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Issue No. 35 November/December 1993
Cover Photo: Frank Klausz in his Pluckemin, New Jersey shop. Photo by Mitch Mandel.



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A WORD FROM THE EDITOR



MAKING DO

The Theory of the Three P's: "Perfectionism leads to Procrastination. Procrastination leads to Paralysis."

I'll bet you think the editor of a woodworking magazine owns the ultimate dream shop, packed with the latest, fanciest high-tech equipment on the market, right? Well, why don't you join me for an armchair tour of my personal workshop, situated in the basement of my house.

Careful on the stairs, I've been meaning to move those pieces of wood. Watch your head. I raised most of the hot-air ducts to get more headroom, but that one's still pretty low.

Over there's my funky old band-saw—a 1950 vintage Sears 12-incher I got from my Uncle Jack. That upper guide broke years ago, but it still runs fine on the replacement guide Jack made for it. I resaw on it all the time. The radial arm saw, grinder, and that old drill press, I bought secondhand. I splurged a few years back and bought that Delta Contractor's saw brand-new. I also went wild with a new 6-in. jointer and a portable thickness planer. Up till then, I hand-planed everything I made at home. I still use my planes a lot, but it's nice to have an alternative.

My workbench? I finally got around to building a new one last year. But for more than three years I made do with my "WorkMate" portable bench and that heavy wooden table with the machinist's vise.

Tool cabinet? Never owned one. I keep my hand tools, chisels and carving tools neatly arranged on those wooden shelves. My turning tools are packed away in boxes, since I sold my lathe. Maybe next year I'll spring for a new one.

The lighting is a bit spotty, but I fill in with clamp lamps when I need more light. I'm planning to install two separate circuits—one for the lights and one for my equipment. In the meantime, I make do with what I have.

That's the point. Make do with what you have. Like you, I dream of the day when I'll have the time and the money to build the workshop I've planned in my head. At the rate I'm going, I may never *complete* my personal dream shop, but I'm building it piece by piece as I go along, adding tools, machinery and improvements as the years go by. In the meantime, I don't let less-than-ideal surroundings prevent me from working.

If you put off woodworking until you have the perfect shop, you'll never make anything. Paralysis. Get going with what you have. Your shop will grow and evolve with time.

David Sloan
Editor & Publisher

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LETTERS

Router Test Follow-up

Your use of a dynamometer in your plunge router review (AW #33) and the graph you created were truly outstanding. This technique stripped through all the hype and hoopla that generally surrounds subjective magazine articles about new products.

[However], leaving the power/load factor [you] developed from the dynamometer testing out of your overall ratings makes me question your outcomes and the purpose of the comparison.

John Peek
Castro Valley, CA

While we were able to measure power differences between routers within the same power class (the 3- to 3½-HP class, for example) we found that these differences didn't have any significant effect on a router's ability to perform most real-life routing tasks.

We feel that size, weight and ergonomic features are the most important criteria when choosing an all-purpose router. Brute power is important only when you push your router to its limits with extremely heavy cuts (raising panels on a router table, for example).

Wood Movement Wisdom

I applaud Jim Cummins for a well-written and researched article on wood movement ("Coping with Wood Movement," AW #34). But Cummins states that when furniture is placed in unheated storage areas such as basements or garages, it will self-destruct. This state-

ment implies that temperature is the culprit. This is simply not true. Hygroscopic objects like wood fare *better* in unheated buildings, because the relative humidity in such areas will stay within a much narrower range than in heated areas.

The problem with storing furniture in garages and basements is usually dampness, which can expose furniture to prolonged levels of relative humidity in excess of 80 percent. This will cause failure of hide glues used in antique furniture within weeks. Modern PVA adhesives also will eventually deteriorate.

Jeff Jewitt
Furniture conservator and restorer
North Royalton, OH

Warning on Walnut

Dick Boak's article on walnut ("Wood Facts," AW #34) reiterates the wood industry's stance that walnut is nontoxic, and I suppose this is strictly true in an industrial setting. However, woodworkers should bear in mind that walnut sawdust is toxic to a large number of plants, and among animals, seriously toxic to horses if used as bedding. While we are all looking for productive uses for our sawdust and planer shavings, we should probably think of walnut byproducts as poisonous.

Jim Cummins
Woodstock, NY

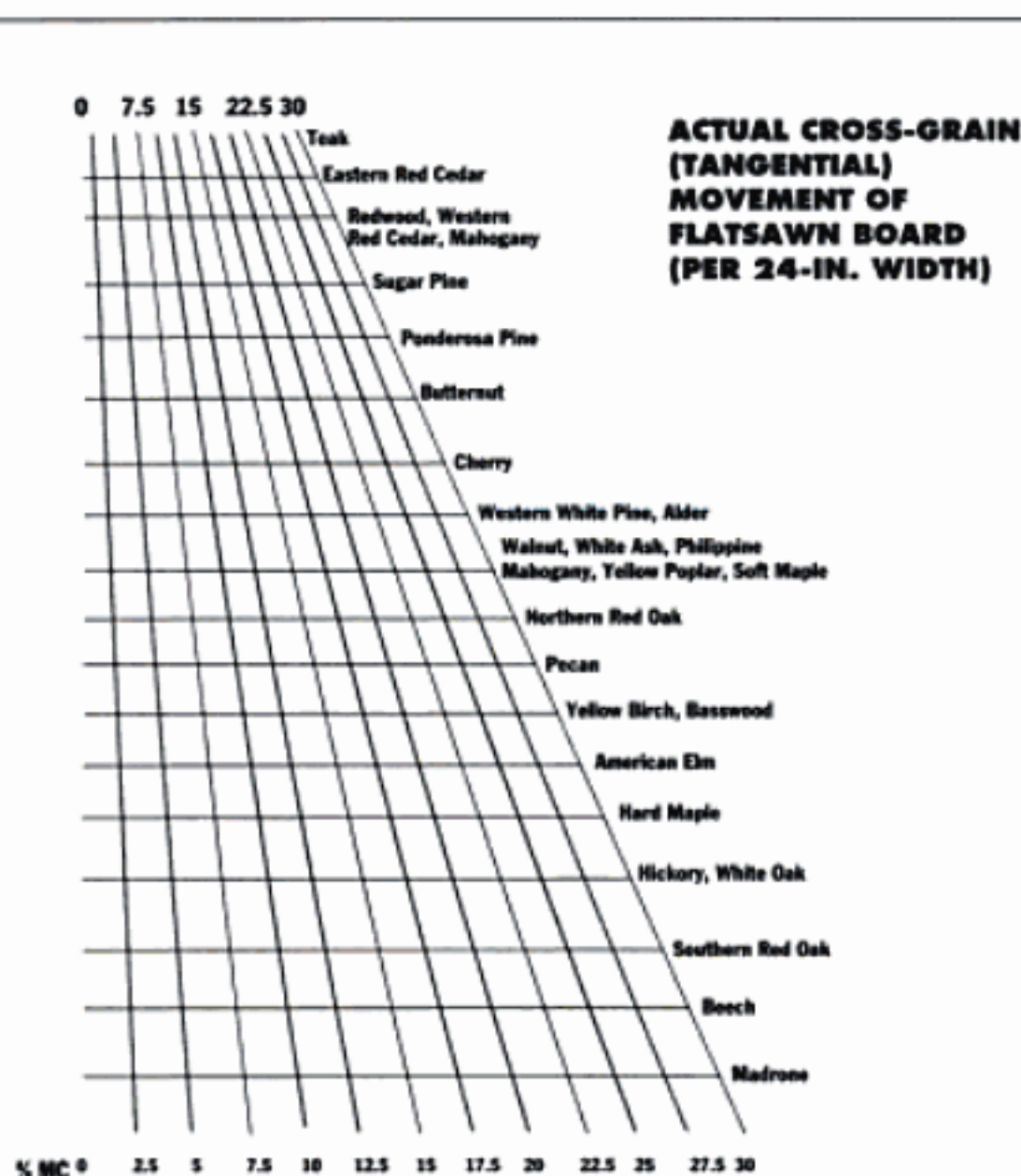
Down on Diamond Hone

Re: Diamond Hone for Carbide Bits ("Toolbox," AW #33), you show a guy with his fingers just millimeters away from the sharpener, which is presumably rotating at 10,000 or so rpm. It would seem to me that would have to be unsafe.

Derek Roff
Albuquerque, NM

I have a problem with the advice to "touch up" router bits on a diamond hone. Many times as a professional sharpener I have to straighten out bits that have been sharpened using these methods. Freehanding a router bit is risky business. [Also], your mention that the power hone "cuts fast and clean" means that it's real easy to put grooves in the surface of the flute, or totally destroy the cutting edge if your hand slips.

Matthew Ver Steeg
Carlisle, IL



Correction

Due to a production error, the base line moisture percentages in the wood movement chart in the last issue (AW #34) did not match the top line percentages. Here is the corrected chart.

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LETTERS

Sharpening Tips

Re: "Handsaw Sharpening" (AW #33). Mario Rodriguez recommends a 30° face bevel for the teeth on a crosscut saw. If your readers use this angle, they will very likely end up bringing their saw to a shop like mine for re-toothed. A 30° face bevel will produce such an extremely thin leading edge to the tooth

that it will neither hold an edge nor its set. Mr. Rodriguez also recommends a 0° hook angle for the teeth on a rip saw. This will make the saw chatter rather than shear. Following are the bevels and angles recognized

as optimum by the manufacturing and sharpening industries:

Chet Howe
United Sharpeners Association
Petaluma, CA

Points Per In.	Type of Saw	Hook Angle	Face Bevel	Set (in.)
14-16	Fine Tooth	-15°	0°-5°	0.006
11-13	Back/Miter	-15°	10°	0.008
8-10	Crosscut	-15°	15°	0.015
5-7	Rip Saw	-8°	0°	0.018

Mario Rodriguez responds: Although it's true that a 30° angle produces a thinner tooth, a sharper angle bevel means a smoother, clean-cutting blade, similar to Japanese saws.

Glue Gaff

Your "Guide to Glues" (aw #34) was concise and full of good information. I did catch one omission, though. Five-minute epoxy is soluble in alcohol even after it cures, which is why instrument builders like it for minor repairs—you can easily clean it up with an alcohol-dampened rag.

Debbie Suran
Deer Isle, Maine

What's on your mind? We value your comments, complaints and corrections. You can reach us by mail, FAX or phone. Send letters by mail: "Editor," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098 or by FAX: (215) 967-8956. To leave a voice message on our Letterline, call (215) 967-7776.

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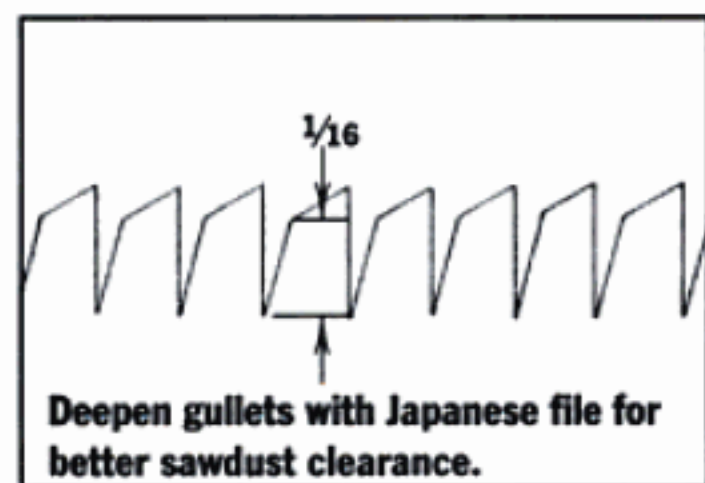
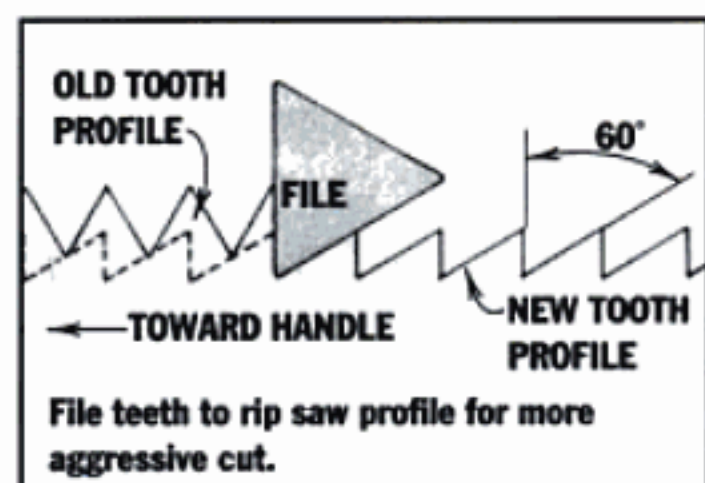
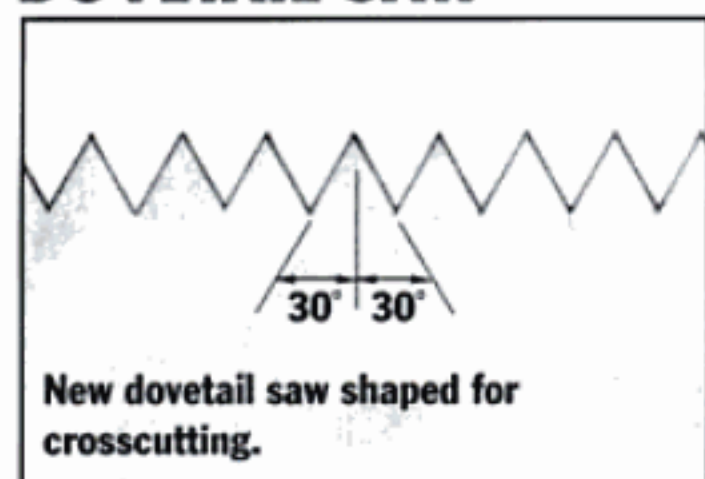
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MODIFYING A DOVETAIL SAW



DRAWINGS BY FRANK KOHRBACH

Modifying a Dovetail Saw

Q Most dovetail saws are sharpened for crosscutting, yet sawing pins and tails is mostly a ripping operation. Is there a way to improve the saw's performance?

L. Bruce Prescott, AZ

A To make a backsaw cut more aggressively for dovetail work, I reshape the angle of the teeth with a saw file. I sharpen by filing straight across each tooth, holding one edge of the file vertical, as shown in the drawing, and filing until this edge touches the point of the old tooth. (See drawing.) I also deepen the gullets with a Japanese file (available from most mail order firms). The file's slim, tapered pro-

file allows me to cut a narrow space that creates more room for sawdust, letting me saw faster.

Frank Klausz
Cabinetmaker
Pluckemin, NJ

Wood Edging On Laminated Countertops

Q How can I get the top of my wood edging flush with a laminated countertop without marring the laminate in the process?

Devon Fujinami
Pittstown, NC

A The trick is to align the edging flush with the surface of the countertop before gluing it in place. First, cut the edging to size, including miters, and sand it for finishing. Then cover the top surfaces of both the wood and the countertop with low-tack masking tape. (If the laminate comes covered with stretch plastic, leave that on and mask only the edging.)

Rout a groove or use a biscuit joiner to cut slots in the pieces to be mated, registering your cuts off the masked surfaces. The tape (or plastic) on the laminate protects the surface from scratches, while the tape on the edging insures that both parts register equally while being slotted.

Before gluing, remove the tape from the edging and laminate, and make a single pass with 220-grit sandpaper to break the inside edge of the edging and the edge of the countertop. This creates a very slight V-joint when the parts come together, so that hands and elbows won't feel a sharp ridge if the edging is a fraction high or low. Then glue plywood splines or biscuits into your slots and glue and clamp on the edging, wiping any excess glue with a damp cloth. When the glue has dried, carefully sand any miters and any raised grain with 220-grit paper.

When finishing the edging, cover

the laminate with masking tape to prevent marking it with stain or finish.

Michael Knepp
Cabinetmaker
Piscataway, NJ

Black Marks On Oak

Q I unwittingly left a rain-soaked lamp on my oak desk, and the next day there was an ugly black stain under the lamp. How can I remove the black mark?

Lee Speed
Jackson, MS

A The mark on your desk is not a stain: it's a dye, and it is the result of a chemical reaction between the iron in your lamp and the tannins in the oak. You can remove the mark by using a homemade bleach.

To make the bleach, you'll need 3 ounces of oxalic acid (sold as dry crystals at paint or drug stores). With a hammer, break up the crystals until they resemble table salt. Put the crystals into a pint-sized jar and fill the jar with rain or distilled water. Shake it frequently over a 24-hour period.

To use the solution, wipe it liberally over the affected area with a cloth and wait a few minutes for the mark to lighten or disappear. Oxalic acid is harmless to most finishes, so you don't have to worry about damaging the rest of the surface.

If the first coat of oxalic acid doesn't remove the blemish, try repeated coats. If they don't do the trick, let the solution dry and try a second mixture, this time substituting denatured alcohol for the water. The idea is to experiment: the acid/water mixture is the more potent of the two, while the alcohol formula will evaporate faster, letting you quickly apply more coats. When the bleach has done its work, neutralize the acid by wiping with household vinegar.

George Frank
Finishing Expert
Warm Mineral Springs, FL

Q&A

Ripping Narrow Sticks

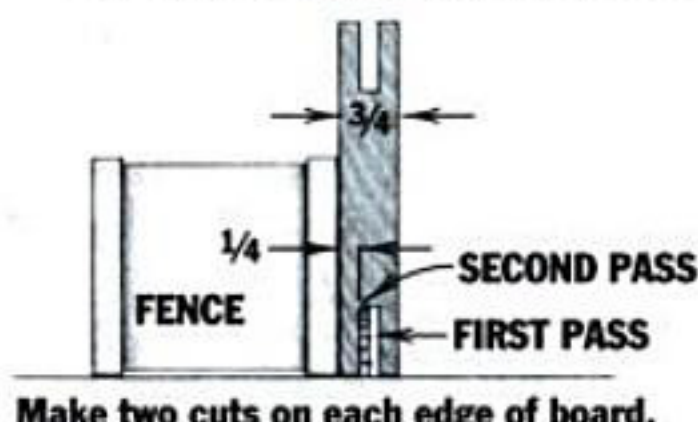
Q I need to make a large quantity of 1/4-in.-square sticks out of pine, and I'm having difficulty ripping them cleanly on my tablesaw. What should I do?

Deacon Joseph R. Heinrich
Linden, NJ

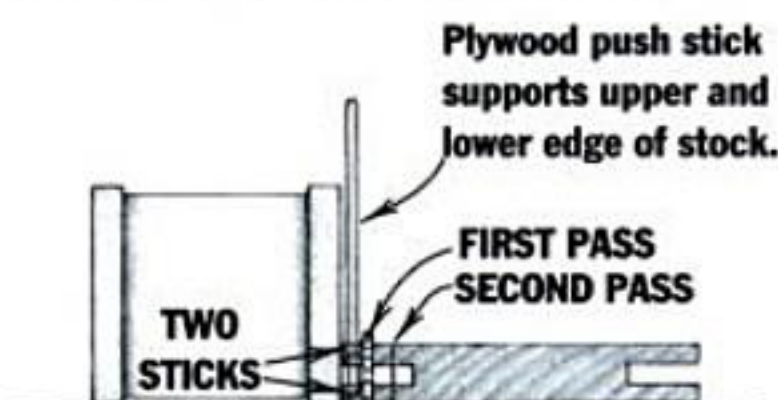
A I make square peg stock by the truckload and use a technique that makes a large volume of sticks quickly. However, to use my technique, you may need to tune your tablesaw first. Also, I recommend a 40-tooth alternate top bevel (ATB) saw blade and a zero-clearance saw blade insert to support the stock.

To make 1/4-in. sticks, pick a straight-grained, 3/4-in.-thick board and joint both edges. Set the tablesaw fence for a 1/4-in.-wide cut, and raise the blade

RIPPING 1/4-IN.-SQUARE STICKS



Make two cuts on each edge of board.



Lay board facedown and rip off successive sticks.

slightly more than 3/4 in. above the table.

Make your first cut with the board on edge (see drawing), pushing the stock smoothly to prevent burning.

Then turn the board end-for-end and make a second cut on the same edge. Flip the board over and repeat the procedure.

Then lay the board facedown on the saw and rip one edge. (See drawing.) This yields two sticks. Repeat the cut on the same edge to get two more sticks. Flip the board over and cut the adjacent edge to get four more sticks.

To prevent kickback, use a thin plywood push stick that supports both sticks as they're ripped off the stock. To make additional sticks from the same stock, just repeat the procedure by starting with a cut into the edge of the board.

For a finished surface, clean up any saw marks on the sticks by making a few passes with a block plane.

Andy Rae
Assistant Editor

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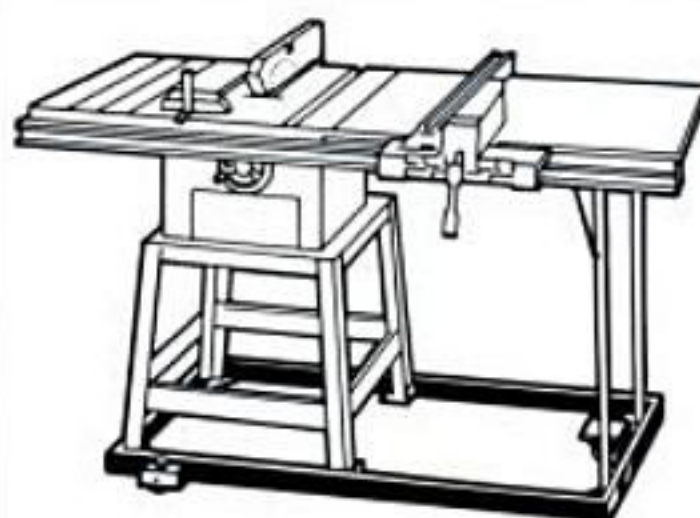
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Q&A

Cool Cutting In Metal

Q Like most woodworkers, occasionally I need to saw or drill into metal. I use a light machine oil to lubricate my cutters, but they still burn from time to time. What am I doing wrong?

Harcourt Scott
Ellsworth, ME

A The key to cool cutting is to start with sharp cutters and to use a speed and feed rate appropriate to the material you're cutting. Bearing down on a drill bit to force it through the material only increases friction, making the tool brittle and dulling its cutting edge.

There are also several products designed to reduce friction (and thus heat) better than petroleum-based lubricants like machine oils. We make

one variety, called Cool Tool, that's made from chlorinated paraffin. A couple of drops on the tool or workpiece creates a solid film (unlike oil, which remains liquid) between the tool and workpiece. Cool Tool can be used on all types of metals for drilling, tapping or even cutting with a hacksaw.

Other products such as Rapid Tap or Tap Magic are similar, but check the label, since some products are designed for use with specific metals. You can buy these lubricants at a

machinist's supply house, or where metalworking machinery is sold.

Bill Davis, Product Manager
Monroe Fluid Technology
Hilton, NY

Got a woodworking question for the experts? Send it to "Q&A," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098, or phone your message to us at (215) 967-7776. FAX: (215) 967-8956.

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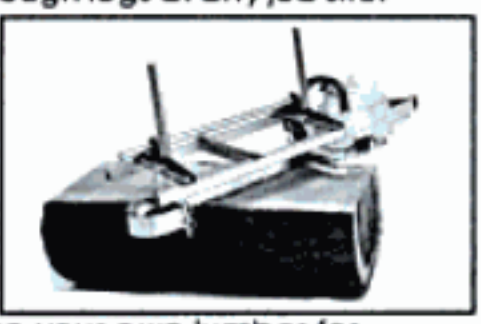
Industrial plastic wrap (good for wrapping delicate turnings when hollowing) is available from Consolidated Plastics, 1864 Enterprise Pkwy., Twinsburg, OH 44087, (800) 362-1000.

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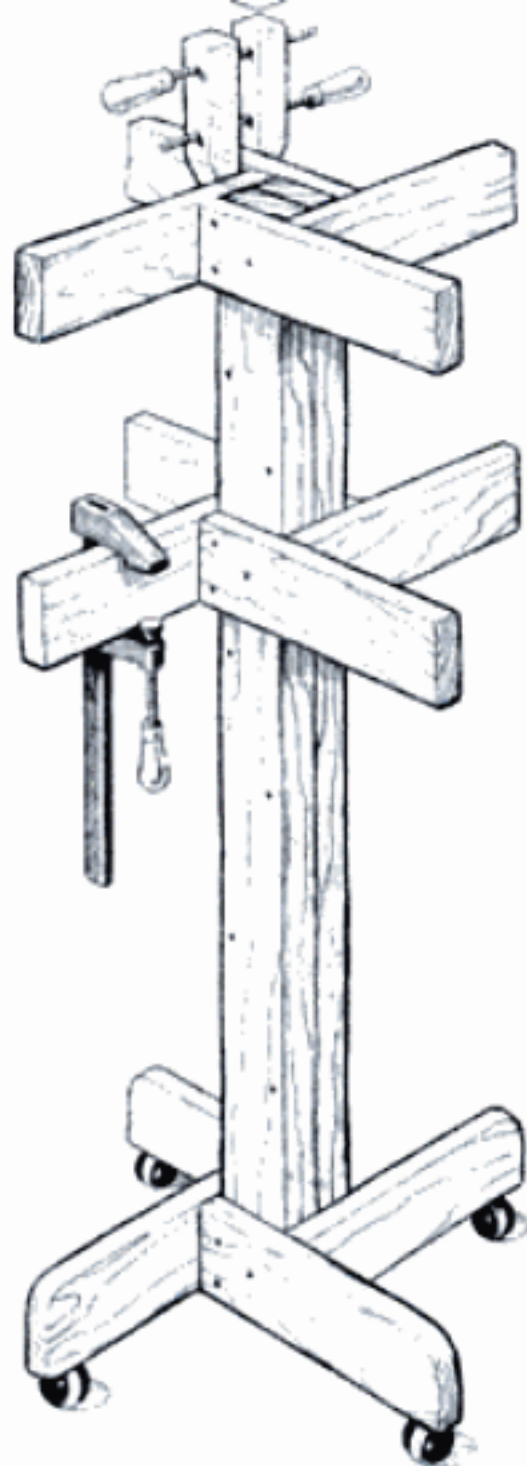
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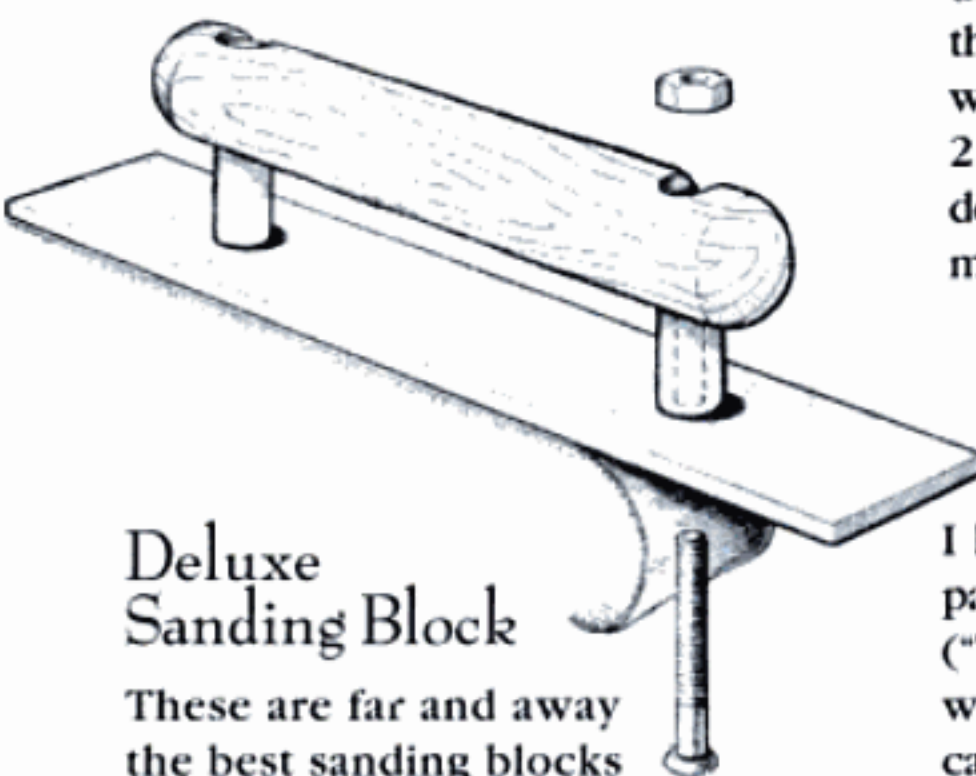
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Rolling Clamp Stand

I made this rolling clamp stand out of construction-grade 2x4s. This one is 4 ft. tall, 20 in. wide and holds an amazing number of clamps—65 at the last count with room left over. It could readily be adapted to take bar and pipe clamps as well. The casters came from a local hardware store.

Raymond Parsons
Cape Coral, FL



Deluxe Sanding Block

These are far and away the best sanding blocks I have ever used. I make each one 6 in. to 36 in. long and 2 in. wide for the carborundrum cloth I use. This comes in rolls so you can just cut off what you need. I attach the abrasive with spray adhesive or glue stick.

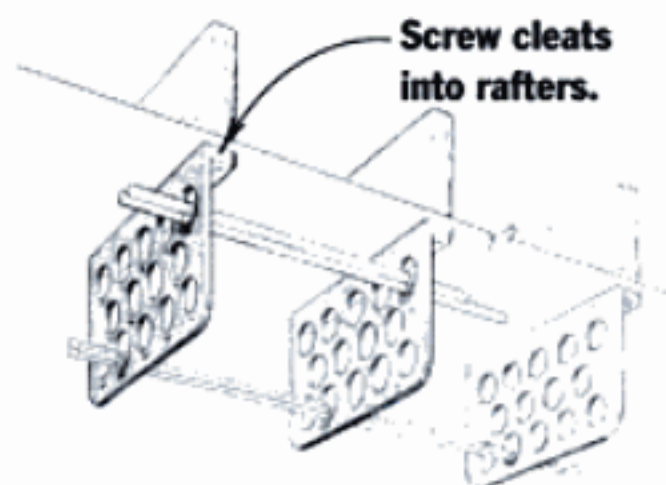
Jay Wallace
Ashland, OR

TECH TIPS

Alcohol in the Shop?

No, not that kind, but alcohol swabs are one of the handiest items in my shop. I use them for removing pencil lines; wiping graphite off drafting tools; cleaning adhesive off sanding pads and removing residues from tools. They will not raise the grain as water does, and they're ideal for cleaning smudges off a wood surface prior to finishing. I even use them as an anti-septic for the inevitable nicks and scratches. \$1.39 for a box of 100 at my local drug store is a bargain.

Richard Reimers
West Seneca, NY



Overhead Storage

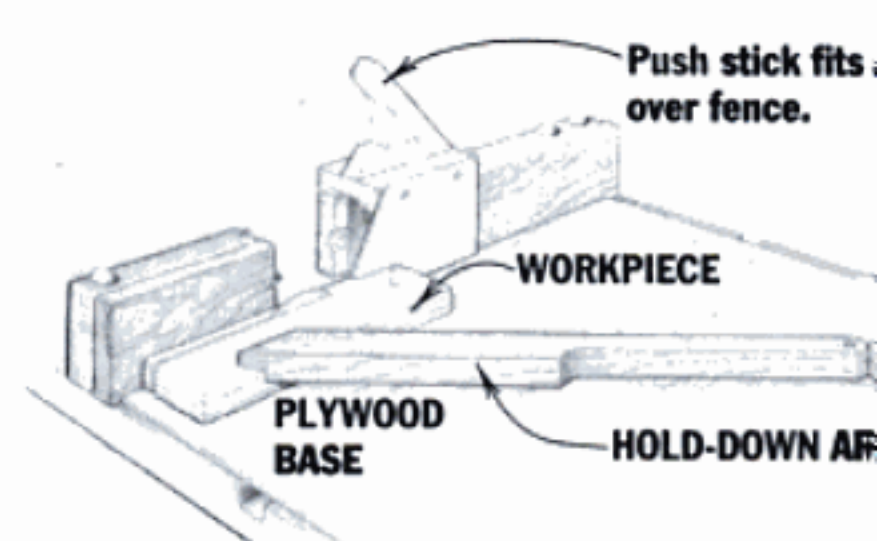
I devised this rack to keep my supply of dowels organized and visible, yet out of the way. I clamped three pieces of plywood together and drilled holes with a 2 1/8-in. hole saw. My rack has each dowel size clearly marked and accommodates lengths from 18 in. to 4 ft.

Craig Bentzley
Chalfont, PA

Clamp-Padding, Take 2

I liked Mike Paliotta's idea of using felt pads to protect wood from iron clamps ("Tech Tips," AW #34), but I've come up with something better: leather. I make a cardboard pattern by tracing the shape off the clamp and then use it to cut pads out of the tongues of old shoes. For removable pads, use rubber cement or double-sided tape. Otherwise glue the leather to the iron surface with Titebond glue or the equivalent.

Allison Cleary
Huntington, VT



Sawing Thin Stock Safely

This simple jig replaces a push stick and takes the risk out of sawing slats or other thin stock. The base is made from 1/8-in. plywood and has a thin slot cut in it for the blade, to prevent off-cuts from falling into the blade slot. A U-shaped push stick fits over both the metal fence and an auxiliary wooden fence and has a thin, 1/16-in. laminated plastic face to push the stock past the blade. Finally, there's a long hold-down/anti-kickback arm that is notched as shown to keep the stock pressed firmly against the fence and table. I find I get the cleanest cuts by jointing the surface of the stock before cutting each slat.

