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WOODWORKER'S JOURNAL

April 2003
Volume 27
Number 2

9/18/03

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INSIDE! page 30
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- ⅝" x 1¼" Arbor accepts dado blades
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- Maximum depth of cut @ 45°: 2⅛"
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- Wheels: Fully balanced cast aluminum with rubber tires
- Blade size: 92½" (¼" to ¾" wide)
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- Includes one ¾" blade
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17" HEAVY-DUTY BANDSAW

- Motor: TEFC capacitor start induction, 2 HP, single-phase/60 Hz, 110V/220V
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- Cutting capacity height: 12"
- Cutting capacity left of blade: 16¼"
- Wheels are fully-balanced cast aluminum with rubber tires
- Deluxe extruded aluminum rip fence
- Blade guides: Euro-style roller disc
- Blade size: 132" x ⅛" - 1" (standard ½")
- 2 speeds: 1600, 3300 FPM
- 4" dust port x 2
- Table tilt 10° left, 45° right
- Quick change blade release/tensioning with blade tensioner indicator
- Height from floor to table: 37½"
- Approximate shipping weight: 321 lbs.

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19" HEAVY-DUTY BANDSAW

- Motor: 2 HP, single-phase, 60 Hz, 110V/220V TEFC capacitor start induction,
- Precision ground cast iron table: 19" x 19" x 1½" thick
- Cutting capacity left of blade: 18¼"
- Cutting capacity height: 12"
- 2 speeds: 1700, 3600 FPM
- Blade size: 143" x ⅛" - 1¼"
- Quick change blade release/tensioning
- Wheels are fully-balanced cast aluminum with polyurethane tires
- Deluxe extruded aluminum rip fence
- Blade guides: Roller disc
- Blade tension indicator
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- MAX. CUTTING DEPTH: 1/16"
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- ON/OFF TOGGLE SWITCH
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- CUTTERHEAD RPM: 8,540
- 57 CUTS PER INCH
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- 2 HP, 220V, SINGLE-PHASE MOTOR
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- CUTTERHEAD SPEED: 5000 RPM
- RATE OF FEED: 16 FPM & 20 FPM
- MAX. CUTTING WIDTH: 14⅞"
- MAX. CUTTING HEIGHT: 6½"
- MAX. CUTTING DEPTH: ⅛"
- NUMBER OF KNIVES: 3 HSS
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- RATE OF FEED: 16 FPM & 20 FPM
- MAX. CUTTING WIDTH: 20"
- MAX. CUTTING HEIGHT: 8⅝"
- MAX. CUTTING DEPTH: ⅛"

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- TWO SPINDLE SPEEDS: 7,000 AND 10,000 RPM
- 3" SPINDLE TRAVEL
- SPINDLE OPENINGS: 1⅜", 2¾", 4", AND 5½"
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- 2-HSS KNIFE CUTTERHEAD
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- 23" TABLE LENGTH
- INFEED TABLE DEPTH-OF-CUT GAUGE
- 16,000 CUTS PER MINUTE
- 1/16" MAXIMUM DEPTH OF CUT
- 45° AND 90° FENCE STOPS
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- 2½" DUST PORT
- APPROXIMATE SHIPPING WEIGHT: 28 LBS.

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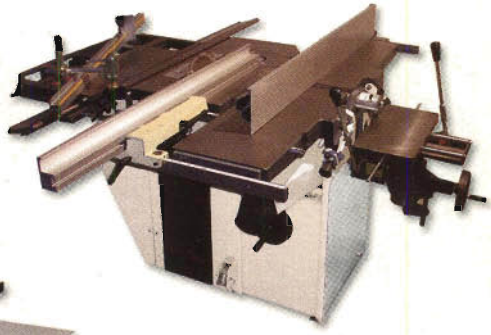

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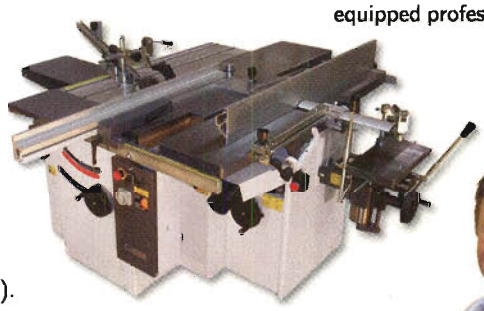

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Woodworker's Journal

Features

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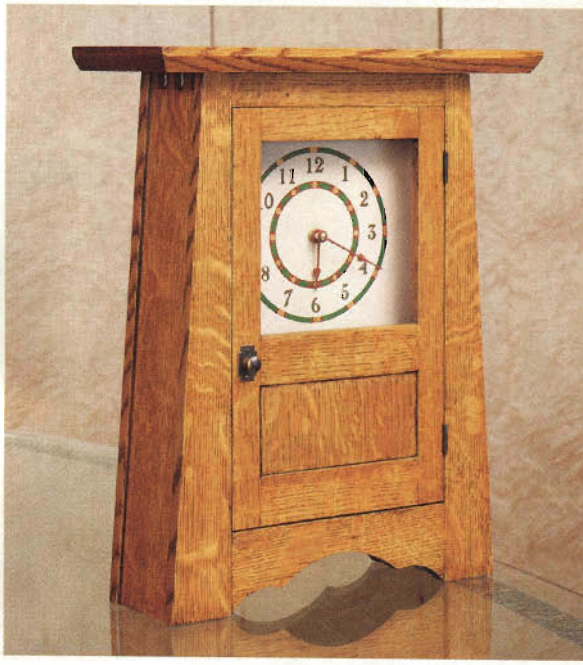

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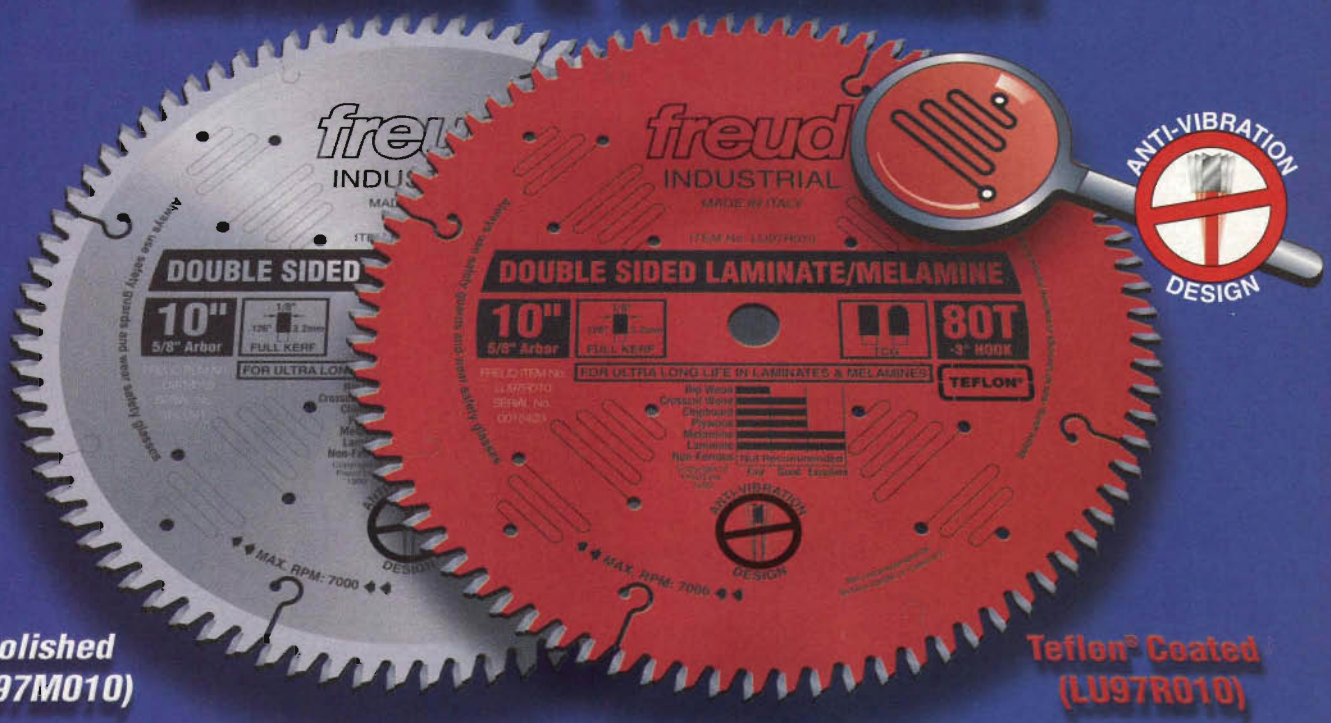
What's the Secret to Chip-Free Cuts in Melamine & Laminates?



Polished (LU97M010)

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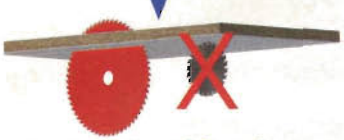
NEW Anti-Vibration Melamine & Laminate Saw Blades...by Freud

Anti-Vibration Design

Reduced Vibration & Chattering



No Additional Scoring Blade Needed

In the past, the best way to make clean, chip-free cuts in double sided laminate was to use an expensive panel saw with a separate scoring blade.

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Standard saw blades vibrate, causing chipping. Freud's unique Laser-Cut **Anti-Vibration** Slots virtually eliminate vibration and sideways movement of the cutting edge against the material. Now, in one easy slice, you can create flawless and chip-free cuts in man-made materials, on a standard table saw eliminating the need for a separate scoring Blade.

The 10" blades have 80 carbide teeth in a negative hook, triple chip grind (TCG) tooth design for long life and optimum performance. The specially formulated **Sub MicroGrain Carbide** is designed to withstand hard, abrasive man-made materials, prolonging the cutting life of your blade.

These blades are available either with Teflon® coating (that prevents heat and pitch build up increasing the cutting life of a saw blade) or traditional polished finish.

Whether you're a production shop or a custom woodworker, Freud makes it easy for you to create endless chip-free cuts in abrasive, double-sided man-made materials.

Melamine Cut with Freud Blade

Melamine Cut with 'Other' Blade

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The Psychology of Woodworking

ISO 9002

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Red saw blades are a registered trademark of Freud TMM, Inc.

(Circle No. 43 on PRODUCT INFORMATION form)

Modern Grime Stories

Up here in the North Country, we often forget to call the muddy week between frostbite and mosquito bites "spring." 'Course, we have been called seasonally challenged by more than one observer. For the rest of you, it is quite clearly spring, and that means it's time to clean up after the big winter sawdust-making marathons. There are tools seriously out of alignment, blades way too dull and innards getting gummy from a diet of oil and dust. Wipe your finger on any "top" you can find not covered with tools. Dusty? You need to get on a shop maintenance schedule, and we've got just the expert to get you started. As **Sandor Nagyszalanczy** points out, it's not a small point. Safety, tool life and frustration levels are all at risk. In fact, it's going to take him two issues to cover all the critical points. If you're smart, you'll pay attention.

> "... it's not a small point. Safety, tool life and frustration levels are all at risk ..."

After all, Sandor's an award-winning author. His article on "Premium Power Tools" from our *October 2001* issue and his book on *Power Tools* were both winners in the 2002 Vaughan Golden Hammer Writing Awards. Sandor's in good company with other writers you'll find in our magazine. In this issue, you'll learn how to make dovetails with **Ian Kirby**, a master woodworker who has written more books than you can shake a story stick at. **Kelly Mehler** puts his expertise from *The Table Saw Book* to work in evaluating a whole fleet of cabinet saws. Kelly's a new expert on our pages, but he joins familiar faces like **Bill Hylton**, who wrote the book (literally) on *Woodworking with the Router* and our finishing expert, **Michael Dresdner,** who also touches on cleaning up in this issue. Finally, there's another newcomer to our pages in the person of **Paul Anthony**, whose side table project starts on *page 36*. Paul's been writing for woodworking magazines for a long time, and we're delighted to welcome him to our pages.

Larry N. Stoiaken

EXCELLENCE!
The Journal recently took top honors in the "Overall Excellence" category of the 2002 Minnesota Magazine & Publications Association Awards. Our eZine took *the same honor for* Internet sites!

MARCH/APRIL 2003
Volume 27, Number 2

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SAWED-OFF. PINT-SIZED. PUNY.

(THE ACCOLADES JUST KEEP ON COMING)

If this doesn't look like much of a drill to you, well, that's precisely the point. Its 3.2 amp motor actually has the same power as the motor in our standard 3/8" drill. But by putting it in the handle, we were able to shorten the head of the drill to a measly 4.75 inches. We call it the Mini-T Drill. And as you've probably already guessed, it can fit into all kinds of places that other drills can't. Like between studs. Or behind refrigerators. Or under decks. (Imagine the possibilities.) For a small drill, the Mini-T is also surprisingly big on features. For starters, it has a no-slip, vibration-dampening cushioned grip. There's also a convenient trigger lock (think cruise control) for extended running. And you'll love its one-touch reverse button, which makes one-handed use a breeze. Plus, at just 3.5 lbs., it's a real lightweight. Other specs include a 3/8" chuck. A motor that goes from 0 to 1,500 RPM with multiple speeds. And a generous 8-foot cord. You get all of this (in a handy carrying case, we may add) for the relatively puny price of $139.99. So look for it at a Sears or Sears Hardware Store near you. Or order it by phone at 1-800-437-9686. You can even get this little gem online at www.craftsman.com. Because sometimes, getting out of a tight spot requires a tool that can get into one.

Now you can boldly go where no do-it-yourselfer has gone before—with a 3.2 amp, 3/8-inch variable speed drill, that is.

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Wright, Sexism and Getting Aligned

Building Mike McGlynn's Frank Lloyd Wright-inspired chair from our June 2000 issue gave Stephen Lookadoo's woodworking skills a real workout.

Mail Call! Contact us by writing to "Letters", Woodworker's Journal, 4365 Willow Drive, Medina, Minnesota 55340, by fax at (763) 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.

My "Master Class"

I just completed a set of Mike McGlynn's Frank Lloyd Wright chairs featured in your *June 2000* issue. At the very end of the article, Mike states, "You've completed a master class in woodworking ..." Boy, was he not kiddin'!

It took me probably four to five months to complete my set, working a little at a time, and I used every tool in my garage except for a router. I have a very small setup and only used a bench table saw, drill press and a jigsaw as power tools. I cut the angled tenons and all the mortises by hand, and had to come up with a few creative solutions for shaping the crest rails.

I also learned how to use a spokeshave, how to cut non-45 degree miters by hand, how to use scrapers and planes and how to upholster and sand more than I thought should be legal in some states! In short, it has been the most difficult, educating and rewarding of my projects to date.

Thanks again for a great project.

Stephen Lookadoo, Jr.
Simpsonville, South Carolina

Mentors Wanted

In response to Larry Stoiaken's questions about women and woodworking (*On the Level*, December 2002), I would like to share my challenges and experiences. I am a 42-year-old woman lucky enough to be able to leave my job two years ago to keep an eye on my then preteen. Needing some sort of outlet, I joined Habitat for Humanity and helped build the first Women Build house. I so enjoyed working with wood, I found a class on hand tools at Rhode Island School of Design, which I enjoyed so much I took the power tools class.

Unfortunately, these were the only continuing education classes in wood/furniture that they offered (and are no longer being offered!). Unless I return to school as a full time student, there do not seem to be any sort of programs available. I would like to suggest to semi-retired craftsmen to offer some encouragement to those of us who are not yet comfortable in taking on projects on our own. Mentorship would be so helpful.

Robin Cardenas
Cranston, Rhode Island

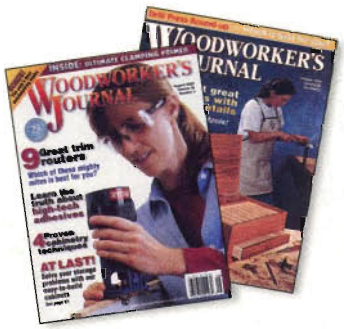
Man, Oh Man

As a man, I cannot presume to speak for women re: the relatively low percentage who report being woodworkers, discussed in your December editorial.

I do think one thing that has had a tremendous impact on women's participation in any number of hobbies is the sexism shown in the representations of those hobbies. Such things as advertisements, story photos, etc., typically don't suggest a world in which women have a primary role. I suspect that often this sexism is unintentional. Nonetheless, the fact that it is so commonplace and unnoticed means that there is a barrier to the kind of open and inviting atmosphere you seem to want to endorse.

Consider, for instance, the picture on page 10 (*Letters*) of the same issue of a man moving a table saw. The letter to which it relates was submitted by "Bev." Why not picture a woman moving a saw? The message conveyed seems to be that either women don't do such things or the woman's point of view doesn't matter.

This one instance is not a huge matter in and of itself. But, when you consider it in the context of years of slights and exclusions, omissions and even ridicule, even a little thing takes on significance.



Women woodworkers have been featured on two of our covers so far.

The publication is an excellent one. You have a terrific opportunity to help shape a subculture by using the magazine sensitively and creatively. I think the undertaking is worth it in principle as well as from a practical point of view.

Rob Ragatz
Pullman, Washington

Aligning Realities

On page 12 of the *October 2002* issue of your magazine is a discussion between a reader and author Ian Kirby on aligning the table with the blade of a table saw (see *Letters*). My father went through the same exercise in the early 1940s on an 8" Delta saw. We didn't have any equipment to make micrometric measurements, so he used an inside caliper.

The blade was raised to the upper limit to get the most length along the table for the longest measurement; he also pushed the blade away from the miter slot to take any play out in that direction. Then he marked the blade next to the table at one position and adjusted the caliper so it barely touched the far edge of the slot and the blade at the shortest distance. (This distance was perpendicular to both the slot and blade.) He turned the blade until the mark was next to the table at the other position and checked the distance to the slot with the caliper. By turning the blade he eliminated wobble or other blade flatness problems.

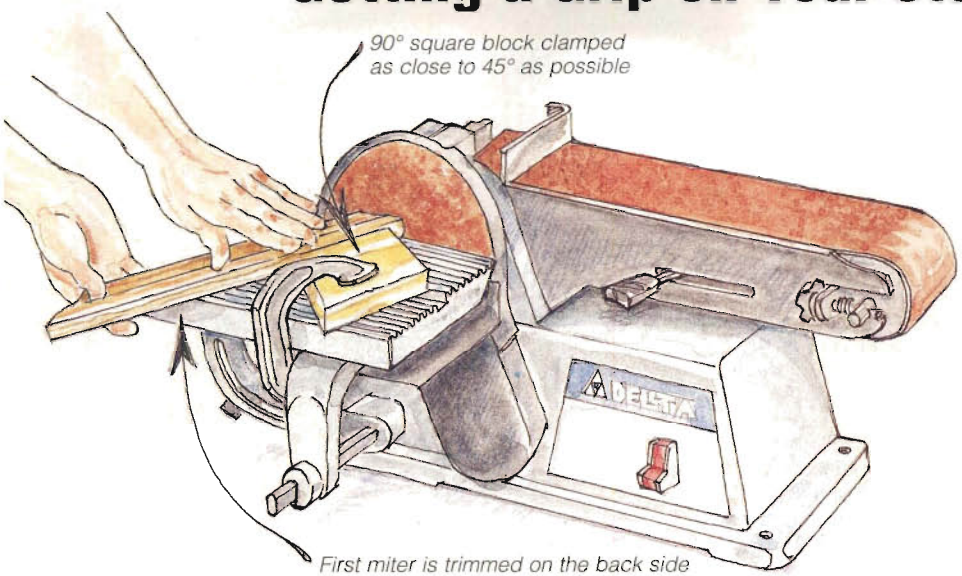
Later I was able to check it with a lever indicator and it was very close — much better than I thought possible for someone working with calipers.

Mr. Kirby is correct about "overengineering" woodworking equipment. I am still using the saw, an 8" tilting table model, and the last time I checked, there was not enough play in the bearings to justify replacement.

Richard B. Saxon
St. Helena, 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.

Getting a Grip on Your Stock



First miter is trimmed on the back side of block. The matching miter is trimmed on the front side.

Perfect Miters

I'm in the picture frame business and came up with this simple idea to ensure perfect miters every time. Cut a block of 3/4" plywood so one corner is exactly 90°. Clamp this block to the sander table as close to 45° to the disc as you can manage. Now cut a pair of miters and trim them on the disc sander, one on the right hand side of the block, the other on the left. You'll find that even if the block is a fraction of a degree out, the miters will still fit perfectly.

Sam Laughlin
Santa Rosa, California

Cross Hair Accurate

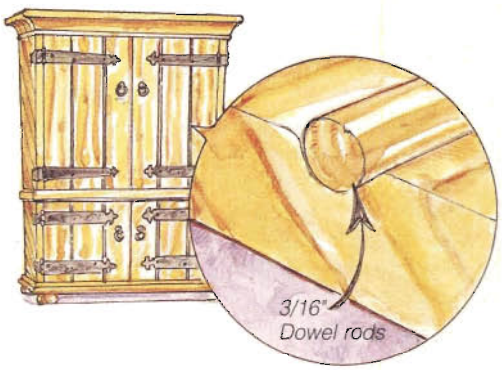
I made an improvement to my router table that has revolutionized my routing. I scored shallow grooves at right angles across the exact center of my black phenolic insert plate — at perfect right angles. I plowed the registration grooves using my router and sharp V-bit. Because the plate is black, I wiped white paint into the grooves and they stood out like cross hairs. Now, regardless of which bit is in the router, I know exactly where the center of that bit is. Setting up for off-the-fence routing is now much quicker and dead accurate.

Cindy McGaha
Russell Springs, Kentucky

Hacksaw Solutions

I occasionally have to cut metal sheet stock that's too heavy for tin snips. My trick is to clamp the metal between two pieces of thin wood, then saw through the "sandwich."

Dennis Deselle
Bunkie, Louisiana

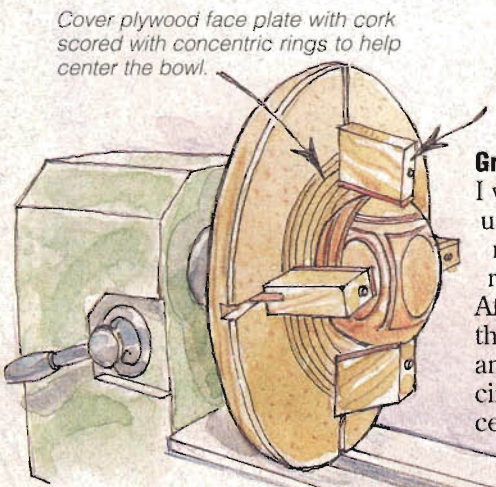


Beading Boards

I wanted the "beaded" look for some oak cabinet doors but didn't have any molding planes or router bits. Instead, I cut a series of 3/16" x 3/16" dadoes, rounded over the edges, and then glued 3/16" dowel rod into the grooves. It gave just the effect I wanted. I plan to try the same technique with thin rope.

Bob Holzer
Phoenix, Arizona

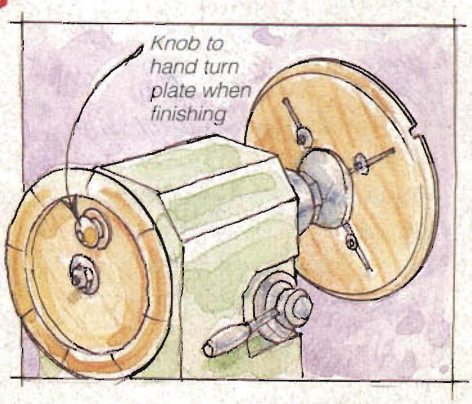
PICK OF THE TRICKS

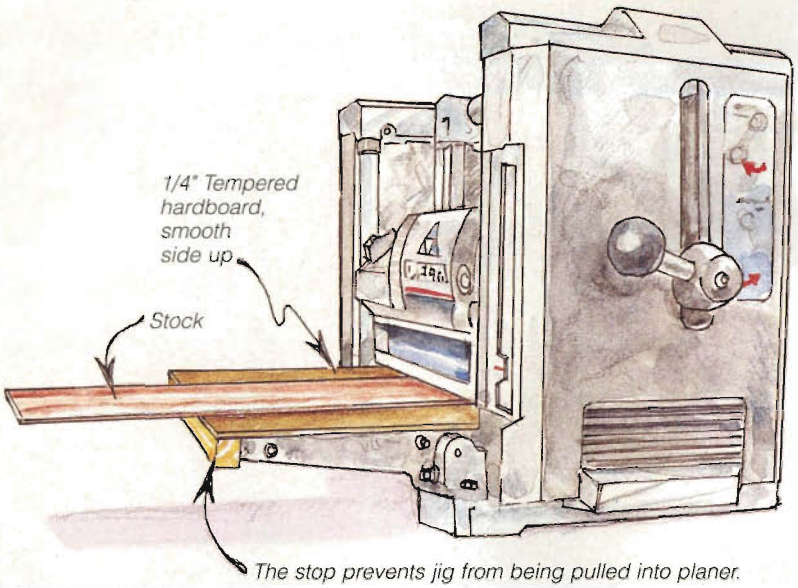


Gripping the Bowl

I was having problems finishing the underside of bowls because I could find no way to hold them securely after removing them from the face plate. After a bit of experimenting, I devised this wooden, four-jaw "chuck." The face and jaws are cork-covered, and engraved circles on the face help me quickly center the work.

Ron Sollinger
Wenatchee, Washington





The stop prevents jig from being pulled into planer.

Planing Thin Stock

I do a lot of laminating, which involves gluing up very thin stock — 1/64" or less. My planer can't handle that, so I made an auxiliary table from 1/4" tempered hardboard, smooth side up. A strip of wood, glued to the underside of the hardboard at a right angle, prevents it from being dragged in through the planer. It's better not to use wax as a lubricant because that could interfere with the glue bond. As a bonus, I found that this technique also helps eliminate sniping.

Donald Cooper
Carnegie, Oklahoma

WINNER!

