April 1991, No. 87
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Fine WoodWorking

Building a File Cabinet

A Child's Rocker

Using Dial Indicators

Design with Moldings

Basic Boxes

Wooton Patent Desks

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Fine WoodWorking March/April 1991

Electric power-carving tools are quick and accurate. Judi Bartholomew discusses them on p. 81. Cover: The Wooton Patent Desk was the showpiece of the best 19th-century businesses (article on p. 52).

Fine Woodworking is a reader-written magazine. We welcome proposals, manuscripts, photographs and ideas from our readers, amateur or professional. We'll acknowledge all submissions and return those we can't publish. Send your contributions to *Fine Woodworking*, Box 5506, Newtown, Conn. 06470-5506.

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DEPARTMENTS

ARTICLES

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Why design for breakage—I once asked an 86-year-old French cabinetmaker, "Why do so many people faithfully copy reproduction furniture with all the bad joint designs and no allowance for wood movement?" He looked at me, smiled and said, "Because they are stupid, and often know no better. To copy is good, but you must know what you are copying; you must capture the spirit of the design. And you must understand your material. Many museum pieces are poor examples to start with. But you don't make kindling out of 200-year-old wood!"

So often I read articles and authors say "This is what made the leg crack," but they proceed to copy it. Why don't they correct it?

I'd be interested in hearing what other woodworkers think.

—Nicholas S. Tyler, Manotick, Ont., Canada

Put up money for trees—This letter is for Dan Ray of Middle, Ia. His letter about cutting down some trees in his neighborhood got me thinking. Instead of just getting a petition signed, why don't the neighbors put their money where their mouths and good intentions are? Offer to pay the man the same price that he would get for selling the lumber, if he will leave the trees standing! Also, cutting a tree is always a gamble when you're trying to get good wood, so what gives him the idea that the wood in his neighbors' trees would be interesting and unusual? Remember a book is not made by its cover. Even if he did get some spectacular wood, I think he would regret it each time he looked to his neighbor's yard...I love wood just as much as the next guy, but sometimes it's better left in the tree.

—Tony Konovaloff, Tahoe Paradise, Cal.

Take the wood—Regarding Mr. Ray's moral dilemma with the walnut tree: Take the wood!

The real problem here isn't cutting and using the tree or destroying a "habitat." The problem is the lack of replanting by the neighbors over the years. They remember when everyone had a yard with big trees, but what did they do when the trees died or blew over? If they are like most of the people I know, they said "Good, now I can grow some grass." They should be replanting as trees are removed. That way, there are always trees of different types and maturity in a neighborhood.

Instead of wasting everyone's effort with petitions, Mr. Ray and his neighbors should get out a shovel and plant trees in their own yards. The city may even supply the trees, if asked. Eventually, the old walnut will die, petition or not. The people taking down the tree should plant some replacements as well, leaving lumber for the future.

By the way, I just took a huge chunk out of my best turning gouge on a buried ½-in. lag screw in a piece of red oak from my neighbor's yard. *—Al Pergande, Orlando, Fla.*

Woodworking means cutting trees—Dan Ray presents a dilemma that we all face. What is the correct action to take? No one wants to destroy the environment, but it is not possible to work wood unless trees are cut. Trees don't live forever, but many will live far longer than humans if we don't destroy them. The questions are which tree to cut and when?

I suggest that attempting to save the ecology is a moot question. The human population doubles every 30 years. The result is that the pressure for materials and land will only continue to increase. Until we stop this population explosion, everything that competes with humans for food or space will be killed or destroyed.

I share your concern for habitat, but I suggest that the realistic answer is use the tree while you have the chance. Even if there are sufficient signatures on your petition for it to be successful, it will eventually fail. I suggest that within 20 years, maybe even 5 years, the trees will be felled and the land cleared for a shopping mall or condos. The economic and social pressures are just too strong for the fragile ecosystem to withstand.

It takes a century to create an old-growth forest, but any fool with a match or a cigarette can destroy it in a day. The population of humans doubles and redoubles. That means there are more and more matches and cigarettes.

—Gerry Flood, St. Paul, Minn.

Freedom more important than tree—The letter from Mr. Ray in the November/December issue concerning the loss of a "habitat" for lumber asked for opinions of other readers. Here goes.

I love the outdoors and, I suppose, prove it by living in Alaska. We have lots of outdoors here. My favorite part of the outdoors are the trees. Bethel is located on the subarctic tundra. Unhappily for me, trees we don't have.

As much as I love trees, I love freedom more. What about the poor devil who owns the trees? Is he not going to be allowed to dispose of his property in a legal manner? The fact that he "needs the money," although striking a responsive chord, really doesn't have much to do with the problem. Nor do the feelings of the cheapskate "do-gooders."

If the contentious folks who want to preserve a bit of beauty in their neighborhood are *really* serious, let them buy the man's trees and then leave the trees for all to enjoy.

Imagine their screams of anguish if others tried to do unto them as they are trying to do unto the fellow down the street!

Shame on them for trying to involve the local government into "stealing" another person's property. We have far too much government as it is. These folks should read a bit of Thomas Jefferson and find out what freedom is all about.

—Warren L. Loschky, Bethel, Alaska

Retiree turns pro—In response to Perry A. Younker's "How can amateurs turn pro?" letter in *FWW* #84, I thought my short woodworking career experiences might prove helpful.

I am 70 years of age and started taking classes in woodwork-

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ing last fall. Since then I've made eight bread boxes and have sold seven of them. I sold them for $25, which is about half their value. The low price helps me sell them quickly and still gives me a little money to apply against my expenses. I consider the difference in what I might get and the price I do get as part of the cost of my education.

I have also made 35 bluebird houses from scrounged lumber. These I'm selling for $5 each and donating the money to my church. I also have orders for several cutting boards.

The message to Mr. Younker and others who may be afraid to try to sell their hand-crafted items is don't wait until you are perfect. Hand-crafted items are unique and do have flaws, but if you are careful, they also have beauty. If I were Mr. Younker, I would call the man and see if he still wants the gun cabinet, and if so, I would build it carefully and price it a little lower than the market. In the worst case, the man wouldn't take it after Younker built it. But someone else probably would. Or it could rather easily be converted into a curio cabinet.

Mr. Younker's idea for an article or series of articles on turning pro is a good one. There's nothing wrong with selling your work, if for no other reason than to give you room to make more projects. Most of us will have to sell something or give it away to have room to continue with the hobby.

—Harold M. Wilson, Tuscaloosa, Ala.

Pricing not an exact science—In the September/October issue of *FWW*, a letter titled "How can amateurs turn pro?" caught my attention. Although I have been a part-time professional woodworker (full-time engineer) for 10 years, I can relate to the question "how would I figure a price?" My customers are referred to me by word of mouth and unfortunately are not extremely wealthy. I have read many articles in your magazine that refer to projects that are custom-made on a contract basis. I would like to know how these types of projects are acquired and how they are bid. The material cost is straightforward, but the labor cost (man hours) is *not* an exact science. This bid and proposal portion of a project is as important, or more so, than the actual fabrication. Marketing and advertising are other issues that also could be explored.

—Herbert W. O'Connell, Ft. Worth, Tex.

Why didn't I think of that—I loved the letter in *FWW* #84 suggesting that secondhand woodworking equipment be used to flatten old phonograph records. It's one of those great ideas that makes one say, "Now why didn't I think of that?"

Please tell the writer that this idea really works well and I have successfully flattened all of my warped 78s. Also, with only a slight modification, this idea does a great job of pressing flowers.

And as soon as I can figure out how to keep my old 16-in. drill press from falling off the shelf, I'll be using it as a bookend.

—Paul Burri, Ventura, Cal.

Oregon maple underrated—I just finished reading Jon Arno's very fine article entitled "Maple: A Versatile Timber" in the November/December 1990 issue of *FWW*, and would like to add a few comments.

From my perspective (being west of the Cascades) there are actually three commercially available maple species—hard maple, soft maple and Oregon maple—in addition to box elder, which I've never heard of anybody using. I'd like to clarify this point because there is a large quantity of this material available, and in Douglas-fir country, it is a vastly underutilized resource. Much of this material is figured and very suitable as a cabinet wood because of its relative dimensional stability. Also because of its lower specific gravity, maple can be worked with hand tools, and it is my belief that with suitable staining, it would resemble cherry. If your readers assume that it is comparable to soft maple, it will continue to be used as pulpwood or firewood, or eliminated as a "weed species" and will not attain the "value added" that many people in Oregon are trying to develop. For those who are interested, I can provide mills and sources of supply, if they contact me.

As to the sanding quality of maples, there is substantial information that indicates that the problem with the maples is not "fuzzing," but rather scratching. For anyone who has worked with hard maple, this is a real problem. According to information published by the USDA Forest Service *(Machining Characteristics of United States Hardwood, Technical Bulletin No. 1267)*, in relative resistance to scratching, hard maple produces 0% scratch-free pieces, and soft maple produces 6% scratch-free pieces. Oregon maple was not considered in the study and so I can only say that it provides a slightly better result. For comparison, the best species listed is elm at 70%. Red oak is at 66% and ash is rated at 52%.

—Stanley S. Niemiec, Corvallis, Oreg.

Scrounging for machine parts—Regarding George Butter's expensive experience in building shopmade machines in "Letters," *FWW* #85, purchasing new machine components from industrial suppliers is indeed a costly proposition. But I have used big business/government wastefulness and those organizations' propensity for obsolescence to my advantage by scrounging many useful parts for making my own woodworking machinery. Perfectly good bearings, sprockets, motors, electrical components and structural steel can be had from junkyards, bargain liquidators and auctions, often costing only pennies on the dollar of current retail.

One of my richest sources of parts is a friendly scrap-metal dealer who contracts to dismantle and haul off old machinery from local industries. Armed with my toolbox, I have dismantled "junk" awaiting the fiery furnace to yield a 5-HP, 3-phase motor and ¼-HP, 30-RPM gear motor for $15 each. A bucketful of sprockets, roller chain, bearings, pulleys and magnetic motor controls went for $20. Other "junk" included a Morrison cabinet-model-type saw, in rusty, but working condition for $30.

Over a one-year period, from this one source, I gleaned all the necessary parts (except for a conveyor belt) to build a 38-in. drum sander, virtually identical to some commercial models. I can realistically hope to have no more than $400 in my sander when it is completed.

From a bargain outlet, I procured a Dayton 2-HP, 3-phase blower (brand-new government surplus) for my dust-collection system for $100. The same outlet had ¾-in. red oak plywood (good on one side) at $19 a sheet.

Auctions have yielded a 12-in. Northfield jointer with 3-HP motor for $120; an 8-in. Crescent jointer sans motor for $90; a 3-HP Moak 1-in. spindle shaper for $80; a dismantled Rockwell/Delta 12-in. radial-arm saw in repairable condition for $175; and an Arco 5-HP rotary-phase converter to run all my bargains for $165.

Sometimes I feel that my penchant for bargain hunting takes precedence over my woodworking. But bargains are where you find them, and imagination, ingenuity and perseverance will help provide the owner of a small shop with equipment that would otherwise be unaffordable. *—Chip Lindley, Henley, Mo.*

A narrow miss—Recently I was feeding a 1½-in.-wide by 36-in.-long piece of oak trim to be used as bookcase edging over a wobble dado blade. The work was held against the tablesaw fence with a featherboard and secured down on the blade with the tip of a screw clamp positioned just behind the blade. I fed all but the last couple of inches of the work over the blade from behind. Then, in a move that probably saved my life, I stepped to one side so I could reach over the action and push the work free with a rubber-coated handle.

When the end of the trim cleared the clamp but was still over

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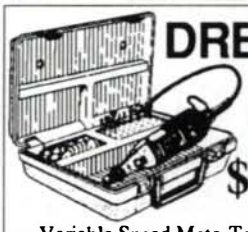

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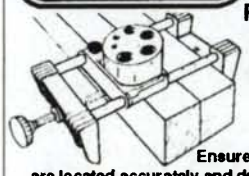

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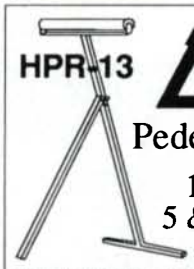

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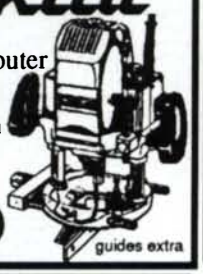

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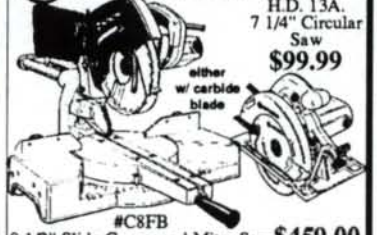

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the blade, it chattered and splintered. The stick shot backward in a slightly rising, 11-ft. arc, spearing the shop wall—two sheets of 1-in. blue board sandwiching 5 in. of insulation batting—and then coming to rest with the end sticking 1 ft. into the basement stairwell. The tablesaw, mind you, is no industrial giant, but a 10-in. Delta that suits my hobby needs.

No one was home; I have a telephone in the shop, but I had removed a receiver upstairs for a nap earlier in the day. Had I been standing behind the trim, I would have been run through somewhere in my lower intestines. I probably would have bled to death trying to reach the unhooked receiver while maneuvering through the house with a 3-ft. piece of red oak sticking through me. Had the wood struck my spine, I wouldn't have moved at all.

What an embarrassing way to die.

The lessons, I think, are to have clamped the hold-down block over the entire blade to prevent the chatter, and to stand to one side. But I'm looking for further suggestions. So is my wife. Please be direct. *—David Arnold, Milton, Mass.*

Woodworking by women—In answer to the letters in *FWW* #85 about women woodworkers, yes, there are some of us out here quietly doing our thing. I share some of the problems discussed by Cheryl Yee. I, too, am short and have small hands. Many of the switches on power tools are mounted in difficult-to-reach, even dangerous, spots. Frequently, they should be moved or modified even for large persons.

I have an additional frustration. With advancing age (I'm 61), my physical strength has decreased. I am forced to think up all sorts of gimmicks to make up for this.

Nevertheless, I'm not going to quit until I'm forced to. I love carving and make useful items, usually with animal or plant themes. I also enjoy making a variety of toys for my children and now grandchildren. I like to design my own projects.

My father let my brothers and me work in his shop, and my sons and daughters had the same opportunity in mine.

I feel very strongly that woodworking should be more available to women than it is. This country suffers from a bias that is entirely cultural. Just look at the ads (in most "popular" magazines and catalogs—not usually in *FWW*). Dad or granddad is making something, with his woman looking on admiringly (usually with *puffy* hairdo, *pink* dress and *high* heels showing how impossible it would be for *her* to be doing the work!). It turns my stomach! Why don't tool manufacturers wake up and realize they have an untapped customer resource consisting of *one-half* the population. A little intelligent advertising would go a long way!

Meanwhile, let's not forget what this male-dominated craft owes to Sister Tabitha (née Sara Babbitt) of the Harvard Society of Shakers, who, about 1812, invented the circular saw.

—Nancy G. Frederick, Hockessin, Del.

Show more work of women—I feel a need to respond to several items in the December 1990 issue of *FWW.*

As a professional woodworker (since 1976) and a woman, I was interested in the letters asking about women woodworkers. I, too, feel we are poorly represented by *Fine Woodworking.*

For example, the article "Woodworking in Alaska" actually mentions two women woodworkers, but although the article has four photos of woodworkers and eight photos of work, only one shows one piece of one woman's work. In a world where we generally go unrecognized, it would be nice if *Fine Woodworking* would help by making an effort to show the work of women

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Deadline for entries is June 15, 1991.

Rules

1. You may enter no more than a total of ten color transparencies of wooden objects made by an individual woodworker or woodworking partnership. You can submit ten photos of a single object, photos of ten different objects or any combination that totals no more than ten.

2. If you enter slides of more than one object, *you must enclose a separate entry blank (photocopied from this page) for each object.* You must code each photo and its corresponding entry blank with matching identifying letters (A, B, C, etc.)

3. Photographs must be good-quality color transparencies. All formats are acceptable, including 35mm, 2¼ in., 4x5, 6x7 and 8x10. Please protect each slide or transparency with separate *clear* plastic sleeves, not paper or cellophane. The photo background should be featureless and of a neutral color that doesn't interfere with the object. Your name, address and photo code letter must be legibly printed directly on each 35mm slide mount or on a label attached to the protective sleeve of each transparency. We cannot accept or judge unlabeled photos.

4. Snapshots, color negatives, color prints, Polaroids and black-and-white negatives or prints cannot be published, so they will not be judged.

5. Work submitted must be of original design and completed since 1988. The primary material must be wood. There are no restrictions on species, tools or techniques. If it's mostly wood and you made it, you can enter it.

6. If you want your photos returned, you must include a self-addressed stamped envelope. *Otherwise, photos will not be returned.* If you wish us to acknowledge receipt of your photos, please include a self-addressed stamped postcard that lists the photos submitted. We'll check it off and send it back to you.

7. All entrants, whether accepted or not, may purchase up to ten copies of the book at 25% off the cover price.

8. Decision of the judges is final.

Entry blank for *Design Book Six*

Mail to: Design Book Six, The Taunton Press, P.O. Box 5506, Newtown, CT 06470-5506

File number (office use)

Name _____

Mailing address _____

City _____ State _____ Zip _____

Daytime phone _____ Evening phone _____

Number of photos submitted for this entry (make sure each object has its own entry blank) _____

Photographer's name and phone _____

Title and/or function of entry _____

Code letter for photo (See Rule 2) _____

Woods used _____

Dimensions: Length _____ Width _____ Height _____ Diameter _____

This entry form conveys to The Taunton Press the right to publish the photos it describes in book or promotional form. If you wish to make additional comments, do so on a separate piece of paper. We may excerpt what you write for publication.

(and minorities) so we would feel less invisible.

As for Cheryl Yee's questions, I am also 5 ft. tall. Early on in my woodworking education, another woman woodworker taught me to make sure my center of gravity is equal to or above a task requiring strength. So I climb up on my workbench to bear down on something if I need to, and I have a 4-in.-high platform I can drag around my shop to raise me up some. (Be careful that your movable platform can't slide out from under you while you're working.) I have one workbench that is only 30 in. high for low work. I have never found a particular brand of tools that is more comfortable for my size. Also, now that I'm over 40, I've learned not to try to "prove" myself at the expense of my muscles. I ask for help if I need it when lifting and carrying. (All woodworkers should do this—it's not a gender issue.) Even with the tricks I've learned about balancing weight and all, it still is disadvantageous to be 5 ft. tall and have arms in proportion to that height. We just have to be jealous of those 6-ft.-tall folks who have better clearance at their tablesaws, and be extra careful in situations where our height makes it harder.

—Denise Grohs, Vilas, N.C.

Tools for small hands—My neighbor, who is a woodworker, brought the last issue of your magazine over to me so I could read the letters concerning women woodworkers. He suggested that I write a letter on the subject.

When I was young and in school, I always wanted to take woodworking, but in the '50s and '60s, girls weren't allowed to take shop any more than guys were allowed to take cooking and home economics. Anyway, I was always very interested in wood and frustrated that I couldn't get involved in it.

I moved to my present address six years ago, and as chance and luck would have it, I moved next to two men who were involved in the trade, each in their own fashion, and that rekindled my interest. With their help, I have been able to pursue my love of wood for the past five years, and although I am not a great woodworker by any stretch of the imagination, I do it for extra money and just the love of making things from wood.

My main interests right now are smaller, decorative items and also Shaker-type furniture. I am also beginning a new line of items in the Southwestern design, such as shelves, wall hangings, etc. Finally, after all these years, I am doing what I love best.

Just a word regarding the comments from the lady who said that tools are really not designed for womens' smaller and a bit weaker hands. I absolutely agree with her. We simply do not have the stretch or the strength that most men have, and manufacturers of hand tools should take that into consideration when designing their tools. There are more and more women out there now who have to use these tools, both around the home and when pursuing a hobby.

—Joan M. Ambeault, Tolland, Conn.

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

—John Lively, publisher

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The quickest way to start your tenon is with Freud's 8" Safety Dado, SD308. The new Anti-kickback Design limits the tooth's bite, reducing the chance of overfeeding and climbing. Laser technology allows us to use a harder Rockwell steel for the blade body, creating a blade that will run truer. Each Micrograin H00K carbide tooth is polished to a razor's edge, virtually eliminating tearout even on problem material.

The right chisel to finish up your mortise is here in this wooden storage box. Each chisel is made from chrome vanadium steel, ground to a fine edge. Then, they are topped with rare boxwood handles that are bound by steel to add strength and prevent mushrooming. Handles are about 5" and overall length is from 9 3/4" to 11 3/4". WC 106 contains: 1/4", 3/8", 1/2", 5/8", 3/4" and 1" chisels.

To start your mortise, we will give you two spiral bits FREE. Our upward cut solid carbide bit removes all the chips for effortless cutting without burning. These spiral bits have more total cutting edge and do not require sharpening as often. Factory tests have shown these bits will last many times longer between sharpening and have an almost unlimited sharpening life. The 75-102 has a cutting diameter and shank diameter of 1/4" with a cutting length of 1". The 75-108 has a cutting diameter and shank diameter of 1/2" with 1 1/4" cutting length.

Save $169.00!

	LIST	NOW
SD308	~~218.90~~	***199.00***
WC106	$ ~~81.40~~	***FREE***
75-102	~~18.30~~	***FREE***
75-108	+ ~~49.40~~	+ ***FREE***
TOTAL	~~368.00~~	**199.00**

The quickest way to produce a tenon without expensive jigs or tenoning machine-
No measuring or marking needed after the saw is set up. Produce multiple tenons without variation in tenon thickness. Here's how:

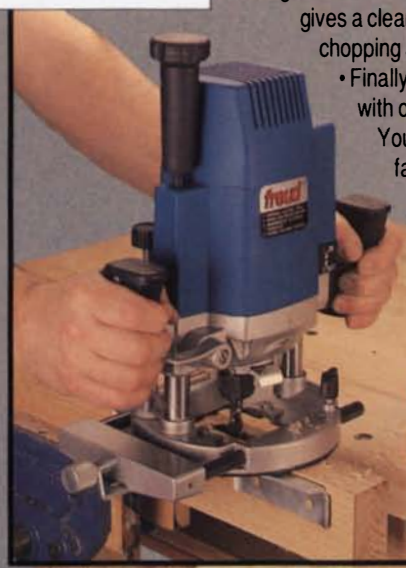
- Set the height of the Freud safety dado to the desired shoulder width of the tenon.
- Adjust your fence with a spacer block for the desired tenon length.
- Now, place your wood in the miter gauge and cut each side of the tenon.

If you need a tenon longer then 13/16" - just make multiple passes. Next comes the mortise and that's free from Freud.

To get a smooth mortise-

- First, set your router to the desired depth of your mortise. (Deep mortises may require multiple passes.)
- Next, align the fence to the position of the mortise. The upward spiral of the solid carbide bit clears all the chips out of the cut to prevent burning. The spiral shear angle of the bit slices the wood almost like a plane and gives a cleaner cut than straight bits that have a chopping action.
- Finally, square off the ends of the mortise with one of your FREE chisels.

You've just made a mortise and tenon the fast and simple way, without special tools. All you buy is Freud's safety dado and the mortise is FREE.



Hurry! Sale ends April 30, 1991!

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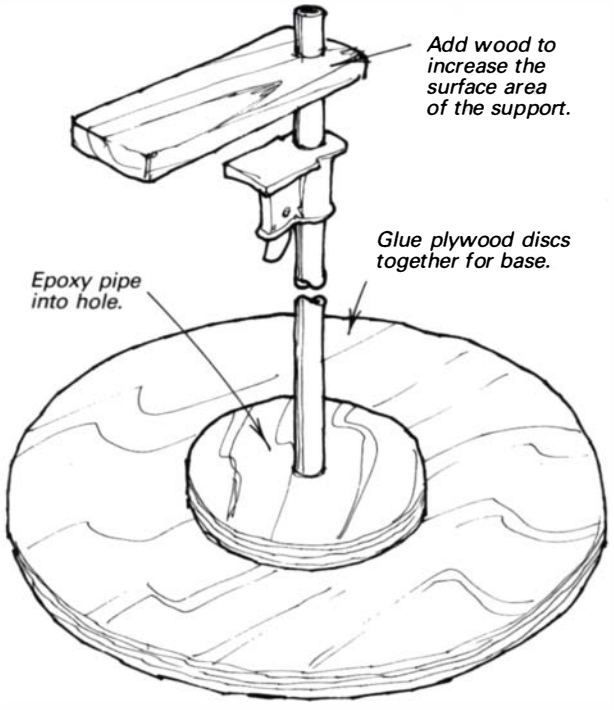
READER SERVICE NO. 152

edited and drawn by Jim Richey

Pipe clamp support leg

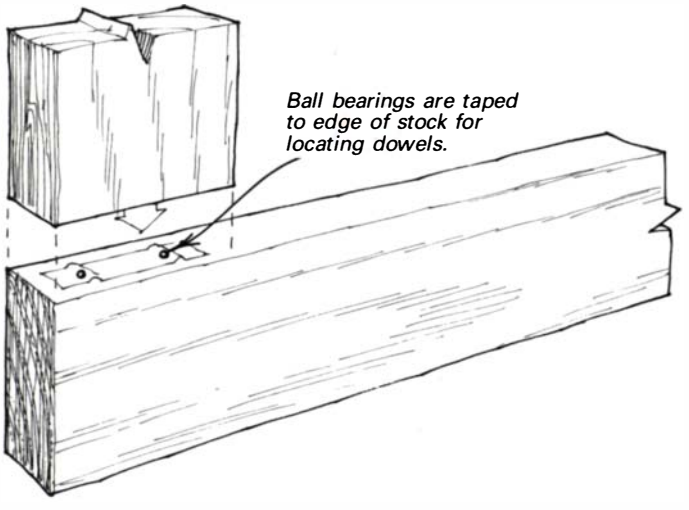


An adjustable support leg is indispensable for holding the other end of a long board you have clamped in your bench vise. Here's how to make a stable and versatile support leg using the tail stop from a ¾-in. pipe clamp, a 3-ft. length of pipe and a plywood base. For the base, cut two ¾-in.-thick plywood discs, one with a 5 in. dia. and the other a 15 in. dia., and then glue them together. Drill a ¾-in.-dia. hole in the center of the 5-in. disc and epoxy the pipe in position. Now slip the tail stop onto the pipe faceup and you are ready to use the support. To increase the surface area of the tail-stop support, simply drill a pipe-size hole in one end of a plywood offcut and place it on top.

The versatility of the humble pipe clamp never ceases to amaze me. It's such a shame we can't buy them in England.

–Jack English, London, England

Ball-bearing dowel locater



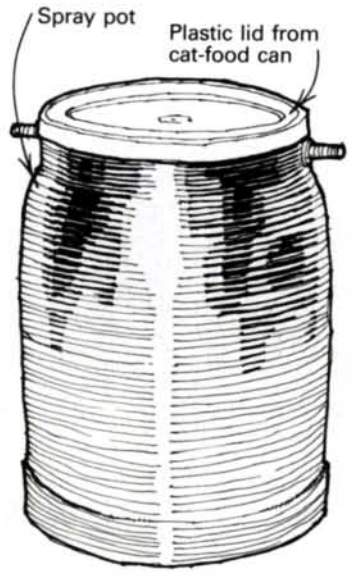
I use the small steel balls from discarded ball bearings to accurately mark the centers of mating holes for dowel joints. I just tape a pair of the small balls to one of the parts where I want the dowel holes. Then I place the other part in position and tap it with a mallet so that the balls make indentations in both pieces. Finally, I drill the dowel holes, using the indents as centers.

Steel BBs are all right to use, but they are a bit too large for fine work. I prefer 1/16-in.-dia. balls salvaged from a discarded router bit bearing or other small ball bearing. I just place the bearing in a steel vise and slowly tighten it until the outer ring of the bearing breaks. Then I scramble to retrieve at least two of the balls as they roll all over the workbench.

–Ed Moorman, Dayton, Ohio

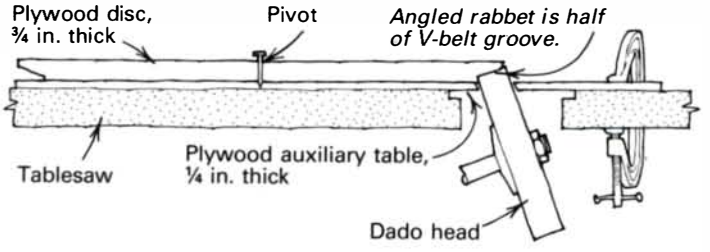
Quick tip: Use the depression in the bottom of an aluminum soda can for mixing small amounts of epoxy, paint or glue. Make sure you clean the depression before putting the can in your recycling bin. *–Jack Howard, Auburn, Wash.*

Avoiding sprayer cleanup



Rather than go to the time, expense and disposal problems of using solvent to clean the quart pot to my sprayer after each use, I keep lacquer in the can all the time and just add more when needed. After spraying, I remove the pot, wipe off the gun's fluid tube, and then seal the pot with an inexpensive plastic cat-food can cover (available at supermarkets). I then attach an identical spare quart pot filled with thinner and run the thinner through the gun for a few seconds to clean the inner workings. I disconnect the air hose, flip the lever release to relieve pressure, and keep the thinner cup attached to the gun until the next time I need to use it. *–Buzz Coren, Tryon, N.C.*

Making large pulleys on the tablesaw



The large, slow-moving turntable I was commissioned to build as part of a stage set for my community's performing-arts center presented an interesting challenge. The 4-ft. turntable had to hold a 200-lb. actor and spin at 2 RPM. Our solution was to use a low-RPM gear-reduction electric motor further reduced by a V-belt turning a 15-in.-dia. pulley. I had no problem locating the small pulley that fit on the motor shaft. But I was unable to find a 15-in.-dia. pulley locally and did not have a lathe to turn one. However, I found another, very simple method to make the pulley.

The pulley consists of two 15-in.-dia. discs, which I bandsawed from ¾-in.-thick plywood and screwed together. But before assembling the two discs, I used a dado head on the tablesaw to cut an angled rabbet in the edge of each disc to form the groove for the V-belt. To do this, I installed the dado head on my tablesaw and tilted the arbor to the same angle as the side of the V-belt. I clamped a piece of ¼-in.-thick plywood to the top of my saw and drilled a small pivot hole into the plywood, 7½ in. from

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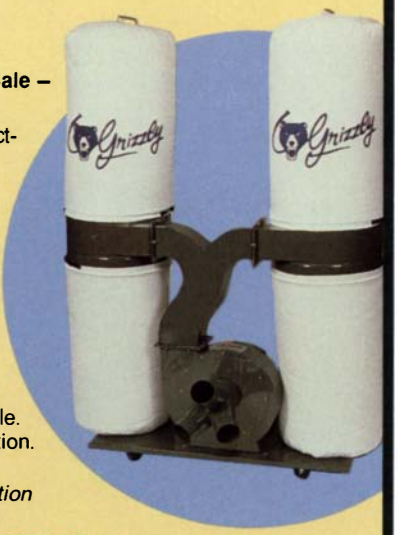

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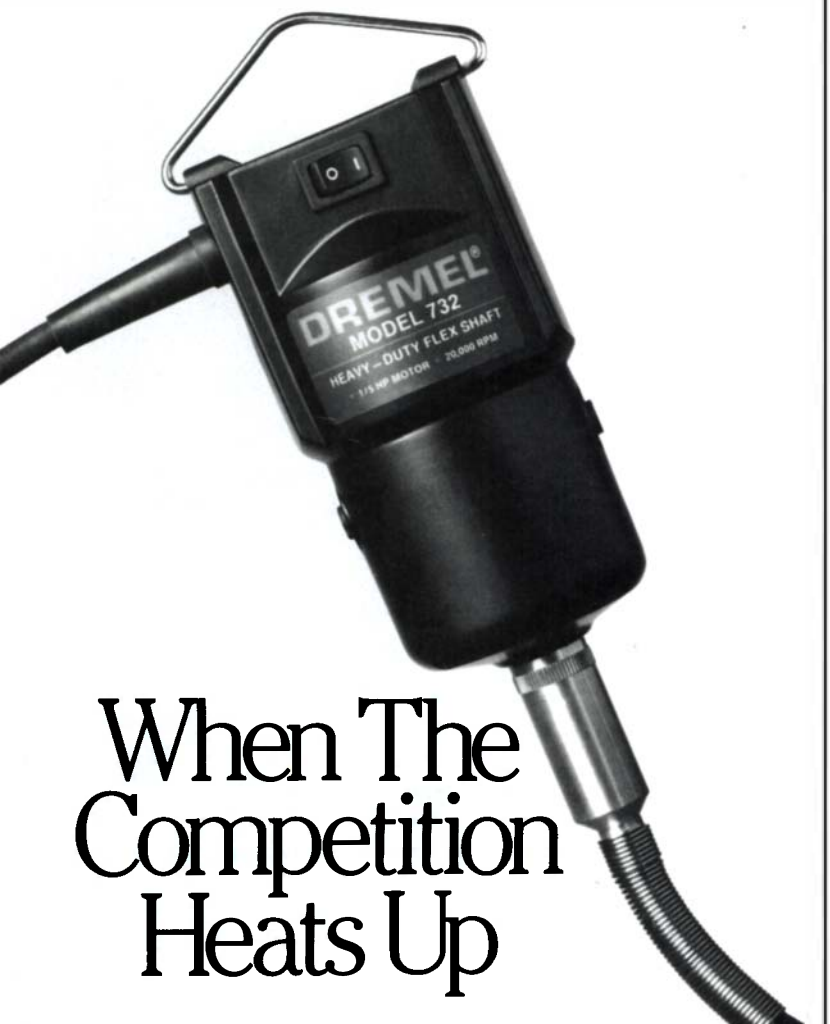

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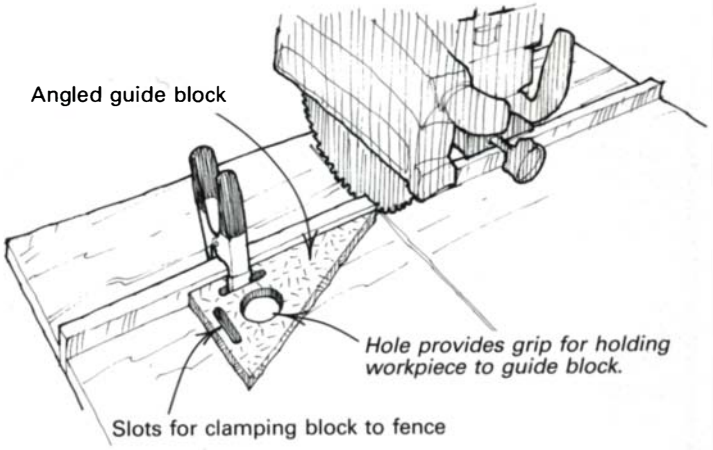
the dado head and in line with the arbor. Then, with the dado blade lowered, I pushed a pin through the center hole of one of the discs and into the pivot hole in the plywood auxiliary table. Next, I turned the saw on and slowly rotated the plywood disc as I simultaneously slowly raised the dado blade. When the rabbet on the first disc was cut to the proper depth, I lowered the blade, removed the disc and repeated the process with the second disc. I then screwed the two discs together to form a strong, durable pulley with an accurate V-belt groove.

–Gene Stemmann, Corvallis, Oreg.

Angle blocks for the radial-arm saw



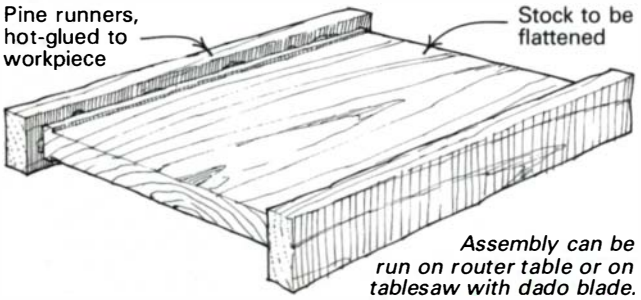
When you need to make angle cuts on a radial-arm saw, it is quicker and more accurate to use precut guide blocks than it is to move and reset the saw arm. But using an angled guide block is safer if the block is fixed to the fence, so I rout ½-in.-wide slots in the block along both perpendicular edges, for securing it to the fence with a spring clamp. In addition, a large hole cut in the center of the block with a hole saw provides a convenient way to hold the work firmly to the guide block during the cut.

–James Hurley, Nevada City, Cal.

Quick tip: A spoon gouge makes a handy countersinking tool. Just push the blade into the wood at the perimeter of your clearance hole and twist your wrist. Gouge sizes for various wood screws are: 7mm for #6 to #8; 10mm for #10 to #12; and 13mm for #14.

–Michael J. Petyo, Allentown, Pa.

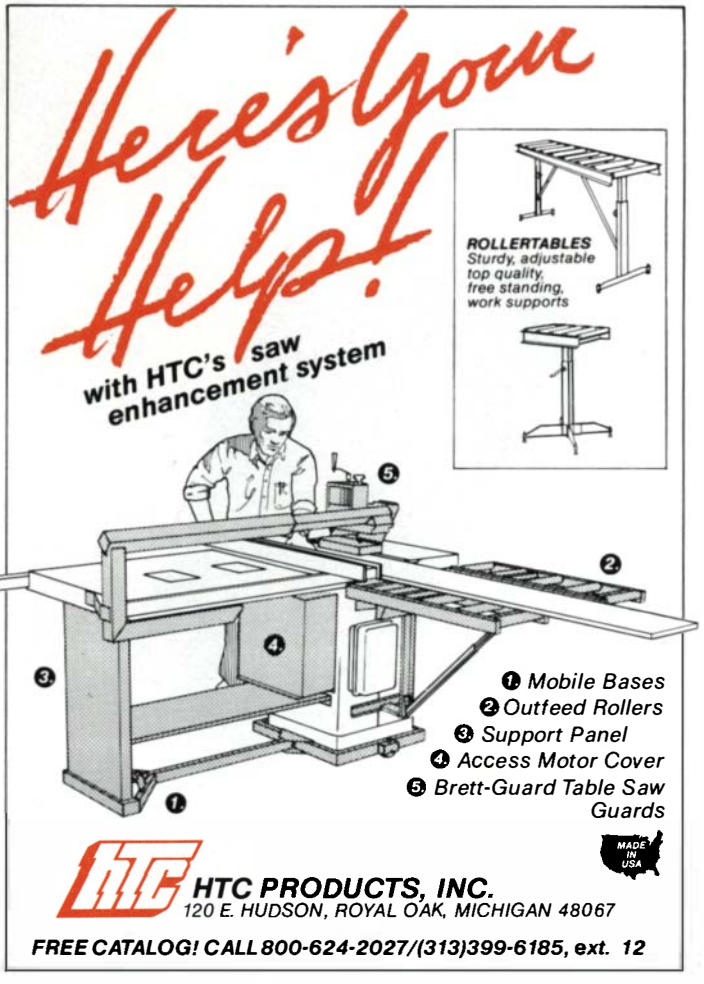
Hot-glue surfacing sled



Assembly can be run on router table or on tablesaw with dado blade.

Tim Hanson's article on surfacing stock with a router (*FWW* #77) brought to mind a quick surfacing method I conceived to salvage a badly misshapen piece of beautifully figured walnut that I wanted to use for a cribbage board.

I first jointed the two long edges of the warped walnut and then fastened two pieces of scrap pine to these edges with hot-melt



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#451		3/16" Beading	3/16" R	7/8"	1/2"	1/4"	$11.00
#233		1/4" Beading	1/4" R	1"	1/2"	1/4"	$13.00
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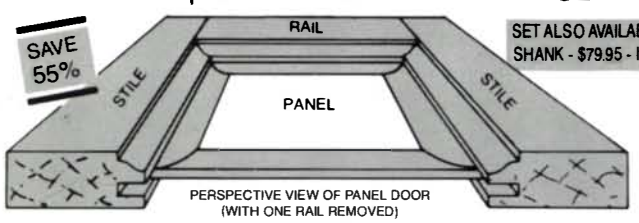

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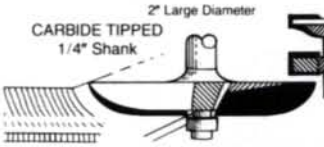

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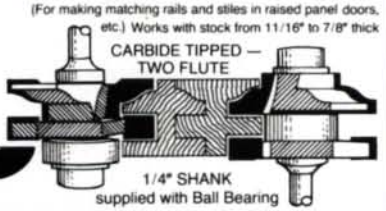

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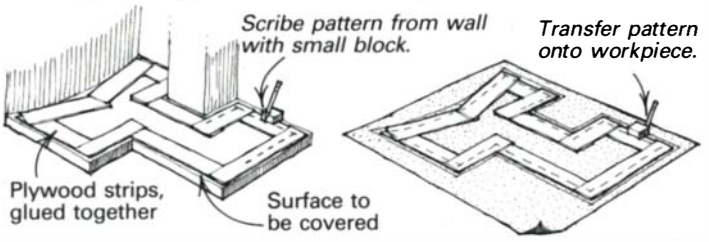
glue, thereby creating a sled with the walnut centered between the two pine runners. To make sure the assembly was square, I held the three pieces together against the fence and top of my tablesaw while the glue set. The hot glue is strong enough to hold the sled together during milling, sets up in minutes and enables easy disassembly when the operation is finished.

I used the sled to flatten the walnut by running it on a router table, but it would work just as well on a tablesaw fitted with a dado blade or molding head. With each fence setting, I made four passes by turning the sled over and swapping it end for end.

–Tom Rose, Los Angeles, Cal.

Quick tip: The simplest method of preventing paint skinning is to store the can upside down. *–E.W. Hunt, Sheffield, U.K.*

Fitting complex countertops

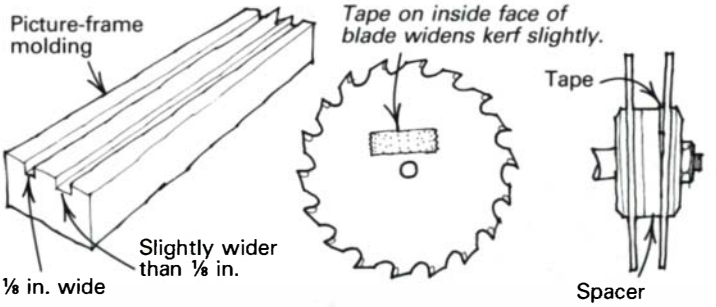


After reading about Lynn Mickelson's spiling technique (*FWW* #81, p. 18) for producing patterns, I decided to share my foolproof method for producing a complicated plywood (or laminate) countertop that must fit perfectly. As a countertop installer, I have used this method for years with excellent results.

First, arrange 4-in.-wide strips of ⅛-in.-thick plywood around the edge of the area the top must fit, as shown in the drawing, and glue the strips together with hot-melt glue to form a loose-fitting pattern. Then, draw an exact pattern onto the assembled strips by holding a small block of wood, about 1-in. square, against the wall and marking every inch or so. Next, remove the strip pattern, set it on the countertop workpiece and transfer the marks from the pattern to the countertop using the same block of wood. Cut out the countertop leaving the line you've just drawn. If you set your saw to cut out the countertop at a slight bevel, you will reduce the amount of sanding that's required to achieve a perfect fit. Finally, belt-sand the countertop to the line and set it in place. You'll have a perfect fit without even having to use your tape measure. This method works even if the corners are out of square and the walls are uneven or curved.

–Harold Stewart, Oxnard, Cal.

Microgrooves with masking tape



While making the picture-frame molding shown in the sketch, I found that I could cut two precise microgrooves simultaneously

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6527	NEW SawZall v/spd 8 amp w/cse & Quick Loc Cord	299	165
0399-1	NEW12V cdlss var/spd drill w/batt. charger & case	290	155
0395-1	9.6V cdlss. drill w/cse	270	148
0219-1	9.6V cdlss. drill w/cse	295	165
0224-1	3/8" drill 4.5A magnum	189	112
0234-1	1/2" drill 4.5Amag0-850rpm	209	112
0244-1	1/2" drill 4.5Amag0-600rpm	209	112
0222-1	3/8" drill 3.5A 0-1000 rpm	179	102
0228-1	3/8" drill 3.5A 0-1000 rpm	169	99
0375-1	3/8" close quarter drill	208	125
0379-1	1/2" close quarter drill	243	154
6539-1	Cdls. scrdrv. 190 rpm	119	69
6540-1	Cdls. scrdrv. w/bits & cse	159	108
6546-1	Cdls. scrdrv. 200 & 400 rpm	126	75
3102-1	Plmbrs rt angle drill kit	330	185
5399	1/2" D-hdle ham drill kit	312	179
1676-1	H.D. Hole Hawg w/case	429	229
6511	2 sp SawZall w/case	224	129
6750-1	Drywall gun 0-4000 4.5A	154	89
6507	TSC SawZall w/case	239	129
6170	14" chop saw	430	259
6014	Orbital sander 1/2 sheet	209	118
8977	Var. temp heat gun	114	75
5397-1	3/8" v/sp ham. drill kit	232	137
5371-1	1/2" v/sp ham. drill kit	335	185
3107-1	1/2" v/sp rt angle drill kit	340	189
6754-1	Drywall gun 0-4000 4.5A	179	119
3300-1	1/2" v/sp mag rt angle drill	309	179
5660	Router 1-1/2 HP - 10amp	325	195
5680	Router 2 HP - 12 Amp	355	219
5455	7/8" polisher 1750 rpm	219	127
6215	16" chain saw	280	169
6365	7-1/4" circular saw	204	119
6366	7-1/4" circ. saw w/lnc & bld	214	125
6368	7-1/4" circ. saw w/fence blade & case	239	135
0235-1	1/2" drill kyls. chuck mag	215	125
6016	1/4 sheet pad sander	84	49
6145	4.5" grinder 10,000 rpm	159	95
6142	6145 w/case & access	197	125
6749-1	Drywall gun 0-2500 4.5A	189	125
6377	7-1/4" worm drive saw	295	169

FREUD SAW BLADES
5/8" Bore - Industrial Grade
CARBIDE TIPPED SAW BLADES

Item	Description	Teeth	List	Sale
LU72M010	Gen Pur. -A.T.B.10"40		58	38
LU82M010	Cut-off 10"	60	77	44
LU84M011	Comb 10"	50	65	39
LU85M010	Super Cut-off10"	80	96	55
LM72M010	Ripping 10"	24	57	37
LU73M010	Cut off 10"	60	70	44
LU87M010	Thin kerf 10"	24	60	38
LU88M010	Thin kerf 10	60	74	44
LU98M010	Ultimate 10"	80	107	68
SD306	6" Dado - Carbide		184	105
SD308	8" Dado - Carbide		196	109
F0	1-3/4" x 5/8" Bisc. 1000 Qty.		32	27
F10	2-1/8" x 3/4" Bisc. 1000 Qty.		32	27
F20	2-3/4" x 1" Bisc.1000 Qty.		34	29
FA	Assor. Biscuits 1000 Qty.		34	29
WC106	6 pc. chisel set w/cse 1/4"-1"		73	52
FB100	16 piece forstner bit set		284	159
94-100	5 pc. router bit door system		288	155
JS100	Biscuit Jointer w/case		300	159
CE82	Planer w/case & carb blds		218	135
FT2000	3-1/4 HP plunge router		299	179

THE NEW "TK" BLADE SERIES

Item	Description	Teeth	List	Sale
TK203	7-1/4 " Framing	24	29	17.35
TK206	10" Framing	24	33	19.80
TK303	7-1/4" Finishing	40	36	21.60
TK306	10" Finishing	40	40	23.95
TK903	7-1/4" Combo	30	31	18.60
TK906	10" Combo	50	45	26.95

MAKITA CORDLESS

Model		List	Sale
6070DW	3/8" v/speed rev. drill, 7.2v	130	78
6071DWK	3/8" v/speed rev. drill w/removable batt, 7.2v	199	115
5090DW	3-3/8" saw kit. 9.6v	256	139
6010DWK	3/8" cdls drill kit 7.2v	164	95
6010SDW	3/8" cdls. drill kit, 7.2v	99	59
DA3000DW	3/8" angle drill, 7.2v	251	139
8400DW	Hammer drill kit, 9.6v	272	149
4390DW	9.6 cdls recip saw kit	230	128
6012HDW	2 spd. driver drill w/clutch & case 9.6	236	122
6092DW	V/sp drill, kit complete	250	125
6093DW	V/sp drill w/clutch-complete	261	127
632007-4	9.6 volt battery	48	30
632002-4	7.2 volt battery	40	28
5007NBA	7-1/4" saw w/elec. brake	233	124
5008NBA	8-1/4" saw w/elec. brake	284	158
B04510	1/4 sheet pad sander	85	54
9900B	3" x 21" belt sander w/bag	268	144
9924DB	3"x 24" belt sander w/bag	282	145
9045N	1/2 sht fin. sand. w/bag	231	129
4200N	4-3/8" circ. saw 7.4A	225	127
4301BV	Orb. v/sp jig saw 3.5A	289	155
JR3000V	Vs. recip saw w/cse	227	124
LS1020	10" miter saw 3.5A	463	289
9820-2	Blade sharpener	373	195
1900BW	3-3/4" planer w/case	209	114
1911B	4-3/8" circ. saw 7.5A	240	139
1100	3-1/4" planer w/case	401	205
9207SPC	7" sander-polisher	276	149
3601B	1-3/8 HP router	255	139
9501BZ	4" grinder, 3.5 amp	126	69
B04530	6" round sander	101	64
B04550	1/4 sht pad sander w/bag	86	58
DA3000R	3/8"angle drill	270	148
HP2010N	3/4" v/sp hmr. drill w/case	300	165
2708W	8-1/4" table saw	504	249
2711	10" table saw w/brake	841	479
2030N	12" planer/jointer	3120	1665
2040	15-5/8" planer	2595	1459
1805B	6-1/8" planer kit w/case	679	359
5005BA	5-1/2" circular saw	223	135
6404	3/8" drill rev. 0-2100 rpm 2A	104	65
6510LVR	3/8" drill rev. 0-1050 rpm	145	79
6013BR	1/2" drill rev. 6Amp	241	135
5402A	16" circular saw-12 amp	636	325
3612BR	3 HP plunge router	377	189
9401	4" x 24" belt sander w/bag	318	165
4302C	V spd. orb. jig saw	302	159
5077B	7-1/4" Hypoid saw	252	138
LS1440	14" Miter saw	721	435
LS1030	NEW 10" Mitre saw	414	225
5007NB	7-1/4" circsaw 13A	209	112
3612B	3 HP plunge router sq/base	377	189

SENCO AIR NAILERS

Model		List	Sale
SFN1	Finishing nailer 1"- 2"	377	275
SFN2	Fin. nailer 1.5" - 2.5"	571	395
SN325	Nailer 1-7/8" - 3-1/4"	665	455
SN4	Gen'l purpose 2" - 3-1/2"	685	475
LS2	Pinner 5/8" - 1	351	255
SKS	Stapler 5/8" - 1-1/2"	351	255
LS5	Pinner 1" - 1-1/2	399	285

BOSTICH AIR NAILERS

Model		List	Sale
N80C-1	Utility coil nailer	845	429
N80S-1	Stick nailer	845	429
T36-50	Sheatth & decking stapler	595	334
N12B-1	Coil roofing nailer	845	429
N60FN-2	Finishing nailer	625	345
T31	Brad nailer	270	155
CWC100	1 HP Pancake Compressor	445	299

SKIL SIZZLERS

6850-02	NEW 1/2" EMH hammer drill w/case 4 amp	255	129
3810	10" Miter saw	263	209
3810K	3810 w/60 tooth carb blade		235
77	7-1/4" worm drive saw	230	144
2735-04	12 v v/spd cordless drill,w/cse.2 batt & xtra special 5 piece bit set	210	129
1605	NEW Biscuit Jointer w/cse	200	119

PANASONIC CORDLESS

EY6205B	NEW v/spd. 12 volt drill w/15 minute charger	390	179
EY6005B	12v cdls drill w/1 hr chgr	315	169
EY6200B	NEW 2 spd. 12 volt drill d-handle w/15 minute charger	350	185
EY6281B	NEW v/spd. 9.6 volt drill w/15 minute charger	350	169
EY571B	V/spd 9.6 volt drill kit	239	128

LEIGH DOVETAIL JIGS
D1258R-12-List 329.00-Sale 255.00
D1258R-24-List 399.00-Sale 299.00
LEIGH INSTRUCTIONAL VIDEO SALE 29.00

MMT	12" multiple mort. & tenon attachment for D1258-12	269	155
MMT	24" multiple mort. & tenon attachment for D1258-24	299	169

HITACHI TOOLS

Model		List	Sale
C7BD	7 1/4" circular saw	230	129
M12V	NEW 3 HP v/sp router	437	235
TR12	Plunge router. 3 HP	354	169
F1000A12	Planer/6"jointer	2835	1505
P100F	12" Planer	2005	1259
C10FA	10" deluxe mitre saw	490	269
C12FA	NEW 12" mitre saw	586	319
C8FB	8-1/2" slide cmpd saw	859	445
FREUD LU91M008	8-1/2" c/bld 48 tooth 58		38
C15FB	15" miter saw	745	379
FREUD LU85M015	15"c/bld 108 tooth	181	115

PIRANHA By Black & Decker CARBIDE TOOTH SAW

Model #	Dia.	Teeth	List	Sale
73-716	6-1/2	18	13.70	7.35
73-717	7-1/4	18	13.90	7.99
73-737	7-1/4	24	17.20	9.29
73-757	7-1/4	40	31.30	16.79
73-759	8-1/4	40	44.65	24.99
73-719	8-1/4	22	19.65	11.95
73-715	5-1/2	16	13.70	7.99
73-740	10	32	32.98	15.95
73-770	10	60	67.02	29.95
73-711	10	50	65.08	29.95

PORTA NAILER

401	porta nailer complete	265	189
501	face nailer complete	265	189

We stock genuine Porta nails !

