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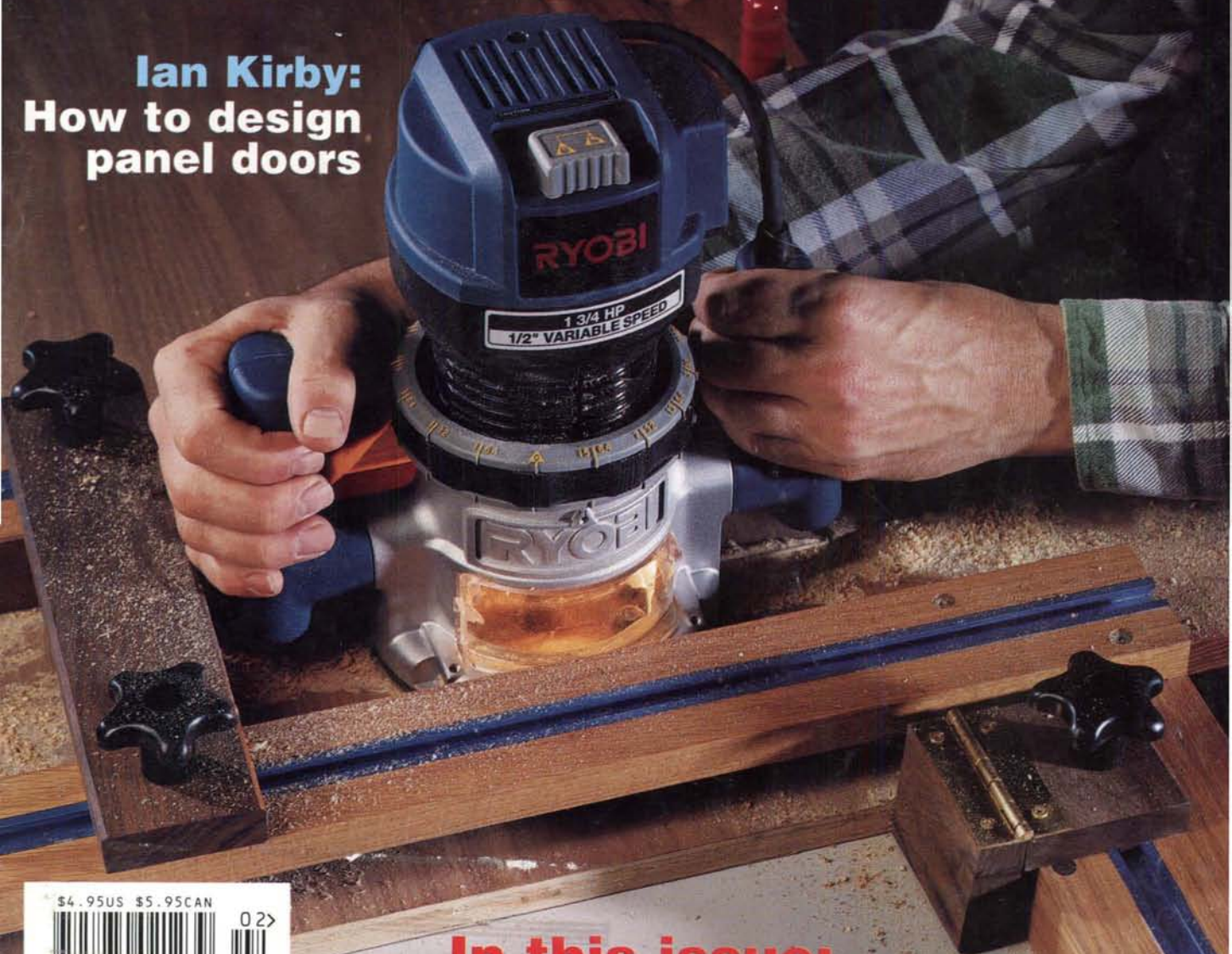
WOODWORKER'S JOURNAL

the magazine
for today's
woodworker

Volume 24
Number 1
February 2000

**Build the Ultimate
Router Jig**

**Ian Kirby:
How to design
panel doors**



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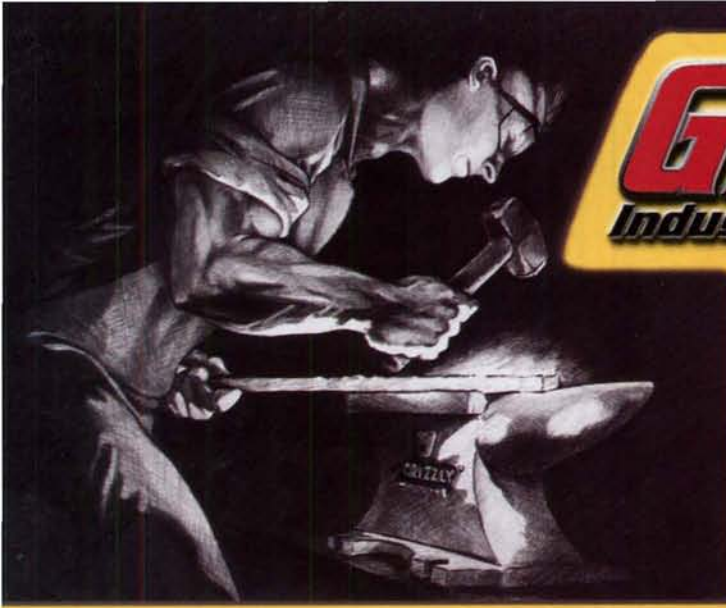


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Arts & Crafts picture frame
Contemporary hall table



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There's more to a frame-and-panel door than meets the eye. Master woodworker Ian Kirby offers a closer look at the all-important designing process.



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By Rob Johnstone

Here's a simple router jig our editor has been using for close to 30 years. Of course, we couldn't resist the temptation to add a few refinements!

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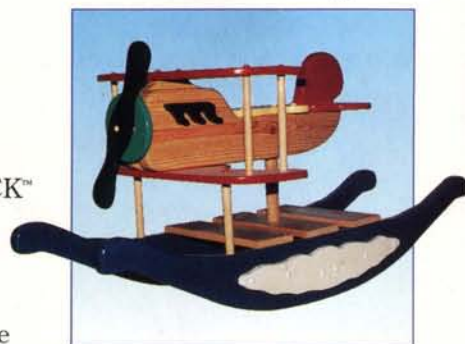
As usual, the best family gifts are handmade — of wood.



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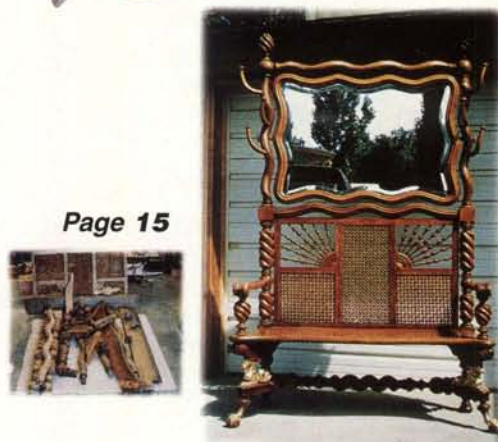
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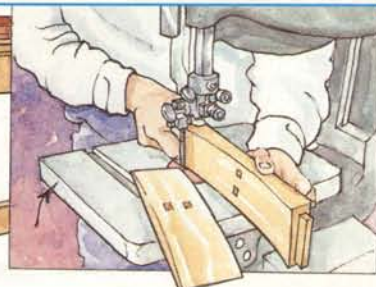
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New Blood for the New Millennium

We're delighted to welcome master woodworker **Ian Kirby** to the pages of *Woodworker's Journal*. Ian was trained in the British Arts and Crafts tradition and has published eight books and dozens of magazine articles on all aspects of woodworking and furniture making. His first article for us, on designing panel doors, starts on page 22. We're looking forward to a long relationship with this extraordinary woodworker.

In our next issue, we'll welcome another well-known woodworker to our fold: **Ellis Walentine**, the former editor of *American Woodworker* magazine and now the host of one of the more interesting woodworking sites on the Internet: *WoodCentral.com*. Ellis is currently running tests on a selection of palm sanders for us — look for his article in your April issue.

If this seems like a trend, that's because I've charged editor **Rob Johnstone** with bringing new blood to your magazine. Like any good forum, we stand only to benefit from fresh perspectives and ideas. In fact, that's the driving force behind our new **Letters** department (see page 8). I welcome your opinions, criticisms and occasional compliments! As a matter of fact, to make it easier, I have some new e-mail addresses for you. Of course, you can still use editor@woodworkersjournal.com but if you'd like to be a little more specific, please add the options below to your web address book:

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Editor Rob Johnstone (right), John Ford (center) and Ridgid's Bob Dueker were surrounded by new power tools in late October. John was the winner of our Woodworker of the 20th Century Contest (see page 18 for all the details).

Speaking of Rob, that's his router jig featured on the cover of this issue (*and on page 48*). Rob was eating sawdust in his dad's shop when he was still knee-high to a table saw. When he did get old enough to run the machinery, he figured out right away how handy a well-designed jig could be. So when I asked for a good shop project for our first issue of the year, Rob spoke right up. Why not build a jig that's stood the test of time, like the one that hung on his dad's shop wall all those years? We dressed it up a bit with the latest hardware, but it's still the same jig — well proven and simple to use.

Larry N. Storaasen

Corrections

The phone number listed in the Resource Digest (Dec. 1999) for **Murray Clock Craft** was incorrect.

The correct number is 800-268-3181.

The number listed in the Digest for **Olympic** stain was also incorrect. Please call 888-774-1010 to reach parent company PPG's customer service line. Finally, the number listed in Shop Talk (Oct. 1999) for the **San Diego Fine Woodworkers Association** was missing a digit. The number is 619-422-7338.

FEBRUARY 2000
 Volume 24, Number 1

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Finishing Thoughts

The concept of different finishing schedules on one box design (*One Design — Three Distinct Looks*, June 1999) was a good idea for an article. Most woodworkers seem to be very poor at finishing.

However, some of the information in the article was not up to par. First is an idea I have trouble getting over to students: sanding wood beyond about 220 grit burnishes the wood and very negatively impacts film adhesion. It also very negatively impacts pigmented stain coloring — highlighting, depth, grain, etc.

Tech sheets from most manufacturers of film finishes state that they will not guarantee film adhesion on raw wood sanded to “excessively fine” grits (usually a limit of 220). Burnishing wood is OK when you are using drying oils or wax as the only finish. Film finishes depend to a large degree on mechanical adhesion (going into small crevices), not chemical binding and penetration the way drying oils behave.

The other idea I take issue with is that topcoat finishes generally are suitable as a primer. Paint primers have a lot of binder and low pigment content relative to topcoat paint films. Paint generally makes a very poor primer. Some topcoat clear films, like alkyd varnish or shellac, can be used as a primer or sealer, since they are essentially binders anyway. Thinning improves adhesion of the first coat because you get more flowout into the minute raw wood surface openings I mentioned earlier.

*Jim McNamara
via e-mail*



Blade-Loc Revisited

Thank you for including our Blade-Loc™ system in your last issue (*Resource Digest*, December 1999). To set the record straight, readers should know that Bench Dog, Inc. manufactures Blade-Loc and owns the patent to it. CMT-USA is one of the companies that distributes the tool under

a private-label agreement with Bench Dog.

We also distribute Blade-Loc, and interested table saw users can call 800-786-8902 or surf our site at www.benchdog.com for more information.

*Norston Fontaine
Bench Dog, Inc.*

Minneapolis, Minnesota

Happy Shop Memories

I applaud you for an excellent journal. My father is very ill and can no longer take part in his favorite hobby, but every time I return home and drop a copy of the *Journal* on the table, I know it cheers him up. Though it may be just a simple smile, I can see his head churning with the memories of being in the shop.

*Stephen Blahusch
via e-mail*

Ryobi BT3000

The review by Russel Trainum (*Tool Preview*, October 1999) didn't mention some of the difficulties I've had with the Ryobi BT3000. There is no room to install an adjustable dado, and you can't use the left side of the fence when making 45° cuts. The fence rails are adjustable, but very difficult to use with the table extension (sold as an accessory).

Mail Call! Contact us by writing to “Letters”, *Woodworker's Journal*, 4365 Willow Drive, Medina, Minnesota 55340, by fax at (612) 478-8396 or by e-mail: letters@woodworkersjournal.com. We ask that all letters, including e-mails, include a mailing address and phone number. We reserve the right to edit for length and clarity.

I would like to see Ryobi sell an attachment to replace the moving table with a solid one, like the piece for the router attachment but with a slot for a miter so the fence can be moved to the left of the blade without taking the sliding table off all the time. I would also like for them to take out the low slot on the right side of the fence. I do like the fence they chose for the saw, but not the design.

*Kenneth Forseth
Shorewood, Illinois*

My shop is too small to allow use of the full length of the Ryobi BT3000 accessory extension rails, so I cut them

to a usable length. I have called Ryobi with several problems and the support from their staff has been excellent. For instance, the manual didn't explain that the saw must be turned upside down to change the belts or that you set the stop for the tilting mechanism by removing the panel on the side away from the switch.

*Harold A. Hubbard
Berkeley, California*

Ryobi Responds:

The Ryobi BT3000 is a very versatile table saw and has earned a number of industry awards since its introduction 10 years ago. One of its strengths (and

also a source of frustration for some users) is the fact that it is almost infinitely adjustable. This gives the saw great versatility, but it also means the saw requires periodic adjustment.

Most of the issues raised by Mr. Hubbard and Mr. Forseth relate to individual preferences and practices. These issues are best resolved in conversation with our technical staff (800-867-9624), as Mr. Hubbard notes. Another good source of user information is the Ryobi Power Tool Forum, found at www.ryobi.com.

*Frank Coots,
Ryobi North America
Anderson, South Carolina*

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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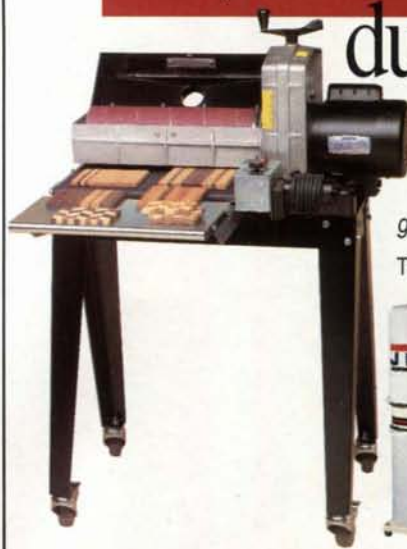


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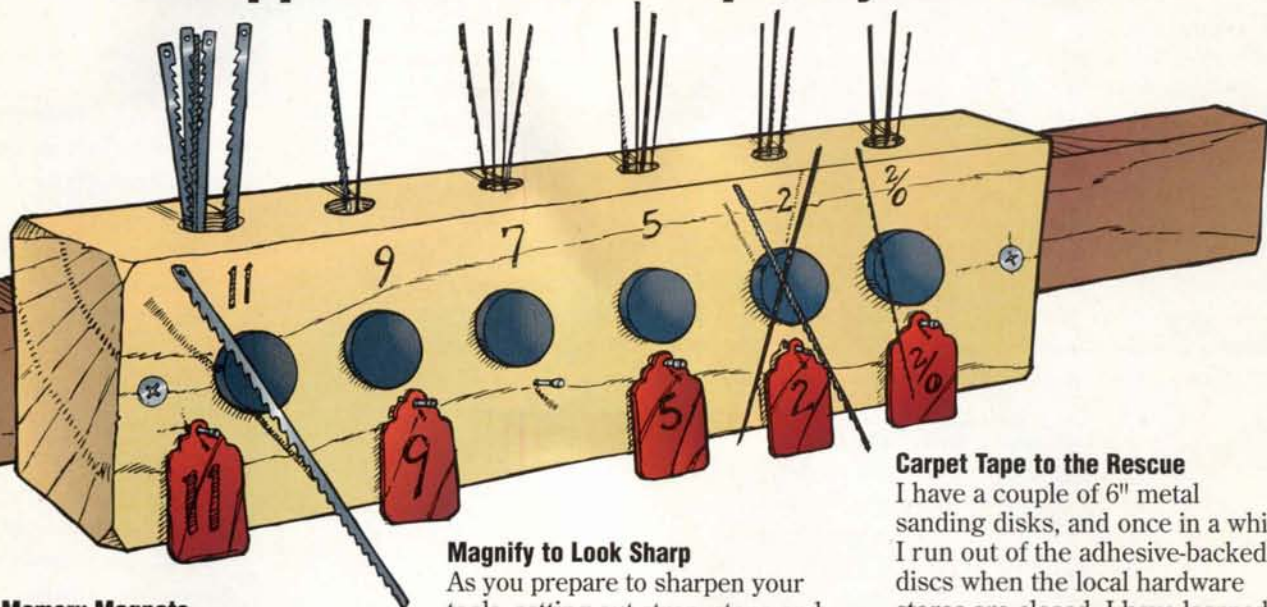
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*Art Gustafson
Cobleskill, New York*

Magnify to Look Sharp

As you prepare to sharpen your tools, setting out strop, stone and lubricant, don't sit down until you have magnification at hand. Be it loupe, optivisor or glass, being able to see and evaluate the cutting edge you are sharpening is as important as your technique. Often what seems like a sharp edge will, under magnification, look like a saw.

*Michael Burton
Ogden, Utah*

Carpet Tape to the Rescue

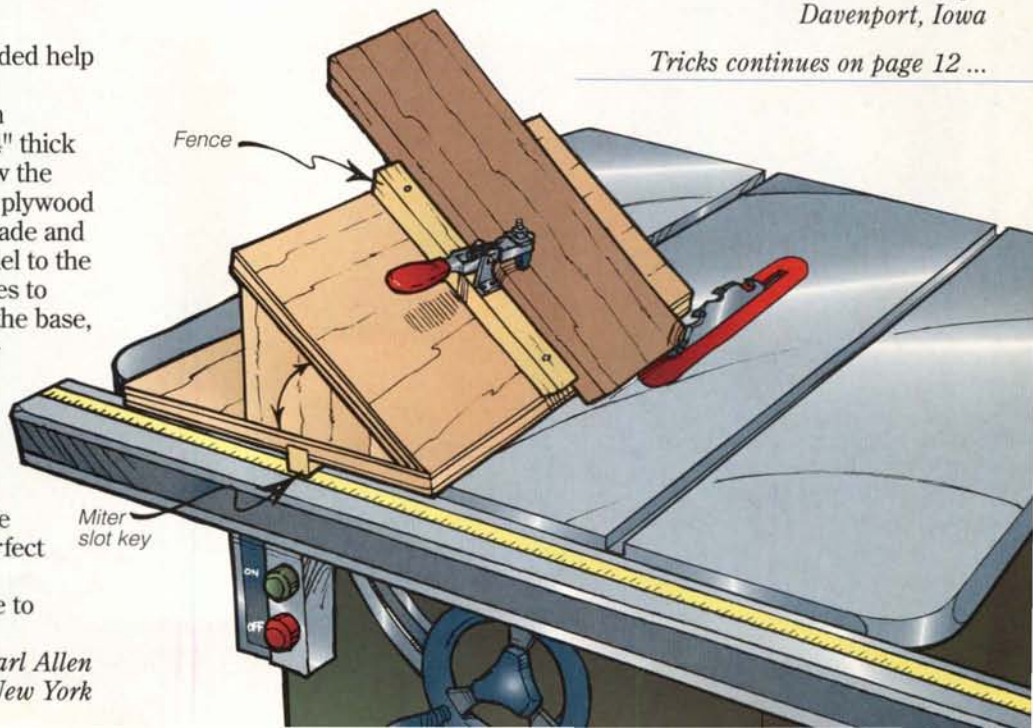
I have a couple of 6" metal sanding disks, and once in a while I run out of the adhesive-backed discs when the local hardware stores are closed. I have learned to keep a roll of 2" wide general purpose carpet tape in the shop for a temporary bond between pieces of wood. It comes in handy for other uses, too. Cover the metal disc with tape, and trim the edge. Remove the tape's backing and add a sheet of sandpaper. Trim the edge of the sandpaper, and proceed with your project.

*Edward Daniel, Jr.
Davenport, Iowa*

Jig for Mitered Corners

My old contractor's saw needed help cutting accurate miters so I designed this jig. Start with a keyed plywood base of 3/4" thick stock. Lower the blade below the table top and make sure the plywood slides smoothly. Raise the blade and cut the side absolutely parallel to the blade. Cut two matching sides to about 48° and glue these to the base, holding their tips to the saw-cut parallel edge. With a steel square, mark a line on the jig at 90° to the blade and add a fence for registering the edges of your stock. Now tilt the blade just a bit until you have a perfect 45° angle for your cuts. Remember to reset the blade to vertical after using the jig.

*Carl Allen
Oswego, New York*



Tricks continues on page 12 ...

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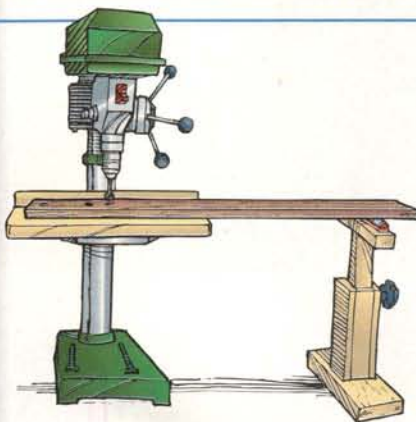
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TRICKS OF THE TRADE



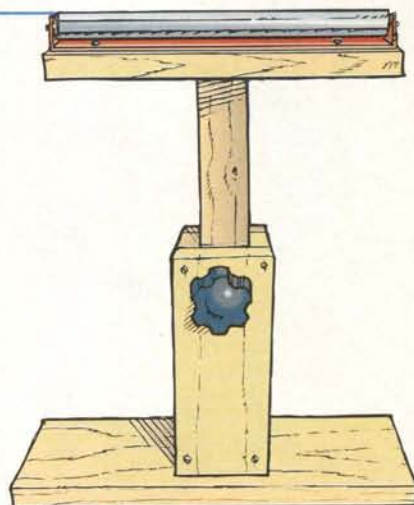
Winner! R. B. Himes will receive a Porter Cable 19.2 Volt Circular Saw for submitting this month's Pick of the Tricks. **Woodworker's Journal** will pay from \$50 to \$150 for all Tricks of the Trade published. In addition, the reader whose trick is selected as our "Pick of the Tricks" will receive a 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. rjohnstone@woodworkersjournal.com.



Project Support

With a roller, a knob with threaded 3/8" stub, a 3/8" insert, some screws and scrap hardwood, I constructed a stand to support long projects being drilled on my benchtop drill press.

The base of the support has a square opening about 1/16" larger than the support piece on each side, so that the support piece will easily slide into the base. To provide for variable height, a knob with a 1/8" threaded stub presses



a movable block against the support piece. I installed a metal threaded insert into the front block. To minimize wear, I epoxied a shoulder washer with a small hole to the movable block. The top platform holds the roller while extending about 1/2" on each end.

*Paul Feldker
Waterloo, Illinois*

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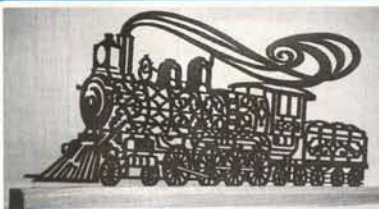
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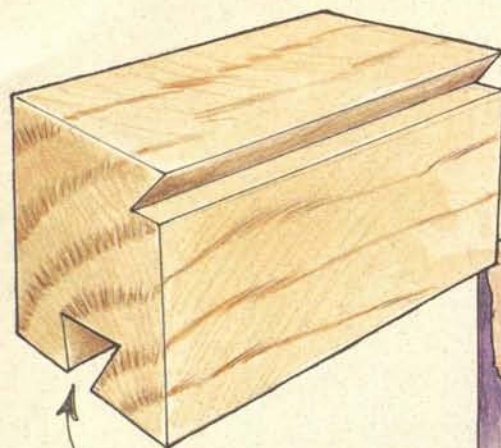
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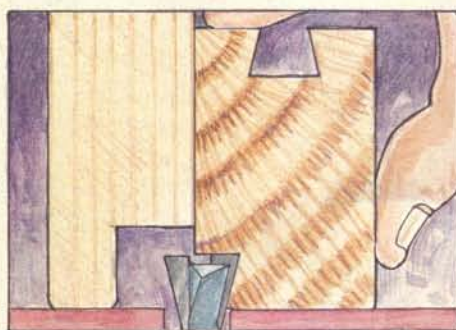




To get a perfect tail set-up, use your guide block to establish your router table's fence position and to set the height of the bit.