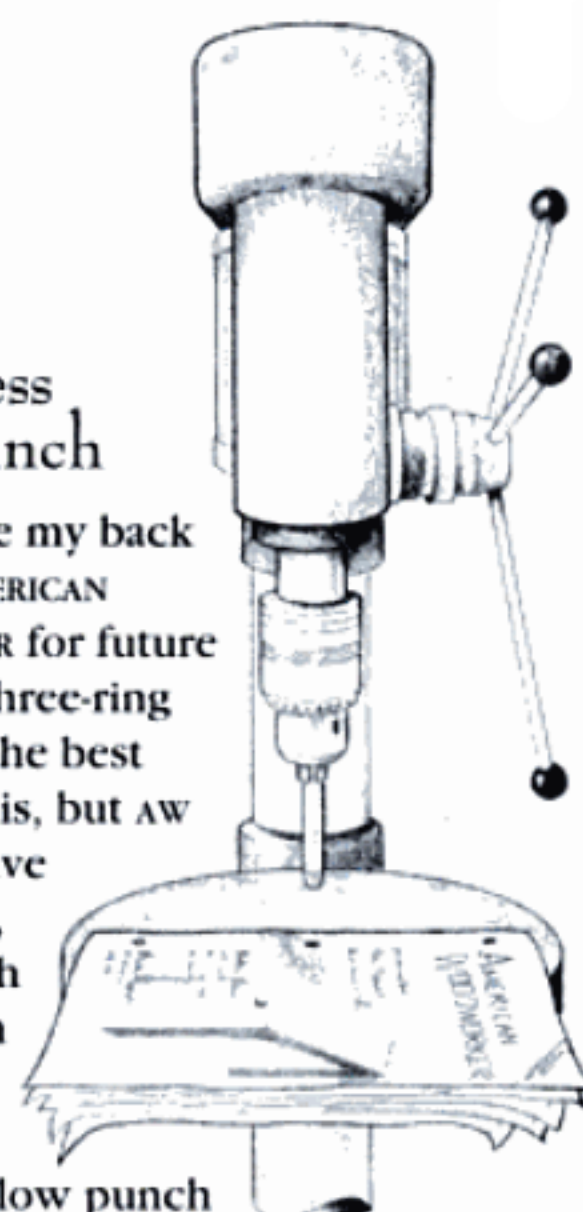
Bob Barnes
Joplin, MO

Drill-Press Paper Punch

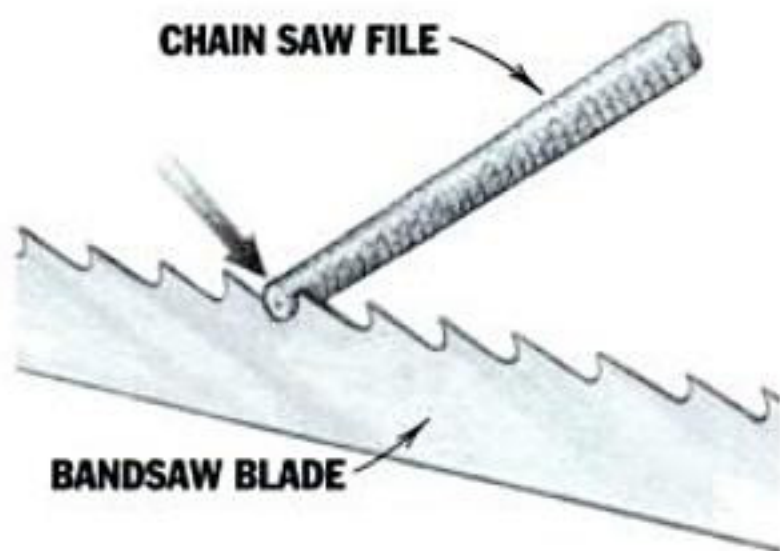
I like to store my back issues of AMERICAN WOODWORKER for future reference. Three-ring binders are the best way to do this, but AW does not arrive prepunched, and it's tough to get through 80 pages.

My solution is a 3/8-in. hollow punch made to punch holes in leather (available from Tandy Leather outlets). I hone the cutting edge sharp and smooth, then chuck the punch in the drill press with a piece of hardwood scrap underneath. It cuts perfectly.

Truett Frazier
Sevierville, TN



TECH TIPS



Filing Bandsaw Blades

One day I was caught with a job to finish, a dull bandsaw blade, and 30 miles to the nearest store. So I clamped the blade between two 12-in. pieces of 1-in. by 1-in. aluminum angle and went to work with a chain saw file. I filed straight across and found that two strokes would create a hook and sharpen the tooth. When I tried it out, the blade still had plenty of set and worked better than new.

Perry Samrow
Slidell, LA



Cow Magnet's No Bull

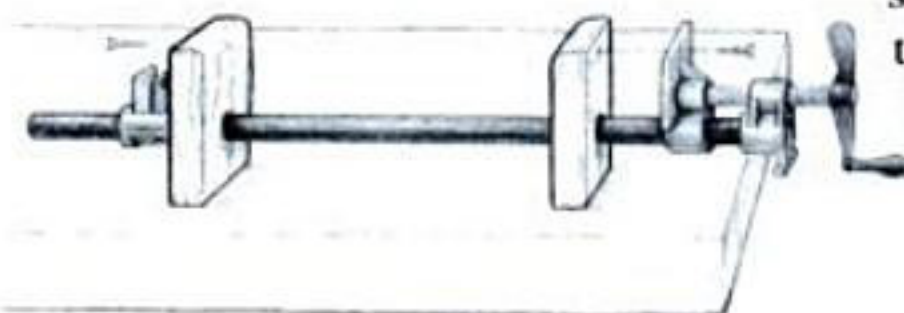
This tip is for those of us with bad backs, large tummies or both. Take a broomstick and drill a 1/2-in. hole in one end. Buy a cow magnet (a cylindrical magnet with rounded ends, designed to lodge in a cow's stomach and catch nails, tin cans etc. on their way through) and epoxy it into the broom handle, leaving an inch or so exposed. With this simple tool you can retrieve metal objects, nails and small tools from the floor or behind the bench. Cow magnets are available at vet clinics and farm-supply stores.

Bear Neef
Pardeeville, WI

Jack of Shims

We make a lot of jigs here and are constantly in need of shim stock. However, anything less than 1/8 in. thick is hard to come by around a shop, so I've turned to old playing cards, which I find invaluable for this purpose. The cards are solid (compared to cardboard) and each one is a consistent thickness—approximately 10 thousandths (0.01 in.).

Howard Gaston
Naples, FL

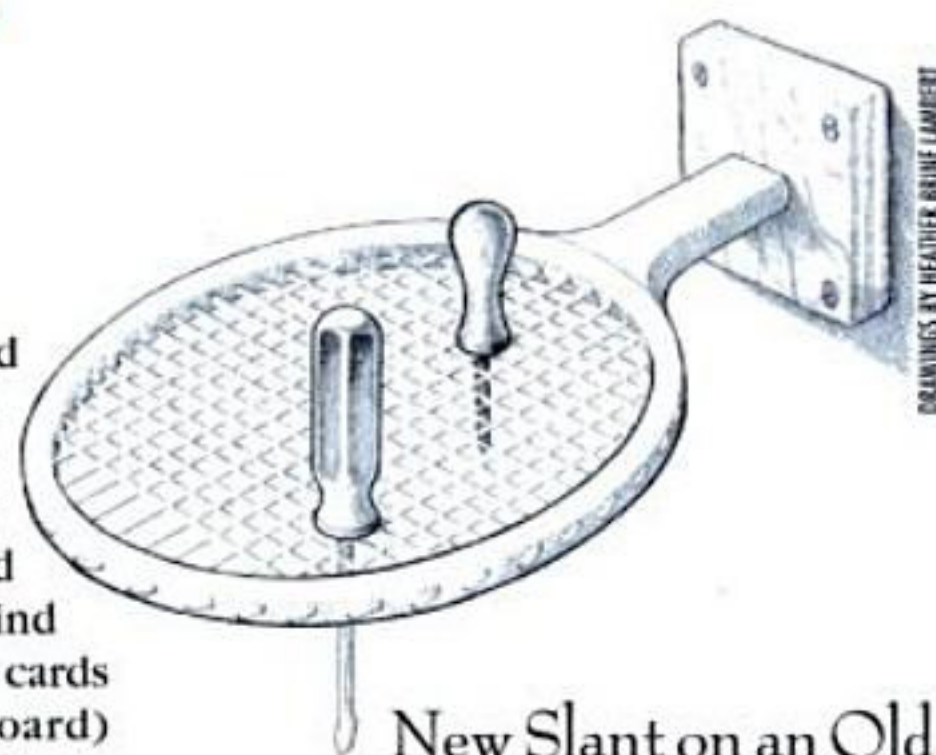


Padding the Clamps: Yet Another Solution

I don't need to hunt around the shop for scrapwood clamp pads, because I attach wooden pads directly to the clamps. I make my pads out of ash, round the inside corners and run a screw through the iron and into the wood. The pads are tall enough so the clamp sits conveniently upright, and you can turn the clamp handle without hitting the surface of the bench.

Art Trent
Calgary, Alberta

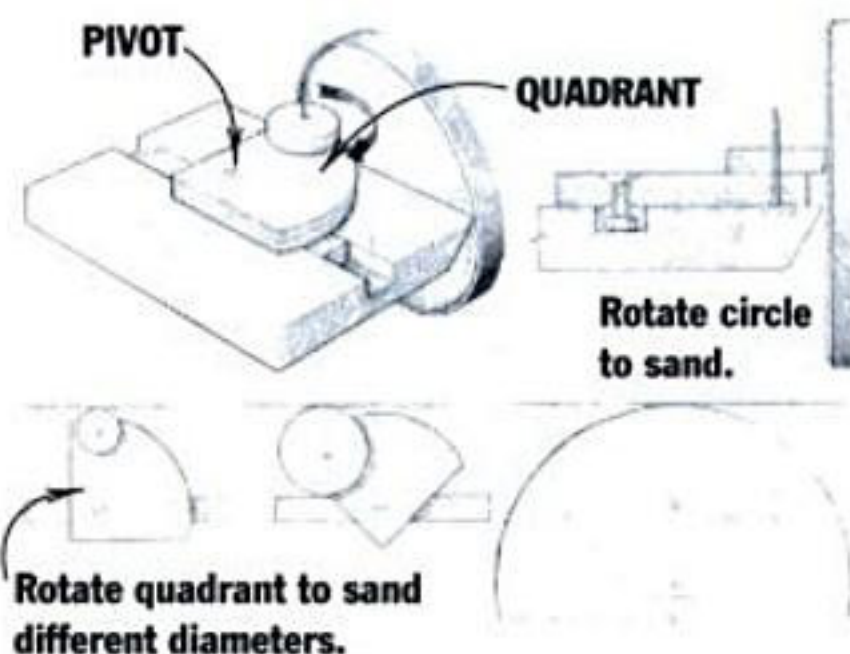
Know a better way of doing something? Designed a clever jig? Send your woodworking tips, along with a sketch or a snapshot to: "Tech Tips," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. We'll pay you \$50 if we publish your tip.



New Slant on an Old Racquet

Here's how to use an old racquet—tennis, squash or badminton—in the shop. Just saw the handle off short and epoxy it into a piece of scrap. Screw this to a convenient spot on the wall and you're set. It's especially handy for small tools with handles such as awls, screwdrivers, chisels and gimlets.

Robert Whiteside
Emporia, VA



Simple Circle-Sander

I made this simple jig for sanding the edges of rounds, the wheels of wooden toys, etc. By rotating the quadrant about its pivot point you can sand discs from 1 1/2 in. up to 11 in. The quadrant is screwed to a short piece of 3/4-in. stock that fits the slot on a conventional disc sander. As an alternative, you could rig it up to work with a belt sander.

Jay Wallace
Ashland, OR

WOOD FACTS



MITCH MARDEL

SITKA SPRUCE

BY DICK BOAK

SPECIES NAMES

Family: *Pinaceae*

Species: *Picea sitchensis*

(Alaska, western Canada, northwestern United States, with possible related species in Siberia.)

TRADE NAMES

Commonly known and traded as Sitka spruce (after a region of southern Alaska), the species is also sold as silver spruce, aircraft spruce, tideland spruce, Menzies spruce, and coast spruce.

APPEARANCE

Sitka spruce heartwood ranges in color from beige to light tan or light tawny brown with hints of pink and yellow. The sapwood is closer to a creamy white color. Grain is generally straight and even, though the tree occasionally spirals as it grows. Such twisting is easily visible in the bark. The wood has minimal but pleasant odor, and resin is present only in occasional small sap pockets or tubes.

WORKABILITY

Sitka spruce is very easy to work, although the early-summer wood (between the darker grain lines) is quite weak and capable of splitting. After sanding, the surface shows no visible pore structure and thus requires no filler. Because of the variable densi-

ty of the wood, Sitka spruce does not accept hand-applied stains consistently, but most clear finishes produce excellent results. Applying high-solvent finishes such as lacquer may result in pitting when the finish comes into contact with the resin in the wood.

TECHNICAL PROPERTIES

With a specific gravity of 0.43 (27 pounds/cubic ft.), Sitka spruce is quite light in weight, yet it has substantial strength along the grain. Quartersawn stock is the most preferable, especially where lightness and strength are primary considerations. Well-quartered stock may display prominent medullary rays in an attractive, almost flamed pattern running perpendicular to the grain. Fallen timber is vulnerable to attack from small boring (pinhole) beetles. Sitka spruce has a tendency to split and stain, and therefore must be dried carefully. End grain should be sealed with wax to slow drying, and sawdust should be brushed free from planks during seasoning to discourage stains caused by moisture and mold.

USES

Because of its extremely high strength-to-weight ratio, Sitka spruce is widely utilized as laminated or solid ribbing in aircraft and glider construction, and in lightweight racing boats. It is ideal as a

soundboard material for musical instruments such as guitars and pianos. Other uses include oars, barrels and small wooden boxes. Larger, best-quality timbers are prized for construction, especially in Japan.

SIZES

Old-growth Sitka spruce trees can attain diameters up to 8 ft., though a 3-ft. to 5-ft. range is more typical. Planks are available in widths of 6 in. to 14 in. Typical lengths are 6 ft. to 20-plus ft. Timber is sold in custom sizes for musical instruments, as well as in primary lumber thicknesses such as 4/4, 6/4 and 8/4. All sizes are reasonably stable if the wood has been dried with care.

TOXICITY

Sitka spruce is not considered toxic, although as with any species a dust mask should be worn during sanding and machining.

SUSTAINABILITY

In some parts of the Pacific Northwest, it is difficult to harvest Sitka spruce because the trees are located in fragile habitats like that in which the spotted owl lives. In other areas, old-growth Sitka spruce have been overharvested and are in danger. Old-growth trees that can be harvested are becoming rare, and responsible loggers have begun to harvest downed trees. Some timber has also been recycled from old salmon traps and bridge trestles.

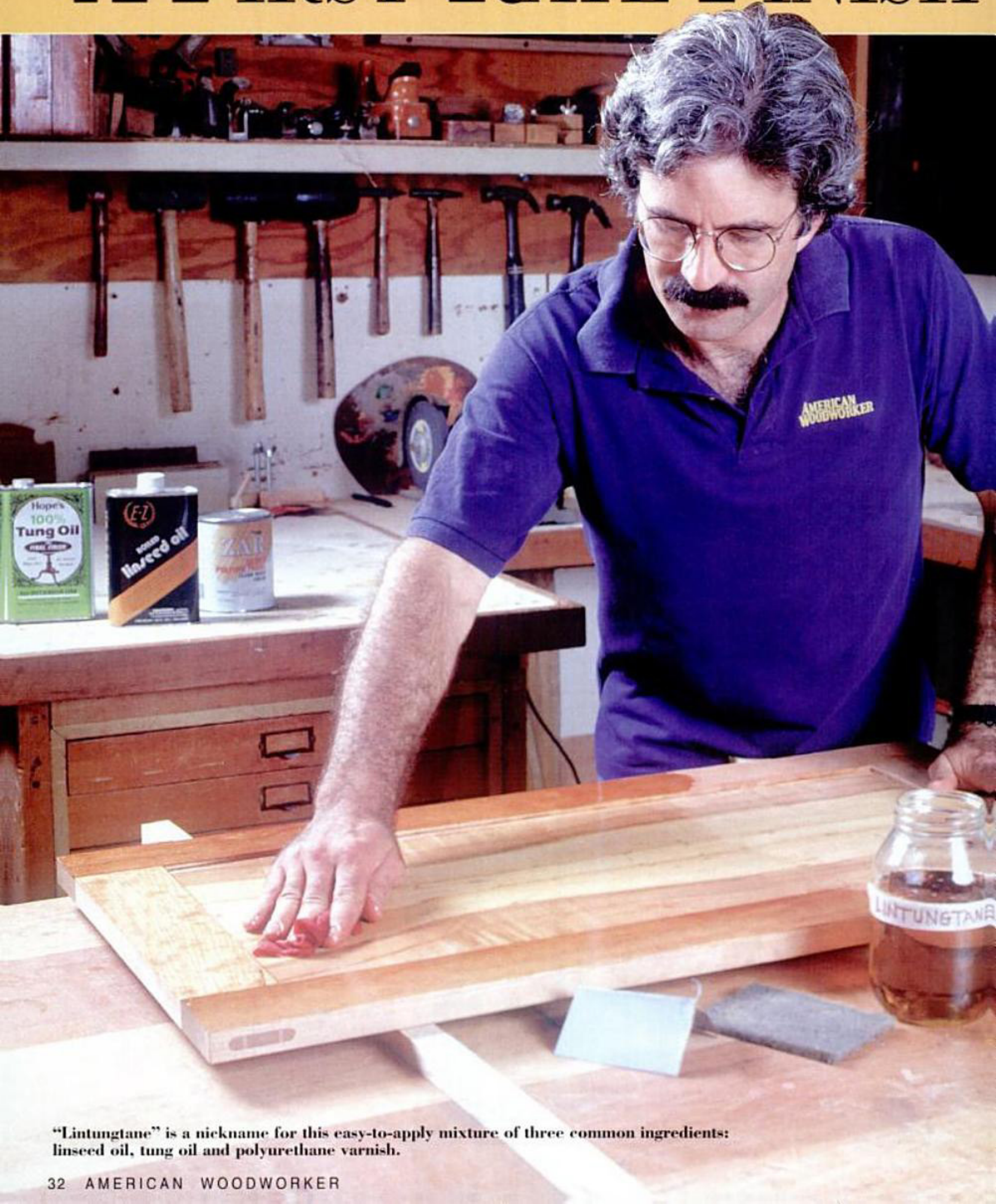
AVAILABILITY

In general, Sitka spruce is only available through specialty wood dealers and musical instrument supply houses.

COST

Kiln-dried, vertical-grain B-grade or better Sitka spruce sells for \$4 to \$7 per bd. ft. A substantial premium is charged for the longer lengths necessary to make boat or airplane struts. Select musical instrument soundboards are priced according to grade and size. ▲

A FIRST-RATE FINISH



"Lintungthane" is a nickname for this easy-to-apply mixture of three common ingredients: linseed oil, tung oil and polyurethane varnish.

This Homemade Oil-Varnish Blend Brings Out the Depth In Wood

BY
ELLIS VALENTINE

Experimenting with finishes is one of the ongoing pleasures of woodworking for me. And often, my best finishing information comes from friends.

On a recent visit to my friend Pimo's shop, I came across a sweet-smelling oil finish he uses for his custom architectural woodwork. When I asked him what it was, he replied, "Lintungtane."

"Lintungtane?" Yeah, right.

It turns out "lintungtane" is his curious name for a homemade mixture of boiled linseed oil, 100-percent pure tung oil and polyurethane varnish (either gloss or satin). Pimo said he likes this mixture because it "lets you feel the *wood* instead of the *finish*." It's also simple to apply and renew, it repairs easily, and it won't crack with age.

You can get a natural-looking finish on paneling and woodwork by wiping one or two coats of lintungtane over a sealer coat of shellac. On furniture, Pimo skips the shellac and builds four or five coats right on the bare wood. This produces a higher luster and better protection, without losing that "close-to-the-wood" feel.

On the minus side, each coat of lintungtane takes at least 24 hours to dry, and the final finish doesn't protect the wood from water and wear as well as varnish or lacquer do. Another slight drawback is cost. A 3-quart batch (1 quart of each ingredient) runs about \$28. You can lower the cost by buying your ingredients in larger quantities.

Mixing

It's easy to mix lintungtane—just combine equal amounts of the three ingredients in a suitable can. An empty 1-gallon can or plastic milk jug works fine, or you can make it up in small quantities as you need it. Though the mixture has a longer shelf life than varnish, it's best to store it in a full container to prevent it from skinning over.

Application

Lintungtane is quick and easy to apply. However, because it's slow-drying, the application process can stretch on for several days. Drying time is even slower during humid weather or when air movement over the surface is limited. Here's the process that works best for me:

Surface Preparation—Since lintungtane produces such a thin coating, the wood should be quite smooth when you start—either hand-planed or sanded to 220 grit. Blow or vacuum the wood to remove any dust remaining in the pores.

Applying the Finish—Lintungtane is self-sealing; your first coat acts like a sealer on bare wood. I thin the first coat about 25 percent with mineral spirits to improve penetration. Wipe or brush a liberal coat of the thinned mixture onto the wood, keeping the entire surface wet for at least 15 minutes. To increase penetration further, rub the wet surface with your rag to generate heat. Then wipe off as much excess as possible with a clean rag. If any oil "bleeds" from the pores, wipe this before it cures.

For a quicker build with less penetration, wipe or brush a very thin coat of shellac (one part 3-pound-cut shellac to four parts denatured alcohol) onto the wood before oiling. (For more on shellac, see *AW* #7, March/April 1989; #11, Nov./Dec. 1989; and #34.)

When the first coat has dried, smooth the surface with an abrasive pad or 320-grit sandpaper. If the finish "pills" (balls up) or clogs your sandpaper or pad, it's not dry enough for recoating.

Now, wipe or brush on a second, full-strength coat of lintungtane. For an ultra-smooth surface and quicker pore filling,

"wet-sand" this second coat with 400-grit wet/dry sandpaper and plenty of lintungtane. (However, I don't wet-sand later coats because the sandpaper cuts through earlier coats, producing an uneven build.) Wait 15 minutes and wipe off the excess.

For a higher luster, apply four or more coats of lintungtane. If you sealed the wood with shellac, you should have a uniform sheen with just two or three coats. Right after applying the final coat, wipe the surface as dry as possible with a clean, dry rag.

Maintaining the Finish

Like other oil finishes, lintungtane needs periodic renewal when the surface starts to look dry or lackluster. Depending on how many coats you've applied, this could be in a few months or a few years. Just rub a thin coat or two on the thirsty-looking areas. ▲

ELLIS VALENTINE
is associate editor of *AMERICAN WOODWORKER*



Author wet-sands the second coat to help fill the pores while removing any surface roughness.

SERVICE WITH A STYLE

BY VOICU MARIAN



MITCH MANDEL

*The Sculptured Curves of
This Elegant Tray
Are Shaped With
a Bandsaw,
Abrasives
and Files*

Almost every year for my wife's birthday I make something special for her in my shop, rather than buying a gift. Last year, as the event was fast approaching, my imagination was racing, trying to come up with a worthwhile project.

While I was cooking breakfast for the family one Saturday morning, I got the idea for this breakfast tray, which has a stand made of walnut and a tray

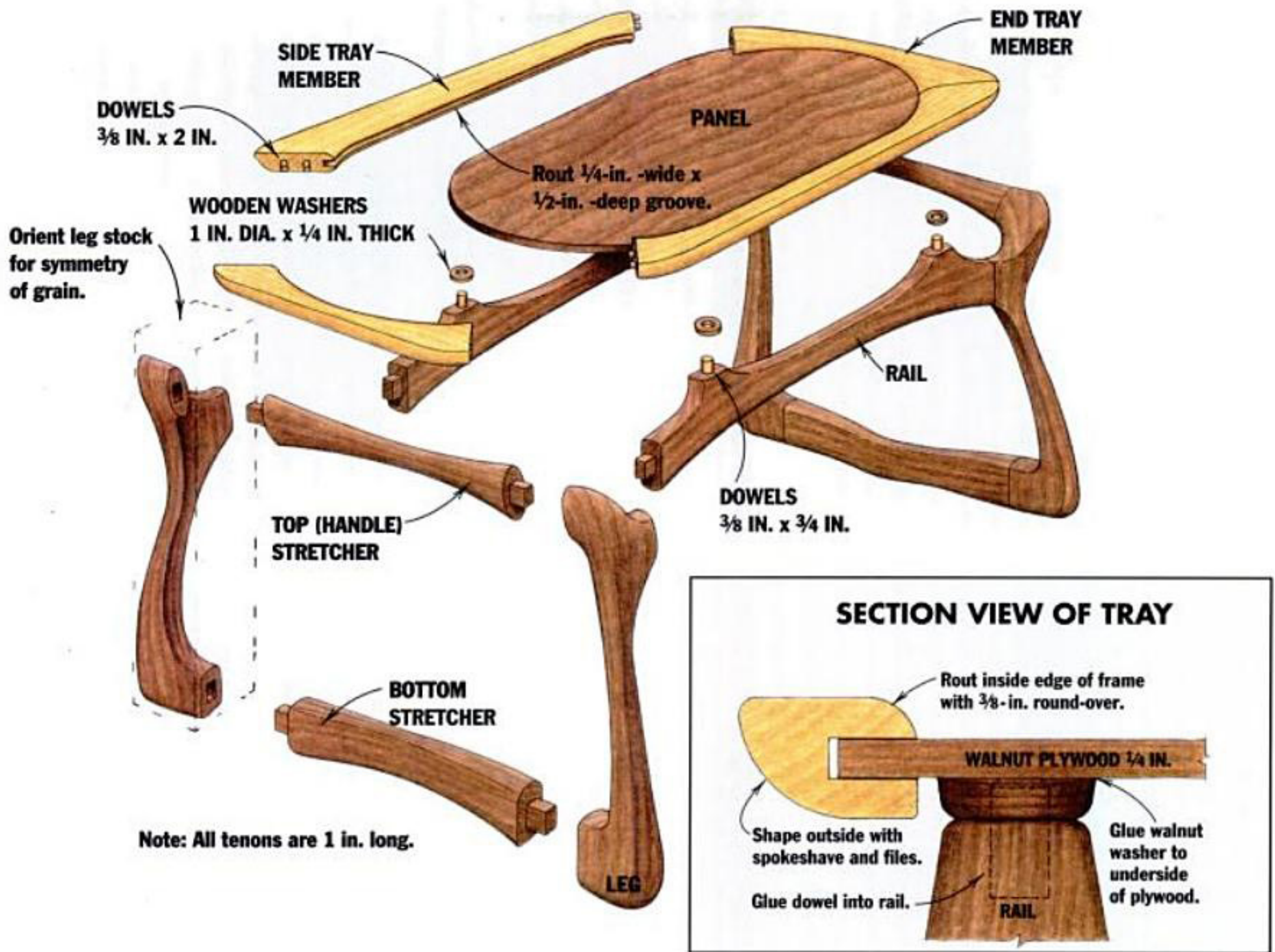
made of maple.

To figure out the ideal design, I sat in bed with a 12-in.-wide board across my lap, supported by two stacks of books, and I removed books until the height felt right. I established the width and length of the tray by setting our dining table with the plates, cups and utensils that you normally find at breakfast and measuring the area covered.

Making the Stand

To make the stand, I first cut out templates for each of the shaped parts. (See Figs. 2 and 3.) I made the templates from mat board (available at art supply stores) because it's durable and will last if I decide to do production runs. I made both top and side templates for the legs and all the other stand parts because of their compound curves. Also, there are separate mortise

FIG. 1: BREAKFAST TRAY



DRAWINGS BY FRANK ROHRBACH

templates for the legs. I'll tell more about this later.

One note: The tray pictured was the first one I built. I've made another since and modified some of the dimensions and the joinery. The drawings and photos in this article reflect those changes.

Once the templates were made, I went to work on the stand, keeping the easier part of the project—the tray—for last. To ensure a uniform color, I made most of the parts from one walnut board and the rest from the same tree.

I used $1\frac{1}{4}$ stock for the legs due to their compound curves. You could laminate thinner boards to make up the necessary thickness, but then the finished legs would show irregularities in the grain pattern at the glue lines. I think this detracts from the overall effect.

BILL OF MATERIALS

PART	QTY.	DIMENSIONS
Legs	4	3 x 4 x 11
Rails	2	$1\frac{1}{4}$ x $2\frac{1}{4}$ x $20\frac{1}{4}$
Handle Stretcher	2	$1\frac{5}{8}$ x $1\frac{5}{8}$ x 9
Bottom Stretcher	2	$1\frac{5}{8}$ x $1\frac{5}{8}$ x 9
Panel (plywood)	1	$\frac{1}{4}$ x 11 x 21
Side Tray Member	2	$\frac{3}{4}$ x $2\frac{1}{2}$ x 22
End Tray Member	2	$\frac{3}{4}$ x $2\frac{1}{2}$ x 12

I began construction by milling the parts to size (see Bill of Materials), orienting the end grain on the leg pieces so the face grain would be symmetrical after the pieces were bandsawn and shaped. (See Fig. 1.) Then I marked the top of each leg to indicate the sides to be mortised.

Cutting the Mortises and Tenons—Although the joinery in the finished piece looks complicated, I simplified the process by cutting the mortises and tenons while the stock was still square.

First, I marked the locations of the leg mortises. Here, the hinged template came in handy. (See Fig. 2.) I wrapped it around each leg and penciled the mortise locations through the "windows" in the template.

I cut the mortises with a $\frac{1}{2}$ -in. hollow chisel mortising attachment on the drill press. As an alternative, you could drill out the waste with a Forstner bit and square the sides by hand with a chisel.

Next, I laid out the tenons on the rails and stretchers with the templates. Then I bandsawned the tenon cheeks and finished up by cutting the

shoulders on the radial arm saw.

One caution about these joints: Don't make them fit too tightly. You'll be assembling the stand after the pieces are shaped and you won't be able to "drive them home" with a mallet.

Bandsawing the Curves—I used the templates to mark the stand pieces. Since each piece has to be bandsawed on two faces to produce the compound curves, you need to use two templates on each piece. (See photo, right.)

On the legs, I bandsawed the front faces first, cutting to the waste side of the line. Then I reattached the offcuts to each leg with hot-melt glue, turned the reassembled legs 90° and bandsawed the side faces. (See photo, far right.) Save the waste pieces opposite the center mortises. These will aid in clamping during assembly.

After sawing the legs, I bandsawed the horizontal members of the stand using the same method. However, before cutting the long rails, I drilled the holes in their top edges to receive the $\frac{3}{8}$ -in. dowels that connect them to the tray. (See Fig. 1.)

Glue-up and Shaping—With all the pieces cut, I was ready to glue the



PHOTOS BY ANDY RAE

Lay out the legs by positioning templates on front and side faces of leg stock, lining up windows of templates with mortises.

stand together. First I glued up the two side assemblies, gently pulling the joints together with pipe clamps. When the glue was dry, I joined the two assemblies with the rails. I used pipe clamps again, but this time I taped the waste pieces that I had saved to the legs to keep the clamps square and to prevent marring the surfaces as I pulled the joints home. When the glue dried, I was ready to begin final shaping of the stand.

Keep in mind that the finished



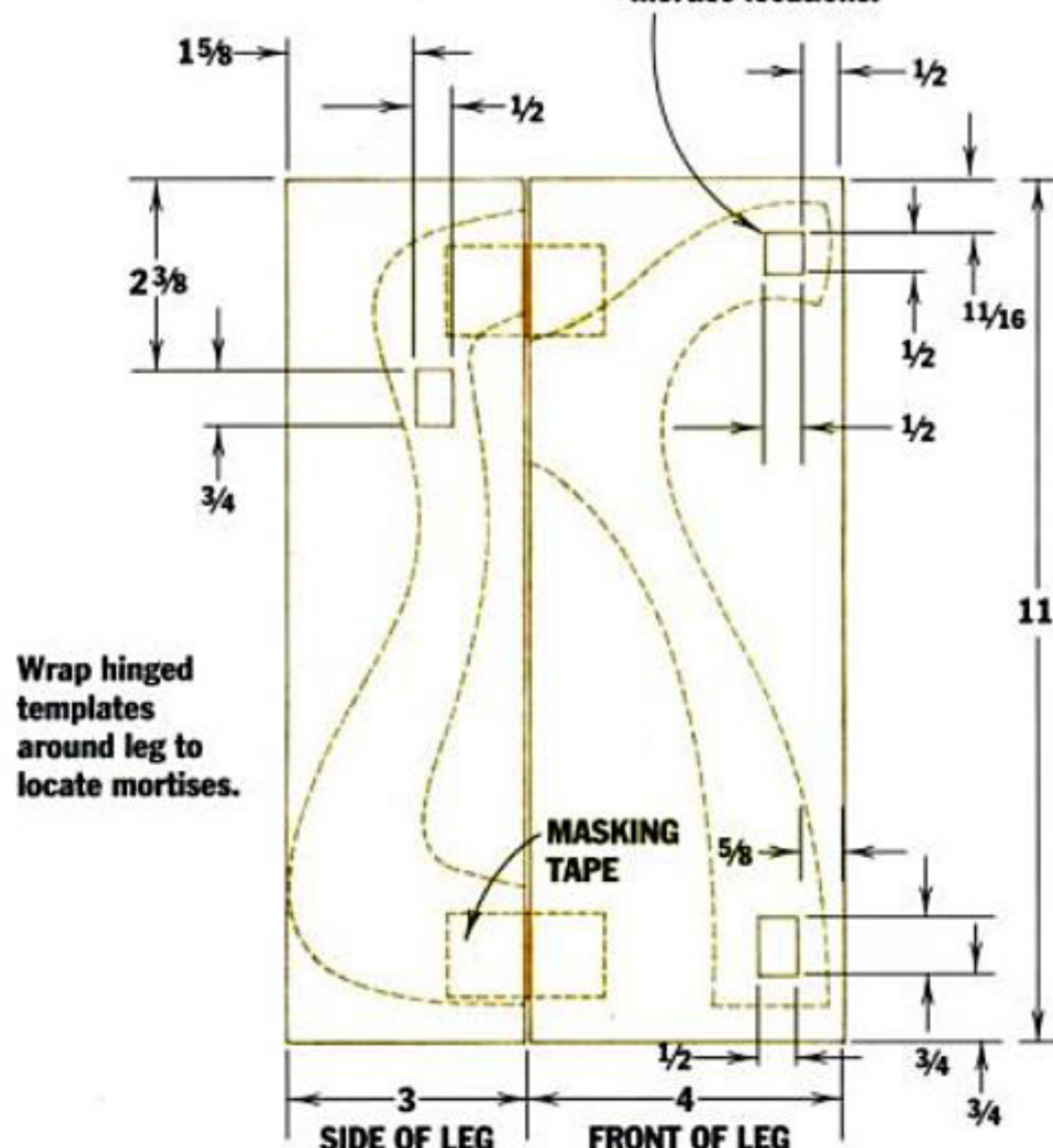
After bandsawing front face, glue on offcuts with hot-melt glue, then make second cut on adjacent face to get compound curve of leg.

piece does not have to fit in a mold. Since it's a sculptural piece, you should shape it by feel rather than following a rigid plan.

To begin the shaping process, I sanded the stand with a 2-in., 40-grit disc on a small air-operated angle grinder, the kind you see in auto body shops. (See photo below.) You could use a sanding drum chucked in a drill or get out your spokeshaves and carving chisels instead. My emphasis was on the flow of the lines and on the smooth passage from one curve into the next. (Be careful not to sand too deeply around the joints—you might accidentally expose a tenon.)

