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AMERICAN WOODWORKER

FEBRUARY 1995 #43

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Page 41 *Maine Planemakers*



Page 52 *Man-Made Boards*

DEPARTMENTS

A Word From the Publisher2

Letters

Router Critique4

Q&A

Plane Crash Surgery.....12

Offcuts

Hand-Carved Carousel18

Tech Tips

Bench Hook and Holding Jig.....24

Just Finishing

Brushing Varnish.....72

Tool Box

Tormek Supergrind 200076

Wood Facts

Ash86

Calendar

Workshops, Seminars, Etc.90

Gallery

Excellence Award Finalists.....92

Shop Solutions

Micro-Shift Fence96

CONTENTS



Page 58 *More Than a Table*

FEATURES

Supertune Your Tablesaw By Tom Burroughs
Elevate Your Tablesaw to the Next Level of Accuracy30
Tablesaw Alignment Tools By Ellis Walentine33

Music Stand By Yeung Chan
Graceful Lines Conceal Ingenious Adjustment Mechanisms34

Infeed/Outfeed Cart By William Wichman
Handle Large Stock Safely with this Clever Roller Support38

Maine Planemakers By Scott Landis
Two Craftsmen Refine a Hand Tool Tradition41

Architectural Bird Feeder By Ric Hanisch
Build a Temple for the Birds.....46

1994 Excellence In Craftsmanship Awards
Inspiring Design and Craftsmanship Among Our Winners.....48

Man-Made Boards By Andy Rae
Match the Panel to the Project52
Speaking the Lingo.....54
Making Plywood: Southern Style55
Panel Characteristics.....56
Beyond the Basic Panel57

More Than a Table By Toshio Odate
A Table That Remembers It Once Was a Tree58
Making the Table60

Buyer's Guide to Lathe Chucks By Stephen Blenk
Hold Work of Any Shape or Size.....62
Specialty Chucks.....67

The Ultimate Steam Box By Mike Dunbar
A Veteran Chairmaker's Simple Apparatus for Steam Bending.....68



Printed on Recycled Paper

On the cover: Ninety-year-old planemaker Cecil Pierce shows off a few of his favorite creations. COVER PHOTO BY SCOTT LANDIS

A WORD FROM THE PUBLISHER

AMERICAN WOODWORKER

AMERICAN WOODWORKER Online

The Woodworking Magazine of the Future

Unless you've been hiding under a rock you've probably heard and read lots about the "Information Highway," a global network of personal computers linked up to each other through telephone lines. Plug your PC into the network and you can share information with millions of people all over the world. With a click of the keyboard you can tap into data, catch up on events, keep in touch with your family—even buy and sell stocks.

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—David Sloan
Editor & Publisher

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Woodworking can be dangerous. Safety equipment such as guards, hold-downs, goggles, dust masks and hearing protection can greatly reduce your risk of injury. But even the best guard won't make up for poor judgment. Use common sense and caution in the workshop. If a procedure feels dangerous, don't try it, no matter how many other folks work that way. Figure out an alternative that feels safe. Your safety is your responsibility.

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SPK-035	2	Ryobi AP12 planer	\$30.50
SPK-040	2	Ryobi AH-115 & AH-125	\$60.80
SPK-045	2	Makita 2030N planer	\$42.70
SPK-055*	2	Delta 22-540	\$30.20
SPK-060	2	Makita 2040	\$51.80

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(Number of knives in parenthesis)

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SJK-020	8" Knives for old Delta & Rockwell (3)	\$28.90
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SJK-035	12-1/2" Knives for RBI 612 & 812 (2)	\$29.90
SJK-040	12-1/2" Knives for Grizzly & other (2)	\$30.90
SJK-045	13-1/8" Knives for Delta RC-33 (3)	\$47.40
SJK-055	15" Knives for Grizzly & other imports (3)	\$52.90
SJK-065	20" Knives for Parks 20" planer (4)	\$92.40
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SCK-020	8" Knives for old Delta & Rockwell (3)	\$106.40
SCK-025	8-1/16" Knives for Delta DJ-20 (3)	\$107.52
SCK-030	12" Knives for Powermatic (3)	\$176.00
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SCK-055	15" Knives for Grizzly & other imports (3)	\$179.00
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BSB-934	1/4"	6 TPI	Skip	\$9.70
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LETTERS

Editors' vs. Operators' Choice

I pretty much agree with Norm and the order and type of tools he has selected in his article "Tooling Up." (See AW #41.) After a tablesaw or radial arm saw, my tool of choice is a combination jointer/thickness planer. The next items that are crucial for furniture building are two routers and a high-quality router table.

Your "Editors' Choice" award is a very powerful recommendation and some companies highlight it in their catalogs. But some of the tools are not "Operators' Choice." In my own case, I have purchased a number of power tools, especially routers, only to find most have serious design and operating limitations. I bought a new DeWalt DW625 based on your Editors' Choice award. We use it, but are not satisfied with it. The DW625 does not mount into a router table very easily, and when you get it there, the controls for depth and speed adjustment aren't conveniently located. The DW625 does have excellent collet and depth adjustment when used in a portable role.

We have owned and/or used the following brands and models in our two-person shop: Bosch 1613EVS and 1615; Hitachi TR12 and M12V; Milwaukee 5680; Porter-Cable 690, 691 and 7539; DeWalt DW625; ELU 3304, 3338 and 3339; Freud FT2000E; Ryobi RE600; various Craftsman models and some I have forgotten about. The best one for router table mounting is the Hitachi M12V, hands down. Its limitation is a collet that requires a 1/4-in. bushing instead of a single piece-collet. So our work-around is to use only 1/2-in. bits. When mounted in a router table, the Bosch 1613EVS has problems with dust and debris getting clogged in the rubber boots that surround the plunge posts. For portable use, the best plunge routers we've used are the ELU 3304/DW614 and DeWalt's DW626.

Your magazine has definitely improved over the past few years. Keep up the good work.

John Swanson
Renton, WA

Good-Looking Lowboy

I was looking for a project to work on last summer. When I locked in on the "Queen Anne Lowboy" by Lonnie Bird,



Built from plans in issue #38, G.C. Aubineau's lowboy has drawer fronts made from madrone burl.

the search was over. I used madrone burl instead of walnut crotch for the drawer fronts. I had never done any carving and was a little afraid I might ruin the legs, which were the most expensive parts. With a little practice and lots of help from my carver friend, I got the feet done. The lines aren't as crisp as on Lonnie's lowboy, but the finished project still looks good. Keep up the excellent work.

G.C. Aubineau
Vista, CA

Warped Plywood Revisited

After reading Mark Stryker's letter ("Warped Plywood," AW #37), I thought his problem must have been poor quality plywood carried by the discount home centers. But I recently purchased several sheets of 3/4-in. birch A-grade ply and after ripping them I found some to be better suited to building a canoe than a cabinet. What gives?

Jim Barreiro
Granda Hills, CA

The Hardwood Plywood and Veneer Association replies:

The fundamental cause of warpage in plywood is an imbalance in the stresses on opposite sides of the central plane of the panel. These stresses arise because of wood's normal tendency to shrink and

swell in response to changing moisture conditions.

Moisture-induced stresses can occur in response to manufacturing characteristics such as unequal thickness, density, grain alignment or moisture content of opposing veneer layers. Even in a highly controlled manufacturing environment, panels have minor imbalances because no two wood plies are exactly the same. But these imbalances usually aren't significant enough to cause warpage. However, changing moisture conditions during panel storage or use can magnify minor imbalances and cause problems.

Here are some recommendations to minimize problems with warpage in hardwood plywood:

- Try to obtain plywood which complies with the HPVA Interim Voluntary Standard For Hardwood and Decorative Plywood. The label or tag for this compliance should read: "HP-1 1993" or "HPVA-HP-1." Plywood manufactured in compliance with these guidelines is not guaranteed to be free of warpage. However, general provisions of the standard do require that panels maintain sufficient flatness for the intended use and the purchaser will have better recourse should any problems (including warpage) arise. If plywood made to the HPVA standard isn't available from your usual supplier, try a more specialized architectural woodwork supplier.

- Maintain reasonable temperature and humidity and prevent uneven moisture absorption. A panel edge or face that is exposed to higher moisture (such as an edge resting on a damp floor) will promote the uneven stresses that can cause warping. When panels are finished, equal or similar treatment of both sides will help maintain balanced movement of moisture in and out of the panel, thereby helping to maintain balanced stresses and flatness.

- Confirm your core requirements. If flatness and stability are of extreme importance for a particular application, you may reduce the potential for warpage problems by using panels with a core of particleboard or fiberboard.

Russell Chapman, HPVA
Reston, VA

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CIRCLE NO. 33 ON PRODUCT INFORMATION FORM

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To Err is Human

Did you catch the spelling mistake on last issue's cover? We did, but not in time to stop the print run. Among the projects listed near the cover's top right corner is something called a "Sculpture Game." The mystery becomes clear

inside the issue. We thank readers for their understanding.

Also: The illustration on page 79 of our December issue (AW #42), was mistakenly credited to Frank Rohrbach. The artist who deserves the credit is Heather Lambert.

Feedback on the Buyer's Guide

We were disappointed not to be included in your special Buyer's Guide issue along with other manufacturers of radial arm saws. Based in Modena, Italy, OMGA is one of the world's leading

More Drill Presses

Missing in the Buyer's Guide chart on drill presses were models from Jet Equipment and Tools (1-800-274-6848). Specifications on Jet's drill presses are listed in the chart below.

Model	List Price	Throat Capacity (in.)	Chuck Capacity (in.)	Quill Travel (in.)	Spindle Speed (rpm)	HP	Volts	Weight (lbs.)	Comments
BENCHTOP									
JET/JDP-8	\$193	4	0-1/2	2	620-3,100	1/6	115V	42	Positive depth stop rod.
JET/JDP-10	\$233	5	0-1/2	2 1/2	540-3,600	1/5	115V	70	Front-mounted switch.
JET/JDP-14J	\$343	7	0-1/2	3 3/8	460-2,500	1/2	115/230V	132	Table tilts & adjusts w/ crank; work lamp.
JET/JDP-14H	\$399	7	1/8-5/8	3 1/4	200-3,630	1/2	115/230V	132	Table tilts & adjusts w/ crank; work lamp.
FLOOR MODEL									
JET/JDP-14JF	\$412	7	0-1/2	3 3/8	460-2,500	1/2	115/230V	156	Table tilts & adjusts w/ crank; work lamp.
JET/JDP-14HF	\$455	7	1/8-5/8	3 1/4	200-3,630	3/4	115/230V	167	Table tilts & adjusts w/ crank; work lamp.
JET/JDP-17MF	\$477	8 1/2	1/8-5/8	4 3/8	200-3,630	3/4	115/230V	189	Table tilts & adjusts w/ crank; work lamp.
JET/JDP-20HF	\$871	10 1/2	1/8-3/4	4 3/8	150-4,200	1 1/2	115/230V	288	Table tilts & adjusts w/ crank; work lamp.





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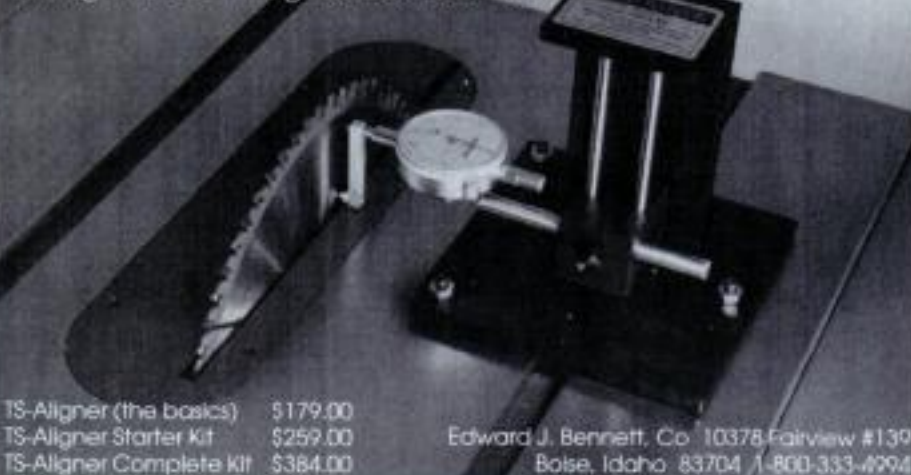
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manufacturers of radial arm saws. The company also produces power miter saws, picture frame machines and equipment for making wood windows and doors. Technical data on our product line may be obtained by calling (toll-free) 1-800-233-6642.

Frank A. Zaccaro
National Sales Manager, OMGA Inc.
South Bend, IN

About Our Special Issue...

AMERICAN WOODWORKER'S 1995 Buyer's Guide (AW #41), was published as a bonus issue to supplement our usual bimonthly issues. Due to the positive response we've received from readers, plans are under way for another Buyer's Guide issue—this one will be bigger and better than the first.

Edge-Jointing by Hand

Thanks for the 1995 Buyer's Guide—it's an excellent resource.

I've always challenged statements of

how indispensable a jointer is, especially for a small woodshop or a "basement operation" like mine. Over the years, AW has featured excellent articles on hand tool alternatives to jointer operations, like flattening boards with a hand plane, etc. But edge-jointing with a hand plane is only touched upon here and there.

Having started woodworking with the "Roy Underhill Approach," and having no space or cash for a jointer, my solution to edge-jointing came when my Record rabbit plane (model #778) arrived. I immediately attached a maple fence about 3/4 in. by 3 in. by 8 in. long to the plane's metal fence, driving screws through the pre-drilled mounting holes.

With the additional bearing surface of the auxiliary wooden fence, this plane cuts a true, square edge. It can remove incredibly fine shavings, but I can just as easily make heavy initial passes to quickly flatten rough-sawn edges. The

iron is quickly and easily adjusted in very small increments. Needless to say, this tool is also great for rabbeting. And it can also cut excellent tenons and tongues on end grain with the scoring nibs in place.

By now I own lots of power tools, so please don't think that I'm a hand tool purist. But I have managed to make trestle tables, corner cabinets, armoires and all kinds of other pieces that call for big-time edge-jointing—all without resorting to jointing by machine.

Tom White
Latham, NY

WHAT'S ON YOUR MIND?

We value your comments, complaints and corrections. Send your letters to: "Editor," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098, or telephone your message to us at (610) 967-7776. Fax: (610) 967-8956.

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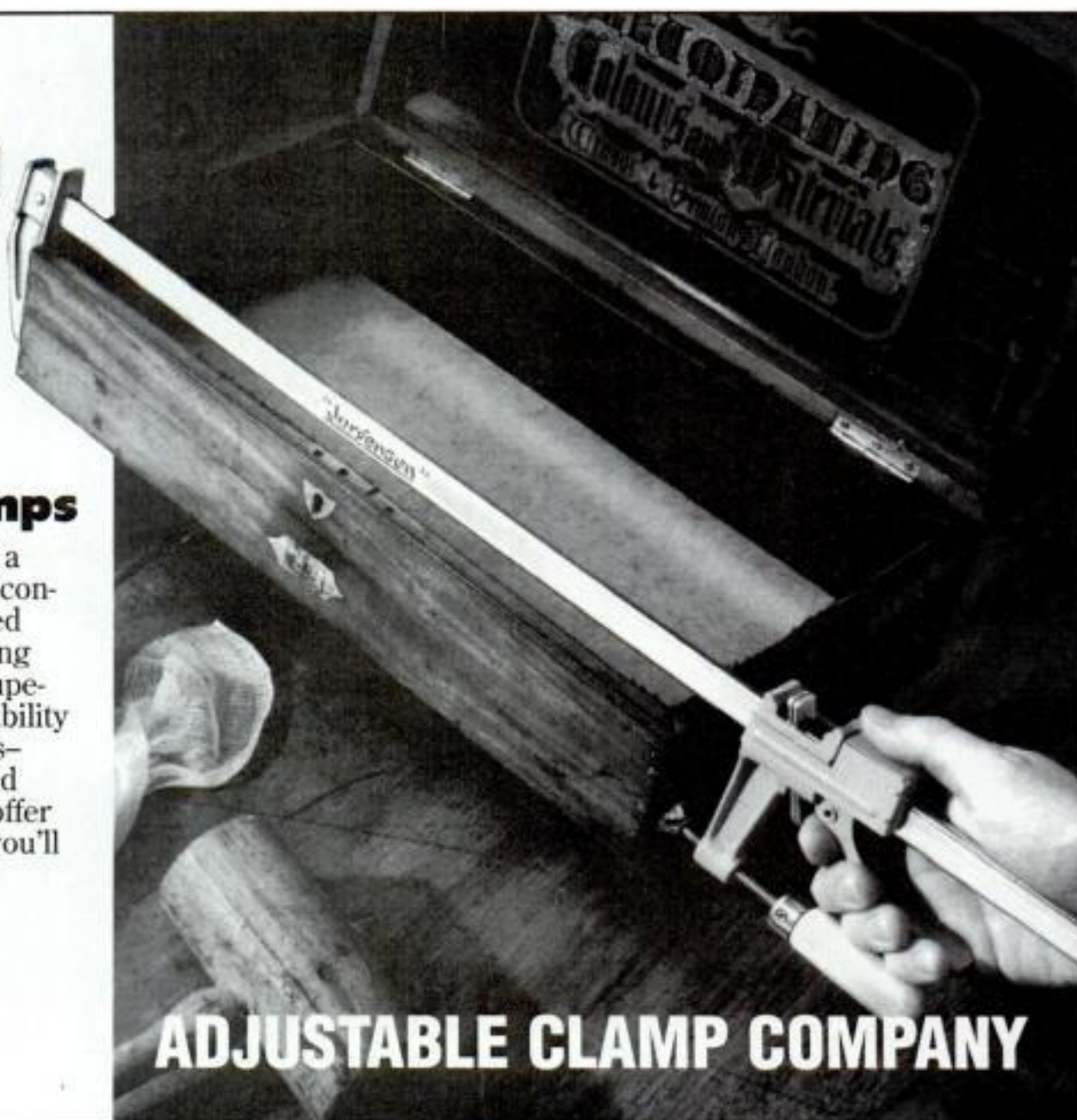
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Published by Helios Enterprises Inc.

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About the Author & Book

Mother of three, Sandra Levarek discovered at home the beauty and rewards of making traditional willow furniture. She collected and documented the various techniques of willow making from woodworking artists across the country. Amazed by how challenging and rewarding it was to make willow furniture, she began to share her knowledge with fellow woodworkers:

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Recreating the Flat on Japanese Chisels

Q What is the purpose of the oval-shaped hollows in the back of Japanese chisels? And what do you do when the chisel's edge runs into the hollows after a number of sharpenings?

D. Siever
Tucson, AZ

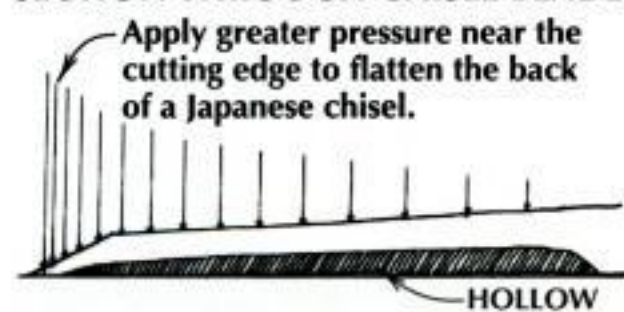
A Most Japanese woodworking tool blades are laminated with two steels. The steel on the front of the tool (the bevel side) is soft and shock-absorbent. The steel on the back, which forms the edge, is extremely hard. The hollows, which are forged (not ground) into the back when the blade is made,

reduce the amount of hard steel to be removed when the back is flattened.

On a new chisel, the hollows stop just short of the blade's end, leaving a narrow flat right behind the cutting edge. The flat does eventually disappear from repeated sharpenings.

To recreate the flat, rub the chisel back on a *kanaban*, or steel lapping

SECTION THROUGH CHISEL BLADE



plate, using a pinch of carborundum powder and a few drops of water. Apply more pressure near the cutting edge than at the rear. (See drawing.)

For more information on sharpening Japanese chisels and plane irons, see "Japanese Blades," AW # 18.

Toshio Odate
Author, sculptor and shoji maker
Woodbury, CT

Restoring a Damaged Floor Finish

Q We recently installed oak floors in our home, staining them with Watco 5-minute stain and finishing them with several coats of Watco clear floor finish. Since then, we have cleaned

Plane Crash Surgery

Q I dropped one of my favorite old cast iron block planes on the concrete floor. It broke in two pieces right at the throat. Is it possible to repair such a break?

Floyd Ellis
St. Louis, MO

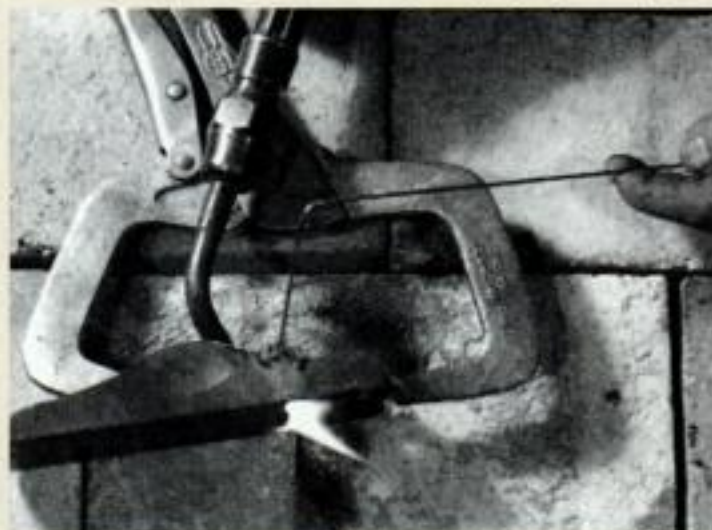
A One of my own old planes broke just as you've described. (See photo, below.) Older planes with thin castings are particularly susceptible to this damage. Fortunately, they can often be brazed back together for much less money than it would cost you to replace them. Your major cost will be the time it takes to reflatten the plane's sole after it is distorted from the brazing process.

Brazing is soldering with a non-ferrous alloy (like brass) that melts at a lower temperature than the metals being joined. Repairing a plane by brazing involves four steps: preparation, brazing, clean-up, and flattening the sole and sides of the plane. If you don't know how to braze, find someone who does; don't practice on your plane. You can do the preparation, clean-up and flattening processes. The brazing itself only takes a few minutes.

Prepare for brazing by stripping the plane of anything removable: throat plate, cap iron, knobs, etc.

Next, grind or file a 45° bevel on the edges of the mating pieces so that when they are clamped together, there is a shallow V-shaped groove to accept the braze. Don't bevel down to a feathered edge—leave about 1/3 of the metal's thickness to butt back together. You'll need to choose whether to bevel the inside or outside of the fracture. Brazing the inside of the plane is more awkward, but makes for a less conspicuous repair.

Now, clamp the broken pieces together; position the clamp along the centerline of the sole to minimize distortion from the intense heat. (See photo, below.) Use a torch to heat the iron around the break and to melt a brazing rod into the joint. Let the plane cool slowly (water-quenching is not advised), and clean up any projecting



Hot solution. Brazing is one way to rescue a broken plane.

lumps of brass with a file.

Check the flatness of the sole with a good straightedge. If the distortion is more than about 0.005-in., I would begin the flattening process on a belt sander with a 120-grit, cloth-backed carborundum belt. Hold the plane diagonally on the belt, occasionally switching the angle from left to right and cooling the metal in water when necessary. Continue until the surface seems reasonably flat.

A belt sander will only approximate a flat surface. For final truing, reassemble the plane and tighten the cap iron. This will distort the plane slightly and put it in its working configuration.

For a dead-flat abrasive surface, I use Fabricut mesh (available at hardware and paint supply stores), set on a piece of plate glass. I rub the plane in a circular motion on 80- or 100-grit mesh lubricated with plenty of water. When the sole is dead-flat, I move up to 150- and 220-grit mesh, moving the plane forward and backward. Next, I clean up each side of the plane in the same way. Lastly, sand all the surfaces with 600-grit wet/dry paper lubricated with oil.

Why not just buy a new plane? My excuse is that good old tools become like pets. Would you scrap your dog for breaking his leg?

Simon Watts
AW West Coast editor

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up some cat vomit from the floor and noticed that the color was lighter in that spot. How can we restore the floor to its original stained color?

Susan Smith
Harrisburg, PA

A As you've discovered, your cat's stomach acid has the ability to break down an oil finish if given sufficient time. Chances are, some of the stain migrated into the oil finish, which accounts for the light spot remaining even after applying more oil. To worsen matters, most commercial stains contain, in addition to pigments, dyes that are broken down by acids.

Try mixing some stain with a bit of floor finish. With a small brush or rag, carefully spread a thin, even coat of the mixture on the spot. Let it dry, then repeat if the color is still too light. Since the stain is diluted by the finish, you'll be able to creep up on the color gradually. When you're satisfied with the

match, give the spot a final coat of clear finish, feathering it out into the surrounding area. The touch-up may not be the cat's meow, but it will probably fool the casual observer.

Michael Dresdner
Finisher and cat lover
Nazareth, PA

Weather-Tight Frame-and-Panel Door

Q I plan to make a frame-and-panel exterior door. How should I build it to prevent rain from running down into the bottom panel groove and rotting the wood?

Bob Howard
St. Paul, MN

A I have examined a lot of old doors (some made over a century ago) and have never seen any rot problems when a properly built door has been painted or varnished regularly.

When you're constructing an exterior door, the grain on the panel should run vertically so that any expansion and contraction of the wood takes place from side to side. Allow for about $\frac{3}{32}$ -in. at each side for every 12-in. of panel width. Using quartersawn lumber will reduce movement. The panels should require a light press-fit into the door frame and should bottom out in the upper and lower grooves, filling those spaces completely.

When using applied moldings instead

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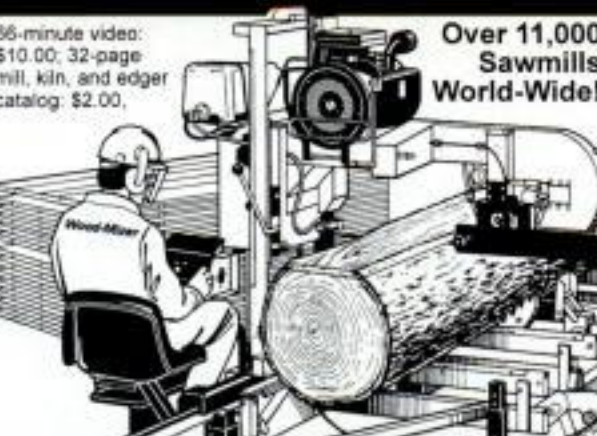
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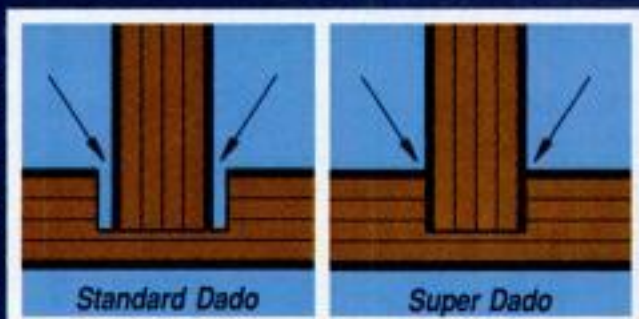
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of grooves to hold a panel in place, put the moldings on the exterior side of the door. Epoxying them to the door frame on a stained door avoids nail holes. For painted doors, prime the backs of the moldings before installing them.

Bill McCarthy
Architectural woodworker
Riegelsville, PA

Storing Hide Glue

Q I occasionally use small amounts of hot hide glue, but I'm always throwing away batches of it after it starts to spoil in the pot. Is there any trick for preserving this stuff?

Bob Wert
Red Head, FL

A There's a tip I picked up from gilders, who use rabbit skin glue in their work. This is an animal glue like hide glue, and both are subject to forming mold, which spoils the glue.

I use a commercial glue pot to heat

the glue, but I replace the big inner sleeve liner with a smaller glass jar. (If you don't have a glue pot, heat the jar in a pot of hot water on a stove.) After a work session, I let the glue cool, then put a lid on the jar and pop it in the refrigerator; it will last for several months.

You can also mix a large quantity of glue in a glass jar, heat it to a cream-like consistency, cover it and put it in the refrigerator. After it cools to a gel-like state you can scoop out as much as you need for a particular job, put it in a smaller jar and heat just that amount.

Chris Storb
Furniture restorer
Riegelsville, PA

Old Wax

Q My homemade wax of carnauba, beeswax and turpentine is now dry as a bone. Will turpentine and heat bring it back to a workable paste?

Mark Smallwood
Boise, ID

A Waxes have an almost indefinite shelf life, you can rejuvenate your mixture with turpentine, mineral spirits or VM&P naphtha. You may get away without reheating if you break up the wax cake first and stir it well with your solvent. If you use heat, do so carefully in a double boiler and watch it closely—the mixture is highly combustible.

Experiment with different solvents to get the workability you want. In general, naphtha evaporates more quickly, while mineral spirits or turpentine will produce a wax mixture that provides more time for rubbing before buffing.

Michael Dresdner
Finishing consultant
Nazareth, PA

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As a courtesy to all Sears/Craftsman tool owners, I bequeath this most prized piece of information to you:

Sears Teleparts Order Department. Call toll-free: 800-366-7278. Hours: Monday-Saturday 6:30 A.M.-9:00 P.M., Sunday 6:30 A.M.-6:00 P.M. (central time). —Mark Lockhart

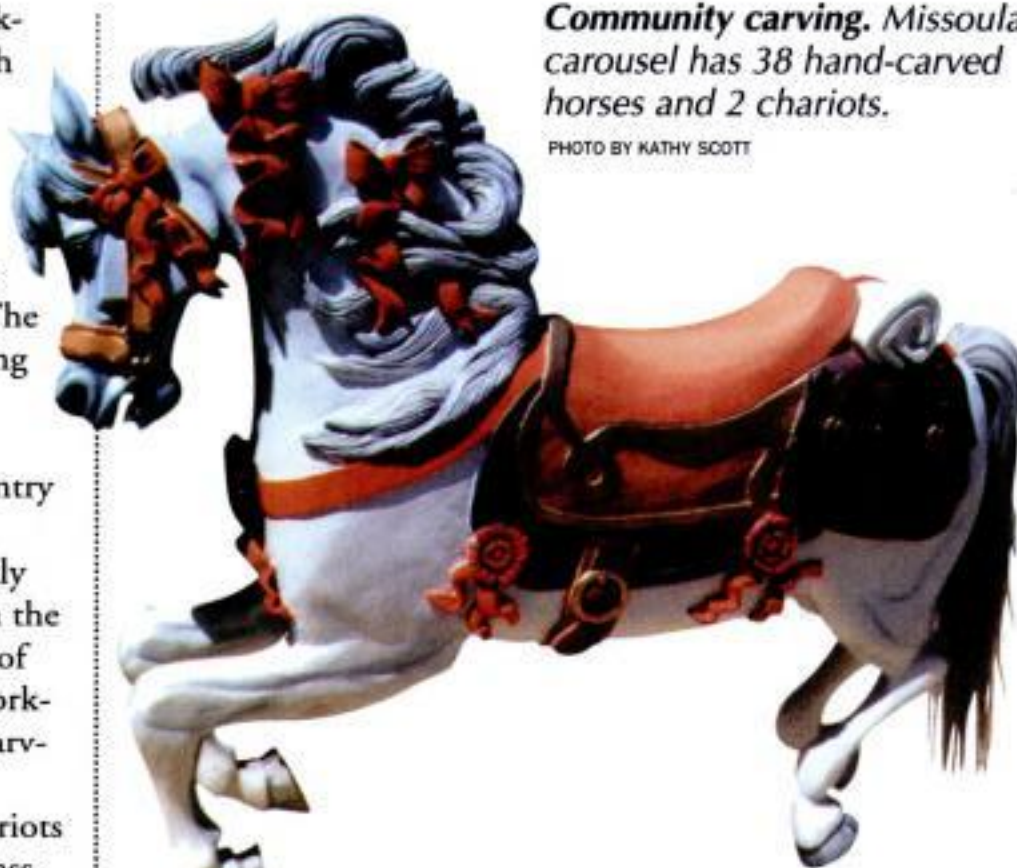
If you have a news item, unusual story or opinion to share, send it to: "Offcuts," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.

MONTANA TOWN GOES CAROUSEL-CRAZY

Missoula cabinetmaker Chuck Kaparich was only going to carve one carousel horse for fun. But word of his project got around town, and soon everyone wanted to lend a hand. The result? The town is putting the finishing touches on the first hand-carved carousel built in this country in more than 50 years.

About 45 carvers, mostly amateurs, are working on the project along with crews of sanders, painters, steel workers and others. They're carving 38 horses and two wheelchair-accessible chariots out of almost 8 tons of basswood. And everyone is pitching in to pay for the project. Schoolchildren raised \$10,000 in pennies—that's about 3 tons of spare change—and local families, civic groups and businesses have also contributed.

Since many horses are



Community carving. Missoula's carousel has 38 hand-carved horses and 2 chariots.

PHOTO BY KATHY SCOTT

sponsored by businesses, their decorations reflect a wide variety of themes, from traditional flowers and ribbons to construction tools. Music for the carousel will come from a circa-1918 band organ.

If you'd like to admire the

beautiful craftsmanship of some of these playful carousel horses, you can order a 1995 "Carousel for Missoula" calendar featuring full color photos. Send \$10 plus \$3 S&H to: A Carousel For Missoula, P.O. Box 3345, Missoula, MT 59806.

CRAFT EMERGENCY RELIEF FUND: A FRIEND IN NEED

Michael Bauermeister, a self-employed cabinetmaker and bowl-carver in Augusta, MO, had a rough year in 1993. First he fell off a ladder and broke his back. Then floods sent the Missouri River through his workshop, destroying much of his equipment. Fortunately, he found out about CERF, the Craft Emergency Relief Fund. CERF gave Bauermeister a loan and put him in touch with sources to replace his tools at special discounts. Bauermeister says, "CERF really came through for me... it was like an extended family

of craftspeople out there that I didn't know existed."

CERF is a nonprofit foundation that provides immediate support to professional craftspeople suffering career-threatening emergencies such as fire, theft, illness and natural disaster. To qualify for aid, you must be a professional craftsman who has been working for a minimum of two years. You must earn the vast majority of your income from your craft, and you must have suffered a disaster not of your own making. CERF help is confidential and comes in two forms:

loans and referrals to participating suppliers who offer special discounted goods or services. Between May 1993 and April 1994, CERF gave out more than \$65,000 in loans, goods and services.

Donations are welcome. While CERF cannot accept physical donations of tools, etc., it will match donors with needy craftspeople.

CERF is the only organization of its kind in the US. To make a donation or to apply for aid, write: CERF, 245 N. Main St. #203, Northampton, MA 01060, or call: (413) 586-5898.