The groove size is based on the router bit you use for dovetails and the thickness of the material you'll be working with. It's easy to make more than one guide block for differently sized keys.

**PICK
OF THE
TRICKS**



Template Key for Sliding Dovetails on your Router Table

Sliding dovetails are a great joint. There's lots of surface available for glue, they look great and hold forever. But they can be tricky, especially setting up.

I generally find the easier something is to do, the more likely I am to do it. An example is making these sliding dovetails. Using a scrap of hardwood, I carefully cut and fit both groove and tail of a dovetail joint. Now, instead of starting from scratch each time, I use the key to guide me in making the initial set-up. This reduces the amount of tweaking I have to do; consequently, I use sliding dovetails more than ever.

R.B. Himes
Vienna, Ohio

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Woodworker's Journal February 2000

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INCRA patents pending

(Circle No. 23 on PRODUCT INFORMATION form)

End of the Century Buyout

By Joanna Werch Takes

JET Buys Powermatic

No Big Changes Planned

JET Equipment and Tools continued its 1999 expansion with an October purchase of Powermatic's line of tools, property and foundry.

The deal took Powermatic away from parent company DeVlieg-Bullard, which had filed bankruptcy. Powermatic remained profitable despite a month-long shutdown.

"The first order of the day is to revitalize the business and be sure to regain the quality that the Powermatic name represents to generations of woodworkers," JET president and CEO Robert Skummer told us.

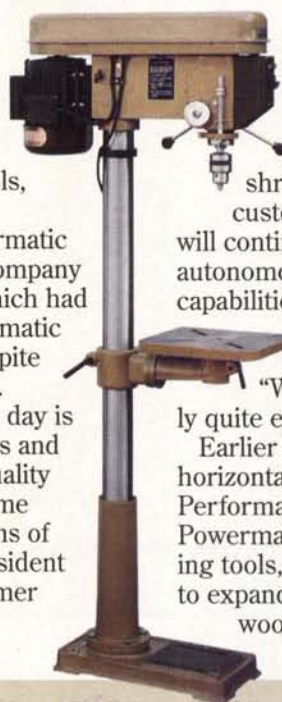
Powermatic president George Delaney agreed, saying that Powermatic would concentrate on shrinking lead times on new customer orders. Powermatic will continue to operate autonomously, but, "JET will bring capabilities to Powermatic that we otherwise would not have," Delaney said.

"We at Powermatic are really quite excited about the change."

Earlier in 1999, JET purchased horizontal surface sander company Performax. The addition of Powermatic's wood- and metalworking tools, Skummer said, continues to expand on the "great base of JET woodworking tools."

Powermatic is staying in Tennessee, using its foundry for castings and honoring all warranties. JET's guidance will even enhance replacement parts availability, a spokesperson said.

J E T
POWERMATIC *INTL*



Old Trees Gain New Protections

Green Goals from 1999

Good news whispered through the leaves of North America's old growth trees last year. Timber companies in both the United States and Canada pledged not to log them, and a U.S. retail giant vowed not to sell old growth products.

In May, the Seattle Times reported a legal settlement in which the U.S. Forest Service agreed to trade 3,040 acres of land in the Deschutes National Forest to Crown Pacific timber company. Crown Pacific pledged to set the land aside as a "Special Management Area" and preserve its old growth 100 years.

A month later, Canadian forestry company MacMillan Bloedel (MB) agreed not to log in any of Clayoquot Sound's valleys that are larger than 2,470 acres.

A Memorandum of Understanding resolved 20 years of controversy about the land on Vancouver Island's west coast.

Home Depot, the world's largest single retailer of lumber, ended summer 1999 by announcing a phase-out on the sale of products manufactured from old growth trees. By the end of 2002, Home Depot will no longer sell old growth lauan, redwood or cedar.

Various environmental groups were involved in these decisions, either as plaintiffs in the Oregon lawsuit or as signers of the Canadian Memorandum of Understanding. MOU signers also represented the Central Region First Nations of the Nuu-chah-nulth Tribal Council.



Les Morgan, FPG International LLC



Dremel's Refinishing Contest grand prize winner discovered his project in a pile of wood parts at an antique sale.

Refinishers Finish First

Dremel Starts a New Contest

Worn chairs, wobbly tables and other old furniture came back to life in the first Dremel Furniture Refinishing Contest.

Contestants submitted before and after photos of projects like a Hoosier cupboard stored on a farm or a 1907 piano from a garage sale, along with descriptions of the steps they took during the restoration.

Judges considered overall appearance, attention to detail, creativity, degree of difficulty and steps taken to complete the project. Tom Kelley of Fort Collins, Colorado, who won the grand prize, shared this insight: "Patience and good tools are the keys to building something you can be proud of."

For contest info, contact Dremel at 800-437-3635 or www.dremel.com.



Completing his restoration of this Hunsinger hall tree took Tom Kelley 85 hours.

Shop Talk continues on page 16 ...

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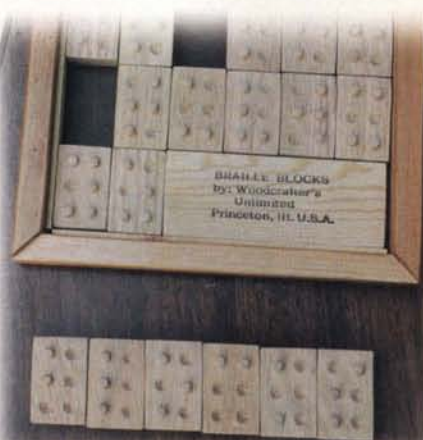
Blocks for the Blind

Club Assists Braille Teachers

Looking for a charitable project, the Woodcrafters Unlimited club in Illinois discovered a need at schools for the blind. For the past year, they've been making sets of braille blocks and donating them to the Hadley School in Winnetka.

The block sets come in two sizes: larger for those just learning the alphabet, smaller for students with more dexterity. Solid wood blocks with holes and pegs represent braille letters. A kerf in the block's top tells students the orientation.

"I think the benefit of making them is the joy of it all and knowing they're being used for a good cause. We have fun making them, and we think everybody else would, too," project coordinator Dave Sawitowski said.



Illinois woodworkers don't finish their braille sets so blind students can feel and smell the different kinds of wood.

To encourage other clubs, the Woodcrafters, with input from the Hadley School, have designed a braille blocks plan. For more info, call Dave at 815-879-0006.

Tuneful Tools:

Music from the Shop

Tool sounds are literally music to the ears of maestro Woody Phillips, who has released a second CD, "Toolbox Classics" as a follow-up to "A Toolbox Christmas."

Woodworking tools are the instruments on both CDs. Beethoven's Fifth, for example, is performed on table saw, jointer, drill press motor, 2x4s, vacuum, hammer, and hand saw.

Started as a novelty, "Toolbox Christmas" has become the best-selling album for Gourd Music. Woody, aka Barry, brings experience as a hardwood floor installer, hobbyist woodworker and trained cellist to the projects.

As a musical trendsetter, Woody shares this advice about his tool music: "I think it's fun, but I wouldn't

recommend listening in your shop. I don't know how you'd know what's coming out of the CD and what's coming out of your tools."

If you think sounds of the shop would be just the thing as you read the morning paper or drive around town, contact Gourd Music at 831-425-4939 or www.gourd.com.



Woody Phillips chooses tools by ear: table saws for sustained sound, hammers for percussion in works like "Jingle Bells."



Shop Talk continues on page 18 ...



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photos courtesy of Greg Collins

Kansas Teacher Wins Ridgid Tools

John Ford: Winner of the 20th Century

Art teacher John Ford's winnings in *Woodworker's Journal's* 20th Century Woodworker contest were a shop full of Ridgid tools.

John, examining each tool in turn, thought the table saw's Ind-I-Cut™ kerf

indicator would come in handy for projects like the Shaker sewing center he's building his wife or a computer center he intends to make from *Woodworker's Journal* plans. John also has two young daughters who inspire him to build toys — and to appreciate the safety keylock system standard on all Ridgid power tools.

John started woodworking with his dad when he was ten. "I always worked alongside him," whittling and carving, John said. He kept at it because he liked the beauty of the material and the challenge of the tasks. Also, John added, "I like the idea of making something myself instead of buying it."

John's materials have included walnut from storm-damaged trees and the osage orange and holly which grow in the Parsons area. Using locally available woods fits the philosophy of **Gustav Stickley**, who received the Woodworker of the 20th Century honor. Stickley wasn't John's nominee, but "I thought Stickley

"I've been making people call me 'Mr. Lucky,'" joked **John Ford**, an art teacher in Parsons, Kansas. After winning a shop full of Ridgid® Tools in the *Woodworker's Journal* 20th Century Woodworker contest, John had good reason to feel lucky.

A few months after John sent in his contest entry nominating **George Nakashima** as the Woodworker of the 20th Century, a truck full of tools pulled into his driveway. Editor **Rob Johnstone** from *Woodworker's Journal* and **Bob Dueker** from Ridgid were on hand to help John set up the tools and fill his two-car garage workshop with a table saw, dust collecting system, lathe, drill press, band saw, jointer, jig saw and oscillating edge belt/spindle sander.

"I like the idea of making something myself instead of buying it."



John's previous projects have included assembling a Martin guitar kit and restoring antique radios. He's currently working on a sewing center.



Although Rob was standing by, John was so eager to get his hands on his new lathe that he volunteered to unload it himself.

and the Arts and Crafts movement were an excellent choice," he said.

A childhood memory of a George Nakashima museum exhibit inspired John's nomination. He found a slab table inlaid with dovetail splines functionally beautiful. "There was nothing on there that didn't need to be there," John said.

Nakashima's work also caused John to look at wood differently. "I remember being in the forest looking at a tree thinking, 'That would be a good one to cut and see what's inside,'" he said.

With his new tools, John can cut into lots of beautiful lumber. One of the first projects he plans for them is building shop storage. His cars haven't lived in the garage for years; now, he says, "it's a lost cause."



Bob Dueker from Ridgid, John Ford and WJ editor Rob Johnstone spent a pleasant fall day setting up John's new shop.

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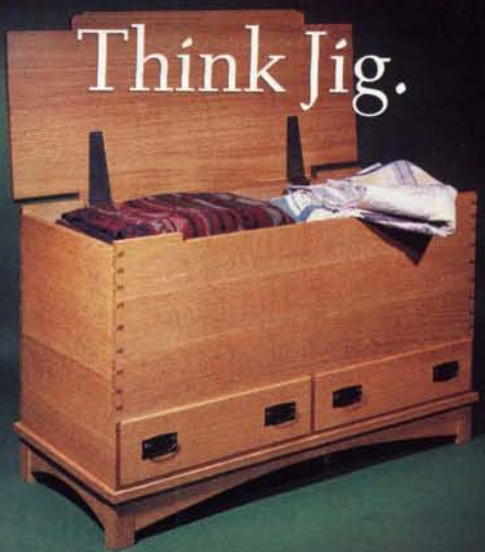


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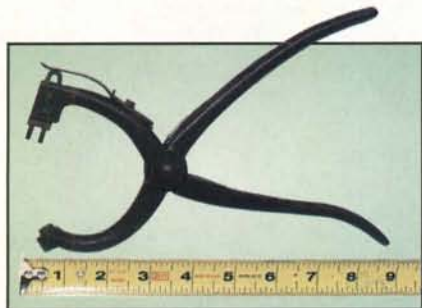
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Cobblers Unravel Mystery

Q In our October issue, we ran a picture of Stephen Tyler's mystery tool. For many of you, the solution to this mystery was a real "shoe"-in.

The Editors
Woodworker's Journal



Despite reader John Fleming's suggestion, this mystery tool was not designed to deter teenagers from piercing their tongues.

A Cobblers like **Jim Moon**, who has worked in the shoe industry for 40 years, said our mystery tool is called a "bow stapler" or a "button stapler." **Bob Sparks** of Terre Haute, Indiana, explained, "It was used to attach ornaments and buckles to shoes, boots or handbags."

"The two prongs should each have a slot on the inside

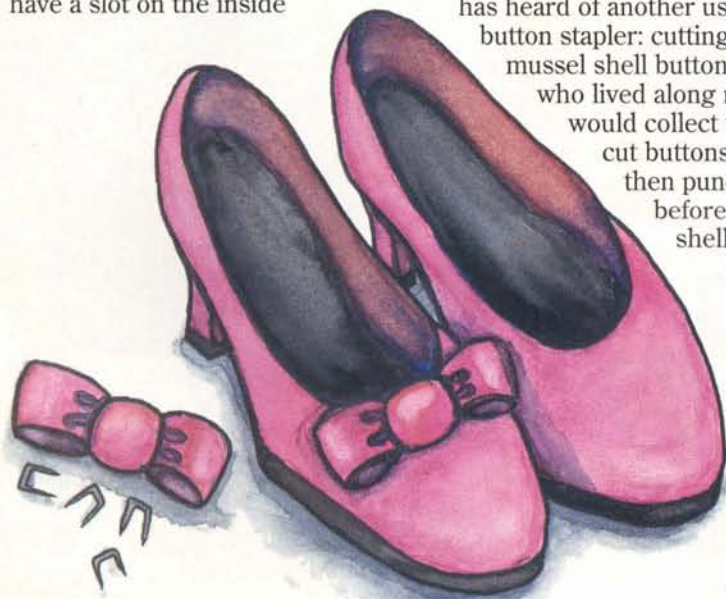


Cut-away view

surface," **Don Eisinger** of Leesburg, Florida, told us. "A flat style staple was inserted into these slots. The bow would then be positioned and stapled. You will note that the lower and upper jaw are curved. This is so you can get inside the shoe to do the stapling."

R.M. Anderson of Phoenix, Arizona, spent 27 years in the shoe business and used his version of this tool quite a bit. "We sold different bows, and women would buy a plain pump and we would staple the bow of their choice to the shoe. They might even come in later to have it changed to a different style," he said.

Karl Haak of Moberly, Missouri, has heard of another use for the button stapler: cutting holes in mussel shell buttons. People who lived along rivers would collect the shells, cut buttons with a die, then punch holes before baking the shell buttons.



Look closely at the business end of our latest mystery tool: the tiny hole may be a big clue to its identity.

Q My friends and I haven't been able to figure out what this tool from my collection is. You can see the round hole on the part that looks like a handle. There's also a pinhole close to the pointed end. That hole goes all the way through the tool, but the two different openings are at an angle from each other — and the hole's bigger on the other side of the tool, too. I'm hoping a fellow reader can tell me what this is.

Phil Monson
Frost, Minnesota



Winner! For taking the time to respond to Stumpers, **Bob Sparks** of Terre Haute, Indiana wins a collection of American Tool's Quick Grip clamps. We toss all the Stumpers letters, published and unpublished, into a hat to select a winner. If you have a question or answer, send it to the editor: Stumpers Dept., Woodworker's Journal, P.O. Box 261, Medina, Minnesota 55340. E-mail: jtakes@woodworkersjournal.com.

A And we're hopeful as well. So far our best guess involves finding some local vampires to slay, but we're pretty sure that's not its intended function. Anybody have a better idea?

Q I've always believed that kiln-dried wood resists changes in relative humidity better than air-dried wood. Now I hear from an old friend that might not be true. Who's right? (There's a dinner riding on this.)

Liam Moriarty
Shiremanstown, Pennsylvania



Whether air-dried or kiln-dried, wood with the same moisture content reacts the same to humidity changes.

A Better start checking the restaurant listings, Liam. According to **Dr. Gene Wengert** from the University of Wisconsin's Department of Forestry, if the moisture content's the same, the wood's the same. "The wood doesn't know if it was kiln-dried or air-dried."

The tricky part is that the moisture content of air-dried wood only gets down to the moisture content of the air. In most of the United States, that's about 12 percent. When you move air-dried wood indoors, it continues to dry — and change shape. Kiln-dried wood, on the other hand, seems to have less shrinking and swelling due to moisture because it's usually dried down to a moisture content of six percent (equal to 30 percent relative humidity).

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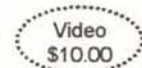
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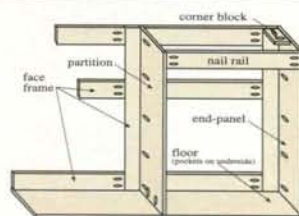


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Frame-and-Panel Doors:

It's all about proportion and detail

By Ian Kirby



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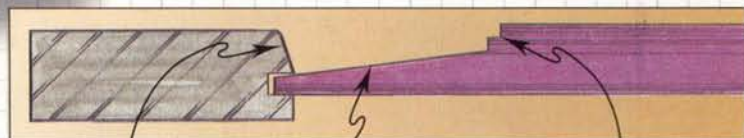
rame-and-panel doors nearly always look pretty good. The reason is that harmony automatically results from the construction: as you can see in the drawings, all the lines follow the architecture of the frame. Nevertheless, if you build without paying attention to proportions and details, while the door might not run all the way to ugly, it probably won't look its best. There are many small decisions to be made, and getting them right is what makes a door really pleasing to the eye.

Why Frame and Panel?

Let's begin by looking at the reasons why we use the frame-and-panel. It's our time-honored solution to the fact that solid wood changes in width and thickness in response to moisture in the air. By making a frame out of narrow pieces of wood, the wide panel trapped in a groove inside the frame is free to expand and contract. A broad beveled edge — called the field — disguises the movement and thins the panel to fit its groove. This system is very old, and people are totally comfortable with how it looks, as shown on the facing page. When we make doors of plywood or MDF, materials that don't shrink or expand, we often rout out shapes that imitate solid-wood frames with panels.

Design by drawing & building

Draw what looks best to you, then build a full-size sample in wood. Look at it in room light, to see how the shadows fall. It'll probably look good, but if you don't like the effect, it's easy to experiment and revise to make the composition harmonious.



Frame edge

A simple molding or chamfer makes a band of light and shadow.

Fielding

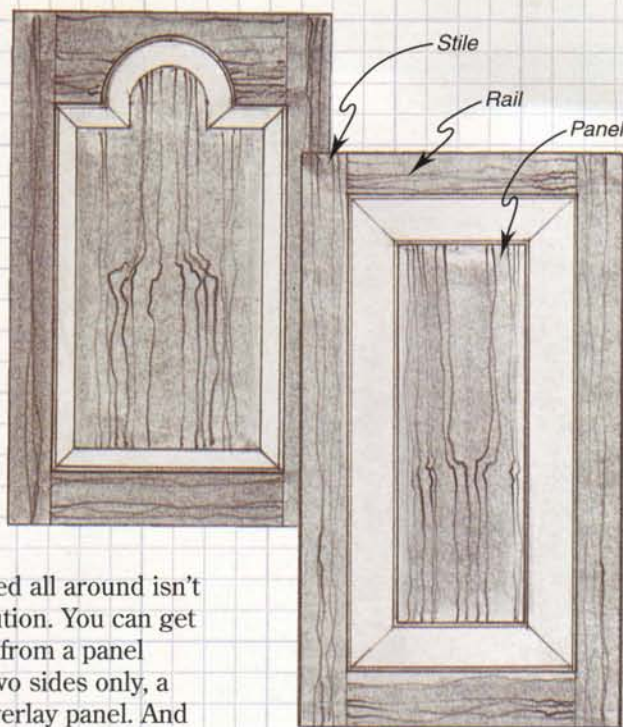
The broad bevel catches light, and also shows a different grain pattern top and bottom. Make it equal to the rail, or wider or narrower, according to taste.

Raising

A small rebate, sawn or routed, makes a line of light and shadow. Double raising adds another shadow line.

Proportion ...

When you specify the dimensions of a frame-and-panel door, you create a composition of lines, rectangles and planes. It's harmonious because it follows the architecture of the rails and stiles. Even an arch-top door is symmetrical about a center line. To study different proportions and details, draw frame-and-panel doors full-size.



Raised and fielded all around isn't the only good solution. You can get the same benefits from a panel that's fielded on two sides only, a flat panel, or an overlay panel. And by adding muntins, you can make panels with any width wood. You'll see these variations in the drawings on the next page.

When you want to design a door, you actually face two sets of decisions: how is it going to look, and how is it going to be made. Although techniques affect appearance, it's a mistake to allow technique to take over. When that happens, everything comes out looking the same. You need to be able to make whatever you design, which usually means choosing or modifying your techniques to suit your design decisions. It's worthwhile not only to explore all of the alternatives made possible by techniques you know, but also to look for new techniques because they will open up more design possibilities.

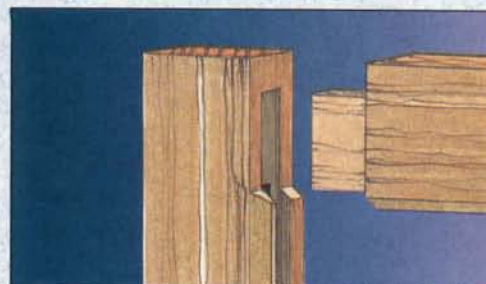
For example, compare making a door with a cope and stick router bit set plus a panel-raising bit, to making it with the table saw. The bit set creates enough of a joint to hold the frame together; it makes matching grooves for the panel, and it molds the inside edge of the frame. Its companion panel-raising bit forms the field and the tongue that fits the groove in the frame,

and might also mold the raised portion of the panel. This tooling gets the whole job done. The trouble is, big door or little door, you can't adjust anything. For all their advantages, router bit sets take control of how the door looks. The table saw, on the other hand, can shape any size groove, rebate, and chamfer, and is easily jugged to saw fields up to 2 7/8" wide. Such details as beads, roundovers and coves can be routed after shaping on the saw. Shop-jugged techniques like these require more know-how than bit sets, but they give you control of dimensions, proportions and details.

Design and Technique

Design is the process of achieving a good-looking result within realistic limitations. The available technology is one kind of limitation. Two more are function and form — the cabinet has to close, so it needs doors; the cabinet is this big, so the doors have to fit. But the foundation under every design problem is neither form nor function. It's economics, which in woodworking means getting the best out of the wood and tools

... and detail



Chamfered edge, mitered shoulder

A chamfer creates a simple band of light or shadow. Try sawing or planing a steep chamfer, 12 to 15 degrees. Any inside edge molding can be mitered by cutting back the shoulder line on the stile to the inside edge of the molding.



Routed edge, coped joint

A complex routed edge makes lots of lines and shadows. A matched set of router bits cuts both parts. Any frame molding can be coped by cutting back the rail shoulder so it fits over the molding on the stile. The coped joint has no tolerance for miscut parts or warped and twisted wood.



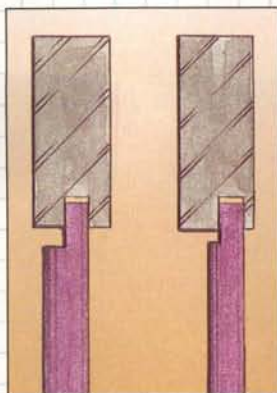
Solving problems

Coped joints with one locating shoulder and soft curves (above) can tolerate sloppy manufacturing and wood variation. A soft molding makes soft highlights and diffuses shadows. Coping a chamfer (below) leaves a fragile feather edge. It's better to miter chamfers.





Flat panels



Shadow lines

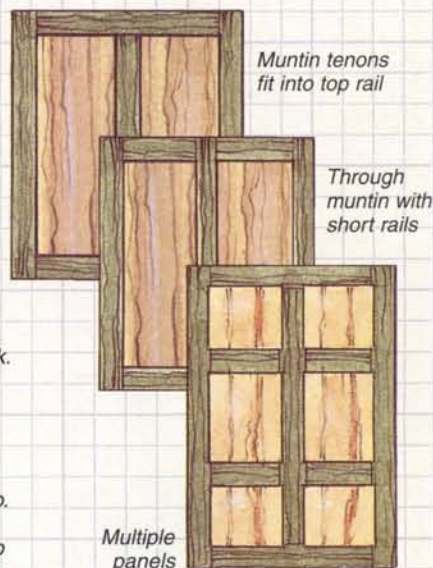
The tongue around the flat panel makes a deep shadow line. To change the width of the shadow, change the length of the tongue. To reveal more of the frame edge, shift the panel toward the back. The tongue can be as thin as 1/8".

