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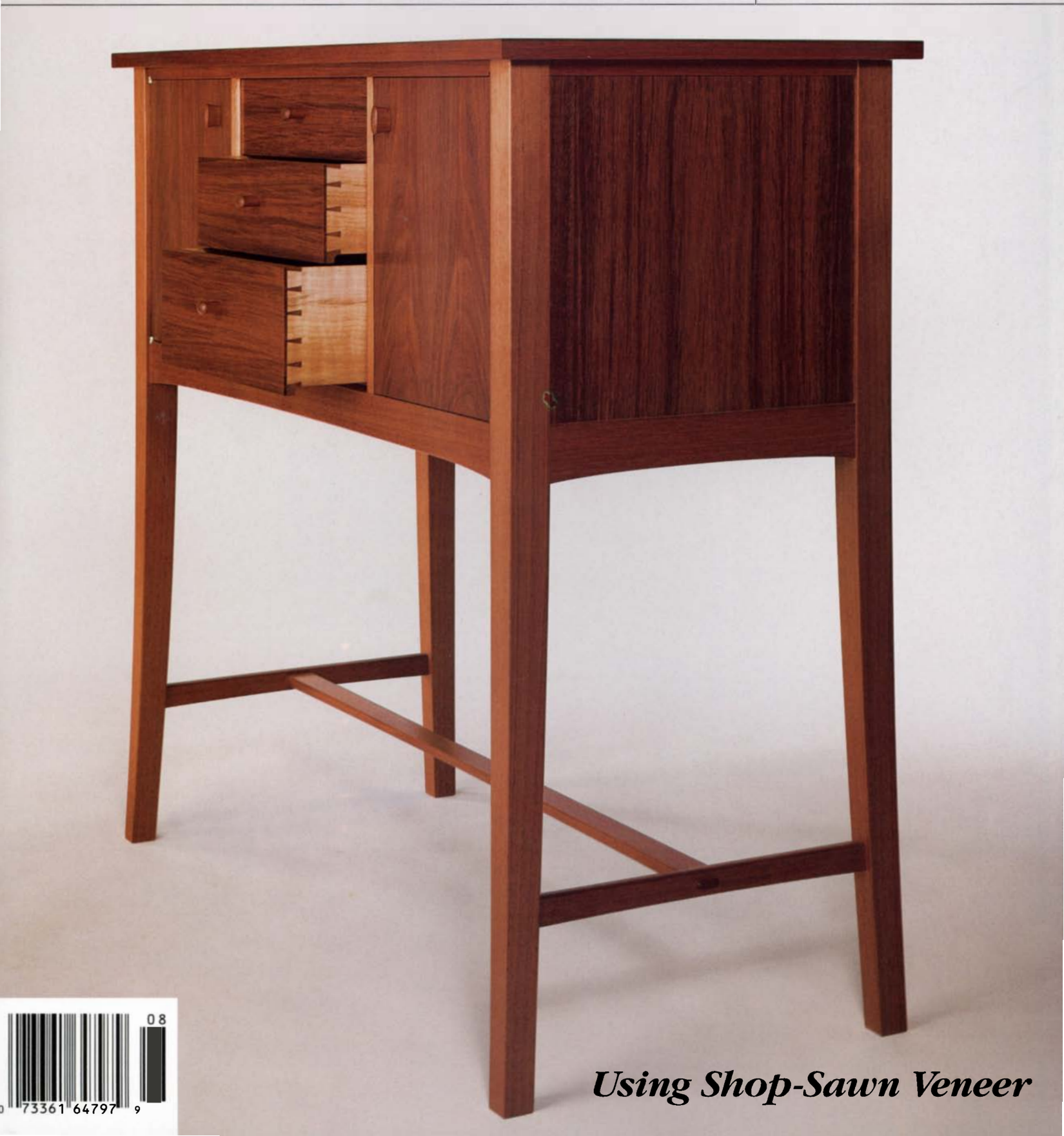

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Fine WoodWorking®

July/August 1994 No. 107

## DEPARTMENTS



## ARTICLES



*One-stop cutting station, p. 40*

*Fitting flush-mounted doors, p. 67*

*Planer tune-up, p. 72*

***On the Cover:*** *All the jarrah veneer for Paul Harrell's jarrah and mahogany sideboard came from one 4-bd.-ft. plank. He tells how to saw and use your own veneer on p. 44. Photo: Sloan Howard*

Fine Woodworking (ISSN 0361-3453) is published bimonthly, January, March, May, July, September and November, by The Taunton Press, Inc., Newtown, CT 06470-5506. Telephone (203) 426-8171. Second-class postage paid at Newtown, CT 06470-5506, and additional mailing offices. United States newsstand distribution by ICD, The Hearst Corporation, 250 West 55th Street, New York, NY 10019 and Eastern News Distributors, Inc., 1130 Cleveland Road, Sandusky, OH 44870. GST #123210981.

**Postmaster:** Send address changes to *Fine Woodworking*, The Taunton Press, Inc., 63 S. Main St., P.O. Box 5506, Newtown, CT 06470-5506 Printed in the USA

**Rising to the challenge**—We all love David and Goliath stories. You know the kind: Little guy faces seemingly insurmountable obstacles and not only survives but triumphs. Some of our woodworking projects probably fall into that category, too. We take on the big challenge, find out it's even more difficult than we thought, but somehow we pull it off. It takes perseverance and vision to succeed in those kinds of projects.

A special kind of vision is what led Patrick Trujillo to succeed in his David and Goliath story. His triumph is the New Mexico governor's desk that graces our back cover, and his story appears on p. 102 in our "Notes and Comment" section. Trujillo's vision allowed him to take on a challenge unlike anything he had done before and succeed.

As a side note to Trujillo's story, I should mention that it was a reader who tipped us off to the story behind the New Mexico governor's desk. Ruth Amernick of Berkeley, Calif., sent us a letter, asking us to report on the competition that led to Trujillo's commission. We always appreciate the tips our readers send us. All of our editors spend a lot of time on the road, visiting woodworkers and developing articles, but no matter how much we travel, there's always something we might miss. That's when we're glad to have our readers helping us as extra eyes and ears.

**By popular demand**—When contributing editor Robert Vaughan wrote about his simple and straightforward method for replacing jointer knives in *FWW* #103, we knew it and the accompanying Video Take would be well received. It gave good advice that could easily be turned into improved jointer performance. Many readers wrote to tell us just that. All the same, we were surprised when so many readers not only wrote or called to laud the article but also wanted a follow-up that covered thickness planers.

We sent Vaughan right back to the shop, and without delay, he has produced an ingenious approach to planer tune-ups. At the center of the technique are two shop-made fixtures Vaughan developed to hold a small dial indicator in all the positions necessary to adjust most common thickness planers. Made out of scrapwood in just minutes, the two fixtures mate with an inexpensive dial indicator to make precision devices any woodworker can afford and use easily. His article begins on p. 72.

But there's more. Vaughan has once again joined forces with associate editor Alec Waters to produce a Video Take (should we call it a sequel to his jointer knives tape?) to go with the planer article. Viewers will get a chance to look over the expert's shoulder as he shows how common adjustments can be made quickly and easily. The magazine article and video are a powerful combination, allowing any woodworker to learn how to improve planer performance. For more on the planer tune-up Video Take, see p. 77.

One final note about Vaughan's earlier jointer knife article and video: Several readers wanted more specific information about the dial indicator and replacement tip Vaughan used. He recommends buying a Mitutoyo (101-204) or Starrett (6632/S or 70793) replacement tip. His source is J&L Industrial, P.O. Box 7604, Charlotte, N.C. 28241; (800) 521-9520. They have a minimum order requirement of $25, so if you need the indicator as well as the tip, Vaughan suggests you might want to order both at the same time.

**The wrong date, by George!**—Bruce Schuettinger caught a discrepancy in his dating of a chest-on-chest discussed in the "Q&A" column in *FWW*# 106, p. 36. George III became the reigning sovereign of Britain in 1760. So the desk, a George III piece, should have been dated circa 1760, not 1755. *—William Sampson, editor*

**Turbine guns for HVLP**—If you read Nick Yinger's article in *FWW* #106 explaining how he made his own high-volume, low-pressure (HVLP) turbine spray unit and then tried to follow his recommendation for a spray gun to go with it, we owe you an apology. The gun cited in the article won't work with a turbine. In his original manuscript, Nick had praised the performance of his DeVilbiss JGHV-501, a turbine-compatible gun. When we learned that model was out of production, we asked a DeVilbiss distributor what gun had superseded it and were told about the model JGHV 5285. That's the one we listed in the article. Unfortunately, what we didn't know was that although the 5285 is an HVLP gun, it won't run off a turbine. It's an HVLP conversion gun: It hooks up to a conventional compressor and converts the high pressure air to HVLP right inside the gun. DeVilbiss no longer makes a turbine-driven HVLP gun.

Other companies do sell turbine-driven HVLP guns, though. Phil Hostetter, a professional finisher in New York City who wrote about HVLP in *FWW* #90, strongly recommends the Accuspray Series 11 gun, available from Woodworker's Supply (800-645-9292) for $355 (with cup). Nick Yinger seconded that and also recommended the gun sold by Croix with their HVLP systems. The gun (with cup) can be purchased separately from the turbine unit (available through Hartville Tool and Supply; 800-345-2396) for $270. We're sorry for any headaches the mistake may have caused.

*—Jonathan Binzen, assistant editor*

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**Praise for tool chests**—My compliments on a knockout issue for *Fine Woodworking* #105. I couldn't believe my eyes; the tool chests were tremendous. I hope you have a tool chest book in the works to show, among other things, chests of historical interest, unusual and ingenious design, more chests like those in your April issue, biographies and work history on the people who crafted and used the chests, mass-produced chests and their inception.

Tool chests and tool organizers are a real passion for me, and a book along the lines of *The Workbench Book* or *The Workshop Book* (The Taunton Press) would be a perfect complement for all woodworkers and lovers of tools.—*Jim Hoffman, Halifax, Pa.*

**Tool chest masterpieces**—I was very impressed by all of the toolboxes in *Fine Woodworking* #105. All of them were real works of art. However, the boxes that I want to build are the two by David Sellery. The details on these boxes are beautiful. Please include measured drawings for them in a future issue. While you are at it, how about showing us the other 21 toolboxes that you didn't publish. This was my favorite article in a long time.

—*Allen Read, Gaithersburg, Md.*

**Cycling gloves battle carpal tunnel syndrome pain**—As a finish carpenter and cabinetmaker, I'm generally loath to wear such uncomfortable gloves as those pictured in the article on carpal tunnel syndrome (*FWW* #105). However, when using vibrating sanders, I often wear my bicycling gloves, which are designed to protect the hands from road shock. Any bicycle shop is sure to have a selection of the padded, fingerless cycling gloves with the price ranging from around $10 into the twenties.

—*Allan L. Smith, Seattle, Wash.*

**Coping with carpal tunnel syndrome**—I read your article on carpal tunnel syndrome (CTS) with great interest. I first developed CTS several years ago while sport bicycle riding. Constant pressure of the palm against the bicycle handlebar caused CTS symptoms to develop. Padded gloves and frequent hand position changes helped to relieve pain.

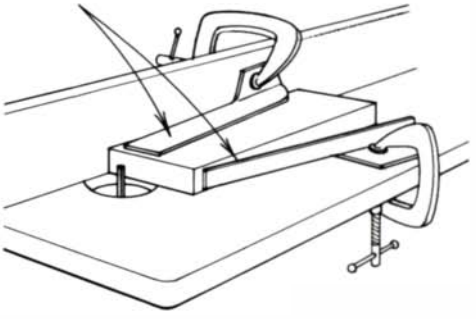
Last summer, while building a deck for my neighbor, CTS became so severe that it drove me to visit my family doctor, an orthopedic surgeon and a neurologist. The bottom line is that I have moderate nerve damage, but I am now able to control pain with the use of a wrist brace. In the article, advice was given to stop doing what causes pain to develop. That is good advice, but the use of a wrist brace was better for me. I've found that I can still ride my bicycle for hours or grasp a hammer or other hand tools with only minimal interference from the brace.

It is most important that the brace be worn while sleeping. I had a bad habit of sleeping with my hand under my pillow with my wrist sharply bent, a very bad habit for CTS sufferers. After the inflammation had cleared up, I started reducing the use of the brace. I now use the brace only when I know that I will be doing some high-risk work. I recently installed 1,400 sq. ft. of ceramic tile in a friend's house and experienced very little CTS pain (lots of other pains though!). Right now, it looks like I'll be able to avoid CTS surgery. By the way, I'm 62 years old.

—*G.S. "Spence" Norwell, Ocean Park, Wash.*

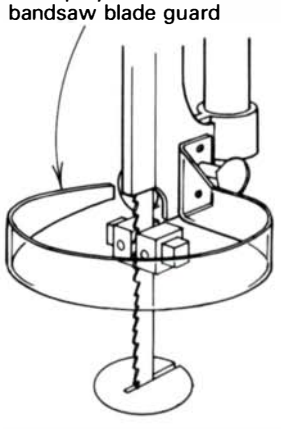
**Two ideas for plastics in the woodshop**—I was glad to see the article on "Plastics in the Woodshop" by Jeff Kurka (*FWW* #105). I have been teaching in elementary school shops for over 20 years and continue to find new and valuable uses for plastics in the shops I work in. My two favorite uses for 3/16-in. polycarbonate sheet are as featherboards and as flexible bandsaw guards (see the drawings at left and below).

Polycarbonate featherboards on router table



As a featherboard, the polycarbonate is especially versatile because it can be formed to fit the task, and its flexibility allows for precise adjustment of pressure where it is needed. I find that beginning 11-year-old students need the help provided by strategically placed featherboards when pushing stock through a router table. The featherboards also allow hands-off processing, using only push sticks to push the material. This not only is an important safety consideration for youngsters who are just learning, but it also holds true for anyone.

Clear polycarbonate bandsaw blade guard



As a bandsaw guard, the flexibility of polycarbonate allows construction of a wraparound guard that can be flexed out of the way when changing blades. Shop students are instructed not to place their hands or fingers under the guard. The guard is a clear indicator to the learners when they are getting too close to the blade. Along with easily accessible push sticks and thorough coaching, the bandsaw guard is a valuable asset in safe bandsaw usage.

—*John Williams, Kingston, Ont., Canada*

**Grinding drill bits for plastics**—Your article on plastics in *FWW* #105 was of interest because I have worked with acrylics and polycarbonates for years along with my woodworking.

The article was exceptionally well-written, and clearly the author has knowledge of the materials far in excess of my own ex-

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perience. But his warning that in drilling plastics, "the cutting tool *tends* (emphasis mine) to grab the material" is an understatement, particularly with larger drills.

However, there is a simple solution to the problem if you are willing to sacrifice an old set of drills. A small flat ground on each drill-cutting face (as shown in the drawing at left) provides a cutting edge essentially like a spade bit. This bit will grab no worse than drilling in wood. In fact, a sharp hardware store spade bit will do the job, but not as cleanly as a twist drill with flats.

All drills larger than ⅛ in. should be ground in this manner for safety, as well as to provide a cleaner hole. Other than due to heat buildup in large drills, the drilling speed then becomes secondary.

*–Jay E. Rubel, Atlanta, Ga.*

**Saw safety without sacrifice**—Sandor Nagyszalanczy's article "Shopmade Tablesaw Guards" (*FWW* #104) is a real eye opener. I've always been concerned about safety, and this article demonstrates how easy it is to provide protection without sacrificing utility of a saw (but his guards do not provide kickback protection). I imagine most of the tablesaw blade guards in the United States sit in a corner covered in sawdust unless the saw is in a shop OSHA (Occupational Safety and Health Administration) inspects. What surprised me was that the saw pictured in Sandor's article does not have a belt guard. I can't imagine it was "removed for photo clarity." *–Phillip Hohensee, Avalon, Calif.*

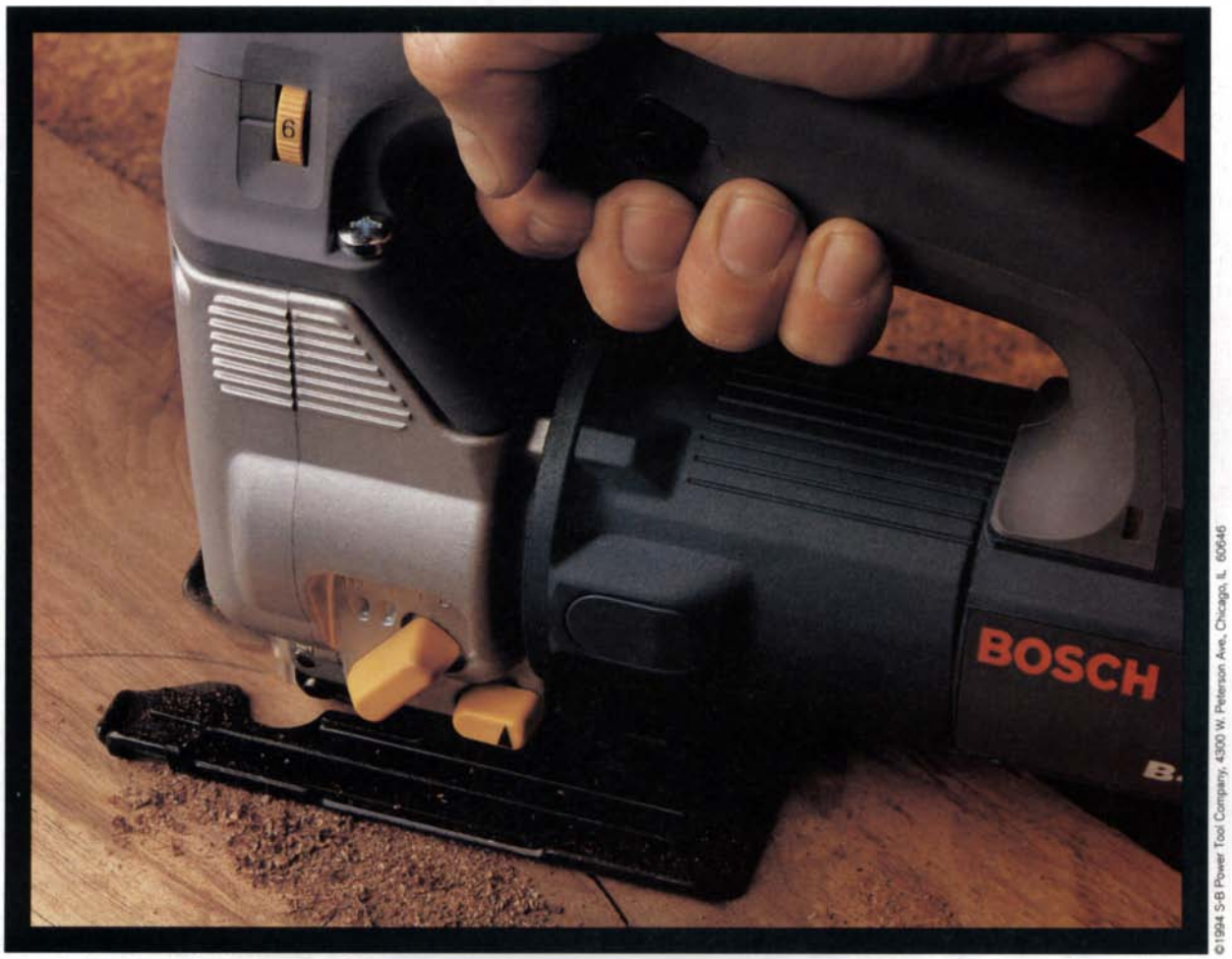
**MDF's longevity**—I very much enjoyed the article regarding medium-density fiberboard (MDF) in *FWW* #104. One question that has concerned me for many years is the life of MDF. Perhaps you could devote an article to comparing solid wood, MDF, particleboard and veneer plywoods.

I have done most of my woodworking with veneer plywoods, but I have shied away from using MDF, fearing that it was not durable enough. Can it support the weight of books in 6-ft. bookcases as both my solid-wood and plywood bookcases can? Are biscuit joints any less durable in MDF, as opposed to other materials? If you choose to write a full article, please do a comparison as well as a discussion on the best adhesives and fasteners to use with each. *–Dov Vogel, Raanana, Israel*

**Tablesaw light could be fire hazard**—Please have a look at p. 18 of *FWW* #105. You see that little light bulb mounted in the tablesaw cabinet? It doesn't belong there. There have been numerous articles in *Fine Woodworking* mentioning the hazardous, explosive nature of wood dust suspended in air within dust-collection system ducts. Even a spark from a static electrical discharge can set off a violent explosion of this mixture.

The same sort of environment exists in the cabinet of a tablesaw. If a chip shatters that little light bulb, or if it vibrates loose from its socket, the resulting small electrical arc could easily ignite the dust/air mixture. *–Les Winter, New York, N.Y.*

**Defending T-handled drills**—In *Fine Woodworking* #105, Eugene McDonald and Jim Mattson write to argue the balance and feel conclusions of Vincent Laurence's cordless drill survey (*FWW* #103). It was good to hear about the advantages of the axial-style drill they prefer; however, these advantages depend on






## The adjustable orbital action jigsaw. Just one more stroke of genius from Bosch.

Most companies would have been satisfied to merely invent the jigsaw. Not Bosch. We followed up with the adjustable orbital action jigsaw. Today, our state-of-the-art leadership can be found in the B4200.

To precisely match cutting speed to the job at hand, its orbital action can be set in four different positions. Plus, it boasts one of the most powerful motors in its class–a hardworking 4.8 amps. And harnesses this power with a variable speed control that dials up 500 to 3100 one inch strokes per minute.

The B4200 is backed by a one year warranty, 90 day satisfaction guarantee and one year service protection plan.

With credentials like these, it doesn't take a genius to see why the B4200 jigsaw is in an orbit far beyond the rest.

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READER SERVICE NO. 54

the drill being pointed toward the floor or ceiling. As soon as you drill or screw into a vertical plane such as a wall or door, the axial style becomes nose-heavy. And while moving your hand up to the back of the motor helps you push the drill, it conversely makes holding up the now cantilevered motor all the more work.

In the other photo in the article where someone is using an axial style drill, the operator is not inclined to hold the drill in the way Mr. McDonald and Mr. Mattson believe is most comfortable and efficient. Perhaps, in this situation, where a wide spade bit is being used, the grip chosen affords better control.

My point is that there is no "best tool" or technique for all situations. I really like the T-handled drill/drivers, but I also have five routers because each one is better than the others at something.

*—David Sellery, Santa Cruz, Calif.*

**Stacking sawhorses are more convenient**—The well-built sawhorse by Voicu Marian (*FWW* #105) struck a responsive chord, I'm sure, with the hearts of hundreds of strong sawhorse builders among your readers. For those who have not yet built, consider a stacking design for the pair, with the supporting members of one all outside the legs so it will nestle on top of the other. This is a convenient feature when loading the trunk of a car or just sweeping up. *—Steven Stroh, Indianola, Ia.*

**Changing formulas for Watco Danish oil**—For years, I have been using Watco Danish oil finish with great satisfaction on my cherry Shaker reproductions. However, last year I bought a new can and found its consistency had changed from a watery to a somewhat gooey consistency. The new consistency was considerably harder to apply and wipe off. I called the Minwax (which makes Watco) consumer help line (800-523-9299) to ask about the problem and was told they had, in fact, changed the formula in 1992 or early 1993, but because of the many complaints received, they were changing back to the original formula.

I was also told that the two types could be distinguished by the paper sticker on the front of the can that listed the color. The gooey formula was identified with a "V" after the color. The cans containing the original formula are now labeled with an "L-II" after the color name. I also noticed that in my case, the undesired version had a date code of 3/23/93 on the bottom of the can. After waiting for the stock to rotate in my local hardware store, I was able to get one of the new cans. It had a date code of 9/28/93. I am pleased to report that the new can does have the same properties as the original. *—R. Porter, Five Islands, Maine.*

**EDITOR'S NOTE:** A spokesman for Minwax confirmed that there are two formulas for Watco Danish oil. The "V" formula is sold in areas such as California and Arizona that have more stringent environmental regulations governing finishing materials. The old "L-II" formula is distributed in all other areas.

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

*—James P. Chiavelli, publisher*

READER SERVICE NO. 39



READER SERVICE NO. 28



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# The company that revolutionized the router bit keeps breaking new ground!

# BANDSAW BLADES
## from CMT Tools

That's right, the company that's set the standard for premium router bits, circular saw blades and other cutting tools has brought its expertise to the bandsaw. And we didn't just put our name on any blade! With our reputation on the line, we've developed a line of blades that will deliver the performance the fine woodworker demands. With over 110 sizes available, CMT Tools has blades to fit just about any popular saw. Most of the blades below are "flexback" style: long-lasting alloy steel bands with hardened teeth that are ideal for wood cutting. For extra-heavy work, try our Bi-metal blades. All blades are .025" thick.

### 52-3/4" Blades. Fits Black & Decker 74-480, 9422

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-521 | 1/8" | 14 TPI | Std. | $12.30 | $9.20 |
| BSB-522 | 1/4" | 6 TPI | Hook | $9.20 | $6.90 |
| BSB-523 | 1/4" | 14 TPI | Std. | $9.20 | $6.90 |
| BSB-524 | 1/4" | 32 TPI | Wavy | $9.20 | $6.90 |
| BSB-525 | 3/8" | 6 TPI | Hook | $9.40 | $7.00 |

### 56-1/8" Blades: Fits Delta 28-160, 28-180, Black & Decker 9443

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-561 | 1/8" | 14 TPI | Std. | $12.90 | $9.60 |
| BSB-562 | 1/4" | 6 TPI | Hook | $9.50 | $7.10 |
| BSB-563 | 1/4" | 14 TPI | Std. | $9.50 | $7.10 |
| BSB-564 | 1/4" | 32 TPI | Wavy | $9.50 | $7.10 |
| BSB-565 | 3/8" | 6 TPI | Hook | $9.70 | $7.30 |

### 57" Blades: Fits Sears 244530, Shopcraft, Duracraft

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-571 | 1/8" | 14 TPI | Std. | $12.90 | $9.60 |
| BSB-572 | 1/4" | 6 TPI | Hook | $9.50 | $7.10 |
| BSB-573 | 1/4" | 14 TPI | Std. | $9.50 | $7.10 |
| BSB-574 | 1/4" | 32 TPI | Wavy | $9.50 | $7.10 |
| BSB-575 | 3/8" | 6 TPI | Hook | $9.70 | $7.30 |

### 59-1/2" Blades: Fits B & D 9411, Pro-Tech 9", Ryobi BS900

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-591 | 1/8" | 14 TPI | Std. | $12.90 | $9.60 |
| BSB-592 | 1/4" | 6 TPI | Hook | $9.50 | $7.10 |
| BSB-593 | 1/4" | 14 TPI | Std. | $9.50 | $7.10 |
| BSB-594 | 1/4" | 32 TPI | Wavy | $9.50 | $7.10 |
| BSB-595 | 3/8" | 6 TPI | Hook | $9.70 | $7.30 |

### 62" Blades: Fits Walker-Turner 10", Skil 3104, Sears 2442

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-621 | 1/8" | 14 TPI | Std. | $13.60 | $10.20 |
| BSB-622 | 1/4" | 6 TPI | Hook | $9.90 | $7.40 |
| BSB-623 | 1/4" | 14 TPI | Std. | $9.90 | $7.40 |
| BSB-624 | 1/4" | 32 TPI | Wavy | $9.90 | $7.40 |
| BSB-625 | 3/8" | 6 TPI | Hook | $10.10 | $7.60 |

### 71-3/4" Blades: Fits Delta 28-140, Shopsmith

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-711 | 1/8" | 14 TPI | Std. | $14.30 | $10.70 |
| BSB-712 | 3/16" | 4 TPI | Skip | $10.30 | $7.70 |
| BSB-713 | 3/16" | 10 TPI | Std. | $10.30 | $7.70 |
| BSB-714 | 1/4" | 6 TPI | Skip | $10.30 | $7.70 |
| BSB-715 | 3/8" | 4 TPI | Skip | $10.30 | $7.70 |

### 72-5/8" Blades: Fits Sears 10", Skil HD3640, Dremel 1120

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-721 | 1/8" | 14 TPI | Std. | $15.00 | $11.20 |
| BSB-722 | 3/16" | 4 TPI | Skip | $10.60 | $9.00 |
| BSB-723 | 3/16" | 10 TPI | Std. | $10.60 | $9.00 |
| BSB-724 | 1/4" | 6 TPI | Skip | $10.60 | $9.00 |
| BSB-725 | 3/8" | 4 TPI | Skip | $10.60 | $9.00 |

### 80" Blades: Fits Boice Crane 800, Sears 2428, 24832N

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-801 | 1/8" | 14 TPI | Std. | $15.70 | $11.80 |
| BSB-802 | 3/16" | 4 TPI | Skip | $11.00 | $8.20 |
| BSB-803 | 3/16" | 10 TPI | Std. | $11.00 | $8.20 |
| BSB-804 | 1/4" | 6 TPI | Skip | $11.00 | $8.20 |
| BSB-805 | 3/8" | 4 TPI | Skip | $11.00 | $8.20 |

### 82" Blades: Fits Delta 28-190, 28-560

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-821 | 1/8" | 14 TPI | Std. | $15.70 | $11.80 |
| BSB-822 | 3/16" | 4 TPI | Skip | $11.00 | $8.20 |
| BSB-823 | 3/16" | 10 TPI | Std. | $11.00 | $8.20 |
| BSB-824 | 1/4" | 6 TPI | Skip | $11.00 | $8.20 |
| BSB-825 | 3/8" | 4 TPI | Skip | $11.30 | $8.50 |

### 92-1/2" Blades: Fits Sears 24393, most 14" imports

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-921 | 1/8" | 14 TPI | Std. | $17.10 | $12.80 |
| BSB-922 | 3/16" | 4 TPI | Skip | $11.70 | $8.80 |
| BSB-923 | 3/16" | 10 TPI | Std. | $11.70 | $8.80 |
| BSB-924 | 1/4" | 6 TPI | Skip | $11.70 | $8.80 |
| BSB-925 | 3/8" | 4 TPI | Skip | $12.10 | $9.10 |
| *Heavy-duty resaw blades:* | | | | | |
| BSB-926 | 3/4" | 3 TPI | Hook | $14.40 | $10.80 |
| BSB-927 | 3/4" | 3 TPI | Skip | $14.40 | $10.80 |
| BSB-928 | 3/4" | 6 TPI | Std. | $14.40 | $10.80 |
| BSB-929 | 3/4" | 10 TPI | Std. | $14.40 | $10.80 |
| BSB-920 | 1" | 3 TPI | Hook | $16.80 | $12.60 |
| BSB-192 | 1" | 8 TPI | Std. | $16.80 | $12.60 |
| BSB-292 | 1" | 14 TPI | Std. | $16.80 | $12.60 |

### 93-1/2" Blades: Fits Delta 28-24S, Jet JBS-14CS, Enlon EN-BS14, Elephant VBS-14, Reliant 14"

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-931 | 1/8" | 14 TPI | Std. | $17.10 | $12.80 |
| BSB-932 | 3/16" | 4 TPI | Skip | $11.70 | $8.80 |
| BSB-933 | 3/16" | 10 TPI | Std. | $11.70 | $8.80 |
| BSB-934 | 1/4" | 6 TPI | Skip | $11.70 | $8.80 |
| BSB-935 | 3/8" | 4 TPI | Skip | $12.10 | $9.10 |
| *Heavy-duty resaw blades:* | | | | | |
| BSB-936 | 3/4" | 3 TPI | Hook | $14.40 | $10.80 |
| BSB-937 | 3/4" | 3 TPI | Skip | $14.40 | $10.80 |
| BSB-938 | 3/4" | 6 TPI | Std. | $14.40 | $10.80 |
| BSB-939 | 3/4" | 10 TPI | Std. | $14.40 | $10.80 |
| BSB-930 | 1" | 3 TPI | Hook | $16.80 | $12.60 |
| BSB-193 | 1" | 8 TPI | Std. | $16.80 | $12.60 |
| BSB-293 | 1" | 14 TPI | Std. | $16.80 | $12.60 |

### 95" Blades: Fits Duro 3022, Powermatic 141, 143

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-951 | 1/8" | 14 TPI | Std. | $17.10 | $12.80 |
| BSB-952 | 3/16" | 4 TPI | Skip | $11.70 | $8.80 |
| BSB-953 | 3/16" | 10 TPI | Std. | $11.70 | $8.80 |
| BSB-954 | 1/4" | 6 TPI | Skip | $11.70 | $8.80 |
| BSB-955 | 3/8" | 4 TPI | Skip | $12.10 | $9.10 |
| *Heavy-duty resaw blades:* | | | | | |
| BSB-956 | 3/4" | 3 TPI | Hook | $14.40 | $10.80 |
| BSB-957 | 3/4" | 3 TPI | Skip | $14.40 | $10.80 |
| BSB-958 | 3/4" | 6 TPI | Std. | $14.40 | $10.80 |
| BSB-959 | 3/4" | 10 TPI | Std. | $14.40 | $10.80 |
| BSB-950 | 1" | 3 TPI | Hook | $16.80 | $12.60 |
| BSB-195 | 1" | 8 TPI | Std. | $16.80 | $12.60 |
| BSB-295 | 1" | 14 TPI | Std. | $16.80 | $12.60 |

### 105" Blades: Fits Inca 710, Delta, Jet & other 14" extended

| Item | Width | Pitch | Style | List | Sale |
|---|---|---|---|---|---|
| BSB-101 | 1/8" | 14 TPI | Std. | $19.20 | $14.40 |
| BSB-102 | 3/16" | 4 TPI | Skip | $13.20 | $9.90 |
| BSB-103 | 3/16" | 10 TPI | Std. | $13.20 | $9.90 |
| BSB-104 | 1/4" | 6 TPI | Skip | $13.20 | $9.90 |
| BSB-105 | 3/8" | 4 TPI | Skip | $13.60 | $10.20 |
| *Heavy-duty resaw blades:* | | | | | |
| BSB-106 | 3/4" | 3 TPI | Hook | $16.20 | $12.10 |
| BSB-107 | 3/4" | 3 TPI | Skip | $16.20 | $12.10 |
| BSB-108 | 3/4" | 6 TPI | Std. | $16.20 | $12.10 |
| BSB-109 | 3/4" | 10 TPI | Std. | $16.20 | $12.10 |
| BSB-110 | 1" | 3 TPI | Hook | $18.90 | $14.20 |
| BSB-111 | 1" | 8 TPI | Std. | $18.90 | $14.20 |
| BSB-112 | 1" | 14 TPI | Std. | $18.90 | $14.20 |

### Bandsaw Tooth Design

**Standard**
General purpose teeth for curved or straight cuts.

**Skip**
Good for soft materials & non-ferrous metals.

**Hook**
Cuts soft woods & non-ferrous metals faster than the Skip tooth.

***Regular Set:*** Best for most wood cuts

***Wavy Set:*** Best for thin material & tube

### Make your own custom bandsaw blades or fix broken blades with our Band Brazing Fixture

This handy jig holds both ends of the blade in perfect position for brazing. Use your propane torch to quickly fix broken blades, or make your own custom blades from the coil stock sold below. Kit includes blade clamp, 1 oz. of flux, 10" of silver solder (enough for about 20 blades) & instructions.

**BBF-001 Soldering Fixture** **List: $67.50** **Sale: $44.90**

### Bandsaw Blade Stock in money-saving 100' coils

These coils are a great money-saver for high-volume shops. All band is our high-quality .025" thick "flexback" stock.

| | 1/8" wide | 1/4" wide | 3/8" wide | 1/2" wide | 3/4" wide |
|---|---|---|---|---|---|
| List | $140.70 | $73.70 | $78.20 | $84.90 | $107.20 |
| **Sale:** | **$105.60** | **$55.30** | **$58.70** | **$63.70** | **$80.40** |
| 4 TPI Hook | -- | BSC-141 | BSC-381 | BSC-121 | BSC-341 |
| 4 TPI Skip | -- | BSC-142 | BSC-382 | BSC-122 | BSC-342 |
| 6 TPI Hook | -- | BSC-143 | BSC-383 | BSC-123 | BSC-343 |
| 6 TPI Skip | -- | BSC-144 | -- | -- | -- |
| 6 TPI Std. | -- | -- | -- | BSC-124 | BSC-344 |
| 8 TPI Std. | -- | -- | BSC-384 | BSC-125 | BSC-345 |
| 10 TPI Std. | -- | BSC-145 | BSC-385 | BSC-126 | BSC-346 |
| 14 TPI Std. | BSC-181 | BSC-146 | BSC-386 | BSC-127 | BSC-347 |
| 18 TPI Std. | BSC-182 | BSC-147 | BSC-387 | BSC-128 | BSC-348 |
| 24 TPI Std. | -- | BSC-148 | BSC-388 | BSC-129 | -- |

### Super Duty Bi-Metal Bandsaw Blades

Sure, our bi-metal blades cost more, but they can pay off handsomely if you plan to keep your saw running all day, every day! Special high speed steel hook-style teeth are electron-beam welded to a tough, flexible back. Last 10 times longer than other blades, cut wood, steel & non-ferrous metals

| Item | Length | Width | Pitch | List | Sale |
|---|---|---|---|---|---|
| BBB-821 | 82" | 1/4" | 6 TPI | $35.60 | **$26.70** |
| BBB-822 | 82" | 3/8" | 4 TPI | $35.60 | **$26.70** |
| BBB-823 | 82" | 1/2" | 4 TPI | $35.60 | **$26.70** |
| BBB-931 | 93.5" | 1/4" | 6 TPI | $37.50 | **$28.10** |
| BBB-932 | 93.5" | 3/8" | 4 TPI | $37.50 | **$28.10** |
| BBB-933 | 93.5" | 1/2" | 4 TPI | $37.50 | **$28.10** |
| BBB-101 | 105" | 1/4" | 6 TPI | $42.10 | **$31.60** |
| BBB-102 | 105" | 3/8" | 4 TPI | $42.10 | **$31.60** |
| BBB-103 | 105" | 1/2" | 4 TPI | $42.10 | **$31.60** |

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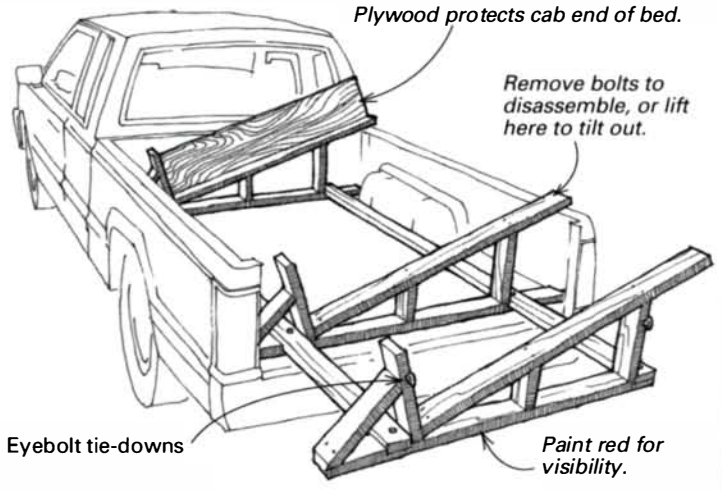
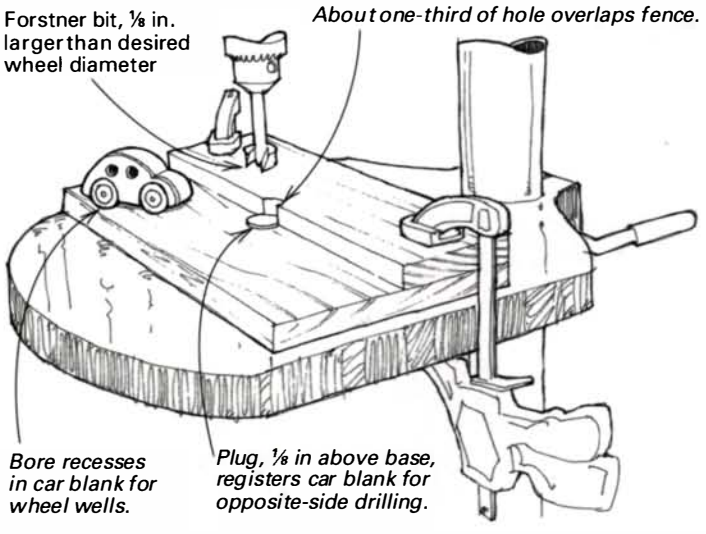
edited and drawn by Jim Richey

## Transporting plywood in a small-bed pickup




This rack solves the problem of transporting 4x8 sheet goods in a small-bed pickup. To make the rack, build three truss-like supports that slip into notches in the 2x4 runners. Fasten with a single bolt and T-nut per joint. Extend the tall side of the rack about 2 in. higher than the side of the truck to provide easy access from the side. To keep the sheet goods from banging the front of the bed, attach a plywood panel to the front support. Paint the back support red for visibility, and install two eyebolts to serve as tie-downs. When the rack is not needed, disassemble it either by removing six bolts or by lifting up on the long ends to tilt it out of the bed. *—Keith Woodworth, Houston, Texas*

## Recessed wheels for toy cars

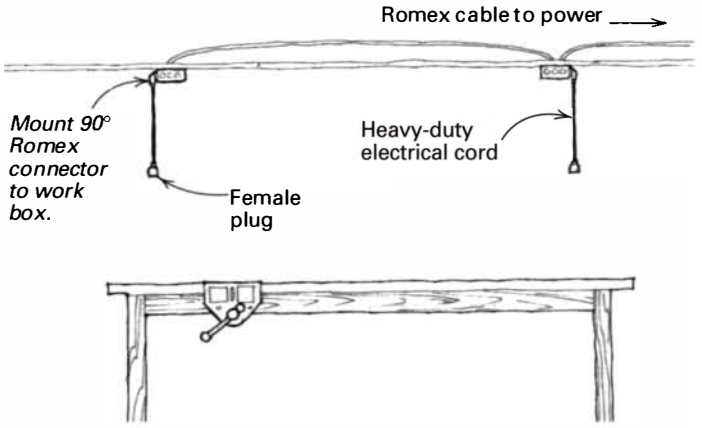



Here is a simple method for recessing the wheels into the bodies of toy wooden cars. First make a jig by face-gluing two ¾-in. boards, one-half as wide as the other, as shown in the sketch above. With a Forstner bit ⅛ in. larger than the wheel you are using, bore a hole into the jig. About one-third of the hole should overlap the fence. Turn or whittle a wooden plug that fits into the hole. Cut off the plug so that it protrudes ⅛ in. above the wide baseboard.

Clamp the jig to the drill press with the plug centered under the bit. Remove the plug. Place a car blank on the jig, and bore front and rear recesses into the car body about ¼ in. deep. Continue with all the car blanks until you've bored all the wheel wells on one side of the cars. Insert the plug. Turn over the car bodies, and place the car onto the jig so the plug registers the car right under the bit. Bore recesses into the other side.

Finally, remove the plug, and replace the Forstner bit with a regular bit, 1/64 in. larger than the dowel being used for the wheel axle. The regular bit will find the center of the hole made by the Forstner bit if you bring the press down slowly, and you allow the stock to move right or left. When the bit begins to bite, hold the stock firmly. *—Clyde Pophal, Madison, Wis.*

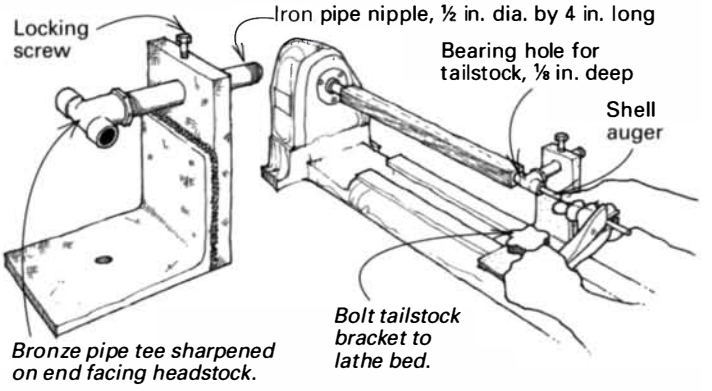
## Overhead plug-ins




This simple bit of rewiring solves the problem of always having a cord underfoot when using routers, drills and the like at the workbench. Run Romex cable above the ceiling, mount work boxes to joists, and with 90° Romex connectors, drop heavy rubber-covered electrical cord with a female plug. A rubber band or twist tie will keep a long tool cord overhead and out of the way when not in use. *—Eric L. Mynter, Remsen, N.Y.*

***Quick tip:*** Because the miter-gauge slot on most tablesaws has been milled to a precise ¾ in. width, the slot makes a great gauge for checking ¾-in. thickness-planed stock. Plane in small increments until the stock just slides in the miter-gauge slot.
*—David R. Johnson, Apple Valley, Minn.*

## Drilling deep holes on the lathe




As a maker of traditional wooden fifes, I need to bore long, straight holes in the ends of my flutes. I do this operation on a lathe using an end-boring jig I made from metal pipe and scrap iron. The tool is adapted from a method described to me by Trevor Robinson, who wrote *The Amateur Wind Instrument Maker* (University of Massachusetts Press, 1980). The jig was developed for hollowing fifes, but it works equally well for drilling lamp cord holes or any deep hole in a turned spindle.

Start by making a special tailstock. Take a ½-in.-dia. bronze pipe tee, and screw a ½-in.-dia. by 4-in.-long iron pipe nipple into the tee. Next weld up a bracket that clamps to the lathe bed with the same hardware used to mount a tool rest. Drill a hole for the nipple through the bracket at the same height as the centerline of the lathe. Then drill and tap the top of the bracket for a locking screw. The locking screw allows you to adjust the pipe assembly for perfect alignment. Then grind around the outside

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HOT DEAL!

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**MODEL G1035**

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- 1-1/2 H.P., 110/220V motor
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- 2 independently adjustable 2-1/2" x 10" fences
- Shipping weight: approx. 220 lbs.

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**MODEL G1017**

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**WITH FREE EXTRA BLADE SET & FREE SHIPPING!**

- 2 HP, 110V motor
- Dual-knife cutterhead
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- Optional dust hood available
- Complete with instruction manual
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**MODEL G1026**

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**SALE PRICE ONLY $750.00**

- 3 HP, 220V motor with reversing switch
- Heavy-duty all-steel miter gauge with full-length bar
- Cast iron wing
- Solid, polished cast-iron table top
- Table with standard wing attachment measures 28-7/8" x 28"
- Large steel handwheels
- Shipping weight: approx. 365 lbs.

HOT DEAL!

## 10" TILTING ARBOR SUPER HEAVY-DUTY TABLE SAW

**MODEL G1023**

REG. $850.00

**SALE PRICE ONLY $750.00**

*Table size with extension wings is 36.06" x 27.08"*

- 3 HP motor, 220V
- Precision ground solid cast iron table and wings
- Steel miter gauge
- Shipping weight: 450 lbs.

HOT DEAL!

## 20" PLANER

**MODEL G1033**

REG. $1195.00

**SALE PRICE ONLY $1175.00**


- Precision ground cast iron bed
- 3 HP, 220V motor
- 2 speeds: 16' and 20' per. min.
- Capacity: 20" wide x 6" tall
- 4-blade all ball-bearing cutterhead
- Shipping weight: approx. 800 lbs.

HOT DEAL!

## 6" x 47" JOINTER HEAVY-DUTY

**MODEL G1182**

REG. $375.00

**SALE PRICE ONLY $355.00**

- 1 HP, 110/220V motor
- Cabinet-type stand
- Longest (47") bed of all jointers in its class
- Heavy-duty center-mounted fence
- Shipping weight: approx. 250 lbs.

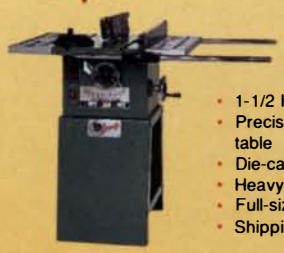
HOT DEAL!

## 10" TABLE SAW

**MODEL G1059**

REG. $295.00

**SALE PRICE ONLY $265.00**



- 1-1/2 HP motor, 110/220V
- Precision groundcast iron table
- Die-cast aluminum wings
- Heavy-duty rip fence
- Full-size, all metal miter gauge
- Shipping weight: 180 lbs.

HOT DEAL!

## 10" HEAVY-DUTY TABLE SAW

**MODEL G1022**

REG. $375.00

**SALE PRICE ONLY $355.00**

- 1-1/2 HP motor, 110/220V
- 2 Cast iron wings
- Precision ground cast-iron table top with T-slots
- Table size with extension wings: 41" x 27"
- Shipping weight: approx. 255 lbs.

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- Heavy-duty rip fence
- One-piece, cast iron body
- Hinged wheel covers
- Micro-adjustable blade guides
- Shipping weight: approx 430 lbs.