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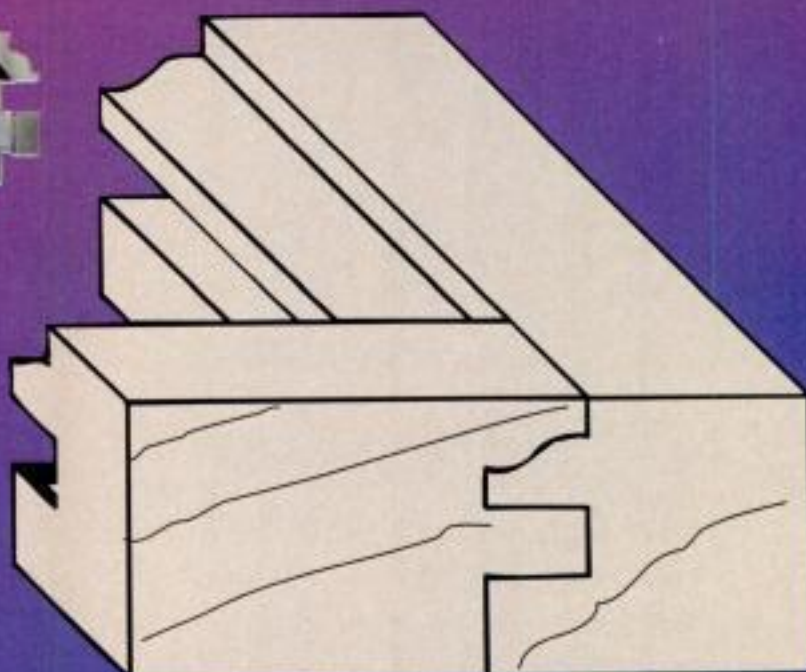
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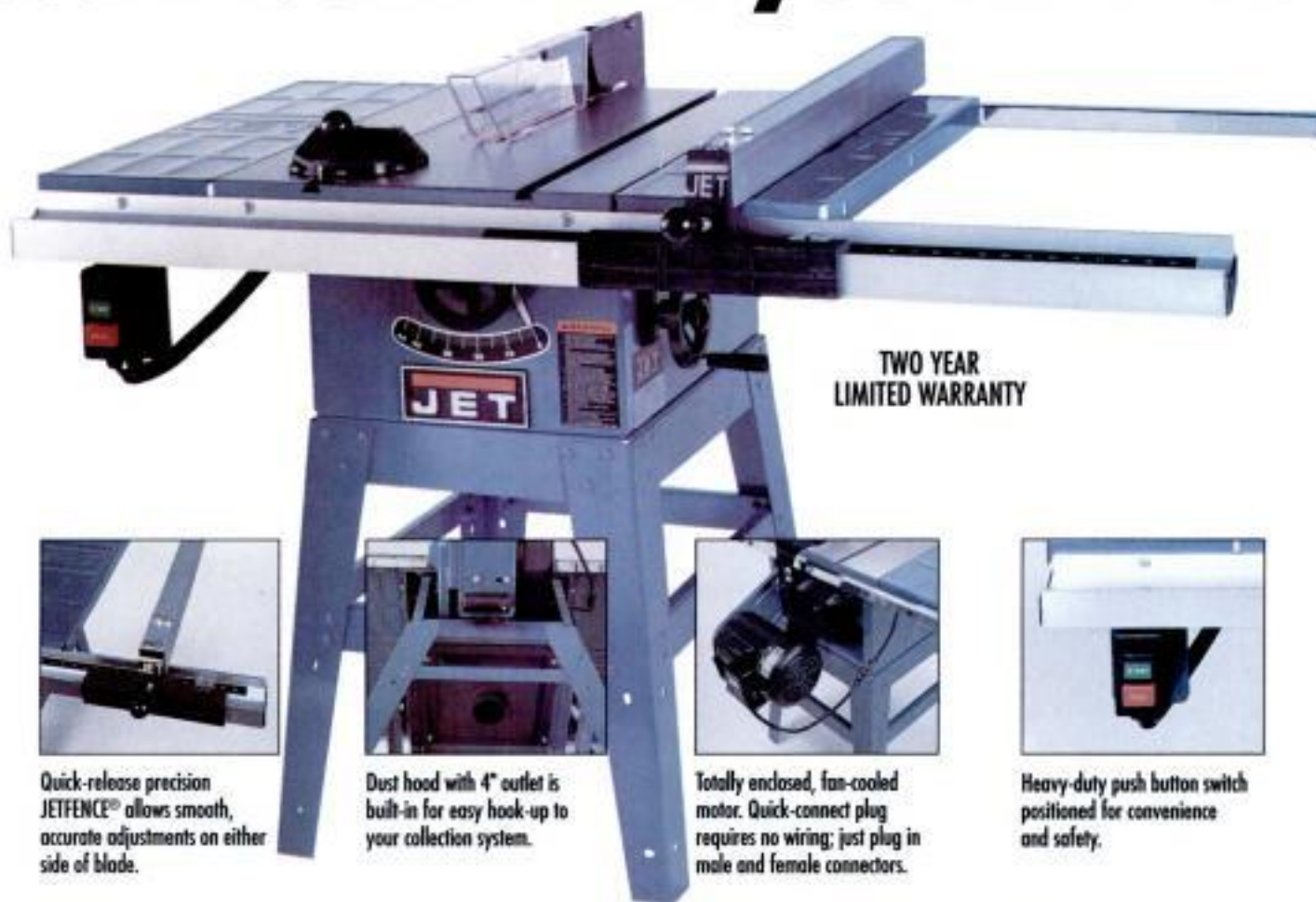
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SPECIAL-NEEDS STUDENTS BUILD CHAIRS WITH PRESIDENTIAL APPEAL



A special touch. Bill Perkins, a member of the Roaring Lion Chair Company, works on an Adirondack-style chair.

PHOTO BY VERA KLINKOWSKY

Making an Adirondack chair for President Clinton or former President George Bush is an achievement that would make any high school student proud. For students at the Roaring Lion Chair Company in Vernon, NJ, the accomplishment is especially satisfying. Vernon High School

woodshop teacher Jim Quinlan founded the company in conjunction with the school's shop program to give neurologically handicapped students more opportunities to acquire work-related skills and attitudes.

Many of the students have reading disabilities or attention deficit disorders. But this

doesn't impair their enthusiasm or their ability to create fine pieces of furniture.

"The chairs are cut, sanded and built by the students. I provide minimal hands-on-assistance, while acting in an advisory nature," explains Quinlan.

The company has provided tremendous benefits to the students. "I learned how to cooperate with others," beams company employee Mandy Livak. "I'm confident. Everyone gets along. It's like a real job." Another member added, "I enjoy working with people."

After the chairs have been completed, they're checked for imperfections before they are marketed through local displays, flyers and newspaper coverage.

Entering its fourth year, the company has sold over 150 chairs. In 1992 and 1993, the entire stock of chairs sold in two days. Teachers, parents,

residents and business people buy the chairs, which cost \$75 a piece.

Vernon High teacher Paul DeCoste is a true Roaring Lion fan, having purchased six chairs over the last several years. "They're excellent quality and very comfortable," says DeCoste. "The chairs are made with heart and soul."

The Roaring Lion Chair Company makes approximately \$2,500 annually in profits, which is used for entertainment, hikes and company clothing.

In 1991, the company's first chair was sent to former President George Bush. He responded in a thank-you letter by saying, "It's important we consider the excellence that is achieved by students." Former New Jersey Governor Jim Florio received a chair in 1992. He described the chair as "an emblem of excellence in our industrial education program and school system."

Recently, the company sent a chair to First Lady Hillary Clinton. President Clinton sent them a thank-you letter.

After graduation, approximately half of the students involved in the company go on to pursue woodworking careers, such as a carpenter's helper, in industries, factories and businesses.

"The true essence of the Roaring Lion Chair Company cannot be measured in sales or skills, but rather, the personal pride each student takes in his or her work, as well as the accomplishments of the group. Each student leaves the shop with a genuine sense of worth and self-confidence every day," concludes Quinlan.

—Vera Klinkowsky

THE SCREW

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an aging hinge must be removed.
To unhinge the hinge that holds the door
a rusted screw must be unscrewed.

I push and twist and hit and scrape
and groan and sweat and curse like sin,
And begin to think evil thoughts about
the one who drove it in.

Did he think of me when he marred the groove
and chipped a corner off the head?
Or was his mind on bread and wine
and other things instead?

Did he ever think back in later years
and regret his sloppy work?
Or was skill in craft not the point at all—
like beer drunk mostly for the burp!

Today,
A clean new screw holds the hinge in place
and all admire who come about.
But the one I hope will approve the most
is the next to take it out....

—Warren Park



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ITEM#	DESCRIPTION	PRICE
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550	Pocket Cutter Kit w/steel case	\$183.
2620	3/8" HD Drill W/S 4.5 amp.	\$ 95.
9853S	Cordless Drill Kit, 12V, 2 batt.	\$167.
556	Plate Joiner Kit, tilt fence, case	\$167.
410	Battery® Underscribe Trimmer	\$149.
7310	Laminate Trimmer, 5.6 amp.	\$ 90.
97310	Trim Kit	\$197.
9690	1 1/2 hp Router, 10 amp - steel case	\$145.
691	1 1/2 hp D-handle Router - 10 amp.	\$149.
7536	2 1/2 hp Router - production base	\$203.
7539	3 1/4 hp Plunge Router W/S	\$261.
9352 VS	3 x 21 VS Belt Sander - steel case	\$169.
362	4 x 24 Belt Sander	\$194.
505	1/2 Sheet Sander	\$120.

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333	# 332 w/dust pick-up, H & L pad	\$ 74.
334	# 333 w/P.S.A. pad	\$ 74.
97336	6" HD Ran. Or. Sander - steel case	\$136.
97336	6" HD Ran. Or. Sander - steel case	\$139.
345	Sawboss 6" saw	\$105.
447	7 1/4" Saw - 15 amp - w/electric brake	\$138.
843	"New" #447 Saw w/blade on left side	\$138.
7116	24" Omnipig® Dovetail Machine	\$294.
7700	10" Miter Saw	\$344.
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—American
Woodworker

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**T-Slot
Saw
Fence**

- Units available individually or as a complete system to provide you greater flexibility when upgrading your table saw
- *Guaranteed* to increase the accuracy and productivity of your table saw
- Quick, easy installation. Fits *all* table saws
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the Excalibur T-Slot
fence comes out
first..."

—Fine Woodworking Magazine

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You can have it ALL with a
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retracts out of the way when
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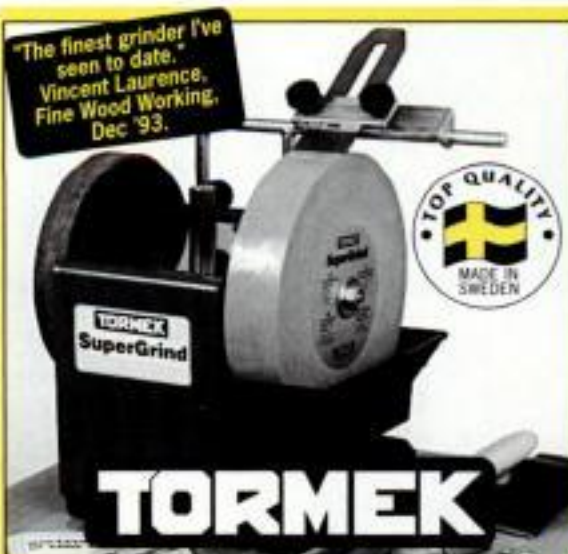


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- Water cooled SuperGrind stone can be switched from fast grinding at 220 grit to fine grinding at 1000 grit using the TORMEK Stone Grader.
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CIRCLE NO. 78 ON PRODUCT INFORMATION FORM

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only \$119 (list \$156, save \$37!)
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in sharpening
discount coupons.
(Total Savings \$82
OR MORE!!)

**Outperformed 36 other
premium blades.**

Wood Magazine test, Sept., '93, pg. 45.



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That Leaves
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BLADES OR DADO SETS. Offer good through Jan. 31, 1995.

Must mention AMERICAN WOODWORKER to receive coupons and extra bonus.

WOODWORKER II	List	SALE
14" x 40T x 1"	\$215	\$149
14" x 30T x 1"	T95	139
12" x 40T x 1"	T83	129
12" x 30T x 1"	T62	119
10" x 40T x 1/8" or 3/32"	T56	119
30T 1/8" or 3/32"	T95	99
9" x 40T	T46	109
30T	T25	99
*8-1/4" x 40T 3/32"	T96	99
8" x 40T 3/32"	T96	99
30T 3/32"	T15	89
7-1/4" x 30T 3/32"	T12	69
**NEW 6" x 40T 3/32"	T96	89

***NEW For Sears & Makita Table Saws **For Saw Boss**

5/8" holes, boring thru 1 1/4" add \$7.50

Larger at Time Basis Shipping \$4.50

FOR BETTER CUTS on all brands of blades, use our
large 1/8" DAMPENERS-STIFFENERS against one side.

- Parallel and flat to .001"
- Stop vibration, flutter, CUTTING NOISE and blade ring
- Tryable and returnable for full cash refund

4" ...	\$21
5" ...	24
6" ...	25

FULL RANGE OF OTHER INDUSTRIAL SIZES

Dear Sirs,

Never before had I seen your blade in action, but I wouldn't have believed it if I had not seen it! I was so impressed with the glass-like cut the Woodworker II blade made on various wood types that I went to "Woodworking Unlimited" the next day and bought your dado set!

David Sharp
Sugar Land, Texas

Dear Sir,

When I first saw your ads for your saw blades, I thought that if one quarter of what you were claiming was true, the blade would be worth buying. Now having bought and used one, I have found all of your outrageous claims to be justified - it's a terrific find!

Peter Lauritzen - Carpentry
Tesque, NM

P.S. I hope to see these available in 7 1/4" size in the future, for skisaws.

"They are right now, Peter."
Jim Forrest

Gentlemen,

I have used many different blades during my forty plus years of working. There is absolutely no comparison to any other blades on the market and your WW I & II blades.

Kenneth L. Salisbury
Huntsville, AL

(From Another Customer)

In closing I would like to add that the Woodworker II blade is by far the finest saw blade that I have ever used. I also have the Forrest dado set which is without a doubt, the king of all dado sets. I work exclusively with red oak and oak veneer plywood and the dado set performs splinter-free cuts as advertised.

It is a pleasure to purchase a product that does what it is advertised to do. Thanks for making such a fine product.

Dennis R. Schule, Owatonna, MN

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New specs, 5° Neg. Pts. & flat, dial
.001/.002 for perfect, tight, smooth,
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NEW AVAILABLE SIZES

	List	SALE
Delta Sidekick 6-1/2"	6-1/2" x 40T x 5/8"	\$149 \$ 89
Sears 8-1/4" & Delta	8-1/4" x 60T x 5/8"	170 99
Hitachi 8-1/2" DeWalt 8-1/2" & Ryobi	8-1/2" x 60T x 5/8"	179 109
Delta	9" x 80T x 5/8"	204 119
Ryobi-Makita & all	10" x 80T x 5/8"	207 129
DeWalt, Makita, B&D & Hitachi	12" x 80T x 1"	229 139
Ryobi-Makita	14" x 100T x 1"	266 179
Hitachi	15" x 100T x 1"	277 189

For good general purpose cuts use Woodworker II 30T &
40T or Woodworker I

Use small stiffener where possible



QUIET! Also help all your other blades to cut better.
Use our 1/8" DAMPENERS-STIFFENERS, against one side.

4" - \$21
5" - \$24
6" - \$25

REDUCE NOISE 50%-75%

WE RECOMMEND OUR FACTORY SHARPENING as some local sharpening creates problems with Micro-chipped edges reducing blade life & cutting quality. 2-4 DAYS ON THESE AND ALL MAKES OF FLAT FACE & CONCAVE CARBIDE TIP SAWS. SHIP VIA UPS. Typical 10" x 40T \$15.00, 60T \$17.75. Add return UPS \$4.50 or 2nd Day Air \$8.

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this trim and crosscut ALL PURPOSE blade gives scratch free POLISHED cuts on all materials RIP or CROSSCUT up to 2".

- All 60T and 3/32" THIN KERT 30° ATB and 5° face hook on 10" dia and under, 12" and 14" are 20° ATB 1/8" K.
- DOUBLE HARDER and 40% STRONGER carbide.
- THIN KERT:

Saves 1/3 wood loss on each cut, radial or table. Feeds easy when used for moderate rip and crosscut on table saw. Reduces "JUMP IN" greatly for better "PULL CONTROL". Practically eliminates bottom splinter on RADIAL-CROSS CUT.

- Totally stops ALL bottom and top splinter on ply veneers in push-cut mode on RADIAL.
- Our STIFFENER STRONGLY RECOMMENDED AGAINST outside of blade only for best cuts.

Made and serviced in USA for your benefit.

	List	SALE
14" x 60T x 1" 1/8"	\$224	\$159
12" x 60T x 1" or 5/8" 1/8" K	198	139
10" x 60T x 5/8" 3/32" K	162	129
9" x 60T x 5/8" 3/32" K	156	119
8" x 60T x 5/8" 3/32" K	150	109
New 8-1/4" x 60T x 5/8" 3/32" K	150	109
New 7-1/4" x 60T x 5/8" 3/32" K	150	109

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OUT PERFORMS 29 + 32 OTHER DADO SETS WOOD Mag. Oct. 91, pg. 62/63 "Best Value"

8-5/8" Bore - List \$321 SALE \$289 • 10-5/8" & 1" Bore - List \$389 SALE \$349

Forrest Dado King (Superior) • Freud D3006 (Excellent) • V.A. 2674E (Good) • U.S. Saw 800-CRFD (Fair) • V.A. 2674T (Poor)

"No tearout on all five woods tested." Fine Woodworking July/Aug. 1991

DURALINE HI-AT For TABLE & RADIAL SAW

(very good on chop saw too!) STOP SPLINTERING those SPLINTERING OAKS, HARDWOOD VENEERS and thin 2 SIDE LAMINATES ON PARTICLE BOARD.

FOR FASTER FEED RATES AND MORE
ABSOLUTE SPLINTER CONTROL

DURALINE HI-AT

Note: Fine Woodworking

Editorial Nov./Dec. 1988

No. 73, pg. 65, S.N.

recommends high

alternating top bevel (ATB)

thin kerfs and large blade

stiffeners for smoothest

cuts on RADIAL SAW, etc.



Jim Forrest, President and designer
microscoping cutting edge.

All 5/8" holes. Boring up to 1-1/4" \$7.50 extra
Larger holes - time basis. Shipping \$4.50

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9" x 80T 1/8" & 3/32"	207	\$179
10" x 80T 1/8" & 3/32"	207	\$169
SPECIAL SALE 10" ONLY \$159		
12" x 80T x 1" 1/8"	212	\$181
12" x 100T x 1" 1/8"	253	\$215
14" x 80T x 1"	232	\$197
14" x 100T x 1"	266	\$226
16" x 80T x 1"	262	\$223
16" x 100T x 1"	294	\$243

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You've probably read the recent articles on the new "quiet" blades. But the fact of the matter is a Forrest 80 tooth Duraline Hi-AT with blade stiffener cuts 50% quieter than those so-called "quiet" blades.

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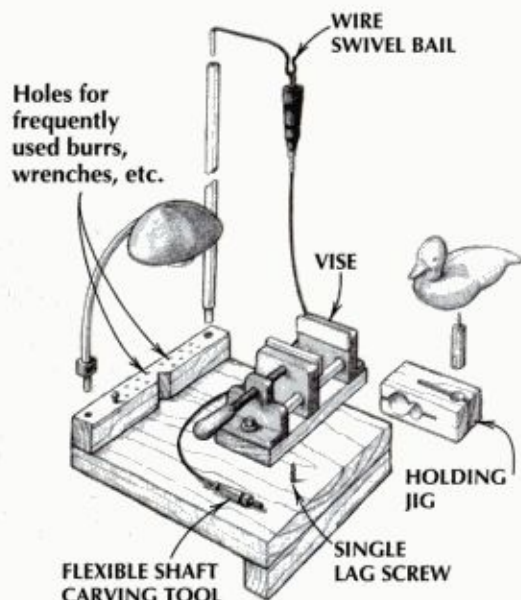
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Best Tip: Woodcarver's Bench Hook and Holding Jig

This is an ideal bench hook for small carvings and can be made from scrap 2x12. I mount the model-maker's vise on a short piece of 1x4 and then lag-screw it to the bench hook. By slacking the bolt I can rotate the vise to any convenient position.

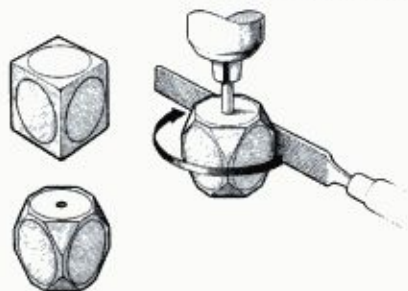
I made the carver's holding jig from a piece of 2x3, slotted and drilled for a 1/8-in. dowel as shown. To hold my work securely, I cut the head off a 2-in. drywall screw and epoxied the shank into the end of the dowel.

Chuck Malvern
Bremerton, WA

Turned Balls on the Drill Press

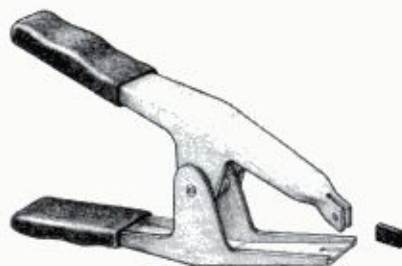
I needed to make a 1 1/2-in.-dia. ball with a hole in it. I started with a 1 1/8-in. cube, then scribed 1 1/2-in.-dia. circles on all faces. After sawing off the corners with a handsaw, I drilled a tapered hole and inserted a 1/4-in. hanger bolt. I then chucked the free end in the drill press and rounded the block with a rasp and files, finishing with fine sandpaper. Finally, I removed the hanger bolt and drilled a hole of appropriate size for the project. (See "Music Stand," page 34.)

Yeung Chan
Millbrae, CA



Add Bite to Your Clamps

Store-bought spring clamps are easily converted to miter clamps by adding swivel jaws. Remove the vinyl tips then



hacksaw a 1/2-in.-long slot down the center. Use needle-nose vise-grips to fold down the two halves of each tip, then drill a hole to take a small bolt or rivet.

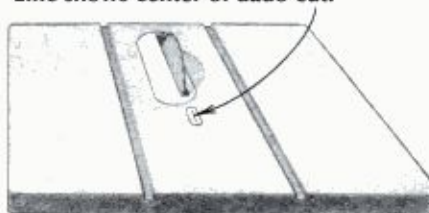
Snap off pieces of the hacksaw blade 1 to 1 1/4 in. long, drill holes through their centers and assemble as shown. For extra holding power, double the blades at each tip. Make sure the teeth point inward for maximum gripping power.

Bert Herrick
Sedona, AZ

Centering the Dado

When using an adjustable dado head I've had difficulty predicting the exact center of the cut. So I set the fence, started the saw and ran a piece of scrap over the blade. Then I marked the exact

Line shows center of dado cut.



center of the cut and transferred the line to an adhesive label on the saw table. Whatever the width of the slot, the center will always be the same. This won't work with stacking dados because adding chippers or filler blades moves the center of cut to the left.

Oscar Williams
Lincoln, NE

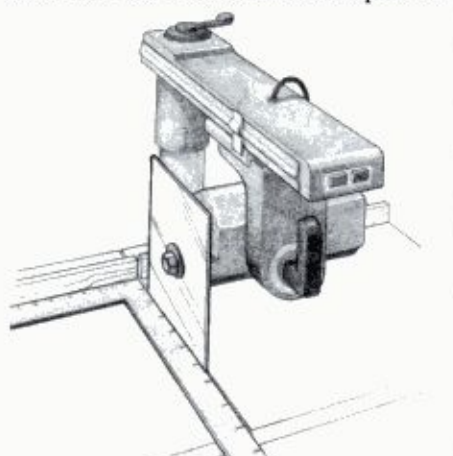
Thinning Glue

I recently wrote to the Borden company, asking what to do when their Elmer's Professional Carpenter's Wood Glue gets too thick to use. They suggested mixing in a drop or two of vinegar. It sounded like a "home remedy" but I tried it and found it really works.

Lewis Michener
Solebury, PA

Squaring a Radial Arm Saw

This jig takes the guesswork out of squaring a radial arm saw. Drill an arbor-size hole in the center of a piece of



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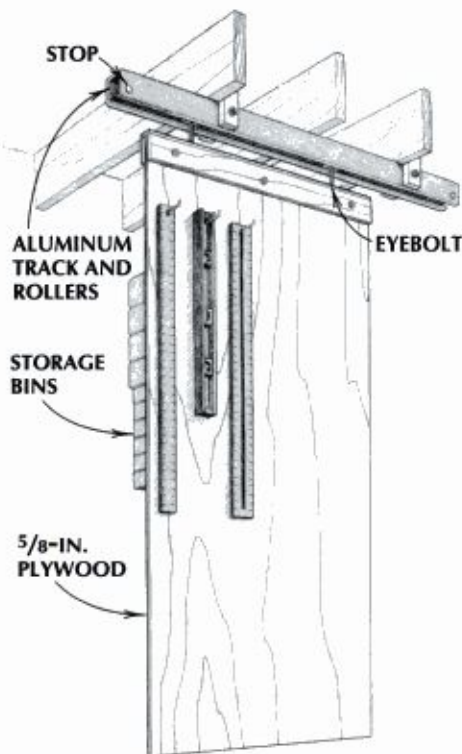
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flat aluminum sheet stock that's about 8 in. square and at least $\frac{3}{16}$ in. thick. Remove the blade and replace it with the aluminum square. You now have 8 in. to lay a framing square against—not just a couple of teeth on a circular blade.

Ron Tye
Yorba Linda, CA

Sliding Storage

Space is scarce in my basement workshop so I made a sliding storage wall. One side has 11 rows of storage bins; on



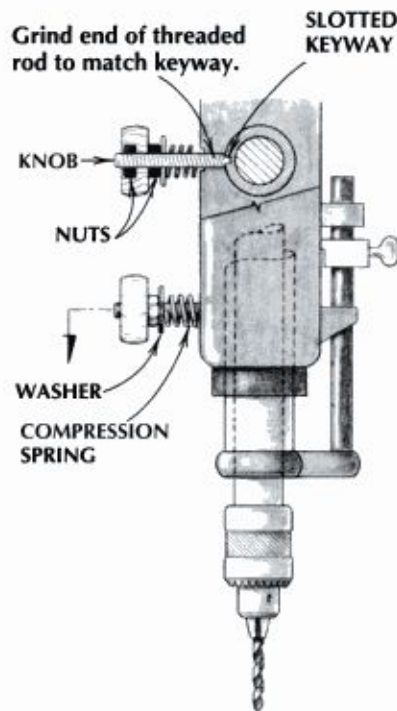
the other side I hang my straight edges, clamps, rulers and level. The whole unit is 3 ft. by 8 ft., but only $4\frac{1}{2}$ in. in depth.

Bill Davis
Orange, CA

Quill Lock-Up

When you're positioning work under the bit on your drill press, it's handy to clamp the quill—this keeps it from retracting when you let go of the spoke. But many machines lack this useful feature, so here's how to add it to your drill press.

Find the threaded bolt or setscrew that engages with a keyway cut in the side of the quill to prevent it from turning. Replace this assembly (slack the lock nut first), then find a bolt or machine screw



with an identical thread, but a couple of inches longer.

Grind down the end to match the original bolt, then make a wooden knob and fasten it with two nuts as shown. When screwed into the hole, this assembly will lock the quill in any position: Back it off a fraction of a turn and it will still engage the keyway while allowing the quill to move freely.

A compression spring under the knob will provide enough friction to keep it from wandering.

Tim Hanson
Indianapolis, IN

Clothespin Organizers

Some people hang mouse traps around the shop to hold notes, drawings, receipts, etc. I prefer wooden clothespins—the spring type. I glue them to shelves, to jigs, behind the bench—even to the overhead joists. Along with papers, they can hold pencils and felt-tipped pens.

Steve Tkaczyk
Gaithersburg, MD

No-Fault Hole Spacing

I recently made a kitchen cabinet with adjustable shelves. I had to space the shelf support pins exactly the same or the shelves would wobble. My solution was to buy a 4-ft.-long piano hinge which has

holes on 2-in. centers. I opened the hinge flat, lined it up with the edge of the cabinet and clamped it. Then I marked the center of the holes with a spring-loaded drill guide called a Vix bit (available from Woodworker's Supply, 1108 N. Glenn Rd., Casper, WY 82601, 800-645-9292). Make sure you orient the hinge so that the same end is down each time—the spacing of the first hole may not be the same at both ends.

Howard Kovarsky
Spokane, WA

Waxing Hot

When lubricating screws with paraffin wax I've noticed that most of the wax flakes off—especially in cold weather. Warm the tip of the screw with a match or lighter and lay it on a block of paraffin wax. This leaves a thin film of wax on the threads that stays put.

Alvin Cles
Boise, ID

Hand-friendly Scraper

Scraper blades are usually steel rectangles with sharp corners—all four of them. Finding this hard on my hands, I grind the blade to the more comfortable profile illustrated. Incidentally, the steel in

Shape to new profile
on bench grinder.



panel saws makes excellent scrapers. Take a worn-out saw to a sheet metal shop and they'll cut any size scraper blanks you want.

John Grew-Sheridan
San Francisco, CA

Sealing Caulking Tubes

Tubes of caulk—even with the cap on—tend to set up in a few days. By standing the tip in a small cup of water I've been able to keep the contents usable for as long as 6 months.

Frank Turner
Southport, IN

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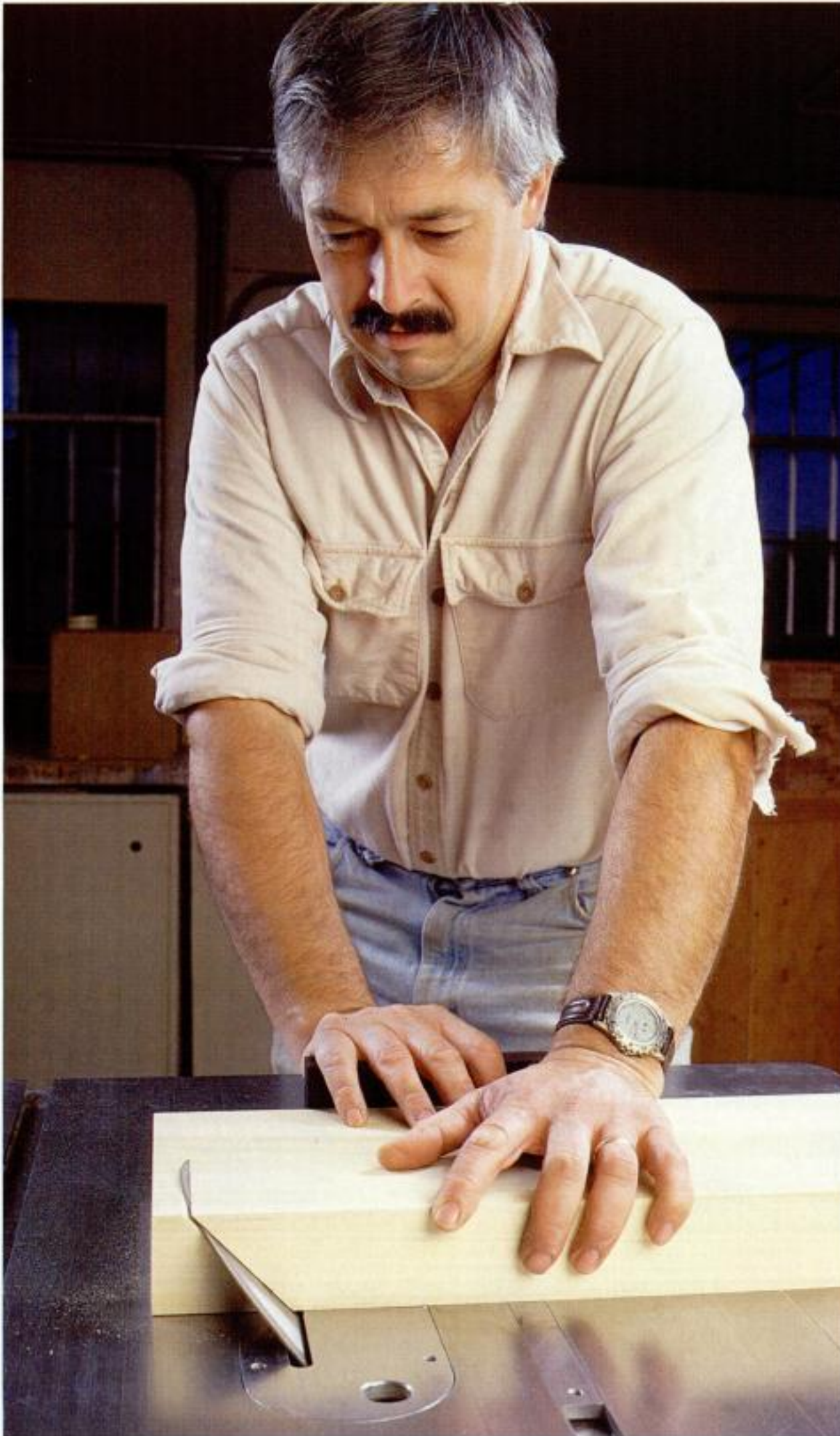
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SUPERTUNE YOUR TABLESAW

If Bevel Cuts Burn After a Standard Tune-Up, Your Trunnions Are Out of Alignment. Here's How to Fix the Problem.

By Tom Burroughs

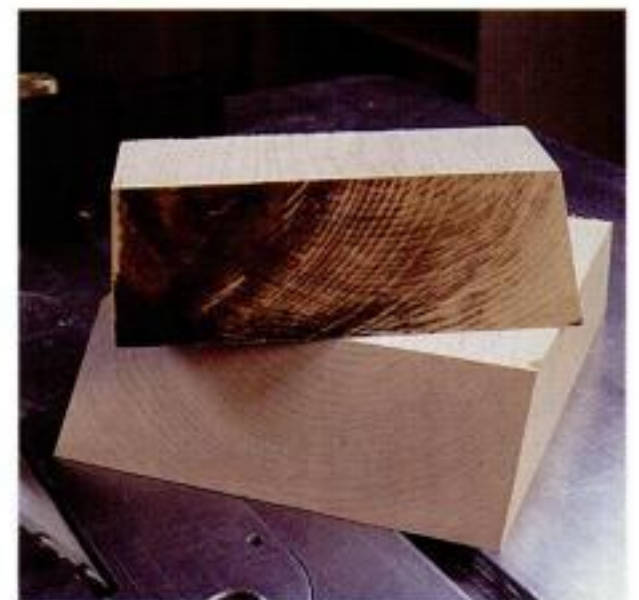


A poorly tuned table saw can ruin your whole day—as anyone who has pushed a smoking workpiece through a saw will tell you. What's more, the source of the problem might not be obvious. If it's not a dull blade or reactive wood, it could be the fence or the alignment of the blade.

Table saw owners' manuals tell you to align the blade parallel to the saw's miter gauge slots for safety, accuracy and smooth cutting. But, even after aligning your saw according to the directions, you may find that the saw binds and burns the wood when the blade is tilted.