Narrow boards

To get the most out of narrow boards, make flat panels and add a muntin. Visually, the muntin is enough — you don't need to raise the panels, too. Make the frame using grooves and stub tenons, and rebate the panels. With no corners to fit and no panels to glue up, these doors are quick to make.

Muntins

A muntin divides the frame to fit narrow panels. The muntin can be held between the rails, or it can follow the form of the stiles. For a different look, divide the door into small panels with rails and muntins. Proportion the muntins to suit the frame.



Muntin tenons fit into top rail

Through muntin with short rails

Multiple panels

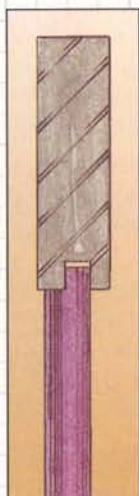
you've got. Of course, it would be nice to buy some spectacular wide planks for panels, but what about the stash of beautiful 6" boards you've been storing for longer than you care to admit?

One way to make a panel out of narrow boards is to glue up the width you need, but maybe the figure makes a lousy edge-to-edge match, or maybe there still isn't enough width, so you add a narrow strip, and now the figure and color don't match: a real distraction. A better alternative is to build door frames with a dividing strip, called a muntin, as shown in the sketches on this page. Although muntins typically tenon into the rails, there's no technical reason why this has to be. They can be cut the same length as the stiles with short rails in between (above), a small technical change that can have a large effect on appearance.

Making a muntin is no more difficult than gluing up a panel, plus it hands you another design choice: to raise or not to raise. While a raised panel is traditional, it's not the only solution. With

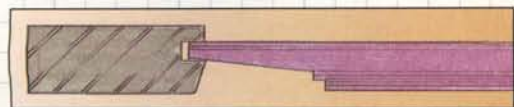


Fielded on two sides



No shadow lines

Raising and fielding two sides of the panel, instead of all four, simplifies how it looks and how it's made. To avoid a shadow line top and bottom, size the panel's tongue to fit the groove in the frame and make the front surfaces almost flush. The telling detail is the little diagonal line where the bevel crosses the inside edge of the frame.



Double-raising

Narrow boards

To use narrow boards, add a centered muntin. The double-raised effect of two small rebates also enriches the composition. These details are easy to saw and rout.

Centered muntin

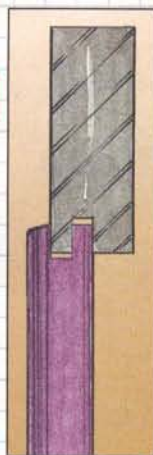




Overlay panels

Edge details

Grooves retain the overlay panel in its frame. To highlight the edge of the panel, chamfer it, or scratch a little bead.



Wide boards

An overlay panel gets the most out of wide, highly figured boards. There is no raising or fielding to disrupt the patterns in the wood. Because the panel stands proud of the frame, it casts dramatic shadow lines. Visually, the panel comes forward, while the frame recedes into the background.

narrow pieces of reasonably dry wood going into a modern interior, movement is not such a big issue, so a flat panel is another good alternative (above).

Retain the flat panel by its rebated edge. The width of the rebate and the location of the frame groove give you control over the shadow lines. If you want less shadow, move the panel groove closer to the front of the frame. For a deep, dramatic shadow, move the groove toward the back.

Light and Shadow

To work out proportions and frame details, draw the door in front elevation, full-size. The drawing shows you a lot, but it can't portray the effect of light and shadow on the different levels of frame and panel. In the real world, you don't see in elevation view. You always see in perspective and it changes as you move or as the door opens and closes. What you see also depends on the light you see it in. The only way to assess the effect of light and shadow is to

build a full-size mock-up and look at it in the room.

If it looks terrific, great: build the doors. However, if your mock-ups aren't as dramatic as you expected, the reason is likely to be depth, or the lack of it. Increasing visual depth makes stronger shadows. You can do it in a number of ways: enlarge the molding, move the panel backward in the frame, change the width of the raising or, on a flat panel, change the width of the rebate.

You'll soon notice that from most viewing distances, all you see of any molded profile is light and shadow, and simple profiles often work best. A chamfer or a little rebate doesn't seem like much of a molding, but it makes a sharp line of light. Until you get quite close to them, complex profiles look about the same as simple ones: lines of light and shadow.

As for the panel itself, raising and fielding is one solution, and a flat panel (top of previous page) is a second. Fielding two sides instead of all four lies in between the two (bottom of facing page). You get the visual strength of the vertical

Multiple panels

To enrich the composition, and to get the best out of ordinary wood, divide the overlay panel into a number of smaller ones. This is another way to make wide doors using narrow wood.



Narrow panels



Square panels

fielding, without cross-grain busyness at top and bottom. Since the wood doesn't move in length, just make a square tongue to fit the groove, with a tight (shadow-free) shoulder line.

To get the most out of highly figured wood, try making an overlay panel (above). The overlay panel comes forward and the frame recedes. With wide boards, make a single panel. With narrow boards, either glue up or else add muntins to divide the frame. The highlights and shadows created by the two levels of panel and frame will really be dramatic.

Learning to see light and shadow is the key to making frame-and-panel doors. To take control of visual effects, you have to take a step beyond technique. The next step is to turn the process around by modifying your techniques to achieve the visual effects you want. This is design at its most practical level. It's very satisfying to work out a solution that not only gets the most out of your materials and shop time, but also produces a set of cabinet doors that really do look their best.



Graceful Hall Table

*A harmonious
confluence of design,
skillful joinery and
thoughtful material
selection ... creates
a rewarding project for
woodworkers with
advanced skills.*

By Richard Jones

Like most furniture builders, I like to glean inspiration for my designs from an eclectic range of sources. As a result, my furniture is contemporary, but incorporates both modern and traditional construction. For example, I prefer to cut dovetails by hand: functionally, they're no better than machine cuts, but they are more appropriate in a refined piece. My goal is to create beautiful furniture, not quickly produced utilitarian pieces. That is to say, the concept, design, look and integrity of my furniture is more important to my clients than how economically it can be produced. That's especially true of this piece.

The concept for this project began with the premise of a tall, elegant table, perhaps located in a large hall or reception area. During the preliminary sketching stage, three



"The concept,
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Richard Jones

elements came quickly to mind. First, it called for cabriole legs. Next, I wanted the top to float above the supporting framework. And finally, a light colored species in the legset would be offset by a dramatically contrasting darker top.

The cabriole curves in the legs further suggested that the front of the tabletop, the front rail and the stretcher should all feature gentle curves. In addition, a low, broken pediment (in effect, a decorative raised back edge) also picks up this curve.

The Tabletop

A trip to my local lumberyard yielded some nice Santos (Bolivian) rosewood for the top (this provided the strong visual contrast to the hard maple I selected for the legs). The top's edges feature dramatic

chamfers, complementing the table's harmonious gentle curves. The top of this table is essentially a wide assembly made from three narrow, edge-glued boards (pieces 1). Rip, joint and plane these color-matched boards, after first selecting them on the basis of their grain orientation. For example, the front board should feature a curved

grain pattern, closely matching the chamfered front edge of the top.

After running the boards through the jointer, follow up with a couple of skims with a block plane, forming a spring joint — a barely visible gap that appears at the middle of the long joint between each pair of boards. This technique ensures a tight fit along the whole glue joint.

Use biscuits along the edges for alignment: no need to glue them in. (I am not persuaded that biscuits add strength to a glue joint.) Plane and sand the resulting slab, then put it aside to settle while you build the legset: biscuit locations occasionally telegraph through if insufficient time is left between the glue-up and the finishing process.) Rip, crosscut and joint the rest of the legset elements to the dimensions on the **Material List** on page 30.

Haunched Tenons

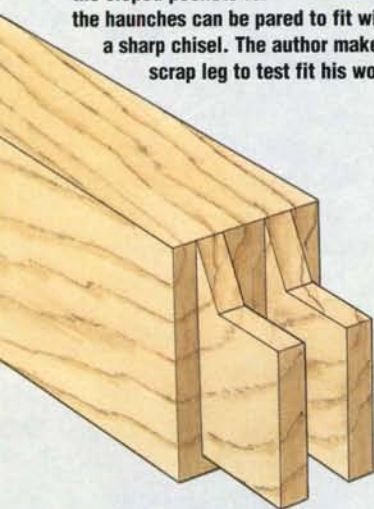
The table's legs are attached to the aprons with ultra-strong double (or "forked") haunched mortise and tenon joints.



Cut your double haunched tenons on the table saw with the aid of a tenoning jig. Slice the haunch by hand with a back saw. Then move to chopping the mortises.



After removing most of the waste on the drill press, the sidewalls and the sloped pockets for the haunches can be pared to fit with a sharp chisel. The author makes a fifth scrap leg to test fit his work.



The author's use of double haunched tenons, complex curves and forked wedged tenons will challenge your woodworking skills.

A Template for the Legs

Use 1/4" hardboard to create the template for the legs. Their profiles, including mortise locations and dimensions can be found in the **Full-size Pattern** on the center pullout. Photocopy and attach the pattern pieces to the hardboard (I use spray adhesive), then cut it to shape on the band saw. Finesse the edges with files and sandpaper.

Select stock for the legs (pieces 2) so the curvature in their grain follows the template. Orient each leg blank (left front, left back etc.) so the most attractive grain will be most visible from the front.

Then use the cabriole template to trace the shape on the two inner faces of each leg, transferring the mortise marks to the relevant faces at the same time. (Note that all the joinery is kept within the confines of the straight parts of each leg.) I suggest making an extra leg out of scrap stock, for experimentation.

You will find it easier to chop the mortises in the legs before you machine their cabriole curves, so set them aside for now.

An Introduction to the Joinery

With the legs laid out and the tabletop glued up and set aside for the moment, this is a good time to take a minute and preview the rest of the joinery, just to help you get oriented. The maple legset for the table is made up of a front and back apron (pieces 3 and 4), a long stretcher (piece 5), two rails (pieces 6) and three short tabletop supports (pieces 7) which suspend and elevate the "floating" tabletop.

The first thing you should know is that the front and back aprons are slightly narrower than the legs, to create a small decorative offset. The tabletop supports are joined to these aprons with sliding dovetails, and protrude above them by 1".

Below, the stretcher and rails are joined together with double wedged (or "forked") tenons, to provide additional strength and beauty. The front apron, stretcher and rails are all curved (the rails are actually curved in more than one plane), and a thin veneer of plain sawn lumber (piece 8) will be glued to the front apron later.

Shaping Cabriole Legs

The first step in shaping the cabriole legs is to make a hardboard template. Use this to lay out the profile on two adjacent faces of each leg blank. Then band saw each leg to shape, taping the cutoffs back in place after each cut, to keep the blank square and more manageable during the second cut. After sawing, use hand tools and sanders (right) to coax the free form legs to their final shape.



Haunched Tenons

Haunched tenons have a distinctive sloping aspect which adds to the gluing area ... and to their level of difficulty. Look to the sidebar (at left) for the proper steps to forming the tenons. Practice on scrap before you move to the actual pieces.

With that done, lay out and chop stopped double mortises in the legs (using the extra scrap leg you created for practice). As long as you are working on the legs, lay out and chop the mortises for the rails as well. Then, band saw the legs to shape, taping the cutoff back in place each time to keep the blank square as you work. Remove the saw marks and refine the curves with a variety of tools: I used a compass plane, spokeshaves, a stationary belt

The word cabriole, derived from the French verb caper, simply means curved. It has roots in both furniture design and ballet dance.



sander, a drum sander, scrapers and a sanding block. With free forms such as these, there is no easy, standardized way to get around this process: you just have to do the work. Round over the sharp front edges and the foot of each leg, making constant comparisons from one leg to the next to maintain their uniformity. For some additional guidelines on the technique, see the sidebar on shaping the legs below.

Sliding Dovetails

The aprons have sliding dovetail dadoes machined into their inside faces which match the sliding dovetail tenons on the ends of the

The floating tabletop and sleek lines of this hall table create a fragile appearance. The double haunched tenons, sliding dovetails and fork-and-wedge tenons, however, combine to make a strong and striking piece of furniture.



Use a band saw to form the curves which create these contemporary cabriole legs. Before you cut, evaluate and orient the legs to best display the figure of the wood's grain.



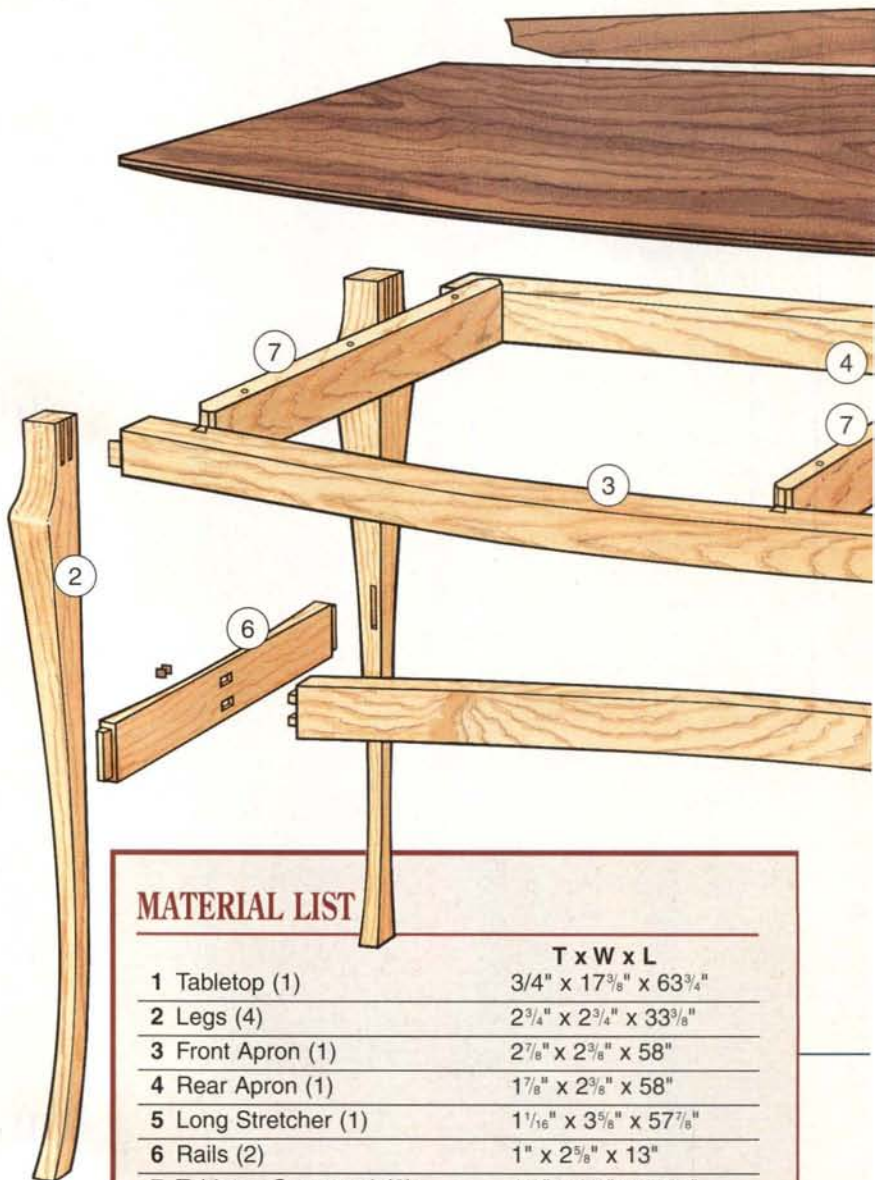
Use a spokeshave, scraper, compass and block plane to reduce imperfections to sandable size. Take your time, working with the grain and keeping the mortised areas nice and flat.

Leg Joinery
(End View)

tabletop supports. Mill these with a 14° dovetail bit chucked in the router table (see the **Pinup Shop Drawings** for locations and dimensions). Pare away the small decorative chamfers on the top of each tenon: these will be visible after the table is assembled.

Now, using a two-step process, plow the matching stopped dovetail dados into the inside faces of the aprons. Do this on all but the center dado on the front curved apron. (Plow this center dado later, you need to wait until the curve is created in the front apron.) Remove most of the waste with a straight bit, then complete the profile with the same dovetail bit you used on the tenons (see the sidebar below for details). Stop these cuts 1/2" shy of the bottom edge of each apron and square out the stopped end with a chisel, dry fitting the tenons until they fit perfectly. Then transfer the curves shown on the **Pinup Shop Drawings** to the top edge of the front apron, and band saw it to shape. Use a belt sander to remove the saw marks.

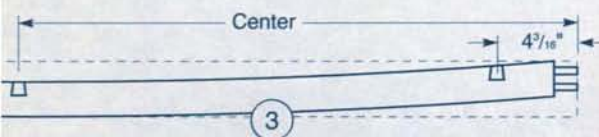
Now that you have the curve established in the front apron, set up and plow the remaining dovetail dado into the center of the front apron.



MATERIAL LIST

	T x W x L
1 Tabletop (1)	3/4" x 17 3/8" x 63 3/4"
2 Legs (4)	2 3/4" x 2 3/4" x 33 3/8"
3 Front Apron (1)	2 7/8" x 2 3/8" x 58"
4 Rear Apron (1)	1 7/8" x 2 3/8" x 58"
5 Long Stretcher (1)	1 1/16" x 3 5/8" x 57 7/8"
6 Rails (2)	1" x 2 5/8" x 13"
7 Tabletop Supports* (3)	1 1/4" x 3 3/8" x 13 7/32"
8 Apron Veneer (1)	1/8" x 2 3/8" x 56 3/4"
9 Wedges (8)	1/8" x 1 1/2" x 3/4"
10 Screws (9)	#8 x 3" Steel
11 Back Edge (1)	7/8" x 1 15/16" x 64"

*The center tabletop support is 1 5/8" longer, see Pinup Shop Drawings



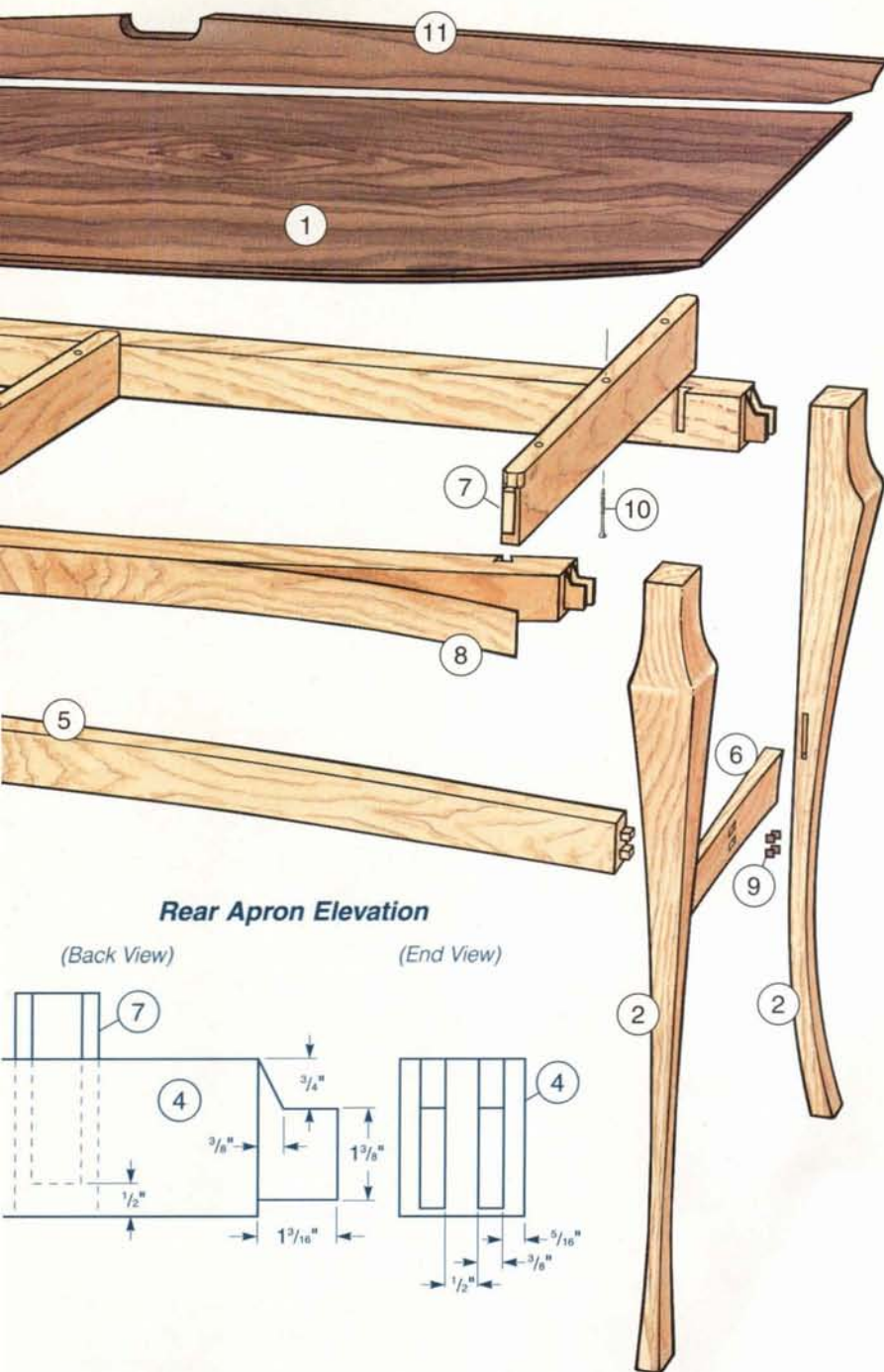
Sliding Dovetails

Sliding dovetails are plowed into both the front and back apron. These are stopped 1/2" from the bottom edge. Because of the curvature of the front apron, you'll have to wait to plow the center dovetail groove until after the apron is shaped. All of the others are created while the apron is squared up. The straight edge routing jig is a big help during this process.



After you plow your stopped dovetail dado onto the apron, square up the end of the dado with a sharp chisel.



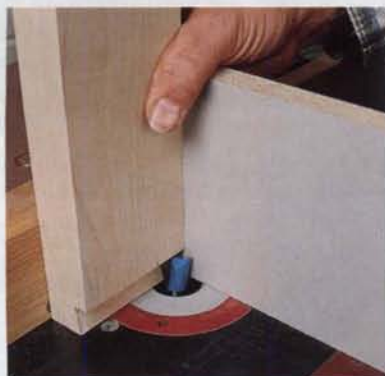


Forked-and-wedged Tenons and More

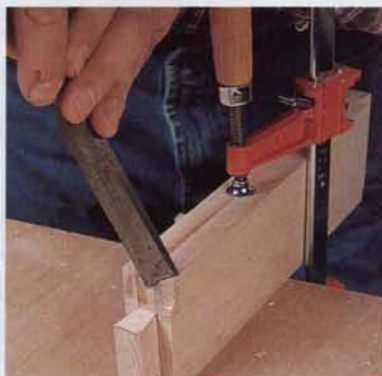
The long curved stretcher is joined to the rails with forked and wedged mortise and tenon joinery. This is a time-consuming and persnickety technique, but it's very strong. Lay out the double (forked) tenons on the stretchers, then machine them on the table saw. The kerfs for the wedges are made on the band saw, with small diameter holes stopping the saw cuts. See **Figure 1** on the next page.

The veneer for the front apron (piece 8) is made by squaring up and then planing a piece of thicker stock. After planing, rip a 3/16" thick strip on your table saw. With a slave board clamped into your planer, plane the cutoff to 1/8" thickness.

