.50
2123	1/2"	7.80	5.00
2124	5/8"	10.35	6.50
2125	3/4"	10.95	7.00
2126	7/8"	11.40	7.25
2127	1"	12.25	7.75
2128	1 1/8"	12.75	8.00
2129	1 1/4"	13.85	8.75
2130	1 3/8"	16.45	10.50
2131	1 1/2"	18.15	11.00
2132	1 5/8"	21.25	14.50
2133	1 3/4"	23.95	16.50
2134	1 7/8"	25.50	17.50
2135	2"	26.25	18.25
2136	2 1/8"	30.50	20.50

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MAKITA TOOLS		List	Sale
804510	Sander	79	43
9900B	3" x 21" belt sander	198	119
9924B	3" x 24" belt sander	188	135
9924DB	3" x 24" belt sander w/bag	214	130
9035	1/2 sheet finish sander	79	48
9045B	1/2 sheet finish sander	158	90
9045N	1/2 " w/bag	158	105
4200N	4-3/8 circ. saw 7.5 amp	152	95
5008NB	6 1/4 circ. saw 13 amp	178	105
5201NA	10 1/4 circ. saw 12 amp	248	215
4300BV	v/spl jig saw 3.5 amp	192	120
4301BV	orb v/spl jig saw 3.5 amp	208	125
2401BW	10" mitre saw	329	185
2400BW	10" mitre saw (for vice)	369	249
JR3000WL	2 sp recip saw w/case	188	120
JR3000V	vs recip saw w/case	178	120
6010DWK	3/8 cordless drill w/case	152	89
5081DW	3-3/8 cordless saw kit	165	109
5080BW	3 1/4" planer w/case	154	92
1100HD	3 1/4" planer w/case	278	160
3808BK	1/4 hp router w/case	132	85
3801B	1-3/8 hp router	168	115
3700B	1/2 hp trimmer		
28,000 rpm		124	82
804530	6" Round Sander	84	55
6710DW	Cordless Screwdriver	148	105
DA3000	3/8" angle drill	158	105
DP4700	1/2 v/spl w/rev 4.8 amp	154	92
HP1630W	3/8 v.s.r. hammer drill w/case	145	98
6300LR	1/2" angle drill w/rev	229	152
84198B-W	1/2" 2 sp. hammer drill w/case	238	150
GV5000	Disc Sander	79	53
6800DB	2500 rpm 3.5 amp	123	79
6800DBV	0-2500 rpm 3.5 amp	133	89
6801DB	4000 rpm 3.5 amp	123	79
6801DBV	0-4000 rpm 3.5	133	89
2030N	12" planer/jointer	1980	1350
2040	15-5/8" planer	1780	1195
1805B	6-1/8" planer kit w/case	416	265
LS1400	14" Mitre Box	578	410

NEW FROM MAKITA!

Model		List	Sale
9820-2	Blade Sharpener	235	160
6602DWK	3/8" 2-sp c/less drill kit	154	94
6010SDW	3/8" cordless drill rev	82	45
DA3000W	3/8" c/less angle drill	172	105
JV1800	var. speed jig saw	145	89
JV2000	var. speed orb. jig saw	165	100
4300DW	cordless jig saw	158	102
5005BA	5 1/2" circular saw		
8 amp. with brake		154	98
5900DW	6 1/4 c/less circ/saw	224	139
9207SPC	7" varispeed electronic sander/polisher	209	130
9303BH	4 1/2" sander-grinder kit	148	95
9035DW	c/less finishing sander	128	79
4014NV	var/speed blower	128	79

NEW FROM MAKITA!

Model		List	Sale
9820-2	Blade Sharpener	235	160
6602DWK	3/8" 2-sp c/less drill kit	154	94
6010SDW	3/8" cordless drill rev	82	45
DA3000W	3/8" c/less angle drill	172	105
JV1800	var. speed jig saw	145	89
JV2000	var. speed orb. jig saw	165	100
4300DW	cordless jig saw	158	102
5005BA	5 1/2" circular saw		
8 amp. with brake		154	98
5900DW	6 1/4 c/less circ/saw	224	139
9207SPC	7" varispeed electronic sander/polisher	209	130
9303BH	4 1/2" sander-grinder kit	148	95
9035DW	c/less finishing sander	128	79
4014NV	var/speed blower	128	79

