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READER SERVICE NO. 1

Fine WoodWorking
November/December 1990

Terry Moore assembles a double-tenon joint for a small table. The tenons are kerfed for ebony wedges. See how he cuts the joint on p. 68. Cover: Nutcrackers make delightful holiday gifts (article on p. 76).

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

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DEPARTMENTS

ARTICLES

Fire investigator warns about oily rags—I was very interested in the letter in *FWW* #82 in which William J. Casmaer of Goleta, Cal., described how he nearly lost his shop because of a fire started by oily rags.

As a professional fire investigator, I have often encountered the same scenario that Mr. Casmaer experienced, only with much more disastrous results. My usual reply to inquiries on how to prevent this type of fire is "read the instructions and warning labels" on the finishing products you're using. But this doesn't always cover all the bases!

Recently, I investigated two fires that destroyed new homes, both within two weeks of move in, for a total loss of nearly $500,000. In each case the *stain* used by the applicator (one a home owner and the other a professional painter) carried no warnings about spontaneous combustion potential for the waste rags. I requested the material safety data sheet (MSDS) from the manufacturer. The carrier for the stain pigment was mineral spirits...a petroleum-base material that is not spontaneously ignitable. There should not have been a problem as there is with linseed and tung oils.

The problem was the 0.02% cobalt metal, which was one of the materials in the pigment. This metal is a catalyst. Tests by a nationally recognized testing laboratory revealed that within 45 minutes of exposure in a test chamber, the fiberglass medium to which the stain had been applied had reached 750°F...more than sufficient to ignite rags.

My advice is never trust any rag that has any stain or finish material on it. Place the rag in a water-filled steel container or lay the rags out in the open *flat* to dry. Until the rags are dry, they pose a potential for spontaneous combustion.

The horror stories could go on and on, but I think readers will get the message with these two. *Be careful with any and all* finishing materials, even latex. Even though the latex might not cause a fire, if you get used to handling all finishing materials the same way, your chances for disaster should be reduced greatly.

—Bruce E. Ryden, Shoreview, Minn.

Are there any women woodworkers?—I enjoy your magazine tremendously. I've photocopied many articles and tips from your magazine for my woodworking file, but I have one question. Are there any women woodworkers around like me? I've seen only one featured in an article. The reason I ask is that it is difficult to find tools and machinery to fit my petite size needs. I'm 5 ft. tall. My hand size and height are real problems. If I find a small tool, say a circular saw, that's the correct size, it doesn't have any real power. I've opted to buy the best and most powerful tools within a moderate price range, but the switches are difficult to reach. My hand position is stretched to the max in order to operate my circular saw and router, which I don't think is a particularly safe situation. I don't think I'll ever give up one of my favorite hobbies, and so I'm looking for tips, articles and equipment for women woodworkers—anything to make equipment safer and easier to handle. Any information or tips by small-size woodworkers on handling large work and machinery would be greatly appreciated. *—Cheryl Yee, La Grange Park, Ill.*

Need more articles on women woodworkers—My husband and I both enjoy your magazine. We are occasional hobby woodworkers and particularly enjoy the sections on techniques. I would like to see more articles and/or photographs that show women as woodworkers. I'm sure there are many like myself who very much enjoy woodworking.

—E. Dianne Looker, Wolfville, N.S., Canada

Educational blocks from scraps—I'm an 89-year-old pack rat and I don't think I'll ever stop being one, as Dario Biagiarelli suggested in the "Notes and Comment" piece in *FWW* #83. My "junk" has yielded so many things for neighbors and myself that I could never consider giving it up. I might be like the person who has a sack labeled "string too short to keep," but I don't think so.

When Mr. Biagiarelli mentioned throwing away pieces of wood, it occurred to me that I had a better idea for those pieces. Any piece of wood that will make or yield a ¾x¾x1½ block will make a dimensional play block. I heard anthropologist Margaret Mead once say that dimensional blocks were educational.

I've made several sets of blocks using the following dimensions that are all multiples of ¾: ¾ in. and 1½ in. thicknesses; 1½ in., 3 in., 4½ in., 6 in. and 7½ in. lengths; and ¾ in. and 1½ in. widths.

When you use several kinds of wood, it is nice to have the variety written on them. On sets I made for my grandchildren I added the following: May you always be...as long lifed as redwood; as sturdy as the oak; as wiry as hickory; as useful as all woods; as nice looking as walnut; and reach for heaven like the pine.

—Wayne French, Shaker Heights, Ohio

Woodworkers could learn from coal miners—In response to the articles in *FWW* #83 on the hazards of wood dust, I write as a retired occupational physician who spent 10 years working in the coal-mining industry, where dust is a well-documented problem.

I want to stress that the dust-collection measures and personal protection with masks described should be considered *secondary* only, and are probably the *least* effective and important means of health protection.

In the coal mines, spectacular success in the control of lung disease was achieved some years ago almost entirely by a two-pronged campaign of engineering action. The first prong is the suppression of dust production. Water is the agent mostly used in coal cutting, and while this is not applicable to woodworking, the principle still applies, as stressed by your writers. The second prong is air-flow control. In principle, large quantities of clean air are pumped to the dust-producing area and are carried away with the dust by a different route. The work is arranged so that workers are always in the clean air side. This is a principle

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1 1/2"	11/16"	2 1/2"	$ 8.85
2"	3/4"	2 3/4"	$15.12
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3"	7/8"	3 1/8"	$19.15

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that should be considered when organizing an effective ventilation system for the woodworking shop.

By all means, have a machine to collect your large airborne particles, but this is all it will do. It will give precious little protection to your lungs, and priority should be given to adequate ventilation. The use of masks and helmets should be regarded as last-ditch efforts when you admit that your primary methods are inadequate.

The remarks about coal mining apply to underground operations, where work is performed in an enclosed area—comparable to an enclosed workshop. If you work out of doors, much of your problem is probably removed. I believe this problem is of rapidly increasing importance because woodworking machines capable of more rapid and efficient removal of material are proliferating, as are man-made materials that combine the various toxic constituents of glues, as well as timber.

—J. Michael Hayman, Uki, N.S.W., Australia

Comments on school directory—I was pleased to see your list of woodworking schools in issue #81, but find it not as helpful as it could be. If you could include just a few words or a short sentence of description on the school's curriculum and specialties, it would help folks pinpoint those schools they would like to write to for more information.

My interests are in traditional domestic architecture, interior design and Asian furniture, mostly Japanese, Chinese and Thai; so I'd like to know more about further study in these areas.

—Gene Fifer, Mountain City, Tenn.

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—Dan Malouin, president, Davis & Wells Inc., Lynwood, Cal.

PVC pipe unacceptable for compressed-air systems—As an engineer in a chemical-production facility, I have a fairly extensive background in the design and operation of piping systems. Michael Dresdner's article on compressed-air systems (*FWW* #82) suggests that PVC piping is acceptable for handling compressed air in the shop. This is in conflict with the recommendations of PVC pipe manufacturers.

While PVC piping may be less expensive to purchase and easier to install, it is not suitable for compressed gasses. Though the manufacturer's reason for the prohibition is not stated, I believe the concern is due to PVC's brittle nature. That is, rather than bending or deforming under severe loads, PVC can shatter suddenly. I know that readers are not planning to pole vault with this pipe, but consider the errant board striking a pipeline or an inadvertent sharp tug on a taut air hose. Fragments of the broken pipe can be propelled violently by the rapidly expanding air and the remaining piping will whip about vigorously, possi-

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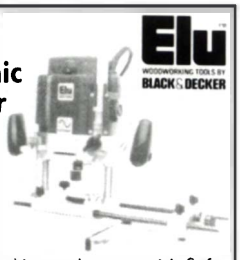

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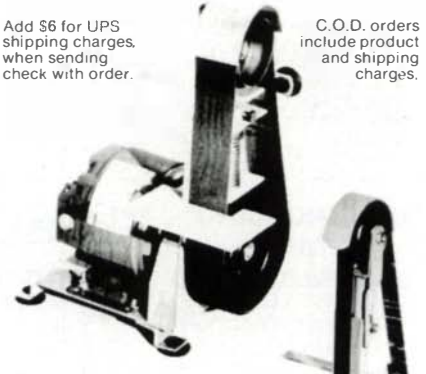

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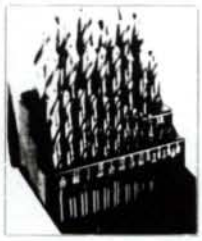

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bly with further breakage, until the pressure has dissipated.

I strongly discourage readers from using PVC piping for compressed air. The low cost does not justify the risk. Instead, I recommend the use of threaded galvanized steel piping discussed in the article. This material is strong, ductile, fairly easy to assemble, and requires fewer supports than PVC.

—Ander Beain, Friendswood, Tex.

Tool users vs. tool collectors—Since people will not let the tool users vs. tool collectors debate (*FWW* #82 and #83) rest, I figured that I should throw my two cents into the fire.

First, I am a user not a collector, but I am more on the collector's side if I had to choose one. The collectors are preserving these tools for the future. Sure, some of them do it just to make money, but a lot of us woodworkers are using the tools to make money also. And often when we tool users are finished, there is nothing of the tool left to preserve. I do not have the money to be a collector, but I do have several of my great-grandfather's still-usable tools hanging on my walls. I have several tools in my kit that are no longer available and I am not going to be thrilled when I can no longer use them for one reason or another. I for one am grateful that some people think the tools of my trade are worth displaying on a shelf or wall.

—Tony Konovaloff, Tahoe Paradise, Cal.

Tool quality, not power, makes the difference—The bottom line in the debate of hand tools vs. machinery (*FWW* #82 and #83) is that machines eliminate much time-consuming, tiring hand labor. Most woodworkers forget that there are two basic facts in this or any other trade. First is the skill of the worker and his/her willingness to learn the proper methods. The second part is what is forgotten more often. If a worker uses poor-quality hand tools or machines that don't hold square, parallel, etc., or uses low-grade stock, then for anyone to expect class "A" work is folly. A skilled worker can't compensate for the tool's faults any more than a novice. Hand tools and machines both have their correct places and uses. Neither is superior to the other.

I'd also like to comment on lumber problems. There has been much recent concern over the use of foreign hardwoods. Putting ecological considerations aside for a moment, it seems as if the main concern of the average woodworker has been "can I get it?", both in terms of foreign and domestic hardwoods. I include domestic hardwoods because the volume used here is far greater than most foreign hardwoods. Lumber companies and the forestry service have hybridized "super trees" for most softwoods. To the best of my knowledge, there has been no similar effort for hardwoods. Such a plan would, over time, relieve pressure on forests everywhere. In the short term, the best thing we could do is to take a second look at woods that were ignored early in our trade's history. *—Edward J. Mattson, Norwalk, Conn.*

More hints for oven cleaner stains—I agree with Dr. Dave Tuel about the value of oven cleaner as a stain (*FWW* #83), but I would go much further. Oven cleaner by itself will not do the job! If you don't neutralize the alkali and apply a polyurethane finish, even sanding the surface with 400- to 600-grit papers will not eliminate the alkali residue. It will attack the finish from the inside and produce an ugly blush. This may take 18 months to 2 years to show up, but it will. I apply white vinegar, a mild acid, after the alkali has dried to ensure a neutral surface for the polyurethane. I've had grief without the acid wash and success with it.

Two other observations learned the hard way. First, the

amount of time the alkali is allowed to stay on the wood does not determine the color; it only controls the penetration. The concentration of alkali controls the reaction and therefore the color. What you get with this process is accelerated "aging" of the wood. Variable concentration begets variable color. Second, spraying directly from the can onto the wood surface results in a spotty application. This may not be detectable due to the foaming action of the oven cleaner reacting with the wood. It is recommended that a cheap brush be used to smooth the foamed coating evenly over the wood surface and remove the uneven coloring. I have found that a 20- to 30-minute soak prior to wipe down gives the best penetration and color results. Good luck!

—Josiah Kirby P.E., Bloomfield, Conn.

Tripping on metrics—Joseph Chapline's letter extolling the merits of metrics revived some old memories. About 15 years ago, the world of engineering and mathematics made a concerted effort to "metricize" the U.S. populace. I earn my living dealing with electronics and physics and so I galloped along with the crowd enthusiastically...until I tripped! I recover from days of engineering by building things from wood, and my old squares, tape measures, architect's scales, etc., have feet and inches on all sides! They have fractions like ½, ¼, 3/10 and 5/64.

At first I thought that I wasn't trying hard enough. It would become obvious to tool manufacturers that metric tools must be fully metric to be practical, and they would become readily available. With practice I would learn to "think" about cabinetry in metric values.

I did learn to visualize structures with metric dimensions, but it causes a sharp pain about 2 in. (50.8cm) behind my eyes. Once again I learned that old lesson: If it isn't broke, don't fix it.

The British system of inches and feet may be old, and it causes awkward contortions for a digital calculator or computer, but it is *not* broken. It is based on human values that work for the analog human brain. People naturally visualize in halves, thirds and halves of halves. The foot (very wisely) has 12 in., allowing whole number division by 2, 3, 4 or 6. Three feet in the yard again allows easy whole number division into halves, thirds, sixths, etc. Inches are most commonly shown divided by the powers of two (and the short, long and longer lines help to keep them sorted). In my workshop I now deal in inches and fractions. I don't believe that the precise length of the inch is important, but it's a comfortable thickness to grab, and I can divide it in half by eye within 1/64. Fractions are friendly.

—Blair Hubbard, Knoxville, Md.

Building machines is expensive proposition—I have built two shop machines from *Fine Woodworking* articles: the "Shopmade Bandsaw" in *FWW* #65 and the "Shop-Built Thickness Sander" in *FWW* #58. In both cases I felt the authors grossly underestimated the costs involved.

The sander is priced at $150 for parts. I spent that for bearings, sprockets, chain, sheaves, belts, hardware, glue, shafts and threaded rod. I made my own feed rolls and sanding drum from wood. A motor (2 HP) was $90, and paint, sandpaper and kiln-dried studs added another $50. Total cost was nearer to $280 than the $150 estimate stated in the article.

The bandsaw has worked out well, but again the cost was in the $300 range, not $75. The top-wheel tracking assembly had to be stabilized to prevent left-to-right oscillation around the top plate mount. The access door was modified so it could be opened without removing the front edge table stiffener. I like

both machines, however, and would build them again.
–George A. Butter, Locust Valley, N.Y.

Destroy a habitat for lumber?–I have a neighbor down the block whose yard is full of huge, old trees and thick vegetation: a magnificent backyard habitat. There is one especially grand giant walnut that must be hundreds of years old guarding the corner of the yard. Everyone admires and comments on the yard's beauty and the value it adds to the neighborhood. Some of the older neighbors remember when everyone had such a yard, but now all most of us have is a good crop of crabgrass.

The guy next door and some of his buddies from across town have talked my neighbor into letting them cut down as many of the trees as they want. Apparently he needs the money. Since everyone knows I'm a woodworker, I've been offered some of the wood at a good price. It should be interesting and unusual wood and I know some of my customers will really like it.

Meanwhile, other people in the area are getting up a petition against cutting the trees and they want me to sign it. The petitioners charge that there aren't many trees left in the neighborhood and our yards of crabgrass should have taught us the need to preserve those we have. It would be nice to have some of that wood, but I sure would miss those trees, especially that big one on the corner. I can either sign the petition or buy some of the wood, but I have to decide soon. I wonder what other *Fine Woodworking* readers would do if this happened in their neighborhoods? *–Dan Ray, Middle, Ia.*

A workbench story–Some four years ago, I renewed an interest in woodworking. At the time I had not done any woodworking for 20 years, not since a half-year course in high school. I was very fortunate to discover the *Fine Woodworking on* series and I began to combine the ideas from the various volumes into my work.

After a year or so of tinkering, and a couple of small projects, I bought a copy of Scott Landis' *The Workbench Book* (The Taunton Press, 1987). After reading it, I undertook the construction of a traditional workbench. I built a mixture of the bench described by Frank Klausz in *The Workbench Book,* and the one described by Tage Frid in *Fine Woodworking on the Small Workshop.*

I was inspired by Klausz's remarks about wood screw vises. Also not caring to spend twice the cost of the entire bench on vises, I turned my own wooden vise screws using Richard Starr's article "Wood Threads" in *Fine Woodworking on Hand Tools.* I turned the screws from dowels I made with the method outlined by Weldon Friesen in *Fine Woodworking on Proven Shop Tips.*

The bench was a joy to build and use. With the directions in your publications, I was able to complete a major project, in less than six months of occasional work, with virtually no prior woodworking experience. *–Howard Henning, Las Vegas, Nev.*

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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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#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
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#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
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#450		1/8" Beading	1/8" R	3/4"	3/8"	1/4"	$11.00
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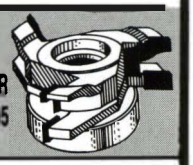

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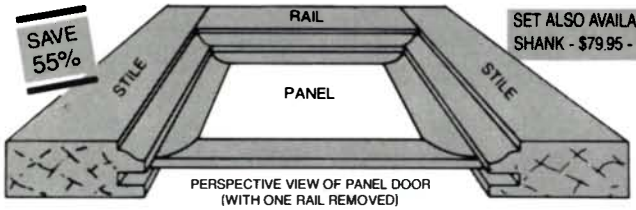

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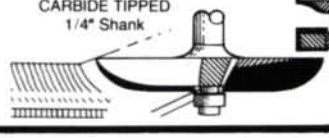

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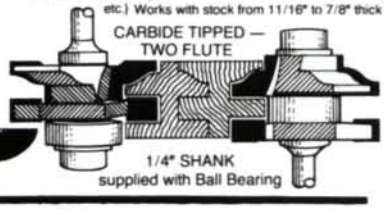

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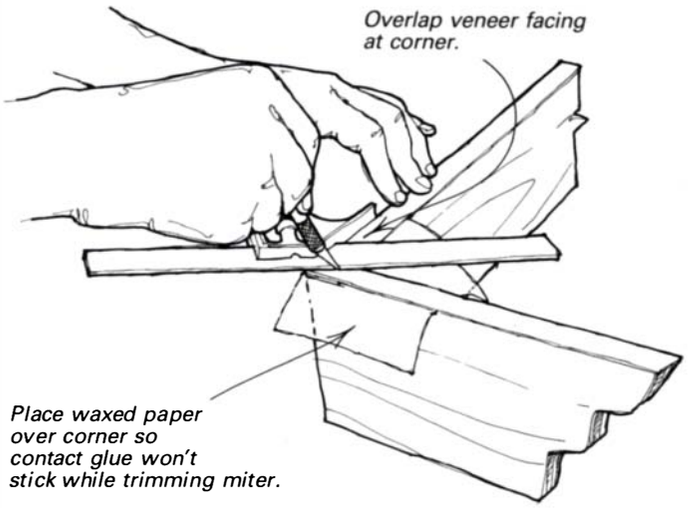
edited and drawn by Jim Richey

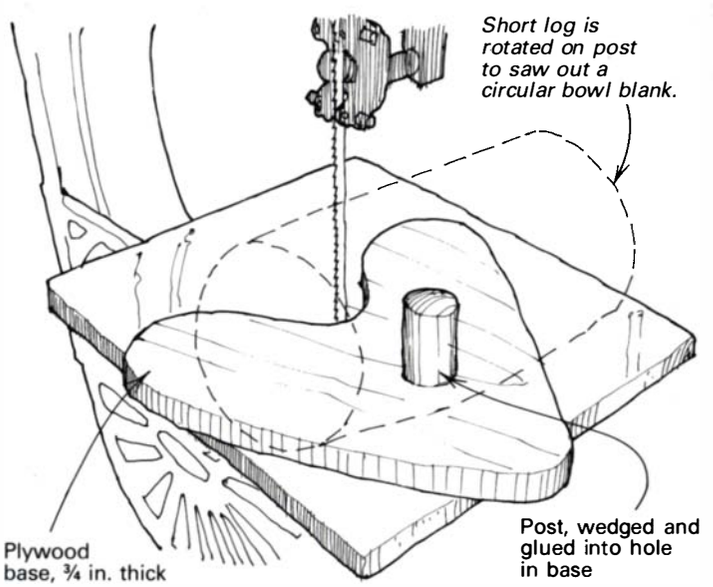
Mitering veneer edge strips



Here's how to neatly miter veneer edge strips at the corners of a carcase. First cut the strips long enough to overlap at each corner, and then apply contact cement to both the case edges and the back of the strips. Before cementing the strips in place, put a small piece of waxed paper over the corners, extending it about 3 in. along each edge. Now you can cement the strips in place, except at the corners where the waxed paper prevents the contact cement from sticking. To miter the corners, place a combination square across the corner and make a neat 45° cut with an X-Acto knife through both strips at once. Remove the waxed paper and push the strips down for a perfect joint. *–Dallas Williams, Los Angeles, Cal.*

Quick tip: Use a Teflon-coated non-stick kitchen pan to hold your contact cement. Any residual cement that remains in the pan will easily peel out after it hardens, leaving a clean pan for the next job. *–Ken Carr, Jersey City, N.J.*

Bandsawing waney-edge bowl blanks



Bandsawing a short section of log into a rough circular blank for turning is a hazardous endeavor. Because the log is unstable, the blade tends to grab, increasing the possibility of it breaking or causing injury to the operator's hands. The system I suggest is considerably safer and particularly useful for those turners who use a pin chuck drive because the blank is ready to mount on the chuck right after it's cut.

The drawing (below, left) shows the details of the fixture. It consists of a ¾-in. plywood base and a turned post that is tenoned, wedged and glued to the base. The post should be sized to fit your pin chuck. The cutout in the base allows the fixture to be pushed close to the blade for sawing out small bowl blanks.

To use the fixture, drill a hole in the log and mount it on the post. Place the fixture on the bandsaw table with the side of the log against the side of the blade (see the drawing), and clamp the base of the fixture to the saw table. Then, just rotate the log on the post to cut a circular blank.

–A. D. Goode, Sapphire, N.S.W., Australia

Quick tip: To clear dust from a face shield, use anti-static papers that have gone through the clothes dryer.

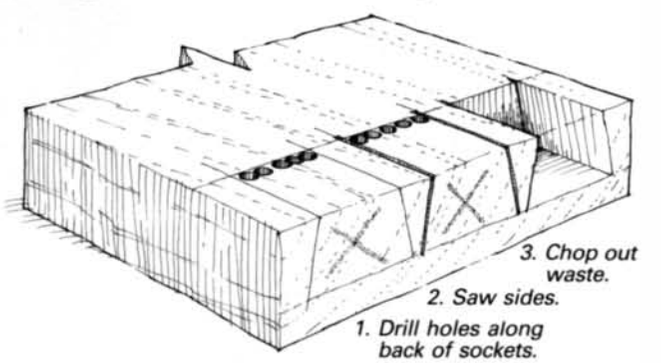
–Orv Dunlap, Phoenix, Ariz.

Carrying lumber by car

Here's an easy way to carry long boards by car that's an improvement over the usual method of balancing the lumber atop the roof and tying ropes everywhere. Plus, the loading is easily done by one person and the lumber won't shift or impair the driver's vision.

Before leaving home, I secure short lengths of rope to suitable structural members inside the trunk and under the hood. At the lumberyard, I simply tie one end of the lumber at a time to the ropes. Protect your car's paint by using towels or foam sections at the contact points. *–Don Rosati, Easton, Conn.*

Cutting half-blind dovetail pins



I've seen lots of how-to descriptions for cutting half-blind dovetail pins, but none has included the technique of drilling holes along the back edge of the waste. By doing so, I can chop out the pins cleaner and faster than with any other method I've tried.

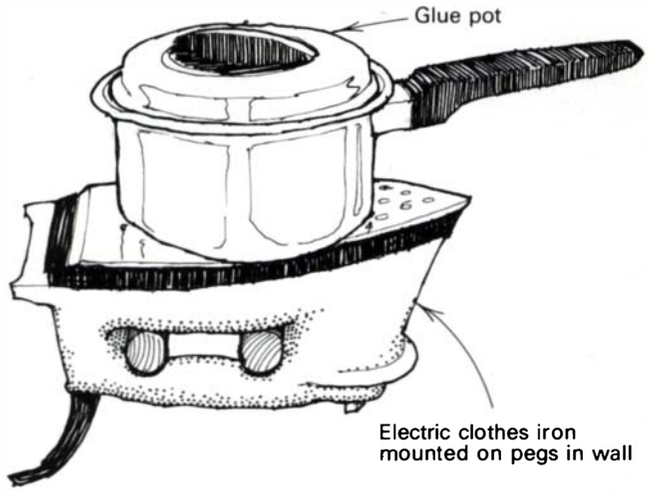
After marking out the pins, use a ¼-in. brad point or Forstner bit to drill several side-by-side holes just inside the line to be chopped away. Use a drill press if you have one, and set the depth stop so that the holes go just to the bottom of the waste section. Next, diagonally saw as much of the pin as you can, extending the sawcut slightly past the line at the back edge of the waste. Now you can easily and quickly chop out the waste with your chisel, and the flat-bottom holes provide a point of reference as you pare the bottom of the dovetail sockets. *–John Toffaletti, Durham, N.C.*

Quick tip: If you don't have a compressor and need to clear chips and sawdust out of mortises and holes, keep a short piece

of flexible tubing on hand. Put one end into the hole or mortise and blow into the other end. I use an 18-in.-long piece of clean, unused auto fuel hose.

—Tony Konovaloff, Tahoe Paradise, Cal.

Glue pot heater



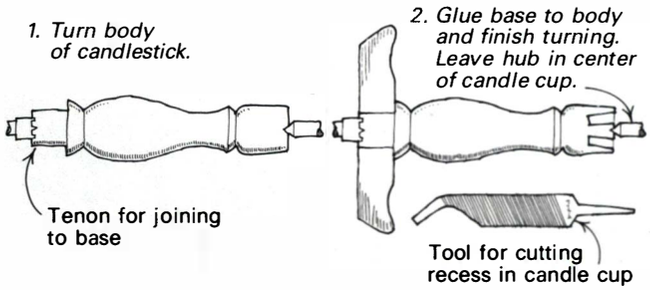
While visiting local furniture refinisher Charles Baird, I noticed his novel method of heating a glue pot. He had mounted a common electric iron upside down on a couple of pegs that protruded from the wall, as shown in the drawing above. The glue pot, which sat on the iron's flat surface, was kept at a low, even temperature thanks to the iron's thermostatic control.

—N. Clarke, Victoria, B.C., Canada

Quick tip: Chainsaw bar oil is the ideal lubricant for moving parts on woodworking tools, such as threads, gears, pivots, bearings, etc. This fine, sticky, non-spreading oil will not be quickly "wicked" off by sawdust as will regular motor oil.

—Tim Hanson, Indianapolis, Ind.

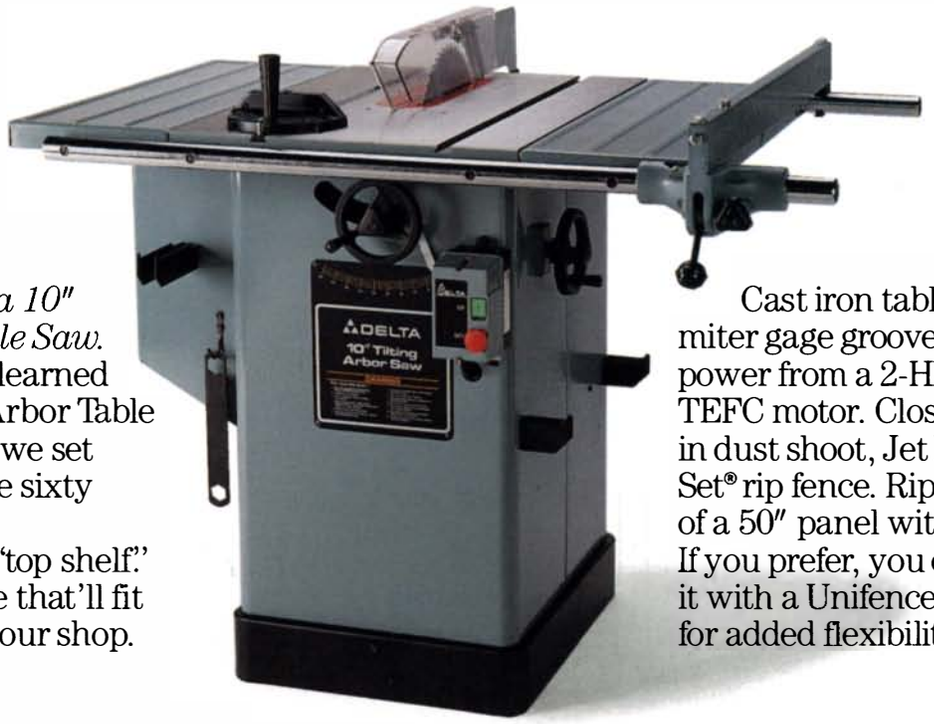
Turning candlesticks



After turning hundreds of candlesticks, I've developed a method that makes production quick and easy. The big advantage of my method is that you can return the holder to the lathe and spin it between centers at any stage of production—turning, sanding, staining, finishing or polishing.

I begin by turning the body of the candlestick to shape and include a tenon on the headstock end for joining the body to the base. I make the tenon 1¼ in. dia. because that size will clear the drive spur and it matches a standard drill bit size. Before removing the body from the lathe, I recess the tailstock end for a candle, leaving a small hub for the tailstock center, as shown. I made a special hooked tool from an old file for recessing the candle cup.

Then I select the wood for the base, center drill it with a



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1¼-in.-dia. bit and glue the base to the body. After the glue sets, I remount the candlestick between centers while I turn the base and then sand, finish and polish the entire unit. I leave the hub in the center of the candle cup until I'm ready to sell the piece, in case I want to repolish it.

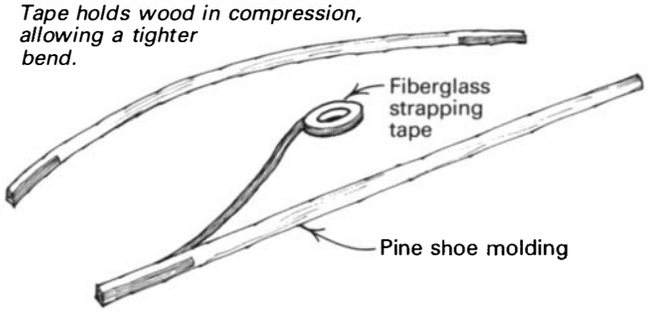
—Robert Long, Cardington, Ohio

Quick tip: To stop glue-covered parts from squirming out of alignment during clamp-up, sprinkle just a bit of sandpaper grit onto the wet glue before assembly. You'll want to keep the grit at the center of the joint where your edge tools won't find it later.

—Steve Becker, Valatie, N.Y.

Bending shoe molding

Tape holds wood in compression, allowing a tighter bend.



If you've ever stood in line at the lumberyard on a Sunday afternoon, then you know my despair when I was faced with yet another trip. Piece after piece of ¾-in. white pine shoe molding had snapped in two as I tried to install them in a bay window alcove. It was only a gentle 8-ft. radius, but three pieces, including the moldy waterlogged piece I rescued from the floor of the shed, broke as I pushed them into place. With only one piece left, I finally succumbed to the reality that an 8-ft. radius is too sharp for bending kiln-dried pine.

So I considered my options. If I soaked the piece overnight, it would surely be pliable enough to take the bend, but I had other things to do the next day and besides it would take several weeks to dry out enough to paint. So I ruled that option out. I could kerf-bend it by making a series of sawcuts about 1 in. apart. But all I had was a portable circular saw and I couldn't quite see making a zillion cuts in the face of the molding without a ridiculous amount of tearout. And every one of those cuts would have to be filled.

Then I thought of steam bending with a back strap and end blocks. Wood compresses 10 times more than it stretches. A back strap on the outside of a bend takes up all the tension and forces virtually all the wood into compression. But I wondered how to get a steel back strap behind a piece of molding, nail it home and retrieve the strap.

Then it hit me. Don't use steel, but instead use a material with a high tensile strength that can be left on the molding and nailed to the wall. So I ran for my roll of fiberglass-reinforced strapping tape. This tape is amazingly strong, expendable and nailable.

I carefully ran a strip of tape on the back side of the molding, pressing it firmly into place and making sure it wouldn't be visible at the top of the molding. At the ends, I wrapped an extra foot of tape around the front, hoping the wraparounds would act like rudimentary end blocks and force the wood into compression just as end blocks do in steam bending.

With hope springing eternal, I slowly forced the molding into the alcove, expecting any second to hear the snap that would

send me cursing to the lumberyard. But it didn't snap. The tape held; its adhesive was sticky enough, and the fiberglass reinforcement was strong enough to absorb all the tension and force the pine into compression. With nary a creak, I sprung the molding into the curve and nailed it home. I trimmed the tape from the ends and within minutes the molding had its coat of paint.

—Christopher Murray, Baltimore, Md.

Quick tip: Instead of fumbling around trying to grasp small nails like those used to attach sawtooth picture-frame hangers, I just slip a round bar magnet into my drill-press chuck and use the quill to push the nail home.

—Rolf Tiedemann, Rochester, N.Y.

Wing nut replacement #1

Here's a wooden knob that is a dressier alternative to Gordon Su's wing nut replacement (*FWW* #79, p. 14). With a compass set to a 1-in. radius, draw a 2-in.-dia. circle. Using the same compass setting, divide the circle into six equal parts and drill ¾-in.-dia. holes at each of the six points. Now drill a shallow hole in the center of the original circle, using a bit with a diameter equal to the smallest measurement across the hex nut that will be embedded in the knob (9/16 in. dia. for a ⅜-in. nut). Drill this hole deep enough for the nut to set flush with the knob's surface, and then chisel the hole to a hexagon shape so that the nut will fit tightly into it. Drill a hole the diameter of the bolt the rest of the way through the knob's center. Now bandsaw the knob free by following the original circle line, sand and bevel the outside edges, and press the nut into its recess.

—Chuck Lakin, Waterville, Maine

Wing nut replacement #2

I recess a T-nut into the top of my wooden hand knobs and fasten it in place with three brass brads. If I need clearance between the knob and whatever it will be up against, I glue a short length of large-diameter dowel to the bottom of the knob before I drill out the center. *—Joseph E. Konkle, South Bend, Ind.*

Wing nut replacement #3

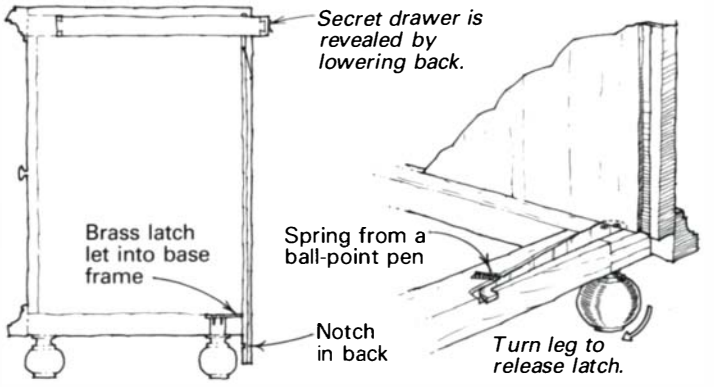
I use a T-nut sandwich in place of a wing nut. These wood knobs are not only more attractive, but let you apply plenty of torque comfortably. Before cutting out the sandwich halves with a hole saw, I drill a recess for the T-nut in the center of what will be the bottom half. I also drill little holes in the perimeter of the recess to accept the T-nut's spurs so I have a tap-in fit, not a disc-cracking, maul-in fit. After gluing the two parts of the sandwich together, I thread a bolt into the hole, chuck the thread end of the bolt into a drill and sand the knob until it is rounded and pleasant to the touch. *—William D. Lego, Rockford, Ill.*

Quick tip: Use chunks of high-density foam, the kind made for upholstered furniture cushions, to quickly and evenly apply

any type of oil finish. Buy 4-in.-thick pieces of foam and cut the applicators to the desired shape on your bandsaw.

–R. Charles Boelkins, Conyers, Ga.

Secret drawer latch

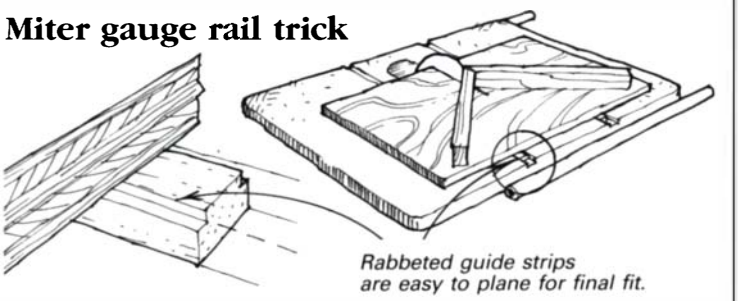


As a gift for my daughter, I recently built a scaled-down version of Alex Krutsky's spice box (*FWW* #72, p. 76). Krutsky's box features a secret drawer that is accessed by sliding the back of the box down. But a not-so-secret catch on the bottom of the box holds the back in place. I redesigned this catch so it's better hidden.

The release mechanism for the back of my box is completely enclosed, as shown in the sketch above, and it is triggered by turning the left rear leg clockwise about one-eighth of a turn. When the leg is turned, a brass latch attached to the leg's tenon rotates out of a notch in the sliding back, allowing the back to drop and therefore providing access to the hidden drawer. A spring from a retractable ball-point pen helps hold the latch in its "locked" position when the back is up. I chose the left rear leg for the catch because it is the least likely to be tampered with by a right-handed person.

This project stirred up a lot of interest in the workshop at the retirement community where I live. Before I sent the box, I placed a few pennies in the secret drawer and I didn't tell my daughter about the hidden latch. My pleasure in completing the project was tripled when she called after spending a lot of time trying to locate the noisy coins. She was quite ready for me to divulge the secret. *–G.E. Van Wynen, Sun City Center, Fla.*

Miter gauge rail trick



The next time you build a tablesaw fixture fitted with wood guide strips that run in the miter-gauge slots, cut small rabbets in the top edges of the guides. The rabbets not only eliminate glue clean up, but they also make final fitting easier because you can handplane the edges of the strips without having to dig into hard-to-reach inside corners. *–Tim Rodeghier, Three Oaks, Mich.*

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

Finish for a butcher block

When my grandfather died, I inherited the old maple butcher block he used at his grocery store for 33 years. I made the block into a coffee table by shortening the legs and finishing it with spar varnish. Now, 26 years later, the finish is gone in many places and the top is sticky. How do I refinish the top without sanding out the knife marks that give the block its character? ***—Peter W. Beall, Lewiston, Ida.***

Michael Dresdner replies: The stickiness of the block's finish probably comes from meat fat that soaked into the wood pores during butchering and/or from sebaceous oil (like the oil we exude through our skin along with our sweat). Both of these contain the same sort of saturated triglycerides that make excellent plasticizers. Your finish may simply be "over-plasticized."

Fortunately, you won't need to sand the top in order to refinish it, and so you can preserve the block's nice character. Simply apply a good paint stripper, scrubbing off the residue with a hard-bristle brush to clean out the low spots. The stripper will remove the oil or fat that's gumming up the finish. Refinish the block with whatever suits you; virtually any finish is appropriate since the block is no longer used for preparing food. Most varnishes and polyurethanes are self-sealing, but if you use lacquer, seal the block first with a coat of fresh shellac. If the top doesn't see too much action, you might want to keep it looking like an active butcher block by sealing it lightly with a thin coat of shellac and topping that off with a good coat of paste wax. From then on, simply rewax as the need arises.

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

Compressed-air quick-change couplings

I recently acquired a compressor to keep up with my children's bicycle flats, as well as for other uses around the shop. I've found that quick-change couplings on the tools and air lines are invaluable time-savers, but to my dismay I'm faced with choosing between several different brands. Are there significant differences that should affect my selection?

—Robert F. Itnyre, Twentynine Palms, Cal.

Randy Jenkins replies: Unfortunately, there is no industry-wide standard for quick-change pneumatic couplings. While most of these fittings look very similar, there are usually enough differences between various manufacturers' fittings that they are not interchangeable.

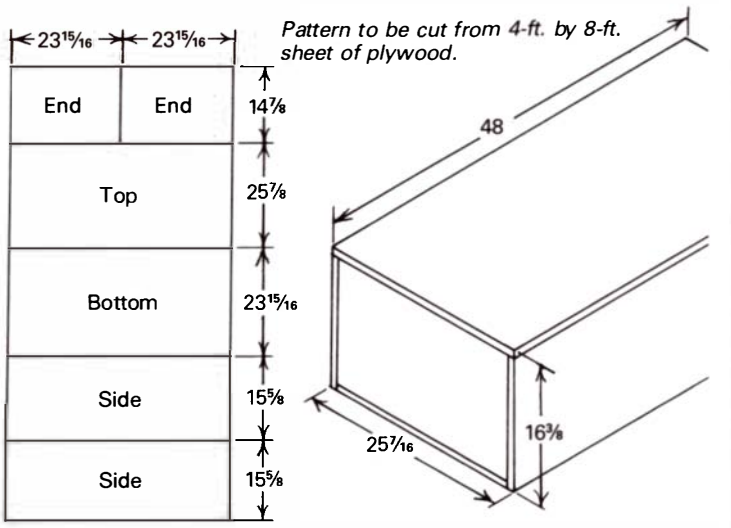
If all you will ever need is one female fitting and three or four male fittings, one of the kits from an import mail-order house will probably meet your needs. If, however, you plan on ever expanding your compressed-air system with additional tools, nozzles or lines, I would suggest that you buy the fittings from a local supplier that can sell you a brand that will continue to be available in the future. Some of the suppliers that stock quick-change fittings are industrial-supply houses, hose and belt distributors, large automotive-supply dealers and pneumatic/hydraulic-supply houses. While local prices may be higher than the mail-order houses, this is one case where the expense is well worth it in convenience and future availability. With a local source handy, you can easily replace female fittings that break or jam without having to replace all your male fittings as well. Male fittings can be purchased as needed with assurance that they will be compatible with the fittings you already have. Also if you buy from a local supplier, the company probably would be willing to attach the fittings to your hoses for you.

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

Plywood box without waste

I have often wondered if it would be possible to construct a box, top included, from a 4-ft. by 8-ft. sheet of plywood with no waste? I have made numerous sketches, but have not yet been successful. ***—Don Renfroe, Dillingham, Ark.***

Sandor Nagyszalanczy replies: Using a little high-school algebra, I came up with dimensions for a box, measuring 16Hx48Wx24D, cut wastelessly from a 4-ft. by 8-ft. sheet. However, these dimensions account for neither the kerf removed by the sawblade nor any realistic joinery. Since most of us aren't equipped with a "laser saw" that could slice up the plywood without waste, I needed to account for minor losses from an ⅛-in.-thick sawblade. I also recalculated some lengths (through trial and error) to come up with a box that could be assembled in a practical way. The final cutting scheme I came up with, shown in the drawing below, will produce a box from a single sheet of ¾-in.-thick plywood. Keep in mind that these dimensions are specifically for ¾-in. plywood. If you would prefer to build this box from a different thickness, you must recalculate the width of the top and the sides.



Once the parts are cut out, they are assembled as shown to form a box or chest that is 48 in. wide, 25 7/16 in. deep and 16⅜ in. high. All the parts are simply butt joined together: The two end pieces are fitted with their surfaces flush with the ends of the sides, top and bottom. All four edges of the top are flush with the outside surfaces of the box and the bottom is inset relative to the sides. The box could be glued and screwed or nailed together, although screws would be much stronger than nails. If you want the box to be strong, yet not show any fasteners on the surface, use plate joinery biscuits, making slots in the edges of the end pieces with corresponding slots in the ends of the inside faces of the sides and bottom. The top may be fitted with any number of different types of hinges, but strap or butt hinges would probably be the strongest and easiest to use for a box of this type. One final note: While this is one solution to the problem, there are probably others that readers may wish to share with *Fine Woodworking*.

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

Variable-speed control for universal motors

I recently bought a small variable-speed control unit to use with my router. However, I was a little hesitant to use the control after I read the information that came with the unit which said not to use it with an "AC only motor." I called the manufacturer and a representative of the company said to make sure that the router's motor is a universal AC/DC or a DC series motor. Can I use the speed control without damaging the router? ***—David Carlson, Richland, Wash.***

Ed Cowern replies: The variable-speed controls offered by several manufacturers, including MLCS, Penn State Industries and Lutron, are really adjustable voltage controls and work very much like transformers used for electric trains. One exception is

that the electronics in these devices can sense motor load and regulate the speed of the power tool to maintain a nearly constant speed, during both light- and heavy-duty work loads. This is highly desirable on tools that must handle variable loading, such as portable drills and routers.

Speed control units, like the one you purchased, always carry the disclaimer that they may only be used with tools powered by universal AC/DC motors. The feature that distinguishes a universal from other motor type is the use of brushes. Motors with brushes are easy to spot: Two removable caps that cover the brush assemblies can usually be seen on either side of the motor housing. With the exception of battery-powered tools, almost any portable power tool (and some small stationary machines) equipped with brushes has a universal motor and can be used with a variable-speed control. AC motors used on most stationary power tools sport induction motors and their speed cannot be controlled by voltage; it is fixed by the frequency of the power.

While in most cases the results of using a variable-speed controller with a portable power tool will be good, occasionally, due to the peculiarities of some motors, the motor speed may fluctuate instead of remaining stable. But you can rest assured that in either case, no harm will be done to the motor or the tool.

[Ed Cowern is an electrical engineer and president of EMS, a company that distributes Baldor electric motors.]

Reducing shop humidity

I recently set up a workshop for making furniture and am experiencing problems with humidity levels. Although I understand how to monitor humidity levels, I'm at a loss as to how to control humidity in my shop. I live in an area where humidity stays between 60% and 70% year-round, but I'd like to find a low-cost way of bringing it down to around 50% if possible.

—Edmund Butler, Gibsons Landing, B.C., Canada

Bill Rice replies: The least expensive way of reducing humidity in your shop is to operate your electric furnace at a setting that is 5° to 7° above the outside or ambient temperature. This method is not exact, but it's most practical when the ambient temperature is in the 60° to 80° range. Heating the shop air will automatically reduce the humidity, although the danger is that you will overheat the air and dry it too much. Another more exact way to use your furnace for reducing the humidity involves installing a humidistat on a shop wall some distance from the furnace. Set the desired humidity on the humidistat; it will automatically turn the furnace on and off as needed. A Ranco wall-mount humidistat, model J10-0808, is available from W.W. Grainger Inc., 5959 W. Howard St., Niles, Ill. 60648; (312) 647-8900 (catalog #2E741).

The most conventional method of reducing indoor humidity is to purchase a cabinet-type dehumidifier that's portable and plugs into a regular 110v wall outlet. I recommend one similar to the Sears 42F5920 that has a capacity of about 20 pints and shuts off automatically when it reaches the desired humidity level. An even pricier solution would be a furnace-mounted dehumidifier; check with your furnace dealer for more information.

[Bill Rice recently retired as a professor of wood technology at the University of Massachusetts, Amherst, and is now a wood drying consultant.]

Granddad's camphorwood sea chest

I was recently given my great grandfather's sea chest, which is made of camphorwood. I'm about to repair the chest, but I've

never seen any articles written about this lovely wood. Can you tell me something about it?

—Wayne Woogen, Fair Lawn, N.J.

Jon Arno replies: First of all, let me express my envy. An authentic, old camphorwood sea chest such as yours is a prized heirloom. Most of these sea chests were reproduced in the Orient and date from the 19th century. They were made out of genuine camphorwood, *Cinnamomum camphora,* or a closely related species of the same genus, all of which belong to the laurel family, Lauraceae. This family has many highly aromatic species, including *Cinnamomum zeylanicum,* a close relative of camphorwood that produces the popular spice cinnamon. Another is the bay laurel, *Laurus nobilis,* the source of bay leaves; and yet a third, sassafras, *S. albidum,* is native to Eastern North America and was once considered an important medicinal plant.

Genuine camphorwood has a soft, orange-tan (also described as golden-tan or amber-tan) color, sometimes highlighted with gray or brown streaks, and typically has a very unattractive grain figure. It is a very enjoyable wood to work with because of its pleasant, spicy odor. It has excellent weathering properties and, like aromatic cedar, its scent inhibits moths, making it perhaps the ideal wood for sea chests or wardrobes. It is somewhat stronger than cedar, being comparable in density to black cherry, and with an average volumetric shrinkage of only 7.4%, green to oven dry, it is quite stable in use.

Unfortunately, camphorwood has been exploited heavily, both for prized cabinet lumber and for the essential oil, camphor, which is distilled from the wood chips. Native to Southern China, Taiwan and Japan, genuine camphorwood has been introduced elsewhere and some is even cultivated here in the United States, primarily in Florida. But there simply isn't enough of it growing anywhere to satisfy international demand. Hence, camphorwood lumber is now both scarce and very expensive. You must also be cautious when buying camphorwood, because there are a number of other woods being sold as camphorwood that are not totally interchangeable with the real thing. The two most frequently encountered substitutes are Borneo camphorwood and East African camphorwood. The Borneo variety, *Dryobalanops spp.,* has a camphor-like odor when freshly cut, but tends to lose its scent rather quickly. Also, it is a much heavier, harder and somewhat less stable wood, with gummy resins and a high silica content that raise havoc with sawblades. The East African variety, *Ocotea usambarensis,* is usually just a bit heavier than the true Asian camphorwood, with a more yellowish color and slightly finer texture. While it is a reasonably acceptable substitute, I would try very hard to locate the genuine Asian species for use in repairing something so precious as your heirloom sea chest. [Jon Arno is a wood technologist and consultant in Schaumburg, Ill.]

Safe use and disposal of strippers

As a professional furniture refinisher, I'm concerned about both the personal safety and environmental impact of using and disposing of stripping chemicals. How toxic or dangerous are these chemicals to use? Also, are they biodegradable, and if not, how should they be properly disposed of?

—Tom E. Hill, Broken Arrow, Okla.

Chris Minick replies: Paint and varnish, by their very nature, are designed to protect wood from common household chemicals. Therefore, it should be no surprise that very strong and sometimes dangerous chemicals are required to remove them. Paint and varnish removers fall into three broad catego-

ries: caustic strippers, solvent-base strippers and non-flammable strippers. Each class poses different hazards to the user and the environment.

Caustic strippers are water solutions of alkaline chemicals, such as sodium hydroxide or potassium hydroxide. These chemicals have the potential to cause severe, irreversible skin and eye damage if handled improperly; therefore, face shields and sturdy rubber gloves are a must when using this stripper. Solvent-base paint removers contain varying amounts of toluene, acetone, methanol, or other strong, toxic solvents. This type of stripper is also highly flammable and must be used in a well-ventilated area to prevent the build up of vapors that may ignite. Non-flammable paint removers usually contain large amounts of methylene chloride, which has been identified by the Food and Drug Administration as a possible cancer-causing agent. Hence, you must take care to limit contact with the liquid and vapors by using the proper protective equipment. (For additional information about chemical hazards, see "Chemical Hazards of Woodworking," *FWW* #80, p. 58.)

Fortunately, a new class of paint removers is now available at paint and hardware stores. These paint strippers contain water and paint-removal chemicals that are non-toxic and non-flammable, and they are much safer to use than conventional refinishing chemicals. These strippers can be safely used indoors without the bulky protective equipment that's normally required when stripping.

Regardless of the type of paint remover used for the project, proper disposal of the waste can be difficult. Spent strippers not only contain the stripping chemicals, but also the residue from the stripped finish. If you've used the stripper to remove old paint, the residue may also contain hazardous amounts of lead pigment. For this and other reasons, stripping wastes are classified as hazardous waste and fall under the jurisdiction of the Environmental Protection Agency (EPA). Each state has its own regulations pertaining to the disposal of hazardous waste, and so you must contact your state EPA (get the number from your phone book) to find out the exact disposal procedures for your area.

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

Staining curly maple

I have a piece of curly maple that I want to use for frame molding. How should I stain the maple to bring out the beauty of its curly grain, without darkening the wood too much?
—Michael F. Gibbons, Barnstable, Mass.

Michael Dresdner replies: It is certainly possible to intensify the curly figure of maple through staining. This is because any transparent dye applied to the raw wood will absorb more into the wavy endgrain (that creates the figure in curly wood) than into the adjacent plain grain. This intensifies the contrast between the waves and the normal grain. For staining, I find that it is best to work with light concentrations of color, flooding the wood completely and wiping off the excess stain while it is still wet. For best results, I'd use a water-soluble aniline dye, which will penetrate the wood the deepest, but other anilines and NGR (non-grain-raising) stains will give very acceptable results as well. However, avoid pigmented stains, as they will muddy the grain, as well as the contrast you seek to amplify. Many chemical stains will also bring out curl: copper sulfate, zinc sulfate and ferrous sulfate enjoy favorable reputations for grain enhancement. As with aniline dyes, such chemicals will darken and

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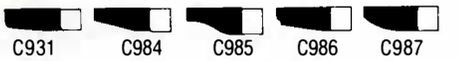

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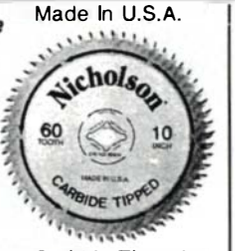

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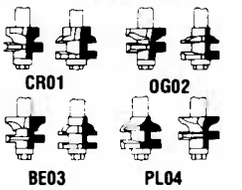

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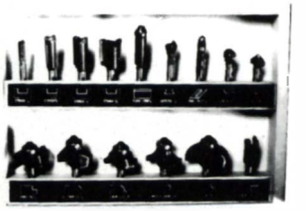

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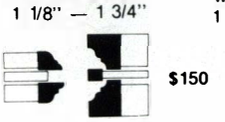

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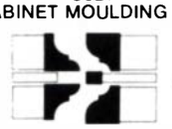

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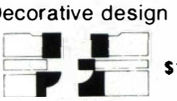

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change the wood's color, but, unfortunately, this usually occurs in a much less predictable way than with dyes.