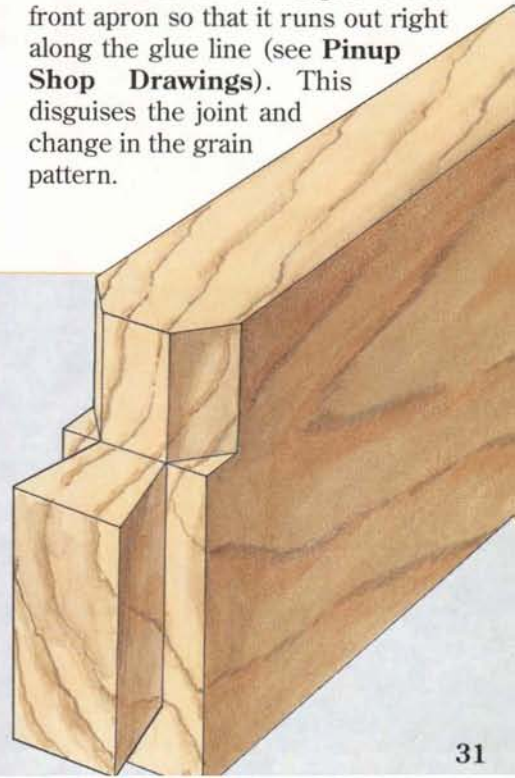
Glue and clamp the veneer strip to the front apron using lengths of scrap to spread the clamping pressure. I used polyurethane glue here because it has a long open time. After cleaning up the excess dried glue, redefine the shoulders on the tenons if necessary. Then rout a bevel on the edges of the front apron so that it runs out right along the glue line (see **Pinup Shop Drawings**). This disguises the joint and change in the grain pattern.



Move to your router table and create the dovetails on both ends of the tabletop supports. Test fit your joints carefully.

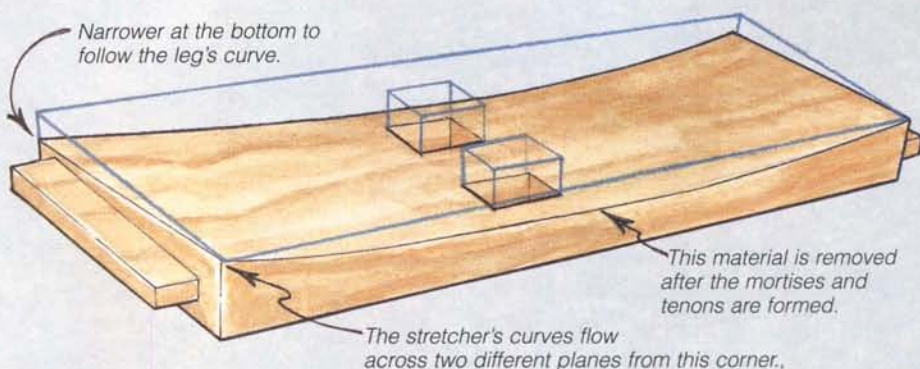


Create a chamfer on the exposed ends of the tabletop supports. These details are visible just under the floating tabletop.

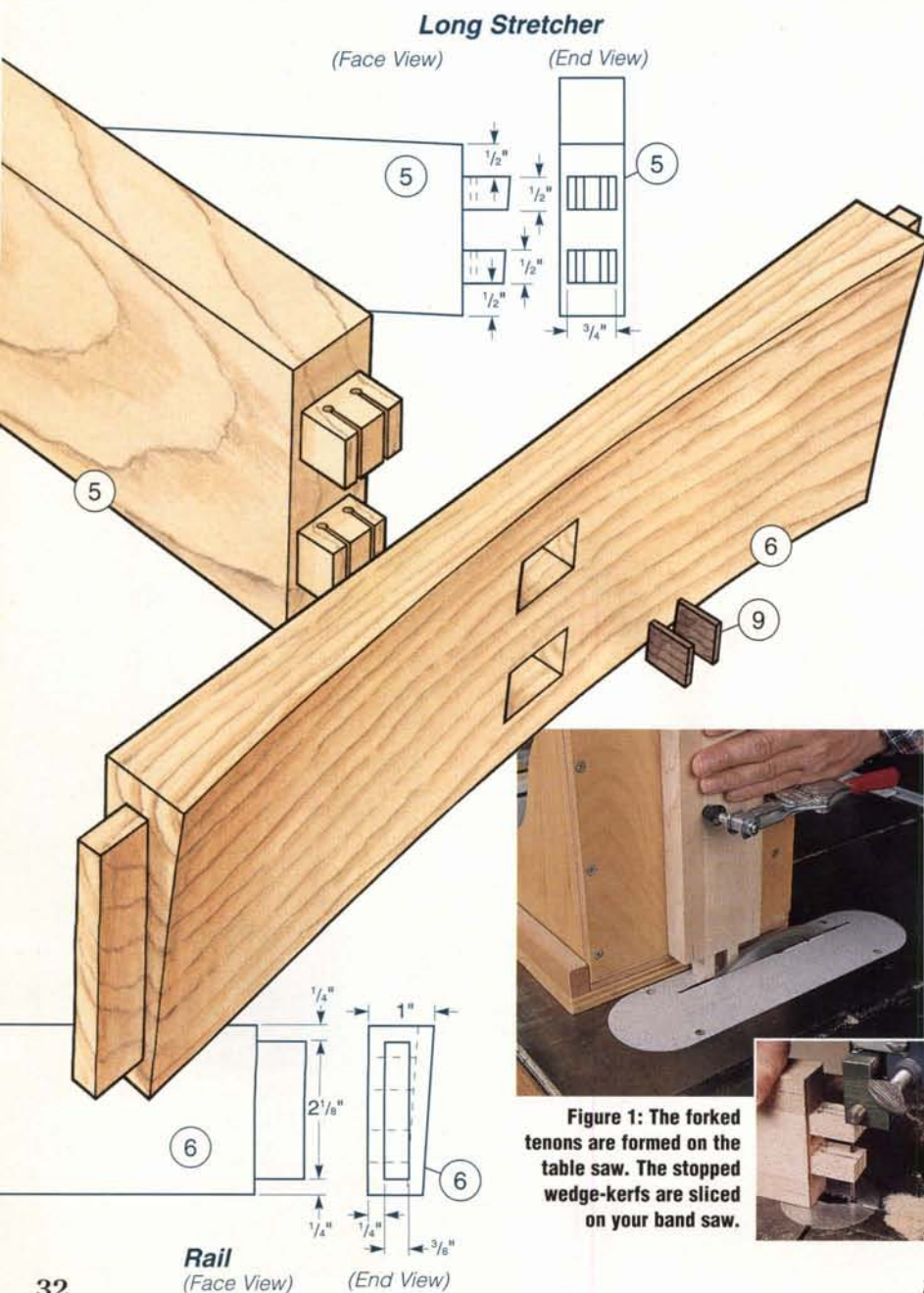


Making Complex Stretchers to Follow the Sculpted Legs

The rails on this table have complementary curves carved in two planes. One curve, running along the top edge of the rail, can be found in the **Pinup Shop Drawings**. It's important, however, to note that the curve is deeper on the bottom edge of the rail than on the top edge. This is achieved by setting a slight angle on your band saw's table. The other curve matches the shape of the cabriole leg, yet is held back to create a decorative line where the rail joins the leg.



Looking deceptively simple, the hall table's rails are a very complex bit of woodworking.



With all the tenons completed, the long stretcher can now be band sawn and belt sanded to shape. The inside face of each rail is flat, but the outside face has compound curves that follow the taper of the leg (see **Full-size Pattern** and the sidebar above). These can be marked free hand during a dry assembly, then cut on the band saw (with the table set at the right bevel) and fine tuned with the compass plane, spoke-shave and other forming tools.

Before moving on, dry fit everything to test the fit. Then band saw the eight wedges (pieces 9, see **Pinup Shop Drawings**) from a piece of dark stock — preferably a cutoff from the tabletop.

Assembling and Finishing the Legset

Prior to assembly, all parts should be scraped and then sanded to 320 grit. Then you must counterbore the three tabletop supports for their screws (pieces 10), as shown on the **Pinup Shop Drawings**. After that, the table's legset can be assembled in four distinct stages.

First, glue the long stretcher to the two rails and drive the wedges in. After drying, clean the wedges flush to the curved shape of the rails with a chisel and sandpaper.

Next, glue each pair of legs (the front and then the back) to their respective aprons. Make sure the

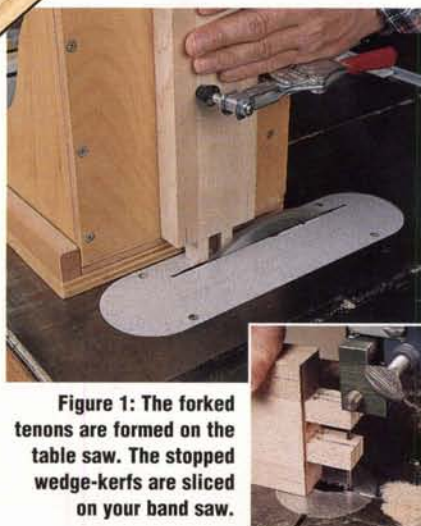
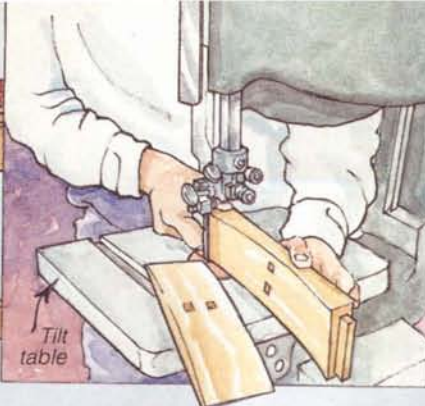
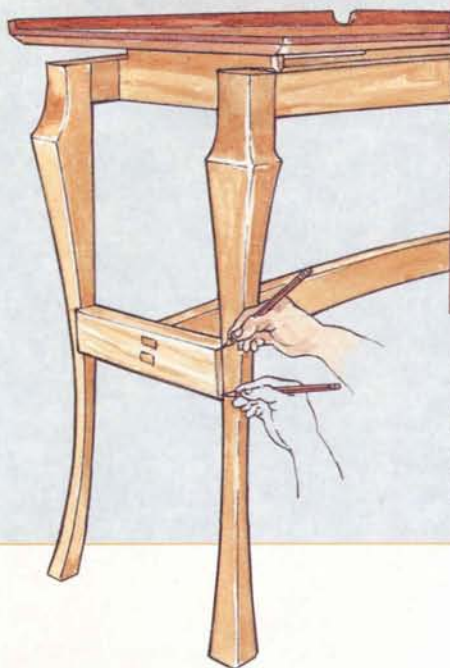


Figure 1: The forked tenons are formed on the table saw. The stopped wedge-kerfs are sliced on your band saw.



After creating the rail's tenons and dry fitting the stretcher to the legs, trace the curve of the legs onto the end of the rails. Move those lines back, to create the set-back. Cut the gentle curve on your band saw with the table set just a few degrees out of square.



Complete the rail's shaping process much as you did the table's cabriole legs. Use planes, scrapers, sandpaper and considerable elbow grease to clean them up. Patience is the key to this step.

haunched tenons are seated properly and each subassembly is square and true as you apply clamping pressure.

The third step is to glue and clamp the tenons on the H-shaped stretcher/rail subassembly into their relative leg mortises.

And the final legset assembly step is to glue the sliding dovetails on the tabletop supports into place by sliding each one down individually, thus revealing one reason for selecting this joint in the first place: it allows for a much less stressful glue-up procedure.

Minor trimming and sanding may be required after each stage of the glue-up. Once completed, apply at least five coats of Tung oil: it's fairly easy to damage but simple to repair, has a nice feel to the touch, and darkens maple satisfactorily.

Completing the Tabletop

With the legset complete, the tabletop can now be completed. After checking for distortion, perform any minor adjustment on the jointer and planer. Square it up by truing the back edge on the jointer, then trim it to the requisite square size on the table saw. This will require a sliding crosscut jig.

Lay out the front curve according to the **Pinup Shop Drawings**, then bevel the bottom of the front edge with a bearing-guided chamfering bit in the router. The rosewood I used had a lot of interlocked and twisted grain, so I sanded the top and bottom faces down through the grits from 120 to 220 using a stroke sander. Hand sanding completed the process to 320 grit.



The tabletop's back edge (piece 11), with its small broken arched pediment, is all that remains to be built now. Transfer the profile from the **Full-size Pattern**, then band saw it to shape. Clean up the curves with a drum sander chucked in the drill press, then sand it down to 320 grit. Glue and clamp this piece to the tabletop (see **Pinup Shop Drawings** for location), then dry fit the completed top to the legset.

Finishing the Tabletop

I sprayed three coats of satin pre-catalyzed lacquer on all faces, rubbing down nibs in between. The top coat was finished with #0000 wire wool and liquid wax. Pre-catalyzed lacquer was chosen for its ability to resist spills and other damage. Should there be a need to refinish in the future, the top can easily be removed to facilitate this.

Once the finish has cured, attach the legset to the upturned top by driving the nine screws through the supports into predrilled pilot holes in the underside of the top. Then turn your hall table upright and place it on exhibition in a nice, conspicuous place.

Richard Jones is a builder of quality furniture from Houston, Texas ... by way of Great Britain.

Get More

The new MultiMaster is three tools in one: detail sander, scraper and flush-cut saw.

Detail Sander

The MultiMaster's patented oscillating motion and special triangle sanding pad permit aggressive sanding along delicate edges and in tight corners.



Flush Cut Saw Blade

Smoothly undercuts door jambs for floor coverings. Plunge cuts into wall board. Cuts wood, plaster and PVC. But because it oscillates, it won't cut you.



Rigid Scraper Blade

Easily removes old putty, caulking and flooring adhesives. Great for scraping paint and varnish or lifting linoleum.



Oscillation

Only the MultiMaster oscillates at a rate of 21,000 strokes per minute in a 3.2 degree arc.



GET MORE

Detail sander, power scraper and oscillating saw all in one tool.

DO MORE

Scrape. Sand. Saw.

SPEND LESS

The New MultiMaster. Best pricing ever.

Until now, a Fein detail sander plus scraper and flush-cut saw would have cost you over \$300. Now, while supplies last, the MultiMaster package includes all of these accessories, and the price

is under \$200*. It's the best Fein value ever. Want a MultiMaster now? Simply call for immediate delivery from a participating Fein dealer near you. To learn more about the MultiMaster, ask for our free brochure and poster.

CALL 1-800-441-9878

*Participating Fein dealers only

Get Even More

The optional Professional Kit includes a carbide rasp, a grout-cutting saw blade, and a segment knife.

Carbide Rasp

Quickly grinds paint, mastic, stone and concrete. Won't load up.



Grout-Cutting Saw

Blade cuts grout to remove damaged tile without breaking surrounding tiles or creating excessive dust.



Segment Knife

Easily slices rigid materials like floor tiles, linoleum, carpet, plastic and leather.



The Fein MultiMaster is a true multi-purpose tool that saves hours of time. With the MultiMaster, finishing is just the beginning.



Finishing is just the beginning.

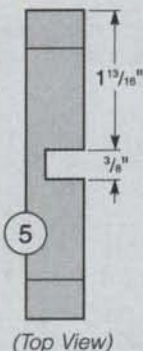
Kitchens by Design, Plainville, NJ/Photo: Carol Bates



Base Foot and Rail Subassembly Detail

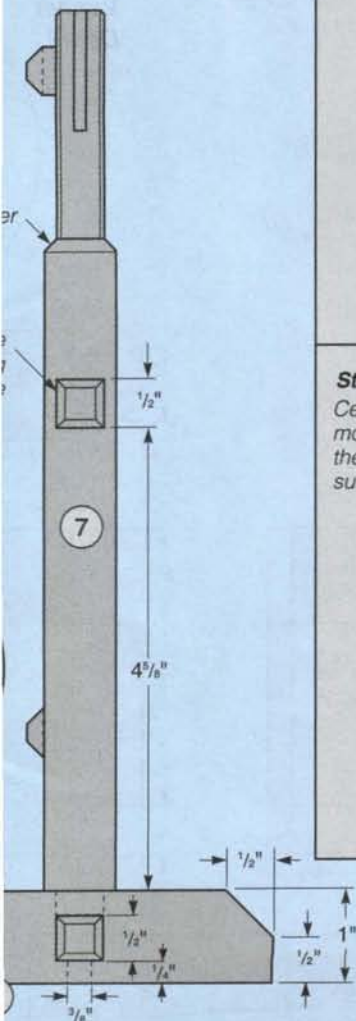
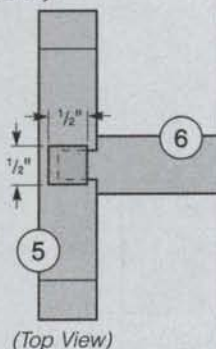
Step 1

Plow the rail dado.



Step 2

Center the upright's mortise after you glue up the foot and rail subassembly.



Picture Frame

(Side View)

T x W x L

1/2" x 3/4" x 7"

1/2" x 1/2" x 3/8"

1/8" ID brass

3/4" 6d (remove heads)

7/8" Brass

Full-Size Patterns

PINUP SHOP DRAWINGS

- 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.



Graceful Hall Table

Full-size drawings and detailed elevations prepare you for this challenging woodworking project.



Arts & Crafts Picture Frame

All measurements and detail locations required for building a traditional or contemporary frame.

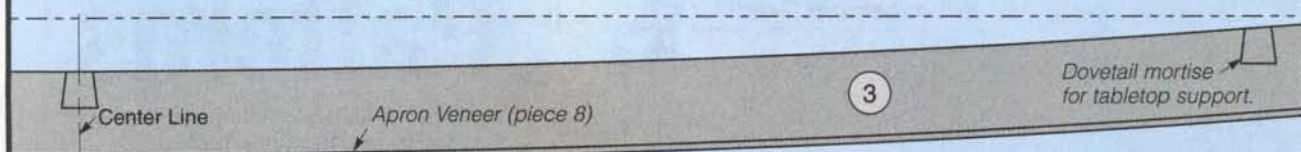


Dado Routing Jig

Elevation drawings providing the construction details needed for the main deck as well as the adjustable stops and hold down clamp.

WOODWORKER'S JOURNAL

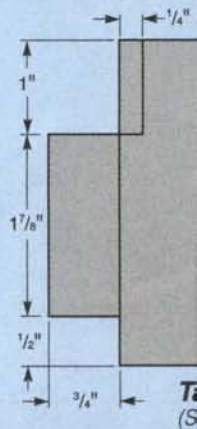
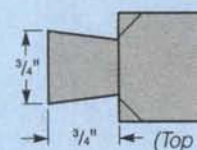
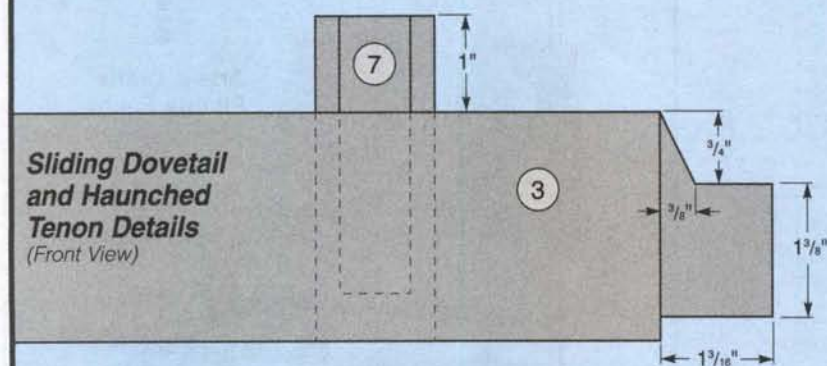
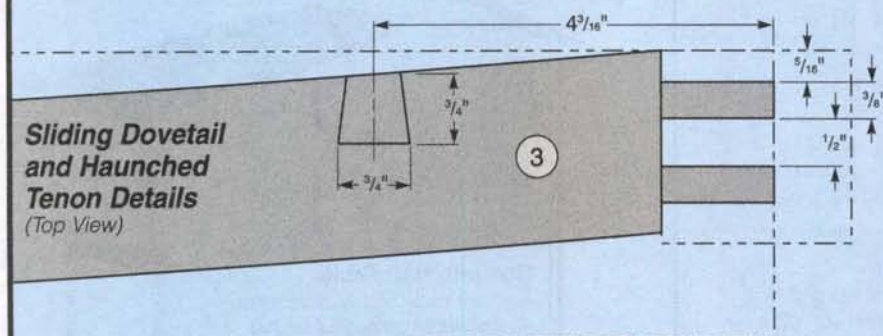
Box 261, Medina, MN 55340-0261.
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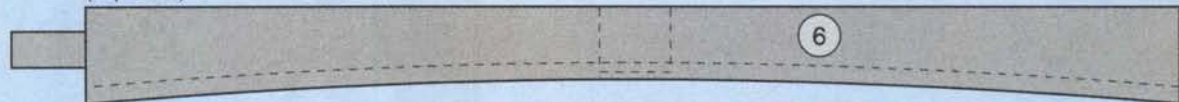
Front Apron
(Top View)

Create the gentle curve on the front face of the apron, then transfer that curve to the back face of the apron to complete the shape.

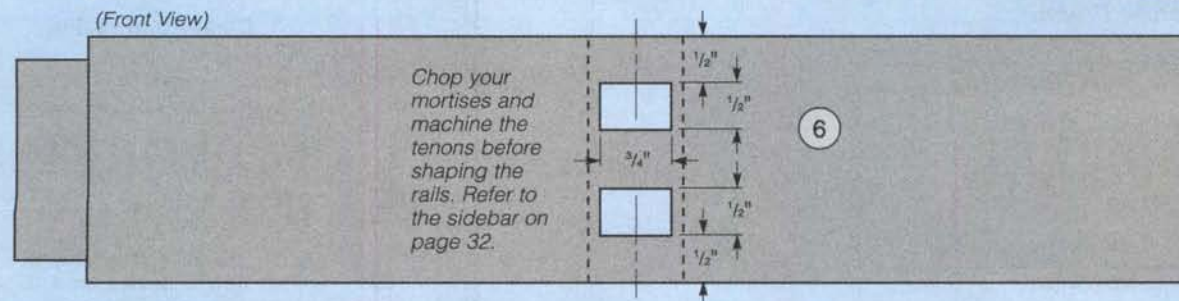
Veneer Detail
(End View)



Rail
(Top View)



(Front View)



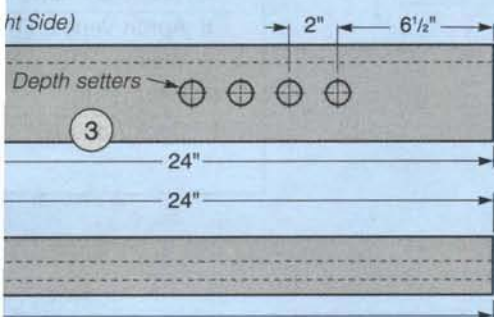
Chop your mortises and machine the tenons before shaping the rails. Refer to the sidebar on page 32.

Long Stretcher
(Top View)

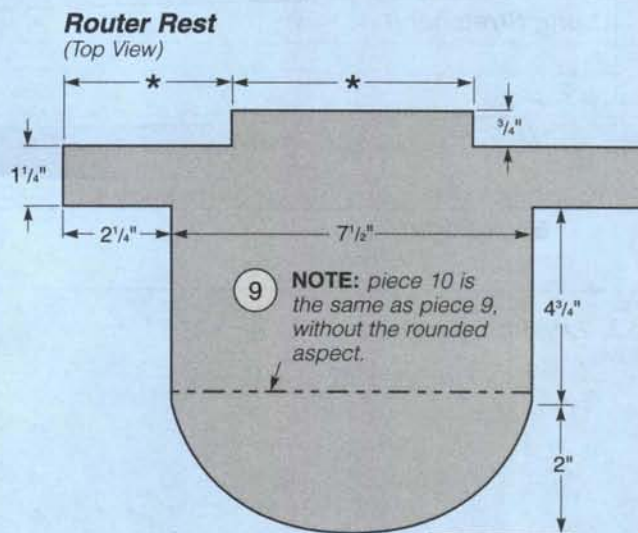
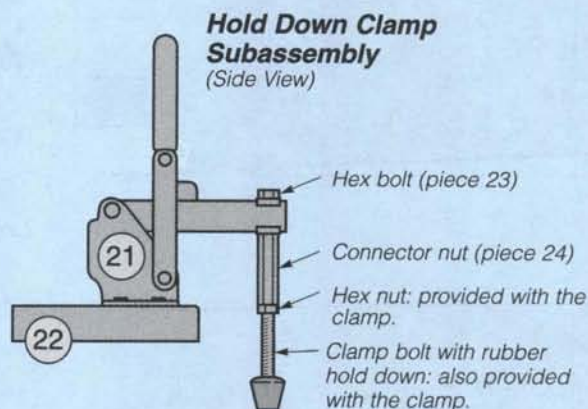
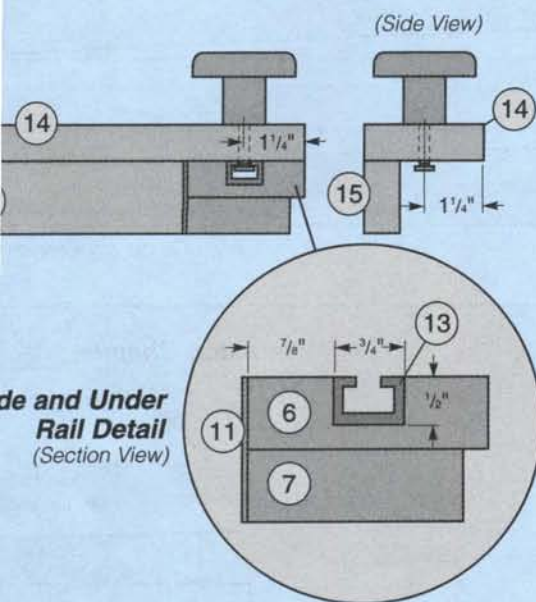
5

Form kerf cuts for the wedges, with holes bored at their ends to prevent splitting.