After removing the bulk of the waste with the grinder, I switched to coarse files, then to fine-cut ones. The

FIG. 2: MORTISE TEMPLATES Cut "windows" at mortise locations.



Author uses air-powered sander to refine the shape of the stand.

idea is to refine the hard edges that give the piece character. I used half-round bastard files, working the straight, flat and convex areas with the flat sides, and the inside curves and concave spots with the round sides.

Once I'd refined the curves, I switched to sandpaper, beginning with 180 grit and working up through 320 grit to bring out the clarity of grain.

Making the Tray

For the tray, I visualized a rectangle with corners rounded inside and out to complement the stand. Building the curved frame was easy because I mitered all the joints while the $\frac{3}{4}$ -in.-thick maple stock was still square.

After cutting the miters, I drilled holes at each miter for the dowels that join the corners, using a doweling fixture and a hand-held drill. If you have access to a plate joiner, you could substitute biscuits instead.

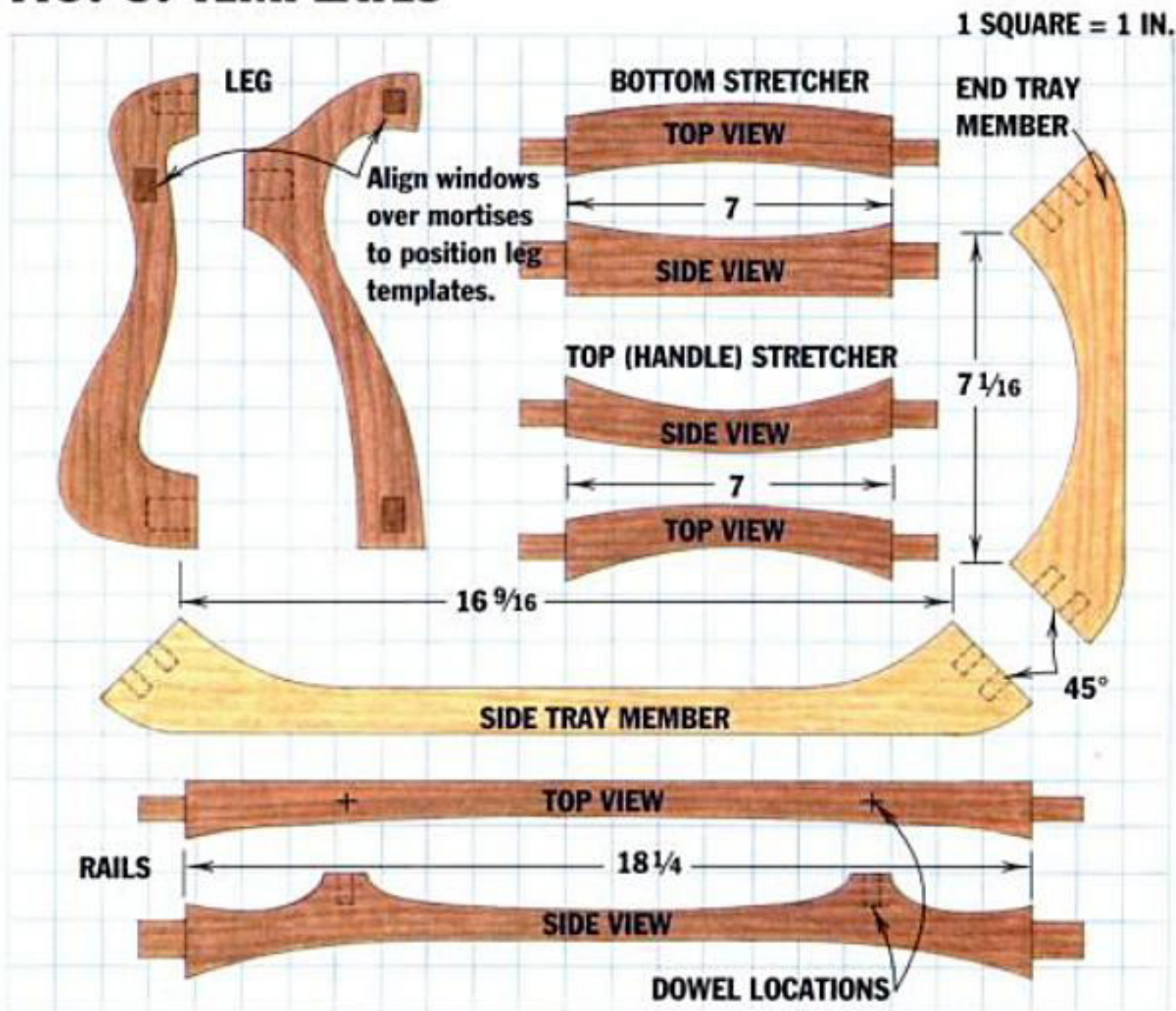
Next, I shaped the inside of the frame. To do this, I assembled the frame dry, and using the frame templates (see Fig. 3), I traced the contours. Then I disassembled the frame and bandsawed the inside curves to rough shape, leaving the outside edges straight to facilitate clamping during glue-up.

After this, I dry assembled the frame again and applied masking tape to hold the corners together. I routed the inside edge to finished shape with a $\frac{3}{8}$ -in. round-over bit, and followed up with a $\frac{1}{4}$ -in. slotting bit with a ball bearing pilot to cut a $\frac{1}{2}$ -in.-deep groove for the panel. (See Fig. 1.)

Making the Panel—I made the panel from $\frac{1}{4}$ -in. walnut plywood. To make the panel fit the curved opening, I laid the dry-assembled frame over the plywood and traced the frame's contours. Then I added $\frac{7}{16}$ in. all around on the plywood for the frame's groove. This left about $\frac{1}{16}$ in. clearance in the groove as insurance against binding during glue-up.

After cutting the panel to shape on the bandsaw, I finish-sanded it and sanded the inside edges of the frame while it was still taped together. Then I took the frame apart and reassembled it with the panel in place, gluing the miters and the panel in its grooves. I pulled everything together with pipe clamps on the straight

FIG. 3: TEMPLATES



When breakfast is over, author displays the tray as sculpture with "food" he made from various woods.

edges of the frame.

Once the glue was dry, I bandsawed the outside to my template lines and used a spokeshave and files to create the gentle curve on the underside of the frame as shown in Fig. 1. Then I finish-sanded the frame.

To keep the tray from sliding around on the stand, I installed four dowels. (See Fig. 1.) The dowels are glued into the holes drilled in the rails and protrude $\frac{1}{4}$ in. Then I turned the stand upside down and placed it on top of the inverted tray to locate the

dowels on the tray. Rather than drilling holes in the tray, I decided to raise the stand visually by seating the dowels in four $\frac{1}{4}$ -in.-thick wooden washers glued to the underside of the panel as shown in Fig. 1. I made the washers by turning a cylinder on the lathe and drilling a $\frac{3}{8}$ -in. hole in the center, then slicing off discs from the cylinder on the bandsaw. The dowels engage the washers and keep the tray from shifting during use.

Because it comes into contact with food, I finished the tray with Behlen's Salad Bowl Finish (available from Garrett Wade Co., 161 Ave. of the Americas, New York, NY 10013, 800-221-2942). I gave the stand several coats of tung oil to bring out the natural beauty of the walnut. When the finish cured, breakfast was served. ▲



VOICU MARIAN lives in Alliance, Ohio and is an amateur woodworker currently pursuing a degree in art education.

WOODEN GIANTS

Photos From an Age When the Forests Seemed Endless



PHOTOS BY A.W. ERICSON

This giant redwood—almost 18 ft. in dia.—was felled in 1892 in Humboldt County, California. It could take a crew of four skilled axmen three to five days to open an undercut like the one in which these loggers and their bosses are sitting.

BY JIM CUMMINS

The fabled Gold Rush of 1849 opened California, but the true wealth of the era was in the region's abundant forests, where redwoods and sequoias were cut into building blocks for a burgeoning nation. A single redwood tree could yield enough lumber for 22 five-room houses, while a logging family might split roof shingles from one felled giant for two full years. Frontier towns were often solid redwood from the rooftrees down to the wooden sidewalks.

Logging these trees was hazardous.

You had to dodge falling branches, some as massive as a fully mature eastern maple—4 ft. thick at the butt and about 80 ft. tall. Once the big trees were down, the only way to split them was with a blast of dynamite.

Despite this awe-inspiring size, few people of the time showed these ancient trees respect. The giant 331-ft. sequoia on the facing page was sawn into lowly farmyard fenceposts and grapevine stakes—these from a tree that embodied such nobility and presence that people had named it "Mark

Twain." Yet as early as 1852, there were some who tried to save the trees. In that year, the California legislature considered (but did not pass) a bill to permanently protect all redwoods. Individuals responded, too. Logging foreman Frank Boole refused to cut down the one major sequoia left in the Converse Basin—the tree still bears his name today.

Of the 2 million acres of virgin forest that once existed, only 6 percent now remain, and only half of these are protected in state and national parks. ▲



M.H. GRANT

The 16 logs on this train (shot in 1885) contained 88,568 bd. ft. of lumber. That's the equivalent of a line of 2x4s more than 25 miles long.



Oxen hauled the first trees out, but the "iron horse" soon followed, like this one on its redwood trestle.



Log sections as big as these were split with dynamite, making a woodsman's life even more perilous.



PHOTO COURTESY OF AMERICAN MUSEUM OF NATURAL HISTORY

The "Mark Twain" sequoia fell in 1891. Sections were displayed in New York and London. The rest was cut up for grapestakes and fenceposts.



Schoolehildren sit on a redwood stump in what was once a majestic forest.



SKIL TOP GUN 2736.04



HITACHI DS 10DVAK



AEG ABSE 15



MAKITA 6911DW



MAKITA 6011DW



RYOBI TFD-222VRK



PORTER-CABLE 9853



MAKITA 6311DW



MAKITA 6211DW



METABO 0126



BOSCH 3054VSR



MILWAUKEE 0407-1

*We Test 26
High-powered
Heavyweights*

BUYER'S GUIDE TO CORDLESS DRILLS

these drills are closely matched, you may be hard pressed to pick the *best* one for your needs.

To help you weed through the field, we put these heavyweights through extensive shop tests. The sidebar on page 42 explains our methodology, while the chart on pages 42 and 43 shows the final ranking. We listed our Editors' Choices in the sidebar on page 44. But before we get to the standings, let's talk about what's important in a heavyweight cordless drill.

Features To Look For

Performance—Today's cordless drills come with a wealth of features, but the most important one is performance: how hard, and for how long, the drill can work. In our endurance tests, the Porter-Cable proved best at hole-drilling, boring 42 1/2-in.-dia. holes

through 1 3/8-in.-thick beech before the battery wore down. The Freud EDS120 drove the most screws, putting 198 3-in. screws into the edge of a fir 2x4. The complete results of our endurance tests appear in the chart.

Keep in mind that these tests pushed the drills to their limits. Your work may not require that kind of sheer power. Also note that in general, the higher a drill's speed, the less torque it develops, and vice versa. If you plan to drive lag screws or bore huge holes, you'll need a drill with high torque and low rpm. On the other hand, small holes will go faster with a drill that generates higher rpm, like the Skil or Hitachi. We found that the drills with two speed ranges were the most versatile.

Ergonomics—After performance, ergonomics is the next most important factor in picking a drill, because this determines whether holding and using

When manufacturers cut the cord on portable drills over a decade ago, they changed forever the way craftsmen work. Since then, technical advances in batteries and motors have led to the development of cordless "heavyweights" that have the power and versatility to replace plug-in drills in many applications.

There are currently 26 12-volt or 13.2-volt cordless drills on the market, and two more will join the group early in 1994, when Bosch and Skil release their latest tools. That's good news for buyers, but since most of

the drill will tire your hands and arms over the course of a day.

We'd like to offer some simple, straight advice here, but ergonomics proved one of the thorniest criteria for us to rate. Some testers argued that T-handle drills, like the Panasonics, have an inherently better ergonomic design than conventional-grip drills, because the T-handles concentrate all the weight of the tool in the palm of your hand. Others preferred conventional-grips, partially because they give you more options for holding the tool, making the drill less tiring to use. We finally agreed on two points: First, only the person who will use the drill can determine which style is best, so you should try both types of handles yourself. Second, T-handles and conventional-grips both have strengths and weaknesses.

T-handle drills are generally more compact than conventional-grip drills, so they'll fit in tighter spaces. However, it's harder to apply force directly in line with a bit when using a T-handle drill. (See photo, page 44.) This means that if you're working in an awkward position, there's a greater chance you'll break a small bit or come off the head of the screw you're driving.

Conventional-grip drills let you grip the handle high to push directly in line with the bit. (See photo.) Some testers thought this provided more stability. Also, the chucks on these drills tend to be close to the top of the body, letting you fit a bit into a tight space. But conventional-grip drills have long handles that place much of the weight far from the hand, affecting balance. In fact, several of the drills, including the Metabo, Sears, Ryobi, Skil, DeWalt and Black & Decker models were front-heavy and required extra effort to hold them horizontally.

Our favorites for balance and control were the Bosch (a conventional-grip drill) and the new, downsized Panasonic EY6100EQK (a T-handle drill). These drills are light (under 4 pounds), have excellent balance and feature handles that will fit both small and large hands. (Other drills that fit

small hands include the Makita T-handles and the Milwaukee, Skil, Ryobi, Sears and Wen—a.k.a. America's Choice—all conventional-grips.)

Switches and controls also affect ergonomics. These would seem to be the easiest things to design well on a simple pistol-grip tool, but several of our testers had problems with switches. For instance, on most drills the reversing switch is located directly above the trigger switch. In this position, it was generally easy for us to access without shifting our hand grip, although we could also push the reversing switch inadvertently when picking up the drill.

Makita and Hitachi took different tacks in designing their reversing switches. The Makita 6011's reversing switch is placed at the back of

its handle, where some testers found it awkward to reach, while the other Makitas and the Hitachi have reversing switches on the left side of the handle. We found that these weren't as convenient for lefties to access.

The big reversing switch on the Panasonic EY6100EQK was our favorite. This switch projects out of the body above the trigger and slides left and right.

Nearly all the drills have comfortable, easy-access trigger switches. The Freud trigger switch sported a comfortable rubber pad, but it fell off frequently in use. (In response to our



HOW WE TESTED THE DRILLS

With tools as evenly matched as these drills, you can't rely on specifications alone to determine which one is best, so we conducted rigorous tests:

First, we ran each battery pack through six charge/discharge cycles to "condition" it and bring it up to peak power. (Not all manufacturers recommend this step, but conditioning all the drills started them on a level playing field.) Then we tested each drill's performance by seeing how many 3-in. screws it could drive into a fir 2x4 on low speed range and how many 1/2-in.-dia. holes it could drill through 1 3/8-in.-thick beech on high speed range. We used a new bit for each drill, ran each test twice and averaged the results.

We also measured maximum torque, but our readings varied widely depending on battery condition, battery temperature and other variables. Our average torque values were close to the manufacturer's, however, so we used their ratings as a factor in evaluating performance.

Finally, our testers conducted hands-on evaluations, checking ergonomics and chuck operation. We scored features from one (unacceptable) to five (excellent). To arrive at an overall rating, we added bonus points for extras like electronic brakes, electronic clutches, extra clutch settings and fast chargers.

Drills with an overall rating above 85 are considered excellent, but keep in mind some drills may have scored lower than that figure solely because they lack extras, which you may not feel you need.

FOOTNOTES

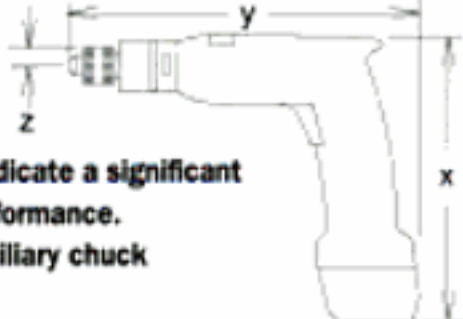
★ Included in the street price:
C=Case, B=Batteries, CH=Charger

★★ manufacturer's specs

★★★ Scores above 85 are considered excellent,
75 to 85 good,
under 75 fair.

Different scores within these ranges do not indicate a significant difference in performance.

★★★★ with auxiliary chuck



BIG CORDLESS DRILLS

Name/Model	Street Price *	Chuck	Ergonomics	Performance	Number of Holes	Number of Screws	Max. Torque (inch-pounds)*
FREUD EDS132 (800) 334-4107 CIRCLE #601	\$260 C, B, CH	●●●●●	●●●●●	●●●●●	40	178	203
FREUD EDS120	\$240 C, B, CH	●●●●●	●●●●●	●●●●●	30	198	177
BOSCH 3054VSR (312) 286-7330 CIRCLE #602	\$195 C, 2B, CH	●●●●●	●●●●●	●●●●●	29	140	140
MAKITA 6911DW (714) 522-8088 CIRCLE #603	\$210 C, B, CH	●●●●●	●●●●●	●●●●●	21	84	(868)
PORTER-CABLE 9853 (901) 668-8600 CIRCLE #604	\$160 C, B, CH	●●●●●	●●●●●	●●●●●	42	131	230
BLACK & DECKER Super Cyclone 2765K (800) 762-6672 CIRCLE #605	\$190 C, C, 2B, CH	●●●●●	●●●●●	●●●●●	28	159	196
DEWALT DW945K (800) 433-9258 CIRCLE #606	\$190 C, 2B, CH	●●●●●	●●●●●	●●●●●	25	172	196
PANASONIC EY6100EQK (201) 348-5334 CIRCLE #607	\$225 C, B, CH	●●●	●●●●●	●●●●●	33	129	174
MILWAUKEE 0407-1 (414) 781-3600 CIRCLE #608	\$210 C, 2B, CH	●●●●●	●●●●●	●●●●●	33	137	156
PANASONIC EY6205EQK	\$220 C, B, CH	●●●	●●●●●	●●●●●	38	183	182
AEG ABSE 15 (800) 243-0870 CIRCLE #609	\$220 B, CH	●●●●●	●●●●●	●●●●●	26	132	160
BLACK & DECKER Kodiak 2666K	\$290 C, B, CH	●●●●●	●●●●●	●●●●●	34	128	250
METABO 0126 (215) 436-5900 CIRCLE #610	\$325 B, CH	●●●●●	●●●●●	●●●●●	31	176	121
DEWALT DW948K	\$290 C, B, CH	●●●●●	●●●●●	●●●●●	39	117	250
MAKITA 6211DW	\$180 C, B, CH	●●●●●	●●●●●	●●●●●	26	88	182
RYOBI TFD-222VRK (800) 323-4615 CIRCLE #611	\$180 C, 2B, CH	●●●●●	●●●●●	●●●●●	25	107	220
MAKITA 6311DW	\$195 C, B, CH	●●●●●	●●●●●	●●●●●	24	85	182
HITACHI DS 10DVAK (404) 925-1774 CIRCLE #612	\$200 C, B, CH	●●●●●	●●●●●	●●●●●	24	144	174
PANASONIC EY6207EQK	\$230 C, B, CH	●●●	●●●●●	●●●●●	29	141	200
SEARS 315.271390 See your nearest Sears store. CIRCLE #613	\$160 C, B, CH	●●●●●	●●●●●	●●●●●	30	147	136
MAKITA 6011DW	\$165 C, B, CH	●●●●●	●●●●●	●●●●●	32	100	139
DEWALT DW947K	\$240 C, B, CH	●●●●●	●●●●●	●●●●●	35	103	90
BLACK & DECKER Kodiak 2661K	\$280 C, B, CH	●●●●●	●●●●●	●●●●●	33	122	150
BLACK & DECKER Kodiak 2651K	\$240 C, B, CH	●●●●●	●●●●●	●●●●●	31	101	90
SKIL TOP GUN 2736.04 (312) 286-7330 CIRCLE #614	\$150 C, 2B, CH	●●●●●	●●●●●	●●●●●	17	116	110
AMERICA'S CHOICE (Wen) 498AC (312) 763-6060 CIRCLE #615	\$99 C, B, CH	●●●●●	●●●●●	●●●●●	27	58	126

SPECIFICATIONS

Overall Rating ***	Battery Volts	Charge Time (min.)	Speed Range (rpm)	Chuck Capacity Min.-Max. (in.)	Clutch Settings	Electric Brake	Weight (pounds)	Clearance x, y, z (in.)	Comments
96.0	13.2	60	0-400 0-1400	1/32-3/8	5 + Drill	Yes	4.30	15/16, 11 1/8, 10 1/8	Padded handle and trigger switch; rocker speed-range switch easiest to use
93.7	12.0	60	0-375 0-1300	1/32-3/8	5 + Drill	Yes	4.20	15/16, 11 1/8, 10 1/8	Padded handle and trigger switch; highest number of screws driven; rocker speed-range switch easiest to use
93.5	12.0	60	0-500 0-1000	3/64-3/8	17 + Drill	Yes	3.60	15/16, 10 1/4, 10 1/8	Has unique 17-position electronic clutch; great balance; lightweight; has trigger guard
92.7	12.0	60	0-1800	1/4-in. Hex Socket	No clutch	Yes	4.15	1 1/4, 8 5/8 (or 11 1/2****), 9	Works like impact wrench; has 1/4-in. hex socket for holding bits; drill chuck optional; develops high torque; very noisy
91.7	12.0	60	0-350 0-1000	3/64-3/8	5 + Drill	No	4.30	1 1/4, 11, 9 1/2	Drilled the most holes; sensitive variable-speed control; optional 1/2-in. keyed chuck
91.2	12.0	60	0-400 0-1300	1/16-3/8	11 + Drill	No	4.55	1 3/8, 12 1/4, 11 1/2	Versa Clutch transmits torque only when you push on screwdriving bit; has trigger guard
91.1	12.0	60	0-400 0-1300	3/64-3/8	11 + Drill	No	4.55	1 3/8, 12 1/4, 11 1/2	Versa Clutch transmits torque only when you push on screwdriving bit; has trigger guard
89.5	12.0	20	50-350 180-1300	1/32-3/8	21 + Drill	Yes	3.80	1 1/8, 8 5/8, 8 1/2	Chuck rotates 4 1/2 turns lock-to-lock; 21 clutch settings; compact size for its power
88.8	12.0	30	0-350 0-1000	1/16-3/8	5 + Drill	Yes	3.90	1 1/4, 10 3/4, 10 1/2	Lightweight, thin handle
88.7	12.0	20	50-350 150-1000	1/32-3/8	5 + Drill	Yes	4.15	1 1/4, 9 5/8, 9 5/8	Chuck rotates 4 1/2 turns lock-to-lock
88.2	12	60	0-370 0-1100	3/64-1/2	10 + Drill	Yes	4.25	1 1/4, 11 3/4, 10 1/8	Includes light; has sensitive variable speed; screw depth-setting accessory available
88.1	13.2	60	0-450	Keyed 3/64-1/2	No clutch	No	6.30	7/8, 12 7/8, 11 3/4	Includes front-mounted handle for greater control; single, low-rpm speed range; keyed chuck
87.5	12.0	10	0-300 0-850	1/32-3/8	5 + Drill	Yes	4.55	1 1/8, 10 1/2, 10 3/4	Sensitive variable-speed control; chuck has rubber ring; contoured body for in-line grip
86.5	13.2	60	0-450	1/16-1/2	No clutch	No	6.20	7/8, 12 7/8, 11 3/4	Includes front-mounted handle for greater control; single, low-rpm speed range
86.3	12.0	60	0-370 0-1150	1/16-3/8	5 + Drill	Yes	4.00	1 1/8, 9 5/8, 9 1/8	Must pull chuck collar to adjust chuck; speed-range switch awkward for lefties
86.0	12.0	60	0-400 0-1300	1/16-3/8	5 + Drill	Yes	4.10	1 9/16, 11 3/8, 11 1/4	Contoured body for in-line grip
85.8	12.0	60	0-370 0-1150	3/64-1/2	5 + Drill	Yes	4.40	1 1/8, 10 1/8, 9 1/8	Must pull chuck collar to adjust chuck; speed-range switch awkward for lefties
85.6	12.0	60	0-400 0-1600	1/16-3/8	5 + Drill	Yes	4.20	1 1/4, 9 1/4, 10	Body and handle fatter than other T-handle drills
85.6	12.0	20	50-350 180-1300	1/32-1/2	5 + Drill	Yes	4.65	1 1/4, 10, 9 1/4	Chuck rotates 6 1/2 turns lock-to-lock
84.3	12.0	60	0-350 0-1000	1/32-3/8	5 + Drill	No	4.30	1 1/4, 11 3/4, 10 7/8	Built-in level; contoured body for in-line grip
81.6	12.0	60	0-450 0-1350	1/16-3/8	5 + Drill	Yes	4.25	15/16, 10 3/8, 10 5/8	Reversing switch on back of handle
80.6	13.2	60	0-1200	1/16-3/8	No clutch	No	5.00	7/8, 11 1/2, 11 3/4	Single, high-rpm speed range; keyed chuck
78.4	13.2	60	0-700 0-1400	Keyed 1/32-3/8	No clutch	No	5.65	7/8, 12 7/8, 11 3/4	Keyed chuck; speed-range switch works stiffly
78.4	13.2	60	0-1200	Keyed 1/32-3/8	No clutch	No	5.10	7/8, 11 1/2, 11 3/4	Single, high-rpm speed range; keyed chuck
77.6	12.0	60	0-600 0-1650	3/64-3/8	4 + Drill	No	4.20	1 1/8, 10 3/8, 10 1/8	Chuck centers bits easily; speed-range switch works stiffly; highest rpm
76.4	12.0	60	340/720 Fixed	1/16-3/8	No clutch	No	2.75	7/8, 10 5/8, 9 1/4	Two-position trigger switch for two fixed speeds; lightest weight drill

PICK OF THE PACK



balance and adequate power in a package which included an innovative 17-stage electronic clutch.

We liked the new Panasonic EY6100EQK, even though it wasn't among the most powerful drills, because it was compact, lightweight, and had good balance, great ergonomics and

21 clutch settings.

Makita's 6911 impact driver was a favorite because it drove screws with just light pressure, and with the optional chuck (sold separately for about \$25) it drilled aggressively. On the down side, it was incredibly loud.

The Freud EDS132 was among the most powerful drills and combined good ergonomics with solid construction. We particularly liked its padded handle and the rocker-type speed range switch, which was the easiest of all to use.



Choosing a drill is a personal matter, and there was a wide divergence of opinion among our testers about what constitutes a "great" drill.

We finally settled on four favorite drills, not all of which were top performers in our objective tests. Here's why:

The Bosch 3054VSR won our vote because it offered light weight, great

comments, Freud plans to fix this problem.) The testers were split on their opinions of trigger guards. Some liked the way a guard protects the trigger if you drop the drill, while others felt that a guard makes a drill less versatile, since it limits how you hold the tool and which finger you use to trip the trigger.

The Chuck—The last major feature of a drill to consider is its chuck. You want one that is designed to center a bit easily and hold it tightly.

Though manufacturers don't recommend it, many woodworkers "speed-chuck" keyless chucks by spinning the drill's motor while holding the chuck collar. In our tests, the Bosch, Skil and Wen drills centered a bit almost automatically when used this way. With most of the other drills, we had to locate the bit carefully to keep it from jamming at an angle between the jaws while speed-chucking.

We found that bits were most likely to speed-chuck at an angle in the



T-handle drills (left) concentrate their weight over the handle and are generally more compact than conventional-grip drills. Conventional-grip drills (right) let you grip the handle high to exert pressure directly in line with the bit, and they offer more options for hand placement.

Panasonic drills, which have a unique, fast-action chuck. (Most keyless chucks turn about 20 to 30 turns from fully open to fully closed. It only takes four to six turns to run the Panasonic chucks lock-to-lock.)

The Metabo chuck had an easy-to-grip rubber ring, and the Sears drill had a ribbed chuck collar that one tester found rough on the hand during speed-chucking.

Most of the keyless chucks tended to slip when we used 1/2-in.-dia. bits with 1/4-in. shanks to drill into oak. The Panasonic chucks were most likely to slip with this bit, while Hitachi, Bosch, Skil and Wen held the tightest. (Many manufacturers offer optional keyed chucks, which hold bits more tightly, and keyed chucks were standard on three Black & Decker models.)

Other Considerations

The Clutch—If you drive a lot of screws, you'll want a clutch that lets you preselect torque for setting

A NEW TWIST ON CORDLESS DRILLS

With the introduction of its 6911DW, Makita has implemented a new twist on cordless drills. This specialty tool works like a combination of a drill and an impact wrench. The variable-speed motor spins up to 1800 rpm, offering high speed for straight drilling. (You have to buy an optional \$25 chuck to use it in this mode.) When the load increases, the impact feature kicks in, providing up to 2500

rotational impacts per minute. Makita claims the tool will produce 868 inch-pounds of torque.

The 6911DW (see photo above) is designed mainly for heavy-duty driving, such as driving lag screws and even tightening bolts on cars or machinery. But we found that it works well both as a drill and a driver. The impact action let us drive big screws without slipping, and we could even drive 2-in. drywall screws into an oak board just

by applying enough light pressure to hold the driver on the screw.

The new Makita drill comes with a quick-release 1/4-in. hex drive socket for holding screwdriver bits. The optional chuck also has a hex shaft, so you can slip it in and out of the drive socket quickly, a handy feature when you're shifting often between driving and drilling. The only drawbacks are high vibration and the noise: it's nearly as loud as a jackhammer.

screws to a precise depth. Most clutches have five or six torque settings, plus a locked setting for drilling or for driving extra-large screws. For finer adjustments, the AEG, Black & Decker 2765, Bosch, and DeWalt DW945 offer additional settings, and the new Panasonic EY6100EQK leads with 21 clutch settings.

The Black & Decker 2765 and DeWalt DW945 offer a unique feature called a "Versa Clutch" which (in the screwdriving mode) engages the chuck only when you push on the bit. This gives you more precise control, because you can temporarily kick in up to 20 percent more torque than the clutch collar setting simply by pushing harder on the bit. For example, this lets you sink a screw in a denser part of a board without having to change the clutch setting.

The Bosch drill's clutch is a technical breakthrough: instead of using mechanical components, it works electronically. To adjust torque, you set a dial to one of 17 settings. Then the electronic circuitry senses current draw and shuts off power at the preselected torque. In our tests, the clutch was very sensitive and much quieter than the ratcheting mechanical clutches on the other drills.

Electronic Brakes—A recent innovation on many cordless drills is an electronic brake, which stops the bit instantly when you release the trigger. This means you don't have to wait for the chuck to stop spinning before starting the next hole or screw. Fifteen of the drills we tested offer this feature. (See the chart on pages 42 and 43.)

HIGH-TECH BATTERY CHARGERS

BY DAVE SELLERS

Breakthroughs in battery design have significantly improved the performance of cordless tools in the last few years. But the biggest high-tech innovation in battery technology is a new generation of fast chargers that can boost a battery to full power in 10 or 15 minutes—about four times faster than conventional chargers.

Fast chargers use microprocessors as well as sensitive voltage, temperature or time sensors to prevent overcharging, which causes the overheating that degrades a battery's service life. Many fast chargers will also run diagnostic tests on a battery. They'll tell you whether a battery is on quick charge or trickle charge, and they'll even report a defective battery pack or one that's too hot to begin charging. Plus, these chargers will take a hot battery, monitor its temperature

and begin charging automatically when it's cooled down.

At the time of our tests, fast chargers were standard on the Metabo, Panasonic and Milwaukee drills. Bosch, Makita and DeWalt offer fast chargers as optional accessories. You can also buy these chargers aftermarket for use with your present drill. Street prices range from \$100 to \$150, compared to \$30 to \$40 for a standard one-hour charger.

DeWalt is also marketing a 15-minute super-charger (model DW9090). (See photo.) This



The DeWalt DW9090, center, charges most brands of batteries in 15 minutes. It indicates the condition of the battery and charge time on its digital display.

\$159 unit will charge battery packs from most name-brand drills (except Metabo, Skil and Freud), and it will charge batteries from 2.4 volts to 13.2 volts. It has a digital display that indicates elapsed time on charge, and it can even analyze a battery to determine whether it's best to trickle-charge instead of fast-charge (trickle-charge is better if the battery has been in storage for a long time or if it's nearly worn out).

Our Recommendations

So, which one of these 26 drills do we recommend? Well, it's sort of like parachuting into the Miss America contest—almost anywhere you look, you'll find a beauty. In the end, we singled out the Freud EDS132 for its

power and solid features, and we liked the Bosch, the Panasonic EY6100EQK and the Makita 6911 for their breakthrough designs and features. See the sidebar on the opposite page for more particulars on each of these drills. ▲

CHARGING TIPS

To get the best performance and longest life from your batteries, follow these tips:

- Avoid repetitive light-work cycles. The phenomenon of "memory"—that is, the tendency of nickel-cadmium batteries to "learn" not to accept a full charge—has been mostly eliminated in the latest generation of batteries. However, it can still be a problem if you repeatedly work your drill on light loads and regularly

drain the battery to the same partial discharge point.

- Brand-new batteries won't always accept a full charge until you run them through three to six charge/discharge cycles to electrochemically "condition" the cells.

- Batteries are temperature sensitive. Don't leave them in the sun or in a hot spot, and don't charge them when the room temperature is below 50°F or above 105°F.

- Excessive discharging can harm a battery pack, so instead of running the battery until it is completely drained, many manufacturers suggest you stop when tool performance has decreased to the point when the drill slows appreciably.

- If a battery hasn't been used for a long time, it may not accept a full charge. Rejuvenate it by discharging it almost completely and recharging a few times.



Like the other pieces in the author's bedroom suite (below), this chest of drawers sports subtle curves and vertical lines inspired by Oriental furniture.

A CHERRY CHEST OF DRAWERS

*The Third Piece
In Our Bedroom
Suite Series**



BY SCOTT COOPER

A furniture designer sometimes has to admit that his work isn't the result of a single brilliant leap of inspiration, but rather one element simply leading to another until the whole design hangs together. That was the case with this bedroom suite. (See inset photo.)

The chest in this suite uses the same mortise-and-tenon joinery and frame-and-panel construction as the bed and nightstand featured in the earlier articles. The chest's legs are connected by top and bottom rails, and the legs and rails are grooved for the flat panels and vertical dividers which form the sides and back. (See Fig. 1.) Five drawer rails hold the front of the chest together. These are grooved on the inside to hold dust panels, drawer runners and the drawer dividers, which are tenoned between the rear legs. (See Fig. 1.)

The leg stock is $8/4$, and I dimensioned it to $1\frac{3}{4}$ in. square, while the rail stock is $4/4$, planed to $\frac{7}{8}$ in. The show wood is cherry and the secondary wood, used for drawer-runner frames and drawer guides, is yellow-poplar.