HOT DEAL!

## 8" SUPER HEAVY-DUTY JOINTER

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REG. $650.00

**SALE PRICE ONLY $625.000**

- 1-1/2 HP, 220V motor
- 3-knife cutterhead
- Magnetic switch for safety and overload protection
- 65" x 8" precision ground, cast iron bed
- Shipping weight: 460 lbs.

HOT DEAL!

## 24" DRUM SANDER

**MODEL G1066**

REG. $1095.00

**SALE PRICE ONLY $1050.00**

- Single phase, 220V, 5 HP motor
- Separate 1/4 HP belt feed motor
- Dual belt-driven sanding drums
- Heavy-duty magnetic switch
- Built-in dust collection ports
- Shipping weight: approx. 500 lbs.

HOT DEAL!

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**MODEL G1029**

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- Handles two machines with ease
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- Shipping weight: approx. 124 lbs.
- Complete with instruction manual

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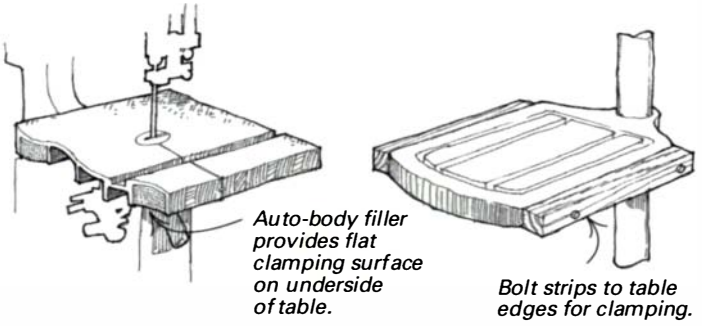
of the opening of one branch end to make a sharp edge to dig into the end of your turning stock. This sharpened end faces the headstock to support the work during drilling.

To use the fixture, first prepare the stock as follows. Cut diagonal drive kerfs on one end with a bandsaw as normal. On the other end, center-drill an 11/16-in.-dia. hole 1/8 in. deep. This shallow hole provides a bearing for the tailstock. Where the first hole ends, drill a pilot hole 3/4 in. deep. Mount the stock in the lathe using the special tailstock. Set the lathe at low speed, around 1,000 rpm. Hold the shank of a long shell auger with vise grips. Drill in the pilot hole through the bronze pipe tee. Because the work is turning and the tool is stationary, the shank of the drill will orbit if the tip wanders off-center. With a little practice, you will learn how to correct this while drilling.

*—Walter Sweet, Wellsville, N.Y.*

## Clamping to bandsaw and drill-press tables



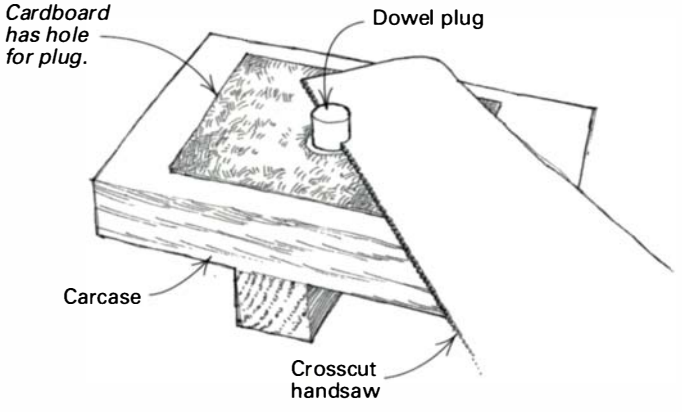

When I wanted to clamp something to my bandsaw table, the stiffening ridges cast into the underside of the table were a real vexation. To solve this problem, I first tried gluing blocks of scrapwood in the voids underneath, but this proved unsatisfactory. Finally, I solved the problem by filling the voids with auto-body filler. Because I don't use large clamps on the bandsaw, I found I only needed to fill the voids along the edge. The filler is quick and easy to install and has worked great for several years.

*—Tom Schrunk, Minneapolis, Minn.*

Clamping work to my drill-press table was always a problem because the underside of the table is full of ribs, and the edge is too narrow. So I bolted a piece of wood to each side of the drill-press table. This gives me two great flat clamping surfaces.

*—James J. Rankin, Easton, Pa.*

## Trimming plugs




A good plug cutter makes it possible to hide screw heads so that they are almost invisible. I make extras to match both color and grain. When installing the plugs, I orient them with the grain, put a few drops of glue in the hole, stir it around the edges with a wire probe and drive the plug home.

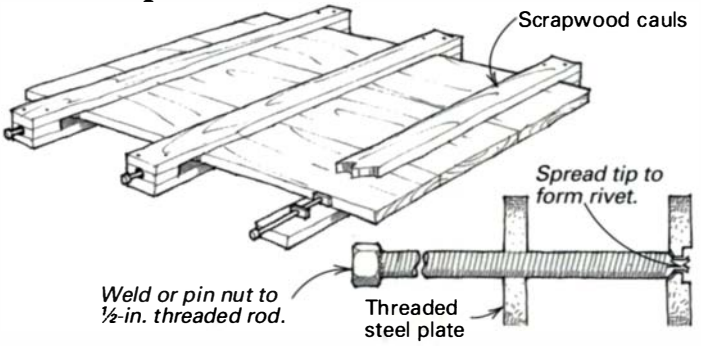
The tricky part comes in trimming the plug down to the surface. To do this, I punch a plug-sized hole in the center of a piece of cardboard and place this over the plug. Then I saw off the excess with an ordinary 10-point crosscut handsaw. The cardboard protects the work and leaves just its thickness to finish off. Don't ever use a chisel for the trimming operation because the plug sometimes chips off below the finished surface. I trim the plug with a finely set block plane; then I sand it flush.

*—Kirk Jenner, Grants Pass, Ore.*

***Quick tip:*** When rewiring your shop (and if your local building codes will allow), locate the electrical outlets and phone jacks 4½ ft. to 5 ft. above the floor. This will prevent them from being covered by the sheet stock or plywood that you often lean against the wall. The raised receptacles will also allow easy access to power and phone if you place your workbench under them.

*—Don A. La Faunce, Eureka, Calif.*

## Push clamps

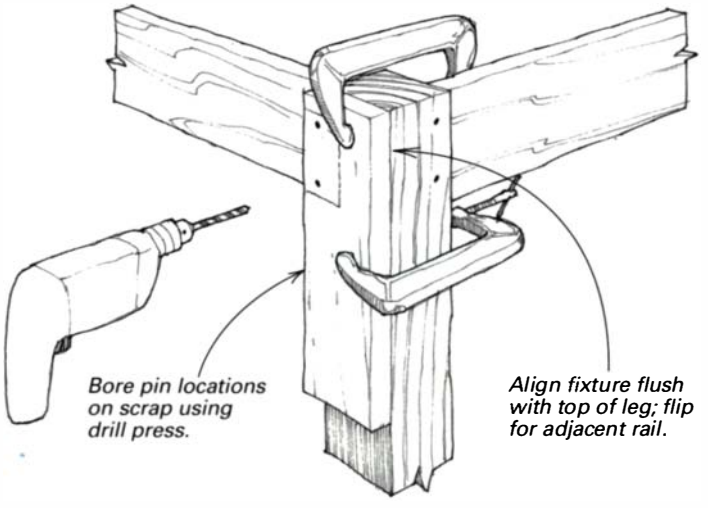



I have only an occasional need to edge-clamp wide boards and have always balked at buying a bunch of sash clamps, not only because of the high cost but also because I don't have the space to store them. So I made several of what I call push clamps, which are simple, small and inexpensive.

To make the clamp, cut a length of ½-in. threaded rod, and weld or pin a nut to one end. Now cut two plates from 3/8-in.-thick strip steel. Drill and tap one plate to travel on the rod. Drill the second plate, and attach it to the turned end of the rod with a loose-riveted joint, as shown. Some ball-and-socket adjustability is incorporated in this joint to allow for minor misalignment. When you are ready to glue up a panel, simply nail and arrange a number of pieces of scrapwood to complete the clamps.

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

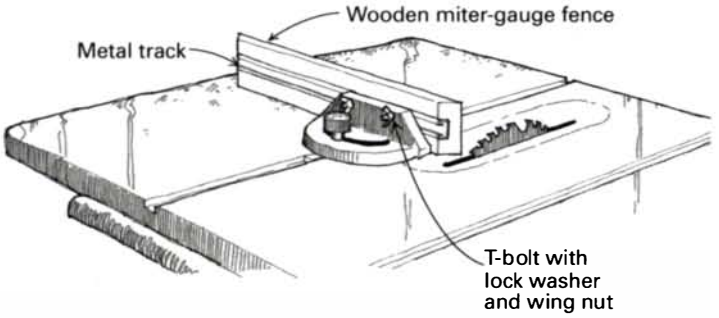
## Drilling pin holes in mortise-and-tenon joints




To pin mortise-and-tenon joints in a table frame, lay out the mortise location on a piece of 3/4-in. scrap the width of the table leg. Then drill two holes using the drill press at the desired pin

locations. Now position this jig on the table leg flush with the top, and clamp and drill the pin holes into the leg with a portable drill. Flip the jig for the other side of the leg. All holes will be in the correct location, drilled straight with no tearout or wandering. *—C.H. Becksvoort, New Gloucester, Maine*

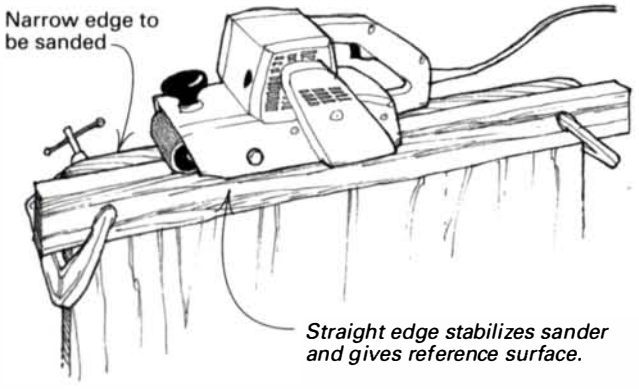
## Sliding miter-gauge fence




I added a sliding fence to my tablesaw's miter gauge to enable it to perform like the gauges found on many European power tools. With a sliding fence, you can move the end of the fence right next to the blade for a 45° miter cut, then reposition it for a 90° cut. I made the miter fence from a piece of maple, metal track and T-bolts made specifically for jigs by The Woodworkers' Store (21801 Industrial Blvd, Rogers, Minn. 55374). Wing nuts with toothed washers lock the fence in position.

*—Don Carkhuff, Darien, Ill.*

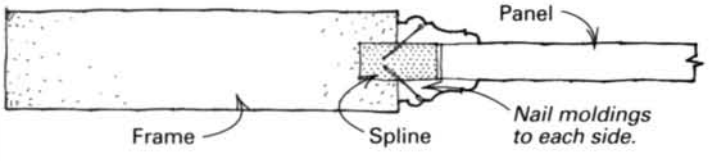
## Beltsanding narrow work




I recently had the problem of beltsanding the edge of a 1-in.-thick tabletop. Try as I might, I couldn't help but rock the belt sander. This resulted in a rounded and uneven edge. I solved this problem by clamping a straight length of scrapwood to the tabletop to increase the surface area for the belt sander to rest on. I used a square to make sure the two surfaces were properly aligned and clamped the scrap piece to the top side of the table to keep from marring it with the clamps.

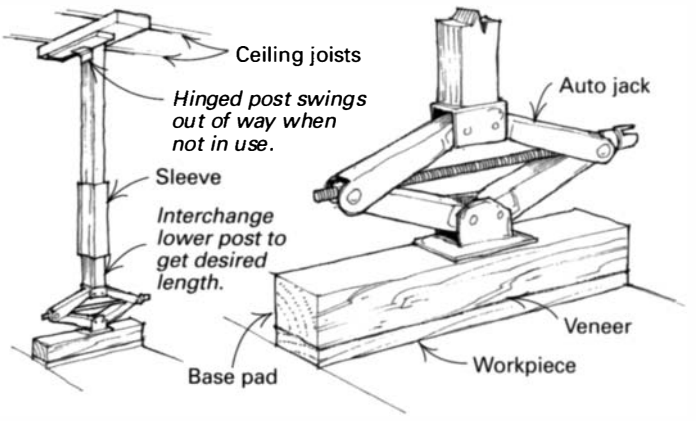
*—Roopinder Tara, Willow Grove, Pa.*

## Paneled door construction




When I was rehabilitating a 1912 home, I discovered this clever trick the builders had used in constructing the interior paneled doors. Start by fitting a spline into the grooved frame. Nail one side of the molding in place. The spline will support and align the molding as it is being fastened. Drop in the panel, and nail the other side of the molding. *—Don Williams, Williamson, N.Y*

## Car jack veneer press



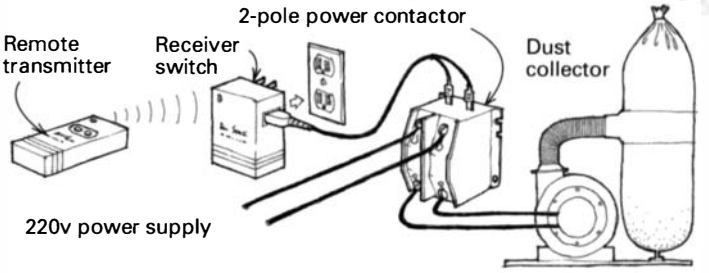

This veneer press is easily made with a scissor-type auto jack and any available lumber. Hinge the arm of the press to a plate that you've attached to the shop ceiling joists. Use a sleeve in the arm to allow different-length lower posts to be inserted, depending on the veneering job at hand.

*—Hector Maclean, Weston, Ont., Canada*

***Quick tip:*** Everyone knows about hickory and mesquite for smoking food because chips are available in those pricey little bags. Less well-known is that scraps and shavings from most common hardwoods like walnut, cherry, oak and maple also work well for smoking. Avoid softwoods and tropical woods.

*—Al Pergande, Orlando, Fla.*

## Remote control for dust-collection system




Recently, I had the opportunity to move my custom woodworking business out of my home into a historic mill. As a part of the move, I made several shop improvements, including upgrading to a 2-hp dust-collection system I hooked up to several additional tools. That's when the problem surfaced. I was spending too much time running over to the dust-collector switch.

One evening, I plunked down my weary bones, grabbed the remote and turned on the television. Click. I realized my dust-collector problems were over. I purchased a remotely activated on/off switch from Radio Shack for under $25, which works like a television remote. By itself, the Radio Shack switch is not beefy enough to power the collection system's motor, so I bought a 2-pole, 30-amp/240v AC contactor with a 110v AC coil and enclosure from my local electrical supply distributor for about $60. The Radio Shack remote-controlled switch serves as a pilot for the heavy-duty contactor.

After a couple hours of wiring, I could start or stop my collector from any location in the shop, which can be a real time-saver when a customer walks in or the phone rings.

*—Jerome Louison, Savage, Md.*

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

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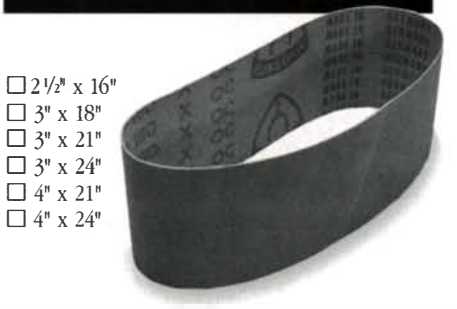

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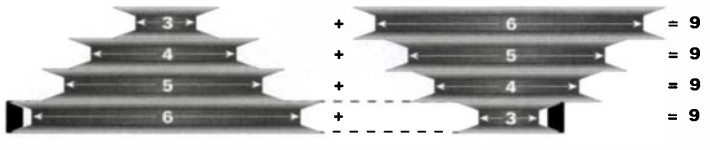
## Belt tension with step pulleys

***When I change speeds on my old four-step pulley drill press, the belt tension changes so much that I'm forced to change motor position a lot to get correct belt tension. Is this normal for drill presses with step-cone pulleys?***

***—Milton Upland II, Fort Lee, N.J.***

***Robert Vaughan replies:*** No. The motor position theoretically should remain the same. I suspect that one of two things have happened. One speed combination could have been so used that the pulley sides have worn, and the original pulley proportions have been altered slightly. The other possibility is that one of the pulleys is not original. My experience is that usually the motor pulley has been replaced with an off-the-shelf pulley that doesn't quite add up.

The diameters of all opposing grooves should all add up to the same number (see the drawing below). For example, nine is the sum of the opposing diameters when examining a drill press using step-cone pulleys with 3 in., 4 in., 5 in. and 6 in. diameters.




The best solution would be to contact the manufacturer and order a new drive pulley. If this isn't possible, then a power transmission supplier can probably offer a stock three- or four-step-cone pulley that might be close. Measure the diameters of your existing spindle pulley, and work things as close as you can. There aren't a lot of choices out there, and I know of no aftermarket source for off-the-shelf five-step pulleys.

[Robert Vaughan is a contributing editor to *FWW* and a woodworking machinery rehabilitation specialist in Roanoke, Va.]

## A Gonçalo alves workbench

***I recently purchased a large quantity of Gonçalo alves at such a great price that I'm thinking of using it to make a workbench: It is cheaper than the maple or beech I had planned to use. I have not been able to discover any information about the qualities of this wood, however. Is it more toxic than the domestic woods? Does it need to be treated as an oily wood, such as teak, when glued? Is it stable with changing humidity and temperature? And is this an endangered species from rain forest cuttings?***

***Last, could you recommend a comprehensive text that would answer similar questions in the future when I come across other exotic species?*** ***—Peter Breu, Manchester, N.H.***

***Jon Arno replies:*** Gonçalo alves (*Astronium fraxinifolium* and *A. graveolens*) is a New World timber native to southern Mexico, Central American and southward into Brazil. It is a fine-textured hardwood with excellent weathering characteristics, but it is best known as one of the most attractively colored woods in the world.

Sometimes called marblewood, its figure consists of beautifully flowing golden yellow, chocolate brown and rust red swirls. With an average specific gravity of 0.95, green to oven dry, it's an extremely dense wood and physically difficult to work with hand tools, although it machines well and is very stable in use. The wood's fine texture and high concentration of oils affect the holding power of adhesives to about the same degree as does rosewood. However, these same properties allow the wood to be polished to a satin smooth, natural finish without the need for lacquer or varnish. As a member of the sumac family (Anacardiaceae), Gonçalo alves is a relative of poison ivy and contains phenolic compounds, which can cause skin rash and even more serious respiratory allergic reactions. As with poison ivy, not all people are affected by Gonçalo alves, but it is a wood that should be approached with caution.

In answer to your last question, there are three books I'd recommend. *Tropical Timbers of the World* (Handbook #607) by Martin Chudnoff and *The Wood Handbook: Wood as an Engineering Material* (Book #001 000 03200-3) are USDA books that are available from the Superintendent of Documents, U.S. Government, Washington, D.C. 20402, and are worth having. But for the most comprehensive coverage of U.S. timbers, I prefer *Timbers of the New World* by Record and Hess. Reprinted by Ayer Co. Publishers Inc., Lower Mill Road, North Stratford N.H. 03590; (800) 282-5413. It's highly sought after by wood enthusiasts, and it's well worth the $57. 50.

Now, as for this bit about using it to make a workbench. Functionally, Gonçalo alves will perform very well in such an application. In fact, within its native range, the lower quality, less figured supplies of this species are employed in rather utilitarian roles, such as dock pylons, railroad ties and decking. But if the supply you've been able to buy at a bargain price is top quality, highly figured Gonçalo alves, well then, I think using it to build a workbench ought to be a felony.

[Jon Arno is a wood technologist and consultant in Troy, Mich.]

## Using backyard trees

***My property has two tulip trees 28 in. to 31 in. dia. and another tulip tree 16 in. to 18 in. dia. Each tree reaches to at least 50 ft. before any branches appear. I also have two oak trees of 30 in. dia.***

***I have always wanted to cut these trees for lumber for my special projects, but their size and location on the property make it difficult, to say the least. Do you know of any tree-removal system that will not ruin the existing landscape?***

***—Ralph Martone, Shelton, Conn.***

***John Sillick replies:*** Removing trees from residential property is usually an expensive proposition, and I would be suspicious of anyone who offers a bargain price. It may be the most expensive of all.

If the trees are near each other, ropes can be used between them to control the fall of branches and bring down log sections in sizes suitable for sawing. The last tree may have to be cut down in 2-ft. sections to avoid damage below.

A crane can be used in tight quarters, but that is not cheap. However, a skilled tree-man who is willing to climb can safely take down most any tree.

There is a trade-off to be considered when choosing how to bring a tree down. Sometimes it is cheaper to replace a $100 shrub than spend $200 trying to avoid injuring it. The same is true about damage to the lawn.

If the trees have to come down anyway, perhaps you don't have to consider this cost in planning to use your own trees for lumber. But you should realize that sawmill operators are often wary about logs that come from residential areas because of the possibility of metal being hidden inside the wood. Metal detectors can be of use in avoiding this danger. Discuss this with your sawyer ahead of time.

Despite all the difficulties, there is something quite special about building furniture from your own trees. The story is certain to accompany each piece you make and pass on through your family, especially if it stays with the property.

[John Sillick cuts his own trees and makes and repairs furniture in Lyndonville, N.Y.]

## Cutting dadoes safely

***In a recent safety meeting at our cabinet shop, the question of cutting dadoes across a narrow piece of plywood arose. We are currently using a tablesaw set up with dado blades, and***

*we either push the workpiece across the saw freehand or we use a miter gauge. We would appreciate any tips that you could give us to make this operation safer.*

*—Alan Hayes, Chattanooga, Tenn.*

***Jim Tolpin replies:*** Not wanting to overly scare you, I must tell you the worst accident I ever saw in a woodshop involved someone hand-feeding plywood across a dado blade on a tablesaw. I'll spare you the gory details—suffice it to say that this is indeed a potentially dangerous operation. Because a dado blade has so much surface area immersed in the cut at any one time, it exerts a tremendous amount of force against the wood. Should the stock shift even slightly as it's being cut, the possibility of the dado blade violently grabbing and throwing the panel off the saw table is very real.

These days, I do not use dado blades to cut grooves in plywood. Instead, I set up a router with a grooving bit (router bit manufacturers now offer cutters sized to nearly any thickness of plywood) and use the tool in conjunction with a simple shop-made cutting guide. (Saw Trax, a commercially made guide for this purpose, is available from Aardvark Tool Co., 2605 W. Alabama Road #202, Acworth, Ga. 30101; 404-427-2414). There are a number of advantages of this method over dadoing: First, it is much safer. There is no chance of the router throwing the panel anywhere, and the cutting business of the router is well out of the way under the baseplate. Second, it does a better job. Unless the dado blades are extremely sharp and the tablesaw's arbor is free of wobble, tearout along the edge of the groove is inevitable. In contrast, the physics involved when making this cut with a router bit (high running speed and cutting angle geometry) generally ensures a tear-free cut. And unlike the cut produced by a dado blade, a routed groove features a perfectly flat bottom—an important consideration if the joint is to show. [Jim Tolpin is a woodworker and technical journalist in Port Townsend, Wash.]

## Cracking crotch-mahogany veneers

*I am having a major problem with small checks (cracks) developing on the surfaces of crotch-mahogany veneers. The checks are small but numerous and are across the grain on all surfaces of the small boxes I'm veneering. I apply a multi-layered finish as follows: a coat of an oil mixture consisting of double-boiled linseed oil and pure turpentine, two coats of orange shellac, two coats of sanding sealer, wood-paste filler, three or four thinned coats of sanding sealer and two coats of sprayed-on lacquer. When the lacquer is dry, I buff it with rubbing compound and finish up with some paste wax. The checks don't appear immediately after the finish is applied, but show up on a gradual basis, some developing months and years after the boxes are complete.*

*—W.T. Cosway, Halton Hills, Ont., Canada*

***Frank Pollaro replies:*** I used to have similar problems with crotch-mahogany veneer. However, the techniques that I'm currently using have practically eliminated this problem for me. First, I coat the veneer with a solution of two-parts white glue, three-parts water, one-and-a-half parts glycerin and one-part denatured alcohol. You can also use this solution for any other stubborn veneers.

I liberally brush the mixed ingredients on both sides of the veneer. I then press the coated veneers between cauls of medium-density fiberboard (MDF), using sheets of plastic to prevent the veneers from sticking to the cauls or to each other. I apply weight gradually, not with clamps, to give the veneer a chance

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| 9" | 60 | 3/32" | 5/8" | 156 | **119** |
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to absorb the mixture. After two days, the veneer should be flat and workable. It may still be damp; however, this will not affect cutting, gluing or pressing the veneer. I use white glue because it has a longer working time than yellow glues.

Second, I've found that crotch veneers work better when applied over another veneer. Although I don't think grain direction matters, it's better than gluing the veneers directly onto flakeboard or MDF.

Third, and most important, after the veneered piece is pressed, I sand lightly to remove any surface glue and then apply a thin coat of hot hide glue with a paint brush. This sizing fills the pores and, I suspect, inhibits the movement of the veneer to reduce checking. When dry, I sand the surface and finish. The hide glue will not affect finishing.

I'm also concerned with the finishing techniques you're using. I see no need to mix oil, shellac, lacquer and wax on a single project. Three or four coats of Waterlox transparent, a thin wiping varnish available from most hardware stores, would surely give you all you are getting from these other ingredients with much less time and effort. It can then be rubbed and waxed using 0000 steel wool to give a lustrous satin finish.

[Frank Pollaro gives workshops on veneering and is a designer and builder of fine furniture in East Orange, N.J.]

## Perfect rivets

***The scrapwood locomotive in FWW # 104, p. 124, was truly inspiring. But it begs the question: How did John Freeborn get the rivets in the locomotive and tender? They look so real and are in perfect proportion. —Charles Rogers, Brighton, Mich.***

***John Freeborn replies:*** The rivets that were used in the scrapwood locomotive are round-head brass escutcheon pins, ¼ in. by 18 gauge (ga.), manufactured by Turner and Seymour Co. (100 Lauton St., Torrington, Conn. 06790; 203-489-9214).

These pins are available in eight different gauges from 12 ga. (.109 dia.) to 19 ga. (.042 dia.) and in various lengths. They are sold in one pound packages only. As an example: One pound of the ¼-in. by 18-ga. contains about 4,972 pins and sells for $11.40. The larger gauge pins are less expensive.

[John Freeborn is a woodworker in New Fairfield, Conn.]

## Repelling lacquer

***I'm having a problem with lacquer repelling, or forming fisheyes, on certain pieces. I refinished a poplar dresser and bureau set and a maple cocktail table. The pieces were the type that can be found in any national furniture store. The grain of the lighter boards in the set and most of the tabletop seems to have been darkened with a substance that appears black in the grain. I sanded all of the pieces way beyond what would be normal, but the black still remains. I wiped the pieces with silicone wash and then stained, sealed and shot them with lacquer. I ended up with fisheyes as large as ¼ in. over all the areas that had the black stain. The only solution I could find was to stain, glaze and then spray on a very light dust coat of lacquer. While the fisheye has been eliminated, the finish is far from satisfactory. Do you have any ideas on what the black stain is, what I can do to get rid of it and how I can improve the finish? —Robert L. Dean Jr., Glen Arm, Md.***

***Tom Wisshack replies:*** The fisheyes you experienced while refinishing your furniture may have been caused by traces of a penetrating oil stain used on the lighter parts of the wood to make them match the darker parts. Such stain can sometimes bleed through the finish coat and cause problems. This would

be my assumption because you took the precaution of using a silicone wash, and you sealed the wood well prior to topcoating it and because you said that the fisheyes occurred only on the black stained areas.

Because of the volatile nature of lacquer, you increase the likelihood of this happening. I suggest that in the future you isolate your stained surface with a thinned-out wash coat of dewaxed white shellac, and then proceed with the finish of your choice. Though shellac is not ordinarily used under lacquer finishes, you will find it to be compatible if you mist a coat of sanding sealer over it. It does a superb job of sealing stained surfaces so that subsequent finishes can be applied without too many problems. You can buy shellac in spray cans, which is very convenient for such jobs.

I would caution you that not all commercially available stains are compatible with all topcoats. I've had problems with various finishes, including polyurethanes, developing fisheyes when used over certain stains. You should experiment with different combinations of stain/topcoat systems to achieve professional results. Don't assume all major name-brand products will work in all situations. Which type of stain will give you the least amount of trouble in terms of applying a topcoat? I believe water-soluble aniline dye, which is dissolved in water, would be the least reactive with lacquer.

You say your finish is far from satisfactory even though the fisheyes have been eliminated. Without more specific information, I can't comment on this aspect of the problem except to say a good finish does not magically appear out of a can. After the final coat of lacquer has dried, I suggest wet sanding with the grain with 600-grit, automotive, wet-or-dry paper to remove any surface defects. Afterward, you can rub out the finish to perfection using fine (0000) steel wool and mineral or paraffin oil. Check your progress frequently by wiping off an area with a soft cloth. There is the possibility of rubbing through a finish that is not completely cured. A final coat of paste wax gives more protection and a nice sheen.

There's one more possible explanation for the fisheyes. It may be that the areas where the black stain is present are sapwood, which in many species is lighter and softer than the heartwood. It's possible that the manufacturer stained these areas to match the surrounding heartwood, but they were then never finished properly. Because these parts of wood often absorb more finish and are less dense, the original finish may not have provided adequate protection against the ravages of some of the spray-on polishes so popular today. These softer portions of the wood may have been quite susceptible to silicone damage, and there is no proof that silicone washes are 100% effective against such abuse. [Tom Wisshack is an antique furniture historian and wood finishing consultant in Galesburg, Ill.]

## Horse drawn vehicles

***I am trying to locate information on the construction of horse-drawn vehicles. I'm especially interested in buggies, buckboards and stage coaches. Authenticity is of paramount importance to me. I am not interested in scale models.***

*—John R. Blomstrom, Austin, Minn.*

***Jim Tolpin replies:*** Having lost myself for several years in the immensely pleasurable (though immensely unprofitable) pursuit of building reproductions of English gypsy caravans, I have acquired some sources of information on building horse-drawn vehicles, many of which may be helpful to you.

Before you go a step further, buy the book *The Wheelwright's*

*Shop* by George Sturt (Cambridge University Press, 1993). Read deeply and well—and be plunged headlong into the esoteric and (at least from this distance) richly romantic world of the English carriage and wagon builders. More than any other documents or plans, Sturt's book will give you both the language and—dare I say it?—the *feel* of what it took to create these immensely useful, durable and handsome constructions.

For excellent silhouette views (though unfortunately not scaled) of American wagons, consult *American Carriages, Sleighs, Sulkies and Carts* by Don H. Berkebile (Dover Publications, Inc., 1977). For measured drawings of a wide variety of farm wagons and some finer carriages (and even gypsy wagons), I highly recommend the offerings of John Thompson, an English author. Write to him at 1 Field Way, Fleet, Hampshire, U.K. I also found his book *Horse-Drawn Carriage Construction* to be a good overview of the construction elements of a variety of vehicles. Other publications on carriage design and construction can be obtained through the Carriage Association of America (Route 1, Box 115, Salem, N.J. 08079; 609-935-1616). Request a list of their publications (many are reprints of 19th-century works), and subscribe to their magazine: *The Carriage Journal.*

But if you are really serious about building a fine carriage reproduction, you owe it to yourself to visit the Museums at Stony Brook located in Long Island, NY. Here you will find one of the world's best collections of carriages—at least 250 at this writing—in original, unrestored, operating condition. By making prior arrangements with the curator, Merri Ferrell, you may be able to take off measurements of certain wagons and make copies of plans and construction information from their extensive library, which includes a collection of *The Hub* magazine, the premier magazine of the carriage building trade in the last century. (Ferrell recommends the *Collection of Essays on Horse-Drawn Carriages and Carriage Parts* by Gordon Cantle available from The Carriage Association, 1993.) This museum even contains actual transfer patterns and transfer ornaments rescued from long extinct carriage shops. To make arrangements, write to the curator, Merri Ferrell, at The Museums at Stony Brook, 1208 Route 25A, Stony Brook, N.Y. 11790.

[Jim Tolpin is a woodworker and technical journalist in Port Townsend, Wash.]

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[Charley Robinson is an associate editor for *Fine Woodworking.*]

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*Send queries, comments, and sources of supply to Q&A,* Fine Woodworking, *PO Box 5506, Newtown, Conn. 06470-5506. We attempt to answer all questions, but due to the great number of requests received, the process can take several months.*

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|---|---|---|
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| 0564-1 | Cordless Drain Cleaner | 192 |
| 3300-1 | Rt Angle Drill | 188 |
| 5192 | Die Grinder | 174 |
| 5362-1 | 1" Hawk Hammer | 318 |
| 5365-1 | 1" Hawk Hammer Kit | 348 |
| 5369-1 | 3/4" D-handle Falcon Kit | 248 |
| 5371-1 | 1/2" Hammer Drill | 183 |
| 5375-1 | 1/2" Hammer Drill Kit | 178 |
| 5392-1 | 3/8" Hammer Drill | 126 |
| 6140 | 4 1/2" Grinder | 98 |
| 6142 | 4 1/2" Grinder Kit | 123 |
| 6175 | 14" Chop Saw | 278 |
| 6369 | 7 1/4" Circ.saw Kit | 147 |
| 6460 | 10" Circular Saw | 258 |
| 6490 | 10" Miter Saw | 254 |
| 6491 | 10" Miter Saw w/80t Blade | 268 |
| 6528 | VS Super Sawzall | 164 |
| 6539-1 | Inline Screwdriver | 74 |
| 6546-1 | 2 spd Inline Screwdriver | 81 |
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| 626SK | 1/4"Crown 1" Stapler Kit | 104 |
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| 9314 | Trim Saw w/ Case | 151 |
| 315-1 | 7 1/4" Circular Saw | 117 |
| 9315-1 | Saw w/Case | 138 |
| 332 | 5" Random Orbit Sander | 66 |
| 351 | 3x21 Belt Sander | 147 |
| 352 | 3x21 Belt Sander w/bag | 152 |
| 352VS | Variable Speed 352 | 163 |
| 360 | 3x24 Belt Sander w/bag | 189 |
| 361 | 3x24 Belt Sander | 184 |
| 362 | 4x24 Belt Sander w/bag | 197 |
| 363 | 4x24 Belt Sander | 191 |
| 410 | Underscribe Router | 149 |
| 411 | Miter fold Trimmer | 164 |
| 505 | 1/2 Sheet Sander | 118 |
| 556 | Biscuit Joiner w/std. fence | 172 |
| 691 | 1 1/2 Hp D-handle Router | 148 |
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| 7537 | 2-1/2 Hp D-handle Rtr | 207 |
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| 7539 | VS Plunge Router | 263 |
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| 59381 | Hinge Mortise Jig | 165 |
| 97310 | Trimmer kit | 193 |

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| R50K | Trimmer 2 base Special | 99 |
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| RA202 | 8" Radial Arm Saw | 388 |
| RE600 | 3hp Plunge Router | 213 |
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| S550 | Finish Sander | 53 |
| SC160 | Scroll Saw | 134 |
| TFD170-2 | 9v Cordless Drill-2batt. | 157 |
| TFD220-2 | 12v Cordless Drill -2batt. | 164 |
| TR30U | Laminate Trimmer | 85 |
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| TS254 | 10" Miter Saw | 198 |
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|---|---|---|
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| 11219EVS | 1 1/2" RotoHammer | 569 |
| B1650 | New! Biscuit Joiner | 178 |
| B4050 | New! Inline Jig Saw | 128 |
| B7000 | New! Detail Sander | 78 |

## BLACK&DECKER

| | | |
|---|---|---|
| 1167 | 3/8" Keyless Drill | 72 |
| 1703 | 10" Miter Saw | 187 |
| 2037 | Drywall Screwgun | 97 |
| 2037W | Drywall gun w/50ft cord | 119 |
| 2670 | 1/2" Impact Wrench | 149 |
| 2721 | 1.5hp Router 1/2" collet | 148 |
| 3105 | Reciprocating Saw | 148 |
| 3379K | Biscuit Joiner | 225 |
| 3339 | 3hp VS Plunge Router | 268 |
| 4076 | 7" Wildcat Grinder | 165 |

**3338 Plunge Router $239**

## DELTA

**37-070 $247**

**6" Table Top Jointer**

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| 14-650 | Hollow Mortse Chisler | 288 |
| 22-540 | 12" planer | 397 |
| 28-180 | 10" band saw | 164 |
| 31-050 | 1" belt sander | 78 |
| 31-080 | 1" Belt 5" Disc Sander | 93 |
| 31-340 | 1" Belt 8" Disc Sander | 203 |
| 31-460 | 4" Belt 6" Disc Sander | 128 |
| 32-100 | Plate Joiner | 258 |
| 36-040 | 8" Compound Miter | 154 |
| 36-090 | Sidekick 10" Miter Saw | 213 |
| 36-220 | 10" Compound Miter | 228 |
| 40-150 | 15" Scroll Saw | 115 |
| 40-560 | 16" Scroll Saw | 177 |
| 40-640 | 20" Scroll Saw | 294 |

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| 11-950 | 8" Drill Press | 199 | 144 |
| 28-160 | 10" Hobby Band Saw | 210 | 145 |
| 31-050 | 1" Belt Sander 2.0 amp | 104 | 78 |
| 31-460 | 4" Belt/6" Disc Sander | 198 | 129 |
| 31-340 | 1" Belt/8" Disc Sander | 268 | 204 |
| 31-080 | 1" Belt/5" Disc Sander | 134 | 94 |
| 40-560 | 16" 2 speed Scroll Saw | 266 | 178 |
| 11-990 | 12" Bench Drill Press | 276 | 205 |
| 11-090 | 32" Radial Bench Drill Press | 399 | 305 |
| 43-505 | 1/2" Bench Router/Shaper | 399 | 279 |
| 22-540 | 12" Bench Top Planer | 595 | 398 |
| 36-220 | 10" Compound Mitre Saw | 350 | 229 |
| 14-650 | Hollow Chisel Mortiser | 668 | 289 |

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| 14-070 | NEW 14" Floor Drill Press | 450 | 349 |
| 28-180 | NEW Bench Band Saw | 232 | 165 |
| 40-640 | NEW 20" Bench Scroll Saw | 466 | 295 |
| 28-190 | NEW 12" Band Saw | 465 | 365 |
| 50-075 | NEW Dust Collector/Sweeper 3/4 HP | 360 | 249 |
| 20-150 | NEW 14" Cut-off Saw | 375 | 219 |
| 36-090 | NEW 10" Sidekick Miter Saw | 293 | 214 |
| 37-070 | NEW 6" var. speed Bench Jointer | 337 | 254 |
| 37-190 | NEW 6" Deluxe jointer | 554 | 469 |
| 36-275 | NEW 8-1/4" Builders Saw | 444 | 265 |
| 36-210 | NEW 10" Compound Mitre Saw | 438 | 259 |
| 36-070 | NEW 10" Mitre Saw | 284 | 169 |

### DELTA STATIONARY

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|---|---|---|---|
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| 34-445 | 34-444 Saw with 30" unifence | 1200 | 775 |
| 22-661 | 13" Planer with 2 HP motor | 1513 | 1189 |
| 17-900 | 16-1/2" Floor Drill Press | 462 | 399 |
| 40-601 | 18" Scroll Saw w/stand and blades. | 1003 | 749 |
| 34-080 | 10" Mitre Box | Xtra Special | 198 |
| 34-761 | 10" Unisaw 1-1/2 HP | 1715 | 1359 |
| 33-990 | 10" Radial Arm Saw | 818 | 639 |
| 37-280 | 6" Motorized Jointer | 488 | 395 |
| 50-179 | 3/4 HP 2 stage Dust Collector | 483 | 345 |
| 70-200 | 20" Floor Drill Press | 1049 | 829 |
| 43-355 | 3/4" Shaper 1-1/2 HP | 964 | 749 |
| 46-700 | 12" Wood Lathe | 548 | 445 |
| 33-055 | 8-1/4" Sawbuck comp with legs | 865 | 615 |
| 34-330 | 8-1/4" Table Saw 13 amp | 343 | 245 |
| 36-540 | 10" Table saw | 210 | 169 |
| 34-870 | 10" Motorized Table Saw | 511 | 395 |
| 32-100 | Stationary Plate Jointer | 645 | 249 |
| 36-040 | 8-1/4" Compound Mitre Saw | 224 | 155 |
| 34-915 | 30" Unifence | 385 | 239 |
| 34-897 | 50" Delta Unifence | 525 | 285 |
| 36-755 | 10" Tilt Arbor Saw | 1264 | 965 |
| 33-890 | 12" Radial Arm Saw | 1829 | 1425 |
| 14-040 | 14" Bench Drill Press | 382 | 335 |
| 28-560 | 16" Three Wheel Band Saw | 487 | 425 |
| 37-154 | DJ15 6"Jointer with 3/4 HP motor | 1451 | 1155 |
| 28-283 | 14" Band Saw w/enc. stand 3/4 HP | 910 | 745 |
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|---|---|---|---|---|---|
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| 35-617 | Combo 10" | 15° | 50 | 54 | 43 |
| 35-619 | Slide Cmpd/Rad Arm 10" | -6° | 60 | 63 | 50 |
| 35-624 | Super Cutoff 10" | 10° | 80 | 78 | 60 |
| 35-625 | Super Cutoff/Rad Arm 10" | -6° | 80 | 77 | 60 |

### NEW DEWALT TOOLS

| | | | |
|---|---|---|---|
| DW944K | 3/8" 9.6V cdlss drill kit w/cs & 2 batt | 283 | 149 |
| DW945K | 3/8" 12V cdlss drill kit w/cs & 2 batt. | 309 | 169 |
| DW364 | 7-1/4" Circ. Saw w/brake, 13 amp | 285 | 154 |
| DW306K | 8.0 amp Recip Saw w/case var. spd | 291 | 164 |
| DW610 | 1-1/2 HP 2 handle Router | 274 | 154 |
| DW411 | 1/4 sheet Palm Sander, 1.7 amp | 97 | 58 |
| DW705 | 12" Compound Mitre Saw | 706 | 385 |
| DW704 | 12" Mitre Saw | 570 | 314 |
| DW100 | 3/8" Drill, 4 amp, 0-2500 rpm, rev | 118 | 68 |
| DW250 | 4.5A Drywall Gun, 0-4000 rpm, rev. | 169 | 98 |
| DW254 | 4.5A Drywall Gun, 0-2500 rpm, rev. | 169 | 94 |
| DW280K | NEW Screwdriver kit complete | 207 | 125 |
| DW402 | 4-1/2" Grinder 6 amp | 158 | 94 |
| DW682K | NEW Biscuit Joiner with case | 429 | 238 |
| DW614 | NEW 1-1/4 HP Plunge Router | 250 | 144 |
| DW615 | NEW 1-1/4 HP Elec. Plge Router | 290 | 158 |
| DW624 | NEW 3 HP Plunge Router | 441 | 245 |
| DW625 | NEW 3 HP Electronic Plge Router | 511 | 274 |
| DW675K | NEW 3-1/8" Planer with case | 289 | 164 |
| DW430 | NEW 3 x 21 Belt Sander | 291 | 165 |
| DW431 | NEW 3 x 21 var. speed Belt Sander | 331 | 189 |

### NEW DEWALT CORDLESS DRILLS

| | | | |
|---|---|---|---|
| DW952K | 3/8" v/spd incl. one 9.6V batt | 280 | 165 |
| DW953K | 3/8" v/spd incl. one 12V batt | 306 | 179 |
| DW962K-2 | 3/8" v/spd incl. two 9.6V XR batt | 324 | 189 |
| DW972K-2 | 3/8" v/spd incl. two 12V XR batt | 352 | 199 |
| DW991K | 3/8" v/spd inc. one 14.4V XR batt | 370 | 219 |

**Above drill kits come w/charger & steel case !**

| | | | |
|---|---|---|---|
| Msx636 | FEIN Triangle Sander Kit | Sale | 185 |
| LPN672 | PONY Air Palm Nailer with glove | Sale | 94.99 |

### SIOUX TOOLS

| | | | |
|---|---|---|---|
| 8030 | New 3/8" variable speed Drill | 250 | 145 |
| 8000 | 3/8"v/sp close quarter Drill 0-1300rpm | 201 | 125 |
| 8005 | Same as 8000 but is 0-2500 rpm | 200 | 134 |
| 690 | 5" Air Random Orbit Sander | 139 | 132 |
| 658 | 5" Air Random Sander - dual action | 261 | 155 |

### DREMEL TOOLS

| | | | |
|---|---|---|---|
| 3950 | Moto Tool Kit with bits & case | 134 | 79 |
| 3952 | Super Moto Tool Kit with accessories | 152 | 95 |
| 1671 | 16" Scroll Saw - 2 speed "Best buy" | 302 | 174 |
| 1695 | NEW 16" var. speed Scroll Saw | 408 | 224 |
| 290 | Electric Engraver with point | 25 | 16 |
| 8508 | Cordless Moto Tool Kit with case | 109 | 64 |
| 1731 | 5" Disc1" x 30" Belt Sander | 189 | 114 |

### JORGENSEN ADJUSTABLE HANDSCREWS

| Item# | Jaw Length | Opening Capacity | List | Sale | Box of 6 |
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| #4/0 | 5" | 2-1/2" | 15.40 | 8.95 | 51.99 |
| #3/0 | 6" | 3" | 16.53 | 9.59 | 55.75 |
| #2/0 | 7" | 3-1/2" | 17.75 | 10.35 | 58.95 |
| #0 | 8" | 4-1/2" | 19.76 | 11.75 | 58.00 |
| #1 | 10" | 6" | 22.63 | 12.50 | 68.00 |
| #2 | 12" | 8-1/2" | 25.95 | 14.50 | 78.00 |
| #3 | 14" | 10" | 32.88 | 18.00 | 99.00 |
| #4 | 16" | 12" | 42.76 | 23.95 | 139.00 |

### JORGENSEN STYLE 37 2-1/2"Throat 1/4"x3/4"

| Item# | Jaw Length | List | Sale | Box of 6 |
|---|---|---|---|---|
| 3706 | 6" | 10.67 | 6.05 | 32.50 |
| 3712 | 12" | 11.82 | 6.50 | 35.10 |
| 3718 | 18" | 13.04 | 6.99 | 37.75 |
| 3724 | 24" | 14.25 | 7.99 | 42.50 |
| 3730 | 30" | 15.88 | 8.85 | 47.75 |
| 3736 | 36" | 17.36 | 9.99 | 53.95 |

### STYLE 36 - STYLE 37 CLAMP W/E-Z HOLD

| Item# | Bar Length | List | Sale | Box of 6 |
|---|---|---|---|---|
| 3606 | 6" | 18.96 | 11.75 | 65.95 |
| 3612 | 12" | 20.11 | 12.49 | 69.95 |
| 3618 | 18" | 21.95 | 13.65 | 76.95 |
| 3624 | 24" | 27.08 | 15.45 | 85.95 |
| 3630 | 30" | 29.42 | 16.85 | 95.95 |
| 3636 | 36" | 35.09 | 18.25 | 103.95 |

### JORGENSEN STYLE 45 5" Throat 1-3/8" x 5/16"

| Item | Jaw Length | List | Sale | Lots of 6 |
|---|---|---|---|---|
| 4512 | 12" | 33.17 | 19.95 | 109.99 |
| 4518 | 18" | 34.97 | 21.45 | 116.99 |
| 4524 | 24" | 37.02 | 22.75 | 123.99 |

### PONY CLAMP FIXTURES

| Model | Description | List | Sale | Lots of 12 |
|---|---|---|---|---|
| 50 | 3/4" Black Pipe Clamps | 14.87 | 7.90 | 89.95 |
| 52 | 1/2" Black Pipe Clamps | 12.40 | 6.80 | 72.95 |

### JORGENSEN STEEL "I" BAR CLAMPS

| Model | Size | List | Sale | Lots of 6 |
|---|---|---|---|---|
| 7224 | 24" | 34.36 | 17.99 | 103.00 |
| 7236 | 36" | 36.88 | 18.99 | 109.00 |
| 7248 | 48" | 40.54 | 20.99 | 119.00 |
| 7272 | 72" | 46.64 | 27.99 | 159.95 |

### ELU BY BLACK & DECKER

| | | | |
|---|---|---|---|
| 3338 | 2-1/4 HP var. speed Plunge Router | 501 | 199 |
| 3304 | 1 HP variable speed Plunge Router | 307 | 169 |
| 3375 | 3-1/8" Univ. Planer 7.2 amp | 329 | 159 |
| 3380 | Biscuit Jointer with case | 569 | 185 |
| 4024 | 3 x 21 variable speed Belt Sander | 338 | 179 |
| 3339 | NEW 3 HP var. spd Plunge Router | 511 | 269 |