In addition to our standard payment (below) Ron Sollinger of Wenatchee, Washington, will also receive a **Porter-Cable 9984 Cordless Drill/Driver** *for being selected as the "Pick of the Tricks" winner. We pay from $100 to $200 for all tricks used. To join in the fun, send us your original, unpublished trick. Please include a photo or drawing if necessary. Submit your Tricks of the Trade to Woodworker's Journal, Dept. T/T, P.O. Box 261, Medina, MN 55340. Or send us an e-mail:* **tricks@woodworkersjournal.com**

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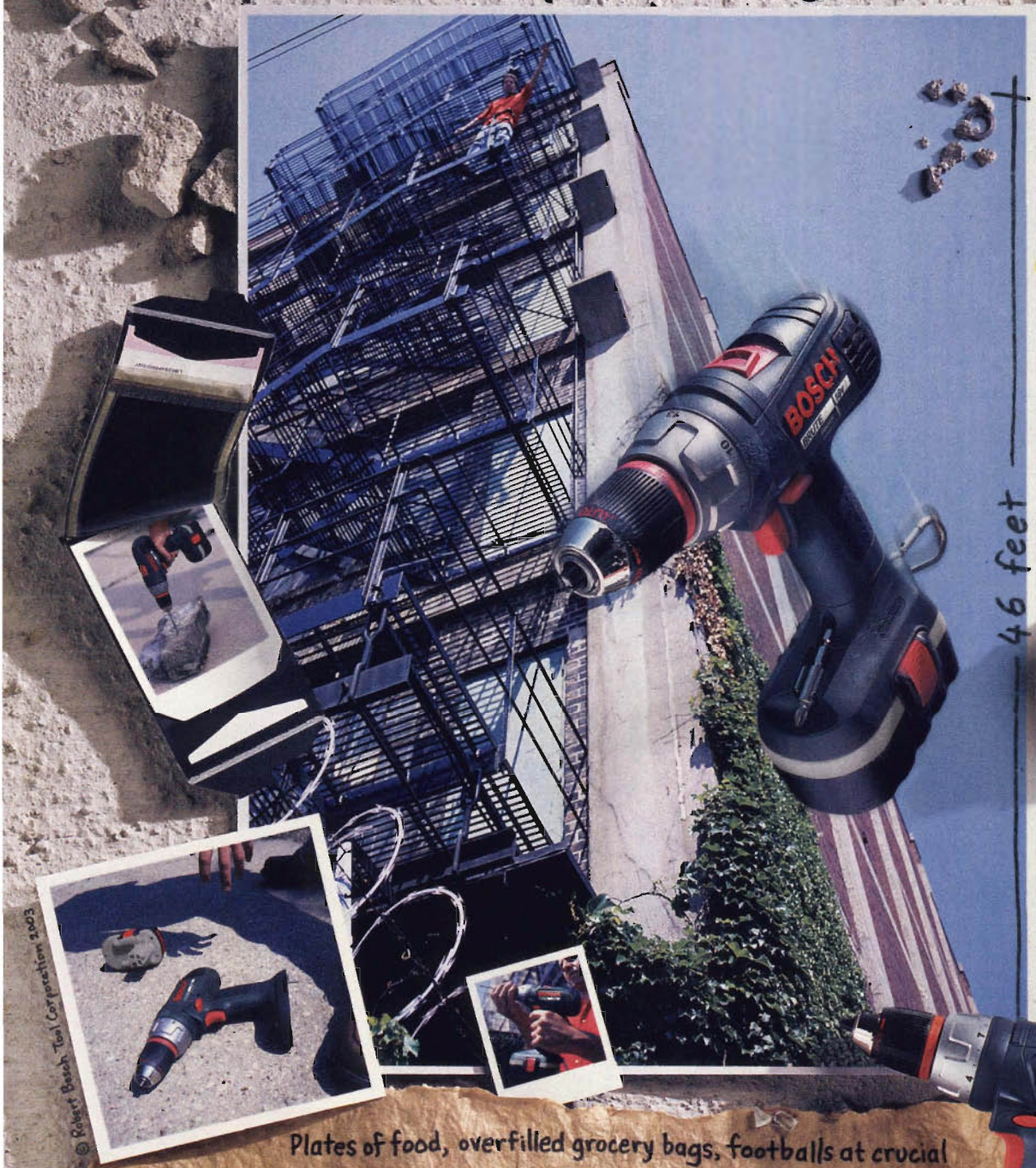

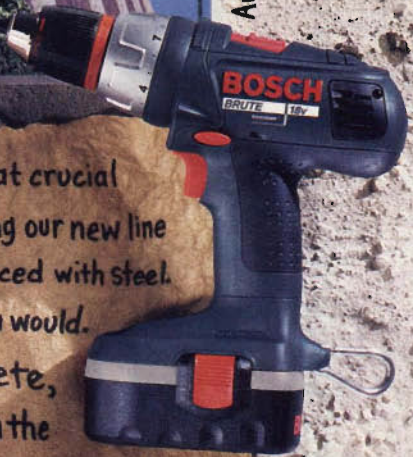

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Bit Prices and Lumber Dimensions

Contact us by writing to "Q&A", Woodworker's Journal, 4365 Willow Drive, Medina, MN 55340, by faxing us at (763) 478-8396 or by e-mailing us at: Q&A@woodworkersjournal.com. Please include your home address, phone number and e-mail address (if you have one) with your question.

Q My question is: why are there router sets that are priced all the way from $30 to $130? It seems to me that sets at both prices do essentially the same thing. Is the price difference due to the carbide? Or the grind? Please help.

Charles R. Hammond
Lyndonville, Vermont

What makes one set of router bits worth $30 and the next worth $130? Author Bill Hylton provides a few possibilities here and looks harder at the topic in his article starting on page 70 of this issue.

A Right now I'm looking at two Roman ogee bits. One is a $35 bit. The other is a $19 clone of the first. What accounts for the $16 cost differential?

It may stem from how they're made (state-of-the-art, computerized, multi-axis grinders vs. old low-tech grinders). More likely, it stems from where the bits are made (Europe vs. the Far East in the case of my two bits) and what the labor costs are in that locale. Additionally, it stems from the quality of the materials used to make them.

Marketing also plays a big role in the cost difference, in my opinion. An industrial customer requires a bit made to tight tolerances and designed to endure hours and hours of sustained use and repeated resharpenings. In the hobbyist marketplace, low cost usually is paramount.

Simplistically, one bit is designed and spec'ed to do a job and is priced according to its manufacturing cost. The other bit is designed and spec'ed to be produced at a given cost.

— Bill Hylton

Q Why is lumber not milled (or, in the case of plywood, manufactured) to its nominal thickness?

If solid wood can be milled to 25/32", and plywood made to 23/32", it seems like it would be just as easy to make both 3/4".

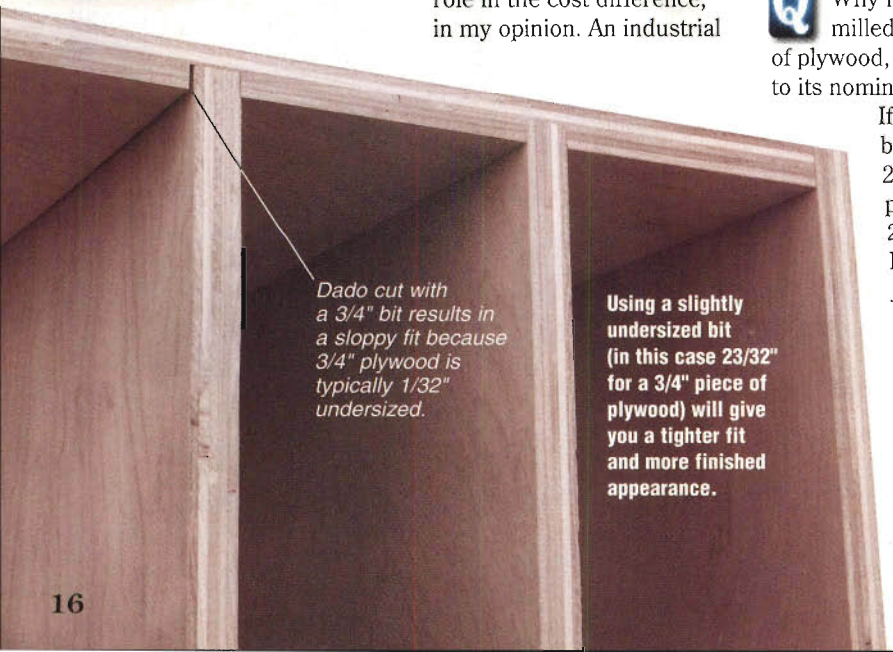
Wynn Moffitt
Whittier, California

A There are several reasons why planing mills and plywood manufacturers don't hold closer tolerances on material thickness. For one thing, wood moves, and no matter what thickness a material is when it leaves the plant, it's likely to be a slightly different thickness when it reaches the end user.

In the case of plywood, the thickness of the finished board depends on a lot of things: the species, thickness and moisture content of the interior plies; the pressure exerted by the plywood presses; and the type and amount of glue between the plies. You can imagine how difficult it would be to control all these variables and produce an absolutely uniform product.

Compounding the confusion, many of the man-made boards sold in the U.S are made overseas, where thicknesses are measured in millimeters instead of inches.

— Ellis Walentine



continues on page 18 ...

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QUESTIONS & ANSWERS

When is glue old? Check the lot number, or just try it on some scrap.

WINNER! *For simply sending in his question on router bit pricing, Charles Hammond of Lyndonville, Vermont wins* ***a Bosch 1581 AVSK jig saw kit.*** *Each issue we toss new questions into a hat and draw a winner.*

Q I have been unable to find a "born on" date or an "expiration" date on any of several adhesives I've looked at. Is there any standardized code used by adhesive manufacturers regarding a date the product was made or when the shelf life has ended?

Rusty Harris
Eureka Springs, Arkansas

A There is no standardized code used for fill dates and, in fact, fill or manufacturing dates are not required by any law.

Some companies don't put any date on, while others do. Of the five companies I spoke to, two print no code or expiration at all; one has it in yy/mm/dd format following the lot number, another has it in the same format preceding the lot number, and one has it in a code where the last three numbers of the lot number indicate the year and week of the year in which the package was filled.

If the glue looks right and flows properly, it is still useable, no matter what date is on it.

— Michael Dresdner

THIS ISSUE'S EXPERTS

Bill Hylton *is a regular contributor to* Woodworker's Journal *and author of* Chests of Drawers *from Taunton Press.*

Ellis Walentine *is a former editor of* American Woodworker *and the founder of* WoodCentral.com *and* WoodFinder *(Wdfinder.com).*

Michael Dresdner *is a nationally known finishing expert and author of* The New Wood Finishing Book *from Taunton Press.*

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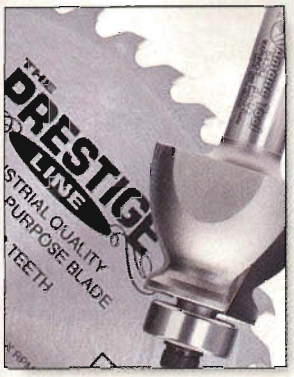

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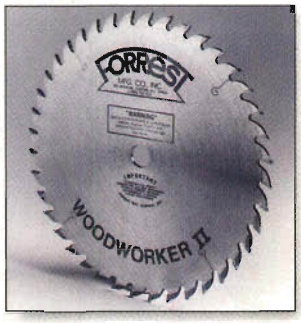

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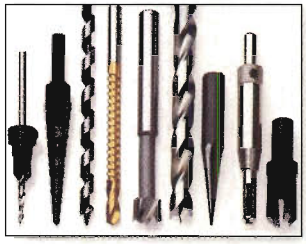

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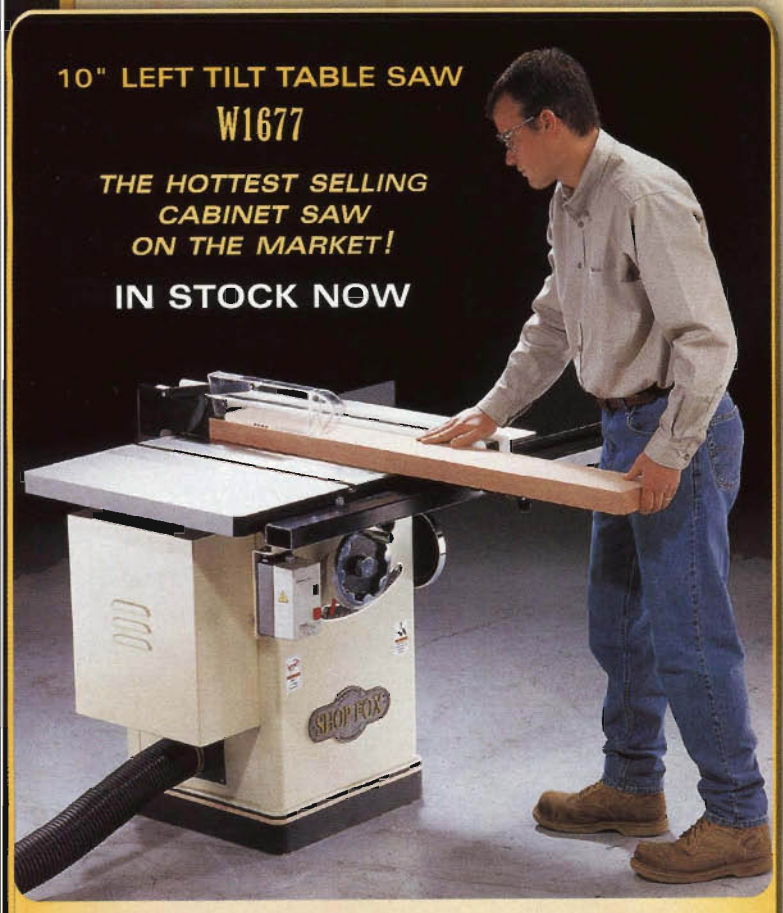

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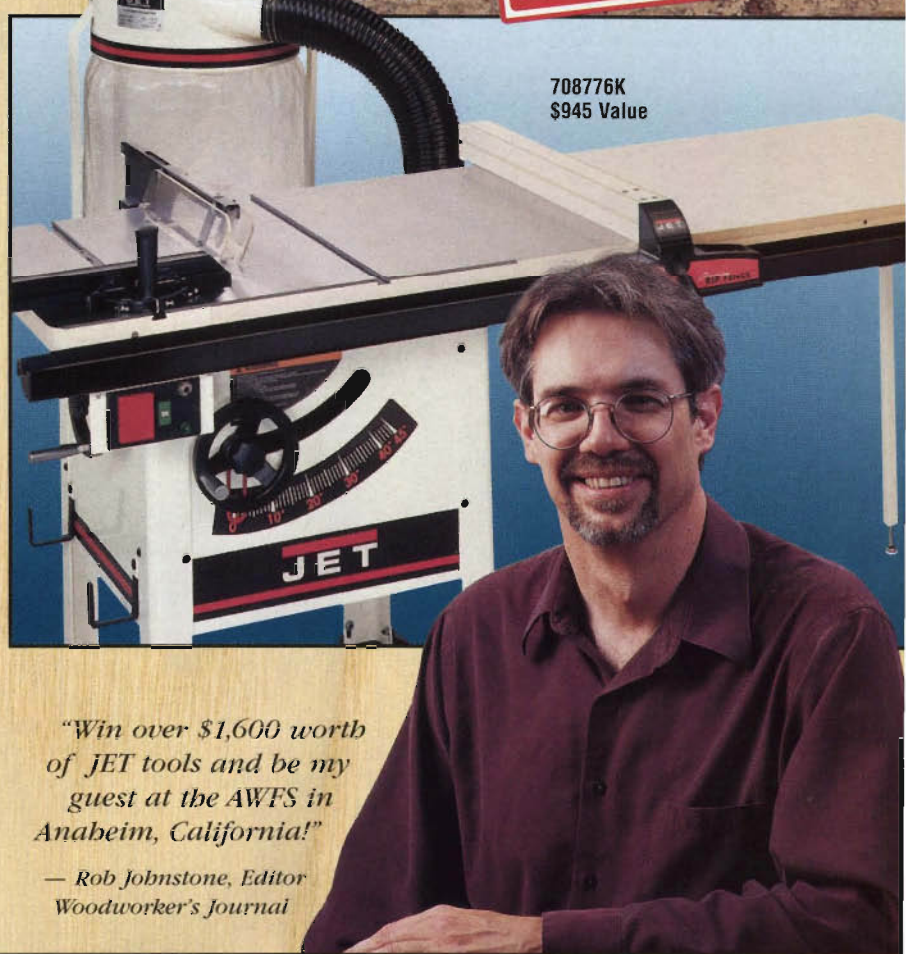

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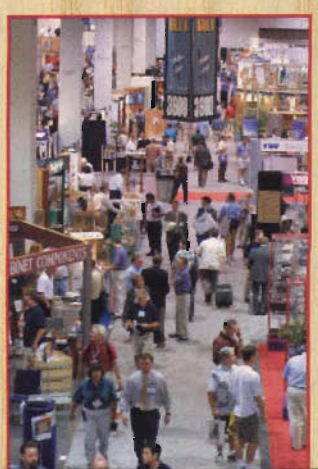

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— Rob Johnstone, Editor Woodworker's Journal

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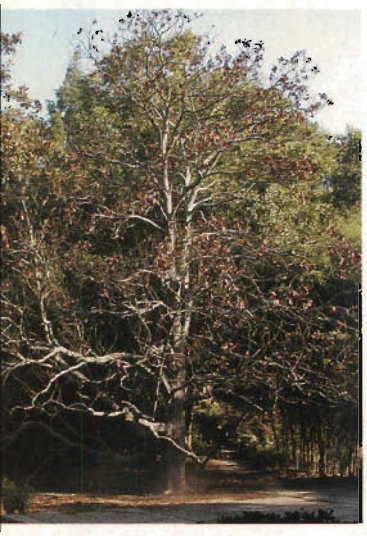
Duke University: Magnolia Memories



Years of students climbing on and carving in Duke's beloved magnolia tree caused trauma like reaction wood and spalting. Ed Karolak claimed the wood when the tree was cut down.

Photos by Arthur W. Clark

Saving a Southern Icon from the Mulch Pile

Local Woodworker Puts Wood to "A Higher Use"

When the chain saws buzzed through an 80-foot magnolia at Duke University's Sarah P. Duke Gardens a couple of years ago, an audience of about 100 gathered to see the Southern icon fall.

In the crowd was a man waiting to inherit the spoils. Ed Karolak had heard the magnolia was to be used for firewood and mulch. He couldn't let that happen. He owed more than 50 years of crafting wood to trees like this one. "I wanted to rescue the tree and put it to a higher use," he said. So he launched the Magnolia Project, his personal effort to memorialize the stately symbol.

Ed saw to it that nothing was wasted. Six men with three chain saws cut some of the 32" diameter trunk into thick slices for tabletops, while the rest was cut into 8' boards. The large boughs were sawed into 3' lengths and the twigs were shredded for mulch. After the behemoth was harvested, Ed split some of the branches lengthwise for turning into bowls. Others he cut into wafers for clocks and vases, hand mirrors and jewelry boxes, snowflakes and earrings.

With every saw cut, Ed learned more about the magnolia's life story. He determined its age to be about 72 (his age, too). The growth rings were distinct until the last 12, which almost ran together. This was a sign either of prolonged drought or of trauma. A horizontal branch slice revealed the pith (center core) had gravitated toward the edge rather than staying centered. Too many climbers may have contributed to this abnormal "reaction wood."

As a magnet for carvers, the magnolia fell victim to fractures and spalting as its sapwood was injured and began to rot. The result was a range of colors, from gold tone (the real color) to a darker, almost walnut shade. Ed said, "There was more spalting than I imagined there would be, so I often had to alter how I used each piece."

Ed attaches a tag with the magnolia's story to every piece he makes from the wood — a reminder to treat trees with respect.

After the wood was delivered to Ed's backyard, he dipped the table slices in polyethylene glycol (PEG) to prevent cracking. The ends of the branches were treated to keep them from splitting as they dried.

Ed is a self-proclaimed air-dry man: "Air-dried wood is definitely brighter and has more life. When you kiln dry, you steam the wood and bake the daylights out of it."

After hewing each board into an object, Ed applied his own finish, a solution of linseed or tung oil, a solvent like turpentine and, depending on the wood, maybe a shot of polyurethane to fill the pores. The former chemistry and math instructor says, "I want the piece to look natural and feel natural to the touch."

Ed had never worked with magnolia, but, except for its peculiar smell when first cut, it threw no curves. Ed found it to be medium hard with an even grain that yielded nicely to the saw. It also fit his philosophy: "It's more meaningful to make something out of a piece of wood that has association with something you've done or someone you've known."

— Ann Goebel

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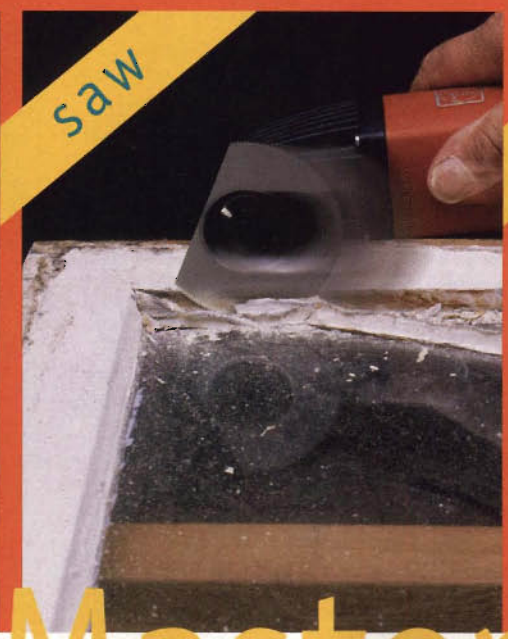

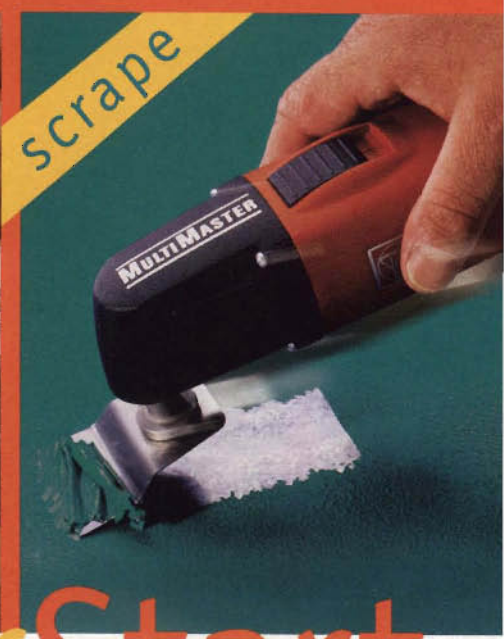

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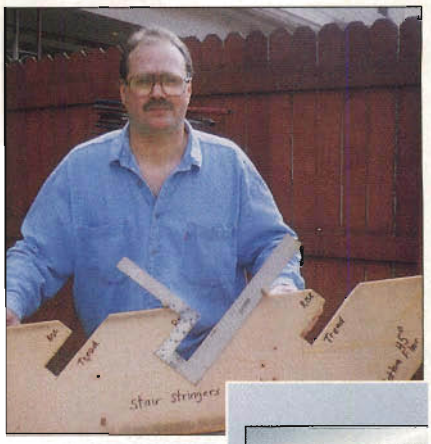
A Square Inventor

Squaring Around an Edge

Martin Doyle, a Pennsylvania woodworker, has patents pending on a squaring tool he says is easier to use and safer to carry in a tool belt. The new square, he's hoping, will find uses in carpentry, cabinetry and a variety of other fields.

Martin's inspiration came to him on the job. He wanted to make squaring around a flange easier for welders like himself, but once he had designed his square, he realized it would also work for woodworking applications, like laying out both inside and outside corners around an edge, or measuring an overhanging ledge on a cabinet. "It's also great for notching out 2 x 4s, trusses and stair stringers," Martin said, "and the 1⅝" opening is perfect for notching lumber." The secondary tongue on Martin's square is parallel to the blade, which allows you to measure height and depth simultaneously.



Pittsburgh welder Martin Doyle's modified square lets you mark the tread and rise on stair stringers in one move or square around an overhang (inset).

— Joanna Werch Takes

Brits Preserve Barnsley's Wood Shop

Carrying on Tradition

Edward Barnsley (1900 - 1987), adapted his style to changing tastes, as in this Jubilee Desk built for the Queen Mother in 1977.

Barnsley's shop in Froxfield in Hampshire, England, built in 1909, is still home to craftsmen and apprentices.

"If I can add to the richness of life a few things that give real joy in use and to the eyes, then I am happy enough," said Edward Barnsley a few years before his death at age 87 in 1987.

The Edward Barnsley Educational Trust is dedicated to making the dream of this influential British woodworker come true. His shop in Froxfield continues to train apprentices under skilled craftsmen, just as Barnsley and shop foreman Bert Upton — whose students included Alan Peters and David Powell — did in their day.

The Trust also preserves the designs and furniture of Barnsley, whose Cotswold style emphasizing solid wood, careful joinery and natural finishes, was rooted in the British Arts and Crafts tradition. You can find out more at *www.barnsley-furniture.co.uk*.

— Simon Watts

Cradle courtesy of Norm Abram.

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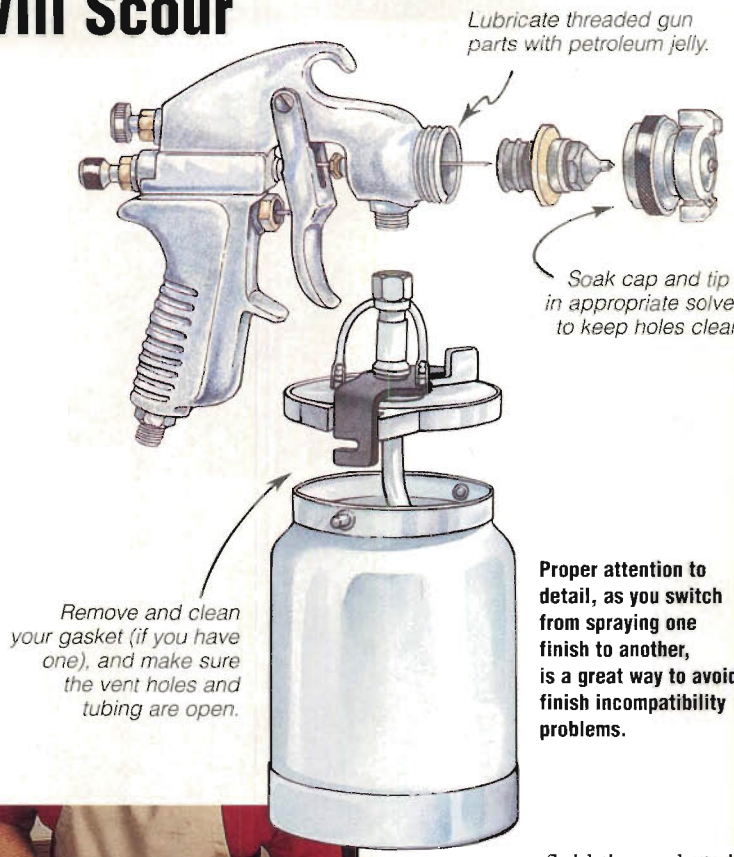
Have Gun, Will Scour

By Michael Dresdner

They say that cleanliness is next to godliness. Truth is, for some of us, it's actually next to impossible.