Bringing out curl without darkening or adding color is somewhat more difficult. In the musical-instrument business I own, we run hundreds of curly and quilted tops for electric bass guitars each year, and stain each *very* lightly with diluted amber/brown water-soluble aniline dye. This works well for us—it's hard to tell that the wood has any dye on it at all. After the instruments are finished, the wood has that warm look and color of slightly aged, natural maple, but the grain fairly leaps out at you. As a result, figured maple is far and away the most popular wood for our basses.

[Michael Dresdner is a finishing consultant in Perkasie, Pa.]

Sharpening an in-cannel gouge

I inherited two Pattern Maker gouges, the largest with a blade that is 17 in. long and 1 13/16 in. wide and has a #5 sweep. I have used the #5 sweep for making some molding for my 18th-century cupboard. I was able to get a fair cutting edge on the blade, but have trouble with the inside cannel. What can I do to get a good cutting edge on this tool?

—Rev. William R. Cameron, Comer, Ga.

John Gardner replies: Sharpening an in-cannel gouge of the size you inquire about is not difficult if you have the equipment and understand the procedure. However, the steel must be of a quality and hardness to take and hold a keen edge. If the gouge has become dull merely from protracted use and frequent whetting, keenness can generally be restored with a couple of slip stones: one should be a medium-grit India slip with a moderate amount of abrasive bite, and the other should be an Arkansas slip for final honing.

If, however, the edge is knicked or broken, or the inside bevel needs to be corrected or renewed for one reason or another, grinding will be necessary. This can be done on an ordinary grinding wheel that has been rounded with a wheel dresser to a slightly wider curve than the inside sweep of the gouge. But I strongly advise against attempting this on ordinary tool grinders, such as those sold at most hardware stores. These turn too fast, and the grinding wheels furnished with them are much too hard. They are likely to overheat the gouge, drawing the temper or burning the steel, and thus ruin the tool. Instead, what I have found to be safe but quite effective, is a white, 80X aluminum oxide, soft-bond grinding wheel mounted on an ordinary polishing head, which is operated by a slow-turning electric motor further slowed down by pulleys to give a speed at the head of 800 RPM to 900 RPM. If care is taken and if the gouge is held on lightly and dipped in water frequently to cool it, there is no danger of burning. After a satisfactory bevel is obtained, the India slip is used and finally the edge receives a thorough honing inside and out with the Arkansas slip.

If the edge of the tool is not heavily knicked, satisfactory results can usually be obtained by working the gouge back and forth on the rounded edge of a course, 8-in. Japanese waterstone. It may take some perseverance, but these Japanese stones cut remarkably fast. To round the edge of the waterstone, use a hard-abrasive tool dressing stick (normally used to dress grinding wheels). Work the dressing stick back and forth lengthwise on the edge of the stone, using plenty of water for lubrication.

[John Gardner is a boatbuilder, author and associate curator of Small Craft Studies at the Mystic Seaport Museum in Mystic, Conn.]

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

by Dick Burrows

Safety in magazine articles—Safety must be a major concern for every woodworker, professional and amateur. None of us can afford the physical, psychological or financial costs of a woodshop tragedy. But even though everyone agrees on that point, when woodworkers talk about safety there often are major disagreements about what constitutes a safe or a dangerous operation.

We continue to receive letters from woodworkers with ideas on safety, and welcome the dialog and will continue to share many of the comments with you. In a recent letter, for example, Luigi De Maio of New York, N.Y., said that he agreed with many of our contributors when they emphasize that shop safety begins with common sense, but felt they often ignored a basic cause of accidents—"using a tool for a purpose for which it was not designed and never intended to be used."

"In this regard, I have found that many of your contributors are in error. For instance, the culmination of your article on Tablesaw Safety Devices (*FWW* #81) was the experiences of one woodworker who lost three fingers by 'carelessly' making a plunge mortise cut with a tablesaw. This cut should never have been attempted with a tablesaw and could have been performed more easily and safely with a router with virtually no dismembering danger to the woodworker. Your April 1990 issue features an article on making a chest-on-chest in which the author recommends that a coved piece for a leg section be cut by feeding the stock flat at a 30° angle to the blade. While this will produce the desired result, there are several alternate methods to produce the same molding without the dangerous consequences of the method illustrated."

Luigi, who says he's been a woodworker for the past 16 years and never had a shop accident except for some bruised fingers as a result of a carelessly induced kickback, said he felt *Fine Woodworking* should stress that the cost of buying the proper tool to do the proper job is minuscule compared to the loss of fingers, hands or worse.

Another reader warned us that even a seemingly harmless tool can be very dangerous. Joe Ulwelling of Durand, Wisc., a longtime subscriber, said he thought telling about his near disaster might possibly save someone's life.

To sand some cedar-chest legs, he installed a 2½-in.-dia. sanding drum, with a ¼-in. shaft, into his drill press, and set the speed to the top RPM. "A very stupid mistake, as when the machine got up to speed, it snapped the shaft and threw the sanding drum out into the room at a very high speed, hitting the wall corner of my shop and coming directly back and striking me alongside the head," Joe said. He said he was bleeding profusely from the impact, but was grateful that the body of the sander, rather than the sharp broken shaft, hit him. "I chalk that one up to stupidity, as I should have known better than to use that high rate of speed on such a large sander with such a small shaft."

Tilting bandsaw tables—A recent item in "Follow-up" (*FWW* #83) alluded to the fact that most bandsaws *could not* be tilted to the left. In response, Donald F. Kinnaman of Phoenix, Ariz., offered a method which he says works on many Rockwell or Delta 14-in. bandsaws. "One can indeed tilt the table up to 15°, which is a more than sufficient angle to cut dovetails. There is a leveling stud threaded into the frame, which can be screwed in or out depending on what leveling the table requires. There also is a jam nut to "lock" the table in position. I've found this stud can be removed and the table will indeed tilt to the left. An interesting detail, that some craftsmen probably do not know anything about." Donald said the stud should be replaced when you're through with the dovetail operations.

More sources of supply

...Garrett Wade, 161 Ave. of the Americas, New York, N.Y. 10013; (212) 807-1155, informs us that it also carries tagua nuts, a vegetable ivory that Clead Christiansen used for turnings in *FWW* #83. The company also says it carries sharpening bits for hollow square mortising chisels, which were discussed in the same issue. The bits are not shown in the latest catalog, but the company says the ordering number is 51J03.01. A set of six sharpening bits, from ⅜ in. to ¾ in., lists for $62.90

...Tagua nuts are also available from Hiltary Agricultural Products, 7117 Third Ave., Scottsville, Ariz. 85251; (602) 994-5752. Company spokesman Lauren Millette also passed on some information about the nuts, which offer workers a way to include ivory in their designs without threatening tusk-bearing animals. "The distinctive recognizable pattern of the (tagua) bean's grain is hard to distinguish from that found in elephant tusks, except by an expert. These patterns of splendor intensify through soft, dry and gentle sanding and polishing." Lauren also said that wet sanding could be used in the early stages of a project, but generally the nut should be kept dry to prevent expansion and warping.

Feedback on sawdust in the garden—David Carnell of Wilmington, N.C., recently offered some more information on using sawdust in the garden, as discussed in *FWW* #82. "Sawdust is no worse than other organic materials in consuming nitrogen as it rots; the organisms decomposing the material require it as a nutrient. Compost recipes all call for adding nitrogen-containing fertilizer to the piles. I water my grass clipping piles with ammonium nitrate solution. The wife of our local sawmill operator has the best garden plot around. It has had rotted sawdust turned into it for years to make tremendous soil."

David also said some types of sawdust can eliminate weeds and improve the makeup of the soil. He said a professional nurseryman told him that black walnut sawdust and shavings leach compounds that kill some plants. Also he said red cedar needles are claimed to be weed killers, and that seems probable since you don't see much of anything growing under red cedar trees.

Securing bandsaw patterns—David Peterson of Jacksonville, Fla., has another method for the Quick Tip in *FWW* #81 about cutting out and taping patterns for scroll saw or bandsaw work. "For taping the pattern to the work when making fine cuts and intricate patterns with a scroll saw or bandsaw, I spray the back of the pattern with artist's adhesive." These types of products are available in craft, camera and photography, and art-supply stores.

David says that spraying this on the back of the pattern gives it the same qualities as masking tape or clear cellophane tape. And after cutting, the pattern can be lifted off without any residue remaining on the workpiece. If the pattern is removed carefully, it can be reused several times.

"The advantage of this method over taping down the pattern is that since it is attached to the workpiece from the back side, it isn't necessary to cut out the pattern before attaching it, and also both the 'good' and 'waste' sides of the pattern stay in place following the sawcut."

Search for perfect shop continues—We have already received quite a few letters, sketches and pictures in response to our request in *FWW* #83 for information on shop layouts. Readers have been discussing such things as natural vs. artificial light, headroom problems, noise, access, tool selection and layout, dust collection and other details. We'd still like to hear more; so send along a snapshot, sketch or letter about your shop. If you don't want to talk about your whole shop, feel free to tell us about some special fixture or setup you developed to handle a particular problem and which you think would be helpful to other woodworkers. □

Dick Burrows is editor of *Fine Woodworking*.

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363	4"x24" belt sander w/o bag	320	179
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617	7-1/4" pushhandle saw 13 amp	205	115
9617	617 comp. w/cse. & carb. blade	235	129
368-1	8-1/4" top handle saw 13 amp	225	135
314	4-1/2" trim saw 4.5 amp	235	125
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7556	1/2" right angle drill	330	179
7511	0-1000 rpm 3/8" v/sp drill 5amp	200	109
7514	0-750 rpm 1/2" v/spd. drill 5 amp	210	119
7545	0-2500 rpm drywall gun 5.2 amp	185	104
7540	0-4000 rpm drywall gun 5.2 amp	180	104
666	0-1200 rpm 3/8" HD v. spd drill	200	122
621	0-1000 rpm 3/8" HD v spd drill	170	99
659	0-4000 rpm drywall gun 4 amp	140	85
9850	12 volt cordless drill w/case	240	135
8500	Extra 12v battery	48	35

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548	Heavy duty bayonet saw	290	189
9548	Above saw w/case	315	195
7548	Top handle jig saw 4.8 amp	240	134
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9629	Recip saw var/spd 8 amp	240	139
9627	Recip saw 2 var/spd. 8 amp	225	128
9647	TIGER CUB recipro saw	195	119
9637	**NEW** Full var/speed 8 amp	240	135

•••PLANERS•••

320	Abrasive plane 3 amp	180	109
126	Porta-Plane 2-13/32" 7 amp	295	199
9118	Above plan w/case & carb. cutter	345	195
367	3-1/4" planer 6.5 amp	240	149
9652	3" Versa-Plane kit w/case & carbide cutter	450	285

•••NEW TOOLS BY PORTER CABLE•••

555	Plate biscuit jointer w/cse	299	165
5556	NEW tilt fence for 555 jointer	60	45
7399	5.6 amp drywall cutout unit	130	78
43218	Drywall cut-out bit	9.50	5.95
7310	5.6 amp laminate trimmer	145	95
7312	5.6 amp offset base lam trimmer	209	125
7319	5.6 amp tilt base lam trimmer	165	105
97310	LAM TRIM KIT W/ STD. BASE, TILT BASE, OFFSET BASE, SLITTER BASE-GUIDE&CSE	330	189
693	1-1/5 HP plunge router	285	165
6931	Plunge router base	120	79

7336 6" var/speed Random Orbit Sander SPECIAL 139

BOSCH

1581 VSC Top Handle Jig Saw with Case — Sale 159

1273 DVSK Var/Spd 4x24 Belt Sander with Stand — Sale 215

•••ROUTERS•••

Model		List	Sale
1608	5.6 amp laminate trimmer	145	89
1608L	Same as above w/trimguide	145	92
1608T	5.6 amp tilt base trimmer	159	99
1609	5.6 amp offset base trimmer	209	122
1609K	Laminate installers kit w/1609 Offset base, trimmer tilt base, trimguide, 1/4" collet, collet nut, wrenches, hex keys and case	300	169
1600	2.25 HP Router D Handle	399	259
1601	1HP Router 25,000 rpm	175	105
1602	1.5 HP Router 25,000 rpm	209	125
1603	1.5 HP D handle router	239	139
1604	1.75 HP 2 handle router 229	118	
1604K	Same as above w/case & access.	279	164
1606	1.75 HP D handle router	259	145
1611	3 HP plunge router	365	198
1611-220V	Above router in 220 volt	395	225
1611EVS	3 HP elec. var/spd plunge router	425	234
1611EVS-220V	Above router in 220 volt	469	299
90300	3-1/4 HP router	525	339

•••DRILLS•••

11-212VSR	Bulldog 3/4" SDS rotary drill	349	194
1198VSR	1/2" var/spd hammer drill	239	133
1198VSRK	Above drill w/case	265	159
3050VSRK	**NEW** 9.6V var/spd cdls. drill w/case & 2 batteries	245	129
9164	3/8" var/spd mighty-midget drill	175	105
9166	1/2" var/spd mighty-midget drill	199	112
1158VSR	Var/spd 3/8" drill 2.8 amp	105	69

1581VST Top handle jig saw with Bosch saw table — 149

1582VST NEW CLIC barrell grip jig saw with Bosch saw Table — 149

•••HEAT GUNS•••

Model		List	Sale
1942	Heat gun 650-900 degrees	99	73
3268	Heat gun 600&1000 degrees	89	65

•••SAWS•••

1581VS	Top handle jig saw	245	133
1581DVS	Dustless top handle jig saw	265	159
1582VS	**NEW** CLIC Barrell grip jig saw	245	133
1582DVS	Dustless CLIC barrell jig saw	265	159
BC	Bosch metal case for above jig saws		30
BBA	Bosch blade assortment for jig saws-30 of Bosch's best selling blades		26.99
1922K	12 volt cordless orbital jig saw complete w/battery, charger & case	239	135
1651	7-1/4 " circ. saw drop foot	195	114
1651K	Above saw w/case & rip fence	230	139
1654	7-1/4" circ. saw pivot base	195	114
1654K	Above saw w/case & rip fence	230	139
1632VSRK	Recip saw 8.4 amp orb var/spd	235	134

•••SANDERS•••

1290	1/2 sheet finishing sander	199	125
1290D	1/2 sheet finishing sander w/bag	205	129
1272	3"x24" belt sander	289	165
1272D	3"x24" belt sander w/bag	309	175
1273	4"x24" belt sander	305	175
1273D	4"x24" belt sander w/bag	325	178
3270D	3"x21" belt sander w/bag 5 amp	235	133
1273DVS	Var/spd 4"x24" belt sander	349	189
BSF	Sanding frame for 1273DVS sander	109	85

•••PLANERS•••

3258	3-1/4" planer w/blade guard	210	127
3258K	3258 planer w/case	235	145
11304	"The Brute" Breaker Hammer	1995	1229

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MAKITA

6093DWK Cordless Drill Kit With Extra Battery & Holster Sale 165

6093DW Cordless Drill Kit W/Battery, Charger & Caser Sale 127

•••CORDLESS•••

Model		List	Sale
6070DW	3/8" var. spd. rev. drill. 7.2 volt	123	78
6071DWK	3/8" var. spd. rev. drill w/removable battery 7.2 volt	198	115
5090DW	3-3/8" saw kit. 9.6 volt	244	139
5600DW	6-1/4" circular saw.10.8 volt	350	199
6010DWK	3/8" cordless drill kit. 7.2 volt	164	95
6010SDW	3/8" cordless drill. 7.2 volt	103	59
DA3000DW	3/8" angle drill. 7.2 volt	270	139
4390DW	9.6 volt cdls. recip saw kit	230	128
6010DL	3/8" drill w/flashlight. 7.2 volt	209	125
6092DW	V/spd. drill. kit comp 9.6 volt.	246	125
6093DW	V/spd. drill w/clutch complete	254	127
6891DW	Drywall gun 0-1400. 9.6 volt	237	135
632007-4	9.6 volt battery	49	30
632002-4	7.2 volt battery	42	28
8400DW	Hammer drill kit. 9.6 volt	270	149
4300DW	Jig saw kit comp.. 9.6 volt	232	129
6710DW	Cordless screwdvr. kit. 7.2 volt	198	119
6012HDW	2 spd. driver drill w/clutch & case 9.6V	228	122
DA390DW	3/8" angle drill kit. 9.6 volt	270	159
ML900	Incandescent flashlight 9.6volt	57	35

•••ROUTERS•••

3705	Offset trimmer	274	159
3601B	1-3/8 HP router	255	139
3700B	1/2 HP trimmer	190	115
3612BR	3 HP plunge router round base	376	189
3612BRG	3 HP router w/set of guides-holder, straight & trimmer	440	229
3620	1-1/4HP plunge router w/case	192	109
3612B	3 HP plunge router sq/base	376	189

•••SANDERS•••

B04510	1/4 sheet pad sander	88	54
9924DB	3"x24" belt sander w/bag	282	145
9045B	1/2 sheet finish sander	228	129
9207SPC	7" sander-polisher	276	149
B04550	1/4 sheet pad sander w/bag	86	58
9900B	3"x21" belt sander w/bag	268	148
9030	1-13/16"x21" belt sander	264	139
9035	1/3 sheet finish sander	112	65
9045N	1/2 sheet sander w/bag	231	129
B04530	6" round sander	102	64
GV5000	Disc sander 5"	109	69
9401	4"x24" belt sander w/bag	324	165

•••GRINDERS•••

9501BZ	4" grinder, 3.5 amp	137	69
9503BH	4-1/2" sander-grinder	153	95
9609B	9" angle grinder, 15 amp	248	145
9505BHZ	5" disc grinder, 5.1 amp	166	99

3612BR 3 HP Plunge Router With Round Base Sale 189

•••SAWS•••

5007NBA	7-1/4" circular saw w/ elec. brake	233	127
5007NBK	5007NBA with Makita case	275	150
4200N	4-3/8" circular saw. 7.5 amp	225	127
4301BV	Orb. var/spd jig saw. 3.5 amp	274	155
JR3000V	Var/spd recip saw w/case	227	124
9820-2	Blade Sharpener	373	199
JV2000	Variable speed orb. jig saw	260	145
5005BA	5-1/2" circular saw	225	135
5402A	16" circular saw 12 amp	636	354
LS1440	14" Mitre saw	708	435
2414	14" cut-off saw AC/DC	350	198
2416S	16" cut-off saw AC/DC	448	249
5008NBA	8-1/4" saw w/electric brake	284	158
5201NA	10-1/4" circular saw 12 amp	589	295
JR3000WL	2 speed recip saw w/case	225	125
LS1020	10" mitre saw	463	295
2708W	8-1/4" table saw w/ carb. bld	490	249
2711	10" table saw w/ brake	319	479
4302C	Var/spd orbital jig saw	287	159
5077B	7-1/4" Hypoid saw	248	138
5007NB	7-1/4" circular saw 13 amp	209	114
LS1011	**NEW** 10" slide cmpd saw	818	525

•••PLANERS•••

2012	12" portable planer. 12 amp	930	475
1900BW	3-1/4" planer w/case	209	114
1911B	4-3/8" planer 7.5 amp	240	139
2040	15-5/8" planer	2470	1459
1100	3-1/4" planer w/case	381	205
1923B	3-1/4" planer 4.0 amp	225	125
1805B	6-1/8" planer kit w/ case	690	359
410	Dust collection unit	480	275
2030N	12" planer/jointer	3410	1665

•••DRYWALL GUNS•••

6800DBV	0-2500 rpm 3.5 amp	154	89
6801DBV	0-4000 rpm 3.5 amp	154	89
6805BV	0-2500 rpm 4.8 amp	177	105
6820BV	0-4000 rpm 5.2 amp	194	95

•••DRILLS•••

DA3000R	3/8" angle drill 0-1400 rpm	270	148
HP1030W	3/8" v/spd hammer drill w/case	198	119
HP2010N	3/4" v/spd hammer drill w/case	285	165
6402	3/8" drill 0-1200 rpm 5.2 amp	175	105
6404	3/8" drill 0-2100 rpm. 2 amp	102	65
6510VR	3/8" drill rev. 0-1050 rpm, 3.5 amp	145	79
6302	1/2" drill 0-550 rpm 5.2 amp	194	119
DA4511	1/2" angle drill 2 speed w/cse	419	245
6013BR	1/2" drill rev. 550 rpm 6 amp	248	135

9924DB 3"x24" Belt Sander With Bag Sale 145

SKIL

2735-04 12V Var/spd Cordless Drill Kit Complete With Case & 2 Batteries Sale 135

77 The Famous Skil 7-1/4 Worm Drive Saw Sale 145

•••JIG SAWS•••

Model		List	Sale
4580	Vari-orbit jig saw w/case	160	105
4540	Var/spd adjustable straight line	113	79
4560-02	Var/spd adjustable auto-scroll w/case	130	89

•••SANDERS•••

7012	2-1/2"x16" belt sander	67	59
7845	4"x21-3/4" belt sander	259	179
7313	3"x18" belt sander 4.5 amp	79	68
7575	1/4 sheet palm sander	70	49
7582	1/3 sheet palm sander	120	75

•••SPECIAL SALE ITEMS•••

6850-02	1/2" EMH hammer drill w/case 4 amp	255	129
1605	**NEW** Biscuit Jointer 6 amp complete with case	200	125
2238	Cordless socket wrench 3/8" drive	54	45
2210	Cordless Supertwist screwdriver	45	35

•••SAWS•••

5865	(825) 8-1/4" worm drive saw	265	164
5250	2-1/4 HP circular saw	76	64
5790	(810) 10-1/4" circ saw drop foot	459	275
5750	(807) 7-1/4" circ saw drop foot	235	145
5625	(552) 6-1/2" circular saw	210	134
3810	10" Mitre saw 15 amp	350	205
3810S	3810 w/60 tooth carb blade		229
5825	(367) 6-1/2" worm drive saw	240	154
5350	2-1/3 HP circular saw	94	75
5656	(553) 7-1/4" circular saw	205	125
5660	**NEW** 8-1/4" 60° circular saw	223	145
5510	(551) 5-1/2" circular saw	158	99
77:04	7-1/4" worm drive saw kit complete w/case, 24 tooth carbide blade & adjustable rip fence	285	185

Thanks to all of our customers for making 1990 our best year ever!

3810 10" Mitre Saw 3 HP Sale 205

1605K Biscuit Jointer w/1000 Assorted biscuits Sale 149

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314	4 1/2" TRIM SAW	125
330	SPEED BLOCK FIN. SANDER	54
345	SAW BOSS 6" CIRCULAR SAW	99
351	3x21 BELT SANDER	125
361	3x24 BELT SANDER	167
363	4x24 BELT SANDER	179
504	3x24 XHD BELT SANDER	329
505	1/2 SHEET FIN. SANDER	108
555	BISCUIT JOINER	164
690	1 1/2 HP ROUTER	119
5116	OMNI JIG	263
6931	PLUNGE ROUTER BASE	76
7334	RANDOM ORBIT FIN. SANDER	120
7538	3 1/4 HP PLUNGE ROUTER	238
9118	PORTA-PLANE KIT	185
9637	VAR. SPEED TIGER SAW KIT	134
9647	TIGER CUB RECIP SAW	116
7519	3-1/4 HP SPEEDMATIC ROUTER	224
5556	PLATE JOINER TILT FENCE	39
9851	12V CRDLSS DRILL KIT,KYLSS CHUCK	136
7336	6" VS RANDOM ORBIT SANDER	136
9505	COMMEMORATIVE 505 SANDER W/CSE	138

Milwaukee

6246 JIG SAW
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0228-1	3/8" VSR PISTOL DRILL	$97
0234-1	1/2" MAGNUM HOLE SHOOTER	115
0382-1	7.2 V CORDLESS DRILL KIT	91
6012	1/3 SHEET FIN. SANDER	108
6014	1/2 SHEET FIN. SANDER	112
6016	1/4 SHEET FIN. SANDER	47
6140	4 1/2" ANGLE GRINDER	91
6256	TOP HANDLE JIG SAW	128
6365	7 1/4" CIRCULAR SAW	113
6511	2 SPEED SAWZALL W/CASE	124

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31-050	1" BELT SANDER	72

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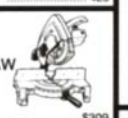
N50FN	FINISH NAILER 1" - 2" CAP	324
N60FN	FINISH NAILER 1" 1/4- 2" 1/2	335
T29-30	BRAD NAILER	309
MII-812	T-NAILER 9/16-2 1/4"	429

RYOBI



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JP155	6-1/8" VS JOINTER	$309
W660	7-1/4" CIRCULAR SAW	89
RE600	3HP PLUNGE ROUTER	205
L1323ALS	3 1/4" PLANER KIT LONG SHOE	109
RA200	8" RADIAL ARM SAW	249

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C12FA	12" MITER SAW	$338
TR8	1 1/2 HP PLUNGE ROUTER	117
F20A	3 1/4" PLANER	97
SB-75	3 x 21 BELT SANDER W/BAG	129
SB8T	3 x 24 BELT SANDER W/BAG	139
SV12SA	1/4 SHEET FIN. SANDER	48
DTC10	7.2V 2 SPEED CORDLESS DRILL	79
DRC10	SAME AS ABOVE BUT W/CLUTCH	85
DV10D	CORDLESS HAMMER DRILL	119
D10VC	3/8" VSR DRILL	69
C7SA	7 1/4" CIRCULAR SAW	69

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EY571B	9.6V VS W/KEYLESS CHUCK	$134
EY6205B	12V VS 15 MIN CHRGE KEYLESS	210
EY6200B	12V 2 SPD, 1/2" CHUCK 15 MIN	199

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1273	4x24 BELT SANDER	170
1273DVS	4x24 BELT SANDER	188
1347A	4 1/2" MINI GRINDER	84
1580VS	VS VAR. ORBIT JIG SAW	99
1581VS	TPO HANDLE JIG SAW VS	132
1601	1 HP ROUTER	99
1604	1 3/4 HP ROUTER	119
1608	LAMINATE TRIMMER	85
1609K	TRIMMER INSTALLERS KIT	159
1611	3 HP PLUNGE ROUTER	195
1651/54	7 1/4" BUILDERS SAW	97
1922K	ORB. CORDLESS JIG SAW KIT	150
3050VSRK	CDLS DRILL 9.6V 2 BAT/CASE	128
3258	3 1/4" PLANER	127

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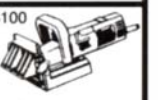

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LU82M010	10"x 60T TC CUT OFF CARB	44
LU84M008	8"x 40T ATB COMBO CARBIDE	38
LU84M011	10"x 59T ATB COMBO CARBIDE	39
LU85M010	10"x 80T ATB CUT OFF CARB	56
LU85M014	14"x 108T ATB CUTOFF CARB	97
LM72M010	10"x 24T ATB RIPPING CARB	37
LU73M010	10"x 60T ATB CUT OFF CARB	43
LU87M010	10"x 24T THIN KERF RIP	38
LU88M010	10"x 60T THIN KERF CROSSCUT	44
LU89M010	10"x 72T TC NON FERROUS	59
LU98M010	10"x 80T TCG SUPERIOR	69
LU78M010	10"x 80T ATB CROSSCUT	69
TK206	10"x 24T ATB	20
TK306	10"x 40T ATB	25
TK906	10"x 50T COMBO	27
PS203	7 1/4"x 24T ATB CARBIDE	19
PS303	7 1/4"x 40T ATB CUTOFF	23
DS308	8"x 18T DADO SET CARBIDE	107
WC104	4 PIECE CHISEL SET	39
WC106	6 PIECE CHISEL SET	52
WC110	10 PIECE CHISEL SET	79
DB107	7PC BRAD POINT SET	16
CS106	6PC CARVING SET	73
CS112	12 PC CARVING SET	129
FRT2000	ROUTER TABLE	169
EB100	EDGE BANDING SYSTEM	229
FB-107	7 PC FORSTNER BIT SET	49

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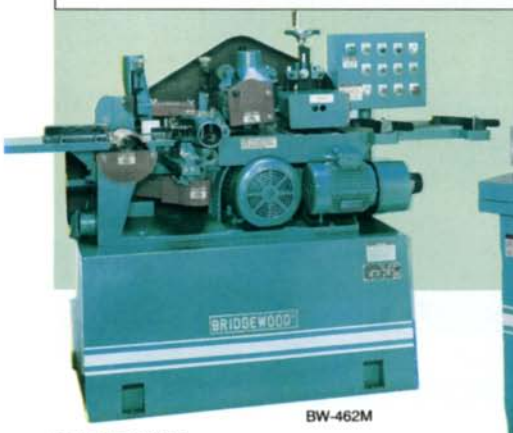

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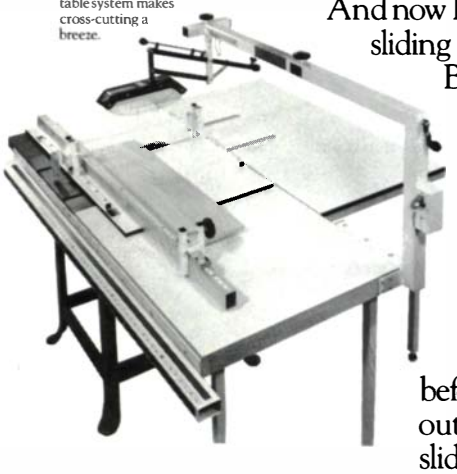

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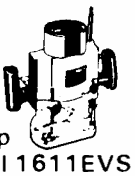

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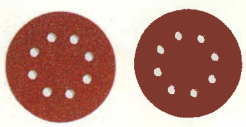

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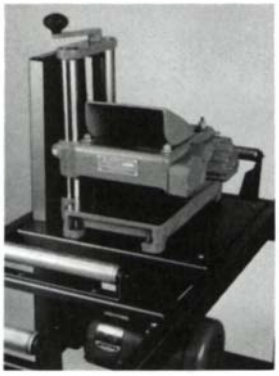

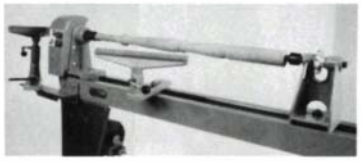

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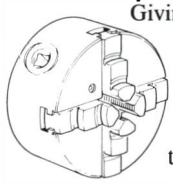

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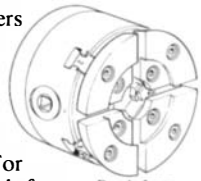

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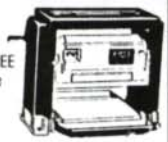

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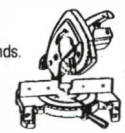

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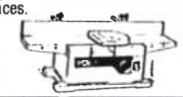

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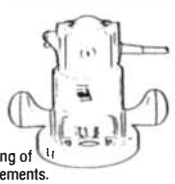

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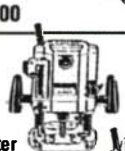

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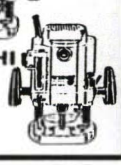

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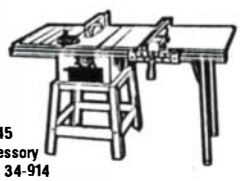

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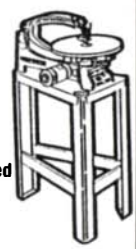

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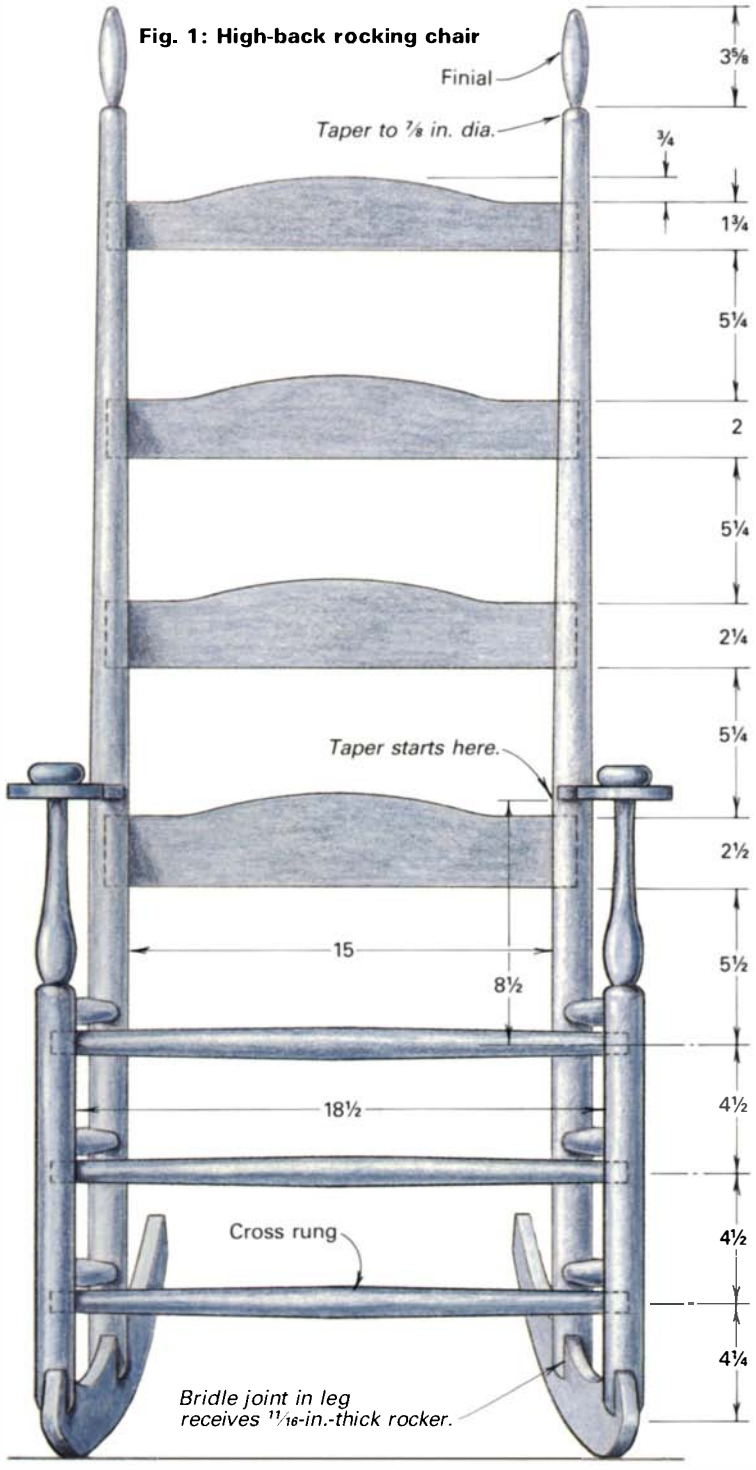
Making a Rocking Chair with Dowels

Alignment techniques for drilling at odd angles

by Ken Oldfield

This chair, based on a photograph of a Shaker rocker, was made with commercially available dowel stock for the rungs, legs and back uprights. The author steam-bent the back slats and uprights.

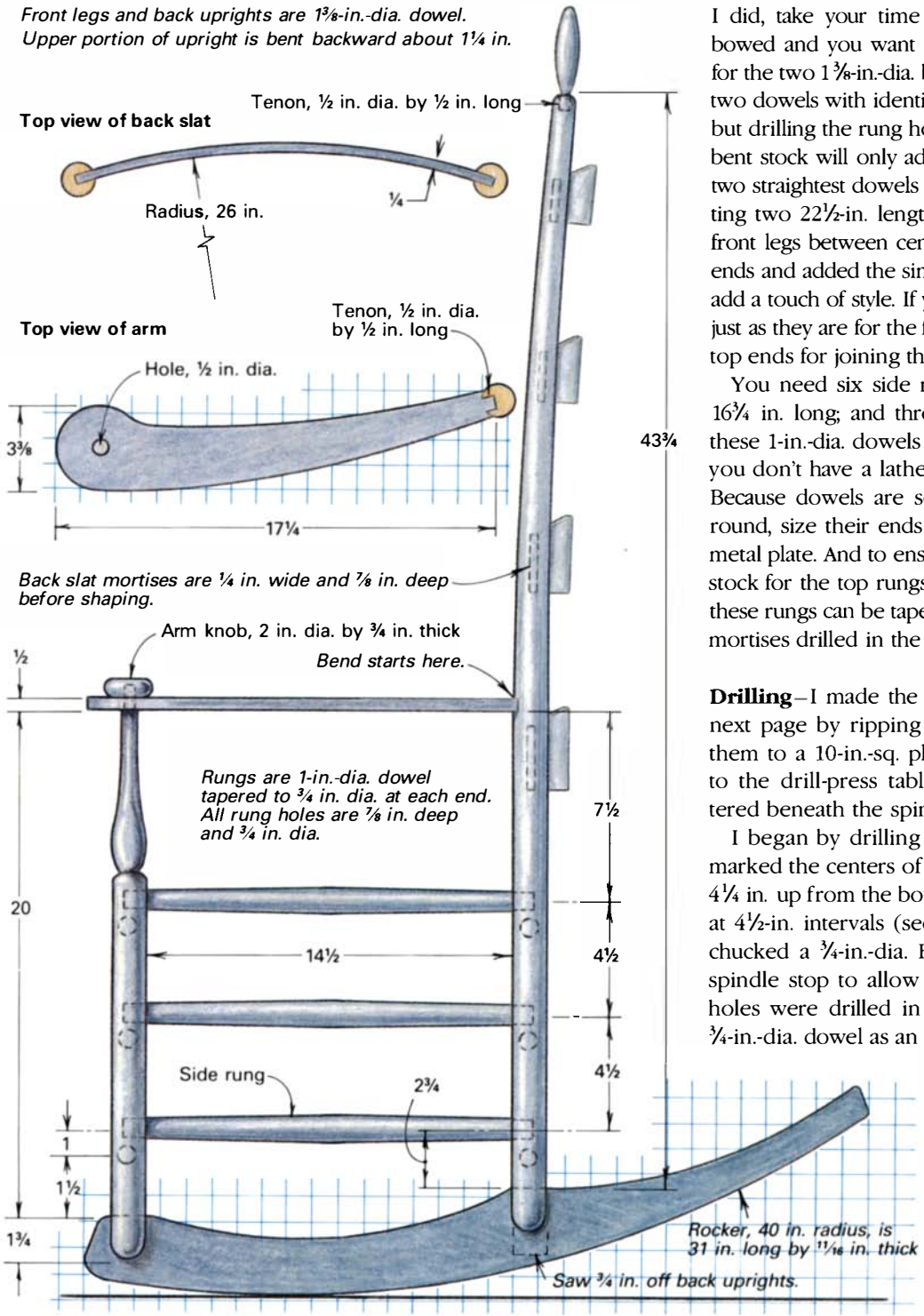
Fig. 1: High-back rocking chair



Drawings: Heather Lambert

I'm an amateur woodworker, but I enjoy the challenge of chair building. After making two different styles of straight chairs, I was considering building a rocking chair for a spare room when I came across a photograph of a late-19th-century Shaker rocker. This design appealed to me because the basic construction looked straightforward and I thought I could build the chair relatively easily and quickly in my basement shop.

However, as I considered the construction, I discovered that the bed of my lathe was too short to handle the 46¼-in.-long back uprights. I realized I could avoid this problem by using hard-maple dowel rod (readily available at my local lumberyard) for these long pieces. I could have turned all the other parts from square stock in the conventional manner, but I opted to also make them from preturned doweling; I used 1⅜-in.-dia. dowels for the back uprights and front legs, and 1-in.-dia. dowels for all the rungs.



The biggest challenges I encountered when building the chair shown here were drilling the holes in the legs at the correct angles for the side rungs and cross rungs, and routing the mortises for the back slats. Because I only wanted to build one or two chairs, I didn't see the need for any elaborate jigs or fixtures. Instead, I made a V-block to hold the legs on the drill-press table and devised some low-tech alignment methods that served me well for drilling and routing at the proper angles.

The measurements given in figure 1 can be scaled up or down to suit your requirements. But keep in mind that the seat is wider at the front than at the back and that the seat angles given are based on the rung lengths shown. If you change any of the rung lengths, you should draw the seat full scale on graph paper and measure the resultant angles with a protractor (unless you change all rung lengths in equal proportion).

Stock selection and preparation—If you use preturned dowels as I did, take your time selecting the stock. These dowels are often bowed and you want the straightest pieces you can find, especially for the two 1⅜-in.-dia. back uprights. You may be tempted to look for two dowels with identical bows and skip the steam-bending process, but drilling the rung holes and routing the back-slat mortises on prebent stock will only add to your problems. I began by trimming the two straightest dowels to 46¼ in. long for the back uprights and cutting two 22½-in. lengths for the front legs. I mounted each of the front legs between centers on the lathe, turned tenons on their top ends and added the simple shaping, as shown on these two pages, to add a touch of style. If you don't have a lathe, you can use the dowels just as they are for the front legs and insert a ½-in.-dia. dowel in their top ends for joining the arms and the decorative knobs.

You need six side rungs, 16¼ in. long; three back cross rungs, 16¾ in. long; and three front cross rungs, 20¼ in. long. I turned these 1-in.-dia. dowels so they tapered to ¾ in. dia. at both ends. If you don't have a lathe, you can use ¾-in.-dia. dowel for the rungs. Because dowels are seldom precisely dimensioned or completely round, size their ends by forcing them through a hole drilled in a metal plate. And to ensure adequate strength, I advise using 1-in.-dia. stock for the top rungs, which support the woven seat. The ends of these rungs can be tapered with a spokeshave to fit into the ¾-in.-dia. mortises drilled in the legs.

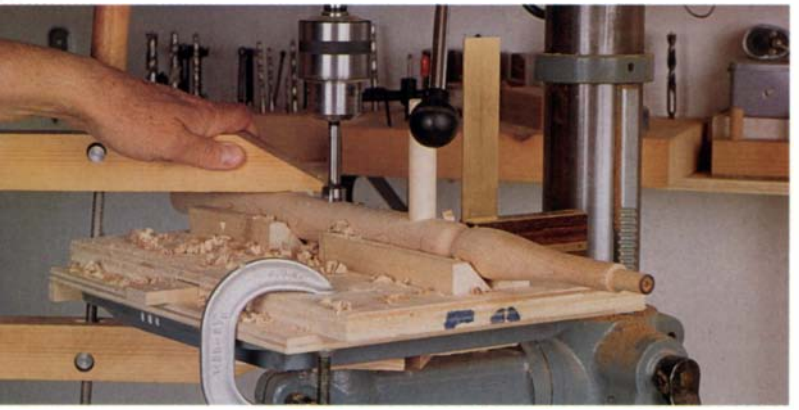
Drilling—I made the 90° V-block shown in the top photo on the next page by ripping two maple 2x2s at a 45° angle and gluing them to a 10-in.-sq. plywood base. The plywood base is clamped to the drill-press table so that a leg laid in the V-block is centered beneath the spindle.

I began by drilling three cross-rung holes in each leg. First, I marked the centers of these holes on all four legs. The first hole is 4¼ in. up from the bottom of each leg and the other two holes are at 4½-in. intervals (see figure 1). For the first hole in each leg, I chucked a ¾-in.-dia. Forstner bit into the drill press and set the spindle stop to allow a ⅞-in.-deep hole. To ensure the next two holes were drilled in line with the first, I used a 4-in. length of ¾-in.-dia. dowel as an "alignment peg." I placed the peg in the first hole and aligned it with a try square standing vertically on the V-block base, as shown in the top photo on the next page. Then I clamped the leg to the V-block and drilled the cross-rung hole. I repeated this process for the cross-rung holes on all four legs.

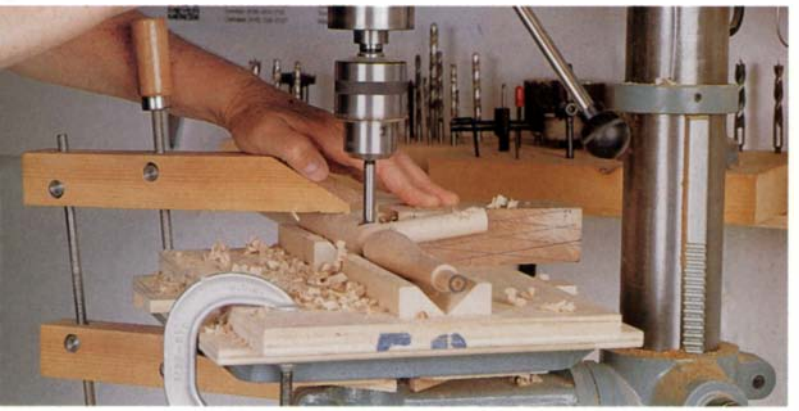
Before marking the side-rung holes, clearly identify each leg as right or left

to avoid confusion when drilling. With this right/left designation in mind, mark the centers of the side-rung holes approximately 90° from and 1 in. above the center of the cross-rung holes. When standing in front of the chair and looking down on the seat, the side rungs in the front legs will actually be centered 83° from the cross rungs: clockwise for the right front leg and counterclockwise for the left front leg. For the back legs, the side rungs will be 97° from the cross rungs: clockwise for the left back leg and counterclockwise for the right back leg. Another way to look at this is that the side-rung holes are placed -7° from 90° for the front legs and +7° from 90° for the back legs.

To align the legs for drilling the side-rung holes at the correct angle, I used a block of wood with lines running at a 7° angle, as shown in the center photo. With a leg in approximate position to drill the top side-rung hole, I put the alignment peg in the adjacent cross-rung hole and rotated the leg until it aligned with the 7°-lines on the wood block (+7° for the front legs and -7° for the back legs). Then I clamped the leg to the V-block and drilled the hole. For the left front leg and the right back leg the block will be behind the V-block, and for the other two legs it will be in front. As you can see in the center photo, you need to cut away a portion of the V-block to accommodate the alignment peg. You'll only need to use the 7° block for the first side-rung hole in each leg, and then you can put the alignment peg in the side-rung hole you just drilled and use the try-square alignment method for the other two holes.



After drilling the upper-cross-rung hole in one of the front legs, the author inserts an alignment peg into this hole. To ensure that the next hole is drilled in the same plane as the first, he rotates the leg until the alignment peg is parallel with a square standing vertically on the base of the V-block fixture.



The correct angle for the first-drilled side-rung hole is established by referencing the alignment peg, inserted into a cross-rung hole, to a line drawn at a 7° angle on a block of wood.

To determine the angle for the slat mortises, the author assembles the back uprights with the cross rungs and then holds one of the steam-bent slats up to the ends of the uprights and marks the angles.

Steaming the slats and uprights—As is typical of Shaker ladder-back chairs, the ¼-in.-thick back slats have a gentle curve on the top edge, and beginning with the bottom slat, each successive slat is slightly narrower than the one below it. The slats will be inserted into ⅞-in.-deep mortises in the back uprights, just like the 16¾-in.-long back cross rungs, but the slats should be crosscut about 2 in. longer to allow for their curvature. You will trim them to exact length after steaming and bending them. I used ash for the slats in the chair in the photo on p. 48, but oak would also be fine.

I built my steamer, shown in the bottom photo on p. 52, from 4½-in.-dia. plastic pipe with two electric kettles as sources of steam. I found that soaking the chair parts in hot water for 15 minutes prior to steaming greatly increased the efficiency of my steamer. After steaming each slat for about 30 minutes, I clamped it over a bandsawn 4x4, which was cut to the desired curvature, and then let it dry overnight. The slat will spring back somewhat after it is removed from the form, and so your form should have a tighter curve than what you want for your finished slats. A word to the wise: I learned the hard way that the harmless looking mist escaping from the kettles and the end of the steamer pipe is not so harmless; leather work gloves are now a permanent part of my steaming equipment.

I rout the mortises in the uprights to receive the slats with a ¼-in.-dia. up-spiral mortising bit. Because of the curve of the slats, the angle of entry of these mortises is not the same as the back cross-rung holes. To determine the angle, dry-assemble the back legs with the three cross rungs and lay this assembly on the bench. Draw a circle on the ends of the uprights to designate their size after they are tapered and hold a slat against the ends so you can mark the angle at which the slat should enter the upright (see the bottom photo). You may have to block up the slat to center it on the uprights. At this time you can also mark the slat for length based on ⅞-in.-deep mortises, and then use it to mark the length of the remaining slats.

Next, glue a ¼-in.-wide by 6-in.-long piece of wood (a Popsicle stick is ideal) to the end of each upright along the lines you just marked to act as a temporary guide while you rout the mortises. After laying out the mortises, put an upright in the bench vise flush with the benchtop and with the Popsicle stick pointing straight up. Then, stand a square against the stick so that its blade is vertical, and rotate the upright until the stick is aligned with the square's blade, as shown in the top photo on p. 52. Now you can rout the mortises.

I made an adjustable jig to guide the edge of the router base and provide stops at both ends (see the top photo on p. 52). I clamped the jig to the bench and routed the first mortise, and then moved the upright and reset the jig's stops to accommodate the different length of each mortise. Then I chiseled the ends of the mortises square and dry-assembled the chair back with the three cross rungs and four slats to check their fit.

Before steam bending the uprights, taper their upper ends and

(continued on p. 52)

Weaving a rush fiber seat

I used rush fiber for the woven seat on my rocking chair. This extremely strong and durable cord is actually tightly twisted paper that comes in a continuous 150-yd. roll. I ordered mine from Lewiscraft, 40 Commander Blvd., Scarborough, Ont., Canada M1S 3S2, but it's also available in the United States from most handicraft-supply houses and many mail-order woodworking supply firms. Although the instructions suggest lightly dampening the cord before weaving, I found this to be no improvement over using it dry.

The actual weaving process is quite simple, but the pattern is based on 90° corners and the seat is not; so first you must "square up" the opening by filling in about 1¾ in. from the sides at both front corners. To make the description easier to follow, I'll refer to the top rungs by number, as shown in figure 2 below, beginning with the top front rung as #1 and proceeding clockwise around the chair so that the top right rung is #4.

To begin filling in the corners, cut a 6-ft. length of cord, double it and tack it at the fold to the inside of rung #2 about 3 in. back from the front leg. Take one of the 3-ft. lengths and while maintaining moderate tension, bring it forward and over the top of rung #1 right next to the left leg. Go around the rung, so the cord is now pointing toward the rear of the chair, and then go left over the top of the cord strand and over rung #2. Bring the cord around the rung, and coming from underneath rung #2 go all the way to the right and over the top of rung #4. Go around the rung and come from underneath and cross over the cord and the top of rung #1, keeping the cord tight. Now, go around rung #1 and from underneath run the cord back about 3 in. and tack it to the inside of rung #4.

Repeat this pattern with the second half of the original 6-ft. length of cord, keeping it tight alongside the first cord. It will end up being tacked to rung #4 about 1 in. back from where the end of the first length was tacked. Now take a second length of cord (about 6 in. longer since it will have farther to go), and repeat the process. Concentrate on keeping the cords close together and making 90° bends in it as it goes to the right and left. With ¼-in.-dia. cord, about six turns over each end of the front rung will be required to create a rectangular opening with square corners.

Now that the opening is squared up, you can start the weaving process. From the hank of cord, coil up as much as you can handle conveniently and cut it off. Tack one free end to the inside of rung #2 and proceed as you did before. However, after you have gone over rung #1 on the right, you take the cord all the way back to and over rung #3. Come from under rung #3, go to your right over rung #4, come from under this rung, and across and over rung #2. Go around rung #2, and then up and over the cross cord and rung #3. Come from under rung #3 to the front, going over rung #1, and start the whole process again.

Keep the 90° angles sharp and accurate by pulling the cord tightly with your thumb and finger as you weave and form them. Viewed from the top, all lines formed by the cord must be parallel or square to each other (see figure 2). A block of wood and a hammer are useful for periodically knocking the cord strands together to keep them tight to each other on the rails. When you run out of cord, tie on another length underneath the seat using a square knot somewhere that subsequent weaving will cover.

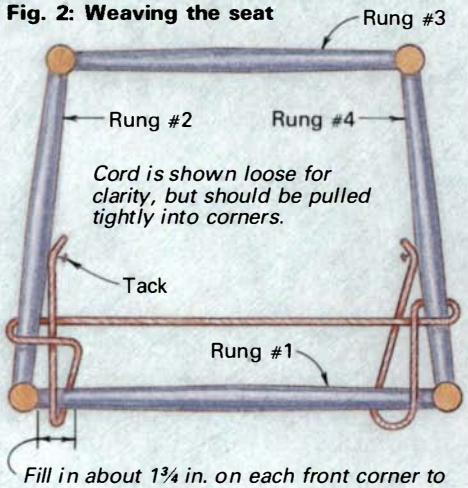
When only about 4 in. of space remains on rungs #2 and #4, fill the "pockets" that have been formed between the upper and lower levels of cord on the sides of the seat with pieces of cardboard (cut from corrugated boxes) to keep the seat firm and give it shape. Lay the cardboard along rung #2 and cut it to a triangular shape as shown. Insert this into the opening and do the same on the rung #4 side. You'll need several pieces of cardboard in each pocket, but don't overdo it or the seat will be very stiff and hard.

Continue with the weaving until about 4 in. of space is left on rungs #1 and #3. Now pack the front and the back of the seat with cardboard in a similar fashion to the sides. Here you will find that fewer pieces of cardboard can be inserted.

