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Departments

- 8 Letters
- 14 Methods of Work
Blemish-free nail holes; Horizontal boring jig; Turning straight tapers; Sizing miniature lumber
- 24 Notes and Comment
Ben Franklin's glass harmonica; German woodworking license
- 32 Tools & Materials
Tablesaws from Sears and DeWalt; Longer-lasting bandsaw blades; What's new at Porter-Cable
- 88 Rules of Thumb
A guide to the wayward ways of wood grain
- 100 Questions & Answers
Designing a rocking chair; Refinishing antique varnish; Honey locust for furniture
- 110 Master Class
Making a curved pediment molding



Craftsman dining table in curly maple, p. 80

On the Cover:

Boatbuilder David Snediker knows how to make a garden bench that braves water and weather. You can see how it's done on p. 52.

Photo: Scott Phillips



Moving to air power, p. 75



Finish cherry without blotches, p. 46

Articles

40 Engineering a Table with Drawers
There's a simple, adaptable system hidden in almost every table

BY WILL NEPTUNE

46 Finish Cherry Without Blotches
This common problem can be avoided easily by choosing either of these methods

BY JEFF JEWITT

49 Mix your own dye stains

50 Three Ways to Rack Lumber

Efficient stock storage opens up valuable workspace

BY MATTHEW TEAGUE

52 A Garden Bench for All Seasons

A boatbuilder wards off weather with Spanish cedar, marine epoxy and copper rivets

BY DAVID SNEDIKER

54 Getting set up for epoxy

58 In Search of the Right Mortising Technique

Five strategies from hand tools to expensive machines for cutting fast, easy and accurate mortises

BY STROTHER PURDY

59 What makes a good mortise?

64 Not Your Father's Pegboard

An organized wall of tools gives you instant access

BY HANK GILPIN

66 Picture-Perfect Clamps

For all mitered joints and budgets, there are clamps to get the job done right

BY ANATOLE BURKIN

70 Build a Houseful of Doors

...without coming unhinged

BY JOHN LIVELY

72 Measuring without a rule

75 Coming Up for Air

Making the leap to air-powered tools

BY ROLAND JOHNSON

80 Stickley Done Lightly

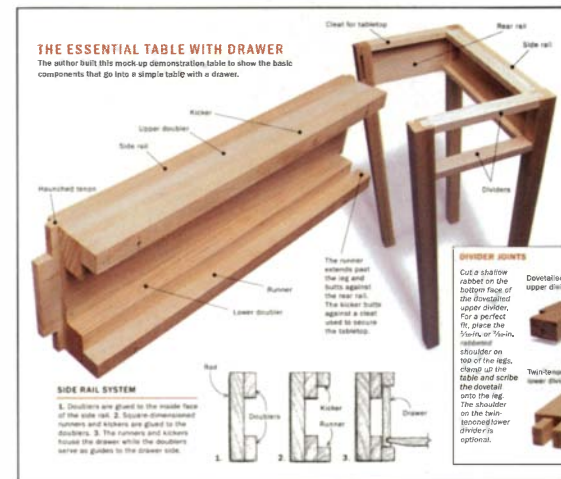
Banquet-sized Craftsman table looks leaner in curly maple

BY REX ALEXANDER

82 No Jointer? No Problem



Picture-perfect miter clamps, p. 66



Engineering a table with drawers, p. 40

Contributors

Jeffrey Greene: With his column on making S-curved pediment moldings, Jeffrey Greene becomes the first contributor to “Master Class,” our new department highlighting advanced techniques developed by master woodworkers. Greene has spent the last 16 years reproducing 18th-century furniture at the rate of about 50 pieces a year. A 12th-generation Rhode Islander, he is the author of *American Furniture of the 18th Century* (The Taunton Press). His book blends the perspectives of furniture maker, connoisseur and historian.



David Snediker (“A Garden Bench for All Seasons”) studied botany in college for two years. He then took up boat building and started Taylor and Snediker with his partner Bill Taylor in Mystic, Conn. They specialize in the restoration of wooden boats. On any given day, their shop is replete with at least five dogs. During the last eight years, studying at night, Snediker completed his master’s degree in archeology.

Hank Gilpin: One day in 1970, Hank Gilpin (“Not Your Father’s Pegboard”) walked into the woodshop at Rhode Island School of Design and watched as Tage Frid steamed a piece of ash and then tied it into a knot. That spelled the end of photography grad school for Gilpin and the beginning of woodworking. He’s been at it ever since, making custom furniture in his shop in Lincoln, R.I. He’s also assistant coach on the Little League team where his son, Willie, throws smoke.



Rex Alexander: A job paneling a room with his cousin Roger got Rex Alexander (“Stickley Done Lightly”) interested in woodworking 27 years ago. That led to apprenticeships with three cabinetmakers,

two carpenters and a wood finisher. Alexander eventually went out on his own, armed with business advice from his uncle Pete, a

lumberyard owner. Alexander, who runs a one-man shop in Brethren, Mich., says he finds work satisfying. “I have no hobbies; woodworking holds together my soul, and my prayer is in the practice of my trade.”



Jeff Jewitt (“Finish Cherry Without Blotches”) owns and runs two separate businesses, one restoring furniture and one selling finishing products. He’s the author of the book, *Hand-Applied Finishes* (The Taunton Press). He also teaches courses and gives seminars on finishing-related topics. And if all of that doesn’t keep him busy enough, you can often find him wearing a cyclist’s uniform and racing his bicycle competitively.

Roland Johnson (“Coming Up for Air”) lives and works in an octagonal house and an adjacent shop he built on 40 acres of prairie land in central Minnesota. He knows as much about repairing the hydraulic system on tractors as he does about making and finishing cabinetry—and he’s been doing that for more than 20 years.

Will Neptune (“Engineering a Table with Drawers”) has been an instructor in the cabinet and furniture making department at North Bennet Street School in Boston since 1985. He has also taught short courses at North Bennet Street as well as at Anderson Ranch. He maintains an active schedule of commission work, including furniture and architectural components, often with an emphasis on woodcarving.

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Letters

Here's what readers think about the changes in *Fine Woodworking*—You say that you want input from your readers (*FWW* #129, p. 8). Well, I came to my subscription through *Home Furniture*, because it addressed design issues more than projects and techniques. I also enjoy the construction, finishing and other shop techniques that have been and still are covered in *Fine Woodworking*. I ask you to keep the tradition of *Home Furniture's* design focus in *Fine Woodworking*.

—Jonathan P. Szczepanski,
Baltimore, Md.

While I agree with most of the changes you made, I must point out that upon reading the article titled "Making Large Moldings," I found myself wondering if I

had not by accident picked up your sister publication, *Fine Homebuilding*. I can appreciate wanting to have as wide a readership as possible, but is it wise to try to be all things to all people? I sincerely hope that furniture making and its related subjects will continue to be the focus of your fine magazine. —Frank Chartrand,
Cap-Rouge, Que., Canada

Although I have always enjoyed your magazine, I must admit that with my busy schedule, I have never before spent more than three hours reading a single issue. Issue #129 is an exception. I must applaud the improvements that you have made to *Fine Woodworking*. Article topics were extremely well chosen. Each article was thoroughly enjoyable and well presented.

Thanks for the input

When we asked for your comments on our improvements and new format, we knew that we would get many letters and that they would praise and condemn us. We were not disappointed.

We chose not to publish a large number of repetitive supporting letters, but the vast majority of those we received agreed with the changes we have made—and will continue to make in coming issues. You are clearly passionate about *Fine Woodworking*, and the excitement you expressed over our last issue was heartening and contagious. A few of you are thrilled about most of what we are doing but disagree with one change or another.

We heard most often about our move to include one article in each issue on how to use your woodworking skills and woodshop to personalize your home. Many of you welcome this addition to your toolbox of talents; others believe that it should not be a big part of the magazine's mission. We include these articles because we know that most of you do want to use your woodworking knowledge to make a home you can be proud of. We also know from visiting readers that there really is something special that happens when a furniture maker adds his touches to a home.

Two new departments in this issue:

We are introducing two of our new departments in this issue: "Rules of Thumb" on woodworking fundamentals (pp. 88-90) and "Master Class" about advanced techniques (pp. 110-114). Between them you will find our very popular "Q&A" department, in which we find experts to answer your questions. You will now find the woodworking events listings on our Web site: www.taunton.com. We switched our newsy "Notes & Comment" and "Tools & Materials" departments to the first half of the magazine. You'll find them immediately after our woodworking tips department, "Methods of Work." Again, after you read this issue, let us know what you think. —Tim Schreiner, editor



I simply could not put this issue down until I had read every word. I have never been compelled to write to a magazine, but I just had to say that the improvements you have made are right on target.

—Andy Sargent, Cleveland, Ohio

I have subscribed for about 20 years now, and I am concerned about some of the trends suggested in the editor's note.

Please avoid the basic stuff. There are lots of magazines that do that. What has distinguished *Fine Woodworking* is going beyond the basics and dealing with projects and techniques that transcend what can easily be found in dozens of introductory woodworking books. If you need to be reminded about what *Fine Woodworking* should be about, look at the back cover of your April issue with the highboy project by John McAlister Jr.

—David Goldstein, Seattle, Wash.

I always read most of the articles in your magazine, but this is the first time that I sat and read the whole magazine in one sitting. I have been a reader for three years and a woodworker for the same amount of time. Thanks for the new format. You have covered new ground.

—John B. Dickinson, Philadelphia, Pa.

What is going on? If I wanted articles on router technique, shop design or boring holes and pushing a board through a tablesaw, I would check out the beginner's section at the public library. We are used to a Cadillac publication, but the last issue was clearly a Yugo.

—Ralph Lauterwasser, Lawrence, Kan.

I have been a subscriber since issue #1 and have learned a great deal from *Fine Woodworking*. I hope you also will remember those of us who are either part-time or full-time professionals who want to sell our pieces and are, therefore, interested in new design and in

Writing an article

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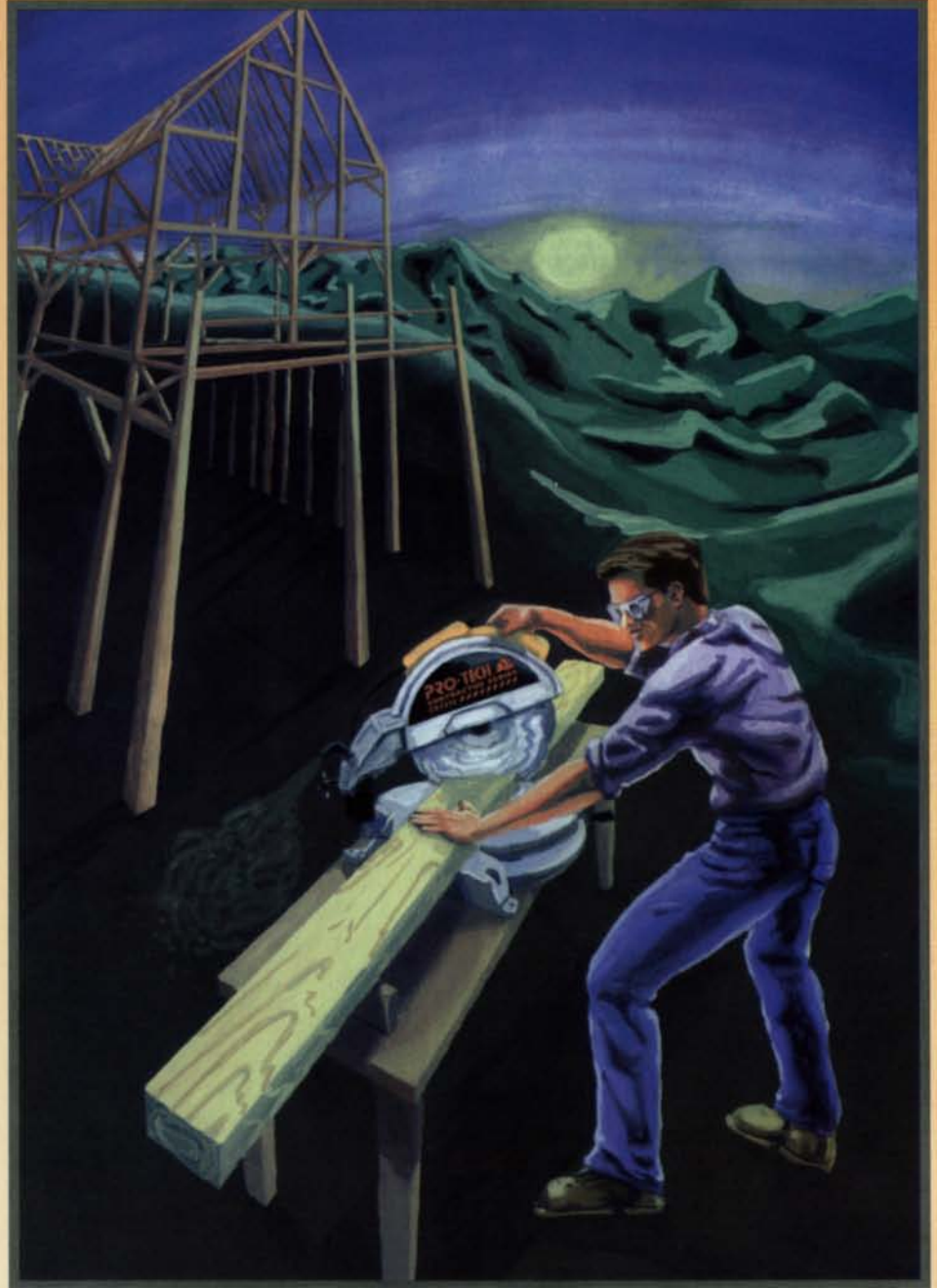
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techniques that enable reasonably fast and repetitive construction when that is desired. Go easy on articles about how a certain stone is better suited to remove plane-iron nicks that can only be seen under a microscope. Even for hobbyists, this sort of thing only feeds a tendency to fiddle endlessly with their tools instead of actually building something.

—Michael Sterner, Washington, D.C.

Through the process of elimination, *Fine Woodworking* is the only periodical I still subscribe to. Its refreshing lack of political and social catastrophe nourishes my soul and leads me to meditate only on those matters I can control: my own skills and their potential.

—Kent McDonell, Ajax, Ont., Canada

Fine Woodworking has always been looked upon by readers as a forum for fine woodworking. In other words, the best that can be done. Many magazines have since come about that are geared toward the amateur. But to do the best work still requires skill and practice. I would like to see *Fine Woodworking* stick to the subjects that inspired all those readers in the first place: furniture. Let your readers be inspired by the projects you pick, and let the other magazines cater to those who don't really care to know the difference between good design and bad. —Bob Stillman, San Jose, Calif.

I want you to know that I am 100% behind your goals. This magazine has been the best in the woodworking field, but there has been something lacking. Your plans to add a department on fundamentals and another on advanced skills is just what this publication needs.

I have noticed a lightening up from the somewhat intimidating tone of the contents, and I appreciate that. I am not an expert, and it looks as though there is to be room for me as a subscriber and active reader. You will get some opposition from those who regularly write to your "Letters" department complaining that the magazine is slipping into a hobby/craft format. But ignore them. Your ideas are just what this magazine needs.

—Andy Pelham, Columbus, Ohio

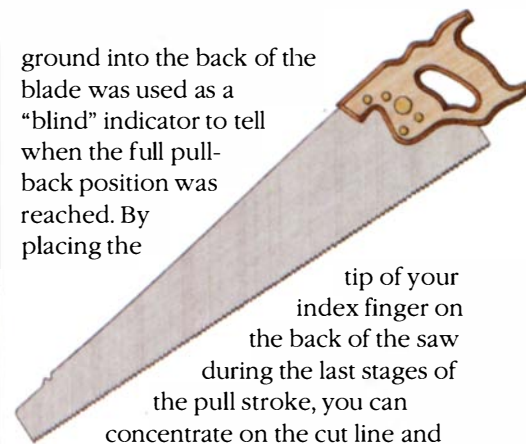
Fine Woodworking has always had a down-to-earth practical side—plenty of meat and potatoes for those who want to learn. You have also had a fluffy, out-of-touch side to you. Maybe you should remain a mix, I don't know, but stop being shaky. Find out who you are, and get back into the groove, please. I will remain a reader in any case. I learn something in every issue, and no doubt always will. —Stephan Koptik, Ada, Mich.

I am a retired furniture pattern maker and also a charter subscriber. *Fine Woodworking* started as the greatest, then slid to where I considered dropping it. But, praise the Lord, someone has breathed new life into it. On the back cover of issue #129 is a picture worthy of being called fine woodworking. I am so glad someone has taken this magazine back to its original quality, written for fine woodworkers both beginners and masters. —R.N. Nichols, Albion, Mich.

Disston panel saw nib—I was greatly intrigued by the explanation that the nib on the back of a Disston panel saw had no practical use (*FWW* #129, p. 20).

May I suggest that the fin that was

ground into the back of the blade was used as a "blind" indicator to tell when the full pull-back position was reached. By placing the



tip of your index finger on the back of the saw during the last stages of the pull stroke, you can concentrate on the cut line and not have to worry that the blade is back too far and will distort on the push stroke. —Frank Grambo, Baltimore, Md.

EDITOR'S NOTE: Several readers also suggested the nib was often used for a dadoed board that served as a blade protector when the saw was not in use. A kerf-wide dado was cut the length of a board, which was placed over the blade. Two holes in the wood held pieces of twine, which when tied around the nib and handle held the wood in place.

About your safety:

Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't try to perform operations you learn about here (or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, don't do it. Look for another way. We want you to enjoy the craft, so please keep safety foremost in your mind whenever you're in the shop.

—Timothy D. Schreiner, editor

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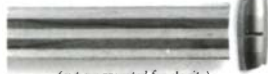
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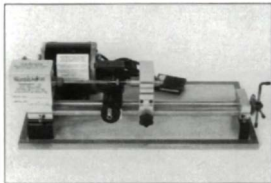
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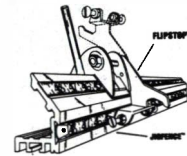
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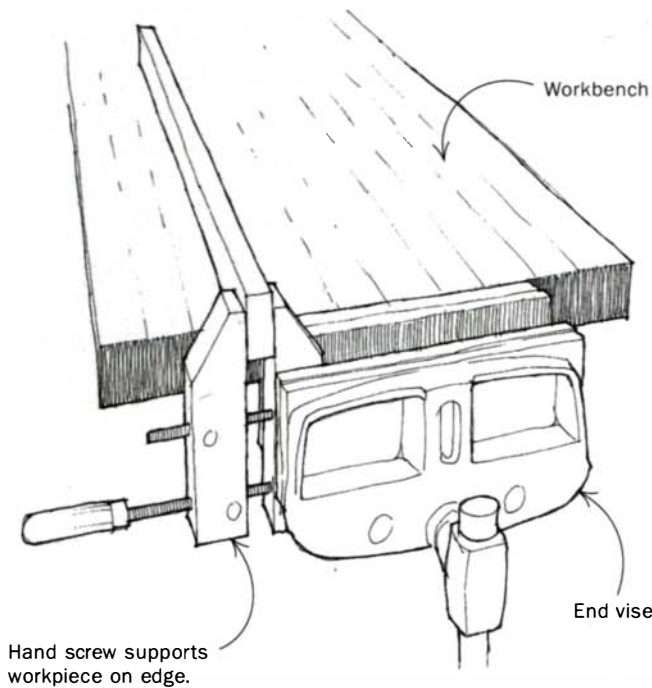
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Clamping boards for planing



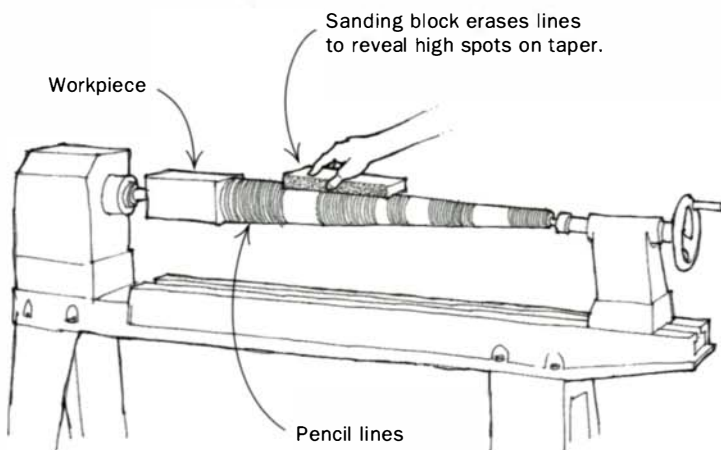
To hold boards on edge on your workbench for handplaning, clamp a small hand screw in the end vise, and tighten the hand screw to the workpiece. This arrangement works well because the benchtop takes all of the downward pressure of planing.

—Anthony Guidice, St. Louis, Mo.

Quick tip: A caning chisel, with its 1/8-in. curved blade, will easily remove a stuck biscuit from its groove before the glue sets.

—R. Rix, Washington, D.C.

Turning a straight taper

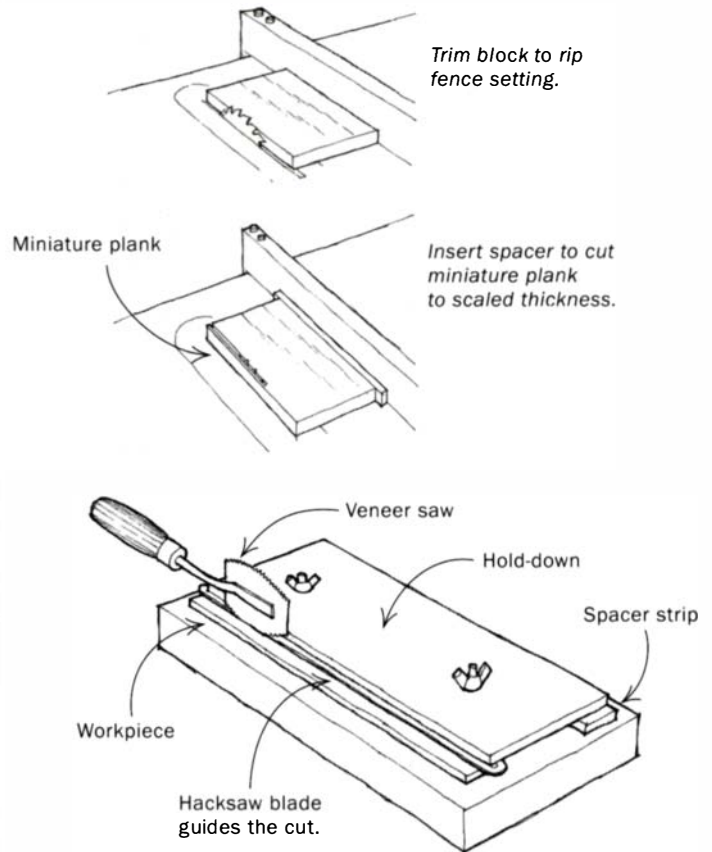


Straight tapers and cylinders are difficult to turn on the first try. To locate the high spots, mark the entire length of the workpiece with a pencil while the piece is turning on the lathe. Then hold a flat

sanding block (with 60- or 80-grit sandpaper glued to the bottom) against the spinning workpiece. The sandpaper will erase the lines on the high points to show you where you need to shave off a little. When the taper is true, the sandpaper will erase all the pencil lines evenly.

Ken Picou, Austin, Texas

Cutting lumber for miniature furniture



In my shop, I have two simple devices that allow me to cut miniature lumber at the frequently used 1:12 scale. I use the first to slice miniature planks from stock lumber and the second to rip the miniature planks to the desired width.

Select a suitable piece of wood about 12 in. long and 5 in. to 6 in. wide, free from knots and other blemishes. Trim the edges of the block lightly with the saw. For the finish cut, place a spacer strip between the block and the fence. This moves the block over so that the strip removed is of the desired thickness.

I use spacer strips about 12 in. long and as thick as the sawblade plus the thickness of the miniature board. So to cut a miniature board 1/2 in. thick (a scale thickness of 1 in.), the spacer strip would be 1/2 in. plus the width of the sawblade. To make a second plank, move the rip fence over, trim the block as before, insert the guide strip and slice another plank.

A piece of standard 3/4-in. stock, 12 in. long by 6 in. wide, will make 12 to 15 miniature planks that scale to 12 ft. long, 8 in. wide and 1 in. thick. I have several permanent spacer strips that allow me to cut miniature planks of varying thicknesses.

The second device for ripping the planks to width is a hold-

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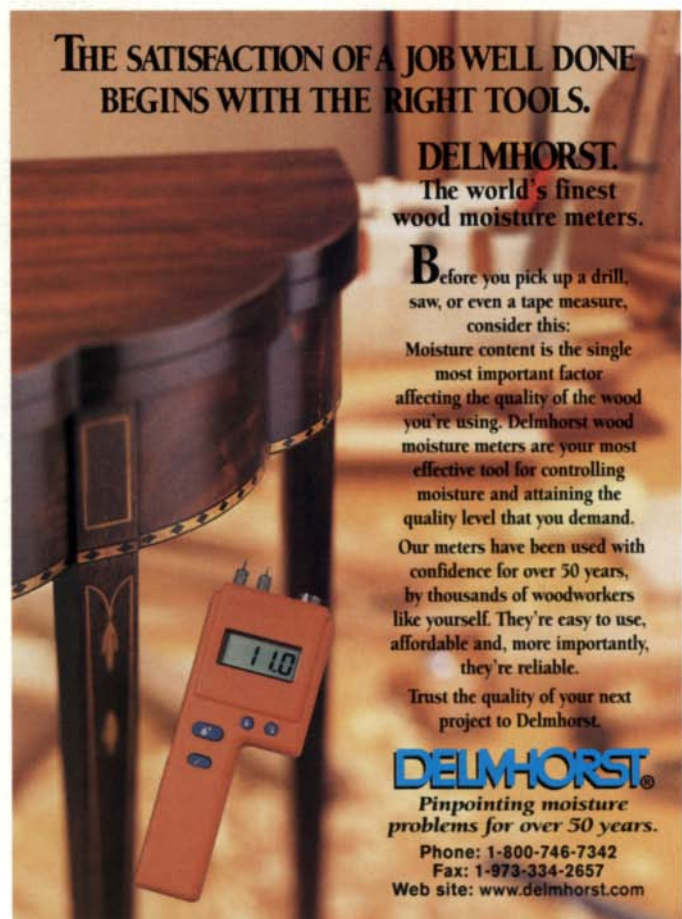
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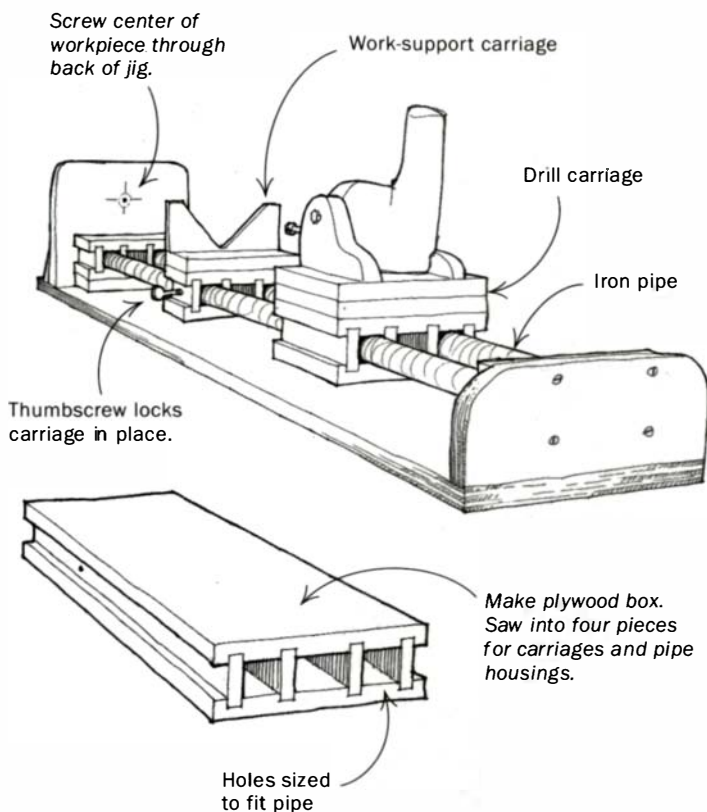
READER SERVICE NO. 161

Methods of Work (continued)

down that uses the smooth edge of a hacksaw blade as a cutting guide. I clamp a plank in the device and run a veneer saw against the straightedge to rip the miniature plank to width. A knife blade tends to follow the grain of the wood and give an uneven cut. The serrated teeth of the veneer saw produce a much better result.

—Don Anderson, Sequim, Wash.

Shopmade horizontal boring jig



I was faced with the challenge of drilling precisely centered holes along the centerline axis of some turned posts. Because the bed of my lathe wasn't long enough to accommodate the posts, I built a horizontal boring jig using plywood scraps and common iron pipe.

The jig consists of a bed and two carriages, one for the drill and another for supporting the work. First I glued up a hollow plywood box, 16 in. long, with three compartments running the full length. I routed grooves for the vertical walls into the top and bottom of the box. Then I carefully spaced and sized the plywood pieces so that the iron pipe would fit snugly in the openings. Later, I cut this box into four sections to make the two carriages and two pipe housings in the bed.

I wanted to be able to lock the work-support carriage in place to the pipe bed, so I drilled holes and installed T-nuts in the walls of the box before gluing it up. After the glue had cured, I cut the 16-in. box into four sections—two longer sections for the carriages and two shorter sections for the pipe housings in the bed.

I added spacer blocks to the top of the drill carriage to raise up and support the drill. I took advantage of the holes tapped into each side of the drill handle to screw the drill in place on top of the

carriage. By adjusting the drill in place with shims, I was able to get it set to cut holes perfectly centered into one end of the turned posts. I also drilled a small pilot hole through the back of the boring jig for a screw to hold the other end of the workpiece steady.

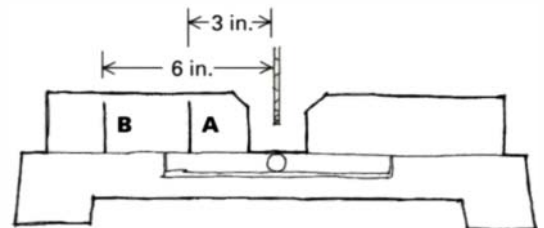
—G.M. Williams, Newport News, Va.

Quick tip: Much comment has been made about the difficulties of adjusting a plunge router when it is mounted under a router table. The simple solution to this problem is to remove the return springs. These springs are located in the base columns. Removing them is a five-minute job at most. You will be able to raise and lower the router with ease.

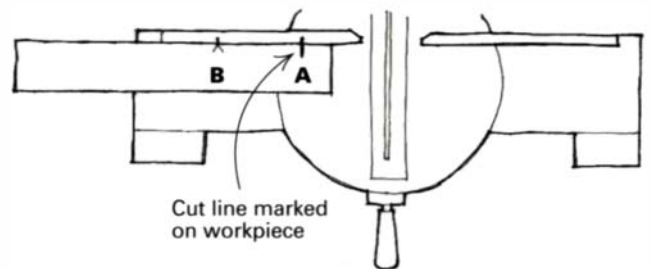
—Charles D. Honl, Burnsville, Minn.

Precise cutoffs with a miter saw

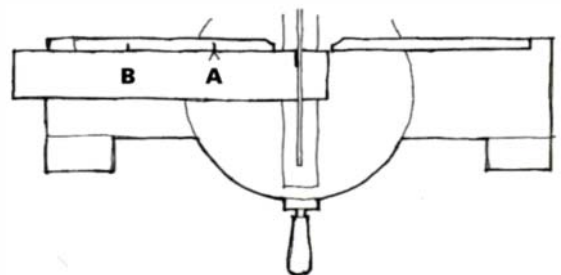
Mark lines at 3 in. and 6 in. from sawblade.



Line up cut line with A, and transfer B to workpiece.



Move transferred line to A, and make the cut.



Blade guards on miter saws make it difficult to line up the cut lines marked on a workpiece with the sawblade. I've developed a solution to that problem: Draw a line on the left side of the back fence exactly 3 in. from the blade. Then draw a second line exactly 3 in. to the left of that, or 6 in. from the blade.

