



ARE 12 VOLTS ENOUGH?

WOODWORKER'S JOURNAL

The magazine
for today's
woodworker

June 2000
Volume 24,
Number 3

Rick White builds
four essential jigs
for your shop

Master woodworker
Mike McGlynn
meets "Mr. Wright"

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Ian Kirby: Project Design
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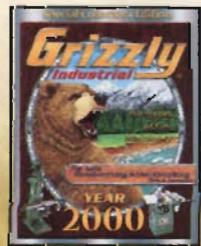
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Inspired by Wright's first Prairie style furniture, these high-backed chairs can cozy up to a bar anywhere.



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By Rick White

Here are four simple jigs that our author would be lost without in his shop.

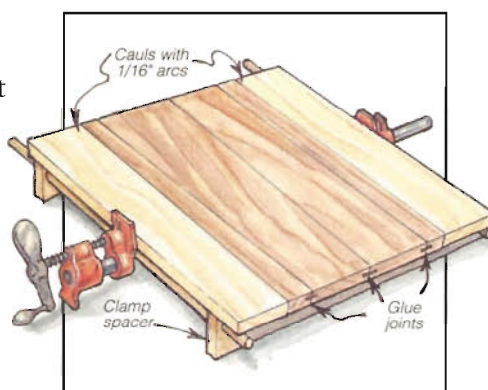


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Mike McGlynn reveals professional chair building techniques and describes how to reach the same results in your home shop.

Web Woodworking (...not so bad)

I sure got an earful after last issue's editorial, where I complained that the Internet is robbing woodworkers of valuable shop time. Already, a bag full of virtual mail from subscribers (none via the post office) has told me how wrong I was — and I even got nailed by my own staff.

Pretty touchy stuff.

Editor **Rob Johnstone** led the charge, reminding me that we were in the "beta testing stage" with our own new e-zine, an online publication devoted to, you guessed it, wood-working on the web.



Scroll forward ... and we're welcoming aboard **Bob Filipczak**, new online editor of the *Woodworker's Journal e-zine*. Bob's a guy who's had an eye on the Internet almost as long as Al Gore. But Bob's also a woodworker (that was my rule). And it was from this perspective that he turned the tide for me in our little office debate. "A computer is a tool," he said. "Woodworkers understand tools." I was moving to firmer ground here. Our conversation strayed to the convertible bench/table Bob considers his piece de resistance and the coffee table he's been putting off for years because he can't decide on the perfect style of legs.

It would be easier to decide, Bob pointed out, if there was a place he could go on the Internet that could summarize woodworking subjects ... leg styles, for example. A place hosted by someone he trusts, that would tell him exactly what's out there, right now, on the World Wide Web. "A place," Bob pressed on, "that could save woodworkers lots of time on the Web, so they could get back to the projects in their shops."

Whoa ... now he had me.

The first issue of our *Woodworker's Journal e-zine* will be "ready to click" soon after this magazine arrives at your doorstep. I do hope you'll all be busy making sawdust in your shops, but if you need something pertaining to woodworking, visit our web site www.woodworkersjournal.com and sign up for the new e-zine (it's free). It will just take a few moments ... Bob will take care of the rest.



A final note: While you're visiting our site, check out the PLANS, PLANS, PLANS section. It's been a massive undertaking, but we're finally able to offer virtually every project that's ever appeared between our covers (over 1,000 ... and growing). Check it out!

Larry N. Storken



I love photos of our readers' shops. Here's "Pick of the Tricks" winner **Wendell Smith** in a corner of his. **Wendell came up with a great idea for moving your power tools around the shop (see page 10).**

MAY/JUNE 2000

Volume 24, Number 3

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Woodworker's Journal (ISSN: 0199-1892), is published in February, April, June, August, October and December by Rockler Press, 4365 Willow Dr., Medina, MN 55340. Periodical postage paid at Medina, Minnesota and additional mailing offices.

Postmaster: Send all address changes to Woodworker's Journal, P.O. Box 56585, Boulder, CO 80322-6585.

Subscription Rates: One-year, \$21.98 (U.S. and possessions); \$27.98 U.S. funds (Canada and other countries). Single copy price, \$4.95 (U.S. and possessions); \$5.95 (Canada/other countries).

SUBSCRIPTION RELATED INQUIRIES:

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Frame and Panel: Cheerio!

I read Ian Kirby's comprehensive article on designing frame-and-panel doors in the February 2000 edition of *Woodworker's Journal* and applaud the information provided.

He went into considerable detail on the necessity of proper proportion, particularly from a visual perspective, but I did not note any formula that outlined the correct proportions.

Both architecturally and visually, the ratio of 1:1.618 (the Golden Mean) is a long-standing tradition that offers a pleasing aspect to the proportions of doors and panels. This formula goes back many centuries and has stood the test of time.

I offer the above as an addition to your excellent article and wish the *Woodworker's Journal* continued success.

Frank Neeson
Melbourne, Australia

I am aware that the British say "rebate" instead of "rabbet" (*How to Design a Frame-and-panel Cabinet Door*, February 2000). However, as an American, I prefer American terms. I'll bet that most of your subscribers would rather read good ol' American words in your fine magazine. On the other hand, it could be worse. You might have decided to use German or Swahili, and I would have really been confused!

Wayne Jensen
Sedro Woolley, Washington



Norm's No "Ten"

Seeing Norm Abram selected as one of the twentieth century's great woodworkers along with icons like Gustav Stickley, Tage Frid and Sam Maloof was a real slap in the face to all of the great master craftsmen who have dedicated their lives to teaching, designing and crafting great pieces of furniture (*On the Level*, December 1999).

How could you put Norm above true craftsmen like Frank Klaus, Ian Kirby, James Krenov, Toshio Odate, George Nakashima,

Michael Dunbar, Betty Scarpino, and many more too numerous to mention?

All of these great craftspeople are great because they have a burning desire for work that comes from their hearts and souls. They all understand what wood can and cannot do for you. They teach correct techniques. They design their own work and teach this critical part of woodworking.

Norm is an amateur compared to these talented craftsmen. If rated from 1 - 10, they would all be a 10. Norm, maybe a 2.

Alfred Petersen
Fremont, Nebraska

Festo Merchant: Toolguide

Toolguide would like to make a correction to your Resource Digest (December 1999). First, Festo Tools are available in the U.S. though Toolguide (not Tooltechnic). Also, our web address was incorrect: www.toolguide.net is the correct URL.

Festo Tool German electric power tools, now sold in the U.S. through Toolguide, bear the mark of quality. Among these tools is the amazing RO 150 rotary/eccentric sander pictured in the Resource Digest.

Xanthe Lancaster
Toolguide
Santa Barbara, California



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A Bevel or a Miter?

The "Jig for Mitered Corners" in the February 2000 *Tricks of the Trade* is worded wrong: it should be called the "Jig for Beveled Corners." Everywhere he mentions a miter, it is actually a bevel cut. It does look like the jig would be helpful to use for 45° bevels.

I like the issues of y'all's magazine. Most of them have some good stories or furniture plans.

Bernie Campbell
Madison Heights, Virginia

WJ Responds:

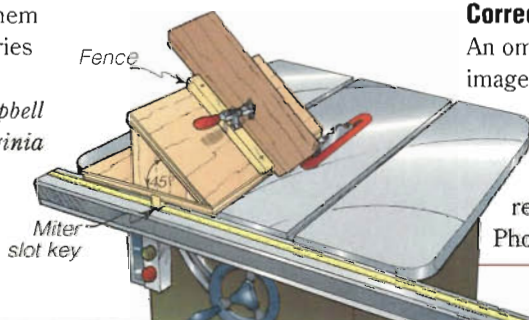
OK, the cuts he's making are bevels

— since a bevel is an angle that isn't a right angle. But, since the picture showed Carl Allen's jig cutting a 45° bevel, it's still a jig for mitered joints. Really. Edge joints at any angle besides 45° are beveled joints, but when you put 45° joints together to make a joint,

it's mitered. (You can look this up in Ernest Joyce's *Encyclopedia of Furniture Making*.) Who said language had to make sense? If it's any comfort to you, we're pretty sure mitered corners do receive a special blessing: why else would the pope use the name for his hat?

Corrections:

An omitted photo credit for images of the Furniture Society conference in the February 2000 *Shop Talk* should have read Tennessee Tech Photo Services.



Safety First: Learning how to operate power and hand tools is essential for developing safe woodworking practices. For purposes of clarity, necessary guards have been removed from equipment shown in our magazine. We in no way recommend using this equipment without safety guards and urge readers to strictly follow manufacturers' instructions and safety precautions.

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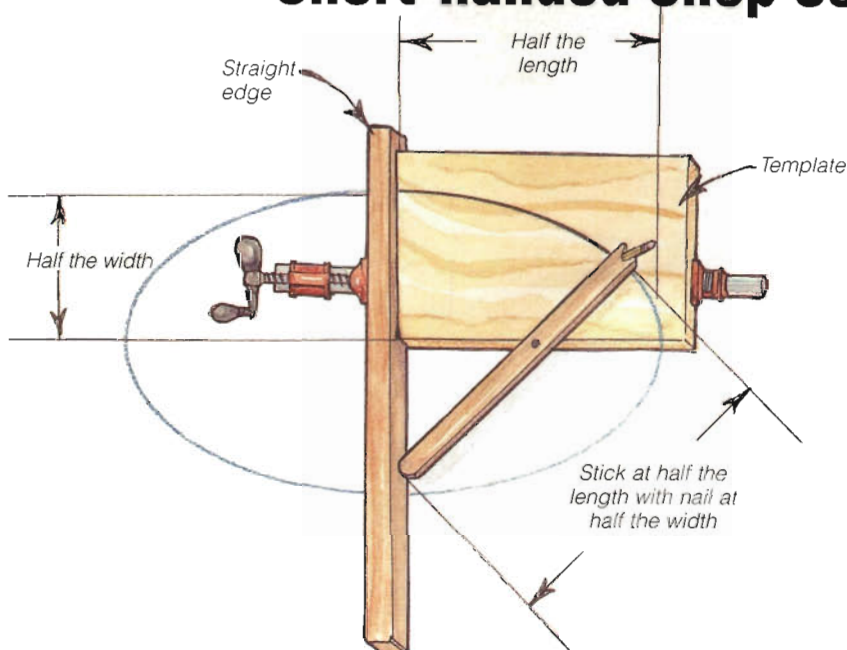
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Short-handed Shop Solutions



Ellipse-Cutting Template

For ellipses, I clamp a straight-edge to a piece of plywood slightly larger than half the width and length of the desired ellipse. (The straightedge stands proud of the plywood.) Then I cut a narrow piece of straight stock to half the length of the ellipse. Drive a finish nail, at a point equal to half the width of the ellipse, through this piece. (Round over one end of the stick and notch the other for a pencil.) With the narrow stick parallel to the straightedge, hold a pencil tightly to the stick's notch and pull the pencil down and away, keeping the round end in contact

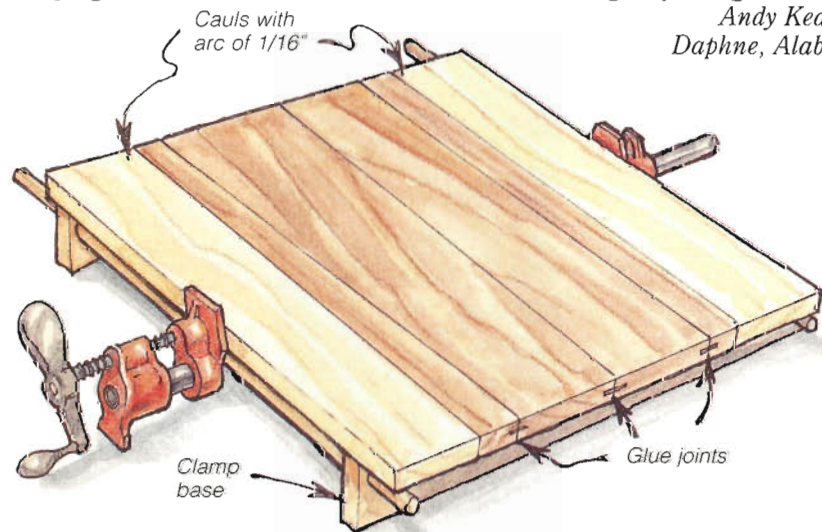
with the straightedge. Cut the pattern out and trace the ellipse one quadrant at a time.

*John A. Wilson
Lexington, Massachusetts*

One Clamp Is All You Need

Short on clamps and don't want to use biscuits or dowels? Duplicate a spring joint and with only one clamp in the center ... bring your boards together. First, plane the very center of each board's edge with one stroke of your #6 or #7 plane. Next, increase your planing area about one third; finally, plane the complete board. More smaller strokes will give you a greater bow.

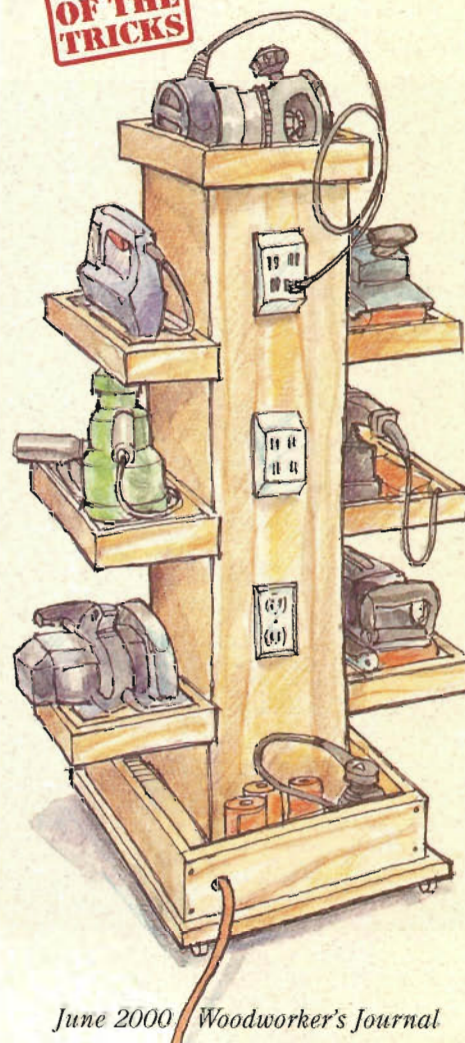
*Andy Kearney
Daphne, Alabama*

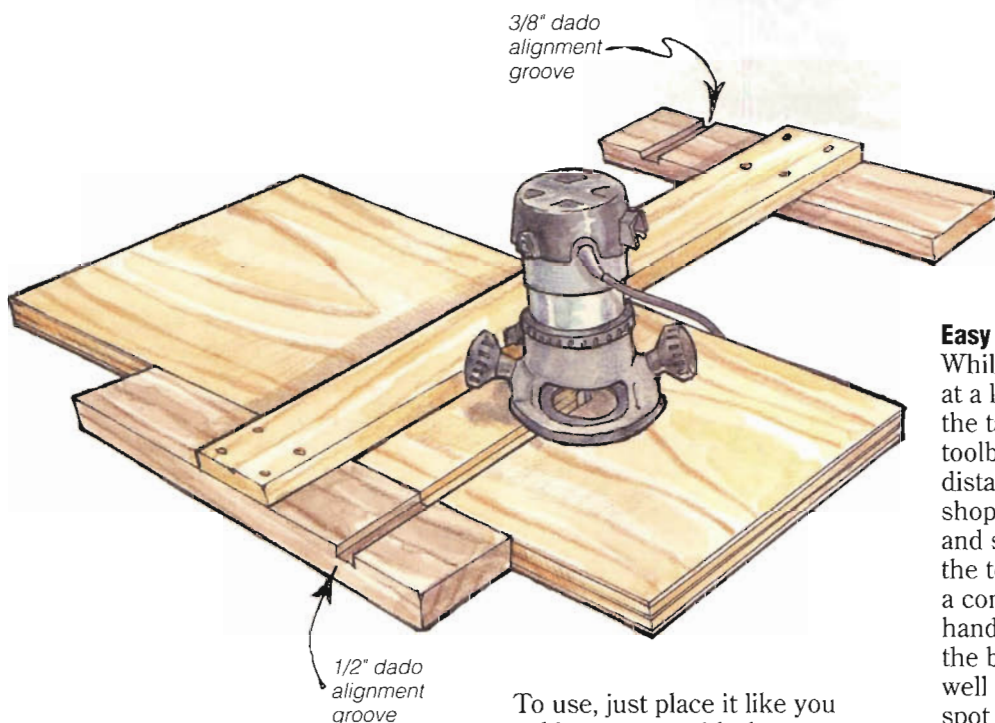


A Place for Everything

My tool stand is the handiest item in my shop: there's always a place to lay the tool I'm using. Each shelf has 1 1/2" edges all around it to hold items in place. The bottom has three sides with 4" walls. The shelves on the inside of the upright (not shown) have a good amount of storage space for belts and discs. A 12-foot electric cord on the back can reach any plug in the shop and can hang in the back when not in use. Casters make the rack very moveable.

*Wendell Smith
Oregon, Wisconsin*





Groovin' Right Along

This simple jig helps me cut grooves right where I want them. Attach two pieces of stock at right angles to another piece for an "H" shaped form. Rout a 3/8" groove in the end of one projection and a 1/2" groove in the opposite end.

To use, just place it like you would a square, with the appropriate groove where you want the groove in your work, and clamp it in place. Just run your router along the edge: your guide is automatically in place.

*James A. Johnson
Brunswick, Ohio*

Easy Way to Cart Supplies

While doing some woodworking at a local museum, I was faced with the task of carrying several heavy toolboxes over considerable distances. A used grocery shopping cart came to the rescue and saved a sore back! It hauled all the tools, plus kept them at a convenient height. It will easily handle several pieces of lumber on the bottom rack. It performed so well it has earned a permanent spot in my workshop: especially good for moving numerous small pieces from one stationary tool to another.

*Maurice Watson
Nova Scotia, Canada*

Tricks continues on page 12 ...

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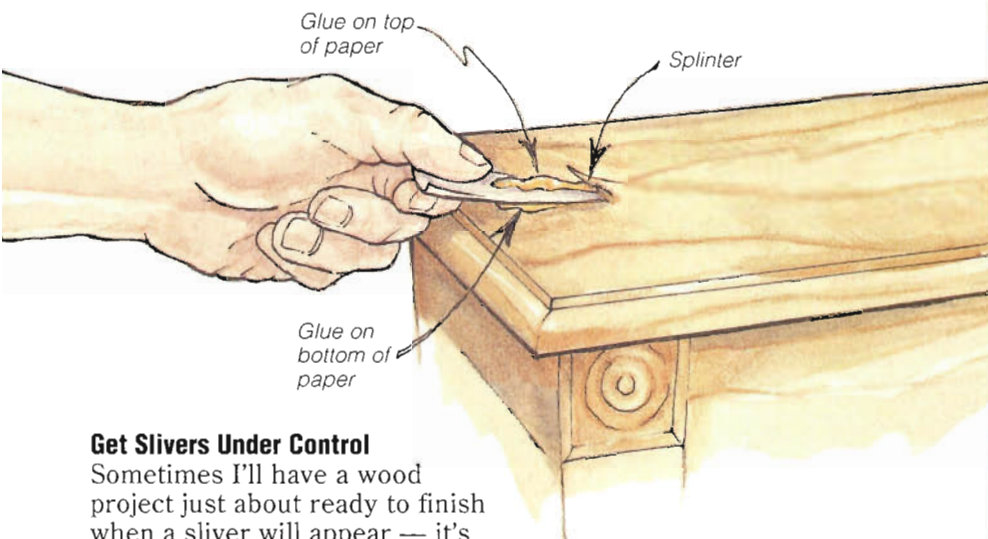
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TRICKS OF THE TRADE



Get Slivers Under Control

Sometimes I'll have a wood project just about ready to finish when a sliver will appear — it's usually a sliver of the grain that didn't show up until after I had started the finish sanding.

Correcting this problem used to be rather difficult, but I found a way to deal with it. Now, I simply place a drop of wood glue on both sides of a small piece of paper, and then I slip this piece of paper under

the sliver. I clamp or weight the sliver in place until the glue is dry, and then sand the repaired area. This corrects the problem and allows me to complete the project at hand.

Howard Moody
Upper Jay, New York



Winner! Wendell Smith will receive Porter Cable's 7529 2 HP plunge router for submitting this issue's Pick of the Tricks. *Woodworker's Journal* pays from \$50 to \$150 for all Tricks of the Trade published. In addition, the reader whose trick is selected as our "Pick of the Tricks" will receive a free tool. To join in the fun, submit your original, unpublished trick to the editor. Include photos or drawings needed to explain your idea. Send all tricks to *Woodworker's Journal*, Dept. T/T, P.O. Box 261, Medina, Minnesota 55340. Or send us an e-mail: rjohnstone@woodworkersjournal.com.

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Breaking the Rules

By Joanna Werch Takes

Turning Grows Up

Not Just Salad Bowls

Twenty-five years ago, reminisced Kevin Wallace, "Nobody else knew what we were doing," when his gallery showed woodturnings. "It basically consisted of salad bowls."

A quarter century later, his del Mano Gallery has become a premier site for woodturning artists, membership in the American Association of Woodturners has hit another record at 8,300, and Kevin says the turning world's "going wild."

Why that's happening is a matter for speculation. "I think a lot of people are getting back to natural products: the handcrafted look and feel to a piece," said Hawaiian turner Derek Bencomo. Christian Burchard thinks moving beyond bowls is what has expanded the

interest. Some contemporary turners still make simple vessels, he said. But Christian, who lives

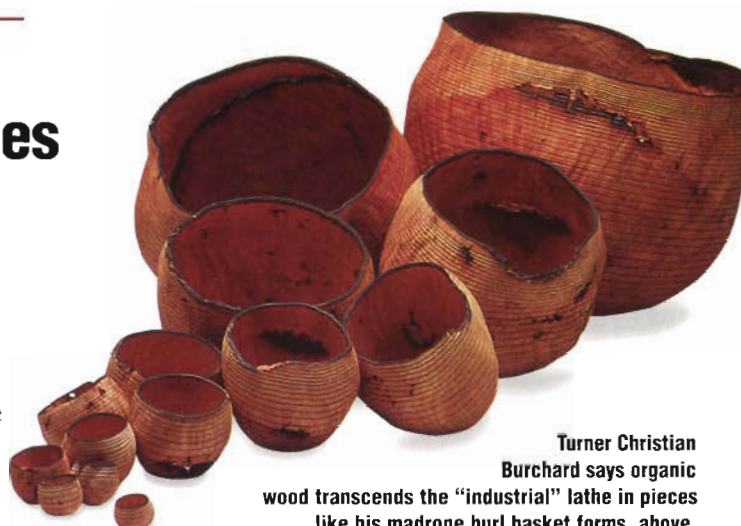
in Oregon, thinks turners' horizons have widened and they feel free to break the "rules" of wood: "You can paint it; you can burn it; you can put metal on it; let it age; carve it and shape it; or change the texture," he said.

Such

experiments may be what's helping turning get more respect at art shows. Jack Slentz, a turner from Arkansas, explained that wood art frequently gets cubbyholed as a craft at such exhibitions.

Lately, though, wood is getting more respect at the bigger art shows. "Prices are going up, and the prices are being paid," Christian said. "There's interest at all levels," Derek added. "You could collect a \$50 bowl or a \$100,000 sculpture."

Jack Slentz, the artist behind the box elder burl work at right, thinks of himself as a sculptor, not a turner. Turning in general, he says, is moving toward sculptural and decorative objects — like Frank Sudol's birch vase, at left.



Turner Christian Burchard says organic wood transcends the "industrial" lathe in pieces like his madrone burl basket forms, above.

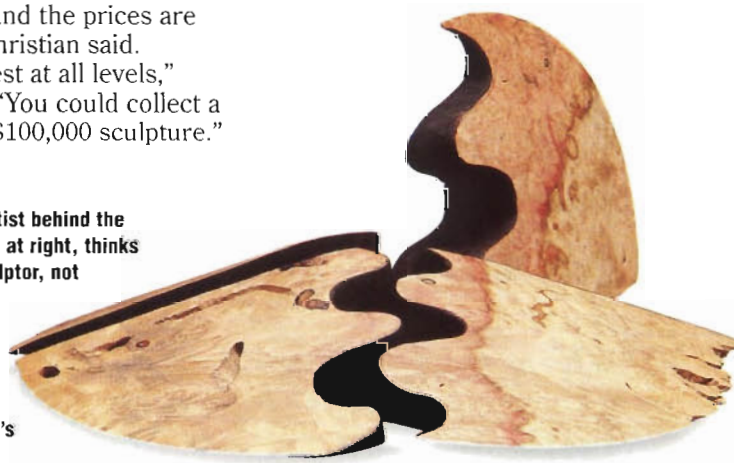


The struggle over whether to define these turners' works as art or craft continues, though. Derek has an unusual view of the debate. "You can put paint in paint balloons, throw it on something and call it art," he said. "For craft, you have to have fine technical skills." Therefore, he thinks craft should "outrank" art.

Whether it's art or craft, you can see some of the latest woodturning at the Turned Wood 2000 show June 24 - July 22. For more info, visit www.delmano.com or call them at 800-del-Mano.



Derek Bencomo pays homage to Hawaii's 100-year turning tradition and to the variety of wood grains in its rainforests with his koa wood bowls, above and above left.





An education under James Krenov at the College of the Redwoods influenced Craig Vandall Stevens' design for this piece.

Novel Wood's a Winner Contest Showcases Talent

Craig Vandall Stevens gained recognition for his skills and for an unusual wood when his "Dame Grenadillo" cabinet took first place in the Furniture and Cabinets category in Rockler Woodworking and Hardware's Third Annual Woodworking contest.

Grenadillo, a lesser-known Central American species, could replace some endangered woods, explained the Sunbury, Ohio resident. For information on Rockler's other winners and next year's contest, visit www.rockler.com.



Craig built his cabinet "from top to bottom," forming his own veneer and forging brass pulls for a spalted maple medallion.

Shop Talk continues on page 16 ...

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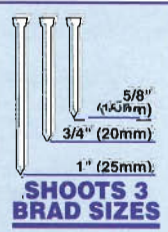
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SHOP TALK

I Should Invent That ...

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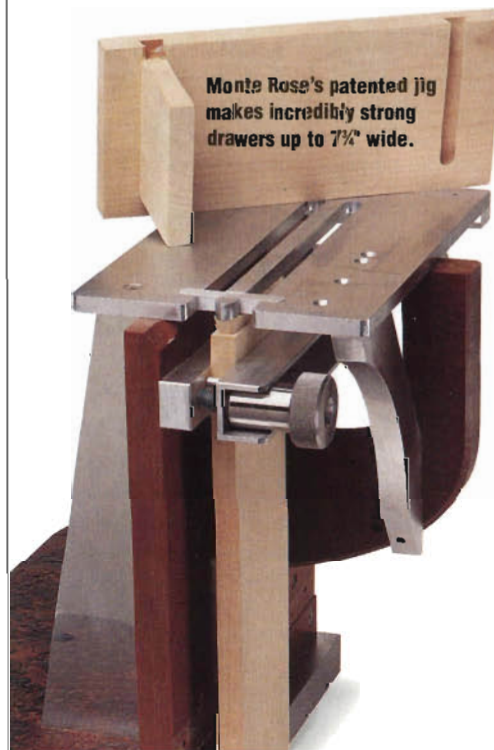
Thought of inventing a slotted dovetail holding fixture? Too late. Monte Rose patented the idea — after kicking it around for decades.

"I grew up around woodworking, and my father was always complaining that drawer fronts weren't strong enough," explained the retired electrician from Bountiful, Utah. Half blind dovetails inspired Monte to rig up a jig that cuts long dovetail tenons on both sides of a drawer, then cuts a long dovetail slot in the drawer face, without changing the router set-up.