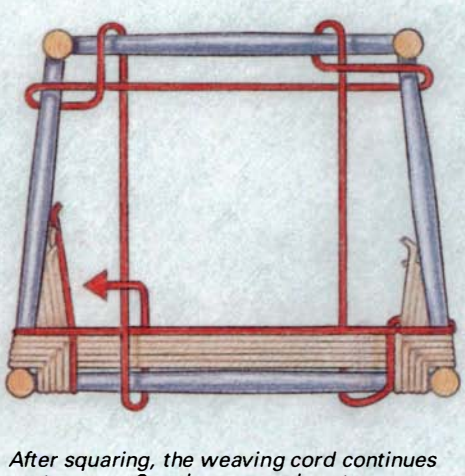
Resume weaving until the sides of the seat are completely covered. At this point there will still be about 1½ in. of rung in the front and back to be covered. To do this, bring the cord up through the center opening (you may have to cut the points off the packing pieces if they extend too far into the center) and forward and over rung #1. Go around this rung and, coming from underneath, go up through the center opening and then to the back and over rung #3. Go around rung #3 and then from underneath go back up through the center opening again. Continue in this way until the front and back rungs are filled in. Tack the end of the cord underneath the seat to rung #3.

When the seat is complete, give both the top and bottom two coats of white shellac to add to its durability. Now sit back and "rock around the clock." —*K.O.*

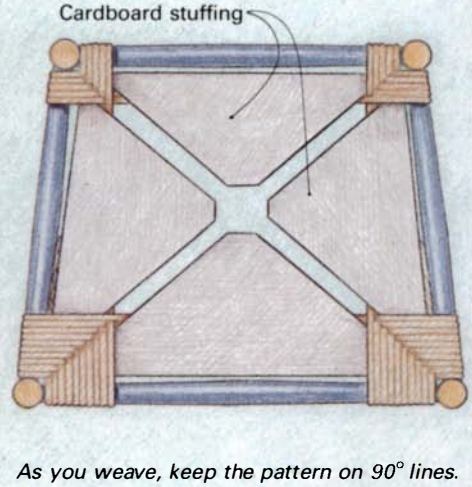
Fig. 2: Weaving the seat



Fill in about 1¾ in. on each front corner to square up seat area.



After squaring, the weaving cord continues on to rung #3 and on around seat.

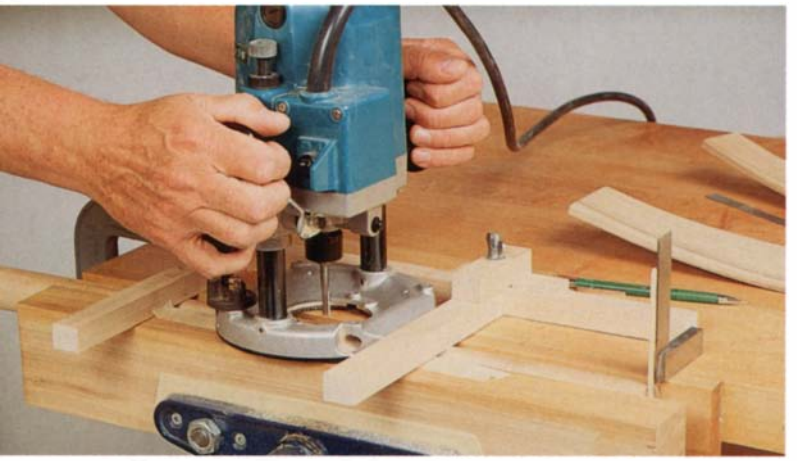


As you weave, keep the pattern on 90° lines.

then drill a ½-in.-dia. hole in the top of each one for the finials. I roughed out the taper with a handplane, beginning at the lowest slat mortise and tapering to ⅞ in. dia. at the top. Then I refined the shape with a spokeshave and smoothed away any facets left from the tools with 80-grit paper on an electric palm sander.

Since only the upper portion of each upright is bent, I didn't bother to steam the whole length. I made a pine plug with a 1⅜-in.-dia. hole in it for one end of the steamer pipe and inserted the tapered end of the upright only up to the point where the arm will join it, as shown in the bottom photo. As with the slats, I soaked the tapered portion of the upright in hot water for about 15 minutes and then steamed it for about 40 minutes. When I removed the upright from the steamer, I clamped it in the bench vise with wedges between the upright and the side of the bench to force the bend, and then I let the upright dry overnight. To ensure that I bent the upright in the proper direction, I inserted the alignment peg used for drilling into one of the cross-rung holes before steaming. Then I made a mental note of which way to orient the plug when I clamped the upright in the vise: either up or down, depending on whether I am bending the left or right upright. This way I didn't have to think about it too much as I hurried to bend the upright after removing it from the steamer. Springback is always a factor when steam bending. To give you an idea of how much springback you can expect, I bent my uprights about 2¼ in. immediately after steaming, and when I took them out of the vise the next day, the bend came back about 1 in., resulting in a total curve of about 1¼ in.

When both uprights were dry, I sawed ¾ in. off their bottom. This tilted back the seat and worked with the arc of the rockers to provide a pleasing center of balance for the chair, whether empty or occupied. Then I bandsawed the 1¾-in.-deep by 1/16-in.-wide bridle joint on the bottom of both legs so they would fit over the rockers.



Oldfield glues a Popsicle stick onto the end of the upright along the line of the mortise angle and aligns the stick with a square standing on the bench. Then he routs the mortises with the aid of a jig that guides the router base and adjusts to set stops for the mortise length.

The author's steamer consists of two kettles with built-in electric hot plates that feed steam through dishwasher hose into a length of plastic pipe. Because only the upper end of the back uprights are bent, Oldfield made a wood plug through which he could insert the tapered upper portion of the upright. The short alignment peg in one of the rung holes reminds him of the direction of the bend.

Rockers and glue-up—After some experimentation with rockers, I found that a 35-in. to 40-in. radius provides a good range of rocking motion. I used a 40-in.-radius arc on the rocker in the photo on p. 48 and it provides an easy rocking motion; a smaller radius would let the chair tip further back. The rockers are bandsawn from 1/16-in.-thick hard maple for durability, and are 31 in. long measured from tip to tail end (see figure 1 on pp. 48-49). I used a spokeshave to break the top edges of each rocker, except for the short flat surfaces where the legs' bridle joints fit. To ensure that the legs seat squarely on these flat areas, dry-assemble the two chair sides (three side rungs and a front and back leg), fit them onto the rockers, and then mark and trim the rockers if necessary.

Next, I disassembled the chair sides and sanded all the parts, finishing up with 120-grit in preparation for glue-up. I glued up the front legs with their three cross rungs first and then the back uprights with cross rungs and slats. Check both of these assemblies by eye to make sure the legs are in the same plane with no twist, and then stand them on the bench with one of the legs against a framing square to make sure the assembly is not racked. When the front and back assemblies were dry, I glued them together with the side rungs, pulling all the joints tightly home with a web clamp. When gluing a chair together, you should make sure that the assembled chair stands on all four legs and then view it from the top and sides to ensure that the angles have not been distorted by clamping pressure.

The curved arms, which I bandsawed from ½-in.-thick stock, fit over the round tenons on the top of the front legs and are joined to the back uprights with a ½-in.-dia. hand-cut round tenon. I drilled the hole to accept the back of the arm at the appropriate angle based on the arm's curve as seen from above. After fitting the arm to the curvature of the upright, I marked around the front-leg tenons and drilled the holes through the arms so they would drop over these tenons. I glued the arms in place and then rounded the bottoms of the legs with a rasp, file and sandpaper and glued the rockers into the bridle joints. To top things off, I turned the finials with ½-in. by ½-in. tenons, rounded the tops of the uprights and glued the finials in place. Finally, I turned the decorative arm knobs, drilled a shallow ½-in.-dia. hole in the bottom of each and glued them onto the tenons that extend up through the arms.

I gave my chair two coats of blue milk paint that I ordered from The Old Fashioned Milk Paint Co., Box 222, Groton, Mass. 01450. This paint is made from lime, milk, clay and earth pigments and contains no lead, chemical preservatives, fungicides, hydrocarbons or other petroleum derivates. The paint has a slight milk odor after it's mixed with water, but this disappears as the paint dries. All other ingredients are basically inert organic materials except for the hydrated lime, which is strongly alkaline when wet, but becomes totally inert when dry. After the second coat was dry, I rubbed it down with 0000 steel wool and then coated the entire chair with Watco Danish oil to deepen the color and give the finish a slight sheen. □

Ken Oldfield is a marketing manager for IBM and an amateur woodworker in Toronto, Ont., Canada.

Jeff Trotter
When he's not busy with his teaching career, Jeff Trotter retreats to his home workshop in Wasilla and woodworks both for pleasure and profit. *Above,* he's shaping an oak wall plaque commissioned by a local taxidermist. Trotter's frame-and-panel walnut blanket chest and segmented turning are shown *at right.*

Woodworking in Alaska

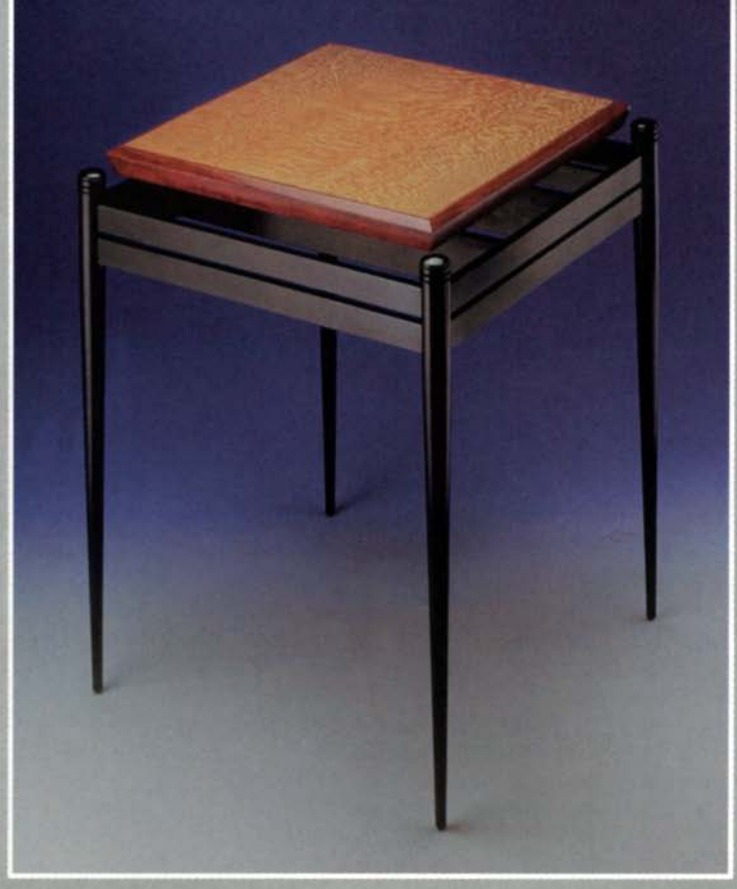
Keeping the chips flying in the frozen North

by Sandor Nagyszalanczy

The day was dead calm and the temperature was 43° below zero and dropping fast. I'd traveled more than 4,000 miles to Alaska to get a taste of the local woodworking, and now it seemed that all I was going to get was frostbite and perhaps a demonstration of how to chop frozen mortises with an ice pick. Of course I was wrong; people in Alaska (except for "cheechakos" [Eskimo name for greenhorns] like me) seem to take winter's cruelest blasts in stride. Before Mike McGill, my Fairbanks host, took me out to his shop to show me the kitchen cabinets he was building, he stoked up the wood stove and asked, "Wanna see a neat trick?" We donned our parkas and went outside where McGill threw a cup of boiling water into the air: It froze instantly into a feathery plume of ice crystals that fell like gentle snow.

I'd journeyed to Alaska to visit almost a dozen craftsmen that I only knew through letters and pictures of their work. But why visit Alaska in February when the entire state is enveloped in snow? The main reason is that Alaskans generally stay close to home during the winter months and spend a lot of time indoors, visiting with friends or working in the shop; the brief summer months are often spent traveling or taking care of outdoor jobs that require favorable weather, like reshingling a roof. In addition, two shows were running concurrently in Anchorage and they provided me with the uncommon opportunity to see the work of craftspersons that I wouldn't be able to visit in their shops. Many of these rugged individuals live in remote areas, far from the urban centers of Anchorage, Juneau and Fairbanks on my itinerary. So pull your chair close to the fire, and I'll tell you about the work I saw in the shows and introduce you to some of the state's woodworkers. But first I'll give you an idea of how many woodworkers make a living in Alaska, a unique environment where woodworkers practice their craft in ways that differ from those found anywhere else in America.

Up north, to Alaska—The spirit of bold individualism is certainly alive and well in Alaska. Most of the woodworkers I met during my travels are talented, resourceful people who came to Alaska to carve out a special life for themselves. All the Alaskans I met had moved up from the "lower 48" (as Alaskans so rebelliously refer to the continental United States) during Alaska's big oil boom in the



Lowell Zercher

Although Lowell Zercher spends much time contract building high-end homes, making furniture in his Anchorage shop is his first love. A former student of the Wendell Castle School, Zercher made several small table clocks for the "Creative Woodworking North of 60°" exhibit, including two like the one he's working on in the *photo at left*. His other pieces in the exhibit included "Floating Jewel" table, *right*, made from Australian lacewood with a purpleheart edgeband, and "Gramod Clock," *center*, which has a stave-built Macassar ebony column supporting a clock face turned from quilted Western maple.

1970s. Many came to work on the trans-Alaskan pipeline, which brings oil from Prudhoe Bay in the far North to the now-infamous port of Valdez. Others worked in the construction that resulted from the population surge caused by the oil boom. Some, like Fairbanks-area furnituremaker Barry Correll and Juneau woodworker Verne Skagerberg, came to Alaska with the military and decided to stay. Still others, like now-retired teacher and woodworker Arnold Geiger, were lured to Alaska by the natural beauty and abundant outdoor recreations, like hunting and fishing.

Regardless of the reasons for coming or staying (many met their future spouses), making a living in Alaska was tough during the economic depression following the end of the oil boom in 1986. Most professional woodworkers had to take outside jobs, usually in construction or teaching, to supplement their woodworking income.

Anchorage furniture designer/craftsman Lowell Zercher (see the photos above) has an interesting analogy for describing the way he makes his living. "We used to have a local movie theater that alternately showed X-rated films and foreign films. The theater made money on the X-rated films so it could afford to run the less popular, but more artistically virtuous foreign films." Similarly, Zercher spends about 75% of his time doing carpentry and construction so he can afford to do what he loves: designing and building high-end furniture. His contracting business often tackles very expensive houses in the Anchorage area, and Zercher often works with the owners in designing built-in cabinets and other interior woodwork. Zercher says there are very few professional furnituremakers selling contemporary furniture in the state. Further, he asserts that Alaskans don't buy more high-end furniture because their purchasing priorities are items that are part of the mobile Alaskan lifestyle: airplanes, guns and snowmobiles (not necessarily in that order).

Photo: Lowell Zercher

This curly koa table, displayed at the "Creative Woodworking North of 60°" show was built by professional woodworker Mike McGill to be used beneath a bay window. McGill purchased the koa lumber for the piece in Hawaii and had the rough slabs shipped to his shop in Fairbanks.

Teaching has become one of the most popular professions for part-time woodworkers mainly because of the summer break the job provides. Jeff Trotter moved from Colorado to Wasilla (northeast of Anchorage) in 1976 and teaches drafting by day, woodworking classes for adults in the evenings, and also runs a part-time woodworking business (see the photos of him and his work on the previous page). In addition to his full- and part-time jobs, Trotter has developed ingenious ways of earning extra money. During the summer he works as a fishing guide in Northern Alaska, and in the winter (which usually lasts from October to April) he does commission work, like making wall plaques for a local taxidermist who mounts game heads and fish. Now retired from teaching, Arnold Geiger lives in an Anchorage suburb and does woodworking in his basement shop. He began by selling small carvings and turnings to his fellow teachers, and eventually started doing business at local bazaars and expanding his line to include cutting boards, jewelry boxes, and small carved pins of animals indigenous to Alaska, such as killer whales and snow geese.

An exception to the multiple-career approach is Mike McGill, a full-time professional cabinetmaker who works out of a large garage workshop at his home in Fairbanks. While McGill's shop

Eugene Doren

Eugene Doren does most of his turning in his small home workshop in Wasilla *(left)*. During spare time on his job with an electric company, he turns on a homemade lathe in a semi-truck trailer. His turnings, *above*, won top awards at Anchorage's "Fur Rondy" show. A fluted paper-birch-burl bowl is at left; the center vessel is ironwood; the tall bowl at right is koa.

handles all kinds of custom woodworking jobs, he earns his best money building kitchen cabinets. He takes on a good number of furniture commissions each year, like the koa coffee table in the bottom photo on the facing page. McGill says that in Alaska, custom woodwork can compete against high-end commercial work because of the added costs of freighting commercial goods to the state (more on this later). Most of McGill's work comes to him by referrals, and he likes to sell to locals rather than seeing them buy furniture from the lower 48 because "it keeps the money in the local economy."

While being a woodworker in an Alaskan city isn't exactly the road to riches, making a living doing woodworking in one of Alaska's vast and isolated wilderness areas takes even more resourcefulness. Englishwoman Frances Braun immigrated to the wilds of central Alaska in 1975 and lives in Delta Junction, 100 miles from Fairbanks. Braun, an energetic woman with an infectious wit, must do a variety of woodworking jobs to pay the bills, and she often has to travel for her jobs. She's done custom boat interiors for clients in Seattle and says that this is "one of the few types of woodworking where people are willing to pay for high-quality work." Braun displays work at craft shows and in a couple of small galleries, but most of her furniture commissions come from previous customers. And when it comes to getting paid for work, barter is still an Alaskan tradition: Braun built a full-length mirror that won first place in a 1988 craft show. Later, she got a call from a guy who wanted the mirror, but was hoping to trade for it. She thought to herself, "Trade what, an old pickup truck?" It turned out that the guy wanted to exchange gold nuggets for the mirror; the deal panned out.

Woodworking in the far North—Running a shop in Alaska has a few hitches that most woodworkers in more temperate climates don't have to worry about. First of all, due to the cold winter weather, a woodworker can't just rent any old shack and call it a shop. An Alaskan shop is expensive to build, both because it needs to be insulated extensively and because the roof has to be designed to carry a substantial snow load without caving in. When I visited woodturner Eugene Doren in Wasilla (see the photos above of his shop and work), he was a little worried about the 3 ft. of snow that had accumulated on his roof, with the heaviest snowfall month, March, still to come. To keep fuel bills from going through the roof, shops need to be heavily insulated—at least to R30 or even R50—and this adds to the cost of construction. Once you have a workspace, you have to heat it for many months each year, which drives up the cost of shop overhead tremendously. Also, devices like dust collectors and compressors can't be located in unheated sheds or closets, as they'll freeze up in winter.

The long Alaskan winters that often inflict residents with a case of cabin fever also bring other problems for woodworkers. The steep drop in temperature causes an accompanying loss of indoor humidity that can have a substantial effect on wooden items and can result in warped or split tops and doors; shrunken, loose joints; and distorted turned forms. To prevent problems from extreme humidity changes, it's crucial that all woodwork is designed to allow for expansion and contraction. Last winter, Fairbanks woodworker John Manthei (see the photos on the following page) repaired several oak tables that had been brought up from the lower 48. Because of the extreme drop in humidity (Manthei's shop is between 0% and 4% in February), some of the tabletops shrank a full 1 in. in width. Extreme dryness in the winter causes most shop owners, as well as home owners, to run a humidifier all season. Cooler temperatures also affect glues and finishes, and can keep glue from drying properly and wreak havoc with glued up panels and laminated items. Exposure to cold can cause many film-type finishes, like lacquer, to crack, and freezing ruins many glues and finishing materials. Severe winter weather can also hamper woodworking in a different way: it can make obtaining supplies or delivering cabinets hazardous or impossible.

Quest for supplies and materials—Unlike woodworkers in most parts of the country who can just walk around the corner or drive into town for their supplies, most Alaskan woodworkers must buy

their lumber, tools and other goods from dealers in the lower 48, typically in Seattle. This is what Juneau contractor and cabinetmaker Craig Youngquist calls "going to civilization" to fill your needs. "It's the shipping that kills you," says Youngquist. Shipping charges on specialty items, like hinges and pulls, might add 25% to 50% or more to the cost of the item. This can make woodworking an expensive hobby, or make a professional's wares prohibitively expensive. Cooperative buying eases the financial sting somewhat, but this requires time and the coordination of a number of people. The Alaska Creative Woodworkers Association (ACWA), based in Anchorage, has arranged several collective purchases of tools and lumber. But as Youngquist points out, "Group purchases are hard to deal with when you need something right away." One way he overcomes supply problems is to order a little extra of everything, just so he has things on hand next time the need arises.

Buying machinery can also be a problem in Alaska. There is a very limited supply of affordable used machines in the state and the cost of shipping new or used machines up from the lower 48 can be painfully expensive. Even tool companies that usually offer free shipping generally charge extra for transporting products to Alaska. Further, utilities, such as 3-phase power, and support services that most city dwellers take for granted, like blade-sharpening shops, are scarce.

It's a common misconception that lumber, a woodworker's bread and butter, is plentiful in Alaska because most of the Southeastern part of the state is extremely timber rich. The truth is, woodworkers in other parts of the state have a dearth of local hardwoods to work with. Paper birch is one of the more prevalent species and, as its name implies, the wood is mostly used as pulp for paper products. The scrawny trees that are sawn into lumber yield mostly narrow boards and some burls for turned work.

Most of the hardwood lumber that fills makers' racks comes to Alaska by barge, and this adds shipping time, as well as cost to every item made. Shipping from Seattle to Juneau can take two weeks or longer, plus barges have minimum charges that make it difficult for hobbyists and other small-quantity buyers to get what they want. Hardwood lumber is available at lumberyards in some Alaskan cities, but you won't find any bargains. One alternative is to bring a little lumber home with you when you travel. The Hawaiian Islands are a popular vacation spot for Alaskans, and some, like Eugene Doren, own land there. Doren harvests his own koa turning blanks from his 20-acre parcel near Hilo, on the big island of Hawaii. He's even brought koa blanks home in his airline luggage.

Some say that the best alternative to the high cost of shipping wood is to stick to the local species. John Manthei is a strong advocate of building with local woods, especially paper birch, and he often steers his clients toward this wood in lieu of imported lumber. In fact, Manthei's portfolio had pictures of furniture made out of red oak in a section labeled "exotics." When I asked him about it, he told me that "anything from outside [what he called] the 'Nation of Alaska' *is* an exotic." Eugene Doren also enjoys the beauty of Alaskan paper-birch burl. He says that the wood's color and grain make it desirable enough that it doesn't have to take a back seat to any other wood.

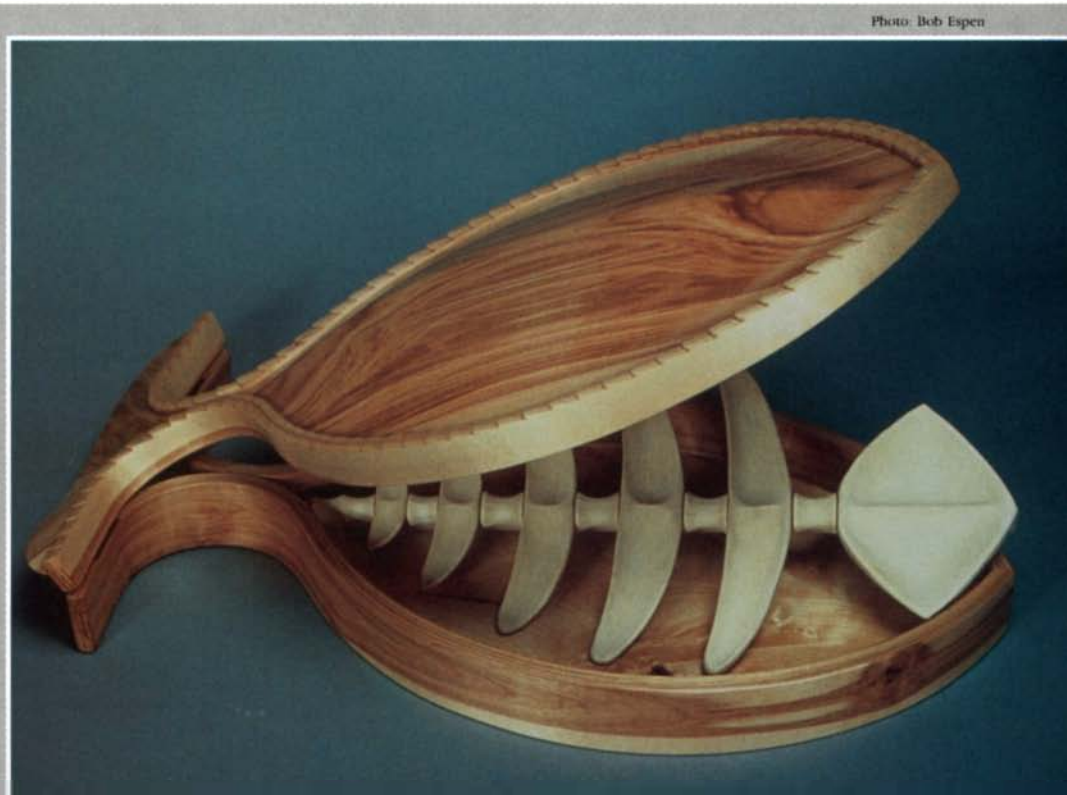
Two shows in Anchorage—One of the highlights of my trip was attending two woodworking shows in Anchorage. "Creative Woodworking North of 60°" was held in the Anchorage Museum of History and Art (AMHA), which co-sponsored the show. This exhibit featured a wide range of regional woodworking, including furniture, cabinets, turnings, musical instruments, lamps, clocks, boxes, and other wooden accessories—a total of 68 pieces by 31 amateur and professional woodworkers. John McGee, the exhibit coordinator and past president of the ACWA, was instrumental in organizing this well-balanced, high-quality exhibit.

Viewing this eclectic collection was a real treat, and each piece revealed as much individuality in its maker's choice of styles, materials and construction as I had come to expect from Alaskan woodworkers. In terms of style, "Creative Woodworking..." was a veritable potpourri: On the traditional end, Tom Gamble of Anchorage made two lovely Queen Anne tables, a coffee table (see the left photo on the facing page) and an end table, all out of black walnut. The coffee table incorporates crisply carved shells on the knees: a nice bit of detail. Approaching the other end of the stylistic spectrum, Lowell Zercher had a group of pieces on display, including his "Floating Jewel" table and "Gramod Clock," shown in the center and right photos on p. 54. Zercher's use of stark forms and alternative materials, such as three rubber O-rings for detail at the top of each table leg, showed influences of his student days at the Wendell Castle School in

John Manthei

Below: **When John Manthei (at right) moved from Wisconsin in 1969 and "just headed north," he probably didn't know he'd someday run a professional woodshop near Fairbanks. With partner Kent Pyne (left), the shop produces all types of woodwork, such as the Alaskan paper-birch chair they're assembling. Manthei's paper-birch "Fish Box,"** ***at right,*** **is a jewelry box; the "skeleton" inside provides a tray for rings and other small items.**

Photo: Bob Espen



"Creative Woodworking North of 60°" featured work of 31 woodworkers, including left to right: Arnold Geiger's laminated birch chair; a carved cherry and basswood mirror frame by Sandy Stolle entitled "Cheer Up Mirror"; Tom Gamble's black walnut Queen Anne coffee table; Frances Braun's "Tulip" koa floor lamp with a spalted paper-birch shade (her other lamp, "Poppy," is reflected in Stolle's mirror); and John Manthei's paper-birch desk chair.

Other pieces in the "Creative Woodworking..." exhibit included, in the foreground above, Bob Espen's koa "Child's Table with Chairs"; in the background (left to right): "Storage Cabinet on Stand," made mostly of red oak by Craig Youngquist; Tom Light's "Birch Corner Cabinet" with a glass door and shelves and a tamboured center compartment; and the cherry "Spinnosaurus Rex" spinning wheel by Dave Jung.

Scottsville, N.Y. Beth Antonsen (another Castle student) from Ketchikan displayed three tables that exploited novel forms and bright colors with an even bolder stroke. Antonsen's "Burgundy Top End Table," made from douka, apple plywood, curly maple and ebony, has four narrow, inverted pyramid legs that intersect a square black top with faint red markings that add a curious, cryptic quality to the table.

Woodturning featured at "Creative Woodworking..." included an entire collection of miniature turned bowls and vessels, all on a nicely turned stand, by Del Ivie, of Chevak; a very elegant ebony vessel by Jeff Trotter; and a crisply detailed cocobolo vase and cup by Anchorage turner Steve Gingrich. Bob Espen, whose Nakashima-inspired koa children's table and chairs can be seen in the foreground of the above photo at right, had a couple of truly novel turnings, including a baseless, spherical bowl he calls the "Politician." He explained that because the bowl has no base, "it has no firm position on anything." And as if the turnings in this show weren't enough, the AMHA held the traveling version of the International Turned Objects Show (reviewed by Michael Podmaniczky in *FWW* #74) in the adjacent exhibit hall.

A lot of the work in the exhibit reflected a good sense of humor, perhaps a quality Alaskans need to mentally survive the long winters. Jim Crum, current president of the ACWA, displayed a piece that looks as if it's right out of a Dalí painting: "Black Saguaro," a birch hat stand carved into a cactus-like form and ebonized. Most of Frances Braun's work incorporates playful elements. "I don't feel that furniture should be a Persian rug that you have to behave yourself around. Furniture should make you laugh," she says. The small koa and walnut table she displayed, called "Tongue in Beak," has rosewood drawer pulls carved into little birds. She said the bird pulls were added to "make a refined piece more accessible and human." Braun also showed two inventively designed lamps that incorporate lathe-turned translucent shades (see the above photo at left). Among whimsical woodworking, few pieces could top Dave Jung's animated spinning wheel, "Spinnosaurus Rex," shown in the above photo at right. Jung, a self-described woodworking putterer and a civil-engineering teacher at the University of Alaska, based the wheel on the traditional hand spinner's "Great Wheel" design, but created its novel frame on the computer using CAD (computer-aided design) software. While experimenting with different shapes, he designed a shroud to hide the clunky looking gearbox mechanism that's driven by the big wheel. The shroud ended up looking like the head of an animal, with the spindle as the eye; the form quickly evolved into a dinosaur-like creature.

One of my favorite pieces in the show was John Manthei's "Fish Box," shown in the photo at right on the facing page, made from his wood of choice, paper birch. The box's piscine shape makes sense because the piece was commissioned by a biologist and part-time halibut fisherman. For the box's shield-shaped lid, Manthei took a lathe-turned vessel, cut it apart, and book-matched the halves back together. This technique grew out of his fondness for exploring new woodworking forms, which he developed while attending the Wendell Castle School as an advanced-studies student in 1985. The sides of the box are bent-laminated, with carving added along the rim of the sides to add detail, obscure the laminations and make the sides look like solid wood.

The other woodworking show I saw ran concurrently with "Creative Woodworking..." and was part of Anchorage's "Fur Rendezvous" festival. This annual event refers back to the days when fur trappers would come into town to sell their pelts, and events at "Fur Rondy," as the locals call it, include dog-sled races through downtown Anchorage, an outdoor ice-carving contest, Arts-and-Crafts demonstrations, and displays of work by area artisans. Just strolling around during the festivities offered an eyeful; dozens of Eskimo women wore their elaborately crafted fur parkas, many with extensive embroidery and silver or carved walrus ivory decorations. The woodworking on display at "Fur Rondy" was reminiscent of a country fair, with many pieces by woodworkers who are strictly hobbyists. Members of the Anchorage Woodcarvers showed a gang of carved figurines, whittled objects and duck decoys, and a 105-ft. carved basswood chain surrounded the display. At the ACWA display, Doren's turnings took several top prizes, including Best of Show; three of his best pieces are shown in the photo at right on p. 55. □

Sandor Nagyszalanczy is associate editor of FWW.

Not so long ago, sabersaws were carpentry tools used mainly for cutting circular holes in plywood or for notching 2x4s. But advancements in design and engineering over the past 10 years have raised the tools' status until most craftsmen now consider them indispensable. The 11 saws in the photos above and at right are all top-of-the-line professional models, most of which feature electronic variable-speed controls, orbital blade action and enough cutting power to cruise through 2-in.-thick maple.

What's New with Sabersaws?

Orbital action and variable speed rev up familiar tool

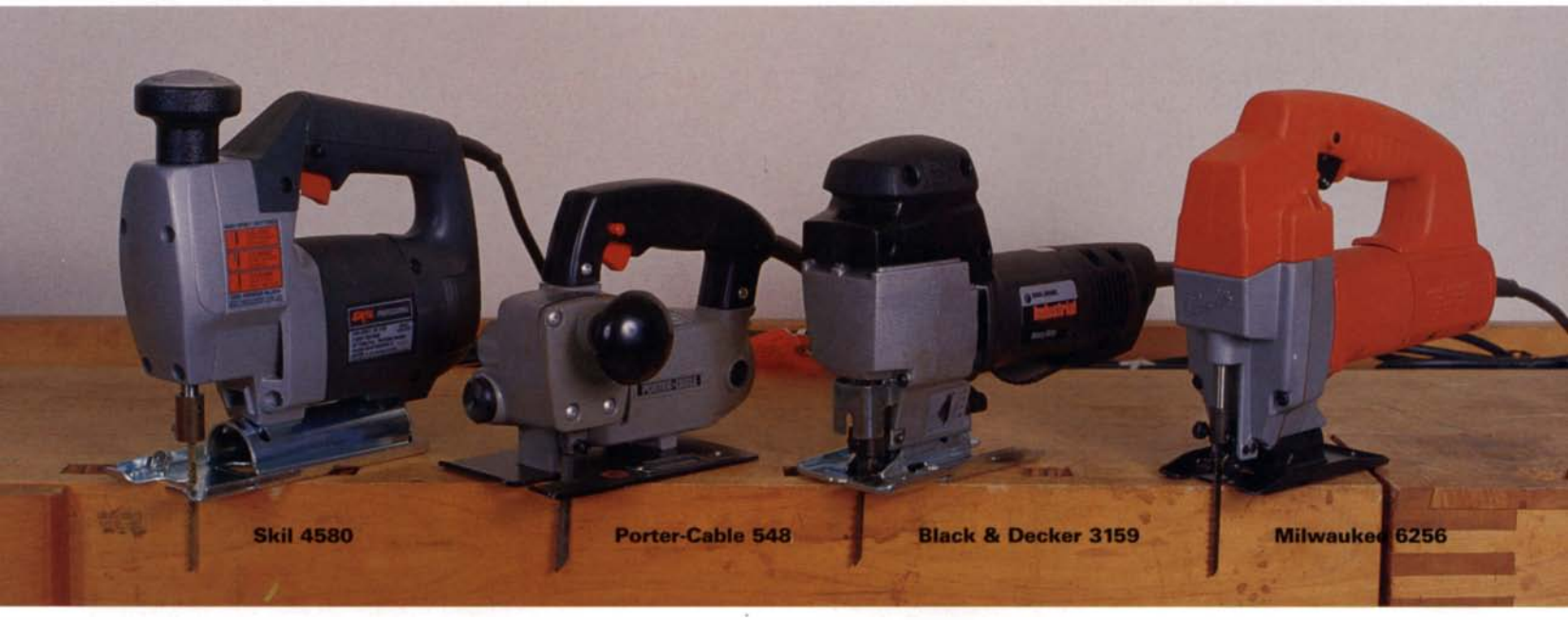
by Hugh Foster

Sabersaws have come a long way since the days when they were used only for making pocket cuts in assembled pieces. Back then a sabersaw blade moved straight up and down, probably at about 3,000 strokes per minute, and cuts were often rough. The addition of variable-speed switches and new blade types improved the quality of cut and enabled the tool to be used more effectively on metal, plastic, plywood and other man-made materials, as well as on solid wood. Then, about 15 years ago, Bosch Corp. designed a sabersaw that could cut through 2-in.-thick hardwood with ease; this ushered in a new era for the humble tool. No longer did the sabersaw stay buried in the bottom of the tool box under the portable circular saw or collect dust beneath the workbench in deference to the bandsaw—it now had the potential to carve out its own niche, both on the job site and in the shop.

I know woodworkers who would rather take a few seconds longer to make a cut with a sabersaw than to get out an awkward and noisy portable circular saw for work that is too bulky or heavy to cut on a tablesaw or bandsaw. Carpenters and cabinetmakers have both found new uses for sabersaws now that they can make plunge cuts without the aid of a predrilled hole (see the bottom photo on the facing page), and can maintain a reliably square edge for the entire length of an 8-ft. cut. At one time Bosch was the lone leader in sabersaw design. Recently, a bevy of other tool manufacturers has followed Bosch's lead. The chart on pp. 62-63 lists more than 30 models from 11 manufacturers besides Bosch, and many of them should be considered in the same class. But, as a reminder of its seminal role in sabersaw design, the Bosch is still the saw that other manufacturers invariably refer to when they say, "Ours is as good as...".

To help readers who are in the market for a new sabersaw, I'll discuss some of the features that have contributed to the continued evolution of this tool, and then I'll make a few observations about specific tools based on about a month of trial cutting, which included pushing the saws through 2-in.-thick maple and around tight circles in plywood and particleboard. By the time you get to the chart you'll probably realize that if your sabersaw is more than about a dozen years old, it's time to upgrade. Chances are that 90% of the saws listed will cut better and make better use of time, effort and blades than the one you're now using.

Lower blade guide—One of the first things I noticed about the new saws was that almost all of them have a lower roller guide to support the blade and minimize side-to-side movement. With my 15-year-old saw I went through blades continually; part of the problem may have been that I never paid more than a quarter for a blade, but I'm more inclined to blame the breakage on the lack of a lower blade guide. This extra support is particularly advantageous when making plunge cuts, as shown in the bottom photo on the facing page, an operation described in most of the owner's manuals. Typically, the lower guides are simply a grooved, hardened steel roller, as shown on the



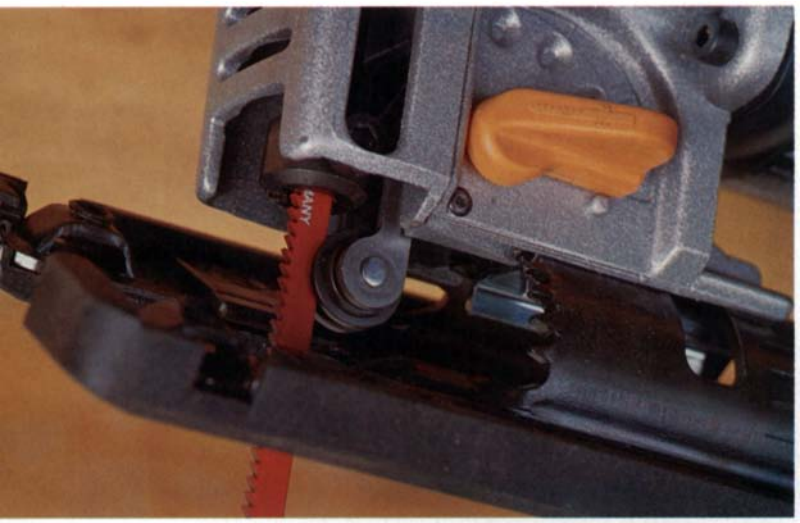
AEG model in the top photo on the next page, but Porter-Cable's top-line saws have three ball bearings, one on each side of the blade and one behind it, a setup similar to blade guides on a fine bandsaw.

Orbital blade action—Another important advancement in sabersaw technology is orbital blade action. In the AEG owner's manual, this feature is referred to as pendulum action, which is probably more accurate terminology for what actually takes place. In the orbital or pendulum mode, the blade moves forward into the work on the up stroke (the cutting stroke) and then moves backward on the down stroke. On most of the tools, the lower blade guide instigates this orbital motion by pushing the blade forward and then letting it move back into its normal position. This helps keep the blade cool because it is not in constant contact with the work and allows the chips and dust to fall away from the kerf. It also increases cutting speed, causing the saw to practically feed itself into the cut. While the orbits are small, ranging from 5/64 in. to just larger than 7/64 in., most orbital sabersaws have a lever that allows four different settings designed for optimum cutting in various materials; these vary from no orbital action, which is best for cutting thick metal, tile or for an extremely clean cut in hardwoods; to the largest orbit, which is best for very fast, aggressive straight cuts or scroll cuts in all kinds of woods, thin metal and plasterboard. Recommendations for when to use the various orbital settings are included in all the owner's manuals. After you've

Plunge cuts are possible thanks in part to the additional support that the lower roller guide gives the blade. You begin a plunge cut by holding the saw vertically with the toe of the baseplate on the work. Then, with a firm two-hand grip, slowly lower the tool until the blade cuts into the work and continue to pivot downward until the baseplate is flat on the work.

tried a sabersaw with orbital cutting capability, I think you'll understand why I wouldn't buy one without it.

Variable speed, and top handle vs. barrel grip—Adjusting the blade strokes per minute gives you more control for cutting fragile materials or making precise cuts. So it's understandable that variable speed was one of the first improvements made to the old standard sabersaws. Then, several years ago, electronic speed control was added so that maximum cutting torque could be maintained at less than full motor RPM even when the load on the tool was increased, a move which otherwise would have reduced blade speed. Now, the smartest electronic tools provide maximum power under most load conditions and at any speed you select. Nearly all of the saws on the market today have variable speed and most offer optional electronic motor control, but the way these controls are positioned on the saw can affect performance. The placement of controls is complicated by the fact that there are two basic shapes of sabersaws: top handle and barrel grip. Many of the top-quality saws are available in both styles.



Most of the lower blade roller guides are similar to the one on the AEG saw shown here. The guide not only supports the blade from behind, but it is also grooved to provide side support to resist twisting and deflection. The tilting mechanism on the baseplate of this AEG has notches that engage with wedges cast into the saw's body to provide positive stops for setting the angle of the base at 15° intervals. The Freud saw uses a similar system of notches.

Although most manufacturers sell blades under their own name, there are really only five different types of blades. The universal blade, second from left, has been popular for years. It fits all the saws except the Porter-Cables and can be found in most hardware stores. The Bosch "bayonet tab" blade, far left, and the Porter-Cable "bayonet hook," far right, were designed to reduce breakage by eliminating the mounting hole that weakens the shank of the universal blade. The Ryobi blade, although only slightly wider than a universal blade, fits only the Japanese saws. The long blade in the center only fits AEG saws.

By and large, the top-handle models have most of the controls up top where they can be operated with one hand, while the barrel models have the on/off switch on the top or side of the grip and the variable-speed controls on dials at the rear of the saw. On the top-handle models, the variable-speed control is presented in a variety of ways. In some cases, the variable speed is built into the trigger so you can adjust the speed to varying working conditions as you go along. And on a few you can lock in the chosen speed. A few of the top-handle saws, such as the Freud and the Ryobi shown in the photos on the previous two pages, have the optimum combination of features: a conventional locking on/off trigger switch and a conveniently located thumb wheel that lets you dial in the speed.

The type of handle is a matter of personal preference, but I prefer the top-handle models. The average barrel grip has a circumference of about 9 in., while the average top-handle grip is somewhere near 6 in. If your hands are average size or smaller, the barrel saw might be too large to grip comfortably. For all but the roughest two-handed work, you'll almost certainly feel more in control with the top-handle model. Additionally, the on/off switch on many of the barrel-grip models is on the left side, conveniently located for a right-hand thumb; but a left-handed operator like me may have some problems with it.

Auto-scrolling—Auto-scrolling, which permits the user to rotate the blade through 360° without moving the body of the saw, was a big deal on the new sabersaw I bought 15 years ago. Now that feature is found on only a few "consumer" models by Black & Decker, Skil and Sears, and I think that indicates how woodworkers feel about it. I always felt the feature was just another way in which the saw could become inaccurate, although this may not be a problem in the newer models. Nevertheless, 15 years' experience has convinced me that auto-scrolling is only useful for a few specific applications.

Baseplates—On all the saws except the Porter-Cables, the bases can be tilted for bevel cutting. Porter-Cable apparently believes that most users don't cut angles with sabersaws and that an angle-setting option only leads to misalignment of 90° cutting. This may be the case for residential contractors or cabinet installers who toss their saw into the pickup truck toolbox and use it on the job for specific and well-defined operations. You'll have to decide for yourself how valuable the tilt base would be for your work. But since most of the angle-adjustable baseplates have a slot that allows positive setting to 90°, as well as other commonly used angles such as 30° and 45°, I find the angle-cutting option worth having. Two of the saws, the top-line AEG and the Freud have teeth cut into the tilting mechanism to lock the base at 15°, 30° and 45° left and right (see the top photo at left).

Cordless sabersaws—Four cordless saws are listed in the chart and shown on the facing page. On a single charge, these saws only average about 30 ft. of cutting through ¾-in.-thick plywood. However, anybody who uses cordless tools much knows the wisdom of having at least two batteries so one can be charging while the other is in use. In all four cases the batteries are interchangeable with other cordless tools from the same company, and three of the companies

There are only four cordless sabersaws on the market. They won't cut for very long on a single charge, but the freedom and convenience they provide make them a good buy for cabinet installers and other on-site craftsmen.

let you buy the cordless saw without the charger. If your sabersaw work regularly takes you up on a roof or into an attic or crawl space, the convenience of a cordless tool may justify its expense.

Accessories—Most of the saws come with a guide fence that attaches to the base for ripping along a straight edge. Many of these fences can also be used as a trammel for circle cutting. Several of the top-line saws have anti-chip inserts that snap into the base and fit closely around a fine-tooth blade for cutting on brittle material. Bosch and AEG have optional dust attachments that can be hooked to a vacuum hose for dust-free cutting (these attachments can be seen extending from the tools' bases in the photo on p. 59). And Bosch and Metabo offer a lubricator attachment that feeds oil or water to the sawblade when cutting metal or plastic. A few companies sell small tables for mounting the saw upside down with the blade extending through the tabletop for use as a stationary jigsaw.

Now that I've discussed the main features you should evaluate when buying a sabersaw, I'd like to offer a few observations about my experiences with some of the saws in the chart.

AEG sabersaws are among the quietest and most accurate I tried. When cutting 2-in.-thick maple with the 4.8 amp FSPE100 and BSPE100, the tools vibrated slightly but controllably, and both of these extremely light and powerful saws cut the material quickly and squarely. Chip ejection, especially in orbital mode, is superb and both of the SPE100 models can be fitted for dust collection. All AEG (3 Shaw's Cove, New London, Conn. 06320) saws accommodate an optional, (replaceable) plastic anti-chip insert. The AEG cordless is the most powerful of all the cordless models I tried.

Black & Decker's professional/industrial models are among the few made in the United States (Black & Decker, 10 N. Park Drive, Hunt Valley, Md. 21030). They feature rubber cord sets and offer square, vibration-free cutting even at the highest speeds. They went through my 2-in. maple test like a hot knife through butter. Black & Decker's British-made "consumer" model didn't fare nearly as well, but since it lists at less than half the price of the professional model, this was no surprise. The barrel-grip model #3159, which has a paddle switch (see the center photo on p. 59) has only two speeds, adjustable by a lever on the tool's side. Black & Decker's baseplate is reversible; one end has a wide blade opening for angle and general cutting and the other end has a narrow slot for anti-chip cutting with fine-tooth blades.

Bosch saws look much as they did a decade ago when the company first redefined what to expect from a sabersaw; but the current models offer several new features. The 1581VS (top handle) and 1582VS (barrel grip) have a chip-blowing device and both can be equipped with a connection for dust extraction and with a blade lubricator. In addition, Bosch (100 Bosch Blvd., New Bern, N.C. 28562-4097) has introduced an innovative toolless blade-changing method. Because of its design, this feature is found only on the barrel-grip model; you simply depress the center portion of the front knob and rotate the handle three turns until it "clicks," letting you know the blade is either secured or released. With my small hands, I appreciated the thin barrel on the 1582VS—it gave me good control when cutting.

Freud (218 Feld Ave., High Point, N.C. 27264) offers a sabersaw that comes with either a top handle or barrel grip. Although it is one of the most powerful saws I tried, it is also one of the quietest. The thumb-dial variable-speed control on the top-handle model makes speed changes very convenient. Both models have a notched baseplate (similar to the one on the AEG model in the top photo on the facing page) for positive locking during bevel cuts.

Hitachi (4487-E Park Drive, Norcross, Ga. 30093) has two sabersaws and both are top-line professional models. The barrel-grip model, the longest saw on the market at 11 3/16 in., is great for cutting on the pull stroke. I found the top-mounted switch to be more friendly to left-handed users than any of the other saws. These saws are certainly as powerful, as quiet and as desirable to own as any I tried.

Makita (14930-C Northam St., La Mirada, Cal. 90638) makes a full range of sabersaws, including a 9.6v cordless saw that cuts soft material like a tiger, but still seems slightly underpowered compared to the 12v AEG cordless. A safety switch permits blade changes without having to remove the battery, but for some reason, on this model only, the blade mounting screw and bracket must be completely removed to install a new blade.

The 4301BV and the 4302C are the most powerful of the Makita saws; in fact, at 6 amps, the 4302C is the most powerful sabersaw I tried. Both saws cut squarely in 2-in.-thick maple even when outfitted with a blade that wouldn't go all the way through the material. The variable-speed dial is at the rear of the 4302C and once set can be locked into the trigger switch.

Metabo makes a 9.6v cordless sabersaw that is the only cordless that features four-position orbital cutting, and I felt this was the best bal-

anced of all the cordless saws I tried. However, like all those saws under 12v, it was slowed by my test cut in 2-in.-thick maple. Holding any of the Metabo sabersaws reminds me a great deal of holding a new Lamello biscuit joiner (the motor of which is made by Metabo): the feel and fit are superb. The Metabo (Box 2287, West Chester, Pa. 19380) saws are pleasantly quiet to use and their inserts for chip-free cutting appear to be the best of those I tried.

Milwaukee (13135 W. Lisbon Road, Brookfield, Wisc. 53005) makes two saws that are both comfortable to run and sufficiently powerful to cut 2-in.-thick maple. The barrel-grip model, #6246, has a paddle switch and no variable speed. The top-handle model, #6256, has variable speeds that are adjustable with a dial on the trigger. Generally I found that the Milwaukee saws offer no-frills, long-term quality.

Porter-Cable offers a variety of sabersaws including the only worm-drive sabersaw on the market, model #548 (see the center photo on p. 59). This small but heavy-duty saw has been around, virtually unchanged, for a long time. Like all the Porter-Cable saws, the baseplate is not adjustable for bevel cuts. The #548 is the quietest saw I tried and has the largest variable-speed range, from 0 to 4,500. Both the #548 and the less expensive #7348 operate exclusively at a single orbital setting.

The #7548 and #7648 are Porter-Cable's electronic variable-speed saws. They both sport the three-bearing, bandsaw-type blade guide and accommodate anti-chip inserts. Porter-Cable (Box 2468, Jackson, Tenn. 38302-2468) is making some changes to its 7000-series sabersaws, but the updated models were not yet available when this article went to print. Unlike all the current Porter-Cable saws, they will accommodate universal and Bosch-style blades, as well as the proprietary Porter-Cable bayonet-hook shank blades (see the bottom photo on p. 60). In addition, the lower blade guides will consist of two side-guide blocks attached to the top of the baseplate, and a back roller bearing similar to the standard lower blade guide found on most sabersaws.

Ryobi's 9.6v cordless is the most comfortable of the cordless tools to operate and it cut through 2-in.-thick maple better than I expected. Ryobi (1424 Pearman Dairy Road, Anderson, S.C. 29621) has two full-power tools: both are top-handle, variable-speed models, and one has orbital action. The orbital JSE60 has electronic constant torque control and it cut easily through the 2-in.-thick maple, exhibiting only moderate (and *absolutely* controllable) vibration. Like Black & Decker, Ryobi uses a reversible base with a narrow slot at one end for chip-free cuts.

"Sears Best" Craftsman sabersaw sells for $78.89 and is geared to the home owner rather than the professional. It has variable speed and auto-scrolling. Sears (Woodworking Division, Portable Electric Tools, Sears Tower, Chicago, Ill. 60684) also carries two other sabersaws that sell for $25 and $43.

Skil (4300 W. Peterson Ave., Chicago, Ill. 60646) has a home owner model that has variable speed and orbital action and sells for $68.50, but in addition it has two saws that are classified as professional models. The #4560 has variable speed and auto-scrolling but no orbital action. The #4580 spreads the usual four-position orbital action over six settings. Although the Skil sabersaws lack blade roller guides, their absence doesn't appear to be a problem on any of the Skil models I tested. □

Hugh Foster is an English teacher, writer and woodworker in Manitowoc, Wisc.

Sabersaws

Company	Model	List Price*	Strokes per Minute
AEG (Germany)	ASP100+ (cordless)	$350.00 (battery and charger included)	2,000
	STSE380	$147.00	450-3,200
	STPE500	$169.00	450-3,200
	FSPE100+	$234.00	300-3,200
	BSPE100	$259.00	450-3,200
Black & Decker (United States)	7588	$85.95	800-3,200
	3157	$211.00	0-3,100
	3158K	$216.00	0-3,100
	3159+	$211.00	2,100/3,100
Bosch (Germany)	3230VS	$145.00	0-3,000
	3238VS	$169.00	0-3,000
	1581VS	$245.00	500-3,100
	1582VS+	$245.00	500-3,100
Freud (Spain)	CA60PE/M+	$230.90	500-3,000
	CA60PE	$227.90	500-3,000
Hitachi (Japan)	CJ65V	$239.00	700-3,200
	CJ65VA+	$268.00	700-3,200
Makita (Japan)	4300DW+ (cordless)	$232.00 (battery and charger included)	2,700
	4320	$133.00	0-3,200
	JV2000	$260.00	0-3,400
	4301BV	$247.00	0-3,100
	4302C+	$267.00	1,000-3,000
Metabo (Germany)	EP140+ (cordless)	$299.00 (battery and charger included)	700-2,500
	E452	$167.00	500-3,000
	EP455	$195.00	500-3,000
	EP564	$275.00	500-3,000
	EP565+	$275.00	500-3,000
Milwaukee (United States)	6246	$219.00	3,100
	6256+	$229.00	0-3,100
Porter-Cable† (United States)	548+	$290.00	0-4,500
	7348	$190.00	0-3,200
	7548	$240.00	500-3,200
	7648	$240.00	500-3,200
Ryobi (Japan)	BOJ-15+ (cordless)	$182.00 (battery and charger included)	2,700
	J60V	$205.00	0-2,700
	JSE60+	$240.00	1,000-2,700
Sears (United States)	17211	$78.89	0-3,000
Skil (United States)	4395	$68.50	0-3,200
	4560	$108.00	0-3,200
	4580+	$128.00	0-3,200

* = Dealer selling prices are typically 25% to 45% lower.
\+ = Photo of model in article.