### BLACK & DECKER

| | | | |
|---|---|---|---|
| 1166 | 3/8" Drill 0-2500 rpm 4 amp | 118 | 65 |
| 2600 | 3/8" Drill 0-1200 rpm 4.5 amp | 167 | 95 |
| 1703-1 | 10" Mitre Saw with 73-770 blade | 344 | 198 |
| 4011 | 1/4 sheet Palm Sander | 86 | 59 |
| 79-034 | Workmate 400 | 184 | 109 |
| 1349-09 | 1/2" Timberwolf Drill 2 speed | 551 | 305 |
| 1180 | 3/8" Drill rev. 0-1200 rpm 5 amp | 207 | 114 |
| 2037 | Drywall Gun 0-4000 5.0 amp | 184 | 98 |
| 2038 | Drywall Gun 0-2500 rpm 5 amp | 184 | 99 |
| 3157 | Orbital var spd Jig Saw 4.5 amp | 263 | 149 |
| 2665K | NEW 3/8" cdls 12V Cyclone Drill | 294 | 168 |
| 5045K | MACHO Rotary Hammer Drill | 813 | 439 |
| 2054 | Tek Gun 0-2500 5.0 amp | 287 | 159 |
| 2660 | Drywall Gun 0-4000 4.5 amp | 149 | 88 |
| 1321 | 1/2" Spade hdle Drill 450 rpm 7 amp | 320 | 188 |
| 2750 | 4-1/2" Grinder 10,000 rpm 6 amp | 156 | 83 |
| 2694 | 7-1/4" Super Sawcat Circ Saw w/cse | 285 | 152 |
| 2695 | 8-1/4" Super Sawcat Circ Saw w/cse | 328 | 162 |
| BD5200 | Quantum New 5" Rand Orb Sander | 160 | 88 |
| BD5900 | Quantum New 1/2" Belt Sander | 121 | 69 |

### Piranha by Black & Decker
**Carbide Tooth Saw Blades**

| Model # | Diameter | # Teeth | List | Sale |
|---|---|---|---|---|
| 73-715 | 5-1/2 | 16 | 14.39 | 7.99 |
| 73-716 | 6-1/2 | 18 | 14.39 | 7.55 |
| 73-717 | 7-1/4 | 18 | 14.60 | 7.99 |
| 73-737 | 7-1/4 | 24 | 18.06 | 9.29 |
| 73-757 | 7-1/4 | 40 | 32.87 | 16.89 |
| 73-718 | 8 | 22 | 20.95 | 10.95 |
| 73-759 | 8-1/4 | 40 | 46.88 | 24.99 |
| 73-719 | 8-1/4 | 22 | 20.63 | 11.95 |
| 73-740 | 10 | 32 | 34.63 | 17.95 |
| 73-770 | 10 | 60 | 70.37 | 33.95 |
| 73-711 | 10 | 50 | 68.33 | 33.95 |

### DURA III- ADJUSTABLE STILTS

| Model | Description | List | Sale |
|---|---|---|---|
| D1422 | 14"-22" extension | 258 | 189 |
| D1830 | 18"-30" extension | 274 | 205 |
| D2440 | 24"-40" extension | 289 | 219 |

**Above models include strap adapter kits**

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### ALUMINUM LADDER JACKS
**Must be installed on Type 1 or Type 1A ladders only**

| Model | Accepts Stage Width | Spans | Attaches to Rung | Sale |
|---|---|---|---|---|
| 10-14-02 | 14" | 2 rung | 2 rungs | 68.95 |
| 10-20-02 | 20" | 3 rung | 2 rungs | 81.95 |
| 10-20-03 | 20" | 3 rung | 3 rungs | 89.95 |

### ALUMINUM ARTICULATED LADDERS
**TYPE II - 225# RATING**

| Model | Size | Weight(lbs) | Sale |
|---|---|---|---|
| M2-6-12 | 6' | 34 | 125.00 |
| M2-7-14 | 7' | 38 | 135.00 |
| M2-8-16 | 8' | 41 | 145.00 |

### ALUMINUM ARTICULATED LADDERS
**TYPE IA -300 # RATING**

| | | | |
|---|---|---|---|
| M6-12 | 6' | 39 | 129.00 |
| M7-14 | 7' | 43 | 145.00 |
| M8-16 | 8' | 46 | 159.00 |

### FIBERGLASS STEP - TYPE 1- 250# RATING

| | | | |
|---|---|---|---|
| 6004 | 4' | 13# | 53.95 |
| 6005 | 5' | 16# | 64.95 |
| 6006 | 6' | 18# | 67.95 |

### FIBERGLASS STEP - TYPE 1- 250# RATING

| | | | |
|---|---|---|---|
| 6004-S w/pail shelf | 4' | 15# | 59.95 |
| 6005-S w/pail shelf | 5' | 18# | 69.95 |
| 6006-S w/pail shelf | 6' | 20# | 73.95 |

### FIBERGLASS STEP - TYPE 1A- 300# RATING

| | | | |
|---|---|---|---|
| 6204 | 4' | 14# | 65.00 |
| 6205 | 5' | 18# | 75.00 |
| 6206 | 6' | 20# | 82.00 |

### ALUMINUM FLAT STEP TYPE 11- 225# RATED EXTENSION

| Model | Size | Working Length | Weight(lbs) | Sale |
|---|---|---|---|---|
| D1216-2 | 16' | 13' | 22# | 117.95 |
| D1220-2 | 20' | 17' | 27# | 135.95 |
| D1224-2 | 24' | 21' | 33# | 159.95 |
| D1228-2 | 28' | 25' | 42# | 185.95 |
| D1232-2 | 32' | 29' | 53# | 209.95 |
| D1236-2 | 36' | 32' | 62# | 239.95 |
| D1240-2 | 40' | 35' | 73# | 298.95 |

### ALUMINUM FLAT STEP TYPE 1- 250# RATED EXTENSION

| | | | | |
|---|---|---|---|---|
| D1316-2 | 16' | 13' | 26# | 127.95 |
| D1320-2 | 20' | 17' | 32# | 152.95 |
| D1324-2 | 24' | 21' | 39# | 169.95 |
| D1328-2 | 28' | 25' | 50# | 199.95 |
| D1332-2 | 32' | 29' | 62# | 229.95 |
| D1336-2 | 36' | 32' | 77# | 299.95 |
| D1340-2 | 40' | 35' | 85# | 329.95 |

### ALUMINUM FLAT STEP TYPE 1A- 300# RATED EXTENSION

| | | | | |
|---|---|---|---|---|
| D1516-2 | 16' | 13' | 31# | 159.95 |
| D1520-2 | 20' | 17' | 37# | 169.95 |
| D1524-2 | 24' | 21' | 45# | 199.95 |
| D1528-2 | 28' | 25' | 56# | 219.95 |
| D1532-2 | 32' | 29' | 66# | 259.95 |
| D1536-2 | 36' | 32'(250# rating) | 79# | 309.95 |
| D1540-2 | 40' | 35'(250# rating) | 89# | 349.95 |

### FIBERGLASS FLAT STEP TYPE 1A- 300# RATING EXTENSION

| | | | | |
|---|---|---|---|---|
| D6116-2 | 16' | 13' | 34# | 179.95 |
| D6120-2 | 20' | 17' | 40# | 199.95 |
| D6124-2 | 24' | 21' | 53# | 239.95 |
| D6128-2 | 28' | 25' | 60# | 269.95 |
| D6132-2 | 32' | 29' | 74# | 309.95 |

### FIBERGLASS FLAT STEP TYPE 1A- 300# XTRA HEAVY DUTY EXTENSION

| | | | | |
|---|---|---|---|---|
| D7116-2 | 16' | 13' | 37# | 209.95 |
| D7120-2 | 20' | 17' | 43# | 245.95 |
| D7124-2 | 24' | 21' | 58# | 279.95 |
| D7128-2 | 28' | 25' | 66# | 309.95 |
| D7132-2 | 32' | 29' | 79# | 369.95 |

**Buy any 3 ladders(can be asst) deduct additional 5% Prepaid Freight and best prices too!**

### RECORD WOODWORKING VISES

| Model | Jaw Width | Opening | | List | Sale |
|---|---|---|---|---|---|
| 53E | 10-1/2" | 15" | Quick release | 199 | 109 |
| 52D | 7" | 8" | Quick release w/dog | 137 | 85 |
| 52-1/2D | 9" | 13" | Quick release w/dog | 186 | 109 |

### KRAUSE MULTIMATIC LADDERS

| Model | Description | List | Sale |
|---|---|---|---|
| 121482 | 12' Aluminum Multi Purpose | 228 | 128 |
| 121499 | 16' Aluminum Multi Purpose | 272 | 148 |

### AEG POWER TOOLS

| Model | Description | List | Sale |
|---|---|---|---|
| HBSE75S | 3 x 21 variable speed Belt Sander | 309 | 175 |
| ABSE15S1/2" | cdls 12 volt Drill complete w/cs | 403 | 174 |
| FSPE100X | NEW Barrell Grip v/spd Jig Saw | 274 | 159 |
| BSPE100 | NEW Top Hdle v/sp Jig Saw w/cs. | 286 | 159 |
| TXE150 | New 6" var/spd Rand Orb Sander | 304 | 139 |
| SKS300 | NEW 10" Compound Mitre Saw | 1019 | 499 |

### HITACHI TOOLS

| | | | |
|---|---|---|---|
| C7SB | 7-1/4" Circular Saw | 233 | 125 |
| C7BD | 7-1/4" Circular Saw with brake | 258 | 135 |
| M12V | NEW 3 HP variable speed Router | 476 | 239 |
| TR12 | Plunge Router 3 HP | 389 | 188 |
| F1000A | 12" Planer/6" Jointer | 2970 | 1559 |
| P12R | 12-9/32" Planer | 1470 | 779 |
| P12RA | Planer/Joiner | 1940 | 989 |
| C10FC | NEW 10" Mitre Saw | 432 | 259 |
| C8FB | 8-1/2" Slide Compound Saw | 1400 | 599 |
| P20SB | 3-1/4" Planer 3.4 amp | 179 | 95 |
| G12SA | 4-1/2" Grinder 6.9 amp | 160 | 89 |
| DS10DVAK | 12 volt Cordless Drill Kit w/2 batt | 393 | 199 |
| NR83A | Framing Nailer 2 - 3-1/2 Full Head. | 700 | 385 |
| NR83AA | Framing Nailer 2 - 3-1/2 Clip Head | 750 | 409 |
| NT65A | 16 ga. Brad Nailer 1 - 2-1/2 | 610 | 318 |
| NT45A | 18 ga. Brad Nailer 13/16 - 1-3/4 | 490 | 269 |
| NV45AB | Coil Roofing Nailer 7/8 - 1-3/4 | 750 | 395 |
| NV83A | Coil Nailer 2 - 3-1/4 | 750 | 415 |
| NV50A1 | Coil Nailer 1-1/4 - 2 | 564 | 305 |
| N5008AA | 7/16" Stapler - 16 ga. 1 - 2 lgth | 580 | 315 |
| N3824A | 1" Stapler 16 ga. 1/2 - 1-1/2 | 630 | 345 |

### WAGNER PAINT & SPRAYER PRODUCTS

| | | | |
|---|---|---|---|
| 120 | Power Sprayer | 70 | 57 |
| CP | Cordless Painter | 100 | 79 |
| 230HD | Power Painter/Sprayer | 100 | 84 |
| 959 | Power Roller | 140 | 105 |
| 255 | Airless Kit | 180 | 130 |
| 375E | Airless System | 195 | 159 |
| 404 | Airless Painter & Roller | 320 | 249 |
| 505 | High performance Airless Painter | 440 | 369 |
| 550 | Professional Airless Painting System | 769 | 685 |
| HVLP | Fine coat finishing HVLP System | 195 | 155 |
| CS2000 | Professional fine finish HVLP System | 339 | 269 |

### DAVID WHITE INSTRUMENTS

| | | | |
|---|---|---|---|
| LP6-20 | Sight Level package - 20x | 310 | 195 |
| LP6-20XL | LP6-20 w/9056 tripod & 7620 rod | 375 | 259 |
| L6-20 | Meridian Level - 20x | 290 | 188 |
| LT8-300 | Level Transit - 26x | 695 | 445 |
| LT8-300P | above Level with optical plum | 821 | 518 |
| LT6-900 | Level Transit - 20x | 389 | 249 |
| LTP6-900 | Above Level with tripod & rod | 601 | 375 |
| ALT6-900 | Automatic Level - Transit - 18x | 638 | 409 |
| ALTP6-900 | above Level with tripod & rod | 708 | 469 |
| AL6-18 | Automatc Level - 18x | 449 | 315 |
| ALP6-18HD | above Level with tripod and rod | 570 | 375 |
| ALP8-20 | NEW Automatic level 20x with tripod & rod | 710 | 539 |
| ML100I | NEW Laser Level | 1099 | 945 |
| ML100 | NEW Laser Level w/detector | 1249 | 1075 |

### QUAL-CRAFT JACKS

| | | | |
|---|---|---|---|
| 2200 | Pump Jack | 79 | 58 |
| 2201 | Pump Jack Brace | 30 | 20 |
| 2203 | Pump Jack guard rail holder | 31 | 21 |
| 2204 | Work Bench & rail holder combo | 53 | 39 |
| | **Buy any 6 (can be assorted) deduct additional 10%** | | |
| 2601 | Wall Jack | 167 | 108 |
| | **Lots of 4 deduct additional 10%** | | |

### PASLODE IMPULSE GUNS

| Model | Description | List | Sale |
|---|---|---|---|
| IM250 | Trimpulse Finish Nailer Kit complete drives 3/4" - 2-1/2" brads | 849 | 565 |
| IM325 | Impulse Framing Nailer Kit complete drives 2" - 3-1/4" nails | 849 | 565 |

### SENCO AIR NAILERS

| | | | |
|---|---|---|---|
| SFN1 | Finishing Nailer 1" - 2" | 448 | 298 |
| SFN2 | Finish Nailer 1-1/2" - 2-1/2" | 571 | 375 |
| SFN40 | NEW Finish Nailer 1-1/4" - 2-1/2" | 571 | 385 |
| SN325 | Nailer 1-7/8" - 3-1/4" | 665 | 419 |
| SLP20 | NEW Pinner w/case 5/8" - 1-5/8" | 399 | 269 |
| SKS | Stapler 5/8" - 1-1/2" | 390 | 259 |
| M2 | Stapler 1/16" wide - 1-3/8" 2" length | 535 | 355 |
| SN70 | Framing Nailer Clip Hd 2" - 3-1/2" | 690 | 475 |
| SN60 | Framing Nailer-Full Hd 2" - 3-1/2" | 638 | 455 |
| | Not available in all states | | |

### AIRY AIR NAILERS

| | | | |
|---|---|---|---|
| 0241SK | Brad Nailer 3/8" - 1-9/16" Same as Senco SLP-20 | 180 | 98 |
| 0250SK | Brad Nailer 3/4" - 2" | 296 | 169 |
| 0626SK | 1/4" Crown Stapler 3/8" - 1" | 194 | 109 |
| 0635SK | 1/4" Crown Stapler 1/2" - 1-3/8" Same as Senco SKS | 310 | 169 |
| | **Above nailers come w/case, fasteners, oil & wrenches** | | |
| 0565T | Angle Finish Nailer 1" - 2-1/2" | 386 | 205 |

**Airy nailers use Senco brand fasteners**

### DUO-FAST AIR NAILERS

| | | | |
|---|---|---|---|
| BB-4440 | Brad Nailer 1/2" - 1-1/4" | 336 | 199 |
| LFN-764 | Finish Nailer 1" - 2" | 564 | 335 |
| HFN-880C | Finish Nailer 1-1/2" - 2-1/2" | 720 | 425 |
| RCN-60\225 | Coil Roofing Nailer | 740 | 435 |
| CN-350 | Framing Nailer - Full Head | 704 | 415 |
| CN-325 | Framing Nailer - Clip Head | 670 | 395 |

### EXCALIBUR Fences & Tables

| Model | Description | List | Sale |
|---|---|---|---|
| TT45R24L9 | 24" Fence | 369 | 299 |
| TT45R50L12 | 50" Fence | 399 | 318 |
| EXSLT30 | Sliding Table | 599 | 475 |
| EXSLT60 | Sliding Table | 745 | 585 |

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***Use your tablesaw to put a straight edge on a wany board.*** *The Joint'r Clamp consists of two sections of aluminum extrusion that are drilled and tapped to accept thumbscrews. One thumbscrew grabs a straight strip of sheet stock, which acts as guide; the other thumbscrew grabs a crooked board you'd like to straighten. Then you just rip.*

## Tablesaw Joint'r-Clamp system

If you have a good-sized bandsaw, then you can get a reasonably straight edge on a crooked board or a flitchsawn plank with an irregular edge. And that's still the safest way to get an edge ready for the jointer. But if you don't have a bandsaw, or if yours is too small to handle a particular board, there's also a way to use your tablesaw to get the job done.

The Joint'r Clamp consists of two sections of aluminum extrusion, with a pair of thumbscrews on each (see the photo above). One thumbscrew on each of the aluminum sections grips a straight strip of plywood or some other sheet material, which you provide, and the other thumbscrew grips the irregular board. You set the Joint'r Clamp to grip the irregular board to rip off only enough to get a straight continuous edge.

The Joint'r Clamp's makers say it "joints in two passes" and "straightens edges without a jointer." Those claims are overblown, but the Joint'r Clamp *will* put a straight, jointable edge on a bowed, crooked or rough-edged board. For about $12, you can hardly go wrong. The Joint'r Clamp is sold through many woodworking catalogs and stores. If you haven't seen it, call The Burt Development Co. (718-885-3314) for the name of a catalog or a store near you.

*—Vincent Laurence*

## Diamond wheel dresser

No matter what technique you use for final honing of cutting edges on your plane irons, chisels and gouges, sooner or later you'll have to regrind the edge. And to get a finely ground edge, you'll need a properly dressed grinding wheel.

I've tried a number of wheel-dressing devices, such as star-wheel dressers, but had never been able to get the crisp, straight surface I wanted. Until now.

Craft Supplies USA has come up with a dressing tool that really works (see the photo below). Developed by woodturner Dale Nish, the diamond wheel dresser has a 1-in.-wide face impregnated with industrial diamonds. Mounted to a comfortable, plastic-coated metal handle, the tool dresses wheels quickly, exposing a fresh, flat surface. Although the diamond wheel dresser is not dust-free, it does seem to create less dust than other dressing tools I've used. Nish says the diamond surface should last most woodworkers a lifetime.

The tool sells for $34.95 and is guaranteed for life. It is available mail order from Craft Supplies USA, (P.O. Box 50300, Provo, Utah 84605-0300; 800-551-8876).

*—William Sampson*

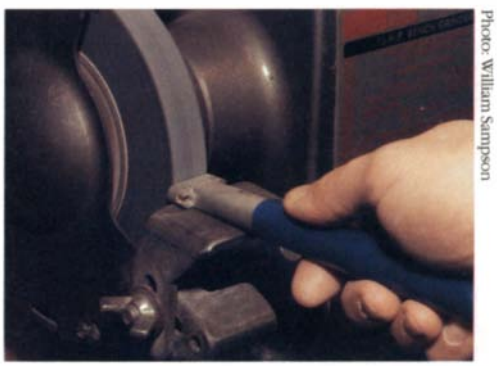

Photo: William Sampson

***Diamond grinding-wheel dresser gives a flat, fresh surface quickly.*** *It also produces less dust than the star-wheel-type dressers and should last a lifetime under normal use.*

Photo: Alec Waters

***Scraper holder prevents burnt fingers, cut hands.*** *Veritas Tools' new scraper holder grips the scraper firmly but permits plenty of adjustment.*

## Veritas scraper holder

Since I began using a cabinet scraper to smooth my furniture projects, I have greatly improved their finish. Moreover, I use less sandpaper, endure less noise from my power sanders and enjoy the cleaner, quieter environment.

The cabinet scraper is not an entirely benign instrument, though. If an occupational health and safety expert were to evaluate the use of a cabinet scraper, he'd warn of burnt thumbs, sore hands and the possibility of the tool cutting the user.

That's why I was excited to try out Veritas Tools' new scraper holder. Made of glass-filled nylon, it's light but strong enough to withstand heavy use. Brass screws secure the blade and allow for its height adjustment. Blade curvature is easy to adjust with a good-sized brass nut in the middle of the tool's back (see the photo at left).

I tried the scraper holder on a maple bed frame I was working on at the time. The holder grips the scraper firmly and permits accurate adjustment. I was able to scrape the whole bed without burning my thumbs or cutting my hands on sharp edges. But I found the tool to be too small top to bottom for me to use comfortably.

To exert sufficient pressure on the tool for it to cut, I had to really bear down on



Photos except where noted: Vincent Laurence

the holder, straining my hands and wrists. Increasing the height of the tool would alleviate the strain I experienced, making it that much more useful to me. I'd be the first in line to purchase a bigger version. For more information or to purchase the scraper holder, contact Veritas Tools at 12 East River, Ogdensburg, N.Y. 13669; (800) 667-2986 or, in Canada, Lee Valley Tools, Ltd., 1080 Morrison Drive, Ottawa, Ont., Canada K2H 8K7; (800) 267-8767.

*—Richard Merrick*

***Belt cleaner helps your belts work better, last longer.*** *The Nu-Life smoked rubber abrasive-belt cleaner cleaned the belt on this stationary sander much better (right) than did a conventional yellow crepe cleaner (left).*

## Nu-Life abrasive belt cleaner

Abrasive belt cleaners extend the life of belts and discs, saving you time and money. Now, a belt-cleaning bar seems a fairly prosaic item, and I'd always thought one was the same as the other. As it turns out, that's not quite so.

I picked up a sample of the Nu-Life product at the Woodworking Machinery & Furniture Supply Fair last September, brought it back to our shop and compared it with a standard, opaque yellowish crepe bar. The crepe bar didn't seem to get eaten up quite as quickly as the Nu-Life bar (made of a translucent smoked rubber), but the Nu-Life bar cleaned the belt substantially better (see the photo above).

Nu-Life abrasive bars are sold through distributors and cost about $6.95 each. For a distributor near you, contact the Abrasive Service Co., Inc. (398 Broad St., Forestville, Conn. 06010; 203-584-2091). *—V.L.*

## Tried & True varnish oil and wood finish

Last fall, for the first time in my life, I had a chance to use real boiled linseed oil. The thin slop usually sold as generic "boiled" linseed oil is merely raw linseed oil with metal driers added. After years of research, Joe Robson came up with his Tried & True varnish oil and wood finish. The varnish oil is pure linseed oil, pressed from flax seeds, oxidized by heating, with no additives. The exact manufacturing process is derived from a varnish-making text dating from 1860. Until six months ago, my standard finish consisted of one coat of "boiled" linseed oil, followed by two coats of pure tung oil for build, protection and shine. Now I use Robson's varnish oil exclusively.

Tried & True varnish oil is unlike any oil I've ever used. It's full-bodied and thick: Applying it is like pushing engine oil. It requires elbow grease, both to apply and to wipe. Once most of the oil has been wiped, it becomes smooth and easy to buff. The build-up is astounding. Two coats of the varnish oil are the equivalent of four or five coats of the so-called boiled linseed oils. The directions call for one coat per day. I've found that this works for temperatures of 70° and above. This winter, when my shop temperature normally hovered between 50° and 60°, I had to wait two to three days between coats.

Robson's other product, the wood finish, is a mix of linseed oil and pure beeswax. It is translucent, looks like crystallized honey and actually spreads much easier than the varnish oil. The finish is not nearly as shiny, more of an eggshell. I'd recommend it for older pieces of furniture, where a matte luster is more suitable.

Both products are more expensive than other oils, but because of the heavy build-up, less oil is required. It takes more elbow grease to apply, but yields a better finish. A pint costs $13.95; a quart is $19.95; and a gallon is $59.95. If you can put together a group order with fellow guild members or woodworking friends and buy 4 gal. (a case), the gallon price comes down to $35.

The fact that it is environmentally benign is a real plus. The Material Safety Data Sheet reads like a fairy tale: no volatile organic compounds, no exposure limit, no carcinogens, though ingestion of large quantities may cause nausea and sickness.

As with most oil finishes, rags will spontaneously combust. Dispose of them according to Robson's directions, which are printed on the labels.

Tried & True finishes are available from Joe W. Robson Cabinetmaker (14 Prospect St., Trumansburg, N.Y. 14886; 607-387-9280) and from Garrett Wade (161 Avenue of the Americas, New York, N.Y. 10013; 800-221-2942). *—Christian Becksvoort*

***Lightweight and versatile, No-Scuff clamps*** *can simplify many glue-ups.*

## No-Scuff clamps

Pipe clamps are great—powerful, versatile, and relatively inexpensive. But there are times when they can truly be a pain.

Enter the No-Scuff jaw clamps (see the photo above). They bring a joint together without having to find an opposing bearing surface. Instead, a self-wedging system, designed not to mar the wood, firmly grabs the wood just behind the joint. The No-Scuff clamps are also very light because they're made of aluminum. So unlike a typical pipe-clamp glue-up where the weight of all those steel pipes may force you to drag someone in off the street to assist in getting the assembly off the worktable, a No-Scuff glue-up weighs little more than the stock you're pulling together. These clamps are also small, making them easy to store when not in use. Getting them to release is a little tricky, requiring a hammer to tap the wedge open.

The No-Scuff comes in a couple of styles: One grips the members you're clamping by their width (good for face-frame and similar glue-ups), the other by their thickness (good for drawing a shelf into a side dado). Both clamps sell for between $15 and $25, depending on where you get them. I got my No-Scuff clamps from Norfield Tools and Supplies (P.O. Box 459, Chico, Calif. 95927; 800-824-6242). They are also available from The Woodworkers' Store (21801 Industrial Blvd., Rogers, Minn. 55374-9514; 800-279-4441) and from Woodworker's Supply (1108 N. Glenn Road, Casper, Wyo. 82601; 800-645-9292).

*—Jim Tolpin*

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# One-Stop Cutting Station

## *Tablesaw jig handles crosscuts, tenons and miters*

by Ken Picou

***Making a crosscut box more versatile—** An accurate sliding-crosscut box makes a good base for cutting accessories, including this corner-slotting jig. This jig mounts or dismounts in seconds and makes for strong miter joints in picture or mirror frames and in small boxes or drawers.*

Tablesaws are excellent for ripping stock, but the standard miter gauge that comes with most tablesaws makes them mediocre at best for crosscutting material or cutting joinery. But by making a simple sliding-crosscut box and a few accessory jigs, you can greatly increase the accuracy and flexibility of your saw and turn it into a one-stop cutting station, capable of crosscutting, tenoning and slotting.

The system I've developed consists of a basic sliding-crosscut box with a 90° back rail, a removable pivoting fence, a tenoning attachment and a corner slotting jig, for cutting the slots for keyed miter joints (see the photo above). This system is inherently safer and more accurate than even the most expensive miter gauge for several reasons. First, it uses both miter slots, so there is less side play than with a miter gauge. Second, the work slides on a moving base, so there's no chance of the work slipping or catching from friction with the saw table. Third, the long back fence provides better support than a miter gauge, which is usually only 4 or 5 in. across. Fourth, the sliding-crosscut box is big, so angles can be measured and divided much more accurately than with a miter gauge (the farther from its point of origin an angle is measured, the greater the precision). Finally, the sliding crosscut box is a stable base on which to mount various attachments, such as a tenoning jig or a corner slotting jig, which can greatly expand the versatility of the tablesaw.

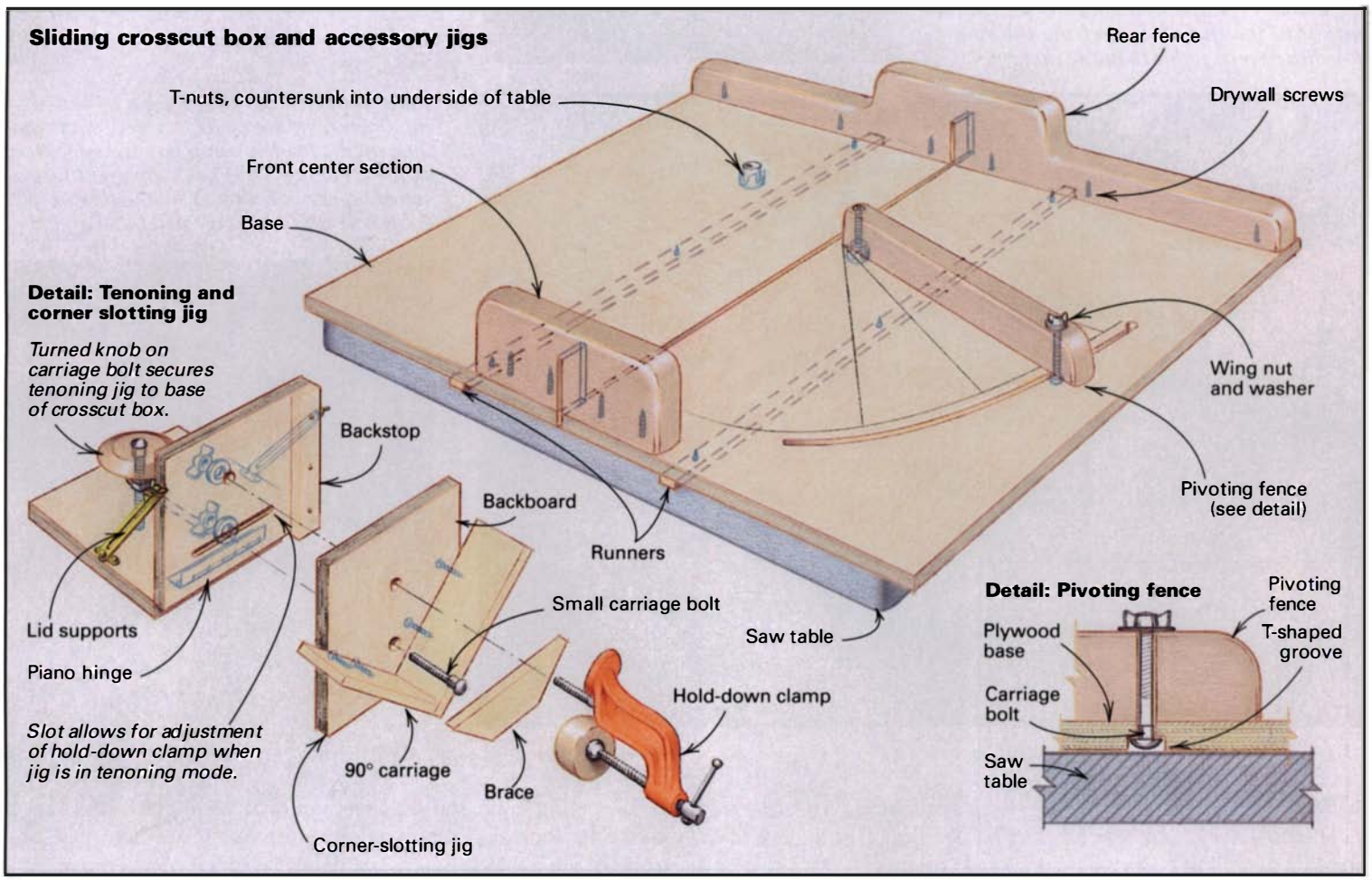
### Building the basic crosscut box

I cut the base of my sliding-crosscut box from a nice, flat sheet of ½-in.-thick Baltic-birch plywood, and then I make it a little bit wider and deeper than my saw's tabletop. A cheaper grade of plywood also would be fine for this jig, but I decided to use a premium material because I wanted the jig to be a permanent addition to my shop.

The runners that slide in the tablesaw's miter-gauge slots can be made from any stable material that wears well. I prefer wood to



Photos: Vincent Laurence



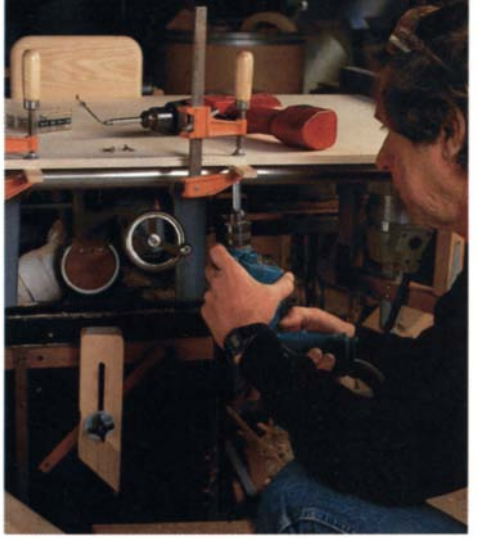

metal because wood works easily, and I can screw right into it. I usually use hard maple, and I've never had a problem. Using a long-wearing, slippery plastic such as an acetal (Delrin, for example) or ultra-high molecular-weight (UHMW) plastic is also a possibility. (For more on using plastics for jigs and fixtures, see *Fine Woodworking* #105, pp. 58-61.)

I start with a maple board of sufficient length that is at least as wide as three or four runners are thick. I plane this board, taking off minute increments with each pass, until it slides easily on edge in one of the slots but isn't sloppy. Once the fit's right, I rip the runners from this board, setting the fence on my tablesaw to just under the depth of the miter-gauge slot. Then I drill and countersink them at the middle and near both ends (I check the dimensions of the Baltic-birch base to make sure I drill the screw holes so they'll fall near the edges of the base). I usually drill a couple of holes near each end as insurance in case a screw drifts off when I'm screwing the runners to the base.

Next I crank the sawblade all the way down below the table and lay the runners in the miter-gauge slots. I position the base so that its back edge is parallel to the rear of the saw table and the front edge overhangs by a couple of inches. I clamp the runners to the base in the front. I drill pilot holes in the plywood from below using a Vix bit (a self-centering drill bit available through most large tool catalogs) placed in one of the countersunk holes in the runners. Then I screw up through the runners into the base. When I've done both runners at the front of the saw, I slide the base back carefully and repeat at the rear (see the top photo on p. 42). I check for binding or wobble by sliding the base back and forth a few times. If the fit is less than ideal, I still have four more chances (the extra screw holes I drilled at both ends of each runner) to get it right. If the fit is good, I drill pilot holes with the Vix bit and screw the runner to the base in the middle, taking care not to let the runner move side to side. I also trim the runners flush with the front and back of the crosscut box.

If the fit's a bit too snug at first, use will tend to burnish the runners so that they will glide more easily. If, after some use they're still a little snug, you can sand the runners just a bit and give them a coat of paste wax. That will usually get them gliding nicely.

Drawing: Michael Gellatly



***Accurate holes are key to an accurate jig.*** *Clamps hold the crosscut-box runners in place (left) while the author drills and screws the runners to the base. Using a Vix (self-centering) bit in the previously drilled and countersunk holes in the runner keeps the bit centered going into the plywood, which helps keep the screws from pulling the runners out of line.*

***Checking and rechecking for a perfect 90°*** *(below), both with a square and with test-cuts, is time well-spent. The accuracy of the whole crosscut box and all jigs that mount to it depends on getting the relationship of rear fence to blade just right.*

***Rear fence helps align jig's hinge—****Using the rear fence as his reference, the author aligns the tenoning jig's hinge with a square (below). The Vix bit ensures that the screw holes are centered, so the screws will go in true and the hinge will be straight.*

***Building accuracy into the jig—***An inaccurate jig is useless, so it's essential that assembly of this jig be dead-on. Fortunately, this isn't difficult; it just takes a little time and patience.

I made both the back fence and the front center section from straight-grained red oak, but any straight-grained hardwood will do (see the drawing on p. 41). I make sure the center portions of both pieces are built up high enough to provide 1½-in. clearance with the blade cranked up all the way.

The front section helps keep the table flat and prevents it from being sawn in half. Because this front section is not a reference surface, its position isn't critical, so I screw it on first.

Then I mount the rear fence about ¼ in. in from and parallel to the back of the Baltic-birch base. I clamp the fence to the base and drive one screw through the base, which I've already drilled and countersunk, into the fence a couple of inches to the right of where the blade will run. This provides a pivot point, making it easier to align the rear fence to the blade.

I remove the clamp, raise the blade up through the base and cut through the front section and the base, staying just shy of the rear fence. So far, there's only one screw holding the rear fence in place. To set the rear fence permanently and accurately at 90° to the blade, I place the long leg of a framing square against the freshly made kerf (saw is *off*) and the short leg against the fence. With the fence flush against the square, I clamp the fence on an overhanging edge and do a test-cut on a wide piece of scrap. I check this for square with a combination square and adjust the position of the fence as necessary. When I've got it right, I put another clamp on the fence near the blade on the side opposite my one screw. Then I drill, countersink and screw through the base into the fence right next to the clamp, and I check the fence's position again to make sure screwing it to the base didn't pull it off the mark (see the bottom left photo). I also make another test-cut, and as long as it's still good, I screw the fence down near the ends and the middles on both sides of the blade (see the drawing on p. 41). If the second cut is not a perfect 90°, then I'll fiddle with the fence until the cut is perfect before screwing it into position permanently. Time spent getting the fence right is time well-spent. If, for aesthetic reasons, you want the rear of the base to be flush with the fence, you can trim the base flush with a bearing-guided, flush-trimming router bit. Either way, the performance of the crosscut box will be unaffected.

Anything from a small wooden handscrew to a fancy commercially made stop will work as a stop block for this fence. A self-stick ruler can be added to the fence or table.

## A pivoting fence

I wanted a pivoting fence for making angled cuts, but I also wanted to be able to remove the fence quickly when I need to cut wide

***Quick, accurate tenons, even in large boards,*** *are easy with the author's hinged tenoning jig (right). A hold-down clamp grabs the workpiece securely and accommodates almost any size workpiece. The big footprint of the tenoning jig's base anchors it securely to the base of the crosscut jig below. The jig is also useful for cutting long miters and angled tenons.*

***Setting angles accurately*** *can be done quickly with a miter square or a bevel square (below). By setting the angle both fore and aft in the tenoning jig, you can be sure the angle will be true across the face of the jig.*

boards. I accomplished this first by setting a T-nut for the pivot point into the underside of the jig's base about 6 in. forward of the fixed fence. Then I routed an arc-shaped track for a carriage bolt at the end of the fence (see the drawing on p. 41). The arc runs from 0° to a bit more than 45°, and there's a plunge-routed hole just below the 0° point through which the carriage-bolt assembly can be lifted out to remove the fence. I marked two common angles (22½° and 45°) onto the jig for quick reference using a large protractor and transferring that angle to a bevel square and then to the plywood. These angles can also be checked and fine-tuned by cutting them, setting the resulting blocks together and checking for 90° with an accurate square.

A slotted screw and washer secure the fence at its pivot point but allow the fence to move, and a wing nut (with washer) fixes the angle of the fence at its outboard end. As with the fixed fence, a stop block may be as simple or sophisticated as you like.

## An adjustable tenoning jig

A simple hinged jig that uses the rear fence as a reference surface will allow you to cut both regular and angled tenons, rabbets and angled edges accurately and without too much fuss. I built this jig also from Baltic-birch plywood. I crosscut it in the basic jig and routed the slots in it on my router table.

To attach the hinges accurately, I indexed both halves against the fixed rear fence, set a length of piano hinge in place and used a small carpenter's square to align the hinges (see the bottom right photo on the facing page). Then I drilled screw holes using the Vix bit and screwed the hinge on.

A small shopmade (turned) knob at the end of a carriage bolt secures the tenoning jig to a T-nut in the underside of the crosscut box's base. The fixed rear fence ensures that the face of the tenoning jig stays parallel to the blade. Two brass lid supports hold a set angle securely (see the photo at left). And a hold-down clamp travels in a slot in the upper portion of the jig, allowing me to hold almost any size workpiece securely (see the photo at right).

## Corner-slotting jig

Attaching directly to the tenoning jig, the corner-slotting jig is easy to build and simple to use. I screwed two scrap boards to a backboard to form a 90° carriage positioned at 45° to the base of the crosscut box (see the drawing). I cut a brace to fit up a few inches from the corner of the 90° carriage and across whatever it is I'm slotting. A hole through the backboard permits a hold-down clamp to bear upon the brace, distributing the pressure of the clamp.

In use, I slide the workpiece into place, then the brace and then I tighten the clamp. The jig feels solid and works well. □

*Ken Picou is a designer and woodworker in Austin, Texas.*

# Using Shop-Sawn Veneer

## *Cut thick with the bandsaw, it works like solid wood, stays put like plywood*

by Paul Harrell

***Sideboard squeezed from a small plank—*** *By doing his own sawing, the author coaxed the primary veneer and edging for this sideboard from a single plank of jarrah. The legs, stretchers and lighter veneer are mahogany.*

I recently came upon a beautiful plank of jarrah—hard, heavy Australian wood—that was exactly what I wanted for a piece of furniture I was planning. The plank was small, though, only 5 ft. long, 1¾ in. thick and less than 6 in. wide. The only way I could get much use out of it was to saw it into veneer. With some careful planning, I squeezed out of it all the veneers and edge-bandings I needed to make the sideboard in the photo above. The same plank, just about 4 bd. ft., wouldn't have been enough to make the top of the piece if I'd used it as solid.

I make my veneer on the bandsaw, as shown in the photo on the facing page, cutting sheets 3/32 in. thick, which is thick enough to be worked much like solid wood with both hand and power tools. It's also stiff enough to be edge-joined with wedge-clamp pressure. The finished surface is more forgiving and durable than thinner commercial veneer (generally, 1/28 in.). I also prefer shop-sawn veneer to the commercial variety because I can cut the solid-wood parts of a piece (legs, frame members, edge-bandings, pulls) from the same planks as the veneer. This means more control in matching grain and color patterns throughout the piece.

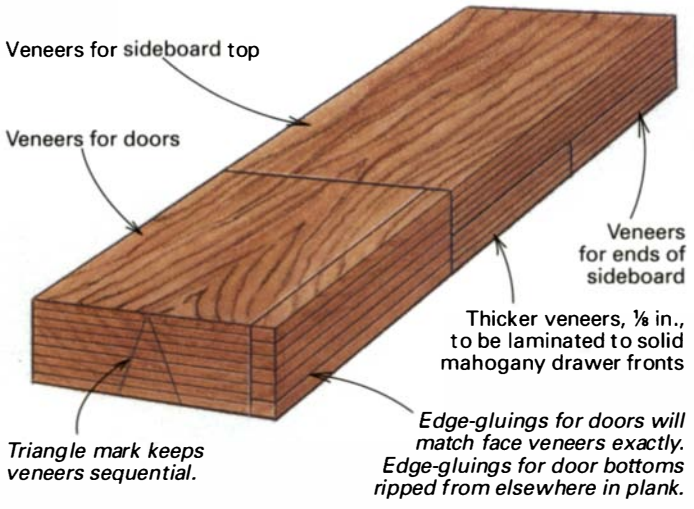
### Veneer or solid wood?

There are several reasons I might decide to use veneer instead of solid wood in a piece of furniture. Clean lines and the lack of end grain give veneered work a refinement that fits some pieces better



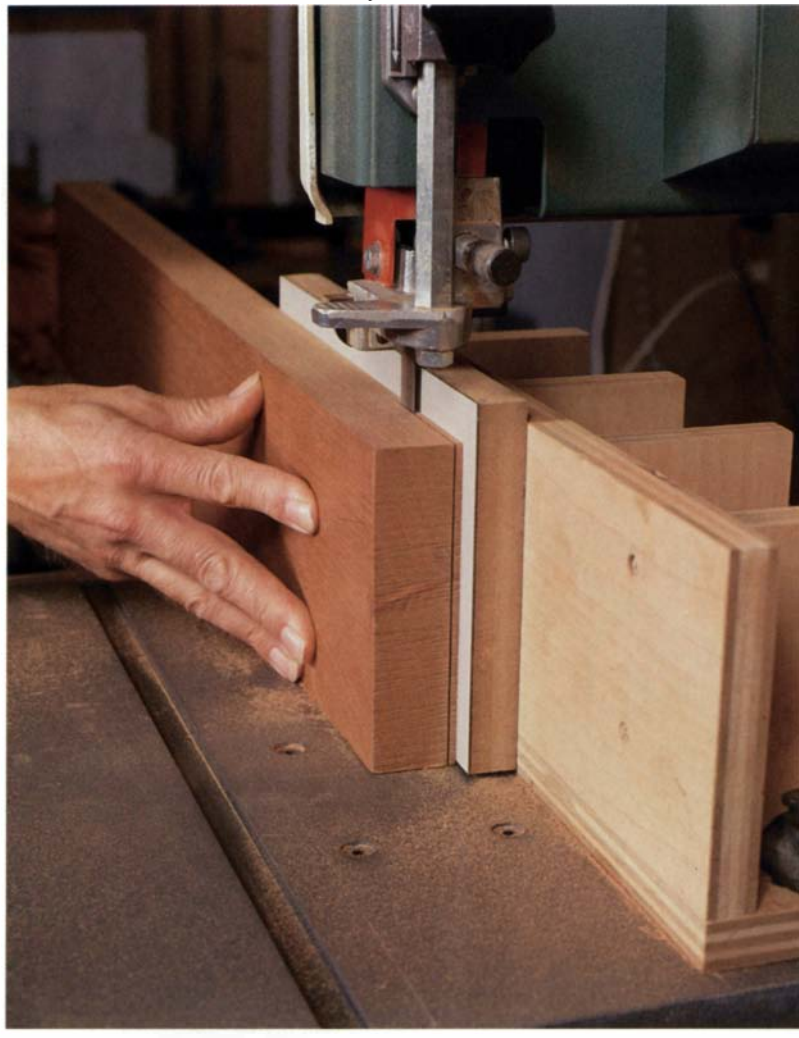
Photo: Sloan Howard

**Fig. 1: Plank layout for veneered sideboard**




*The author chose the more highly figured end of the plank for the door veneers. The pattern worked well vertically and would have been unbalanced if used on the top.*

***To bandsaw 3/32-in. veneers,** clamp a high, half-length fence to the saw table, angled to accommodate the natural drift of the blade. Rip wide boards for better resawing; then edge-glue to rejoin the veneers.*



than others. If I were making a table or a case piece for a formal dining room, for instance, I'd consider using veneer; in a kitchen table, where veneer seems out of place, I'd probably use solid wood. Because wood movement is not a problem with veneered panels, they offer options not available with solid wood. The top of the sideboard, for example, has a pattern involving cross-grain pieces and inlay that would quickly self-destruct in solid wood.

Veneer can add strength, too. A veneered back panel, glued in, gives rigidity to a case. Veneered tops can be solidly attached and partitions and drawer runners can be glued into veneered carcases. All of this gives a strong and stable construction. For a detailed look at the ways I used veneer and solid wood, see the boxes on p. 48 and the drawing on p. 49.

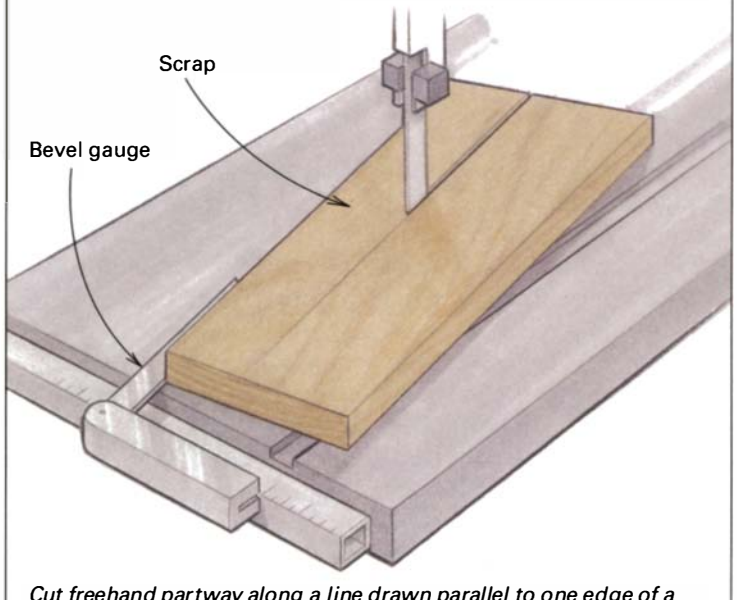
One thing veneering won't do is save time. Doing quality veneer work always takes longer than working with solid wood, and I do it only when the possibilities it offers really fit the piece.

## Laying out a plank

Before making any cuts, I take time to look at the milled plank or planks and decide how the grain patterns will work best with the various parts of the piece I'm planning, as shown in figure 1 above. I make sure there will be enough wood for all the veneers, plus pieces for edge-gluings and, in some cases, legs and stretchers. Both sides of every panel must be veneered to keep the stresses balanced, but for surfaces that won't show, I use veneer from less-desirable parts of the plank or from a different wood.