WINTER KIT SPECIALS

6093DWH	Makita cdls v/sp drill kit w/clutch & brake. Includes extra battery & holster	313	165
9850K	Porter Cable cdls var/spd drill kit Includes extra battery	288	165
7334K	Porter Cable 5" random orbit sander w/case & 1 roll 100X & 150X discs	253	149
7335K	Porter Cable 5" v/spd random orb sander w/case & 1 roll 100X & 150X discs	273	159
7336K	Porter Cable 6" v/sp rand orb sander w/case & 1 roll 100X & 150X discs	278	165
555K	Porter Cable plate biscuit jointer w/case & 1000 assort. biscuits	339	189
JS100K	Freud plate biscuit jointer w/case & 1000 assort. biscuits	351	184
1581VSK	Bosch top hdle jig saw with case & 30 Bosch blades	305	185
1582VSK	Bosch CLIC barrell grip jig saw w/case & 30 Bosch blades	305	185

BIESMEYER FENCES

B-50	50" commer. saw fence	329	299
T-SQUARE 52	52" homeshop fence	249	239

WEDGE SMART LEVEL

Model	Description	List	Sale
SM-TR2	2 FT level w/sensor	120	108
SM-TR4	4 FT level w/sensor	150	135
SM-TR6	6 FT level w/sensor	180	162

JORGENSEN I-BAR CLAMPS

Model	Size	List	Sale
7224	24"	27.11	17.55
7236	36"	29.10	18.65
7248	48"	31.96	19.75
7260	60"	35.60	23.55
7272	72"	37.30	25.29

ADJUSTABLE HANDSCREWS BY JORGENSEN

Item#	Jaw Length	Open Cap	List	Sale	Box of 6
#3/0	6"	3"	15.57	8.89	49.98
#2/0	7"	3-1/2"	16.74	9.95	53.55
#0	8"	4-1/2"	18.63	11.95	62.95
#1	10"	6"	21.30	12.99	71.49
#2	12"	8-1/2"	24.45	15.95	81.89
#3	14"	10"	31.01	18.95	104.95
#4	16"	12"	40.30	24.89	146.85

STYLE 37 2-1/2"Throat 1/4" x 3/4" JORGENSEN

Item#	Jaw Length	List	Sale	Box of 6
3706	6"	9.30	6.29	35.65
3712	12"	10.30	6.79	38.59
3718	18"	11.37	7.35	41.69
3724	24"	12.42	7.99	45.25
3730	30"	13.85	9.05	51.19
3736	36"	15.15	9.95	56.65

PONY CLAMP FIXTURES

Model	List	Sale	Lots of 12
503/4" black pipe clamps	13.10	7.89	83.99
521/2" black pipe clamps	10.93	6.30	68.25

BOSCH

Model		List	Sale
1581VS	Top handle jig saw	239	133
1582VSC	NEW CLIC Barrell jig saw	245	133
	Bosch metal case for above jig saws	34	30
	Bosch blade assortment for jig saws 30 of Bosch's best selling blades	25.99	
1942	Heat gun 600° - 900°	99	65
1272D	3" x 24" belt sander w/bag	299	169
1273D	4" x 24" belt sander w/bag	315	178
1290D	1/2 sheet sander w/bag	209	115
11-212VSR	Bulldog 3/4"SDS rtry drill	339	194
1198VSR	1/2" v/sp hammer drill	229	133
1608	5.6A laminate trimmer	140	87
1608L	Same/above w/trim guide	145	92
1609	5.6A offset base trimmer	205	115
1609K	Lam installers kit w/1609	295	169
1601	1 HP Router	165	105
1602	1-1/2 HP Router	199	125
1603	1/2 HP D hdle. router	223	139
1604	1-3/4 HP 2 hdle. router	219	118
1604K	Same as above w/cs & acc	269	165
1606	1-3/4 HP D hdle. router	243	145
3258	3-1/4" planer w/bide guard	210	118
3270D	3" x 21" belt sand. w/bag	225	135
1273DVS	V/sp 4x24 belt sander	339	189
1611	3 HP plunge router	349	198
1611EVS	3 HP V/speed router	410	229
1651	7-1/4" circ. saw drop foot	179	109
1654	7-1/4" circ. saw pivot base	179	109
1632VSRK	Recip saw 8.4A orb-v/sp	225	135
3050VSRK	9.6v cdls v/spd drill kit comp	235	135
1370DEVS	6" heavy duty random sndr	369	225
3283DVS	5" random orbit sander	159	95

ELU BY BLACK & DECKER

Model		List	Sale
3338	2.25 HP v/spd plunge router	387	249
3304	1 HP v/spd plunge router	261	178
3375	3-1/8" univ. planer 7.2A	280	159
3380	Biscuit jointer w/case	485	245
4024	3 x 21 v/spd belt sander	289	188
3303	1 HP plunge router	210	159

BLACK & DECKER

Model		List	Sale
1166	3/8" Drill 0-2500 rpm 4A	96	59
2600	3/8" drill 0-1200 rpm 4.5A	125	85
1707	8.5" crosscut miter saw	813	445
1703	10" miter saw w/73-770 bld	313	179
2694	NEW 7 1/4 super sawcat.	242	159
2695	NEW 8 1/4 super sawcat.	265	175
4011	1/4 sheet palm sander	82	62

JET TOOLS

Model	Description	List	Sale
JBS-14MW	14" band saw 1 HP	482	375
JTS-10	10" tbl saw w/std 1-1/2 HP	554	449
JTS-12	12" tbl saw w/std 1-1/2 HP	630	499
JWS-18	1/2 sharper w/std 1 HP	479	365
DC610	1 H.P. dust collector	321	245
DC1182	2 H.P. dust collector	577	415
DC1883	3 H.P. dust collector	850	639
JJ-4	4" jointer, 1/2 HP	310	275
JJ-6	6" jointer, 3/4 HP	465	365
JWP12	12-1/2" bench plnr 2 HP	569	365
JWP12D	Dust chute for JWP12	45	22
JSG-6	6 x 48 belt & 12" disc sander, 1-1/2 HP	634	465
JDP10	NEW 10" bench drill press	209	165
JDP14M	NEW 14" bench drill press	339	285
JDP17M	NEW 16 1/2" bench drill press	399	365
JDP14MF	NEW 14" floor drill press	419	349
JDP17MF	NEW 16 1/2" floor drill press	459	379
JDP20MF	NEW 20 1/2" floor drill press	819	645

RYOBI SPECIALS

Model		List	Sale
R500	2-1/4 HP plunge router	326	155
TS25IU	10" miter saw	392	179
TS25IUS	10" miter w/acc. kit & B&D 73-770 carb blade	435	225
AP10	10" surface planer 13A	820	358
RA200	8-1/4" radial arm saw	515	245
RE600	3 HP plunge router	398	205
BE424	NEW 4X24 var spd belt sndr	340	175
BE321	3 x 21" v/sp belt sander	259	129
SC160	NEW 16" bench scroll saw	260	145
TFD170VRK	9.6V cdlss drill kit	254	159
TFD220VRK	12V cdlss drill kit	279	169
JM100K	NEW Biscuit jointer w/cse	430	215

PORTER CABLE

Model		List	Sale
690	1-1/2 HP router 8A	225	124
691	1-1/2 HP router D hdle	245	135
518	3 HP 5 speed router	560	335
520	3 HP 15A router	510	315
695	1-1/2 HP router/shaper	310	198
696	H.D. shaper table	170	115
351	3" x 21" belt sand w/o bag	225	128
352	3" x 21" belt sand w/bag	235	129
360	3" x 24" belt sand w/bag	310	174
361	3" x 24" belt sand w/o bag	290	168
362	4" x 24" belt sand w/bag	325	184
363	4" x 24" belt sand w/o bag	310	179
315-1	7-1/4" top hdle circ saw	195	115
9315-1	315-1 comp. w/cs & carb bld.	225	129
617	7-1/4" pushhandle saw	195	115
9617	617 comp. w/cs & carb bld	225	129
314	4-1/2" Trim saw	215	125
9548	X HD bayonet saw w/case	290	195
9629	Recip saw v/speed 8A	235	139
9627	Recip saw 2 speed 8A	225	128
666	3/8" HD vsp drill 0-1200 rpm	185	122
621	3/8" HD vsp drill 0-1000 rpm	155	95
320	Abrasive plane 3 Amp	160	109
9118	Porta plane kit 7 Amp	335	189
7545	0-2500 drywall gun 5.2A	169	104
505	1/2 sheet pad sander	195	112
7511	3/8" v/sp drill 5.2 Amp	185	109
7514	1/2" v/sp drill 0-750 rpm	195	117
7548	Top hdl jig saw 4.8A	230	129
7648	Barrel grip jig saw 4.8A	225	145
330	Speed block sander 1/4 sht	97	55
555	Plate biscuit jointer w/case	299	165
345	6" saw boss 9 Amp	170	99
9345	345 comp. w/cs & carb bld	220	129
100	7/8 H.P. router	165	98
5116	Omni-Jig	395	265
9647	TIGER CUB recip saw	195	119
9850	12v cordless drill w/cse	230	135
8500	Extra 12v battery NEW Tools By Porter Cable!	48	35
9637	Full v/sp recip saw 8 A	240	135
7519	3-1/4 HP Router 2 Handle	399	235
7538	3-1/4 HP Plnge Router 2 Hdl	399	235
7536	2-1/2 HP 2 Hdle Router	355	205
7537	2-1/2 HP "D" Hdle Router	375	219
7538	3-1/4 HP plunge router	399	235
7399	5.6A drywall cutout unit	120	75
7310	5.6A laminate trimmer	145	89
7312	5.6A offset base lam trim	209	119
7319	5.6A tilt base lam trimmer	165	105
97310	Lam Trim Kit w/std. Base, Till Base, Offset Base, Slitter Base, Guide & Cs	330	185
7334	5" random orbit sander	205	119
7335	5" Var Speed 2500-6000 rpm Random Orbit Sander	225	129
7336	6" Var Speed 2500-6000 rpm Random Orbit Sander	225	134
693	1-1/2 H.P. plunge router base.	280	165
6931	Plunge router base	120	75
9505	**505 Commemorative Edition**		
	1/2 sheet pad sander w/oak case		139

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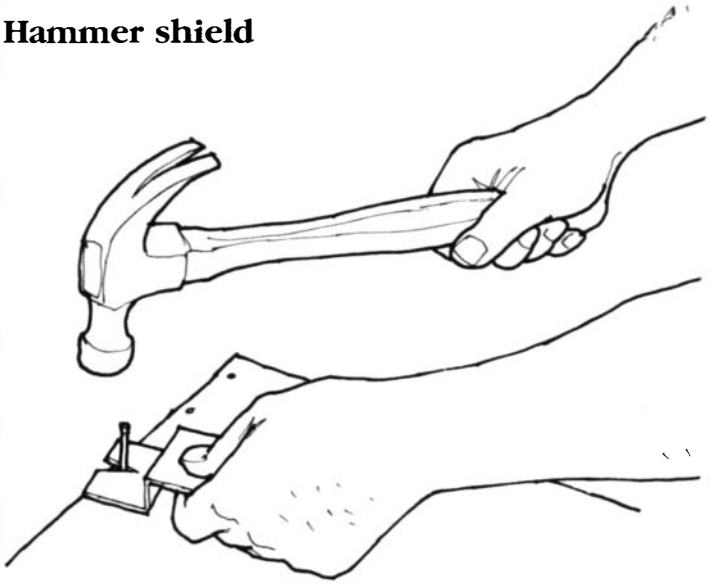
READER SERVICE NO. 14

by using two blades with a spacer between them. To make one of the grooves a tad wider than the normal ⅛-in. kerf, I stuck a small piece of tape on the inside face of the outboard blade to cause it to wobble slightly.

–Bryan Humphrey, Wilmington, N.C.

Hammer shield



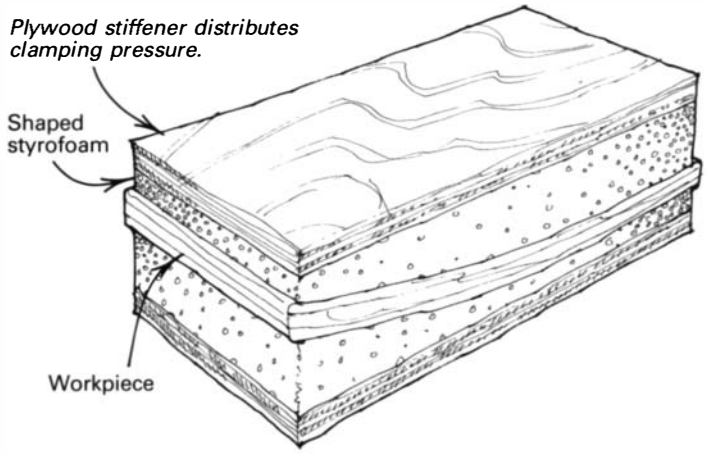
I've found that the simple hammer shield shown above is great for preventing hammer marks on special projects or woodwork. I made my shield from a small section of discarded steel strapping, which I obtained from a local lumber dealer, but any fairly heavy piece of sheet metal will work equally well. Simply cut a narrow tapered slot in one end for slipping the shield around the nail being driven, and then bend the other end up and out to form a handle. The tapered slot allows the shield to be used for almost any size nail.

–Howard E. Moody, Upper Jay, N.Y.

Quick tip: A safety pin clipped on your work belt or around a belt loop is handy for removing splinters.

–Peter Buchanan, Ipswich, Mass.

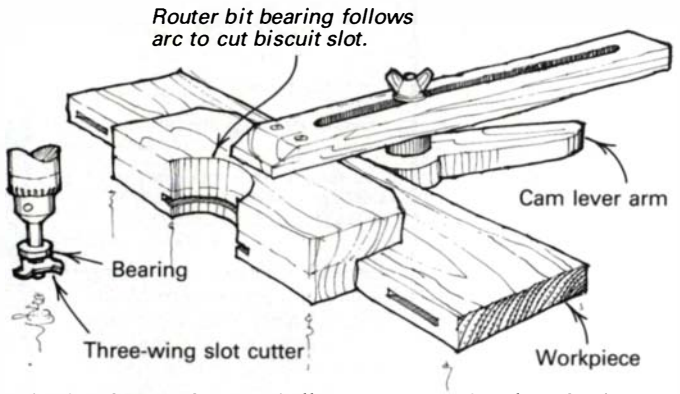
Clamping with styrofoam



To cushion irregularly shaped workpieces for clamping or gluing, I use shaped blocks of solid styrofoam backed by plywood scraps. To make these highly effective cauls, bandsaw or carve one side of each styrofoam block to conform roughly to the contours of the

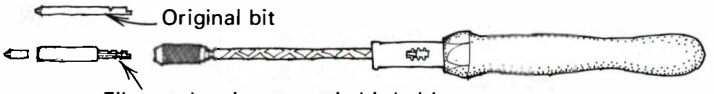
workpiece. Leave the other side of the styrofoam flat and back it with a scrap of plywood to form a rigid surface that can receive the pressure of the clamp or vise. As pressure is applied, the styrofoam compresses to the exact shape of the workpiece. After unclamping, any styrofoam adhering to glue joints can be readily brushed or scraped off. Scrap styrofoam can be scavenged from appliance packing, as well as book shipments received at bookstores or libraries. *—Donald M. Carmichael, Tacoma, Wash.*

Biscuit joinery on the drill press



I made this fixture for my drill press to cut the slots for biscuit joints. The fixture holds the workpiece and acts as a guide for a 5/32-in.-wide three-wing slot cutter mounted in the drill press chuck. To use this method, make sure the router bit bearing is mounted above the cutter and adjust the quill so the cutter is positioned on the centerline of the workpiece. Then, place the workpiece in the fixture and tighten the wing nut on the adjustable cam lever arm, so the cam can be used to lock the workpiece securely into the fixture. Now, with the drill press running at its highest speed, push the assembly into the turning cutter from right to left and let the bearing follow the semicircular cutout to rout a biscuit slot. Incidentally, this same fixture can be used on a router table if you move the bearing to the other side of the cutter. *—Ben Janney, Franklin, Ohio*

Magnetic tip for a spiral screwdriver



File notches in magnetic bit holder for use in spiral screwdriver chuck.

When the Phillips bit for my spiral screwdriver recently broke, I was disgusted to find that one new bit cost more than a whole packet of tips for a magnetic screwdriver bit holder. So instead I bought a magnetic bit holder and modified it to fit the spiral screwdriver. It wasn't hard. All I had to do was file notches for the drive and locking pins to correspond to those on the old bit. Now my spiral screwdriver is more useful than it has ever been. With the wide range of tips that are available for magnetic screwdrivers, I'm finding new uses every week in metalwork, as well as woodwork.

—A. Clarke, Moonta Mines, Australia

Methods of Work buys readers' tips, jigs and tricks. Send details, sketches (we'll redraw them) and photos to Methods, Fine Woodworking, *Box 5506, Newtown, Conn. 06470-5506. We'll return only those contributions that include an SASE.*

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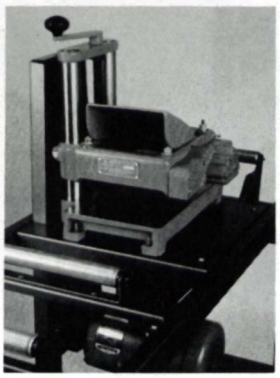

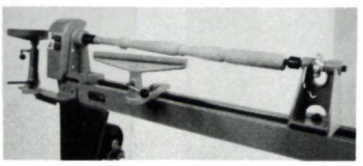

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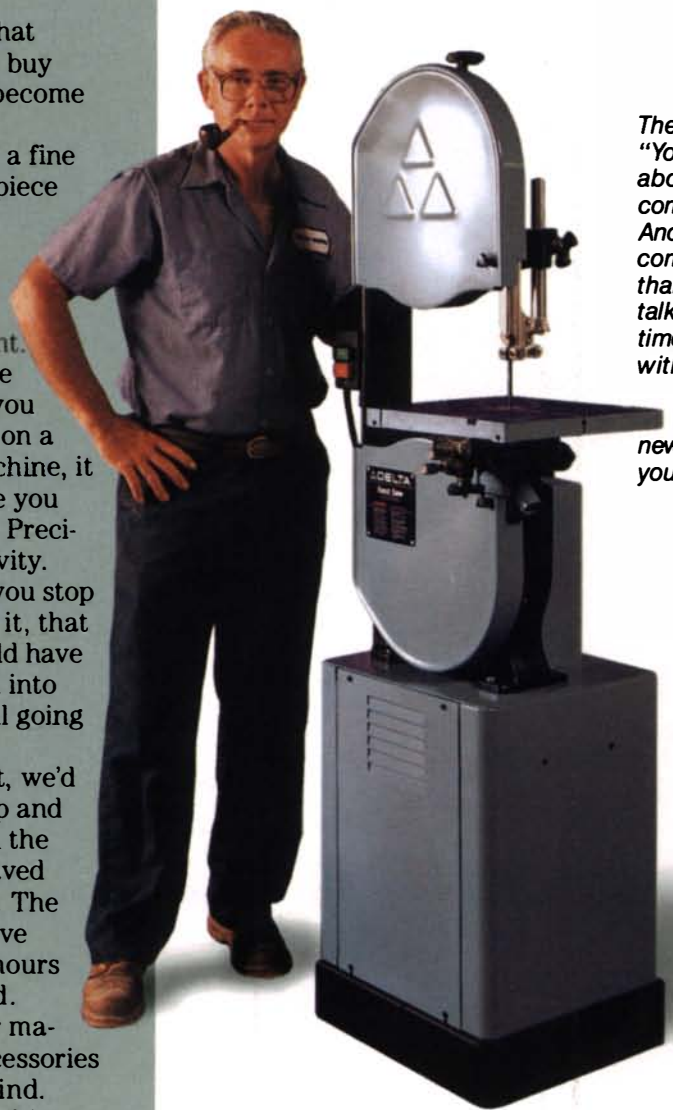

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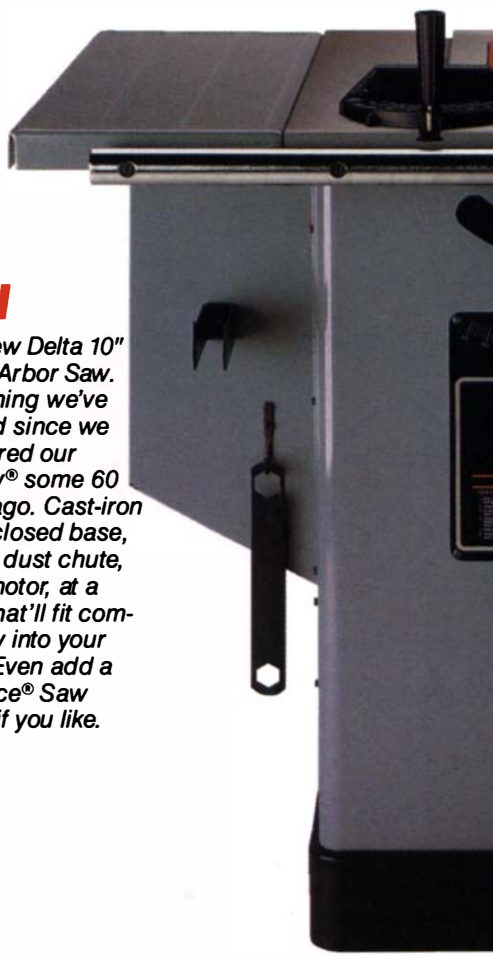

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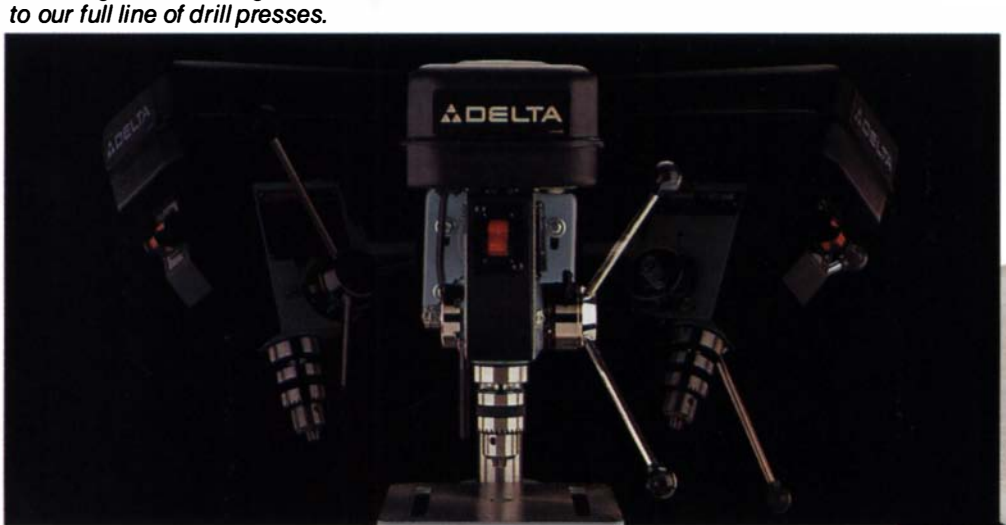

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Restoring an old tool chest

I recently bought an old yellow pine carpenter's tool chest that I want to refinish and use as a coffee table/end table. The steamer-trunk-size chest is about 80 to 100 years old and covered with paint; some parts of the bottom have deteriorated to the point that only clumps of long splinters remain. How can I restore my chest? ***—Justus Garman, Baltimore, Md.***

Bruce M. Schuettinger replies: To restore the damaged wood on your antique tool chest, you could take three different courses of action. One, the damaged wood on the lower edges of the chest could be cut out and new wood of the same species glued in its place. Two, the majority of the damaged wood could be removed and the resulting depressions blended into the rest of the surface with a block plane. This would eliminate the worst of the splintering; and since tool chests are usually abused in everyday use, the repair would not appear unusual. Third, hide glue or aliphatic resin (yellow glue) could be injected between the splinters and the damaged area could be pressed together with strong packing tape. Remove the glue squeeze-out before allowing the repair to dry. Once the glue is dry, lightly sand the wood to remove any residue on the surface. There are also several complicated conservation procedures that could be used; however, this piece probably would not justify their expense or time.

To refinish your tool chest, I would use a natural resin varnish such as Rockhard Tabletop Varnish by Behlen (I buy mine from Wood Refinishing Supply Co., Inc., 1267 Mary Drive, Macedon, N.Y. 14502; 315-986-4517). This type of finish probably would have been put on the tool chest when it was made. When applying this finish, or whatever one you decide to use, apply extra coats to the problem areas on the bottom edge to build up a hard, protective layer.

[Bruce Schuettinger is owner of Antique Restorations Ltd. in New Market, Md.]

Growing your own posts

I intend to bend some tapered posts about 4 in. in diameter into a 4½-ft. radius while the wood is still green. To provide wood for this size post, I am planning to grow trees in a sunny lot in Southern California. What species of trees would be suitable for this project? ***—David Foos, Studio City, Cal.***

Drew Langsner replies: Bending 4-in. posts to a 4½-ft. radius will not be easy, even with green wood. If you're serious about this, I suggest growing ash or walnut. Another good possibility is Western cedar. Grow the saplings in rich soil, and be sure to provide adequate water. With the trees adding about ¼-in. growth rings every year (which is very fast), you may get these trees to the diameter you need in 10 years. Once the trees are established and growing well, prune off all the lower limbs and allow only one trunk per root. Crowding will help force the trees to grow upward rather than out to the sides.

The advantage of planting black walnut and Western cedar is that both of these species also have extremely good decay resistance. Contrary to common belief, black walnut grows very quickly in optimum conditions.

[Drew Langsner is an author, farmer and woodworker living in Marshall, N.C.]

Bubbles in a spar varnish finish

I recently finished some exterior mahogany paneling by brushing on several coats of some commercial spar varnish. I worked during a warm, dry week, waited 24 hours and sanded between coats. However, the final coats developed air bubbles that dried in the varnish. What did I do wrong?

—Ken Jacobs, Waxahachie, Tex.

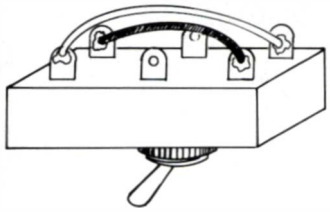
Chris Minick replies: Recent government legislation requires finish manufacturers to reduce solvent levels in their products. To comply, some makers have increased the resin content in their mixtures, resulting in higher-solids finishes that go on thicker per application. While a thicker film is usually beneficial with most varnishes, this is not so with spar varnish, which customarily contains tung-oil-modified phenolic resins, making the varnish bubble and wrinkle when applied in a thick film. Unfortunately, this tendency is inherent in the drying process and can't be controlled by the user. To ensure better success in the future, apply spar varnish sparingly, brushing out or spraying on each coat as thinly as possible. Also, notify the manufacturer of your dissatisfaction with the product. Reputable manufacturers are sensitive to customer problems and many will compensate you for your inconvenience.

[Chris Minick is a product development chemist and amateur woodworker in Stillwater, Minn.]

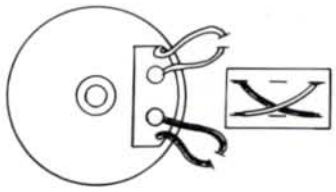
Reversing switches for electric motors

I have a four-pole, 110v, 60-cycle motor that lacks a terminal box for switching wires to reverse rotation. The motor has two power leads, two leads to a capacitor and two leads to an overload-reset switch. Is it possible to reconfigure these to insert a reversing switch? —Earl M. Wintermoyer, Niceville, Fla.

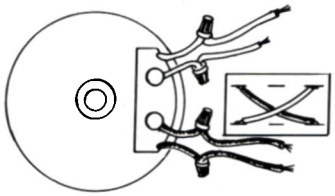
Edward H. Cowern replies: From the wiring you describe, it's difficult to make a blanket statement on how to reverse the direction of your motor, if indeed it can be done. Here are the basics.



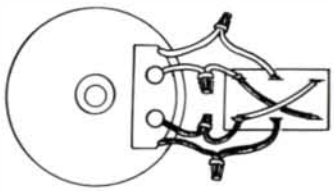
1. Solder two wires to diagonally opposite lugs on DPDT switch.



2. Locate motor starting winding wires and clip.



3. Add lengths of wire to each cut end.



4. Connect ends to switch lugs as shown.

The reversing scheme shown in the drawing above (described in *FWW* #16, p. 19) uses a 10-amp, 125v, a.c. double-pole, double-throw switch (DPDT). This switch will handle up to 1½-HP motors; use a higher-amperage switch for bigger motors. In most single-phase, capacitor-start induction motors, the two leads that need to be reversed are associated with the starting winding and are usually labeled #5 and #8. By cutting these leads and connecting them to the DPDT switch, as shown, these leads will be reversed when the switch is flipped, causing the motor to start and run in the opposite direction.

Before attempting the installation of a reversing switch, take note: Many machines are sold with motors dedicated to run in only one direction and, although it's technically possible to pull out the leads necessary to make the motor reverse, it would not be a task for an amateur. As a rule of thumb, if the motor's nameplate or the connection diagram on the motor or in the manual has a notation to interchange leads to cause the motor to reverse, then it can be done. If not, chances are good that it can't be done easily. A word of caution is also due: Running certain machines in reverse can be very dangerous. For example, lathe

faceplates and chucks can come unscrewed, sawblades can loosen, etc., when those machines are run in reverse. Be sure your machine can tolerate reverse operation before attempting any change. [Ed Cowern is an electrical engineer and president of EMS, a company that distributes Baldor electric motors.]

Dealing with powder post beetles

I've just refinished an oak chest of drawers and every few days I see fine wood powder inside the drawers. I located a small hole in the carcase and tried spraying the area with a generic bug killer, but I'm still getting the powder. How can I kill whatever is destroying my furniture?

—Don Goff, Monroe, Conn.

Walter R. Tschinkel replies: The most likely culprit and source of your wood powder is a member of the beetle family *Lyctidae,* though it's also possible that beetles belonging to the *Anobiidae* or *Bostrichidae* families are involved. All of these insects bore and reproduce in dead wood. High starch content in the sapwood of some oaks make these species particularly attractive to the beetles. In any case, the standard recommendation is the same. If only one or two holes are present in the furniture, don't do anything. However, if you locate more, find a pest-control company in your area with a fumigation chamber and have the job handled professionally. These companies generally use registered fumigants, such as methyl bromide and vikane, which are not suitable for do-it-yourself treatments.

If you feel that fumigation is not worth the money and effort, but still want to get rid of the beetles, try this low-tech approach: Warm the infested area with a heat lamp or other localized heat source. An hour above 110°F ought to kill any unwelcome lodgers. [Walter Tschinkel is an entomologist living in Tallahassee, Fla.]

Aging properties of cyanoacrylate glue

I've used cyanoacrylate glue for building wooden ship models for 12 years and never had a problem. But some of my modeling cronies have told me that the bond will last only for a limited number of years and that this glue causes wood to deteriorate. Is there any truth to these claims?

—David Sigel, Dallas, Tex.

George Mustoe replies: Cyanoacrylate adhesives are quite resistant to aging. Although engineering studies have shown that bond strength may decrease by as much as 50% after several years of outdoor weathering, deterioration is not a problem for typical indoor applications.

Cyanoacrylates set up within a moment or two, and reach total solidification within 48 hours, producing an inert plastic film that would not be likely to react with adjacent materials. I can find no published references to any type of deterioration problems, but I can think of one possible explanation, assuming your friends have reliable powers of observation. Cyanoacrylate adhesives solidify in response to traces of moisture or weak alkalinity, causing the cure rate to be highly variable depending upon the chemical nature of the joint surfaces. On slightly alkaline substances, such as glass, the glue will set within 10 to 30 seconds. The same adhesive may take several minutes to solidify when it is used on wood, which typically contains weak acids that inhibit the polymerization reaction. To speed curing, workers commonly treat wood and other porous materials with some weakly alkaline substance, perhaps a light dusting of baking soda or a drop of a commercial "accelerator." I suppose it's possible that traces of these chemicals trapped in the porous surfaces adjacent to the glueline could eventually cause deterioration. Mind you, this is all speculation, not established fact. But I think it's safe to say that

the glue itself is not likely to be a cause of wood deterioration. [George Mustoe is a geochemistry research technician at Western Washington University in Bellingham, Wash.]

Catching glue spots before finishing

I've never seen any method for detecting and removing overlooked spots of glue before finish coats are applied. I found out the hard way that the finish makes a spot stand out like a sore thumb. Can you offer any suggestions?

—W.V. Henry, Asheville, N.C.

Sandor Nagyszalanczy replies: Check for glue spots on your finish-sanded furniture by wiping the wood lightly with naphtha or mineral spirits. These mild solvents won't raise the wood's grain, so you won't have to resand the piece, but it will enhance spots of glue, and they will appear lighter than the surrounding wood. Remove these spots by deftly scraping them with a very sharp chisel. If you have a light touch and avoid digging in with the corners of the chisel, you'll leave behind only a smooth, non-glue-spotted surface. You may wish to use a scraper blade instead, especially if the glue has dried into a smear over a larger surface. For glue spots in the corners of a carcase or drawer, use a sharp chisel, working it into the corner from both sides at a low angle, to pop the excess glue out.

Ultimately, the best cure for glue spots is not to use too much glue in the first place. Use just enough to coat the surfaces or edges that are being joined, but don't scrimp excessively and leave a starved joint. How to tell when you've used just the right amount of glue? Watch the joint as you apply clamping pressure; a row of tiny "pearls" of glue will be pressed out that are easy to scrape off after they've dried.

[Sandor Nagyszalanczy is associate editor of *FWW*.]

Thinning down NGR stains

I like the simplicity and versatility of working with non-grain-raising (NGR) stains, but I don't use color in high concentrations. I can buy clear NGR solution to thin the stain, but it's expensive. Isn't there a more economical choice?

—John R. Patterson, Staten Island, N.Y.

Michael M. Dresdner replies: Since NGR stains are already predissolved, it is not necessary to thin them with their own solvent. Instead, you can use a diluent—a liquid that will thin the mixture without causing the solution to coagulate or precipitate. Both alcohol and lacquer thinner are acceptable diluents for most NGRs, but I have seen some that will only accept lacquer thinner. Incidentally, in addition to containing alcohol, most lacquer thinner also contains one of the "cellosolve" compounds, which are frequently used as the primary solvent for NGR stains. [Michael Dresdner is a contributing editor to *FWW* and a finishing consultant in Perkasie, Pa.]

Tablesaw pulley problems

My Sears 10-in. tablesaw uses the weight of the drive motor to tension the belt. Unfortunately, this arrangement makes the motor and drive pulley cant, causing the belt to climb the edge of the pulley, resulting in noticeable vibration and excessive belt wear. Is there some kind of add-on belt-tightening system that will remedy this problem?

—Hugh L. Pryor, Walnut Creek, Cal.

Mark Duginske replies: The system that Sears uses to maintain tension on the drive belt with the motor weight works well when it is new and properly adjusted. However, when the system is worn or poorly adjusted, the motor and drive pulley will cant, as you've experienced. In lieu of any sort of complicated

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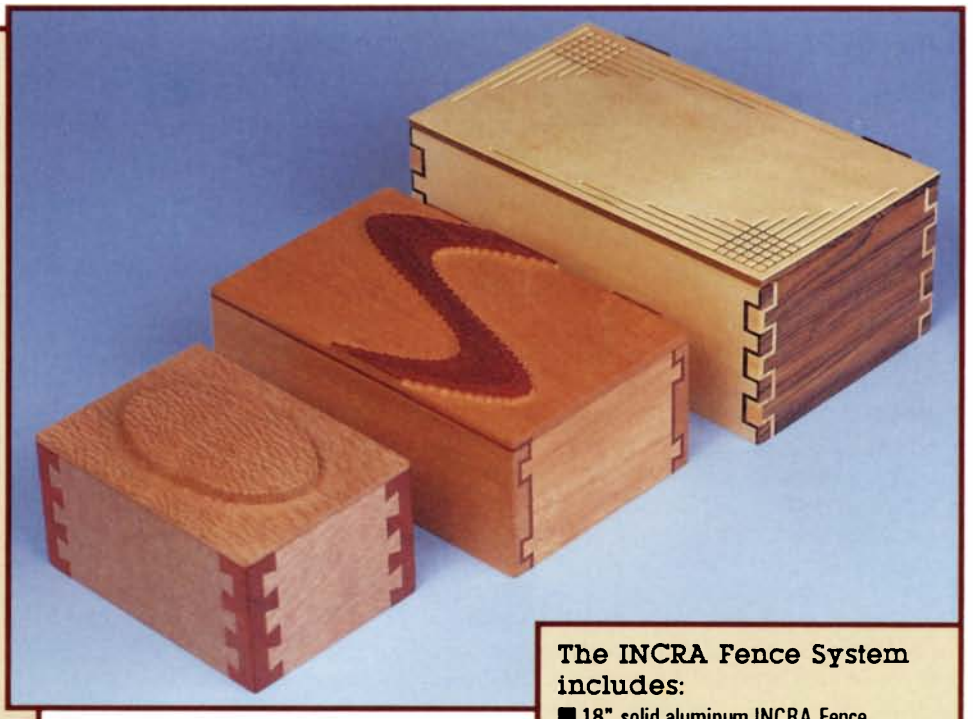
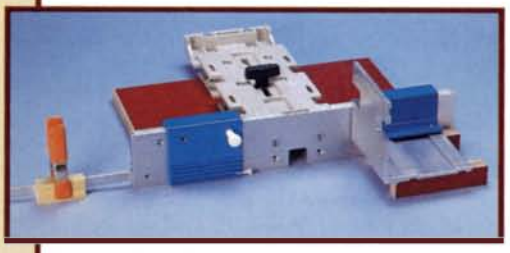


Left to right: The Corner Post Dovetail, the INCRA Double Dovetail, and the new INCRA Double-Double Box Joint. The lid patterns were all made using the INCRA Fence System.



The INCRA Fence System, featuring the patented INCRA Stop, and the optional Right Angle Fixture add a whole new dimension to INCRA JIG's already impressive capabilities. (Spring clamp not included.)

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belt-tightening system, I suggest that you analyze the problem and find a way to correct it. Does the position of the motor slip because the bolts that attach the motor to its mounting plate loosen? If that is the case, I would suggest fitting lock washers under the nuts and star-type (external tooth) washers between the mounting plate and the motor itself. Most hardware stores carry these star washers as a specialty item in a bolt or fastener display. Is the bracket that attaches the mounting plate to the tablesaw frame worn or bent? If it is worn and sloppy, you may be able to rebuild it by drilling out the hole for the bolt or pin that hinges it and using a larger bolt or pin. If the bracket is bent or broken, you can probably order a new one from Sears.

Another possible remedy would be to bolt the motor on at a slight angle, away from the direction of sag. This should cause the motor and its pulley to be straight when belt tension is applied. If all else fails, you might try bolting a piece of angle iron to the motor bracket under the frame to keep the motor steady. [Mark Duginske is a woodworker, teacher and author who lives in Wausau, Wisc.]

Problems with a walnut gun stock

For the past several years, a friend has been having difficulties with the claro walnut buttstock of his Browning shotgun swelling and splitting. He says the problem developed because the company made the stock from "salt-cured" wood about 20 years ago. Could this be the cause of the problem?

—Sinclair W. Chiles III, Bethlehem, Pa.

Jon Arno replies: I'm unaware of any wood seasoning process involving salt and I've never heard the term "salt cured" applied to anything other than ham. However, if you are right that the stock is claro walnut, there is a very good chance this could be the cause of the problem. The term claro is often used for walnut harvested from commercial walnut plantations in California and Oregon. Since these trees are grown for nut production, they are almost always grafted using English walnut, *Juglans regia,* as the scion and the native Hind's walnut, *J. hindsii,* as the rootstock. The wood that develops in the lower bowl of the tree around the graft union is beautifully figured and makes a very showy veneer. Unfortunately, it is also loaded with reaction wood, making it very unstable when cut into lumber. Although most woods tend to split as they shrink, you mention that your friend's gun stock is "swelling and splitting," and this further suggests the presence of reaction wood. Unlike normal wood, reaction wood is prone to significant shrinkage longitudinally along the grain as it dries. When exposed to an increase in humidity, it has a tendency to swell and separate from the adjacent, normal wood tissue.

In my mind, the one remaining mystery is why this swelling and splitting problem didn't begin until more than a decade after the gun was manufactured. Typically, if a wood is going to have a stability problem, it shows up relatively soon after the item is put in service. In answer to this, I can only offer a couple of possibilities. Perhaps the finish has finally worn to the point where it is no longer providing an effective moisture barrier. Or maybe the gun is being exposed to substantially higher humidity than it was before. This might be the case if your friend has moved from a dry climate to a more humid one, or if he has changed the place where he stores the gun to one that is more humid. [Jon Arno is a wood technologist and consultant in Schaumburg, Ill.]

Send queries, comments and sources of supply to Q&A, Fine Woodworking, *Box 5506, Newtown, Conn. 06470-5506.*

by Dick Burrows

The price of an heirloom—We often receive questions from readers interested in knowing the cost of building a particular piece of furniture featured in *Fine Woodworking*. And even though most of our readers are amateurs who don't have to turn a profit on each project, they are still very concerned with how many hours must be invested to complete a major piece.

Recently we received a pretty good analysis from one of our readers that I think is worth passing along. Chris Odea of St. John's, Newfoundland, Canada, built the pencil-post bed designed by Chris Becksvoort (*FWW* #76). He said he generally followed the plans and procedures presented in the article, but did have to laminate the posts from 2-in.-thick cherry, because he couldn't find 12/4 stock as Becksvoort had.

Since he didn't have a shaper, he also had to take another approach to tapering the posts. He bandsawed the first four tapers on each post and then dressed them on a jointer. To form the adjacent tapers to complete the eight sides of each post, he resorted to a plane and belt sander after laying out the tapers with the sparmakers' gauge described in *FWW* #41.

"Keep in mind that I'm a hobbiest when it comes to woodworking and so I may take more time for specific jobs than some of your more accomplished readers, but I thought you and your readers would be interested," he said. Here is Chris's time sheet:
Dress and glue up four rough posts—4 hours
Dress and bandsaw four-sided taper on posts—6 hours
Mark and plane corner tapers on posts—7 hours
Dress and tenon head and foot rails—4 hours
Install angle iron brackets in dadoed channels—4 hours
Sand four posts—3 hours
Drill mortises in posts—1 hour
Drill posts for bolts—2 hours
Sand head, foot and side rails—1 hour
Fit and adjust rails and posts with bolts—3 hours
Dress wood for headboard—1 hour
Cut headboard, mortise posts for same, tenon headboard, sand and fit—12 hours
Dress wood for tester—3 hours
Dado and fit tester—4 hours
Finish-sand and stain with two coats of varnish—10 hours
Assemble bed and install bolts and caps—2 hours.

All totaled, the project required 67 hours. The cost of materials was $625 (Canadian), including $475 for rough cherry, $90 for bed bolts and caps (including shipping and duty) and $60 for angle iron, screws, varnish and other items. Was it worth it? Chris seems to think so: "The project and the end result were very rewarding and I look upon this bed as a family heirloom that will be passed on to subsequent generations."

Feedback on chairs from dowels—Brian Boggs, a chairmaker from Berea, Ky., was disturbed by our recent article on building a rocking chair with components that started out as dowels. Among other things, he was upset by some of the joinery used by author Ken Oldfield.

"In any armchair and especially a rocker, a lot of stress concentrates at the rear arm joint," says Boggs. "This is tension stress, which the dowel joint is rather poor at resisting (see *Understanding Wood* by R. Bruce Hoadley, p. 127, The Taunton Press, 63 S. Main St., Box 5506, Newtown, Conn. 06470-5506). Oldfield's arm joint will not withstand much stress. A ½-in. by ½-in. round tenon just won't do. It should be at least ⅞ in. to 1 in. deep and ⅝ in. dia., with a locking pin like the Shakers used."

Boggs, who wrote about his chairs in *FWW* #78, also said he felt that making a chair from dowels is not top-notch woodworking but hobby-craft. I liked the chair, and also felt Oldfield's approach made the chair project seem manageable to a person with a regular home shop. Many woodworkers are apprehensive about trying to build a chair, and I hoped this would get them started. As always, I'd be interested in hearing your reaction, along with any suggestions on how to help readers try chairmaking.

More thoughts on kitchen design—Dennis Preston of Brookfield, Conn., responded to Frank Klausz's article on building kitchen cabinets (*FWW* #84) with some of the ideas he came up with while completely renovating his kitchen.

First, to maximize space and convenience, he suggested substituting banks of drawers for the single drawer and cupboard door arrangements usually found below countertop units. Conventional setups tend "to waste good storage space because only the front few inches serve as convenient storage; to find anything you usually have to get on your hands and knees and dig out those items behind the front row. If you look into the typical under-counter cabinet, you'll see more space than anything else."

As an alternative, he built "graduated drawers on full suspension slides that range from 2 in. to 10 in. deep, to accommodate all kinds of cutlery, pots and pans, small appliances, etc. When you need something, you simply pull out the drawer and there it is at your fingertips, without digging on your hands and knees. I also utilized the drawer concept under the sink where the two adjacent drawers are designed to fit around the plumbing."

He also suggested re-evaluating the idea of locating cabinets over a deep counter. He said this arrangement causes problems for shorter people because they have to reach out and up, and so most cabinets only have two shelves; anything else would be out of reach. The space above the top of the cabinet is usually blocked off by a closed soffit or left open to display seldom-used objects.

"My feeling is that the soffit should be eliminated and the cabinets should run to the ceiling; however, these cabinets should not be located over a 25-in.-deep counter, but rather a narrower counter, say 14 in., so that you can get closer and eliminate the great horizontal reach. The 14-in.-deep lower cabinet can have many closely spaced shelves, so that canned and packaged goods are visible and not buried at the back of the cabinet. Basically, if you are designing a kitchen, or any workspace for that matter, don't accept convention without asking yourself whether the design makes sense for the people who are going to be using it."

Feedback on finishing

...Richard Schrader of Socorro, N.M., wrote to offer a suggestion for folks having problems finding good cloths for applying tung oil/urethane mixtures and other similar finishes. "I use Kimwipes Tissues. They are virtually lint free, chemically inert and free of foreign matter. In putting finishes on pool cues, I've never had a tissue fall apart and I have consistently gotten smooth, high-gloss finishes without dust specs as you inevitably get with cotton cloths and other woven fabrics." He said the wipes are available in sizes 4½ in. by 8½ in. or 15 in. by 17 in. from most laboratory-supply firms. He listed Fisher Scientific, 50 Fadem Road, Springfield, N.J. 07081; (201) 467-6400 as his source.

...A couple of finishers have pointed out that some readers may have misunderstood a statement in the wood bleaching article in *FWW* #86 concerning the need to mix A/B wood bleaches before use. These two-part bleaches (sold in hardware and paint stores or through mail-order houses) produce the best effect when used together, but don't necessarily have to be mixed together before they are applied to the wood. As indicated in the article, you can use two separate applicators and in effect mix the components on the wood. Coat the wood liberally with part A, and then wait a few minutes and use another applicator to apply a wash of part B while the wood is still wet. "It is important that part A is still wet and active when it contacts part B, or you won't get the full effect of the mix," said author Michael Dresdner. He also pointed out that some manufacturers suggest mixing the two

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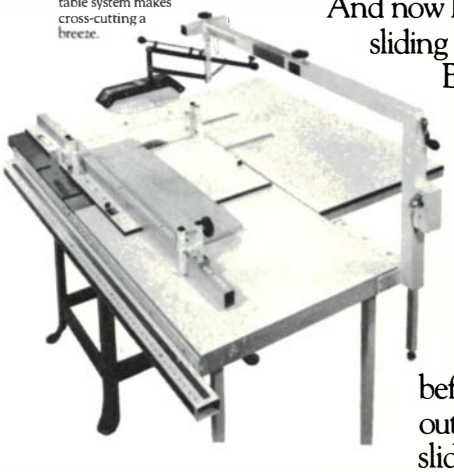

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parts before application. If that is done, the liquid must be applied quickly to the wood, before the chemical action wears out.

...In response to a "Q&A" item on refinishing butcher block (*FWW* #85, p. 26), Thomas E. Wisshack of Galesburg, Ill., said he would take the procedure a step further to include washing the surface with either a soap-and-water scrub or an alcohol rinse to remove any traces of the stripper, which usually contains wax or some other substance to retard evaporation. Also, the wash is a good way to remove stain, silicone or other substances the stripper may have missed, thus creating a cleaner surface for refinishing.

"On most surfaces, an alcohol scrub after stripping does the trick. Flood the surfaces with denatured alcohol and scour it with medium steel wool. Immediately wipe this off with rags or paper towels. Repeat a second or even a third time as needed. You will be amazed at how much coloring matter and other residue is still in the wood. For less delicate surfaces (say a pine cupboard with traces of milk-base paint), use a soap-and-water scrub after initial stripping. Mix a strong solution of Arm and Hammer Washing Soda (trisodium phosphate), available at many grocery and hardware stores, in hot water in a bucket. Scour the surface with this solution and steel wool, and then rinse and dry. The solution will continue the stripping action and remove certain paints, grime and grease, leaving a clean surface. If the wood darkens you can bring the natural color back with oxalic acid."

English sycamore and maple—David M. Truesdale of Middletown, Del., offered some information on the English wood named sycamore that was used on several pieces in an article on British craftsmanship in *FWW* #86.

"I think *FWW* should let those readers who aren't extremely familiar with wood names know that English sycamore is a maple. As a matter of fact, this tree is known as sycamore maple in the United States. Sycamore maple is a beautiful wood; it turns a beautiful orange color shortly after sawing. I believe it is this natural color of sycamore maple that causes all of the Madison Avenue commercial maple-furniture manufacturers to put an orange-shade finish on everything made from maple sold in this country." He said he had tried to plant some sycamore maple trees on his property in Delaware, but found the trees didn't do very well in that part of the country.

Know Your Woods by Albert Constantine, Jr. (Charles Scribner's Sons, New York, N.Y.), also points out that the wood is sometimes known as scotch plane or weathered sycamore, because of the color change as it weathers. In describing the English sycamore sold in the U.S., the Constantine manual states, "In its natural form it is highly desired for its lovely white color, and is particularly adaptable for staining to any color desired. Outside of holly, this wood is the nearest to white that can be obtained."

Flip-flop photo series—Kenneth Bauman of Montrose, Minn., pointed out that a photo on p. 67 in *FWW* #86 had been reversed accidentally. The photo shows a series of wood samples that had been bleached. The species names and the photos do not match when numbered left to right, as indicated in the type under the picture. The species are, from left to right: maple, mahogany, oak, rosewood, cherry, walnut and cedar.

Protect glue from freezing—Ron Hill of Barrington, R.I., offers another suggestion for a reader looking for a way to protect water-base finishes and glues from freezing ("Q&A," *FWW* #86).

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91A

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He said he and his brother-in-law found an old refrigerator that didn't work, but had a sound cabinet.

"Most people will be only too glad to give it to you. Change the light switch so the light stays on all the time. If the switch or wiring is damaged, simply drill through the back or side of the case and install a porcelain socket with a light switch on the outside of the box. By putting in a 60 w. or 75 w. light blub, the interior of the box soon warms up to a rather acceptable temperature and the box's insulation helps keep heat loss to a minimum. You can store water-base finishes and glues inside and take them out as needed, as long as you don't leave the door open too long. If you're concerned about too much heat, you could always wire the light circuit with a thermostat that would turn the light off at a given temperature." Since the items stored in the case have a water base, there should be no fire hazard, he said.

Jack Carlyle of Minneapolis, Minn., also suggested a method using an old refrigerator. He said his was a discarded self-defrosting model. He removed the compressor unit and coils and hooked the defroster heating coil to a 120v outlet. He said he has stored latex paint and caulking compounds with no trouble. As with the first unit discussed above, a thermostat could also be added to the system, but Jack said he hasn't felt the need for one.

Similar suggestions for using refrigerators as storage chests were also made by Keith Muirhead of Dresden, Kan., and Larry V. Johnson of Virginia Beach, Va.

Vacuum-bagging book—We apologize to Gougeon Brothers, Inc., 100 Patterson Ave., Box 908, Bay City, Mich. 48707, and any readers who were inconvenienced by our reference to the Gougeon vacuum-bagging manual, mentioned in sources of supply in *FWW* #86. The manual, *Advanced Vacuum Bagging Techniques,* is out of print, but the company expected to have copies available sometime in February 1991.

Safety tip on plate joiners—Safety continues to be a prominent topic whenever woodworkers get together. And often we are reminded that tools that appear the safest can be just as dangerous as the ones everyone knows can hurt you.

Stephen Smith, who describes himself as a plate-joiner enthusiast, stressed that point in a letter from Denver, Colo., after reading our article on this popular joinery system (*FWW* #85). "I have a friend who lost the tip of his finger with the incorrect use of this machine. I consider the biscuit joiner to be much more dangerous than it looks to the casual observer."

In addition to our discussion of fences and the machine's anti-kickback pins, he recommended that we stress that the joiner never be used freehand. "Always clamp down your workpiece or have it butted up against a stop on your workbench. Secondly, be aware of which way the machine will kick back should it decide to do so, and keep your fingers out of the way."

Stephen also said he felt the tool was a lot more versatile than the article implies. How about it? Anyone out there got some special jigs or advanced techniques for this tool. Send them in.

Information about Anaheim show—The wrong address appeared for the Woodworking Machinery and Furniture Supply Fair, to be held Sept. 28-Oct. 1, 1991, at the Anaheim Convention Center in Anaheim, Cal. For more information, write to the Woodworking Machinery and Furniture Supply Fair, 1516 S. Pontius Ave., Los Angeles, Cal. 90025; (213) 477-8521. □

Dick Burrows is editor of FWW.

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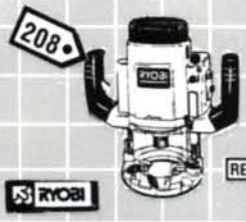

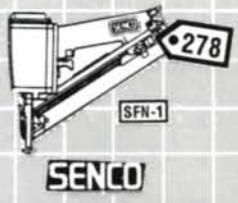

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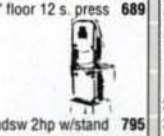

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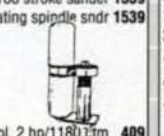

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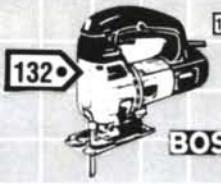

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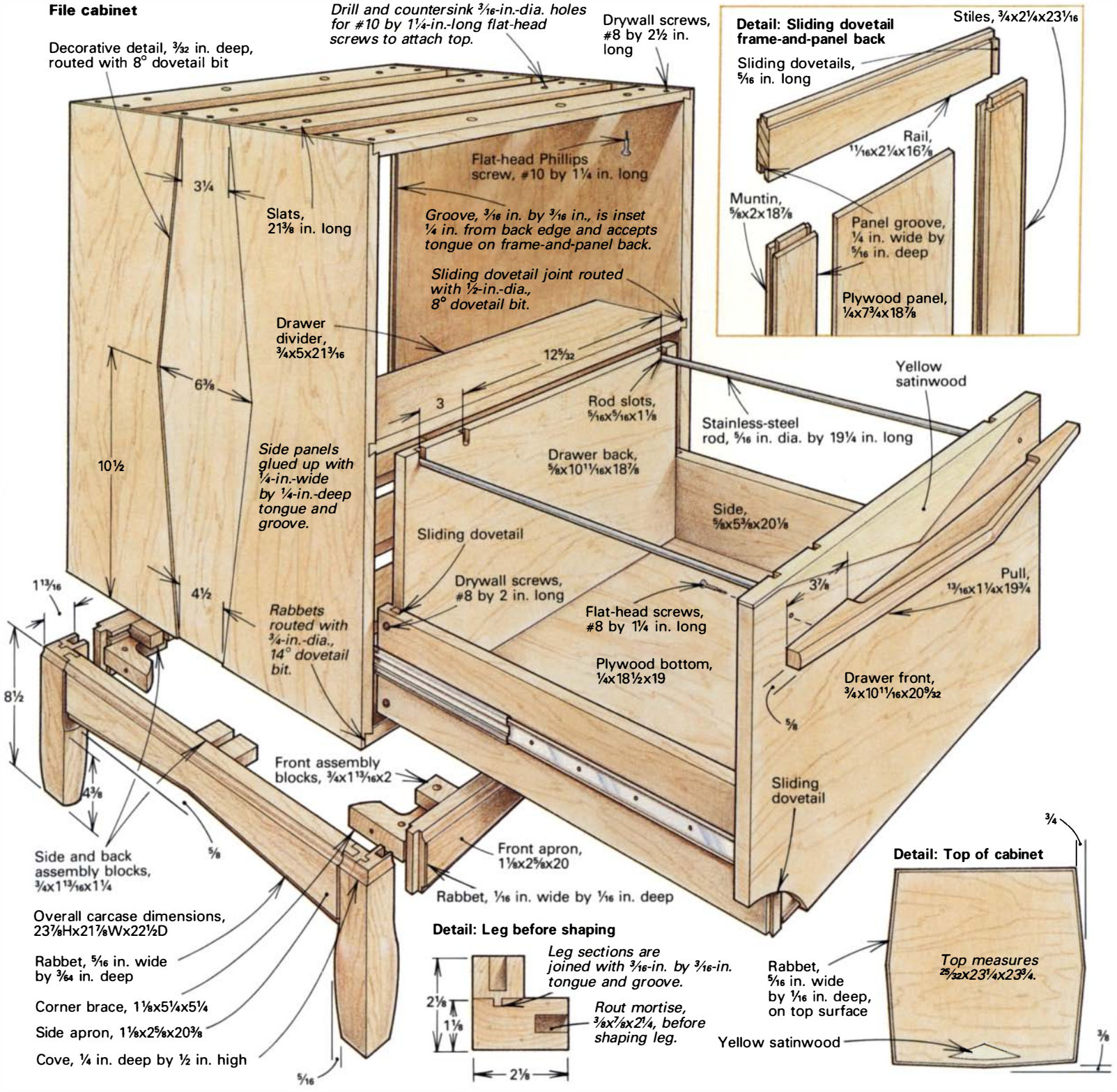
Building a File Cabinet

Router techniques for joinery and decoration

by Pat Warner



Most file cabinets look like department-store safes. My file cabinet started out as a chunky rectangular box, but I softened the lines and made it visually interesting by adding a separate base with shaped legs and by introducing a theme of triangles, which appear in many elements of the cabinet. The triangles first appear in the satinwood inlays in the drawer fronts and top, and the design is repeated in the shape of the top's edge, in the drawer pulls and in the shapes cut from the aprons on the base. Rabbets routed into the aprons and top and recessed opposing-triangle accents routed into the sides create shadow lines that reinforce these triangular designs. This is one of those rare projects that I wouldn't change if I were to build it again, but if you think it looks difficult, you could ignore most of the detail work, thereby simplifying construction, and still produce a good-looking, functional piece.

Building this file cabinet, shown in the top photo, is also a great learning project; it includes basic woodworking skills and is a tour de force of router techniques. The carcase is a simple white oak box that is joined with router-cut dovetailed rabbets, tongues and grooves, and sliding-dovetail joints. Designing the joints for the frame-and-panel back, shown in the bottom photo, was a challenge because each element is in a different plane. Although the back is unnecessarily complicated, it creates an extremely rigid carcase and makes the cabinet attractive enough to be used away from a wall. I decorated the drawers, which are joined with sliding dovetails, by routing a contrasting triangle of satinwood into each drawer front. Both drawer inlays and a satinwood triangle inlaid into the separate top were fitted by a process called complementary template routing: A router with a bushing or ball-bearing piloted bit is guided by a master template to simultaneously create complementary working templates. These templates then guide the router to create perfectly matching pieces that fit together snugly. (For more on this technique, see *FWW* #75, pp. 59-61.)

For maximum accuracy, I also used a template and a ball-bearing guided bit to shape many of the cabinet pieces, such as the overhanging sides and the front edge of the top and aprons. I usually assemble my own piloted bits by adding a bearing with an inside diameter matched to the shank of the router bit and an outside diameter suited to the job at hand. As a safety precaution, be sure that the cutting diameter of the bit is greater than the inside diameter of the bearing and that at least ¾ in. of the bit's shank is chucked in the router's collet. If the shank is long enough, I sometimes stack two bearings on the bit for greater depth of cut, to cover the shank on longer bits and to ensure solid contact with the template. A drop of Locktite (available from auto-supply stores) on the bearing's inner race will hold it in place. I bought my bearings from Valley Chain and Gear (1320 Grand, San Marcos, Cal. 92069) and the router bits from Paso Robles Carbide (731C Paso Robles St., Paso Robles, Cal. 93446) and MLCS Ltd. (Box 4053, Rydal, Pa. 19046).

Above: This white-oak file cabinet was made with a variety of router shaping and joinery. Its boxy appearance is softened by recurring triangular designs that appear in the inlaid drawer fronts and the top, in the shape of the aprons and overhanging top edges, and in the routed detail on the side panels.

Right: The author created this complicated frame-and-panel back, joined by sliding dovetails, as a personal design challenge. All the elements of the back are in different planes to create interesting shadow lines. A simple panel back can be substituted to ease construction.