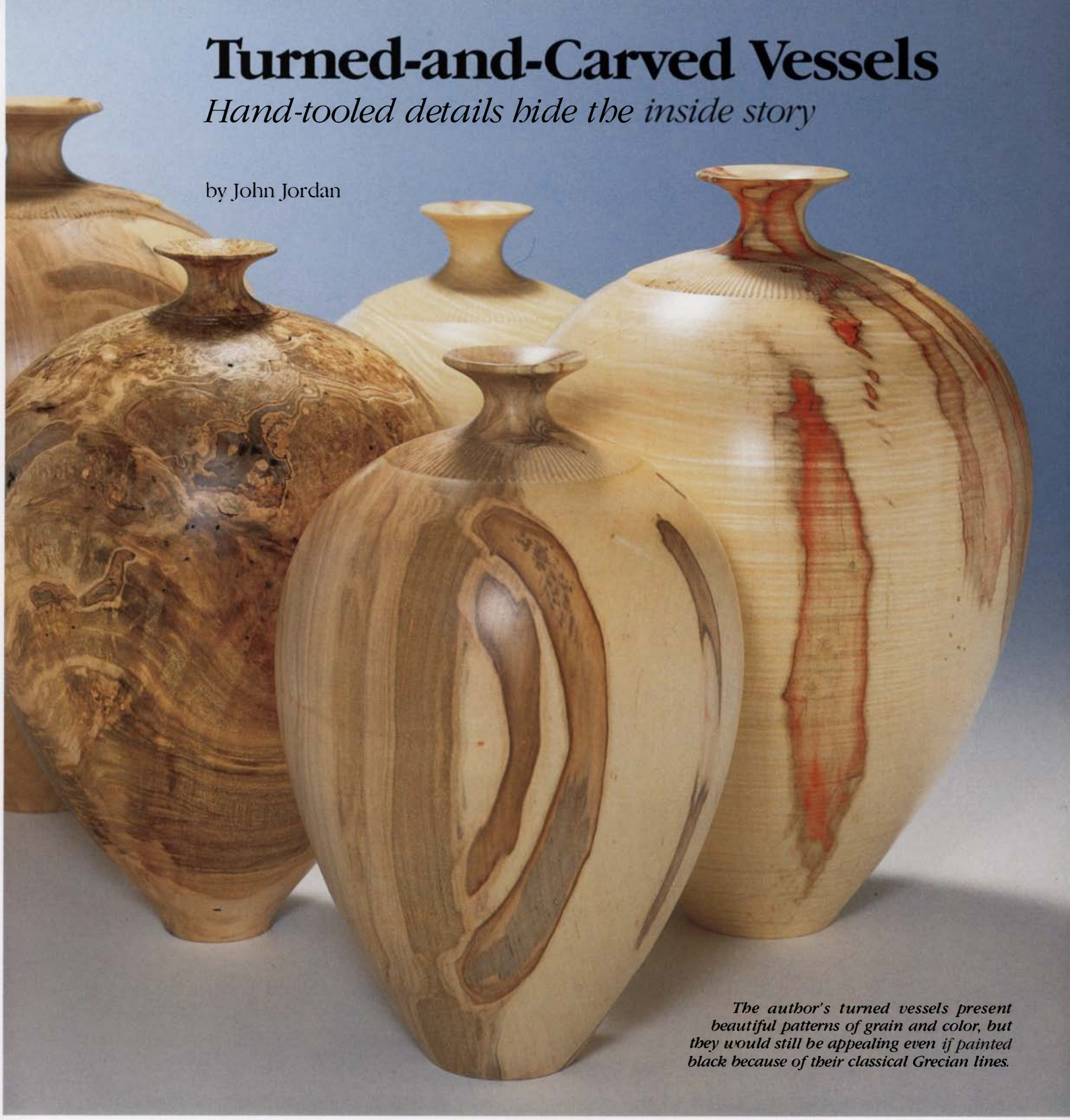
	Length of Stroke (in.)	Cutting Capacity (in.) Wood	Mild Metals	Steel	Amps (A) or Volts (V)	Weight (lbs.)	Orbital Settings	Noise dBA	Comments
	1	2 3/8	1/2	1/8	12V	3.5 (no battery)	3	81	$199.00 without battery and charger; battery interchangeable with other AEG tools
	3/4	2 1/8	3/8	1/8	3.3A	3.5	0	72-99	Top handle
	3/4	2 1/2	3/8	3/16	4.4A	3.75	3	72-99	Top handle
	1	2 3/8	3/4	1/4	4.8A	4.5	4	60-97	Anti-chip insert; barrel grip
	1	2 3/8	3/4	1/4	4.8A	4.5	4	72-92	Anti-chip insert; top handle; includes case
	11/16	2	NR	NR	3.5A	4	0	78-97	Consumer model; no lower blade guide; auto-scrolling
	1	2 3/8	3/4	1/4	4.5A	6.25	4	84-99	Top handle
	1	2 3/8	3/4	1/4	4.5A	6.25	4	84-99	Model 3157 with case
	1	2 3/8	3/4	1/4	4.5A	6.25	4	84-99	Barrel grip; two speeds only
	3/4	2	1/2	1/8	3.1A	4.5	0	—	—
	3/4	2 3/16	19/32	5/16	3.1A	4.5	3	—	—
	1	2 3/8	3/4	3/8	4.8A	5.5	4	77-99	Top handle; anti-chip insert; DVS dust attachment available for $265.00
	1	2 3/8	3/4	3/8	4.8A	5.75	4	77-99	Barrel grip; anti-chip insert; DVS dust attachment available for $265.00; no-tool click-in blade
	1	2 3/8	3/4	1/4	5A	5.4	3	60-87	Top handle
	1	2 3/8	3/4	1/4	5A	5.4	3	60-87	Barrel grip
	1	2 9/16	NR	1/4	3.7A	5.5	4	69-92	Top handle
	1	2 9/16	NR	1/4	3.7A	5.3	4	69-92	Barrel grip
	9/16	15/16	NR	NR	9.6V	3.3	0	82	$118.00 without battery and charger; battery interchangeable with other Makita tools; no lower blade guide
	11/16	2	NR	1/4	2.9A	2.9	0	—	—
	3/4	2	NR	1/4	3.2A	3.5	4	71-92	Barrel grip; paddle switch
	1	2	NR	1/4	3.5A	6	4	89-101	Top handle; variable-speed dial on trigger
	1	2 3/8	NR	3/8	6A	5.5	4	81-100	Top handle; variable-speed dial on rear of tool
	5/8	1 1/2	1/4	1/8	9.6V	3.75	4	72-83	Barrel grip; $251.00 without charger; battery interchangeable with other Metabo tools
	3/4	2	3/8	1/8	4A	3.75	0	68-92	Top handle
	3/4	2	3/8	1/8	4A	5	4	70-102	Top handle
	1	2 3/8	3/4	1/4	5A	5.25	4	68-92	Barrel grip
	1	2 3/8	3/4	1/4	5A	5	4	68-92	Top handle
	1	NR	NR	NR	3.8A	5.5	0	92	Barrel grip; paddle switch; single speed
	1	NR	NR	NR	3.8A	5.75	0	70-95	Top handle
	7/16	2 3/4	NR	1/4	3.5A	6.5	1	58-84	Always orbital; anti-chip insert; no lower blade guide; worm drive requires lubrication
	1	2 3/4	NR	1/4	4.A	6	1	72-95	Always orbital
	1	2 3/4	NR	1/4	4.8A	6.5	4	70-97	Top handle; anti-chip insert; three guide bearings
	1	2 3/4	NR	1/4	4.8A	6	4	70-97	Barrel grip; three guide bearings
	9/16	15/16	1/16	NR	9.6V	3.5	0	78	No lower blade guide; sold only with battery and charger; battery interchangeable with other Ryobi tools
	1	2 3/8	13/16	1/4	3.5A	4.75	0	64-96	Top handle
	1	2 3/8	13/16	1/4	3.5A	5.5	4	79-96	Top handle
	3/4	NR	NR	NR	2.5A	5.75	0	—	Consumer model; auto-scrolling; no lower blade guide
	5/8	1 1/4	3/8	3/16	3.2A	4	4	75-96	Consumer model; no lower blade guide; top handle
	13/16	1 1/4	3/8	3/16	3.5A	5.5	0	75-94	Professional model; no lower blade guide; top handle
	13/16	1 1/4	3/8	3/16	3.5A	5.5	6	75-94	Professional model; no lower blade guide; top handle

NR = Not Rated
† = All Porter-Cable models use only P-C bayonet-hook shank blade; fixed base on all Porter-Cables allows no angle sawing.

Turned-and-Carved Vessels

Hand-tooled details hide the inside story

by John Jordan



The author's turned vessels present beautiful patterns of grain and color, but they would still be appealing even if painted black because of their classical Grecian lines.

Any experienced woodturner will tell you that the ultimate success or failure of a piece is determined by its form. And while turned objects provide a means to creatively use wood color and patterns, no amount of flashy grain will save a piece that is poorly shaped. Although I adjust my turning blank on the lathe to take advantage of emerging grain patterns, it is the classical form and deceptively simple curves of the vessels shown here that fascinate me.

The first small-neck vessels I made were hollowed through the bottom, and while I was very pleased with the results, rechucking the piece from each end was difficult and time-consuming. In addition, this technique required shaping the inside of the neck, before the outside shape was finished. This was a difficult procedure that yielded inconsistent results because the tool extended as much as 14 in. beyond the tool rest. Later, while carving one of my vessels, I realized that a decorated area would conceal a glueline. This meant I could part off a piece for the neck and hollow out the inside of the vessel. Then after gluing the neck back in place, I could hide the joint with a decorative carving. Best of all, I can do all of these operations with the bottom of the blank screwed to a faceplate.

The procedures for making one of these pieces are pretty simple, but you must be careful, particularly in the later stages. After the inside is hollowed and the neck is being fitted and shaped, a

Left: When shaping the outside, leave a raised shoulder area around the neck for carving and leave extra stock at the base for support when hollowing the inside. The neck stock is parted off for hollowing the inside and then glued back on for shaping.

Above: A hook tool reaches the inside shoulder area of the vessel for hollowing. Take light cuts because it is easy to catch your tool in the endgrain and ruin the vessel.

slip or a catch can destroy many hours of work instantly. Some of the pieces I turn are fairly large, 12 in. to 15 in. tall and 10 in. to 12 in. in diameter; however, I suggest you try a more modest size until you are familiar with the technique.

Turning the outside—I turn these pieces from straight-grained green wood. Unlike most bowl work, the grain is oriented parallel to the lathe axis, making it easy to manipulate the blank so that the grain and color best suit the evolving shape. Because there is less radial shrinkage than tangential shrinkage in wood, the vessels will become slightly oval; but they are still more stable than most bowls, which are turned on a faceplate with the grain perpendicular to the lathe axis. I cut blanks from a log section, avoiding the pith. Each blank should be two to two and one-half times as long as its diameter. This leaves plenty of stock for the neck and for mounting a faceplate to the bottom.

You should avoid blanks with highly figured or twisted grain, crotch grain or grain that does not run parallel with the lathe's axis because the turning will distort badly or become lopsided. Wood with curly or fiddleback grain is fine, and gets what I think is a pleasing texture as it dries. Also, many burl woods work well and can be oriented for maximum yield and best figure. I like to find wood that has a lot of color contrast, as you can see in the vessels shown here.

I mount the blank between centers, turn it to rough shape and flatten the bottom for fastening the faceplate. During the roughing stage, I shift the blank at either the headstock or the tailstock or at both ends at once to take advantage of emerging figure and color, to align the grain with the lathe axis or to avoid defects. Once the blank is roughed out, remove it from the lathe and screw the faceplate to the bottom with 1½-in.- to 2-in.-long drywall or sheet-metal screws. The sharp threads of these screws provide a much better grip in the endgrain than the shallow threads of regular wood screws.

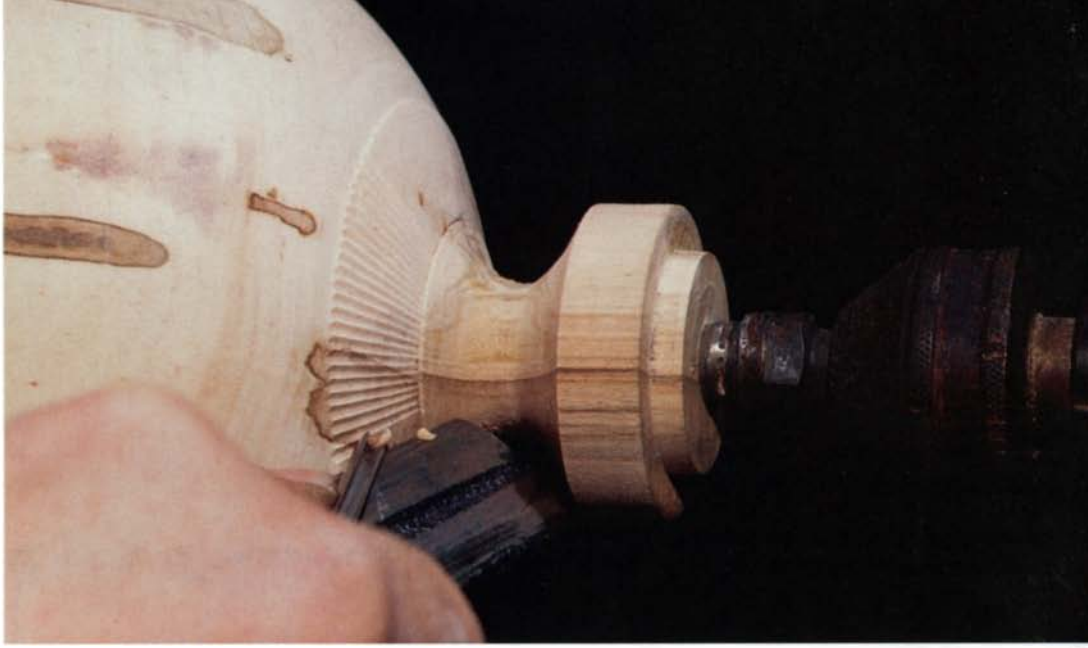
Remount the blank on the lathe and use a revolving center in the tailstock for additional support as you finish turning the smooth and flowing curves of the vessel. I prefer to do this with a ⅜-in.-deep fluted bowl gouge with the edges ground back, cutting from the large to the small diameter. I rough out the vessels with a pulling cut and then make the final light cuts with the gouge's bevel rubbing against the piece. To make small refinements in the shape and for final smoothing, I employ a technique I learned from Del Stubbs, a California woodworker who turns everything from salad bowls to musical instruments. This method involves using a scraper tilted at an angle to make a sheer cut, which produces a smooth surface requiring little sanding. Clean cuts eliminate the heavy sanding needed to remove tool marks or torn grain that can quickly ruin a good curve or soften details.

Leave a raised shoulder area for carving and a cylindrical section for shaping the neck, as shown in the left photo above. This cylinder will be parted off and later reattached after the vessel is hollowed out. The neck cylinder needs to be long enough to allow flexibility in shaping the neck, as well as for a tenon at each end—one for gluing the neck back to the vessel and one for mounting the neck in a spigot chuck so you can turn the inside to match the interior curve of the vessel. Use a small tool when parting off the neck cylinder because the less wood removed in the joint area the better the grain match when you rejoin the cylinder to the vessel. Also, leave extra wood in the foot area for support when hollowing the vessel. This wood will be turned away after the rest of the piece has been completed. Now turn a 1½-in.-dia. by ¼-in.-long tenon on the end of the neck cylinder to remount it in a spigot chuck, and cut the cylinder off with a narrow parting tool. If you don't have a spigot chuck, you can just part off the neck and glue it to a scrap block for faceplate mounting. Put the neck cylinder in a plastic bag to prevent checking while you work on the inside of the vessel.

Hollowing out—I hollow out the vessel by first drilling a hole from the top to just shy of the finished inside depth. The hole serves as a depth guide for roughing out waste, eliminates the need to cut directly into endgrain and removes the slow-turning center, which is difficult to cut. Begin by cleaning up the parted off surface on top of the vessel with a gouge and make a small dimple in the center for starting a drill. To determine the depth, I visualize the foot area that is not yet turned and measure from the top of the vessel, allowing ½ in. to ¾ in. for the rough bottom thickness. I drill the hole with a long ⅜-in.-dia. electrician's drill held in a pair of Vise-Grips and pushed in by hand, using the tool rest for support. A lamp or shell auger would also work. Push the drill in, pulling back often to clear the chips, until you reach the full inside depth.

Rough out the inside of the vessel, making cuts from the center to the outside, but allowing for your wall thickness. To reach into the shoulder area, you will need either a tool with a bit that can be swung or fixed to the left, or a hook-shaped tool. I prefer Dennis Stewart's hook tool (Dennis Stewart Enterprises, 1383 N.E. 25th, Hillsboro, Oreg. 97124), as shown in the above photo at right, although some people find it awkward. For bigger pieces, I have made larger hooks and longer straight tools that fit in the Stewart handle. It is very easy to catch your tool in the endgrain, however, and so you must work slowly and take light cuts. You should keep

Above: After turning the inside of the neck to shape, align the grain and draw reference marks so you can reposition the pieces when gluing them back together. A good fit is essential for an invisible glueline.



Right: The author uses the tool rest to guide the veiner when carving flutes in the shoulder. For straight flutes, cuts must be made on the vessel's centerline, and for spiral flutes, raise or lower the tool rest.

the pieces fairly small until you have some experience at working with the tool extended some distance over the tool rest.

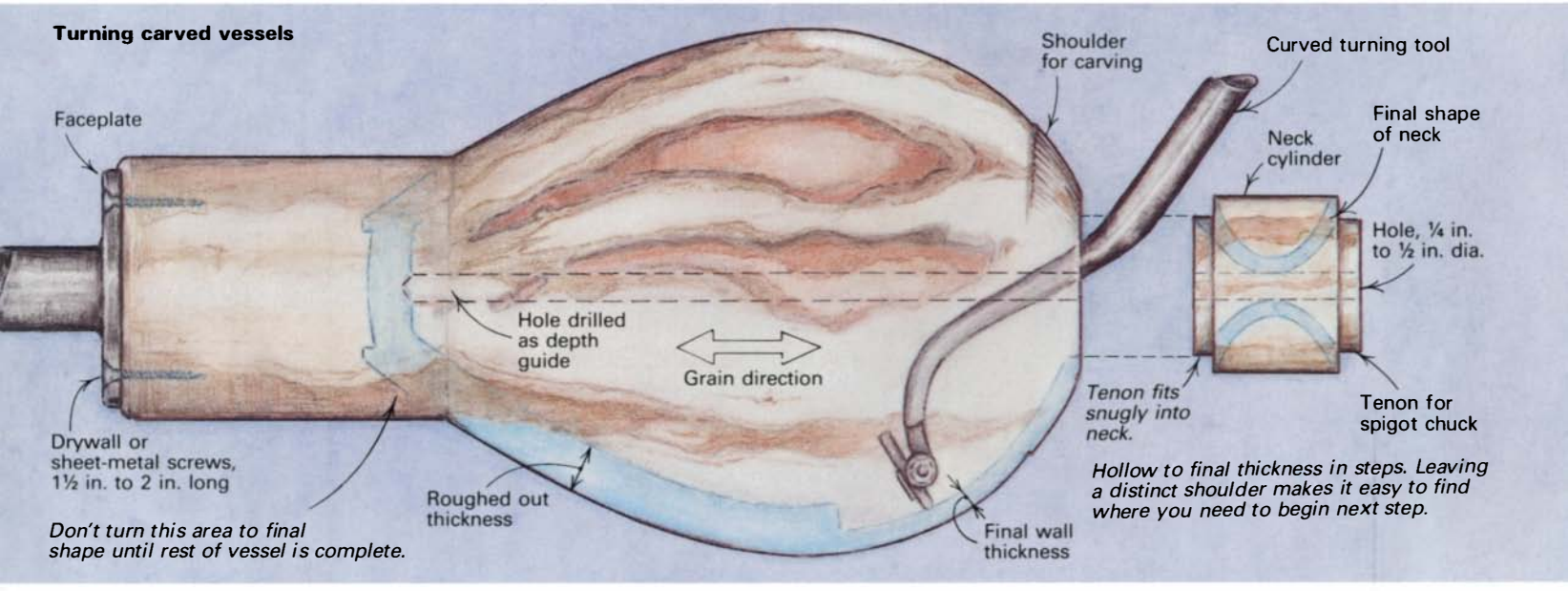
With the interior roughed out, begin turning the vessel to final thickness by working the tool from the top down, thinning out an inch or two at a time and cutting from the center out; then move the tool lightly up and down the wall to smooth it out. By thinning out in stages, thicker wood supports the cut. Always leave a distinct shoulder where the last cut ends so you can easily feel where you left off and where wood needs to be removed. Stop the lathe often to blow or vacuum out the chips and check the wall thickness. Standard double-ended calipers work well for gauging the thickness of many pieces, but you may need to make your own devices for checking difficult-to-reach places or larger pieces. Once you've been making these vessels as long as I have, you probably won't need to measure as much, but will rely instead on feel, sound and instinct.

As a general guideline, take the walls to a final thickness somewhere between ⅛ in. and 3⁄16 in. for small pieces and between ¼ in. and 5⁄16 in. for larger pieces. I vary the actual wall thickness depending on the size of the piece and the density and type of wood. It's hard to define proper wall thickness because it's an intuitive process that is learned through experience. You'll know when the wall thickness is right by the weight of the piece. But this is only revealed after the piece is off the lathe. Since the base area is small, you may want to leave the walls slightly thicker in the lower part to provide a balanced feeling, but avoid making the piece top- or bottom-heavy.

Fitting the neck—I turn the inside of the neck before gluing it back on the vessel, because this interior profile is somewhat visible through the small neck opening. I also like the neck's inside shape to be consistent with its outside shape. I mount the neck cylinder in a spigot chuck by the tenon that was turned on the end. If you don't have a spigot chuck, mount the neck on a glue block, three-jaw chuck or screw center. Lightly true the outside of the cylinder, and turn a straight or slightly tapered tenon about ¼ in. long and slightly larger in diameter than the opening in the vessel. Drill a ¼-in.- to ⅜-in.-dia. hole lengthwise through the center of the neck and turn the inside to match what will be the profile of the outside lower portion of the neck.

Because the hollowed out vessel is somewhat flexible and possibly warped, you will need to be extra cautious from this point on. Carefully enlarge the opening in the vessel top to fit the neck tenon by taking very light cuts with a diamond-point scraper or skew on its side. A good fit is essential to having a nearly invisible glueline. The neck should fit snugly, but it can split the vessel if it is too tight and forced in place. Align the grain and mark both pieces with a pencil, as shown in the left photo, so they can be

Turning carved vessels



Photos: John S. Cummings; drawing: Bob Goodfellow

Left: Jordan supports the neck of the vessel with his left hand while taking very light cuts with a small gouge to shape the inside of the neck. Any mistakes at this stage can ruin the project.

Above: The bottom is shaped after the vessel is parted off. The tailstock holds the vessel against a padded cone mounted on the headstock so the author can turn a slight recess in the bottom.

repositioned quickly when gluing up. Next, apply a liberal coat of gap-filling cyanoacrylate glue (Hot Stuff) to both surfaces. (Hot Stuff is available from many hobby stores and most mail-order woodworking suppliers.) Align the marks and lightly tap the neck into the bottle, allowing a few minutes for the glue to harden. Bring the revolving-cup center chucked in the tailstock up to the neck for support, and then rough-turn the shape of the neck, cutting away the excess wood to expose a tight glueline. If you are going to carve the shoulder, take a light cut across the raised shoulder, leaving it about 1/16 in. proud of the vessel surface, and stop the cut at the glueline. This creates a step at the glueline and serves as a stop for the carved flutes. If you choose not to carve, then finish-turn the neck, blending it in with the shape of the vessel. For these uncarved bowls, I like to turn three small decorative grooves, one right on the glueline and one to either side, as you can see in the second vessel from the left in the photo on p. 64. You can vary the amount of grooves, but I think an odd number looks best.

Carving the flutes—The shoulder flutes are carved with a small veiner using the tool rest as a guide. Set the tool rest parallel to and almost touching the area to be carved, and adjust the height so the center of the veiner is on the centerline of the vessel. Test the height adjustment by lightly dragging the veiner backward, making a light impression on the shoulder and checking that it is on center. You can also spiral the flutes by raising or lowering the tool rest. Start carving the flutes by pushing the veiner across the tool rest toward the neck, stopping at the glueline and taking care not to cut into the neck. Rotate the vessel backward slightly and cut another flute next to the previous one, as shown in the photo at right on the facing page. Continue until the entire shoulder is fluted, adjusting the width of the last two or three flutes so you don't end up with a half flute or an extra wide flute at the end. Since you are cutting across endgrain, a sharp tool will yield clean cuts with no tearout and there is no changing grain direction to give you trouble. You may choose to carve a random pattern, but I think the symmetrical flutes best suit the style of these vessels. I also use this method when carving large-neck vessels.

Finishing up—Finish turning the outside of the neck using a small gouge, taking care not to cut into the flutes. Move the tailstock back and shape the top recess or bevel inside of the neck, supporting it with the first two fingers of your left hand and guiding the gouge with your left thumb and right hand (see the left photo above). Take light cuts toward the inside, even though you'll be going against the grain, because this reduces chatter and yields a smooth surface with a sharp tool. You may need a small roundnose scraper to smooth and shape right inside the hole.

To finish shaping the area around the foot, measure the depth of the piece with a dowel or your long drill and transfer this measurement to the base of the vessel. Define the outside bottom with a parting tool and leave enough wood so that when the bottom is recessed slightly, the thickness will be consistent with that of the walls.

Applying a finish—The key to a good finish is surface preparation, starting with clean gouge cuts and ending with proper sanding. Grain that has been badly torn and sanded out will never look right. Sand the neck, as well as the rest of the piece, by hand or with a foam-padded power sander, being careful not to damage the carving. I usually start with 150-grit sandpaper, followed by 220-grit, and then finish up by hand-sanding with 320-grit or 400-grit paper.

I like a minimal amount of finish—just enough to protect the piece from dirt and to bring out the color. On light-colored woods, I wipe on lacquer sanding sealer, thinned enough to totally penetrate the wood. After the lacquer has dried (about 15 to 20 minutes), I polish the piece with fine Scotch-Brite pads or steel wool before parting off the vessel. During this operation, leave a 1-in. stub at the bottom so you can remount the vessel to turn the bottom. Don't try to cut the vessel free with the parting tool; saw through the last 1/2 in. of the stub or you risk having the piece bounce loose and breaking. After the vessel is removed, I apply a coat of tung oil.

To shape the bottom, I remount the vessel between centers after reshaping and padding the waste block as a drive center. First I turn a small cone on the waste block that will fit inside the neck of the vessel and then I pad this cone with thin foam or Naugahyde. The vessel is held against the drive cone with light pressure from the revolving center in the tailstock, centered on the stub left on the bottom of the vessel, as shown in the above photo at right. Be careful not to overtighten the tailstock, as too much pressure will break the vessel. With a small gouge or roundnose scraper, recess the bottom and turn the stub down as small as you can without actually parting off the vessel. Remove the piece from the lathe and pare off the remaining stub with a sharp chisel. Allow several days for the wood to stabilize, and then smooth the bottom rim with a flat sanding block to ensure that it sits flat, and sand the recess by hand or with a 1-in. disc. Apply another coat or two of oil if you like and sign the bottom. □

John Jordan is a full-time woodturner in Antioch, Tenn.

An Inconspicuous Vanity Table

Hinged lid reveals makeup and mirror

by Terry Moore

The author's oriental-style vanity table and matching stool are of contrasting East Indian rosewood and bird's-eye maple. Moore used maple wedges to secure the aprons' protruding through tenons to the legs. Removable velvet-lined jewelry and makeup trays are hidden under the vanity's mirrored lid.

I got the idea for this vanity while watching my wife put on her makeup in the bathroom, walk to her jewelry box in the bedroom, and then walk to a mirror on the other side of the room to put on earrings. The whole process seemed unnecessarily convoluted to me and I thought that if this ritual could be simplified, it would be more enjoyable. My vanity stores both jewelry and makeup and has a mirror conveniently located inside its hinged lid, which hides everything when closed.

The vanity's design is based on 18th- and 19th-century Korean furniture, and its frame-and-panel lid, as well as the stool seat, are highlighted with spectacularly contrasting East Indian rosewood and bird's-eye maple, as shown in the photo at left. The leg-and-apron base is joined with mortises and protruding through tenons. Brass stays hold the lid open to display the inside mirror that can be used when applying makeup. The frame-and-panel case bottom is maple and the compartments contain velvet-lined jewelry trays that are joined with hand-cut dovetails. Quality pervades every aspect of construction and joinery, which can all be done with simple machine setups and enjoyable handwork.

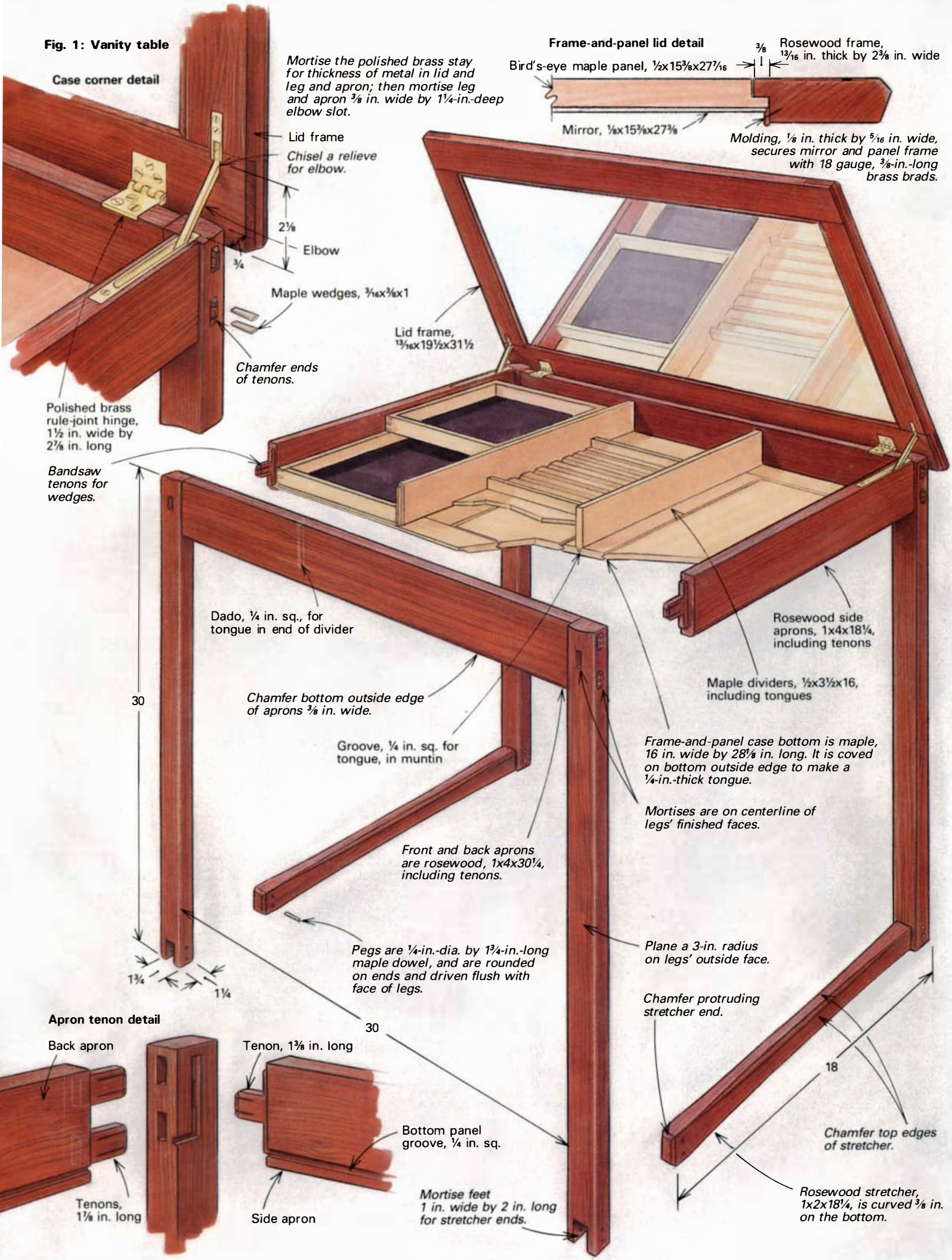
Cutting mortises—Following the dimensions in figure 1, joint and plane the leg stock. Cut the blanks to length, but leave them square until after you've cut their through mortises. Do the same for the aprons, but don't chamfer the bottom edges until you've cut their tenons. I prepared an extra leg and an extra front apron and adjacent side apron to lay out the joints, set up my machines and practice making the tricky mortises and tenons. To resist twisting, the front and back aprons have two through tenons on each end, and each side apron has a ¼-in.-long haunch on either side of its single through tenon. To join the aprons to the top of the leg, the side-apron tenon passes between the front-apron tenons; the short haunches on each side apron don't penetrate the leg deeply enough to touch the cheeks of the front-apron tenons.

Lay out the through mortises for the ⅜-in.-thick by 1-in.-wide tenons from the dimensions in figure 1. The mortise for the single-tenon side apron is on the centerline of the wide face of the legs. And the centerline of each double-tenon front and back apron mortise should be 9/16 in. from the inside and 11/16 in. from the outside of the still-square leg pieces. Each double mortise ends up in the center of the narrower side of each leg after you plane the decorative 3-in. radius shown in figure 1.

Using a horizontal borer, I cut the deep through mortises for the double tenons and the single tenons. (If you don't have a horizontal borer, you can substitute a drill press with a hollow-chisel mortiser or a plunge router.) Then I reset the borer depth and cut the ¼-in.-deep mortise for the side-apron haunch, as shown in the top, left photo on p. 71. I used a special rotary miller bit, made by

Drawings: Bob La Pointe

Fig. 1: Vanity table



Inca and available from Garrett Wade Co. Inc., 161 Ave. of the Americas, New York, N.Y. 10013; (212) 807-1155. If you use a borer or router to cut the mortises, square their corners by hand with a chisel. This isn't tedious, since there are only four legs, and I think the experience is therapeutic. Just make sure the chisel is the same size as the mortise and very sharp. Chisel halfway through from the outside of the leg, turn it over and complete the job from the inside of the leg. Finally, to accommodate the dovetail effect of the double-wedged tenons, taper both ends of the mortises. (I'll tell you more about the wedged tenons later.) I tapered the mortises with the same chisel I used for squaring their corners by enlarging the outside openings a little more than 1/16 in. on each end and tapering the walls to the halfway point of each mortise (see the top, center photo on the facing page).

After cutting the mortises in the top of each leg, I handplaned the radius on the outside surface. You need five lines to mark out the radius: a 3-in. arc on each end of the leg, a line running down each side about 1/8 in. below the leg's outside surface to intersect with the arcs and one along the centerline of the face to be radiused. Then handplane the radius to the lines on each side without planing the centerline off, as shown in the top, right photo on the facing page. The irregularities left by the plane can be removed with a scraper and fine-grit sandpaper held on a felt block. There may be faster ways to shape a radius, but since this vanity table isn't a production piece, the intimacy of handwork is a pleasant respite from the incessant roar of machinery. So take the phone off the hook and enjoy your hand tools.

Open mortises in the bottom of the legs accept the stretchers, as shown in figure 1, and are cut with a dado blade on the tablesaw. For safety's sake, I clamped the leg in a tenoning jig, so the radiused surface faces the blade. The mortise dimensions are 1 in. wide and 2 in. long, and the stretchers' chamfered ends protrude through the legs. I finished the stretchers by bandsawing a curve on the bottom edge so that only the ends touch the floor. Then I smoothed the bottom edge and chamfered the top edges with a compass plane.

Cutting the apron tenons—Mark out the 3/8-in.-thick by 1-in.-wide tenons on the extra apron pieces, using the dimensions in figure 1, and use the pieces to set up the tenoning jig and dado blade on the tablesaw. Note that the side-apron tenons are shorter than the front- and back-apron tenons and are offset differently. When the setup is correct, cut the front- and back-apron tenons' outside cheeks 1/4 in. from each apron's outer surface. Then reset the jig and cut the inside cheek 3/8 in. from the inner surface of a test piece. A corner of the resultant test tenon should fit its mortise tightly, and when you're satisfied that it does, cut the cheeks on all the front- and back-apron tenons. Repeat this process for the side aprons (using the extra apron to practice), only this time cut their tenons' outside cheeks 1/8 in. from the outer surface. Then reset the jig and cut the inside cheek 1/2 in. from the inner surface. Again, check that the resultant tenon fits the mortise, and when it does, cut the inside cheeks on all the side-apron tenons.

To cut the tenons to width on the tablesaw, I positioned the pieces against stops on a sliding table and set the dado blade to cut just short of the shoulder, as shown in the bottom, left photo on the facing page. First I cut the 3/8-in.-wide shoulders on both edges of the front and back aprons, and then formed their double tenons by wasting the 1 1/4-in.-wide section between them. You should do this on the extra apron first and check that its tenons fit the mortises before cutting the real aprons. Mark the side aprons' single tenons right on the workpieces (including the extra side apron) and then bandsaw them to width and crosscut their 1/4-in.-long haunches.

Next, I dry-assembled the legs and aprons and scribed a line around the end of the tenons where they protrude from the mortises, as shown in the center, right photo on the facing page. A block plane works well to chamfer the end of the tenon to this mark. Finally, I bandsawed two kerfs for wedges in each tenon. It isn't essential to wedge the through tenons at the leg-and-apron joints, but the wedges are textural, decorative elements that strengthen the joints and hold them together during glue-up. Start the cuts for the wedges a little more than 1/16 in. from the chamfer in the end of the tenon and stop them at half the tenon length.

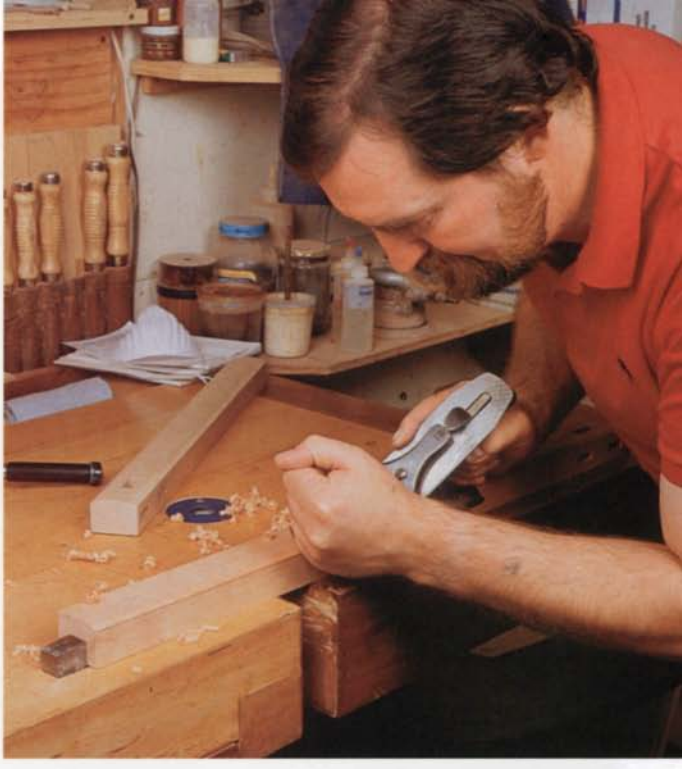
To complete the leg-and-apron joinery, I cut a 1/4-in.-sq. groove for the bottom panel 3/8 in. from each apron's lower edge. Then I reassembled the legs and aprons, marked the groove across the legs and chiseled it out so it was continuous from the front and back aprons to the side aprons. Finally, before setting the aprons aside and working on the frame-and-panel case bottom, I planed a 3/8-in.-wide, 45° chamfer on the bottom outside edge of each apron.

Making the frame-and-panel bottom—The vanity's case is portioned into three interior compartments with dividers in the center of the muntins that separate the panels in the case bottom. Each bottom panel is narrow enough to be a single piece of wood. The corners of the bottom frame are slip-jointed and the frame has a 1/4-in.-sq. panel groove in its inside edge. The two muntins have a panel groove on both sides and 1/4x1/4x2 1/2 stub tenons on their ends that fit the groove in the front and back frames. Raise the panels by routing a 1/2-in.-wide cove in their top and bottom edges to leave a 1/4-in.-thick tongue. Now, dry-assemble the frame and panels. When you're satisfied that everything fits, glue and clamp the frame, being careful not to glue the edges of the panels, thereby restricting wood movement.

The top edges of the 3 1/2-in.-wide compartment dividers are 1/8 in. below the upper edges of the aprons. The dividers have a continuous tongue on each end and the bottom edge, which I cut on a shaper using two 1/2-in.-wide cutters with a 1/4-in.-wide collar between them, as shown in the bottom, right photo on the facing page. Then I bandsawed and chiseled a 1/4-in.-wide shoulder on top of the dividers.

When the glue on the frame-and-panel assembly is dry, cove the bottom, outside edge of the frame to leave a 1/4-in.-thick tongue that fits the groove in the aprons. Then rout a 1/4-in.-sq. groove down the center of each muntin for the two compartment dividers. You can do this by guiding a router against a straightedge. To mark out the dado in the aprons for the tongue on the ends of the compartment dividers, assemble the legs and aprons with the bottom and mark where the divider grooves intersect the aprons. Extend these marks up the aprons to 3 in. above the case bottom. After disassembling everything, I cut these dadoes with a plunge router.

Assembling the legs, aprons and bottom—Before assembly, sand everything with fine-grit paper. I'm especially careful to sand areas that would be hard to get at when the vanity is assembled. Then get everything ready for glue-up: the glue, a brush, a damp rag, tenon wedges, and a small hammer to drive them in. It's important to assemble parts systematically and you must work quickly to clamp everything together before the glue dries. You may want to practice with a dry run of each assembly step. I glued up the subassemblies first: the front legs and apron, the back legs and apron, and the case bottom and dividers. Brush a thin coat of glue on the tenons and on the sides of the mortises, but don't apply too much or you'll have an oozy mess. Clamp the joints, brush a light coat of glue on the wedges, and alternately tap each pair home until equal amounts of the wedges are exposed. Since the wedges secure the tenon in the mortise, you can remove the clamps and



Left: The author uses a horizontal borer with a rotary miller bit to cut the through and haunched tenons on the top of a leg.

Center: Moore squares the round mortise left by the horizontal borer and then enlarges the ends and chisels a taper halfway through the mortise to accommodate the "dovetailing" effect of the wedges.

Right: After marking five lines for the radius on the still square leg, the author planes the outside faces.

Left: After cutting the front-apron cheeks with a tenoning jig and dado blade on the tablesaw, Moore wastes the wood between the tenons. He uses a dado blade and a sliding table with stops to limit the space between tenons.

Right: Scribe around each tenon on its still-square ends with a marking knife, holding the knife's flat side against the leg. Chamfer the ends of the tenon to the mark.

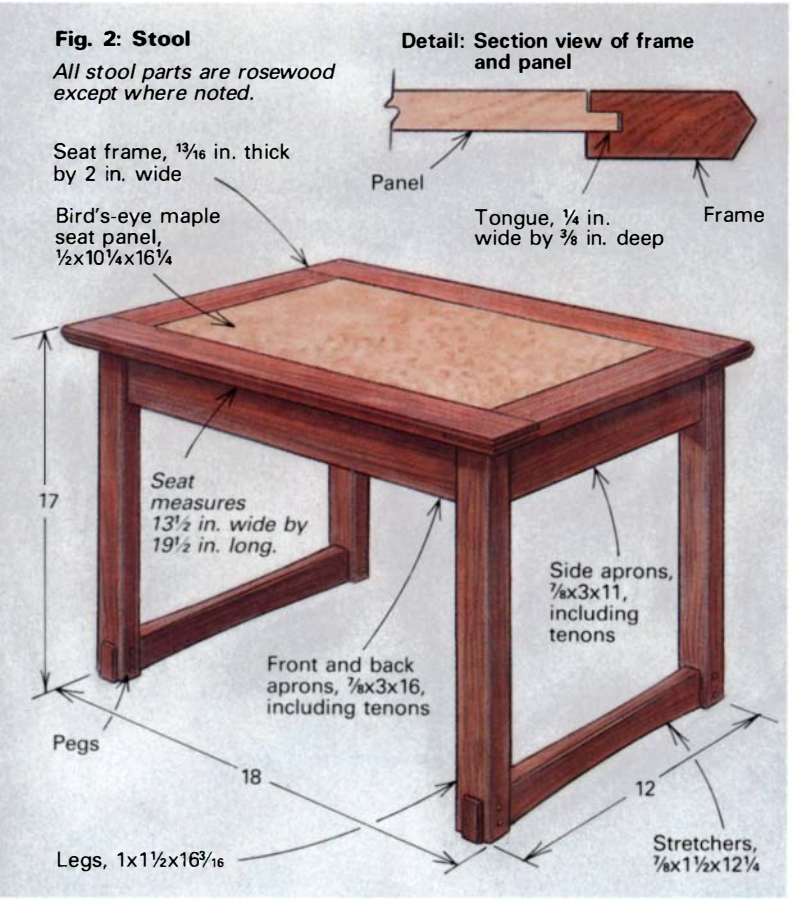
Below: Moore cuts the tongue on three sides of a divider on a shaper. He clamps the workpiece on a sliding table and uses two 1/2-in.-wide cutters with a 1/4-in.-thick spacer in between.

clean up the squeeze-out. Then glue the dividers to the bottom panel. To ensure even clamping pressure along the length of the divider, clamp with a radiused caul under the bottom panel and keep the divider centered on and square to the panel.

When these subassemblies are dry, assemble the bottom panel to the front legs and aprons. To do this, first glue the divider tongues in the grooves in the apron. I didn't glue the bottom-panel frame to the aprons, but you could, since the grain and wood movement of the frame and aprons run in the same direction. Next, glue the side-apron tenons to the mortises in the front legs, and glue the back subassembly to the side aprons and dividers. Clamp the case from front to back, wedge the tenons, and then clean up the squeeze-out. Finally, handsaw the wedges flush with the protruding ends of the tenons.

When the leg-and-apron assembly is dry, turn the table upside down and glue the stretchers to the bottom of the legs. The stretcher ends should protrude evenly in front and back. Clamp across each joint and let the glue dry before you peg the joints. For pegs, I used two ¼-in.-dia. by 1¾-in.-long maple dowels with radiused ends that are flush with the leg's surface when driven in.

Building and hanging the lid—The lid's East Indian rosewood frame is secured with a slip joint, which I cut on the tablesaw with a tenoning jig and dado blade. After assembling the frame, chamfer its top and bottom outside edges and then rout a ⅜-in.-wide by 9/16-in.-deep rabbet in its inside edges for the panel and mirror. Since the mirror may have to be replaced, I secured it and the panel to the frame with a nailed in, removable molding. I resawed and book-matched two pieces of bird's-eye maple for the ½-in.-thick panel, and after gluing it up and cutting it to size, I routed a ¼-in.-sq. rabbet in its top edge. The resultant tongue should lap the tongue in the frame's rabbet and leave the panel's top surface flush with the face of the frame.



Before installing the mirror and top panel, hang the lid on the base with hinges and install the stays. The pivot point of the hinge must be beyond the leg to prevent the lid's ¾-in. overhang from binding when the lid is opened. You could use wide butt hinges for this, but instead I hung the lid on 1½-in.-wide by 2⅞-in.-long rule-joint hinges (available from most woodworking-supply catalogs). On these hinges, one leaf is longer than the other and this extends the pivot point beyond the legs. However, I used the hinges upside down so the knuckle would be up, making it unnecessary to mortise the knuckle into the bottom of the lid. To reverse the hinge, I countersunk the screw holes in its back and polished those new visible faces. Then, with the hinge edges flush on the inside edge of the back apron, I scribed the placement of the long leaves with a marking knife and cut the mortise with a sharp chisel. To mark the hinge placement in the lid frame, temporarily fasten both hinges in the apron and set the lid in place. Ensure that its overhang is uniform all around, and then scribe the location of the hinges in the lid frame. Remove the hinges, hold them against the scribe marks and extend the marks around the hinge. Finally, mortise the hinges into the lid frame.

I used lid stays that are milled from solid brass. (I bought mine from Jack Dale, 18299 Mariposa Creek Road, Willits, Cal. 95490; 707-485-8251.) These stays are strong, and since they are mortised into the side aprons and lid frame, no part of them is on the inside of the aprons, which could interfere with the jewelry trays. The instructions that come with each set of stays assumes that the back of the lid is flush with the back legs. Since there's a ¾-in. overhang, you must install them according to the dimensions in figure 1 to ensure they will be flush with the leg. I recommend that you practice on a mock-up lid and apron. I plunge-routed the mortises for the stay into the lid and apron by guiding the router's fence against a strip of wood taped onto the apron.

Before permanently screwing the hardware in place, I polished it (including the screw heads) on a buffing wheel and applied four coats of lacquer to the wood and rubbed it out to a high sheen. Since the panel is removable, you can lacquer it before assembly and then secure it and the mirror in the lid frame. Drill holes for small brass brads and gently nail the molding in place.

Making the jewelry and cosmetic trays—The case's middle compartment is for cosmetics and tissues. I attached a grooved board to a piece of maple, which fits loosely in the compartment. The grooves, which are routed across the width of the board, hold eyeliner pencils, lipsticks and other makeup items. The best way to customize the storage compartments is to check with the client before making them. Each side compartment has two removable jewelry trays: both are half the depth of the compartment, but one is the same size as the compartment and one is half its length. The smaller tray slides from front to back on top of the lower box so you can access the jewelry in the bottom tray. I dovetailed the 5/16-in.-thick by 1½-in.-high tray sides and grooved them for a ¼-in.-thick maple plywood bottom, which I covered with black velvet.

Making the stool—The stool (shown in figure 2 at left) is simply a miniature of the vanity table. All the details are the same, except that I used blind tenons, instead of wedged through tenons, for the leg-and-apron joints. The seat of the stool is similar to the lid of the table, except that it doesn't open. It's fastened to the grooves in the aprons with wooden cabinetmaker's buttons. □

Terry Moore has been a professional furnituremaker in Newport, N.H., for 15 years. In 1986, The League of New Hampshire Craftsmen awarded this vanity Best in Show during its annual juried exhibit.

Maple: A Versatile Timber

Sometimes fancy, sometimes plain, but never dull

by Jon Arno

Maple has something to offer every woodworker, from general contractors to turners. Even though maple's inconspicuous figure lacks the striking contrast that gives ring-porous woods, such as oak and ash, their bold character, this diffuse-porous wood is subtly beautiful. Unlike colorful walnut or cherry, light-colored maple has warm brown accents and a translucent, opalescent quality in the way light plays off its surface. And most maple is easy to work and readily takes a finish, and can be used in anything from the finest furniture to packing crates, floors, bowling alleys and pins, cabinets, chairs and eating utensils.

Best of all, maple is exceptionally plentiful and often inexpensive. The latest USDA Forest Service statistics estimate that approximately 42 billion cu. ft. of maple stock (including both hard and soft maple species) is growing on timber lands in the Eastern United States. Most of it is relatively young second growth, but enough of it is of adequate size to produce sawtimber yielding more than 90 billion bd. ft. And this doesn't include stands of bigleaf maple in the Pacific Northwest, maple in unharvestable reserves, or both soft and hard maple available for logging in Canada. Of the commercially important hardwood cabinetmaking timbers native to North America, only the oaks are more plentiful than maple. Sugar maple, *Acer saccharum*, (the tree shown here), which is harder than most oaks, is the most common maple cabinetmaking wood; however, softer maples, such as red maple *(A. rubrum)*, are also abundant and can be cost-effective substitutes.

There are about 125 species of maple distributed primarily in the Northern Hemisphere. About two-thirds of all these maples are native to China and the bulk of the remainder is spread out from England to Japan. North America claims only 13 native species and just 6 of these represent important commercial sources of timber. Despite the limited number of species, though, the United States and Canada provide the vast majority of the world's total production of maple lumber. Commercially, the lumber is divided into two groups: hard maple and soft maple, as given in the chart on p. 75.

Differences between hard maple and soft maple—Hard maple is stronger than soft maple and is better suited to woodwork that takes abuse, such as floors and countertops. Hard maple is cut from two closely related species: sugar maple and the less plentiful black maple, *A. nigrum*. The woods of these two trees, which grow in the Northeastern and Central United States and Southeastern Canada, are virtually indistinguishable in appearance. While black maple tends to be slightly lighter in weight, sugar maple has an average specific gravity of 0.56 (oven dry weight/green volume). Both hard maples are about as heavy as northern red oak and heavier than black walnut and black cherry. (For more on specific gravity, see Bruce Hoadley's book, *Understanding Wood*, The Taunton Press, 1980.)

