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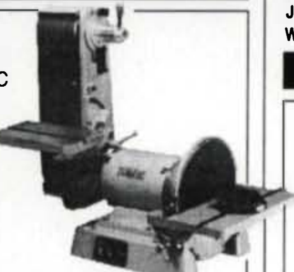

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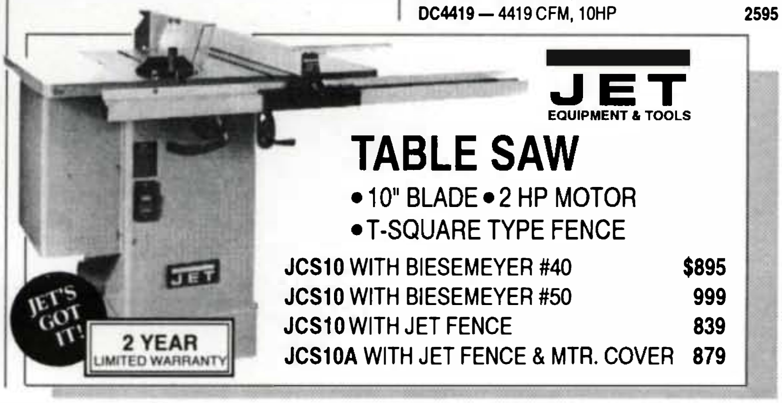

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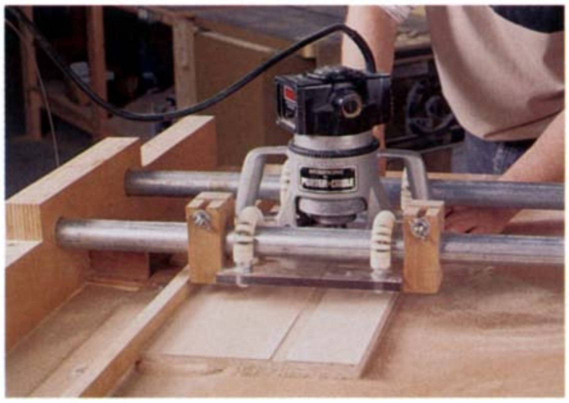

To make routing sheet goods faster and easier, Steven Grever shows how to build and use his panel router on p. 48 (photo: Sandor Nagyszalanczy). Cover: Judith Ames clamps up her cherry nightstand (article on p. 66). Cover photo: Jim Boesel.

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*, PO Box 5506, Newtown, Conn. 06470-5506.

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DEPARTMENTS

ARTICLES

Postmaster: Send address changes to *Fine Woodworking*, The Taunton Press, Inc., PO Box 5506, Newtown, CT 06470-5506.

Why we mail *FWW* in paper wrappers—Ecological and conservational issues are emotionally charged concerns, and often in the search for remedies, we latch onto half-baked solutions before we have fully ascertained the facts. Take, for instance, the matter of wrapping the magazines in plastic. We have to wrap them in something because our reader surveys show that more than 95% of you save your issues of the magazine, and that means we have to deliver them in good shape. Yet over a period of several years, we got a lot of complaints from readers who objected strongly to the plastic wrappers. Not only did these wrappers consume petrochemicals in their manufacture, but also they added non-degradable mass to the landfills.

So after much debate here, we switched to a "biodegradable" plastic wrapper. But that only triggered more objections, primarily from folks who claimed that "biodegradable" plastic was a hoax at worst, or just another polluter at best. Most of these readers urged us to go back to slipping the magazines in brown paper sleeves as we had done for more than a decade.

Well, we reopened the whole issue. We discussed it, we argued about it, we cussed it. In the end, we came back around to where we started: With brown paper wrappers, only this time we had them made from recycled paper. Now everybody's happy, right? Not entirely. The paper wrappers don't protect the magazines quite as well as plastic ones do, and we have gotten letters from several subscribers who didn't like the fact that their issues arrived scuffed and torn. Clearly, we'd like to find a way of sending the magazines through the mail that doesn't pollute and that doesn't damage copies. Unfortunately, we can't have it both ways. If your issue of *FWW* arrives damaged, just send us the torn wrapper, and we'll replace your copy free.

—John Lively

Furniture from unknown exotics—Questions dealing with the survival of tropical forests and the people who inhabit those regions are being hotly debated by woodworkers in many countries. It's a complex issue and the discussions range from demands for a boycott of all tropical rain-forest timbers to the further expansion of sustained-yield harvesting plans and other developmental programs. In reading about some conferences and debates on the issue, I was intrigued by proposals encouraging woodworkers to experiment with little-known species of exotics, which are now mainly wasted. We presented photos of some typical "waste" woods from Peru in *FWW* #82, and we want to know more. If you've been experimenting with some of these neglected woods and have built furniture from them, we'd like to see some photos and hear about your work. Send your material to Dick Burrows, editor, *FWW*, PO Box 5506, Newtown, Conn. 06470-5506.

Studley tool chest at Smithsonian—Readers who have been fascinated by the magnificent tool chest shown on the back cover of *FWW* #71 and later issued as a poster can see the chest itself at a show to open this August at the National Museum of American History of the Smithsonian Institution in Washington, D.C.

The owner of the chest, Pete Hardwick, said he has loaned the chest to the Smithsonian. In addition to making the chest available to the general public, the Smithsonian has also turned up some interesting information about the chest and its maker, Henry Studley. Hardwick said the researchers in Washington have found that Studley, from Quincy, Mass., was listed in Civil War rosters as a carpenter and was a prisoner of war for several years in a southern camp in Galveston, Tex.

The chest was also pictured in the February 1991 issue of *Smithsonian*, which is published by the institution. That article pointed out that the "intricately inlaid chest is described in [Studley's] obituary as 'one of the most remarkable things of his creation ... a most ingenious contrivance containing multitudinous number of tools of all sizes and kinds.' "

Studley, a Masonic brother, also embellished the chest with numerous Masonic symbols, a fact that many readers notified us about shortly after the photo was published. The chest, which measures 39Hx19½Wx9½D, contains several hundred tools. Many were manufactured by Studley himself; others were produced by commercial toolmakers before 1900.

In the weeks after we published the chest, receptionists at the *FWW* office estimated that about half the calls they received involved requests for more information on the chest. Some retail stores, amazed by the response the photo received from customers, also put the magazine backward in display racks so people could see the tool chest first. Hardwick himself was deluged with so many requests and blank-check offers to buy the chest that the rural post office near his home had to transfer his address to a larger station.

We are still receiving requests about the chest, especially about how much it's worth. Hardwick said that the value of the piece is still not established, because researchers are still discovering new information. For example, he said, two of the planes were made by Stanley, but they apparently are the only examples of these planes ever produced by the company. If you add up the value of individual tools, you might get a figure like $20,000, but "it's difficult to place value on something that's one of a kind, very beautiful and complete. It seems to be the only wall-hung tool box of its kind from that early era," Hardwick said.

Follow-up on Vega duplicator—Jon Snoeyenbos, president of Vega Enterprises, has pointed out an error in our article "Lathe Duplicators" in the January/February issue (*FWW* #86). "The maximum-diameter spindle-turning capacity of the Vega duplicator is 2½ in. less than the swing of the lathe, not 2½ in., as shown in the comparison chart on pp. 70-71. Our duplicator is routinely used on 12-in.- and larger-diameter turnings." We apologize for the error.

—Dick Burrows

John Lively is publisher of FWW. *Dick Burrows is editor.*

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Hints for a successful business—After reading letters in *FWW* #86 about making woodworking one's full-time occupation, I feel that my two cents might help. For me, woodworking is a hobby and I am a novice. But in 1983 I started my own business designing electronic products. Although the technology of my craft is different, the problems and challenges of being an entrepreneur are very similar to those of an independent woodworker; therefore, I would like to share some of the things I have learned over the years.

First, try to convince yourself that woodworking as a business is not much different from any other business and that everything applicable to business in general (marketing, cash flow, taxes, laws, etc.) is applicable to woodworking. Often there are short courses at colleges or universities on the above topics; so try to take them before you make any commitment. The information may not seem to apply to you at first, but it will all make sense after you have been in business for a while.

Ask yourself these questions. Why should anyone hire me? Who are my competitors? How do I assure a constant flow of business? What will my monthly overhead be (taxes, insurance, rent, utilities, telephone, loan payments, salary, wood, supplies, etc.)? What happens if I get sick? What if I become injured on the job and cannot work for a long period of time? How will the long hours affect my family? Will my spouse support me in my venture? If your answers to some of these questions sound like, "Because I'm cheaper than my competitor," "I don't have many competitors," "My reputation will spread by word of mouth," then your success is in question from the start.

The old adage about a starving artist is very true today. Most people do not like to pay much for art because they do not see it as a necessity. Custom work is usually too inconsistent to keep a steady cash flow; therefore, develop your own product to keep you afloat during the lean times. I could go on and make this a very long letter, but let me just say that it may take guts or nerves to start a business, but it takes brains to stay in business. I am sure you know the expression "Measure twice, cut once." It applies to starting a business as well. Put as much quality and design time into your business plan as you would a major project. Let me make one addition to the above expression: "Think thrice, measure twice, cut once." *—Robert A. Bonetti, president Tru-Data Systems, Sterling Heights, Mich.*

Tips for turning pro—After years of amateur status, I took the plunge and turned pro by joining ranks with a world-class pipe-organ builder here in Utah. I've learned much in my few months in the shop, but three things are so profound that I must pass them on. First, a good shop apron with lots of pockets is my best tool. Now the necessities of pencils, rulers, try square, etc., are always within reach. Second, a drill with a cord is an interesting artifact of the past. I have a couple at home, and I just hate them. Third, the metric system of measurement is absolutely wonderful. Using the metric system wasn't my idea. But when I got to the organ shop, all the drawings were scaled in millimeters; so I adapted.

What have I learned? It's true that you can't build an organ more accurately with the metric system than with the English version, but I don't make mistakes with the metric system. That means the shop is more productive. Formerly, simple subtraction involved mental gymnastics. For instance, quick—subtract 9⁄16 from 4¼. I'll admit that's the kind of math that has produced a bad cut or two for me in the past. Now, quick—subtract 10mm from 105mm. That's the kind of math that I don't err with.

—Duane McGuire, American Fork, Utah

No teacher like experience—It seems as though I've noticed an increasing number of letters from persons hoping to make woodworking their vocation. I personally enjoyed woodworking more when my family's next meal wasn't dependent upon how well I could guess how long it would take me to design and build something I've never built before. In this regard, there's no teacher like experience! But despite the financial uncertainties, there are few feelings as nice as when a client thanks you for a job well done on a one-of-a-kind piece that you've just put your heart into.

Should individuals wish to dive into the deep end and become self-employed woodworkers, they should be aware of the business end of their venture. There's much more to know than just time and material! When you go pro, you're spotlighted by the many ordinances that regulate the industry. Here in Sparks, Nev., a cabinet shop is required to obtain a permit to store or use flammable finishes; a booth to spray in; a permit to produce sawdust; a license for each city and county you deliver to and install in; a contractor's license to install your product; insurance of numerous quantities; and the list goes on and on ... and this is all before you can start your saw! Until you know what is really involved in starting a shop, keep your talents a low-profile hobby. I would hate to see a talented individual become a starving artist.

—Kenneth R. Goff, owner
Unique Design Cabinet Co., Sparks, Nev.

More on metric vs. English—As a pathologist, I have worked in medical laboratories for 20 years. I am also addicted to woodworking. I use SI units (an international metric system), the more rational and simpler cgs (centimeter-gram-second) system, and the ancient Greek-Latin-French-English systems that became feet and inches, pints and pounds. I can interconvert and mix the systems with some ease.

Which system we use, whether for a garage workshop or a commercial furnituremaking business, cannot be decided by any mathematical test. Neither is more accurate than the other. Accuracy is simply a measure of how close you come to the true value, and that depends on the care with which your measuring tools are made and used, and nothing more.

In woodworking, the easily done decimal calculations, for which the metric system is touted, are almost never necessary. In fact, as one reader recently pointed out, one of the graces of the English system is the ability to lay out and divide lines by repeated division by two, frequently with such ease by approximation that rulers aren't necessary after the first measurement.

Neither system is by itself technologically more advanced in isolation, although metric forms are easier to use for the tight specifications required, for instance, in making metal or ceramic tools or fine parts. But we're talking here about woodworking. I also sometimes hear that the metric system is more "scientific" than the English. Hogwash. Science is a method of investigation, independent of the system of measure. The metric system simply lends itself more readily to measurement of some of the things modern science probes. *—William A. Rouse, M.D., Rockford, Ill.*

Do property owners have rights?—Dan Ray's letter about destroying a habitat (*FWW* #85) raises a number of interesting topics, including the modern trend of supposing we may infringe upon the right of property owners to dispose of their property as they see fit (presuming the lack of a workable covenant or local ordinance which prohibits a specific action). One could be more sympathetic with the petitioners if they had made an attempt over the years to foster similar growth in their own yards. Then, the act of cutting the trees would make the yard in question stand out *after* the deed was done.

Anyone who has spent much time around a sawmill can tell you that each species of tree reaches maturity in a certain average number of years. While this age will vary with climate and geographic area, it is predictable (exceptions are easily verified by a trained forester) and may be likened to the number of days it takes a field of wheat to ripen or a head of beef to reach mar-

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ket weight. Waiting until after the trees are mature to cut them for the sawmill reduces the yield of useful lumber because some of it will be lost to decay. From the description of the neighbor's yard, the trees are probably beyond their commercial prime. If that is the case, they should be harvested without delay, before the lumber value decreases anymore and they weaken enough to be knocked down in a windstorm.

Besides the monetary value of a tree, there is the ecological value. The amount of carbon dioxide the trees remove from the atmosphere, the homes they provide for any wildlife found in town, the shelter they provide for flora on the ground and the pure enjoyment they give to anyone who merely walks past them on the sidewalk is of incalculable worth. Whether the trees fall at once to a chainsaw or over a span of years to natural causes, the larger question here is how they will be replaced. Waiting until a large tree dies or is cut before planting its replacement is an unsatisfactory answer.

Trees will try to replace themselves even in developed areas, but homeowners usually regard seedlings as weeds and pull them from lawns and flower gardens as soon as they emerge. For people who have only crabgrass left, the answer is to plant trees where nature is not able. Decades of poor stewardship will not be balanced by forcing one man to comply with a petition that prevents him from cutting the remaining, albeit aged, example of what all could have had. If the trees are cut and a few dedicated arborists are initiated as a result of the controversy, some good will have been done.

—Edward J. Paragi, New Haven, Ind.

Plenty of wood, if you look for it—In response to the tree controversy started in *FWW* #85, I'd like to suggest that people leave the trees alone until they have to be harvested and instead concentrate on salvaging wood. There is already enough cut wood around; you just have to look for it.

I have torn down buildings that produced 14-in. by 20-in. white pine boards, 2-in. by 8-in. chestnut, 2-in. by 18-in. oak planks and 5/4 poplar floorboards. Walnut, cherry and whitewood have all been turned into gun cabinets, buffets, tables, cradles, corner cabinets, etc. This I call "giving new life to old wood!"

It would be nice to hear from others who make things from salvaged lumber. *—Earle H. Haffa, Geneva on the Lake, Ohio*

Warnings on lead inlays—I'd like to make a few points about using lead for inlay, as mentioned in *FWW* #86. Although solid metallic lead is not nearly as toxic as lead salts or molten lead, some precautions are in order. First, it is advisable to wear gloves when working with lead, or, that being too clumsy, wash well immediately afterward. Second, be especially careful when shaping the material—edge tools are preferred because they don't create airborne dust. If sanding can't be avoided, a good dust mask is vital: Inhaling lead dust is just as bad as inhaling lead fumes. All in all, if non-lead pewter can be used, it would be the preferred material. It doesn't have to be shellacked to keep its shine either. One last aside—asking a jeweler to run lead through the same rolling mill that is used for silver may not go over well. At brazing temperatures, any lead that has contaminated the silver will alloy with it and cause severe pitting in the silver surface. *—Jeff Shay, Pasadena, Cal.*

More on lead inlays—Your note on "lead inlay" (*FWW* #86, pp. 22-23) gives excellent detailed help on using lead and pewter. You could give your readers even more help by adding a

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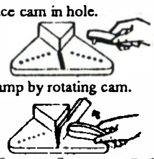

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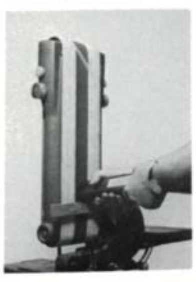

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caution about toxicity of lead and antimony: They are classic heavy metal poisons. They must be handled with care in the shop, particularly during any filing or sanding operations. Woodwork containing lead inlays might also be hazardous to the end user if not handled properly. *—Robert Deffeyes, Arlington, Tex.*

Fire hazards of plastic air lines—I don't know whether you can stand any more feedback on the use of PVC pipe for compressed air, but I would like to bring up an aspect of this unsafe practice that none of your correspondents has mentioned.

I work in a plywood plant in which PVC was used extensively for compressed-air piping. Many times over the years, I have seen the stuff blow out with a deafening roar due to vibration-induced fatigue, but the scariest occurrence was when sparks from a fire in a veneer dryer (a not uncommon occurrence) ignited a smoldering fire in a sawdust deposit atop a rafter adjacent to a PVC compressed-air pipe. The heat weakened the pipe, causing it to blow out. The resulting blast of air produced a blowtorch-like jet of flame some 20 ft. long, which ignited the nearby roof structures and spread flames far and wide. Fortunately, the overhead sprinklers and some frantic hose work by the crew kept the whole place from going up.

There are few fire accelerants as effective as a blast of air. Think what a bellows does to a forge, or a gust of wind to a forest fire. The use of plastic air-supply lines in a woodworking shop could turn a small, easily managed fire into a major holocaust. Similarly, rubber or plastic blow-down hoses should not be kept charged to the nozzle, but shut off at the metal supply pipe between uses. People tend to treat compressed air pretty casually, but in my experience, it is a powerful force that deserves considerable respect. *—L.B. King, Wolf Creek, Oreg.*

More hints for women woodworkers—Small women having to use tools designed for an average-size man do run into problems. As the director of the now-defunct Jamestown Artisan Center for Woodworking, I taught woodworking to more than 700 people. The variety of students was vast, but we were able to adapt in most cases. Here are some things Cheryl Yee (*FWW* #85), or anyone smaller than an average-size man, might try.

Denise Grohs' suggestion of a movable platform is great (*FWW* #87). In our shop, we had a 2-ft. by 4-ft. platform made from laminated plywood sheets, and it was used frequently by anyone shorter than 5 ft. 6 in. People with small hands might consider routers with "D-handles"; the trigger-like switch is right at your fingertip. You may be able to get a "D-handle" for the router you own. Also try using smaller, but powerful, electric hand tools, like the Makita 6½-in. circular saw. This and other smaller electric tools can do the work of ones harder to handle. Check the horsepower.

Build table extensions beyond the cutting area of your stationary power tool so there's no need to reach over the blade to keep boards from falling on the floor. Place non-skid mats or tape on the floor to assure your footing if you have to stretch. Don't use long push sticks to extend your arm length; it's better to build safe jigs to securely hold work and guard against kickback. Tune up your bandsaw and, whenever possible, use wider blades for ripping cuts; it is much safer than using the tablesaw.

Try using Japanese hand tools. In general, the saws have smaller handle diameters than Western saws. Keep all your tools very sharp: Not only will they be safer, but they take much less strength to use. *—Elizabeth Bradbury, Allentown, Pa.*

A woodworker's dream wood—If woodworkers were to design a new species of tree, what would it be like? It would have


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to work well, not fuzz or burn or tear. It would have to have enough strength to carve well and to feel good under a plane or chisel. It should have an attractive grain and color, but not so much that it distracts from what it becomes. It should be stable and offer no surprises a year after it leaves the shop. It should stain evenly and hold paint.

While we are at it, let's make the tree beautiful too. How about flowers? Let's go for broke: make it grow fast, and stand like a column in a Greek temple. Let's make it tower over any Eastern hardwood tree.

What should we call this wonder wood? How about *Liriodendron tulipfera.* It is the often-ignored tulip tree, the misnamed "yellow poplar."

I had a state forester walk a 20-acre plot of woods I recently acquired. When he saw the tulip trees, 30 in. in diameter, straight and clear for nearly 50 ft., he said, "There's a forester's dream. This is a good wood."

I had a blown-down tulip milled and was greatly surprised by the quality of the lumber: It is not really soft, but ranks between white pine and cherry in density and can serve well even as stair treads. It doesn't, as one book claims, "stink forever." It planes wonderfully and does not fuzz as the name poplar would have you think. A 15-in. tulip board will not cup as readily as most other woods. Tulip's workability and stability made it a popular wood for colonial craftsmen, as well as the modern wood of choice for solid-core plywood.

—John Sillick, Lyndonville, N.Y.

Another treatment for cast-iron tables—Your "Q&A" section on p. 24 (*FWW* #86) includes an item regarding wax or talc for cast-iron machine tables. I have had exceptional results by first using a fine emery cloth to clean all evidence of wax, talc and fingerprint oil, and then by coating the surface with "slip plate" manufactured by the Superior Graphite Co., 120 S. Riverside Plaza, Chicago, Ill. 60606. This material dries to a hard coating in 60 minutes at 70°F and appears to have a permanently slick surface.

—Grant Ritter, Roscoe, Ill.

Sources for flags—Regarding the article "Making a Nutcracker" by Fred Sneath in *FWW* #85, I had trouble finding flags for the soldiers. I finally located some 4-in. by 6-in. flags at Tyndale Flag Service, 7-B N. Clover Lane, Harrisburg, Pa. 17112; (717) 545-6228. The company has a good assortment and ships anywhere.

I have made five nutcrackers; Fred put together a good article. But I have found that finer-grained wood finishes better than pine. *—Calvin A. Hoerneman, Mechanicsburg, Pa.*

Hints on finishing door panels—With regard to Joe Beals' article, "Cabinet Door Frames," in *FWW* #86, I would like to add a couple of tricks I use. The first is finishing the center panel prior to assembling the door. Not only is the panel easier to finish prior to assembly, but this will prevent an exposed unfinished strip from showing should the center panel shrink after the door is installed. The second trick is applying a thin coat of wax to the edges, front and back surfaces near the corners, to prevent any possibility of glue from the frame joints sticking to the panel. Care must also be taken when you size the center panel. If the panel bottoms in the stile grooves when at its minimum width, such as if you build the doors in a dry, heated shop in the winter, the panels can break the frame when they later expand from summer humidity. Conversely, if the panels are loose when you assemble them in a high-hu-

midity environment, they may shrink enough to leave an exposed gap when they later dry.

—Keith Hacker, Scandia, Minn.

Quiet down the vacuum cleaner—I enjoy your magazine and your comparison of tools. Most of us woodworkers use one tool almost as often as our saw and hammer: the shop vacuum. The old model I have makes more noise than my router. How about rating these tools according to noise levels?

I seem to do better work in a clean shop, but I hate having to wear my ear protectors during cleanup. To me, a quiet vac would be worth spending extra money for. A retractable cord wouldn't be bad either.

—Lawrence J. Raleigh, East Sebago, Maine

A South African view of pink ivory—In *FWW* #84, Jon Arno answered a question from David Nevins about pink ivory wood. I'd like to point out a couple things.

Pink ivory is called red ivory in Africa. The technical name is *Berchemia Zeyheri* and it does come from the *Rhamnaceae* group.

The Zulu people have many uses for it. Medicinally, it is used as an enema for treating backaches and rectal ulcers in children. It is also taken orally as a health drink. In some areas of Transvaal, the fruit is stored in grain baskets until it becomes a thick syrupy mass and is highly esteemed as a sweetmeat. In Natal or Zululand, only the chiefs were allowed to carry knobkerries (clubs) made from red ivory. Today, however, a couple of self-taught carpenters are making furniture from it. When first cut, the wood is usually a bright pink-red and then fades to a deep red. It is close grained, hard and strong.

What Mr. Nevins might have been offered could be *Guibourtia Coleosperma,* locally known as false mopane. About three years ago, a local sawmill was given a concession to cut this timber in Zambia and I believe some of it found its way to your country. It's a truly beautiful wood: fairly hard and beautifully figured; some of the local craftsmen have enjoyed using it. A French dealer recently informed me that "African rosewood," as he called it, is very sought after in Europe, where it is used for door handles, finger plates and other small fine pieces.

Finally, I would be happy to hear from woodworkers in the United States who might want information on the indigenous timbers of southern Africa, of which there is a great variety.

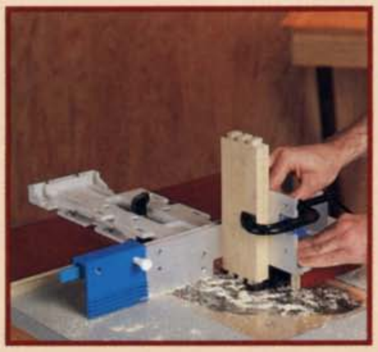
—Bill Crauser, Kensington, South Africa

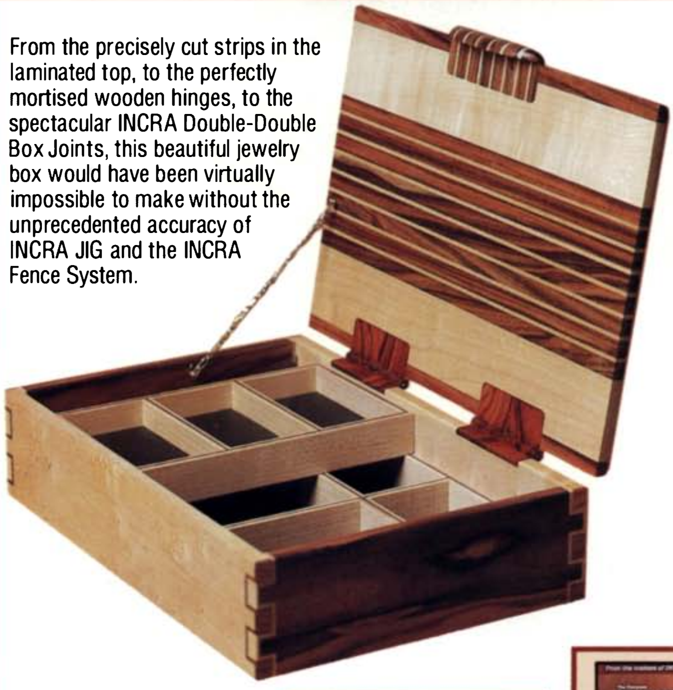
Mantle photo reversed—Regarding the photo on the back cover of *FWW* #86: That decoy would be more at home on the "right" where it was originally photographed. The fly wallet highlights the error and John Bryan's signature on it indicates the correct position. A beautiful piece of work, though, no matter how you look at it.

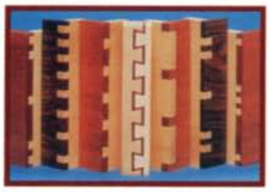
—Dana C. Armour, Mendon, Mass.

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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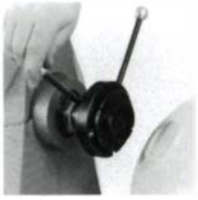

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9637	VARIABLE SPEED TIGER SAW KIT	134
9647	TIGER CUB RECIPROCATING SAW WITH CASE	116
9851	12 VOLT CORDLESS DRILL KIT W/KEYLESS	133
5556	PLATE JOINER TILT FENCE FOR MODEL 555	39
9505	COMMEMORATIVE 505 WITH OAK CASE	135
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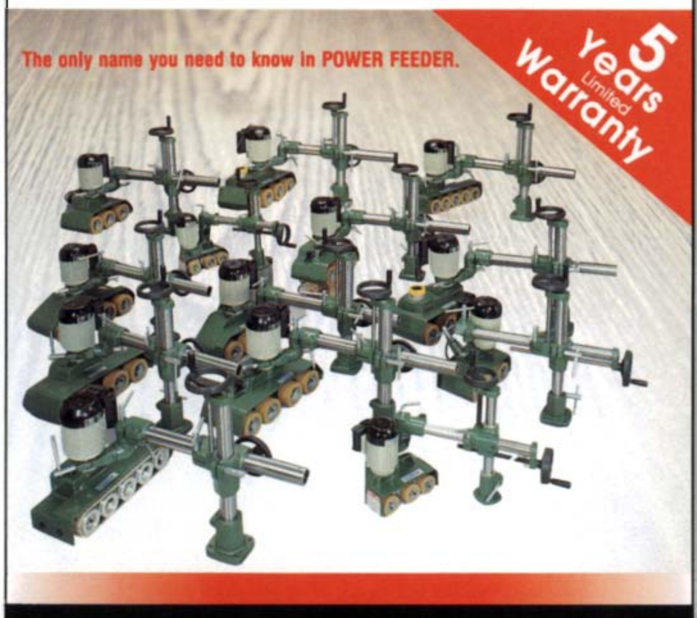

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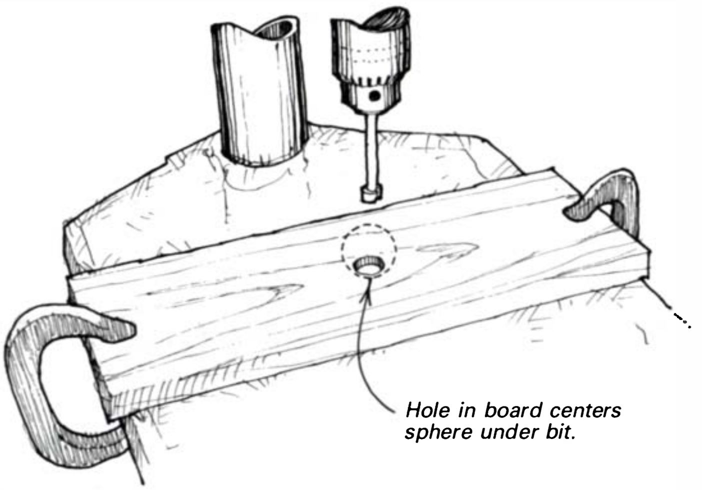
Drilling centered holes in spheres



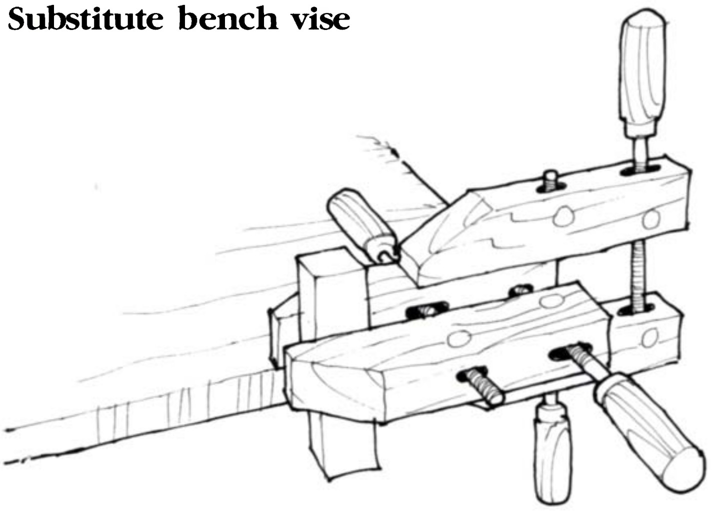
In my high-school woodshop class, we needed to drill ½-in.-dia. holes partway through 100 1¼-in.-dia. hardwood balls. I suggested to the instructor that we clamp a board to the drill press table and bore a ¾-in.-dia. hole in the board to serve as a socket to hold the ball being drilled. Then we chucked a ½-in.-dia. Forstner bit into the drill press and set the stop to the desired depth. One student held each ball while another drilled. Each hole was perfectly centered. This technique worked so well that my instructor suggested that I submit it to the "Methods of Work" column. Many of the methods shared by readers of *Fine Woodworking* have been put to good use in our shop and I hope that this idea may be useful to another woodworker.

—Heather Groff, Vida, Oreg.

Quick tip: To remove oil and grease stains from woodworking projects, spray them with automobile starting fluid, which is mostly ether, and then wipe it off with a clean rag. The stains come off and the wood dries in seconds. Be sure to observe safety precautions on the can.

—George F. Bergmaier, Monroeton, Pa.

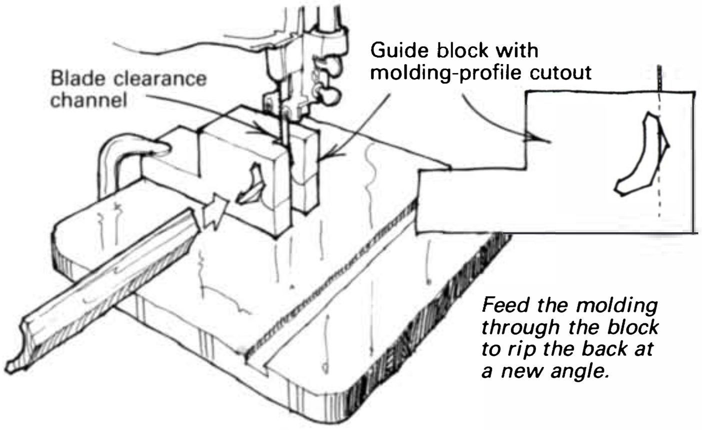
Substitute bench vise



Here's a make-do vise I set up until I have the time to build a proper woodworker's bench with a built-in vise. Simply clamp one hand screw to the corner of a sturdy table with another hand screw. The bigger the hand screws the better. This temporary arrangement produces a more than satisfactory substitute bench vise. For a more permanent solution, you could secure the hand screw directly to the tabletop with a lag screw. Recently I used this setup to support doors while I planed them to final dimensions.

—Jonathan Percy, Newport, R.I.

Altering the angle of cap molding



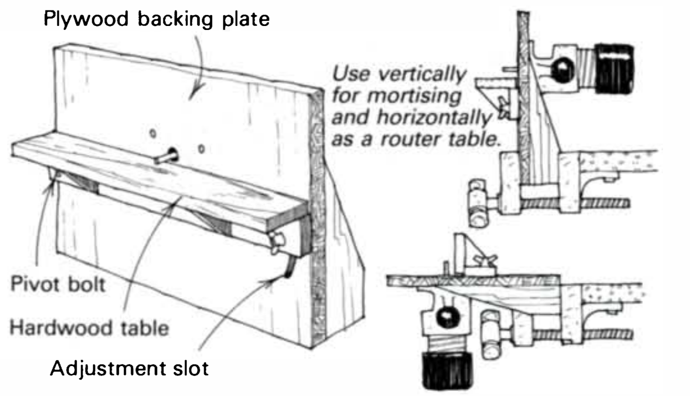
When finishing an attic (and in other situations), you may need to alter the back of cove molding to fit an angle greater than 90°. This bandsaw guide allows you to make the alteration quickly and accurately. First, cut out a guide block that can be clamped to your bandsaw table, as shown in the sketch. Then, trace the profile of your molding onto the end of the guide block and bandsaw a molding-shaped hole in the block to permit the molding to slide through with a light-friction fit. Next, cut away a sawblade clearance channel in the block.

To use the device, clamp it to your bandsaw table so that when the molding is fed through the cutout in the block, the blade will trim the back of the molding at a new angle, as shown. By tilting and shimming beneath the block, you can rip both back corners of your molding to the desired angles.

—E.G. Lincoln, Parsippany, N.J.

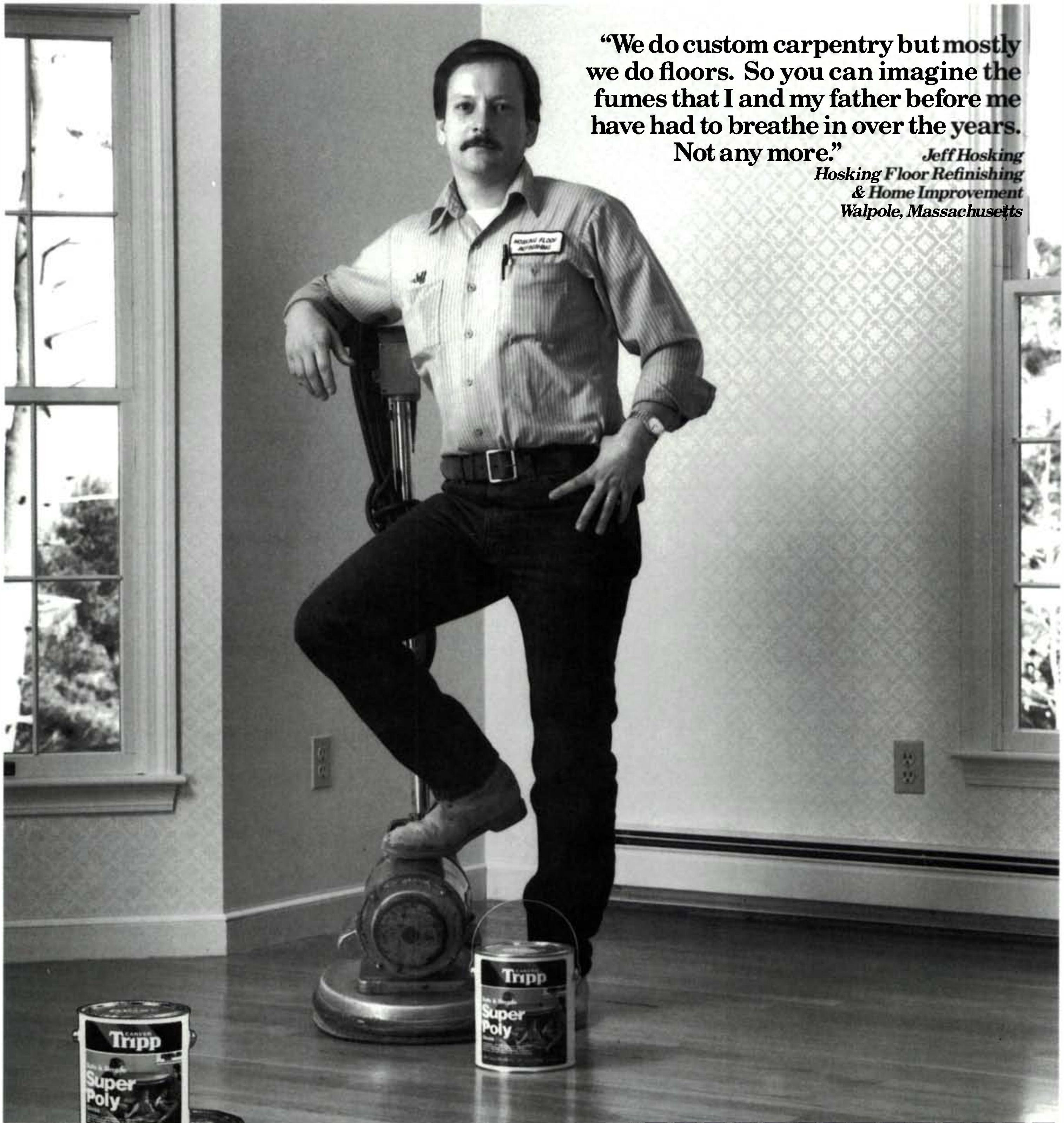
Quick tip: To keep soft aluminum particles from clogging your abrasive wheel, file or saw, simply spray the item with Pam no-stick cooking spray. It also prevents welding spit from sticking to a metal surface. *—Tim Hanson, Indianapolis, Ind.*

Router mortising fixture revisited



This revision of James Gier's router mortising fixture (*FWW* #78, p. 10) is made entirely from wood and so it is less expensive and it doesn't require any metal milling. In addition, the table pivots on my fixture to locate the mortise, providing an easier and more consistent adjustment than Gier's fixture, where the router pivots.

First, mount the router to a plywood or particleboard backing plate; a sink cutout from a countertop is ideal for this because it's about the right size and comes faced with plastic laminate. On the back of the plate, rout out a seat for the tool's base, leaving about ¼ in. of material, and mount it in the seat with machine screws countersunk in the top surface. The adjustable hardwood table is attached to the backing plate with a pivot bolt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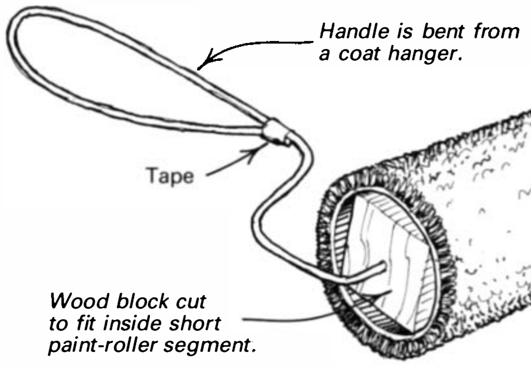
on one end and a bolt and wing nut through a slot on the other end, as shown in the sketch on the previous page. This approach allows for very fine adjustments, because when you raise or lower the end of the table, it moves only half as much under the bit.

Incidentally, you can make a fine router table by screwing a cleat to the underside of the plate so that you can hold the fixture in the vise horizontally. *—Stephen Hjemboe, St. Paul, Minn.*

Quick tip: Easy-Off oven cleaner turns redwood ebony black. *—J. Voltas, Fall River, Mass.*

Throwaway glue roller

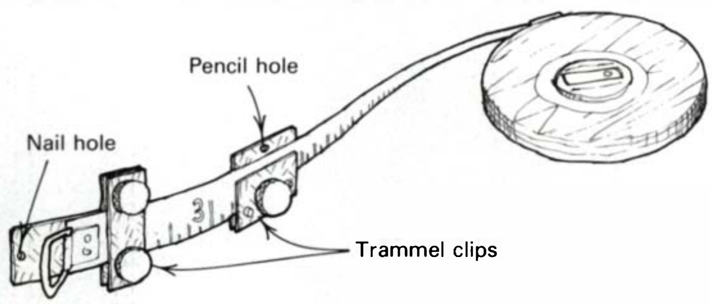


In the shop, paint rollers do a wonderful job of spreading glue, especially contact cement. But it's not long before the roller frame is ruined by adhesive buildup. So rather than purchasing and discarding roller frames at $3 each, I make my own disposable rollers.

First, I purchase standard 9-in.-long fleece roller cylinders which I cut into quarters to give me four 2¼-in. lengths. Then, on the tablesaw, I rip a scrap 2x4 down to a size that will fit snugly inside the roller cylinders (about 1$^{1}/_{16}$ in. square). I cut 2¼-in.-long blocks off this workpiece and center-drill one end of each block for a $^{7}/_{64}$-in. hole. After pushing one of the blocks into one of the roller segments, I bend a coat hanger into a handle shape, as shown in the drawing, and insert it into the hole in the block. One of these handy rollers will last through most laminating jobs. *—Lee Maughan, Panaca, Nev.*

Quick tip: If you have machines with miter gauge slots that you rarely use, such as a bandsaw, cut a filler strip and fasten it into the slot with double-faced tape. You'll find that working on a flush, smooth tabletop is easier and much more fun. *—Richard H. Dorn, Delwein, Ia.*

Shopmade trammels for a measuring tape



While working in the stone business for many years, I used two simple homemade clips and a metal tape measure to mark large

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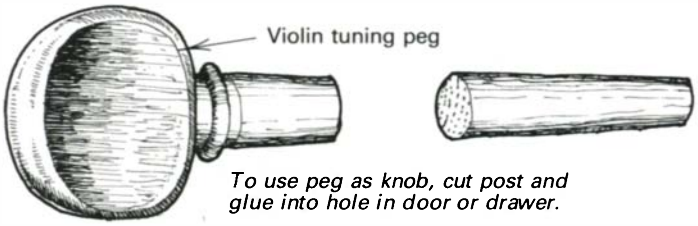
circles and arcs with up to a 50-ft. radius. One clip fastens near the end of the tape and has a hole for a nail. When the front edge of this clip is clamped on the 2-in. mark, the nail hole is exactly at the end of the tape. The other clip has a hole for a pencil point and can be clamped anywhere along the tape.
—Robert R. Schaefer, Maspeth, N.Y.

Quick tip: Shoe leather scraps, usually free from your neighborhood shoe-repair shop, make excellent clamp pads. Just trim them to the proper size and attach them with a dab of glue.
—Don Rosati, Easton, Conn.

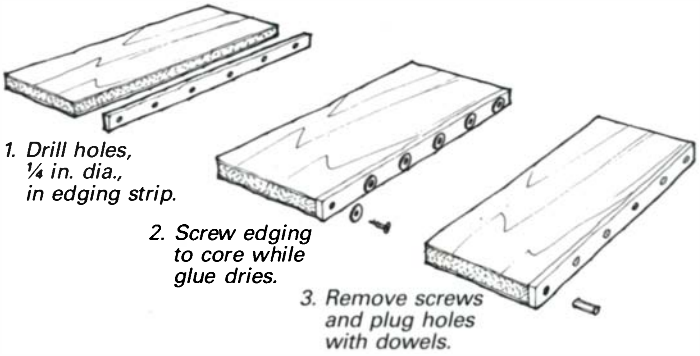
Cabinet pulls from tuning pegs



At the same time I was working on a Shaker wall cabinet I happened to stop by a music store for a set of guitar strings. While there, I noticed the violin tuning pegs for sale and decided to use one for a knob on my cabinet. Tuning pegs have several qualities that make them ideal as knobs on small cabinet doors and drawers. They are made of ebony, which contrasts well with most woods, and they are locally available at a reasonable cost. But best of all, tuning pegs are shaped and polished in such a way that they feel smooth and comfortable to the touch. To install the peg, I simply cut off all but ½ in. of the post and glued it into a hole in the cabinet door. *—John Kodis, Pasadena, Md.*

Quick tip: While helping in the kitchen of a friend who owned plenty of dull knives but nary a sharpening stone, I discovered that the unglazed foot of a porcelain dish makes a serviceable whetstone. When you draw the knife across the foot, you will leave a slight mark; so avoid the heirloom china lest your resourcefulness be unappreciated.
—Gregory V. Tolman, Mammoth Lakes, Cal.

Edging plywood without clamps



Instead of using clamps, I like to secure wooden edging strips to plywood cabinet doors with screws until the glue dries. First I drill ¼-in.-dia. holes through the solid-wood edging strip every 4 in. along its length. I apply glue to the back of the strip, set it in place along the edge of the plywood, and immediately drive a drywall screw with a large washer through each hole into the

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621	3/8" VSR Drill	98.
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9505	Commemorative edition 505 polished housing /oak case	135.
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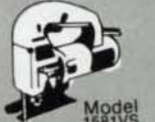

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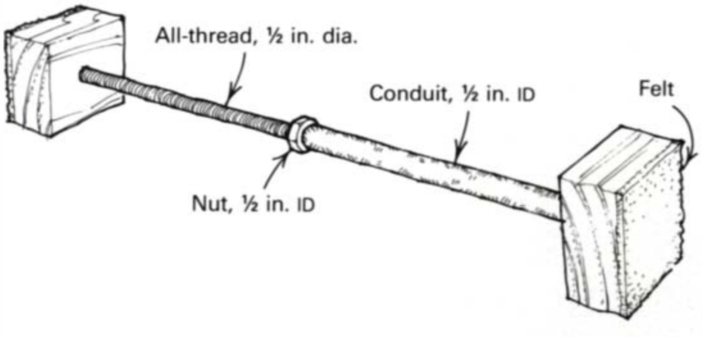
core material. After the glue dries, I remove the screws, drill each hole to about 1 in. deep and plug with a dowel. When the plugs are trimmed flush, they add visual interest to the edging.

—Bruce Clattenburg, Owen Sound, Ont., Canada

Furniture disassembly jack



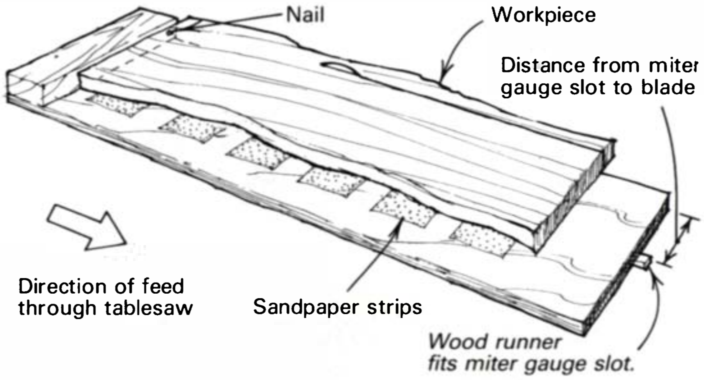
Those of us who repair furniture often come across a chair or table that is so loose it needs to be totally disassembled and reglued. But invariably there are always two or three joints that, unlike the rest of the rickety piece, will not come apart no matter what. I use a shopmade jack to solve this problem. The jack, shown in the sketch, is composed of a short length of ½-in. conduit, a piece of ½-in.-dia. all-thread, a nut and two padded blocks. When you tighten the nut against the end of the conduit, even the most reluctant joint will give up, usually with no damage.

—Lee Crowder, Easton, Md.

Quick tip: Old hard drives from personal computers contain several useful components. The bearings and spindle make a smooth-working lazy Susan, and the platters make excellent ¹⁄₃₂-in.-thick spacers for a tablesaw dado blade.

—Jim Clifton, Kalamazoo, Mich.

Board-straightening fixture



This is a great board-straightening fixture. Simply press one end of the crooked board into the nail at the head of the fixture, allowing the board to overhang the plywood base by ½ in. or so. Hold the board on the sandpaper strips so it won't move, and slide the whole arrangement through the tablesaw with the wood runner in the miter gauge slot. You can straighten a dozen boards in five minutes.

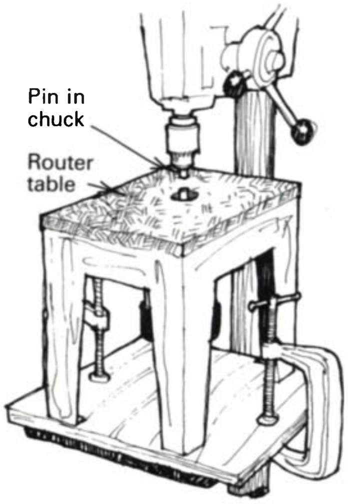
—Jim Puterbaugh, Portland, Oreg.

Quick tip: To reduce tearout problems, wipe down a board with a damp cloth a few minutes before passing it through the thickness planer. The water makes the fibers flexible enough so

they don't break. I've had good results with bird's-eye maple.

—Bruce Searle, Roberts Creek, B.C., Canada

Pin routing on the drill press



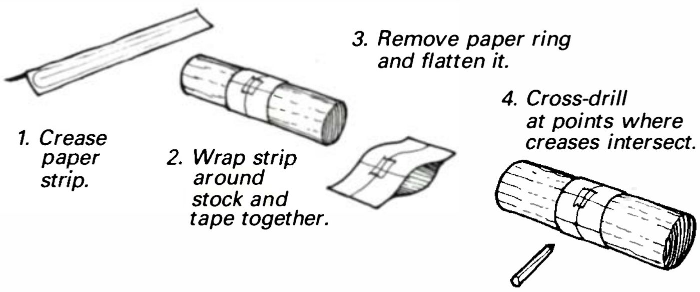
Occasionally I need a pin router, but not often enough to justify the expense or to permanently dedicate the scarce shop space in my garage. So I came up with a way to convert my drill press into an inverted pin router quickly and easily.

First, screw a rectangular particleboard base to the legs of your router table so it can be clamped to your drill press table. Mount a short length of drill rod or an inverted drill bit in the drill press chuck to act as the pin, and then lower the quill all the way and lock it. Next, lower the drill press table a couple of feet so the router table will fit between the table and the pin. Then, clamp the router table to the drill press table after you have carefully centered the router bit beneath the pin.

To use the pin router, raise the quill and place your workpiece on the router table. Then lower the quill and lock it when it is at the right height to engage the pin routing pattern.

—David Jeffrey, McKinleyville, Cal.

Cross-drilling round stock



Here's a method for laying out points for cross-drilling round stock. Fold a strip of paper in half lengthwise and crease the fold with your fingernail. Unfold the strip and wrap it tightly around the stock. Align the crease at the overlap and join the strip with a piece of tape. Slip the ring off the stock and flatten it, creasing both ends with your fingernail again. These two creases will be directly opposite each other when you slip the ring back onto the stock, and therefore can be used to mark the layout points for the through hole. Use a marking punch to transfer the points to the stock. For tubular stock you can drill from both sides. With solid stock, drill a small-diameter pilot hole at each mark so they will meet in the center; then drill through with the correct size bit to remove any irregularity.

—David Jones, Victoria, B.C., Canada

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Sawing box joints without tearout

In my 55 years as an amateur woodworker, I have faced many challenges. But one that still stumps me is how to cut box joints on the tablesaw without getting excessive grain tearout?

—Virgil G. Klein, Wichita, Kan.

Sandor Nagyszalanczy replies: Even if you have a precisely made jig and work carefully, tearout can be a problem when cutting box joints on a tablesaw. This is especially true with coarser-grained woods like red oak or Philippine mahogany. Fortunately, there are several good strategies for combating tearout. First, your dado set, especially the outer blades that cut the edges of each box joint finger, must be sharp. The area on the workpiece most likely to tear out is at the back of the cut. To remedy problems here, I usually back up the workpiece with a fresh piece of 14-in. plywood every time I make a new set of joints. Tacked to the face of the box joint jig, the backup piece firmly supports the grain as the dado blade cuts through. The other area where tearout is common is the bottom of the cut. To avoid this, fit the tablesaw with a shopmade throat plate. This will help support grain at the end of the workpiece during cutting. First, cut a blank to fit the opening in the saw, lower the blade fully, and then start up the saw and carefully raise the blade through the new plate until it's at the depth of cut needed for your box joints.

How you handle the workpiece and jig during the cut also greatly influences the quality of the box joint. To prevent the workpiece from shifting during the cut, clamp it to the jig instead of just holding it. When making the actual cut, push the work through the blade, stop, shut off the saw and lift the jig-workpiece over the blade—never pull it backward through the running blade.

If you've done everything right and you're still having tearout problems, here are a few more tricks. Apply some masking tape over the area to be cut; drafting tape (available at stationery- and drafting-supply stores) works well because it's thin and easy to remove cleanly. The tape supports the wood's surface fibers during the cut. If this fails, lightly score across the ends of the workpieces at a distance from the ends exactly equal to the depth of cut. Use a try square and a sharp knife, and score both sides, as well as edges of all ends that will receive box joints.