To make an exact cut, align the cut line on the workpiece with the first line on the fence. Transfer the second line to the work-

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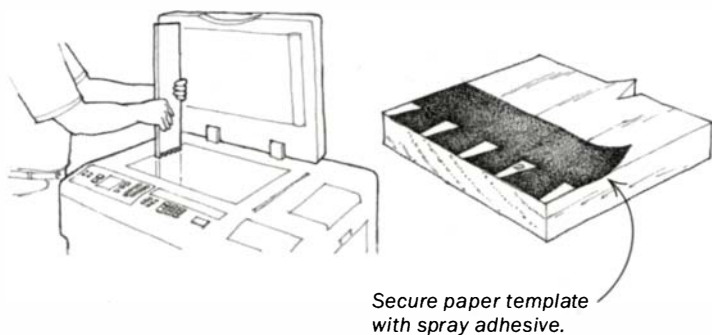
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READER SERVICE NO. 124

Methods of Work (continued)

piece. Shift the workpiece to the right until the second line on the workpiece lines up with the first line on the fence, and make the cut. —*Dave Basch, Chatsworth, Calif.*

Photocopy machine dovetail layout

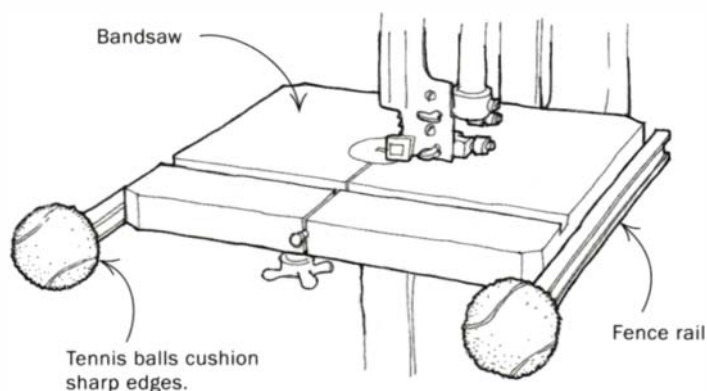


This technique simplifies one of the most awkward and error-prone procedures in making dovetails—marking out tail locations from the pins. First cut the pins. Then, with the pin workpiece standing on end, make a photocopy of it. Be sure to mark it with an identifying number that will reproduce in the copy.

Now glue the photocopied pin pattern to its mating workpiece to give a perfect cutting guide for the tails. Use rubber cement or 3M Spray Mount repositionable artist's adhesive. Aligning the pattern is easy because the photocopy will clearly show the edges and ends of the pins.

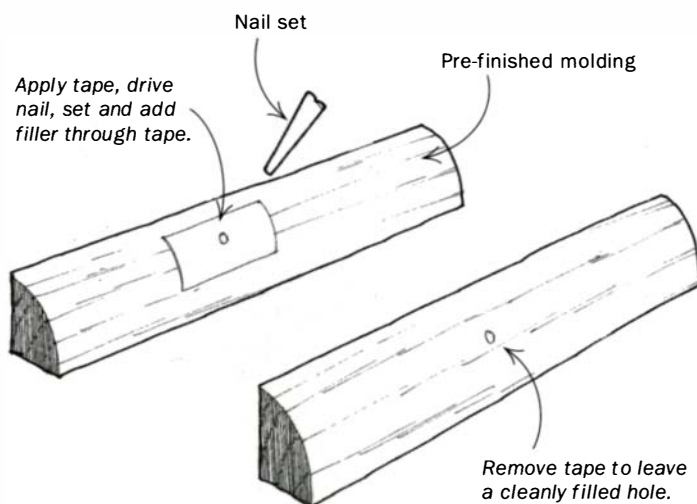
You can now either cut directly from the photocopied pattern, or you can use a straightedge and knife to mark through the pattern onto the wood. The result is accurate, tight, perfectly aligned joints every time. —*J.P. Moss, Jamaica, N.Y.*

Safety bumpers from tennis balls



In smaller shops like mine, where space is at a premium, there's the constant danger of bumping into protruding fence rails, like those on my bandsaw. A used tennis ball slipped over the end of a fence rail serves as a bold visual reminder of possible danger and as a cushion against the inevitable bump. Simply cut an X-shaped incision with a hobby knife, and press-fit a ball over the fence rail or similar protruding object. —*Robert R. Llewellyn, Memphis, Tenn.*

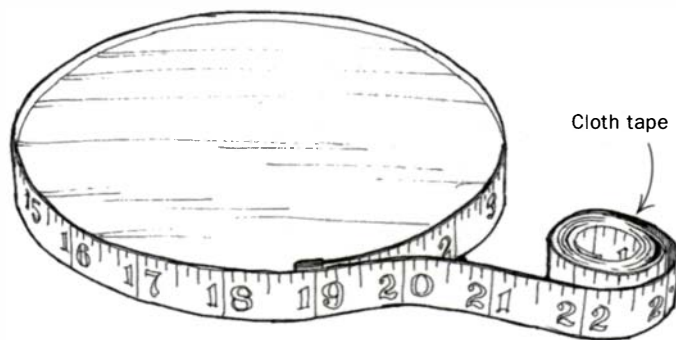
Blemish-free nail holes



I recently milled some oak molding and before installation stained and finished it to match the existing woodwork. After spending hours to obtain a beautiful finish, I wanted to avoid the inevitable wood-filler smudges that occur when filling the finish-nail holes. So I came up with this simple idea.

Place a short piece of masking tape where you wish to nail. Hammer and set the nail right through the tape. Apply the wood filler over the tape. When you peel away the tape, you have a perfectly filled hole, and the filler does not ruin the finish on the surrounding area. —*James Vasi, Williamsville, N.Y.*

Dressmaker's tape is handy in the shop



A cloth dressmaker's tape, available from any sewing store (or swiped from a nearby household sewing machine), is a good addition to the woodworking shop. Use it for measuring those curved items that defy a metal tape. When necessary, attach it with masking tape. To find centers, just fold the tape in half.

—*Roger Russell, Anderson Island, Wash.*

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

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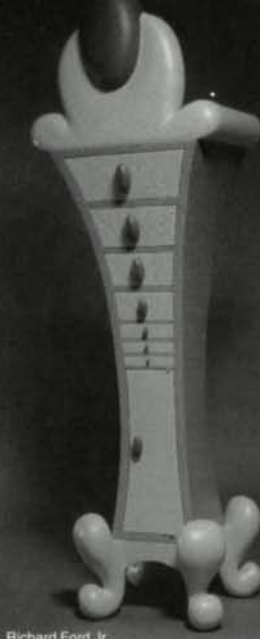
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Richard Ford Jr.
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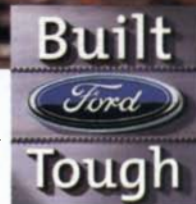
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Notes & Comment

So, you want to be a professional woodworker



License to bill. It's quite an ordeal to become a professional cabinetmaker in Germany. Reinhold Fäth had to pass a grueling day and a half examination before he could hang out his shingle.

Imagine you have years of woodworking experience, then your dream comes true: Your aunt gives you money to set up a woodworking shop, and someone orders lots of fine furniture for his new home. In the United States, you could start a business. Here in Germany, you could not—

not without a piece of paper stating you hold a master's degree in cabinetmaking.

There are four parts to the master's examination: financial and bookkeeping;

pedagogics, for your apprentices; woodworking theories; and one practical part, also known as building the masterpiece.

Building the masterpiece is a cruel, one-and-one-half day examination of how good and how fast you are at building a piece that you've never made before. You draw plans that must be approved. Upon approval, you build the piece in a foreign workshop. While you work, one of the examiners will visit the workshop a few

times, without knocking, to see how good you are at both machine and handwork. The whole thing is reminiscent of a medieval initiation rite.

I passed the examination and have been in business for a while now. I've sent photos of a beechwood writing cabinet I recently completed. Have you ever seen such beechwood? Over here it is very rare.

—Reinhold Johann Fäth, Heiligenberg, Germany



“We are definitely not Sears”

Kestrel Tool Co., started 15 years ago by Gregg Blomberg, makes crooked knives, adzes and other tools favored by traditional American sculptors of the Northwest. After studying applied technology and gunsmithing, Blomberg became interested in Native American culture.

He was told that if he wanted the tools of the trade, he'd have to make them himself.

Believing that the best tools for

a particular craft are made by those who participate in the craft, Blomberg now sells about a dozen different adzes and half again as many crooked knives. The Kestrel catalog also sells slip stones for sharpening and instructional booklets about traditional Northwest crafts. Kestrel Tool is a small company that makes excellent, hard-to-find tools. Its catalog states: “For efficiency we manufacture in small batches as the tools are needed. Although we strive to keep all our tools in stock, we are definitely not Sears.” For a catalog or to place an order, call (800) 669-3943.

—Jefferson Kolle, senior editor

Northwest carving tools. Kestrel Tool Co. was started by a gunsmith who couldn't find traditional carving tools for Native American sculpture.

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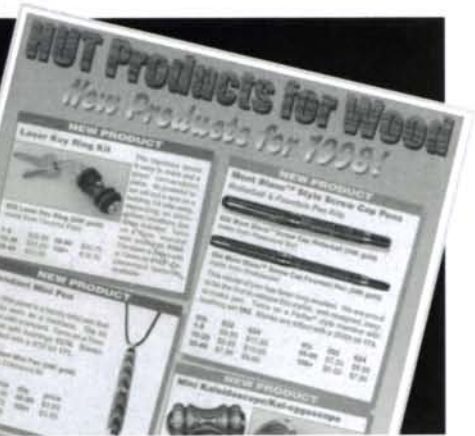
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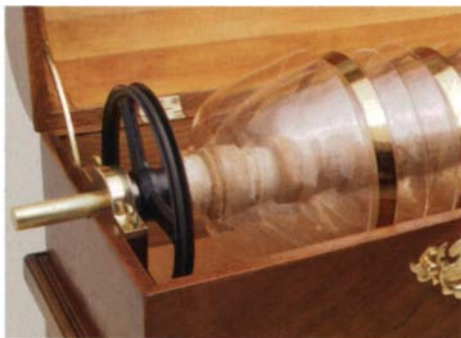
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Ben Franklin's armonica faithfully reproduced



The armonica may be Benjamin Franklin's most endearing invention. It is a musical instrument based on drawing sound from a water glass by rubbing a moistened finger around its brim. The instrument's heart is a set of glass bowls of different diameters nested to each other and fixed to a spinning shaft housed in a wooden cabinet. It is played by lightly touching the spinning glasses, which are tuned to different pitches. When I first saw a photo of Franklin's instrument, I knew I had to design and build one.

Using information supplied by The Franklin Institute Science Museum in Philadelphia, where Franklin's original armonica is kept, I followed the dimensions, materials and case construction techniques as closely as possible, but some major changes were made. The left drawer in the original is a fake, but I decided that my armonica would have two functioning drawers, and they would hold water for the player's fingers. I lined these with epoxy. The original armonica was foot-powered and had a flywheel attached to store energy.



Ben Franklin, inventor. When he wasn't writing the Constitution or playing with kites in lightning storms, Ben Franklin might have been playing the armonica, a strange instrument reproduced here by Steven Lash.

Because my instrument is powered by electricity, I left out that detail.

Because of the efforts of Gerhard Finkenbeiner, a scientific glassblower who reinvented the armonica (also known as a glass harmonica) using quartz glass, Franklin's instrument is enjoying a renaissance. I used one of Finkenbeiner's glass harmonicas with 36 glasses.

My armonica measures 45 $\frac{3}{4}$ in. long by 36 $\frac{3}{4}$ in. tall by 19 $\frac{3}{4}$ in. deep. The case is made of white oak, and the coopered lid is made of spruce. The body of the stand is made of fir, and the legs are mahogany. The case and the stand were veneered with mahogany.

—Steven M. Lash, Bloomfield Hills, Mich.

Fiddle making mountain man

My family wanted to buy a violin for our daughter, and we were lucky enough to be introduced to George T. Fortune. This gentleman is in his mid-seventies, and he hand makes fiddles—violins says my daughter, who takes classical music lessons.

Upon hearing that I was a woodworker, Mr. Fortune gave us all a tour of his shop. I expected many tools accumulated over many years. What impressed me was the number of handmade tools in Mr. Fortune's shop. Clamps are made from his wife's leftover sewing bobbins, gouges are made from reworked files and all the forms for bending violin bodies are his own creation. The only power tools in sight were a small Sears bandsaw, a drill mounted as a drill press and a heater for wood bending. It was quite a blow in my own campaign to convince my wife that I must buy tools for my shop.

Fiddle making was Fortune's way to get busy in the shop after retiring from stonework and carpentry in the late 1970s. Country music was always his family's passion, and he has made more than 30 instruments. The first six were made without drawings or design notes. In comparison to the measurements of a Stradivarius, he thinks he "got it pretty close to right."

—Daniel Alley, Cincinnati, Ohio



Staying busy in his seventies. Mr. George T. Fortune turned his talents to fiddle making when he retired from masonry. He also makes a lot of his own tools.

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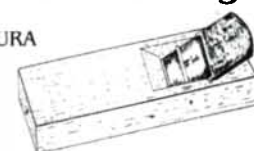
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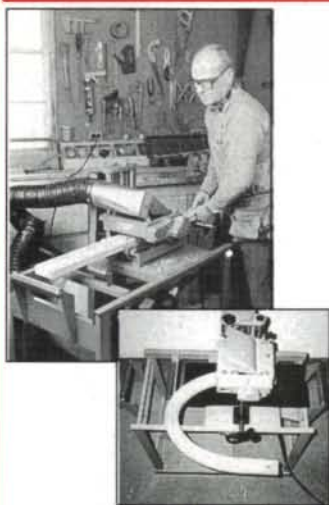
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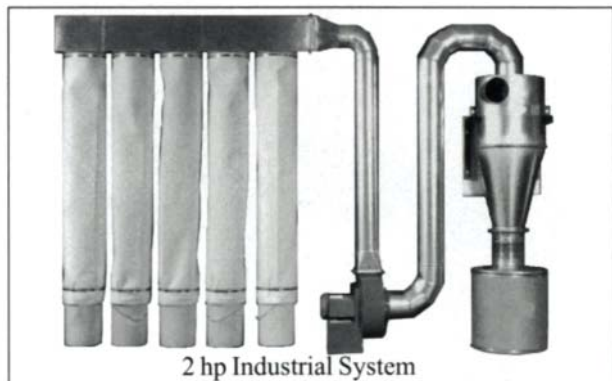
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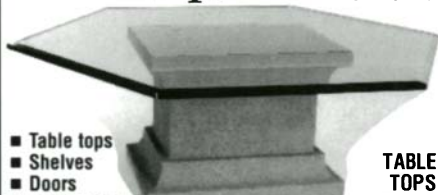
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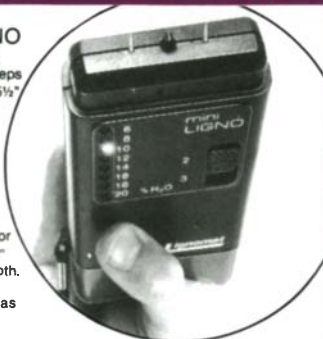
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Tablesaws from Sears and DeWalt



Craftsman model 29951 contractor's saw. A newly designed extruded aluminum rip fence comes with Sears' higher-priced tablesaws.

Craftsman contractor's saw compares well to others in its class

When we looked at the contractor's saws currently on the market (see *FWW* #123, pp. 54-61), Sears had discontinued one model and was still developing the one shown in the photo above. The model 29951, which is now available, stacks up fairly well to the other saws surveyed.

The instruction manual is written and illustrated clearly. The warranty, maximum depth of cut, maximum rip settings, runout figures and decibel levels are all as good or better than the other saws we looked at. The blade-guard assembly is sturdier and more convenient than many of the other ones we tried. Blade-height and angle-adjustment wheels operate smoothly. A 13-amp motor wired for 120v handled 4/4 stock with ease; thicker stock required a slower feed rate.

Sears Exact-I-Rip fence system is noticeably different from what we saw on the other saws. The Exact-I-Rip rides effortlessly on an extruded aluminum track, has a micro-adjusting knob and stays put when locked. Its rip capacity is 24 in. to

the left and 30 in. to the right of the blade.

There is one drawback to the rip fence. It can be locked out of square, which can cause a potential kickback situation if the fence is angled toward the back of the blade. To guarantee proper alignment, push the fence firmly against the infeed-side guide rail when locking it.

The price of the saw is about \$780.

—William Duckworth, associate editor



DeWalt model DW744 tablesaw. The rip fence on this saw has a rack-and-pinion adjustment mechanism.

DeWalt's portable tablesaw has an accurate rip fence

By their very nature, portable tablesaws must be a compromise of many features, including weight, power and capacity. DeWalt has struck a nice balance with its new portable saw.

The DW744 saw has a 13-amp, 120v universal motor, plenty of power to handle sheet stock and 4/4 lumber. At 70 lbs., with built-in carrying handles, it's light enough to move around with ease (see the photo below).

But what's most impressive about this saw is that it comes with an accurate rack-and-pinion fence that moves sweetly and can be finely adjusted. The fence lock, however, is not adjacent to the adjusting wheel where you'd expect, which makes it confusing to tell whether it's locked.

The saw has a rip capacity of 24 $\frac{1}{4}$ in., which lets you rip a sheet of plywood down the center—as long as you get some help with supporting the stock on the saw's small tabletop.

The height-adjustment wheel takes forever (25 cranks) to fully raise or lower the blade. The saw I tried out had a twist in the tabletop, less than $\frac{1}{32}$ in. across the diagonals, but I didn't notice any ill effects as a result.

My biggest concern with this saw is the size of the tabletop. When the blade is fully raised, there's only 5 $\frac{1}{4}$ in. between it and the front edge of the table. When starting a cut, you have to make sure that your stock is well balanced and that it remains

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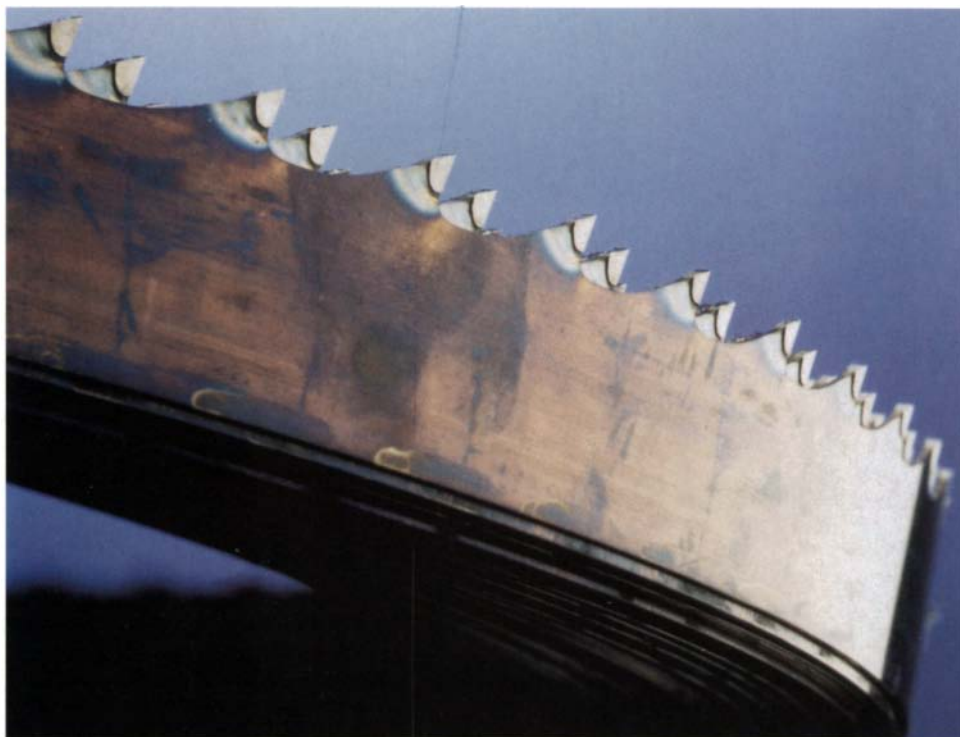
flush against the fence when ripping.

There are plenty of nice design features, however. The fence can be mounted to the right or the left of the blade. Like a router, there are flats for a wrench on the motor shaft for easy blade removal. The spring-loaded tilting arbor is easy to move, but because it slides freely, it's difficult to dial in precise angles other than 90° or 45°.

This saw won't substitute for a heavy, stationary tool for furniture work, especially if you need to regularly cut large sheet goods or stock thicker than 1 in. But it's good for tight spaces or for those who need a portable saw. The DW744 sells for about \$549. A stand is available for \$100 more, and an outfeed table costs \$90.

—Gary Rogowski, contributing editor

Industrial resaw blades for the small shop



Longer-lasting bandsaw blades. The teeth on Laguna's Barracuda bandsaw blades are made of Stellite (a type of carbide), which can be resharpened.

Laguna Tools now sells a style of bandsaw blade that was only available to large industrial users such as sawmills. Called the Timbercut Barracuda, these resaw blades have large Stellite teeth welded to the carbon-steel backing. Stellite is a type of carbide, but less brittle than carbide typically used in woodworking cutting tools.

Barracuda blades aren't cheap; they cost about five times as much as regular steel blades, but Laguna says Barracudas can be resharpened several times before they need replacing. I tried a 3/4-in. blade with teeth spaced 5/8 in. apart on my 16-in. bandsaw and was surprised at the quality of the cut surface, which is smoother than what I get with ordinary steel resaw

blades. A source at Laguna advised that the blade be tracked unconventionally. For best results, I was told, adjust the tracking so that the blade's teeth, which are fatter than the backing band, hang over the edge of the saw's wheels.

Sawdust from the Barracuda, which cuts a 1/16-in. kerf, contains more chip than dust. If you've never worked with large bandsaws, unfolding the blade is a bit intimidating because of the extremely sharp teeth and high amount of spring tension.

Stellite-tipped blades are available in widths 3/4 in. to 3 in. A 3/4-in. blade costs \$1 per inch. For more information, call Laguna Tools at (800) 234-1976.

—Anatole Burkin, associate editor

A well-made dovetail saw with British roots



Independence Tool's hand-crafted saw. The dovetail saw is modeled after an 1830 British backsaw.

A growing number of small-scale tool manufacturers are reintroducing the pleasures of owning and using finely crafted hand tools to modern woodworkers. Independence Tool is one such company. It's now making a dovetail saw, modeled after an 1830 British saw.

This saw has an intricately shaped open handle with a bead and peak (the fancy cutouts at the top of the handle) and nice horns at each end to improve the grip. The brass back running the length of the blade is machined, not folded as on most dovetail saws, and imparts both stiffness to the blade and an overall balance to the tool.

With a 9-in. blade made of high-carbon spring steel and 15 teeth per inch, this saw breezes through both hard and soft woods and stays right on the line. It costs \$124.50. To order, call the company at (508) 386-2436.

—Mario Rodriguez, contributing editor

Big Bosch belt sanders shed a few pounds

A professional-quality belt sander is a heavy tool, often weighing 15 lbs. or more. That weight offers some assurance that the tool was built to last, and it also puts needed pressure against the workpiece for efficient sanding. Too much weight, however, translates to muscle fatigue.

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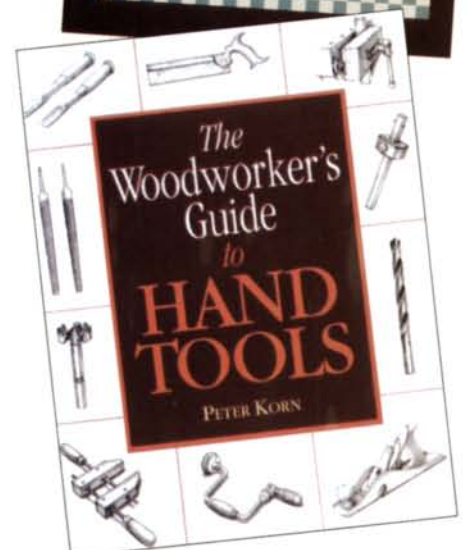
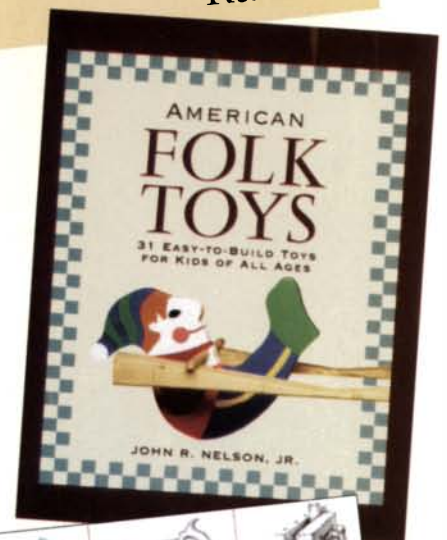
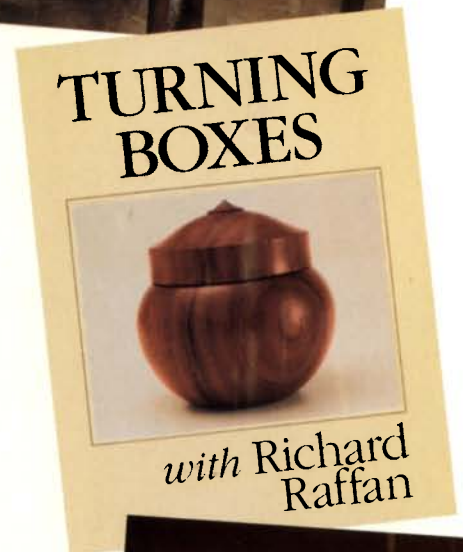
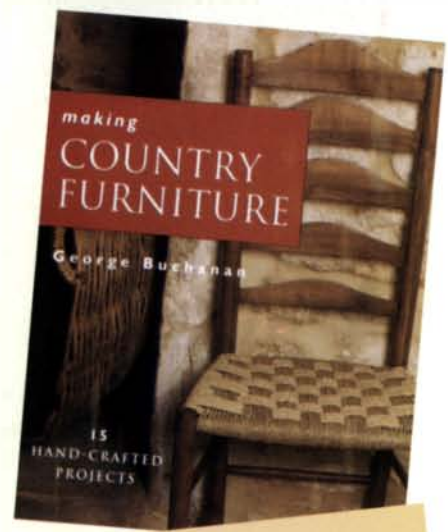
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A full-size belt sander at 12 lbs. Bosch reduced the weight of the 1275 and the 1276 line of belt sanders.

chines keep plenty of pressure on a workpiece, but they are less taxing to operate for long periods. Bosch also redesigned the tracking mechanism for improved performance and moved the variable-speed switch on the DVS models within easy reach of an index finger.

I tried out a 1276DVS (4-in. by 24-in. variable-speed machine) and found the 10.5-amp motor up to any task (see the photo above). The dust extraction is quite effective, as long as you empty the bag when it's half full. An exhaust port for the engine cooling fan is located on the tool's left side, which delivers a strong blast of air, unwelcome when you happen to be working at eye level. Otherwise, the machine is comfortable to handle and balance. The 1275 and 1276 series sanders range in price from \$210 to \$225. —A.B.

New offerings from Porter-Cable

Porter-Cable engineers have been busy developing new tools as well as tweaking some older favorites. First the new stuff: compressed, liquefied-gas powered nail guns. The Bammer line of cordless finish nailers (15 ga. and 16 ga.) and a medium crown stapler should be available sometime this year. The expected retail price for each is about \$299. Bammer guns use a mechanical (Piezo) ignition system, which eliminates the need for batteries. The engines are oil-free; the fuel cells, which are rated for about 3,000 shots, will cost less than \$7 each.

Also available this year is another biscuit joiner, the model 557 (see the photo below). It comes with 2-in.- and 4-in.-dia. blades, which allow for seven depth settings, including a narrow setting for joining material only 1½ in. wide. The most impressive feature of the new model, however, is the fence. It's adjustable for acute and obtuse angles, 0° to 135°, depth of cut is easily dialed in with a micro-adjusting screw, and it folds flat to permit flush cuts. The retail price for the machine will be less than \$250.

The Quicksand 5-in. random-orbit palm sander has a new brother: a 2.4-amp variable-speed model. It looks much like the original except for a slightly longer palm handle, which actually makes it more comfortable to hold. The speed is adjustable from 5,000 to 12,000 orbits per minute. It will sell for about \$90. For more information, contact Porter-Cable (800-487-8665). —A.B.



Porter-Cable has a new biscuit joiner. The fence on the model 557 biscuit joiner adjusts from 0° to 135°.

Senco introduces AccuSet line of pneumatic nailers

Senco has a new line of nailers aimed at entry-level woodworkers. The AccuSet line currently includes two staplers and two brad guns.

Several features distinguish these red-and-black guns from Senco's gray industrial line. Some features worth noting are comfortable ergonomics, a rear exhaust system that blows dust and oil away from the workpiece, and a gauge that tells when the nail supply runs low. A knurled nut behind the driver allows you to quickly adjust the depth of nail set.

The 1-in. stapler costs about \$110, 1½-in. stapler about \$150, 1¼-in. brad nailer about \$99 and 2-in. brad nailer about \$140. For a distributor, call AccuSet at (888) 222-8144.



New 18-ga. nailer. The AccuSet line of imported nail guns was designed by Senco.

Coming soon: More tools from DeWalt

New products being launched by DeWalt this year are mostly geared to the construction trades. But a few tools will be of interest to furniture- and cabinetmakers.

For working in tight spaces, DeWalt has come up with cordless, right-angle drill/drivers in 9.6v and 12v models. The drills have high- and low-speed ranges as well as variable-speed triggers. Also on the horizon are a ½-in. corded drill with electronic anti-lock control (to cut off power in the event the drill jams), a new 7¼-in. framer's saw, three reciprocating saws, percussion drills for working in concrete, upgraded cutoff saws for metalworking and a metal grinder.

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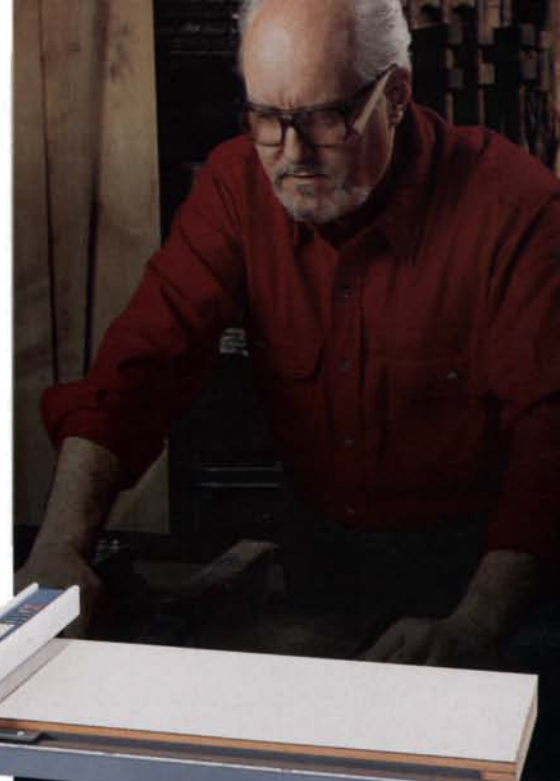
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Engineering a Table with Drawers

There's a simple, adaptable system hidden
in almost every table

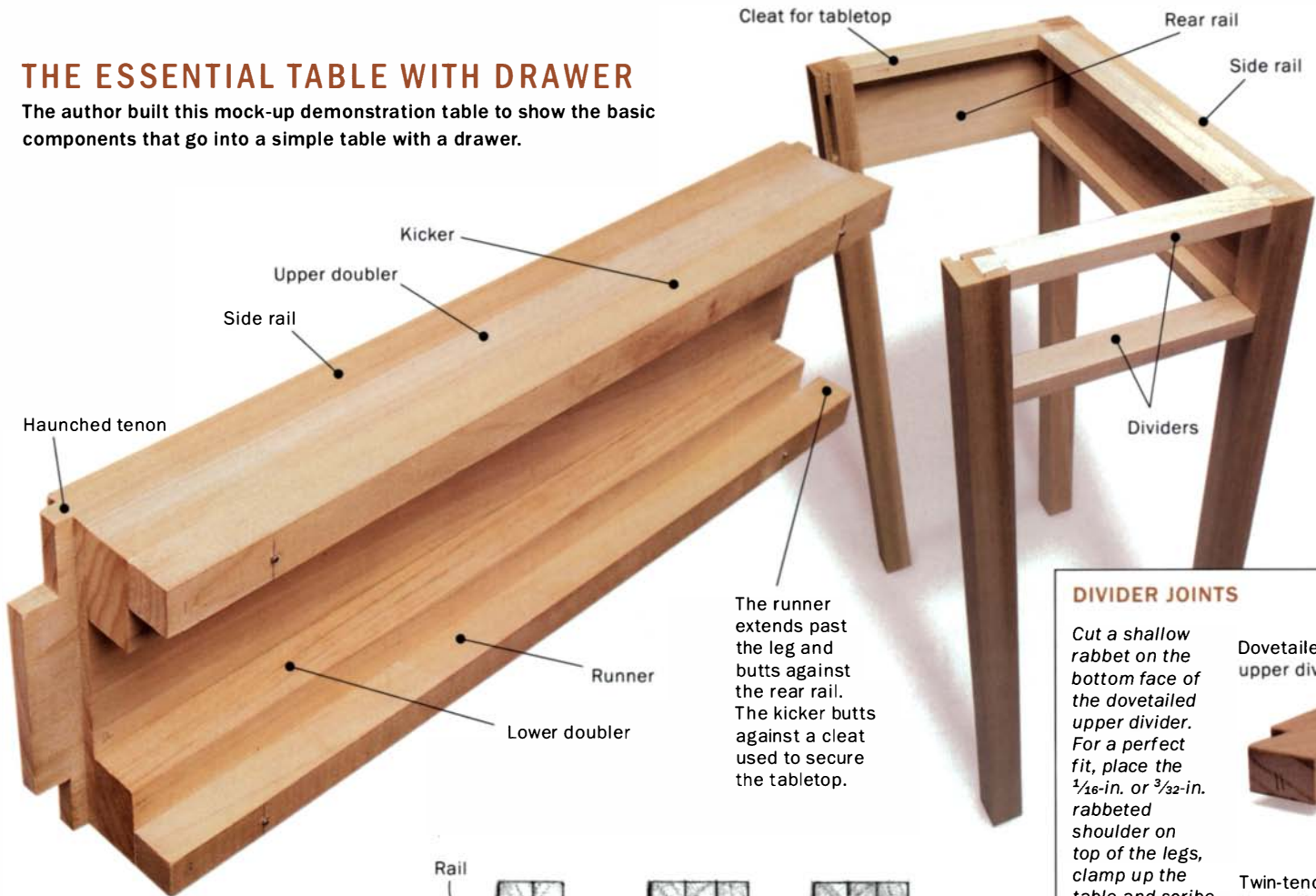
BY WILL NEPTUNE



Many tables, one approach. The author's students at North Bennet Street School have used his system (mock-up at right) successfully in many styles of tables (above).