How can your saw still be out of alignment after you've gone through the standard alignment procedures outlined by the manufacturer? The answer is probably that the table surface is not perfectly aligned relative to the saw's *trunnions*, the two semi-circular castings inside your saw on which the blade arbor and motor assembly rotate when you tilt the blade.

If one trunnion is higher or lower than the other, relative to the table surface, a tilted blade will be slightly cocked to the right or left (see Fig. 1) a condi-



A new slant on table saw tuning. Even a perfectly aligned blade may burn the wood when the blade is tilted, producing results as shown in the inset photo. Adjusting the relationship of the trunnions to the table will solve the problem.

tion known as "heel." If the heel exceeds the clearance between the sides of the teeth and the blade body—usually about 0.014 in. on carbide-tipped saw blades—the side of the blade will actually rub on the work and cause burning on the cut surface. Even when the heel isn't this severe, you can wind up with burned edges on bevel cuts from the sides of the saw teeth pressing against the wood.

To better visualize what happens, place the long edge of a business card on a table and tilt the card 45° to represent a tilted blade. You can see that the blade will be in line with the cut because the pivot axis (the edge of the card) is parallel to the table. Now, lift one end of the card off the table about 1/4 in. If you hold the card perpendicular to the table, you'll see that a vertical blade will still be in line with the cut. But, when you tilt the card 45°, it will be apparent that the blade is no longer aligned.

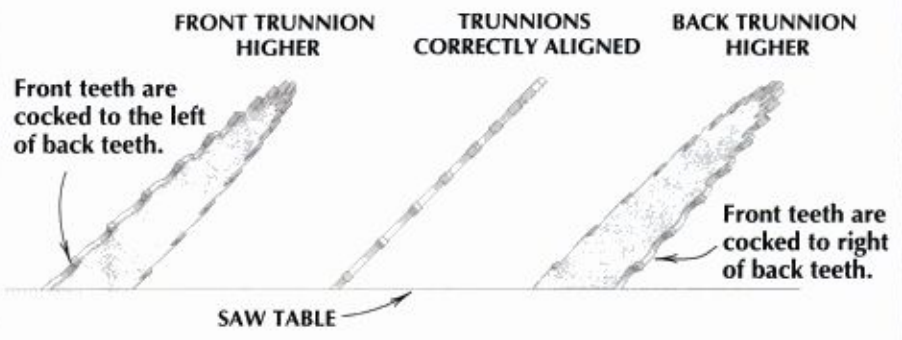
In my experience, I've found that the majority of tablesaw trunnions are out of alignment with the table. In this article I'll explain how to diagnose the problem and correct the trunnion alignment so your saw will cut straight and true, regardless of the bevel angle. In the interests of accuracy, you'll need a vernier caliper that can measure in thousandths of an inch.

Standard Alignment

Before you can measure trunnion alignment, you need to align your saw blade with the miter slot in the standard way—with the blade vertical—according to the manufacturer's instructions. (See AW #9 and #39.) For really accurate adjustments—within 0.001 in. to 0.002 in.—I recommend you replace the blade with an *alignment bar*, a flat metal bar about 1/4-in. thick by 2-in. wide by 12-in. long with a 3/8-in.-dia. hole about 1 1/2 in. from one end. I purchased mine ready-made as part of a kit from Exact Cuts Inc. (P.O. Box 268, Florence, OR 97439, 800-643-7411). The bar allows me to take measurements at a greater distance from the arbor than I could with a blade.

When aligning your saw, it's a good idea to set your blade height somewhere near the middle of the height range you use most, probably about 2 in. I recommend this because on some saws the casting and machining is so out of square that simply raising or lowering the blade will shift it out of parallel with

FIG. 1: EFFECT OF TRUNNION ALIGNMENT ON BEVEL CUTS



the miter gauge slot. By making your adjustments with the blade at an average height, you'll minimize this shift for most of your work.

Use a combination square or a caliper to measure the distance from the miter gauge slot to the bar at two locations—in front of and behind the table opening—then adjust the table according to the manufacturer's instructions to make the bar parallel to the slot. There are also special dial-indicator devices for measuring this distance. (See sidebar.) Only after you've run this standard tune-up procedure, are you ready to check out the trunnion alignment.

Measuring Trunnion Alignment

Now you're ready to check and correct the trunnion alignment. For this procedure, you'll need one or two blocks of metal about 3/4 in. square and 2 in. long, with square, flat ends and crisp edges. Brass bar stock (available from Small Parts Inc., P.O. Box 4650, Miami Lakes, FL 33014, 305-557-8222) works well. On saws where the blade tilts away from the fence, one block will do; if the blade tilts toward the fence, you'll need two blocks. Glue them together with cyanoacrylate glue, with the top block extending approximately 1 in. beyond the bottom block. (See Fig 2A.)

With the alignment bar mounted on the arbor (see photo, Fig. 2) tilt the arbor so that the bar is at a 45° angle. After making sure the table surface is clear of any sawdust or debris, place your brass block(s) on the saw table facing the bar and lightly touch the edge of the block to the bar. (See Fig 2A.) Now, measure the distance from the miter slot to the block in both the front and back of the table opening. Since the bar is tilted 45°, the difference between these

measurements will indicate how much your trunnions are out of vertical alignment with the table top. If the difference is greater than 0.004 in., the saw needs to be adjusted.

Correcting Trunnion Alignment

Correcting trunnion alignment is a simple matter of installing shims underneath the table, but figuring out where and how much to shim is a bit more complicated. Fig. 2A shows a formula for calculating shim thickness using the difference you found when you measured to the angled bar. If the arithmetic puts you off, you can make the adjustments by trial and error.

For shims, you can use washers of different thicknesses or 0.010-in.-thick aluminum flashing (available at hardware stores). For finer adjustments you can make shims from soda or coffee cans or use machinist's shim stock (available from Reid Tool Supply Co., 2265 Black Creek Road, Muskegon, MI 49444, 800-253-0421).

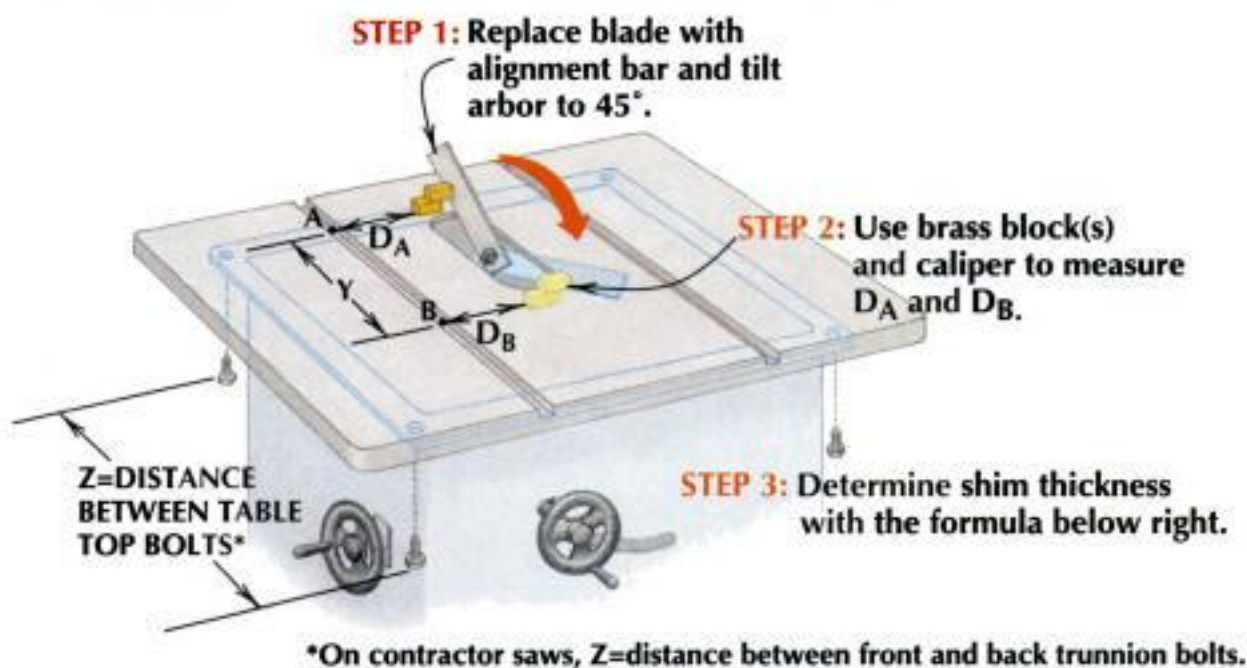
Exactly where you install the shims depends on the type of saw you're adjusting. On cabinet saws, add the washers or shim stock between the saw cabinet and table top. (See Fig. 2B.) On contractor saws, install the shims between the table and the brackets that hold the trunnions to the underside of the table top. You can generally access these bolts by lying on your back under the saw. Be sure to wear safety goggles to protect your eyes from any sawdust that might fall from the saw.

On saws where the blade tilts toward the left miter gauge slot, add the shims at the end of the saw where the measurement (D_A or D_B in Fig. 2A) is greater. If the blade tilts away from the left miter gauge slot, add the shims at

FIG. 2: CORRECTING TRUNNION ALIGNMENT

Aligning your tablesaw's trunnions to the table surface involves the two main steps shown here: 1. Measuring the misalignment; and 2. shimming the tabletop to correct the misalignment. For accuracy, you'll need a vernier caliper capable of measuring in thousandths of an inch.

A. MEASURING TRUNNION ALIGNMENT

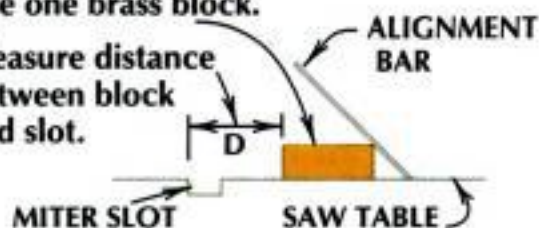


Finding the problem. With the alignment bar tilted, measure the distance from the miter slot to the bar fore and aft of the throat opening. Brass blocks aid in measuring.

IF BLADE TILTS TOWARD MITER SLOT

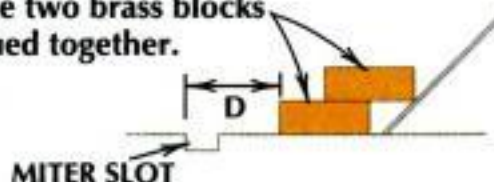
Use one brass block.

Measure distance between block and slot.



IF BLADE TILTS AWAY FROM MITER SLOT

Use two brass blocks glued together.



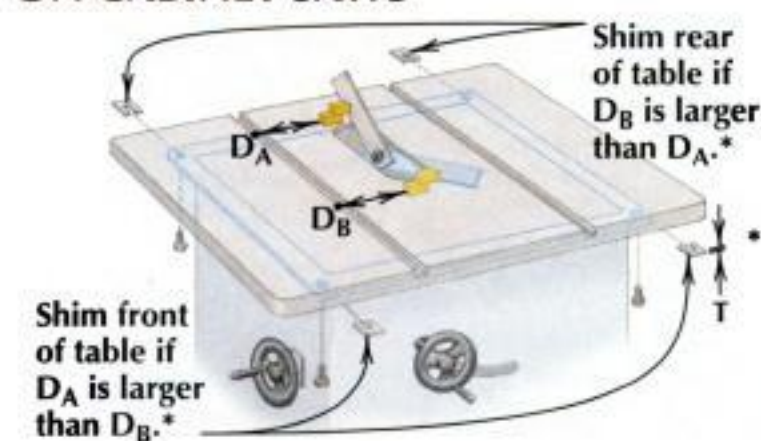
CALCULATING SHIM THICKNESS

To calculate shim thickness (T), use the formula: $T = (D_A - D_B) / Y \times Z$

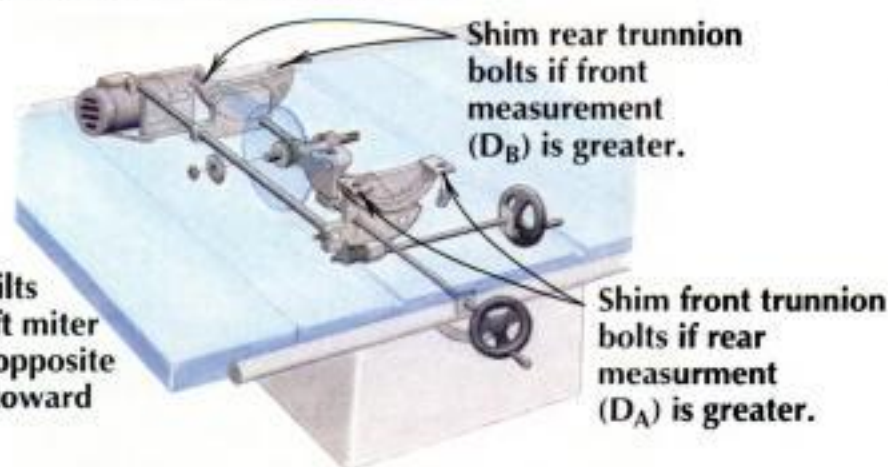
Example: If $D_A - D_B = 0.014$
 $Y = 12$ and $Z = 27$,
 $T = 0.014 \text{ in.} / 12 \text{ in.} \times 27 \text{ in.}$,
 $T = 0.031 \text{ in.}$

B. SHIMMING TABLE TOP TO CORRECT MISALIGNMENT

ON CABINET SAWS



ON CONTRACTOR SAWS



the end where the measurement is smaller. (See Fig. 2A.) After you install the shims, re-tighten the bolts.

Now, return the arbor and alignment bar to the vertical position and check to make sure it is still parallel to the miter gauge slot, making adjustments if necessary. Then, tilt the bar back to 45° and measure the alignment with the blocks as explained above. Strive for no more than 0.004 in. difference between the final front and rear measurements. If the difference is still greater than 0.004 in., add or subtract shims. If you

find that the difference is worse than before, it's a sure sign that you've installed the shims at the wrong end of the saw. Remember that each time you loosen the table top or trunnion bolts to add shims, you must again align the saw with the bar in a vertical position before you can re-measure with the bar in the 45° position. If you measure and calculate the shim thickness carefully, you'll stand a better chance of getting it right the first time.

Adjusted to these tolerances and using a good sharp blade, your saw

should cut as you have always imagined a saw should cut. With no side pressure, your saw blades will make cleaner,



TOM BURROUGHS is an engineer who has been working wood for 40 years. His home is in Arizona.

truer cuts and remain cleaner. More importantly, chances of your work kicking back will be greatly reduced. ▲

TABLESAW ALIGNMENT TOOLS

By Ellis Walentine

There are plenty of ways to align your saw blade to your table-saw's miter gauge slot. You can simply compare the distance at the front and the rear of the blade with a combination square or a thin stick (see AW #39), or you can measure the distance with a caliper. While such methods are adequate for blade alignment, there are times when you would like to measure other variables, such as fence flatness and blade angle. I recently checked out two measuring devices—the TS-Aligner and the Infinitii AAG-100—that make it easy to gauge these and other variables accurately and conveniently—but at a price. Here's what I found:

TS-Aligner

Inspired by measuring devices used in machine shops, the TS-Aligner (\$179) is a meticulously designed instrument that rides in your miter



The TS-Aligner can measure vertically and horizontally. Offset tip allows measurements close to the table.

gauge slot on three ball bearings and measures the distance to the blade or fence with a dial indicator. The aluminum block that holds the indicator's mounting shaft has two delrin sleeve bearings that move smoothly up and down on precision-ground stainless steel rods for measuring runout of vertical surfaces over a 3⁷/₈-in. height range. This vertical measuring ability allows you to check the squareness of the blade to the table, and, when used with the optional set of steel reference triangles (\$170), it lets you set blade tilt

angles to within 1/60°. Accuracy within 1/10° is possible with the standard "poor man's angle" feature. Other options include the molded case (\$60), a machinist's square for calibrating the tool (\$25) and a "long reach gauge" (\$40) that comes in handy for measuring runout at the arbor flange.

Like any new tool, the TS-Aligner took some getting used to, but it worked very smoothly and provided accurate and useful information about my saw. The well-written owner's manual is an education in itself and covers the tool's functions clearly and exhaustively. On the downside, I found the three-bearing arrangement tricky to set for a zero-clearance fit in the miter slot, but I was able to overcome this with a screwdriver and a little ingenuity. I also worried about dust fouling up the bearings and sleeves, but the manufacturer warrants the tool to be dust-proof.

(The TS-Aligner is available from Edward J. Bennett Co., 10378 Fairview #139, Boise, ID 83704, 800-333-4994.)

Infinitii AAG-100

The Infinitii AAG-100 (\$149.95) is less complicated to understand and use than the TS-Aligner and it has some different abilities. The heart of the tool is a precision dial indicator mounted on a brass bar. Also mounted on the bar is a movable brass fence that can either slide in a miter gauge slot or reference on the edge of a machine table, making the Infinitii useful for other shop measuring tasks as well.

For measuring angles and squareness, the Infinitii gauge relies on the fact that its tip is set exactly 1 in. above the bottom of the brass bar. When you butt the end of the bar against the object to be gauged, the indicator displays the displacement at the tip, 1 in. above the table surface. To find the angle that corresponds to this measurement, you look it up in a tangent table. (If the measurement is zero, the object is square to the table.) While not as accurate as a gauge that measures



The Infinitii AAG-100 measures distance at 1 in. above the table. The removable brass fence fits in the miter slot.

over a greater height range, the Infinitii is accurate enough for most woodworking purposes.

One feature I found somewhat frustrating was the slot-and-set-screw arrangement for adjusting the width of the brass fence. If you take out all the play between the brass fence and the miter gauge slot, it's difficult to move the gauge back and forth smoothly in the slot, which leads to choppy readings. The solution is to allow a tiny bit of clearance, but this compromises the accuracy slightly.

(The Infinitii AAG-100 is available from B.C. Ames Co., 131 Lexington St., P.O. Box 70, Waltham, MA 02254, 800-438-4249.)

Do You Need One?

The big advantage of precision measuring tools is that they can save you from having to adjust things by trial-and-error. With either of these devices you can "supertune" (see main article) your table saw without the brass gauge blocks mentioned in the main article. I found the TS-Aligner to be more versatile than the Infinitii for table saw measurements, but the Infinitii conceivably has more uses around the shop.

If I were really dependent on perfect angles and dead-square cuts, I wouldn't hesitate to buy one of these tools. But, for practical purposes, you can tune your saw acceptably with less sophisticated methods.

Music Stand

Flowing Lines Conceal Ingenious Mechanisms for Height and Tilt Adjustments

by Yeung Chan



Sleek lines. Height and angle adjustment knobs don't intrude on the graceful, all-wood form of Chan's music stand. He integrated these adjustment mechanisms into the base and rack assemblies.

One of the best things about being a woodworker is the freedom to make whatever furniture I desire for myself and my family. As designer, maker and customer, I can experiment with any style, construction and material I choose. When the Bay Area Woodworkers' Association sponsored their annual 2x4 contest, I decided to answer the challenge and, at the same time, make this walnut music stand for my younger son, Wesley. (See photo, left.) It may not look possible but this piece can be made from an 8-ft.-long walnut 2x4.

A music stand is a fairly simple piece of furniture but it must be adjustable to accommodate people of various sizes playing different instruments. I wanted the stand to have simple, clean lines without any protruding wing nuts or adjustment knobs. I designed it so that the height and tilt of the rack are controlled by hidden, spring-loaded friction devices. The mechanisms work very smoothly. Height and tilt adjustments can be easily made with only one hand. The tripod base is stable even on carpets or uneven floors.

Constructing the Base

The base is made from three identical legs fastened to each other with glue and biscuit joints. When laying out each leg on $\frac{7}{8}$ -in.-thick stock, make sure that the grain of the wood approximately follows the contour of the pattern to avoid any short grain weakness. (See Fig. 1.)

After cutting the legs on my bandsaw and smoothing out their edges with a spokeshave and drum sander, I made a special sliding table to bevel the joining end of each leg exactly 60°. (See photo, facing page.) Next, I used my biscuit joiner to cut two biscuit slots at the upper end of each leg. (See Figs. 2 and 3.) If you cut all six slots with the same fence setting, the slots are bound to match each other. Caution: Don't place the slots too close to the center or they will be bored out when you drill the post hole later.

Insert the biscuits and test-fit the joints, pushing all three legs together simultaneously. If necessary, trim the pieces until all the joints butt together nicely. While the parts are still together, make pencil marks where each leg butts into the next.

Disassemble the legs and rout a $\frac{3}{8}$ -in.-radius round-over on all four edges of

each leg, stopping at the pencil marks you just made. I recommend using a router table or shaper for this process.

Now, glue-up the base. Since it is nearly impossible to clamp, I just applied glue and held the pieces together by hand until the glue tacked. Then I cleaned off the squeeze-out. After the glue cured, I finished shaping the base with a carving knife.

Next, drill a $\frac{13}{16}$ -in. hole in the base for the post. To ensure a vertical hole, I used the drill press—supporting the music stand base on an auxiliary table clamped to the drill press table.

The friction mechanism that allows for vertical adjustment of the post is located in the wall of the post hole. (See Fig. 4.) A spring in a hole presses the wooden friction block against the post. My stand, with its one friction block, easily holds the weight of a magazine. You may want to install two or three friction blocks if you expect to be using heavy scores or books.

Making the friction mechanism involves three steps. First, drill a 1-in.-deep, $\frac{3}{8}$ -in.-dia. hole for the spring, coming up at a shallow angle from the bottom of the post hole. (Be careful not to drill all the way through the leg.) Second, chisel out a $1\frac{1}{4}$ -in. by $\frac{3}{8}$ -in. by $\frac{1}{4}$ -in.-deep mortise over the spring hole for the friction block. Third, cut the friction block from a blank with a handsaw. (See Fig. 5.)

Post and Ball Construction

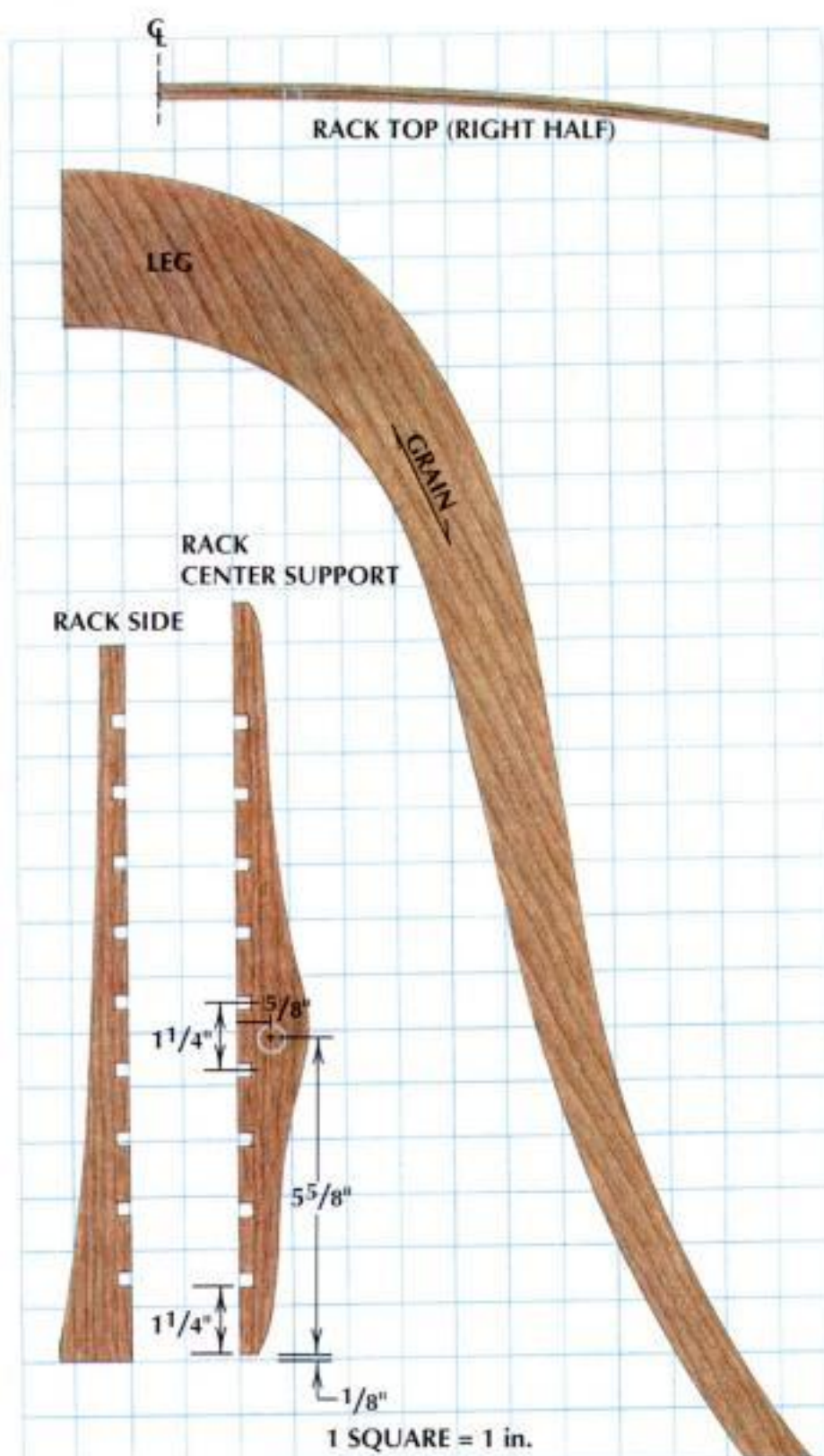
The $\frac{13}{16}$ -in.-dia. post is 40 in. long and has a $1\frac{1}{2}$ -in.-dia. turned ball attached to its lower end. (See photo, facing page.) If you don't have a lathe, you can make a router jig to turn the post. (See AW #28, pg. 16.) I sanded the post until it just slid easily through the hole in the base. Since I don't own a lathe, I shaped the ball on the drill press as shown in Tech Tips on page 24 in this issue. Drill a $\frac{13}{16}$ -in.-dia. hole in the ball and glue it onto the post.

Making the Rack

The rack is basically a frame with $\frac{1}{4}$ -in.-square slats let into the back of it. The slats are also let into the front edges of two center supports which are mounted on an adjusting swivel block. (See Fig. 6.) Note that the rack frame is $\frac{3}{4}$ -in. wider across the top.

To make the rack, begin by creating full-size patterns of the sides and center supports. (See Fig. 1.) Mark the dado

FIG. 1: PATTERNS



placement on the patterns; you'll need them for reference.

Thickness your stock for these four pieces and cut them to $1\frac{1}{4}$ in. by 14 in. (Note that the side pieces are $\frac{5}{16}$ -in. thick, and the center pieces are $\frac{3}{8}$ -in. thick.) Using the side piece pattern, transfer the dado reference marks onto one of the side pieces. Clamp all four pieces together face-to-face and gang-cut the dados on the tablesaw.

Now, lay out the side and center piece profiles, taking care to line up the dados on the patterns with those on the stock. Cut the profiles to shape and make the rack's bottom piece.

Next, make the rack's curved top. This piece is actually made of two $\frac{5}{32}$ -in. strips of stock laminated together. A half-pattern of the top piece is shown in



60° cut off. Alignment blocks enable Chan to make bevel cuts in the legs.

FIG. 2: BASE DETAIL

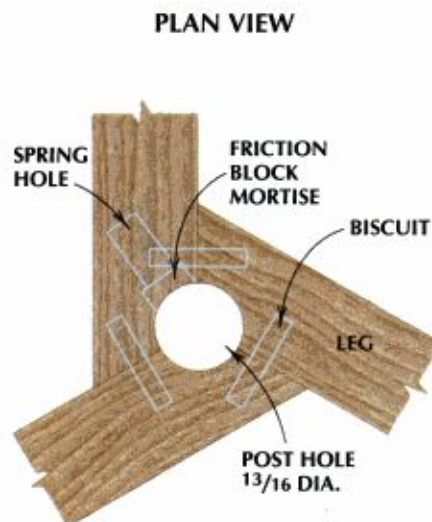


FIG. 3: CUTTING THE BISCUIT SLOTS

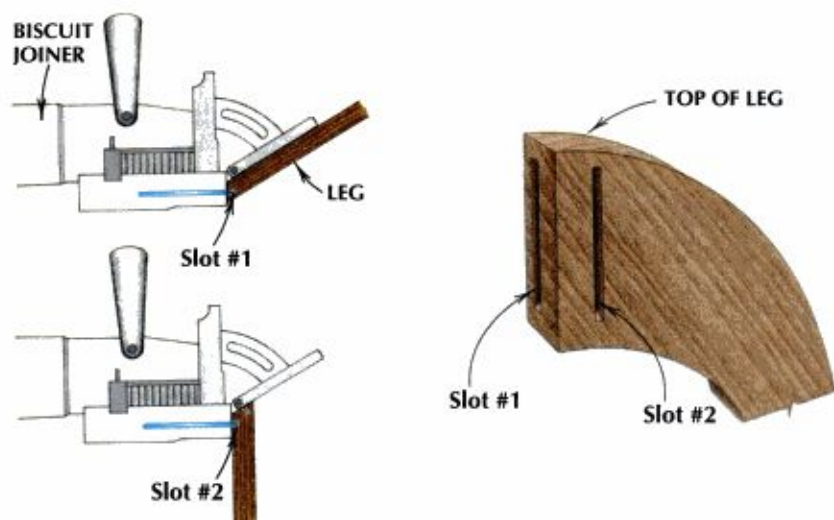


FIG. 4: FRICTION BLOCK DETAIL

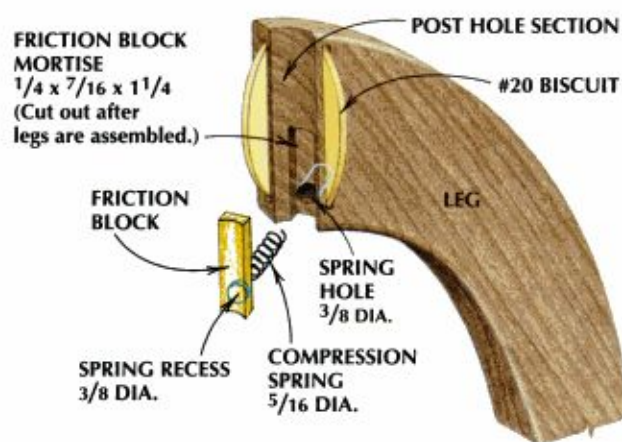


FIG. 5: MAKING THE FRICTION BLOCK

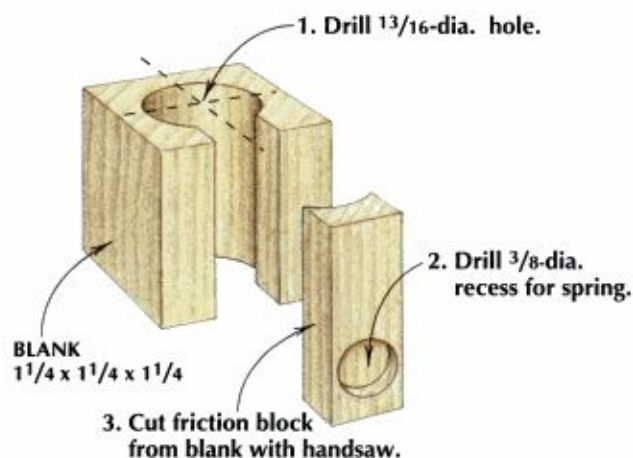


Fig. 1. Use this pattern to make a full-size form to create this laminated part.

Rabbit the ends of each rack side piece to accept the frame top and bottom pieces. Cut the top piece to length. Then glue the sides, top and bottom together. Don't glue the center supports on at this stage. I pinned the rabbit joints with 1/8-in. dowels as shown in Fig. 6. When the frame is dry, make the slats and test-fit them in the dadoes in the frame sides. Then finish-sand the slats and glue them into place.

I wanted the rack to have the look of continuous grain running around it—uninterrupted by slat or dowel ends—so when the glue was dry, I trimmed off both sides of the rack with a block plane and covered them with walnut veneer.

Making the Swivel Block

The swivel block allows the rack to tilt back and forth and to pivot around the post. Two rubber-faced, spring-loaded wood plugs inside the block serve as friction devices to allow tilt adjustability. (See Fig. 6.)

Make the swivel block from a 1x2 blank 4 1/2 in. long. Drill a 1 3/16-in.-dia. hole 1-in. deep in the center to accept the post. Next, drill a 1/2-in.-dia. hole for the dowel. Then put a piece of scrap 1/2-in. dowel in the hole and drill two 3/8-in. holes for the friction plug devices. (The scrap dowel will minimize tear-out.) I rounded over the edges of the swivel block, stopping short of the 1/2-in. and 1 3/16-in. holes.

The next step is to make the friction

plugs. To achieve the proper concave face, I first drilled a 3/8-in.-dia. hole in a blank of wood, then whittled the plug from the blank. (See Fig. 7.) I faced the plugs with 1/16-in.-thick rubber cut from an inner tube.