After deciding how to use the plank, I cut it into manageable pieces before sawing the veneer. Sawing veneer from large, heavy planks is difficult and best avoided. I look for places to crosscut long pieces and usually rip wide planks before sawing the veneer. Even if I had a bandsaw with 10 in. or 12 in. under the guides, I wouldn't attempt to saw veneer that wide. Better results will come by ripping the plank in half, sawing veneers from the narrower

**Fig. 2: Finding a bandsaw blade's natural cutting angle**



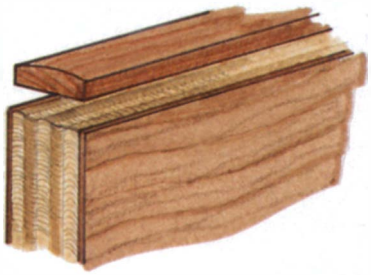

*Cut freehand partway along a line drawn parallel to one edge of a scrap. Stop the saw, and measure the angle of approach with a bevel gauge. Then remove the scrap, and clamp on a veneer-cutting fence at the same angle.*

Photos except where noted: Jonathan Binzen; drawings: Bob La Pointe

**Fig. 3: Edging options for veneered panels**

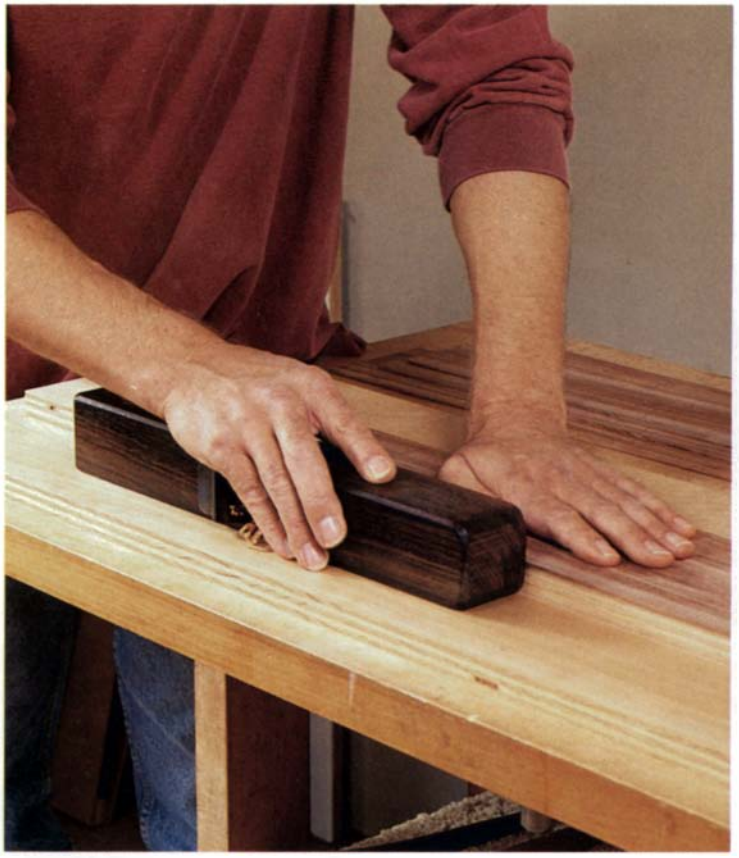
*Veneer, 3⁄32 in., can be applied as an edge-gluing after face veneers (above) or before (below), which leaves faces uninterrupted.*

*With larger edge-gluings, shapes can be worked on the edge with hand tools or a router.*



*Even cleanly cut plywood edges show a washboard effect. For a tight joint, take down the end-grain bumps with a slightly convex scraper or a narrow sanding block before gluing on the edging. Be sure to avoid shaving the face veneers.*

***Error-free edge-jointing—****Prepare veneers for edge-gluing by jointing them in pairs on the shooting board. Lay one veneer face up and the other face down to compensate for any error in the angle of the plane blade.*



pieces and then edge-joining the veneers to restore the full width.

Although I do a lot of careful planning, I try to remain flexible. A thick plank may have defects inside that make some of the veneer unusable. Or, if I'm lucky, there may be some beautiful color or pattern I hadn't anticipated. After looking at all the veneer, I may make changes in some of the dimensions or even major changes in the design to make the best use of the wood.

## Sawing veneer

You don't need a large, expensive bandsaw to saw your own veneer, but you do need one that is well-tuned. Sharp blades are essential. Start with a new one, and change it when it starts to dull. The most obvious sign of dulling is increased resistance to feeding. But also, keep an eye on the quality of the cut. A dull blade leaves a more ragged surface and may give a bowed rather than a perfectly vertical cut. Half-inch skip tooth blades with 3 or 4 teeth per inch are good resaw blades. Larger blades often have too much set and produce more sawdust and fewer veneers.

The rip fence that comes with most bandsaws is inadequate for sawing veneer. A shopmade fence tall enough to support the full width of the wood and stopped just past the blade to let the sawn wood move will give much better results (see the photo on p. 45). Because it's held in place by clamps, you can angle it to follow the lead of the bandsaw blade. Bandsaw blades rarely want to cut at exactly 90° to the front of the table. To find the lead of the blade, draw a line parallel to one edge of a piece of scrap, and bandsaw freehand partway along the line. Then turn off the saw, and set a bevel gauge so that its handle is along the front edge of the bandsaw table and its blade is along the edge of the scrap, as shown in figure 2 on p. 45. Use the bevel to set the veneer fence.

It is important to maintain constant pressure against the fence when cutting veneer. Use a smooth, steady feed rate from start to finish without stopping. I usually surface the plank with a light pass on the jointer between cuts. When the veneer is sawn, it should be stacked in the order it was cut and covered with a heavy piece of wood to keep it flat until you're ready to use it

If the sawing goes well and the veneers are consistent in thickness, it is possible to glue them to the core as they come from the saw. I usually take one or two light passes through the planer, though, to ensure uniform thickness.

I have a small Inca jointer with a thicknessing attachment that works well cleaning up the veneers. Its lack of a power feed is an advantage when planing veneer. Large power-feed planers, especially those with segmented feed rollers, tend to eat veneer. Clamping a piece of plywood across the infeed and outfeed tables, covering up the bed rollers, may solve this dietary problem. You can use the same arrangement if your planer won't adjust low enough to plane veneer.

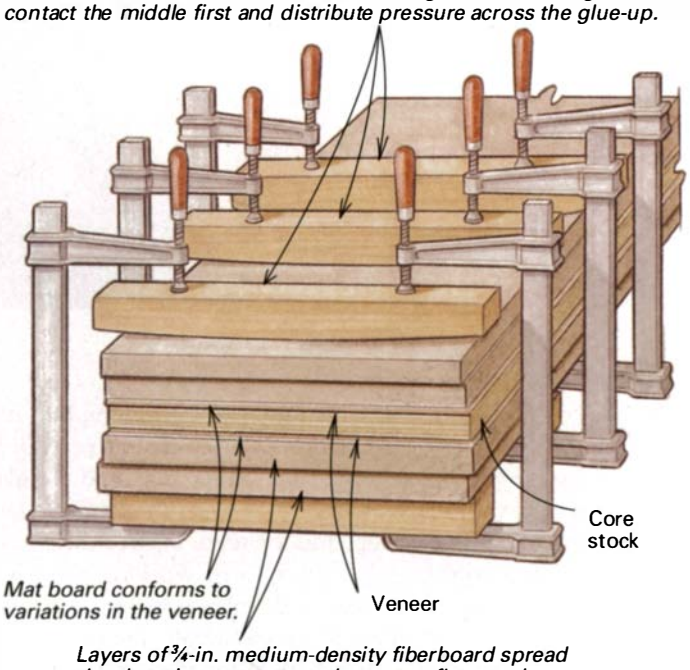
## Edge-joining veneers

The next step in preparing the veneer is edge-joining the pieces to get the widths I need. I lay out all the veneers, and then I make final decisions on how to use them, trying various patterns. I do this for all the surfaces at the same time so that I can see the effect of different arrangements. When I'm satisfied, I mark across the face of each group of veneers with a triangle to keep them in order. If there is any trimming to width or length to be done, I use the tablesaw just as I do with thicker stock.

***Thick veneers edge-glue like solid wood.*** *Lay the pieces to be joined between two fixed clamping boards. Hold the workpieces flat near the joint with one hand as you tighten a series of wedges with the other to apply pressure.*

**Fig. 4: Clamp-and-caul veneer press**

*Softwood cauls, crowned about 1/16 in. along the bottom edge, contact the middle first and distribute pressure across the glue-up.*




*Layers of ¾-in. medium-density fiberboard spread the clamping pressure and ensure a flat panel.*

*Veneer is held in register during glue-up with brads or tape.*

***Shoot the edges—***I take a pair of veneers to be joined and, using a shooting board, shoot the edges with a sharp jointer plane, as shown in the photo on the facing page. I do the shooting with one veneer face side up, the other face down. This compensates for a plane that may not be cutting at exactly 90° to the shooting board. Then I try the joint: It should be tight along its entire length with little pressure. Because veneers are somewhat flexible, it is possible to pull a badly fitting joint together, but don't be tempted. Take the time to shoot one or both edges again until the fit is right.

***Wedge-glue the edge joints—***The edge-joining goes quickly. With the veneers on a flat surface, I use pairs of wooden wedges to apply pressure, as shown in the photo above. Two strips of wood clamped to the benchtop are all you need for stops. They should be parallel, and about ½ in. farther apart than the width of the two veneers. I put a bead of glue on the edge of one veneer; then I put both veneers down between the wooden strips and push the joint together. A strip of newspaper keeps me from gluing to the benchtop. I use one hand to press down on the veneers at the joint while using the other to tighten the wedges. With all the wedges hand tight, I check the joint and then tap the wedges with a small hammer to set them. This technique makes it easy to keep the veneers flat during glue-up and also works well when gluing other thin stock, like drawer bottoms. Accurately jointed edges require minimal clamping pressure, which keeps the veneer from buckling.

## Core materials

I generally glue sawn veneer to a core of Baltic-birch plywood. It is readily available in a variety of thicknesses and is strong. Lumber core plywood also works well but, unfortunately, can rarely be found in anything but ¾ in. thickness in this country. Medium-density fiberboard (MDF) and sheet goods of this type might be suitable, too, but I avoid them. I'm not convinced they're strong enough for some applications, and I don't like the smell and the dust they make in the shop. And MDF is terrible for planes and other hand tools. In some cases, when I need an unusual thickness, I'll make my own plywood core stock. I just stack an odd number of veneers with the grain in each sheet running at 90° to its neighbors and glue them together in my veneer press.

It's important that your core stock be flat. Buy it flat, and store it so it stays flat. You can stack it horizontally or vertically, as long as it's fully supported. Lean it against a wall, and it's sure to warp. Some warpage can be flattened in the veneering process, but it's better not to count on it. Perfectly flat core stock is vital for surfaces that will be unsupported, like cabinet doors or desk fall flaps.

## Prepare for the press

With all the veneers edge-joined and the plywood cut to size, I get ready to glue up. If any of the plywood is going to get edge-gluings before veneering, I do that next. (For a range of options in edging veneered panels, see figure 3 on the facing page.)

I use a cabinet scraper to clean up the glue squeeze-out at joints in the veneer. Then I give both sides of the plywood and the bottom surface of the veneers a quick rub with 280-grit sandpaper: An oxidized surface is no good for gluing. Neither is a dusty one, so I clean off the sanded surfaces with the brush attachment on my shop vacuum and wipe them down with a clean cloth. Finally, it's a good idea to mark the veneers and core clearly, so a veneer

***Flush-trimming edging is a two-plane procedure.*** *One is set for a coarse cut; the other is set for a fine cut. On edge-gluings applied before face veneers, the outside corners must be crisp for a good joint.*

doesn't get turned the wrong way during the glue-up.

I use yellow glue for most veneering. For something that will take a long time to clamp up (a large tabletop or a curved door), plastic resin glue will give a longer open time. I spread the glue with a scrap of veneer that has an edge notched on the bandsaw. (The kerfs are about ⅛ in. deep, and the teeth between them are the same width as the kerfs, 1/16 in. or so.) Working quickly, I spread the glue evenly on one side of the plywood and then place the veneer on the glued surface. I turn the whole thing over, glue the other side of the plywood and apply the veneer to that side. To keep the veneers from shifting in the press, I hammer a few small brads into what will become waste at each end. If there is no extra length that can be cut off after the glue-up, I use masking tape to hold everything in place. I start a piece of tape on the face of one veneer, pull it down tightly over the edge of the core and onto the other veneer. Three or four pieces along each side of the panel should keep things from shifting.

### Into the veneer press

The basic clamp-and-caul veneer press shown in figure 4 on p. 47 is probably the simplest and least expensive setup for pressing veneers, but there are many possibilities. Veneer screws in frames are powerful, if bulky. A vacuum press, if you do enough veneering to justify the cost, is ideal. It equalizes the pressure perfectly over the entire surface of the veneer and can be used to do curved as well as flat surfaces. If you use a setup like mine, tighten the clamps in the center of the panel first, and move outward toward the edges. This avoids trapping glue in the center of the panel.

I usually leave a panel in the press for at least four hours. When it comes out of the press, the glue will have set, but the panel will still contain a lot of moisture from the glue. Never let a freshly veneered panel dry faster on one side than the other, or it will cup. When a panel comes out of the press, I stand it on end, so it is exposed to the air on both sides. Another alternative is to put it flat on the bench, cover it with a piece of plywood or MDF and weight it down. Once a panel dries completely (in one or two days), it will be stable.

When the panel is dry, I straighten and square one edge on the jointer. I trim the other three sides on the tablesaw to within 1/32 or so of final dimension and clean up the edges with a jointer plane. Then I'm ready to apply the edge-gluings or cut the joints. □

*Paul Harrell is a furnituremaker in Pittsboro, N.C.*

## *Creating a pattern with sawn veneer*

I made the pattern on the top of my sideboard by joining the veneers before gluing them to the plywood core. I began by edge-gluing four narrow pieces of jarrah for the center section. I squared the ends of this section using a crosscut box on the tablesaw. Then I lightly shot the ends with a sharp jointer plane to eliminate irregularities in the sawn surface. Next I glued the end veneers of the mahogany frame to the center section. The joint is edge grain to end grain, so I used a gap-filling glue from Garrett Wade (161 Avenue of the Americas, New York, N.Y., 10013, 800-221-2942) that has a high solids content and fills the end grain nicely. I glued on these end pieces 1/32 in. over long and flushed them to the jarrah afterward. Then I glued on the front and back veneers of the mahogany frame. All these glue-ups were done with wedges (see the article on p. 44).

I glued the completed top pattern to the core in my press set up (see figure 4 on p. 47), simultaneously gluing a sheet of mahogany to the underside of the core. As with all veneer glue-ups, I cut the veneer so that its width and length were fractionally less than the core stock. When this came out of the press, I trimmed and planed the edges and applied ⅛-in. mahogany edge-gluings, mitered at the front corners and butted at the back. I cut the miters on the tablesaw and did final fitting with a 45° block on my shooting board. I trimmed the edgings flush to the veneer with a pair of handplanes (see the photo above). If there is any chance of tearout in the face veneer, I finish with a scraper. With the edge-gluings on, I routed a ⅛-in. by ⅛-in. rabbet around the top edge and glued a jarrah edge bead into it. I ripped the bead on the bandsaw and glued it in with the bandsawn edge outward. I use masking tape as a clamp, starting alternate pieces from below (inward pressure) and above (downward pressure). And I don't spare the tape. When I'm finished, there isn't any wood showing around the edge. *—P.H.*

## *Structural advantages of veneered panels*

Veneered panels deliver a number of clear advantages over the traditional solid-wood frame and panel, which has to accommodate wood movement and relies solely on its frame for rigidity. The drawing on the facing page illustrates the advantages of veneered panels in a variety of applications.

**End panels,** 1 in. thick, create a large gluing surface, free from wood movement, for a rock-solid end assembly. The construction can eliminate the need for stretchers.

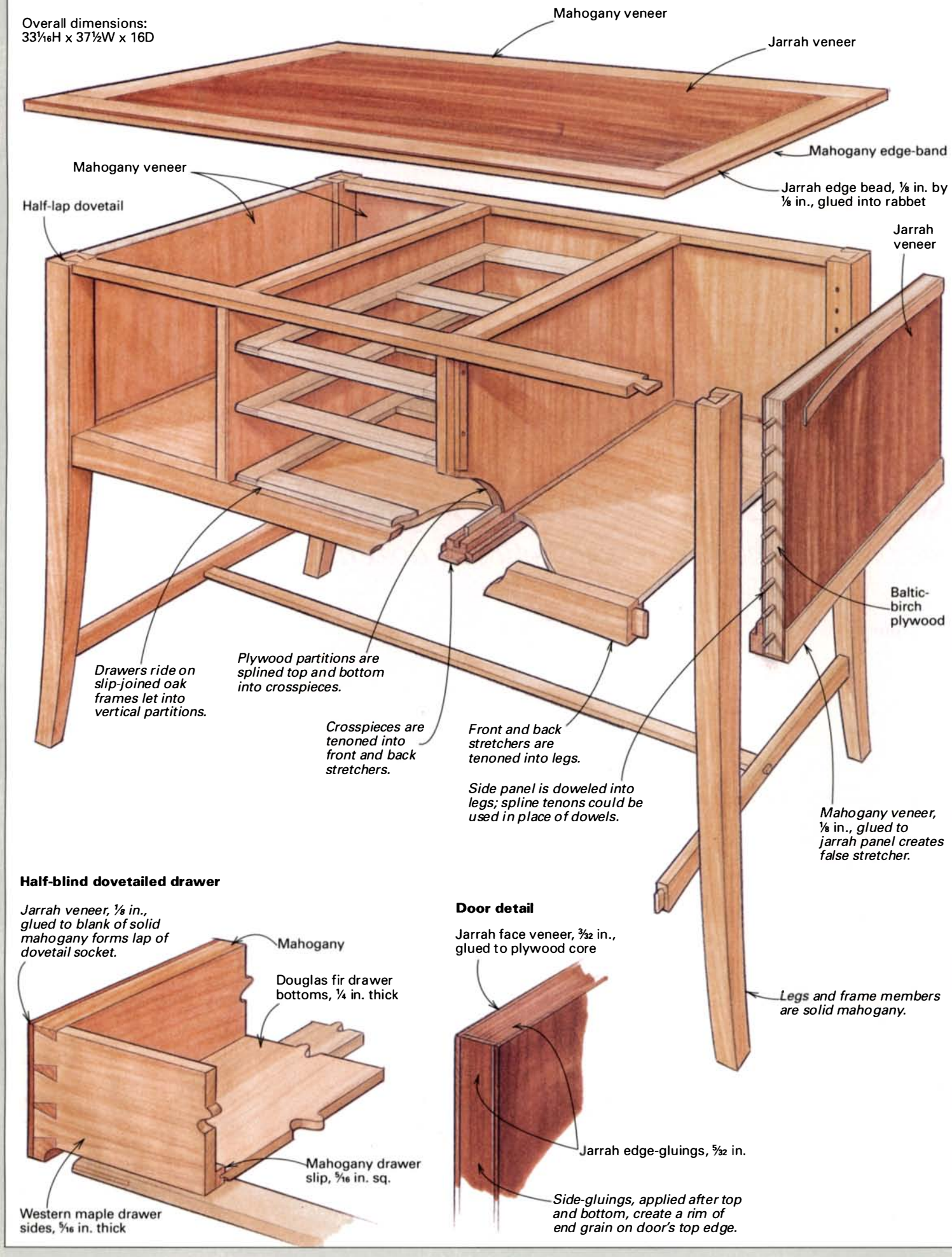
**Back panel,** ⅜ in., is glued into a rabbet, providing racking resistance. Bottom panels are also glued in place.

**Partitions:** Because the partitions won't move with the seasons, the drawer-runner frames can be let into them and glued along their full length.

**Doors:** The stability of the plywood core is particularly welcome in an unfixed member like a door. Besides keeping the doors flat, the lack of seasonal movement permits fitting to much closer tolerances in the door opening.

**Top:** Because it won't move, the top can be joined solidly to the ends, stretchers and partitions, increasing resistance to sagging. The stability also permits cross-grain patterning. *—P.H.*

## Building a sideboard with shop-sawn veneer




### Half-blind dovetailed drawer




### Door detail

***You don't need a shaper for cope-and-stick** joinery anymore. Now the market is teeming with router bits in a variety of styles competing for your cope-and-stick business.*

# Router Bits Tackle Cope and Stick

## *Deciphering the differences between dozens of cutters*

by Jeff Greef

Making frames with molded edges for glazed or raised-panel doors like the one in the photo above is a lot easier now that there are specialized stile-and-rail router bits on the market. But there are over 50 bit sets to choose from. To sort through this wide array of offerings, I obtained bits from 16 suppliers and manufacturers and put them through their paces. My objective was to find the real differences between bits and to provide guidelines for choosing a set. I inspected each set closely, scrutinizing for quality by eye. Then I tried out each set on pine, poplar and oak to check the cut and the fit of the joints they produced.

Stile-and-rail bits cut two profiles: a stick profile and a corresponding cope cut. The stick is the contour on the inside edges of a door or window frame on both the vertical members (stiles) and the horizontal ones (rails). The cope is a negative version of the stick and is cut into the ends of the rails, so they fit over the stick on the stiles, as shown in the drawing on the facing page.

All the stile-and-rail bit sets I examined cut a tenon and open mortise joint in addition to the cope and stick. The open mortise is the last few inches of the groove that also holds the panel. This joinery is adequate for small- and medium-sized cabinet doors. You can beef up the joint with dowels or loose tenons in open mortises. Also, with some bits, you can make a rabbet for glass instead of

***Solid bit sets like these come in pairs** and have cutters that cannot be removed from the shank.*



Top photo: author; photos except where noted: Sloan Howard

a groove for a panel. If you make the glass rabbet, use a reinforcing joint because the tenon-and-open mortise joint is eliminated.

***Solid bit sets***—Cope-and-stick bit sets come with solid bits or stacking bits. The cutters on solid sets cannot be removed from the shank for shimming or reconfiguration. As a result, the quality of the fit of cope to stick is entirely a function of how the bits are ground. Solid bit sets have two bits, one for sticking and one for coping, as shown in the bottom photo on the facing page. The main advantage of solid sets is ease of use. You just chuck 'em up and go. The main drawback is lack of adjustability. If you get a set that gives a good fit, you'll be fine, but if not, you're stuck.

Sharpening is another consideration with solid sets. Carbide router bits are sharpened by grinding the flat face of the carbide. When the face is ground, the profile changes slightly as the cutting edge recedes along the bevel of the edge grind. Consequently, the fit of cope to stick changes a little, too. Because there is no adjustment with solid sets, you can't compensate for these changes.

A solid set would be a possible choice for someone who is willing to sacrifice precision for ease of use and doesn't intend to use the bits enough to require resharpening.

***Stacking two-part***—Like the solid types, these bits come in pairs, one bit each for coping and sticking (see the photo on p. 52). But with these bits, the slot cutters and profile cutters are separate and can be removed from the bit shank. This allows you to place shims between them to adjust the fit of the joint. The shims, provided by all manufacturers, are thin washers that fit over the shank. Shims won't cure all mismatches but should take care of 90% of them.

Two-part stacking bit sets are among the most costly of all stile-and-rail sets. And there is more set-up time because you must adjust the fit with shims when making test-cuts. But once the bits are properly shimmed and set up in two router tables, you never have to change setups. For any production situation where the bits would be used a lot, a stacking two-part set is the logical choice.

***Stacking reversible***—Unlike all the other bit sets, which come with mating pairs of cutters, these use a single bit to cut both the cope and the stick. After cutting the copes, you remove the cutters from the bit arbor, and rearrange them to cut the stick. Just like the stacking two-part sets, reversible sets are adjustable with shims, as shown in the photo below. These sets cost less because you buy only one cutter assembly instead of two. But they won't last as long between sharpenings as a two-part set because the cutters in a reversible do twice as much work.

If you want adjustability and you plan to make only a few doors, I would consider the reversibles because they cost less than two-part sets and their results are just as good. If you make a lot of doors, though, the constant need to switch a reversible set between cope and stick would become irritating.

The reversibility of these bits, while making them inexpensive and convenient, limits the range of possible profiles because a single cutter must shape both the cope and the stick.

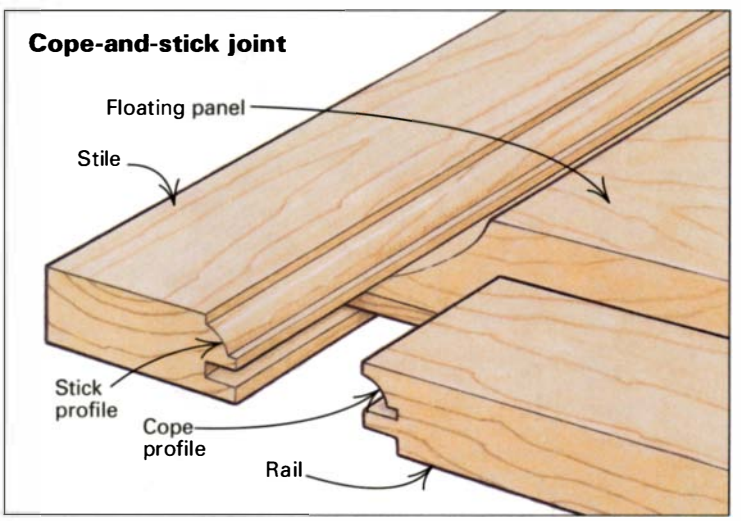
***Hybrid***—With hybrid bit sets, you use a separate cutter for each part of the joint (see the top photo on p. 53). You make separate setups for each of the sticking, coping, grooving and tenoning passes. This can be tedious, but there are no shims to fuss with, and there is wide adjustability. And hybrids let you vary stock thickness. All the previously mentioned cutters are designed for specific stock thicknesses, usually ¾ in. Hybrid sets are the logical choice for special applications where you need to use odd stock thicknesses or for panel grooves that are wider than the standard ¼ in.

***Architectural***—These sets are designed specifically for making architectural windows and doors. The cutters are stackable and come in both reversible and two-bit sets, as shown in the bottom photo on p. 53. Cutting standard architectural stock at thicknesses of 1⅜ in. or 1¾ in. with such bits will require either a 3-hp router or multiple passes with a less powerful machine.

## Which bits are best?

Once you've narrowed your search to a particular type of bit set, there are a number of factors to consider in choosing between bits. They run from the purely objective—price and specifications—to more subjective considerations. I've compiled data from my review of the bits in the chart on p. 52, and I'll explain what I looked for and why. When you buy bits, keep in mind that quality varies from bit to bit even from the same manufacturer. Examine bits closely, and return any that aren't up to snuff.

***Grinding quality***—You need a sharp edge on the carbide to get a smooth surface on the wood. Both the face and edge of the carbide must be ground smoothly. I found all bits had smooth face




***Reversible sets use one bit to cut both sides of the joint.*** *The cutters can be shimmed to fine-tune the fit of cope to stick.*

Drawing: Heather Lambert

## Cope-and-stick router bit sets

| Manufacturer/ supplier | Country of manufacture | Manufacturer's stock number | Price | Stock thickness * | Profile type | Profile depth * | Shank diameter * | Fit of cope and stick |
|---|---|---|---|---|---|---|---|---|
| **Solid bits** | | | | | | | | |
| Carb Tech | Taiwan | AY12 | 69.95 | ¾ | Ogee | ⅜ | ½ | Cope good; tenon loose |
| Hartville | Taiwan | 83641 | 65.00 | ¾ | Bead | ⅜ | ½ | Excellent |
| MLCS | Taiwan | 849 | 74.95 | 1 (min.) | Step ogee | ½ | ½◆ | Very good |
| SY | Taiwan | C1393 | 99.95 | ¾ | Round | ¼ | ½ | Cope good; tenon loose |
| Woodtek | Taiwan | 821026 | 74.95 | 1 (min.) | Step ogee | 9⁄16 | ½◆ | Cope good; tenon loose |
| **Stacking two-part sets** | | | | | | | | |
| Bosch | U.S. | 85625M | 133.40 | ¾ | Ogee | ⅜ | ½ | Fair |
| CMT | Italy | 891-502 | 129.00 | ¾ | Round | 9⁄16 | ½ | Excellent |
| DML | U.S. | 02024 | 150.00 | ¾ | Round | ⅜ | ½ | Excellent |
| Eagle | U.S. | 185-0900 | 99.99 | ¾ | Bead | ⅜ | ½◆ | Excellent |
| Freud | Italy | 99-261 | 153.00 | ¾ | Ogee | 10mm | ½ | Good |
| MLCS | Taiwan | 843 | 74.95 | ¾ | Round | ⅜ | ½◆ | Excellent |
| Porter-Cable | U.S. | 43550 & 51 | 144.00 | ¾ | Bead | ¼ | ½◆ | Good |
| Whiteside | U.S. | 6002 A & B | 126.00 | ¾ | Ogee | ⅜ | ½ | Excellent |
| **Stacking reversible bits** | | | | | | | | |
| Amana | Israel | 55350 | 117.60 | ¾ | Ogee | ⅜ | ½ | Very good |
| Eagle | U.S. | 184-0105 | 59.99 | ¾ | Ogee | ⅜ | ½◆ | Excellent |
| F.S. Tool | Canada | FRB27 | 109.00 | ¾ | Ogee | 12mm | ½ | Excellent |
| Grizzly | Taiwan | G2926 | 49.95 | ¾ | Step ogee | ½ | ½◆ | Excellent |
| Hartville | Taiwan | 82141 | 39.00 | ¾ | Ogee | ⅜ | ½ | Excellent |
| MLCS | Taiwan | 894 | 69.95 | ¾ | Ogee | ⅜ | ½◆ | Very good |
| SY | Taiwan | C1654 | 49.95 | ¾ | Step ogee | ⅜ | ½ | Fair |
| Velepec | U.S./Israel | ROSRA-90-8 | 110.00 | ¾ | Ogee | ⅜ | ½ | Very good |
| Whiteside | U.S. | 6151 | 69.95 | ¾ | Ogee | ⅜ | ½ | Excellent |
| Woodtek | Taiwan | 820739 | 37.50 | ¾ | Step ogee | ⅜ | ½◆ | Fair |
| **Hybrid bits** | | | | | | | | |
| Freud | Italy | 99-060 & 062✚ | 60.00 | unlimited | Step ogee | ½ | ½ | Good |
| Velepec | U.S./Israel | 3-piece set | 140.00 | unlimited | Ogee | ⅜ | ½ | Good—very small gap |
| **Architectural bits** | | | | | | | | |
| Amana | Israel | 55340 | 156.45 | to 1¾ | Ogee | ¼ | ½ | Excellent |
| Freud | Italy | 99-050 & 051 | 96.00 | to 1¾ | Ogee | 6mm | ½ | Excellent |
| MLCS | Taiwan | 893 | 54.95 | to 1¾ | Ogee | ¼ | ½◆ | Very good |
| SY | Taiwan | C1552 | 89.00 | to 1¾ | Bead | 5⁄16 | ½ | Good |

◆ Also available with ¼-in. shank. * Inches except where noted ✚ Two-piece set

*Stacking two-part bit sets are paired and have removable cutters that can be restacked and shimmed for fit. Some have the anti-kickback design shown in the inset photos.*

| Quality of edge grind | Smoothness of cut | Comments |
|---|---|---|
| | | |
| Below avg. | Below average | |
| Average | Average | Burning—insufficient back grind |
| Below avg. | Average | Burning—insufficient back grind |
| Below avg. | Below average | |
| Below avg. | Average | Burning—insufficient back grind |
| | | |
| Best | Best | Without shims, bearing sparks against cutter |
| Best | Best | Anti-kickback design |
| Best | Best | |
| Average | Average | |
| Best | Best | Anti-kickback design |
| Below avg. | Best | |
| Average | Average | |
| Average | Average | |
| | | |
| Best | Average | |
| Below avg. | Below average | |
| Best | Best | |
| Below avg. | Below avg.—small nicks | |
| Average | Average—small nicks | |
| Below avg. | Best | |
| Below avg. | Below average—small nicks | Out of balance—cutters not ground at equal radii |
| Below avg. | Best | |
| Below avg. | Below average | |
| Below avg. | Below avg.—small nicks | |
| | | |
| Best | Best | |
| Below avg. | Best | |
| | | |
| Below avg. | Average | Vibration |
| Best | Average | Anti-kickback design |
| Below avg. | Average | |
| Below avg. | Below avg.—small nicks | |

grinds. The major variable was the quality of the edge grind. I evaluated edge grinds by running a pencil tip along the carbide to see whether it slid smoothly or scraped along. Then I examined the stick each cutter produced, looking for nicks in the cut. Generally, I found bits with the best edge grinding left the best finish cuts.

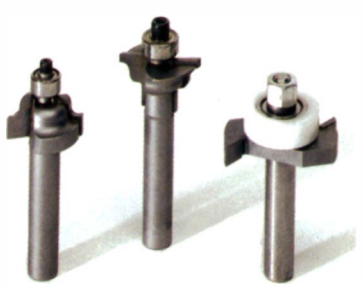
***Back grind***—Another critical aspect of grinding is the angle of back grind. In back-grinding, the edge is ground at a sharp enough angle that only the very point touches the wood; the portion behind the edge should not. Without that clearance, burning will result. The heat can ruin the carbide, not to mention the workpiece.

***Cutter balance***—If bits are not balanced, they will vibrate while in use. I checked for mismatched cutters with the bits in the router. With the router unplugged, I held a steel rule on the router table and spun the bit. When the end of the rule just scraped one cutter, I spun the bit around to see how the other side compared. This technique will only show gross deviations from proper grinding indexing but is worth using whenever you chuck up a new bit or if an old bit is cutting poorly or with excessive vibration.

***The fit of cope to stick*** depends upon two factors. The first and most important is how well the manufacturer ground the cutters so that the cope is an exact match for the stick. The second is how well you set up the adjustments (where possible) to make the matching parts align. You can produce ill-fitting joints with well-ground cutters if you don't shim properly. But no amount of shimming will fill gaps in joints made with poorly ground cutters.

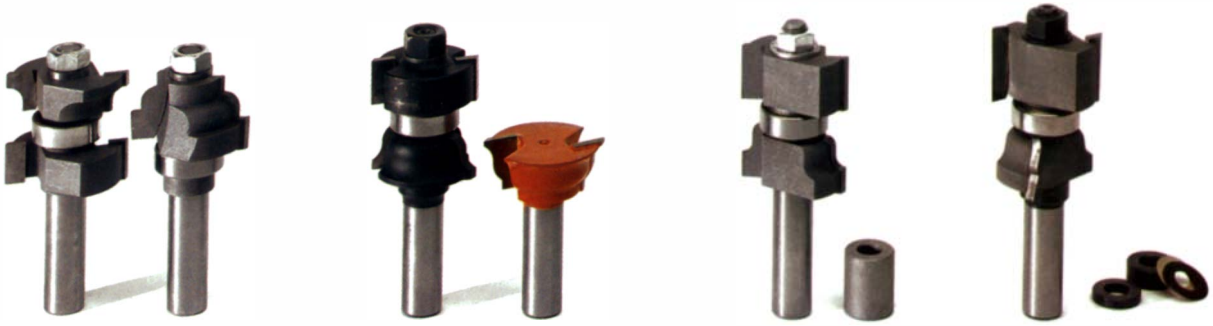
Solid cutters are not adjustable, so how well the joint fits is up to the manufacturer. Of those I tested, all had good matches of cope to stick, but several had poor fits of the tenon in the groove. The fits varied with different types of wood, which is common because router bits are ground at an angle that is a compromise between the optimum rakes for cutting hardwoods and softwoods.

***Anti-kickback design***—The Italian bits (Freud and CMT) are well-made and impressive-looking with their anti-kickback design that limits the depth of cut, reducing the danger of kickback and severe injury (see the inset photos on the facing page). Most technical representatives I spoke with thought this feature was a good idea on



***Hybrid bit sets separate the slot cutter from the profile cutters.*** *This set has mated profile cutters; two-bit sets, which have reversible profile cutters, are also available.*

***Architectural bit sets will tackle full-sized windows and doors*** *and come in both paired and reversible sets.*



***Voids in the brazing*** *behind the carbide cutter can compromise the safety of a bit. The wire in the photo points to a void that is larger than the pinhole most manufacturers permit. But because it's within the diameter of the guide bearing, it's not likely to cause a problem.*

***A defective shank*** *like this one, left rough on one side, can cause serious vibration. Remove the cutters to inspect a new bit before running it.*

larger diameter cutters, such as panel raisers where kickback is a serious threat, but overkill on smaller bits like these. I tend to agree.

***Price and value***—Why are there such wide price variations between bits of the same type? There are a number of factors that affect the quality and price of bits: different grades of carbide, types of brazing and brazing material, various edge-grinding and shank-grinding techniques. But it's difficult for the consumer to ascertain by observation or inquiry which materials and techniques were used to make a particular bit. I talked to Steve Cash, who runs a sharpening service here in Santa Cruz and sees thousands of bits a year. He said that, roughly speaking, higher price reflects the use of more expensive materials or processes in manufacturing.

In selecting for price, look for the lowest cost per cut. If you do a lot of cope-and-stick work, it makes sense to spend the money for a higher priced bit that will cut cleanly for a long time. If you have just a few doors, buy a less expensive bit. You may have to do some touch up sanding behind the bit, but you'll still come out ahead.

Personally, I think the best values among cope-and-stick bits are the reversibles. Because you're only paying for one shank, the prices are considerably lower than for two-part bits of comparable quality. Unless I knew I'd be in a production situation, I'd accept the extra toil involved in changing setups and get reversibles. The solid bits, though they seem like a bargain, didn't impress me with their performance. They were the only bits I tried that burned, and I also dislike their lack of adjustability.

## Defective bits

When you have your new bits, take a close look at them before putting them to use. Defective bits are not unheard of, and some potential problems will be evident on visual inspection.

***Brazing voids***—The brazing between a router bit's carbide cutter and steel body attaches the cutter to the body, and it acts as a cushion that protects the brittle carbide from fracturing under impact. Wherever there are gaps in the braze line, the possibility of fracture increases. If the carbide breaks while the bit is spinning, the result can be like shrapnel. The consensus among the manufacturers I spoke with was that nothing larger than a pinhole void in the brazing was acceptable. But the location of the void is important, too. The bit in the top photo had a void larger than a pinhole, so I sent it to Jim Effner for expert evaluation. (Effner is a former technical services engineer with Leitz, the German manufacturer of cutting tools, and is the author of *Chisels on a Wheel*, a book about motor-driven cutters.) He said that because the void was at the small diameter of the cutter and within the span of the guide bearing, it wouldn't get much stress and wouldn't pose a problem.

***Misground shank***—I learned my lesson about carefully inspecting bits from experience. One bit that looked fine at first vibrated so much when I started it up that I immediately shut off the router. When I removed the cutters from the shank and looked closer, I found that half the upper shank was rough and unground, as shown in the bottom photo. In addition to checking for this type of defect, look at the lower section of a bit's shank. For the collet to grip it properly, the shank should be polished smooth and be free of blemishes.

***It's not the bit, it's the collet***—While you're paying all this attention to your bits, don't forget that they're in a partnership with your router's collet. Collets take a lot of abuse, and if they start to become egg-shaped, through wear or metal fatigue, they'll cause problems with your bits. According to Jim Effner, collets have a fairly predictable life span of 1,000 hours of use. So keep track of their birthdays, and replace them before they get too ancient. □

*Jeff Greef is a woodworker and writer living in Santa Cruz, Calif.*

## *Sources of supply*

*Amana Tool Corp., 120 Carolyn Blvd., Farmingdale, NY 11735; (800) 445-0077

*Bosch—SB Power Tool Co., PO Box 12217, New Bern, NC 28562; (800) 334-5730

Carb Tech—Trend-lines, 375 Beacham St., Chelsea MA 02150; (800) 767-9999

CMT, 5425 Beaumont Center Blvd. Suite 900, Tampa FL 33634; (800) 531-5559

*DML—Primark Tool, 1350 S. 15th St., Louisville KY 40210; (800) 242-7003

Eagle America, PO Box 1099, Chardon, OH 44024; (800) 872-2511

Freud, 218 Feld Ave., High Point NC 27264; (800) 334-4107

*FS Tool, PO Box 510, Lewiston NY 14092; (800) 387-9723

Grizzly, PO Box 2069, Bellingham, WA 98227 (800) 541-5537

Hartville Tool and Supply, 940 W. Maple St., Hartville, OH 44623; (800) 345-2396

MLCS, Box 4053 C13, Rydal, PA 19046; (800) 533-9298

*Porter-Cable, 4825 Highway 45 N., Jackson TN 38305; (800) 321-9443

SY—Cascade Tool Co., Box 3110, Bellingham WA 98227; (800) 235-0272

*Velepec, 71-72 70th St., Glendale, NY 11385; (800) 365-6636

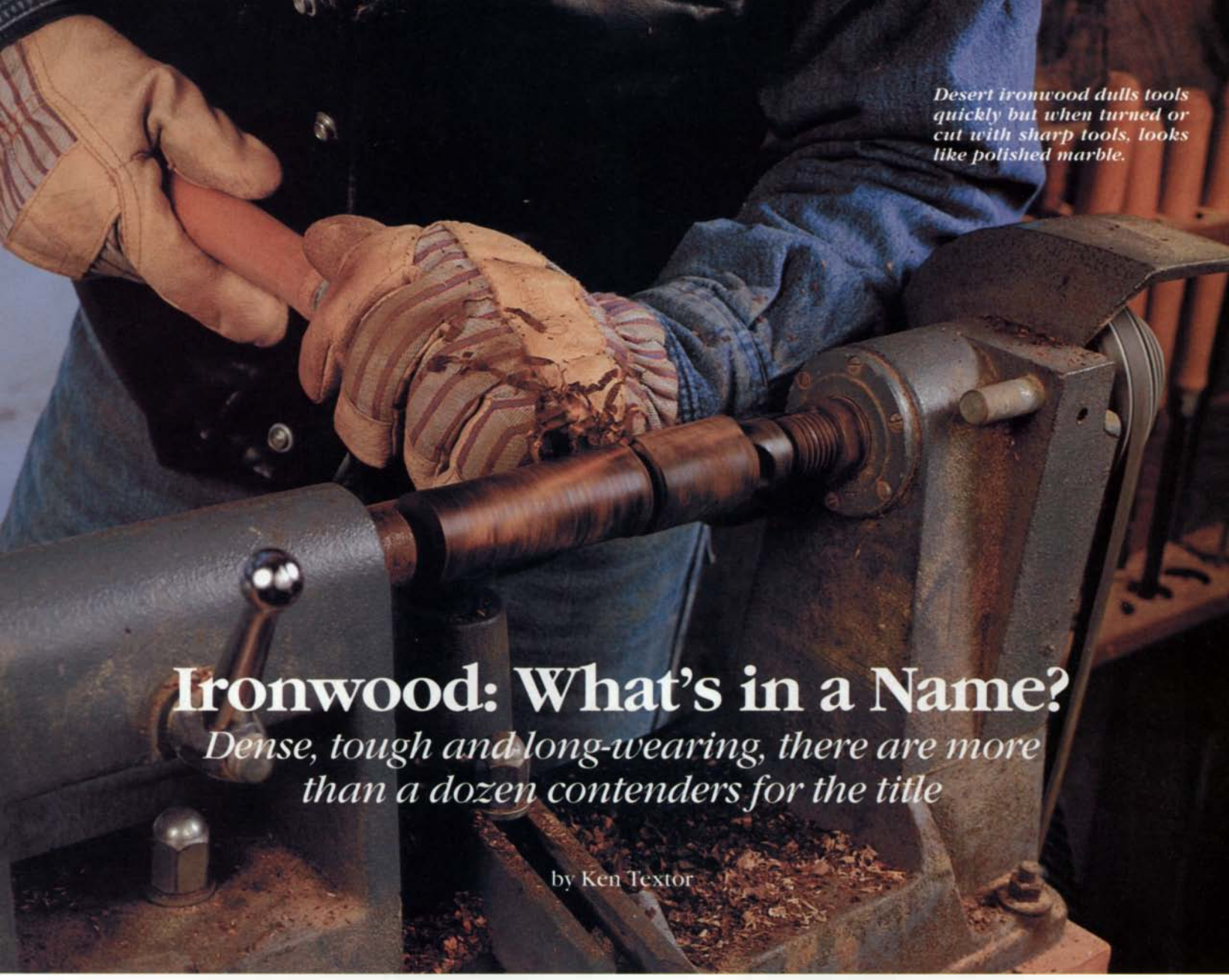
*Whiteside Machine Co., 4506 Shook Road Claremont NC 28610; (800) 225-3982

Woodtek—Woodworker's Supply, 1108 North Glenn Road, Caspar WY 82601; (800) 645-9292

* These companies do not sell directly to the public but will tell you who their local distributor is.



Photos this page: author



*Desert ironwood dulls tools quickly but when turned or cut with sharp tools, looks like polished marble.*

# Ironwood: What's in a Name?

## *Dense, tough and long-wearing, there are more than a dozen contenders for the title*

by Ken Textor

Corrective surgery on my definition of ironwood began several years ago during a tour of an aging lumber mill in northern Maine. Heavy sawn timbers were moved around that mill on rollers the guide said were made of ironwood.

The trouble was, the rollers didn't look like ironwood—at least, not ironwood as I knew it. The material I had always heard referred to as ironwood was a dark brown wood that was known most commonly as lignum vitae (see the box on p. 57). These rollers were definitely cream-colored with a light brown heartwood. Foolishly, I mentioned this to my elderly guide.

"Son," he said patiently, "all my life, we've called that ironwood. Some of the university folks call it hop hornbeam. I don't really care what anybody calls it, but those rollers have been there since 1932. To me, that wood's as good as iron." End of discussion.

Since then, I've found that when you mention ironwood to North American woodworkers, you're apt to be talking about at least four different woods. And if any old-timers or botanists are listening, you're up to 13 species in North America alone.

The four woods most frequently called ironwood in North America today are indeed hop hornbeam (*Ostrya virginiana*) and lignum vitae (*Guaiacum sanctum*, or *G. officinale*), as well as American hornbeam (*Carpinus caroliniana*) and desert, or sonora, ironwood (*Olneya tesota*).

During the first half of this century, a number of other woods were also called ironwood, including one most commonly known as inkwood (*Exothea paniculata*), another that was sometimes called white ironwood (*Hypelate trifoliata*), leadwood or black ironwood (*Krugiodendron ferreum*) and darling plum or red ironwood (*Reynosia septentrionalis*). Other North American

***Rare and expensive, desert ironwood is best used for small projects** such as this replacement chisel handle. The grain of desert ironwood is so fine it doesn't require a finish, though it will develop a patina.*

Photos except where noted: Vincent Laurence

**Hop hornbeam**
*Ostrya virginiana*

**Lignum vitae**
*Guaiacum officinale*

**American hornbeam**
*Carpinus caroliniana*

**Desert ironwood**
*Olneya tesota*

woods sometimes referred to as ironwood include three species in the genus *Bumelia* (*B. swartz, B. lycioides, B. tenax*), casuarina (*Casuarina equisetifolia*), buckwheat tree (*Cliftonia monophylla*) and a rare cousin of the hop hornbeam, the western hop hornbeam (*Ostrya knowltonii*).

## What makes a wood an ironwood?

Iron is, above all, heavy, and this is the first characteristic that you notice when handling most of the would-be ironwoods. The relative weight of a wood is expressed in terms of its specific gravity. This is simply a measurement of the wood's weight compared with an equal volume of water. For instance, to find the specific gravity of dried white oak, you would compare the weight of an average cubic foot of white oak with a cubic foot of water. White oak is lighter than water, with an average specific gravity of 0.68 as compared to the reference standard, water, at 1.00.

With a specific gravity ranging from 1.34 to 1.42, black ironwood is clearly the ironwood most true to its name. Desert ironwood, with a specific gravity of about 1.15, is a distant second. But the problem with black ironwood, as with most ironwoods, is its scarcity. Its growing range is confined to southern Florida, some islands in the northern Caribbean and parts of Mexico and Belize. In researching this article, I made dozens of phone calls but was still unable to find a commercial source of black ironwood. As it turns out, black ironwood was available for small turnery and specialty items until sometime in the 1930s, but even then, supplies weren't always reliable. Today, about the only way to get your hands on some black ironwood is to know the tree and to know someone who has one in his or her backyard.

The same is true of white ironwood, red ironwood and inkwood, all of which have high specific gravities, good rot resistance, tremendous hardness and other iron-like qualities. They all grow in the same general areas as black ironwood, attaining heights of no more than 40 ft. with trunk diameters ranging from 12 to 20 in. Because of their small size and relative scarcity, these species never became viable as timber species. Without commercial value, they eventually became unavailable.