This sugar maple growing on a hillside field in Connecticut is more than 4½ ft. in diameter at chest height and stands over 100 ft. tall. Wood from these trees is known commercially as hard maple.

Even though all of the soft maples are substantially lighter in weight than hard maple (and therefore inferior for applications such as flooring), red maple really isn't all that soft. Its average specific gravity is 0.49, which falls midway between that of black cherry (0.47) and that of black walnut (0.51). When it comes to first-rate domestic cabinetwoods, that's pretty good company to be keeping. And red maple is more plentiful and usually much less expensive.

With a little careful selection, cost-conscious woodworkers can come up with some excellent wood among the soft maples. The key is choosing the right species for any given job, and soft maples are diverse enough to span a great many applications. Most of the

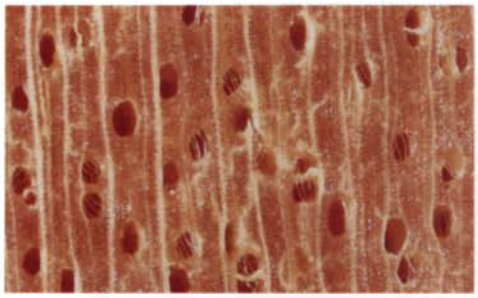
grain patterns found in hard maple also occur in soft maple, but some of the soft maple species actually possess more interesting color. For example, the heartwood of red maple, which grows throughout most of the Eastern United States, is usually darker than that of sugar maple. It has interesting gray highlights and sometimes dark, chocolate-brown markings.

The softest and lightest soft maple is box elder *(A. negundo)*, which is found throughout most of the United States. It's also the finest textured of the maples, making it very pleasant to work with and a favorite among turners. Bigleaf maple, a Western species, and silver maple *(A. saccharinum)*, which is plentiful throughout the East, are the remaining two major U.S. timber-producing soft maples. Both of these species are relatively soft and easy to work, and they have the additional advantage of being much more stable than hard maple. In fact, bigleaf has an average volumetric shrinkage of only 11.6%, which is quite comparable to black cherry.

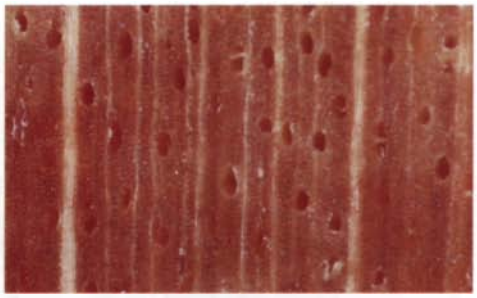
Maple's many faces—In most woods, figure is produced by variation in texture between the springwood and summerwood. In maple, however, the figure is produced by bands of warm-brown- or amber-colored fibrous tissue demarcating the annual rings from the wood's overall creamy yellow hue. Like the annual rings, the medullary rays in maple are much darker than the background tissue, and they pepper the tangential surface with short, thin lines, which are similar to the ray flecks in beech. But maple's rays are softer and more subdued, like the weave of shear fabric. Even plain-figured maple, shown in the top, left sample on the facing page, seldom produces absolutely straight grain and the figure on its tangential surface usually curls and contorts like the veins in fine marble.

In some instances, ordinary maple trees may produce extraordinary figures, which are commonly referred to as fiddleback, quilted and bird's-eye maple. Bird's-eye figure (shown in the top, right sample on the facing page) ranks among the world's finest and most sought after cabinetwoods. (For more on this, see "Bird's-Eye Maple," *FWW* #74.) Curly figure (shown in the bottom, left sample on the facing page) is sometimes called fiddleback or tiger-stripe maple and is often used for the back of stringed instruments, like violins. Quilted figure (shown in the bottom, right sample on the facing page), which occurs most often in the Western bigleaf maple, *A. macrophyllum*, is prized for tabletops and inlay. Only a small percentage of maple woods brought to market have these

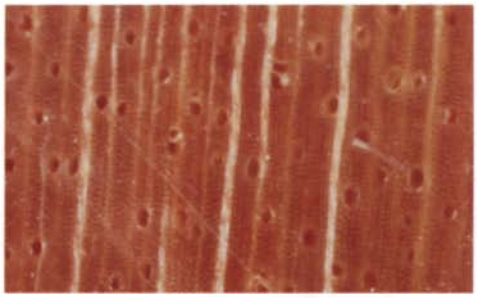
Which maple is which?



This 15-power macrophotograph of river birch endgrain reveals characteristics that are not visible to the unaided eye. The rays of river birch are narrower than the diameter of its largest pores.



Sugar maple has two size rays and the widest are as wide or wider than its largest pores. Sugar maple is the most common maple cabinetmaking wood. This species is also related closely to black maple.



Soft maples, such as the silver maple shown here, generally display more uniform ray width than hard maples. Distinguishing between species of maple, however, is difficult without chemical analysis.

Maple is so common that you usually know when you are looking at it. But of all the wood you could confuse maple with, birch is the most similar. Birch and maple have a long history of being used in the commercial manufacture of cabinets, and so they're often encountered—sometimes together in the same project. Both are fine-textured, light-colored woods and have similar working characteristics. Even when you look closely, you can see that both have relatively small, uniform-size pores that are evenly distributed.

With a little practice, distinguishing maple from birch is not difficult. Some cabinetmakers can differentiate the two by smell. When fresh, maple and birch have distinctly different scents, and you can train your nose to recognize the difference.

You can also see physical differences between maple and birch. Birch generally has a somewhat chalky, less-lustrous surface than maple, and birch has an ash-gray cast, while maple is often yellowish beige. If you look closely at maple's cleanly crosscut endgrain, you can see its medullary rays, which diverge from the center of the tree. On the tangential surface of maple, the rays appear as a profusion of evenly dispersed, very fine, dark brown lines that run parallel to the grain. Each ray is only about 1/64 in. to 1/32 in. long, but they're in such abundance that they lend a warm color to the wood. On the radial surface, the rays appear as distinct, narrow, amber-orange bands that run across the grain, occasionally 3/4 in. to 1 in. long if you're lucky enough to have cut directly through the ray. The rays in birch, however, are so fine and so similar in color to the background tissue that they are virtually invisible on either the tangential or radial surfaces without magnification.

To differentiate between maple and birch with certainty, you should examine their endgrain using a 15-power hand lens. Cleanly slice the endgrain of both samples with a razor blade and compare what you see through the lens with the three photos above of river birch, sugar maple and silver maple. In birch, the diameter of the largest pores is greater than the width of the widest rays.

It is extremely difficult, however, to distinguish between various species of maples (as you can see from the photos above, center and right). Some technical references report that soft maples have rays that are relatively uniform in width, while hard maples have both wide and narrow rays. Also it is possible to distinguish red maple from sugar maple by chemical analysis. When a water solution of ferrous sulfate is applied to the surface of these woods, red maple turns bluish-black, while sugar maple turns green. —*J.A.*

Photos this page: John P. Limbach, Ripon Microslides

special figures, which are the result of abnormal growth. In some instances, the tree's living, wood-producing layer (the cambium layer, located just inside the bark) develops spots that fail to produce wood tissue at a normal rate. While this process may not affect the entire tree, it generally persists for years, as the spots enlarge and build up layer upon layer of convoluted grain. Depending upon the degree of malformation and how you cut the log, a number of distinct figures may be obtained from a single piece.

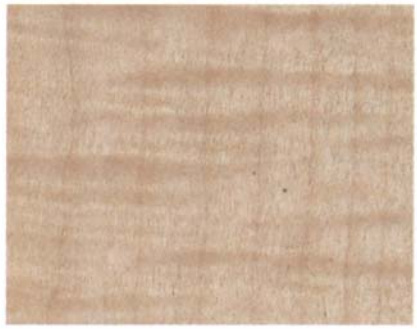
Machining and finishing maple—Plain-figured maple machines exceptionally well and will hold very sharp details. In fact, the latin name for the maple genus, *Acer,* means sharp because lances and skewers made from it held a sharp point. Plain maple's even grain allows it to be sawed, chiseled, handplaned or machine planed, or drilled without much chipping or tearout. When it is routed, it has a tendency to develop burn marks that are difficult to sand out, and so you must use a sharp, clean bit and keep your feed speed high. Because of hard maple's density, working it with hand tools requires some muscle, but the results are gratifying. Figured maple, on the other hand, can be very difficult to handplane or scrape cleanly, and it requires using a plane with a surgically sharp blade. Hard maple turns so predictably and yields such defect-free products that it has long been favored for commercial production of round items: kitchen utensils, bowling pins, furniture parts, dowels, spindles, spools and heavy-duty conveyor rollers. And when hard maple is sanded on the lathe, it doesn't gum up sandpaper as cherry does.

Few woods are as easy and as pleasant to finish as maple. It has a moderately high natural luster, and you can quickly smooth its surface with scrapers or fine-grit abrasives. Some soft maples can be more difficult to work to a smooth surface free of fuzzy grain, and they may require more sanding with fine-grit paper than hard maple. A single coat of tung oil on maple tabletops, counters and cutting boards may be sufficient protection against stains from food and drink spills. But bare maple does have adequate porosity to accept stain and allow glue to bond. Also, because of maple's fine texture, you can finish it to a high gloss without using special fillers. Only a coat or two of light-bodied varnish is needed to build up a glassy smooth surface. And since maple is so hard, it supports virtually any finish without a great risk of denting or chipping. (For more on working with bird's-eye maple, see Bill Keenan's article in *FWW* #74.)

There are no chemicals in maple that threaten its utility. Although there are minute traces of tannin in maple bark, it is absent from the wood. Volatiles in common varnishes, lacquers and glues don't react adversely with maple to destroy their bond or affect drying time. In fact, given its fine texture, maple is excellent for painted projects because its featureless grain won't telegraph through the finish.

Limitations—Given maple's pleasant working characteristics and subtle beauty, there is little mystery as to why it is used in so many diverse applications. But it is not suited to every purpose and indeed has some significant shortcomings. First of all, since hard maple is not very stable compared to most other popular cabinetwoods, woodworkers should prepare for wood movement. Hard maple's average volumetric shrinkage of 14.7% (green to oven dry) is nearly 30% greater than that of black cherry (11.5%) and almost twice as large as that of Honduras mahogany (7.8%). Hard-maple spindles and tenons tend to loosen when exposed to seasonal fluctuations in humidity. Furthermore, hard maple has a rather pronounced tendency to warp because it develops severe stresses when drying. Its high volumetric shrinkage is compounded by a somewhat large difference between its 9.9% tangential shrinkage and its 4.8% radial shrinkage.

Ordinary maple, ***above, left,*** *is subtly beautiful, but bird's-eye figure,* ***above, right,*** *is probably one of the most sought after cabinetwoods in the world. Figured maple woods are freaks of nature resulting from abnormal growth. Curly figure, also called fiddleback or tiger maple,* ***below, left,*** *is often used in stringed instruments. Quilted figure,* ***below, right,*** *occurs most often in bigleaf maple.*



Maples

Commercial Name/Species	Specific Gravity	Shrinkage(%) T	R	V
Sugar, *Acer saccharum**	0.56	9.9	4.8	14.7
Black, *Acer nigrum**	0.52	9.3	4.8	14.0
Red, *Acer rubrum***	0.49	8.2	4.0	12.6
Silver, *Acer saccharinum***	0.44	7.2	3.0	12.0
Bigleaf, *Acer macrophyllum***	0.44	7.1	3.7	11.6
Box elder, *Acer negundo***	0.42	7.4	3.9	14.8

Specific Gravity = oven dry weight/green volume
T = Tangential shrinkage, green to oven dry
R = Radial shrinkage, green to oven dry
V = Volumetric shrinkage, green to oven dry
* Hard maple
** Soft maple

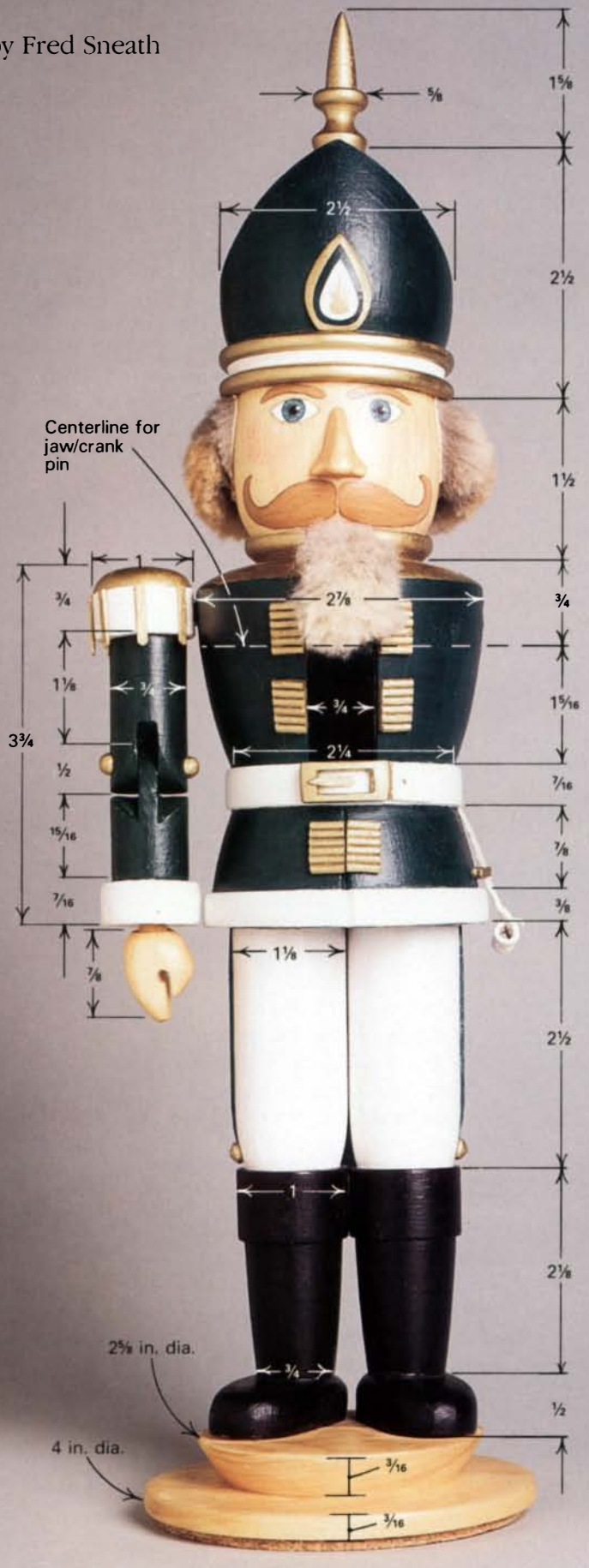
Another limitation is that maple has a low resistance to decay. Because maple lacks tannin or other strong chemical defenses often found in more durable woods, it is quickly attacked by fungi. On the positive side, though, the stains caused by fungi can produce a very attractive spalted pattern, which is actually prized for use in cabinetry and in turned decorative bowls. Spalted box elder can be especially nice. It is susceptible to attack by the fungus *Fusarium negundi*, which produces beautiful, coral-colored streaks, rather than the usual brown or blue-black coloration found in most spalted woods. Spalted wood, however, must be thoroughly seasoned as soon as possible after the staining occurs in order to force the fungi into dormancy. Otherwise, the wood will structurally deteriorate as the fungi multiply and literally devour the wood tissue. Unless producing spalted wood is your objective, maple should be dried quickly to remove all surface moisture, before the fungi can get established. Even when properly dried, though, maple is a very poor choice for marine or exterior projects of any kind. □

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

Making a Nutcracker

An intrepid trio brings a traditional toy to life

by Fred Sneath



The idea of making a nutcracker germinated in my mind for years, nurtured by the annual appearance of the brightly painted wooden toys in stores and by seasonal productions of Tchaikovsky's ballet on stage and on television. However, I didn't actually begin turning my first one, a gift for my eight-year-old daughter, until a week before Christmas. The result was the white-haired stalwart in the red tunic, Cornelius Crownheart, shown below. As I recall, the final coat of urethane was still tacky when my wife and I wrapped gifts on Christmas Eve.

Since then I've made two companions: Tobias Trueblue and Reginald Righteous, shown below and at left. The construction of all three is based on the traditional form of wooden figure nutcrackers, such as the hero of the children's tale by Hoffman, *The Nutcracker and the Mouse King,* which is the basis of the popular ballet by Tchaikovsky. Their nominal duties are carried out by manipulating their lower jaws with the crank handles that protrude from their backs. However, there are more efficient ways of crack-

Cornelius Crownheart, right, and Tobias Trueblue face off in a duel. The range of motion of their fully articulating arms makes it easy to imagine them coming to life when the lights go out.

The torso, head and helmet are all turned together. Here the author rounds over the small beads that become the rim of the miter-type hat worn by Reginald, the green-clad nutcracker.

After bandsawing the head, including the helmet, from the torso, Sneath clamps the torso in a hand screw and bandsaws the channel that houses the jaw/crank.

ing nuts, and I designed these fellows to be capable of far greater deeds when spurred on by a child's imagination.

The readily available mass-produced nutcrackers from Asia, and their original European antecedents, are wonderfully suggestive of Christmases past, but they are also fairly static objects. In designing my version, I wanted to increase mobility beyond the working jaw without sacrificing the stiff "wooden soldier" quality. Although Cornelius, Tobias and Reginald stand on their pedestals rigidly at attention, they can brandish their swords and flourish their flags thanks to fully articulated arms that move at the shoulders, elbows and wrists. I added this mobility to capture the magical storybook moment when the lifeless wooden toy becomes the handsome prince.

Making these nutcrackers is quite straightforward. The basic body parts require three separate turnings: The torso, head and helmet are turned as a unit; both arms are turned together as a single spindle and then sawn into shoulder, upper arm and forearm segments; and both legs are turned as a single spindle and then sawn apart. I also turn the pedestal and a finial for the helmet. Feet and hands are carved from wood scraps and the uniform details are fashioned from toothpicks and small dowels. The elbow and wrist joints are the most demanding parts of the job, but even they are not particularly time-consuming.

Turning the torso and head—For the nutcracker described here, I begin by turning the torso, head and helmet from a piece of pine, 3 in. square by 8⅛ in. long. The blank for this turning can be a solid block or laminated from ¾-in.- or 1½-in.-thick stock. I turn the piece with the base of the torso at the headstock and the top of the helmet at the tailstock. The mark left by the headstock center will be covered by the legs, and depending on the helmet style, the mark left by the tailstock center will be sawn or sanded away or will be used to locate the finial, which is turned separately. The only significant details on this turning are the bottom trim of the coat, the belt at the waist, the collar and the brim of the helmet (see the left photo above). Any or all of these details can be varied to give each soldier a unique look. It's a good idea to make the shoulder area of the torso the same diameter as the hem of the coat for two reasons. First, it's easier and safer to get a square cut when bandsawing the head off; and second, it makes it easier to clamp the torso in a hand screw or vise when you need to notch and drill it.

When this turning is complete, the head with helmet is bandsawed from the torso. With the head removed, I clamp the torso in a hand screw and then mark out and bandsaw the ¾-in.-wide channel that houses the jaw/crank. This channel runs from the top of the torso to the top of the belt, as shown in the above photo at right. The channel's sloping extension on the back of the torso (shown in the details on the next page) can be initiated with care on the bandsaw, but it must be completed with a chisel and file. Next, I bandsaw the jaw/crank from ¾-in. pine (see the drawing), but I leave a little extra at the top where the beard will be attached so I can trim it later to match the profile of the turning. Fit the crank to the channel by either paring the sides with a chisel or sanding the crank.

The jaw/crank pivots on a 3⁄16-in.-dia. mild steel rod. To ensure that the rod runs squarely through the upper part of the torso, I remove the crank, clamp the torso in a hand screw again, and use a drill press to bore a 3⁄16-in.-dia. hole that's 90° to the channel and ⅝ in. below the shoulder line. I remove the torso from the hand screw and insert the jaw/crank into the channel, flush with the top of the torso section. Then, I clamp the torso in a vise and drill through the jaw/crank with a portable electric drill using the hole through the torso as a guide. Now you can insert the steel pin and work the jaw/crank up and down to make sure it moves easily. With the jaw in the closed position, draw along the profile at the top, front of the turning, and then remove the crank and trim the "chin" to this line on the bandsaw.

Turning and fitting the arms and legs—The two legs can be turned from a single 10¼-in.-long spindle, with the thigh tops at the headstock and tailstock and the ankles meeting at the center. Turn the middle 1 in. of the spindle to ¼ in. dia. so that when the legs are sawn apart you'll have a ½-in.-long tenon at both ankles for joining them to the feet. The feet are ½-in.-thick rectangular blocks rounded at the heel, toe and upper edges with a disc sander. The thighs are joined to the torso with a short length of ¼-in.-dia. dowel. I also join the feet to the pedestal with ¼-in.-dia. dowels, and this is as good a time as any to turn the pedestal (using a faceplate). But don't glue anything together until all the parts have been painted.

The arms are turned in the same manner as the legs, with the shoulders at either end of a single spindle and the cuffs meeting in the middle, as shown in the top photo on p. 79. The arm spindle should be 10¾ in. long, which includes an additional ½ in. for each arm to accommodate the overlap in the completed elbow joints and ½ in. of waste at each end of the spindle. After this spindle has been cut in half at the cuffs, bandsaw each arm at the shoulders and elbows before working on the articulated joints.

The drawing illustrates how the arm segments are joined. Of the three joints, the shoulder pin joint is the simplest. The domed shoulder cylinders, which have been cut from the arm spindle, are fitted with two ¼-in.-dia. dowels; one connects the shoulder to the torso and the other links the shoulder to the upper arm. The dowels should be glued into holes drilled in the shoulder cylinder, but be able to rotate freely in the holes in the torso and upper arm.

The elbow joint employs a mortise in the upper arm and a tenon in the forearm pinned with a ¼-in.-dia. dowel. The mortise

and tenon may be roughed out on the bandsaw, but additional carving with a knife and file is necessary to open up the joint so the forearm moves forward through 90°.

The ball-and-socket joint, which allows full rotation of the wrist, is the most interesting technical feature of this project. The joint is constructed as a separate unit before being mounted in the hand and forearm. The ball can either be turned or carved on the end of a 1-in.-long by ⅜-in.-dia. dowel that will be inserted in the cuff. The socket, into which the ball must fit snugly, is formed on the end of another short length of ⅜-in.-dia. dowel with a hand-held rotary tool fitted with a round-head carving bit, as shown in the bottom photo on the facing page.

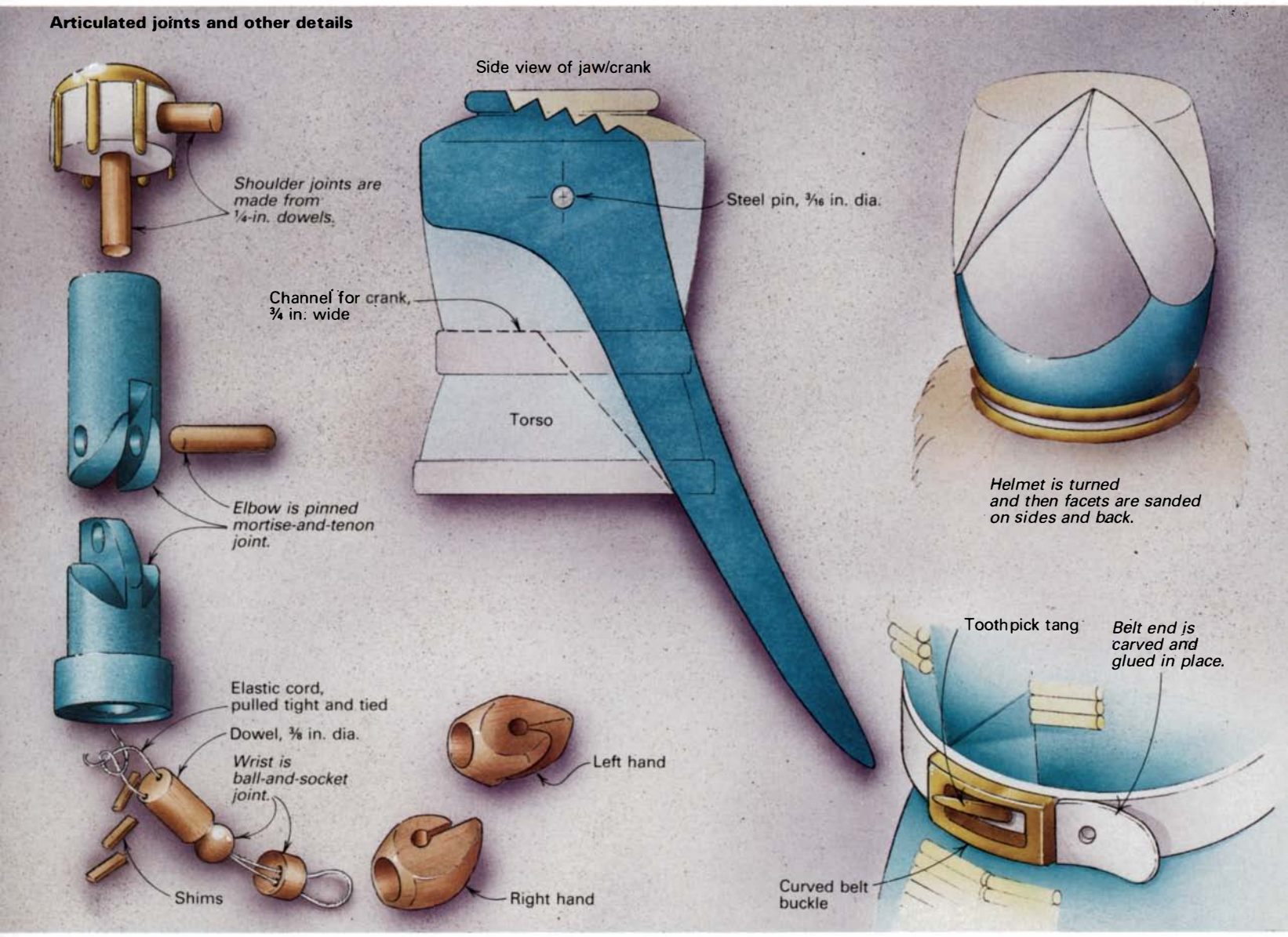
After the socket has been hollowed out, its dowel is cut to ⅜ in. long. This short dowel will eventually be inserted into the hand, but first the ball and socket are drilled so they can be tied together with an elastic cord I scrounged from an airline baggage tag. The elastic cord provides enough tension so the wrist will hold whatever position it is moved into. I drill the holes for the elastic with a 1/16-in.-dia. drill bit in the rotary tool. The joint details show how the elastic is laced through the joint and tied at the end of the ball dowel. Shims made from bits of toothpick are inserted beneath the knot to increase tension on the joint if necessary. The mechanics of the joint are now complete, but this construction won't really come to life until you add the hand.

I use small scraps of pine to carve the mitten-like hands. I leave the fingers undifferentiated to retain some of the simplicity of traditional nutcrackers. A ⅛-in.-dia. hole, bored at the juncture of thumb and fingers, allows the hand to "grip" a sword handle or flag staff. A ⅜-in.-dia. hole is bored into the wrist end of the hand to receive the socket dowel, which is then glued into the hand. To allow freer movement of the hand, I hollow out the end of the cuff a little, and then I drill a ⅜-in.-dia. hole in the center of the cuff to receive the hand-and-wrist assembly. Don't glue the ball dowel into the cuff because you may want to remove it later and add shims beneath the knot in the elastic cord to increase the wrist's tension.

Detailing—Now you can temporarily assemble all the major components and stand back and check out your work. The helmet may require some additional shaping and you still need to make the small details, such as the belt buckle, buttons and sword. Make all the details before attaching any of them and then paint all the small parts before gluing them because you will get a better paint job.

I reattach the disembodied head to the torso by inserting ⅛-in.-dia. dowels on either side of the jaw/crank channel. But first I decide whether or not to tilt the head and helmet back slightly. The type of helmet usually plays a role in this decision. For Cornelius' black bell-shaped helmet, I opted for a stiff-back, chin-in look with the brim parallel to the floor. But I wanted Tobias' flared white

Articulated joints and other details



Drawing: Clarke Barre

shako to appear to be set back on his head, and so I sanded an angle on the base of the head. I imparted some tilt to Reginald's green tapered miter in the same manner, but with a less pronounced angle. The basic shaping of both the black and the white helmets was complete when they came off the lathe, but Reginald's green miter headdress required further shaping at the back and sides, as shown in the drawing. I formed the three facets on a sanding disc and finished them with a sanding block.

All three helmets are fitted with finials turned from ⅝-in.-dia. dowels. The finial on the bell-shaped helmet is doweled into a hole where the tailstock center had been. The finials on the other two helmets are notched on the base to fit the helmet shape and are mounted near the front. For the white shako you'll need to fill the hole left by the tailstock center if it is not smoothed out when you sand the slight dome on the top. You'll also need to carve a small visor for the shako. To further individualize each helmet, I cut a small insignia badge from pine and shaped it to fit the helmet's curvature. Then I painted the detailed design on lightweight paper, cut it out and glued it to the badge.

The most important detail you will add to your nutcracker is the nose. Copy it from pictures or model it after a nose you know, but don't be afraid to make it distinctive because it is largely responsible for giving an individual personality to each nutcracker. After I carve a nose from pine, I pin it to the face temporarily with a 3/32-in.-dia. dowel in order to experiment with placement before gluing.

Uniform details include tunic buttons cut from ¼-in.-dia. dowel for Cornelius and Tobias, drilled through with a ⅛-in.-dia. bit for the latter, and piping cut from 3/32-in.-dia. dowel for Reginald. I glued six short pieces of the piping to paper to form the groupings before I painted them. The shoulder epaulets are cut from the wide end of toothpicks and arranged around the shoulder cylinders. The belt buckle is cut from pine with a bit of a toothpick attached as the tang. The belt end is also cut from pine with a small hole drilled for the final notch. Trousers are trimmed with toothpick stripes and ¼-in.-dia. dowel buttons at the boot tops.

The sword and flagstaff are cut from ⅛-in.-dia. dowel and the sword hilt is a miniature bowl turned from ¾-in.-dia. dowel. The flagstaff is cut down the middle just far enough to hold the 4-in. by 6-in. flag (see the cover photo). I bought my flags from The Flag Shop, 508 Rideau St., Ottawa, Ont., Canada K1N 5Z6. I use a jeweler's saw to cut the flagstaff, but a coping saw or a fine blade in the scroll saw should also do the job. Once the flag has been glued into the staff, I add a finial turned from ¼-in.-dia. dowel. Cornelius carries the maple leaf flag of Canada, and his uniform is painted to match. Although the other two flags are the national banners of specific countries, I chose them to suggest regimental colors, not to make a political statement. When not being held in one or both hands, the flagstaff may be set into a small turned base.

The rapier sword, when not challenging the Mouse King or other miscreants, is slung at the hip in an open scabbard fashioned from a narrow strip of leather doubled back in a loop. I used a short piece of dowel and a toothpick end to hold the scabbard and sword securely against the hip.

Painting—At this point I prepare the parts for painting by giving them all a coat of urethane, except on surfaces to be glued. Most of the nutcrackers I've seen are painted with gloss enamel, but I prefer using artists' acrylics for their color range and surface texture. For the silver and gold metallic accents, I use brush-on lacquer.

Paint the uniform first and then the small details, saving the face for last. By then you'll be familiar with your paints and brushes and will have gained some confidence. Skin color is determined by the wood you use and I made the rosy cheeks by applying colored pencil and smudging it. The moustache and eyebrows are traditionally painted and their color will be dictated by the material you use for the hair and beard. I paint the facial features directly on the wood, but they could also be painted on paper and then cut out and glued onto the face. For the nutcrackers shown here I used scraps of rabbit and fox fur left over from fur coat alterations and glued them in place. Alternatively, the hair and beard could be made from a number of materials: yarn, carpeting, fake fur or an old toupee.

The nutcracker is now ready to assemble with glue at the fixed points: head to torso, torso to legs, legs to feet, and feet to pedestal. Apply a final coat of satin urethane to add sheen and protect the painted surfaces, and then glue a cork circle to the bottom of the pedestal.

As a postscript, Cornelius now gets around in style on a music-box stand (see the cover photo), which I gave to my daughter on the Christmas following his arrival. The turned maple box is painted to match the nutcracker and the musical mechanism plays "Waltz of the Flowers," a composition from *The Nutcracker,* as one might expect. □

Sneath turns all the arm parts from a single spindle, which allows enough length to accommodate the overlap at the mortise-and-tenon elbow joint. The sleeve cuffs are in the middle of the spindle and the shoulders are at each end. Above, Sneath marks the point where he will saw the upper arm and forearm apart.

With a round-head carving bit in a rotary tool, Sneath forms a socket on the end of a ⅜-in.-dia. dowel as part of the ball-and-socket wrist joint. After the socket is complete, a ⅜-in. length of the dowel will be cut off and tied to the ball with elastic cord. Then the short socket dowel will be glued into a carved hand.

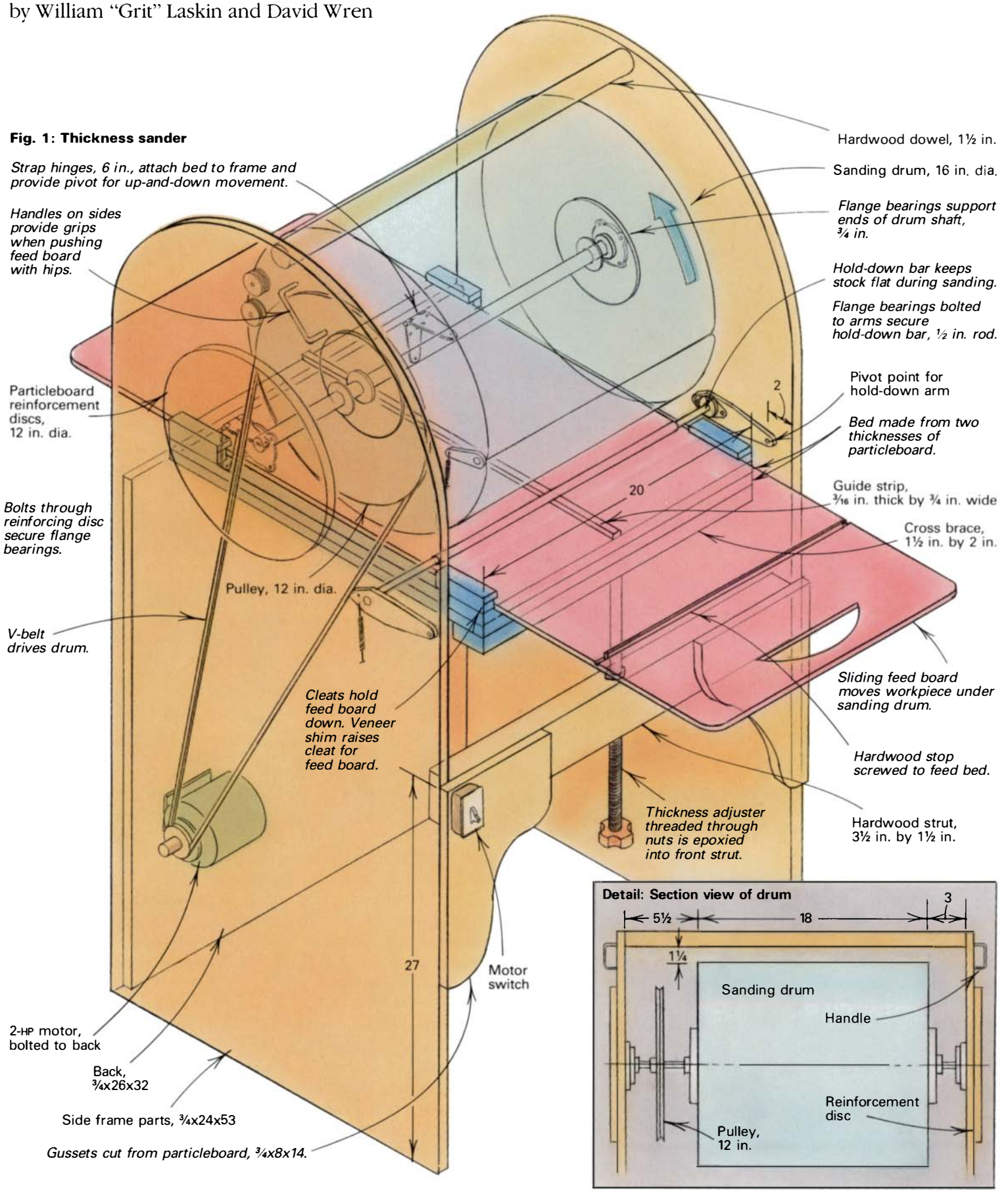
Fred Sneath is a retired educator who lives and builds toys and musical instruments on Stony Lake near Woodview, Ont., Canada.

Building a Thickness Sander

A large drum turns an abrasive machine into a smooth operator

by William "Grit" Laskin and David Wren

Fig. 1: Thickness sander



Drawings: Aaron Azevedo

Like most other woodworkers, guitarmakers routinely need to plane and smooth wide, flat pieces of wood for instrument parts. Unfortunately, the job is usually too delicate for most stationary thickness planers. As guitarmakers, we often have to plane the sides, back and top of a guitar to 1/10 in. or less, and most planers don't surface stock much thinner than 1/8 in. Further, many of the wood varieties typically used by guitarmakers, such as rosewood, curly maple or koa, are susceptible to splintering and tearout from the cutting action of a thickness planer. The alternatives are scraping, handplaning and hand-sanding the wood or running the stock through a thickness sander, if you have one at your disposal.

Thickness sanders come in several different styles. The Cadillacs of the breed are the wide-belt sanders: expensive machines that sport power feeds, accurate thickness adjustments and oscillating sanding drums. The lower-cost alternatives are drum sanders that have a small-diameter drum, wind-on sandpaper and manual feed. The problem with these is that resinous woods, like rosewood, easily clog the small surface area of the sandpaper. We considered building one from mail-order plans, but those we saw were so poorly conceived, we decided that we could design and build a better machine ourselves. The machine we came up with, shown at right, fulfilled our basic tenets: it was quick and inexpensive to build and it operates to close tolerances. Building the machine requires mostly woodworking tools and skills and very little metalworking. It will be a welcome addition to any woodworker's shop.

A large-drum thickness sander can provide even a small shop with the capacity to abrasive-plane and smooth wide stock. This sander, designed and built by Grit Laskin and David Wren, is economical to make: the drum and most parts were cut from 3/4-in.-thick particleboard.

Anatomy—Our sander incorporates elements of both wide-belt and small-diameter drum-style machines. The large-diameter sanding drum provides a lot of surface area, similar to a wide-belt sander, which extends sandpaper life. But because the single sheet of paper is wrapped around the drum, there's no need for an elaborate belt-tracking mechanism, as found on the wide-belt machines.

The large-diameter drum is made from separate discs that are cut and routed to shape and then glued together. A special grip mechanism, which will be described later, secures and tightens the sandpaper around the drum. To change sanding thickness, the sander's bed moves relative to the drum, not the other way around. The bed is hinged at the back end and rests on a threaded rod at the front, allowing adjustment. The workpiece is supported and guided by a feed board that slides along the bed. The feed board is moved manually, eliminating the need for a separate power-feed drive mechanism—keeping complex construction to a minimum.

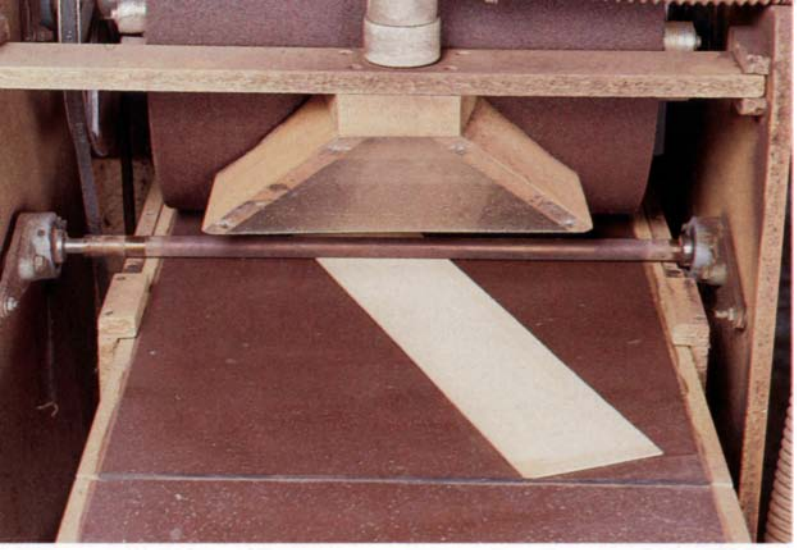
To keep costs down, most sander parts are 3/4-in.-thick particleboard. Other supplies needed for building the machine include flange bearings, a few pulleys and a 2-HP motor, all available from W.W. Grainger Inc., 5959 W. Howard St., Niles, Ill. 60648; (312) 647-8900. You'll also need strap hinges, springs and a few other supplies, which should be available from your local hardware or building-supply store.

Building the frame—The body or frame of our thickness sander is made up of nine pieces: two side panels; one back panel; a front strut and two reinforcing gussets; a dowel strut at the top edge; and two circular side reinforcements. All the pieces were cut to the dimensions given in figure 1; straight edges were cut on the tablesaw and curves on the bandsaw. The pieces were then assembled with glue and screws run into predrilled holes. The most sensible order for assembly is to first attach the reinforcing circles to the side panels, and then attach the back panel to the sides. Next take the front cross strut and mark the location for the threaded rod that will raise and lower the table. Drill a hole larger than the rod through the strut, and use a 1/2-in. chisel to mortise a space to inset nuts for the rod on both the top and bottom of the strut. Glue the nuts in place with five-minute epoxy while threading the rod through them, to make sure the threads align. When the epoxy has set, remove the rod, and glue and screw the strut to the frame, as well as the gussets to the sides and the strut. Also, glue and screw in the large dowel that reinforces the sides above the drum. Finally, attach a handle to the threaded rod. A simple block of wood is fine; you just want something that will enable you to turn the rod in small, incremental movements.

Bed and feed board—To ensure that the bed would be sturdy enough to resist the pressure of the drum without deflection, we made it from two pieces of particleboard glued and screwed together. Further reinforcement is provided by a thick hardwood cross brace that spans the infeed side of the bed and provides a bearing point for the adjustment rod. The photo above shows an additional curved piece of mahogany beneath the bed. Ignore this; it was an experiment on the first sander we built. You should locate the strut as shown in figure 1.

A feed board that directly supports and guides the workpiece during sanding rides atop the bed. The feed board is a piece of 3/4-in.-thick particleboard that's a little less than 1 1/2 in. narrower than the bed and long enough to support the workpiece, as well as engage the hold-down cleats after the workpiece is through the drum. For our sanding needs, a 53-in.-long feed board is long enough to support guitar side strips, which are normally 32 in. to 34 in. long.

To guide its travel along the bed, a 1/4-in.-deep by 3/4-in.-wide groove is dadoed along the center of the feed board's bottom. The groove accepts a 3/16-in.-thick guide strip that's screwed to the bed. Two cleats at both ends of the feed board capture it and keep it flat on an extended bed. To ensure smooth feed-board movement, a



To ensure that the sandpaper wears evenly, narrow workpieces are run through the sander on an angle. The spring-tensioned hold-down bar, just in front of the drum, puts downward pressure on the stock, to help keep it flat during sanding.

thin veneer shim between the cleats and the bed provides a bit of clearance. To keep the workpiece from slipping backward during sanding, a 3/16-in. hardwood stop (we used ebony) is inset into a 1/8-in.-deep groove in the feed board (see figure 1 on p. 80). The sandpaper sheet that you'll glue to the bed later, for drum truing, also helps keep the work in place during sanding. Finally, a semicircular slot cut into the feed board provides a hand grip for hauling it back after each pass.

Install the bed to the frame with two 6-in. strap hinges, bolted through the back of the sander. While marking the hinge holes, keep the bed square to the frame and as level as possible. The cross brace at the bed's infeed end should rest on the adjustment rod. Thread the rod in place, and where it contacts the brace, screw on a small square of Plexiglas or metal to reduce wear.

Making the drum—For convenience and economy, the sanding drum is also made from particleboard. To keep the drum from being physically unwieldy, yet still big enough to yield a large sanding surface, we chose a diameter of 16 in. This translates to a more than 4-ft. circumference, which provides an ample sanding surface. Because we needed to be able to sand a large guitar back or top, which can be more than 16 in. wide, we made the drum 18 in. wide.

The cylindrical drum is made by stacking 24, 3/4-in. particleboard discs, which are individually rough cut, template routed, and glued and screwed together (see figure 2 on the facing page). Later, the sandpaper clamp is added, and the drum is balanced and trued to the bed. But the first task in making the drum is to bandsaw each disc (a sabersaw is also good for this job), making each one slightly larger than its final diameter. Each disc is then trimmed to shape, including the sandpaper slot, using a piloted straight bit in a router and a 1/4-in.-thick Masonite template temporarily screwed to the disc to guide the cut.

To reduce the weight of the drum, we hollowed out most of the discs by sabersawing away all but a 2-in.-wide border around the perimeter of the disc and around the sandpaper-grip slot. Don't worry about making perfect cuts; the drum will be balanced later. The two outer discs and one in the center are left solid and are concentrically drilled to fit the drum's 3/4-in.-dia. steel shaft. The drum attaches to the shaft via a pair of 6-in. pulleys screwed to the outside discs. (Pulleys are available from a hardware store or from Grainger.) Drill three mounting holes through each pulley (easily done with a twist bit), slide the pulleys on the shaft, and use the holes as a template for drilling pilot holes. Then screw the pulleys on.

Now you're ready to glue and screw the discs together one at a time. Align the sandpaper slot and the outer edges of each successive disc so that the stack is as cylindrical as possible. The two outer discs, with pulleys attached, are glued on last. As a final touch, slightly recess the leading edge of the drum around the sandpaper slot (see the detail in figure 2). Using a rasp or file, gently round the first 1/2 in. on the leading edge of the slot, to prevent premature wear in that area.

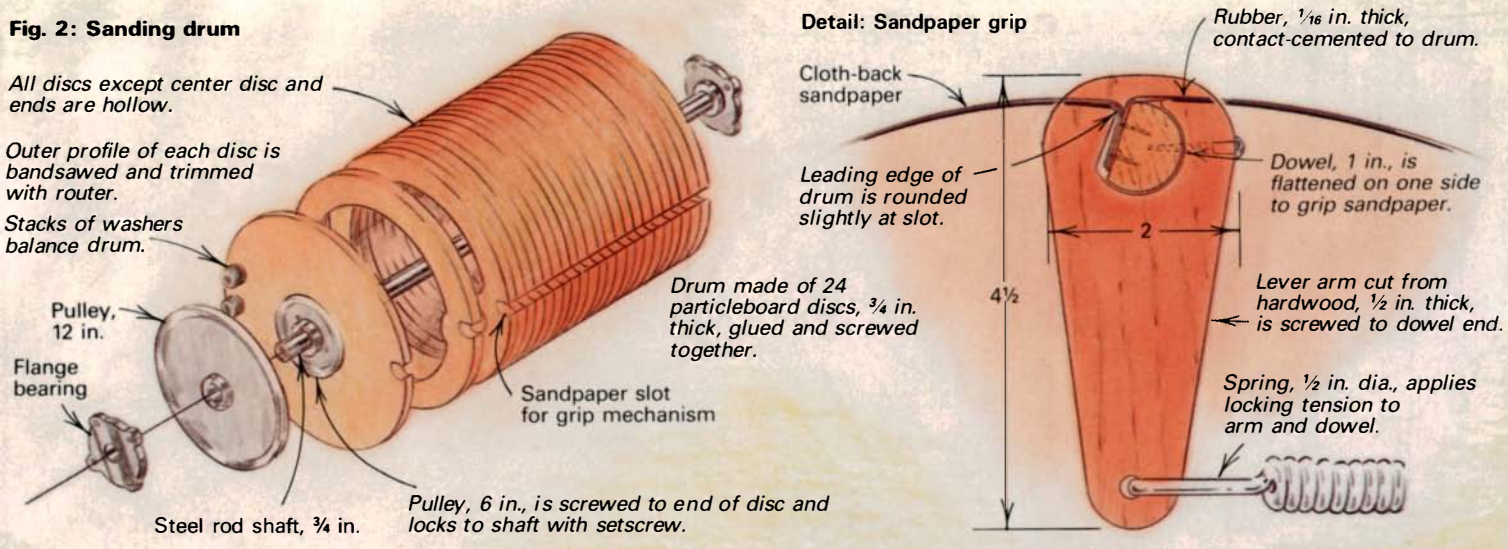
The sandpaper grip—To easily attach or remove the cloth-back sandpaper that wraps around the drum, we devised a simple sandpaper grip. Start with a 1-in. hardwood dowel that's at least as long as the drum. Plane one side of the dowel flat, until you're almost halfway through, and then drill a row of small pilot holes on the leading edge of the dowel flat for 3/4-in.-long brads, which keep the sandpaper from slipping. Nip the brad heads with wire cutters, leaving 1/8-in.-high, sharply pointed studs. Trim the dowel to length, leaving 1/2 in. protruding from each side of the drum. The ends of the dowel are attached to lever arms cut from hardwood scraps, as shown in the detail in figure 2. With the dowel in place in the slot, screw the arms on as shown and attach one end of a spring to the bottom of each arm with an eye hook that's been pried open slightly. Stretch the springs out about one-third more than their relaxed length, mark the spot and insert a small, sturdy cup hook. Bend or slip the end of the spring around the hook and the grip is complete. To change sandpaper, you simply lift the lever arm, which releases the ends of the cloth.

Mounting the drum—The thickness-sander drum rotates on a 3/4-in.-dia. steel shaft (a 5/8-in. shaft will also work) supported at both ends by four-hole flange bearings (Grainger #5X698) bolted to the sides of the sander. The holes drilled in the sides for the bolts that hold each flange should be slightly larger than the attaching bolts themselves, to give you a bit of flexibility in aligning the drum, should you need it.

To mount the drum, first draw a vertical centerline on the inside faces of the side panel. This helps you position the drum. Now, slip the drum onto its shaft and lock it by tightening the setscrews on the two pulleys screwed to the drum. The 12-in. pulley and the V-belt that will drive the drum can now be attached, but you won't tighten the setscrew until the pulleys have been aligned with the motor later. Next attach the flange bearings to the shaft ends by tightening the setscrews in each. With the bed level and the feed board in place, lay a piece of wood, approximately 1/8 in. thick, on top of the feed board. Lift the drum into position, resting it on the wood, center the flanges to your pencil lines and mark the position of the flange's bolt holes. Finally, remove the drum, drill the holes, and then realign the drum and bolt it in place.

Prior to any further work with the drum, the motor must be mounted to the thickness-sander frame and wired to a switch. We chose a 2-HP, 1,750-RPM, single-phase motor, which has more than enough power for our needs. The motor base is bolted directly to the back of the sander, and the switch (we used a standard motor switch, rated to handle the amperage of the motor) is screwed onto one of the particleboard gussets on the front of the sander. A small 3-in. pulley is mounted on the motor shaft and aligned with the 12-in. pulley, and then both pulleys are tightened on their shafts. The smaller pulley driving the larger one produces a slow drum speed, which makes the sander suitable for hand-feeding.

Balancing and truing the drum—The extra bulk of the drum around the sandpaper-grip mechanism throws the drum out of rotational balance. To correct that, we screwed two stacks of large fender washers on each end disc directly opposite the grip, a process similar to adding balancing weights to car tires (see figure 2).



A hole drilled through the side of the frame allowed screwdriver access and made it easy for us to add weight during balancing. We just kept spinning the drum and adding washers until it came to rest at different spots after each spin—indicating that it was balanced. When you do this, make sure the V-belt is disconnected and add the same number of washers to each side of the drum; our sander took two stacks of 11 on each side, 44 washers in all.

Now comes the fun part: truing the drum. Start by contact-cementing a sheet of 40-grit cloth-back sandpaper to the feed board. With the drum under power, crank the bed up until the paper bites into the particleboard drum and sands down the high spots. Take a few subsequent passes, raising the bed and moving the feed board so that you use a fresh area on the sandpaper each time. Repeat the process until every bit of the drum has been sanded. The drum should now be perfectly even across its width and parallel to the bed. Recheck the balance, especially if you removed a great deal of material during truing.

To complete the drum, glue on a 1/16-in.-thick dense rubber sheet with contact cement. (For rubber sheets, check with your local building-supply store or in the yellow pages under "rubber products.") The rubber serves as a backing for the sandpaper, gives the paper a better bite and extends its life. The trick to applying the rubber is working slowly and smoothing it down as you go, to avoid air bubbles. Start with a rubber sheet that's wider than the drum and longer than its circumference; any excess can be trimmed with a sharp knife after gluing.