Proper attention to detail, as you switch from spraying one finish to another, is a great way to avoid finish incompatibility problems.

The devil is in the details, or so they say, and that's true for finishing, too. Sometimes, it's the little things that trip you up: things like a clean spray gun.

We all know that spraying through a dirty gun can contaminate our finishes. Droplets of incompatible solvents can create spots or "fish-eyes" where the finish refuses to flow out smoothly. Bits of old dried finish cause annoying globs of dirt to mar the beauty of what we spray. I'm not going to lecture you about good cleaning habits. That was your mother's task. Instead, I'll give you a few tips that will make gun cleaning easier, and a nice little trick that often allows you to skip the arduous cleaning ritual altogether. (See "A Complete Washout," next page.)

Dismantling and Soaking

The first step after spraying is to pour out any remaining finish, then flush the gun by spraying a few ounces of the finish's solvent through it. Now pour some of the solvent for the finish in a pan and use it to soak the small parts and scrub the large ones. The photo (above right) shows the parts to be removed in the relative position they occupy in the gun. Remove the air cap, fluid tip, gasket ring, fluid needle, spring, and control knob. Soak them in solvent, then scrub with a small brush to be sure they are clean, and that no holes in the fluid tip or air cap are blocked. Be especially careful with the gasket ring — it's easy to lose. Not all guns have one, but those that do won't spray without it.

Remove and soak, from left to right, the air cap, fluid tip, gasket ring, fluid needle, spring, and control knob. Scrub the fluid passageways of the gun with solvent and a bottle brush.

Use a Q-tip® to apply a small amount of petroleum jelly to all the threaded parts of the gun before you reassemble. This keeps them moving freely and easy to disassemble next time you clean.

Scrubbing and Reassembling

Don't soak the gun body. It contains packing material, just behind the fluid tip, that can be destroyed by some solvents. Instead, scrub the fluid passageways, those areas that finish flows through, with solvent and a bottle brush. Before I reassemble the gun, I apply a bit of petroleum jelly on all the threads. That keeps them turning smoothly and makes it easier to disassemble everything for the next cleaning. Finally, make sure the fluid tip seats very snugly when you screw it back in or it will cause the gun to spit.

A Complete Washout

Switching from one sprayed material to another does not always mean stopping to do a complete cleaning sequence. More often than not, I switch from one finishing material to another simply by spraying a succession of solvents through the gun before I reload with a different, incompatible coating.

Let's say you just finished spraying waterbased polyurethane, and now need to spray oil-based polyurethane. Logic would suggest that you could rinse out the gun by spraying a few ounces of water through it, followed by a few ounces of mineral spirits, the solvent for oil-based polyurethane. Unfortunately, that won't work. The mineral spirits would not remove all the water, and you might end up with water droplets in your finish.

Each solvent in the photo above is miscible only with the solvent directly next to it. Start the rinse process with the solvent for the finish being removed, and end with the solvent for the finish being loaded. Just be sure to use all the solvents in between — don't skip a step.

Miscible Solvents

The key is to remove all traces of each solvent by "chasing" it with a succession of fully miscible solvents. The term miscible describes two liquids that will mix in any proportion. Alcohol and water are miscible because you can mix any amount of either one into any amount of the other. Water and mineral spirits are not miscible, so water won't chase out mineral spirits, nor vice versa.

By using a succession of miscible solvents, you can remove all of the previous solvent at each step. The photo at left will give you a guide to which steps are necessary. For example, to go from waterbased polyurethane to SealCoat™ (dewaxed shellac), you need only rinse with water, then denatured alcohol. But to go from waterbased polyurethane to oil-based polyurethane, you'd rinse with water, followed by alcohol, then lacquer thinner, and finally mineral spirits. To go the other direction, follow the steps in reverse order.

Contributing editor Michael Dresdner is a nationally known finishing expert and author.

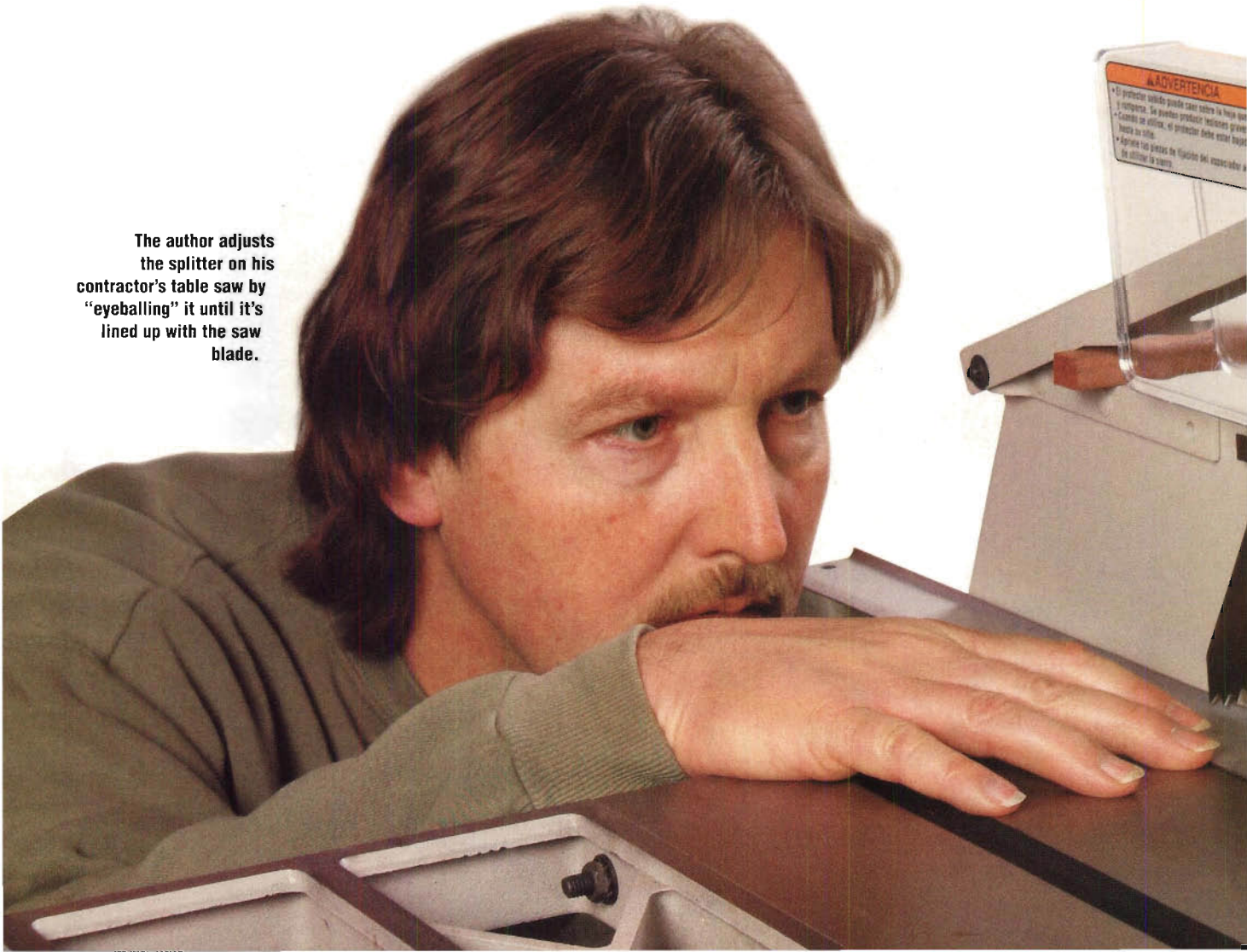
8 Steps to Shop

By Sandor Nagyszalanczy

In the first of his two-part series, our expert presents a calendar of duties and important details on cleaning, lubrication, inspection, adjustment and worn part replacement.

A clean, well organized shop with sharp bits and blades and well-tuned power tools and machines is not only a more efficient and pleasant place to work, but a safer one as well: Sawdust and chips that are allowed to accumulate pose both a health and fire safety hazard. Furthermore, machines that go out of adjustment or fall into disrepair are not only frustrating to use, but can cause miscuts and accidents. Even if you're not a follower of the "stitch in time saves nine" adage, doing a little cleanup and tool maintenance on a regular basis will save you time, trouble, and money in the long run (tools kept in good tune require less in the way of expensive repairs and last longer).

On the other hand, properly maintaining your shop can be a confusing matter: What should you do and when and how often should you do it? To provide a leg up on the what-and-when issues, I've put together a calendar of daily, weekly, monthly and bi-annual maintenance duties (see pages 32 - 33) required in a typical small shop.



The author adjusts the splitter on his contractor's table saw by "eyeballing" it until it's lined up with the saw blade.

Maintenance

This includes important fire safety cleanup tasks (example: vacuuming fine dust from light fixtures and electrical junction boxes) and the upkeep of spray booths, air compressors and dust collection systems. The rest of this article addresses the question of how to maintain your tools and provides in-depth information on proper cleaning, lubrication, inspection, adjustment and replacement of worn parts. In the next issue, I will provide a complete maintenance "checklist" for the most common shop machines and a variety of portable power tools.

General Machine Maintenance

One theory of machine maintenance is to just let things go until they break; then fix them. But this is not only expensive, it is inconvenient — you just know your router won't poop out until just days before the winter holidays, when you're frantic to finish making gifts. Unless your shop is powered by a water wheel or steam engine, all your tools operate with electric motors, pulleys, belts and gears that need periodic attention. The following section offers a comprehensive list of standard cleaning and lubricating procedures, tune-ups and adjustments, and even small repairs that you can do yourself to keep your machines in top working order. One caveat: Some of these procedures may not accurately describe your machines. When in doubt, consult the manual or a qualified machinery service person. And, of course, all described procedures should only be attempted with sharp blades and cutters removed and the tool or machine disconnected from electrical power.

Cleaning Equipment

One of the easiest ways to prolong the life of all your equipment is to simply keep it clean. Accumulating sawdust and chips get in the way of using machines and can upset accuracy and usability. Sawdust buildup on mechanical components, like a table saw's trunnion or a compound-miter saw's turntable, can throw off the accuracy of adjustments and make setting sluggish or impossible. Sawdust that clogs cooling vents on motors can cause tools to overheat. And fine dust (which tends to accumulate in electrical switch and junction boxes) can actually ignite from a tiny spark and cause a devastating shop fire!

The Shop Maintenance Calendar

Every Day (of use):

Empty shop garbage cans and any open dust bins.

Clean out rag storage cans; put rags soaked with oil finish out to dry.

Lubricate air-powered tools (nail guns, random-orbit sanders, etc.) and/or refill reservoirs on automatic oilers.

Every Week:

Clean sawdust from shop's floors and benches.

Drain moisture from compressor's air storage tank, pipes and manifold and filter/moisture trap(s).

Shake dust collector's filter bags to remove excess dust cake (more often if necessary).

Empty sawdust from dust collector bags or bins (more often if necessary).

Empty shop vacuum and clean filter (more often if necessary).

Every Month:

Vacuum fine dust from tops of light fixtures and out of electrical outlets, switches and junction boxes.

Vacuum prefilters on air filtration devices.

Clean out sanding tables, machines not connected to dust collection.

continues ...

Spraying a machine's working parts with a dry lubricant such as Boeshield T-9 helps the parts turn, slide and run more smoothly, and won't attract dust as a liquid grease or oil would. To prevent rust and aid parts sliding, the machine's cast-iron tabletop is sprayed with Bostik TopCote.

Vacuuming a machine or portable power tool with a high-velocity shop vacuum is usually better than blowing dust out with compressed air, which can propel debris farther inside a motor or mechanical assembly. (That goes for shop floors and benches too; blowing launches fine dust into the air, where it is respirable, only to settle again on every surface.) If you must use compressed air, keep the pressure below 50 pounds. Loosen oily gunk with a bristle brush before vacuuming, or pry it from narrow slots and cavities with a Popsicle® stick or narrow screwdriver. Use a crevice tool to vacuum hard-to-reach spots and remove fine dust from electrical components.

In addition to the machines themselves, you should also clean all your saw blades, router bits, shaper cutters, etc., to keep them in top cutting condition. Remove pitch and resin buildup by scrubbing them with a nylon-bristled brush and a cleaning product. Some woodworkers use oven cleaner for this chore, while others prefer to use a specialized blade/bit cleaner, such as "Oxi Solve" or "Pitch Rx."

Lubricating Machines

If your shop is graced with vintage cast-iron machinery, you're already aware of the lubrication needs of older machines fitted with Babbitt bearings or bronze bushings which required occasional lubrication. Most of these machines are fitted with oil cups or reservoirs: fill them with SAE 10 or 20 non-detergent machine oil (NOT auto motor oil). On machines with grease nipples, use a grease gun to inject a lithium-soda type bearing grease (never substitute oil!). Make sure to clean gummy deposits and sawdust from oil cups and nipples before lubricating them. To keep your drill press quill operating smoothly, occasionally apply a few drops of SAE 40 machine oil into the center of the quill's pulley. If your thickness planer has a gear-driven power feeder, top up its gearbox with a heavier-viscosity gear oil between SAE 90 and SAE 140.

Most modern machines have arbors and power transmission shafts fitted with permanently sealed ball bearings that don't require any additional lubrication — oiling them only attracts dust and creates a gummy mess. But that doesn't mean that other parts of your machines don't require

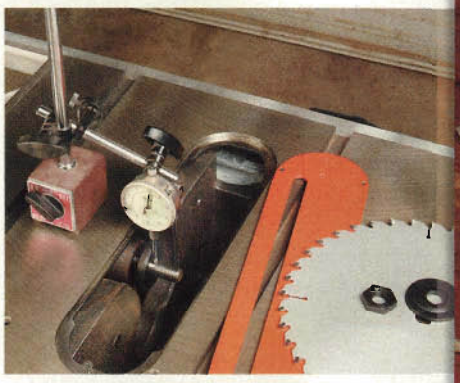
Vacuuming a belt sander with a high-velocity shop vacuum removes fine dust buildup from the motor and running parts, helping them to run better and last longer.

attention. Mechanisms that raise and lower the arbor on a table saw or shaper, raise and lower the table on a planer or jointer, and tilt the table on a band saw, as well as other mechanical adjusting components, all need occasional cleaning and lubrication to work at their best. Because woodshop machines are constantly pelted by sawdust, never use wet lubricants on these parts, such as greases, oils and non-drying sprays. Dust will stick to these compounds, and this is a sure way to create a sticky mess that will eventually gum up the works. Instead, coat trunnions, gears, dovetailed ways, screw threads, etc., with a dry lubricant, like powdered graphite, or with a spray lubricant that dries to the touch, such as Boeshield T-9. Drying spray lubricants are also good for machine tabletops, miter gauge slots and other surfaces, as they not only prevent rust from forming, but reduce friction to help tools and workpieces glide smoothly.

Checking Bearings and Arbors

Permanently sealed ball bearings can last for decades, especially in machines that only receive occasional use. But any bearing can go bad over time and produce an audible "death rattle" in the form of a clicking, thumping or whining noise emitted when the tool is running. If you hear such noises, it's possible that the bearings need replacement — a job that's beyond the scope of this article. Check your owner's manual for replacement instructions and a parts list, or contact your local service center.

Vibration and poor performance in a machine may indicate bad bearings or a bent arbor, shaft, warped flange or other drive component. You can check components for these problems by reading the amount of excess play (known as "runout") with a dial indicator, as shown in the photo below. This precision tool basically uses a clock-like gauge to show the in-and-out movement of a short rod protruding from the case. If you can't borrow a dial indicator from a well-equipped friend, purchase a very affordable model from Enco Manufacturing (800-873-3626). The dial indicator is fastened to an adjustable arm mounted on a magnetic base that's easy to temporarily secure to a cast iron or steel tabletop or surface. Position the end of the indicator's rod in firm contact with the arbor, shaft, flange, etc. you are checking. Zero the indicator's dial (rotate it until the needle shows a zero reading, then lock the dial down), then manually rotate the arbor/shaft and watch the needle; it shouldn't show a movement of more than a few thousandths of an inch. If it does, it indicates excess runout (the part isn't running straight and true). The component is therefore suspect and requires further



Checking for excess play or "runout" that can cause vibration and poor performance in a table saw is easy with a dial indicator. The tool's magnetic base holds it firmly in place as the indicator's plunger reads the concentricity of the arbor.

Clean off built-up finish on spray guns, spray booth walls, etc.

Check the condition of the air filter and the oil level in your compressor's pump (latter not required for oil-less models).

Test and reset ground-fault interrupt (GFI) outlets and circuits.

Twice a Year:

Inspect condition of machines and portable power tools; service as needed (see sections above).

Check fire extinguishers; recharge or replace as necessary.

Change oil in air compressor pump (oil-less compressors exempt).

Treat stationary tool tops, metal tools, clamps, etc. with rust preventative.

Check compressed air system (tank, hoses, fittings) for leaks.

Check condition of filter bags or cartridges on dust collectors, air cleaners and shop vacuums; replace as necessary.

Inspect central dust collection system's ductwork and flexible hoses for air leaks or clogs.

Check first aid kit for completeness; refresh supplies as necessary.

Check condition of glues and finishes; properly discard products that have spoiled or are past their expiration dates.

Check shop for leaks or moisture that may ruin tools and stored lumber and supplies.

After checking for correct pulley alignment on a table saw with a straightedge, the author repositions the drive pulley on the motor by first loosening a setscrew, then sliding the pulley into position.

inspection by an experienced machinery repair person. If arbors and shafts show no runout, yet there is still machine vibration, warped blades or bent bits may be the cause. You can also check the trueness of these with a dial indicator.

Servicing V-belts & Pulleys

Transmission of power from the motor to a stationary machine's blade, bit, knives, belt or disc is handled by rubber V-belts and metal pulleys (benchtop machines fitted with universal motors use short-toothed drive belts or are direct drive). Drive belts need to be occasionally checked and adjusted to keep machine performance in top form. First, inspect all belts, and replace any that show excessive or uneven wear and/or cracking. Make sure to choose a replacement belt that is not only the same length as the original, but is also the same size. The majority of the smaller woodshop machines use B-series belts, but there are exceptions; it's best to take the tool with you to your power tool dealer for comparison. If an original belt is unavailable or difficult to obtain, you can replace it with a segmented "Power Twist Link" belt. For proper operation, machines with multiple V-belt drives require that both or all three belts be replaced at the same time with a matched set of belts; contact your tool dealer or machine manufacturer for replacements.

Adjust belt tension as necessary (some tools use spring pressure or the weight of the motor for tensioning), setting tension according to the tool's manual. If instructions aren't available, set the tension just tight enough so that the belt doesn't buck or oscillate rapidly when running at full speed.

> "Because woodshop machines are constantly pelted by sawdust, never use wet lubricants on these parts. Dust will stick to these compounds, and this is a sure way to create a sticky mess that will eventually gum up the works."

Check pulleys and sheaves for excess wear. This is usually only an issue on often-used tools fitted with inexpensive cast zinc pulleys, which can and do wear out over time and cause excess vibration and uneven belt wear. Check to make sure that pulleys are in good alignment with a straightedge. Reposition pulleys as needed by shifting their position. While you're at it, check all pulley setscrews for tightness, and replace any missing setscrews.

Removing and Preventing Rust

It's an unfortunate fact that rust never sleeps, and continues to grow and degrade the condition of our metal tools even when we're not using them. Surface rust on cast-iron tool tops makes it difficult for wood parts to slide smoothly across them, which is a safety concern as well as an annoyance. And heavy rust on mechanical components — trunnions, screw threads, etc. — makes tool settings and adjustments difficult or impossible to perform. It takes less time to prevent rust than to deal with it once it's formed, so take time often to coat all non-painted or anodized ferrous metal parts with a rust-preventative (if you live near the ocean, also coat bare aluminum parts, which salt air can corrode). Spray-on rust preventatives, such as Boeshield "T-9" or Bostik "TopCote" are very easy to apply and form a dry film, which won't

Depending on how rusty your machines gets, try a ScotchBrite pad, a wire brush chucked in a drill, or chemical cleaners. Scraping with a razor blade on really heavy rust works well.

The author uses a carpenter's framing square to check and set this 12" compound miter saw's fence square with the blade. A quick test cut afterwards confirms the adjustment.

rub off onto raw wood parts. Avoid all sprays and coatings that contain silicone, which can create serious finish contamination problems.

To clean up rusty machines, remove light rust with a plastic abrasive pad (e.g. ScotchBrite), a wire brush or a wire wheel

If the motor housing on your power tool has visible caps, unscrew them to check the condition of the motor brushes. Replace both brushes if one or both are worn down to 1/4" or shorter.

chucked in a drill. Heavier rust may require a chemical cleaner, such as Naval Jelly or Bullfrog RustRemover. The fastest way to remove really heavy rust deposits is to scrape them off with a single-edge razor blade, fitted to a safety handle.

Inspecting Electrical Components

Although a machine's power cord and plug, on/off switch or magnetic starter aren't particularly prone to wear (the exception may be benchtop tools that are plugged and unplugged more often) any problems here can lead to serious safety hazards. Therefore, check electrical cords for fraying and plugs for cracks and exposed or broken wires and replace or repair them at the first sign of trouble. To keep electrical switches working properly and prevent fires, vacuum out junction boxes that are accessible. Replace switches that work intermittently, or spray them with contact cleaner.

Induction motors, found on most stationary machines, don't require much in the way of servicing (aside from being kept clean; see above). Universal motors found on nearly all portable power tools, however, have brushes that should be checked and replaced occasionally. With every 50 hours of use, check them, if accessible, by removing the caps on the sides of the motor housing. If the carbon portion of either brush is less than 1/4" in length, replace both brushes, even if only one is worn out. If brushes aren't user removable, or you're unsure of replacing them yourself, have the work done at an authorized tool service center.

Aligning Fences, Miter Gauges and Safety Equipment

Most stationary machines have a basic fence that must be aligned correctly for smooth — and safe — operation. A large try square (or accurate framing square) is handy for checking a fence for square on a jointer, radial-arm saw, compound-miter saw or other type of crosscut saw. (An exception is the table saw, where a rule is used to check and set a rip fence parallel to the saw blade.) A try square is also good for setting square on miter gauges used with table saws, band saws, stationary sanders, etc. Adjust and lock the stop screw for each angle setting (45, 22½ deg., etc.) using a miter square, combination square and/or a protractor. Always take a trial cut after setting a fence or miter gauge and check the work piece to confirm your adjustments.

The guards attached to and/or built into your power tools are there to protect you. But they can't do their job properly if they're damaged, misaligned or misadjusted. Look over plastic blade and bit guards for obvious cracks or broken or missing mounting hardware. Lubricate articulating guards (such as over-arm table saw guards or cutoff saw guards), which must lift or retract smoothly during use; a sticking guard could snag on the work and cause a miscut or an accident. Some guards, like a splitter-type table saw blade guard, require careful alignment to work properly; the splitter must line up perfectly with the blade kerf, or the guard can bind on the work. Check to make sure the splitter and blade line are perfectly parallel with a straightedge: With its edge held against the blade, it should clear the splitter slightly. Realign the splitter as necessary, following the directions in the machine's manual.

Sandor Nagyszalanczy is a writer, photographer, and author of seven books, including Power Tools: An Electrifying Celebration and Grounded Guide *from Taunton Press.*

Cabriole Leg Side Table

By Paul Anthony

Template routing and a bit of hand tool shaping render lovely legs on a "nouveau cabriole" table with an aged cherry finish.

When it comes to furniture projects, side tables are a perennial favorite. They dress up any room and offer a great opportunity to showcase your woodworking skills to family and friends.

One of the primary features of any table is its leg design. With this cherry table, I wanted to step away from typical tapered or turned legs to something more elegant. I designed these legs to be sort of "nouveau cabriole" — conveying the grace of a traditional cabriole leg without the visual weight. They are surprisingly easy to make. I devised a system of template routing that ensures the profiles match very closely. After routing, a bit of planing, shaving, and filing refines the legs to their final form. I found the task quite enjoyable and rewarding.

Cutting the Pieces to Rough Size

Begin by cutting all the pieces roughly to size. I prefer roughsawn lumber because it allows more stock control.

After a light pass through the planer reveals the general grain and figure of my roughsawn lumber, I select the most attractive boards for the top (piece 1). Lay out your pieces several inches oversized in length and at least 1/4" oversized in width. After ripping and crosscutting to these rough sizes, sticker the pieces and let them sit for a day or so in the shop. This allows the gross wood movement to occur before the final machining.

The best approach to forming the mortises in the legs is to plunge to full depth at the beginning and end of each mortise. Then remove the waste in between by making successive shallow cuts.

Making Templates and Leg Blanks

While waiting for the top and apron stock to relax (pieces 2 and 3), I worked on the legs (pieces 4). As mentioned, I used templates to rout the front and side profiles before doing the final shaping.