That was over 20 years ago, but he didn't apply for a patent until he retired. The process took about three years and \$12,000, Monte said. He's still looking for a manufacturer for the jig, but he's confident. With a thickness planer and a router, "Everybody can use it," he said. "The drawer is like a jigsaw puzzle. Once it's assembled right, it can't come apart."

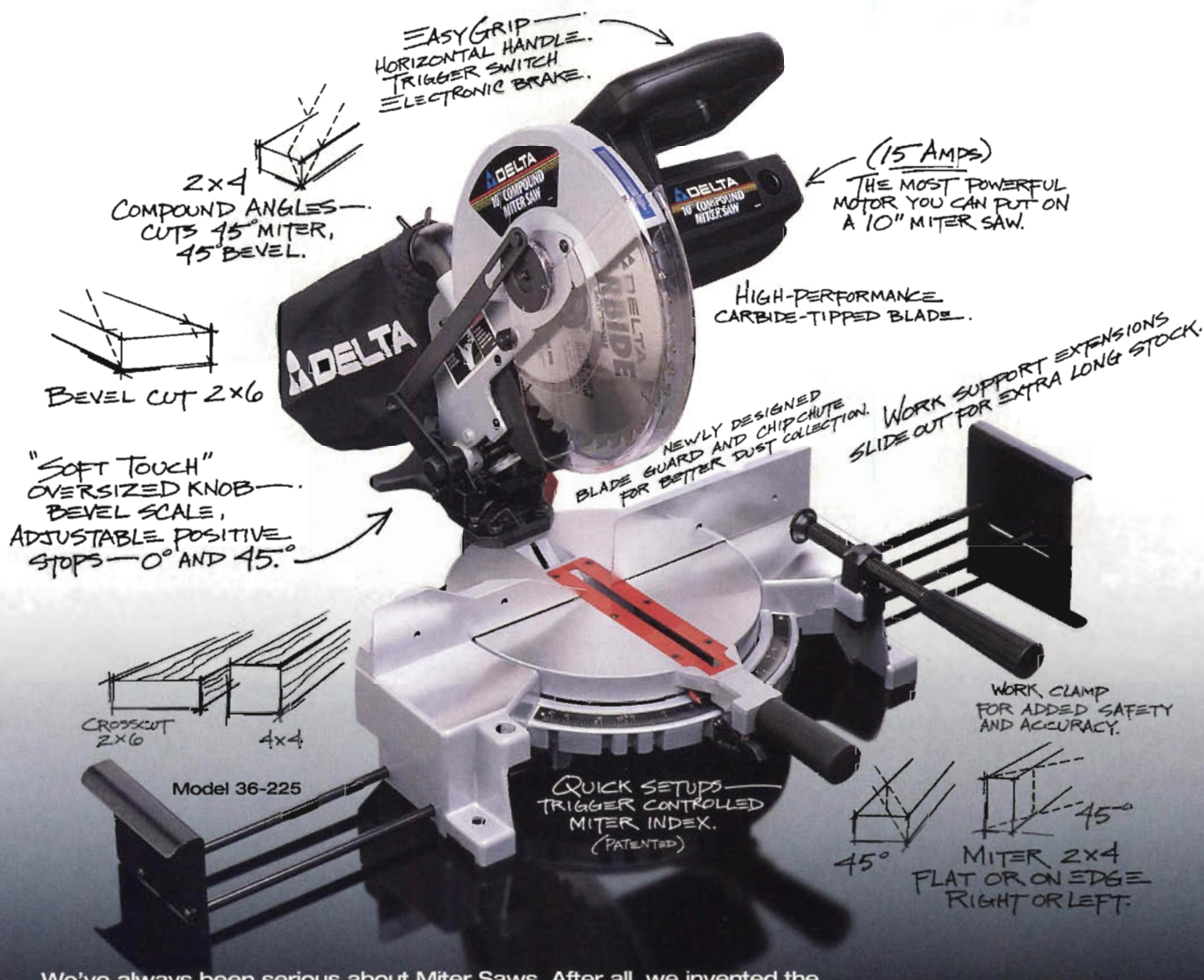
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SHOP TALK



Most Vietnamese woodworkers sit while they work — often on the floor. Occasionally, their shop will be on the street.

Another World

Woodworking in Vietnam

"When I go to Staten Island," New Yorker Bob Mathison says, "I ask, 'What kind of tools do they have there?'" So it's not surprising that his Asian vacation became an education in Vietnamese woodworking.

In Vietnam, "You'll see a shop with one band saw or one table saw, and that's the power for the shop," Bob said. "These guys are hand carving and hand chiseling mortise and tenons with an amazing level of accuracy," because they have so much experience with it. They even make their own wooden tools. "At first, when I saw people hitting a chisel with a block of wood I thought, 'Oh, it's a poor country; they can't afford a mallet,'" Bob said — but then he found the tool actually worked well.

It's fascinating, Bob said, and someone should research the

Carving, painting and staining are common in today's Vietnamese woodworking (which, Bob says, is largely "fake Chinese antiques" for export). These techniques, and the tropical woods of the region, are also found in traditional temples.

photos by Joel Moskowitz



Choking up on the handle provides leverage for this block and chisel set — an example of hand-made Vietnamese tools.

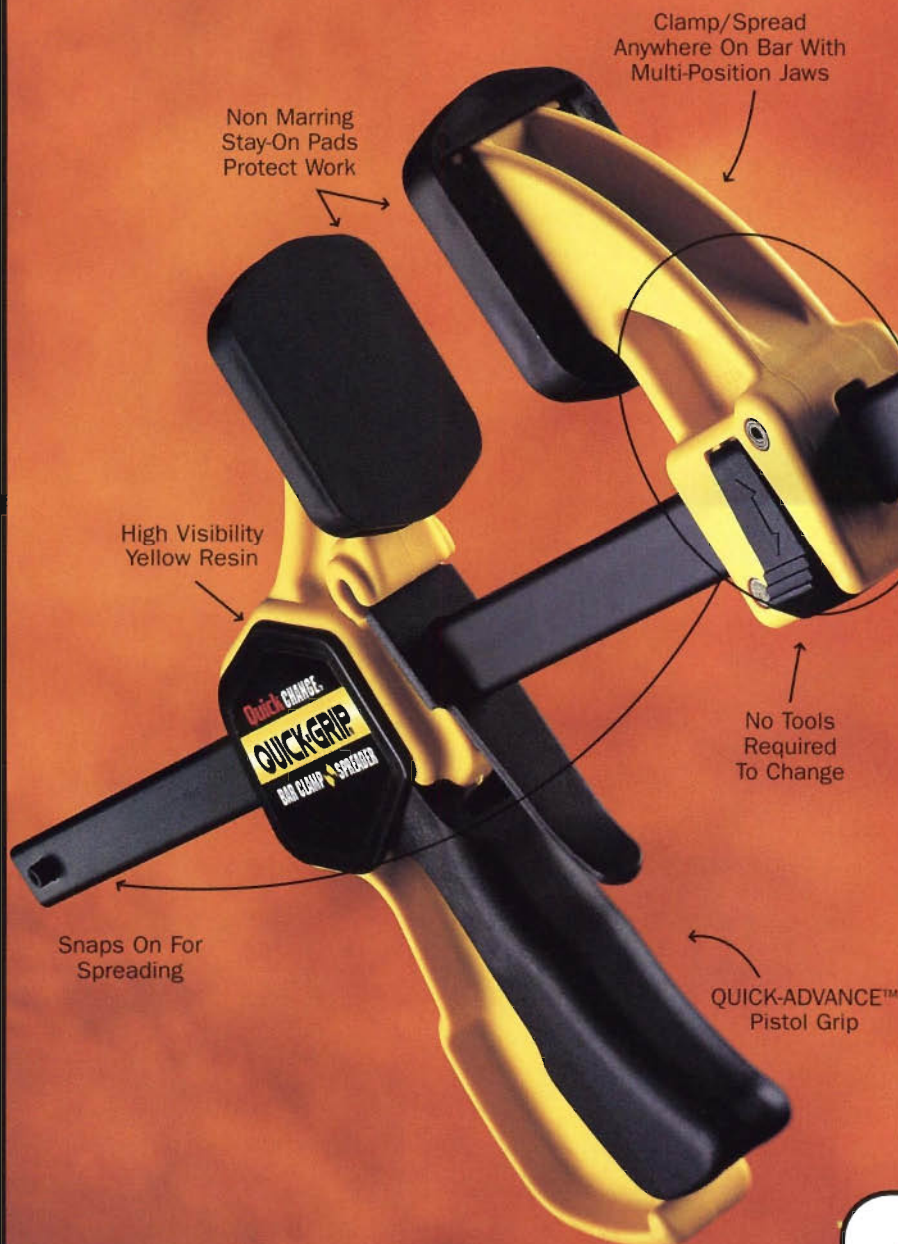
Vietnamese hand tool tradition "before the whole thing disappears." When does he think that will happen? "Ten years. Fifteen, tops."

Meanwhile, more pictures from his trip are at his web site, the Museum of Woodworking Tools, www.antiquetools.com.



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On Pins and Needles

Q Enclosed is a picture of a tool. We would like to know its name and what it was used for. It was bought in an antique shop out of curiosity.

The steel blades are $1\frac{1}{16}$ " long x $1/16$ " thick. Together, the hardwood handle and the brass plate the blades are screwed to measure $3\frac{3}{4}$ ". The brass plate makes up $1\frac{3}{8}$ " of this. The total diameter of the tool is $1\frac{3}{4}$ ". On the side of one cutting blade is "DUE BUOI" or, possibly, "BUOL," with two bullheads engraved. We don't know what the heck it is.

Bill Frerking
and Ken Erskine
East Peoria,
Illinois



A Well, except for those purposeful-looking blades on the end, it kind of looks like a paintbrush. Was it one of Edward Scissorhands' toys as a youth? Or does someone out there have a better idea?

Q Could you tell me about the properties of spruce? I need to know if it would be usable for a sauna I'll be building. Any info would be appreciated. Thanks.

Tami Smith
Indianapolis, Indiana



Sitka
spruce

A We wouldn't recommend the softwood spruce for a sauna — particularly its sapwood, which resists preservation treatments — but it is a fine wood for other uses. In fact, did you know that the Sitka spruce variety is Alaska's state tree? The Alaska Forest Service says the state harvested over 32,000 board feet of it in 1999.

The colors of Sitka spruce can cover the range of spruce wood, with creamy white to light yellow sapwood and pinkish yellow to brown heartwood. It's usually straight-grained and lightweight. Thin panels can be highly resonant, which makes them popular in piano sounding boards and guitar faces. It also shows up in ladders, light aircraft and oars. Sitka spruce grows in Alaska — obviously — and all the way down the Pacific coast of North America.

If you're interested, you can find more fascinating info about Sitka spruce, and a ton of other woods, at the U.S. Forest Product Lab's web site, www2.fpl.fs.fed.us.



We're still stumped on this tool, folks. Phil Monson's 10" "dagger" from the February 2000 issue has drawn some response — but none of the letters we've received agree with each other. Our tool experts don't know what it is. Phil doesn't know what it is. We don't know what it is. Help! Send your letters or e-mail to the address on this page.



Q In reference to the Pick of the Tricks contribution by R.B. Himes regarding sliding dovetails (Tricks of the Trade, February 2000), I'm a bit puzzled by the remark, "Sliding dovetails are a great joint. There's lots of surface available for glue, they look great and hold forever." I was under the impression that sliding dovetails are used when it is necessary to make provisions for the wood to expand, e.g., breadboard ends. If the joint is glued, the dovetail can't slide. I've always pinned this joint.

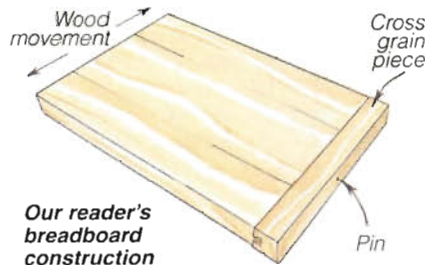
Thomas E. Jordan
Newton Highlands, Massachusetts



Winner! For taking the time to respond to Stumpers, Bill Frerking of East Peoria, Illinois wins a collection of American Tool's Quick Grip clamps. We toss all the Stumpers letters into a hat to select a winner. If you have a question or answer, send it to the editor: Stumpers, Woodworker's Journal, P.O. Box 261, Medina, Minnesota 55340. Or send us an e-mail: jakes@woodworkersjournal.com

A Is a sliding dovetail only appropriate for those situations where wood expansion can be expected? I don't believe so. Although a sliding dovetail is a very appropriate joint for areas of possible expansion and contraction, such as breadboard ends, it is also a fine joint for other situations where movement isn't necessarily a problem.

My experience tells me that in all but the most reactive woods it would be fine to just glue the joint.



This is because the glue itself is not a static entity — it, too, will move with the expanding and contracting joint. We know this to be true because glued mortise and tenon joints stay together for 100 plus years, even though the grain directions of the mortise and tenon are often opposite of each other.

There is one instance where you would want to pin a sliding dovetail: where you want two faces to always line up, such as on the front of a cabinet carcass. To make the face of your drawer dividers stay flush with the face of your cabinet carcass, regardless of humidity, you would pin it at the front. With the pins in place, any movement would be towards the rear or inside of the cabinet.

Your question: glue or pin? The answer, like many woodworking situations, is: it depends!

Mike McGlynn
Contributing Editor

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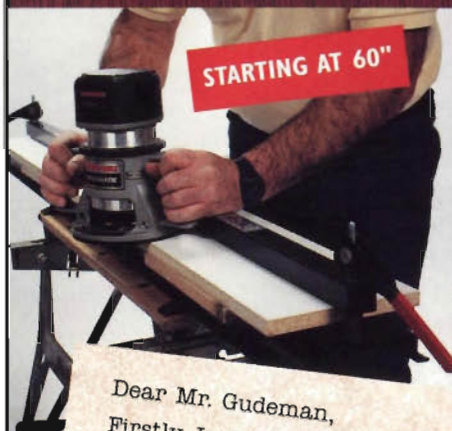
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A "Vegetarian" Woodworker

By Joanna Werch Takes



One of Craig Nutt's "vege tables" is this tomato made of bloodwood, maple and poplar, with a marquetry top.

photo by
Rickey Yanaura

Like many woodworkers, Craig Nutt recognizes the gentle curve of a Queen Anne leg when he sees it: it's just that he tends to see it in a stalk of asparagus.

Vegetables, shoes and other unusual shapes have become staples in Craig's work, but it was traditional pieces that brought him into the field. With no woodworking background, he got a job restoring antique furniture, learned to create dovetails through trial and error, and eventually decided that his newfound skills would allow him to create entire pieces of furniture.

After a few years of crafting piecrust tables and

18th century style TV cabinets, though, Craig started to get bored with period furniture. In a way, he was living a double life.

"I was painting and doing sculpture and making LPs of free, improvised music," he said. "I didn't even want my furniture clients to know I was doing this other stuff. I had my occupation and my art, and they were two different identities."

A conference in the late 1970s proved the turning point. Although Craig's goal was to pick up techniques from traditional furniture makers, he came back from the meeting inspired to channel his artistic expression into his woodworking. By combining the freedom of his other pursuits with tight furniture making techniques, he found, "I could get spontaneity into a medium that's anything but."

He still draws on elements of traditional woodworking, but with a new twist. For example, plant forms have been used as ornamentation on woodwork throughout history. Craig, however, has created "vege tables" and other pieces where the structure and the ornamentation are the same element.

It started when he was asked to do a piece for a whirligig exhibit, and the idea of a flying vegetable popped into his head. The ideas kept coming, and people responded. "The vegetable pieces became



Smithsonian curators collected Craig's Radish Salad Bowl for the Renwick Gallery of the National Museum of American Art.

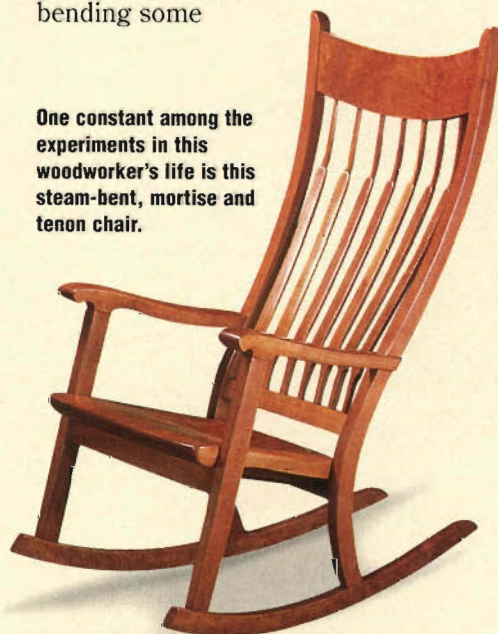
photos by John Lucas

a vocabulary I could use to say different things: a visual vocabulary," he said. "Some got political; some were sensual." As the vegetable pieces lay around his studio, Craig started seeing them as furniture parts — bending some



Lately, Craig's been experimenting with concrete — as in the top of this mahogany bridge table.

photo by John Lucas



One constant among the experiments in this woodworker's life is this steam-bent, mortise and tenon chair.

photo by Rickey Yanaura

asparagus or celery, for example, would give him a Queen Anne table leg.

"It's a way to make a little bit of fun of the traditional style, in a respectful way," he said. Although Craig paints most of his vegetable pieces in realistic colors, he also creates a natural wood version of some pieces.

"To me, they read very differently," he said, while admitting that his journey to putting paint on wood was a long one. "I started out as a wood guy," he said. "I thought,



photo by Michael McCracken

"When you come up with appealing ideas that also seem to be stupid — those are usually really good ideas."

Craig Nutt

photos by Craig Nutt



Commissioned for Atlanta's international airport before the 1996 Olympics, the turned and carved Cornucopia is a 10-foot corn jet of painted yellow poplar. Its "shuckspan" is also 10 feet.

"I don't want to compromise the wood by staining it," and painting it was out of the question."

When he does paint a piece, Craig frequently builds it from tulipwood (also known as yellow poplar), with a close grain that takes paint well. In general, he uses mostly domestic woods, including walnut and cherry. Bleached curly maple and Swiss pearwood have also appeared in the natural wood versions of his work.

In all his pieces, Craig focuses on the idea rather than the technique. "At one point I considered myself

a turner," he said, "and I do turn a lot, but on some pieces I use bent laminations, some I steam bend; I do a fair amount of marquetry, and a little bit of inlay."

After working with wood for 20 years, he said, it feels natural. "I'm equipped to work with wood. I know how it behaves, and I have a whole bag of tricks and techniques. Wood is like a comfortable pair of shoes."

Craig Nutt's portfolio and catalog are at www.mindspring.com/~cnutt.



photos by Rickey Yanaura

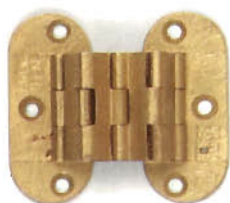
Painted and naturally finished Swiss pear versions of the Celery Chair with Carrots, Peppers and Sno Peas strike people very differently, Craig says. One is a vegetable first, then a chair; the other is a piece of furniture — and then you notice the vegetables.

First ... Get the Hardware

By Ian Kirby



Decorative overlay hinges are attractive and easy to install. One limiting factor is the face frame width.



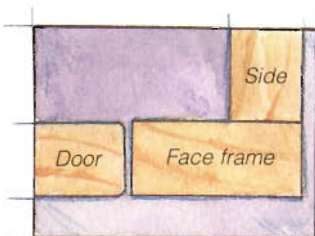
Hafele leaf hinges are one of the author's favorites. They're mounted in mortises on the edges of the face frame and inset doors.



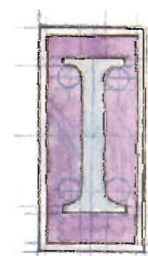
Soss hinges, like the Hafele's above, must be mounted in the door's edge. Invisible when closed, they require routing a stepped slot in both parts.



Knife hinges mount on the top and bottom edges of the door, and inside edges of the opening. The knuckle is all you see when the door is closed.



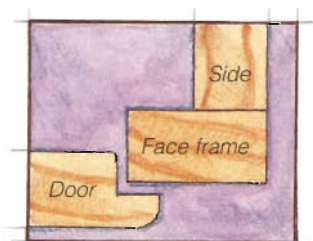
Inset doors are captured within the cabinet's framed opening.



In the best of all woodworking worlds, once you have penciled the working drawing or cobbled the full-size mock-up, you could make the cutting list and get down to sawing wood. But when hinges are involved, the first step has to be buying them. You are best off holding the actual bits of metal before you get serious about milling any wood. If you bull ahead without the hardware, you're heading straight for trouble. This is because whenever you assume that the hinges you need will be straightforward, readily available,

will fit to the work and be no problem, they turn out to be plenty of problem. This part won't work with that one, or the hinge won't fit the wood thickness, or the way the hinge opens requires a cabinet built in some other way, or the size and finish you need is on perpetual back-order — doesn't this sound familiar? The outcome is a compromised piece, or else a redesign and rebuild to accommodate the actual — versus your imagined — hinges. You can avoid all of this frustration if you simply resolve to get the hinges while you are preparing the wood from the cut list — while there's still





3/8" overlay doors require specialized hinges and fit both inside and over the cabinet's opening.



time to adjust. And while the topic of this article is hinges, everything I've said so far holds exactly true for drawer slides, an equally troublesome type of hardware. In both cases the complexity arises because it's a two-part problem: the movement that the hardware makes possible, and the way the hardware is attached to the wood.

Inset and Overlay Doors

Doors and cases fall into two general types. In one type the door is framed by the case. We call it an inset door. In the other type the door sits on the edges of the case, and we call it a plant-on or overlay door. The hinge has to be chosen accordingly. Another important consideration is over what range does the door have to open — 90°, 120°, or 180°? An inset door usually can't open more than 90° without binding on the case, unless you find an articulated hinge that moves the door clear while it pivots open. In some instances the hinge is simply screwed onto the door and stile or jamb, while in others it has to be let into the wood.

The length of screw and the material it sinks into together determine the holding power, but in many situations this is limited by the thickness or other properties of the material. In particle board or MDF, for example, you can't screw a hinge onto an edge, whereas you would have no problem in plywood or solid wood. Or, consider an elegant door with a glass panel. You wanted to use 1/2" material for the rails and stiles, but the glass is heavy and your material is too elegantly thin for the hinge screws. When you let the hinge in, that is, form the mortise one-half of the hinge will fit into, there is very little room for error. Let it in too deeply and the door will bind on the case ... not enough and you will



This 3/8" inset hinge for lipped doors features a dog-leg leaf to fit around the door's rabbet. They're a good choice for kitchen cabinets as the lipped door conceals gaps.



The snap closing hinge is a unique version of a lipped overlay hinge. Its design allows for more flexibility, for example 1/4" overlay ... a testament to the author's motto: first, get the hardware.



Ice box style hinges are useful as a decorative option in the lipped door category of hinges. No piece of hardware is without its advantages and disadvantages.



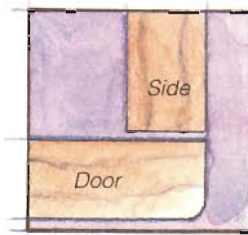
Butts hinges work well for inset or overlay doors. Sheet brass types are cheap and easy to find, solid brass butts bring class and distinction to a project



No-mortise hinges are a variation of the butt hinge theme. They're decorative and easy to mount.



Piano hinges are a great choice for heavy-duty situations. They're usually surface mounted but can also be mounted in a shallow rebate.

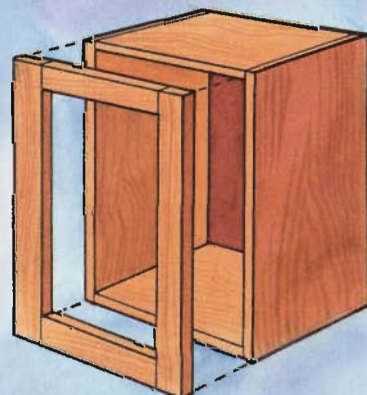


Full overlay doors are planted in front of the cabinet and hide the front edge of the side from view.

won't fit to the woodwork, you have to live with some approximation of what you wanted. Most hinges will work equally well for cabinet doors that swing or upward-opening lids on boxes and chests, though naturally there are specialty gizmos for each particular application; quadrant stays for example. When you are shopping for a specialty hinge, don't neglect architectural hardware. When the scale is right, it can be the answer to some difficult problems. In the end, choosing a hinge goes straight to the quality of your project. People will judge your work, at least in part, by the quality of the

create a gap where you don't want to see one. You must have the right screws, and if you drive them at the wrong angle, the heads will protrude and jam the hinge. This isn't to say that you can't design your way around such problems, because you can. My point is that you have a much better chance of success if you tackle this part of the design at the beginning, rather than at the end. Getting a drawer or door to move the way you want can only be done with hardware designed to produce that movement. And if the hardware

Build with a Face Frame ...



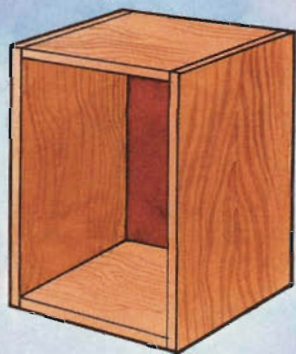
There are two basic construction methods for just about any cabinet you're going to come across; face frame and frameless (which is sometimes called Eurostyle). Each type

hardware. For instance, a 1½" pressed brass butt hinge does exactly the same job as a 1½" solid brass hinge. The solid brass hinge is a lot more expensive than the sheet metal hinge, but it is engineered and manufactured to a higher standard, and it will look great. When all is said and done, we can divide most hinges into three main groups. The terminology here is mine, not necessarily what's usual in the trade.

Traditional Hinges

Traditional hinges all feature two leaves with interleaved barrels connected by a pin, which in small sizes is not removable. Though traditional hinges come in different configurations, all pivot through the geometric center of the pin, and they generally are not adjustable after installation. This makes accurate installation critical, because if you get it wrong, it's difficult and messy to revise. Accurate installation requires paying careful attention to layout and measurement, or the construction of jigs, usually both. The three principal types of leaf hinges include butt hinges, back flap hinges (or rule joint hinges) and piano hinges.

... or Eurostyle Construction



of cabinet calls for its own varieties of hinge. Hinges for face frame cabinets tend to be traditional in nature. Hinges for frameless cabinets more often come from the 32mm system.

New Style Hinges

New style hinges have a non-traditional way of locating the attachment point or pivot point. Some, like Soss hinges, incorporate multiple pivots to achieve a clearance throw or some other motion. Though new mechanisms come on the market at times, I find knife hinges, Soss hinges and my favorite, Hafele leaf hinges, to be commonly available and extremely useful.

32mm Cup Hinges

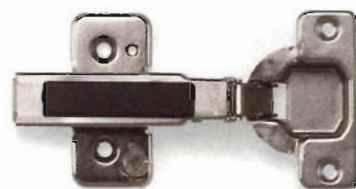
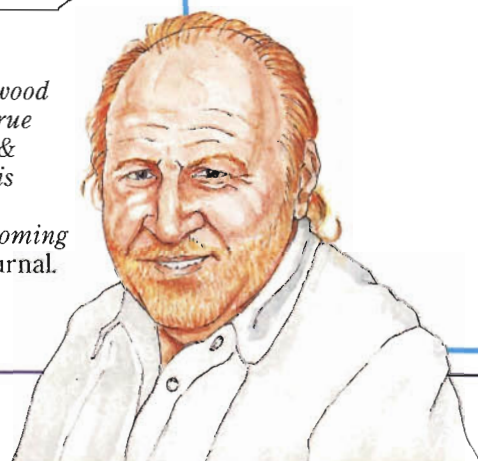
Though the European 32mm system is a complete method of cabinetmaking, it has also thrown a number of innovative products onto the general market. 32mm cup hinges in particular can be used whether or not one adopts the whole system, though naturally they make the most sense in the manufacturing context for which they were designed. Cup hinges deliver motion by way of multiple pivots, they can be adjusted after installation, and they're designed for a wide range of door-opening situations. 32mm hinges are available as either surface or cup mounted.