Hold-down bar—The hold-down mechanism is not an absolute requirement, but it's helpful, especially if you plan to sand very thin boards. The hold-down bar flattens uneven or slightly warped boards before they're sanded by the drum. The mechanism consists of a steel bar that's held loosely at either end by spring-tensioned arms that secure the workpiece tightly against the feed board as it's fed into the sanding drum. Start by covering a ½-in.-dia. steel rod with vinyl tubing, available from a conveyor-supply company. (You can substitute rubber tubing or wrap the rod with duct tape.) Leave the ends of the rod bare, as these are set into a pair of two-hole flange bearings (Grainger #4X727). These bearings are self-aligning, which means that one side can move up or down independently and not inhibit the rolling motion of the rod as uneven stock is fed through. The flange bearings are bolted to two small arms made from ¼-in.-thick Masonite that are bolted loosely to the frame, to allow up-and-down movement (see figure 1 on p. 80). Springs at each end, which pull the arms and bar down, are attached in similar fashion to the sandpaper-grip springs.

The last element you'll need to deal with before you've completed your thickness sander is dust collection. The small shroud on the original machine we built, shown in the photo on p. 81, was woefully inadequate and captured no more than 20% of the dust the sander produced. So we recommend that you equip your sander with a shroud that fully encloses the top of the machine. A piece of thin, flexible sheet metal, such as sheet aluminum (available at most hardware stores), is ideal for this job. The connection port for a shop-vacuum hose should be located on the outfeed side of the machine.

Using the sander—We've had good success using 60-grit cloth-back sanding belts. We buy this material in rolls from a local abrasives supplier; you could also buy a 36-in.-wide by 60-in.-long thickness-sander belt from The Sanding Catalog, Box 5069, Hickory, N.C. 28603; (800) 228-0000. By tearing the belt's width and length in half, you have enough for two 18-in.-wide by 52¼-in.-long sheets. This length covers the 16-in.-dia. drum (actually 16⅛ in. with rubber covering) and includes about ¾ in. extra on each end for the sandpaper grip. Secure the paper tightly in the grip, and check it occasionally during sanding to ensure it hasn't loosened. Also make sure to clean the sandpaper periodically with a regular rubber belt-cleaning stick.

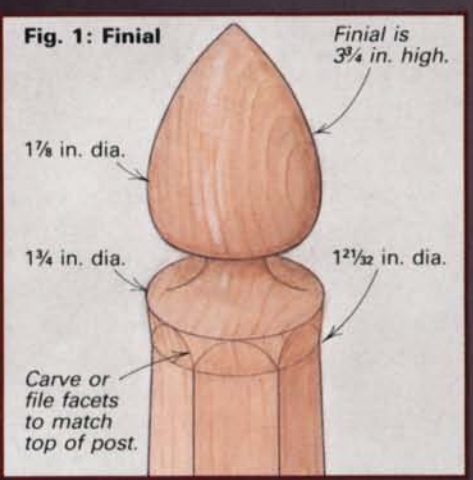
To use the sander, slide the feed board out on the infeed side, and set one end of the workpiece against the stop and the other under the hold-down bar. To take advantage of the full width of the paper when sanding narrow stock, you can set the stock on the feed board at an angle (see the photo on the facing page). Now set the bed height by turning the adjustment handle. Eyeball the gap between the feed board and drum, and adjust the bed height to set the degree of sanding desired. Now switch on the motor and take a trial pass, pushing the stock through in one smooth, continuous motion. To cut down on vibration and to keep the sander from moving, we bolted the machine to a wall. Also, if your floor is slippery, you may find it easier to push the feed board with your hips while grabbing handles—regular kitchen-type drawer pulls—screwed to the frame. Beyond that, you now only have to deal with the particular idiosyncrasies of your own sander. All homemade tools have their own personalities, and once you learn their quirks, a good working relationship will quickly follow. □

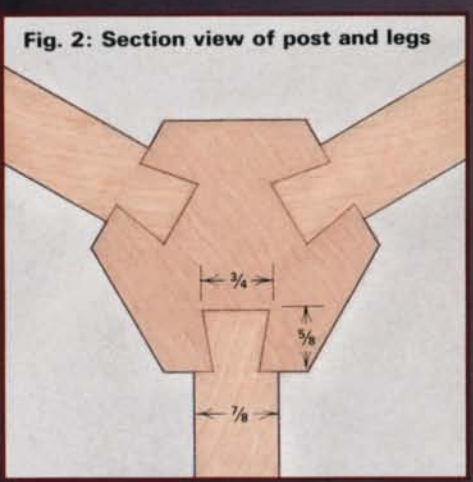
Grit Laskin is a guitarmaker, author and musician. David Wren is a guitar restorer and builder. Both live and work in Toronto, Ont., Canada. A kit for the drum sander is available from W.G. Laskin, 192 Dupont St., Rear, Toronto, Ont., Canada M5R 2E6.

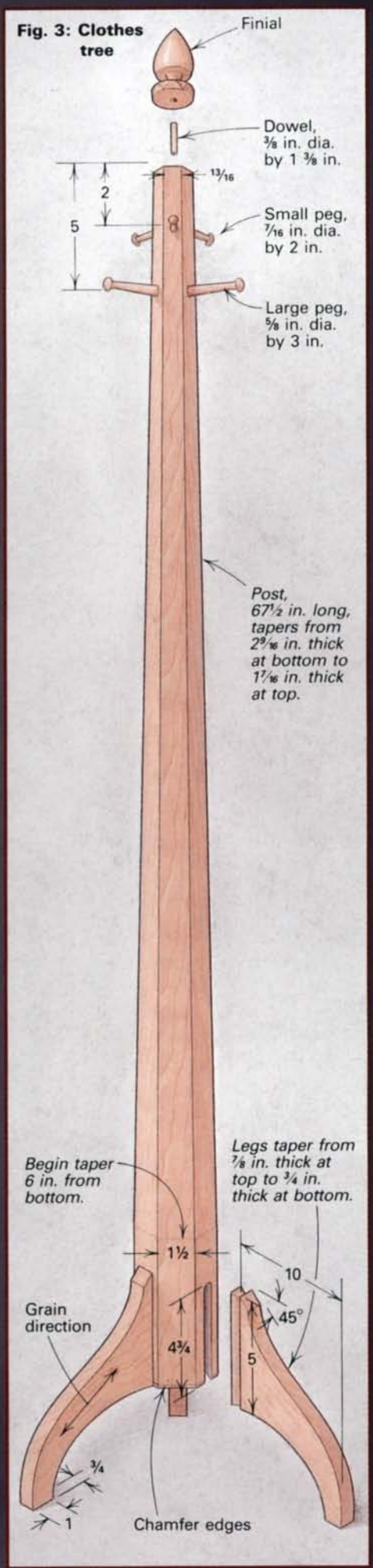
A Cherry Clothes Tree

A simple project to hang your hat on

by Christian H. Becksvoort







The author borrowed design details from a number of pieces to create this cherry clothes tree. The legs are from a Shaker round stand, the post and finial from a pencil-post bed and the pegs from a Shaker pegged wall board.

Recently I was commissioned to build a bedroom clothes tree to complement a cherry pencil-post bed I had already made (*FWW* #76, pp. 32-37). My initial reaction was to copy the bed's eight-sided posts. An eight-sided clothes-tree post with four legs seemed logical, but no matter what kind of legs I drew, none looked right. I even considered gluing up a lathe-turned flattened cone for a base, but this was too heavy visually.

To lighten the appearance and conform to the simple lines of the bed, I decided on a tapered hexagonal post with three legs secured with sliding dovetails. I made full-size cardboard cutouts so I could determine the best shape for the legs, and settled on the cyma legs, one of my favorite styles, taken from a Shaker round stand. Shaker pegs were a logical choice for hangers. I used three 3-in.-long pegs on the same facets as the legs and three 2-in.-long pegs higher up on the remaining three facets. To top off the post, I used the same modified acorn finial as the one on the pencil-post bed. This finial design was originally used to top off the back legs on chairs by Robert Wagan of the Mt. Lebanon Shaker community in New York.

Making the post—To build the clothes tree, I started by first ripping the post stock into a hexagon with 1½-in.-wide facets and then tapering it on my jointer. To prepare the stock, crosscut a 3½-in.-wide piece of ¾ cherry to 67½ in. long. Joint the wide face of the stock flat and plane it to 2 9/16 in. thick. The 1½-in.-wide facets at the base of the post predetermine the measurements: 2 9/16 in. from face to face and 2 15/16 in. from point to point (see figure 4). To lay out the hexagon, I divided the thickness of the stock in half and scribed a centerline across the bottom. Using a sliding T-bevel set at 120°, I drew the lines shown in figure 4 to define the first two cuts.

Before ripping the bevels on the tablesaw, move the fence to the side of the blade opposite the direction the blade tilts, raise the blade about 1½ in. and then set it to 30°. Adjust the fence, as shown in figure 4, so the blade cuts on the waste side of the layout line and the cut-off scrap is not trapped between the fence and the blade. After making the first cut, I flipped the stock end for end, keeping the same edge against the fence, and ripped the second facet. Since I didn't change the fence position, both cuts met at the centerline. Now, on both faces of the stock, draw a pencil mark 1½ in. from the cuts just made and, using the sliding T-bevel, draw the lines on the end of the stock for the third and fourth cuts. As you did for the first two cuts, adjust the fence and make the third cut, and then flip the stock end for end and rip the last bevel.

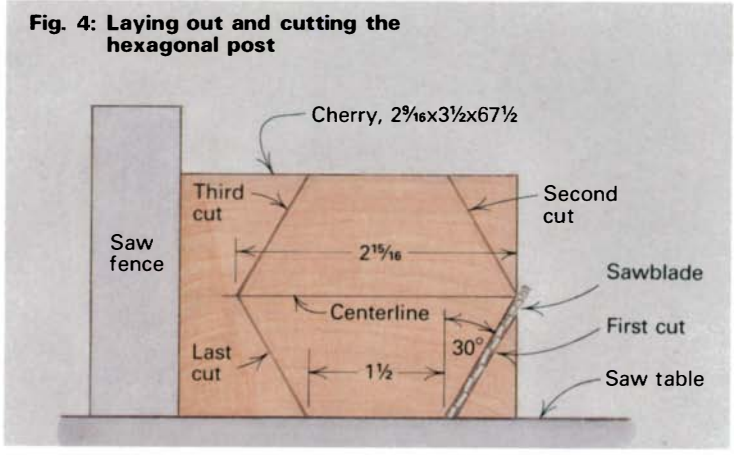
I prefer tapering the post on the jointer because it's quick, easy and produces smooth surfaces. You want to leave 6 in. of untapered stock at the bottom of the post, for dovetailing the legs, and then taper the remainder from 2 9/16 in. thick to 1 7/16 in. thick at the top. This requires removing 9/16 in. from each facet, which I do in two passes with the jointer set to take a 9/32-in.-deep cut. First, draw a reference line at 30¾ in. from the top on each facet. Then with the top of the post at the end of the infeed table, lower the reference mark onto the cutter and feed the post, bottom end first, through the cutter. If your jointer doesn't have this capacity, make multiple passes of lighter cuts, but taper each facet equally. Tapering can also be done with a bandsaw and handplane, but this is difficult because the bandsaw table must be tilted to 30°. When you are finished tapering, sand out planer marks or sawmarks, easing the transition between the taper and the straight surface at the base. (See *FWW* #54, p. 54, for more on tapering on a jointer.) A word of advice regardless of your tapering method: Mark the tapers before cutting them and draw the smaller hexagon, 13/16 in. per side, on the top of the post. As the tapering progresses, the end view becomes an optical illusion, and without these marks, it is difficult to determine which facets have been tapered.

Shaping and dovetailing the legs—The three legs that support the clothes tree are cut from ⅞-in.-thick stock, with the grain running the length of the leg, and dovetailed into the post. Develop a pattern from figure 3 and then trace it onto the stock and bandsaw the three legs. Be sure that the bottom of the leg and the edge that will be dovetailed into the post are perpendicular and that this edge is perfectly straight. I used a drum sander attachment on my lathe to sand the curve underneath the leg flat and to shape the curve on the top to a crowned profile.

When the three legs are sanded, it's time to cut the dovetails, which can be done on a table-mounted router or by hand. Using a router-table setup is less time-consuming, but not as much fun. I'll discuss both methods, since I use both in different circumstances.

To rout sockets and pins for sliding dovetails, I use a ¾-in. dovetail bit with a 14° angle chucked in my table-mounted router. Set the bit for a ⅝-in.-deep cut and adjust the fence so the cutter is centered on a facet of the post laying flat on the table. I clamp a second fence of scrapwood on the other side of the post to hold it in place, and then clamp a stop to the fence 4 in. past the router bit to control these cuts. Hold the post firmly down on the table

Fig. 4: Laying out and cutting the hexagonal post



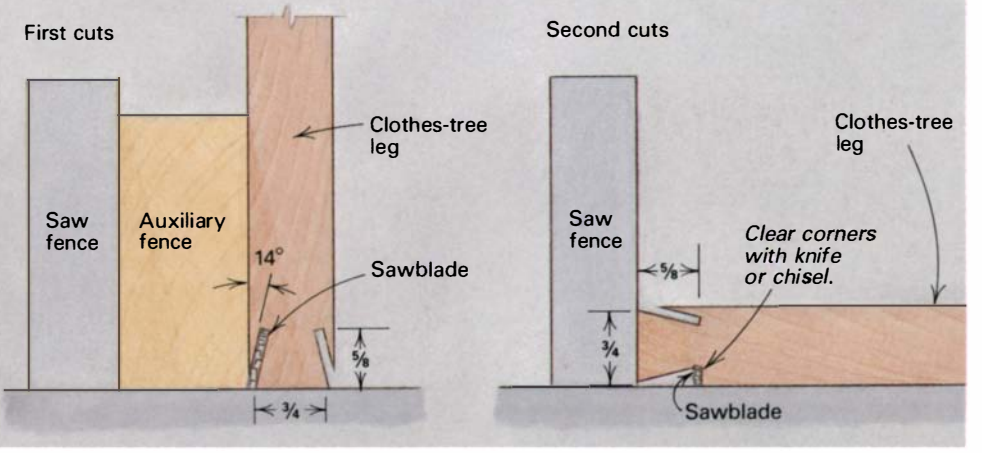
Above: Fences on two sides of the post and a stop block to control the length of cut ensure accurate and consistent dovetail slots for joining the legs to the post.

Right: Becksvoort cuts the dovetail pins on the leg ends quickly after setting the fence through a series of trial-and-error tests on a scrap block.

Photo previous page: Kip Brundage; drawings: Vince Babak

Using the dovetail pin on the leg as a guide, the author scribes the layout for the slot, which is cut with a dovetail saw and then chopped with chisels.

Fig. 5: Ripping dovetail pins



and slide it into the cutter, as shown in the top photo on the previous page, until it hits the stop. Gently back out the post and repeat this twice more on the alternate facets until you've cut 4¾-in.-long dovetail sockets for the three legs.

To cut matching pins on the legs, remove the stop and the second fence without changing the cutter height. Add a wooden auxiliary face to the fence and move this face into the cutter until a little less than ⅛ in. of the cutter is exposed. Then make a test run: slide a scrap block past the cutter, flip it over, cut the other side and fit it into one of the sockets. If the fit is too tight, move the fence back a hair and recut a scrap. If the fit is too loose, move the fence into the cutter and test again with another scrap. Once you've found the correct position for the fence, cut the pins on the three legs, as shown in the bottom, right photo on the previous page.

If I'm not routing the dovetails, I usually rip the pins on the leg first and then handsaw or chisel the slots to fit. To do this, begin by setting the tablesaw blade to between 12° and 14°, so that it's just under ⅝ in. high, and by adjusting the fence to cut a pin about ¾ in. wide (see figure 5). Cut both sides of the pins on all three legs. Then reset the blade to 90°, lower it and cut the waste on the shoulders. The two sawcuts should just meet, but not overlap. The remaining waste in the corner must be cleaned out with a knife or chisel.

To lay out the dovetail slot, position the leg so that the pin rests on the bottom of the post, centered on one of the facets, with its shoulders touching the edge of the post. Mark around the pin with a knife, as shown in the photo above, and use a square to transfer these lines 4¾ in. down the face of the facet. With a dovetail saw, cut the slot on the waste side of the lines, being careful not to saw beyond the 4¾-in. stopping mark.

Clearing the waste from the slot takes about 30 minutes, if the grain is straight. First, anchor the post firmly in a vise with padding so it won't be marred. Then make a stop cut with a ½-in. chisel in the end of the slot. Next, waste the bulk of material from the post, beginning at the bottom and working to the stopped cut. To clean the bottom and sides to fit, use a no. 2 pencil and blacken the first ½ in. of the bottom and two sides of the pin. Force the pin into the slot until it binds and then withdraw it. The pencil smudges in the slot reveal tight areas where binding occurs. Shave these areas and slightly beyond with sharp ½-in., ⅝-in. and ¾-in. paring chisels. The pin slides about 1/16 in. to ⅛ in. further into the slot with each fitting. Continue the trial-and-trim technique until the pin hits the end of the slot. Although the fit must be tight, hand pressure should be enough to slide the leg into place. However, it may take a few mallet taps to get the leg out. Because each leg will fit slightly differently, I marked the slot and leg so they could be paired again during assembly.

When all the legs were fitted, I handsawed the flat area on top of each leg to approximately 45°. Taper the leg from its ⅞-in. thickness at the dovetail to ¾ in. at the bottom of the foot. Now finish-sand all three legs and glue them into their respective slots. Because of this tight fit and the self-wedging action of the dovetails, clamping should not be necessary. When the glue has dried, sand the bottom sides of the three legs flush with the post.

Making and installing the pegs and finial—Although I turned the pegs for my clothes tree on a lathe, similar-size cherry pegs are available from Shaker Workshops (Box 1028, Concord, Mass. 01742; 617-646-8985) or Cherry Tree Toys, Inc. (Box 369, Belmont, Ohio 43718; 614-484-4363). Be sure you buy the pegs before drilling the post so the holes are the right size. My large pegs, located 5 in. from the top on the same facets as the legs, have ½-in.-dia. tenons, while the small ones, located 2 in. from the top on the remaining three facets, have ⅜-in.-dia. tenons. Lay out the holes on the centerline of each facet, and then tilt the table on the drill press to compensate for the taper of the post so that the facet lies perpendicular to the drill bit. Position the post under the bit and clamp it into place. Drill the ½-in. holes about ⅝ in. deep and the ⅜-in. holes ½ in. deep. I've found that the top hole for mounting the finial is best drilled with a doweling jig. To do this, find the center of the top and locate the barrel of the jig directly over the center. This is easiest if you insert a ⅜-in.-dia. brad-point bit into the barrel. Because the post is tapered, small shims are required at the top to mount the doweling jig.

To turn the pegs on the lathe, cut the tenons with a plug cutter on the drill press, and then mount the blank in a chuck, steadying it with the tailstock center. After you turn the pegs, cut off the waste, back off the tailstock center and finish-sand the pegs on the lathe. Apply a dab of glue to each tenon and glue the pegs into their holes.

The 1⅞-in.-dia. by 3¾-in.-long finial is turned from a 2x2x5 cherry blank. Before mounting the blank on the lathe, drill a ⅜-in.-dia. by ¾-in.-deep hole in the bottom of the finial for doweling it on the post. The finial flares slightly as it goes up from its base, which should be the same diameter as the corner-to-corner measurement at the top of the post. After the finial is turned, glue a ⅜-in.-dia. by 1⅜-in.-long dowel into the top of the post. Position the finial on the dowel and with a knife, outline the top of the post on the bottom of the finial. Carve or file six flat, half-oval facets into the base of the finial, as shown in figure 1. This provides a smooth transition from the turned finial to the hexagonal post. When the fit is perfect, sand the finial smooth, glue it to the post and apply the finish of your choice. I like the soft glow of a hand-rubbed oil finish. □

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Frame-and-Panel Carcases

A classic solution for sound construction

by David Savage

The haunch on the side of the tenon plugs the panel groove, and it stiffens the whole joint. Colored stick-on dots placed on the parts as they are machined make it easier to maintain the correct relationship of the pieces during assembly.

As long as we are daft enough to work in solid wood, we must contend with the fact that wood is constantly altering its width. Since wood moves only across its width, and not along its length, you can easily set up cross-grain constructions that restrict movement. This inevitably leads to disaster because the forces involved are immense. Just remember how ancient stoneworkers split marble slabs from a mountainside. They would drill a hole, insert one dry wooden peg and add water; the expanding peg would do the rest.

An unknown worker in medieval Europe solved this problem when he discovered the frame-and-panel construction. His goal had been to build a coffer that wouldn't self-destruct. The sides and tops of these coffers usually split because traditional slab construction techniques called for rigidly fastening wide boards together with metal or wood cleats. I've always imagined that after experimenting with heavier and stronger slabs, our medieval friend realized that no panel was strong enough to resist splitting. Eventually he found he could build a strong frame from relatively narrow components and fill the spaces between the frame members with separate panels. The key to the system was fitting the panels loosely in grooves cut into the frame; this left the panels free to expand during wetter seasons and to contract when the humidity dropped.

This medieval discovery dramatically changed the history of furniture design, and the frame-and-panel system is as valuable today as it was 500 years ago. In fact, the technique has been called a hallmark of British furnituremakers. Our furniture design, at its best, tends toward quiet confidence. Our oaks, elms and other native timbers are the envy of the world, and we like to use them with restraint and in the solid. Our weather is so changeable—damp and foggy one day, bright and dry the next—that if we didn't use special techniques, such as frame and panel, most of our best carcase work would likely split right down the middle. Although contemporary woodworkers might make panels from plywood, particleboard, medium-density fiberboard or plastics (man-made, dimensionally stable materials which can fulfill the designer's dreams more cheaply and more efficiently than solid wood), I still favor solid wood for my work, such as the piece shown in the top photo on the next page. So I will concentrate on solid techniques in this article.

Once you master the frame and panel, you might like to build a cabinet like mine. The basic dimensions are shown in figure 1 on p. 89. As you can see, the piece is basically two boxes with doors. The two boxes are connected with a simple frame-like middle section, just like the one that forms the base.

Pros and cons of frame and panel—In addition to accommodating wood movement, frame-and-panel constructions, such as the one in figure 2 on p. 89, enable the woodworker to control the graphics of the timber better than is possible with slab constructions. Frequently, the most exciting figure in a walnut board, for example, is next to a natural defect. With frame-and-panel systems, you can cut around the defects and produce small clear panels to fit within the frames. Highly figured but structurally weak timber can also be supported by a strong frame. If the frame is designed by someone with a sensitive eye for rhythm and proportion, light and dark color, and tone, the frame will create lines that enhance the beauty of the individual panels and draw the components into a cohesive whole. The detailing on the frames and the surface variations of the fielded panels also create patterns of light and shadows that are infinitely more complex and interesting to the eye than any flat surface could be.

The design possibilities of frame-and-panel construction are virtually infinite, especially when you consider that you are not limited to vertical components, such as doors, cabinet backs and sides. The frame-and-panel unit can be tipped horizontally, as shown in the bottom photo on the next page, to form a surface that can be

Photo above: John Gollop

Photo: John Gollop

The author's double cabinet of quartersawn English oak is a simple piece that relies heavily on sensitively judged proportions. Note how the bottom stiles in both doors are wider than the rails and how they relate visually to the dark midsection and base. The piece was designed by Savage and built in his shop by Malcolm Vaughan.

This blanket chest by Luke Hughes has both horizontal and vertical framed units that support decorative veneered plywood panels. Reeded molding on the mitered corners hides the leg joint on the chest, which is 42½ in. wide, 21½ in. deep and 20 in. high.

Photo: Luke Hughes

built upon and divided at will. Since the strength of the furniture is in the frame, the panels are usually thinner than comparable slabs; so the piece has strength without excess weight.

Of course, frame-and-panel assemblies do have certain disadvantages. They are slow and quite expensive to build. Producing a frame and panel demands considerable skill and precise machine work, if you hope to assemble the unit without a great deal of costly, time-consuming fitting and fiddling. The problems seem even greater when you progress from simple doors and backs to frame-and-panel carcases, which involve joining frames, rails or panels at the corner of a leg. These projects can be a real muddle of tenons, grooves and dovetails, but they're actually quite manageable, as shown in the drawing on the facing page, if you follow the correct sequence for laying out and cutting the joints.

Building frames and panels—I recommend that you build a pair of frame-and-panel doors rather than attempt a carcase as your first project. Building doors is a good exercise for developing skills, and once you can build good doors, frame-and-panel carcases will be a lot more manageable. Since I'm running a business, I favor machine techniques, such as hollow-chisel mortisers for cutting mortises and tablesaw jigs for tenons. I groove frames with a dado blade on the tablesaw, and raise panels and cut moldings on a shaper. You could, of course, do all the work with hand tools or any combination of hand tool and machine techniques, depending upon how your shop is equipped. In any case, there is no room for sloppy, inaccurate work. The key is to produce quality work, efficiently and quickly, because quality divorced from speed is meaningless in almost any situation.

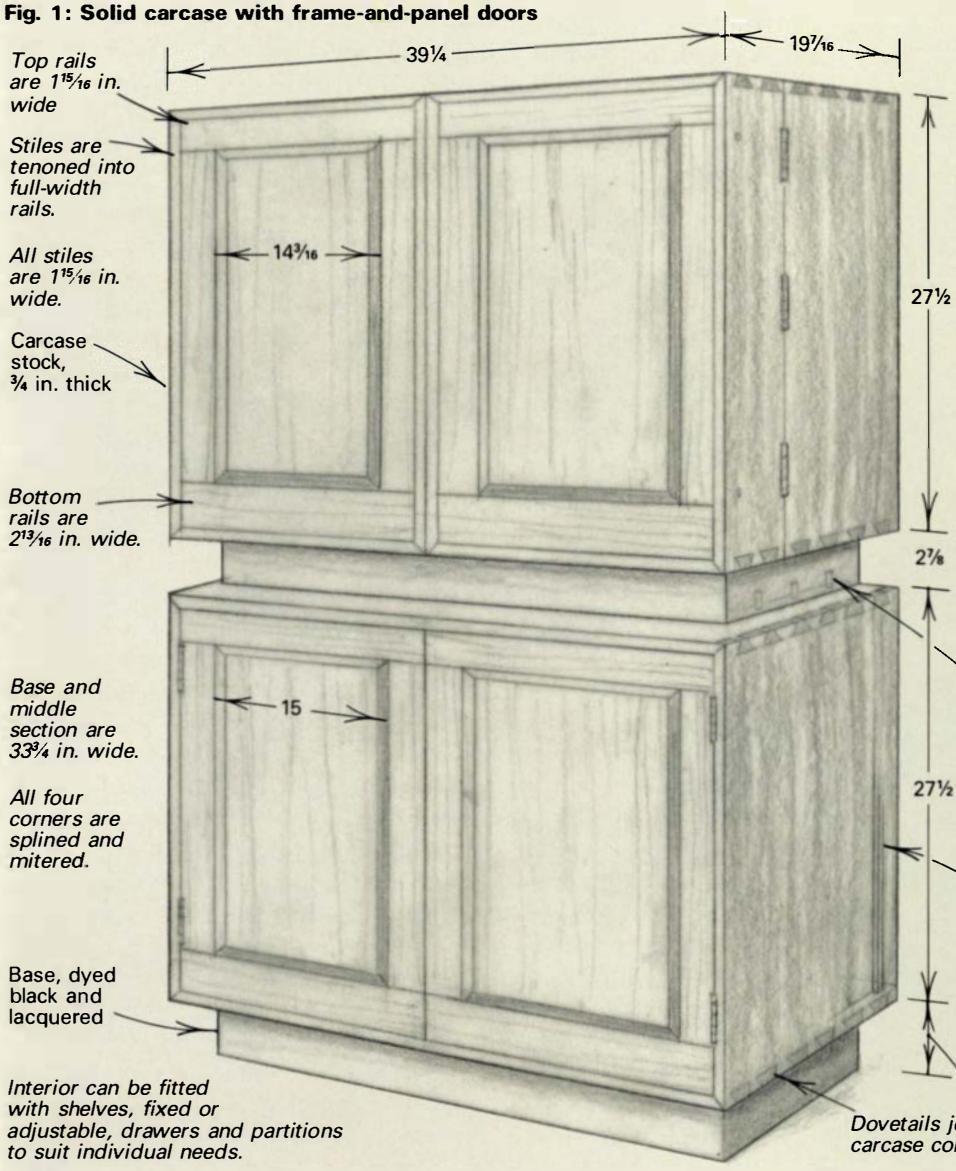
With large doors and architectural fittings, you generally mortise the stiles and fit the rails to them. This keeps the endgrain of the rails out of sight and lets you clamp across the narrowest part of the structure. With smaller cabinet doors, you could run the rails across both doors to maintain a continuous figure in the timber, and that brings us to the delicate business of design, wood selection and joinery layout.

Design considerations—Design can be an intimidating word, but it's just the first part of any job. In my shop we always work from drawings. The more complicated the piece, the more detailed the plans. Experienced craftsmen can build from scale drawings, but others are far better off to make large-scale or full-size versions. We always make our sketches on thin sheets of plywood, which can be dusted off when needed and propped behind the bench when not. A paper drawing is just a nuisance.

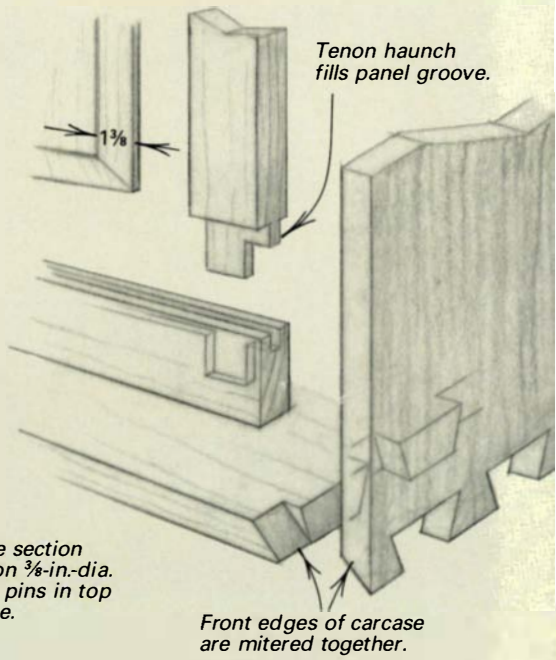
Now comes the fun. Design drawing is the process of resolving unknowns: the width of stiles and rails, the length of tenons and other joinery, the look of the completed structure, and other details. First, work out the proportions. Decide on the width of the stiles, bearing in mind that visually they will have a double width where the doors meet. The top rail is usually the same width as the stiles, but the bottom rail can be a little bit wider. So why make the bottom rail wider? Pure aesthetics—it prevents the visual illusion of the panel dropping out of the frame. I cannot tell you to make your stiles 2 in. wide and the bottom rail 2½ in. wide, because you must determine these measurements to suit each individual project. But proportioning the frame is a delicate job: 1/16 in. can make the difference between a very special piece and something rather ordinary.

Make the drawing with two different sides: use the left to resolve visual problems and the right to resolve technical problems. On the left you'll play with light and shade, rhythm and movement. Here you control the pace and manner in which the eye moves across the surface of your furniture. Think of the relationship between the different

Fig. 1: Solid carcase with frame-and-panel doors



Detail: Carcase corner



Detail: Section view of base

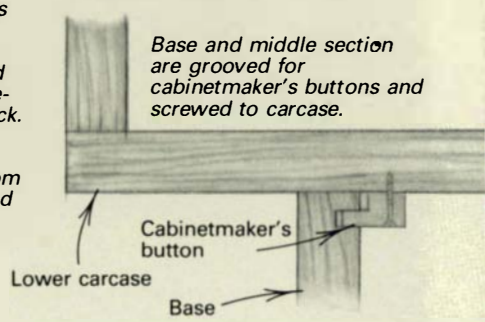
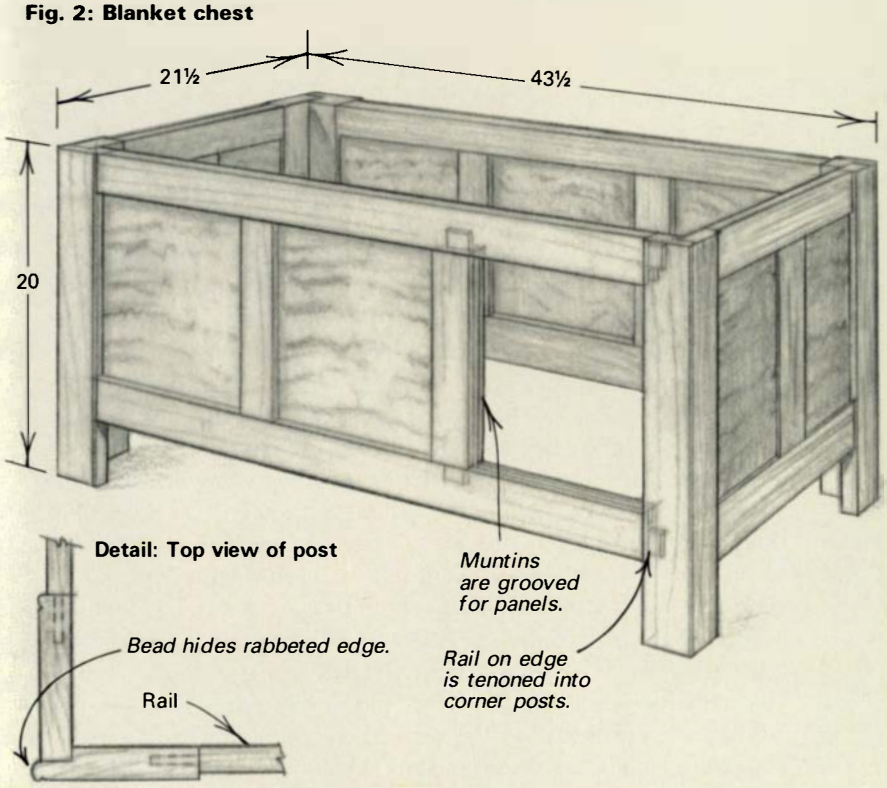
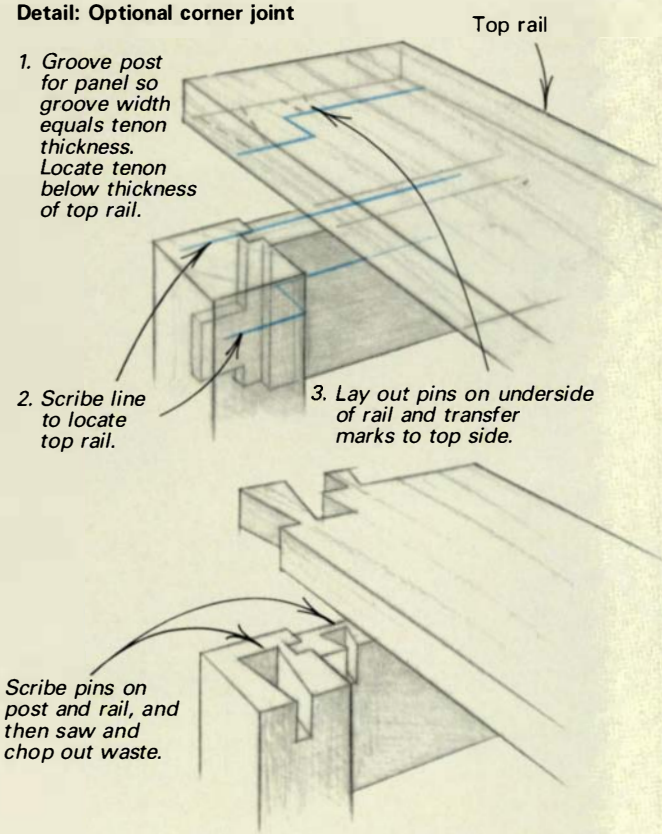


Fig. 2: Blanket chest



Detail: Top view of post

Detail: Optional corner joint



Drawing: Kathleen Rushton

Photo: James Jackson

The hyedua (ogea) and pearwood in Martin Grierson's collector's cabinet create contrasting frames and panels. The case's mitered corners are tapered to lead the eye into the panel. The cabinet back is a frame with wide pear panels for an uninterrupted surface.

Alan Peters built this chest of drawers in solid English walnut with ebony details. The horizontal frame-and-panel units supporting the drawers allow flexibility for deciding where to divide compartments. The dividers and uprights are doweled into the horizontal units.

Photo: Alan Peters

accents as musical notes in a score. Decide on the width of the fields for the individual panels. Experiment with the visual rhythm of differently spaced verticals. Examine the effects of various moldings on light and shade. Literally play around. Creative thought has many of the same features as children's play, so relax and enjoy the process. What feels right will probably look right and be right.

The right side of the drawing should resolve the technical questions of joinery. The object is to think through the building process so you can comprehend how things will be done. Design with a tooling catalog at your elbow, and do not design a groove of 5/16 in. if you don't have a cutter that size. Make the groove match the 1/4-in. or 3/8-in. cutter you own. Assess, for example, the position of the panel in relation to the joints. For expansion, allow the groove to be 1/8 in. or so deeper than the panel held within it. You should also locate the panels slightly below the surface of the frame, so you can clean up the assembled frame without marring the face of the panel. It helps to draw a full-scale cross section of this area since the groove, panel width and molding are so closely interrelated.

Some general technical points may be of assistance. Make grooves and mortises and tenons one-third of the frame thickness, and place them exactly in the center of the thickness. Draw your tenons 1/8 in. less in length than the depth of their mortises. Do not be tempted to make deeper mortises in the wider bottom rail—it only complicates the job. The most important thing to grasp is the function of the haunch, shown in the photo on p. 87. This little so-and-so is only there to plug a hole where the groove in the frame carries through to the end. Making stopped grooves is a real bore—these haunches fill the gap and stiffen the tenon joint at the same time.

When sketching out the panels, be sure to allow for expansion or contraction after they leave your shop. Near my home in Devon, which is on the English channel and very damp, I can be fairly certain that panels will not expand after leaving my shop, but you must make an assessment of the relative humidity in your area. The panels must fit in the frame loosely so the wood can expand and contract with the seasons. The amount of space between the panel and the bottom of the frame groove varies, but generally you should leave at least 1/16 in. all around in a damp environment and 1/8 in. to 1/4 in. in a dry season. Once you've worked out all the details on your drawing, you can use it to make up a cutting list.

Roughing out stock—Spend some time selecting the timber, and keep in mind that straight-grained timber is the safest choice for frames. When you've sorted through the stock, machine the frames before final-dimensioning the panels. At this time you should also cut several test pieces. These are not just scraps, but are short pieces that should be grooved and dimensioned just like the furniture components, so they can be used to set up the machines and mark out all the joints, thereby saving time and minimizing waste. You must be very accurate when crosscutting, ripping and thicknessing stock. Cleaning up and fitting operations will remove only a shaving; so trust your drawing and set the machines accordingly. The frames can be laid over the timber for the panels so you can choose the visual graphics of the panels more accurately.

Rather than cut the rails to length at the beginning, I make both doors as one large piece and cut them apart later. This saves time and ensures that the figure and color of timber is unified. I clamp the two rails together and mark out the mortises, scribing across both top and bottom rails with a sharp marking knife. To minimize errors when machining, I pencil over the waste sections. In measuring out the stock, remember to leave about 1 in. at each end of the rails for horns and 3/16 in. for the sawkerf separating the two doors. The horns protect the mortise and minimize the chance of breaking the joint when clamps are applied.

Now set up your mortising gauge and lay out the joint in the exact center of the rail. This makes it easier to locate the tenons and the grooves in the frame. As added insurance, always gauge from the same face of each piece, usually the face that will end up not showing. To simplify this operation, I arrange the stock so all the non-visible sides are facing down. After laying out the mortises with a marking gauge, I chop all the joints in the top rail with my hollow-chisel mortiser, readjust the depth stop to account for added width of the bottom rails and chop the mortises in those pieces.

It's essential that the stiles are crosscut exactly, and I mean exactly, the same length because the shoulders are gauged from the ends when tenons are cut on a tablesaw. For safety, attach a high auxiliary fence to the regular rip fence, as well as to a sliding carriage so you can move the pieces on end past the blade. You can make your own sliding carriage, as discussed in *FWW* #60, p. 12, or buy a standard tenoning jig. Resist the temptation to cut the tenons freehand; otherwise you risk a dangerous throwback. You can also rout the tenons or cut them by making multiple passes with the piece laid flat and supported by the miter gauge. Cut a tenon on a test piece and check its fit in your mortise. Adjust your setup until the tenon makes a friction fit into its mortise. The fit should not be too tight because the glue will swell it slightly.

Before cutting the tenon shoulders, use the test pieces to set the blade so it just kisses the tenon. Then set the rip fence to the length of the tenon and guide the work past the blade with the miter gauge or sliding table. It is important not to cut off all the waste material in a single pass. Instead, remove half the waste with the first pass, and then butt the end of the tenon stock against the miter gauge, as shown in the bottom photo at right, to remove the rest of the waste to the shoulder. If you cut at the shoulder line on the first pass, the waste will jam between the blade and fence and come whistling back at you.

When using the rip fence as a dimension stop, it is important to run all pieces from the same point on the fence. Again, the secret of clean-cut shoulders is checking the cut on a test piece until it is exactly right, using a very sharp blade and backing up the cut with a scrap piece against the miter gauge to prevent "spelching" or tearout. Now cut the haunches on the tablesaw using the two-step sequence you used for the tenon shoulders: cut the cheek with the piece on end in a sliding carriage, and then eliminate the waste by rotating the piece 90° and crosscutting to the haunch shoulder using the saw's regular miter gauge to support the piece. Check your drawing carefully before you cut; it is very easy to cut haunches in the wrong place.

Most woodworkers cut the panel grooves on a tablesaw fitted with a dado blade, which can be adjusted to make various width cuts with and across the grain. The width of cut and its position should be adjusted to exactly coincide with the width and location of a tenon. Make sure you groove the correct side of the rails and stiles or it will spoil your whole day.

Raising the panels can be done with a tablesaw, but the operation leaves a poor finish that must be cleaned up with a shoulder plane. I've obtained the best results by raising the panels on a shaper, using specially designed high-speed steel tooling honed to a mirror shine. These cutters leave a cloud of chips and a beautifully polished field with one pass.

Finish the panels to 180-grit with a hand-held pad sander and test fit the panels with a scrap piece. If everything fits, knock up the frame with the panels inside. During assembly, you'll be glad that you left the horns on the end of the rails; they protect the piece from accidental damage and are useful when knocking apart a tight mortise-and-tenon joint. If the joint is too tight, shave the tenon cheeks with a shoulder plane. If all is well, you can remove the horns with a fine handsaw and true the surface with a handplane after gluing the pieces together for final assembly. Apply your finish to the panels; I generally use oil or lacquer for exterior surfaces and wax for the interior. The finish will help keep the panels free, should any glue seep into the grooves accidentally.

Before assembly, make a pass with a finely tuned handplane on the grooved sides of the stiles and rails to remove any remaining machine marks. I recommend a PVA glue for mortise-and-tenon joints, as this allows for some flexibility as the rails expand and contract. Finally, fine-tune the face of the frame with a series of quick cuts with a finishing plane. As you move the plane across the joint, you will see the value of locating the panel below the level of the frame. You can true the face of the frame without damaging the panel and can bring the plane in from any angle or side that produces a clean cut. After sanding lightly with 220-grit paper, apply finish to the entire piece. □

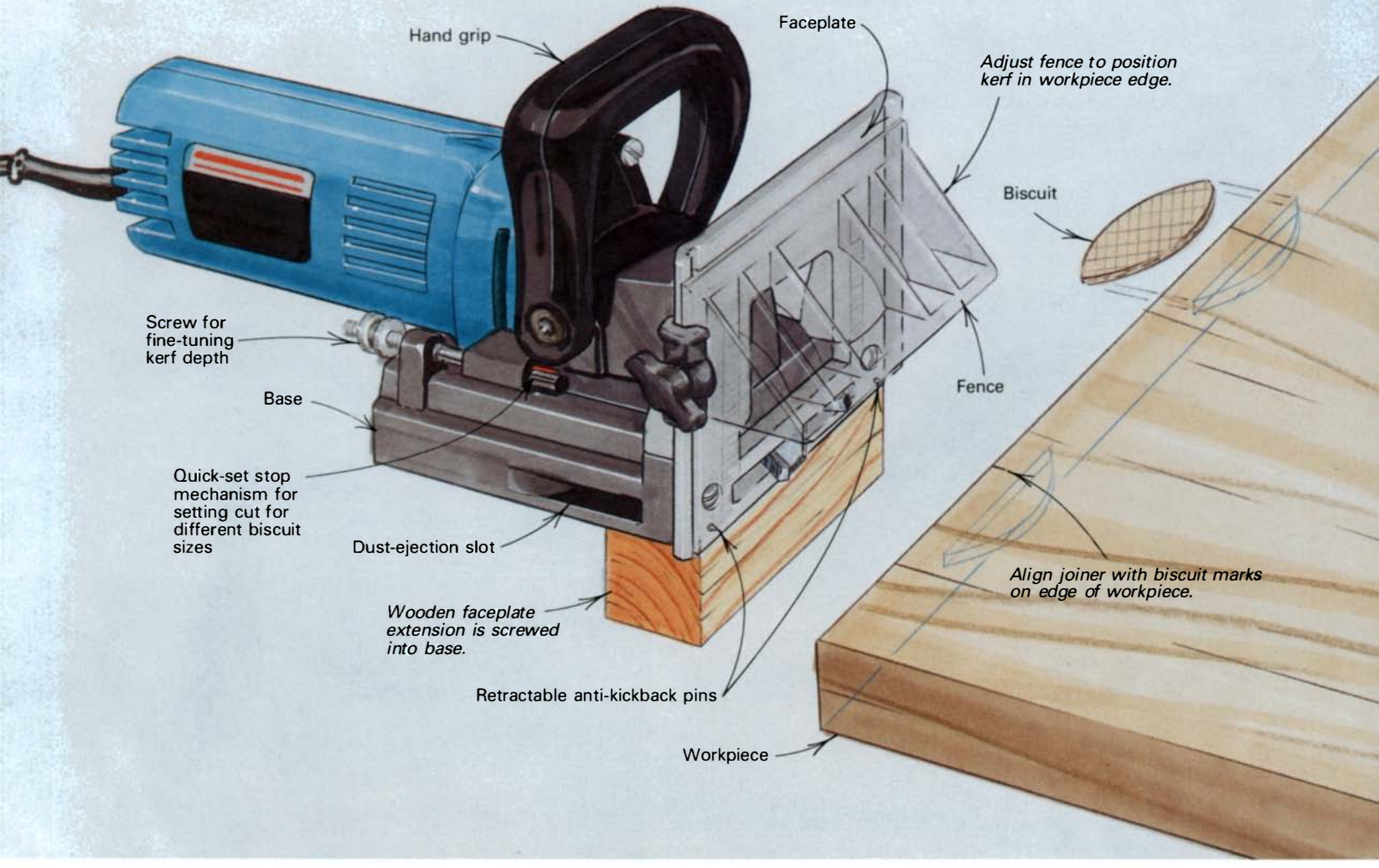
Tenons are sawn with stock held against a high auxiliary fence and supported by a miter gauge. Because of the danger of kickback, never attempt this cut freehand.

Tenon shoulders are cut on the tablesaw in two stages. The first cut removes about half the waste, and the second cut, as shown below, removes the rest and establishes the shoulder line. Cutting all the waste in a single pass could result in the scrap being trapped between the blade and fence and getting thrown out from the saw.

David Savage is a furnituremaker, designer and teacher in Devon, England. For more information about instructional programs at David Savage Furnituremakers, write him at 21 Westcombe, Bideford, Devon, England EX39 3JQ.

Photos this page: John Gollop

Biscuit joiner



A Plate Joiner Primer

Using biscuits to best advantage

by Ben Erickson

My biscuit joiner has become a valuable addition to my tool collection. When I bought it three years ago, I wasn't sure whether it would be a tool I couldn't live without or one that would gather dust with the other flashy, but not especially useful equipment I own. One problem was that this machine didn't come with many instructions and I had to learn to use it by trial and error. But the time and effort I invested in the biscuit joiner was worth it. I found it can efficiently handle a variety of techniques, some of which I'll share with you.

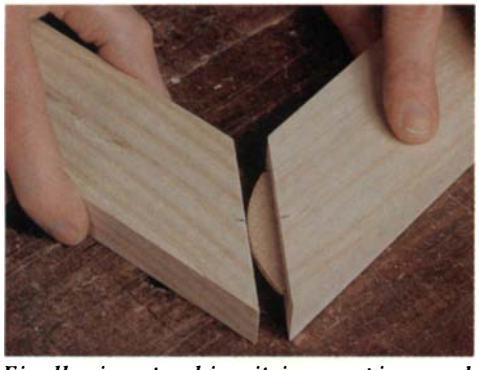
The versatility of the biscuit-joinery system goes beyond joining narrow pieces to make large panels. Biscuits can be used to join face frames, such as those on kitchen cabinets; butted and mitered carcase corners; carcase divider frames and shelves; drawer corners; mitered frames, such as the picture frames being kerfed in the top, left photos on the facing page; and leg-to-apron joints. And you can use biscuit joints in solid wood, plywood and fiberboard.

Although a biscuit joint is similar to a splined joint, biscuits are thin football-shaped plates of compressed wood that you insert into slots or kerfs. You cut the kerfs with a biscuit or plate joiner, like the one in the drawing above, by plunging its carbide-tip sawblade into a workpiece. You can adjust the joiner's fence to cut the kerf a specific distance from the edge or face of a workpiece. And you can also

Drawing: Aaron Azevedo

To join a mitered frame, align the joiner's faceplate to the end and its fence down on the top face, and plunge the cutter.

Next, spread glue in the kerf and on the joining surfaces. The Lamello dispenser is specially designed to spread glue in the kerf.



Finally, insert a biscuit in one piece and quickly assemble the parts before the compressed biscuit swells.

Erickson sets the fence height of his biscuit joiner and aligns it with the blade using wooden measuring blocks, which are ⅛ in. to ¾ in. thick, that he made for the job. He uses plastic-laminate shims for thicknesses less than ⅛ in.

adjust the plunging depth of the joiner's blade to vary the depth and length of the kerf to match one of three available biscuit sizes: no. 0, for which you cut a 5/16-in.-deep by 2 3/16-in.-long kerf; no. 10, which requires a ⅜-in.-deep by 2⅜-in.-long kerf; and the largest, no. 20, which requires a ½-in.-deep by 2 9/16-in.-long kerf. If biscuits are used to align surfaces, as on edge-to-edge panel joints, any size will do. But if biscuits provide a joint's sole strength, such as when you join the end of one workpiece to the edge of another on leg-to-apron joints, you should use the largest biscuit possible. Don't place the biscuit closer than 3/16 in. from the face of the workpiece, however, or the biscuit may pucker the wood's surface when it swells.

When you glue a precompressed biscuit in the kerf with water-base adhesive, it swells and becomes tight. So try biscuits in their kerfs before gluing them, because there may be some variation in their thickness (and the tightness of the fit). If a biscuit fits too tightly, I sand it lightly on 100-grit silicon-carbide floor-sanding paper that I've taped to a board. The humidity in Alabama causes biscuits to expand on the shelf, and so I keep mine sealed in the double plastic bags they arrive in. If humidity has caused your biscuits to swell, you can dry them before use by placing them in a warm, dry location, such as under a wood stove, in a low-heated oven or in a microwave.

Adjusting the joiner's fence—The fence on some biscuit joiners, like my Freud (218 Feld Ave., High Point, N.C. 27264; 919-434-3171), doesn't always remain parallel to the blade during adjustment. If the two aren't parallel, the kerfs in adjoining pieces won't be aligned. At best, the pieces will be misaligned; at worst, they may be impossible to join. Instead of measuring the distance between the blade and fence, I use measuring blocks, like those in the above photo at right, to ensure that the two are parallel. I made a set of 2-in.-wide by 5-in.-long blocks that are from ⅛ in. to ¾ in. thick, in ⅛-in. intervals. You can use thin plastic-laminate shims for thicknesses less than ⅛ in.

I set the fence by holding the joiner's base against a flat surface and stacking the required number of blocks under the fence to set it the desired distance from the blade. Press down firmly on the joiner and the fence and then tighten the fence lock knobs. Be sure to consider the distance from the blade to the base of the faceplate (⅜ in. on the Freud) when setting the fence with blocks.

Making a typical biscuit joint—The easiest way to learn about the applications of biscuits is to make a simple joint: Instead of using dowels, try using biscuits to align and reinforce edge-to-edge joints. Align and butt together the edges of two boards and mark across the joint where you want the biscuits. If biscuits are mostly for alignment, they should be spaced 8 in. to 12 in. on center. First adjust the biscuit joiner's depth of cut, and then adjust its fence to locate the kerf in the middle of the panel edge. To cut the kerfs, first clamp the

panels to a bench, align and press the joiner's fence against the top surface, and then press the joiner's faceplate against the edge, aligning the machine's centerline with the mark. Turn the machine on and plunge the blade at each mark on both panels. After you apply water-base glue in the kerfs and on the edges of both panels, insert biscuits in the kerfs in one side, and then assemble both panels and clamp them. Unlike doweled joints, there's adequate lateral slop in the kerfs to allow minor adjustments. Although this slop is an advantage during glue-up, you still have to align parts laterally during assembly. Work quickly during glue-up, because within minutes the compressed biscuits swell and become very tight in the 5/32-in.-wide kerfed slots. The Lamello glue applicator (available from Colonial Saw, Box A, Kingston, Mass. 02364; 617-585-4364), shown in the center, left photo on the previous page, has a slotted tip that puts the right amount of glue on the sides of the kerf. The applicator is a convenient time- and mess-saver, and I put a lead weight in its wooden base to keep it on the bench when I remove the inverted bottle.