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

Air-dried vs. kiln-dried lumber

Is it possible to air dry lumber and achieve results comparable to kiln drying it? If the answer is yes, then what steps should I take to achieve these results? How does air-dried lumber differ from kiln dried in functional properties, such as warpage, stability, strength, finishing and glue adhesion?

—Michael O'Banion, Westminster, Md.

Bruce Hoadley replies: Before I answer your question, a little background information is in order. Air dried indicates lumber that has been dried until it's in equilibrium with average outdoor atmospheric conditions in a particular locale. In Maryland, this would be a moisture content of about 14% to 17%. Indoor conditions are typically less humid, especially during the winter heating season, and so lumber that's been kiln dried for indoor use would probably be targeted for a moisture content in the 6% to 8% range. No matter how long lumber is left to air dry outdoors, it will never reach the lower moisture contents attainable through the artificial temperature and humidity controls employed in kiln drying. However, air-dried lumber can be brought indoors and allowed to slowly lose additional moisture and eventually reach "kiln-dried" levels of moisture content.

Comparing the properties of air-dried and kiln-dried lumber requires considerable qualification and therefore is difficult to explain in a brief response. In a nutshell, though, the main differences will reflect the various levels of moisture content typically found in air- vs. kiln-dried stock. For example, air-dried lumber is ideal for outdoor uses, but if it was used for building indoor projects, the subsequent moisture loss could result in shrinkage and warpage. For interior uses, lumber that's been kiln dried to a moisture content that approximates indoor conditions would certainly have minimal dimensional changes. Most of wood's strength properties increase with moisture loss; so generally speaking, kiln-dried lumber should be slightly stronger. Many woodworkers sense that the softer (weaker) air-dried wood is easier to work with hand tools; on the other hand, machined surfaces will be of higher quality if kiln-dried material is used. Most of the common woodworking adhesives and finishes (with some exceptions) perform well on either air-dried or kiln-dried stock.

Additionally, remember that air drying or kiln drying may be done properly or poorly, so favorable results—or problems—may develop with lumber dried by either method. Typically, defects such as severe surface checks, weathering discoloration, sap stains and sticker marks are more apt to occur in air-dried lumber, whereas stress-related defects such as case hardening or honeycombing are more likely in kiln-dried material. For more information, see *Understanding Wood*, published by The Taunton Press, 63 S. Main St., PO Box 5506, Newtown, Conn. 06470-5506.

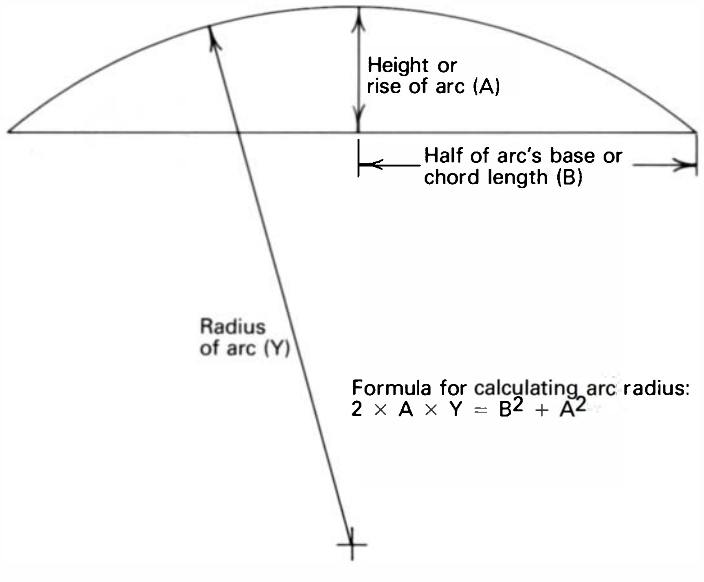
[Bruce Hoadley is professor of wood technology at the University of Massachusetts at Amherst and a contributing editor to *FWW*.]

Figuring the radius of an arc

From time to time I've done a project involving an arc of a circle where I know the arc's rise and its base (also called cord) length, but I don't know its radius. I usually find the radius by trial and error, using a set of trammel points. Is there an easy mathematical method?

—Ernest Dean, Felton, Cal.

Robert Vaughan replies: This problem had stumped me on a few of my past projects, but fortunately I have discovered a formula for calculating an arc's radius, using a little math and basic algebra. Don't panic; I'll take you through the process step by step. Let's start by assigning letters to the various parts of the puzzle illustrated below and use them to create the formula.



"A" will equal the rise or height of the arc. "B" will equal half of the arc's base or cord length. And "Y" stands for the arc's radius we're trying to find. Now we'll use these letters to create the formula, which is $2 \times A \times Y = B^2 + A^2$. To illustrate how this formula is used, let's say we want to draw an arc with a height of 3 in. and a base length of 14 in. Applied to the formula, that means A = 3 and B = 7 (half of 14). Plugging in the known values, we have: $2 \times 3 \times Y = 7^2 + 3^2$. After squaring the numbers on the right half of the equation, we can add them together

READER SERVICE NO. 108

READER SERVICE NO. 76

to get 58. On the left, we multiply 2 and 3 to get 6Y. Since the idea is to isolate "Y" on one side of the equal sign, we use a little algebra and divide both sides by 6. On the left side, $6 \div 6 = 1Y$ or just Y; on the right side, $58 \div 6 = 9.666$. Hence, Y, which represents the arc radius we're after, equals 9.666 which rounds off to 9¹¹⁄₁₆. There are probably lots of other formulas for calculating an arc's radius, but the above method seems the easiest for me to remember.
[Bob Vaughan is a woodworking-machinery rehabilitation specialist in Roanoke, Va.]

How far can a strong shelf span?

I make a lot of built-in shelves for books and stereo gear, but I'm never sure if the structural strength of these shelves is really adequate. How much weight can a 1x10x36 clear white pine shelf support without sagging? I'd like to see a table showing the strength of various types of wood used in this application, including hard and soft woods, medium-density fiberboard (MDF) and plywood. *—Bob Maxwell, Washington, D.C.*

David Stenstrom replies: I would also like to see a table that relates the strength and length of various wood shelves, but I never have. The best I can do is relate my experience on the matter. In my shop, we select shelving material that is stronger than what we need, since it's usually not possible to predict what the customer will end up putting on the shelf. We typically do not use solid stock for shelves, since it is likely to cup or twist (this is especially true for wider shelves). When we use edge-banded ¾-in.-thick plywood for shelves, we prefer lumbercore plywood, since it is stronger than veneer core. MDF is stable, but doesn't have much strength in a shelf span. Either MDF or plywood can be stiffened by gluing 1x2 hardwood strips on both edges of each shelf, spanning its length. For shelves that must bear very heavy loads, consider using 1-in.-thick plywood. If you do choose solid stock for shelving, the stronger hardwoods, such as oak and ash, would probably be stiffer and less likely to sag than softer species.

Concerning shelf length, I've found it best to keep shelves in the range of 30 in. to 36 in., if the design permits. Any longer and the consequences are uncertain. For instance, here in our office, even a 36-in.-long plywood shelf with ¾-in. edging sags when fully loaded with tool catalogs. The Architectural Woodworking Institute (AWI) standards specify that "All adjustable, exposed shelving unsupported for a length exceeding 36 in. shall have a minimum thickness of 1 in."
[David Stenstrom is a furnituremaker and manages a custom woodworking shop in Portland, Maine.]

Repairing a perfume-damaged finish

I have a chestnut-brown-colored ash dresser with a lacquer finish. Unfortunately, perfume was spilled on it. The perfume was removed quickly, but not before it damaged the finish, removing the lacquer's gloss in the area of the spill. What can I do to repair the finish?
—Richard M. Burton, Sarnia, Ont., Canada

Michael Dresdner replies: From your description, it sounds as if the finish is still intact, merely dulled by the alcohol in the perfume. Fortunately, you can repolish the dulled lacquer with just about any automotive polishing compound. Just follow the directions on the can's label and see my article, "Rubbing Out a Finish," in *FWW* #72. Be sure to buy a "polishing" compound instead of a "rubbing" compound: The latter is usually a coarser grit and will not allow you to polish the finish to as high a gloss.

If the surface level of the finish in the perfume-affected area is significantly lower than that of the surrounding area, the repair will be much more difficult. The spot will require filling in some way, either by burning in with a shellac stick (if it's a very small area), respraying the area with more lacquer, or "padding in" more finish using the French polishing method. All of these techniques require more explanation then I can cover here. You might want to check with a professional refinisher in your area before you begin such a repair, to make sure the job is not going to put you in over your head. You might also want to read George Frank's article on French polishing in *FWW* #58.
[Michael Dresdner is a finishing consultant in Perkasie, Pa.]

Light streaks in purpleheart lumber

Recently I encountered some purpleheart wood with light colored streaks. Lumberyards are unable to guarantee stock that is not streaked, but my clients usually see the streaks as defects or cracks. Do you have any suggestions?
—Lorelei Gruss, Brooklyn, N.Y.

Jon Arno replies: Purpleheart is a member of the legume family, *Leguminosae,* and is cut from about 20 different species in the genus *Peltogyne.* Various species of this widespread genus range from extreme southern Mexico to south central Brazil. As a result of genetic differences between the species and significantly different growing conditions throughout their range, there is a great deal of variation in the color, density and grain texture of purpleheart available on the international market. While not all purpleheart displays the light-colored streaks you mention, this is a fairly common feature and it is caused by different colors of gum and resin deposits in the wood's vessels. In fact, most purpleheart contains these vessel deposits, but their colors are usually dark enough that they are not conspicuous. For example, of the five species of purpleheart in my wood sample collection, two of them have vessel deposits that are almost chalk white, while one of the remaining three has deposits that are virtually coal black.

Unfortunately, I doubt if there is any totally satisfactory way of removing these deposits. A thorough rub down with denatured alcohol can lighten the color of purpleheart and this might make the light-colored streaks less noticeable, but it will also rob the wood of its characteristic violet-purple color.

Your best solution is to shop around for a source of purpleheart with the consistent natural color preferred by your clients. Owing to the many middlemen in today's lumber trade, it is difficult to trace a particular supply of wood to its point of origin, but some regions tend to produce purpleheart of superior color and finer texture. One species, *P. purpurea,* which comes from the Darien region of southern Panama, produces one of the prettiest and most vivid purplehearts. In Panama, it is called nazareno and it is sometimes marketed here under that name. Another especially nice purpleheart comes from the species *P. lecointei,* which is native to the Para region of north central Brazil and it is sometimes marketed as pau roxo. These, of course, are not the only species of *Peltogyne* that produce wood with nice color, but because they are sometimes marketed separately, you may be able to track them down. If you can, the odds are good they will be about as pretty and as uniformly dark in color as is possible with purpleheart.
[Jon Arno is a wood technologist and consultant in Schaumburg, Ill.]

Woodworking to prevent archival damage

What kinds of deleterious effects can woods, wood materials and finishes have on archivally kept photographs and rare books? Do public archives, such as the libraries at Smithsonian Institution use special woods or finishes in and on their display and storage cases? *—Chris Pierson, Walled Lake, Mich.*

Chris Minick replies: Manufactured wood products, wood finishes and even solid wood all "off gas" materials that are potentially dangerous to photographs and rare books. Formaldehyde vapors emitted from manufactured wood products, such as particleboard, MDF and hardwood plywood, are particularly

detrimental to color photographs. Consequently, these common construction materials should be avoided when building display or storage cases for photographs and books.

The Upper Midwest Conservation Center of the Minneapolis Institute of Art recommends that metal cabinets with a baked enamel finish be used for storing rare photos and books. When you display books and photos, you should isolate them from any finished wood by mounting them with archivally acceptable photo or book mounts. Museum-quality mounting materials are usually available from large art-supply stores or by mail order from University Products Inc., 517 Main St., PO Box 101, Holyoke, Mass. 01041-0101; (800) 628-1912.

I don't know of any special or secret finishing materials used on museum display cases. Standard air-drying polyurethane varnishes are routinely used by many large museums for finishing display cases. The finishes are allowed to thoroughly cure before the case is used. Cure times for finishing materials are surprisingly long, often involving several months.

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

Oil or varnish for protecting wood?

For years I've coated the roughsawn cedar exterior siding of my cabin on Lake Michigan with straight linseed oil, assuming I'd get good protection against the elements. But I recently read that oil isn't a good vapor barrier. If this is true, why do some finish manufacturers promote their products as containing linseed oil, as though it was the ingredient that gives good protection? *—H.O. Smith, Midland, Mich.*

Michael Dresdner replies: Finish manufacturers usually state the contents of their products as a service to the user, not to imply that the finish is ideal for every application. An oil finish, such as raw linseed oil, does indeed protect wood better than no finish at all, but not as well as some others. Oil finishes provide a rather poor moisture vapor barrier, and coat for coat, oil is a worse vapor barrier than most film-type finishes, such as varnish or polyurethane. An oil finish does repel water quite nicely, but this isn't the same thing as moisture *vapor,* which has a much greater ability to penetrate a finish, and therefore degrade the wood.

Manufacturers' claims that their finishes contain linseed oil seems to confuse woodworkers about the difference between an oil finish and an oil-base varnish. By definition, a mixture of oil, resin and solvent is a varnish. A finish with a larger percentage of oil than resin is commonly referred to as a "long-oil" varnish. Most commercial Danish oil finishes on the market fall squarely in this category, their names notwithstanding. Because the amount of resin is so small and because these finishes are so easy to apply, their working characteristics are much closer to an oil finish than to varnish, especially when only one or two coats are applied. However, if you apply 10 coats of say Watco or Waterlox, both oil-resin mixtures, you'll soon accumulate a significant amount of resin on the wood's surface. Thus it is not surprising that such a film develops the characteristics of a varnish: it *is* varnish. And the resin adds considerably to the film's protective abilities.

[Michael Dresdner is a contributing editor for *FWW.*]

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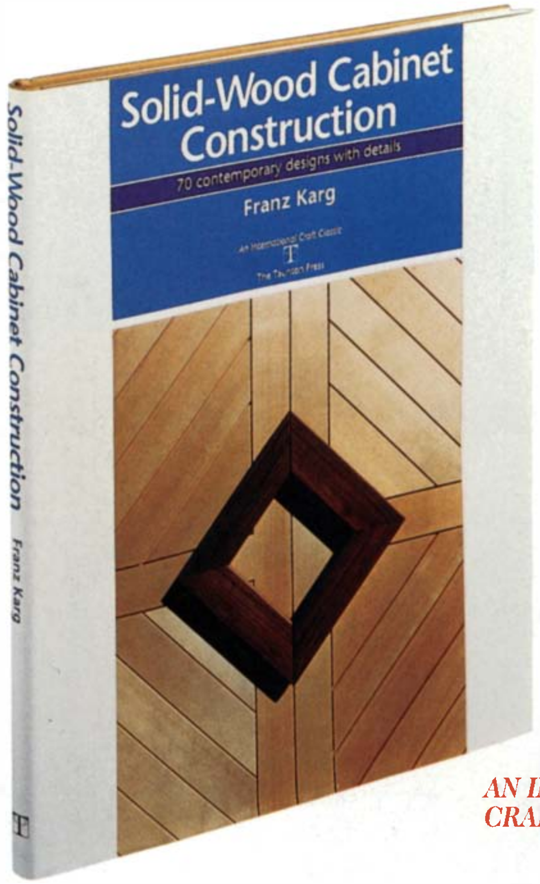

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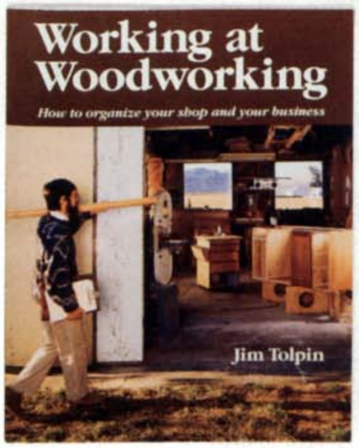

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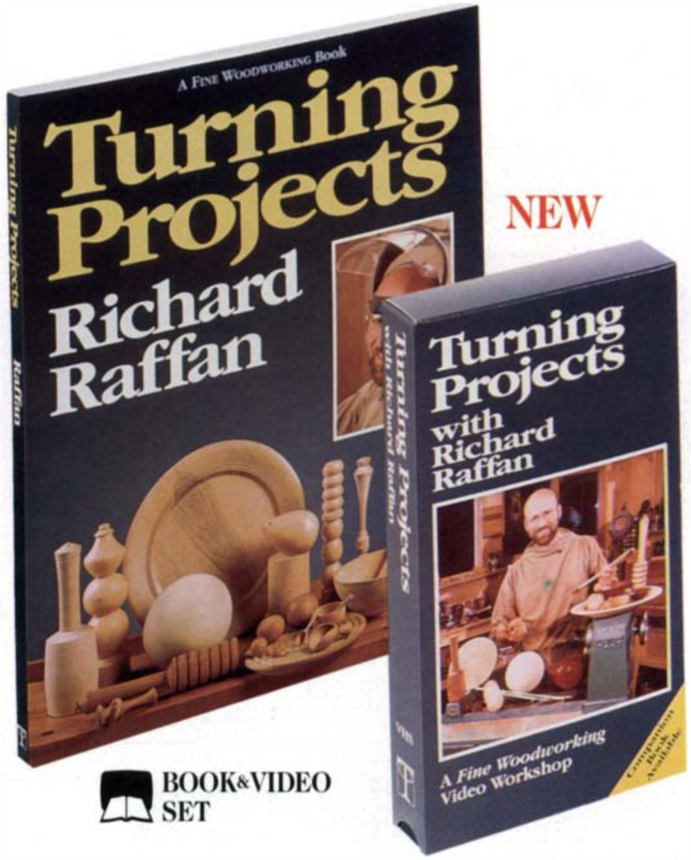

Turning Projects
by Richard Raffan

Richard Raffan is back! His new book/video set offers 23 intriguing woodworking projects that range from practical to whimsical, from simple to complex. The book provides complete instructions, and step-by-step photos and drawings, and they're backed up by 12 clearly demonstrated projects on the video screen.

But you get more than a mere collection of projects. By the end of the book and video you'll have mastered a skill-building course in woodturning. You'll learn how to select the wood species best suited for the project at hand; manipulate skews, gouges and parting tools to produce the whole repertoire of wood-turning cuts; consider the structure of a project as it develops on the lathe; and do it all safely. With the help of Raffan, you'll be producing better work, faster...and having a lot of fun with it.

Among the projects covered:

* cooking utensils
* beads
* hand mirrors
* spinning tops
* long, thin spindles
* bowls
* bottle coasters

The Book: SOFTCOVER, 176 PAGES, 400 PHOTOS, 36 DRAWINGS, **#070095, $19.95**
The Video: 90 MINUTES, **#060065, $39.95**

SAVE $9.95 ON THE SET: $49.95
#07A183

A Richard Raffan classic book-video set

Turning Wood
by Richard Raffan

Here is a fine way to learn the craft of turning wood. The book features complete chapters on centerwork and faceplate turning, as well as the work area, lathe, tools, stock, abrasives and finishes. There are exercises, projects and a 16-page color gallery of work for inspiration.

The video excels at showing you things the book can't. You see Raffan from a variety of useful perspectives, up close, over the shoulder and from a distance.

The Book: SOFTCOVER, 176 PAGES, 266 PHOTOS, 166 DRAWINGS, **#070039, $19.95**
The Video: 117 MINUTES, **#060011, $39.95**

SAVE $9.95 ON THE SET: $49.95
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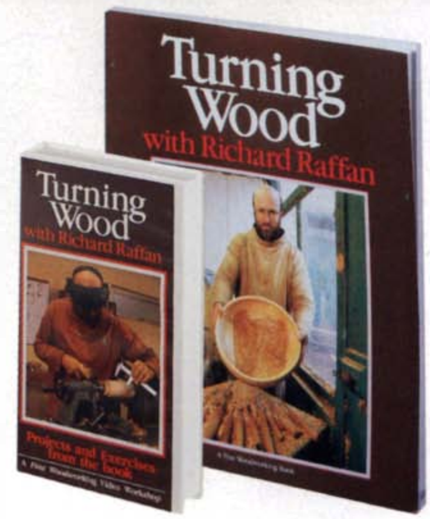
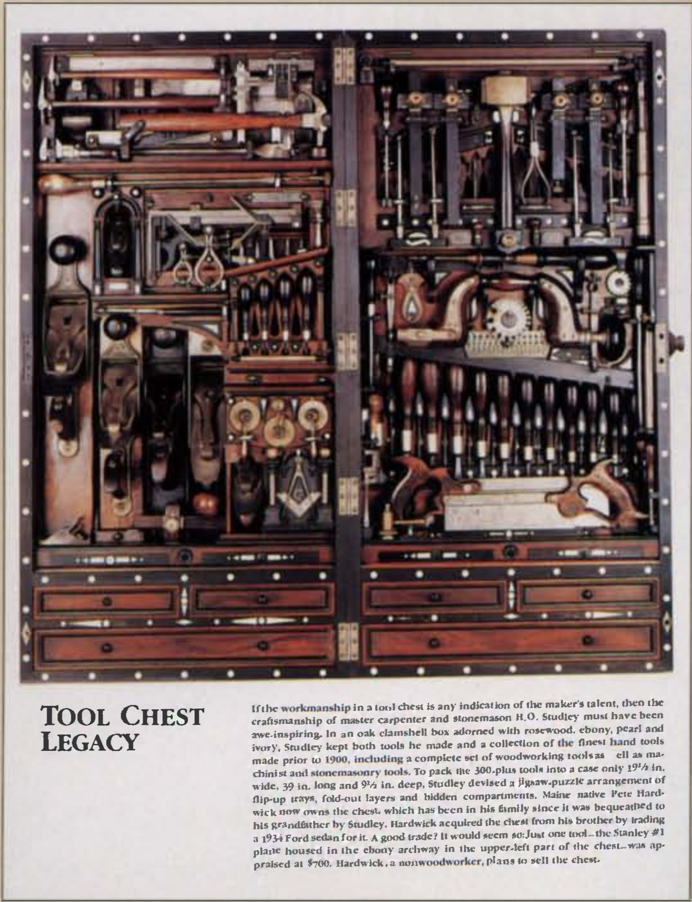
"...fully exploits the video medium...and the dry wit of Mr. Raffan is an added bonus."
— Video Choice



To order use the insert in this issue, or call toll-free 1-800-888-8286.

TAUNTON BOOKS & VIDEOS
...by fellow enthusiasts

From Back Cover to Poster



Now available from *Fine Woodworking* magazine

The response to *Fine Woodworking's* July/August back cover was overwhelming. So many of you called or wrote asking for a poster reproduction of the exquisite tool chest by H.O. Studley, that we decided to go ahead and print one up.

We rephotographed the chest and enlarged the photo to fill the 18″ x 26″ poster shown above. Seen at this size, Studley's ingenuity and workmanship is even more apparent.

The poster is printed in full color on the same book-quality stock as the *Fine Woodworking* covers. And we'll mail it to you carefully rolled to keep it suitable for framing.

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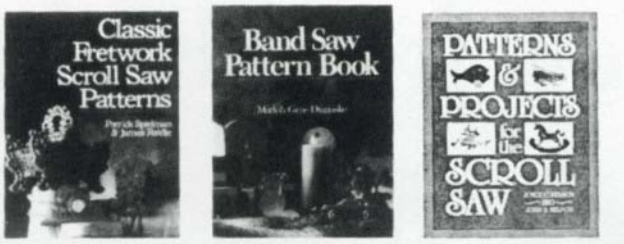
EXCITING NEW BOOKS FOR WOODWORKERS!



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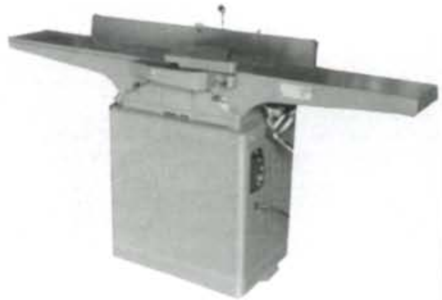

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23-680	6" bench grinder 1/4 HP	81	75
23-880	8" bench grinder 1/2 HP	136	115
11-950	8" drill press	164	148
40-150	15" hobby scroll saw	178	139
28-160	10" hobby band saw	189	144
31-050	1" belt sander 2.0amp	93	78
31-460	4" belt/disc sander	178	139
31-340	NEW 1" belt/8" disc sander	226	184
31-080	NEW 1" belt/5" disc sander	134	95

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40-560	16" 2 speed scroll saw	266	185
23-580	5" Bench grinder 1/5 HP	60	54
11-990	12" Bench Drill Press	266	185
11-090	32" Radial bench drill press	399	279
43-355	3/4" Shaper 1 1/2 h.p.	950	685
43-505	1/2" Bench router/shaper	399	279
22-540	12" Bench top planer	595	389

DELTA STATIONARY

34-761	10" unisaw 1-1/2 HP	1715	1325
33-990	10" radial arm saw	727	575
37-280	6" motorized jointer	440	375
50-179	3/4 HP 2 stg. dust coll.	435	345
50-180	1 HP dust collector	535	415
50-181	2 HP dust collector	760	599
22-667	13" planer w/2 HP motor w/stand & ext. wings	1750	1099
33-050	NEW 8-1/4 Sawbuck	742	545
33-055	Above saw comp w/legs	865	589
34-330	NEW 8-1/4" Tbl Saw 13A	321	235
34-985	1/6 HP stock feeder	698	459
32-100	NEW station plate jointer	645	285
36-040	NEW 8-1/4 cmpd mitre saw	216	165
34-897	50" Delta unifence	500	349
36-755	NEW 10" Tilt Arbor Saw	1203	885

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6527	NEW SawZall v/spd 8 amp w/cse & Quick Loc Cord	299	165
0399-1	12V cdlss drill kit comp	290	155
0402-1	same as 0399-1 w/kyls chuck	290	165
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 3.5A0-1000 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 speed SawZall w/case	224	129
6750-1	Drywall gun 0-4000 4.5A	154	89
6507	TSC SawZall w/case	239	129
6170	14" chopsaw	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	189
5680	Router 2 HP - 12 Amp	355	219
6215	16" chain saw	280	169
6365	7-1/4" circular saw	204	119
6366	7-1/4" circ. saw w/fnc & 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
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LU84M011	Comb 10"	50	65	41
LU85M010	Super Cut-off10"	80	96	56
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	69
TK203	7-1/4" Framing	24	29	18.25
TK206	10" Framing	24	33	20.75
TK303	7-1/4" Finishing	40	36	22.65
TK306	10" Finishing	40	40	25.10
TK903	7-1/4" Combo	30	31	19.49
TK906	10" Combo	50	45	28.25
SD306	6" Dado - Carbide		184	109
SD308	8" Dado - Carbide		196	119
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	158
JS100	Biscuit Jointer w/case		300	159
FT2000	3-1/4 HP plunge router		299	179

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
4390DW	9.6 cdls recip saw kit	230	128
6012HDW	2 spd. drill w/clutch-comp	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 shtfin. 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" planer - 7.5 amp	240	139
1100	3-1/4" planer w/case	401	205
9207SPC	7" sander-polisher	276	149
3601B	1-3/8 HP router	255	135
9501BZ	4" grinder, 3.5 amp	126	69
BO4530	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	1699
2040	15-5/8" planer	2595	1375
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	83
6013BR	1/2" drill rev. 6 Amp	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
4300BV	3 sp. orbital 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" circ saw 13A	209	112
3612B	3 HP plunge router sq/base	377	189
2012	12" portable planer	895	465

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MR1/T1	Router table	139	109

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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

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N80C-1	Utility coil nailer	845	419
N80S-1	Stick nailer	845	419
T36-50	Sheathing & decking stapler	595	334
N12B-1	Coil roofing nailer	845	419
N60FN-2	Finishing nailer	625	339
T31	Brad nailer	270	155
CWC100	1 HP Pancake Compressor	445	299

SKIL SIZZLERS

6850-02	1/2" EMH hammer drill w/cse	255	135
3810	10" Miter saw	263	209
3810S	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	135
1605-02	NEW Biscuit Jointer w/cse	200	119

PANASONIC CORDLESS

EY6205BC	NEW v/spd. 12 volt drill w/15 minute charger & case	390	179
EY6005B	12v cdls drill w/1 hr charger	315	169
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3718	18"	11.37	7.35	41.69
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	Bosch metal case for above jig saws	34	30
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1942	Heat gun 600° - 900°	99	65
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1273D	4" x 24" belt sander w/bag	315	178
1290D	1/2 sheet sanderw/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/blde 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

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Model		List	Sale
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3304	1 HP v/spd plunge router	261	178
3375	3-1/8" univ. planer 7.2A	280	158
3380	Biscuit jointer w/case	485	245
4024	3 x 21 v/spd belt sander	289	188

BLACK & DECKER

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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
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4011	1/4 sheet palm sander	82	62

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JJ-8	8" jointer, 2 H.P.	1252	939
DC610	1 H.P. dust collector	321	245
DC1182	2 H.P. dust collector	577	405
DC1883	3 H.P. dust collector	850	639
JJ-4	4" jointer. 1/2 HP	310	275
JJ-6CS	NEW 6" jointer, 3/4 HP	579	389
JWP-15H	15" planer 3 H.P.	1565	989
JWP12D	Dustchute for JWP12	45	22
JSG-6	6 x 48 belt & 12" disc sander	634	475
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
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JDP17MF	NEW 16 1/2" floor drill press	459	379
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Model		List	Sale
JP-155	6 1/8" jointer/planer	611	305
R500	2-1/4 HP plunge router	326	155
TS-254	NEW 10" mitre saw	397	205
TS-254K	Above saw w/acc. kit & B&D 73-770 carb blade	495	249
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
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TFD170VRK	9.6V cdls drill kit	254	145
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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
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7511	3/8" v/sp drill 5.2Amp	185	109
7514	1/2" v/sp drill 0-750 rpm	195	117
7548	Top hdl jig saw 4.8A	230	135
7649	Barrel grip jig saw 4.8A	225	149
330	Speed block sander 1/4 sheet	97	55
555	Plate biscuit jointer w/case	299	165
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9647	TIGER CUB recip saw	195	119
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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, Tilt Base, Offset Base, Slitter Base, Guide & Cs	330	185
7334	5" random orbit sander	205	119
7335	5" v/spd random orbit sander	225	129
7336	6" v/spd random orbit sander	225	134
693	1-1/2 H.P. plunge router base	280	165
6931	Plunge router base	120	75
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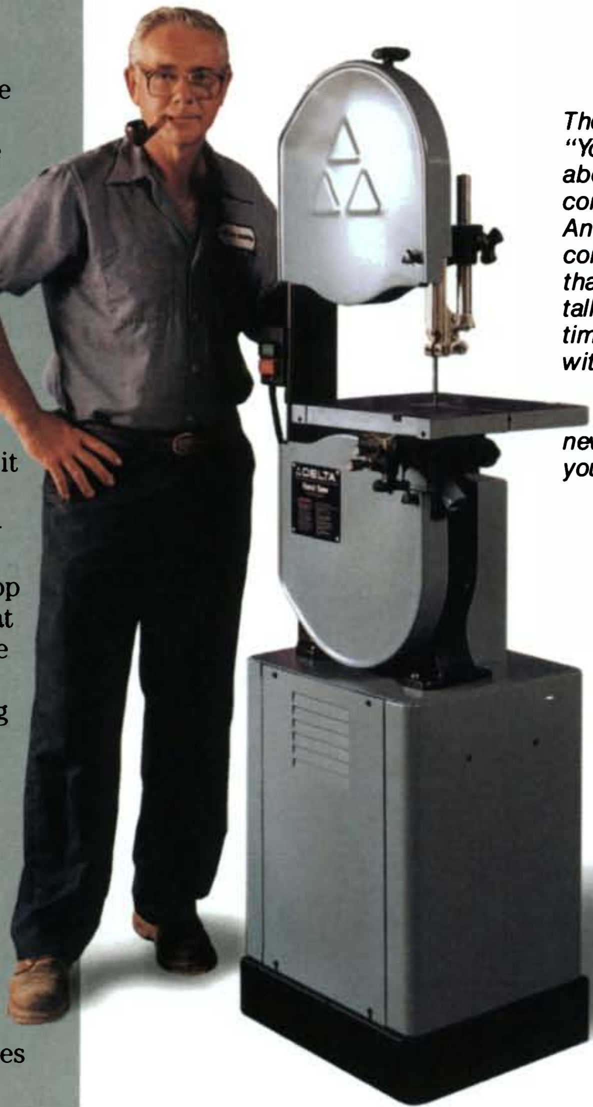

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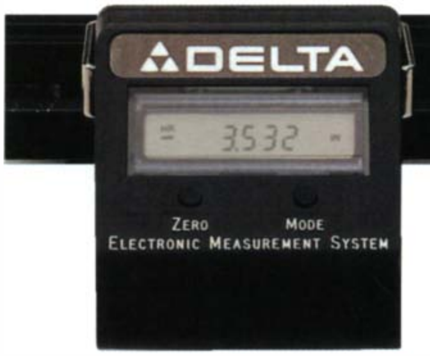

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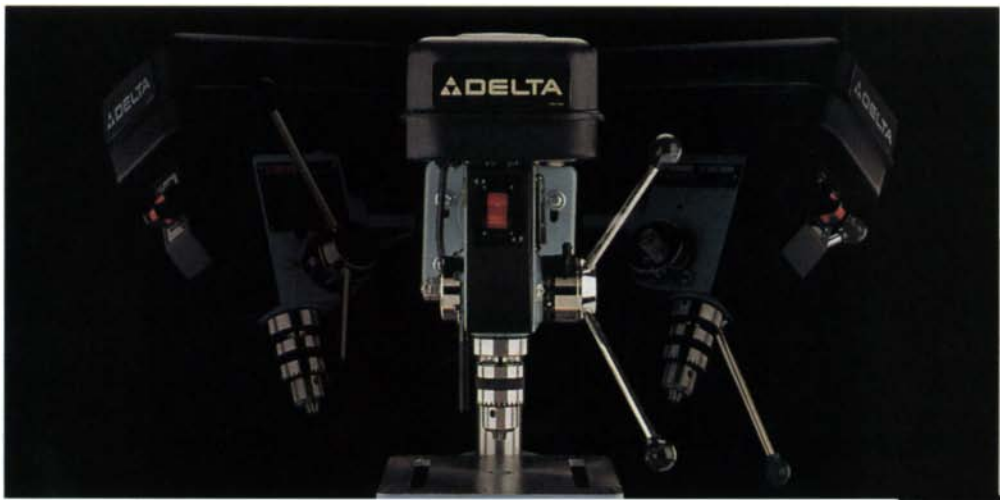

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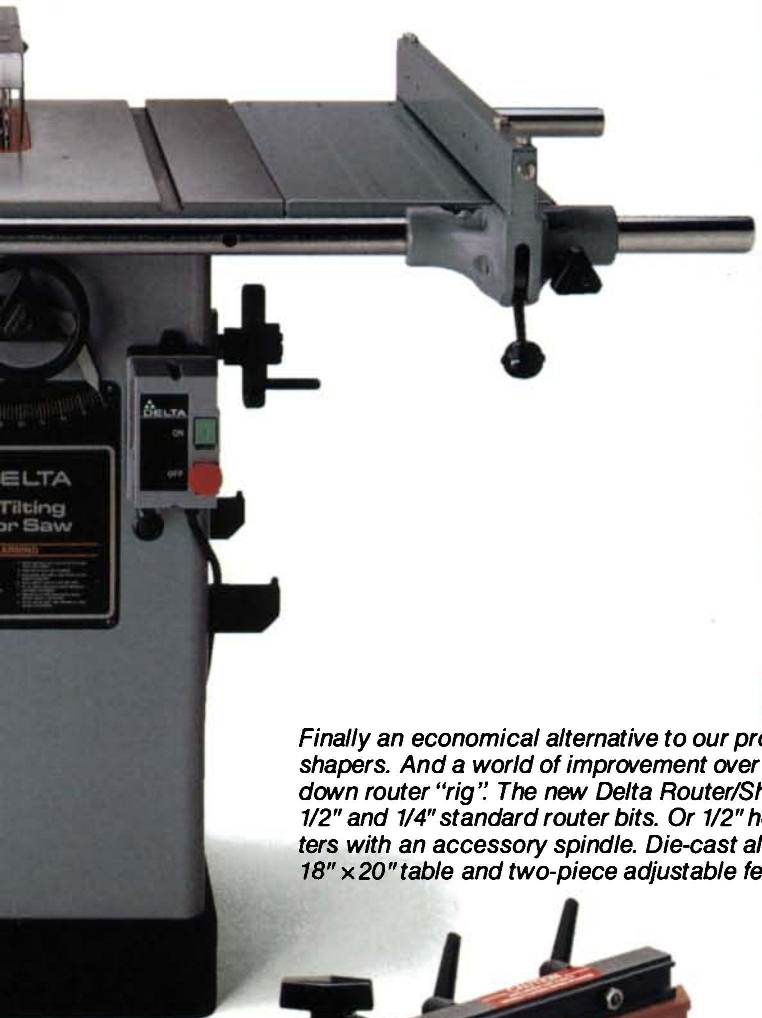

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A Semielliptical Table

Veneering laminated aprons and inlaying ebony

by Bill Clinton

Many of my designs are developed from photographs and drawings of historical furniture. The table shown in the photo on p. 47, for example, is based on 18th-century English and American semicircular or semielliptical pier tables, which were generally set against a wall between windows in a dining or sitting room. The legs on many of these early tables were fluted and embellished with elaborate marquetry, which I found a little overwhelming. I decided to simplify my mahogany table and support it with turned legs that gently taper to thin ebony feet. The semielliptical top is veneered with quilted mahogany and decorated with ebony string inlay. I also added a small white dot of tagua nut vegetable ivory to the turned ebony drawer knobs.

In building tables, I use the top as a guide for sizing the base and for developing jigs or full-size drawings, and so I began by drawing a pattern of the tabletop with a shop-built ellipse tracing machine. This machine is also needed to trace patterns for the forms used to laminate the curved front aprons. I simplified the base construction by joining the curved aprons to the turned legs with loose tenons and by cutting all the mortises with a router and jig. Then I adapted my router to the ellipse machine to trim the tabletop edges and to cut a concentric groove for the string inlay.

Drawing an ellipse—An ellipse is an attractive shape, but drawing one can be frustrating, especially if you use the traditional "pin and string." I developed my own system based on the ellipse tracing machine in the 18th-century Dominy workshops. That machine was simply a beam trammel with three points: one scribe and two pivots. Each pivot slides in one of two wood tracks that cross at a right angle in the center of a baseplate. The pivots on my machine (the router version is shown in the bottom, right photo on p. 46) are screwed to shaped blocks that slide in dovetailed tracks. The size and shape of the ellipse being drawn can be changed by varying the lengths of the beam and tracks and the location of the pivots.

To use the machine, you need to know the ellipse's width (the minor axis) and length (the major axis) and to locate the center of the machine base at the point where these two perpendicular centerlines cross in the middle of the ellipse. I laid out the tabletop pattern in the drawing on a ¼x20x56 piece of plywood by marking one-half of the ellipse's 36-in.-long minor axis perpendicular to and intersecting the center of its 48-in.-long major axis. After aligning the tracks with the ellipse axes, I temporarily screwed the tracks to the plywood. The points are adjusted by setting the scribe 18 in. (half the ellipse width) from the first pivot, which slides in the major axis track; and setting the second pivot, which slides in the minor axis track, 24 in. (half the ellipse length) from the scribe. Clamp the three points to the beam before tracing the half-ellipse.

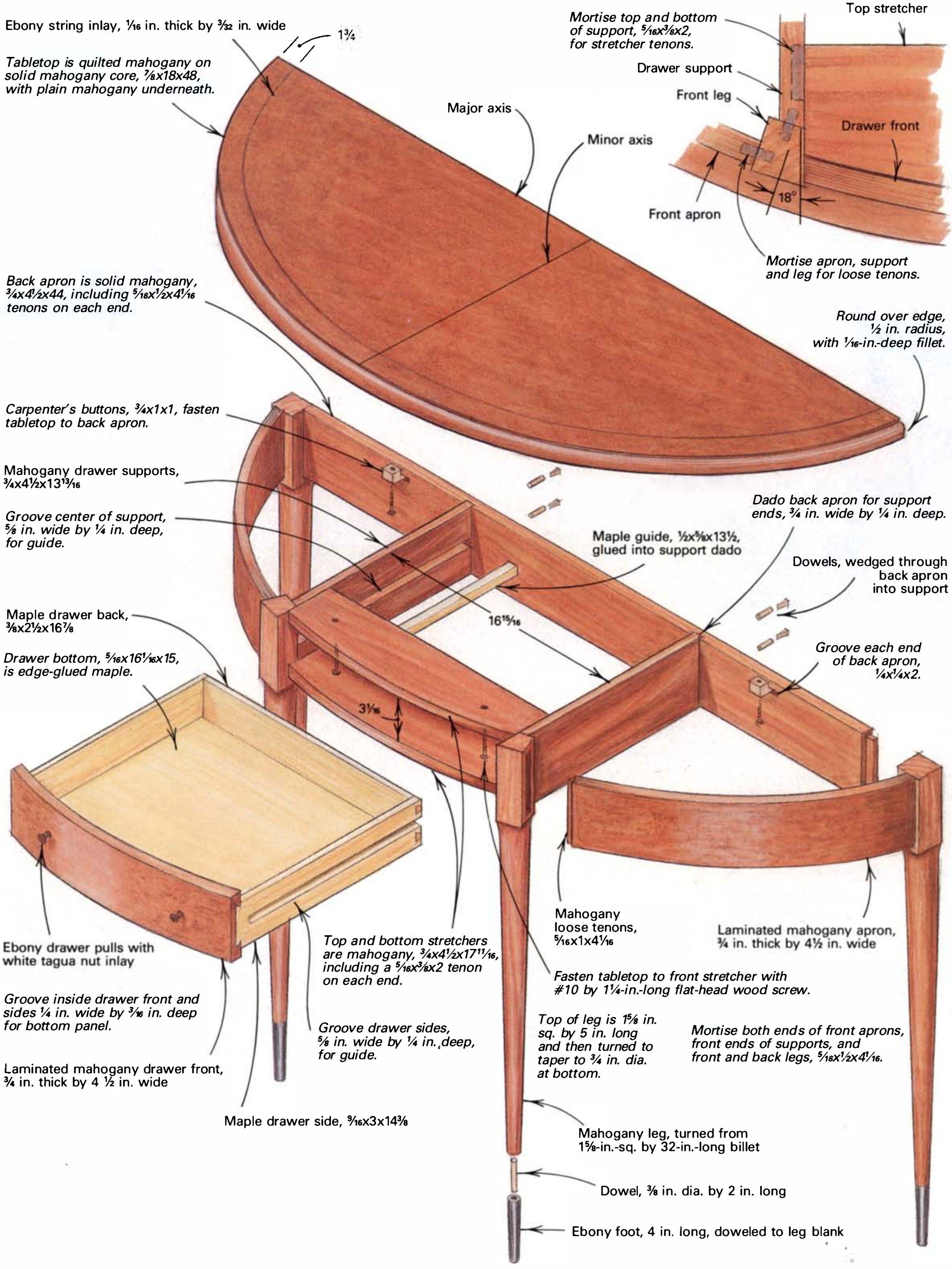
Before bandsawing the half-ellipse, I drew a full-size plan of the table's framework on the plywood. First, with the ellipse machine still set up, draw the concentric ¾-in.-thick front apron and drawer front 1 in. inside the top's perimeter. To do this, simply move and reclamp the scribe, without changing the pivot points. I then removed the ellipse machine, so I wouldn't have to work around it, and drew drawer supports and guides, back apron, stretchers, and leg tops with their mortises and loose tenons; that way I could take lengths and angles directly from the plan when machining the parts. To make paper patterns for the drawer-front- and two apron-laminating forms, I reattached the ellipse machine to the plywood and used it to draw the inside edges of the curved parts on separate sheets of paper. Extend the lines beyond the length of each part and then trace the crosscuts from the drawing on the plywood underneath.

Making and mortising the curved front—I glued up seven laminates plus a face veneer for the two ¾-in.-thick front aprons and the drawer front, and clamped each assembly between laminated plywood forms, like the one in the top, left photo on p. 46. The drawer-front form is made by gluing up a 5¼x5x21 stack of plywood, rubber cementing a paper pattern on top and bandsawing the form in half along the pattern line. The apron forms are made the same way, except their initial plywood stack is 5¼x6½x23. Note: each form is extra thick and long on both ends to ensure that the edges of the laminations are clamped adequately.

After the laminations dry overnight, transfer the marks from the paper pattern to the part, which can then be removed from the form, jointed and cut to the dimensions in the drawing. As shown, the end of the apron that joins the front leg is crosscut perpendicular to the tangent of the apron curve. This is easy to do on the tablesaw (shown in the top, right photo on p. 46). Set the blade perpendicular to the table and place the apron's convex side flat on the table (the tangent). After aligning the blade with the cut mark taken from the pattern, clamp the apron to the miter gauge, insert a curved support block under the workpiece and clamp the block to the gauge before making the cut. Repeat the procedure for the same joint on the other apron. The angle on the apron end that joins the rear leg is 5° less; so for these cuts, use the same miter gauge techniques as before, but angle the blade 5° toward the apron. You can make test cuts in the scrap you previously ripped from the apron edge and check the angle by laying it on the full-size drawing. The same procedure is used to cut the ends

Photos: Gary Weisenburger; drawings: Kathleen Rushton

A semielliptical table



***Left:** This three-side-box router jig is ideal for cutting the angle in the top of the front legs. The author grooved the jig's bottom at 18° and clamped a stop on the sides to limit the angled face to 4 1/2 in. long. **Above, left:** Clinton made laminating forms for the aprons and this drawer front using paper patterns he drew with his ellipse machine. He glued the patterns to plywood, sawed to the pattern line, and glued seven mahogany laminations plus veneer between the clamped forms. **Above, right:** The author crosscuts the curved apron by setting its cut-off mark on the table, which is tangent to the curve at that point, and aligning the mark with the blade. **Right:** Clinton adapted his router to a flat beam on the ellipse machine to trim the edge of the tabletop and to rout a groove for the ebony string inlay, shown here.*

of the drawer front at 18°, as shown in the drawing.

I cut 5/16x1/2x4 1/16 mortises in both ends of the curved aprons with a table-mounted router and a 5/16-in.-dia. straight bit. Since the apron ends that join the front legs were crosscut with their convex sides on the saw table, you can plunge-cut the mortise on that end by guiding the same face against a perpendicular fence on the router table. To mortise the apron ends angled 5°, I tilted the fence 5° so the end would be flat on the router table. Although I gauged mortise length by starting and stopping the cut on pencil marks on the fence, you can do this by clamping stop blocks to the fence.

Making and mortising the legs—The 32-in.-long mahogany legs taper from 1 5/8-in.-sq. tops to 3/4-in.-dia. ebony feet, which I doweled to the legs before turning them. After turning the legs, I routed mortises for the loose tenons that join the aprons and drawer supports using a three-side-box mortising jig. Each leg's square top is clamped in the box and the router base runs on the box's upright sides between two stop blocks. (For more on this jig, see Tage Frid's article in *FWW on Joinery*, The Taunton Press, 63 S. Main St., PO Box 5506, Newtown, Conn. 06470-5506.) As shown in the drawing, one side of the square top of the front legs must be angled 18° to accommodate the drawer. You can bandsaw this angle, but I routed it with another three-side jig, shown in the bottom, left photo. I grooved the jig's bottom at 18° and secured the leg by driving screws through the jig bottom and inconspicuously into the leg mortise. Guide the router base on the jig's top edges and set the straight bit's cutting depth to leave the leg's front face 1 5/8 in. wide.

Making the straight parts—Following the dimensions in the drawing, cut the remaining parts, including the two stretchers, which link the front legs and act as a drawer stop; the back apron; loose tenons; the pair of drawer supports and guides; and the drawer sides, back and bottom. The front of each stretcher is curved by marking out the shape from the drawer-front laminating form, and then bandsawing and planing to the line.

The stretchers have 5/16x3/8x2 integral tenons on their ends. To cut them, I adjusted my table-mounted router so a 5/16-in.-dia. straight bit would protrude 7/32 in. (the width of the shoulder above the table) and set the fence 1/16 in. from the bit. I then routed both faces, holding the work flat on the table while running the end against the fence, and bandsawed the excess width from the outer edge to make a 2-in.-wide tenon. To cut the 5/16x1/2x4 1/16 integral tenons on the back apron's ends, I moved the fence 3/16 in. from the bit and repeated the process, this time routing all four sides for a 7/32-in.-wide shoulder all around. Before removing the bit, rout the mortises in the angled front of the drawer supports. I guided each support against an 18° angled fence following the method used to mortise the angled apron ends. Also, rout the 5/16-in.-wide mortises near the top and bottom edge of each support for the stretchers.

The drawers are next. I set up my router with a ball-bearing-guided slot cutter to groove the inside of the drawer front and sides 3/16 in. deep to accept the bottom's 1/4-in.-thick rabbeted edges. Don't groove the narrower drawer back, since the bottom is slid under the back and screwed to it. The slot-cutting bit can also now be used to groove the back apron for cabinetmaker's buttons, which will fasten the top to the base.

The drawer slides on 1/2x5/8x13 1/2 guides, which are glued into each support's groove. I set up the tablesaw with a dado blade to machine a 5/8-in.-wide by 1/4-in.-deep groove in each support and in the outside of each drawer side. I also dadoed a 3/4-in.-wide by 1/4-in.-deep groove across the back apron where the drawer supports join it.

To hide the drawer-front laminations, I glued strips of mahogany on the edges. Then I hand-cut the half-blind and through dovetails on the front and back corners (you could also rout them) and glued up the drawer.

Assembling the base—Before assembling the various sections of the base, I sanded the legs and aprons to 220-grit. Then I glued and clamped the rear legs to the back apron, and assembled the stretchers to the drawer supports. When those assemblies were dry, I glued them together. Next, the drawer supports were fit in the dadoes in the back apron. After the glue dried, I reinforced the dadoes with wedged dowels. The last step was the trickiest: attaching the curved aprons and front legs. This is one of those times when you should take the phone off the hook. After a dry run, I glued all the mortises and loose tenons together and put a few band clamps around the assembly. I also added pipe clamps from front to back to secure the front legs against the ends of the supports. While the base is drying, you can glue up the solid mahogany core for the tabletop and then let the two assemblies set overnight.

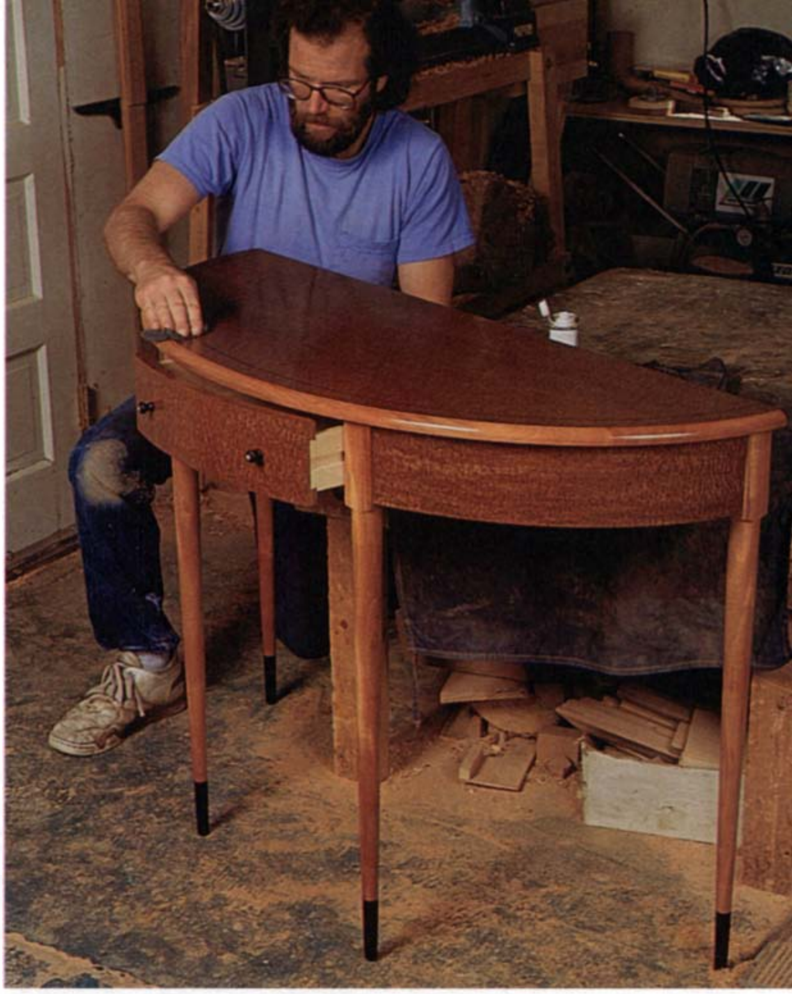
Making the top—The core of the veneered tabletop is solid mahogany, assembled with several pieces of ⅞-in.-thick stock. The rough blank should be at least 19½ in. wide, to provide a waste strip for screwing down the ellipse machine and router attachment. Allow the glue to dry for 24 hours and then plane the glue-up to 13⁄16 in. thick; this core, plus the quilted mahogany veneer on top and plain mahogany veneer on the bottom, yields a ⅞-in.-thick top. In gluing the veneers, I rolled a liberal coat of yellow glue on the core only, since moisture in the glue could cause the veneers to curl up, or worse, stick to the roller and shatter. Since I don't have a veneer press, I clamped each veneer on the substrate with a 20-in.-wide by 48-in.-long curved caul (plywood fastened to a sturdy, slightly curved frame). The curve ensures adequate pressure in the center of the tabletop. After the veneer had dried for about 20 minutes, I removed the clamps to make sure it was completely glued down. If some areas don't bond, you can sponge them with water to reactivate the glue and reclamp the caul. But if you wait much longer than 20 minutes, the glue may be too dry to be reactivated.