Conclusion

It is not a revolutionary thought, but it needs to be said. You're not ready to cut wood until you have your hardware in hand. Countless woodworking horror stories could have been avoided by this simple act of preparation.

Imaginary hardware has modified or ruined too many projects. Promise yourself to grab your brass before you grab your saw and you will be a happier woodworker.

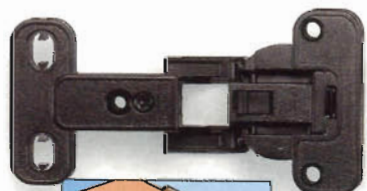
Ian Kirby is a master woodworker, designer and wood scientist. Ian is one of the true masters of the British Arts & Crafts tradition. Look for his continuing series on woodworking design in upcoming issues of Woodworker's Journal.



Cup hinges for overlay or inset doors. Available for every conceivable situation, but pay attention to how far they open.



While similar to standard European hinges, these surface mounted units require no mortise or cup to be drilled. They're typically mounted with the help of a jig.



Aximat – A special sort of cup hinge that opens the door and swings it flush to the side of the cabinet.

Indispensable Jig Hardware For Your Shop

By Al Wolford

When the editors told me Rick White would be building four essential jigs for the shop in this issue (see page 52), I started thinking about all the jigs I've walked woodworkers through over the past decade. Technically, there's no such thing as "jig hardware"; but there is a selection of specialty hardware



If you're building a jig to last, try UHMW plastic. It's self-lubricating, easy to cut and available in 3/8" and 3/4" thicknesses.



Multi-directional ball bearing rollers are available in two sizes and offer more flexibility than standard roller and bracket sets.



Toggle clamps are the hands-down winner as top shop jig hardware. Combine them with knobs and T-tracks for a wide variety of jigs.



Two of the top jig aids, T-track and roller and bracket sets.



that really lends itself to jigs and fixtures. Generally, a woodworker will call and explain their expected outcome, as in, "I'm building a jig that has to securely hold my stock during a cut, but will let it go right away when I want it to ..." or "What can I use to keep things rolling, yet keep them stable ...".

Collected on this page are seven of the hardware items I find myself recommending most often when one of these conversations gets started. A close eighth, for those of

you keeping score, would be a low-priced lazy Susan, which I swear ends up in more shops than kitchens. They're especially handy for finishing fixtures. All of these items are available in woodworking catalogs and specialty stores, but you won't find them in your local hardware store.

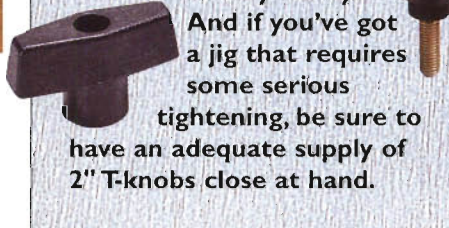


SHOP KNOBS

A collection of plastic knobs like the ones shown here are key components of the well-equipped shop. The 5-star

knob at left is perfect for any jig employing a T-track, while the round knob at right makes for easy tightening. (Why nick your knuckles with a wing nut?) If

you're faced with a tight squeeze, ratchet knobs (at right) come in very handy. And if you've got a jig that requires some serious tightening, be sure to have an adequate supply of 2" T-knobs close at hand.

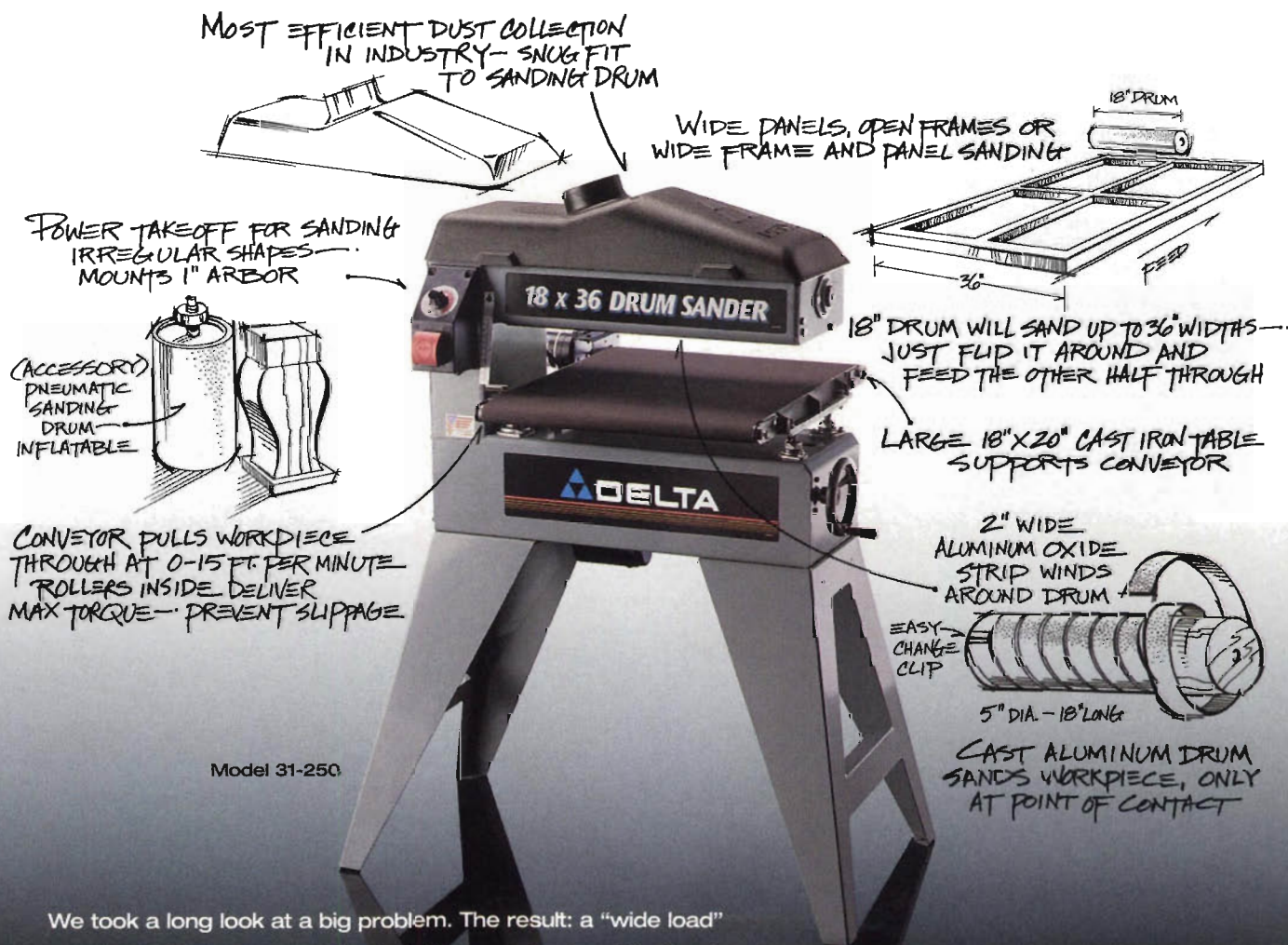


Top honor for most frequently used jig hardware would have to go to toggle clamps, followed closely, especially over the past few years, by T-tracks and T-slot bolts. Roller and bracket sets must have found a home in virtually every short-handed shop in America, but ball bearing rollers are even more versatile. Both are more than just a convenience; they do make long cuts safer. Another newcomer that's ending up in more and more shops is UHMW plastic stock, the perfect candidate for auxiliary fences and oft-used templates. Of course, if you're building a jig that will have a prominent place in your shop, the old standby, solid brass knurled knobs and threaded brass inserts, will still impress any woodworker who wanders in.

Al Wolford, one of our long-term editorial advisors, has been addressing subscribers' hardware quandaries for over ten years.

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Delta's new "Wide Load" Drum Sander: 36-inch wide surface sanding with a 2-inch strip.



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Stepping Up to Hardwood

By Ellis Walentine



Random width is the most common way to purchase hardwood lumber. The thickness of rough sawn hardwood is measured in quarter inch increments.

My very first woodworking projects (bookshelves and stepstools) were made from 3/4" thick pine from my local lumberyard. Sound familiar? Most of us start out with pine because it's readily available and easy to work. But by the time our fifth set of bookshelves is behind us, we're ready to move on to hardwoods. Without a few pieces of specialized information, however, the transition can be daunting.

The good news is that hardwoods are widely available, affordable and workable with the equipment you already own. When you step up to hardwoods, you enter a whole new woodworking world.

Beauty of Hardwoods

Hardwoods come from deciduous trees, including domestic species (oak, maple, walnut, cherry, etc.) and exotic species (rosewood, ebony and other tropical woods). They're preferred for woodworking projects for several reasons.

In general, hardwoods are stronger than softwoods, so they lend themselves to lighter, more graceful designs. They are also denser, so they take a higher polish while resisting dents and scratches.

Perhaps best of all, they occur in a kaleidoscopic range of natural colors and figures that can be put to visual advantage in your projects.

Where to Buy

One source of confusion about hardwoods has to do with where they are sold. The average lumberyard or home center usually carries only a few common hardwood species, intended mainly for finish carpentry and DIY projects.

They're provided in standard lengths and widths, surfaced on four sides (S4S) and sold by the running foot. Except for the most mundane projects, this isn't the best way to buy hardwoods.

For the best variety and pricing, you'll want to find a lumberyard or sawmill that specializes in hardwoods. A good way to locate these local suppliers is to ask local cabinet shops and woodworking guild members where they buy their wood. You can also look in the Yellow Pages (Lumber: retail).

If you're looking for something special, a small local sawmill may be your best bet. There are upwards of 50,000 sawmills (many of them portable band saw mills) in North America, so there's bound to be one in your vicinity. Often, a small mill will cut wood to special order at a very reasonable price.

Exotic wood dealers tend to be located in or near larger cities. Also, look in the marketplace sections of woodworking magazines.

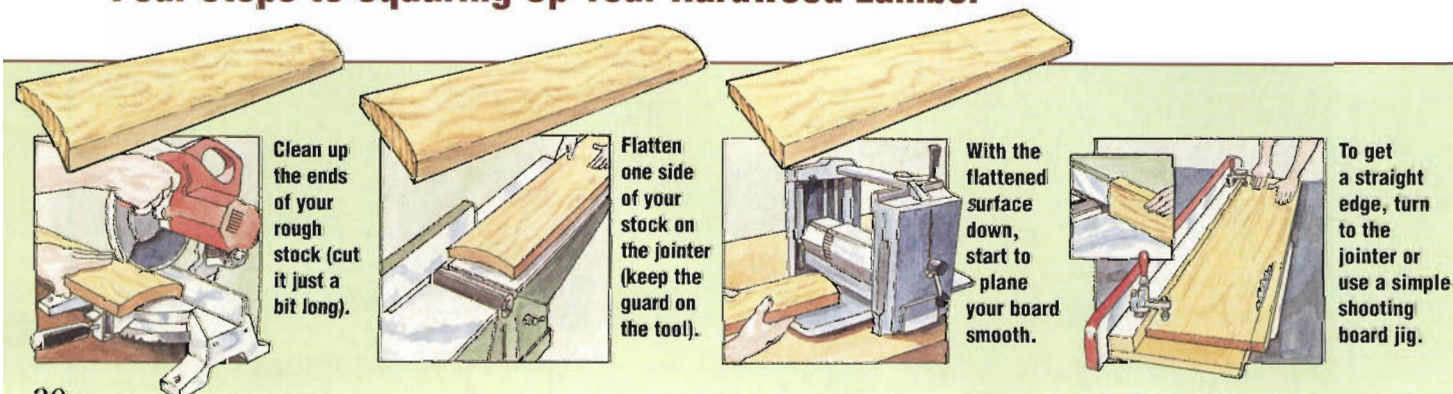
Hardwood Buying Savvy

When shopping for hardwoods, you'll find that they're sold differently than softwoods: they have a terminology all their own. For instance, furniture-grade hardwoods are usually sold "in the rough" (not surfaced), although most dealers will plane it to a specified thickness for a modest fee.

Rough sawn lumber is specified according to its thickness in quarters of an inch when sawn (e.g., 4/4 = 1", 6/4 = 1 1/2", etc.). You can figure on losing about 1/4" of thickness when you plane off the rough surface, so keep this loss in mind when making your purchase.

Hardwood lumber is rarely cut to exact widths or lengths, and these will differ according to the individual batch and species. You'll get the best prices on "random" widths and lengths, because there is less labor involved for the dealer; but you'll want to add a larger waste factor when working with randomly sized stock.

Four Steps to Squaring Up Your Hardwood Lumber



One great thing about working with hardwood is that you surface the lumber before you use it, so you're always working with perfectly flat stock. Another benefit is the wide variety of naturally occurring colors which will make your finished projects more beautiful.

Moisture Content

Though most hardwoods are sold "kiln-dry" (generally around 6% to 8% moisture content), you may find "air-dry" or "green" lumber as well, especially at sawmills. Air-dry lumber often has more color and character than kiln-dry lumber, but it contains more moisture; so you'll have to plan your work to accommodate further wood movement. If you're in no hurry to use the wood, green wood is the most economical alternative of all, but you'll need to know how to stack and dry it properly.

How Wood is Graded

Hardwoods are graded from standards set by the National Hardwood Lumber Association. The highest domestic grade is "FAS" (firsts and seconds), which has 83% clear wood, without any knots or defects. Next comes "selects," which are at least 83% clear on one face. Other grades include #1, #2 and #3 Common.

You can save some money by buying the lowest grade yielding the pieces you need. If you need long, clear pieces that will be seen on both faces, FAS is for you. If all you need is small pieces, #1 or #2 Common lumber may prove to be more economical.

One additional note about specialty hardwood dealers: Some will allow you to pick through their inventory to find exactly the pieces you need ... usually for an extra charge (be sure to ask in advance).

You may also want to take a block plane with you when you go shopping for rough sawn hardwoods. Scrubbing some material off the end grain or face of a board tells you a lot about its color and grain pattern.

Working with Hardwoods

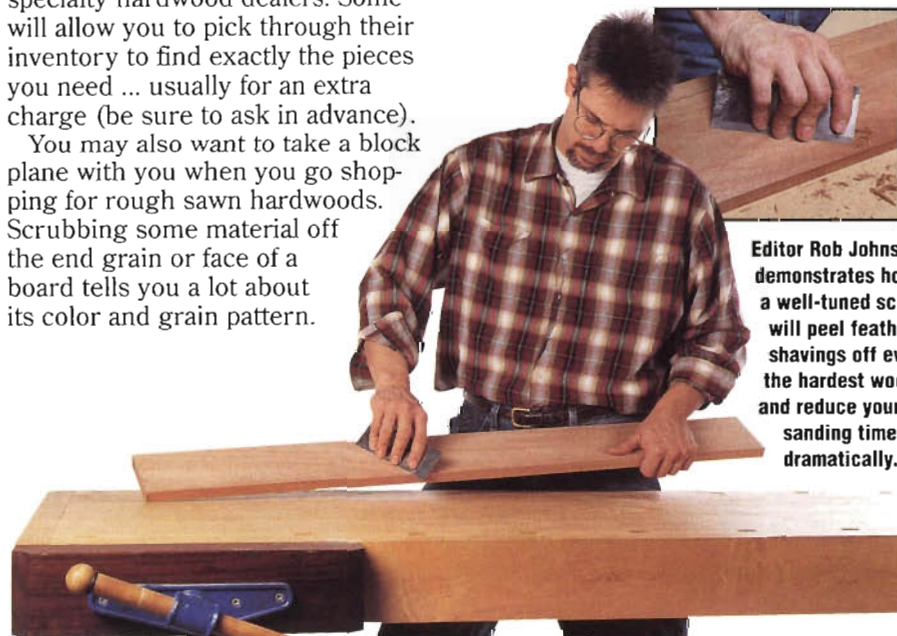
A suspicion shared by many novices is that hardwoods are more difficult to work than softwoods. Actually, all of the hand tools and machines you use to cut and shape softwoods can be used for hardwoods as well, though your techniques may vary slightly.

Since your lumber is likely to be rough sawn, a jointer and planer are a must. Follow the steps at the bottom of the preceding page to surface your hardwood.

Most woodworkers use carbide-tipped blades and cutters when working hardwoods, especially exotic species. Carbide tooling is more expensive, but lasts longer and gets the job done much better.

For edge tools such as chisels and planes, you'll find that a slightly steeper bevel angle (around 30°) will cut better and last longer in hard or dense wood. One hand tool that you'll find particularly useful for hardwoods is the cabinet scraper. And, finally, when sanding hardwoods, it pays to work your way up through the grits, to eliminate the scratches left by coarser grits. Hardwoods are less forgiving than softwoods in this respect.

Ellis Valentine is the former editor of American Woodworker and the principal personality behind Woodcentral.com and Wdfinder.com



Editor Rob Johnstone demonstrates how a well-tuned scraper will peel feathery shavings off even the hardest woods and reduce your sanding time dramatically.

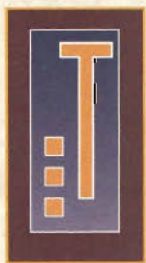


RIGHT INSPIRED STOOLS

By Mike McGlynn



INSPIRED BY THE MASTER OF THE PRAIRIE SCHOOL,
THESE CHAIRS ARE STYLISH, STRONG AND DESIGNED TO LAST.



his set of chairs was adapted from a Frank Lloyd Wright design first included in the Husser house (1899):

one of the first to show elements of what would later become known as the Prairie style. For my client, the design had to be modified into a bar-height stool, so I added rails to the base to strengthen the structure (which wasn't necessarily one of Wright's strong points).

This is not an easy project, and I know many woodworkers shy away from building chairs. But while this design calls for some difficult joinery, if you take it step by step, you'll do fine. The underlying principle behind all my joinery choices is strength. No piece of furniture takes as much abuse as a chair: if you don't make it bombproof, it will soon become loose and fall apart.

Wood Selection

You'll need some 8/4 stock for the legs and 5/4 for the other parts. Select straight grain stock, which lessens the chances of warping and looks better with Wright's designs. The wood should be well-dried with even moisture content, and you should let the boards sit in your shop for a week or two before starting, so they can acclimate.

While you are letting the wood adjust, get started by making the leg templates. These templates will not only help you lay out your parts, but they will be used as shaping templates later on. I like to make my templates out of 1/2" baltic birch plywood; it stays straight and has solid edges. Lay out your templates as shown in the **Full-size Pattern**, then saw them out with a combination of your band and table saws. It

"IF YOU
FOOLISHLY
IGNORE BEAUTY,
YOU WILL SOON
FIND YOURSELF
WITHOUT IT. ... IF
YOU INVEST IN
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REMAIN WITH YOU
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YOUR LIFE."

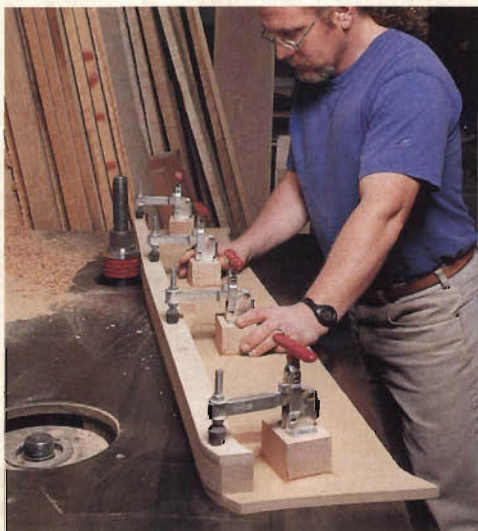
FRANK
LLOYD
WRIGHT

is *very* important that you do an accurate job on these templates. Make sure all the straight lines are true, all the curves are fair and the edges are square. Now lay out and drill the attachment holes and

dowel marking holes (for the crest rail). You'll find their locations on the **Full-size Pattern**.

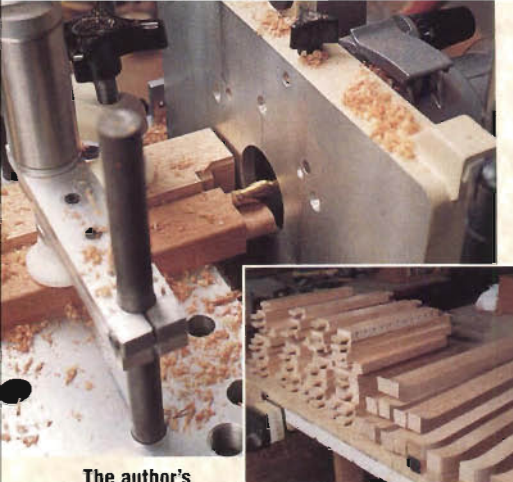
As soon as you're comfortable that your stock has acclimated, mill your leg stock. Face joint one side, then plane the stock to the 1⁷/₁₆" dimension. Sand the faces of your planks after planing — it's easier to sand milling marks off a nice wide board. Lay out the legs (pieces 1 and 2) using the templates. It's fine and dandy to nestle the legs to get more pieces out of each board, just remember you're going to have to cut them slightly oversize, so leave a bit of room to maneuver.

Cut the leg blanks out with your band saw. Leave between 1/16" and



The author has a large professional shaper to use for template shaping. A router table equipped with a piloted flush trim bit is a more likely small shop alternative. Shape the long planes of the legs with the set up shown at right — then shape the curved ends and feet by hand.





The author's Multi-router allowed him to create angled tenons with ease. We designed a tapered ramp (shown below) to help our readers achieve the same results.

1/8" extra to mill off when you template shape. Don't leave more than 1/8" because it results in chipping, especially if you template shape on a router table.

Template shaping is a great way to ensure multiple pieces are identically shaped. It's also a great way to destroy parts and injure yourself if you are not careful. The keys to safe template shaping are: Leave no more than 1/8", and preferably 1/16", to mill off. You *must* keep your hands well away from the cutter.

Your template must be attached to your stock with no flex and you *absolutely* must know which way the cutter is rotating and how it will interact with the wood grain.

When you're wrapping up this project, you don't want to be filling screw holes on the outside of the legs. That's why you attach your templates to the inside faces — so the screws can be strategically driven into the areas which will later become mortises.

Use a shaper if possible as it's more stable and you can use a bigger cutter. If not, a router table will work fine if you are careful. Have a piece of scrap wood to practice on before you start with your actual parts.

When you're finished shaping all the legs, clean up your milling marks with a sharp scraper and some sandpaper. **NOTE:** The faces you are cleaning up must remain square and flat because some will be joint faces. The last step is to cut any excess off the feet on your table saw, to ensure all of your legs are the exact same length.

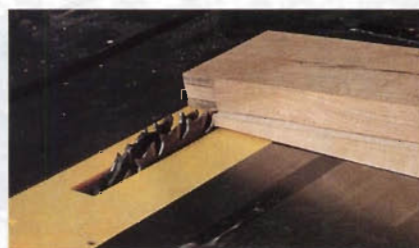


The mortises on the legs are the same size, but are asymmetrically placed. Use a sharp Forstner bit to rough them out.

Mortise and Tenon Joinery

Now we come to the heart and soul of chairmaking: the joints. Many of the mortise and tenon joints are angled, which makes them more difficult (see the sidebar below). However you cut the mortise and tenons, the mortises should be cut first. As you will notice from the **Pinup Shop Drawings**, all of the mortise and tenons are the same size: 1/2" x 1 1/2". Completely lay out all the mortises on one front and back leg to use for the drill press setup (shown above) and then just mark the centerline of all other mortises on the rest of the legs. Sort your legs into matching pairs and complete the boring. After the mortises are chopped, cut all the

BUILD AN ANGLED TENON RAMP



One of the challenges this chair presents is the angled tenons on the main side rails (as shown in the detail drawings at right). The author used his Multi-router to create the angled tenons. Most of us are not lucky enough to own a tool with that level of sophistication.

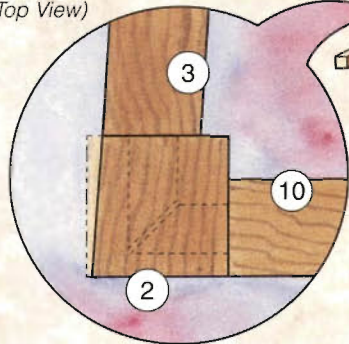
We created a ramp-shaped sled, secured to the miter gauge, to form the angled tenons. Because the lower and upper tenons are located on the legs at different positions (again see the detail drawings), you will need to create two ramps, at slightly different angles. See the Pinup Shop Drawings for more details.

Flop the ramp to form the angled tenons for each rail. Secure the ramp to the miter gauge with screws. A slick solution to a tricky problem.

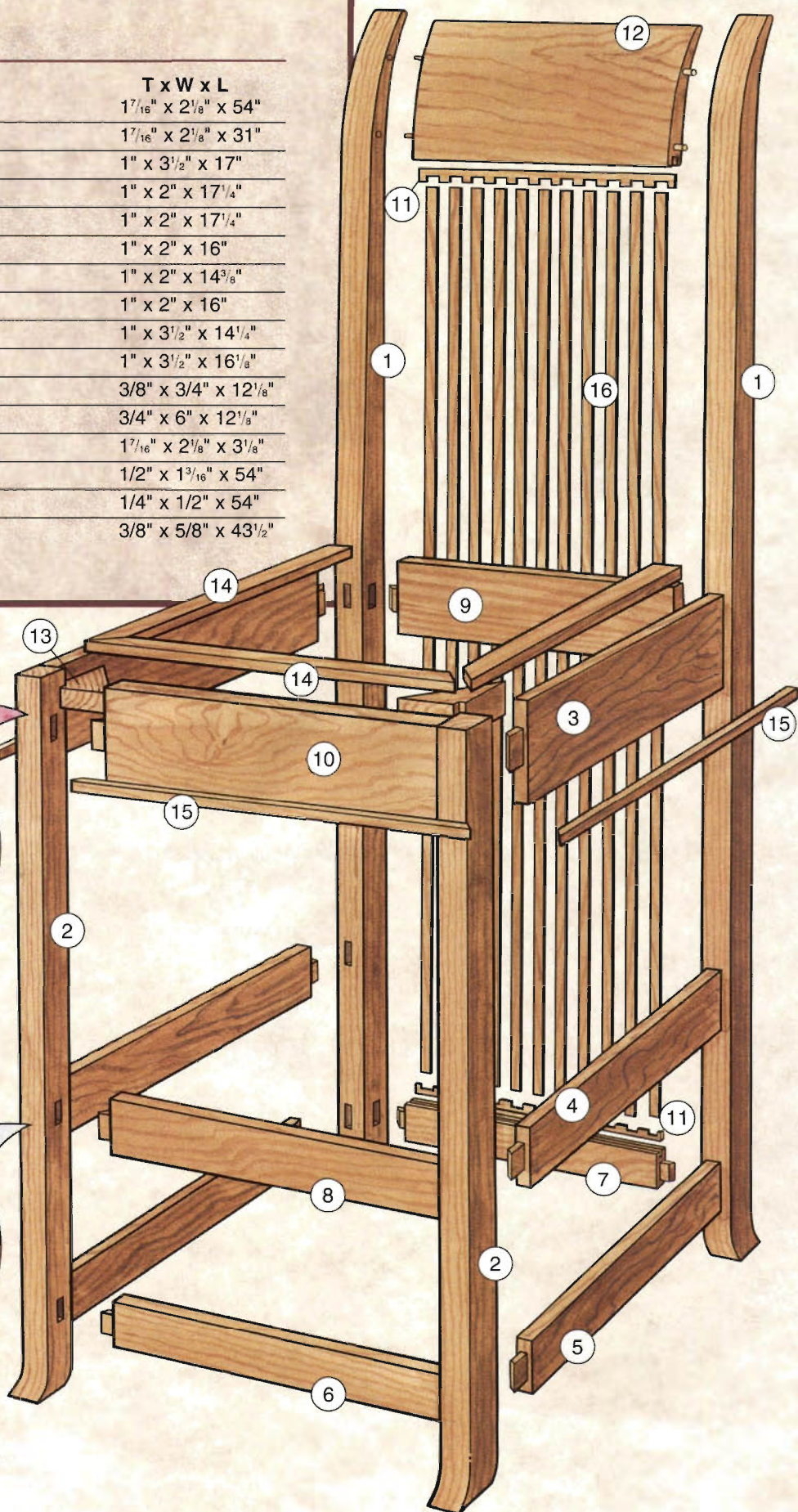
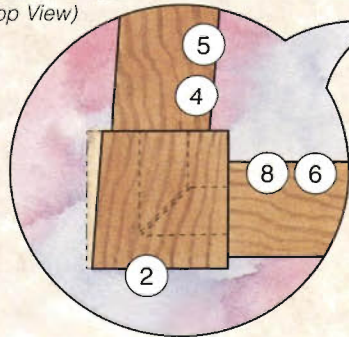
MATERIAL LIST (CHAIR)

	T x W x L
1 Back Legs (2)	17 ¹ / ₁₆ " x 2 ¹ / ₈ " x 54"
2 Front Legs (2)	17 ¹ / ₁₆ " x 2 ¹ / ₈ " x 31"
3 Upper Side Rails (2)	1" x 3 ¹ / ₂ " x 17"
4 Middle Side Rails (2)	1" x 2" x 17 ¹ / ₄ "
5 Lower Side Rails (2)	1" x 2" x 17 ¹ / ₄ "
6 Lower Front Rail (1)	1" x 2" x 16"
7 Lower Back Rail (1)	1" x 2" x 14 ³ / ₈ "
8 Middle Front Rail (1)	1" x 2" x 16"
9 Upper Back Rail (1)	1" x 3 ¹ / ₂ " x 14 ¹ / ₄ "
10 Upper Front Rail (1)	1" x 3 ¹ / ₂ " x 16 ¹ / ₈ "
11 Slat Receivers (2)	3/8" x 3/4" x 12 ¹ / ₈ "
12 Crest Rail (1)	3/4" x 6" x 12 ¹ / ₈ "
13 Corner Blocks (2)	17 ¹ / ₁₆ " x 2 ¹ / ₈ " x 3 ¹ / ₈ "
14 Trim Cap (1)	1/2" x 1 ³ / ₁₆ " x 54"
15 Trim (1)	1/4" x 1/2" x 54"
16 Slats (11)	3/8" x 5/8" x 43 ¹ / ₂ "

Upper Rails Tenon Detail
(Top View)



Middle and Lower Rails Tenon Detail
(Top View)





The author used his Multi-router to create tiny round tenons on the end of the slats. Our alternate method is "notched slat receivers."