Simplified Machining

This project is a study in simplified machining. All grooves, for example, are cut $\frac{1}{4}$ in. wide and $\frac{5}{16}$ in. deep, with a $\frac{5}{16}$ -in. setback from the face of the part. Since most parts are $\frac{7}{8}$ in. thick initially, this setback centers the groove, avoiding confusion as to which side is which.

I also machined the frame rails and panel dividers while they were a full $\frac{7}{8}$ -in. thickness. This allowed me to use the same router setup for grooving the rails, dividers, and legs. Later, I planed $\frac{1}{16}$ in. off the outside faces of the rails and panel dividers to achieve a reveal. (See Fig. 1 and Bill of Materials.)

The tenons for the side, back and bottom front rails are all the same size: $\frac{3}{8}$ in. wide and $\frac{5}{8}$ in. long. The mortises on the legs start out $1\frac{1}{16}$ in. deep because I find it easier to cut them while the leg stock is still $1\frac{3}{4}$ in. square. But after the legs are shaped to their final dimension— $1\frac{1}{2}$ in.—the mortises end up just slightly deeper than $\frac{5}{8}$ in.

* *The bed and nightstand appeared in AW #33 and #34.*

FIG. 1: CHEST OF DRAWERS

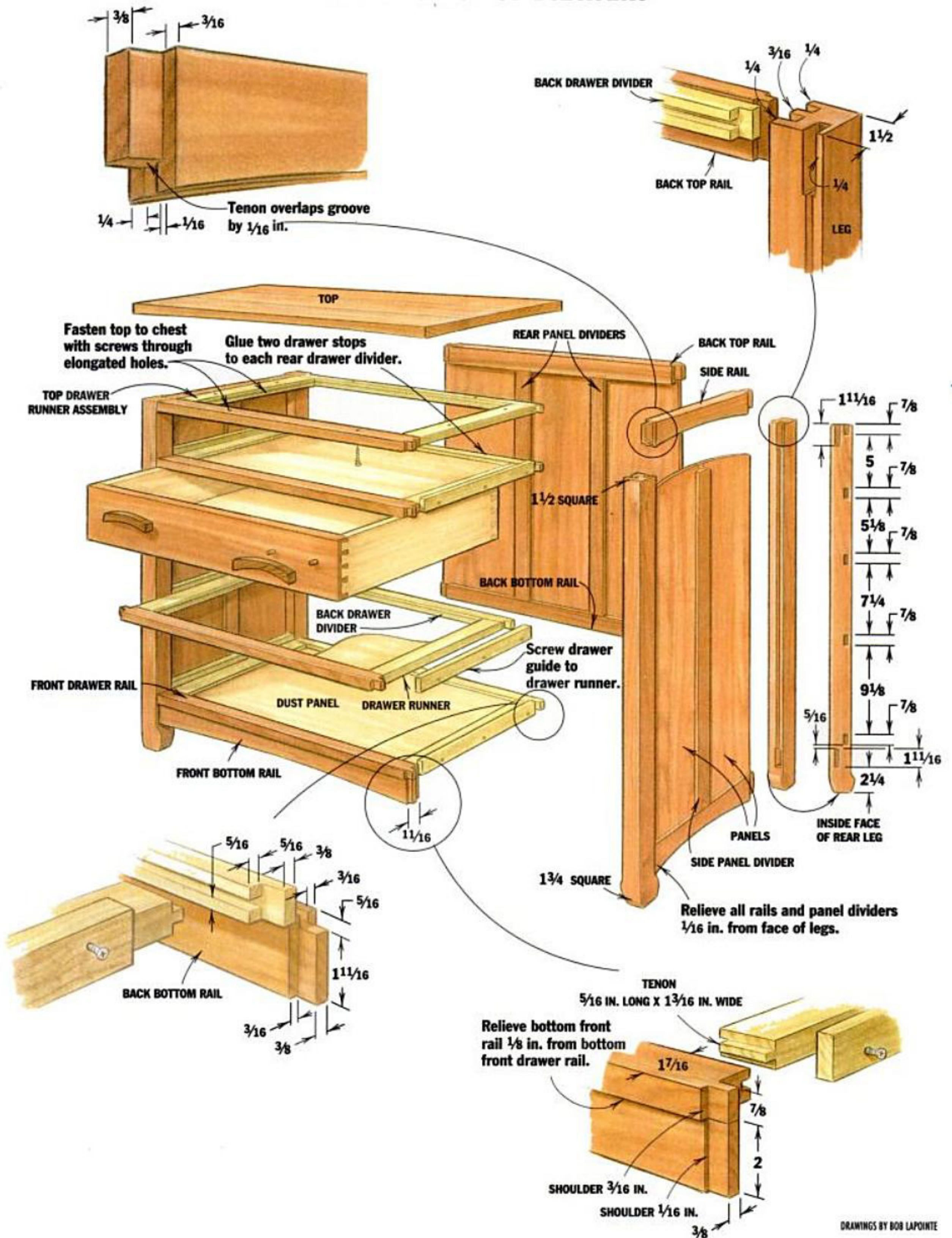
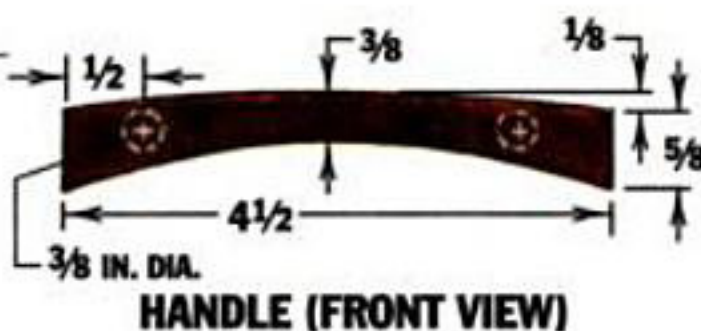
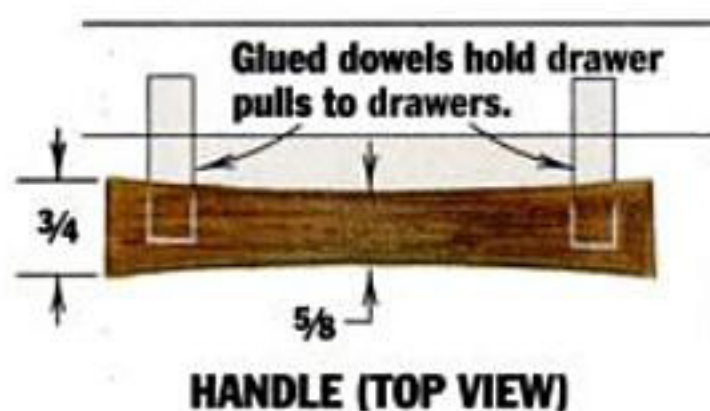
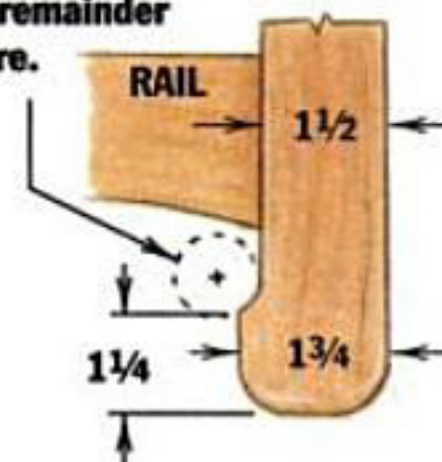


FIG. 2: FRONT AND SIDE ELEVATIONS



Cut curve with radius of $\frac{1}{2}$ -in. Forstner bit, then rip remainder of leg to $1\frac{1}{2}$ in. square.



Machining the Parts

I made the parts in the same order that they're listed in the Bill of Materials. I started with the top so I could choose the best wood for it. I also wanted to allow plenty of time in case the glued-up top was going to warp, so I could plane it flat again before attaching it to the frame.

The legs came next. I marked their mortises with the aid of a story pole (see sidebar), then machined the mortises into the $1\frac{3}{4}$ -in.-square stock with a horizontal mortiser. Using a U-shaped jig made from excess leg stock to hold the work, I drilled the curves on the bottom of the legs with a $\frac{1}{2}$ -in.

dia. Forstner bit and then bandsawed the remainder of each leg to final thickness. It's important that the tops of the legs remain square, or the shoulders on the rails won't fit tightly. Also, the legs should be exactly $1\frac{1}{2}$ in. square, because rail widths and some of the interior shoulder lengths depend on this dimension.

I made the frame rails next. I cut the tenons with a dado head on my table-saw and bandsawed the curves in the side rails. After cleaning up the saw marks, I grooved the rails with a slotting cutter in my router table, centering the groove on the tenons. Then I dry assembled the rails and legs to deter-

mine the sizes for interior parts such as the vertical panel dividers and the drawer supports. (The Bill of Materials provides finished sizes for these pieces, but it's always best to measure and cut to fit.) The panels came last. Be sure to leave $\frac{1}{8}$ in. of clearance side-to-side for wood movement.

Each panel is a two-piece book-match resawn from $4/4$ stock. I set them aside to stabilize for a couple days, then I faced and thickened each half individually before gluing the book-matched pairs into panels. This way, I was able to avoid the tearout that is so common when planing book-matched panels.

BILL OF MATERIALS

PART	QTY.	DIMENSIONS
Top	1	$\frac{7}{8} \times 16\frac{1}{4} \times 29\frac{1}{4}$
Legs	4	$1\frac{3}{4} \times 1\frac{3}{4} \times 35\frac{1}{8}$
Back Rails	2	$\frac{3}{4} \times 2 \times 26$
Front Bottom Rail	1	$\frac{11}{16} \times 2 \times 26$
Back Drawer Dividers	5	$\frac{7}{8} \times \frac{11}{16} \times 26$
Front Drawer Rails	5	$\frac{7}{8} \times 1\frac{7}{16} \times 26$
Rear Panel Dividers	2	$\frac{3}{4} \times 2 \times 29\frac{1}{2}$
Rear Panels	3	$\frac{1}{4} \times 7\frac{7}{16} \times 29\frac{1}{2}^*$
Side Rails	4	$\frac{13}{16} \times 2 \times 13\frac{3}{4}$
Side Panel Dividers	2	$\frac{13}{16} \times 1\frac{1}{2} \times 30\frac{1}{8}$
Side Panels	4	$\frac{1}{4} \times 6\frac{1}{8} \times 30\frac{1}{8}^*$
Drawer Runners	10	$\frac{7}{8} \times 1\frac{1}{2} \times 13\frac{1}{8}$
Drawer Guides	8	$\frac{7}{8} \times 1\frac{1}{2} \times 12\frac{1}{2}$
Dust Panels	4	$\frac{1}{4} \times 13\frac{1}{8} \times 22\frac{3}{8}$
Drawer Fronts	4	$\frac{7}{8} \times \text{height} \times 24\frac{3}{4}^\dagger$
Drawer Backs	4	$\frac{7}{8} \times \text{height} \times 24\frac{3}{4}^\dagger$
Drawer Sides	8	$\frac{7}{8} \times \text{height} \times 13\frac{3}{4}^\dagger$
Drawer Bottoms	4	$\frac{1}{4}$ -in. plywood [‡]
Drawer Stops	8	Cut to fit.
Drawer Pulls	8	See Fig. 2.

Where appropriate, lengths include $\frac{5}{8}$ -in.-long tenons for mortises or $\frac{5}{16}$ -in.-long tenons for grooves.

*Approximate dimensions. Size to fit grooves.

†Approximate lengths. Size to fit.

When all the parts of the frame fit, I put them together temporarily and noted which faces should be planed back to provide reveals. This is also the time to check the fit of the drawer runners and to screw the drawer guides to them.

I hand-planed all the show surfaces

Here's the order for assembling the parts: Start with the sides. Assemble two legs with a bottom curved rail, then slide the side panels and vertical divider in from the top. Since the mortises for the top rail are open at the top (see Fig. 1) you can then slide the top rail down into position and

before glue-up, because this provides a clean and bright surface for finishing.

Glue-up

Assembly is tricky on this chest because so many parts have to go together at the same time. I'd recommend that you enlist some help for the final stages of the glue-up and use a glue with a longer closed assembly time than yellow glue. (For more on glues, see AW #34.) White glue or plastic resin glue works well.

square the assembly.

After these side assemblies dry, you'll glue up all the other carcass parts at one time, so it's important to arrange the parts neatly and in a sensible order. Then follow these steps: First, lay one side of the chest flat and insert all the front rails, all the back drawer dividers, and the back bottom rail. Second, immediately add the drawer runners for that side, the dust panels, and the other side's drawer supports. Third, quickly lift the other side assembly over this forest of sticks, and insert all the tenons. Finally, stand the chest on its feet and drop the back panels, dividers and top rail into place. Piece of cake.

Like the nightstand in this bedroom suite (see inset photo, page 46), the top has an undercut edge. The drawer pulls also have the same profile as on the nightstand, and the drawers are made with hand-cut dovetails. ▲



SCOTT COOPER
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MAKING A STORY POLE

This Scrapwood Tool Ensures Perfect Measurements

BY JIM CUMMINS

An old carpenter once told me he'd worked in a shop where it took three years to find and eliminate the one ruler that didn't agree with all the others. After that, he said, things smoothed out a lot. Even if you don't have that problem, when you have to lay out a number of dimensions in a row, errors can add up. A story pole marked with precise locations, like the one shown here, provides a reference—a single

master ruler—that keeps measurements uniform from piece to piece. It also provides a permanent record of construction for future use.

To make a story pole, choose a



Using a story pole to lay out dimensions on posts such as legs and rails keeps measurements uniform from piece to piece.

straight stick about 1 in. square and cut it the same height as the piece you're building. Then scribe marks on each face of the stick to indicate the heights, lengths and setbacks for various parts. For example, you could label one side "FRONT" and have it represent the heights and lengths of the mortises for the parts spanning the piece's front.

Another side could be labeled "BACK" and marked with the corresponding mortises on the back legs.

Label each mark clearly on the pole, so it can tell its story again in the future. You never know when you'll want to make this piece again. And remember that while drawings are a designer's primary tool, a builder does well—as Teddy Roosevelt urged—to carry a big stick.

TURN A TOY TOP



Based on a 142-year-old family heirloom, this top makes a great gift for young and old alike.

Send It Spinning With a Tug On the String

BY J. BARRIE BLACKBURN

In 1850 my grandfather, Henry Blackburn, left his home in Liverpool, England on a trip that would take him to Australia and later to America. Barely 3 years old, he carried a simple cloth bag containing only a change of clothes and his prized possession: a toy wooden top given to him by his father. The top was made from a hard burl of dark wood, and its stem was the whitest ivory.

Since Henry's time, that top has been handed down through five generations of Blackburn children. It is still a prized possession and a model for the top you see here. After my own son passed away, I started making these tops for my daughters, family and special friends, as a way to pass on a bit of the Blackburn legacy. Though the basic shape remains the same, no two tops are exactly alike, giving them a unique appeal that no

mass-produced toy can match.

To make the top, start with a 2-in. by 2-in. blank of dense hardwood that's 3¼ in. long. My favorite wood is Osage orange. It's important that you choose wood of uniform density so the top will be evenly balanced around its center. That way, it will spin true instead of wobbling.

Turning the Top

STEP 1: Mount the blank between centers and rough out a 1½-in.-dia. cylinder. Then remove the blank and roll it on a smooth, level surface to test the balance. If it rolls smoothly, you're in business, but if it rolls unevenly and hesitates at each revolution, turn another piece.

STEP 2: Remount and shape the blank to the dimensions in the drawing. Don't part off the body now; instead, leave a thin section of

scrap attached to each end where it's mounted to the headstock and tailstock. At this point, I put some decorative lines—or "racing stripes," as my grandson calls them—on the top. (See drawing.) To do this, I turn my parting tool sideways and "wear" the

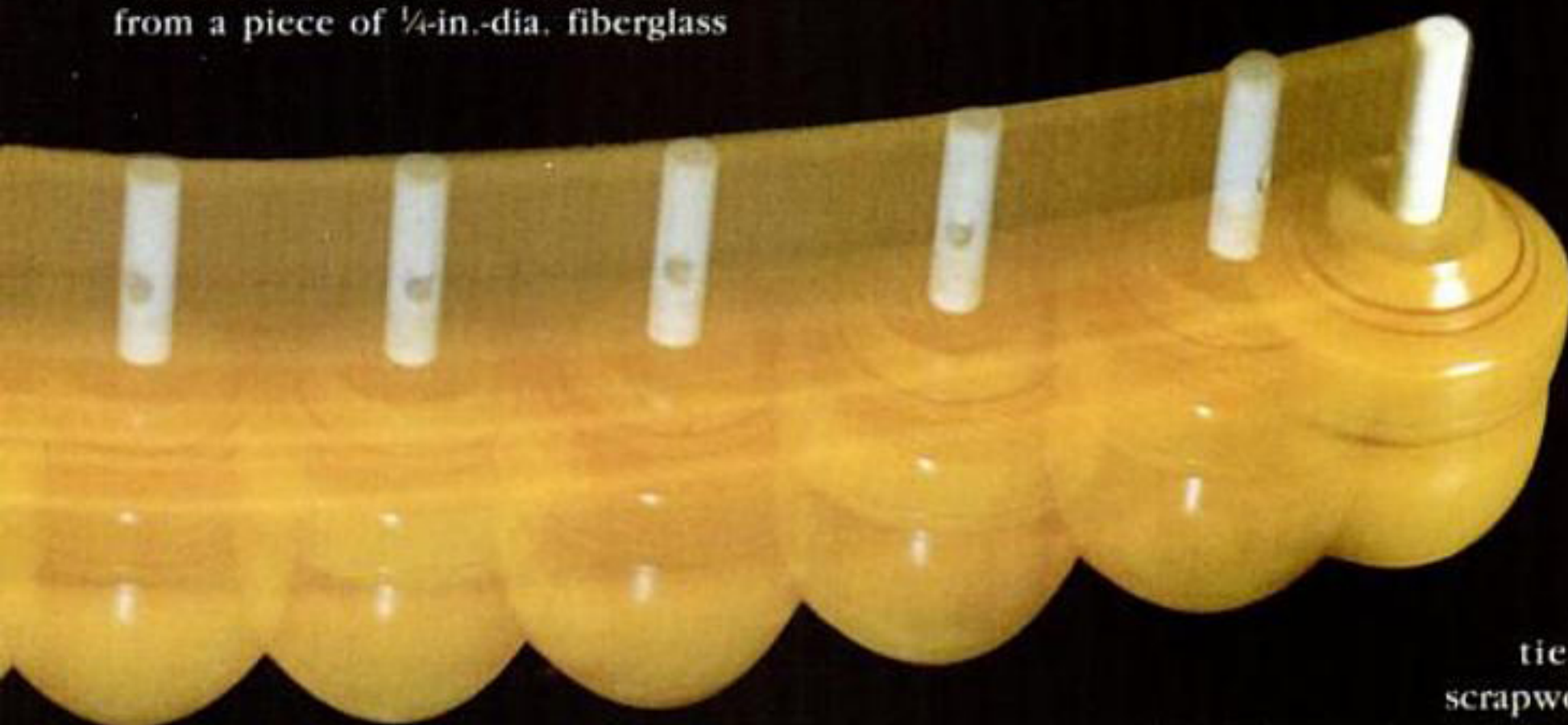
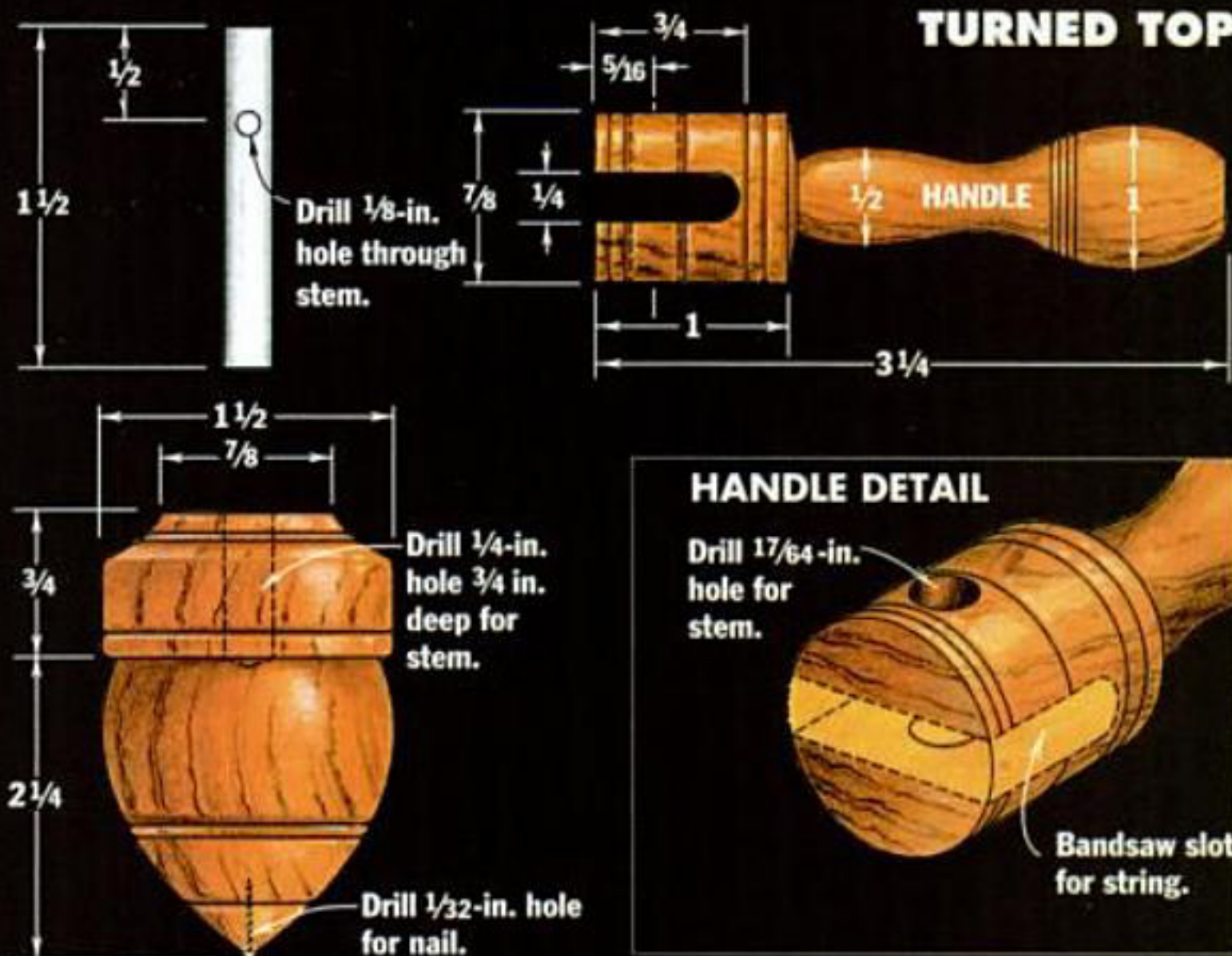


With one end of the top pressed against the tailstock for support, drill the stem hole. Use the center marks left by the drive center to align the bit.

lines into the turning top rather than trying to cut them. After this stage, I final sand the top.

STEP 3: Drill a 1/4-in.-dia. hole for the stem. I do this on the lathe with the top held in a drill chuck in the headstock. (See photo, below opposite.) The center marks left on the scrapwood help you align the drill bit precisely with the top's centerline while you support the other end with the tailstock. The hole should extend 3/4 in. into the body of the top. (See drawing.) Next, turn the top around and drill a 1/32-in. pilot hole for the nail that will serve as the top's point. With the holes drilled, saw the scrapwood off the top end and sand the end smooth. You'll finish the bottom later.

STEP 4: Now it's time to turn the stem. The original top had a stem made from ivory, but I make mine from a piece of 1/4-in.-dia. fiberglass



drawing, then bandsaw the waste. Finally, finish the top and handle.

Using the Top

First, place the stem through the hole in the handle, and thread an 18-in. length of waxed nylon string through the hole in the stem. Then turn the top to wind the string on the stem. I like to tie a small bead or piece of scrapwood to the exposed end of the string. I find this gives me a better grip for pulling.

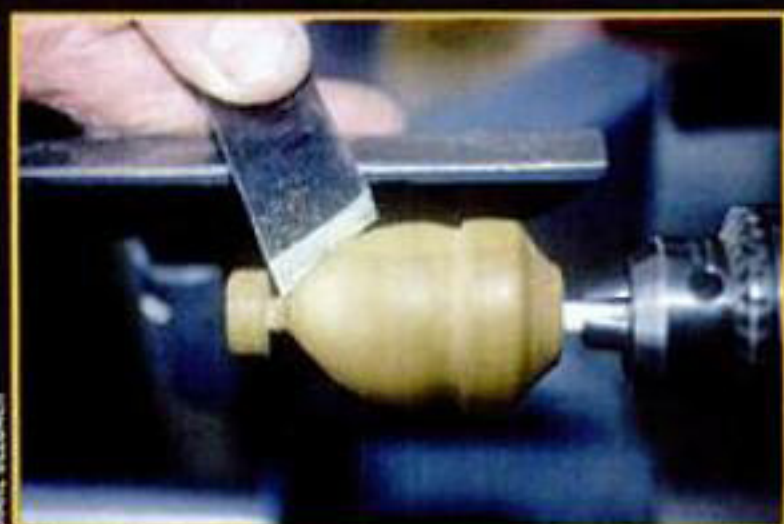
To spin the top, hold the handle with one hand while you pull the string with the other hand. The top will drop out of the handle and spin for up to a minute or more. If the top jumps as it spins, try enlarging the flat spot on the nail head. ▲

rod (available from Laird Plastics, 2450 Lunt Ave., Elk Grove Village, IL 60007, 800-873-8407). You could use a wooden dowel just as well. After cutting the stem to length, drill a 1/8-in.-dia. hole in it for the string, then

glue the stem in the top, leaving about 1 in. exposed. When the glue is dry, chuck the stem in the drill chuck on your lathe to finish turning the bottom, as shown in the photo at left.

STEP 5: To give the top a durable tip, drive in a 3/8-in.-long, 16-gauge linoleum nail. A block of scrap with a 3/16-in. hole for the stem will support the opposite end of the top during nailing. When the nail's in place, you'll need to sand a small, flat spot on the head to make the top spin properly.

STEP 6: Turn the handle to the dimensions in the drawing, then drill a 17/64-in. hole in the handle for the stem. To create a string slot in the handle, drill a second 17/64-in. hole at right angles to the first, as shown in the



Chuck the top's stem in a headstock chuck to finish turning the point with a skew.



J. BARRIE BLACKBURN

is a fourth-generation woodworker who advises Boy Scouts pursuing their woodworking merit badge.

USING THE SHAPER: BEYOND THE BASICS

BY LONNIE BIRD

Techniques for Arched Panels, Curved Work, Complex Moldings and Cope-and-Stick Joinery



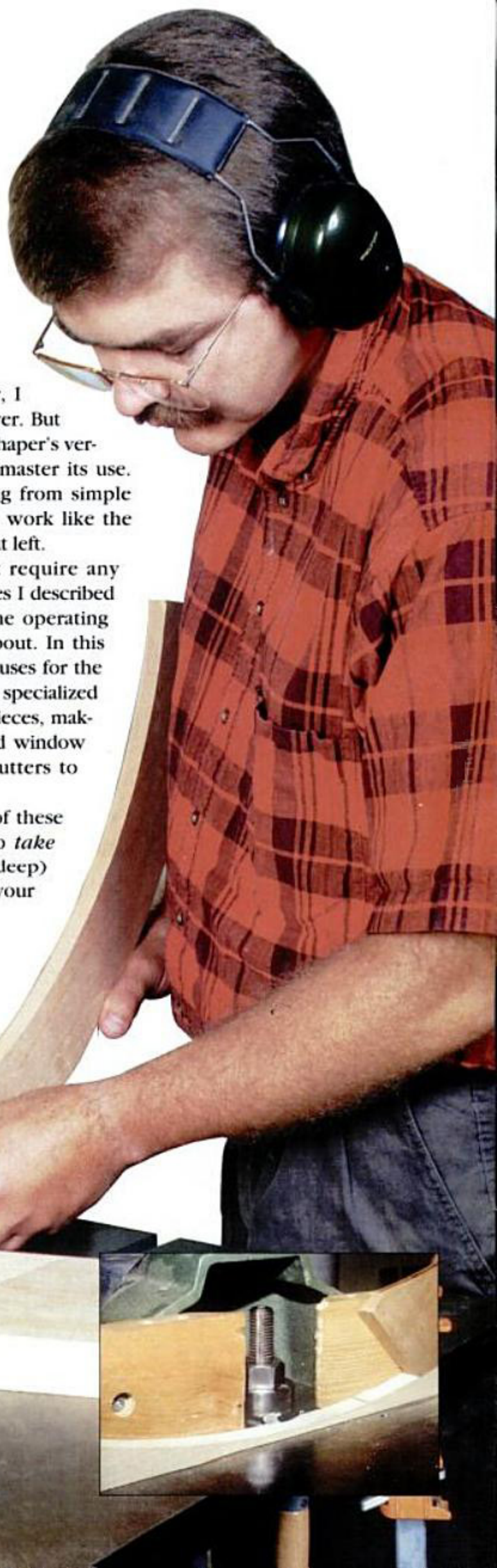
To make a curved door casing like this one, author uses a cradle-fence setup and a featherboard (right). Featherboard is removed in the inset photo to show setup. Workpiece rides on the cradle fence.

The first time I used a shaper, I was impressed by its raw power. But I didn't really learn about the shaper's versatility until later, when I began to master its use. Now I use my shaper for everything from simple round-overs to large-scale, complex work like the arched doorway shown in the photo at left.

Complicated shaper tasks don't require any more skill than the simpler procedures I described in the last issue,* but there are some operating tricks and jigs you need to know about. In this article, I'll talk about more advanced uses for the shaper and explain how to do some specialized work, such as shaping curved workpieces, making cope-and-stick joints for door and window frames, and using small standard cutters to form complex moldings.

One warning: when you try any of these procedures, be especially careful to *take shallow cuts* (no more than $\frac{3}{8}$ in. deep) rather than one deep cut to reach your final profile depth.

**"Shaper Basics" appeared in AW #34.*





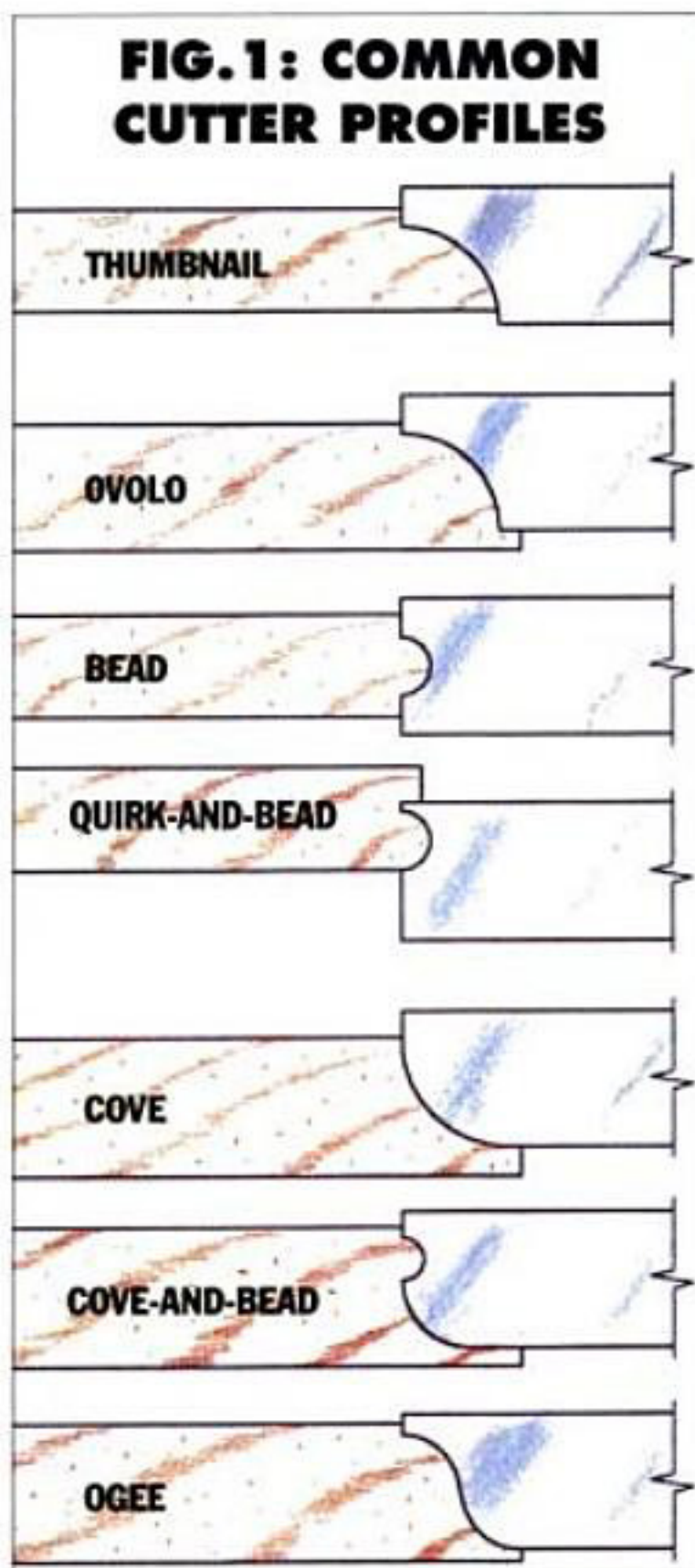
To prevent kickback when freehand shaping, place the work against a starting pin, then pivot the work into the cutter.

Shaping Curved Work

The shaper is well suited to profiling curved parts. In fact, there are three basic ways to shape curved stock: freehand; with a pattern; and with a curved fence. Each has advantages for certain kinds of work.

Freehand shaping without a fence is the easiest method for shaping curved work. You guide the work with a ball-bearing rub collar mounted on the spindle above or below the cutter, much like using a ball-bearing pilot bit in a router table. To use this method, you must remove bandsaw marks and other irregularities from the edges to be shaped, or the rub collar will transfer them to the shaped profile.

When freehand shaping, you *must* use a guard and a *starting pin* to safely begin the cut; otherwise the workpiece could be kicked back violently, possibly causing serious injury. A starting pin is a short, tapered steel rod you install in the shaper table near the cutterhead. (See photo above.) Most shapers have starting pins, but if yours doesn't, you can easily make one by tapping a hole



in the table for a machine bolt. When starting a cut, first place the work against the pin, and then pivot it into the spinning cutterhead.