After lightly scraping the veneer to remove any glue, I traced the tabletop's semielliptical perimeter from the plywood pattern. Align the pattern's straight back edge (the ellipse's major axis) parallel to and 1 in. from the edge of the veneer. Then bandsaw the top's perimeter to within ⅛ in. of the pattern line, but don't cut the back edge. Also, trace the minor axis perpendicular to and in the center of the major axis, pressing lightly so you can sand away the line.

To trim the curved edge and rout the groove for the string inlay, I adapted my router to the ellipse machine. I replaced the original beam with a wider ½x3x24 beam, as shown in the bottom, right photo on the facing page. I fastened the dovetail pivot blocks through slots in the beam with screws and wing nuts, so the pivots are adjustable. And I replaced the scribe with my router and a ½-in.-dia. straight bit, to trim the table's edge. To make the router adjustable, I screwed an aluminum plate to the top of its base and fastened the plate to the underside of the beam with screws and wing nuts.

To use the router ellipse machine, align its tracks on the tabletop's axes and screw the major axis track to the top's back waste. Rout to the line in two passes, but remove only 1⁄16 in. on the second pass, for a smooth edge. On the first pass, set the bit to cut 18 1⁄16 in. from the first pivot, which slides in the major axis track, and 24 1⁄16 in. from the second pivot, which slides in the minor axis track.

Now rout the concentric groove for the string inlay. Replace the ½-in. bit with a 1⁄16-in. straight bit, set to cut 3⁄32 in. deep. Reset the router (without altering either pivot position) so the bit will be 16¼ in. from the major axis pivot. The inlay is ripped from 1⁄16-in.-thick by 3⁄32-in.-wide ebony. After coating the pieces with glue, I hammered them into the groove, butting the mitered ends together. After the glue dried, I scraped the inlay flush with the veneered surface. To finish the top, remove the ellipse jig, rip the 1-in.-wide waste from the back edge and rout the curved edge of the table with a ½-in. roundover bit, leaving a 1⁄16-in.-deep fillet on top. I fastened the top to the base with two wood screws through either end of the top stretcher and with cabinetmaker's buttons on each end of the back apron, as shown in the drawing.



Clinton built this pier table from a mahogany core, veneered the top, aprons and drawer front with quilted mahogany, and inlaid the top with a string of ebony. The feet are ebony as are the drawer pulls, which he decorated with vegetable ivory plugs.

Applying the finish—After assembling the frame and tabletop, I raised the wood grain with a damp sponge, resanded everything, and applied tung oil. Brush on the first coat, let it set and wipe it off. When the first coat was dry, I sanded with 400-grit and then applied four more coats, sanding in between with 600-grit. Finally, after a light buffing with 0000 steel wool, I applied Watco Satin Wax. For a tougher, more moisture-resistant finish, you could use a mixture of one-third each oil, varnish and turpentine.

Finally, I turned two ebony drawer pulls with tenons, and drilled and plugged them with tagua nut. You can make the vegetable ivory plugs on a drill press with a plug cutter by holding the nut between clamp jaws. I drilled the center of the pulls by spinning them in a Jacobs chuck in the lathe headstock while I advanced a drill bit in a tailstock chuck. Glue the tagua into the pulls and sand off the excess plug. Then drill holes in the drawer front and glue the pulls in place. □

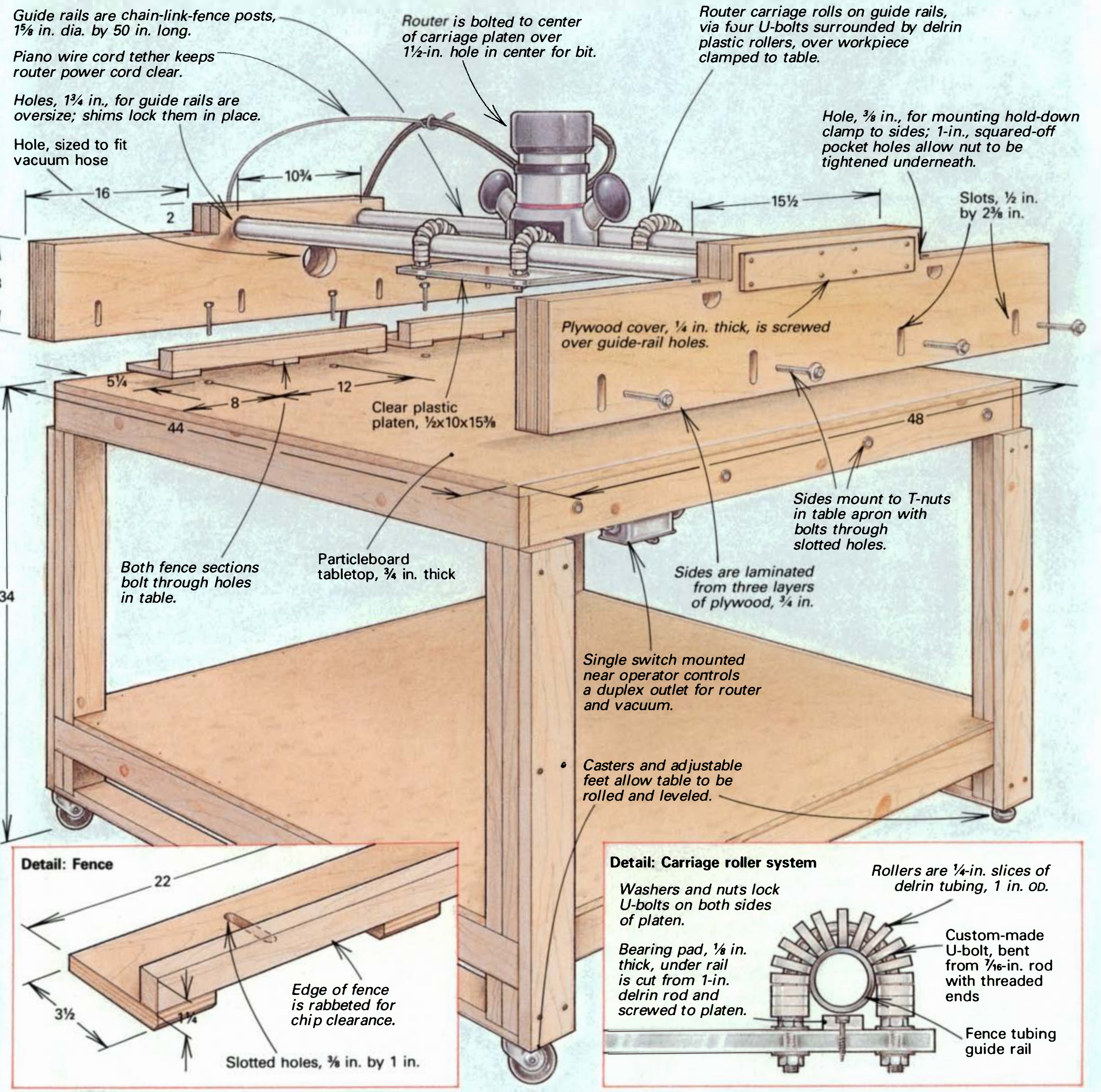
Bill Clinton is a furnituremaker in Bozeman, Mont.

A Shop-Built Panel Router

Tearout-free dadoes in large sheet stock

by Steven Grever

Fig. 1: Panel router



Photos: Sandor Nagyszalanczy; drawings: David Dann

While contorting to squeeze myself into the back corner of a melamine cabinet to touch up some chip-outs, I told myself there must be a better way to cut this stuff than on a tablesaw. The problem with melamine, I explained to my fussy customer, is that one piece will cut perfectly while the next will chip at the edges. My explanation fell on deaf ears. "Just get in there and touch it up if you want to get paid," my client dictated.

Once the ordeal was over and the check was in hand, I sat down to work out a small-shop system that would eliminate chipping when cutting or shaping sensitive sheet materials, like melamine or thin-face-veneered plywood. I had previously routed clean, crisp dadoes and rabbets in these materials, but moving the router from cut to cut and maintaining accuracy was difficult and time-consuming. What I needed was something like a panel saw, which would support the workpiece while the blade moved through the cut. But unlike a normal panel saw, the device I envisioned would employ a router and operate *horizontally* rather than vertically.

When I designed my device, I borrowed some ideas from commercial panel saws, which had the motor-blade assembly fastened to a plate suspended from two parallel guide rails. This setup was efficient, without being overly complicated to build. It also yielded several other advantages: most parts could be fabricated from wood or purchased locally; the router mount permitted easy installation or removal, so this versatile power tool wasn't permanently lost to one operation; the depth of cut could be controlled with the router's height-adjustment mechanism; and the device could be sized to accommodate a 24-in. panel, the largest size I was likely to encounter.

The panel router I ended up building is shown in the photo above and in figure 1 on the facing page. But even after working out a plausible design that incorporated the features mentioned above, I had to refine several details to make my machine function smoothly and accurately. I'll tell you how I solved these problems so you can avoid the same pitfalls if you decide to build your own panel router. Figures 1 and 2 illustrate the parts and sizes I used, but you may wish to make your machine larger or smaller. In any case, you'll need to build a router carriage and guide system, so I'll start with those components.

The router carriage—The heart of my machine is a movable carriage, which supports a standard router. Four U-bolts, each ringed with numerous plastic rollers, are attached to a clear plastic platen to allow the carriage to ride back and forth on two parallel guide rails suspended over a table on which the workpiece is clamped. I decided to use two 50-in. lengths of 1⅞-in.-dia. chain-link-fence post for the guide rails. I used a piece of tubing made of delrin plastic (available from a plastic-supply house) with a 1 in. OD and a 7/16-in. bore, which I sliced into rings for the rollers. With those two components on hand, I calculated the size of the U-bolts needed for a snug fit between the rollers and guide rails. Unfortunately, I couldn't find the 2 3/16-in.-dia. U-bolts I needed, and so I headed to a local sheet-metal shop, which made me a pair of U-bolts from 7/16-in. steel rod shaped with a wire bender and a jig block. My design called for the U-bolts to fasten to the platen with nuts and washers on both sides. This meant threading the legs of each U-bolt to 1¼ in. deep. I wish I had done this before the rod was bent because there wasn't enough room to rotate a regular die-holder handle between the legs of the U-bolt. Instead, I had to cut the threads with the die held in a pair of lock-jaw pliers; a much more tedious job.

I was now ready to make the platen. Polycarbonate plastic seemed just the ticket; besides being strong enough to support the router, the clear material increased visibility under the carriage. I cut out a rectangle 10 in. wide by 15⅜ in. long from ½-in.-thick

The author's shop-built panel router is a versatile machine for grooving or rabbeting delicate sheet materials without chipping them. Here, Grever cuts dadoes in melamine using a standard router mounted on the machine's sliding carriage.

stock, and marked the U-bolt mounting holes, aligning them to match the 10¾ in. spacing of the guide rails. Next, I positioned my router over the exact center of the platen and oriented the grips in line with the guide rails. That way the grips could be used to pull the carriage back and forth. After marking the grips' orientation, I marked the location of the screws used to hold the regular plastic base to the router and outlined the tool's center opening. I used the drill press to bore all the holes, including a 1½-in. hole in the center of the platen, which is large enough to accommodate any bit I planned to use. Lastly, at the points directly under the center of each U-bolt, I drilled holes and screwed on solid delrin plastic discs, which serve as rub pads between the guide rails and the platen (shown in the detail in figure 1 and in the left photo on the following page).

I took the rollers I had previously sliced from delrin tubing and enlarged their center holes to 29/64 in., to allow the discs to rotate freely on the arched portion of the 7/16-in.-thick U-bolt stock. After covering the unthreaded portion of each U-bolt with rollers, I added washers and nuts, as shown in the detail in figure 1, and attached the U-bolts to the platen. Next, the guide rails were coated with molybdenum disulfide (a dry lubricant available from your local bearing-supply house) and inserted through the U-bolts. I adjusted the tension on the nuts on the underside of the platen until the rail glided through each U-bolt pair freely, yet without excess play.

Building the table—To support the guide rail-carriage assembly, as well as the workpieces the machine would cut, I constructed a stout 44-in. by 48-in. pine table with a ¾-in.-thick particleboard top. No fancy joinery was needed: I used drywall screws to join the table's apron and legs and reinforced the joints with corner blocks and cross supports, for added strength and stability. Casters on two legs make this large table mobile, and adjustable feet on the other two allow the table to be leveled on an uneven floor.

Next, I cut out three layers of ¾x10x47 birch plywood for each of the side supports that hold the guide rails. Before gluing up the layers, I bandsawed a step in each piece, as shown in figure 1. After trimming and cleaning up the laminated sides, I drilled a number of holes as shown. Two oversize holes, 1¾ in. dia., were bored in each side for the guide rails. The extra ⅛ in. around each rail end provides enough play for adjusting the pieces to the same height and parallel to each other. The ends are then locked in place by shims, made from plastic laminate scraps, forced in

Above: *The router carriage is made from clear polycarbonate, held by four U-bolts ringed with plastic rollers cut from delrin tubing.* ***Right:*** *The laminated-plywood sides support the steel tubes that guide the router carriage and the beam for the hold-down clamp. Slotted holes allow the sides to move up and down, and one side has a hole for vacuum hose connection.*

around the rails and capped with a cover plate made from ¼-in. plywood. Bolts attach the sides to T-nuts in the table apron through four slotted holes (see the photo above, right). The slotted holes allow the height and tilt of the guide rails to be set so that the carriage will ride at exactly the same distance above the workpiece all the way across the table. Two ⅜-in. holes drilled in the upper edge of each side provide places to attach the panel router's hold-down clamp (made later). A ¾-in.-dia. hole is bored through the side beneath each of these mounting holes and then squared off with a chisel, to create a pocket for the hold-down bolt's locknut.

To hold workpieces square to the router's path of cut, I mounted an adjustable fence to the table. The basic fence is assembled from two pieces: a base and an upright section glued on at a 90° angle. Rabbets in the lower edge of the fence provide clearance for dust or chips, so they don't prevent the workpiece from butting up flush to the fence. For greater flexibility in adjusting cuts, I divided the fence into two sections, like a shaper fence. Bolts fitted through slotted holes in each fence section attach through holes in the table, bolted from underneath. With this arrangement, you can set each fence half independently; by offsetting them, you can edge-trim with the router.

To deal with the cloud of dust that routers produce, I made a funnel-shaped chute out of some scrap ⅜-in. plywood, and glued and screwed it to the side support and table just behind the gap in the fences. A hole bored through that side provides a socket for a shop-vacuum or dust-collector hose (size the hole as needed to fit your vacuum setup).

Wiring and the cord—For safer operation, the router is turned on and off with an easy-to-reach remote switch mounted on the frame of the table. This switch (a regular household on/off switch rated to handle 15 amps) controls a duplex outlet box mounted to the rear of the table. Both the router and the shop vacuum are plugged into this outlet and the power switch on each machine is left on, allowing the operator to start and stop both units simultaneously.

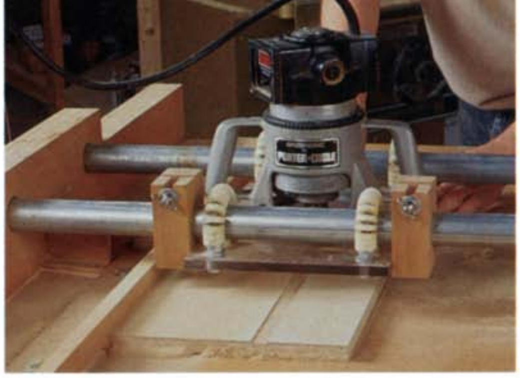
To keep the router's power cord from running afoul of the work or the carriage, I made a cord tether from a length of 7⁄32-in.-dia. piano wire. I discovered this wire in a hardware store and found it was strong enough to support the cord, yet springy enough to flex as the router carriage moved. One end of the wire is held in place by screws under the ¼-in. plywood cover on the side support. A short section on the other end coils around the cord, leaving enough slack for the carriage to travel across the table.

The hold-down—My panel router needed some kind of mechanical hold-down, since hand pressure alone can't keep a workpiece from creeping during a cut. Further, if a panel is cupped or twisted, the depth of a dado cut will change along the length of the cut—not a desirable condition. Therefore, I made the hold-down clamp shown in figure 2 and the left photo on the facing page. Its construction is sturdy, yet its chain-driven action makes it quick to use. The clamp consists of an upper beam that bolts to the side supports and spans the width of the table. The beam holds two threaded rods that ride in captured nuts and that are topped with gears linked together via a chain loop. A crank atop one rod turns both rods simultaneously to lift or lower the clamping bar evenly.

To make the hold-down, I machined the upper beam from 8⁄4 oak, 1⅞ in. wide by 48¼ in. long, and drilled bolt holes on the ends of the beam to align with the mounting holes in the sides. For the raising-lowering mechanism, I bought two 3-in.-dia. chain gears, with ½-in. bore, and 40 in. of #35 chain (which fits the gear teeth) from a bearing company. The gears were mounted on two ½-in.-dia. threaded rods, one 9 in. long and the other (for the clamp's crank) 10½ in. long, held in place with nuts and lock washers above and below the gears. Placing the rods about 16 in. apart, I assembled a loop of chain over the gears and then separated the rods until the chain was moderately taut. After marking each rod's center on the beam, I drilled two ½-in. holes through the beam and counterbored halfway through from below with a 9⁄16-in. drill. I then embedded two ½-in.-dia. by 1-in.-long nuts into the countersunk holes, pinning them permanently in place with sheet-metal screws.

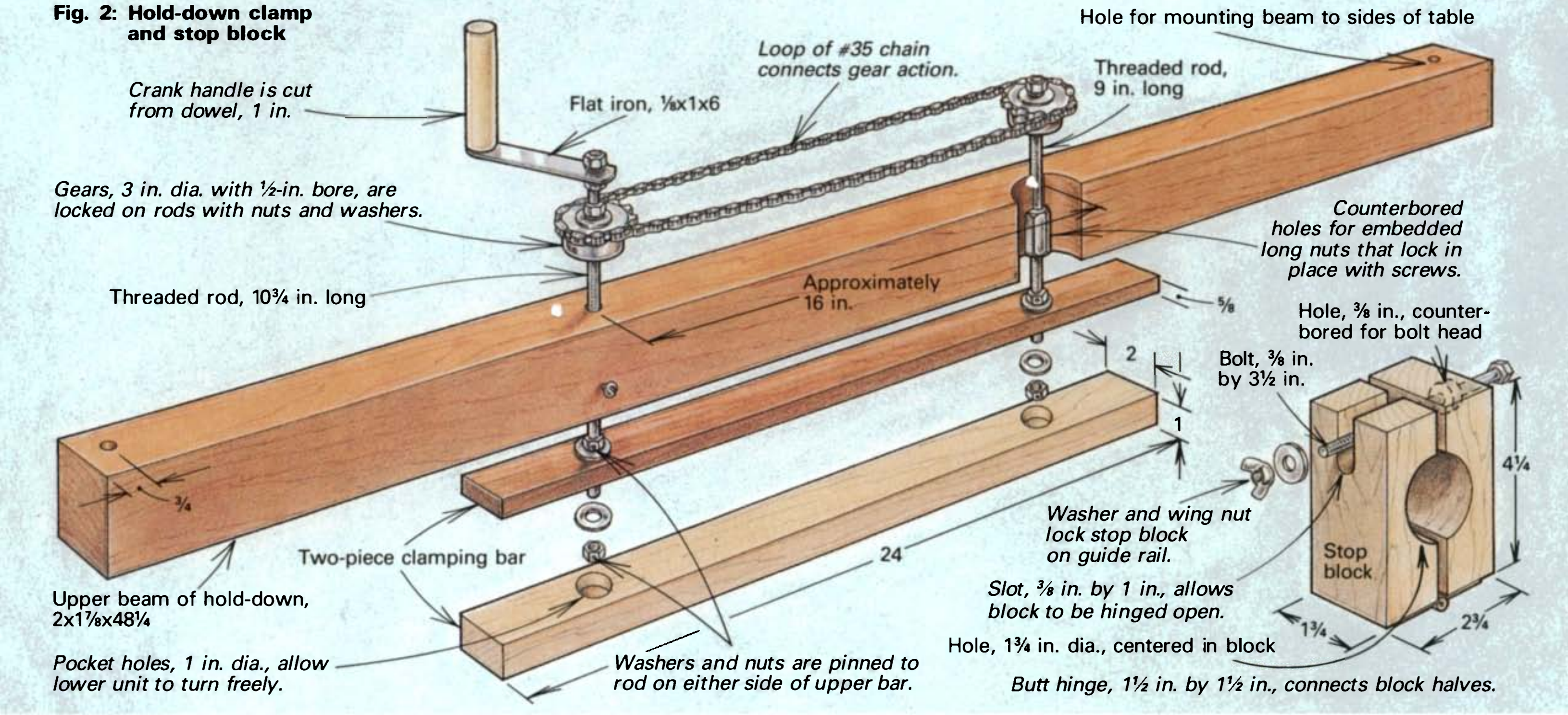
Attached to the bottom of the threaded rods is a clamping bar. I made the bar from two pieces of yellow poplar, which is soft enough not to mar the workpiece. The ⅝x2x24 upper piece was drilled through with ½-in. holes on the same centers as the threaded rods. The top of the lower 1x2x24 piece was drilled partially through with two 1-in.-dia. holes, located on the same centers as before. These latter holes provided pockets for a ½-in. nut and washer on each rod end. Nuts and washers were then installed about 1 in. onto the ends of the threaded rods, and the upper half of the clamp bar was slipped on. A washer and nut were then installed, tightened only slightly, and locked onto each rod with a ⅛-in. tension pin driven through a hole drilled in the nut (shown in figure 2). After checking that the rods turned smoothly, I glued on the lower piece of the clamping bar. Finally, I installed an L-shaped hand crank, made from some flat iron and a length of 1½-in.-dia. dowel, on top of the threaded rod on the side nearest the panel router's fence.

Stop blocks—To increase the versatility of my panel router, I made a pair of hinged stop blocks that clamp to the guide rails



***Left:** To keep sheet goods steady during routing, the author built a special hold-down clamp; two threaded rods, connected by gears and chain, raise or lower a clamping bar via a crank on top. **Above:** By locking the router carriage in place with two wing-nut-tightened stop blocks, the author can run sheet materials through the panel router for lengthwise cuts.*

Fig. 2: Hold-down clamp and stop block



easily. Each block is hinged in the middle and tightened with a wing nut. By using one or two stop blocks, I can make stopped dadoes or run sheet goods along the panel router fence, for lengthwise cuts, as described below.

To make the stop blocks, I started with four yellow poplar pieces, each 2x2⅝x3¾. I bored each with two holes, one 1¾ in. dia. and the other ⅜ in. dia., located as shown in figure 2. Next, I used a ½-in. drill to counterbore each ⅜-in. hole from one end to ⅜ in. deep. Each block was then ripped down the center of its 2⅝-in. face into two halves. I made the ⅜-in. hole on the non-counterbored side into a slot by sawing out the waste on the bandsaw. I embedded the head of a ⅜-in.-dia. by 3-in.-long hex-head bolt and lock washer into the counterbored hole, gluing the bolt head in place with quick-setting epoxy. Once the epoxy had set, I screwed a small butt hinge to the side opposite the slot, connecting the block halves. The finished stop blocks open to slip around a guide rail and lock in place with wing nuts backed by washers fitted on the bolts.

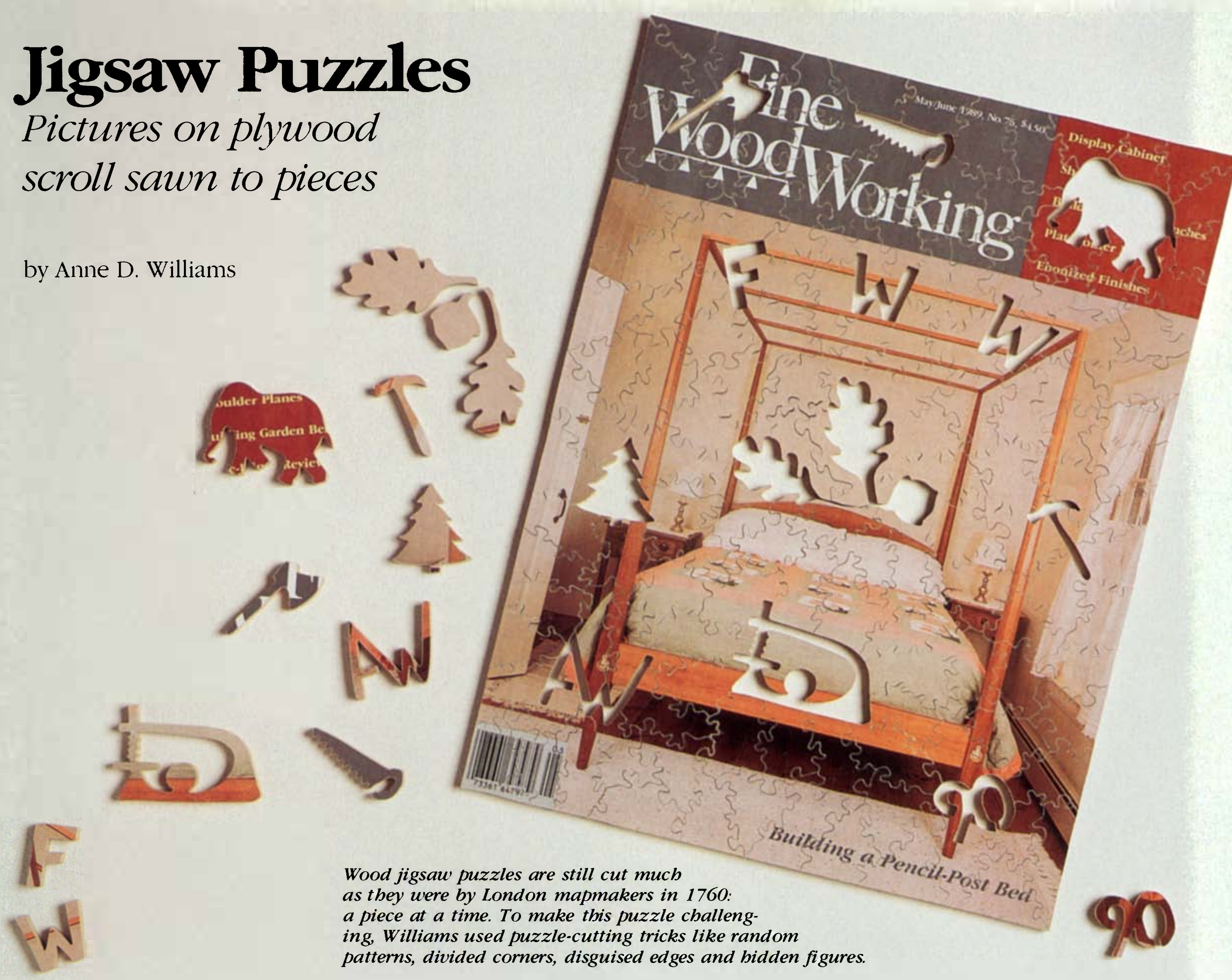
Since using the panel router in my shop, I have found it more useful than I had anticipated. Of course, the device cuts dadoes across cabinet sides, for shelves or dividers, to perfection. But by locking the position of the router carriage on the guide rails using a pair of stop blocks on either side, workpieces can be rabbeted or grooved lengthwise, as shown in the photo above, right. The panel router can also cut stopped dadoes with one or both stops locked to the guide rail, limiting the travel of the carriage. You can also start and stop a cut in the middle of a panel by lowering the bit into the workpiece. This is possible with my regular router, but a plunge router would be much better. My panel router can also work as a pin router if you lock the carriage and fit a dowel guide pin directly below the bit. A thin pattern attached to the bottom of the workpiece follows the guide pin as the bit cuts the matching shape on the top side. You do have to be very careful, because there is not much room beneath the carriage for handling small workpieces. But more important than all these extra benefits, I have discovered that my panel router works melamine without any chipping. And that means no more angry customers telling me to touch up chipped areas inside cabinets. □

Steven Grever is a woodworker living in Madison, Wisc.

Jigsaw Puzzles

Pictures on plywood scroll sawn to pieces

by Anne D. Williams



Wood jigsaw puzzles are still cut much as they were by London mapmakers in 1760: a piece at a time. To make this puzzle challenging, Williams used puzzle-cutting tricks like random patterns, divided corners, disguised edges and hidden figures.

Way back in 1760, London mapmakers began gluing their engravings to wood backings, cutting them into small pieces and marketing these jigsaw puzzles as educational toys. The subject matter later expanded to historical and Biblical scenes and then to nursery rhymes and children's stories. The transition from child's toy to adult amusement came about 1900, when puzzle makers turned to pictures that would appeal to adults and cut them into smaller and more numerous pieces, like the puzzle above. These wood jigsaw puzzles have been a tradition in my family for decades, and in 1977 I began cutting my own. My methods evolved from tips I learned from other puzzle makers and were honed while cutting several hundred puzzles for friends and relatives.

Although most of my cutting has been for adult puzzles, these instructions can easily be adapted for children's puzzles. However, you should keep a child's ability, as well as tendency for ingesting small objects, in mind when determining the size of the pieces, complexity of the puzzle and type of finish, which should be nontoxic. Whether you focus on children's or adults' puzzles will influence your equipment needs. So here I'll discuss saws and blades, gluing a picture to plywood and some cutting techniques.

Choosing a saw—While there has been some evolution from the hand-held fretsaws used to cut the first puzzles, modern scroll saws are essentially the same as those introduced in the 1870s, although powered by a motor rather than a treadle. I started working with the Dremel Motoshop (Dremel, 4915 21st St., Racine, Wisc. 53406), a small but fairly versatile scroll saw, with a power takeoff for sander and flexible-shaft tools. The simplicity of this saw and the ease of changing blades makes it a good choice for beginners. It is excellent for cutting children's puzzles and does a reasonably good job on the smaller pieces for adult puzzles.

However, the Motoshop does have limitations. Its throat, which is the distance from the blade to the back post that supports the upper arm, is only 15 in., and that limits the size puzzle that can be cut. When cutting interlocking puzzles, it is best for the diagonal measurement of the picture not to exceed the saw's throat depth. An experienced cutter can handle a diagonal up to twice the throat measurement, but for large puzzles, you really need a saw with a deeper throat, about 18 in. to 24 in. Another limitation is that the Motoshop's 3-in.-long pin-end blades come in only two thicknesses, and even the finer blade is too wide to make intricate cuts required for the best adult puzzles. When I realized that puzzles weren't a passing fancy, I bought a used Delta/Rockwell scroll saw (Delta International Machinery Corp., 246 Alpha Drive, Pittsburgh, Pa. 15238) with a 24-in. throat and variable-speed mechanism. Its throat easily accommodates a 16-in. by 20-in. puzzle, which I normally cut into about 600 pieces. The variable speed allows me to cut between 650 and 1,700 strokes per minute (SPM); for puzzles I usually set it around 1,200 SPM.

Photo this page: Susan Kahn

Because the Delta is a rigid-arm saw with spring-controlled blade tension, blades break more frequently than with the newer parallel arm or C-frame saws, which hold the blade under constant tension. If I were buying a new saw, I would look at a Hegner (imported by Advanced Machinery Imports Ltd., PO Box 312, New Castle, Del. 19720) or RBI Hawk (RBI Industries Inc., 1801 Vine St., PO Box 369, Harrisonville, Mo. 64701), both of which have received good reviews from my puzzle-cutting friends. For more on scroll saws, see *FWW* #47, pp. 51-53 and *FWW* #74, pp. 50-54. I also recommend that you read Patrick Spielman's *Scroll Saw Handbook* (Sterling Publishing Co., 387 Park Ave. S., New York, N.Y. 10016-8810; 1986).

Blades—Puzzle making requires very thin blades. The thickness of the blade, which determines the width of the sawkerf and thus how tightly the pieces fit, should be 0.01 in. or less. The width of the blade, which controls how tightly you can turn, should be less than 0.05 in. The number of teeth per inch (t.p.i.) needed depends on the thickness of the material. A general rule of thumb is that at least three saw teeth should contact the wood; but for ¼-in.- or 5mm-thick plywood, I use blades with 20 to 30 t.p.i. You should look for scroll saw blades that are hardened and tempered with unset teeth; these make smooth cuts that require little sanding. Often the blades break before they have a chance to get dull, but if you've been cutting for more than half an hour with the same blade, you probably should change it anyway. A dull blade produces a ragged cut and leaves more of a burr on the underside of the puzzle.

My favorite blade, a Parker Manufacturing 14B5 Trojan (0.008 in. thick, 0.035 in. wide, 20 t.p.i.), has been discontinued, and so I have been exploring alternatives. So far the most promising choice seems to be the Eberle Blitz 2/0 blade (0.009 in. thick, 0.024 in.

Handling large-scale puzzles

by Al Pergande

I originally decided to make jigsaw puzzles after reading about a Maine woodworker who made his living by cutting puzzles with a foot-powered jigsaw and selling them to tourists. About this time, I was planning a vacation and so I requested a DeLorme Maine Map and Guide (available from DeLorme Mapping Co., PO Box 298, Freeport, Maine 04032) from the state tourist board. The 24-in. by 36-in. map had pictures of all the local flora and fauna around the border and close-ups of all the big cities. I fell in love with it and thought it would make a wonderful puzzle. I had just begun woodworking and had no scroll saw; so I stashed the map away when I got home. Five years later I actually made the puzzle and along the way I learned some things about working on larger projects.

The saw: The larger the puzzle, the deeper the saw throat you need. In theory, you can cut a puzzle with fully interlocking pieces of any length, as long as the picture is not more than twice as wide as the saw throat is deep. The length is not a problem, since you can keep nibbling off corners until the project is done. In practice, though, it's awkward to swing wide pieces around the fragile sawblade. For best results, the diagonal of the puzzle should be no more than twice the throat; even that size will take some thoughtful maneuvering to execute properly. I find it easiest to work with pictures that have a maximum diagonal equal to the saw throat, and I cut these big pictures into 8-in. by 10-in. chunks before making the individual pieces. Since I originally set out to make big puzzles, when the time came to buy a saw I obtained a kit for building a jigsaw with a 26-in.-deep throat. The company I bought my kit from has since gone out of business, but you could build your own large scroll saw (*FWW* #70, pp. 51-53).

Cutting the puzzle: In spite of the size of my saw, it's still a tricky proposition to work with a picture as large as the Maine map. I had my son help maneuver the picture through the blade while cutting it into manageable chunks. If you break a blade during this operation, don't try to start again at the same point. Replace your blade and cut from the other side to meet the first cut. And don't forget to cut lots of bumples and mating sockets when you're sectioning large puzzles, or else these pieces will be non-interlocking. Bumples are the little protrusions on each piece and the sockets are the matching voids in an adjacent piece.

After I get a puzzle into manageable chunks, I lay out my figure pieces and cut up the puzzle as detailed in the main article. I've had good luck with rubber cement to hold my figure patterns in place, although you need to be careful removing the pattern to avoid damaging the picture. The figure pieces for my Maine map were particularly challenging because I wanted to keep all the city names on single pieces. One trick that I use to make puzzles more challenging is to overlay a couple of edge sections and then cut two layers at once. This results in several pieces that are exactly the same shape so that only the picture will give a clue to its proper location.

Some people claim to cut whole puzzles without disassembling the pieces so that the horizontal and vertical cuts run the entire length and width of the puzzle. I always end up with pieces falling off the edge of the saw table with this technique, and so I just section the puzzle into smaller pieces and then reassemble the puzzle as I go. Reassembly allows for sanding the back and is crucial for detecting missing pieces. I've found that I can only work for about an hour before I start to get bored and my back aches.

For storage, a box about three to four times the assembled volume of the puzzle works well. For example, a 12-in.-wide by 18-in.-long puzzle on ⅛-in.-thick plywood (27 cu. in.) will fit nicely in a 90-cu.-in. to 120-cu.-in. container. Decorative tins and glass jars work well or you could also build a nice wooden box. □

Al Pergande makes puzzles in Orlando, Fla.

To cut this 24-in.-wide by 36-in.-long puzzle, Pergande first divided it into smaller chunks. The figure pieces that personalize the puzzle require careful planning.

wide, 33 t.p.i.), available from American Intertool, Inc. (1255 Tonne Road, Elk Grove Village, Ill. 60007; 708-640-7766).

Safety–Although the scroll saw is normally not a dangerous tool, safety should be a concern. Because I remove the blade guard and hold-down for greater maneuverability and visibility, I must press the work down firmly on the table, as shown in the photo on the facing page, to prevent it from being snagged and damaged by the blade. Because of frequent blade breakage and possible flying fragments, always wear safety goggles to protect your eyes. I also wear a dust mask when cutting because the fine dust created by the saw can damage your lungs (see "Dust and the Woodworker," *FWW* #83).

Ingredients–The principal components of a jigsaw puzzle are the picture and the plywood backing. The plywood should be ¼ in. thick and sanded on both sides, with no knots or patching and no voids in the core. For practice, beginners can start with lauan or pine plywood, available at local lumberyards, but these materials often contain core voids. The more traditional material for wood jigsaw puzzles is bass plywood, which is soft, easy to cut, light in color, and has little noticeable grain (available from Craftsman Wood Service Co., 1735 W. Cortland Court, Addison, Ill. 60101; 800-543-9367, and Constantine, 2050 Eastchester Road, Bronx, N.Y. 10461; 800-223-8087). However, I like to use hardwood plywoods with more distinct color and grain, such as Honduras mahogany, African striped mahogany or walnut, since the back of the puzzle isn't covered with a picture. These plywoods are available from some woodworking-supply stores and better-stocked lumberyards. Although these woods take longer to cut and cause more blade breakage, I prefer the more luxurious appearance of the final product.

Finishing the wood is up to the cutter. With bass, lauan or pine plywood, I usually leave the wood unfinished. But I always finish the good side (which becomes the back of the puzzle) of the entire sheet of mahogany or walnut plywood by brushing on two coats of lacquer before I subdivide it into puzzle-size panels. Then a coat of Butcher's paste wax buffed to a glossy finish brings out the beauty of the wood.

Mounting the picture–Virtually any picture that is printed on good-quality paper can be cut into a puzzle. Calendar prints, posters, photo enlargements, business cards, wine labels, and wedding invitations are just a few of the possibilities; your imagination is the only limit here. And there are many alternatives for mounting pictures. Some cutters swear by wallpaper paste, while professional puzzle makers often use dry mounting presses. Amateurs can do this too by taking advantage of local frame shops that provide this service. Others use rubber cement, but I don't recommend it because it seems less durable than other glues and also tends to discolor the print over time. I've found that yellow or white glue is a simple way to mount the picture. Yellow glue dries faster, giving you less time to work, but bonds better because it is water resistant.

To begin, cut a piece of plywood about 1 in. larger than the picture. Then, dampen the back of the picture with a wet, but not dripping, sponge to reduce wrinkling when the picture is glued. Using a paintbrush or small roller, apply a thin, even coat of glue to the unfinished side of the plywood and mount the damp picture on the glue surface. For maneuverability, large prints can be loosely rolled up first and then unrolled onto the glue surface. Next, gently squeegee the picture, starting from the center and working toward the edges, as shown in the photo below, to eliminate air bubbles and smooth out the print. Carefully sponge off excess glue, but be gentle because the damp print is easily torn. Let the print dry overnight. Usually a properly smoothed print does not have to be weighted during drying, but pictures printed on heavy stock sometimes curl up on the edges. To resist this tendency to curl, I clamp these pictures for 10 or 15 minutes with small spring-loaded binder clips.

After the glue has dried, I use a paper towel to pad on two coats of a clear acrylic non-yellowing floor wax, like Future. The wax protects the picture against smudging or damage while cutting and in later use. A standard spray fixative, available from art-supply stores, could serve the same purpose. In either case, allow the coated picture to dry overnight.

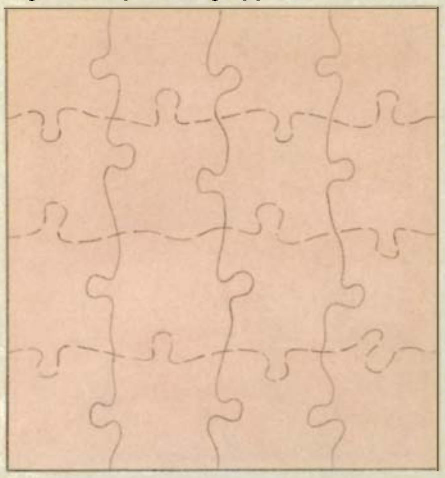
After rolling glue onto the plywood backing, Williams mounts the picture, smoothing from the center to the edges to eliminate air bubbles. For pictures printed on heavy paper, which tends to curl at the edges, she clamps the edges for 10 or 15 minutes.

Planning the cutting design–Conditioned by die-cut cardboard puzzles, many people visualize jigsaw puzzles in the standard grid-like pattern. Although some wooden-puzzle makers use strip cutting to replicate the commercial designs, as shown in figure 1 on the facing page, most crafters have developed their own unique approaches to cutting puzzles. My favorite puzzles have random patterns, and are full of figures shaped like people or animals and even letters that can spell out messages, as shown in the photo on p. 52 and figure 2 on the facing page. I enjoy cutting puzzles this way, even though it takes longer, because they can be customized to fit the recipient. However, these figure pieces do make a puzzle easier to complete because of their distinctive shapes and so you may want to eliminate them to increase the challenge.

Some manufacturers produce puzzles with all identical pieces so that only the picture gives clues for assembly. But there are other more interesting and less devious ways to trick puzzlers, such as the traditional divided corners and disguised edge pieces, as shown in figure 2. Irregular edges really perplex those who try to complete the puzzle outline first. I have also developed a taste for the non-interlocking color-line cutting, which was popular during the first quarter of this century. A cut right along the roof line of a house, for example, makes it hard to see that the blue sky piece and the brown roof piece fit together.

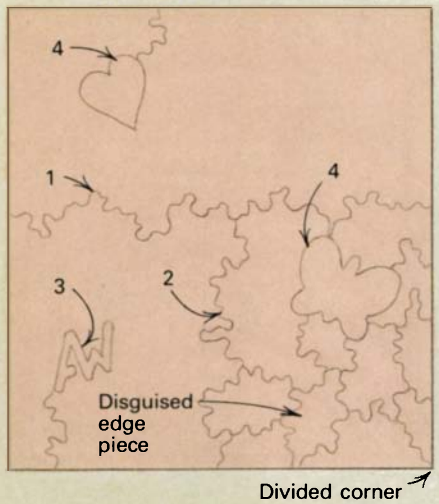
Experienced cutters do most of their cutting freehand, except for the figure pieces, which are developed from patterns. I have several hundred patterns: many I've created, but I've also borrowed ideas from newspapers, magazines and books. The enlarging and reducing features on photocopy machines work great to change pattern size. I make my patterns by drawing the shape on a removable self-stick label (available from office-supply stores); be sure you don't get non-removable labels, as they will damage the picture. Decide where you will put the figure pieces before you

Fig. 1: Strip-cutting approach



Strip cutting in a grid-like pattern is typical of commercially cut puzzles. The solid lines show the first set of cuts and the dotted lines indicate the second set of cuts. Note that each piece interlocks with all the adjacent ones.

Fig. 2: Random-pattern approach



Cuts 1 and 2 divide the puzzle into manageable sections. Signature (3) and figure (4) pieces are cut next. The sections are then randomly cut freehand. Note the divided corners and disguised edge pieces that make a puzzle more challenging.

With the hold-down and guard removed for greater visibility and maneuverability, Williams must hold the work firmly against the table to prevent the blade from snagging and damaging the puzzle as she cuts out a figure piece. A pattern drawn on a removable self-stick label helps in planning and cutting figure pieces.

begin cutting out the puzzle, and then remove the label backing and press the patterns lightly onto the picture.

I believe that each cutter should develop a personal signature piece to include in every puzzle. Not only does it reflect pride of craftsmanship, but it also helps collectors identify their finds. Par Co. Ltd., the top-of-the-line puzzle maker from 1932 to 1974, always incorporated a seahorse-shaped piece into its products. I use a logo based on my initials, as do several other contemporary cutters.

Cutting the puzzle—All cutting should be done with the picture side up so the slight burr from the blade will be on the underside. I begin by trimming the excess wood from the edges of the picture, and then, if the puzzle is 12 in. sq. or larger, I make some main cuts to divide it into manageable sections, as shown in figure 2. If the puzzle's diagonal measurement exceeds the saw throat depth, the puzzle can be bisected by cutting from the edge to the center, removing the sawblade, and then making a second cut from the opposite edge to the center. Remember to include the loops for an interlocking puzzle.

Once the puzzle has been sectioned, cut out all the figure pieces along the pattern lines, as shown in the photo above, and then gently peel off the pattern, being careful not to pull off the picture as well. Cut the rest of the puzzle freehand, using any type of cuts desired, as shown in figure 2. I usually average about one and one-half or two pieces per square inch when cutting puzzles for adults. Plan ahead when cutting the last few pieces in a section so you don't end up with one abnormally small or large piece. Assemble the cut pieces on a plywood tray as you go, to avoid losing them. Although puzzle cutting is easy, I suggest practicing on a plywood blank before cutting into your favorite picture.

When finished, check the back of the pieces for burrs by sandwiching the assembled puzzle between two pieces of plywood, and then flipping it over. Cuts in hardwood plywoods generally are very clean and require no sanding. Bass, lauan or pine plywood, however, will usually have noticeable burrs on the back. If the back is finished, sand the edges of each piece individually as needed; if the back is unfinished, sand the entire surface with 120-grit paper wrapped around a block. Finally, count the pieces as you take the puzzle apart and put them in a sturdy cardboard box that will stand up to wear. Label the box with the title, dimensions, number of pieces, maker's name and date. For a special gift, use a wooden box.

Variations and repairs—True puzzle fanatics will appreciate variations that make puzzles difficult to assemble. Double-sided puzzles can be tricky to put together, particularly if they have the same or similar pictures on each side, but they aren't hard to cut. After gluing a picture on one side and waxing it, repeat the procedure on the back. While cutting, keep a ⅛-in.-thick piece of plywood under the puzzle to minimize the burr on the underside. Periodically turn the uncut section over and cut from the other side, so that the small burr that does occur will not signal the puzzler as to which side is which. For a harder puzzle, omit the picture and let your victims struggle to put the pieces together using only the shapes and wood grain as clues. Steve Malavolta's multilayer puzzles develop this technique to a high degree (see *FWW* #60, pp. 66-69).

If you lose a piece, a replacement can be made easily. Assemble the surrounding pieces and if they do not interlock well, tape across their backs to hold them together. Then make a pattern on bond paper in one of two ways. You could place the paper under the assembled pieces and trace the shape with a finely sharpened pencil. But the technique I prefer for intricate interlocking pieces is to cover the void with a piece of bond paper and then lightly rub the edges of the pieces with a pencil to reveal the shape of the missing piece. For either method, glue the paper tracing or rubbing to plywood, in the same way that you glue an entire picture. After the glue is dry, cut along the outline and sand or trim as necessary for a precise fit. Erase the pencil pattern and match the piece to the surrounding area with colored pencils, watercolors or acrylics. Alternatively, you can take a section out of a copy of the original picture or look in magazines or calendars for a picture with a good color match. Cut out a piece of picture that is larger than the replacement piece. Then glue the picture to the precut replacement piece and trim the excess with an X-Acto knife. □

Anne Williams, a puzzle aficionado and economics professor at Bates College in Lewiston, Maine, cuts and collects puzzles. She is the author of Jigsaw Puzzles: An Illustrated History and Price Guide *(Chilton Book Co., 201 King of Prussia Road, Radnor, Pa. 19089; 1990).*

Photos except where noted: Charley Robinson; drawings: Vince Babak


Details and trim on the sapele-paneled front of this entertainment center conceal its door and drawer openings. Its real secret, however, is that the center cabinet, which holds the television, pivots open to reveal a temperature-controlled wine closet.

Building an Entertainment Center

Pivoting cabinet reveals hidden wine closet

by Carl Jordan and Tim O'Brien

Our company recently built an entertainment center that was far from being a typical built-in cabinet. First of all, it's hidden among 200 ft. of paneling and cabinets, and its 4-ft.-wide midsection pivots open to reveal a hidden, atmosphere-controlled wine closet. This pivoting feature required special attention: the weight of the cabinet, equipped with a television and stereo speakers, is nearly half a ton. Yet even a petite person can open the secret cabinet, retrieve a bottle of wine and then close the door with one hand.

To complicate matters even more, the entertainment center was part of a major renovation in a two-story condominium in Vail, Colo., a resort community where space is scarce, and the architect incorporated some pretty unorthodox designs to utilize every precious cubic inch in the ground floor addition. The concealed wine closet, for example, is triangular and hidden in a corner behind the entertainment center. A diagonal corridor was needed to bring natural light to the windowless entry, and the entertainment center (shown in figure 2 on pp. 58-59) had to be laid out diagonally to the outside walls.

In this article, we'll tell you how we overcame all these design problems—working with angles, hidden doors and a pivoting cabinet—to build the entertainment center shown in the photo above. Its construction is simple, and we'll briefly describe how we used biscuits and hidden screws to join carcases. The real challenge was the pivoting center cabinet, with its curved side panels and hinge mechanism. These details are hidden by the paneling in front of the cabinets, and so we'll begin by discussing that first.

Disguised door openings—One way to make cabinet openings invisible is to blend the cabinet fronts with adjacent paneled walls. We accomplished this by designing the cabinet front to match the wall's vertical panel joints and horizontal trim. We also emphasized the joints and trim on stationary panels to downplay the gaps we had to leave around the cabinet doors, for smooth operation.

Our clients wanted the walls in each room of the condo's 1,200-sq.-ft. addition to have the same contemporary motif, which we based on standard 4-ft.-wide panels. We settled on the design shown in figure 1, which we made entirely of vertical-grained sapele, an African hardwood with a fine texture and reddish- or purplish-brown heartwood. We routed a ¼-in. radius on each panel's vertical edges after banding them with ¼-in. sapele, to make the joints between them resemble the spaces around the cabinet doors. The tops and bottoms of the doors were banded with Honduras mahogany edge tape (its color is close to sapele) and the edges were left square. We also installed a chair rail 30 in. above the floor between upper and lower panels, and accented the 2-in.-wide rail by making it thick enough to stand out ⅛ in. from the panel surface. Thin shadows cast by the rails, which we used throughout the addition as a convenient division between drawers and doors under countertops, hide gaps above and below doors in the entertainment center. Lastly, to provide a design accent and disguise breaks through the chair rail, like where the pivoting cabinet hinges, we installed a block of endgrain in the rail at panel intersections (every 4 ft.). We routed grooves to divide the surface of each block into eight 1-in. squares. Blocks located in a rail where a door opens get cut in half, but the break is not readily apparent since the cut looks like one of the decorative grooves.

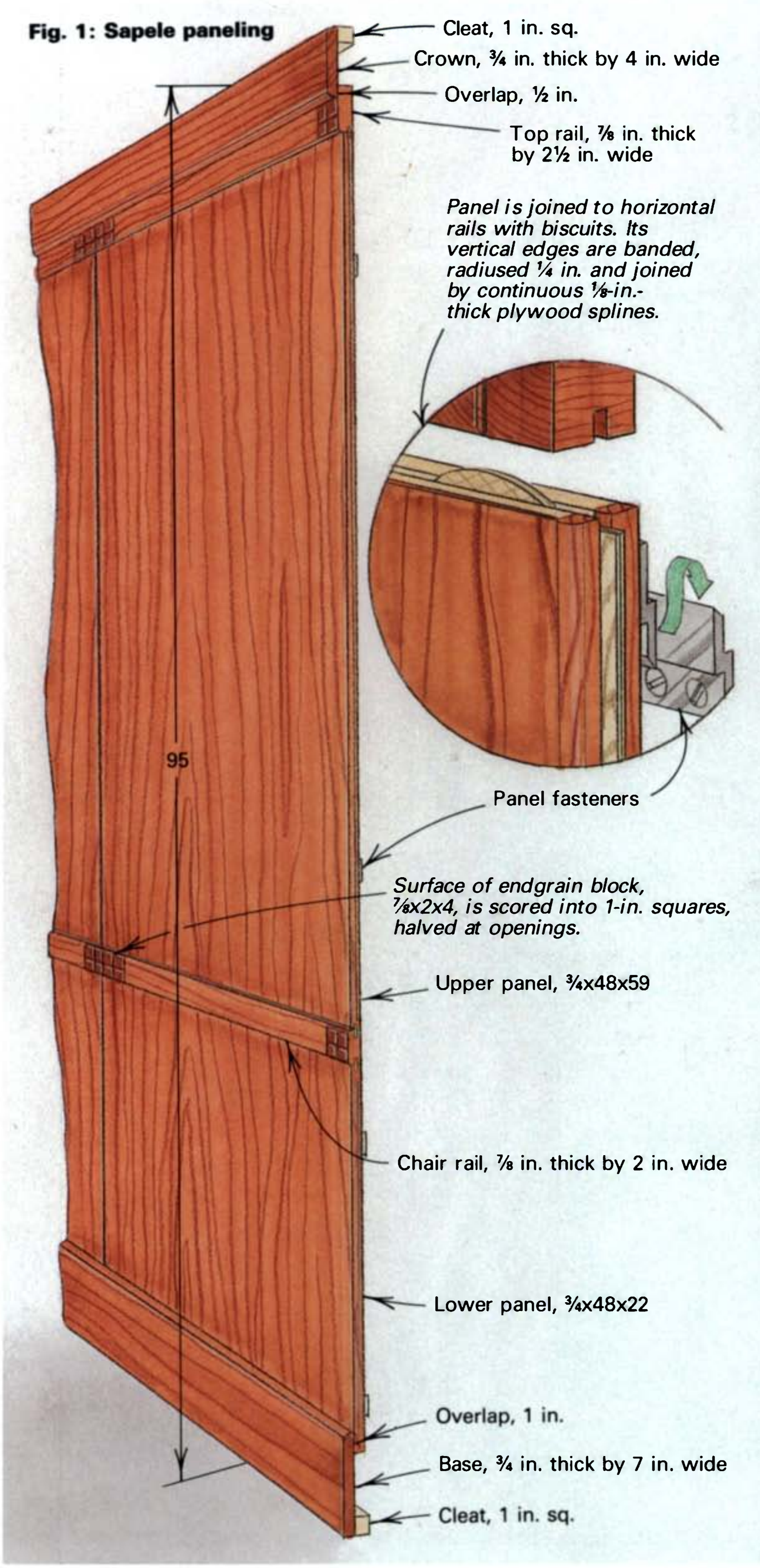
All of the panels are medium-density fiberboard (MDF) veneered with sapele. The panels and cabinet sides were veneered on one side and doors were veneered on both sides. We matched and numbered each piece to avoid drastic differences in color or grain on adjacent panels. Vertical-grained sapele veneer has a narrow, uniform roey figure, much like mahogany, and any mismatched panels would stand out like a sore thumb. The stationary panels are glued and splined to each other, to the chair rail and to an upper rail, which is similar to the chair rail. The paneling is trimmed at the ceiling with crown molding and at the floor with baseboard.