NOTCHED SLAT RECEIVERS

Rather than chop a series of small mortises, cut two slat receivers and notch them on your table saw. If your layout is off by just a little bit, the regimented orientation of the slats will make your error noticeable.



Lay out and notch the slat receivers in matched pairs on your table saw. In this operation, accuracy is critical.

rails (pieces 3 through 10), except the crest rail, from 1" stock. Lay out your tenons with as much accuracy as you can muster, using scrap lumber to check your setups as you go (see the sidebar on page 34). When all of these joints are done, there is the matter of the mortises for the back slats. Make a pair of slat receivers (pieces 11) and cut notches into them as shown in the sidebar at left. Don't forget to plow a groove in the bottom back rail for one of these receivers.

There are a couple more steps before you can move on to the crest rail. The first procedure is to form the angle on the front legs (as shown above). Here again it pays to have an extra blank to test your set-up. Now move on to mitering the tenons. Even though you want as much gluing surface as possible, allow 1/32" to 1/16" between the mitered tenon faces for glue squeeze-out.

A Defining Element: the Crest Rail

The crest rail (piece 12) is complex and time-consuming, and one of the truly defining elements of this design. Work very carefully as you shape it, and refer to the sidebar



After the mortises are chopped, the front legs are sliced to match the angled shape of the chair's footprint.

below for the procedure to create the concave and convex shapes.

Once you've got the shape right, the last step on the crest rail is the dowel joints. Like everything else about the crest rail, this is a rather complex job and requires a well-made jig. The positions of the dowel holes in the legs are marked by lightly tapping a small brad through the appropriately sized holes previously drilled in your template. Detailed drawings of the doweling jig for the crest rail are shown in the **Pinup Shop Drawings**. You must be *very* accurate in the drilling of the dowel holes in the legs and crest rail. They must line up perfectly! (See the photo, below right.)

Now comes the fun part — sanding everything up to 220 grit. **NOTE:** Be very careful about not rounding the wrong edges. After everything is sanded to 220, you are ready to start assembly.

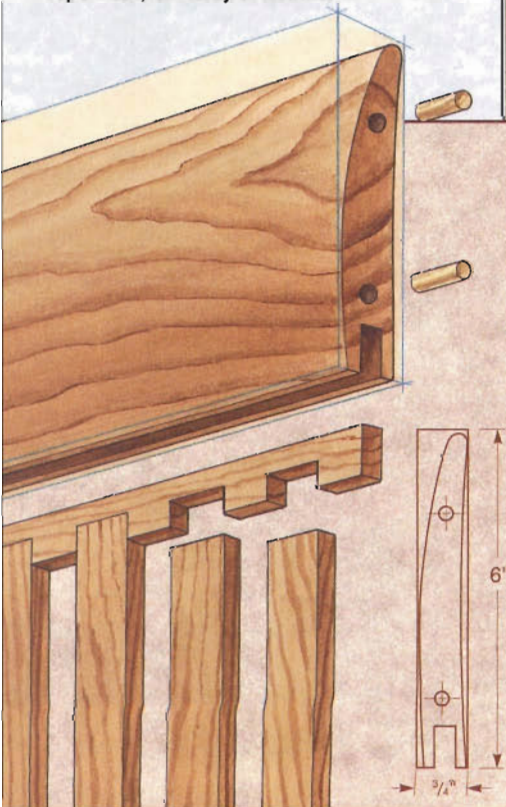
SHAPING AND DOWELING THE CREST RAIL

Cut your stock 27" long so you can shape two rails at once (assuming you're making more than one chair), and then step to the table saw to plow the groove for the slat receiver.

The next step is to shape the front and back faces of the crest rails. I made a round bottom wooden plane for this step, shaping the back (concave) face by planing on a marked line and gradually flaring out from there. The same task could be accomplish with chisels and scrapers, it will just take longer. Shaping the front (convex) face is much easier, because you can use a regular flat-bottomed plane. Once again, you should mark a center line



— in this case the high point — but, in addition, you should mark both the edges and ends for how much material you need to take off. When both faces are shaped, you will need to sand them smooth and roundover the top edge. This can be done with a light, sure touch and a random orbital sander. Cut the rails to length



"CHAIRS TAKE
LOTS OF
ABUSE: IF
YOU DON'T
MAKE THEM
BOMBPROOF,
THEY WILL
LOOSEN AND
FALL APART."

MIKE
McGLEYNN

Assembly

I prefer to assemble the sides of the chairs first, then assemble the sides to one another. I also prefer to use West System epoxy for my adhesive. I want these chairs to last one or two lifetimes, and this is the glue that will do it. Before you start to assemble, you should do two more things that will help prevent foul language. First, ease all sharp tenon corners; this will prevent the tenons catching as they're inserted.



Plans for this doweling jig appear on the Pinup Shop Drawings.

on your table saw with the concave side down. It is also a good idea to put masking tape over the outline on the concave side to prevent chipping.

Second, start with a clean, padded bench surface with all the equipment and supplies that will be required — there's nothing worse than having something half-assembled and precariously balanced and then realizing you don't have the right size clamp at hand! The assembly itself is pretty straightforward. With a glue brush, apply glue to all appropriate mortises on the back leg. Slip in the rails. Apply glue to the front leg mortises, slip it in place and clamp this subassembly with bar clamps. Epoxy usually takes eight to twelve hours to cure so you may have to complete one side in the morning and the other in the evening.

Once each of the sides have cured, they can be assembled to each other, just as before, with one exception. Before inserting your tenons, check each mortise for hardened glue and clean it out with a chisel.

When these assemblies have cured, there are several small items to take care of before you can finish. Fabricate and install the corner blocks (pieces 13). The dimensions are given on the **Pinup Shop Drawings**. Glue them in place with spring clamps or a bar clamp and notched caul. Before you can get to the next step — installation of seat rail trim — you need to be sure the seat rails and front legs are perfectly flush with one another.

Despite your best efforts, there may be some subtle misalignments here — trust me!

With utmost patience, a sharp scraper, block plane and a hard sanding block, true any discrepancies. The seat rail trim cap (piece 14) is the easier to install of the two trim strips. Miter, trim to fit, tack and glue it in place. The trim strip (piece 15) on the bottom of the rails is a little more complex, as it has to

be applied with glue only. It is best to do the two side pieces first and the face piece last. The front miter must land exactly on the corner as you glue the strips on. The last step is to install the back slats (pieces 16). These slats are simple to make and install. Snap the slats into place by inserting one end and gently flexing each slat; you'll be able to pop the other end right in.

(Don't forget to glue them first.) Lastly, attach the slats to the back seat rail with two small nails apiece. Use a temporary spacer block so they don't end up crooked.

Before we move to finishing, there are a couple of prep steps to complete. First, the nail holes in the slats and the uncovered template screw holes on the legs need to be filled and sanded. Choose a putty that, when finished, will be somewhat darker than the wood itself. This allows for the natural darkening that occurs with cherry.



Be sure to gather all the supplies and equipment you'll need for the glue-up before you start the process.

UPHOLSTERY

While not exactly woodworking, upholstery (as done here) is an easily mastered skill. Two tools will make upholstering much easier: A power staple gun of some sort and a webbing stretcher. Follow the steps below to top off your chair.



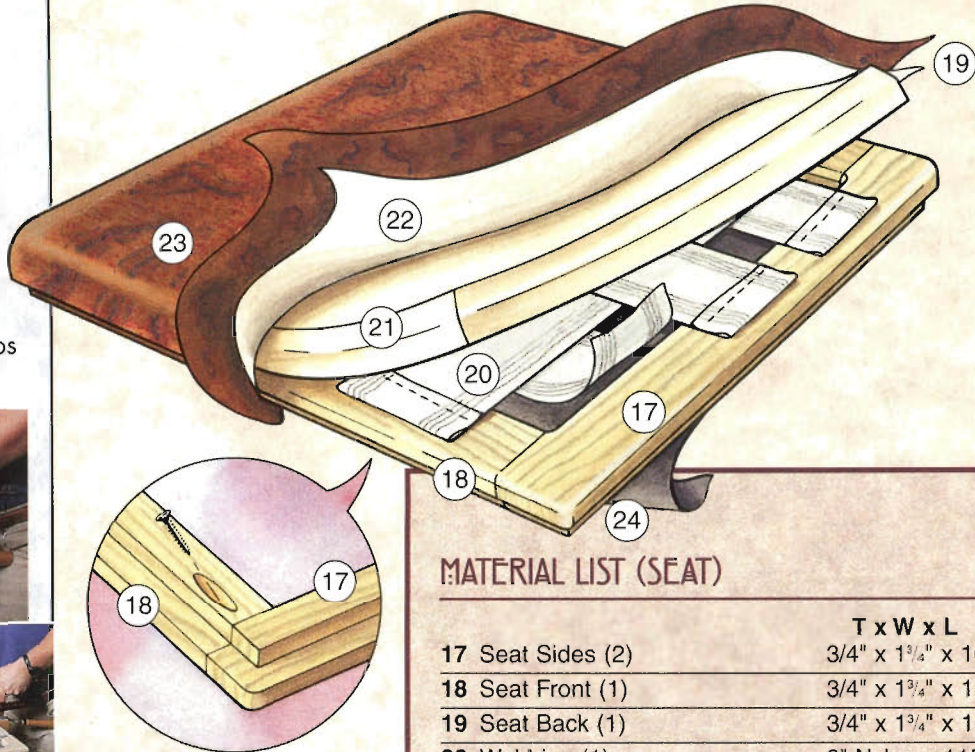
Use 3" nylon webbing: fold over a small flap and secure it with staples, stretch and staple again. Weave the webbing to increase strength and durability. The webbing must be evenly spaced on the frame.



Cut the foam to size and bevel its edges. Start the upholstery process by wrapping the frame and foam with muslin cloth. You don't have to remove every single wrinkle during the muslin wrapping step.



Wrap and staple the cover (cloth or leather) in place, taking care to keep it wrinkle-free. Pay special attention to the corners. Complete the upholstery by stapling on a bottom cloth.



MATERIAL LIST (SEAT)

	T x W x L
17 Seat Sides (2)	3/4" x 1 3/4" x 16 3/8"
18 Seat Front (1)	3/4" x 1 3/4" x 13"
19 Seat Back (1)	3/4" x 1 3/4" x 10 7/8"
20 Webbing (1)	3" Nylon x 115"
21 Foam (1)	1" x 16 1/4" x 17"
22 Muslin (1)	22" x 24"
23 Fabric Cover (1)	22" x 24"
24 Bottom Cover (1)	22" x 24"

Finishing

There are many choices of finish that could be used on these chairs. I recommend Deftoil: it's easy to apply, goes a long way, and enhances the look of cherry. The drawback to oil is that it is not very durable. So after the oil has completely cured, follow it up with polyurethane. Apply three coats, smoothing between each application with extra-fine steel wool.

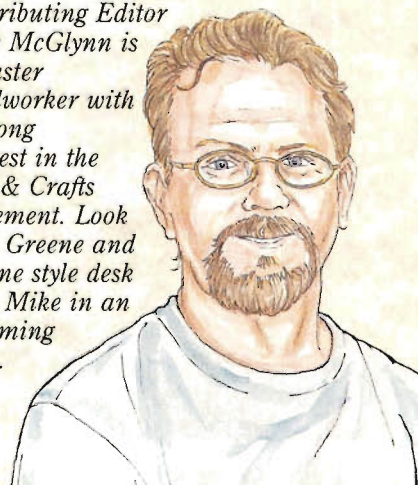
Upholstered Seat

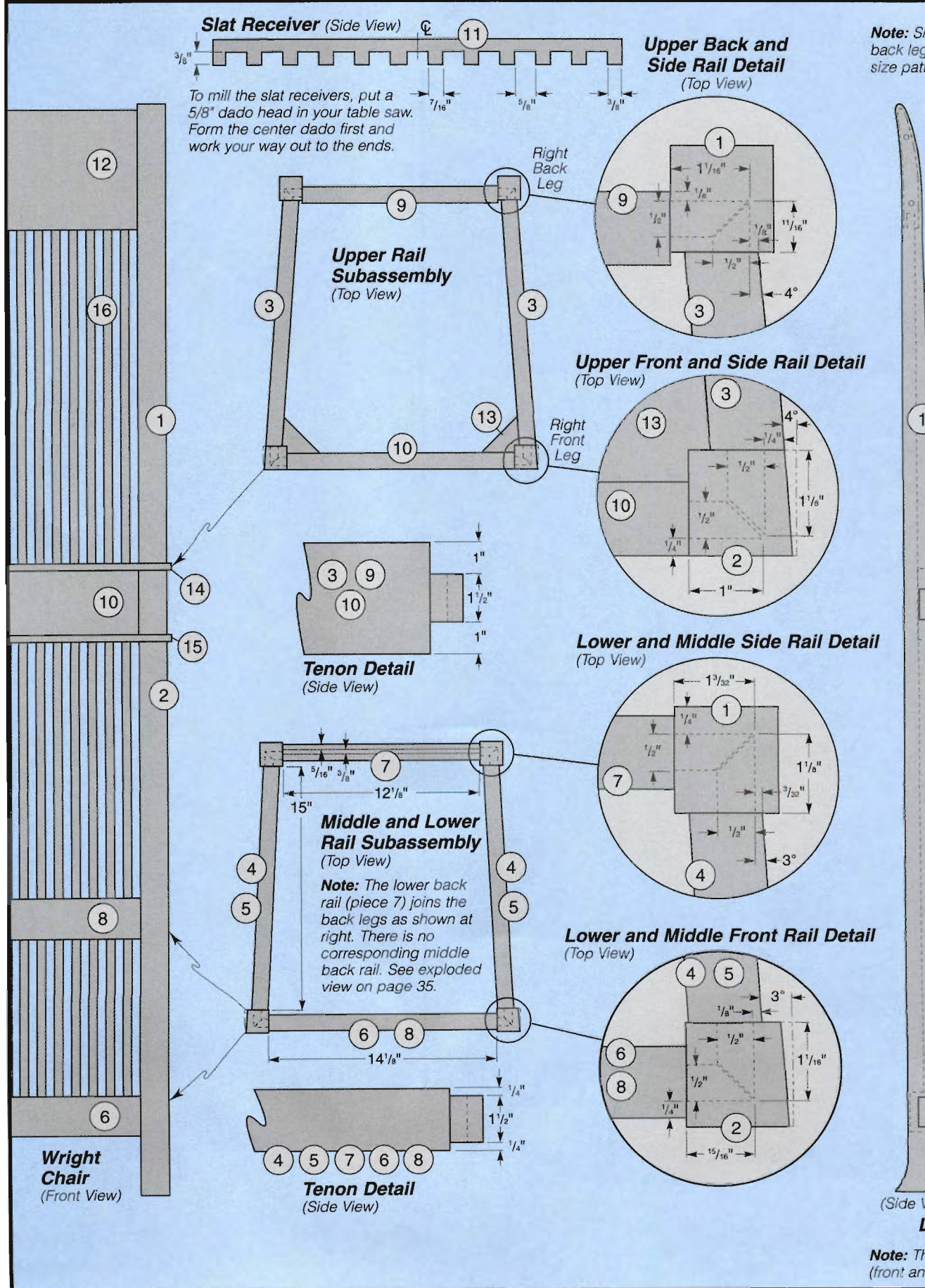
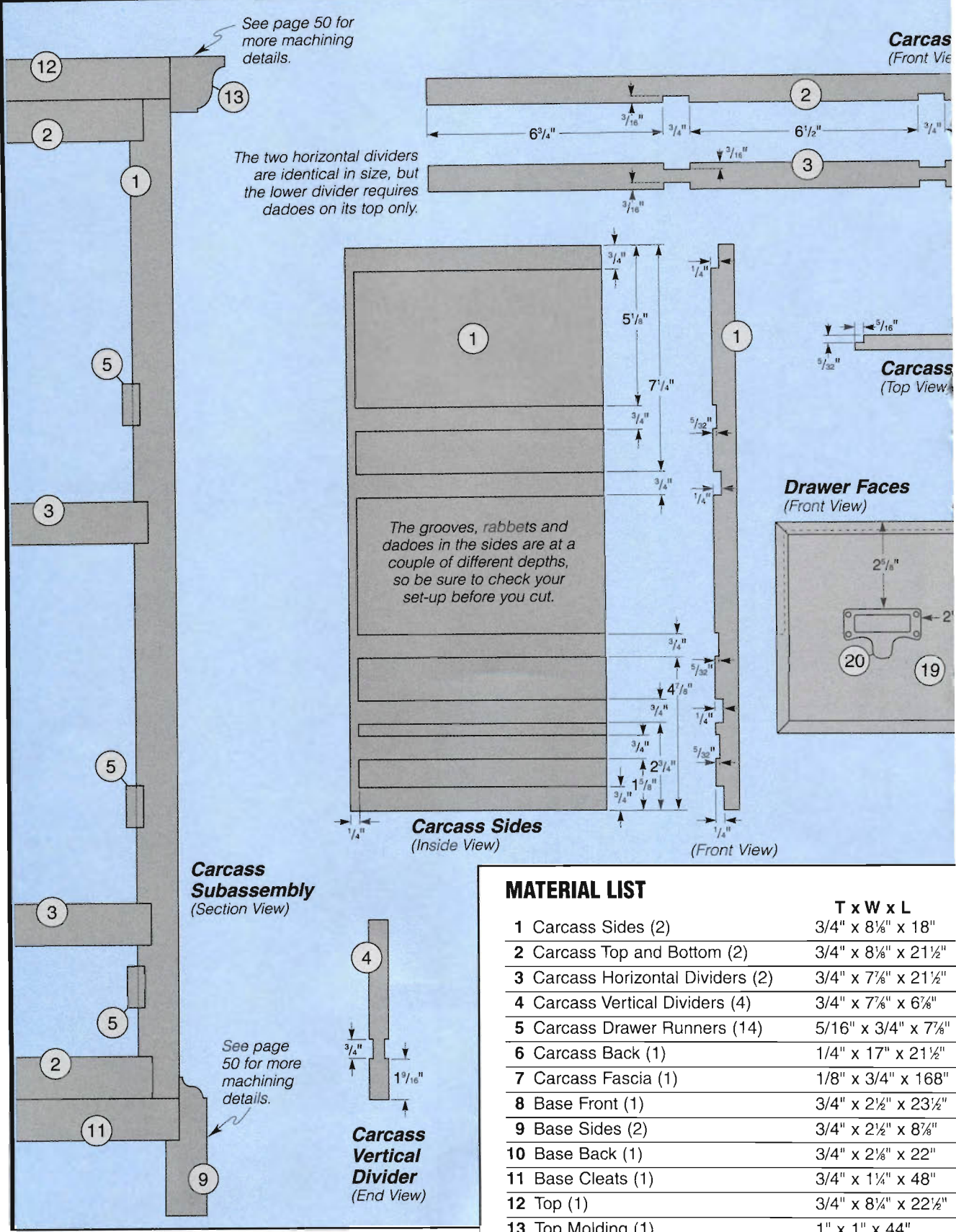
There is only one thing left to complete your chair: the upholstered seat. Many people might feel it best to farm this job out to an upholstery shop, but it is not a difficult job. The first step is to build the frames (pieces 17 through 19). Most upholstery frames are made of a medium density hardwood that is strong but not so hard that it is difficult to staple into. The dimensions of the frame are shown on the **Pinup Shop Drawings**. As you can see, the joinery is very simple — glued butt joints and pocket screws. After you have glued up the frame, the next step is to cut a rabbet around the outside. This is easily done on a table saw. Next, round over the outside and inside top edge with a 3/8" roundover bit. This roundover provides a smooth edge

to the seat and eliminates sharp edges that might bear against the webbing. Give a good sandpaper break to any other sharp edges to reduce wear on the cloth. Follow the steps in the sidebar at left if you choose to do the upholstery

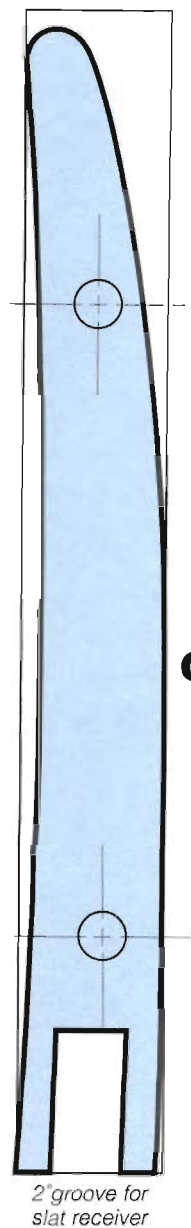
I don't attach seats like this; they sit nicely in place, and it's a real pain to look for a screwdriver when somebody spills something on them. So, that's it! You've completed a master class in woodworking ... so take a load off and enjoy. It just so happens you've got a good-looking place to do just that.

Contributing Editor Mike McGlynn is a master woodworker with a strong interest in the Arts & Crafts movement. Look for a Greene and Greene style desk from Mike in an upcoming issue.

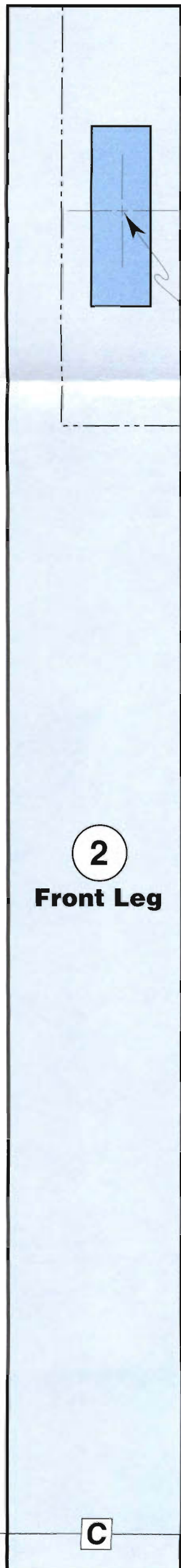




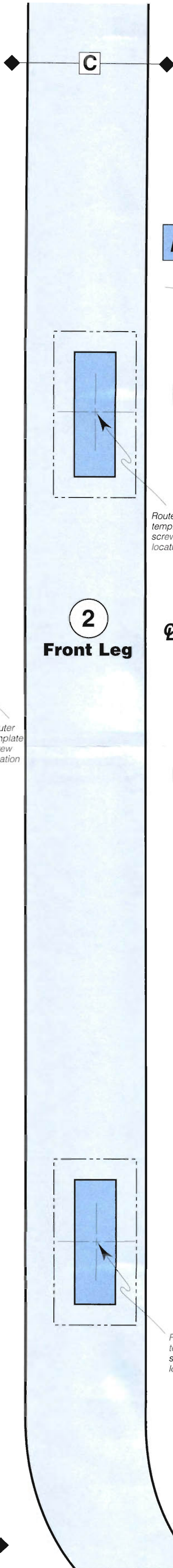
NOTE: Attach the routing templates to the inside face of the leg blanks so you can drive your screws into areas which will later become mortises.



12
Crest Rail

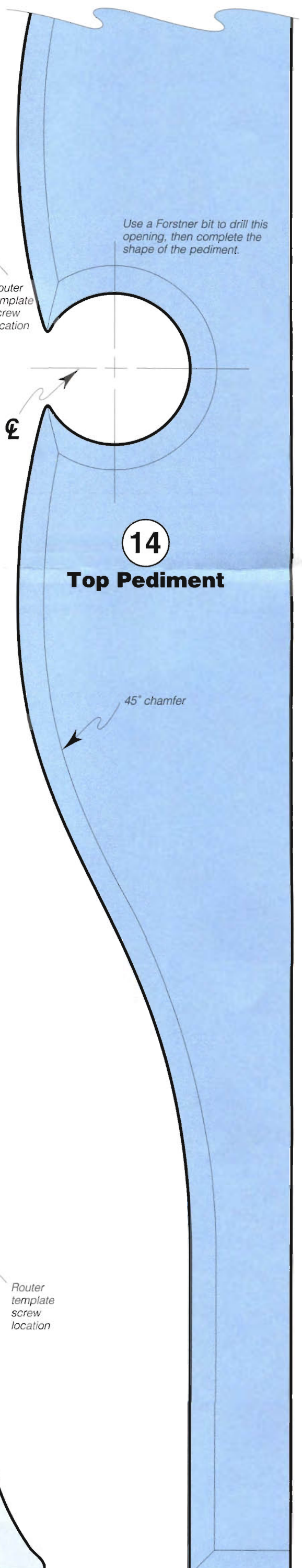


2
Front Leg



2
Front Leg

Apothecary Cabinet



14
Top Pediment

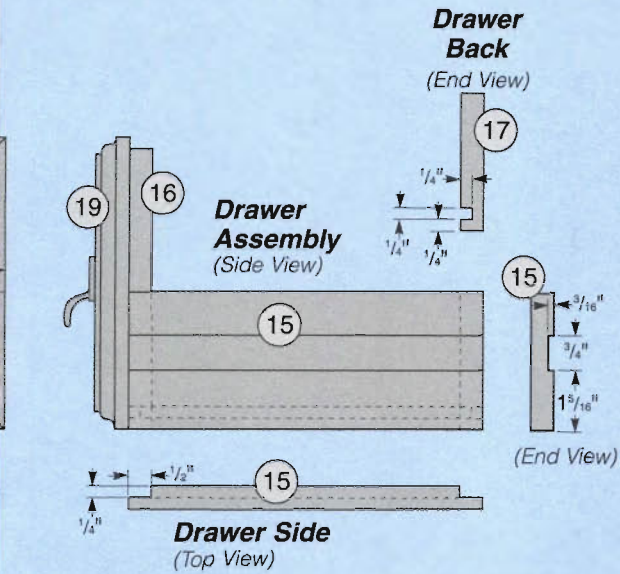
Top and Bottom



The carcass top and bottom are identical in size, but the bottom requires no dadoes.