There are a few other safety rules to observe when freehand shaping. First, avoid shaping small pieces. The work should be large enough to grasp firmly with your hands at a safe distance (6 in. minimum) from the cutterhead at all times. Second, when possible, shape



Author raises an arched panel with a pattern against a spindle rub collar. Toggle clamps hold work to pattern.

the curved edges of a piece before cutting it to finished size. The added mass of wood will provide you with a better grip and will help reduce chatter.

Pattern shaping is a second method of shaping curved stock. Here, you fasten a pattern to your work. The pattern rides against a ball-bearing rub collar on the spindle while the cutter shapes the edge of the workpiece.

Patterns should be made of a stable, warp-free material, such as high-quality hardwood plywood or fiberboard. Be sure to smooth the edges carefully, because any roughness will transfer to the work.

Pattern shaping has several key advantages over freehand shaping. Patterns let you easily and accurately shape multiple pieces to the same profile. And because working with a rub collar limits the depth of cut, you can shape entire profiles without fear of the piece being pulled into the cutter. Patterns are also very efficient, because you don't have to spend a lot

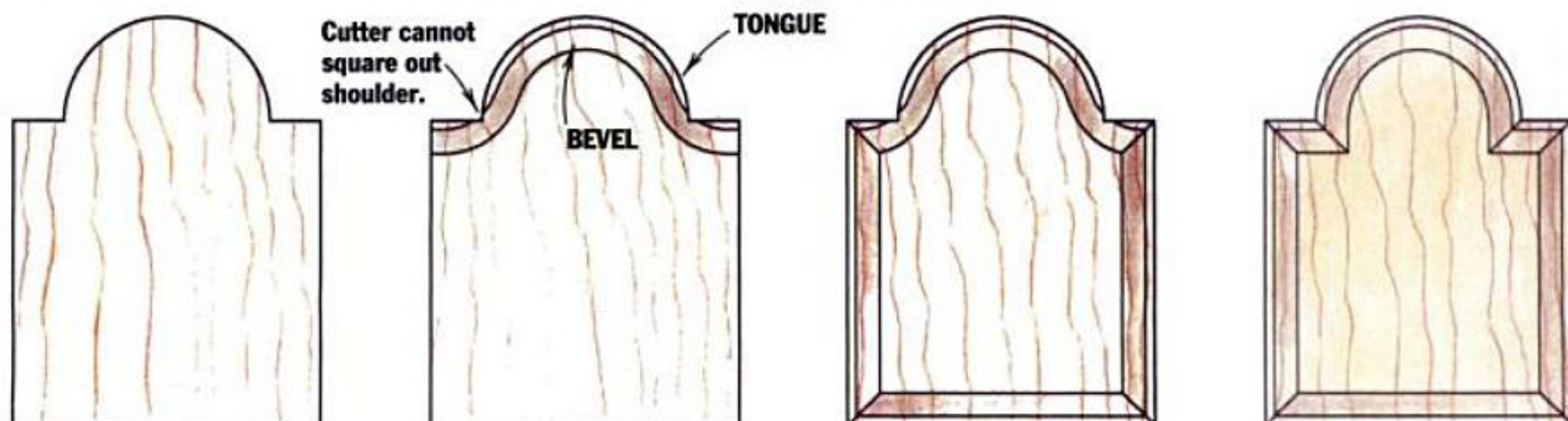
FIG. 2: RAISING A SHOULDERED ARCH PANEL

STEP 1: Cut panel blank to size. Allow enough material for panel tongue.

STEP 2: Shape arch with panel-raising cutter using pattern or rub collar.

STEP 3: Shape straight edges with panel-raising cutter and box fence.

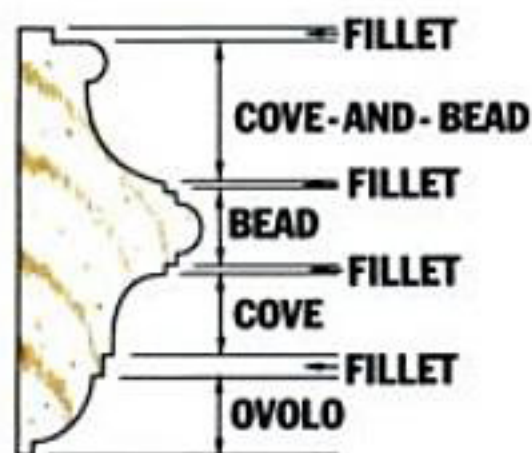
STEP 4: Carve shoulders of arch with skew chisel.



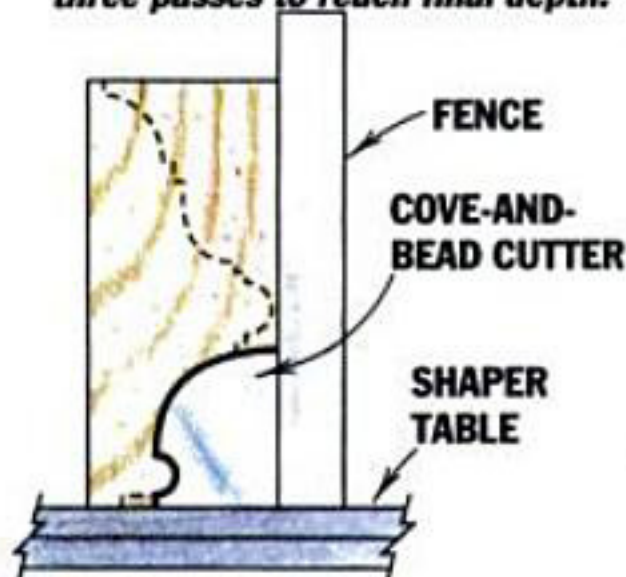
DRAWINGS BY MARIO FERRO

FIG. 3: SHAPING A COMPLEX MOLDING

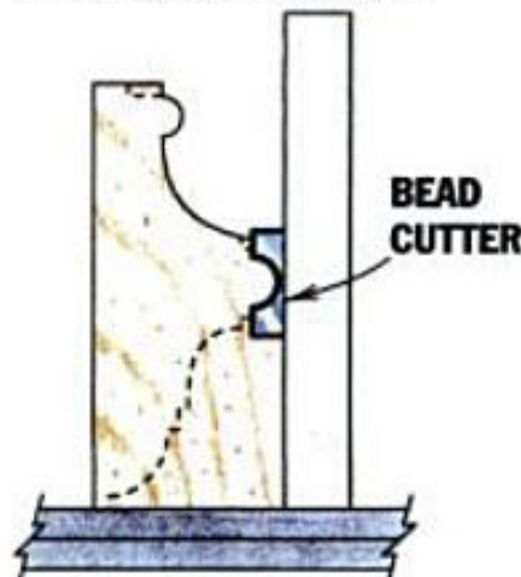
This complex molding is actually four simple profiles with fillets as transitions.



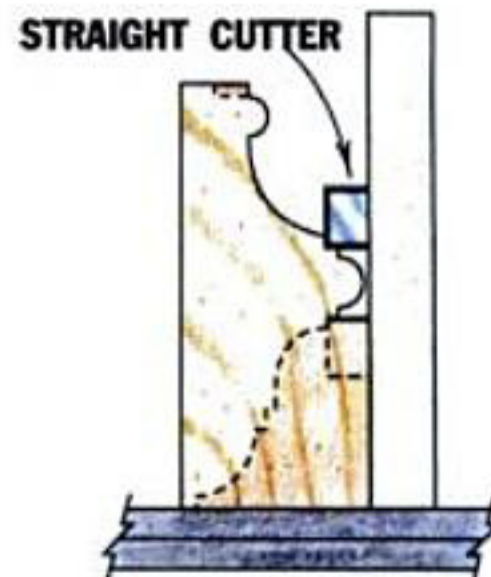
STEP 1: Cove-and-bead is the heaviest cut. Shape it first to avoid chatter later, taking at least three passes to reach final depth.



STEP 2: Cut bead while you still have flat surfaces to ride on the table and fence.



STEP 3: Cut fillets with a straight cutter.



of time cleaning up the edges of your curved workpieces prior to shaping. Just saw the curves slightly oversize and shape away the excess wood.

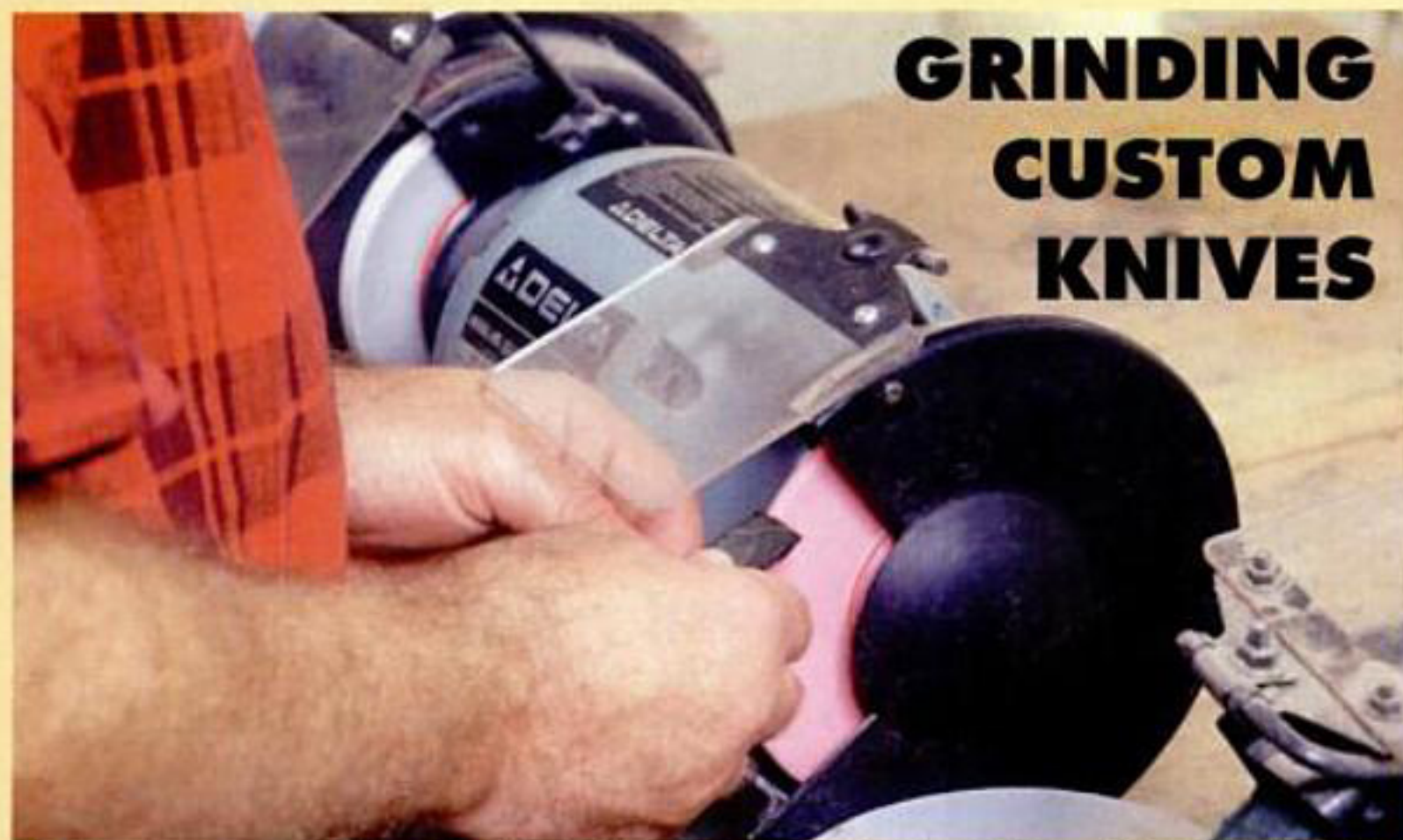
There are several ways to fasten the work to the pattern. The easiest is to use small brads or nails slightly longer than the pattern thickness. Several strategically placed brads will usually hold the work solidly. Locate the nails where they won't show on the finished piece, such as under hardware or in an area that will eventually be removed. The brads should protrude about $\frac{1}{8}$ in. into the workpiece.

You can also use toggle clamps to hold your workpiece on top of a pattern. (See photo, previous page.) In addition to securing the work, toggle clamps provide handholds for a better grip while shaping. This method works best if you need to shape only one or two edges; otherwise the clamps will be in the way. Make the pattern larger than the work so you will have a place to bolt the clamps. Attach strips of wood to the edges of the pattern to keep the stock from creeping under the force of the cutterhead.

Pattern shaping, like freehand shap-

ing, is dangerous to attempt without a starting pin, *unless* your pattern extends beyond the workpiece and contacts the rub collar before the work contacts the cutterhead.

A curved cradle fence is a third option for shaping curved work. (See lead photo.) A curved cradle is attached to the fence, letting you shape stock vertically. This technique can produce profiles—such as on the face of curved trim—that can't be shaped with the other two methods, but it works only if the outside shape of the workpiece is part of a true circle.



A filler strip tacked to the jig prevents the workpiece from tilting during the second rabbeting pass.

GRINDING CUSTOM KNIVES

Custom shaper knives allow much greater flexibility than stock varieties, and they're not as difficult to grind as you might think. Once you have mastered the skill, you can match almost any profile.

I make custom knives from bevel-edge high-speed steel blanks, which

lock into milled grooves in a pair of lock collars (both available from Charles Schmidt Co. Inc., 301 W. Grand Ave., Montvale, NJ 07645, 800-544-2447). The steel comes in widths from $\frac{1}{2}$ in. to $3\frac{1}{2}$ in. and thicknesses of $\frac{1}{4}$, $\frac{5}{16}$ and $\frac{3}{8}$ in. Wider knives require a larger shaper with lots of horsepower, so I limit myself to 2-

in.-wide steel when grinding knives for my $\frac{3}{4}$ -in. shaper. Because the balance of the knives is more critical with wide knives, beginners shouldn't use steel wider than $\frac{3}{4}$ in. until they have gained some experience and accuracy in the grinding process.

I use a 6-in. bench grinder fitted with a $\frac{3}{4}$ -in.-wide wheel and a $\frac{1}{4}$ -in.-wide wheel. I round the corners of both wheels with a diamond dressing stick so I can grind fluid curves on the knives.

Layout

When you lay out your pattern on a knife blank, you have to take into account that the knives, when mounted in the cutterhead, will contact the workpiece at an angle, usually about 13° . Because of this angle, you'll have to grind your knife profile deeper than the desired molding shape. (See drawing.)

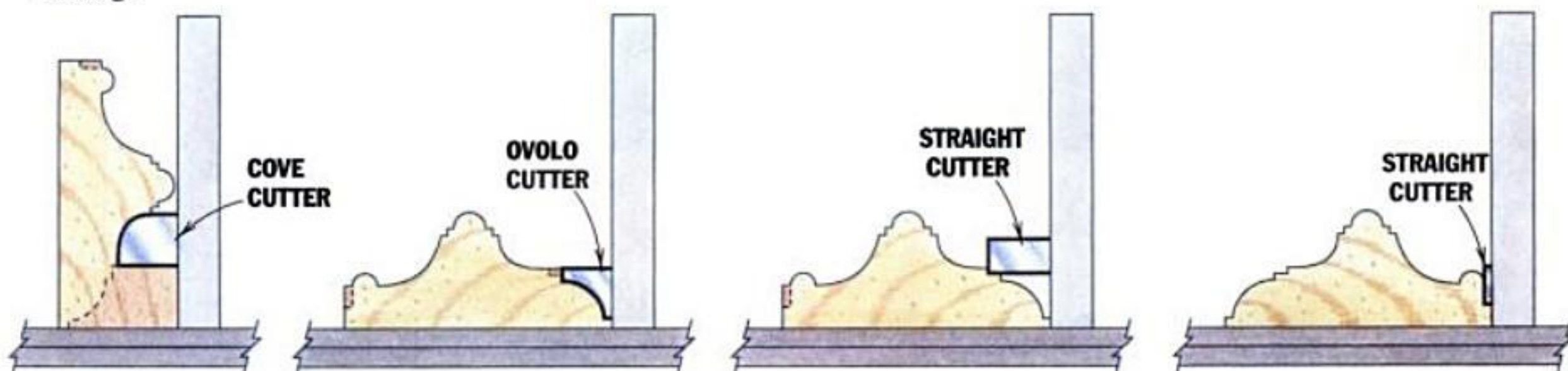
To lay out the correct profile on the knife blanks, first make a sample piece of molding with hand tools or simple cutters and cut it at a 13° angle. Notice that the cross-sectional profile of this mitered end is slightly longer than the

STEP 4: Shape cove before removing lower corner of molding.

STEP 5: Lay molding flat on shaper table to cut ovolo.

STEP 6: Cut fillet with straight cutter.

STEP 7: Reverse stock and cut final fillet.



To use this method, first make a cradle with the same radius as the outside edge of the work. Attach the cradle with screws to the front of your regular shaper fence, with the lowest point of the cradle directly in front of the spindle. (See lead photo.) Since the fence limits the depth of cut, you don't need a rub collar for cradle-fence operations. I recommend using a featherboard to hold the stock in close contact with the fence. Since the featherboard might cause some snipe at the beginning and end of the cut, you should make your curved blanks long

enough to trim off the sniped ends.

Shaping Complex Moldings

The shaper is an ideal machine for making moldings. Even complicated moldings are just combinations of a few basic shapes (ovolos, coves, thumbnails, ogees and beads) that you can produce on a shaper with simple cutters. (See Fig. 3.)

There are some good reasons to make complex moldings with a series of simple cuts. First, it's cheaper than purchasing wide, complex cutterheads (not to mention a shaper large enough

to run them). In addition, you have more design freedom when reproducing old profiles on furniture and architectural woodwork. You can reproduce many complex profiles if you have several sizes of cutters (e.g., 1/2 in. to 2 in.) with the common profiles. Small cuts are also safer and less intimidating than wide, heavy cuts.

When creating complex moldings, it's important to plan the sequence and feed direction of individual cuts before you start shaping. Many shapes, such as the ovolo, may be cut from either a face or an edge, while others, such as

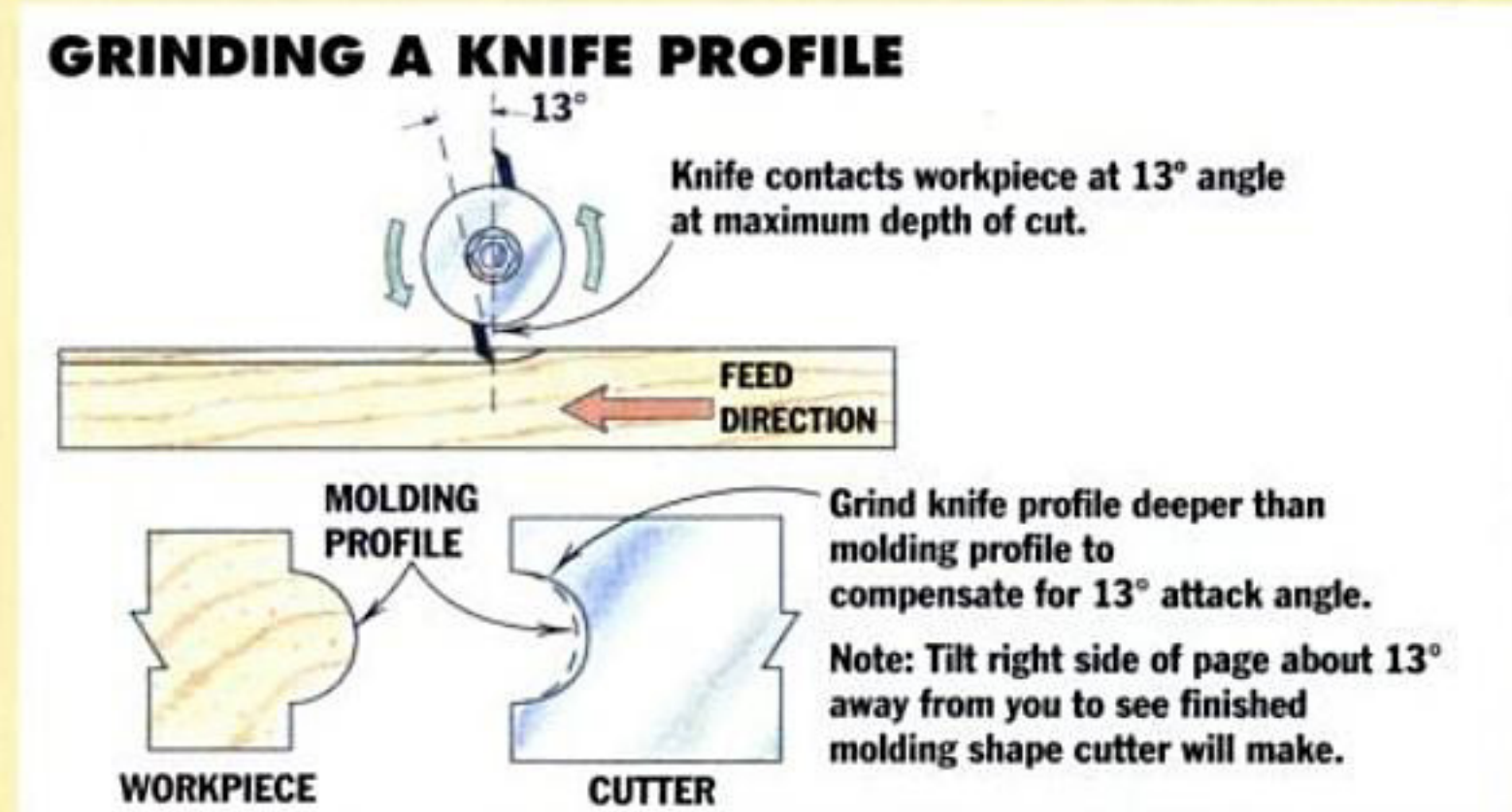
square end. This is the shape you'll trace on the blanks.

Now, coat the backs of the blanks with machinist's layout dye (available at auto supply stores) to make your lines more visible when grinding. When the dye has dried, scribe the outline of your sample molding's angled face onto the blank.

Grinding

Before you grind, make sure the knife blanks are the same width, thickness and length. Start with a blank long enough to produce a finished knife that extends at least halfway *into* the collar and no more than three times the knife's thickness *out of* the collar. Hold the blank freehand (no tool rests) and maintain a bevel angle of about 25°. (See photo.) Move the knife slowly and smoothly across the wheel to create flowing curves. When the knife feels warm, dip it in water to prevent the edge from overheating. Continue grinding gradually until you reach your layout lines.

Once you've ground both knives, compare the two and make minor



adjustments as necessary. Diamond needle files can be helpful for tuning up the tight corners and fine details. Hone the bevels with a slipstone and rinse the knives in water to remove the grit.

Now, mount the knives in the lock collar so they both extend the same distance from the collar. You can check this with a block of wood or a dial indicator. Turn the spindle by hand to be sure both knives are equally extended. If they aren't, the cutterhead

may be dangerously out of balance.

After tightening the collar screws, secure the cutterhead on the spindle with the keyed lock washer and spindle nut. Adjust the fence position and spindle height, set the shaper speed at 7000 rpm or less, and you're ready for a test cut. If you find any small ridges in your test piece, you may have to touch up the grinding on one of the knives slightly to bring the edges into perfect alignment.—LB.

the quirk-and-bead and cove-and-bead, must be cut from the face. It's vital for the workpiece to have flat surfaces in contact with the shaper table and fence so the stock doesn't tip into the cutter.

If you remove stock in the wrong order, you jeopardize the quality and safety of your cut. For example, consider the complex molding shown in Fig. 3. The order and direction of the cuts I use to shape this molding are illustrated.

On complex moldings, you can make some of the cuts, such as wide, deep coves, with your tablesaw. (See AW #25, p. 43.) Then add smaller profiles on either side of the cove with the shaper. Many crown-molding designs for furniture can be made this way.

Arched Raised Panels

Arched panels became very popular in the 18th century and were used extensively in doors of case pieces. In those days, when panels were raised by hand, the arch was usually semicircular with a distinct shoulder on either side. (See Fig. 2.)

Today, most panel raising is done with shapers. Since shapers can't create inside corners, most arched panels are made with sweeping curves instead of distinct shoulders. Unfortunately, these curves don't look as crisp or distinctive as the originals. But if you're willing to do a little hand-carving after raising the panel with a shaper, you can still create inside corners on arched panels. (See Fig. 2.)

When making frames for your arched panels, first groove and stick the straight pieces of the frame using a fence set in line with the rub collar. Then remove the fence, insert the starting pin and groove and stick the top rail freehand, using the rub collar to follow the arch. Shape all frame parts facedown so their faces will be flush when you assemble them. ▲



LONNIE BIRD

makes reproduction furniture and teaches woodworking at the University of Rio Grande in Ohio.

DOORS AND WINDOWS ON THE SHAPER

Window sash and frame-and-panel doors have much in common. Both usually have a frame made of two horizontal members (rails) and two vertical members (stiles) surrounding a panel of wood or glass. On door frames, the stiles and rails are grooved to accept a raised panel. (See drawing.) Window sash have grids of "sash bars" built into their outer frames to separate the panes of glass. Instead of grooves, they have rabbets to receive the glass. I call the horizontal sash bars muntins and the vertical ones mullions, although there is much disagreement over terminology.

Cope-and-Stick Joinery

Door frames and window sash are often constructed with so-called "cope-and-stick" joinery. (See drawing.) In cope-and-stick joinery, a decorative molded edge called a "stick-ing"—usually a simple profile, such as an ovolo, ogee or thumbnail—runs around the inside edges of both the stiles and rails, giving the finished assembly a lighter appearance. The ends of the rails and muntins are "coped" on the shaper to form a complementary fit to the sticking profile.

Cutter manufacturers sell cope-and-stick cutter sets that stack on the shaper spindle so you can cut any combination of profiles and grooves or

rabbets. The drawback to these sets is that they produce *stub tenons* which are only as long as the depth of the rabbet or groove in the stiles (usually about 1/4 in.). These stub tenons aren't strong enough to support the weight of the glass or raised panel and will eventually loosen.

If you want to make your rails with longer tenons, the trick is to first cut the tenons on the shaper or tablesaw and then make the coping cuts with a cutter mounted on a stub spindle. (See photo, below.) The stub spindle has a recessed cap screw to secure the cutter, allowing the tenon to pass unobstructed over the top of the spindle.

Sash are more difficult to make than panel frames because they require extreme accuracy if all the parts are to fit perfectly.

Here's the sequence I use for making sash, along with some pointers for each step:

STEP 1: Make a working drawing for the sash you want to make. It should have dimensions for all the parts and for the glass openings. Be sure to plan the sash so all the glass openings will be of equal size. This will yield a uniform appearance and make glass ordering easier.

STEP 2: Dimension enough lumber for stiles, rails and sash bars. Make the sash bar stock wide enough to rip into two or three sash bars—it's simpler,



A cradle fence allows you to shape the face of a circular section. Stub spindle copes end of rail while allowing tenon to pass unobstructed.



This simple plywood jig holds muntins safely for sticking and rabbeting.



safer, and more accurate to make several muntins or mullions together. Also, prepare enough stock for a few extra bars; they'll be invaluable for setting up the shaper.

STEP 3: Lay out the parts as accurately as possible with a sharp #4 (hard) pencil or a knife, marking each piece where it intersects the others. To do this, I lay out one stile and one rail, then use these as story poles to lay out the rest of the stock, including the sash bars. (For more on story poles, see the sidebar on p. 49.)

STEP 4: "Stick" the stiles with the shaper.

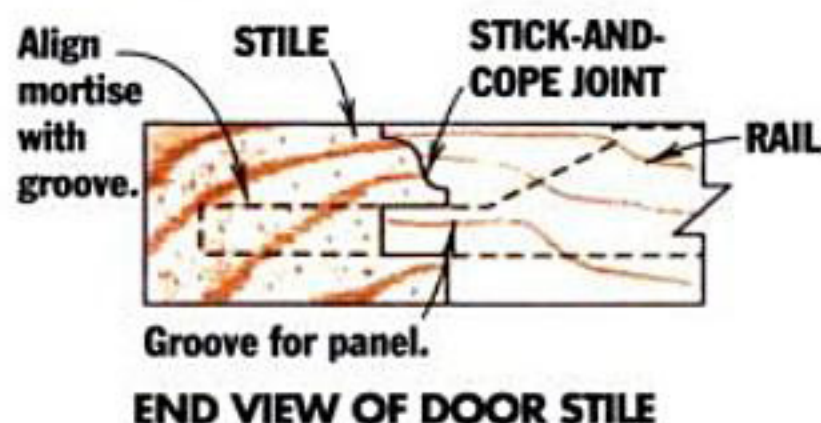
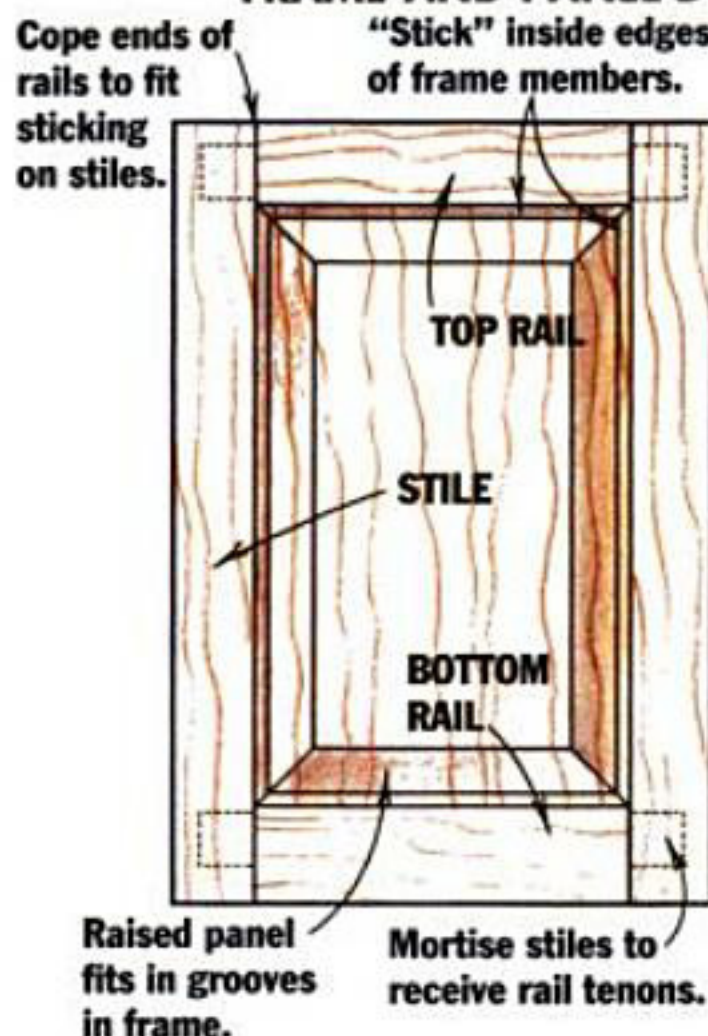
STEP 5: Cut the mortises in all parts. The front cheek of the mortises should just touch the edge of the rabbets of the stickered parts. Mortise all the way through the wide stock that will be ripped apart for muntins.

STEP 6: Cut the tenons on the rails, muntins and mullions. Make the tenons a friction fit in the mortises and keep the lengths between shoulders consistent.

STEP 7: Cope the ends of the rails, muntins and mullions with the shaper and stub spindle, using the miter gauge for stability. I use a 1/4-in.-thick piece of plywood as a reference fence

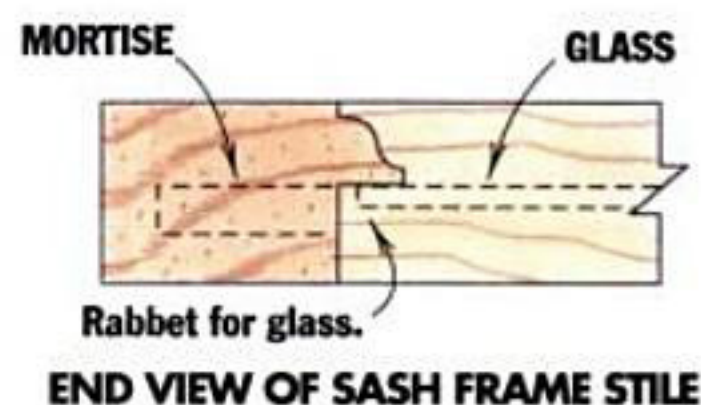
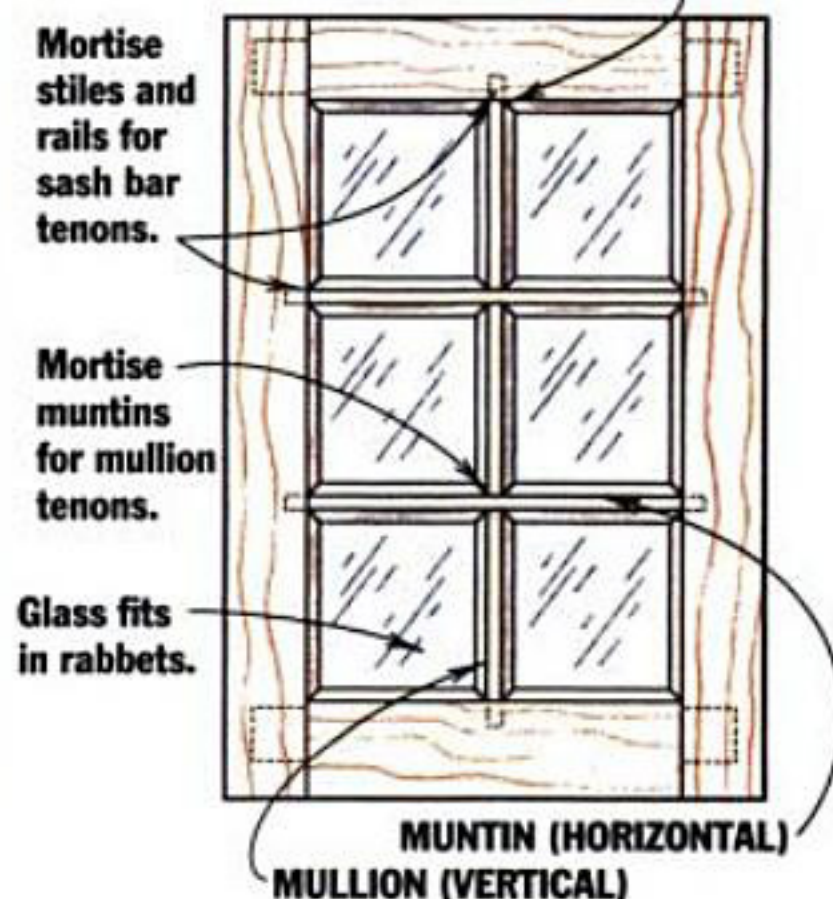
COPE-AND-STICK JOINERY

FRAME-AND-PANEL DOOR



SASH FRAME

Cope ends of frame parts & sash bars.



for the tenon shoulder. (See photo, opposite.) Test-fit the joint to be sure the cope is a perfect match to the sticking profile.