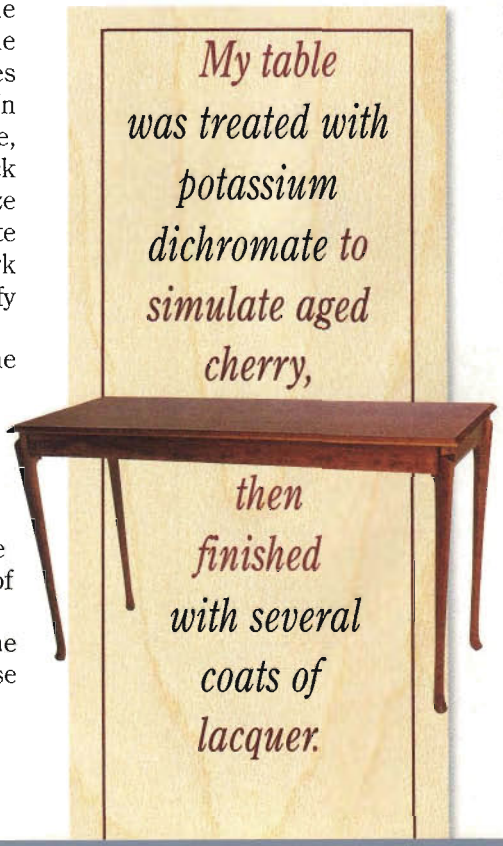
Start by making the front and side templates using 1/2" hardwood plywood, cutting them to the shapes shown in the *Elevation Drawings* on the next page. (Note the horn at the top and bottom of each leg. This material is used for clamping and will be cut off after the leg is shaped.) Cut close to the lines using a jigsaw, then hand plane and sand the edges to ensure straight lines and fair curves. Mark the centerlines and horn lines on the template and extend the centerlines down the ends of the templates. In order to stiffen the side template, I glued on a piece of 3/4" thick plywood that I sawed to rough size then trimmed to match the template using a flush-trim router bit. Mark the front profile template to identify its front and back.

Use straight-grained stock for the leg blanks, laying out a centerline on each end. Mark the horn lines onto the blanks and lay out the front and side profiles, aligning the side template centerlines with those on your blank. Lay out the front profile on the back edge of each leg, too.

It's best to rout the mortises in the legs before shaping them because the square blanks provide a longer surface for your router edge guide. Fully lay out one 1/4" x 2½" mortise, as shown in the *Elevation Drawings*. You'll use this to set up your router edge guide. The rest of the mortises need only start and stop lines, which you should lay out now, too. Then cut the mortises to 5/8" deep, as shown in the photo above.

Cutting the Profiles

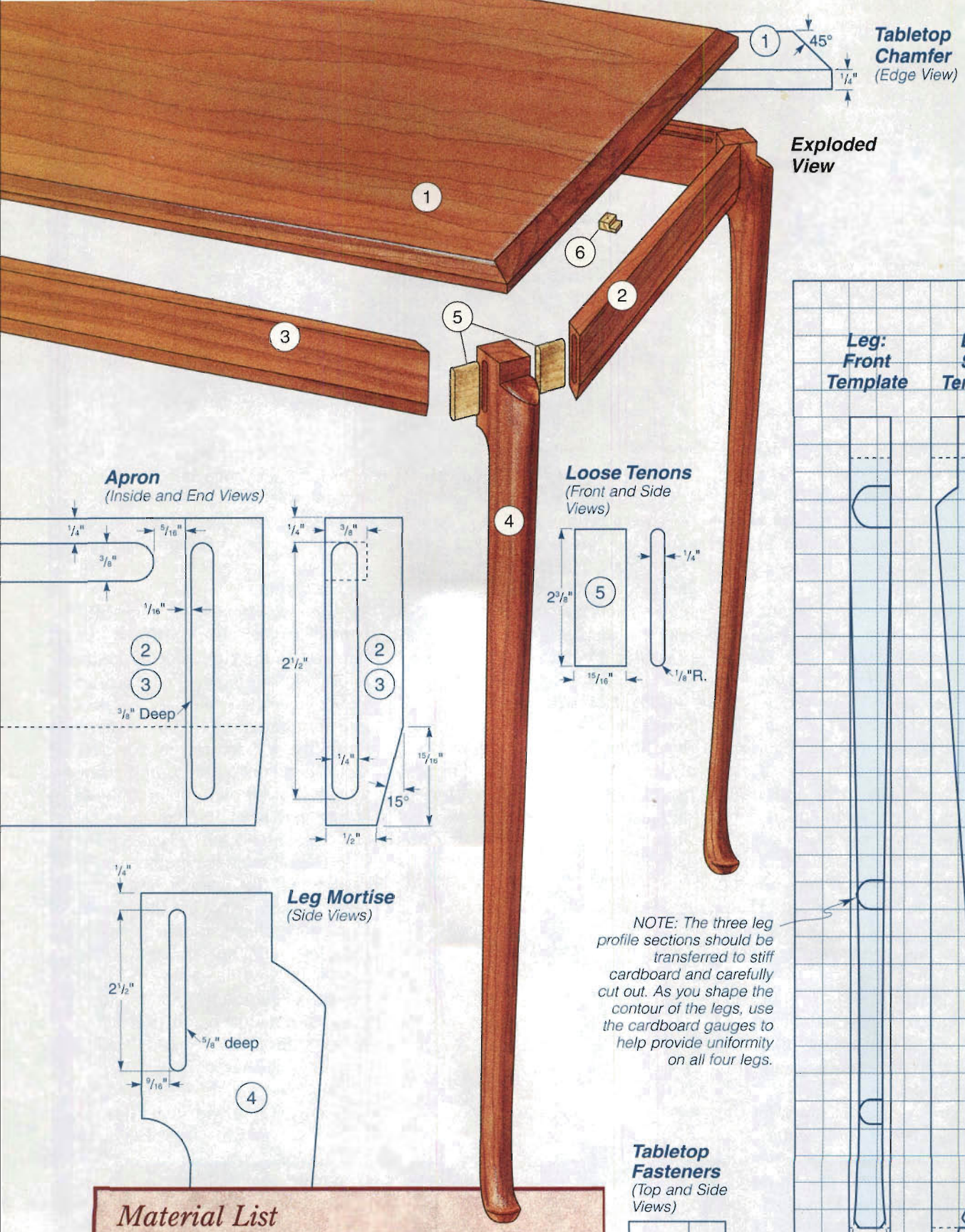
Next, cut the side profile on each leg. Begin by band sawing to within 1/16" of your cutline. You'll need to attach full-length offcuts later for template routing, so make each cut in one continuous pass. For the front of the legs, begin at the top, cut along the horn line, swoop up around the tip of the knee, then down to the toe. Then, finish up the cuts above the knee and make the V-cut where the foot meets its horn.



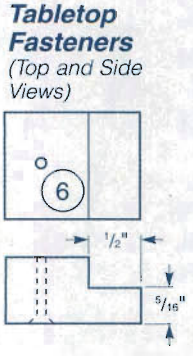
Screw the side profile template to the leg horns, aligning the centerlines on each. Mount the template to the right side of the leg to prevent routing against the grain at the knee and toe. Use hot-melt glue or double-sided tape halfway down the leg to prevent template flex. Then rout to the profile using a flush trim bit on a router table, as shown in the top photo on page 39.

Use hot-melt glue to reattach the offcuts to the leg, carefully aligning the edges. To prevent workpiece tearout when removing the offcuts, I first apply thick cellophane tape to the leg at the hot-melt glue locations. Now band saw the front profile. Feed the workpiece knee-down (see middle photo, page 39) to present an uninterrupted bearing surface to the saw table.

The 3" width of the leg is too wide to template rout with most bits, so I rout it in two steps. Begin by attaching the front profile template to the front of the leg blank using enough hot-melt glue or double-sided tape to prevent flexing. Outfit your table router with a flush-trim bit that has a bearing at the shank end and a cutting flute at least 1¼" long. Then rout flush to the template as



NOTE: The three leg profile sections should be transferred to stiff cardboard and carefully cut out. As you shape the contour of the legs, use the cardboard gauges to help provide uniformity on all four legs.



Each square equals one inch.

Material List

		T x W x L
1	Top (1)	13/16" x 20" x 50"
2	Short Aprons (2)	3/4" x 3" x 16"
3	Long Aprons (2)	3/4" x 3" x 46"
4	Leg Blanks* (4)	1 1/2" x 3" x 31 1/4"
5	Loose Tenons (8)	1/4" x 2 3/8" x 15/16"
6	Tabletop Fasteners (6)	1/2" x 1" x 1 1/4"

**Leg blanks are longer than the finished legs.*

shown in the photo at the bottom of this page. Finish up by switching over to a flush-trim router bit with a 2" cutting flute and a tip-mounted bearing for riding along the previously routed surface, as shown in the inset photo below.

Finish the top and base separately before connecting them, and make sure to finish the underside of the top to prevent warping.

Shaping the Legs

Smooth all of the faces and fair the profile curves using a block plane, spokeshaves, and a scraper. A block plane held sharply skewed will plane the surfaces most of the way down from the knee, as shown in the photos on page 40. If you're not handy with a plane and spokeshaves, use rasps and files instead.

After smoothing the curves, draw a centerline down the front of the leg. I measure across the width at several points, making tick marks, then I use a flexible strip of wood or plastic to connect the marks and establish the line.

Use some stiff cardboard to make cross section templates (see the *Drawing* at left). Then set a block plane for a heavy cut and begin planing the curves at the front of the leg, working from the knee downward. Work as symmetrically as possible, removing the same amount of material from each side of the centerline. Use the templates to gauge your progress as you go, working the curves to within about 2" from the foot. When you're close to the desired profile, set your block plane and spokeshaves for a fine cut, then go over the surfaces again. After taking each pass, roll the tool over on the curve just a bit to take each subsequent pass. This way, you'll end up with a surface made up of a series of close, small facets that can be sanded smooth. When you are done shaping the front, round over the rear of the legs to a radius of about 1/8".

Now you're ready to begin carving the foot. First undercut the area below the toe, carving away the top section of the horn at the same time. Then use your spokeshaves, chisels or files to generally round the shin. Next, smooth the entire leg with 100-grit sandpaper, then 150-grit.

With the sanding completed, start on the final shaping of the foot and knee. Brush the workpiece to rid it of sanding grit, then carve two opposing facets, about 2" long on either side of the foot, as shown in the bottom photo on page 40. Each facet is about 1/2" wide at its low end. The upper end blends into the curve at the front of the leg.

Use a wide chisel to create a sharp junction where the top of the knee meets the top of the leg. Then pare the tapered facets on each side of the knee, as shown in the inset photo on the next page. Cut each taper about 1/4" at its widest point. Don't fret if the cuts aren't perfect; you can fair them afterward using a fine-grit emery board like those used for nail manicures. Round the edges above the knee to match the width of the facet at its top end.

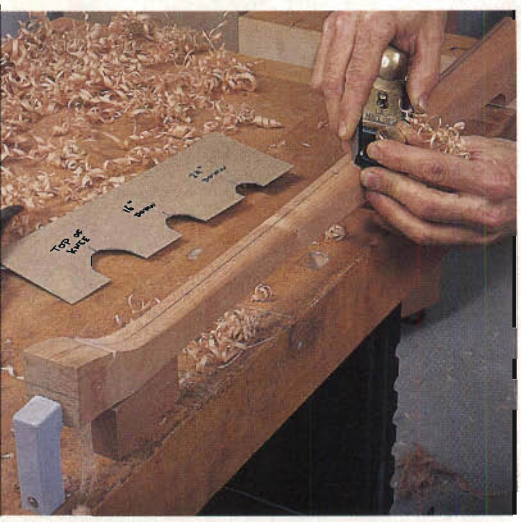
Finish up by cutting the leg to final length. First, cut the top horn off each leg. Then cut all the legs to 28¼" using a stop block on your saw to ensure consistent length. Shim at the rear of the leg to prevent it from collapsing against your chop saw fence or table saw sled fence as you trim off the lower horn. Finish up by doing any necessary shaping and sanding near the sole of the foot after removing the horn.

After band sawing the front and back profiles to within 1/16" of the cutline, attach the side template and rout to the cutline using a flush-trim bit.

Reattach the offcuts to the front and back of the leg with hot-melt glue, then band saw the side profiles to within 1/16" of the cutlines.

The first step in routing the side profile is to use a flush-trim bit with a bearing at the shank. The bit translates the shape of the front template to the stock. Then switch to a bit with a tip-mounted bearing (inset), to finish the profile. This bearing rides along the routed surface you just created.

A block plane held sharply skewed will smooth away most of the router marks. Use spokeshaves, scrapers, or files on tighter curves near the foot.



Use cardboard cross-section templates (see drawings) to gauge your progress when shaping the curves on the front of the leg.

Turn to your chisels to complete the shaping of the legs. After undercutting the toe, carve from the foot toward the ankle to shape what your block plane couldn't reach. Then (inset) move up to the knee and use a straight chisel to pare opposing facets, starting 3/16" from its centerline.

Blind Spline-miter Joinery

Joint, plane, rip, and crosscut the aprons to size and mark them for orientation, placing the nicest grain facing outward. Then saw a miter on each end.

The apron-to-leg joints on this table are a bit unusual. What I did here was basically sandwich a leg in between a splined-miter, or loose tenon, joint. A typical splined-miter joint is often used to connect the corners of a case or deep frame, with a spline or loose tenon spanning two mating slots or mortises — to provide increased joint strength. The trickiest part of making a blind spline-miter joint (where the edges of the spline don't reach the edge) is cutting the mortises. Here's how I approach it.

First, I lay out a 1/4" x 2½" mortise on the face of one miter, locating it 1/16" in from the inside edge. Then I clamp all four workpieces back-to-back to form a peak, as shown in the photo below, right. This creates a square edge for registering a router edge guide and at the same time provides more surface for the router base to ride on. Align the workpiece ends and locate a clamp as close as possible to the end without obstructing router travel. Mount the whole assembly in a bench vise or clamp it against the edge of a thick benchtop with a couple of pipe or bar clamps. Before cutting, extend the mortise end lines across all of the faces.

Set up your router with an edge guide and adjust the fence so the cut favors the inside edge of the miter. You can make your fence out of a short, straight length of wood clamped to the router base. Now rout the 3/8" deep mortises as shown in the photo. Make sure the rotation of your bit is pulling the fence tight to the stock as you cut to prevent climb-cutting. Rout the mortises in the two center pieces first, then unclamp the assembly and slide the outer pieces to the other end, aligning everything for routing the opposite ends of the inner pieces. Afterward, reverse the sandwich and rout the remaining mortises in the same manner.

Forming the Bevels and Grooves

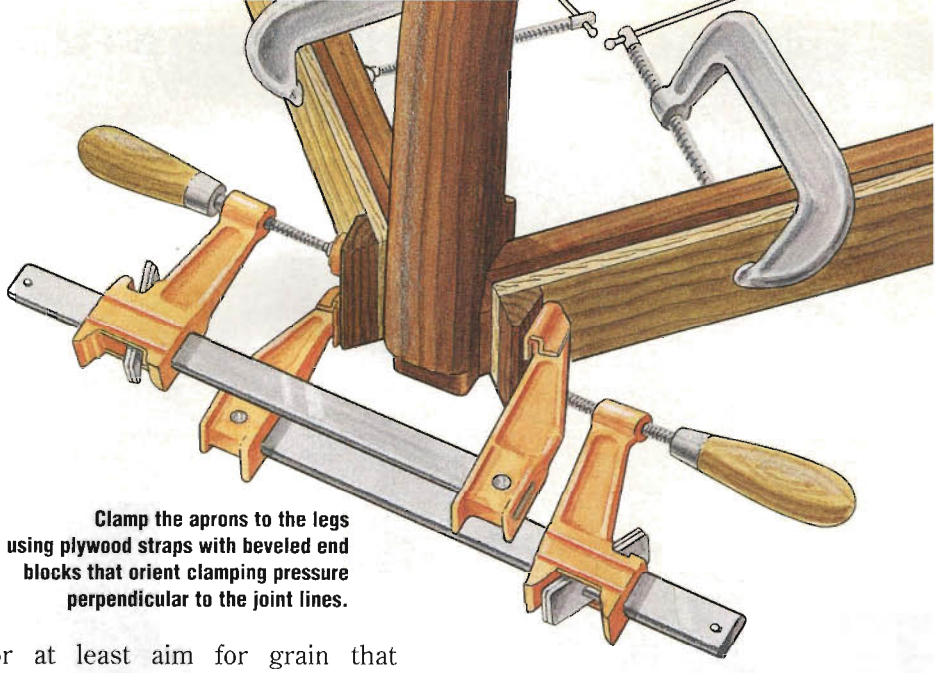
Set your table saw blade to a 15° angle and saw the bevels on the aprons as indicated in the *Elevation Drawings*. Clean up the saw marks with a hand plane afterward. Saw or rout a groove near the top inside edge of each apron to accept the tabletop fasteners, as shown in the *Drawings*. Stop the grooves short of the apron ends so you do not compromise joint strength. Alternatively, you could cut a series of short grooves at the fastener locations using a biscuit jointer.

In preparation for assembly, sand the aprons and legs through 220 grit, and make the loose tenons for the joints. To make the tenons (pieces 5), first mill a strip of 1/4" x 2⅜" stock about a foot long. Plane the stock for a snug fit into your mortises. Rout, plane, or sand a bullnose profile on the edges of the strip, then crosscut eight 15/16" long sections to create the individual tenons.

Dry assemble the base to make sure everything fits well and to rehearse your clamping procedures. The best way to clamp these joints is to make up some plywood clamping straps that include beveled blocks on the ends for applying clamping pressure directly across the joint, as shown in the *Illustration* at right.

To make the clamping straps, glue the blocks in square form to the ends, then saw the bevels after the glue dries.

When gluing up, I apply glue to the faces of the miters as well as to the mortises and tenons. Make sure to carefully align the aprons with the tops of the legs. Wipe away any excess glue immediately with a damp rag. Alternatively, you can wait until the glue turns rubbery, then cut it away with a sharp chisel.



Clamp the aprons to the legs using plywood straps with beveled end blocks that orient clamping pressure perpendicular to the joint lines.

Making the Tabletop

To make the top from several boards, I joint one face of each board, then plane it to 13/16" thick. I try to plane equal amounts off both faces to equalize any inherent stresses in the lumber. Then comes the fun part — laying out the individual boards for position. I consider any tabletop a canvas of sorts, and I try to compose the grain for nice flow and a good color match along the joint lines.

As with any edge-joined panel, it's usually more attractive to arrange the boards so that their widths are approximately symmetrical. It also helps to match straight grain to straight grain at the edges of boards, or at least aim for grain that continues the same slope on an adjacent board. In any case, try to avoid crashing wild grain into straight grain along a joint line. When you are happy with the arrangement, draw a large triangle that spans all of the board for reference when you do your glue-up.

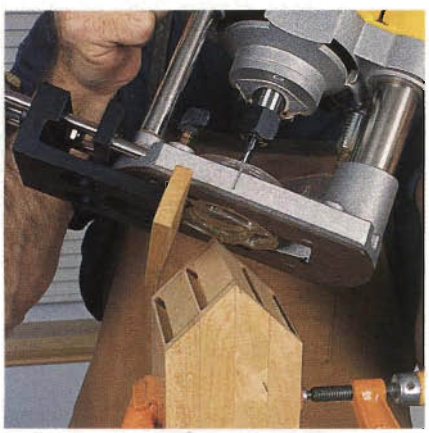
Glue up the top, carefully aligning the edges to be as flush as possible. If you've dressed your stock flat, you won't need biscuits or splines to help alignment. I use a rubber mallet to smack any proud boards into line. After glue-up, wait several days before planing or sanding the top. Glue introduces moisture into the wood, swelling it at the joints. If you flatten the top before the moisture has had a chance to thoroughly evaporate, you invite depressions at the joint lines later.

After the glue cures, rip and crosscut the top to final size. Flatten it using a belt sander or hand plane, then sand the top through 220 grit. I routed a chamfer on the edge, but you could leave the edges square if you like, slightly easing them with sandpaper.

Fasten the top to the base using tabletop fasteners (pieces 6). I made my own from wood, but commercial metal clips work fine. When screwing the clips to the top, set the shoulders of the clips back a bit from the side aprons to allow expansion of the top during the humid season.

After an industrious and careful final sanding, I applied the finish. Now, with such a lovely table on hand, the only problem is to decide which room it will best suit!

Paul Anthony is a woodworking writer and teacher and the author of Home Storage Projects *from Taunton Press.*



When it's time to rout the mortises in the mitered aprons, clamp them back-to-back. The resulting peak creates a shoulder for the edge guide and provides bearing for the router base.

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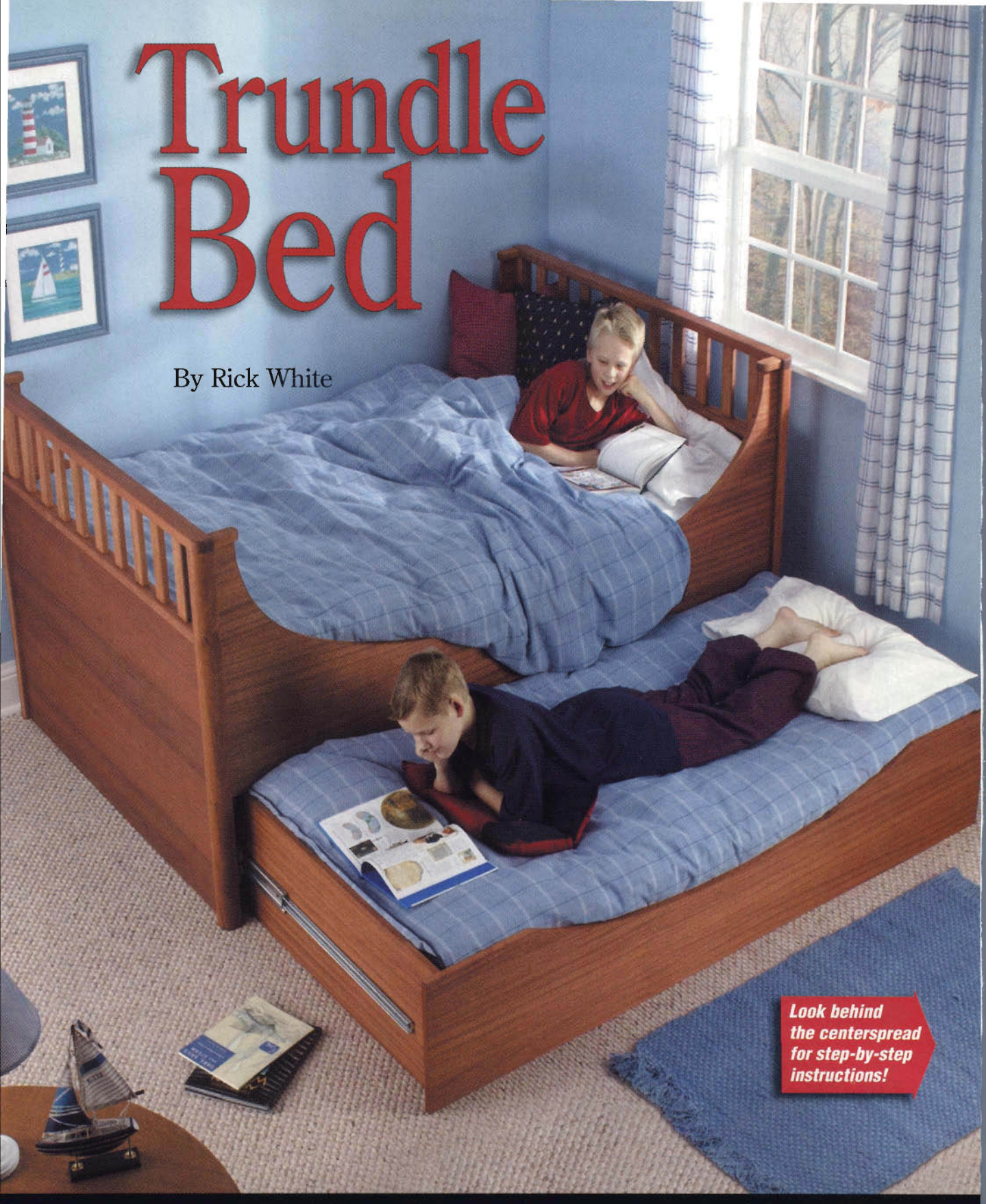
Trundle Bed

By Rick White



Look behind the centerspread for step-by-step instructions!

You're always ready for company with our modern twist on the time-honored trundle. Simple bed hardware and ultra-large slides combine to make a sturdy and beautiful bed.

Trundle Bed

By Rick White

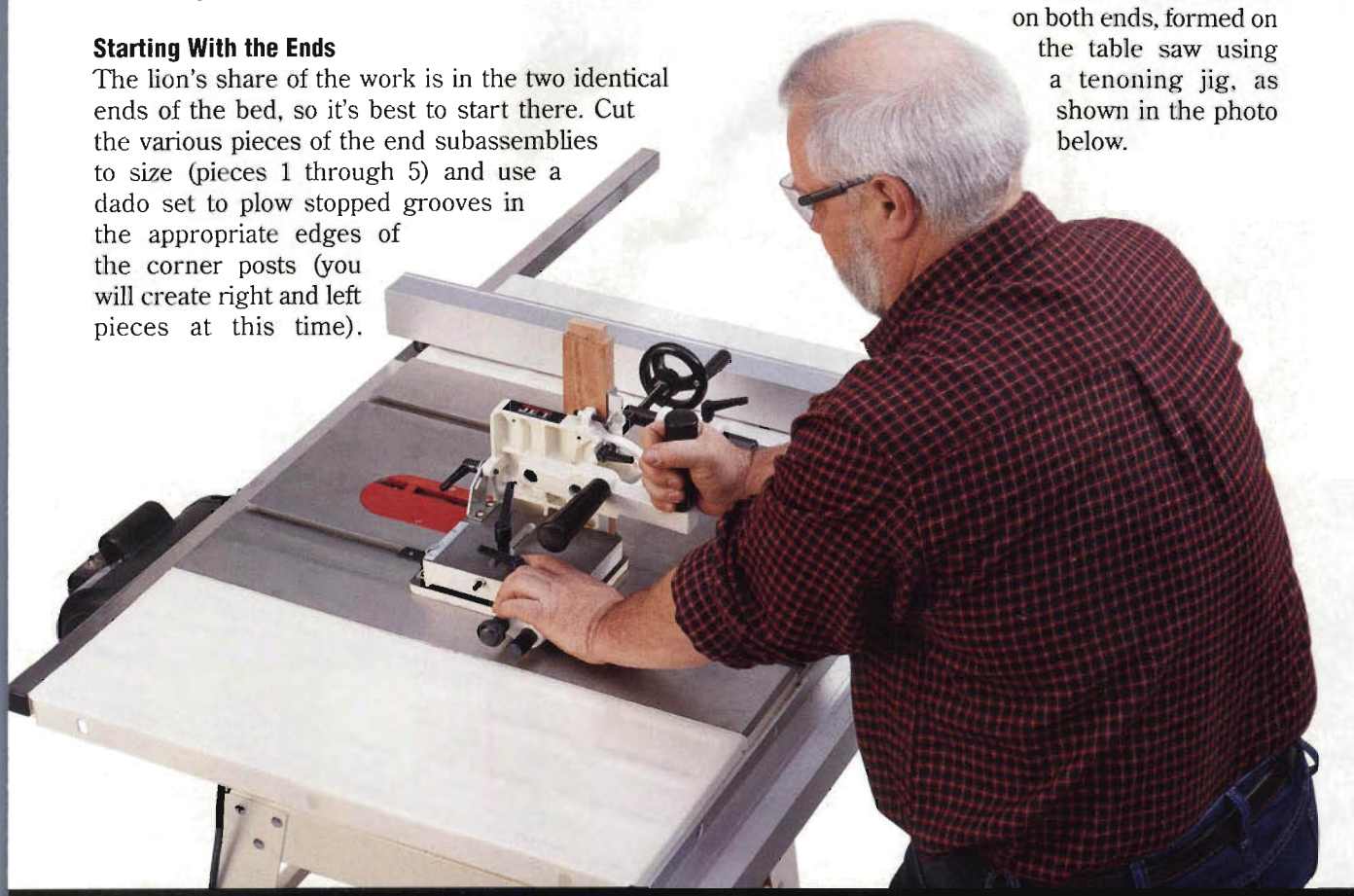
Trundle beds are great space-savers and the ultimate in practicality, but pushing and pulling that large, unwieldy trundle can be challenging. The trundle, even when it has wheels on it, can twist or skew out of alignment and get stuck. I solved that problem with a pair of extra-large slides. The casters on the bottom of the trundle support the weight and the slides keep it straight. I was tempted to use the slides alone, but the manufacturer made it clear that they are "not designed to carry human weight." This bed's nautical design inspiration came from a 40-foot sailboat a friend of mine owns. It's easy to make and looks great. I made mine out of mahogany and sized it to last well beyond the grade school years — the upper bunk has a full, extra-long mattress; the trundle, a twin mattress.