Horizontal Dividers
(Front View)

5
Drawer Runners



	T x W x L
14 Top Pediment (1)	3/4" x 3" x 24 1/2"
15 CD Drawer Sides (12)	1/2" x 3" x 7 3/4"
16 CD Drawer Fronts (6)	1/2" x 5 7/8" x 5 7/8"
17 CD Drawer Backs (6)	1/2" x 3" x 5 7/8"
18 CD Drawer Bottoms (6)	1/4" x 5 7/8" x 7 1/4"
19 CD Drawer Faces (6)	3/4" x 6 3/8" x 6 3/8"
20 CD Drawer Pulls (6)	Brass cardholder
21 Wide Drawer Sides (2)	1/2" x 1 3/4" x 7 3/4"
22 Wide Drawer Front and Back (2)	1/2" x 1 3/4" x 20 5/8"
23 Wide Drawer Bottom (1)	1/4" x 20 5/8" x 7 1/4"
24 Wide Drawer Face (1)	3/4" x 1 7/8" x 20 5/8"
25 Wide Drawer Pull (1)	Brass

Full-Size Patterns

- Open staples carefully, remove pattern and fold staples back in place.
- Use graphite paper (available at art supply stores) or cut and trace full-size patterns onto your stock.
- Cut out the elevation drawings and pin them to your shop wall.

Apothecary Cabinet

Complete elevations for all the dadoes, grooves and rabbets, as well as a full-size template for the broken pediment.



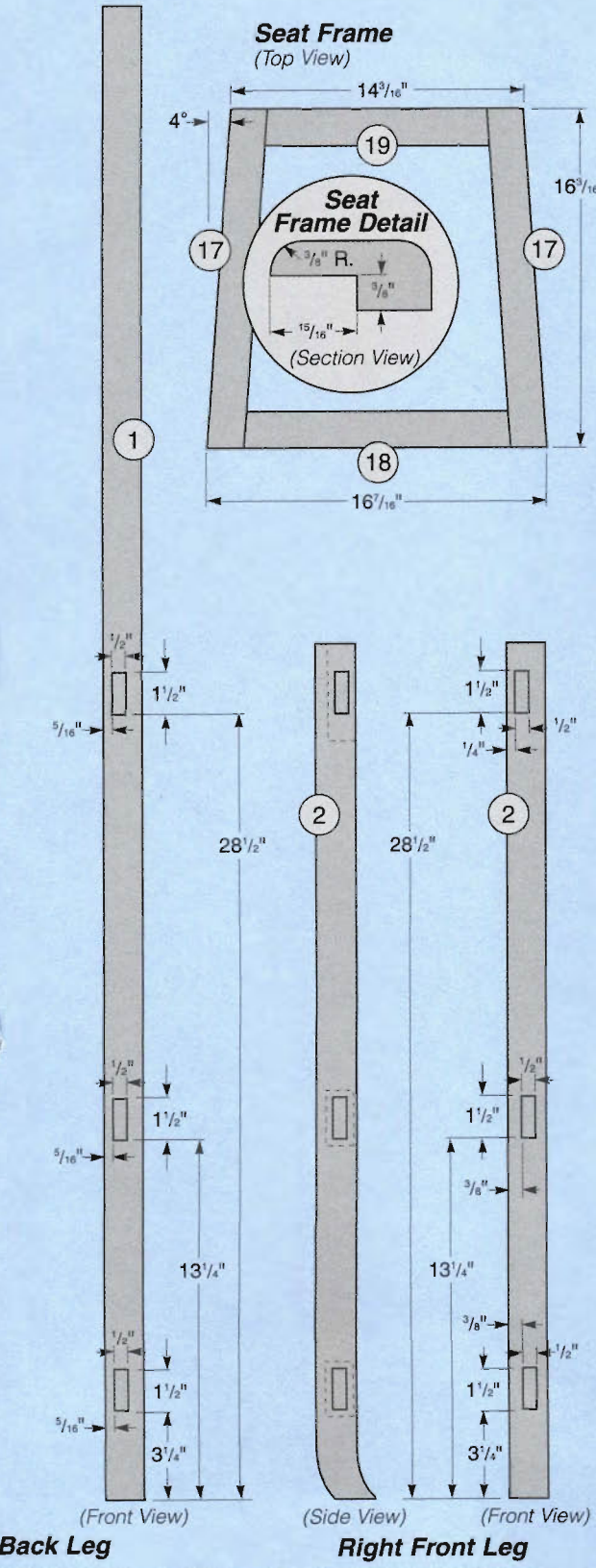
Frank Lloyd Wright Chair

Shaped leg patterns and a complete set of elevation drawings. Plus, more details for the tenon ramp jig and crest rail jig to help you through the trickiest joinery.

WOODWORKER'S JOURNAL

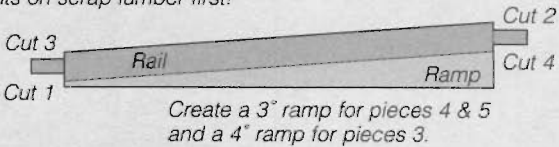
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view details for front and are presented on the full (see other side).



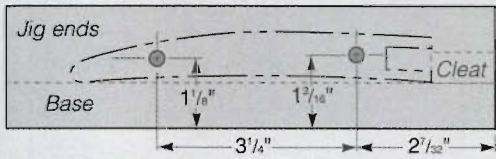
Left and right legs mirror each other. Be sure to mark each set back as left or right and layout your mortise positions accordingly.

Tenon Ramp: Two tenon ramps are required to build this chair. Create one at a 3° incline for pieces 4 and 5 and a second at 4° for pieces 3. Starting at cut 1, mill the tenon cheeks, using the dimensions shown in the rail details at left. Turn the rail end for end and upside down to form cut 2. Now spin the tenon ramp end for end and re-attach it to the miter gauge. Make cut 3 and then turn the rail end for end and upside down to make cut 4. Note that several set-ups will be needed to accommodate the various tenon lengths and depths of cut (see rail details at left). Be sure to test your cuts on scrap lumber first!



Crest Rail Doweling Jig

The positions of the dowels in the crest rail are critical. Build the jig shown below to place the dowels properly. Start with a base cut to 3/4" x 8" x 13 1/8". Rip a 1/2" x 1" x 13 1/8" cleat. Attach it flush to one long base edge (see below). Now cut two 3/4" x 2" x 8" jig ends. Glue and nail them in place and locate the holes as shown below. Test the jig with scrap lumber.

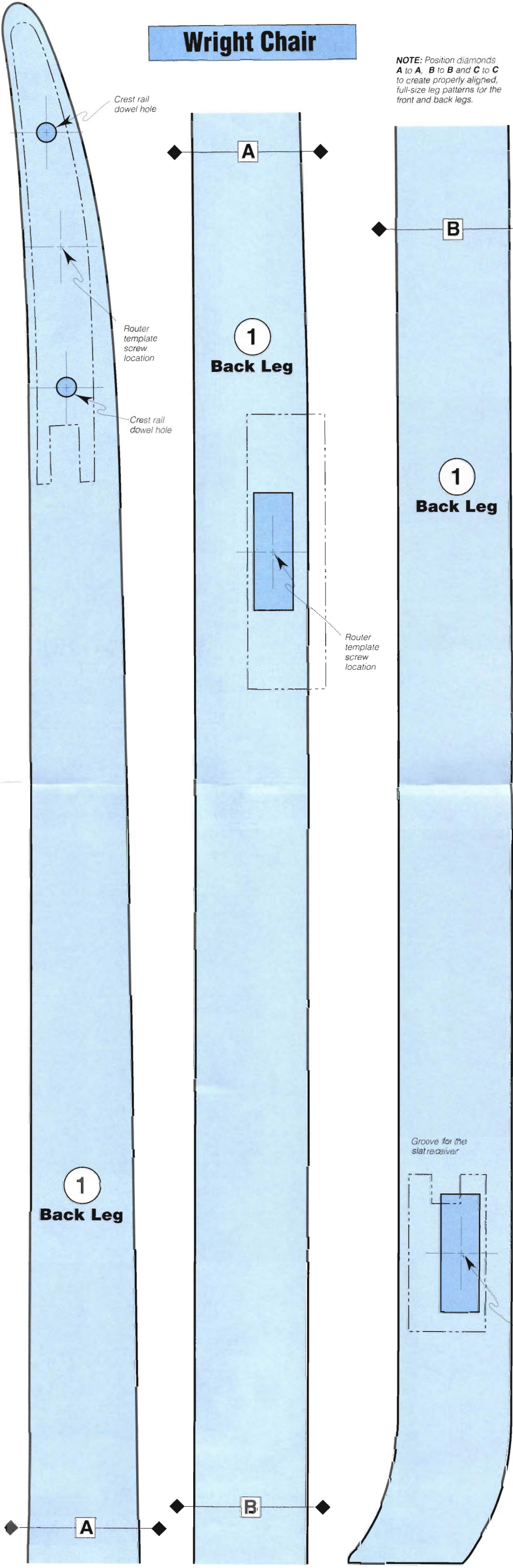


MATERIAL LIST

	T x W x L
1 Back Legs (2)	1 7/16" x 2 1/8" x 54"
2 Front Legs (2)	1 7/16" x 2 1/8" x 31"
3 Upper Side Rails (2)	1" x 3 1/2" x 17"
4 Middle Side Rails (2)	1" x 2" x 17 1/4"
5 Lower Side Rails (2)	1" x 2" x 17 1/4"
6 Lower Front Rail (1)	1" x 2" x 16"
7 Lower Back Rail (1)	1" x 2" x 14 3/8"
8 Middle Front Rail (1)	1" x 2" x 16"
9 Upper Back Rail (1)	1" x 3 1/2" x 14 1/4"
10 Upper Front Rail (1)	1" x 3 1/2" x 16 1/8"
11 Slat Receivers (2)	3/8" x 3/4" x 12 7/8"
12 Crest Rail (1)	3/4" x 6" x 12 1/8"
13 Corner Blocks (2)	1 7/16" x 2 1/8" x 3 1/8"
14 Trim Cap (1)	1/2" x 1 3/16" x 54"
15 Trim (1)	1/4" x 1/2" x 54"
16 Slats (11)	3/8" x 5/8" x 43 1/2"
17 Seat Sides (2)	3/4" x 1 3/4" x 16 3/8"
18 Seat Front (1)	3/4" x 1 3/4" x 13"
19 Seat Back (1)	3/4" x 1 3/4" x 10 7/8"
20 Webbing (1)	3" Nylon x 115"
21 Foam (1)	1" x 16 1/4" x 17"
22 Muslin (1)	22" x 24"
23 Fabric Cover (1)	22" x 24"
24 Bottom Cover (1)	22" x 24"

Wright Chair

NOTE: Position diamonds **A** to **A**, **B** to **B** and **C** to **C** to create properly aligned, full-size leg patterns for the front and back legs.





Apothecary CD Cabinet

Organize and store your musical medicines in this traditionally styled pine cabinet.

By John English

It's not often that items from two distinct millennia can share the same home. A thousand years ago, armies on the march across Europe brought with them their own version of today's pharmacist, the traveling apothecary. Wise in the ways of nature, apothecaries supplied field hospitals and the generals' private surgeons with healing herbs and potions. They stored these in small cabinets that were easy to travel with while on a campaign. The cabinets were small enough to be carried by one person, yet their large array of drawers and compartments allowed for a versatile and comprehensive storage system. That concept translates well to this pine cabinet designed to store, sort and arrange a collection of music or software CDs. And though it's a long

jump from the bloodthirsty screams of a battlefield to the sweet strains of modern rock and roll, I'm sure there are some among us who can still see a parallel.

Getting Started

This cabinet was designed to be built by anyone with basic tools and woodshop skills. The joinery is simple dados and rabbets, all milled on the table saw with the aid of an easy to make jig called a dado sled. For dimensional stability, I used knotty pine veneered MDF for the carcass. Matching select grade knotty pine was used for the pediment, fascia and drawer fronts, and aspen got the call for the drawer sides (a hardwood my local lumberyard carried in 1/2" stock). The back and drawer bottoms are 1/4" plywood, while the drawer slides can be milled from any suitable scrap of hardwood you have in your shop.

The first step in construction is to cut all the parts of this project to the dimensions shown in the **Material Lists** on pages 49 and 51. Let your select pine acclimate to the humidity levels in your shop for a few days before you begin. When machining veneered MDF, use a sharp carbide-toothed saw blade and a zero-clearance insert.

Easy Sledding

All the joints in this project are simple grooves, dados (grooves that run across the grain) and rabbets (grooves along the edge of a workpiece). Make all of these cuts on the table saw, using a dado head and a dado sled like the one shown at right. A dado head is a saw blade combination that leaves a kerf up to 13/16" wide. The least expensive (and least accurate versions) are

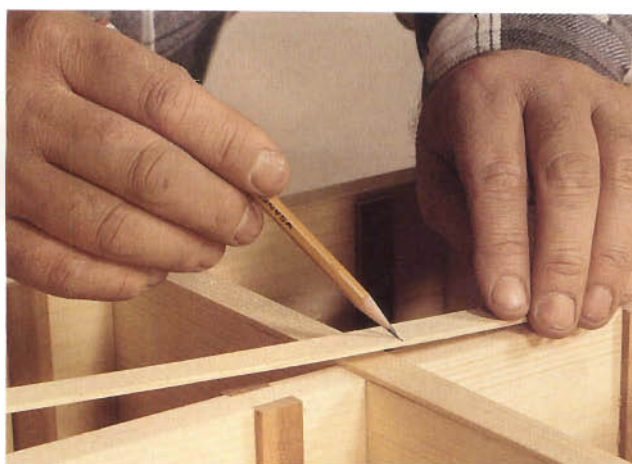


Figure 1: The fascia hides the edges of the MDF and the dados for the dividers. Apply the horizontal strips first, then cut the vertical strips to size, laying them out as you go to ensure a perfect fit.

one-piece affairs called "wobble" dados. If you are just getting started, I recommend you invest in a dado head made up of two blades and a collection of carbide-tipped cutters inserted between them. You'll end up with cleaner and more accurate cuts.

The sled I used is a 16" x 32" piece of 1/2" plywood, with hardwood runners attached to the bottom.

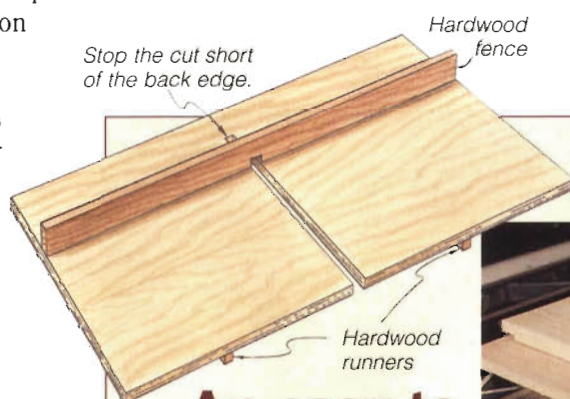
To build it, cut two 18" long runners so they slide easily in the grooves in your table saw. Mill their thickness to be 1/8" shy of the top

of the grooves, then drop a couple of washers into each groove. Place the runners on top so that the washers lift the top of the runners flush with the tabletop.

Lower the blade below the table, then set your fence 16" from the blade. Butt the plywood against

the fence and mark the runner locations on the front and back edges of the plywood. Glue and clamp the runners in place and, after the glue has set, trim the ends of the runners flush.

Install a 3/4" dado head in the saw and run the sled three quarters of the way through the plywood, leaving about 4" of the base uncut. Then use a square to lay out a line for the fence, at exactly 90° to the dado cut. A straight length of hardwood stock will work fine for your fence. Glue and screw the fence in place, leaving a few inches of uncut base behind the fence to add stability to the jig.



An easy to make dado sled

The dados, grooves and rabbets in this project are all made on the table saw. While it's easy enough to use your fence to help form the drawer grooves, I recommend a dado sled when cutting multiple rabbets and dados. A couple of runners, a base and a fence are all it takes to make your own. Once assembled, set the cutter height (taking into account the

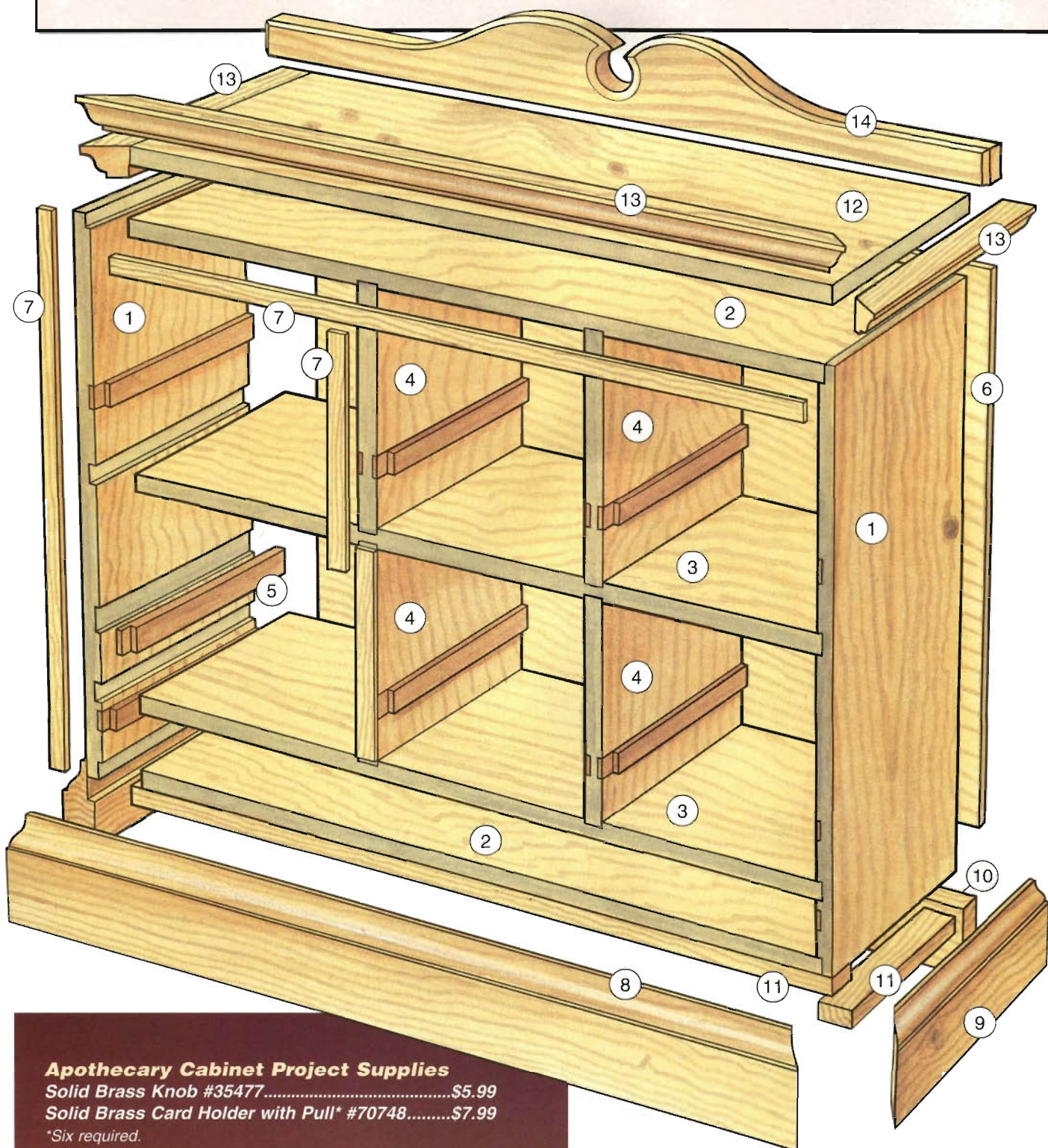
CAUTION: Keep your hands clear of the dado head as it exits the back of the fence!



thickness of the base), then hold each workpiece tightly against the fence as you make a cut at each marked location. A stop block clamped in place will help to register multiple cuts. Remember, several different depths of cut will be required, depending on the dado or rabbet location and function.

MATERIAL LIST (Carcass)

	T x W x L		T x W x L
1 Carcass Sides (2)	3/4" x 8 1/8" x 18"	8 Base Front (1)	3/4" x 2 1/2" x 23 1/2"
2 Carcass Top and Bottom (2)	3/4" x 8 1/8" x 21 1/2"	9 Base Sides (2)	3/4" x 2 1/2" x 8 7/8"
3 Carcass Horizontal Dividers (2)	3/4" x 7 7/8" x 21 1/2"	10 Base Back (1)	3/4" x 2 1/2" x 22"
4 Carcass Vertical Dividers (4)	3/4" x 7 7/8" x 6 5/8"	11 Base Cleats (1)	3/4" x 1 1/4" x 48"
5 Carcass Drawer Runners (14)	5/16" x 3/4" x 7 7/8"	12 Top (1)	3/4" x 8 1/4" x 22 1/2"
6 Carcass Back (1)	1/4" x 17" x 21 1/2"	13 Top Molding (1)	1" x 1" x 44"
7 Carcass Fascia (1)	1/8" x 3/4" x 168"	14 Top Pediment (1)	3/4" x 3" x 24 1/2"



Apothecary Cabinet Project Supplies

Solid Brass Knob #35477.....\$5.99

Solid Brass Card Holder with Pull* #70748.....\$7.99

*Six required.

To order, call 800-610-0883 and mention code W0060.

Quick and easy drawers

The Carcass

Using the **Pinup Shop Drawings** at the center of the magazine, locate and mark all the dados, grooves and rabbets on the carcass sides, top, bottom and dividers (pieces 1 through 4). Don't forget to lay out the locations for the dados that will hold the drawer slides (pieces 5). Form the rabbets on the long edges of these parts on the table saw, using the saw's fence to guide the workpiece. Then plow the rest of the rabbets and dados using the sled, as shown on page 48. When forming dados that mirror each other or fall on opposite sides of the same piece of MDF, clamp a registration block on the sled's fence to



Plow grooves in the faces of the drawer sides (for the drawer runners) using a dado head and the saw's fence. Use your new dado sled for the rabbet cuts (see page 48).



Attach the fronts and backs to the sides (after slipping the bottom in place) using glue and nails. A nail spinner and nail set make fast work of the multiple drawer assembly.

help ensure accuracy. It's a slick trick to speed up the process.

Crosscut the drawer runners to length (pieces 5) and form the notch at their ends, then glue and clamp them in place. When they're set, sand all the carcass parts down to 220 grit: they'll be harder to work on after assembly. Now glue and clamp the top, the bottom, both horizontal dividers and the four vertical dividers into their relevant dados and rabbets. Make sure all the fronts are flush and the cabinet is square as you apply clamping pressure.

Attach the back (piece 6) in its rabbets with 1" brads every four inches or so along the perimeter.

Then rip the 1/8" thick strips of

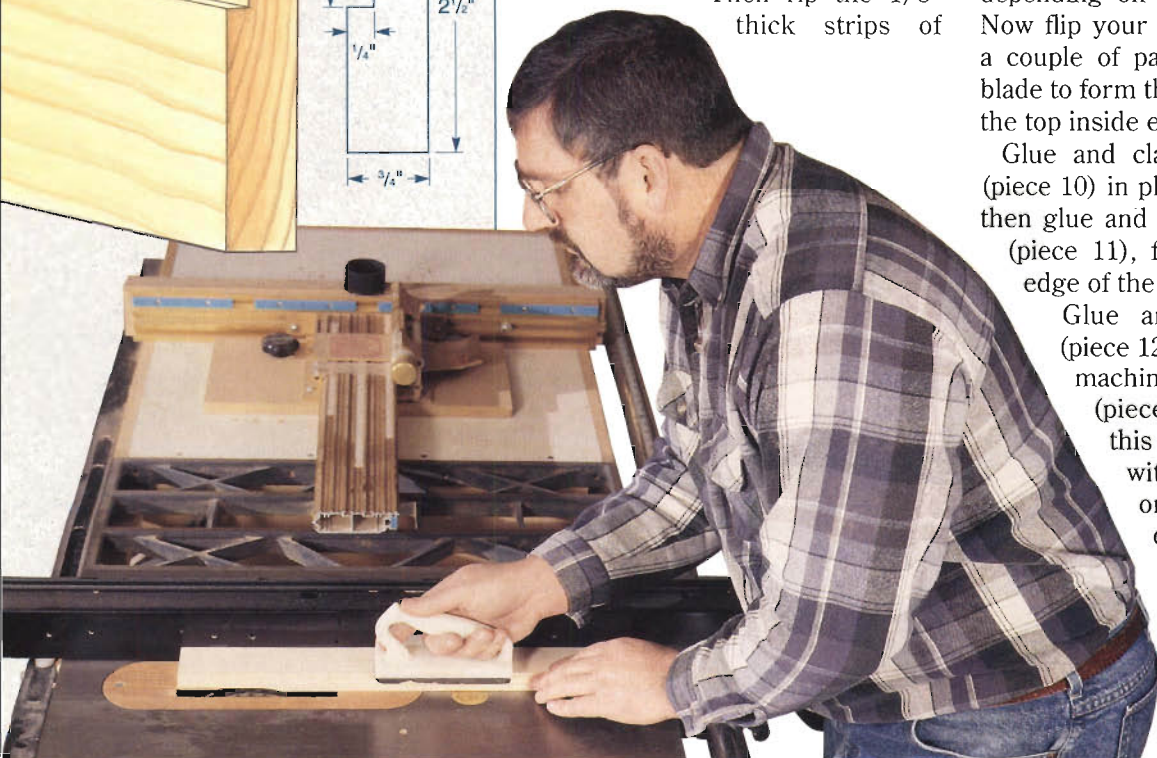
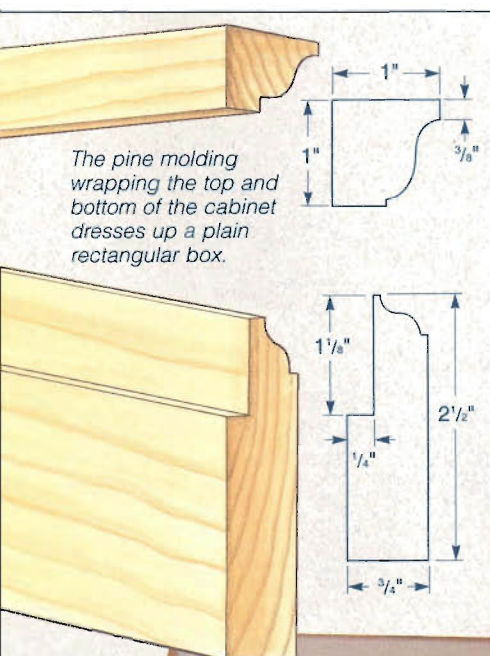
pine fascia (pieces 7) from the edges of a wider board. These will hide the MDF edges, *along with the exposed dado joints*. Carefully lay out and cut each strip, as shown in **Figure 1** on page 48. When everything fits, use some instant glue (Elmer's has some specifically for woodworking) to attach the strips to the front of the carcass.