Assembly and Finish

The first step in assembling the music stand is to install the swivel block assembly between the two center supports. Drill a 1/4-in.-deep, 1/2-in.-dia. blind hole in each center support piece as marked on the pattern. (See Fig. 1.) It's important that the holes be matched perfectly to each other for smooth tilt operation. Cut a 5-in. long, 1/2-in. dowel and sand it until it just slips without binding in the swivel block. Place the assembly

FIG. 6: MAKING THE RACK

CONSTRUCTION HINTS

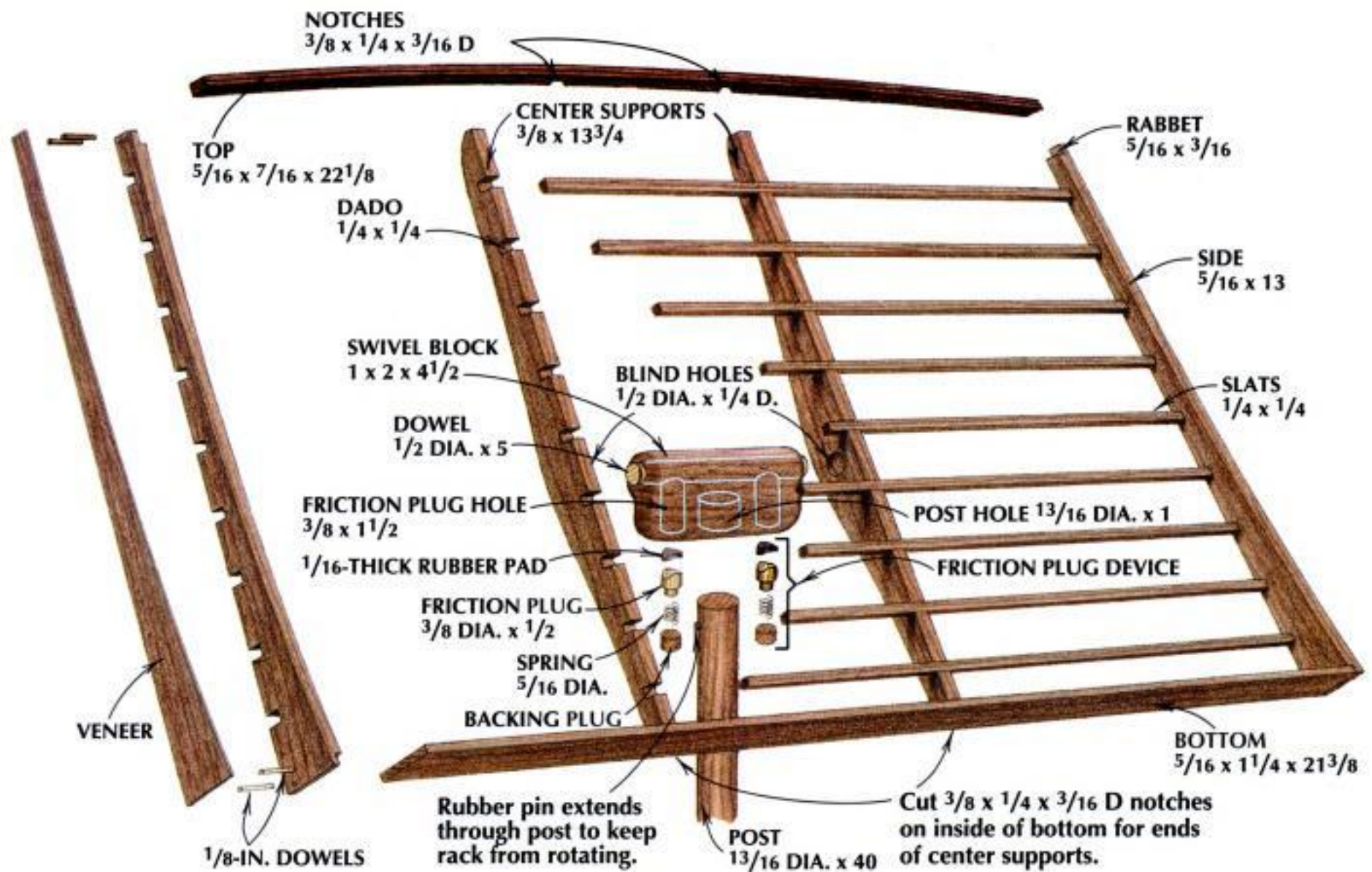
- Before shaping sides and center supports, gang-cut dados with all four pieces clamped together.
- Make the swivel block and then glue the center supports to swivel block dowel before gluing center supports to rack.

FIG. 7: MAKING A FRICTION PLUG

1. Drill $\frac{5}{8}$ -dia. hole.

2. Cut out plug.

3. Cut plug shank.



between the center supports and glue the ends of the $\frac{1}{2}$ -in. dowel into the center support holes. For smooth tilt operation, it is crucial that the center supports be square to the swivel block and parallel to each other.

Next, cut the $\frac{3}{16}$ -in.-deep notches in the rack top and bottom pieces to accept the ends of the center supports. Then glue the center support assembly to the rack.

Get a handful of $\frac{3}{16}$ -in.-dia. compression springs of various lengths and strengths from the hardware store to try out in the friction mechanisms. A spring about twice the length of the hole should work well, but you'll have to experiment with various springs to get the pressure you want. You can also shorten a spring

hole by inserting a piece of dowel in it.

Install a spring and the friction block into the base. Insert the post through the hole and place the rack on the post. Check the post height adjustment resistance. Minimal friction will work for sheet music; for scores and albums you may need to add another friction block.

When you're satisfied with the height adjustment, insert the rubber-faced friction plugs in the swivel block. Try different springs until the rack tilt resistance is right. Glue in backing plugs and trim them off.

Disassemble the stand and finish all of the parts. I used Watco oil, rubbing it down between each coat with 400-grit wet/dry sandpaper then finishing up with steel wool.

Reinstall the friction mechanism and post back into the base and drill a hole through the top of the post for a rubber pin that restricts free spin of the rack. (See Fig. 6.) I used a section of $\frac{3}{16}$ -in.-dia. O-ring available at any hardware store. Trim it until it projects slightly on both sides of the post. You may need to experiment a little bit in order to get the friction just right.



YEUNG CHAN designs and makes furniture in northern California.

Finally, slip the rack onto the post, pick one of your favorite songs and you're ready to make music. ▲

Infeed/Outfeed Cart

Handle Large Stock Safely With This Cleverly Designed Storage Cart and Roller Support **by William Wichman**



Supporting roll. The author's mobile cart holds a dual-purpose roller support. In the photo above, Wichman positions the cart on the outfeed side of his tablesaw and uses the plastic roller to support the end of a long board.

My shop is fairly small, so space must be used carefully. As in the case in many workshops, quite a bit of room is taken up by my tablesaw. I built a wood base for the saw and added extension tables and an aftermarket rip fence. But something was still missing: additional infeed and outfeed support which would enable me to make cuts in large panels or long boards without a helper.

To solve the infeed/outfeed problem and also create some mobile storage space, I designed a cart that holds a combination infeed/outfeed support. The "infeed" side of the support consists of 11 conveyor-type skate wheels held in an oak frame. The "outfeed" side of the support has a single plastic roller that's 28 in. long. To switch between roller (outfeed) and wheel (infeed) mode, I simply flip the support over in its yokes. A small aluminum plate, screwed against the outside face of each yoke, holds the infeed/outfeed support in place when it's in use. (See photo, right.)

The support yokes are attached to the ends of a cart that's mounted on locking rollers. Easy to maneuver and more stable than most roller stands, the cart and its dual-purpose support stow under my saw's extension table when not in use. (See photo, page 40.) Inside the cart, there's a single adjustable shelf and enough storage space for a variety of supplies and portable power tools.

Making the Cart

When sizing the cart, its roller base and the infeed/outfeed support, it's important to account for the space underneath your extension table and for the height of the saw table surface. The dimensions shown in the drawing on

the following page may need to be adjusted to work with your tablesaw.

I made my cart from oak boards, oak plywood and some left-over plywood covered with butcher block-look plastic laminate. The cart's construction details are fairly straightforward. As shown in the "Cart Construction" drawing, the top and bottom of the cart fit in rabbets milled in the sides. After cutting the rabbets, I ripped two 1/4-in.-deep, 5/8-in.-wide grooves in each side to hold steel shelving standards.

A solid oak face frame covers the plywood edges on the front and back of the cart. The stiles and rails join with splined miter joints. At the back of the cart, the face frame is grooved to hold a 1/4-in.-thick oak plywood panel. I made a pair of flush-fit, frame-and-panel doors to fit the opening on the front of the

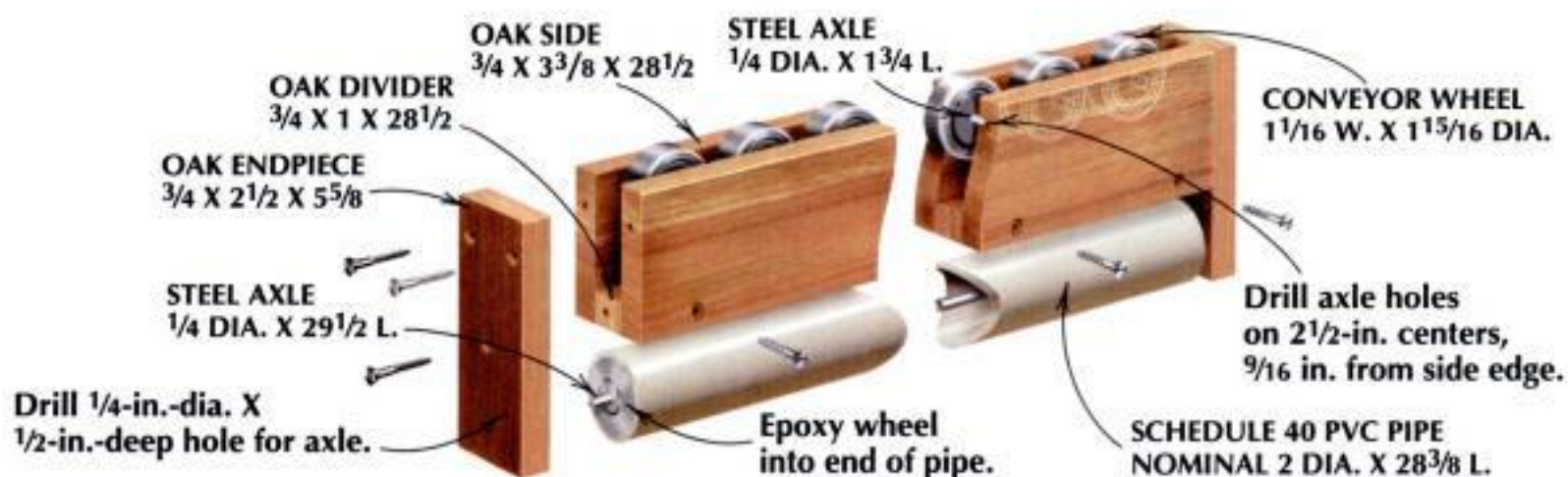


Infeed mode. Skate wheels support long boards for crosscutting.

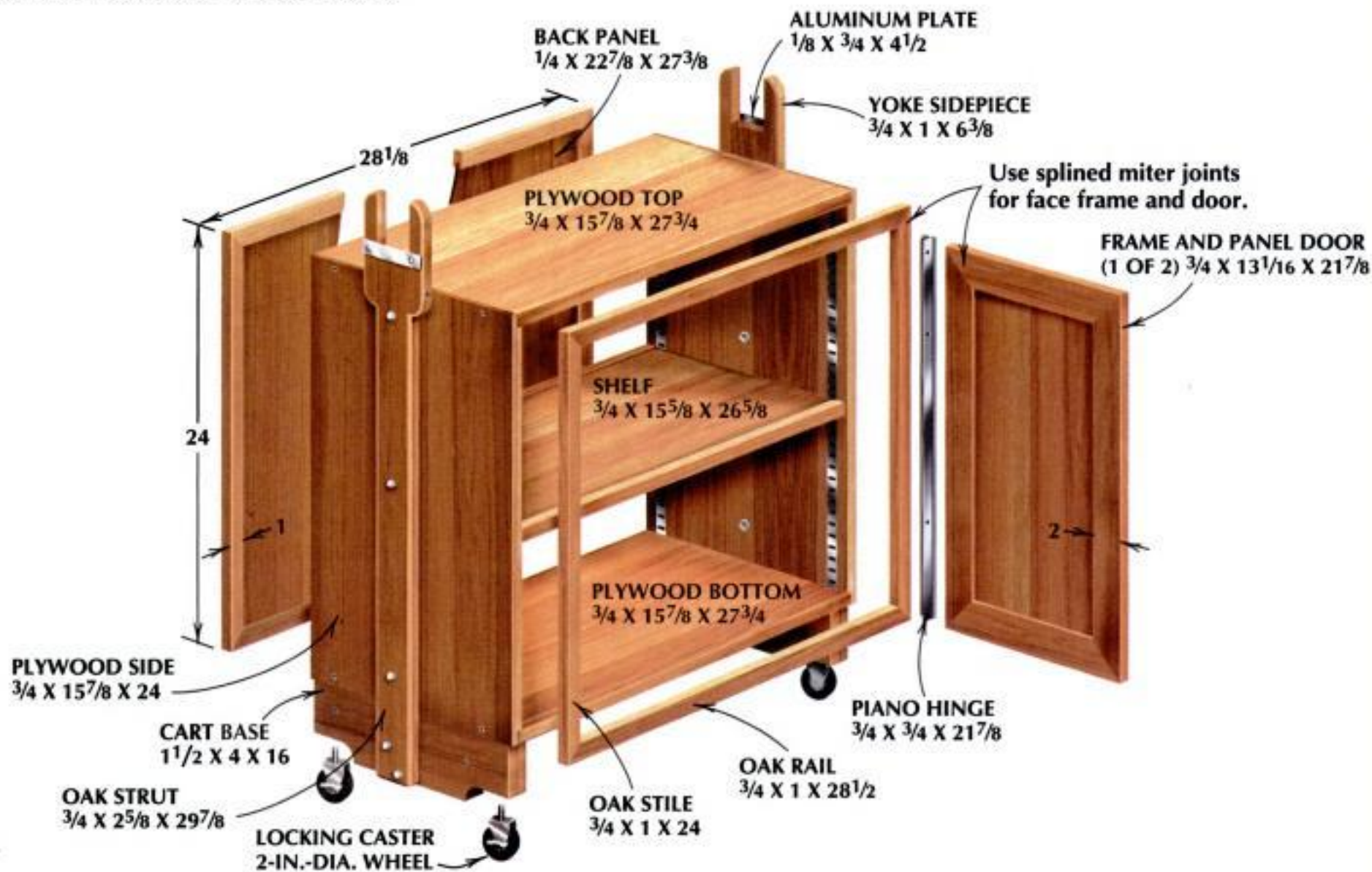


Quick change. Switching from wheels to outfeed roller is simply a matter of flipping the support over in its yokes.

ROLLER SUPPORT CONSTRUCTION



CART CONSTRUCTION



cart. The doors swing on piano hinges and close against magnetic catches.

The cart's roller base, also made from oak, is attached by driving screws through the cart bottom. I used spindle-type casters with 2-in.-dia. wheels, but platform-type casters would also work well as long as they can lock.

Conveyor Wheels and Plumbing Pipe

The moving parts of the infeed/outfeed support are $1\frac{1}{16}$ -in.-wide by $1\frac{15}{16}$ -in.-dia. steel skate wheels—the kind used to make conveyers. The wheels run on ball bearings and accept $\frac{1}{4}$ -in.-dia. axles. I bought my wheels locally from a com-

pany that sells bearings and bearing supplies. For a mail-order source, try McMaster-Carr Supply Co. (P.O. Box 440, New Brunswick, NJ 08903, 908-329-3200.) The roller is made from nominal 2-in., schedule 40 PVC pipe, available at any plumbing supply outlet.

To support the wheels and roller, I made a simple frame from $\frac{3}{4}$ -in.-thick oak. (See drawing, page 39.) The "infeed" side of my support is sized to carry 11 skate wheels, which are held between a pair of oak side members.

Two more skate wheels and a long, $\frac{1}{4}$ -in.-dia. axle are required to install the roller. After cutting the pipe to fit in the roller support, I used epoxy to glue a wheel in each pipe end. Since the

inside diameter of the pipe is slightly larger than the outside diameter of the wheels, you'll need to shim the wheels when gluing. ▲



WILLIAM WICHMAN practices architecture and woodworking in Kentucky.



Storage mode. When not in use, the mobile cart and its roller support stow underneath the table saw's extension table.

Maine Planemakers

*One Chooses Wood, the Other Metal;
Both Combine Tradition and Technology to Enliven a Hand Tool Heritage*

by Scott Landis

"The invention of the plane was an act of genius," wrote Josef M. Greber in his 1956 classic, *The History of the Woodworking Plane*. The plane, Greber proclaimed, "is the noblest tool of the artisan and especially the joiner." Its ability to transform rough lumber into flat stock underlies the most exquisite achievements of cabinetry, furniture and architecture.

Greber traces the "victory march" of the plane from ancient Greece, describing along the way dozens of designs, from scrub planes, rabbets and routers to a remarkable assortment of specialized molding planes. His evolutionary trail peters out around the beginning of the 19th century,

just before the Industrial Age spawned millions of mass-produced metal hand tools and then rendered them obsolete with power machinery.

Cecil Pierce and Tom Lie-Nielsen straddle that fault line in tool development. Separated by two generations and less than 30 miles, these Maine planemakers are tinkering at different branches of the same tradition. Pierce is an 89-year-old, dyed-in-the-wool wooden plane enthusiast. Lie-Nielsen is a low-volume manufacturer of high-quality metal planes. Both individuals have roots in Maine's boat-building heritage. And both have found ways to temper and refine a revered hand tool tradition with Yankee ingenuity. ►

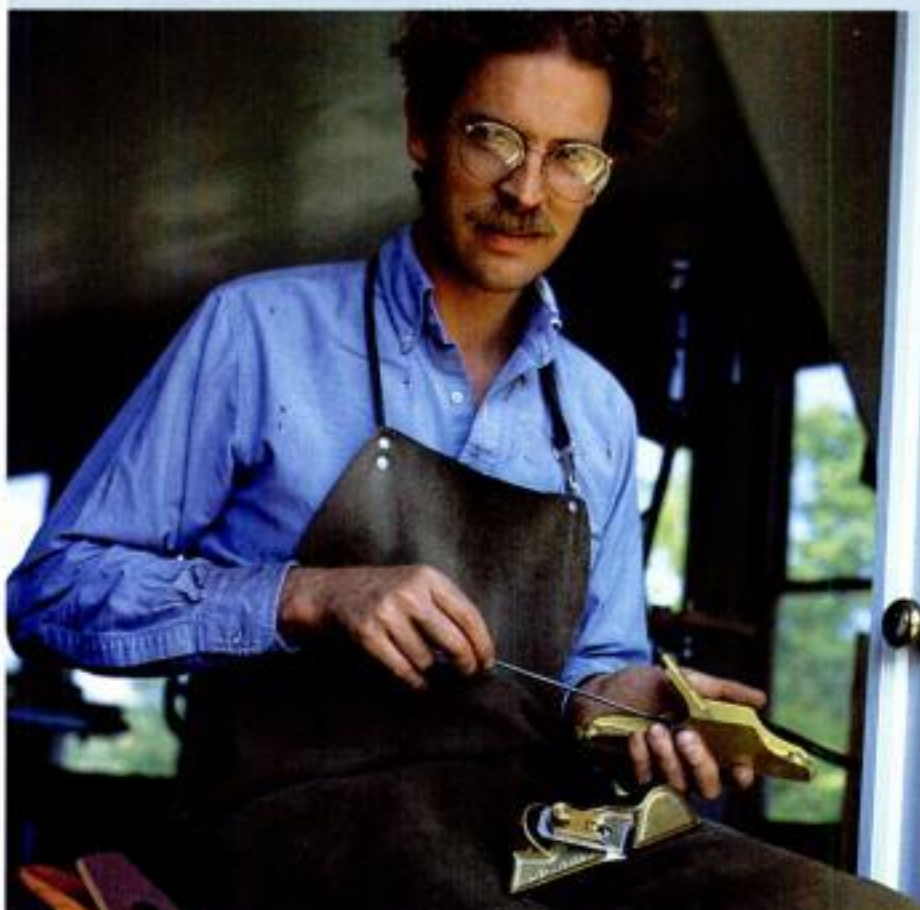
CECIL PIERCE



Cecil Pierce crafts his planes from solid blocks of wood. The tiger maple for this model came from a piece of firewood. Setscrews in the sides—a Pierce innovation—help keep the blade aligned.



TOM LIE-NIELSEN



Tom Lie-Nielsen builds near-replicas of antique Stanley planes. Model No. 1, shown at left, is an improvement over Stanley's original No. 1 bench plane.



CECIL PIERCE



▲ **Tracing the pattern.** Using a simple template, Pierce marks up a blank that will be shaped into a wooden plane.

◀ **Made to shave.** There's little in the way of ornamentation in a Pierce plane. Heft, beautifully shaped handles and functional, well-crafted construction distinguish these handmade tools.

Cecil Pierce's passion for planes was forged in the 1920's and 30's, in the shipyards of East Boothbay, ME, not far from his home on Southport Island. He speaks with reverence for the talented, hard-working "outboard joiners" who routinely transformed acres of rough-hewn oak and pine into smooth-hulled yachts and work boats.

"All of the first-class men in the joiner's shops built their own planes," Pierce explains. "I don't want to see this craft die."

The sturdy, wooden-body planes Pierce builds in his cluttered shop—roughly a dozen of them a year—are sold to both collectors and users. Word of Pierce's prowess as a planemaker has spread steadily since the 1992 publication of his book, *Fifty Years a Planemaker and User*. But Pierce makes much more than planes. His collection of shop-made scrapers would be the envy of any woodworker. And when he isn't building tools, Pierce builds furniture. When I visited him last year, his living room was full of finished pieces

awaiting delivery. And in his shop, a classic Poole dory (a local boat design) was nearing completion.

The division between work and leisure is suitably blurred for Pierce. He makes most of his planes and scrapers in a tiny alcove between his workshop and his kitchen. "My whole house is a shop," he offers. "It's incidental that I live here."

Making a Pierce Plane

According to Pierce, decent wooden planes can be built of practically any stable hardwood—from mahogany to apple. Pierce buys exotic tropical woods like cocobolo, Brazilian tulipwood or lignum vitae to fashion into plane bodies. But just as often, he takes his material where he finds it. For example, the body of the beautiful tiger-maple jack plane, shown on the previous page, started off as a piece of firewood. The average price for a Pierce plane is around \$375.

Pierce's planes are elegant performers, and no two are alike, but the planemaker is quick to point out that they are not art. In the lexicon of Maine watercraft, a

Pierce plane is more lobster boat than clipper ship. If Pierce can't find the width or thickness he needs in a single block of wood, he'll add a separate handle or build the body out of two pieces and attach a laminated sole. He is unconcerned about the orientation of grain in the body. "You have enough trouble finding the right wood," Pierce says, "and the old planemakers didn't seem to care." If the wooden body of a plane cracks, he plugs it with epoxy.

Pierce begins the plane-making process by tracing the body's pattern onto a hardwood blank. (See right photo, above.) All of Pierce's planes are made with handles that are well-proportioned and comfortably shaped. A secure, one-handed grip is especially important for this woodworker, who lost the fingers on his left hand to a hungry jointer "half a lifetime ago."

After cutting the body roughly to shape, Pierce turns his attention to the underside of the plane, boring the $\frac{3}{8}$ -in.-wide mouth and chiseling the opening square to a depth of about $\frac{1}{2}$ in. He chamfers the rear edge (behind the



Clearing the throat. Major waste removal in the throat is done with a 2-in. firmer chisel and a gouge. An integral handle, shown roughed out on the plane in the background, is a standard feature on all Pierce planes.



Getting it flat. To check the throat's blade-bearing ramp for flat, Pierce coats a plane blade with machinist's fluid and rubs it on the ramp. High spots show up as blue marks and are removed with chisels or scrapers.



Making adjustments. A small pocket, ground into the plane iron just below its bevel, provides a recess for the nailset as Pierce fine-tunes cutting depth with a few light taps. Note the adjustable throat plate.

blade) and uses a router bit in a milling machine to excavate a recess in front of the mouth for an adjustable throat plate.

By Pierce's lights, an adjustable throat plate makes the chip breaker redundant in a bench plane. "If you're planing cantankerous wood, you want to close your throat off to a few thousandths—just enough to let a shaving come through. That does the job just as well as the chip breaker," Pierce says.

Nevertheless, Pierce installs chip breakers in about half of his planes. "I wouldn't put them in," he explains, "except that so many people think they're important."

Working with the plane right-side-up, Pierce begins chopping the throat pocket with a 2-in. chisel, holding the bevel down "to steer it better" and to keep the blade from digging in. (See left photo, above.) As the ramp of the pocket begins to take shape, he saws along both sides of the throat with a specially tapered handsaw. Pierce shapes the front of the pocket with a large gouge. Working back and forth between the chisel, the saw and the gouge, Pierce

gets the blade bearing surface, or ramp, close to its final 45° slope. Then he butters the back of a plane blade with Prussian blue machinist's fluid and rubs the blade around on the ramp to mark the high spots. (See middle photo, above.) These are removed with a file or chisel. "You won't get 100 percent contact," he says, "but you ought to get good contact the whole length."

Pierce trues the sole of the plane the same way. He finds the "hummocks" by rubbing the sole across a surface plate "blued" with machinist's fluid, and he removes them with a cabinet scraper.

For comfort and appearance, the handle gets a lot of attention. Pierce begins shaping with a skew chisel and a No. 50 Nicholson cabinetmaker's rasp, then finishes up with several shop-made scrapers.

Setscrews in the Sides

"I've learned a lot since I wrote the book," Pierce claims. "One recent development I've come across solves a problem common to both wooden and metal-body planes: how to keep the blade square to the sole as cutting depth

is adjusted and the blade is sharpened."

Pierce drills and taps each side of the plane with a pair of 1/4-in. setscrews. When properly adjusted with an Allen wrench, the two pairs of setscrews bear snugly against the sides of the blade, holding it square to the sole without impairing up-and-down adjustment. Another aid in fine-tuning blade position is the small pocket that Pierce grinds just behind the blade bevel. Fitting the tip of a nailset in this recess, Pierce can tap the blade back easily to lower its position. (See right photo, above.)

Nearing the 90-year mark, Pierce insists that he's still learning. Refinements like the setscrews are in keeping with the maker's pragmatic balance between tradition and technology. A long-time advocate of cast-steel blades, he now prefers a cutting edge of high-speed steel. A narrow strip of HSS is brazed to the cast blade; Pierce hones the edge with diamond sharpening stones. "I'm breaking new ground," he says, adding that "if the tides allow," his next book will be called *Sharpening the Edge with Diamond*.

TOM LIE-NIELSEN



Bevy of beauties. (Clockwise from upper left) a skew block plane, a low-angle block plane, a low-angle jack plane and a scrub plane.

Not far from Pierce's place in Boothbay, 40-year-old plane-maker Tom Lie-Nielsen of Warren, ME, is absorbed by production. In a cinder block foundry and machine shop alongside Route 1, Lie-Nielsen Toolworks manufactures near-replicas of vintage Stanley planes.

Early in his career, this son of a Rockland boatbuilder asked: "Why *don't* they make 'em like they used to?" And for the last 13 years, Lie-Nielsen has been answering his own question. In the process, he has taught himself to cast bronze, heat-treated steel and machine metal. His business currently employs 15 full-time workers and produces close to 7,000 tools a year.

Lie-Nielsen launched his company in 1981 after leaving Garrett Wade in New York, where he worked as a tool buyer. He returned home to Maine intending to get back into boats, with a little machine-shop business on the side. But what began as a small foray into plane-making soon grew into a consuming enterprise.

Lie-Nielsen got off the ground with two of the most challenging planes in his line: an edge plane adapted from the

plane modeled after the Stanley No. 140 "rabbit and block," which was discontinued in 1944. "There are things about them that are still difficult," he says ruefully. Their open-sided designs make the castings prone to warp and the skew plane's compound angles presented formidable challenges to mold-making and machining.

The company currently sells 15 different cutting tools, including a beading tool, a low-angle jack plane (a delightful performer that Lie-Nielsen calls "an overgrown block plane"), a scrub plane and the No. 1 bench plane. (See photos, above.) Each year he sees the introduction of one or two new tools, all of them based, so far, on lapsed Stanley models.

If Lie-Nielsen leaped into the market at the shallow end, he is making his way to deeper water with recent additions like the low-angle jack and the No. 2. Lie-Nielsen's No. 2 is an ambitious reproduction of the Stanley No. 602 Bedrock smooth plane, manufactured from 1902 to 1940. The Bedrock series was Stanley's flagship line featuring a heavier blade and heavy-duty castings, a more sophisticated system of adjustment and a machined surface between the

Bronze Bodies and Well-Tempered Blades

All but three of Lie-Nielsen's planes have bodies cast in manganese-bronze, giving these tools their delightful gleam and substantial heft. "Bronze was an easy choice," Lie-Nielsen claims. The manganese-bronze alloy he uses is strong and extremely durable. It's tricky to pour, but on small production runs it's not much more expensive than iron.

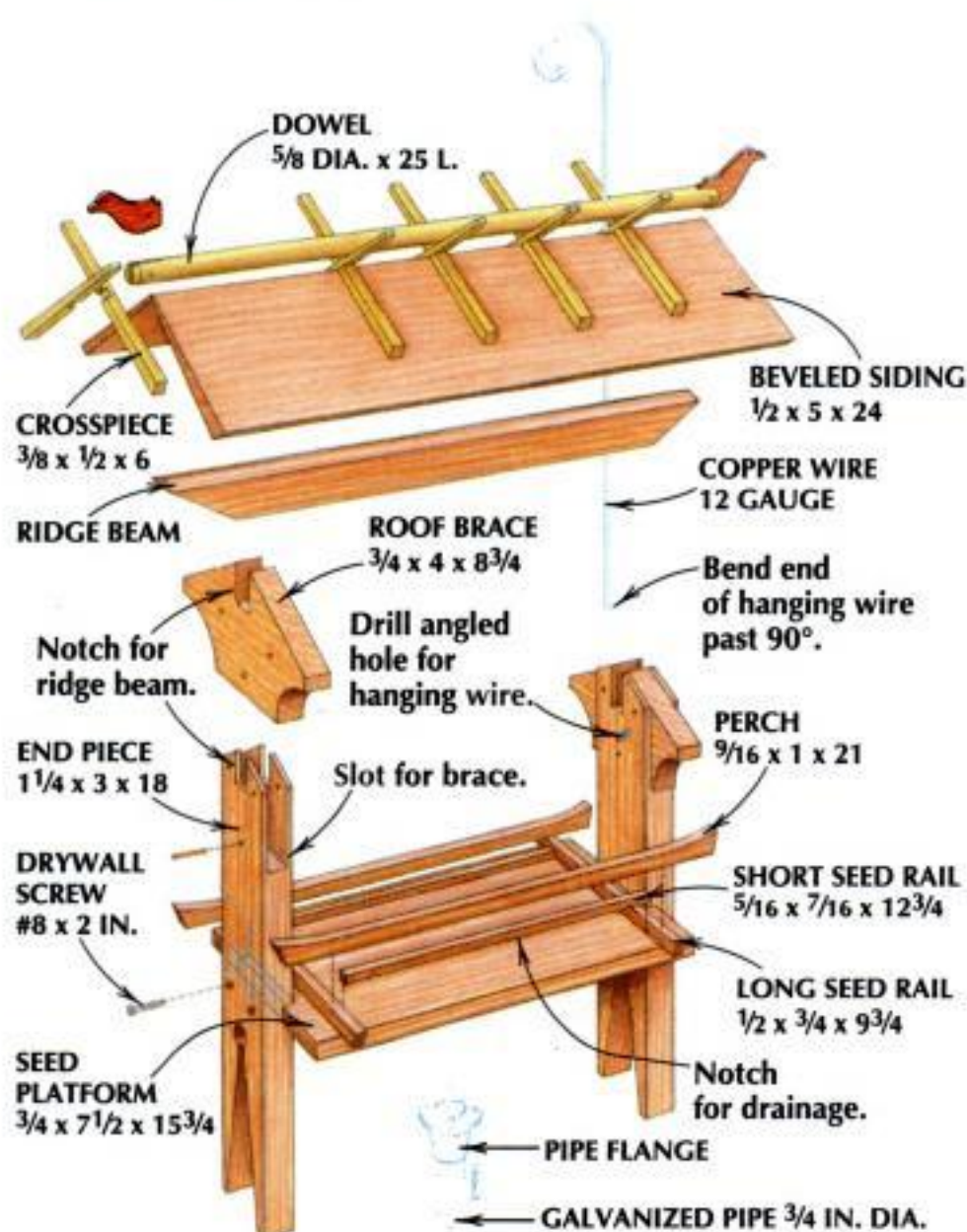
Producing an exemplary bronze body is only half the battle. Lie-Nielsen is equally proud of his blades, which he tempers himself in a makeshift operation near the back of his shop. He begins with water-hardened tool steel in thicknesses rarely found in standard planes. Lie-Nielsen's low-angle jack plane, for example, carries a $\frac{3}{16}$ -in.-thick blade. The heavy blade is stiffer and less prone to chatter, but it takes longer to treat.

When I visited the Lie-Nielsen shop, I found the owner immersed in the elemental process of tempering his tool steel. The heat-treating "salt pot" was leaking and it had taken all morning to reach its working temperature of around 1450°F. While large-scale manufacturers have switched to more modern tempering methods, Lie-Nielsen favors salt treatment because it provides steady, uniform heat. It's almost impossible to overheat a blade—the surest way to ruin steel—since not even the thin edge of the blade can get hotter than the salt bath.

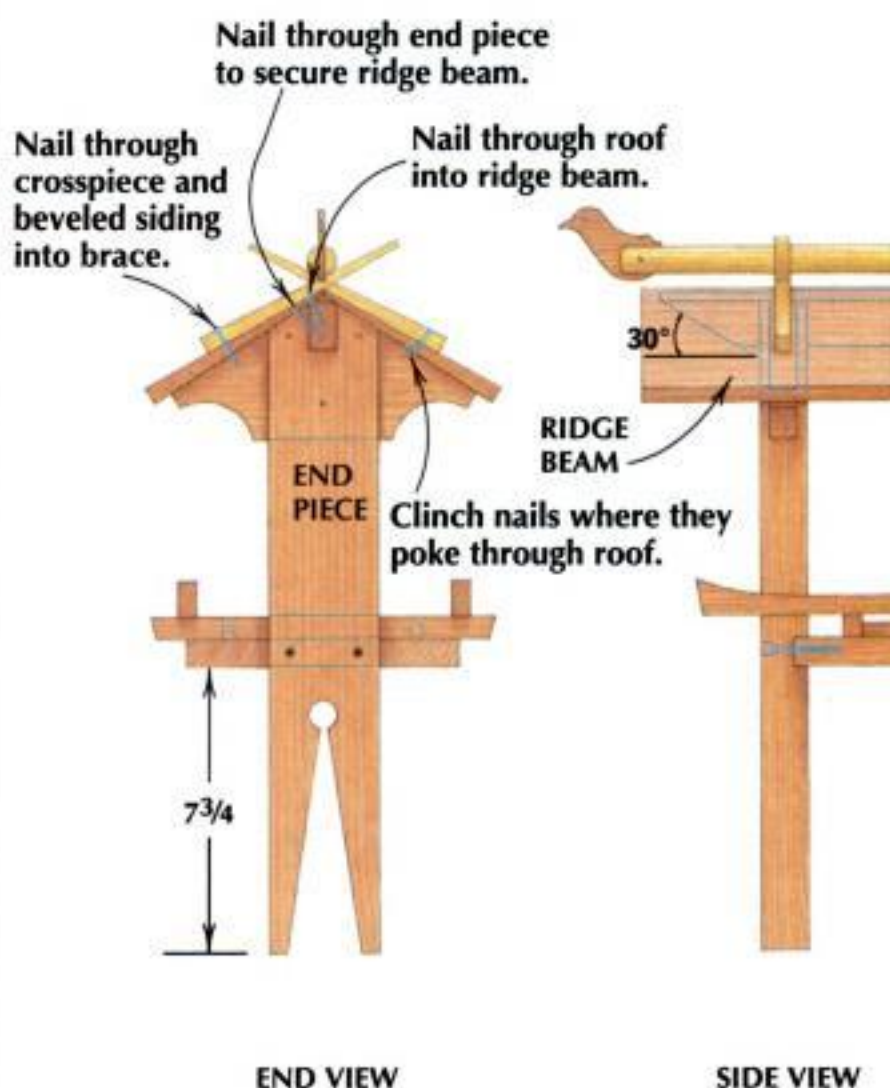


Molten manganese-bronze. In the Lie-Nielsen foundry, the molten alloy, known for its strength and beauty,

BIRD FEEDER



ELEVATION VIEWS



wire. Make the pins about 1/32 in. longer than the thickness of the end pieces so you can peen over the ends to create mini rivets. For even greater strength, you can reinforce these bridle joints with epoxy.