Since our paneling depended so much on straight lines, we made sure the carpenters installed the new ceiling level throughout the addition. We checked this with a laser transit, and then used the instrument to locate the top edge of the lower panels. We hung those panels on the drywall with aluminum panel fasteners (#PFS 3 from Panel Fastening Systems, Inc., 1371-5 Church St., Bohemia, N.Y. 11716; 800-544-9522), joining the panels' vertical joints with splines and the horizontal chair rail joints with biscuits on 8-in. centers. After installing the chair rail, we used the same methods to hang the top panels and the top rail.

The stationary cabinets—For ease of transport, we designed the two 4-ft.-wide stationary cabinets so they could be knocked down into two 2-ft.-wide modules—one square and one triangular. As it turned out, we moved each cabinet to the installation site in one piece. Then we screwed the units to a 2x6 framed pediment, which we in turn screwed to the floor and the ceiling.

Each module is a simple box with glued butt joints reinforced with biscuits and #8 by 3-in.-long drywall screws, driven in inconspicuous spots. The sides, shelves, top and bottom of both the triangular and square modules are ¾ in. thick. The back of the triangular module is also ¾ in. thick, because it must be strong enough to be screwed to the wall and hold the cabinet in place. The square unit's back is ¼ in. thick, but it is installed 2 in. from the wall and not screwed to the studs. The front edge of each module's sides and shelves are edgebanded with ¼-in.-thick by ¾-in.-wide sapele. After the square and triangular modules were screwed together, we glued the chair rail and endgrain blocks to the fixed shelf and then built and installed the drawers, doors and movable shelves.

Fig. 1: Sapele paneling

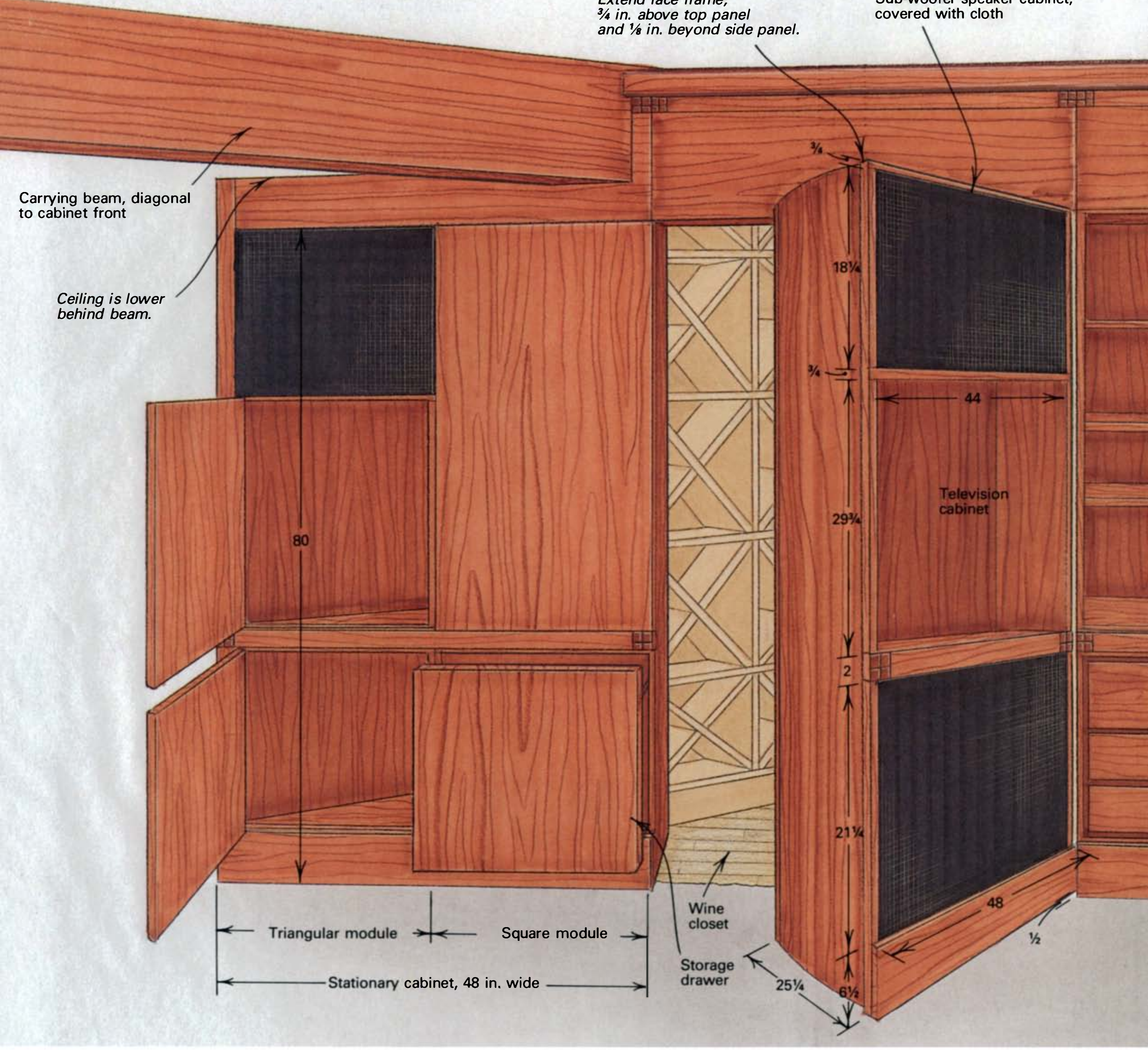


The inside dimensions of the modules and pivoting cabinet didn't hamper us in adapting their interiors to house the electronic components. The tuners, tape decks and amplifiers stack easily on shelves above the chair rail in the stationary cabinet on the right. The shelf heights in the pivoting cabinet were set to accommodate the television and sub-woofer speakers. Our client's audio/video expert emphasized that tight, solid cabinet construction is essential to prevent speaker vibration, and so most shelves are glued, splined with biscuits and screwed to cabinet sides and backs.

There are four drawers in the entertainment center, but only the left-hand drawer has a 2-ft.-wide paneled front below the chair

Photo facing page: Rod Stookey; drawings: Aaron Azevedo

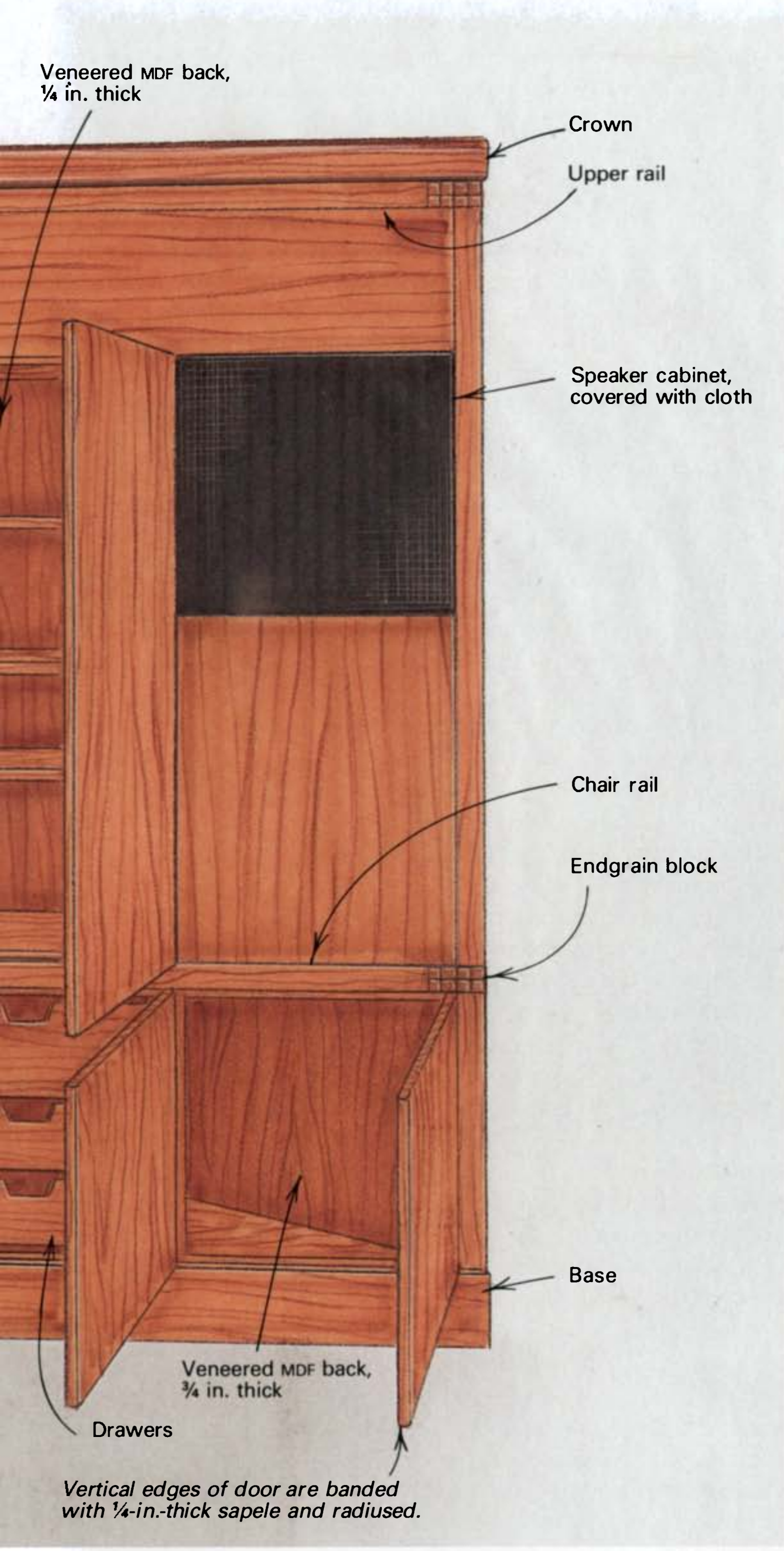
Fig. 2: Entertainment center with secret door



rail. The three shallow audio and video cassette drawers on the right are hidden behind a 2-ft.-wide door, as shown in figure 2. We dovetailed the corners of all the drawers with a Sears/Craftsman 12-in. dovetail jig, which produced strong joints in a fraction of the time required for hand-cut versions. We hung the drawers on full-extension ball-bearing drawer slides.

Neither the drawer front nor the doors have pulls, because they'd give away the location of the openings. Instead we installed spring-loaded magnetic touch latches. The full overlay doors hang on European-style, free-swing (not self-closing) hinges, and we had to cut into the case's back and build cubby holes to accommodate the hinge's surface mounting plate on the pointed end of the triangular module, as shown in the top photo on the facing page. Holes cut into the Sheetrock wall accommodate the cubby hole.

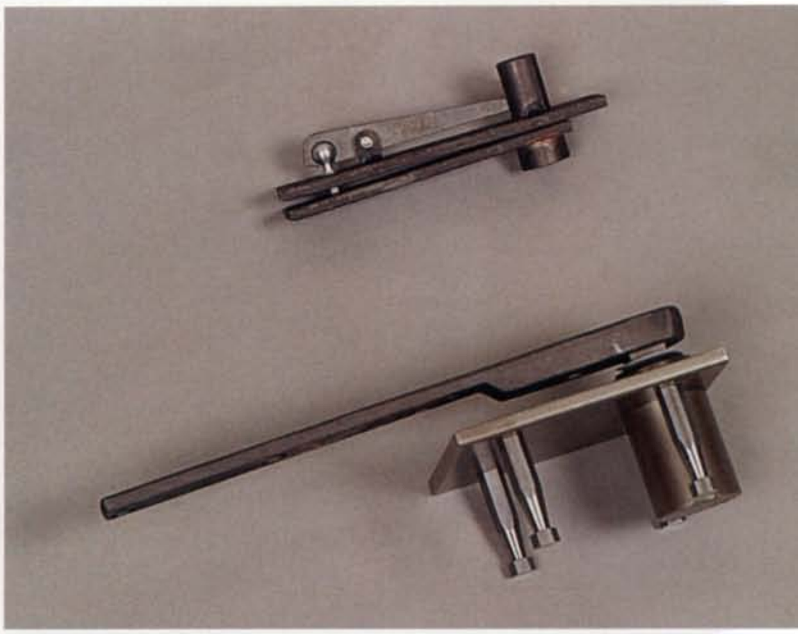
Designing the center cabinet's pivot—After aligning the cabinets and temporarily screwing them down in the shop, we connected the units by building the header over the center opening. Then we went shopping for hinges for the pivoting cabinet. Piano hinges would be strong enough, but they would be visible. Concealed heavy-duty scissor-type barrel hinges would require an additional heavy frame on the stationary cabinet. Therefore, we decided to adapt an industrial-grade heavy-door pivot system. Because the cabinet weight exceeded the pivot capacity, we supported the unit on casters. We selected a #117-¾ lower pivot and #340 upper pivot from Rixson-Firemark, Inc., 9100 W. Belmont Ave., Franklin Park, Ill. 60131; (708) 671-5670, as shown in the center photo on the facing page, and Cushion Ride #II-3 casters from Darnell Corp., PO Box 7009, City of Industry, Cal. 91744-7009; (818) 912-1688. The



pivots are double-acting, meaning they can swing in either direction (although the center cabinet only swings out), and they're designed to mount in the top and bottom edge of a door weighing up to 400 lbs. The casters have soft rubber wheels and rubber shock absorbers that protect the cabinet's electronic components from jarring when the wheels roll from the hardwood floor beneath the cabinet up onto carpeting. The shock absorbers also prevent the pivots from loosening.

Since we had never before used these $500 pivots, we evaluated them first on the drawing board and then with a full-scale mock-up (see the bottom photo). We learned that to keep the pivots out of sight, their axes had to be offset from the cabinet's face, as well as from its right corner. Because of this, the base molding and the side of the stationary cabinet are coved to prevent the cabinet's

__Right:__ The authors cut cubby holes in the triangular cabinet back to accommodate the hinge mounting plate. To allow the touch latches to work, the authors removed the hinge spring so the doors swing free. __Below:__ The lower Rixson-Firemark pivot is cemented into a recess in the floor and its removable arm is screwed to the rotating cabinet's underside. One half of the adjustable upper pivot is screwed to the cabinet top and the other half to the header. The authors positioned the upper pivot with a plumb bob they suspended over the lower pivot point.



Jordan mocked up the rotating cabinet to evaluate the pivot. The varnished wood represents the cabinet's base and the white laminate serves as the cabinet front. The side of the adjacent cabinet is coved to accommodate the pivoting cabinet's corner.

Photos this page: Gary Weisenburger

***Above:** The plywood and ribbed core for the pivoting cabinet's curved side panel is sandwiched between cross cauls in this veneering jig. Then the jig and panel is put into a hydraulic veneer press for four hours. **Left:** Four of these shock-absorbing casters support the pivoting cabinet and cushion the ride for its television. But the authors altered the casters to adjust their height. They welded threaded rod to a plate, bolted the plate to the caster's base and threaded on a new base. The rod sticks through a hole in the cabinet bottom, to which they screwed the new base. They adjusted the caster height by turning the rod, and then they secured it by tightening the lock nut.*

right front corner from binding when the unit is opened. We found the best way to cut the shape in the large panel was to cove a piece of solid sapele, and then inlay it into the side. We also learned that the rotating cabinet's left side panel must be a 44¾-in.-radius curve (with its center on the pivot axis) to clear the stationary cabinet, and both the left and right side panels must be curved symmetrically. After we worked out the mechanics of the pivots on mock-ups, we traced patterns for the cabinet shelves and for the curved top and bottom plates for the side panels.

Laminating the curved panels—We made the curved side panels by laminating ⅛-in.-thick veneered MDF over a 1⅜-in.-thick, hollow lauan plywood and pine frame core. First we made the core frame, which resembles a stud wall. It has vertical ¾-in.-thick by 1⅛-in.-wide upright ribs on 2 in. centers. We used the pivot mock-up to measure the angle on the rear edge of the curved panel, so we could accurately bevel the back rib in each core frame. The ribs are screwed on both ends to curved 1½-in.-thick by 1⅛-in.-wide laminated plywood plates. The four curved plates—one each for the top and bottom of the two panels—are laminated from two layers of ¾-in.-thick plywood and bandsawn to the pattern. After building the core frame, we glued ⅛-in.-thick lauan plywood on each side.

We used the offcuts from the bandsawn plates to build a veneering jig for the curved panels, as shown in the top photo. We made the 26-in.-wide by 80-in.-long jig to match the outside shape of the panel by screwing 10 concave cross cauls, including four of the offcuts, 8 in. on center between two 1x4 plywood rails. Then to make sure we had enough time to press the ⅛-in.-thick lauan plywood on the core frame, we slightly diluted the yellow glue before applying it. Basically, we aligned the outside lauan sheet with reference marks on the jig, tacked the lauan in place and coated it with a heavy layer of glue. We then rolled glue onto the core frame and tacked it in place on the lauan in the jig. We repeated the process to attach the inside lauan skin. Next, we screwed the convex offcuts, plus six more identical cauls, to the jig, as shown in the top photo. Then the whole assembly—the curved jig and cauls with the panel in between—was clamped down in our hydraulic veneer press.

After four hours of drying time, we trimmed excess lauan flush to the core's square front edge with a laminate-trimming bit. To trim the panel's 30° beveled back edge, we modified the router base with an angled block so the bit would be parallel to the core frame. Next we glued and pressed the sapele panel to the inside (concave) surface of both cores. But we waited until after assembling the cabinet to glue on the outer sapele skin. This way, we could screw through the curved side panels to fasten the center cabinet's shelves and its top and bottom panels, and the screw heads would be hidden under the sapele veneer on the outside of the curved panels.

Assembling the center cabinet—After trimming the excess sapele panel flush with the core frame, we bandsawed the cabinet's shelves and its top and bottom, and then assembled the cabinet. We first splined and glued the horizontal top and bottom and the shelves to the left side panel, and fastened them with #8 by 3-in.-long drywall screws. After we fastened the right side panel to the horizontal panels, we laminated the ⅛-in.-thick sapele panel to the exterior sides of the cabinet. To do this, we hand-clamped the sapele between the cabinet and the veneering jig, laminating one side of the cabinet at a time. Next we glued the edgebanded, ¾-in.-thick veneered back panel to the back edge of the curved sides. To complete the center cabinet, we glued a face frame, including the chair rail, to the front edges of the curved side and horizontal panels.

Final details—Before finishing the cabinets and taking them to the installation site, we did a dress rehearsal of the installation. It's a good thing we did, because when we put 400 lbs. of sandbags in the pivoting cabinet to simulate its contents, the shock absorbers in the casters allowed the cabinet to settle under the weight. When this happened, chair rails on the midsection and the stationary cabinets didn't line up. To compensate for this, we removed the casters and attached a heavy adjusting screw to them, as shown in the bottom photo. The threaded rod protrudes through a hole in the cabinet bottom; you can adjust the caster height by turning the rod and then locking it in place with a nut. After this setback, actual cabinet installation took two men less than a day. But before moving the cabinets to the site, we finished them in the shop following a five-stage process: staining, applying a vinyl wash coat, filling the grain, applying a sanding sealer and topcoating with lacquer.

Although electrical power is supplied to outlets inside the stationary cabinet, the wires between components in this cabinet are run through 3-in.-dia. cooling holes in the cabinet back and they're accessible in the 2-in. gap between the wall and the cabinet back. But the wires to the speakers in the triangular modules run through the wall to the backs of those end modules, which are screwed flush to the drywall. To connect the center cabinet's television and large speakers to the other components, we draped all the power, cable and speaker wires from the top of the pivoting cabinet to the top of the right-hand stationary cabinet. □

Carl Jordan is part owner and Tim O'Brien is an associate of Glasbrenner & Associates, Ltd. in Avon, Colo.

Photos this page: Carol Jordan

Making Salad Servers

Curved laminates for lifting the lettuce

by Tage Frid

These light yet strong walnut servers are reoiled every time you toss your green salad and dressing. Their S-curve shape prevents them from sliding into the bowl.

Most of us serve salad with a large spoon and fork, and sometimes both are connected, like a pincer. But I think a fork is unnecessary and a pincer is apt to squeeze the juice from tomatoes before you can get them to your mouth. The pair of S-shaped spoons shown here lets you toss and serve salad without mashing it, and their top curves prevent them from sliding into the salad and getting covered with salad oil. I made the servers by laminating two thin pieces of walnut in a simple jig and by shaping them with basic shop tools. Here's how.

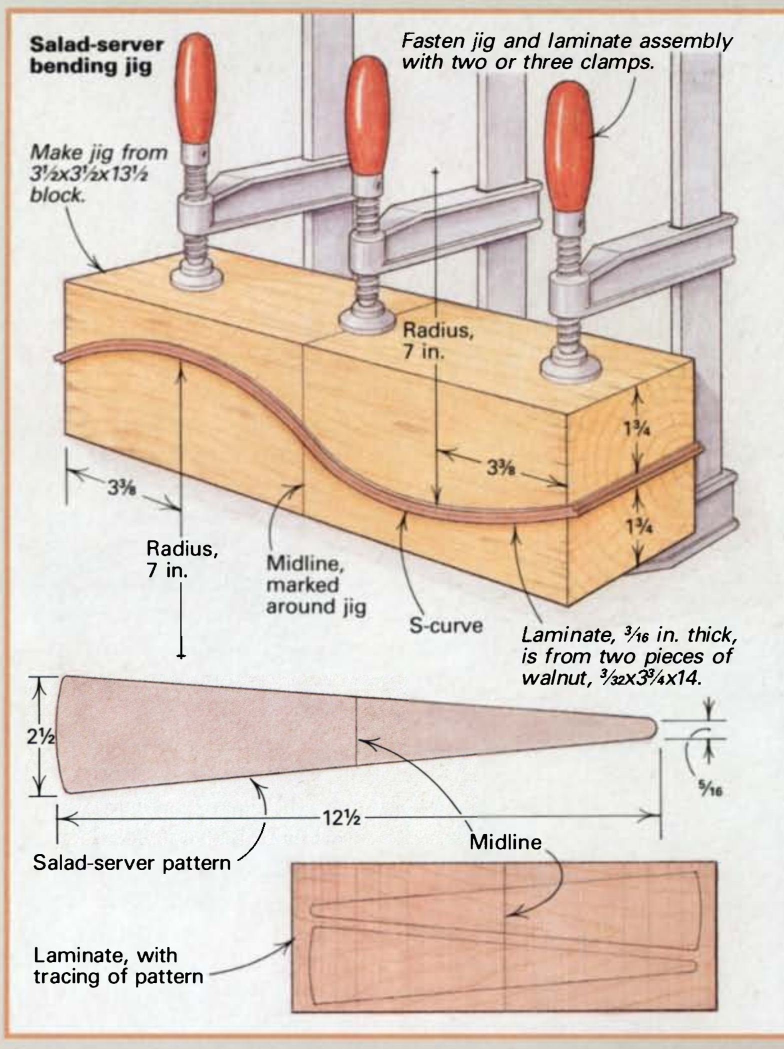
Both spoons are curved identically and are made from a single laminate of two $\frac{3}{32}$x$3\frac{3}{4}$x14 pieces of walnut veneer. You can use multiple layers of any species of veneer, but hardwood is best because it's more durable. The bending jig is easy to make. Start with a $3\frac{1}{2}$x$3\frac{1}{2}$x$13\frac{1}{2}$ block of wood. Lay out the S-curve with two 7-in. radii, and mark a midline around the block $6\frac{3}{4}$ in. from its end, as shown in the drawing. Then bandsaw the block at the S-curve.

Assemble the veneers with non-toxic adhesive, like yellow glue, and make sure their edges are aligned. Now, place the assembly between the jig halves and loosely secure the jig with one clamp in the center. Tap the jig to align its midlines, realign the veneer edges if necessary, and add clamps at each end and tighten them. After you wipe off excess glue, let the assembly dry for 24 hours. If you're neat, you shouldn't have to protect the jig from glue by shellacking and waxing it or by putting newspaper between it and the laminate.

Before removing the clamps, transfer the jig's midline to the laminate and, after removing it from the jig, mark the line across one face of the laminate. Next, make a cardboard pattern of the servers and draw a midline across it, as shown. Mark out each server on the laminate by laying the pattern first in one direction and then the other, aligning the midlines (shown at right). Now bandsaw each server.

I smoothed each server's straight edges, rounded its back and radiused the corners on its end with a belt sander, which I clamped upside down in my workbench vise. If you shape the server with files and sandpaper, clamp it in a vise, but be sure to fill the server's concavity with scrapwood, or the vise pressure may break it.

Finally, smooth the surfaces with a scraper blade and lightly sand them before finishing. Don't use a finish with driers on eating utensils, because the dried film can be toxic. Instead you can use a salad-bowl finish (available from many mail-order suppliers), or you can seal the servers with edible salad oil. Remember not to soak the servers in dishwater because they might delaminate. If you try the servers and decide you'd rather have one as a fork, cut three tines by drilling two $\frac{1}{8}$-in.-dia. holes an inch or so from the end and bandsawing to each hole with two cuts. I like a wide space between tines so the fork is easy to clean. □



Tage Frid is a contributing editor to FWW.

Photo: Susan Kahn; drawing: Vince Babak

To get the best performance and cutting quality out of a bandsaw, you must choose a blade with features that best fit the task. Here, the author uses a ½-in., 3-t.p.i. hook-tooth blade to cleanly resaw an oak board into thin veneers. The blade's wide body is less susceptible to deflection when cutting thick stock.

Bandsaw Blades

Making the right choices for top performance

by Mark Duginske

The difference between being a mediocre or an accomplished woodworker often depends on how well you master the subtleties and small details of the craft, especially when it comes to fine-tuning machinery. The bandsaw, for example, is one common shop tool where the little things can add up to either great or disappointing performance. And one of the most important features of any bandsaw is the blade you choose. Believe it or not, there are more than 500 different bandsaw blades on the market, in various sizes, blade body types and tooth configurations. The blade is an important part of any saw, but with a bandsaw, it is a crucial factor in determining the performance of the machine, and ultimately, the quality of the work you produce with it.

In this article, I'll discuss the various types and sizes of bandsaw blades, so you can decipher the manufacturers' specifications (or carry on an intelligent conversation at your local saw shop) when buying a blade. I'll also elaborate on which blades I've found to be best for particular woods and woodworking tasks. Finally, I'll give you a few pointers on how to adjust your bandsaw and set its guides and thrust bearings for optimum blade performance and longevity; you'll see that some blades need slightly different saw setups than others. But first let's examine the basic qualities and features of the blade itself.

Bandsaw blade anatomy—Basically, a bandsaw blade is a strip of strong, thin steel, with teeth on one edge, that's been welded into a loop. Blade material typically comes in a continuous roll, and then blade manufacturers or saw shops weld up individual blades in different lengths to fit various bandsaws. In action, a bandsaw blade must perform two somewhat contradictory tasks: It must flex around the wheels of the saw yet cut perfectly straight. To accomplish this, the blade body is made from pliable steel that's resistant to metal fatigue from the constant flexing. However, this steel is too soft to hold a durable edge, and so the teeth are hardened after they are ground and set. The blade weld (or braze) must be strong enough to tolerate being tensioned while moving at about 30 MPH during the cut. Further, the weld must be perfectly aligned, lest the blade will vibrate or cut roughly.

In addition to these basic features, each blade design has its own applications and particular cutting characteristics. Blades are distinguished according to several features, including their width and the size and form of their teeth, which determine if the blade will be better suited to coarse or fine cuts, large- or small-radius curves, thick or thin stock, and hard or soft woods. Understanding the functions of the various blade features, as well as the nomenclature by which blade sellers describe them, will help you select the best blade for a particular woodcutting job.

Blade width—When they're sold, bandsaw blades are primarily distinguished by their length, which for any given saw depends on the diameter of the wheels and the distance between them. Blade width is measured from the flat side of the blade to the tip of its teeth. Consumer-grade bandsaws typically use blades that range in width from 1/16 in. to 1/2 in. or 3/4 in. The width determines how tight a radius the blade can cut: The narrower the blade, the tighter the turn. However, the narrower the blade, the more susceptible it is to deflection. For this reason, wider blades are preferred when making straight cuts in thick stock or when resawing.

In most cases, it's best to select the widest blade that will cut the smallest-radius curve you need. You can find charts in machinery reference books or sometimes on a blade box that show blade width/minimum radius. But I find it easier to remember a few household items that indicate minimum cutting diameters: a 1/8-in. blade cuts to the diameter of a pencil eraser; use a dime for the 3/16 in., a quarter for the 1/4 in., the base of a traditional-style teacup for the 3/8 in., and the rim of the teacup for the 1/2 in.

Unless your bandsaw's wheels are 18 in. in diameter or larger, a 1/2-in. blade is the widest I recommend. Although some owner's manuals say that you can use a 3/4-in. blade, the bandsaw's crowned wheels only contact wide blades in the center, and this can cause the blade to rock back and forth, resulting in excessive vibration. Also, 3/4-in. blades are thicker than narrower blades and tend to break prematurely when they are forced to bend around smaller wheels; it is also difficult for a smaller saw to put enough tension on a wide blade to make it perform properly.

Tooth pitch—A blade's pitch refers to the size of the teeth, which largely determines both how fast and how smooth the blade will cut. Pitch is usually stated as teeth per inch (t.p.i.), which is the number of teeth on 1 in. of blade. Generally, the finer the pitch (the more teeth per inch), the slower but smoother the cut. The coarser the pitch (larger the t.p.i.), the faster but rougher the cut. Narrow blades usually have a fine pitch. There are some wide blades available with 14 or 18 t.p.i., and these usually provide the best combination of fine teeth, blade strength and heat dispersion for cutting non-ferrous metals and very hard exotic woods.

To keep a bandsaw blade from binding in the kerf of the cut, the teeth are "set": bent slightly to alternating sides to make the front of the blade thicker than the back. The number of set teeth on any given blade is usually determined by the pitch. On blades with a fine pitch, every third tooth is a "raker," or unset tooth; the tooth before each raker is set to one side and the tooth after each raker is set to the other side. On some coarse-pitch blades, every fifth or seventh tooth is a raker and those between are set alternately.

When selecting blade pitch, you should consider how thick your workpieces will be and pick a blade that will have at least three teeth in the workpiece at all times during the cut. This guarantees a smooth transition: as the tooth at the top enters the wood, the bottom tooth exits. By choosing the proper pitch, you'll get a clean cut, little vibration, easy feeding and long blade life. Of course, very thin wood, less than 1/4 in. thick, is the exception because it is less prone to vibration or chatter. It's also important to match pitch to the hardness of the material. The harder the wood, the finer the pitch should be; the softer the wood, the coarser the pitch. If the pitch is too coarse, you'll notice vibration and chatter, but if it's too fine, the blade will produce excessive heat, which shortens blade life. A fine-pitch blade also requires more feed pressure, which produces more heat. The moisture and resin content of the wood must also be considered. Green or wet wood requires a coarser pitch, not finer than 6 t.p.i., to keep the blade gullets—the hollows between teeth—from clogging with chips (this is especially true with thick stock). Resinous woods like pine (even when properly dried) also require a coarser pitch, not finer than 14 t.p.i., so they won't gum up the blade. Wood resins can even bake onto the teeth of a hot blade, requiring cleaning with mineral spirits and a fine-wire brush. Non-resinous woods such as oak, maple and walnut can be cut with a fine-pitch blade (14, 18 or 24 t.p.i.) without clogging or gumming problems. Very dense exotics like rosewood, ebony and teak require a blade with between 12 and 18 t.p.i. These woods are hard enough to quickly destroy a finer blade due to the heat generated from cutting. Therefore, use a wide blade with these exotics if possible; a wide blade body acts as a heat sink, keeping the teeth cooler and increasing the length of time they stay sharp.

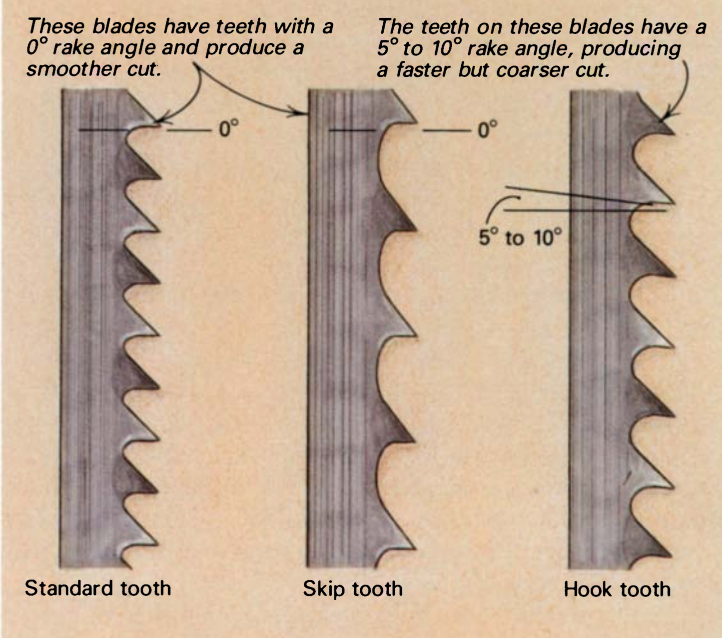
Tooth form—This term describes the shape of the tooth, the size and shape of the gullet between the teeth, and the rake, which is the angle of the cutting edge of the tooth relative to an imaginary line perpendicular to the back edge of the blade. The rake determines the angle at which the tooth contacts the wood, and is the single most important factor affecting a blade's cutting performance.

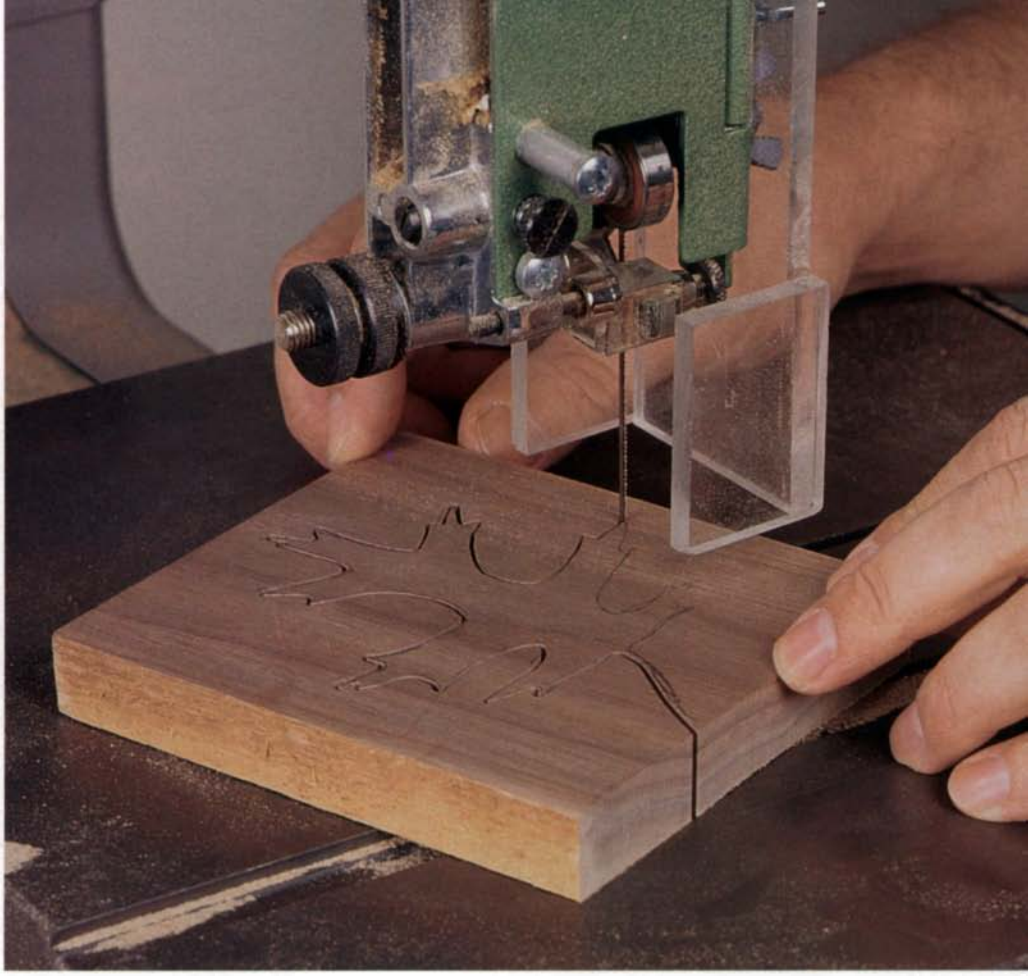
Woodcutting bandsaw blades usually come in three tooth types: standard, skip and hook (see the drawing below). The standard and skip designs have a 0° rake. In contrast, a hook-tooth blade has a positive rake of 5°, 7° or 10°, causing the teeth to cut more aggressively. Unfortunately, this produces a rougher cut than a standard- or skip-tooth blade, where teeth work with a scraping action that creates a smoother cut, but hook teeth generate less heat.

A standard-tooth blade has a gullet the same size as the tooth. These blades are most commonly available in narrow widths, such as 1/8 in. and 1/16 in., and the latter is only available with standard teeth. Because of their numerous teeth and 0° rake, these blades produce very smooth cuts.

A skip-tooth blade, as its name implies, has half as many teeth as the standard tooth, and thus larger gullets between teeth. The skip-tooth design comes in all blade widths except 1/16 in., which isn't wide enough to accommodate the large gullets. Skip-tooth blades cut much faster than standard blades, but the finish they leave behind is coarser, especially on crosscuts. They also last longer

Three common bandsaw blade tooth forms





Above: *Although hundreds of blades are available, Duginske uses only five for the majority of his bandsawing jobs. The blades are, from left to right: a ½-in., 3-t.p.i. hook tooth; ¼-in., 4-t.p.i. skip tooth; ¼-in., 6-t.p.i. hook tooth; ⅛ in. 14 t.p.i.; and a ⅟₁₆ in. 24 t.p.i.* ***Right:*** *A ⅟₁₆-in. blade's ability to make extremely tight turns and produce an exceptionally smooth cut make it ideal for intricate patterns, like this maple leaf Duginske is sawing from walnut.*

because they generate less heat; fewer teeth means less friction. Further, skip-tooth blades have larger gullets than regular blades do, which make them less prone to breakage, and their larger capacity makes for good resawing. However, skip-tooth blades tend to vibrate (called harmonic flutter), which can leave a rough diagonal corduroy pattern on the surface of the cut. If you encounter this condition, reduce your feed rate, change your blade tension (either increasing or decreasing it slightly may work) or switch to a finer-tooth blade.

The positive rake angle on a hook-tooth blade makes its teeth bite into the workpiece more aggressively. This design, combined with rounded gullets that resist clogging, gives hook-tooth blades several significant advantages when they're used for cutting wood with the grain, such as ripping or resawing. The positive-rake teeth actually pull themselves into the stock, so cutting requires less feed pressure. This places less stress on the blade body, decreasing the likelihood of deflection and wandering cuts, and less pressure on the bandsaw's thrust bearings. Because of these characteristics, hook-tooth blades stay sharp longer and produce good results at a moderate blade tension. Their only drawbacks are that they require more horsepower while cutting and they tend to make rough crosscuts.

Choosing the right blade—Beyond specifying a blade that's the correct length for your bandsaw, selecting the right combination of the features described above can make choosing a blade complex and confusing. Unfortunately, there is no one magic blade that does everything well. But you can easily assemble a small collection of blades that will let you do almost any bandsawing task cleanly and efficiently. For almost all my work building furniture and cabinets, I use one of five different blades, shown in the left photo above, and switch to a special-purpose blade only when necessary (discussed later).

My two narrowest blades are a ⅟₁₆ in. 24 t.p.i. and a ⅛ in. 14 t.p.i. The ⅟₁₆-in. blade yields an exceptionally smooth cut and I find it much faster for sawing intricate patterns or open fretwork than a scroll saw (see the above photo at right). The blade's only weakness is that its teeth are too fine for resinous woods. The ⅛-in. blade also yields a fairly smooth cut, and saws through pine with less clogging. It's my blade of choice for crosscutting small pieces and sawing fine joinery, such as dovetails. This size is also a good choice for fine cuts in harder woods like maple, hickory or exotics. I prefer the standard-tooth design, but a ⅛-in. skip-tooth blade is also available for faster yet rougher cuts, such as for sawing out a curvaceous cabriole leg.

Among medium-width blades, my choices are a ¼-in., 4-t.p.i. skip tooth and a ¼-in., 6-t.p.i. hook tooth. These two blades provide a wide range of cutting options, and either can be left on the saw as a general-purpose blade. The 6 t.p.i. is better for a finer finish cut in harder woods (see the top photo on the facing page), while the 4-t.p.i. skip tooth is better in thicker stock for quickly cutting out curved parts. The 4 t.p.i. can even be used for resawing in a pinch, and it's also my choice for cutting basic joinery, such as tenons. If you plan to cut very hard woods, you might also want to keep a ¼-in., 8-t.p.i. standard- or skip-tooth blade on hand.

My favorite blade for making long, straight cuts and for resawing is a ½-in., 3-t.p.i. hook tooth. If you are cutting a lot of medium-thick (1¼ in. to 1½ in.) stock or dense exotics, you may consider selecting a 4-t.p.i. or 5-t.p.i. hook-tooth blade instead. For your most demanding resawing jobs, such as cutting a board into thin veneer, use a new blade or set aside a sharp ½-in. blade just for resawing.

There are hundreds of special-purpose bandsaw blades designed for cutting metal, plastic and other materials. For particleboard, wood with lots of knots or very hard exotics, a bimetal blade, with its durable high-speed steel teeth, is a good choice. However, I find that these blades are impractical for general woodworking. Besides being expensive, bimetal blades are primarily designed to run at low speeds in metal-cutting applications, and the stiff blade body tends to vibrate or fatigue prematurely on saws with wheels less than 20 in. in diameter.

Saw setup for best blade performance—Woodworking bandsaw blades are designed to be disposable. Even if you could find a saw shop to resharpen one, it would probably cost more than a new blade. Therefore, it's important to extend the usable life of a blade as long as you can. Blades can take a lot of wear, but they cannot tolerate abuse by being run on an improperly adjusted saw. Before expecting good performance from any blade, the bandsaw's wheels should be aligned, as described in my article in *FWW* #75, and the saw's tires should be clean and in good shape. The time this takes is insurance that your blade will track evenly and cut without twisting or deflecting.

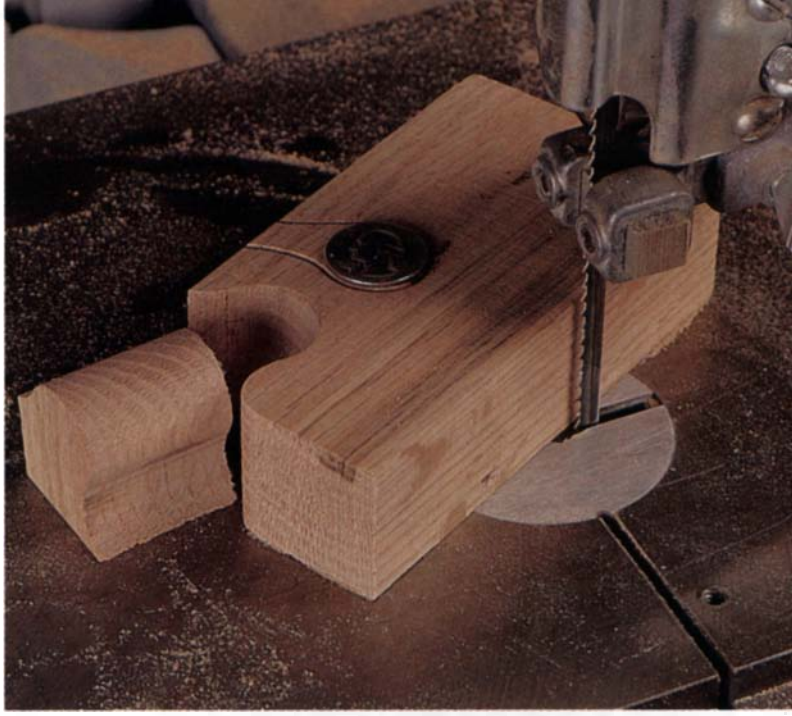
Next, the bandsaw's thrust bearings and blade guides should be adjusted meticulously. First, rotate the blade so that the weld (the least-straight part of the blade) is directly opposite the guide assembly. Then lower the guide post until the upper guide assembly is about 1/4 in. above the workpiece. (Don't wait until after adjustment to do this; moving the guide post can throw the following adjustments off.) Each thrust bearing should be set to leave about a 1/64-in. space between it and the back of the blade. If you have metal blade guides or guide bearings, set about 0.004 clearance (the thickness of a twice-folded dollar bill) between the blade and the guides, placing the guides just behind, but not touching, the teeth. For optimum performance, the thrust bearing and guides should be readjusted each time the guide post height is reset.

The guide and thrust bearing setups are a little different for 1/16-in. and 1/8-in. blades. These blades work better and last longer if the thrust bearings are advanced 1/64 in. past the point of contact with the back of the blade; this gives the blade body more support. Also, raise the upper guide assembly about an inch above the workpiece, to allow the blade to flex back gently during cutting. If the upper guides are closer, they force the blade to bend back sharply during cutting, which increases stress and shortens blade life. To protect against injuries from the extra blade that's exposed, I made a clear plexiglass guard and screwed it to the top guide assembly (shown in the photo at right on the facing page).

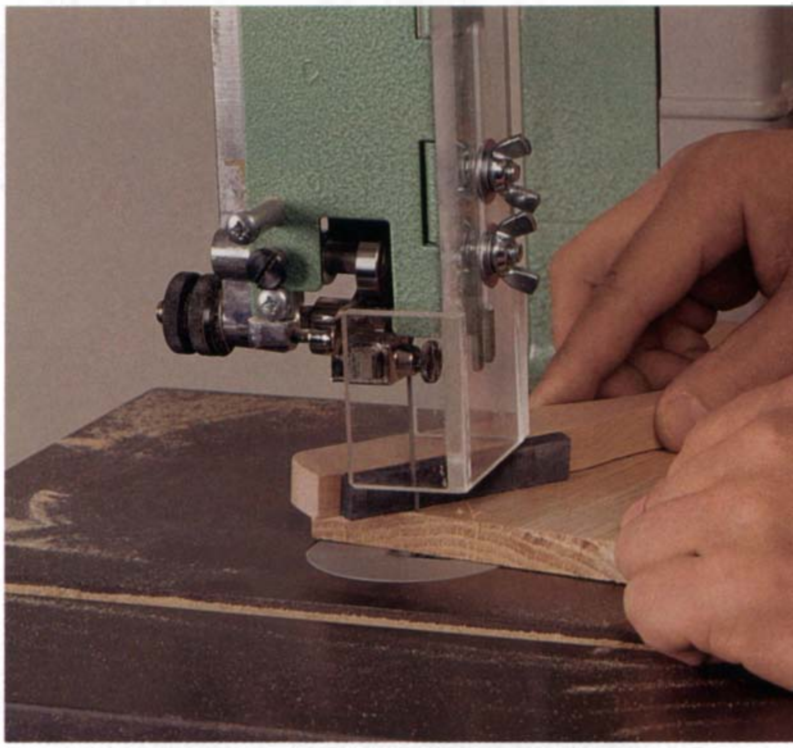
An excellent way to extend a blade's life, as well as improve its performance, is to round its back edge with a file or stone. This eases the blade's normally sharp-cornered back edge, allowing the blade to run smoother in the kerf, especially when cutting tight radii. Rounding also makes the blade body less susceptible to metal fatigue and failure, increasing blade life (rounding has *tripled* the life of my 1/16-in. blades). And it evens out the weld seam, allowing the blade to run more smoothly and quietly. However, rounding won't fix a bad weld; if the weld on a new blade seems misaligned, return it.

I round the back of the blade while it's running on the saw by lightly touching the back corners with a file, diamond hone or sharpening stone. I've had the best results using a silicon-carbide stone fitted on a wood handle (available from Garrett Wade Co., 161 Ave. of the Americas, New York, N.Y. 10013, and Woodcraft Supply, 210 Wood County Industrial Park, Parkersburg, W.V. 26102-1686). Because this is a grinding process, be sure to wear safety glasses, and since sparks are created, clean out the sawdust from the inside of the bandsaw first. Start by holding the stone against the back corner of the blade and then move it back and forth for a minute or so. After rounding the other corner, sweep the stone around the back of the blade in a continuous, smooth motion. Since rounding the back of a narrow blade can push it off the wheel, lightly feed a scrap of wood into the blade during rounding (see the bottom photo).

Blade life and tooth sharpness are both prolonged if a blade produces as little heat as possible while it's cutting; ideally, the teeth should be dull by the time the blade breaks. Narrow blades are most affected because they do not dissipate heat as well as wide blades. You can prevent the blade from heating up by replacing your standard metal guide blocks with special aftermarket guides, called Cool Blocks (available from a variety of mail-order tool suppliers). These contain a dry lubricant, which decreases the friction between the guides and the blade, and they actually polish the blade to increase its lubricity and extend its life. □



__Above:__ For smooth curved cuts in thick hardwoods—down to radii as small as a quarter—a 1/4-in., 6-t.p.i. hook-tooth blade excels. Many woodworkers like to keep either a 1/4 in. 6 t.p.i. or 4 t.p.i. on their saw as their general-purpose blade. __Below:__ Rounding the back edge of a bandsaw blade with a sharpening stone or file makes it cut smoother and last longer. When rounding a narrow blade, the author lightly feeds a scrap of wood into the blade to keep the pressure of the stone from forcing the blade off the wheel.

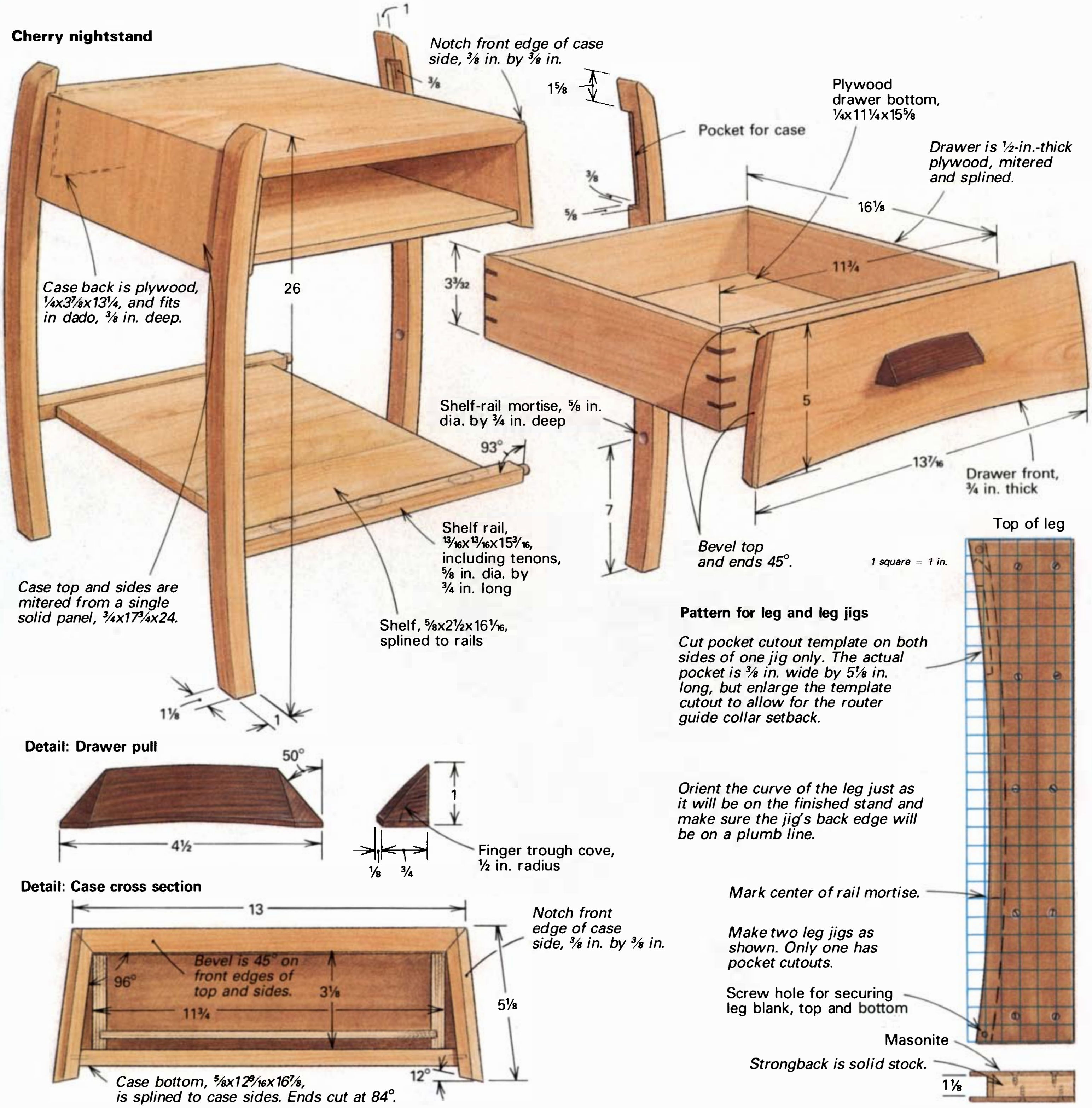


Mark Duginske is a consulting editor to FWW *and an author, teacher and woodworker in Wausau, Wisc.*

Curved-Leg Nightstand

Tablesawn splines reinforce mitered drawer

by Judith Ames



Curved parts can instill a piece of furniture with visual tension. The springy arched legs of the nightstand shown here, for example, give the piece an animated look, like a puppy ready to pounce. In fact, when I delivered the first completed pair, I teasingly included feeding and care instructions.