THE ESSENTIAL TABLE WITH DRAWER

The author built this mock-up demonstration table to show the basic components that go into a simple table with a drawer.



The runner extends past the leg and butts against the rear rail. The kicker butts against a cleat used to secure the tabletop.

DIVIDER JOINTS

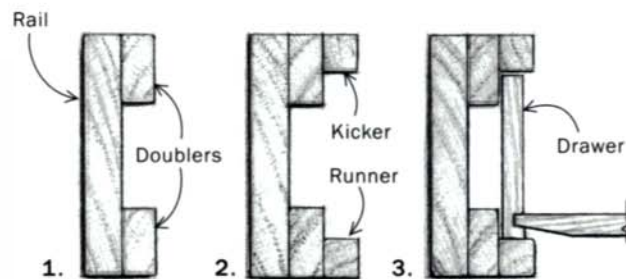
Cut a shallow rabbet on the bottom face of the dovetailed upper divider. For a perfect fit, place the $\frac{1}{16}$ -in. or $\frac{3}{32}$ -in. rabbeted shoulder on top of the legs, clamp up the table and scribe the dovetail onto the leg. The shoulder on the twin-tenoned lower divider is optional.

Dovetailed upper divider

Twin-tenoned lower divider

SIDE RAIL SYSTEM

1. Doublers are glued to the inside face of the side rail. 2. Square-dimensioned runners and kickers are glued to the doublers. 3. The runners and kickers house the drawer while the doublers serve as guides to the drawer side.



I like to tell my woodworking students that there's a Shaker nightstand hidden in every table with drawers. I may be overstating my case, but only by a bit. At the North Bennet Street School, we teach strategy. Our largely traditional approach to building tables with drawers isn't the only approach, but it's almost endlessly adaptable; once you understand it, you can apply it to Chippendale writing desks, Pembroke tables, contemporary tables, whatever you like. An approach is liberating: It leaves room for good design and good workmanship while eliminating the need for mock-ups, prototypes and reinventing the wheel.

There's nothing new about this attitude. Thomas Chippendale's *Chippendale Director* contains page after page of chairs and chair backs. No joints. No dimensions. Nothing about how to build a Chippendale chair. Chippendale assumes his readers already know

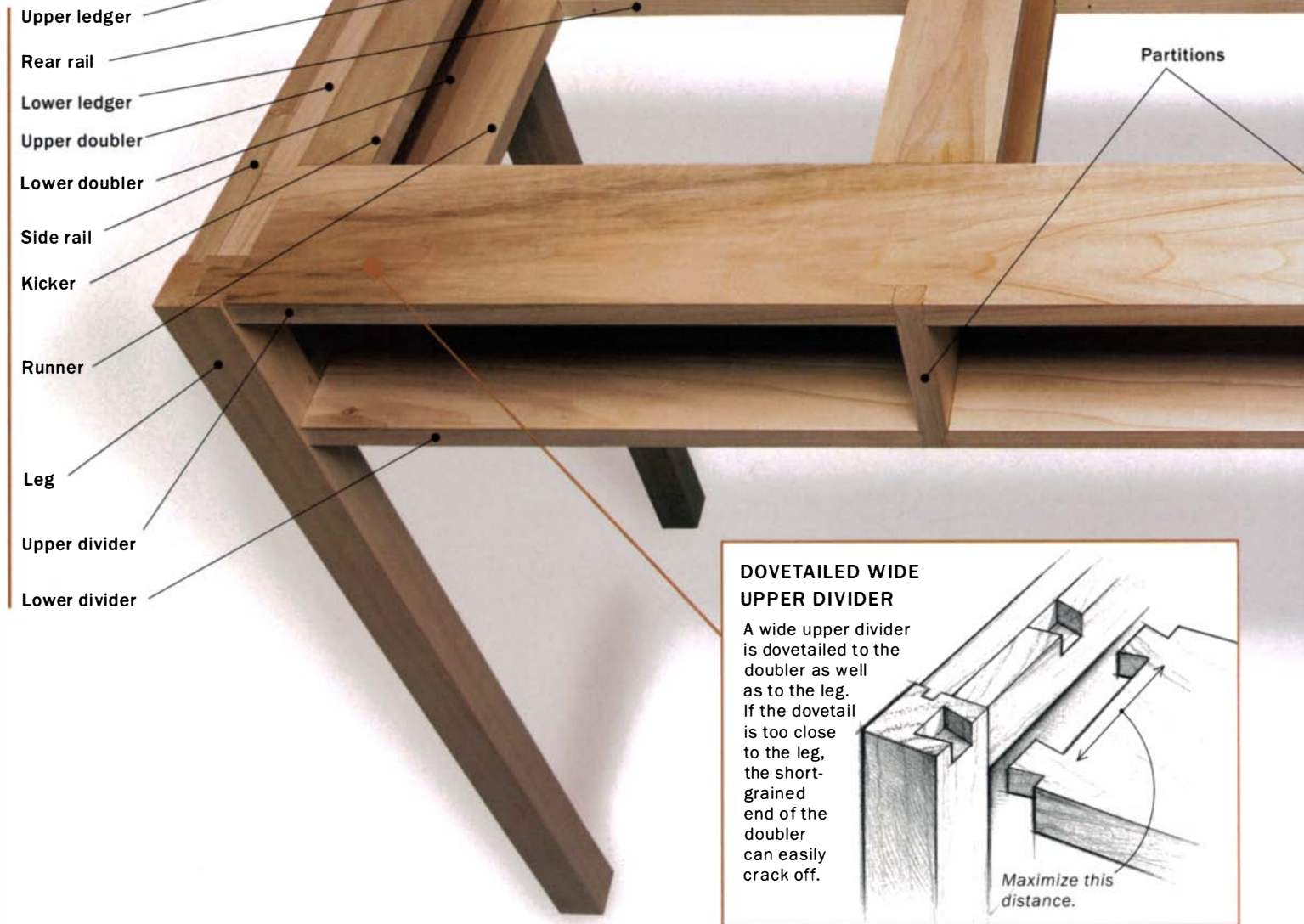
how to build a chair and that chairs are all built the same way.

When our students build a table with drawers, they learn a system. I recall one student who started a veneered Pembroke table after having done a simpler table with a drawer. "Remember when you built the Shaker nightstand?" I said to him. "Now here's what you're gonna do different." His eyes lit up and he said, "Ah, and you just make this longer, and curve that and, oh, yeah, yeah, yeah." He already knew how to build a Pembroke table—he just didn't realize it.

The single-drawer demonstration table I built (see the photo on the facing page) reveals the basic components of a simple table-with-drawer system: dividers, which replace the front rail to make room for the drawer; doublers, which fill out the side rails and serve as drawer guides; runners, which support the weight of the

REVEALED: A TABLE WITH MULTIPLE DRAWERS

In this demonstration table, the author reveals the components of a long table with multiple drawers. For illustrative purposes, he built two types of partitions.



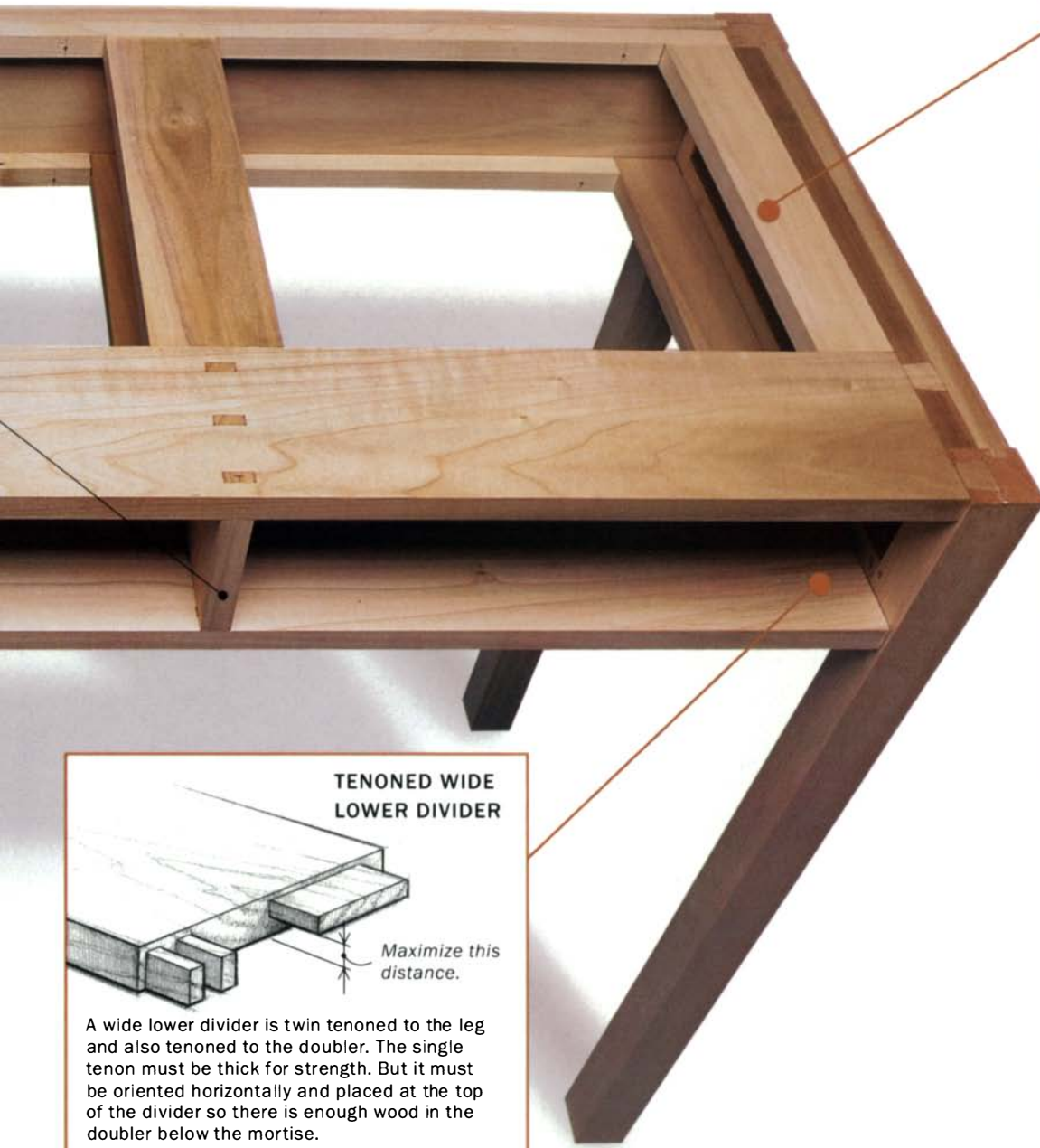
drawer; and kickers, which keep the drawer from tipping upward when pulled out. Some tables require ledgers to support the runners and kickers, and there are others that do without doublers. Nevertheless, if you took apart a Pembroke table, you'd find the basic components in one fashion or another. And you'd know the secret to building tables with drawers: Inside, they're all about the same. Knowing this is like having a deck full of jokers. You can just keep playing the cards.

A strategy for construction as well as design

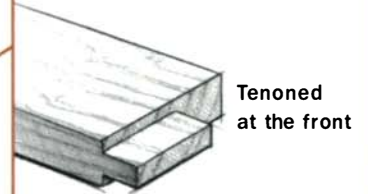
It's worth taking a close look at the components that make up the table-with-drawer system, not only in terms of how each functions as part of an overall design but also in terms of how each is constructed in concert with the other components. Although there's no reason why you couldn't apply my strategy to building a table

by hand, I'm going to assume you will use a tablesaw and a thickness planer. For me, efficiency demands the use of machines, even for the construction of traditional furniture forms.

The key to efficient construction lies in designing joints that share like dimensions and like locations relative to the leg. The tablesaw cuts related parts to equal length; the planer establishes consistent thicknesses and widths. Together, the tablesaw and thickness planer allow groups of parts to have compatible machine-cut joints. When you plane the dividers to thickness, you can also plane a number of square-dimensioned sticks for runners, kickers and ledgers. If you make the haunched tenons on the rails and the twin tenons on the lower divider the same length and location from the face of the leg, then you can cut all the mortises on a hollow-chisel mortiser with a single fence setting. And you can cut the main shoulders of these joints, as well as the dovetails on the upper di-



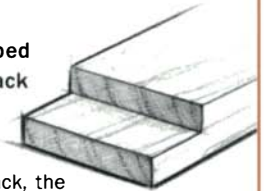
KICKER AND RUNNER



Tenoned at the front

At the front, where strength is needed, the kicker and runner are tenoned to the dividers.

Half-lapped at the back



At the back, the kicker and the runner are half-lapped to a ledger strip. The runner should be half-lapped on top, so it rests on the ledger supporting the drawer. The kicker should be half-lapped on the bottom, because the drawer, if tipped, will push against the kicker from below.

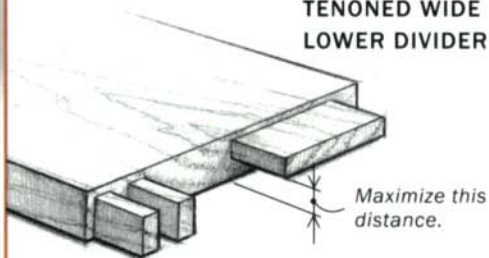
Snapped into place

Kickers and runners can be installed after the table frame has been glued up.

First insert the tenon of the kicker or runner. Then slide in the ledger.



TENONED WIDE LOWER DIVIDER



A wide lower divider is twin tenoned to the leg and also tenoned to the doubler. The single tenon must be thick for strength. But it must be oriented horizontally and placed at the top of the divider so there is enough wood in the doubler below the mortise.

vider, without changing the dado height or the fence setting.

Once you've milled the pieces, you're ready to put together the essential table: four legs, three rails and two dividers. The upper divider is dovetailed into the leg; the lower divider can't be dovetailed, so it's twin tenoned (see the drawing above). With the table glued up, you can take your time installing the inner pieces—doubblers, kickers, runners and (if need be) ledgers.

The first pieces to go inside I call doubblers because, roughly speaking, they double the thickness of rails. More important, the doubblers bring the rail assembly flush to the inside face of the leg, so you don't have to notch the runners and kickers. Some people would call the doubblers side guides, and that's what they are as far as the drawer is concerned: blocks that keep the drawer from shifting from side to side as it's pulled out. Cut four doubblers to length, and glue them to the top and bottom of the side rails. That's that.

Onto the surface of each doubler, glue one of the little square sticks you thickness planed at the same time as the dividers, one stick at the top of each upper doubler to serve as a kicker, one stick at the bottom of each lower doubler to serve as a runner. Taken together, a doubler and runner or a doubler and kicker form an L-shaped piece of wood, which you could make by rabbeting one piece. But they're much easier to make and install inside the table as two pieces. The wide face of the doubblers remains stable when glued flush against the rail. The kickers and runners are such small squares that they won't curl or twist.

What to do when the span gets long

On a small table like my single-drawer demonstration table, gluing the runners and kickers to the doubblers, letting them butt against the dividers and the rear rail (or a cleat for securing the



tabletop), provides enough strength to support the drawer. On a larger or heavier table or on a table with multiple drawers (see the photo on pp. 42-43), you may need to join the runners and kickers at the front and back of the table.

At the front, you can tenon the runners to the lower divider and the kickers to the upper divider. You may not want to tenon the runners and kickers at the back of the table, however, because you'd have to

glue up all the pieces at once. Imagine doing that on a five-drawer lowboy with offset drawers!

To avoid having to glue up all those sticks at once, dado two small sticks (which you have milled and ready) across their width to accept a half-lap joint from each runner and kicker, and then brad the sticks temporarily to the rear rail as ledger strips (see the drawing on p. 43). To allow you to install the kickers and runners after the table frame is glued up, cut them a touch short. Cut the tenons relatively short as well. Even a $\frac{3}{8}$ -in. tenon will take the weight of a drawer. Just slide in the tenons, and snap the pieces into place. Then slide in the ledgers, using the brads to locate them for gluing.

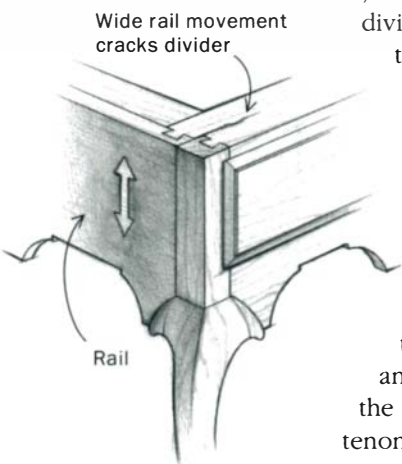
If the span of the table is long and you need the dividers to be stronger, there are only two things you can do: Make the dividers wider, or make them thicker. Making them thicker is, by far, the easiest route to take because a little thickness adds a lot of strength. But many designs simply won't allow for a thick divider.

If you settle on making wide dividers, however, you'd better make them really wide. An extra $\frac{1}{2}$ in. of width isn't going to increase the stiffness of the divider to speak of, and an undersized divider will deflect downward. I'd make the divider 4 in. wide at least; a 4-in. divider is no more work than a narrower one. The trouble is, a wide divider stands a good chance of cupping or twisting. To resist racking, you have to join a wide divider not only to the legs but also to either the doublers or the side rails.

When you join a divider to a side rail or doubler, however, you run the risk that the movement of the rail as it expands and contracts will work the divider like a lever. To prevent movement in the rails from cracking the dividers, keep the rails relatively narrow (ideally less than 4 in. wide), and make the dividers really wide so that movement at the inner dovetail is spread out over a greater distance before it reaches the front dovetail.

Joining the dividers directly to the side rails is historically accurate, but it's tricky because you have to mill dividers longer than the rear rail and then notch the dividers around the

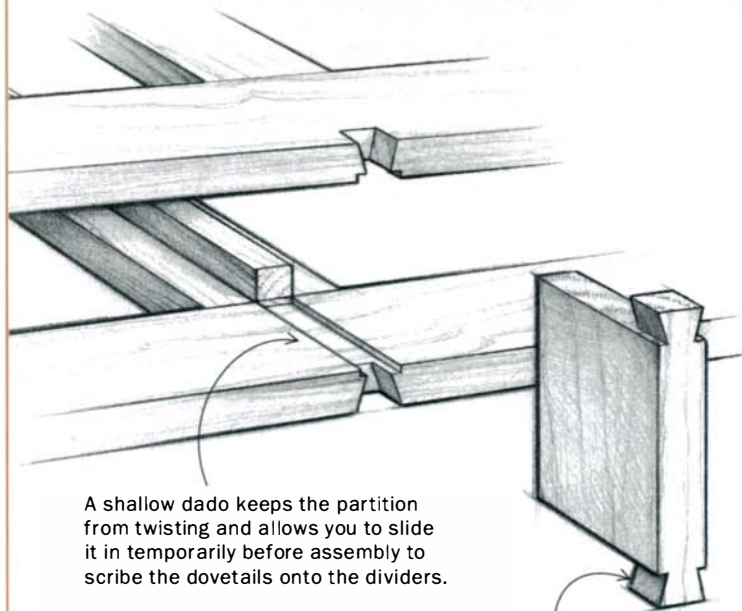
leg. The other way to join wide dividers—attaching them to the doublers—is awfully tempting. A big advantage to attaching wide dividers to the doublers rather than to the rails is that you can make both dividers the same length as the rear rail. The dovetails are easy to cut because they share a shoulder, and all these shoulders can be cut with the same dado setup used for the rail tenons. The forward dovetail is joined to



TWO PARTITION OPTIONS

DOVETAILED PARTITION

A dovetailed partition is easier to install than a tenoned partition because it can be slipped into place after the dividers have been assembled.



A partial, or stopped, dovetail doesn't compromise the divider.

the leg exactly as it would be on a narrow divider. The inner dovetail can be either a full dovetail, as it is in my demonstration table, or a half-dovetail. In either case, leave as much space as possible between the inner dovetail and the end of the doubler. If the housing for the dovetail is close to the end of the doubler, the little short-grained piece that remains can easily crack off.

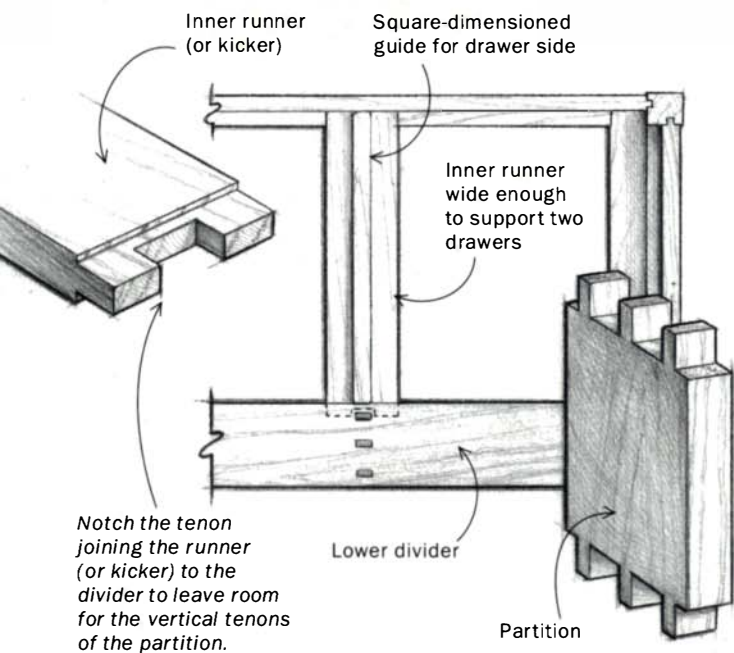
Joining the lower divider to the lower doubler is a little trickier. The lower divider, you remember, is twin tenoned into the leg, so you don't want to dovetail it to the lower doubler because then assembly would be difficult. Instead, join the lower divider to the lower doubler with a horizontal tenon, cut to the same length as the twin tenons. This inner tenon must be as thick as possible for

THAT SUPPORT THE SPAN



TENONED PARTITION

The strongest way to tie together the dividers between the drawers is a vertical partition with through twin tenons or triple tenons. (The plan view drawing below is shown at the lower divider.)



strength, with little or no shoulder on top, so there is enough wood in the doubler below the mortise to provide adequate strength; the doubler will still have plenty of wood above the mortise (see the bottom left drawing on p. 43).

Whether you make the dividers wider or thicker, sizing them is a judgment call. Err on the side of over-built. If the table bounces, what are you going to do about it? If it's a bit sturdier than it needs to be, you'll never know, and you'll be none the worse for it.

How to handle more than one drawer

A table with multiple drawers requires a partition tying together the dividers between each drawer and a complement of internal

runners, kickers and drawer guides. It makes sense to mill the partitions at the same time as the dividers; just be sure to leave the divider blanks long, and whack the ends off. There are your partitions, already at the proper width.

If you feel comfortable with the span of the dividers and you simply want two drawers for looks or functionality, then you can stop dado a non-structural partition into the dividers from behind. But if the dividers are really long—for example, 3 ft. or 4 ft.—the stopped-dadoed partition may pop out when the table deflects downward.

The easiest way to strengthen the joint between the partition and the divider is to use the same twin-tenon arrangement used to join the lower divider to the legs. On my multi-drawer demonstration table, the dividers are so wide, I used triple tenons (see the photo and drawing at left), but the idea is the same. I usually run the tenons through the dividers and sometimes even wedge them. If you join a pair of 3-ft. dividers together with two partitions and join the whole assembly to the legs, then you've created a girder. It's amazing how stiff this system is.

So now that you have partitions between the dividers, how do you support the drawers in the middle of the table? You mill runners and kickers wide enough to support drawers on both sides of the partitions, tenon them to the dividers and half-lap them to the ledger on the rear rail.

Treat these inner runners and kickers as you would the runners and kickers next to the doublers, with one big exception. You have to notch the middle of the tenons so they don't interfere with the vertical twin tenons of the partition. To keep the drawers from swimming around, take another square stick, and glue it onto the center of the runner, long grain to long grain, to serve as a drawer-side guide. Problem solved.

You could also dovetail the partition to the dividers. A dovetailed housing cut across the full width of the dividers would compromise the dividers, so use a stopped dovetail in the front to tie the dividers together, plus a shallow $\frac{1}{8}$ -in. dado across the width of the dividers to keep the partition from twisting (see the drawing on the facing page).

Dovetailed partitions are easier to install than tenoned partitions because with dovetailed partitions, you can attach both dividers to the legs and then simply slip the partitions into place. The shallow dado allows you to slip the partition into the dividers and then scribe the tail onto the dividers before cutting its housing. It's possible to cut the dado narrower than the dovetail to hide it from the front, but now I'm getting into variations on variations.

The beauty of this approach to engineering a table with drawers is that it doesn't rely on the proportions or the style of the table. You can cut big legs or little legs; you can set the rails flush to the legs or inset them; you can turn the legs or taper them; you can make the table long and low and turn it into a coffee table or tall and long and call it a writing desk.

What I hope I've constructed here is a conceptual framework onto which you can overlay your own design ideas. □

Will Neptune is a furniture maker and a woodworking instructor at the North Bennet Street School in Boston.



Finish Cherry...

This common problem can be avoided easily by choosing either of these methods

BY JEFF JEWITT

Years ago, one of my first projects was a simple Shaker-style table for my wife. After carefully selecting the best grain and figure for all the parts, and sweating through the construction details, I was ready to apply a finish. I wanted something really special, so I chose a dark-red dye stain and applied it first to the tabletop. I had a sense something wasn't quite right as soon as I wiped the stain with a rag. Dark, ugly splotches began to appear. I was nervous, but figured the problem would disappear when the stain dried, so I stained the rest of the table. The result was a disaster. I managed to salvage the top by removing a good 1/8 in. of wood with a belt sander and applying a clear finish. But those beautiful book-matched legs, covered with the most delicate ray fleck patterns, now stand in a corner of our living room under a coat of green milk paint.

Cherry is a joy to work. It's easy to cut, shape and sand. If left unstained and coated with a clear finish, it eventually matures to a deep, reddish-brown color coveted by antique dealers as well as woodworkers. In an attempt to duplicate that old-timey color and overcome the pink-salmon hues of freshly machined cherry, many woodworkers use full-strength stain as a first coat and end up with the same blotchy mistake I did. But there are ways to avoid splotching. The first step is to understand the causes.

Knowing why cherry splotches will help you avert the problem

Splotches develop in cherry (and other woods like birch, red alder and soft maple) because of the uneven penetration of stain. It penetrates

unevenly for a number of reasons, and any one or a combination of them can condemn your finishing efforts. So before devising a strategy to prevent blotching, it helps to identify which obstacles may exist within the wood you have on hand. I know of three reasons why stain will penetrate unevenly in cherry.

Resin deposits, the most common culprit—Cherry is one of many woods that often have unseen, concentrated deposits of resin within the wood as a result of the kiln-drying process. The resin deposits attract stain solvents, causing stains to penetrate more in some areas and less in others. It's hard to know when this is going to happen. One easy test will warn you of trouble ahead



A clear coat of thinner tells all

Knowing where splotching is likely to develop is half the battle. By saturating the surface of a piece of cherry with thinner (see the photo at left), you can get a good reading on how splotch-prone that wood will be. —J.J.



Without Blotches

(see the box and photo on the facing page). Saturate the wood with any common solvent, such as denatured alcohol, paint or lacquer thinner. Splotch-prone areas will show up right away because they will absorb the solvent faster, just like they would with stain.

Alternating grain, avoid it when possible—When the grain direction changes within the same board, the stain will penetrate unevenly. This effect can be dazzling, as in curly figure, but more often than not, as in areas around knots, a less-than-attractive appearance is the result. It's usually easy to avoid this condition when it exists, simply by reading the grain direction on the edge of a board and cutting around problem areas when you select wood for cabinet or furniture parts.

Improper sanding, the easiest cause to detect and correct—The most obvious truths are sometimes hard to see: Improperly sanding the surface of any wood species can cause problems. And careful sanding is especially essential with cherry. Dull sandpaper can burnish the surface rather than cut it, making it less likely to accept a finish. Leaping from rough to really fine abrasives is also a no-no, leaving scratched surface areas that are more porous than others. A scraped or planed cherry surface will usually accept a clear finish evenly, but a stain applied over these surfaces will often spell trouble, too.

I usually sand cherry with a random-orbit sander, starting with

100-grit and proceeding up through 180-grit, changing grits at 120 and 150. I switch to fresh paper often and inspect the surface in backlighting to make sure I don't miss any spots. I then hand-sand, using 180-grit, with the grain of the wood. Such careful sanding won't eliminate splotching, but it will help to minimize it, especially in concert with the finishing techniques outlined below.

Two strategies that work

Some people attempt to tame splotching by controlling how much stain is absorbed. I've heard several woodworkers who swear that the new gel stains help control stain penetration, but I've found that they don't work very well on raw cherry. Washcoating is another technique popular with professional finishers. A washcoat seals off the surface of the wood with a very thin resin—diluted shellac, thinned oil or glue size—which decreases the penetration of a stain. But this technique is hard to control evenly, and less penetration means a lighter shade of stain.

I've used two methods to prevent blotches that are well within the range of just about any woodworker's finishing talents. Both are applied by hand, and both yield finishes that have depth and luster with little or no splotching. The first technique (see the top photos on p. 48), which is the easiest, will change cherry from its initial pinkish tone to a golden color that will continue to darken with age. I recommend this technique only for projects that have been carefully matched for grain and figure because exaggerated

color differences in the lumber won't be concealed.

The second technique, which is a bit more complicated, will satisfy those who want a dark, rich color without waiting for nature to do the job. It can also be used for projects that are made from wood of varying color and figure.

The quick and easy method uses oil and dark shellac to supply color without stain—After sanding your project through 180- or 220-grit, apply a light coat of boiled linseed oil or Watco Danish oil. It's not necessary to flood the surface, just apply

enough oil with a rag to make the wood look wet. This step enhances the grain and adds depth. After a day or so of drying time, lightly scuff-sand the surface using 320-grit sandpaper. Wipe off the dust with a rag, and then apply a dark garnet-colored shellac to the surface.

I use a 2-lb. cut (meaning a ratio of 2 lbs. of dry shellac flakes dissolved in a gallon of alcohol) and wipe it on with a rag in a process called padding (see *FWW* #112, pp. 60-63), but you could also use a brush. This shellac has a dark golden-brown tone that adds a bit of color to the cherry. If you want a darker color, you can apply an-

QUICK AND EASY METHOD



Finishing doesn't get any easier than this. A sealer coat of oil (1) and subsequent topcoats (2) of a dark-toned shellac (buton or garnet) will give a rich finish on cherry that will only improve over time. The author pads on the shellac with a lint-free rag.



INSTANT AGING METHOD

Start with a light amber dye stain. A first coat of heavily diluted water-soluble dye stain evens out the colors among different pieces of wood (1), and is the first step toward building up layers of color in the cherry.



This thick, gloppy stuff adds more color. Using a gel stain as a glaze (2), applied over a sealer coat of shellac, is an easy method for adding more color to the cherry.



other coat of the dark shellac. If you're satisfied with the color after one application, you can apply a lighter colored shellac for additional coats. (For more protection, you can apply a varnish as the topcoat.) Build the finish to your liking, and after the proper drying time, rub out the shellac (or varnish) with 0000 steel wool and a dark paste wax.

The color of this finish will start out as a light golden brown but will quickly pick up reddish tones after a month or so when exposed to light and air. By the end of the first year, your project will have a deep-red tone that just keeps getting better with age.

Instant aging is trickier—This finish will result in a rich, dark color (see the bottom right photo) and will help to even out tonal disparities in the wood. Prepare for the finish by sanding the wood through 180-grit. Using distilled water (free of minerals that might stain the wood), wet the surface of the wood to raise the grain. After the wood is dry, smooth down the raised fibers with 220-grit.