Add Some Molding and a Top

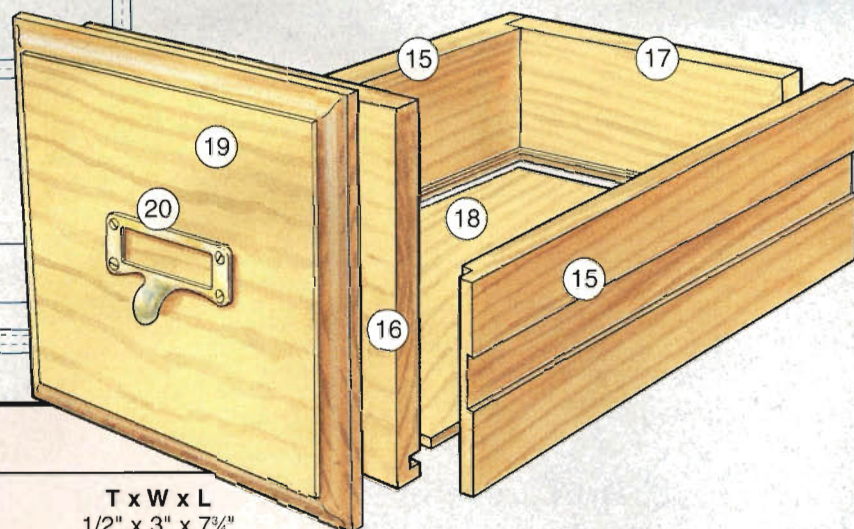
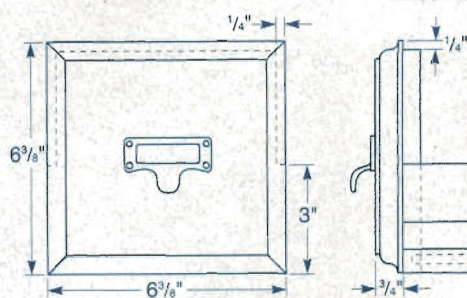
The base front and sides (pieces 8 and 9) can all be machined from a 48" length of stock. After ripping this long piece to width, use a bearing-guided router bit to mill the ogee pattern along the outside top edge. Any similar profile will do, depending on what bits you own. Now flip your piece over and take a couple of passes over the dado blade to form the deep rabbet along the top inside edge.

Glue and clamp the base back (piece 10) in place. Cut and fit, and then glue and nail, the base cleats (piece 11), flush to the outside edge of the carcass.

Glue and clamp the top (piece 12) in place next, then machine the top molding (piece 13). Once again, this is just a strip of pine with a profile routed onto one edge. The difference in this case is that the molding measures



Drawer Assembly (Front, Side and Top Views)



MATERIAL LIST (Drawers)

	T x W x L
15 CD Drawer Sides (12)	1/2" x 3" x 7 3/4"
16 CD Drawer Fronts (6)	1/2" x 5 7/8" x 5 7/8"
17 CD Drawer Backs (6)	1/2" x 3" x 5 7/8"
18 CD Drawer Bottoms (6)	1/4" x 5 7/8" x 7 1/4"
19 CD Drawer Faces (6)	3/4" x 6 3/8" x 6 3/8"
20 CD Drawer Pulls (6)	Brass cardholder
21 Wide Drawer Sides (2)	1/2" x 1 3/4" x 7 3/4"
22 Wide Drawer Front and Back (2)	1/2" x 1 3/4" x 20 5/8"
23 Wide Drawer Bottom (1)	1/4" x 20 1/8" x 7 1/4"
24 Wide Drawer Face (1)	3/4" x 1 7/8" x 20 7/8"
25 Wide Drawer Pull (1)	Brass

larger than standard 3/4" stock, so you'll have to rip it out of a short length of 2 x 4 material. Make sure this stock matches your other material in color and grain. Once it's cut to size, miter it to wrap the front and sides of the top, then glue and clamp it in place.

Apply the Pediment

Trace the shape of the broken pediment (piece 14) from the **Full-size Pattern**. After drilling out the center opening, cut out the shape with your saber saw or band saw, then sand the curved edges with a drum sander chucked in the drill press. Use a chamfering bit on the forward edges to complete the machining (but don't chamfer the bottom edge). Sand the pediment smooth and attach it to the top with glue and clamps.

The Drawers

The six CD drawers are absolutely identical, so building them is relatively easy. After cutting all the parts to size, use a 1/4" dado head

to mill grooves in all the sides, fronts and backs (pieces 15, 16 and 17). These grooves will hold the bottoms (pieces 18). Use your sled to mill the rabbets that hold each corner together (see the **Pinup Shop Drawings**). Dry fit the drawers together, slipping the bottoms in place as you do, and make any necessary minor adjustments. When everything fits, glue and nail the drawers together.

Cut the six CD drawer faces (pieces 19) from a single length of board if possible. That way, you can have continuous grain flowing across each set of three faces. Mill a decorative profile on all four edges of the front of each face, then temporarily mount the faces to the drawers with double-stick tape. Do this with the drawers placed in the cabinet ... it will allow you to properly center the drawer faces into their openings. Drive screws in from the back through pre-drilled pilot holes. (Remove the screws, take off the double-stick tape, then reattach the faces with glue and

screws.) Center a brass cardholder pull (pieces 20) on each drawer face, drilling pilot holes as you go.

The single wide drawer (pieces 21 through 24) is constructed in exactly the same fashion as the CD drawers, the only difference being that a single brass pull (piece 25) takes the place of the cardholder pulls. You may have to counterbore for the head of this pull's bolt.

Final Thoughts

The most appropriate finish for this traditional knotty pine cabinet is amber shellac. After removing the hardware, fill any unwanted holes (especially in the knots), then sand the entire cabinet down to 220 grit. There are several acceptable ways to apply the shellac (see Michael Dresdner's column on page 58); for most folks, I recommend brushing it on. Just be sure to keep the coverage even; by doing so you will keep the color consistent.

Now sort through those CDs of yours (yes ... it's okay to hide your teenager's *Rage Against the Machine*), and doubly impress your friends with your musical good taste and woodworking skills.

John English, a former editor of Today's Woodworker magazine, has been building projects and reviewing tools for Woodworker's Journal for many years.



ESSENTIAL TO SUCCESS IN YOUR SHOP

By Rick White

I get more fun and satisfaction from building jigs than from almost any other aspect of woodworking. Maybe that's because a well-designed shop jig delivers satisfaction to you over and over, project after project.

The best jigs are made in desperate moments. Often shortly preceded by the words: "How the @#%&*% do I do that!"

Often jigs serve such a specific purpose that you use them for one job and then throw them away. (Or keep them in a corner for a few years ... and then throw them away.) It bugs me to see those useful workhorses discarded, but sometimes you just have to face facts. The jigs in this article are the keepers: workhorses deserving rest, but never put out to pasture.

Crosscut Sled

There are probably hundreds of designs for table saw crosscut sleds. I borrowed this one from my original partner-in-crime, former *Today's Woodworker* editor Chris Inman. The purpose of a crosscut sled is to add a high level of safety and accuracy to several tasks, such as crosscutting, mitering and dadoing. The drawings at right explain how the jig is assembled. The runners on the bottom of the sled

must match the spacing of the miter gauge slots on your specific saw. The only tricky part to this jig is the curved T-slot on the the deck. To mill it, make a simple circle cutting jig by mounting your router on a strip of 1/4" hardboard. Drill a 5/16" hole in one end and use the 5/16" carriage bolt to align this with the pivot hole you drilled in the base. Chuck a 3/8" straight bit in the router, then place the router on the jig so the bit is centered in either of the 3/4" diameter holes. Attach the router to the circle jig, set the bit height so it's the same depth as the 3/4" holes, and make the first cut. (You might want

to do this in several passes, depending on the power of your router's motor and the sharpness of the bit.) Change to a T-slot bit to make the second cut: the 3/4" holes are wide enough to set that bit below the surface to start this cut, which has to be made in one pass. Beyond that, this is a simple project to complete; just pay careful attention to the material list and elevation drawings at right.

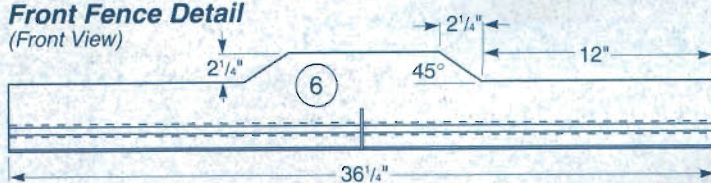


CROSSCUT SLED

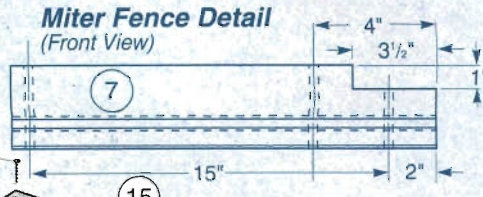


With this table saw jig, an old favorite of Rick's, dados, miters and crosscuts are easier, safer and more accurate than ever.

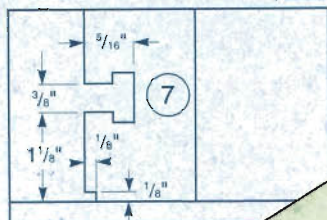
Front Fence Detail
(Front View)



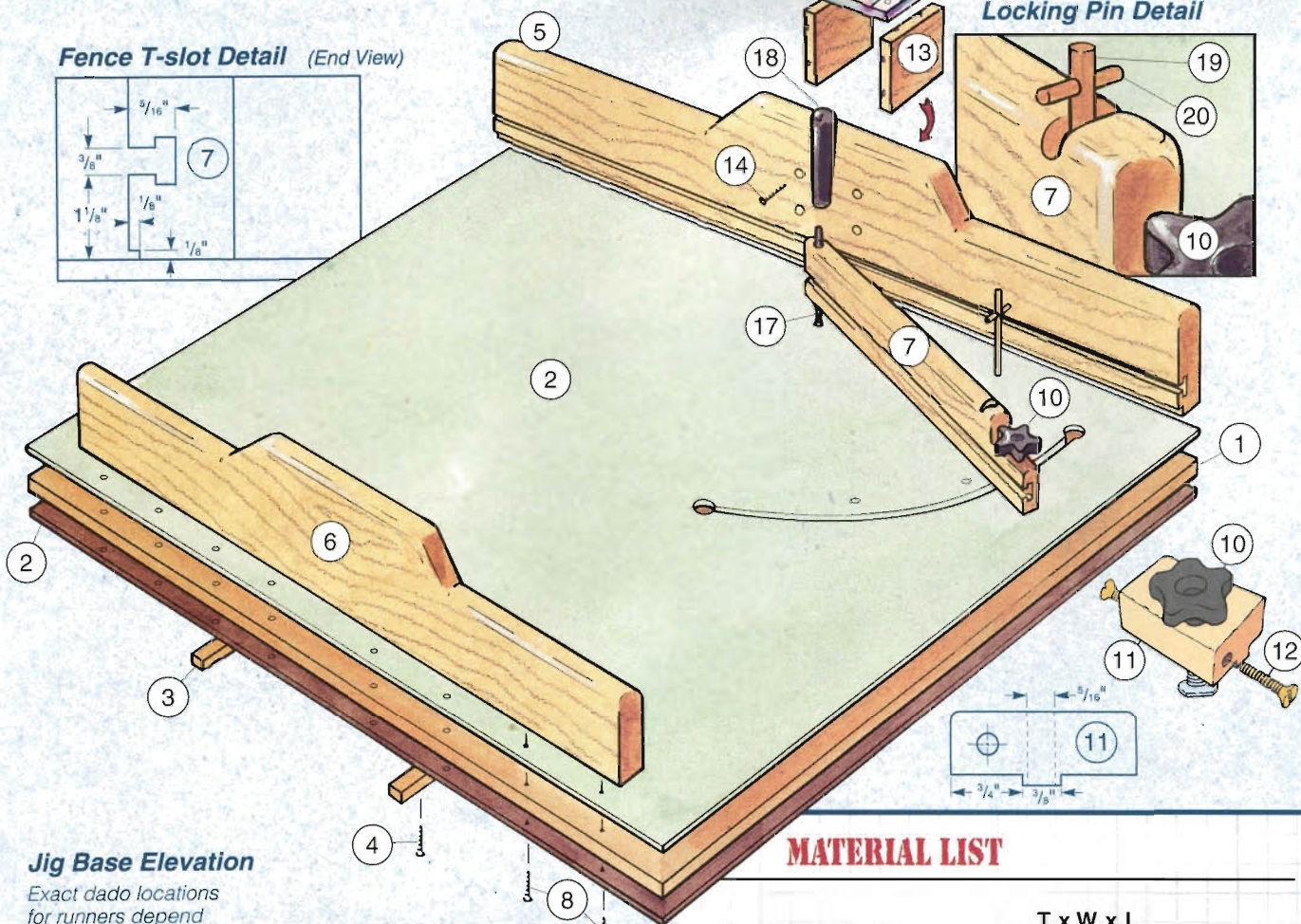
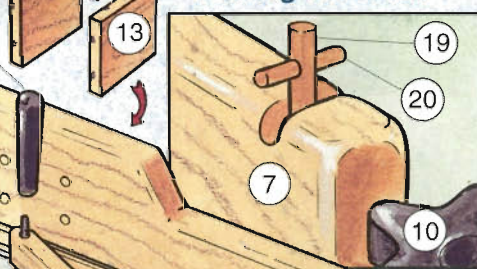
Miter Fence Detail
(Front View)



Fence T-slot Detail (End View)

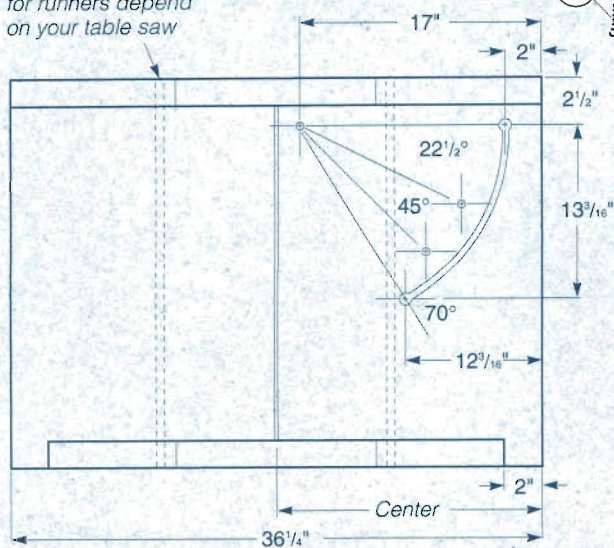


Locking Pin Detail



Jig Base Elevation

Exact dado locations
for runners depend
on your table saw



MATERIAL LIST

	T x W x L
1 Plywood Core (1)	1/2" x 27" x 36 1/4"
2 Plastic Laminate (2)	1/16" x 27" x 36 1/4"
3 Runners (2)	3/8" x 3/4" x 27"
4 Screws (16)	#8 x 3/4" Flat head
5 Front Fence (1)	1 1/2" x 5 5/8" x 36 1/4"
6 Rear Fence (1)	1 1/16" x 5 5/8" x 32 1/4"
7 Miter Fence (1)	1 1/16" x 3 1/2" x 17 3/4"
8 Screws (16)	#8 x 1 1/2" Flat head
9 Short T-bolts (2)	5/16" x 1 3/4", 18 Threading
10 Hold-down Knobs (2)	5/16", 18 Threading
11 Stop Block (1)	3/4" x 2" x 2"
12 Micro Adjust Bolts (2)	1/4" x 1 1/2", 20 Flat head
13 Guard Walls (2)	3/4" x 4" x 4"
14 Screws (4)	#8 x 2 1/2" Flat head
15 Plastic Shield (1)	1/4" x 4" x 4"
16 Long T-bolt (1)	5/16" x 3 1/2", 18 Threading
17 Carriage Bolt (1)	5/16" x 4", 18 Threading
18 Post Handle (1)	5/16", 18 Threading
19 Locking Pin (1)	3/8" x 5"
20 Cross Dowel (1)	1/8" x 1"



THE EASIEST CENTERED MORTISES



There isn't much to this next jig, but it's been one of my favorites for years. It's a mortising guide that automatically centers itself on the edge of just about any board. With it, you'll cut perfect mortises every time, right down the center of your workpiece. All you need is a plunge router and a straight bit the width of your intended mortise. Clamp a 1/4" piece of plywood to one side of your stock, and you can even form an off-center mortise. Like most of the jigs that earn a spot in my shop, flexibility and ease of use are key.

The jig is just a simple, 3/8" thick Plexiglas® router base, with ten holes drilled in it. Two of these holes are occupied by 5/16" ID bearings in place with the help of a washer and aircraft nuts. (These bearings are available from Eagle America; call 800-872-2511.) The bearings can be

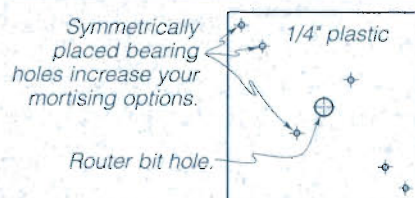
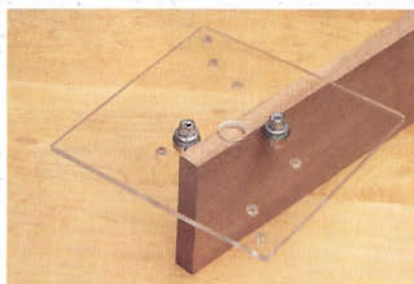
Here's a fail-proof jig to help you center a mortise on any sized edge easily and accurately.



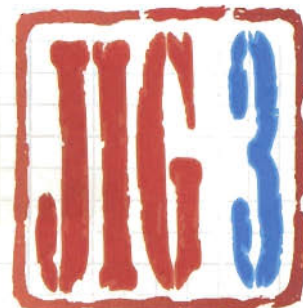
moved to any set of mated holes, to accommodate various board thicknesses. Three holes are used to mount the base to the router, and the last hole is for the bit.

To change the width of a mortise, just change the bit to one of a different diameter. You can even leave this base on the router permanently as a replacement for the original base if you wish. In that case, you'll just have to remove the bearings when you're performing other tasks. For such a simple jig, it's amazing how often I find myself reaching for it.

Drill extra bearing guide holes closer together for mortising narrower stock. This allows you to get closer to the ends of a board.



Drill countersunk holes to match your router base.



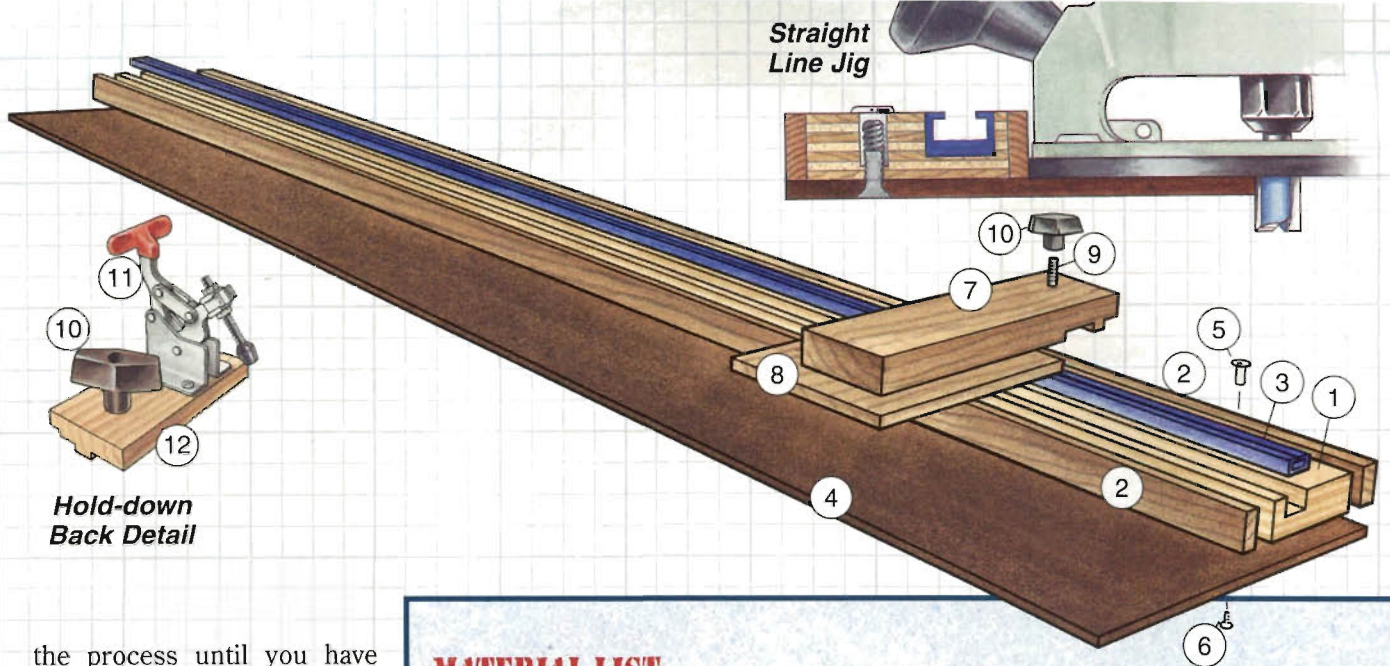
STRAIGHT LINES ON TARGET

Use this jig to rout a stopped or through dado, or even to rip a straight edge on your table saw.

Reach for Jig #3 whenever you have to straighten a rough edge or plow a groove. This jig is a multi-use straightedge, designed to custom fit your portable router. The router runs along its fence, and that guides a straight bit along a hardboard template attached to the bottom of the fence. Whenever you need to make a cut, just line up the edge of the template with your pencil line: you'll never again have to go through the old measure-and-clamp routine. The jig also performs a bonus function on the table saw: more on that later.

The heart of the jig is a very straight, jointed plywood fence (piece 1). This is sealed along its two ripped edges with strips of solid hardwood banding (pieces 2). A groove is then plowed in the top, to house an aluminum T-slot track (pieces 3).

Cut one 1/4" hardboard template blank for each straight bit you own. Each of these templates (pieces 4) should be 7" wide to begin with. Attach the first template to the bottom of the jig with binding posts (pieces 5 and 6), then install your largest straight bit in your portable router. Run the router along the fence, and it will trim the template to size. Use a permanent marker to note the bit size on the template, then chuck the next largest bit in the router. Attach a new template, and repeat



**Straight
Line Jig**

**Hold-down
Back Detail**

the process until you have individual, marked templates for each of your commonly used bits.

If you stopped right there, you could make any through groove, rabbet or dado you want with this jig. To tackle stopped cuts, you need to add a pair of adjustable stops that will limit the router's travel.

The adjustable stops are simply short lengths of stock (pieces 7), each of which is attached to a base (piece 8) with glue and clamps. These bases need to be a little wider than the stops, so they won't interfere with the router's travel (otherwise, the machine's handles might hit the stops). The wide bases also keep the stops aligned at 90° to the fence.

The stops are secured to the jig with T-bolts and knobs (pieces 9 and 10), which make them adjustable along the entire length of the fence.

Earlier, I mentioned a bonus function of this jig, and here it is. By attaching a couple of toggle clamps (pieces 11) to a spare set of hold-down bases (pieces 12), you can clamp an S2S board to this jig. Then you can run the jig along your table saw fence and trim one edge of a rough board straight.

MATERIAL LIST

	T x W x L		T x W x L
1 Fence (1)	3/4" x 2 1/4" x 60"	7 Stop Blocks (2)	3/4" x 2 1/2" x 7"
2 Fence Banding (2)	1/4" x 3/4" x 60"	8 Stop Block Bases (2)	3/4" x 4 1/4" x 5 1/2"
3 T-slot Track (2)	3/4" x 30"	9 T-bolts (4)	18 5/16" x 1 1/2"
4 Templates (3)	Cut to fit	10 T-knobs (4)	18 5/16" Plastic
5 Nuts (5)	Binding post nut	11 Toggle Clamps (2)	Steel
6 Bolts (5)	Binding post	12 Hold-down Bases (2)	3/4" x 1 3/4" x 4"



The hold down option on the jig will allow you to slice a straight edge on a rough piece of stock.



CUTTING DUST

The last of my favorite jigs is designed for anyone who wants to breathe a little easier. This simple downdraft sanding table removes fine dust from my shop as I sand.

Storing it is easy. The case is only the thickness of a 2 x 4, so it hangs neatly out of the way on the shop wall. (You can make the sidewalls higher if you need to accommodate a larger dust hose.) When it's on the workbench, that thin profile also means the top of the jig is low enough to work on without raising my arms too high — which is a prescription for fatigue.

A downdraft table for your day to day sanding doesn't have to be an intricate, time-consuming project with squirrel-cage fans and layers of filters. This little beauty comes together in one afternoon and will handle the lion's share of your shop dust.

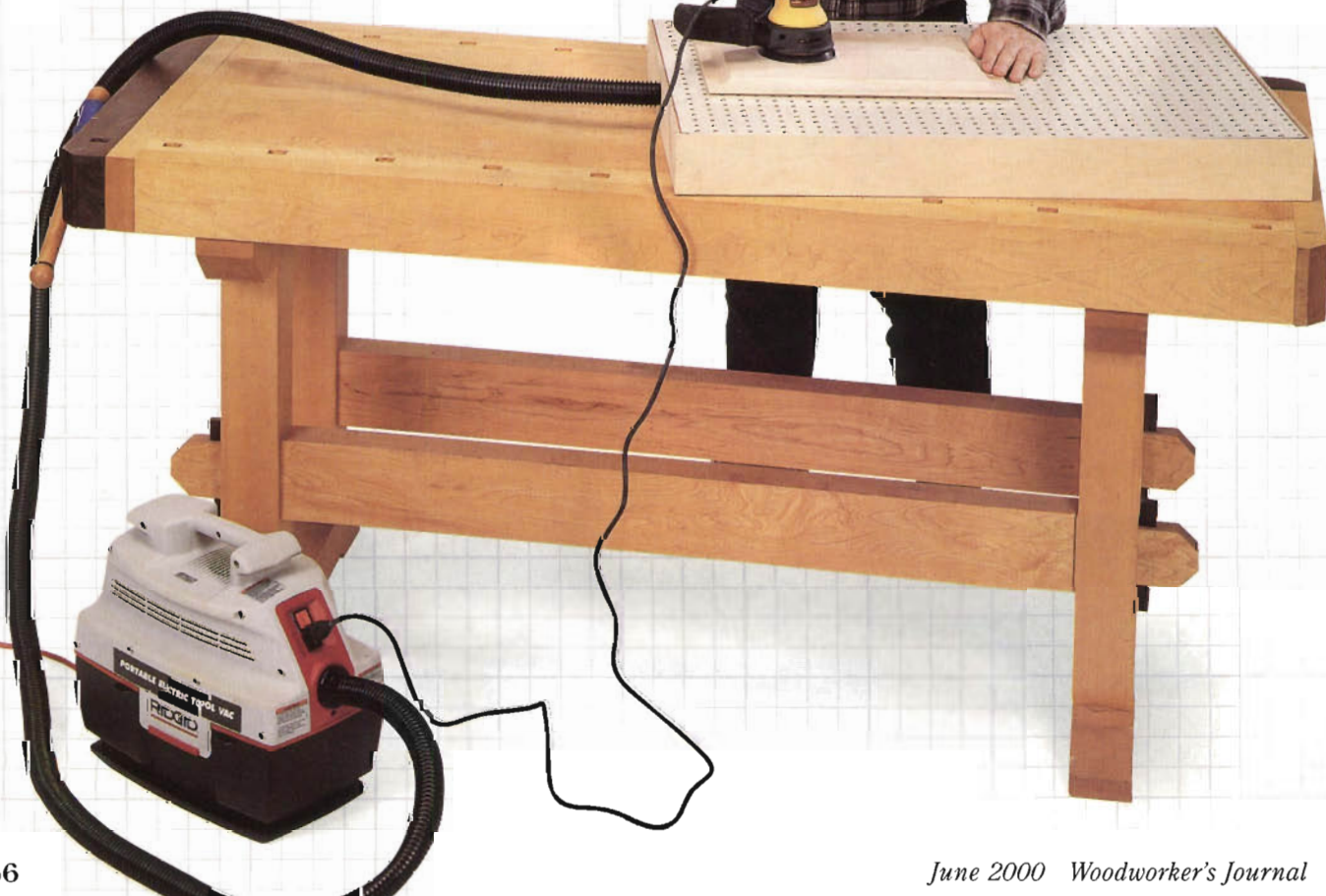
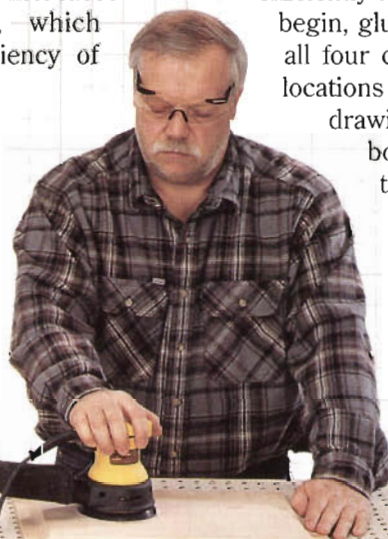
With small parts, I just lay the jig on the bench. To increase the efficiency of the downdraft box, I cover the unused area of the top with paper or hardboard, increasing suction in the section I'm using.