The basic concept of the nightstand is very straightforward, as you can see in the drawing; the drawer case nestles into pockets routed in each leg. The construction, however, is complicated by the bandsawn curve of the legs, the angles of the drawer case and the beveled-and-inset drawer front. When building furniture with curved parts, jigs are helpful for orienting each curved piece along the straight horizontal and vertical lines necessary for machined joinery. And a few hours invested in constructing a jig allow precise and easy repetition of a machining process. That's why the description that follows begins with a story of jigs.

Making the leg jigs—Two jigs are required for machining the legs. The jigs are almost identical, but one is used as a template for trimming the legs to shape and the other is notched to provide templates for routing the pockets into which the corners of the drawer case fit (see the detail in the drawing on the facing page). Each jig consists of a 1⅛-in.-thick solid wood strongback sandwiched between two pieces of ¼-in.-thick Masonite. One edge of each strongback is curved to receive a leg's convex curve. The curved edges of the Masonite pieces overlap the strongback and provide templates for trimming the concave curve of the leg blanks with a router and a 1-in.-long flush-trimming bit. Because the pocket cuts in the legs will be made with a straight mortising bit and a router-base-mounted guide collar, the notches in the pocket-cutting jig are ³⁄₃₂ in. larger than the actual leg pocket, to allow for the setback between the collar and the bit's edge.

To begin, make a leg pattern by referring to the gridded portion of the drawing. Plot points along a full-scale grid you've drawn on a piece of Masonite and connect them in a continuous, even curve by drawing along the edge of a ¼-in. by ¾-in. strip of hardwood bent so it touches each point. Bandsaw close to the line and carefully true up both curved sides with a rasp or spokeshave. Take care to keep the edges square with the pattern's surface. Note: the pattern is 1 in. wide, the actual width of the finished leg, but it should be 28 in. long. The leg blanks will also be rough-cut 28 in. long, which allows 1 in. extra at each end for screwing the leg to the jig.

Use the pattern to lay out the curved parts for the jigs so that the back edge of each jig is plumb in relation to the curve of the standing leg; this ensures that the shelf-rail mortises will be drilled at the proper angle. Bandsaw the parts, leaving the lines, and then screw the pattern to each part and use it as a template to flush-trim the parts with a router. Carefully mark and bandsaw the pocket cutouts in two of the Masonite jig parts. Finally, glue and screw the parts of the jigs together using the pattern to check the alignment of the strongback and the Masonite pieces.

Shaping the legs—Select stock with grain that follows the leg curve as closely as possible, and plane it to 1⅛ in. thick. Then, locate the pattern on the face of the boards (positioned for minimal grain runout), and draw the legs, leaving about ³⁄₁₆ in. between them. Bandsaw the blanks and true up the convex curves with an edge sander, a belt sander mounted square to a table, or a spokeshave or handplane, using the pattern to check the accuracy of the curve. Next, you can trim the blanks' concave curves in the leg-trimming jig. Place each leg in the jig and secure it with a screw in each end. Then, trim the curve with a router or shaper using a 1-in.-long flush-trimming bit set so the bearing will run along one of the Masonite templates.

The mitered drawer case and its beveled-and-inset drawer front give this cherry nightstand a clean, uncluttered look. But the curved legs give it character and make it a challenge to build.

The next step is to rout the leg pockets, but first examine the grain patterns and colors of the trimmed legs, to decide where each will look best. Now, label them accordingly—front or back and left or right—and mark the corner that will get the pocket cutout. The ⅜ in. width of the pockets is determined by the template on the jig, but the pockets in the front legs are ⅝ in. deep while those in the back legs are 1 in. deep. Set up the router with a ½-in.-dia. mortising bit and the appropriate guide collar, and then adjust the router for a ⅝-in.-deep cut. Screw one of the front legs into the jig and clamp the jig to the workbench with the proper side up for the leg you are working on. I made a full-depth cut at each end of the pocket to prevent chip-out and then I raised the bit and made two or three passes to cut the rest of the pocket to full depth (see the bottom photo on the next page).

While the leg is still in the jig, you can drill the ¾-in.-deep mortise in the concave edge to receive the front and rear shelf-support rails. Since the back of the jig is plumb, relative to the curve of the leg on the finished piece, you can bore the mortise at the correct angle on the drill press. Clamp the pocket-routing jig to a fence attached to the drill press table so the center of the mortise, which is determined by a line marked on the jig, lines up with the tip of a ⅝-in.-dia. brad-point bit (see the top photo on the following page). After drilling the hole, remove the leg from the jig and repeat these procedures for the mortises in the other legs. Remember to make the back-leg pockets 1 in. deep. Then use a chisel to square up all the pockets' round corners left by the router bit. Finally, bandsaw the top and bottom of one leg to the angles given in the detail in the drawing on the facing page, and then use it to mark the other legs by aligning the pocket cut-

Photo this page: Mark Van S; drawing: Bob La Pointe

Left: *Ames cuts a pocket for the drawer case with a leg mounted in a router jig, setup with a mortising bit and a guide collar screwed to the base. The leg's concave curve has been flush-trimmed in a similar jig, but without pocket cutouts.* ***Above:*** *The shelf-rail mortise is drilled with the leg still mounted in the pocket-routing jig. The jig's back is plumb relative to the curve of the finished leg, which ensures that the holes will be drilled at the correct angle.*

outs. Complete the legs by sanding all surfaces to 150-grit and then ease all the edges slightly.

Building the drawer case–The drawer case sides and top are made from a 3/4-in.-thick panel that is mitered 5 1/8 in. from each end so it will "wrap around" to form the upper portion of the case. Thus, the grain pattern flows uninterrupted around the top and sides of the case. Select the boards with the prettiest grain pattern for this panel, match them carefully edge to edge, and then glue them up to form a panel about 18 in. wide by 25 in. long. Also, choose a good-looking, 3/4-in.-thick piece that matches the case panel and mill it to 6 in. wide by 15 in. long for the drawer front. Next, plane the stock for the case bottom and the low shelf to 5/8 in. thick, and glue up these two panels (both slightly oversize). At this time you can also mill the two 13/16x13/16x16 boards for the shelf rails. I used 1/4-in.-thick cherry veneered plywood for the case back and the drawer bottom, and 1/2-in.-thick plywood for the perimeter of the drawer.

After all the parts are rough-milled, square up the panel for the top and sides, and then rip it to 17 3/4 in. wide and crosscut it to 24 in. long. Before sawing the sides from the top, you need to do the following: cut the dado for the case back about 1/4 in. from the rear edge of the panel, rip a 45° bevel on the panel's front edge, and sand the sawmarks from the bevel. Now you're ready to crosscut the sides from the ends of the panel. The sides and top on the finished case come together at a 96° angle; therefore, each piece must be cut at 48°. To make these cuts, tilt the tablesaw blade to 42°, the complement of 48°, and use a sliding crosscut box. Set a stop block so the angled blade will cut through the panel's upper surface 5 1/4 in. from its end. Accounting for the approximately 3/16-in.-wide sawkerf of the tilted blade (based on a 1/8-in.-wide carbide blade), you should be left with a 13 1/16-in.-long top piece. Now, trim both ends of the top at a 48° angle, cutting no more than 1/16 in. from its length. Finally, readjust the blade to 12° and trim the bottom ends of the side pieces.

Normally I would use splines to reinforce long miter joints, like those between the top and sides. But here all four upper corners will be securely locked into the leg pockets, and so the strength of the glued miter joint is sufficient. I do, however, use biscuit splines to locate and join the case bottom to the sides.

The angles, length and location of the bottom must be very precise to keep all the joints tight. So, working from the dimensions in the drawing on p. 66, cut the bottom to length at opposing 84° angles and carefully locate the biscuit slots in both sides. Then, adjust the plate joiner to the appropriate angle for cutting slots in the sides by taping a 6°-angle wooden wedge to the joiner's base. The same wedge, applied to the joiner's fence, gives the correct angle for the slots in the case bottom's ends. After cutting the slots, dry-assemble the case to make sure the joints come together. To do so, lay the top and sides end to end with their inside faces down on the bench, and connect both joints with several strips of filament-reinforced strapping tape. Then, turn the parts over, insert the biscuits, and slip the bottom into the taped-up case assembly. If the miters don't close, trim the bottom slightly; if the bottom fits too loosely, trim the top length carefully. When you've got a perfect fit, give the inside surfaces a final sanding.

Gluing up the case and legs–Since you already taped the sides and top together when you checked the fit of the bottom, you can now lay the assembly on the bench with the miters open. Begin by gluing biscuits into the slots in both of the sides and then glue the bottom to one of the sides. Next, spread glue in that side's miter joint and close up the miter by lifting the side and bottom. Slide the 1/4-in.-thick plywood back into its dado to help support the bottom, which is now cantilevered over the top. Spread glue in the other miter joint and in the biscuit slots in the bottom's open end, and then lift the other side to insert the splines, as shown in the top photo on the facing page. I used bar clamps to pull the spline joints home and stretched four lengths of strapping tape from side to side across the bottom. Then I removed the clamps and set the case aside to dry. If the joinery is precise, the tape provides sufficient force to hold everything together and eliminates the chance of the clamps forcing the case out of symmetry.

Before the case will fit into the pockets on the front legs, you need to trim 3/8 in. off the beveled front edges of its sides. This will create a flat area on the front of the sides that coincides with the 3/8 in. width of the leg pockets (see the drawing on p. 66). Using a crosscut box on the tablesaw, set the blade to cut 3/8 in. deep and then stand the case on its side against the crosscut box's fence to make the cut. Trim the bevels on both sides in this manner, but use a fine-tooth handsaw for the perpendicular cuts at the top mitered corners. Test-fit the case to the leg pockets and, if necessary, trim the bevel a bit more until it fits. When it does, sand the top and sides of the case to 150-grit.

Now you can dry-assemble all four legs to the case and measure between them for the length of the shelf rails and the width of the shelf. Crosscut the rails to length, adding 1 1/2 in. for the two 3/4-in.-long tenons. You can cut these 5/8-in.-dia. round tenons with a dowel cutter chucked in the drill press. Dowel cutters, which are available from many mail-order supply houses, are similar to plug cutters but are capable of a deeper cut. Center the tenon and make it a scant 3/4 in. long, so it doesn't bottom out in the mortise. I made a simple U-shaped jig, with its ends cut at 93 1/2°, to hold the rail and to guide the handsaw for cutting the angled shoulders. Then I sanded the rails and shelf to 150-grit, slotted them for biscuit splines and glued them together.

Now you're ready to glue up the nightstand. Yellow carpenter's glue should give you enough working time, but if it's a hot day, add a little water to lengthen the setting time or switch to hide glue if you want to avoid the rush entirely. Spread glue on the shelf-rail mortises and tenons and in the leg pockets, mindful of not having too much squeeze-out. Clamp side to side, directly across each shelf rail, and side to side and front to back around the drawer case.

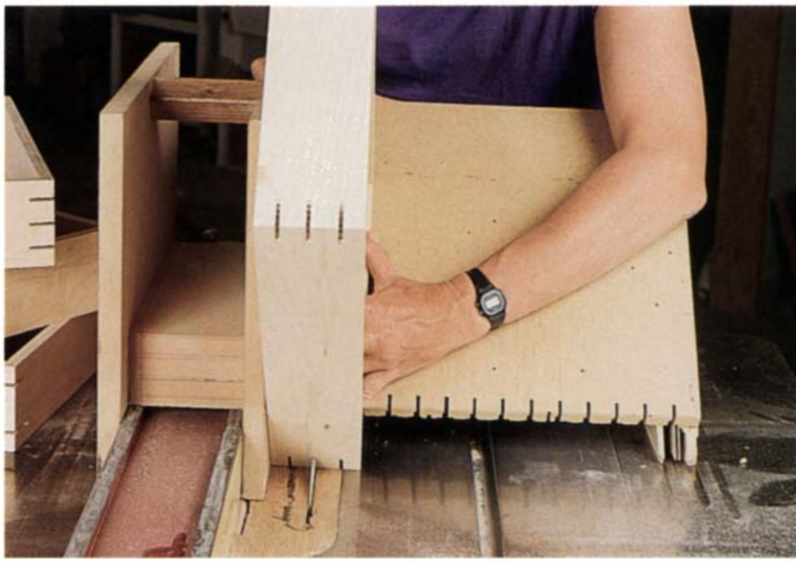
Assembling the drawer—You now have a nightstand that needs a drawer. Despite the trapezoidal shape of the opening, the drawer sides are not angled to match. I made the drawer parts 1/32 in. shorter than the height of the opening and sized the drawer to fit exactly the width at the top of the opening. Then all it took was a light pass or two with a handplane along the top outer edge of the drawer sides to achieve a perfect fit within the case; no need for side or bottom guides. The mitered drawer body is constructed in the same way as the case top and sides. The plywood parts are mitered, dadoed for the bottom, taped together end to end, and then glued up around the bottom using strapping tape to hold the last corner together. However, because the drawer corners are not confined as the case corners are, I reinforced them with splines. The bottom photo shows the tablesaw jig I used to hold the drawer at a 45° angle while cutting the spline grooves across its corners. I used a carbide sawblade that I had sharpened to a flat-bottom kerf especially for this operation.

Cut the ends of the drawer front at a 96° angle so that the front will just fit between the legs and come flush with the top front edge of the case. Then rip the drawer's top edge at a 45° bevel to mate with the case's beveled top edge. Note that the ends of the drawer front are only beveled partway to match the bevel of the case sides and the flat of the legs (see the drawing). The drawer front measurement should be exactly the same along the length of its inside face as the opening in the case. Now you want to slightly curve the flat areas on the ends of the drawer front to follow the gentle curve of the legs. Lastly, lay out the gentle bottom curve on the drawer front with a 1/4-in. by 3/4-in. bending stick, and then bandsaw the curve and true it up with a spokeshave.

To mount the drawer front, attach double-faced tape to the front of the drawer body and place the drawer in the case so it protrudes slightly. Then align the drawer front with the top edge of the cabinet and press it against the tape on the drawer body. Carefully withdraw the drawer and stand it upright on the drawer front, so you can drill pilot holes for attachment screws from inside the drawer. Remove the tape, countersink the pilot holes and screw the front to the body. You can enlarge the pilot holes in the drawer body to provide a little slack for fine-tuning the fit.

The first step in making the 4½-in.-long wenge drawer pull is to rout the finger trough in its back bottom corner. Because of the difficulty and danger of routing such a small piece, you should begin with a piece of wenge that is 7/8 in. by 1 in. and at least 10 in. long. If I'm making several pulls, I'll use a piece long enough for all the pulls I need. In any case, be very careful. I think the best way to make these cuts is to clamp the workpiece in a bench vise and use a bearing-guided ½-in.-radius cove bit in a hand-held router. Mark the 4½ in. length for each pull, allowing 1/8 in. between for sawing them apart later. Then mark 5/8 in. from both ends of each pull to denote the ends of the finger trough. Set the bit to make a ½-in.-deep by ½-in.-wide cove and cut all the troughs. Next, rip a 45° angle on the face of the pull stock and crosscut the pulls to length so that the ends have opposing 50° bevels.

Above: *After applying strapping tape across the case's top-to-side miter joints, Ames flips over the taped up parts, brushes glue on the joints, folds the sides up and inserts the splines into the slots in the bottom's edges. A few lengths of tape stretched from side to side across the bottom will provide adequate clamping pressure.* ***Below:*** *After gluing the mitered drawer body together, Ames cuts the grooves for the corner splines with a jig that holds the drawer at a 45° angle to the saw table and rides along the rip fence.*

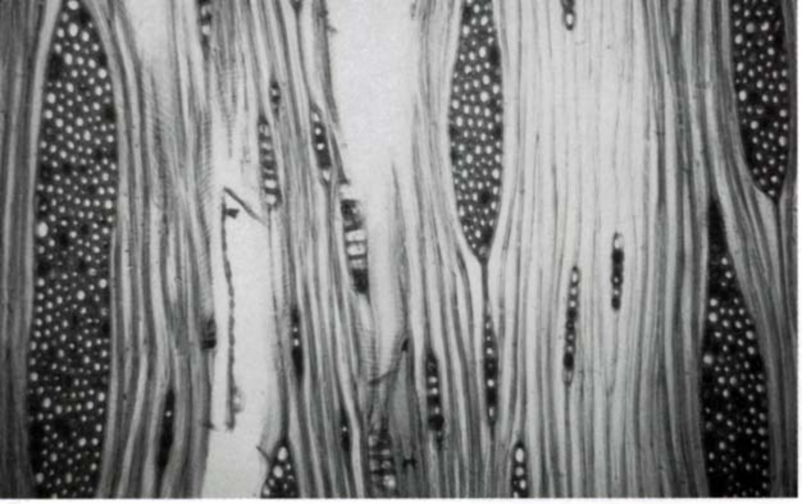


The final shaping was done freehand against an edge sander fitted with a 100-grit belt. First I beveled each end about 30° from the back to the front. Then I sanded a slight arch from end to end along the top edge and did the same on the pull's 45° face. Finally, I moved to the sander's exposed drum and shaped a concave curve along the bottom to match the arch on the top, and hand-sanded to 220-grit.

I attached the pull to the drawer front with 3M's DP110 industrial-grade epoxy. Then I gave the whole nightstand a final sanding with 220-grit before applying three coats of an oil-varnish mix. □

Judith Ames builds custom furniture in Seattle, Wash.

Photos except where noted: Jim Boesel



***Left:** Soft maple's grayish cast may distinguish it from hard maple's creamy white to light reddish-brown color, but a microscopic check is reliable. Magnified 10 times, hard and soft maples look similar. The rays in this red maple sample (soft) look like fine, evenly sized and evenly spaced lines. **Far left:** Magnified 250 times, you see that ray width (seriation) is up to eight cells wide in this sugar maple sample (hard). Rays are only up to five cells wide in soft maple.*

Adventures of a Wood Sleuth

Making a positive ID settles each case

by Bruce Hoadley

When I was a student majoring in wood technology, I accepted my wood anatomy and identification curriculum as just one more of the many academic requirements for professional competence. I knew my wood-identification skills were important in many phases of wood technology, but I gave little thought to ever using this expertise outside my chosen field. During these subsequent years, however, I have been fascinated by the parade of wood-identification problems that have come my way from all walks of life. Of the calls and letters I receive asking for assistance in identifying wood, only the occasional inquiry is directly related to my own profession as a wood technologist and then it usually involves some routine problem in lumber sales or manufacturing technology. Most of the requests come from the unrelated fields of science, commerce and law. In some cases, identifying the wood is the only matter of concern; in others, identifying one or more wood samples is but a small piece of a much larger and more complex problem.

The anecdotes that follow are offered as a sampling of the surprising breadth of wood-identification applications in the real world. They also serve to illustrate a few of the principles, techniques and anatomical features that are involved in identifying wood.

Commercial lumber questions—As might be expected, disputes between vendors and customers concerning the species of hardwood or softwood lumber arise from time to time. If I were to single out the most frequent controversy in this category, it would be whether soft maple has been substituted for hard maple in a lumber shipment.

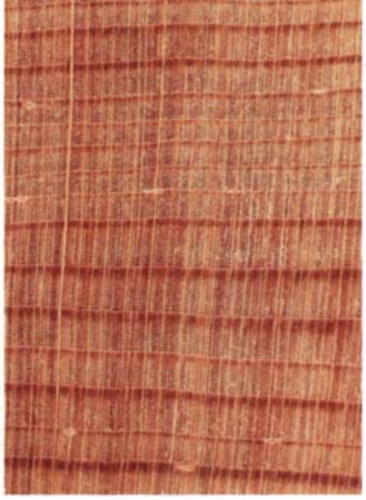
Typically, the customer suspects that the lumber is not hard maple because an unusually large number of pith flecks is evident on the tangential surfaces of boards after they are dressed. Pith flecks are found regularly in soft maples (shown in the above, right photomacrograph); however, they are occasionally numerous in hard maple. Therefore, hard and soft maples are separated more reliably by examining the rays with a microscope (see the above, left photomicrograph), rather than with a hand lens.

In one instance, I examined a total of 12 tangential sections from 3 boards, and the largest rays were 4 and 5 seriate (the width of rays measured in cells). Only 2 rays were 6 seriate, and gray-colored mineral streaks were also evident. Therefore I concluded that the lumber was indeed soft maple, as claimed by the customer. In all other instances of this hard vs. soft maple controversy, however, I was able to find many rays that counted 8 or more seriate in every tangential section sampled, indicating that the lumber was hard maple, as claimed by the supplier.

Another commercial-shipment question stands out in my mind because of the personal embarrassment it caused me. In the midst of a busy day, I received a call from an engineering firm that was participating in the renovation of a large warehouse. Douglas fir *(Pseudotsuga menziessi)* had been specified for the structural posts, but upon receiving the shipment, the firm suspected that another species had been supplied.

The project was on a tight construction schedule, and before proceeding, the contractor wanted confirmation that the timbers were Douglas fir. I assured the caller that checking for Douglas fir was a simple matter and that I would be happy to do so as soon as samples were sent to me. Unfortunately, all I said was "samples," without specifying their size. For the next two days I awaited delivery, but none came. Finally, on the third day, a trucker appeared at my office with a dolly laden with 20-in. lengths of 12x12s. I felt myself flush with embarrassment as I realized the unnecessary time and cost of shipping such large chunks when I only needed splinters, which could have been mailed in an envelope.

In examining the pieces, the reason for concern became obvious. The wood didn't look much like Douglas fir. Some pieces (like the one in the left photomacrograph on the facing page)



***Right:** This slow-growth Douglas fir endgrain, magnified 10 times, shows narrow, inconspicuous latewood, giving an even-grained appearance. Normal-growth Douglas fir has uneven grain from wider growth rings and conspicuous latewood. **Far right:** Magnified 150 times, you can see Douglas fir's spindle-like fusiform rays, which contain single horizontal resin canals, and spiral thickenings in longitudinal tracheids (the main cell type in softwoods).*

were so slowly grown—there were 80 rings per inch in a few portions—that they appeared even grained, lacking the usual distinct, uneven-grained rings so characteristic of Douglas fir. The heartwood color was more yellowish brown than the familiar reddish brown of Douglas fir heartwood, and some of the pieces had only a trace of the characteristic Douglas fir odor.

Nevertheless, tangential sections examined microscopically confirmed that every piece was Douglas fir. Each sample had spindle-shaped fusiform rays (shown in the above, left photomicrograph) and abundant spiral thickenings (helical ridges along the inner surface of the cell wall) in the earlywood tracheids (non-living cells that function as food conductors and give support), as shown in the above, right photomicrograph. In reporting the results, I assured the firm that the wood was the correct species, but urged that the material be checked to determine whether the structural grade requirements had been met. Since then, I have been very careful to give clear instructions regarding the size of samples to be submitted for identification.

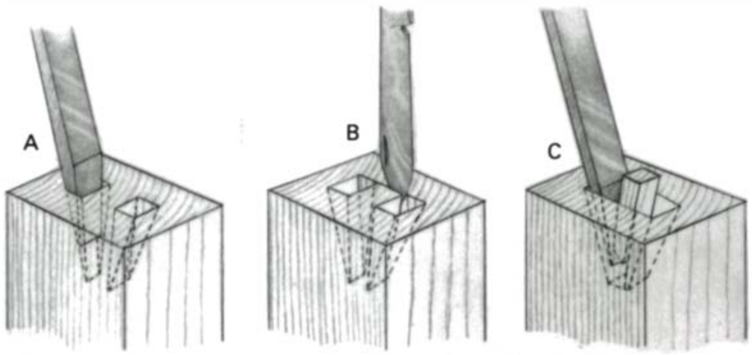
Identifying wood in furniture—Compared to identifying a single sample of wood or even a series of 20 or 30 samples, checking all the woods in a major furniture collection is a challenging task. Such an assignment presented itself when I was invited to assist in identifying more than 200 pieces of case furniture in the Garvan Collection and related collections at the Yale University Art Gallery. Here the task had an added challenge: the samples had to be taken inconspicuously and with a minimum of damage to the objects. I had to read as much as possible from the surface characteristics of the wood and assess such physical features as weight, color, evenness of grain and prominence of rays. Fortunately, woods such as beech or oak have conspicuous rays, and old stain or paint can actually help highlight ray size and distribution.

In sampling primary woods (the visible exterior woods in a piece of furniture), small fragments can be removed from an inconspicuous spot, such as under a glide caster on the bottom of a foot or under a drawer lock at the edge of the original mortise. Using the methods shown in figures 1 and 2, it was often possible to inconspicuously remove the necessary section for microscopic examination directly from the piece at a point of wear or minor damage, and it was sometimes possible to take tiny sections directly from the inside faces of shrinkage checks, which usually occur precisely along a radial plane.

The routine in surveying a piece of furniture is first to decide visually which components are of the same wood, and then to establish a sampling plan to microscopically verify a representative number of samples of each apparently different wood type. Although microscopic checking most often simply confirms the initial visual identification, occasional surprises do turn up.

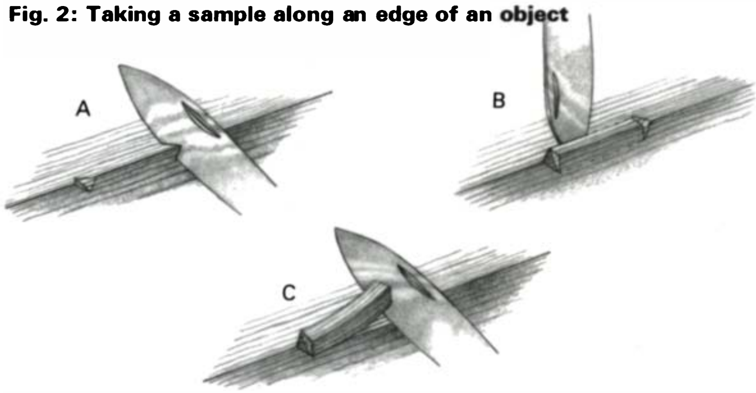
For example, I quickly glanced at the side panels in a chest and thought they were hard pine because of obvious uneven grain. I decided to examine a radial microscopic section for confirmation and, anticipating hard pine (shown in the top, left photomicrograph on the next page), expected to see dentate ray tracheids (which appear like uneven cell walls with tooth-like projections that reach into the cell cavity) and pinoid cross-field pits (which are multiple, variably sized oval- to football-shaped pits that are elongated diagonally across the field). I was startled to find myself staring at hemlock, like that shown in the top, right photomicrograph on the next page, which has smooth-wall ray tracheids and cupressoid cross-field pits (which are oval with oval apertures that are narrower than the border on either side). I had followed my intuition and had failed to check for resin canals, which are a hallmark of pine. Resin canals are easy to see with a hand lens and

Fig. 1: Taking a sample from an endgrain surface



To remove a sample from an endgrain surface, first use a narrow chisel to make a pair of wedge-shaped parallel holes (A). Use a thin knife blade to connect the walls of the two holes and define the sample (B). Finally, use the narrow chisel to undercut and pry out the sample (C).

Fig. 2: Taking a sample along an edge of an object

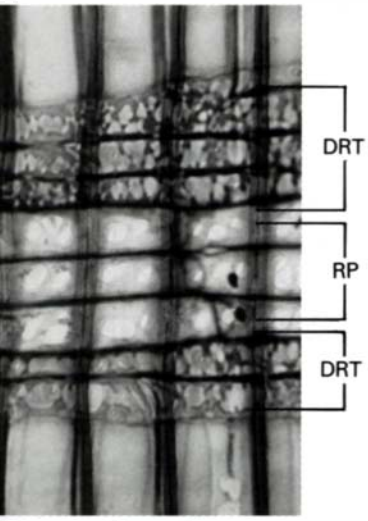


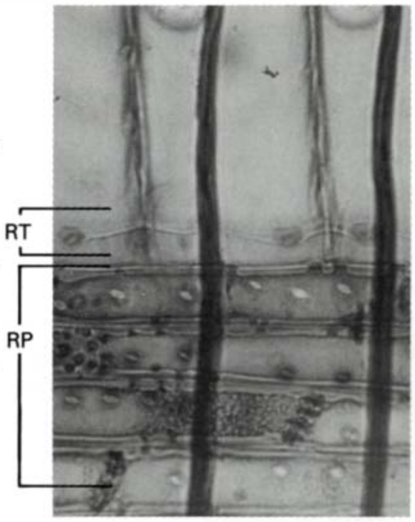
To remove a small sample from the edge of a board, first use a knife to notch a pair of stop cuts (A). With the knife tip, score the edges of the sample to guide the split (B). Finally, engage the knife edge in the bottom of one of the stop cuts and gently pry the sample free with a slight twisting motion of the knife (C).

they were not present. Catching these occasional surprises is a sobering reminder that visual impressions alone can be quite deceptive and that microscopic follow-up is a comforting safety net.

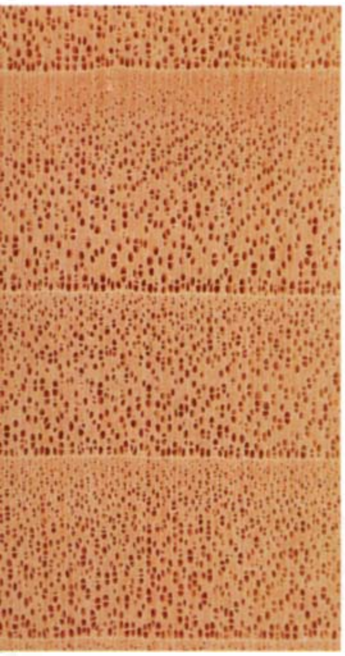
The Garvan Collection experience made me especially alert when identifying woods with surface features obscured by old finish, stain or accumulated dust and dirt. A painted Windsor chair is the ultimate test in wood identification. The layers of earlywood pores in ring-porous species such as oak and ash are usually detectable, and the conspicuous rays of oak and beech will often show through even the muddiest of finishes. The diffuse-porous hardwoods are especially deceptive and sometimes impossible to identify.

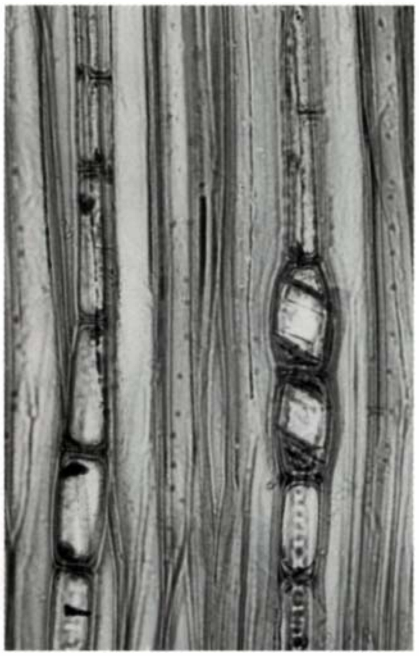
Maple, and particularly soft maple, was perhaps the most commonly used wood for turnings, so it is usually assumed that legs and similar turnings are maple. But a surprising number are not.





Left: *Under 275-power magnification, you can see Southern yellow pine's uneven-wall, dentate ray tracheids (DRT), which are found in all species of hard pine. It also has oval or football-shaped pinoid pits in the ray parenchyma (RP).* ***Right:*** *This photomicrograph of Eastern hemlock, magnified 550 times, shows the smooth-wall ray tracheids and oval-shaped cupressoid cross-field pits in the ray parenchyma.*





Left: *Quaking aspen's rays are so fine that they are nearly invisible when you look at them with a hand lens; in fact its rays are uniseriate (a single cell wide).* ***Right:*** *This photomicrograph (magnified 250 times) shows crystals in the longitudinal parenchyma cells in black walnut.*

Microscopic examination of a tangential section normally puts the question to rest. For example, the stout turned legs of 17th-century chairs are often found to be aspen (shown in the bottom, left photomacrograph), as quickly revealed by its thin uniseriate rays.

Perhaps the greatest single surprise in the case furniture of the Garvan Collection was a chest that had been labeled butternut. It certainly looked like butternut in surface color and figure. But the routine microscopic sampling paid off, as the sections revealed gash-like pitting on the radial walls of the vessels and large crystals in many of the longitudinal parenchyma cells, shown in the bottom, right photomicrograph. These features reliably confirmed black walnut.

Lawsuits—I have been a consultant and expert witness in lawsuits in which wood or wood products were involved and wood identification was in some way critical to the outcome. The most difficult single problem that I have ever encountered resulted from an accident in which a window washer fell when his ladder suddenly broke. The man suffered head injuries that left him permanently incapacitated.

The ladder was sold as having hemlock rails. I identified one rail as Western hemlock, an acceptable species for ladder rails. The other was apparently fir, individual species of which are usually considered indistinguishable on the basis of wood tissue alone. Confusingly, the ladder code allows noble fir *(Abies procera),* but not other species, and so it became critical to know which fir species was used.

Crystals in the ray parenchyma cells were extremely sparse. Fortunately, I remembered a journal article on work done at Forintek Laboratory in Vancouver, B.C., Canada, that established a correlation between the ray-parenchyma crystal count and various fir species. I made crystal counts and then consulted the paper. The low number suggested that the wood was not *A. procera,* but probably *A. amabilis* or *A. lasiocarpa.*

As a check of my own work, I submitted a sample of wood to Forintek Laboratory. Their findings were similar. Next, I tried a color spot test that gives a purple coloration on subalpine fir *(A. lasiocarpa),* but not on Pacific silver fir *(A. amabilis).* The wood sample from the ladder gave no reaction. Ray-cell contents are reported to be clear or pale yellow in *A. balsamea* and *A. lasiocarpa,* but dark brown in other Western firs. The contents of ray cells in the questionable ladder rail were dark brown.

I concluded that the ladder rail was probably Pacific silver fir, and that its extremely low density (0.25 specific gravity) and weakness were principal contributing factors in the ladder's failure.

Just for fun—Wood identification need not always be serious or important. For a change of pace, I sometimes find myself identifying wood just for fun. This is not to say that the task is always successful or easy.

A friend once dropped off a small sack of assorted woods to "check out when you get a minute." When time permitted, I laid them out on my bench. I didn't recognize a single one. With a razor blade I cleaned up an endgrain surface on each for a closer look with a hand lens. They were all hardwoods, but strangers every one. A few looked like dipterocarps, perhaps lauan or meranti. I called my friend to ask him the source of such an exotic assortment. The reply was that they were crating boards from a Japanese motorcycle. I threw in the towel. □

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***Right:** A Chippendale style fretwork mirror frame is a classic and enduring design. The carved upper corners are optional, but they add a sense of the handwork characteristic of the period. The carved-and-gilded ornament at the top* **(above)** *carries this detailing further.*

Making a Fretsawn Mirror Frame

Reflections on a classic design

by Ben Bacon

Fretwork mirrors, with their characteristic intricately sawn decorations, are one of the most popular and enduring designs of the 18th century. Huge numbers of them, ranging from simple Queen Anne examples in walnut veneer to complex American Federal designs, were manufactured in England and America. Although some stylistic and regional variations can be found, the mirrors were basically the same no matter where or when they were made. I think this design's popularity is due to the pleasing size and shape of the mirrors and their exotic components–fine-quality walnut or mahogany veneers, and gilded moldings and ornaments. These mirrors can be simple or elaborate; they prove that a truly good design doesn't depend on a lot of decoration.

My mirror, shown in the photo above, right, is Chippendale in design and feel, but is based on several English mirrors I've seen. I reduced its size to bring it in scale with today's rooms. I also designed the carved cartouche at the top (see figure 2 on the next page and the photos on p. 77), but it too is loosely based on period work I've studied. My mirror is circa 1770, and so I chose mahogany veneer rather than walnut. Most earlier fretwork mirrors were walnut, usually with cross-grained walnut sight moldings (moldings that surround the exposed portion of mirror), but later mirrors were almost always mahogany, with straight-grained sight moldings.

Mirror frame construction is straightforward: four lengths of mahogany molding glued to four pieces of ¾-in. by ¾-in. pine backing (see figure 1 on the next page). Note that the mahogany molding overhangs the pine section and forms the rabbet for the mirror. The frame can be mitered together and left that way or solid mahogany blocks can be inset into the top corners and carved, so the molding flows around scalloped corners, like mine. The fretsawn top, bottom and ear-like pieces on the curves are also pine, veneered with highly figured mahogany, and glued to the frame. The cartouche is optional. When used, it is carved separately, gilded and then set into a pierced circle in the center of the top piece.

Veneering the frame components–I always begin work with veneering because it is fairly time-consuming. Start with one piece of mahogany veneer, preferably one with grain ascending in a herringbone pattern, mark out what you need for the top and bottom (reserving the best for the top), and cut it into two rectangles slightly larger than the top and bottom. Do this carefully–figured veneer is very brittle; use a straightedge, clamped down to avoid sliced fingers, and a sharp knife. Select the best of the waste veneer for the ears and cut out four pieces so the grain on them flows smoothly into the grain of the top and bottom, as shown.

The backing is well-seasoned pine, between ⅜ in. and ½ in. thick. As with the veneer, prepare two oversize rectangles. Glue

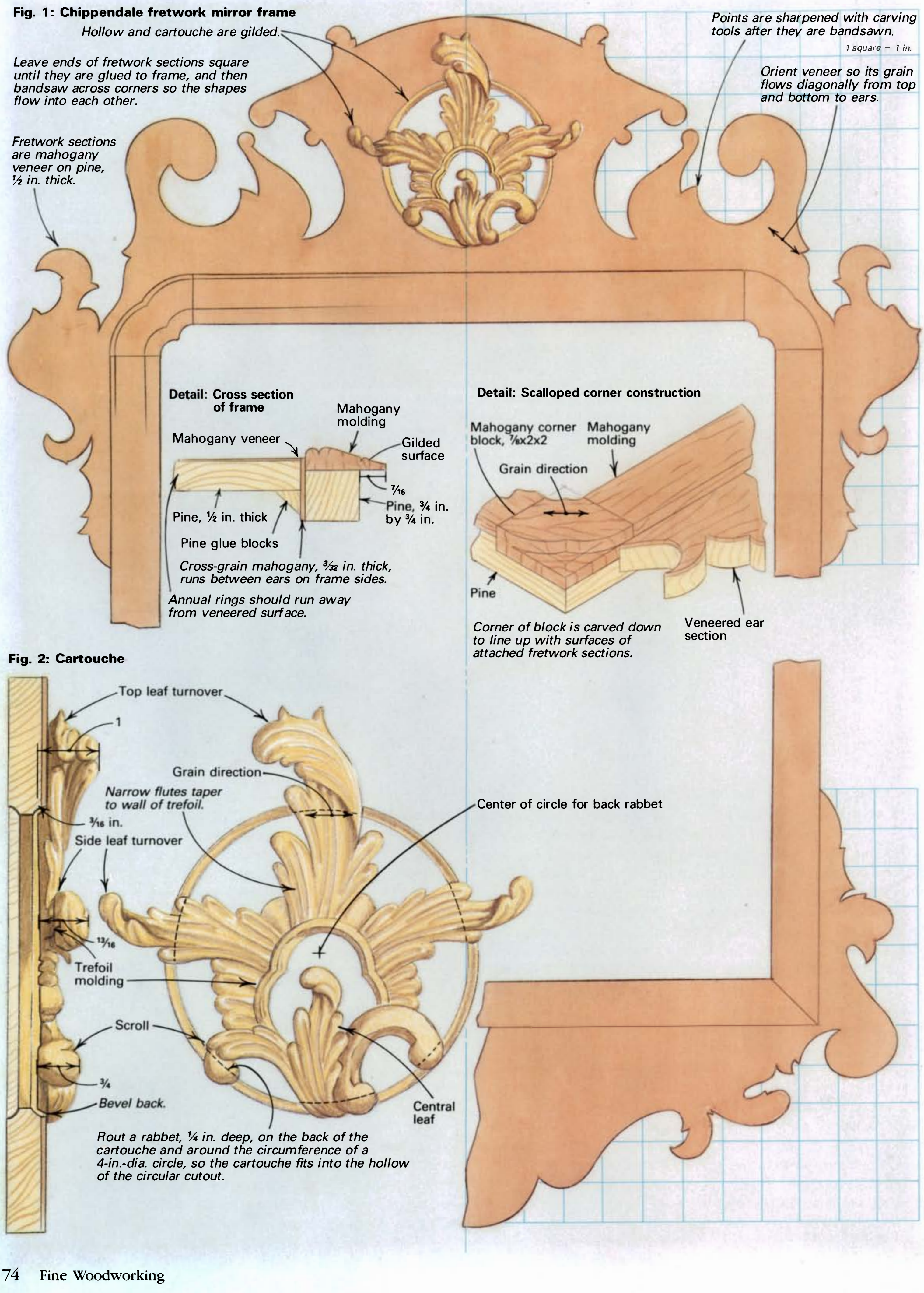


Fig. 1: Chippendale fretwork mirror frame
Hollow and cartouche are gilded.
Leave ends of fretwork sections square until they are glued to frame, and then bandsaw across corners so the shapes flow into each other.
Fretwork sections are mahogany veneer on pine, ½ in. thick.
Points are sharpened with carving tools after they are bandsawn.
1 square = 1 in.
Orient veneer so its grain flows diagonally from top and bottom to ears.
Detail: Cross section of frame
Mahogany veneer
Mahogany molding
Gilded surface
7/16
Pine, ¾ in. by ¾ in.
Pine, ½ in. thick
Pine glue blocks
Cross-grain mahogany, 3/32 in. thick, runs between ears on frame sides.
Annual rings should run away from veneered surface.
Detail: Scalloped corner construction
Mahogany corner block, 7/8x2x2
Mahogany molding
Grain direction
Pine
Veneered ear section
Corner of block is carved down to line up with surfaces of attached fretwork sections.
Fig. 2: Cartouche
Top leaf turnover
1
Grain direction
Narrow flutes taper to wall of trefoil.
3/16 in.
Side leaf turnover
13/16
Trefoil molding
Scroll
¾
Bevel back.
Center of circle for back rabbet
Central leaf
Rout a rabbet, ¼ in. deep, on the back of the cartouche and around the circumference of a 4-in.-dia. circle, so the cartouche fits into the hollow of the circular cutout.

the veneer onto the non-cupping side, so the pine's annual rings are concave to the glueline, as shown in figure 1. This arrangement allows the wood's natural cupping tendency to counteract the tendency to cup toward the veneered face. Apply glue to both surfaces, but not enough to bleed through the thin lamination to the show surface. Align the veneer on the pine and clamp it between slightly bowed cauls to ensure adequate pressure in the middle. You should let the assemblies dry for as long as possible—a week or more if you can spare the time and clamps. Remember, the thin pine could flex and twist under the weight of a lot of heavy clamps, and so the clamped-up assemblies must be kept flat as they dry.

Building the frame—The next step is to build the basic frame. The molding shape I used is typical of those on period mirrors. I had a shaper cutter made to match the profile and then I machined the moldings, but you could make it with a scratch stock. (For more on this, see *FWW on Period Furniture*, The Taunton Press, 63 S. Main St., PO Box 5506, Newtown, Conn. 06470-5506.) The molding is shallow and it won't take much time to cut these short lengths.

If you don't want to carve the scalloped corners at the two top miters, glue all four lengths of molding to the pine, gently flush up the outer edges with a block plane, and then cut the pieces to the finished sizes in figure 1 and miter their ends. Join the four sections using glue and either two nails or a nail and a screw, or insert wood splines across the miters. Assemble two opposite corners and then join the two halves together. If you're driving in screws or nails, work consistently in either a clockwise or counterclockwise direction—a change in direction may twist the frame.

Adding the mahogany blocks that form the scalloped corners at the top miters requires a slightly different procedure. Glue your mahogany molding onto the pine, and miter and assemble the frame as explained above, except don't use screws or nails on the two top miters; a good glue joint should hold them while you fit the mahogany blocks, which span and strengthen the corners. Now, measure ¾ in. down the sight edge of your two side moldings and square a line across them. Do the same at both ends of the top molding. Cut through the mahogany and into the pine with a fine handsaw, stopping ⅜ in. from the back of the pine, so that you can fit a ⅞x2x2 mahogany block across each miter. As shown, insert the two mahogany blocks with their grain running at right angles to the miters. The blocks are thicker than the molding, but you'll plane them flush later. When the blocks are dry, turn the frame over and rout or carve out their backs level with the rabbet on each side. Then plane their outer edges flush with the outside of the frame.

Now take your veneered boards out of the clamps. Despite your efforts to keep them straight, they may be slightly bowed. Don't worry about this—it's characteristic of the mirror. You should scrape and sand the veneer now because it will be too delicate after the fretwork is cut. For the finest finish, lightly dampen the veneer to raise the grain and sand again with fine-grit paper. Next, joint one side of each board to make a good butt joint between it and the frame. Align the veneer grains on the top, bottom and ears as previously described, and then mark out the fretwork design on these pieces (refer to the grid in figure 1) and bandsaw the shapes. Leave the ends of the top and bottom sections square, as well as the ends of the ear sections that will join with the top and bottom. After the veneered sections are glued onto the frame, connect the lines cleanly with a coping saw and carving tools. If you plan to fit an ornament or cartouche, now cut out the 4-in.-dia. circle in the top with a coping saw, and carve the hollow around the circle with a #8 or #7 gouge (see the detail in figure 1); watch out for constantly changing grain direction. Turn the board over and use a #3 gouge to bevel the back of the circle and refine its edge.

Next, mark out the position of the ears on the frame, and then mark a few points, ¼ in. down from the top edge of the molding, around the frame as a reference for aligning and gluing the veneered face of the fretwork sections. If you are going to carve scalloped corners, do it now before gluing on the veneered sections. If you aren't, proceed to the section on attaching the fretwork.

Carving scalloped corners—Carving the two top scalloped corners is a little tricky. Grain changes directions so many times that you'll probably feel you're teasing the shape out of the wood rather than carving it. Before you begin, clamp the frame onto your bench. Offcuts from your molding, turned upside down, will mate with the molding on the frame and provide a good clamping surface. Also, support the rabbets of your mahogany corners while you carve them by fitting triangular scrapwood blocks under them.

The first step in carving is to plane or chisel each mahogany block so it's level with the highest point of the molding on each side. Chisel off the bulk, and make light passes with a block plane to level across the corner. Then, make a cardboard template of the scallop and mark out the sight edge and back edge of the molding. Use a ruler as a guide and mark where to cut the flat corner section on each block's outer edges. When you attach the veneered sections, their surfaces should be at exactly the same level as the flat area—¼ in. down from the top edge of the molding (see figure 1).

Carefully cut straight down with the appropriate gouge to form the back and sight profiles, as shown in the photo below, right. I used a #8 16mm gouge to form the sight profile, and a #5 20mm and #2 20mm gouge to form the back profile. Work the flat corner down by paring away the waste, as shown in the photo below, left, until you reach the proper level. Make sure the inner and outer profiles of the corner blocks sweep cleanly and strongly around the miters. Your eye will follow the outlines and the heights of the molding; it's crucial to get these right so that the corners don't appear wobbly. Once you're satisfied with these profiles, begin carving the block so the molding profile continues around the corner. The general principle is to mark out and carve the high point

Left: *After planing the mahogany block level with the moldings and then drawing the shape of the scalloped corner onto the block using a cardboard template, Bacon lowers the outside corner to the same level as the surface of the fretsawn veneer sections that will be attached after the corners are carved.* ***Right:*** *Carefully controlled vertical cuts with the appropriate gouge form inner and outer profiles that guide a viewer's eye smoothly around the frame's corners.*

Photos: Dick Burrows; drawings: Aaron Azevedo

Working diagonally across the block, Bacon uses a gouge to carve out the molding's dominant curve.

and low point, and then shape the molding profile between them.

I used dividers to lay out a line that designates the high point of the molding's upper ogee. Then I started carving along the sight edge with a #8 or #9 gouge, to lower the front part of the molding to the greatest height of the front ogee (see the photo above). Check the height by laying a ruler or flat block of wood from one molding to another. You'll have to adjust your direction of cut constantly to cope with changing grain direction. Carve gently, feeling your way along. Remember, keep a sharp junction of the molding at the miter line; also, you should get less tearout if you carve from the edge of the block toward the center diagonal over the miter (shown above).

Next, draw a line ⅜ in. from your sight edge, linking the quirk beads on either side of your block. Cut in the quirk (shown in the left photo below) with a parting tool. Once you've established this line, it's easy to form the hollow of the front of the ogee with a small #8 gouge (see the top, right photo below), and then to round over the top of the ogee with a fishtail gouge or a back-bent gouge. Now tackle the big ogee. Mark in $\frac{5}{32}$ in. from the back edge and lower a step all the way around. Then carve the quirk with a parting tool and round over the bead and the high point of the large upper ogee with a back-bent gouge (see the bottom, right photo below). Finally, smooth out the hollow of the ogee with a #8 12mm gouge.

Sand the hollows of the ogees gently, to ease the facets left by your carving tools. Use nothing coarser than 180-grit paper, and sand as little as possible; sanding dulls the sharpness of carving, and shouldn't be used on quirks or areas where sharpness is critical. Run your fingers over the molding to feel any irregularities. If you need to carve out bumps after sanding, thoroughly clean the molding before recarving—little specks of sandpaper grit dull carving tool edges. When the carving is completed you can attach the veneered sections.

Attaching the fretwork sections—The fretwork sections are butt glued to the frame's edges. First, glue the top and bottom sections in place, let them dry, and then attach the four ears. I used commercial spring clamps (available from many mail-order suppliers) to clip the sections in place while they dried; you can make similar spring clamps by hacksawing a C-shaped piece from an old upholstery spring. After the glue dries, strengthen the joints by gluing triangular blocks between the frame and the veneered sections (see figure 1 on p. 74). After the glue blocks are dry, draw lines across the frame's upper corners so the curve of the top piece flows into the curves of the two ears. Bandsaw this detail and ease sawmarks around the edges with carving tools, beveling the sides back slightly as you work. Then, use your carving tools to sharpen the tight intersections of the fretsawn curves. Lastly, glue on the cross-grained strips of mahogany (about $\frac{3}{32}$ in. thick) that cover the pine on the outer edges of both sides between the ears. Now the mirror is complete except for final sanding and finishing.

If you plan to gild the front ogee of the sight edge, cover it with masking tape while staining and finishing the frame. After staining my mirror, I shellacked it and then gessoed and gilded the sight edge, the hollow around the top circular cutout and the cartouche. Then I distressed the gold with water, rottenstone and pigments, and gave the whole mirror frame a light coat of wax. □

Ben Bacon is a woodcarver and writer in London, England.

***Above:** The line of the quirk is drawn across the corner (a pair of dividers keeps the spacing right), and then the quirk is carved with a parting tool. **Top, right:** Following the quirk, Bacon forms the hollow of the lower ogee with a #8 gouge. **Bottom, right:** After lowering a step behind the high point of the upper ogee and cutting in the quirk with a parting tool, Bacon rounds the tops of the ogees and bead behind the upper quirk with a back-bent gouge.*

Carving stylized leaves

Left: Bacon uses a setting-in cut to form a vertical wall around the central leaf. He then carves up to the wall to create a flat area that will be the top of the trefoil molding ***(right)***.

Left: After establishing a wall around the trefoil and then piercing all the way through within this wall, the author begins to refine the leaf details. Here he carves the individual leaf tips. Once the flowing, tapering hollows of the leaves are carved with various gouges, Bacon uses fine fluters to carve within the broad hollows ***(right)***. *The narrow flutes must follow the flow of the larger hollows and run together as they reach the trefoil wall.*

The cartouche has fine detailing, and a high-quality dense wood, such as basswood or clear pine, is best for carving it. The grain pattern isn't important, because the piece will be gessoed and gilded. But make sure the grain runs horizontally.

Begin by bandsawing a circular blank, slightly larger than the carving, from 1-in.-thick stock. Draw a 4-in.-dia. circle on the back of the piece, as shown in figure 2 on p. 74, and rout a ¼-in.-deep rabbet outside this line so the carving will fit into the hollow around the edge of the circle in the veneered top section. Now, turn the blank over, draw the cartouche on its surface and bandsaw the profile.

To make it easier to hold the blank for carving, glue it onto a piece of plywood, with newspaper in between so you can separate the pieces later. (You only need about six drops of glue.) Bandsaw pieces of softwood to slip under the rabbet to support the edges while you carve. You can also bore $1/16$-in.-dia. holes around the profile of the pierced trefoil to facilitate stock removal.

Two basic principles apply to this type of carving: work from greatest height to lowest; and create the flow and movement of the carving before you worry about details. The greatest height is where the top leaf turns over. Since you want this area to remain full thickness, mark it so you don't carve it away. Begin carving with a wide gouge to lower the rest of the carving to the next greatest height, about $13/16$ in. thick, at the tips of the two turnovers on the left and right leaves. Now you've established the dominance of the top member over the whole carving. Continue to think this way and mark out your next height: the turnover of the leaf in the middle of the trefoil, which should be about ¾ in. Lower everything except the top and two side turnovers to this height.

Next, mark out the borders of the two bottom leaves and the scroll on the lower right. Using a parting tool or tight gouge (#10), carve a ⅜-in.-deep groove around the outside of this line, to relieve pressure for the next cut and to create a vertical wall around the basic shape. To make this setting-in cut, select a gouge with the appropriate sweep to follow the outline, hold it at a 90° angle and force it into the wood, as shown in the top, left photo. Set in all around the shape and then pare away the wood up to the wall, working from about 1 in. out (see the top, right photo). Make sure this surface is flat and even because it will form the top of the trefoil molding.