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34-821	9" contr. saw w/o motor	500	395
34-410	10" contr. saw w/o motor	871	650
34-710	super 10" motorized saw	579	450
15-081	15" floor model Dipress	467	375
15-080	15" bench model	467	375
37-287	Saw/Jointer Combination	1018	810
37-809	6" Motorized Jointer	413	335
37-290	4" delta Joiner w/o motor	346	275
22-651	RC-33 - 13" Planer	1943	1450
43-122	Wood Shaper w/stand and 1 HP Motor	869	495
46-140	11" lathe, gap bed model w/stand w/o motor	407	335
52-483	1 hp motor for #34-821	170	130
62-042	1 1/2 hp motor for #34-410	230	170
62-144	1 1/2 hp motor for #37-290	136	105
62-142	1/2 hp motor for #28-243 and #46-140	121	85

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List 161	SALE 100	
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List 186	SALE 103	
#587	7 1/4" Speedtronic	
List 199	SALE 125	
#315-1	7 1/4" Top Hdl	
List 186	SALE 103	
#368-1	8 1/4" Top Hdl	
List 176	SALE 110	

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List 449	SALE 349	
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List	\$897.00	
Sale	\$1943.00	
#28-243	14" Band Saw with Open Stand without Motor	
List	\$594.00	
Sale	\$440.00	
#22-651	13" Planer	
List	\$1943.00	
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Model		List	Sale
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#30	6"	13.35	8.50
#20	7"	14.35	8.95
#10	8"	15.97	9.55
#1	10"	18.25	11.25
#2	12"	20.94	12.95
#3	14"	24.58	16.75
#4	16"	27.75	18.25

JORGENSEN BUSH CLAMPS

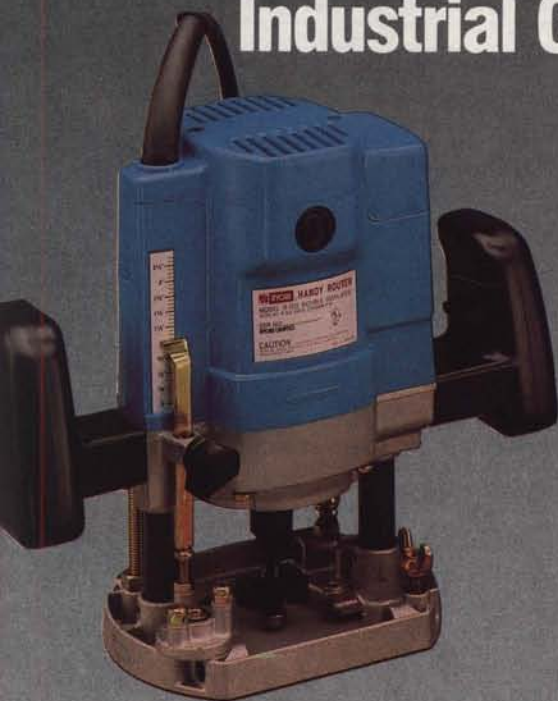
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#3708	6"	7.80	5.50
#3712	12"	8.75	5.95
#3718	18"	9.84	6.55
#3724	24"	10.54	7.35
#3730	30"	11.78	8.25
#3736	36"	12.85	8.95

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1950	3/8" High Torque	165	110
5930	Reversible Hammer	179	120
1970	3/8 rev/hi torque screwdriver	179	120
1980	Rev/ adj. clutch Scruddrill	179	120

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04-140	Straight 2 Flute	3/4	3/4			15.60
16-100	Mortising	3/4	1/2			12.73
18-104	Solid Carbide Round Nose	1/2	3/4	1/8		17.64
20-104	"V" Grooving		1/2		1/2	21.15
22-104	Dovetail		1/2	(14°)	1/2	16.33
26-100	Panel Pilot	3/4	1/4			9.43
30-106	Cove			1/2	3/8	33.64
32-100	Rabbit	1/2			3/8	27.62
34-114	Rounding Over		With Bearing Guide	3/8		30.03
38-100	Roman Ogee		With Bearing Guide	5/32		32.90
40-106	Chamfer	1		(45°)		26.42
42-106	Flush Trim	1/2	1/2			15.62
44-100	Solid Carbide Flush Trim	3/8				7.64
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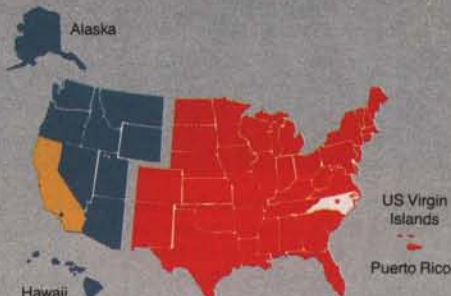
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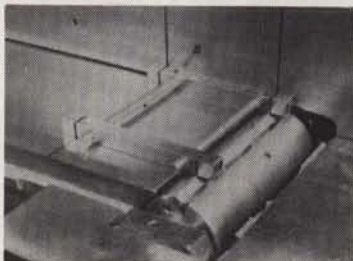
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EZ-506	Cordless Electronic Drill/Driver — 2 speed	159	95
EZ-580	C/less Caulking Gun — 30 tubes per charge	179	107
SCRIE	0-2000 Screwgun — 5 amp — heavy duty	125	75
SCRIE	0-4000 Screwgun — 5 amp — heavy duty	125	75
BE 8RL	3/8" Variable Speed Drill, rev. 3.8 amp	86	52
BE 10RL	3/8" Variable Speed Drill, rev. 5 amp	125	75
SBE-401RL	3/8" Hammer Drill, var/sp. reverse	88	53
SBE-10RL	3/8" Hammer Drill, var/sp. w/rev hvy-duty	145	87
SBZE-13RL	1/2" Hammer Drill, 2-sp. rev. hvy-duty	169	101
TC 25E	Tech Driver variable speed 5 amp	150	90
PC 70	Circular Saw 7 1/4" 12 amp. hvy-duty	157	94
VS 130	Orbital Sander 20,000 O.P.M. 1/3 sheet	75	49
VS 260	Orbital Sander 25,000 O.P.M. 1/2 sheet	156	89
VSS 260	Orbital Sander 25,000 O.P.M. 1/2 sheet w/bag	189	119
HBSE 75S	3" x 21" var/speed Belt Sander w/bag	199	119
BSPE 60	Jig Saw - Orbital var/speed hvy-duty 4.6 amp	214	128
RSK 600	Reciprocating Orbital Saw, 10 amp 2/sp w/case	229	137