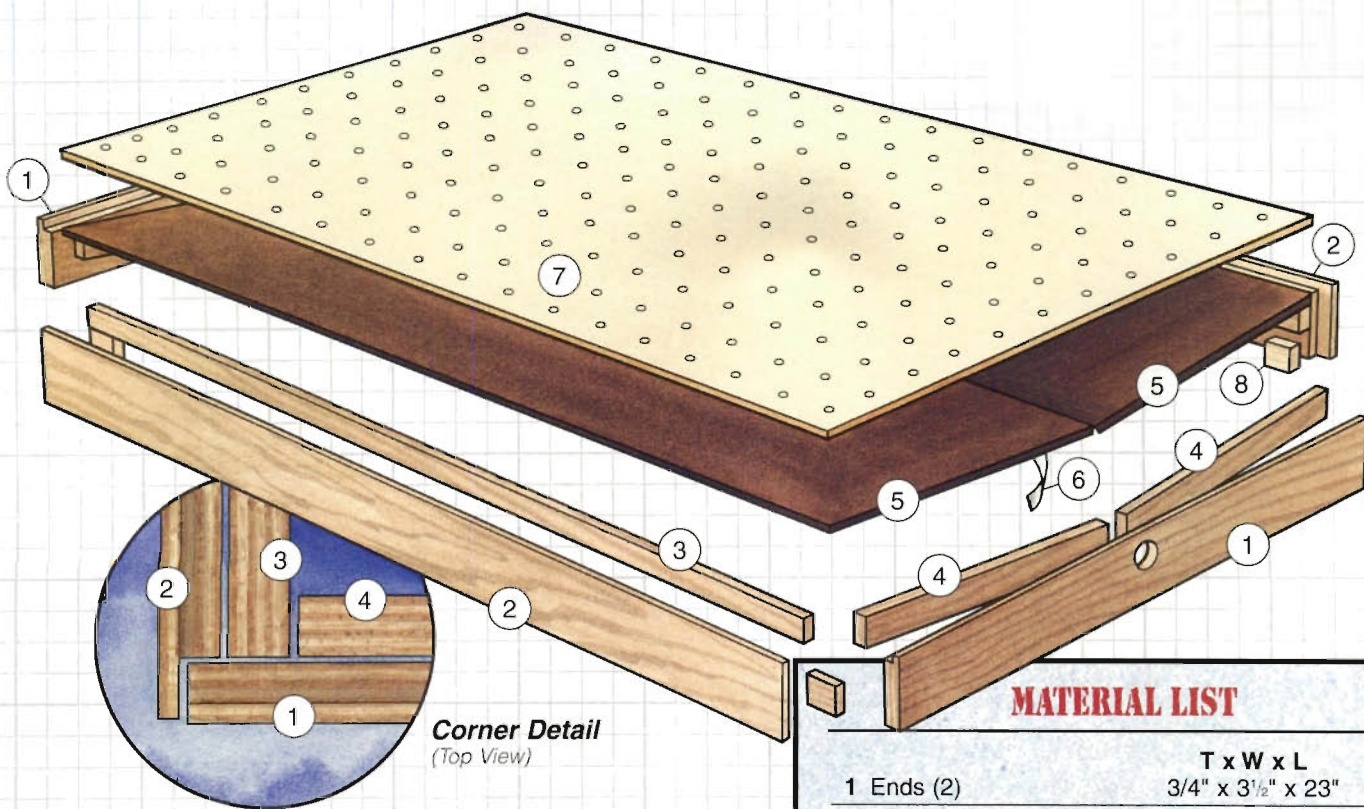
The jig is essentially an air box. By maintaining a thin profile, you can keep the volume of air to a minimum. This increases the airflow rate, which improves the efficiency of the jig.

Start construction by cutting the ends, sides, and cleats (pieces 1 through 4) to size, then secure the corners with glued and nailed butt joints. Cut the bottoms next (pieces 5), and install them in two halves to form a slight V-shape, as shown in the **Exploded View** at right.

The V-shape creates a valley that catches dust and funnels it more efficiently toward the vacuum. To begin, glue and nail (or screw) all four cleats in place, at the locations shown on the detail drawing at right. Cut the bottom to size and temporarily install the two halves.

This tabletop downdraft jig is a handy to use, easy to store addition to anyone's shop.





Corner Detail
(Top View)

MATERIAL LIST

	T x W x L
1 Ends (2)	3/4" x 3 1/2" x 23"
2 Sides (2)	3/4" x 3 1/2" x 36"
3 Long Cleats (2)	3/4" x 1 1/2" x 34 1/2"
4 Short Cleats (4)	3/4" x 1 1/2" x 20 1/2"
5 Bottom Halves (2)	1/4" x 11" x 34 1/2"
6 Bottom Tape (1)	Duct tape
7 Top (1)	1/4" x 23" x 35 1/4"
8 Glue Blocks (4)	3/4" x 1" x 1 3/8"

Clamp a few scraps to the sides, just to hold the bottom in place for a minute. Then turn the jig upside down and apply duct tape (piece 6) along the joint. Turn the jig back upright and secure the bottom to the cleats with small nails or panel pins, squaring the box as you go.

The top (piece 7) is nothing more than a piece of 1/4" pegboard. I used a brand with a finished face to help prevent scratching. You can

cut it to rest on the top and secure it with duct tape, or trim it to fit just inside the box and let it rest on the bottom. Either method allows for easy replacement when it gets a worn. If

the top flexes too much, add a couple of band sawn triangular cleats to the carcass ends to support it.

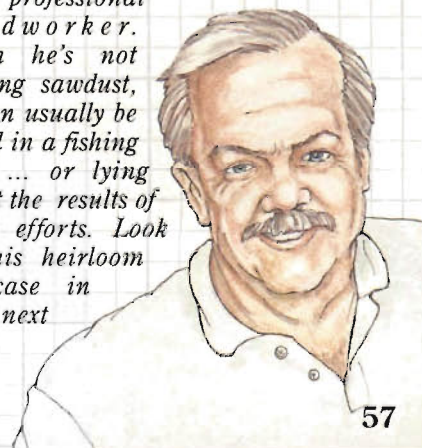
Attaching a vacuum or dust collector hose is generally just a matter of drilling the right size hole for the hose end. Some manufacturers offer flanges that can be screwed to the box: the hose is then held to this flange with a friction fit. One of my own collectors has hoses that perfectly match the steel flanges used on electrical circuit breaker boxes. Bring your hose to a home center and spend a little time in the plumbing aisle to find the right connector. Virtually any size dust collector will work with this jig, but it goes without saying that bigger is better — just be sure to wear ear plugs.

It was hard narrowing down to just four jigs. My shop is full of little dandies from hinge mortising jigs to roller stands to elaborate tenoning jigs for the table saw. But if I had to pick four jigs that I couldn't get along without, these would take top honors in my shop.



Rick used a shop vacuum with a special switch designed to be used with dust-creating power tools. When you plug your sander into the vacuum, each time you start the tool — the vacuum starts. When you turn your tool off, the vacuum continues for a short time.

Rick White is a contributing editor for Woodworker's Journal and a long time professional woodworker. When he's not making sawdust, he can usually be found in a fishing boat ... or lying about the results of those efforts. Look for his heirloom bookcase in our next issue.



Start to Finish: The Endurance Test

By Michael Dresdner

Picking the “right” finish for your most recent woodworking triumph seems like a daunting task, what with all the confusing array of choices on the paint store shelves. However, with a logical approach and a “scorecard” to help, it is a fairly easy process.

Durability

The three primary questions you need to answer before you begin your finishing are: durability (what must the finish endure), appearance (what should it look like), and application (how do you want to apply the finish ... rag, brush, spray gun, pad, etc.).

Perhaps most important of the three, “What must the finish endure?” is the question I ask first. Not all pieces will get the same treatment. An art turning, for

example, will be handled gently and rarely over its lifetime, and can get by with nothing more than a coat of oil or wax. By contrast, a kitchen table or countertop may be asked to endure hot coffee pots, scratches from cutlery and china, food stains, and even chemicals and strong cleansers. Patio furniture finishes will have to tolerate wide swings in humidity and temperature, while floors and baseboards will want a tough finish that takes and “hides” dents. Some kitchen objects, like wooden spoons and cutting boards, may do best with no finish at all.

You’ll know best how gently or roughly the furniture in your house will be handled. I use the following guidelines as reminders of what is typical for various pieces of furniture and what the finish might have to endure.

Bathroom and dressing room: humidity swings, nail polish remover and alcohol (in perfumes).

Fireplace mantles: high heat and humidity variations.

Kitchen cabinets, tables or counters: heat, scratches, food stains, chemical cleaners and abrasive cleansers.

Floors: serious abrasion, dents and heavy wear.

Living room/bedroom furniture: moderate to light abrasion.

Patio furniture: wide humidity and temperature changes, water and sun (UV damage).

Bookcases, picture frames, boxes and ornamental wood: light wear (most any finish will be appropriate here).

Another major consideration when it comes to durability is how thickly the finish is applied. A very thin finish, no matter what its

The author starts by asking “what must the finish endure?” Some projects will be expected to withstand hot coffee pots, scratches from keys, food stains and even chemicals and strong cleansers. Make sure they’re adequately armed to face these finishing indignities.



3 FINISHING QUESTIONS

Approach every finishing job by answering these three questions:

1 Durability: what indignities must your finish endure?

2 Appearance: what do you want your project to look like?

3 Application: how do you want to apply the finish ... spray gun, rag, brush, pad, etc.?

nature, will not protect as well as a thicker version of the same finish. There are limits, of course. Most finishes will crack or "check" if they are applied too heavily. A good rule of thumb is to keep finishes below 8 mils to prevent checking, and above 3 mils for good durability. A mil is .001" (one thousandth of an inch). By way of comparison, a typical sheet of copier paper is just under

4 mils. One sprayed coat typically adds about one mil when dry, a wipe-on coat less than half of that, and a brushed coat about 2 mils. If you sand between coats or rub afterward, that will reduce the thickness. A wash coat on the raw wood counts as zero mils.

Appearance

Of course, stains will change the color of wood, but clear finishes also alter how wood looks. Most waterborne lacquers and polyurethanes are completely clear to slightly blue-gray. They will add almost no color to white woods like maple, holly, or spruce. Shellac and lacquer are slightly amber, and will

add a bit of warmth and color to the wood. Oil, Danish oil, and oil-based varnishes and polyurethanes tend to add the greatest amount of amber color, especially with several coats applied.

There is a more subtle effect that shows up in certain woods. With figured woods, like curly or bird's-eye maple, you can actually use the finish to intensify the

figure, or "pop the grain," even without adding any stain. The best grain popper I've found is boiled linseed oil, but shellac, lacquer and most oil-based varnishes work almost as well. If you apply one or two coats of oil to a piece of figured wood, it will add depth and make the figure fairly jump out at you. This characteristic is called "chatoyance," from the French "like a cat's eye." If you've ever seen the semi-precious stone called "Tiger-Eye," you'll notice that as you change your viewing angle, the light and dark bands of color change places. You can get a similar effect by adding linseed oil to certain woods, such as figured maple and ribbon mahogany.

Finishing Thoughts continues on page 60 ...

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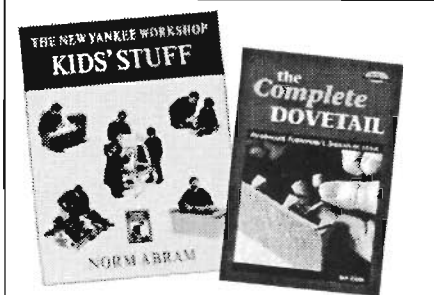
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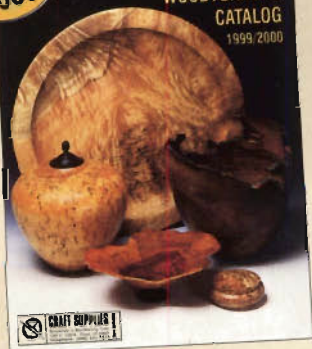
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FINISHING THOUGHTS

Application

The truth is that most finishes can be applied in most any manner. Shellac, for example, can be wiped on with a rag, brushed, or sprayed. The same is true of Danish oil, varnish, and most water-



Most finishes can be applied in variety of ways. Here editor Rob Johnstone experiments with spraying shellac on a prototype from this issue after a little encouragement from the author.

bornes. But some finishes lend themselves more to one applicator or another, and some are even specifically formulated for

a particular application method.

Waxes and jelled finishes are specifically designed for wipe-on/wipe-off application, and are too thick to spray or brush. Though most any varnish or polyurethane can be wiped on instead of brushed, some

are particularly designed for easy wiping and thin application and will say so on the can. Certain lacquers and conversion varnishes are

FINISHER'S SCORECARD: Common finishes and their characteristics

Wax — thin; apply by rag; easy to repair; poor chatoyance; sheds water but takes water marks; poor solvent, scratch and heat resistance; fair stain resistance.

Oil and Danish oil — thin; apply by rag; easy to repair; good chatoyance; good water, heat, and solvent resistance; poor scratch resistance; fair stain resistance.

Shellac — apply thin or thick by rag, brush or spray; easy to repair; good chatoyance; poor heat and alkali resistance; good water and scratch resistance; fair solvent resistance; good stain and acid resistance.

Lacquer — apply thin or thick by brush or spray; easy to repair; good chatoyance; poor to fair heat resistance; good water, scratch, stain and solvent resistance.

Oil varnish — apply thin or thick by

rag, brush or spray; not easy to repair; good chatoyance; good water, heat, solvent, scratch and stain resistance (if thick).

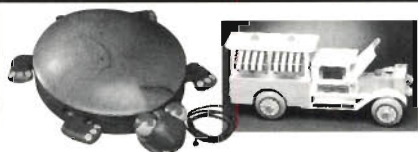
Polyurethane (oil base) — apply thin or thick by rag, brush or spray; not easy to repair; good chatoyance; good water and stain resistance; excellent solvent, heat, and scratch resistance.

Waterborne acrylic-polyurethane — apply thin or thick by pad, brush or spray; moderately easy to repair; poor chatoyance; good water, stain, solvent, heat, and scratch resistance.

Two part coatings (catalyzed lacquer, conversion varnish, automotive polyurethane) — apply thick by spray; very difficult to repair; excellent water, stain, solvent, heat and scratch resistance; chatoyance varies.

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that some woods
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certain clear
finishes.

designed for spraying and will dry too fast to be spread with a brush or rag.

In many cases, you can decide how to apply the finish after you choose the one you want to use. But be aware that some coatings work best with a particular applicator, and let that guide your choice. Also, remember that wiping a finish on and off will leave you with a thinner protective layer per coat than either spraying or brushing.

Making the Right Choice

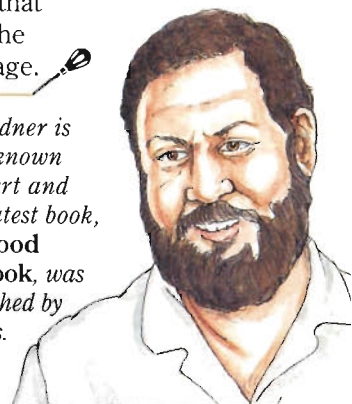
Once you choose the characteristics you need for the piece you are finishing, you simply have to match them up with the finish that fits. That is easier said than done. To do that, you need to know the characteristics of the finishes themselves

— which ones have good heat, stain, or scratch resistance, which can go on by rag, which are typically thin or can be applied thicker, which offer good chatoyance, and so on. To make that a bit easier, I've included a “scorecard” (see page 60) that rates the common finishes by their characteristics.

One More Caveat

There is one other consideration you might want to take into account when approaching a finishing job: repairability. I did not add it as a major question because in most cases we are not concerned with how easy a finish will be to repair. For those cases where it matters, I have added it as an item to the “scorecard” that appears on the preceding page.

Michael Dresdner is a nationally known finishing expert and author. His latest book, **The New Wood Finishing Book**, was recently published by Taunton Press.



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Mighty 12 Volt Drills

By Charles Self

From a tool that started its life a couple decades ago with grim to even worse power ratings, the cordless drill has grown to an army of 3.2 to 24 volt versions. Most woodworkers, however, rarely need the full power of even a 12 volt drill.

For most of us, woodworking with a cordless drill means running in a dozen or so #6 x 3/4" screws after drilling the pilot holes ... possibly countersinking the holes, and then moving on to other things while the tool rests. We want cordless drills with the delicacy to drive #4 screws, but with enough power to ram a few dozen 2 1/2" or 3" screws through cabinet backs and into wall studs when such work is at hand. Woodworkers want an easy handling drill with sufficient power and plenty of battery reserve, which is light in weight and a good value. Comfort, a good chuck, easily worked controls and durable batteries are all bonuses.

When examining the world of 12 volt cordless drills, I found many changes from their early years: longer-lived batteries and a larger choice of handle styles. Several makers now provide a 15 minute option for charging. Nickel metal hydride (NiMH) is a new battery material and is the likely replacement for our old NiCads.

The nickel cadmium types have always had disposal problems, something less difficult with NiMH.

These days, most craftsmen prefer two speed ranges: the top speed lets you drill quickly for pilot holes, while the lower range is great for driving longer screws. It is also important when using larger diameter drill bits. Forstner bits, especially in sizes over 1/2", are best run at speeds under 500 rpm. Faster speeds overheat the bit, ruining it for future use. It is possible to sustain a slower speed with trigger control only, but the fail safe feature of a 0 - 250, 0 - 350 or 0 - 450 speed range cannot be overestimated. A lower speed range also makes it easier to keep your drill bits from "walking," without resorting to a center punch.

Consumer Drills

For someone short of money, but absolutely in need of a cordless drill, either of the two consumer type drills I found make a good choice.

Black & Decker's blaze orange Firestorm HP331K-2

offers two dozen clutch positions, a three hour charge time, two NiCad batteries, a T handle and two speed ranges, 0 - 250 rpm and 0 - 900 rpm, with variable speed reverse. The keyless chuck accepts bits and accessories up to 3/8" in size. Overall, the drill looks

Firestorm HP331K-2

Price: \$79
0 - 250 rpm;
0 - 900 rpm

24 clutch positions

Black & Decker: 800-544-6986



Black & Decker's professional-looking HP331K-2 is more than sufficient as a woodworker's starter drill. Handle padding adds comfort.



Skil 2480-04

Price: \$79
0 - 700 rpm
6 clutch positions
Skil: 877-754-5999



The lightest duty tool in the test, the Skil 2480-04 has a single speed range. It's a very good entry-level cordless drill.

professional, feels good, has a nicely padded handle and works well. It is not as sophisticated a tool when compared to the powerhouses of this test, but is more than sufficient as a starter drill for woodworkers. The case has a nice exterior compartment for bits and accessories.

Skil's 2480 drill comes with a light and appeared to be the lightest duty tool I looked at in this group. It has six clutch positions, two NiCad batteries, and a three hour charger. The T handle configuration offers a single speed range, 0 - 700 rpm, and a keyless 3/8" chuck. This is a good entry-level cordless drill for the light duty stuff that comprises the lion's share of drill driver tasks.

Padded and Special Use Handles

DeWalt, as always, offers a wide range of 12 volt drills. Three met my criteria: two speed ranges (if possible); T handle; pistol grip; specialty grip. Numerically first, the DeWalt DW965K is a right angle 12 volt cordless drill that offers a single NiCad battery and a 60 minute charger (a 15 minute charger is optional for all DeWalt 12 volt batteries). The 3/8" keyless chuck operates cleanly and holds well.

The handle (and therefore the drill) is structured for special uses: in general shop use it quickly tires



**"What matters is that
the drill does what
you need it to do,
when you need it
done, with no hassle
and no excess stress
on either you or
the tool."**



the hand, but it is a doozy for getting inside cabinets and other structures that require you to screw in, for example, hinges and drawer glides. The switch is a long paddle style that makes it easy to operate the tool when it is stuck up in a corner somewhere and only a fingertip can reach the paddle to turn it on. The speed ranges are 0 - 450 and 0 - 1,200 rpm, with variable speed reverse. It's a little pricey, at about \$195 as described, but well worth it for these specialized needs.

DeWalt's DW971K-2 pistol grip keyless chuck 3/8" cordless drill offers a standard 60 minute charge time. It comes with two NiCad batteries and 24 clutch positions, working through speed ranges of 0 - 450 rpm and 0 - 1,400 rpm. That ties it with the DW972 and Makita's 6213DWBLE and 6313DWAE for top RPM honors. It has variable speed reversing, and the back of the grip is nicely padded, with the padding carried up far enough to protect the thumb web. Handling is good, and better if you like pistol grip drills. Price is about \$209.

The DeWalt DW972K-2 is the T handle 3/8" keyless chuck offering from Big Yaller.

This version comes with two NiCad batteries and a 60 minute charger. The DW972 is a clean handling drill I rated as excellent in use, battery duration, general ease of operation, and overall feel. Speed ranges are 0 - 450 and 0 - 1,400 rpm, just as with the DW971, and the slide switch operates easily. As with its companion pistol grip, the tool comes with two dozen clutch positions, a padded back on the T handle, and a good case. Price is about \$186.

Bosch's 3315K is an excellent handling T handled model, with 15 clutch positions, two NiCad batteries in the kit, and a one hour

Shop Test continues on page 64 ...



DeWalt

DW965K – Right Angle
Price: \$195
0 - 450 rpm; 0 - 1,200 rpm

DW971K-2 – Pistol Grip
Price: \$209
0-450 rpm; 0-1,400 rpm
24 clutch positions

DW972K-2 – T-Handle
Price: \$186

DeWalt: 800-433-9258

At 1,400 rpm, DeWalt's pistol grip drill had one of the highest speeds among drills in the test.



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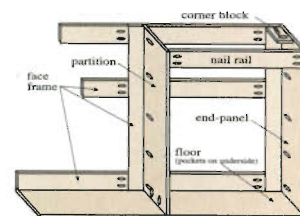
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3315K – T-Handle
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0 - 1,200 rpm
16 clutch positions
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a worklight and batteries with two amp hour capacity. The handle is unpadded but very comfortable. The drill is easy to handle.

The Makita drills have a more highly tipped snoot, or tip, than any of the others. Some people prefer lower angles, as featured on the DeWalt, while others prefer the Makita high tip. Given a few screw holes, tip angle did not appear to make any appreciable difference in handling ergonomics to me. You may find that it makes a difference to you, but when switching back and forth, I found little difference in how tired my hands and arms became while using the different types.

Overall, the 6213DWBLE drill rates excellent in handling, battery charge duration, and general use.

Cost is about \$219. The 2.2 amp hour NiMH battery makes no

apparent difference in performance at this level, but has other advantages, including longer run times and in the future, greater amp hour capacity possibilities.

Makita's second offering is the 16 clutch position 6216DWBE. This is another NiMH drill, with two 2.2 ampere hour batteries, a 60 minute charger, and a keyless 3/8" chuck. It's a T handle, with the high angle, with running speeds of 0 - 450 and 0 - 1,300 rpm, as well as variable speed reversing. The overall handling is similar to the 6213DW; the difference is top speed and number of clutch positions. Price is slightly higher, at around \$239.

Makita's 6313DWAE also has six clutch positions, with two, two ampere hour NiCad batteries, a T handle, 0 - 450 rpm low range and 0 - 1,400 rpm high range, and variable speed reversing. The battery charger takes 60 minutes to a full charge, and the keyless chuck has a 1/2" capacity, the largest in the review samples. Similar in construction to the other Makita drills, this sturdily made

charge. A 15 minute charger is optional for the 1.7 ampere hour batteries. The T handle is unpadded, but has excellent handling characteristics: those with small hands may find the spread at the handle butt a bit wide, but for those with average and above sized hands, it's just fine. Overall, an excellent drill, with keyless 3/8" chuck, 0 - 400 low speed range and 0 - 1,200 high speed range, and variable speed reversing, available at about \$169.

Low Bulges, High Tips

I'll start **Makita** with the 6213DWBLE, an excellent six clutch position drill with a NiMH battery and a T handle. It comes with two batteries and a one hour charger. Speed ranges are 0 - 450 and 0 - 1,400, with variable speed reversing on this 3/8" keyless chuck model. This kit includes



Makita

6213DWBLE – Price: \$219
0 - 450 rpm; 0 - 1,400 rpm
6 clutch positions

6216DWBE – Price: \$239
0 - 450 rpm; 0 - 1,300 rpm
16 clutch positions

6313DWAE – Price: \$209
0 - 450 rpm; 0 - 1,400 rpm
6 clutch positions

Makita: 800-462-5482



Makita's drills have a more highly tipped snoot, or tip, than any others in the test. Some people prefer this handling, while others like DeWalt's low angles. As far as ergonomics go, our tester found that it didn't matter.

unit handles very well in almost all reasonable uses. Price is \$209.

Hitachi presents a single 12 volt drill, with its T handle DS13DV2. The 3/8" keyless chuck works well, and overall feel of the tool is fine. The battery top (the part that inserts into the handle) causes the tool to be designed with a low down bulge that is uncomfortable for some hands and extra comfortable for others. The DS13DV2 comes with two NiCad batteries, a 60 minute charger and 22 clutch positions. Speed ranges are 0 - 350 and 0 - 1,200 with variable speed reversing. An electric brake eases transition from one screw, or drill hole, to the next. Overall, a nicely made tool that comes in at a good price, \$168 on average.

Hitachi DS13DV2

Price: \$168

0 - 350 rpm; 0 - 1,200 rpm

22 clutch positions

Hitachi: 800-546-1666

Hitachi's two speed switch is located on top of the drill's barrel.



A battery bulge near the bottom of Hitachi's single 12 volt drill is uncomfortable for some — but extra comfortable for others.



Shop Test continues on page 66 ...

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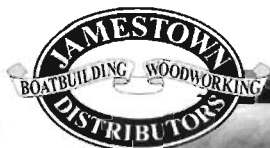
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SHOP TEST

Reversible Batteries

Milwaukee's pistol grip entry is the 0501-23, priced at about \$195. The unit has a 20 position clutch and comes with two 1.4 amp hour NiCads (2.0 are available), and a 60 minute charger. The back of the grip is padded, and the keyless chuck is 3/8" in capacity. Handling is good and can be changed to fit the situation. Every other cordless drill I checked uses batteries that insert into the handle; the Milwaukee drills use a slip-on battery than can be reversed to change the handling of the tool by changing the balance a bit. It works, and is a very nice touch. Speed ranges are 0 - 360 and 0 - 1,100, with variable speed reversing. The electric brake is a nice touch, too, letting you go from one screw, or hole, to the next without the bit spinning. Electric brakes are time savers.

Milwaukee enters the T handle arena with the 0502-03, again at around \$195, with a 20 position clutch, two 1.4 amp hour batteries, and a 60 minute charger. Again, 2.0 amp hour batteries (the model number becomes 0502-20) are available. Speed ranges are the same as for the pistol grip model, 0 - 360 and 0 - 1,100, with variable speed reversing. This battery may also be repositioned to change handling, but in this configuration, it seems to be a waste of time. Handling is excellent. The electric brake is a help when moving from one spot to another to drive or drill.