•Assemble the rest of the feeder in this order: First, screw the end pieces to the seed platform. Then nail in the ridge beam, checking that the end pieces are square to the seed platform. Finally, nail the siding to the ridge beam and to the end pieces.

•Use the same riveting technique as above for making the birds' "eyes" and for attaching the bird silhouettes to the dowel. Interestingly, I've noticed peck marks on the copper eyes of some of my wooden birds: Perhaps real birds treat my lifelike decorations as competition.

•Mark out the half-lap joints in the cross pieces by laying each pair on the roof and scribing the four shoulder cuts with a knife. Then cut the joints with a

fine-tooth saw and pop out the waste with a chisel. Nail these parts to the roof, then lay the dowel-and-bird filigree over the crosspieces and quickly nail it.

•Soften all the sharp edges, especially on the perches and seed rails, with a spokeshave. You could use sandpaper instead, removing any "whiskers" left from the sawing process.

Installing the Feeder

You have two options for installing your feeder on site: Attach it to a post sunk in the ground, or hang it on a branch. If you opt to hang the feeder, drill two holes through the roof structure, locating them in line with the inside face of the end pieces. Then drill angled holes in the end pieces. (See drawing.) Slide pieces of wire (coat hangers work fine) through the holes in the roof, bend the ends a little past 90°, then tap the ends into the angled holes.

Finally, use pliers to form decorative hooks at the opposite ends of the wire.

Once you've installed the feeder you can fill 'er up with quality seed. I've found that it pays to experiment if your aim is to find a seed mix your clients like. Some mixes have components that birds treat as inedible filler. I've noticed that birds prefer certain brands, which I suspect is a matter of freshness.

In addition to the regular customers, you can depend on occasional visits from a variety of migrating pilgrims. Yesterday brought an Evening Grosbeak and an



RIC HANISCH is an architect and designer nesting in Pennsylvania.

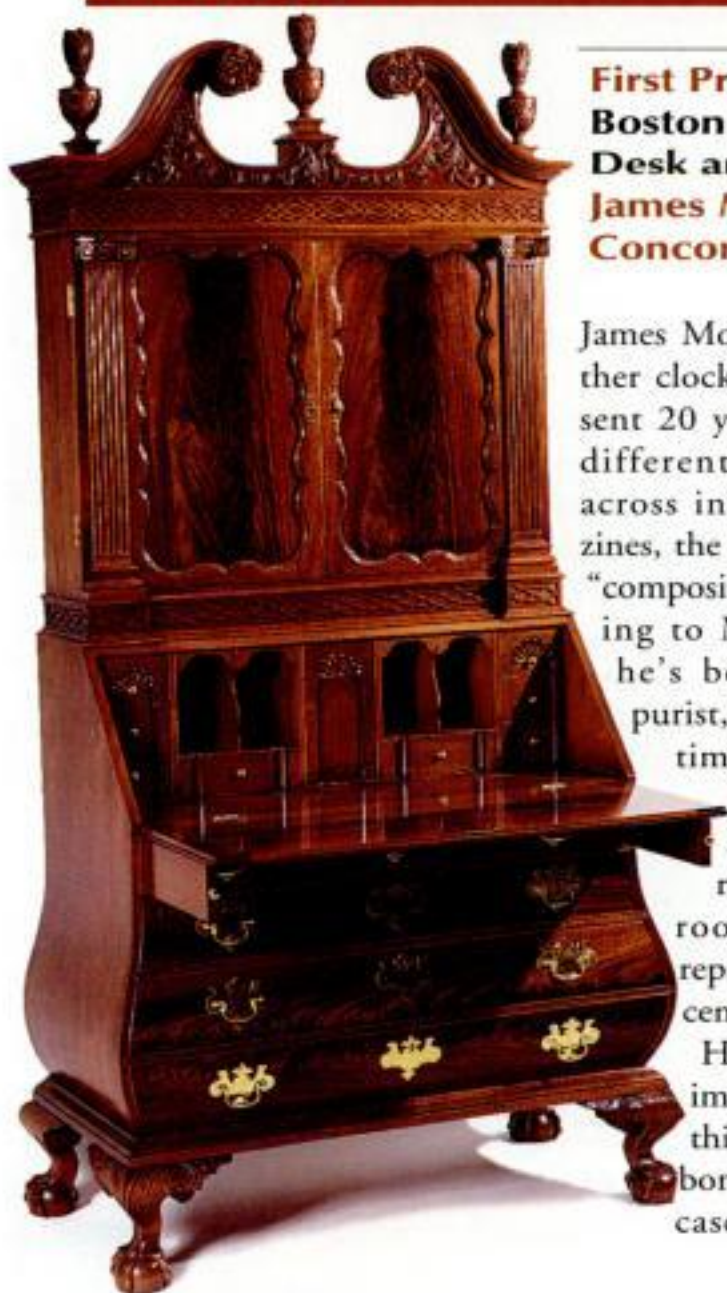
Indigo Bunting for the first time. These daily reminders that I'm a small part of the web of life serve to renew my sense of wonder. ▲

AMERICAN WOODWORKER 1994 Excellence in Craftsmanship Awards

Each year, when AW's editors meet to select the winners of our annual Excellence in Craftsmanship awards, we're always pleasantly surprised by the diversity and the high quality of the work submitted by our readers. This year was no exception, as we sorted through a record number of entries—from the U.S. and three foreign countries—to pick the winners.

It wasn't easy, especially since there was such a tremendous variety of work. We based our selections on three primary criteria: design excellence, degree of difficulty and quality of workmanship. When all of the votes were tallied, we were amazed to find that three different interpretations of the classic bombé chest had survived the trek to the win-

AMATEUR



**First Prize
Boston Bombé
Desk and Bookcase
James Moon
Concord, NC**

James Moon built a grandfather clock as a wedding present 20 years ago. Based on different designs he came across in books and magazines, the clock came out as a "composite" of styles, according to Moon. Since then he's become more of a purist, and now this full-time doctor and part-time woodworker has filled his living room and dining room with his own reproductions of 18th-century furniture.

He's also significantly improved his skills, as this mahogany Boston bombé desk and bookcase demonstrates. "I

took this project on as one of the most difficult pieces I could make, knowing I'd never find anything like it in a furniture store," says Moon.

He travelled to the Winterthur Museum in Wilmington, DE, to trace the detailed carvings from the original desk and bookcase, which is attributed to John Cogswell of Boston. The sides and drawer fronts are made from 3-in.-thick solid stock. Moon sculpted them by cutting a series of kerfs just short of their profile lines and knocking out the waste between the cuts with a chisel. He then used a scrub plane and scraper for final shaping.

"The contest deadline is what inspired me to finish this piece," explains Moon. It has ten secret compartments, is finished in shellac and is ornamented with decorative brass handles.

**Second Prize
Anniversary Desk
Jonathan Baran
Adams, MA**

"Designs pop into my head at the strangest times, like when I'm going to sleep; then I'll get up and start sketching while ideas are fresh in my mind," says Jonathan Baran. A former finish carpenter who was inspired to do finer work, Baran took a course with woodworker William Sayer and soon plans to start his own furniture-making business. This desk was an anniversary present for his wife, so it had to be something special.

"I tend to like curves," says Baran, "so as I sketched the design, I added curves to the piece that blended in well as it evolved." He used kevazingo (rotary-cut bubinga



First-Prize awards. The winners of the three award categories—amateur, student and professional—each receive an engraved Excellence in Craftsmanship Award in addition to the \$1000 cash prize. Second-Prize winners receive a cash prize of \$300 and Third-Prize winners get \$200 each.

ner's circle. To satisfy ourselves that we weren't being unfairly biased toward the bombé form, we took another close look at all the finalists and stood by our initial results.

So, here are the winning entries in our 1994 competition. Some of this year's close runners-up appear in "Gallery" on pages 92 and 93 of this issue. We extend our congratulations to the winners and our sincerest thanks to everyone who participated in this year's contest.

Please note: The deadline for entries in AW's 1995 Excellence in Craftsmanship competition is June 1, 1995. See page 70 for details and entry blank.

veneer) for the top, the detail at the bottom of the legs and the pigeonhole compartments behind the tambour doors. The tambour handles and border inlay are ebony and the inlaid writing area is made from book-matched walnut burl.

Baran hand-cut the 104 mortise-and-tenon joints for the upper drawer case. Since the sides and front of the upper case are angled, he cut compound-angle dovetail joints on 4 of the 6 drawers. The finish is a penetrating rubbing varnish.



Third Prize Wedding Vessel Linton Frank Perkasie, PA

Linton Frank just started turning three years ago, propelled by a course from renowned turner David Ellsworth. Since then, he's focussed his attention on bowls and hollow vessels. "I try to come up with new forms that no one else has done," says Frank.

The inspiration for this piece came from the story of a two-spouted vessel that Frank saw in a book on Southwest Native American pottery. He discovered that certain Indian tribes used vessels like this during their wedding ceremonies. Water and sacred objects are placed in the vessel, then the bride and groom drink from the two spouts.

"I thought it was a beautiful story," says Frank, "so I



included that feeling by making the vessel's shape similar to the human heart." Hollowed throughout, the piece is turned from broadleaf maple burl on three separate axes. Decorative bands around the top of the spouts are made from segmented pieces of ebony, maple and purpleheart, symbolizing the exchange of wedding bands.

STUDENT

First Prize Display Cabinet Seth Janofsky Fort Bragg, CA

Many woodworkers come to the craft after exploring other disciplines. Seth Janofsky, for example, earned degrees in literature and photography before one day, "it just came bustin' out of me that I wanted to make furniture." He devoured books and magazines on the subject and spent a year studying under James Krenov at the College of the Redwoods in Fort Bragg.

"As I gained familiarity with different styles, I got interested in Japanese woodworking," says Janofsky. In designing this display cabinet, he followed Krenov's influence to take advantage of unusual sizes and shapes. "I like long, low pieces that



are elegant and unadorned," he explains.

Janofsky used basic hand tools to make the cabinet, including a hand plane of his own design that can be pushed or pulled. Made of black walnut and Port Orford cedar, the case is doweled together. Janofsky used bridle joints on the frame-and-panel doors and back panels. It's finished with shellac, tung oil and wax.

Second Prize Tool Box "Dragon Chasing the Pearl" Peter Cabot Boston, MA

Peter Cabot paid his way through college working as a carpenter and went on building houses out West for a number of years. But he grew frustrated with the fast pace and bottom-line mentality of construction. "Since I'd grown

up in Boston with its strong tradition of fine furniture, I came back East and found what I was looking for in North Bennet Street School's woodworking program."

At the school, each student makes a tool box as a first project. Cabot used the opportunity to learn as much as possible about joinery and to explore different design elements. His final design for the chest was influenced by the furniture of the Ming Dynasty. The shape resembles that of an ancient Chinese



PROFESSIONAL

First Prize Massachusetts Bombé Slant Top Desk Jonathan McLean Marlboro, MA

Though he began building this bombé slant-top desk as a student at the North Bennet Street School, Jonathan McLean only recently completed it by working between the jobs he gets making furni-

ture as a professional.

The idea for this desk came from a picture in a book, but McLean incorporated elements from other period pieces. The finial-topped columns are his own design. "I look at this piece as a woodworking sampler," says McLean. "Making it involved joinery, sculpting, carving, turning—almost every technique in a woodworker's repertoire."

The entire piece was made from two mahogany boards, primarily using hand tools.

The sides join the top and bottom with half-blind dovetails. To shape the bulged sides, he crosscut multiple kerfs in the 12/4 board, chopped out the bulk of the waste with chisels, then refined the curves with hand planes and scrapers. The finish is French polish with garnet and blond shellac.

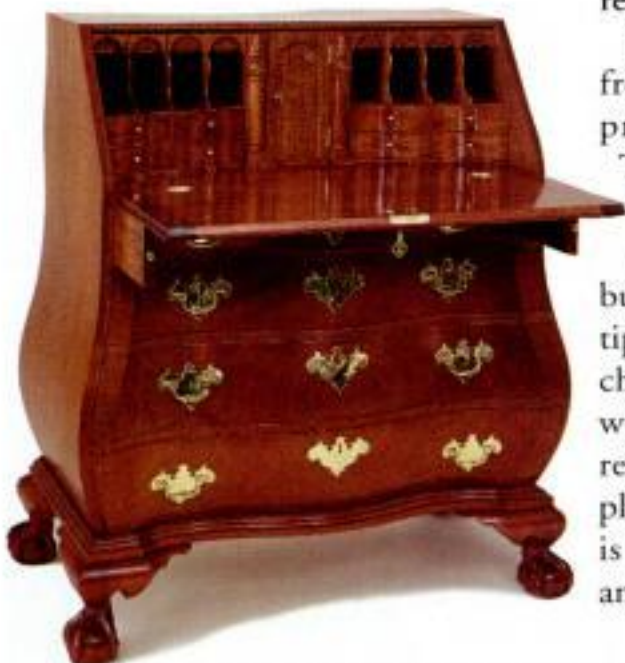
Second Prize (Tie) Guitar Bob Gleason Hilo, HI

"When I finish a guitar and put the strings on it, that's what justifies all the hours of construction," says Bob Gleason. He made and repaired simple stringed instruments in college. But in 1977 he met a graduate of The Apprentice Shop (a luthier's school in Springhill, TN), and was suddenly struck by a desire to learn more. "I knew how to make a guitar," he recalls, "but the school taught me to refine the process to an art."

Gleason settled in Hawaii, "where woodworking and music are both highly valued, and people revere koa and other native woods." On this concert-size acoustic guitar, the sides, back and top are



made of koa. Gleason used rosewood for the fingerboard, bridge and binding. He added a Hawaiian theme to the guitar with an abalone inlay depicting the Hawaiian Islands. Mother-of-pearl hula dancers are inlaid along the fingerboard.



military campaign chest. The pierced brasswork emblem—a dragon chasing a pearl—is a metaphor for nature and its pursuit of perfection and beauty.

The case and drawers are joined with hand-cut dovetails, and the flush panel doors fold back into pockets on the sides. The legs were joined to the stand with Chinese double-tenoned miter joints that required a special tablesaw jig to make. "This is the one piece I'll never sell because it's nice to have as a showpiece in my shop," says Cabot.



Third Prize Demi-Lune Hall Table David Frechtman Boston, MA

David Frechtman's interest in design got him into woodworking. Realizing he needed more instruction in joinery techniques, he enrolled in the woodworking program at Boston's North Bennet Street School in February 1993. "At first, I found the level of craftsmanship intimidating," recalls Frechtman, "but when you raise your expectations, it's amazing what you can accomplish."

The inspiration for this table came from an extremely rare piece of quilted mahogany. The wood came from a 10-ft.-dia. tree that was cut nearly 40 years ago in the Honduras jungle. The tree fell into a ravine and remained



there for 18 years before loggers dragged it out and milled it, discovering its rare quilted figure.

Used as 1/8-in.-thick veneer on the semi-elliptical table top, the wood "actually looks three dimensional—like a puffy satin quilt," says

Frechtman. The apron is pomele veneer over brick-built mahogany and both the top and apron are adorned with stringing, bandings and inlays of curly maple. The legs are inlaid with a variation of the line and berry motif that he calls "vine and ivy inlay."

Second Prize (Tie) Letter Cabinet Larry Fagan Prescott, AZ

Larry Fagan worked as a mechanical engineer before becoming a professional woodworker. Taking courses at the College of the Redwoods, he financed his woodworking education and tool purchases with his full-time job. He took the plunge into full-time woodworking in 1992.



This letter cabinet was inspired by a similar cabinet that Fagan saw in the Gamble house, a well-known Arts and Crafts Style house in Pasadena built and furnished by architects Greene and Greene. He made four prototype legs for this piece before "getting it right." The cabinet is made from mahogany and bird's-eye maple. Fagan carved the handles by hand.

"The work should be aesthetically pleasing, even if no one sees it," Fagan contends.

For example, the sides are joined with half-blind dovetails to false top and bottom pieces, over which the final top and bottom show faces are applied, thus hiding the dovetailed joinery.

Third Prize Mirrored Chest "Night on the Town" Glen G. Grant Andover, MA

When Glen Grant built his own house back in 1962, his thin budget forced him to make his own tables, chairs and other furnishings. He liked the results and continued to make furniture. After turning out a variety of colonial-style pieces, Grant began to develop a style all his own.

Grant likes to impose modern forms on traditional styles. "Often I see a traditional piece that I like, yet it looks boring. I try to add some visual movement to give it a different feel and excitement."

The chest is made from a single 4-in. by 20-in. by 18-ft. plank of mahogany. The top and bottom case pieces, rails, pulls and "rooster tail" are



black walnut. The dovetailed drawers have poplar sides that match the contour of the carcass. The drawer faces display the bulls-eye and hourglass patterns that result from sculpting them from solid stock. Grant finished the piece with shellac and wax.

MAN-MADE BOARDS

Match the Panel to the Project With This Comprehensive Guide to Sheet Goods

by Andy Rae

For many years I worked in solid wood. Then I landed a job in a cabinet shop. Instead of dealing with the random thicknesses, widths and lengths of solid lumber, I plunged into the uniformity and dimensional stability of man-made boards: hardwood plywood, fiberboard and particleboard.

I soon learned to appreciate the ease with which man-made boards could be worked. For example, I could dimension panels for an entire kitchen in the time it would take to thickness the solid stock for one piece of furniture.

Man-made boards date back to ancient Egypt, when craftsmen made plywood as a substrate for gold leaf, decorative painting and prized veneers. But the evolution of man-made boards didn't really pick up until the 1930's when modern adhesives and

mass production brought plywood into the Industrial Age as a relatively late arrival. The advent of W.W. II caused a significant increase in plywood production, as the material was used to manufacture thousands of planes and boats.

Pros and Cons

Today, man-made boards—referred to as “sheet goods” by woodworkers—are used extensively by industries of all kinds. The 32-mm cabinet system has streamlined production with automated joinery, hardware and edge-banding machines. For small shops, there are some important benefits in using panels instead of solid wood: There's better availability and the large size and uniformity of sheets means less waste. Because of their stability, man-made boards enable woodworkers to design

and build projects without worrying about wood movement.

All three categories—plywood, fiberboard and particleboard—get high marks for making good use of forest resources. Fiberboard and particleboard are made from what was once considered wood waste. Plywood can provide the appearance of solid wood, while requiring premium veneers on “show” faces only.

Man-made boards do have some drawbacks, however. Sheet goods are heavy and awkward to maneuver. And the face veneers on plywood are thin, so careful handling is necessary to prevent damaging them. The urea formaldehyde (UF) glue used in the manufacturing of panels dulls tool edges and can weaken the binders used in carbide cutters. And the formaldehyde in UF glue is known to cause eye, nose and throat irritation. Though some manufacturers are beginning to reduce formaldehyde levels (see “Beyond the Basic Panel,” page 57), the typical “off-gassing” of formaldehyde from panels remains a health concern.



Select your sheet. **A** Medium density fiberboard, **B** fir plywood, **C** solid core plywood with oak face, **D** hardboard, **E** lumber core plywood, **F** particleboard.

PHOTOS BY ROBERT GERHEART

Plywood

In quantities used and varieties available, plywood is a long-time leader among man-made boards. In 1993 alone, the U.S. consumed 18.5 billion sq. ft. of plywood, 830 million of which was hardwood plywood. Hardwood plywood can have cores made from hard or soft wood plies, but the face veneers are hardwood.

Cabinetmakers use hardwood plywood for interior casework like kitchen cabinets and book shelves. Because the face plies are made from hardwood veneers, hardwood plywood is perfect where the look of solid wood is desired. Hardwood plywood is good as a substrate for painting because it has smooth faces and great dimensional stability.

Plywood is made by gluing thin face veneers ($\frac{1}{40}$ to $\frac{1}{28}$ in.) to a core of wood plies or composite material such as particleboard or medium density fiberboard (MDF). The oversized panels are sawn to size and finish-sanded. (See "Making Plywood," page 55.)

Common thicknesses for hardwood plywood are $\frac{1}{4}$ in., $\frac{1}{2}$ in. and $\frac{3}{4}$ in. Keep in mind that these sizes are nominal. Generally, the panel you buy will be thinner than the stated size: For example, $\frac{3}{4}$ -in. plywood is typically $\frac{23}{32}$ -in. thick, or $\frac{1}{32}$ in. under the nominal size. Panels are typically 4 ft. by 8 ft., although you can order longer sheets if you're willing to pay extra. European boards like Baltic birch are sized to the metric system and come in odd sizes. Typical size is 150 cm. by 150 cm. (roughly 5 ft. by 5 ft.).

Veneer core (VC) plywood is the typical board found in small shops. The core is made from plies glued together

in alternating grain directions. This crossing of the grains gives VC plywood its uniform strength and dimensional stability. VC plywood is relatively lightweight and does a good job of holding fasteners. These qualities make it ideal for casework. Medium density overlay (MDO) is an exterior-grade VC plywood with a smooth paper face that's useful for sign projects and other outside work.

Typically, a $\frac{3}{4}$ -in.-thick sheet of VC plywood has seven plies—five core plies and two face veneers. Higher-grade plywood has a greater number of plies (usually 13 in a $\frac{3}{4}$ -in.-thick panel) which makes the panel stiffer and more stable. With a high quality plywood such as Baltic birch, Finnish plywood or Appleply (see sidebar, page 57), a raw edge can be sanded and polished for a decorative effect. But for most VC plywoods you can expect small voids in the core (under 1-in. diameter) due to knot holes. While voids won't greatly affect the strength of the panel, edges will need to be filled or, better yet, banded with solid wood. (For more on edging, see AW #42, pg. 70.)

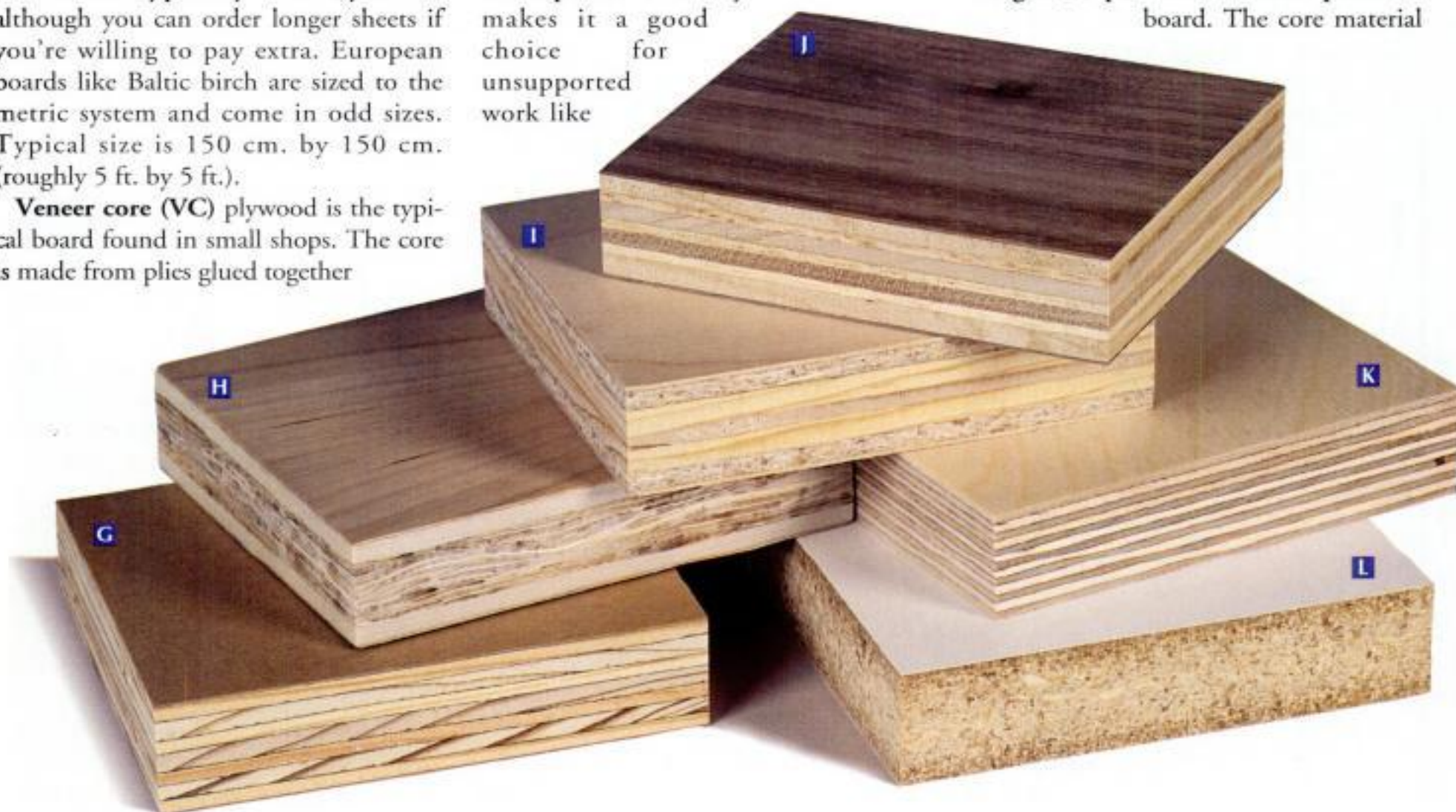
Solid core plywood consists of hardwood face veneers glued to a MDF or particleboard core. Solid-core costs less than VC plywood and it's void-free. Also, its superior stability makes it a good choice for unsupported work like

free-hanging doors. However, solid core is heavy and it doesn't get high marks for stiffness or holding screws.

Lumber core plywood has a core made from strips of solid wood (usually lauan or alder) that run in the same direction as the face veneers. To stabilize the construction and create a smooth substrate for the face veneers, thin cross-banding plies are glued between the solid wood core and the face veneers. The core of edge-glued wood gives lumber core the ability to span relatively longer distances with minimum deflection, plus it has excellent screw-holding ability. Like VC plywood, lumber core has a tendency to twist if not held down. Another drawback is the price: Lumber core typically costs almost twice as much as VC plywood. Panels come in standard 4x8 sheets, but only in $\frac{3}{4}$ -in. thickness.

Combination cores are a fairly recent innovation in the plywood industry. Developed to optimize the use of wood waste products and marginal timber, this plywood sub-category combines several core veneers with one or more layers of either MDF or particleboard.

Called by various names such as ArmorCore, Classic Core or Fiber-Ply, combination boards are made mostly in $\frac{3}{4}$ -in.-thick panels. A sheet typically weighs 30 percent less than particleboard. The core material



G Medium density overlay (MDO) plywood, **H** Fiber-ply plywood with cherry face, **I** ArmorCore plywood with maple face, **J** 9-ply walnut plywood, **K** 13-ply Baltic birch plywood, **L** melamine-coated particleboard.



A solid feel. Made mostly from mahogany plywood, the paneling, cabinetry and desk in this home office have the feel and look of solid wood.

is usually three plies of veneer in the center and a layer of MDF or particleboard on either side with outer plies of hardwood veneer. Cost is less than a standard VC panel, and screw-holding is superior to that of solid core.

Medium Density Fiberboard

Commonly called "MDF," medium-density fiberboard is the panel to choose when you need a surface or substrate

that's extremely flat and smooth. MDF is made from what used to be considered waste—refined wood chips that are ground into fibers. The raw material can be hardwood or softwood, or a combination of the two. The fibers are blended with a small amount of urea glue and paraffin waxes (for moisture resistance). This mixture is then blown into a forming machine that makes a continuous mat. A hot press squeezes the mat flat

under tremendous pressure (up to 50,000 lbs.), then the panel is sanded to finished thickness and sawn to size.

Unlike plywood, MDF comes in very precise thicknesses: A $\frac{3}{4}$ -in.-thick panel is right on the money. Suppliers stock sheets in $\frac{1}{4}$ -in., $\frac{1}{2}$ -in. and $\frac{3}{4}$ -in. thicknesses, and standard panel size is $\frac{1}{2}$ in. over 4 ft. by 8 ft. to allow for later trimming by the user.

The dense, homogeneous character of MDF gives it great stability, making it an ideal material for jigs and fixtures. However, MDF is susceptible to moisture if left unsealed and swelling will cause a permanent change in thickness. A film finish or surface veneer will protect boards from absorbing moisture. Because MDF has no grain to provide stiffness, panels have a tendency to sag under load, even under their own weight. To prevent bowing, you'll need to keep spans short (see chart, page 56), or design a support structure that will prevent sagging. Don't use regular wood screws in MDF because they'll strip out. Instead, use deep-threaded screws for good grab. For even better holding power, use knock-down fasteners.

Common woodworking glues bond well to the surface of MDF, but the porous edges should be sized before gluing. (A thin coat of white glue works fine.) Panel faces are smooth enough to go right into the finish room, and MDF's uniform surface makes it an

PHOTO BY PHIL SMITH

SPEAKING THE LINGO

How do you tell the lumberyard or your supplier the exact look of the plywood you want to buy? Learn to speak the lingo, that's how. The Hardwood Plywood and Veneer Association (HPVA) has a well-established system for grading the appearance of outer or face veneers, including the type of grain pattern. "Flatsawn" or "plain sliced," "book matched," "quarter sliced" and "rotary-cut" are the most common choices. (For more on types of veneer matching, see AW #42, pg. 69.)

When ordering panels, you can describe the quality of veneer you want with letters and numbers. (See chart below.) Face veneers are given a letter from A to E, while veneers deemed good only for the back side of the work are described by a number from one to five. For example, "A-3" plywood has a premium-quality face veneer and a utility or "shop-grade" back and would be described as "good one side." A panel designated as "A-A" will have two premium sides.

Another point to remember: If you're ordering a batch of panels for one project (say, to line the walls of a room), be sure to ask for "sequence-matched and numbered." This way, face veneers are from the same log in the order sawn, providing a continuity of grain from sheet to sheet.

—A.R.

VENEER GRADES FOR PLYWOOD

FACE GRADES		BACK GRADES	
A	Premium appearance; no knots.	1, 2	Sound surface; small knots and repairs that are progressively less restrictive.
B	Good appearance with natural characteristics of species; sapwood.	3	Small open defects; repaired splits, joints, bark pockets.
C, D & E	Sound surfaces, but has patch repairs in increasing size ranges.	4	Open splits and joints; 4-in.-dia. knot holes.

MAKING PLYWOOD: SOUTHERN STYLE

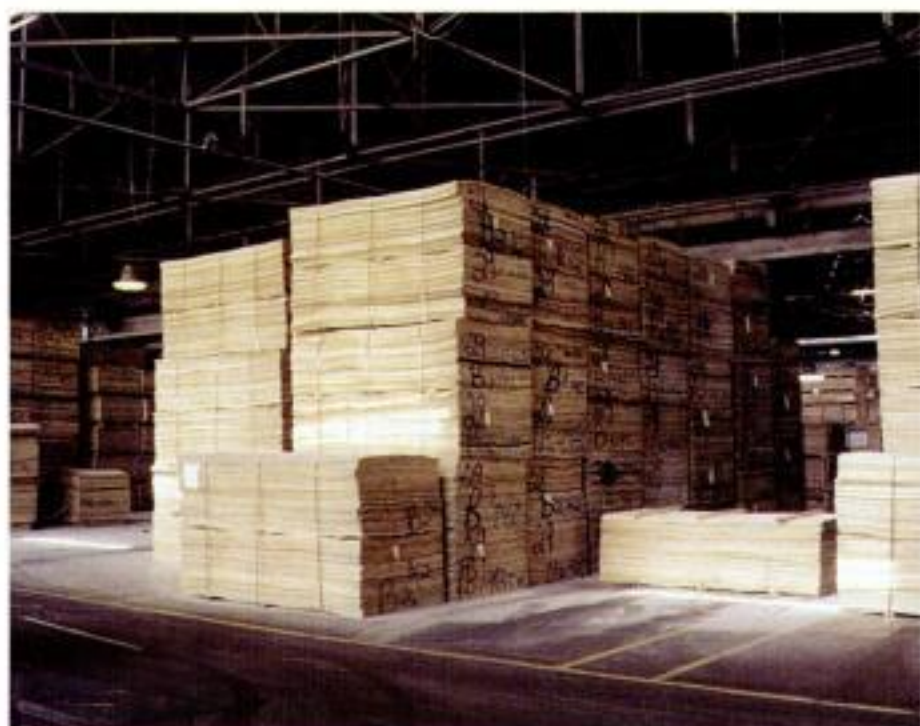
“We’ve been making hardwood plywood for over 40 years,” explained Bruce Halliburton, the sales manager at Georgia Pacific’s plywood plant outside Savannah, GA. Halliburton served as my guide during an intensive, day-long tour of the 200,000 sq.-ft. facility.

Anticipating a high-tech, fully automated operation, I was surprised at how “hands-on” and basic the panel-making process turned out to be.

Face and core veneers are selected by eye for appearance and grade, then the veneers are sent through a pair of glue rollers. Each slippery, adhesive-coated sheet is caught in mid-air by two workers who arrange the plies in alternating grain directions to form

a stack of panels. (See photo, upper right.) The next stop for this massive stack is a cold press that temporarily sets the glue; then the panels go to an enormous hot press that heats the sheets and glue while forcing the glued plies together. After pressing, panels are sawn to size by a series of circular saw blades and finish-sanded to 180-grit.

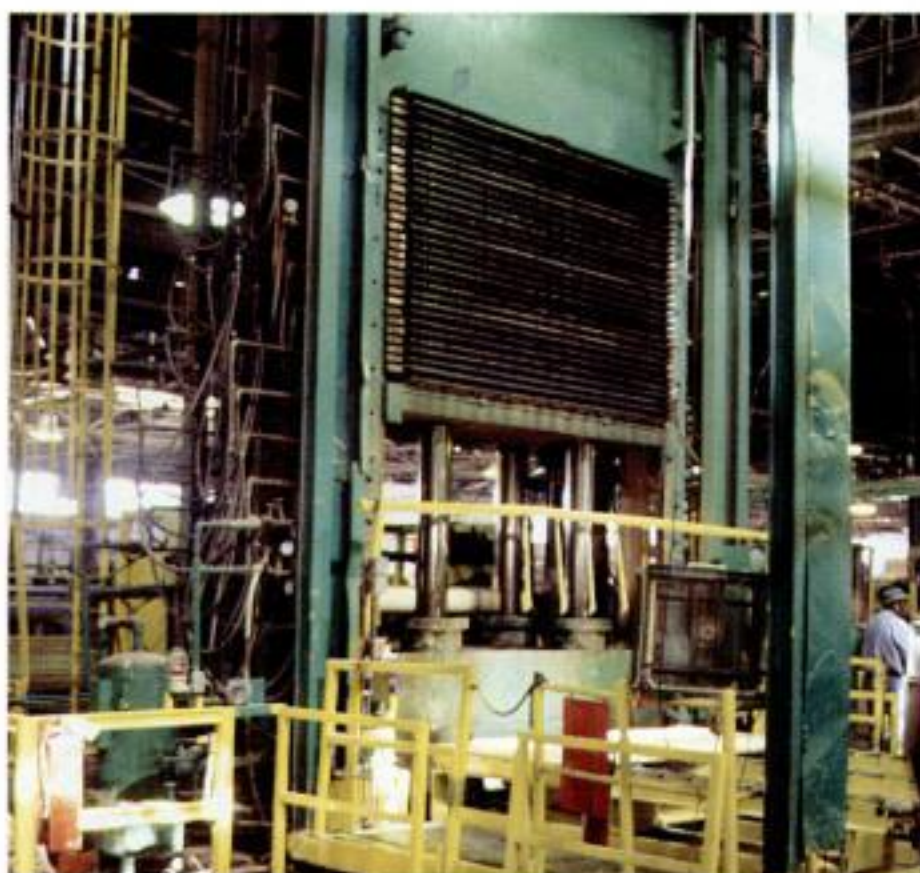
At the end of the line sits Annie-Jo Harris, an employee of the plant for almost 30 years. With the aid of six huge, strategically placed mirrors, Harris checks the edges and faces and assigns each sheet a grade as panels track past her viewing booth. At 4,000 sheets a day, Annie-Jo knows plywood better than anybody. —A.R.