The *Bumelias*, casuarina and the buckwheat tree, for similar reasons, never really gained commercial acceptance. And the western hop hornbeam is just too scarce to be viable commercially.

***Tough, but not impossible to work, hop hornbeam is a good wood for utilitarian applications such as this bench-vise screw.***

## Commercially available ironwoods

Probably the most commercially successful of the ironwoods is desert ironwood. Though it doesn't attain much more than shrub size, it's still generally available through specialty wood dealers. But because of its size and its slow growth rate, desert ironwood is relatively rare and, therefore, quite expensive: from $6 to $12 per pound, which works



Wood sample photos: Robert Marsala

**Leadwood, black ironwood**
*Krugiodendron ferreum*

**Darling plum, red ironwood**
*Reynosia septentrionalis*

**Bumelia**
*Bumelia spp.*

**Casuarina**
*Casuarina equisetifolia*

out to somewhere between $36 and $72 a board foot. Moreover, because of the strong demand for and relative scarcity of desert ironwood, some environmental organizations would like to see stricter controls on its sale, distribution and harvesting.

But even if price, availability and environmental concerns weren't a problem, desert ironwood would still be a challenge. Because of its density and high mineral content, tools have to be razor sharp to work it, and they'll need to be sharpened often to keep cutting (see the top photo on p. 55). With sharp tools, though, a marble-like finish is possible (see the bottom photo on p. 55).

Because of its expense and the size it's available in, desert ironwood is used mostly for smaller items, such as sculptures, letter openers and pen stands.

***A couple of ironwood "lights"***—Compared to most of the tropical ironwoods, desert ironwood and lignum vitae, the two hornbeams that go by the name *ironwood,* are positively lightweights. Their specific gravities are both about 0.70, and neither is particularly rot-resistant nor is as hard as any of its tropical and desert brethren.

For both of these woods, the ironwood name is the most important part of their appeal. Other more commonly available woods are heavier (live oak and some hickories), more rot resistant (black locust and Osage orange) and nearly as tough and hard (yellow birch and some hard maples). But they both have a long-standing reputation of wearing well, as the origins of the term *hornbeam* attest.

The name *hornbeam* predates *ironwood.* It came from an Old World cousin, the European hornbeam. For hundreds of years, the wood of this tree was favored for making yokes for oxen, its strength and durability put to the test daily. Yokes that survived were passed on from one generation to the next, and along with them, the reputation of the tree from which they were made.

Having worked with both American hornbeam and hop hornbeam, I can testify to their hardness, toughness and the comparative ease with which they work (see the bottom photo on the facing page). Just the same, I wouldn't go out of my way to buy more of either species, largely because there are more readily available substitutes with similar and even superior qualities. To me, their prime value seems to lie in their mystique as ironwoods.

Indeed, it seems those who are trying to market various woods are the ones most eager to label a wood *ironwood.* This is probably the heart of the ironwood name game: a matter of marketing, even among the early Colonials. After all, it's easier to sell a wood called ironwood than lignum vitae, *Carpinus caroliniana* or any of the rest.

For the bewildered woodworker, I have some simple advice: Stick with the local lore. As I learned on my tour through that lumber mill in northern Maine, there's not much you can say that will shake someone's faith in his or her ironwood. □

*Ken Textor is a writer, boatbuilder and sailor in Arrowsic, Maine.*

## *Lignum vitae: contender or pretender?*

If we use specific gravity as the prime consideration in calling a wood ironwood, then lignum vitae, at 1.14, is clearly an ironwood. Moreover, although botanists don't recognize it as such, if you go into any boatbuilding shop in the southeastern United States and ask for ironwood, you'll most likely be handed a chunk of wax-coated lignum vitae. Lignum is notoriously unstable, famous for cracking and checking, hence the wax coating to moderate moisture exchange.

That said, lignum also possesses a characteristic that almost wholly redeems it: It's naturally self-lubricating, impregnated with oils that make it perfect for several specialty markets. One of these is lignum's main traditional use as a submerged bearing for a boat's propeller shaft. This is still its principal use. It's also still used for pulley sheaves and shells, caster wheels and various other turned, usually nautical, items in which great strength and low-friction are assets.

Lignum vitae is generally available today, but it costs about the same as desert ironwood ($36 to $72/bd. ft.) and, in fact, is more like desert ironwood than any of the other ironwoods. It dulls tools incredibly fast, like desert ironwood, has an almost identical specific gravity, and cuts and takes a polish nearly the same.—*K.T.*

***Coping with wood movement was the challenge** in making this table from ceramic tile and solid wood. The author's solution also shows off the petroglyph tile work of Colorado artist Suki Strong.*

# Tile Tops Accent Southwest-Style Tables

## *Careful choices of materials and techniques make these tables work*

by Tom Jordan

When clay artist Suki Strong asked me if I would be interested in building Southwest-style tables for her handmade petroglyph tiles, I thought it sounded like a great idea. This was a chance to combine art into functional furniture and depict some of our fond feelings for the history of Western Colorado, where we live. A collaborative effort such as this can be fun as well as a rewarding experience, but it also raised challenges in construction.

I had to come up with a Southwest design that was unique and yet complementary to the tiles. But it also had to be structurally sound to support and frame them, accounting for wood movement and the fixed tiles. A lot of Southwest furniture is sort of rough-looking to the eye and to the touch. I have never been able to build that way, and if you learn how to build cabinets and furniture that are smooth and fine, it is hard to change. Therefore, I wanted to show the design and yet have smooth lines and nice joinery. I also wanted the tables to have a look that was as natural and clean as possible (see the photo above). When mixing two media as we

***Disappearing drawer—** When the author builds his tile tables in an end table size, he turns the front apron into a drawer front.*



Photos except where noted: William Sampson; top photo: Tom Hicks

## Building tile tables

### Coffee table

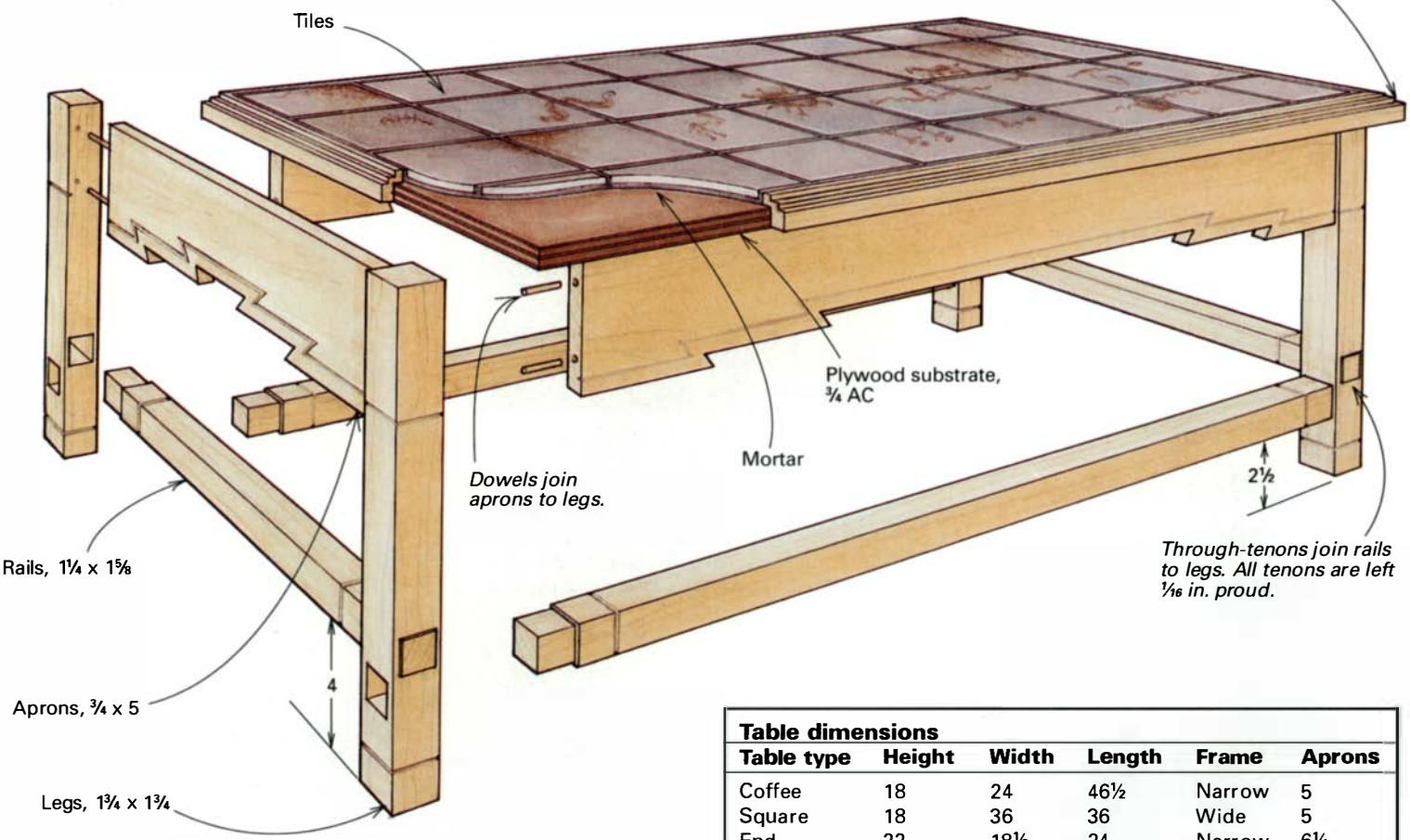
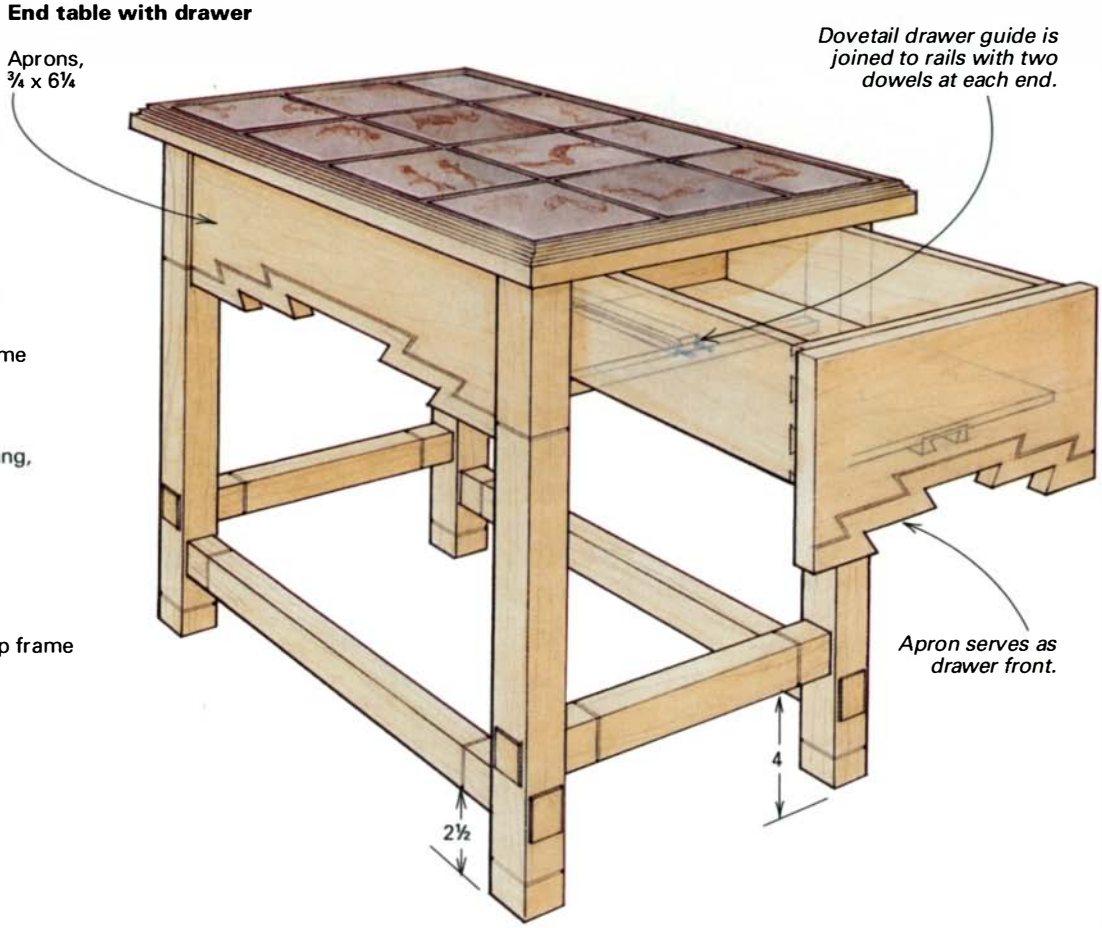


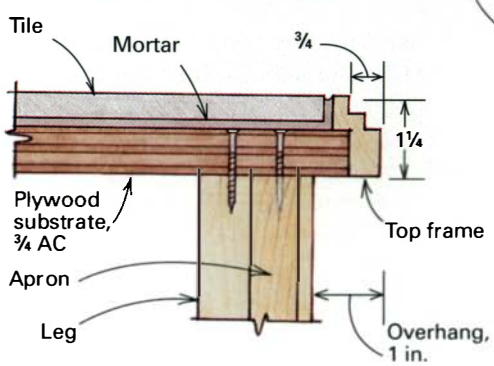

**Table dimensions**

| Table type | Height | Width | Length | Frame | Aprons |
|---|---|---|---|---|---|
| Coffee | 18 | 24 | 46½ | Narrow | 5 |
| Square | 18 | 36 | 36 | Wide | 5 |
| End | 22 | 18½ | 24 | Narrow | 6¼ |

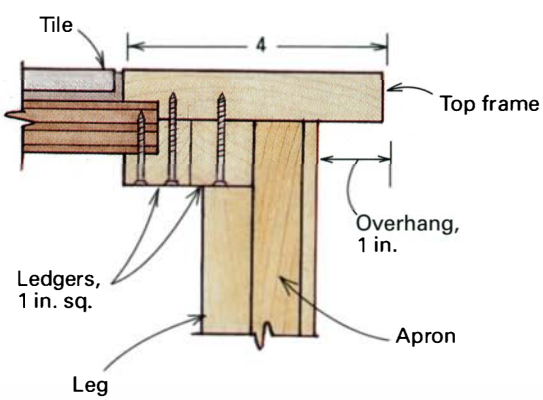
### End table with drawer




**Detail: Narrow frame top (for end, coffee tables)**




**Detail: Wide frame top (for square table, not shown)**




Drawing: Kathleen Rushton

***Adding Southwest styling—** Jordan cuts the zigzag edges of the table aprons with a jigsaw; then with a router and a V-groove bit, he adds a relief line to follow the edge.*

## Tiles make the table

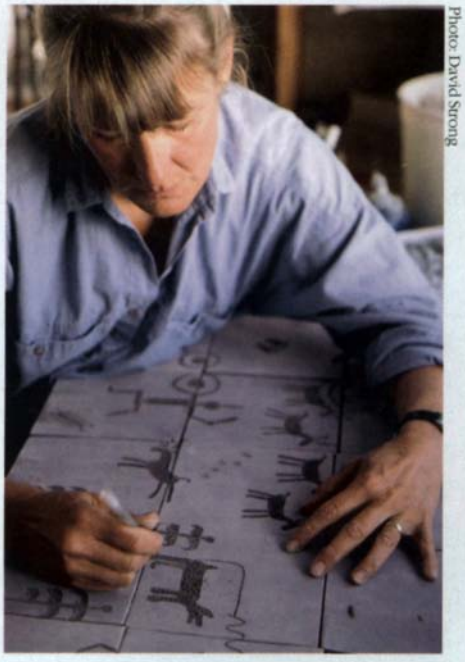


Photo: David Strong

***Custom tiles for a custom table—**Colorado artist Suki Strong reproduced Indian petroglyphs for her handmade tiles, which helps set them apart from factory tiles.*

My Southwest-style tables were built specifically to frame Colorado artist Suki Strong's handmade tiles. Her petroglyph designs are authentic reproductions of works of the Anasazi and Fremont Indians that she has seen during travels throughout the Southwest.

She makes her tiles of high-fired stoneware, cuts them to size and then paints them with liquid colored clay. She carves out the designs before the tiles are dipped in glaze. The tiles are then kiln-fired at 2,350° for 14 hours. Even though every precaution to avoid warpage is taken, with that intense heat, some does occur. We feel that this just adds to the overall character of the tables. However, this does make it more difficult to set the tiles than if we used low-fired, factory tiles.

As far as cost, there really isn't much comparison between handmade and factory tiles. It's the difference between one-of-a-kind artwork and a mass-produced product. This doesn't mean there aren't factory tiles that would make good tabletops, and there's no question factory tiles would be easier to use because of their uniform size and shape. The choice depends on what design idea you want to show with your table. *—T.J.*

did, they must complement each other without one dominating the other.

### Lumber to fit the style

Because we were working on a local theme, I felt that I should build them out of local materials. I chose Colorado Douglas fir, which is cut in the mountains not far from my home. Some people refer to this wood as "barn lumber" because a lot of people use it for barns and corrals. Most people would think it strange to build furniture out of it. On the contrary, with a little bit of extra effort in sorting and selecting, I can end up with some beautiful wood. Most of it is full 2 in. and extremely rough, which makes it even harder to read. Usually, I end up with a lot of throwback, which gets used for other not-so-nice projects, and of course, a certain amount ends up in the firewood box. Fortunately this wood is reasonably priced. The fir is somewhat soft, but the table wouldn't be the same if it were built from an Eastern hardwood.

When selecting Douglas fir, I look for as much vertical grain as I can with what I call "small, tight character knots" and also some color variation. Because this lumber is air-dried outdoors, I knew that I had to let it dry until it was stable for our area. This usually means taking it from about 12% moisture content (MC), when I get it, to about 7% when it is ready. Having a good moisture meter helps with taking weekly checks. In most cases, three or four months is sufficient drying time. It also helps if I flatten, straighten and cut it slightly oversized before I sticker it. Once I feel that the wood has reached a stable moisture content, I can go ahead and do the final flattening, straightening and sizing. All the above procedures are especially important for these tables because when you frame a non-flexible object such as tiles, you can't afford any movement either way in the frame.

### Mortises and tenons make it sturdy

One of the basic looks of Southwest furniture is the through-mortise and tenon, so I chose to use it on the lower bracing, as shown in the drawing on p. 59. I start the mortises on the drill press with a 1-in. Forstner bit, being careful to finish the hole from the other side because fir is notorious for chipping out easily. I use a jigsaw to clean out the corners the drill bit doesn't get and then a sharp chisel for the final clean-out and fit. The tenons are done on the tablesaw for the shoulder cut and the balance cleaned out on the router table. Because the lower bracing is quite strong and the tops also hold the legs together, I felt that doweling the aprons to the legs would be sufficient. The design of the aprons is cut out with a jigsaw, as shown in the top photo, cleaned up with a 1-in. belt sander and finish-sanded by hand. For the relief line that follows the edge, I used a standard V-groove router bit and a straightedge. This procedure is rather delicate and requires care and patience. The matching relief lines on the legs and bracing are done on the router table.

For the matching end tables, I replaced the front apron with a ¾-in. rail, and the apron becomes the drawer face, as shown in the bottom photo on p. 58. The rail ties the two front legs together and also supports the front of the drawer guide, which is a basic dovetail guide. For this, I use a harder wood like maple because it can take the wear better. With a fine sanding and a good coat of wax, these guides work quite smoothly, and they are a nice addition to the tables.

I had two types of tile substrates and frames, depending on the table frame style

(see the drawing details on p. 59). Both have ¾-in. AC fir plywood with the good side showing underneath. I cut a ¾-in. by ¼-in. rabbet to house the plywood. The frame is first glued up and then glued to the plywood. The 4-in. flat frame used for square tables has a ¼-in. by ½-in. rabbet and uses another 1-in. rabbeted stop piece underneath to hold the plywood. The rectangular top is attached directly to the legs with screws through the top. The wide-frame, square top has a 1-in. ledger glued to the aprons to attach the top. Both end up with a ½-in. space for mortar and tile. This would vary with different tile thicknesses.

After sanding, the tables are ready to be assembled. Everything has to be right before the glue goes on, and they are clamped because they won't come apart after a couple of minutes. The finish is applied before the tile mortar goes in. For these tables, I chose Sam Maloof's finish recipe, which is one-third polyurethane, one-third raw tung oil, and one-third linseed oil, applied over a six-day period. The fourth, and final coat, is one-half tung oil and one-half linseed oil with some beeswax melted in (see *FWW* #42, p. 55). While it is wet, I use some 600 wet-or-dry sandpaper to help smooth and drive in the finish. This finish is nice because it is durable as well as soft to the eye and touch. It also has a natural look to it.

## Setting the tiles

I seriously debated whether or not I should let a professional tile setter place the tiles, but after having so much time and energy in the tables, I didn't feel good about turning them over to someone else at that point. I had done some tile work on various house projects and figured I could handle it. Most of the basic materials and tools for tiling are available at home center and hardware stores.

The frame has to be masked off to keep excess mortar away from the wood (see the top left photo). Even with a good finish, the chemicals in the cement will stain the wood. Although it is more expensive, I recommend using 3M blue masking tape because it does not deteriorate as quickly as the regular kind of masking tape. It is generally available in stores that sell to professional drywall installers and painters.

After mixing the mortar, I use a trowel to lay it on the substrate. Using a screed board, as you would use when pouring concrete, helps get the right amount of mortar level, so the tiles end up flush with the frame (see the top right photo). A notched trowel gives the mortar the right depth and texture to accept the tiles (see the bottom left photo). I press the tiles into place as shown in the bottom right photo, making sure they are even at the edges. This can be tricky with handmade tiles such as these (see the box on the facing page). If some mortar squeezes out between the tiles, it must be cleaned off before it dries.

Before grouting these tiles, I also had to mask them: It would have been really difficult to get the grout out of the figures drawn in them. This wouldn't be necessary with smooth glazed tiles. Because of the width of the grout lines, I used a sanded grout, which comes in many colors. It is applied liberally with a grout-sponge trowel, and while wet, it is wiped down with a damp, tight-woven cloth. Do not use a regular sponge or fuzzy cloth for this because bits of material may get into the grout. After a seven-day cure, the grout must be sealed with silicone to protect it from staining. □

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*Tom Jordan builds furniture and custom cabinets in Collbran, Colo.*

**TILING A TABLETOP**

***Laying down the mortar—** After masking the table edges, the author applies mortar to the substrate with a trowel.*

***Leveling the mortar—** Using a screed board, Jordan makes sure the mortar is an even thickness across the substrate.*

***Preparing the tile bed—** A notched trowel makes ribs in the wet mortar as Jordan uses the tool in the final step before setting the tiles.*

***Setting the tiles—**Jordan keeps the tiles in sequence to maintain the pattern. With these handmade tiles, he must pay extra attention to placing them, so there are no protruding edges.*

# Steam-Bending Basics

*Simple tools and techniques make bending wood easy*

by Andrew K. Weegar

***Steam-bending is fairly simple:*** *Choose the right wood, pay attention to the grain and give it plenty of steam. A plumber's propane torch boils water in a 5-gal. can, and a section of auto radiator hose conducts the steam to the simple wooden steambox. A bending jig that uses dowels or wedges to secure the bent stock will save a lot of time, effort and clamps.*

Several times a year, I give boatbuilding demonstrations at county fairs and woodworking shows. Nothing attracts more consistent interest than steam-bending. Whenever I fire up the steambox and start to bend wood, a crowd gathers; it seems the idea of bending wood makes even the most experienced woodworker nervous. But with relatively few tools and a few simple procedures, most woods can be bent to surprising curves.

## The process

When we steam wood, the steam doesn't actually penetrate the wood but brings any moisture already present in the wood to a boil, softening or "plasticizing" the wood fibers. The high humidity of the steambox keeps the wood from drying out. With sufficient exposure to the steam, you have anywhere from a few seconds to several minutes to coax it into a new shape. Boiling works as well as steaming, and if your workpieces are small—thin strips for Shaker boxes for instance—then boiling them in a shallow tray may be easier than fussing with a steaming apparatus.

## The setup

The makeup of your system has a lot to do with how much bending you anticipate doing. Most makeshift rigs work in a pinch. When I was a graduate student living in Boston, I hoisted a 17-ft. boat through a third-story porch door with a block and tackle, so I could



Photos except where noted: Charley Robinson


***A steambox can be made of almost anything.*** *The author connects sections of PVC drain pipe for long pieces and uses a couple of cobbled-up wooden boxes for shorter pieces. For best results, especially on thicker pieces, the box should be as small as possible.*

use the kitchen stove, my girlfriend's tea kettle and a length of stovepipe to bend new gunwales.

Whatever you use, it must be capable of providing large quantities of wet, hot steam. Although many people use portable camping stoves, I've never had much luck getting them to provide enough heat to really build up steam. An outside fire fueled by scrapwood works well but requires constant tending: Too little fire and the water won't boil, too much and your tank will boil dry, baking your stock. Many snowshoe makers and Windsor chair bodgers use simple rigs that fit over the top of a wood stove.

A portable propane torch, the kind plumbers used for melting lead, works well for me (see the photo at left). I had legs added so that the torch would be freestanding and used an adapter that allowed it to run off a hose from a larger propane tank. I use a 5-gal. kerosene can to hold the water. Initially, I directed the steam into the steambox with a short length of radiator hose, as shown in the photo at left. To increase the volume of steam, I later cut a 4-in. circular hole in the top of the can and directed the steam through a length of 4-in.-dia. stovepipe.

## The steambox

The steambox is just that: a box to hold steam. A number of things will work. For long awkward pieces, such as snowshoe frames, wooden skis, sleigh runners or the 20-ft. gunwales on a canoe, schedule 40 PVC pipe works well, but it tends to sag in the middle. Support it on wooden boards as long as the pipe. Clean metal stovepipe can be used as well, though it tends to bake the pieces near the sides. For most stock, a simple wooden box works best, providing insulation and holding the steam. I use several steamboxes, as shown in the photo above: PVC pipe for bending long stock, a 6-ft. wooden box 16 in. sq. that can hold more than 50 boat ribs at once, and a smaller 5-in.-sq. wooden box just over 4 ft. long for bending hardwood stem stock, chair parts or barrel staves.

In choosing a steambox, especially when bending hardwood over an inch in thickness, always use the smallest box that will hold the stock. In any steam chamber, some kind of internal rack is needed to keep the stock separated and off the floor, so the steam can circulate freely around it. Copper wire will work, as will clothes-hanger wire, though the iron will stain the wood. Most of my steamboxes use dowels. The end of the box should be loose-fitting to provide a relief; pressurized steam is unnecessary and dangerous. A hinged lid can provide easy access to the box, but a blanket or rag stuffed in the end works just as well.

## The stock

No point in the steaming operation is as important as carefully selecting your stock. No matter how elaborate your steaming setup, poor-quality wood simply will not bend. The grain should travel in a straight line through the stock that will be bent and not wander off the sides. Any part of the stock that will be bent must be absolutely free of knots, wavy or irregular grain, surface checking or any imperfections. Avoid wood with insect damage or fungal stains, which weaken the wood. Some sources claim that wood bends better with the flat of the grain parallel to the face of the bending form, while others prefer the grain perpendicular to the face of the form. (For reference in this article, we'll call the former flatsawn, the latter quartersawn, regardless of how the stock was milled). After bending thousands of ribs for the canoes that I've built, I've found that, for the most part, it makes no difference. I often bend quartersawn white oak to show off the medullary ray patterns and haven't noticed any increase in failure. In fact, on the especially tight bends required at the ends of a canoe, I select quartersawn northern white cedar, which I find less likely to tear out along the grain than flatsawn stock.

***Riven vs. sawn stock, green vs. dry stock***—If you own or have access to a woodlot, you may want to cut your own trees and try riving your stock. This has several advantages. You can select the best trees, and you can split green wood, which follows the grain, whereas a sawblade follows an indifferent path. Wood you've split yourself can be bent immediately while the wood is still green. Steaming drives the sap out of the wood, which dries it. After the wood has cured on the form, it will be ready to use.

Perfectly good stock also can be had from lumber piles at a local sawmill. I have found most sawyers will go out of their way to help a customer with an unusual request, if you let them know what you're doing and tell them what you need. And partly dried wood may have some advantages. It is easier and faster to obtain for most people, and some sources (including the British Ministry of Technology) indicate the cells of green wood may actually be more likely to rupture during the bending process, leading to failures. In addition, air-dried stock needs less time to dry and set on the form and is less likely to distort or split during bending.

If you use stock that has air-dried, it can be soaked to regain some of its moisture content. In this way, I've steam-bent cherry that had been drying in a barn loft for 30 years. Boards can be sunk in a pond or stream, or they can be wrapped in wet cloth and sealed in plastic. Woods can be stored indefinitely like this; I have some white oak boards that have been sunk in my duck pond for more than two years, but a few days of this treatment is usually enough. Some woods, such as white ash and white oak, tend to discolor near the surface when soaked for too long, but this can be planed off or removed with oxalic acid.

The one type of wood that should always be avoided is kiln-

***You can't bend that wood**—Common opinion is that kiln-dried wood, particularly pine, can't be bent. Carpenter Greg Marston of S. Bridgton, Maine, who built the kiln-dried, white pine hand rail on this banister, didn't know that.*

dried, which has baked-in defects such as casehardening (tiny cracks in the surface of the wood) that can lead to failures. The first rule in bending wood, however, is that there are no hard and fast rules. Not long ago, I saw a house carpenter bend a piece of kiln-dried white pine, a poor species for bending to begin with, to a fairly impressive curve on a staircase banister (see the photo above). Against all expectations, it worked "slicker than a smelt," as they say here in Maine.

***Stock preparation***—Bending wood places it under a great deal of stress, and therefore, the stock to be bent should be carefully prepared. Because the ends of a curve often distort (see "Making a bending form" on p. 66), I cut pieces several inches longer than I will need. I leave stock that will take a sharp bend slightly oversized in thickness as well, usually about 1/16 in., which allows me to plane off any slivers that pop up when the wood is bent.

To prepare the stock, first plane off any sawmarks, and then handplane off any snipes left by the thickness planer. Chamfering the edges that will be in tension with a block plane or sandpaper will keep loose fibers from plucking up. Clearly mark stock that has to be bent with a certain face down, and be sure to use a pencil or indelible ink, or the steam will erase your mark.

## Woods that bend

A number of sources offer confusing, often contradictory, information about which species of wood are appropriate for bending. One source that I read listed ash, probably everyone's favorite, as a poor choice, and others offered general advice such as "softwoods do not bend well," which would no doubt come as a surprise to boatbuilders who rely on white cedar and tamarack for steam-bent ribs.

In my applications, I use mostly cedar, white oak and white ash, which all bend well. Oak, ash and beech are probably the woods chosen most often for bending and with good reason. They are readily available in the quality needed for bending and bend easily. Often I'll bend several dozen pieces without breaking one. Oak and ash are almost always seen on bent chair arms (see the photo at right), sleigh runners and toboggans. In other applications, I've found American elm, the birches, maples, walnut and hop hornbeam all bent well. (Many older snowshoe frames were yellow birch.) Other species, such as cherry, bend with difficulty, but I have bent inch-thick cherry to a tight radius by choosing the stock carefully and leaving it in the box a long time. Mahogany, pine and spruce need great care, good luck and druidic supplications to bend at all, but again, determination and preparation can often overcome the reluctance of even these species to take a bend. Over the last century, canoemakers in Maine routinely used spruce and mahogany for gunwale stock, and bent pine is seen on many an old staircase banister.

Boatbuilders are good sources of information on bending wood because they do it regularly. Luthiers are another. Many books also offer good advice. Read as many sources as you can rather than making up your mind on the basis of one author's advice—unless it's mine.

Above all, experiment. I wanted to use black locust for the stems of a canoe I was building but wasn't sure it would bend well, and I got as many different answers as people I asked. I begged a board from a local sawmill, telling them I'd buy more if it bent well. It did and I did. Whenever I think of it, I set aside scraps of species I haven't tried. Then, when I'm firing up the steambox, I throw them in. *—A.W.*

***Woods that bend**—Although oak and ash may be the most popular woods for bent chair parts (like the arms and backs of these chairs built by Greg Marston, S. Bridgton, Maine), maple, birch, beech, American elm and walnut will also work well.*

***Two kinds of bending failures—** Compression failure (inside curve of the bottom piece) is often due to oversteaming. Tension failure (outside curve of all pieces) can be reduced by using straight-grained stock and a backing strip.*

Experience also has taught me that some stock is better shaped *after* it is bent. I follow this simple rule: Pieces that have to take an acute bend and are likely to experience a higher failure rate are finish-shaped after steaming.

A trick used by snowshoe makers is to relieve or cut away some of the wood where it takes the sharpest bend. This can be determined and marked off by eye and accomplished with a simple jig for a handplane or thickness planer. While this may slightly reduce the strength of the finished piece, it will greatly improve the ratio of success in bending. Finally, it's always good practice to prepare and to steam several extra pieces in case one breaks.

### Getting ready

Some of the other important factors in bending success are also the most basic. Preparedness is certainly one. At all costs, avoid the urge to fire up the boiler and to figure out the rest while the wood is steaming. I know the results: more fuel for the fire. Have everything ready, laid out and clearly marked before starting. This can be particularly important when making repairs, as shown in the photo on p. 66. Make sure that you have enough clamps handy, and always remember that you're dealing with live steam. The steam can cause serious burns to the face and hands if not handled properly.

Nonwork-related factors can lead to other failures. Here are some

## *Heating-pad bending eliminates the steam*

by Bruce Gray

I like steam-bending wood. It's fun to see wood do something it's not supposed to do. But I admit, I hate scorching my hand on a hot pipe heated by a butane torch, ammonia gas stinging my nose or steam billowing up into my shop rafters where I store kiln-dried wood. When I was faced with removing a back slat from a Shaker-style chair I had made, I knew standard methods wouldn't work. My solution was the heating-pad approach. Let me explain how it works (see the drawing).

After sanding the slat to remove any existing finish, soak a bath towel in hot water. The towel should be quite wet but not dripping. Fold the towel around the back slat; then wrap the towel with thick plastic sheet (I use 6-mil plastic) to keep the moisture in. Loosely tie the plastic in place with a cord, pulling only the ends tight. Don't use knots, just a few overlapping wraps to keep the cord from slipping, because the cord needs to be removed quickly. Now that you've built a wet-towel and plastic-sheet steambox, you'll need some heat. The heating pad I use is the drug store variety used to soothe sore joints. Mine is rated at 120 watts, 125v and measures 12 in. by 14 in. Fold the pad over the plastic, and secure with a cord as before. Cover the pad with a folded, dry towel for insulation. Turn the heater on to high and presto: one efficient steambox without steam!

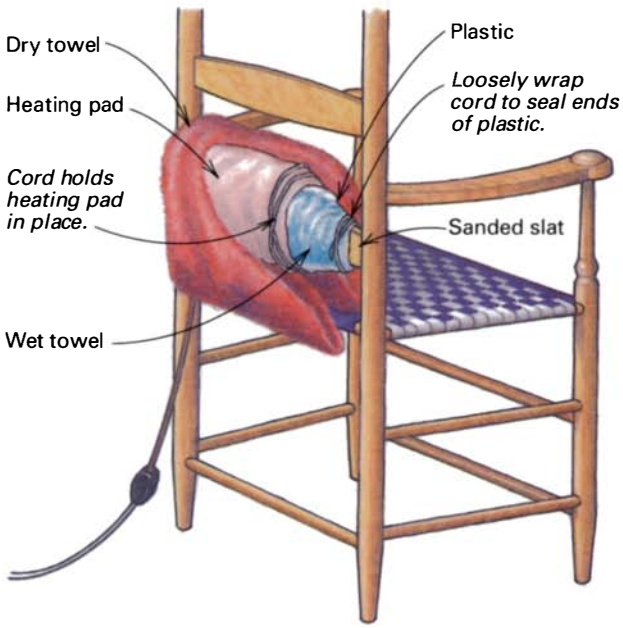
Heating time varies with wood species, thickness and initial moisture content. About 1½ to 2 hours turned the ¼-in.-thick, kiln-dried, bird's-eye maple slat to putty and the same for a 1-in.-dia., air-dried ash back post. Like traditional steaming, the method is quick. Like soaking, steam time is flexible, and the wood has a relatively long working time. Because there is little need to monitor the process, you can focus your attention on other work while you are steaming.

It's easy to see if the wood is ready to bend, just test-bend the wrapped assembly with your hands. A slow yield to your force indicates the wood is ready. Leather work gloves will protect your hands from the hot wood.

If you have just a few small pieces to bend, you can't beat the heating-pad approach for low cost, ease and speed. □

**Heating-pad bending**

*A drug store heating pad and a wet towel supply enough damp heat to soften wood for bending.*




*Bruce Gray builds custom furniture in Grand Bay, N.B., Canada.*

Drawing:LeeHov

***Be prepared**—When making repairs such as replacing the rib in this canoe, it's important to have everything ready, pieces marked for proper orientation and clamps at hand because of the limited working time of steamed stock.*

things to remember: Make sure your shoelaces are tied; clean up clutter, and check that an extra long piece won't take out the overhead lights when you bend it around.

## Steaming

Start timing how long the wood has been steaming from the moment you see steam coming out of your box. Opinions vary as to how long the wood should spend in the steambox. Most sources recommend one hour for each inch of thickness, but those on the more conservative side recommend an hour for each ¼ in. of thickness. Much of the discrepancy can be related to the species used, whether it is green or dry, and the tightness of the curve the wood is being bent to. Because it is possible to oversteam wood, making it more brittle, the best solution may be a compromise. For stock under ¾ in., I use the inch-an-hour schedule. But, I'll leave a 1-in. piece in the steam for two hours or more. With experience, you'll be able to feel when the wood is ready: Properly steamed wood will feel floppy when you wiggle it from one end and will take a slight test-bend around your knee with no resistance.

## Bending

As wood is bent, the fibers on the outside of the curve are stretched into tension, while the inside fibers are pushed into compression. This can lead to two kinds of failure, as shown in the photo on p. 65. The first, compression failure, occurs when the wood crumples and folds during bending. This is often a sign of overexposure to steam. The second, more common failure, is tension failure. It occurs when long slivers of wood break off and peel away on the outside of the bend. Minor slivers can be glued down or sanded or planed away, but severe slivers will continue through the work, sometimes breaking the piece in half.

Several factors will reduce tension failure: proper selection of stock and supporting the outside edge with some kind of strap, a thin, wooden batten or an elaborate spring-steel strap with adjustable end stops. I usually opt for the wooden batten. Waxed paper between the stock and a steel strap will prevent staining.

For any piece that takes an acute bend, lay a tension strap over the stock as soon as it comes out of the box, and fasten the wood to the jig either at one end or in the middle. Bend the wood slowly and deliberately, pausing occasionally for a few seconds to allow the fibers to stretch. You can help "stretch" the wood by bending the stock with your hands.

Once the wood is bent, it should be left on the form for at least 24 hours to avoid springback, which is relaxing of the fibers that occurs when the wood is unclamped too soon. There are several other ways to reduce springback. One is to work quickly: the sooner the wood is bent after it's removed from the box, the less it will spring back later. You can also compensate for springback by making the curve of the bending form slightly tighter than the curve of the finished piece.

Repeated bending failure can be attributed to several factors. 1) The wood itself: Trying to bend the wrong species, poor stock of the right species or kiln-dried wood of any species can lead to failures (see "Woods that bend" on p. 64). 2) Problems with the steam: You need a lot of consistent, hot steam to limber the wood. 3) Not using bending straps.

Finally, there's one trick that might work when all others fail: Sing to your wood as it's steaming. The English playwright William Congreve noted in 1697 that "music hath charms to bend the knotted oak"—something even steam can't do. □

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*Andrew Kimball Weegar is the owner of Kimball Canoe Co. and builds wood and canvas boats in North Bridgton, Maine.*

## *Making a bending form*

The shape of the curve you're bending will be only as good as the form you bend it on. Boatbuilders and others who work in curves speak of a curve being fair, which holds the same meaning here that it did in chivalry: pleasing to the eye with no distracting bumps or dips.

To develop a fair bending form, you can trace a curve you want to duplicate, or eyeball a curve, full-sized, directly onto your stock. A word about the jig stock: It need not be fancy. My jigs are built from waste pieces of plywood and dimension lumber, and I am shameless about finding it wherever I can: construction sites, demolition sites and even the dump. All of it works about the same. Stack the pieces to give you the necessary thickness.

Two things will ensure your finished form will give the wood you bend over it the shape you're after. First, because the ends of bent wood often distort, continue the curve for several inches at either end of your form. Second, because wood tends to spring back, make the last quarter of the curve from ¼ in. to ⅜ in. tighter than the actual desired shape.

Once you've established a line, flex a clear, flawless 1-in. by ¼-in. pine or spruce batten to follow it. Nail on opposite sides of the batten along its length; then sight along it. Any humps or hollows where the nails force the curve should jump out at you. Remove and re-tack the nails until you're satisfied with the finished curve, and mark it with a sharp pencil. Saw wide of the line, and use a spokeshave, block plane and rasp to smooth to the line. Carefully running the curve past a sanding disc mounted on a tablesaw saves time on wider forms.

One last piece of advice: It's a good idea to make the form thick enough to bend several pieces at once. It always pays to steam an extra piece in case one breaks. And design it so dowels or wedges can be used to secure your bent stock (see the photo on p. 62). Otherwise, you'll tie up a lot of clamps in a hurry. —*A.W.*



Photo this page: John McKeith

# Fitting Flush-Mounted Doors

*Step-by-step procedure ensures small, even gaps*

by Steven Thomas Bunn

VIDEO TAKES
SEE PAGE 70

Installing flush-mounted doors is the bane of many woodworkers. The trick is putting them in so they fit with even gaps all around and so they lie smoothly in plane with the case front. I've fitted hundreds of doors for Thomas Moser's cabinet shop. Over the years, I've learned some tricks for installing doors accurately without a lot of measuring. If, after following this step-by-step guide, your doors still aren't exactly right, the story on p. 70 has some tips on how to make the adjustments.

## Make doors oversized

A crucial step to properly fitting doors is to make them slightly oversized in both height and width. I make my doors ⅛ in. to 3⁄16 in. larger than their openings, so I have plenty of material to trim to a precise fit.

## Fitting the doors

When you fit doors and install hinges, always work on a level, flat surface. Every time you move the piece, it racks the carcase, which can affect the door opening. When the completed piece is installed, I use small tapered wedges under the corners as necessary to return the carcase to a level position and correct any misalignment in the doors.

My goal when fitting doors is to have a 1⁄16 in. gap at the bottom and sides and 1⁄32 in. to 1⁄16 in. at the top. For double doors, I shoot for the same gaps at sides, top and bottom and 3⁄32 in. to ⅛ in. between the doors (see the photo below) to allow for expansion and opening clearance. You

***Well-fitted doors show quality craftsmanship**—Inset doors that fit with tight even gaps are a sign of quality work. An organized approach simplifies the process and helps eliminate sloppily hung doors.*

Photos: Charley Robinson

can use these same techniques, however, to create whatever gap suits you.

The first step is to determine the width of the opening. I measure at the top, middle and bottom and use the largest dimension to calculate the trimmed width of my doors. I make a single door 1/16 in. narrower than the largest opening dimension, which leaves another 1/16 in. for final trimming. If double doors are to go in the opening, I subtract 3/16 in. from the largest dimension and divide by two to get the width for each door. This leaves 1/16 in. for opening the center gap to final width after the doors are hung.

I rip the doors to width, being careful to take equal amounts off each stile. If one stile is more than 1/32 in. wider than the other, it will probably be obvious after assembly. I make a light jointer pass on each edge to clean up the sawmarks.

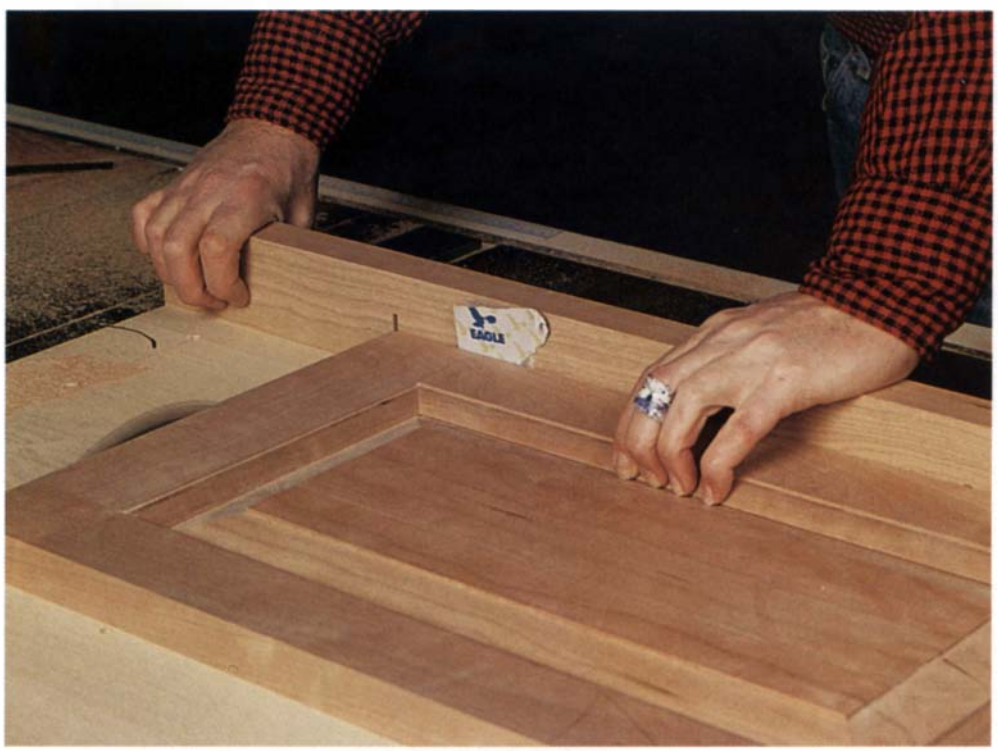
I set the doors in the opening and push them tightly against the hinge stiles to check the fit. Then I joint equal amounts off both doors as necessary to create a 3/16 in. overall center gap. The door isn't trimmed to height until later in the fitting process.

***Fitting the hinge stile and bottom***—To establish a known starting point for fitting the door, I trim the bottom rail square to the hinge stile using a sliding-crosscut box on my tablesaw (see p. 40 in this issue). Next I set the first door in the case opening with the bottom rail resting flat on the bottom face-frame member and push the door gently against the case side. If the case is truly square, the hinge rail will rest flat against the case side, and I go on to fit the top of the door. In my experience, this is rare. Case panel sides can be out of square or slightly trapezoidal because of faulty glue-up or because the case bottom is larger or smaller than the top. The result is the door touches the case side at the top or the bottom with a gap at the opposite end. Most of the gaps that I have encountered range from as narrow as a piece of paper to as large as 1/16 in.

To eliminate the gap between the hinge stile and the case side and to get the door to fit the out-of-square opening, I cut the door's bottom rail at an angle. I use the same crosscut box on my tablesaw, but this time, I shim out either the top or bottom of the hinge stile with folded paper or a wedge to taper the bottom rail, as shown in the photo below. I make a rough approximation of the shim's thickness by butting the door's hinge stile gently against the case side and measuring the gap, either at the top or bottom, between the door and the carcase. I find it helpful to mark the corner that needs to be shimmed, so I don't get confused when placing the door in the crosscut box. I take as small a cut as possible and test-fit the door after each cut. After fitting the door's bottom and hinge sides, I clean up the bottom edge on the jointer, taking off no more than 1/32 in.

***Fitting the top***—To fit the top of the door, I place it back in its opening, resting the door bottom on two pennies. The pennies act as 1/16-in. spacers. Holding the door in the opening so the back of the door is tight against the face frame at the top of the opening, I strike a pencil line across the inside of the top of the door, as shown in the photo at left on the facing page. This line determines both the angle that must be cut on the top rail and the door's length. I then measure down and draw a second line parallel to and 1/32 in. below the initial line. Cutting to the top line allows the door to drop into the opening. Cutting to the lower line establishes a 1/32 in. door gap. Again, as with the bottom rail, I use shims and make multiple passes with the crosscut box on the tablesaw to establish the correct angle and work down to the line, adjusting my shims in or out as necessary to split the line with the sawblade.

Be patient: Taking off too much too soon may leave you with a badly fitting top rail or a door too short to be of use. Don't cut to the second and final pencil line until you are satisfied with the cut of the first. Checking the door as soon as it will drop




***Cutting doors down to size***—*A sliding-crosscut box for the tablesaw makes it easy to trim doors accurately to size. A paper shim between the fence and the door produces a tapered bottom rail to fit an out-of-square opening.*

***Accurate layouts without measuring***—*Marking the door in place is more accurate than transferring measurements (right). Penny-spacers under the bottom rail establish the bottom gap.*

into the opening gives me a second chance to verify that my pencil guidelines were correct. Cutting directly to the second line without test-fitting can result in a lopsided fit. The error may be less than 1/64 in., but the eye catches small differences in the gap between one side and the other of the door and case and magnifies them.