To color the wood and minimize splotching, you can build up color in layers. Apply a light amber-brown dye stain (see the bottom left photo on the facing page) as the first coat of color (called a base or a ground stain). This color is sometimes sold as honey amber, but you can use just about any light shade of golden-brown dye. The dye is diluted with four or five times the recommended amount of water and should have the appearance of strong tea. If you cannot find a suitable color of dye stain, you can mix your own (see the box above). This base stain, applied as a diluted solution, will add depth and will even out the tones of different boards.



Mix your own dye stains

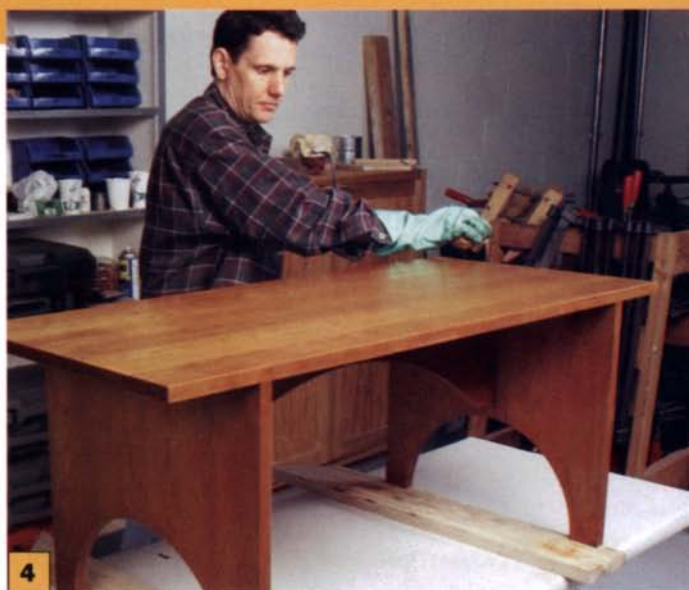
If you don't want to buy a premixed water-soluble dye stain, it's easy to mix your own from pure colors—by weight—using five parts lemon yellow, one part red and one part dark brown. If you don't have access to a scale, you can make a diluted 1-qt. solution by adding 1 teaspoon of yellow, a pinch of red and a pinch of dark brown using the tip of a spoon (see the photo at left). Mix the stain in a glass or plastic container, and wear gloves and a dust respirator when mixing dyes: This stuff stains skin as well as it stains wood. —J.J.

After the base stain is dry, very lightly scuff-sand the surface with a synthetic abrasive pad. Seal in the dye with a 1-lb. cut of shellac, and let that dry. To add more color and depth, you can apply a dark pigment glaze. I use a dark-brown gel stain (see the bottom right photos on the facing page), such as Bartley's dark-brown mahogany, brushed on and wiped clean. After the glaze is fully dry, apply orange shellac, brushed or padded on, to add more color to the final finish. Keep in mind, no matter what finish you put on cherry, it will continue to darken all by itself, getting better looking with each passing day. The more it's exposed to light, the faster that will happen. □

Jeff Jewitt restores furniture in North Royalton, Ohio. He and his wife also own Homestead Finishing Products.



Nearing the finish line. When wiping off excess gel stain with a rag (3), you can control how much is left on the surface for just the right effect. Successive coats of orange or garnet-colored shellac build up the color in layers (4). The more coats you apply, the darker the finish will become.



3

4

Three Ways to Rack Lumber

Efficient stock storage opens up valuable workspace

BY MATTHEW TEAGUE

Finding an orderly way to store lumber is integral to creating an efficient shop. Side-stepping boards to get to machines and benches is not only unsafe, it's also no way to spend a day. For most, the key to a good storage system is keeping lumber out of the way but close at hand in as small an area as possible. There are almost as many storage methods as there are woodworkers. A look at three different lumber racks might help you adapt the system that will work best in your own shop. □

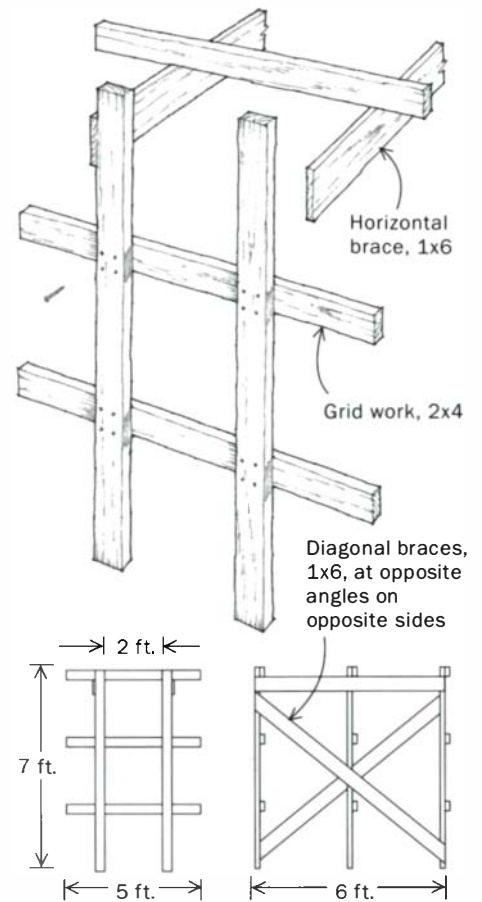
Matthew Teague is an assistant editor of *Fine Woodworking* magazine.

No frills storage

Kelly Mehler, a woodworker and teacher living in Berea, Ky., uses lumber racks that are as simple and efficient as you'll find. It doesn't take days or even hours to build a similar setup. "It looks like a tic-tac-toe board standing straight up," he says. "You'd be amazed how much strength you get out of a 2x4 when it's standing on its end." He's built three of these 2x4 grids. They stand straight up and are connected with horizontal 1x6 lumber. Each rack has nine holes with openings that are about 2 ft. sq., and the boards just slide right in.

"The flow of work is very important to me," Mehler says. He has two racks built this way—one on either side of his radial-arm saw. "I just pull the boards right off the racks and onto the radial-arm saw and rough mill them to size."

"It's all just nailed together," he says. "Screws would be better, but I didn't really think about it when I put them up 18 years ago."



Built to last. Kelly Mehler has used the same basic rack for more than 18 years. He stacks boards in the order they came off the tree and often lets them dry for a year or more.

Going vertical

After 19 years as a stairbuilder, teacher and spare-time kayak builder in Long Beach, Calif., Lon Schleining prefers vertical storage. "As a matter of fact," he says, "I moved into my shop because it had a high ceiling."

Schleining says that vertical storage saves him valuable time and labor. "My old shop had a low ceiling, and it seemed like the board I was after was always at the bottom of the pile. All I did was stack and unstack and move lumber around. It was like a gift from God when I got to a space where I could get to any board rapidly."

The boards are stored on end on a platform and are held up vertically by angled 2x4s. "I really stole the design from a local hardware store," he says. "They have big A-frames with lumber stored on both sides. I just built half of that and bolted it to the wall."

He also uses 1x6 plywood indexers that are notched to move on a horizontal board to denote and separate different species. "It makes it ever so handy," he says, "like having your paperwork in files."



Photo: Strother Purdy



Photo: Joe Romero

A handy file of woods. You won't find Lon Schleining spending his day stacking and unstacking boards. His vertical storage system uses plywood indexers to separate species and keeps everything in easy reach.



Photo: Timothy Schreiner

Storing sheet goods

For John West, a cabinetmaker in Danbury, Conn., storing a large amount of sheet goods is an inevitable part of the job. "The general-use stuff we keep vertically," he says. "If it's something that'll be here a while, we store it horizontally."

West's racks are held off the ground with 2x3 lumber (he uses three boards sandwiched and bolted together) and plywood. Vertical bays are 18 in. wide and 12 ft. deep. Four horizontal racks are built one over the other and used to store sheet goods flat. The horizontal racks are 6 ft. wide, constructed out of 2x6s and have a plywood top. All the racks are held together with bolts.

"It is important to build something that will be big enough to handle anything you might have," says West. "Fiberboard comes in about 5 ft. 1 in. wide in 10 and 12 ft. lengths. The racks are 5 ft. 3 in. on the same principle. It would be easy to build a smaller rack for whatever you might need."

Staying flexible. John West designed his system based on the heavy supply of sheet goods his projects often entail, but the stalls accommodate varying types of stock as his needs change.

A Garden Bench

A boatbuilder wards off weather with Spanish cedar, marine epoxy and copper rivets



BY

DAVID SNEDIKER

When I got to the planning stage, I decided my garden bench—our garden bench—wouldn't have any vertical mortises to catch and hold rainwater, and I'd use copper rivets to fasten any mechanical connections. The bench would have a coved seat and a comfortable cant to the back. I wanted the seat height to be lower than the conventional 18 in.; my thought was that a 16-in. seat height would allow people to sit on the bench in a relaxed position. The bench would be held together with marine epoxy (see the box on pp. 54-55) and made from a maintenance-free wood that would weather to a salty gray in our seacoast town of Mystic, Conn.

Send your kids to college, or make a bench from teak

Last year, I replaced a 22-ft. section of rail on one of the Coast Guard's training vessels. I used 16/4 teak, and the cost of the wood alone was \$4,000. I'd recently bid on a job to replank a sloop with

Bench

Every spring, when the gardening catalogs arrive in the mail, I know it's about to happen again. My wife will leave the catalogs open, turned to the pages with the garden benches, and she'll ask me to make one for her. This has gone on for years now, and finally, this spring, she hit me with an ultimatum. "Build one, or I'm going to buy one," she said.

Fair is fair. I am a boatbuilder, and she had been asking for years. I'd built myself a fishing boat and a couple of doghouses for Pete and Copper. It was time to build a bench.

mahogany. The best price I could find for pattern-grade mahogany was \$5.54 a board foot. Teak and mahogany are without a doubt very good marine woods, but I wanted to find something less expensive for the garden bench.

Spanish cedar was the answer. It's about half the cost of mahogany, a quarter the price of teak and its weather resistance is superb. Spanish cedar grows in Mexico and Central America, and it is more closely related to mahogany than it is to cedar. It has a color similar to mahogany and working properties similar to pine, although it's not nearly as soft as pine. It holds a crisp edge and glues up well. Unfortunately, Spanish cedar's popularity as a wood to make humidors has driven up the price. I've seen Spanish cedar advertised for \$15 per board foot; I got mine for less than \$3 per board foot from a lumberyard that caters to boatbuilders.

All the wood I ordered was 6/4, which required that I laminate

for All Seasons



some of the bench's parts. Aside from allowing me to buy thinner, less expensive stock, laminating the back legs that cant at 9° to form the bench's back allowed me to use two pieces of wood with opposing grains to ensure ultimate strength.

The slats for the seats are $1\frac{5}{16}$ in. thick and 2½ in. wide. They span almost 4 ft. Taken individually, the boards won't hold much weight, but five of them together, with a $\frac{3}{8}$ in. space between each board, comfortably support two people on the bench. In fact, the slight springiness of the narrow boards gives a cushioning effect when you sit on the bench.

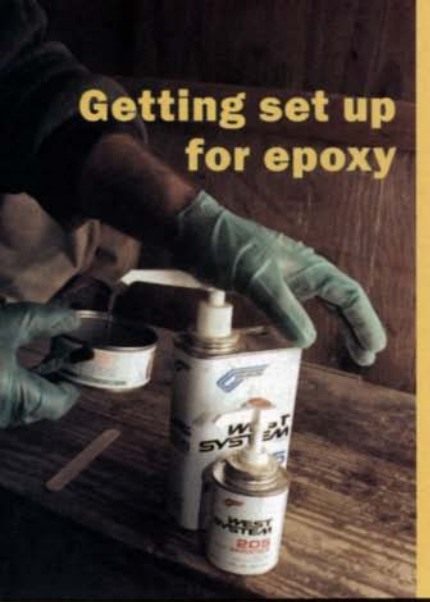
Thin back slats are decorative, not structural

In the garden catalogs my wife left (not so subtly) lying about, many of the benches had vertical mortises in the back rails. Vertical mortises can become water traps—something I wanted to



Back leg template serves dual purpose. A medium-density fiberboard (MDF) template, scaled from the plans, is traced on laminated stock for the back legs. Mortise locations for both front and back legs are also marked on the template. Once the template is laid out, measuring is kept to a minimum.

Getting set up for epoxy



With one big exception, a wooden boat is like a large piece of furniture. If you imagine your dining room table used as a surfboard, you'll get an idea of the stresses and strains a boat goes through.

We use a lot of marine epoxy when we build boats. If you've used epoxy before, you probably remember squeezing goo out of messy little tubes of hardener and resin and then being unsure if you got the pro-

portions just right. Well, forget the uncertain proportions of resin to hardener. A company called Gougeon Brothers makes an almost-foolproof, totally waterproof epoxy called West System.

Gougeon makes epoxies with different working times, and it makes a slew of different additives with weird names like microballoons and micro-light. Some additives fill gaps, and some turn the epoxy into a

structural component.

The second best thing about West System epoxies is the technical support offered by the company. It has a whole library of manuals that explains the different epoxies, the different additives and their uses. And when you call the company (517-684-7286), you're not on hold listening to Mantovani for 10 minutes; there are patient technicians on the other end who know their stuff.

avoid in my bench. I applied the slats to the back of the rails, which did several things. It let me avoid having any vertical mortises that could hold rain water, and it gave the bench back a little depth, not unlike a fielded panel in a door. Also, I could assemble the rest of the bench and then experiment with different slat sizes and spacing until I found something that pleased my eye.

I used a hot glue gun to tack different slats with different spaces between them before I found a pleasing configuration: 10 slats 1 3/4 in. wide. Of course, you could try different combinations of slats and spaces if you find my layout not to your liking. The space between the back slats is about equal to the width of the boards that make up the seat slats, with a half-width space between the back legs and the first back slat at each end.

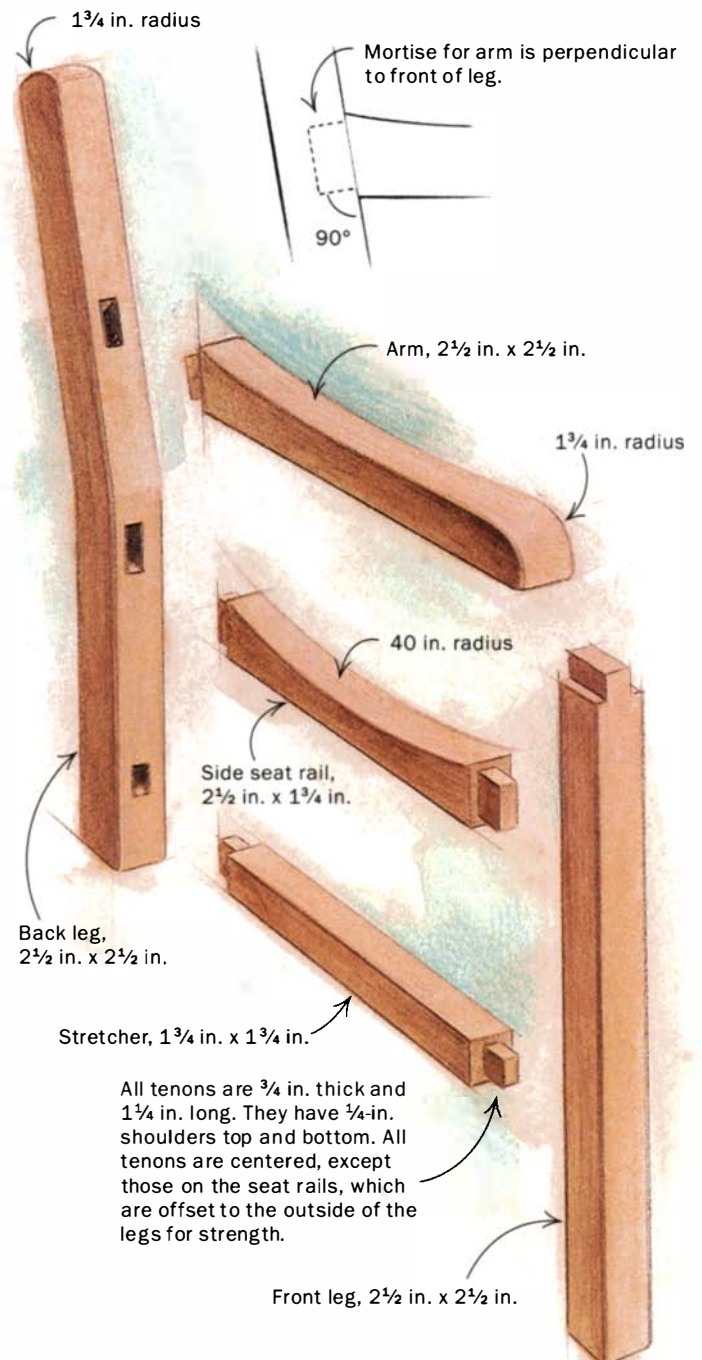
The back slats and the seat slats are fastened with copper rivets (see the box on p. 57), a technique foreign to many woodworkers but as common to boatbuilders as nails are to carpenters.

Fair curves for the arms and seat stretchers

In boatbuilding parlance, a curve is called fair if it is pleasing to the eye and devoid of kinks and flat spots. Aside from the 2 3/4 in. radius on the top of the back legs, there are two curved components on my bench—the arms and the side seat stretchers. I arrived at the curve of the arms by bending a thin piece of wood along the length of the arm blank. When I found a curve that pleased my



Plane the straights, scrape the corners. After roughing out the back legs on a bandsaw, the author dressed the legs' front side on a jointer. The legs' back side, with their inside corners, had to be dressed by hand. He used a plane on the straight sections of the legs and a scraper on the hard-to-reach inside angles.



The first best thing about West System epoxies is the calibrated pumps that screw onto the top of the containers of resin and hardeners (available in sizes from 1/2 pint to 5 gal.). No guessing, no messing—one push of the resin pump, one push of the hardener pump and you have a perfectly proportioned batch.

There are a few things to keep in mind when using epoxy. When you think you've

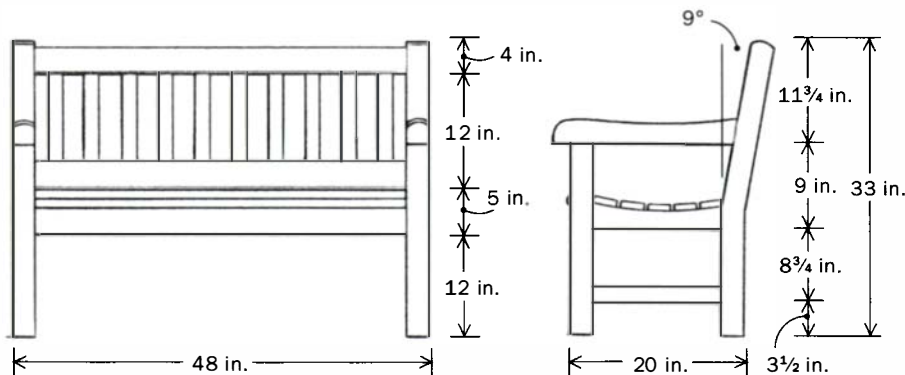
stirred the ingredients together for long enough, stir a little more. And never spread epoxy with your stirring stick. Throw it away, and use a clean spreader. We use disposable flux brushes. Epoxy is good glue because of its tenacious adhesion to almost everything. During a glue-up, we lay down waxed paper on any surface we want to keep epoxy-free. White vinegar is pretty good at dissolving uncured epoxy; alcohol

is better. We always wear gloves when working with epoxy, and if we have a major glue-up to do, we don Tyvek suits because if epoxy gets on your clothes, forget about it.

Epoxy cures by an exothermic chemical reaction; it gives off heat as it hardens. When the reaction starts, finish your clamping in a hurry, or pull everything apart and scrape off the still-viscous epoxy. What once was the consistency of

maple syrup will quickly turn to heavy cream, then leather and before you know it, your tools will be stuck to the wood. The reaction is far from instantaneous, and as mentioned, different West System products go off at different speeds.

When we want something to stay glued forever, we use West System epoxies, available at most boatyards. They aren't inexpensive, but no good insurance is. —D.S.



NO-MAINTENANCE OUTDOOR BENCH

The author's design, his construction techniques, even his choice of wood all kept in mind that the garden bench would stay outside year-round. The copper rivets will oxidize to a pleasant green color and won't stain the weather-resistant Spanish cedar wood. There are no vertical mortises in the bench's construction that will trap water, and the mortise-and-tenon joinery is held together with waterproof marine epoxy.

Avoid making two left legs. The back legs have identical shapes. The only difference between the two is the locations of the mortises for the seat rail and the bottom stretcher. To avoid confusion when laying out mortises, the author labels the legs L and R and clamps them with the template in their proper orientation.



eye, it was just a matter of tracing a line onto the blank and cutting along the line with a bandsaw. The slight radius along the top of the arm's width was drawn with a pencil, roughed out with a handplane and finished with a spokeshave and sandpaper.

For the curve on the side seat rails, I cut a plywood template 15 in. wide—the distance between the bench's front and back legs. I swung an arc with a 40 in. radius from the plywood's centerline across the width of the plywood and then cut along the arc and traced the curve onto the roughed out side rails.



Construction notes

Most of the bench's frame is held together with centered mortises and tenons. Offsetting the seat-rail mortises to the outside of the front legs allowed me to make stronger full-length tenons on the seat rails themselves (see the drawing on p. 54).

I used a router and a $\frac{5}{16}$ -in. roundover bit to smooth the exposed edges of the bench. Where the arms meet the front and back legs in a flush joint, I finished the roundovers with a file and sandpaper.

There are many excellent exterior finishes on the market, but I



Empirical angle checking. With the exception of the joint between the bench arm and the back leg, the bench parts intersect at right angles—what boatbuilders call *normal off*. From his plans, the author knew what the arm-to-back-leg angle should be, but for the tightest fit, he wanted to check the angle from the actual construction. He dry-clamped the leg stretcher between the legs, and using a square and a bevel, he determined the exact angle. He then transferred the angle to his tablesaw for cutting the arm's tenon shoulders.



Six slats and five spaces. One seat slat fits tight to the back legs and another overhangs the front seat rail by $\frac{1}{2}$ in. Between the remaining four slats are five spaces. The author subtracted the combined width of the four slats from the distance between the front and back slats. Dividing that remainder by five gave him the width of the spacer blocks that hold the seat rails tight when they are riveted.

decided to leave the bench unfinished. Spanish cedar is very resistant to water, weather and worms, and it will turn a pleasing driftwood color if it is left in the raw. Besides, if I applied finish one season, I would have to do it again the next season, and that's one maintenance regimen I'd rather not start. As a way to stop water from wicking into the end grain, I painted the bottom of the bench's four legs with a coat of epoxy.

Further tips on the bench's construction are explained in the photos and in the captions. I'm happy, and my wife is happy. Bring on summer! □

David Snediker and his understanding wife, Roberta, live in Mystic, Conn.

Copper rivets



Take a look at an old pair of Levis. The knees may be blown out and the hems have probably failed, but the copper rivets at the major stress points are, undoubtedly, still

holding strong. And guess what holds together the ironwork in a skyscraper? Rivets. Lots of them. Wooden boats are held together with rivets for the same reason; they are a one-time, permanent fastener.

Rivets are often used to fasten wood too thin to accept a screw and a bung, such as the back slats on the garden bench, but they can be used to face join all types of wood. In the simplest terms, riveting is a matter of through-nailing two pieces of wood, slipping a washer over the pointed end of a nail and then pounding on the end of the nail until it mushrooms over. In the age of self-drilling, galvanized drywall screws and biscuit joiners, rivets may seem low-tech, but it's somehow reassuring that their brute strength doesn't rely on high-torque spinning or the glue-activated expansion of compressed wood fibers.

Copper is wonderful for riveting wood. It is malleable enough to peen easily around a copper washer. All rivets are made of two parts: nails and burrs, sometimes called roves. Burrs look like washers. Nails look like carpenter's common nails, and in fact, they are sized in similar penny weights. Eight penny is referred to as 8d, 10 penny as 10d and so on. Like all nail wire gauges, the higher the number, the smaller the diameter.

Copper nails are sold by the pound; burrs are sold by the ounce. To order rivets and burrs, try Jamestown Distributors at (800) 423-0030 or The Wooden Boat Shop at (800) 933-3600. You want to get nails that are at least ½ in. longer than the combined thicknesses of the wood you are going to fasten. Too long is not a problem because you are going to snip off the pointed end of

the nail during the riveting process. What is a problem is if you order the wrong size burr. Ideally you want a burr one gauge size larger (that is, one hole size smaller) than the nail you are using. That's because it's easier to flatten the end of a nail around a tight burr than one that jumps off the end of the nail every time you hit it.

You only need one special tool to set rivets, and you can make it faster than you can read this paragraph. Drill a ¼-in. hole 2 in. deep into the end grain of a scrap of hardwood that's about the size of a hot dog. The thing you just made is called a rove set. You'll need a heavy, squarish piece of iron (riveters call it a buck). A sledgehammer will do fine. You need a lightweight ball-peen hammer. And here's how you set rivets:

Drill a pilot hole through both pieces of wood to be riveted. Use a drill bit that's one size smaller than the diameter of the nail. Tap the nail through the pieces of wood. Put a rove over the nail point. Using the hardwood hot-dog-with-a-hole, tap the rove tight to the wood. Then, and this is important, snip off the end of the nail a distance from the face of the rove equal to the nail's diameter.

Back up the head side of the nail with the buck—push hard!—and start tapping the stub end of the nail with the flat end of a lightweight ball-peen hammer. Hit the stub end just hard enough to dent it. Rather than kink the nail in the hole with hard blows, what you want to do is start to spread the nail stub around the rove. Tap, tap, tap with the flat head of the hammer until the stub is flattened. Then use the ball end of the hammer to round over the flattened copper stub. Tap, tap, tap until the rove and the nail head just dimple each face of the wood.

If the boards are tight, the rivet is set. Should the boards ever shrink and loosen on the rivets, cinch them with a few more hammer taps. Try that with a bunged screw. Riveting is fast and efficient. Using a rivet to fasten wood reminds me of the slogan of a popular lacquer-like home-hairdo product of the 1960s: Set it and forget it. —D.S.



In Search of the Right Mortising Technique

Five strategies from hand tools to expensive machines for cutting fast, easy and accurate mortises

BY STROTHER PURDY



MAN OR MACHINE

Everyone can find a way to cut mortises well, whether through improving skills or finding a better tool. Some prefer the quiet approach of the chisel (above), and others go for the fast and furious router (right). Other good options include the drill-press-and-chisel approach, hollow-chisel-mortise machines and dedicated slot mortisers.



The first mortise I cut looked as though a miniature dynamite charge had been set off inside the board. Splinters pointed out of the hole in every direction. Inside, my chisel had mashed out nooks, crannies and side passages instead of cutting the straight, flat and square hole I intended. It was plain to see that I had not been born with the skills to chop mortises by hand.

For a while I contemplated buying my way out of learning this skill. Though a good craftsman never blames his tools, I reasoned, a smart one tries to use the best one for the job. My tool wish list, however, was long and underfunded. A jointer and a planer had higher priority than a plunge router or a hollow-chisel mortiser.

In time I learned to cut mortises by hand with reasonable speed and pretty good results. It took a while, but I found I enjoyed the work. The mortises didn't look too hot, but the assembled joint eventually hid them from discerning eyes. I did wonder how strong they were. I knew that yellow glue did not hold across or fill gaps. This told me the uneven fit of my mortise-and-tenon joints couldn't be very strong. Sure, they held together when I tried to pull them apart, but I had no way to test them for the years of use and abuse I wanted them to withstand. It was time to find out how well the mortise had to fit the tenon to stay together and then learn how to cut them that way.

Good design, fit and glue make strong mortises

I asked Carl Swensson, a woodworker with more than common knowledge about joinery, what made a mortise-and-tenon joint strong. His lengthy reply, which lasted several days, was both enlightening and frustrating.

Boiled down, a strong joint is the product of balanced design (so that one member isn't stronger than the other), an accurate fit and a good glue bond. Everybody knows that glue will make a joint stronger. Swensson was the first who could tell me why. When a joint is under stress, the glue bond spreads it across the cheeks of the mortise and tenon. In a joint without glue, such as one that's only pegged or wedged, the stress will concentrate along edges and at points. This means that the fit must be tight in these places. In a glue joint, the fit is still important, but the accuracy and quality of the glue surfaces are crucial.

To find out more about glue bonds and their requirements, I spoke with Mike Witte, a technical manager at Franklin International. He sent me several manuals about glue, which I read in spite of the great risk of falling asleep. To bond at their full strength, almost all glues need a smooth-but-unburnished surface, free of loose fibers, because glue needs to pene-

trate a few thousandths of an inch into intact wood. If the surface is burnished—by a dull router bit, for example—the glue can't seep into the pores and has little grip. If the surface is covered with loose fibers, such as a dull chisel might leave, the glue attaches to the loose fibers and not the joint walls. The lesson here is that sharp tools increase joint strength.

Witte confirmed a sobering rule about glue joints: For the glue to do its job, the gap between mortise and tenon should not exceed 0.005 in. This sounded like something I'd need a computer numerically controlled (CNC) router to achieve. However, the way to get these kinds of tolerances really isn't by measuring but by feel. If a mortise and a tenon go together easily, don't need to be hammered home, yet don't come apart without effort, Witte claims they'll be within 0.005 in. apart (see the box below).

Use chisels for low-cost but high-skill mortising

Chisels are the ubiquitous mortising tool. Everybody has them, but many woodworkers don't use them because they re-

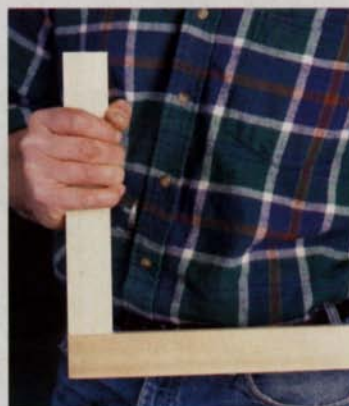
What makes a good mortise?

That's simple: a clean surface for a strong glue bond and a tight fit with the tenon.

THE FIT SHOULD BE...



Not too tight: If you have to hammer the joint together, it's too tight. You'll likely split the mortise if you tap aggressively.



Not too loose: You shouldn't be able to move the tenon in the mortise at all or feel any back-and-forth movement when you try.

But just right: The tenon should fit into the dry mortise with hand pressure only. It should not come apart easily, and it certainly should be able to withstand gravity. A good fit may even need light mallet taps to drive the joint apart.

FOR A STRONG GLUE BOND, THE MORTISE CHEEKS SHOULD BE...

- flat and smooth, so they meet the tenon evenly.
- unfinished, so the glue can penetrate the mortise cheeks.
- free of loose fibers, which would soak up the glue and not allow it to penetrate solid wood.





MORTISING CHISEL AND MALLET

Brian Boggs chops a mortise in a chair leg. Though it's the slowest way to cut a mortise, he derives great pleasure from chopping precise joints with good tools.



quire superlative skill to handle, and they are slow. I found that the first complaint is a half-truth, and the last is, well, true.

I visited Brian Boggs at his chair shop in Kentucky to see whether the humble mortising chisel and mallet were capable of cutting with the precision that glue manufacturers required. When he greeted me, the fact he held a mortising chisel in one hand and a micrometer in the other answered my question. Boggs' recipe is simple: The quality of the mortise depends largely on how the chisel is tuned. Boggs told of the occasion when a student who could not chop a good mortise borrowed his chisel and had no further problems.

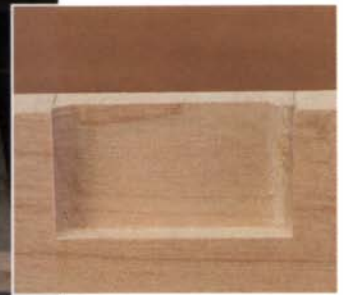
Mortising chisels generally have long, stout blades as thick or thicker than they are wide. This allows them to be hammered aggressively and deeply into hard woods without breaking. Unlike most power tools, few chisels arrive from the factory ready to go. To tune one, use an engineer's square to check the surfaces and a benchstone to make them true. The bottom and sides of the blade must be flat and square (the top of the blade is irrelevant). The cutting edge must be both razor sharp, straight and perpendicular to the sides. If not, the chisel will wander no matter how hard you try to keep it going straight down. Never hone a mortising chisel's edge on a buffing wheel because it will round the corners of the blade, right where it should be sharpest to cut the mortise walls.

Boggs begins a mortise by scoring his layout lines with bench chisels to keep splinters from running. He then removes an even 1/16 in. depth across the whole mortise. This creates a shoulder for the chisel to register against. The amazing thing is that a well-tuned mortising chisel is almost self-guiding after the first 1/16 in.

DRILL AND PARING CHISEL

Carl Swensson uses a drill press to quickly hog out the mortise waste (below), then a paring chisel to shave off the ridges left by the twist drill. Easy to see, the ridges make excellent guides for paring the mortise cheeks square and flat.





PLUNGE ROUTER AND JIG

The block-and-clamp jig gives the plunge router a stable base to cut quick and accurate mortises in small pieces.