Since I mark the same surface of each panel and then align my biscuit joiner on the pencil line, it's nearly impossible to cut kerfs from the wrong side of a panel edge. If you plan to cut a panel to length after glue-up, the biscuits must not come through the end of the panel. So draw the biscuit marks at least 1½ in. to 2 in. from the finished ends. On a fielded panel, keep biscuits far enough from the edge so that you don't cut into them when raising the panel.

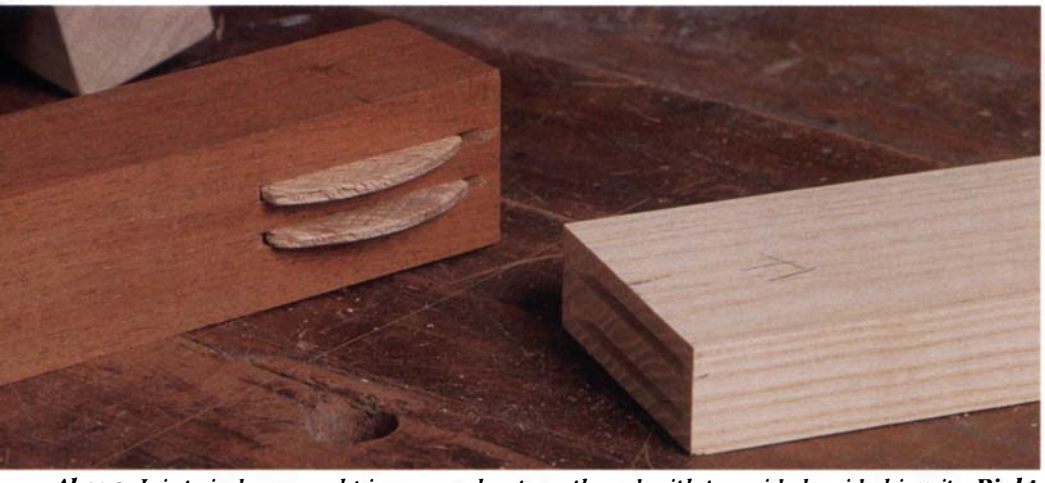
Making face-frame and leg-to-apron joints—You can biscuit-join face frames by cutting kerfs into the edge of the stile and into the endgrain of the rail. The rail should be 3/8 in. wider than the longest biscuit or the biscuit will penetrate its edge. For added strength on frames that are thicker than 1 in., you can use two biscuits side by side (as shown in the left photo below). If both the rail and stile are the same thickness, you can do this by first setting the joiner's fence at least 3/16 in. from the blade, in order to leave that much thickness between the biscuit and the surface of the workpiece. Then cut the kerf for the outside biscuit, guiding the fence against the outside of the rail and stile. Next, turn the pieces over and guide the fence against their inside surface, to cut the kerf for the inside biscuit.

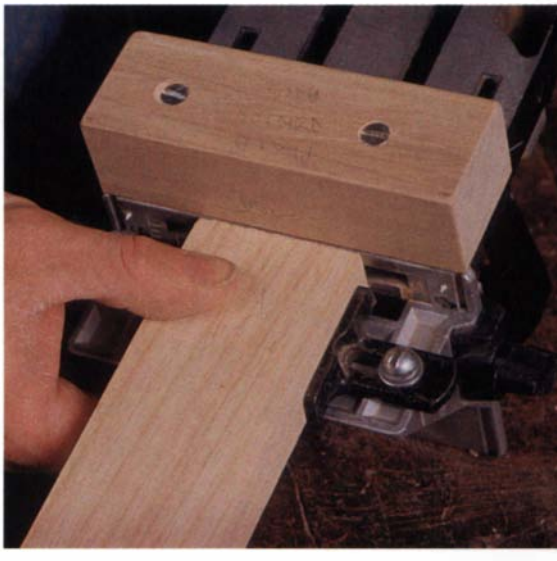
Although I don't have technical data on the strength of biscuit joints, I conducted my own evaluation, which showed that mortises and tenons resist breakage much better than biscuits in leg-to-apron joints on chairs or dining tables. The legs are long lever arms and I don't think the biscuits are deep enough in the leg or apron to provide counteracting strength. But I do trust biscuit joints on small tables and other pieces of furniture that aren't subjected to much abuse. Making a leg-to-apron joint with biscuits is similar to making a face-frame joint, except the apron is often thinner than the leg. If one surface of each is in the same plane, set the joiner's fence against those faces to cut the kerfs in both workpieces. You can strengthen thick leg-to-apron joints with two biscuits by guiding the joiner's fence against the surfaces that are in the same plane. Cut the first kerf in each workpiece and then reset the fence and cut the second kerf. If the apron's inside and outside faces are offset from the leg (so that they don't share a common plane), I guide the joiner against the outside surfaces of the legs. Tape a shim, as thick as the outside offset distance, to the fence. Kerf the apron first by guiding the shim on the apron's outside face, and then kerf the leg by removing the shim and guiding the bare fence on the leg's outside face.

When cutting into the end of a narrow rail or apron, my joiner's retractable anti-kickback points, which are about 4⅜ in. apart, may not contact the apron's surface. So to prevent kickback, I attached a stop to the right side of the joiner's fence, as shown below in the photo at right. To do this, I drilled and tapped a ¼-in.-dia. hole in the joiner's fence and adapted a depth-of-cut fence from one of my rabbeting planes. The stop gives me the additional benefit of centering apron ends without marking for biscuits on each one. Similar stops can be made from wood or angle iron.

Biscuit-joining mitered frames—Mitered frames, such as the one being joined in the left photos on the previous page, are kerfed for biscuits in the same manner as described for face frames except you kerf the mitered edge. Since a no. 0 biscuit requires a 2 3/16-in.-long slot, the mitered edge must be slightly longer so that the biscuit edge doesn't penetrate the outside of the mitered frame. If the face of the frame is molded, register the fence against its flat back.

Biscuit-joining carcases and shelves—Butt-jointed box corners on carcases should be reinforced with biscuits in the lower half of the top piece's edge. This minimizes short grain above the biscuit kerfs in the inner face of the side piece. If the end of the side piece and outside of the top piece are aligned, you can set the joiner's fence once for both cuts. To cut kerfs in the edge of the top, clamp it flat on a bench and hold the joiner's fence against the outer surface of the workpiece. To cut kerfs in the side piece, clamp it vertically in a vise, hold the fence against the edge and plunge the cutter into the inner face. But used this way, the joiner's faceplate is narrow and unstable. So I increased its surface area with a wooden extension block, shown in the photo at right on the facing page. I cut three 2x2x5 blocks of wood and bolted one to the joiner's base, flush with





***Above:** Joints in large workpieces may be strengthened with two side-by-side biscuits.* ***Right:** To help prevent kickback when cutting pieces too narrow to contact the joiner's pins, Erickson screwed a rabbeting plane depth stop to the base. The stop also helps align workpieces.*

Above: *For assembling a shelf to a carcase side, Erickson uses large biscuits.* ***Right:*** *A wooden faceplate extension is screwed to the joiner's base to stabilize the machine and make it safer for kerfing vertically held parts.* ***Below:*** *To kerf the carcase face, Erickson removed the joiner's fence and holds the faceplate against the workpiece. He guides the base against a plywood straightedge clamped to the work.*

the faceplate. (Don't use bolts long enough to interfere with the joiner's blade.) I used the other two blocks to align the fence by placing one block at the back of the joiner base and one under the fence. Unless the extension block interferes with a setup, I leave it in place.

When joining a shelf to a carcase side piece, shown in the top, left photo, center the biscuit in the shelf edge and cut the kerfs as I just described for carcases. To cut the kerfs into the surface of the side piece, remove the joiner's fence and guide its base against a straightedge (usually held square to the workpiece edge) while you hold the faceplate against the workpiece. For just one or two biscuits, I use a T-square guide. But if I must cut kerfs for many shelves, I clamp a wide, square plywood straightedge to the carcase side piece, as shown in the bottom, left photo. To position the plywood guide in the same spot on a number of pieces, I screw a stop on the end of a long guide and hook the stop over the end of the carcase workpiece.

If you plunge the joiner vertically down into the face of a workpiece clamped to a bench, hold the faceplate down firmly and be sure to pull up on the joiner motor before you turn it on. The return spring that keeps the blade retracted within the base may not be strong enough to function when the machine is used vertically. Failure to keep the blade retracted may allow it to contact the workpiece prematurely and this could result in a dangerous kickback.

Making drawers—It's faster to biscuit-join drawer parts than to join fronts and sides with rabbets and dadoes. I make drawer sides ½ in. to 9/16 in. thick (depending on the size biscuit) and make the front and back ¾ in. thick. Like butt-jointed carcase corners, kerf the ends of the front and back, as well as the inner face of the drawer sides. For strength, I position the biscuits close together.

Biscuit-joining mitered box corners—After mitering the ends of box sides, attach the joiner's 45° fence on the faceplate to make an obtuse angle (reverse the fence on a Freud joiner). Then, on stock that is ¾ in. thick or less, set the fence to cut a single line of kerfs close to the inside corner of the mitered edge. This ensures that the biscuit edge won't penetrate the outside of the box. On thicker workpieces, you can cut two lines of kerfs. Use large biscuits near the inside of the corner and small biscuits near the outside. Since the anti-kickback pins do not retract parallel to the miter fence, they may misalign the position of the biscuit kerf. To solve this problem, first press the faceplate against the mitered surface, slide it down until the fence contacts the inner surface of the workpiece, and then plunge the cutter. The anti-kickback pins should still contact the surface enough to prevent kickback. Faceplates with rubber surfaces, which are standard on some biscuit joiners, may prevent this problem, as well as pins that are too far apart to engage a narrow workpiece. □

Ben Erickson does production millwork and furniture work in Eutaw, Ala.

The Furniture of Charles Rennie Mackintosh

An architect's innovative approach to material, form and color

by Ben Bacon

Above: When Mackintosh was commissioned to design the "Room de Luxe" for the Willow Tea Room in Glasgow, Scotland, he designed everything, including the lead-glass windows and carpeting. He used his high-back chairs to create private spaces in a public establishment.

Left: Although Mackintosh was primarily an architect who designed unique and inventive furnishings for his interiors, his high-back chairs are probably his best-known designs. This chair, the tallest of those he made, was constructed from oak and painted white, and it has an upholstered seat and back. (Photo courtesy of Glasgow School of Art/Hunterian Art Gallery.)

Nearly a century ago, design in Victorian Britain was slavishly devoted to retrospective styles such as naturalism, historicism and classicism. Out of that conventional crowd arose a young Scottish architect named Charles Rennie Mackintosh, who produced powerful designs of buildings and furniture with clean lines that abandoned Victorian clutter. In doing so, he led interior design unequivocally into the 20th century. Although his fellow architects have chosen a place in history for Mackintosh as one of the first true modernist architects, little is known about how astoundingly prolific he was in all aspects of furniture design. Between the turn of the century and 1920, Mackintosh completed more than a dozen major architectural commissions and he designed not only buildings, but the interior spaces and all furnishings in them.

Probably best known for his high-back chairs, like the one shown at left on the facing page, Mackintosh developed many eye-catching designs based on form and unity, rather than hackneyed motifs. Many of his designs were considered revolutionary in 1900 and still stand today as landmarks in the evolution of modern furniture, making Mackintosh one of the trendsetters for furniture design in the 20th century. This article will examine Mackintosh's background, influences of his time period, and how his architectural ideas extended into all aspects of interior design, including furniture and decorative ornament. I'll also delve into the details, construction and material aspects of Mackintosh's furniture.

Early influences—Born in 1868 in Glasgow, Scotland, Mackintosh became an architectural assistant for the Glasgow firm of Honeyman and Keppie and studied drawing in the evenings at the Glasgow School of Art. Mackintosh soon won architectural competitions and used a scholarship award to travel to Italy to study architecture. After returning to Glasgow, he applied his prodigious talent and considerable energy to design everything from buildings to furniture to teaspoons. His early influences are documented in his notebooks: sketches of Italian churches and Scottish castles, studies of furniture ideas, as well as delicate watercolors of flowers. He studied everything around him—old and new, man-made and natural—and later used his eclectic knowledge to create his own startling work.

Although the popular styles and trends of the time, including art nouveau and the Arts-and-Crafts movement, clearly influenced his sense of design, the simplicity of Japanese art made a strong impression on the young Mackintosh. Japanese woodcuts had just come to Britain, and to Mackintosh they were a revelation; they embodied the Japanese spareness-in-design principle that no object exists in isolation, but reflects on all the objects surrounding it, as well as incorporates color harmony and precise spacial arrangement. These Japanese principles were a seminal discovery that had a profound effect on Mackintosh. Throughout Mackintosh's career, Japanese aesthetics was his guide for fighting his way through the clutter and mishmash of styles and design motifs common in Victorian England.

Mackintosh the architect—Around the turn of the century, Glasgow was considered the "Second City of the British Empire," awash with money and confidence. It was here that Mackintosh developed the majority of his work. He rapidly made a name for himself with new buildings and remodeling commissions, and he gained a reputation for creating unusual interiors and furniture. For Mackintosh, as for Frank Lloyd Wright, America's premier modernist architect, a successful design was one in which everything from the building itself, to its siting, landscape and interior furnishings, had to be part of one unifying theme. Mackintosh differed from many of his contemporaries because he designed his buildings from the inside out, considering first the planned use of the space, and then designing the building's exterior shape to best suit those plans. Unfortunately, with his demanding approach, few clients had the patience to complete a project with Mackintosh because he would often insist on designing everything: the building, its furniture, stained-glass windows, fireplaces, clocks, carpets and curtains—even candlesticks and water faucets. When allowed to build as he wanted, Mackintosh's results were cohesive and fresh. After viewing the airiness and lightheartedness of the interior he designed for the Willow Tea Room, shown in the photo at right on the facing page, it's hard to believe that it was designed and built in the heyday of Edwardian dreariness.

Mackintosh's career advanced with several public commissions, and by the time he won a prestigious competition to design an addition to the Glasgow School of Art, Mackintosh had become the most exciting name in Scottish architecture. The interiors that Mackintosh created to accompany his commissioned buildings are just as complete and impressive an accomplishment as the buildings themselves. Even in his early work, no aspect of Mackintosh's furniture design was taken for granted. He invented a new language of ornament to decorate his furniture, and put as much thought into designing a billiard table or a pulpit as he did into an entire house. If a Mackintosh chair has four legs, you are given the impression that it is because Mackintosh thought deeply about the problem and decided that four was the ideal number of legs for that particular chair.

Encouraged by his rising reputation, Mackintosh furnished a room for the eighth Exhibition of the Vienna Secession in 1900. His stand

A master at successfully implementing unusual forms in his furniture, Mackintosh displayed the two pieces shown here at the eighth Exhibition of the Vienna Secession in 1900, which gained him great popularity in continental Europe. The high-back armchair, ***left,*** *is made from dark-stained oak with a horsehide seat; the cheval mirror,* ***right,*** *is painted-white oak with two rows of small jewelry drawers on the sides.*

Photo: Chuck Miller

Strongly believing in the unity of interior spaces, Mackintosh designed most of his furniture pieces for a specific room. The bedroom and furnishings at the Hill House in Helensburgh, Scotland, one of Mackintosh's major domestic commissions, demonstrate his ability to design unusual furnishings that work together harmoniously in their intended space.

at the exhibition was sparsely furnished with about 10 furniture pieces plus some watercolors and 2 gesso panels he and his wife, Margaret Macdonald, created. Two pieces, a tall cheval mirror and a high-back chair with an oval comb (see the photos on the previous page), startled viewers and demonstrated Mackintosh's command of making unusual shapes in his furniture work together. The idea of a high-back chair was seemingly ridiculous and inevitably clumsy, yet with careful proportions and likable forms Mackintosh made it work beautifully. The mirror's thick coats of white paint and soft contours give it a molded look that predates plastic furniture by decades. The setting he designed for this startling furniture was spare and elegant: his exhibition stand set the pieces off to best advantage and to concentrate their effect. His work was very well received by the Viennese and Germans, and he developed a great popularity in continental Europe that continued throughout his career.

After the exhibition, Mackintosh's architectural commissions flooded in and he produced vast amounts of work. In 1900 alone, he designed almost 80 pieces of furniture, and over a 25-year period, Mackintosh designed more than 400 original pieces of furniture—a prodigious output for any designer. Yet even in producing this tremendous quantity of work, the *quality* of his ideas never declined. You can't help but be overwhelmed by his inventiveness and the sheer quantity of new ideas and motifs that Mackintosh dreamed up.

Furniture and interior unity—Because Mackintosh designed a building from the inside out, he always designed a piece of furniture for a specific room. The room itself was the focus and the furniture contributed to it, thus making the interior feel unified. This sense of unity fits the lessons that Mackintosh learned from Japanese aesthetics: use only a few pieces of furniture, don't overdecorate them, make them work together, don't crowd the negative space between forms, and make that negative space work as hard as the furniture pieces themselves.

Mackintosh's interiors achieved unity in various ways, but his most-often-used tool was composition: each piece was designed with all the other furniture and architectural details of the room in mind. And because their placement in the room was also planned, the furniture pieces worked together to control and unify the space within the room. His high-back chairs, for instance, were designed both to be a place to sit and to act as low walls within a room. Mackintosh's interior for the Willow Tea Room (shown in the photo at right on p. 96) uses high-back chairs arranged around the tables, elegantly creating private, intimate space in a bustling public area. He used this tactic of creating private space with a partial barrier over and over again both in his furniture and buildings. For instance, slender columns at each side of the window seat at Hill House, one of Mackintosh's commissions for a private home, created a personal, cozy area in a large room. He also used columns in the Glasgow School of Art library to divide a large open space into smaller study areas. Colors and motifs were also coordinated in a Mackintosh interior; whether for a room or for a whole house, Mackintosh developed a scheme for everything from living room carpets to garden gazebos, often repeating a common motif, such as groupings of geometric shapes or floral medallions.

The interdependence of a room and its furniture is a crucial key in understanding Mackintosh's work. In their planned settings, his pieces resonate harmoniously with the entire room. Conversely, if one element is seen out of context, the room may look slightly unbalanced. This is especially true of the high-back chairs, which can look ludicrous if they're in the wrong setting. Though the chairs may be an extreme example, many of Mackintosh's furniture pieces lose some of their impact when exhibited outside of the environment Mackintosh designed for them. For example, consider the furnishings in the master bedroom at Hill House, shown in the photo above. Imagine how differently the bedstead or chair would look if displayed separately.

Attention to details—Mackintosh is remarkable not only for his breadth of vision, but for the concentration of unceasing inventiveness and attention to detail within the overall view. Everywhere in his designs, details delight: tiny jewelry drawers run down the sides of his cheval mirror (see the photo at right on the previous page); delicate iron arches on the front of the Glasgow School of Art form a sort of visual reception room in front of the building's facing wall; the hammered-lead panel in a dark-stained-oak hall settle is adorned with stylized peacocks that have body shapes echoing the graceful sweep of the settle's side cutouts. These details do more than delight; by complementing the overall form of a furniture piece with many intimate, sympathetic details, Mackintosh constantly reminds us of his overall design concept, while at the same time he imbues each piece with a fresh, human feeling.

The same freshness of view applies to his ornamentation: The surfaces of many of his pieces sparkle with insets of clear- and stained-glass work, silver and plastic inlays; his chair backs are sometimes decorated with carved gesso panels or stylized apples or tulips; and bas-relief-carved birds, with slender, stylized legs stride across doors. The boldness of his design first attracts us, and then we are sucked into the piece by its details. The result: Viewing a Mackintosh piece is as enjoyable from 6 in. as it is from 6 yds.

Furniture construction and materials—Mackintosh showed the same concern in determining the materials used to make his furnishings as he did in designing and decorating them. As long as the materials, such as then-new plywoods and Erinoid (an early plastic material), served the needs of the design, he eagerly incorporated them into his creations. Although Mackintosh occasionally created pieces that showed off the beauty of wood, he was not in love with wood, as was his contemporary, William Morris, and other craftsmen who were part of the popular Arts-and-Crafts movement. Mackintosh saw wood as a useful material to functionally create the forms that he designed. Although most of Mackintosh's furniture is made primarily from wood, it rarely looks like wood; he often used thick coats of enamel paint to hide the grain and to accentuate the shape and flow of his design. Some painted pieces, like the high-back chair in the left photo on p. 96, look hauntingly

similar to modern molded-plastic furniture. He often disguised or decorated wood in other ways, like the big square-faced clock shown at right, which has an ebonized finish and a dial inlaid with Erinoid. He also used other craft materials, such as leaded glass, silver, pewter and decorative fabrics, to enliven his furniture and accentuate its form. For example, he would often inset small glass panels into his chairs to give them a fragile quality and emphasize the delicacy of their design.

As with materials, Mackintosh prized craftsmanship, but not more than design or new ideas; it's been said that any cabinetmaker could make a piece of Mackintosh furniture, but only Mackintosh could have designed it. Typically, his furniture is constructed very simply; absent are the hallmarks of extraordinary craftsmanship, such as delicately dovetailed drawers or other fancy joinery. The fact is, most of his furniture was built by local tradesmen in Glasgow who ran ordinary woodworking businesses, rather than by artisans from respected craft workshops. Since Mackintosh wasn't a cabinetmaker himself, he wasn't governed by a cabinetmaker's knowledge of traditional joinery. His furniture designs often contained sinuous parts that were fret-cut instead of bent or laminated and oddly shaped parts presented in startling ways—ways that no sensible cabinetmaker would have dreamed of. Yet if he felt that the design of a particular piece warranted it, Mackintosh would demand that it be executed to the highest standards. This kind of attention to craftsmanship was lavished upon his metalwork and glasswork more often than not. Consider, for example, the cabinet Mackintosh designed for 14 Kingsborough Gardens in Glasgow (see the bottom photo at right). It has ruby-colored glass insets and doors overlaid with silver leaf and decorated with standing figures; the interplay of color, form and decoration gives the piece a certain preciousness and dream-like quality.

Unfortunately, because he was more often concerned with form than with careful craftsmanship, Mackintosh's constructions were often faulty, sometimes to the point of structural weakness. Close inspection of the furniture at Hill House or the Glasgow School of Art reveals constructions that a skilled furnituremaker would have probably avoided, such as joint areas in a chair apron too small for adequate strength. Mackintosh's forms sometimes required unusual shapes that forced wood to be joined in ways that inevitably failed. This, I think, accounts for the sense of unease that many furnituremakers feel when looking at some Mackintosh pieces: they sense unsound construction. The unconventional joints and wood shapes are less disturbing because they are usually concealed by an opaque finish. Many of Mackintosh's designs would have undoubtedly been better executed if fabricated from other materials, such as plastics and metals. But unfortunately, these materials and technologies came after Mackintosh's career.

Epitaph—Ironically, although Charles Rennie Mackintosh was a vital catalyst of the modernist movement, it had no place for him once it was in full swing; and so for the latter part of life, he devoted himself mainly to painting watercolors. In his final years, Mackintosh's reputation in Britain finally came to match his reputation abroad, and today more attention is paid to his impact on both architecture and furniture. The bulk of his work is still in Glasgow and much of it, fortunately, is still in its original setting. His message of unity in design travels clearly across the years and is reflected in the momentous developments of the modernist movement. But what comes across to me is the enormous inventiveness of the man and his grasp of design, which is inspiring and monumental, yet domestic and welcoming in its mastery of human practical and aesthetic needs. □

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

Photo: Glasgow Museums & Art Galleries

***Above:** This clock, designed by Mackintosh in 1917 for the Derngate House in Northampton, England, has an ebonized wood face with domino-shaped plastic inlay dials. (Photo property of the British Rail Pension Fund on loan to Glasgow Museums & Art Galleries.)*
***Below:** Mackintosh occasionally lavished precious craftsmanship on his pieces, such as this painted wood cabinet, one of a pair designed to flank the fireplace at 14 Kingsborough Gardens, Glasgow. Colored glass insets and doors are overlaid with silver leaf and decorated with Moorish figures.*

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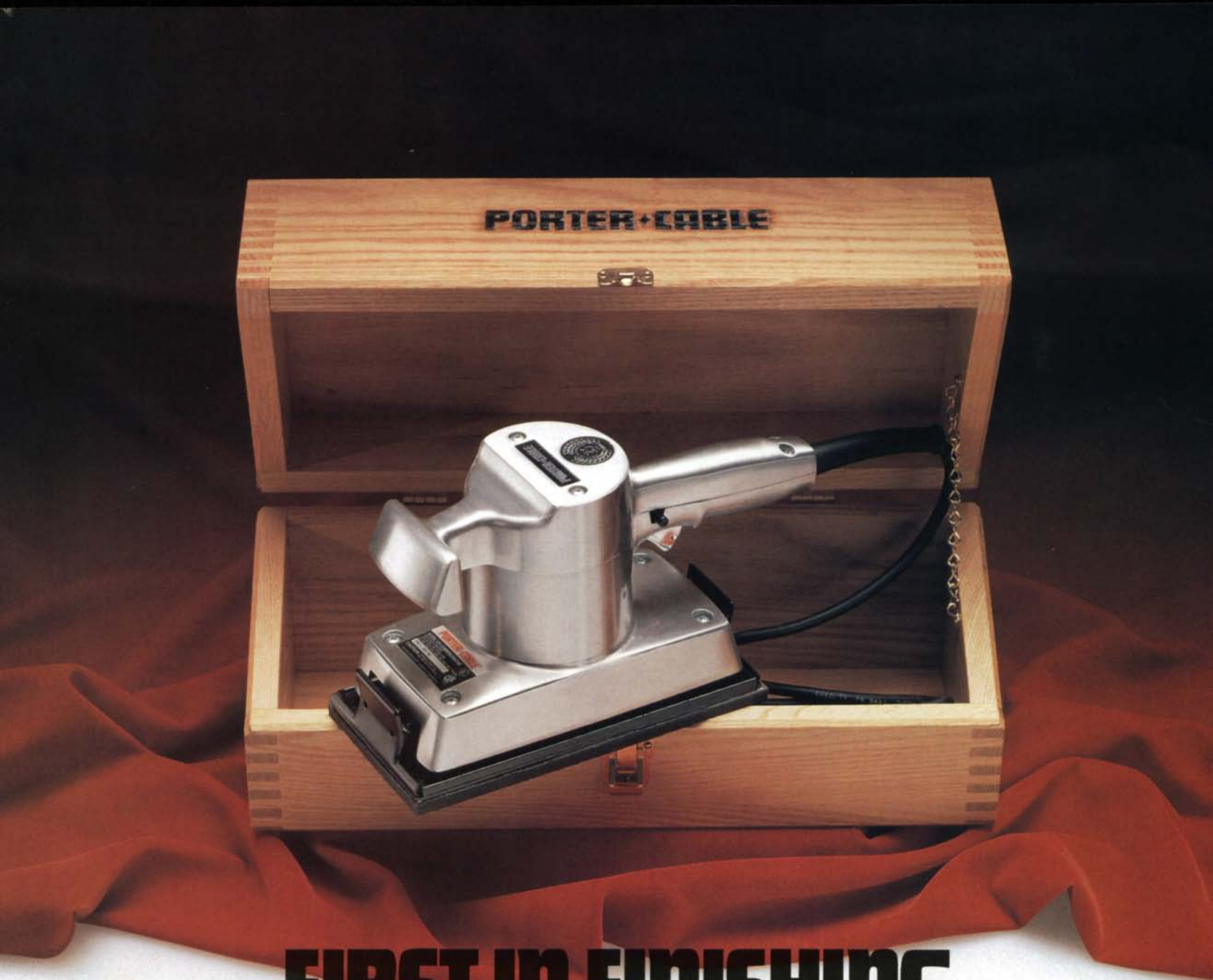

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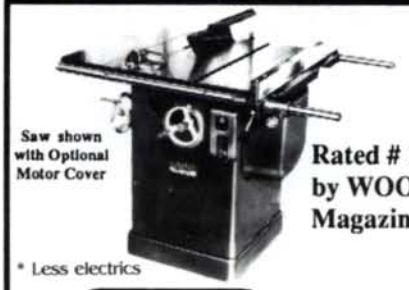

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READER SERVICE NO. 131

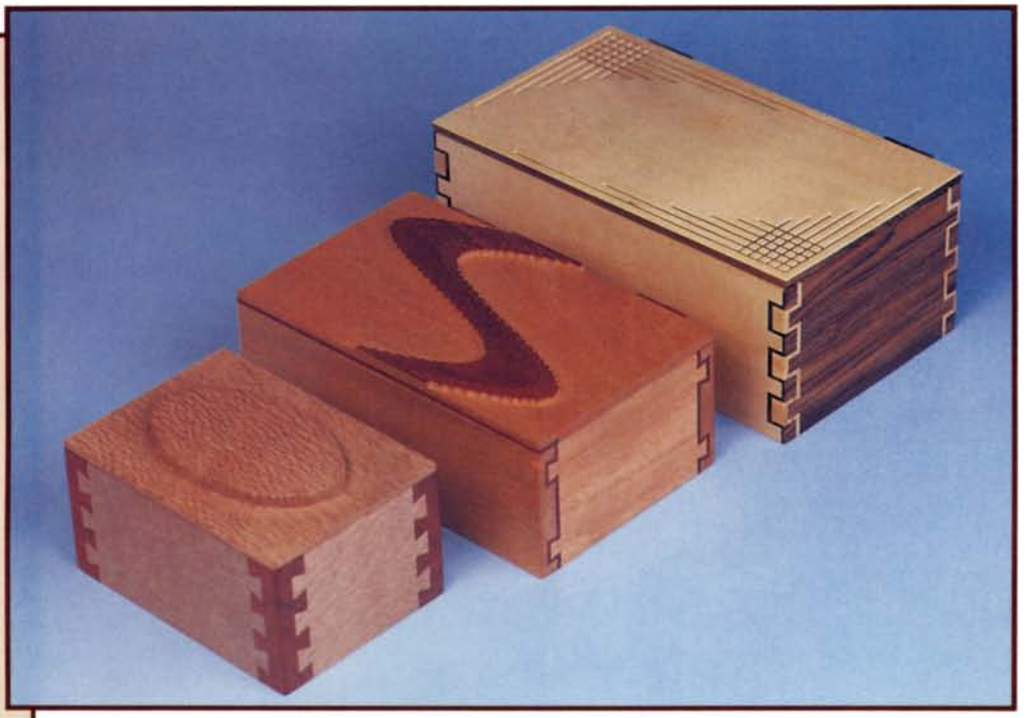
How would you make these without INCRA® JIG . . . and the INCRA Fence System, featuring the exclusive new INCRA Stop?

The astonishing work exhibited on this page is just a small sampling of the many new woodworking capabilities that INCRA JIG and the new INCRA Fence System put in your shop. More than just an accessory, this system adds a whole new dimension to INCRA JIG's already impressive capabilities.

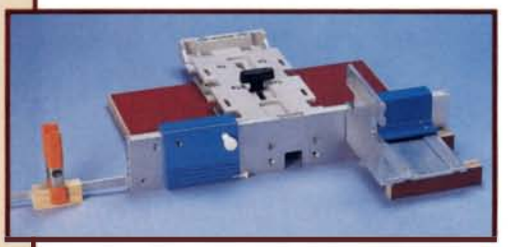
At the heart of the INCRA Fence System is the patented new aluminum **INCRA Stop.** It uses the same precision rack positioning technique found in INCRA JIG to give you all of the capabilities, and more, of having a second INCRA JIG mounted directly to your fence. Its ability to easily control the length of any cut with INCRA precision will make it the best stop block you've ever used. But that's just the beginning. INCRA Stop's elegant design lets you make an infinite variety of decorative patterns for box lids, trays, door panels, cabinet fronts, and more. To show you how, templates and plans for making the INCRA Wave pattern featured in this ad are included free with each INCRA Stop.

The 18" solid aluminum **INCRA Fence** is flat to within 0.004". Attached is a 17" sliding extender bar for clamping a stop block up to 15 inches beyond either end of the fence — extremely useful for making long mortises or slots on the router table.

The new **INCRA Right Angle Fixture,** which holds your work perpendicular to the table, is an invaluable compliment to the Fence System. It also works as a stand alone unit for non-INCRA applications. This precision aluminum fixture is perfectly square to both the fence and the table. Its intelligent design includes many special features for high functionality and ease of use.



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



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

A perfect mortise like the one for this wooden hinge is simple with the new INCRA Stop.

With a highly useful (and affordable) second INCRA Stop, multiple mortises are easy.

FREE templates and plans for making the INCRA Wave are included with each INCRA Stop. You can also easily make an unlimited variety of your own unique patterns.

With the Official INCRA JIG Handbook & Templates you can make all of the joints shown here plus many more.

The INCRA Fence System includes:

- 18" solid aluminum INCRA Fence, flat to within 0.004".
- 17" aluminum extender bar for clamping a stop block up to 15" beyond either end of the fence.
- Patented aluminum INCRA Stop —like having another INCRA JIG mounted directly to either end of your fence. An optional second INCRA Stop is extremely useful for many advanced capabilities. (INCRA Stop requires an INCRA Fence.)
- FREE INCRA Wave plans, templates, and instructions.
- Extensive, fully illustrated manual with detailed instructions and tips.

The INCRA Fence, INCRA Stop, and 17" Extender can be purchased individually or as a complete INCRA Fence System.

Also Available:

- Aluminum Right Angle Fixture for securely holding your work perpendicular to the table. Glides along the INCRA Fence, or can be used as a stand alone unit.
- 26" INCRA Fence for use with two INCRA JIGs.
- The INCRA JIG Handbook plus 17 Templates
- INCRA GAUGE
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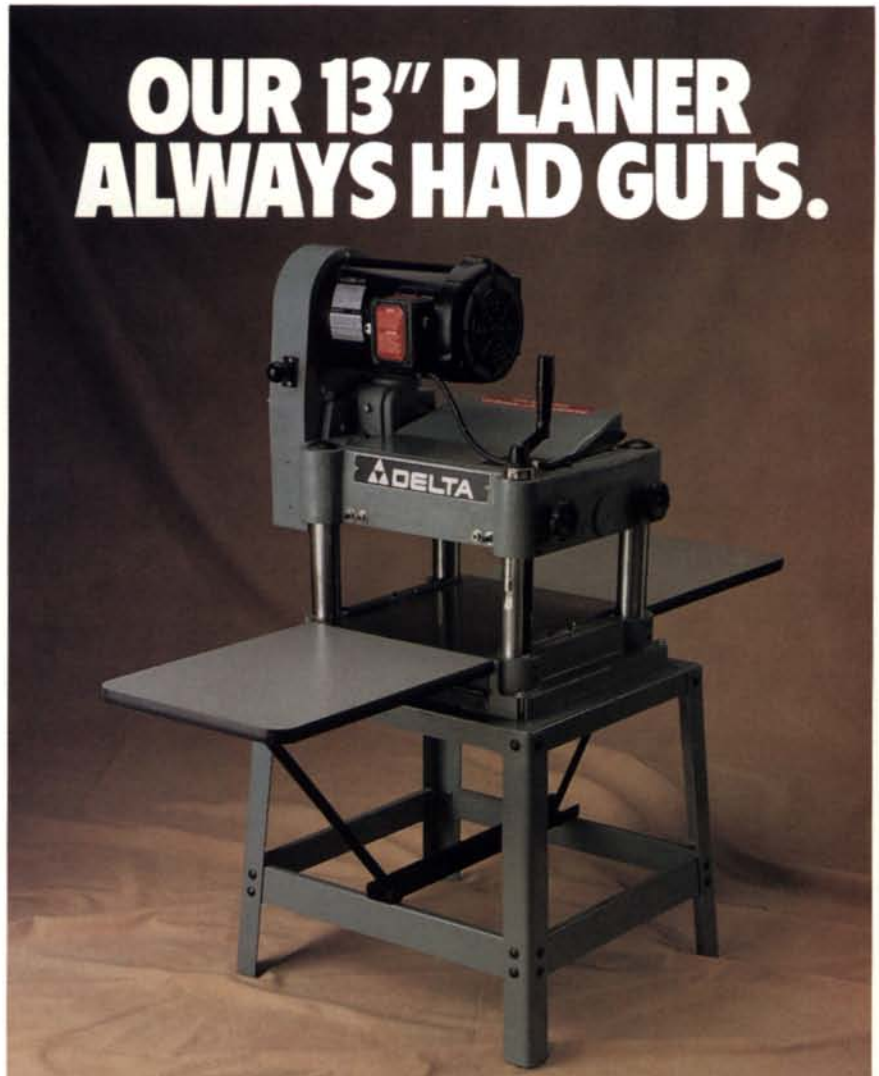

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*Offer good only on purchases of DC-33 promotional models 22-667 and 22-669 from participating distributors in the continental U.S., Alaska and Hawaii from April 1 to February 28, 1991.

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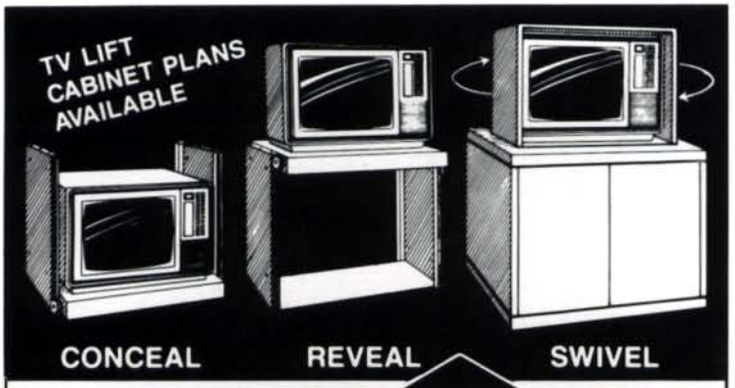

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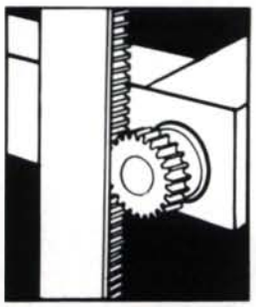

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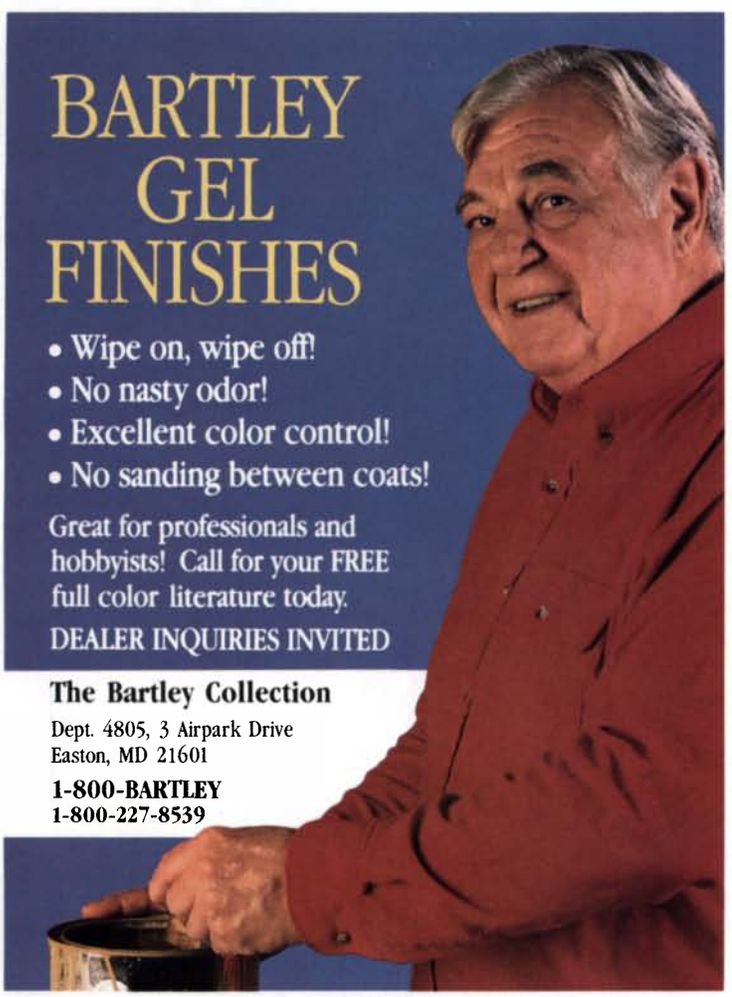

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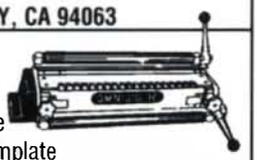

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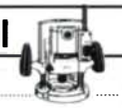

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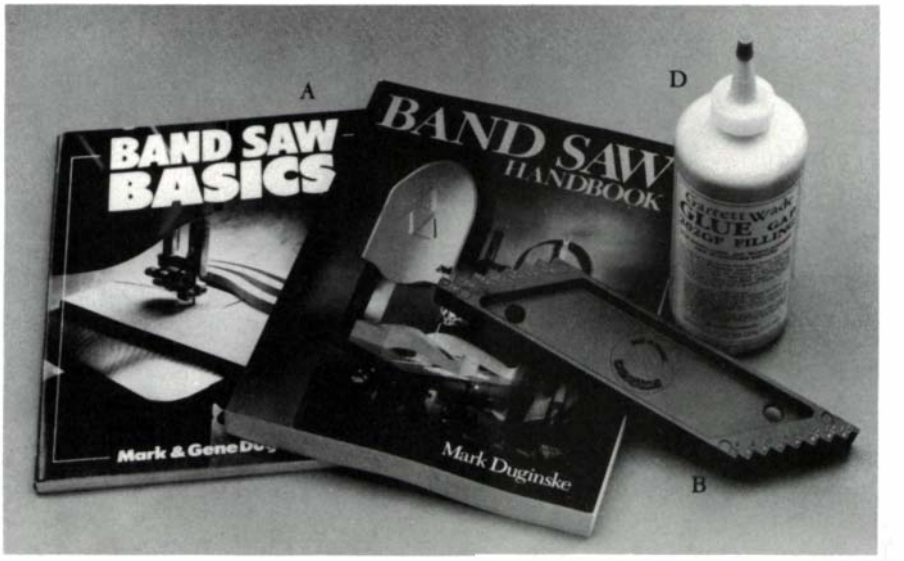

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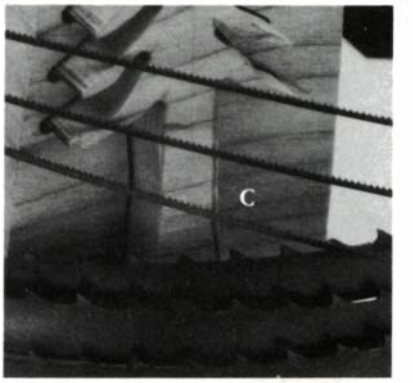

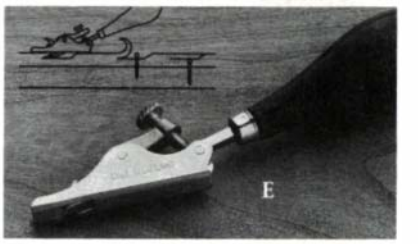

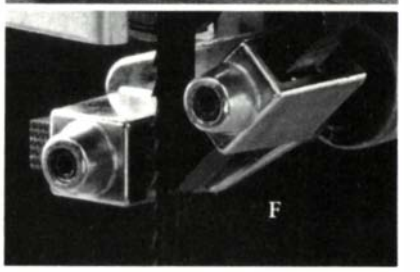

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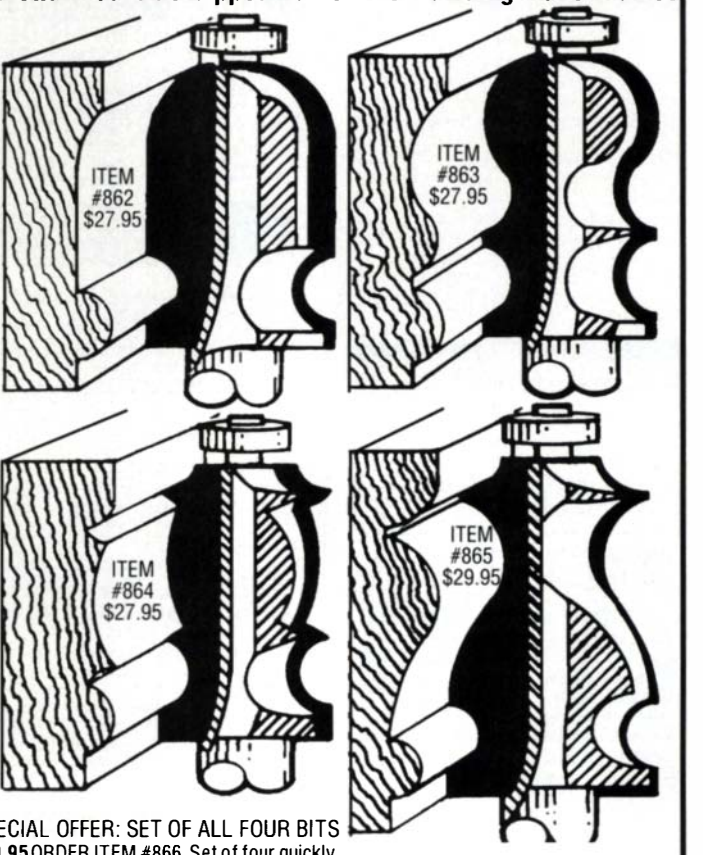

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READER SERVICE NO. 55

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.

ARKANSAS: **Show**–Fall Festival arts & crafts show and sale, Oct. 19–21. Newton County Fairgrounds, Jasper. Sponsored by the Newton County Arts & Crafts Guild. For info, contact Betty Carpenter: (501) 294-5555.
Juried exhibit–Regional Craft Biennial, Oct. 20–Nov. 16. Decorative Arts Museum, 7th and Rock Streets, Little Rock. For info, contact David Niles, Arkansas Arts Center, MacArthur Park, Box 2137, Little Rock, 72203. (501) 372-4000.
Workshop–New Methods in the Cleaning of Paintings and Wooden Artifacts, July 11–16, 1991. Application deadline: Nov. 1. For info, contact Parker Restoration, 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.
Juried show–The Fine Art of Woodworking, thru Oct. 28. Highlight Gallery, Box 1515, Mendocino, 95460. (707) 937-3132.
Show–Contemporary Masters, thru Oct. 27. Current works by artists of the Jacobson collection. del Mano Gallery and Studio, 11981 San Vincente, Los Angeles, 90049. (213) 476-8508.
Workshop–Saw sharpening clinic and Japanese hand tools with Robert Meadow, Oct. 27–28. Contact J. vanArsdale, The Pull of the Saw, 3537 69th Ave., Oakland, 94605. (415) 635-7182.
Cancelled show–San Diego Woodworking Show, scheduled for Nov. 2–4. Postponed indefinitely. For info, contact 1516 S. Pontius Ave., Los Angeles, 90025. (213) 477-8521, (800) 826-8257.
Workshop–A Direct Approach to Japanese Hand Tools with Robert Meadow, Nov. 3–4. College of the Redwoods, Ft. Bragg. For info, call (707) 961-1001.
Show–Northern California Woodworking Show, Nov. 9–11. San Mateo County Fairgrounds, 2495 S. Delaware St., San Mateo, 94403. For info, contact 1516 S. Pontius Ave., Los Angeles, 90025. (213) 477-8521, (800) 826-8257.
Fair–Holiday Crafts Fair, Dec. 1–2. Reel Lumber Co., 1321 N. Kraemer Blvd., Anaheim. Contact Holiday Crafts Fair, 520 S. Claudina St. #0, Anaheim, 92805. (714) 778-8955.
Show–San Diego Gift & Stationery Show, Jan. 13–15. San Diego Convention Center, San Diego. For info, contact George Little Management, 2 Park Ave., Suite 1100, New York, NY 10016. (212) 686-6070.
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.

COLORADO: **Classes**–Woodworking and related classes, year-round. Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401. (303) 988-6160.
Juried exhibit–6th annual exhibit sponsored by the Woodworkers Guild of Colorado Springs, thru Nov. 11. Colorado Springs Pioneers' Museum, Colorado Springs. Contact John Lewis, 918 N. Royer St., Colorado Springs, 80903. (719) 632-8548.
Workshops–One- and two-week woodworking and furniture design workshops, summer of 1991. Scholarship deadline: March 15. Workshop registration begins Jan. 1. Teachers include Alan Peters, Thomas Moser, Peter Korn, Harv Mastilir, Kathleen Loe, Michael Emmons, Sam Maloof, Simon Watts. Anderson Ranch Arts Center, Box 5598, Snowmass Village, 81615. (303) 923-3181.

CONNECTICUT: **Workshops**–Boatbuilding, Oct. 19–21; Introduction to Power Tools and Equipment, Oct. 27–28; 18th-Century Woodworking Methods, Nov. 3–4; Fine Finishes for Furniture, Nov. 10–11; Japanese Joinery, Nov. 17–18. Contact Brookfield Craft Center, Box 122, Route 25, Brookfield, 06804. (203) 775-4526.
Workshops–Daytime and evening woodworking workshops for adults and children, thru December. Including song bird carving, Nov. 8–11. Guilford Handcrafts Inc., Box 589, Guilford, 06437. (203) 453-5947.
Juried festival–12th annual Holiday Festival, Nov. 3–Dec. 23. Guilford Handcrafts Inc., Box 589, Guilford, 06437. (203) 453-5947.
Juried exhibition–The Celebration of American Crafts, Nov. 12–Dec. 23. National juried/invitational event. For info, contact Creative Arts Workshop, 80 Audubon St., New Haven, 06510.

DELAWARE: **Conference**–The Substance of Style: New Perspectives on the American Arts & Crafts Movement, Oct. 19–20. Winterthur Museum, Winterthur, 19735. (302) 888-4600.
Research fellowships–Winterthur research fellowships available. Applications accepted until Dec. 1. Contact Research Fellowship Program, Winterthur Museum, Garden and Library, Winterthur, 19735. (302) 888-4649.

DISTRICT OF COLUMBIA: **Exposition**–3rd annual Washington Crafts Expo, Dec. 7–9. Sheraton Washington, Woodley Rd. N.W. at Connecticut Ave. For info, contact Barbara Reynolds at (202) 775-8881.
Show–Washington Gift Show, Jan. 6–9. Washington Convention Center. For info, contact George Little Management, 2 Park Ave., Suite 1100, New York, NY 10016. (212) 686-6070.

FLORIDA: **Juried show**–5th annual Starke Festival of the Arts, Oct. 27–28. On the streets of downtown Starke. For info, contact Nancee Clark, Box 1530, Gainesville, 32602. (904) 372-1976.
Exhibition–Works in Wood, thru Nov. 4. A 46-object invitational exhibit. Florida Gulf Coast Art Center, 222 Ponce de Leon, Belleair, 34616. (813) 584-8634.
Juried show–Holidayfest '90, Dec. 7–9. Downtown West Palm Beach. Deadline: Nov. 15. Contact Holidayfest, Box 3366, West Palm Beach, 33402. (407) 659-8004.

GEORGIA: **Exhibition**–Masterworks, thru Nov. 13. Featuring turned wood vessels by Rude Osolnik and Bob Stocksdale. Great American Gallery, 333 Buckhead Ave., Atlanta, 30305. (404) 261-1712.
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.

IDAHO: **Exhibit**–Four-man woodworking exhibit, Nov. 5–21. Transition Gallery, Idaho State University, Pacatello. For info, contact the gallery at (208) 236-3451.

ILLINOIS: **Show**–19th annual Midwestern Wood Carvers Show, Nov. 3–4. Belle-Claire Exposition Hall, 200 S. Belt East, Belleville. Sponsored by Belleville Wood Carvers Club. For info, contact Don Lougeay, 1830 E. D St., Belleville, 62221. (618) 233-5970.
Workshops–Windsor chairmaking and Shaker furniture, October and November. Five-day, live-in instruction. The Dovetail Joint, 1332 Harlem Blvd., Rockford, 61103. (815) 965-6677.

INDIANA: **Juried show**–3rd annual Works in Wood, thru October. Chesterton Art Gallery. Featuring handcrafted wood furniture and objects. Contact the gallery, Box 783, Chesterton, 46304. (219) 926-3041.
Seminars–Woodworking and related seminars, one Saturday each month, November thru April. Including tablesaw, router, bandsaw, lathe. Edward B. Mueller Co., 3940 S. Keystone, Indianapolis, 46227. (317) 783-2040.

IOWA: **Show**–International Turned Objects Show, Oct. 27–Jan. 6. Iowa State University, Ames. For info, contact International Sculpture Center, 1050 Potomac St. N.W., Washington, DC 20007. (202) 965-6066.
Juried exhibit–Octagon Annual, Nov. 11–Dec. 30. Entry deadline: Sept. 1. Octagon Center for the Arts, 427 Douglas, Ames, 50010. (515) 232-5331.

KENTUCKY: **Workshops**–Woodturning and joinery instruction, thru October. One day to one week. Contact Jim Hall, Adventure in Woods, 415 Center St., Berea, 40403. (606) 986-8083.
Show–Louisville Woodworking Show, Oct. 19–21. Commonwealth Convention Center, 221 4th Ave., Louisville, 40202. For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521, (800) 826-8257.

LOUISIANA: **Juried show**–15th annual Holiday Crafts Market, Nov. 17–18. City Park Botanical Gardens, New Orleans. Contact Louisiana Crafts Council, Box 1287, Baton Rouge, 70821. (504) 383-1782.
Juried competition–Lafayette Art Association annual national juried competition of two- and three-dimensional art, Apr. 1–30, 1991. Slides deadline: Jan. 15. Contact Marta Fielding, Lafayette Art Gallery, 700 Lee, Lafayette, 70501.

MARYLAND: **Exhibition**–Pull Up a Chair, Nov. 1–Dec. 22. Assortment of chairs incorporating various media including wood. Meredith Gallery, 805 N. Charles St., Baltimore, 21201. (301) 837-3575.