***Fitting the knob stile***—Once I am satisfied with the consistency of the top gap, I joint the top of the door to remove the sawmarks. If I'm installing a single door, I check the side gaps at this point by pushing the door's hinge stile snugly against the case side. This should leave a 1/8-in. gap between the knob rail and the case side. If necessary, I'll plane the knob rail and then install hinges as described later. If I'm installing a pair of doors, I follow the same procedure with the second door as the first. When fitting the second door, I make sure that the width of the bottom rails at the points where they meet the knob stiles is within 1/32 in. Although both bottom rails may be tapered, the eye won't notice that as much as the misalignment of the bottom rails at the center of the pair of doors. Also, I carefully match the top gaps of both doors in the opening.

I set both fitted doors in the opening with their hinge rails tight to the case sides and check the center gap between the two doors. If there isn't a consistent 3/16-in. gap from top to bottom, I adjust it with a plane. I don't attempt to establish my final 1/8-in. gap between the doors until after the hinges are installed. I finish fitting the doors by sanding the edges of the top, bottom and hinge stile with a sanding block.

## Installing hinges

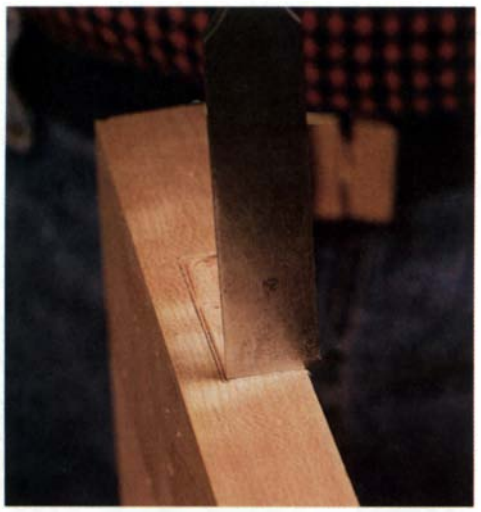
I cut hinge mortises by wasting away the bulk of the material with a Ryobi laminate-trimming router and a 1/4-in.-dia. straight bit and then paring to my layout lines with a sharp chisel. The only way I've found to get a consistent and accurate hinge gap, however, is to test my router setup on some scrap. I actually install a hinge, complete with at least one screw for each leaf and then measure the gap between the scrap pieces. When the gap is 1/16 in., I know I have the router bit set at the proper depth. Setting the depth is a trial-and-error process, but I can get pretty close the first time by measuring the thickness of the hinge at the knuckle (the hinges I normally use are 3/16 in. thick). From the hinge thickness, I subtract my desired gap and divide by two to get the mortise depth for each hinge leaf.

To install hinges on a door, I start by marking the hinge location. I position hinges so that the top of the top hinge and the bottom of the bottom hinge align with the inside edge of the top and bottom rails respectively. This establishes the location for the outside shoulder of the hinge. To layout the hinge mortise, I hold an opened hinge tightly against the hinge rail and scribe around it with a knife, as shown in the photo at right. I use the setup router to remove the majority of waste within the layout lines; then I use a chisel to clean up

***A knife is more precise than a pencil***—*Scribing around the hinge accurately marks its position. Darken the scribe line with a pencil to make the line easier to see when routing away the waste.*

the shoulders to the knife marks, as shown in the photo below. It's a good idea to pencil in the scribe lines before routing to make the knife marks more visible. I install both hinges on the door, using just one screw on each leaf. Note that where hinge leaves wrap around the hinge pin, one leaf is notched at the top and bottom and the other leaf is solid. For uniformity, I make it a rule to place the notched leaf on the door and the solid leaf on the case.

To mark the hinge locations on the case, I set the door with hinges installed back in the case opening. I put pennies under the door to re-establish the bottom gap. Holding the door tightly against the case side, I make tick marks on both ends of both hinge barrels with a knife. I remove the door, lay a loose hinge against the tick marks and scribe around the hinge plate with a knife. I rout and chisel the hinge mortise as before and hang the doors in the case with one screw in each leaf.



***Pare mortises gradually** to the scribed line, alternately cutting down and from the side. Be patient, and work slowly for best results.*

### Final adjustments

With the doors screwed in place, I check my gaps along the hinge stiles and at the tops and bottoms around both doors. If everything looks right, I plane the knob stiles of both doors until the center gap between the doors is from 3/32 in. to 1/8 in. After I am satisfied that my gaps are consistent and even all around the door opening, I remove the doors. To provide swing clearance for the doors, I joint a slight taper toward the back of the door on the knob stiles of both doors. I drill a hole for the knob, centered on the knob stile and 5 in. down from the top of a base cabinet's door. (On wall or top cabinets, I mount the knob 5 in. from the bottom, and on center cabinets or cabinets on stands, I'll position the knob 2 in. above center.) Then I finish-sand the door and break all the edges with sandpaper.

I reinstall the doors on the case and feel all around the door opening to see that the door is sitting in the opening evenly and that both doors lie flat in plane with each other. If they are satisfactory, I install the remaining screws, knobs and door catches. After the door is installed and I am happy with everything, I break the edges of the door opening lightly with sandpaper.

This is the procedure I use to fit flush doors at its simplest. It is rare that everything goes this smoothly, though. When things don't turn out, I resort to one or all of the problem-solving techniques discussed in the story at right. □

*Steven Bunn is a woodworker in Bowdoinham, Maine.*

## Video: Installing flush doors

VIDEO TAKES

The fit of the doors can make or break a cabinet. Shot in the shop, this video shows the nuances of proper installation to achieve even gaps and a door that lies in the same plane as the cabinet face. And if you end up with a dog-eared corner that protrudes or recedes from the face plane, cabinetmaker Steven Bunn takes you through the steps to correct the problem. To order this 26-minute video cassette (VHS), call (203) 426-8171, or send $10 to The Taunton Press Order Department, DoorVid 011038, P.O. Box 5506, Newtown, Conn. 06470.

*—Charley Robinson, associate editor*

## Adjusting problem doors

No matter how careful I am, I always seem to end up with a door that just doesn't want to cooperate. A corner sticks out here or recedes into the case or a corner droops there. All of the problems, however, usually fall into one of four areas. These areas and the methods for correcting the problems are detailed in the drawings and the text below.

**Uneven gap at top or bottom:** Sometimes my doors will fit perfectly without hinges, but once installed, the gap becomes uneven along the top or bottom edge, as shown in figure 1 on the facing page. Hinges, even when taken from the same box, may be slightly different in thickness, which affects the side gap and throws an angle into the top and bottom gap. First I'll check the single screw that I've placed in each leaf to hang the door temporarily. If these screws are tight, I'll add the other two screws to each leaf to see if that will pull the door into line. If the door is still out of line, a small shim of sandpaper under one or both screw plates should bring the door back into alignment. The last resort is to rework the hinge mortise.

**Hinge stile not in plane:** You can install the hinges perfectly and still have one corner of the hinge stile either proud of or sunken below the plane of the door opening. If the door is out by as much as 1/16 in., this alignment problem can be overcome by offsetting the two remaining screws in the hinge plate, as shown in figure 2 on the facing page. To begin, loosen the first screw that you installed in the offending hinge. Then, to pull a door in, offset the screws in the door side of the hinge plate toward the back of the hole. To push a door out, place the screws hard against the edge of the hole nearest the barrel. After installing the new screws, I usually remove the initial screw until I'm permanently hanging the door so that I don't cancel any leverage my offset screws have gained. Before reinstalling the removed screw, I plug the hole with toothpicks dipped in glue. Then I redrill the pilot hole, so I don't affect the fit of the door.

**Top of knob stile not in plane:** If there is twist or wind in the door, the rest of the door may fit perfectly, yet the top of the knob stile might either be recessed or protrude. Because I almost al-

**Fig. 1: Uneven gap at top or bottom**

*If door droops after hinges are installed, a sandpaper shim placed under one or both hinge leaves will open side gap and level top and bottom gaps.*

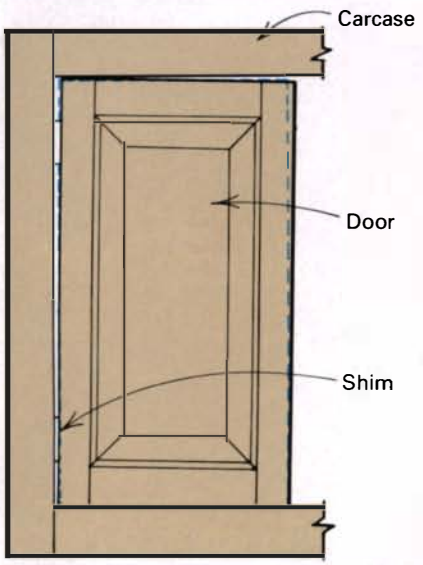
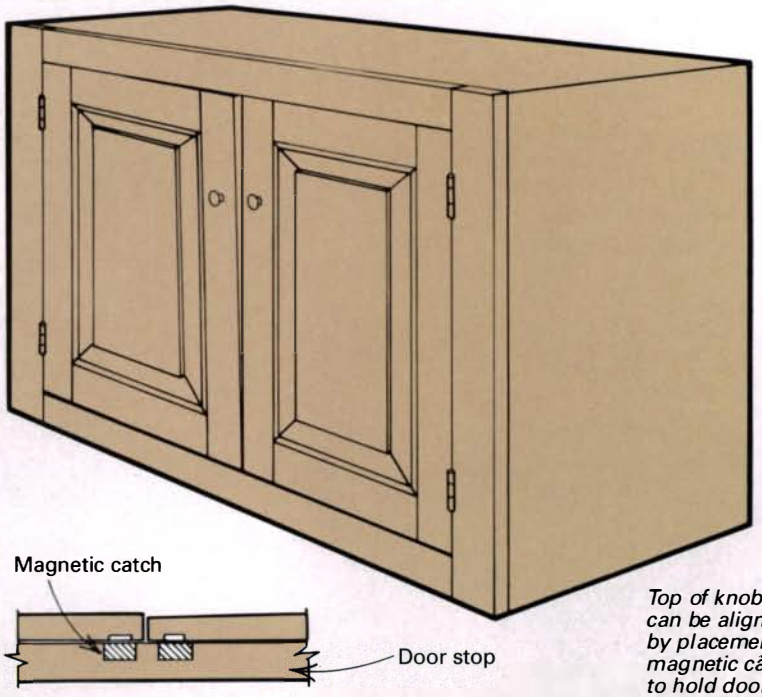
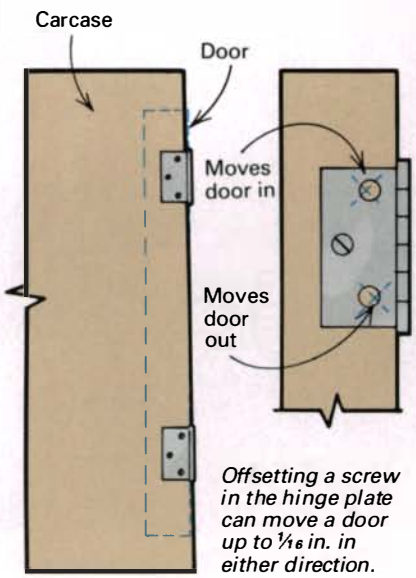



**Fig. 3: Top of knob stile not in plane**



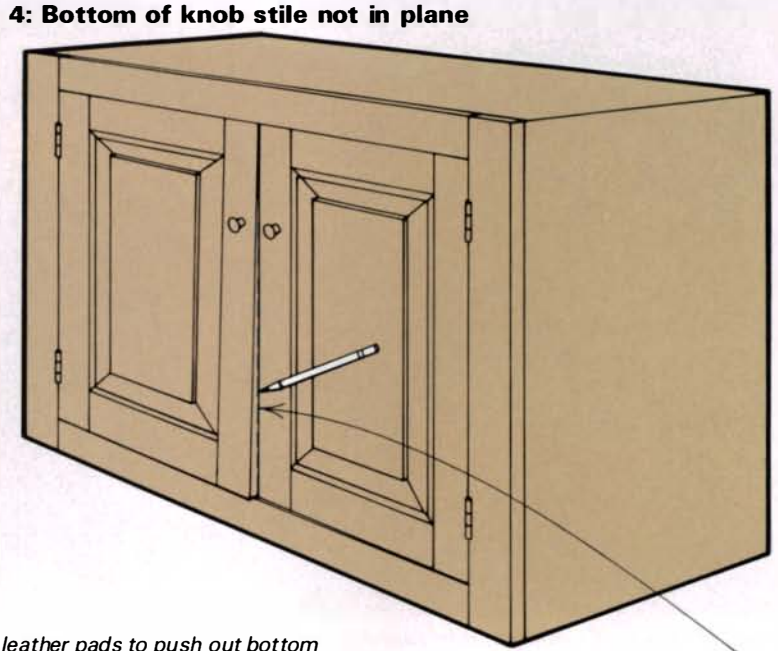

*Top of knob stile can be aligned by placement of magnetic catch used to hold door closed.*

**Fig. 2: Hinge stile not in plane**




*Offsetting a screw in the hinge plate can move a door up to 1/16 in. in either direction.*

**Fig. 4: Bottom of knob stile not in plane**



*Use leather pads to push out bottom of knob stile. A protruding knob stile, however, must be sanded or planed flush.*

*Mark edge using adjoining door as guide.*

ways install magnet catches at the top of my doors, I can locate the magnets to pull or push a door into line (see figure 3 above). I've generally found non-magnetic catches have too much play to be effective in aligning doors. In turn, pulling in the top of the stile almost always pulls in the bottom of the stile as well. I can usually correct this problem by gluing a leather button on the door bottom to push this corner back into plane.

**Bottom of knob stile not in plane:** If the knob stile is recessed at the bottom, a leather button glued to the door will easily correct this problem as mentioned previously. But a protruding knob stile is the most time-consuming problem to correct when fitting doors. My solution is to sand the protruding door flush. The difference in thickness of the tapered stile is only noticeable when the door is open, and even then, most people will not be aware of it.

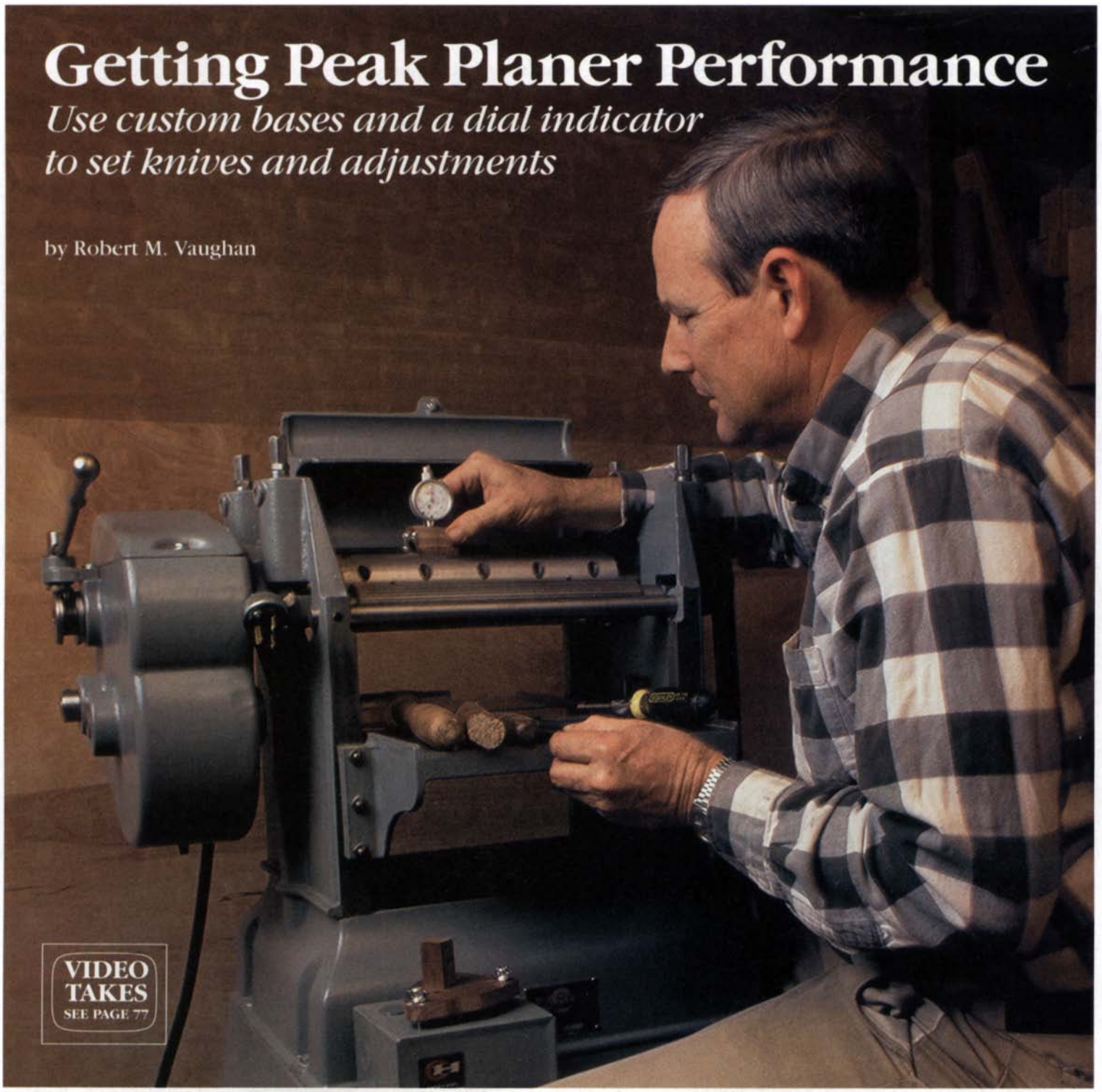
I mark the amount of protrusion on the edge of the stile with a pencil, using the adjoining door's stile or the door frame as a guide, as shown in figure 4 above. Then I remove the door from the case and sand the taper with a belt sander. After determining that the doors are in the same plane, I final-sand the tapered door and install the knobs. If the door has an obvious twist to it, the high corners can be belt-sanded down before installation. —*S.B.*

Drawings: Maria Meleschnig

# Getting Peak Planer Performance

## *Use custom bases and a dial indicator to set knives and adjustments*

by Robert M. Vaughan




***Simple tools and inexpensive gauges can improve planing** if you are patient and careful. Here, the author is installing knives in a 12-in. Parks planer using a dial indicator mounted in a base made to fit the cutterhead. Other tools for the job include a bed-resting gauge (by his knee), a mallet and block for tapping, and a prying tool (in hand). Note that the planer's plug is disconnected.*

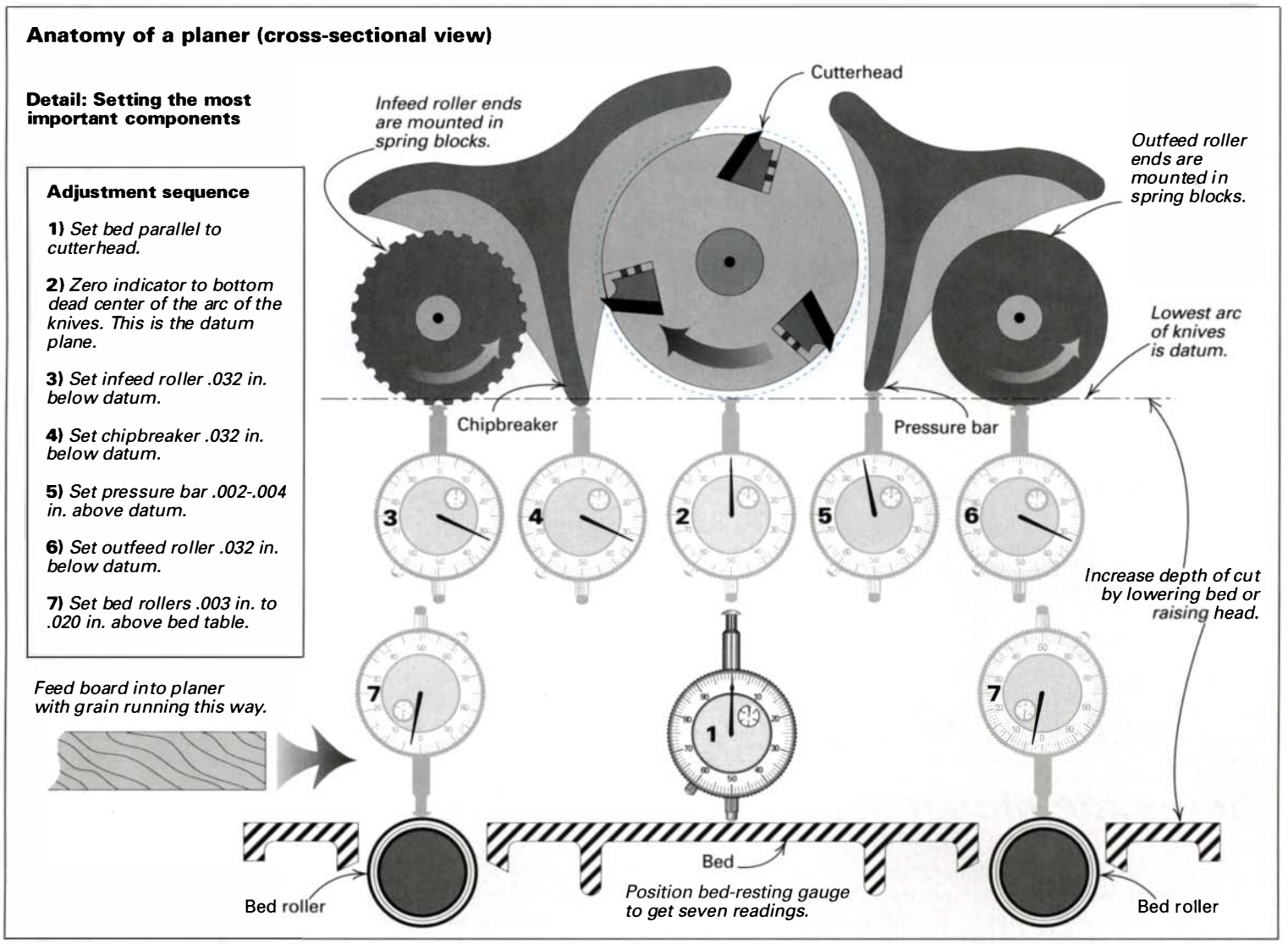
When it comes to dimensioning stock, a thickness planer is indispensible. That is, unless the knives are dull or the machine's adjustments are out of whack. Dull knives are noisy and strain the motor. Nicked knives produce a molded surface instead of a flat one. Planer misadjustments cause end snipe, tearout, chatter marks and feed difficulties. Improper planing technique also leads to poor surfacing. Until you are sure that your machine is adjusted properly, it's hard to tell whether your planing problems originate with the tool or with the user.

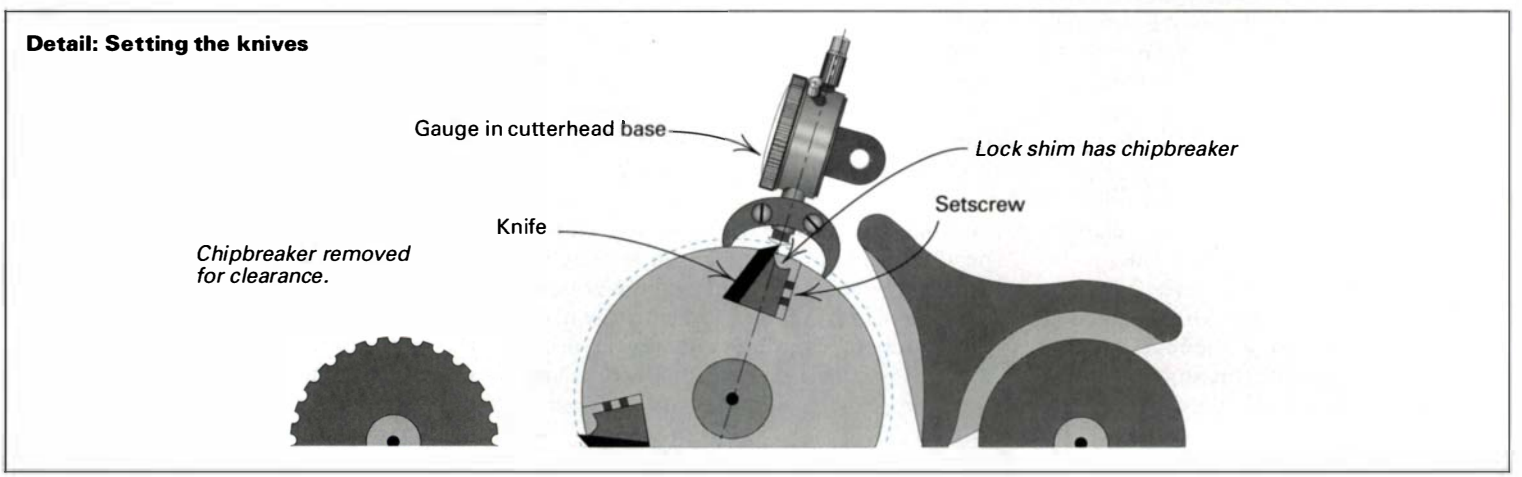
Fortunately, you don't have to be an experienced machinery mechanic to install knives or troubleshoot your planer. With a little patience and the right tools, you can diagnose and tune up your own machine (see the photo above). To get predictable results, you'll need two gauging devices, which will let you observe measurements that you may otherwise gain only by trial and error and by feel. First use a gauge that rests on the cutterhead to set the knives. Then use a gauge that rests on the planer bed to measure the relationships between the cutterhead and the machine's other critical parts. These two gauging instruments, which have been used in the woodworking industry for at least 75 years, are simply dial indicators mounted in customized bases.

For up to several hundred dollars, you can buy gauges from various machinery manufacturers or aftermarket sources. But if you need to save your pennies for another tool purchase, I'll show you



Photo this page: Alec Waters




how to make your own gauges using wood (or plastic, aluminum or steel), a few nuts and bolts, and an ordinary dial indicator of the proper size with about a ¼-in. plunger range (see the box on p. 74).

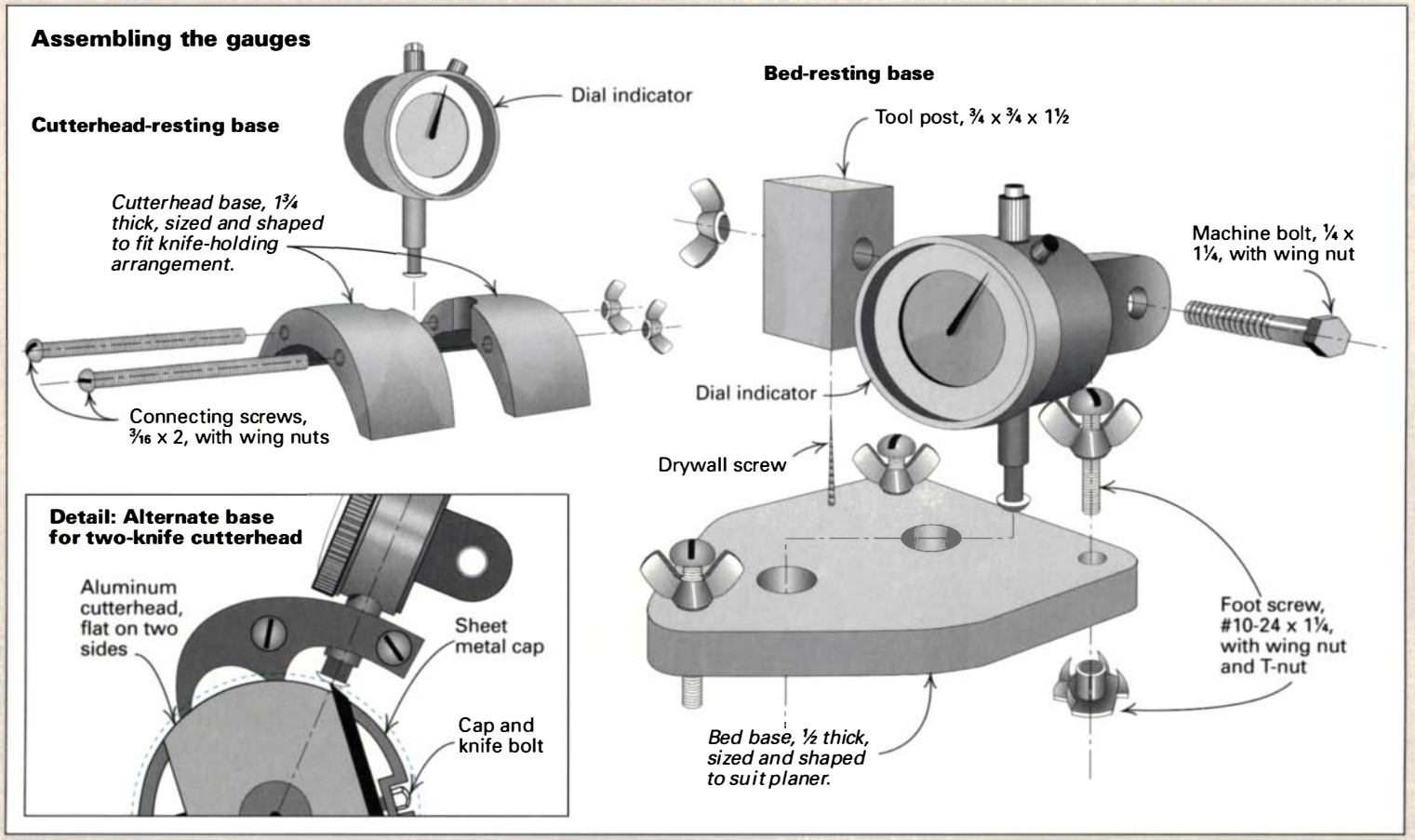
## Understanding your planer

The Parks planer shown in the photo on the facing page, though it is no longer made, contains all the common features found on a thickness planer. Your model may not contain all the components I'll address here. Even so, you should still be able to adapt the same principles to make adjustments to your own machine.

As a board passes through a planer, it is influenced by the relative positions of seven different components: the knives in the cutterhead (above the stock), the bed and bed rollers (below the stock), the infeed roller and chipbreaker (above the stock on the infeed side), and the outfeed roller and pressure bar (above the stock on the outfeed side). The drawing above shows the relationships of these parts and the initial adjustment settings. Later, if I need to, I'll tweak with the adjustments to fine-tune the planer's cut.

To understand where each of the planer's seven components plays its role, it's helpful to follow a board as it's being planed. First the wood is placed on the planer bed and fed by hand between the infeed roller and the front bed roller. The powered infeed roller grabs the wood and drives it beneath the floating chipbreaker and under the rotating cutterhead. Next the board passes under the

Drawings: Matthew Wells




# *Shopmade planer-setting gauges*

My shopmade gauges were adapted from the heavy steel gauges I service planers with in the field. For occasional use, the shopmade gauges give equally precise readings. I devised the gauges so one dial indicator can be interchanged from one base to the other. Because planer dimensions vary, the bases' measurements will also vary. To size them, first get the right dial indicator.

**Selecting a dial indicator:** A dial indicator is excellent for showing crucial relationships of machine components. One of the inexpensive imported units goes for about $25 (Enco Manufacturing, 5100 W. Bloomingdale Ave., Chicago, Ill. 60639; 800-873-3626). After you thoroughly study the parts of your planer and all its adjustment limits, sketch a full-scale cross section of these (see the top drawing detail on p. 73). This will help you choose a dial size and also show you how the bases need to be shaped. Select an indicator that will fit easily and can be read clearly in your planer. I use a 1¾-in.-dia. dial with a ⅜-in.-dia. convex replacement tip, like Starrett's or Mitutoyo's hardened, chrome-plated type. Convex tips provide better contact over a knife.

**Making the bases:** To make the cutterhead-resting base, first make a full-size sketch of your cutterhead (see the bottom drawing detail on p. 73). Extend a line from the center of the cylinder out over the tip of a knife. Position your indicator over the line with the plunger pointing at the center of the cutterhead. Next draw a base profile with two feet resting on the cutterhead. For two-knife cutterheads, try making an indicator base that has both feet on one side (see the drawing detail above). Mark where the plunger stem passes through the base. Then transfer your base profile to a block of wood, and drill and cut to size. Using the hardware shown, assemble the gauge.

For the bed-resting base, make a crow's-foot (tripod) arrangement. The position of the screw feet should be such that the feet won't drop down in the bed-roller slots. Use the planer sketch to locate the indicator tool post. I devised mine so that I can swap the indicator from the front to the back of the post. Finally, round and polish the bottoms of the base's screw feet. —*R.V.*

pressure bar and out between the powered outfeed roller and the back bed roller as it exits the machine. Having any of these components out of whack will cause problems, so checking each is essential. Start by setting the knives in the cutterhead. But before you do anything, prepare the machine, and get the tools you'll need.

## Preparation

First, unplug the machine. You'll also want to disconnect the dust boot to gain better access. Then remove the guard for the pulley, so you can advance the cutterhead. Besides the dial-indicator gauges, you will need a few other tools: an ice pick (or other device to pry up the knives), a wooden block and a mallet to tap the knives down, and Allen wrenches to tighten the lock shim and to turn the jackscrews (if your machine has them). Study your owner's manual so that you will know how to adjust the components on your particular machine and gather the required wrenches. Some metal shims may be handy for fine-tuning adjustments. Depending on what you find once you get into the job, you may also need a file, some emery cloth, and solvent and lubricant. And make sure you're comfortably seated.

## Setting the knives

When setting the knives parallel to the cutterhead, remove and reset one knife at a time to avoid distorting the head. This requires a

spare sharpened set of knives. I always have my knives sharpened at a professional sharpening shop. If knives are being installed on an empty cutterhead, then lightly install all the knives, and go from knife to knife, gradually increasing pressure. For maximum support and safety, the knife should be as far down in the slot as practical. (For more on setting knives in a round cutterhead, see *FWW* #103, p. 86). There may be differences between cutterheads, too. Some have jackscrews, or there may be two knives in the cutterhead instead of three (see the drawing detail on the facing page).

To check if your old planer knife is a safe size after resharpening, remove the lock shim (also called a lock bar or gib) from the cutterhead, and lay the knife about where it should be. If you see any light through the setscrew holes, reject the knife; it is too narrow and could be thrown from the cutterhead. Don't exert a lot of force on the setscrews, or you'll distort the cutterhead and the screw threads. Apply equal torque on the screws to get uniform pressures and deflections. I get enough leverage from the 6-in.-long leg of my Allen wrench. It's a good idea to lay a rag over the exposed blade to protect your hands in case you lose your grip.

To use the cutterhead gauge, I lightly tighten a knife close to its proper height. This varies from machine to machine, so you should check your owner's manual for the recommended height. I then clamp the dial indicator's ⅜-in.-dia. shaft in the wooden base so that when the base is rocked on the cutterhead, the dial will move only about .015 to .020 in. At this point, I turn and lock the moveable dial face, so the indicator's hand points to zero when the plunger tip is moved over the tip of the knife (see the top photo). Now the indicator will register the height of the knife edge relative to the cutterhead.

Lightly tighten the setscrews on the outer ends. I usually snug the left side to exact position, go back to the right side and raise or lower that side of the knife to where it should be, and lock it in position. Then working from left to right, over each setscrew, I either raise or lower the knife until I can lock it at the proper height (see the photo at right). Rocking the indicator's plunger over the knife edge shows me the maximum protrusion of the knife edge. Keep in mind that the wood of the gauge base is light and sensitive. Take a few minutes to get the correct feel of the gauge base contacting the round cutterhead. Repeat the sequence—one knife at a time—for the other knives in the cutterhead.

## Setting the machine

Once the knives are set, install the indicator in the other base with the plunger tip up. Drop the planer's bed until the bed-resting gauge can be easily placed directly beneath the cutterhead. Crank up the bed until the plunger tip just touches the bottom of the cutterhead. Be sure the cutterhead has been rotated so that the knives are out of the way. Then place the gauge at one end of the cutterhead, and rock the cutterhead as you zero the dial at bottom dead center. Zero the other end of the cutterhead as well. Brush the plunger under the center of the cutterhead. If there is a sizable difference (more than .015 in.) between the middle reading and the ones taken from the outsides, then the bed has been worn too much and needs to be re-machined.

***The bed***—The planer bed and cutterhead should be parallel. How to make them parallel varies from machine to machine. Some machines require the table be adjusted and others require the head position be adjusted. For those machines that have no adjustment, the only option is to set the knives in the cutterhead, so they will be parallel to the bed instead of the cutterhead.

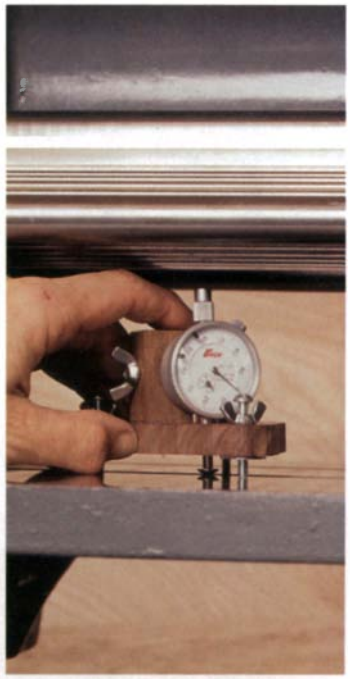
Before working with the dial indicator, make sure that the bed has no slop in it as it moves up and down. Most machines have wear shims that can be adjusted. A sloppily fitting head or bed will give poor surface results, such as snipe and washboard.

***A cutterhead gauge enables knives to be set consistently** to within one or two thousandths of an inch. The wing nuts on the base allow plunger height adjustment.*

***Gauge helps to anticipate knife shift**—Using the planer cutterhead as a reference, Vaughan reads the gauge over each setscrew to know whether to raise or lower the knives and to anticipate how much each of the knives will shift during tightening.*

***Defining the cutting arc***—Using the cutterhead gauge again, double-check (over each setscrew) the positions of the knives in the cutterhead. Final setscrew tightening often causes the knife to squirm up a hair. Then position the indicator back in the bed-resting base so that the plunger is at bottom dead center of the cutterhead. Lower the table without disturbing the position of the gauge base. Rotate the cutterhead by hand until one of the knives is at bottom dead center. Carefully raise the table until the plunger tip just touches the knife. Reach in and steady the position of the base

Photos except where noted: author



***The planer bed gauge has to work in different positions.*** *The base's screw feet are located so the gauge can straddle the bed slots. To check the feed rollers, orient the dial indicator, so it can take overhead readings. To check the bed rollers (shown here), flip the indicator on the tool post, sticking the plunger down through the hole in the base.*

***The bed gauge checks infeed and outfeed components.*** *It also shows if bed adjustments are needed. By turning the pulley, the author rocks the cutterhead to be sure that he is reading bottom dead center of the arc of the knives.*

while raising the bed just enough to make the knife move the plunger about .015 in. Zero the dial when the knife rotates through bottom dead center of its arc (see the bottom photo). This defines on your gauge the lowest point of the cutting circle. This will be your datum. It is this plane that defines the position of the planer's upper internal components. Neither the bed nor the cutterhead positions should be disturbed while making the rest of the upper adjustments on the planer.

***The infeed roller***—Straddle the bed roller slot with the feet of the gauge base, and move the indicator in and out under the infeed roller. The position for serrated steel infeed rollers should be about .030 to .035 in. below the cutting arc for most machines. Rubber rollers will be slightly lower. For sectional infeed rollers or chipbreakers, you'll have to average the measurements. Consult your manufacturer's literature to get an exact figure of the correct position in relation to the cutting arc.

When adjusting the infeed roller to the correct position, the face of the indicator may not be in the most convenient spot for viewing. If this is the case, cut a triangular block of wood about 2 in. high, and fasten a mirror to it with double-faced tape to view the results when standing above the planer. This mirror can be used for the other internal components as well.

***The chipbreaker***—Like the leading edge of a handplane's cap iron, the chipbreaker in a planer prevents long tearouts from occurring. The chipbreaker is often, but not always, set to the same distance below the cutting arc as the infeed roller. Proper alignment keeps long strips of wood from lifting as the top of the board is being cut by the knives. Set the chipbreaker to manufacturer's specifications using the gauge in the same way it was used to set the infeed roller. Some machines have anti-kickback fingers or pawls just ahead of the chipbreaker.

***The pressure bar***—The pressure bar is located behind the cutterhead and keeps the newly cut surface from bouncing up into the cutterhead as the stock enters and exits the planer's feeding system. During the cut, it performs a hold-down function when feeding warped stock. If it is set too high, the wood will flutter and a washboard texture will result. And it's likely that end snipe (a slightly thinner section) will occur. If it is set too low, feeding will be impeded. A majority of surfacing problems can be traced to this component, so its position is critical. I normally set a pressure bar about .002 to .004 in. above the cutting arc for surfacing face-jointed lumber. For surfacing lumber that is rough on two sides, a slightly higher setting usually works well.

***The outfeed roller***—The outfeed roller is usually smooth or rubber-coated, so it won't mark the planed surface. Set the outfeed roller exactly like the infeed roller. It should also be set to the same distance below the cutting circle, unless the manufacturer's instructions state otherwise.

***The bed rollers***—The bed rollers reduce friction as stock is being fed, and they prevent premature wearing of the bed tables. So, it's important that the rollers turn easily and are aligned precisely. Bed rollers are located in slots in the bed directly below the two feed rollers. The dial indicator will have to be reinstalled in the base with the plunger down to check the position of the bed rollers (see the top photo). Adjust the feet so the plunger moves up only about .015 in. when the base sits on the bed. The weight of a wooden base is often not enough to overcome the opposing spring pressure of the indicator's plunger, so hold the base down for accurate readings.

The rougher the lumber, the higher the bed rollers should be set to reduce friction. However, if they're set too high, the workpiece may vibrate, producing a rippled surface. Conventional practice is to set the rollers .002 in. above the bed when dressing faced lumber and about .020 in. when dressing lumber that's rough on both sides. On this machine, I set the rollers to .002 in. and then insert .020 in. shims on those rare occasions when I'm dressing lumber that's rough on two sides (see the top photo on the facing page). Machines with no bed rollers don't usually have performance problems related to the lack of bed rollers. But the beds don't stay flat nearly as long either, and the motors work a bit harder.

## Helpful hints to better surfacing

The dimensions I have shown are those I use for a starting point when adjusting planers and are far from being written in stone. Other factors such as component wear, wood dryness, wood straightness and operator preferences can easily dictate that things be adjusted differently.

***Adjustment problems***—Adjustment screws on planers usually are held in place with locknuts. When the correct settings are reached by turning the adjustment screw, those settings usually alter when the locknut is tightened. Its always a good idea to watch the indicator's hand when the locknut is tightened, so the setscrew can be turned to compensate for the difference.

***Spring pressure***—Downward spring pressure can sometimes have an effect on planer performance. A heavy spring can emboss infeed roller prints on softwood when making that light final pass. Light pressure can cause roller skidding when rough or warped lumber is dressed. How much is enough? Only the performance of your machine will tell you that.

***Safety***—Because planers pull the wood away from you, loose clothing and jewelry can be a hazard. Noise is also a factor. When knives get dull, they loudly beat off the chips rather than cut them. So always wear ear plugs in addition to eye and breathing protection. Try to cut out defects such as knots beforehand, and never plane a board that's less than ¼ in. thick or shorter than the distance between the feed rollers.

Any cutterhead that is moderately exposed on the outfeed side should have a shroud over it to prevent easy access to the spinning knives. Drive belts and gears should also be covered, so you don't come in contact with such moving parts. Last, never look into the machine (infeed or outfeed end) when it's running.

***Dust collection***—Though this machine was not shown with a dust collector, for best planing results, as well as for health concerns, you should have a dust- and chip-evacuation system. Chips can pile up and get pressed into the wood under the outfeed rollers and get dragged around by the knives. This makes for little dents on the wood that will eventually spring back as little bumps when the wood takes in more moisture. Ideally, your planer should produce long, clean shavings (see the photo at right).

***Planing for success***—Planer-operator technique can have as much to do with poor surface quality as a poorly adjusted machine. For example, slower feed rates tend to produce smoother surfaces. And hardwoods generally should be fed slower than softwoods. Also, keep these guidelines in mind when you are planing: Not supporting long stock as it enters and exits the planer will almost always result in a snipe. Trying to surface warped stock will usually cause a washboard surface because the wood is not flat on the planer bed. Taking too heavy of a cut can cause tearout; feeding the wood against the grain will cause tearout; and dressing knotty or highly figured wood increases the risk of tearout. Not taking a light final pass to get to finished dimension can result in a rough surface. High moisture content in the lumber makes the fibers stringy and difficult to cut cleanly. The result is a fuzzy surface. It also will likely be a bear to feed properly. Finally, a planer smooths stock and makes the faces parallel. It will not straighten warped stock. □

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*Robert Vaughan is a contributing editor to* Fine Woodworking, *and he rehabilitates woodworking machines in Roanoke, Va.*

***Temporary bed-roller shims make heavy milling easier***—*When Vaughan wants to do heavy planing, he elevates the bed rollers with temporary shims. This is easier than having to adjust each end of both rollers individually. The shims, tethered on a string for convenience, are removed when it's time to do finer surfacing.*

***The proof of proper planing is all in the shavings.*** *When a planer is producing long, clean shavings and little dust, chances are good that the machine is well-tuned. The smooth, tearout-free knot on this planed board of poplar shows that it's well worth the fuss of using dial-indicator gauges to install knives and set planer components.*

## *Video: Planer tune-up*

VIDEO TAKES

Setting a planer's knives and adjustments is ranked high among the mysteries of woodworking. If the owner's manual doesn't scare you, the tools and anticipated time will. But Robert Vaughan eliminates the mystery and intimidation in this 30-minute video (VHS). To order, send $10 to The Taunton Press, Planervid #011037, P.O. Box 5506, Newtown, Conn. 06470, or you can call (203) 426-8171. *—Alec Waters, associate editor*

# Built for Comfort: The Three-Slat Chair

## *Correct curves are key to comfort, durability*

by Christian H. Becksvoort

***Shaped seat and curved back slats provide comfort, while curved, laminated back legs ensure the chair will be able to withstand lots of racking and abuse.***

Comfortable chairs, especially wooden chairs, are notoriously difficult to design. Consequently, I'm always on the lookout for good chairs. Whether in a restaurant, at a friend's house or in a waiting room, every time I sit down, I instinctively analyze what makes my seat comfortable, or not.

Several years ago, my wife bought a double folding chair at a flea market for the grand total of $2. The chair is of a style that was mass-produced around the turn of the century and used almost everywhere, in auditoriums, schools, Grange halls and libraries. Although not much to look at, it's a very comfortable chair. The two contact points, the seat and back, are well-formed and provide support right where it's needed. I decided to borrow the back curve and seat shape, the elements that make the chair so comfortable, and incorporate these features into a nonfolding, four-legged dining chair with mortise-and-tenon construction.

I also adjusted the back angle to 14° from vertical because the original was a little too "laid-back" for a dining chair. After a series of sketches, I came up with the chair shown above and in the drawing on pp. 80-81. Once I'd worked out the details, I made a full-sized drawing from which I later made patterns for each chair part.

***Simple form makes bent-lamination easy.*** *Plywood scraps form two mating halves with square outside edges to provide even clamping pressure over the length of the back-leg lamination.*

### Laminating and shaping the legs

One of the first decisions I made was to laminate the curved back legs rather than cut them from a big blank. Having repaired countless older chairs, I've learned that curved back legs cut from solid stock are extremely vulnerable to breaking: The short grain where leg meets floor invariably breaks, sometimes with the slightest tap.

I made a form for the leg-blank lamination from six pieces of scrap ¾-in. plywood. I bandsawed the plywood to rough shape and then disc-sanded the two halves of the glued-together form until I had a fair, smooth curve on each half with a nice match between the two.

I cut 5/16-in.-thick strips for the lamination from a 4-in.-wide piece of 16/4 stock that was 38-in. long. That way, I was able to match the grain from front to back and get both back legs from the same lamination. I marked each bandsawn strip in order of cut, applied glue between each, wrapped them in plastic wrap so they wouldn't stick to the form and clamped them in the form for 24 hours (see the photo at left). The next day, I cut the lamination in half lengthwise along its face, ran the outside edge of both pieces over the jointer and then ripped them to 1½ in.

I cut the back legs so that the tops are



Top photo: Susan Kahn

35 in. high and the bottoms are at 73° to the floor (see the drawing on p. 81). Then I marked and disc-sanded a flat section perpendicular to the floor on the front faces of the back legs, where the side rails will intersect the legs.