Chopping down as far as the chisel will go in $\frac{1}{8}$ -in. increments, Boggs travels from one end of the mortise to the other and back again. The chisel's strong bevel breaks out chips as it cuts. Finally, he pares the cheeks lightly with a wide bench chisel.

Carl Swensson also cuts his mortises with chisels, but he begins on the drill press and finishes by paring the cheeks and ends with bench chisels. This method is slightly faster than chopping entirely by hand, but the drill press does take time to set up. Swensson drills a number of non-intersecting holes with a twist drill $\frac{1}{32}$ in. thinner than the mortise is wide. The remaining waste between the drill holes is easily tapped out. The ridges left by the drill help him guide the chisel when paring the mortise walls flat and square (see the bottom photos on the facing page).

It's rewarding work, but cutting mortises by hand is slow and tedious. Chisels do have one important advantage over all other mortising tools, though, and that's their versatility. You can chop or pare a mortise of any size and shape anywhere on any piece of wood, which isn't always true of power tools.

Plunge routers cut fast, simple and precise mortises

The router is to the woodshop what the microwave is to the kitchen. The two are fast, efficient and versatile tools, but I always

have a lurking suspicion they're bad for my health. The plunge router, however, is considered by many woodworkers to be one of the most useful tools for mortising.

Jeff Miller, a Chicago furniture maker and instructor, claims to have spent years sorting out the plunge router for mortising. It plunges accurately enough but doesn't move from side to side without help. It's also a top-heavy tool and needs a stable platform to ride on. The key to mortising small parts accurately with a plunge router, Miller found, was a simple, stable and versatile jig to guide it—just a large block with clamps attached (see the photo above). The clamps hold the workpiece parallel to and even with the top of the block. The router rides on the block, and its fence registers on the opposite edge of the block.

For work that doesn't fit in the jig, the plunge router makes the journey to the workpiece with ease. John McAlevey, a Maine woodworker, uses a plunge router with a fence or a template to cut mortises that would be difficult with any other tool except a chisel and mallet.

Routers are capable of very smooth cuts, but not without some technique. They're light-duty tools, and even the monstrous 3-hp plunge routers need to be handled carefully and used gently. The jig or platform must be rigid to keep the router from wobbling. A



HOLLOW-CHISEL MORTISER

A drill press that cuts square holes? Faster than a plunge router, hollow-chisel mortisers don't produce much dust or noise, and they leave the mortise ends automatically squared up.

bit plunged too fast or without wood on all sides will cut gouges down the mortise cheeks. Probably the best technique is to remove the waste in horizontal increments of $\frac{1}{32}$ in., moving the router slowly from end to end. An unstable jig or moving too fast will cause the bit to wander and cut steps in the mortise cheeks. An alternative is to plunge all the way down at either end of the mortise first. Then remove the waste in the middle. Both techniques will cut very clean mortises.

The price for the plunge router's speed is noise and dust—I frankly don't enjoy using routers. They screech loudly and produce volumes of fine dust. Safety goggles, hearing protectors and a good-quality dust mask help, but I dislike working in sensory deprivation gear, unable to hear the phone ring or see my work through the dust and scratches on my goggles. Nonetheless, I have to admit the speed of the router trumps its disadvantages. I watched McAlevy cut 14 mortises with a router in the time Carl Swensson cut three by hand.

Drilling square holes: hollow-chisel mortisers

A dedicated hollow-chisel mortiser is a peculiar and wonderful tool, thereby typically English. In a nutshell, it's a specialized drill press with a hollow and square chisel mounted around an auger bit. A quill feed plunges the spinning bit and hollow chisel into the workpiece, in effect drilling a hole and paring it square simultane-

ously. A series of these cuts produces a typical rectangular mortise.

Nial Barrett, a woodworker in upstate New York, owns a small one he's found to be a great mortising tool (see the photo at left). It's reasonably quiet, fast, makes chips not dust and cuts square holes. With a price of about \$300, it might seem the perfect mortising tool. However, these advantages come with a few problems. The drill-press-style setup limits the size of the workpiece to about 6 in. high. The workpiece must be rectangular in cross section, or it will be difficult to clamp firmly to the machine. The smaller-sized bits ($\frac{1}{4}$ in. and $\frac{3}{8}$ in.) heat up and burn or crack easily if misused. Finally, even when well-tuned, hollow chisels produce a moderately rough cut (see the inset photo at left).

Barrett does not see the roughness as a problem, and he points out that he's never had a joint fail. I checked with another hollow chisel user, Tom Stangeland, a woodworker in Washington state, who agreed. It's a point well taken: After all, the perfect mortise is simply one that stays mated to its tenon. If the hollow-chisel mortiser cuts well enough, then it cuts perfectly well.

Industrial advantages: dedicated slot mortiser

Dedicated slot mortisers are industrial-grade machines with many advantages over the router and the commercial milling jigs. Slot mortisers have a horizontal drill-style head that slides forward and back, giving the cutter a plunging action. With all other methods, the piece stands still and the cutting tool moves. With slot mortisers, the workpiece is mounted on a sliding table that moves laterally to the head. This table can also be adjusted in height.

Slot mortisers cut very smooth, very accurate mortises even faster than a router (see the inset photo on the facing page). They are surprisingly quiet—quieter than hollow-chisel mortisers—and produce chips not dust. They're made to withstand years of abuse without a whimper. And they're capable of almost any size or type of mortise in a workpiece that will fit on their bed. Maybe this is why I found, without looking very hard, several one-man shop owners who shelled out several thousand dollars to buy one. In the long term, the machines are simply worth it. Chris Becksvoort doesn't regret a penny he spent on his slot mortiser.

Besides using his slot mortiser for all the common mortises,

Router milling jigs

A huge number of commercial jigs are available for the router, ranging from the simplest subbase to elaborate computer numerically controlled (CNC) rigs for the most ambitious hobbyist. Among them are a few interesting machines designed to turn the router into an all-purpose production milling tool. I'll call them router milling jigs for lack of a better term. They have names like Matchmaker, Mill-Right and Multrouter. I've had the pleasure to see the Multrouter in action cutting mortises.

The Multrouter isn't hard to describe: It's a router jig gone mad (see the photo at right). There are more levers, knobs,



DEDICATED SLOT MORTISER

Chris Becksvoort cuts a slot for a mortise lock in a finished door. Unlike a router, a dedicated slot mortiser is quiet and a simple pleasure to use.



Becksvoort uses his for end boring bedposts, lock holes in finished doors (see the photo above) and even cutting sliding dovetails in the bases of Shaker candle stands (a long story and a complex jig). Good technique is similar to routing a mortise, with one exception. To get the very best cut, Becksvoort raises the table a hair, recuts one face, then flips the workpiece and cuts the opposite face.

And the right tool is...

With the dedicated slot mortiser, I found a compromise of speed, noise and dust production that I really liked. The stumbling block, of course, is the price. Until I win the lottery, I'll putter along with

my chisels, paying more attention to the sharpness of my tools and the fit of my joints. Chisels are hard to beat for their affordability and sheer pleasure of craftsmanship. Although this is my solution to making strong joints, I know much depends on personal preferences, so I don't necessarily recommend this route. I can make sacrifices of speed and ease to avoid noise and dust because I don't run a professional shop. If I did, I might get a plunge router or maybe a hollow-chisel mortiser. Unfortunately, each person I approached might have convinced me his tools and techniques were best, if I hadn't seen all the others. □

Strother Purdy is an associate editor of Fine Woodworking magazine.



stops, setscrews, tables and fences than any healthy woodworker should be asked to handle. But talking with Peter Turner, a Maine woodworker, made the jig seem devilishly easy to use.

The machine houses a standard fixed-base router in a frame that raises and lowers on linear bearings. The workpiece is clamped on a platform that moves from side to side and in and out. The platform also tilts, making angled work possible. It can cut mortises, tenons, dovetails, box joints and anything in-between.

The great advantage of the machine is its speed in cutting more than a few mortises. The initial setup takes a while,

but the adjustment for each operation is minimal. Once running, it can cut mortises in 15 seconds and tenons in less than 10. If you blink, you miss the process. Piles of parts for large casework can be milled in minutes. And the quality of the cut is excellent, though no better than any well-jigged router.

The main limitation is the price of the machine. Turner admits that he was not able to afford a new one, which costs about \$2,300. But a bit of luck threw an inexpensive used one his way. He bought the machine with a friend, reducing his investment to a fraction of the cost of a new one. —S.P.



Not Your Father's Pegboard

An organized wall of tools gives you instant access

BY HANK GILPIN

The first thing people notice when they visit my shop is the tool rack. Not the wood scattered and stacked everywhere, not the furniture under construction, not the big old machines. Nope, they always walk over to the wall of open tool and clamp storage and say, "Wow, your shop is so organized."

I'm never sure if the shop's neatness is a letdown or a pleasant surprise. But it doesn't really matter. I didn't build my tool rack for display. I am neat by nature and by need fairly organized. We do a lot of handwork at my shop, and because I always have at least one other person working with me, I wanted a rack that would put the full array of hand tools within arm's length of two benches.

The wall's layout is simple and practical. Each of the primary tools—every plane, chisel, file, measuring device and saw—has a spot to sit in and can be taken out without moving anything else. Blades stay sharp, squares stay true and saws stay straight. The slanted shelves for the planes and chisels make the tools easy to locate and grab. A strip of wood tacked along the lower edge of these shelves keeps the tools from sliding off, and $\frac{1}{16}$ -in.-sq. strips between the tools keep them spaced properly.

The shallow shelves above the plane and chisel racks hold sanding blocks, mallets, drills and the less frequently used planes and scrapers. At the bottom of the rack is hanging storage for clamps and shelving for the myriad blocks, wedges, battens and pads used with the clamps.

I didn't rush into the rack's design. I thought about my work habits and sketched out a number of alternative arrangements. But I built the entire project in one day. I used construction-grade plywood and nailed and glued it together. I don't think I could come up with a simpler, easier-to-use solution. After 24 years of use, it serves the shop well. □

Hank Gilpin makes custom furniture in Lincoln, R.I.

Organization out in the open. It's easier to stay organized when tool storage is close at hand and unobstructed. The convenience of the author's simple system keeps tools from piling up on the bench.

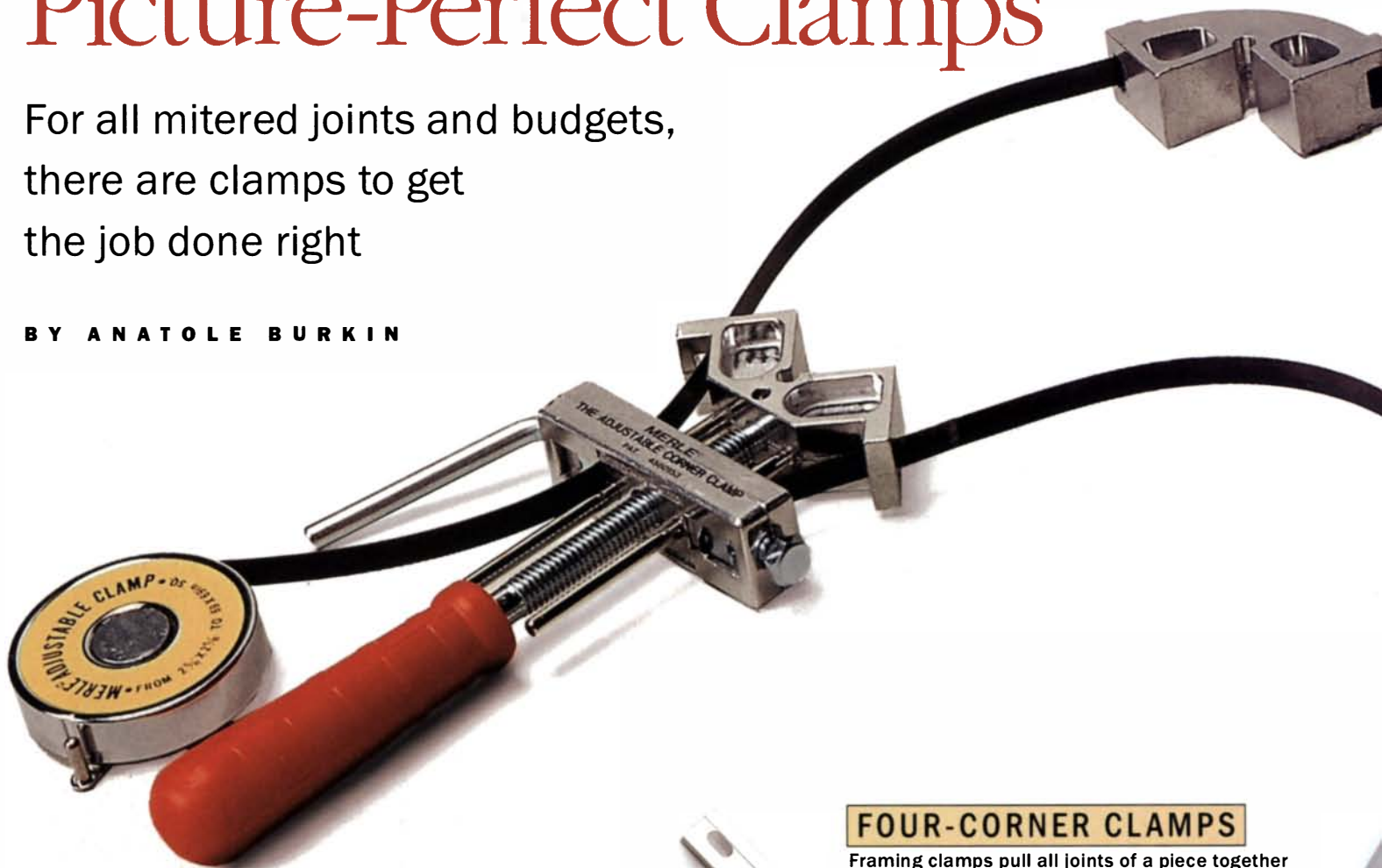


Photos: Jonathan Binzen

Picture-Perfect Clamps

For all mitered joints and budgets, there are clamps to get the job done right

BY ANATOLE BURKIN



FOUR-CORNER CLAMPS

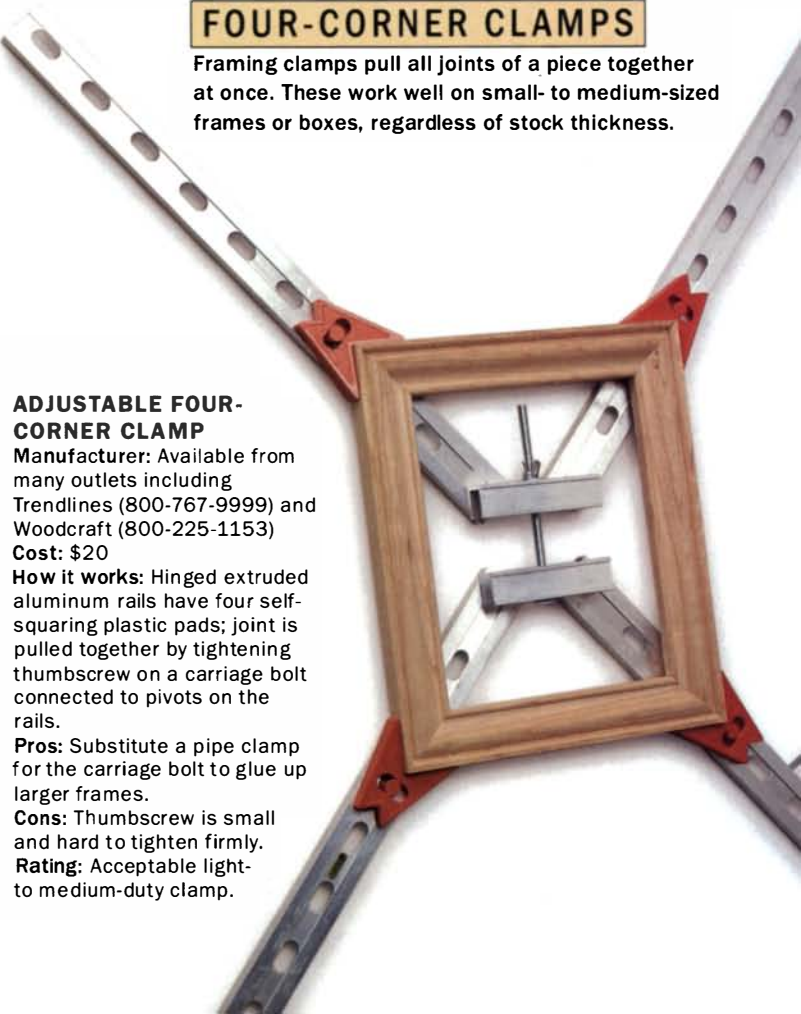
Framing clamps pull all joints of a piece together at once. These work well on small- to medium-sized frames or boxes, regardless of stock thickness.

A good miter joint begins with an accurate cut and ends with a precision clamp. Errors made along the way—a cut that's off a degree or a clamp that won't pull the joint tight—can get compounded. It's like using a checkbook: mess up one entry and the entire running balance turns to slop.

A clamp won't solve problems of bad geometry, but if the math adds up, a good clamp should accurately position stock and firmly close the joint. Nothing is more maddening than trying to get by with a clamp that won't bring a joint home or won't hold it securely while the glue sets.

There are a lot of ways to clamp miters, and readers of *Fine Woodworking* have come up with many ingenious solutions. Manufacturers have been prolific, too. I looked at more than 20 clamping devices currently on the market and included the best 16 in this survey. I evaluated the clamps on several criteria: ease and precision of alignment, ergonomics and pressure exerted on a joint. To measure the amount of pressure a clamp exerted, I slipped a 0.0015-in. feeler gauge into a joint and tightened the clamp.

If the feeler gauge slipped out with a gentle tug, I labeled the clamp light-duty. If a tight grip was required to remove the feeler gauge, I labeled the clamp moderate-duty. If I had trouble pulling out the gauge—or in some cases couldn't pull out the gauge without mangling it—I described the clamp as heavy-duty. Overall performance ratings are as follows: adequate, good and excellent. I didn't



ADJUSTABLE FOUR-CORNER CLAMP

Manufacturer: Available from many outlets including Trendlines (800-767-9999) and Woodcraft (800-225-1153)
Cost: \$20

How it works: Hinged extruded aluminum rails have four self-squaring plastic pads; joint is pulled together by tightening thumbscrew on a carriage bolt connected to pivots on the rails.

Pros: Substitute a pipe clamp for the carriage bolt to glue up larger frames.

Cons: Thumbscrew is small and hard to tighten firmly.

Rating: Acceptable light- to medium-duty clamp.

BAND CLAMPS

Band clamps wrap around a workpiece; they can be used on boxes as well as frames. They're not affected by the thickness of stock, only the circumference.

VARIO-ANGLE STRAP CLAMP

Manufacturer: American Clamping Corp. (800-828-1004)

Cost: \$39; pack of six extra corner blocks: \$13

How it works: Hand-screw-style band clamp with take-up spool. Removable corner blocks are hinged to adjust to any angle.

Pros: Self-adjusting corner pads work well; comfortable hand screw puts lots of pressure on the joint.

Cons: Take-up reel action is a bit sticky. Short handle.

Rating: Good medium-duty band clamp.

PONY BAND CLAMP

Manufacturer: Adjustable Clamp Co. (312-666-0640)

Cost: \$9

How it works: Cloth band with ratcheting mechanism wraps around workpiece. Comes with four 90° corner blocks. Ratchet must be tightened with screwdriver or wrench.

Pros: Low cost. Clamps angled joints as well as circles.

Cons: Stamped-steel corner blocks (not pictured) are unstable.

Rating: Acceptable light- to medium-duty band clamp.



MERLE ADJUSTABLE CORNER CLAMP

Manufacturer: MLCS (800-533-9298)

Cost: \$25; 40-ft. band: \$7

How it works: Metal hand-screw-style band clamp with removable 90° aluminum corner blocks.

Pros: Smooth take-up reel and large handle let you crank a joint tight.

Cons: Heavy band and spool need to rest on a work surface for stability when clamping small parts.

Rating: Excellent heavy-duty band clamp at a competitive price. Works on frames or boxes.

QUICK-ADJUST BAND CLAMP

Manufacturer: Wolfcraft (630-773-4777)

Cost: \$33

How it works: Hand-screw-style band clamp with removable 90° corner blocks.

Pros: Corner blocks provide good stability when clamping a frame laid out on a workbench.

Cons: Handle is small. Take-up spool consists of rubber band strapped around thin plastic axle.

Rating: Acceptable light- to medium-duty band clamp.

PONY 4-CORNER FRAMING CLAMP

Manufacturer: Adjustable Clamp Co. (312-666-0640)

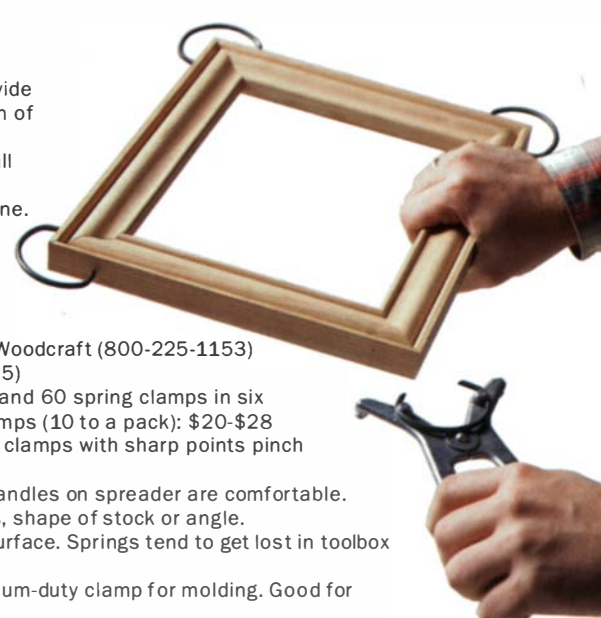
Cost: \$16.50

How it works: Threaded rods with thumbscrews and corner blocks wrap around workpiece.

Pros: Handles frames or boxes with 90° corners; plastic corner blocks provide good alignment. Comes with four extra extension rods. Thickness and width of frame are unlimited; will clamp stock from 2 in. by 2 in. to 48 in. by 48 in.

Cons: Long threaded rods require lots of workspace; thumbscrews are small and uncomfortable to turn.

Rating: Acceptable light- to medium-duty clamp. Simple yet gets the job done.



ULMIA SPRING CLAMP

Manufacturer: Ulmia. Sold by Woodcraft (800-225-1153) or Peck Tool Co. (800-454-8665)

Cost: \$155 for a kit (spreader and 60 spring clamps in six sizes); spreader only: \$45; clamps (10 to a pack): \$20-\$28

How it works: U-shaped spring clamps with sharp points pinch the joint together.

Pros: Quick and easy to set. Handles on spreader are comfortable. Not limited by width, thickness, shape of stock or angle.

Cons: Leaves slight mark on surface. Springs tend to get lost in toolbox or sawdust pile.

Rating: Excellent light- to medium-duty clamp for molding. Good for furniture-grade work.

ONE-CORNER CLAMPS

These clamps won't mar the workpiece. One joint at a time can be carefully aligned.



PROFESSIONAL MITER VISE

Manufacturer: Similar vises available through many outlets including Trendlines (800-767-9999), Woodcraft (800-225-1153) and Garrett Wade (800-221-2942)

Cost: \$40-\$45

How it works: Two threaded spindles move a pair of jaws.

Pros: Sturdy. Head rotates and swivels. Can be bolted to bench. Vise body is slotted to allow for sawing through stock with a handsaw to mate surfaces.

Cons: You need to position parts carefully to get good clamping pressure. Clamp pads are shallow.
Rating: Good for medium-duty clamping pressure. Cast-iron vise is solid and can withstand shock of nailing a joint together.



MITER CLAMP GS11

Manufacturer: American Clamping Corp. (800-828-1004)

Cost: \$125

How it works: One-corner clamp with hand screw.

Pros: Adjustable for joints of 75°, 90° and 120°. Swiveling clamping jaws with non-slip pads pull the joint together tightly.

Cons: Limited to 4-in.-wide stock.
Rating: Good medium-duty clamp.



BESSEY ANGLE CLAMP WS3

Manufacturer: American Clamping Corp. (800-828-1004)

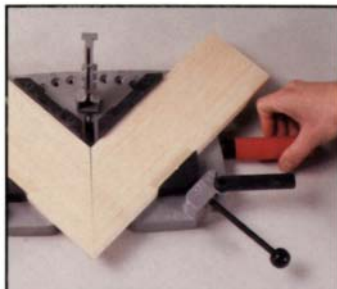
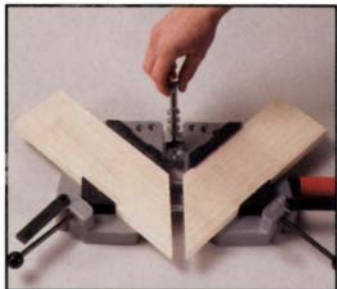
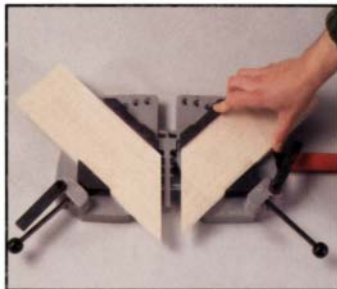
Cost: \$21; larger WS6 model: \$54

How it works: Single-corner 90° clamp with hand screw.

Pros: Automatically adjusts for two different thicknesses. Will align stock for butt joints, too.

Cons: Limited to stock of 1¾ in. (WS6 model will handle stock nearly 4 in. wide). Small surface area of clamp pads.

Rating: Good medium-duty clamp for oddball jobs, including frames or boxes. Also good for fixing a shelf butt-joined inside a case side.



MULTI-ANGLE CLAMP MGS100

Manufacturer: Gross Stabil (800-671-0838)

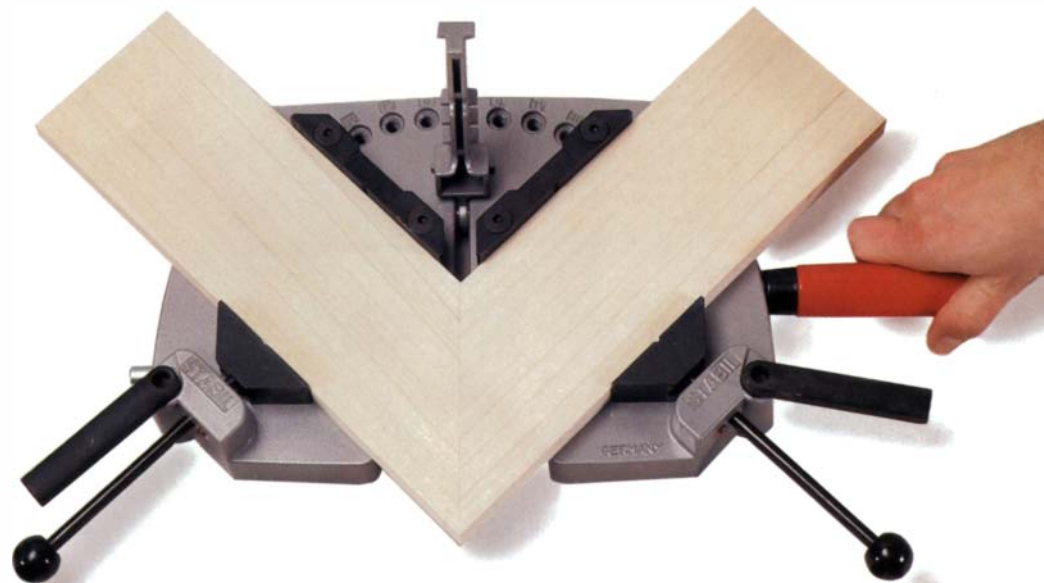
Cost: \$105

How it works: Two halves of a miter are clamped into the jig; hand screw pulls joint together.

Pros: Tool aligns stock perfectly. Clamps miters of 15° to 120° in 15° increments. Will also clamp small (up to 4 in. dia.) round or oval workpieces. Excellent ergonomics.

Cons: Cost. Limited to 4-in.-wide stock.

Rating: Excellent heavy-duty clamp. Best of the one-corner clamps.



Three steps to a perfect miter. With Gross Stabil's Multi-Angle Clamp, stock is butted up against an alignment bar (top photo) in the center of the jig. After clamping the workpieces in position, the bar is swung out of the way (center). Turning a screw clamp closes the joint (bottom). The outside corner meets first; additional pressure closes the joint.

CONSTRUCTION-GRADE CLAMPS

Choose one of these heavy-duty clamps when you need to glue up large pieces.



MAXI MITER JIG MG 1000

Manufacturer: Gross Stabil (800-671-0838)

Cost: \$129

How it works: Hinged clamp pad with rubber feet, which grips both edges of the stock, is attached to each piece. A bar clamp pulls clamp pads together to cinch the joint.

Pros: Large-capacity clamp (8-in.-wide stock) that clamps miters from 30° to 120°. Works on beams, rafters, large casework.

Cons: At first, all the heavy moving parts feel unwieldy; with use, it gets easier.

Rating: Excellent heavy-duty clamp for big jobs.



GROSS STABIL MITRE CLAMP GSP8

Manufacturer: Gross Stabil (800-671-0838)

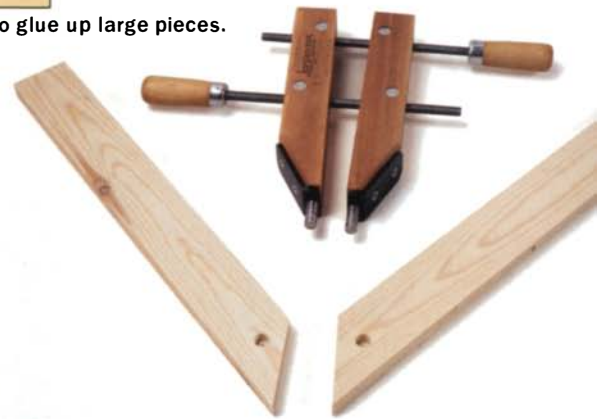
Cost: \$44

How it works: Padded screw clamp is attached to both halves of a workpiece using two bar clamps. To close the joint, the screw clamp is tightened.

Pros: Any angle can be joined. The plastic pads won't mar the surface. Tool pulls the joint tight, but may slip if overtightened.

Cons: Clamp pads won't work on molded surfaces. Screw clamp handle is small.

Rating: Good medium-duty clamp for mid- to large-sized jobs and odd angles.



JORGENSEN HAND SCREW CLAMP ADAPTERS

Manufacturer: Adjustable Clamp Co. (312-666-0640)

Cost: \$8 for an adapter;

10-in. wooden hand screw: \$14

How it works: Pins attached to tips of clamps engage in holes drilled on each side of a miter.

Pros: Large comfortable handles make it easy to put lots of pressure across a joint of any angle.

Cons: Must drill 1/2-in.-dia. holes partway through stock.

Rating: Good heavy-duty clamp for the price.



CAM-ACTION MITER CLAMP

Manufacturer: Hartford Clamp Co. (860-528-1708)

Cost: \$41.90

How it works: Cam-action, one-corner clamp with serrated jaws.

Pros: Fast-acting, industrial-strength miter clamp good for 90° joints. No limit to width or thickness of stock.

Cons: Jaws mark workpiece. Glue or damp conditions will cause cast-iron body to rust. Handle awkward to reach when working on a flat surface.

Rating: Good heavy-duty clamp for paint-grade joints or trim work.

CLAM CLAMP

Manufacturer: Chestnut Tool Co. (800-966-4837)

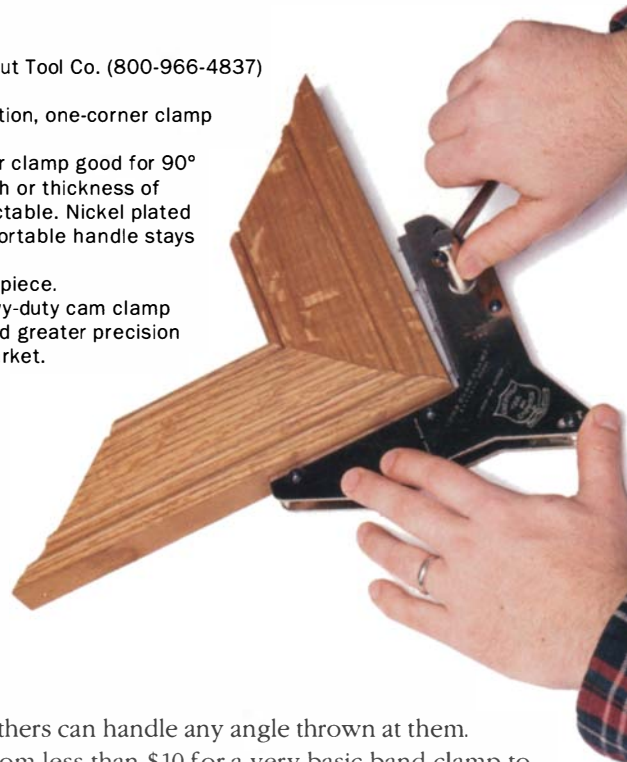
Cost: \$45

How it works: Cam-action, one-corner clamp with serrated jaws.