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Atlas, Boice Crane, Rockwell	3	4 x 5/8 x 1/8	\$14.10
Hutchinson	3	4 x 7/8 x 1/8	\$14.10
Craftsman	3	4 5/8 x 5/8 x 1/8	\$17.30
Duro	3	5 1/8 x 3/4 x 1/8	\$20.10
Boice Crane, Rockwell	3	6 x 5/8 x 1/8	\$18.00
Boice-Crane	4	6 x 5/8 x 1/8	\$24.00
Powermatic	3	6 x 3/4 x 1/8	\$18.00
Hestong, Hutchinson	3	6 x 7/8 x 1/8	\$18.00
Oliver	2	6 x 1 x 1/8	\$12.00
Walker-Turner	3	6 1/8 x 3/4 x 1/8	\$21.00
Delta	3	6 1/8 x 10/32 x 3/32	\$21.00
Craftsman	3	6 1/8 x 5/8 x 1/8	\$21.00
Duro	3	6 1/8 x 3/4 x 1/8	\$21.00
Oliver	3	6 1/2 x 1 x 1/8	\$21.00
Boice-Crane	4	6 x 5/8 x 1/8	\$22.00
Boice Crane, Rockwell	3	6 x 5/8 x 1/8	\$24.00
Powermatic, Pryor	3	6 x 3/4 x 1/8	\$24.00
Powermatic	3	6 x 7/8 x 1/8	\$24.00
Oliver	3	8 x 1 x 1/8	\$24.00
Northfield	4	8 x 1 1/4 x 1/8	\$38.70
Delta	3	8 1/8 x 5/8 x 3/32	\$27.00