Now, draw the outside of the trefoil and repeat the process used to establish the wall around the lower leaves: Carve a narrow groove around the trefoil (this time only $3/16$ in. deep); set in around the trefoil with a gouge that conforms to its curve; and lower the wood outside the wall, working from about ¾ in. out.

Draw the ⅛-in.-wide flat top band on the trefoil molding and then carve the hollow around the interior of the trefoil with a #8 gouge. Next, mark out the full width of the trefoil molding and the profile of the bottom leaf and scroll, and begin piercing through. Do this with carving tools, nibbling away until you reach the plywood at the bottom. Carve only the outline of the leaves.

Now you can start thinking about details. Transfer a tracing of the top and two side turnovers from the drawing to your carving, or sketch directly on your carving, using dividers to measure distances from the drawing. Mark the greatest heights of your leaves—the points that you won't carve away—and round over the backs of the leaves so they curl over. Make the leaves rise and fall in a gentle ogee shape between the trefoil wall and the turnovers; they should dip beneath the trefoil wall and rise sharply to form the turnover. Pencil in any marks that you might have cut away, and draw in all your individual leaves. Use a parting tool to nip out the waste from between leaf tips, as shown in the bottom, left photo, and use gouges to form the outline of each leaf.

Using the same sequence as you did for the three top turnovers, carve the bottom leaf and scroll. Remember, establish the flow of the leaf before you attempt to define individual leaf members. Set in the leaves of your turnovers, and then carefully carve away beneath them so they overhang.

Once you've done all this work, it's time for fine modeling. Flat leaves look boring. To liven them up, the surfaces are made to twist and turn, defined by broad flutes. Draw in the flowing lines that you want to achieve, and then carefully carve your big hollows with #5, #6, #7 and #8 gouges. Remember, the broad hollows should taper, getting thinner toward the trefoil. Once you've done this, use fine (#10 and #11) 2mm gouges to flute within the confines of the hollows you've carved, as shown in the bottom, right photo. The flutes should follow the flow of your broad hollows and run together as they approach the trefoil; like real leaves, these leaves should splay gracefully.

When you're satisfied with your work, loosen the carving from its backing by flooding the plywood with alcohol. Wait a few minutes for the alcohol to weaken the glue joint, and then gently pry off the carving by working around the perimeter with a spatula or flat chisel. Finally, turn it over and gently bevel back the wood from the edges of the leaves to give the carving an airier feeling. *—B.B.*

Custom Miter Gauge Fence

Adding speed and accuracy to tablesaw crosscutting

by Randy Jenkins

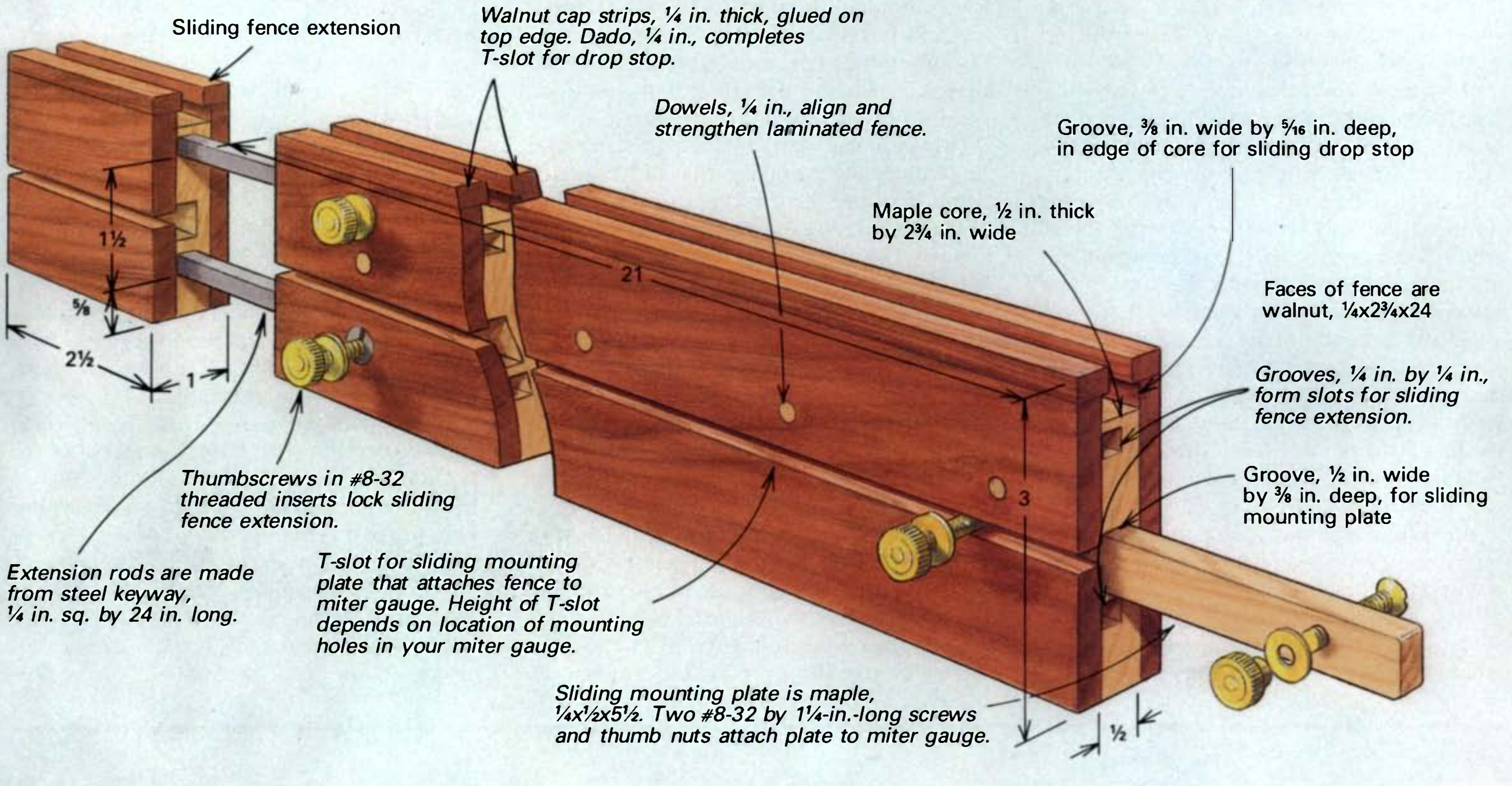
After looking at some expensive industrial-grade tablesaws, I became fascinated with their high-quality miter gauge fences. The best fences featured multiple stops that could be set and then dropped into place whenever needed for accurate cut-off work. The idea inspired me to design and build a custom miter gauge fence, shown in the photo on the facing page, that I use on a Sears 10-in. tablesaw in my home shop.

I designed my custom fence using a computer-aided design (CAD) program on my home computer. The program helped me create shop drawings that included dimensions for all the parts. Designing with CAD was slower than just making a few sketches, but its accuracy later proved its worth: I didn't have to deviate at all from my plans when I built the actual fence.

My design consists of a laminated wooden rail (shown in figure 1 below) that's mounted to the head of the saw's regular miter gauge via a sliding mechanism. This allows the rail to be slid back and forth (perpendicular to the blade) so that it can be set to clear the blade if the gauge's angle is changed or if the blade is tilted. A T-shaped slot on top of the rail allows a sliding attachment for the fence's drop stop, which can be positioned anywhere along the rail and locked in place with a small hand knob atop it. To allow stopped cuts on workpieces longer than the 24-in. rail, a short extension rail attached to two square steel rods, which ride in channels cut in the rail, pulls out of the end. The fence was built mostly from wooden parts. The other hardware was store-bought, except for the shopmade locking nut for the drop stop.

Construction—I started with kiln-dried stock and laminated the fence together, using maple for the core and walnut for the faces. After cutting out the maple core, I mounted a dado blade on my tablesaw and plowed four separate grooves, located as shown in figure 1 below. The ⅜-in. by $\frac{5}{16}$-in. groove at the top edge is for the sliding drop stop, the two ¼-in. by ¼-in. grooves are for the extension rods, and the ½-in. by ⅜-in. groove in the side of the core is for the sliding mounting plate that attaches the fence to the miter gauge. Note that the location of this latter groove was chosen to accommodate the mounting holes on my Sears miter gauge; you may have to locate this groove slightly higher or lower on the core to fit your own gauge. After cutting the grooves for the extension rods, check the ¼x¼x24 keyway stock (available from a hardware

Fig. 1: Custom miter gauge fence



store or industrial-supply house) for fit; each rod should slide freely, but shouldn't be loose.

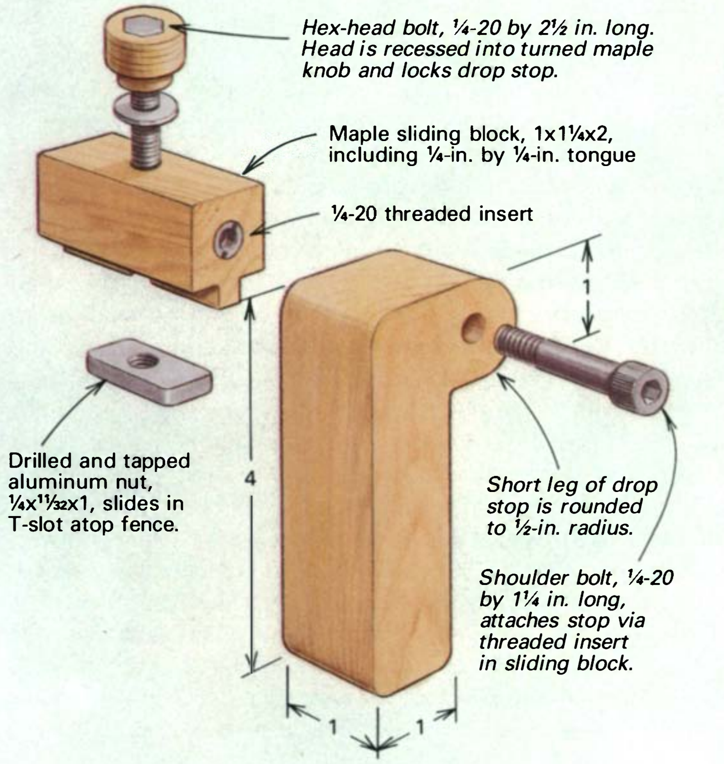
After cutting out the walnut faces about 1/8 in. oversize (for trimming later), the three sections of the fence were aligned and clamped up dry. Four equally spaced 1/4-in. holes were drilled for alignment dowels, located as shown in figure 1. After unclamping, I spread yellow glue on both sides of only the core, to minimize glue squeeze-out into the grooves. With the alignment dowels in place, I assembled both sides and clamped the fence between 3/4-in. plywood battens, clamping first in the middle and then toward each end. About 30 minutes after clamp up, I ran the keyway stock through the grooves to remove any glue squeeze-out.

The fence stayed in the clamps for 24 hours and then cured for several days before the edges were trimmed to final dimensions. I then glued on a 1/4-in. by 1 1/16-in. walnut "cap" directly over the top groove on the rail, cleaning up the edges with a flush-trimming bit in my router afterward. A 1/4-in.-wide slot, centered on the top edge, was then plowed with the dado blade. This completes the T-slot for the sliding drop stop. Another 1/8-in.-wide dado, located to suit your miter gauge mounting holes, completes the T-slot for the sliding mounting plate on the back of the fence.

Next, I squared the ends of the fence and cut 2 1/2 in. off the end opposite the sawblade, for the extension. Using five-minute epoxy, I glued the two pieces of keyway stock into the appropriate slots in the extension, also inserting the rods partway into the main fence to maintain alignment while the glue set. Then, two #8-32 threaded inserts were fitted into holes centered on the keyway slots on the back of the main fence for thumbscrews that lock the extension rods. If your threaded inserts are too long, grind them to length.

The sliding mounting plate that attaches the fence to the miter gauge is made from a piece of 1/4x1/2x5 1/2 maple that I trimmed until it slid smoothly in its slot. Two holes drilled in the side hold the mounting studs, which are epoxied in place. To fit the Sears miter gauge, I used #10-24 t.p.i. machine screws with their tops ground down to fit into the slot. A pair of thumb nuts locks the fence to the miter gauge head.

Fig. 2: Sliding drop stop



This shopmade miter gauge fence expands a tablesaw's crosscutting capacity and accuracy, and provides a drop stop for repeat cuts.

The sliding drop stop—Starting with a piece of 1-in.-thick rock maple, I cut a 1 1/4-in.-wide by 2-in.-long piece for the drop stop's sliding block. On the tablesaw, I cut a 1/4-in. by 1/4-in. tongue centered on the 1-in.-thick edge of the block, to fit the groove in the top of the fence. The tongue should fit with little play, yet still slide easily. The block receives two holes: a 1/4-in. hole centered on and through the tongue, for the stop's lock screw, and a 5/16-in. hole that gets fitted with a 1/4-20 t.p.i. threaded insert, for attaching the stop itself (see figure 2 below). Drilling and inserting must be done so that the hole and the threaded insert are perpendicular to the end of the sliding block. From the same 1-in. maple stock I cut an L-shaped piece 2 in. wide and 4 in. long, for the stop itself. The end of the short leg is rounded to a 1/2-in. radius, and a 1/4-in. hole is drilled to accept a 1/4-20 shoulder bolt with a 1 1/4-in.-long shank, which attaches the stop to the sliding block.

The drop stop locks to the fence via a small hand screw that fits into a homemade rectangular nut that engages the T-slot in the fence. I made the nut from a piece of 1/4x11/32x1 aluminum stock, center-drilled and tapped for the 1/4-20 locking bolt. The corners of the nut were rounded to ensure smooth sliding. To make the locking knob, I started with a 1-in. maple cube, drilled a 7/16-in. recess about 1/4 in. deep and centered on one side of the cube, and then drilled a 1/4-in. hole through the cube, concentric with the first hole. Insert a 1/4-20 by 2 1/2-in.-long hex-head bolt through the cube, slip on a washer and regular nut, and tighten to pull the hex head fully into the recess. A drop of cyanoacrylate adhesive, such as Super Glue, on the hex head ensures that the bolt stays in place. With the nut removed, the shank of the bolt can then be chucked in the lathe or drill press and the block turned round and shaped to your liking.

Assemble the sliding drop stop on the fence and try all movements. Adjust tight-fitting pieces with judicious sanding and filing, and then disassemble the fence, final-sand all the parts and finish to your liking; I used Watco oil. Finally, reassemble the drop stop with a washer under the lock knob.

To use the fence, slide its end as close to the blade as possible and tighten the screws. Slide the fence over as necessary when you're using a dado blade or when cutting miters. The drop stop normally folds back and out the way when not in use, but also quickly hinges down to act as an end stop for repetitive-length crosscuts. With the stop up, one end of a workpiece can be trimmed, and with the stop dropped, the other end can be cut to precise length. You may wish to make several drop stops, if you're making repetitive cuts for multiple parts. □

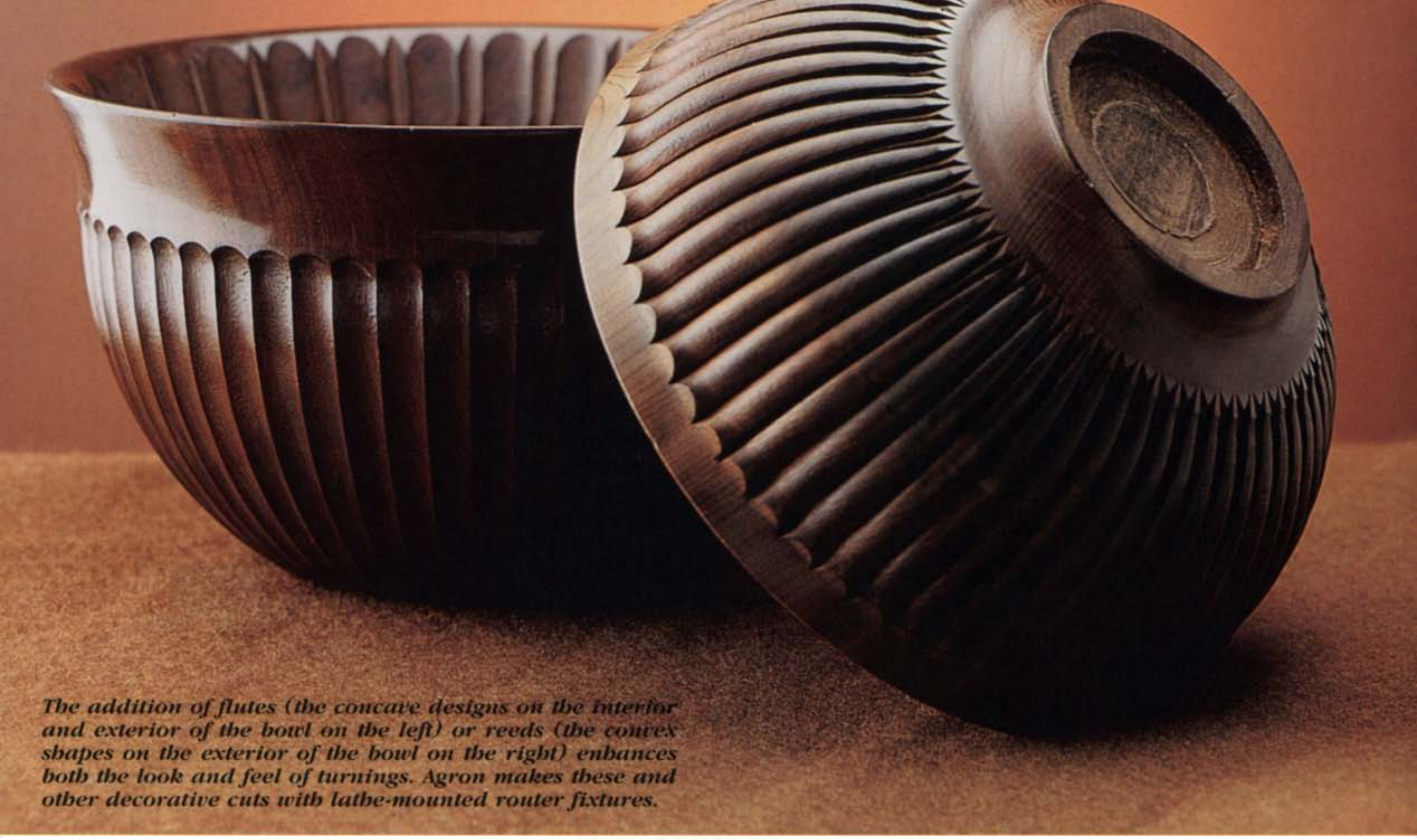
Randy Jenkins is a woodworker and retired compressor-systems specialist in Lafayette, La.

Photo: Sandor Nagyszalanczy; drawings: Bob La Pointe

Decorative Routing on the Lathe

Special fixtures provide unlimited possibilities

by Daniel Agron



The addition of flutes (the concave designs on the interior and exterior of the bowl on the left) or reeds (the convex shapes on the exterior of the bowl on the right) enhances both the look and feel of turnings. Agron makes these and other decorative cuts with lathe-mounted router fixtures.

About 10 years ago, at age 55, I sold my business in Tel Aviv and my wife and I moved back to our hometown of Jerusalem. Our new house had a large basement for a shop, and I bought a small lathe and three turning chisels, and began fooling around. Pretty soon I was hooked on turning and my basement was filled with heavy, old woodworking machines, including a patternmaker's lathe equipped with a compound slide rest.

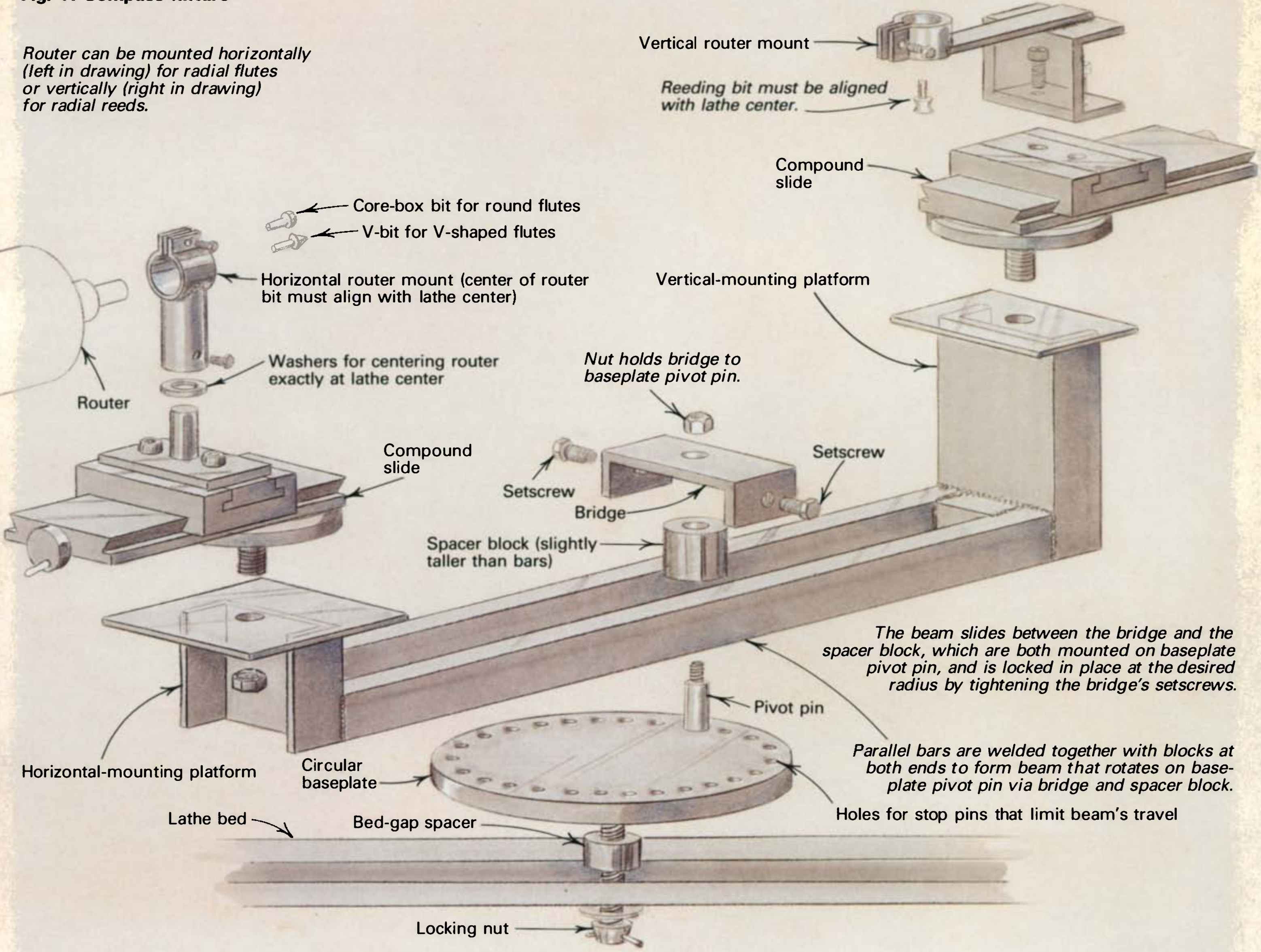
I read everything I could find about lathe work, but two books in particular really captured my interest. First and foremost was *The Principles and Practice of Ornamental or Complex Turning* by John Jacob Holtzapffel (1884, reprinted by Dover Publications Inc., 31 E. 2nd St., Mineola, N.Y. 11501; 1973), which describes the lathes that Holtzapffel designed specifically for decorating the surfaces of turnings with a large variety of intricate patterns. Another publication that I happened on was *Polychromatic Assembly for Woodturning* by Cyril and Emmett Brown (Linden Publishing Co., 3845 N. Blackstone, Fresno, Cal. 93726; 1982), which focused on constructing turning blanks from many tiny staves or wedges of various colored woods.

These influences inspired me to build two fixtures that mount on the lathe bed and hold a router so it can be moved in arcs and planes to make decorative cuts on turnings. An indexing ring, mounted outboard of the headstock, allows me to rotate the workpiece in equal increments for routing radial flutes (concave) or reeds (convex) on the interiors or exteriors of bowls and platters (see the photo above and on p. 82). In addition to fluting preturned bowls, I use a router or drill for cutting recesses in workpieces to receive inlays of contrasting woods, thereby creating polychromatic, geometric designs (see the sidebar and the three bottom photos on p. 83.

I made the fixtures, which I call "compass" and "swing" (see figure 1 on the facing page and figure 2 on p. 82), by welding various steel parts together, but they could also be made from hardwood. Because I can vary the orientation of the router, the shape of the bit and the depth and angle of the cut, design variations are endless. I'll describe the basic setups and some of the ways that I've used the fixtures to decorate finished pieces, which will give you a taste of the possibilities.

The basic fixtures and attachments–My lathe is equipped with a compound slide rest like those found on metalworking lathes. A slide rest holds a cutting tool and moves it along the bed or across the bed by means of hand screws. A compound slide rest can also be rotated to allow fine adjustments at any angle to the work. Some of the setups that I use with my router fixtures require an auxiliary compound slide rest to facilitate setting up and fine-

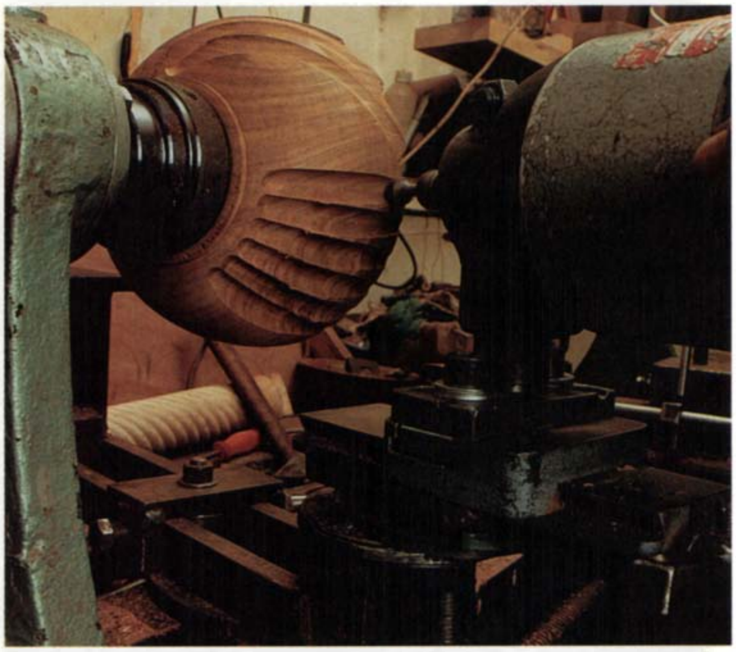
Fig. 1: Compass fixture



tuning (see figures 1 and 2). You should be able to buy a slide rest from any company that sells machinist's lathes and you might even find one at a secondhand machinery store or flea market. Enco Manufacturing Co. (5000 W. Bloomingdale Ave., Chicago, Ill. 60639) has a compound mill and drill table, listed in its catalog for about $140, that could be adapted for use with my fixtures.

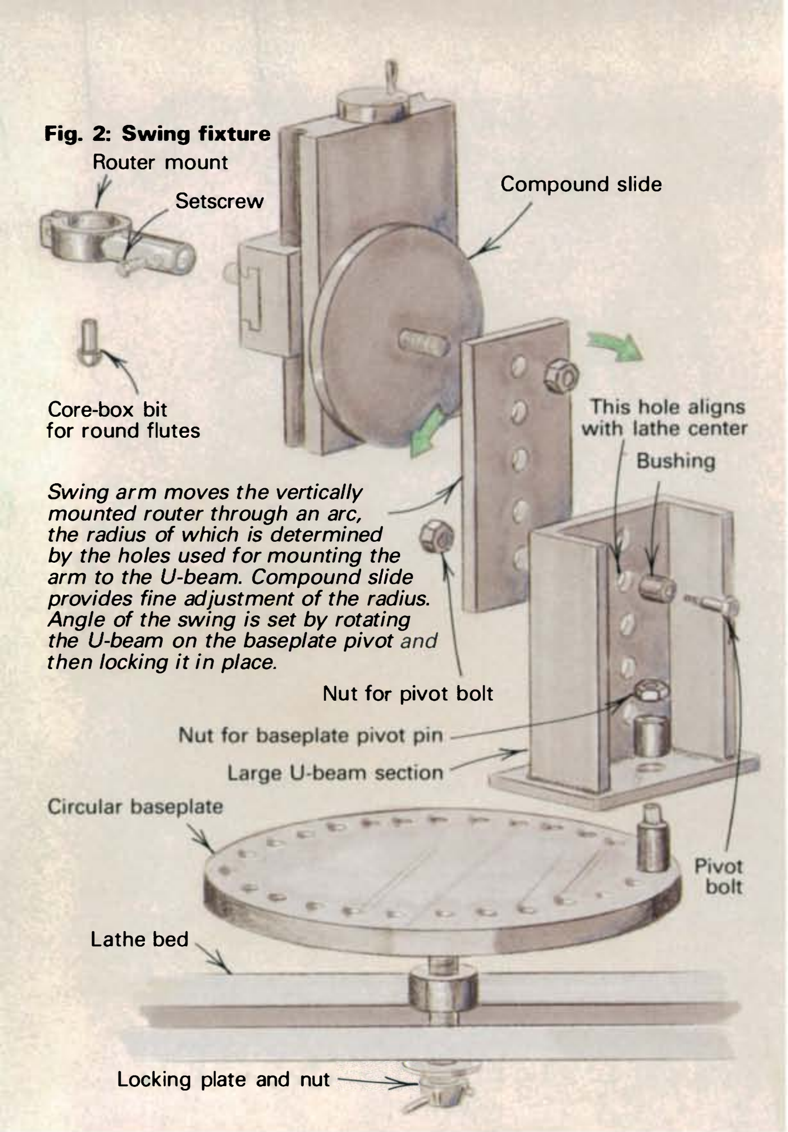
My lathe was not equipped with a built-in indexing system, and so I made an indexing ring and mounted it on the outboard end of the lathe's mandrel (see the top photo on p. 83). This allows me to rotate the workpiece in small increments and then lock it in place with a spring-loaded indexing pin. My ring has 72 evenly spaced holes on one face, 96 holes on the other face and 60 holes around the outer edge. Since I've been using it, however, I've found that 72 holes at 5° increments are adequate for most work. The indexing pin was designed so that fine vertical adjustments could be made, which are sometimes necessary when a workpiece is removed and then rechucked on the lathe.

I have two different clamping rings for mounting my Konnen router. The clamping ring, for mounting the router horizontally (shown at left in figure 1 above), is welded to a short length of round bar stock with its inside diameter turned to fit the slide rest's tool hold-down bolt. The clamping ring can then be rotated to set the router at the desired angle and locked in place by tight-



To cut exterior radial flutes, Agron mounts the router horizontally on the compass beam, which rotates on the baseplate's pivot pin via the bridge assembly (visible directly below the bowl).

Photos: Shuki Kook; drawings: Aaron Azevedo



Flutes routed at an angle across the exterior surface of a bowl create a spiral effect, as shown above. The author routs these spiral flutes with his swing fixture, which holds the router vertically above the turning and allows it to be swung back and forth through various radii and angles. The swing mounts on the same baseplate as the compass fixture.

ening both the Allen setscrew tapped into the pipe and the nut that holds the bar stock to the slide rest. The other clamping ring is for mounting the router vertically on the compass fixture's beam for cutting radial reeds (shown at right in figure 1). You will have to adapt the mounting attachments to fit your router, but make sure the router will be firmly supported and exactly parallel or perpendicular to the bed.

The compass—I call the basic fixture for routing radial flutes and reeds the compass because it guides the router through various preset arcs. As you can see in figure 1, the compass is assembled from several component parts beginning with a circular metal baseplate. The baseplate has a ⅝-in. threaded rod tapped into the center of its underside. This means the plate can be secured anyplace along the lathe bed by tightening a nut against a locking plate beneath the bed. A round guide block, center-drilled to slip over the threaded rod and sized to slide in the bed gap, centers the baseplate on the bed. A threaded pin, on which the compass beam pivots, is screwed near the rim on the top of the baseplate, and a ring of holes is drilled around the plate's outer edge for stop pins to limit the beam's travel.

The compass beam is made by welding steel blocks between the ends of two steel bars. A section of U-channel is then welded to each end of the beam to support the vertical and horizontal router mounting platforms. To mount the beam on the baseplate pivot, I milled a spacer block to slip between and stand just slightly higher than the parallel bars. I drilled a hole in the center of this block so it can be placed over the pivot and then I placed the beam on the baseplate with the parallel bars straddling the spacer block. A U-shaped bridge, which is also drilled to fit over the pivot, spans both bars and is secured with a nut on the pivot. Because the spacer stands slightly proud of the bars, the beam will still slide back and forth. Both ends of the bridge are drilled and tapped to receive setscrews to lock the beam after it is located at the desired radius. The beam should be considerably longer than the lathe's swing because when you rout the surface of shallow bowls or plates, the radius of the curvature will be larger than the radius of the workpiece.

For both horizontal and vertical mounting, a compound slide is mounted on the appropriate platform (see figure 1). When making the beam's platforms, keep in mind that the entire mounting assembly must be sized so the center of the router bit will align with the lathe's drive center. When the router is mounted vertically, this alignment can be fine-tuned by moving the bit in and out of the chuck. But no such easy adjustment is possible when the router is mounted horizontally, and so I made the platform a little low and then shimmed the router up to the lathe's center by inserting washers below the clamping ring's pipe (see figure 1). To decorate a bowl's exterior, the router must be mounted on the beam pointing toward the baseplate pivot; to decorate a bowl's interior, the router must point away from the pivot.

Routing flutes and reeds—Begin your work by preturning the bowl or platter. Then unplug the lathe and lock the workpiece in place by engaging the pin in one of the indexing ring holes. For cutting flutes, the router is mounted horizontally, level and at exact lathe center height, as shown in the photo on the previous page. If you want flutes to cover the entire surface of the bowl or platter, you only have to rough-turn the vessel close to final shape before setting up the fixture because the flutes will finish the job. However, if you want spaces between the flutes, you'll have to turn the bowl to the desired final shape before adding the flutes. You should also finish-sand the surface before fluting because sanding afterward will destroy the crisp edges of

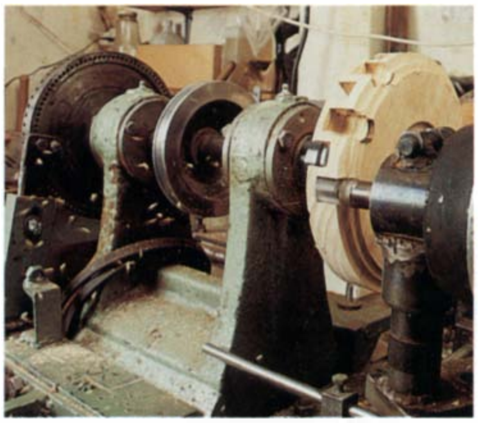
(continued on p. 84)

Precise setups for inlaying turned forms

After playing around with the compass and swing fixtures described in the main article, I realized that the router mounted on a compound slide rest could be used to mill recesses for inlays in turning blanks. This method produces blanks with fewer gluelines, and therefore less chance for errors, than conventional stave-lamination systems.

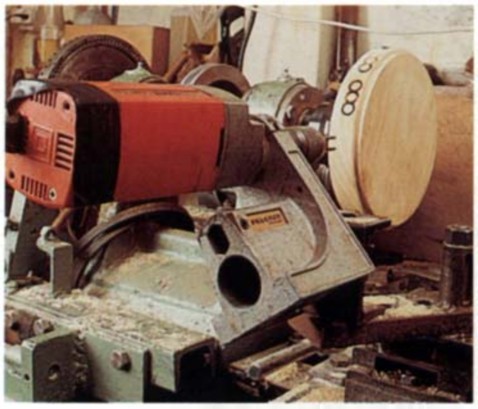
The vases shown here were constructed by stack-laminating preturned rings. I begin with blanks, which are discs of various thicknesses depending on their placement in the finished vessel, and I turn each blank to its proper diameter and shape. I inlay the edges of the blanks that will become the decorative bands and then I use a parting tool to separate the outer ring from the inner core of each blank. The core pieces from the larger blanks can be reused for the narrower parts of successive pieces. In some cases I use the router to cut mating rabbets in adjacent pieces before parting off the rings. The rabbets ensure concentricity and make it easy to align the designs prior to gluing. The rabbets are made by slowly rotating the lathe by hand with the router locked in place perpendicular to the disc's face and fitted with a rabbeting bit. Always rotate the workpiece against the rotation of the cutter. After laminating the rings together, I mount the rough vessel on the lathe and carefully turn the exterior shape to refine the designs.

When cutting the recesses for the inlays, cuts should be made with the grain, that is from the larger to the smaller diameter of the blank. It's also advisable to arrange stops either by clamping blocks directly to the slides or by setting up adjustable rods, as shown in the left, top photo. The photos here of finished vases are accompanied by photos showing the setups I used for routing or drilling the slots for some of the inlays. —D.A.

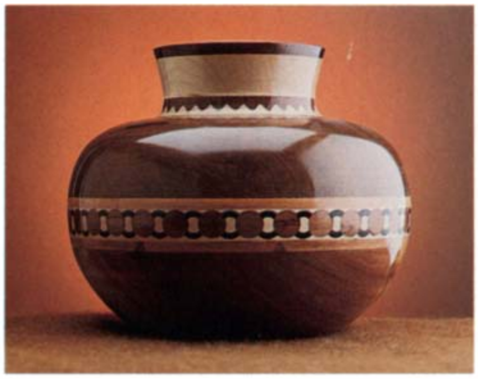


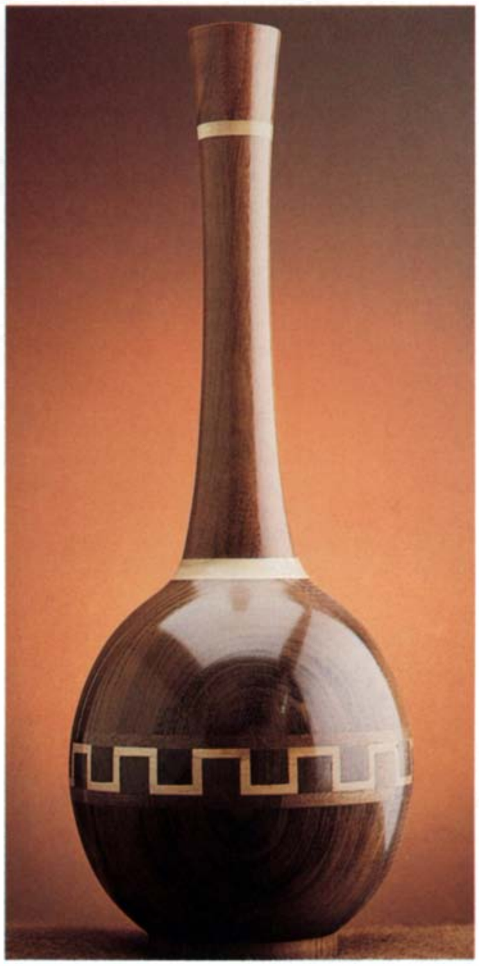
*A square wave pattern, such as that on the tall vase (**below**), is what you're left with if you alternate square slots in both edges of a blank and insert contrasting cubes in them. The setup is shown **above**. The router is mounted on the lathe's slide, fitted with a mortising bit, and moved into the blank with the slide rest's hand screw. When you reverse the blank to cut the second set of slots, you may have to adjust the indexing pin (at the far left in the photo **above**) slightly so these slots are exactly centered between the first slots. By leaving a little more than the thickness of the pattern at the base of the slots, you can true up both faces of the blank after the cubes are inlaid.*

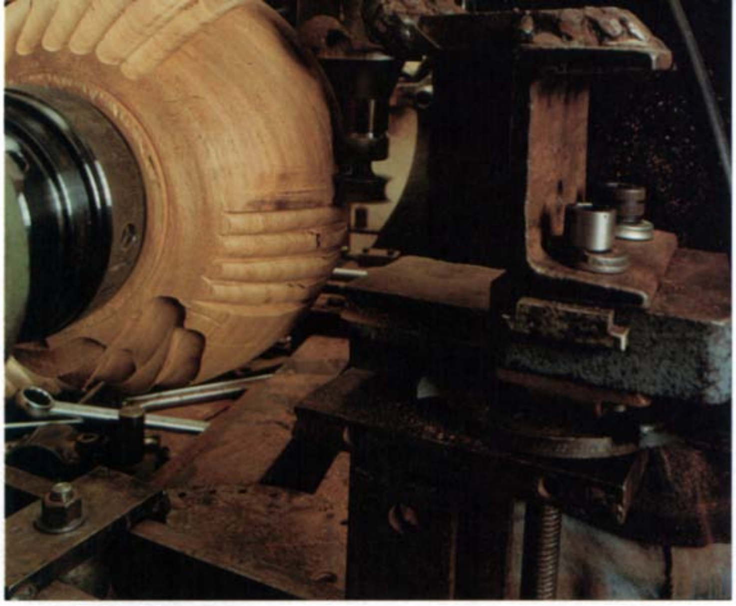
*The feather pattern on the bottom of the vase in the photo **below** is made by routing large V-grooves in a preshaped blank with the router mounted horizontally on the lathe's compound slide, as shown in the photo **above**. Prism-shaped inserts are glued in the grooves and then turned flush with the blank's surface. To get outlined feathers, like those shown on the vase **below**, Agron inlaid dark-colored feathers, turned them flush, and then repeated the process with a shallower V-groove and light-colored inserts.*



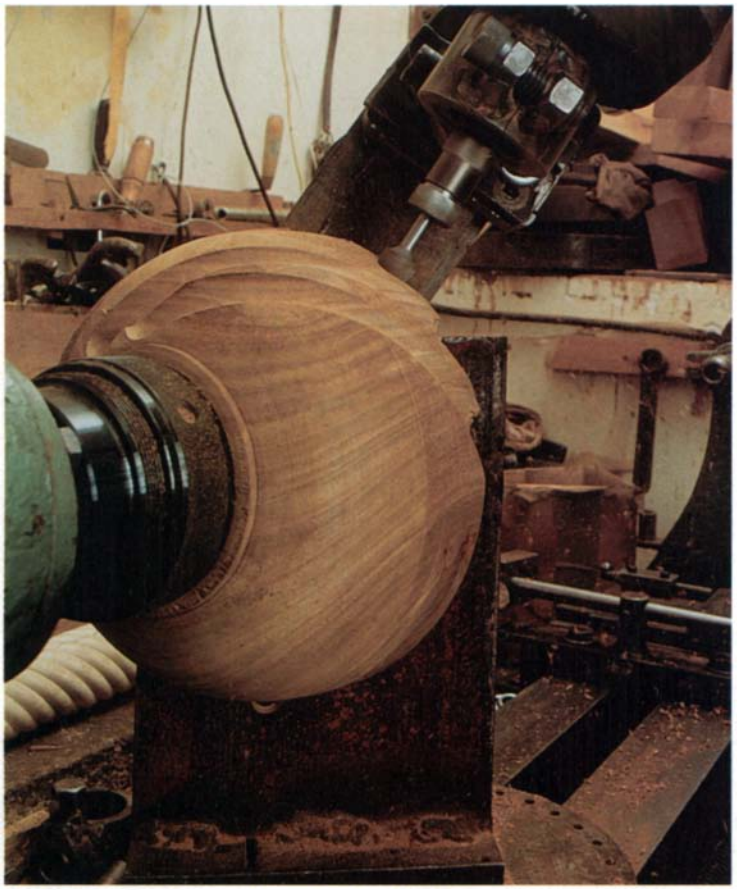
***Above:** Agron rigged up a vertical drill attachment for mounting his portable drill horizontally on the lathe bed. Here he is using a plug cutter to make circular grooves into which he will inlay rings cut from a center-drilled dowel. The rings should fit somewhat loosely in the groove to allow glue and trapped air to escape when they are inserted. Circles can be inlaid by using a Forstner drill bit instead of a plug cutter. The vessel shown **below** has a band inlaid with circles overlapping previously inlaid rings.*







***Above:** For cutting exterior radial reeds, the author mounts the router vertically on the beam's high platform. The beam rotates on the baseplate pivot pin and depth of cut is adjusted with the slide rest. **Below:** The author routs angled flutes using the swing fixture. The router is pivoted via the swing arm, which is bolted through a bushing to the vertical section of a large U-beam that is in turn bolted to the compass fixture's baseplate.*



the flutes. All cuts should be made from the larger to the smaller diameter of the workpiece whenever possible.

When cutting radial flutes, I first set the fixture's cutting radius, which is the distance between the pivots on the cutter and the compass beam. Then I set the center of compass rotation by sliding the baseplate along the bed and rotating it until the pivot is directly below the center of the desired radius of cut. Lock the baseplate to the bed and use the slide rest hand crank to finely adjust the desired radius and subsequently to control the depth of cut. To ensure that the compass fixture's radius is exactly the same as the bowl's preturned curvature, set the compass to a radius slightly smaller than the radius of curvature and then rout a shallow sizing groove in the bowl's surface. You can then turn the bowl to match the radius of the sizing groove in either of two ways. First, if there is room on the bed to mount the lathe's tool rest, you can swing the router out of the way and hand-turn the bowl to this precise radius; or you can chuck a mortising bit in the compass-mounted router, set it for a shallow cut by adjusting the slide rest, and finish-turn the bowl's shape by swinging the compass through its arc while you rotate the workpiece by hand. Remember, if you will be leaving spaces between the flutes, you should finish-sand the surface at this time.

Next, you need to determine the amount of taper, the width (determined by size of bit and depth of cut) and the spacing of the flutes. This is done by trial. First, I create the taper by loosening the baseplate and rotating it so the router is pulled slightly away from the bottom of the workpiece. This results in a shallower and, therefore, narrower cut at the base of the piece. Next, I adjust depth of cut until it is as shallow as possible, but runs the full length of the final design. I clamp a bar across the slide as a stop to preserve this depth-of-cut setting. Then, to set the distance between cuts, I rotate the workpiece a number of holes along the indexing ring; this number must divide evenly into the total number of holes on the ring to ensure that the flutes will be evenly spaced around the bowl. I then make a second shallow cut, rotate the workpiece the same number of holes and make a third cut. Since the final width of cut and the spacing between cuts is determined by the size of the bit and the depth of penetration, I gradually increase the depth of all three cuts until the desired decoration is achieved. You may need to make minor adjustments in the taper as you proceed with the deeper cuts. Now you can clamp the depth stop at the final setting and rout all remaining flutes, rotating the bowl an equal number of indexing holes between them. To ensure a smooth finish cut, make at least two passes for each flute and make sure the last pass removes very little stock.

For cutting radial reeds, which are convex-shaped decorations, I follow the same system, except that the router is mounted vertically and I use a custom-made hollow-ground cutter, as shown in the top photo. You can align the bit with the lathe center by fine-tuning how far it is inserted into the chuck. The router attachment is again mounted on a slide rest for adjusting the depth of cut.

Using the swing to make spiral flutes–I designed the swing fixture (see figure 2 on p. 82 and the bottom photo here) for cutting flutes at an angle, which creates the spiral effect on the bowl in the photo on p. 82. The fixture consists of a 10-in. length of 8-in.-wide U-beam welded to a flat plate that is drilled to fit over the pivot on the compass' circular baseplate. The U-beam has a vertical row of arbitrarily spaced holes (one of which is aligned with the lathe's center) that will receive a pivoting bushing. The swing itself is a steel bar with holes bored along its length so it can be bolted to the U-beam and pivot on the bushing. The compound slide is bolted to the swing bar and the router is attached vertically to the slide. The desired radius of the swing is determined by selecting the appropriate holes in the U-beam and bar. The plane through which the router will swing, which determines the angle of the spiral, is determined by pivoting the U-beam on the circular baseplate before tightening it down. Fine adjustments of the radius and depth of cut are set with the compound slide. The procedures for rough-turning, presanding and determining the flute's taper and spacing are the same as for fluting with the compass fixture. □

Daniel Agron does decorative turning and occasionally teaches turning in Jerusalem, Israel.

Windsor Settee

Stretching a traditional design to seat two

by Mac Campbell

The author redesigned the traditional Windsor settee so the bow would flow more smoothly in a continuous curve from the arm. He also fanned out the spindles evenly, eliminating the usual gap between the third and fourth spindles on each side, and extended the arms by 3 in.

The continuous-arm Windsor is my favorite chair. The graceful curve of the back bow, uninterrupted by attached arms, is a masterful use of wood. Thus, I was delighted when a client who had previously bought several chairs asked me to design a matching settee with an overall width of about 50 in. I was determined that the settee would possess the qualities I most admired in the chairs—exceptional visual lightness and delicacy, strength and durability, and flexibility and design integrity for longevity and comfort.

I had to modify my basic design slightly to make it more suitable as a settee. My Windsors have relatively short arms, so they can be pulled up to a dining table. Since settees are more likely to be used as narrow couches, however, I added one spindle to each side and extended the arms 3 in. This meant changing the end profile of the seat, so the stumps supporting the ends of the arms would tilt forward as they do on the chairs.

In addition, when I designed my chair, I softened the bend between the upper and lower portions of the back so the bow would flow more smoothly, even though this meant sacrificing some of the flat arm section to the beginning of the upward sweep. I also changed the spindle arrangement. Continuous-arm Windsors usually have two spindles plus the stump supporting each arm, and these three components tilt forward. Then there is a noticeable gap, and the back spindles (usually nine) are fanned out and tilted back from the seat. But to emphasize the flow, I fanned out all 13 spindles evenly, eliminating the gap between the second and third spindles on each end. This means that the third spindle on the chair pierces the back bow diagonally from corner to corner. On the settee, the fourth spindle has this same problem, because of the extra spindle I added on each end. I ruined several back bows trying to drill this hole on chairs and discovered, I suspect, one reason why the gap was originally left between the spindles. Eventually, with the help of a friendly welder, I devised a drill guide, shown in the top, left photo on the next page, for boring this awkward hole. This spindle arrangement is, I think, unique to my chairs, and so I wanted it in the settee.

The back and seat angles of the chairs, arrived at over several years of tinkering, are quite comfortable, and I transferred these angles directly to the settee. I didn't have to measure the angles for the middle legs; I just set the outside legs in place without glue, tied a string tightly between them as a drill guide, as shown in the top, right photo on the next page, and bored the holes.

The contour of the settee seat is taken from the centerline of the chair, with the front somewhat rounded off, since there is no pommel. Many Windsors have a relatively slight hollow in the seat, but this reduces the comfort of the chair. I prefer to hollow the seat to a depth of about 1 in. (see the seat pattern detail in figure 1), with the deepest part about 3 in. from the rear edge of the carved area. Keeping the deepest portion this far to the rear prevents the sitter from sliding forward, and thus improves comfort. I also round the front of the seat to eliminate the more traditional sharp edge that can cut off circulation in the legs, particularly for short people.

I think back-brace spindles are unnecessary on chairs, because they limit the flexibility of the back, which adds to the comfort. With the settee, however, I feared that the long, straight back might bow backward when two people leaned against it. The settee back could withstand this, but the bowing action could be uncomfortable on the human back. So I opted for a double set of bracing spindles, supported by blocks fit into mortises centered between spindles E and F.

Photo: Mac Campbell

***Left:** Fanning the spindles out evenly causes the third spindle on chairs, shown here, and the fourth spindle on the settee to pierce the back bow diagonally from corner to corner, making the hole difficult to bore. So Campbell fabricated this guide from metal tubing, rod and a C-clamp. Putting the bottom rod into the seat hole makes it easier to align the bow hole. **Right:** To align the middle legs with the outside legs, Campbell stretches a string between the two outer legs and uses it to sight the hole with a hand-held power drill.*

The settee bow bending form is a simple system of blocks and cleats mounted on a ¾-in.-thick plywood base that can be secured with the dogs on a workbench. The ends of the bow are secured by U-shaped pieces of plywood, which can be slipped on faster than clamps. Cleats and rotating blocks also save time, so the steamed bow can be secured before it cools.

Steam-bending—The most difficult piece in the settee is the back bow, and so I did this first. I prefer straight-grained ash, oak or hickory; ideally, a 94½-in.-long strip should be split from the log and worked down to $\frac{15}{16}$ in. thick by 1½ in. wide. Since the stock is bent in both planes, grain orientation is not important, as long as the grain is straight from end to end. I often bend stock green, and let it air dry on the bending form shown in the bottom photo.

The arm pattern detail in figure 1 shows how to lay out the flat portion of the arm and the beginning of the bow. Since the arms and the bow are cut from the same strip, the stock must be wider and flatter at each end and then taper toward the middle. I formed this double taper by fixing the stock on a special jig that runs through the thickness planer, but you could bandsaw it. To make the jig, taper a 1⅞x4x100½ strip of 8/4 hardwood to the dimensions shown in figure 2. Then all you have to do is place the stock in the planing jig and make repeated passes until the planer is set at 1⅞ in. (the thickness of the jig). Feed roller pressure will bend the blank to conform to the jig and cut a smooth, even taper. Once the blank is tapered, round the edges on one side with a ¼-in.-radius roundover bit. On the side *not* rounded over, mark the center of the blank to help align the piece in the bending form.

Make the bending form out of any ¾-in. material; mine is fir plywood. The back of the form, which is 14 in. high by 45 in. long, with the corners rounded to an 8-in. radius, is screwed to a larger plywood base (see the bottom photo). The arm forms are rounded to a 7-in. radius so that the curve covers 80°. At the outer end of this curve is a straight, 4-in.-long portion. Attach the arm forms to the back form with corner blocks, screws and glue; the arm form should be located so its curve starts 12 in. below the top of the back form.