MATERIAL LIST



ht is determined by the size of your router.



* These measurements are determined by the size of your router.

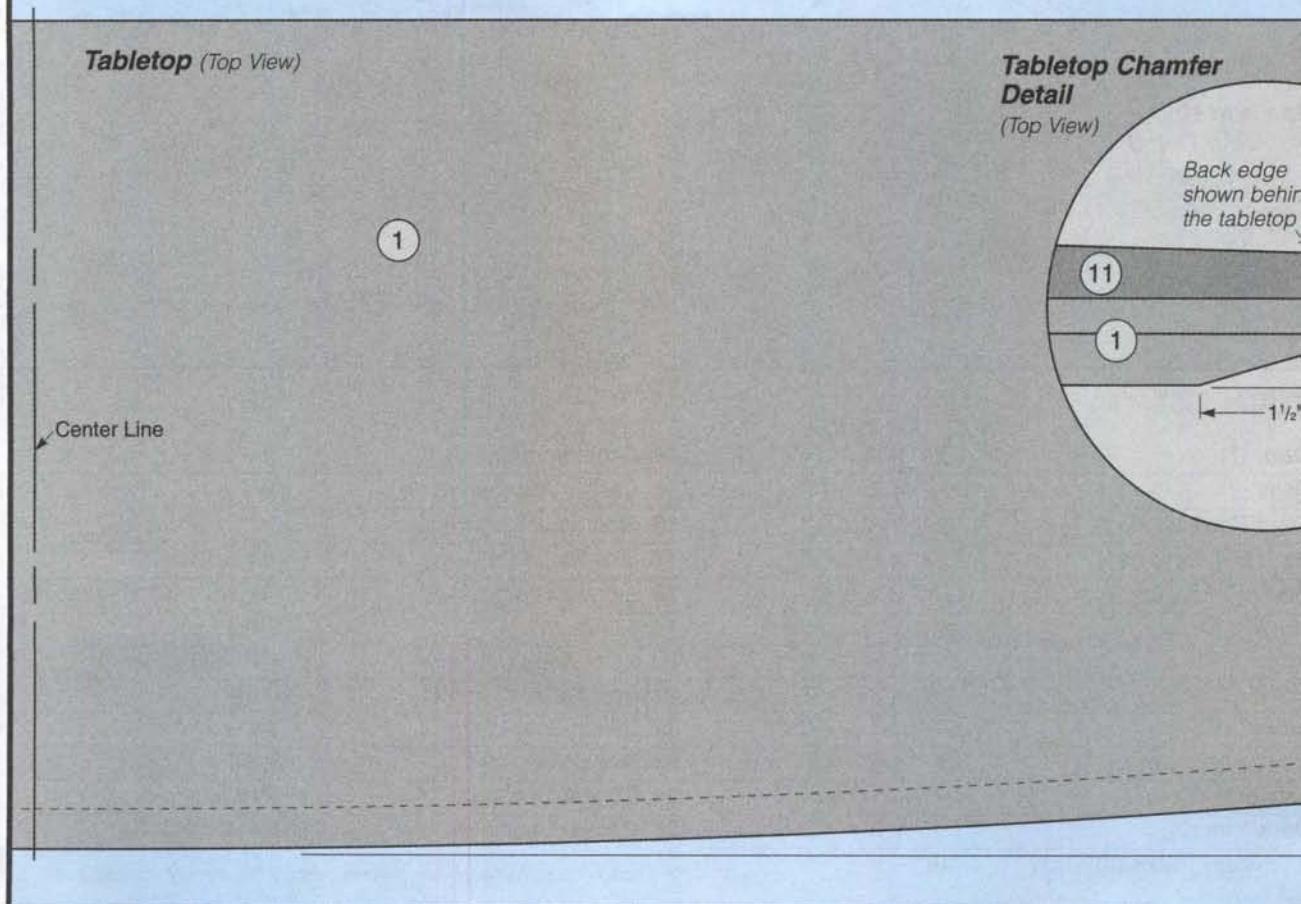
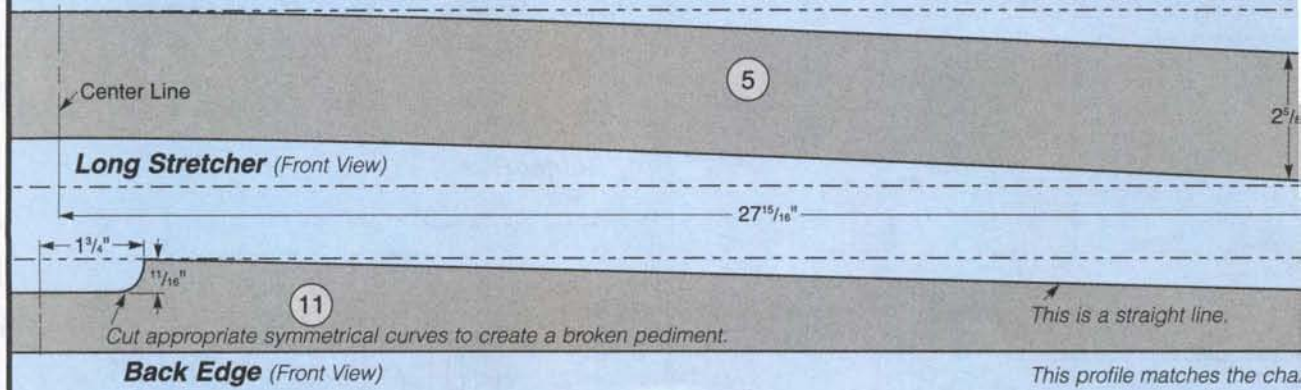
MATERIAL LIST

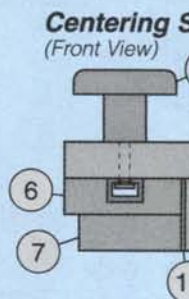
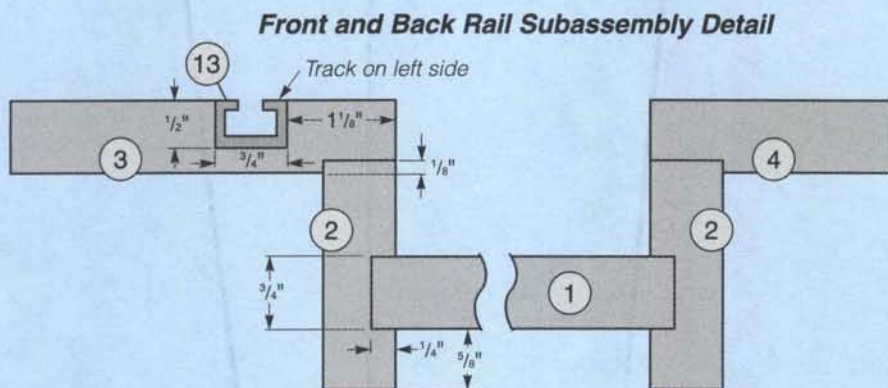
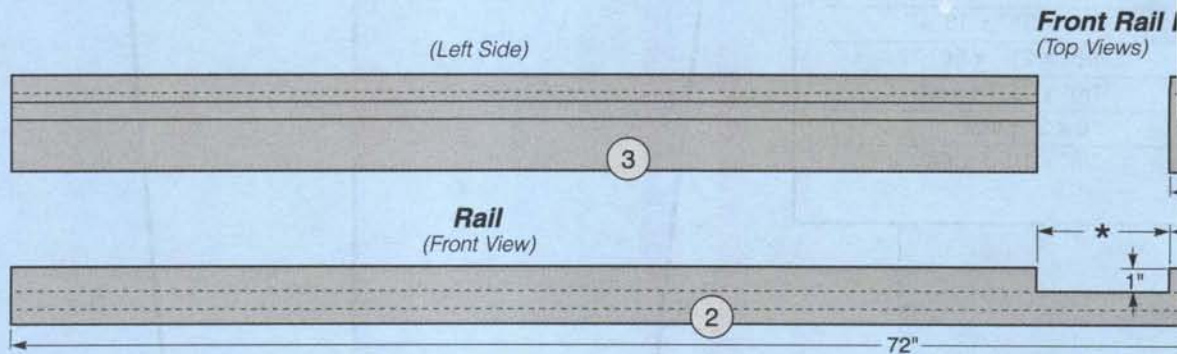
	T x W x L
Track (1)	3/4" x 26 1/2" x 72"
Rails (2)	3/4" x 2 3/8" x 72"
Front Rail Return (1)	3/4" x 4" x 72"
Rear Rail Return (1)	3/4" x 2 1/2" x 72"
Walnut Plugs (bag)	3/8" Dia. flat
Guide Rails (2)	3/4" x 2 1/2" x 39"
Under Rails (2)	3/4" x 2 1/4" x 25 7/8"
End Spacer (1)	3/4" x 2 1/2" x (*)
Router Rest (1)	3/4" x 8 3/4" x 12"
Router Receiver (1)	3/4" x 6 1/4" x 12"
Laminate liners (2)	1/16" x 1 1/4" x 25 7/8"
Track Trim (2)	1/8" x 3/4" x 26 1/2"
Aluminum Tracks (3)	48"

	T x W x L
14 Centering Stop (1)	3/4" x 2 1/2" x (*)
15 Center Stop Return (1)	3/4" x 1 1/2" x (*)
16 Side Stop Tops (3)	2/4" x 2 3/4" x 2 7/8"
17 Side Stops (3)	3/4" x 2 3/8" x 2 7/8"
18 Stop Knobs (5)	Plastic, 5/16" thread
19 T-Bolts (5)	Steel
20 Stop Hinge (1)	1 1/2" x 36" (Piano)
21 Hold Down Clamp (1)	Steel
22 Clamp Spacer (1)	3/4" x 2 1/2" x 4"
23 Hex Bolt (1)	5/16" x 1" Steel
24 Connector Nut (1)	5/16 ID
25 Hanger Cleats (2)	3/4" x 1 3/4" x 24"

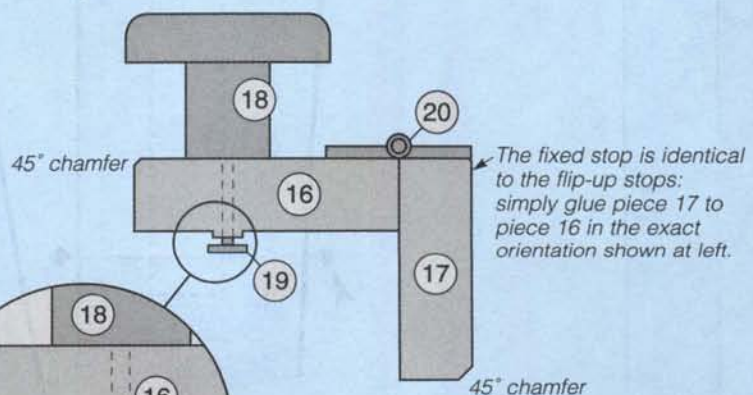
* These measurements are determined by the size of your router.

-
- Long Stretcher Tenon Detail**
(Front View)
- 5
- 1" (Total height of the tenon assembly)
- $\frac{1}{2}"$ (Tenon thickness)
- $\frac{1}{2}"$ (Tenon thickness)
- $\frac{5}{8}"$ (Tenon thickness)
- $\frac{1}{2}"$ (Tenon thickness)
- $\frac{1}{2}"$ (Tenon thickness)
- Long Stretcher**
(End View)
- 5
- $\frac{3}{4}"$ (Total width of the tenon assembly)

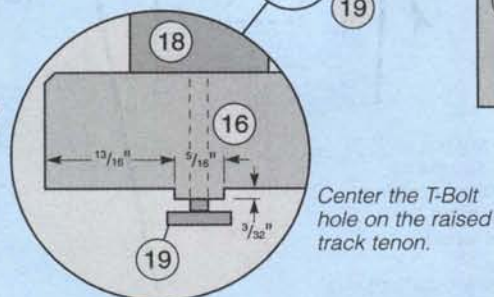




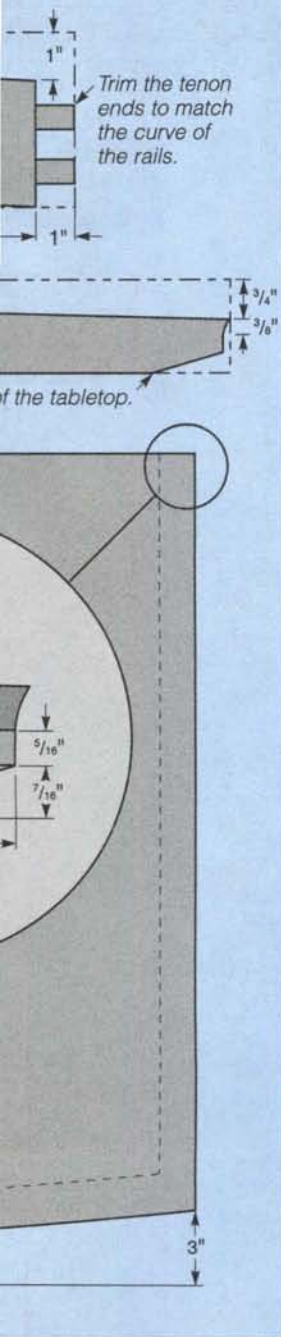
Flip-up Sliding Stop (End View)



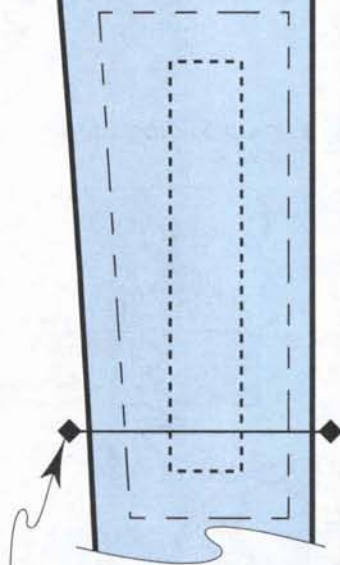
Sliding Stop Machining Detail



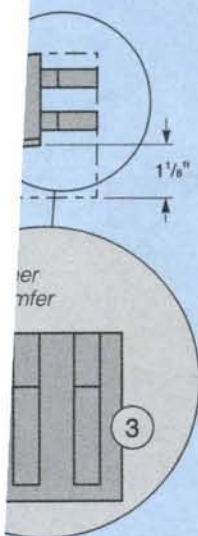
$3/4" \times 17/8" \times 63/4"$
 $23/4" \times 23/4" \times 333/8"$
 $27/8" \times 23/8" \times 58"$
 $17/8" \times 23/8" \times 58"$
 $11/16" \times 35/8" \times 577/8"$
 $1" \times 25/8" \times 13"$
 $11/4" \times 33/8" \times 137/32"$
 $1/8" \times 23/8" \times 563/4"$
 $1/8" \times 1/2" \times 3/4"$
 #8 x 3" Steel
 $7/8" \times 15/16" \times 64"$



Photocopy the
 pattern segments
 and ensure a proper
 fit by aligning the
 squares when
 constructing your
 Full-Size leg pattern.

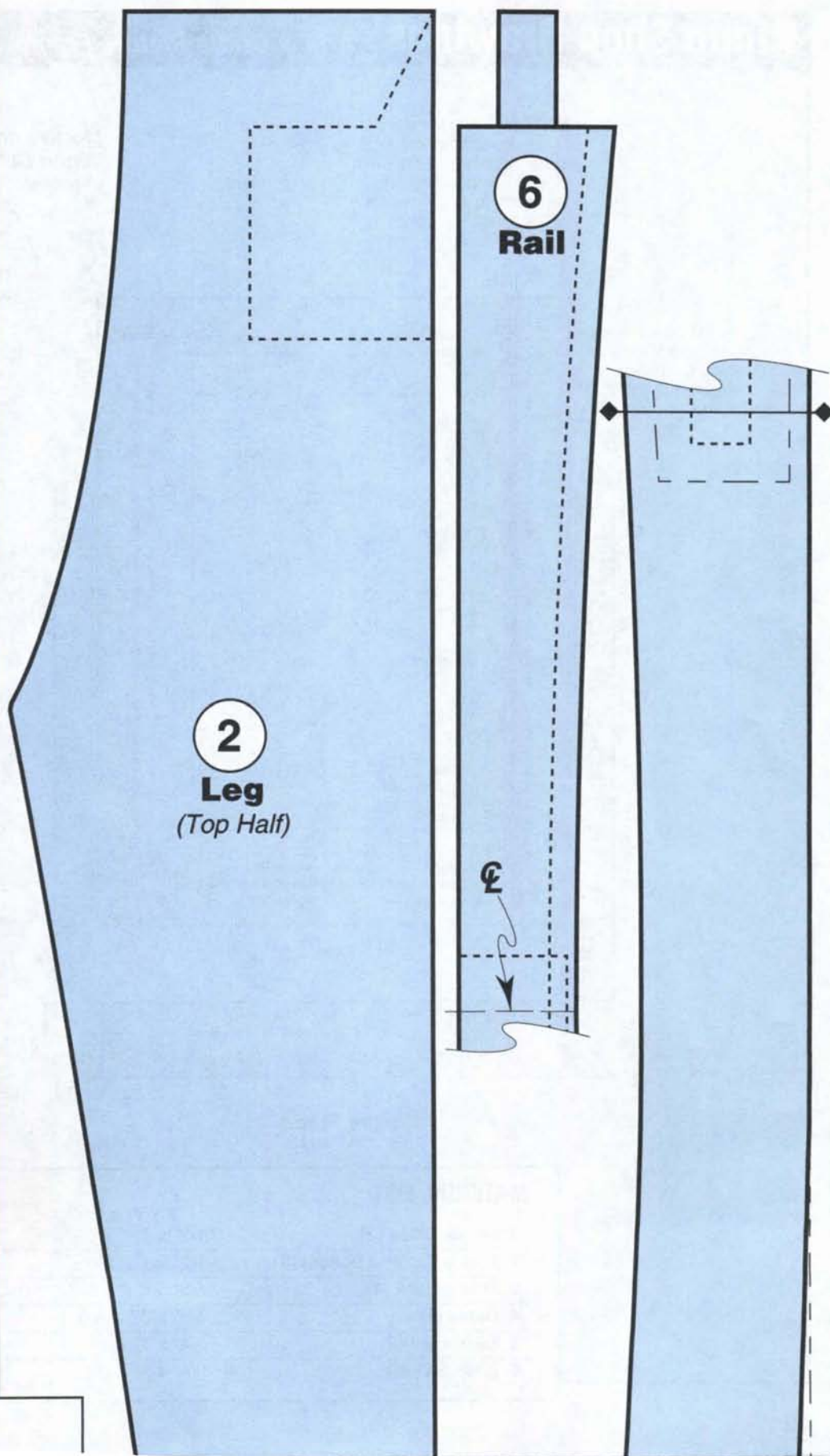
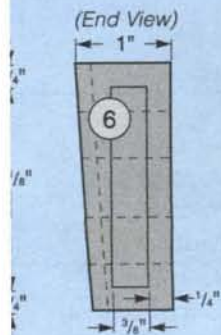


2
Leg
 (Bottom Half)



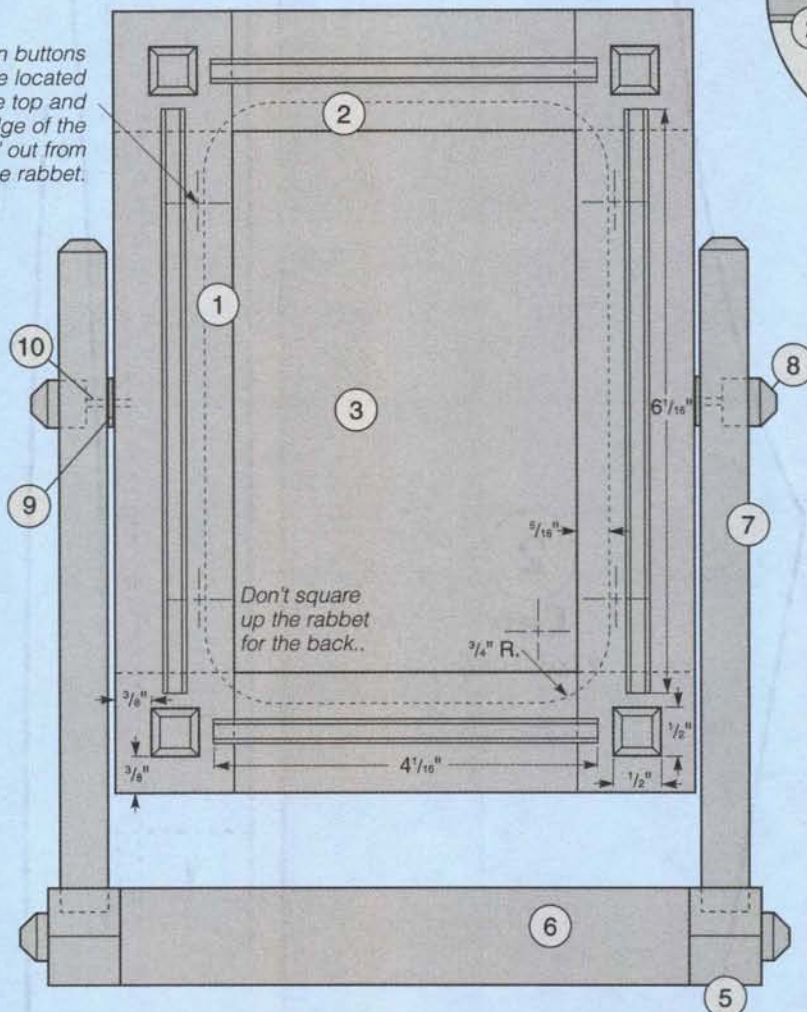
Counterbore the screw's pilot holes from both edges of the tabletop support. This allows the screws to flex as the tabletop expands and contracts.

op Support
(w)



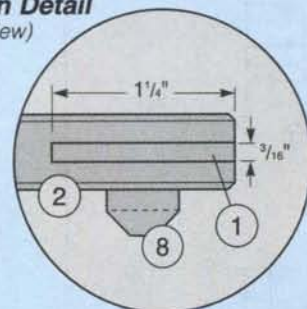
NOTE: the inlays are optional and more appropriate for a contemporary version. From a design perspective, it is important to stop them short of the pyramid plugs.

The turn buttons (pieces 11) are located 2" from the top and bottom edge of the frame and 1/8" out from the rabbet.