Constructing the carcase—All carcase parts were milled to ¾ in. thick from 4/4 white oak and then cut to the dimensions in the drawing. The sides were glued up with tongue-and-groove joints to ensure flat, even pieces during clamping. I cut the tongues and grooves on a router table using a ¼-in. rabbeting bit for the tongues and a 3/16-in.-thick three-wing slot cutter for the grooves. To center the slots and tongues, I made cuts in two passes, one from each face of the piece. I cut the tongues to be about 0.005 in. shy of the bottoms of the ¼-in.-deep grooves, to allow space for trapped glue and to prevent the tongues from bottoming out.

Rather than install a solid subtop and bottom, I used a series of slats joined to the sides with dovetailed rabbets that are glued and screwed. The slats eliminate normal carcase glue-up and simplify milling operations. Also, they can be cut from random widths of lower-quality stock, and they let you install components one at a time, at a comfortable pace.

My slats are 4 in. to 6 in. wide, crosscut as shown in the drawing. The single-face dovetail that joins the slat to the side is half of a sliding dovetail cut with a ¾-in.-dia., 14° dovetail bit in a table-mounted router set to take a ½-in.-deep cut. I clamped the slat on end to a sliding fence attachment and adjusted the fence so the bit cut ¼ in. into the inside face of the slat. (See "Routing Sliding Dovetails," *FWW* #79, p. 57, for more on this technique.) I then drilled and countersunk two 11/64-in.-dia. holes in each end of the slat, for #8 by 2½-in.-long bugle-head drywall screws. The sharp twin-threaded screws are virtually unstrippable when screwed into 5/32-in.-dia. pilot holes drilled into the sides. I lightly chamfered the

Photos this page: Sandor Nagyszalanczy; drawing: David Dann

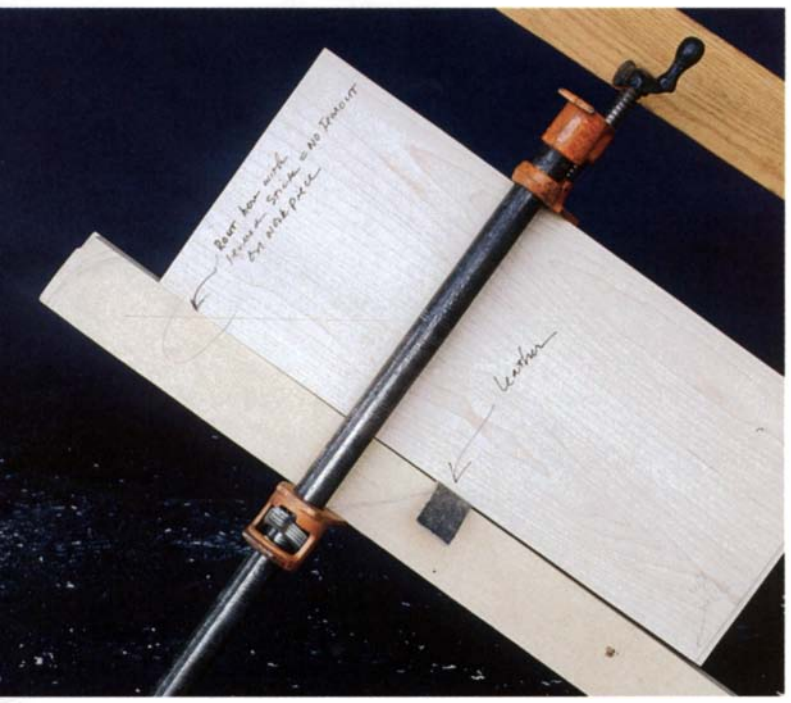
edges of the slats and drilled 3/16-in.-dia. holes in the subtop planks for the 12, #10 by 1¼-in.-long flat-head Phillips screws that secure the top. No allowance need be made for wood movement because the grain is oriented in the same direction for the top, subtop, bottom and sides.

I cut the mating dovetail rabbet in the sides with a hand-held router controlled by a template and a bearing-guided bit. I used the same dovetail bit as on the slats, but with a 1.125-OD bearing mounted on the bit's ½-in.-dia. shaft. The template was positioned on the side panel and the depth of cut was adjusted so that the dovetailed slat end fit into the dovetailed rabbet in the side panel, as shown in the drawing. This setup is a trial-and-error process that should be practiced on scrap stock. Take light cuts and test the fit after each pass with one of the dovetailed slats until it is perfect. Then measure the fence setup on the practice piece and transfer it to the cabinet side. The offset-knob router subbase, shown in the top photo below, adds stability to this operation, particularly at the ends of the cut where only one-fourth of a regular router base would be on the template. (This subbase is available from Trendlines, 375 Beacham St., Chelsea, Mass. 02150.) I used a technique I call spring-clamping to secure some ¾-in.-thick material to the edge of the side panel to prevent tearout, as shown in the bottom photo below.

The frame-and-panel back is held in place by 3/16-in.-sq. slots that I routed with a bearing-guided, 3/16-in. two-wing groove cutter. I positioned the slots ¼ in. from the back edge of the carcase, on the inside edges of the sides and rear slats. Then I routed the optional opposing triangular detail in the cabinet sides, shown in the drawing on p. 44, with a bearing-guided, ½-in.-dia., 8° dovetail bit in a hand-held router set for a 3/32 in. deep cut and guided by a template. Before beginning work on the back panel, I routed the sliding dovetails for the drawer divider. In a single pass, rout the 5-in.-long dovetail ways on the horizontal centerline of the side panels with a ½-in.-dia., 8° dovetail bit mounted in a hand-held router controlled by a template and guide collar. Cut the dovetail pins with the same bit on the router table using the sliding fence attachment as previously described, only this time rout dovetails into both faces of the divider.

Left: The offset-knob router subbase, shown here with the router removed, increases surface area on the template for a more stable operation. The dovetail bit shows the correct setup for routing the dovetailed rabbet on the side panel.

Below: When routing the dovetail rabbets, a small piece of leather, clamped between the panel and scrap, levers the scrapwood tightly to the panel to help prevent tearout. This is a handy trick when a template interferes with clamping a scrap closer to the cut.



Backing up the cabinet—To finish the carcase, feel free to make the back any way you want. If the cabinet will be against the wall, a simple plywood panel may satisfy you. A more attractive solution would be ordinary frame-and-panel construction. Those with a more masochistic bent may decide to duplicate the sliding-dovetail frame-and-panel back that I developed, shown in the bottom photo on the previous page. To create interesting shadow lines, the rails, stiles, muntin and panels are all in different planes. This means the joinery must be offset to the rear of the panel. Although I show dimensions for the components of the back panel, you should dry-assemble your carcase and then cut these components to fit the opening in your particular carcase. After constructing the frame-and-panel back, as shown in the drawing, I routed a continuous 3/16-in.-sq. tongue around its perimeter. The tongue is 3/16 in. from the outside face of the stiles so that the entire back will be set into the carcase 1/16 in., to produce yet another shadow line. All the parts, including the back edges of the carcase, were lightly chamfered.

I began assembling the carcase by temporarily clamping the two sides to one of the slats, forming a U-shaped assembly. Line up the top rear slat to the rear of both side panels and clamp it in place. Using the predrilled holes in the slat as a guide, bore the 5/32-in.-dia. pilot holes into the sides for the #8 screws. Remove the clamps, and then glue and screw the slat in place. I used a 90° brace to clamp the slat in place before screwing, to ensure the carcase was square. After gluing and screwing all the slats on one end, turn the carcase over, sparingly glue up the upper half of the tongue on the outer edge of the back panel and the lower half of the slot in the carcase to avoid squeeze-out, slide the back into place, and begin assembling the opposite end starting with the rear slat. Finish up the carcase by gluing the drawer divider in place. Again, sparingly apply glue to the last half of the socket and the front half of the tenon. From start to finish, it took me about an hour to put the carcase together. But because of the step-by-step assembly, I didn't feel like I needed eight hands to control all the clamps, clamping pads and furniture components involved in carcase glue-up.

Building the base—Because of the weight of a full file cabinet, the base had to be rugged. I added stout corner braces to my mortised-and-tenoned base to resist the abuse of even the most ruthless mover. To beef up the base and allow it to protrude beyond the carcase (5/16 in. on the sides and front and 1/16 in. in the back), I made the aprons, legs and corner braces from 1⅛-in.-thick white oak, as shown in the drawing on p. 44. Although I could have mitered the leg sections together for a better grain match, I glued them together with a tongue-and-groove joint for easier assembly and a more precise fit, matching the pieces as well as I could. I glued up three 24-in.-long L-shaped units with 2⅛-in.-wide outside faces from the 1⅛-in.-thick stock. Cutting these units in half yielded six 12-in.-long legs. Although the legs will be a little long, the extra

Photos this page: Patrick Warner

length provides a safe handle for the machining operations you will perform before cutting the legs to their finished length of 8½ in. I used one of the extra leg blanks to experiment with designs and the other for testing machine setups.

Before shaping the legs, rout an open, ⅜-in. centered mortise, ⅞ in. deep by 2¼ in. long, into each 1⅛-in.-wide face on all the legs. To avoid vibration and deflection, I made multiple passes with a single-flute ⅜-in. bit chucked in a table-mounted router. Then, starting at the top of the leg, I routed 5/16 in. off the same face of the leg with a flush-trimming bit and a template to create the 4⅛-in.-long section at the top of the leg. Now, using the same bit and a template with a 20-in. radius on its guide edge, shape the bottom of the leg on the edge you just shaped. I repeated that radius cut on both outside faces of the leg, first jigsawing the basic shape and then dressing up the face on my 4-in. edge sander. Finally, I hand-sanded a 1¾-in. radius onto the lower portion of the mortised face edge.

Dimension the aprons, according to the drawing, before routing the ⅜-in.-thick by 5/16-in.-long tenons with a bearing-guided rabbeting bit. Again, I ran a bearing-guided flush-trimming bit against a template to rout the triangular recess into the bottom edge of the front and side aprons. Next, rout the 5/16-in.-wide by 3/64-in.-deep rabbet on the face of each apron with a bearing-guided rabbeting bit. I also used a bearing-guided bit to rout a 1/16-in.-sq. rabbet at the tenon shoulder of each apron to provide another shadow line.

With a bearing-guided two-wing groove cutter, rout 3/16-in.-sq. slots on the inside face of each apron, to accept the tongued assembly blocks that fasten the base to the carcase (see the drawing on p. 44). Sand all the members and glue up the frame. After assembly I routed a ¼-in.-deep cove along the top edge of the front and side aprons, as well as the tops of the legs, with a bearing-guided ½-in.-radius cove bit, to blend the lines of the base into the carcase. I used very light climb cuts on the leg tops, moving the router from right to left to avoid end-grain tearout. But a safer technique is to stop the cut just shy of the leg edge and finish up the detail with sandpaper wrapped around a 1-in.-dia. dowel. Next, cut the corner braces and tongued assembly blocks, as shown in the drawing, and attach the front assembly blocks in place with #12 screws. To allow for wood movement, use pairs of blocks, spaced a screw width apart, on the sides and back. Locate the corner blocks so their holes or slots line up with the access holes in the corner braces. Then turn the carcase upside down, position the base upside down on the carcase and transfer the location of the holes in the assembly blocks to the bottom slats. Drill 5/32-in.-dia. pilot holes in the slats and fasten the base to the carcase with #12 by 1¼-in.-long round-head sheet-metal screws. Note that the carcase is fixed in front so that all movement will occur at the back, where the screws slide in the slots formed by the paired blocks.

Making the drawers—The drawers consist of a full-height front and back joined by sliding dovetails to half-height sides, which help reduce the weight of the drawers and conserve wood. The bottom slides into grooves on all four edges. To withstand heavy loads, I chose 18-in. Accuride #C3800 drawer slides with a load rating of 75 lbs., which I bought from Cabinet Hardware Manufacturing Co., 14560 S. Marquardt Ave., Santa Fe Springs, Cal. 90670. The slides require ½-in. clearance between each drawer side and the carcase, and so flanged, flush-inset drawer fronts work well. One caution: when measuring for the drawer compartments, allow ½-in. clearance for the hardware based on the inside dimensions of the carcase and not the drawer fronts; otherwise, the hardware won't fit properly.

Cut all drawer parts to size and then rout the sliding dovetails using the same ⅜-in.-dia., 8° dovetail bit set to take a ⅜-in.-deep pass for all joints. Again, although the drawing shows my drawer component dimensions, be sure to make adjustments as necessary to fit your actual carcase. I left 3/64-in. clearance on the sides of my drawers and a little bit more, about 1/16-in. clearance, on the top and bottom to prevent the drawers from sticking when their fronts expand. Also, leave at least ½-in. clearance between the drawer backs and the carcase back, because a carcase of this size can move as much as ¼ in. with changing humidity levels.

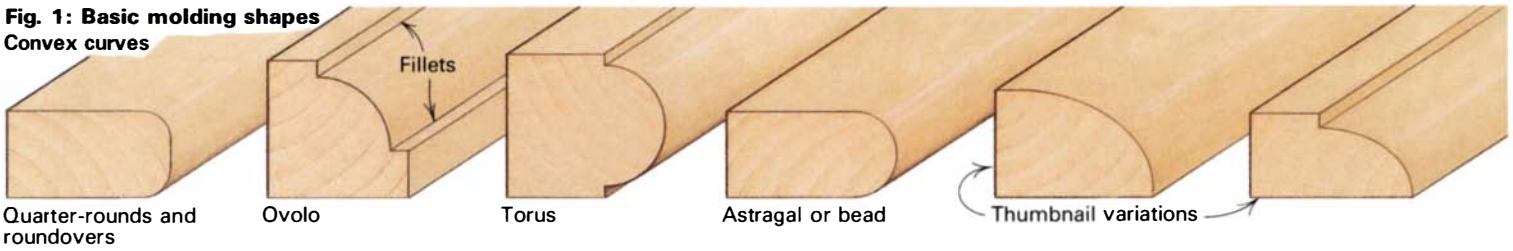
Using the previously described technique of complementary routing to make templates, inlay the full-thickness yellow-satinwood triangles into the drawer fronts. Now rout the 5/16x5/16x1⅛ rod support slots into each drawer front and back, as shown in the drawing on p. 44. The three slots are spaced 15 5/32 in. and 12 5/32 in. apart sothe rods can support either legal- or letter-size suspended file folders. The location of the slots is critical for smooth movement of the file folders, and so I suggest setting up the cuts first on a piece of scrap. To hang the file folders, I bought some 5/16-in.-dia. stainless rod at the junk yard, cut it to length, and dressed it by chucking it in the drill press set at its slowest speed and buffing it with 320-grit silicone-carbide paper and 0 steel wool. Finally, rout the groove for the ¼-in.-thick plywood bottom; be aware that the groove is 3/16 in. deep on the sides and back, but ⅜ in. deep in front.

To assemble the drawers, first apply glue to the front sockets and to the pins on the front of the sides and then slide these pieces together. The plywood bottom slides into its grooves until it reaches the end of each drawer-front groove. The extra depth of this groove allows the bottom to slide past the front of the drawer back, which is then slid into position without glue. Pulling the bottom into the groove in the drawer back still leaves 3/16 in. of the bottom in the front groove so that the bottom is supported on all four sides. Now screw the sides to the back, as shown in the drawing. When finishing the piece, I removed the back and bottom, leaving these pieces and the inside of the carcase unfinished to minimize the outgasing of solvents within the cabinet.

The finger grips for the applied pulls are routed into oversize stock with a bearing-guided ¼-in.-radius core-box bit and a template before the triangular-shaped pull is bandsawn. Sand the front edge to the correct radius, using a coved piece of scrap as a sanding block, and then cut the pull to length. Locate the centerline of the pull 1⅛ in. below the top of the drawers and secure the pull with three #8 by 1½-in.-long flat-head screws.

Topping off the cabinet—I made the separate slab top of 25/32-in.-thick white oak about 6 in. wider than the finished top is deep because I shaped and then ripped a strip from the back of the top and glued it to the front, to hide the edge of the satinwood inset. After gluing up the top, rout the satinwood triangle into its front edge using the same template and procedure as for the drawer fronts. Then using a template with a 60-in. radius, rout an arc across the back edge of the top. Rip a 2-in.-wide strip from the back and, using the same template, rout the complementary arc across the front edge of the top. Now glue and clamp the strip ripped from the back edge to the front edge. Finish shaping the top using a flush-trimming bit in a hand-held router guided by a template to cut the triangular edges on the sides and front (see the drawing). I routed a 5/16-in.-wide by 1/16-in.-deep detail around the edge of the top with a bearing-guided rabbeting bit. Sand the top's edge to a ⅞-in. radius with a piece of coved scrap and secure it to the carcase with 12, #10 by 1¼-in.-long flat-head screws. I finished the cabinet with three coats of Watco oil and wet-sanded the final coat. □

Patrick Warner teaches classes on router techniques and making jigs and fixtures. For more information, contact the author at 1427 Kenora St., Escondido, Cal. 92027.



Designing with Moldings

Dressing up a basic case with classic profiles

by Cameron Russell

For some time now, I have been fascinated by the way a few decorative strips of wood can transform wooden cases into beautiful pieces of furniture. We generally call these strips moldings, but they have been made in hundreds of distinct forms, shapes and sizes designed to suggest a certain period in history, to focus attention on a particular piece of furniture or an architectural feature, or simply to add interesting textural detail. Once I became hooked on moldings as decorating tools, I began to notice them everywhere. The 100-year-old buildings found in most towns, built during a Neoclassic revival in architecture, are as much a source of inspiration as the period furniture in museums, galleries and antique stores. The relationship between furniture and buildings has always been close and is especially noticeable when examining the decorative moldings that have been used through various historical periods.

In general, whether we speak about furniture or architecture, moldings frame or define a particular aspect of a design in the same way that a border or mat frames a picture. Furniture molding includes everything from a tiny bead that outlines a drawer front to the large compilation of shapes that forms the cornice of a 7-ft.-tall cabinet. The base or plinth molding on a traditional cabinet defines where the lower portion of the cabinet meets the floor, just as a cornice molding around the top of the cabinet defines the top section. A molding may also be found in the area where the upper and lower cases are joined, to distinguish one part of the cabinet from the other. Dividing a large mass into two smaller, usually unequal, masses adds visual appeal to the cabinet and draws attention to the proportioning of the upper and lower sections. Just as moldings define the major portions of a cabinet, smaller versions of molding profiles frame other parts of the cabinet, such as window panes, door panels and drawer fronts.

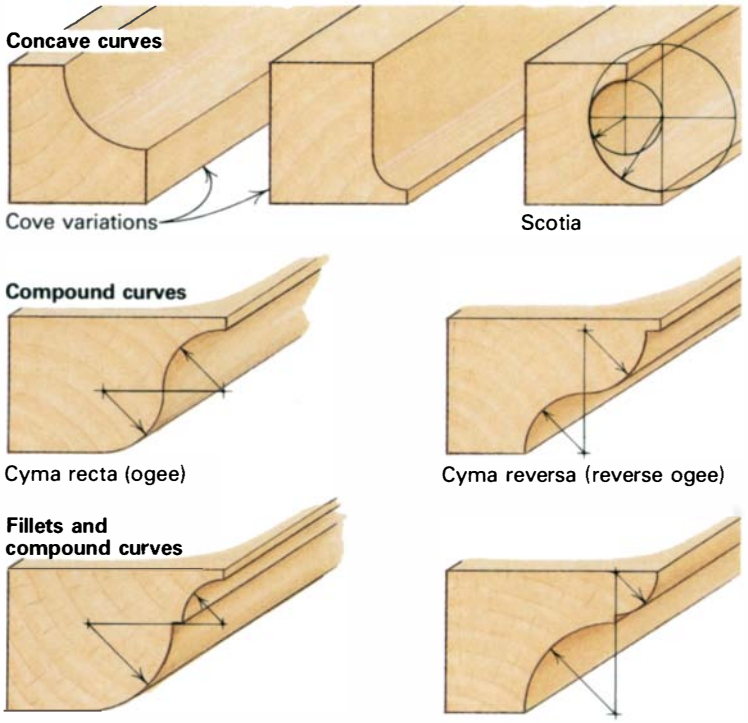
If moldings only outlined notable details on a design, they could be simple squares or rectangles. But moldings are decorative details themselves and their shapes must complement the overall furniture design. Often similar molding profiles are repeated in several areas on a piece to provide a sense of visual unity throughout the entire design. In addition, the moldings' curved surfaces create a sense of depth by reflecting and absorbing light. Convex curves reflect light to create highlights, while concave curves create shadow lines. The interplay of light and shadow of a few well-placed moldings can transform a simple box or two into an interesting and exciting piece of furniture (see the photos on the facing page).

Basic molding shapes—There are hundreds of molding profiles, as evidenced by the plethora of router bits, shaper cutters and molding head blades available through most woodworking catalogs. Most of these shapes can be traced back 2,000 years to Greek and Roman architecture. Even the names given to shapes, like ogee and astragal, derive from the classical vocabulary. In their simplest forms, all molding profiles are made of convex (outside), concave (inside) and compound (S-shaped) curves.

Outside curves are often called quarter-rounds, roundovers or bullnoses. Each of these names describes the shape of a quarter circle that remains when the arris (the sharp edge formed by two meeting surfaces) is removed from the edge of a board, as shown in figure 1 above. When the quarter circle is set farther into the corner of the board, the molding shape is called an ovolo, a profile found frequently in classical architecture. The noticeable difference between a simple roundover and an ovolo are the small ledges called fillets, shown in figure 1. Fillets cast small shadows along the length of the ovolo molding that contrast with the light reflecting from the convex curve between them.

Whereas roundovers and ovolos are composed of quarter circles, half circles are used in the profiles of the torus and astragal or bead, as shown in figure 1. Also originating in classical architecture, torus moldings (a half circle between two fillets) are frequently used at the base of columns. Astragal moldings are normally small and used either as components of larger moldings or as frames for parts such as drawer fronts. While portions of circles are used for most convex curved moldings, thumb or thumbnail moldings employ one-quarter of an ellipse. Used in many styles of furniture, the thumbnail and its variations are most frequently applied to the edge of tabletops and chest lids.

Many concave profiles are merely the opposites of their convex counterparts. For example, a straightforward quarter circle removed from a square corner is a cove, which originates from the classical cavetto most frequently found in architectural cornices. With minor adjustments of the cutter, you can create numerous



Small moldings can make a big difference in the appearance of your projects. What began as a pair of simple cases ***(right)*** *has been transformed into an imposing china cabinet* ***(below)*** *with the help of moldings that set off the individual components yet draw them together into a unified piece. This cabinet was constructed and finished by Karen Robertson, Bonnie Schmaus and Lisa Halliday, students in Russell's furnituremaking and design class. These plywood carcases give no hint of the detail and style of the china cabinet that would evolve. By comparing the "before" and "after" photos, you can see where moldings were added at the cornice, midsection and base, as well as detailing for the doors and drawers, and the effect they have.*

variations on the basic cove, as shown in figure 1. Another variation of the cove is a scotia, formed by the combined arcs of two circles, one of which has twice the diameter of the other. The scotia profile is used a great deal in architectural work to create a heavily shadowed effect.

Beyond concave and convex curves, the ancient Greeks and Romans also frequently used compound or S-shaped curves. The combination of inside and outside curves creates visual interest because of the play of shapes in close proximity to one another, such as the variations on the Roman ogee profile, cyma recta and cyma reversa, shown in figure 1. Cyma recta and cyma reversa denote the relationship between the inside and outside curves. In cyma recta, the curves begin from the horizontal; in cyma reversa, they start vertically. Altering the location of the arc's center point regulates the extent of the curvature in the S-shape. Fillets can also be used with compound curves to enhance the shape and emphasize the transition. A number of router bit manufacturers are marketing these profiles under the generic term "classic."

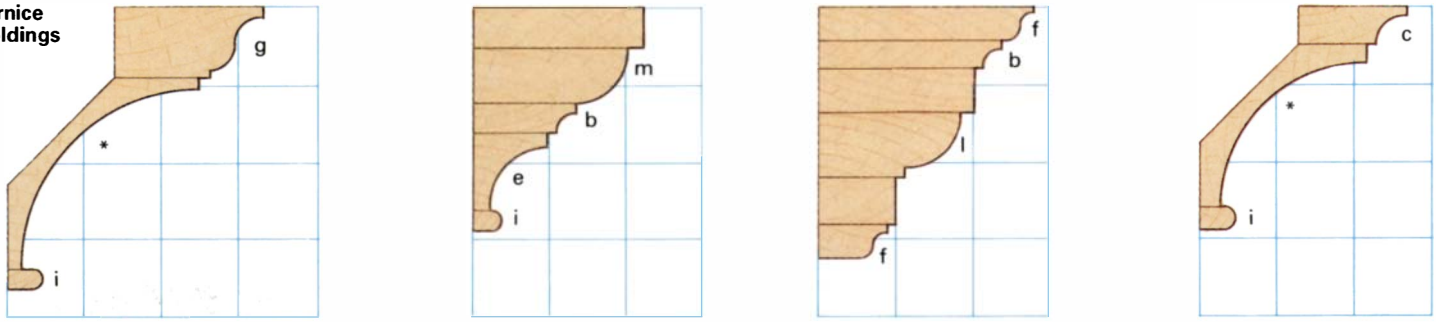
Combining the profiles—Before deciding which of the basic profiles to combine in your molding design, let's look at how moldings are created. Moldings are usually developed in one of two ways. First, the profiles can be shaped directly into the furniture, such as edging designs for tabletops and chest lids. These integrated moldings are usually simpler in detail and limited in size so they don't interfere with the function or strength of the part. This is why the thumbnail was such a popular edging for tabletops in period furniture. The second option is to combine a number of small and simple profiles into more complicated compound forms that are applied to the piece. These compound moldings are frequently found in cabinet plinths and cornice moldings. In addition to allowing more complicated shapes, making applied moldings is also less restrictive: You can machine the parts with the grain in strips, rather than work with large, awkward parts that include cross-grain machining, such as a solid tabletop. Since applied moldings are most often used for decorating pieces, they can include more delicate detailing in a wider variety of profiles than integrated moldings. Applied moldings also serve the often overlooked role of covering up joinery, fastenings and raw edges. In

Photos: Cameron Russell; drawings: Vince Babak

Fig. 2: Reproducing traditional moldings

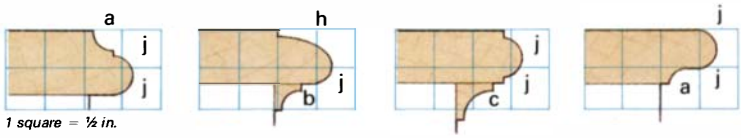
These drawings show how period moldings can be measured, sketched and then separated into pieces that are easily shaped with a router or tablesaw (see sidebar for details).

Cornice moldings



1 square = 1 in.

Edge treatments



1 square = ½ in.

A combination of the following router bits shaped the above moldings as indicated:

*Tablesawn cove
See sidebar for details

Core box:
a. ½ in. dia.

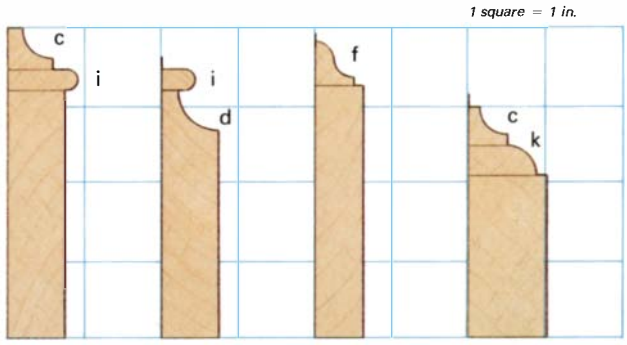
Cove:
b. ¼ in. radius
c. ⅜ in. radius
d. ½ in. radius
e. ¾ in. radius

Ogee:
f. ⅜ in.
g. ⅞ in.

Thumbnail:
h. 2½ in. dia.

Roundover:
i. ⅛ in. radius
j. ¼ in. radius
k. ⅜ in. radius
l. ⅝ in. radius
m. ¾ in. radius

Base moldings



fact, moldings are commonly used with architectural interior paneling to conceal plywood edging and to cast shadow lines for a feeling of greater depth.

In addition to how you will create your moldings, you need to consider the angle from which the molding will be viewed. A molding placed above eye level requires a different combination of profiles than a molding situated below eye level. As shown in the china cabinet in the bottom photo on the previous page, the cornice molding is above eye level, and so the profiles are directed downward toward the viewer's eye. The inward-pointing miters at the corners of the cornice molding help draw the viewer's attention to the central area of the cabinet. The base molding, on the other hand, must have upward-pointing details to be most effective. There are some similarities between furniture moldings and classical architecture details for both cornices and bases. However, in furniture, base molding details are better kept simple. Then, crisp fillets and delicate beads are not near floor level at the mercy of passing feet, vacuum cleaners and childrens' toys. Moldings located in the middle sections of cabinets or on tabletop edges are more likely to be viewed from a range of angles. The molding separating the upper and lower portions of the cabinet in the bottom photo on the previous page is viewed from above when the viewer is standing but from straight on when sitting, especially if the viewer is a few feet away. Therefore, moldings at this height include details directed both upward and very slightly downward.

When compiling individual profile shapes in a single molding, guidelines have evolved from the study of classical moldings and from the way these moldings have been adapted to furniture. First, monotonous repetition of identical profiles should be avoided. More effective visual harmony results from a mixture of convex, concave and compound curves, as well as straight sections. Second, the most successful molding profiles have curves meeting other curves or straights at an angle close to 90°. This makes the transition from one profile to another more dramatic.

The moldings in figure 2 above were all taken from actual samples of period furniture. Originally these moldings were probably made by shaping a solid piece of wood with a series of rabbet and molding planes. The technique is detailed in Thomas Sheraton's *Cabinet Maker and Upholsterer's Drawing Book,* and is summarized in an article on moldings by Victor J. Taylor in *FWW* #41, pp. 57-59. With modern tools, however, moldings are most easily made from a number of smaller pieces, carefully selected for grain and color match. The individual pieces are then routed, shaped or cut with a molding head and assembled into the complete molding shape. When properly executed, it is difficult to distinguish between the original one-piece molding and the built-up imitations.

The profiles shown in figure 2 have been broken down into basic elements and the appropriate tool used to shape each element, usually a router bit, is indicated. Although cutting and combining the various profiles to make these moldings are both relatively easy, some of the pieces are small and require great care and special techniques and holding devices to avoid injury. I prefer a table-mounted router with a fence to guide the stock. For the smaller moldings, I use featherboards and hold-downs to safely guide the stock past the cutter. When routing any of the smaller profiles on predimensioned stock, you should first shape the edge of a wider board and then rip the molded edge to the proper size. Be careful: No molding is worth risking an injury.

I reproduce period furniture moldings if the rest of the details on the piece are historically accurate. Although moldings have been used for thousands of years in both furniture and architecture, they are not restricted to period furniture reproductions. A great deal of Post-Modern architecture and furniture design owes much of its impact to the readaptation of historical proportions and details, including moldings. Whether you favor designs of the past or present, moldings can add a rich visual element that unites the basic components into a coherent whole. □

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Tablesawn cove moldings

If you've been woodworking for any length of time, you've probably seen at least one technique for cutting cove moldings on a tablesaw: running wood over the sawblade at an angle. This method works extremely well and can be used to cut cove moldings several inches deep. But setting up the angled fence and determining the depth of cut can be a problem. Although I am not sure of its origin, I use a simple lay-out jig that greatly simplifies setting up for coving operations.

The layout jig is an adjustable parallelogram made of four straight-edge pieces of hardwood that are bolted together at the corners, as shown in figure 3 at right. Four flat-head bolts are countersunk so the jig will sit flat on the saw table. Wing nuts or wooden knobs (see *FWW* #85, p. 22) make it easy to lock the parallelogram to the appropriate setting.

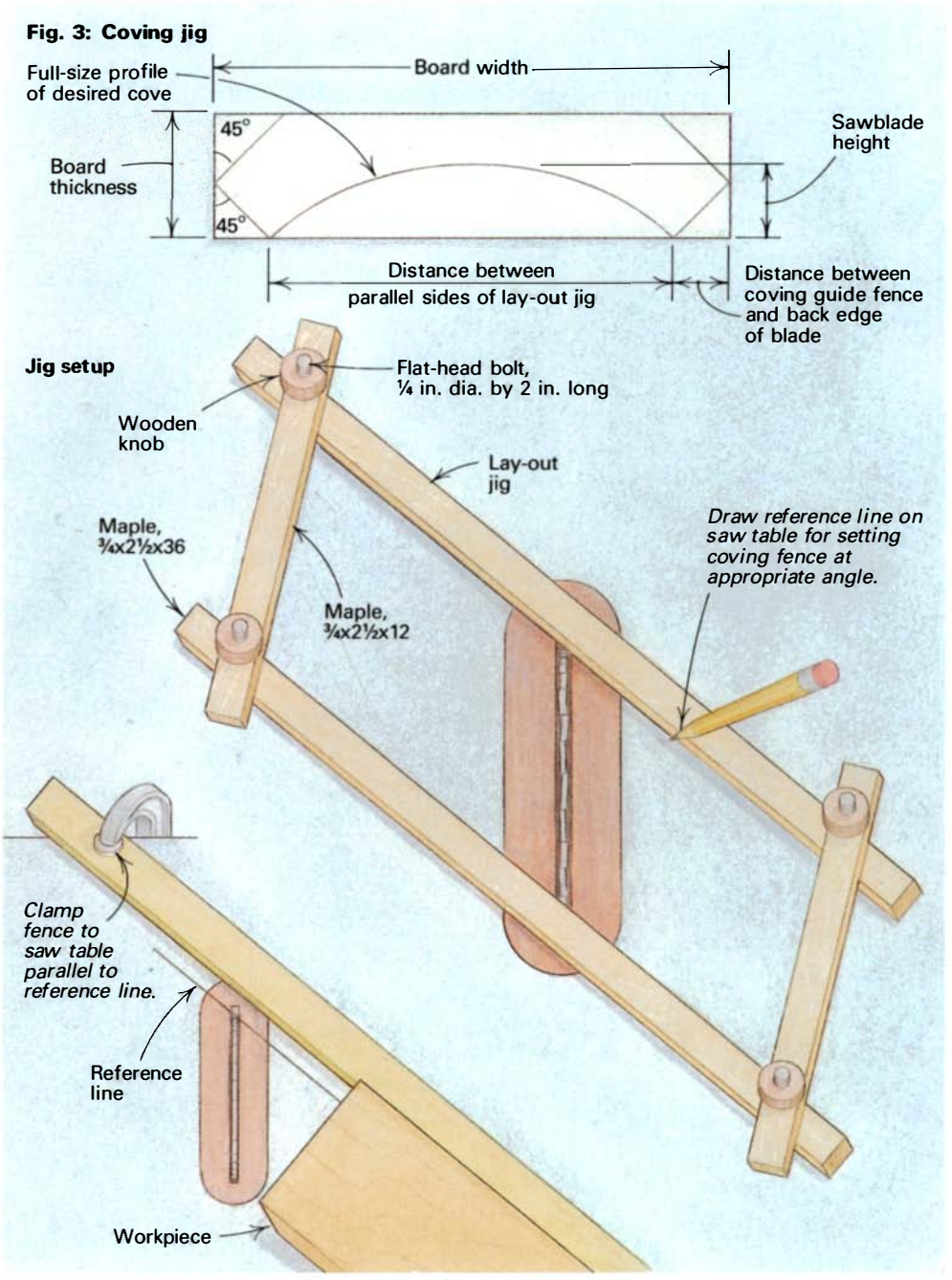
To use the parallelogram, you will need to draw a full-scale profile of the desired cove, as shown in figure 3. You can lay out the arc with a compass if you like, but I often use the bottom of a paint can or some other handy circular template. Now, box in the arc with a rectangle the size of the board from which the molding will be cut. Finally, mark off the corners at 45°, beginning where the arc meets the face side of the board. You can now take the measurements for blade and jig adjustments directly from your drawing.

To set up the tablesaw for coving, first adjust the layout jig so that its long parallel sides are the same distance apart as the arc of the cove at its widest point, and then set the sawblade height to the full depth of the cove. Lay the jig across the table so that its long sides just touch the sawblade where it enters and exits the saw table. Draw a reference line on the tablesaw top along the edge of the jig, to show the correct angle for feeding stock to cut the desired cove. Clamp a ¾-in.-thick plywood fence with smooth edges to the saw table parallel to the reference line just drawn and the same distance behind the line as the space between the start of the cove and the edge of the workpiece, as determined in your full-scale drawing (see figure 3). An alternative approach is to clamp the fence parallel to the original layout line at a convenient distance from the blade and to cove a wider board than needed. When the coving operation is finished, rip the board to the appropriate width.

To cut the cove, lower the sawblade until it protrudes about 1/16 in. Start the saw and pass the wood over the blade with the aid of a push stick. A featherboard or push stick should also be used to keep the board tight to the fence. Always use a push stick to ensure your fingers don't get close to the blade. Raise the blade 1/16 in. and repeat the procedure until you reach the desired depth of cut. A slow and consistent feed rate will yield a fairly smooth cut. Make the final pass with a steady feed rate and with the saw set for a very light cut, to yield a surface that is easily scraped and sanded smooth. I have found that a 50-tooth carbide-tip combination blade and an 80-tooth carbide crosscut blade produce similar results.

Once the cove has been cut, finish the molding by ripping the 45° angles on the edges, as shown in figure 3. Clean up any sawblade marks on the angled surfaces with a couple strokes of a handplane or with a light pass over the jointer. I remove blade marks on the coved section with a curved steel scraper and then sand it smooth with a contoured sanding block, made from rigid styrofoam insulation, of the appropriate radius. I wouldn't want to machine, scrape and sand hundreds of feet of cove molding using this technique, but for the few feet needed for a piece of furniture, it is an effective means of making attractive moldings. —*C.R.*

Fig. 3: Coving jig



Wooton Patent Desks

A Victorian innovation in office furniture

by Deborah Cooper

"With this Desk a man absolutely has no excuse for slovenly habits in the disposal of his numerous papers, and the man of method may here realize that pleasure and comfort which is only to be attained in the verification of the maxim, 'A place for everything and everything in its place'." (Advertisement, circa 1880, for the Wooton Cabinet Office Secretary.)

With dozens of pigeonholes and compartments, hinged and rotating parts, and elaborate exteriors, Wooton Patent Desks embodied the Victorian love of things adaptable, convenient and complex. Both in their construction and use, these desks reflect the drastic changes in the manufacturing and business world during the 19th century. Wooton desks (see the photos above and others on the following pages), manufactured in Indiana from 1874 to 1897, were typical of the increasing use of mass-production techniques and machinery to yield high-quality furniture in quantities sufficient to satisfy the worldwide markets opened by expanding communication and transportation systems. The design of the desks provided an ingenious solution to the businessman's problem of organizing the increasing volume of paperwork that accompanied the rapid expansion of business. From both the business and design perspectives, the Wooton Patent Desk earned the sobriquet "Desk of the Age."

Photos above: Courtesy of Richard and Eileen Dubrow Antiques

This Superior-Grade Cabinet Secretary, known as the Globe desk (shown open at left and closed at right), was made by the Wooton Desk Co. of Indianapolis, Ind., around 1880 and is one of the finest examples of its kind. Wooton Cabinet Secretaries were also sold in three lesser "grades"—ordinary, standard and extra—all of which were similar but distinguishable mainly by the amount and quality of the decoration on the external case, drawer fronts and writing flap (shown closed at left).

The founder of the desk-manufacturing company, William S. Wooton, was born in Ohio on May 12, 1835, the eighth of thirteen children. Records from the Friends Church show that prior to 1860, he was living near Terre Haute, Ind., where he was a member of the Honey Creek monthly meeting. By 1860 he had moved to Richmond, Ind., where he was listed as a patternmaker in the city directory. From April to December of 1869, Wooton was a partner in the Richmond furniture manufacturing firm of George H. Grant and Co., which mass-produced school, office and court furnishings. In 1868 and 1869, while working in Richmond, Wooton designed and patented a school desk and chair that could be folded together for easy storage and transport, demonstrating his interest in adaptable furniture, as well as his concern for protecting his inventions with patents.

When Wooton moved to Indianapolis in 1870, he established William S. Wooton and Co. During its first year of business and with only four employees, one of whom was probably Wooton, the company produced school furniture, office desks and church furniture valued at $18,500. An early business card carried the illustration of a school desk, which was probably the company's primary product at that time.

On Oct. 6, 1874, Wooton's Patent Cabinet Office Secretary, now known as the Wooton desk, officially came into existence when patent #155,604 was issued to William S. Wooton for "a secretary constructed in three parts, two of which are together equal in width to the other, each part being provided with compartments or pigeonholes suitable for storing books, papers, etc., and the lesser parts hinged to the greater part, to serve as doors to the secretary." The patent also described the hinged writing table and a locking mechanism for the doors. The accompanying patent drawing illustrated these points, as well as the basic form of the secretary, although it differed in several details from the desks that were actually produced. For instance, the writing table hinges shown in the patent drawing were replaced by pivots with supporting brackets; the locking mechanism, although operating like the one shown in the patent drawing, was recessed into the door; and the pigeonhole configuration shown in the drawing was also modified during production of the desks. Such differences in detail point to Wooton's overall concept of a convenient, capacious cabinet secretary as the significant part of the patent. A month after the date of the patent, Wooton, together with John G. Blake and Harmon H. Fulton, filed articles of association for the Wooton Desk Co., and rapid activity followed to begin production. On March 5, 1875, the *Indianapolis Journal* reported, "The Wooton Desk Co. will erect a factory this season with room for 150 men. Thus, from little industrial acorns do great manufactories grow."

On Jan. 18, 1876, only 15 months after patenting his secretary, Wooton was granted patent #172,362 for his Rotary Desk (see the two left photos on the following page). The patent describes pivoted or hinged cases installed in the ends of desks that provided more shelving and pigeonholes than available on a more conventional desk, and, at the same time, made the storage area easily accessible. The actual mechanism for hinging or pivoting the cases was not described, but Wooton did point out that the panels inside the kneehole had to be curved to accommodate the rotating cases.

Both these patents reflect Wooton's goals as an inventor. He seemed less concerned with gadgetry, mechanisms and the technical aspects of desk construction than with the larger questions of the user's needs. He saw the trend toward bigger business and realized new devices were needed to cope with the changes. His inventions offered efficient, compact utilization of space, as well as convenient access to high-capacity storage and filing systems. Wooton desks were used by all kinds of businessmen, including those at the forefront of industrial and financial development. John D. Rockefeller owned one, as did railroad magnate Jay Gould and President Ulysses S. Grant.

In spite of the worldwide success of his furniture business, by 1880 Wooton had turned away from it to devote his full energy to various Quaker ministries across the country. After he sold the business, it was renamed the Wooton Desk Manufacturing Co. and continued to produce desks in Indianapolis and Richmond, Ind., under various owners until 1897. When Wooton died on Aug. 26, 1907, his obituary remembered him only as a well-known evangelist and religious organizer who as a young man spent his spare time in cabinetmaking.

The age of the Wooton desk—Throughout the 20 years that Wooton desks were produced, the basic form remained the same, although there were numerous modifications in the details of functional design and decorative styling. In tracing the changes, one can distinguish an early period of experimentation followed by increasing standardization. The early desks display various com-

Photo: Courtesy of Richard and Eileen Dubrow Antiques

Wooton's Rotary Desks featured pedestals with pigeonhole cabinets that pivoted open. They were available in only two grades, standard and extra, but came in an array of styles, including flat top, roll-top and cylinder top. The standard-grade flat-top oak desk with a single rotary tier ***(left)*** *was the simplest example of this style, while the extra-grade cylinder-top two-tier rotary desk* ***(below)****, with its burl-veneered panels and incised designs, was one of the most ornate.*

Above: *The Eastlake pattern secretary was an attempt to capitalize on the popularity of Charles Eastlake's book* Hints for Household Taste, *which decried excessive ornamentation. The plain pattern secretary* ***(below)*** *was developed after the Wooton Co. moved to Richmond, Ind., in 1884. It was similar to the original ordinary-grade desk, but was even plainer.*

Building the king of desks

by Gene Lehnert

A Wooton desk is a magnificent piece of furniture. Even though the Victorian-age filing system is a little outdated, I think the Wooton Cabinet Secretary offers several advantages over a flat-top desk. I've seen a Wooton used quite effectively as a credenza behind a conventional desk, and as a home office, the 100-plus pigeonholes provide a hiding place for everything. Just as the manufacturer claimed in the late 1800s, it is unquestionably the "king of desks."

Building a Wooton Cabinet Secretary is an involved process that touches on almost every facet of woodworking: carcase joinery, box-in-box construction, turning, carving, engraving, joinery, pigeonhole construction, shaping moldings and veneering; it also requires leather work, metalwork and even cardboard work (used for the ledger-card file boxes). The drawing on p. 57 shows how a Wooton desk goes together and it gives the overall dimensions of a black walnut secretary I built (also shown in the top, right photo on p. 56). It is a reproduction of a standard-grade desk that I measured during a repair job. My material costs ran around $1,600, which included leather for the writing surface; brass for the hardware; veneer for drawer fronts, writing flap and exterior raised panels; as well as about 150 bd. ft. of black walnut and 90 bd. ft. of pine for drawer parts and pigeonholes and as structural material in the main case and doors. The following construction tips aren't intended to cover everything you need to know to build a Wooton, but an experienced furnituremaker with adequate time

Photos this page except where noted:
Wooten Patent Desks, manufactured by the Wooten Desk Co. in Indianapolis, Indiana
Collection of the Oakland Museum of California

binations of shelves, drawers and pigeonholes and the exterior designs varied from desk to desk. But by 1876, the Wooton Desk Co.'s first illustrated catalog showed the company had developed standardized designs that allowed it to adopt more efficient mass-production techniques to meet the increasing demand for its products.

The 1876 catalog showed six different models of Rotary Desks, each in two grades: standard and extra. They included flat-top, roll-top and cylinder-top desks with rotary cases installed in both ends or just one; there was also a Partner's Desk with rotary cases installed in all four corners. The secretaries in the catalog were offered in four grades—ordinary, standard, extra and superior. The catalog illustrations were carefully drawn in great detail and match numerous extant desks. Further, existing desks match each other in the configuration of interior compartments and in the stylistic detailing on the exterior. The variation that appeared in earlier secretaries was no longer tolerated; in fact, special requests for pigeonhole alterations were refused. An 1875 letter from the Wooton Desk Co. to Spencer Baird at the Smithsonian Institution states that the company was "so hurried in getting out our desks that we cannot at this time undertake any changes in interior arrangement of desks." According to the *Indianapolis News* of April 14, 1876, the factory was producing 150 desks per month and marketing them to customers worldwide.

The significant difference between the grades of Cabinet Secretaries and Rotary Desks was not in function but in decorative style and ornamentation. All grades of Wooton desks had similar pigeonhole configurations and were constructed primarily of black walnut from Indiana forests. But the amount and complexity of the exterior ornamental detailing and the type of veneer used on the raised panels depended on the grade of the desk. The ordinary grade had no veneer. Burl walnut adorned the standard grade; maple or Spanish cedar trimmed the extra grade; and the most expensive veneers—holly, satinwood and ebony—embellished the superior-grade desks.

By using grades to distinguish its models, the company clothed its desks in robes of increasing richness so they could be sold in a variety of markets. At a time when cabinetmakers earned about $2 per day and a seven-piece suite of parlor furniture could be purchased for $55, even the smallest ordinary-grade secretary was expensive at $100. The standard-grade secretary cost between $135 and $165, depending on the size of the desk, and the extra grade sold for between $200 and $250. The superior grade (shown in the photos on pp. 52-53) cost from $500 to $750, which was so expensive for the time that even John D. Rockefeller purchased an extra- rather than a superior-grade secretary.

Between 1880 and 1884, the Wooton Desk Manufacturing Co. changed its marketing approach. The ordinary and superior grades had proved unpopular and the company stopped marketing them. Further, the concept of grades was replaced by an emphasis on pattern, which allowed production of more models in the standard-grade category. The Wooton Desk Manufacturing Co. then sold four *patterns* of desks: the standard pattern and the extra pattern, which looked the same as before, and two new patterns, the Queen Anne and the Eastlake (shown in the top, right photo on the facing page). The Queen Anne pattern is well represented among surviving desks, which attests to its popularity. On the other hand, Eastlake pattern secretaries, named after furniture-design writer Charles Eastlake, are rarely encountered today.

One other pattern of secretary was developed, probably after the company moved to Richmond, Ind., in 1884. The interior of the new plain pattern (see the bottom, right photo on the facing page) was only slightly simpler than the other desks, but the exterior was plain indeed. There was no decorative gallery, no carving and no veneer to contrast with this oak secretary. Some of the exterior moldings had chamfered edges and others were reeded, but the effect was simple and utilitarian. Perhaps the design simplicity reduced the cost of production and put the selling price within reach of new customers, because this pattern is well represented among surviving desks.

The plain pattern seems to have been the company's last success. During the 1870s and 1880s, when large pigeonhole files were a viable solution to the businessman's needs, the company had merely to keep pace with popular taste in furniture design. But by the 1890s, it was the functional rather than the decorative aspect of Wooton desks that had become old fashioned. The increase in paperwork had outgrown the limited storage capacity of a Wooton desk and pigeonholes were being replaced by the widespread use of manila folders and file drawers. Unlike the easily remodeled decorative style of the desks, the functional design was bound by the patent specifications. It could not be significantly redesigned and the product still be called a Wooton Patent Desk. And so the time passed when Wooton's ingenious invention could be called the "Desk of the Age." □

Deborah Cooper is project manager at the Oakland Museum in Oakland, Cal. Parts of this article were adapted from essays by Cooper and Betty Lawson Walters in the 1983 exhibition catalog, Wooton Patent Desks: A Place for Everything and Everything in Its Place, *published jointly by the Indiana State Museum, Indianapolis, Ind., and The Oakland Museum, Oakland, Cal.*

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and patience should be able to glean enough to draw a plan and build a similar desk.

Base: The rectangular area of the base is sized to fit the main case, and the side pieces, or legs, extend to support the doors. I laminated the legs from five pieces of ¾-in.-thick stock and doubled up both cross pieces. It would have been nice to use a shaper with knives ground to the leg molding profile, but I achieved the same results with multiple router passes using three different router bits. The door support bumper helps prevent the doors from sagging and keeps the mating doors positioned when closed.

Main case: The case must be solidly built and securely joined to the base to support the hinged doors and writing flap when open. The ¾-in.-thick side frames are mortised and tenoned together, and their front edges are doubled to create a 1½-in.-wide surface for the hinges. I reinforced the rail-and-stile joints of the side and back frames by gluing and screwing ⅝-in.-thick pine boards across them on the inside of the case, although this was not done on the original. The bottom is glued and screwed into rabbets in the sides, and the top overlays the sides and is screwed and glued to the top rails of the side and back frames. The two horizontal dividers are glued and screwed to the top of the pine reinforcing boards that run front to back. I glued and screwed 2x2s to the case bottom to secure the case to the base.

Door cases: Door construction is similar to case construction except for the curved parts at the top. I bent the curved rails, which have an outside radius of 12 in., by kerfing their back sides and soaking them in water. I cut the blanks for the C-caps and the

Left and right: *Lehnert patterned his desk after a Wooton standard-grade cabinet secretary. He took great pains to reproduce the details, including 40 cardboard drawers, incised decorations on the writing flap and intricate patterns on the hinges.* ***Below, left:*** *A trophy-plate engraving machine is used with a double-size template to carve the hardware patterns onto a brass sheet. Then the hardware's outer shape is sawn.* ***Below, right:*** *Lehnert uses a Mill-Route duplicating machine to rout the design on the writing flap panel. The Mill-Route works like a pantograph: it guides a router via a stylus that is moved around a full-scale pattern of the desired design.*

front and side panel moldings with my bandsaw circle-cutting jig. Note that the inside radius of the front panel moldings is ¾ in. smaller than that of the C-caps to accommodate the deeply inset curved panel. The panel is a ¼-in.-thick pine board, which I soaked for a day so it would be pliable enough to bend. I then glued and screwed it to the back side of the curved rails and applied the walnut burl veneer to the panel after it had fully dried.

As with the main case, the framework is reinforced by ⅝-in.-thick pine boards glued across the joints inside the door cases. The left door is 1 7/16 in. narrower than the right door so the moldings on the right door are centered when the doors are closed. The center moldings overhang the right door by 9/16 in. to span the 5/16-in. gap between the doors and to overlap the left door by ¼ in.

The decorative groove (false frame and panel) on the inner sides of the door cases is routed with a template and guide bushing. The door latch operates via a T-handle connected to a 14-in.-long steel rod running through the inside of the right door. An old-fashioned keyed door-lock mechanism is mounted under the escutcheon on the door case. When the handle is turned, a notched latch engages a hook on the main case and a lock strike on the left door.

Pigeonholes: The pine pigeonhole boards are trimmed with solid walnut splined onto their front edges, which adds a dramatic color variation. I cut and dry-assembled the outer frame of the pigeonhole sections first, to ensure they fit perfectly inside the cases. I used a dado blade on the tablesaw and a sliding crosscut table with a hold-down clamp to cut the shallow dadoes for joining the parts.

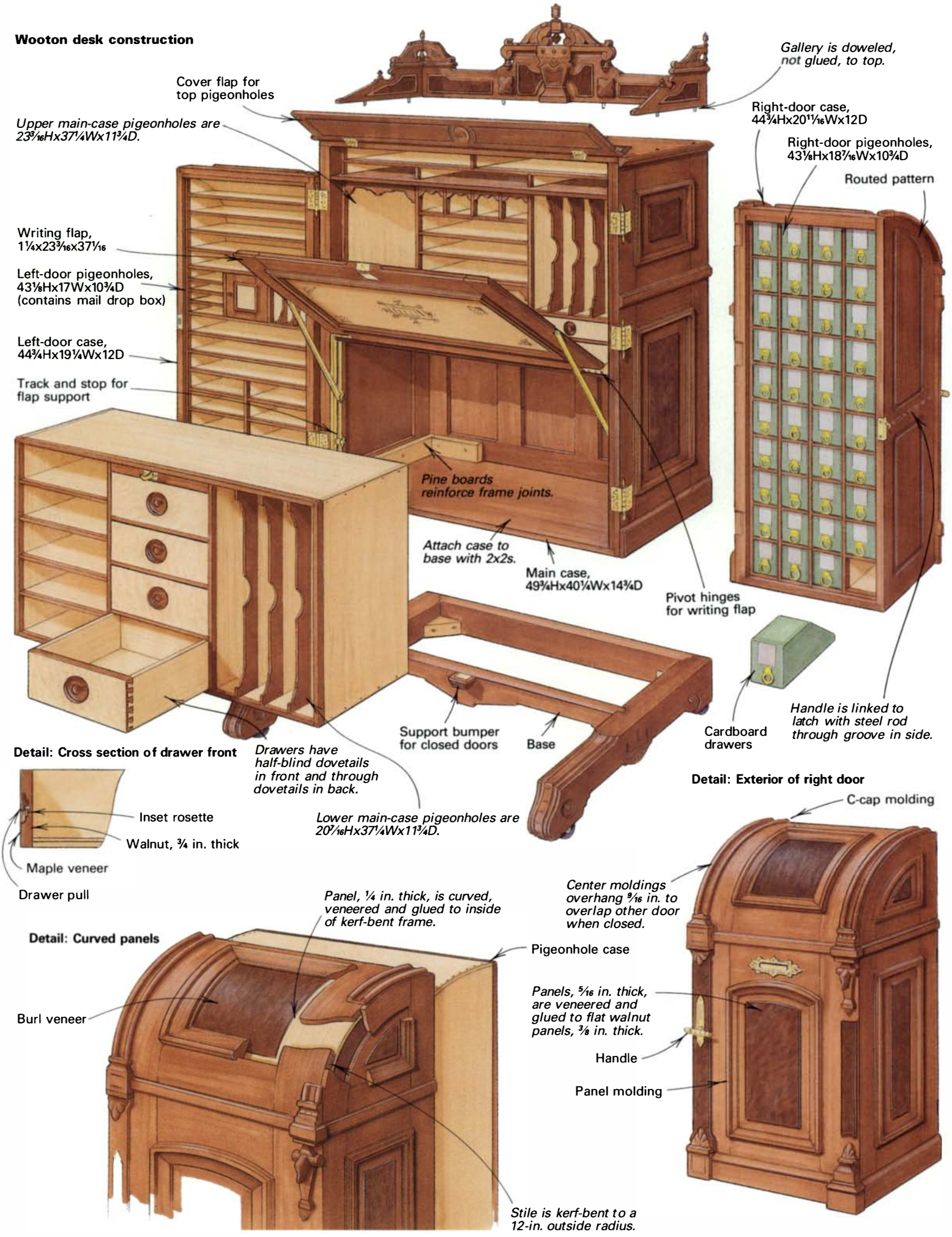
Engravings: The original Wooton desks had decorative cast hinges and escutcheons. But when I found it would cost about $3,000 to set up and cast the hardware for one desk, I decided to engrave it instead. I made charcoal rubbings from an original desk and photo-enlarged them to double size. Working from these copies, I used a scroll saw to make ⅛-in.-thick plastic templates and engraved the brass hardware using a two-to-one trophy-plate engraving machine (see the bottom, left photo). I then sawed the outer shape of each particular piece of hardware, spray painted them black and removed the paint from the engraved surfaces with steel wool. The decorative design in the bird's-eye maple veneer on the writing flap was routed similarly. Here, though, I used a Mill-Route duplicating machine (made by Progressive Technology, Box 672525, Houston, Tex. 77267) and a one-to-one pattern (see the bottom, right photo).