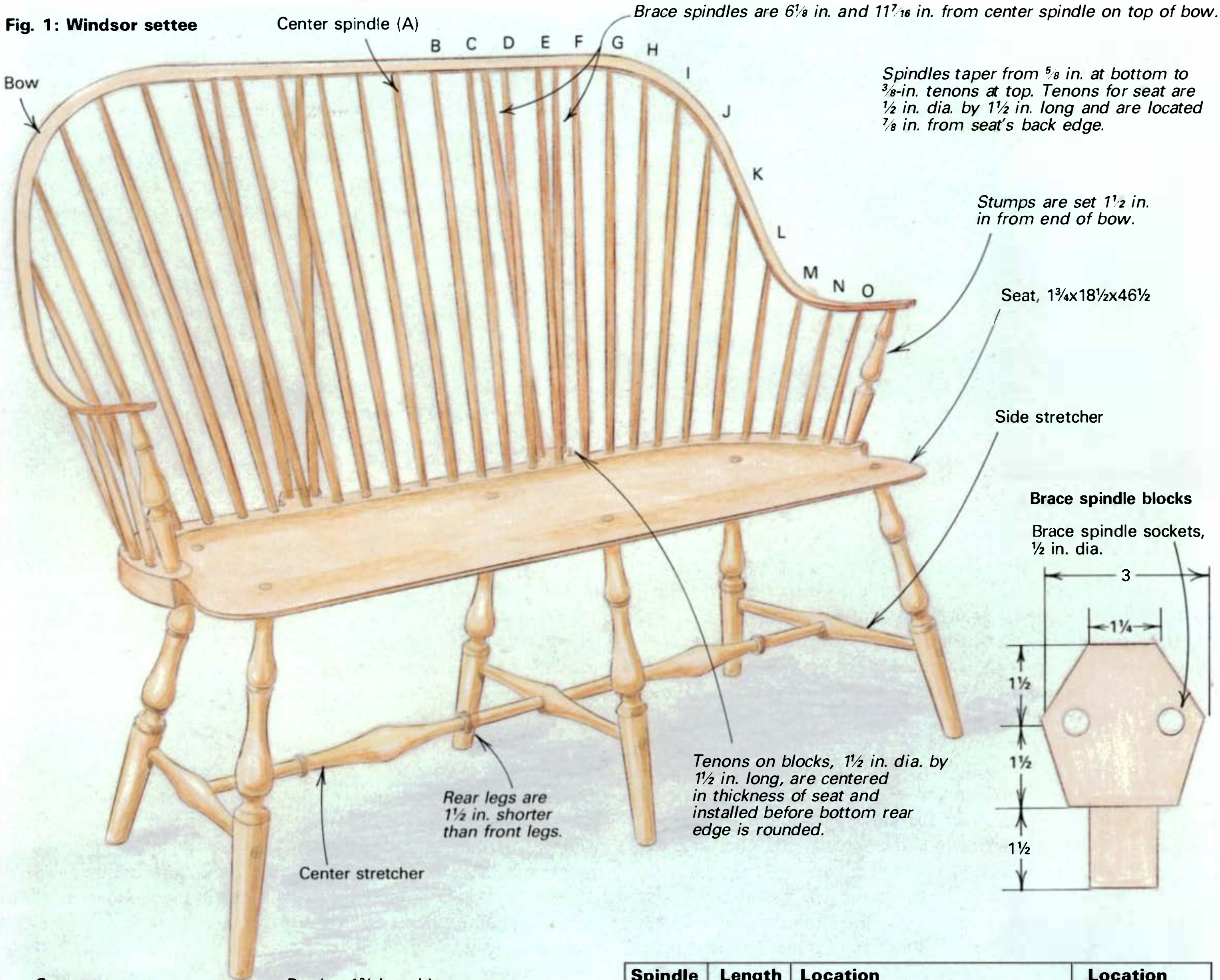
The bending blank is so thin that it will lose its heat quickly and must be locked into position within 25 to 30 seconds of being taken from the steamer. To reduce wasted motion, screw 2x2 turn-buttons on the form to guide the blank around the back corner and to minimize twisting. In addition, screw tapered cleats just above the corner bend of the back, so mating wedges can be driven between the cleats and the blank to lock the steamed stock in place. Turn-buttons on the side forms keep the lower part of the back bend snug to the form, and the ends of the arms are secured with small U-shaped pieces of plywood, shown in the bottom photo, which are slipped in place once the bend is complete.

After clamping the plywood base in the dogs of my workbench, I started cooking the blanks in the steamer. It will take between one and two hours until the blank is limber enough to bend. The exact time will depend on moisture content, steam temperature, etc. When the blank is limber, remove it from the steamer and place it on the form, aligning the center marks on the form and blank. The unrounded edges must be facing up, and the arm pads should be facing away from the form. Drive in the two tapered wedges, and draw one end of the blank around the form, tucking it under the rear turn-button on the way. Rotate the side turn-button as you go by it, and then continue the bend for the arm and slip a plywood U-clamp over it. Now do the other end.

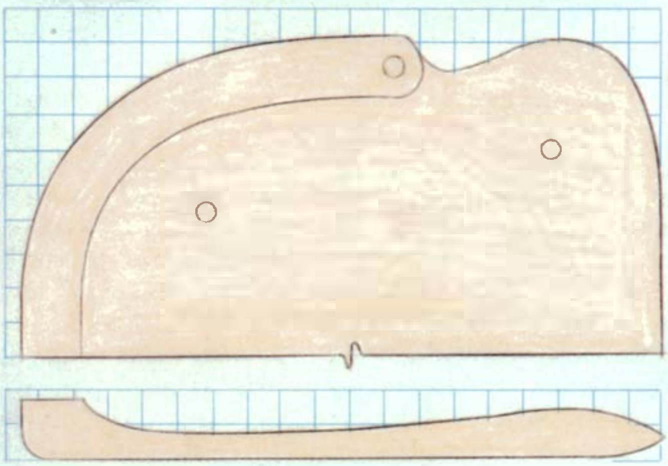
Constructing the base—While the back is drying in the form, a process that can take several days or even weeks depending on the season and the original moisture content of the green wood, laminate the pine seat blank. I began with a 20-in.-wide by 48-in.-long rough 8/4 block and machined it to 1¾x18½x46½. Next, draw the seat outline, as shown in the seat pattern in figure 1, and mark the

Photos except where noted: Dick Burrows; drawings: Kathleen Rushton

Fig. 1: Windsor settee



Seat pattern



Spindle	Length (in.)*	Location on Bow	Location on Seat
A	26¼	Center	Center
B	26¼	2½ in. O.C.	1¹⁵⁄₁₆ in. O.C.
C	26¼	2½ in. O.C.	1¹⁵⁄₁₆ in. O.C.
D	26¼	2½ in. O.C.	1¹⁵⁄₁₆ in. O.C.
E	26¼	2½ in. O.C.	1¹⁵⁄₁₆ in. O.C.
F	26¼	2¾ in. O.C.	1¹⁵⁄₁₆ in. O.C.
G	26¼	2¾ in. O.C.	1¹⁵⁄₁₆ in. O.C.
H	25¾	2¾ in. O.C.	1¹⁵⁄₁₆ in. O.C.
I	24½	2¾ in. O.C.	1¹⁵⁄₁₆ in. O.C.
J	22½	3 in. from center of spindle I	2 in. O.C.
K	19	4 in. from center of spindle J	2 in. O.C.
L	13½	3½ in. from center of spindle M	2 in. O.C.
M	10¾	2¾ in. from center of spindle N	2 in. O.C.
N	10¼	2⅝ in. from center of spindle O	2 in. O.C.
O	10½	2⅝ in. from center of stump	2 in. O.C.

* = Includes ¼ in. to ½ in. for trimming after assembly
O.C. = On center

Arm pattern

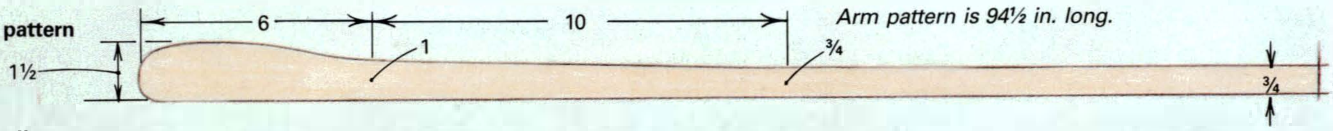
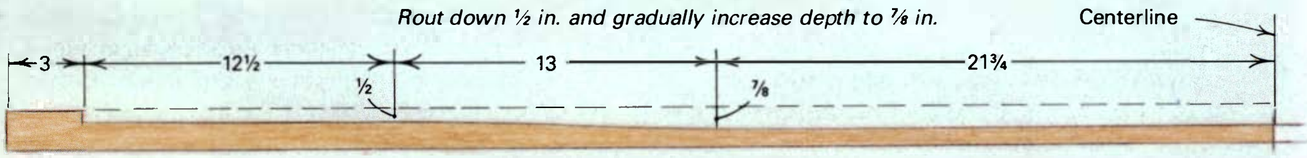


Fig. 2: Planing jig

Jig, 4 in. wide by 100½ in. long, is 1⅝ in. thick at ends and tapers to ¾ in. thick in middle.



The leg and stump holes are bored from the top down, so any tearout is hidden on the bottom. The drill is guided by a notched scrap of 2x3x8 hardwood, crosscut on one end to the desired angle. Pencil lines drawn on the seat indicate the direction in which the angled legs lean.

locations for the legs, stumps and spindles on top of the blank. I laid out the holes in the seat using a compass to step off the center points of the holes about ⅞ in. in from the rear edge of the seat. The chart in figure 1 gives measurements for locating the spindle centers along the top of the seat, as well as the bow.

I drilled the leg and stump holes from the top down, so any tearout would be hidden on the bottom. The easiest way to get the holes at the right angle is to take a scrap of 2-in.-thick hardwood, about 3 in. wide and 8 in. long, and crosscut one end to the desired angle; I have one block with its end cut at 16° for the front legs and another cut at 22° for the back legs, and a separate 20° block for stumps. Cut a V-groove in the angled ends. After drawing the angle-guide lines on the top of the blank, place the guide block on the seat so that the drill bit rests in the V-groove and lines up with the center of the hole, as shown in the photo above. Make sure the other end of the block is centered on the angle-guide line, and drill away. Using the same system, drill the hole for the center spindle at 8° off vertical.

The seat can be carved with whatever tools you have: traditional gutter adze, chainsaw, body grinder or router-based carver. My favorite is the Woodcarver, a cutting head that fits on a small body grinder and removes wood at a ferocious pace (see the review in *FWW* #87, p. 124). I followed this with progressively finer sanding discs on the grinder and then hand-sanding. Regardless of method, start with a marking gauge fitted with a pencil to lay out the 1¾-in.-wide border supporting the spindles and stumps. When refining the seat shape, rely on your hands to find high and low spots, and sand them out. Finally, mortise the blank for the blocks that support the brace spindles, shown in figure 1.

The next phase of construction is lathe work—33 spindles, plus 6 legs, 5 stretchers and 2 stumps, as shown in figure 3. For strength and visual unity, the spindles should be from the same stock used for the bow. Turning spindles that taper from ⅝ in. dia. to ⅜ in. dia. can be a challenge; you'll need to use a steady rest or your hand to prevent the slender pieces from whipping. Sometimes I rough out the spindle with regular lathe tools, and then do the final smoothing on the lathe with a handplane, used like a skew chisel, and a body grinder (see *FWW* #69, p. 45).

Legs, stretchers and stumps are straightforward spindle turning, with dimensions as shown. Any hardwood can be used, although I prefer maple for its hardness and abrasion resistance. The legs are all identical, save those at the rear, which are cut 1½ in. shorter so the seat will tilt backward comfortably. The center legs should be marginally shorter than the outer legs, to ensure that the bench doesn't rock from the center, but I simply trimmed them slightly after assembly. Once the turning is completed, bandsaw a slot in the end of each tenon to receive a wedge. I've found that cutting two slots ⅛ in. apart in the top tenon of the stumps is good insurance against any loosening from seasonal humidity fluctuations. Slots for the tops of the spindles are cut later; bottoms are not slotted.

Now is a convenient time to assemble the seat, legs and stretchers. Begin by dry-fitting the legs, aligning the wedge slots perpendicular to the seat grain. Now drill for the front to back stretchers. I did this freehand, using an extra-long auger bit in a slow-speed electric drill (see *FWW* #69, p. 46). Drill until the lead screw just begins to exit, and then remove the drill and complete the hole from the other side. Remove the legs, reassemble them with the front to back stretchers in place, and drill for the center stretchers. Now bandsaw some wedges: ½ in. wide for the stumps, ⅝ in. wide for the legs and ⅜ in. wide for the tops of the spindles; I prefer walnut for a visual accent, but you can use any hardwood. Swab all the mortises in the seat and undercarriage with glue, put a dab on the tenons and put it all together, driving a glue-coated wedge in each projecting tenon. Because of the long assembly time, I glued up everything with G2 epoxy, thickened with anti-sag powder and tinted with powdered stain, available from Lee Valley Tools Ltd., 1080 Morrison Drive, Ottawa, Ont., Canada K2H 8K7. Clean off squeeze-out with a rag dampened in glue solvent (alcohol works well with epoxy); after the glue has dried, trim the projecting tenons flush.

Assembling the back—You're now ready to drill the remaining spindle holes in the seat and bow. Before doing so, however, sand the bow to eliminate the fuzzy grain raised during steaming. If the grain has separated anywhere, line these splits with glue (stained with powdered pigments to match the final finish of the settee), and wrap them with waxed paper and several strips of inner tube.

Once the bow is completely smooth, dry-fit the stumps and the center spindle in their seat holes. As you recall, these holes were bored earlier before the seat was hollowed. Clamp the center of the bow to the top of the center spindle. To prevent splitting, clamp across the pad at the end of one arm. Now hold the arm in place on top of the spindle and drill the ½-in. hole for the stump, aligning the drill by eye. Once this is done, set the arm on the stump and repeat the process for the other arm. Now drill the ⅜-in. hole in the bow for the center spindle, and place the curved bow on the spindle.

The installed bow now becomes your guide for drilling the rest of the spindle holes in the seat, using the same extended auger bit as for the stretchers. Align the drill between the location marks on the seat and spindle and advance the bit until just the lead screw comes through the bottom of the seat; this guarantees that the hole is deep enough and provides an escape for hydraulic pressure when the spindle is inserted. Glue swept to the bottom of the hole during assembly fills the exit holes nicely.

After the seat holes are drilled, bore the matching holes in the bow with a brad-point bit mounted in a high-speed (2,500 RPM) drill. Traditionally, these holes were drilled by eye, but I built a jig (see figure 4) to make the process simpler and more reliable. This drilling jig is two blocks assembled with plywood squares and walnut strips. One block is fixed to a beam and one is movable. The outside strip on each is bored with a ⅜-in.-dia. hole. The hole in the movable block is a drill guide; the other houses a dowel or threaded rod protruding about 1 in. To use the jig, drop the dowel into a seat hole and clamp the sliding part just above the corresponding hole in the bow. Guide the bit through the hole and bore through the bow. Because of the angles of the holes, the bit may want to

Fig. 3: Lathe work

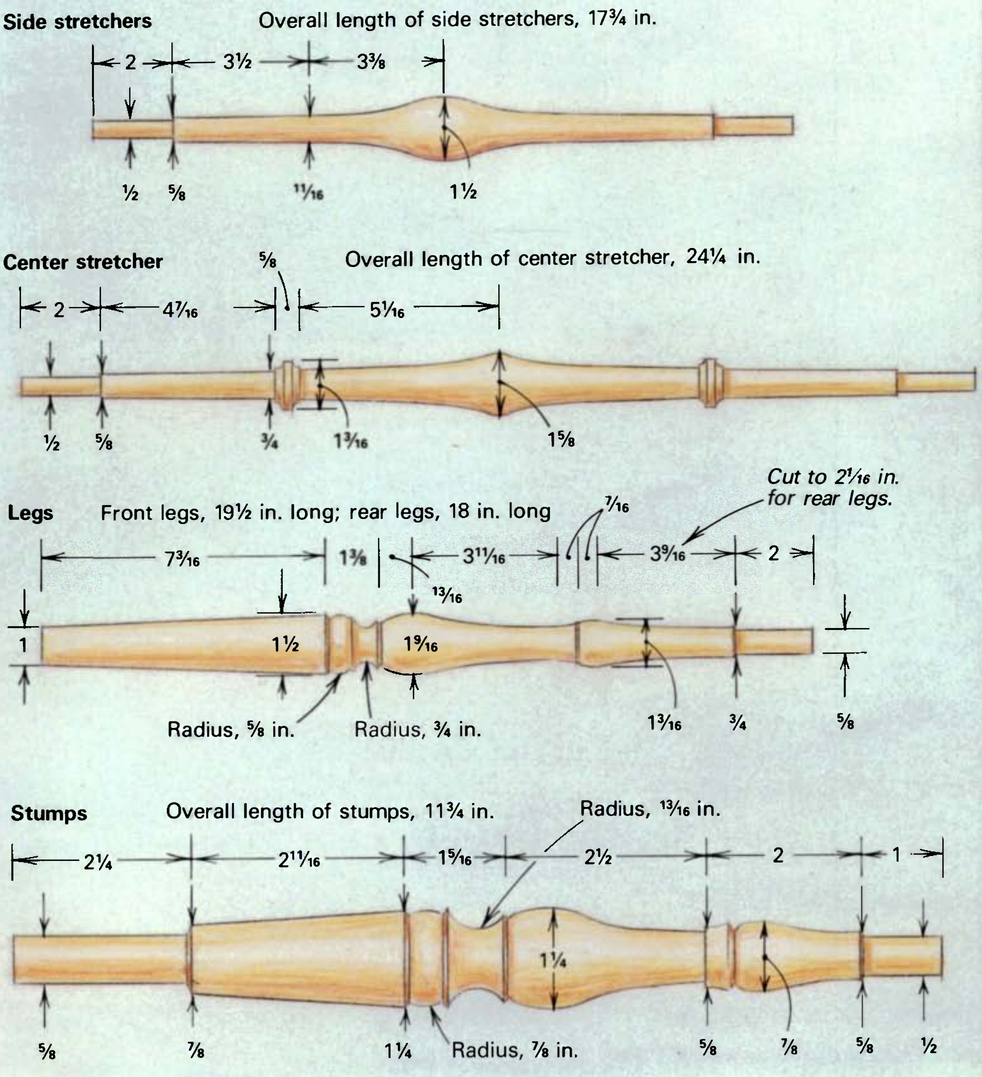
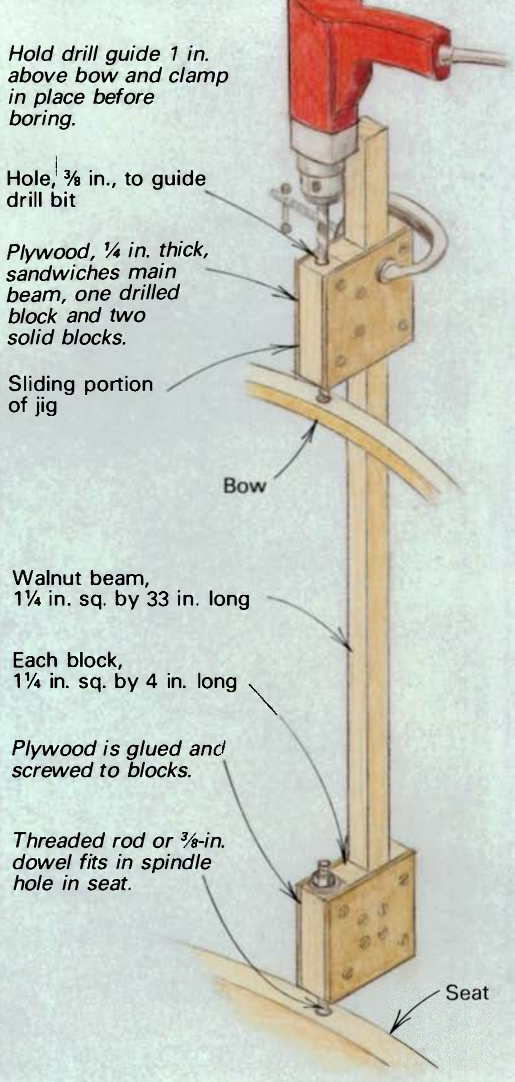


Fig. 4: Drilling jig



skitter off to one side. You can get around this by starting each hole by eye, holding the bit nearly perpendicular to the bow until the spurs begin to bite, and then slowly raising the drill into the proper line as the bit rotates. Use the drill guide to finish the hole.

When all the spindle holes are bored, you are ready for final assembly. First, dry-fit all the spindles in the bow (the extra-long tenons will slip well through). Then place the bow on the chair and insert the spindles one by one into the seat holes; this takes patience. When all the spindles are bottomed out in the seat, mark where each enters the bow. These marks are guides for trimming the spindles and cutting the wedge slots. When all the spindles are marked, use a rubber mallet to remove the bow, leaving the spindles in the seat. The spindles must remain in order, since each length is different. Remove one spindle at a time and slot it for a wedge, stopping each slot cut just above the mark where the spindle enters the bow. When you have done this, take a deep breath, disconnect the phone and get ready to glue up the back of the settee.

Start with the stumps. Swab glue into the holes in the seat and insert the stumps. Trim the projecting tenons close (not flush) to the bottom of the seat, drive a glue-coated wedge into the tenon and wipe off excess glue. Remove the spindles one by one from the seat and insert them in the corresponding holes in the bow, making sure that the slots in the spindles are perpendicular to the bow. Next, put glue in all the seat holes and on the upper tenons that project through the bow, and then set the spindle-and-bow assembly in place. Gradually work the spindles into the seat holes, drawing glue into the hole and fitting the arms to the stumps as you go. When everything is snug, wedge all the tenons in the bow and wipe off excess glue. Because the fourth spindle from each end enters and exits the bow at such an extreme angle, it is often reluctant to seat properly, even with a wedge. The solution here is to drive the wedge in delicately, and then wrap the protruding tenon with a couple of layers of waxed paper, followed by several wraps of tightly stretched strips of inner tube to clinch the bow on the tenon. This keeps everything where it belongs and eliminates any need to fill the joint later. Leave everything alone until the glue is thoroughly dry, and then trim the projecting tenons with a coping saw and smooth everything with a 120-grit disc on a body grinder and with hand-sanding. Your settee is now ready to finish.

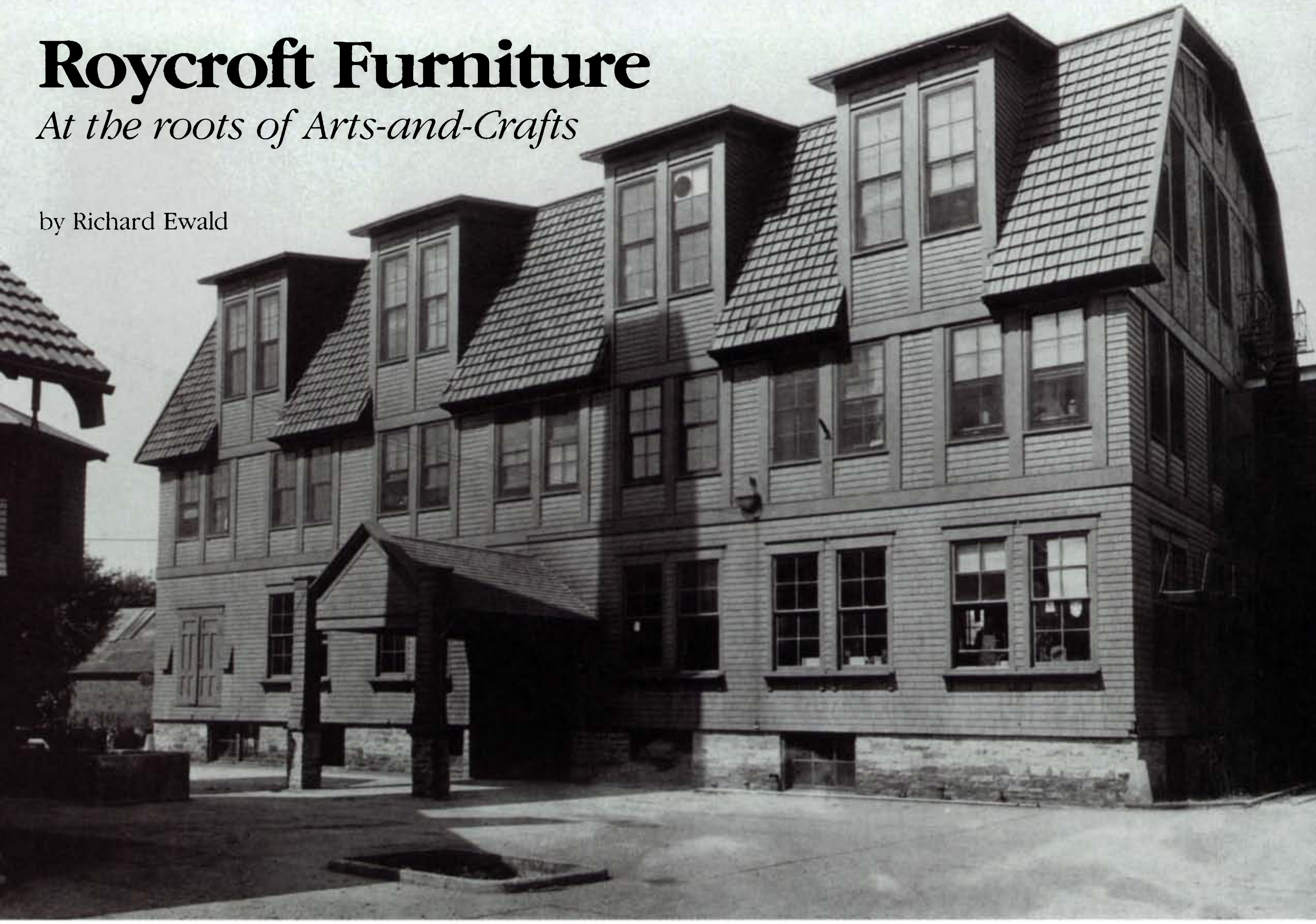
Traditionally, Windsor chairs were painted, but most of my clients prefer clear finishes. This can be a problem since the woods used—ash, pine and maple—don't react to stain the same way; a wiping stain emphasizes differences, rather than blends them together. I use spray-on alcohol- or lacquer-base stains (non-grain-raising stains are available from many local and mail-order suppliers). Although they don't penetrate very deeply, I haven't experienced any chipping or wearing through, and they blend the wood colors without masking figure. After staining, apply a topcoat. I like tung oil-varnish mixtures, which develop a lovely soft patina over time. □

Mac Campbell designs and builds furniture in Harvey Station, N.B., Canada.

Roycroft Furniture

At the roots of Arts-and-Crafts

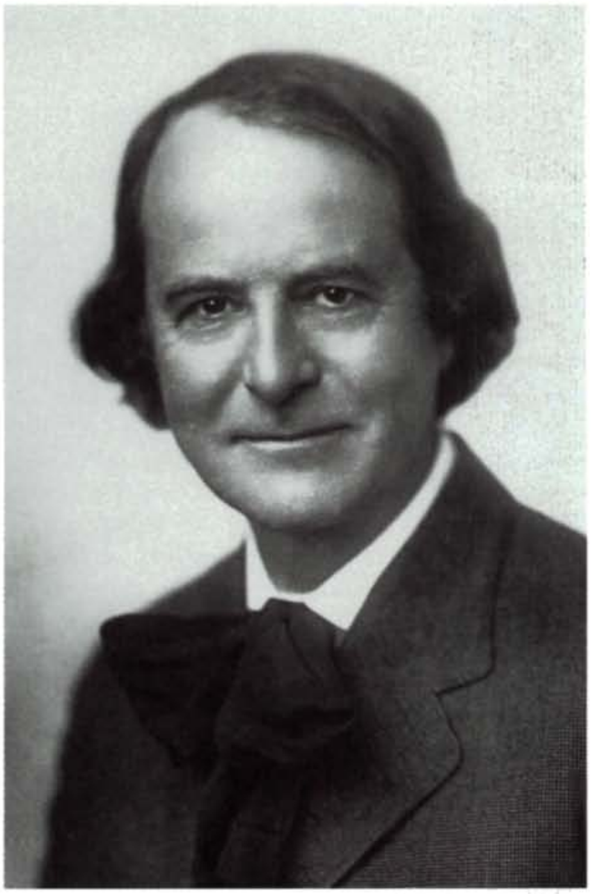
by Richard Ewald



Above: The Roycroft furniture shop, circa 1910, employed 10 full-time woodworkers and several part-timers. But the Roycroft community brought in world-renowned artists and designers, and was a large employer in the East Aurora, N.Y., area.

Right: Elbert Hubbard was the founder and spiritual leader of Roycroft, a utopian Arts-and-Crafts community that flourished around the turn of the century. He coined the name Roycroft as a contraction of Royal Craftsmen.

Below: This well-equipped bench room in the Roycroft furniture shop is indicative of the importance the Roycrofters assigned to handwork. Although they accepted the use of machinery, it was subservient to design.



Top photo: Courtesy of Chester and Onda Dylewski, Roycroft Campus Antiques
Bottom photos: Courtesy of Kitty Turgeon and Robert Rust, Roycroft Associates Design Studio and Gallery

When the subject of Arts-and-Crafts furniture comes up, Elbert Hubbard's name does not spring to mind as easily as Gustav Stickley's. But it should. Though he was never a woodworker, Hubbard is the man most responsible for creating Roycroft: a community, a business and a philosophy of life and work that still exists today as a rallying point for Arts-and-Crafts history, woodworking and the notion that making and owning hand-crafted objects join body, mind and spirit.

At its zenith in 1910, the Roycroft community, in the western New York village of East Aurora, employed 500 as book printers, blacksmiths and other metalworkers and furnituremakers. It was a gathering place for artists, philosophers, writers and designers, drawn there by Hubbard (shown in the bottom, right photo on the facing page), a successful soap salesman who pitched the concept and rewards of making and owning functional art.

The entire Roycroft campus, including the 35-room inn where all those guests stayed, was eventually designated a national historic landmark. But in 1989, the National Trust added Roycroft to its list of the 11 most endangered historic places. It marked the latest financial crisis in a long effort to maintain the legacy of an enterprise that faltered when Hubbard died in 1915 and virtually collapsed altogether in the 1930s, before being revived in recent years.

A crafts revival in the 1960s reawakened East Aurora's memory of the unruly, creative and productive crowd that spiced up the town in the first two decades of the century. Although Roycroft originally brought in outsiders, many of today's townspeople have relatives who worked in the Roycroft shops. Now the efforts of entrepreneurs Robert Rust and Kitty Turgeon of Roycroft Associates, local history buffs, and several woodworkers and other craftsmen have revitalized the old enterprise. Reproduction work is being commissioned and sold. Developers and historic preservationists are working together to save the old buildings. East Aurora, which maintains a museum for native son and former U.S. president Millard Fillmore, also refuses to forget Elbert Hubbard and founded a museum in his name in the 1960s.

The beginnings—Born in Bloomington, Ill., in 1856, Hubbard quit school as a teenager to sell soap door-to-door. Eventually, he and his brother-in-law John Larkin formed a soap manufacturing company, which they moved to Buffalo, N.Y., in 1875. The Larkin Soap Co. was an enormous success, due in no small part to Hubbard's flair for clever jingles and marketing ideas.

A man of intellectual aspirations and spiritual ideals, Hubbard was a writer and he read widely, particularly the works of philosopher John Ruskin and designer William Morris, leaders of the English Arts-and-Crafts movement. In 1893, he quit the soap business and the next year traveled to England, met Morris, and returned full of literary fire and the vision of creating a Morris-style crafts community combining publishing and manual arts. Within another year, Hubbard had bought printing presses and published his first book and the first issue of his magazine, *The Philistine,* which contained essays about design, art, philosophy, literature and religion, as well as new works of fiction.

Hubbard's magnetic personality and publishing success brought him enough income, fame and visitors to create a stir in East Aurora. By 1896, Roycroft woodworkers were building furniture in the English Arts-and-Crafts style and they began selling it to visitors in 1897. It wasn't until 1898 that Gustav Stickley, another upstate New Yorker, who was producing furniture in the Shaker and Queen Anne styles, made a similar pilgrimage to England to visit Morris. Upon his return, he too experimented in the Arts-and-Crafts style and published *The Craftsman,* a magazine that ultimately became a sort of bible for the Arts-and-Crafts movement in America.

Eventually, a Roycroft furniture catalog was published and Hubbard promoted the furniture as feverishly as he had soap. But woodworking at Roycroft began as an answer to the needs of the inn and the print shops and never became more than a small part of the community. Even though Hubbard got a head start on Stickley and his brothers, Roycroft never produced as much furniture as they did or received as much attention in the trade press. Still, Roycroft was nationally known at the time as a major manufacturer of what was inappropriately called Mission style or Mission oak. The name supposedly had something to do with spare furnishings of the Franciscan missionaries of California. This furniture didn't really resemble monastic furniture, but the name stuck and serves as a reminder that its makers thought they served a social mission: to reform the tastes and habits of Victorian America, typified by proper citizens who sat in corsets and stiff collars upon a clutter of European-derived furniture that was delicate, heavily ornamented with carvings and covered with cushions and fabrics, and who felt their polite society was at the pinnacle of human evolution.

Joining body, mind and spirit—The American Arts-and-Crafts movement sought to throw open the windows of the emerging stuffy parlors and sitting rooms and bring in furniture and furnishings meant to express new ideas, or rather, reaffirm old ideas that the industrial revolution and mass production had displaced. Through Morris and Ruskin, Hubbard and Stickley reached back into medieval Europe for their insignias and for organizational ideas based on guild systems and on a reverence for skilled handwork and everyday objects as art. The furniture style they embraced was rectilinear, massive and extremely durable.

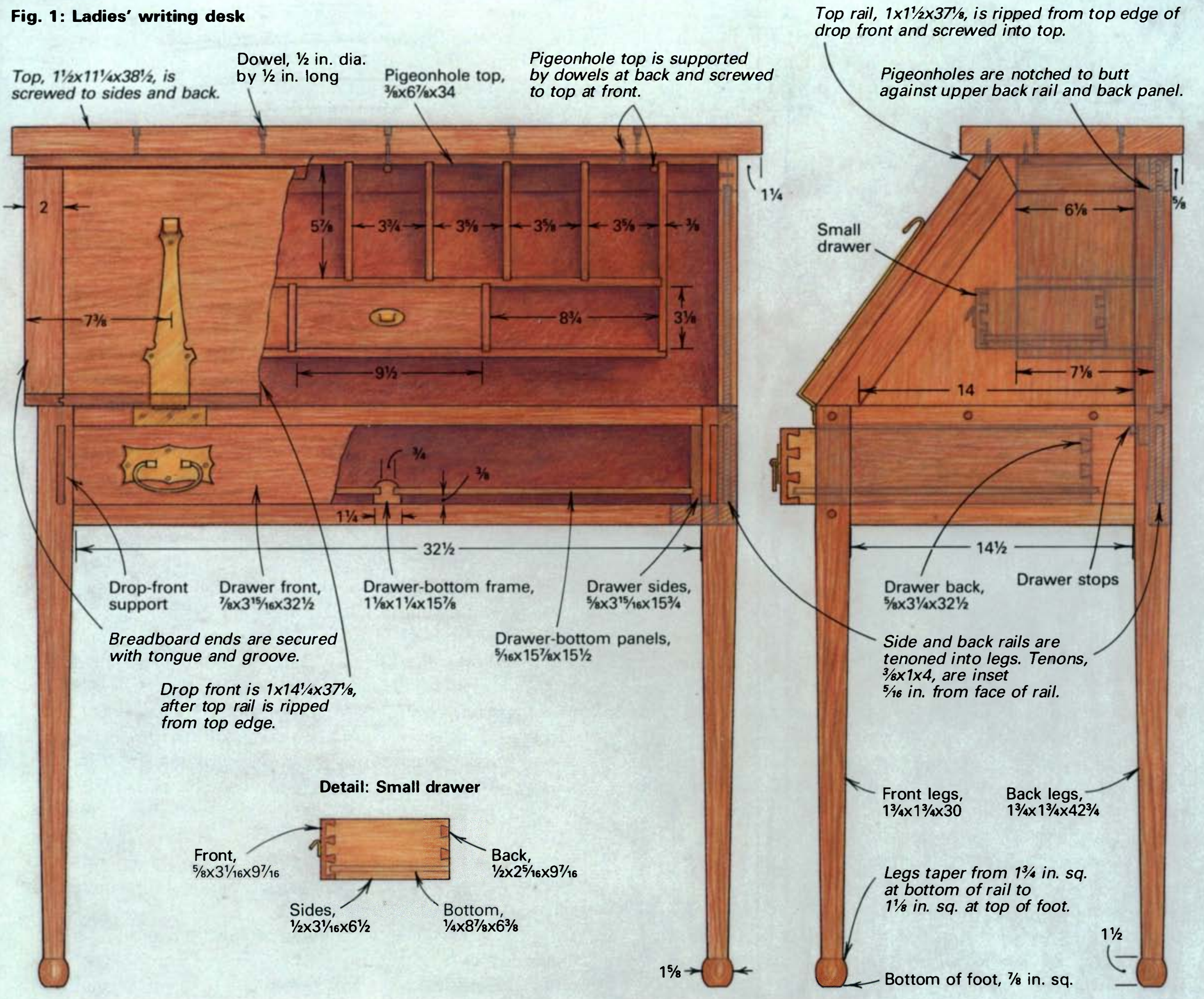
These old ideas were taken up quickly in the lively social climate of Hubbard's time. This was long before television and even radio, but it was the heyday of the orator and the pamphleteer, and Hubbard was equal to the challenge, averaging a hundred speeches a year and publishing constantly. Rural utopian communities sprang up. Educators called for manual-arts education for the upper classes. Psychologists praised the value of handcrafts in reducing stress and reversing illness.

Roycroft grew, not as a commune or guild, but as a corporation. Hubbard attracted talented designers to East Aurora. The woodworking shop (shown on the facing page), however, remained relatively small even during the peak period from 1912-1919, when there were several hundred employees. The pay was relatively low, but there were unusual benefits. Employees could buy shares of stock and save money through payroll savings and checking account services in the Roycroft Bank. They were encouraged to learn many crafts and work in different shops, use the library, learn to sing or play an instrument, and join the band or the ball teams. Hubbard moved among them like an inspiration, a handsome man with a warm personality, cutting a striking figure in his wide-brimmed Stetson hat over his long hair.

But because he was most interested in publishing authors like Rudyard Kipling, Stephen Crane and Carl Sandburg, and greeting famous visitors, Hubbard didn't have time for designing furniture. A bookish man, Hubbard was not known to have woodworking talents. In fact, he once admitted that he deferred decisions in the woodworking shop to James Cadzow, who at the time was the shop foreman. Historians say other cabinetmakers and shop foremen who probably influenced specific designs were Herbert Buffum, Victor Toothaker and Albert Danner, a German artisan sometimes referred to in promotional literature as "Uncle Albert Roycroft."

Roycroft furniture, like the ladies' writing desk in the drawings on the following pages, was sturdily built with mortises and tenons and dovetails. Quality quartersawn oak, shipped from as far away

Fig. 1: Ladies' writing desk



as the Carolinas, was standard stock. The Roycrofters were not as single-minded about oak as Stickley, however, and so ash, walnut, Honduras mahogany and bird's-eye maple were also used.

The unadorned, straight-back Roycroft furniture appears Gothic in proportions but Shaker in simplicity. It stands on legs that are generally stout and straight, but sometimes taper or end in bulbous feet. Some chairs were fitted with leather seats or back cushions that were fastened with brass tacks. Wags of the era said Roycroft furniture was built so a child couldn't destroy it and four men couldn't lift it.

The dark Roycroft finish, a combination of stain, filler and wax polish, was long considered a secret. Outsiders suggested its characteristic weathered look could be produced by soaking furniture in a barrel of soapy water, old scrap metal and rusty nails. Some have speculated that the finish was produced with ammonia fumes.

While Arts-and-Crafts philosophers praised the sanctity of handwork, the Roycroft shop was well equipped with machinery: tools considered acceptable as long as they served the design and not the other way around. Ray Kuchenbeisser, a sawmill operator who today lives a few miles from East Aurora, still uses three machines he bought when the Roycroft shop was dismantled in 1936: a 36-in.-wide thickness planer, a 16-in. double-arbor tablesaw and a tenoner/mortiser. A fire at his mill in 1945 damaged three other tools: a double-spindle shaper, a 36-in.-wide jointer and a 36-in. bandsaw. "I'd have to go out and dig up the bill to see what I paid for all that, but I'm pretty sure it was $435," says Kuchenbeisser.

Roycroft needed every cent. The Depression delivered a near-fatal blow to an enterprise that had been staggering for decades. For as quickly as the Arts-and-Crafts movement had burst on the scene as a style and a business opportunity, it vanished just as fast, although some of its ideas lived on.

The demise of Arts-and-Crafts—Hubbard went down with the Lusitania in 1915. By 1916, Stickley had stopped publishing *The Craftsman* and was bankrupt two years later. Although Hubbard's son, Elbert Hubbard II, lacked his father's vision and charisma, he maintained Roycroft until it went bankrupt in 1938. And so Arts-and-Crafts furniture lost two visible and colorful proponents and makers.

But by then, it had also lost its market. With its emphasis on handwork, the furniture was more expensive than the mass-produced work it hoped to supplant. Ironically, the "common man" could not afford the furniture built by and for the common man.

Drawings: Lee Hov

Fig. 2: Desk construction

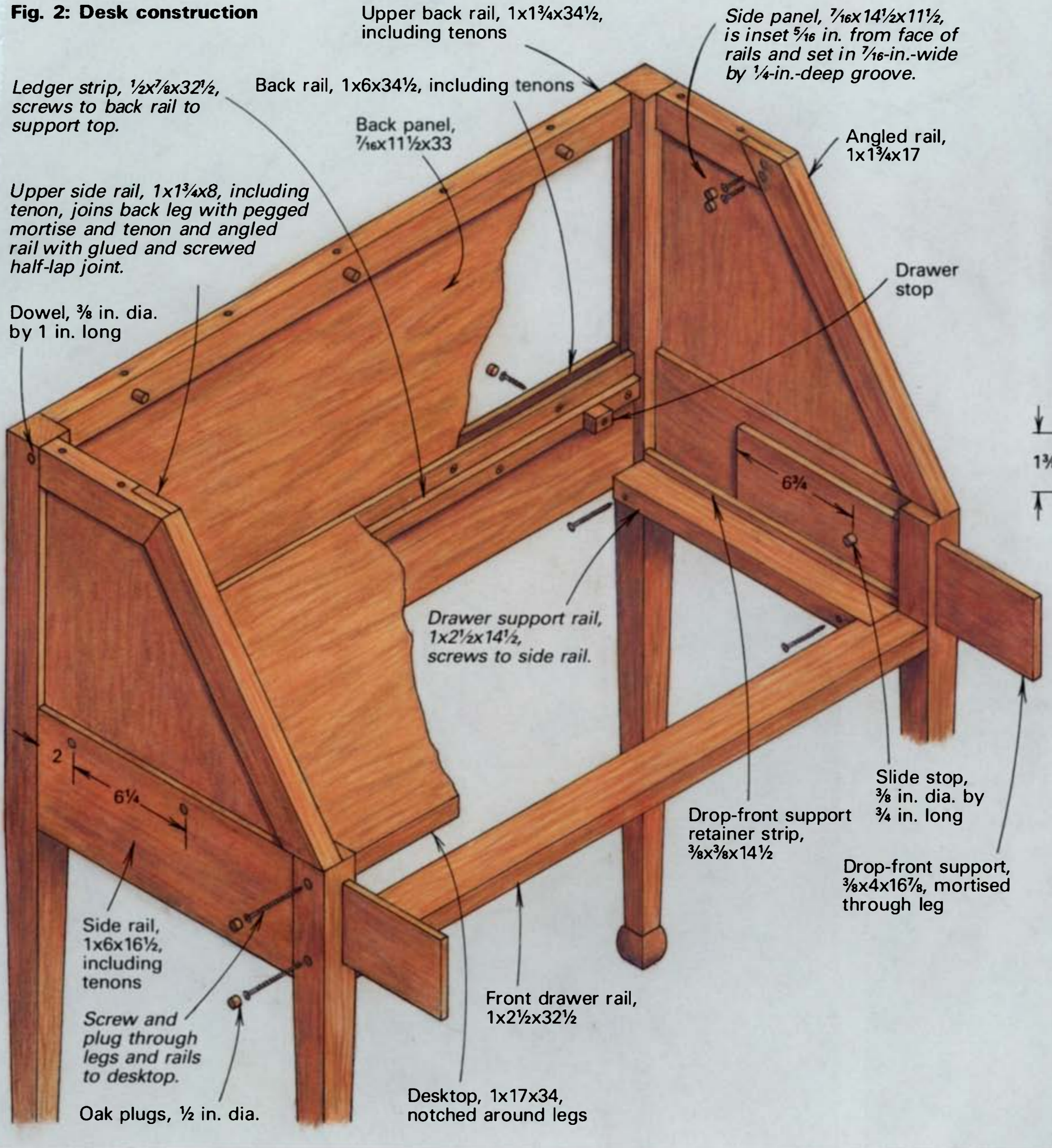
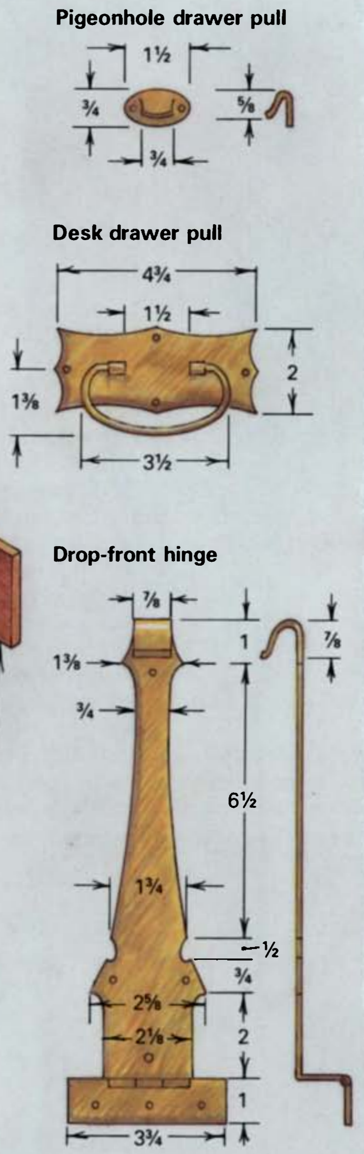


Fig. 3: Hardware

All hardware made from ⅛-in.-thick copper.



Because it was a simple style, it was easy to copy and mass produce. And because the style was so closely identified with a certain time and set of ideas, it was quickly dated. The style that was meant to rise above fashion went right out of fashion. The emerging American middle class opted for the mass-produced style and was unwilling to pay for things embodying values like honesty and durability.

Today, Arts-and-Crafts furniture is bringing higher prices than ever among collectors. Those who spot the Roycroft stamp on a piece know they have found something more rare than a Stickley, but no less a product of that special time. This revived interest suggests that the ideas of Elbert Hubbard and others live on in the appreciation of work that is carried out by hand to enrich the mind and spirit of both the maker and user. □

Richard Ewald is a freelance writer in Westminster West, Vt. The drawings in this article are copyrighted by Roycroft Associates and may not be used for commercial purposes. Permission is granted for individual projects, but reproductions should be signed and dated to avoid confusion for later historians. Roycroft Associates, East Aurora, N.Y., provides authentic reproduction hardware for the desk in the drawings, as well as a full line of reproduction items.

Further reading

The Arts and Crafts Movement in America, 1879-1916, Robert Judson Clark, editor. Princeton University Press, 41 Williams St., Princeton, NJ 08540; 1972.

The Arts and Crafts Movement in New York State, 1890s to 1920s, The Gallery Association of New York State, PO Box 345, Hamilton, NY 13346; 1983..

The Craftsman Homeowner Club Newsletter, The Roycroft Shops, 31 Grove St., East Aurora, NY 14052.

Furniture of the American Arts and Crafts Movement by David Cathers. New American Library, 1633 Broadway, New York, NY 10019; 1981.

History and Renaissance of the Roycroft Movement by Charles F. Hamilton, Robert Rust and Kitty Turgeon. Buffalo and Erie County Historical Society, 25 Nottingham Court, Buffalo, NY 14216; 1984.

Roycroft Handmade Furniture, House of Hubbard, c/o Roycroft Gift Shop, 31 Grove St., East Aurora, NY 14052; 1973.

The Roycroft Movement: A Spirit for Today?, State University of New York College at Buffalo, Buffalo, NY 14260; 1977.

Above: Helen McPherson, a professional woodworker from Eltham, Victoria, built this 18Hx27Wx14D sea chest with mountain ash panels and silky oak frames and top. Jarrah wood, fumed darker with ammonia, was used for peg heads and other embellishments.

Right: This 42Hx33Wx30D chair, by woodworker Lex Whadcoat of Bairnsdale, Victoria, is from blackwood and silver ash. Bent-lamination techniques were used for the continuous arm-backrest. It is finished with catalyzed lacquer.

Below: Bill Hawtin's hall table has a 60-in.-long huon pine top and a base of maple and Australian myrtle, which grows in Tasmania.

Woodwork from Australia

Melbourne-area group shows its finest work

by Bill Hawtin

Bottom, left: Stephen Hughes, a woodcraft instructor and turner from Frankston (a suburb of Melbourne) used sweet-smelling huon pine for these turned-and-carved vessels. Margaret Salt, an artist from Mt. Martha, Victoria, painted the designs on the turnings, which were then finished with a lacquer sealer and beeswax.

Top, left: Huon pine was the wood of choice for the 20Hx69Xx18D lowboy built by professional woodworker Neville Selleck. A resident of Richmond, a suburb of Melbourne, Selleck made the lowboy's drawer pulls from black bamboo and chose huon pine for the carcase because of its highly aromatic properties, even though it sells for between $10 and $12 a board foot.

Above: A professional woodworker from Tecoma, Victoria, Hamish Hill built these 4-ft.-high shelves from mountain ash, a eucalyptus that is indigenous to the mountainous regions of eastern Victoria and Tasmania. The twin end tenons on each shelf pierce the sides and lock in place with wedges.

Most woodworkers take pride in displaying their painstakingly crafted wares to the public. This was especially true for the members of the Victorian Woodworkers Association (VWA), who held their seventh annual exhibition last November at the Doncaster Civic Center in a suburb of Melbourne, Australia. The exhibition drew about 1,500 visitors who saw an eclectic collection of 97 pieces selected by a panel of local judges. The work shown here exemplifies the diversity of the display, which ranged from small turned objects to furniture to large, non-functional pieces produced by all manner of techniques. The materials used in the work are even more diverse, including indigenous Australian woods (like blackwood and huon pine), imported tropical exotics, driftwoods, sheet goods and non-wood materials.

To liven up the exhibit, a demonstration weekend was held during which about 20 enthusiastic volunteers carved, coopered, turned, chainsawed, and performed feats of blacksmithing and cabinetmaking. Demonstrators included Helen McPherson, who showed how she makes small wooden boxes; Neville Selleck, who constructed stools and tables; and Hamish Hill, who, with the assistance of Heather Chapple, constructed a large wooden horse. This latter project was done in accord with the famous Melbourne Cup horse race run during the course of the exhibit.

The VWA's annual exhibition has become a prestigious event for its members, and for some, a profitable one too: 25% of the pieces were sold during the show, for a total of $8,000 (Australian dollars). The VWA, headed by president Brian Griffiths, holds monthly meetings for its members, and provides demonstrations, lectures, and visits to industry and group discussions, all aimed at improving the skills of its members. □

Bill Hawtin is a professional woodworker from West St. Kilda, a suburb of Melbourne, Victoria. For more information about the VWA, contact the organization at 7 Blackwood St., North Melbourne, Victoria 3051, Australia.

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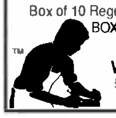

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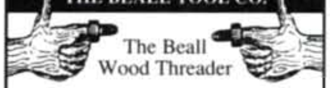

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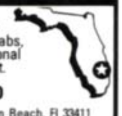

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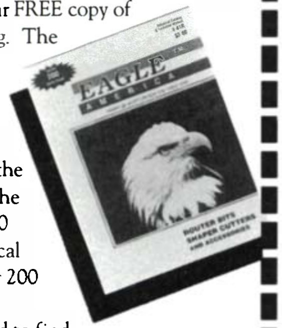

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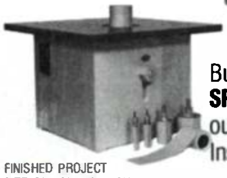

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Listings of gallery shows, major craft fairs, lectures, workshops and exhibitions are free, but restricted to happenings of direct interest to woodworkers. We list events (including entry deadlines for future juried shows) that are current with the 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.

ARKANSAS: **Workshop**–New Methods in the Cleaning and Painting of Wooden Artifacts, July 11–16. Parker Restoration, PO Box 93, Gentry, 72734. (501) 736-8510.

CALIFORNIA: **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, thru 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–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.
Show–Beside Great Waters, thru May 18. Featuring turnings by Dennis Elliott and furniture by Michael Tidwell. Banaker Gallery, 1373 Locust St., Walnut Creek, 94596. (415) 930-0700.
Show–Turned Wood '91, June 1–July 7. Los Angeles. Featuring 24 turners. Opening reception, June 1. del Mano Gallery, 11981 San Vicente Blvd., Los Angeles, 90049. (213) 475-8508.
Juried show–Artists Market, June 1–2. Long Beach Museum of Art. For info, contact Joanne France, 401 Manila, Long Beach, 90814. (213) 494-3526.
Show–Furniture and other items from Pacific Northwest woods, June 1–30. Sponsored by Humboldt Woodworking Society and Ambiance Gallery. Contact Ambiance Gallery, 226 F St., Old Town, Eureka, 95501. (707) 445-8950.
Juried show–Contemporary Crafts Market, June 7–9. Santa Monica. Contact Roy Helms & Associates, 777 Kapiolani Blvd., Suite 2820, Honolulu, HI 96813. (808) 836-7611.
Juried show–San Diego Woodworkers Design in Wood Show, June 18–July 7. In conjunction with the Del Mar Fair. For info, contact R.C. McNamara, 3893 Mt. Blackburn Ave., San Diego, 92111. (619) 277-1949.
Classes–Saturday morning tool clinic, May 11; Building a 15-ft. lapstrake canoe, May 18–25. San Francisco. Contact the National Maritime Museum Association, Bldg. 275, Crissy Field, San Francisco, 94129. (415) 929-0202.
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. Contact Continuing Education in Engineering, UC Berkeley, 2223 Fulton St., Berkeley, 94720. (415) 642-4151.