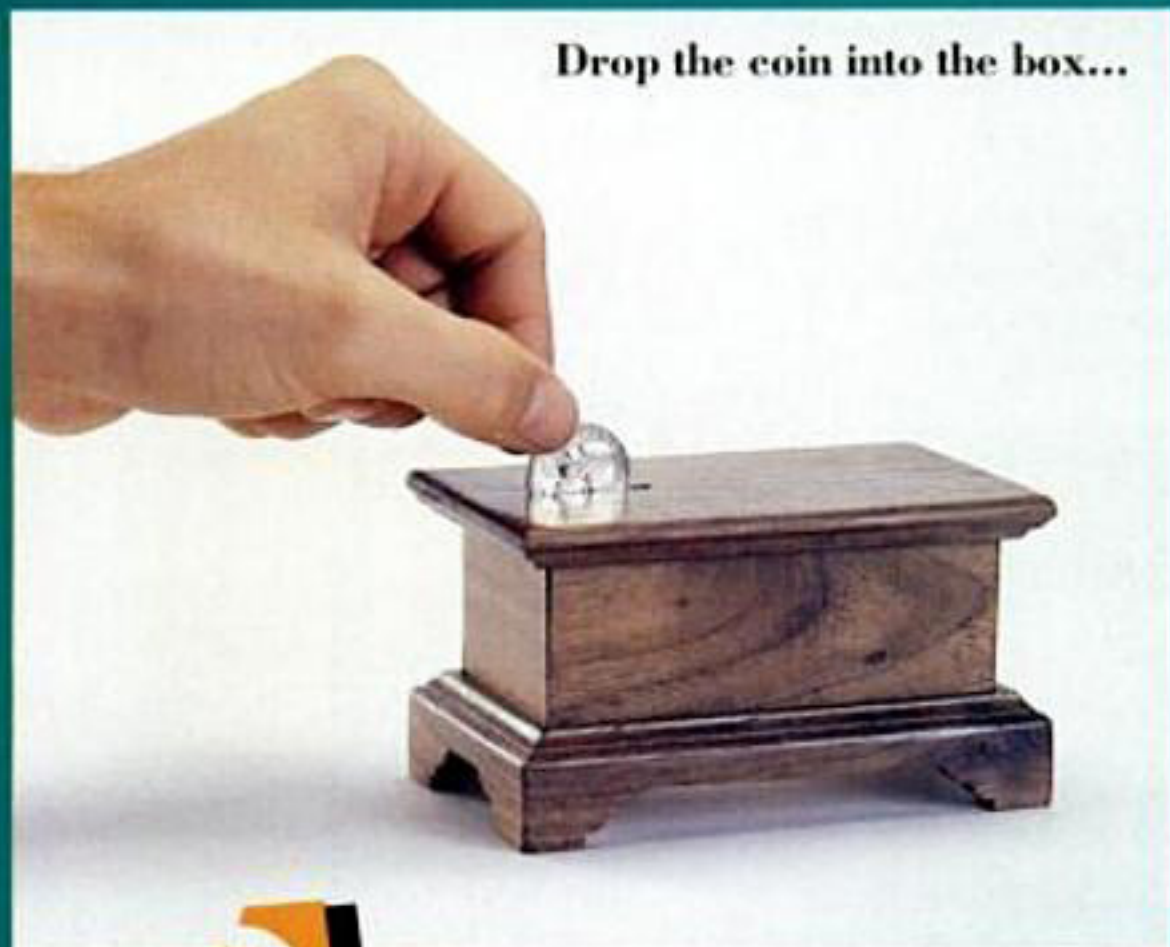
STEP 8: Rip the sash bars to finished width on a tablesaw using a push stick.

STEP 9: "Stick" the rest of the stock. Use the stiles to set up the shaper and cut from underneath. Use a holding jig (see photo, opposite) to safely and accurately stick the muntins and mullions.

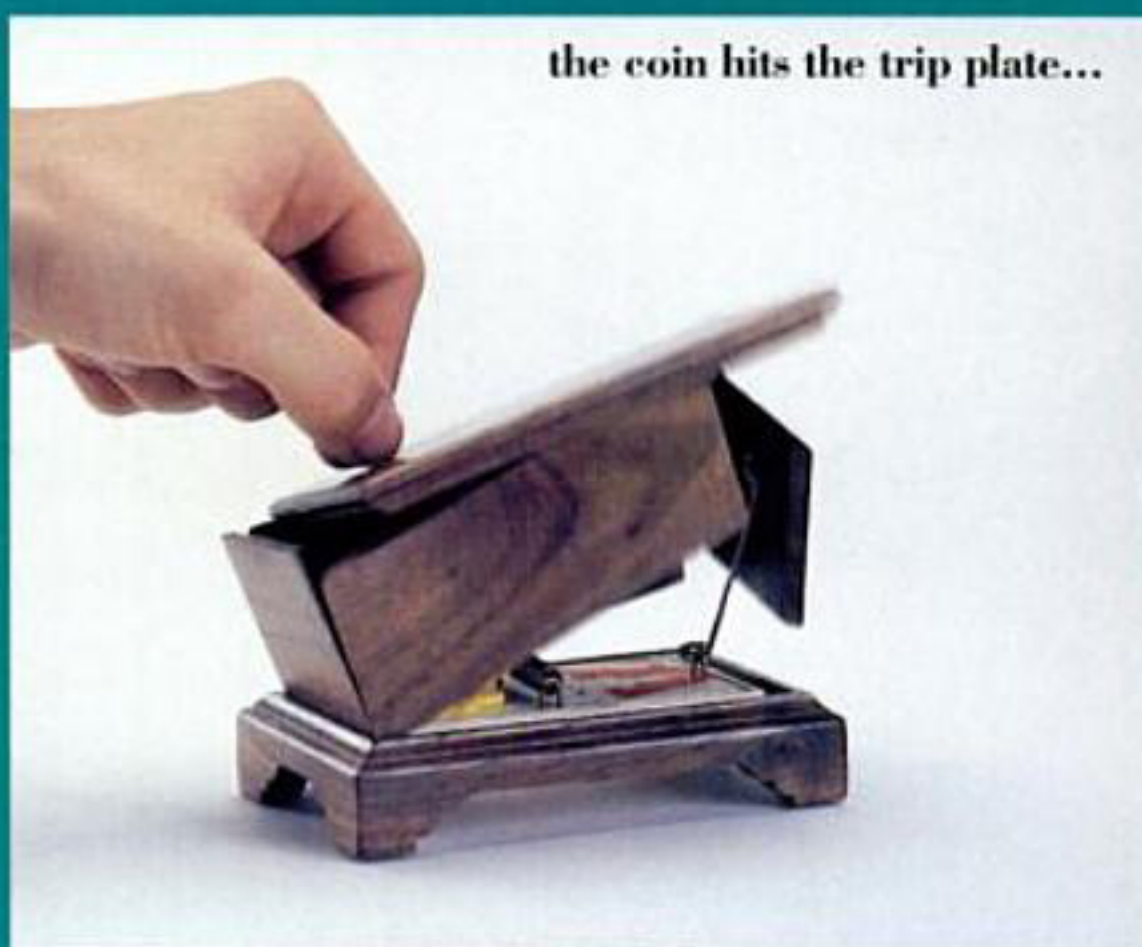
STEP 10: Rabbet all the parts for glass. Use the shaper and a straight cutter, again cutting from underneath. Rabbet one edge of each sash bar with the jig, then tack a strip of wood in the notch in the jig. This will "fill" the rabbet and prevent the stock from twisting when you rabbet the second edge. (See photos, above.)

STEP 11: Assemble the parts dry to check the fit, then carefully glue them up on a flat surface to prevent the frame from twisting.—L.B.

Drop the coin into the box...



the coin hits the trip plate...



EXPLODING

and the box explodes!



*A Gift for the
Prankster on
Your List*



These boxes look like miniature furniture, but they actually conceal a powerful surprise.



BY ANDY RAE

A few years ago I hosted a guild meeting in my shop and invited my friend Palmer Sharpless to attend. Our guild was suffering some growing pains, and I hoped that Palmer, a well-known turner and teacher, might lend some of his organizational expertise.

Palmer didn't say much when the meeting began. He just

BOXES

placed a small wooden coin box on my bench and began to solicit donations. Someone finally coughed up a quarter (woodworkers are notoriously tight), dropped it into the box, and POW! The box exploded into pieces.

It was just what our group needed—a little humor.

This year, when AW was looking for an unusual Christmas gift, Palmer's surprise box came to mind. We made several boxes in our design shop, and once again they were a big hit.

There's no big secret to the "surprise" in the box. The explosive power comes from a wooden mousetrap that sits inside the box, surrounded by four loosely fitting sides. (See drawing.) When you drop a coin through the slot in the top, it triggers the trap. The trap's bail swings, hitting small catchblocks attached to the box's sides. That's when the fun erupts.

You can build one of the boxes shown here, or better yet, create your own version of boxed "dynamite." We found that thin stock— $\frac{1}{8}$ in. or so—for the top and sides yields the maximum exploding action. Also, if you keep the box somewhat squat, the bail will punch the top upward as it swings.

Here are a few more construction tips:

The mitered sides should fit tightly inside the lip on the edging, so the box will look solid to the casual observer.

To keep the sides from binding when the trap is sprung, limit the lip on the bottom edging to $\frac{1}{4}$ in. Then leave a $\frac{1}{16}$ -in. clearance between the sides and the mousetrap. (See drawing.)

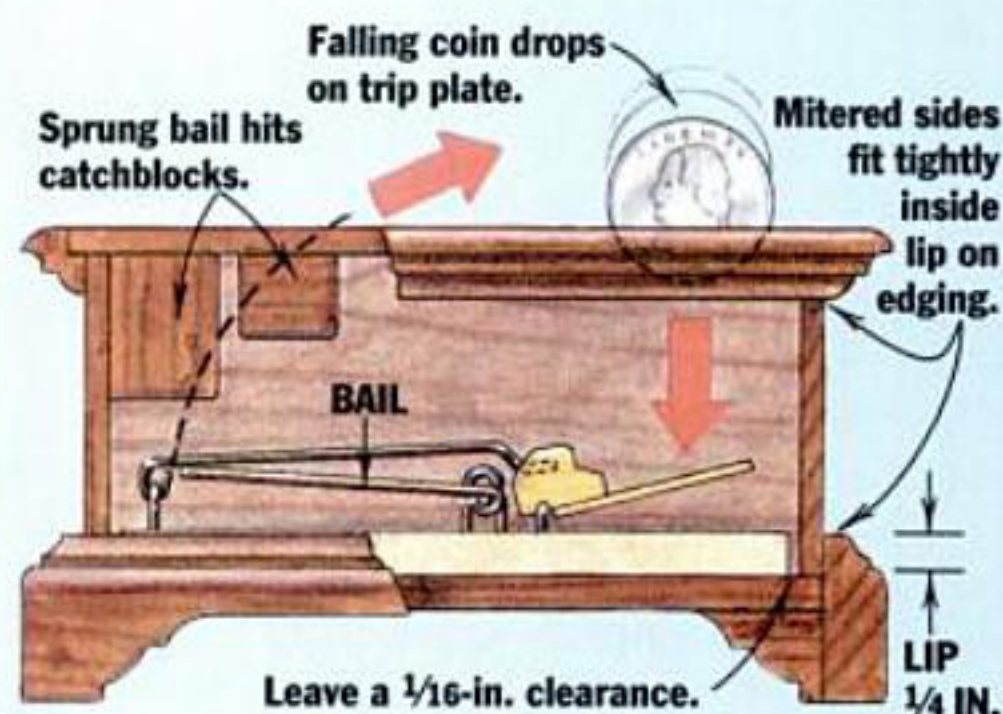
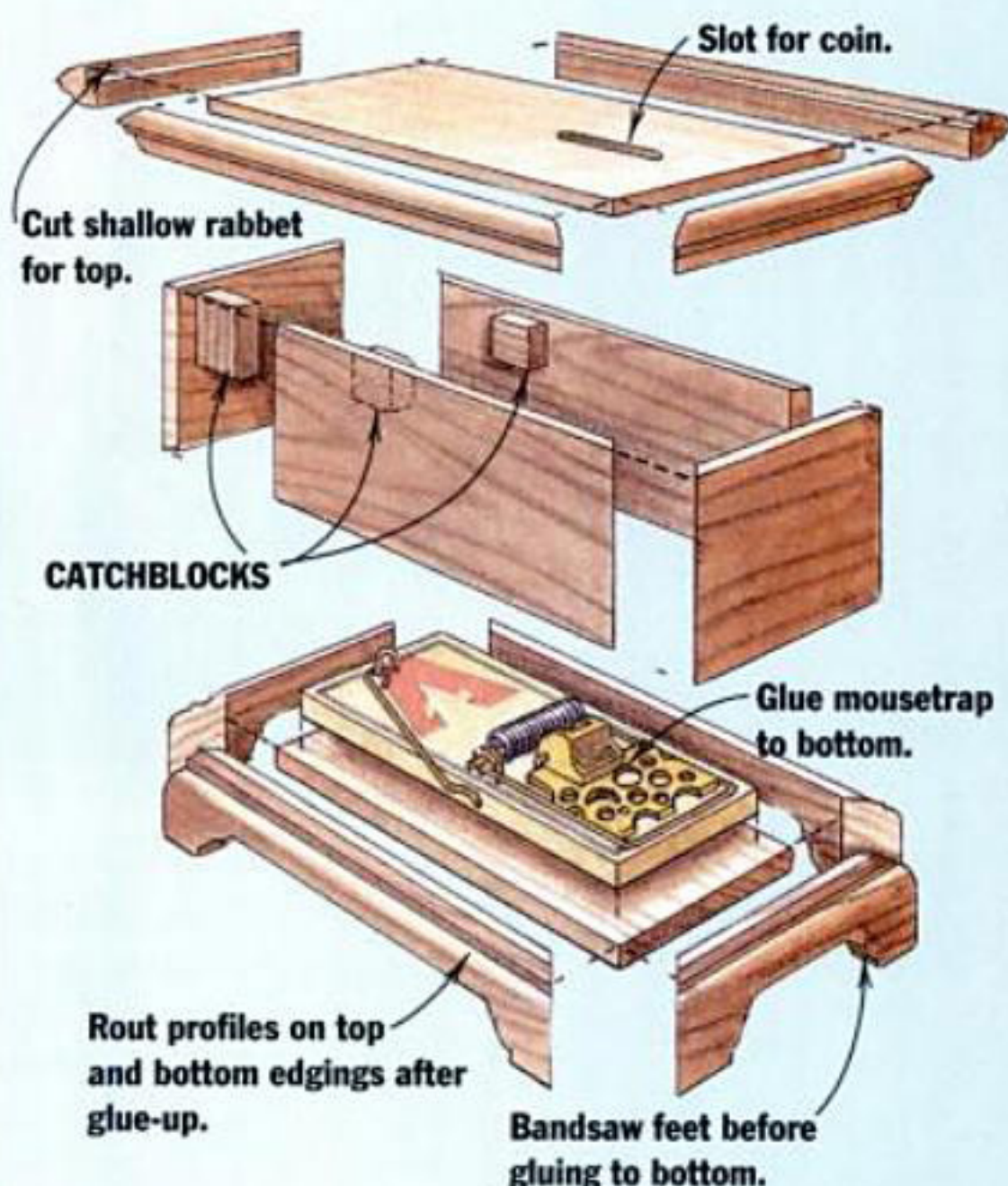
It's easiest to bandsaw the foot profile on the bottom edging before glue-up. Then glue on the top and bottom edgings and rout the decorative moldings.

To assemble the box for action, set the trap, slip the four sides into the grooves, and place the top over the sides with the coin slot above the trip plate. Then look for your first victim.

ANDY RAE

is an assistant editor of AW.

EXPLODING BOX





SPOKESHAVES

A spokeshave is the ideal tool for shaping the flowing curves of cabriole legs. Here a leg is held in a colonial-era leg clamp.

These 300-year-old Tools Are Still Unrivaled For Curved Work

BY ELLIS VALENTINE

Say “hand tools” and most woodworkers immediately think of hammers, chisels, planes, and saws. But there’s another venerable, though often overlooked, hand tool with a rich history and plenty of uses in the modern shop: the spokeshave.

Descended from the early drawknife, this simple two-handled tool has been around since the 16th century, when it was used by wheelwrights, coopers and bodgers. Nowadays, spokeshaves are still unrivalled for many kinds of curved work, such as shaping chair seats, cabriole legs, and curved templates.

Alan Miller, a prominent furniture

restorer in Pennsylvania, describes the spokeshave as a “holy marriage between a drawknife and a plane.” Like a drawknife, it has two handles that you use to either pull *or* push the blade through the work, and like a plane, its sole limits the depth of cut. But while planes even the wood’s surface by spanning the high and low areas, a spokeshave tends to follow contours because its sole is so short. This tendency makes it ideally suited for curved work.

Spokeshaves are more difficult to control than planes. They involve “more feel and nuance than many other hand tools—very much like playing a musical instrument,” according to Miller. Yet they are also more responsive to your whims and intentions. Properly tuned and sharpened, a spokeshave can produce a glistening surface.

Types of Shaves

The earliest spokeshaves had wooden bodies, but in the mid-

1800s wooden shaves were supplanted by metal-bodied tools, which didn’t wear as quickly. Today both types are still used, though metal is the most popular.

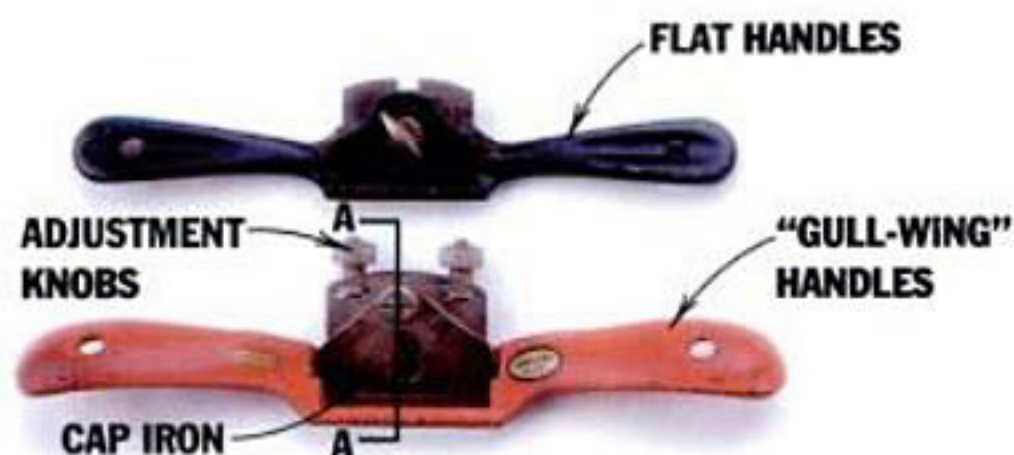
Metal spokeshaves are usually made of cast iron and have a short planelike blade held bevel-down at a 45° angle to the sole. On the simplest shaves, you adjust the depth of cut by loosening the blade-locking screw and sliding the blade up or down. More sophisticated models control depth by means of two knurled nuts that engage slots in the blade. (See drawing.)

On wooden spokeshaves, the blade’s bevel faces upward and the bottom of the blade is in nearly the same plane as the front sole. At each end of the blade are bent tangs that fit into tapered holes in the body of the shave. (See drawing.) To make depth adjustments, you tap either the bottom of the blade or the tops of the tangs with a mallet. (Some contemporary wooden shaves have threaded

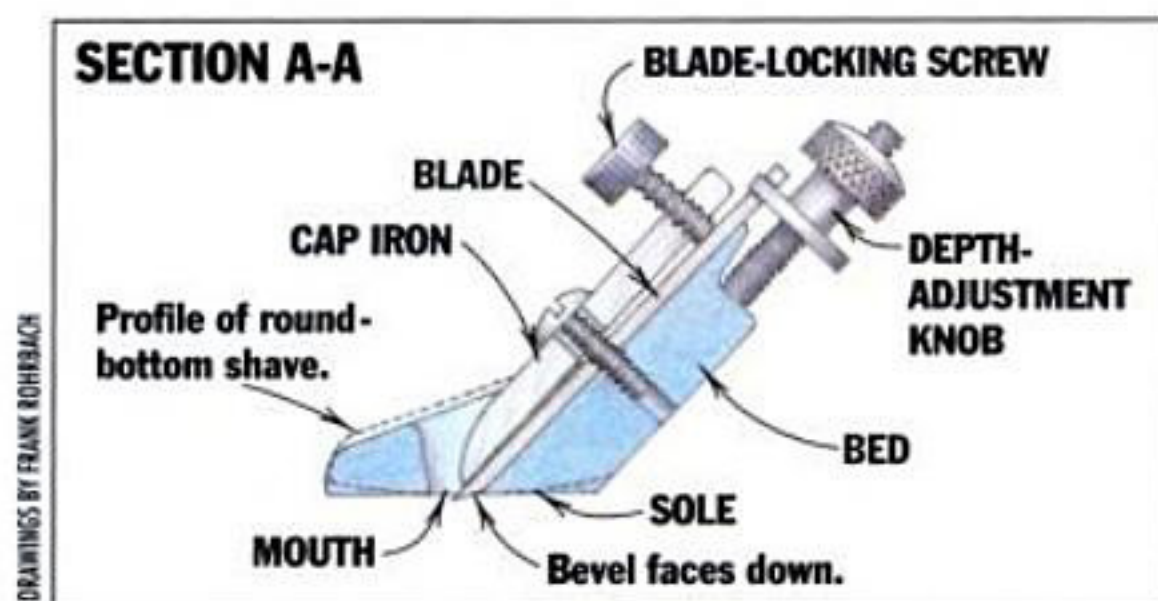
PHOTOS BY ELLIS VALENTINE

COMMON SPOKESHAVES

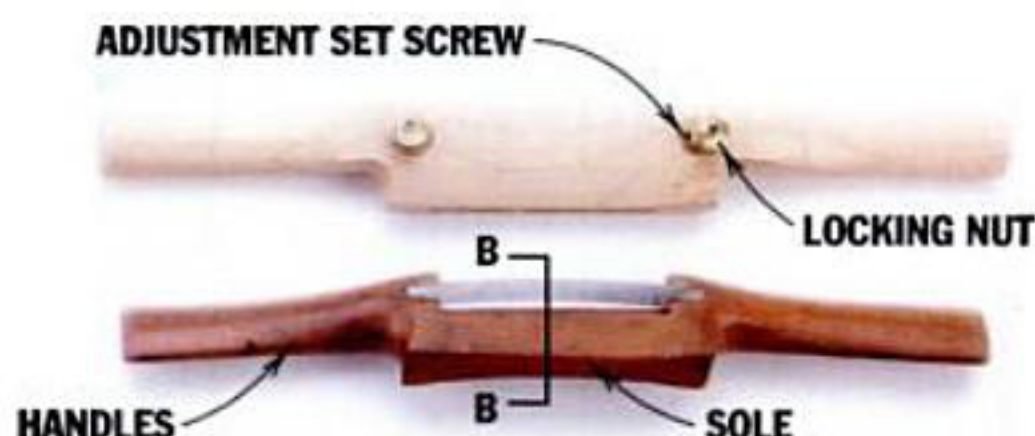
FLAT-HANDLED SPOKESHAVE



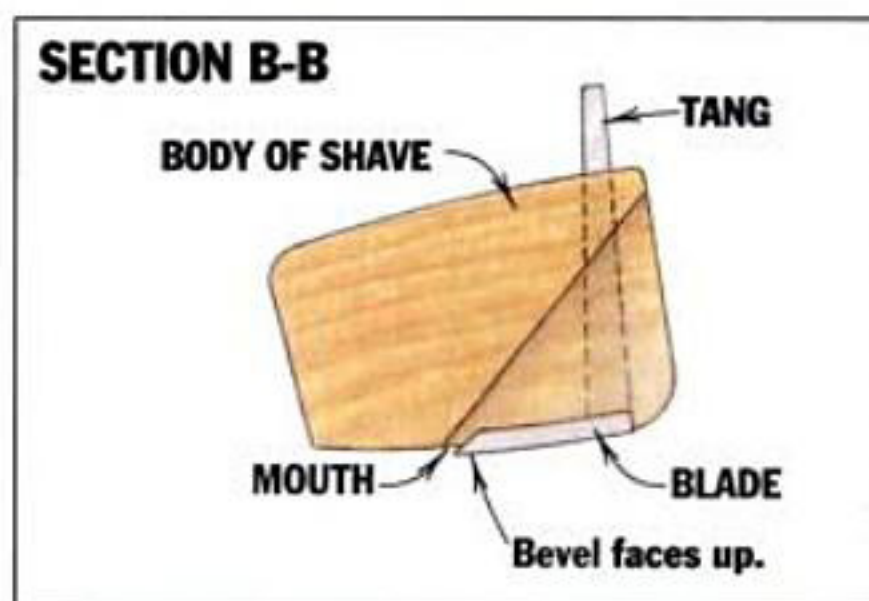
ADJUSTABLE SPOKESHAVE



CONOVER WOODEN SPOKESHAVE



OLD WOODEN SPOKESHAVE (BOTTOM VIEW)



NITCH MANDEL

tangs with cap knobs to lock in the depth setting.) A variation on the traditional wooden shave is the Japanese spokeshave, which uses a narrow, planelike blade set in tapered grooves as in Japanese planes (see AW #34).

Metal and wooden shaves are designed for essentially the same work, but there are some differences between them. One is sole clearance. While the entire sole of a metal shave touches the work, the wooden shave contacts the workpiece at only two points, the front of the sole and the cutting edge. This arrangement makes the shave more susceptible to chatter, but it also offers more clearance for skewed cuts and working tight radii.

Another difference between metal and wooden shaves is blade angle. The blade on a metal shave is angled much higher than the blade on a wooden one. (See drawing.) The wooden shave's lower blade angle makes it better suited to end-grain work but slightly more prone to tearing out on faces and edges.

Although wooden shaves may be adjusted for fairly precise cuts, they function best for removing stock quickly. Alan Miller also likes a really sharp wooden spokeshave for working

on changing grain. "You can cut diagonally with it and skate across the grain," he says. "With a metal shave, the sole sometimes gets in the way."

Many special-purpose spokeshaves have been devised over the years (see sidebar, p. 63), and they remain the best way to accomplish specialized tasks, like chamfering curved edges and smoothing the seats of Windsor chairs.

One type of shave which deserves special mention is the *adjustable-throat* spokeshave, currently made only by the German firm, Kunz. Almost an exact copy of the original (American) Bailey model of 1858, the Kunz shave lets you adjust its depth of cut with the flick of a single knob on the front of the tool. This adjust-

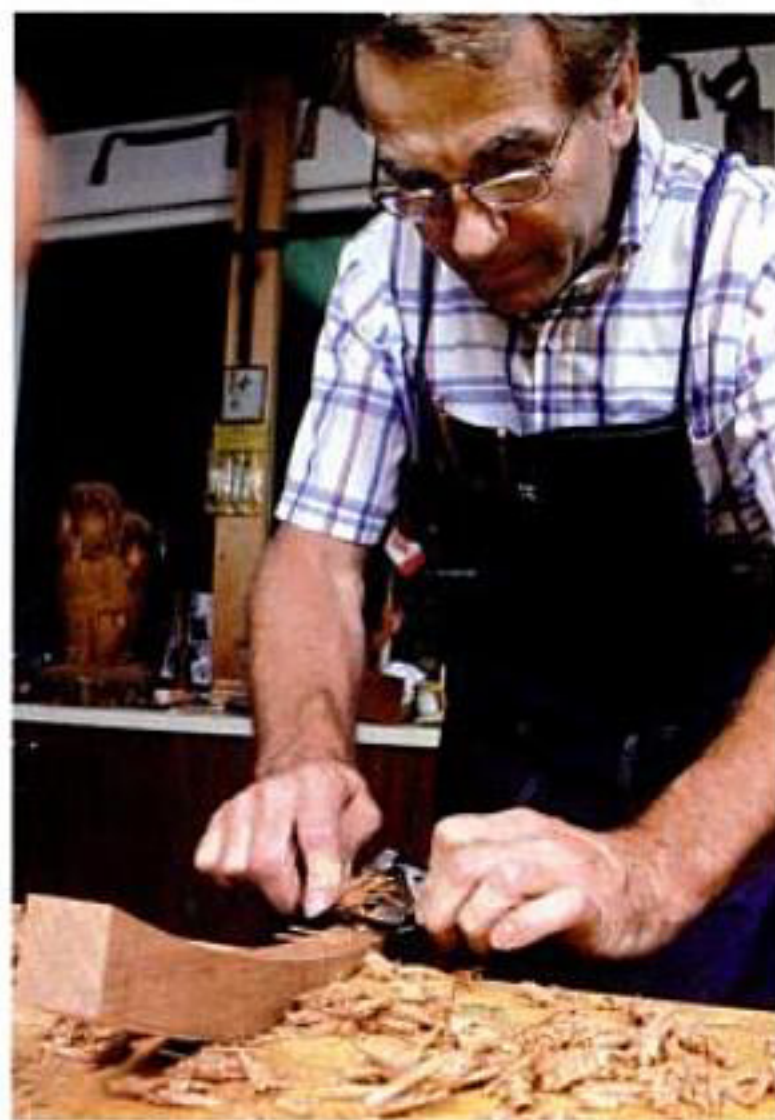
ment also changes the configuration of the sole to a slightly concave shape, making it easier to get into tighter inside curves.

Buying a Spokeshave

Whether you purchase a spokeshave new or at a flea market, you don't need a complicated or beautifully



Frank Klausz uses his thumbs and forefingers to direct pressure to the front sole of the spokeshave on both push stroke (right) and pull stroke (left).



crafted tool to do excellent work, as long as the blade, the sole, and the throat are in good condition. Adjustable depth-setting knobs are worth looking for if you plan to do a lot of work with the tool. And regardless of the size of shave you're buying, heavier is better. A heftier shave will cut with less chatter.

When buying an iron shave, try to find one labeled "malleable." This means the metal is less brittle than regular cast iron and it won't be as likely to break if dropped.

Also, the type of work you intend to do will influence whether you buy a curved- or flat-soled spokeshave. With its narrower base, a curved-soled shave is better for shaping tight concave curves, while flat-soled shaves work better on convex curves because the wider sole makes greater contact.

Tuning a Spokeshave

You'll need to tune your spokeshave for smoothest cutting. On a metal shave, start with the mouth opening, which should be smooth, uniform in width and parallel to the blade. If it isn't, use a fine mill file to adjust it. It's also a good idea to file the bed smooth. (See drawing.) And if there is a cap iron, be sure its edge makes continuous contact with the blade.

Next, check the sole. Whether it's curved or flat, the sole on a metal spokeshave should be smooth, with softened edges to prevent scratching the work. Adjust it with files and progressively finer grits of wet-or-dry sandpaper (to 320 grit or higher), removing as little material as possible to avoid widening the mouth opening. (For more on tuning metal shaves, see *AW* #4, September/October 1988.)

Wooden spokeshaves need less tuning than metal ones. For example, it isn't as critical that the sole be perfectly smooth, since only the front of the sole and the edge of the blade will touch the workpiece. However, it is important that the tangs fit tightly in their holes to resist working loose in use. If the tang holes are too wide, shim them with slips of veneer.

Sharpening

You sharpen a spokeshave much as you would a plane blade or chisel. First,

SOURCES

Spokeshaves are available from the following sources:

Cast-brass spokeshaves: AMT, Fourth Avenue and Spring Street, Box 70, Royersford, PA 19468, (215) 948-0400. *CIRCLE #616*

Conover adjustable wooden spokeshave kit: American Woodcraft Tools Inc., 4425 Emery Industrial Parkway, Cleveland, OH 44128-5754, (216) 831-4404. *CIRCLE #617*

Japanese wooden spokeshaves: The Japan Woodworker, 1731 Clement Ave., Alameda, CA 94501, (800) 537-7820. *CIRCLE #618*

Metal spokeshaves: Garrett Wade Co. Inc., 161 Ave. of the Americas, New York, NY 10013, (800) 221-2942. *CIRCLE #619*

Woodcraft Supply Co., 210 Wood County Industrial Park, Box 1686, Parkersburg, WV 26102-1686, (800) 225-1153. *CIRCLE #620*

remove any grinding marks from the blade's back and bevel by lapping them on a bench stone or wet-dry sandpaper, then sharpen on a bench stone. When sharpening the bevel on a metal shave, you may find it easier to hold the blade in a kerfed block for a better grip. Give the corners of the blade a few extra swipes to round them slightly so they won't dig into your work. Also, when sharpening the blade of a wooden shave, you must take care to grind the edge of the blade parallel to the edge of the shave's mouth.

The correct bevel angle for both metal and wooden shaves is between 23° and 25°. To check this, simply measure the length of the bevel. It should be just slightly more than twice the thickness of the blade.

Using a Spokeshave

Spokeshaves are easy to use on either the pull or push stroke because they're light and they contact only a small area of the workpiece. However, they can be susceptible to chatter, depending on the grain of the wood

you're shaving, blade sharpness and depth of cut, the mouth opening, and the shape of the sole relative to the radius of the curve you're cutting. Here are some tips that should make spokeshaving much easier for you:

- Set the blade for thin shavings. Frank Klausz, the well-known cabinetmaker, does this by eye, sighting across the front sole and adjusting the blade until it just "peeks" out of the mouth.

- Get a firm grip on the shave. Whether pushing or pulling, pinch the spokeshave on or alongside the blade while grasping the handles firmly between fingers and palms. (See photos, previous page.) On shaves with flat handles (as opposed to arched "gull-wing" types), Klausz uses the downward force of his thumbs for control, while his palms push or pull the handles. "The better you direct the [thumb] pressure, the better your control," he says.

- Work "downhill" on the grain. Your spokeshave will tell you where the grain changes. If you shave against the grain, in an "uphill" direction, you can expect some nasty chatter and tearout.

- Keep steady pressure on the front sole. Use your wrists to keep the front sole on the work. Don't rotate your wrists when you encounter high or low spots; you'll just follow those irregularities.