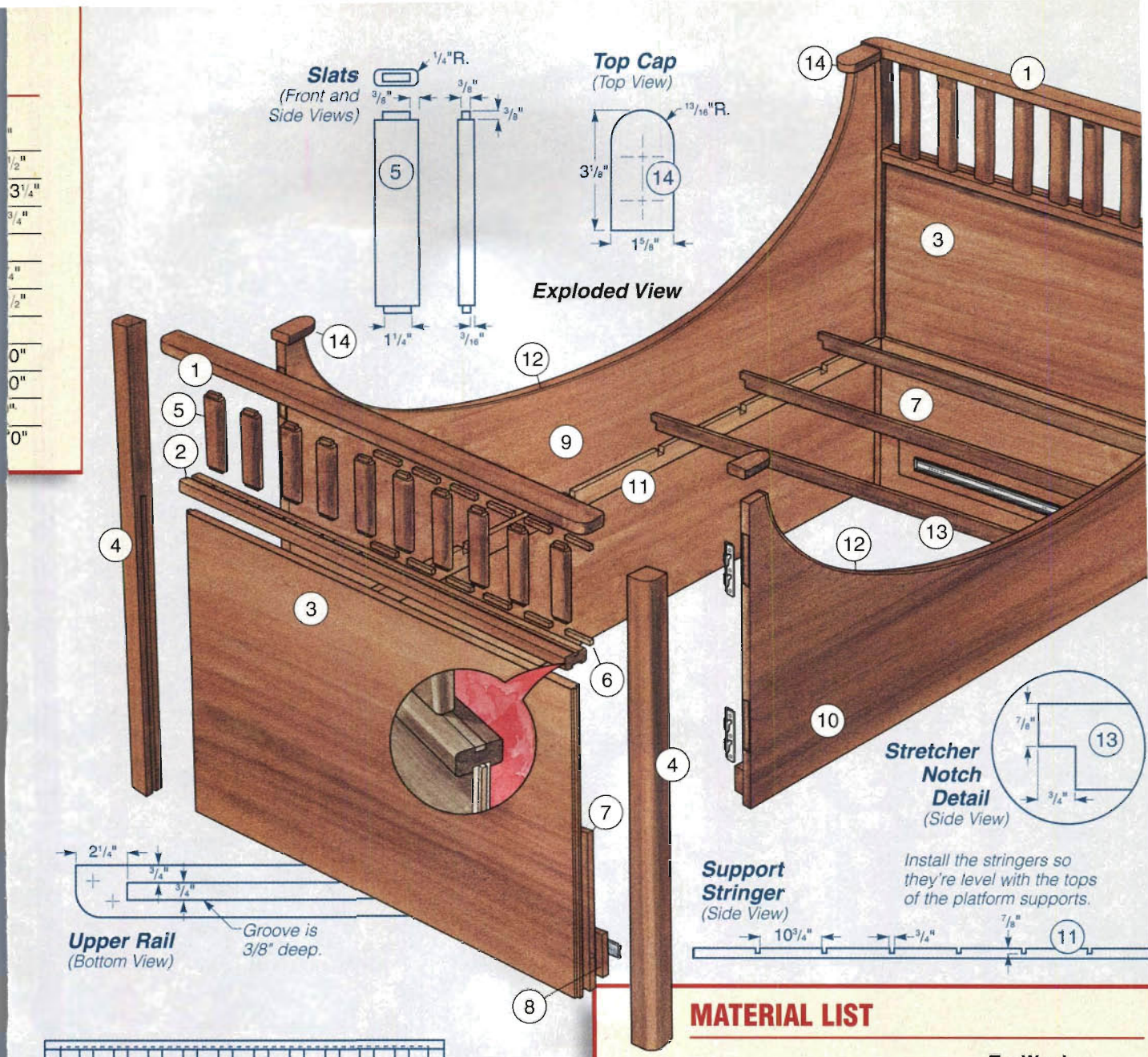
MATERIAL LIST

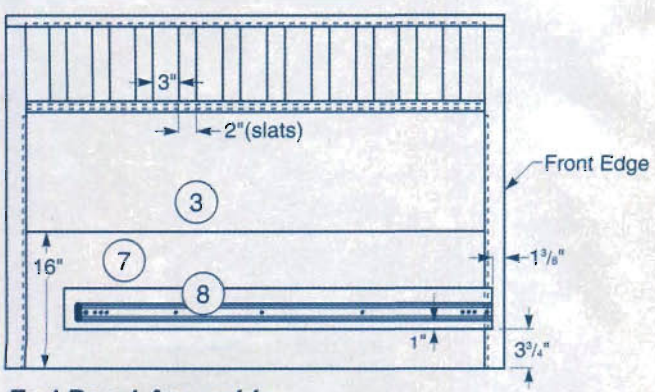
		T x W x
1	Upper Rails (2)	1¼" x 2¼" x
2	Lower Rails (2)	1¼" x 2¾" x
3	End Panels (2)	3/4" x 29¾"
4	Corner Posts (4)	2¼" x 2¼" x
5	Slats (20)	3/4" x 2" x 9
6	Slat Spacers (44)	3/8" x 3/8" x
7	Platform Supports (2)	3/4" x 16" x
8	Slide Supports (2)	1" x 4¾" x 4
9	Side Panel, Back (1)	3/4" x 39¾"
10	Side Panel, Front (1)	3/4" x 25¾"
11	Support Stringers (2)	3/4" x 1¾" x
12	Edging (2)	1/8" x 7/8" x

Starting With the Ends

The lion's share of the work is in the two identical ends of the bed, so it's best to start there. Cut the various pieces of the end subassemblies to size (pieces 1 through 5) and use a dado set to plow stopped grooves in the appropriate edges of the corner posts (you will create right and left pieces at this time). Square up the groove ends with a chisel. Use the same dado head to form the matching tongues on the end panels. Look to the *Elevation Drawings* for all of your construction details. The upper and lower rails also have have grooves (the uppers' are stopped, the lowers' are through) plowed into them. The slats have tenons on both ends, formed on the table saw using a tenoning jig, as shown in the photo below.



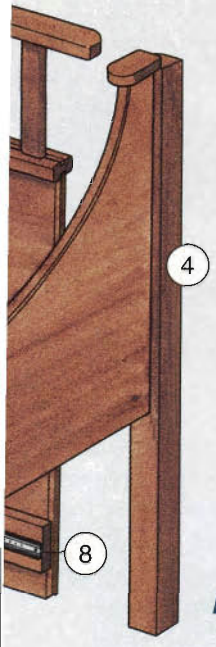




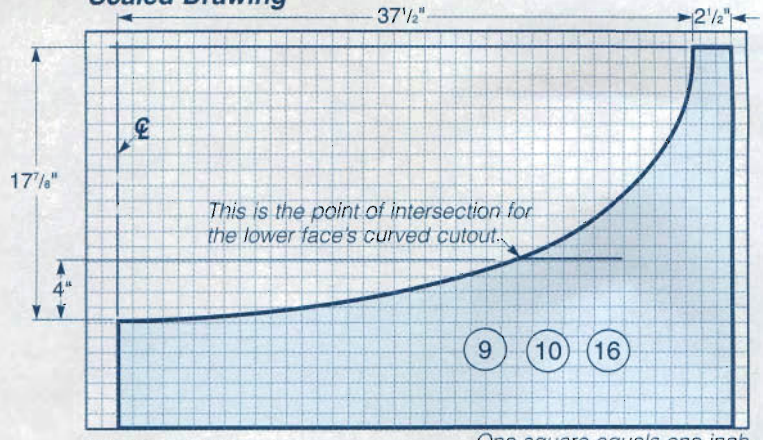
End Panel Assembly
(Inside View)

MATERIAL LIST

		T x W x L
13	Stretchers (6)	3/4" x 1 3/4" x 54"
14	Top Caps (4)	1" x 1 5/8" x 3 1/8"
15	Upper Bed Platform (1)	3/4" x 54" x 81 1/2"
16	Lower Face (1)	3/4" x 13 3/8" x 79 9/16"
17	Plyedge® (1)	1/16" x 7/8" x 28"
18	Lower Box Sides (2)	3/4" x 13 3/8" x 46"
19	Lower Box Back (1)	3/4" x 13 7/8" x 75"
20	Lower Bed Platform (1)	3/4" x 38 1/2" x 75"
21	Corner Glue Blocks (4)	3/4" x 3/4" x 2 1/8"
22	Cross Supports (8)	3/4" x 1 7/8" x 37"
23	Long Supports (2)	3/4" x 1 7/8" x 75"



Scaled Drawing

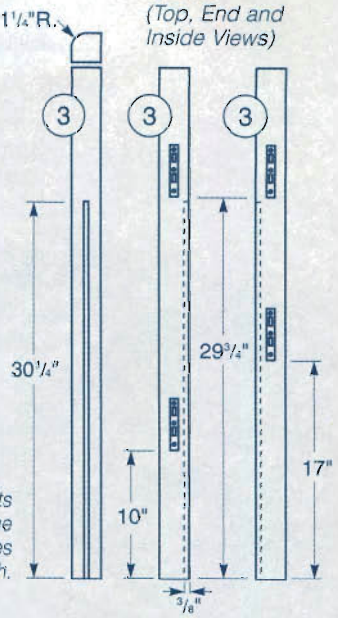


One square equals one inch.

NOTE: Use the scaled drawing above to lay out the curved cutouts on the side panels and lower face.

Posts

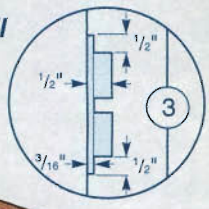
(Top, End and Inside Views)



Mount the bed rail fasteners to the posts first, then transfer their locations to the ends of the side panels. The top edges of the side panels and posts are flush.

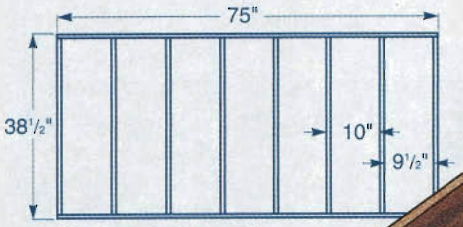
Bed Rail Mortise Detail

(Cutaway View)



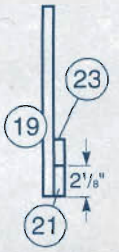
Lower Box Rectangular Frame Subassembly

(Top View)



Build the rectangular frame assembly first, then build up the lower box around it.

Attach the lower face from the inside of the rectangular frame with screws.



Lower Box Back and Long Support

(End View)

NOTE: The six 4" fixed casters (item #189315) for this project are available at www.northerntool.com.

Hard-to-find Hardware

The following supplies are available from ***Woodworker's Journal.***

Heavy-duty Slide Set #30755.....$199.99

Bed Rail Fastener Sets* #28589.....$10.59

**Two required.*

To order your supplies, call 800-610-0883 and mention code W3043.

Now turn to your handheld router and round over the appropriate edges of the rails and slats. As long as you have your router out, go ahead and form the mortises for the bed rail hardware. On the posts, this is a two-level mortise, as shown in the *Detail* at left. One task remains before you can assemble the bed ends: ripping sufficient stock for the slat spacers (pieces 6). Test fit the spacer stock in the grooves in the rails before you cut them all to length. The groove houses the slat tenons, and the spacers hold the slats in place and fill in the groove.

Assembling the Ends

As you should always do, test fit all the end pieces together to be certain you are ready for glue-up. When they all fit, start with the rail and slat subassemblies. To ensure symmetrical placement of the slats, glue a spacer dead center in each rail groove and glue the slats and spacers in place, moving out from the center. Once the glue cures, you can trim off any excess length on the outer spacers. Now attach the rail and slat subassemblies to the plywood end panels with glue and clamps. The last step is to glue the posts to the subassemblies you've just created. I drove screws through the top rail into the post for extra strength, plugged the holes and sanded them flush.

Make the platform and slide supports (pieces 7 and 8) and attach them to the inside of the bed ends with glue and screws, as shown in the *Exploded View* (at left). A final sanding is all that is needed to complete the two bed ends.

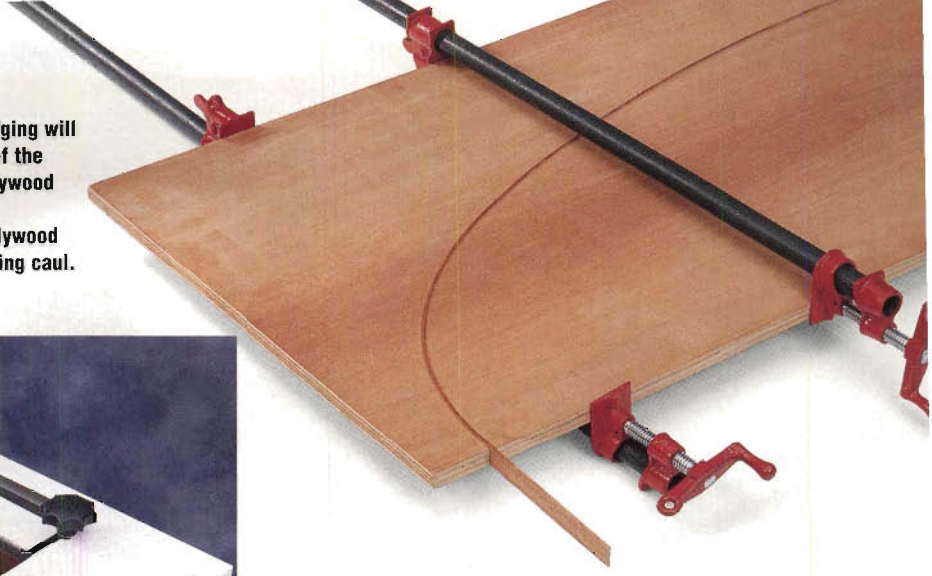
Side Panels

The front and back side panels (pieces 9 and 10) are made of plywood. Cut them to size now and, while you're at it, cut up your support stringers (pieces 11) and edging (pieces 12) used to cover up the horizontal plywood edges.

Once you've got these pieces cut to size, lay out the long, curved cutouts on the two sides (see the *Scaled Drawing* for dimensions). Use a jigsaw to cut the curve exactly on the line. Next, use the drop material as a clamping caul as you glue the edging in place (see photo on next page). While the glue is curing, use the *Elevation Drawings* to help you lay out the notches on the bed support stringers and stretchers (pieces 13). I formed the notches using my band saw. While you are at the band saw, cut the curved ends of the top caps (pieces 14) and then

continues on page 50 ...

Countersinking a number of holes along the notched stringers makes it easy to attach them to the sides.



Solid hardwood edging will protect the edge of the bed's hardwood plywood for years. Use the "drop" from the plywood cutout as a clamping caul.

Use a stationary belt sander to complete the shape of the top caps.

step to the belt sander to clean up the cut. As soon as you take the clamps off the front and back, sand the edging flush and trim the end flush, too. Attach the bed support stringers and top caps to the sides, using screws and glue. (Plug the screw holes on the top caps.) Finally, rout the shallow mortises (this is just a single-level operation) to accept the bed rail hardware, and square up the ends with a chisel. Wrap up the top by cutting the upper bed platform (piece 15; not shown in *Exploded View*) from a couple of pieces of plywood. Sand the front and back, mount the hardware, and you're ready to move to the trundle.

Lower Box

The lower bed is really just a gargantuan drawer — big enough to hold a mattress. Cut up the components first (pieces 16 through 23). Now cut the curve in the lower face and trim it, just as you did with the sides. You'll also need a little 1/16" Plyedge® on the 13⅜" ends. While the glue is setting, join the cross supports and long supports together with screws to make a rectangular frame (see *Elevation Drawings*). Next, attach the lower box sides to the rectangular frame with glue and screws. Fit the lower box back between the sides and secure it to the frame and sides with glue and screws.

Now you'll need to take a moment to set up the bed frame so you can properly locate and attach the lower face. First, block up the lower box subassembly to account for the space your casters will occupy (this distance depends on your caster size). There should be 3/4" on either side of the box (between pieces 8 and 18) to allow for the slides. With everything in position, center the lower face in the opening (keep it a tad off the floor) and secure it to the lower box subassembly by driving screws through the long support. Pull the trundle assembly out, place the glue blocks in the corners (see *Drawings*) and square up the whole thing by installing the platform with glue and screws. After the glue is dry, flip the lower bed box over and mount the casters. Sand the lower unit and get ready to finish.

Last Details

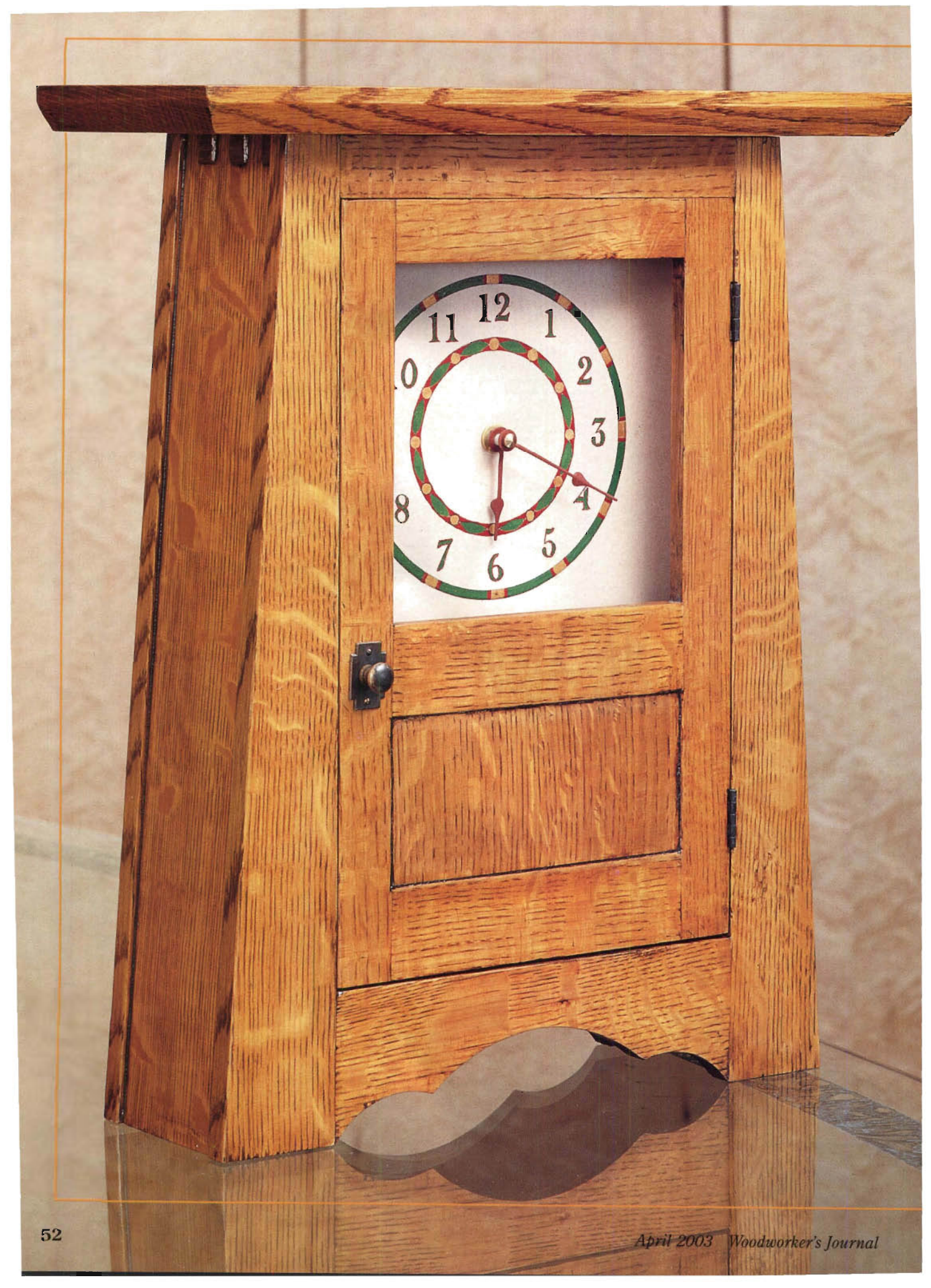
Before you put this project (and its user) to bed, you need to mount the large Accuride® slides. Attach the slides to the bed ends, but do not attach them to the trundle box until you have the bed in position. Unlike many slides, these extra-large models do not come apart in any way. When I mounted my trundle in place, I put 1/8" spacers under the caster wheels; this allows the box to slide on the drawer slides, but the wheels will support the trundle when a person is lying on the mattress.

I put on an application of Watco oil as a prime coat, and then followed up with two coats of polyurethane to provide durability. Then it was up to the spare room for guests to use — although I confess that I was the first person to give it a test. Very comfortable!

Rick White is an expert woodworker and long-time contributing editor and project builder for Woodworker's Journal.

HARDWOOD SHOWCASE

Shopping for hardwoods has never been so easy!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CRAFTSMAN CLOCK

By J. Petrovich

The design of this clock is loosely based on designs from the Arts & Crafts period. Not a specific reproduction of any particular clock, my design emerged from some rough sketches and a little recomposing at the bench.

To date, I have made two versions of this mantel clock: one from leftover teak flooring, the other from four old bed slats which were cut from quartersawn white oak. While teak was not a wood typically used during the Arts & Crafts movement, that clock seems quite at home in a Scandinavian style dining room.

Movement and Face Frames

Clock construction of any kind necessarily begins with the clock movement, and there are literally hundreds from which to choose. I personally like quartz movements. They require little maintenance beyond a yearly battery change. They are also quite accurate, adaptable and inexpensive.

The face frames of this clock are also central to its design and construction. They establish the angle of the case sides, serve as the hinge frame for the doors and display the best qualities of the wood selected. For these reasons the joinery needs to be clean and predictable. If the rails and stiles are not flush and true, the small scale of the clock leaves little room for correction.

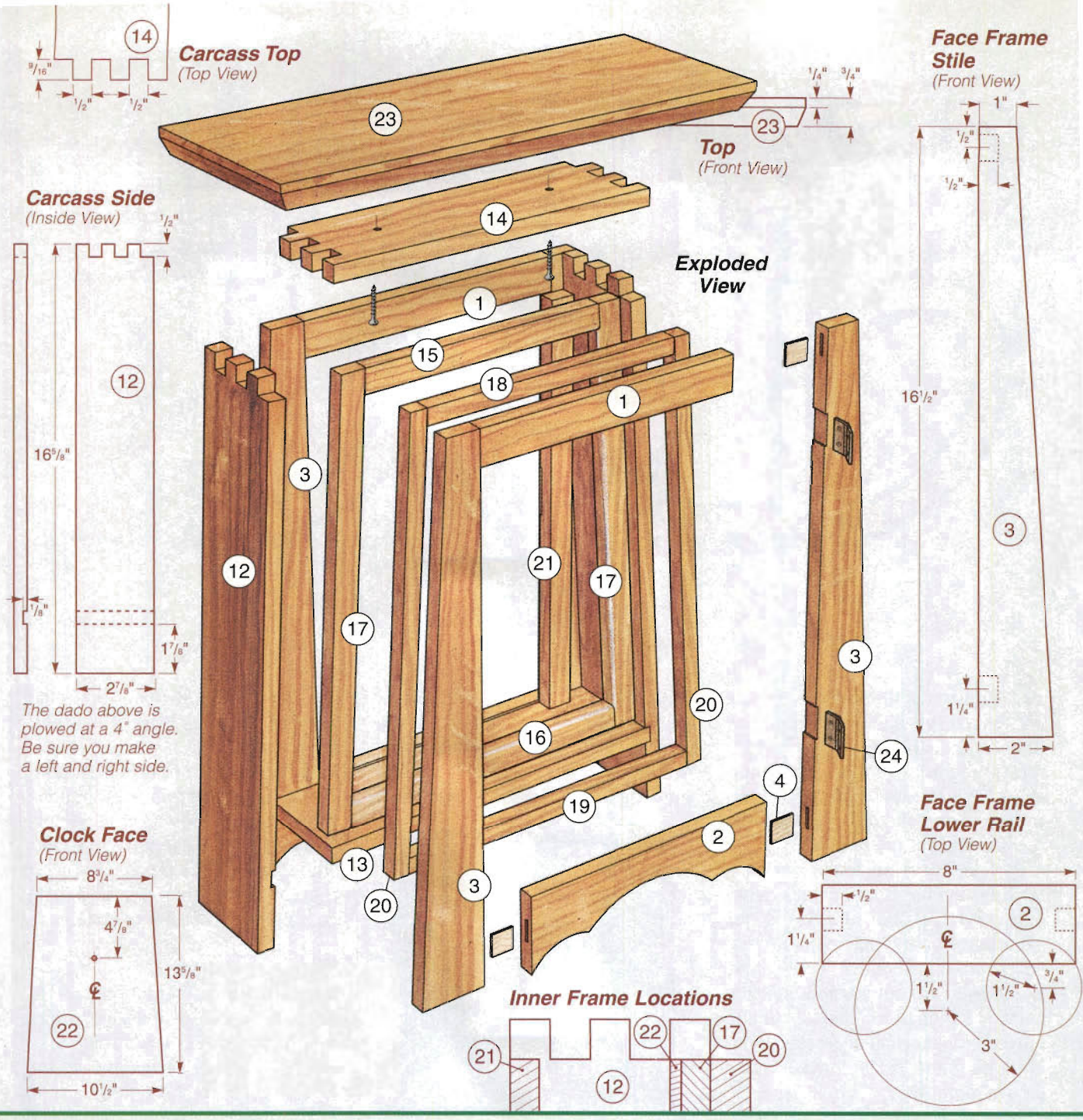
To join the face frames and doors, I elected to use thin loose tenons. The carcass sides have decorative box joints at the the top of the case, while shallow hidden dadoes accept the carcass bottom. Basic joinery combines for a beautiful clock case.