From here to eternity. Over one million sheets of poplar-core veneer stretch as far as the eye can see at Georgia Pacific’s plywood plant in Savannah, GA.



Rolling the glue. Workers catch glue-covered plies and arrange them in alternating grain directions to make a stack of plywood sheets.



Pressing it hot. Individual sheets are pressed under 250 lbs. per sq. in. at 270°F.



Quick saw. Two saw blades trim the ends of panels square to the sides.

PANEL CHARACTERISTICS

Panel Type	Cost ¹	Weight ($\frac{1}{2}$ "x4x8)	Dimensional Stability	Flatness	Screw Holding	Deflection ² (in.)	Water Resistance	Comments
Softwood Plywood	Fir \$20	68 lbs.	Good	Poor	Good	$\frac{5}{16}$	Good	Good for utility shelving.
Veneer Core Hardwood Plywood	Birch \$50 Walnut \$80	55 lbs.	Good	Fair	Good	$\frac{1}{4}$	Good	Used for casework, shelving and paneling.
Solid Core Plywood	Birch \$35 Walnut \$60	80 lbs.	Good	Good	Fair	$\frac{1}{2}$	Fair	Used for casework, table tops and other flat work.
Lumbercore Plywood	Birch \$100 Walnut \$140	60 lbs.	Fair	Fair	Excellent	$\frac{5}{32}$	Good	Excellent shelving material; good where rigidity is needed.
MDF	\$33	105 lbs.	Excellent	Excellent	Fair	$\frac{3}{4}$	Poor	Used for painted and veneer surfaces, jigs.
Particleboard	\$20	95 lbs.	Excellent	Good	Poor	$\frac{13}{16}$	Poor	Used for countertops and as a substrate for plastic laminates.

KEY: Notes: 1=A-2 grade panel 2= $\frac{1}{4}$ "x10x36 panel with uniform load of 100 lbs.

Information courtesy of American Plywood Association, Hardwood Plywood and Veneer Association, National Particleboard Association.

excellent substrate for veneers or laminates. Surfaces can be routed and edges can be shaped to take a sharp, crisp profile. Lightly sand edges before finishing in order to remove the nap left after machining. One caution: Machining MDF produces a fine dust that gets everywhere; good dust collection and a dust mask are a must.

Hardboard, sometimes referred to as Masonite (the brand name of International Paper Company's board), is similar to fiberboard in that it is made from ground-up fibers. Because it's commonly available in $\frac{1}{8}$ -in. and $\frac{1}{4}$ -in. thicknesses, this type of board is more suited to fixture work rather than furniture making. Slightly denser than MDF, hardboard has a smooth, burnished surface that needs roughing up before gluing (120-grit works well). Hardboard is available with vinyl or plastic-covered surfaces.

Particleboard

Often called flakeboard or chipboard, particleboard is made from chips that are compressed under heat and pressure. This dense board is ideal as a substrate for plastic laminates (the surface is too coarse for thin wood veneers), and its low cost is attractive to many woodworkers. Cabinetmakers use particleboard for countertops and cabinets. Like MDF, particleboard is heavier than plywood and sensitive to moisture.

Particleboard is generally available in a wider selection of thicknesses than plywood or MDF. All the standard

thicknesses—from $\frac{1}{4}$ in. to $\frac{3}{4}$ in.—are stocked, as well as thicker panels like 1 in., $1\frac{1}{4}$ in. and $1\frac{1}{2}$ in. Panels are typically 48 $\frac{1}{2}$ in. wide by 96 $\frac{1}{2}$ in. long.

Unlike MDF, the large chips in particleboard leave a rough edge which requires banding with a solid material. Like MDF, working with particleboard requires good dust collection.

Sharp carbide cutters are a must when working with particleboard. The National Particleboard Association recommends using a 50-tooth, triple-chip saw blade and a 10° positive hook angle for the tablesaw. Lower hook angles or negative hook angles work best on radial arm saws.

Coated particleboard panels covered with materials like plastic melamine (MCP), paint (Kortron) or vinyl, have tough, wear-resistant surfaces. Using coated panels can save time where you don't want to be bothered with finishing chores—as with cabinet interiors, for example. Coated panels can be worked like regular particleboard, but chipping on the surface (particularly with MCP) is a problem when cutting on the tablesaw. To reduce chipping—



ANDY RAE is an assistant editor of AW.

especially on the underside of panels—lower the saw blade until the teeth barely project through the surface of the work. ▲

SOURCES

Plywood is available by mail from:

Boulter Plywood

24-AW Broadway
Somerville, MA 02145
(617) 666-1340 Circle #601

M.L. Condon

250 Ferris Ave.
White Plains, NY 10603
(914) 946-4111 Circle #602

Steve Wall Lumber

P.O. Box 287,
Mayodan, NC 27027
(800) 633-4062 Circle #603

The Woodworkers' Store

21801 Industrial Blvd.
Rogers, MN 55374
(800) 279-4441 Circle #604

More information on man-made boards is available from:

American Plywood Association

7011 S. 19th Street
P.O. Box 11700,
Tacoma, WA 98411
(206) 565-6600

Hardwood Plywood and Veneer Association

1825 Michael Faraday Dr.,
P.O. Box 2789
Reston, VA 22090
(703) 435-2900

National Particleboard Association

18928 Premiere Ct.,
Gaithersburg, MD 20879
(301) 670-0604

BEYOND THE BASIC PANEL

When it comes to panel products, there are almost as many varieties as there are species of wood. Made from a variety of materials—from space-age plastics to recycled garbage—the following panels are gaining popularity for commercial and small shop applications. —A.R.

PLYWOODS

A Appleply. American-made (in standard sizes), this high-quality, multi-layer plywood has a core made entirely from void-free sheets of alder. (*States Industries*, 503-688-7871.)

B Finland Color Ply. A high grade of Finnish plywood impregnated on the face and back with a translucent, colored resin. (*Finland Color Plywood*, 310-396-9991.)

CDE Bending plywood. Made with uni-directional veneers or with saw kerfs cut on one side, this board can be bent to radii as small as 1 in. Some trade names are Wiggle Wood (C), Kerfkore (D) and Italian bending poplar (E). (*North American Plywood*, 213-941-7575; *Kerfkore Unlimited*, 800-637-3539.)

COMPOSITE BOARDS

FC Medex and Medite II. Both of these MDF boards are formaldehyde free. The glue used in Medex makes this board highly resistant to moisture. (*Medite Corp.*, 503-773-2522.)

H FiberStrate. This is an MDF board made with waterproof glues for outdoor projects. (*Georgia Pacific*, 404-652-4000.)

II Honeycomb. Fabricated with a honeycomb core, these lightweight panels are extremely rigid. Cores are foam, plastic (I) or cardboard (J); with facings of wood, hardboard or plastic laminate. (*Norfield Corp.*, 203-792-5110; *Tricel Corp.*, 708-336-1321.)

K Gatorfoam. Available in thicknesses from $\frac{3}{16}$ in. to $1\frac{1}{2}$ in., these lightweight panels are made with a foam core faced with resin-coated paper, and are easily veneered. (*International Paper Co.*, 704-872-8974.)

ENVIRONMENTALLY-FRIENDLY BOARDS

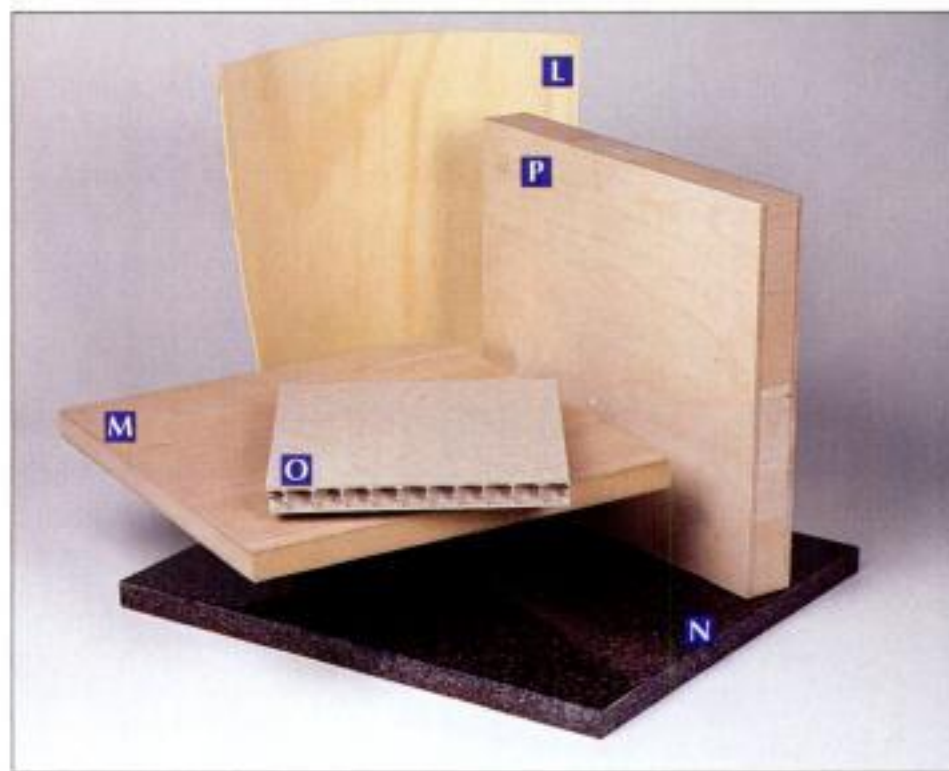
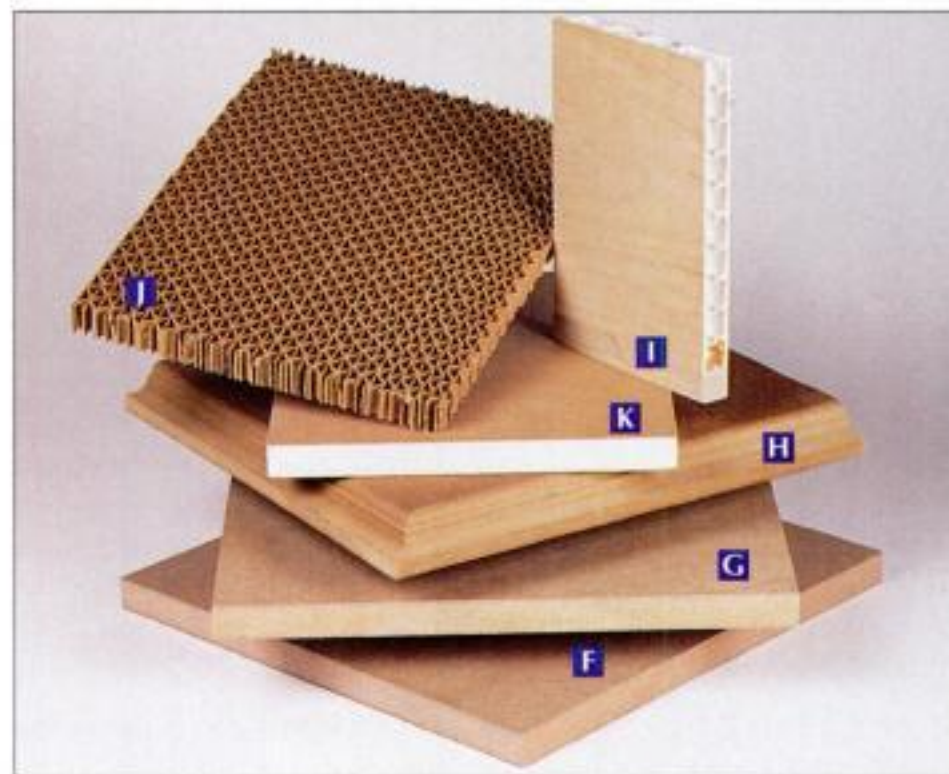
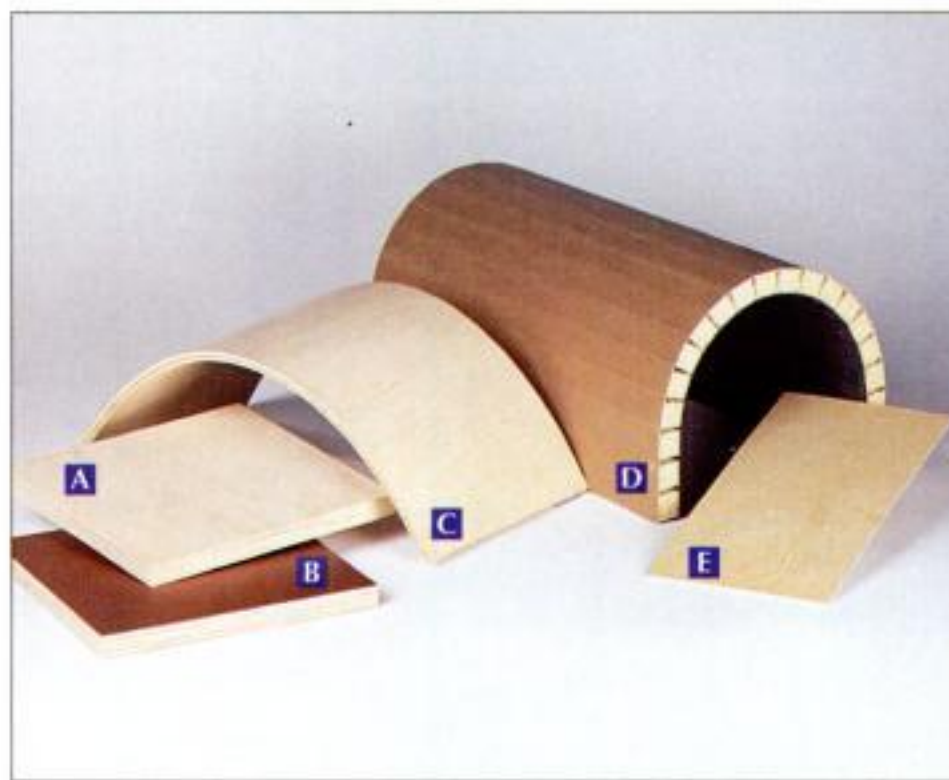
L Hoop pine plywood. Made from plantation-grown Australian hoop pine, these panels can be bent into shallow curves. (*Riteco Supply*, 713-896-6200.)

M EcoPanel. Made with certified hardwood face veneers, EcoPanels have cores of either Medite II (see above) or Gridcore (see below). (*Eco Timber*, 415-864-4900.)

N Environ. Resembling granite in appearance and weight, this solid-surface board is made from waste paper and soybean flour. (*Phenix Biocomposites*, 507-387-4848.)

O Gridcore. Replacing lauan plywood on Hollywood sets, Gridcore panels have a honeycomb structure that makes the panels extremely rigid. Boards are made from grain, cardboard and old Newsweek magazines. (*Gridcore Systems*, 619-431-8494.)

P Ecoform. This extremely stiff, yet lightweight panel has a core of plantation-grown, end grain balsa sandwiched between hardwood veneers. (*Baltek Corp.*, 201-767-1400.)



More Than a Table

A Table that Remembers it Once was a Tree



Heart and soul. This massive pine table, more sculpture than furniture, embodies Odate's belief that wood has a spiritual quality that can help people regain a sense of their relationship to the natural world.

Quite a few years ago—in the late 70s and early 80s—four college students were spending some of their time at my house. We ate together, drank together, discussed philosophy and exchanged ideas. They were not under a strict apprenticeship like I had gone through, but they worked very hard, both mentally and physically.

One of these students was a part-time lumberjack. He told me about a large, knotty log of pine he had found. It had been left in the woods because it was oddly shaped and useless for the lumber

mill. I expressed my interest in the log immediately. I already had the idea for a dining table in my head—a great slab of wood with its natural edges and imperfections intact, evidence of the living tree from which it came.

He brought the log to me the following week. I removed the bark right away and cleaned the log with a hard brush. It was a dark colored, massive organic body. It had an overwhelming, dynamic rhythm. I can remember sliding my hand along its contour; it was like touching a huge animal. I felt a warm familiarity and a powerful trust. I told myself not to lose this sensation when I built the dining table.

Cutting the Slab

I examined the contour of the log and decided to cut a slice about 5-in.-thick for the table top. To be sure the plank would not have any twist, I positioned the log with the uncut imaginary table top vertically and marked vertical plumb lines on both ends. (See drawing.) Then, I connected the two plumb lines with ink lines along the sides of the log.

Next, I turned the log so the table top was horizontal. I placed a mirror on the other side of the log so I could see the line on the opposite side while I cut. I began cutting at the narrow end of the log with a 3-ft. chain saw, watching the line on the near side of the log while I

By Toshio Odate

peeked at the tip of the saw reflected in the mirror. (See drawing.) Where the log got wider towards the middle, I switched to a 4-ft. bar on my saw.

As I was cutting the pine log, I thought back to when I was an apprentice in Japan. I remember a great sawyer named Tenjin who sliced many thin panels using only a handsaw. Some of these panels were 3 ft. wide and only $\frac{3}{8}$ -in. or $\frac{1}{2}$ -in. thick. He used an unimaginable amount of energy and skill to slice such panels by following only two thin ink lines.

After making the first cut, I used a portable power plane to smooth and flatten the sawn surface, eliminating any twisting, warping and saw marks. I rough-trued the surface with a hand plane, then I marked another set of lines parallel to this surface. When I completed the second cut, I planed this side the same way as I had the other, except this time I carefully checked to see that the thickness was consistent.

To keep the plank from warping, I cut six 2x4s about 2 ft. longer than the width of the plank. I tied them to the plank from both sides. (See drawing.) After I tied the plank, I painted both ends and about 8 in. up the faces with shellac. I covered the ends with box-like shapes to slow the speed of drying. If the middle of the plank were to dry and shrink a little bit faster than the ends, the ends would have less chance to crack.

When I had finished these preparations, I sheltered the plank beneath the broad eaves of my workshop roof, making sure that air could circulate freely on all sides. It was about this time that the table gained its owner.

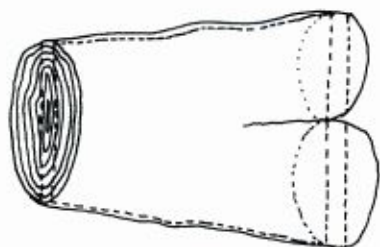
A very good friend, Dr. William Gundermann, expressed a great deal of interest in my approach to woodworking. As different as our professions are, we discovered a common appreciation for the organic aspects and the sculptural qualities of wood. In the table top I had drying out by my workshop, we both saw the beauty of the tree in its natural state. We agreed that the table that might be created from this log section should always remember that it once was a tree.

My friend had recently lost his mother and I decided to make this table for him to show my sorrow for his great loss. He spent many hours in my studio watching the table take shape and taking the photographs shown on the following pages.

CUTTING AND DRYING THE TABLE TOP

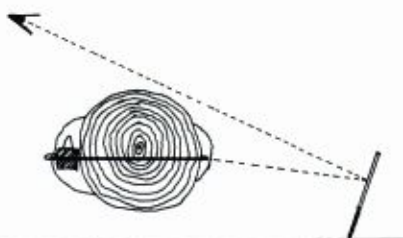
STEP 1: LAYING OUT THE SLAB

With the log turned so the intended slab is vertical, Odate uses a plumb bob to lay out the slab thickness on both ends, then he snaps ink lines along the length of the log connecting the corresponding end lines.



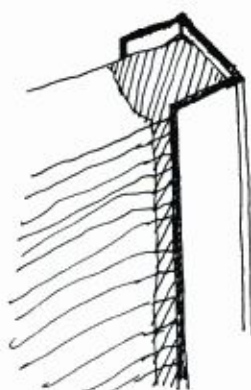
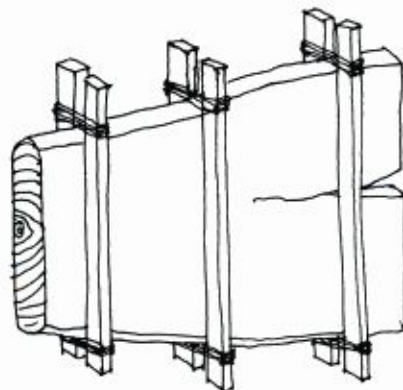
STEP 2: CUTTING IT STRAIGHT

After turning the log 90°, Odate rips along his lines with a chain saw. To keep his saw from wandering in the cut, Odate watches the tip of the saw in a mirror while sawing.



STEP 3: PREPARING THE SLAB FOR DRYING

Pairs of 2x4s tied around the freshly-cut slab prevent it from cupping as it dries. Odate then coats the ends of the slab with shellac and encloses them in three-sided boxes to keep the ends from drying too quickly and splitting.



Final Thoughts

My decision to support the table top with two tapered sliding dovetailed beams and four octagonal legs was based on the design of a small, old Shinto shrine in Japan. The floor of that shrine was elevated by six simple columns, high enough so people could walk underneath it easily. The shrine was very simple yet it looked heavy and strong. My attention was drawn towards its upper structure. In the same way, I wanted to draw people's attention to the table top—the thick plank, with its strong, familiar contours and its grain which told an old story.

I made this table not as a cabinetmaker nor as an interior designer; I made it as a sculptor. Like many of my other sculptures, the table reflects my inner

thoughts on human emotions in a synthetic society that is moving quickly toward dehumanization. I hoped people would look at, touch and feel the table so



they could communicate with the organic world. Only then would my purpose of constructing the table be accomplished. ▲

TOSHIO ODATE is a noted sculptor and shoji maker who teaches design at Pratt Institute in Brooklyn, NY. He is the author of the book, *Japanese Woodworking Tools: Their Tradition, Spirit and Use* (1984, Taunton Press, Newtown, CT 06470).

MAKING THE TABLE

After planing the bottom surface of the table flat and squaring the ends, Odate made two dovetailed beams to connect the top to the legs. The dovetails are sharply angled for strength in this soft wood and the beams and their sockets are slightly tapered from end to end to assure a tight fit. Here, one of the beams is ready to be driven home with a **akeya**, a mallet sometimes called a "commander."



Odate lays out the tenons on the table legs with a **suji-keshiki**, or line-marking gauge. He uses these markings to lay out the mortises on the undersides of the beams.



To prepare the tenons, Odate first saws and pares the deep grooves between the tenons (see photos, above), then he chisels away excess material from the edges of the tenons (see photo, left), and smooths them with a **tsukinomi**, a large paring chisel or "slick."



The finished joint has many shoulders to add strength. When assembled, none of the complicated joinery is visible from the outside.



The joinery complete, Odate cuts the octagonal profiles on the legs. After bandsawing the legs square, he makes 45° saw cuts to his layout lines (left), then removes the waste on the beveled edges with a drawknife (above).



Final steps. After driving the dovetailed beams into place, Odate assembles the legs to the beams with rice glue. He wipes one coat of Watco oil on the completed table to even out the color and help protect the surface.

Buyer's Guide to Lathe Chucks

Not Just Chucks, but Chucking Systems Designed to Hold Work in a Variety of Shapes and Sizes

by Stephen Blenk



A good turn. A scroll-type chuck is great for gripping bowls and hollow vessels for turning on the lathe.

Whether your lathe is a bench-top model or a big, full-featured one, ultimately it's just a platform for spinning wood. Once you go beyond basic spindle turning, finding a way to hold your work on the lathe becomes a major concern. Sooner or later, you get tired of designing turning projects around the limitations imposed by a standard faceplate or spur center.

The answer is to buy an aftermarket lathe chuck. Today's chucks—which function more like chucking *systems*—are designed to hold work of all shapes and sizes. These multi-function chucks enable you to take on all kinds of projects: small, delicate turnings, large bowls with recessed bases, boxes, hollow vessels and more.

A chuck may be the single most expensive turning tool you buy next to the lathe itself, so it is very important to select one that gives you flexibility. For this Buyer's Guide, I tested 10 chucks from six different manufacturers. All of the chucks were tested on the same lathe—a 4-speed, 12-in. Rockwell-Delta model.

Most of the chucks I tested qualify as “scroll-type” combination chucks patterned after metal-working chucks. The Sorby Precision Combination chuck, one of the first true multi-function chucks designed for wood turning, isn't reviewed here, mainly because it's no longer sold in the U.S.

Many of today's lathe chucks share

the same basic features. Each has four self-centering jaws or collets that can be adjusted in to grip a “spigot” or round tenon, or adjusted out to grip a recess. (See drawings, opposite page.) Two specialized chucks are covered in the sidebar on page 67. In addition to these basic jaws or collets, each chuck has accessories that can multiply your lathe's capabilities many times over: screw centers, pin chucks, faceplate rings and different specialized attachments. Some are designed to grasp miniature work; others will hold a large bowl so you can finish the bottom. (See photo, opposite page.) Most of these chucks use screw-in inserts that will fit popular headstock spindle sizes.

Testing the Chucks

Before I get into the chuck-by-chuck evaluation, I'll discuss the features and considerations that were important factors in rating this equipment.

Versatility: Does the chuck offer accessories that allow it to hold plates, bowls and boxes in a range of sizes as well as regular and irregular shapes?

Ease of setup and use: How easy is it

to mount the chuck on the lathe and change jaws?

Ease of stock preparation: Do you have to pre-turn your workpiece to fairly exact dimensions, or will the chuck's jaws adjust wide enough to grip a range of shapes and sizes?

Repeatability: Can you dismount and then remount a workpiece and have it stay centered?

Safety: Does the chuck hold the workpiece securely, while minimizing dangers to the operator? Do the jaws project out, endangering your knuckles?

Cost: What's the base price with standard equipment and the *real* cost after adding the accessories you need?

Using these criteria, I compiled the chart on page 64-65, and also completed the evaluations that follow.

Nova Chuck

The New Zealand-made Nova was the first "scroll-type" woodworking chuck to hit the U.S. market. Its standard equipment includes a 2-in. jaw set, a screw center and a wrench set for tightening.

Options include 1-in. and 4-in. jaw sets, a stepped jaw set, a spigot jaw for gripping long tenons, nylon jaws for soft work and oversize Cole Jaws for holding the rim of a bowl so you can work on the base. (See photo, left.)

I like the improved screw chuck attachment with its more aggressive, knife-edge thread. Earlier versions of the screw chuck have a tendency to slip as they age. I also like the setscrew that lets me set the chuck's adjustment tension. Repeatability (remounting pieces) is possible, although perfect realignment was tricky to achieve.

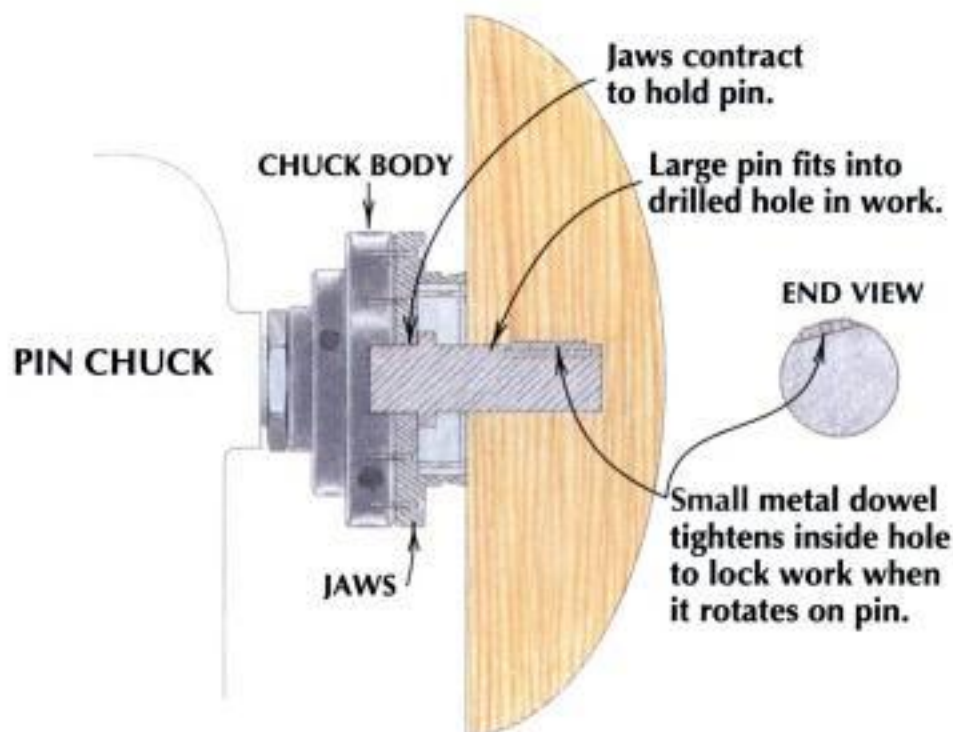
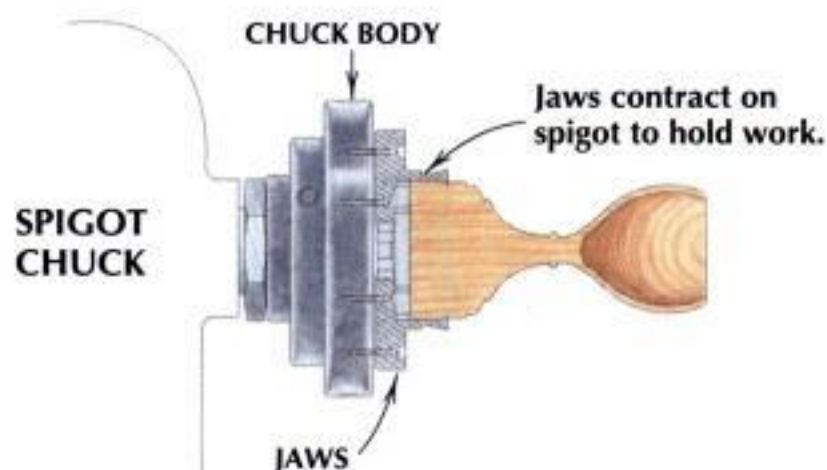
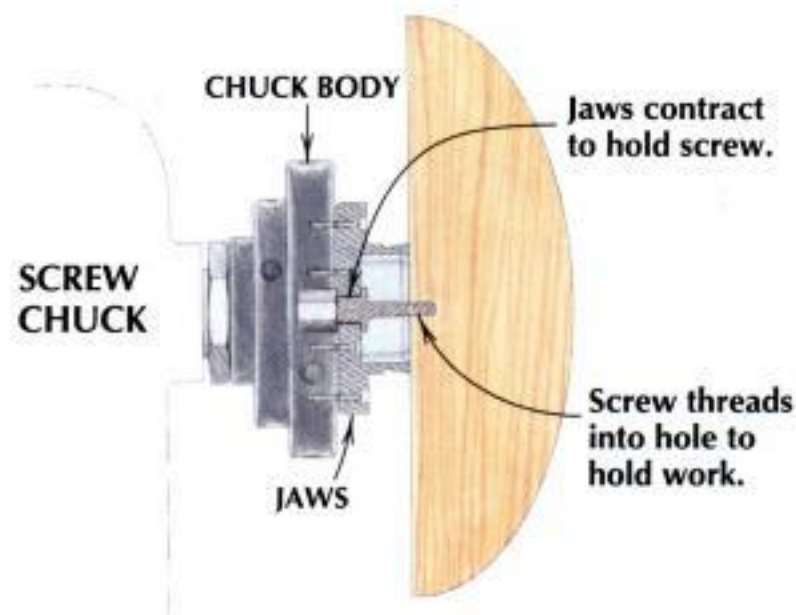
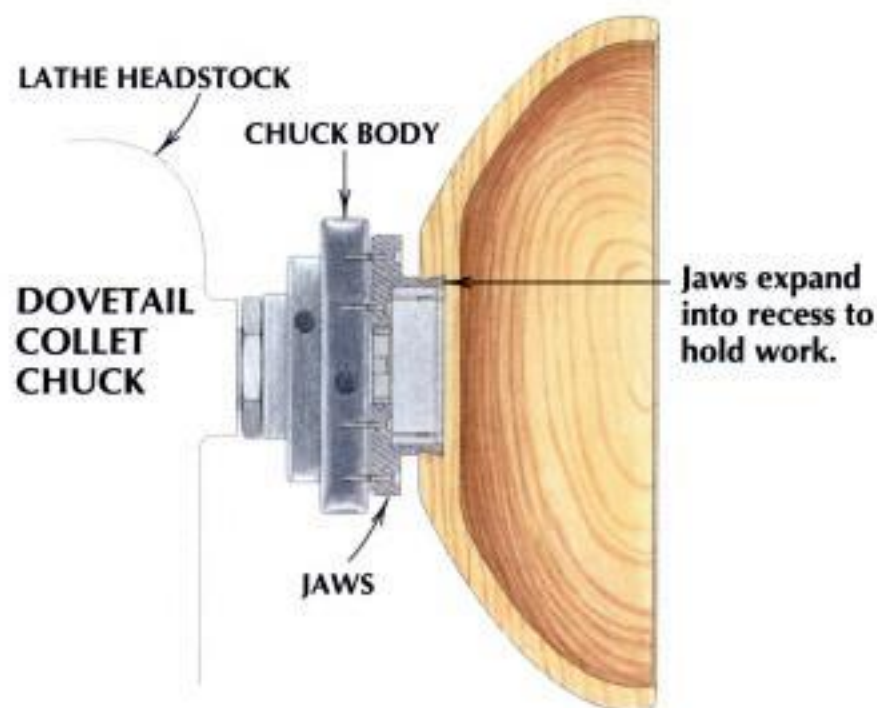
The standard 2-in. jaws are shallow (just under 1/2 in.) and have only a single grasping edge at the top. The most useful accessories were the Cole Jaws and the 1-in. jaws for holding miniature work. The optional 4-in. jaws were useful for large shallow platter work, but in my judgement, the holding power isn't adequate for large deep vessels.

Bottom line: I'd rate the Nova a solid all-around chucking system and a good value for your money.



Around the rim. With oversize jaws like the Cole Jaws on this Nova chuck, you can grip a bowl by its rim in order to finish the base.

FOUR WAYS TO GRIP THE WORK



NOVA CHUCK



ONEWAY STRONGHOLD CHUCK



ONEWAY 4-JAW CHUCK



AXMINSTER 4-JAW CHUCK



AXMINSTER CARLTON CHUCK



Oneway Stronghold Chuck

This Canadian chuck system appears to be directly descended from the Nova chuck. Expanding/contracting jaws are available in three sizes (designated #1, #2 and #3). The Stronghold comes standard with #2 (mid-size) jaws and a screw center. These jaws are a tad deeper than Nova's and they've also added serrations at the base of the jaws to grasp the work more securely, making them better for deep end-grain work that really stresses a chuck.