COLORADO: **Classes**–Woodworking and related classes, year-round. Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401. (303) 988-6160.
Workshops–Summer woodworking and furniture design workshops. Teachers include Alan Peters, Thomas Moser, Peter Korn, Harv Mastilir, Kathleen Loe, Michael Emmons, Sam Maloof, Simon Watts, Gail Fredall Smith, Jim Barefoot, Robert DeFuccio, Nora Hall, Monroe Robinson, Bob Flexner, Stephen Proctor. Anderson Ranch Arts Center, PO Box 5598, Snowmass Village, 81615. (303) 923-3181.
Exhibit–Art of Woodworking, May 2–27. Stanley Village, Estes Park. Sponsored by Art Center of Estes Park. For info, contact Lynda Vogel, Art Center of Estes Park, PO Box 3635, Estes Park, 80517. (313) 586-5882.
Gallery walk–Art walk weekend, May 17–19. Exhibits at 12 galleries featuring numerous artists, including Fred Cogelow. For info, contact Jenny Kosenka at (313) 586-5801.
Workshops–Woodworking classes and workshops sponsored by Colorado Woodcarving Guild, July 20–Aug. 2. Also, Colorado Open Woodcarving competition championships, July 27–28. For info on both, contact Colorado Woodcarving Guild, 2613 Alteza Lane, Colorado Springs, 80917. (719) 574-8323.

CONNECTICUT: **Exhibits**–Gilding the Lily, thru Apr. 20. Creative Arts Workshop, 80 Audubon St., New Haven, 06510. (203) 562-4927.
Exhibit–Best of the Nutmeg Woodturners League, thru Apr. 22. Including the work of all 24 members. Brookfield Craft Center, PO Box 122, Route 25, Brookfield, 06804. (203) 775-4526.
Juried show–15th annual SoNo Arts Celebration, Aug. 3–4. Application deadline: Apr. 30. On the streets of South Norwalk. For info, contact The SoNo Arts Celebration, Exhibiting Arts Committee, PO Box 2222, South Norwalk, 06852. (203) 849-9366.
Workshops–Turning Between Centers with Bill Gundling, May 4–5; Bandsaw Techniques with Bill Gundling, May 18; Shaker Basketry: Round Bottom Basket with Gerrie Kennedy, May 18–19; Making Boxes with Carolyn Chadwick, May 11. For info, contact Brookfield Craft Center, PO Box 122, Route 25, Brookfield, 06804. (203) 775-4526.
Juried exhibition–23rd annual Celebration of American Crafts, Nov. 11–Dec. 23. Deadline for slides: June 15. Contact The Celebration, Creative Arts Workshop, 80 Audubon St., New Haven, 06510. (203) 562-4927.
Exhibition–56th annual exhibition of Society of Connecticut Craftsmen, July 13–Sept. 29. Including woodwork. Stamford Museum & Nature Center, Stamford.
Juried exhibition–34th annual Guilford Handcrafts Expo, July 18–20. Guilford. Also, classes for adults and children. Contact Guilford Handcrafts, PO Box 589, 411 Church St., Guilford, 06437. (203) 453-5947.

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: **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: **Fair**–ACC Craft Fair Atlanta, Apr. 26–28. Apparel Mart, Atlanta. For info, contact American Craft Enterprises, PO 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, PO 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.
Show–International Turned Objects Show, June 29–Nov. 10. Morgan Cultural Center, Madison. For info, contact International Sculpture Center, 1050 Potomac St. N.W., Washington, DC 20007. (202) 965-6066.
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.
Competition–Design Emphasis '92 furniture design competition, call for entries. Sponsored by and held in conjunction with the International Woodworking Machinery & Furniture Supply Fair '92, Aug. 21–24, 1992, Georgia World Congress Center, Atlanta. For info on the competition, contact Shirley Byron, IWF 8931, Shady Grove Court, Gaithersburg, MD 20877. (301) 948-5730.

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, PO 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.

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, PO Box 132, Clinton, 52733. (319) 259-8308.

KANSAS: **Competition**–Topeka Competition 15, thru 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.

KENTUCKY: **Workshops**–Woodturning and joinery instruction. One day to one week. Contact Jim Hall, Adventure in Woods, 415 Center St., Berea, 40403. (606) 986-8083.

LOUISIANA: **Juried competition**–Lafayette Art Association national juried competition of two- and three-dimensional art, thru Apr. 30. Contact Marta Fielding, Lafayette Art Gallery, 700 Lee, Lafayette, 70501.
Seminar–Financial Management, May 17–18. New Orleans. For info, contact Architectural Woodwork Institute, 2310 S. Walter Reed Dr., Arlington, VA 22206-1199. (703) 671-9100.

MAINE: **Classes**–House Design and Building, 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, PO 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.
Juried festival–Columbia Festival of the Arts, June 28–30. Kittamaqundi Lakefront, Columbia. For info, contact Columbia Festival Artisans '91, Columbia Art Center, 6100 Foreland Garth, Columbia, 21045. (301) 730-0075.

MASSACHUSETTS: **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.
Workshop–Subtractive Methods of Working with Wood, Sculpture and Furniture Design with Rich Penziner, May 25–27. Also, summer sessions: June 30–July 20, July 22–Aug. 11, June 30–Aug. 11. Horizons, 374 Old Montague Rd., North Amherst, 01002. (413) 549-4841.
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, PO Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Show–Regional Wood Furniture: A Varied Approach, thru June 23. Fitchburg Art Museum, 185 Elm St., Fitchburg, 01420. (508) 345-4207.
Workshops–House Building, May 20–June 7, July 29–Aug. 16, Aug. 26–Sept. 13; Timber Framing, June 17–21, July 22–26; Cabinetmaking, June 24–28, Oct. 7–11; Finish Carpentry, July 8–12, Sept. 30–Oct. 4. The Heartwood School, Johnson Rd., Washington, 01235. (413) 623-6677.
Classes–Woodworking classes, throughout most of the year. Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.
Show–Boston Craft Market, June 21–23. For info, contact WRS, 3000 Chestnut Ave., Suite 300, Mill Centre, Baltimore, MD 21211. (301) 889-2933.
Fair–ACC Craft Fair West Springfield, June 18–20 (trade), June 21–23 (public). Eastern States Exposition, West Springfield. Contact American Craft Enterprises, PO Box 10, 256 Main St., New Paltz, 12561. (800) 836-3470.

MICHIGAN: **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: **Exhibit**–Furniture, I Presume, thru Apr. 28. Minneapolis Institute of Arts, 2400 3rd Ave. S., Minneapolis, 55404. (612) 870-3000.
Fair–ACC Craft Fair Minneapolis, May 10–12. Minneapolis Convention Center. For info, contact American Craft Enterprises, PO Box 10, 256 Main St., New Paltz, NY 12561. (800) 836-3470, (914) 255-0039.
Symposium–American Association of Woodturners 5th national symposium, June 14–16. North Texas State University, Denton. Including demonstrations, discussions, exhibits, more. Contact AAW, 667 Harriet Ave., Shoreview, 55126. (612) 484-9094.
Juried festival–19th annual Minnesota Crafts Festival, June 15–16. College of St. Catherine, St. Paul. For info, contact MCC-Festival, Suite 308, 528 Hennepin Ave., Minneapolis, 55403. (612) 333-7789.
Juried show–9th annual Upper Midwest Woodcarvers' Exhibition, July 22–26; Blue Earth. For info, contact Harley Schmitgen, 311 E. 14th St., Blue Earth, 56013. (507) 526-2777.
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, PO Box 37051, Minneapolis, 55431.

MISSOURI **Classes**–Bent Laminations, Apr. 27; Tuning a Block Plane, May 18. Both with Ron Diefenbacher.

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#230		1/4" Round Over	1/4" R	1"	1/2"	1/4"	$12.00
#353		5/16" Round Over	5/16" R	1 1/8"	1/2"	1/4"	$14.00
#209		3/8" Round Over	3/8" R	1 1/4"	5/8"	1/4"	$15.00
#355		1/2" Round Over	1/2" R	1 1/2"	3/4"	1/4"	$17.00
#656		3/4" Round Over	3/4" R	2"	7/8"	1/2"	$21.00
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#340		1/8" **Cove**	1/8" R	5/8"	3/8"	1/4"	$12.00
#205		1/4" Cove	1/4" R	1"	1/2"	1/4"	$12.00
#206		3/8" Cove	3/8" R	1 1/4"	9/16"	1/4"	$13.00
#207		1/2" Cove	1/2" R	1 1/2"	5/8"	1/4"	$14.00
#208		3/4" Cove	3/4" R	1 7/8"	3/4"	1/2"	$26.00
#460		1/4" **Bull Nose**	1/4" Dia. of Circle		3/8"	1/4"	$14.00
#461		3/8" Bull Nose	3/8" Dia. of Circle		3/4"	1/4"	$15.00
#462		1/2" Bull Nose	1/2" Dia. of Circle		7/8"	1/4"	$16.00
#464		3/4" Bull Nose	3/4" Dia. of Circle		1 1/8"	1/4"	$21.00
#506		1/2" **Pattern**	Flush Trim	1/2"	1"	1/4"	$15.00
#507		5/8" Pattern	Flush Trim	5/8"	1"	1/4"	$16.00
#508		3/4" Pattern	Flush Trim	3/4"	1"	1/4"	$17.00
#366		1/8" **Slot Cutter**	3/8" Deep	1 1/4"	1/8"	1/4"	$14.00
#368		1/4" Slot Cutter	3/8" Deep	1 1/4"	1/4"	1/4"	$14.00
#204		3/8" Rabbeting	3/8" Deep	1 1/4"	1/2"	1/4"	$13.00

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ITEM NO.	BEST CUT BEST PRICE	DESCRIPTION	ANGLE/DEPTH/RADIUS CIRCLE DIAMETER	LARGE DIA.	CUTTING LENGTH	SHANK SIZE	PRICE
#210		1/4" **Core Box**	round nose	1/4"	1/4"	1/4"	$ 9.00
#211		3/8" Core Box	round nose	3/8"	3/8"	1/4"	$10.00
#212		1/2" Core Box	round nose	1/2"	11/32"	1/4"	$13.00
#418		3/4" Core Box	round nose	3/4"	5/8"	1/4"	$15.00
#213		1" Core Box	round nose	1"	3/4"	1/2"	$17.00
#214		1/4" **Straight**	plunge cutting	1/4"	3/4"	1/4"	$ 6.50
#215		5/16" Straight	plunge cutting	5/16"	1"	1/4"	$ 6.50
#216		3/8" Straight	plunge cutting	3/8"	1"	1/4"	$ 6.50
#217		7/16" Straight	plunge cutting	7/16"	1"	1/4"	$ 6.50
#474		1/2" Straight	plunge cutting	1/2"	1"	1/4"	$ 7.00
#775		1/2" Straight	plunge cutting	1/2"	2"	1/2"	$14.00
#218		5/8" Straight	plunge cutting	5/8"	1"	1/4"	$ 7.00
#219		3/4" Straight	plunge cutting	3/4"	1"	1/4"	$ 9.50
#220		1" Straight	plunge cutting	1"	1 1/2"	1/2"	$11.00
#500		3/8" **Flush**	**Trimming**	3/8"	1/2"	1/4"	$ 7.00
#502		1/2" Flush	Trimming	1/2"	1/2"	1/4"	$ 7.50
#503		1/2" Flush	Trimming	1/2"	1"	1/4"	$ 8.50
#221		1/2" Flush	Trimming	1/2"	1 3/16"	1/2"	$ 8.00
#545		**Tongue & Groove**	Straight	1 5/8"	1"	1/4"	$29.00
#845		Tongue & Groove	Straight	1 5/8"	1"	1/2"	$29.00
#546		Tongue & Groove	Wedge	1 3/16"	1"	1/4"	$29.00
#846		Tongue & Groove	Wedge	1 5/8"	1"	1/2"	$29.00
#450		1/8" **Beading**	1/8" R	3/4"	3/8"	1/4"	$11.00
#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
#453		5/16" Beading	5/16" R	1 1/8"	1/2"	1/4"	$14.00
#454		3/8" Beading	3/8" R	1 1/4"	5/8"	1/4"	$15.50
#455		1/2" Beading	1/2" R	1 1/2"	3/4"	1/4"	$17.00
#530		3/16" **Edge Beading**	3/16" Dia. of Circle		1/2"	1/4"	$15.00
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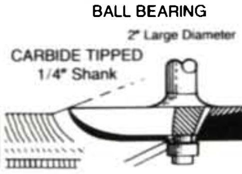

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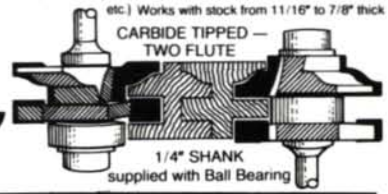

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READER SERVICE NO. 6

Woodcraft Supply, Dierbergs Heritage Place, 12511 Olive Blvd., Creve Coeur, 63141. (314) 434-5779.
Juried fair–4th annual Laumeier Contemporary Arts and Crafts Fair, May 11–12. Contact Laumeier Sculpture Park, 12580 Rott Rd., St. Louis, 63127. (314) 821-1209.
Seminars–Adhesive/Caulks & Sealants short courses, May 12–17. Radisson Plaza Hotel, Minneapolis. Contact The Adhesive and Sealant Council, 1627 K St. N.W., Suite 1000, Washington, DC 20006. (202) 452-1500.
Exhibit–Beneath the Ice: The Art of the Fish Decoy, thru June 3. St. Louis County Dept. of Parks and Recreation, Clayton. Contact Susan Flamm, Museum of American Folk Art, 61 W. 62nd St., New York, NY 10023-7015. (212) 977-7170.

NEW HAMPSHIRE: **Juried show**–The Shaker Tradition in Furniture and Wood, May 11–Sept. 2. Canterbury Shaker Village in association with the Guild of New Hampshire Woodworkers. Also, Wood Day, May 11, featuring demonstrations. For info, contact John Skewes, Guild of New Hampshire Woodworkers, 132 Drinkwater Rd., Kensington, 03833. (603) 778-7360; or call Scott Swank, Canterbury Shaker Village at (603) 783-9511.
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 carving, more. Contact The Hand & I, PO Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.
Workshops–Violin Craftsmanship Institute workshops including Bow Repairing, June 3–7; Basic Bow Repair: Introduction to the French Method, June 10–14; Basic Bow Maintenance and Repair Workshop, June 17–21; Basics of Violin Maintenance and Minor Repair, June 10–14; Violin Repair for Craftsmen, June 17–21; Advanced Violin Repair: Neckgraft, June 24–28, July 1–5; Violin Building and Varnishing, July 8–Aug. 16. University of New Hampshire, Continuing Education, Brook House, 24 Rosemary Lane, Durham. 03824-3528.

NEW JERSEY: **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.
Juried show–12th annual South Jersey Woodcarvers show, June 1–2. Museum of American Glass, Wheaton Village, Millville. Contact William Schade at (609) 881-2402.
Workshops–Summer woodworking workshops including Furniture Conservation with Dean Squires, June 8–9; Painted Surface Treatment in Furniture Design with Robert Dodge, June 15–16; Traditional Gilding with John Philibert, June 21–23; Hand Carved Signs with Raymond Halacy, June 28–30; Classic European Wood Carving with Nora Hall, July 5–9; Cabinet Making with David Van Hoff, July 12–17; more. Peters Valley Craft Center, Layton, 07851. (201) 948-5200.

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

NEW YORK: **Juried show**–Chautauqua Crafts Festival '91, July 5–7, Aug. 9–11. Bestor Plaza, Chautauqua Institution, Chautauqua. Deadline: Apr. 20. For info, contact Chautauqua Crafts Festival, PO Box 89, Mayville, 14757.
Exhibit–Furniture by Wendell Castle, thru Apr. 28. American Craft Museum, 40 W. 53rd St., New York City, 10019. (212) 956-3535.
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.
Exhibition–14th annual Wood Carving Exhibition, May 4–5. Creative Arts Building, Erie County Fairgrounds, Hamburg. Sponsored by Southtowns Wood Carvers of western New York.
Workshops–Japanese Hand Tools with Robert Meadow, May 4–5, June 8–9. Saugerties. Also, Professional Hand Tool seminar with Robert Meadow, May 11, Putney VT. Contact The Luthierie, 2449 W. Saugerties Rd., Saugerties, 12477. (914) 246-5207.
Show–13th annual Great Neck Celebrates Crafts, May 5. Outdoors, Middle Neck Rd., Old Village, Great Neck. Contact Creative Faires Ltd., PO Box 1688, Westhampton Beach, 11978. (516) 288-2004.
Exhibition–Explorations II: The New Furniture, May 9–Aug. 4. Featuring work of 11 artists, including many furnituremakers. American Craft Museum, 40 W. 53rd St., New York City, 10019. (212) 956-3535.
Fair–American Craft Fair at the Armory, May 10–12. 7th Regiment Armory, New York. For info, contact American Craft Enterprises, PO 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. 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, PO Box 825, Woodstock, 12498. (914) 679-8087.
Classes–Summer woodworking with Maurice Fraser and Bill Gundling, beginning June 3. Free demonstrations, May 28. For info, contact Craft Sudent League, 610 Lexington Ave. at 53rd, New York City. (212) 735-9732.
Exposition–Restoration Expo & Workshop, June 7–9. Niagara County Fairgrounds. Featuring demonstrations, workshops, more. Contact Town of Newfane Historical Society, PO Box 1824, Newfane, 14108. (716) 778-7197.
Workshops–Refinishing with Mike Mahoney, June 8–9; Lofting with Everett Smith, June 15–16; Building a Herreshoff Pram with Bill Smithers, July 6–13. The Antique Boat Museum, 750 Mary St., Clayton, 13624. (315) 686-4104.
Juried show–Clearwater's Great Hudson River Revival, June 15–16. Westchester Community College, Valhalla. Contact Joan Silberberg, RFD 2, Pudding St., Carmel, 10512.
Juried festival–15th annual American Crafts Festival, June 29–30, July 6–7. Lincoln Center, NYC. For info, contact American Concern for Artistry & Craftsmanship, PO Box 650, Montclair, NJ 07042. (201) 746-0091.
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.
Meetings–New York Woodturners Association, first Tuesday of each month. Woodturning techniques and exhibits also. The Craft Student League, YWCA, 610 Lexington Ave., New York City.

NORTH CAROLINA: **Workshops**–Many summer woodworking and woodcarving workshops. Contact John Campbell Folk School, Route 1, PO Box 14A, Brasstown, 28902. (800) 562-2440, (704) 837-2775.
Workshops–Spoon Carving, May 4–5; Dough Trough, May 11–12. Country Workshops, 90 Mill Creek Rd., Marshall, 28753. (704) 656-2280.
Exhibits–Haywood Community College Graduate Show, thru May 19; including woodworking. Also, New Members exhibit, thru Aug. 4. Both at Folk Art Center, Blue Ridge Pkwy., Asheville. Sponsored by Southern Highland Handicraft Guild. For info, contact the guild at PO Box 9545, Asheville, 28815. (704) 298-7928.
Classes–Furniture with Tage Frid and Doug Sigler, June 3–4; Woodworking with Skip Johnson, June 17–28; Methods for Furniture with Lauren McDermott, July 1–2; Carving with Paul Sasso, July 15–26. Penland School, Penland, 28765-0037. (704) 765-2359.
Juried shows–Highland Heritage Arts & Crafts Show, June 13–16; at Asheville Mall. Also, Heritage Arts & Crafts Show, July 3–7; at Thashers' Reunion. Contact High Country Crafters, 46 Haywood St., Asheville, 28801. (704) 254-2787.
Meetings–North Carolina Woodturners, second Saturday of every month. Also holds woodturning workshops for all levels. For info, contact Eric Hughes, Route 3, PO Box 300, Conover, 28613. (704) 464-5611.

OHIO: **Expo**–Midwest Carousel Exposition, Apr. 26–28. Mansfield. Contact The Carousel Works at (419) 522-7558.
Workshop–Spray Finishing Technology, May 13–17. Technical Training Center, DeVilbiss Ransburg Industrial Liquid Systems, Toledo. Contact Richard Kruppa, Bowling Green State Univ., Bowling Green, 43403. (419) 372-7560.
Seminar–Detailing and Billing, June 14–15. Cincinnati. Contact Architectural Woodwork Institute, 2310 S. Walter Reed Dr., Arlington, VA 22206-1199. (703) 671-9100.

OKLAHOMA: **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.
Exhibit/Competition–Oklahoma City Woodcarvers 25th annual exhibit, May 31–June 2. Penn Square Mall. Contact Ronald Schessl, 8617 Huckleberry Rd., Edmond, 73034. (405) 282-0224.
Show–15th annual Eastern Oklahoma Woodcarvers Association show, July 12–14. Kensington Galleria Shopping Mall, 71st and S. Lewis, Tulsa. Judging in more than 25 categories. For info, contact Tom Hamilton, 701 W. Kiowa, Cleveland, 74020. (918) 358-2685.

OREGON: **Exhibits**–Furniture by David Dochow and Tom Ross, thru Apr. 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.
Show–Port Orford Arts Festival '91, May 3–5. Including goblet turning, wildlife carving and woodworking demonstrations. Rick Cook Wood Gallery, 705 Oregon St., Port Orford. For info, call (503) 332-0045.
Show–Art of Three Men, May 4–June 9. Featuring woodworker Tom Allen and furnituremaker Michael Elkan. Made in Jefferson Gallery, 3259 Jefferson Scio Dr. S.E., Jefferson, 97352. (503) 327-2543.
Workshops–Furniture Repair with John Barrett, May 19; Custom Knifemaking with Tim McCreight, June 17–21; Traditional Japanese Woodworking 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.
Competition–Table Lamp + Chair 1991 furniture design competition, June 6–22. Deadline for entries: May 10. Contact Lynne Leigh Paul, PO Box 69352, Portland, 97201. (503) 246-7314.
Meetings–Guild of Oregon Woodworkers, third Friday of every month. For location, contact the Guild at PO Box 1866, Portland, 97207. (503) 293-5711.

PENNSYLVANIA: **Workshops**–Many woodworking workshops, including Countour Knife Grinding and Setup in the Woodworking Industry, Apr. 18–20; Wood Finishing Techniques, Apr. 30–May 8; Wood-Mizer Band Sawmill Service, May 3–4; Wood Bending and Design, June 10–14; Thomas Moser Furniture Design and Marketing, June 17–21. For full course schedule, contact Hardwood Initiative Training Program, Centre County Vo-Tech, Pleasant Gap, 16823. (814) 359-2793.
Show–Woodworking World Scranton Show, Apr. 19–21. Montage Ski Area Lodge, Scranton. For info, contact Woodworking Association of North America, PO Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Workshops–Shaker Oval Boxes with John Wilson, May 3–4; Building a Continuous-Arm Windsor Chair with Michael Dunbar, May 18–19; Woodturning for Cabinetmakers with Michael Dunbar, June 8–9; Chemical & Natural Dye Coloring, Color Bleaching and Difficult Stain Removal with Prew Savoy, June 22–23. Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Rd., York, 17402. (717) 755-8884.
Exposition–Tool and Machinery Expo, May 3–5. Force Machinery Co., 914 E. Main St., Morristown. For info, contact Force Machinery, 2271 Route 22, PO Box 3729, Union, NJ 07083. (201) 688-8270.
Juried show–Lancaster Designer Art and Craft Market, May 4–5. Lancaster Country Central Park, Lancaster. Sponsored by the Lancaster Designer-Craftsmen. For info, contact Jean Lehman, PO Box 765, Lancaster, 17603-0765. (717) 295-1500.
Juried exhibition–Water/Life, May 4–June 9. For info, contact Lynn Berkowitz, Luckenbach Mill Gallery, 459 Old York Rd., Bethlehem, 18018. (215) 691-0603.
Exhibition–Spring Craft Celebration, May 18–19. Grounds of the Pennsylvania Designer-Craftsmen Craft Center, Tyler State Park. More than 100 crafters. Contact Pennsylvania Designer-Craftsmen, PO Box 718, Richboro, 18954. (215) 860-0731.
Show–Market Square Traditional Wholesale Show, June 8–10. Valley Forge Convention Center, King of Prussia. For info, contact Market Square Shows, PO Box 220, Newville, 17241. (717) 776-6989.
Classes–Woodcarving/Clay Sculpture with Joe Dampf, July 1–5; Power Carving for Beginners with Werner Tollefsbol, July 1–5; Swiss Style Chip Carving with Wayne Barton, July 8–12; Power Carving/Advanced with Nancy Jones, July 8–12; Woodcarving in the Round with Bob Butler, July 15–19, July 22–26; Bird Carving/Advanced with Wayne Edmondson, July 15–19; Clay/Wood with Joe Dampf, July 29–Aug. 9; Bird Carving/Beginners with Carl Sinkula, Aug. 26–30. Also, woodcarving show and all-wood festival, July 13–14. For info on all, contact Cook Forest Sawmill Center for the Arts, PO Box 180, Cooksburg, 16217. (814) 677-3707.
Juried festival–25th annual Sidewalk Sale/Central Pennsylvania Festival of the Arts, July 11–14. On the Penn State campus, State College. For info, contact CPFA, PO Box 1023, State College, 16804. (814) 237-3682.
Classes–Windsor Chairmaking, all levels, weekly and weekends. Contact Jim Rendi, Philadelphia Windsor Chair Shop, PO Box 67, Earlville, 19519. (215) 689-4717.
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: **Exhibitions**–Exhibitions of faculty mixed media, thru Apr. 27; regional selections, thru May 18; summer faculty and staff exhibition, May 24–Aug. 9. Arrowmont School of Arts and Crafts, PO Box 567, Gatlinburg, 37738. (615) 436-5860.
Convention–Unfinished Furniture Association first national convention and trade show, June 2–4. Nashville Convention Center. For info, contact the Association, 36 S. State St., Suite 1806, Chicago, IL 60603. (312) 782-5252.
Workshops–Artistic and Functional Woodturning with Ray Key, June 3–7, June 10–14; Woodturning: Vessel Forms with Michael Peterson, June 17–21; Woodturning: A Multiple Axis Approach with Stoney Lamar, July 8–12; Woodturning with Philip Moulthrop, July 29–Aug. 2; Woodturning Hollow Vessels with David Ellsworth, Aug. 5–9. Arrowmont School, PO 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, PO Box 567, Gatlinburg, 37738. (615) 436-5860.
Show–Smoky Mountain Sculptures in Wood show, Oct. 5–6. Chilhowee Park, Kerr Building, Golden Gloves Arena. Woodcarving competition with 17 categories. Contact Jack or Carole Williams, 2608 Reagan Rd., Knoxville, 37931.

TEXAS: **Juried competition**–Furniture of the '90s, American Society of Furniture Artists and Council for the Visual and Performing Arts art-furniture competition and exhibition, thru May 3. University of Texas Medical School Gallery, Houston. For prospectus, contact ASOFA, Competition, PO Box 270188, Houston, 77277-0188.
Juried festival–Kaleidoscope Creative Arts Festival, May 11–12. Art Museum of Southeast Texas, 500 Main St., PO Box 3703, Beaumont, 77704. (409) 832-3432.
Show–7th annual Woodcarving show and sale, Oct. 18–

19. Ridgmar Mall, Ft. Worth. Sponsored by Ft Worth Woodcarvers. For information and an application, contact Dan Mingea, 1805 Thomas Place, Ft. Worth, 76107. (817) 731-9565.

***VERMONT:* 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, PO Box 344, Warren, 05674. (802) 496-5545.

***VIRGINIA:* Exhibition**–Geometric Constructions, thru 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. Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.
Juried show–16th annual Richmond Craft and Design Show, Nov. 15–17. Richmond Centre for Conventions and Exhibitions. Deadline: June 1. For info, contact Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.

***WASHINGTON:* Workshops**–Introduction to Woodworking for Women, May 4, May 11; Building an Alaskan Eskimo Baidarka (kayak), May 10–19. The Center for Wooden Boats, 1010 Valley St., Seattle, 98109. (206) 382-2628.
Exhibition–From the Woods, May 25–Aug. 18. Whatcom Museum, 121 Prospect St., Bellingham, 98225. (206) 676-6981.
Juried show–5th annual Kitsap County Woodcarvers Club show, June 8–9. Kitsap Mall, Silverdale. For info, contact Chuck Malven, 6015 Osprey Circle E., Bremerton, 98312. (206) 373-3609.
Symposium–Use of the Lathe: Ideas for the Classroom, June 21–23. Overlake School, Redmond. Instructors include Allen Androkites, Kip Christenson, Leo Doyle, Bonnie Klien, Albert LeCoff, Christopher Weiland. For info and application, contact Wood Turning Center, PO Box 25706, Philadelphia, PA 19144. (215) 844-2188.
Show–Beneath the Ice: The Art of the Fish Decoy, June 24–Aug. 19. Tacoma Art Museum, Tacoma. For info, contact Museum of American Folk Art, 61 W. 62nd St., New York, NY 10023-7015. (212) 977-7170.
Conference–18th annual Museum Small Craft Association Conference, Oct. 4–6. Papers invited on small craft of explorers and natives at first contact in North America, due by July 4. For information, contact MSCA Conference, Center for Wooden Boats, 1010 Valley St., Seattle, 98109. (206) 382-2628.
Conference–Perspectives from the Rim, July 11–14. University of Washington, Seattle. National surface design conference. For info, contact Diana Nielsen, UW Extension GH-22, University of Washington, Seattle, 98195. (206) 543-0888.
Meetings–Northwest Woodworkers Guild, last Wednesday of each month. Contact Kirk Kelsey, 744 N. 78th, Seattle, 98103. (206) 789-2142.
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.

***CANADA:* 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.
Workshop–Lathe Turning with Dale Nish, May 25–26. Tools 'n Space Woodworking, 338 Catherine St., Victoria, B.C., V9A 3S8. (604) 383-9600.
Juried show–8th annual Wood Show, Aug. 9–11. Durham Community Centre, Grey County. For info, contact The Wood Show, PO Box 920, Durham, Ont., N0G 1R0. (519) 369-6902.
Classes–Various woodworking classes including bird carving, wood sculpture, willow chairmaking and more. For information and schedule, contact the Haliburton School of Fine Arts, PO 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, PO 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, PO 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:* 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–Oxford International Summer School, Aug. 4–10. Classes in art, craft and design. For brochure, contact Oxford Summer School, c/o Richard Speed, Gable End, Hatford, Nr Faringdon, Oxfordshire, SN7 8JF. (0865) 718298.
Classes–Woodworking classes. Smith's Gallery, 56 Earlham St., WC2. Contact Laetitia Powell, Parnham, Beaminster, Dorset, DT8 3NA. (0308) 862204.

***GERMANY:* 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. Contact Koch Trade Fairs, 157-161 E. 86th St., New York, NY 10028. (212) 369-3800.

***JAMAICA:* Exposition**–Furniture Focus 1991, Apr. 29–May 2. Oceana Hotel, Kingston. Featuring Jamaican and Caribbean furniture manufacturers and products. For info, contact Margueritte Jones, JAMPRO, 866 2nd Ave., New York, NY 10017. (212) 371-4800.

***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, PO Box 11228, Caparra Heights Sta., 00922. (809) 751-6900.

***SINGAPORE:* Fair**–Singapore Trade/Gift/Toy Fair, May 21–25. World Trade Centre Singapore. For info, contact Eileen Lavine, Information Services, 4733 Bethesda Ave., Suite 700, Bethesda, MD 20814. (301) 656-2942.

The Art and Mystery of Tennessee Furniture and Its Makers Through 1850 by Derita Coleman Williams and Nathan Harsh. *Tennessee Historical Society, Tennessee State Museum Foundation, 505 Deaderick St., Nashville, Tenn. 37219; 1988. hardback; 337 pp.*

Tennessee Furniture is a recent addition to a growing body of scholarship on Southern antique furniture. The complete title really says it all. This is an in-depth examination of Tennessee's furniture history. The book's authors have gathered material from state archives and newspapers, as well as personal correspondence from the period to provide a basis for understanding the lives and times of the cabinetmakers, carpenters and joiners who built furniture in Tennessee in the 18th and early 19th centuries. Williams is a college instructor and ex-field researcher for the Museum of Early Southern Decorative Arts (MESDA). Harsh is a practicing attorney. Their backgrounds have prepared them well for this type of meticulous research.

The book's first chapters more or less deal with the sociological context within which the furniture was built. These chapters focus on individual crafters, the apprenticeship system, census information, marketing practices, and patrons who purchased the furniture. The inventories taken of deceased-crafters' shops were particularly interesting to me, because they indicate the types of tools used and the types and quantity of furniture kept on hand. There is also a checklist of individuals making furniture during the years encompassed by the study.

The major portion of the book is composed of photographs of furniture with descriptions. The photos are divided into color and black-and-white groupings, which make comparisons more awkward than usual because there are more places for you to look to find relationships between inlays, moldings or whatever. The black-and-white section is subdivided into chapters by form, i.e. desks are all together and then tables, chests, cellarets, etc. The photos are high quality and large enough to clearly show details of inlay, carving or the patterns cut into pie-safe tins, for instance. Many full-length pictures are supplemented by closeups of details, interior or back views, signatures or other interesting items.

Each chapter begins with an essay on the form being illustrated, and then each illustration is accompanied by a brief, detailed description. In striving for brevity, the authors occasionally have created a riddle. For instance, the caption for Plate III (a slant-top desk and bookcase) includes the following construction description: "Walnut connecting molding, shelves of bookcase adjustable with grooves, ¾ dust boards, parallel back boards set into routed sides and slightly chamfered ends, with the desk case having ⅜ in. showing and the bookcase having ⅝ in. showing, cornice is correct as found, never having had a pediment." What are the back boards parallel to? What is it that has chamfered ends? What do the ⅜ in. and ⅝ in. show? There are also some discrepancies and inconsistencies from one caption to another. Back boards are variously said to be routed, rabbeted, grooved, paneled or set into the sides or ends. Drawers are separated by rails and dividers. Nails are described as wrought, cut and square. It is often difficult to know when the authors are using different terms to describe the same things, and when they are drawing a distinction between two different things by giving them different names. This may be because the descriptions were written by different people, over a long period of time; but some attempt should have been made for more consistency. Sometimes the authors' unfamiliarity with woodworking terms gets in the way of their descriptions, as when, on p. 103, a drawer side is mistakenly called a drawer blade. In one or two instances, a proofreader has simply slipped up, as on p. 100, where the "top and bottom drawers" are "open dovetailed to case sides."

These faults are all minor, however, when compared to the huge amount of good, solid information presented. For those studying Southern antique furniture, this is a wealth of material, with many previously unpublished pieces, which can't help but stimulate comparison with furniture from other regions. The authors have opened the door to this by touching on the similarities in inlay design between Greene County, Tenn., Pennsylvania and the Shenandoah Valley area of Virginia. Although it is not inlaid, the tall chest illustrated as Plate XXIII could easily be attributed to a shop in the Winchester, Va., area, because of its striking similarities in quarter-column stop-fluting, foot design and drawer layout. Elsewhere in the book, links are established between cabinetmakers in North Carolina and Tennessee, and between pie-safe builders in Wythe County, Va., and those in eastern Tennessee. Could Williams and Harsh be persuaded to explore this topic further? I hope so. *–David Ray Pine*

Country Accents by Nick Engler. *Rodale Press, Inc., 33 E. Minor St., Emmaus, Pa. 18098; 1989. hardback; 123 pp.*

Unlike the other project books in the Build it Better Yourself series by Rodale Press, this one leans more to the arts-and-crafts theme than to cabinetmaking or furniture design. Of the 14 plans offered, only two–a handsome, little adjustable candle stand and a miniature chest of drawers–strike me as serious projects. The remaining items include pull toys, bird decoys, toy soldiers, a butter press, cut-out animal wall hangings, small carvings and Shaker oval boxes. Shaker boxes are popular reproductions these days and the other items may also have roots in American folk art; but to me, most of what is offered here conjures up an all-too-modern image of craft-sale knickknacks.

Engler, who has written other books in this series, does his usual fine job in explaining the step-by-step construction techniques, and the accompanying isometric, exploded drawings make each project a snap to follow. Although I have a definite prejudice against the kind of dust collectors this book offers, it is a technically well-executed work and will certainly command interest in appropriate circles. On the positive side, projects like these are ideal for using up short cuts, which inevitably collect in the shop. I suppose that converting these scraps into garage-sale fodder or Christmas gifts for distant relatives could have a certain therapeutic value in soothing the conscience of a frugal woodworker. However, by the time you've bought all the necessary paints and art supplies, and have spent hours on end squinting through your bifocals to apply them, both the economy and the logic of this strategy begs hard review. *–Jon Arno*

Classic Architectural Birdhouses and Feeders by Malcolm Wells. *Malcolm Wells, PO Box 1149, Brewster, Mass. 02631; 1988. $9.95, paperback; 92 pp.*

Until I came across Malcolm Wells' *Classic Architectural Birdhouses and Feeders,* I thought I'd read everything about constructing these items. This book's imaginative and innovative designs are what make it different. Wells provides sketches and dimensioned plans for more than 25 of his structures, but his intent is to encourage originality rather than duplication; so the book is most useful as a source for ideas. You won't find any stodgy, boxy, strictly utilitarian structures here. Wells builds with commonly available tools and materials–mostly scrap lumber–to fashion houses and feeders that have as much appeal to humans as birds. Wells is an architect and it shows. You'll find a wide variety of novel structures here; some are designed to be suspended from a wire or cord, others attach to tree trunks, fences and house walls. One unique feeder even relies on a sod roof. None of the projects requires more than a few hours to complete. Wells' birdhouses and feeders are not complex, but they are attractively proportioned and practical. He doesn't lose sight of the need to provide adequate ventilation, properly sized win-

dows for attracting particular birds and easy accessibility for periodic cleaning. Left to weather naturally, his structures "age gracefully as rain and sunlight work their magic."

Following a brief introduction and a few words about tools, materials and safety, Wells gets down to designing and building. The book is packed with his handsome sketches, construction details and exploded views. They're fully dimensioned for the reader interested in simply duplicating the structures, but they're equally useful as a guide for constructing structures with pleasing proportions. The accompanying text is brief but clear and sufficiently complete so even a novice woodworker won't get stuck halfway through any of the projects. Wells provides important birdhouse and feeder measurements for many common birds. I wish this list was more complete, but it's a small omission and Wells does supply a reference for the curious reader interested in additional design information or in the nesting habits and peculiarities of various birds.

Wells' enthusiasm is infectious and you may discover, as I did, scrap pressure-treated wood and cedar siding from a remodeling job ideal for fashioning your own novel and imaginative structures.

—Alan Platt

Practical Woodturner by Frank Pain, revised by James A. Jacobson. *Sterling Publishing Co., 387 Park Ave. S., New York, N.Y. 10016-8810; 1990. $12.95, paperback; 160 pp.*

It was 17 years ago that I acquired a lathe attachment for my power drill as a gift from my wife. Not knowing much about woodturning, I went to my local library to see what was available on the subject. There were a number of books to choose from, but I must have been lucky that day, for I went home with *Practical Woodturner* by F. Pain. I could not have gotten a better start in woodturning and that book has remained in my collection to this day (not the copy I borrowed from the library, of course).

I now find myself in possession of a new revised and expanded edition, and was at first alarmed to think someone would tamper with it; but all is well and Jacobson has done a good job maintaining the integrity of this most important book. Deletions are minimal, and the original text and line drawings are intact, along with information regarding types of steels, chucks and equipment now available. Also, some nice, up-to-date photographs of classic turning accompany and further clarify the text.

Pain's wisdom and humor come through to encourage and inspire the reader to get to the lathe and try out the cuts, to hold the tools lightly and let them do their job, to "cut wood as it prefers to be cut." The methods described here are sound and you can have confidence in them. You realize this is a practical man trying to help you learn not only how to, but why to turn.

If you want to learn about woodturning, I think this is the best how-to book available. As Jacobson points out in the foreword, "In addition to its quality as a text, the book is also historically important to the field of woodturning." It is one of the most enjoyable books you can read on the subject, and should be part of every woodturner's library.

The only negative aspect of this revised edition is the omission of all the original photographs, especially those of Pain.

—Dennis Elliott

David Ray Pine is a furnituremaker in Mt. Crawford, Va. Jon Arno is a wood technologist and consultant in Schaumburg, Ill. Alan Platt is an amateur woodworker in LaGrangeville, N.Y. Dennis Elliott is a woodturner in western Connecticut.

Photo: Stretch Tuemmler

Anthony Giachetti's fluted cabinet, 65Hx32Wx19D, is made of curly mahogany and rosewood with Swiss pearwood inlay accenting the contours of the doors. The balls adorning the tops of the legs and the inlay hint of an Art Deco influence.

Photo: Dean Powell

***Above:** Mitch Ryerson creates a whimsical mood with his "Washboard Rockers." These children's rockers, 26Hx12Wx21D, were developed from the idea of recycling old materials into new uses.* ***Below:** Trompe l'oeil, exquisitely executed, adorns the cover of Silas Kopf's "Typewriter Desk." Although the desk is closed, the marquetry scene on its front makes it appear open with a typewriter, books and other implements inside.*

Photo: David Ryan

Art That Works–Contemporary decorative arts

Art That Works: The Decorative Arts of the Eighties, Crafted in America is a touring exhibition that includes more than 130 objects ranging from rugs, glass and tableware to furniture, lighting and decorative accessories created by more than 100 of America's foremost designers/crafters. Art Services International, a non-profit educational institution, organized this circulating art exhibition that will visit 15 museums throughout the country during its three-year tour. Guest curator is Lloyd E. Herman, founding director of the Smithsonian Institution's Renwick Gallery and one of the nation's foremost authorities on America's contemporary craft movement.

Herman points out that although the industrial revolution has eliminated the need for crafters to make our home furnishings and clothes, it has not precluded our desire for beauty in these furnishings. Unlike their colonial counterparts trained in apprenticeship programs, contemporary artisans are being educated in universities or specialized art schools, resulting in more sophisticated, stylish designs. The photos above show some of the works from the exhibit, pieces that are decorative as well as functional: "art that works." It's obvious that ornamentation is again finding its place in well-crafted pieces as today's artists move further away from the minimalist's viewpoint.

Herman feels that the 112 artists he selected for this exhibition took ideas and elements they had drawn from their past or from other cultures and developed them

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into a higher form, "exemplifying the sophistication of style and workmanship prevalent in American crafts today."

The exhibition will be at the Philbrook Museum of Art, Tulsa, Okla., through Sept. 1, and then will be traveling to other locations. For more information on the exhibit or to order the 176-page, softbound catalog with 118 color and 20 black-and-white photos, contact Art Services International, 700 N. Fairfax St., Suite 220, Alexandria, Va. 22314; (703) 548-4554.

—Marcy Edmiston, Alexandria, Va.

Photo: Alastair D. Gowans

Species of turned eggs

Most wood collectors save samples in standard ½x3x6 pieces. But James A. Hislop, a Scottish woodturner and collector, has combined his passions to create a far more attractive display. He turns 2x2x3½ blanks into egg shapes. Over the years, he has turned more than 10,000 eggs, 240 of which are housed in the cabinet shown above.

He feels the egg form best shows the color and grain of the various woods and has turned several eggs of the same species to illustrate nature's infinite variety. His collection includes woods from around the world. One in particular has an unusual story behind it. This egg is from Nyireh batu, a scarce Malayan hardwood that grows in Mangrove swamps. The tree was cut in 1939. Hislop, who was working in Malaya at the time, went off on war service, leaving the timber in the hands of a local Chinese man. When he returned about five years later, the man produced the timber which he had hidden from the Japanese at great personal risk. This egg can truly be called a war-time souvenir.

—A.J.M. Cathro, Blairgowrie, U.K.

A little $8,000 note

Although the spinet is the smallest member of the harpsichord family, this 6-in. replica created by master miniaturist Gerald Crawford carries the theme to extremes. The spinet shown below is an exact copy of the full-size original attributed to John Hitchcock, a mid-18th-century London craftsman. Crawford, a Sedona, Ariz., craftsman who began making miniatures when he was 14 years old, calls it his "greatest creation." He worked more than 400 hours to duplicate "every aspect of the original, inside and out."

Crawford makes a few numbered and signed miniature spinets each year. The spinet here, which the Winterthur Museum sells for $8,000, has more than 700 separate parts, including 61 inlaid keys of bone and ebony. Each key functions independently and although the miniature spinet does not play notes, striking a key causes a corresponding string to be plucked, as in an actual spinet. For more information on this and other miniature masterpieces in the Winterthur collection, contact Winterthur Museum, Garden and Library, Winterthur, Del. 19735.

—Charley Robinson

Cut nails and memories

When I built a corner cupboard, from plans drawn by the late Carlyle Lynch, I thought the beauty of the magnificently grained walnut lumber I used would be the focal point of the cupboard. As it turns out, this project initiated a journey into my past, which provided more satisfaction than actually seeing the finished product. And a rusty can of cut nails was the unlikely source that prompted this existential journey.

As you might have guessed, these particular cut nails had a very special history: My father gave them to me many years ago. He had saved these nails after tearing down the old storage shed next to the vegetable garden in our family's backyard (the "farmyard" as we called it). The shed was home for all sorts of rakes, shovels, hoes, fertilizers, gadgets and doodads. Most of the tools were very old with visible signs of toil written upon them and there always seemed to be chunks of dried mud clinging to their metal. I always loved opening the door of that shack and smelling the peculiar aroma of mother earth subtly seasoned with old fertilizer and stagnant air.

This backyard shed was also the summer home of my Hungarian grandpap, Istvan Medve, whom we fondly referred to as Zeda. He always wore a long-sleeve denim shirt (long before it was fashionable), old bib overalls and weathered clodhopper boots. There he'd sit, on the door stoop of the shed, whittling a birch stick. Rain or shine, hot or cold, Zeda would spend hours at his summer home away from home, gardening, tinkering or idling away the time with visitors. And how he loved it when his grandchildren came by for a visit. Occasionally he would dazzle us with a riddle or trick of some sort until we thought he was larger than life. Almost every time we stopped by, he would have our favorite treat—Grandmam's homemade taffy. At the time, the little pieces of candy he gave us seemed to be the highlight of the visits. Little did I know that more than three generations later, the memories of those visits would be much

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sweeter than the taffy ever was.

When I was ready to build the cupboard, I spent the better part of an evening painstakingly straightening those rusty nails. However, what began as a difficult and laborious task was soon transformed into a fulfilling labor of love. Suddenly I realized that these encrusted pieces of steel served as a conduit to an almost forgotten part of my childhood. And nailing on the back of my walnut cupboard created a moment I will never forget. After the final nail was driven, I stood back and paused for a nostalgic moment. The memories embodied in those nails symbolically reconstructed the shed next to the farmyard. Suddenly I was reminded of Zeda and my father, and I felt the convergence of three generations of my family: our lives, our histories and our souls. It was a spiritual experience that still carries powerful reverberations for me to this day.

The walnut corner cupboard still stands proudly in the dining room of my home, accented by the solid-brass period hardware and antique glass panes. The wood's patina emits a comforting glow of warmth and hospitality that, at times, becomes therapeutic. However, the true essence of this piece lies not in its external beauty, but within the living history provided by a handful of cut nails. The cupboard's real character, as is often the case with people we know and love, lies comfortable and deep within its soul.

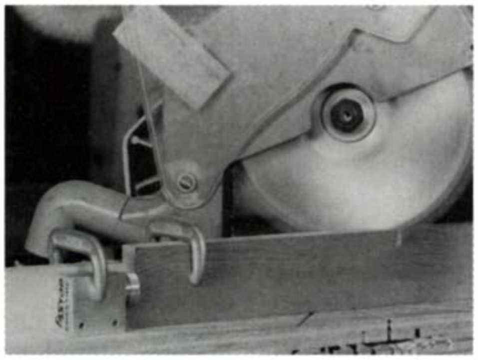
—Don Midway, Bethlehem, Pa.

Product reviews

Fastop, *Witty Inventions, Inc., PO Box 10807, New Iberia, La. 70562.*

Fastop is an adjustable stop block that clamps or screws to the fences of your woodworking tools, as shown on the chop saw in the photo below, and that makes accurate cutoffs, stopped grooves or exact positioning quick and easy. Although I was skeptical that the Fastop was any better than a block of wood, it has become my favorite stop, because the threaded knob allows fine-tuning after the Fastop is secured in place.

Photo: Pierre Escuriex



The Fastop is easily clamped to a fence and its adjustment knob can be set for repeatedly accurate results, whether you're using a chop saw (shown here) or other tools like a tablesaw, shaper, router table or drill press.

The knob has a threaded shaft (16 t.p.i.), with flats ground at 90° intervals, that screws into a machined aluminum block. A spring-loaded plunger rides on the flats and provides stops every quarter turn of the knob. Turning the knob from detent to detent moves it in or out 1/64 in.; a complete turn moves it 1/16 in. The knob's 1/2-in.-long threaded shaft provides an adjustment of plus or minus 1/4 in.

Although screw holes are provided for permanently mounting the blocks to the tool fence, I just clamp the blocks in place, as shown, which makes it easy to move the Fastops from machine to machine as needed. In use, I clamped each Fastop where I wanted it and then made a test cut on scrapwood. After measuring the test piece, I could accurately adjust the Fastop for a precise cut. Fastops can also be used to the left or right of the blade or even vertically. So far I've used them on my router table, shaper, tablesaw, chop saw, bandsaw and drill press. By using two Fastops at right angles to each other, I can precisely position the X and Y axes on my drill press. Fastops are available for $29.95 each (postpaid), only from Witty Inventions at the address listed previously.

—Randy Jenkins, Lafayette, La.

The Scangrind 150 Wet Grinder, *Scanslib ApS, Urbakken 9-13, Oland, 9460 Brovst, Denmark.*

Your workmanship won't be worth a damn if the edge of your tool isn't sharp. With practice, you can become handy at regrinding the edge of a plane blade or chisel, but you always run the risk of overheating the edge, thus drawing the temper out of the blade. And narrow grinding wheels make it difficult to evenly regrind the edge of a wide tool, such as a plane blade.

To overcome the most common grinding problems, there are several water-cooled grinders on the market. One of these, the Scangrind 150, made in Denmark and distributed by The Wood and Shop, Inc. (5605 N. Lindbergh, Hazelwood, Mo. 63042; 314-731-2761), has a 6-in.-dia. by 1½-in.-wide stone that revolves in a water reservoir, as shown above. The Scangrind is a simple tool: the wheel is driven at 120 RPM through quiet-running plastic gears by a 110v electric motor. A tool rest that's adjustable in two places supports the item being ground. A single switch turns the unit on and off and determines the direction of rotation: toward the user for tool rest work and away for free-hand sharpening jobs, like knives and shears. The water reservoir is molded directly into the orange plastic case that encloses the motor-and-gear assembly.

Using the Scangrind is simply a matter of

Photo: Charley Robinson

The Scangrind is a water-cooled, slow-turning wet grinder that won't damage the tool's temper during sharpening.

adding a couple of cups of water to the reservoir, setting the tool rest and switching the unit on. It has enough power to grind blades as wide as the wheel. A sufficient film of water is carried by the rotating wheel to the tool, and I found the tool barely got warm—even with heavier than normal grinding pressure. The standard gray grinding wheel is medium coarse, which is good for redressing tool edges prior to honing. And by flipping the Scangrind's switch the other way, you can touch up a knife edge. The Scangrind's water tray is easily cleaned, although you don't have to do this after each use: The grinding wheel can stay immersed in water.

My only complaint with the Scangrind concerns the tool rest; while I liked the built-in, sliding locking handles, I thought the rest should be sturdier. When grinding long-handle tools, like turning gouges, just a little force would push the rest out of adjustment or deflect it into the wheel.

Overall, the pluses for the Scangrind 150 far outweigh the minuses. The unit is compact and convenient to use, quiet and efficient, and affordable at a suggested retail of $143. Further, white and pink finer-grit replacement grinding wheels are available for less-coarse work, as well as a green wheel for carbide, glass and even stone. Scangrind also makes the model 200 which has an 8-in.-dia. by 1½-in.-wide wheel ($174 suggested retail). This wheel yields a nice hollow grind in a plane blade or chisel, making it easy to hone a final edge.

—Sandor Nagyszalanczy

Notes and Comment

Do you know something we don't about the woodworking scene in your area? Please take a moment to fill us in. Notes and Comment pays for stories, tidbits, commentary and reports on exhibits and events. Send manuscripts and color slides (or, black-and-white photos—preferably with negatives) to Notes and Comment, Fine Woodworking, *PO Box 5506, Newtown, Conn. 06470-5506.*


RYOBI
RANDOM
ORBIT
SANDER

Photos: Sandor Nagyszalanczy

CARVING AROUND THE CLOCK

You could say that Charles Gabhart, of Jasper Clock Co. in Jasper, Ind., builds clocks, but that's only part of the story: Both hall clocks shown above involved the skills of more than half a dozen Indiana artisans. The design for the "Lionhead" clock (above, right) was inspired by a 1750s George III barometer and carved by professional woodcarver Philip K. Smith. The 94½-in.-tall case is Honduras mahogany with beveled glass. The German clock movement features a nine-tube Westminster chime, a custom face engraved by Michael Parsons, a moon dial painted by Florence Woods and an ebony and engraved brass pendulum. The clock, which took 650 hours to build, was gold-leafed by Linda Merrill and lacquered by her husband Perry. The solid cherry clock (above, left) is what Gabhart calls "country regency" style. Smith also did its iris-motif carvings and flower-vase finial atop the 91-in.-tall case. The base's wraparound carvings, shown in the bottom photo at left, were adapted from a 1920s repoussé (hammered relief) silver tea set. Both clocks are prototypes for a planned limited-production series.