Detailing and finishing: The decorative appliqués and carved elements of the gallery were roughed out on the bandsaw and then carved to final shape and assembled. I sanded all surfaces to at least 200-grit and most to 600-grit before finishing. Much of the furniture built during the Victorian period was varnished and so I wanted to follow suit. However, the vertical surfaces, pigeonholes and numerous carvings and moldings intensified problems with varnish runs and sags. I solved these problems by using Bartley's Clear Varnish (available from Bartley Collection Ltd., 3 Airpark Drive, Easton, Md. 21601). This gel varnish is applied like an oil finish; it's rubbed on with a cloth and the excess is wiped off almost immediately. For the pigeonholes that were too small to get my hand into, I applied the finish with a cloth wrapped around a stick. □

Gene Lehnert teaches woodworking and builds furniture in Galveston, Tex.

Photos this page: Jim Boesel; drawing: Bob La Pointe

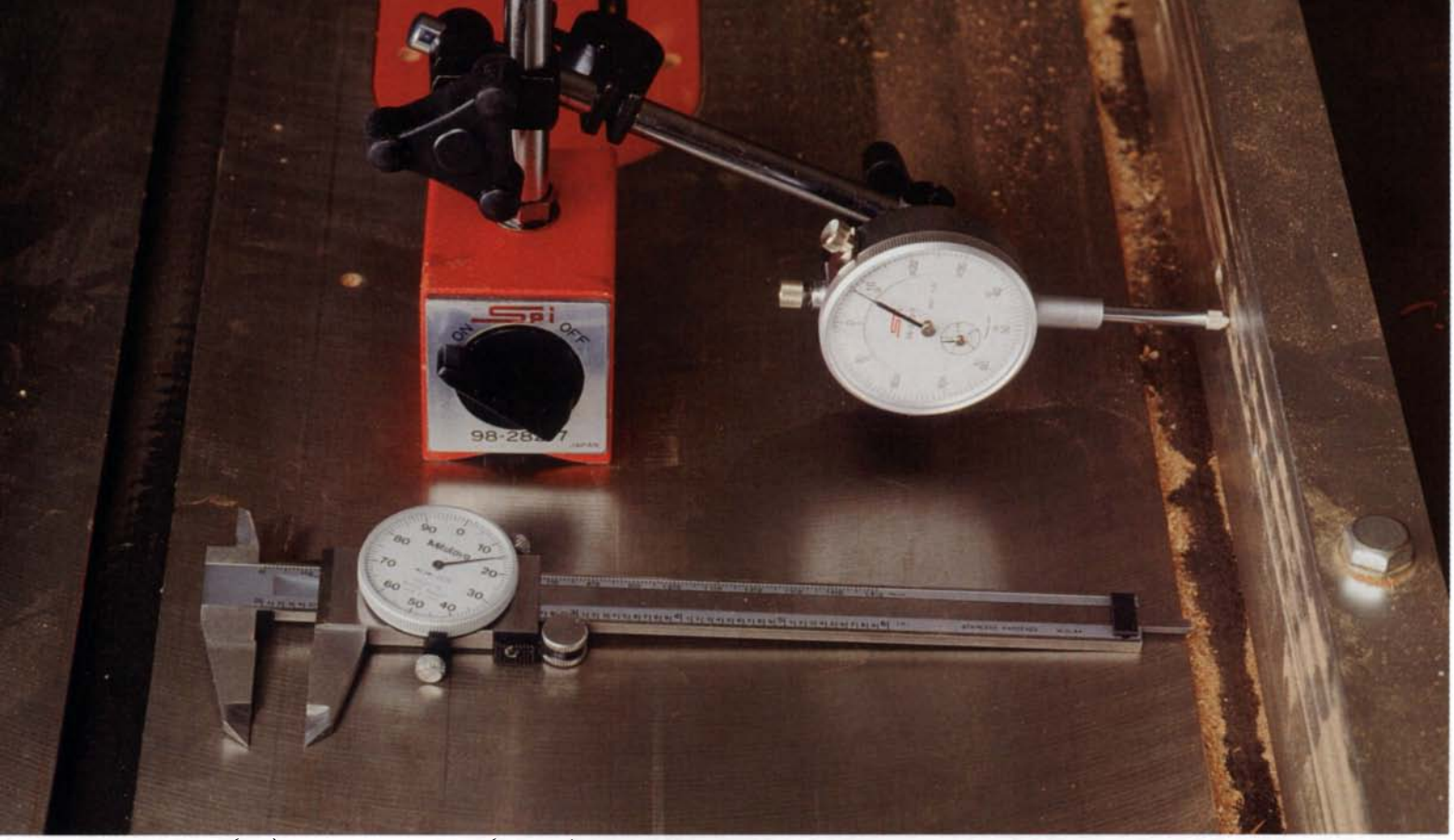
Wooton desk construction



Detail: Cross section of drawer front

Detail: Exterior of right door

Detail: Curved panels



A dial indicator (top) and a dial caliper (bottom) are precise machinist's tools that are very handy in the woodworking shop for jobs like setting up equipment and jigs, troubleshooting problems, such as cutter vibration, and measuring wooden parts.

Using Dial Indicators and Calipers

Machinist's tools for woodshop setups and measurements

by Robert M. Vaughan

Eighty bucks can buy a lot of nice things for your woodshop. So why spend the money on a pair of machinist's instruments—a dial gauge and dial caliper—that you probably won't use everyday? The answer is that these two precision measuring tools will help keep the machines you depend on running at peak performance and with greater accuracy than ever before.

When used either alone or together, a dial indicator and dial caliper are extremely versatile tools capable of dozens of precise measuring jobs in the woodshop. They are useful when making delicate adjustments to machinery and jigs, such as squaring up a drill press table to the bit, setting the height of a shaper cutter, or adjusting a fence on a router table. Further, a dial indicator is indispensable for diagnosing machinery problems, such as warped sawblades or bent arbors—necessary evaluations when buying or repairing used machinery as well. Dial indicators and calipers also earn their keep when directly measuring wood and wooden parts: checking the thickness of a freshly planed board, determining a dowel's actual diameter, or laying out mortises and tenons. When used together, the dial indicator and caliper complement each other; after precise adjustments to a machine setup are made with the dial indicator, you can use the caliper to check the effect, by measuring a test piece cut on the machine.

It takes a bit of effort to learn how to use these devices, but no more than what is required to operate a new microwave oven or car stereo. Here I'll tell you how I choose and use dial indicators and calipers in my woodworking shop, including which types to buy (and where to find them), how they operate and how to set them up. And I'll present more than a dozen different applications, to give you some ideas for using them in your own shop.

Dial indicator and caliper anatomy—Dial indicators, dial calipers and their accessories are built to exacting standards, and typically capable of measuring minute differences within a few thousandths of an inch. At the heart of both tools is a small gauge, with a watch-like needle that shows readings on a calibrated dial. On both tools, the dial is movable so it can be set to zero, regardless of needle

Photo this page: Sandor Nagyszalanczy

position. While these tools come in many sizes and dial configurations, increments on most are 0.001 in., with one revolution of the needle equaling 1/10 in. A secondary dial on some dial indicators shows how many times around the needle has traveled.

The needle on a dial indicator gauge is connected to a spring-loaded plunger that moves in and out, turning the needle via a rack-and-pinion gearing system. Most plungers accept screw-on removable tips, which are available in a variety of styles for different applications. The gauge attaches to a set of adjustable arms that allow the indicator to be positioned over or beside the part being measured. The arms mount to a special base that has an on/off switch that controls the strong magnets inside, used to clamp the tool to a metal surface. The dial indicator is meant to be held stationary by the magnetic base while the part you wish to measure presses against the tip of the indicator's plunger. Before taking a measurement, the indicator's rotating dial should always be turned until the needle reads zero. Now any variation in the measured surface as the part is rotated or moved past the indicator's tip will be displayed in thousandths of an inch by the needle on the dial.

Like the dial indicator, the needle on the dial caliper's gauge is actuated by rack-and-pinion gearing and reads the motion of two sets of jaws designed to take inside or outside measurements. As the jaws open, a rod slides out the bottom of the tool, for measuring the depth of holes and recesses. Most dial calipers have a small thumb wheel for adjustments and a knob to lock a measurement in place.

Both of these precision instruments need to be treated with care and should be stored in a covered box when not in use. Wood chips and dust can clog the gears on a dial caliper or the plunger on the dial caliper; a small paint brush is handy for sweeping away dust.

Which tools to buy—Although there are many styles of dial indicators and calipers, I recommend that the average woodworker buy a dial caliper with a 6-in. measuring range and a dial indicator with a 1-in. range. Since these instruments are tools of the machinist's trade, local machine-tool dealers or industrial suppliers are logical sources. However, these dealers often only inventory medium- to high-quality instruments with name brands like L.S. Starrett Co., Brown & Sharp and Mitutoyo. A top-quality dial-indicator set and dial caliper can easily run $300. Fortunately, many mail-order machine-tool houses offer imported dial indicators, magnetic bases and dial calipers that are adequate for woodworking applications and together cost under $80 (see the sources of supply box).

Often, good-quality, used dial indicators and calipers are available at pawn shops. But check them before buying: Push the dial indicator's shaft in and out and make sure the needle returns precisely to the same spot each time. If it returns slowly or roughly, particularly when the indicator is upside down, the plunger shaft is probably distorted or bent. If you notice this problem, never squirt oil or WD-40 into the works; it wreaks havoc with delicate working parts. When buying a used dial caliper, check the jaws for dings or alignment problems, and make sure they operate smoothly.

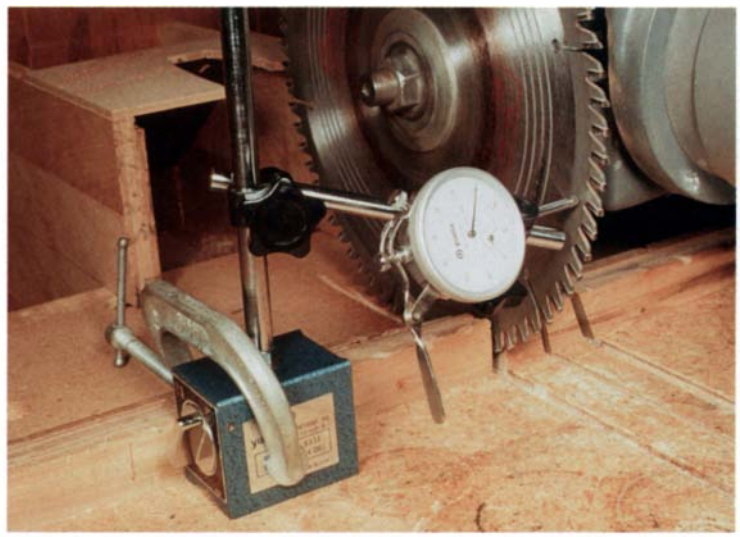
Principles of use—As versatile as dial indicators and calipers can be, they're like a set of encyclopedias—they must be used to be of any real value. When using the dial indicator on machinery, there are a few general rules to follow. Most importantly, you must unplug the machine before beginning work and *never* use the dial indicator to read a shaft or surface that's turning under power! Fix the indicator's base to the machine's metal table or frame or, if you're working on a wooden jig, clamp the base in place. Then position the plunger tip against the part and perpendicular to (or parallel, as in the case of setting shaper knife height) the surface or shaft in the direction you want to measure. For example, to check the runout (the amount that a shaft or disc is out of round) of a sawblade, the plunger is placed perpendicular to the flat body of the blade. On narrow surfaces, such as the side of a thin shaft, a large, flat accessory tip screwed to the plunger makes it easier to get a true reading.

When turning a shaft, pulley, etc., to take a measurement, isolate the turning force as far from the part being read by the indicator as possible. For example, when checking spindle runout on a drill press, turn the motor pulley rather than the spindle, because hand-turning can deflect the spindle and give a false reading. When measuring thin or delicate items, put as little indicator plunger pressure as possible against the surface being measured, to avoid deflection from the plunger spring. Also, examine the surface being checked for large dips, protrusions, burrs or rough spots. These defects can make the indicator show more runout than there is.

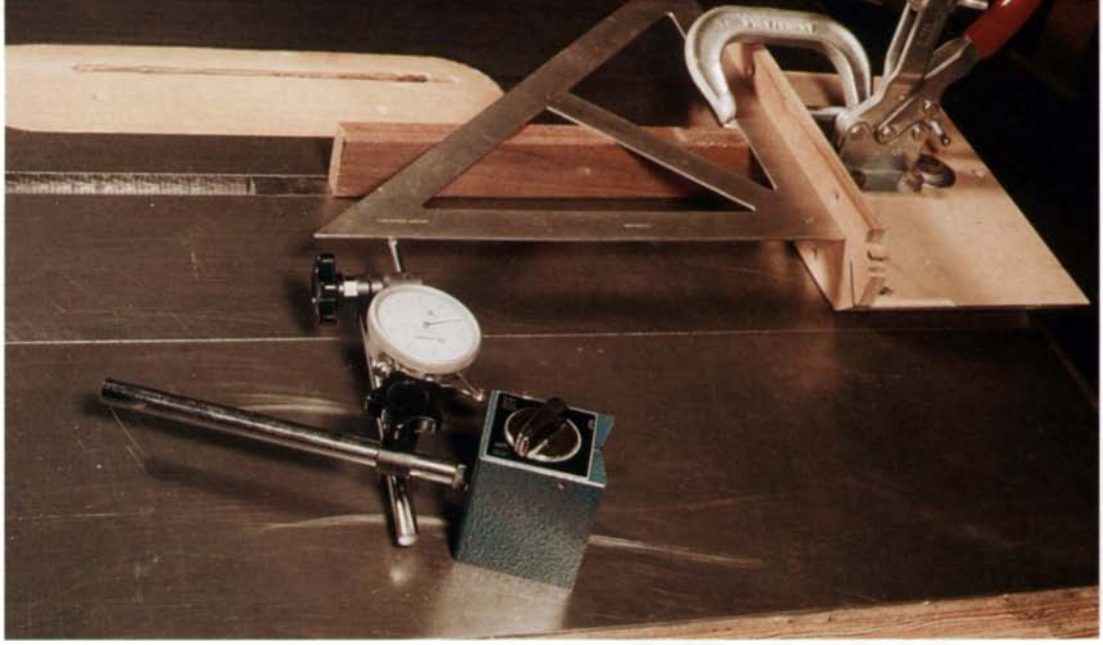
Getting accurate readings from a dial caliper takes a bit of finesse. When measuring the outside of a shaft, drill bit, etc., the caliper's jaws should be positioned at a right angle to the shaft. Apply just enough pressure to close the jaws, especially when checking wooden parts; some woods compress rather easily. Also, wood movement from humidity changes can affect the thickness of a part in one area more than another; several measurements should be taken and averaged, for accuracy. Measuring inside dimensions requires the same technique except on holes with less than 1/4 in. ID. The narrow flats on the edges of the caliper's inside-measuring jaws cause the indicator to read slightly undersize.

Applications—You'll find there are literally hundreds of uses for dial indicators and dial calipers around a woodworking shop, but here I'll describe just some of those typical in a cabinetmaking or furnituremaking studio. Experiment and you'll come up with your own favorite applications.

General machinery setup—*Checking adjustment accuracy:* Most machines have handwheel cranks for setting the height or angle of blades and cutters. You can use the dial indicator to determine how much movement occurs in one crank of the handwheel so you can eyeball fine adjustments quickly. Simply set the dial indicator tip against the machine's arbor or spindle, crank the wheel once and read the amount of movement. Then repeat this to be sure. You can divide this measurement by four or eight and put



A dial indicator will quickly tell you sawblade runout in thousandths of an inch. After making sure the arbor is true, the indicator's base is clamped to the radial-arm-saw table and then the indicator reads wobble in the surface of the sawblade.



Left: To set the tablesaw miter gauge at a perfect right angle to the blade, a steel draftsman's square is clamped to the head of the gauge and the indicator bears against the square as the gauge is slid along in the miter slot. Any change in reading indicates that the gauge head is not exactly square and needs adjustment.

Right: The amount a shaper cutter is raised and lowered can be accurately gauged by setting up the dial indicator with the tip against the top of the spindle, as shown. After raising or lowering the spindle the desired amount, take a cut and use a dial caliper to check the results on the workpiece.

tape marks on the handwheel every 90° or 45°, for making even finer adjustments quickly.

Checking an out-of-round pulley: Machine rumble and vibration is often caused by an out-of-round pulley, and with the tip of the indicator against the side of the pulley, you can check the pulley's trueness. If the rumble seems to be in sync with the revolutions of the belt, check by putting the indicator tip against either of the inside surfaces of the V-belt groove.

Checking shaft or arbor runout: After attaching the magnetic base to the machine's table or frame, set the indicator's tip perpendicular to and against a smooth part of the shaft. Watch the needle as the shaft rotates and read the amount of runout on the dial. On threaded shafts, slip a flat sleeve over the threads, to prevent the reading from being affected by the grooves.

Checking for warped sawblades: Put the tip of the indicator against a smooth body of a blade and turn the spindle by pulling on the V-belt or, on a radial-arm saw, by turning the arbor itself (see the photo on the previous page). Mark any high spots with a pencil, rotate the blade 180° on the arbor, lock it on and check again. If the readings for the two blade positions differ, check the saw arbor's runout, as described above.

Tablesaw—*Checking the miter slot for parallel to the blade:* Clamp the dial indicator's magnetic base to the head of the miter gauge; most heads are non-ferrous cast alloy, and so the magnet won't work. After raising the sawblade fully, set the indicator's tip against the face of the blade. Now slide the miter gauge back and forth and watch the readings. Repeat this operation with the blade in several positions, in case the blade is warped. Adjust the saw table on its frame as necessary (see "Tuning Up Your Tablesaw," *FWW* #78) until the indicator reads zero or a minor variation.

Squaring the miter gauge head: Clamp an accurate draftsman's steel triangle (or a try square) to the saw's miter gauge, elevating it an inch or two above the saw table with a scrap of wood (see the left photo above). Fix the indicator's base to the table and set the indicator's tip against one side of the triangle. Now slide the miter gauge back and forth and take a reading; adjust the angle of the head until there is minimal or no variation showing on the indicator.

Setting the rip fence parallel to the miter slot: With the dial indicator clamped to the miter gauge as described earlier, place the indicator's tip against the rip fence and, with the fence locked, slide the miter gauge back and forth. Adjust the fence so that its back end reads a few thousandths of an inch farther away than at the front end. Any roughness on the surface of the fence may cause the reading to undulate a bit; so use your best judgment.

Shaper—*Setting up shaper cutters:* For precise cutter-height adjustment, place your dial indicator's plunger parallel to the spindle so that the tip is against the top of the spindle (see the above photo at right). Then, raise or lower the spindle until you've reached the desired setting, take a cut and use the dial caliper to check the workpiece. If the cut is about 0.007 in. below where you want it, use the dial indicator to confirm that it is raised by the exact amount. The precision fit I get using this method when setting cope-and-stick or glue-joint cutters makes the purchase of these two tools worthwhile.

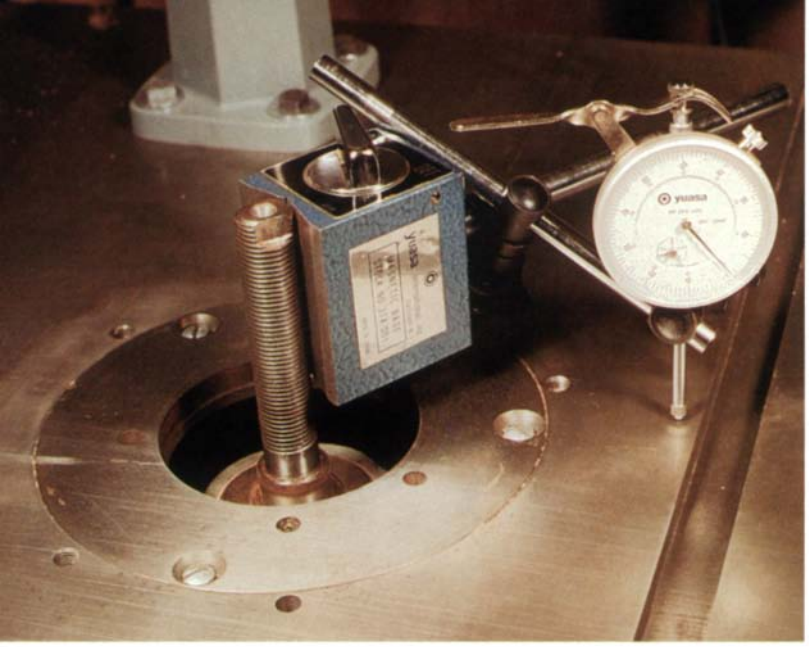
Checking spindle squareness to table: After checking for spindle runout, as described earlier, check for spindle squareness by attaching the base directly to the spindle, using the base's V-groove if it has one (see the top photo on the facing page). Now sweep the indicator around the table; if the needle shows variations from one side to another, the table is out of square.

Drill press—*Checking for runout:* You can check the runout of your drill press chuck and quill by attaching the magnetic base to the column and putting the dial indicator's tip against the smooth surface of the chuck or against the shank of a chucked bit or rod (see the bottom, left photo on the facing page).

Squaring the drill press table: Do this just as described for the shaper, only attach the magnetic base directly to the chuck, or remove the indicator's mounting arm from the base and mount it directly in the chuck and set the indicator tip against the table.

Sizing drill bits: This is an easy job for a dial caliper. If you don't have a caliper, you can use a dial indicator by attaching the base to your saw or jointer table, so that the tip is against the surface, and rolling the drill bit underneath to check its diameter. Use a conversion chart to change decimals into fractions.

Radial-arm saw—*General setup:* The dial indicator is very useful in performing the numerous adjustments necessary to make a radial-arm saw cut precisely (see "Adjusting the Radial-Arm Saw,"



By attaching the dial indicator's magnetic base directly to the shaper spindle, you can check the squareness of the spindle to the table. Closely watch the dial as the indicator sweeps the table; any change in the dial reading indicates that the spindle is out of square with the table.

FWW #73). For instance, to check the saw's squareness of cut, first remove the dial indicator's arm from its base and clamp the arm between the arbor flanges that normally secure the sawblade. Level the indicator's plunger and place the tip against one leg of a framing square while you hold the other leg firmly against the saw fence. Now pull the saw carriage down the arm and watch the reading; adjust the radial arm until there's little or no variation.

Router—*Setting up router operations:* Dial calipers are particularly handy when working with router jigs and setups. For example, you can easily check the diameter of a router bit with the caliper's outside jaws and just as easily check the width of a groove with the inside jaws. You can also use the caliper's rod for measuring the depth of the groove (see the bottom, right photo). Use the dial indicator to check router bits, the collet and arbor for runout (see "Tuning up Your Router," *FWW* #86) or for accurately setting a fence on your router table for cutting box joints, sliding dovetails, etc.

Jointer and planer—*Setting jointer knives:* With the base's magnet off and placed on the outfeed table, lock the dial indicator's arms so that the tip, fitted with a flat tip, touches the table. Zero the indicator's dial and then rotate the jointer's cutterhead so that one of the knives is top dead center. Now slide the indicator's tip over the knife and move it along its length; the dial should read zero across each knife. Using this method, you can also check if the cutterhead is parallel to the outfeed table.

Setting up and using a planer: A dial indicator, fitted with a special base, is very useful for setting the planer's knives, as well as bed-roller height (see my article "Adjusting a Planer With a Dial Indicator," *FWW* #70). You can use the dial caliper's outside-measuring jaws to check the thickness of stock before or after it's run through a thickness planer.

Joinery—*Making dowel joints:* Standard-size dowels aren't always exact in diameter. Check dowel diameter with the dial caliper; rotating the dowel while measuring will tell you if it's out of round as well. Use the caliper's inside-measuring jaws to size the hole produced by your drill bit and doweling jig before glue-up, to avoid a too-tight or too-loose joint.

Mortise-and-tenon joinery: Just as with checking dowel diameter, you should use the dial caliper to check your tenons for proper thickness, shoulder size and depth, and to check the mortises for proper size and depth, all of which will produce a stronger joint and make glue-up a lot easier. You can also use the dial indicator to set the fence for either tenon cutting or mortising; the dial will show you how far the fence is moved in or out, so you can make an adjustment within a few thousandths of an inch needed for a perfect fit. □

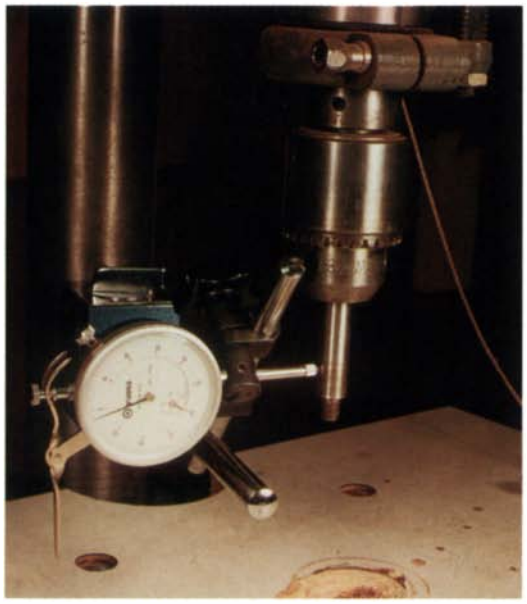
Bob Vaughan is a woodworking-machinery rehabilitation specialist in Roanoke, Va. Photos by author except where noted.

Sources of supply

Dial indicators and/or dial calipers are available from the following.

Enco Manufacturing Co., 5000 W. Bloomingdale, Chicago, IL 60639.
Grizzly Imports Inc., 1821 Valencia St., Bellingham, WA 98226.
MSC Industrial Supply Co., 151 Sunnyside Blvd., Plainview, NY 11803.
Penn Tool Co., 1776 Springfield Ave., Maplewood, NJ 07040.

Photo: Sandor Nagyszalanczy



Left: To check a drill press chuck for concentricity, attach the dial indicator's base to the column and set the indicator's tip against a chucked drill bit or rod. Any change in reading indicates runout.

Right: A dial caliper has special jaws for making several kinds of precise measurements, including a rod that slides out the bottom of the tool for checking the depth of a groove in a frame member.

Oscillating-Spindle Drum Sander

Shop-built machine for smoothing curves

by Joseph E. Konkle

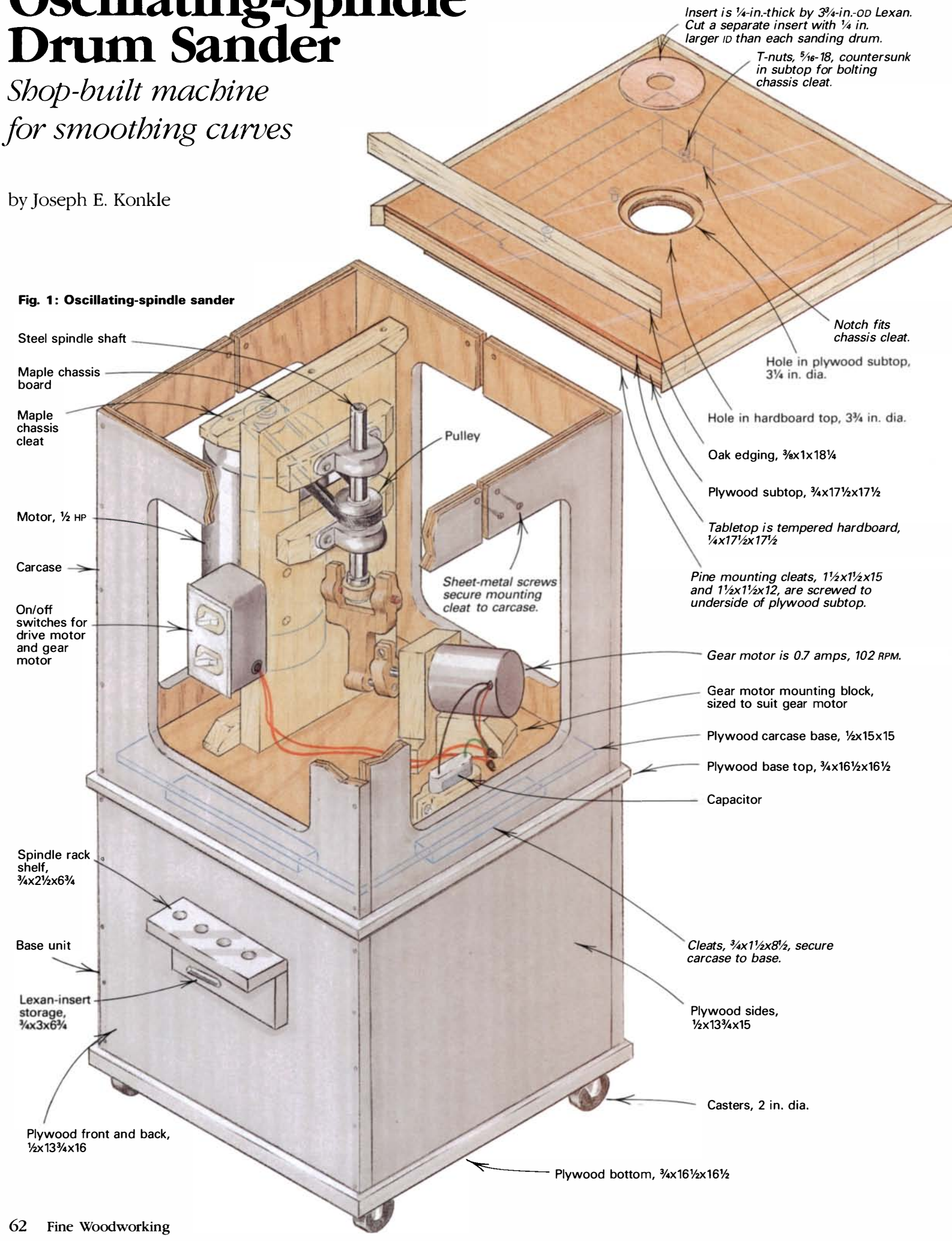


Fig. 1: Oscillating-spindle sander

You can't beat the accuracy and convenience of an oscillating-spindle sander for smoothing the edges of curved work like furniture aprons or legs. You simply cut the pieces wide of the line and then precisely sand to the exact size needed, and you can do this without leaving the sanding scratches so common with an ordinary drum sander. In spite of the spindle sander's utility, its price has kept it out of most home shops like mine, and so I developed an economical shopmade alternative, shown at right and in figure 1 on the facing page. My sander is readily assembled from some fabricated wood parts, a fractional horsepower-drive motor, a gear motor to provide the oscillation, and a handful of common hardware. I glued together pairs of 2-in.-long rubber expansion drums of various diameters, like those normally used in a drill press or portable drill motor, and mounted them on a carriage bolt to make the sanding spindles. The drive motor rotates the sanding spindle at 1,750 RPM, while the gear motor provides 102 oscillations per minute with 1½ in. of travel.

Assembling the chassis board—This machine started as an idea and then evolved bit by bit as I worked out the details. I began by clamping the chassis board, shown in the photo and figure 2 on the next page, to my workbench and then moving the motor, drive shaft and other parts around on it until I had figured out how the mechanics were going to work. Then I bolted everything in place. Once I had everything functioning properly, I built the carcase around the chassis board (see figure 1).

Begin making the 1x8⅞x17 hard maple chassis board by laying out and drilling the 12, 5/16-in.-dia. mounting holes for the motor, pillow blocks and cleats that connect the chassis board to the tabletop and base. I mounted my components with T-nuts, so I could tighten everything with a single wrench, but regular nuts and washers can also be used. If you use T-nuts, drill ⅜-in.-dia. holes to accept them. Then drill the 5/16-in.-dia. screw hole. You may have to relocate some of these holes depending on the motor you use. (Your motor should rotate counterclockwise when viewed from the shaft end, to keep the sanding drum tight in the shaft threads.) Next, I drilled a hole for blade access and used a scroll saw to cut the 1⅞-in.-high by 3½-in.-wide hole for the drive belt to pass through the chassis. Then I cut two pieces of 1x1½x7 maple for mounting the self-aligning bronze pillow blocks (bearings that can accommodate the rotating and linear movement of the shaft). The maple mounting blocks provide clearance between the drive shaft and chassis board for the thrust collar and the yoke, which together with the crank arm transfer the gear motor's rotary motion to vertical movement in the shaft. The chassis board attaches to the carcase with a cleat at the top and bottom, as shown in figure 1.

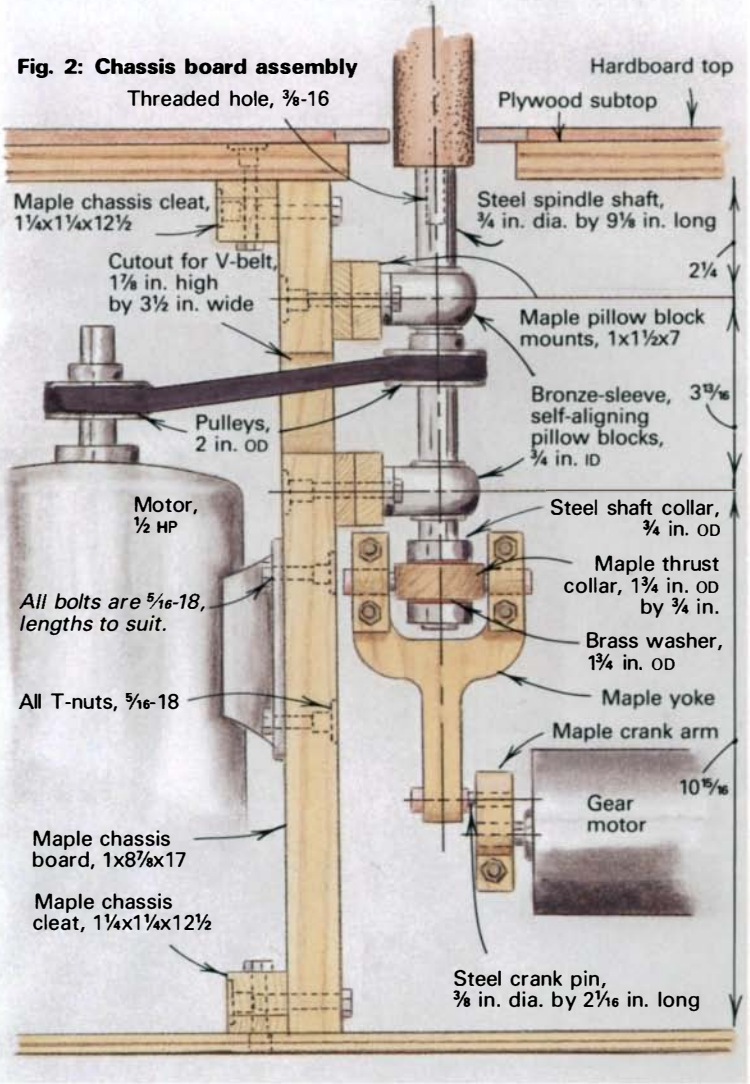
Before assembling the chassis board components, you'll need a ¾-in.-dia. by 9⅛-in.-long steel spindle shaft with the top end dressed square and drilled and tapped 1¼ in. deep for a ⅜-16 carriage bolt. This is an easy job for your local machine shop. To begin assembly, bolt the pillow blocks and their mounting blocks to the chassis. Insert the shaft (threaded end up) through the bottom bearing, the 2-in.-dia. pulley with the V-belt around it, and then the top bearing. With the shaft positioned so its threaded end extended ⅜ in. above the end of the chassis board, I slid the pulley up to within 1/16 in. of the lower face of the top bearing and locked the setscrew. With the shaft in place, I temporarily mounted the motor so the centerline of the 2-in.-dia. motor pulley would be level with the spindle pulley's centerline when it is centered within its 1½-in. stroke between the two pillow blocks. I used ¼-in.-thick shims under the motor base to properly tension the V-belt. A little trial and error may be in order here, as the belt must be loose enough to permit the sander shaft to move up and down, yet tight enough so it won't slip.

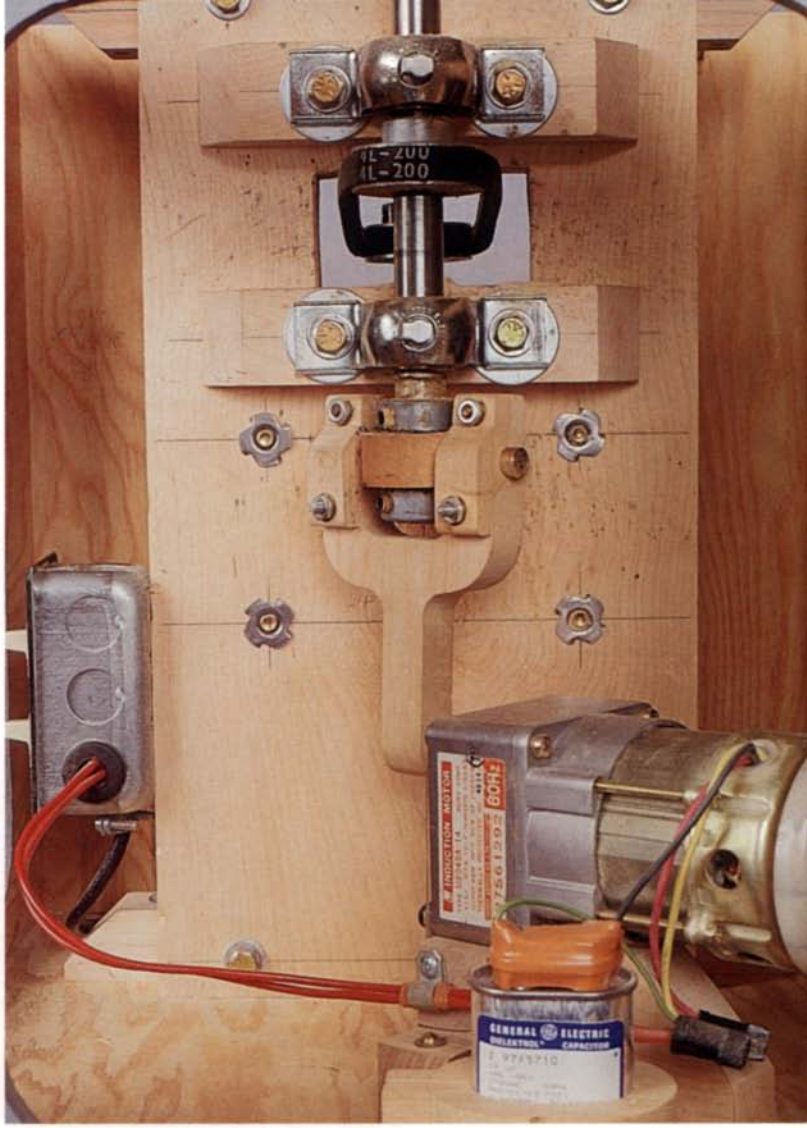
This oscillating-spindle sander is an economical and easy-to-build tool that's also a joy to use. It requires less than a sheet of plywood and except for the drive motor, the parts cost less than $100.

Adding the oscillation—The yoke, thrust collar and crank arm, shown in the left photo on p. 65, in conjunction with the gear motor, provide the up-and-down motion and should be fabricated next. I laid out the yoke on a face and edge of a 1x3 5/16x5⅞ maple blank, as shown in figure 3 on p. 65, and then drilled the ½-in.-dia. bushing holes. It is important that these holes be perpendicular and square to the stock; so I held the work in a vise and bored the holes on a drill press. Bandsaw the yoke from the blank and make the two cuts shown in figure 3 to form the mating surfaces for the bushing caps. Now, draw a profile for the yoke bushing caps on two ¾x¾x2 pieces of maple and then clamp them together, aligning the bushing hole centerlines end to end. Drill a ½-in.-dia. hole centered on the intersection of the butted centerlines and the clamped joint, and then separate the pieces and bandsaw to the lines as laid out. I tested the bushings' fit and opened up the split at the top of the yoke because more clamping action was needed. When the bushings fit securely, drill the 3/16-in.-dia. holes for the machine screws that secure the caps to the yoke and press the lower bushing into the ½-in.-dia. hole, using epoxy to secure it if necessary, to complete the yoke.

Lay out the thrust collar on a ¾-in.-thick piece of hard maple that is at least 1¾-in. square. Drill a ¾-in.-dia. hole through the face of the blank for the shaft, and then drill a ⅜-in.-dia. hole through the blank from one edge to the other for the thrust rods, as shown in figure 3. To be sure these holes are parallel to the face of the collar, the blank should be clamped and bored on the drill press. Next, cut two pieces

Photos: Charley Robinson; drawings: Aaron Azevedo





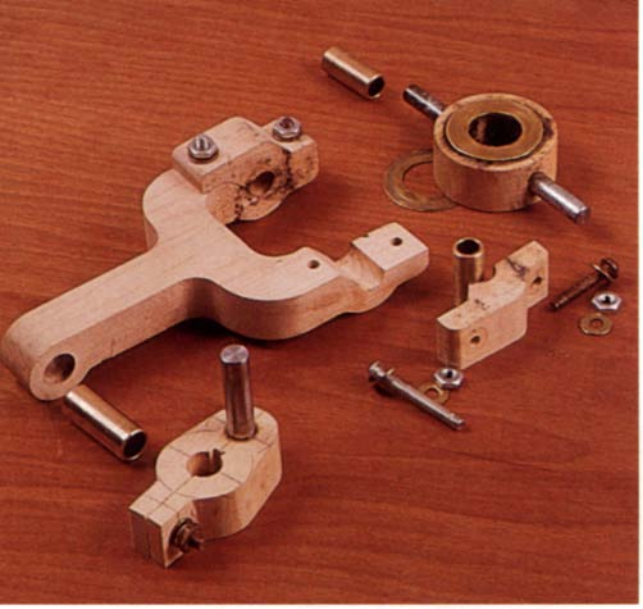
of ⅜-in.-dia. steel rod 1⁷⁄₁₆ in. long and epoxy these into the holes in the thrust collar. Install the completed thrust collar into the yoke and tighten the ⅜-in.-dia. machine screws. Mount the yoke on the end of the spindle shaft with two ¾-in. shaft collars, as shown in figure 2. I've found that a couple of washers cut from sheet brass and inserted between the thrust collar and the shaft collars greatly reduce wear on the maple thrust collar.

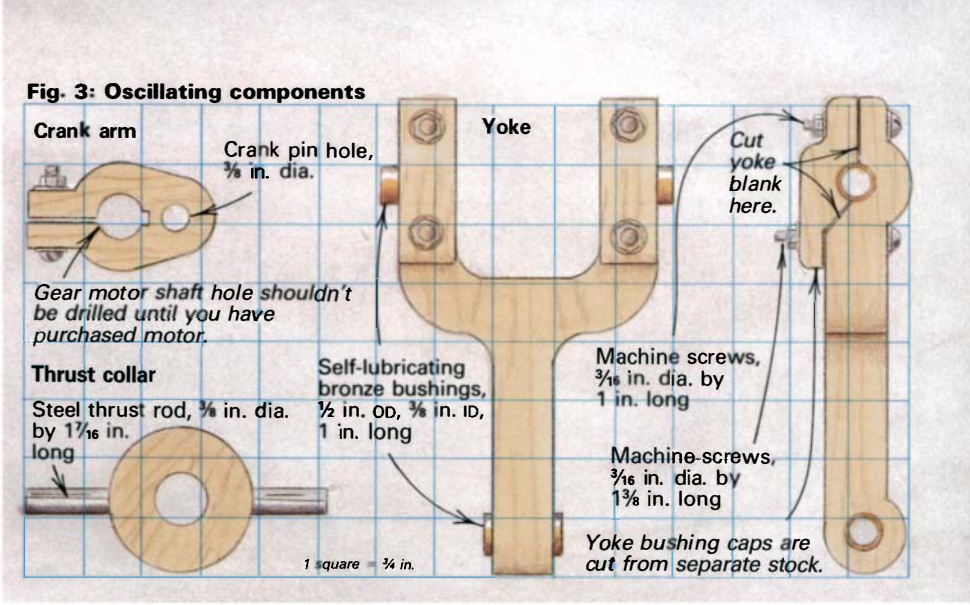
I designed my crank arm for 1½ in. of spindle travel based on an ad I'd seen for a commercial spindle sander. However, the spindle travel can be easily modified for a longer or shorter stroke by changing the distance between the shaft holes on the arm. Again, I drew the crank arm pattern and drilled the holes in the maple blank before bandsawing it to shape, as shown in figure 3. Drill a ⅜-in.-dia. hole for the crank pin and another hole to fit the shaft of the gear motor. (My gear motor required a ½-in.-dia. hole; don't drill a hole until you have your motor.) After bandsawing the outline of the arm, I also kerfed the gear motor shaft hole, and then drilled a ⅜-in.-dia. hole for the clamping machine screw. Cut a 2¹⁄₁₆ in. length of ⅜-in.-dia. steel rod and epoxy it into the crank pin hole. With the mechanical parts completed, I built the carcase to house the chassis board.

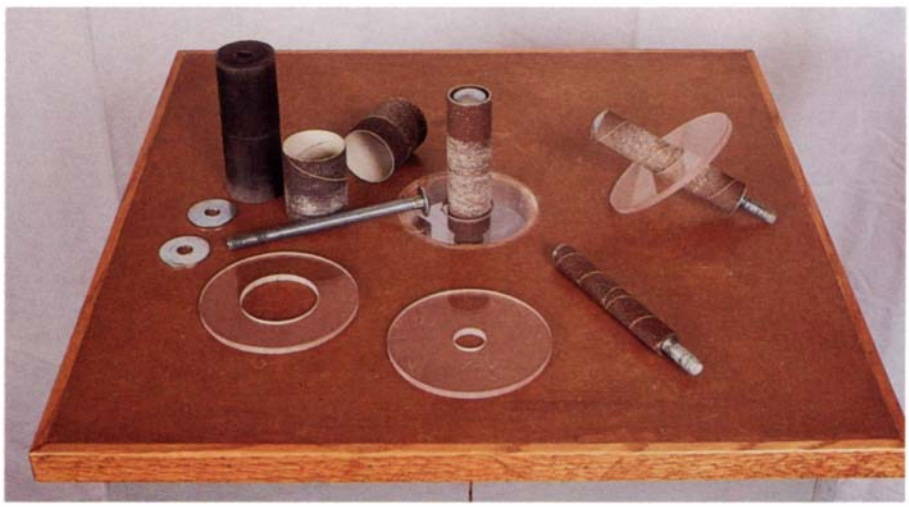
Constructing the carcase—Because I have a very small shop, I wanted my spindle sander to be a benchtop model that would fit under my workbench when it wasn't needed. But after building the 16-in.-sq. by 19-in.-high fir plywood carcase, as shown in figure 1 on p. 62, I found the machine was too tall for comfortable benchtop use. As an afterthought, I added the base (with casters for mobility) to make the unit freestanding and to bring it back down to working height. The base is simply a plywood cube that's butt-joined, glued and screwed (see figure 1). Gravity and cleats screwed to the top of the base hold the carcase in place. If I built this again, I would include storage drawers in the base for my supply of sanding drums, which now takes up other valuable shop space.

The sander's 18¼-in.-sq. tabletop, shown in the photo at right on the facing page, is made from ¾-in.-thick plywood, surfaced with ¼-in.-thick tempered hardboard and edgebanded with ⅜-in.-thick by 1-in.-wide oak. Make the top by cutting the plywood subtop to size and the hardboard top slightly oversize, and mark the centers of both pieces. Use the center mark on the subtop to locate the T-nuts that will secure the chassis board. Counterbore the through holes and then insert the T-nuts into the subtop. To provide a ¼-in.-wide ledge for the ¼-in.-thick Lexan inserts (you need one with a 3¾ in. OD and an inside diameter ¼ in. larger than each sanding spindle you'll be using), I cut a 3¾-in.-dia. hole centered in the hardboard and a 3¼-in.-dia. hole centered in the plywood. After gluing the hardboard to the plywood so the holes are concentric, use a flush-cutting laminate bit in a router to trim the edges of the hardboard to size. I glued and nailed the mitered oak edgebanding in place, and then glued and screwed the mounting cleats to the underside of the top, as shown in figure 1.

The carcase, top and chassis board can now be assembled. Begin by marking the center of the carcase base and lowering the chassis board into the carcase, locating the spindle shaft directly over the just marked center. Depending on its size, you may have to remove the motor. The 10-in.-wide by 13½-in.-high openings bandsawn into each side of the carcase provide easy access for assembling the machine and for belt adjustments later. Mark the carcase base, remove the chassis and drill holes in the base for







***Left:** The chassis board is the heart of this machine and holds most of the mechanical parts, including the drive motor, which is bolted to the back side of the board.* ***Above:** The crank arm, yoke and thrust collar, clockwise from the bottom, connect to the gear motor and the spindle shaft to provide the up-and-down motion of the sander. These maple parts have been in service more than two years with no appreciable signs of wear thanks to the self-lubricating bronze bushings and the brass washers that protect the thrust collar.* ***Right:** The center hole in the hardboard top is ½ in. larger in diameter than the hole in the plywood subtop, to which it is laminated. This difference provides a ledge for Lexan inserts, which support the workpiece. Each drum has its own insert with a hole that has an inside diameter ¼ in. larger than the spindle. Commercial sanding drums that are easily adaptable to this sander are also available.*

bolting the chassis cleat in place. Elongating these holes slightly will allow minor adjustments to ensure the spindle shaft is perpendicular to the table after assembly. Reinstall the chassis board, bolt it to the base and then lower the top in place. After bolting the chassis board to the top, drive #8 by 1½-in. round-head wood screws through all four sides of the carcase into the top cleats on either side of each bandsaw entry cut.

All that remains to complete the assembly is to install the gear motor, but first a few words about gear motors. I used a salvaged motor (from Burden's, 1000 W. O St., Lincoln, Neb. 68528; or Northern Hydraulics Inc., 12205 River Ridge Blvd., Burnsville, Minn. 55337) that cost less than $10. If you use a salvaged or surplus motor, it may not be the same one I used. Also, gear motors come with a wide range of specifications—direction of rotation, RPM and power. Motor power doesn't seem to be a factor (my motor draws 0.7 amps) and direction of rotation is irrelevant. But based on the specifications of commercial sanders, you should choose a motor that runs between 60 RPM and 125 RPM. Also, some motors will require a separate, running capacitor, an electrical device that is essential to proper motor operation. Check the motor nameplate or consult your local electrician for the correct capacitor.

You will have to design a platform to mount your gear motor on the plywood base. To determine the thickness of the mounting platform, clamp the crank arm onto the gear motor shaft and insert the crank pin into the yoke. Make sure both the spindle shaft and the crank arm are in the "up" position and then measure from the base of the gear motor to the plywood base. Some final shimming may be necessary to ensure that the crank and the spindle shaft reach top dead center simultaneously. The gear motor can be positioned on any radial axis from the spindle shaft. I ran wires to two separate switches, one for the gear motor and one for the drive motor, but you can also wire both motors into the same switch.

Making the sanding spindles—I made the sanding spindles by gluing two 2-in.-long commercially available rubber sanding drums together to yield a 4-in.-long sanding face. Remove the stock mandrels, contact-cement the drums end to end, and then slide them onto a 5/16-in.-dia. threaded rod and lightly tighten a nut on each end to hold the drums in axial alignment. After the adhesive sets, ream out the hole in the rubber to ⅜ in. dia. by drilling through with successively larger diameter bits until the rubber easily slips onto a ⅜-in.-dia. by 5-in.-long carriage bolt, which serves as the tightening mandrel. You'll need to grind the shoulders under the carriage bolt head flush with the bolt's outside diameter. As an alternative, Singley Specialty Co. (Box 5087, Greensboro, N.C. 27435) offers 3-in.-, 4½-in.- and 6-in.-long sanding drums that use regular sheets of sandpaper and can be easily adapted to this machine.

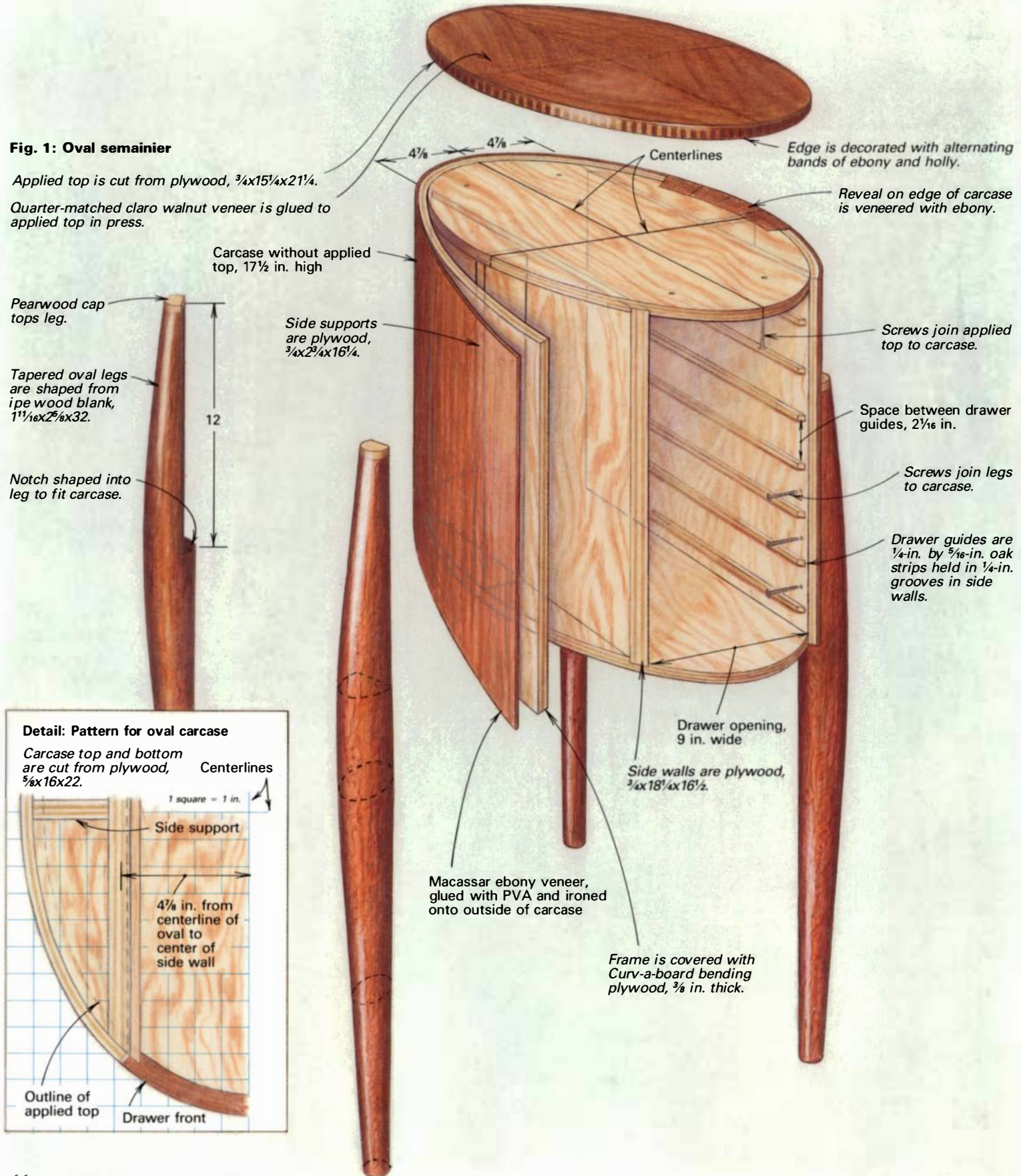
To use the sander, screw the mandrel with sanding drums in place onto the spindle shaft. I've found that hand-tightening expands the rubber sanding drums enough to prevent them from slipping. Spin the sanding drum by hand several times to be sure all parts move freely. If all is well, turn on the motors but be ready to switch them off if anything is amiss. After running your sander for a short time, recheck all fasteners to make sure they are still tight. □

Joe Konkle is an amateur woodworker in South Bend, Ind.

An Oval Semainier

Quick-set veneering a bendable-plywood carcase

by Reid H. Leonard, Ph.D.

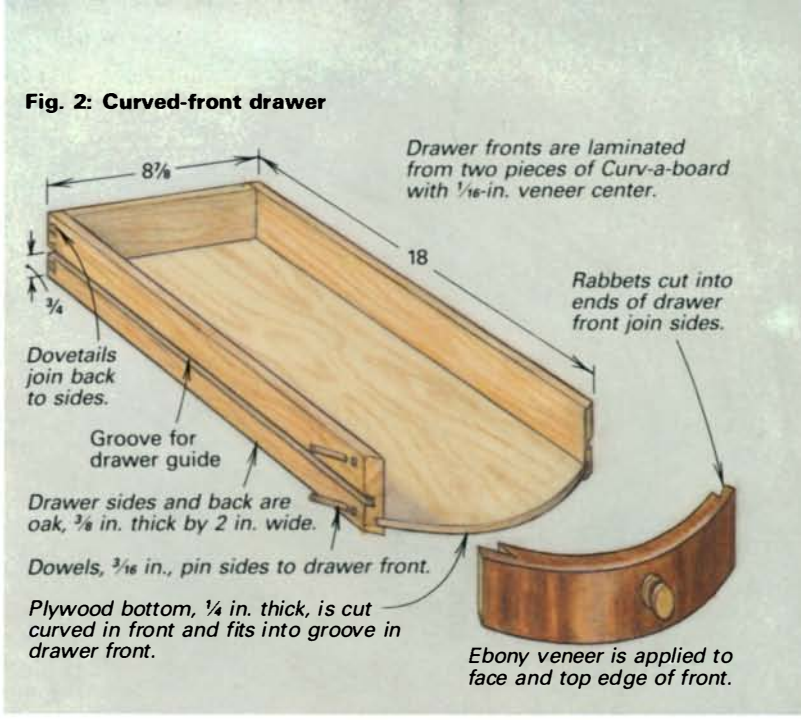


Photos: Sandor Nagyszalanczy; drawings: Lee Hov

I've been participating in arts and crafts shows for years, displaying a wide range of woodwork including tall, seven-drawer cabinets the French call "semainiers." In the last two decades I've made more than 35 semainiers in sizes suitable as sculpture stands or flat files or for lingerie, jewelry or silverware. I built most of these from a secondary wood or plywood and covered it with veneers from my eclectic collection of exotic and domestic species. Veneer lets me use rare woods in an economical way, and it allows decorative patterns not possible with solid lumber.