My favorite feature on this chuck is its key-tightening system. As shown in the photo on page 66, the key allows you to exert substantial tightening torque with just one hand, leaving your other hand free for holding the workpiece. Another noteworthy feature: The insert has double-cut threads, which makes it possible

to switch from inboard to outboard (left-hand thread) mounting without changing inserts.

The Stronghold's big #3 jaws allow you to turn a 20-in.-dia. bowl. They'll contract to hold a spigot up to 5-in. across and expand to a whopping 6-in. outside diameter. Optional Mega Jumbo jaws can grip a bowl rim up to 16 in. in diameter. On the down side, I'd like to see a more aggressive thread on the standard screw center and the chucks' instruction booklets could be more complete.

Oneway 4-Jaw Chuck

Oneway's smaller model chuck, simply called the 4-Jaw, closely resembles the Nova chuck. The Oneway 4-Jaw accepts three sets of expanding/contracting jaws, with the mid-size #2 jaws and a screw center as standard equipment. Another

LATHE CHUCKS

Model	Base Price	Ease of Setup	Ease of use	Stock Prep	Repeatability
Nova <i>Circle #611</i>	\$160	●●●	●●●	●●●●●	●●●
Oneway Stronghold <i>Circle #612</i>	\$269	●●●●●	●●●●●	●●●●●	●●●●
Oneway 4-Jaw <i>Circle #612</i>	\$189	●●●●●	●●●●	●●●●●	●●●
Axminster 4-Jaw <i>Circle #613</i>	\$249	●●	●●●●●	●●●●●	●●●●●
Axminster Carlton <i>Circle #613</i>	\$259	●●●	●●●●●	●●●●●	●●●●●
Vicmark 3½-in. Chuck <i>Circle #614</i>	\$180	●●●	●●	●●●●●	●●●
Vicmark 6-in. Chuck <i>Circle #614</i>	\$260	●●●	●●	●●●●●	●●●
Sorby Premier Robot Chuck <i>Circle #615</i>	\$78	●●●	●●	●●●	●●●●
Sorby Eccentri-Chuck <i>Circle #615</i>	\$195	●●●	●●●	●●●●●	●●●●●
Glaser Screw Chuck <i>Circle #616</i>	\$100	●●●●●	●●●●●	●●●●●	●●●●●

KEY: *Accessory jaws for Axminster are necessary to mount other optional jaws.

option is the Jumbo Jaw set that works like Nova's Cole Jaws. The Oneway 4-Jaw chuck, like the Stronghold, includes a T-handled hex wrench for changing jaws.

Compared to the Nova, the Oneway 4-Jaw has extra holes for the tightening bars, which makes for less searching when you're mounting a piece. Its standard jaws are also slightly deeper and have serrations to grip better. The 4-Jaw works well, but of the two Oneway chucks, I think the larger Stronghold model is the way to go if you can afford the extra cost.

Axminster 4-Jaw Chuck

The Axminster 4-Jaw is a chucking system that combines the precision of a fine machinist's chuck with the versatility of a scroll-type chuck. The basic set includes

inside and outside machinist's jaws and a spring-loaded adjusting key (which prevents accidents caused by starting the lathe with the key in the chuck).

The Axminster 4-Jaw is the most adaptable chuck I've ever used. It can be used with optional dovetail jaws, faceplate rings, screw chucks, pin chucks, soft jaws and even jaws named after an [Englishman—the O'Donnell Jaws](#). (See [photo, page 67.](#)) **Warning: There's NO STOP** on this chuck, so the jaws can back right out of the chuck if you loosen them too far! On the down side, many of these jaws are specialized, expensive and targeted to the professional turner. Also, you're forced to purchase a set of accessory jaws (\$79) just to mount any of these accessories to the chuck.

The long O'Donnell Jaws give you unrestricted access around the bottom

VICMARK 3½-IN. CHUCK



VICMARK 6-IN. CHUCK



SORBY PREMIER ROBOT CHUCK



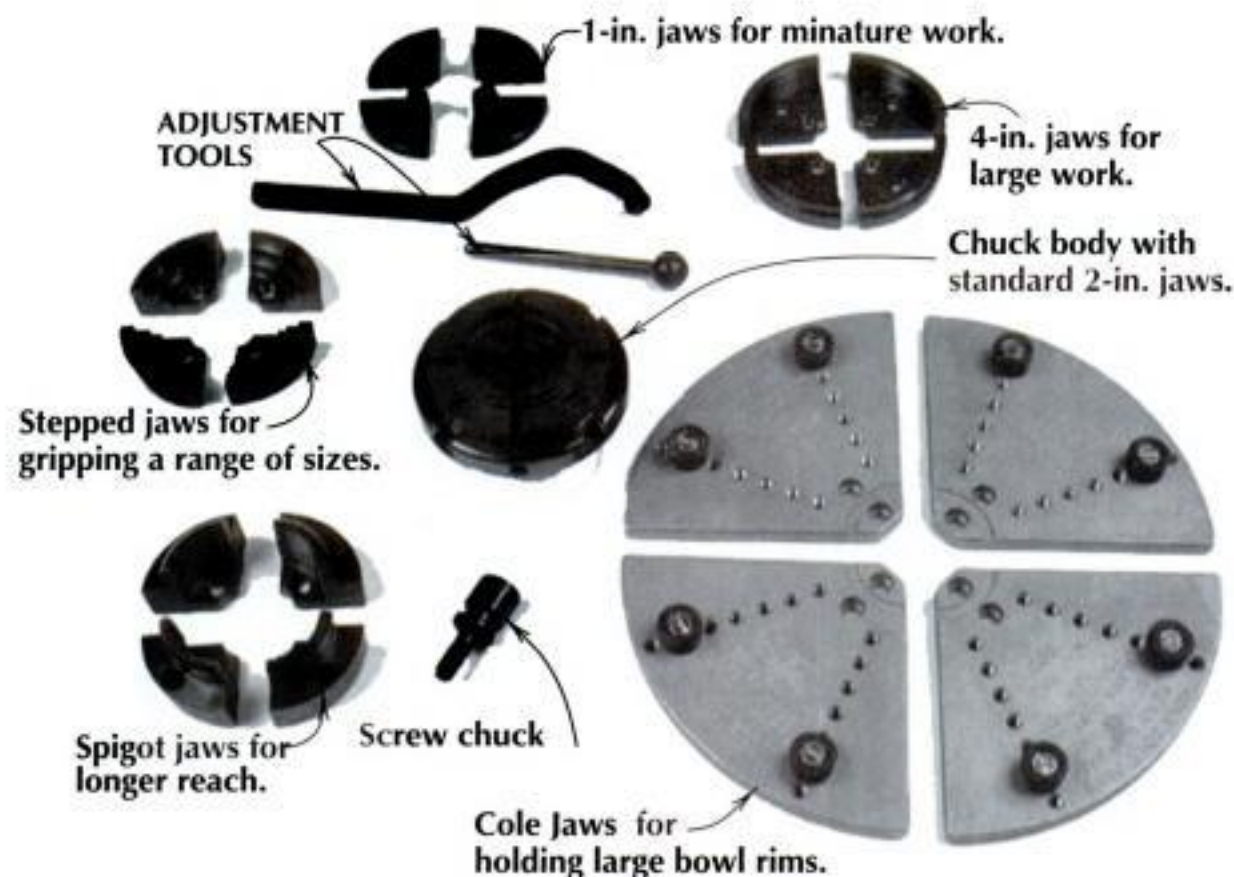
SORBY ECCENTRI-CHUCK



GLASER SCREW CHUCK



Safety	Standard Equip.	Accessories (Price)	Chuck Body Diameter (in.)	Remarks
●●●●●	2-in. jaws (exp. & cont.) screw chuck	stepped jaws (\$29.95) miniature 1" jaws (\$22.95) Cole Jaws (\$69.95) 4-in. jaws (\$32.95) spigot jaws (\$35.95) nylon "pro" jaws (\$24.95)	3¾	Two-handed tightening
●●●●●	#2 jaws (exp. & cont.), screw chuck	#1 jaws (\$40.00) #3 jaws (\$47.00) Jumbo Jaws (\$80.00) Mega Jaws (\$110.00)	4⅝	One-handed, key tightening
●●●●●	#2 jaws (exp. & cont.) screw chuck	#1 jaws (\$33.95) #3 jaws (\$37.00) Jumbo Jaws (\$80.00)	3¾	Two-handed tightening
●●●●	Stepped machinist jaws (exp. & cont.)	access. jaws* (\$74.50) 1-in. pin chuck (\$80.00) Faceplate rings (\$70.00 ea.) A,B, or C jaw sets (\$70.00 ea.) wood jaw plates (\$50.00) O'Donnell jaws (\$130.00) screw center (\$55.00)	3⅞	One-handed key tightening, very precise, but expensive
●●●●	accessory jaws, "A" jaws	same as Axminster 4-Jaw	3¾	One-handed key tightening
●●●●	2-in. jaws (exp. & cont.), screw chuck	step jaw set (\$35.00) 1-in. jaw set (\$27.00)	3⅝	Two-handed tightening
●●●●	2½-in jaws (exp. & cont.), screw chuck	1-in. jaw set (\$33.00) 4½-in. jaw set (\$40.00) wood jaw plates (\$40.00 ea.) faceplate rings (\$22.00-\$27.00 ea.)	5¼	Two-handed tightening, very large capacity
●●●●	55mm expanding jaws	40mm jaws (\$29.00) 75mm jaws (\$29.00) screw chuck adaptor (\$18.00) wood jaw plate adaptor (\$34.00) pin chuck adaptor (\$19.00)	2⅞	Limited adjustment range
●●●●	offset screw chuck, hex ball drive & socket adaptor	accepts premier robot chuck as accessory	3⅞	"Zero" setting was also eccentric, excellent axis repeatability
●●●●	screw chuck with 3 base diameters	None	3½	Best screw chuck on the market



Different jaws. The Nova chuck, with its array of accessory jaws, represents a typical scroll-type lathe chuck. The standard jaws that constitute the core of this chucking system are shown surrounded by different accessory jaws.

of a bowl, but installing them requires removing the accessory jaws from the chuck body in order to reach the mounting screws.

This is an excellent chuck, and I especially like its high-quality machine work. But for basic production, it's overkill.

SOURCES

Lathe chucks are available from:

Craft Supplies

Nova, Oneway, Sorby, Vicmark,
Axminster 4-Jaw, Glaser
(800) 551-8876

Circle #605

Garrett Wade

Axminster 4-Jaw
(800) 221-2942

Circle #606

Glaser Engineering Co.

Glaser
(310) 823-7128

Circle #607

Lee Valley Tools

Oneway
(800) 267-8767

Circle #608

Packard Woodworks

Oneway, Axminster, Glaser
(800) 683-8876

Circle #609

Axminster Carlton Chuck

Axminster's newest chuck, the **Carlton**, has a smaller body and mounts closer to the headstock than the 4-jaw model, so it runs smoother with large work mounted. All the Axminster jaws mentioned above will fit on it, but, unlike the 4-jaw model, it comes standard with the accessory jaws so you don't have to shell out extra money. Better yet, the Carlton has a keyed adjustment similar to the Stronghold but the key has a longer shaft to let you tighten even wide-based vessels without interference. The toothed key gear on the Carlton remains exposed—a slight safety hazard.

The machining is excellent, and this chuck scores high in the repeatability category. A positive "click" announces each increment of tightening. Like the 4-jaw model, this chuck's jaws *could* back all the way out. Though it lacks a single versatile set of jaws, this is an excellent chuck—I like it better than the Axminster 4-Jaw.

Vicmark 3½-in. Chuck

The Australian-made 3½-in. Vicmark chuck is also modeled after the Nova. It comes standard with a 2½-in. expanding/contracting jaw set and a screw center. Options include a 1-in. jaw set for small work and a stepped-jaw set making it suitable for all-around work.

The 3½-in. Vicmark chuck required complete disassembly to clean out the



Just one hand. The Axminster Carlton (shown above) and Oneway Stronghold chucks have key adjustment that leaves one hand free to hold the work.

cosmoline (a preservative grease) to make it work. The screw center didn't align well in the jaws and tended to slip in the chuck when I tried to screw a bowl blank onto it. (Once tight, the threads held well.) The screw protrudes over 1¼-in., limiting its value for thin stock. Tightening requires two hands to hold the "tommy bars" in its holes on the chuck body, while a setscrew lets you tension the adjusting mechanism.

I had no real difficulty using the 3½-in. Vicmark, but I think the Nova and Oneway 4-Jaw do a better job.

Vicmark 6-in. Chuck

The 6-in. Vicmark is simply a larger version of Vicmark's 3½-in. model, and it's the heaviest chuck in the bunch. A screw center and 2½-in. expanding/contracting jaws are standard. Options include 1-in. and 4½-in. jaw sets, faceplate rings and wood jaw plates which can be turned to any shape you need.

The bigger 6½-in. Vicmark was more than strong enough for gripping deep work. The accessory jaws were simple to change and their large capacity can grip



O'Donnell Jaws. The long jaws on this Axminster chuck accessory give you unrestricted access around the bottom of a bowl, but installing them is difficult.

a spigot up to $4\frac{1}{16}$ in. dia., and expand into a $5\frac{7}{16}$ -in. recess (second only to the Oneway Stronghold with accessory jaws). The Vicmark can be adapted for use on different lathe spindles with a threaded insert that's very substantial, but occasionally unscrews when the chuck is removed.

This chuck is big enough to handle deep work and large-diameter bowls, but it was difficult to tighten large work securely with the two "tommy bars" supplied. Despite its heavy-duty appearance, I'd consider buying one of the other brands that are a bit easier to use.

Premier Robot Chuck

Made in Britain by Sorby, the Premier Robot chuck is a light, compact chuck with expansion-only jaws. Options include 40mm and 75mm jaws, a screw center, wood jaw plates and a pin chuck.

To adjust this chuck, you tighten a conical spindle adapter against a taper on the jaws to open them. Because of this design, the adjustment range is limited (it will grip a dovetailed recess from 50mm to 55mm), but it's relatively easy to use once the stock is carefully prepared. Removing jaws doesn't require tools, but I *could* have used three hands.

The Premier Robot chuck gave me no unpleasant surprises, but I didn't like the precise stock preparation required. I found it works best as an accessory to the new Sorby Eccentri-Chuck. (See sidebar.) There are two other chucks in Sorby's Robot Chuck line, the **Superior** (compression-only jaws) and the **Vantage** (expansion and compression jaws).

Recommendations

The Oneway Stronghold is my top choice for scroll chucks in value and capability for the price. It's well designed, built to last and its key adjustment makes it easy to use. It offers a good range of mounting possibilities in its standard form and the accessories cover most turning situations. Though it costs more than the Nova or the Oneway 4-Jaw, to me it's worth the price.

My second choice is the Axminster Carlton chuck. The only thing it lacks is a more versatile set of standard jaws. Its machine work surpasses that of the Stronghold and its key adjustment is comparable. If you want to go the economy route, the Nova and the Oneway 4-Jaw are both excellent, versatile chucks for fewer dollars. ▲



STEPHEN BLENK is a contributing editor of *AW*.

SPECIALTY CHUCKS

I tested two chucks that aren't designed for multi-purpose use. Each of these chucks perform their special function especially well.

ECCENTRI-CHUCK

If you'd like to have some real fun at the lathe, Sorby's Eccentri-Chuck lets you create wild off-center turnings. (See photo, below.) The chuck allows the workpiece



How did he do that? Sorby's new Eccentri-Chuck turns tricky creations by offsetting the turning axis from the lathe's axis.

axis to be eccentrically offset from the lathe axis. You can set the amount of eccentricity by simply loosening two Allen screws, moving the work on the chuck's offset base and then retightening. The offset is clearly marked in increments on the chuck body.

The Eccentri-Chuck comes supplied with a

screw center and a hex-ball drive and socket adapter for off-set turning between centers. You can also mount one of Sorby's Robot Chucks (see main article) eccentrically to grip work. The only problem I found was that the "zero" setting is still slightly eccentric.

GLASER SCREW CHUCK

The practical simplicity of the Glaser screw chuck (see photo, page 65) reflects Jerry Glaser's long experience with turning. He has designed a strong, aggressive, knife-edge screw chuck available in $\frac{3}{8}$ -in. or $\frac{1}{2}$ -in. diameters that simply does NOT strip out, even in end-grain. I was able to mount this chuck in the same center hole three separate times to turn three nesting bowls. An accessory left-hand thread screw is available for outboard turning.

In addition to the excellent screw, Glaser's chuck is set up for three different face diameters by means of a ring that can be completely removed or inverted to give different contact faces. The Glaser screw chuck works so well, it may be all the chuck some turners need for their natural edge bowl work. —S.B.

The Ultimate Steam Box

Put an End to Broken Parts With This Veteran Chairmaker's Easy-to-Build Steam Bending System

by Mike Dunbar



Off-the-shelf ingredients. The steam "box" is made from schedule 80 plumbing pipe and fittings. Automobile radiator hose conveys steam from the can to the steam chamber. A propane-fueled burner provides the heat.

Woodworkers have been experimenting with different ways to bend wood for centuries. While it's possible to increase wood's plasticity by using chemical compounds, the time-honored method for bending wood has always involved steam treatment. Steam provides the two crucial conditions that make wood more pliable: heat and moisture. The steaming process should heat the wood to a temperature of around 180°F, at the same time increasing its moisture content to around 25 percent.

When I began to teach classes in Windsor chairmaking over 13 years ago, I steamed chair parts in a wooden box. To provide steam, I used a pair of aluminum kettles and a two-burner electric

hot plate. This apparatus did the job, but just barely. The hot plate took ages to boil the water and wasn't capable of generating a large volume of steam. And I soon discovered that the first half-hour's-worth of steam went into saturating the box rather than the workpiece. Steam box durability was yet another problem. Repeated cycles of saturation and drying out tended to tear wooden steam boxes apart.

Whenever I'd get together with woodworkers or chairmaking students, the discussion would inevitably turn to possible improvements in steam box design and function. Many folks have contributed ideas, and the evolution of my "ultimate" steam box (shown above), owes much of its success to their suggestions.

Quite a few people suggested making a metal steam box. Unlike wood, metal is impervious to water. But it's also extremely conductive. So to work effectively, a metal steam box needs to be wrapped in insulation. Without it, too much heat escapes and handling the box is hazardous, even with protective gloves.

Woodturner Ernie Conover was the first to suggest making a steam "box" from PVC (polyvinyl chloride) plastic pipe—the type stocked by plumbing supply outlets. The rest of the materials for making the box can be found at any hardware store, department store or home center that has automotive and lawn-and-garden sections. If you have to buy everything, the complete steaming setup will cost between \$100 and \$150.

Basically, there are three key features that make this steam box setup work effectively. First, there is a heat source that quickly brings water to a vigorous, rolling boil. Secondly, the box itself, or steaming chamber, is made from an impervious material that is also a good insulator. And finally, the box has tight-fitting joints that promote steam concentration. I've been using this new box for over a year to steam my own chair parts and those for students in my chairmaking courses. We have yet to break a chair back that's come out of this steamer.

A Lobster-Boil Burner

The heat source is a propane-fired 170,000-BTU burner. This type of burner was originally developed for crayfish and lobster boils, so its main purpose is to bring a large pot of water to a vigorous boil as quickly as possible. These burners have long been common in coastal regions, especially in southern states. But in the last several years they've made their way inland. You can usually find the burners alongside barbeque equipment in department stores and home centers. They cost between \$50 and \$60.

I suggest using a 20-lb. propane bottle to fire the burner. When I'm teaching a class, this is enough fuel to last an entire afternoon. Propane is relatively inexpensive and canisters can be refilled at numerous locations.

The water is held in a five-gallon, steel gasoline can. **Caution: Buy a brand new one that has never held fuel. Don't try a used can!** Five gallons is enough water to last most of an afternoon. Refilling is easy, thanks to the 2-in.-dia. vent cap found on most cans. When I'm working

by myself, I fill the can only part way; but even with a full five gallons of water, the burner can produce a vigorous boil in 15 minutes or less.

Making the Box

The steam chamber itself is made of schedule 80 PVC pipe. Because of its thick gauge, schedule 80 pipe can stand up to the intense heat required for steaming wood. The pipe resists sagging when hot, and even with a full load of steam, the outside surface of the box doesn't get any hotter than the hood of a car on a sunny day. The heat and moisture stays where it's supposed to—inside the steam chamber.

My steam box is 60 in. long, but there's no reason why you can't adapt my design to longer or shorter boxes. Part of this length is taken up by a 4-by-2 reducing T/Y fitting that connects two equal lengths of pipe. (See drawing, below.) Using a plastic bushing, I further reduced the inside diameter of the "Y" opening to 1 1/4 in. All PVC joints are glued together with PVC cement.

The PVC chamber is pierced horizontally by four 3/8-in. by 5-in. bolts. These create a rack that holds the wood in the upper half of the tube where it is the hottest. I cover the bolt shanks with clear vinyl tubing to prevent the steel from staining the wood. (As an alternative, you could use stainless steel bolts.) To prevent steam leakage through bolt holes, I use neoprene washers beneath the bolt heads and hex nuts.

I use neoprene end caps—plumbers call these test caps—to seal the pipe ends. The cap on the closed end of the chamber is held in place with a large hose clamp. The opposite cap remains

removable. I don't advise permanently sealing one end of the chamber with a cemented PVC cap. It's helpful to have access to both ends of the box in case a small piece of wood gets lodged inside.

To convey the steam from the gas can to the steam chamber, I use a heavy-duty auto radiator hose with an inside diameter of 1 1/4 in. Hose clamps secure the hose to the can's spout and to a short section of 1 1/4-in.-dia. schedule 80 PVC pipe that extends into the "Y" leg of the T/Y fitting. This "slip" fit is tight enough to prevent steam from escaping, but it allows the box and burner to be separated for easy storage.

The airtight design of the box calls for some sort of pressure relief. This is accomplished by drilling two 1/2-in.-dia. vent holes in the underside of the tube. I located each vent hole about 4 in. from each end cap.

I made a simple X-frame wooden sawbuck to support the steam box. Both ends of the box are supported by the sawbuck frame. Because the intense heat can soften the PVC cement, it's also a good idea to support the middle of the box. I do this with a "cradle" made from perforated metal strapping that is fastened across opposite upper rails of the sawbuck.

Getting Steamed Up

Putting the box to work is easy, but it's a good idea to have several accessories handy before you begin. A large plastic funnel makes quick work of refilling the gasoline can with water. Starting the burner is easier if you have a barbeque lighter, and I couldn't do without a pair of corn tongs. You don't want to remove freshly steamed wood from the box without tongs of some sort. (See photo, opposite page.)

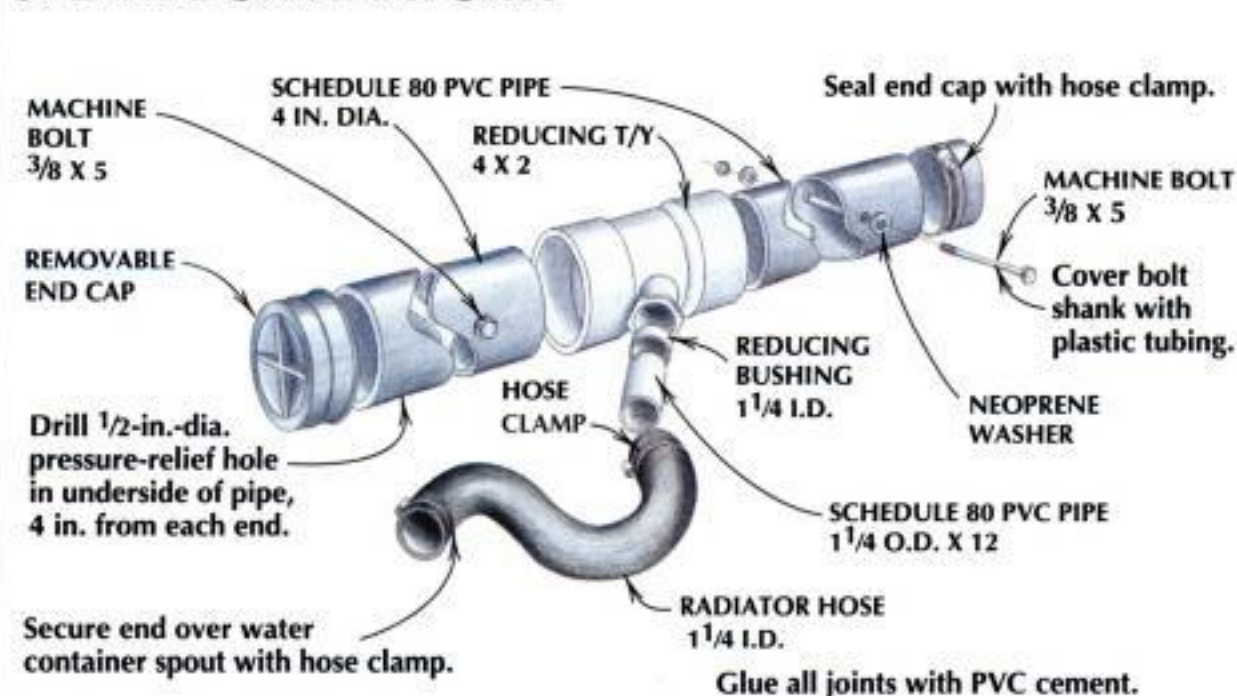
It's also a good idea to do all your steaming outside. When the water first boils, you can expect some surge into the box and out of the vent holes. It usually takes me approximately 15-20 minutes to steam a couple of chair backs. Over

this period of time, you'll be creating a tremendous amount of water vapor. This isn't the kind of humidity you want in your workshop.▲



MIKE DUNBAR is a contributing editor of *AW*. He makes Windsor chairs and teaches chairmaking in New Hampshire.

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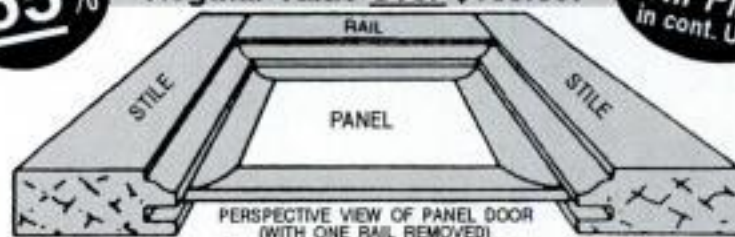
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JUST FINISHING

Brushing Varnish

The Low-Tech Way to Durable Beauty

by Michael Dresdner



It's a good bet that the first finish you ever brushed on wood was an oil varnish. For centuries, varnish has been the finish of choice for furniture makers. To

this day, it remains a very durable, very beautiful, easy-to-apply coating that holds its own among all the high-tech plastics available for finishing wood. In this column, I'll tell you a bit about this versatile finish and how to apply it successfully with a brush.

About Varnish

Varnish usually contains resin, oil and solvents. It is made either by adding natural or synthetic resins to oil or by chemically converting the oil into a resin. The oil component makes varnish flexible enough to tolerate wood's expansion and contraction. Resins, which are thicker liquids or dissolved solids, add strength and durability to the cured film. They also help the varnish to go on thicker and dry faster. Most varnish also contains solvents such as naphtha or mineral spirits. These solvents thin the liquid and make it more manageable, allowing you to brush it out smoother and thinner. They eventually evaporate and have no effect on the final film.

Varnish cures by a process called "polymerization" whereby oxygen from the air enables small molecules to link up and form larger ones. When the molecules become large enough, they form a solid protective film that covers the wood.

Choosing a Varnish

A quick trip to the paint store will confirm that the term "varnish" is unfortunately all but passé. Nowadays, manufacturers label their cans with terms like "urethane," "clear finish" or even "liquid plastic." Your clue is the solvent—if the

label calls for clean-up or thinning with naphtha, mineral spirits or paint thinner, the coating is a varnish.

Varnishes are often classified by the types of resins they contain. As a general rule, the more expensive varnishes tend to dry faster and brush out better. Here are the main varnish categories:

- **Spar varnish** is usually a mixture of tung oil and phenolic resin. It is a very flexible exterior coating made to tolerate the wide range of movement that wood experiences outdoors. It may also contain ultraviolet (UV) light blockers to help protect the wood from adverse effects of the sun such as fading and darkening.
- **Floor varnish** is an interior version of spar varnish. Usually made with synthetic alkyd resin, it offers enough flexibility and toughness to protect wood from heavy shoe traffic without chipping.
- **Table-top** or "rubbing" varnish is usually a less flexible alkyd mixture designed to dry hard enough to polish to a high gloss. (See AW #39.)
- **Polyurethane** varnish, a relative newcomer, has quickly become the single most popular category of varnish. Polyurethane is an oil that's been modified into a very durable resin that offers both the flexibility of exterior varnishes and the toughness and scratch resistance of interior ones. Today there are polyurethane formulations for most varnish categories, from table-top coatings to exterior finishes.

Applying Varnish

For most woodworkers, one of the beauties of varnish is that it can be brushed on. Brushing eliminates the overspray, the waste and the expensive



Good form. To brush varnish correctly, grasp the brush by the ferrule, tilt it 60° to the surface and apply increasing pressure as you move the brush.

equipment associated with spraying. In fact, once you get the rhythm down, brushing varnish is a great way to relieve stress. (If you prefer to spray, you'll have to thin your varnish with naphtha. Spray on thin coats to avoid sagging and allow plenty of drying time between coats.)

For brushing, choose a soft, springy

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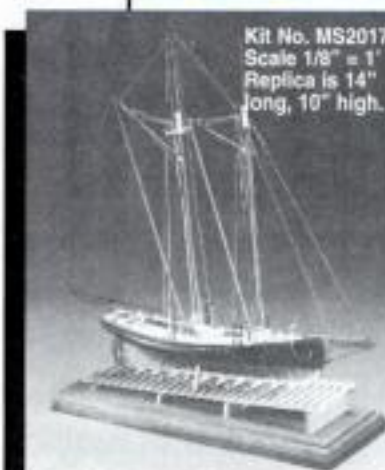
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brush with fairly long (at least 2½ in.) bristles and a chisel end. (See drawing.) I prefer a 2-in.-wide, natural China bristle (hog hair) brush with "flagged" tips for large flat areas and a 1-in., angled sash brush for inside corners and tight areas. Flagged tips resemble what the shampoo commercials call "split ends." Though undesirable in your hair, they help eliminate brush marks in varnish. Pick a brush with a chisel end rather than one that is cut off flat. A top-quality brush will probably cost at least \$15 to \$20, but it will last a long time. It will also handle better, flow the material out smoothly and leave fewer brush marks. (For more on choosing and caring for brushes, see AW #26.)

Prepare the brush by soaking the bristles all the way up to the metal ferrule in either naphtha or mineral spirits. After about a minute, squeeze out the excess solvent but don't shake or spin the brush. You want the brush to be wet but not dripping. Pre-soaking the brush

helps the varnish flow better and clean up easier. It also helps eliminate that annoying line of dried varnish crust that sometimes forms just below the ferrule of your brush.

Applying the Varnish

Pour some varnish into an empty coffee can, filling it no more than halfway. I find that most varnishes are formulated too thick for my brushing style, so I generally stir in about 10 percent mineral spirits or naphtha. Turpentine also works but it makes the varnish dry much slower. Before brushing, test the varnish on a piece of wood scrap to make sure the varnish flows out smoothly and uniformly.

Dip only a third to half the length of the bristles into the varnish, then lightly touch the tip of the brush to the inside wall of the can, above the liquid line, to eliminate drips. Apply the varnish to the wood with the tip of the brush, moving *slowly and evenly* in the direc-

tion of the grain. Hold the brush by the ferrule—not the handle—at a 60° angle to the surface and press down until the bristles curve slightly. Increase the pressure as you move across the wood to **keep the varnish flowing evenly**. (See photo, page 72.)

Start with low areas and tight corners (such as the fields on a raised panel door), saving the large flat areas for last. Keep each coat thin, since several thin coats will dry much better than one or two thick ones.

Once you've finished brushing a section, go back and "tip it off" to smooth out the brush strokes. To do this, hold the brush at 90° to the wood and gently drag only the very tips of the bristles through the wet varnish.

As soon as you are finished brushing, clean your brush—first in mineral spirits, then in warm soapy water. Rinse the brush, shake out the water and re-shape the bristles by wrapping the brush in brown bag paper. ▲

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leisurely 90 rpm and is constantly bathed in water from a removable trough. Burning a tool's edge is virtually impossible. Yet the stone removes material quickly, so the sharpening process won't tire you out.

The key to the machine's performance is its large (2-in.-wide by 10-in.-dia.) aluminum oxide grindstone and an 11-in.-long universal support that acts as a tool rest, either for free-hand grinding or as a base to mount various jigs. Together, the wide stone and rigid support provide an extremely stable and solid assembly.

The Tormek comes standard with a straightedge jig for sharpening chisels, plane irons and spokeshave blades. To sharpen, you clamp the tool in the jig, slip the jig over the support and then set the desired bevel angle using a plastic template called an Angle Master.

From there it's a simple matter of moving the tool edge back and forth over the stone surface. You can remove the tool and jig to check your progress, then quickly return to the grinding process with the *exact* angle as before. I found I could grind a new bevel on a chisel in less than a minute.

Instead of separate coarse and fine wheels, Tormek's 220-grit stone can also function like a 1200-grit stone with the aid of an optional silicone carbide "stone grad-

er." If the wheel becomes grooved, an optional diamond abrasive truing tool restores it to perfect roundness and a flat grinding surface.

After grinding at 1200-grit, you switch to the 8 $\frac{3}{4}$ -in.-dia. leather honing wheel to remove any burrs left on the tool edge and polish it to razor sharpness.

By reading Tormek's excellent manual and taking my time, I was able to grind and hone chisels and plane irons on the first try with no problems. I'd had trouble getting even bevels on my $\frac{3}{4}$ -in. oval-section skew chisel, but clamping it in the straightedge jig made the job easy. Working on the Tormek is not only safer than running a high-speed bench grinder, it's also more relaxing since you don't have to worry about burning the edge. The unit's rubber feet and weight (32 lbs.) make it stay put on your bench without the need to clamp it down.

The optional gouge jig works well for grinding the ends of carving or turning gouges in either a straight or fingernail profile. With the optional turning tool jig, you can sharpen parting tools, scrapers and skew chisels.