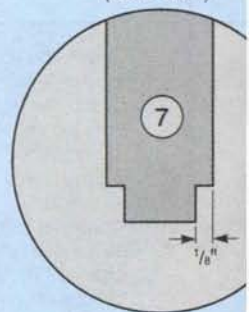


Picture Frame
(Front View)

Mortise and Tenon Detail
(Top View)



Upright Tenon Detail
(Side View)



MATERIAL LIST

	T x W x L	
1 Frame Sides (2)	1/2" x 1 1/4" x 8 1/8"	7 Uprights (2)
2 Frame Top and Bottom (2)	1/2" x 1 1/4" x 6 1/8"	8 Plugs (8)
3 Frame Back (1)	1/8" x 4 1/4" x 6 1/4"	9 Washers (2)
4 Glass (1)	1/8" x 3 13/16" x 5 13/16"	10 Nails (2)
5 Base Feet (2)	3/4" x 1" x 4"	11 Turn Buttons (4)
6 Base Rail (1)	3/4" x 1" x 7"	

Arts & Crafts Picture Frame

By Jim Jacobson

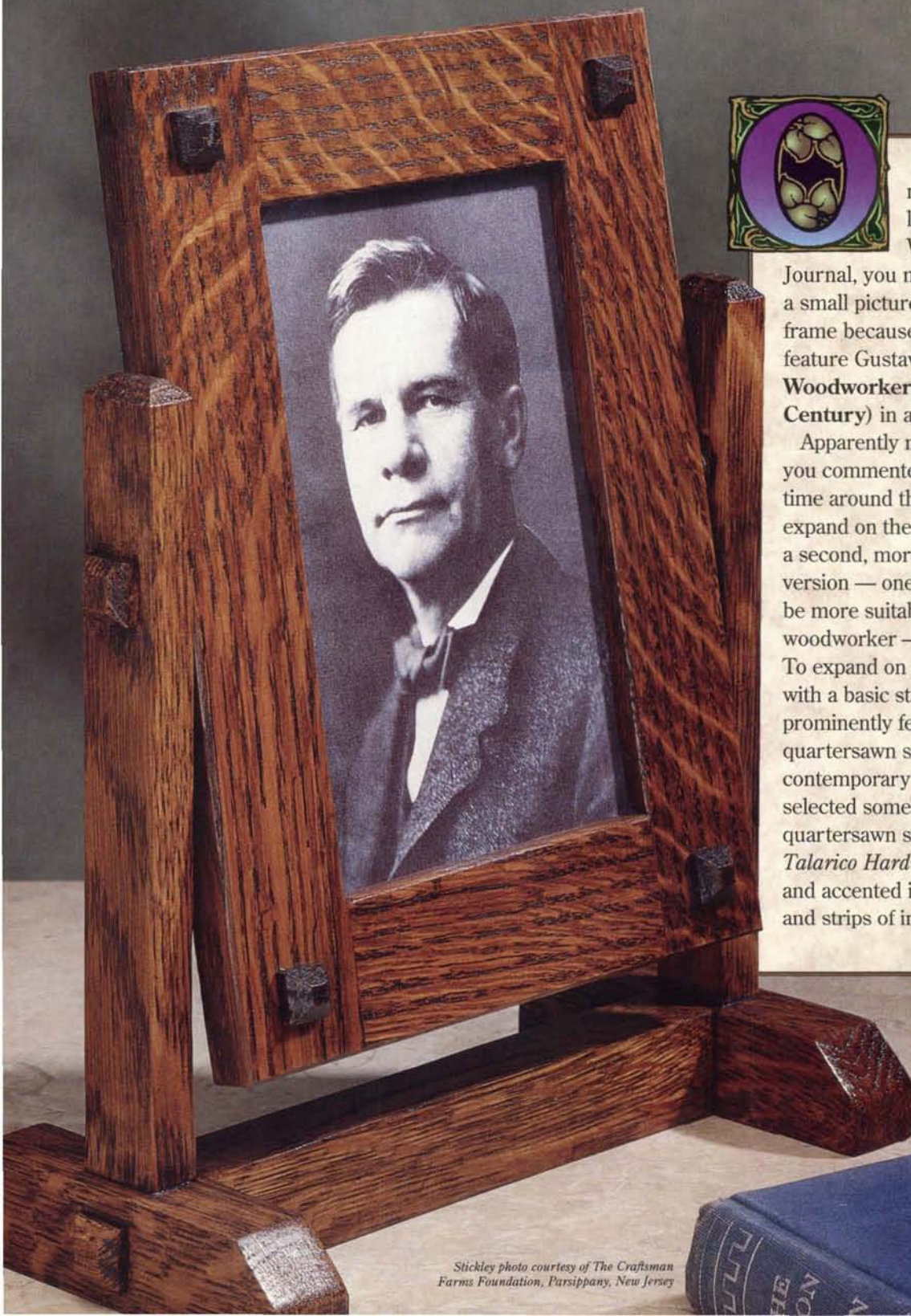
Build a stylish picture frame over the weekend. This issue's Pinup Shop Drawings provide details for a traditional Arts & Crafts look or a more contemporary style with inlays.



On the cover of your last issue of Woodworker's

Journal, you may have noticed a small picture frame. I made that frame because the staff wanted to feature Gustav Stickley (the **Woodworker of the 20th Century**) in an appropriate setting.

Apparently more than a few of you commented on it, because this time around the staff asked me to expand on the theme and develop a second, more contemporary version — one that would perhaps be more suitable for a modern woodworker — like Norm Abram. To expand on the theme, I came up with a basic stand for the frame, prominently featuring chamfers and quartersawn stock. For my contemporary version, I simply selected some beautiful quartersawn sycamore (*courtesy of Talarico Hardwoods; 610-777-0400*) and accented it with ebonized plugs and strips of inlay.



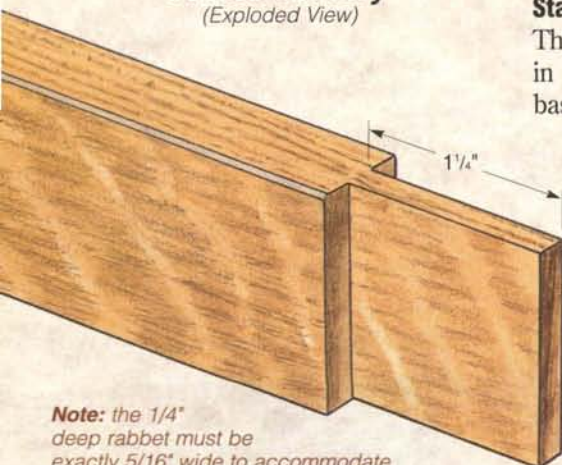
Stickley photo courtesy of The Craftsman Farms Foundation, Parsippany, New Jersey

Setting Up: Tools and Materials

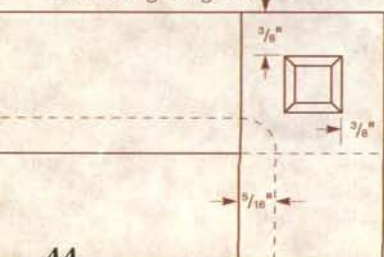
The essence of Arts & Crafts furniture was simplicity. The idea was to incorporate pre-industrial age values (such as hand built quality) into the machine age. An Arts & Crafts piece was sturdy, functional and attractive, but never gaudy or over-dressed in the way that Victorian pieces had been. This Arts & Crafts picture frame follows those guidelines: it is sturdy and durable, attractive in its own right, but not so ornate that it overpowers the image in the frame.

Construction is vintage Stickley. The material is quartersawn white oak and the frame is assembled with open mortise and tenon joints. The uprights are mortised into the feet and pyramidal plugs are prominently used to evoke that pre-Industrial Age feeling.

Frame Joinery (Exploded View)



Note: the 1/4" deep rabbet must be exactly 5/16" wide to accommodate the rectangular glass.



**Rabbet
and Plug
Locations**

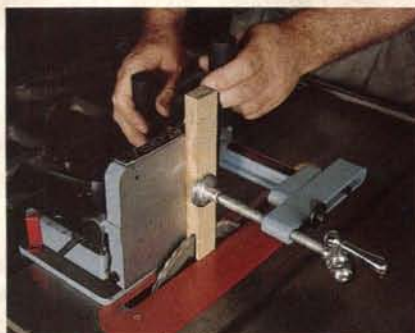


Figure 1: The author used his tenoning jig to form the tenons on the ends of the frame top and bottom and then reset it to plow the open mortises in the sides.

While the frame's construction is relatively simple, it does require a fair bit of tooling. For example, you'll need access to a tenoning jig for the table saw, a mortising machine or attachment for your drill press, and a power miter saw. You'll also need a sander and a bearing-guided rabbeting bit for your portable router. Once you've assembled your tools, keep in mind this is the perfect project for setting up a production run.

Start with the Frame

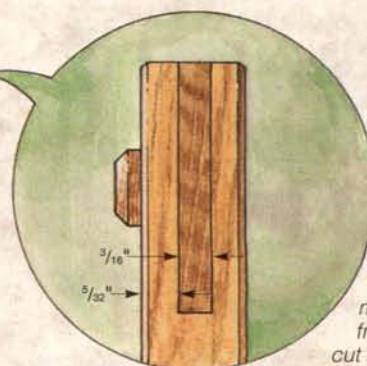
There are two distinct subassemblies in this project, the frame and the base. The frame is made up of two

sides, a top and a bottom (pieces 1 and 2). After cutting these parts to the dimensions shown in the **Material List**, lay out the open mortise and tenon joints that hold them together. All the dimensions are provided on the **Pinup Shop Drawings**. Use your table saw's tenoning jig to create the tenons on the ends of the frame top and bottom, then reset the jig to plow the open mortises in the frame sides (see **Figure 1**). Test all of these cuts on scrap before milling the actual workpieces, paying special attention to how the parts fit together. You need a tight fit, but not one where you have to force the pieces together.

Glue up the frame, applying glue to each mortise and tenon. Clamp the assembly so it is square and the joints are tight, then use four more clamps on the corners to ensure good contact between the tenon cheeks and the mortise walls.

When the glue is dry, sand the entire frame before creating the rabbet for the back and glass (pieces 3 and 4). Refer to the **Pinup Shop Drawings** and the **Elevation Drawings** below for the dimensions

Corner Detail (End View)



Note: the 3/16" deep mortises for the frame plugs are cut after assembly



Figure 2: The size of the rabbeting bit and bearing is critical. The goal here is to fit a square cornered piece of glass into an opening with rounded corners.



and location of this rabbet, then mill it, as shown in **Figure 2**. Use a piloted bearing bit to create a rabbet exactly 1/4" deep by 5/16" wide. You want to be precise here to ensure the rounded corners of this cut will accept the rectangular piece of glass you'll install later.

The Feet are Next

After cutting the feet and base rail (pieces 5 and 6) to their overall dimensions, lay out the chamfers on each foot, following the dimensions on the **Pinup Shop Drawings**. Use your miter gauge with the stock clamped tightly in place to form these chamfers on the table saw. Since there will be some overlapping joinery, I recommend you complete the dado and tenon joint between the feet and the base rail now. Set up your table saw with a dado head and form the dado at the center of each foot. Use the same basic setup to mill the cheeks on the base rail. Once you've got a tight fit, set up your mortising machine with a 1/2" bit and chisel and form the shallow mortises that will accept the plugs on the outsides of the feet. Now go ahead and glue the feet to the rail, taking care to keep everything square.

When the glue is dry, create another mortise on the top of each foot for the uprights (pieces 7). While you're at it, form the mortises toward the top of these uprights (for the plugs) and drill a small through hole for the nail that will hold the frame in place later. Check the **Pinup Shop Drawings** for all the dimensions and locations. As the mortising machine bit is a set size, while tenoning jigs are adjustable, it makes sense to chop your mortises first, then mill the tenons to fit. Once you've cut the mortises for the uprights into the feet, move to the uprights and form the tenons at their ends. These tenons can be milled on the table saw using the same jig you used earlier to build the frame. Check their fit in the mortises you just formed, then use the power miter saw to trim the chamfers at the tops of the uprights and on the plugs. (Use the same method described in the short article at right.)

Assembly

Before starting your assembly, move back to the mortising machine to form the four mortises for the pyramidal plugs (pieces 8) on the face of the frame. Test the fit of these plugs, as well as the four on the base subassembly. Now sand all parts through the grits to 220 grit, slightly chamfering the edges, then apply the stain of your choice. Traditionally, this would be a dark reddish brown: Stickley used to achieve this, but now we can use much safer and simpler stains to gain essentially the same results.

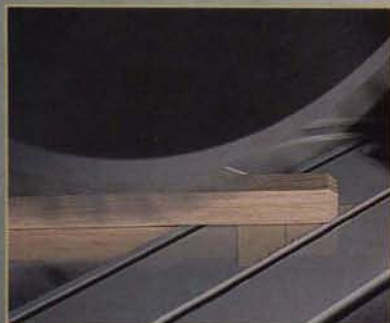
Install the frame plugs and the two on the feet, but hang onto the



Medieval Influences

The influence that medieval architecture and design had on the Arts & Crafts period is evident in the widespread use of pyramidal plugs found on turn of the century Mission, Roycroft and other furniture lines. These plugs resemble the beaten heads of iron nails, used extensively in the carpentry and leatherwork of medieval European households.

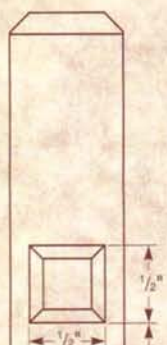
Begin making the plugs by setting your miter saw to 45° and attaching a piece of masking tape to the bed of your miter saw. Rip a piece of stock to 1/2" square, then set it on the saw and make the first chamfered cut, as shown below. Before moving the workpiece, mark the stock's location with a pencil line on the tape, then simply line up the end of the stock with this mark as you rotate the piece 90° to make the other three cuts. Trim the plugs to length on the band saw: your miter saw is far too aggressive for this cut and the plugs will just go airborne.



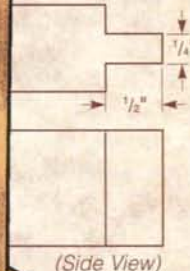
Your power miter saw is a good choice for forming the chamfered tops on the plugs. Just be sure to switch to the band saw when you're ready to cut them to length.

Picture Frame (Exploded View)

Base Joinery (Side View)



Base Rail Tenon (Top View)



(Side View)

MATERIAL LIST

	T x W x L
1 Frame Sides (2)	1/2" x 1 1/4" x 8 1/8"
2 Frame Top and Bottom (2)	1/2" x 1 1/4" x 6 1/8"
3 Frame Back (1)	1/8" x 4 1/4" x 6 1/4"
4 Glass (1)	1/8" x 3 13/16" x 5 13/16"
5 Base Feet (2)	3/4" x 1" x 4"
6 Base Rail (1)	3/4" x 1" x 7"
7 Uprights (2)	1/2" x 3/4" x 7"
8 Plugs (8)	1/2" x 1/2" x 3/8"
9 Washers (2)	1/8" ID brass
10 Nails (2)	3/4" 6d (remove heads)
11 Turn Buttons (4)	7/8" Brass

Ebonized Accents

By Gregory Pluth

In the world of fashion, if you can't find the right color, it's standard practice to "go with black." In woodworking, black also gets the nod, but it's more typically employed as the perfect accent color, complementing without competing. For years, ebony was the species of choice for this role, but today it is in short supply. It's also something of a waste, since you can achieve the same look, often with desirable grain highlights, by using a simple chemical reaction to transform oak's natural color to pure black — *ebonizing* it.

Of course, you could choose to paint the accents, but paint fills the pores and blends the grain configurations, masking the natural beauty. Staining will add color to oak while retaining its character, but stains can be messy to use and difficult to apply evenly. The following ebonizing process is easier than staining and creates a deeper black than can be attained with stains or dyes.

Try ebonizing something small at first, like the plugs on the frame at right. You can move on to small jewelry boxes, or even the top of an end table, once you get the hang of it. If you are

working with previously treated wood, be sure to strip the finish and sand to 280 grit or finer.

The process couldn't be simpler. First, completely immerse a handful of steel nails in a cup of white vinegar (use a wide-mouth container, such as a peanut butter jar). Let this steep for about a week, or until the liquid becomes murky. Try some of your brew on an oak scrap to see how it responds. It may be ready in as few as four days. No pressure, though: it will still be ready after a month. When you're happy with the appearance of your mixture on the scraps, liberally brush the solution onto your accent pieces. As it reacts with the tannin in the oak, the darkening begins. Apply several coats, allowing the wood surface to dry between coats. This takes about half an hour. When the oak is as black as you like, brush on household ammonia. It neutralizes the vinegar acid, stopping the reaction in its tracks. Once the piece is dry, it's ready. You'll find that your ebonized stock finishes nicely and accepts glue with no problem.



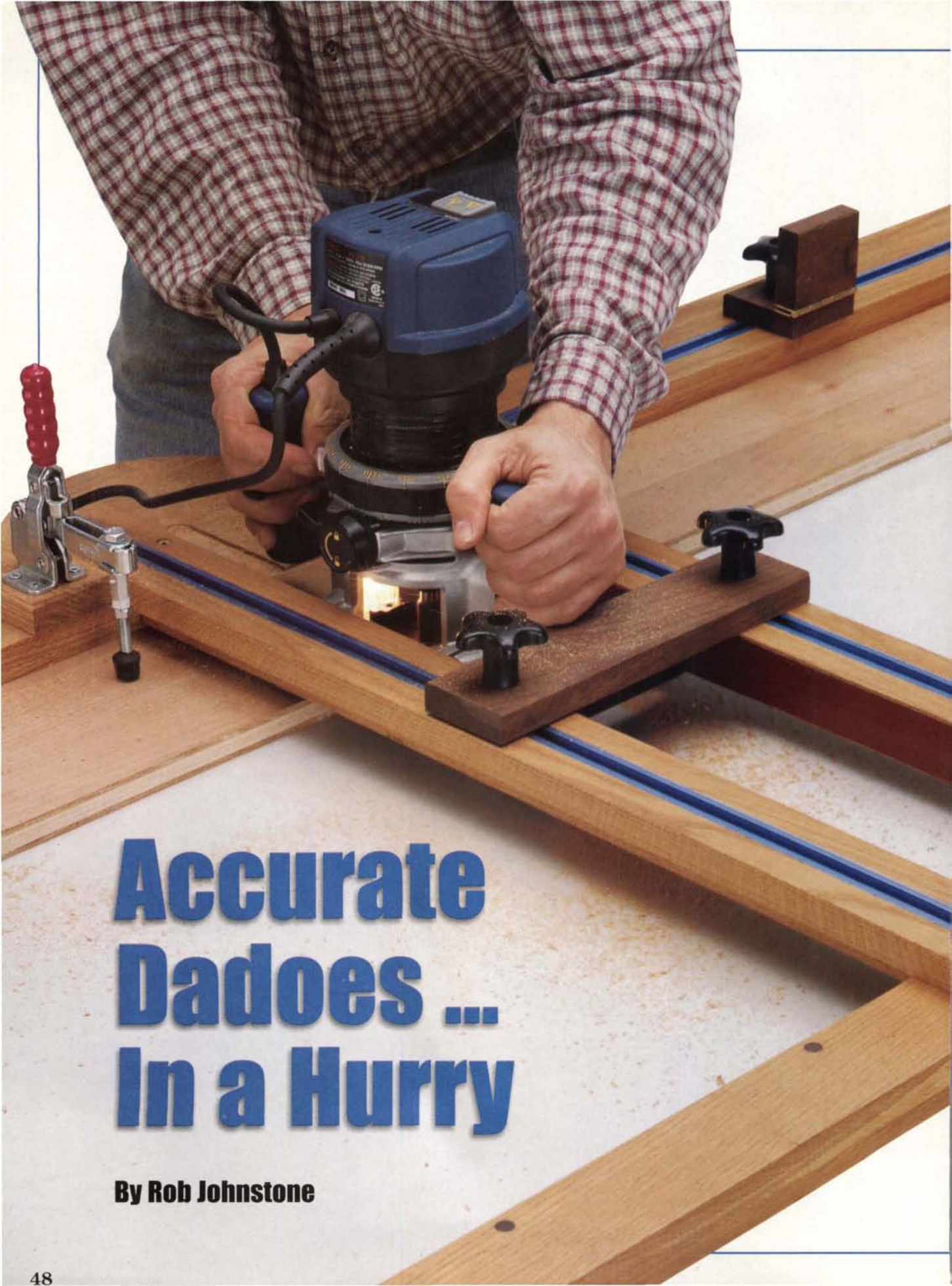
two at the top of the uprights for now. Dry fit the uprights in the feet and, using small brass washers (pieces 9) as spacers, nail (piece 10) the uprights to the frame. (Note: Predrill holes in the uprights just large enough to provide a snug fit for the nails. Also, be sure to extend the pilot holes into the frame to prevent splitting.) When everything fits well, glue the uprights to the feet, keeping the frame in position so they dry at 90°. Plug the last two mortises, apply a satin finish to all the stained parts, and set the photo and glass in the frame to test their fit.

Cut the frame back to size and band saw, then sand the corners to perfectly fit the rabbet in the back of the frame. Apply your stain and finish both faces of this piece. When the finish has dried, install the back, photo and glass with four turn buttons (pieces 11) at the locations shown in the **Pinup Shop Drawings**.

Now that you've completed your first frame, it may be time to clean up the shop and set it up for a production run. After all, framed photographs do make for wonderfully personal gifts.



This contemporary frame struck us as more suitable for a turn of this century woodworker, like Norm Abram. Check out the Pinup Shop Drawings for the inlay locations.



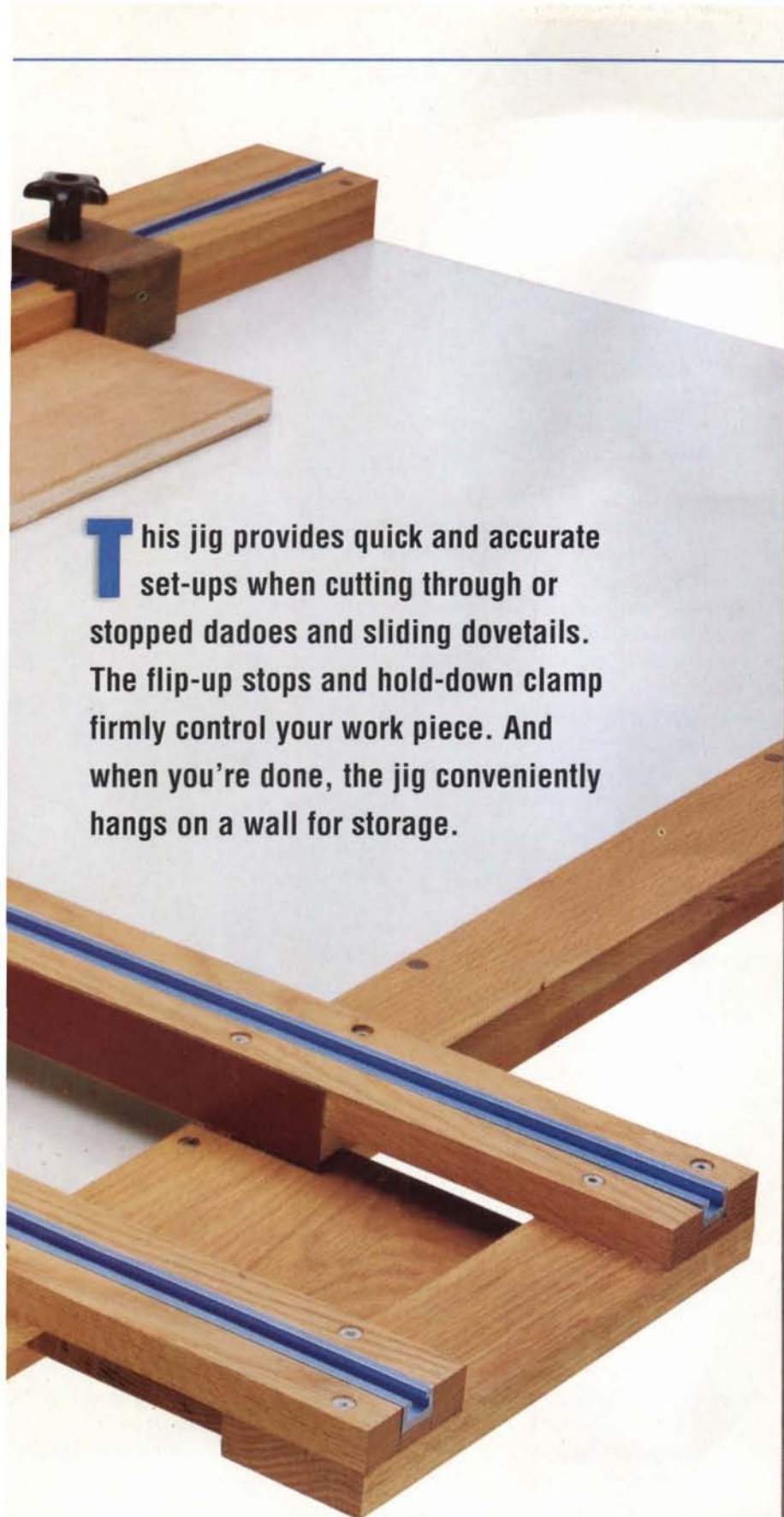
Accurate Dadoes ... In a Hurry

By Rob Johnstone

Quick and Easy Grooves

Quick, easy and accurate ... that's what you'll get with this jig. It's quick to set up (both depth settings and dado placements), and it's quick when it comes to making repeatable cuts: the sliding hinged stops help you plow successive indexed dados (like those on matching bookcase sides) in a hurry.