Although I've also built round and square semainiers, my favorite, shown in the photo below, is oval. But because oval-shaped cabinets, such as those often employed in Parisian Art Deco designs, are difficult to build by standard coopering—not to mention difficult to veneer—I've developed my own method for oval carcases. It involves wrapping a simple plywood frame with a special bending plywood, and then veneering it using white glue (polyvinyl acetate) as an adhesive, pressed and quick-set into place with a regular household iron. In this article I'll tell you in detail how I built my oval semainier, starting with a plywood carcase.

Fig. 2: Curved-front drawer



Building the carcase—The carcase consists of a basic plywood frame covered with the bending plywood. The top and bottom of the case were made first, starting with two pieces of ⅝-in. plywood, each 16 in. wide by 22 in. long. After drawing centerlines down the length, width and edges of each piece, I plowed a pair of ¾-in.-wide by ⅛-in.-deep grooves with a dado blade on my tablesaw. Each pair of grooves was centered 4⅞ in. to either side of the lengthwise centerline (see figure 1). These grooves accept the vertical side walls that connect the top and bottom and form a 9-in.-wide drawer compartment. After plowing the grooves, I drew a 16-in. by 22-in. oval on only the top blank, tacked it to the bottom blank with small brads, and cut out both ovals at once with a sabersaw. With the two ovals still tacked together, I sanded their edges smooth, and then separated them and pulled out the brads. I also cut out the cabinet's two ¾-in. plywood side supports at this time, each 2¾ in. wide by 16¼ in. long.

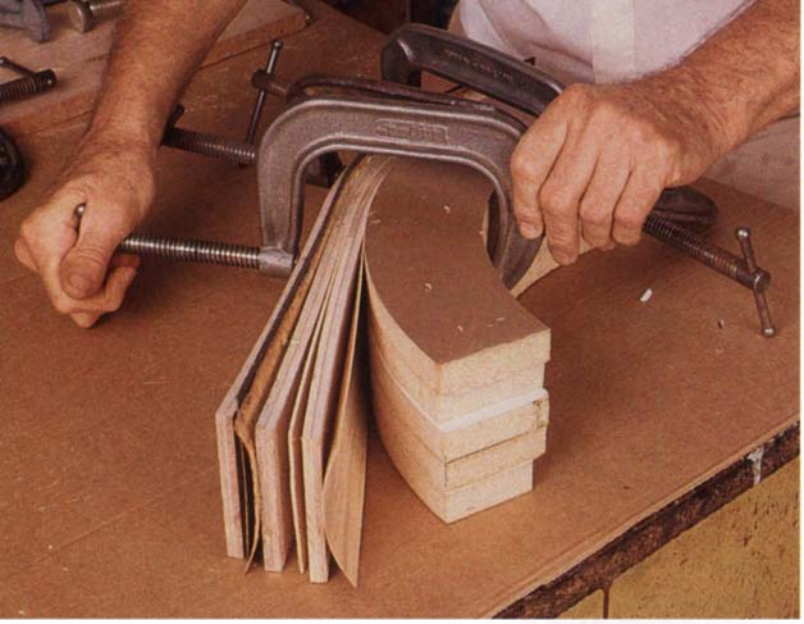
Next, I cut the two side walls, each 16½ in. wide by 18¼ in. long, from ¾-in. plywood. The drawer-facing surface of each side must receive seven grooves, cut with a dado blade, to house the drawer-guide strips. The grooves are laid out on only one side wall, spaced as shown in figure 1. Since all the drawers are the same depth, this layout work is critical and should be done with a marking knife. Following the marks, I set my tablesaw's rip fence for the first ¼-in.-wide by ⅛-in.-deep groove and then dadoed both side walls. I repeated this process until all the grooves were done.

The 14 oak drawer-guide strips were ripped on the tablesaw to their ¼x5/16x18 final dimensions. They were then glued and clamped into their grooves in the side walls. Make sure the guides are well seated in their grooves. Having been careless at times myself, I know from experience that a high-riding drawer-guide strip can create all kinds of trouble later when you're fitting the drawers.

Next I assembled the plywood frame pieces, first applying glue into the dadoes in the top and bottom, and then setting the side walls and side support strips in place. The assembly can be clamped, nailed or stapled until the glue sets. It's important to keep the drawer compartment square during glue-up, and so I cut two scrap pieces and temporarily tacked them across the ends of the sides. After the glue was well set, I handplaned the square edges of the side walls that projected slightly beyond the top and bottom, and then smoothed them to conform to the oval.

Applying the covering—To create a continuous surface on the outside of my semainier, I used Curv-a-board bending plywood

Leonard built this seven-drawer cabinet, called a semainier by the French, from ebony-veneered plywood, using his own method of constructing and veneering a curved carcase.



After making a caul from scraps of particleboard, the author clamps up one of the curved drawer fronts to form a sandwich of bending plywood around a veneer center. Scraps of bending ply and veneer cushion the front while it's being clamped.

Leonard employs an unusual method to apply the veneer to the outside of his semainier: PVA glue that he quick-sets by heating the veneer with a clothes iron. Here, he tests the iron's heat on a scrap to make sure it won't scorch the veneer.

from Paxton Lumber Co., 1815 S. Agnew, Oklahoma City, Okla. 73108. Curv-a-board is a 9mm-thick (a little less than ⅜ in.) three-ply board with two lauan outer layers glued over a thin, flexible center ply. Curv-a-board comes in 4-ft. by 8-ft. sheets and bends parallel to the grain, which runs the width of the sheet. For my first trial with this material, I covered a 12-in.-dia. cylinder, and it worked very well.

I covered the exterior of the oval semainier frame by wrapping it with a single sheet of 17¾-in.-wide by 53-in.-long Curv-a-board. I started by tacking one edge of the ply to the front left side wall, wrapping the ply around the back, and gluing and nailing it down with 3d box nails as I worked around the case. I like nails because their heads hold the soft lauan while the glue sets. The Curv-a-board moaned in protest while it was bent, but it didn't break. Once the sheet was tacked to the right side wall, I used a sabersaw and rasp to trim the ends flush to the drawer opening. I also belt-sanded the slight overhang on the top and bottom of the case. Next, two narrow strips of Curv-a-board were glued and nailed to the edge of the top and bottom around the drawer opening. The nail heads were set below the surface and the seams between these strips and the main panel were sanded flush. I then filled the holes, as well as any other defects, seams or cracks, with auto-body putty.

Curved drawers—The drawers for the semainier are basic in their construction (see figure 2 on the previous page), except for their curved fronts, which I laminated to match the contour of the carcase. Each drawer front was glued up from two layers of Curv-a-board, with a 1/16-in. veneer crossbanding sandwiched in the center, resulting in a final thickness of about 13/16 in. To make a caul for the lamination process, I started by gluing up a 3-in.-thick blank from some particleboard scraps. With a pencil, I first marked a centerline onto the blank and then drew the curve by tracing the narrow end of the carcase. This curved line represents the shape of the final outside surface of the drawer front. To get the final caul profile, I followed the curved line, marking another line parallel to and 13/16 in. (the thickness of the drawer front) *inside* of it. Then I bandsawed to this line, smoothed the surface of the caul and re-marked the centerline.

In preparation for gluing up the drawer fronts, I cut enough Curv-a-board and 1/16-in. veneer for seven fronts. I made each front slightly oversize—2⅜ in. wide by 11 in. long—to be trimmed later. After spreading yellow glue between each layer, I clamped the three-layer sandwich in the caul, using scraps of veneer on the inside and Curv-a-board on the outside, to prevent the clamps from denting the surface (see the top photo). After about three hours of clamp time, each laminated front was removed, but first the centerline was transferred to each new drawer front, to serve as an aid in centering and trimming later. The top and bottom edges of each front were then cleaned up with a handplane, until each was 2¼ in. wide.

Next I cut the drawer sides and backs from ⅜-in.-thick oak. The sides are 2 in. wide by 18 in. long and the backs are 2 in. wide by 9 in. long. The drawer backs are through-dovetailed to the sides, which leaves a 8⅞-in.-wide drawer after trimming. After using a dado blade on the tablesaw to plow a groove in the sides and backs for the ¼-in. plywood drawer bottoms, I plowed another set of grooves in the sides for the drawer guides, making them slightly wider than the ¼-in.-wide guide strips. The bottom of this groove was spaced ¾ in. up from the bottom edge of each drawer side.

To join the drawer fronts to the sides, I cut ⅜-in.-wide and about ½-in.-deep rabbets on the ends of each front. I did this again with the dado blade in the tablesaw, using the saw's miter gauge to guide the crosscuts. A groove for the drawer bottom was cut in each front with a kerf-cutting (also called slot-cutting) bit chucked in the router. Finally, I used the inside edge of a drawer front to mark one end of each bottom and then bandsawed each to shape.

With all the drawer parts ready, I assembled the back and sides around the bottom, applying yellow glue to all joints. To pin the sides to the drawer fronts, I drilled two 3/16-in. holes through each drawer side and then inserted short dowels. After the glue dried, I tried each drawer with the carcase. Aligning each drawer's centerline with the case, I marked the ends of the drawer fronts and then trimmed them with a belt sander held upside down in my bench vise until they fit the openings. After a little more sanding and checking for unfilled holes or defects, the carcase and drawer fronts were ready to veneer.

Veneering the carcase—I decided to cover the plywood exterior of my oval semainier with veneer from a beautiful flitch of Macassar ebony. First I cut enough leaves of the veneer into 18-in. lengths to cover the approximately 6-ft. circumference of the cabinet when laid out side to side. Then I spread the leaves out on the bench to check the grain pattern, carefully preserving the order in which they came off the flitch. I numbered the consecutive leaves with chalk, and then trimmed their long edges straight and parallel with a straightedge and a veneer saw. The leaves for the drawer fronts were taped together into a mat and set aside, to be applied later.

In lieu of using hot hide glue to attach the veneer or a cumbersome caul for gluing and clamping the veneer, which are the most

traditional methods, I've developed a procedure that works just as well, but requires less skill and preparation to execute. I applied the veneer a leaf at a time using PVA glue as the adhesive. But instead of clamping the veneer down while the glue set, I used a household clothes iron to set the glue quickly. I used Parabond M447 glue (available from Para Chem, Box 127, Simpsonville, S.C. 29681; 803-967-7691) for this method, which I've found dries firmly, doesn't get rubbery and cleans off with sanding better than other PVA glues I've tried.

To apply the veneer, I first brushed on a fairly heavy coat of glue, applying it to the plywood carcase—not the veneer. The veneer leaf was then laid down and temporarily held in position with several small pieces of masking tape at its leading edge. The leaf was then pressed down with the iron set on low heat (350°F to 400°F). I always test a small piece before beginning, shown in the bottom photo on the facing page, to make sure the iron won't scorch the veneer. I moved the iron slowly back and forth over the leaf (not too slowly, or scorching will occur) and followed it with a veneer roller held in my other hand. The method works because the heat evaporates the water in the glue and the roller applies enough pressure on the plasticized glue to keep the veneer flat as the glue dries.

Once the first leaf was in place, each successive leaf was butted up to the last, attached with tape tabs and ironed on as before, with the area near the seam ironed first. You must be constantly watchful for areas where the veneer has lifted; if heat is applied too quickly, the veneer may be lifted by steam. In fact, I have not been able to use this method to veneer large, flat surfaces because the iron remains in full contact with the wood, which overheats the surface and scorches or shrinks the veneer enough to create open seams. On the convex surfaces of the oval carcase, the iron contacted only a narrow area at one time, so overheating wasn't a problem.

After the veneer was applied all the way around, the excess overhanging the top and bottom was carefully trimmed off with a knife (you can also use a laminate trimmer) and the edges were lightly sanded. An oval panel cut from ¾-in. plywood, later screwed to the top of the carcase, serves as the semainier's actual top. This applied top was cut slightly smaller than the case itself; I drew the same oval as before, but this time on a 15¼-in. by 21¼-in. piece. The size difference created a ⅜-in. ledge (also called a reveal) around the top of the finished semainier.

The applied top was veneered next, using four quarter-matched leaves of claro walnut glued with urea formaldehyde and secured in a press until the adhesive cured. The edge of the applied top was then decorated with alternating bands of ⅛-in.-wide holly and ¼-in.-wide ebony veneer. The ⅜-in.-wide reveal around the top of the carcase that's left exposed after the applied top is screwed on must also be veneered; for this job I used ebony veneer scraps, 2 in. or 3 in. wide, orienting the grain radially around the edge.

To veneer the drawer fronts, I used a veneer saw to crosscut the mat, taped together earlier, into seven strips. These strips were then glued on using the PVA-hot iron method described above. I also glued scraps of ebony veneer to the top edge of each front, to hide the laminations. Finally, strips cut from the top and bottom of the mat were ironed onto the edges of the carcase just above and below the drawers.

The legs—All that remained to complete my semainier was to make and install the legs and the drawer pulls. I chose an exotic wood called lapacho (commonly called ipe) for the legs; I had managed to select a piece that had a nicely mottled grain pattern and was a good color match to the ebony veneer on the carcase. Starting with four 1 11/16x2⅝x32 billets, I bandsawed and handshaped them to an oval cross section that tapered at both ends. Ipe

After lacquering the carcase, drawers, drawer pulls, legs and applied top separately, Leonard uses wood screws to join the parts together and complete his oval semainier.

does not shave well with a drawknife or spokeshave—my usual method of shaping such parts. Instead, I used a rasp and coarse sandpaper to do the shaping work. I then cut and shaped a slightly concave notch 12 in. down from the top of the leg where it joins the case, and then drilled pilot holes in the carcase for the screws to attach it. To lend detail, I made four small caps from pearwood and glued them atop the legs. I also chose pearwood for the drawer pulls. I sawed out seven ¾x⅞x1½ oval blanks on the scroll saw and shaped them with a rasp and files. I found it easier to finish the pulls before attaching them to the drawer fronts.

Next, the carcase, drawers and other parts were finish-sanded to 180-grit and then sprayed with sanding sealer. After the sealer had dried, I resanded using 220-grit paper, and then topcoated the parts with four applications of lacquer. The applied top was then wet-sanded with 400-grit paper and sprayed with gloss lacquer, to give it a lustrous finish. After the finish had dried, I took a good look at the cabinet and decided that the color of the walnut was too light in relation to the ebony. Therefore, I resprayed the top with a black toning lacquer, darkening both the top and the holly-ebony band around it. I then sanded through the stain somewhat, which gave the walnut a sort of tortoiseshell appearance; this was a good match for the ebony. All that was left was to screw the legs and applied top to the carcase, and the pulls to the drawer fronts, and then figure out what to fill those seven drawers with. □

Reid Leonard is a woodworker in Pensacola, Fla.

***Left:** Finishes are first leveled out with microfine sandpaper wrapped around a rubber block. The block is moved in long, straight strokes, about 1 ft. long. Water or naphtha is used as a lubricant.* ***Above:** Polishing compounds can be removed from the buffing pad by running the pad at high speed against the end of a stick. The pad will become soft and fluffy as the compound is thrown off.* ***Right:** A power buffer, used with modern automotive polishing compounds, can be one of the most important tools in the wood finisher's arsenal. Here the author buffs out the lacquered top of a dining-room table.*

Auto-Body Tips for Fine Finishes

Swapping elbow grease for a power buffer

by Scott Lawrence

Years ago I made a horrible mistake. I had just opened my own refinishing and restoration shop and was going all out to establish a good reputation. When I was hired to refinish a dining-room table, I knew that nothing less than a flawless, mirror-perfect finish would do. After glopping on numerous coats of lacquer with a cheap, hand-held airless sprayer, I started rubbing out the surface, which now resembled a lunar landscape, with 600-grit wet-or-dry sandpaper, pumice and vast quantities of elbow grease. After a few exhausting, anxiety-filled days of backbreaking labor, the perfect finish miraculously appeared. The customer loved the hand-rubbed finish, and I was soon buried in word-of-mouth referrals, all expecting flawless finishes. Rapidly approaching nervous exhaustion, I began to search for ways to speed production and minimize labor.

To make a long story short, the method I came up with lets me rub out a tabletop, or any large finished wood surface, in an hour or so. What discovery made this possible? At some point I noticed that auto-body shops had huge lacquered surfaces to rub out to a smooth high gloss. And a customer having a $25,000 car refinished was apt to be even more fussy than my clients; so these auto-finish guys had to know some tricks. What I eventually found out was that these tricks worked on wood, too, making it possible for me to rub out a finish very quickly with top-quality results and to make a profit on even very nasty furniture-repair problems. All I had to do was take advantage of high-tech automotive polishing compounds, abrasive pads and a high-speed, electric power buffer, like the one shown on the facing page.

This method is not without risk, as anyone who has used a high-speed buffer can tell you. The difference between success and failure is often just one inattentive second. The tool can be mastered with practice, but I recommend that your early efforts be on expendable practice pieces. You can also use the finishing compounds with traditional hand-rubbing techniques, if you don't want to risk using the buffer. For more on hand-rubbed finishes, I suggest you read Michael Dresdner's article "Rubbing Out a Finish," *FWW* #72.

Automotive products for wood finishers—My rubbing out system is based on items that are readily available at most auto-supply stores. For the initial stage, I sand the surface with Imperial Wet or Dry Color Sanding Paper, lubricated with water or naphtha. This finishing paper, manufactured by 3M Co. (Industrial Abrasives Division, 223-6N-01 3M Center, St. Paul, Minn. 55144), ranges from

1,000- to 2,000-grit, which makes the 600-grit paper many finishers use seem like a belt sander by comparison.

After leveling the surface with the micropapers, I switch to Meguiar's Mirror Glaze machine glazes #1 and #3 (Meguiar's, 17991 Mitchell S., Irvine, Cal. 92714). These compounds are not the heavy color coats that most wood finishers associate with glazes, but are self-cleaning polishing compounds that break down into finer and finer abrasives as they are rubbed on a surface. The Meguiar's compounds are ideal with high-speed buffers, like my Black & Decker 7-in. professional model with lamb's wool bonnet. I've found that the lower-price tools ruin your hearing and burn out in a couple of months, but they still beat hand-rubbing. And I haven't had good results with the slow-speed orbital waxer/polisher machines sold in some stores.

Rubbing out a finish—Most of the finishes I work with are lacquer, and that's the finish I'm working with on the table shown here. But the buffing method will also work with many polyurethanes, varnishes and other film finishes, too. To be sure, though, try out the technique on a test surface before you risk something valuable.

Before attempting to level out a lacquered surface to eliminate orange peel, drips and other defects, let the finish cure at least a week; otherwise, the film will continue to shrink, exposing new defects as you work. I begin with 1,000-grit paper, which quickly levels the surface, but doesn't scratch the way 600-grit wet-or-dry paper does. To avoid gouging or hollowing the surface, I wrap the paper around a rubber block when sanding, as shown in the left photo on the facing page. Work carefully; any gouges you make at this stage must eventually be removed before you can achieve a perfect finish.

Ordinary naphtha from your local hardware or paint store makes a good lubricant with the 1,000-grit paper, but if you're thrifty (some say cheap) like me, a squirt bottle filled with water and a few drops of dishwasher detergent works just fine. Some finishers prefer naphtha because it won't raise the grain as water will if you sand through the finish coats. But assuming you've sprayed on two or three coats of lacquer, the 1,000-grit paper is very unlikely to cut through to the bare wood.

I level the edges of the lacquered piece first, taking short, straight strokes about a foot long with the sandpaper block. Remember, you only want to level the surface, not eliminate all the scratches, and you must be especially careful not to remove too much material at the edges, where finish layers may be thinner than at the center of the table. Once the edges are level, move on to the center section, blending the strokes from there into the edge areas. Wipe off the surface regularly to check your progress. When the surface is uniformly dull and flat, it's time to rub out the surface with polishing compounds.

Meguiar's machine glaze #1 will quickly remove the light sanding scratches left by the 1,000-grit papers. Apply a generous amount of the compound to the tabletop, smearing it evenly over the surface with the pad of your buffer. Now you're ready to buff. I generally buff out a 2-ft.-sq. area at a time, and then move onto another area. Once the whole surface is done, I make long passes over the entire top to blend the areas together. You may have to reapply the compound once or twice before the surface is free of scratches and any remaining orange peel. Generally all the scratches will be eliminated by a few minutes of power buffing. The self-cleaning compound will dry within a few minutes and can be blown off with compressed air or wiped off with a soft rag.

If you're after a satin finish, buff no further. Now switch to a gray Scotch-Brite pad (also available from 3M) backed by a rubber block and use Meguiar's #1 as a polishing compound. I find that this combination of Scotch-Brite pad and rubber block produces a smoother, more consistent rub than Scotch-Brite alone. For a bit more gloss, repeat the process with the Scotch-Brite and Meguiar's #2 or #3 compounds, which are finer than #1. Just be sure to apply consistent rubbing pressure on the block and to keep your strokes straight.

For a high-gloss finish, you must first clean the #1 compound from the buffer pad. This can be done easily by running the pad against the end of a stick, as shown in the photo at right on the facing page. The stick fluffs and separates the fibers and makes it possible for the rotation to spin off any remaining material. After removing any residue from the tabletop with a damp rag, repeat the buffing operation with Meguiar's #3 glaze. This should leave a surface that is near perfect, with perhaps just a few swirl marks at most. You can buy ultrafine rubbing compounds (sold as swirl-mark eliminators), but I find that final-buffing with a clean lamb's wool pad on the power buffer works just fine and leaves less mess to clean up. The final buffing is done with only light pressure on the tool, with the pad held at a very low angle to the surface. Be careful around the edges of the finish: the pad should rotate away from the edge at the point of contact and not into the edge.

If everything has worked as planned, you should be able to read the directions on the back of the Meguiar's container reflected in

the finish surface. If you have the misfortune to notice a flaw that you missed, all is not lost; you can spot-level and buff that area and blend everything together using the same sequence as before.

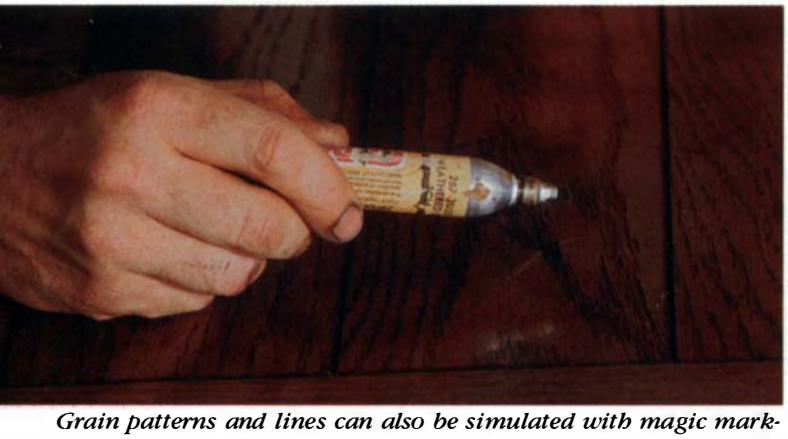
Repairs with a power buffer—The power buffer is one of the mightiest weapons in the finisher's arsenal. In skilled hands, it can quickly remove serious scratches in lacquer that otherwise might have to be patched or recoated.

The trick to buffing out deep scratches is to take advantage of both the heat generated by the buffer and the thermoplastic nature of nitrocellulose lacquer, which means the material will soften and spread enough to fill in a scratch in the finish. This technique works best with a thick topcoat layer. First, you must make sure the surface being repaired is clean and completely free of wax or oil. You can remove the wax with naphtha or a commercial dewaxer. Then, using a clean lamb's wool buffer, apply the contact area of the pad to the scratch and move the pad slowly, about an inch per second or slower, across the damaged area. Within moments, you should see the finish flowing and being forced into the scratch. Minor blistering is no problem since that can be leveled out later.

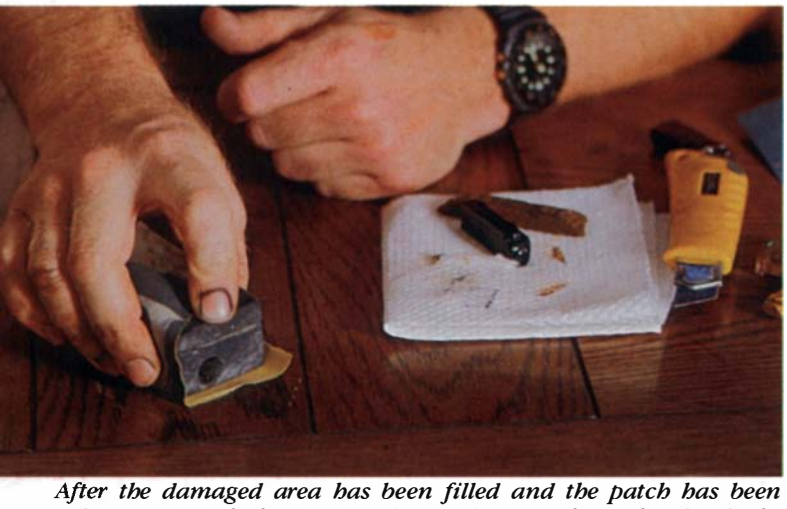
After a few passes, walk around the table and buff the repair area from the opposite direction so that you move lacquer from the other side of the scratch. Continue this process until the scratch is filled, or until your nerves can't take it anymore and you tell yourself "close enough." It's better to end up with a minor, easily overlooked crease in the surface than risk cutting through the topcoat. Level any blistering or roughness with microfine paper on a rubber block, and then buff out with Meguiar's #1 and #3 compounds until the repair area matches the sheen of the rest of the surface.

Even experienced buffer operators should try this procedure on a practice piece first, but it's a trick worth learning. It's amazing to see even a deep scratch fill up with lacquer and disappear.

Two different colors of shellac sticks can be used to create a grain pattern in the patch area. Here Lawrence blends some dark lines into the lighter base patch with a hot knife.



Grain patterns and lines can also be simulated with magic markers or special finisher's markers.



After the damaged area has been filled and the patch has been colored to match the surrounding grain area, the author levels the surface with microfine paper on a rubber block.

Repairing wood finishes with shellac sticks—Auto-body finishing technology can be valuable to a woodworker who is faced with repairing or restoring a finish. One of the most challenging repairs for a finisher, for example, is fixing a damaged spot right in the middle of a high-gloss tabletop. The usual technique is to fill the damaged area with liquid shellac by heating one of the colored shellac sticks available from woodworking- and finishing-supply houses. You won't usually have any trouble finding a stick with the right color and you can melt enough of it with a match or a hot knife to fill the damaged area so it's level with the surrounding finish. In some cases, however, you may need two different colored sticks to simulate grain (shown in the top, left photo) or you may need to draw grain lines with a marker, as shown in the center, left photo. I got my markers from Mohawk Finishing Products Inc., Route 30 N., Amsterdam, N.Y. 12010; (518) 843-1380. But no matter how skillfully I worked, the repair usually showed somewhat until I applied automotive techniques to the problem. The microfine paper on a rubber block excelled at leveling and smoothing the repair, as shown in the bottom, left photo. For this operation, naphtha is the most effective lubricant, because this chemical levels the burn-in area faster than the surrounding finish.

After leveling out the burn-in area with microsandpaper, a very light rubbing or just a few light passes with the buffer will blend in the patch with the surrounding finish. Usually I don't find it necessary to topcoat over this repair.

When working with a polyester finish, such as so-called Euro-style black lacquer pieces, I would never rub out with anything coarser than 2,000-grit sandpaper. If you have to work regularly on polyester finishes, you might be interested in Mohawk's Gray Lapping Film, a sandpaper-like product that comes in several grades, all finer than the microfine paper. Again, wrap the abrasive around a rubber block for best results. Since polyester doesn't flow out as does nitrocellulose when buffed, the polyester finish must be rubbed out with finer and finer abrasives. After sanding the area as finely as possible, buffing with Meguiar's glaze #3 will restore the sheen to the glossiest polyester finish. I also like the fact that the Meguiar's products are about a third of the price of many compounds marketed specifically for rubbing out polyester finishes. □

Scott Lawrence is a professional furniture finisher and restorer in Colorado Springs, Colo. Photos by Gary Weisenburger.

Queen Anne Furniture

History and elements of style

by Norm Vandal

"All beauty," according to William Hogarth, "is derived from the infinite form and infinite variety achieved by the curve." With that, the 18th-century engraver and satirist put his finger on the most important design element of Queen Anne furniture.

While the rectangle brings structure and mass to an object, the curve lends it animation and grace. Decoration, in the form of moldings, turnings and carving, is almost wholly dependent on the curve. The delicate balance between curves and straight lines is fundamental to understanding Queen Anne furniture. But curves alone cannot define a group of furniture. What then are the specific elements that distinguish the Queen Anne style?

The cabriole leg, shown here and in the drawing on the next page, is the essential feature of all Queen Anne furniture. Apart from its obvious embodiment of Hogarth's "line of beauty," the cabriole leg represents the ultimate expression of form and gentle animation over decoration. It is accompanied in the drawing by several other important elements of the style that also derive from the S-curve: the scrolled pediment, scalloped apron, vase-shaped splat and curved chair back. Moreover, during the Queen Anne period, simple fan and shell carvings replaced elaborate inlays and emphasized the beauty of natural wood. And woodwork was built to a human scale, carefully designed for both use and appearance.

When examining a piece of furniture, the question "Does this belong to the Queen Anne style?" is largely beside the point. There is more to be learned by asking "What are the Queen Anne characteristics in this piece?" or "Do certain elements conflict with the Queen Anne style?" Only by gaining exposure to a broad range of furniture and familiarity with these hallmarks of design can the reader assess the degree to which a particular piece of furniture satisfies the Queen Anne formula.

The Queen Anne period—Interestingly, Queen Anne never sat in a "Queen Anne" chair, nor did she store her clothing in a highboy named after herself. She never could have guessed that a style of furniture, which saw embryonic development during her reign (1702-1714), would eventually carry her name. Historical epochs are seldom named until well after their time has elapsed, and the Queen Anne period was not identified as such until at least 150 years after Anne's death. Even then, the term was coined not on her native soil but in North America.

In England, furniture bearing the characteristics of what Americans call Queen Anne is termed "Georgian," after George I, Anne's successor. The architecture of that time period—in both countries—is also referred to as Georgian. Perhaps American historians and collectors had an aversion to the name King George (we fought George III in the Revolution), or perhaps the gentle, fluid lines that describe this style of furniture are more readily associat-

Photo: Courtesy of Joseph Hennage

This highboy (Connecticut, circa 1740 to 1780) is a fine example of Queen Anne furniture. The harmony between curves and straight lines, the balance between motion and stasis, and the emphasis of form over decoration are hallmarks of the Queen Anne style.

ed with feminine qualities. In any event, furniture in the Queen Anne style was not fully developed in England until at least 10 years after the queen's death, and about 10 years after that in the Colonies.

The Queen Anne period is generally thought to include all early 18th-century American furniture that exhibits most of the aforementioned characteristics. But there's a double fallacy in assigning a firm beginning and end date to any style period. In the first place, it implies that as of a certain date cabinetmakers ceased working in one style and switched to another. And it suggests that all furniture produced during that period was stylistically homogeneous. With respect to the Queen Anne period, it is more constructive to say that between 1720 and 1760 American colonial design was seriously influenced by a popular English style, which was inspired in turn by Dutch, Spanish, Italian and even Chinese aesthetics.

Taste in art is an acquired preference that relates less to a universal standard of beauty than to the basic human desire to be accepted by our peers. In early 18th-century America, colonial cabinetmakers considered London the cultural center and arbiter of correct taste. Trade with the motherland provided the colonists with finished goods, and many tools and fabrics to make their own. Little English furniture was shipped to the Colonies, except in the South. (The Southern Colonies had an agricultural economy and few hardwoods suitable for furniture.) What little furniture reached Northern ports served mainly as a status symbol for the emerging merchant class and as a model to enterprising cabinetmakers.

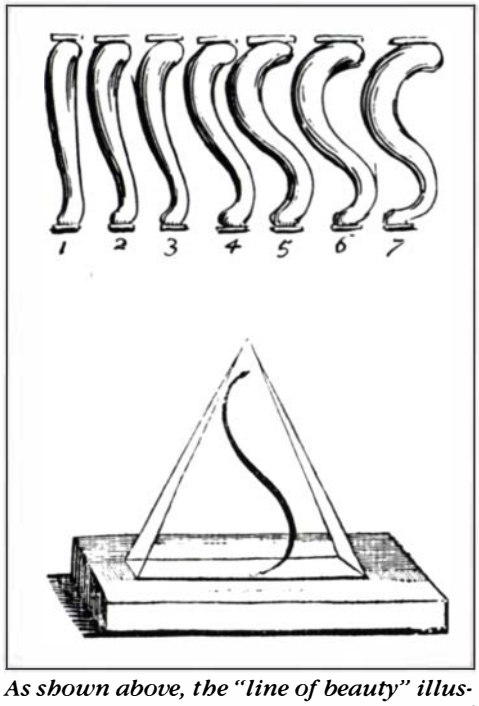
Given the social, economic and political stature of 17th-century and 18th-century London, it's no surprise that English furniture was admired by the population and emulated by craftsmen in the isolated Colonies. Of course, many colonial cabinetmakers were recent emigrants from England and had been well trained in the contemporary furniture style. But independent craftsmen, even those who were trained abroad, were quick to modify these basic designs until their products were as distinct from their English predecessors as English furniture was from its continental precursors. This mixing of old with new didn't necessarily create new trends, but it clearly illustrates the way in which style and taste evolved.

Regionalization—Despite extensive outside influence, America need not apologize for its furniture heritage. In terms of creativity, it stands alone and contributes more than its share to the body of international furniture history. American Queen Anne furniture is dynamic and unique, innovative yet simple, without extraneous frills. And it is generally expertly crafted. What's more, the Queen Anne style lasted longer and achieved greater sophistication in America than the Georgian style did in England.

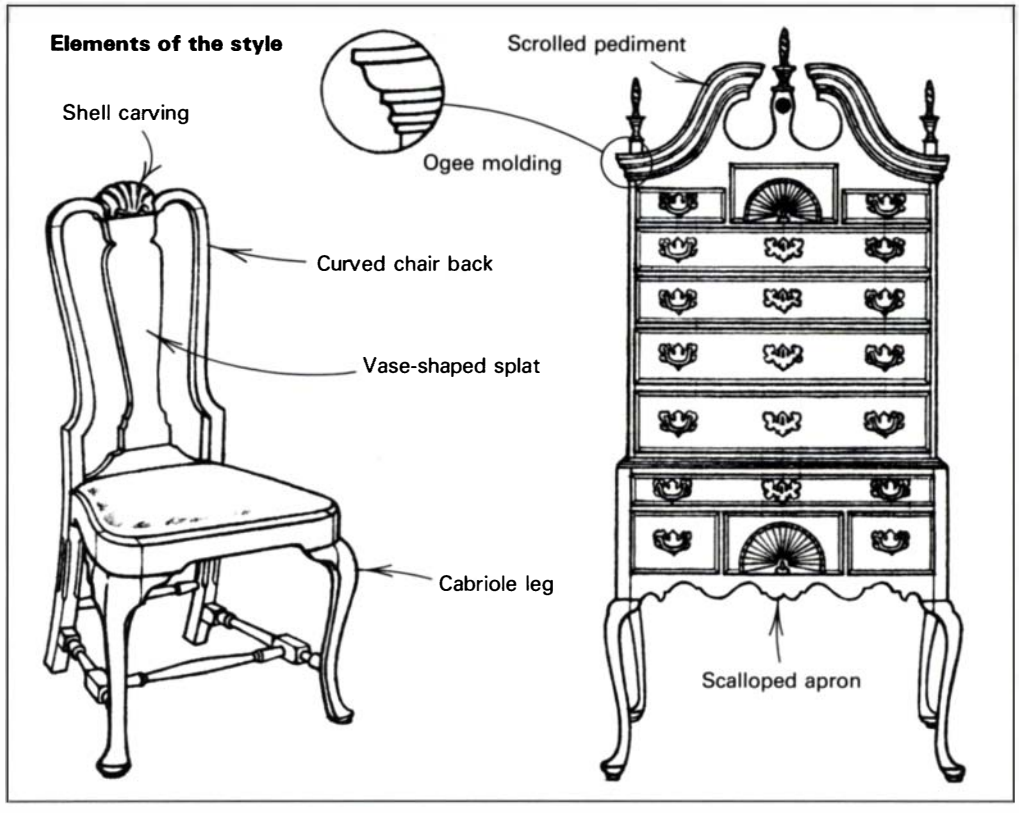
As furniture in the Queen Anne style developed in North America, it began to exhibit distinct qualities in each of the various colonial enclaves. Portsmouth, Boston, Newport, New York, Philadelphia and Charleston were the major regional style centers of the period. Furniture from each of these centers exhibits unique and identifiable traits. Through careful documentation of similar characteristics, furniture historians can often assign provenance and may even identify a specific maker.

Massachusetts Queen Anne furniture, for example, is typically spare. Legs are delicate and graceful, and designs tend to be vertically oriented. Newport cabinetmakers were among the first in New England to make extensive use of carved elements, such as the ball-and-claw foot, and C-scrolls and shell carvings on the knees of cabriole legs. Flat stretchers are another unique feature of Newport chairs. In contrast, New York pieces tend to be rectilinear and squat, with oversize elements, while Philadelphia furniture is closely related to contemporary English design. The trifid foot is a trademark of Philadelphia chairs, as are volutes on back splats and spiral scrolls on crest rails. New England furniture tends to be more conservative and more innovative than that of the Middle Atlantic and Southern Colonies. The complex, independent economy of New England fostered the development of a furniture style that was more functional and less ornate than English imports. The relatively aristocratic, agricultural colonists of the South tended to accept fewer digressions from the established English standard.

There are several factors that contribute to such regional diversification, the most important being the background and training of the craftsmen. The Colonies were settled by people from distinct



As shown above, the "line of beauty" illustrated in William Hogarth's Analysis of Beauty *(1753) represents the major component of Queen Anne furniture: the S-curve, as employed in the cabriole leg.*



cultures—Massachusetts by the English and New York by the Dutch—who were predisposed to certain styles and technologies. Popular taste also helped dictate the style in which craftsmen labored. And taste was greatly affected by the prevailing religious, political and economic climate of the community.

Finally, a craftsman's work was affected by the materials that were available. New England cabinetmakers had ample supplies of maple, walnut and cherry. These hardwoods are difficult to work, which encouraged conservative designs. Newport and Philadelphia cabinetmakers, on the other hand, had access to imported mahogany, which is perfect for carving, and so their work developed in that direction. Generally, the Northern areas used more indigenous woods than the Southern Colonies, which relied on imported woods.

Style—Queen Anne furniture can also be distinguished by three different, discernable styles: high, vernacular and Country. These styles occurred to some extent in all regions of colonial North America. High-style pieces are characterized by a well-resolved design and careful joinery. They are usually urban and were directly influenced by English prototypes or design books. They are made of high-quality, expensive woods like walnut or mahogany, and are usually finished clear to emphasize the beauty of the materials. These sophisticated pieces were purchased by the wealthy merchant class for their best rooms.

Vernacular work is an obvious imitation of high-style furniture, but it falls somewhat short of its goal. Either the joinery or the design is not as well executed, and the piece is made of less costly native hardwoods. The finish is clear, but the wood is frequently stained or grain painted to look like mahogany or walnut.

Country furniture is usually quite distinct from both high-style and vernacular examples, although evidence of their relationship still exists. Country style pieces might be considered rustic, because of their apparent lack of sophistication, but they express great individuality and a colloquial charm derived from ethnic or rural folk traditions. Joinery on Country furniture tends to be straightforward, sometimes crude. The finish does not necessarily imitate expensive materials, and paint is common. Of course, there are many exceptions to these generalizations. Not all high-style pieces are urban, nor are all Country pieces rural. Differences between styles are often subtle.

Furniture and architecture—The first furnituremakers in America were also house carpenters, joiners and shipwrights. And this situation persisted well into the 18th century, when economic improvements fostered specialization. In rural areas, however, joiners and carpenters continued to build furniture until well into the industrialized 19th century.

The relationship of carpenter to cabinetmaker reflects the general relationship of architecture to furniture. The book *Ten Books on Architecture* by Vitruvius (first century B.C.), the oldest written work on architecture in the Western world, demonstrates that the ancients had a system that could be judiciously applied to produce beautiful forms. Italian Renaissance architects, such as Palladio, interpreted Vitruvius' description of the so-called classical orders and published guidebooks for contemporary builders. In the 17th century these were translated into most modern European languages, and they ushered in a lengthy period of classical revival in Europe, England and the American Colonies.

A classical order is a group of architectural elements combined according to a prescribed formula. The system dictates the size, location, proportion and profile of all members of the order. Mathematical divisions of the base of the column, called diameters, are used to size and proportion every element, from the height and width of the largest structure to the smallest decorative molding. Moldings are used to enhance the appearance of structural supports and to ease the transition between major elements of the order. Each member is composed of one molding, or several moldings, with a unique profile determined by its use or location and the order in which it is found. Plain surfaces between decorative members can be embellished with carved motifs such as leafage, scrolls or statuary. The triangular area framed by the pediment might carry a cartouche (an ornate scrolled frame). A panel within the frame can display a painting, the name of the owner or builder, or the date of construction.

From the base to the scrolled pediment, the entrance of the John Williams House in Deerfield, Mass., and the highboy in the photo on p. 73 bear witness to the intimate relationship between architecture and furniture during the Queen Anne period.

At first glance, Queen Anne furniture may not resemble classical architecture, but a more careful examination reveals certain members of the orders. Then, as now, cabinetmakers were looking for ideas, and the guidebooks that were available served this purpose well. The classical orders provided a vocabulary of design elements that could be applied to furniture. Furniture designs reiterated familiar architectural features and cabinetmakers were encouraged to follow the rules of proportion, although less dogmatically. The scrolled pediment that added an element of grace and dignity to front entrances (see the photo above) could also be used to crown a high chest of drawers, with the same decorative effect (see the photo on p. 73). Moldings, friezes, pilasters, cornices and architraves were but a few of the other architectural elements employed in the design of Queen Anne furniture. □

Norm Vandal is a cabinetmaker in Roxbury, Vt., a consulting editor to FWW, *and author of* Queen Anne Furniture, *the new book from which this article was adapted. The book is available from The Taunton Press, 63 S. Main St., Box 5506, Newtown, Conn. 06470-5506.*

Photo this page: Courtesy of Historic Deerfield, Inc., Deerfield, Mass.; drawings: Lynn McVicker

Queen Anne style furniture is readily identifiable by a few of its basic elements, such as cabriole legs, scrolled pediments and flame-carved finials. The author borrowed these elements and applied them to the design of his contemporary Queen Anne bedroom set shown here.

Contemporary Queen Anne

Designing a bedroom set with period elements

by Larry Dern

In the 10 years that I've been designing and building furniture, I have consciously tried not to lock myself into a particular design style. My goal has been to develop the ability and flexibility to design for a variety of tastes and decors. Nonetheless, a majority of my commissions have been for contemporary furniture with clean lines and a minimum of applied details or moldings. However, I was given the opportunity to work with a whole new set of design elements when commissioned to build a Queen Anne style bedroom set consisting of a four-poster bed, a tall chest and a pair of night tables (shown in the photos above).

The furniture was for a new house overlooking Humboldt Bay, near Arcata, Cal., built by friends of mine, Bill and Dottie Haukenberry. The 10-ft.-high ceilings, spacious rooms, covered porches, scrolled corbels (rafter support brackets), detailed custom trim work and the grand Honduras mahogany staircase all combine to give the house an elegantly classic yet contemporary look: a style the owners call Southern Victorian. As avid antique collectors, the Haukenberrys had already decided on Queen Anne style furniture for the 24-ft. by 40-ft. master bedroom, but they weren't able to find what they wanted commercially. So they asked me to design a bedroom set using my contemporary interpretation of the Queen Anne style to fit in with the modern amenities of the house.

To get a feel for Queen Anne style, I visited furniture stores and checked out library books on antique furniture (see Norm Vandal's article on pp. 73-75). Then I began sketching the pieces, accounting for the functional requirements of the case pieces and incorporating Queen Anne elements, like cabriole legs, scalloped aprons, broken scrolled pediments and flame-carved finials. Aside from practical and stylistic considerations, I also had to proportion the pieces so they wouldn't be lost in the large, high-ceiling room. I call the resulting designs contemporary Queen Anne; they are unmistakably Queen Anne in appearance, but far from being reproductions.

Blending the period with the practical—The sides of case pieces built during the Queen Anne period were nearly always made from wide solid boards. I decided not to follow this style because I knew that these solid sides also nearly always split due to seasonal expansion and contraction. Instead I used cope-and-stick frames and raised-panel sides for the tall chest and the night tables. Another major break with tradition was using doors on the upper portion of the tall chest instead of running drawers all the way up. This was done for practicality because the top drawers become rather inaccessible; adjustable shelves behind the doors provide more efficient storage. In addition, the raised-panel doors are a unifying element among the pieces, relating to the frame-and-panel sides on all three case pieces and to the two raised-panel doors on each night table (see the drawing).

Using stiles and rails instead of the typical solid wood sides also allowed for full web-frame construction between drawers without restricting the side panels. The horizontal frame members in the

Photos: Sandor Nagyszalanczy; drawing: Aaron Azevedo

front are mortised and tenoned into the leg posts for strength and stability, and the web frames are dadoed into the raised-panel frame stiles on the sides, which in turn are splined to the legs (see the detail in the drawing). All the drawers, except for the two large bottom drawers on the tall chest, are joined with traditional hand-cut half-blind dovetails and they slide on a maple center guide (see the drawing). The fronts of the two bottom drawers on the tall chest join directly to the sides with sliding dovetails. The sides of these drawers are set in ½ in. from each end of the drawer front to allow clearance for a touch of modern technology: a set of Accuride #3037 drawer slides. The bottom web frame on the tall chest has the traditional dust panel to keep the interior clean.

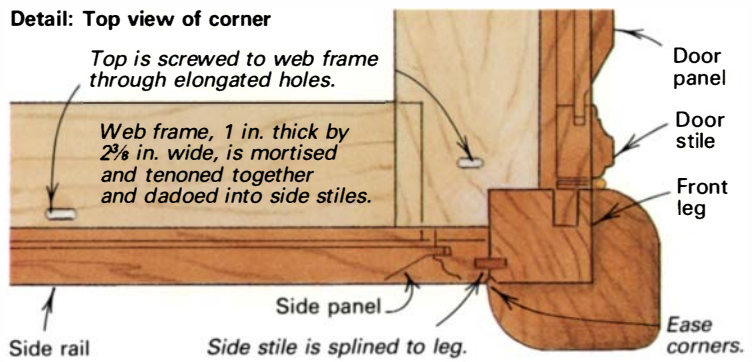
The characteristically Queen Anne cyma curve gooseneck moldings and the flame-carved finials that cap both the tall chest and the bed visually tie the set together, and create the feel of the period. I eliminated the bonnet top behind the curved pediment on the chest, so it would fit nicely against a wall beneath a sloping ceiling. Since I don't have a vast array of shaper cutters geared to the details of period moldings, many of my design decisions were based on the cutters I had. However, the gooseneck molding is such a unique and prominent feature that I hired friend and woodturner Joe Cusimano to grind a set of knives to a pattern that I designed and then I ran them on a large shaper at a local millwork shop to form the moldings. I also had Cusimano turn the bed posts after I had mortised them for the headboard, footboard and side rails. When I assembled the king-size bed in my shop, it looked huge with its 7-ft.-tall posts, but it seemed perfectly proportioned against the long north wall of the Haukenberry's high-ceiling room.

Probably the most recognizable element of Queen Anne furniture is the cabriole leg. I knew from the start that the set wouldn't be complete without them. I opted for bracket feet under the tall chest, as opposed to raising it on slender cabriole legs, in order to get the most storage. Fortunately, the night tables were ideal candidates for the lowboy form: low cases raised on cabriole legs. The legs on the night tables are bandsawn from 4x4s and the upper square section extends all the way to the top of the case, which guarantees a solid base. I didn't carve shells on the knees, which is typical of high-style Queen Anne furniture, because I wanted to preserve the clean, uncluttered look and the simplicity of Country style furniture. Scalloped aprons go with cabriole legs like fish and water, but when researching Queen Anne furniture I noticed many different apron designs. The height and curvature of the leg and knee block, along with the overall proportions of a piece, provide a unique set of criteria for defining the aprons' patterns. I suspect that period cabinetmakers did just as I did and designed the apron curves to provide the best visual effect.

I finished the pieces with three coats of satin varnish and rubbed out the last coat with 0000 steel wool and flax soap. The brass hardware from Garrett Wade (161 Ave. of the Americas, New York, N.Y. 10013) was reproduced from period patterns and complements the clean look of the unstained Eastern black cherry.

This commission presented me with a whole new set of design, engineering and construction problems. The departure in style enabled me to expand the parameters of my design vocabulary, and increased my appreciation of period furniture. It was a challenge I'm glad I had the opportunity to accept. □

Larry Dern builds a line of jewelry and desktop boxes, as well as custom furniture, in Trinidad, Cal.



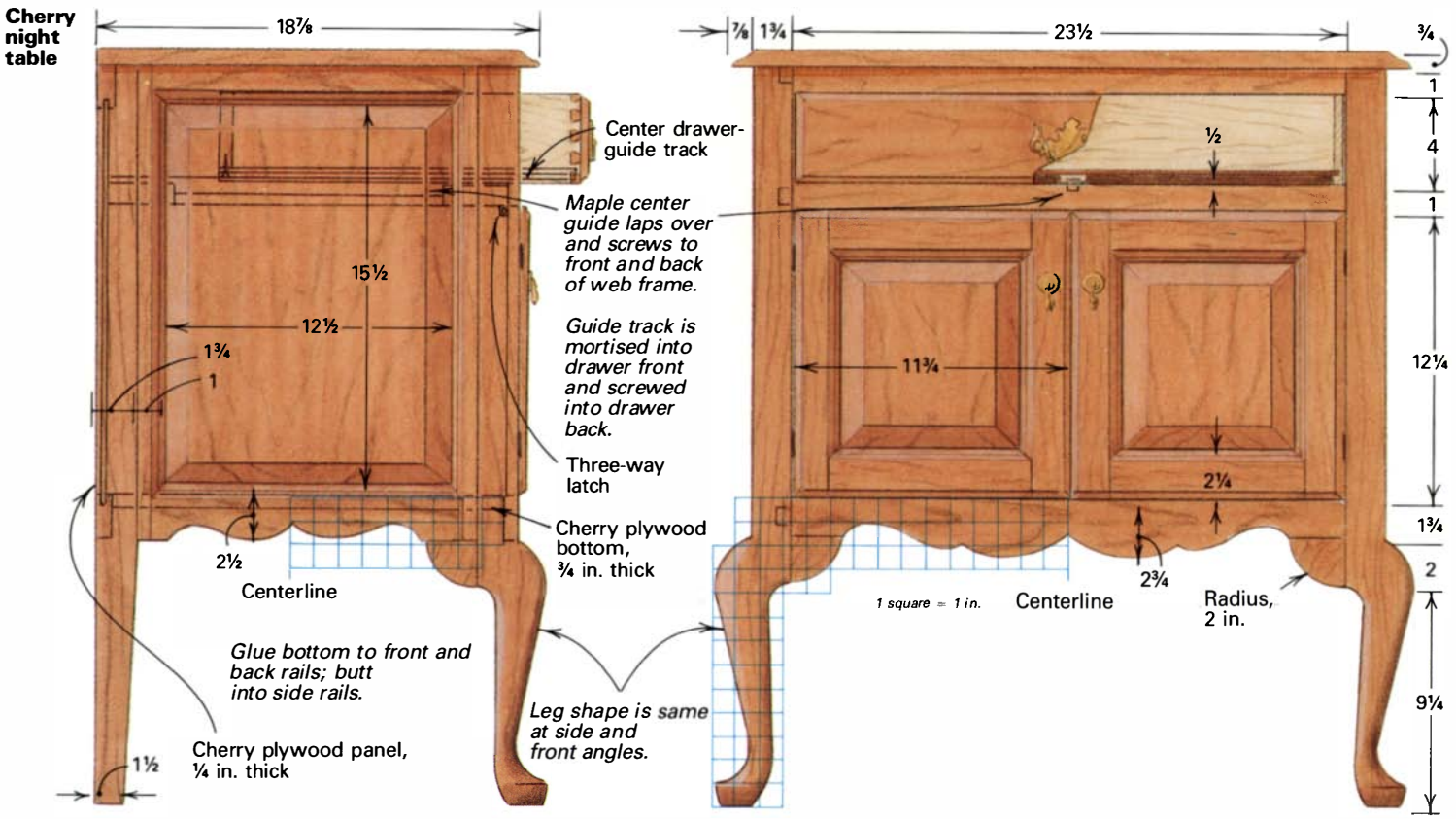


Photo: John Grunke

These pecan trees grow on a nut-producing plantation in Georgia. The pecan is the largest of the U.S. native hickories, but its trunk usually doesn't yield long boards.

Hickory and Pecan

America's muscle woods

by Jon W. Arno

I've always been a bit surprised that hickory and pecan aren't often used in furnituremaking, even though lots of these beautiful woods are harvested in this country. In fact, the only hardwoods harvested in greater quantities are oaks, poplars and maples, all common furniture woods. About the only time you hear any reference to hickory is in relation to ax handles or sporting goods.

Timber dealers sort the eight most valuable hickory species into two groups, true hickory and pecan hickory, each of which refers to four distinct species. True hickory is one of the heaviest and strongest of our domestic woods. It is remarkably springlike and very resilient when exposed to repeated bending and shock. Even in an age of synthetic materials, hickory maintains its international reputation as the first choice for tool handles, and it is also used for sports equipment, pallets and crates. Despite its iron-like hardness, you can steam-bend hickory easily and you can machine its creamy white sapwood and light-tan heartwood to a crisp edge. And this close-grained wood finishes well and doesn't require fillers. Pecan hickory has the same attributes as true hickory, although it isn't quite as hard and dense, and therefore it isn't quite as strong. But pecan is easier to work and its reddish-brown heartwood often has a more mellow figure.

In this article I'll tell you a little more about these attractive woods and their working characteristics, and I'll help you identify them (see the sidebar on the facing page). I think you'll find that hickory, and particularly pecan, *Carya illinoensis* (from trees like those in the photo above), are worth a closer look before you plan your next furniture project.

History of a tough family—True hickories and pecan hickories are from the same genus, *Carya*, which is commonly called hickory. This genus belongs to the Juglandaceae family, which also includes the walnut genus, *Juglans*. Although this ancient angiosperm family was once distributed around the world, all species of hickory and walnut were annihilated in ancient Europe by glaciers. Walnut was reintroduced into Northern Europe a couple of millenia ago through the trade of nuts, but hickory was never re-established. Thus, hickory never had a chance to become part of the European cabinetmaking tradition.

Considering 17th-century America's abundance of walnut, oak, maple, chestnut and cherry, you can understand why colonial craftsmen chose these familiar furniture woods and ignored the hickories. The North American Woodland Indians taught the settlers to eat the sweet hickory nuts, and the displaced Europeans also learned to use hickory for ax handles, wagon spokes and archery bows.

Pecan, *C. illinoensis*, on the other hand, became popular in the French settlements in the lower Mississippi Valley for the distinct and still-popular French Provincial style furniture. With its cabriole legs, scalloped skirts and framing, beaded edges, and considerable hand-carved decoration, it's a wonder this style found a new medium in pecan. Although the pecan hickories are the softest of the hickories, none of them are as easy to carve as walnut and chestnut, which the French used in Europe.

Hickories are bargains—True hickory and pecan hickory are widely available from sawmills and sawyers at prices ranging from

$1 to $2 per board foot. Hickories grow throughout eastern North America, from southern Canada to central Mexico. But genuine pecan, (*C. illinoensis*), with a botanical name meaning "the hickory of Illinois," is primarily a Southern species native to the lower Mississippi Valley. Since the development of the papershell variety of nuts, however, pecan has been cultivated throughout the Gulf Coast states, from Texas to Northern Florida and Virginia. In fact, Georgia, which was once totally void of this species, now leads the nation in pecan nut production. Unfortunately for the woodworker, orchard-grown genuine-pecan trees produce short lengths of lumber.