- Skew your cuts. By turning the shave about 15° to 30° from the direction of the cut, you'll even out surface irregularities more quickly. This technique works especially well on difficult grain. When cutting curved end grain, as on the tight curves behind the knees of cabriole legs, hold the shave perpendicular to the workpiece and use side-ward slicing cuts.

Spokeshaves can add a sculptural dimension to your woodworking and put you in closer touch with your own abilities. With some practice, you'll be "shaving" with the best of them. ▲



ELLIS VALENTINE

is associate editor of American Woodworker.

Wooden shave, ca. 1880

Wooden shave,
ca. 1875

Chamfer shave,
Stanley #65, 1884

Double-bladed shave,
Stanley #62, 1877

Rabbit shave,
Stanley #68, 1911

Open-handed shave, ca. 1920

Round-bottom shave,
Stanley #63X, 1911

Round-bottom shave,
Stanley #67, 1897

Cooper's shave,
Cincinnati Tool, ca. 1890

Flat-bottom metal shave,
date unknown.

Wooden shave, 1991
(AW #21)

Miniature cast-brass shave,
ca. 1960

Miniature cast-brass shave,
ca. 1920

Convex wooden carving shave,
ca. 1875

Japanese shave, 1993

Adjustable compass shave,
E.C. Stearns #13, 1900

Combination shave,
A.C. Batchelder, 1857

Double-edged shave, 1880

Concave shave, Stanley #55, 1870

Adjustable-throat shave, ca. 1850

Adjustable-throat shave,
Kunz, 1993

Adjustable-throat wooden shave, Stanley #84, 1905

Adjustable-throat metal shave,
Stanley #73, 1905

SPOKESHAVES THROUGH THE YEARS

Before the advent of portable power tools, spokeshaves were much more common—and more specialized—than they are today. Early shaves were handmade of wood, but cast iron versions proliferated after 1850. These metal shaves offered better wear resistance and longer blade life than their wooden counterparts.

Here's a glimpse at some unusual spokeshaves, past and present. Many other varieties, shapes and sizes surface regularly at auctions and flea markets. Apart from cosmetic changes and minor mechanical innovations, the basic form and function of the spokeshave remains intact, testimony to the enduring utility of these simple tools.—E.W.
Thanks to tool collector Bill Phillips for lending us many of the spokeshaves pictured here.



Your toddler will have hours of fun on this small-scale indoor sliding board.

MITCH MANDEL

PINT-SIZED SLIDE

*A Super Slide
for Your
Preschooler's
Playroom*

BY PHIL GEHRET

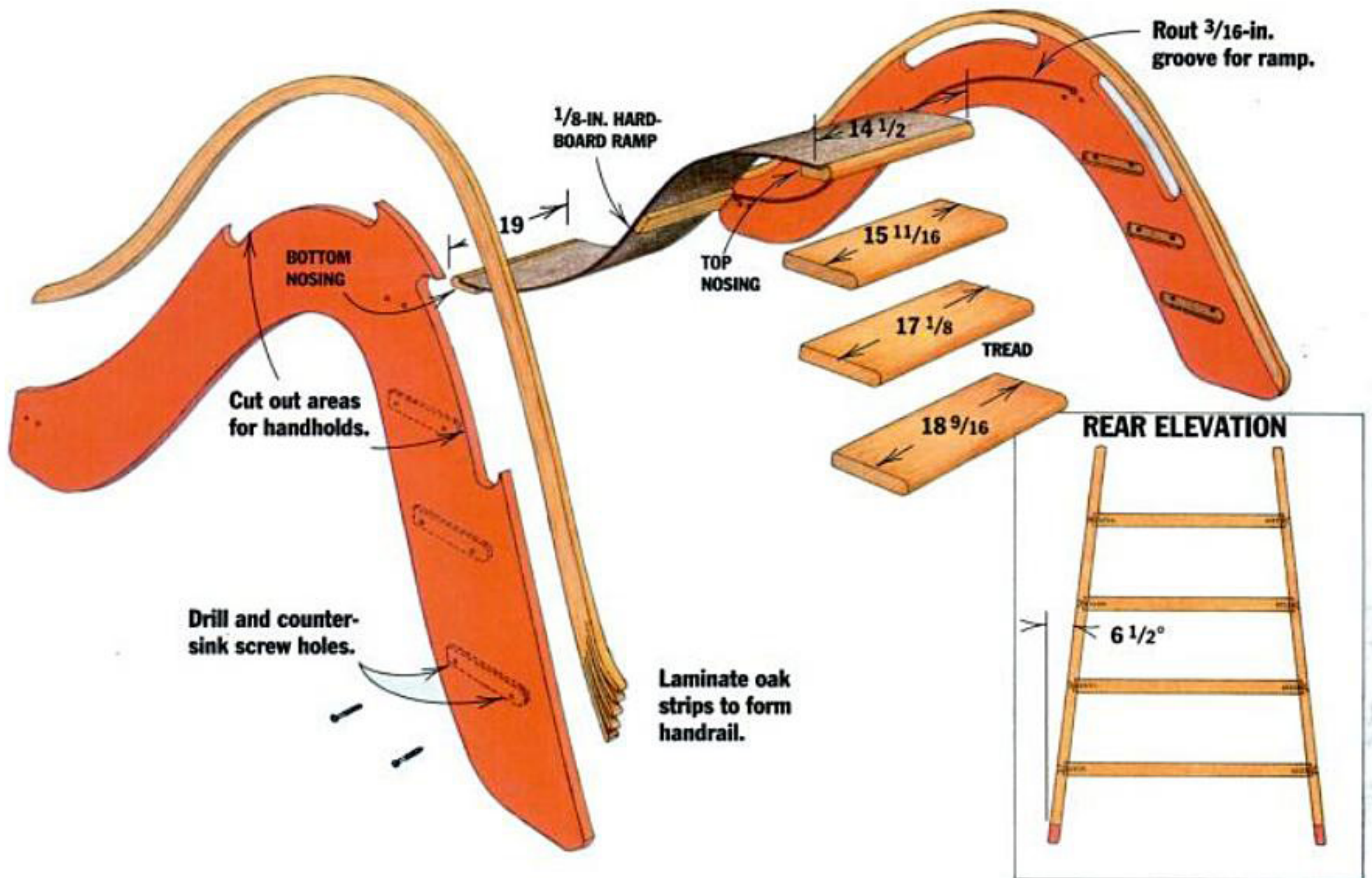
One day while leafing through some old toy catalogs, I came upon a toddler's slide that inspired me to design the one you see here. The slide in the catalog was for outdoor use, but I figured an indoor version might be just the thing for the day-care center my daughter operates. I knew my guess was right when I took the finished slide to the center. The kids' eyes lit up and they grinned

from ear to ear as they tried it out.

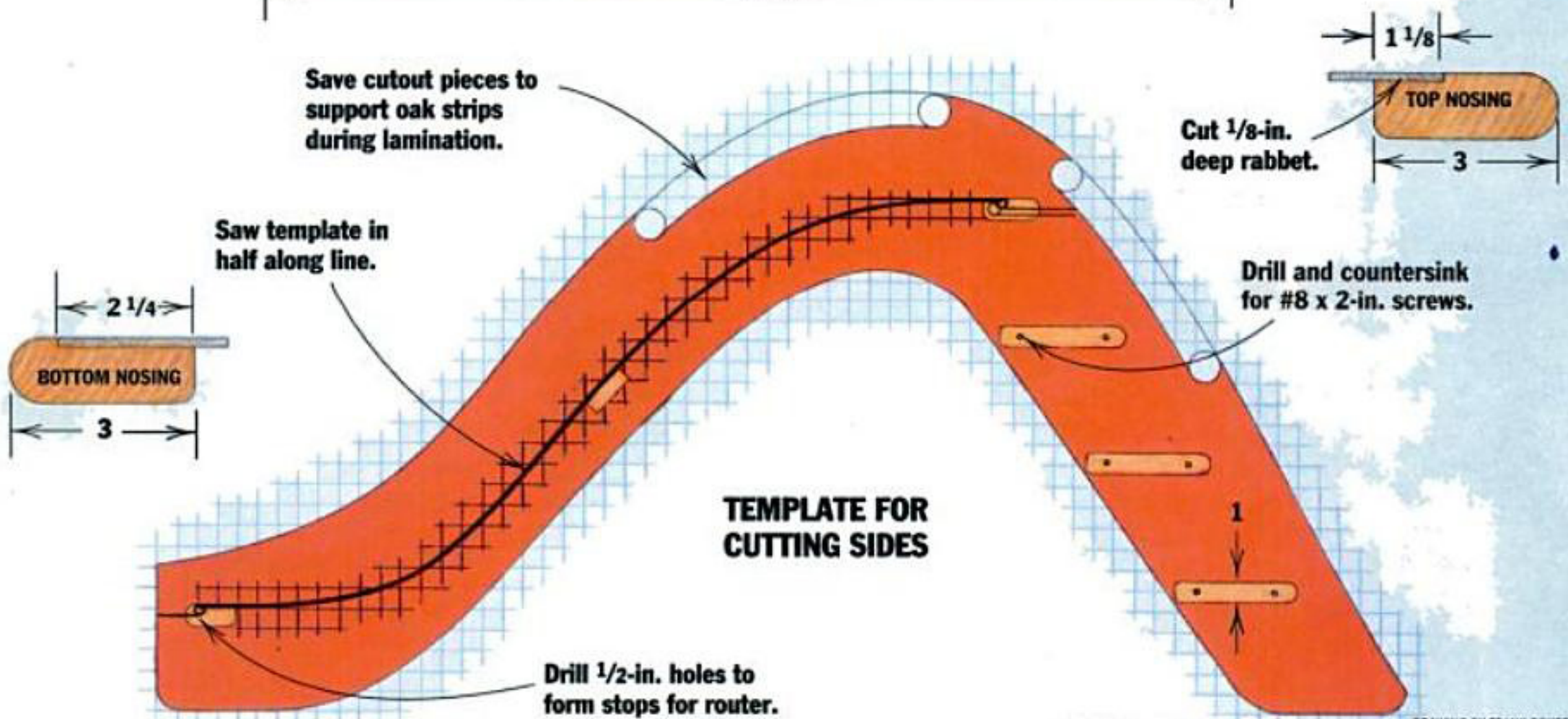
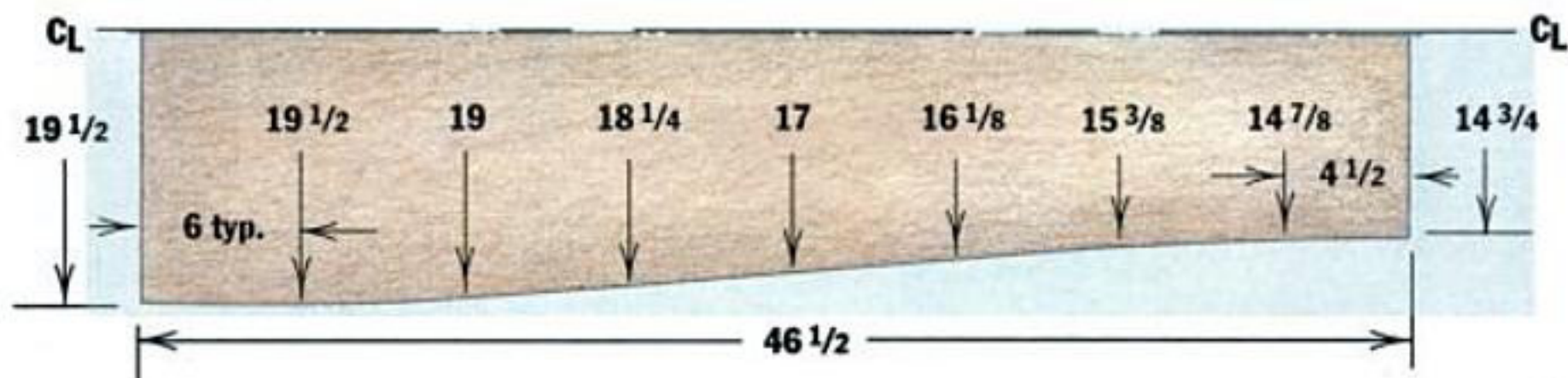
This sliding board is only 30 in. high, and it is meant for youngsters just beginning to walk and climb—about 18 months of age—up to about 4 years old (older kids might be too heavy). It's intended for indoor use, though you could take it outside when weather permits.

The slide consists of two $\frac{3}{4}$ -in. birch plywood side pieces, a $\frac{1}{8}$ -in. piece of

CHILD'S SLIDE



HARDBOARD-RAMP PATTERN



ONE SQ. = 1 IN.

DRAWING BY FRANK ROHRBACH



To rout the ramp groove, run the router template guide bushing along the edge of the template. The hole at the end of the template's curve provides a stop for the router.

tempered hardboard that forms the ramp, three oak treads and two oak nosing pieces to hold the ends of the ramp. (See drawing.) The long edges of the hardboard ramp fit in grooves routed into each side piece, and laminated oak strips form a decorative handrail. (See sidebar.)

The sides are splayed $6\frac{1}{2}^\circ$ from vertical, so you'll have to cut a matching bevel on the 1-in.-thick treads and nosings and a gentle curve on the edges of

the ramp. (See drawing.) Construction is straightforward, though final assembly will require a helper.

Making the Template

I designed a two-piece template to define the shape of the side pieces and locate the grooves that hold the curved ramp. Begin by laying out the overall shape and cutouts for the handholds on $\frac{1}{4}$ -in. hardboard, using the grid lines in the drawing.

Next, lay out the curved line for the groove in the template. Each end of the curved line terminates as a tangent to a $\frac{1}{2}$ -in.-dia. hole, as shown on the grid. The holes will act as stops when you rout each groove. When the layout is finished, cut the template to size with a saber saw, then saw along the curved line, cutting the template in half.

Making the Sides

To form the side pieces, rejoin the two halves of the template temporarily and fasten them to a piece of $\frac{3}{4}$ -in. birch plywood with double-sided tape. Rough out one side piece with a saber saw, keeping about $\frac{1}{16}$ in. from the template edge. The rounded ends of the handhold area are a tight curve for the saber saw, so I made these with a $1\frac{1}{2}$ -in.-dia. Forstner bit and then sawed out the rest of the opening. Save the waste from the handholds; you'll use it later when laminating the rails.

Next, rout the side to finished size, using a $\frac{1}{2}$ -in.-dia. pattern bit with a shank-mounted pilot bearing (available from MLCS Ltd., Box 4053, Rydal, PA 19046, 800-533-9298). Now you're ready to cut the groove. Remove the bottom half of the hardboard to expose the groove template. Mount a $\frac{3}{16}$ -in. straight bit in your router and a $\frac{1}{2}$ -in.-dia. template guide bushing on the router baseplate. Rout a $\frac{3}{16}$ -in.-deep groove, following the template edge, as shown in the photo. Now rout $\frac{1}{4}$ -in.-deep dados for the steps, using a straight bit. You can clamp a straight-edge to the side and use that as a fence to guide the router.

Make the second side piece like the first one, except rout a dado and groove on the opposite side, making the left-hand and right-hand side pieces mirror images.

Complete the side pieces by gluing on the laminated oak handrail described in detail in the sidebar. Finally, radius the edges of each side piece with a router and a $\frac{1}{4}$ -in. round-over bit.

Treads, Nosings and Ramp

Because the sides are slanted, you'll need to cut the treads and nosings to varying lengths. Follow the dimensions in the drawing, then bevel the



To assemble the slide, bend the hardboard ramp into the grooves in the side pieces as your helper starts the screws into the nosings and treads.

ends of each part.

On the tablesaw, cut a $\frac{1}{8}$ -in.-deep rabbet on the top of the two nosing pieces. (See drawing.) When you glue the ramp in this rabbet, the hardboard will be flush with the top of the nosings. Test the fit to make sure there aren't any protruding edges to scrape tender bottoms.

The hardboard ramp is the easiest

part to make. Simply lay out the gentle curves on $\frac{1}{8}$ -in. tempered hardboard, following the dimensions in the drawing, then cut them with a saber saw.

Assembly

Before final assembly, I finished the treads, nosings, laminated rails and hardboard ramp with polyurethane. I also primed the side pieces and put a

finish coat of paint on their insides.

Assembly is simply a matter of bending the hardboard ramp to fit the grooves and driving #8 by 2-in. all-purpose screws through the sides and into the treads and nosings. Well, at least it sounds simple. This is one of those operations that requires at least two pairs of hands, so get help.

First, predrill and countersink the screw holes. Next, lay one side piece on a workbench and fit the ramp into the groove while your helper does the same with the other side piece. To help hold the sides approximately in line while fitting the ramp, you can install the screws loosely in the bottom nosing, then install the other nosing and treads. With that done, glue and clamp the ramp in the rabbets in the top and bottom nosings, fill the screw holes with putty, and finish painting. ▲



PHIL GEHRET
is a cabinetmaker in the AW Design Shop.

MAKING CURVED LAMINATIONS

When you need to make a curved wooden piece, like the handrail in the accompanying article, lamination is a quick and easy way. Form the curved part by cutting strips of wood thin enough to be bent to the desired shape. Apply glue, and stack and bend the strips around your form.

You can use this technique for many applications, including curved moldings, bent chair legs and backs, and stair rails.

To make the handrails for the child's slide, I cut five $\frac{3}{16}$ -in. by 1-in. by 96-in. oak strips (figuring in a little extra length). With help from a friend, I brushed glue on both sides of all but the top strip (apply glue only on the underside of this piece) and stacked the pieces together.

Before the glue set, I quickly bent and clamped the laminated strips around the outside edge of each side piece, which acted as a form. (See photo.) To support the strips over the handholds, I temporarily inserted the waste piece I cut out from those areas.

When the glue dried, I removed the clamps, cut the ends flush with the ends of the sides, and routed a $\frac{1}{4}$ -in. round-over profile on the edge of the rails. —P.G.



Form the curved handrails by gluing, bending and clamping a laminated stack of thin oak strips around the edges of the slide's sides.

TAMBOUR CLOCK

*A Timely Timepiece
For the Holidays*

BY JIM CUMMINS



An easy veneer project, this clock's insides are glued up from layers of 1/4-in. plywood.

MITCH MANDEL

Two years ago, I found the front of an old clock, and I thought I could salvage it by installing a modern quartz movement. My wife, Karen, swooping her hands in sinuous curves, described the tambour case she wanted me to build. Now the clock sits on a high bookshelf over our television, foretelling the inevitable commercials every 10 minutes.

Since then I've made several similar mantel clocks, some combining old faces with new movements, and the one shown above, which has a modern dial and a chiming quartz movement (available from TimeSavers, Box 12700, Scottsdale, AZ 85267, 800-552-1520). Each of these movements required an irregularly shaped opening, so I couldn't just drill a large hole in the front of a solid piece of wood and slide in the movement, as you can with most kit clocks. Instead, I made a veneered clock with a core built from 10 layers of 1/4-in.-thick lauan plywood. (See drawing.) With the layers taped into a block, it was simple to bandsaw the overall curve (see photo, right) and

then separate the layers to cut one opening at a time.

Laying Out the Clock—I used a template made from stiff cardboard to lay out the clock. The inset drawing gives the dimensions, but your dimensions will vary according to the size of the clock bezel you use. Note that you only cut the profile of the clock on the



Tape the plywood layers into a block to hold them securely for bandsawing the tambour profile.

cardboard (and pierce the center point). You'll mark the openings for the clockworks and bezel directly on the core by tracing the parts.

On my wife's small clock, I laid out the curves of the tambour profile on the same centerline, producing a tambour with a tall peak. On this larger chiming clock, I raised the center point of the two outer curves by 3/8 in. This created a tambour with a shorter peak and a clock with a more relaxed outline.

Cutting the Core—Cut the plywood core layers to form a rectangular block, then tape the layers together, trace on the tambour profile and bandsaw the shape. I like to drill a couple of alignment-pin holes in the waste ends of the core to help steady the layers during gluing. Also, to help you align and trace the clock movement later on, drill a hole for the clock shaft.

Next, separate the layers of the core and number them so you glue them up in the right order. Then trace and bandsaw the openings, layer by layer. Either nibble out tight corners or predrill them. If you position the bandsaw entrance

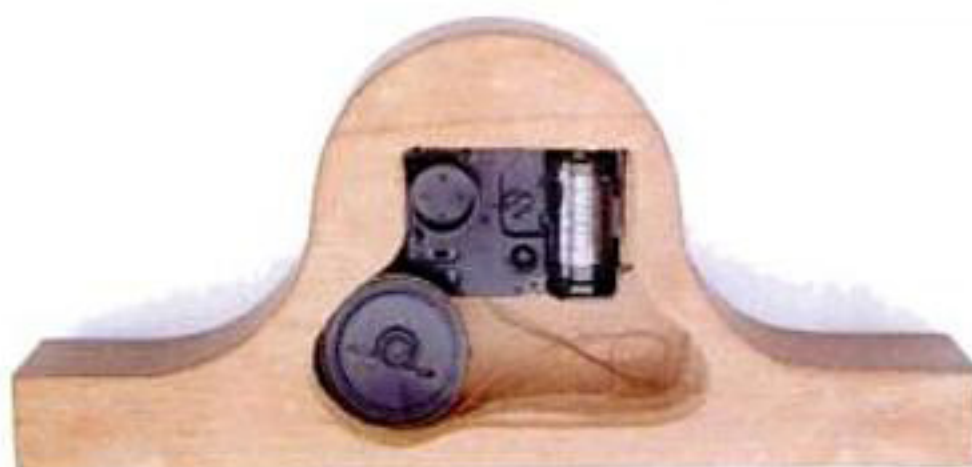
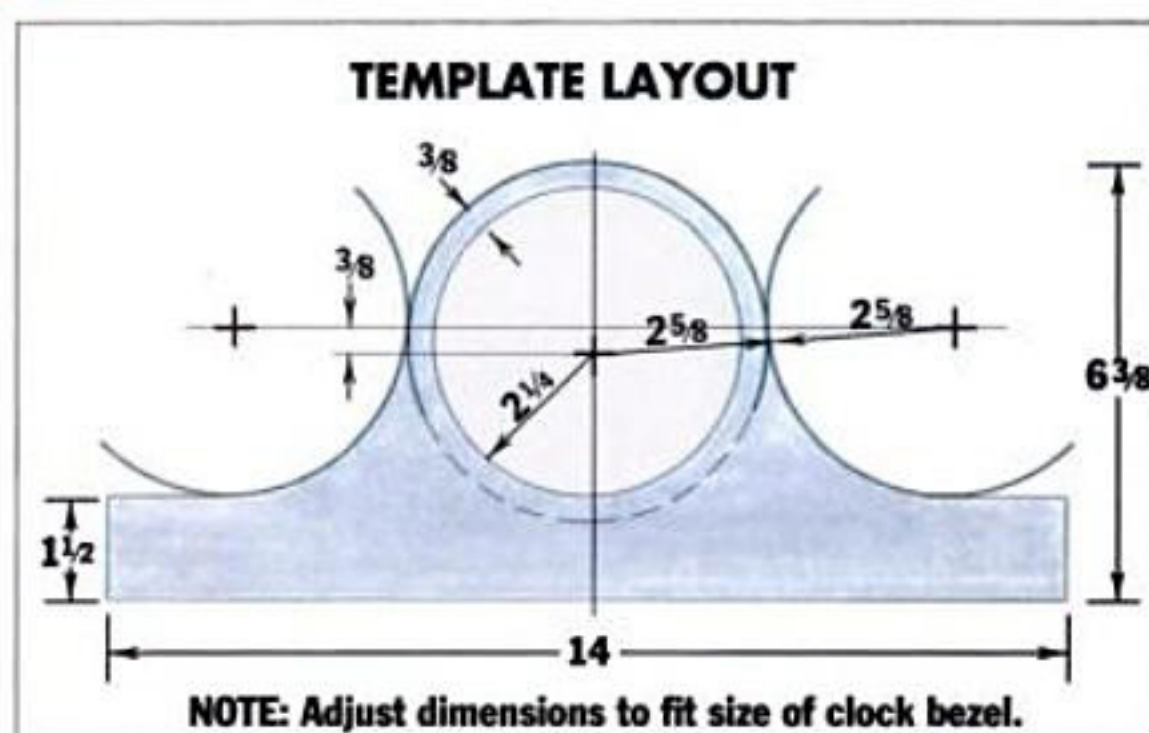
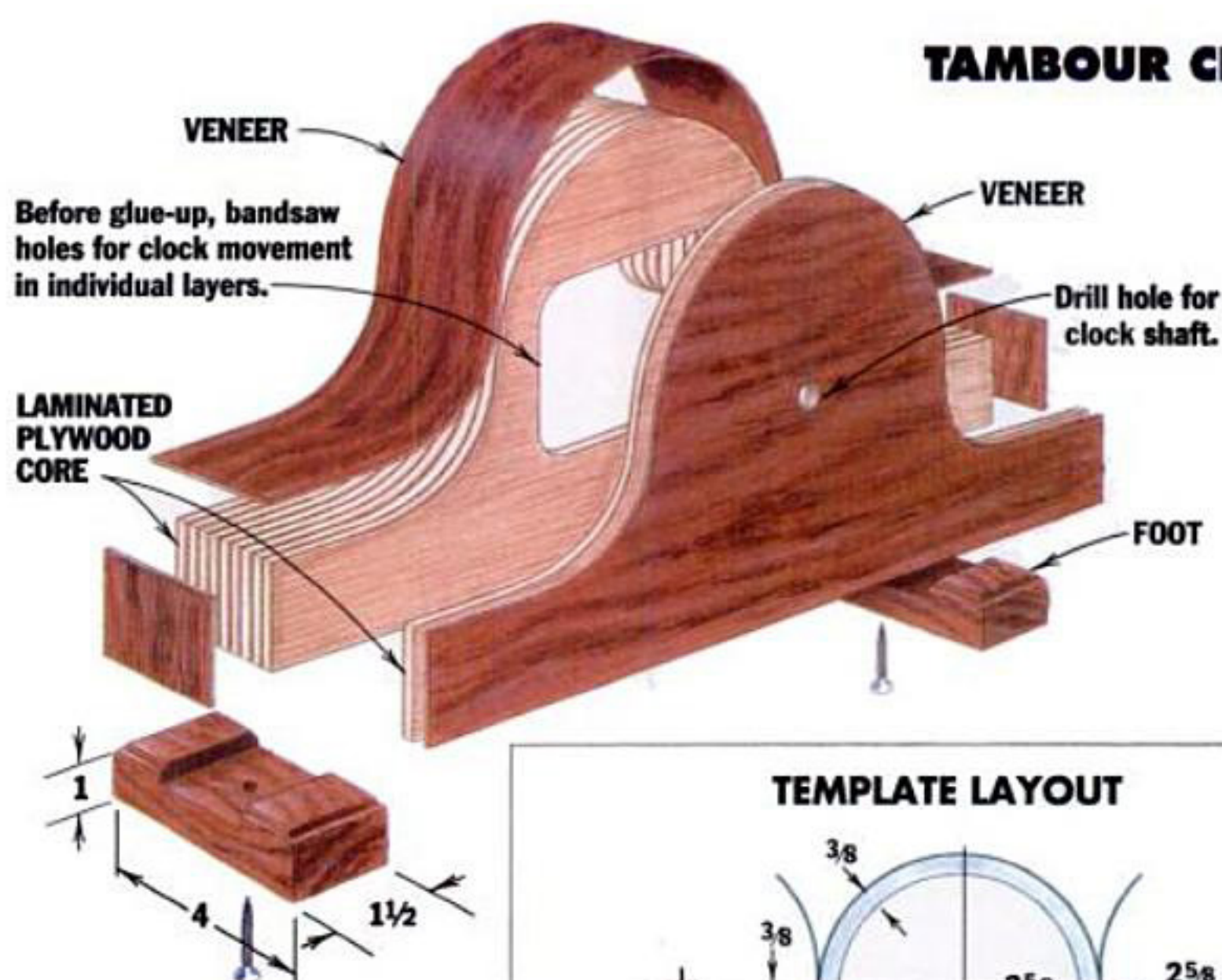
kerfs on opposite sides of adjacent layers, the core will be stronger. Remember, the kerfs won't show after the veneer is glued on.

Choosing Veneer—The chiming clock is covered with Brazilian rosewood veneer (available from Certainly Wood, 11753 Big Tree Rd., East Aurora, NY 14052, 716-655-0206). For the other clocks, I used a variety pack of veneers (available from Constantine's, 2050 Eastchester Rd., Bronx, NY 10461, 800-223-8087). I've found a veneer assortment to be very useful around my shop. The different wood colors come in handy, and the various thicknesses are invaluable as shims, accent strips and kerf fillers.

To veneer a curved surface like this clock, choose veneer thin enough to follow the bends without cracking ($\frac{1}{32}$ in. thick or less). Pick straight-grained veneer, since this is easy to repair if it splits. Just tape the splits together with masking tape before applying the veneer. Any minor gaps will fill with sanding dust and finish later, becoming invisible. (For more on veneering, see AW #16.)

To avoid splitting the veneer, cut the pieces with several light strokes of a utility knife, rather than making one or two heavy cuts. (Veneer suppliers sell special saws and tapes for dealing with veneers, but these aren't a necessity.)

Gluing the Veneer—I worked with slightly oversized pieces and veneered the top first, using standard yellow glue. Then I glued the ends and finally the face, allowing each step to dry and sanding the edges squarely flush before proceeding. Veneering in this order allows the face veneer to cover the



Because it's difficult to rout a cavity $1\frac{3}{4}$ in. deep, author bandsaws plywood layers individually to make the odd-shaped opening in the back of the clock.

edges of the curved veneer, obscuring any of the core's minor irregularities.

I used the offcut from the original plywood block as a clamping caul when veneering the top. To ensure that the veneer is compressed tightly, especially around the curves, you can line the offcut with strips of $\frac{3}{8}$ -in., adhesive-backed foam weather stripping. It's available at any hardware store.

A word about gluing: water-based glues cause veneers to swell and curl and may lead to clamping and buckling problems. To avoid this, apply the glue only to the plywood, not to the veneer.

Decorative Touches—This rosewood clock has feet made of stepped blocks, while some tambour clocks are set on decorative metal feet or on a molded base with bracket feet. These are all added after the main work is done, and you should follow your own inclinations here. I think the clock is most attractive without a lot of gingerbread.

The veneer on my wife's clock is Philippine mahogany. When the job was done, I realized this stuff looks remarkably like lauan plywood. So I stained it brown and finished it with Bartley's paste varnish. At least it's not pink anymore. The rosewood clock is finished with Waterlox, a wiping varnish. ▲



JIM CUMMINS
writes, edits and putters around his picture-frame shop in upstate New York.

BEAUTIFUL BAUBLES



This assortment of ornaments includes (right to left) one with a burl globe, one with a marbled finish, one made from a banksia seed pod, and one finished with a handpainted scene.

MITCH MANDEL

Turn a Few Trimmings For the Christmas Tree

BY ROBERT ROSAND

Some of the best-received Christmas presents I've ever given are turned ornaments like these shown here. They have a graceful and elegant look, and they're quite lightweight, which adds to the mystery of their construction. Also, no matter how many I make, no two are ever quite the same.

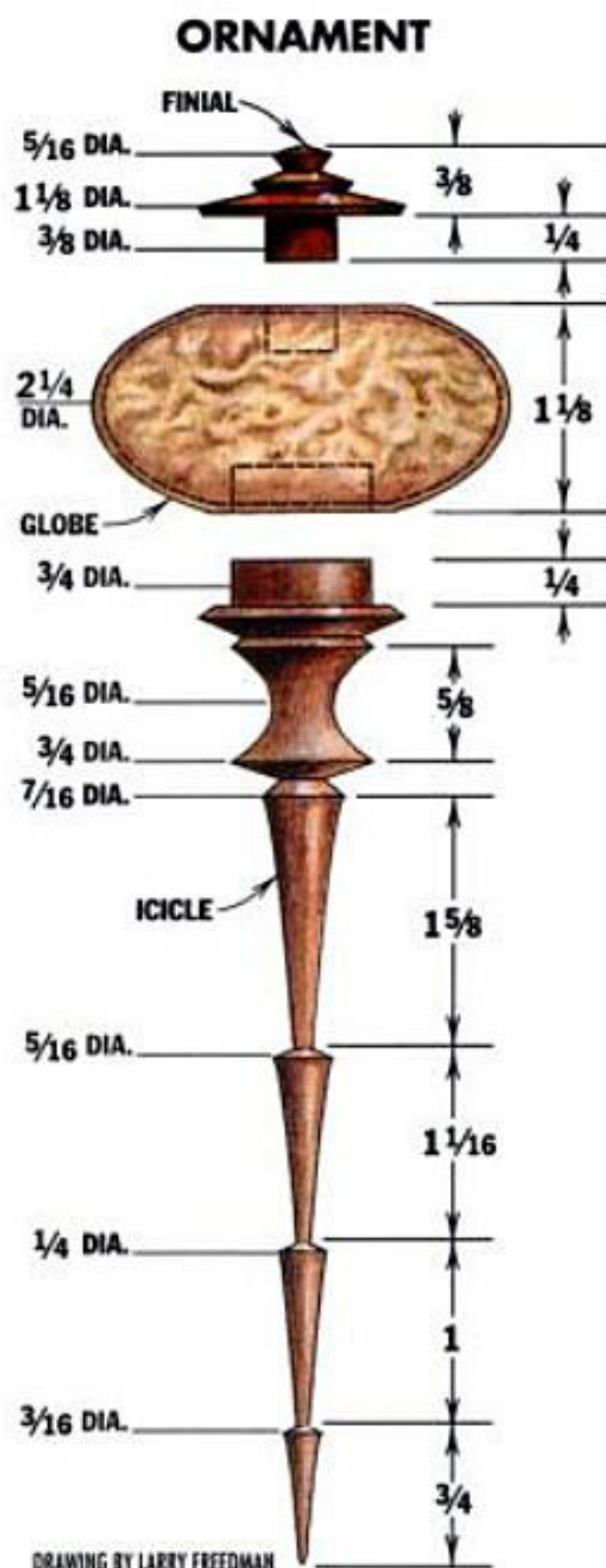
These ornaments have a hollow globe, which I usually make from a burl. When the ornaments will be painted or marbled, I'll use a straight-grained wood such as cherry or walnut. The icicle at the bottom and the finial at the top are made from contrasting woods, such as walnut, ebony, cherry and ash.

A shop-made bent-angle tool (see photo below) is the only special tool I need to turn these pieces. This is nothing more than a piece of $\frac{1}{4}$ -in.-square steel, with a $\frac{3}{16}$ -in. high-speed steel tip silver-soldered to it at about a 42° angle (high-speed steel stock available from Enco Mfg., 5000 W. Bloomingdale Ave., Chicago, IL 60639, 312-745-1500).