Foley-Belsaw	3	8 5/8 x 1 1/8 x 1/8	\$27.00
Powermatic	3	12 x 5/8 x 1/8	\$36.00
Craftsman	3	12 x 3/4 x 1/8	\$38.00
Paris, Powermatic	3	12 x 7/8 x 1/8	\$38.00
Craftsman	3	12 x 1 x 1/8	\$38.00
Northfield	4	12 x 1 1/4 x 1/8	\$52.80
Powermatic	3	12 x 1 3/8 x 1/8	\$38.80
Newman	4	12 x 1 1/2 x 5/32	\$57.80
Boice-Crane	3	12 1/4 x 5/8 x 1/8	\$39.00
Powermatic	3	12 1/4 x 7/8 x 1/8	\$39.00
Boice-Crane	4	12 1/4 x 1 x 1/8	\$39.00
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Rockwell	3	18 1/8 x 1 1/8 x 5/32	\$86.40
Powermatic	3	18 1/4 x 1 1/4 x 5/32	\$88.40
Paris	4	20 x 1 x 1/8	\$80.00
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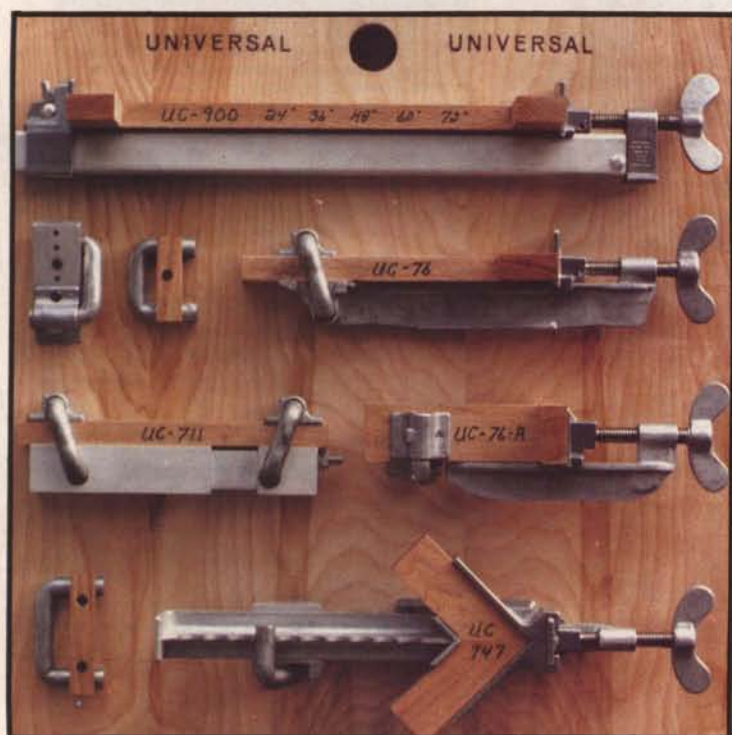
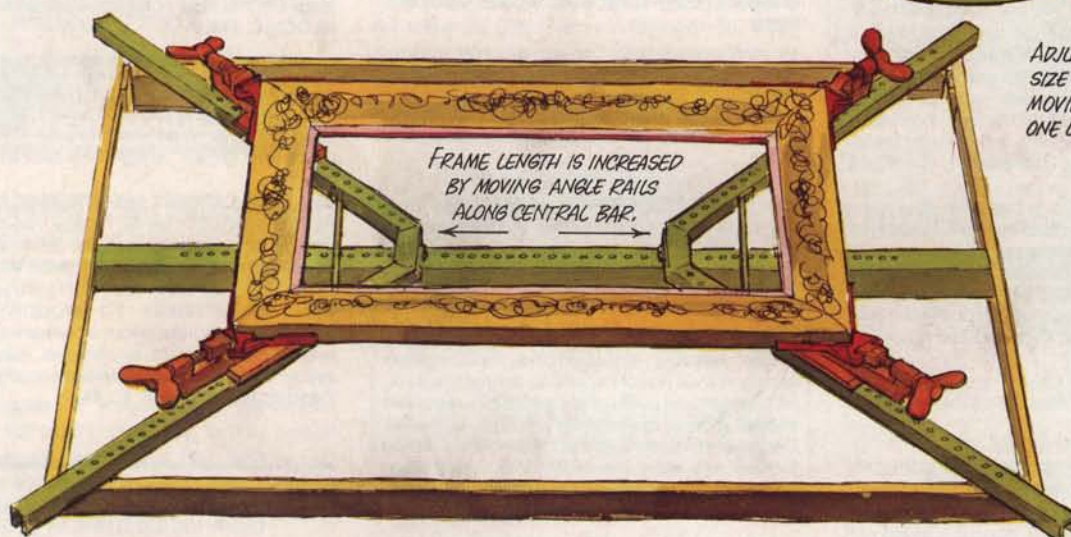
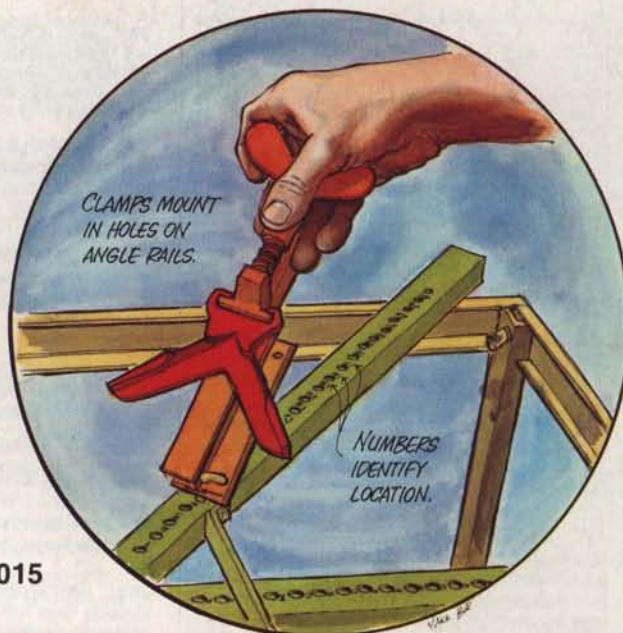
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