From the very first issue of Woodworker's Journal (27 years ago!) clocks have been favorite projects. This easy-to-build offering continues the tradition.

Stock Preparation

Begin work by taking all of the stock required for the clock down to a consistent 1/2" thickness. Surfaced material bought at the lumberyard may vary by up to 1/16". If you do not have access to a thickness planer, you should keep this in mind.

With the dimensioned stock in hand, it is time to decide where to best use the most attractive pieces. With that in mind, cut the face frame rails and stiles (pieces 1 through 3) for the front and back frames. They should all be cut to exact length at this time, but don't cut the tapers for the stiles just yet. That task is more easily dealt with after joining. Be sure to mark where all the pieces will mate. I use

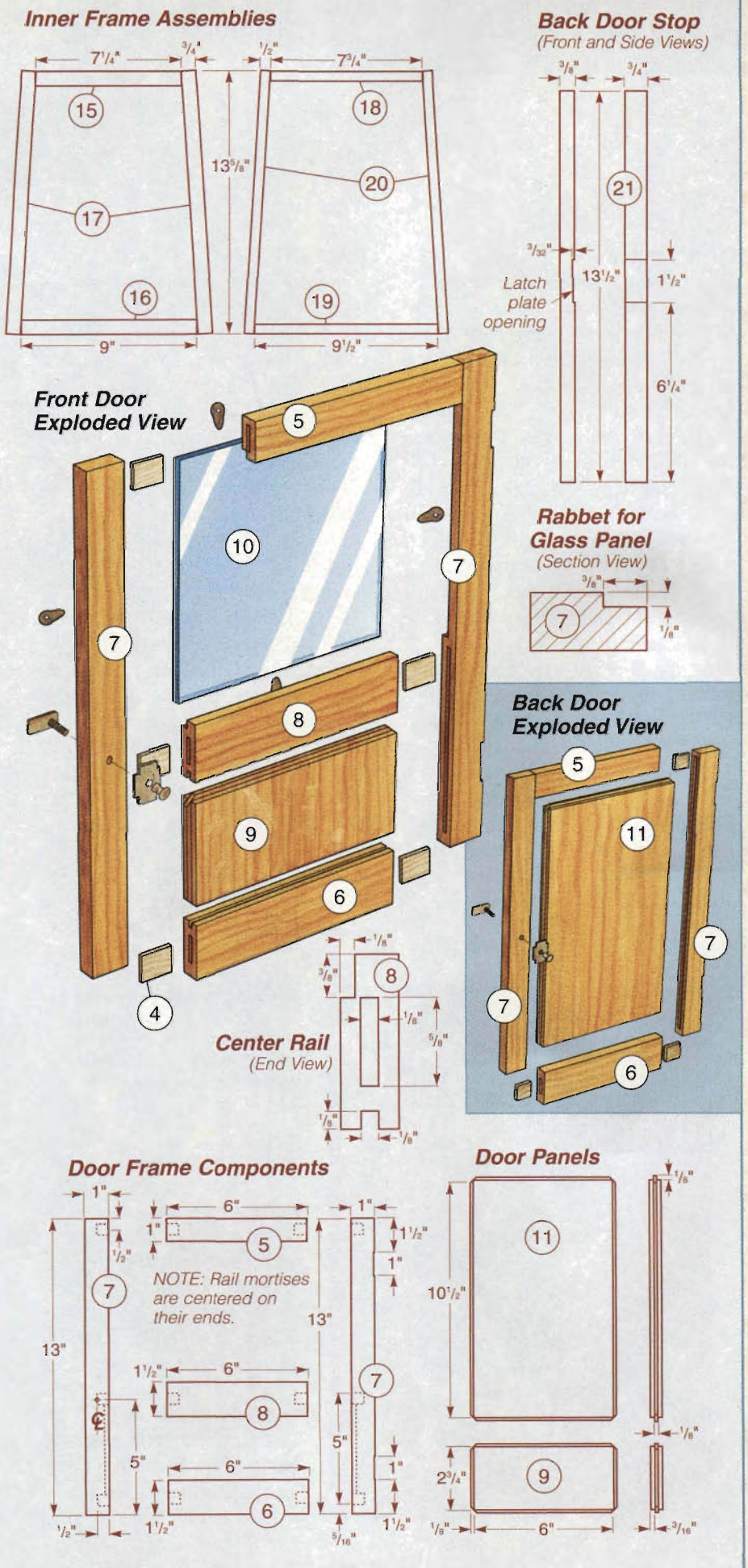


MATERIAL LIST

		T x W x L
1	Face Frame Upper Rails (2)	1/2" x 1" x 8"
2	Face Frame Lower Rails (2)	1/2" x 2 1/2" x 8"
3	Face Frame Stiles (4)	1/2" x 2" x 16 1/2"
4	Loose Tenons (18)	1/8" x 5/8" x 1"
5	Door Upper Rails (2)	1/2" x 1" x 6"
6	Door Lower Rails (2)	1/2" x 1 1/2" x 6"
7	Door Stiles (4)	1/2" x 1 1/16" x 13"
8	Front Door Middle Rail (1)	1/2" x 1 1/2" x 6"
9	Front Door Lower Panel (1)	1/2" x 6 1/4" x 3"
10	Front Door Glass Panel* (1)	1/8" x 6 5/8" x 6 5/8"
11	Rear Door Panel (1)	1/2" x 6 1/4" x 10 3/4"
12	Carcass Sides (2)	1/2" x 2 7/8" x 16 3/8"
13	Carcass Bottom (1)	1/2" x 2 7/8" x 10 3/4"
14	Carcass Top (1)	1/2" x 2 7/8" x 9 7/8"
15	Clock Face Frame; Top Rail** (1)	3/8" x 3/4" x 7 5/8"
16	Clock Face Frame; Bottom Rail** (1)	3/8" x 3/4" x 9"
17	Clock Face Frame; Stiles** (2)	3/8" x 3/4" x 13 7/8"
18	Inner Trim Frame; Top Rail** (1)	1/2" x 1/2" x 7 7/8"
19	Inner Trim Frame; Bottom Rail** (1)	1/2" x 1/2" x 9 5/8"
20	Inner Trim Frame; Stiles** (2)	3/8" x 1/2" x 13 7/8"
21	Back Door Stop (1)	3/8" x 3/4" x 13 1/2"
22	Clock Face (1)	1/4" x 10 1/2" x 13 5/8"
23	Top (1)	3/4" x 5 1/2" x 14 3/8"
24	Door Hinges (2)	1" x 1" Brass

*Purchase after door frame is made.

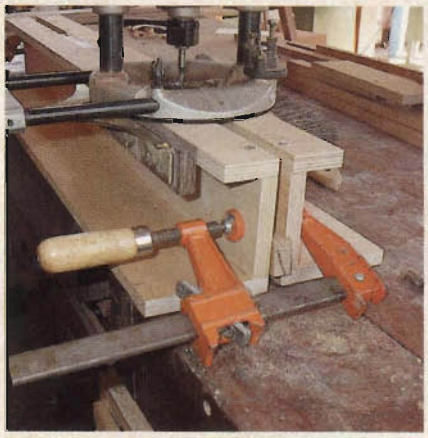
**Trim to fit inside of carcass.



matching numbers at the joints and an arrow that points to the inside plane of the face frame. Next lay out the start and stop marks for the mortises.

Skinny Mortises

Because the stock is 1/2" thick, I elected to use 1/8" thick loose tenons (pieces 4). That allowed for 3/16" on either side of the tenon.



Two "L" shaped fixtures are used to hold the door and face frame components as the author routs his "skinny" mortises.

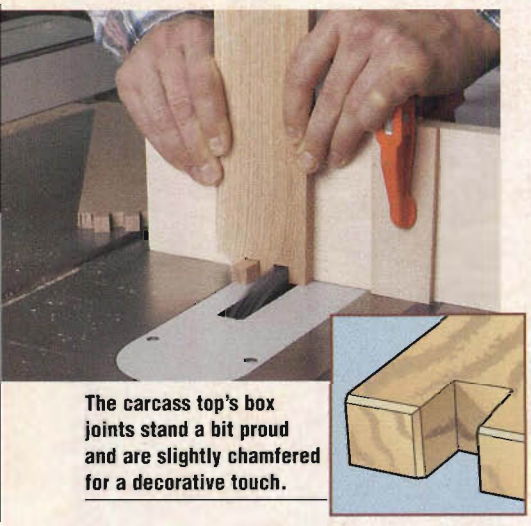
To hold and register the stock during routing, I made a relatively simple jig (see photo above). These "L" shaped fixtures allow room beneath the guide/support member for clamping. The whole assembly then fits easily into a bench vise for stability. Be certain to mark one side of the fixture for registration. This is important as it provides a fixed distance from the same edge.

To cut the mortises and grooves, I used a 1/8" up-spiral plunge bit and a gentle feed rate. While the bit is not removing much material, the bit itself is somewhat slender and fragile. Plunge the "stop" cut first, then the "start" cut, then clean out the balance of the material, plunging no deeper than 1/8" per pass.

Forming the Loose Tenons

Dimensioning the loose tenons is relatively simple at the table saw. Use stock large enough that the tenons

To help form the box joints, attach a simple fence with a registration key to your miter gauge. Always test your cuts on scrap.



The carcass top's box joints stand a bit proud and are slightly chamfered for a decorative touch.

can be ripped safely and cleanly from the outside of the blade. The loose tenons should fit into the mortises with finger pressure.

Once the loose tenons are cut to size and the face frames dry fitted, lay out and cut the front and back door stock (pieces 5 through 11). There are rabbets for the glass panel and grooves for the back door panel to be cut and plowed. Refer to the *Elevation Drawings* on the previous pages for construction details. I used a 1/8" slotting bit with a bearing at the router table to cut the channel for the door frame panels. Because the panels are flush with the frames, I made the cuts as close to the centers of the 1/2" stock as I could. After slotting the pieces with all registration marks facing down on the table, I flipped the pieces and ran them through the slotting bit again to center them. Make the door assemblies 1/32" oversize — it's easier to plane them slightly for a snug fit than it is to get lucky with a glueup that produces a clean and even reveal all around the door.

Clock Carcass

Like the face frames and the doors, the carcass of the clock (pieces 12 through 14) is made from 1/2" stock. Box joints are used at the top of the case — not so much for strength as for visual detail. Cutting the fingers a bit long on the carcass top allows them to protrude just a hair and to be slightly chamfered.

The bottom of the clock (piece 13) is joined to the sides with an angled dado joint. Remember when cutting the dado in each side that the angles measure the same, but are opposite in orientation.

Before moving on to assembly, mill the two interior frames (pieces 15 through 20) and test fit them inside the carcass. (Make sure their combined width accommodates the shaft of your clock movement.) The bottom rail of the trim frame (piece 19) also serves as a door stop, but the back door stop (piece 21) stands alone and is glued to the inside of the rear face frame's stile.

Assembly

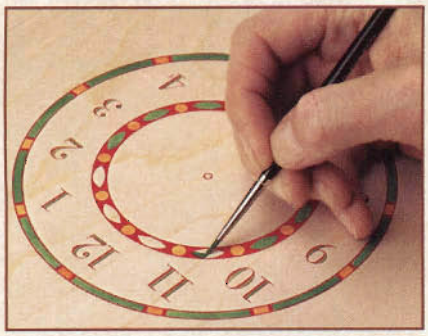
With the frames, doors and carcass all cut and jointed, mark the tapers for the sides of the face frames. Cutting them now, after mortising them, lessens the chances for a misstep. I used the band saw to make the cuts then mounted pairs of them together in the vise for cleanup. I generally stay a blade width off the line and plane down to the mark. Once all four stiles are smooth and identical in angle, glue up the face frames.

After the face frames have cured, there is scrollwork to be done on the bottom rail. Deferring this work until after the face frame is glued provides a little extra support to the bottom edge of the rail where it meets the stiles. The face frames are now ready for final sanding.

With the face frames, doors and case glued, the next consideration is the face of the clock (piece 22). I used a 1/4" thick panel of Masonite that I painted with gesso

The author made his own hardware for this clock. You can follow his design (photo at left) or use the alternative supplies listed in the colored box, above right.

Door hardware is a matter of taste. For my first (teak) clock I used a small brass knob (treated with steel wool and gun bluing) and a small magnet for a catch. This would be a good solution for you if you chose not to make your own knob and latch. For this version of the clock, I wanted a custom fix to the catch situation. With a bit of threaded rod, a knob, a short length of tubing and



Painting the clock face's numerals and dial details adds a bit of color to spice up the clock. See the Editor's Note in the column below.

after I had cut it to fit the opening of the case. (Gessoed panels are also available at art supply stores.) Onto this panel I laid out a clock face that I had generated on the computer. After darkening the outlines of the numerals and the time rings I carefully over painted with gouache and then drilled the center hole for the clock shaft.

(*Editor's note*: Laying out a clock face can be a challenging and daunting task. To remove that potential obstacle from your building pleasure, *Woodworker's Journal* is providing a clock face [see box above] silk screened onto a piece of 1/4" birch plywood. You may use the clock face as it comes or paint the numerals and dial details as you desire. Make your own clock face or use ours ... the choice is up to you.)

Once the clock face panel is complete it is ready to mount to the clock face frame, which is positioned directly behind the trim frame. Four screws sunk through the panel and into the clock frame provide more than adequate support.

With the face mounted inside the case the clock is ready to receive the face frames, both front and back. During construction of the second clock I found it was much easier to glue one frame to the case at a time. The top (piece 23) is mounted to the case with two screws sunk through the inside of the case's top and into the top piece itself.

To mount the doors I used 1" x 1" hinges (pieces 24). I did not like their bright brass look so I steel-wooled them and then darkened them with some touch-up gun bluing. (Bluing is available at sporting goods and gun stores and is quite simple to use.)

I sanded the entire clock up to 220 grit and applied a golden highlighted stain. Three coats of medium luster polyurethane with a light sanding between the coats sealed the deal. I used small glass retainers to secure the glass panel and mounted the quartz movement to complete the details. Now all I needed was a suitable mantel and a cup of tea to enjoy watching the hours tick away.

J. Petrovich is a furniture designer and maker from Salinas, California. His last Woodworker's Journal *article appeared in the December 2002 issue.*

Hard-to-find Hardware

The following supplies are available from **Woodworker's Journal**.

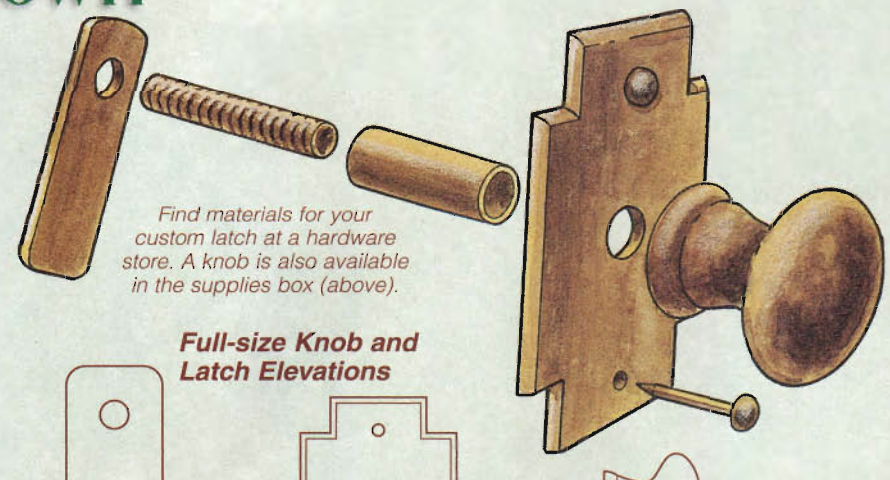
Clock Face #57443	$17.99
R. C. Quartz Movement #20958	$27.99
Knobs* #67553	$2.59
Hinges** #25908	$2.99
Bag of Glass Retainers #28506	$2.29

*Two required. **Two pairs required.

To order these supplies, please call 800-610-0883 and mention code W3043.

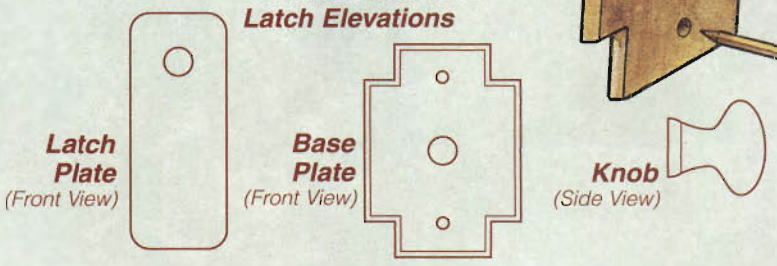
Making your own knob & latch

some scraps of brass, I made a knob operated catch. The tools required are common to most home shops. I soldered the latch plate to the threaded rod which screwed into the knob. I used the brass tubing as a race in which the knob-rod assembly turned. The base plate is a small piece of brass trimmed and drilled for rod access and the mounting brads. Making your own hardware can be fun. But like the clock face, don't let it be an obstacle to building the project. Alternative hardware is available in the colored box above.



Find materials for your custom latch at a hardware store. A knob is also available in the supplies box (above).

Full-size Knob and Latch Elevations



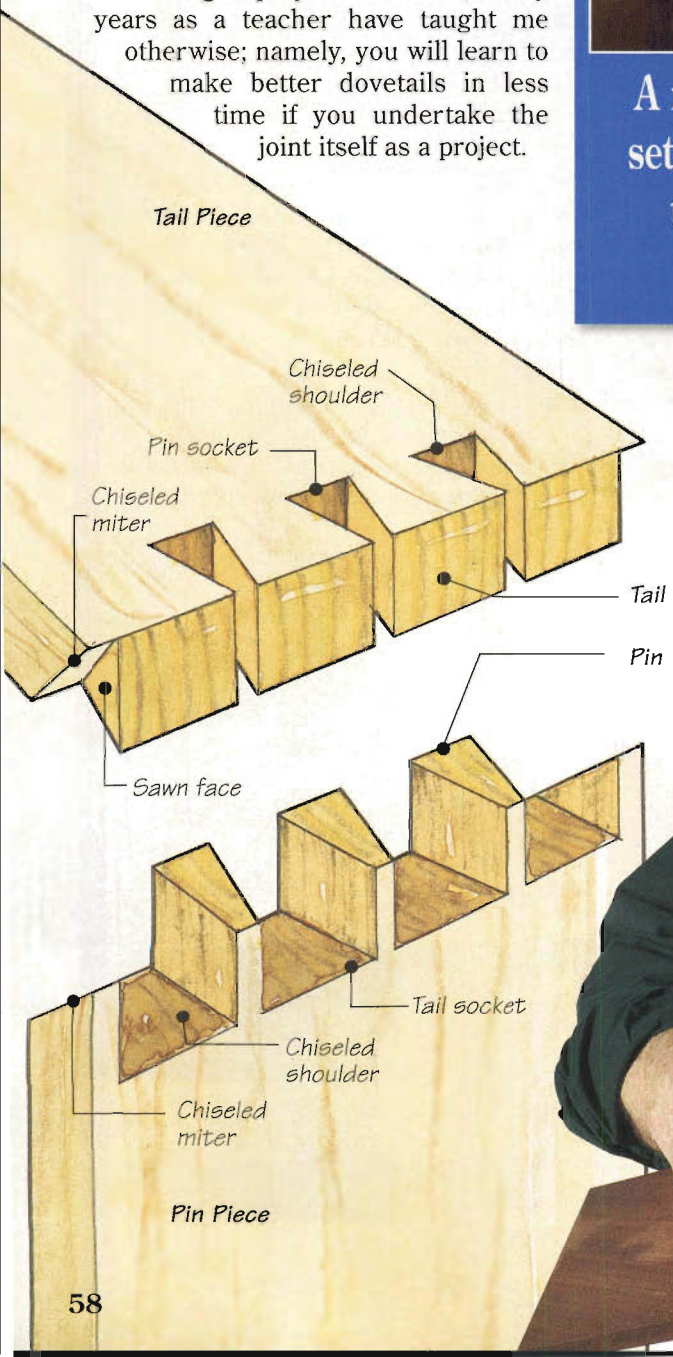
Diligent Practice Makes Perfect Dovetails

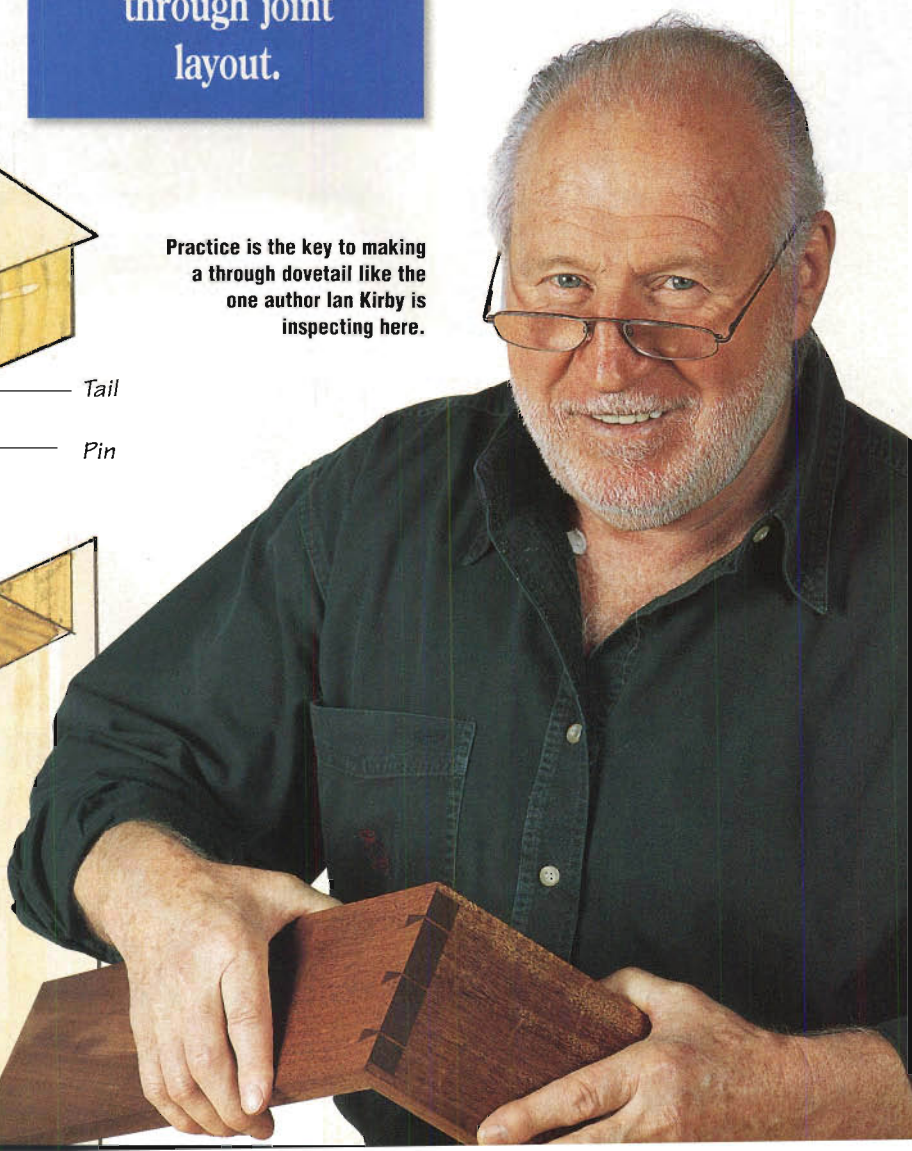
By Ian Kirby

I was initially asked to design a project that incorporated hand-cut through dovetails. The concept appears sound — that you can learn to make a through dovetail joint as part of making a project. However, many years as a teacher have taught me otherwise; namely, you will learn to make better dovetails in less time if you undertake the joint itself as a project.

A mitered corner sets off an elegant through joint layout.

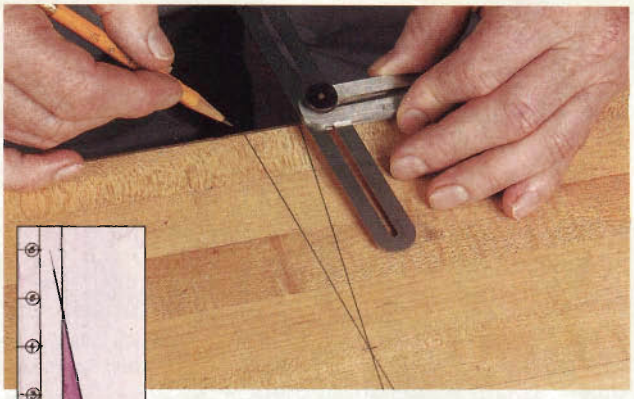
To understand why, consider the mortise-and-tenon joint. All you can see of a completed mortise-and-tenon joint are the shoulder lines. Hidden inside, you could have a real woodworking nightmare, but if the shoulders are tight you assume the rest of the joint is equally good. The through dovetail does not allow for such forgiveness. Each interface is plainly in sight, and any attempt to

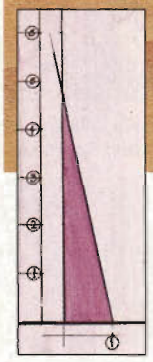




Practice is the key to making a through dovetail like the one author Ian Kirby is inspecting here.