With the optional planer blade jig, you can sharpen planer or jointer knives of any length, providing the knives are at least $\frac{5}{8}$ in. wide. Overall, I'd recommend the Tormek without reservation for any shop. (Price: \$369 includes straightedge jig, Angle Master and honing compound.) *Tormek U.S.A., 14205 W. Wisconsin Ave., Elm Grove, WI 53122, (800) 586-7635. Circle #627*

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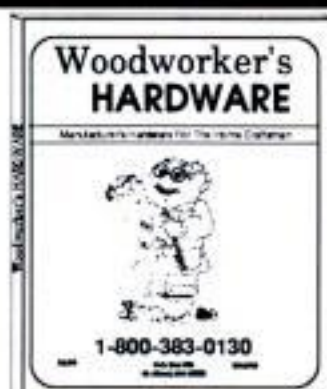
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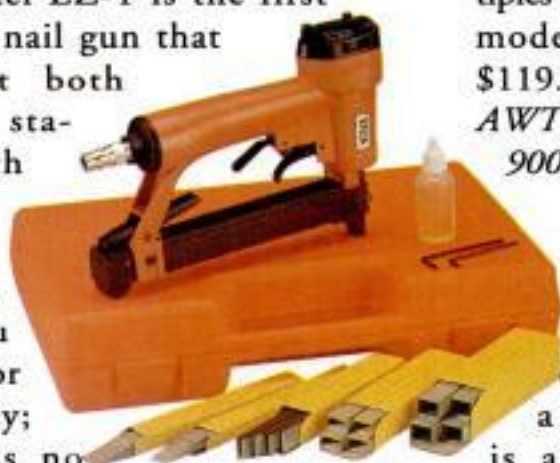
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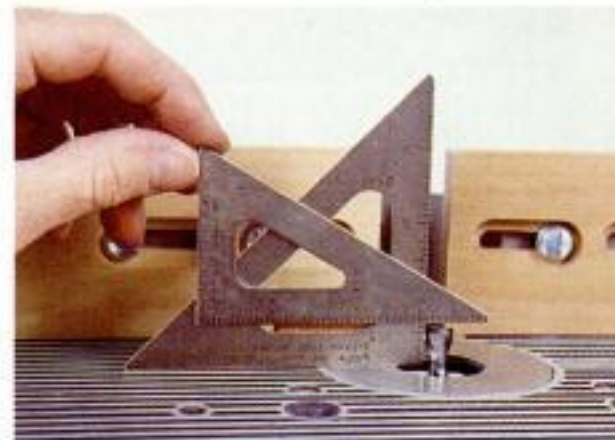


by your shop vacuum, which connects to the table. The vacuum hose should have a minimum diameter of 2 1/2 in. Interior baffles distribute the vacuum effect evenly across the top, which is covered with a non-skid, perforated foam pad that grips the work. When we tried a random orbit sander with Eliminator Jr., it collected nearly all the dust. The unit works best on flat stock that you can lay directly on the table top. The manufacturer recommends using an orbital or random-orbit sander with the unit. (Price: \$74.95) *The Eliminator Jr., Dept. AWT, 23425 W. Wall St., Lake Villa, IL 60046, (800) 838-3302. Circle #619*

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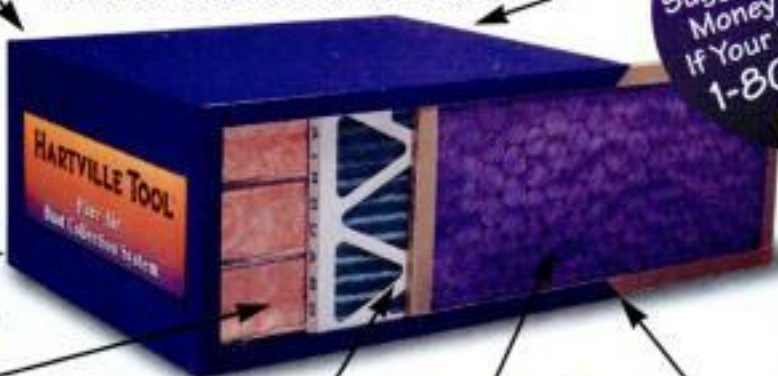
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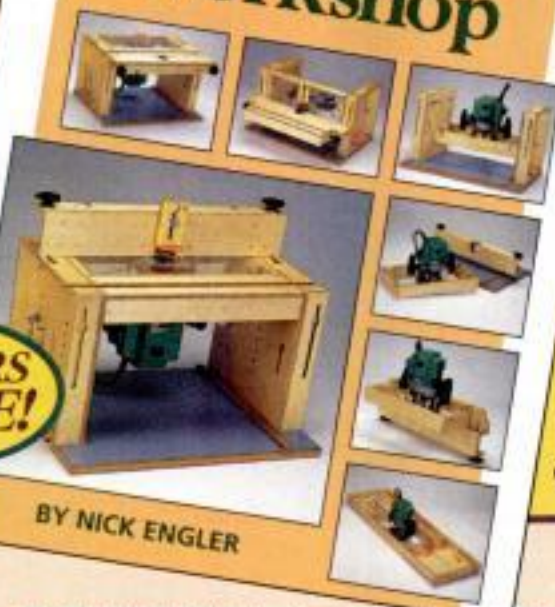
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WOOD FACTS

Ash

by Paul McClure



"Yggdrasil." That's what the Scandinavian ancients called the tree. In Nordic folklore, its branches welcomed the gods who might travel its trunk to the earth. Its roots provided avenues to the places of the dead.

We call it ash. This tree, which populates temperate areas of much of the world's northern hemisphere, long ago carved its place in our own North American heritage. Indians and trappers used ash for packsaddles, paddles and canoe ribs. As material for wagon wheels, tool handles and furniture, this wood was an everyday part of pioneer lives. Since the Civil War, when baseball was invented, most of the great sluggers have slammed their way into history with bats of ash.

Although about 70 species of ash exist worldwide, 98 percent of the com-

mercial lumber sold in this country comes from three species that grow east of the Rocky Mountains: white ash, green ash and black ash. It's difficult to differentiate the wood from these three species, and most lumber dealers simply lump them together as "American ash."

Oregon ash, a species that grows on the Pacific coast, is similar in appearance, but less abundant and lighter in weight than eastern ash.

Of non-domestic species, Japanese ash, or tamo, is the one most commonly available here, but usually only in veneer form. It sometimes exhibits a highly unusual "peanut" figure. European ash sometimes produces highly prized lumber with brown to black heartwood that's sold as "olive ash."

Appearance

Ash generally ranges in color from the medium greyish-brown of black ash heartwood to the pale tan of white ash.

It has open pores, a coarse grain and very pronounced, often wild, figure, particularly when flat-sawn.

Workability

Ash is strong, flexible and relatively lightweight. It's a preferred wood for steam bending. Although it has a moderate blunting effect on tool edges, it cuts well with both hand and power tools and holds crisp details. It glues and sands exceptionally well and accepts finishes readily. Pre-boring is necessary for nailing or screwing.

Uses

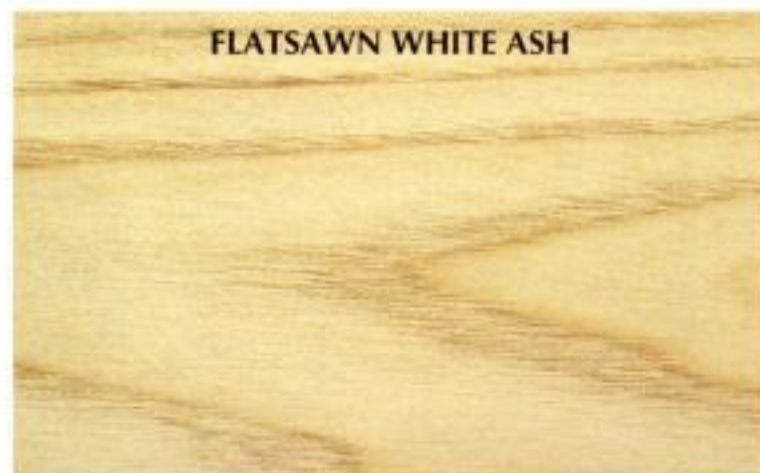
Highly shock resistant, ash lumber is used widely for sports equipment (bats, hockey sticks, etc.) and tool handles. Because of its flexibility, it is used for much bent work: chairs, boat parts, fishing nets and wheelwright work. Ash is used extensively in both lumber and plywood form for cabinets and furniture.

ASH

SPECIES AND COMMON NAMES	<i>Fraxinus americana</i> - white ash <i>F. pennsylvanica</i> - green ash, red ash <i>F. nigra</i> - black ash, brown ash <i>F. excelsior</i> - European ash <i>F. mandschurica</i> - Japanese ash, tamo
GROWING REGION	U.S., Canada, Europe, Japan and southeast Asia.
SPECIFIC GRAVITY	0.66 to 0.71
DENSITY	41 to 43 lbs./cubic ft.
WOOD MOVEMENT¹	Small (less than 1/4-in./ft.)
DURABILITY	Subject to powder post beetle damage; will decay outdoors if not treated with preservative.
SUSTAINABILITY	Sustainable at current harvest levels.
AVAILABILITY	Hardwood lumber dealers.
SIZE: THICKNESSES	4/4 through 16/4
WIDTHS	4 to 16 in.
LENGTHS	8 to 16 ft.
COST: LUMBER	\$2.75/bd. ft.
VENEER	\$0.70-\$1.10/sq. ft.

¹ Indicates movement across the grain.

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PRODUCT INDEX

	Page #	Circle #		Page #	Circle #
ABRASIVES			Horton Brasses	9	401
Econ-Abrasives	73	4	Jamestown Distributors	17	40
Performax Products	91	172	Paxton Hardware	74	402
Red Hill Corp.	83	16	White Chapel Brasses	16	305
Sand-Rite Mfg.	28	26	Woodworkers Hardware	77	20
ACCESSORIES			KITS & PLANS		
Airstream Dust Helmets	77	50	Adams Wood Products	10	9
Beall Tool Co.	83	65	American Coaster	82	176
The Edward J. Bennett Co.	6	85	Butler Design Studio	94	24
Biesemeyer	13	92	Camp-Tech Designs	83	—
Carter Products	16	170	Cherry Tree Toys	83	70
Clark Machine Tool & Die	82	5	Creativecraft Plans	83	304
Dynamic Engineering	83	46	Designer Furniture Plans	14	301
Exact Cuts	14	84	Furniture Designs	9	302
Excalibur Machine & Tool	22	21	Gatto Plan Supply	80	164
F.L. Doyel Inc.	73	171	Pat Mahaney	82	—
GP Designs	83	93	Model Expo	73	167
HTC Products	74	75	Murray Clock Craft	10	204
JDS Company	5	33	Nelson Designs	83	181
Jointech	95	52	Shaker Workshops	10	175
Keller Dovetail System	21	66	Specialty Furniture Designs	28	303
Leigh Industries	27	6	Sunbury Millwork	83	1
Lignomat	71	17	Windy Hill Woods	83	—
Roll-Top-Cover	22	30	Wooden Memories	16	174
RMC Mfg. Co.	14	8	LUMBER & VENEERS		
Shapes & Surfaces	71	36	Blue Ox Brand Hardwoods	82	67
Tormek	22	78	Bristol Valley Hardwood	83	180
Vega Enterprises	17	22	Central Distributors	6	69
Village Originals	83	94	Certainly Wood	14	47
Wagner Electronic Products	19	11	Colonial Hardwoods	82	—
ADHESIVES			Groff & Hearne Lumber	82	89
AmBel Corp.	94	90	Handloggers Hardwoods	84	—
Gougen Brothers, Inc.	83	64	Niagara Lumber & Wood	82	41
BITS, BLADES, CUTTERS			Nyle Corporation	9	95
Amana Tool	19, 21	58, 59	Riteco Supply	5	28
Cascade Tools	17	62	Steve Wall Lumber	73	168
CMT Tools	3	79	Willard Brothers Woodcutters	82	13
Eagle America	5	45	Wood-Ply Lumber	83	182
Forrest Mfg.	23	88	Woodworkers Source	27	96
Greer Manufacturing	82	37	MISCELLANEOUS		
MLCS Ltd.	27, 71	81, 80	Furniture Medic	91	34
The Tool Club	82	83	Steelmaster Buildings	28	173
BOOKS & VIDEOS			Wholesale Glass Brokers	74	23
Helios Enterprises	11	—	POWER TOOLS		
Linden Publishing	83	177	Better Built	73	42
Time Life Books	25	55	Clayton Machine	28	74
Video College of Woodworking	28	25	Delta International	7	77
CLAMPS			Dewalt Industrial Tool Co.	87	70
Adjustable Clamp	10	161	Enlon Import Corp.	Cover 4	97
American Clamping Corp.	74	57	Fein Power Tools	77	44
FINISHING SUPPLIES			Freud	15	61
J.A. Harchuck Sales	8	184	Gilliom Mfg.	9	165
Liberon/Star Supplies	82	—	International Tool	29	99
GENERAL WOODWORKING			Jet	19	15
CATALOGS			Kasco Manufacturing	28	71
Constantine's	16	169	Laguna Tools	9, 71	2, 98
Garrett Wade	28	73	Powermatic	17	31
Grizzly Imports, Inc.	Cover 2	53	R.B. Industries	94	54
Hartville True Value	80, 9	10, 19	Ryobi America	75	35
Highland Hardware	94	3	Seco Investments	6	51
MacBeath Hardwood Co.	84	—	Sunhill Enterprises	8	12
McFeely's	88	87	Tool Crib of the North	79	76
Van Dyke's	82	179	Wilke Machinery	21	307
Veritas Tools, Inc.	77	49	Woodmaster Tools	5	—
Woodcraft Supply	16	60	Wood-Mizer	14	91
Woodworkers Store	88	14	TURNING SUPPLIES		
HAND TOOLS			Bonham's Woodworking	95	162
Antique & Used Tools	82	—	Supplies	80	163
Harris Tools	10	166	Conover Lathe	73	202
Fine Tool Journal	74	18	Craft Supplies USA	82	178
Pootatuck Corp.	95	86	Packard Woodworks		
Stanley Tools	Cover 3	43	WOOD PARTS		
HARDWARE			Midwest Dowel	94	32
Ball & Ball	27	—	WOODWORKING SHOWS		
Crown City	83	—	DJC Enterprises	82	29
			Woodworking Shows	22	82

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ADVERTISER INDEX

	Page #	Circle #		Page #	Circle #
Adams Wood Products	10	9	Jamestown Distributors	17	40
Adjustable Clamp	10	161	JDS Company	5	33
Airstream Dust Helmets	77	50	Jet	19	15
Amana Tool Corp.	19,21	58,59	Jointech	95	52
AmBel Corp.	94	90	Kasco Manufacturing	28	71
American Clamping Corp.	74	57	Keller Dovetail System	21	66
American Coaster	82	176	Laguna Tools	9,71	2,98
Antique & Used Tools	82	—	Leigh Industries	27	6
Ball & Ball	27	—	Liberon/Star Supplies	82	—
Beall Tool Co.	83	65	Lignomat	71	17
Edward Bennett Co.	6	85	Linden Publishing	83	177
Better Built	73	42	MacBeath Hardwood Co.	84	—
Biesemyer	13	92	Pat Mahaney	82	—
Blue Ox Brand Hardwoods	82	67	McFeely's	88	87
Bonham's Woodworking Supplies	95	162	Midwest Dowel Works	94	32
Bristol Valley Hardwoods	83	180	MLCS	27,71	81,80
Butler Design Studio	94	24	Model Expo	73	167
Camp-Tech Designs	83	—	Murray Clock Craft Ltd.	10	204
Carter Products	16	170	Nelson Designs	83	181
Cascade Tools	17	62	Niagara Lumber & Wood	82	41
Central Distributors	6	69	Nyle	9	95
Certainly Wood	14	47	Packard Woodworks	82	178
Cherry Tree Toys	83	70	Paxton Hardware	74	402
Clark Machine Tool & Die	82	5	Performax	91	172
Clayton Machine	28	74	Pootatuck Corporation	95	86
CMT Tools	3	79	Powermatic	17	31
Colonial Hardwoods	82	—	R.B. Industries	94	54
Conover Lathe	80	163	Red Hill Corp.	83	16
Constantine's	16	169	RMC Mfg. Co.	14	8
Craft Supplies U.S.A.	73	202	Riteco Supply	5	28
Creativecraft Plans	88	304	Roll-Top-Cover	22	30
Crown City Hardware	83	—	Ryobi America	75	35
Delta International	7	77	Sand-Rite Mfg.	28	26
Designer Furniture Plans	14	301	Seco Investments	6	51
Dewalt Industrial Tool Co.	87	70	Shaker Workshops	10	175
DJC Enterprises	82	29	Shapes & Surfaces	71	36
F.L. Doyel Inc.	73	171	Specialty Furniture Designs	28	303
Dynamic Engineering	83	46	Stanley Tools	Cover 3	43
Eagle America	5	45	Steelmaster Buildings	28	173
Econ-Abrasives	73	4	Sunbury Millwork	83	1
Enlon Import Corp	Cover 4	97	Sunhill Enterprise	8	12
Exact Cuts	14	84	Time-Life Books	25	55
Excalibur Machine & Tool	22	21	Tool Crib of the North	79	76
Fein Power Tools	77	44	The Tool Club	82	83
Fine Tool Journal	74	18	Tormek	22	78
Forrest Mfg.	23	88	Van Dyke's Graphics	82	179
Freud	15	61	Vega Enterprises	17	22
Furniture Designs	9	302	Veritas Tools, Inc.	77	49
Furniture Medic	91	34	Video College of Woodworking	28	25
Garrett Wade	28	73	Village Originals	83	94
Gatto Plan Supply	80	164	Wagner Electronic Products	19	11
Gilliom Mfg.	9	165	Steve Wall Lumber	73	168
Gougeon Brothers	83	64	Wholesale Glass Brokers	74	23
GP Designs	83	93	White Chapel Brasses	16	305
Greer Manufacturing	82	37	Wilke Machinery	21	307
Grizzly Imports	Cover 2	53	Willard Brothers Woodcutters	82	13
Groff & Hearne Lumber	82	89	Windy Hill Woods	83	—
Handloggers Hardwoods	84	—	Woodcraft Supply	16	60
J.A. Harchuck Sales	8	184	Wooden Memories	16	174
Harris Tools	10	166	Woodmaster Tools	5	—
Hartville True Value	80,9	10,19	Wood-Mizer	14	91
Helios Enterprise	11	—	Woodply Lumber	83	182
Highland Hardware	94	3	Woodworkers Hardware	77	20
Horton Brass	9	401	Woodworkers Source	27	96
HTC Products	74	75	Woodworkers Store	88	14
International Tool	29	99	Woodworking Shows	22	82

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MINNESOTA

FAIR

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Somerset: January 13-15. North Jersey Woodworking Show. Garden State Exhibit Center. 50 Atrium Dr. (800) 826-8257.

NEW YORK

LECTURES & WORKSHOPS

Rochester: January. Furniture Design. Seth Stern. Sponsored by Rochester's Woodworkers Society, Inc. Strong Museum Auditorium. (716) 586-2071.

Rochester: March. Kitchen Cabinet Design & Construction. Paul Levine. Sponsored by Rochester's Woodworkers Society, Inc. Strong Museum Auditorium. (716) 586-2071.

CLASSES

Bronx: Now thru April. Various woodworking classes including routing, turning, woodcarving, finishing and more. Constantine's. 2050 Eastchester Rd. (718) 792-1600.

EXHIBITION

New York: January 19-February 25. Cabinets by Wendell Castle. Features cabinet styles from 1984-1994. Peter Joseph Gallery. 745 Fifth Ave. (212) 751-5500.

NORTH CAROLINA

CLASSES

Brasstown: Now thru April. Various woodcarving, woodturning and woodworking classes going on at John Campbell Folk School. Rt. 1. (800) 365-5724.

SHOW

Charlotte: March 10-12. Charlotte Woodworking Show. Merchandise Mart. 1500 E. Independence Blvd. (800) 826-8257.

OHIO

SHOW

Columbus: January 20-22. Greater Columbus Woodworking Show. Ohio Expo Center/Fairgrounds. 600 E. 17th Ave. (800) 826-8257.

CLASSES

New Castle: January thru March. Various woodworking classes including figure carving, chip carving and turning. The Hardwood Store. 1695 Dalton Dr. (513) 849-9174.

PENNSYLVANIA

WORKSHOP

Quakertown: January thru March. Numerous 3-day-weekend bowl turning workshops with David Ellsworth. Beginner to intermediate. Limit 4 students. 1378 Cobbler Rd. (215) 536-5298.

SHOWS

Harrisburg: March 24-26. Harrisburg Woodworking Show. Farm Show Complex. Cameron & Maclay Sts. (800) 826-8257.

Philadelphia: April 21-23. The Philadelphia Furniture Show. Artisan-made furniture and furnishings. 150 exhibitors. PA Convention Center. 160 N. 3rd St. (215) 440-0718.

FESTIVAL

Millersville: March 18-19. Woodcarving and Wildlife Art Festival. Demonstrations, competitions, tools, materials and more. Over 80 craftspeople and artists. Student Memorial Center. Millersville University. (717) 684-5349.

TENNESSEE

CLASSES

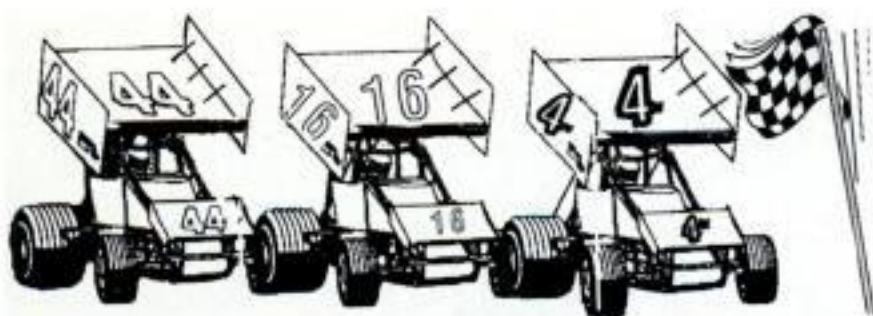
Gatlinburg: March 6-31. Various woodturning classes. Arrowmont School of Arts and Crafts. (615) 436-5860.

WISCONSIN

SHOW

Milwaukee: February 3-5. The Greater Milwaukee Woodworking Show. Wisconsin State Fair Park. I-94 & 84th St. (800) 826-8257.

"Calendar" listings are free; but listings are restricted to woodworking workshops, seminars, trade shows, etc. Please include: date and address of event and a contact phone number. Send listing at least two months prior to date of event to: "Calendar," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.



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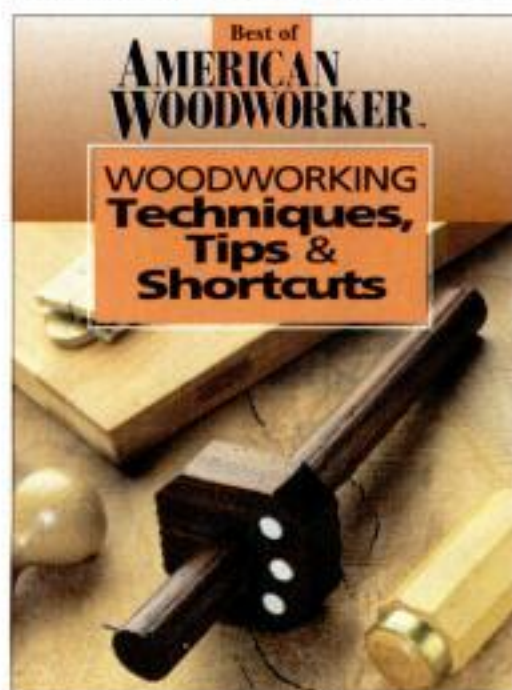
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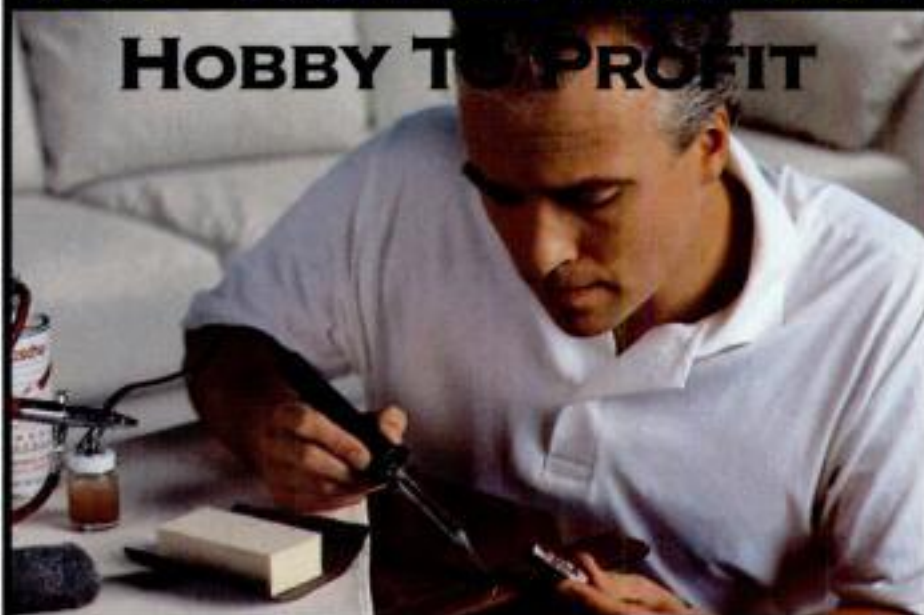
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GALLERY

Excellence Award Finalists

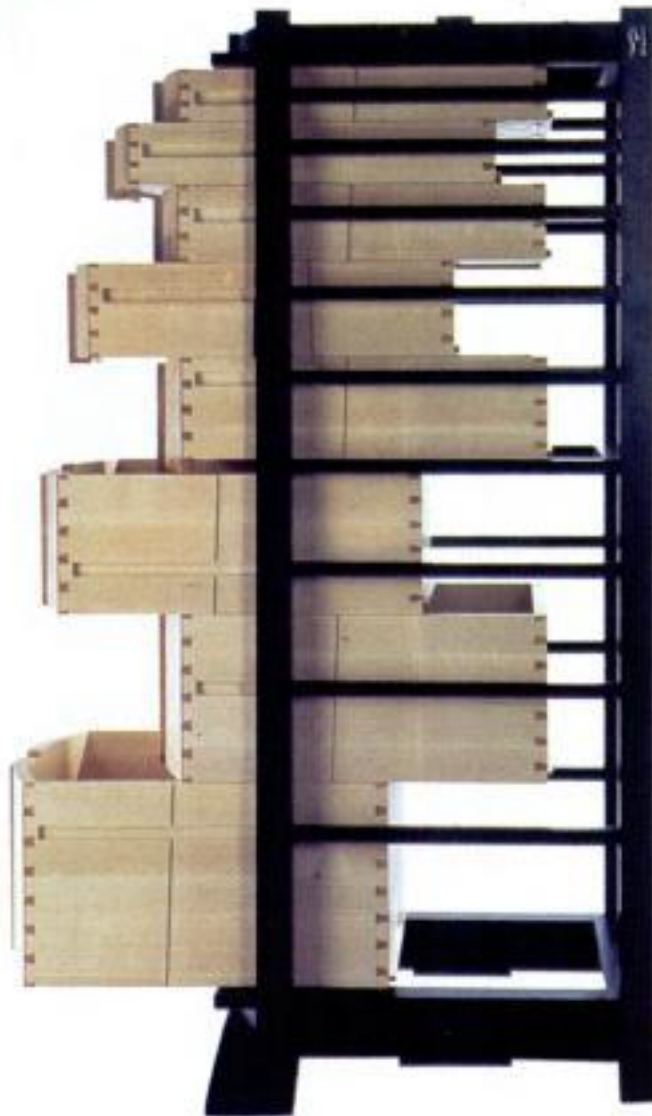
Our third annual Excellence in Craftsmanship Awards packed the AW mailbox with an unprecedented number of entries. In addition to the winners (see pages 48-51), there were numerous examples of excep-

tional craftsmanship and ingenuity. Here's a look at some of the finalists in all three categories—amateur, student and professional. For details on how to enter our 1995 contest, see page 70.



▲▲
"Column of drawers"
by Christoph Neander,
Providence, RI. Professio
Bleached ash,
aniline-dyed ash, silver.
23 W. X 23 D. X 58 H.

PHOTO BY JAMES BEARDS



▶
Captain's desk
by Daniel Paris,
Auburn, WA. Amateur.
Pau ferro, maple,
ebony, leather.
32 W. X 24 D. X 37 H.

PHOTO BY DANIEL PARIS



▲
Sheraton work table by Judith P. Hanson,
Boston, MA. Student.
Mahogany, bird's-eye maple,
cocobolo, poplar.
18 W. X 17 D. X 27 1/2 H.

PHOTO BY LANCE PATTERSON



▲ Lamp by Ed Sheriff, Birmingham, AL. Amateur. Rosewood, birch, acrylic, rice paper, dimmer switch. 14 Dia. X 31H.

PHOTO BY ED SHERIFF



▲ "18th Century TV Chest" by Steven M. Lash, Bloomfield Hills, MI. Amateur. White oak, veneers of walnut burl, yew, laburnum. 31³/₄ W. X 20¹/₂ D. X 37³/₈ H.

PHOTO BY DIRK BAKKER

▼ Four-poster bed by Bob Ingram, Philadelphia, PA. Professional. Maple, tiger maple, wenge. 88 W. X 68 D. X 78 H.

PHOTO BY JACK RAMSDALE



▼ Showcase cabinet by John Cameron, Boxford, MA. Student. Hickory, cedar of Lebanon, ash. 37 W. X 22 D. X 61 H.

PHOTO BY SETH JANDOSKY



▼ Bed and nightstands by Steve Turino, Wakefield, RI. Professional. Lacewood, macassar and gaboon ebony, MDF. Bed: 86 L. X 65 W. X 46 H. Stands: 18 W. X 18 D. X 26 H.

PHOTO BY RIC MURRAY



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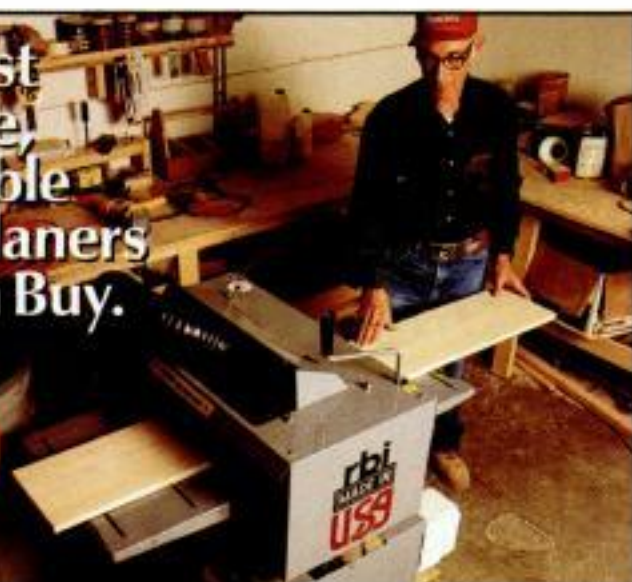
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A couple words of caution: If your

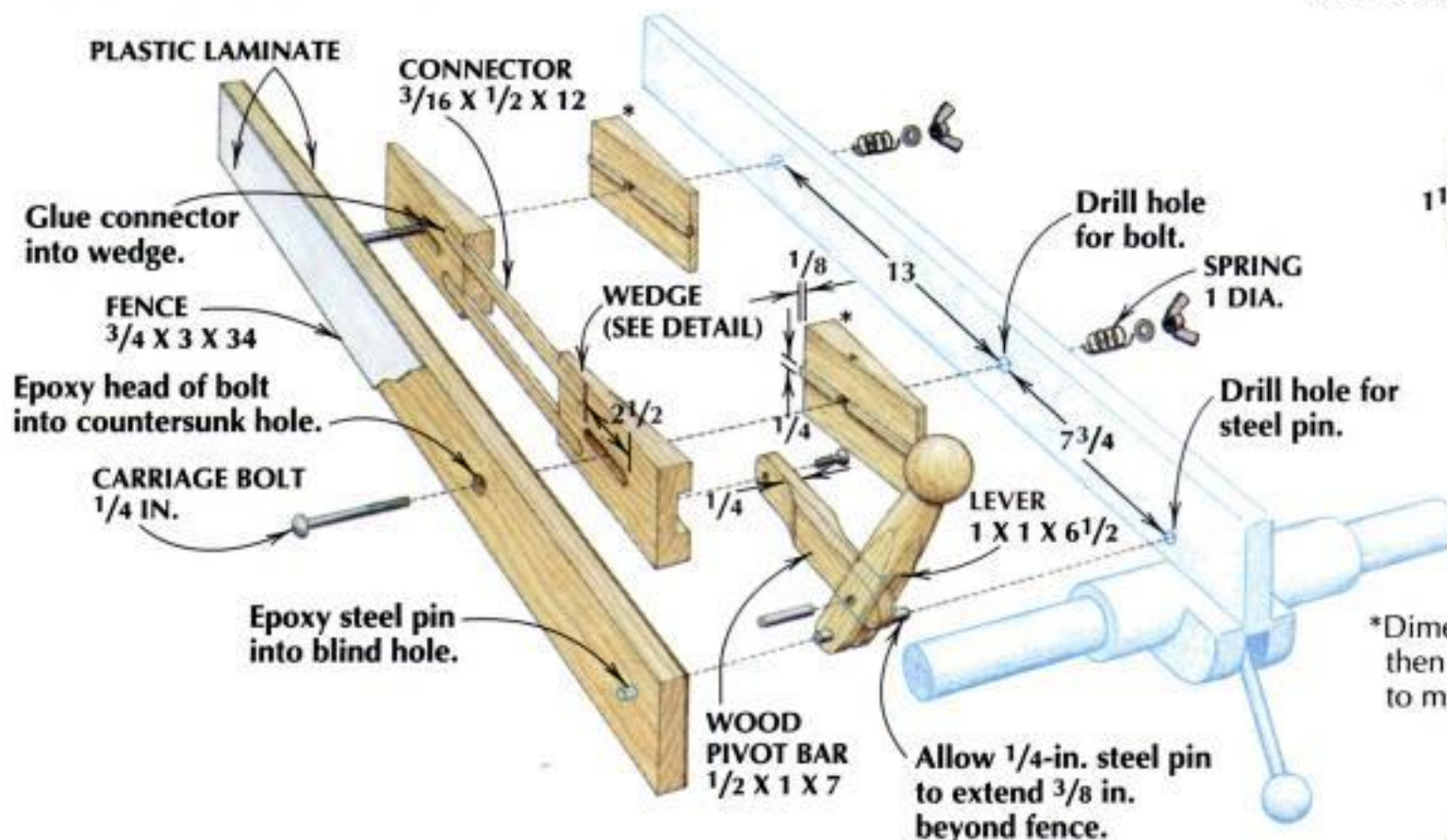
regular saw fence has a connecting rod or other moving parts inside, you'll want to locate the bolts and lever pin where they won't interfere with the functioning of the fence. That could mean making the wedges taller or shorter than shown here so the holes and slots through the wedges will be centered on the heights of the wedges. ▲

ANDY RAE works as an assistant editor of *AW*.

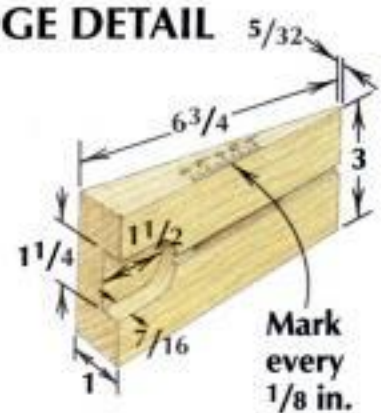
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