According to the U.S. Forest Service, there are more than 40 billion bd. ft. of standing hickory saw timber in the United States. But hickories are exotics almost everywhere else in the world. Of the 15 species of hickory worldwide, 3 (which are of little commercial value) grow in China and the rest grow in the United States. The eight domestic species of hickory, shown in the chart on the next page, are commercially valuable, and great quantities of true hickory are cut for tool handles, target bows, skis and firewood. The hickory genus, however, suffers from identity problems here in its native range, because both true hickory and pecan hickory are often bundled together and marketed as "mixed hardwoods." Here you'll find both hickories mixed with other woods like oak, ash and sometimes elm, all of which are used in pallets and crates. Since sawyers may not know what hickory species they're cutting, customers can't count on uniformity from shipment to shipment or from board to board. If you're after genuine pecan, you will probably have the best luck in the South, where most of the pecan nut plantations are located. However, this isn't a guarantee, because true hickories crossbreed with pecans and air-borne cross-pollination creates a hodgepodge of hybrid species. This causes botanists to say the hickories are highly unstable.

Working with hickory—Both true and pecan hickories are ring-porous or semi-ring-porous woods, with large earlywood pores and smaller latewood pores. However, like walnut, hickory's mellow figure is caused by the somewhat gradual transition between earlywood and latewood. This also means that the wood can be planed and turned smoothly, because the cutter edge won't chatter

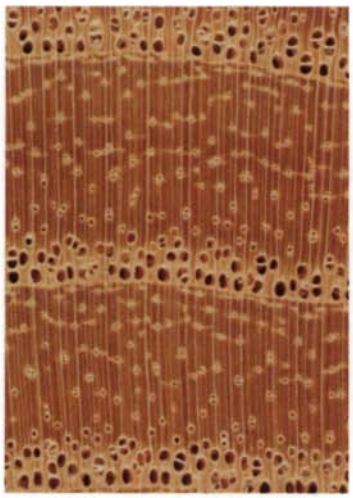
Identifying hickories

If you plan to buy any of the true hickory or pecan hickory species, you must be able to distinguish them from mixed hardwoods, like ash and elm; you might be able to do this with your naked eye. But to distinguish the true hickories from the pecan hickories, you'll probably have to look at clean-cut end-grain samples with a 10-power hand lens and compare them with the photomacrographs below.

White ash, *Fraxinus americana* (shown in the left photomacrograph), can be mistaken for hickory, especially if your samples are light-colored sapwood. White ash reveals an abrupt transition from large earlywood pores to dense, more lustrous latewood pores. The smaller pores in the latewood are surrounded by parenchyma, forming light-colored patches against the darker background tissue. Hickories, on the other hand, have continuous thin bands of parenchyma, forming fine white lines, that are parallel to the annual rings.

Slippery elm, *Ulmus rubra* (shown in the center, left photomacrograph), may be more difficult to distinguish from hickory than ash. With a hand lens, you can see elm also has light-colored wavy bands, which are formed by the latewood pores. In hickory, the bands and pores are separate. Also, elm's earlywood is a narrow strip that is usually just a few pores wide, and the transition from earlywood to latewood is very abrupt.

Separating true hickories from pecan hickories is difficult; as members of the same genus, they're very similar. However, shagbark hickory, *Carya ovata* (shown in the center, right photomacrograph), is ring-porous and reveals a more abrupt transition from earlywood to latewood than pecan. Pecan, *C. illinoensis* (shown in the far right photomacrograph), is typically semi-ring-porous and the transition is more gradual. Also, shagbark does not have bands of parenchyma in the earlywood; pecan does. —*J.A.*



This 10-power photomacrograph of white ash endgrain shows abrupt transition from earlywood to latewood and light parenchyma around latewood pores. These traits distinguish it from the hickories.

Slippery elm can be distinguished from the hickories by its latewood pores inside light-colored, wide wavy bands of parenchyma. The earlywood is seen as a narrow strip only a few pores wide.

Shagbark hickory is ring-porous and distinguishable from pecan by an abrupt transition from earlywood to latewood and by thin bands of parenchyma that cross its rays only in the latewood.

Pecan, unlike shagbark hickory, is typically semi-ring-porous and there is a gradual transition from earlywood to latewood. Its thin parenchyma bands are evident in both the earlywood and latewood.

Photos this page: R. Bruce Hoadley

Left: Pecan hickory is commonly darker than true hickory. Its rust-colored heartwood mellows in time to a reddish brown with creamy white sapwood. ***Right:*** *This sample of true hickory, which is the end scrap of 1-in.-thick by 6-in.-wide tongue-and-groove flooring, is lighter in color than pecan.*

Hickories

Commercial Name/Species	Specific Gravity	Shrinkage (%) R	T	V
True hickories				
Shagbark hickory, *C. ovata*	0.72	7.0	10.5	16.7
Shellbark hickory, *C. laciniosa*	0.69	7.6	12.6	19.2
Pignut hickory, *C. glabra*	0.75	7.2	11.5	17.9
Mockernut hickory, *C. tomentosa*	0.72	7.7	11.0	17.8
Pecan hickories				
Pecan hickory, *C. illinoensis*	0.66	4.9	8.9	13.6
Bitternut hickory, *C. cordiformis*	0.66	NA	NA	NA
Water hickory, *C. aquatica*	0.62	NA	NA	NA
Nutmeg hickory, *C. myristiciformis*	0.60	NA	NA	NA

Specific Gravity = Oven dry weight/volume at 12% moisture content
R = Radial shrinkage, green to oven dry
T = Tangential shrinkage, green to oven dry
V = Volumetric shrinkage, green to oven dry
NA = Information not available

Shagbark hickory has curly, shaggy bark and its small round nuts are edible and sweet, but difficult to crack. The hard, elastic, reddish-tan heartwood is lighter in color than pecan (*C. illinoensis*) and it's surrounded by a wide band of creamy yellow sapwood, especially on immature, second-growth trees.

Shellbark hickory prefers moist soil, and its range is much smaller than shagbark. Shellbark has less shaggy bark and its edible nuts are slightly larger than those from the shagbark, but otherwise the two woods are identical.

Pignut hickory is plentiful in the Appalachian foothills from Massachusetts to Georgia. The nuts are bitter, but they're used to fatten livestock. Pignut wood is the hardest of the hickories.

Mockernut hickory tolerates dry, sandy soil and it's found farther south than other true hickories. Its small, edible nut is in a thick husk, and its wood may vary due to different growing conditions.

Pecan hickory is primarily cultivated for its nuts, especially the papershell variety. Pecan is the largest of all the hickories, growing to 140 ft. tall and more than 6 ft. in diameter. Its dark reddish-tan heartwood is often streaked with dark brown or black, and it is semi-ring-porous with a more mellow figure.

Bitternut hickory is plentiful and widespread. It is sometimes marketed as pecan, but it's lighter in color. It grows farther north where the wood may have a flamboyant figure due to slower growth and a more abrupt transition between earlywood and latewood.

Water hickory is native to the coastal plains of the South Atlantic and Gulf Coast states, and prefers swampy soil. This smaller tree's nuts are tiny and bitter, but its wood is very similar to pecan.

Nutmeg hickory nuts are shaped like true nutmegs, hence this tree's name. Its wood has the favorable characteristics of pecan (it's dark and has a subtle figure), but it is easier to work. It may be the connoisseur's choice, if it can be found. It grows in pockets from Texas to the Carolinas, but it isn't plentiful and is seldom separated from other species in sawmills.

or lift and tear out porous earlywood tissue. Due to the extreme hardness of hickory, you get crisp, unfrayed edges when you shape, bore and saw it. And hickories contain proportionally more cellulose and less gum and lignin (the natural adhesive that bonds wood cells together and makes wood rigid and brittle); so sharp bits and blades won't friction-burn as readily as they do on some woods, such as cherry and maple. Despite being so hard, hickory's low lignin content makes it one of the world's most limber woods. The four true hickories are especially resilient and have a springlike elasticity.

Compared to walnut, hickory has a fine texture and considerably more surface luster, making it easier to polish and more appropriate for rubbed wax or oil finishes. Provided your hickory is seasoned adequately, it doesn't wool up when sanded, and you probably won't need fillers to achieve a glassy smooth finish if you coat it with heavy bodied varnish. These characteristics are common to all of the hickories, but there are notable differences between true hickories and pecan hickories.

True hickories—The four species of true hickories are harder, heavier and more elastic than pecan hickories. As with many dense woods, true hickories shrink considerably when drying, and so the wood is somewhat unstable. True hickories are generally lighter in color than pecan hickories, as shown in the samples above. But you can't always tell the two types of hickories apart by color, because growing conditions may produce true hickory with attractive, dark heartwood that can be streaked with rust-red or chocolate-brown highlights (see the sidebar). Old, slow-growing true hickories often yield beautifully figured boards, which tool-handle makers grade defective and hence price cheaper than pecan. But these old trees are rare and you have to look for this kind of wood.

Second-growth true hickory, which grows rapidly on fields that have been logged, has wide annual rings, light color and straight grain, and this wood is the handle maker's choice. Since this second-growth wood has proportionally more dense latewood, it is stronger. The demand for hickory tool handles is so high that only 25% of true hickory timber ends up as ordinary lumber. And much of the wood that doesn't meet the handle maker's requirements is sold as firewood or converted into chips for smoking meats. In fact, few cabinetmakers have had enough experience with true hickory to tell us about its working characteristics.

Pecan hickories—The pecan hickories are slightly softer and easier to work than any of the true hickories, but genuine pecans are still hard enough to be on par with white oak. Many of the characteristics that make pecan hickory less desirable for tool handles are what make it ideal for cabinetmaking. Genuine pecan is 20% to 30% more stable than the true hickories. Its average volumetric shrinkage (13.6%, green to oven dry) is less than white oak and sugar maple. As a result, properly made joints in pecan furniture remain snug and, provided the wood is seasoned carefully, warping and checking aren't serious problems. And with the exception of bitternut, pecan hickories are darker than true hickories and seldom need staining. Their natural, rust-tan color, shown in the left sample above, mellows in time to a rich and attractive reddish brown when finished with penetrating oil or clear varnish. Even though pecan isn't as elastic and resilient as the true hickories, it is still a first-class muscle wood compared to most of the other common, domestic hardwoods. □

Jon Arno is a wood technologist and consultant in Schaumburg, Ill. Wood samples provided courtesy of A&M Wood Specialty, Inc., 358 Eagle St. N., Box 3204, Cambridge, Ont., Canada N3H 4S6; and Constantine, 2050 Eastchester Road, Bronx, N.Y. 10461.

Small, electric power carvers are quick and efficient for roughing out stock and cutting fine details. Bartholomew uses a reciprocating carver to rough out a cedar owl. She will change to a flexible-shaft rotary grinder, like the one hanging by her shoulder, to carve finer details.

Power Carvers

High-speed cutting with hand-tool precision

by Judi R. Bartholomew

I'm convinced that power carvers, such as rotary grinders and electric reciprocating machines, are the best tools for sculpting wood. It may take you a while to get used to the carvers, but once you do you'll find they excel at many carving tasks. Reciprocating devices are great for texturing or roughing out pieces quickly and accurately. I rely on rotary grinders for removing tool marks, surfacing and polishing. For ultra-fine detailing, I use high-speed microgrinders, which have smaller hand pieces than most rotary grinders. When guided skillfully, power carvers can rival the work of an accomplished craftsman sculpting wood by hand.

Of course, power carvers may not be suited for everybody. I know carvers who say they can rough out a piece with a mallet and gouge faster than they can with a power tool. This is true if you can clamp the piece securely, and I often work that way myself. But if I anticipate hours of back-breaking labor on tough wood, I rough out with power. Once most of the waste is gone, power carvers are easier to control than hand tools when working gnarly grains. Since the power comes from the tool, not from a mallet, it is relatively easy to change your wrist angle or move your body to cut in from another side, although the tools can kick back dangerously if you try to cut against the grain. As with any power tool, you must wear adequate eye and ear protection, as well as a dust mask or respirator.

In this article, I'll discuss the major types of electric power carv-

ers listed in the chart on pp. 84-85: rotary grinders powered by an electric motor in the tool or by a flexible shaft connected to a separate motor; high-speed, microcarving rotary tools often used for jewelry work; and self-contained or shaft-connected tools with reciprocating chisel-like blades. But before discussing specific tools, I'll explain how the various types work.

Rotary tools—Rotary grinders, both the self-contained and flex-shaft models, are familiar tools in many craft fields. The hand pieces are machined to hold either a collet that can be tightened down on a cutter shaft or a three-jaw Jacobs chuck like those on power hand drills. Some of the simpler machines have built-in collets that only accept certain-diameter shafts. Others have interchangeable collets to handle everything from tiny dental burrs to ¼-in.-dia. bits. Frequently, the devices are equipped with speed-control mechanisms that can be set from 0 RPM to 35,000 RPM or higher; others run at just one or two speeds, commonly between 10,000 RPM and 30,000 RPM. A few companies now sell adapters so that rotary grinders can run reciprocating blades as well.

The key to obtaining maximum performance with rotary cutters is to let the tool do the work. Don't bear down enough to stall the motor. I favor a two-hand grip: one hand holds the tool securely while the other guides it. Grasp the tool firmly, but don't strangle it, and don't risk overheating the motors by blocking the cooling vents with your fingers. With a flexible-shaft drive, the motor is either mounted to a bench or suspended from hooks or brackets. I prefer suspended motors because they can be hung out of the way, right over the work area. But the flex shafts can crimp if bent too far, and so hand-held grinders generally are easier to move around since you only have to manipulate a thin electric cord going to the receptacle.

Photo: Judi Bartholomew

In creating this cherry "Monege" (French for carousel), the author laminated the animal collection at various depths, and then used hand tools, a reciprocating carver and a flexible-shaft grinder to texture the 1½x22x22 background; detailing was done with ⅛-in. and 3/32-in. rotary cutters, while ultra-fine polishing was performed with a hand-held grinder and both diamond and ruby burrs. The plaque weighs about 25 lbs. and culminates in the 4-in. relief of the gilded gladiator horse shown in the foreground.

Reciprocating machines—I have been pleasantly surprised by how well the back-and-forth carving motion of these tools works. The tool's usual blade stroke length of 1mm minimizes the chance of splitting the wood during a cut. A sharp reciprocating blade can even smoothly scoop with the grain, a maneuver almost unheard of with hand-carving. Curly or fiddleback grains that switch direction without much notice are more easily carved with a gouge at a 90° angle to the grain. On most other woods, you will have more control and less vibration when you work at a 45° angle to the grain.

With the reciprocators, the blade vibrates only on contact with the wood. As you work with harder woods and increase the pressure on the tool, the SPM slows down as the carving head compensates for the load. When this happens, I switch to a smaller blade or take a lighter cut, to let the chisel resume a full stroke and work at optimum capacity. Reciprocators generally come with 5 to 10 blades, which are adequate for most work. I use large gouges for roughing out, V-shaped parting tools for outlining areas and defining details, and narrow U-shaped veiners in tight spots. Bent gouges or spoon gouges are ideal for smoothing background areas. I generally sharpen the blades like conventional hand-carving tools. For working in hardwoods, I prefer blades with a long primary bevel and a narrow secondary bevel. I avoid secondary bevels on blades for softer woods, because they can cause tearout.

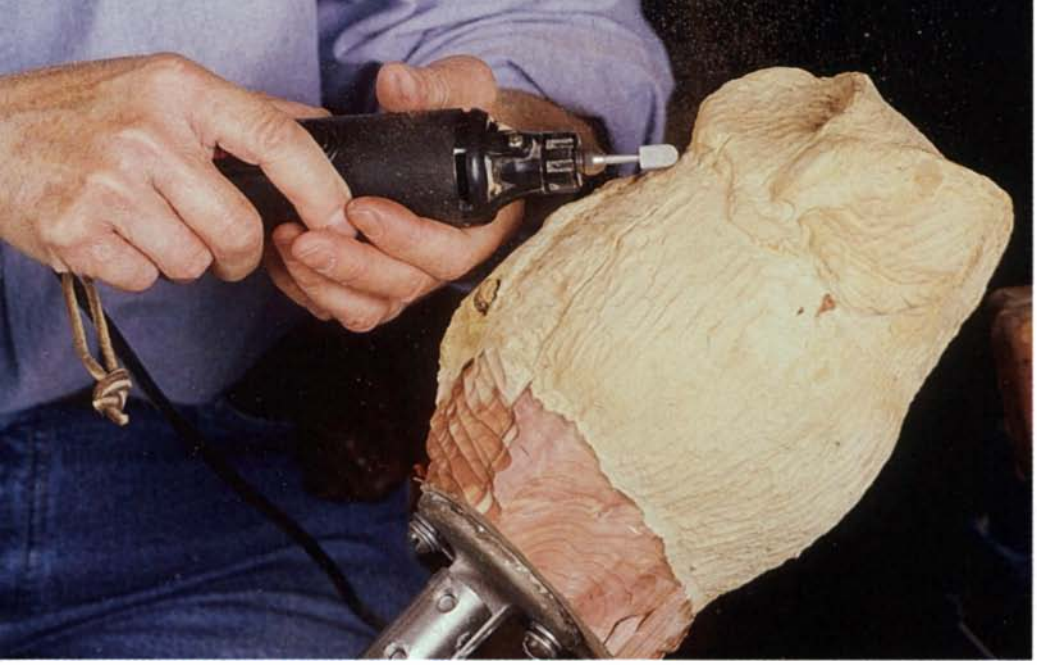
Microcarving grinders—These high-speed rotary tools are designed for intricate, precise cutting and polishing, and you may have seen some in your dentist's office. The hand pieces on these devices are connected by a pliable, coiled electric cord, making them very maneuverable in tight places. But because the microcarving machines use finer bits with smaller-diameter shafts, it's critical that you heed the maximum RPM warning on individual bits.

Evaluating carving tools—As a professional carver, I rely on several types of machines in my work, as explained in the photo on the previous page and in the photo at left. In general, I've found that the machines with ball-bearing components stay cooler, run quieter and more smoothly, and are longer lived. Many companies market die grinders for metalworking or other trades, and I've listed a few of the manufacturers that offer flexible-shaft models in the chart or sources of supply box. Specifically, they are Dumore Corp., Enco Manufacturing Co. and Hatzco Industries. Similarly, several other companies are listed that make models which I was unable to review by publishing time. These include Cyclone, Micro-Mark and Mini Craft. Before buying any tool, I recommend you try several types of carvers to see what's best for you.

Chicago Wheel and Manufacturing Co.—The 18,000-RPM F-1000 model was one of the first power carvers I owned and it has continued to be reliable. While it is not particularly suited for delicate work, it does hog wood quickly and very accurately.

Dremel Moto-Tool—This company offers several constant-, two- and variable-speed grinders with a wide choice of bits and accessories. The model I like best is the single-speed #2750, which has ball bearings and a 28,000-RPM motor. This unit is a reliable, versatile worker. Dremel also manufactures a cordless model, as well as many of the rotary grinders sold by Sears.

I also liked Dremel's flexible-shaft unit (#732) that has a ⅕-HP, 20,000-RPM motor, a sensitive foot-operated speed control, and ro-



Left: Rotary grinders are fast, but they produce hefty doses of sawdust. The author's two-hand grip makes it easy to control the tool as it cuts: The rear hand holds the tool securely and the front hand guides the cutter as it moves across the cedar blank.

Right: Reciprocating carvers offer an option for those who prefer the look of tool marks and want to avoid dust. The tools, which cut only when pressed against the wood, as shown, cut smoothly when used across the grain or at a 45° angle to the grain.

tary hand piece that can handle ¼-in. and ⅛-in. collets. With the hand piece furnished, I could do rough and intermediate work. The motor ran smoothly and coolly, and the cable-end reinforcements on this model were the best of the machines I tried.

Foredom Electric—Foredom's #CC-30 is a good 1/10-HP, variable-speed machine equipped with the company's standard #30 hand piece and a 36-in. flexible shaft. Even at 15,000 RPM, it is smooth running and comfortable to handle. The hand piece has a key-tightened Jacobs chuck, which will handle cutters with a ⅛-in.-dia. shaft. A microchuck can be purchased to hold hair-thin bits, sizes 60 to 80. For fine detailing I recommend its #8 hand piece with collet. The company also offers a ⅛-HP motor, as well as models with different shaft lengths and hand pieces.

Gesswein & Co.—The Power Carver by Gesswein includes a table-top controller unit with transformed d.c. power source; a hand piece with cradle; and ⅛-in., 3/32-in. and 1/16-in. collets. The grinding speeds range from 5,000 RPM to 55,000 RPM, and the motor has a reverse switch. Unlike the other models in which the collets slid into the hand pieces easily, I found that changing the Gesswein collets was difficult at times since the hand piece had to be taken apart whenever the collets had to be changed. I tried this model at its maximum speed of 55,000 RPM and found that the hand piece began to scream and heat up. However, Gesswein offers an optional hand piece for hardwoods, which turns at a more reasonable 30,000 maximum RPM.

Grizzly Imports Inc.—The Grizzly #G-1806 is an 18,000-RPM flexible-shaft grinder with an easy-to-operate foot speed control. The unit comes with a stiff, 36-in.-long flexible shaft, detachable hand piece and hanger bracket. Its ¼-HP motor makes it a good choice for roughing work.

NSK America Corp.—The variable-speed Electer GX has a sealed d.c. motor that turns up to 40,000 RPM. It comes with ⅛-in., 3/32-in. and 1/16-in. collets, a tapered hand piece with a holder and wrench, and fuses to prevent overloading. The burrs change easily with the flip of the chuck control lever located on the side of the hand piece. You need only insert the burr, finger-tighten the collet, flip the lever and it's ready to go. This carver did a good job of removing wood when detailing, and it remained cool and quiet throughout.

Pfingst & Co.—The Pfingst #CHP-440 has a ⅛-HP motor, foot-operated speed control, and hand piece that accepts ¼-in., ⅛-in. and 3/32-in. collets. I found I had to remove the hand pieces carefully, because the pressed-metal wrapping on the shaft ends could pull out easily. The grinder proved gutsy enough, without bogging down or vibrating loose, even with coarse-cutting bits. Pfingst also manufactures the Carve-Ease model from P.C. English.

Rakuda—The company rates its #RA-200 as a professional model reciprocator. It features an ample 72-in. flexible shaft, which gives

(continued on p. 85)

Sources of supply

The following companies distribute at least one of the following: reciprocating or rotary machines, flexible shafts, hand pieces, collets, cutters or blades, power-carving kits or accessories.

Barap Specialties, (616) 352-9863.
CLT Co., (501) 524-8525.
Carefree Woodcarving Supply, (602) 488-0318.
Craft Supplies USA, (801) 373-0917.
Craftsman-Wood Service Co., (800) 543-9367.
Dumore Corp., (414) 633-8221.
Dupli-Carver Enterprises, Inc., (317) 271-1542.
Frank Mittermeier, Inc., (212) 828-3843.
Frog Tool Co., Ltd., (312) 648-1270.
Garrett-Wade, (800) 221-2942.
Harbor Freight Tools, (800) 444-3353.
Highland Hardware, (800) 241-6748.
Kimball Woodcarver Co., (912) 598-8903.
Leichtung Workshops, (800) 321-6840.
Marlin Industries, Inc., (704) 743-5551.
Sculpture House, Inc., (212) 679-7474.
Silvo Hardware Co., (800) 331-1261.
Trendlines, (617) 884-8951.
Veracka's Carousel Barn, (708) 966-1266.
Warren Tool Co., Inc., (914) 876-7817.
Wood Carvers Shop, (203) 634-4454.
Woodworker's Supply, (800) 645-9292.
The Woodworkers' Store, (612) 428-2899.

Electric Power-Carving Systems					
Manufacturer or U.S. Distributor	**Model**	**Description**	**Cutting Action**	**Motor, Recommended Speed (Range or Maximum)**	**Collet or Chuck Dia.**
Chicago Wheel & Mfg. Co.— (312) 226-8155, (219) 879-8390	Handee F-1000	Flexible shaft with hand piece and motor	Rotary	⅜ HP; 18,000 RPM	⅛ in., ¼ in.
Cyclone/Chesterfield Craft Shop—(609) 298-2015	150	Flexible shaft with hand piece and motor	Rotary	⅓ HP; 0-20,000 RPM	3/32 in., ⅛ in., ¼ in.
Dremel Moto-Tool Inc.— (800) 437-3635, (414) 554-1390	2750	Hand-held grinder	Rotary	1.15 amps; 28,000 RPM	1/32 in. to ⅛ in.
	2850	Hand-held grinder	Rotary	1.15 amps; 15,000/28,000 RPM	1/32 in. to ⅛ in.
	3950	Hand-held grinder	Rotary	1.15 amps; 5,000-30,000 RPM	1/32 in. to ⅛ in.
	Heavy-Duty 732	Flexible shaft with hand piece and motor	Rotary	⅓ HP; 0-20,000 RPM	1/32 in. to ¼ in.
	Free-Wheeler 850	Hand-held cordless grinder	Rotary	6v battery; 15,000/20,000 RPM	1/32 in. to ⅛ in.
Enco Mfg. Co.—(800) 621-4145, (312) 745-1500	801-1780	Flexible shaft with hand piece and motor	Rotary	0.115 HP; 10,000 RPM	3/32 in.
	801-1785	Flexible shaft with hand piece and motor	Rotary	¼ HP; 16,000 RPM	¼ in.
The Foredom Electric Co.— (203) 792-8622	CC-30	Flexible shaft with hand piece and motor	Rotary	1/10 HP; 0-15,000 RPM	0 to 3/32 in.
	R-25	Flexible shaft with hand piece and motor	Rotary	1/10 HP; 0-20,000 RPM	⅛ in.
	S-30	Flexible shaft with hand piece and motor	Rotary	⅛ HP; 0-18,000 RPM	0 to 3/32 in.
	H-44B	Flexible shaft with hand piece and motor	Rotary	1/10 HP; 0-20,000 RPM	¼ in.
Gesswein & Co.— (203) 366-5400, (800) 544-2043	Power Carver	Hand-held microgrinder with transformer	Rotary	28.5 watts d.c.; 5,000-55,000 RPM	1/16 in., 3/32 in., ⅛ in.
	PH-1X	Hand-held microgrinder with transformer	Rotary	26 watts d.c.; 0-35,000 RPM	⅛ in.
Grizzly Imports Inc.— (800) 523-4777, (800) 541-5537	G-1806	Flexible shaft with hand piece and motor	Rotary	¼ HP; 0-18,000 RPM	3/32 in.
Hatzco Industries— (708) 485-3600	Leigh LG-6	Flexible shaft with hand piece and motor	Rotary	¼ HP; 17,500 RPM	¼ in.
Micro-Mark—(800) 225-1066, (201) 464-6764	15230/15232	Hand-held microgrinder with transformer	Rotary	1.2 amps; 5,600-21,000 RPM	3/32 in., ⅛ in.
Mini Craft/National Fulfillment Systems—(800) 288-5331, (301) 785-7200	MB-1010	Hand-held drill grinder	Rotary	100 watts d.c.; 1,000-17,000 RPM	Keyless
	MB-120	Hand-held drill grinder	Rotary	40 watts d.c.; 1,000-30,000 RPM	Keyless
NSK America Corp.— (708) 228-1175	Electer-GX	Hand-held microgrinder with transformer	Rotary	150 watts d.c.; 0-40,000 RPM	1/16 in., 3/32 in., ⅛ in.
P.C. English Enterprises Inc.— (800) 221-9474, (703) 582-2200	Carve-Ease 091001	Flexible shaft with hand piece and motor	Rotary	⅛ HP; 0-14,000 RPM	¼ in.
Pfingst & Co.— (908) 561-6400	CHP-440	Flexible shaft with hand piece and motor	Rotary	⅛ HP; 2,000-14,000 RPM	¼ in.
	CH	Flexible shaft with hand piece and motor	Rotary	1/10 HP; 2,000-14,000 RPM	¼ in.
Rakuda/The Japan Woodworker— (415) 521-1810, (800) 537-7820	RA-200	Flexible shaft with hand piece and motor	Reciprocating	3.2 amps; 6,600 SPM	¼ in.
	Flex Shaft Assembly	Flexible shaft with hand piece †	Reciprocating	NA; 1,000-3,450 RPM	¼ in.
Sears/Craftsman— (800) 366-3000, (312) 875-2500	25147	Flexible shaft with hand piece and motor	Rotary	0.95 amps; 7,500-25,000 RPM	1/32 in. to ⅛ in.
	61003	Hand-held grinder	Rotary	1.15 amps; 5,000-30,000 RPM	1/32 in. to ⅛ in.
	61001	Hand-held grinder	Rotary	1.15 amps; 30,000 RPM	1/32 in. to ⅛ in.
Sugino Corp./Auto Mach— (708) 397-9401	Hi Holiday Woodcarver	Flexible shaft with hand piece and motor	Rotary hammer	55 watts; 6,000 RPM	¼ in.
	HCT-30	Hand-held carver	Reciprocating	80 watts; 10,000 SPM	¼ in.
	WCT-100	Flexible shaft with hand piece †	Reciprocating	NA; 2,800-6,000 RPM	¼ in.
Sum-Flex/Woodcraft Supply Corp.— (800) 225-1153, (800) 535-4482	09N31	Flexible shaft with hand piece †	Rotary or reciprocating	NA; 1,800-3,600 RPM	1/32 in., ⅛ in., ¼ in.
Sun Flag +	Easy Carve 750	Flexible shaft with hand piece †	Reciprocating	NA; 1,000-7,000 RPM	¼ in.
Wood Carvers Supply— (800) 284-6229, (804) 583-8928	Master Carver	Flexible shaft with hand piece and motor	Rotary or reciprocating	¼ HP; 0-18,000 RPM	3/32 in., ⅛ in., ¼ in.
	Optima II	Hand-held microgrinder with transformer	Rotary	70 watts; 2,000-24,000 RPM	3/32 in., ⅛ in.

NA = Not applicable
\+ = U.S. distributors for Sun Flag are Carefree Woodcarving Supply, The Japan Woodworker and Woodcraft Supply (phone numbers in sources of supply or above).

	List Price*	Comments
	$435	3/16-in.-dia. flexible shaft; wrench, reducer collets, lubricant included
	$185	Ball-bearing hand piece, speed control available; high-torque micromodel with 35,000 RPM available
	$56	Includes 20 assorted bits; optional 36-in. flexible shaft
	$98	Includes 30 assorted bits, thrust bearing, 6-ft.-long power cord; two speeds only
	$123	Includes 40 assorted bits, thrust bearing, carrying case
	$195	39-in. flexible shaft; foot-operated speed control
	$101	Requires three hours to recharge; two speeds only
	$304	Includes 1/8-in. collet; adaptable to d.c.
	$542	Includes 1/8-in. and 1/4-in. collets; adaptable to d.c.
	$300	36-in. flexible shaft; speed control
	$380	37-in. flexible shaft; speed control; other hand pieces available
	$240	39-in. flexible shaft; hanging bracket; foot-operated speed control
	$280	42-in. flexible shaft; foot-operated speed control; tabletop dial available
	$665	Reversible motor; overload switch; 6-ft. cord
	$485	Reversing switch; overload switch; optional 3/32-in. reducing collet
	$120	36-in. flexible shaft; foot-operated speed control
	$395	Optional reducer collets, speed control; similar models with different HP and RPM available
	$95	5.4 ozs.; optional electric cables
	$57	Optional modeling kits
	$34	Optional modeling kits
	$785	Reversible motor; overload switch; optional hand pieces, foot-operated speed control
	$148	Speed control
	$169	Optional speed control
	$164	Optional foot-operated speed control, hand pieces
	$540	76-in. flexible shaft; six blades; carrying case
	$275	76-in. flexible shaft; five blades
	$92	4.5 lbs.; maximum-speed switch
	$45	1.7 lbs.; finger pad speed control; pantograph kit available
	$27	1.7 lbs.; tabletop speed control; carrying case available
	$378	60-in. flexible shaft; five blades; one collet size
	$288	2 lbs.; five blades; optional rotary head; one collet size
	$155	60-in. flexible shaft; operated by electric drill; one blade size
	$89	40-in. flexible shaft; five blades; two interchangeable heads
	$89	59-in. flexible shaft, five blades, wrench included; heavy-duty model available
	$300	38 1/2-in. flexible shaft; five blades; two hand pieces; foot-operated speed control; optional bench dial
	$250	Includes 1/2-in.-dia. hand piece, reversing switch

* = Dealer selling prices are typically 5% to 25% lower.
† = Motor or drive source not included.

good maneuverability. Another good feature is that the hand piece doesn't twist the flexible shaft because it swivels on the shaft via a system of roller bearings. Roughing out or moderately texturing wood was relatively easy with the spanners included, but when detailing it took a little while to get used to the drag caused by the longer flexible shaft. Blade changing was easy, and the leather sleeve on the hand piece made the grip comfortable.

Sugino Corp./Auto Mach—The company's reciprocating carver (#HCT-30) comes with a single spanner and five blades. It handles very well when carving moderate to light work, and the tool's top-rated speed of 10,000 SPM produces a smooth cut in a variety of woods. When sharpening these blades, I found I got best results with just a primary bevel and no secondary bevel. Vibration loosened the threaded collar holding the carving head, and the company sent me an O-ring, which kept the collar tight, but made the blade wobble. Wrapping plumber's tape on the threads eventually solved the problem, though.

Sugino's other model I tried, #WCT-100, features a 5-in.-long carving head with a comfortable hand piece. The two spanners provided let me securely snug down the five blades that are included. The flexible shaft is designed to be attached to a drill or bench-mounted motor, running at 3,400 RPM to 3,500 RPM, but even when attached to my 3,100-RPM drill press, it easily whittled away at a piece of hand-held cherry. Don't use excessive pressure, though; the blades bend fairly easily.

Sum-Flex/Woodcraft Supply Corp.—The #09N31 model includes a reciprocating 90° elbow-shaped hand piece, a rotary grinder head with four collet sizes, and a 40-in. flexible shaft that can be connected to a motor running between 1,800 RPM and 3,600 RPM. I tried carving walnut at about 2,700 RPM, and got a smooth cut, although the carver did heat up after I had used it a short while. The blades provided are good, but I had difficulty removing them without pliers on the collet collar.

Sun Flag—The Easy Carve 750 attaches to any motor not exceeding 7,000 RPM. Because the arbor is a little less than 1/4 in., you'll need a Jacobs chuck on the motor to hold it. The reciprocating hand piece and shaft snap on easily, and the six blades supplied are easy to change. While detailing, this machine cut quietly and smoothly without overheating. Two 4-in.-long springs nicely reinforced the ends of the flexible shaft, and the optional collar allows direct connection to most flexible-shaft motors.

Wood Carvers Supply—The Master Carver model includes both reciprocating and rotary hand pieces; five cutters; 1/4-in., 1/8-in. and 3/32-in. collets; a 1/4-HP, 0 to 18,000-RPM hanging motor; and foot-operated speed control. The machine runs smoothly enough for fine carving and neither the motor nor hand pieces overheated. The reciprocating carver operates from 3,000 SPM to 12,000 SPM, and produced a better cut at the high speed. The tightening tools are simple to use and colored orange, making them easy to spot.

Wood Carvers Supply's Optima II microgrinder offers variable speed, up to 24,000 RPM, with a tabletop control supplying power to the hand piece. It comes with 1/8-in. and 3/32-in. collets, and a wrench to tighten them. There are no vents in the hand piece to "inhale" dust; venting is provided on the convertor, which sits on your bench. This simple machine is quiet, stays cool and handles detail work and roughing out comfortably. □

Judi Bartholomew is a professional woodcarver in Milwaukee, Wisc. Photos by Dick Burrows except where noted.

Traditional Swiss Boxes

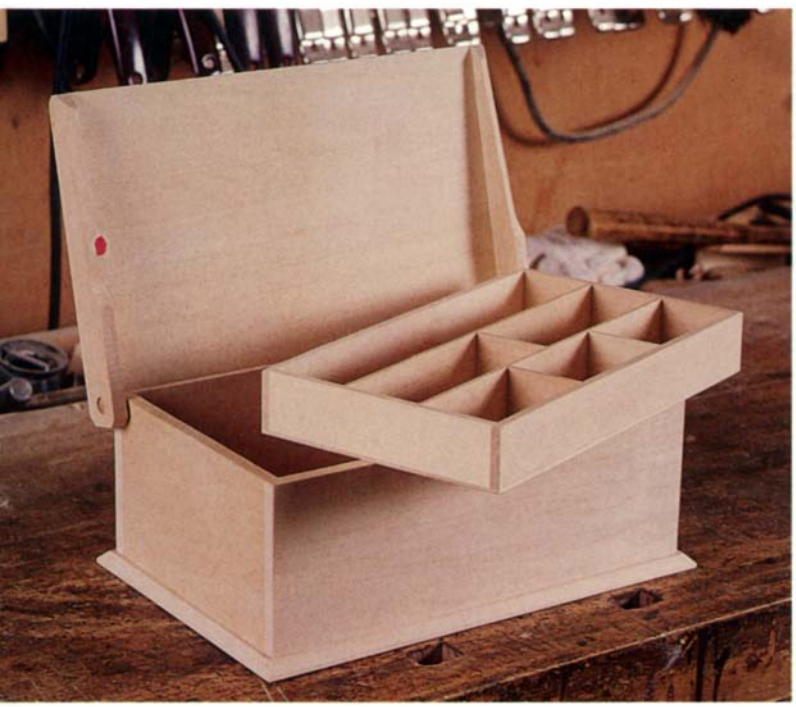
Top hinges on wooden pins

by Gottlieb Brandli

Boxes are wonderful projects for woodworkers. You can make them in a multitude of sizes, with a plain or fancy design, and from a variety of woods. In addition to being beautiful, a well-designed box can be tailored to store everything from jewelry to family heirlooms. And a small box is such a manageable project that you can afford to invest extra time on design and technique to ensure everything fits together perfectly.

Each year during the last two decades I've built hundreds of boxes based on a design that is fairly common in my native Switzerland. Ironically, I found the original antique that inspired my version at a friend's house in Wisconsin. The box was about 150 years old and from beech wood, which is commonly used for boxes made in Europe. As you can see in the photo below, my basswood box is not very fancy, but designed so it can be embellished with chip carving, inlay, rosemaling or other decorations. If you want a fancier box, you can build it with raised panels, which are especially nice in book-matched walnut, butternut or cherry.

Regardless of the wood you use, the technique and joinery will be the same as those I'll discuss here. Since I build 100 to 150 boxes at a time, I rely heavily on machine techniques, primarily the tablesaw and shaper, but the same method can be adapted to produce a single box. A table-mounted router will work fine if you don't have a shaper. The important thing is to work accurately; I keep tolerances within 1/128 in. or so. This not only ensures tight joints on each box, but allows parts from one run to be assembled with parts from another run; this is important to me because I sell many boxes in kit form. If a customer ruins a piece during assembly or messes up a carving, I can provide replacement parts that fit.



This basswood box is based on traditional European design and intended to be decorated with carving, rosemaling or other device. The wood is so stable and the pieces so thin that the box remains intact, even though several cross-grain constructions are used.

Extra parts make it easy to set up tools for future production runs. I've found that woodworkers often start out by making a single box, but then find themselves building more for other family members or friends. Because of the simple design of the box, you have the option of making two different sizes simultaneously, just by working with sides that are 2¼ in. or 4¼ in. high; the base, lids and trays will be the same regardless of side height.

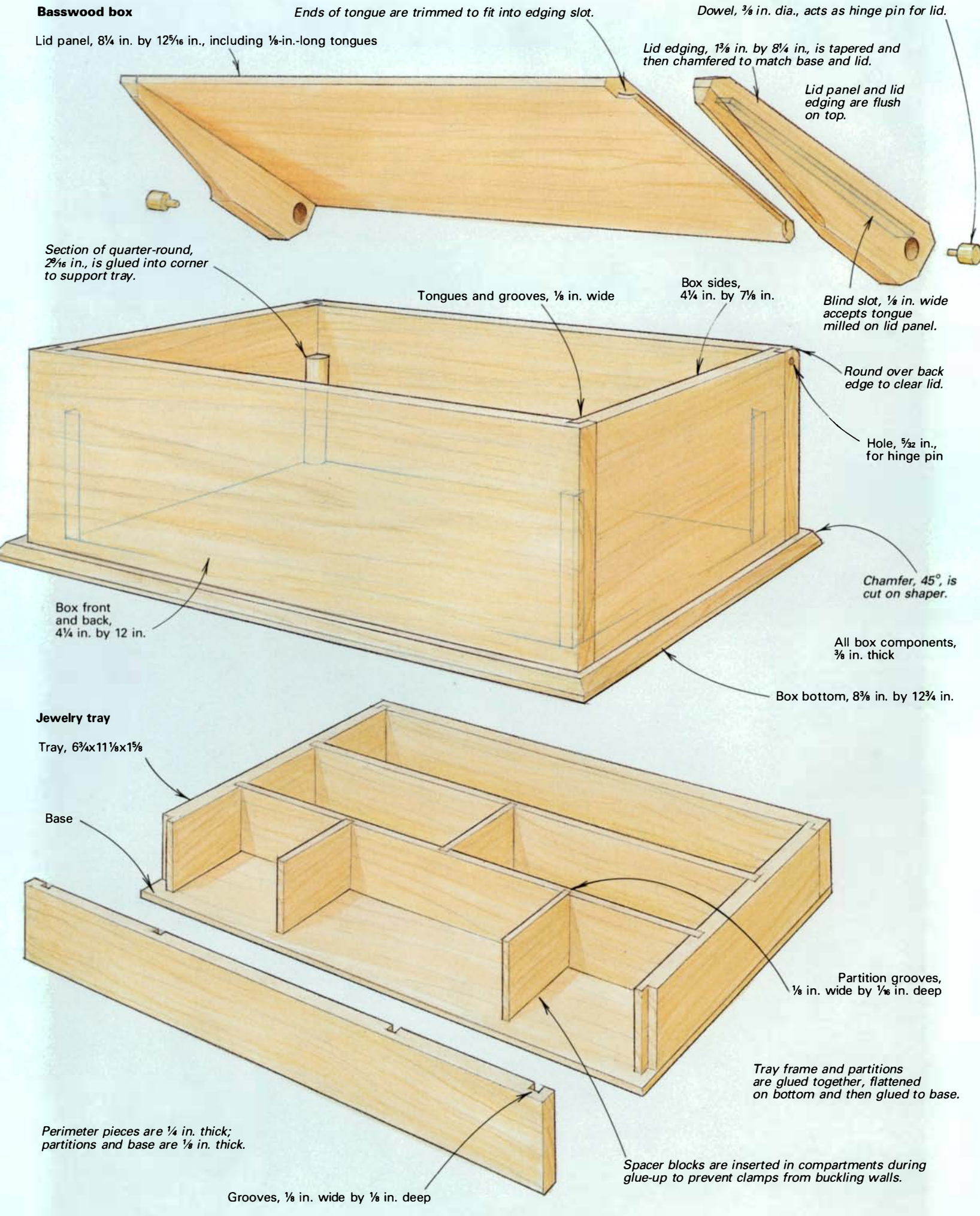
The joinery on this box is designed to lock the components together to prevent warpage. The corners are secured with a tongue-and-groove joint, and the lid is reinforced with slotted edging strips that fit on tongues on the lid. The base is glued directly to the sides. All components are ⅜ in. thick, except for the base and tray, which has ¼-in.-thick sides, front and back and ⅛-in.-thick partitions.

The basswood I use is relatively easy to machine, but it is so soft that cutters must be sharp or the stock will tear. These tearouts can be sanded, but the edges look much better straight from the cutter, and so I frequently hone the cutters with a diamond whetstone. For softwoods I prefer high-speed steel cutters, which take a sharper edge than carbide but need to be honed more often.

As with any woodworking project, seasonal wood movement can be a problem, especially since my boxes appear to violate several time-honored prohibitions against cross-grain constructions. Normally I would avoid these situations, but I haven't had any problems and I sell boxes all over the country, so they are exposed to varying weather conditions. I think the lack of problems is due to the stability of the basswood and the use of thin, relatively narrow components. If you'd rather take out a little extra insurance, though, you could make the tongue on the lid a little larger and spot-glue it into the middle of the edging slot. Also, when gluing on the bottom, orient the grain so the annual rings are arching away from the box and run a single screw up through the bottom into the middle of the side. This way the screw holds everything together, in case the bottom piece moves. For more information on boxes, see *Fine Woodworking on Boxes, Carcases and Drawers* (The Taunton Press, Box 5506, Newtown, Conn. 06470-5506).

I try to minimize wood movement by buying well-seasoned stock at about 6% moisture content (MC), which I find will pick up moisture at a uniform rate in most of the country. This means that as long as the components are exposed to air equally on all sides, they

Drawings: Kathleen Rushton; photos: Dick Burrows


Basswood box
Ends of tongue are trimmed to fit into edging slot.
Dowel, 3/8 in. dia., acts as hinge pin for lid.
Lid panel, 8¼ in. by 12⁵⁄₁₆ in., including ⅛-in.-long tongues
Lid edging, 1⅜ in. by 8¼ in., is tapered and then chamfered to match base and lid.
Lid panel and lid edging are flush on top.
Section of quarter-round, 2⁹⁄₁₆ in., is glued into corner to support tray.
Tongues and grooves, ⅛ in. wide
Box sides, 4¼ in. by 7⅛ in.
Blind slot, ⅛ in. wide accepts tongue milled on lid panel.
Round over back edge to clear lid.
Hole, 5/32 in., for hinge pin
Chamfer, 45°, is cut on shaper.
Box front and back, 4¼ in. by 12 in.
All box components, ⅜ in. thick
Box bottom, 8⅜ in. by 12¾ in.
Jewelry tray
Tray, 6¾x11⅛x1⅝
Base
Partition grooves, ⅛ in. wide by 1/16 in. deep
Tray frame and partitions are glued together, flattened on bottom and then glued to base.
Perimeter pieces are ¼ in. thick; partitions and base are ⅛ in. thick.
Spacer blocks are inserted in compartments during glue-up to prevent clamps from buckling walls.
Grooves, ⅛ in. wide by ⅛ in. deep

When working with power tools, Brandli uses several simple jigs and fixtures to speed production, ensure accuracy and keep fingers out of danger. This device serves as a backing board to push a workpiece past a shaper cutter. The arm on the top holds the piece snugly down on the table. The dimensions of the holding jig depend on the type of machine you're using.

The author's tapering jig holds narrow lid-edging pieces at an angle, so a beveled cut is made when the assembly is pushed past the shaper knives. The clamps hold the pieces securely and the base is large enough to provide a firm handhold without bringing fingers near the cutting edge.

will stay nice and flat. The ⅛-in.-thick basswood lid is so flexible that a warped piece can be held flat by the sides. For added moisture protection, however, I advise finishing both the inside and outside of each box. The most popular finishes are polyurethane or oil.

Cutting the joints—I buy rough ¾ basswood from local mills, resaw it and run it through the thickness planer and sander in my shop to smooth the pieces and make them the exact thickness for the various parts. Next, the pieces are cut to width and length to match the dimensions in the drawing. Here again, accuracy is important. When crosscutting, I ensure all pieces will be the same by relying on stops mounted to an auxiliary fence screwed to the tablesaw miter gauge. One trick that I've found helpful when cutting pieces to length is using a two-position stop. It's simply two pieces of wood connected by a hinge. You can cut one length with the hinged piece down and the other with the hinged piece up out of the way.

The corner-joint grooves on the front and back pieces are cut on the tablesaw with a ⅛-in.-thick, 60-tooth carbide-tip blade that I reserve just for this job. Although I work from shop drawings showing the exact dimensions needed for every cut, it's faster and more accurate to set the blade and fence with a sample piece from a previous run, rather than measure everything again and again. To double-check the setup, I test the groove with a tongue on a piece cut in a previous run and fine-tune the saw until the fit is perfect.

The slots in the lid-edging pieces are also cut on a tablesaw using the same blade and depth-of-cut setting. This can be a dangerous operation since a plunge cut is needed to make the blind slots. I clamp wood stops to the saw fence in front of and behind the blade. Then I rest the piece against the front stop, drop the piece on the blade and use a push stick to advance it to the rear stop. This works fine because the slot is relatively shallow. As I cut the slots, I separate the pieces into two stacks to ensure I make the correct number of lefts and rights, and then I pair up pieces with similar colors. Before changing the sawblade, it's a good idea to cut the necessary grooves for joining the tray components. The procedure is the same as for the box components, but you have to be a little more careful with these delicate pieces.

Once all the pieces are grooved and slotted, they can be used to check the shaper cutter setup for forming the mating tongues. If a shaper isn't available, you can cut the small tongues with a slot cutter in a router or on the tablesaw. For accuracy I always set the shaper cutter above the stock, so the tongue will be formed on the bottom of the piece. Having the cutter on top means that if stock thickness varies slightly, the irregularities will be eliminated and all the tongues in the run should come out exactly the same. Since the short sides of the tray are only 1⅜ in. wide, I cut the tongues on three of these narrower pieces simultaneously on the shaper by lining them up edge to edge. This makes it easier to hold the pieces against the fence and the wood snugly against the table. To make this operation safer, make a simple jig like the one shown in the top photo. Basically, it's a base wide enough to bear securely against the fence, and fitted with an arm extending forward over the stock to be machined. The arm holds the work down, while the base guides and backs up the workpieces. This jig can also be used later when chamfering the base and lid.

We now have all the parts needed for the box, but if left this way it would be very plain. For visual interest and to give each box a sense of unity, I add a few chamfers to the lid, bottom and lid edging. Again, I rely heavily on my shaper, but you can chamfer with a router or handplane.

Before chamfering the lid edging, I first taper the pieces as shown in the drawing on the previous page. I do this on the shaper, with the tapering jig shown in the bottom photo, but it would be just as easy to clamp or tape a pair together and trim them with a bandsaw or handplane. The jig is simply a clamping device that holds the pieces at an angle so that a straight pass in effect leaves a tapered edge. The tapered pieces can then be chamfered to match the bevel around the bottom and on the front and rear edges of the lid.

The lid and bottom are shaped as shown in the drawing with a 45° chamfering bit on the shaper or router. The bottom is chamfered on all four edges, but only the front and rear edges of the lid are shaped. Again, use the holding jig to secure the pieces. The edging pieces are chamfered with the same shaper setup, but you'll need a device like the tapering jig described above to hold each piece and to keep your fingers away from the blade.

The ends of the lid edging must also be chamfered to continue the bevel on the front and rear of the lids. I do this on the tablesaw, fitted with the guard shown in the top photo on the facing page. Several pieces can be beveled at one time by holding them against the miter gauge and pushing them past the blade. The waste falls under the guard, safely out of the way. Two blade setups are needed: one for the small chamfer at the rear and another for the larger angle in front. The only other shaping needed is to round over the upper outside edge of the back, to provide clearance for opening and closing the lid. Again, a shaper or router, as well as a handplane or sandpaper on a block, can be used.

The final step before assembly is drilling a 13/32-in.-dia. hole in the lid edging for the 3/8-in.-dia. hinge pin. While you're at the drill press, you can also drill the ends of the back side for the narrower end of the pin. I made an L-shaped guide to support the piece upright (see the center photo at right), for drilling these 5/32-in.-dia. holes.

Assembling the box and tray—Because of the number of parts in the box and tray, a squaring jig is essential. Mine has a plastic laminate base, so glue won't stick to it. Two 1x4 oak blocks, which meet at a perfect right angle, are screwed onto the base, and two similar blocks are used as clamping pads on the remaining sides of the box or tray. In assembling the box, use restraint with the glue. You don't want to contend with a lot of squeeze-out, especially in interior corners where it is difficult to sand.

When you assemble the tray, remember the parts are delicate; so you can't be in a hurry or else you'll break them. Use the squaring jig and avoid squeeze-out just as you did in assembling the box, and remember to put spacers into the cavities so the clamps won't bend the 1/8-in.-thick partitions. Be careful with the first clamp because pieces sometimes will slide out of line. Go easy on the clamping pressure and try to hold all the bottom edges flat on the squaring jig. After the glue has cured, sand the tray with fine-grit paper and ease the edges of the four vertical corners. Allow about 1/16 in. between the tray and the box, to provide an air escape.

Generally, both the bottom of the box and the tray need to be flattened after they come out of the clamps. You might assume that you could do this on a belt sander, but the belt buckles just enough in the middle to make it difficult to get a flat bottom. Rather than risk damaging a good piece, I rely on a lot of elbow grease and flatten the assemblies on sandpaper-covered particleboard, as shown in the bottom photo. This is not an easy job, but it's good exercise and will get your heart pumping. Just be sure each assembly is held flat on the paper and pushed back and forth diagonally.

To glue the bottoms on, I sandwich the box and its bottom between two pieces of particleboard, line everything up and clamp carefully. Put scrapwood cleats under the bottom particleboard sheet to lift the base high enough for the clamp heads to slide underneath. I clamp the tray bottom in the same manner. Inside the box I glue four little 5/16-in. by 5/16-in. quarter-round corner posts to support the tray. I apply a small amount of glue and press these pieces into the corners; they stay in place without being clamped.

Assembling the lids requires extra precision and attention. You'll have to trim the end of the tongues on the lid to fit the blind slots in the edging. I do this with a router, but you can easily use a bandsaw or knife. Coat the tongue with glue and insert it in the slot. If the lid is warped a little, just bend the thin basswood enough to force it into the slots and clamp carefully, using protective wood blocks. Once the glue has cured, the top of the lid can be finished on a stationary belt sander with a 120-grit belt. I also have a V-shaped cradle that can be clamped to the sander to finish the chamfers and ensure everything is flush and smooth. You can also do this freehand. I don't sand any finer than 120-grit because I like the box to be a little rough, so the finish has something to grab onto.

The final step is to attach the lid. You may have to do a little hand-sanding and clean some glue seepage out of the hinge pin holes with a 5/32-in.-dia. bit. I always add a drop of glue to the hinge pin on the left side, but never on the right side. That way I can remove the lid if I want to carve or inlay it. After decorating and finishing is completed, I glue in the remaining pin. □

Gottlieb Brandli operates the Swiss Cabinetry Shop in Monroe, Wisc., and conducts woodworking seminars around the country. For more information, write him at 1609 13th Ave., Monroe, Wisc. 53566.

***Above:** An elevated guard attached to a standard tablesaw fence shields the blade from Brandli as he cuts corners off edging components. The cutoffs fall safely out of the way under the guard.* ***Right:** It's easy to bore holes into the ends of box components with this simple jig, which is made from an L-shaped plywood stand screwed to a base that can be clamped to a drill press table.* ***Below:** Rather than risk ruining a box frame by flattening it on a belt sander, the author trues the surface by repeatedly running it over sandpaper glued to a sheet of particleboard. The box is kept flat on the table and advanced at a slant.*

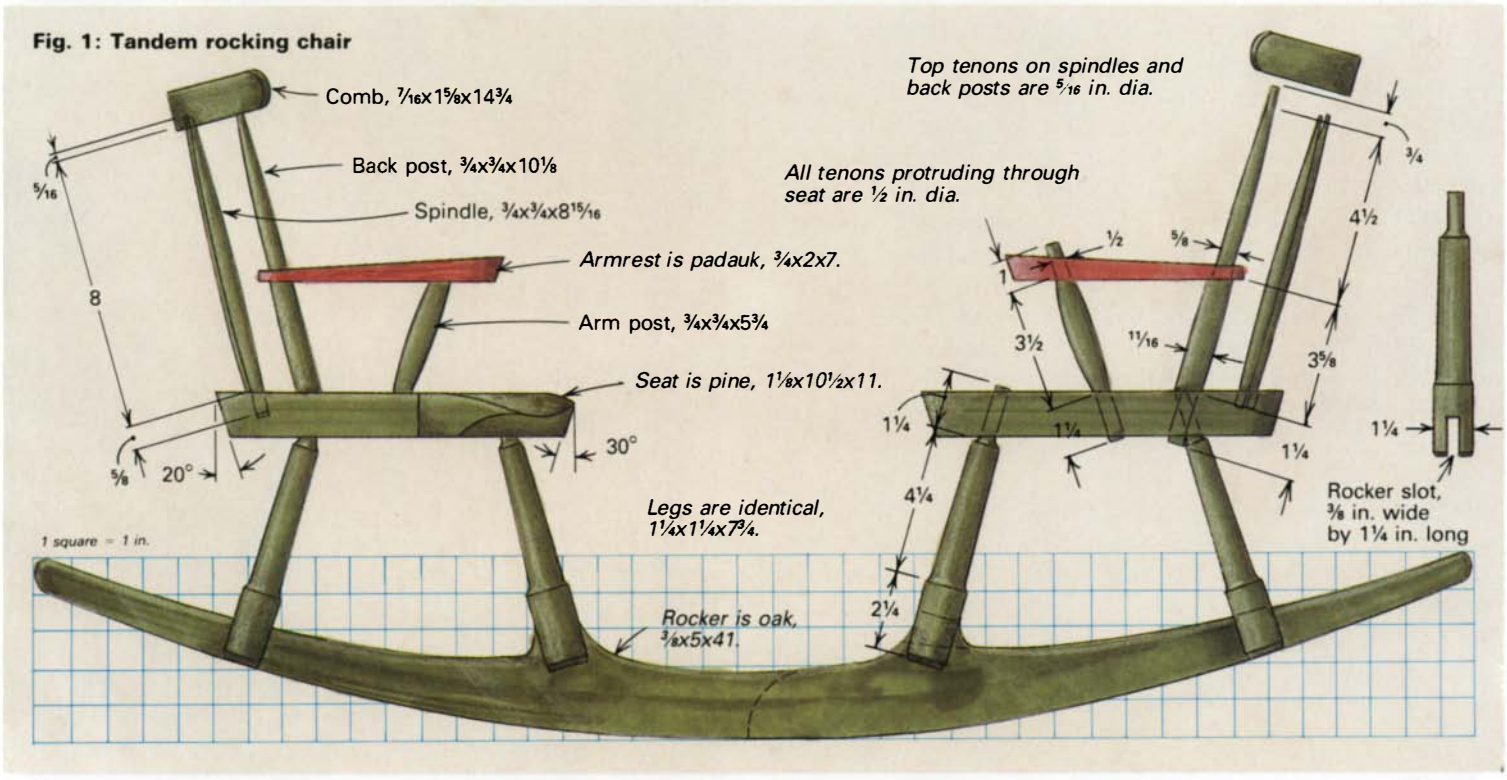
Making a Child's Rocker

A tandem Windsor for two toddlers

by Mario Rodriguez

Rodriguez's 13-month-old daughter, Isabel, tries a tandem Windsor rocker. It's finished with latex paint and has oiled padauk armrests.