Tools for dovetailing (starting at bottom right): cutting gauge, try square, dovetail saw, Japanese miter gauge, sliding bevel, bevel-edge chisels, Warrington hammer, coping saw, pencil, marking knife.





Years ago, every bench in the shop featured sloped layout lines like the ones shown above. Woodworkers don't measure angles in degrees, they measure them as slopes, expressed as the ratio of width to length. Set your sliding bevel to the slope made by the layout from your measurements.

doctor a gap or an "oops" is equally visible. Successful dovetail making requires learning specific sawing and chiseling skills, which are then applied to making practice joints. When your practice joints look good, you can apply your new skills to any project you care to.

Four types of dovetail joints are used to join boards at the corner to form a box, a drawer, or the case that holds drawers or doors. The joints are through dovetail, single lap dovetail, double lap dovetail, and secret miter dovetail. Learning to make the through dovetail lays the groundwork for making the other three.

Dovetail Methodology

The methodology, described here, is simple and elegant:

- Cut the slope of the tails with a dovetail saw, remove the waste between the tails with a coping saw, and flatten the bottom of the pin socket with a chisel.
- Use the tails as a template to mark out the pins with a knife.
- Cut the sides of the pins with a dovetail saw, remove the waste between the pins with a coping saw, and flatten the bottom of the tail socket with a chisel.

Note that only two tools make the mating faces of the joint: the long grain faces that fit together come straight from the dovetail saw, and the end grain shoulder lines come from the chisel.

The complete dovetail kit is shown above. None of the tools is unusual. I use a Lie-Nielsen dovetail saw whose crisp cut leaves a fine surface and a fine kerf. I like the sliding bevel by Starrett for its positive lock nut and high quality, and the design of my Japanese miter square makes mitering the edges of the joint a breeze.

Diligent Practice Deserves Good Wood

Choosing the right practice wood is important. My first choice is Honduras mahogany. Being neither too hard nor too soft, it saws cleanly down the grain and chisels cleanly across the grain — two factors important for success. Poplar is an acceptable second choice. It saws well but it doesn't always chisel crisply across the grain. Oak, cherry, or maple are too hard as starters. Don't even think about trying to save a few dollars by using inferior or scrap material. Dimension your practice and test pieces to 5/8" thick, 4 3/8" wide and about 14" long.

Designing the Joint

The strength and durability of a through dovetail is demonstrated by its survival on so many pieces of old furniture. So, unlike a mortise-and-tenon joint where designing for strength is a major factor, designing for appearance is the major concern of dovetail joinery.

The appearance of the joint comes from two elements:

- the slope or angle of the tails and pins
- the layout or size relationship between tails and pins

Judgments about appearance are always somewhat subjective. Here are my thoughts on the matter. A slope of about 1:5 states simply and clearly, "I am a dovetail." (See "Setting the Sliding Bevel" below.) Make it 1:9, and the slope looks like a box joint gone wrong. Make it 1:3, or greater, and you have a problem with the short grain at the edges breaking off — and it looks crudely made besides.

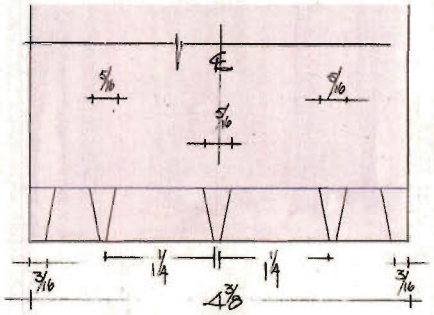
Although layout can vary radically, it's generally accepted that small pins produce a more elegant joint due to the eye-catching contrast in color and size of the end grain and long grain shapes. Additionally, the fineness of the small pins declares that the joint is hand-made because no router bit is small enough in diameter to cut the narrow end of the pin socket.

I recommend two stages of practice. The first stage, making practice cuts on the pin and tail pieces, introduces marking out and sawing. The second stage, making a complete joint, adds removing waste, flattening the tail and pin sockets, and dry assembly.

Setting the Sliding Bevel

Woodworkers never had a tool which measures angles in degrees; rather, they measured angles as slopes, which are expressed as the ratio of width to length.

In my formative years you would find sloped layout lines on every bench in the shop. *(See inset drawing on page 59.)* Use a sharp pencil and mark the lines boldly. If you prefer not to mark your bench, use a piece of card stock or MDF. Begin by drawing a line about 6" long perpendicular to the bottom edge. Next, mark a point one inch from the line to the right. At 4¾", make a mark and join a line to the one inch mark. This is the slope I used for the practice joint. If you check it with a protractor, it's about 78°.



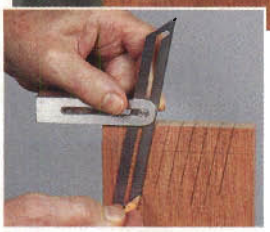
Dovetail layout is the first step in mastering the joint. Here, the author chooses small pins to create an elegant appearance. Transfer this pattern to your stock for best results.

Practice Cuts

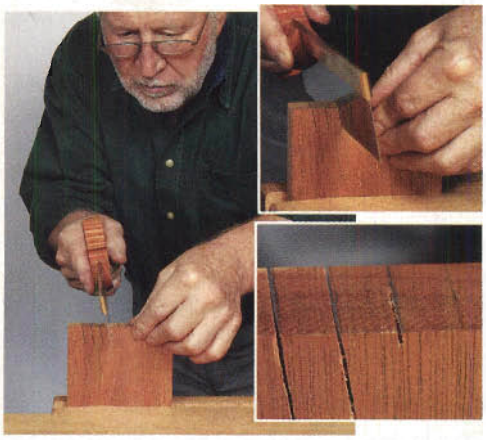
Marking out — Square the end of your wood using a table saw or a chop saw. Set your cutting gauge to about 1/32" less than the thickness of the wood. (See "Setting Your Gauge: Flush, Shy or Proud?" on page 63.) Knife a line around the end of the piece. Set the wood upright in the vise and square a series of sharp pencil lines across the end grain *about* 3/8" apart. Next, mark the tail slope lines from the end grain lines with the sliding bevel. Note that I've extended the guidelines well below the gauge line. When you set the saw at an angle to saw the tail, these elongated lines provide a more helpful line of sight.

Practice cuts: Set your cutting gauge 1/32" less than the thickness of the workpiece.

Knife a line around the workpiece, pressing the fence firmly against the squared off end.



Square a series of pencil lines 3/8" apart across the end grain (above). On one side mark long sloping tail lines (left) from the end grain lines.



Start the cut at the far side, follow the squared line, then angle the saw by sighting down the elongated guide line. Use light pressure and keep the saw teeth horizontal.

Grip and stance — Grip and stance are keys to using a handsaw effectively. Grasp the saw in a pistol grip, using the lower three fingers and thumb. Extend your index finger straight down the side of the handle for fine control. Stand back from the work, left foot forward if you saw right-handed, so that when you bend over you look down on the cut. Stand far enough to the side so that saw, wrist, forearm, upper arm, and shoulder move in the same plane. This alignment ensures that the saw moves back and forth like a piston on a connecting rod and prevents the saw from jamming in the cut.

Cutting the Tail Slopes

Set the workpiece vertical in the vise about 3" above the jaws. Start the cut with a pull stroke from the far edge, blade raised slightly at the heel and guided by the thumb of your other hand. Follow the pencil line across the end grain and cut a guide kerf to the depth of the teeth. Now angle the saw to the slope by sighting down the extended pencil guideline. Use a full stroke of the saw and continue cutting with the teeth held horizontal.

Don't force the saw. If it jams, you are standing too far left or right. Move slightly if you are not on the line. If you are not on the guideline as the cut proceeds, just carry on. You can't change direction part way down and the slight angle deviation doesn't matter so long as the cut is straight and perpendicular to the workpiece.

You need only make one round of practice cuts to realize that this is the foundation for success on the real thing. The more you practice, the better you become. Re-square the stock by cutting off the practice cuts, mark the tail slopes in the other direction, and make another round of cuts. If you want to

practice pin cuts and cutting to a knife line, mark the end grain with a marking knife and sliding bevel. (Note this is for practice purposes only. When making a complete dovetail joint, you mark out the pins using a completed tail piece as your template, not a sliding bevel.) Extend pencil guidelines down the face of the pin piece with a try square. Once you're satisfied with the practice cuts, you can move on to a practice joint.

Making the Practice Joint

Mark out the joint following the measurements on the drawing. The two end cuts are made as a miter, so you mustn't cut them along with the rest of the pins. Tag them with marking tape as a reminder.

Cut the tails — Cut the slope of the tails as you did on the practice piece. To cut the mitered end slopes, you have no option but to begin on the corner nearest you. Align the saw so that it will cut simultaneously straight across the top end grain and down the slope as the cut proceeds. Once again, prior practice on this cut alone will help enormously because it's initially quite awkward.

Remove the waste — Remove the waste between the tails with a coping saw. Unlike other Western saws, it cuts on the pull stroke. Grip the handle with two hands and stand square to the work. This grip and stance best ensures that you will keep the blade perpendicular to the surface of the workpiece. To begin the cut, push the blade into the kerf to within 1/16" of the bottom of the cut. The key to making the cut is to keep sawing in the same place as you gently turn the handle so you can saw parallel to the shoulder line.

Masking tape tabs remind you to treat the end cuts differently because they are to be mitered.

With the saw teeth held horizontal, cut the slopes of the tails down to the knifed shoulder line on both sides. Saw the outer edge end slopes (left), starting from the near corner.

Remove the waste with a coping saw. The key is to keep sawing in the same place while turning the blade from vertical to horizontal.

Establish the shoulder lines by vertical paring with a 1/4" bevel-edge chisel. Flatten the pin sockets (right) by horizontal paring, using the shoulder lines as your guide.

Flatten the pin sockets — Make the socket flat and square with a 1/4" bevel-edge chisel, first by vertical paring, then by horizontal paring. Begin by putting the workpiece on a cutting board to protect the bench. Vertical paring establishes the shoulder lines. If necessary, remove the waste incrementally with thin chisel cuts, but angle the chisel towards you about 10°. This ensures that you leave the shoulder line on the opposite side unscathed. Make the last cut with the chisel set squarely in the knife line, which establishes a clean, accurate shoulder line. Flip the workpiece and establish the other shoulder line in the same way.

Vertical paring establishes the outer edges of the shoulders, but because the chisel is angled back from the vertical, you are left with a "pitched roof" mound in the center. Set the tail piece vertical in the vice and remove the mound by horizontal paring. Fit the end of the chisel in the palm of your cupped hand so it becomes an extension of your forearm. Lock your arm tight to your body, and with feet planted firmly fore-and-aft, push the chisel from your back leg. Remove the mound with thin slices, making the last slice from one shoulder line to the other. It's easier to see and control the chisel work in the larger tail socket, but with a little practice you'll master flattening the pin socket equally well.

Marking and Cutting the Mitered Edge

Clamp the workpiece on edge in the vise. Place the point of your marking knife in the gauge line on the vertical face and hold it perpendicular to the work. Slide the miter square up to the knife. The point of contact is the setting for the square and where you knife the miter line. Saw the

waste, then clean up the miter shoulder line by vertical paring.

Marking the Pins from the Tails

Set the pin piece square in the vise so it protrudes 1/8". Disassemble the try square and use the fence held tight to the face of the protruding pin piece as a register. Bring the end grain of the tail piece to the register and align the edges of the two pieces with the blade of the try square.

The tails are the template. The mark is a clean deep line from a Swiss Army knife held tight to the wall of the tail. Using a try square, mark pencil guidelines down from *each* knife line on the outside face of the piece to guide your saw cut.

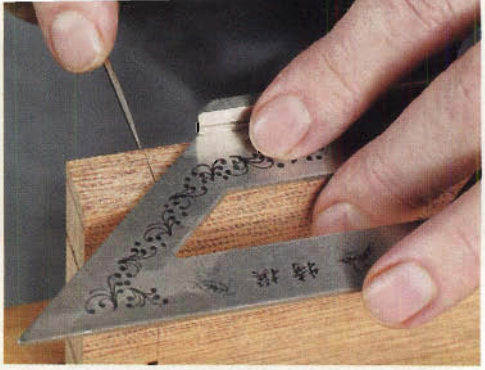
Cutting the Sides of the Pins

Now is the moment of truth. Where you make the initial saw cut relative to the knife line is what determines the accuracy of the resulting joint Your aim is to split the knife line. Interface tightness depends upon the initial few strokes made in a couple of seconds. The remaining task is to saw down to the shoulder line, staying parallel to the pencil guideline. If you cut with the saw teeth horizontal, as you should, the saw cut ends on the knife line on both sides of the workpiece.

Removing Waste Between Pins and Flattening the Tail Socket

Remove the waste between the pins with a coping saw. It's the same procedure as before, but you have more material to remove and more room to work.

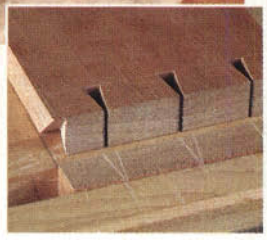
Next, work on a cutting board, starting with the narrow side of the socket uppermost. Use the same width chisel on each side of the workpiece to establish the shoulder lines. Because of the pin angle, the waste left at the edges is best removed by horizontal paring when you flatten the socket using the shoulder lines as guides. Don't undercut these shoulders in the middle — it's bad practice. Check your work with a try square.



To position the miter square, slide it to the point of the knife which is registered in the shoulder line. Then saw the waste from the mitered edge.

Clean up the mitered face by careful vertical paring.

Butt the fence of your try square firmly against the protruding pin piece. Register the tail piece to the try square fence and align the edges with the try square blade (right).



Hold the tail piece firmly in place with the heel of your hand as you knife the pins. The knife lines clearly show where you have to cut to make a tight interface.

Marking and Cutting the Mitered Edge

Marking the miter for the pins is the same as for the tails. The miter square in contact with the point of the marking knife (registered in the shoulder line) sets the position for marking the miter.

Once marked, saw off the waste. Be very controlled at the end of the cut: don't let the saw drop and damage the pin below.

Begin refining the miter by vertical paring. Position your chisel in the knife line and cut down about 1/16". This establishes a small land on the edge. Next set the workpiece at 45° in the vise and remove the remainder of the waste by horizontal paring, using the land as a guide.

Closing the Joint

To assemble the joint, use a Warrington hammer. See that the head is clean, especially from dried glue, or you will emboss each tail. Tap each tail in sequence — hard enough to drive it about 1/8" — and listen to the hammer tone. If one of the tails is too big and the joint too tight, you will hear a definite change in tone that indicates which tail or socket to ease by paring.

When it comes time to glue up a dovetail joint, you close it initially with a hammer as you do when it's dry. Final closure is with a bar clamp. The tighter you have made the joint, however, the more you are in

Square pencil guidelines down from the knife lines to guide your saw cuts.

danger of breaking off the outer edge pieces. It's normal to use a clamp across the joint to close up the two outer glue lines.

Setting Your Gauge: Flush, Shy or Proud?

The shoulder lines are marked with a knife blade set in a cutting gauge. The gauge runs on the end grain of the board as its guide. For the knife line to be accurate, the end of the board must be dead square. If you want to make a square or oblong box with dovetail corners, the four pieces have to be made exactly the same length or equal in pairs. In other words, the squareness of the finished piece is achieved by making the parts accurate at the preparation stage.

Where you set the gauge to mark the shoulder line will determine the length of the tails. You could set it a little proud so the ends of the tails and pins stick out beyond the surface of the sides; you could make the ends flush with the sides; or you could set the gauge — as I've shown — slightly shy of the thickness of the sides so the ends will be below the surface of the sides. Here's why you do it this way. After the assembly is glued up, you clean the surfaces of machine marks and dirt using a hand plane. The end grain of each joint now acts as a reference to guide you in keeping the sides all the same thickness. If you were to remove the original end grain, you have no reference. This method is at the root of making a hand-made drawer — a project you should attempt only after you are able to cut dovetails with skill and accuracy.

Establish the shoulder lines by vertical paring from each side. Leave the center mound and corner waste.

Once you have flattened the tail sockets by horizontal paring, it's easy to use the flat land to remove the remaining corner waste (inset) .

Slide the miter square to the point of the knife which is located in the shoulder line.

Establish the miter face by vertical paring for about 1/16", then set the pin piece in the vise at 45° and complete the miter using the small land as a guide.

A Controversy — Tails or Pins First?

It's not a matter of which is right or wrong, but rather which method holds more logic.

Tails first — The tail saw cut must be perpendicular to the surface of the board, and it must be a straight line, but it doesn't have to exactly follow the line of the slope. Marking the pins from the tails is an easy setup, because you set the pin piece in the vise and the tail piece is positively aligned and firmly held in place. The end grain knife line shows clearly where you make the end grain cut, followed by a vertical cut.

Close the joint with a hammer blow to each tail in turn. A change in tone tells you which tail is too tight.

Pins first — Marking the tails from the pins is a difficult setup, because you have to balance the pin piece upright on end with no reference point for positioning. This positioning and balancing act is made more difficult if the parts are cupped or distorted in any way. You must mark the tails from the pins with a pencil line because a knife line going with the grain is barely visible. Pencil lines vary in thickness, so where will you saw — left, right, or center? Finally, sawing the tail must be dead accurate; there is no room to deviate from the sloping marked line.

Master woodworker Ian Kirby is a regular contributor to Woodworker's Journal. *His book,* The Complete Dovetail, *is available from Linden Publishing.*

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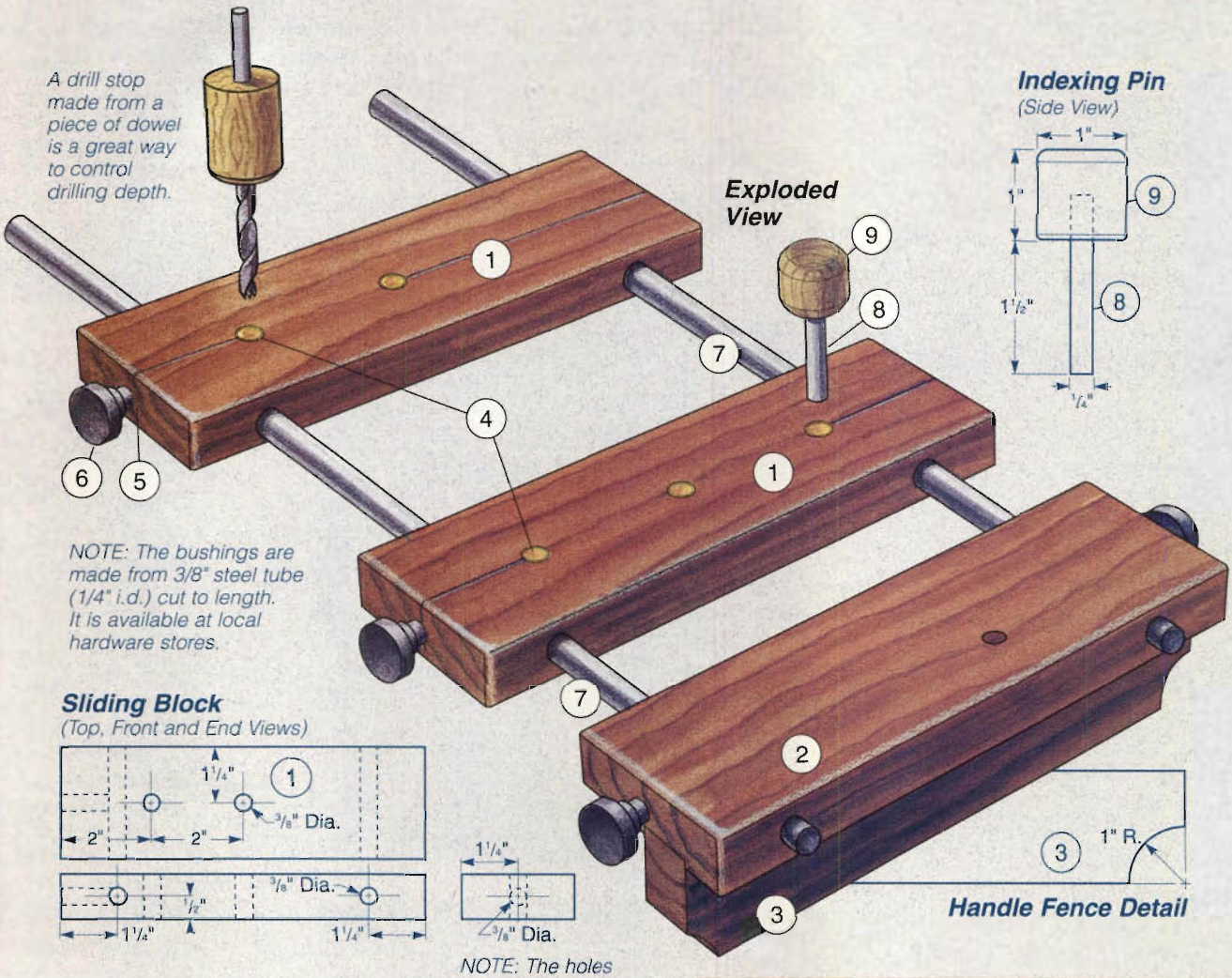
The Most Versatile Shelf-pin Jig

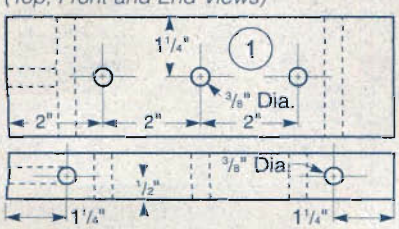
By H. Wesley Phillips

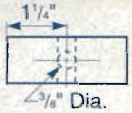


Sliding Block
(Top, Front and End Views)

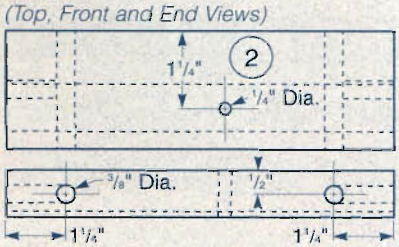
NOTE: The holes for the threaded must reach the holes for the guide bars.

Sliding Block
(Top, Front and End Views)

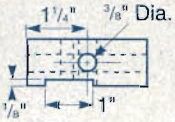




Handle
(Top, Front and End Views)



Plow a 1/8" groove to accept the handle's fence.



MATERIAL LIST

		T x W x L
1	Sliding Blocks (2)	1" x 2½" x 8"
2	Handle (1)	1" x 2½" x 8"
3	Handle Fence (1)	1" x 2" x 8"
4	Steel Bushings (5)	3/8" o.d. x 3/4"
5	Threaded Inserts (4)	1/4-20 x 3/4"
6	Knurled-headed Bolts (4)	1/4-20 x 1½""
7	Guide Bars* (2)	3/8" Dia. x 15"
8	Indexing Pin (1)	1/4" Dia x 2"
9	Wooden Knob (1)	1" x 2" x 8"

*Length may vary as desired.

While metal shelf standards are a very strong and versatile application, I think they can detract from the overall visual effect of certain pieces of furniture. I was building a custom bookshelf recently and decided that I could improve the overall appearance of the project by going with pins to support the shelves instead of shelf standards.

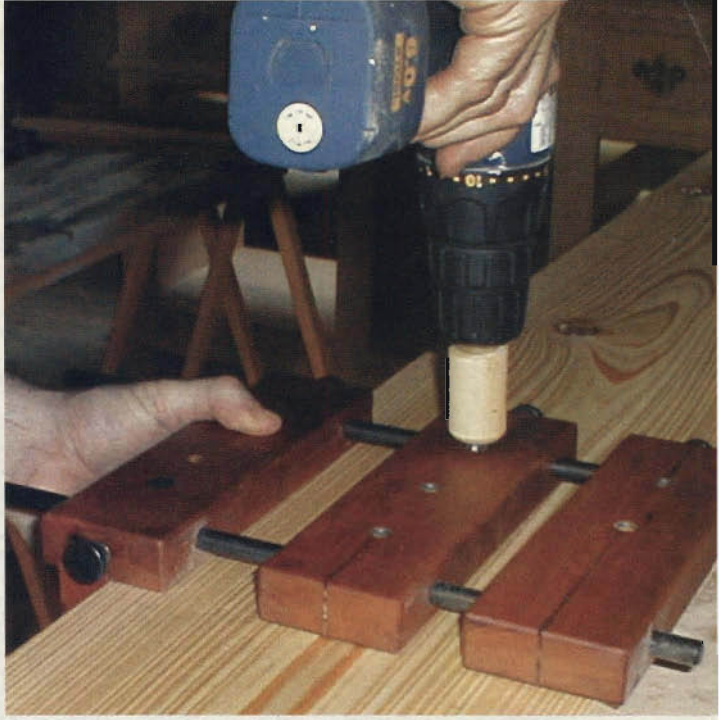
To achieve accurately and evenly spaced shelf pin holes, I designed this jig. The jig allows you to drill four holes per setting in rows at the front and back of cabinet sides. Because it is adjustable, the locations for the rows of holes can easily be varied and set for casework of different depths and dimensions. The vertical relationship of the holes is fixed at 2". The 3/8" o.d. drill guide bushings work perfectly for aligning a 1/4" drill bit.

Layout and Construction

Because this jig will become a tool in your shop, pay particular attention to stock preparation and layout accuracy throughout this project. Begin by selecting the stock for the wooden jig parts. I chose cherry because it's a tight-grained hardwood that holds bushings well, and is durable as well as attractive. After you've cut the hardwood parts to size and shape (pieces 1, 2 and 3), lay out the holes for the guide bars in the sliding blocks and handle. Be sure to take a moment to plow the slight groove for the handle fence at this time. Refer to the *Elevation Drawings* on the opposite page for all the construction details. I marked the hole locations on the handle and then used the handle as a guide for marking the two sliding blocks. The holes will need to be drilled slightly larger than the guide bar's diameter.

Next, with the handle and sliding blocks on the guide bars, I laid out the holes for the five steel bushings (pieces 4). These holes need to be drilled slightly undersize to get a good press fit. I inserted the bushings using a hammer and wooden block, leaving them flush with the top surface of the sliding blocks.