MASSACHUSETTS: **Classes**–Wood II, Design & Artisanry and Wood III, Design & Artisanry, Jan. thru May. School of the Museum of Fine Arts, 230 The Fenway, Boston, 02115. (617) 267-1219.
Show–New England Woodworking World Show, Oct. 19–21. Eastern States Exposition Center, Springfield. Contact the Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Exhibition–Surfaces, Oct. 30–Nov. 23. Furniture exhibition featuring dining tables, hall tables, shelves and more by 20 artists, including Peter Dean, Tom Loeser, Wendy Maruyama, Jamie Robertson, Rick Wrigley. Clark Gallery, Box 339, Lincoln Station, 01773. (617) 259-8303.
Exhibit–Carvings and sculptures from the New England Woodcarvers Inc., Nov. 10. American Legion Hall, Bedford. For info, contact Paul Ward, 4 Freeman Rd., Chelmsford, 01824. (508) 256-6391.
Conference–Founding conference of the Woodworkers Alliance for Rainforest Protection, Nov. 16–18. University of Massachusetts, Amherst. Contact John Shipstad, WARP, Box 133, Coos Bay, OR 97420-0013. (503) 269-6907.
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.
Classes–Woodworking classes, throughout most of the year. Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.

MICHIGAN: **Show**–Metro-Detroit Woodworking Show, Dec. 7–9. Cobo Hall, 1 Washington Blvd., Detroit, 48226. For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521.

MISSOURI: **Fair**–1st woodcraft fair, Oct. 20–21. Demonstrations, exhibits and for-sale items. Contact Paxton Beautiful Woods, 6311 St. John, Kansas City, 64123. (816) 483-7000.
Show–Woodworking show, Nov. 24–25. Columbia Mall, Community Room, Columbia. Featuring work by the Midwest Woodworkers Association. For info, call Steve Pagan at (314) 442-8851.

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

NEW HAMPSHIRE: **Program**–Tour of Canterbury Shaker Village museum, craft and marketing facilities, Oct. 27. Sponsored by Guild of New Hampshire Woodworkers and Shaker Village. Preregistration required. Contact Shaker Village, 288 Shaker Rd., Canterbury, 03224. (603) 783-9511, (603) 783-4403.
Classes–Classes in fine arts and studio arts. Manchester Institute of Arts and Sciences, 114 Concord St., Manchester, 03104.
Classes–Various craft classes, including woodworking,

Photo: Brian Gulick

Toshio Odate, shown here working on a typical set of low Japanese horses, will be teaching Japanese joinery, Nov. 17-18, at the Brookfield Craft Center in Connecticut.

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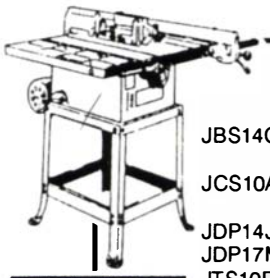

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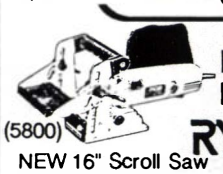

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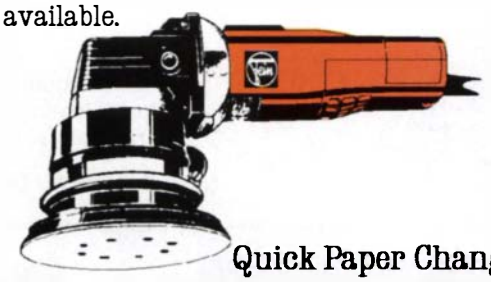

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year-round. Contact The Hand & I, Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.
Juried show–National Rocking Chair Show, thru Jan. 15. Hanover. For info, contact Lynne DiFrancesco, Rubens and Locke, 40 S. Main St., Hanover, 03755. (800) 333-3448, (603) 643-4327.

NEW JERSEY: **Juried show**–Super Crafts Star Show, Oct. 26–27. Giants Stadium Club, East Rutherford. For info, contact Creative Faires Ltd., Box 844, Tuxedo, NY 10987. (914) 351-5171.
Show–5th annual Fall Wood Carving Show, Nov. 17–18. New Jersey National Guard Armory, Route 38 E., Mt. Holly. Presented by the South Jersey Wood Carvers. For info, contact Jack or Connie Raleigh at (609) 829-8731.
Show–Atlantic City Giftware & Collectibles Show, Jan. 4–7. Convention Hall, Atlantic City. For info, contact George Little Management, 2 Park Ave., Suite 1100, New York, NY 10016. (212) 686-6070.

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

NEW YORK: **Classes**–Various woodworking classes. Constantine, 2050 Eastchester Rd., Bronx, 10461. (212) 792-1600.
Classes–Japanese hand tools with Robert Meadow, Oct. 20–21; tablesaw techniques with Bill Gundling, Nov. 3; restoration and reproduction turning with Bill Gundling, Nov. 17–18. The Crafts Student League, 610 Lexington Ave. at 53rd St., New York City. (212) 735-9732.
Auction–10th annual benefit auction, Oct. 24. Christie's East, 219 E. 67th St., New York City. Sponsored by the Associates of the American Craft Museum. For info, contact Lynn Millinger at the museum at (212) 956-3535.
Show–Central New York State Show, Nov. 3–4. New York State Fairgrounds, Center of Progress Bldg., State Fair Blvd., Syracuse, 13209. For info, contact the Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Show–Albany Woodworking World Show, Nov. 9–11. New Scotland Ave. Armory, 130 Scotland Ave., Albany, 12208. For info, contact the Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Workshops–Hand-tool workshops with Robert Meadow, Nov. 17–18, Dec. 8–9. The Luthierie, 2449 W. Saugerties Rd., Saugerties, 12477. (914) 246-5207.
Show–Toymakers, Nov. 23–Dec. 2. Benefit reception, Nov. 26. American Craft Museum, 40 W. 53rd St., New York City. Display and sale of contemporary hand-crafted toys, as well as performances and craft demonstrations. For info, contact Lynn Millinger at the museum at (212) 956-3535.
Juried show–Craft Art from Western New York 1990, thru Nov. 25. Buffalo. Featuring artists having lived in western New York state. Contact Burchfield Art Center, Rockwell Hall, State University College at Buffalo, 1300 Elmwood Ave., Buffalo, 14222-1095.
Exhibition–Five-Star Folk Art, thru Dec. 2. Museum of American Folk Art/Eva and Morris Feld Gallery at Lincoln Square, Columbus Ave. & 66th St. Featuring folk art from the 18th to 20th centuries. For info, contact Susan Flamm at (212) 977-7170.
Meetings–New York Woodturners Association, first Tuesday of each month. Woodturning techniques and exhibits also. The Crafts Student League, YWCA, 610 Lexington Ave., New York City.
Show–Long Island Woodworking World Show, Jan. 18–20. Hofstra University, 100 Fulton Ave., Hempstead, NY 11550. For info, contact the Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3876.
Juried show–Handmade in the USA, Feb. 23–27. Passenger Ship Terminal Pier 90, New York City. Sponsored by George Little Management and American Craft Enterprises. For info, contact Lynn White, George Little Management, 2 Park Ave., Suite 1100, New York City, 10016. (212) 686-6070.
Exhibition–Mondo Materials, thru Feb. 24. Collage panels created from commercially available materials and found objects, including wood. Cooper-Hewitt Museum, 2 E. 91st St., New York City, 10128. (212) 860-6868.

NORTH CAROLINA: **Fair**–43rd annual Southern Highland Handicraft Guild Fair, Oct. 19–21. Asheville Civic Center, Asheville. Contact Alice Hardin, Box 9545, Asheville, 28815. (704) 298-7928.
Workshop–Woodcarving with Helen Gibson, Oct. 28–Nov. 3. Campbell Folk School, Brasstown, 28902. (800) 562-2440.
Course–Development Program for Managers in the Wood Industry, Nov. 5–9. North Carolina State University, Raleigh. One-week course focuses on wood technology, management skills and control of industrial operations. For info, contact Ed Jerger, NC State, Box 8005, Raleigh, 27695-8005. (919) 737-3181.
Conference–4th annual national conference for Arts & Crafts Movement, Feb. 22–24. Grove Park Inn, Asheville. Including show, sale, seminars, demonstrations, tours, panel discussions. For info, contact Bruce Johnson, Box 8773, Asheville, 28814. (704) 254-1912.

OHIO: **Workshops**–Introduction to Woodturning with Tim Cartwright, Oct. 23; Cane Weaving Techniques with Susan Gearhart, Oct. 25; Cabinetry Layout and Design with John Freeman, Oct. 30; Tablesaw Techniques with Joe Loscocco, Nov. 1; Toy/Gift Projects wtih Tim Cartwright, Nov. 8; Finishing Techniques I, Nov. 13; Finishing Techniques II, Nov. 15; Finishing Techniques III, Nov. 20. The Woodworkers' Store, 2500 E. Main St., Columbus, 43209. (614) 231-0061.
Show–Columbus Woodworking World Show, Jan 11–13. Veterans Memorial Hall, 300 W. Broad St., Columbus, 43215. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.

OKLAHOMA: **Show**–6th annual Wonderful World of Wood Show, Nov. 9–11. Southroads Mall, 41st Street and S. Yale, Tulsa. Contact David Davies, 8274 E. 33rd St., Tulsa, 74145. (918) 664-8971.

OREGON: **Classes**–Business of being an Artist, Oct. 20–21; Design, Production and Marketing of Fine Furniture, Nov. 10–11. Oregon School of Arts and Crafts, 8245 S.W. Barnes Rd., Portland, 97225. (503) 297-5544.
Show–Oregon Woodworking Show, Oct. 26–28. Memorial Coliseum Complex, 1401 N. Wheeler St., Portland, 97227. For info, contact 1516 S. Pontius, Los Angeles, CA 90025. (213) 477-8521, (800) 826-8257.

PENNSYLVANIA: **Workshops**–Gold-leafing techniques with Bill Adair, Oct. 20; sharpening techniques with Prew Savoy, Oct. 27; green woodworking with Drew Langsner, Nov. 3–4; period finishes with Robert Mussey, Jr., Nov. 17; chip carving with Wayne Barton, Dec. 1–2. Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Rd., York, 17402. (717) 755-8884.
Juried exhibitions–National juried exhibition of contemporary crafts, thru Nov. 4. Water/Life, May 4–June 9, 1991; deadline: Jan. 15. The Dining Experience/A Craft Expression, Aug. 10–Sept. 22, 1991; deadline: Feb. 27. For info, contact Lynn Berkowitz, Luckenbach Mill Gallery, 459 Old York Rd., Bethlehem, 18018. (215) 691-0603.
Juried fair–Lancaster Designer Craft Market, Nov.

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7511	3/8" VSR Drill	109.
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1273DVS	4"x24" VS. dustless belt sander	189.
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33-050	Sawbuck	569.
33-990	10" Radial arm saw	549.*
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17-900	16.5" Drill press	359.*
28-283	14" Wood band saw w/¾HP motor encl. steel std	675.*
34-444	10" Contractors saw	619.
28-245	14" wood band saw w/std. ½HP motor	495.*
43-122	Shaper, light duty, 1HP, 1PH	599.*
22-661	NEW! DC-33 13" Planer	1099.*
37-154	6" long-bed jointer w/electricals	999.*
37-350	8" long-bed jointer w/electricals	1350.*
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2–4. Artworks Expo Center, Ephrata. For information, contact Jean Lehman, Box 765, Lancaster, 17603-0765. (717) 295-1500.
Show–Central Pennsylvania Woodworking World Show, Nov. 16–18. Pennsylvania State Farm Complex, 2301 N. Cameron St., Harrisburg, 17110. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Juried show–9th annual Pennsylvania National Arts & Crafts Show, Mar. 22–24. Pennsylvania State Farm Complex, 2301 N. Cameron St., Harrisburg, 17110. Deadline: Jan. 1. For info, contact Pennsylvania National Arts & Craft Show, Box 449, New Cumberland, 17070. (717) 763-1254.

TENNESSEE: **Juried exhibition**–Woodturning: Vision and Concept II, Oct. 24–Dec. 8. 4th annual American Association of Woodturners Symposium, including demonstrations and seminars by national turners, Oct. 25–27. Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

TEXAS: **Classes**–Timber frame home design, Nov. 10–11. Contact Wynter Chauvin, Red Suspenders Timber Frames, Route 7, Box 8383, Nacogdoches, 75961. (409) 564-9465.
Show–7th annual charity show and sale, Oct. 26–27. Greenspoint Mall. Sponsored by the Woodworkers' Club of Houston. Contact Bill Sallans, 1131 Glourie Dr., Houston, 77055. (713) 465-0291.
Juried competition–Furniture of the '90s, American Society of Furniture Artists and Council for the Visual and Performing Arts art-furniture competition and exhibition, Apr. 8–May 3, 1991. University of Texas Medical School Gallery, Houston. Entry deadline: Dec. 31. For prospectus, contact ASOFA, Competition, Box 270188, Houston, 77277-0188.

UTAH: **Juried exhibit**–The New Utah Furniture: Contemporary Concepts, thru December. Nora Eccles Harrison Museum of Art, Utah State University, Logan, 84322. (801) 750-1412.

VIRGINIA: **Exhibit**–Recent Thoughts: New Furniture Designs, thru Oct. 21. Work by cabinetmaker Peter Kramer. The Washington Arts Building, Gay and Jett Streets, Washington.
Competition–7th annual International Creative Marquetry Show (ICMS), Oct. 30–Nov. 21. The Hofheimer Library, Virginia Wesleyan College, Norfolk. Contact Suzanne Cartwright, 63 Church Lane, Sproughton, Ipswich, Suffolk, IP8 3AY, England, or Joyce Howell, Virginia Wesleyan College, 1584 Wesleyan Dr., Norfolk, 23502.
Show–Richmond Craft and Design Show, Nov. 16–18. Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.
Show–Virginia Woodworking World Show, Jan. 4–6. Norfolk Scope, St. Paul and Brambleton Streets, Norfolk, 23501. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.
Exhibition opportunity–Place settings of three or four pieces that are functional or metaphorical. Deadline: June 30, 1991. Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.

WASHINGTON: **Exhibitions**–Musical instruments featuring work of luthiers, drum makers and flute makers, thru Oct. 28; Michael Elkan furniture and sculpted towers, thru Oct. 28; 10th anniversary members-only show, thru Nov. 10; 11th annual box competition and container show, Nov. 15–Dec. 31; children's toys and furniture show, Nov. 15–Dec. 31. Northwest Gallery, 202 First Ave. S., Seattle, 98104. (206) 625-0542.
Workshops–Block making, Oct. 20; ship nameboard carving, Oct. 27. Northwest School of Wooden Boatbuilding, 251 Otto St., Port Townsend, 98368. (206) 385-4948.
Classes–Woodworking classes, year-round. Also, beginning three-dimensional carving, thru Oct. 27. Contact Port Gamble Klallan Tribe, Box 280, Kingston, 98346. (206) 638-2794.
Juried show–Clock show, Oct. 25. Also, woodworking and furniture by area artists on display, year-round. Artwood, 1000 Harris Ave., Bellingham, 98225. (206) 647-1628.
Show–Annual woodworking show/arts alive festival, Oct. 27–28, Nov. 3–4. LaConner Civic Garden Club, 622 2nd St., LaConner. Sponsored by Northwest Corner Woodworker's Association and The Wood Merchant. Contact Dianne Lindsay, 474 Lois Lane, Sedro Woolley, 98284. (206) 856-4947.
Juried show–10th annual Woodcarving Show, Nov. 10–11. Western Washington Fairgrounds Expo Hall, Puyallup. Sponsored by Northwest Carvers Association. Contact NCA, Box 6092, Federal Way, 98063-6092. (206) 564-3278.
Show–Western Washington Woodworking Show, Nov. 16–18. Seattle Center, 305 Harrison St., Seattle, 98109. For info, contact 1516 S. Pontius Ave., Los Angeles, CA 90025. (213) 477-8521, (800) 826-8257.
Meetings–Northwest Woodworkers Guild, last Wednesday of each month. Contact Kirk Kelsey, 744 N. 78th, Seattle, 98103. (206) 789-2142.

WISCONSIN: **Show**–Milwaukee Woodworking World Show, Oct. 26–28. MECCA, Milwaukee. For info, contact Woodworking Association of North America, Box 706, Plymouth, NH 03264. (800) 521-7623, (603) 536-3768.

CANADA: **Classes**–Various woodworking classes including bird carving, wood sculpture, willow chairmaking and more. Contact the Haliburton School of Fine Arts, Box 339, Haliburton, Ont., K0M 1S0. (705) 457-1680.
Exhibits–Turned vessels by Ted Hodgetts, thru Oct. 31; Fieldcote Memorial Park and Museum, Box 7099, Ancaster, Ont., L9G 3L3; (416) 648-8140. Also, Dec. 6–Jan. 6 at The Craft Gallery, Ontario Crafts Council, Chalmers Building, 35 McCaul St., Toronto, Ont., M5T 1V7. (416) 977-3551.
Juried exhibition–Explorations in Wood, Dec. 2–Jan. 13. Maltwood Gallery, Victoria, B.C. Deadline: Oct. 31. Contact Glenn Gerein at (604) 382-1939 or (604) 592-8264.
Seminar–Lathe turning with Dale Nish, Nov. 16–18. For info, contact Tools 'n Space Woodworking, 338 Catherine St., Victoria, B.C. V9A 3S8. (604) 383-9600.
Meetings–Canadian Woodturners Assoc. meetings, throughout the year. Second Tuesday of each month. Contact Bob Stone, Box 8812, Ottawa, Ont., K1G 3J1. (613) 824-2378.
Meetings–Blue Mountain Woodworking Club meetings, throughout the year. Third Wednesday of each month. Contact Glenn Carruthers, Box 795, Stayner, Ont., L0M 1S0. (705) 444-1752.

AUSTRALIA: **Exhibition**–Annual Woodcraftsmens Guild of Queensland members' exhibition, Nov. 2–4. Auditorium, Brisbane Botanical Gardens, Toowong Brisbane, Queensland. For info, contact Clive Price, 76 Burns Pde., Chapel Hill, Queensland, 4069. (07) 378-8652.

ENGLAND: **Exhibit**–The Decorative Beast, thru Dec. 30. Including woodwork from the V&A Collection. Crafts Council Gallery, 12 Waterloo Place, London, SW1Y 4AU. 071-930 4811.
Classes–Woodworking classes. Smith's Gallery, 56 Earlham St., WC2. Contact Laetitia Powell, Parnham, Beaminster, Dorset, DT8 3NA. (0308) 862204.

GERMANY: **Fair**–International Hardware Fair, Mar. 3–6. Cologne. For info, contact KölnMesse, Messeplatz 1, Postfach 21 07 60, D-5000 Köln 21 (Deutz).

Country Furniture: 114 Traditional Projects by Percy W. Blandford. *TAB Books Inc., Blue Ridge Summit, Pa. 17294-0850; 1988. $15.95, paperback; 250 pp.*

This is a fine book of plans and helpful suggestions for making country furniture. Blandford's style is as honest and direct as the pieces he shows how to make.

The designs are for solid wood, using traditional joints. Some knowledge of woodworking is assumed, but there is a range of projects, from a very simple three-legged stool and a nailed box to more challenging pieces using dovetails and mortise-and-tenon joinery.

Most of the pieces can be made with saws, planes and chisels. Some projects, such as the candle stand, require a lathe, but the author has designed these turned pieces to be built up from shorter sections by those people with shorter-bed lathes.

There are 11 major categories of projects: simple small assemblies; shelves; benches and stools; tables; chests and boxes; racks and stands; hanging cupboards and cabinets; standing cupboards; chairs; beds and cradles; and other furniture.

There are no photographs, but each project has very clear pen-and-ink plans with an exploded view and an illustration of the finished piece. All dimensions are in inches, and each project has a materials list. It would be helpful if the materials lists had the letter of each piece from the plan in addition to the name.

I certainly agree with the author when he says, "I believe that furniture adapted to modern needs from the styles developed by our ancestors can be very satisfying, both in the making and subsequent using." *–Jerry C. Blanchard*

Angel Carving and Other Favorites by Ron Ransom. *Schiffer Publishing Ltd., 1469 Morstein Road, West Chester, Pa. 19380; 1988. paperback; 40 pp.*

Ron Ransom's book, *Angel Carving and Other Favorites*, will surely be a favorite among hobbiest carvers and those who like to surround themselves with the Christmas spirit. The book is filled from beginning to end with folksy angels, Santas and even a Noah's ark, and Raggedy Ann and Andy.

All of the patterns are basic, and the black-and-white step-by-step photographs are well positioned and clearly indicate how individual cuts should be made. I especially liked the "Night After Christmas Santa": a sleepy-eyed elf in a nightshirt with an open drop seat on the reverse. Although the pieces are very simple, they possess a certain spark that holds your eye and makes you want to see more. And you *do* get more with this book: another Santa holding a "Merry Christmas" banner is really quite handsome.

The only fly in the ointment of this otherwise fine book is the sharpening section. When are the people who write how-to books on woodcarving going to stop recommending the use of pocket knives? First of all, developing the technique to achieve a razor-sharp edge with this type of knife takes a great amount of practice and even then, most people never get the feel for it. Many accidents are caused when a novice carver tries to force a reluctant blade through the wood. A sharp #24 X-Acto blade is a better tool to use for these non-intricate carvings and besides, if you do cut yourself, at least it will be a clean wound and will heal quickly.

The color plates at the end of the book are very nice. Ransom uses paint well to bring out the individual personalities of his characters. *–John Heatwole*

Victorian Fretwork: Over 100 Ready-to-Use Patterns and Decorative Ideas by John T. Jenson. *Garden Way Publishing, Schoolhouse Road, Pownal, Vt. 05261; 1990. hardback.*

Victorian Fretwork is a book of patterns aimed at weekend woodworkers who are looking to jazz up the outside of their homes. If you have a house with no ornamentation or with a style that lends itself to the Victorian vernacular, then this book may be for you. The book consists of six chapters that deal with columns (actually the spandrels or brackets attached to the columns), porch fencing (these should be called balustrades, but this is *not* a technical book), gables, screen doors, shutters and picket fences.

Victorian Fretwork begins with a brief overview of the history of fretwork and concludes with an explanation of the economic and industrial conditions that led to the popularity of the Victorian style. The author states that the Victorian fretwork featured in his book originated in late-19th-century San Francisco, Cal. It would be perhaps more accurate had Jenson traced its development from the "English summer cottage" to the "Vermont cottage" to the "Texas saloon," which he also mentions in his introduction. Did Queen Victoria lend her name to the style after a visit to California?

Leafing through *Victorian Fretwork* left me with a few questions. The book's jacket states that Jenson sketched his patterns in Europe and the United States. Which ones are which? Do any of the porch column, baluster and screen-door patterns go together? Does it matter? The author explains how to scale up his patterns if they are not the right size, but gives no information about what the "right size" should be.

If you are looking for some designs to finish off a plain porch or want to "Victorianize" a house with no style to call its own, then look to *Victorian Fretwork*. If you want some ideas for designing your own architectural fretwork, you can certainly find them here. But if you want your designs grounded in some sort of geographical or historical context, you'd better look elsewhere.

–David Ray Pine

Power Tool Woodworking by Gordon Warr. *B.T. Batsford, 4 Fitzhardinge St., London W1H 0AH, England; 1989. paperback; 158 pp.*

This British book is about portable power tools such as drills, routers, planers and saws. As a rule, I like foreign woodworking books because they offer a perspective not usually seen in the United States. I first learned about plunge routers and biscuit joiners through British books and magazines. These tools weren't yet available in America, and it was obvious that the Europeans were far ahead in tool design and development.

When I first got this book I was anxious to look through it to see what was new in European tools. I have to admit I was disappointed that there were no revolutionary tools or new concepts. However, it was refreshing to realize that some higher-quality tools, such as the Elu plunge router, are readily available in this country.

Each chapter of the book is dedicated to a particular tool and its accessories, and discusses the pros and cons of various designs and models. This is not particularly relevant to the American reader because many of the models discussed are not available here. This is one of the major drawbacks of the book. Likewise, the attachments and the accessories for these unavailable tools are not pertinent to the American buyer. However, it is interesting to see the variety of attachments that are available, especially for drills and portable circular saws.

Despite the drawbacks, this book would still be worthwhile if it covered more owner-made jigs and fixtures. Unfortunately, there are only a handful of jigs, and if you couldn't figure those out yourself, you should give up woodworking.

A good section on tune-up and maintenance could also make this book valuable, but unfortunately this is not discussed in depth. Very little is said about sharpening, lubrication, alignment and troubleshooting.

The book seems to be out of date in its style and content. These types of broad-topic books were popular 10 or 15 years ago when there was a new interest in woodworking. Most people now have

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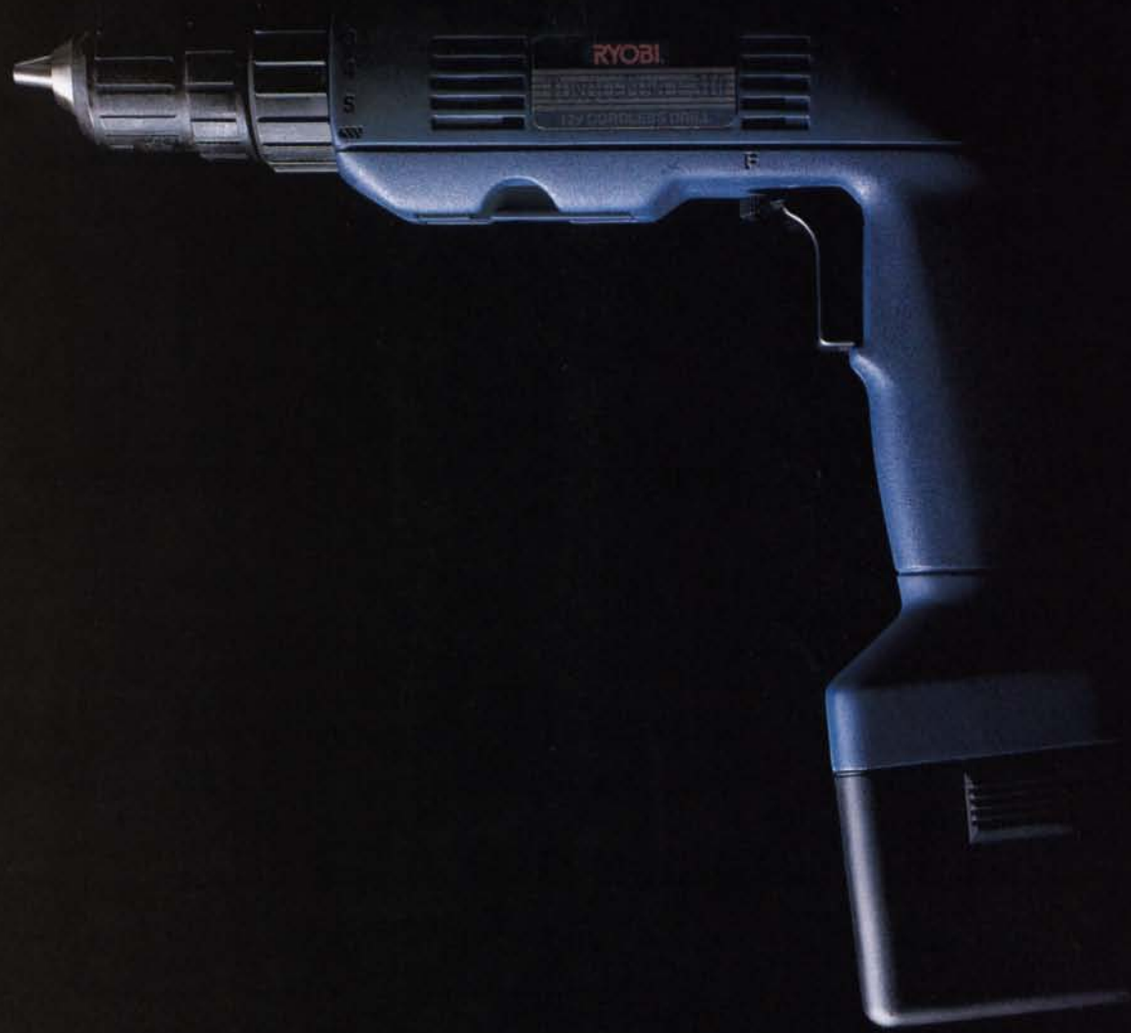

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their tools and the next step is to learn how to use them better.

Although this book is well written, I felt it was geared too specifically to the British woodworker and didn't offer what those of us working in other countries need to pick the right tool or to get the most out of it. *–Mark Duginske*

Craftworker's Marketing Kit by Ken Heller. *Breakthrough Communications, Dept. 218, Box 2009, Wheaton, Md. 20902; $29.95.*

You've honed your woodworking skills and come up with a line of products that you think will sell. Now the question is how to get your work out in front of the public. Ken Heller has compiled what he calls the Craftworker's Marketing Kit, which may be helpful in getting you started.

The kit consists of three mailing lists: 100 mail-order catalog houses that sell crafts; 105 craft fair, show and festival organizers; and 100 shops and galleries from across the country that sell crafts. I know from my own years in the crafts business that the lists include many of the major national wholesale/retail shows and some top-notch galleries. It is up to you to contact these organizations to find the shows that might be appropriate for you, and/or to find the retailers who are interested in buying your work. Heller offers some good advice and information on how best to do this.

There is one addition to the kit that I feel would be helpful: In addition to presenting names and addresses the lists should include a description of the type of work, price range, terms, etc., that each retailer is looking for; and some information about the nature of the shows, fairs and festivals, costs involved, and jurying procedures. This would help in choosing exactly who to contact.

Also included in the kit are publications that cover a wide range of craft-related subjects. The list includes books and periodicals covering the how-to side of crafts, as well as many dealing with business and marketing.

In my opinion, the Craftworker's Marketing Kit is well worth the price. If you can pick up one good wholesale account or find a show that works for you, the kit has more than paid for itself. *–Ken Altman*

The Encyclopedia Of Wood by Aidan Walker, et al. *Facts On File Inc., 460 Park Ave. S., New York, N.Y. 10016; 1989. $29.95, hardback; 192 pp.*

To refer to this book as an encyclopedia is a bit misleading. It is indeed a scholarly work, but it is not the dry, rigidly structured kind of reference work the term "encyclopedia" normally connotes. In fact, the bulk of the book makes for very pleasant, even entertaining reading. The beautiful, four-color illustrations and well-written text convey the story of wood as both a renewable resource and an essential raw material for craftsmen and industry. The book contains six sections beginning with a forward by John Makepeace that sets a somewhat dichotomous theme, stressing both the conservation and utilization of wood. Succeeding chapters then explore the issues from the often conflicting points of view of the woodworker, the botanist, the conservationist and the lumber producer. What is truly remarkable here is how skillfully the authors avoid taking any editorial position on whose special interests should prevail in the management of this worldwide resource.

One section, spanning 78 pages and appropriately entitled "The Directory of Wood," catalogs more than 150 of the world's most important timbers. Each wood is presented with a color illustration of its grain, a map of its natural range and a summary chart of its basic working characteristics and strength properties. The related copy provides additional botanical background, common names, availability, primary uses and other helpful information. All things considered, this section is well organized and a valuable reference, but it is so ambitious in scope that it tends to suffer in a few spots. The diamond-shaped color illustrations of the grain measure less than 2 in. from tip to tip and many of them are so muddy and off color they are of little value in helping the reader recognize the wood. The equally tiny range maps are at best barely accurate enough to indicate the country of origin. For example, American basswood is shown to grow from about New York City all the way north to Baffin Island, above the Arctic circle in Canada. Beyond this, some of the terminology used in the headings is misleading, at least with respect to American usage. For instance, Eastern white pine, *Pinus strobus*, is lumped in with the yellow pines, and the term redwood is used to denote the European, Scots pine, *P. sylvestris.* On either side of the Atlantic, the former is simply wrong, while I'm sure the latter would make perfect sense to a European reader. The book refers to American redwood as sequoia, after the botanical genus which produces it, and that is certainly neither ambiguous nor illogical.

It is obvious this book plays primarily to British readers, but it is still a valuable reference and I would recommend it for the serious student of exotic woods. Europe's heavy reliance on imported timbers predates our now growing consumption of these exotics and we have much to learn from the hands-on experience of European woodworkers and their price-induced sense of economy in using wood as a precious resource. *–Jon Arno*

Woodcarving Art, 1991 Calendar by Bob and Mary Mischka. *Box 336, Whitewater, Wisc. 53190; $9.95.*

The Best Woodwork from Design Book Five, 1991 Calendar The Taunton Press. *63 S. Main St., Box 5506, Newtown, Conn. 06470-5506; $12.95 ($14.95 Canada).*

In this age of tight schedules and deadlines, a calendar can become almost a tyrannical force in our lives. Fortunately, these forces don't have to be sterile pages of numbers and confining boxes. Each year more companies publish calendars that are visual delights, featuring color photography of almost any type of food, travel, nature, sport or other interest, including woodworking. Two of my favorites for woodworking in 1991 are *Woodcarving Art* and *The Best Woodwork from Design Book Five.*

Woodcarving Art presents some of the best color pictures of carving I've seen. And the selection of subjects ranges from a stunningly realistic 44-in.-high statue of St. Alexis by Neil Cox to a very lifelike Cooper's hawk by Greg Woodard to a "Man at Grindstone" caricature by Marvin Kaisersatt. In addition, the opening pages of the calendar include brief biographical sketches of the 14 artists (one couple and 11 individuals for the months) and Gerald Copeland, who made the cover piece "Sea Leader." In discussing the calendar, Bob and Mary Mischka say they want to help promote woodcarving as an art. This calendar is certainly a good step in that direction.

Carvings, turnings, musical instruments and furniture are featured in *The Best Woodwork from Design Book Five.* It would seem logical that I'd like this one, since I and the other editors of *Fine Woodworking* magazine were judges for the *Design Book,* but the calendar itself is the handiwork of the folks in the book department down the hall. They've put together a nice sampling of styles and periods. Each of us will have our favorite months, but that's to be expected with any calendar. But all in all, I think the collection will entertain and inspire many during the year. *–Dick Burrows*

Jerry C. Blanchard is a woodworker, metalworker and engraver in Monterey, Cal. John Heatwole is a woodcarver from Bridgewater, Va. David Ray Pine is a furnituremaker in Mt. Crawford, Va. Mark Duginske is a woodworker and author in Wausau, Wisc. Ken Altman makes boxes in Silverton, Oreg. Jon Arno is a wood technologist and consultant in Schaumburg, Ill. Dick Burrows is editor of FWW.

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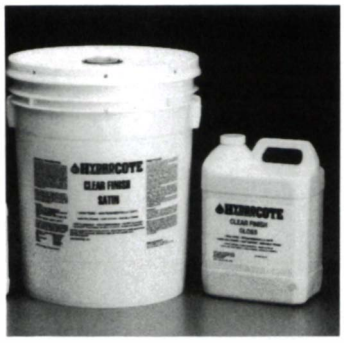

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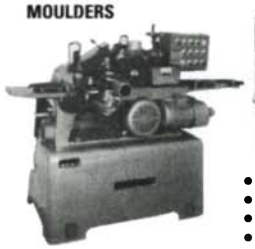

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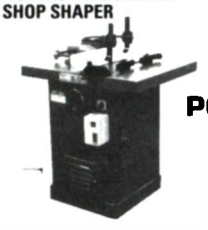

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Photo: Jim Zintgraff

Gerald Dubinski, a hobbyist woodworker in San Antonio, Tex., built this secretaire in just two months working evenings and weekends. It was another five months, however, before the three-dimensional chinoiserie decorations were finished by local artist Annabelle Loyd.

A project for the weekend woodworker

Inspired by a similar piece he had seen in a local interior decorator's studio, Gerald Dubinski, a hobbyist woodworker, designed and built the Chippendale-style secretaire shown at left. Working from photographs, and with the help of a draftsman, Dubinski drew up blueprints, dimensioning the piece to fit into his dining room. Spurred on by a challenge from his wife, he completed the secretaire in just two months, working only evenings and weekends.

The secretaire, built in three sections of solid cherry, has a lower chest of drawers, a middle desk unit and an upper bookcase. These units include two secret compartments and a total of 20 drawers: the largest are dovetailed together, while the smaller ones are rabbeted. After several unsuccessful attempts in his home shop, Dubinski had the crown shaped at a local custom cabinet shop. Outside shops also did the double-beveled mirrors in the doors and the hand-tooled leather writing surface inset into the drop-down desk front.

The piece is finished in a style known as chinoiserie, a French term that reflects the incorporation of Chinese-inspired qualities or motifs. Dubinski gessoed the three pieces to seal the wood grain and to fill any cracks before spraying the lacquer base color and a special heat-reactive lacquer that gives the secretaire a crazed, antique look. The chinoiserie was a new experience for Texas artist Annaelle Loyd. To give the figures a three-dimensional effect, Loyd used modeling clay to sculpt them on the surfaces of the secretaire, and then she painted them. After about five months of on-and-off work, the secretaire was ready for the final top coat of clear lacquer.

—Charley Robinson

Photo: Reg Eaton

This brass-framed beech brace, made by Thomas Turner and Co., of Sheffield, England, has an ebony head and handle, lever chuck and an internal bit-ejector spring.

The ultimate brace

One of the most fundamental tools found in any woodworker's cabinet is the brace. The Chinese are credited with developing the first double-crank brace, which imparted a continuous rotary motion to a cutting bit, around the turn of the second century. However, the European version, which is the form we recognize today, didn't appear until the early 15th century, when it was first depicted in Flemish paintings. The 1982 raising of King Henry VIII's flagship, *The Mary Rose,* off the Southern coast of England brought the oldest known examples of these braces to light. The braces found in the carpenter's cabin, where they had remained undisturbed since 1545, were elegantly simple. They consisted of a

one-piece wooden stock with a revolving head held in place with a peg and a metal "bit" that was fixed in the "chuck." Because the bit was permanently fixed to the chuck, a separate brace was required for each hole size.

Although the primary purpose of the brace and bit is for boring holes, the introduction of metal chucks made other jobs possible, such as using different bits for countersinking, screw driving, reaming, tapping and nut running. With the advent of industrialization came a plethora of inventions and innovations for braces, mostly from the now legendary iron and steel town of Sheffield, England. The zenith of these improvements occurred in 1849 when a "Royal Letters Patent" was granted to Sheffield toolmaker John Cartwright for "An Improved Brace for the Use of Carpenters and Others." This radical design consisted of a brass frame with internal filling and a revolving handle and head, similiar to the one in the bottom photo on p. 130. The specified material for the filling and handles was either wood or the horn of the black buffalo, which became soft and moldable when boiled. Although horn-filled braces are very rare, many others have been found with exotic hardwood fillings of ebony, rosewood or beech. Other less-common examples include brass frames filled in boxwood or, unfortunately, ivory.

The potential of this strikingly beautiful brace was recognized by Sheffield manufacturer William Marples, who had the foresight to purchase the patent from the inventor. Marples, who later became one of the largest manufacturers and merchants of tools in England, called his framed brace the "Ultimatum," a name that is now used generically among tool collectors. However, when Marples' patent rights expired in 1863, Sheffield toolmakers were free to trade, copy and exploit the framed brace. Any tool company could have its name applied to these braces and spuriously proclaim to be the maker or manufacturer. This is illustrated by the Sheffield (U.K.)-made framed brace on display in The National Museum of History and Technology, in Washington, D.C., stamped "B. Mills & Co., Philadelphia."

During the heyday of the "Ultimatum," many Sheffield firms advertised tools, cutlery and other metal products in U.S. business directories. For example, the 1851 New York business directory contained advertising from more than 20 Sheffield firms. Interestingly enough, the United States was a major importer of these expensive tools, judging by the early specimens that occasionally turn up at flea markets and garage sales with prices far below the current values. According to a leading British auction house, one could pay anywhere between $1,800 and $5,500 for an authentic boxwood-filled, brass-framed brace in prime condition. A more ordinary, ebony brace from that period can fetch approximately $350 to $450.

In the 1880s, the American machine-made iron-ratchet brace was imported into Britain. These durable and mechanically superior tools, which sold for less than half the price of an "Ultimatum," sounded the death knell for the less functional and cumbersome, albeit attractive, framed braces. By the early 1900s, all production of the framed brace had halted. However, it had enjoyed more than 50 years of continuous production and will undoubtedly go down in history as "the ultimate brace."

—Reg Eaton, King's Lynn, Norfolk, England

EDITOR'S NOTE: Reg Eaton is the author of *The Ultimate Brace: A Unique Product of Victorian Sheffield,* which is available from Tom Witte, Box 399, Mattawan, Mich. 49071; $40 including postage and handling. Michigan residents add 4% sales tax.

Product reviews

***Three specialty clamps:* The QUICK-GRIP bar clamps by American Tool Cos. Inc. and NOVAelite and SUPER-NOVA clamps by Moore Tool Co.,** *American Tool Cos. Inc., 301 S. 13th St., Suite 600, Lincoln, Neb. 68508; Moore Tool Co., 54 Glen Drive, Hudson, N.H. 03051.*

A general woodworking axiom is that you never have enough clamps, and now a couple of American manufacturers have broadened your choices when you try to fill that void. American Tool Cos., maker of Vise-Grip locking pliers, has introduced the QUICK-GRIP bar clamps; and the Moore Tool Co. has developed the SUPERNOVA and the NOVAelite clamps.

The QUICK-GRIP clamps (available in 6-in., 12-in., 18-in., 24-in. and 36-in. jaw openings) feature a sliding pistol grip that you repeatedly squeeze to clamp the workpiece; a separate trigger releases the clamping pressure. The amount of force generated depends upon the strength of the operator and usually ranges between 250 lbs. and 300 lbs.

I found these lightweight, general-purpose clamps useful for operations that require one hand to align the parts as you apply clamping pressure. While making a workbench recently, I tried using QUICK-GRIP clamps to compress the maple strips for the top, but I found that I needed the added pressure of my I-beam bar clamps to eliminate all the gaps. Although the QUICK-GRIP clamps lacked sufficient squeeze for this job, they held the boards in place while I secured the two-handed clamps; they are also convenient for jobs requiring less pressure (see the left photo above).

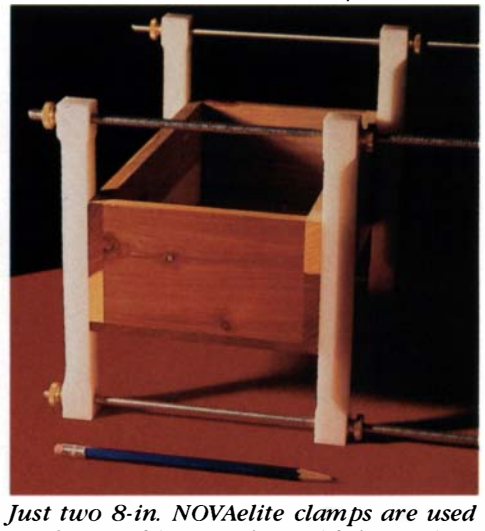
QUICK-GRIP clamps are thoughtfully designed and well made, and the narrow profile and squeeze-handle tightening means you don't have to allow the normal clearance between clamps to turn a crank. The jaws and handles are made of glass-filled nylon and they come with removable, rubber clamping pads. My only concerns are that the handles may be slightly too large for people with small hands and that squeezing the grips is a bit strenuous when there is a lot of clamping to be done. Suggested list prices range from $21 for the 6-in. clamp to $34 for the 36-in. clamp.

The unique feature of Moore Tool Co.'s new clamps, one of which is shown in the above photo at right, is the reversible-beam

Photo: Bill Stankus

The one-handed locking mechanism and the soft jaw pads make the QUICK-GRIP fast and easy for securing work to your benchtop or for other awkward clamping jobs.

Photo: Courtesy of Moore Tool Co.



Just two 8-in. NOVAelite clamps are used to glue up this cedar box with butt joints. The wide face of the beams distributes the pressure across the entire joint.

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clamping jaws made of a white, nylon-like material. The jaws have two different working surfaces; one is a straight knife-like edge and the other is a crowned cylindrical surface. The jaws have holes at either end for threaded rods and come in different sizes and clamping pressures depending on the model. The NOVAelite model is available in jaw sizes of 8 in., 12 in. and 16 in., with a clamping force rated at 30 lbs. The larger, heavier duty SUPERNOVA clamps, rated at 100 lbs., are available with 16-in., 20-in. and 24-in. jaws. In use, as the drive nuts are tightened on the threaded rods, the crowned, cylindrical surface begins to flatten. The rated force is achieved when the jaws are completely flattened against the workpiece.

The crowned surfaces distribute clamping pressure over the length of the jaw, providing more even clamping pressure and enabling you to use fewer clamps in many situations. The synthetic jaw material is non-marring and eliminates the need for wooden clamp pads to protect the work surface. To accommodate workpieces up to 36 in. thick, each clamp comes with coupling nuts and pairs of 6-in.-, 12-in.- and 18-in.-long threaded rods.

Because the knife-like edge of the clamps have very little surface contact, they are useful in finishing operations. For example, the ends of a shelf can be held by the knife-like edges with the threaded rod running the length of the shelf. You can then hang onto the clamp while staining or painting both sides of a shelf. The clamp jaws are stain, solvent and adhesive resistant. When finished, the entire assembly can be hung up by the clamp to dry.

With a little thought, you will find new ways for these unusual clamps to help in your workshop. The long, narrow clamping jaws can eliminate the need for numerous clamps when gluing up drawers. You can clamp across the face of a rail-and-stile frame to ensure that the construction stays flat. Or a series of clamps could be used with cauls to make a small veneer press. While I don't foresee these clamps replacing bar or adjustable clamps, I think they would work well for production work requiring light to medium clamping. My major complaint with these clamps is that the miscellaneous couplings, brass knobs and lengths of threaded rod are easily misplaced.

—Bill Stankus, DeWitt, N.Y.

Redimix epoxy gun, *Chem-Tech, 4669 Lander Road, Chagrin Falls, Ohio 44022.*

Using epoxy commonly involves precisely measuring quantities of resin and hardener, followed by a messy, laborious and inconvenient mixing process. It would certainly be easier if the sticky stuff came ready to use like other adhesives. And now it does. Chem-Tech, the formulator of T-88 Epoxy Adhesive, offers a twin-tube cartridge gun system that dispenses up to 8 ozs. of premixed epoxy. Chem-Tech makes it easy for you to try this system by offering a starter kit, which includes a gun, two empty cartridges and four mixer nozzles for $43, including shipping and handling. Available individually, the refillable cartridges cost $5 each and the disposable mixer tubes are $1.40, delivered.

A squeeze of the Redimix gun trigger delivers properly measured and thoroughly mixed epoxy. Less than half a teaspoon of epoxy is left in the disposable mixing tip.

The glue gun is about the size and configuration of a standard caulking gun and it has two pistons that press equal amounts of resin and hardener from a twin-tube cartridge into a mixing nozzle. The cartridges hold 4 oz. each of resin and hardener. The 4-in.-long disposable nozzle has fins, or baffles, inside that thoroughly mix the epoxy before it leaves the nozzle.

Before using the Redimix gun, you must first mark one cartridge tube and one piston for the resin, and the other tube and piston for the hardener. (A felt-tip marker works fine.) Then fill the respective tubes with resin and hardener and insert the pistons. Install the cartridge on the gun, point the gun up so air bubbles rise to the cartridge's tip and squeeze out epoxy and air until the air is eliminated and equal amounts of resin and hardener are ejected into a disposable cup. Next, install the mixing nozzle by pushing it over the cartridge tip and turning it 90° to lock it in place. Squeeze out and discard the first half teaspoon of the mixture, to ensure equal amounts of resin and hardener are present, and then just squeeze the gun handle to apply epoxy to the workpiece. You can apply a line of epoxy to a surface to be glued, fill a seam or void, or inject epoxy into punky, rotten wood. Finally, when you finish, remove and discard the nozzle, and thoroughly clean and cap off the cartridge tip. For very small amounts of epoxy, dispense the required amount without using the mixing nozzle, and then mix the resin and hardener by hand.

As a former boatbuilder, I used barrels of epoxy the old fashioned way, and I was skeptical that a system this easy could be effective. But the resin and hardener were thoroughly mixed when they came out of the nozzle, and the epoxy cured in the prescribed amount of time. The nozzle end can be trimmed, without affecting the mixing operation, so you can dispense a bead from about 1/16 in. dia. up to about 1/4 in. dia.

I was also wary that the mixed glue would harden in the nozzle during extended use. To avoid this problem, Chem-Tech suggests that you squeeze out a half teaspoon of the thermosetting epoxy every 30 minutes. Because I used the gun in 90° sunshine, I evacuated the nozzle every 15 minutes and had no problems.

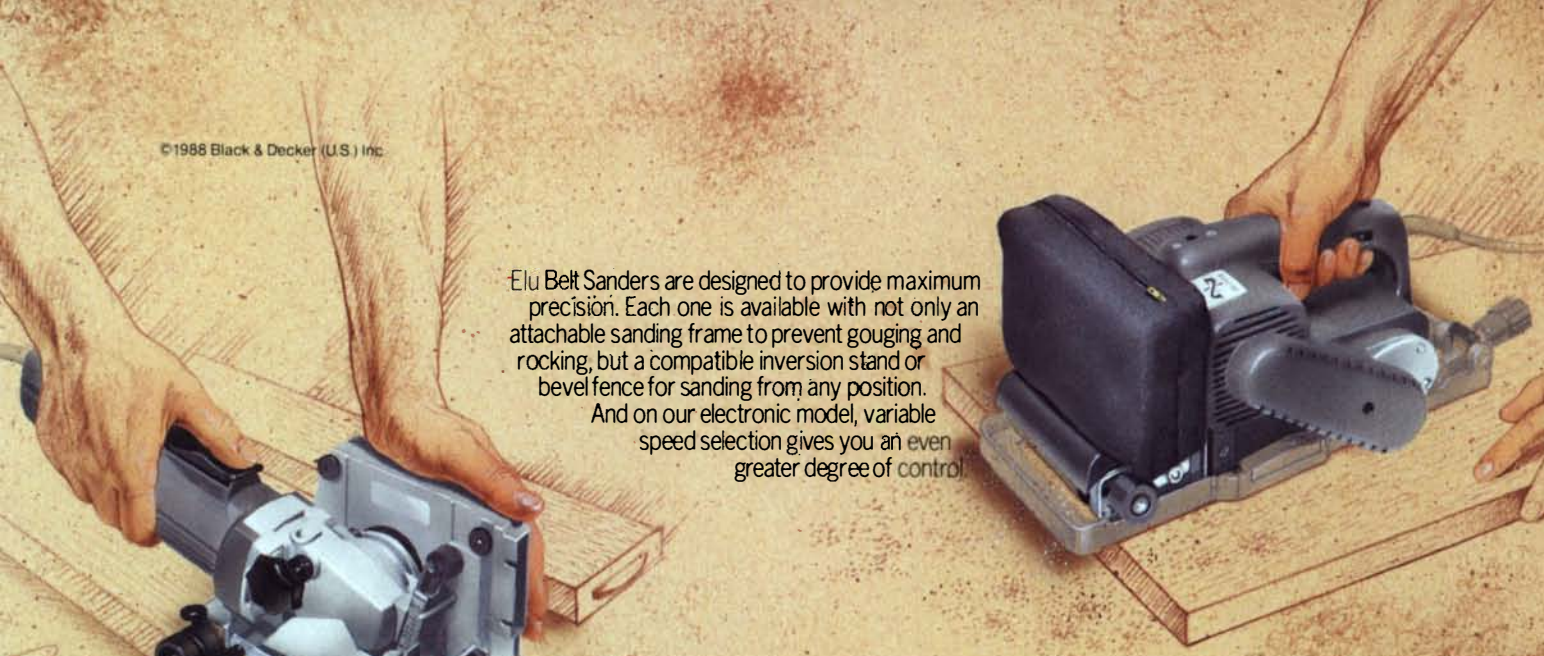
One problem I did have was that the storage cap became glued to the cartridge in spite of my thoroughly cleaning the cartridge tip. There may have been seepage from the cartridge or contamination if the cap was turned 180°, but I had to use pliers to remove the cap after the cartridge had been left for a week. Although I easily removed the encrusted glue in the opening with a piece of wire, I suggest you mark a line on the cap and one on the cartridge, to ensure that you replace the cap the same way after each use.

The Redimix dispensing system worked well and I think it would make a good addition to any shop that regularly uses epoxy.

—Gary Weisenburger

Notes and Comment

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



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ANYTHING LESS WON'T CUT IT.

Photos: Mark Bennett

MARQUETRY MENAGERIE

The fragility and diversity of life are major themes in this marquetry wall mural by Lora Hunt and Spider Johnson, a husband and wife team from Mason, Tex. The 8-ft.-wide by 4-ft.-high mural, entitled "Life's Undeniable Necessity: Conquering Hunger," was commissioned by Boston University for the school's Biological Sciences Center. BU's only guideline was that the piece reflect the biological diversity of the planet. To achieve this goal, the artists joined together more than 5,000 pieces of veneer from 83 species to create 82 animals and 49 plants in 11 different habitats. Even though many species depicted in the mural are threatened or endangered, the artists feel that the planet really belongs to these creatures, not to man. Hence, the only man-made object depicted in the mural is the littered drink can, shown in the top, left detail, washed up on an otherwise pristine shore. The ivory-billed woodpecker, shown in the bottom, left detail, is a species believed to be extinct. The artists included it as a reminder of the intense fragility of life's legacies, and how the unthinking destruction of wildlife habitats can drastically affect the intricate beauty of creation. The artists estimated it took about 1,500 hours to complete the mural.