Pros: Fast-acting miter clamp good for 90° joints. No limit to width or thickness of stock. Teeth are retractable. Nickel plated to ward off rust. Comfortable handle stays out of your way.

Cons: Jaws mark workpiece.

Rating: Excellent heavy-duty cam clamp with more features and greater precision than others on the market.



include any of our 20 test clamps whose performance was poor.

Miter clamps come in many varieties. Some wrap around the entire workpiece. Others grip one corner at a time. There are clamps more suited for trim carpentry or paint-grade work because they leave small teeth marks, which can be filled. Other clamps are geared for large jobs, and won't perform well on small projects.

Band clamps can be used for frames, mitered cases or other projects where you need to encircle the entire workpiece. For superior clamping pressure, choose a clamp designed to tackle one corner at a time. Some one-corner clamps have several preset

angle settings; others can handle any angle thrown at them.

Prices range from less than \$10 for a very basic band clamp to about \$150 for a top-of-the line miter clamp. There are plenty of good clamps priced somewhere in the middle. For mar-free, furniture-grade work, however, the pricey ones did pay off in extra precision, ease of use and brute power.

Just remember, even the best clamp in the world won't make up for an inaccurately cut joint. □

Anatole Burkin is an associate editor of *Fine Woodworking* magazine.



Build a Houseful of Doors

...without coming unhinged

BY JOHN LIVELY

Even before we moved into a Tudor cottage from the 1920s, I knew the doors had to go. Their faceted glass knobs, single flat panels and the dozen coats of gloppy paint definitely did not go with the house. And the doors were ugly to boot.

Soon after we moved in, I was sitting at the drafting table when despair settled in. Building one or two doors was no big deal, but making 16 doors was going to be a prison term of doing the same toilsome tasks over and over.

It was a sad Saturday morning when I told my wife I was going down to the building-supply store to check out the doors. It was even sadder still, when all I found were a lot of raised-panel doors in the Colonial style, a smaller selection of Mediterranean style and hundreds of hollow-core doors whose most exciting feature was a seamless skin of rotary-cut veneer.

By noon, I was back at the drawing board designing much simpler doors with biscuit joints instead of mortise and tenon. My plan was to figure out a strategy that would allow me to make and hang a single door in a weekend or two.

I also wanted to come up with a method of building a door to fit exactly into an existing opening, thus avoiding the tedious

and messy task of lugging all my tools out of the basement and into the living space of the house.

Simple elements, major effect

For the sake of straightforward construction, I had to keep the number of elements in each door to a bare minimum—four frame members and one panel. To add interest to the design of the frames, I decided to run stopped chamfers on their inside edges. And on one door, I cut a double-

my house. But by fiddling with the details, you can adapt this basic approach to design doors that will work with your house.

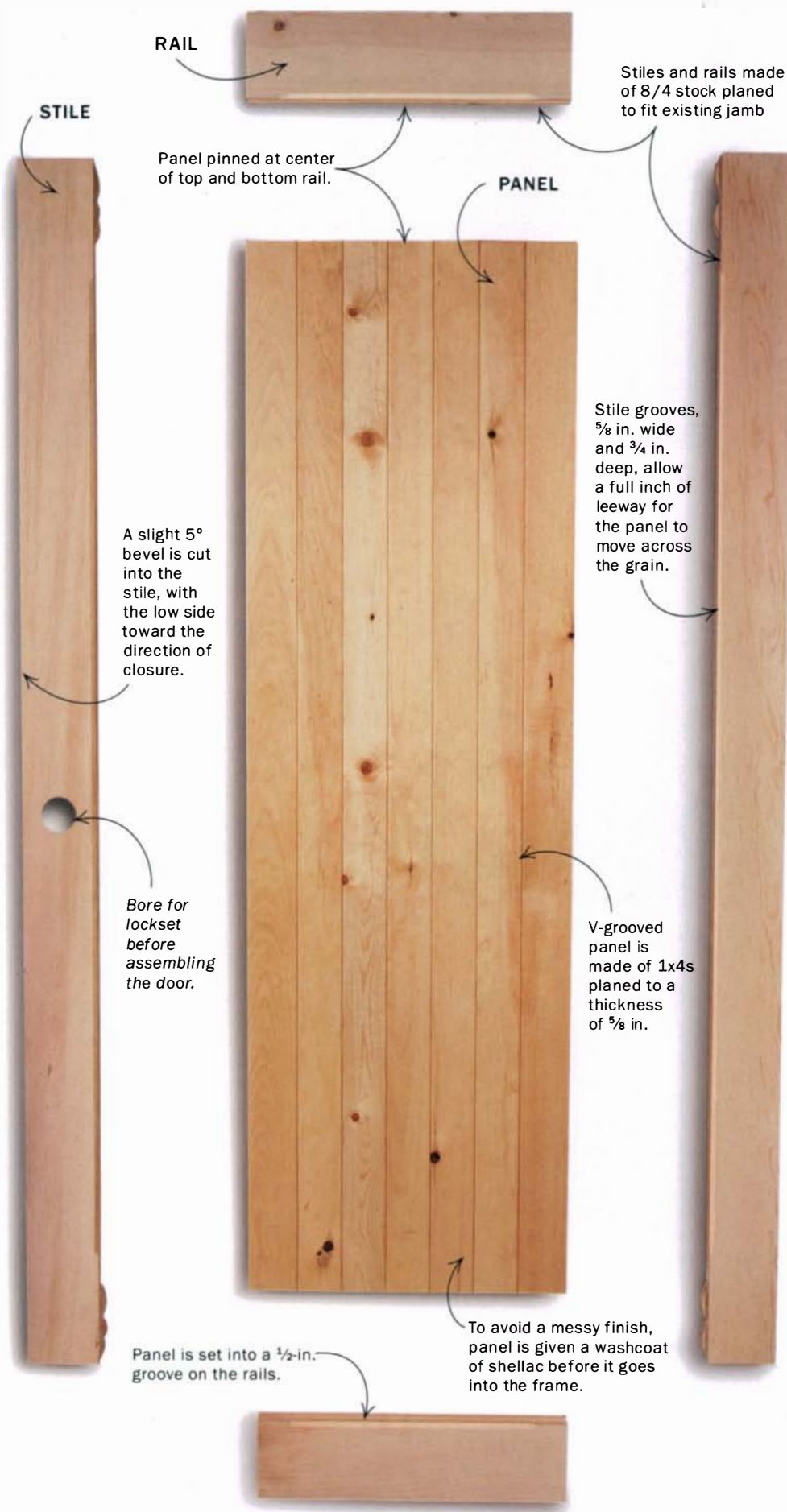
A door's vertical frame members (stiles) ought to be at least 4½ in. wide, but I prefer them a little wider. The typical back set for a knob location is either 2¾ in. or 2¾ in., which means to keep knobs centered, stiles should be either 4¾ in. or 5½ in. Also, after boring two big holes in your latch stile, there's not a lot of beef left if you're using narrow stock.

MY STRATEGY WAS TO MAKE AND HANG A DOOR IN A WEEKEND AND TO AVOID THE TEDIOUS TASK OF LUGGING ALL MY TOOLS OUT OF THE BASEMENT INTO THE LIVING SPACE OF THE HOUSE.

sprung Gothic arch into the top rail and carved a dogwood blossom. V-grooved 1x4s seemed the right remedy for making such large panels something more than unrelieved expanses of planed wood. After making the first couple of doors, I was surprised at the visual impact these simple details made.

The doors I made harmonize (to my eye anyway) with the Arts-and-Crafts style of

Traditionally, a door's horizontal frame members (rails) are of unequal widths, the bottom rail being considerably wider than the top one. This arrangement offers a maximum amount of wood to be involved in the usual mortise-and-tenon joinery. But with biscuit joinery and modern glues, you can size the rails to your liking. Because you're gluing long grain to cross grain, a 5½-in. rail will provide good strength with-



out enough cross-grain movement to break the joint loose. I get plenty of strength using double rows of biscuits in all four joints.

Precise dimensioning is key to speed

The greatest aid to speed and efficiency is accuracy in milling. If your stock is milled up square and true, the rest of the work will go smoothly and quickly. But if you mess up on the first part, well, you'll be sorry. So to begin, check and recheck your jointer fence and sawblades for perfect squareness.

Unless you want to move the stops on your door jambs—they'll either be nailed or rabbeted into the jambs—it's best to make your doors the same thickness as the ones you're replacing.

Next edge-joint one edge, rip to width, then edge-joint the sawn edge. Crosscut the rails, but leave them a little long until



Strong-enough biscuits save time

A double row of #20 biscuits, rather than a mortise and tenon, saves time and provides plenty of strength to hold a modest 5/8-in. panel.

you determine the final length.

The last step is to plow the grooves in the frame for the panel. I cut grooves 5/8 in. wide and 1/2 in. deep across the length of the rails. In the stiles, I cut grooves 3/4 in. deep, giving the panel a full inch of leeway to move across the grain. Also, I stop the grooves so they don't run far into the joint area.

Before we go on, let's back up a minute. By making a door in your own shop, you

Measuring without a rule



When it comes to fitting parts precisely in trim carpentry and cabinet work, a tape measure is about as useful as a baseball bat in a billiard game. A tape measure has all those spaces between the gradations, and in the real world, things seldom fall right on the mark. So you wind up rounding off to the nearest one-sixteenth.

Say you're measuring for a door. The jamb is almost $29\frac{11}{16}$ in. wide, and you want clearances of $\frac{1}{16}$ in. on the hinge side and $\frac{3}{32}$ in. on the latch side. One stile is a smidge over $4\frac{5}{8}$ in. wide, the other just shy of $5\frac{1}{4}$ in. So to cut the rails to the correct length and make the entire door come out to the right width, you do some eighth-grade arithmetic, then measure and mark the cut. Right? No. Not if you want a precise fit every time. To get that kind of fit, you need a more reliable, more empirical reference. Lots of cabinetmakers and trim carpenters use a two-stick story pole, which, as the name suggests, tells the whole story.

WORK OUT OF THE JAMB



Mark once, cut once. A nickel spacer on the top of the stile and two wedges on the floor hold the stile steady. A centerline is marked alongside the strike plate (above). Laying out the hinge locations with a striking knife (left) is easy work with the stile clamped to the hinges.

can dimension it precisely to the opening *before* you assemble it. This saves the tedious trial-hanging, unhinging and trimming that carpenters have to endure.

The best measuring method that I've found for this kind of work is described in the box above. So here I'll stick to explaining the standard clearances between door and jamb. Old-time carpenters called it nickel and dime, meaning a skinny $\frac{1}{16}$ in. (dime) clearance at the top and a fat $\frac{1}{16}$ in. (nickel) clearance on each side. My carpenter hero Tom Law takes exception to the traditional wisdom.

Law calls for $\frac{1}{16}$ in. on the hinge side, $\frac{3}{32}$ in. on the latch side and $\frac{1}{16}$ in. at the top. Bottom clearances typically call for $\frac{1}{2}$ in. for vinyl floors, $\frac{3}{4}$ in. for hardwoods and $1\frac{1}{2}$ in. for carpet. Once you've measured the opening and have determined the dimensions of the door, you just may have one more problem.

In heaven, square is square, but on earth, door jambs in older houses seldom are. So check the head jamb for square. If it is square, fine. If it's not and if you're going to build and hang a bunch of doors, it's worth your time to make a big adjustable bevel from two pieces of scrap wood.

Check for squareness, or lack thereof, from the hinge side, and adjust your bevel to the angle made by the hinge-side jamb and the head jamb. If the head jamb is out of square, you can bet the threshold is too. While you're checking the angle of the threshold, here's a tip that can save re-trimming a door after it's hung: Adjust the bevel to the threshold-to-hinge-side angle.

To make one, take some $\frac{1}{8}$ -in. rippings from the edge of a jointed 2x4, and saw the ends nice and square. When they make contact with the opposite side of the jamb, clamp them together, and mark a line across the one onto the other. Label it "opening width." To figure the other door, all you do is measure from this mark the total clearance you want (in this case, $\frac{5}{32}$ in.), and make another mark labeled "door width." To determine the exact width of the rails, clamp the stiles together, butt a rail against them, tape the story sticks together at the door-width mark, and measure off the back side of the stiles onto the rail stock.

To get stile length, use a longer pair of sticks in the same way. No squinty-eyed reading of $\frac{1}{32}$ -in. hash marks, no rounding off to the nearest gradation, no fraction conversions and middle-school math, no trimming to fit later.

A tape measure will get you in the ballpark. A story pole will sink your eightball every time, in one shot. —J.L.



Then holding the bevel tightly against the hinge-side jamb, swing the bevel out across the floor in the angle the door will swing. Any lumps or humps in the floor that will prevent the door from swinging fully open will show up immediately.

Once you've assembled the door to all the other specs, you can transfer the angles from the bevel gauge to the top and bottom of the door and trim to fit in the shop.

Fit the hardware before assembly

Unlike carpenters, you don't have to wrestle a whole door around to mortise for

hinges, bore for the lockset and mortise for the latch plate. You can fit all the hardware to the stiles before attaching the rest of the door to them. This makes the work easier, especially if you're nursing a bad case of bench back.

Bevel the edge of the door—The narrow outside edge of the lock-side stile should be beveled to about 5° , with the low side of the bevel toward the direction of closure. Whether you're doing this on your jointer or with a handplane, don't wait until the door is assembled to do it. And don't

worry about the bevel interfering with clamping during glue-up. The angle is too slight to throw things off.

Install the lockset—To locate the centers of the lockset bores, hold the lock-side stile against the head jamb using a nickel spacer on top and two wedges underneath. The centerline of the existing latch opening will be the centerline for both lockset bores (see the inset photo on the facing page).

Follow the template included in the lockset box to find the back-set axis for the face bore and the longitudinal center for the

KEEP IT IN THE SHOP



Adding detail to an unassembled frame.

Work moves quickly throughout the shop when you don't have to haul a heavy door from one work area to the next. With the stile clamped securely in the bench, a series of chopping cuts and a smooth pass pares the waste away for a clean mortise that fits every time (above). To prevent tearout when boring for the lockset, drill the beveled edge first, then make two half-depth face bores (right).





When everything is square. Work blocks clamped to a sawhorse hold the door steady while it's dry-fit. Using a polyurethane glue allows plenty of time to make sure that everything is flush, square and aligned. Just remember to mist the biscuits with water to help the glue cure properly.

transverse bore. Bore diameters are fairly standard, regardless of brand—1 in. for the latch barrel (transverse bore) and 2½ in. for the knob barrel (face bore).

I use Forstner bits for all the doors. If you bore through the edge first, then run the face bore half-depth on each side, you won't risk the nasty tearout that comes when the 1-in. Forstner breaks through into the larger hole (see the bottom right photo on p. 73).

Mount the hinges—Laying out the hinge locations for an existing jamb is simple. Again, put a nickel on top of the stile, wedge it from the floor against the head jamb and clamp the stile to the hinges. Use a striking knife to mark the mortises directly off the hinge leaves.

Then back in the shop, with the stile in a

vice, you can cut the mortises in whatever fashion you prefer, knowing that you won't have to jigger the fit when you hang the door.

The high craft of door hanging

In the traditional sense, door hanging is a mystery you don't have to worry about. That's because, if you've followed the method described here, you've already done it. You have actually incorporated hanging the door into the very process of making the door.

So after you have applied the finish, mounted the hinges and installed the lock-set, all that's left is to slide the hinge pins home and shut the door. Click. □

John Lively is the editor-in-chief of The Taunton Press.



A door that travels well. The author uses the same door design for a clean look in the master bedroom.

Coming Up for Air

Making the leap
to air-powered tools

BY ROLAND JOHNSON

I launched my woodworking career with a few hand tools, some clamps, a used lathe bought at a garage sale, a borrowed belt sander and a brand-spanking-new 5-hp air compressor with a spray gun. The compressor was an extravagant purchase at the time, but for refinishing furniture, the spray gun gave me a competitive edge over other local refinishers. Twenty-two years later, that compressor is one of the most important tools in my shop.

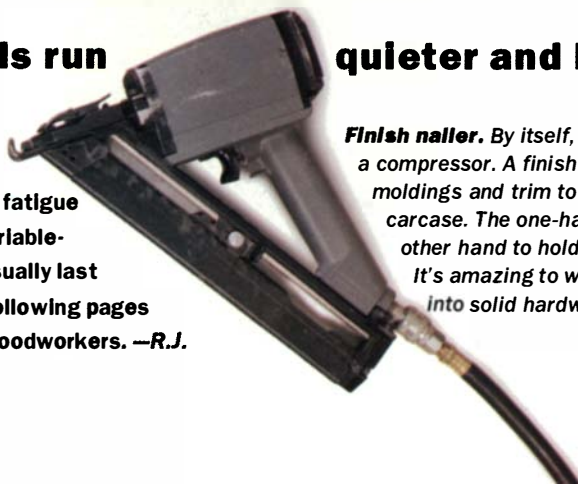
Nowadays, I use a compressor for more than just spraying finishes. I also use it to power my air-driven finish nailers (see the photo below), orbital and inflatable drum sanders, die grinders, blow guns, drills and a vacuum generator for my veneer press. Almost every electric tool you use has an air-driven counterpart with the advantages



Air-powered tools run

quieter and last longer

Most electric tools have an air-driven counterpart. Air tools, because they lack armatures of wound copper wire, are usually lighter in weight, reducing fatigue on the operator. Most air tools also have built-in variable-speed controls, run cooler and more quietly, and usually last longer than electric tools. Listed here and on the following pages are some of the more useful choices available to woodworkers. —R.J.



Finish nailer. By itself, this tool is excuse enough to buy a compressor. A finish nailer makes it easy to apply moldings and trim to cases without damaging the carcass. The one-handed operation frees up your other hand to hold moldings and trim in place. It's amazing to watch a 2-in. finish nail disappear into solid hardwood with the flick of a finger.

Pumping up the pressure:

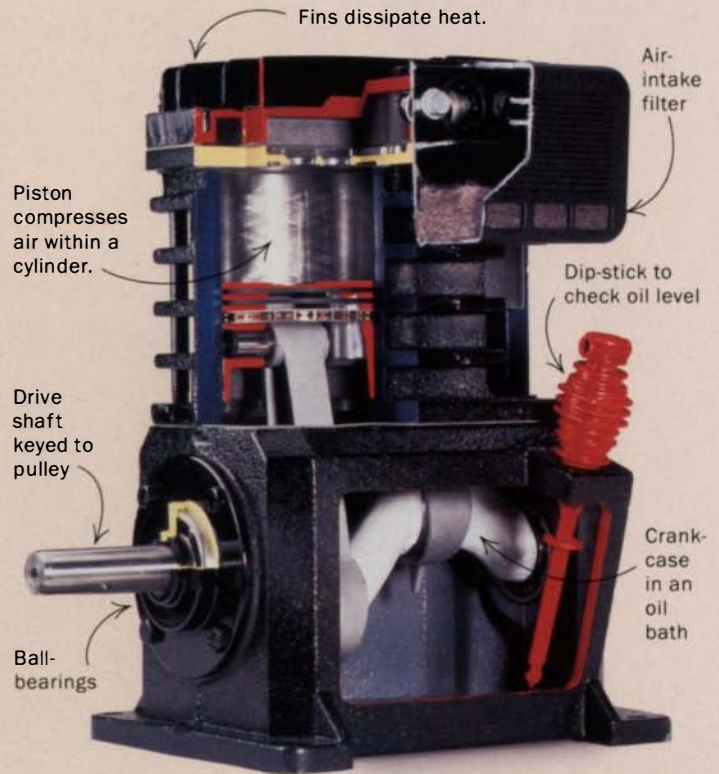
THE SAME PRINCIPLES THAT POWER AUTOMOBILES

Compressors force air into a tank with a pump powered by an electric motor (or gas engine) using pulleys and a V-belt. Pistons, like those inside of internal combustion engines, pump the air into a receiving tank for storage. A check valve at the tank, a pressure switch and a safety-relief valve control the air pumped into the tank.



Compressed air is available from the tank through a threaded bung with a shut-off valve attached to it. In a single-stage compressor, a piston pumps the air directly into the receiving tank. In a dual-stage compressor, the air is compressed first in one large cylinder, then

compressed a second time in a smaller cylinder about half the size of the first. Dual-stage compressors run more quietly at slower speeds and generate less heat. Lower operating temperatures translate to less moisture condensation in the system. Maximum operating pressure for a single-stage compressor is usually about 100 to 130 pounds per square inch (psi). Dual-stage compressors operate at much higher pressures—usually around 200 psi—meaning the storage tank will hold and deliver more air. —R.J.



CUTAWAY OF A CAST-IRON PUMP

of lighter weight, variable speed and longer life. To convert to air-powered tools, the most expensive investment you'll have to make—if you don't already own one—is a compressor that can handle the demands of delivering enough air.

If you're planning to buy a new compressor or trying to decide if the one you already own will meet your needs, you can cut to the chase by knowing what to look

for (see the box above). The size of the compressor you'll need will depend on which tool you use that demands the most air. All pneumatic tools are rated by how much air they consume. You'll see that listed in a catalog or on the tool as a ratio of cubic feet per minute (cfm) of air used at a specified tank pressure, listed as pounds per square inch (psi). For example, an average spray gun uses only about 11 cfm at

50 psi, but an orbital palm sander consumes about 12 cfm at 90 psi. A compressor has to deliver enough air for the tool with the highest rating—in this case, the orbital sander.

If you plan to operate more than one air-powered tool at a time, you can calculate the combined air consumption simply by adding the cfm totals for both tools. (A compressor for a spray gun and an orbital

TOOLS



Brad nailer. Same benefits as the finish nailer, but the smaller gauge nails leave smaller holes to fill. Brads are also less prone to splitting fragile moldings. The smaller size makes it easier to get into tight spaces and causes less fatigue if you're using the tool for a long period of time.



Crown stapler. Once you have stapled the backs into cabinets or put together a jig with an air stapler, you will never pick up a hammer to do the same job again. Crown staples hold plywood much better than nails, and the thin tines on the staples cause fewer cases of splitting or blow-out.



Air router. Compact and powerful with variable speed, this is a great detail or inlay router. It's about the size of a laminate trimmer, but heavier. Adjustable base tilts in both directions, which expands the range of profiles router bits can cut.

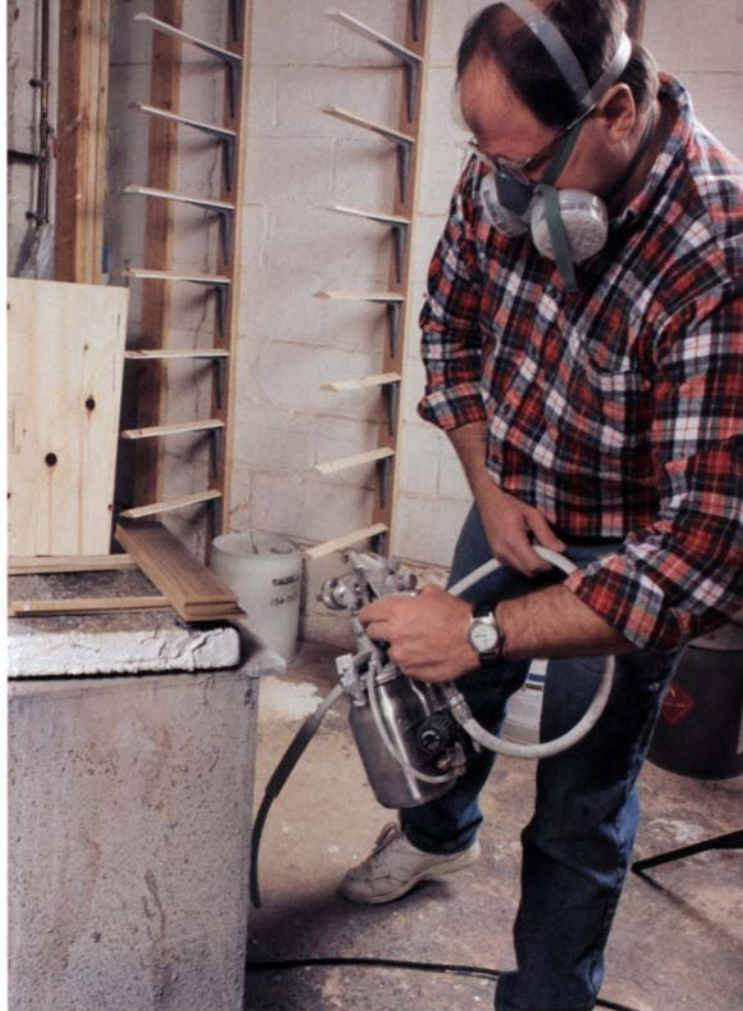
palm sander would have to deliver at least 23 cfm at 90 psi.) Also, you should add at least a 25% margin over the rated consumption, just to be sure the system will run efficiently. If you intend to use a second pneumatic device only intermittently, the compressor could be a bit smaller.

Compressors are commonly rated by the horsepower capacity of the electric motor or gas engine powering the compression pump. Although this may be a way to get an approximate idea about the output of the compressor, it's not all you need to know. The real criterion by which to judge a compressor's output is the amount of air it delivers. Some manufacturers refer to this figure as free air.

Look for durable materials and practical sizes

Compressors made with cast-iron cylinders and crankcases (belt driven and lubricated with oil) are stronger and will last longer than those made from aluminum. My main shop compressor is a cast-iron Campbell Hausfeld unit that I bought in 1976 (see the top right compressor in the photo on the facing page). With the exception of my having to spend \$36 to replace four reed valves in the head, that unit has required no other repairs, and it's still running fine. If it does ever need to be rebuilt, I know it can be done at a reasonable cost. Most aluminum compressors are not designed to be rebuilt, so essentially they become throwaway units when their service life is up.

You can also buy smaller, oil-less, direct-drive compressors that boast a respectable air delivery for about half the cost of a standard belt-driven, oil-lubricated unit. But direct-drive compressors are quite noisy. I



Spray guns are fast and efficient. There's one good reason most professional finishers use spray guns: You can apply better finishes faster than you can with any other application method. Period. Shown here is a standard-duty, non-bleed, external mix, siphon-feed gun with a 1-qt. aluminum cup.

do have a small direct-drive portable for occasional job-site use, but I wouldn't consider a larger one for shop use.

How you intend to use the compressor affects the orientation of the air tank. Vertical tanks have a smaller footprint, making them more desirable when floor space is at a premium, but they are difficult to move around. Horizontal tanks work better as portable compressors because the lower

center of gravity makes them less prone to tip over. They can also be placed under a workbench to help free up floor space. The most common size tanks are 20 to 30 gal. for portables and 30, 60 and 80 gal. for heavier, stationary compressors.

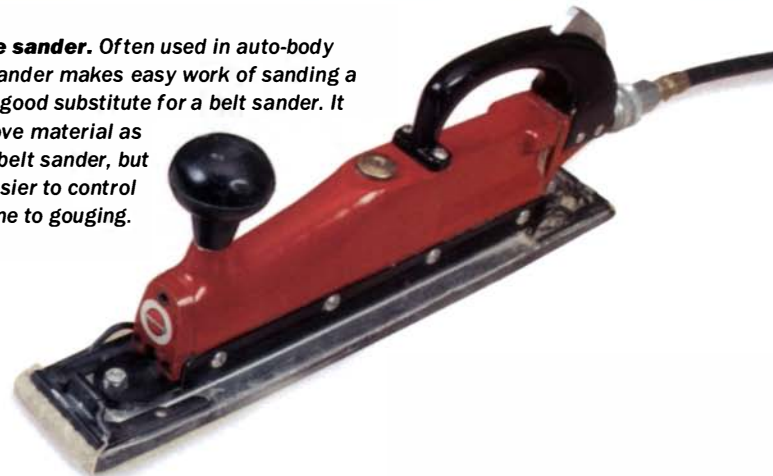
Choose your hoses carefully

Whether you plumb a system in copper pipe from a stationary compressor or work

Die grinder. This is a great tool for doing cleanup work on carvings and moldings, a kind of infinitely variable hand-held shaper. There are many grinding burrs and special bits commercially available for this tool. The author often uses interchangeable abrasive cones.

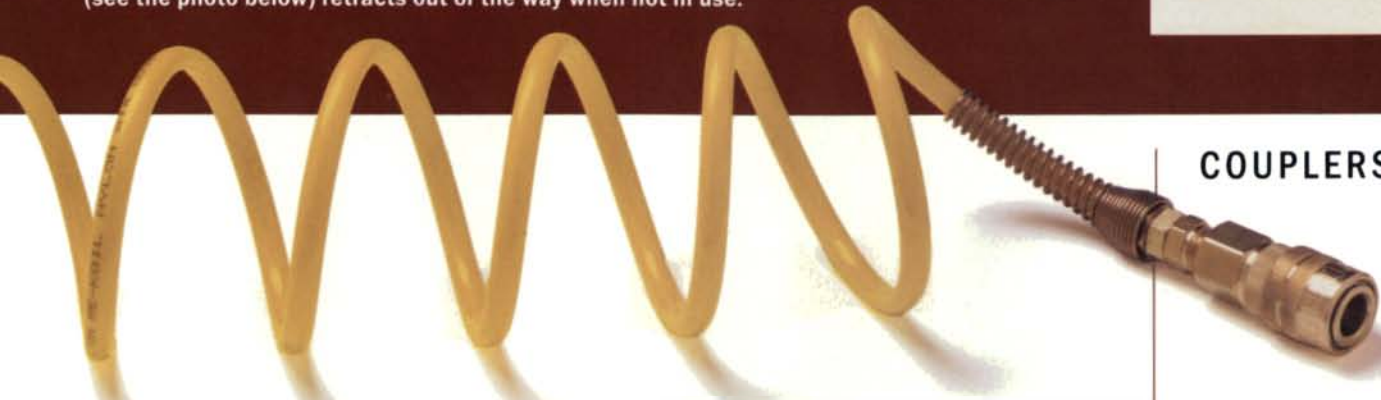


Straight-line sander. Often used in auto-body shops, this sander makes easy work of sanding a panel. It is a good substitute for a belt sander. It will not remove material as quickly as a belt sander, but it is much easier to control and less prone to gouging.



Flexible hoses

Sized by their inside diameter (ID), hoses vary in strength and flexibility. Most air tools run off hoses from ¼ in. to ¾ in. ID (see the photo at right). The thickness of the outer wall and the quality of the material from which it's made can affect the flexibility of the hose. Recoil hose (see the photo below) retracts out of the way when not in use.



Making the right connections:

NO TWO MANUFACTURERS MAKE THE SAME COUPLER DESIGN

Although some small portable compressors have hoses that are permanently connected to the compressor outlet, most systems have detachable hoses that connect to the compressor by means of a male and female coupler assembly. The female coupler—usually mounted on the compressor—has a spring-loaded collar on the body and can be attached to the hose a number of ways (see the photo below). When the collar is pushed back, the male plug—mounted on the hose—is locked in place with an airtight seal. This same method is used to connect tools to an air hose.



Amflo, Aro, Bedford, DeVilbiss, Grayco and Milton (see the photos at right) are some of the more common brands of couplers. Most of them are not interchangeable. Your best bet is to choose one brand and stick with it. I find few shop scenarios more frustrating than grabbing a hose to power one of my air tools, discovering the wrong combination of fittings and having to scramble around to find the right hose. —R.J.

COUPLERS



Milton, M-style



Milton, T-style



Aro #210, push-on series

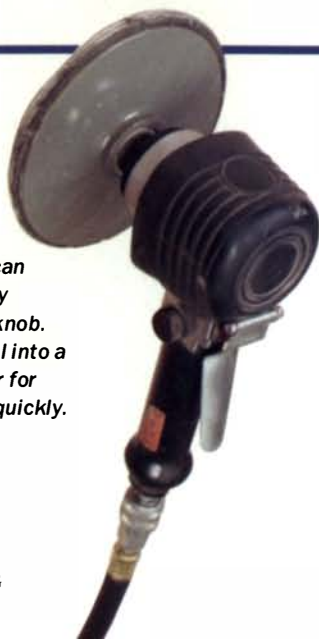


Lincoln, long-stem style

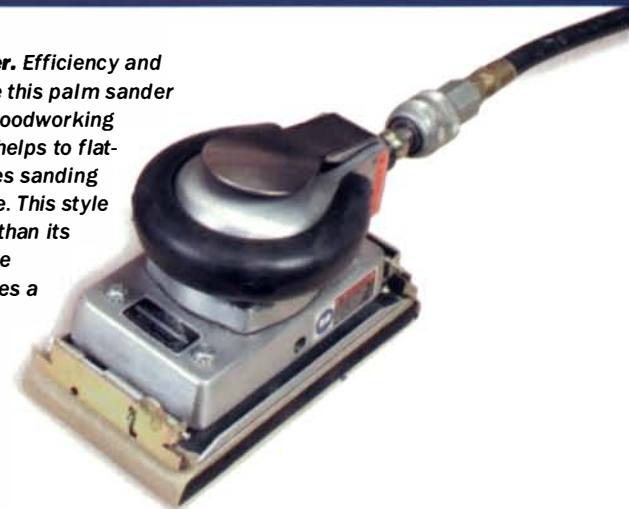
TOOLS CONTINUED

Dual-action sander.