Because you move the router across the stock — not the stock across a table saw, it's also a lot easier (especially on your back). And if you do any type of cabinetry, from bookcases to entertainment centers, you'll find this jig indispensable for plowing three styles of common dados: stopped, through and sliding dovetail.



This jig provides quick and accurate set-ups when cutting through or stopped dados and sliding dovetails. The flip-up stops and hold-down clamp firmly control your work piece. And when you're done, the jig conveniently hangs on a wall for storage.

Through dados are the easiest to make ... although not as attractive if they remain in plain view.

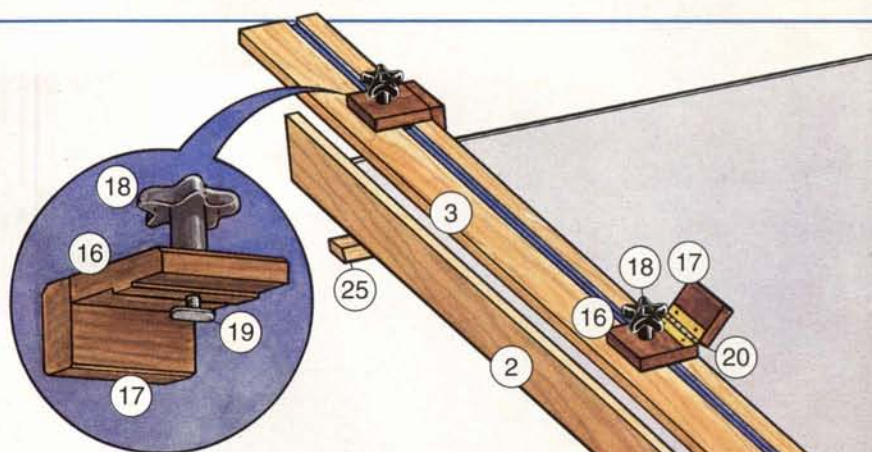
Stopped dados allow you to hide the forward aspect of the joint ... but also force you to accommodate the stopped portion of the joint with a matching notch or rebate.

Sliding dovetails are a more challenging variation of a dado. The familiar wedge-like shape creates a strong and attractive mechanical joint.



scrap wood and a little know-how are all you need sometimes. For example, a bare-bones version of this jig hung in my father and uncle's woodworking shop from the day I set foot in it. It was made from fir plywood and nondescript scrap lumber ... but was constantly in demand as people worked through their various projects. As a matter of fact, the first bookcase I made for my wife was machined on that jig more than 20 years ago. Of course our version is a Mercedes when compared to that basic Volkswagen bug, but if you're looking for a valuable tool for your shop, feel free to use whatever scrap material you have on hand to create your own version.

Start by cutting the deck (piece 1) from a sheet of melamine and the rails (pieces 2) from hardwood stock. Go ahead and cut the front and rear rail returns (pieces 3 and 4) at the same time. Move to your table saw, and with a dado head in place, plow the long grooves in the rails and the shallow rabbets on the front and rear rail returns. Look to the **Elevation Drawings** on the opposite page and **Pinup Shop Drawings** on the center pullout for the machining details. Remember most sheet stock these days is just a bit under a true 3/4" thickness. Check your grooves in scrap lumber to be sure they fit properly. Now take a few moments to find out how large an opening you will need to create for your router.



Stop Block Detail

For this jig to be accurate, your router must fit snugly between the guide rails. And to ensure smooth sliding action, these rails are lined with plastic laminate. This also means they'll wear better for you. If the liners do begin to show wear, you can just peel them off and replace them with fresh laminate. (*Voila!*, good as new!)

Measure the width of your router base plus the two pieces of the plastic laminate you will be using. This is the only way to arrive at the opening you'll need for your router, as shown in **Figure 1**.

Custom Measurements

Take the measurement you found for the router opening and transfer it to the top edges of the rails, 24" from one end (see the **Pinup Shop Drawings**). Form a notch on each rail to accommodate the router rest and receiver. I left the dado head in my saw to nibble out these notches with the help of my miter gauge.

Measure from the end of the rails to the edges of your notch and cut your front and rear rail returns into properly sized segments. Then look to the **Pinup Shop Drawings** for the location of the track groove in the face of the left front rail return segment. While you're at it, find the locations of the quick depth setting aids

in the face of the right front rail return. Use a Forstner bit to bore these four 1" diameter stopped holes at exactly 1/8", 1/4", 3/8" and 1/2" depths. These holes serve as an instant depth setters.



Figure 1: Determining the space required for your router is critical to the success of this jig. Measure your router and the two pieces of laminate to get the exact dimension.

Now you're ready to start the first assembly phase. Predrill and counterbore pilot holes, then attach the rails to the deck with #8 x 1 1/4" screws and glue (**Figure 2**). Cap the screw holes with walnut plugs (pieces 5). Next, join the front and rear rail return segments to the deck/rail subassembly, again using glue and screws capped with the walnut plugs. Check to be sure the rail segments are square.

Melamine, an easy to find sheet stock, is a good choice for this shop jig, due to its hard plastic surface and dimensional stability. It is sized at 49" x 97" to allow for trimming. The factory edge is often damaged during shipping.

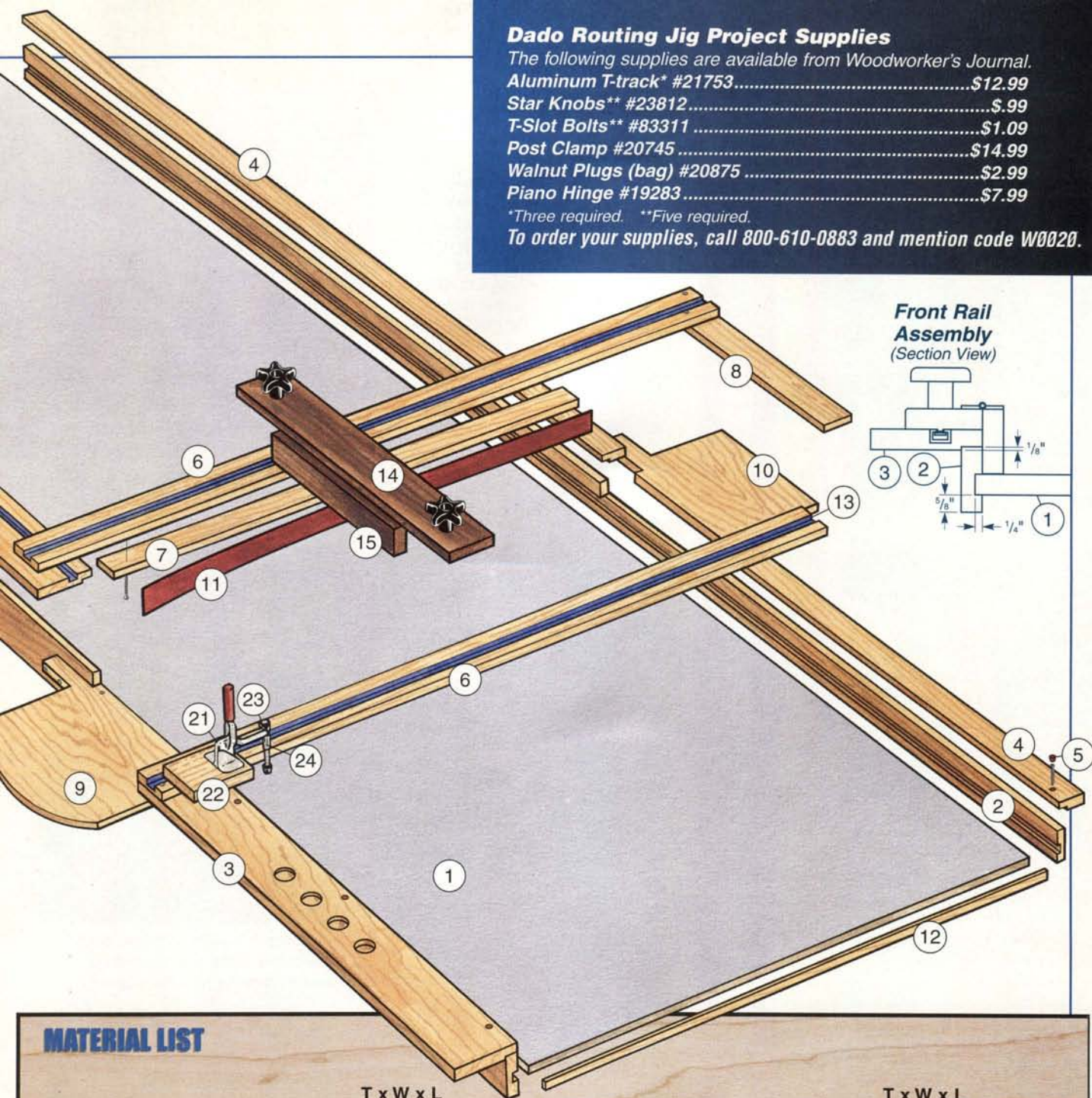
Dado Routing Jig Project Supplies

The following supplies are available from Woodworker's Journal.

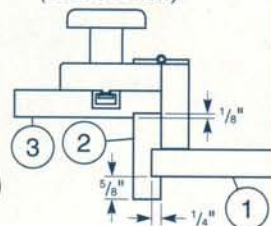
Aluminum T-track* #21753.....	\$12.99
Star Knobs** #23812.....	\$.99
T-Slot Bolts** #83311.....	\$1.09
Post Clamp #20745.....	\$14.99
Walnut Plugs (bag) #20875.....	\$2.99
Piano Hinge #19283.....	\$7.99

*Three required. **Five required.

To order your supplies, call 800-610-0883 and mention code W0020.



Front Rail Assembly
(Section View)



MATERIAL LIST

	T x W x L
1 Deck (1)	3/4" x 26 1/2" x 72"
2 Rails (2)	3/4" x 2 3/8" x 72"
3 Front Rail Return (1)	3/4" x 4" x 72"
4 Rear Rail Return (1)	3/4" x 2 1/2" x 72"
5 Walnut Plugs (bag)	3/8" Dia. flat
6 Guide Rails (2)	3/4" x 2 1/2" x 39"
7 Under Rails (2)	3/4" x 2 1/4" x 25 7/8"
8 End Spacer (1)	3/4" x 2 1/2" x (*)
9 Router Rest (1)	3/4" x 8 3/4" x 12"
10 Router Receiver (1)	3/4" x 6 1/4" x 12"
11 Laminate liners (2)	1/16" x 1 1/4" x 25 7/8"
12 Deck Trim (2)	1/8" x 3/4" x 26 1/2"
13 Aluminum Tracks (3)	48"

	T x W x L
14 Centering Stop (1)	3/4" x 2 1/2" x (*)
15 Center Stop Return (1)	3/4" x 1 1/2" x (*)
16 Side Stop Tops (3)	2 1/4" x 2 3/4" x 2 7/8"
17 Side Stops (3)	3/4" x 2 3/8" x 2 7/8"
18 Stop Knobs (5)	Plastic, 5/16" thread
19 T-Bolts (5)	Steel
20 Stop Hinge (1)	1 1/2" x 36" (Piano)
21 Hold Down Clamp (1)	Steel
22 Clamp Spacer (1)	3/4" x 2 1/2" x 4"
23 Hex Bolt (1)	5/16" x 1" Steel
24 Connector Nut (1)	5/16 ID
25 Hanger Cleats (2)	3/4" x 1 3/4" x 24"

(*) Adjust these pieces' lengths to accommodate your router.



Four holes drilled to specific depths become a feature that lets you quickly set your router to predetermined settings. Use a Forstner bit to bore these holes to 1/8", 1/4", 3/8" and 1/2". It's quicker and safer than flipping the router over to measure from the base plate.



The center stop not only allows you to stop your dados accurately, but also lines up your dado cuts to the path of the router bit. Use contrasting paint colors in shallow saw kerfs to identify where the center of the dado is, as well as where a full 3/4" dado will fall.



Flip-up sliding stops allow you to register multiple identical dados on matching pieces. Bookcases, display shelves and cabinets of all sorts are easier to make with this basic shop jig.

Cut the guide rails and under rails (pieces 6 and 7) to size. Move back to the table saw and plow grooves for more aluminum track down the length of each guide rail, then attach the under rails to the guide rails with glue and screws driven up through the bottom. Clamp the guide rail subassemblies onto the deck subassembly exactly flush to the edges of the notches. Measure edge to edge across the guide rails to determine the exact length of the end spacer (piece 8). Cut this piece to length and secure it to the guide rails with countersunk screws and glue. Finally, go ahead and attach the guide rail subassembly to the deck subassembly with countersunk screws, but no glue.



Figure 2: Attach the rails to the melamine deck with screws and glue. Cover the exposed screw holes with walnut plugs.

Special Seating

The router rest and the router receiver (pieces 9 and 10) are made from hardwood and are mounted into the notched openings that you created earlier in the rails. Both of these pieces must be surface sanded or planed down to the nominal thickness of manufactured sheet stock (about 11/16"). This will keep your router from "stepping down" as it enters sheet stock that will be clamped to your jig's deck.

On the band saw, shape both pieces to fit into the notched opening and form the rounded



Keep your jig out of harm's way by machining matching beveled hanger cleats. One goes on the back of the jig, the other on the wall.

rest's back edge. Predrill for countersunk screws as shown on the exploded view, and mount them to the jig with screws only. On your table saw, slice the laminate liners (pieces 11) from high-pressure plastic laminate. Then, using contact cement, glue the liners to the inside faces of the guide rail subassembly. Use a file to smooth the edges of the plastic laminate.

Slice the deck trim (pieces 12) from a piece of hardwood, cut two pieces to length and glue them to both ends of the deck. I used masking tape to "clamp" the trim until the glue cured.



Figure 3: The hold-down clamp is mounted on a spacer block and modified with a 1" long hex head bolt and a connector nut.

Bells and Whistles

Now you've come to the features that really add to this jig's versatility. Start by mounting the aluminum tracks (pieces 13). Cut the pieces to length with a hack saw, and be sure to file or sand the ends smooth to remove any sharp edges. Next cut the centering stop (piece 14) to the same length as the end spacer and the center stop return (piece 15) so it's 1/16" less than the distance between the laminate liners. Glue these pieces together (as shown in the **Pinup Shop Drawings**). After the glue has cured, place the stop on the guide rails and drill 5/16" diameter holes to align with the aluminum track. Next, cut the side stop tops and side stops (pieces 16 and 17) to size. Reveal the top's raised tenon, which slides in the aluminum track, in two passes on your table saw. Drill the 5/16" holes to mount the knobs and T-bolts (pieces 18 and 19) and cut sections of piano hinge (piece 20) to join the tops and sides, forming two flip-up sliding stops. Glue up the third side and top for the end stop which does not flip up.

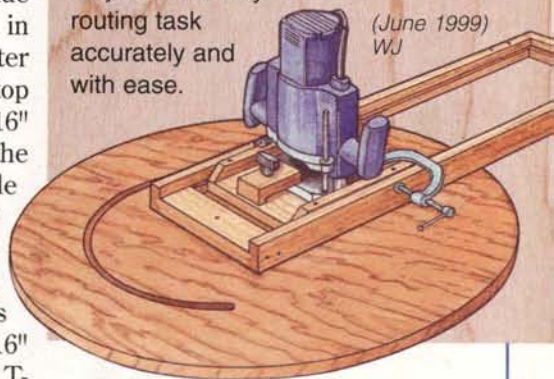
To hold your work in place as you are routing, mount a hold-down clamp (piece 21) just to the right of the guide rail. I found that to get the proper reach and clearance when operating the clamp, I needed to glue a clamp spacer (piece 22) to the front rail and add a hex head bolt and connector nut (pieces 23 and 24) to the clamp, as shown in **Figure 3**.

One quick note: this jig is designed to plow dados into 3/4" stock. If you need to work in 1/2" or 3/8" material, all you need to do is slide the appropriate thickness spacer on top of the deck. (Double stick tape will help keep the spacer from sliding.)

Router Jigs from the Past

(January 1995)
Today's Woodworker

Routers are very useful ... but they need direction. Left to their own devices, they tend to wander. We've built several jigs over the years for just that purpose. In fact, if you have all three of these jigs in your shop, you will be able to do just about any routing task accurately and with ease.



(June 1999)
WJ

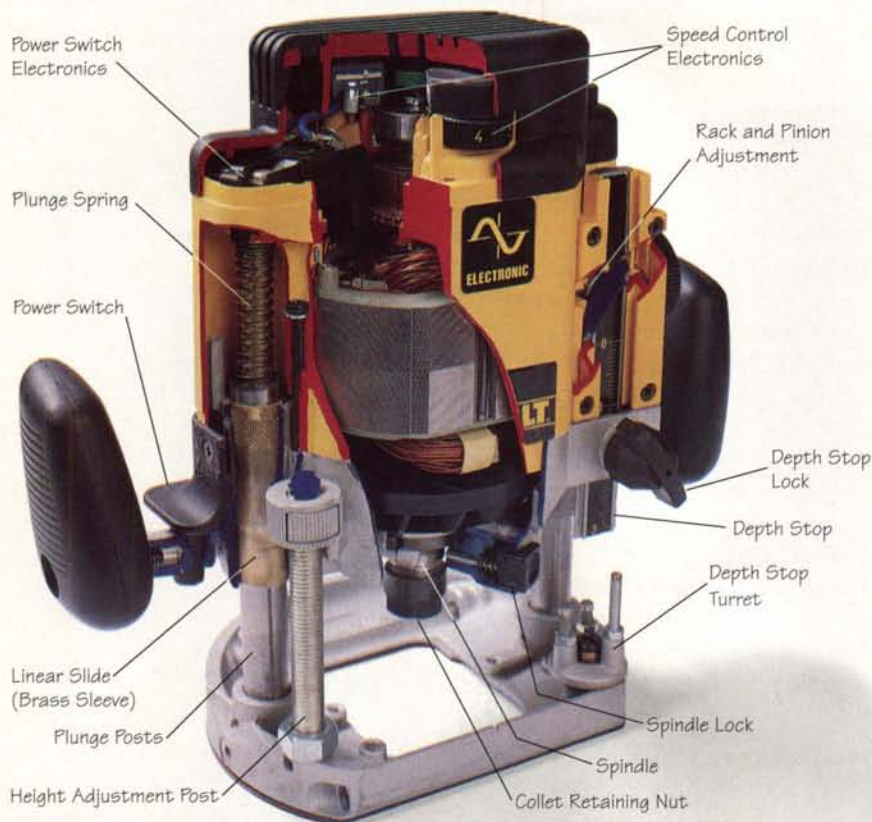
Final Details

When properly marked, the center stop can help you line up one-off dados. To find your registration lines, use your router to plow a 3/4" dado in a scrap of plywood which is clamped in place. Slide the center stop over the dado and use a combination square to transfer the edges of the dado onto the stop. Find the halfway point and mark it. Take the center stop to the table saw and, with the blade just barely above the tabletop, scribe the three lines into the face of the center stop. Once you clean up the kerfs, you can paint them contrasting colors.

Now would be a good time to mount the hanger cleats (pieces 25) to the back of the jig and on a convenient spot on your shop's wall. Then sand the hardwood smooth and apply a couple of coats of an oil finish to it ... just to keep the dust from sticking.

Monster Plunge Routers

By Rick Christopherson



Need more power for your routing applications? Want to have the biggest power tool on the block? Then you may be a candidate for a monster plunge router. These powerful tools are quickly becoming an indispensable part of the woodshop.

Power is still the number one consideration when talking about large plunge routers. These units are equipped to handle the new generation of large diameter shaper-like bits — offering both the power and ability to operate at reduced rpms. They're also more than up to

the task of plowing 3/4" by 3/4" deep grooves — in one pass instead of four. But it's not just about power with these routers. In fact, when it comes to accuracy, some woodworkers prefer these larger units. And manufacturers continue to add new features to the

basic design to further expand their abilities. Special height adjustment knobs, electronic variable speed control and soft start circuitry on most of these models have effectively served to "tame" these monsters and make them much more friendly to hobbyist woodworkers.

Smooth and Accurate Plunging

One of the most important characteristics of a plunge router is the smoothness of the plunging action. If the motor doesn't move along the slides smoothly, you're asking for problems. This relates to frictional binding and off-axis binding. Frictional binding occurs when the linear slides (*see the anatomy photo at left*) are not smooth. Some of the routers I examined had rough aluminum bores in the motor housing serving as linear slides. These were the most choppy. The routers with Teflon® sleeves had the best plunging action.

And don't discount handle size when considering smooth operation. It's a matter of personal preference, so if you're in the market, be sure to go out and get a little "hands-on" experience to ensure the right fit.





Craftsman 27511

Price: \$240 (on sale at \$199)
15 amps (120 volts)
3.5 HP
10,000 - 22,000 rpm
Sears: 888-809-7158



The trigger grip plunge lock on the Craftsman 27511 is the most convenient of any tool when it comes to hand-held operation.

Locks and Depth-stop Accuracy

Several routers stand out for having good plunge locks. The Craftsman 27511 has the best lock overall. It is incorporated into the left handle, and can be engaged or disengaged without removing your hand from the handle. Another good lock can be found on the DeWalt 625, which has a smooth cast aluminum lever. The short-throw action is also easy to operate. I also like the plunge lock on the Porter Cable 7539 because it locks when you release the lever.

One of the basic tasks of a plunge router is to plunge the router bit to a specific depth with precision. All plunge routers have a depth stop for this purpose, but they aren't all easy to set. Ideally, you would set the tip of the router bit on the surface of the wood, zero out the depth gauge, and then set

the depth stop to the desired distance below the surface. The router which stands out as performing very well in this respect is the DeWalt 625, followed closely by the Hitachi M12V.

Power Switch and Speed Control

The location and operation of a router's power switch is an important issue for safety and convenience. Most importantly, you don't want to remove your hands from the router's handles to turn the tool on and off; it just isn't safe. The Craftsman 27511 and Porter Cable 7539 routers both use a trigger-type switch mounted on the router's handle. These are the most convenient to reach. The Makita and Ryobi routers have a toggle switch located near the

Shop Test continues on page 56 ...

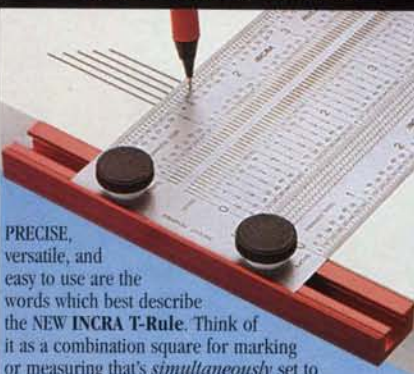


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DeWalt 625

Price: \$289
15 amps (120 volts)
3 HP
8,000 - 22,000 rpm
DeWalt: 800-433-9258

The plunge depth-stop system on the DeWalt 625 is the most accurate of the tools in our examination.

handle, which is also easy to operate. Toggle switches work well for both hand-held and table-mounted operations.

The majority of large plunge routers come equipped with electronic soft-start motors and variable speed. This is very important for these hefty routers. Without the soft-start circuitry, the startup torque can jerk the router out of control. Furthermore, large router bits perform better at lower speeds, which results in less burning. All of the routers we examined had variable speed and soft-start circuitry.