Next I bandsawed a taper on the inside edges of the bottom section of the back legs, from 1 in. sq. at the floor to 1½ in. sq. just below the flat at the side-rail intersection (about 12½ in. from the floor). I also tapered the tops of the back legs to 1 in. wide on their inner edges, as viewed from the back (see the drawing on p. 80), and to ¾ in. front to back, cut from the back and originating just above the flat for the side-rail intersection. If I'd tapered the tops of the back legs on their front edges, I would have changed the seat-back angle, making the chair slightly less comfortable.

I prepared the two front legs of the chair by jointing, planing, ripping and crosscutting rough 8/4 stock to end up with two 1½x1½x17½ blanks. Then I tapered them on their inside faces from 1 in. sq. at the floor to 1½ in. sq., 3 in. from their tops.

### Leg-to-rail joinery

I used mortise-and-tenon construction on this chair because it has no stretchers, so the strongest possible leg-to-rail joinery was necessary. I laid out all the rails with a 3/16-in. reveal at the leg intersections except the back rail, which I made flush to the inside of the chair.

I cut the four rails from rough 4/4 stock that I planed to thickness and cut to shape from my full-sized patterns. The front and back rails start out as 2¼-in.-wide blanks, but the side rails start out 3¼ in. wide to allow for the bandsawn curve that dictates the seat's contour. This takes the side rails down to 2¼ in. Also, I cut the side rails at 5° on both ends (85° in the front and 95° in the back), which makes them parallel, though slightly skewed uphill.

At this point, I cut the tenons to fit the mortises. All tenons are centered on the rails except for the back rail. I offset it to within 1/16 in. of the back face to keep it from being too close to the inside corner of the leg, thus compromising the integrity of the joint. Next I dry-fitted the legs and rails together. I held the chair together with band clamps while I checked the fit of the joints, dimensions of parts and angles. While the chair was dry-clamped, I also cut a wooden pattern of the seat profile (from the side) and of the back slats (from the top) from my full-sized drawing. I drew the pattern for the back slats by swinging a pair of 18-in.-long arcs, ½-in. apart, using a piece of string to create a 41¾ in. radius. Then I laid this pattern onto the top of the two back rails so that the back of the pattern intersects the front outside corners of both back legs. I scribed this line of intersection onto the top of the back legs, extended the line down the insides of the legs and then jointed down to the line, using the jointer fence to maintain the angle. Given the leg spacing and the radius of the back slats, the scribe marks formed about an 11° angle from the front edges of the legs, allowing the back slats to sit flush against the back legs. At this stage, I finish-sanded the four legs and rails to 320-grit. Then I assembled the back legs and rail as a unit, pinned the joints and set the assembly aside to dry. I did the same for the front assembly. When it was dry, I connected the two assemblies by gluing and pinning the two curved side rails.

### Making the seat

I cut the seat from a 6-in.-wide, 17-in.-long piece of 16/4 stock, choosing a piece with nice color and devoid of sapwood. I also laid out the pattern on the flatsawn face of the board so that the seat surface would be quartersawn (see the top photo on p. 80). This reduces the amount the seat will move side to side, and it's quite attractive. Also, the parallel grain makes it less obvious that the seat is glued up from a number of pieces. I jointed the edges and glued the seat blank together. When the blank was dry, I bandsawed the seat to match the pattern and then disc-sanded to fair in the four curved edges.

Shaping the seat top and bottom is probably the most time-consuming step in the whole chairmaking process. I clamped the seat upside down between two bench dogs and beltsanded across the grain with an 80-grit belt. I've found that by holding the sander perpendicular to the grain but moving it in a rocking motion with the grain, I can remove stock quickly without gouging the workpiece. As it turned out, the concave portion of the underside of the seat near the front legs was just about the tightest radius possible with this technique, but it worked. I flipped the seat over and sanded the top using the same technique. The top went much faster because its concave section was so much shallower.

Next I use a 1-in. by 5-in. soft sanding pad (available from Econ-Abrasives, P.O. Box 865021, Plano, Texas 75086; 800-367-4101) chucked into an electric drill. This soft pad, with a 100-grit disc on it, took out the 80-grit cross-grain scratches and conformed well to the contour of the seat. I repeated on the front and the back of the seat through 180-grit paper. Then I switched to a round, 5-in. orbital finish sander at 220-grit because it leaves fewer and smaller swirl marks. I continued with the finish sander through 320-grit.

When the seat was smooth and scratch-free, I beveled its sides and back edge. I shaped the front edge to a rounded point (see the drawing on p. 81). This went quickly using a combination of block plane, rasp, file and sandpaper. The seat was now ready to be fitted to the chair. I did this with a couple of sheets of carbon paper, using a technique similar to one used by machinists with their bluing (see the box above).

Because the back of the seat is beveled and has such a pronounced curve, the ends of the back rail are exposed (see the drawing on p. 81). This doesn't provide as much support for the seat as I'd like, so I added a second rail on the inside of the back of the chair. I glued and screwed it to the inside of the back rail and made sure it's tight and flush to that original rail. For additional strength and because the chair has no stretchers, I added corner

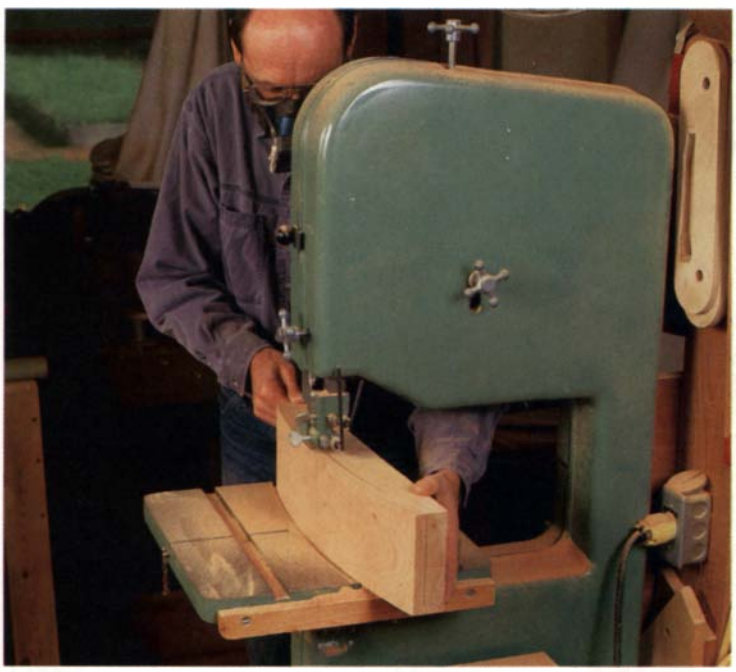
## *Fitting a shaped seat*

**To fit a seat that isn't flat onto a base that is takes a bit of trial and error. I place the seat in position on the chair base, its back edge touching the back legs and its sides centered. By looking beneath the seat on the sides, I can see where the high points are and where I need to remove stock from the rails and legs. Most of the fitting involves fairing into the front legs and hollowing out the side rails where the back of the seat is lowest. With the chair base clamped into the bench vise for stability, I use my belt sander with an 80-grit belt to do most of the work. After one or two test-fittings, the seat begins to look like it belongs on the chair.**

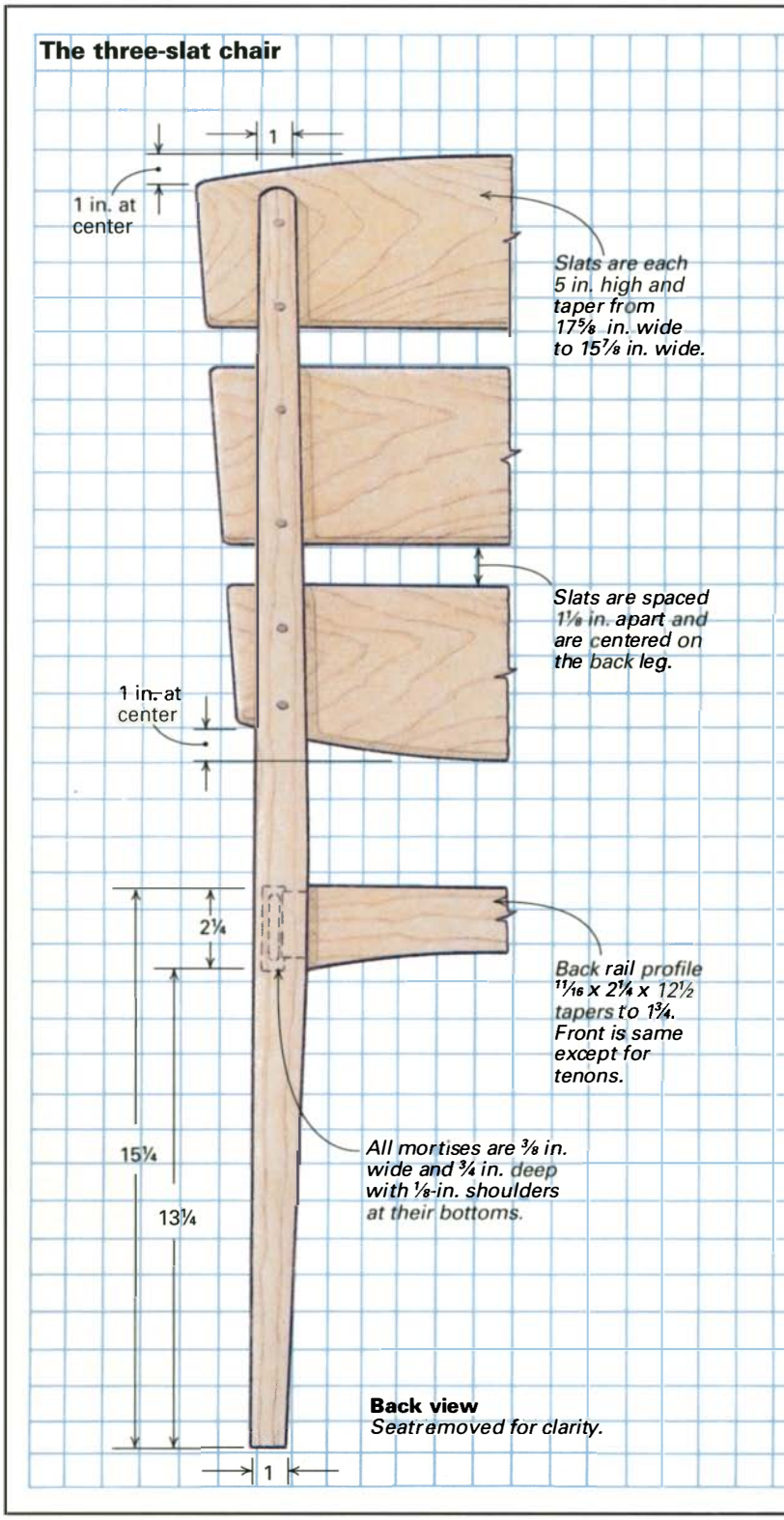
**By now, points of contact have become difficult to see. To circumvent this, I take two sheets of carbon paper (yes, its still available at office-supply stores) and place them, carbon side down, on the front edge of the chair. I press the seat down and move it slightly back and forth, which leaves dark patches at the points of contact. I work down these points with a rasp and file. After just a few more fittings, I've got a custom fit between seat and chair base.** —*C.B.*

Photos except where noted: Charley Robinson

***Quartersawn blank from flatsawn stock.*** *Quartersawn lumber is more stable than flatsawn and is easier to grain-match, but it's hard to come by and more expensive. By starting with thicker stock and laying out adjacent seat parts on top of each other across a board's width, the author created quartersawn parts.*



***Achieving a nearly perfect grain and color match*** *is possible by sawing the pieces from the same board. A steady hand and slow feed rate will keep the cuts on line, and sanding will take out the slight bandsaw ripple seen on the outside face of this board.*




blocks to the inside of each corner, notching the front blocks on the bandsaw to accommodate the leg corners. When screwing these blocks into place, I'm careful not to mount the blocks too high, which would interfere with the fit of the seat.

At this point, I finish-sanded the seat by hand to 600-grit. Then I screwed the seat to the chair base with two screws up through the front rail and two through the auxiliary back rail, both of them about 6 in. apart.

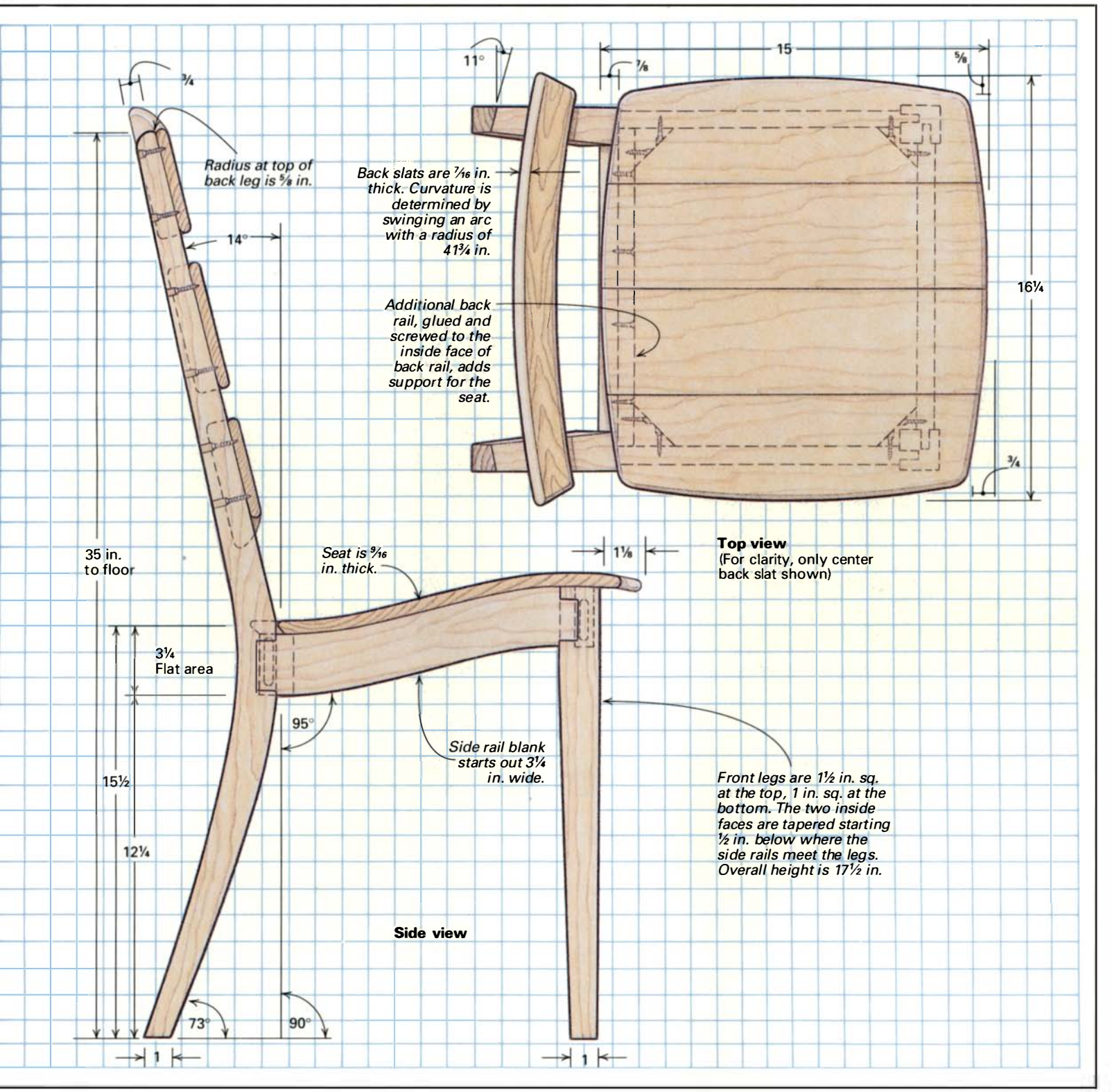
## Preparing the back slats

I took my pattern for the back slats from the full-sized drawing, transferred the shape three times onto a piece of 18-in.-long, 5-in.-wide 12/4 stock and bandsawed the slats out (see the bottom photo). This keeps the grain and color nearly the same on all three slats, from top to bottom. I shaped the top and bottom slats by giving them the same radius at the corners (viewed from the front) that I gave them front to back by cutting them on the bandsaw (see the drawing above). I also tapered the slats' width from top to bottom. I set the slats on my bench and used spacers to keep the slats 1⅛ in. apart as they will be on the chair. I marked a 1¾-in. taper from the top corner of the top slat down to the bottom corner of the bottom slat, bandsawed to the line and then smoothed the taper with rasp and file.

I repeated the sanding process I used on legs, rails and seat, ex-



Drawing: Heather Lambert




cept that I used a pneumatic spindle sander for grits 80 through 150. A random-orbit sander will also do the job, just not as quickly. I also rounded all the edges on the front faces of the back slats at this time to make the seat more comfortable and to give the chair a softer appearance overall.

I clamped the slats to the chair temporarily with spring clamps, the top one at 36 in. from the floor, the other two with 1⅛-in. spaces separating them. Then I marked the centers of the back legs, top to bottom, and I located the screw holes, two per slat on each leg.

I removed the slats and drilled countersunk pilot holes for the screws from the back side of the legs. Because the back slats were only 7/16 in. thick after sanding, I drilled through the leg just until 5/16 in. of the bit was showing. Then I reclamped the slats to the back legs and drilled into the slats until I felt the countersunk portion of the bit just bottom out. Finally, I glued and screwed the slats to the legs, plugged the screw holes carefully and resanded the backs of the legs.

I used three coats of tung oil as a finish. For a final touch, I added leather pads to the bottoms of the legs to protect fine hardwood floors from being scratched by the end grain of the chair legs. □

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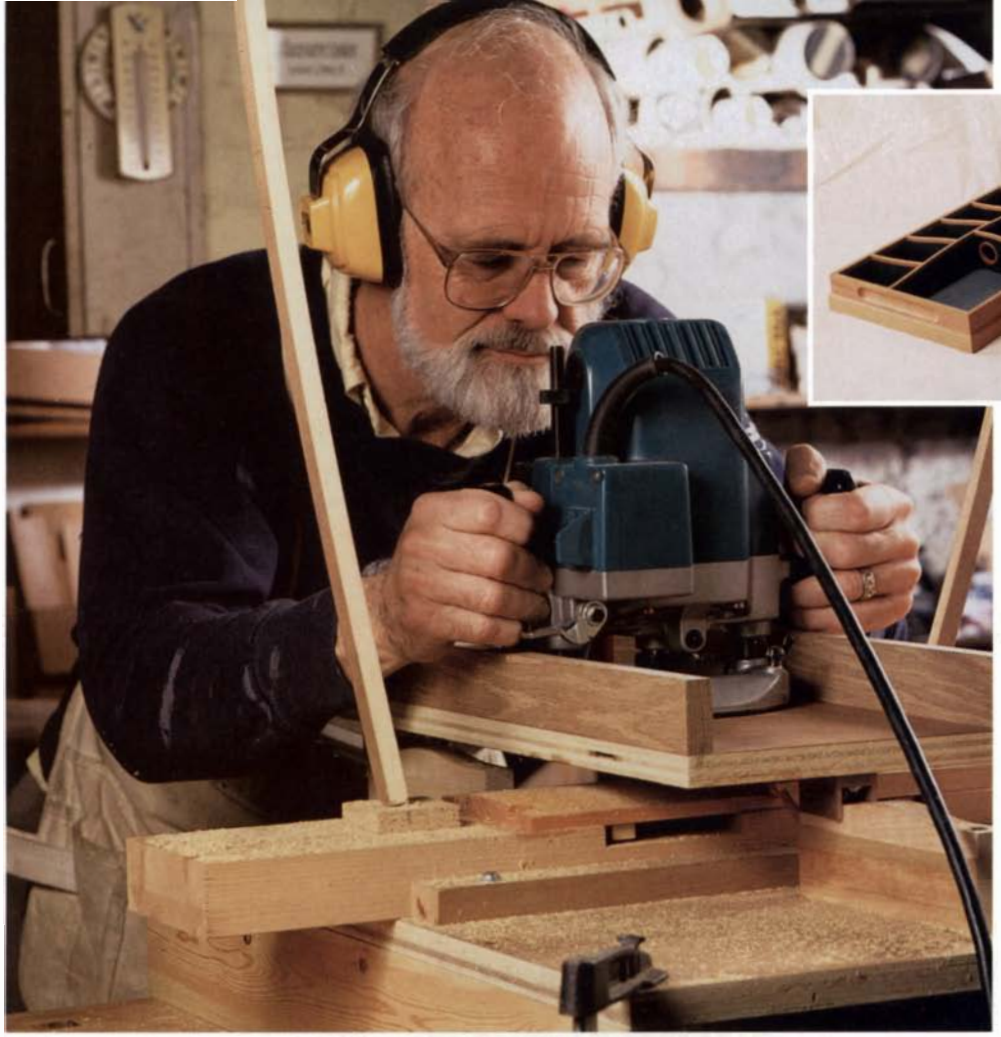
*Christian H. Becksvoort builds custom furniture in New Gloucester, Maine and is a contributing editor to* Fine Woodworking.



***Jig lets router follow any contour**—Working like a router sled, the author's jig allows quick, consistent shaping of the curved side of a box. The author wedges a pair of poles (go-bars) against the ceiling to hold the workpiece carrier in place.*

***Handsome figure, appealing shadow lines** result from the framed, vaulted lid and curved sides on the author's box.*

***The velveteen-lined tray fits neatly** into the box, resting on corner blocks to leave a space below. Curved-top dividers echo the curvature of the lid.*

# Making a Curved-Face Box

## *Jig-guided router shapes the sides*

by Abijah Reed

Several years ago, I received a commission from a family friend to build a jewelry box. She wanted something fairly simple with a tray that would lift out, but she left the final design up to me.

For a challenge, I made the box with curved sides and top (see the photos at right). The top is vaulted front to back and side to side, forming a dome, outside and inside the lid. To shape the sides of the box, I made a jig that is, in effect, a router sled (see the photo at left), which lets me pattern-rout in small, consecutive passes. The jig's guides can be made and installed easily, so you can produce any curve you like.

With the help of the drawings, I'll explain how I made the box and how the jig works. I've included only a few dimensions to give the general construction. That way, you can adapt the techniques to your design whether your box is for jewelry or for other treasures.

### Building the box

I chose cherry for the jewelry box. Cherry's grain adds simple yet elegant patterns that enhance the box's curves. I broke the box into four parts (see figure 2 on p. 84): a vaulted top panel, the sides, a plywood bottom and the tray. Each side of the box has an upper (lid) section and a lower (box) section, as shown in the top right photo. I shaped interlocking beveled lips where the lower edge of the lid mates the top edge of the box (see section A-A in figure 2 on p. 84). This is also the stage that I fit the hinges at the back of the box.

Next I temporarily joined the side sections with cleats so that I could shape each side as a single piece in my jig. (The cleats remained in place until after I had mitered, splined and glued up the box's corners.)

Because the two-section sides are about 4 in. high, I needed a way to shape a curve of that width, on sides of any length. The profiles of each of the four sides also have to match perfectly at the corners. Here's where the router jig comes in.

***The router sled***—I devised the jig shown in figure 1 below with three parts: a baseplate with three guides, a workpiece carrier and a router carriage. With the work screwed to the carrier, I move the carriage back and forth over the three parallel guides, advancing the carrier between passes. The shape of the curve is governed by the guides; the depth of cut is controlled by the router setting.

The baseplate has three guides for the same reason there are three legs on many stools: stability. Small wooden side plates, glued to the sides of the carriage followers, straddle the guides and prevent the followers from slipping off. I made the guides and followers out of hard maple, but any dense hardwood will do. It's important that the shape of the follower match the router-bit shape exactly. This way, your curve will be faithfully reproduced. Before using the jig, lightly wax the guides and followers to get the smoothest action.

The workpiece carrier provides an easy means of clamping the work down because the carrier sticks out from under both sides of the router carriage. To apply downward pressure, I used go-bars, which are just a couple of spars wedged between the work and the ceiling. (For more about go-bars, see "Methods of Work," #95, p. 18). The force of the go-bars is strong enough to hold the work during cutting, yet it's light enough to allow me to slide the carrier a small distance between router passes. After about 10 or 20 passes, I just readjust the lower end of each go-bar on the carrier, so the down pressure remains substantially vertical.

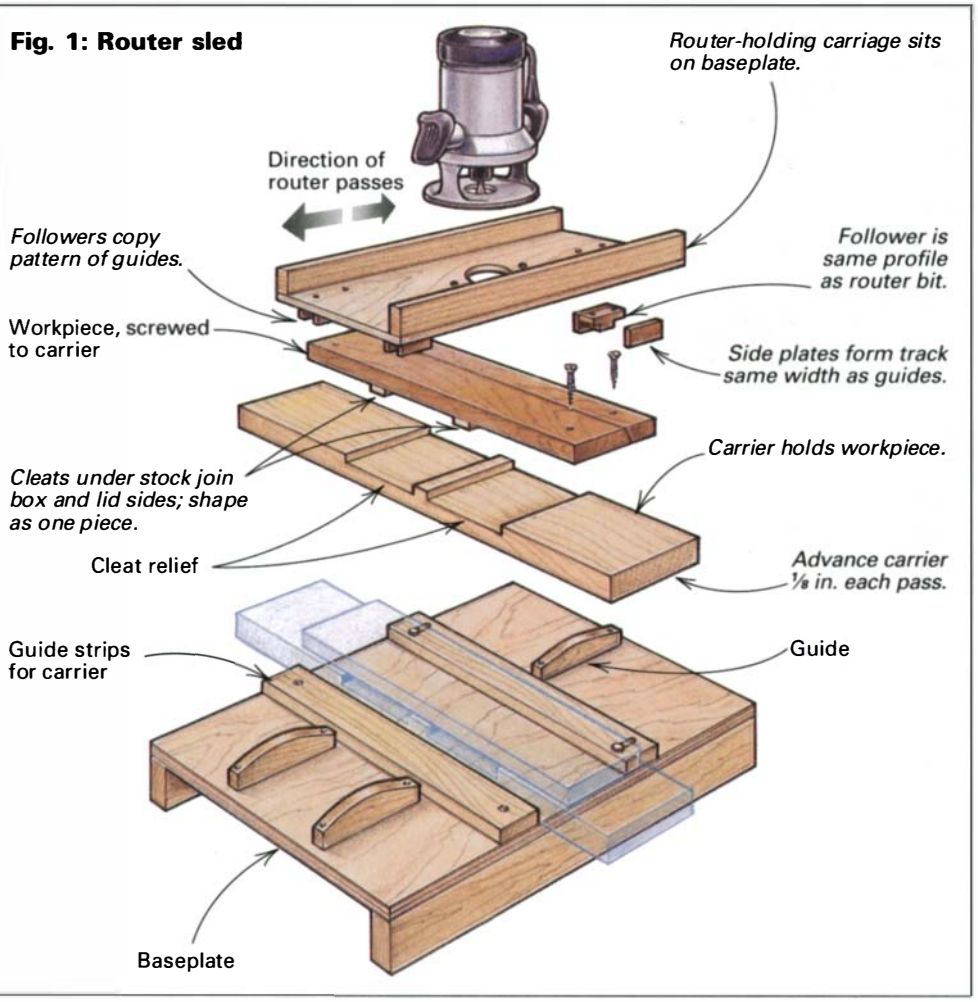
***Shaping and clamping up the sides***—When you shape wood the way I'm describing, you get a slightly scalloped surface. The scalloping effect can be reduced by moving the work less between router passes. I slide the work about ⅛ in. transversely after each pass. This leaves a surface that's ready for sanding.

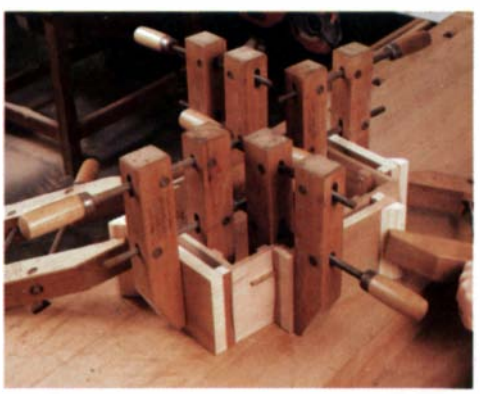
To glue the splined and mitered corners of the box, I made some clamping blocks, for each of the four sides. Each block, which is curved like a caul to mate with the box side, incorporates a 45° sloped surface to orient the clamp pad in the right direction (see the photo below).

***Forming the top***—Because the rectangular lid panel dishes on the inside and bulges on the outside, I drew ellipse-like contour lines to serve as topographic templates (see the photo on p. 84). To keep the contours even and symmetrical, I drew them on my computer. You could also freehand the lines of one quadrant, and then reflect and copy the top's other three (see *FWW* #97, p. 76). Just use a mirror or trace through a pane of glass, and then tape the quarters together.

I glued the contour drawing onto the 1-in.-thick panel stock. From side- and end-view drawings of the dome, I determined the depth of each contour line. I then plunged holes with a ¼-in. spiral bit in my router every inch along each line. As I went from line to line, I readjusted the depth of cut. (For more about depth-guide holes, see *FWW* #97, p. 69). When all the holes were routed, I freehand-carved away the waste using my angle grinder equipped with a carving wheel (King Arthur's Tool, 3225 Earl Dr., Tallahassee, Fla. 32308; 904-893-8550). I carved to within 1/16 in. of the hole bottoms, and then I

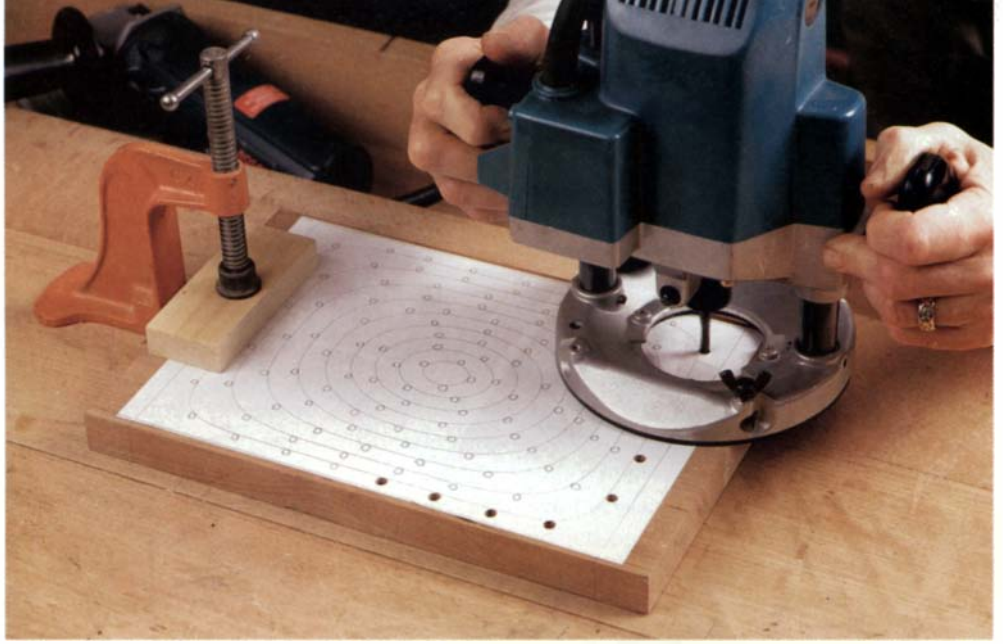
**Fig. 1: Router sled**



***Cauls and blocks enable positive clamping*** *of the box's corners. Hand screws keep the miter joints tight, and eight cleats, screwed to the box's inside, align and fix the lid sides. Before assembly, Reed used a router jig to angle each side 45° to the bit as he slotted the miters for splines.*

Photos: Alec Waters; drawings: David Dann



***Topographic lines establish the lid's contour.*** *After plunging depth-guide holes with a router, Reed shapes the lid using a power-carving wheel. Smoothing is done with sanding discs, carving burrs and hand-sanding. He uses the same method for both the lid's concave interior and the bulge on its exterior.*

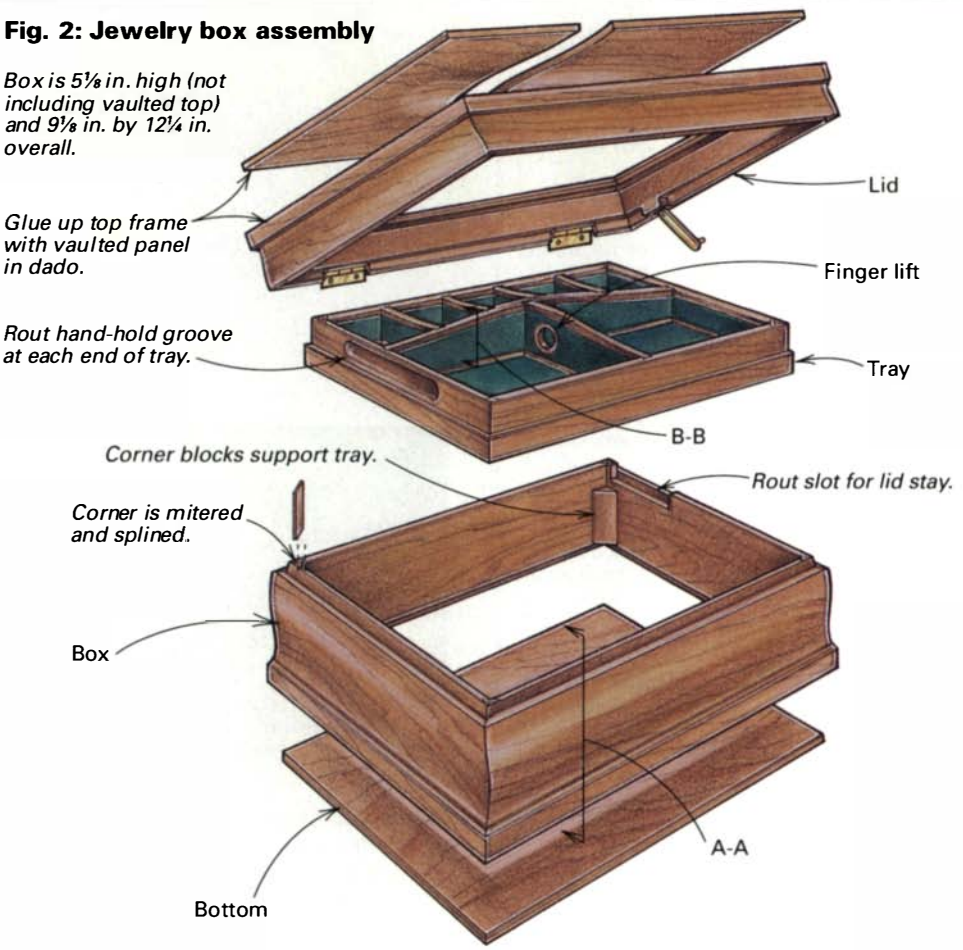
switched to finer carving burrs. I repeated this procedure to shape the panel's inner surface, too, though the curves are slightly different. (The panel tapers from ¼ in. thick at the center to around 5/32 in. thick at the edges.) Then I hand-sanded both sides.

***Assembling the lid and tray***—The lid is essentially a frame and panel. The vaulted panel (top) is not glued, but it is centered in the cross-grain direction by a notch, which fits over a block that's hidden in the frame's dado. The tray bottom is plywood, into which I routed shallow dadoes to receive the divider pieces that form the tray compartments. Because the top of the divider joints (dadoes and miters) would be exposed, I covered them with cherry veneer (see section B-B below).

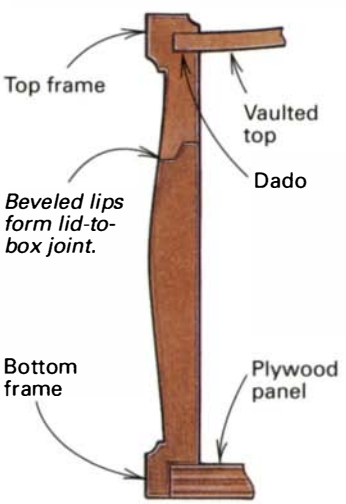
I made the center divider with a hole in the middle, so the tray can be lifted out easily, balanced on one finger. For two-handed lifting, I routed finger holds in the ends of the tray using a core-box bit. I lined the tray with velveteen. To make the material flush with adjoining wood, I routed slight tapered recesses around the edges of the dividers and the finger hole (see figure 2). The liner's recessed edges really give the box a finished look. □

*Abijah Reed makes musical instruments and furniture in Putney, Vt.*

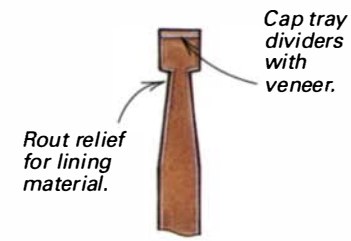
**Fig. 2: Jewelry box assembly**




**Detail: Section A-A**




**Detail: Section B-B**



# Sealers: Secret for Finishing Success

## *Techniques for smooth, durable results*

by Chris A. Minick

***Seal first for a better finish.*** *Sealer promotes adhesion and acts as a barrier between separate layers of finish. It can also reduce absorption of the final finish and simplify sanding between layers. Here, Minick brushes a 2-lb. cut of his favorite sealer, super-blond shellac, onto a mahogany tabletop.*

Ever try to duplicate the glass-smooth finish that you saw on a fine piece of furniture? Even if you match the stain color exactly, fill the grain pores properly and use an identical topcoat, somehow your finish looks different, or it doesn't feel as smooth. The reason may be that you didn't use a sealer. Understanding why to use sealers and how to apply them will bring a new dimension to your work.

Sealers are the unsung heroes of finishing. For example, high-end furniture often has several layers of finish (usually lacquer or varnish) bonded together with sealers to form a cohesive film. But you would be hard-pressed to know that the sealers are there. When I finished the mahogany tabletop shown in the photo above, I sealed before grain-filling and again before the final finish layer. However, when I started woodworking, I didn't see the usefulness of sealing. It looked like an extra step. Just by dumb luck, the oil-based varnish I used back then worked without a sealer. My early finishes were acceptable, but not great. With time, I began to experiment with different finishing techniques. Several peeling finishes later, I came to realize the error of my non-sealing ways.

### Types of sealers

Sealers serve a variety of functions in the woodshop: They ease sanding, decrease finish absorption, promote finish adhesion, and they act as a barrier coat between separate finish layers. Sealers come in several chemical compositions, each tailored to perform a specific task (see the bottom right photo on p. 86). There are three basic sealer types: varnish-based sanding sealers; lacquer-type sealers, including thinned nitrocellulose lacquer and shellac (super blond and orange); and vinyl sealers, which are tougher than the other two.

***Sealers make sanding easier***—Sanding sealers perform a dual function: They seal the wood and provide a smooth, flat substrate for the final finish. A thin coat of sanding sealer stiffens the wood fibers, so subsequent sanding will cut them off cleanly. The result is a flat, smooth ready-to-finish surface. Most sanding sealers contain metal stearates to make sanding easy. This is the same stuff used on non-loading sandpaper. The soft stearate pigments add volume to the coating. As a result, sanding sealers build fast and dry quickly, but they're relatively soft.

Resist the temptation to use sanding sealer as build coats for your finish; it's never a good idea to apply a thin, hard finish over a thick, soft one. This practice

Photos except where noted: Alec Waters

***Shellac between finish layers** improves finishes. You can sand grain-filler smooth without scratching the under layers, add colored glaze coats without them bleeding, and alternate oil- and water-based layers of finish if shellac is used between layers. Here, shellac sealer helps achieve an instrument-quality finish on mahogany.*

Photo: Robert Marsala

***To avoid blotchiness, seal before grain-filling.** The author treated the halves of this ash board differently to show the effect of sealing the wood. The dark lower part, which was not sealed before the grain was filled, displays ghost-like smudges. The more even-looking upper part was sealed before the grain was filled.*

***The best ways to apply common sealers** are to brush on shellac, both super blond and orange (left); brush on varnish-based sanding sealer (front); and spray on vinyl-based sealers (right).*


causes increased cold-checking and impact-cracking of hard lacquer finishes. To envision these phenomena, picture a thin layer of ice over soft, unfrozen mud. As you step on the ice, the mud moves, and the ice cracks. Just remember that sanding sealers are meant to be sanded down to the wood before you apply the topcoat finish. If you do this, you shouldn't have problems.

***Sealers decrease finish absorption—*** Finish-thirsty woods like cherry, pine and lauan benefit from a sanding-sealer coat, even if they don't need to be sanded smooth. The stearate solids in combination with the resin in the sealer stuff up the small pores and soft areas in the wood, thus minimizing absorption of the next coat of finish. This is particularly beneficial when you spray on a low-solids lacquer. But, if you use similar reasoning for stain, you can run into trouble. I've seen woodworkers brush sanding sealers on wood before staining in an attempt to eliminate unevenness on blotch-prone woods like pine. I haven't found this helpful. Instead, I use a home-brew of linseed oil as a pre-stain conditioner to reduce blotchiness (see *FWW* #101, p. 67).

Once you've stained the wood and it's dry, you should seal in the stain layer. This way, you can sand before the next finish layer while the sealer protects the stain from scratches. This is especially helpful if you have to do some grain-filling. Fresh shellac makes a great sealer for this, as does a thinned coat of clear lacquer. But a thin coat of vinyl sealer provides even more protection from sanding abrasion because vinyl sealers are tougher. Sealing before filling the grain will also eliminate smudges that give an undesirable ghosting effect to the wood (see the photo at left).

***Sealers promote finish adhesion—*** Oily woods like teak, rosewood and cocobolo contain natural resins that can cause major finishing problems (see the photo at right on the facing page). Lacquers may peel from the surface or become sticky after they have dried. Worse yet, some oil-based varnishes applied over these woods will refuse to dry at all. Luckily, special vinyl sealers have been developed to make the overlying finish fast, which eliminates these headaches. Vinyl sealers derive their name from the vinyl-toluene-modified alkyd resins with which they are formulated. Vinyl sealers come in a fast-drying lacquer mix for spraying or dissolved in mineral spirits for brushing under an oil-based varnish. Regardless of the carrier solvent, vinyl resins form an impervious layer between the wood and the finish, thus preventing future finish failure. For similar reasons, pigmented primers, such as BIN (William Zinsser & Co., 173 Belmont Drive, Somerset, N.J. 08875; 908-469-8100), are useful when applied under painted finishes.

When you're using vinyl sealer, pay attention to the manufacturer's instructions regarding cure time. Failure to overcoat some vinyl sealers within the specified time can lead to finish delamination. Similarly, vinyl sealers are not really compatible with water-based finishes because water-based resins will not properly ad-

***Incompatible sealer leads to a peeling finish—****Always check sealer and finish compatibility first on scrapwood. As the author discovered many years ago on this butternut door, vinyl sealer and water-based polyurethane don't mix.*

***Sealers increase finish adhesion on oily woods*** *like teak (an unfinished piece is at top). A water-based topcoat knifed with an X shows adhesion differences (from left below): shellac-sealed (good adhesion); not sealed (poor adhesion); vinyl-sealed (poor adhesion). But vinyl sealer is excellent under an oil-based topcoat.*

here to vinyl-alkyd coatings (see the photo at right). But shellac has tremendous barrier properties and adheres phenomenally to both oil-based and water-based finishing materials. Professional furniture refinishers often apply shellac over stripped wood to seal in waxes, silicones and stripper residue that would otherwise interfere with the finish. You can buy shellac pre-mixed, but I prefer to mix shellac fresh using dry flakes and ethyl alcohol. Fresh shellac brushes or sprays on, dries quickly, seals well, is compatible with all common finishes and sands easily. That's why shellac is the sealer of choice in my shop.

***Sealing between layers of finish—*** Sealers allow different finishes to be overlaid on the same project (for more on this, see *FWW* #104, p. 87). That's why sealers became an indispensable part of my finishing routine when I started doing multi-layer finishes. For instance, my favorite mahogany finish consists of a yellow ground stain followed by grain filler, three different-colored glaze layers and two or three finish coats. Although I don't use this finish sequence often, when I do, it sure is pretty (see the top right photo on the facing page).

Here's how the sealer works: Each layer is separated from the next by a coat of shellac. The sealer over the ground stain protects it from abrasion when sanding the filler, and sealer prevents the color from bleeding into subsequent layers. The grain filler is sealed to prevent the porous filler from absorbing color from the first (rosewood) glaze coat. Sealing after this glaze layer keeps it from "walking" into the next (walnut) glaze coat. Another layer of shellac lets me use an oil-based asphaltum glaze (needed for its color) over the water-based glazes. After I seal the asphaltum layer, I brush on a water-based topcoat. This finish would not be possible without the shellac sealer coats.

A word of caution when you're layering finishes: Make sure all your base coats, topcoats, sealer coats and fillers are chemically compatible. The door in the photo at left is a classic example of what can happen when you ignore this simple rule. I left the peeling water-based topcoat as a reminder of this lesson. Generally, it's wise to choose all your materials from the same finishing family. For instance, varnish sealer and oil-based pore filler can be used under polyurethane. The same philosophy holds true for finishes in the lacquer family and for the water-based finish family. I've had good luck combining oil-based sealers, fillers and stains with water-based topcoats, as long as I seal between each layer with fresh shellac. But the only sure way to tell if your finish layers will be compatible is to test your entire finishing sequence on scrap before you commit it to your project. A little up-front sealer testing can save hours of stripping hassles later. □

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*Chris Minick is a finishing chemist and a woodworker in Stillwater, Minn. He is a regular contributor to* FWW.

# Reflections from a Golden Era

## *A carver and a gilder team up to craft gold-leaf tables*

by Nancy Thorn

***The Rolls-Royce of gold-leafing—****Water-gilt gold-leafing is the pinnacle of the gilder's art, and this table is covered with more than 6,500 sq. in. of the finest, Russian 23k gold leaf. A pair of these tables, reproduced from a photo in an auction-house catalog, required 2,000 hours of intricate carving and gilding to complete.*

The contractor was trying to satisfy his client, who had been unable to purchase a pair of tables when they had come to auction. Now he approached Steve Pancoast, a Portland, Oregon-based master carver and designer. He showed Pancoast an auction catalog photograph of an elaborately carved and gilded pier table of the Rococo era. Then he told Pancoast, "I want two, just like this one."

The complicated joinery of the tables made them a woodworker's nightmare, but the intricate detailing was a carver's dream, and a gilder's glory. I got involved when Pancoast called me about gilding the tables.

Pancoast's task was daunting. He had to create a structurally sound, authentically sculpted design from a flat image only 5 in. high. The single photograph offered him only a few clues to the table's construction. Hairline stress fractures telegraphed through the gesso and gold leaf to reveal some of the intricate joints. The picture also showed the worn condition of the early 19th-century pieces: the chipped gesso, the gold leaf worn through, exposing warm,



Photos: Nancy Thorn

***Water-gilding is a tedious task.*** *Working on small areas at a time, tissue-thin sheets of gold are delicately laid onto the carved, gessoed and burnished clay surface. The leaf then must be burnished with agate and rubbed with rottenstone.*

red clay and what appeared to be a painted faux marble top.

Pancoast decided to make an interpretation rather than an exact duplicate from the photograph. The bases were constructed of basswood because it is a fine carving wood. The close grain and stability of basswood also make it excellent substrata for the gesso primer used under the water gilding.

Each section was carved separately to a final rough-out stage, fitted together and detailed. Given the limited space between all the elements, it was tight chisel work.

Carving for a gilded piece required that Pancoast exaggerate all his cuts, or overcarve, and leave his carving somewhat unrefined. Without overcarving, the thick layers of gesso would have obliterated all the details. In spite of this, the completed carvings were so beautiful it seemed a shame to paint them white with gesso.

The gilding decisions, in comparison to the design and construction, were fairly straightforward. It was obvious from the photograph and the era of the originals, that the tables were water gilded: the Rolls Royce of gold-leaf finishes.

Gilding is a three-step process that includes applying gesso, gilder's clay and gold leaf. Gesso is a calcium-carbonate, water, and rabbit-skin-glue mixture that fills the wood's pores and provides a smooth base for the gilder's clay. I applied six coats of gesso and then smoothed it with wet cotton rags and boar's hair brushes. Then the pieces were ready for clay.

Gilder's clay is traditionally ochre and warm, brick red in color. The ochre color hides the breaks in the gold's deep hollows, and a second red coat warms the gold and leaves a rich surface when seen through worn areas in the gold. The clay contains rabbit-skin glue, which is the agent that adheres the gold to the clay.

We were lucky to get some 23k Russian gold leaf because it has a wonderful, rich, deep color and is especially heavy in weight. I start applying the leaf at the top of the piece. The area to receive the gold is flooded with distilled water and a piece of gold leaf, cut to approximate size for a given area, is picked up and placed with a wide flat brush called a gilder's tip.