Air-driven, dual-action sanders tend to remove material faster than their electric counterparts. You can switch from orbital to rotary action simply by turning a knob. Rotary action turns this tool into a disc grinder, which is better for removing a lot of material quickly.



Orbital palm sander. Efficiency and variable speed make this palm sander a real asset to any woodworking shop. The large pad helps to flatten panels and makes sanding face frames a breeze. This style of sander is heavier than its electric cousin, so the weight of the tool does a lot of the work.



from a portable unit, you must use a hose for the final delivery of air to the tool. Air hoses come in a variety of sizes and grades (see the photo at left). I use 1/4-in. hoses for all my air tools, including my spray gun. If I were using a high-consumption tool, such as a sandblaster, or using hoses longer than 50 ft., I would use a 3/8-in. hose to help keep the pressure from dropping. The larger the air demand or the longer the hose, the more the pressure will drop in a small-diameter hose.

Most standard air hose is made from three layers: an inner tube, which is usually natural rubber or high-quality PVC; the carcass, which is a braided, high-tensile material bonded to the tube; and the jacket, which is the outer cover that protects the hose from damage. Recoil hose, also referred to as re-trak, is a hose made from nylon or polyurethane and wound into a coil that will stretch for use and spring back into a compact size when released (see the photo at left). These hoses work well when mounted overhead a workbench.

What I look for is a hose that remains flexible when it's inflated. I bought some bargain hoses a while back that seemed soft and supple, but I was surprised to find that they became stiff as frozen rope when filled with air at 90 psi. The better quality hoses cost more, naturally, but the extra expense is worth it to me.

Hoses that are more flexible do have one drawback. It's easy to interrupt the air flow by accidentally stepping on the hose. This can be disastrous if you are spraying a finish because you interrupt the smooth application of the topcoat. I get around that problem by using a different hose for my spray gun—one that has a significantly



Use two hands for this tool. Inflatable drum sanders carry out some tasks no other tool can accomplish—free-form sanding on flat or curved surfaces. Used here with a recoil hose mounted above the workbench, this tool is a workhorse.

larger outer cover to give the hose more resistance to kinking or being squashed.

Maintain your system to extend its life

Water in the system is always the biggest problem, causing rust inside tools and moisture problems in finishes. So you need to keep the air system as dry as possible. On a regular basis, drain the compressor tank of accumulated moisture. Also, store hoses with the ends coupled to keep contaminants, such as sawdust, from entering the lines. Clean the air-intake filter and any

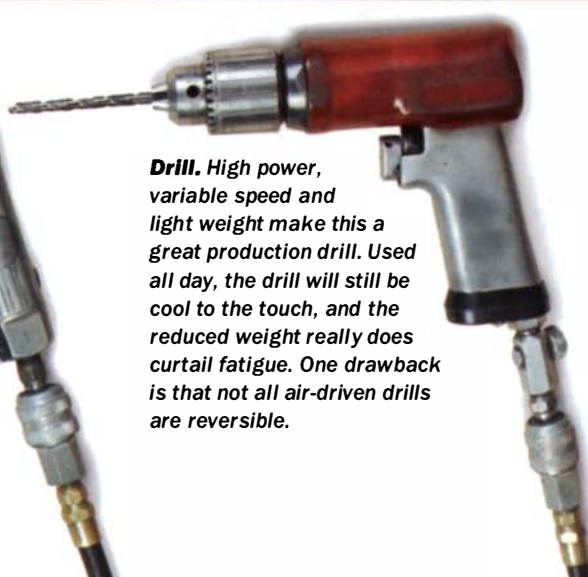
other filters in the system on a regular basis. Empty water traps daily.

The oil in the compressor pump's crankcase should be checked monthly and changed annually—more often if the compressor sees heavy use. By following a maintenance checklist, your compressor and your air-powered tools will have a long life. □

Roland Johnson spends an average workweek equally divided between woodworking and tending his farm.



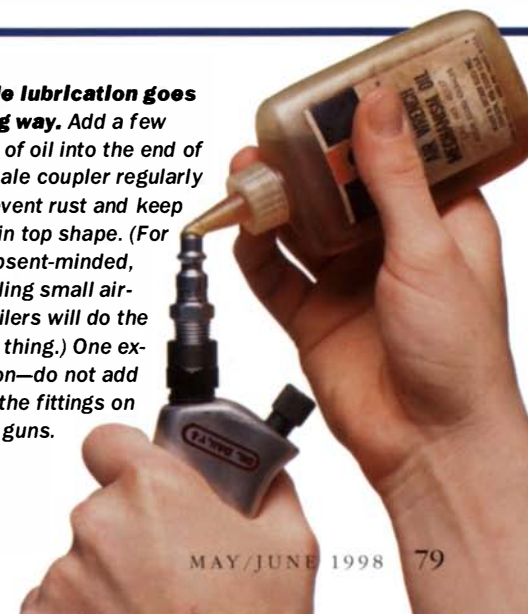
Angle-head drill. This drill's small size is ideal for getting into tight spaces or drilling at awkward angles. There are even smaller angle-head drills on the market than the one shown here. Variable speed and high power make this a versatile tool, and it fits comfortably in your hand.



Drill. High power, variable speed and light weight make this a great production drill. Used all day, the drill will still be cool to the touch, and the reduced weight really does curtail fatigue. One drawback is that not all air-driven drills are reversible.

A little lubrication goes a long way.

Add a few drops of oil into the end of the male coupler regularly to prevent rust and keep tools in top shape. (For the absent-minded, installing small air-tool oilers will do the same thing.) One exception—do not add oil to the fittings on spray guns.





Stickley Done Lightly

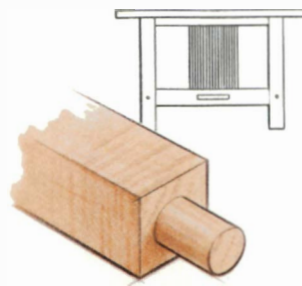
Banquet-sized Craftsman
table looks leaner
in curly maple

BY REX ALEXANDER

Craftsman-style furniture is traditionally made of fumed, quartersawn white oak. Gustav Stickley was one of the champions of the Craftsman movement, and his name is synonymous with a distinctive style of blocky, muscular furniture. In Stickley's 1909 book *Craftsman Homes*, he talks about native woods and how to use them. "Oak is a robust, manly sort of wood and is most at home in large rooms which are meant for constant use, such as the living room, reception hall, library or dining room."

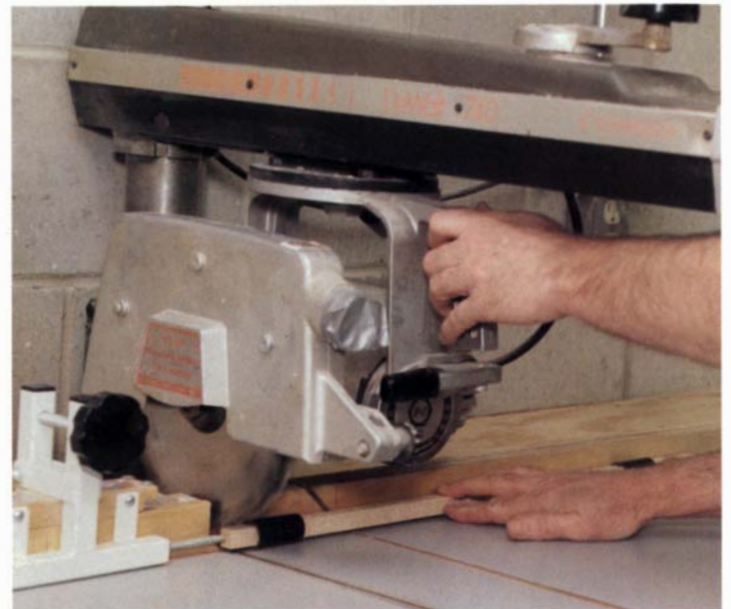
The oak version of the table shown here was first featured on the cover of *FWW* #122. That photo illustrated my article about building an Arts-and-Crafts side chair. After the article was published, I received many calls—not about the chair, but regarding the table.

One client wanted a lighter, more feminine pick of wood: figured maple. She chose a design I had already used for an oak table. Its inspiration came from Stickley's No. 657 library table and Frank Lloyd Wright's rectilinear furniture. With a top measuring 48 in. by



SQUARE SPINDLES, ROUND TENONS

Making the spindles round in a PVC pipe jig on the radial-arm saw is faster than using traditional methods for machining square tenons.



Cutting round tenons on square stock. Slip two pieces of PVC pipe over a spindle. Carefully rotate the spindle against the radial-arm saw's fence and a stop block while moving the cutterhead, fitted with a dado blade, to remove the waste.



110 in., it's meant for entertaining large groups. Even with bulky legs to support its mass, the use of curly maple (finished in a light tone) gives the table a more feminine, lighter presence.

Birds-eye maple was my customer's wood of choice. But I knew it would be nearly impossible to find birds-eye in the large dimensions required: $\frac{3}{4}$ in. thick and 10 ft. long. We settled on curly maple. Birds-eye was selected as a secondary wood, and its use was limited to the spindles.

Buying lumber by the log allows book-matching



Finding 200 bd. ft. of curly maple in the lengths I needed also proved to be difficult, so I sought out a timber broker and sawyer. I decided to buy whole logs and have them resawn, which would take extra work and time. But it was worth the trouble because I was able to tell the sawyer just how I wanted the logs cut. Using wood from the same tree guaranteed that I would be able to

match the figure and color. (For more on locating a sawyer and cutting logs, see *FWW* #128, pp. 52-55.)

My customer told me that she didn't want her table to appear "too bossy," that is, she didn't want it too wild with figure. So I had the logs flichtsawn (sawed completely through in successive layers). This method yields a combination of flat or tangential grain and quartersawn or radial grain. I ended up with boards that had a lot of curl in the quartersawn areas and calmer grain in the flatsawn areas. The areas of greatest curl were on the outside edges of the log.

I like to use air-dried wood because it machines cleaner, with less tearout. But air drying, I was told, wasn't an option with the curly maple. Curl is actually an abnormality to maple, and it causes stress in the wood. Kiln drying, I was told, would help stabilize the maple. Well, I hate to imagine what that stack of lumber would have looked like if I had air dried it. Curly maple was an apt de-

No Jointer? No Problem



I made the mistake of purchasing a used light-duty jointer many years ago. For several months the machine tugged on my patience because it would not heed my commands to mill lumber flat. Then I made peace with it. I distanced myself from this dog of a tool, which now lies in its own corner of the shop, its bite and growl silenced, the unplugged power cord curled peacefully about its legs.

Long planks, such as the 10-ft. pieces used to make up the Stickley tabletop, present a difficult milling challenge when they are warped and twisted. Jointing them flat can waste much material. I relied on my carpentry background and tools to solve the problem.

❶ Before you begin to scribe, you need a fairly flat surface on the edge of a board to write on. If the edge is rough and ragged, snap a line and cut off the waste with a circular saw. The opposite edge can then be ripped straight on the tablesaw. Trim the ends as well.



❷ In cabinet work, I often have to scribe a flat cabinet to fit a warped wall. I flipped the concept on its head and found a way to scribe a crooked board using a flat surface for reference. Then I use the scribe marks to guide a powered hand planer and flatten one face.

Use a tablesaw and its long outfeed table to serve as a guide for scribing warped stock. It's important that you take the time to level the outfeed table to the exact height of the tablesaw. Also, make sure the table's surface doesn't suffer from dips or other imperfections.

When a plank is badly warped, balance it on the outfeed table and tablesaw using weights or blocks of wood to prevent one corner from sitting too high. So when you scribe, you end up splitting the difference between high and low spots.



3 After scribing, flip the plank over, and remove waste with a power planer, paying close attention to the scribed line. Finish up using a No. 7 jointer plane. To check your progress, flip the plank over onto the outfeed table and see if it rocks.

You don't have to completely flatten every square inch of the plank before resorting to a thickness planer to true the other side. As long as the plank won't rock as it goes through a planer, the other face can be trued. You do have to remove any bow because a thickness planer can temporarily compress the bow out of a board as it passes through. Once the second face is true, flip it over, and send the first face through the machine to clean it up.



4 Squaring an edge comes next. Because I don't own a working jointer, I have an alternative method for jointing. I chuck the board in a vise and use a power hand planer fitted with a homemade carriage that keeps the tool square to the edge. Take light passes and sight along the edge to check your progress.

5 A power planer can only get you so far. I get a good glue edge by jointing stock on a router table. My router is attached under the side extension of my tablesaw, which allows me to use the tablesaw's fence for routing, too. For jointing, I made an adjustable, auxiliary fence that fits over my rip fence.

I use pieces of $\frac{3}{4}$ -in.-thick melamine for my auxiliary fence and attach it to the saw fence using L-brackets and carriage bolts. Alternatively, you can use an adjustable router-table fence (FWW #90, p. 57) that allows you to offset one-half of the fence relative to the other. To joint a board, adjust both fences in the same plane, and then adjust the rip fence to take off only $\frac{1}{32}$ in. Joint a few inches of a board, turn off the router and reposition the outfeed half of the auxiliary fence flush against the jointed section.

I've had good results jointing edges using a $\frac{1}{2}$ -in. solid-carbide up-cut spiral bit or a $\frac{3}{4}$ -in. carbide-tipped straight bit. After jointing one edge, rip the other side using the tablesaw, and joint that edge on the router. Correct any slight imperfections using a No. 7 jointer plane. Then slightly hollow out the center of each glue edge with a scraper to avoid a starved joint. I don't use biscuits or splines to align boards. I do, however, glue up only two or three planks at a time so that I don't go crazy trying to keep everything flat.



6 After letting a panel dry overnight, I use a No. 80 cabinet scraper to remove gluelines and any tearout left by the power tools. On a tabletop this big, it's easier to just hop aboard, and go to work on your hands and knees. —R.A.



scription of the lumber's condition after kiln drying (for more on flattening lumber, see pp. 82-83).

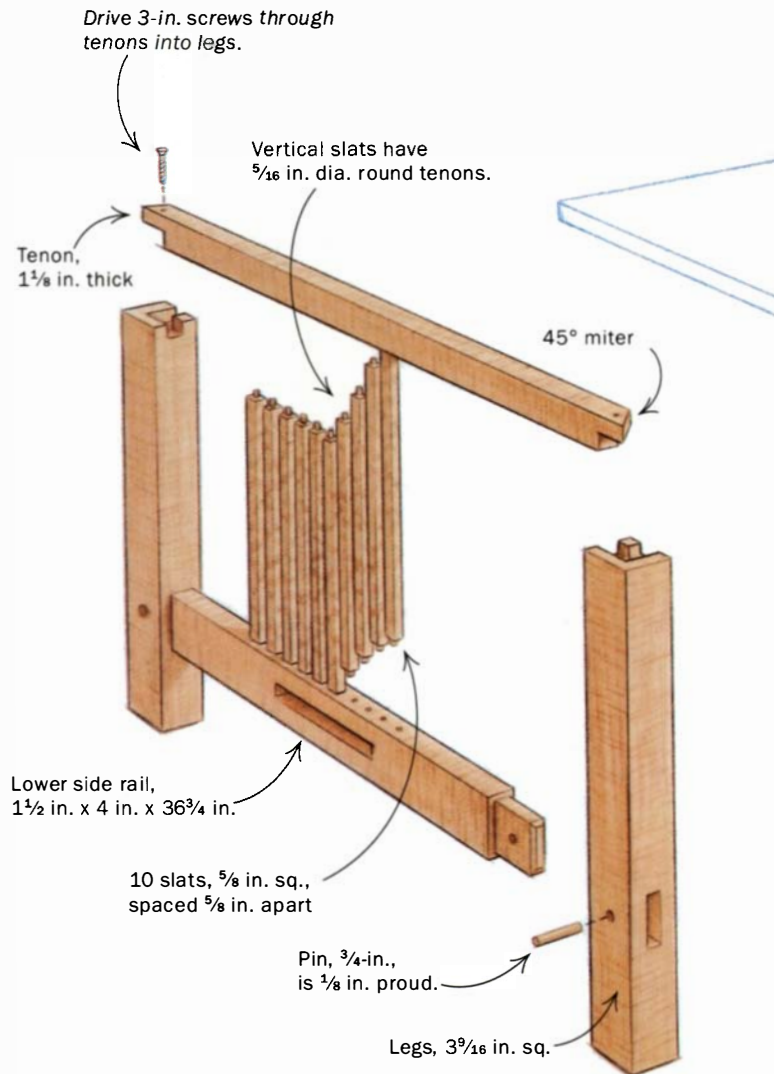
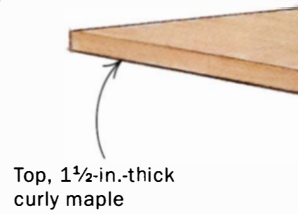
Variations on a Stickley theme

The grain—rays or flecks—found in premium quartersawn oak adds visual interest to Stickley's rather simple furniture. I used curly maple to achieve a similar effect by matching up the most-figured planks and gluing them up for the massive top.

Stickley was a stickler for uniform figure on his work. Because legs made of solid stock only show quartersawn figure on two sides, he solved the problem by making legs from four mitered quartersawn sections (see *FWW* #121, pp. 54-57). Some people solve the problem by simply gluing quartersawn veneer on two faces. Because this table has an altogether different look and feel

ARTS-AND-CRAFTS DINING TABLE

Mortise-and-tenon construction is reinforced with pins and screws.



Subtop keeps the base from racking



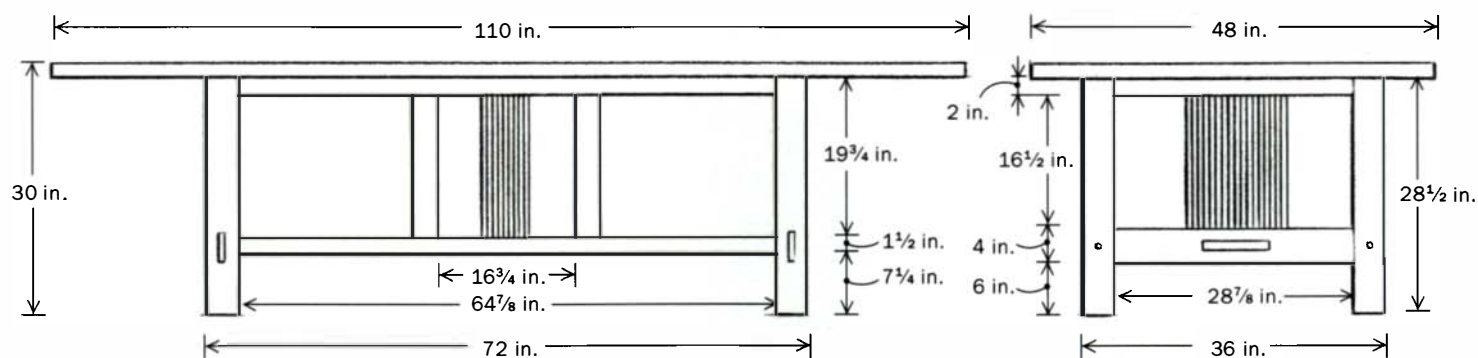
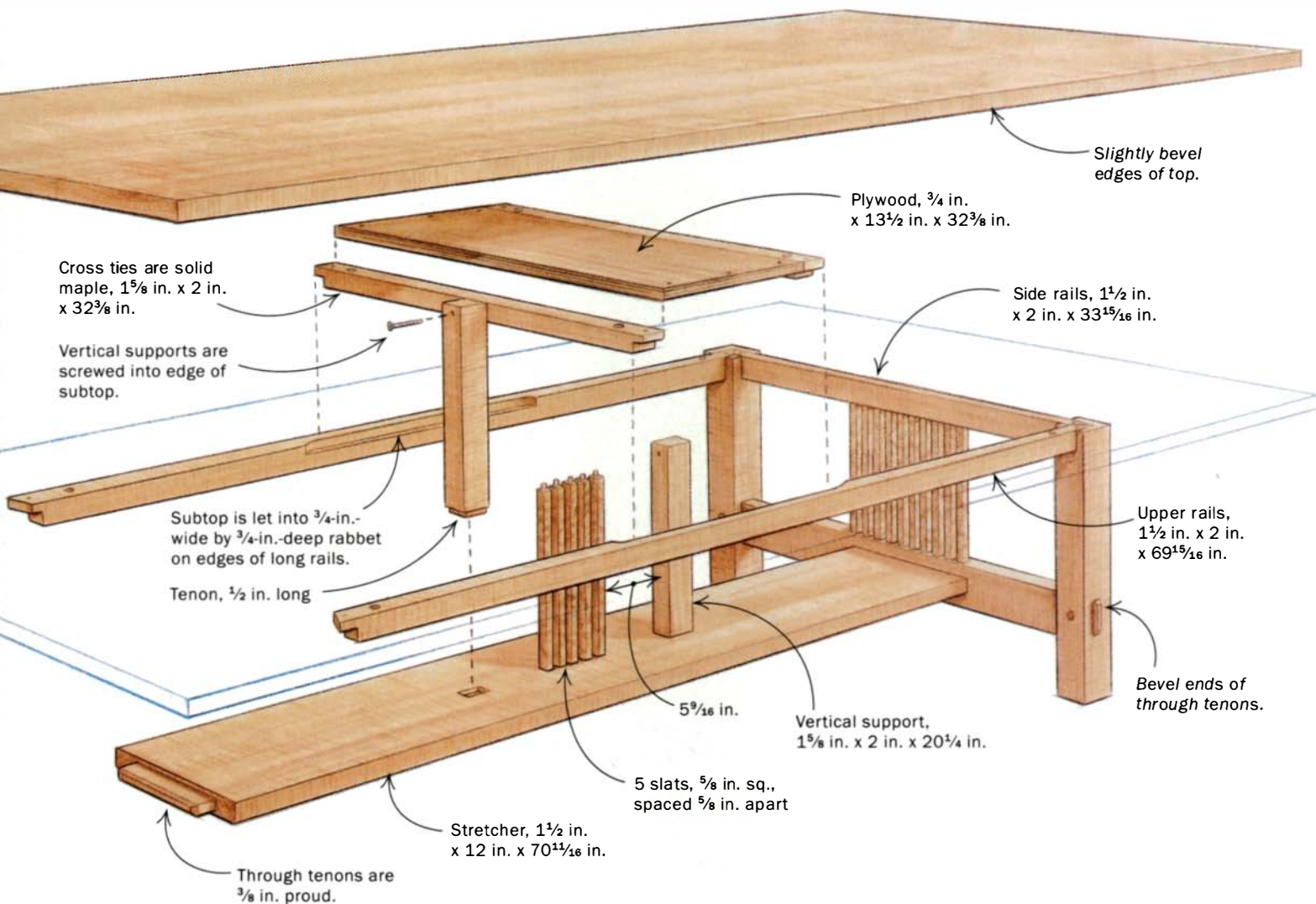
from standard Stickley, I laminated two pieces of 8/4 book-matched stock for the legs and left it at that.

The spindles are best machined after you have dry-fit their matching components, which I use to mark off the location of the tenons. I machine round tenons on the ends of the spindles using a radial-arm saw, a dado blade and two short sections of PVC pipe that allow me to rotate the stock evenly.

Using the assembled rails as a marking guide, I lay out the tenons on a piece of scrap spindle stock to set up my radial-arm saw. I fit the radial-arm saw with a dado blade and position a stop block to establish the tenon's length. Before cutting, I slip a piece of plastic pipe over each end of a spindle, keeping the ends exposed. Be sure there is no slop in the fit. I place the stock against the stop block and back fence and make a cut (see the photos on p. 81). Then I rotate the spindle about 90° and make successive cuts to all four sides to remove most of the waste. I round over the tenons by carefully spinning the spindle/pipe fixture against the stop block and fence while moving the dado head back and forth.

Hidden beneath the tabletop is a subtop, a piece of ¾-in. plywood with solid maple edges (cross ties) on two sides. A subtop has several purposes: It houses the mortises for the spindles attached to the stretcher, keeps the long side rails from flexing and helps keep the top flat. The subtop is screwed and glued to the rabbet in the long upper rails (see the photos above). Two vertical supports, which are mortised into the stretcher, are screwed to the cross ties of the subtop.

The subtop, as well as rails, are drilled out for screws to fasten the top. The large top will move considerably with seasonal changes in humidity, so I make the screw holes wide enough to allow the screws to move with the wood. I drill 1-in.-dia. holes 1½ in. deep



from the top of the aprons with a Forstner bit. From the bottom of the apron, I drill toward the 1-in. holes using a #8 countersink bit.

A recipe for finishing

Before applying the finish, I use a Stanley No. 80 scraper; then I sand beginning with 220-grit, going through 600-grit. All edges are relieved slightly using a block plane or file and sandpaper.

I use a combination of oils, polyurethane and beeswax. First I heat boiled linseed oil in a pan on an electric hot plate outside my shop. Just before it begins to smoke (usually at about 120°F), I remove it from the burner and liberally apply it to the table and base with a rag using rubber gloves to protect my hands. After about 20

minutes, I wipe it off and let it dry for 24 hours. I repeat the process two more times for a total of three coats. After the last coat of linseed oil has dried for three days, I apply three coats of an equal mixture of tung oil and polyurethane, letting each dry for 24 hours.

My top finish coat consists of equal parts beeswax, tung oil and boiled linseed oil. I melt the beeswax in a double boiler, remove it from the heat and add the other ingredients. When the mixture cools, it develops a creamy texture. I apply that with my hand and wipe it off with a rag. After a day, I'll apply one more coat and buff it with a clean cloth. □

Rex Alexander makes furniture, cabinetry and millwork in Brethren, Mich.

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A Guide to the Wayward Ways of Wood Grain

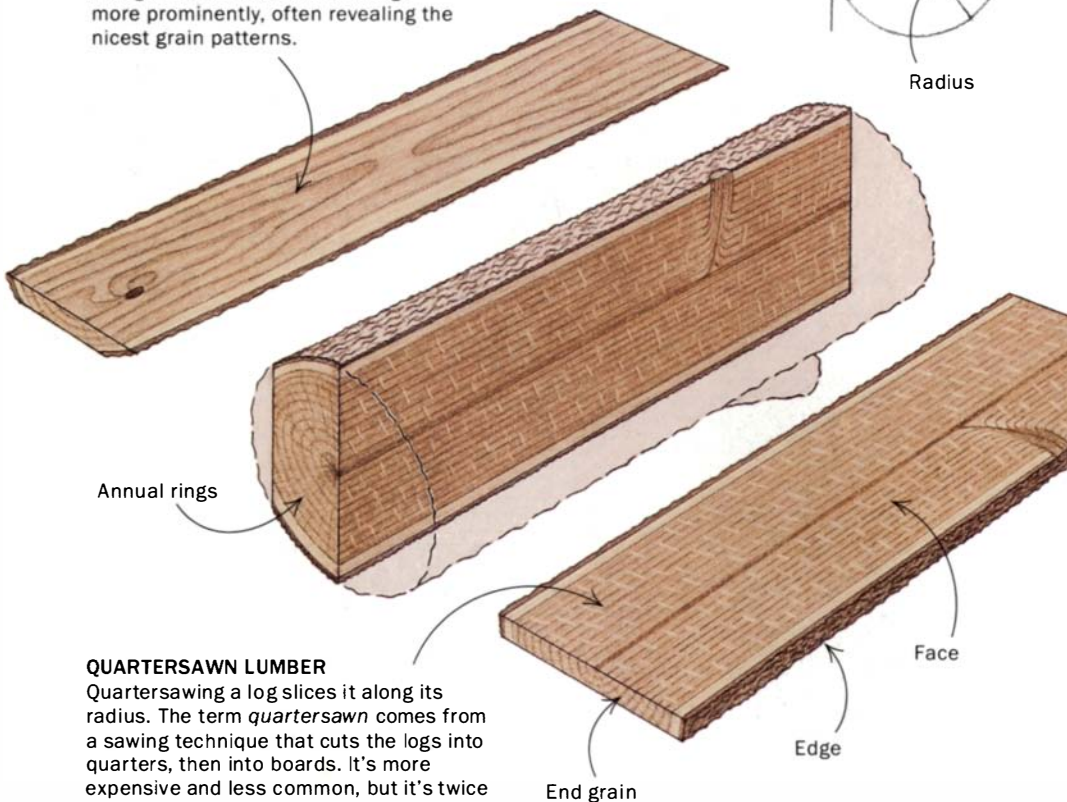
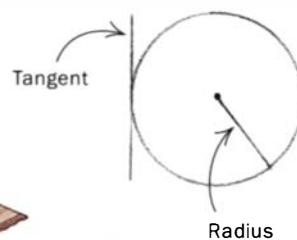
As one of our contributing editors is fond of saying, a board's grain is a bit like a cat's fur. If you brush the cat's fur in the wrong direction, you tend to make the cat hiss. Brush it in the right direction, and the cat purrs. Working wood with the grain will yield smooth boards. Cutting it against the grain will give you endless grief. Grain, however, is a bit harder to read than fur. But being able to read wood grain is an important part of working the material successfully. Grain can tell you quite a bit about a board. It can tell you where a board's strengths and weaknesses are and the direction the wood will move most. Grain patterns will also recommend the best ways to cut a particular board.

GRAIN PATTERNS DESCRIBE THE STRUCTURE OF WOOD

Lines of grain delineate the annual growth rings of the tree and, therefore, its structure. Depending on how a board has been milled, you will see flat grain, quarter grain or end grain on a board's face. Usually, though, lumber isn't cut with end grain on the face. The grain's orientation not only makes the lumber look different but also makes it behave differently (see the drawing below).

FLATSAWN LUMBER

Flatsawing a log slices it along a tangent. Flatsawn lumber is stable in thickness but tends to twist and cup. Flat grain shows the annual rings more prominently, often revealing the nicest grain patterns.



QUARTERSAWN LUMBER

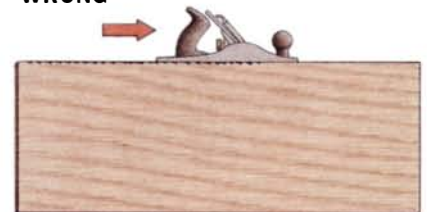
Quartersawing a log slices it along its radius. The term *quartersawn* comes from a sawing technique that cuts the logs into quarters, then into boards. It's more expensive and less common, but it's twice as stable in width than flatsawn and doesn't warp much. Quarter grain has a subtle figure but reveals beautiful ray patterns in oak—a feature taken advantage of by Arts-and-Crafts designers.

CUT AGAINST THE GRAIN AT YOUR PERIL

In woodworking, as in life, it never pays to go against the grain unless you must. If you don't cut a board with the grain, the blade will tear out bits of wood to remind you. When the grain is straight, you are in luck. Frequently, though, it's impossible to avoid cutting against the grain. Strongly figured woods such as bird's-eye maple have grain that goes in every direction at once. In this situation, making light cuts with very sharp tools helps. And if you still get tearout, remember that scrapers and sanders can get rid of it.

IDEAL BOARD WITH STRAIGHT GRAIN

WRONG



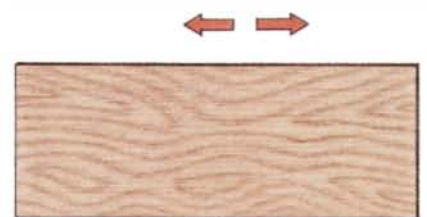
Cut *against* the grain and the wood will tear out.

RIGHT



Cut *with* the grain for a smooth edge.

COMMON BOARD WITH WAYWARD GRAIN



Pick the best direction, cut lightly and plan to sand.



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Item	Style	List	Sale
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ADT-002	Crown	\$111.90	\$79.90
ADT-003	Traditional	\$111.90	\$79.90
ADT-004	Colonial	\$111.90	\$79.90

Prefer to make your own templates? Our pattern set allows you to make templates in four styles!

Our new Arched Door Pattern Set gives you designs for the four styles shown above on heavy paper stock. You simply trace the outline onto plywood, then cut out your own template set. Includes complete instructions.

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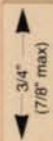
Doormaker's Sets!



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Super Duty Flush Trim Bits

Perfect for routing arched panel doors and other patterns!

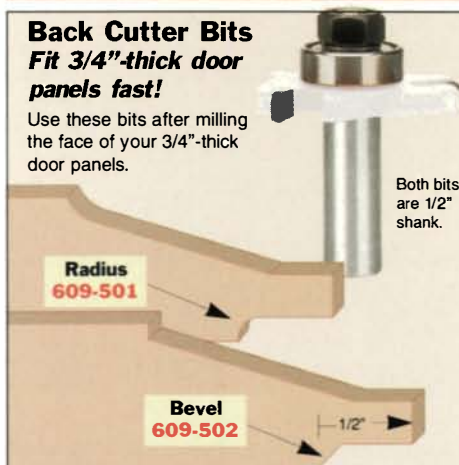
Our Super Duty Flush trim bits feature massive 3/4" diameter bodies for optimum strength, 3/4" diameter bearings and down-shear cutting to eliminate frayed or chipped surfaces. These bits are designed for heavy-duty cutting, making them the perfect bit to use when routing arched panels and rails. Both bits are 1/2" shank.