Turning the Globe—Start by gluing a piece of stock about $2\frac{1}{2}$ in. square and $1\frac{1}{2}$ in. thick to a waste block that's been turned to a cylinder. Then mount the block in a three-jaw chuck (or on a small faceplate), true up the globe with a $\frac{3}{8}$ -in. gouge, and begin to refine the shape. If you have trouble with tear-out on burls and your tools are sharp, try applying a 50/50 mixture of turpentine and sanding sealer to the wood prior to your final cut. Lay it on wet, then wipe off the excess and turn.

The section of the globe closest to the waste block will form the top. Don't turn it down too far at this point ($1\frac{1}{2}$ in. dia. is good). If you remove too much material, the globe may become so flimsy that you'll get chatter when you try to hollow it.

When you achieve the desired shape, you're ready to begin hollowing. First, with a drill in a tailstock chuck, drill a $\frac{3}{8}$ -in.-dia. hole through



To refine the shape inside the globe, the author uses a shop-made bent-angle tool (top).

the globe stock and into the waste block. Then, on what will be the bottom of the globe, use a pencil to mark a $\frac{3}{4}$ -in.-dia. circle around the drilled hole. This circle denotes the size of the opening into which you'll glue the icicle. (See drawing.)

Now use a small flat-nosed scraper to widen the hole to the diameter of the pencil line. (I use a miniature scraper, available from Bonnie Klein, 17910 SE 100th St., Renton, WA 98059, 206-226-5937.) Making this cut gives you some room to work. After this, you can start to open up the interior with a $\frac{1}{4}$ -in. round-nosed scraper. However, you'll need the angle tool to get around the corners and refine the interior. (See photo below.)

I use double-ended calipers (available from Craft Supplies USA, 1287 E. 1120 S., Provo, UT 84601, 801-373-0917) to check the side wall thickness, and try to work the walls as thin as possible. You should find it easy to obtain a finished wall about $\frac{1}{4}$ in. thick. As you gain confidence, you may wish to go thinner to make the ornament lighter.

Parting Off the Globe—When the exterior is turned to your satisfaction, use the gouge (or the long point of a skew) to remove excess material from the top (headstock side) of the globe. This will refine the shape further. Leave enough material so the globe won't break off when you sand it—a section about $\frac{3}{8}$ in. dia. or $\frac{3}{4}$ in. dia. should be good. Then sand the globe up to 400 grit and apply a coat of sanding sealer. Remove the excess with a paper towel. (If the paper catches, it will tear rather than grab as a rag might. That saves both your fingers and the ornament from damage.)

Now part off the globe. If all went well, you should have a hollowed globe with a $\frac{3}{8}$ -in.-dia. hole in the top and a $\frac{3}{4}$ -in.-dia. hole in the bottom.

Turning the Spindles—I generally turn the icicle and the finial out of



When turning the icicle, make light cuts and support the work with your fingers to keep it from chattering.

one piece of stock, about 7½ in. long by 1¼ in. dia. However, a long piece like this can vibrate and chatter as you reduce the diameter. If you are not really confident in your spindle-turning skills, you may wish to use two shorter pieces.

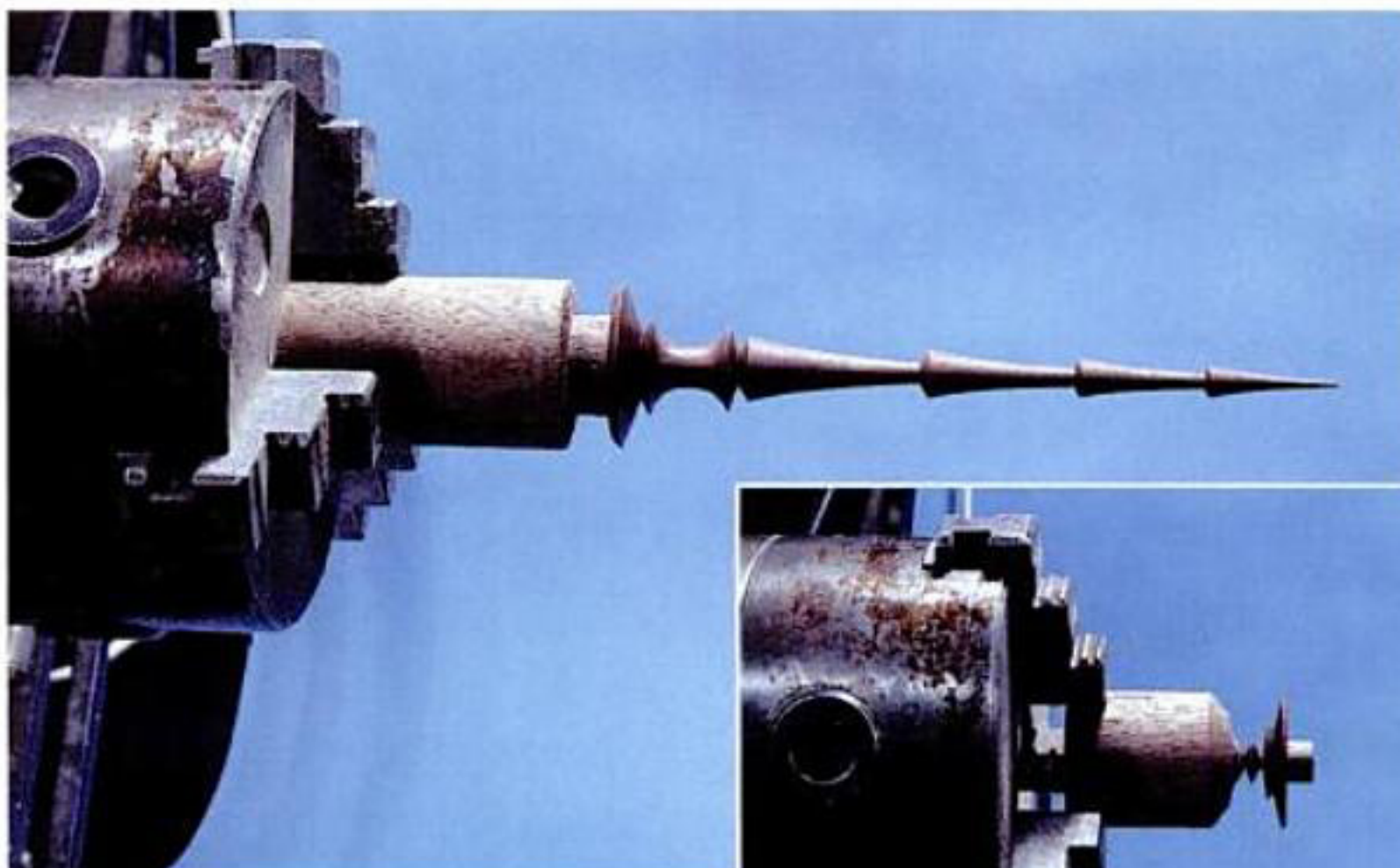
To make the icicle, first mount the stock between centers and turn it to a cylinder with a roughing gouge. The section of the cylinder that's closest to the tailstock will be the bottom of the icicle, and I like to remove most of the excess there at this stage, while the end is supported by the tailstock.

Next, mount the cylinder in a three-jaw chuck, true it up again and start turning the icicle profile with a small skew. Work in sections, starting with the thinnest segment at the bottom. Take fine cuts and support the work from behind with your fingers to eliminate chatter. (See photo above.)

Use the long point of the skew to turn the tapered segments on the icicle, and sand and seal each one as you complete it. (The fragile icicle is likely to break off if you try to sand the segments later.) Each segment should be a bit longer and larger than the previous one. (See drawing.) Feel free to be as decorative as you like.

After you've finished the profile of the icicle, turn a tenon to fit the ¾-in.-dia. hole in the bottom of your globe. (See center photo above.) I undercut the tenon slightly, striving for a slightly loose fit, and the five-minute epoxy I use allows me a little play. Otherwise, I'd have to force tight parts together during assembly, and that could destroy the ornament. When the tenon is done, part off the icicle.

Turning the Finial—I like to keep the finial about the same diameter as the thickest part of the icicle, for the



Make the icicle and finial from the same cylinder, turning tenons on each to mate with the holes in the globe.



When gluing, clamp the ornament lightly in a vise. Fitting the tip of the icicle into a hole drilled in a scrap block protects it from damage.

sake of visual continuity and aesthetics. Start the finial by turning a tenon to fit the ¾-in.-dia. hole in the top of the globe. (See photo, above right.) Again, I undercut the tenon for a good fit. You can shape the finial with a ⅛-in. spindle gouge and refine the lines with the long point of the skew. When you're satisfied with the shape, sand lightly and apply sealer, then part off the finial with your skew.

At this point I mount the tenon of the finial in the three-jaw chuck and clean up the top with a skew. I also mark the centerpoint of the finial and drill a small hole to accept a brass screw eye for hanging the ornament.

Assembly—Now it's time to assemble your ornament. I use five-minute epoxy and clamp the ornament gently in a vise until it dries. (See photo above.)

When the epoxy is dry, you can insert a screw eye and spray on your preferred finish. Deft semi-gloss lacquer works well for me.



Options—After you've turned a few hundred ornaments, you may want to try some variations. Occasionally, I'll get a piece of wood that has a nice bark inclusion and then I'll make a very small turning—something similar in shape to the tip of the icicle but more decorative—which I glue inside. I paint some ornaments with primer and turn them over to a local artist, who marbleizes them for me. My wife paints others with nostalgic country scenes.

I've also made some unusual globes using banksia seed pods from Australia. (See lead photo.) These pods (available from Craft Supplies USA) turn like wood, but first you have to turn away about ⅛ in. of the outer layer, a fuzzy reddish material which flakes easily. When I hollow seed-pod globes, I don't make them as thin as the normal ornaments. I've discovered that if you turn walls much thinner than ¼ in., the darker "eyes" around the holes will pop out, leaving you with a reject or a less attractive ornament. ▲



ROBERT ROSAND
is a professional woodturner who lives in Bloomsburg, PA.

JUST FINISHING

STAIN BOARDS



BY MICHAEL DRESDNER

Have you ever walked through a fine antiques shop or furniture store and wondered: “Why can’t my finishes look like that?” The secret of a professional finishing job is often the staining technique. Seasoned finishers have two things that you may not have—lots of experience with color mixing, and a “stain board.”

Stain boards (sometimes called “color boards”) are shop-made color samplers that let you preview various stain combinations as they will appear under different finishes and on different woods. Making a stain board is a creative and inexpensive way to spend a few hours, and it will give you more control over your finishes because you’ll know in advance what the finish will look like. And besides getting invaluable experience in hands-on color mixing, you’ll find that trying out new colors and effects can be lots of fun.

Preparations

You can make a single stain board for a specific project or make several with different woods and finishes. I like to work with strips of wood about 18 in. long and 4 in. wide, planed to a thickness of at least ½ in. Drill a hole through the face of each board near the top so you can hang it on your shop wall later for comparison.

Next, sand the stain boards as you would a finished piece. Most finishers sand to 150 grit or 180 grit before staining. With pigment stains, the rougher the surface, the more pigment particles the wood will accept and the darker it will appear. Finer sandpaper will impart greater clarity to the grain, but the wood won’t take as much pigment, so the color will appear lighter. With dye stains, surface texture doesn’t matter because the color is completely dissolved in the solvent.

Divide each of your sample boards into four or five segments with strips of 1-inch masking tape. The tape will prevent the stains from bleeding from one segment into another, and the masked areas will remind you what the wood looked like before staining.

Now, gather together all the stains, sealers and top coats that you like to use. Check the expiration dates on any finish cans to make sure the product is still fresh. Also grab a pen or marker to record your formulas on the back of the samples. This way, if you happen



Stain boards are a good way to preview how stains will look on a finished project.

JUST FINISHING

upon a truly great color you'll be able to reproduce it later.

Staining

There are two ways to create a personalized wood stain—by premixing individual stains or by layering one stain over another. The first method, premixing, works only with compatible stains, that is, stains having the same solvent. For example, you can mix two water-based stains together, but you can't mix an oil-based stain with a water-based stain.

The other method is to apply stains in layers, one color on top of another, until you get the look you want. Compatibility is less important with this layering method, but if you're using both oil-based and water-based stains, put the water-based ones on first. Water-based dye stains will not penetrate through an oil film.

If this is your first time mixing colors, my advice is, don't hold back. No matter how awful you think a color combi-

nation will look, try it anyway—it may surprise you. Experience will teach you which combinations to avoid.

Stain only one side of each board so that you can write your "formula" on the flip side. Use a brush or rag to flood the stain onto your sample square, and wipe off all the excess before it dries. Try your color combinations on each type of wood you plan to work with, because the color of the wood will affect the look of the stain.

One advantage of aniline dyes is that you can create colors right on the wood by going over the board with first one dye, then another. Between each staining operation, I wipe off everything that did not absorb. Since I work with water-soluble dyes, there's no need to wait between coats for the stain to dry.

Once you are finished with all your color experiments, make sure to write your formulas on the back of each board. Then remove the masking tape and allow the stains to

dry according to the manufacturers' recommendations.

Finishing

It's important to use the same finish on your stain board that you plan to use on your project. Sealers and top coats almost always add some color to wood, and most stains look different under different finishes.

Apply the sealer and/or top coat to your stain board as you normally would. Don't forget to note the type of top coat in your formula on the back.

When your sample board is finished, you'll have a handy finishing guide for future projects and a better understanding of how professional finishers color wood. ▲

LOOKING FOR STRAIGHT ANSWERS?

Send your questions about finishing problems, materials, and techniques to: Michael Dresdner, AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098

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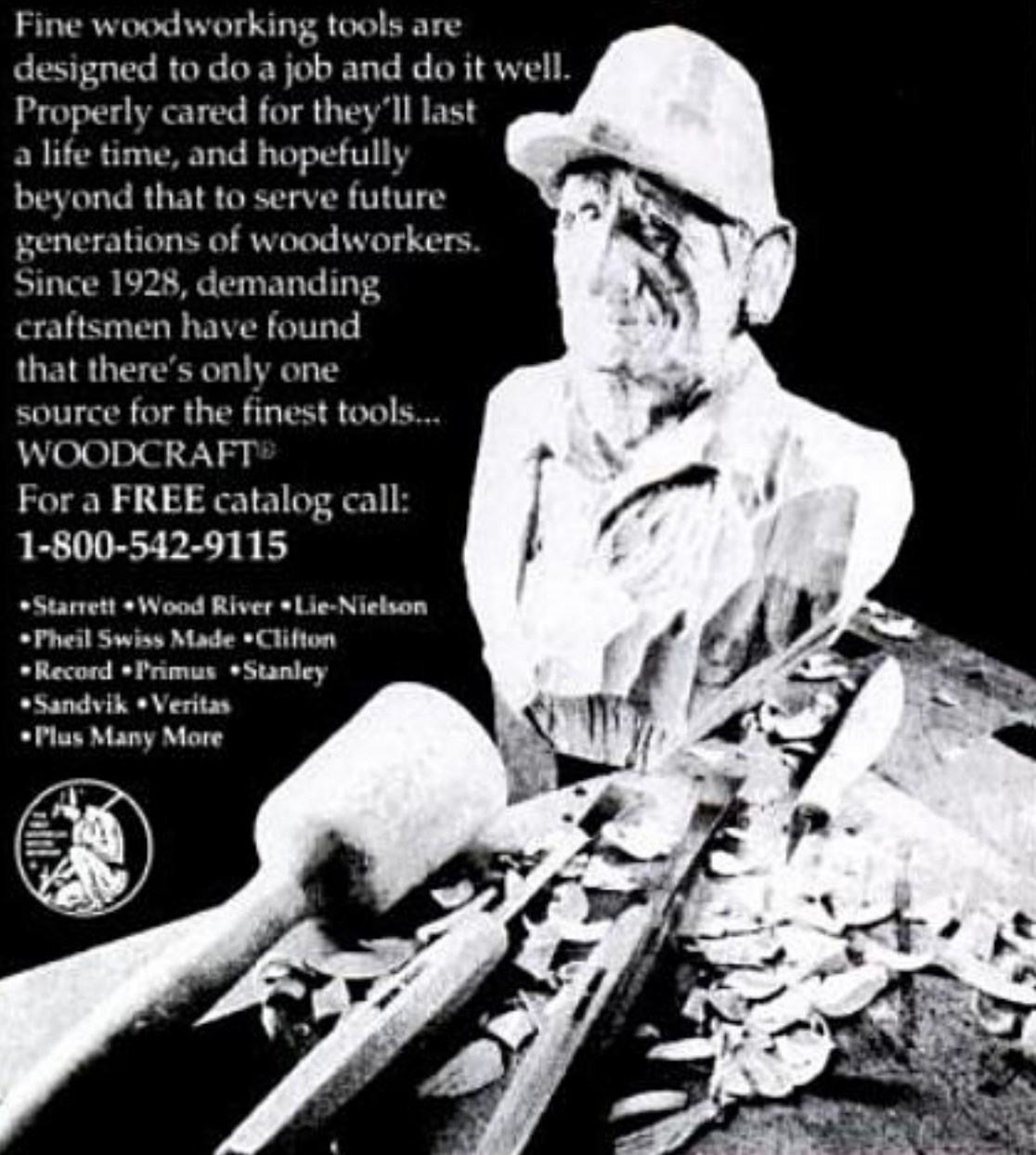
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TOOL BOX

HOT TOOLS FROM THE HARDWARE SHOW

AMERICAN WOODWORKER editors visited the National Hardware Show in Chicago in August and found a few tools worth mentioning.



Ryobi Hits a Triple With Three New Products

Ryobi's budget-priced **Oscillating Spindle Sander** (model OSS450)

will smooth contours that belt or disc sanders can't reach. The spindle holds a sanding sleeve that oscillates up and down while rotating at 2000 rpm, so the machine sands quickly without scratch marks and without burning the wood. It comes with 1/2-in.- and 1-in.-dia. interchangeable rubber spindles. Optional spindles from 3/4 in. dia. to 3 in. dia. are available. (Price: \$200) **CIRCLE #621**

With the motorized feed control system on its new **RA202 Radial**

Arm Saw, Ryobi has eliminated the tendency radial saws have to cut too aggressively and jerk the saw head toward you. The system, which can be retrofitted to Ryobi's RA220 saws, consists of a small motor and clutch assembly that's connected by a cable to the saw's handle. It lets you adjust the feed rate from 0 to 32 ft. per minute, and it automatically retracts the saw head when you release the saw's trigger. (Price: \$700 for the RA202 saw; \$130 for the retrofit kit) **CIRCLE #622**



Ryobi's new **Air Flotation and Clamp Table** uses the power of a standard shop vacuum to make sawing and sanding easier. The accessory table attaches to rails on Ryobi's BT3000 tablesaw and has hundreds of air holes on its surface. By directing a shop vacuum's exhaust flow to the holes, you can "float" a bulky workpiece on a cushion of air for easier maneuvering through the saw blade. To clamp work down for sanding or routing, just connect the vacuum's intake for powerful suction. (Price: \$100) **Ryobi America Corp., Dept. AWT, Box 1207, Anderson, SC 29622-1207, (800) 323-4615. CIRCLE #623**



Ergonomic Staple Gun

Many staple guns kick back when you squeeze the trigger, and often they don't drive staples all the way home. Black & Decker solves these problems with its **Power Shot** staple gun. This gun's ergonomic design puts the handle directly over the working end, so you can fire a staple with less hand pressure. The tool accepts six sizes of staples, and a handy "staples remaining" window lets you know when it's time to reload. (Price: \$19.99) **The Black & Decker Corp., Dept. AWT, 701 E. Joppa Rd., Towson, MD 21286, (800) 762-6672. CIRCLE #624**



Scraper Holder Saves Fingers



The **Veritas Scraper Holder** protects your fingers from heat and muscle strain during long scraping jobs. Just slip any 6-in.-long scraper into the holder's reinforced nylon body and turn two brass screws to clamp it in place. A third screw at the center lets you set the amount of bow in the scraper to control how aggressively it cuts. (Price: \$24.95, includes scraper) **Veritas Tools Inc., Dept. AWT, Box 1720, Ogdensburg, NY 13669-1720, (800) 667-2986. CIRCLE #625**



Keep Finishes Fresh ▲

Keeping finishes and paints from hardening in the can during storage is a major headache. But a plastic disk called Gallon Saver provides a simple solution. You slide the flexible disk into a can until it rests on the surface of the leftover finish. It provides an airtight seal that keeps the finish fresh for later use. Gallon Saver comes in sizes to fit 1-, 2- and 5-gallon containers. And since paint doesn't stick to it, you can reuse each disk several times. (Price: 99 cents for 1-gallon size) *Sugrue Products Inc., Dept. AWT, 5644 N. Artesian Ave., Chicago, IL 60659, (312) 334-7900. CIRCLE #626*

Fast C-Clamps ▼

Wolfcraft's Quick-Jaw C-Clamp has a quick-release mechanism that lets you make coarse adjustments with the push of a button. You turn the screw only for the final tightening on the work. The cast aluminum frame is lighter than cast iron clamps, and the jaws have removable plastic covers to protect fragile workpieces. Available in 3-in., 4-in. and 6-in. sizes.



(Price: \$15 for 4-in. clamp)
Wolfcraft Inc., Dept. AWT, 1222 W. Ardmore, Itaska, IL 60143, (708) 773-4777.

CIRCLE #627

TOOL BOX

Clean Abrasive Belts Faster ▼

The Nu-Life abrasive belt cleaner quickly cleans sawdust-clogged sanding belts and disks, increasing their working life. The 1½-in.-square by 8¼-in.-long Nu-Life product is made of dense "smoked rubber" so it cleans faster and breaks down slower than



standard crepe rubber cleaners. It will also clean abrasives clogged with metal, plastic and even glass residue. (Price: \$6.95) *Abrasive Service Co. Inc., Dept. AWT, 398 Broad St., Forestville, CT 06010, (203) 584-2091. CIRCLE #628*



▲ This Tool Rest Is Tough

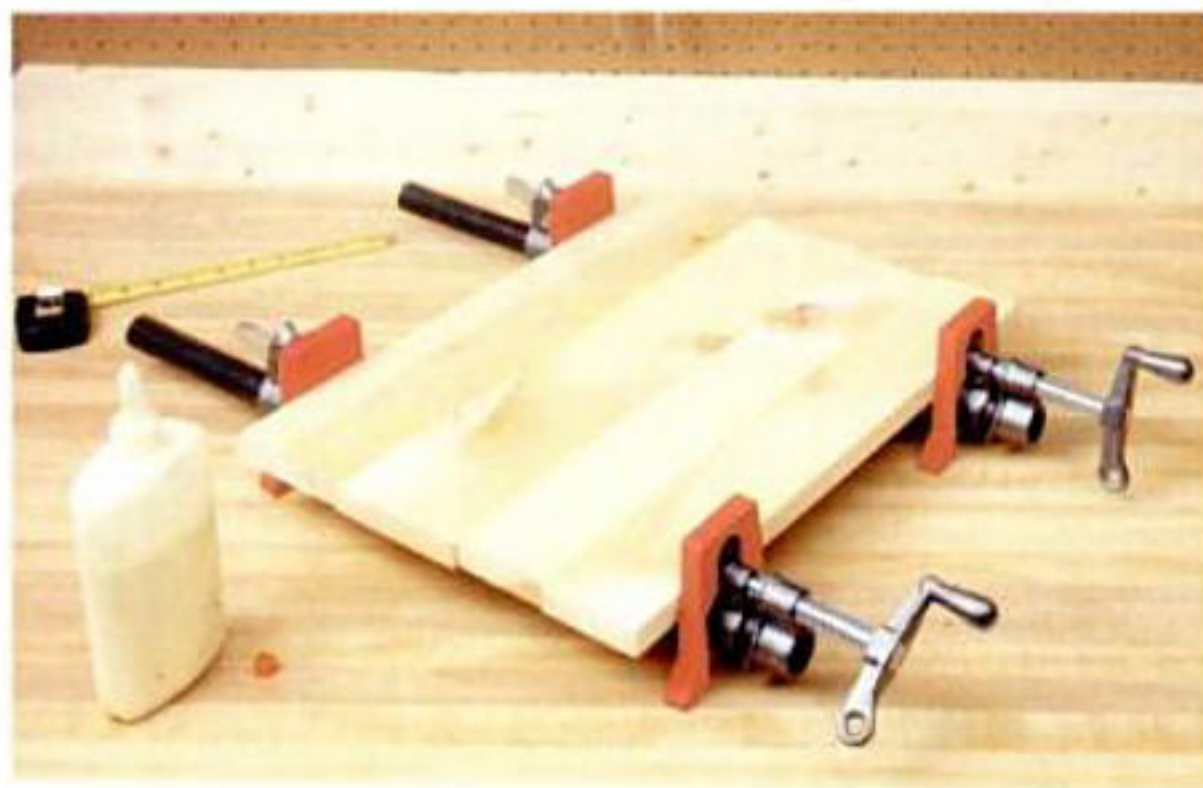
Veritas' new anodized aluminum tool rest replaces the flimsy one that usually comes with 6-in. or 8-in. bench grinders, and makes it easy to accurately sharpen edge tools. This rest mounts to a bench and adjusts or folds away quickly by simply loosening the two handles.

The 4-in.-wide table accepts optional sliding and pivoting jigs for plane irons, chisels and skewers. It wraps around grinding wheels up to 1 in. wide, providing support for operations on the sides of the wheel. (Price: \$34.95)

Veritas Tools Inc., Dept. AWT, Box 1720, Ogdensburg, NY 13669-1720, (800) 667-2986. CIRCLE #629

▼ Pads Hold Clamps Upright

Stand-Up Clamp Pads fit onto any brand of ¾-in. pipe clamps and hold the clamps upright so your hands are free to position the workpiece. These pads also protect the work from the



clamp's metal jaws, so you won't have to hassle with wood clamping blocks. (Price: \$8.31 per pair) *Warren Tool Group, Dept. AWT, 10610 Freedom St., Garretttsville, OH 44231, (216) 527-4324.*

CIRCLE #630

Now That's Rockin'!

There seems to be a different style of rocker for everything we do, whether we're rockin' out, rocking the baby, or just dozing on the porch. Here's a sampling of rockers from a book called *The Rocker*, by Bernice Steinbaum (1992, Rizzoli International Publications Inc., 300 Park Ave. So., New York, NY 10010), that celebrates this American tradition. Sit back and enjoy!

▶ Rocker by David Ebner. White oak, cane. Dimensions: H: 32 in., W: 24 in., D: 36 in.



▶ Rocker by George Gordon. Curly maple, leather. Dimensions: H: 42 in., W: 28 in., D: 36 in.



DOUGLAS DALTON

▶ Double rocker by Sam Maloof. Fiddleback maple, ebony. Dimensions: H: 46 in., W: 52 in., D: 46 in.



GENE SAXSE

▶ "Deception" rocker by Trent Hickmon. Maple, koa, acrylic, ebony, rosewood, guitar hardware. Dimensions: H: 40 in., W: 22 in., D: 44 in.



KRISTEN HICKMON



GREGG FLEISHMAN

▶ "Rock 'n' Roll" rockers by Gregg Fleishman. Finland birch plywood. Dimensions: H: 35 in., W: 24 in., D: 37 in.

GALLERY



High-back rocking chair by Jeremy Singley. Cherry, hickory. Dimensions: H: 46 in., W: 27 in., D: 36 in.



Rocking chaise by Michael Hurwitz. Mahogany, paint. Dimensions: H: 36 in., W: 24 in., L: 78 in.



Rocker by John Bickel. Walnut. Dimensions: H: 46 in., W: 24 in., D: 44 in.



Double rocker by Greg Harkins. Red oak. Dimensions: H: 47 in., W: 45 in., D: 36 in.



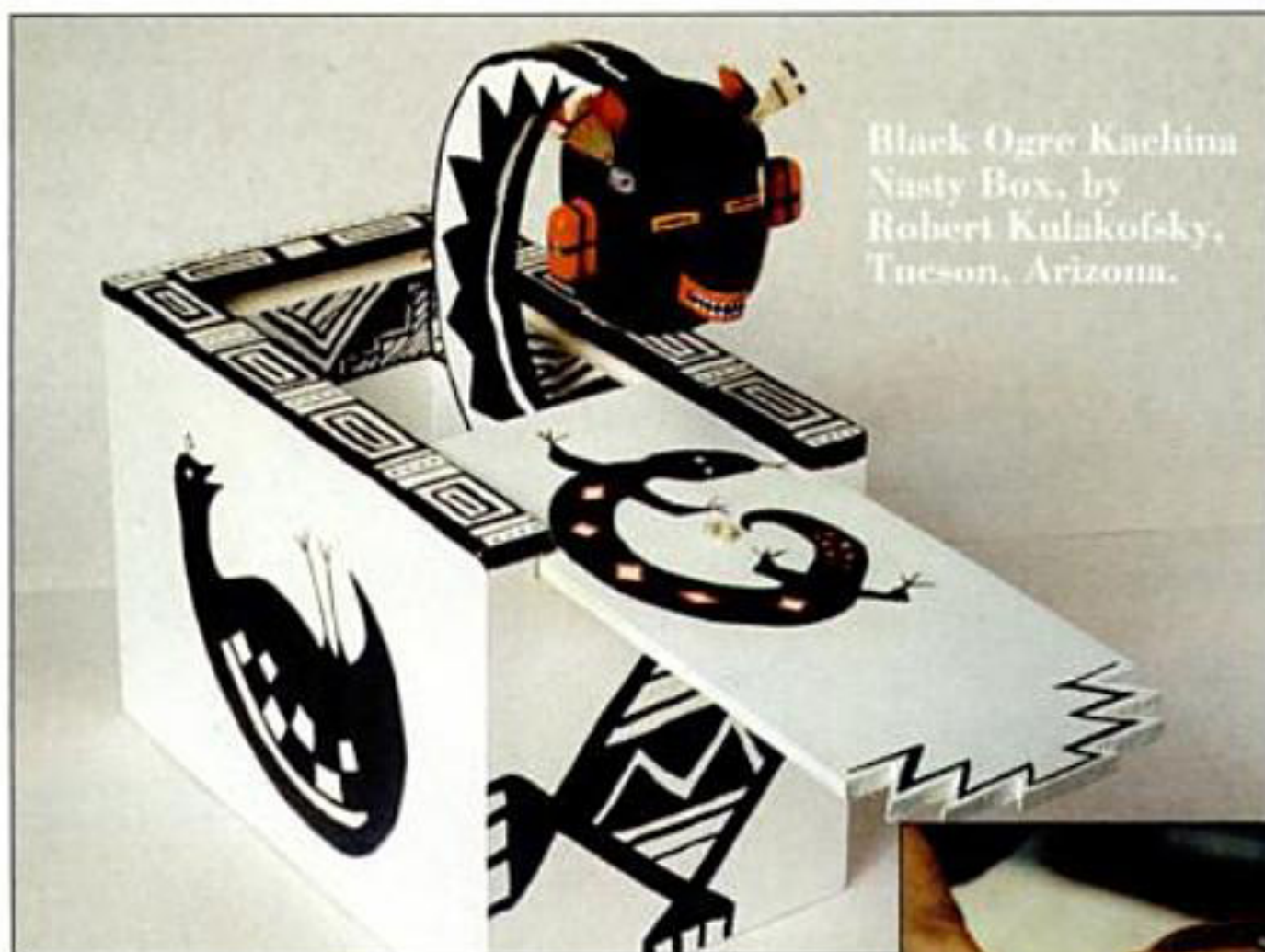
Rocker by Donald Green. Mahogany, milk paint, leather. Dimensions: H: 48 in., W: 20 in., D: 40 in.

Nannie rocker by Greg Harkins. Red oak. Dimensions: H: 47 in., W: 54 in., D: 36 in.



Want to see your work in "Gallery?" Send color slides or color transparencies to: "Gallery," American Woodworker, 33 E. Minor St., Emmaus, PA 18098. Please include materials, dimensions, name of photographer, your name, address, and phone number. We'll pay you \$35 if we publish your work. If you want your photos returned, enclose a self-addressed stamped envelope.

FINAL PASS



Black Ogre Kachina Nasty Box, by Robert Kulakofsky, Tucson, Arizona.

The Nastiest Box of All

We thought readers would rise to the challenge when we decided to hold a contest to see who could build the snappiest nasty box. (See AW #29.) But we didn't figure we'd get so many works of art.

Pictured here are the winning box, made by Robert Kulakofsky (left), and the work of our two finalists, Ross Mennie and George F. Farrell, Jr. Technically, Kulakofsky's piece isn't a *nasty* box. The creature inside doesn't jump out and snap your thumb when you pull the lid open; it just pops up to surprise you. Kulakofsky said he made the alteration because the little figure represents a Kachina—a friendly spirit god of the Hopi and Zuni Indians—

and it didn't seem appropriate to have it striking people. The sides of his boxes are painted with designs taken from ancient Indian pottery.

Kulakofsky receives \$100 for winning the contest. Congratulations to all contestants on a job well done!



Shark Nasty Box, by Ross Mennie, North Vancouver, British Columbia.



Pagan Idol Nasty Box, by George F. Farrell, Jr., Central Square, New York.

Sustainable Wood Database

Since the best way to save endangered trees is to encourage the use of abundant alternatives, an ecology group is developing a computer database of sustainable timbers.

The Forest Resource Information System (FORIS), produced by the group Tree Talk, will provide detailed information on 800 commercially viable species, including structural properties, woodworking properties, and price, size and availability.

The database will run on Mac and IBM-compatible computers and is expected to be available in November. A home-computer version will sell for around \$150. For information, write Tree Talk, 431 Pine St., Burlington, VT 05401, or call (800) 858-6230.

Pioneer Turner Dies

When artist, sculptor and teacher James Prestini died last July at age 85 in Berkeley, California, he hadn't touched a wood lathe in nearly 40 years. Yet his impact on the world of wood turning was profound.

Prestini started experimenting on the lathe in 1933 and was one of the first to realize the potential of the lathe for creating objects of art. The elegant, thin-walled bowls he produced set the stage for the experimental pieces of today's avant-garde turners.

Albert LeCoff, director of the Wood Turning Center in Philadelphia, commented on Prestini's influence: "[His work] was the first time people looked at an object made from the

lathe and realized this thing [the lathe] could be used to make art, not just industrial parts."

Despite the acclaim for his work, Prestini stopped turning in 1953, remarking, "you can only make circles. Creative sculpture requires a maximum freedom of expression." In the years that followed, he won further praise as a designer, sculptor and educator. Today Prestini's turned works and wood and metal sculpture are part of the permanent collections of more than 250 museums around the world.

Coming Next Issue:

- Buyer's Guide to Aftermarket Tablesaw Guards
- Making a Pennsylvania Spice Box
- AW's Excellence in Craftsmanship Winners