***Basswood carves and gilds well.*** *The dogs, and other major sections of the table bases, were rough-carved in basswood and joined together. Once assembled, the carvings were completed and the wood gilded.*

The water soaks into the gesso, pulling the gold down with it onto the surface and into the hollows. The rabbit-skin glue adheres the gold to the clay. So it goes, onto the next area, with each piece slightly overlapping the other pieces of gold leaf around it.

These sheets of gold were 3¼ in. by 4 in., and we used 500 of them for each table. Almost every gilded surface was burnished with an agate that polishes the clay underneath, which increases the gold's reflectivity and brings it to a high shine. For these two tables, we had to put in 70 hours of burnishing alone, a tedious and hand-numbing job.

When the client saw the newly gilded pieces, he was so enthusiastic that we only needed to use a little rottenstone to take the edge off the shine and expose a little of the red clay here and there, where worn areas would naturally occur. A single coat of thinned garnet shellac finished the tables. The top frames were bolted onto the base, and the shaped, marble tops were dropped into place.

With more than 2,000 hours of labor and $1,200 of materials invested, people often ask, "was it worth the effort?" You bet! We satisfied the client and ourselves, the best of all worlds. □

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*Nancy Thorn has been conserving, restoring and also doing architectural gilding since 1971. Her studio is located in Portland, Ore.*

# WOODWORKER'S MART

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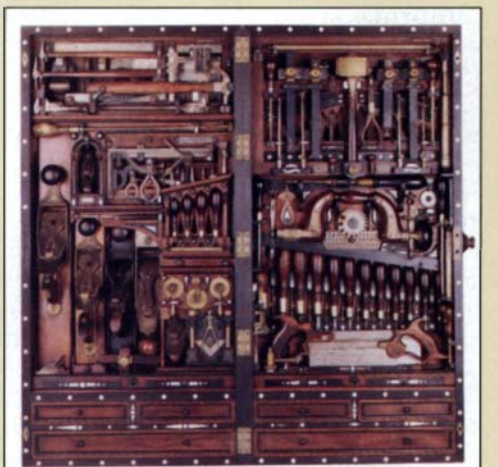

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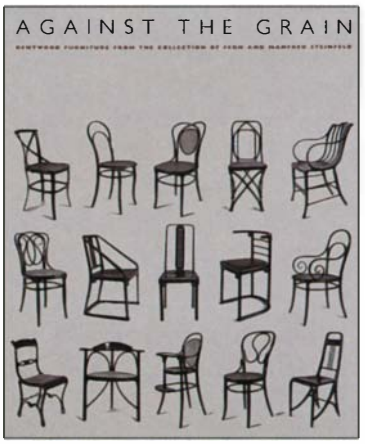
**Against the Grain: Bentwood Furniture from the Collection of Fern and Manfred Steinfeld** by Ghenete Zelleke, Eva B. Ottillinger and Nina Stritzler. *The Art Institute of Chicago, The Museum Shop, 111 South Michigan Avenue, Chicago, Ill. 60603; 1993. $29.95, hardback; 124 pp.*

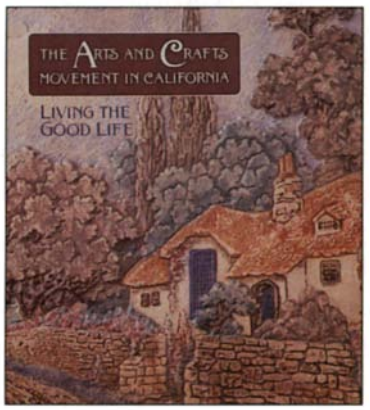



*Against the Grain* is the catalog of a recent show at the Art Institute of Chicago that charted the rise and flourishing of bentwood furniture. The furniture is superb and is shown in beautiful duotone reproductions, a process in which black-and-white images are overlaid with sepia to produce a subtle atmospheric effect. Three essays accompany the photos of the furniture and tell the story of its evolution and of the businesses that produced it.

Though there were other significant players, the main influence in bentwood furniture was the Thonet Company. By the mid-1840s, after a bumpy start, Thonet was producing bentwood pieces for the Viennese aristocracy using bent-lamination, taking thin pliable strips and gluing them up in curved forms. Later, pressured by competition and the loss of a protective patent, Thonet switched to steam-bending. The change had a profound impact, expanding Thonet's market by making the furniture cheaper to produce, easier to ship (bent parts for 36 chairs could fit in a 1-cubic-meter crate) and more durable in wet climates where delamination had posed problems.

The expansion of Thonet's business is nearly as impressive as the longevity of its beautiful designs. It was a double pleasure to see excellent pictures of the furniture while reading the engrossing history of its manufacture. *—Joshua Markel*

**The Arts and Crafts Movement in California: Living the Good Life** by Kenneth R. Trapp, et al. *Abbeville Press, 488 Madison Ave., New York, N.Y. 10022; 1993. $55., hardback; 328 pp.*




If your image of Arts-and-Crafts furniture starts with Stickley and ends with Greene and Greene, you'll find this book an eye opener. Furniture, though, is only part of the picture. The book includes photos and information on pottery, ceramic tiles, paintings, drawings, metalware, architecture and garden design.

*The Arts and Crafts Movement in California* is the catalog of an exhibition organized by the Oakland Museum of Art. It includes numerous high-quality photos along with essays, artists' biographies, company histories, a bibliography and endnotes, all clearly written and accessible. An effort was made to include objects not previously published, making this a particularly useful resource.

In nine comprehensive, thoroughly readable essays, the authors broaden and deepen the perspective on the social and artistic accomplishments and shortfalls of the Arts-and-Crafts movement. They document the changes in how people lived and worked, the experiments with utopian communities and the exclusion of minorities from the Arts-and-Crafts movement.

Along with the fine scholarship, I was inspired by the photos of furniture. Some old favorites were here, including the Greene brothers' Thorsen House sideboard, which never ceases to impress. But there are also a lot of interesting unfamiliar pieces, like the carved and elaborately painted drop-front desk by Arthur and Lucia Mathews and two beautiful redwood pieces by William Templeton Johnson, with extremely simple lines and eucalyptus-leaf and pod carvings on the front panels. *—Brian Kelly*

## VIDEO

**Hollow Turning** by John Jordan and **Bowl Turning** by John Jordan. *John Jordan Videos, 6320 Burkitt Road, Antioch, Tenn. 37013; 1993. 39.95 each, VHS; 2 hours each*


These are two exceptional how-to videos. They combine high production values with John Jordan's skill in turning and teaching. The instruction is relaxed, steady and full of insights. Jordan's commentary is friendly but focused; each process is thoroughly described, but there are also enjoyable quiet moments of just watching the shavings fly. In both tapes, Jordan's approach is low-tech. No fancy, expensive chucks or fixtures, just common-sense solutions.

Whether you are learning from scratch, wanting to progress to a more advanced level or looking for a refresher, *Bowl Turning* is hard to beat. In it, Jordan establishes basic information about the lathe, about safety and tool technique and incrementally builds upon that knowledge. Our understanding is moved steadily along with the aid of clear diagrams. Jordan emphasizes relaxed and sensitive use of a few basic tools and awareness of one's total body movements. The deep-fluted bowl gouge is the primary tool at work on both natural and flat-rimmed bowls, in both wet and seasoned stock. Grain direction, wood movement and distortion are clearly explained. The sharpening segment is probably worth the cost of the video. Power-sanding, finishing the bottom, a discussion of finishes and a compact review of design considerations round out the presentation.

*Hollow Turning* is more specific and not an entry-level tape. The knowledge and skills provided in *Bowl Turning* are all but required for success in turning hollow forms. Turning any thin-walled and small-mouthed vessel requires working by touch. Obviously, teaching something that can't be seen is difficult. Jordan's diagrams provide an understanding that is well beyond the usual demonstrations. But lightning really strikes when the bottle's whole top is removed and the wasting process is seen in full view. Jordan closes the tape with an admonition to practice, to concentrate and to plan on wrecking a few pieces! *—Steve Loar*

*Joshua Markel is a furnituremaker and writer in Philadelphia, Pa. Brian Kelly teaches woodworking at North Bennet Street School in Boston, Mass. Steve Loar is an author, teacher and turner in Warsaw, N.Y.*

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

***INTERNATIONAL:*** **Tour**-Tour Europe with George Frank, Oct. 3-13. For more information contact Eva Frank, Horizon Travel, 3530 South Osprey Ave., Sarasota, FL 34239. (813) 955-6567.
**Tour**-Crafts Study Tour in Switzerland, Oct. 7-16. For more information, contact Drew Langsner, Country Workshops, 90 Mill Creek Road, Marshall, NC 28753. (704) 656-2280.

***ALABAMA:*** **Show**-Alabama Woodworker's Guild annual juried show, Aug. 16-27. Sloss Furnace National Landmark gallery, Birmingham. For more information, contact Richard Brewer at (205) 822-1119.

***ARKANSAS:*** **Workshops**-Wood-strip canoemaking, bamboo fly-rod making, forged toolmaking for the woodworker, October thru November. White River Artisans School, 202 South Ave., PO Box 308, Cotter, 72626. (501) 435-2600.

***ARIZONA:*** **Call for entries**-Turning Plus... Redefining the Lathe-Turned Object III, Dec. 10-February 5. Deadline: Sept. 30. For more information, send an SASE to Arizona State University Art Museum, Nelson Fine Arts Center, Box 872911, Tempe, 85287-2911. (602) 965-2787.

***ARKANSAS:*** **Meetings**-Woodworker's Association of Arkansas meets the first Monday of each month at 7:00 p.m. at Woodworkers Supply Center, 6110 Carnegie, Sherwood, 72117. For more information, call (501) 835-7339.

***CALIFORNIA:*** **Workshops**-Woodworking for women. Furnituremaking with hand tools using traditional joinery, weekends. San Francisco. For more info, contact Debey Zito (415) 648-6861.
**Workshops**-Various workshops including Japanese woodworking, joinery and sharpening. For info, contact Hida Tool Co., 1333 San Pablo, Berkeley, 94702. (415) 524-3700.
**Lecture**-Recent Discoveries in Philadelphia Furniture, July 12. American Decorative Arts Forum, M.H. de Young Memorial Museum, Golden Gate Park, San Francisco, 94118. (415) 456-8177.
**Show**-Contemporary works in wood with Kim Taylor, thru July 31. St. Supery Winery, Rutherford. For more information, contact Kim Taylor Cabinetry at (707) 258-1460.
**Show**-The Carnival of Carvings by the Tri-Valley Woodcarvers, Sept. 10-11. The Barn, 3000 Pacific Ave., Livermore. For more information, call (408) 252-8251.
**Exhibition**-International Lathe Turned Objects: Challenge V, July 3-Oct. 1. For more information, contact California Crafts Museum, Ghirardelli Square, 900 North Point, Box 25, San Francisco, 94109. (415) 771-1919.
**Call for entries**-Sierra woodworking exhibition, Oct. 21-Nov. 13. Deadline: Aug. 1. North Columbia Schoolhouse Cultural Center, Nevada City. For further information, send an SASE to NCSCC, 17894 Tyler Foote Road, Nevada City, 95959. (916) 265-2826.
**Class**-Building the Norwegian Sailing Pram with Simon Watts, Oct. 10-15. For more info, contact the National Maritime Museum Association. Building 275, Crissy Field, San Francisco, 94129. (415) 929-0202.
**Show**-Woodturning by Clead Christiansen, Dennis Elliott, J. Paul Fennell, Jay Hostetler, Hugh McKay and more, thru July. The Banaker Gallery, 251 Post St., #310, San Francisco. (415) 397-1397.

***COLORADO:*** **Classes**-Woodworking and related classes, year-round. For more information, write Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401, or call (303) 988-6160.
**Juried exhibition**-Vail Arts Festival July 9-10; Beaver Creek Arts Festival Aug. 13-14. All arts media, fine crafts. Send SASE for prospectus/application to Vail Valley Arts Council, PO Box 1153, Vail, 81658. (303) 476-4255.

***CONNECTICUT:*** **Classes**-Southwest-style tables, shoji screens, Adirondack chairs and guide boats, bowl turning and strip plank boatbuilding, July thru August. For more info, contact the Brookfield Craft Center, PO Box 122, Brookfield, 06804. (203) 775-4526.
**Show**-Greater Connecticut Woodworking Expo, Oct. 28-30. New Haven Coliseum, New Haven. For more information, contact Good Living Expositions, PO Box 41, Spring Valley, NY 10977. (914) 356-2100.
**Show**-Guilford Handcrafts, July 14-16, Guilford Town Green, Guilford. For more information, call (203) 453-5947.
**Show**-On The Green, Sept. 10-11, Hubbard Street Green, Glastonbury. For more information, contact Glastonbury Art Guild at (203) 659-0634.

***DELAWARE:*** **Show**-Delaware Valley Woodworking Show, Sept. 30-Oct. 2. South Jersey Expo Center, Hall A, 2323 Route 73, Pennsauken. Contact the Woodworking Shows, 1516 South Pontius Ave., Los Angeles, CA 90025. (310) 477-8521.

***DISTRICT OF COLUMBIA:*** **Show**-Washington D.C. Woodworking Show, Sept. 23-25. D.C. Armory, Main Hall, 2001 E. Capitol St., Washington, D.C. 20003. For more information, contact the Woodworking Shows, 1516 South Pontius Avenue, Los Angeles, CA 90025. (310) 477-8521

***FLORIDA:*** **Meetings**-South Florida Woodworking Guild meets every second Monday, 7 p.m. Constantines, 1040 East Oakland Park Blvd., Ft. Lauderdale. For further information, contact Woody McLane at (305) 565-2729.
**Meetings**-Central Florida Woodworkers Guild meets the second Thursday of each month, Winter Park. For more info, call (407) 862-3338.

***GEORGIA:*** **Workshops**-Japanese woodworking by Toshihiro Sahara. One Saturday each month. Contact: Sahara Japanese Architectural Woodworks. (404) 355-1976.
**Lectures**-Setting up a small shop, July 11; the uses of the router, Aug. 8. Presented by The Woodworkers Guild of Georgia. DeKalb College Central Campus, Building H. For more information, call (404) 892-2487.

***ILLINOIS:*** **Show**-Chicagoland Woodworking Show, Sept. 16-18. Odeum North Hall, 1033 N. Villa Ave., Villa Park, 60181. For info, contact the Woodworking Shows, 1516 South Pontius Avenue, Los Angeles, CA 90025. (310) 477-8521.
**Exposition**-American Craft Exposition and sale, Aug. 26-28, The Henry Crown Sports Pavilion, Northwestern University, Evanston. For more information, call (708) 570-5096.S
**Show**-SOFA 1994: Sculpture, Objects and Functional Art, Oct. 20-23. Sheraton Chicago Hotel & Towers, Columbus Drive, Chicago. Contact: Expressions of Culture at (312) 654-0870.

***INDIANA:*** **Classes**-Various woodworking classes and workshops. For info, contact Woodworkers Unlimited, 6038 E. 82nd St., Indianapolis, 46250, or call (317) 849-0193.
**Classes**-Various hands-on woodworking classes woodturning, furniture building, finishing and technique classes. Superior Woodworking Supply, 922 Ft. Wayne Ave., Indianapolis, 46202. (317) 635-5747.
**Call for entries**-Works in Wood, Oct. 1-30. Deadline: Aug. 1. Chesterton Art Gallery, 114 South Fourth St., Chesterton. For info, contact Marsha Demkovich at (219) 926-4711.

***KANSAS:*** **Meeting**-International Wood Collectors Society Annual Meeting, Aug. 7-11, Topeka, Kansas. Wood and woodcraft auctions, woodworking demonstrations, woodcraft displays, wood sample sales and swap. For more information, contact Allan Ingle, 217 N.W. 35th St, Topeka, 66617.

***KENTUCKY:*** **Workshops**-Woodturning and joinery instruction. For further information, write Jim Hall, Adventures in Wood, 415 Center St., Berea, 40403, or call (606) 986-8083.
**Meetings**-Kyana Woodcrafters Inc. meets the first Thursday of each month. Bethel United Church of Christ, 4004 Shelbyville Road, Louisville, 40207. For info, call (502) 426-2991.
**Workshops**-Traditional Windsor chairmaking instruction. One-week courses. For further information, contact David Wright (606) 986-7962.
**Workshops**-Woodturning workshops with Rude Osolnik, May thru September. All ability levels welcome. For more information, call (606) 986-4440.

***MAINE:*** **Workshops**-Two-week basic and intermediate furnituremaking courses. Faculty includes Peter Korn, Skip Benson, John McAlevey, Charles Durfee, Bill Thomas, Scott Hausmann, and Owen Edwards. For more information, contact Center For Furniture Craftsmanship, 125 W. Meadow Road, Rockland, 04841. (207) 594-5611.
**Show**-Fourth Annual Woodworker's Show, July 9-10, Bridgton Historical Society's 18th century farm "Narramissic," in South Bridgton. Contact: Greg Marston at (207) 647-8378.
**Juried show**-Third annual Guild of Maine Woodworkers show, Aug. 4-8. Maine Festival at Tomas Point Beach, Brunswick. For info, contact Karl Grose at (207) 443-2843.
**Meetings**-Guild of Maine Woodworkers meets the first Wednesday of every month. For time and location, call Guild of Maine Woodworkers at (800) 805-5100.
**Internship**-Summer boat building internship offered by The Landing School of Boat Building and Design in Kennebunkport. For more information, call The Landing School at (207) 985-7976.

***MARYLAND:*** **Workshops**-Basic and advanced chip carving with Wayne Barton; basic woodturning with Frank Amigo, May thru September. Maryland Hall for the Creative Arts, Annapolis. (410) 263-5544.
**Meeting**-Chesapeake Woodturners Regional Conference '94, Annapolis. Featuring demonstrations by David Ellsworth, Giles Gilson, John Jordon, Bonnie Klein. For more information write to Conference '94, Chesapeake Woodturners, 403 Chesterfield Ave., Centreville, 21617. Written inquiries only.
**Show**-Havre de Grace Arts & Crafts Show, Aug. 20-21. Tydings Memorial Park, Havre de Grace. For more information, contact The Havre de Grace Arts & Crafts Show, PO Box 150, Havre de Grace, 21078.(410) 939-0121.

***MASSACHUSETTS:*** **Instruction**-Full-time program in fine furniture construction. Complete facilities. Wm. B. Sayre, Inc., One Cottage St., Easthampton, 01027. (413) 527-0202.
**Classes**-Woodworking classes, throughout most of the year. For information, contact Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.
**Workshops**-Summer woodworking workshops of one and two weeks, thru August. For beginning and advanced students. For info, contact the North Bennet Street School, 39 North Bennet Street, Box SW, Boston, 02113. (617) 227-0155.
**Workshops**-Various woodworking workshops thru October. The Heartwood School, Johnson Hill Road, Washington, 01235. (413) 623-6677.
**Workshops**-Toolmaking for woodworkers. First three weekends of each month, registration limited to two students per weekend. For more info, contact Ray Larsen, Genuine Forgery, 1126 Broadway, Hanover, 02339. (617) 826-8931.
**Classes**-Make a Mt. Lebanon candle stand, Shaker lap desk, writing-arm Windsor chair, or Shaker oval boxes. July thru September. Berkshire Workshops, PO Box 928, Sheffield, 01257. (413) 229-3280.

***MICHIGAN:*** **Meeting**-Michigan Violinmakers Association, July 31. Visitors welcome. Host: Bob Mead, 1661 Heather Wood, Troy, 48098. For more information call (313) 641-5138.

***MINNESOTA:*** **Classes**-Woodcarving classes year-round. For information, contact the Wood Carving School, 3056 Excelsior Blvd., Minneapolis, 55416. (612) 927-7491.
**Exposition**-Blue Earth Minnesota Woodcarvers Exposition, Aug. 26-28. Contact: Blue Earth Area Chamber of Commerce, 111 North Main, Blue Earth, 56013. (507) 526-2916.

***MISSISSIPPI:*** **Classes**-Various woodworking classes. For more info, contact Allison Wells School of Arts & Crafts, Inc. Canton. (800) 489-2787.

***MONTANA:*** **Show**-Montana Woodcarvers Good Wood Show V, Sept. 30-Oct. 2. Billings Elk's Club, 934 Lewis. For more information, contact Dick Torbert (406) 628-7447.

***NEBRASKA:*** **Meetings**-Omaha Woodworkers Guild meets at 7 p.m. the third Tuesday of every month. Westside Community Center, Omaha. Contact: John Cahill, 334-5550.

***NEW HAMPSHIRE:*** **Classes**-Fine arts and studio arts. Manchester Institute of Arts and Sciences, 114 Concord St., Manchester, 03104.
**Classes**-Various woodworking classes. For information, contact The Hand & I, PO Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.
**Auctions**-Antique and craftsman's tool auctions, year-round. Contact: Richard A. Crane, Your Country Auctioneer, 63 Poor Farm Road, Hillsboro, 03244. (603) 478-5723.
**Workshops**-Week-long Shaker-style furniture and chairmaking workshops, year-round. For more info, contact Mary Sweet, Dana Robes, Wood Craftsmen, Lower Shaker Village, Enfield, 03748. (603) 632-5385.
**Workshops**-Windsor Chairmaking. For schedules, contact Mike Dunbar, Box 805, Portsmouth, 03802. (603) 431-4676.
**Fair**-League of New Hampshire Craftsmen's Fair, Aug. 6-14, Mt. Sunapee State Park, Newbury. For more information, call (603) 224-3375.

***NEW JERSEY:*** **Exposition**-Central Jersey Woodworking Expo, Sept. 23-25. Monmouth Park, Oceanport. For more information, contact Good Living Expositions, PO Box 41, Spring Valley, NY 10977. (914) 356-2100
**Show**-Delaware Valley Woodworking Show, Sept. 30-Oct. 2. South Jersey Expo Center, Hall A, 2323 Route 73, Pennsauken. For more information, contact the Woodworking Shows, 1516 South Pontius Avenue, Los Angeles, CA 90025. (310) 477-8521
**Show**-Peters Valley Craft Fair, July 30-31, Peters Valley Craft Center, 19 Kuhn Road, Layton, 07851. (201) 948-5200.

***NEW MEXICO:*** **Classes**-Woodworking classes. North New Mexico Community College, El Rito, 87520. (505) 581-4501.
**Classes**-Fine woodworking classes. For more information, write Santa Fe Community College, Santa Fe 87502, or call (505) 438-1361.

***NEW YORK:*** **Classes**-Various beginning and advanced woodworking classes. Constantine's, 2050 Eastchester Road, Bronx, 10461. (718) 792-1600.
**Classes**-Traditional 18th-century woodworking techniques with Mario Rodriguez. Contact: Warwick Country Workshops, PO Box 665, Warwick, 10990. (914)-986-6636.
**Meetings and classes**-New York Woodturners Association meets bi-monthly. YWCA, 610 Lexington Ave. (53rd. St.) New York City. Contact Howard Alalouf (914) 337-0226.
**Classes**-Various gilding classes for fine furniture, antiques, frames, carvings, restoration. Center for the Gilding Arts, 381 Park Ave. South, New York City. (212) 683-4822.
**Classes**-Boatbuilding, refinishing, paddlemaking, woodbending lapstrake planking, thru September. For more information, contact The Antique Boat Museum, 1000 Islands, Clayton, 13624. (315) 686-4104.
**Classes**-Woodworking, turning, carving, furniture finishing, and refinishing, beginner to advanced. The Crafts Students League at the YWCA, 610 Lexington Ave., New York City, 10012. For more information, call (212) 735-9731.
**Classes**-Building a Shaker Blanket Chest and Advanced Shaker Furniture Design, begins, mid-September by Eric Eklum. For more information, call the director of adult education, Jamestown Public Schools (716) 483-4384.
**Show**-Chautauqua Crafts Festival, July 8-10 and Aug. 12-14. Chautauqua Institution. For more information, contact the Chautauqua Crafts Alliance, PO Box 389, Fredonia, 14063-0389. (716) 679-3413.
**Show**-Snug Harbor Craft Fair, Sept. 30 and Oct. 1-2. Newhouse Center for Contemporary Art, Snug Harbor Cultural Center, Staten Island. For information, call (718) 448-2500.

***NORTH CAROLINA:*** **Meetings**-North Carolina Woodturners, second Saturday of each month. For more information, contact PO Box 1833, Hickory, 28603. (704) 324-5960.
**Classes**-Carving, turning, toolmaking bowls, vessels and more, May thru July. For more information, contact the John C. Campbell Folk School, Route 1, Box 14A, Brasstown, 28902. (800)-365-5724.
**Classes**-Furniture design and construction, carving for furniture and sculpture, joints and joint technology, hand-cutting the dovetail, May thru August. For further information, contact the Penland School of Crafts, Penland, 28765-0037. (704) 765-2359.
**Workshops**-Summer workshops in chairmaking joinery turning boatbuilding, woodworking with kids. For more information, contact Drew Langsner at Country Workshops, 90 Mill Creek Road Marshall, 28753. (704) 656-2280.
**Show**-Annual North Carolina Piedmont Woodcarvers Show, Oct. 1, Statesville. For information, contact Bob Williams, Route 7, Box 234, Mooresville, 2815. (704) 663-3736.
**Show**-Summerfest Art and Craft Show, Asheville Civic Center, Aug. 19-21. For more information, contact Gail Gomez, High Country Art and Craft Guild, 13 Biltmore Ave., Asheville, 28801. (704) 252-3880.

***OHIO:*** **Workshop**-Getting professional results with the shaper with Lonnie Bird, July 30-Aug. 27. University of Rio Grande. For more information, call (614) 245-7325.

***OKLAHOMA:*** **Show**-Eastern Oklahoma Woodcarvers Association 18th annual woodcarving show, July 8-10. Tulsa Promenade Shopping Mall, 4107 S. Yale Ave. For more information, contact Russell Hayman (918) 847-2236.

***OREGON:*** **Meetings**-Cascade Woodturner's Association meets every third Thursday. For information, contact Cascade Woodturners, PO Box 91486, Portland 97291.
**Classes**-Oregon School of Arts and Crafts, 8245 S.W. Barnes Road, Portland, 97225. (503) 297-5544.
**Call for entries**-Table, Lamp + Chair 1994, Sept. 24-Oct. 22. Portland. Deadline: Aug. 12. For more information, or entry form, send a SASE to Furniture & Lighting Design Competition, PO Box 5906, Portland, 97228-5906. (503) 226-3556.

***PENNSYLVANIA:*** **Classes**-Windsor chairmaking, weekly and weekends. Contact Jim Rendi, Philadelphia Windsor Chair Shop, PO Box 67, Earlville, 19519. (215) 689-4717.
**Festival**-Central Pennsylvania Festival of the Arts, July 14-17. State College. Contact Katherine Talcott, Visual Arts Director, PO Box 1023, State College, 16804-1023. (814) 237-3682.
**Workshops**-Woodcarving seminars, thru August. Sawmill Center for the Arts, PO Box 180, Cooksburg, 16217. For more information, contact Marilyn Karns (814) 677-3707.
**Call for entries**-First Wharton Esherick Museum Woodworking Competition/Exhibition. Deadline: July 15. For information and application, send SASE to Wharton Esherick Museum, PO Box 595, Paoli, 19301-0595. (610) 644-5822.
**Workshops**-Woodturning with David Ellsworth, July 22-24 and 29-31. For info, contact David Ellsworth, Fox Creek, 1378 Cobbler Road, Quakertown, 18951. (215) 536-5298.
**Show**-Penn's Colony Festival and Marketplace, Sept. 17-25, North Park, Pittsburgh. For further information, write to Penn's Colony Festival, PO Box 8157, Pittsburgh, 15217, or call (412) 487-6922.

***TENNESSEE:*** **Workshops**-Green wood turning, Windsor chairmaking, woodcarving, turning hollow vessels, July 11-15. For more info, contact the Tennessee Technological University, Appalachian Center for Crafts, Box 430, Route 3, Smithville, 37166. (615) 665-0502.
**Show**-Smoky Mountain Woodcarvers Show, Sept. 30-Oct. 2, Dollywood, Pigeon Forge. For further information, call (615) 691-1855.

***TEXAS:*** **Meetings**-North Texas Woodworker's Association meets the third Tuesday of each month. Contact Bruce May. NTWA, PO Box 831567, Richardson, 75083. (214) 271-0125.
**Classes**-Woodworking classes year-round. Bowl turning basics to advanced furniture and cabinetry. Woodshop, Inc. Woodworking School, 1225 W. College, Suite 612, Carrollton, 75006. (214) 466-3689.

***VERMONT:*** **Courses**-Yestermorrow Design and Building School, Route 1 Box 97-5, Warren, 05674. (802) 496-5545.
**Workshops**-Carving wood sculptures, July 16-19, Aug. 13-16 and Sept. 10-13. For more information, contact Timothy Fisher, 50 N. Pleasant St., Middlebury, 05753. (802) 388-4520.

***VIRGINIA:*** **Show**-Claytor Lake Arts and Crafts Show, Sept. 3-5, Claytor Lake State Park, near Dublin. For more information, contact Kathy Hudson, PO Box 1369, Salem, 24123. (703) 389-6163.
**Call for entries**-The Wood Show IV, Aug. 6-28. Deadline: July 10. For more information, contact the Middle Street Gallery, PO Box 341, Washington, 22747. (703) 675-3440.

***WASHINGTON:*** **Show**-Foundry Furniture: Forged and fabricated functional art, Aug. 11-Oct. 9. Peterson Art Furniture, 122 Central Way, Kirkland, 08033. (206) 827-8053.

***WEST VIRGINIA:*** **Workshops**-Progressive Windsor chairmaking, July 10-15; twig furniture, July 18-22; basic cabinetry, July 24-29. For more info, contact Crafts Center, Cedar Lakes, Ripley, 25271. (304) 372-7873.

***CANADA:*** **Workshops**-Five days of intensive hands-on Ultra-Lite-Sawmilling in a rain forest on a small N.W. Pacific Island with Will Malloff. The North Island College, Box 320 Sointula, B.C. V0N 3E0. (604) 974-5429.
**Workshop**-Traditional Windsor chairmaking. Weekly courses. For more information or a brochure, contact David Goodwin, The Village Chairmaker, Sparta, Ont., N0L 2H0. (519) 775-2751.
**Call for entries**-The Wood Show, Aug. 5-7. Five categories: chairs, birds, bird houses, turning and miniatures. For more information, contact The Wood Show, Box 920, Durham, Ont. N0G 1R0. (519) 369-6902.
**Workshop**-Birchbark Canoe Building, July 23-Aug. 7. The course is on Lake Superior (Wisconsin). For information, contact David Gidmark, Box 26, Maniwaki, Que. J9E 3B3.
**Workshop**-Contemporary Turning and Furniture Design, July 29-Aug. 1. For more information, contact Saskatchewan Craft Council, c/o Michael Hosaluk, 813 Broadway Ave., Saskatoon, Sask., S7N 1B5. (306) 382-2380.
**Call for entries**-North Bay Wood Show, Aug. 19-21, Memorial Gardens Fairgrounds, Chippewa St. Deadline: Aug. 1. For more info, contact Cryderman Productions, 136 Thames St., Chatham, Ont. N7L 2Y8. (519) 351-8344.
**Call for entries**-Markham Wood Show, Sept. 9-11. Markham Fairgrounds, McCowan Road, N. of Highway 7. Deadline: Sept. 1. For more info, contact Cryderman Productions, 136 Thames St., Chatham, Ont. N7L 2Y8. (519) 351-8344.
**Call for entries**-Edmonton Wood Show, Sept. 30-Oct. 2. Northlands Agricultural Complex, 73rd & 116th Ave. Deadline: Sept. 15. For more info, contact Cryderman Productions, 136 Thames St., Chatham, Ont. N7L 2Y8. (519) 351-8344.
**Show**-Contemporary Woodturning and Furniture Design, July 29-Aug. 1. SIAST, Kelsey Institute, Saskatoon, Sask. For information, contact the Saskatchewan Craft Council, 813 Broadway Ave., Saskatoon, Sask. S7N 1B5. (306) 653-3616.
**Association**-The Canadian Woodturners Association. To receive our quarterly newsletter, CWA membership and benefits, send $20 to 12A-4991 Highway 7 East, Suite 236, Markham, Ont., L3R 1N1, or call (905) 479-0755.
**Workshops**-Courses on ecosystem-based forest use. Introduction, Aug. 15-19; forest hydrology Aug. 29-Sept. 2; landscape ecology, Sept. 19-23; stand level management, Sept. 26-30. For more information, contact Silva Forest Foundation, PO Box 9, Slocan Park, B.C., V0G 2E0. (604) 226-7222.

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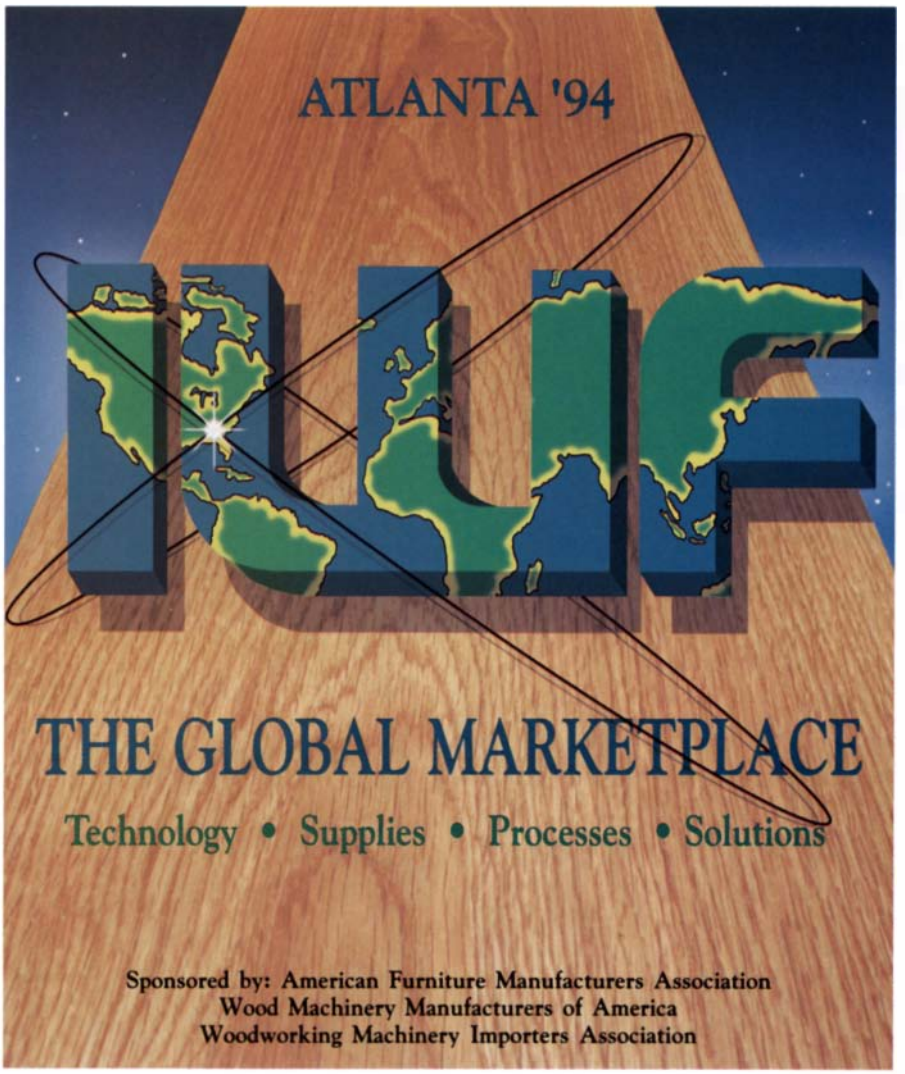


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***Carving for furniture**—Nearly all of Patrick Trujillo's furniture contains carving. To rough-out this mahogany sea horse, he uses both Japanese and English carving tools. Trujillo also made the traditionally carved pine sideboard in the background.*

## Carving a niche in the governor's office

When Judy Adams spotted an advertisement for a furniture competition, she thought this was just the break her furnituremaker boyfriend, Patrick Trujillo, needed. In the advertisement, the New Mexico Arts Commission sought a designer/builder to construct hallway furniture and a formal desk and credenza for the governor's office. Trujillo feared that the selection committee might be looking for an old-fashioned Spanish-colonial design. But Adams, who is also an artist, persuaded him that there was no way of telling what the final criteria might be. She told Trujillo to offer his best work and to expect to win the job.

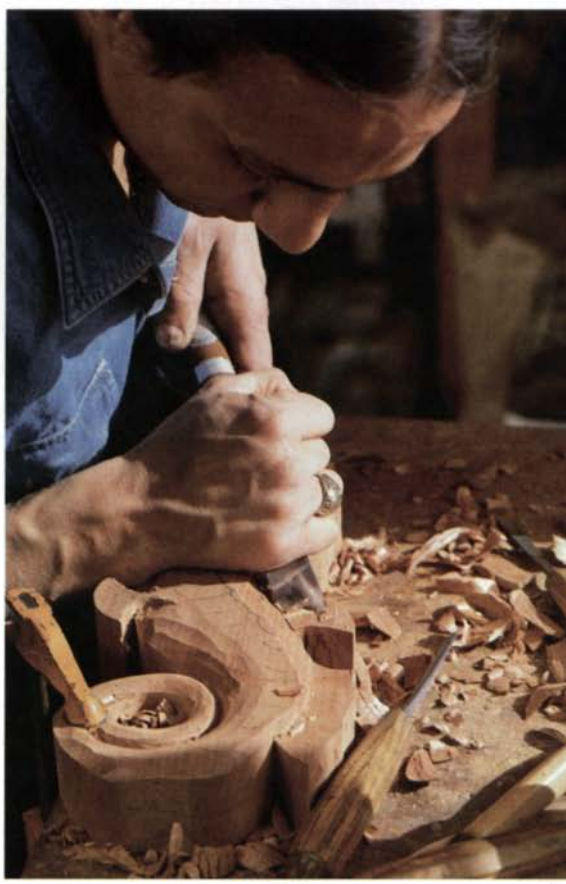
Two days before the application deadline, Trujillo, a self-proclaimed prince of procrastination, told one of the project's designers that he lacked a resume. "No problem," said the designer, as he took down facts about the maker. Trujillo said, "He made me look like a genius on paper."

With the addition of some photos of previous work, Trujillo's application made it to the next round of the competition: creating scale drawings for furniture groupings around the capitol building.

Next Trujillo hitched up the horse trailer (also his live-in studio), loaded the horses, dog, food and a few tools and headed for his mountaintop hideout. His home shop (see the photo above left), located in the 500-folk town of La Madera, N.M., is already pretty secluded by most peoples' standards. But for real inspiration, Trujillo prefers the solitude of the mountains and canyons (see the photo above right).

Over a long weekend, Trujillo created a set of drawings that made a good impression on the project's interior designer. She asked for changes, but they moved the design closer to the simpler and more modern styling that Trujillo prefers. With a foot in the door, Trujillo went back to the mountains for another week of drawing.

***Inspired by a sacred land**—Reached by horseback, this mountain overlooking a New Mexico canyon provides Trujillo a secluded retreat to seek ideas for carving. Shown below surveying the landscape, he uses nature for most of his inspiration. He often takes wooden panels with him to carve, so he can be totally focused.*



***Carving new life into wood**—Like Geppetto shaping Pinocchio, Patrick Trujillo turns a piece of mahogany into a lifelike creature. Starting with a block, and occasionally referring to his sketch, he carves a sea horse for a built-in cabinet at Evangelo's bar in Santa Fe, N.M.*

Photos this page: Alec Waters

This time, he included sketches of the carvings he had in mind (similar to the one in the photo at left on p. 102). The new drawings took him past the hall furniture level. His concept of cherry and walnut furniture with perimeter panels carved in restrained New Mexico motifs had finally earned him the prized governor's desk and credenza commission. Trujillo confided that, ideally, he wishes he could have also built some of the hall furniture, so everyday citizens could see his work. But it was good that other makers got their chance, too.

All the qualifying rounds and a negotiation over the price of the work had slowed the start of the project. The commission said the job should cost $16,000, but Trujillo needed $20,000 (materials alone cost around $8,000). He won that bout and began his solo effort to beat the scheduled completion date. To decrease interruptions, he worked all night and slept during the day. Despite the urgency, he stuck to a plan that used no metal fasteners and allowed complete freedom for the wood to move. All the carving was done by hand (see the bottom right photo on p. 102). Working 14-hour days, except Thanksgiving and Christmas, Trujillo completed the desk. But not the credenza!

In a cold sweat, Trujillo went to the committee to confess he couldn't meet the deadline. Fortunately, construction problems had delayed completion of the capitol by one month. After another round-the-clock work cycle, Trujillo delivered the 650-lb. desk and 400-lb. credenza on time (see the back cover for the finished pieces).

Trujillo said that he thanks Adams the most for giving him the initial motivation. Though he feels he collected his biggest reward in the form of increased self-esteem. As he put it, "To get the job, design it and build it in six months—I couldn't believe I did it."

*—Sven Hanson, Albuquerque, N.M., and Alec Waters, associate editor*

## Wendell Castle piano debuts

A 9-ft. grand piano built by Wendell Castle debuted in March at the Toledo Museum of Art, which commissioned the piece.

The work is Castle's fifth piano, including the commemorative 500,000th Steinway piano he built in 1987. That piano was featured on the back cover of *FWW* #74. The new piano features a light-colored, curly maple-veneered case resting on a base veneered in 50-year-old cocobolo. Instead of three legs, the piano has two curving, laminated supports. Steinway and Sons worked with Castle during the design process, said a museum spokesman.

Based in Scottsville, N.Y., Castle is internationally recognized for his highly sculptural art furniture designs. A free brochure about the piano and Castle's piano designs has been published with support from the Peter Joseph Gallery in New York City. For more information, write to the Toledo Museum of Art, Box 1013, Toledo, Ohio 43697.

*—William Sampson, editor*

***Castle creates fifth piano—Commissioned by the Toledo Museum of Art to replace one of its two concert grand pianos, this is Wendell Castle's latest effort in piano design. Veneered curly maple and cocobolo highlight the piece, which was built in cooperation with Steinway and Sons.***

Photo: Toledo Museum of Art

## Almost everything I need to know I learned in seventh-grade woodshop

American secondary schools are changing, and woodshop is on the way out. It is too expensive, too machinery intensive. Kids need power courses for college.

I say we need more woodshop, not less. You've seen the book, *Everything I Need to Know I Learned in Kindergarten*. I was a slow learner. I didn't get a clue until my early teens when I took my first shop course. Back in the '50s, at Bret Harte Junior High in Oakland, Calif., we were taught to plan and build according to that plan. We learned to respect our tools and take care of them. We took pride in what we built. And, most important, we learned to appreciate, respect, and conserve the beautiful material with which we worked.

We made drawings; we showed invisible joints; we did complex math, adding fractions, multiplying board feet, figuring costs. But more than the basic math, we had to develop an aesthetic sense. We had to deal with form and function. We had to work with proportion and balance.

It was about 40 years ago that I made a small table at which my younger sister could play dolls. That table is still knocking around. Since then, I have made bigger and grander tables, big oak and walnut suckers on which lumberjacks could dance, but each of them has been just an amplification of the one that I made in fourth-period woodshop that smelled of pine resin.

Now everyone must be computer literate, but I cannot see someone using a contemporary computer program 40 years from now. Who is going to reminisce about the scent of a freshly booted-up disc? Who is going to have fond memories of the texture of a printer? But a hammer will swing with its top-heavy balance the

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same way forever. Freshly cut pine still smells like fresh pine.

When I mentioned this subject in my gym, the conversation about the latest sports news immediately stopped, and everyone chattered fondly about chopping blocks, shoe-shine kits, tables and breadboards. One guy still used the tackle boxes he made 30 years ago to store his collection of precious stones. His carefully crafted nail chart still hangs on his garage wall. I don't know anyone who keeps their history tests, do you? It is special to make something from scratch; something uniquely self-defining about an object that would never have existed without your hand. We need so much more of that feeling. Maybe you are better off knowing your Apple from a hole in the ground. But there is sure something special about making something with your hands, something that pleases the senses. Something that works. Something you can be proud of for a long time to come.

We all should have made more tables.

*—John Marlowe, San Francisco, Calif.*

## MDF finishing tips

Woodworkers looking for information about finishing medium-density fiberboard (MDF) may find some answers to their questions in a new free pamphlet.

Produced by M.L. Campbell, a subsidiary of Pratt and Lambert, the pamphlet discusses surface preparation and common finishing problems, such as finish absorption and soft finish/ poor cure characteristics. Write to M.L. Campbell, Co., P.O. Box 22, Buffalo, N.Y. 14240. *—W.S.*

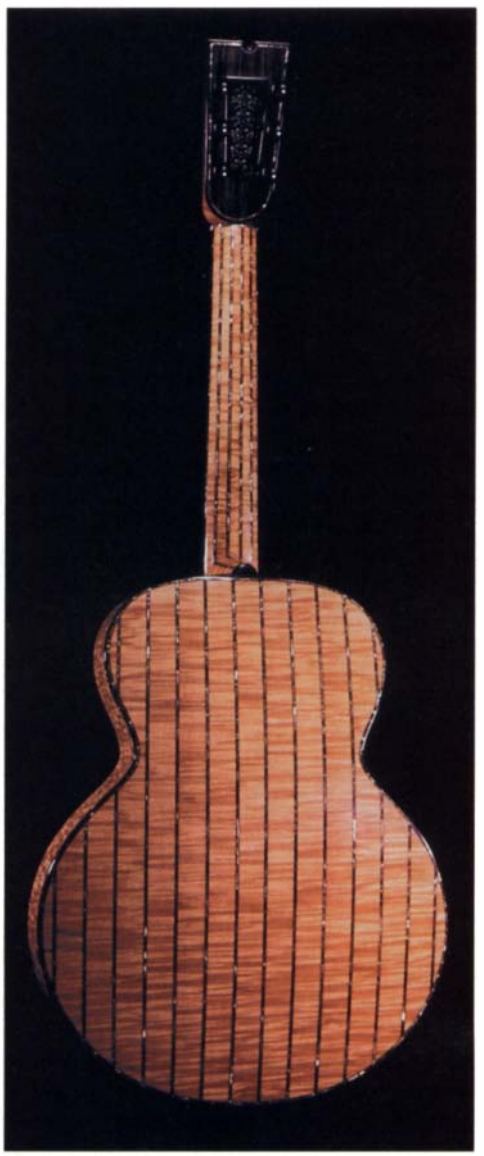
***Translating inspiration into an instrument**—Inspired by the Notre Dame cathedral in Paris, guitarist John McLaughlin asked Michigan luthier Abraham Wechter to build him a similarly inspired guitar. The result is* Our Lady, *as shown in the photo above left. The back, sides and neck (above right) are bird's-eye maple separated by bands of abalone. In a reflection of the cathedral's famous rose window, 14k gold metalwork decorates the guitar's soundhole (center).*

## Guitar inspired by cathedral

Gothic cathedrals were the focal point of inspiration in their time and place. Their elaborate spires, arches and spectacular stained-glass windows were all masterpieces of craftsmanship. Now one of the most famous examples of those architectural marvels has become the inspiration for another more musical work of art and craftsmanship.

Guitarist John McLaughlin was inspired by the Notre Dame cathedral in Paris and commissioned Michigan luthier Abraham Wechter to build "Our Lady," the guitar shown in the photos on this page. McLaughlin was especially taken by the magnificent rose window over the cathedral's south transept. That influence is particularly evident in the 14k solid gold metalwork that decorates the instrument in the soundhole and peg head.

The instrument features neck, back and sides all constructed of quartersawn bird's-eye maple with abalone strips in between. The soundboard was made of book-matched European spruce. *—W.S.*



### *Notes and Comment*

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



Photos this page: Lou Hands


# DESK OF ENCHANTMENT

As part of a recent overhaul of the New Mexico state capitol building in Santa Fe, an official art committee sponsored a competition to design furniture for the governor's office. Entrants designed pieces that would capture the beauty and heritage of "The Land of Enchantment." Patrick Trujillo of La Madera, N.M., won the competition.

He made the 7-ft.-long desk and the 12-ft.-long credenza shown above. Trujillo, who constructed the two pieces from solid cherry and walnut, carved 23 panels for the commission. The stylistic carvings in the desk convey the region's diverse cultural, historical and geographical aspects, and the credenza's panels depict New Mexico's distinct flora. The carvings and trim details reflect three important style influences in Southwest furniture: Indian, Spanish and Anglo-American. When asked about the effort involved in the wood carving, Trujillo replied: "Oh that was the easy part. I spent more time researching the carving subjects and then building carcases that would allow wood movement." For more about Trujillo's work, see the story on p. 102.

Photos: Alec Waters