Fig. 1: Tandem rocking chair



Photos: Gary Weisenburger; drawings: Aaron Azevedo

When I heard that friends were expecting twins, I set to work on a special gift for their joyous occasion: a toddler-size tandem rocker with two tiny comb-back Windsor chairs that face each other. Of all the Windsors I make, children's chairs are the most satisfying, but they pose a few unique design problems. For instance, the chairs look good with compressed, chubby legs and posts—like a baby's legs and arms—but they need proportionally stronger joints, since children's furniture takes more abuse than adult furniture. Furniture for little people should be easy to clean, because kids are sure to grab it with oatmeal-covered hands. So, even though I reduced the height of an adult chair by 50%, I reduced the diameter of the turned parts only 25%, and I simplified the shape of turned parts by not decorating them with coves and beads. The tandem rocker's turnings are pleasantly plump, so they have heavier tenons and thus stronger joints, and oatmeal doesn't have anywhere to hide. As you can guess, these design solutions work for single rockers, as well as for tandems.

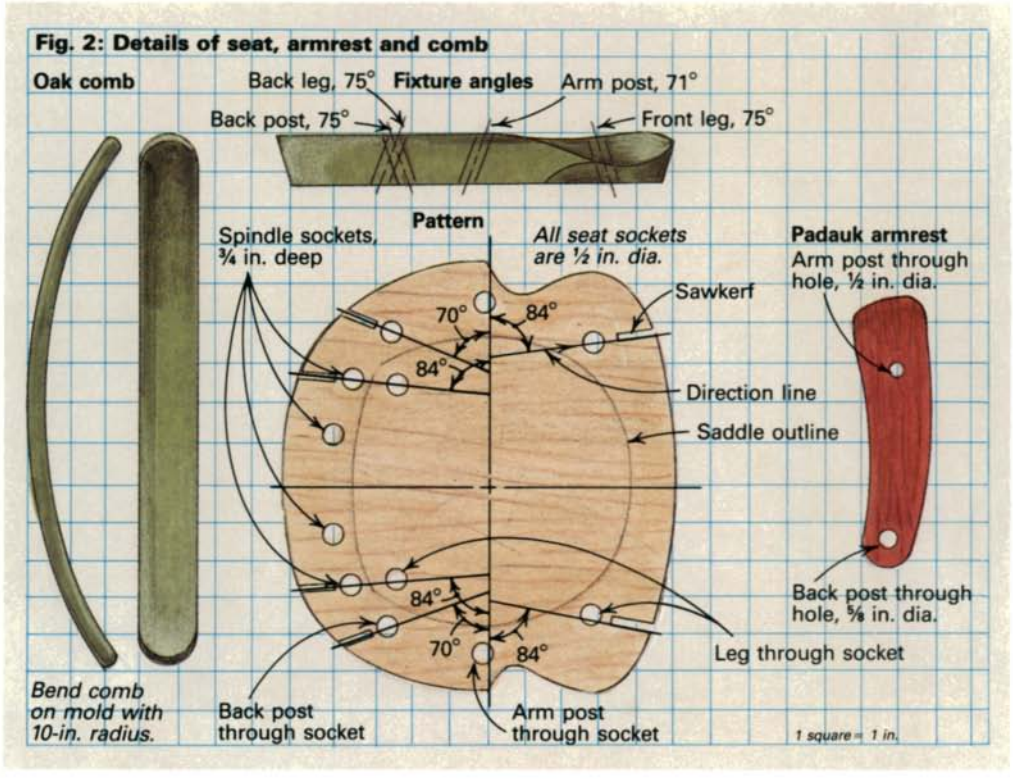
I'll tell you how I built the tandem rocker shown on the facing page, and, where appropriate, I'll tell you how to adapt the design for a single rocker. In most cases I'll describe how to make parts for a single chair, but remember to double everything for the tandem version. You'll see that the posts and legs are simple to turn, and since there aren't any stretchers between them, you don't have to drill angled stretcher sockets in the legs. Drilling the seat's compound-angle post and leg sockets can be intimidating, but the process can be simplified if you break it down into two factors: the angle at which the member meets the seat and the direction in which the part leans, which I call the direction line. I simply use a hand-held drill with guide blocks to set the angles and then aim the drill along the direction line. And don't let steam-bending the seat back combs throw cold water on your desire to build this tiny Windsor, because that part of the project is fun. The same is true of scooping out the seat: it only has to look good, because little padded rumps don't stay in one place long enough to get comfortable anyway. In fact, this design is as forgiving as the toddler it's intended for and every part can be made to fit together during assembly, even if you've drilled a few holes a little off.

Drilling the seat—When drilling angled holes, imagine you're shooting them with a hand gun. I used shopmade guide blocks (described later), like the one in the photo below, to angle the drill bit accurately, and I aimed the bit and the guide block's plywood base along the direction line. I marked the seat top with direction lines, the centers of the post and leg sockets, and traced the seat's outline from a thin plywood pattern, as shown in figure 2. It's easier to mark the seat with direction lines and clamp the guide block on it before you scoop it out. Holes in the blank won't affect saddling (carving the seat) if you use wide carving tools, like an inshave.

If you drill ⅛-in.-dia. holes in the pattern to indicate the socket centers, a pencil point will fit in them so you can transfer the centers to the seat accurately. Likewise, saw ⅛-in.-wide kerfs on each angle direction line in the pattern edge, to transfer the lines. Select a pair of 1⅛x11x14 clear pine seat blanks with the grain running front to back. This size will provide 3½ in. of waste on the back of the seat for clamping when you drill it and scoop it out. Align the front edges of the pattern and blank, mark the hole centers and their direction lines, trace the seat's outline and bandsaw the waste from its front edge. Although I marked the pattern with an outline of the scooped out saddle, I drew it freehand on the seat blank. As I said, the saddle doesn't have to be carved accurately.

I made the drill guides by gluing and nailing ¾x¾x2½ angled blocks on the end of ¼x¾x8 plywood strips, marking each block with the socket type and appropriate angle. To drill a ½-in.-dia. socket, align and clamp the block's plywood base to the seat on the direction line, with the block's angled front edge ¼ in. (half the socket diameter) from the hole's center. Center the bit's point, align its angle with the block's angle and aim the bit in the direction of the line. Use the guides to bore the post and leg sockets through the seat into a backing block, and then drill the ¾-in.-deep spindle sockets by eye, without guide blocks. Do this by putting the back posts in their sockets and align the bit angle parallel with the posts while you aim the bit along the direction line through the socket.

Carving the saddle—After drilling the seat, I clamped it to the workbench and scooped out the saddle, a simple dish about



To drill through-sockets in the seat, for the legs and posts, the author uses a guide block to set the drill angle and points the drill bit in the direction of lines marked on the seat. He marked the direction lines and socket centers from a plywood seat pattern.

***Above:** Rodriguez scoops out the saddle with an inshave. Since the tool's long, angled handles prevent him from cutting steeply into the seat, he'll finish around the back edges with a wide gouge.* ***Left:** The author carves the front of the seat with a drawknife. He shaves to a line that is marked on the middle of the edge and that curves around the sharp corner where the top rolls over.* ***Below:** Rodriguez steam bends the combs for about 45 minutes in a closed plastic pipe connected to a wallpaper steamer. Then the combs can be wedged against forms on his plywood bending fixture.*

⅝ in. deep, with an inshave (see the top photo). The angle and length of the handles on my inshave prevented me from using it to make a steep cut into the seat, and so I finished carving the abrupt radius at the back of the saddle with a 1-in.-wide #3 carving gouge. Since the seat is small, you could use a wide gouge exclusively to scoop out the saddle.

I used a drawknife and a spokeshave to shape the front of the seat. The front of its top rolls over to the beveled (undercut) bottom edge to accommodate a seated toddler's legs. As shown in the center photo, the sharp corner on the front edge, where the top surface meets the bevel, is a curved line: it begins on the top adjacent to the arm post, curves down below the seat's mid-thickness at its round front corners, and then sweeps up to the pommel (the center of the saddle's front). To visualize this curve, use your finger as a guide to draw a straight line at the mid-thickness of the seat's bandsawn front edge. I then used that line as a guide to draw the curved sharp corner on the front edge. To make the tandem seats identical, I carved their rolled over fronts until they were symmetrical and looked alike, and then I carved their bevels. The bevel angle changes from 90° in the hollow curve near the arm post, to 45° around the seat's left and right corners, to 30° across the front. I clamped the seat on the benchtop to spokeshave the rolled over edge and then on edge in a vise to carve the bevel with a drawknife.

When you're finished carving, bandsaw the seat's back edge on the pattern line, setting the saw table at 20° to bevel the edge as shown in figure 1, and then smooth it with a spokeshave. While you're at the bandsaw, cut out the rockers and a pair of combs according to the dimensions in figures 1 and 2 on pp. 90-91. If you're building a single chair, refer to figure 1 to alter the rockers; the rest of the chair is the same. I laid out, bandsawed and smoothed the edges of the tandem rockers and the combs from single pieces of 1-in.-thick green oak. I then resawed them into matched pairs. By cutting out the combs now, you can steam bend and dry them while you turn the spindles, posts and legs.

Steam-bending the combs—It doesn't take much effort to bend these small combs and they are less likely to break than larger ones. As you can see in the bottom photo, I generated steam with an electric wallpaper steamer, which you can rent at most paint stores, and used a section of 6-in.-dia. plastic sewage pipe as a steambox. I supported this long pipe in the middle, to prevent it from sagging, and elevated the lidded end so condensation would drain through a hole at the opposite end. While waiting for steam to fill the box, wrap your combs in damp towels to keep them green—they will bend easier than dried wood.

When steam is billowing from the box, indicating that it's hot, put the combs in for about 45 minutes (or longer if they're dry). A good rule of thumb is 45 minutes to an hour per inch of thickness. Use caution and wear gloves when you open the steambox lid and insert or remove hot wood—scalding steam can be invisible. (I recommend that beginners wear a long-sleeve shirt to prevent burns on their wrists.) By the way, you can quickly heat your lunch in the steambox and this is a good time to break and eat it.

I bent both combs on a fixture that has two 10-in.-radius solid wood bending forms screwed to its 1-in.-thick plywood base, which you can see in the bottom photo. The fixture's plywood base has ¾-in.-dia. dowel holes that are ¾ in. from the bending forms. After I wedged an end of a hot comb against a dowel at one end of the form, I bent the comb and inserted a dowel at the other end to hold the comb loosely in place. I then hammered a wedge between the second dowel and the comb, driving it against the form. The solid bending form retards drying on the face of the comb against it, so wrap the hot comb with a wet towel for more

even drying. Although even drying retards springback when you remove the piece from the form, you'll still get a small amount, which is all right. Leave the comb wedged in place to dry for a couple of days and go to work on the turnings.

Turning the spindles, posts and legs—As you can see in figure 1 on p. 90, the turnings don't have any decorative coves or beads, as on most Windsors. And none of the parts are longer than 10⅜ in. or thicker than 1¼ in., so you can use hardwood cutoffs from your scrap box; any hardwood will do, because this chair, like a traditional Windsor, is painted. Eighteenth-century chairmakers used green wood, because it turns easily, but it is supple, and the limber spindles might whip as you turn them to their finished diameter. You can overcome this by using a steady rest or by following the tool's cutting edge with your free hand. If turning the spindles proves too difficult, you can whittle and scrape them smooth by hand.

Taper the tops of the spindles and back posts to fit holes in the bent comb, and taper the spindle bottoms to fit the seat sockets. To fit the posts to the armrest holes, turn a ½-in.-dia. by 1-in.-long straight section in the top of the arm post and a ⅝-in.-dia. by ½-in.-long straight section with a 1/32-in.-wide shoulder in the middle of the back post. Each post has a tenon in the bottom to fit its seat socket. Before taking any of the parts off the lathe, sand them to 100-grit, being careful to leave the shoulder in the back post crisp, for a good fit in the armrest.

All of the chair legs are identical: they flare to 1¼ in. dia. at the bottom, where they're slotted to fit the rockers, and they have a tenon at the top, which fits a socket in the seat. I sized each turning by holding an open-end wrench over it with one hand and slowly cutting to the diameter with a gouge I held in my other hand. Turn the legs from billets that are 3 in. to 4 in. too long and leave a square section on each end, to facilitate cutting the rocker slots. I cut these slots by guiding the legs' square ends on the bandsaw table. You can either bandsaw or chisel out the waste and then cut the square ends off the legs. If the slots aren't wide enough, plane the rocker slightly thinner, which is easier than opening the slot.

Assembling all the parts—Assembly is similar for a single or tandem rocker, since you only assemble one chair on the pair of rockers at a time. First, sand the seat with 100-grit paper. Leave the corners crisp and sharp, but use sandpaper to round them where the flat top curves down into the scooped out saddle.

Before assembling the posts and armrests, cut a shoulder on each post so it fits flush on its seat top. Set the post in its socket and mark around it at the seat top. Remove the post and refine the shoulder by sawing it to 1/16 in. wide at the line, and then put each post back in its socket to fit the armrests.

I bandsawed the armrests to the pattern lines shown in figure 2 from ¾-in.-thick padauk, and fit them to the back posts and arm posts before shaping them. I also drilled two holes in the armrests after marking their centers, an angle line and a direction line, again before shaping them. By doing it this way, you won't have invested time and effort shaping the armrests and you shouldn't feel badly throwing a piece away and starting again if the angled holes are drilled a little off. To set up for drilling, lay the seat on a flat benchtop with the back post and arm post in their sockets and hold the armrest parallel to the seat, against the posts and with the armrest at the height of the shoulder in the middle of the back post. Then, as shown in the photos above, draw a drill-angle line parallel to each post on the edge of the armrest and draw direction lines on the armrest top. When you sight along a direction line, its post should appear plumb. Drill the ½-in.-dia. arm-post hole and ⅝-in.-dia. back-post hole, and bend the posts so you can

***Left:** Before drilling the armrest for the back posts and arm posts, the author holds it in position and marks the edge where each post will meet it. Then he sights the direction to point the drill, where each post appears plumb, and marks direction lines on the top of the armrest (**right**).*

slide the armrest down in place. Once it fits the posts, mark the excess length beyond the armrest, cut it off, apply glue on the post tenons and in the armrest sockets, and assemble the seat, posts and armrests. I wedged the top of the arm post and pinned through the armrest into the back post with a dowel.

Now, align the seats, legs and rockers by first assembling them without glue. Push the legs into the seats and rockers by twisting them into the correct holes. Fit the front leg slots over the humps in the rockers; then bend the rockers and fit the back-leg slots on them wherever the legs land. When both seats are in place, the rocker should look balanced, with the seats at symmetrical angles. If they aren't, change the seat angle by shaving the rocker's top edge. I checked the seat height symmetry with a measuring stick and then by eye; when everything looks right, it is. Next, mark a line from the seat bottom to the leg and around each leg where it protrudes through the seat. Disassemble everything, saw off the excess leg tenons (leaving the line), apply glue to the tenons and slots, reassemble everything, and align the marks on the seats and legs. Then drive wedges in the leg tenons to bear against the seat end-grain, and pin each leg to the rocker with dowels.

After you remove the steam-bent comb from the bending fixture, sand it smooth. Then, before putting the spindles in the seat sockets, hold the comb symmetrically against its two back posts and mark the comb's edge for the post socket centers on the surface of the comb for the drill angle. Then, drill the comb and put it on the posts, insert the spindles in their seat sockets (aligning them so they are symmetrical and spaced about equally), and mark the centers and angles of the comb's spindle sockets. Drill the spindle sockets freehand in the comb by aiming the drill at the marked angle and straight between the comb's surfaces. Now glue the comb to the posts and spindles.

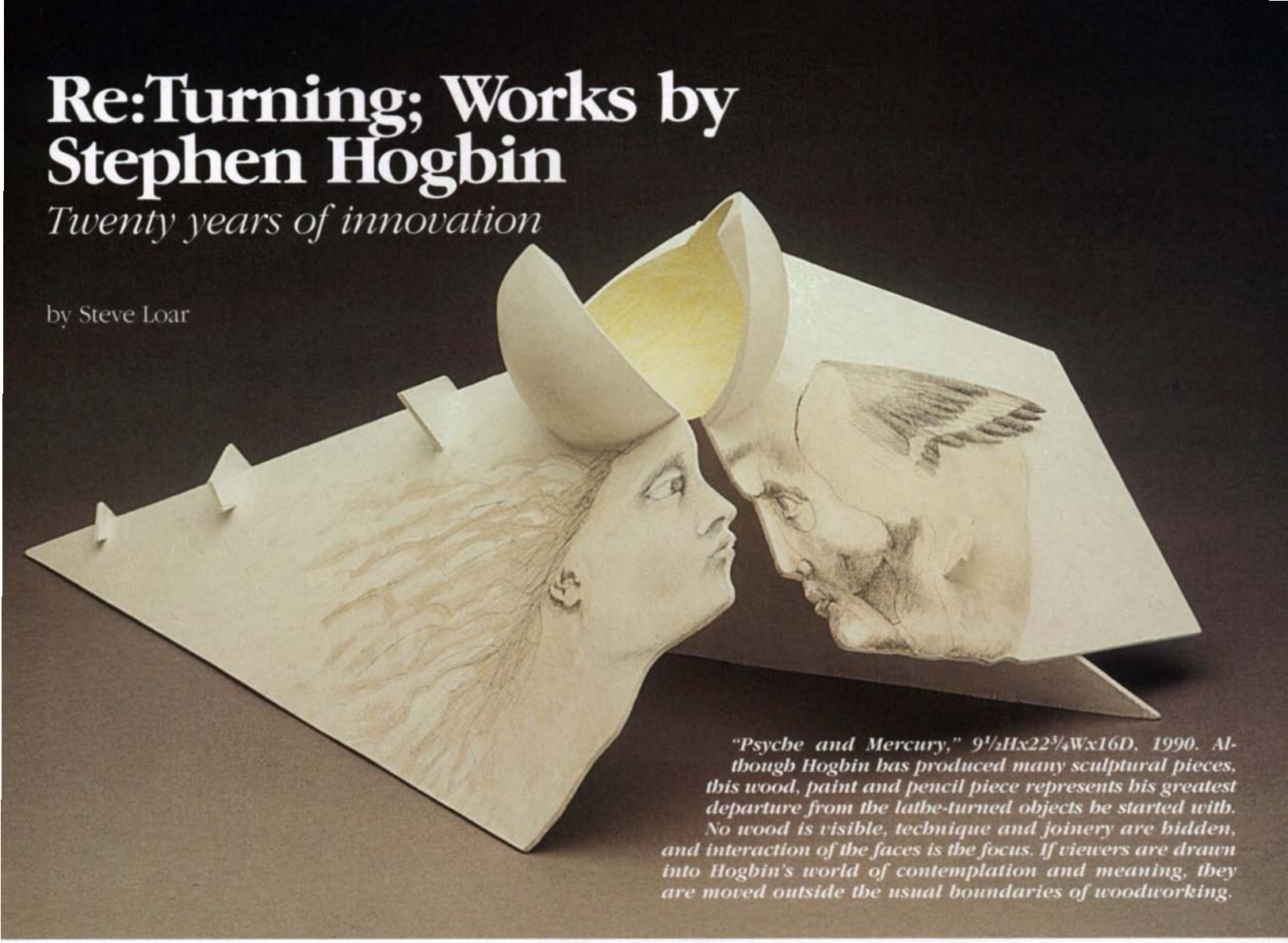
Finishing the chair—I painted my tandem rocker with flat latex paint after I sanded it with 100-grit paper. Since the armrests aren't painted, I sanded them to 220-grit and rubbed Watco oil on them (you could coat armrests with clear lacquer) before applying any paint. Finish the armrests first, though; otherwise it would be difficult to remove any paint that might drip on the wood. Flat or satin latex paint comes in a variety of colors, it goes on easily by brushing or spraying, and it sands easily between coats. To make the painted surfaces more durable, you can spray it with a light coat of satin lacquer, but I prefer a flat finish rubbed with wax. □

Mario Rodriguez is a cabinetmaker and 18th-century woodworking consultant, and he teaches antique restoration in New York City.

Re:Turning; Works by Stephen Hogbin

Twenty years of innovation

by Steve Loar



"Psyche and Mercury," 9½Hx22¾Wx16D, 1990. Although Hogbin has produced many sculptural pieces, this wood, paint and pencil piece represents his greatest departure from the lathe-turned objects he started with. No wood is visible, technique and joinery are hidden, and interaction of the faces is the focus. If viewers are drawn into Hogbin's world of contemplation and meaning, they are moved outside the usual boundaries of woodworking.

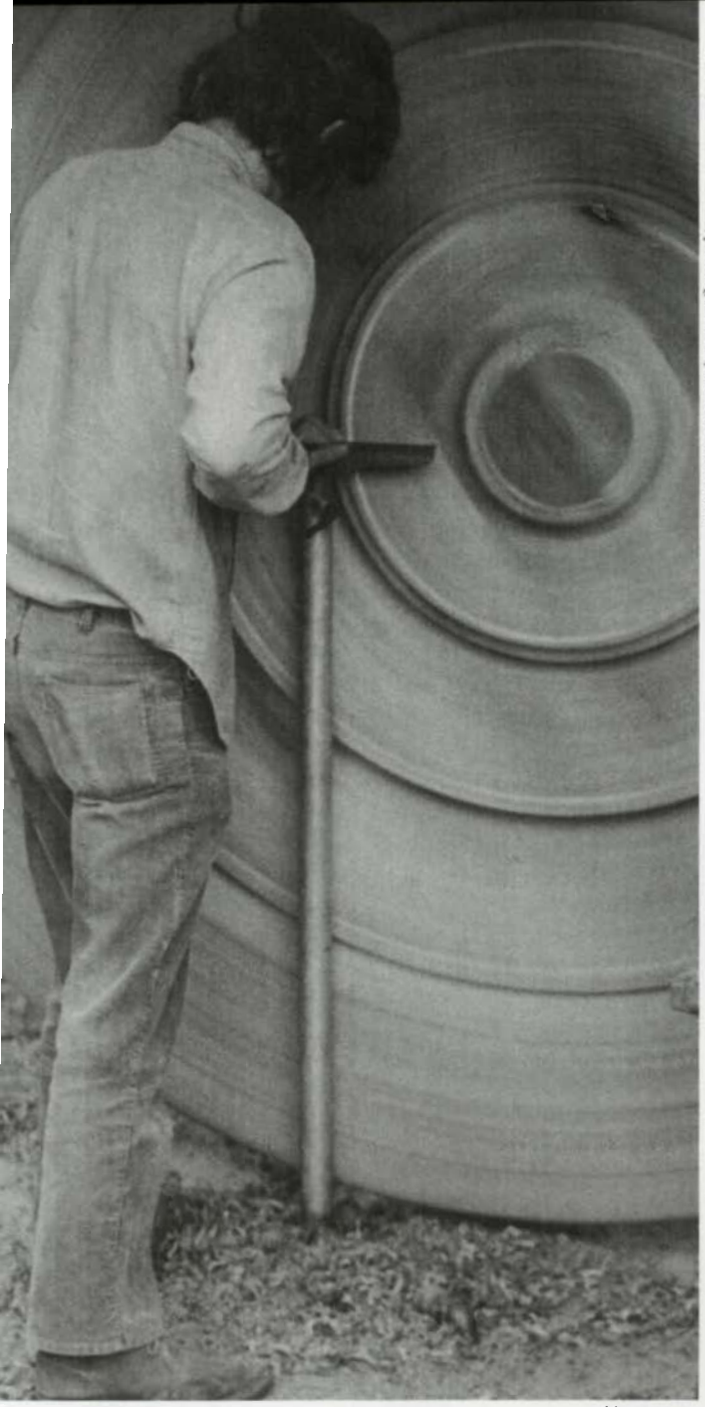
Fooling around is not an activity that is generally encouraged in woodworking. However, Canadian artist Stephen Hogbin's career has embraced it. In the 1970s, he put the woodturning world on its ear by cutting apart his turnings to reveal new shapes. And he created new forms by reorienting and reassembling the sawn sections of his turnings to further extend the sculptural capabilities of the lathe. Over the years he has continued to experiment with forms ranging from tiny to gigantic and embellished with slick, polished surfaces, as well as rougher natural textures and a variety of found objects, metal, paint and even concrete. The old question of "Why would anyone cut up a perfectly good bowl?" just seems to drive him on.

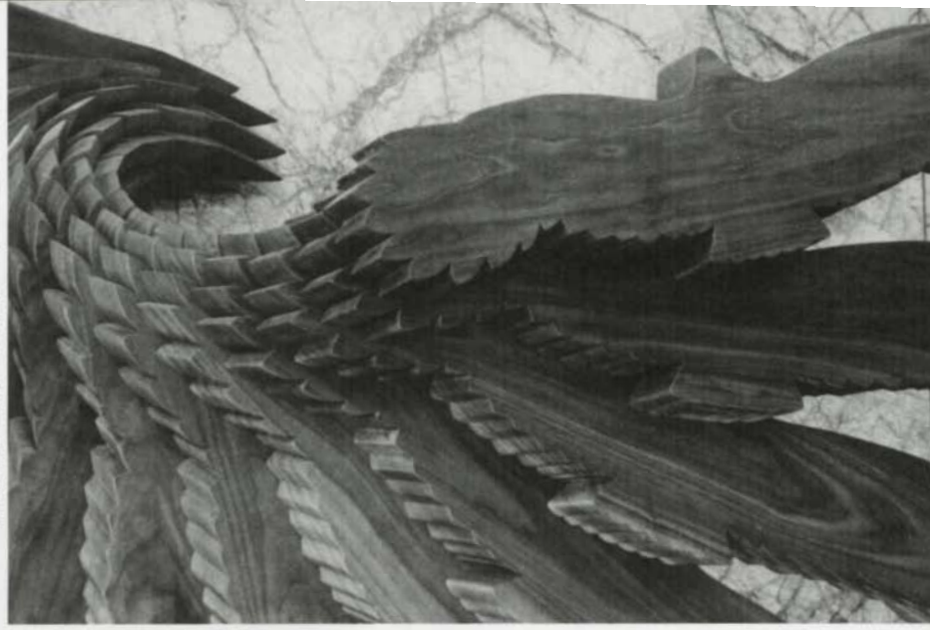
Many consider the 1981 Turned Objects Show at the Amaranth Gallery in Philadelphia, Pa., to be the first major showing of contemporary woodturning. But even by these standards, Hogbin had already created a stir with his techniques and his large-scale objects. A full decade later, Hogbin's work is still considered radical as seen in Re:Turning, an exhibition of 34 pieces representing 20 years of Hogbin's lathe-oriented work. By 1981, he had already developed his huge truck-axle lathe (shown in use in the top, left photo on the facing page), and created pieces of furniture utilizing its 7½-ft.-dia. turning capacity (see the center, left photo on the facing page). He had turned, split and reassembled a whole series of bowls and sculptures, and cast some of them in aluminum. Hogbin was also developing large-scale architectural projects, as shown in the top, right photo on the facing page, that carried the look and feel of segmented turnings. But their size forced him to develop an alternative milling technique for moving a router across the oversize work, rather than spinning the work past a stationary lathe tool. (See *FWW* #53, pp. 44-47, for more on his variable-arm milling machine.)

By the time spalted woods became popular with the general public in the early 1980s, Hogbin had already gone beyond the basic graphics in spalted wood by overlaying the natural patterns with color and texture. The piece in the center, right photo on the facing page, from the "Walking Bowl" series, utilizes the earlier segmented bowl techniques, yet the "legs" that elevate the sculpture give it a feeling of movement. In some of his newest work, shown in the photo above, Hogbin stretches the "Walking Bowl" action concept even further by using these sculptural pieces as a three-dimensional canvas. This new work will probably perplex many, making them question its purpose and place within woodworking. Stephen Hogbin encourages that questioning through his innovative sculptures, and continues to experiment and explore, working to create things that are beautiful and intriguing, and that force us to question both what an object does and why. □

Steve Loar lives in Warsaw, N.Y. He is an associate professor in the School of Art and Design of the Rochester Institute of Technology (N.Y.), where he teaches three-dimensional design. The exhibition, Re:Turning; Works by Stephen Hogbin, 1970-1990, was held last fall at the John Aird Gallery in Toronto, Ont., Canada. It was curated by Alan C. Elder of the Ontario Crafts Council and sponsored by the Ford Motor Co. of Canada Ltd.

Photo left: Michael Thomas; photo right: Ministry of Government Services





"Binary Spirit" (1980) is a 132Hx192Wx24D sculpture of American poplar and black walnut made for the North York Court House and Land Registry Office, New Market, Canada. Several of Hogbin's projects in the 1970s were large-scale architectural installations that forced development of new techniques. Here, the feel of the small segmented turnings is carried through to a large scale, changing the basic relationship between the viewer, the object and the medium.

***Above:** Stephen Hogbin works the face of a 7½-ft.-dia. disc on his shop-built lathe. The lathe has a 1-HP motor that feeds power through a four-step pulley and a ¾-ton Ford truck axle and differential. Speeds range from 60 RPM to 1,000 RPM.* ***Below:** These 2¾-in.-high by 5½-in.-dia. bowls, produced in 1972 in cherry and cast aluminum, show technical control and beautiful proportions. The sensuality of wood is brought home as we respond to the handsome but stark translation in aluminum. The simple change in medium radically alters our perception and appreciation of the form.*

***Above, left:** "Chair," 40Hx28Wx34D, 1974. This Western red cedar chair is two quarters of a large disc that was stack-laminated, turned, cut up, and then reassembled and finally sawn into a seating contour.* ***Above, right:** This painted cherry bowl, 12Hx10½Wx9½D, is from Hogbin's "Walking Bowl" series. It not only capitalizes on the intrigue inherent in split turning, but a pair of "legs" adds interest by pushing the vessel into the air. Having developed a concept, Hogbin likes to continue to explore various gestures, colors and textures.* ***Below:** This spalted maple bowl with painted accents (4 in. high by 12 in. dia.) was considered high risk when executed in 1982. At that time, spalted wood was just coming into vogue and the investigation of pattern on pattern did not emerge as a major direction in furniture or graphic design until the late 1980s.*

Photos except where noted: Larry Ostrom

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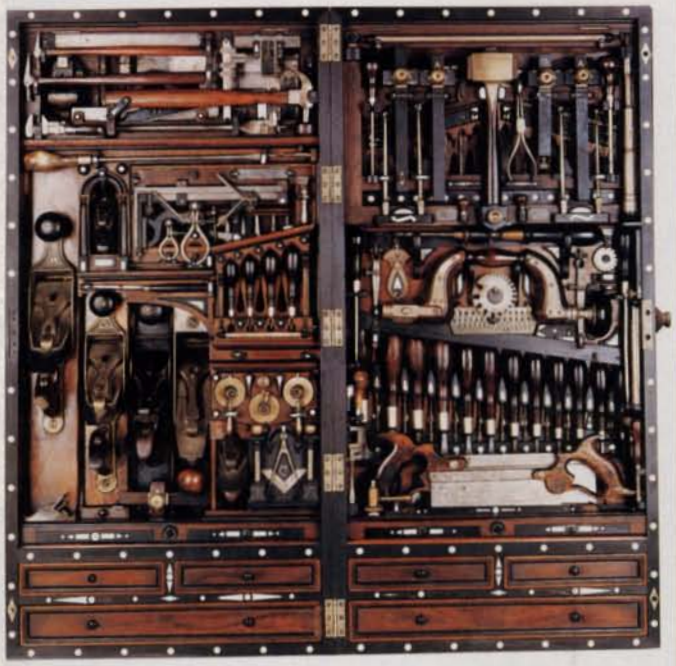

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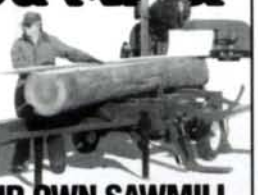

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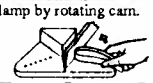

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READER SERVICE NO. 103

READER SERVICE NO. 70

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

ALABAMA: **Juried show**–Magic City Art Connection, May 3–4. Cultural and financial district, Birmingham. For info, contact Magic City Art Connection, 1128 Glen View Rd., Birmingham, 35222. (205) 595-6306.

ARIZONA: **Exhibit**–Turned wood vessels and bowls by Ed and Philip Moulthrop, Mar. 1–31. Reception: Mar. 7, 7–9 P.M. The Hand and The Spirit, 4222 N. Marshall Way, Scottsdale, 85251. (602) 949-1262.

CALIFORNIA: **Exhibit**–Contemporary American Wood, thru Feb. 23. Featuring the work of turner Dennis Elliott. Banaker Gallery, 1373 Locust St., Walnut Creek, 94596. (415) 930-0700.
Classes–Building the Chamberlin Dory Skiff, Feb. 23-24, Mar. 2–3, Mar. 9–10. National Maritime Museum Association, Building 275, Crissy Field, San Francisco, 94129. (415) 929-0202.
Workshops–Various workshops including Japanese woodworking, joinery and sharpening. Contact Hida Tool Co., 1333 San Pablo, Berkeley, 94702. (415) 524-3700.
Solicitation–New artists wanted for the Los Angeles Craft & Folk Art Museum Research Library. Used by collectors, curators, architects, designers. No fee. Contact the Craft & Folk Art Museum Library, c/o the May Co., 6067 Wilshire Blvd., Los Angeles, 90036. (213) 934-7239.
Exhibit–Weaving...Wood, Mar. 16–Apr. 27. Featuring the work of turner Dennis Elliott. La Jolla Gallery Eight, 7464 Girard Ave., La Jolla, 92037. (619) 454-9781.
Workshops–Furnituremaking with hand tools using traditional joinery, weekends. Call for schedule: Debey Zito, (415) 648-6861.
Show–Sacramento Woodworking Show, Mar. 22–24. Community Convention Center, 1100 14th St., Sacramento, 95814. For info, contact 1516 S. Pontius Ave., Los Angeles, 90025. (800) 826-8257, (213) 477-8521.
Exhibit–Mixed Use Space, thru Mar. 24. Security Pacific Corp., Cultural Affairs, 333 S. Hope St., Los Angeles, 90071. (213) 345-7039.
Show–Northern California Woodworking Show, Apr. 26–28. San Jose Civic Auditorium, 145 W. San Carlos St., San Jose, 95110. For info, contact 1516 S. Pontius Ave., Los Angeles, 90025. (800) 826-8257, (213) 477-8521.
Show–Southern California Woodworking Show, May 3–5. Pasadena Center, 300 E. Green St., Pasadena, 91101. For info, contact 1516 S. Pontius Ave., Los Angeles, 90025. (800) 826-8257, (213) 477-8521.
Juried show–Artists Market, June 1–2. Long Beach Museum of Art. Deadline: Apr. 1. For info, contact Joanne France, 401 Manila, Long Beach, 90814. (213) 494-3526.
Show–Woodworking Machinery & Furniture Supply Fair, Sept. 28–Oct. 1. Anaheim Convention Center, Anaheim. For info, contact Arthur Schwartz, 1516 S. Pontius Ave., Los Angeles, 90025. (800) 826-8257, (213) 477-8521.
Seminar–10th International Wood Machining Seminar, Oct. 21–23. Berkeley. For info, contact Continuing Ed. in Engineering, UC Berkeley, 2223 Fulton St., Berkeley, 94720. (415) 642-4151.

COLORADO: **Exhibit**–Vail Craftsmen Fine Custom Woodworking Show, thru Feb. 28. Vail Public Library. For info, contact Tim O'Brien, Box 1274, Avon, 81620. (303) 328-7253.
Show–Colorado Woodworking Show, Mar. 15–17. National Western Complex, 1325 E. 46th Ave., Denver, 80216. For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (800) 826-8257, (213) 477-8521.
Classes–Woodworking and related classes, year-round. Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401. (303) 988-6160.
Workshops–One- and two-week woodworking and furniture design workshops, summer. Scholarship deadline: Mar. 15. Teachers include Alan Peters, Thomas Moser, Peter Korn, Harv Mastilir, Kathleen Loe, Michael Emmons, Sam Maloof, Simon Watts. Anderson Ranch Arts Center, Box 5598, Snowmass Village, 81615. (303) 923-3181.

CONNECTICUT: **Workshops**–Advanced Bowl Turning with Bill Gundling, Feb. 23–24; Furniture Design with Seth Stem, Mar. 2–3; Router Techniques with Bill Gundling, Mar. 9; Making Hardwood Furniture with Josh Markel, Mar. 9–10; European Style Cabinets with Paul Levine, Mar. 16–17; Sign Carving with Frank Switaj, Mar. 16–17; Carving the Ball-and-Claw Foot with Eugene Landon, Mar. 23–24. Turned Lidded Vessels with Michael Mode, Apr. 6–7; Turning Between Centers with Bill Gundling, Apr. 13–14. For info, contact Brookfield Craft Center, Box 122, Route 25, Brookfield, 06804. (203) 775-4526.
Juried exhibition–34th annual Guilford Handcrafts Expo, July 18–20. Guilford. Deadline for entries: Mar. 3. Also, classes for adults and children. Contact Guilford Handcrafts, Box 589, 411 Church St., Guilford, 06437. (203) 453-5947.
Exhibit–Best of the Nutmeg Woodturners League, Mar. 9–Apr. 22. Opening reception on Mar. 9, 2-5 PM. Including the work of Dennis Elliott. Brookfield Craft Center, Box 122, Route 25, Brookfield, 06804. (203) 775-4526.
Exhibition–Living with Fine Crafts, Mar. 10–Apr. 16. Sponsored by the Brookfield Craft Center and Silo Gallery. Featuring lectures, workshops, demonstrations in conjunction with the show, as well as furniture and accessories. Contact the Silo, New Milford. (203) 355-0300.
Exhibit–Gilding the Lily, Mar. 24–Apr. 20. Creative Arts Workshop, 80 Audubon St., New Haven, 06510. (203) 562-4927.

DISTRICT OF COLUMBIA: **Juried show**–9th annual Washington Craft Show, Apr. 18–22. Departmental Auditorium, 1301 Constitution Ave. N.W. For info, contact Women's Committee of the Smithsonian Associates, Arts & Industries Bldg., Room 1465, Smithsonian Institution. (202) 357-4000.
Seminars–Coatings for Furniture Conservation II, Apr. 29–May 2; Coatings for Furniture Conservation III, July 29–Aug. 1. For info, contact Training Secretary, CAL/MSC, Smithsonian Institution, 20560. (301) 238-3700.

FLORIDA: **Show**–Central Florida Woodworking Show, Mar. 8–10. State Fairgrounds, 4800 U.S. Highway 301 N., Tampa, 33610. For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (800) 826-8257, (213) 477-8521.
Juried show–SunFest '91, May 2–5. West Palm Beach. Applications now accepted. Contact SunFest '91, 319 Clematis St., Suite 319, West Palm Beach, 33401.

GEORGIA: **Show**–Atlanta Woodworking Show, Apr. 5–7. Inforum, 250 Williams St., Atlanta, 30303. For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (800) 826-8257, (213) 477-8521.
Fair–ACC Craft Fair Atlanta, Apr. 26–28. Apparel Mart, Atlanta. For info, contact American Craft Enterprises, Box 10, 256 Main St., New Paltz, NY 12561. (800) 836-3470, (914) 255-0039.
Workshop–Introductory Workshop in Timberframing, May 6–11. Upper Loft Design, Timberframe Housewrights, Highway 441, Box 1846, Clayton, 30525. (404) 782-5246.
Fair–Prater's Mill Country Fair, May 11–12. For info, contact Prater's Mill Foundation, 101 Timberland Dr., Dalton, 30720. (404) 259-5765.
Workshops–Japanese woodworking by Toshihiro Sahara. One Saturday each month, year-round. Contact Sahara Japanese Architectural Woodworks, 1716 Defoor Place N.W., Atlanta, 30018. (404) 355-1976.
Conference–Custom Woodworking Business Conference and Exposition, Nov. 22–24. Georgia World Congress Center, Atlanta. For info, contact John Berry, Trade Show Div., Vance Publishing Corp., 400 Knightsbridge Pkwy., Lincolnshire, IL 60069. (708) 634-2600.

IDAHO: **Juried festival**–23rd annual Art on the Green, Aug. 2–4. North Idaho College, Coeur d'Alene. For entry deadline and info, contact Citizen's Council for the Arts, Box 901, Coeur d'Alene, 83814. (208) 667-9346.

ILLINOIS: **Show**–Chicagoland Woodworking Show, Apr. 19–21. Odeum, 1033 N. Villa Ave., Villa Park, 60181. For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (800) 826-8257, (213) 477-8521.

INDIANA: **Show**–Market Square Traditional Wholesale Show, Feb. 22–24. Coliseum & Exposition Center, Fort Wayne. For info, contact Kathy Goodrich, Box 220, Newville, PA 17241. (717) 776-6989.
Seminars–Woodworking and related seminars, one Saturday each month, thru April. Including tablesaw, router, bandsaw, lathe. Edward B. Mueller Co., 3940 S. Keystone, Indianapolis, 46227. (317) 783-2040.

IOWA: **Juried fair**–21st annual Art in the Park, May 18–19. Four Square Park, Main Ave., Clinton. Deadline: Mar. 15. For info, contact Clinton Art Association, Box 132, Clinton, 52733. (319) 259-8308.

KANSAS: **Competition**–Topeka Competition 15, Mar. 30–Apr. 28. Topeka Public Library Gallery of Fine Arts, Topeka. For info, contact Larry Peters, Topeka Public Library, 1515 W. 10th, Topeka, 66604-1374. (913) 233-2040.
Juried show–Dimensions '91, June 7–9. Sar-Ko-Par Trails Park, Lenexa. Entries deadline: Mar. 31. Contact Dimensions '91, c/o Parks & Recreation, 13420 Oak, Lenexa, 66215. (913) 541-8592.

LOUISIANA: **Show**–New Orleans Woodworking World Show, Mar. 15–17. Municipal Auditorium, 1201 St. Peter, New Orleans. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Juried competition–Lafayette Art Association national juried competition of two- and three-dimensional art, Apr. 1–30. Contact Marta Fielding, Lafayette Art Gallery, 700 Lee, Lafayette, 70501.

MAINE: **Classes**–House Design and Building, Mar. 4–15, May 6–24, June 10–21, July 8–26, Aug. 5–23; Post and Beam Building, Apr. 21–26, Sept. 15–20. Shelter Institute, 38 Centre St., Bath, 04530. (207) 442-7938.
Show–Portland Woodworking World Show, Apr. 26–28. Portland Expo Bldg., 239 Park Ave., Portland. Contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Classes–Woodworking classes for adults and children in daytime, evenings and on weekends. Portland School of Art, 97 Spring St., Portland, 04101. (207) 775-3052.

MARYLAND: **Juried fairs**–Sugarloaf's 16th annual Spring Arts & Crafts Fair, Apr. 19–21; Montgomery County Fairgrounds. Sugarloaf's 14th annual Spring Crafts Festival, May 3–5; Maryland State Fairgrounds. For info on both, contact Deann Verdier, Sugarloaf Mountain Works, 20251 Century Blvd., Germantown, 20874. (301) 540-0900.

MASSACHUSETTS: **Workshops**–Tablesaw Techniques with Paul Ruhlman, Feb. 27–28; Router Techniques with Paul Ruhlman, Mar. 5–6; Woodturning with Paul Ruhlman, Mar. 12–13; Finishing and Refinishing with Sal Suterg, Mar. 19–20, 26–27; Veneering with Alan Chapman, Apr. 2–3. The Woodworker's Store, 2154 Mass Ave., Cambridge, 02140, (617) 497-1136.
Juried exhibition–Exhibit focusing on functional and practical quality of studio furniture with which to live and work, Sept. 28–Nov. 16. Deadline: Mar. 1. For info, contact Julie Mansfield, Society of Arts and Crafts, 175 Newbury St., Boston, 02116. (617) 266-1810.
Workshops–Shaker Oval Box Making, Mar. 2–3; Bowl Turning, Mar. 9–10. Weekend Blacksmithing with William Senseney. Berkshire Workshops, Box 928, Route 7, Sheffield, 01257. (518) 794-7966.
Classes–Wood II, Design & Artisanry and Wood III, Design & Artisanry, thru May. School of the Museum of Fine Arts, 230 The Fenway, Boston, 02115. (617) 267-1219.
Juried fair–21st annual Craft Fair, May 17–19. School for Professional Crafts at the Worcester Center for Crafts, 25 Sagamore Rd., Worcester, 01605. (617) 753-8183.
Retreat–Woodworking Association of North America Woodworking Retreat, June 9–14. Cape Cod. Workshops include Advanced Woodworking Skills with Gottlieb Brandli; Basic Machine Use & Woodworking Techniques with Mark Duginske and Brad Witt; Chip Carving with Wayne Barton; Furniture Repair and Restoration and/or Marquetry with Allan Fitchett; and more. Contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Classes–Woodworking classes, throughout most of the year. Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.

MICHIGAN: **Exhibit**–Turned wood by Dennis Elliott, thru Feb. 23. The Sybaris Gallery, 301 W. 4th St., Royal Oak, 48067. (313) 544-3388.
Show–Detroit Woodworking World Show, Apr. 12–14. Michigan Expo and Fairgrounds, 1120 W. State Fair, Detroit. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Show–International Turned Objects Show, thru Mar. 4. Northern Michigan University, Marquette. For info, contact International Sculpture Center, 1050 Potomac St. N.W., Washington, DC 20007. (202) 965-6066.
Seminar–Wood Finishing: Improving Quality and Meeting Compliance Regulations, Mar. 4–6. Amway Plaza, Grand Rapids. For info, contact Daniel Cassens, Dept. of Forestry & Natural Resources, Purdue University, West Lafayette, IN 47907. (317) 494-3644.
Renovation–Renovation of a showcase home, May 3–19. Specialists in interior and exterior restoration will renovate home. Sponsored by Bay County Historical Society, Bay City. For information, contact Candace Smith at (517) 892-2501.

MINNESOTA: **Fair**–ACC Craft Fair Minneapolis, May 10–12. Minneapolis Convention Center. For info, contact American Craft Enterprises, Box 10, 256 Main St., New Paltz, NY 12561. (800) 836-3470, (914) 255-0039.
Juried festival–19th annual Minnesota Crafts Festival, June 15–16. College of St. Catherine, St. Paul. Deadline: Mar. 1. For info, contact MCC-Festival, Suite 308, 528 Hennepin Ave., Minneapolis, 55403. (612) 333-7789.
Workshop–8th annual Villa Maria Woodcarving Workshop, Aug. 11–17. Frontenac. Classes include relief carving, birds, small animals, chip carving, marquetry, more. Villa Maria Workshop, Box 37051, Minneapolis, 55431.

MISSOURI: **Exhibit**–Beneath the Ice: The Art of the Fish Decoy, Apr. 8–June 3. St. Louis County Dept. of Parks and Recreation, Clayton. For info, contact Susan Flamm, Museum of American Folk Art, 61 W. 62nd St., New York, NY 10023-7015. (212) 977-7170.

MONTANA: **Juried show**–2nd annual Good Wood Show, Mar. 22–24. Sponsored by the Montana woodcarvers Association. At the Metra Center on the Billings fairgrounds. For info, contact Monty Sullins, 204 Nash Lane, Billings, 59105. (406) 245-8173.

NEW HAMPSHIRE: **Classes**–Classes in fine arts and studio arts. Manchester Institute of Arts and Sciences, 114 Concord St., Manchester, 03104.
Classes–Various woodworking classes, year-round. Including small boxes, kitchen utensils, lathe turning, hand

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2804	3/8	$15.00
2805	1/2	$17.00

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1205	1/2	$17.00

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carving, more. Contact The Hand & I, Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.

***NEW JERSEY:* Show**–Super Crafts Star Show, Mar. 8–10. Meadowlands Stadium Club, East Rutherford. Contact Creative Faires Ltd., Box 1688, Westhampton Beach, NY 11978. (516) 288-2004.
Seminars–Carving and Sharpening, Mar. 9; Wood Finishing and Refinishing, Mar. 16; Lathe Turning/Sharpening, Mar. 23. For info, contact Force Machinery Co., 2271 Route 22, Union, 07083. (201) 688-8270.
Show–Super Crafts, Apr. 5–7. Garden State Convention & Exhibit Center, Somerset. For info, contact Creative Faires Ltd., Box 1688, Westhampton Beach, NY 11978. (516) 288-2004.
Auction–Tool auction, Apr. 6. Holiday Inn, Clinton. Sponsored by Crafts of NJ (Collectors of Rare and Familiar Tools). For info, contact Joe Hauck, 85 Brunswick Ave., Lebanon, 08833. (201) 236-2072.
Juried fair–21st annual Peters Valley Craft Fair, July 27–28. Deadline: Apr. 10. For info, contact Peters Valley Craft Fair, Layton, 07851. (201) 948-5200. Also, summer studio assistantships available in woodworking, June thru Aug. Application deadline: Apr. 1. Contact Peters Valley Craft Center at address above.
Juried festival–Waterloo Arts & Crafts Festival, May 4–5. Waterloo Concert Field, Waterloo Rd., Stanhope. Fall Waterloo show, Sept. 28–29. For info on both, contact Stella Show Management Co., 105 Shady Lane, Randolph, 07869. (201) 768-2773.

***NEW MEXICO:* Classes**–Woodworking classes. Northern New Mexico Community College, El Rito, 87520. (505) 581-4501.

***NEW YORK:* Classes**–Various beginning and advanced woodworking classes, including woodturning, wood finishing, router techniques, marquetry, tool sharpening, furniture repair and more. Constantine, 2050 Eastchester Rd., Bronx, 10461. (212) 792-1600.
Meetings–New York Woodturners Association, first Tuesday of each month. Woodturning techniques and exhibits also. The Crafts Student League, YWCA, 610 Lexington Ave., New York City.
Juried show–Clearwater's Great Hudson River Revival, June 15–16. Outdoors, Westchester Community College, Valhalla. Deadline: Feb. 22. For info, contact Joan Silberberg, RFD 2, Pudding St., Carmel, 10512.
Juried show–Handmade in the USA, Feb. 23–27. Passenger Ship Terminal Pier 90, New York City. Sponsored by George Little Management and American Craft Enterprises. Contact Lynn White, George Little Management, 2 Park Ave., Suite 1100, New York City, 10016. (212) 686-6070.
Exhibition–Mondo Materials, thru Feb. 24. Collage panels created from commercially available materials and found objects, including wood. Cooper-Hewitt Museum, 2 E. 91st St., New York City, 10128. (212) 860-6868.
Fair–New York International Gift Fair, Feb. 24–28. Jacob Javits Convention Center, New York City. Including Accent on Design and American & International Crafts. Contact George Little Management, 2 Park Ave., Suite 1100, New York, 10016. (212) 686-6070.
Workshops–Chip Carving, Mar. 2–3; Stenciling with Bronze Powder, Mar. 23; Restoration & Reproduction Turning, Mar. 23–24. The Crafts Student League, 610 Lexington Ave. at 53rd St., New York City. (212) 735-9731.
Workshops–Japanese Hand Tool workshops with Robert Meadow. Mar. 9–10, Apr. 13–14, May 11–12. The Luthierie, 2449 W. Saugerties Rd., Saugerties, 12477. (914) 246-5207.
Workshop–The Glued Panel Production Process, Mar. 15–16. Bath area. Sponsored by Northeast Wood Machining Association. Contact Daniel Parrent, (607) 776-2165.
Exhibition–The Cooper-Hewitt Collections: A Design Resource, beginning Mar. 26. Including contemporary and period furniture. Cooper-Hewitt Museum, 2 E. 91st St., New York, 10128.
Show–Buffalo Woodworking World Show, Apr. 5–7. Erie County Fairgrounds, 5600 Mckinely Pkwy., Hamburg. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Show–7th annual Spring Fling Crafts Festival, Apr. 12–14. Nassau Coliseum, Uniondale. For info, contact Creative Faires Ltd., Box 1688, Westhampton Beach, 11978. (516) 288-2004.
Exhibit–Angel Chairs: New Works by Wendell Castle, thru Apr. 13. Peter Joseph Gallery, 745 5th Ave., New York City, 10151. (212) 751-5500.
Exhibit–Furniture by Wendell Castle, thru Apr. 28. American Craft Museum, 40 W. 53rd St., New York City, 10019. (212) 956-3535.
Show–13th annual Great Neck Celebrates Crafts, May 5. Outdoors, Middle Neck Rd., Old Village, Great Neck. Contact Creative Faires Ltd., Box 1688, Westhampton Beach, 11978. (516) 288-2004.
Fair–American Craft Fair at the Armory, May 10–12. 7th Regiment Armory, New York. For info, contact American Craft Enterprises, Box 10, 256 Main St., New Paltz, 12561. (800) 836-3470, (914) 255-0039.
Juried show–1991 Lilac Art Show, May 18–19. Highland Park, Rochester. For info, contact Arts for Greater Rochester, 335 E. Main St., Suite 2, Rochester, 14604. (716) 546-5602.
Fair–International Contemporary Furniture Fair, May 19–22. Jacob Javits Convention Center, New York City. For info, contact George Little Management, 2 Park Ave., Suite 1100, New York, 10016. (212) 686-6070.
Juried fair–Woodstock-New Paltz Arts and Crafts Fair, May 25–27. Ulster County Fairgrounds, New Paltz. Contact Quail Hollow Events, Box 825, Woodstock, 12498. (914) 679-8087.
Exhibit–Leo Kaplan Modern Gallery features furniture of Peter Dean, Wendy Maruyama, Mitch Tyerson, Paul Sasso, Tommy Simpson, Jan Stanger and Edward Zucca. 969 Madison Ave., New York City, 10021. (212) 535-2407.

***NORTH CAROLINA:* Conference**–4th annual national conference for Arts & Crafts Movement, Feb. 22–24. Grove Park Inn, Asheville. Contact Bruce Johnson, Box 8773, Asheville, 28814. (704) 254-1912.
Juried show–Showcase of Woodcarvings, Feb. 23–24. Grady Cole Center, 310 N. Kings Dr., Charlotte, 28204. For info, contact Showcase of Woodcarvings, 1418 Armory Dr., Charlotte, 28204. (704) 336-2584.
Workshops–Woodcarving with Helen Gibson, Feb. 24–Mar. 1; Woodcarving with M.W. Rainey, Mar. 3–9; Shaker Boxes with Bert Smith, Mar. 3–9; Woodcarving with M.W. Rainey, Mar. 10–16; Woodcarving with Helen Gibson, Mar. 17–23; Woodworking with Jerry King, Mar. 17–23; Woodcarving with Hal McClure, Mar. 24–30; Woodcarving with Roy Hellman, Apr. 7–13; Woodturning with John Jordan, Apr. 7–13; Woodcarving with Helen Gibson, Apr. 14–20; Norwegian Bentwood Boxes with Dana Hatheway, Apr. 14–20; Shaker Boxes with Bert Smith, Apr. 26–28; Woodcarving with M.W. Rainey, Apr. 28–May 4. John Campbell Folk School, Route 1, Box 14A, Brasstown, 28902. (800) 562-2440, (704) 837-2775.
Workshops–Advanced Windsor Chairmaking, Mar. 4–8; Spoon Carving, May 4–5; Dough Trough, May 11–12. Country Workshops, 90 Mill Creek Rd., Marshall, 28753. (704) 656-2280.
Seminar–A Development Program for Managers in the Wood Industry, Mar. 11–15. North Carolina State University, Raleigh. For info, contact Ed Jerger, NC State, Department of Wood and Paper Science, Box 8005, Raleigh, 27695-8005. (919) 737-3181.

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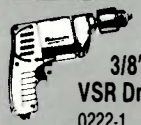

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SCR2-2	Drywall screwdriver	95.
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3238VS	VS, Var. orbit std. duty jigsaw	105.
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90300	3¼ HP Production router	339.
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1608T	NEW! tilt base laminate trimmer	99.
1632VSK	VS, Var. orbit Panther recipro saw	135.
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3270D	3"x21" dustless belt sander	135.
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3050VSRK	New9.6v VSR cordless drill kit w/case, 2 batteries	129.

BOSCH

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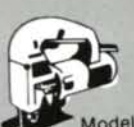

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READER SERVICE NO. 25

OHIO: **Show**–Greater Cincinnati Woodworking Show, Mar. 1–3. Cincinnati Gardens, 2250 Seymour Ave., Cincinnati, 45212. Contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (800) 826-8257, (213) 477-8521.