Craftsman 27511

The Craftsman 27511 router has some impressive features, and they're not just window dressing. Like the joystick of an F-16 jet, all of the primary controls are literally right at your fingertips. The plunge lock can be set and released by a simple squeeze of the left handle. Squeeze the trigger on the right handle, and you activate the soft-start motor. The variable speed control is right under your thumb, and is the easiest to use of all the routers tested. This router is extremely well suited for hand-held

operations, but if you are planning to use it in a router table, you'll find the placement of these controls to be less convenient.

The spindle-lock of this router is exceptionally well suited for either hand-held or table operation, and is the best design of all the routers we examined. It's near the top of the motor, and because it isn't spring-loaded, you don't need to hold it in, leaving both hands free for tightening or loosening the collet. To prevent you from operating the router with the



"Whether you want to make toys, furniture, decorative objects, boats, or trim for your house, the router is an essential part of your tool kit."

Ian Kirby
The Accurate Router
Cambium Press

spindle lock engaged, there is a warning light on the front of the router, and the motor's power is disabled — a great safety feature.

With all of these features going for it, I had to look long and hard to find any criticisms for this router. One small point was that the trigger lock is a little difficult to engage, especially if you have large fingers. Secondly, the plunge depth gauge should have been printed from bottom to top in order to properly use the zeroing feature. Neither of these issues are significant enough to sway me from liking the tool.

DeWalt 625

The most impressive feature of the DeWalt 625 is its depth control system, which is head and shoulders above the rest. The depth gauge uses a rack and pinion adjustment that is very sound and has a rigid feel. The moveable sight-glass is magnified for better accuracy and allows you to zero out the gauge. The pointer on the sight-glass is very thin for greater accuracy, but this also makes it difficult to see — a little bit of red paint on the edge would have helped. The bottom of the depth stop also has a micro-adjustment screw for fine tuning the depth.

Large plunge routers are just that: large. The DeWalt is fairly compact, and this is helpful when trying to maneuver it in close quarters. The plunge action is smooth and uses long brass sleeves to reduce off-axis binding. The plunge lock lever is cast aluminum and has a good feel and operation. The power switch is a little stiff to operate, but the variable speed control is well placed and easy to use.

freud FT2000E

Price: \$209
15 amps (120 volts)
3.25 HP
3,000 - 22,000 rpm
freud: 800-334-4107

The freud FT2000E has good, stable handles for hand-operated control. Its height adjustment knob is easy to operate in both hand-held and table operations.



This is an excellent router for hand-held operation, yet it still has good features for table mounting. The router does not come with a depth adjustment knob, but you can pick one of these up for \$20.00 (part number DW6966). Most of the routers I examined had 1/2" collets and collet adapters for use with 1/4" bits. The DeWalt ships with separate collets for 1/4" and 1/2" use, a better alternative. However, swapping between the 1/4" and 1/2" collets requires you to remove the collet from the retaining nut. Since the collet snaps into the retaining nut,

this can be a bit difficult. As an alternative, you can pick up a spare retaining nut for \$5.00 (part number 942893).

I hooked up the shop vacuum to the integral dust collection attachment when testing this unit and was impressed with its effectiveness, even when removing a lot of material.

freud FT2000E

I found freud's FT2000E router particularly well suited for table-mounted use. As one of the lowest priced routers in my test, it is not feature rich, but this is what makes

Shop Test continues on page 58 ...

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it well suited for table operation for a low cost. The router has good, stable handles for better hand-operated control. A height adjustment knob is included and is easy to operate in both hand-held and table operation. The power switch is smooth and can be operated without removing your hand from the handles. I found the depth stop to be rudimentary with a little play in the threads. This is probably due to the quick release threads, which are spring-loaded and operated with a push button. This quick release feature requires two hands to operate. The plunge depth sight-glass is magnified, and although not as good as the DeWalt, it's still better than others.

Bit changes are made with one wrench, and the spindle lock is effective and easy to use. The variable speed control is located behind the power cord and is not readily visible. The plunge lock lever is cast aluminum and smooth, but, with the stiff return spring, it may disengage if not securely locked. The router includes a 1/2" collet and a 1/4" collet adapter.

Hitachi M12V

The Hitachi M12V router has the best collet of any router I examined. If you have ever had a router bit stick in the collet, you will really appreciate this design. This is the type of collet you might expect to find on a shaper, not a hand-held router. The collet is threaded onto the router spindle and doesn't need a separate retaining nut. This design locks and releases router bits better than typical collets which

Hitachi M12V

Price: \$225
15 amps (110 volts)
3.25 HP
8,000 - 20,000 rpm
Hitachi Power Tools:
800-829-4752



Hitachi's depth stop has rack and pinion adjustment and can be zeroed out. The collet is impressive, comparable to what would be found on a shaper.



use a separate retaining nut — it grips tightly and won't stick! A machined collet adapter is included for 1/4" bits. With a side-mount spindle lock, router bits can be changed with equal ease whether the router is resting on its back or inverted in a table.

The depth stop system uses rack and pinion adjustment and can be zeroed out. Although this depth stop is not as rigid as the DeWalt

system, this is a versatile design. The power switch is mounted on the side of the motor and has both an upper and lower flange for easier use. Unless you have very small fingers, you might find adjusting the variable speed control difficult. For my money, the control dial is recessed into the top of the motor housing too deeply to be easily operated.

Makita 3612C

I found the Makita 3612C to be a good router for table use, but not as well suited for hand-held use. One bonus for Makita users is the fact that this is the only router with a braking system to bring the motor to a stop quickly when you turn off the power. Although this is a great safety feature for table use, it's a little strong for hand-held use, and I had a hard time keeping the router from twisting when I applied the brake.

The power switch on the Makita router is the best among the multipurpose options and is easily used for both hand-held and table operation. This toggle switch is mounted on the motor housing



"The sound a router makes while idling should not change appreciably in the cut. If it does, you may be stressing the bit and the motor."

Pat Warner
The Basics of Craftsmanship
Taunton Press

near the right handle. The variable speed control is located on the front of the motor and is easy to operate. The plunge-depth stop consists of a screw with a knob on top, but there is no pointer and the indicator gauge is stamped onto the motor housing.

For hand-held use, the handles are firm and comfortable, but the plunge slide is not as smooth as other models. Much to their benefit, the Makita designers made sure the height adjustment is easy to reach and operate, especially when the unit is installed in a table.

Shop Test continues on page 60 ...

Makita 3612C

Price: \$279
15 amps (115 volts)
3.25 HP
9,000 - 23,000 rpm

Makita Power Tools:
800-462-5482



The toggle switch on Makita's router works equally well for both table and hand-held operations.

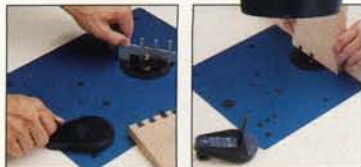
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Porter Cable 7539

The Porter Cable 7539 router is one of the best built routers in this review and carries one of the highest price tags to match. As usual, you get what you pay for. The router is very large and rigid, and so are the handles. Like the Craftsman, a trigger switch is incorporated into the right handle; however, the trigger lock is much easier to operate. A five position slide switch on the top of the motor controls the motor speed, and the speed indicators are large and easy to read.

You might think the largest router in the group would be best suited for router table operation, but that's not the case. The router was designed for hand-held operation and requires some modification to be used in a router table. Since the plunge-lock lever locks the plunge when you release it, changing the height in a router



Porter Cable 7539

Price: \$315
15 amps (120 volts)
3.25 HP
10,000 - 21,000 rpm
Porter Cable: 800-487-8665



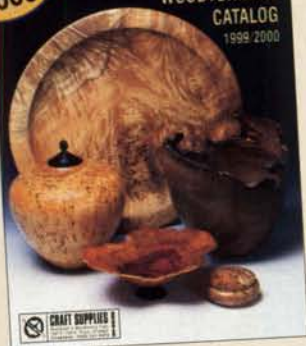
The spring-loaded plunge lock lever on the Porter Cable router locks the depth when you release it.

Shop Test continues on page 62 ...

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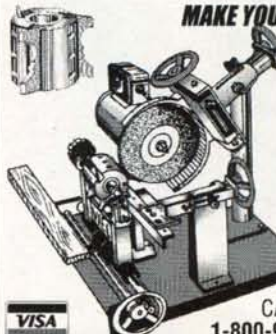
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Ryobi RE600

Price: \$249
15 amps (120 volts)
3.25 HP
10,000 - 21,000 rpm
Ryobi: 800-525-2579



Ryobi's speed control switch is conveniently located so it can be adjusted while your hands are on the handle.



SHOP TEST

table requires two hands. An optional height adjustment knob is available (part number 5300, for \$18.00), but installing it disables the turret and replaces the depth stop. As a hand-held router, the Porter Cable is excellent. The depth stop is effective, and although it is fairly basic, consisting of a rod with a moveable pointer, it's better than the majority of other depth stops. In table use, a spindle lock really helps in changing bits, but for hand-held operation, two wrenches provide much more leverage for tight collets. The Porter Cable was the only router in the group that didn't have a spindle lock.



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"... some claim that [the router] is the single most important shop tool invention of the twentieth century."

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If I look for a complaint, it's that the standard baseplate on the router is too small for even a medium sized bit to fit through. Because of the design of the baseplate, you can't change the opening size. I think this unit would be more versatile if it was shipped with the optional Plexiglas baseplate (*part number 42187, for \$12.00*), which not only has a larger bore but can be further enlarged or modified by the user.

Ryobi RE600

The Ryobi RE600's depth gauge is a stamped steel bar without a pointer, which locks in position with a thumb-screw. The linear slides on the right side are brass inserts and moderately well-spaced, but the left-hand post rides in an aluminum bore without a bearing surface. Since the height adjustment screw passes through the motor base and into the plastic upper housing, there is a noticeable grind from the screw threads riding against the housing.

This router also has very well-placed controls, with the power switch, speed control and plunge lock well within reach from the handles. Like the Makita, the Ryobi uses a toggle switch on the motor housing, which is within easy reach of the right handle. The variable speed control on this unit is mounted just above the power switch and, again, your finger can easily reach it.

Conclusion

Each of the routers I examined had their strong and weak points, depending on the intended use of the tool. No single router was considered ideal for all applications, but several routers stand out in their established niche. The best router for you is the one that has the features and designs which are best suited to the type of work you perform most often.

If you are going to use the router mostly for hand-held use, choose a router with convenient controls and extra features like the Porter Cable 7539 or the Craftsman 27511, or a compact and full-featured model like the DeWalt 625. For combined use, both in and out of a router table, you should probably choose a router which has a good mix of features for both applications like the Hitachi M12V or the DeWalt 625. If you are buying one of these routers mostly for use in a router table, then look for one which has controls that are easily accessible when inverted, but doesn't have all of the costly accessories you won't use in the table, such as the Freud FT2000E, Makita 3612C or the Ryobi RE600. These routers are also the lowest priced of the pack.

One thing to remember with all of these units: you're going to end up with a lot of power between your hands. Be careful!



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Tool distributor Tech Mark is now offering the complete line of Czech-made Rojek (pronounced ROY'-ek) tools, but sales manager Joe Moriconi is quick to point out that Americans don't always realize what that means.

"Because it was behind the Iron Curtain and under communist rule, people thought of Czech work as substandard," Moriconi said. "But the Czechs are very respected tool builders and machine builders. Before World War II, their machinery industry was much larger than Germany's."

Founded in 1921 by two machinist brothers who decided to go into business for themselves, Rojek continued to operate after the communists took possession of it, but the Rojek family scattered throughout the Czech Republic. When communism fell, one family member was still working as an

employee of the factory. Others came back to the town of Castolovice, and a founder's son and grandchildren regained the helm. They've invested heavily in automated CNC metalworking, increased hiring in the city and worked hard to gain a share of the world marketplace. Besides selling

the line of traditional
woodworking
tools



Rojek's KPF 300 combo 12" circular saw and shaper (above), rated at 3 HP, lists for \$2,825. Their MSP 315 jointer/planer (below) features a 12" jointer bed and lists for \$2,350.

— table saws, shapers, planers and jointers, etc. — under the Rojek name, the factory also sells to German and Italian companies which relabel the products.

For Americans, Moriconi said, Rojek's mid-range prices and high quality are very competitive. "The advantage at the moment in the Czech Republic and other Eastern European countries is the labor rates have not caught up with Western rates," he said. "You get a lot more machinery for the dollar." For more on the Rojek line, call Tech Mark at 800-787-6747 or visit them at www.tech-mark.com.

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The 250 Handyman will sharpen 200 or more bits before needing replacement.

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The model 9845 kit sells for about \$299. For more info, call 800-487-8665.



Porter Cable's 19.2 volt Saw Boss™ circular saw is an industry first.

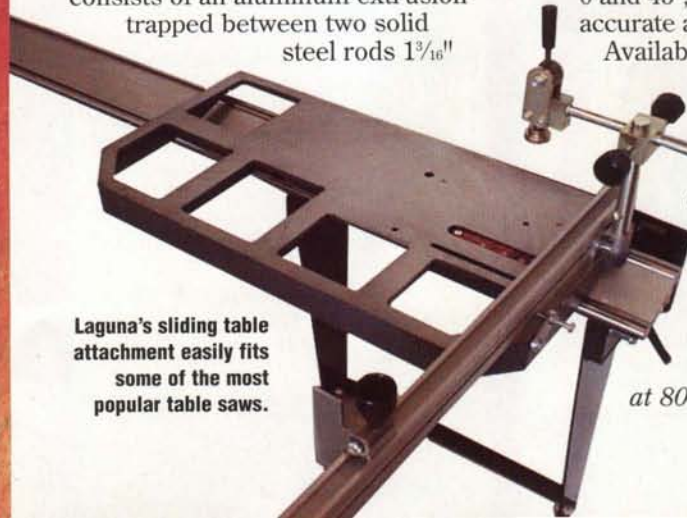


Laguna Introduces Sliding Table Attachment

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Laguna's sliding table attachment easily fits some of the most popular table saws.

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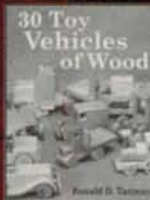
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A Strong Argument for Loose Tenons

By John English



Perfect mortise and tenon joints using a clamp and a handheld drill? At only \$30.00 to set up, it's going to be hard for woodworkers to resist Journeyman's new beadLOCK™ loose tenon system.

mortises, but beadLOCK's version has a number of advantages over a standard squared tenon. The multiple flutes are, in effect, the equivalent of joining either three 1/2" dowels or five 3/8" dowels together. The innovative shape offers a large amount of side-grain gluing surface, for an extremely strong joint. The design also prevents the joint from wiggling from side to side and working itself loose over the years.

The most popular furniture joint just got a whole lot easier. Journeyman Tool Company's new beadLOCK™ system is a dream to work with and delivers perfect mortise and tenon joints every time. Aside from their patented jig, the only tool required is a drill — no more chisels, mortising machines, table saw jigs or endless shaving to get that exquisitely cut joint. All you have to do is clamp the jig in place and drill a few holes, then insert a length of the company's pre-milled tenon stock. It truly is that easy.

Why a Loose Tenon?

I shop tested the beadLOCK™ system and discovered a number of surprises — not the least of which was that the system also makes a wonderful doweling jig for standard 1/2" and 3/8" dowel stock. But its true value lies with its designed function: creating mortises for the company's premanufactured hardwood loose tenons. All loose tenons floats in the space formed by two opposing



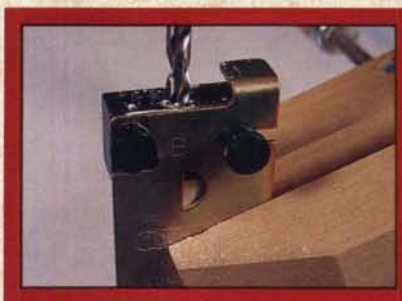
Some Workshop Observations

Back in my shop, I took a long, hard look at the beadLOCK jig and its matching moldings. The kit I tested was the top of the line version, which included everything necessary to construct joints with both 3/8" and 1/2" thick tenon stock. The first thing I discovered was both the plate and the two guide blocks were made in the USA of hardened steel, so they're as durable as they need to be for years of regular use. Block machining was top quality, and the set screws were big enough to grip and use.

Three Steps to Success with the beadLOCK™ Jig System



There are three steps to using beadLOCK's system. With the stock cut to size, begin by drawing a witness mark across both pieces, right where the center of the joint should lie.



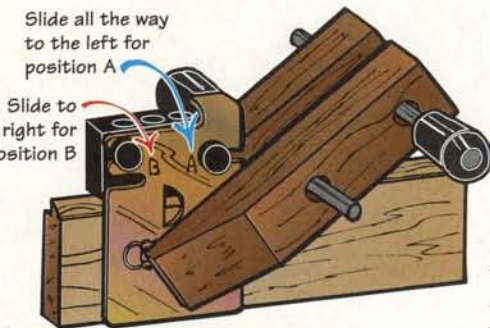
Next, clamp the jig to each part in turn, lining it up with the witness marks. Drill holes with the jig at the "A" setting, then switch to the "B" setting and complete the drilling.



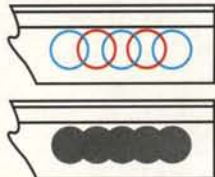
The third step is to cut the tenon stock to length and dry assemble the joint to check the fit. Then you're ready to glue up and clamp the mortise and tenon joint together.

Tools by the Numbers

Tools Required.....clamp and drill
Total Joint Depth.....up to 12"
Shim Set.....one 1/32", four 1/16"
Tenon Stock.....two 12" lengths; birch
Individual 3/8" or 1/2" Kit.....\$30.00
Combination Kit.....\$45.00
Journeyman Tool.....920-485-0350



Once the beadLOCK is clamped in place it's a simple matter to switch from position A to position B and drill the holes required for your tenon stock.



Position A holes are shown in blue; position B holes are shown in red.

The matching hardwood stock I received in my kit tested at 6 percent moisture, which is just about as dry as it can be in this part of the country. That's good — if the molding shrinks too much after assembly you'll end up with a loose fitting joint. The birch molding lay straight as a die on my bench, and came packed in 12" lengths. The individual 1/2" and 3/8" kits each contain two feet of molding, while the combination kit I tested comes with two feet of each size molding.

One nice thing I discovered was the length of the tenon is only limited by the length of your drill

bit. The beadLOCK jig itself places no limits on length. That means that, for small assemblies, you can use perhaps an inch of molding, while in large joints like tables or desks, a three or four inch long tenon can be used.

About the only thing I didn't like about this system is that the shim package, designed to offset the jig for stock that's thicker than 3/4", was made of plastic. I would have preferred steel.

Tool Preview continues on page 72 ...

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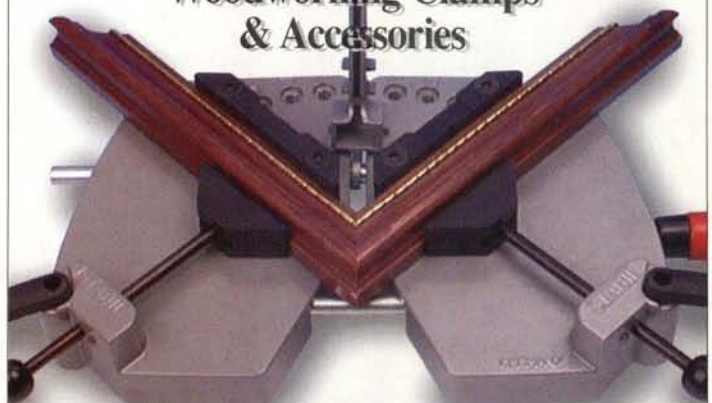
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Overall Impressions

I made several mortise and tenon joints in various species and thicknesses of stock, all without any mishap. Each of the joints I constructed fit like a glove. I followed the manufacturer's instructions (beadLOCK is made by the Journeyman Tool Company of Horicon, Wisconsin) and trimmed the tenon stock 1/8" shorter than the combined depth of the two mortises: doing this, all my joints closed perfectly under clamping pressure. It didn't take long to discover that such tight joinery doesn't require a whole lot of extra glue. My suggestion is to mask the joint to collect the excess squeeze-out.

The system requires that you clamp the jig to the work, then lock

the guide block in place and drill three holes for the 3/8" stock (or just two for the 1/2" molding). Then you loosen the jig, slide the block to the right and lock it down before drilling the last two holes. I found the holes come out more evenly if you drill the first set of holes twice before moving the block, then slow the drill speed down on the second set of holes.

All in all, my impressions of the beadLOCK system were overwhelmingly positive. This simple jig brings mortise and tenon joinery within the reach of all skill levels, providing an inexpensive way to produce perfectly fitting, repeatable, error-free joints every time, with nothing but a drill and saw.



Loose tenon stock (available in 3/8" and 1/2" dowel diameters) should be trimmed about 1/8" shorter than the combined depths of the mortises to allow for glue relief.

For offset joints, where the mortise isn't centered on a standard piece of 3/4" thick stock, the factory provides a set of shims.



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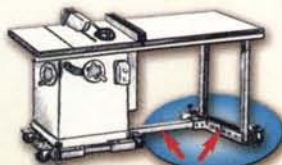
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The High Chair first appeared in the July/August 1992 issue of *Today's Woodworker*.

New Addition Inspires Some Fine Woodworking

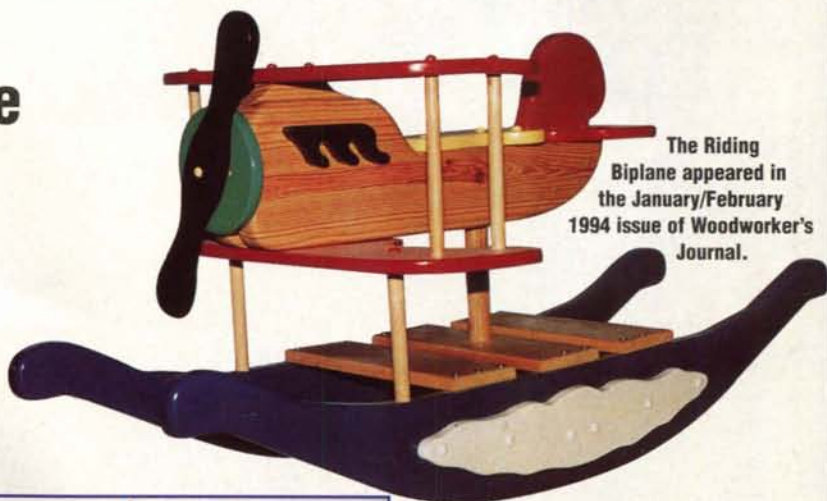
Everyone knows a new addition requires some woodworking. **Richard Patterson's** granddaughter, Cori, inspired the Worland, Wyoming woodworker to create some future heirlooms. Reaching for Issues 22 and 30 of *Today's Woodworker*, he crafted the high chair and matching crib out of hard maple. Richard says the plans in *Today's Woodworker* — and now *Woodworker's Journal* — make it easy for "weekend woodworkers" to complete some nice projects.

The original Barrister's Bookcase was featured in the September/October 1990 issue of *Today's Woodworker*.



A Convoy Cabinet

When West Point, New Yorker **Robert Rabb's** mother-in-law asked him to build a display case for his father-in-law, he knew just where to turn. The Barrister's Bookcase plan from the second year of *Today's Woodworker* provided just the setting to display his father-in-law's collectibles and the driving awards he'd gained during his career. Robert reports he learned some great new techniques on this project and finished it well before the official retirement.



The Riding Biplane appeared in the January/February 1994 issue of *Woodworker's Journal*.



Hunt Board: *Woodworker's Journal*, March/April 1995

These Curls Are to Dye For

This beautiful Hunt Board table made from curly maple by **Dwight Franke** of Chesapeake, Virginia, was featured some years back in *Woodworker's Journal*. "I dye stained the chest to highlight the curls and even out the wood's grayish cast," Dwight told us.

A High-Flying Future Woodworker

"I had almost as much fun building this as my son has riding on it," said **Steve Moloney** of Covington, Ohio. He and his son were both flying high after Steve finished work on our Riding Biplane just in time for his son's second birthday.



Winner! Steve Moloney will receive a Bosch 1294 VSK sander for his contribution to End Grain. Send your 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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