Up-to-Date T Handle

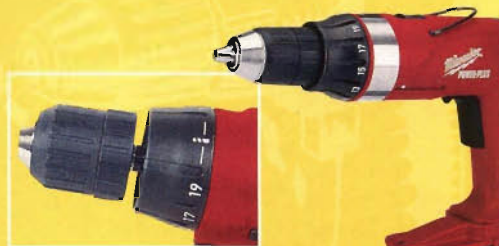
Ryobi's pistol grip 12 volt cordless drill is the CD125. The drill offers six clutch positions, two batteries, a 60 minute charger, and two speed ranges, with low giving 0 - 300 rpm, and high running from 0 - 1,000 rpm. The keyless chuck is 3/8" capacity, and there is no padding on the handle. The drill handles

Milwaukee

0501-23 – Pistol Grip
0 - 360 rpm; 0 - 1,100 rpm
20 clutch positions
Price: \$195

0502-23 – T-Handle
Price: \$195

Milwaukee: 877-729-3878



Milwaukee's slip-on battery, which can be reversed to change the tool's handling and balance, works well for the pistol grip.

well, but not superbly. It is a shade lower in power and battery durability than the other drills in the review, but is also lower in cost than most. For those needing a solid entry-level drill with a pistol grip, the Ryobi CD625 is a good offering at around \$125.

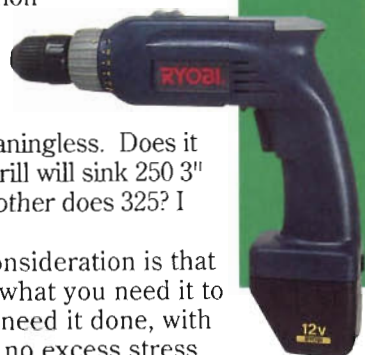
Ryobi's T handle offering is more up-to-date than the pistol grip, with a padded back and thumb position, two dozen clutch positions, two NiCad batteries and a one hour charger. Speed ranges are 0 - 375 and 0 - 1,350 rpm. The 3/8" chuck is keyless, and the electric brake speeds up operations. Overall, this is a durable tool that handles a bit better than any other tool in the review. I do have some concerns about the drill's overall power and battery durability. Price is right around \$130.

Conclusion

In general, I found these 12 volt drills to be excellent values for the money, with a savings of as much as \$40 (within the same brand) when compared to 14.4 volt drills. There is also a savings in weight, as the batteries and motors are lighter in all these models than those in the 14.4 volt range.

I didn't do the standard "drive a few hundred" tests on screws, because such tests within the context of the non-commercial woodworking shop (we hobbyists) are essentially meaningless. Does it matter if one drill will sink 250 3" screws and another does 325? I don't think so.

The main consideration is that the drill does what you need it to do, when you need it done, with no hassle and no excess stress on either you or the tool. For most common woodworking applications, these 12 volt drills are excellent. They are comparably light and easily manipulated: they are well made and durable.



Ryobi
R10510K2 - T-Handle
Price: \$129

CD125 - Pistol Grip
Price: \$125
0 - 300 rpm; 0 - 1,00 rpm
6 clutch positions

Ryobi: 800-525-2579



Ryobi's T handle is more up-to-date than its pistol grip: the R10510KS has 24 clutch positions and speed ranges of 0 - 375 rpm and 0 - 1,350 rpm.

After choosing your new drill, one of the first things to do is to try it with different size screws at different clutch settings in different woods. Make up a set of shop notes on the results. (A clutch position that lets the drill drive a 3" screw through 3/4"



MDF backer board and into a stud is enough to drive the same screw right through, and out the other side, of a 1 1/2" piece of butternut.) As with all tools, the more familiar you are with the tool, the better the results you'll get.

Before you make your purchase, I strongly suggest you handle the drills you are thinking of buying: most are widely available, and you can do your test handling, checking out as many as you need to before buying (regardless of where you buy). Check prices versus features, company reputation and service centers, and then try handling the drills that top your list. Select the best buy among that group on that day, and I believe you'll be well satisfied for a long time.

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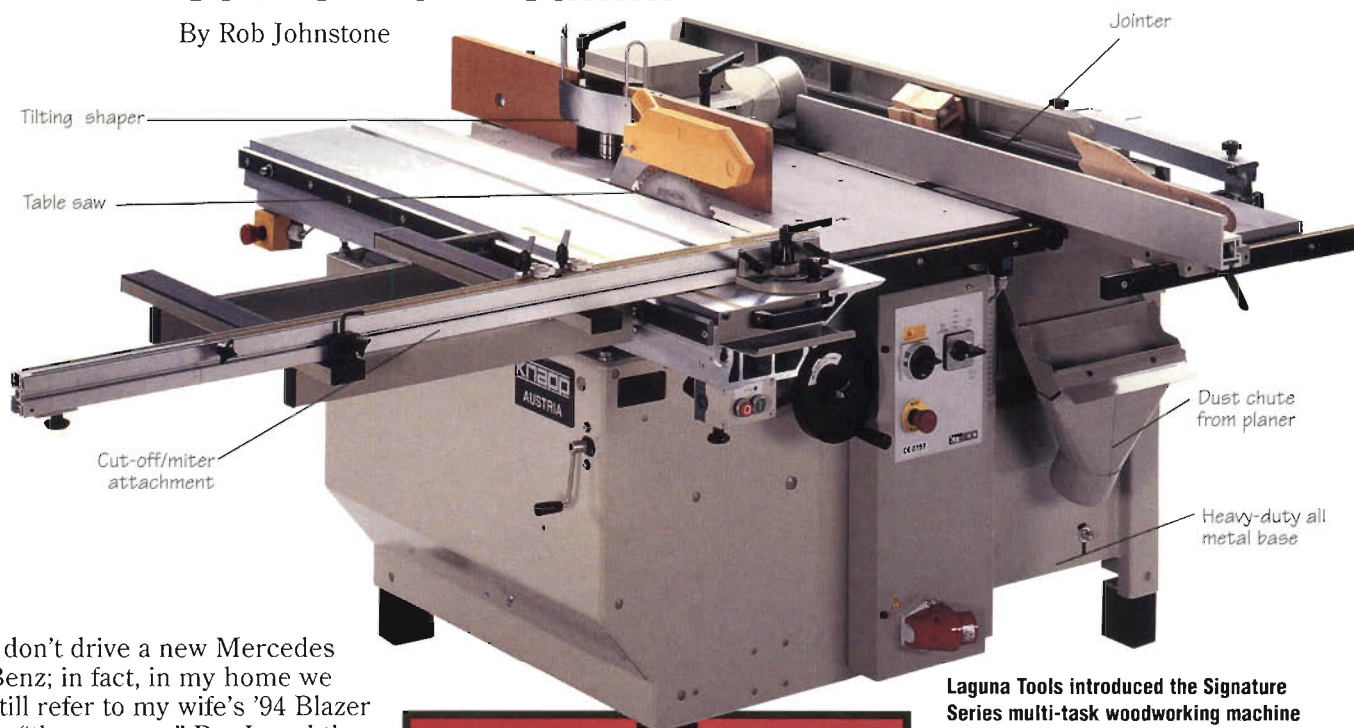


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(Circle No. 141 on PRODUCT INFORMATION form)

California Dreamin'

By Rob Johnstone



I don't drive a new Mercedes Benz; in fact, in my home we still refer to my wife's '94 Blazer as "the new car." But I read the motoring section of my local paper every Sunday to bone up on the latest engineering marvels rolling off production lines around the world. And I still look longingly at shiny transportation wonders that cruise by me on the freeway ... even though most of them cost more than my first house!

In the same way, as I strolled through the aisles of the Anaheim woodworking show, I felt drawn to a large machine gracing the floor of Laguna Tools' booth. It was commanding in its presence, and as you instinctively understand a luxury car's engineering superiority, I knew this machine was something special.

Austrian Import

The Signature Series by Laguna Tools may be the best made and most expensive combination machine in the world. California-based Laguna calls it a "series" because it is not just one machine; each machine is unique. They describe it as the industry's most "highly evolved combination machine" and, having spent the better part of an hour "test driving"

Tools by the Numbers

Motors (3) Siemens.....5.5 HP
Saw Blade.....14"
Jointer/Planer.....16"
Weight.....3,250 lbs.
Signature Series\$18,000 to \$35,000
Laguna Info.....800-234-1976
www.lagunatools.com

it, I would have a hard time arguing with their choice of words.

Made by Knapp in Austria, each machine is custom built for its particular owner, one at a time. (You even get a brass plaque with your name on it with your purchase.)

Knapp is not a neophyte to the combination or multi-task woodworking machine market. In fact, they were one of the very first to design and build a universal combination machine, almost 100 years ago. They continued to refine the concept, culminating with the Signature Series. After their European success was well established, Knapp looked around for a U.S. partner. They were

Laguna Tools introduced the Signature Series multi-task woodworking machine to North America at the International Woodworking Fair in Anaheim, California.

drawn to Laguna because of their long history of importing and promoting high quality woodworking tools. (Turn to page 70 for information on their Robland X31.)

Multi-tasking

You name the woodworking task, and the Signature Series can accomplish it. Ripping sheet stock: no problem. Cross cutting sheet stock or dimensional lumber ... piece of cake. Super accurate miter cuts — they're easy. Suppose



One of three 5.5 HP Siemens electric motors. Power is never a concern with Knapp's ultimate combination machine.



Shown above with the mortising accessory, the Signature Series combination machine is the "luxury car" of multi-task woodworking machines. Every Signature Series machine is custom built to meet each customer's specific requirements.

you need to plane some rough stock to a proper thickness and joint the edge before you rip it to size: just do it. In fact, on this specific machine, the jointer, planer, sliding cutoff/miter table and basic table saw features performed on par with the finest single use machines I've used. The same can be said about the shaper (the shaper head can tilt forward and back) and the mortising attachment ... all are of superior quality. And well they should be, when you consider these machines cost between \$18,000 and \$35,000, depending on how they are equipped.

Who's Buying

Torbin Helshoj of Laguna told me that in Europe, this machine would be found everywhere from professional cabinetmakers' shops,

to museums and even historic buildings needing a full-time craftsman to work on-site.

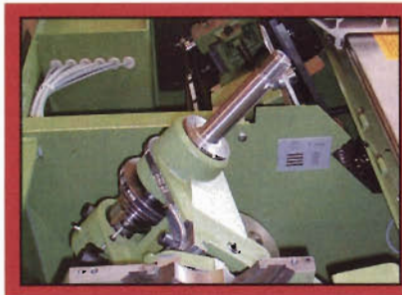
Here in the U.S., Torbin indicated that about half the machines are going to professional shops and the other half to upscale private woodworkers. "The timing was right to bring them over," he said. "The machines are selling well enough ... but we would like to sell more. I think we will; the interest is great."

I'm pretty sure I won't be purchasing a Signature Series machine any time in the near future (unless that's my ship I see on the horizon). But I sure wouldn't mind. Just as I imagine how good I'd look in a European sports car ... well, you get the picture.

Tool Preview continues on page 70 ...



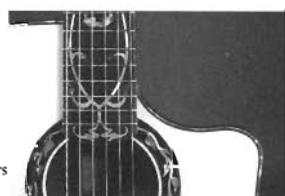
An extremely accurate miter/cutoff gauge. All of the elements of the sliding table saw system are engineered to exact tolerances.



The machine's impressive shaper holds up to a 1 1/2" dia. cutter. Its ability to tilt back 3° and forward 45° provides amazing shaping potential.

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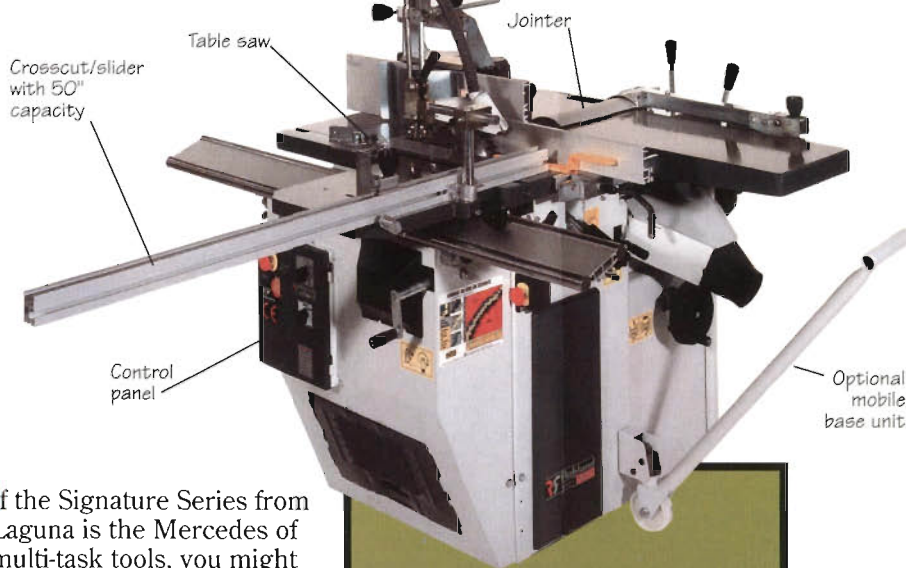
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Robland X31



If the Signature Series from Laguna is the Mercedes of multi-task tools, you might call the Robland X31 the Volkswagen: well built, but not as flashy — a steady, space-saving tool. The concept behind combination machines is simple. Why buy several expensive tools, each for a different task, when you can design a single machine which will perform many tasks. After all, you don't usually run your shaper and table saw at the same time, do you?

Some would argue that specific tools for each task are more convenient ... none of that fooling around changing your machine over each time you need to move on to the next task. And multi-use tool advocates would respond that each time you use a specific tool, you need to take a few moments to set it up for the specific task at hand ... so why not save floor space with a multi-use tool?

Robland X31

For some reason, the combination machine idea has always been more accepted in Europe than in the United States. I don't know if it has to do with our wide open spaces or with the fact that we build double-wide garages!

While the Signature Series may be beyond the means of many of us, it is not the only multi-use

woodworking machine around. In fact, Laguna offers the Robland X31 in the \$6,000.00 price range, and it is a fine piece of engineering in its own right. Not cheap, but take a moment to add up what you'd invest (or would like to invest) in stationary power tools ... did you say yikes?

Versatility is the key to the X31's success. The combination machine features a 10" table saw with 50" crosscut capacity, a 12" jointer as well as a 12" x 9" thickness planer. With its shaper and mortise attachment, the X31 seems to be a whole shop full of machines wrapped up in a single all-metal base. The machine is powered by three separate 3 HP motors (one reason set-up goes so quickly). A long-time offering of Laguna Tools (over thirteen years), the Robland X31 continues to be a successful, serious woodworking option for the hobbyist and professional alike.

Tools by the Numbers

Motors (3) German.....3 HP
Saw Blade.....10"
Jointer/Planer.....14"
Weight.....1,100 lbs.
Price.....\$6,000
Laguna Info.....800-234-1976
www.lagunatools.com

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- 1 HP, 120V, 10.0 amps
- No load speed: 1793 RPM
- Wheel diameter: 12" • Base: 13" x 10"
- Shipping wt.: 92 lbs.

~~\$119.99~~ **\$89.99**

ITEM 37297-3SDA

DELTA

OSCILLATING SPINDLE SANDER ATTACHMENT WITH SANDING SLEEVES

This attachment turns almost any drill press into an oscillating spindle sander. Accepts up to 3" sanding drums. Includes table with dust outlet, 1" and 2" steel inserts, 2 drive belts, gear box, belt guard, mounting bracket and hardware. 40 strokes per minute on 2" diameter drill chuck running at 2000 RPM; 3/4" stroke; 8-1/2" x 8-1/2" table; 2-1/4" diameter dust outlet; Includes 3 each of 80 and 120 grit sandpaper, 1/2", 3/4", 1", & 1-1/2"

~~\$59.99~~ **\$39.99**

ITEM 53574-1SDA

24 PC., 2-1/2" SANDING SLEEVE SET

Includes 3 each 80 and 120 grit sanding sleeves - 1/2" through 1-1/2"

ITEM 53510-4SDA **\$5.99**

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ITEM 37144-4SDA

B. 18 VOLT CORDLESS, 5-3/8" CIRCULAR SAW KIT

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ITEM 37412-7SDA

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ITEM 37145-1SDA

\$29.99

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ITEM 41290-0SDA

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RIP FENCE

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ITEM 40745-2SDA

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ITEM 38437-2SDA

CARBIDE TIP PLATE JOINER REPLACEMENT BLADE

- Blade teeth: 6 carbide tip teeth
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~~\$89.99~~ **\$69.99**

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- Cutter head size: 3"
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ITEM 30289-4SDA

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ITEM
38268-0SDA

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The Latest in German Engineering

With Metabo's new cordless drill/drivers, the venerable German company has introduced some innovative ideas. "These new models feature Metabo's patented impulse action, making them the only cordless line available in the marketplace with this technology," vice president of marketing David Smith said.

This intermittent, pulsed rotation allows the tool to excel at a variety of tasks, including loosening tight screws and unscrewing screws with damaged heads.

"The easier it is for a user to adjust the tool for his own needs, the more versatile the product is," Smith added. The five drills in the line are available

in 12, 15.6 and 18 volt models, with a maintenance-free motor, adjustable torque with up to 20 settings and a keyless chuck. Speed ranges are 0 - 450 rpm and 0 - 1,650 rpm. Available in T or pistol grip handles, some offer the "Plus" system, with higher torque and a more powerful motor.

Metabo, with headquarters in Nürtingen, Germany, has produced tools since its first metal-boring drill in 1924. The new drills range in price from \$188 to \$279.

For more information, call Metabo; 800-638-2264.



Earth-friendly Sanding Stones

You knew glass came from sand, but did you know sanding blocks could come from glass? Earthstone International's new abrasive blocks bring enviro-consciousness to the woodshop by grinding glass (from landfills) into a fine powder which makes up 98 percent of their lightweight, foam glass sanding blocks. Chemical- and odor-free, the QuickSand™ blocks strip, feather and prepare a variety of surfaces.

The blocks conform to the shape of most surfaces, but don't clog, tear on nails or screws, or leave a residue. Heavier, floor-bound dust particles eliminate clouds of sandpaper dust, the manufacturer claims. Removing paint, varnish and other coatings is another use for the QuickSand blocks, which sell for about \$4.99 each. *For more information, call 1-877-ECO-BLOCK or visit them at www.earthstoneintl.com.*

Keep 'em Sharp

Keeping blades sharper than ever is the goal of Diamond Machining Technology's new DuoSharp™ Diamond Stones for woodworkers — the first double-sided diamond bench stones on the market, according to DMT™. Featuring their monocrystalline diamond abrasive and quick cutting interrupted surface, the manufacture says the new stones also feature improved precision flatness — critical to woodworkers looking for the perfect edge. They come in four grit combinations, from 1,200 mesh/9 micron to 220 mesh/60 micron and two stone sizes, 8" x 2 5/8" (42 square inches of diamond surface) or 10" x 4" (80 square inches of diamond surface). An optional base is also available. Prices range from \$99 (for the 8" without a base) to \$155 (for the 10" with a base). *For more info, call 800-666-4DMT.*



Meet My Robot, PR96

ShopBot's Personal Robotic Tool (PR96) is the robot servant of your dreams. Provide a computer (PC with a 386 or higher processor) and router (standard 3/4 HP), and the ShopBot will work with your software ... routing multiple parts in a four foot by eight foot work area. It works with several different software options — and with drills or power tools. Program the pattern, then step back and watch your computer and your ShopBot rout, drill and cut with .002" recut



accuracy, 60 to 80 pounds linear cutting force and up to 120" per minute X, Y cutting movement speed. Cost of the PR96, available by mail order exclusively through Rockler Woodworking, is about \$3,995. Call 800-279-4441 for more info.



ShopBot's personal CNC router tool can cut while you work on something else. It's compatible with CAD and other software.

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D2271 ROLLER TABLE

Use this versatile roller table wherever you need extra workpiece support. Features all-steel welded construction and measures 19" x 65" long. Comes with 9 ball bearing rollers and has four independently adjustable legs for any leveling requirement. Adjustable in height from 26 1/2" to 44 1/2". **1000 lb capacity**



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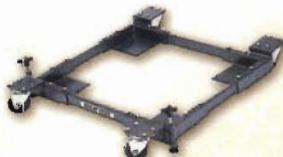
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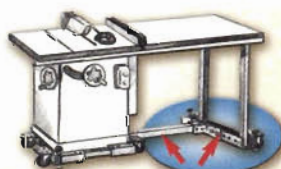
D2057 HEAVY-DUTY MOBILE BASE

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D2058 SUPER HEAVY-DUTY MOBILE BASE

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- 1200 lb capacity



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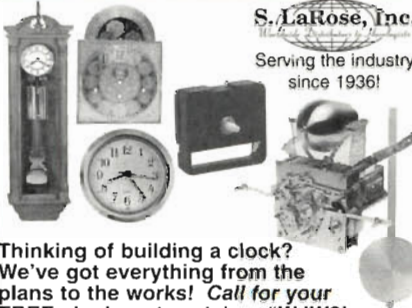
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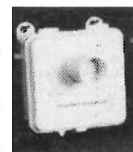
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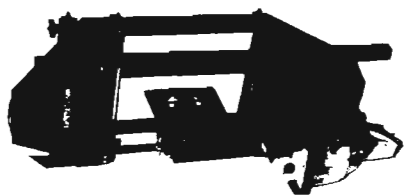
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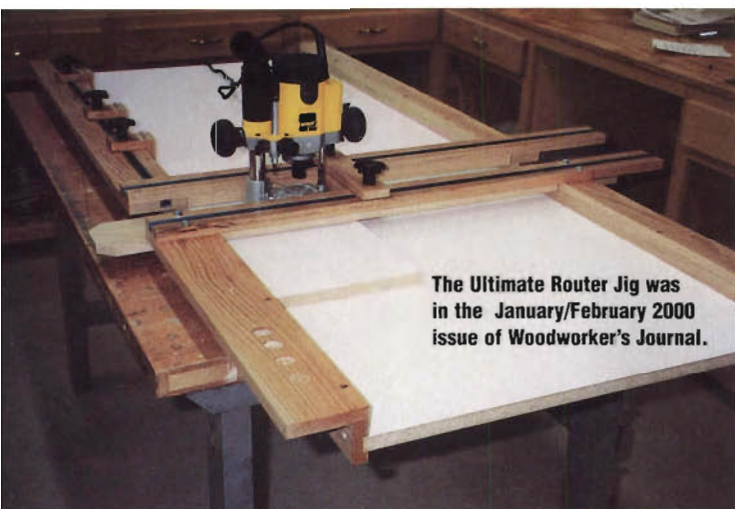
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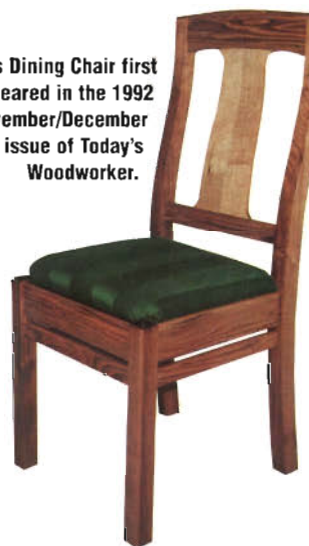


The Ultimate Router Jig was in the January/February 2000 issue of *Woodworker's Journal*.

A "Penultimate" Jig

"A few suggestions" for building the Router Jig came from **Ray Povio** of Fairport, New York. Ray put a stacked dado blade on his radial arm saw to cut the lower rail notches and made the right rail on his jig adjustable. "This way, I can adjust for wear and tear or expansion and contraction," he told us.

This Dining Chair first appeared in the 1992 November/December issue of *Today's Woodworker*.



The Perfect Chair

Needing a chair to match a desk, **Don Bickford** of Owatonna, Minnesota, changed the wood in our Dining Chair from cherry to butternut and came up with the perfect solution. Our chair was originally designed to match the dining table from the September/October 1992 *Today's Woodworker*.

The Irish Parlor Clock was featured in the Nov/Dec 1998 issue of *Woodworker's Journal*.



Key design elements of a *Woodworker's Journal* desk inspired this cupboard.

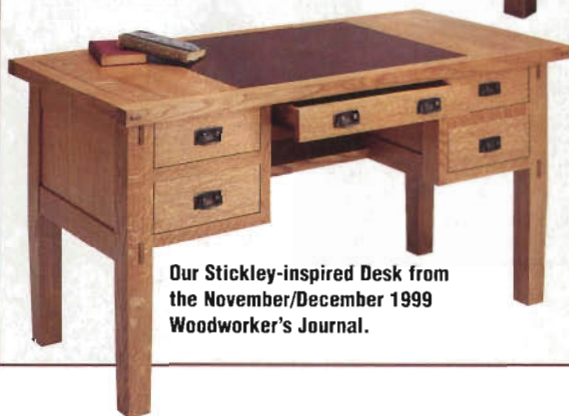
Minor Modifications

The Stickley desk we recently featured inspired **Roger Goodland** of Estes Park, Colorado to adapt the pieces into a cupboard for his daughter's dishes. "Stickley pulls weren't in the budget," so Roger used Mission pulls to maintain an authentic look.



Time for a Challenge

It was time for **Stephen McLeod** of St. John's, Newfoundland to take on a challenge, and the Irish Parlor Clock in a recent *Woodworker's Journal* fit the bill. He made some small changes in the design — like eliminating the bottom molding and changing the dimensions — but, for the most part, the Canuck woodworker left the plan as it was. "I enjoyed it very much and look forward to more projects!" he said.



Our Stickley-inspired Desk from the November/December 1999 *Woodworker's Journal*.



Winner! Ray Povio wins a Bosch 1640 VSK fine cut saw for his contribution to *End Grain*. Send letters and photos to: *End Grain*, *Woodworker's Journal*, P.O. Box 261, Medina, Minnesota 55340. If we publish yours, we'll throw your name in a hat for our free tool drawing. Photos of projects from *Woodworker's Journal* or *Today's Woodworker* are eligible.

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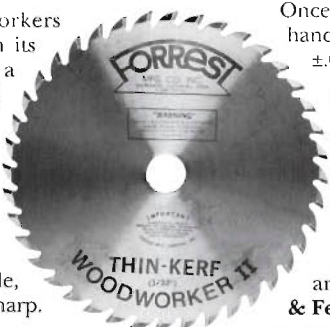
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14" x 30Tx1"	\$139	\$125	\$111
12" x 40Tx1"	\$129	\$116	\$103
12" x 30Tx1"	\$119	\$107	\$95
10" x 40Tx 1/2" or 3/8"	\$109	\$107	\$95
10" x 30Tx 1/2" or 3/8"	\$99	\$89	\$79
9" x 40T	\$89	\$89	\$79
9" x 30T	\$79	\$79	\$71
8 1/2" x 40Tx 3/8"	\$89	\$89	\$79
8" x 40T	\$79	\$79	\$71
8" x 30T	\$69	\$69	\$55
7 1/2" x 30T	\$59	\$59	\$55
**6" x 40T	\$49	\$49	\$41
**5 1/2" x 40T x 1/4" x 10mm	\$80	\$80	\$71

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8" set	\$269	\$260	\$245
10" set	\$349	\$314	\$297
12" set	\$449	\$404	\$382

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10" x 60 Tooth (5/8" hole)	\$129	\$116	\$103
12" x 60 Tooth (5/8" or 1" hole)	\$139	\$125	\$111

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14" x 80 T (1" hole)	\$179	\$177	\$158
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	Sale Price	10% Off First Blade	20% Off Second Blade
6 1/2" x 40 T Delta, Sidekick, & Others	\$99	\$89	\$79
8 1/4" x 60 T Sears, Delta, Ryobi	\$109	\$98	\$87
8 1/2" x 60 T Hitachi, Dewalt, Ryobi, FreudTR125	\$119	\$107	\$95
9" x 80 T Delta & Others	\$129	\$116	\$103
10" x 80 T Delta, Bosch, Mitachi, Makita, Ryobi, AEG, All	\$139	\$125	\$111
12" x 80 T Dewalt, Hitachi, Makita, B+D, Sears, All	\$149	\$134	\$119
14" x 100 T Makita, Ryobi	\$189	\$170	\$151
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