OKLAHOMA: **Seminar**–Build a Windsor Chair with Michael Dunbar, Mar. 2–3. Tulsa Area Vo-Tech School, Memorial Campus Cabinet Shop, 3420 S. Memorial Dr., Tulsa. Sponsored by Green Country Woodworkers, Box 470856, Tulsa, 74147-0856. (918) 743-2024.
Show–Oklahoma City Woodworking World Show, Mar. 8–10. Myriad Convention Center, 1 Myriad Gardens, Oklahoma City. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Workshops–Between center turning, Mar. 16; bowl turning, Mar. 23. Both with Alan Lacer. Moore-Norman Vo-Tech, adult programs, (405) 364-5763.
Fair–Woodcraft fair, Apr. 20–21. Featuring demonstrations, exhibits and wood items. Contact Paxton's Beautiful Woods, 5420 S. 99th East Ave., Tulsa, 74147-0171. (918) 665-2411.

OREGON: **Workshops**–Alternative Book Structure with Sandy Ticock, Feb. 23–24; Business of Being an Artist, Feb. 23–24; Faux Finishing with Ted Swift, Feb. 24; Japanese Tools and Joinery with Makoto Imai, June 24–28; English and French Wood Finishing Techniques with Bruce Luckhurst, July 15–19. Oregon School of Arts and Crafts, 8245 S.W. Barnes Rd., Portland, 97225. (503) 297-5544.
Show–Woodturning show, Mar. 16–Apr. 13. Features 11 area woodturners. For info, contact Made in Jefferson Gallery, 3259 Jefferson-Scio Dr., Jefferson, 97352. (503) 327-2543.
Meetings–Guild of Oregon Woodworkers, third Friday of every month. For location, contact the Guild at Box 1866, Portland, 97207. (503) 293-5711.
Exhibits–Furniture by David Dochow and Tom Ross, Apr. 4–28; Juried show of student work, May 2–June 2. Oregon School of Arts and Crafts, 8245 S.W. Barnes Rd., Portland, 97225. (503) 297-5544.
Competition–Table Lamp + Chair 1991 furniture design competition, June 6–22. Deadline for entries: May 10. Contact Lynne Leigh Paul, Box 69352, Portland, 97201. (503) 246-7314.

PENNSYLVANIA: **Seminars**–Japanese Tool Use, Feb. 23; Lathe Turning Between Centers, Mar. 2; Carving and Sharpening, Mar. 16. Force Machinery Co., 914 E. Main St., Norristown, 19401. (215) 279-0950.
Juried festival–25th annual Sidewalk Sale/Central Pennsylvania Festival of the Arts, July 11–14. On the Penn State campus, State College. Application deadline: Feb. 23. For info, contact CPFA, Box 1023, State College, 16804. (814) 237-3682.
Juried exhibitions–The Dining Experience/A Craft Expression, Aug. 10–Sept. 22; deadline: Feb. 27. Water/Life, May 4–June 9. For info, contact Lynn Berkowitz, Luckenbach Mill Gallery, 459 Old York Rd., Bethlehem, 18018. (215) 691-0603.
Juried show–Long's Park Arts & Crafts Festival, Aug. 31–Sept. 2. Lancaster. Deadline: Feb. 28. Contact Long's Park Arts & Crafts Festival, Box 5153, Lancaster, 17601.
Workshops–Many woodworking workshops, thru June, including Wood Carving: Introduction to Techniques with Robert Butler, Feb. 28 and Mar. 2; Glue and Plywood, Mar. 5–6; Wood Carving: Furniture Components with Robert Butler, Mar. 14–16; Wood Machining Techniques and Practices, Apr. 10–25; Contour Knife Grinding and Set-Up in the Woodworking Industry, Apr. 18–20; Wood Finishing Techniques, Apr. 30–May 8; Wood-Mizer Band Sawmill Service, May 3–4. For full course schedule, contact Hardwood Initiative Training Program, Pleasant Gap, 16823.
Workshop–35th annual Hardwood Lumber Grading and Inspection, Mar. 4–8. Penn State campus, University Park. For info, contact Agricultural Conference Coordinator, 306 Agricultural Administration Building, University Park, 16802. (814) 865-8301.
Juried show–International Lathe-Turned Objects Challenge IV. Entries deadline: Mar. 11. Port of History Museum, Philadelphia. For info, contact the Wood Turning Center, Box 25706, Philadelphia, 19144. (215) 844-2188.
Exposition–6th annual Northeast Wood Products Expo, Mar. 21–23. David Lawrence Convention Center, Pittsburgh. For info, contact NEWPEX '91, Dame Associates, 51 Church St., Boston, MA 02116. (617) 482-3596, (800) 843-3263.
Juried show–9th annual Pennsylvania National Arts & Crafts Show, Mar. 22–24. Pennsylvania State Farm Complex, 2301 N. Cameron St., Harrisburg, 17110. For info, contact Pennsylvania National Arts & Crafts Show, Box 449, New Cumberland, 17070. (717) 763-1254.
Exhibit–Contemporary American Crafts, thru Mar. 31. Including work by David Ellsworth. Philadelphia Museum of Art, Parkway at 26th St., Philadelphia, 19101. (215) 763-8100.
Show–Woodworking World Scranton Show, Apr. 19–21. Montage Ski Area Lodge, Scranton. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Show and competition–8th annual William Rush Woodcarving and Wildlife Art Show & Sale, Nov. 2–3. Penn State Delaware County campus, Lima. For deadline and info, contact Bob Young, 736 Oak Way, Havertown, 19083. (215) 446-8945.

TENNESSEE: **Workshops**–Turning Green: From Tree to Finished Piece with Michael O'Donnell, Mar. 4–8, Mar. 11–15; Bowl and Plate Turning and Carving with Alan Stirt, Mar. 18–22; Woodturning: Off the Ground with Steve Loar, Mar. 25–29. Also, exhibitions of faculty mixed media, thru Apr. 27; and regional selections, thru May 18. Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.
Juried exhibition–From All Directions, Oct. 17–Dec. 14. Entry deadline: July 6. Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

TEXAS: **Show**–Woodworking World Houston Show, Mar. 1–3. Pasadena Convention Center, 7902 Fairmont Pkwy., Pasadena. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Show–Woodworking World San Antonio Show, Mar. 22–24. Villita Assembly Building, Navarro at Villita, San Antonio. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Workshop–Timber frame construction, Apr. 3–7. For information, contact Wynter Chauvin, Red Suspenders Timber Frames, Route 7, Box 8383, Nacogdoches, 75961. (409) 564-9465.
Exhibition–16th annual Texas Crafts Exhibition, Apr. 6–7. Outdoors at the University of Texas, Austin Winedale Historical Center. For info, contact the Winedale Historical Center, Box 11, Round Top, 78954-0111. (409) 278-3530.
Juried competition–Furniture of the '90s, American Society of Furniture Artists and Council for the Visual and Performing Arts art-furniture competition and exhibition, Apr. 8–May 3. University of Texas Medical School Gallery, Houston. For prospectus, contact ASOFA, Competition, Box 270188, Houston, 77277-0188.
Show–North Texas Woodworking Show, Apr. 12–14. Dallas Convention Center, 650 S. Griffin St., Dallas, 75202.

For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (800) 826-8257, (213) 477-8521.
Juried festival–Kaleidoscope Creative Arts Festival, May 11–12. Art Museum of Southeast Texas, 500 Main St., Box 3703, Beaumont, 77704. (409) 832-3432.

VERMONT: **Workshop**–Historic Plaster Repair with Andrew Ladygo, Apr. 11–14. Canterbury Shaker Village, Canterbury. For info, contact Judy Hayward, Preservation Institute for the Building Crafts, Box 1777, Windsor, 05089. (802) 674-6752.
Workshops–One- and two-week workshops in woodworking: May 12–25, June 16–22, July 21–27; cabinetry: June 9–15, July 14–20; furnituremaking: June 23–29. For info, contact Yestermorrow, Box 344, Warren, 05674. (802) 496-5545.

VIRGINIA: **Show**–Herndon Antiques Show and Sale, Apr. 5–7. Herndon Community Center, 813 Ferndale Ave., Herndon, 22070. For info, contact Liz Atkinson, Herndon Woman's Club, Box 334, Herndon, 22070.
Exhibitions–Geometric Constructions and Shrines & Icons, both Mar. 8–Apr. 26. Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.
Exhibition opportunity–Place settings of three or four pieces that are functional or metaphorical. Deadline: June 30, 1991. Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.

WASHINGTON: **Exhibitions**–Bedrooms: Where Your Dreams Come True, thru Feb. 28. For information, contact Northwest Gallery, 202 First Ave. S., Seattle, 98104. (206) 625-0542.
Meetings–Northwest Woodworkers Guild, last Wednesday of each month. Contact Kirk Kelsey, 744 N. 78th, Seattle, 98103. (206) 789-2142.
Workshops–Oar making with Ray Speck, Mar. 2; planking with Carl Brownstein, Mar. 9; general cruising with George Maynard, Mar. 23; interior joinery with Doug Bakke and Charlie Moore, Apr. 6. Northwest School of Wooden Boatbuilding, 251 Otto St., Port Townsend, 98368. (206) 385-4948.
Workshops–Building a Lapstrake Boat, Mar. 16–24; Lofting workshop, Apr. 6–7; Maine Guide Canoe workshop, Apr. 15–20. The Center for Wooden Boats, 1010 Valley St., Seattle, 98109. (206) 382-2628.
Juried show–11th annual Woodcarving Show, Nov. 9–10. Western Washington Fairgrounds Expo Hall, 9th and Meridian, Puyallup. For deadline and info, contact Northwest Carvers Association, 115 Del Monte Ave., Fircrest, 98466. (206) 564-3278.

WEST VIRGINIA: **Exposition**–Appalachian Hardwood Expo '91, June 13–15. Mercer County Technical Education Center, Princeton. For info, contact AHE, 105 Old Bluefield Rd., Princeton, 24740. (304) 425-9551.

WISCONSIN: **Show**–Greater Milwaukee Woodworking Show, Feb. 22–24. MECCA Convention Hall, 500 W. Kilbourn Ave., Milwaukee, 53203. For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (800) 826-8257, (213) 477-8521.
Juried festival–19th Festival of the Arts, Apr. 14. Stevens Point. Contact Festival of the Arts, Box 872, Stevens Point, 54481. (715) 341-7543.
Exhibit–Beneath the Ice: The Art of the Fish Decoy, thru Mar. 18. Milwaukee Public Museum, Milwaukee. Contact Susan Flamm, Museum of American Folk Art, 61 W. 62nd St., New York, NY 10023-7015. (212) 977-7170.

CANADA: **Workshops**–Vancouver's leading carvers demonstrate their techniques, Mar. 10. Lathe Turning with Dale Nish, May 25–26. Tools 'n Space Woodworking, 338 Catherine St., Victoria, B.C., V9A 3S8. (604) 383-9600.
Exhibit–Open house and graduate show, Sheridan College, School of Crafts and Design. Apr. 27–28. Includes work of furniture-design students. Sheridan College, 1460 Trafalgar Rd., Oakville, Ont., L6H 2L1. (416) 845-9430.
Classes–Various woodworking classes including bird carving, wood sculpture, willow chairmaking and more. For information and schedule, contact the Haliburton School of Fine Arts, Box 339, Haliburton, Ont., K0M 1S0. (705) 457-1680.
Meetings–Canadian Woodturners Association meetings, throughout the year. Second Tuesday of each month. Contact Bob Stone, Box 8812, Ottawa, Ont., K1G 3J1. (613) 824-2378.
Meetings–Blue Mountain Woodworking Club meetings, throughout the year. Third Wednesday of each month. Contact Glenn Carruthers, Box 795, Stayner, Ont., L0M 1S0. (705) 444-1752.
Juried show–Spring One of a Kind Canadian craft show. For dates and deadlines, contact Jeanette Pielrangelo, The Canadian Craft Show, 21 Grenville St., Toronto, Ont., M4Y 1A1. (416) 923-5624.

AUSTRALIA: **Shows**–Australian Timber & Working with Wood Shows, July 26–28, R.A.S. Showgrounds, Sydney; Oct. 3–6, Royal Exhibition Building, Melbourne. For info, contact Patrick O'Reilly, Riddell Exhibition Promotions Pty. Ltd., 10 Mallett St., Camperdown, NSW 2050. (02) 565 1099.

ENGLAND: **Exhibit**–Can't Stop Me Now, thru Feb. 24; focusing on the work and careers of 20 Setting-Up Grant recipients, covering a range of crafts. Crafts Council Gallery, 12 Waterloo Place, London, SW1Y 4AU. 071-930 4811.
Exhibition–International Practical Woodworking exhibition, beginning Feb. 21. Wembley Exhibition Hall. For info, contact Sovereign Exhibition Management, Park House, 55 Park Lane, Carshalton, Surrey SM5 3EE. (01) 773 3751.
Exhibition–39th National Marquetry exhibition, May 18–June 1. Elliott Hall, Harrow Arts Centre, Uxbridge Rd., Hatch End, Harrow, Middlesex. For info, contact Sid Skiller, 37 Elm Park, Stanmore, Middlesex, HA7 4AU. (081) 954 4042.
Classes–Woodworking classes. Smith's Gallery, 56 Earlham St., WC2. Contact Laetitia Powell, Parnham, Beaminster, Dorset, DT8 3NA. (0308) 862204.

GERMANY: **Fair**–International Hardware Fair, Mar. 3–6. Cologne. For information, contact KölnMesse, Messeplatz 1, Postfach 21 07 60, D-5000 Köln 21 (Deutz); or Koch, 157-161 E. 86th St., New York, NY 10028. (212) 369-3800.
Exposition–Ligna Hannover '91, May 8–14. Hannover Fairgrounds, Hannover. World fair for machinery and equipment for the wood and forestry industries. For info, contact Hannover Fairs USA, 103 Carnegie Center, Princeton, NJ 08540. (609) 987-1202.
Fairs–Furniture and Interiors fair, Sept. 25–Oct. 1. Trade Fair for Building Systems, Building Materials and Building Renovation, Oct. 31–Nov. 6. For info on both, contact Koch Trade Fairs, 157-161 E. 86th St., New York, NY 10028. (212) 369-3800.

ITALY: **Fair**–Milan Furniture Fair, Apr. 12–17. Running in conjunction with 5th Salone del Complemento d'Arredo (furnishing accessories exhibition). For info, contact Cosmit, 20123 Milano, corso Magenta 96. 02 48008716.

PUERTO RICO: **Exposition**–2nd World Expo for Woodworking Machinery and Furniture Supply, June 21–23. Roberto Clemente Coliseum, San Juan. For info, contact Exposiciones Las Americas, Box 11228, Caparra Heights Sta., 00922. (809) 751-6900.

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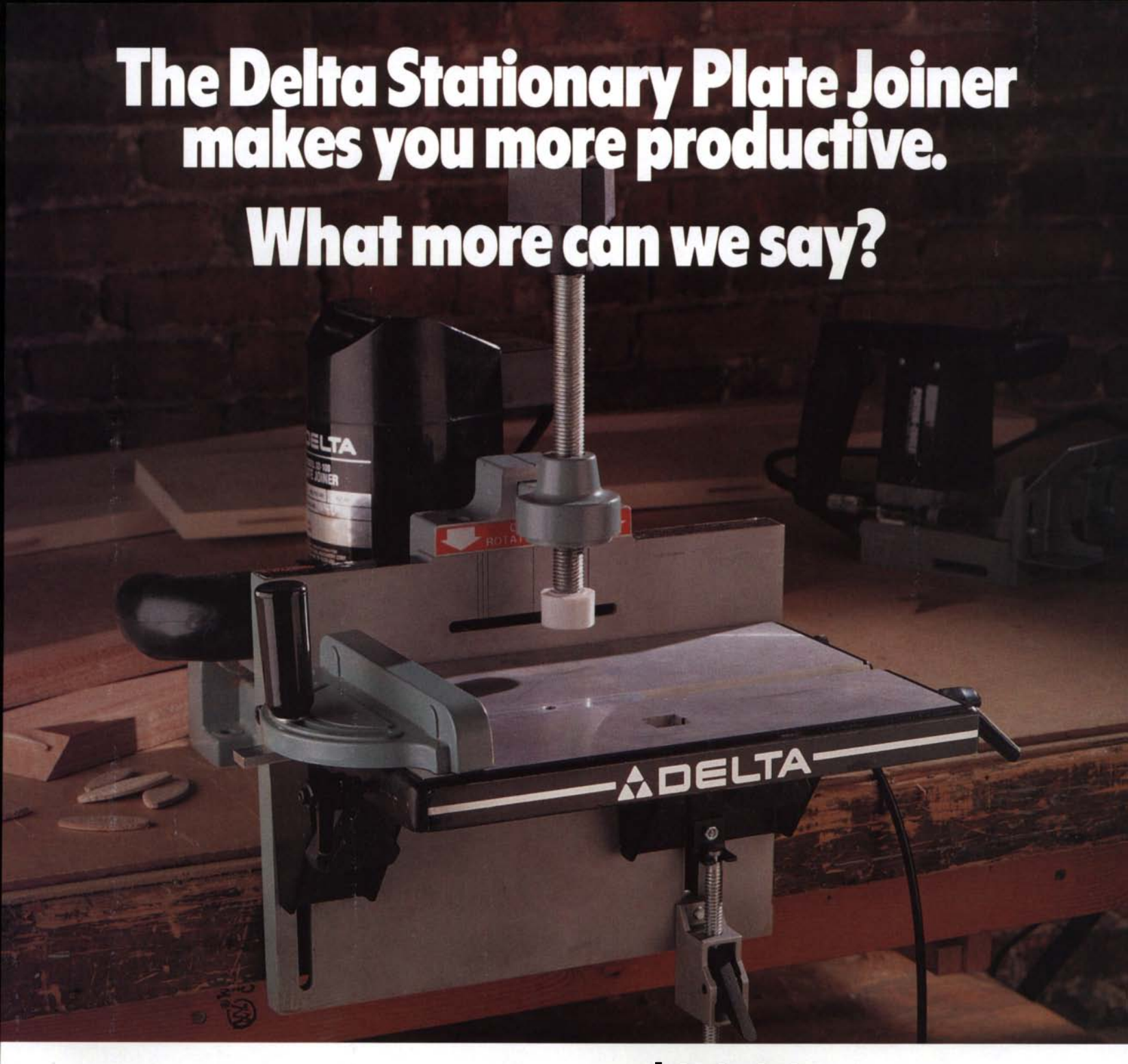

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READER SERVICE NO. 44

Woodcarving with Rick Bütz by Rick and Ellen Bütz. *Madrigal Publishing Co., Inc., 517 Litchfield Road, Box 1629, New Milford, Conn. 06776; 1989. $16.95, paperback; 127 pp.*

Woodcarving with Rick Bütz is a fine book for the hobbiest because it pertains to the actual act of carving. All of the projects, which include a chip-carved quilt rack, a St. Nicholas, birds, animals and fold pieces, are very simple in design and are easy to grasp. While some of the projects will require power tools for the roughing out stage, most need only a coping saw and a very basic set of chisels, gouges and knives.

The photographs by Ellen Bütz and the text complement one another very well. The writing is clear and to the point, and the photographs are sharp and show cutting angles to good advantage. Those who have contemplated woodcarving as a hobby but felt they did not possess the skills will be able to get a start by reading this book. With a little patience, anyone can carve just about any project offered by Bütz.

However, the staining and painting tips are not very good as a whole. Rightly, Bütz recommends that beginners carve white pine and basswood. He also often recommends using water-base acrylic paints and oils thinned with turpentine, but the wood is porous and here is a problem. The paints, because of their thinning agents, spread almost immediately upon contact with the wood. Painting like this is almost impossible to control, and instead of subtle hues, most of the carvings in the book are rather muddy.

The above criticism should not keep you from utilizing this book, for in all other ways it is very well done and can start a person on the road to much enjoyment and satisfaction.

—John L. Heatwole

Shoji: How to Design, Build, and Install Japanese Screens by Jay van Arsdale. *Kodansha International/USA Ltd., 10 E. 53rd St., New York, N.Y. 10022; 1988. $15.95, paperback; 96 pp.*

For many years, *shoji* screens, the translucent sliding doors that are a trademark of Japanese architecture, have held a special fascination for me. However, with the exception of articles in *Fine Woodworking,* there has been a virtual void of written material on the subject until now. *Shoji: How to Design, Build, and Install Japanese Screens* provides a good introduction that any woodworker with reasonable abilities will be able to follow.

The book opens with a gallery section showing Japanese screens and interiors in both their native context and Westernized versions. These photos are representative of various uses of *shoji* and set the mood for applying Japanese decor in the home. The only disappointment here is the lack of color photos, which would have added rich detail to this, as well as other sections of the book. Yes, I know that *shoji* are a study in light and shadow; but the quality of the cover color photos indicates what we missed.

A brief history of the use of *shoji* in Japan and adaption for use here is followed by a section on appropriate wood selection. Paper and substitutes such as fiberglass and plastic are discussed, though not in as much detail as I would have liked. It also would have been a nice touch to include a couple of pages of actual paper and fiberglass samples, rather than photographic reproductions, to further guide the novice in this choice. This is followed by a discussion on the care and use of Japanese hand tools, which are used exclusively throughout the book.

The meat of the book is van Arsdale's detailed chapter on making a typical *shoji* screen. All aspects of construction are covered, from planning and layout to the final product. Throughout, the text is peppered with clear, easy-to-follow line drawings detailing the steps involved. While the drawings are a strong point of the book, it would also have been helpful to include a series of photographs of the author at work on a screen. Notably missing here is the use of machines to speed up production for making duplicate joints in large jobs. Except for planing the lumber, the author is strictly a hand-tool advocate, something most of us will find alien to modern Western woodworking. It is easy enough to adapt van Arsdale's joinery to machine setups, but it would have been helpful if this had been covered in the book.

The final section of the book is on projects for the home and includes drawings of 58 different lattice patterns, which should prove extremely useful in designing *shoji.* Different methods of installing screens are well covered here, as well as some special projects such as skylights and Japanese lanterns.

Overall, van Arsdale's *Shoji* is a welcome addition to the field of Japanese woodworking. The author takes neophytes by the hand and leads them from start to finish. The book's well-organized format also allows it to be used as a quick reference guide by those more advanced in *shoji* construction.

—Ben Erickson

Band Saw Projects by Tom Crabb. *Sterling Publishing Co. Inc., 387 Park Ave. S., New York, N.Y. 10016-8810; 1988. $9.95, paperback; 128 pp.*

This is Tom Crabb's second book about bandsaw projects. His first book, *Making Wood Boxes with a Band Saw,* is primarily focused on boxes and containers, and this latest book adds a new assortment of these popular projects that can be produced with the bandsaw. It also covers a variety of techniques unique to the bandsaw, such as intarsia (making a picture out of pieces of solid wood).

Both of Crabb's books are unique in that the designs are new and refreshing. It is always disappointing to buy a book and then thumb through it and not see anything completely new. The projects range from A to Z; some are quite clever and tasteful, and some are downright homely.

Band Saw Projects fulfills the two necessary requirements of a good woodworking book. First of all, it stimulates the reader, and secondly, it gives enough technical information so that the reader can duplicate the projects. Even if you never try any of the projects in this book, you will still come away with a better idea of the remarkable capabilities of the bandsaw. This book imparts a vicarious pleasure and confidence in the bandsaw, and the book is entertaining. More than once I found myself smile as I read it. This is a credit to the author's writing style, which is short and sweet; not a lot of time or space is wasted. The book benefits from the 139 large, clear pictures and drawings.

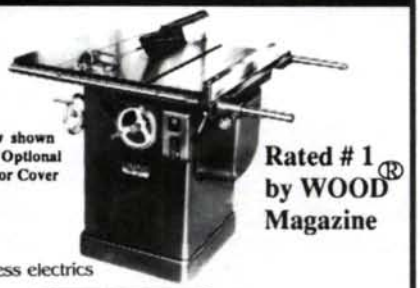
The book starts out with a section that discusses bandsaw tracking, guides, wheel alignment and vibration. The next section is on blades. The book would benefit from more detailed material in these two introductory sections.

Joints that can be made on the bandsaw, as well as jigs, are covered next, and the rip fence and miter gauge are also described. A homemade circle cutter using a trammel point is discussed in detail. The most interesting jig shown, which is used for cutting half-lap miters, holds the workpiece off the table at a 45° angle to the blade.

The midsection of the book shows how to make containers and boxes out of solid wood, such as limbs or firewood. Crabb shows some designs for round objects that look like lathe turnings. He uses a technique for making double-wall vessels that produces a container with an outer wall decorated with pierced sabersaw cuts. But the author also departs from circular designs to focus on a clever folding box made by using finger joints.

Eleven different intarsia designs are shown. Intarsia is a technique in which pieces of solid wood are cut and fitted together,

Rated #1



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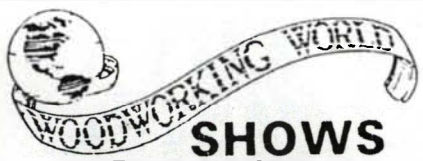

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forming a design. It is similar to marquetry, but solid wood is used rather than veneer.

The strength of this book is its interesting techniques. If the book has a weakness, it is in the realm of design. With experimentation and practice, some of these techniques could be very useful to the bandsaw owner. Perhaps the strongest point in favor of this book is its ability to stimulate experimentation.

–Mark Duginske

Carving Horses & Carriages with Power Tools by Billy J. Smith. *Sterling Publishing Co., 387 Park Ave. S., New York, N.Y. 10016-8810; 1989. $12.95, paperback; 144 pp.*

A carver can try to reproduce a subject exactly, or to exaggerate its features as caricature, or to catch the simplified essence of things. This third approach prevails in *Carving Horses & Carriages,* and the book deserves great respect. I believe that no one can carve a seal the way an Eskimo can, because no one quite sees a seal with the intensity of an Eskimo (leaving aside town-bound work done strictly for tourists). Similarly, antique weather vanes and paintings of horses, done before the age of the photograph, capture an inner truth about these then-essential workmates that goes beyond mere likeness.

A retired businessman, Smith started carving horses only a few years ago, but he and his family have been involved with them intimately for a lifetime. Basing his designs on antique sensibilities and on the work of well-known earlier carvers, Smith has an inner vision that transforms imitation into art. Folk art, perhaps, but in my book still art of a high order. His first carvings may have been tentative, but his latest work just punches the idea of "horse" at you.

Smith's working methods—abrasive tools used on the end of a flexible shaft—and his step-by-step instructions for horse and carriage models are inviting to any beginner. But they are secondary to his talent. I'd encourage anybody to try this stuff. The author is no lordly expert; he admits he can't even sharpen a knife. He's just an amateur furnituremaker who happens to love horses, art and wood. When he started carving, almost by chance, he found out he could do it. (In his words, "Wham!") Now he wants you to try it too, and he gives tricks for decorative painting, wheel making and harness making that will help you get started. You'll never know if you can do it if you don't try.

–Jim Cummins

The Woodworker's Shop: 100 Ways to Enhance Your Workspace by Percy W. Blandford. *TAB Books Inc., Blue Ridge Summit, Pa. 17294-0850; 1989. $14.95, paperback; 249 pp.*

This is one of those rare books that succeeds in contradicting the age-old proverb about not judging a book by its cover. The photo on the front cover pretty much sums up the contents of this book: An impeccably dressed gentleman is standing near a shiny new bench, over which hang some shelves laden with an array of equally shiny (and probably unused) tools. Add some strategically placed shavings on the benchtop and it looks more like a display in a retail store than a woodworking shop. I picture someone with a shop like this owning a book like this. When you turn the cover and get into the book, I think most readers will be disappointed. I feel that the book fails to live up to its title.

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in your shop, you should be able to find projects [in this book] that will help you do your work more quickly, more economically and more accurately." I would venture to say that there has yet to be a woodworking book published from which most of us woodworkers, whether amateur or professional, couldn't glean some useful information, this one included. But there does seem to be a profusion of useless information and an overabundance of regurgitated technical drawings showing jigs that the "normal" production shop, or for that matter even the competent amateur, would not consider worthy of the time it takes to build the "timesaving" devices.

I found that the good information this book does contain is elementary, as in the chapter on layout. Also the chapter on hand tool accessories, with its plan for a shooting board, and the final chapter on shaper and router accessories both contain good, basic information.

My beef with this book is that when the material is solid, the format in which it is presented was very disappointing. Quite frankly, the same information can be found in so many other books, as well as back issues of some magazines, and I find the quality of these other sources superior to that presented here. The lack of any photos and the overall feel of the line drawings speak of low economy rather than high quality in the production of this book. *—Terry Moore*

Woodworker Guide to Woodturning by Michael O'Donnell. *Argus Books Ltd., 1 Golden Square, London HP2 4SS, England; $21.95, paperback; 121 pp.*

Only part of the audience will have the stamina to wade through the early chapters of *Woodworker Guide to Woodturning*. The density of theory, which lays the groundwork for the actual turning, is formidable and nearly impassable. O'Donnell takes the act of turning and attempts to precisely quantify and label every aspect of it. Once through this introduction, however, the reader is amply rewarded with clear applications. O'Donnell is sensitive to the beginner's worries about such things as speed, vibration and resistance to the tool edge. The fundamentals of both spindle and faceplate work are thoroughly explained. I especially liked the fact that this book provides the knowledge of the "why" of turning, in addition to the "how." Also of note is that there is no "gallery" of finished work—not even O'Donnell's wonderful bowls; there is just a very intelligent explanation of turning wood.

Visually, the photos vary from clear and close to dark and murky; but fortunately, at least half of the illustrations are line drawings. These are the best I've seen, with exceptional choice of view and clarity of explanation. Given O'Donnell's demands on our ability to conceptualize, and the fact that most of us understand the world best when it's presented visually, it's something of a shame that he didn't take the next step and make this book into a video. *—Steve Loar*

John Heatwole is a woodcarver living in Bridgewater, Va. Ben Erickson does production millwork and furniture work in Eutaw, Ala. Mark Duginske is a woodworker, author and FWW *contributing editor from Wausau, Wisc. Jim Cummins is an amateur woodworker in Woodstock, N.Y. Terry Moore is a professional furnituremaker from Newport, N.H. Steve Loar is an amateur woodworker and associate professor in the School of Art and Design of the Rochester Institute of Technology in New York.*

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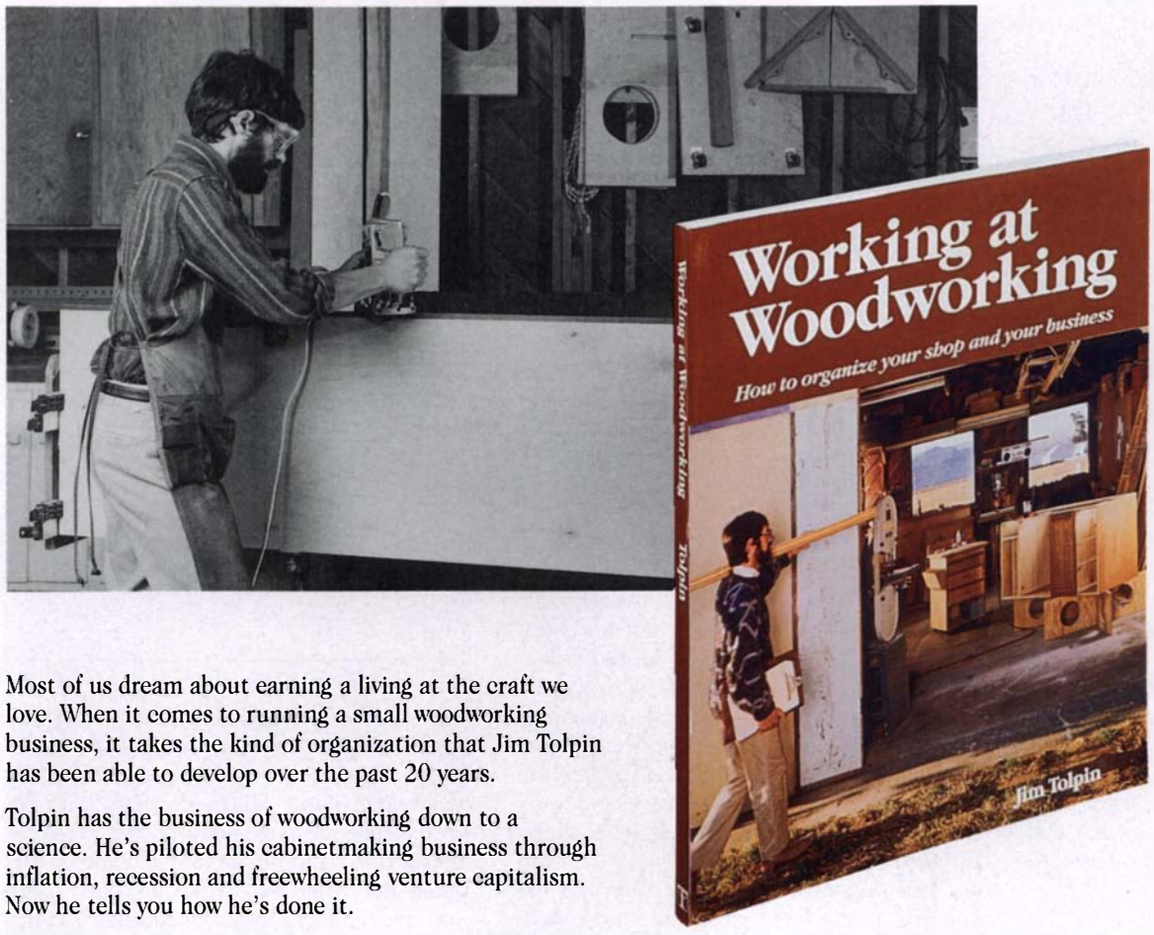

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After 10 years as a cabinetmaker building kitchens for new homes, I have arrived at the point where I hope I have committed all the major errors of the trade and that the future holds the promise of smoother sailing with a profitable business. But I can never forget the adventures and mishaps along the way, the incidents most likely to be laughed at years after the event. Invariably these have involved deliveries of finished goods—situations that provide the greatest potential for disaster.

This potential was recently heightened for me when my brother-in-law and I began building reproductions of early Texas-style furniture and cabinets from longleaf pine lumber resawn from old building timbers. After years of production cabinet work, we at last had the opportunity to be real craftsmen. We banished particleboard and staples from our shop and were learning how to use handplanes and carving tools and to hand-cut dovetails. We were happier than two pigs in mud.

After several months of this work, we were commissioned to build a large cabinet, 84Hx60Wx24D, for an office located directly in front of the Alamo in the center of San Antonio. It was a reproduction of an early wardrobe, put to modern use housing video equipment, and would take its place alongside several 19th-century originals.

After weeks of work, our beautiful reproduction of an early Texas cabinet, built from solid longleaf pine and adorned with raised-panel doors, crown molding and dovetailed base, was ready for delivery. Before we left for San Antonio, I began to sense the adventure we were headed for when it took five men to coax all 700 lbs. of cabinet into the delivery truck.

Arriving at the Alamo, we decided to take a quick walk through this shrine to Texas independence. As a matter of fact, our customer's building was located in what was once the Alamo courtyard, the place where Col. Travis drew his famous line in the dirt and where some of the bloodiest fighting took place. It was here that Jim Bowie and Davy Crockett fought their way into history. Being an eastern transplant living in the heart of Texas, I always remind my Texan friends that many of the Alamo martyrs were Irishmen from New York.

As we were opening the truck, we were met by Steve, a Texan and veteran furniture mover with the build of a Brahman bull, who regarded our cabinet as just another challenge to his strength. Steve assured me that he had the situation under control. But I would shortly see that "under control" means different things to different people. We wheeled the behemoth into the building. Sizing the cabinet to the elevator entrance, Steve made it clear to the owners that their elevator had been built too small. He then unveiled his novel plan to place the cabinet on top of the elevator, at which time they summoned their secretary, the self-proclaimed expert on maneuvering large objects up this particular elevator shaft.

Once the top of the elevator was lowered to the first-floor level, I gazed up through the shaft three floors to the roof. I forewarned everyone that it was a tight fit and pointed to an electrical conduit dangerously crossing the back of the shaft. As my apprehensions continued to mount, I joked to my brother-in-law that two more Irishmen from New York were about to meet their end at the Alamo as elevator fodder, and I asked if he would consider leaving his collection of handplanes to me should I alone survive this latest delivery adventure.

Somehow I now overrode all the warning lights that my 10 years of experience in cabinetmaking had fine-tuned in my head. Reluctantly positioning myself on top of the elevator, my brother-in-law at my side and Steve (the fearless furniture mover) on the other side of the cabinet, we managed, after much grunting and groaning, to balance the 700-lb. cabinet on a 4-in.-wide beam running across the top of the elevator. Things happened swiftly from this point on, but the events are no less vivid.

Although the secretary assured us that we had complete control of the elevator through the auxiliary control box at my fingertips, she had failed to flip the red switch in the elevator and the controls were actually in the hands of demanding passengers on each floor who now ignored notices that the elevator was out of service. So, before the countdown was over, we were suddenly launched up, up and away at high speed through the elevator shaft.

I had previously limited my elevator excursions to the quiet, air-conditioned, well-lit interiors. This ride atop an elevator, balancing a 700-lb. titanic on a 4-in. beam, clearing the shaft sides by fractions of an inch at full upward throttle, watching the wires and electrical boxes whiz by, provided a new perspective. I liken the experience to a ride on the Cyclone at Coney Island without a seat belt.

In the ensuing seconds many thoughts passed through my mind. I first realized that I was not in a very good position for a person with a wife and five young children, and that barring a malfunction, our present course would end abruptly in one of two ways. One, we were about to encounter at high speed a stoutly built 100-year-old roof that would end our excursion into the stratosphere and make us candidates for a sardine can. Two, we were about to receive a very unique view of the Alamo that few tourists ever experience, our masterpiece cabinet having reached escape velocity and blown a crater-size hole in the roof.

Drawing: Leah Hernikl

Yet neither was to be our fate. We came to an abrupt halt 3 ft. above one of the upper floors. I immediately inquired about the well-being of my fellow travelers who reported that, although shaken, they were intact and also desirous of rapid escape. At this point, not willing to cross any hero's line into the annals of history, I recalled a childhood movie where the spy slipped out of the lodged elevator via the trapdoor in the ceiling. So I began frantically and firmly stomping on the elevator top until Steve informed me that my escape efforts would be futile. The trapdoor could only be accessed from inside the elevator car.

In the midst of my panic, our ever-confident elevator operator appeared, once again assuring me through a crack in the door that the elevator was still at my complete command and that a finger touch on the control switch would ease us into position to unload the cabinet on the second-floor level. But our trial by elevator was not to be cut short. Seemingly with a mind of its own, the elevator all of a sudden proceeded downward.

At this point I turned my full attention to the control panel located at knee level, repeatedly pressing the stop button to no avail, when I heard a long and loud crunching noise that sounded exactly like longleaf pine giving way under excessive pressure. I

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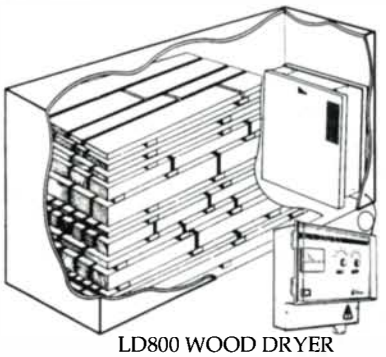

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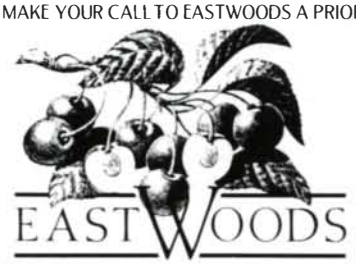

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feared the worst when this sound was accompanied by a loud wail from Steve, who still was hidden from my view on the other side of the cabinet.

Coming to a halt on the first floor, I looked up from the controls to see Steve standing in front of me unscathed. Our 700-lb. cabinet had disappeared. My gaze then followed my brother-in-law's up the shaft to behold our masterpiece, lodged above us in the elevator shaft, dangling three floors over our heads, poised to deliver us the final blow should the thin piece of electrical conduit that suspended it give way. It had us cornered now with no escape, trapped for the final charge. It was too late to surrender or call for reinforcements. Just then the elevator door flew open and I fell out onto the crowded lobby floor.

Three tense hours later we freed the crunched cabinet with the expert help of two elevator servicemen. After this latest delivery adventure I concluded that we may grow in wisdom, learning from mistakes, but there are some situations, like getting 700-lb. cabinets jammed in elevator shafts, that we may always need to bring us down to earth. Now when we sense such foreboding situations on the horizon, telling each other to "Remember the Alamo" keeps us on our toes.

—Kevin Durkin, Austin, Tex.

Photo: Courtesy of Christie's New York

This Badminton Cabinet became the world's most expensive piece of auctioned furniture when it sold at Christie's of London for more than $15 million.

Badminton anyone?

Although the Nicholas Brown desk and bookcase, which sold for $12.1 million in June 1989 (*FWW* #78, p. 116), still holds the American record for an auctioned piece of furniture, it has been surpassed as a world record by the Badminton Cabinet, shown at left, which sold at Christie's in London, England, last summer for $15.2 million. The cabinet has little to do with badminton, except it was in the Duke of Beaufort's home at the time the game was invented there.

The buyer, Barbara Piasecka Johnson of Princeton, N.J., is a Johnson and Johnson pharmaceuticals heir. Johnson says she plans to exhibit the cabinet, along with her collection of furniture and paintings, this spring in London and then, pending approval of an export license, ship it to the U.S.

The piece was commissioned in 1726 by Henry Somerset, the third Duke of Beaufort, and finished in about 1730. Built in Italy, the 7½-ft.-wide cabinet stands 12½ ft. tall, and its surface is inlaid with lapis lazuli and pietre dure birds and flowers. It is adorned with gilt bronze sculptures of the four seasons and topped with the Beaufort coat of arms. Some experts say the cabinet is the most important piece of privately owned furniture in Great Britain today. *—Charley Robinson*

Saving the rain forest

In the five minutes it takes to read this article, environmentalists say that another 500 acres of rain forest will be destroyed. But can anyone do anything to change the situation? This was the topic last fall as more than 100 woodworkers, botanists, foresters, timber dealers and just plain interested people from all over the world converged at the University of Massachusetts in Amherst for the founding conference of the Woodworkers Alliance for Rainforest Protection, better known as WARP (Box 133, Coos Bay, Oreg. 97420-0013; 503-269-6907).

Organizers said the conference was designed to be an intense, educational weekend to help woodworkers understand the rain forest and to rally their support for rain-forest protection. The education began with a conducted tour of the Smithsonian Institution's traveling rain forest exhibit at Boston's Museum of Science. The display presented information about a rain forest ecosystem and the problems of managing it, and suggested resources for further research and ideas for developing a personal plan for dealing with rain-forest problems. The rest of the weekend was filled with formal presentations from international experts, as well as discussions and informal conversations about woodworkers' relationships with tropical timber. Many of the afternoon debates about how craftsmen might alleviate the rapid devastation of the rain forest continued until well past midnight.

All of the speakers predicted the same grim consequences if nothing was done to protect the rain forests. Dr. Harry van der Slooten, former co-director of the National Forest Products Laboratory in Manaus, Brazil, said that the world's tropical forests have only a five-year supply of mahogany left and that Brazilian rosewood is practically extinct. Dr. Peter Ashton, professor of dendrology at Harvard University, said that selectively cutting well-known species often relegates 50% of the rain forest's timber to trash. And Ted Teusher, a teak specialist and environmental analyst for Smith and Hawken (importer and retailer of outdoor furniture), added that Burmese teak forests are almost completely depleted.

After listening to the speakers, I have no doubt that the world's rain forests are in retreat. I was particularly disturbed by reports of the wasteland caused by cattle ranchers who slash and burn to create grazing land. Since rain-forest soil is typically low in nutrients, it can sustain cattle for only a few years and then ranchers burn off another strip for grazing land, and so on. And yet it seems difficult to blame transient ranchers, because most of them are too poor to eat their own beef; these economics are part of the problem. As Dr. Ashton put it, the price woodworkers pay for tropical timber isn't high enough: there's too much windfall profit and too little is given back to the land and its native people.

The talks were often scientific and technical, and at times I felt almost overwhelmed with new information. I found myself agreeing more and more with moderator Richard Jagels, professor of forest biology at the University of Maine, who wrote in his monograph, "Tropical Forests—Slowing the Destruction" (*Miscellaneous Publication 710,* University of Maine, 1990), that there isn't a single cause or one simple solution. By Sunday morning, WARP's membership began to formulate a four-point agenda: to work to protect the entire forest ecosystem, its inhabitants and future generations, because the forest's people are as important as its trees; to explore and support projects that are engaged in sustained yield harvesting, such as the Yanesha Forestry Cooperative in Peru (see "Managing a Rain Forest," *FWW* #82), to ensure that the forests will be perpetuated; to acknowledge the importance of temperate-zone forests, but attach a special urgency to the protection of tropical rain forests, which are less resilient and take longer to regenerate; and to educate WARP members, as well as the woodworking community, so they act responsibly when buying wood and consuming products made from tropical hardwoods.

The greatest amount of discussion, as well as disagreement, was about whether WARP should back a certification program,

like Smart Wood, which was created by the Rainforest Alliance (270 Lafayette St., Suite 512, New York, N.Y. 10012). Ivan Ussach, who represented the Rainforest Alliance at the conference, said the program would certify and label lumber that comes from sustained yield harvests. To obtain a Smart Wood certificate, well-managed harvests must also have a positive effect on the environment and local communities. WARP agreed to collaborate with such a program.

I think everyone left the founding conference with fresh ideas and a personal action plan. Most woodworkers I talked with agreed to discontinue their boycott of tropical woods. They agreed to the importance of paying higher prices in order to add value to the wood from sustained yield timber harvesters. And most of the woodworkers seemed to be looking forward to experimenting with lesser-known species of wood that are now wasted. Utilizing everything and trashing nothing is part of sustained yield harvesting practices, and so future containers of lumber from these harvests are expected to include a large percentage of unfamiliar wood.

Woodworkers at the conference agreed they could help each other by passing on information about the working qualities, stability and special applications of these woods. If you've built something with a relatively unknown species of tropical wood and you'd like to share your experience, please send us a photo and description of your work along with information about the wood and its working qualities.

—Gary Weisenburger

U.S. turners hold national symposium

In recent years, few areas of woodworking have undergone a more rapid and expansive development than woodturning. One of the latest chapters in this evolution was written last October when the American Association of Woodturners (AAW) held its annual woodturning symposium at the Arrowmont School of Arts and Crafts in Gatlinburg, Tenn. For three days the 70-acre campus was the scene of numerous workshops and seminars on tools, materials, techniques, design topics and even photography. The ranks of instructors included such woodturning luminaries as Frank Cummings, David Ellsworth, Giles Gilson, Dale Nish and Palmer Sharpless. Several panel discussions, including a colloquium on the methods and practices of teaching woodturning, rounded out the program.

Photo: Nancy Gerard

These totem poles were assembled at the AAW symposium from turned segments made by the group's regional chapters.

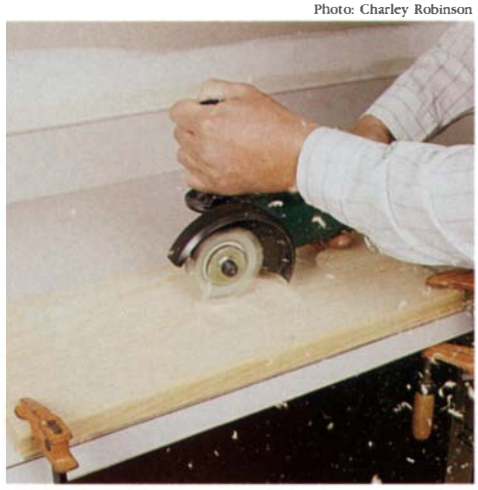
As in previous years, the 1990 symposium attracted both professional and amateur turners from all over the country, as well as a handful from abroad. The 350 attendees came ready to share their viewpoints and examples of their current work. In fact, an "instant gallery" was set up in one studio to allow attendees to display and/or sell their turnings. Arrowmont also sponsored a more formal display of work, Woodturning: Vision and Concept II, a national juried exhibition. The exhibit, which opened during the conference and remained on display until Dec. 8, featured 78 turnings made by 67 artists, many of whom were on hand at the symposium to discuss their work.

While the symposium provided the AAW and its members the chance to catch up on official business, the event generated some new business for a handful of companies selling lumber, tools and supplies at the mini trade show. Arrowmont's scenic environment, nestled in the Smoky Mountains, also provided turners a relaxed atmosphere in which to socialize and even have a little fun. There was a Friday night banquet, where donated turnings were auctioned off for the AAW's scholarship fund, and a Saturday picnic. My favorite event was the raising of two turned-object totem poles, shown at left. Each pole was comprised of turned segments created by various AAW regional chapters. The segments were threaded, one by one, onto a steel pole embedded in the ground.

The dates for the next symposium were tentatively scheduled for April or May when this issue went to press. For the exact dates, place and more information, contact Mary Redig at (612) 484-9094.

—Sandor Nagyszalanczy

Photo: Charley Robinson



The Woodcarver imitates the cutting action of a chainsaw tip for rapid, safer and more easily controlled wood removal during freehand shaping.

Product review

The Woodcarver, *Arbortech Pty. Ltd., 50 Westchester Road, Malaga, Western Australia 6062.*

Anyone who has spent much time with a chainsaw knows that its tip is a very powerful tool for freehand shaping wood. Moving the saw lightly back and forth over the wood will remove large amounts of wood in a hurry without much concern about grain direction or knots. Unfortunately, a chainsaw is also noisy, smoky, expensive, maintenance hungry and dangerous. Australian woodworker-turned-inventor Kevin Inkster has come up with a tool that retains the advantages of chainsaw shaping, but gets away from most of the drawbacks, although, like any power tool, it still must be treated with care and respect.

Called the Woodcarver (see the photo above), the tool consists of a heavy-gauge pressed-steel disc that is just under 4 in. in diameter and has six teeth spaced around the edge. It is mounted on a small angle-head grinder. The teeth resemble chainsaw teeth in appearance, as well as performance.

Setting up the tool is simple. The Woodcarver attaches to the grinder like a rigid grindstone; no back-up pad or spacer is necessary. The grinder's safety guard, which is normally at a right angle to the grinder's axis, should be shifted 45° to that axis to ensure the pull of the tool is away from the operator. To maintain control of the cutter, the grinder's auxiliary handle must be used at all times. You should wear a glove on your right hand to deflect the stream of chips and a full-face shield to keep from swallowing them. It is also essential that the workpiece be absolutely solid; any movement here could allow the tool to dig in and cause disastrous results.

Literature supplied with the tool suggests removing large amounts of wood by holding the disc at a right angle to the work-

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piece so that only the edge is presented to the wood. I found this to be remarkably effective in everything from pine to bird's-eye maple, regardless of grain direction. Though the tool cuts extremely fast, it is fairly easy to control and produces a reasonably smooth cut. Though trying to maintain flat surfaces is more difficult, control is still good and the tooled surface is easily cleaned up with a 60- or 80-grit sanding disc.

The product literature also suggests using the tool with the disc parallel to the wood, much as you would use a sanding disc. I found this approach more troublesome and difficult to control. The teeth dug in, kicking the tool sideways and severely gouging the wood. These digs were more than a little frightening because the tool moved quickly and powerfully when it started to dig in. I have some painful memories of what chainsaw-style teeth do to human flesh and I don't like having that kind of weapon even slightly out of control. It is possible that with more practice I could teach the tool better manners, but I suspect that instead I will use it mainly at right angles to the wood.

And use it I will. I bemoan the fact that I received the Woodcarver just after handshaping the seats for a set of Windsor chairs and a settee. The Woodcarver would have saved considerable time on that job. Although the seats were pine, the Woodcarver would have enabled me to shape them just as easily had they been oak or other hardwood, a project I would not like to attempt by hand.

There are two changes I would like to see incorporated in the Woodcarver. The teeth are made with an approximate 25° hook angle, giving it an aggressive, self-feeding cut. I would prefer to see this angle reduced to between 10° and 15°, giving a less aggressive yet more controllable cut. And in some situations I found that visibility was limited by the disc itself. Perhaps designers could come up with a way to put openings in the disc so it would "disappear" when rotating and give the tool user a more complete view of the workpiece.

Although I did not have to sharpen the tool, I expect the process would be much like sharpening a chainsaw. And although the manufacturer sells a 6mm aluminum oxide "dressing stick" for sharpening the Woodcarver, I suspect that a ¼-in. chainsaw file with the Woodcarver held in a vise would work like a charm.

The Woodcarver is distributed in the United States and Canada by Ryobi America Corp. (1424 Pearman Dairy Road, Anderson, S.C. 29625) at a suggested retail price of $50. Although the tool is widely available through home centers, hardware stores and mail-order catalogs, you can call Ryobi at (800) 323-4615 in the U.S., or (800) 265-8149 in Canada, to find your nearest retailer.

–Mac Campbell
Harvey Station, N.B., Canada

Photo: Lynn A. Dobson

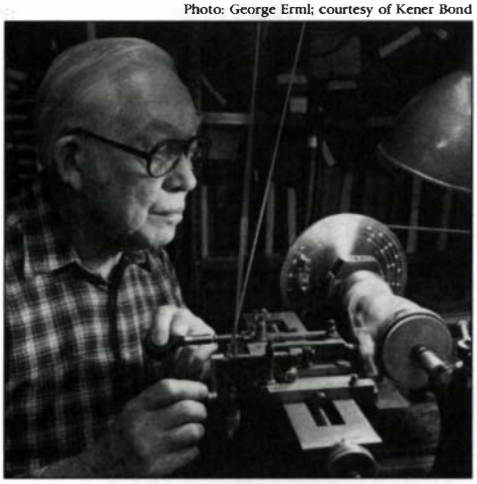
Dobson began carving matchsticks with a broken razor blade on a bet with a fellow veteran while recovering in a Navy hospital during World War II.

Match carvings

While passing the time with other veterans in a Navy hospital during World War II, my father, Elmer Dobson, made a bet that he could stretch a matchstick ¼ in. without breaking it. Borrowing from whittling methods learned during his rural Iowa upbringing, he carved a chain out of a matchstick and won the bet. Then he went on to carve pliers, which actually open and close. His most difficult carvings include chain links, a cage with a free-floating ball, and working pliers, all carved from the same matchstick. To carve the matchsticks, he carefully broke one of those super-thin double-edge razor blades, which are no longer available, so it had a long, sharp point. It took hours of steady handwork and keen eyesight to carve the tiny sticks. Although he hasn't done any microcarving since the early 1960s when he carved a second matchstick with the chain links, ball in cage, and pliers for me, he still does some cabinetry and carpentry. Recently he built a bell-shaped gazebo roof and a porch railing, copied from an old photo, for my 1889 house.

–Lynn Dobson, Lake City, Iowa

Photo: George Erml; courtesy of Kener Bond



The late Frank Knox working on another ornamental turning on his Holtzapffel lathe in 1984.

Frank Knox: 1901-1990

Frank Knox, the first contemporary ornamental turner in the United States and a craftsman who did much to revise that art in this country, died at his home in New York City last July, at age 89. Knox had a very successful career as an expert in office-forms management and he wrote several books on this subject. His real love began when, nearing his retirement in the late 1970s, he purchased a Holtzapffel ornamental-turning lathe. Knox began working with wood by taking several workshops in cabinetmaking; during this time he became aware of ornamental turning (OT).

Most turners who became interested in OT found their way to Knox's workshop in New York. He was always willing to demonstrate OT techniques and also to let his students look at and touch the outstanding works he produced with this machine. Knox also became an expert on the varieties of woods used in OT work and he acquired an extensive collection of these, which he incorporated into his own OT creations. In the summer of 1980 he demonstrated ornamental turning at the seminar on ornamental and engine turning held at the Rochester (N.Y.) Institute of Technology. Knox was one of the few individuals who owned a Holtzapffel lathe and used it to produce OT pieces. He wrote a book on ornamental turning–the first volume on this subject to appear in 90 years.

Knox left his lathe to the North American Center For Ornamental Turning at the College of Fine and Applied Arts of the Rochester Institute of Technology, where it has joined two other Holtzapffels to be used by students to explore this turning process.

–Kener E. Bond, Jr., Pittsford, N.Y.

Notes and Comment

Got an idea you'd like to get off your chest? Know about any woodworking shows, events or craftsmen of note? Just finished a great project? If so, we'd like to hear about them. How about writing to us? And, if possible, send photos (preferably with negatives) to Notes and Comment, Fine Woodworking, *Box 5506, Newtown, Conn. 06470-5506.*

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NEW DIMENSIONS

When Joel Evett, a sculptor and restorer of European antiques, hired Roberta Boylen as a finisher in 1986, he had no idea she would become his wife and a partner in his business, Studio Classico in Belmont, Mass. Boylen, recently back from Italy with an advanced degree in history and painting, suggested that Evett use more color in his sculptures; Evett, in turn, encouraged Boylen to add three-dimensional elements into her paintings. Out of mutual respect and inspired by the antiques that surrounded them daily, they combined their talents and began working together on furniture. Evett specializes in the three-dimensional work–cabinetry, hardware and relief sculpture–and Boylen follows with the two-dimensional treatments–painting and other finishing.

"Amazon Rainforest Cabinet," right, is a product of this collaboration. The 80Hx35Wx22D piece is poplar with a pickled-and-waxed finish, and has 2-in.-deep shadow-box door panels. Evett carved and applied the flora and fauna to the plywood panels and then Boylen painted them with the medieval technique of egg tempera over gesso. The mirror frame (below, right), called "Nel Giardino" (In the Garden), is 77Hx34Wx2D maple, faux marble and gold leaf with a narrative painting that suggests a fable. The walnut and glass-top "Trout Table" (21Hx23Wx23D) features three-dimensional swimming fish (below, left).

Photos: Dean Powell