Item	Cutter Diam.	Cutter Length	Overall Length	Price
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606-691	3/4"	1"	3"	\$36.90

Back Cutter Bits Fit 3/4"-thick door panels fast!

Use these bits after milling the face of your 3/4"-thick door panels.



Both bits are 1/2" shank.

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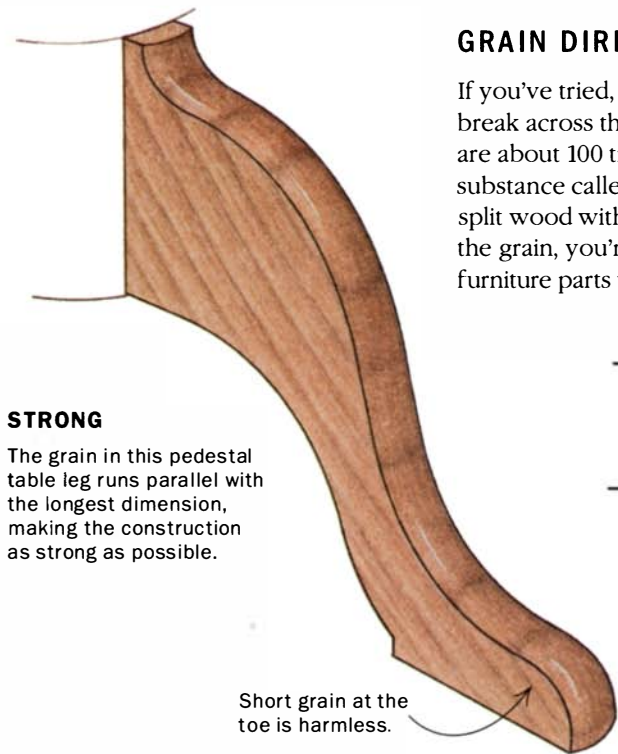


In Australia: coming soon!

Rules of Thumb (continued)

GRAIN DIRECTION DETERMINES A BOARD'S STRENGTH

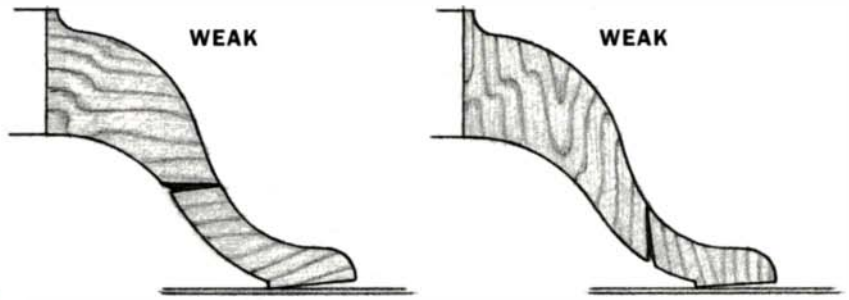
If you've tried, you know that wood is far easier to split along the grain than it is to break across the grain. This is because wood is made up of tough cellulose fibers that are about 100 times longer than they are wide. They're held together by a glue-like substance called lignin, which is much less strong than the fibers themselves. When you split wood with the grain, you're breaking lignin bonds (easy); when you break across the grain, you're snapping cellulose fibers (much harder). Though tempting, designing furniture parts with short grain is never a good idea.



STRONG

The grain in this pedestal table leg runs parallel with the longest dimension, making the construction as strong as possible.

Short grain at the toe is harmless.

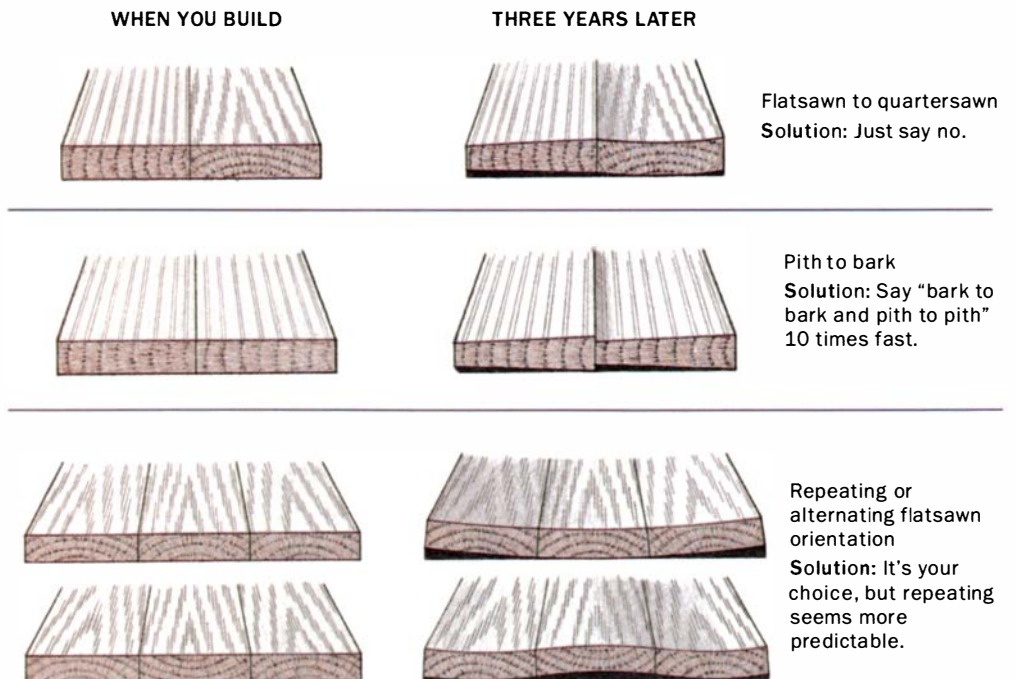


Weight of table will split the short grain in the ankles of these feet.

GRAIN EVEN TELLS YOU WHERE YOUR WOOD WILL MOVE

Wood's wayward ways are not more evident than in the way that it moves. Even after you mill a board straight, flat and square, it will grow and shrink, bend, twist and cup. Wood moves for two reasons: internal stresses in its structure and changes in moisture content because of changes in relative humidity (you can ignore this only if you live in sunny Southern California where the relative humidity never changes). Helpfully, a board's grain will tell you how much and in which directions a given board will move.

Flatsawn lumber will tend to cup toward the bark, flattening out its annual rings. Quartersawn lumber doesn't warp as much, but it can shrink unevenly in thickness, less toward the pith (the center of the tree) and more toward the bark. These reasons and others make it unwise to join boards with different grain.



WOOD MOVES AND NEVER STOPS

When wood absorbs or loses moisture from the surrounding air, it moves. Because the relative humidity can vary sharply between seasons and even between rooms (think of the proverbial damp basement and dry attic), wood expands in the summer and shrinks in

the winter. Expect a North American hardwood (such as oak) to shrink and swell about 1/4 in. across 12 in. of flat grain and 1/8 in. across 12 in. of quartersawn grain between highs and lows of humidity. Finishes will reduce movement, but won't eliminate it.



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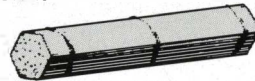
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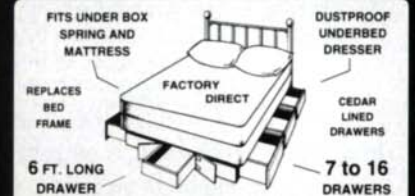
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Parts and manual for Walker-Turner drill press

I've recently become the owner of a 15-in. drill press made by Walker-Turner of Plainfield, N.J. I would like to know whether this outfit is still in business and, if not, whether a manual and parts are available.

—William Wright, Annapolis, Md.

Robert Vaughan replies: Walker-Turner was bought by Rockwell (now Delta) in the early 1950s. Rockwell kept some of the machines in its product line for a few years, but only one prominent Walker-Turner design still exists as a Delta machine—its fine radial-arm drill press (model no. 15-126). Some of the older radial-arm drill-press parts will fit your machine, but you'll have to contact Delta for information about specific parts (800-248-3358).

[Robert Vaughan repairs and restores woodworking machinery in Roanoke, Va.]

Refinishing an antique varnish

I have a curly maple handmade desk built in 1938. The finish is varnish, and it's badly alligatored. Is there any way to refinish this desk without stripping the old finish? —Robert Funk, Shelton, Conn.

Jeff Jewitt replies: It's certainly possible to restore a finish without stripping, and we do it all the time in my conservation and restoration business.

There are two approaches you can take with an alligatored varnish finish. The easiest is simply cleaning and re-waxing the piece, which works fine if the cracks are not deep. Use a two-step method for cleaning.

First remove all the hardware, and wipe the surface thoroughly with a cloth dampened in mineral spirits or naphtha, changing to a clean part of the cloth frequently. This will remove all oil-soluble dirt such as old waxes, polishes and skin oils.

When the piece is dry, switch to a water-based cleaner (a capful of Dawn dish-washing detergent mixed in a quart of warm water works well). With a damp cloth, use the cleaner to remove any remaining water-soluble dirt. Finally, wipe the piece with a clean cloth.

To minimize the cracked appearance,

you can sand lightly with 400-grit non-loading sandpaper. Proceed carefully, and sand just enough to knock off the surface of the old varnish. When done, clean off all sanding residue, and apply a colored paste wax that matches the overall tone of the wood. Liberon and Briwax both make colored waxes for this purpose.

If the cracks go deeper, keep sanding. Wipe the piece periodically with mineral spirits to make sure you are not sanding through any color layers. When you have removed as much of the old varnish as you can, pad on two coats of dewaxed pale shellac (see *FWW* #112, pp. 60-63). I use a 2-lb. cut made from fresh flakes. When dry, rub with steel wool and wax.

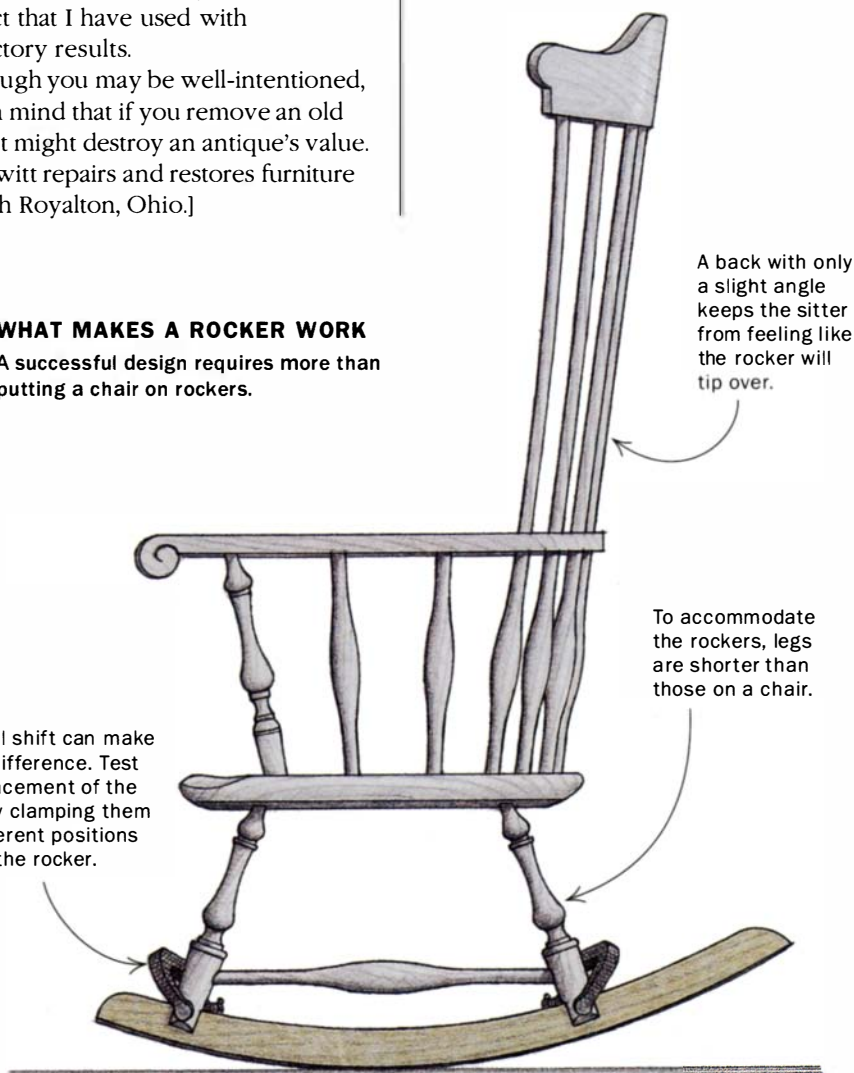
An alternative product that you can use is a padding lacquer, which is shellac modified with other resins in a solvent mixture that should "bite" into the old finish. Behlen's Qualasole is a product that I have used with satisfactory results.

Although you may be well-intentioned, keep in mind that if you remove an old finish, it might destroy an antique's value. [Jeff Jewitt repairs and restores furniture in North Royalton, Ohio.]

WHAT MAKES A ROCKER WORK

A successful design requires more than putting a chair on rockers.

A small shift can make a big difference. Test the placement of the legs by clamping them at different positions along the rocker.



Designing a rocking chair

I am interested in designing a rocking chair. I have found plenty of information on chairs but nothing basic about the geometry of a rocker. Can you explain seat placement and back angle relative to the rockers; provide a geometry for the rocker linkage with respect to the ground; and a seat geometry for an average person?

—John W. Williams, Bellevue, Wash.

Mario Rodriguez replies: You raised a number of legitimate and important questions regarding the design of a rocker. However, I've found that there are no clear and singular answers. There are so many things to consider when designing a rocker. I really couldn't dictate curves, angles and lengths as a

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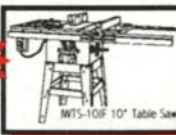
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formula because they might change depending on a particular design.

Because of the special demands put upon a rocking chair (as compared to a regular chair), every aspect of its design and construction should be carefully considered. For instance, a rocking chair's legs must be shorter than those of a chair to compensate for the addition of rockers. And a rocker's back should be only slightly angled; otherwise, a sitter might feel like the chair will tip over when in use.

In my experience, it takes three or four tries to come up with a successful original design, but there are a few ways to speed the process along. The simplest approach is to use an existing rocker as a model. After measuring, inspecting and trying the chair, you can make adjustments and changes for your version.

Another method that helps me in the shop is to experiment with the position of the legs on the rockers. On a Windsor rocker, for instance, the legs are slotted to receive the rockers (see the drawing on p. 100). This construction allows you to temporarily clamp the legs to the curved rockers as well as experiment with the position of the chair on the rockers. A small 1/2-in. shift in the chair's position



HONEY LOCUST
(Gleditsia triacanthos)

along the rockers can shift the sitter's weight and dramatically change how the chair rocks.

[Mario Rodriguez lives in Haddonfield, N.J., and teaches woodworking at the Fashion Institute of Technology in New York City. He is a contributing editor to *Fine Woodworking*.]

Honey locust for exterior projects?

A recent windstorm blew down a large wild cherry tree in my yard. It, in turn, knocked down seven honey locust trees more than 50 ft. tall. I've cut the trunks into 8 ft. lengths and will have them sawn at a local mill. I've heard that locust is very hard and rot resistant and that it's often used for fence posts, but I was thinking of using the wood for furniture projects, carved signs and building a deck. What do you think of this idea? And if I do end up using the wood for indoor projects, what finish do you recommend?

—John Scotford, East Thetford, Vt.

Jon Arno replies: What a windfall! Honey locust, *Gleditsia triacanthos*, is one of our nicest native hardwoods. Unfortunately for most woodworkers, it's almost unknown and is seldom available through lumber dealers.

Honey locust's close cousin, black locust (*Robinia pseudoacacia*), is sometimes seen on the commercial market, and many woodworkers assume the two woods are similar. Actually, they're quite different, and of the two, honey locust is by far the nicer furniture wood. Unlike black locust, though, honey locust is not particularly rot resistant, so it should be reserved for interior furniture projects.

Both woods are a little on the hard side, but honey locust is a bit softer and is noticeably easier to work. With a specific gravity of 0.60, it's similar in density to white oak or pecan. It has a very attractive ash-like figure, and its appearance is further enhanced by its warm color—a decidedly darker reddish-brown—not unlike genuine mahogany. Black locust is grayish-yellow in color.

Honey locust has a very low tendency to warp, making it a relatively easy wood to air-dry. Black locust is equally stable,

BLACK LOCUST *(Robinia pseudoacacia)*



but it takes much longer to season because its pores are clogged with bubble-like structures called tyloses. Tyloses retard the release of moisture, but are also responsible for black locust's well-known rot resistance. The pores in honey locust are open, however, making it more prone to decay and unsuited for exterior projects.

As an interior furniture wood, though, honey locust is truly outstanding. Like most other ring-porous woods, a filler is required if you're after a glass-smooth finish, but that's about honey locust's only drawback. Its beautiful natural color requires no stain. Also, unlike black locust, which is notoriously difficult to glue, honey locust accepts adhesives and finishes quite well given its density. As for finishes, my first choice for honey locust is orange shellac. It seems to give this species an especially beautiful amber glow.

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

Do you have a question you'd like us to consider for the column? Send it to Q & A, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506.

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30T	\$125	\$99	\$89	\$79
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8"x40T 3/32"	\$136	\$99	\$89	\$79
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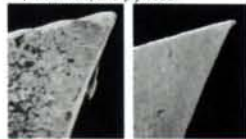
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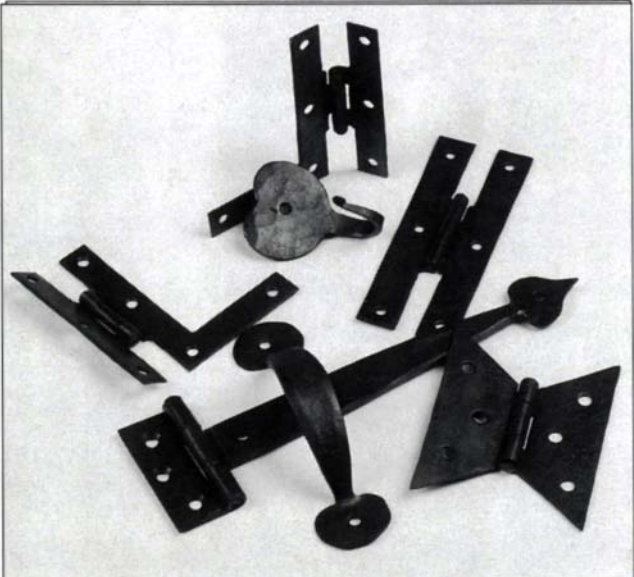
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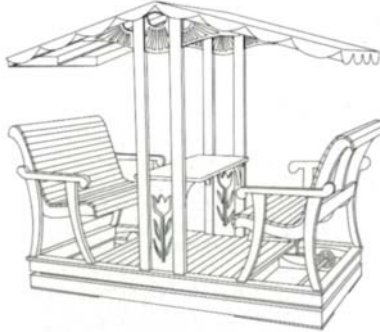
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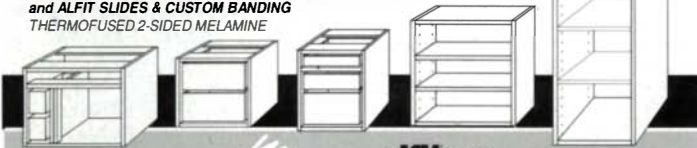
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INDEX TO ADVERTISERS

A & I Supply	25	DM Sales and Engineering	95	Horton Brasses	107	North Bennet Street School	94	Specialty Furniture Design	93
Abbey Machinery & Supply	20	Dakota Cty. Technical Col.	37	Hut Products For Wood	25	Northeast Hardwoods	93	Sunhill Machinery	25
Adams Wood Products	27	J.A. Dawley Co.	37	Inkra Rules	109, 111	Northern Hardwoods	95	Syracuse Industrial Sales	12
Airware America	19	Delmhorst Instrument Co.	15	Innovation Specialties	95	Northwest School Boatbuilding	30	System-One Truck Equip.	33
Amana Tool Company	19	Delta International	29	International Tool Corporation	113	Northwest Timber	92	TNT Virutex	94
American Design & Engr.	12	Martin Donnelly Antique Tools	95	IWF	91	Norwood Sawmills	92	Talarico Hardwoods	92
American Furniture Designs	92	Michael Dunbar	105	Irion Lumber Co.	106	Nyle Standard Dryers	12	Target Enterprises	93
American Saw & Mfg	3, 95	Dunham Hardwoods	7	Ironwood Designs	95	Oakwood Veneer	95	James L. Taylor Mfg. Co.	15
Anderson Manufacturing	92	Dust Boy, Inc.	94	Ironwood Mill Right	109	Old Village Paint	94	Tech Mark Inc.	30
Anderson Ranch Arts Center	97	Eagle Woodworking	92	Jamestown Distributors	94	Old World Machine	37	Tech-Wood Inc.	106
Art Teco	95	Ebac Lumber Dryers	106	The Japan Woodworker	20	Olympic Stains & Finishes	13	Tenryu America, Inc.	38
Ashman Technical Ltd.	7	Econ-Abrasives	31	Jesada Tools	89	Oneida Air Systems	30	The Tool Chest	94
Auton Company	28	Electrophysics	33	Jet Equipment	39	Oregon College of Art & Craft	20	Timberking	111
Aviation Industrial Supply	30	Engraving Arts	94	L.L. Johnson Lumber Company	93	Packard WoodWorks	94	Titebond	33
Baklund-Hellar Inc.	38	Excalibur Machine & Tool	93	Jointech	38	Paxton Hardware Company	92	Tool Crib of the North	99
Ball & Ball Hardware	96	Fein Power Tools	11	Keller & Company	31	Peck Tool	92	Toolguide Corporation	15
Bar Maid Mini-Refrigerators	95	Felder	104	Kelly Tool Works	94	H. H. Perkins Company	30	Tools On Sale	86
Bar Specialty Tools	92	Fine Paints of Europe	95	Kreg Tool Company	25	Peters Valley Craftsmen Inc.	105	University of Rio Grande	25
The Beall Tool Co.	95	First Choice Steel Buildings	94	Kremer Pigments	92	Pioneer Millworks	93	Van Dyke's Restorers	15
Berea Hardwoods	96	Ford Truck	22	Laguna Tools	3, 11, 15, 96	Pisgah Logging	95	Vass, Incorporated	108
Better Built Corp.	12	Forrest Manufacturing	103	The Landing School	93	Pootatuck Corporation	33	Vega Enterprises	38
Blue Ox Hardwoods	92	Franklin Ace	101	Peter Lang Co.	94	Porter Cable	17	Viel Tools Inc.	108
Bosch Power Tools	2	Fuji Industrial Spray Equip.	20	Robert Larson	106	Powermatic	115	WGB Glass	31
BrandNew	93, 106	Furniture Designs	27	Launstein Hardwoods	104	Precision Casework	15	Wetzler Clamp Company	3
CAB Parts	7	Garrett Wade Company	31	Lee Valley/Veritas	111	Pro-Tech Power Inc.	9	Whitechapel Ltd.	111
CNA Insurance Companies	21	Gilmer Wood Company	106	Leigh Industries	97	Quality VAKuum Products	7	Wilke Machinery Co.	27
Carter Products	104	Goby's Walnut Wood	106	LeNeave Supply Company	19	RR Plans	93	Williams & Hussey	28
Certainly Wood	95	Thomas Golding School	105	Liberon/Star Supplies	92	Rare Earth Hardwoods	94	Winkler Wood Products	106
The Chippendale School	96	Good Hope Hardwoods	93	Lie-Nielsen Toolworks	12	Red Hill Corporation	93	Winterwoods	92
Classic Designs by Burak	28	Gorilla Glue	7	Lignomat Moisture Meters	33	Ridge Carbide Tool Co.	94	Wood Mark	96
Co-Matic Machinery Ltd.	107	Gougeon Brothers	94	Philip C. Lowe	105	Dana Robes Wood Craftsmen	92	Wood Write Ltd.	12
Collins Tools	12	Granberg International	108	Luthiers Mercantile Intl.	105	Ross Industries	33	Wood-Mizer	101
M.L. Condon Lumber	111	Groff & Groff Lumber	31	Makita	98	Router News	93	Wood-Ply Lumber Corp	95
Conover Lathes	101	Gross Stabil	38	Manny's Woodworker's Place	28	St. James Bay Tool	93	Woodcraft Supply	7, 111
Conover Workshops	105	HTC Products, Inc.	31	Mass Bay Wood Products, Inc	95	Safety Speed Cut Mfg	94	Woodmaster Power	104, 109
Constantine	101	Harper Hardware Company	12	McFeely's Square Drive	109	Sand-Rite Mfg. Co.	27	Woodsmith Store	104
Craft Supplies	11	Hearne Hardwoods, Inc	101	Mercury Vacuum Presses	11	Sandy Pond Hardwoods	92	Woodworker's Depot	37
Crown City Hardware Co.	92	Hida Tool & Hardware	28	MicroPlane	101	School Of Classical Carving	105	Woodworker's Dream	94
Center. for Furn.		Highland Hardware	109	Midwest Dowel Works, Inc.	92	Shapes & Surfaces	28	Woodworker's Source	93
Craftsmanship	33, 105	Historic Woodworks	106	MLCS Ltd.	111	Shopbot Tool	27	Woodworkers Discount	
Francois Cullen	95	Home Lumber Co., Inc.	3	W. Moore Profiles	19	Smithy	37	Books	109
D & D Wood Supplies	93	Homeco Ace Home Center	104	Mountain Lumber Co.	95	Southern Union Comm. Col.	105	The Woodworking Voyeur	93

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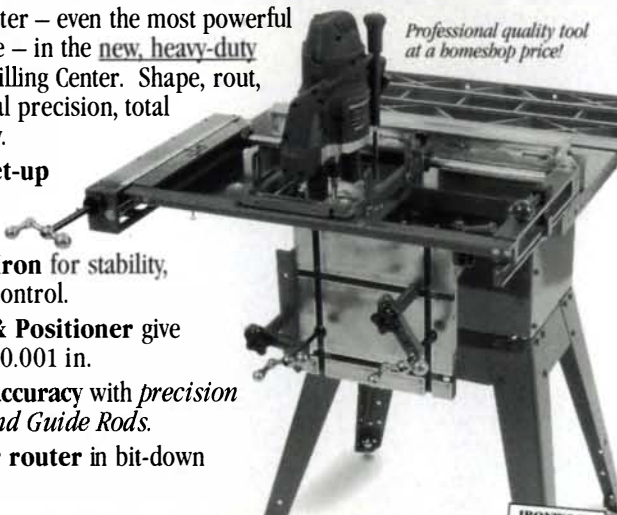
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READER SERVICE NO. 108

Making a curved pediment molding

BY JEFFREY P. GREENE

Impressive bonnet tops were the crowning feature of many mid-18th-century American case pieces. Highboys, chest-on-chests and secretaries in the Queen Anne and Chippendale styles owe their enduring stature in part to their impressive architectural pediments. The pediment and its curved moldings look beguilingly simple when well designed and executed, yet they test the skill of even the most experienced craftsmen. Any small inconsistency in either the molding's overall curve or its profile is glaringly apparent. The curve needs to be smooth, continuous and flowing, and the profile, or cross section, must be uniform throughout the molding's length.

Before making the curved molding, it is best to begin with a full-scale drawing of the pediment, so you can develop the design and work out its details in advance. From the full-scale drawing, I make a pattern of the molding shape on poster board and use that to transfer the shape to solid stock the same thickness as the finished molding. In bandsawing the molding blank, I cut close to the line on the outside edge but leave about 1/2 in. extra width on the inside of the molding: This margin will support the router base while I cut the profile. Although the ends of the molding eventually



STEPPING OUT WITH A ROUTER

One smooth side is essential. After tracing out and bandsawing the molding's rough shape, Greene fairs and smooths the outside edge of the molding with a spokeshave. A good edge and fair curves are imperative because all the router work will be indexed off this edge.



Greene uses a router with an adjustable guide bearing and a 3/4-in. straight bit to remove waste on this pediment molding for a Boston Queen Anne highboy. Craftsmen in the 18th century established a similar stepped profile with chisels before carving the final profile.

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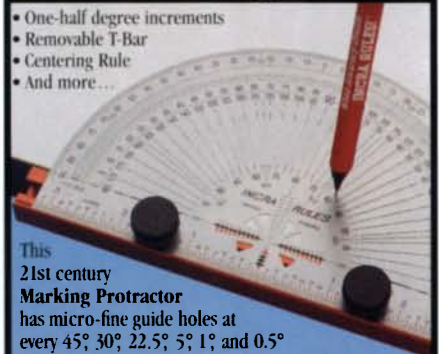
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ROUTER REFINES THE PROFILE

Using various router bits, Greene nibbles toward the profile line, leaving the rest to be cleaned up with chisels and gouges.



Calculating the curve. The penciled profile is Greene's gauge as he adjusts the depth and distance of cut. Several passes with a round-bottomed bit clean out the large curve.



Load-bearing wall. The thin wall of stock Greene leaves on the molding's inside edge helps support the router. Here, he defines both sides of the molding's small bead with a straight bit.

The wall comes down. With nearly all the routing finished, Greene chisels away the thin support wall. For the final router passes, which define the molding's inside edge, he supports the router with a piece of scrap from the original molding stock (right).



will be mitered, for now they should be cut at right angles to the layout lines.

I use a spokeshave to refine and smooth the curve of the molding's outer edge. It is vital that this edge be accurate, continuous and smooth because all other features of the molding will be gauged from it. By running a hand along the curve one can detect irregularities in the shape that the eye might not. I use another poster-board pattern to draw the molding profile onto both ends of the molding blank.

At this point, I attach the molding blank to a flat board (here, a piece of melamine-coated flakeboard) with a few screws. The screws go through the board into the molding blank near its outside edge, which will be the thickest part of the finished molding.

More than half of the wood in the molding blank will be cut away, and a router with a roller-bearing guide is a good way to remove most of it. I don't like the noise and mess routers produce, and I abhor their use in joinery. But for some tasks, they are well suited. In making period furniture, I think modern equipment is appropriate for any work that requires more horsepower than skill, allowing today's craftsman to invest his or her time in the things that are done best only by hand.

I remove most of the wood with a $\frac{3}{4}$ -in.-dia. straight bit, taking about $\frac{1}{4}$ in. at a pass and creating a stepped profile. In the 18th century, straight moldings with complex profiles would have started as a series of rabbeted steps, each of which would then be shaped with a molding plane. A similar approach would have been taken in carving a curved molding: First the major features of the profile were carved

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HAND TOOLS ON THE HOME STRETCH



Greene uses chisels to create the beads, and he uses gouges to smooth the coves, taking the molding down to the line and preparing for clean up with scrapers and sandpaper.

Chamfer me first. Turning the top step into a quarter-round (left) starts with a 45° chamfer chiseled along its edge. The chamfer gives way under the chisel to a faceted curve.



Curved clean up. Curved scrapers take out the facets and bumps left by the chisels and gouges. Sandpaper makes it smooth.



as a series of curving steps—the height and width of which were easily gauged—and then those steps were carved to the molding's final profile.

With most of the material routed away, I switch to a round-bottom bit to refine the shape of the main cavetto, or cove, with three or four passes. I use the profile drawn on the end of the molding as a guide to adjust the depth of cut and the position of the roller guide. Before defining the molding's inside edge with a straight bit, I chiseled away the thin wall of full-thickness stock I had left there. To support the router for the last cuts, a full-thickness cutoff from the original molding stock was adhered to the router base with hot glue. The piece rides smoothly on the melamine surface of the backing board.

It is up to the individual maker to decide how much of the profile he wants to cut with power equipment and how much by hand. I bring the molding to its final shape by hand.

Using a bench chisel, I carve the square step at the top of the molding to its quarter-round shape: first to a 45° chamfer of uniform width and then to its final shape. The half-round bead is carved in a similar manner. I use a shallow gouge to refine the profile of the large cavetto. In carving all of these features, it is necessary to change the direction of cut often, because the molding snakes across the direction of the grain and the slope of the profile varies from vertical to horizontal. I use curved scrapers to further refine and smooth the profile of the molding, after which only some light sanding is required to complete the piece.

—Jeffrey P. Greene,
Newport, R.I.

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A Marriage of Art and Craft

Mary Ann Nardo, a painter, is married to Jon Mitguard, a woodworker. Ten years ago, they collaborated on their first piece of furniture: a spice cabinet for their kitchen. Jon made the cabinet, and Mary Ann made the cabinet more beautiful. Since that time, they've gone into business as Inwood Design in San Rafael, Calif., fulfilling a dream they had of working together. Jon favors fine-grained, highly stable quartersawn Douglas fir for the furniture. Mary Ann uses multiple washes of water-color paints to build up every leaf and tendril. Their work is certainly a marriage of fine art and fine furniture.