Threaded inserts (pieces 5) are installed at both ends of the handle and one end of each sliding block. They hold knurled-knob headed bolts (pieces 6) which secure the sliding blocks and handle to the guide bars in their desired positions. I installed the threaded inserts so they were just flush with the surface.



To make best use of the author's jig, create a drill stop from a length of dowel so you can easily register the depth of your holes. Set up the jig to line up the shelf pin holes and your task is almost done.

My next step was to put a small radius on all the edges, using a stationary sander. Then I glued the two pieces of the handle and fence together and drilled a 1/4" hole for storing the indexing pin (piece 8) when you don't need it. I made a little knob (piece 9) from a section of dowel to top off the indexing pin. With everything else done, I sanded the assembly with 120 through 220 sandpaper and finished the wood with linseed oil and wax. I also used a woodburning tool with a chisel point to mark the centerlines of each sliding block.

The beauty of this jig is its versatility. And if you wish to have a second set of longer guide bars ... there will be even more opportunities to put it to good use.

H. Wesley Phillips, an electrical engineer by trade, has been woodworking for 25 years in South Carolina.

Evenly spaced shelf holes are more attractive to the author than applied metal shelf standards. His simple and adjustable jig is sure to do long and valuable service in your shop.

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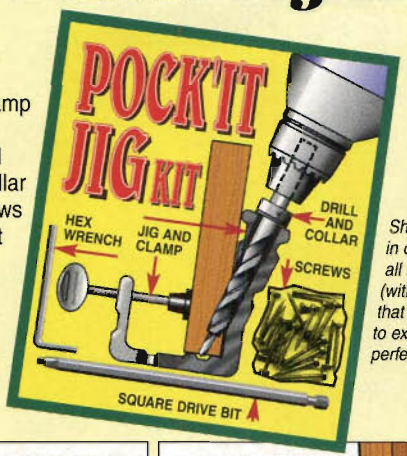

Shown here in our kit, are all the pieces (with your drill) that you'll need to execute perfect joinery.

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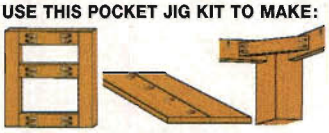

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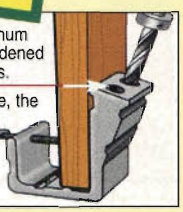

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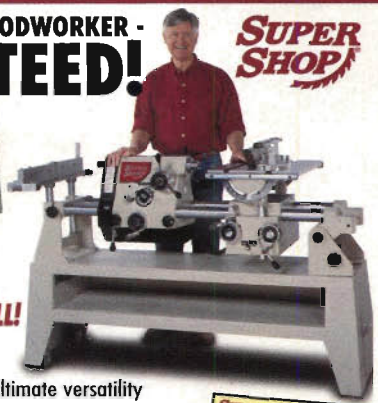

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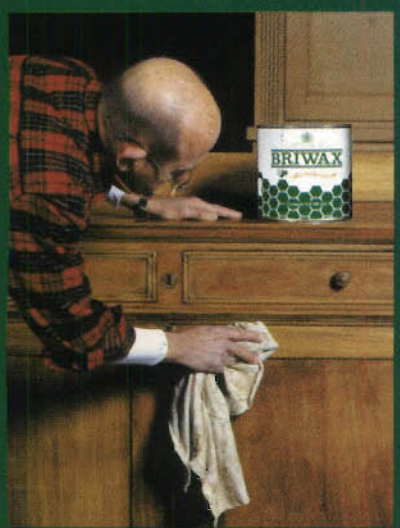

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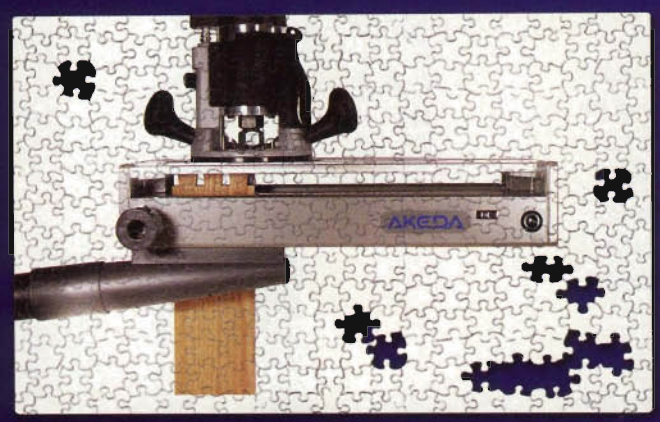

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Cope and Stick Router Bit Sets

By Bill Hylton

While window sash bits aren't exactly new, the profusion of configurations available now may surprise you. With the bits and bit sets now on the market, you can use your router table to make frames, show and display cases, glazed cabinet doors, and even architectural windows and glazed passage doors.

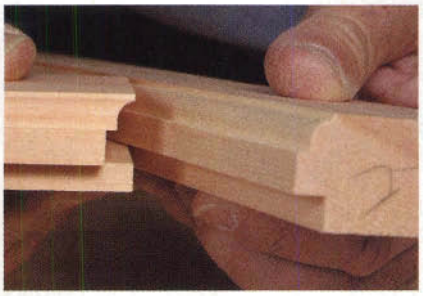
All of these bits work in the same fundamental way, but the designers have incorporated some interesting wrinkles. For example, two of the bit sets — from Italian rivals CMT and Freud — provide a means of securing the glass in the frame. Other sets help you make frames with mortise and tenon joinery, something that's important for a frame that's supporting a lot of heavy glass.

None of the bits can produce both cabinetry and architectural frames, because of differences in scale, proportion and stock thickness. So you'll need to pick a bit set that's appropriate for the project you have in mind. Don't expect one bit set to produce good results across the board.

No one cutter set can do it all. Architectural sashes (bottom) are beyond the capacity of bit sets designed for cabinetry (top). Select the set best suitable for your job.

Using the Bits

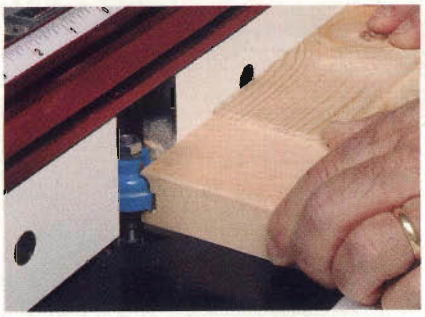
In general, you use one of these bits to "stick" all the parts; the other bit to "cope" the ends of the rails. The sticking cut yields the decorative profile and the rabbet for the glass. The cope cut produces the negative match; the cope itself fits against the contours of the profile perfectly, while a blocky tongue projects into the rabbet.



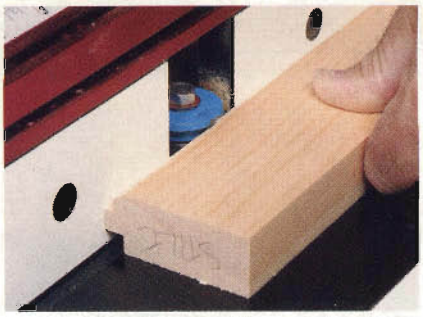
Two cuts make it work. The sticking cut (right) combines a decorative profile and a rabbet for the glass. The cope (left) is the negative and nests perfectly to the sticking.

Setting up the bits is not difficult. You'll want to make test cuts with both bits to familiarize yourself with what they do. A tangible result of the tests should be a setup block. The block should have a cope cut across one end and a sticking cut along an edge. The sticking cut should be the setting that "looks" best to you from an aesthetic standpoint. The cope cut should be the setting that matches the sticking. Keep the block with the set, and use it to set up the bits.

To make a simple frame with such a set, you would cut two stiles and two rails to size. Cope the rail ends first so you don't have problems with blowout, where the wood splinters as the bit exits the cut. If both edges of the rails are still flat, you can back up the cut



Cope the rail ends first. A push block helps keep the rail square to the fence and backs up the cut to prevent tearout.



The sticking cut is straightforward. Feed the stock along the fence. The bit cuts the profile and the glass rabbet at the same time.

with a scrap block. The bit passes from the good wood into the scrap, and you never get blowout. Rout the sticking after all the copes have been cut. Set the bit and the fence, and feed the stock along the fence.

Assembly is a cinch. Assuming the bit set is accurately made, the cope will nest snugly against the sticked edge. A slip fit (not a tight friction fit) provides clearance for glue. Before opening the glue, do a dry run. Fit the rails between the stiles, and get the parts squared. You can make this task easier if you cut a piece of hardboard to use as an assembly gauge. Make it the dimensions of the opening (about 1/8" wider and longer than the glass pane), but nip off the corners so the hardboard doesn't inadvertently get glued into the frame. Lay out the parts face down and assemble them around the hardboard gauge.

When everything is ready, use a small brush to apply glue to the rail ends. Assemble the parts, then clamp them.

Dividing the Frame

If you want to divide the framed area, you can make the divider strips with the same bits. Though they are often (and interchangeably) called sash bars, the vertical divider is a mullion, the horizontal divider a muntin. If you halve the opening, the divider obviously will be full-length. But if you divide the space for four or more panes, either the mullion or the muntin will need to be broken. The structure will be stronger if you segment the longer piece, but you can break up either the mullion or the muntin.

Because these parts are usually quite slender, you should adjust your procedures. Do as much work as you can with wide stock. And before you stick a sash bar that's been reduced to its final width, make yourself a push stick to keep your hands clear of the bit.

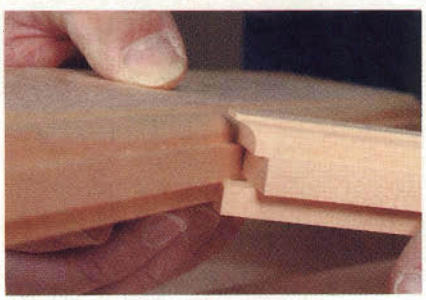
If you need two muntins and three mullions, for example, cross-cut one wide blank for the muntins and one for the mullions. Cope the ends of these pieces and stick both long edges. Rip one mullion from the blank, then stick that blank's "new" edge. Rip the second and third mullions from that blank and the muntins from the muntin blank. Then use your push stick to hold the slender parts as you stick the second edge of each piece.

To assemble the divided frame, you apply glue to the coped muntin and mullion ends as well as the rail ends. Press the coped ends into the sticking on the stiles (and rails and mullions and muntins). Clamp the assembly until the glue sets. Apply a finish, install the glass, and the unit is completed.

Assembly is very simple. To eliminate glue-up frustration, mark alignment points on rails, stiles and the mullions and muntins. A practice run, done without glue, is the right time to do this.

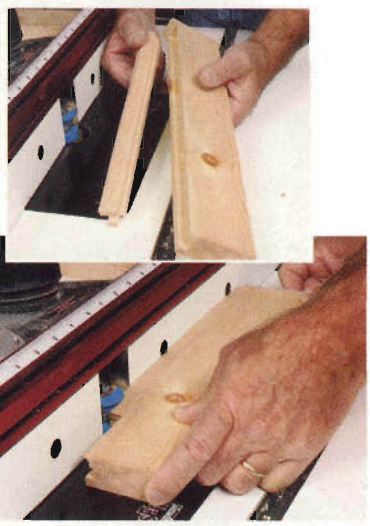
Reinforcing the Joints

Ahh, but there's always a hitch. Here it is the strength and longevity of the joinery. In a door, and especially in an architectural door, the joints need greater strength than a simple glued butt joint can provide. Yes, there is a little mechanical interlock, but the glue is holding the parts



The mullions and muntins tuck into the sticking, whether it's on a stile, a rail, or another sash divider.

Narrow sash bars are ripped from a wide blank. Cut it to length, cope the ends, and stick the long edges. Then rip a sash bar from each edge.



Cope the long edge of a scrap to make a pusher for narrow sash bars (top). It'll hold the slender piece in perfect alignment and keep your fingers clear of danger (bottom).

What's New in Cope and Stick Bit Sets

To make windows and doors with integral mortise and tenon joinery, use a two-bit set, such as this one offered by Jesada.

For making divided-light cabinet doors, Freud sells a different sort of bit set. The cope cutter produces a 3/16" long, 5/16" thick tenon.

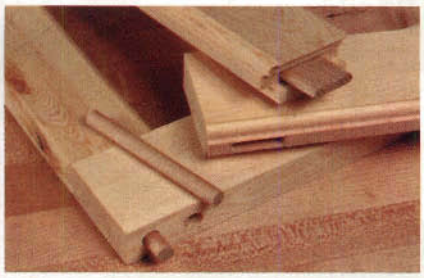
This Grizzly set consists of two bits. One cuts the cope, while the other cuts the sticking. Both cuts are made with the good side up.

This reversible assembly bit by Woodline USA is a low cost alternative to a pair of bits. The profile cutter is an integral part of the shank.

Uncomplicated cabinet doors, even those with divided lights, can be handled with the Sommerfeld glass panel set from CMT.

For making traditional divided-light cabinet doors with real mortise and tenon joinery, try CMT's set, designed by Lonnie Bird.

A finished appearance from the back as well as the front is the what you get with Freud's recoverable bead set.



Reinforce a routed window sash joint with a mortise and loose tenon or with dowels driven into holes drilled through the stile edge.

An inverted cutterhead allows you to cope a tenoned rail. The tenon passes above the cutter as it copes the rail's shoulder.

together, and the joint is almost nothing but end grain to long grain gluing surface.

One solution is to reinforce the joints with dowels or mortises and loose tenons. (Using biscuits is problematic because the mating surfaces aren't flat. In addition, the rails may not be wide enough to accommodate a standard biscuit. The mullions/muntins sure won't.)

Sometimes, dowels can be added to a joint after it has been glued and assembled. Drill through the edge of the stile into the joint, then drive a dowel into the hole.

Introducing mortise and loose tenon joints to the construction is manageable if you have a plunge router and an edge guide. After making the window frame as outlined above, rout mortises in both the rails and stiles. Plane down scraps of the working stock to make loose tenons. You can reinforce the sashbar joinery with dowels. Use your plunge router to bore holes for the dowels. Having these joints not only strengthens the frame, it makes it easier to assemble.

Traditional mortise and tenon joinery is accommodated by the design of Jesada's window sash bit set (other manufacturers also market this style). The cope bit has an inverted cutterhead. You cope the rails (and sash bars) with them face down on the router table. A tenon can pass over the cutter (see *photo* above).

With this set, you cut the mortises and tenons first, then you cope the rail ends and finish up by routing the sticking on all the parts. A simple frame, consisting of stiles and rails, is not difficult to make. Add a gridwork of mullions and muntins, however, and properly locating all the mortises can be a challenge. Here's where an accurate drawing of the assembly, including a section view, is very helpful (see *photo* on page 70).

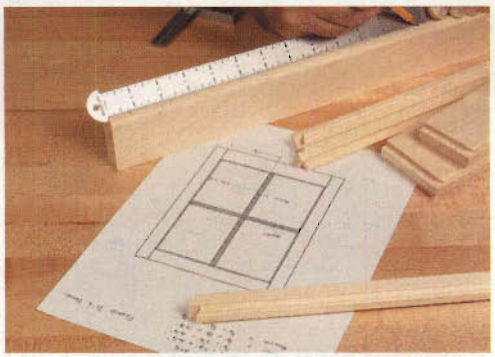
Freud has a divided-light set for making cabinet doors. The cope bit produces 3/16" long tenons at the same time that it forms the cope. With this set, you cut the joinery after routing the copes and the sticking. Lay out the mortises on the rails, stiles, and sash bars. You can cut the shallow mortises by whatever means you favor. Because the tenons are square-cornered, the mortises also should be square-cornered. You'll need to trim the tenons on the rails with hand tools.

Freud's divided-light door set produces a stubby tenon as a part of the cope cut. Lay out and cut mortises for these tenons after the parts are routed.

CMT's bit set for divided-light cabinet doors was designed by furnituremaker Lonnie Bird. The approach you take with this three-bit set closely parallels that used in making the bulkier architectural

continues on page 74 ...

sashes. You lay out and cut the mortises and tenons. An inverted-head cutter produces the copes. The sticking is produced in two passes: one to cut the bead profile, the other to cut the glass rabbet. The big advantage with this system is that you can make tenons longer than 3/16".



With the Freud divided-light set, you lay out and cut the mortises after the cope and stick cuts are made. A precise drawing is essential.

Securing the Glass

Assemble the sash or door parts cut with any of these sets and you'll have a sturdy, attractive unit ready for glazing. What you won't have is an integrated means of securing the glass. You have to use glazing points and compound or rip retainer strips.

A recoverable bead set from Freud (a cloned set is available from Woodline USA) features a standard cope cutter. But the sticking bit is special, because it cuts a profile on both edges and leaves a slot between them. One molded edge projects 1/8" beyond the other. This is the width of a table saw blade's kerf, so you can rip that molded strip from the part, then use it to secure the glass. And it will be the same size as the stuck bead.

After the cabinet door frame is assembled, securing the glass is a matter of fitting the bead strips, mitering their ends, and gluing them in place.

A rubber retainer strip is at the core of CMT's solution to the glazing problem. Their bit set, designed by Marc Sommerfeld, adds a special slot cutter to a conventional sash set. You rout the rails and stiles. Then you use the special cutter to slot the shoulder of the glass rabbet. After the door is assembled and the glass placed, a rubber retainer, which secures the glass, is pressed into the slot.

To cut the slot in just the right location, the workpiece is laid face down on the router table. You adjust the bit so its shank-mounted bearing rides on the delicate edge of the sticked profile. That will give you the correct slot depth and position the retainer to hold the glass without rattling.

Bill Hylton is a regular contributor to Woodworker's Journal *and the author of* Woodworking with the Router *from Reader's Digest.*

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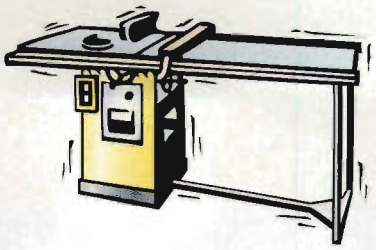
Cabinet Saws: Shop Stalwart

By Kelly Mehler



For the last five months, the outrageous scene in my shop has included nine new full-size cabinet saws. Why? So I could soak up enough information to help you make a wise, well-informed choice when you're ready to invest.

The benefits of a cabinet saw over a contractor's saw make for a long list. First, the added power is appealing. The contractor's saw has to limit motor size to about 1½ HP to meet household 110V current. In my view, this is somewhat underpowered for a table saw. The additional power in cabinet saws means they last longer, cut through hardwoods at full capacity (3") with ease, and allow for the use of standard kerf blades for smoother, burn-free cutting (some even accept 12" blades for more capacity). To take advantage of this power, you have to provide a 230-volt circuit. All homes have this current available; it's just a matter of providing a dedicated circuit with its own breaker and outlet.

Additionally, the construction of cabinet saws makes them easier to tune, and they stay true longer, thus requiring less maintenance. Because of the motor placement they are better balanced and take up less space than a contractor's saw. They're also quieter.

So why are there so many contractor's saws in home shops? In a word ... price. From my experience, though, I have found that the purchase price is not always the final cost. When you consider that the life of a well-maintained cabinet saw could easily stretch over generations, the initial price could be looked at as a long-term investment.

Features to Consider

Power Plant: All the saws I looked at had at least 3 HP, while the European Hammer, Laguna and Rojek (pronounced roy-yek), had 3.6 HP — all more than adequate to drive their standard 10" blades. The Europeans can also handle a 12+" blade, for around 4" maximum cutting capacity.

In this test, all of the table saw tops were cast-iron, and almost all measured out nearly flat — essential for maintaining accurate cuts on a cabinet saw. As for size (important for adequate support of your work), the North American saw tops are about the same at 27" deep and about 40" wide. This essentially gives the operator a good 13" of table support in front of the blade, but only 6" to 7" after the blade. You really have to add an outfeed table to be safe.

The Euro models have deeper tops: about 32" on the Laguna and Rojek and 39" on the Hammer. With 12" of support in front of the blade, this allows 20" to 27" after the blade. I would still add outfeed support, but for a lot of work you wouldn't need it. The extension wings on all of the cabinet saws that had them were either 8" or 10" wide and cast-iron as well.

Rip Fence: A premium quality rip fence makes your work more accurate, efficient, safe and enjoyable. These days, many table saws come with premium fences. In this review, most had clones of the Biesemeyer T-square style fence. Of those, most have the ability to remove or replace the fence facing material. The majority have gone to high-density polyethylene (HDPE), a slick hard

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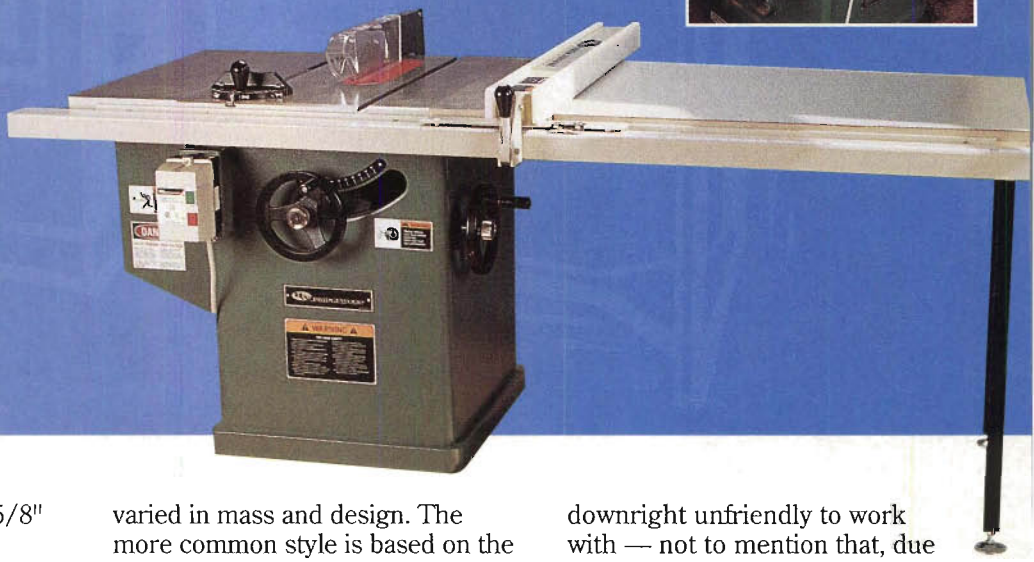
An adjustable, thin cursor with a small amount of magnification makes fence alignment easy for accurate cutting.

The open end of the metal fence tube can leave you with unpleasant memories of bruised hips and cut fingers. Bridgewood's (and JET's) thoughtful end caps are a welcome addition.

Bridgewood BW-10-LTS

Street Price: $1,299
Weight: 475 lbs
Made in: Taiwan
Tilt: Left only
Motor: 3 HP, 13.5 amps
Top: 28" X 41½"
Blade size: 10"
Blade Included: Yes
Warranty: 1-year
Phone: 800-235-2100
www.wilkemach.com



wearing plastic from 1/2" to 5/8" thick, while General and Powermatic still use high quality Baltic birch plywood surfaced with a plastic laminate. Laguna decided to go with an equally slick and long wearing 3/8" phenolic facing material. I found none of the plastic faced fences could be used for accurate ripping without first shimming between the faces and the fence tube. In contrast, the Baltic birch faces were flat and straight on both sides.

European safety standards require that fences have the capability to be set in both a high and a low position, as well as be adjustable forward and back. (The Delta Unifence is a familiar example of Euro-style fence design.) These fences were flat and true on all faces but were not as rigid and easy to use as the Biesemeyer clones (the exception being the Unifence).

Trunnion Assembly: The trunnion is the structural member inside the body of the saw to which the arbor and motor are attached. These varied in mass and design. The more common style is based on the original Delta "U" made in three parts and used in the Delta, JET and Grizzly. The "box" style is a much heavier one-piece casting and is used in the General, Bridgewood, Powermatic and Laguna. The Rojek and Hammer use a completely different design attached to the bottom of the top instead of the cabinet. They also adjust straight up and down rather than in an arc. These assemblies were solid cast and worked smoothly.

Safety Features

The table saw is a tool with great potential — for both creativity and accidents. For my part, I want to operate a table saw with safety devices that protect me but don't unduly hinder my experience. Unfortunately, I have not found this to be the case with the currently provided blade guard assemblies on North American table saws.

Besides being flimsy affairs, with two exceptions on the General and Powermatic, I found them all downright unfriendly to work with — not to mention that, due to their design, they can only be used for through cutting.

The European models in this review, Laguna, Rojek and Hammer, use what looks like a similar blade guard system to ours, but with some welcome distinctions. A 2½" riving knife behind the blade is used instead of a splitter, and the blade cover attached on top can be quickly removed when necessary. The riving knife comes right up to the back of the blade, matching the blade's contour, adjusted to be just a bit lower than the top of the blade. As the blade is raised or lowered, the riving knife stays in this same relationship. For this reason, the guarding system becomes nearly transparent and does not interfere with your work! To make non-through cuts or to use a jig, it only takes a few seconds to remove the blade cover. There is no need to remove the riving knife, as it does not interfere in any way.

The magnetic power switches on all these saws allow for mounting to the left of the blade, where they are more accessible. Additionally, all but the Hammer could be turned off with your knee.

Dust Collection

Efficiently collecting all of the dust your saw makes is another safety issue. To test this, I hooked up a 1 HP, two-stage dust collector to each saw and cut up my winter's supply of kindling!

All of the North American saws reviewed now provide the user with a motor cover to completely enclose the cabinet, as well as an inclined floor that leads to an exterior 4" dust port. On most of the saws, the collector was only able to remove the sawdust that was within a few inches of the outlet, and it left a mounting pile inside the cabinet that blew around once the saw was turned on.

I was pleasantly surprised to see how much more efficient the Unisaw was at keeping its cabinet nearly empty of sawdust. Its advantage is a steeply funneled floor with the port at the bottom "back" of the table saw instead of the side. This placement utilizes the blade velocity to actually shoot the sawdust directly toward the port.

Still, even the Unisaw was not as efficient at collecting sawdust as the European saws. Each of these encloses either the whole blade or the front in a shroud beneath the table. The sawdust is directed with the force of the spinning blade through an opening in the shroud to a hose leading to the outside dust port. Additionally, each of these tools has a dust port in the blade cover to capture the majority of dust produced above the table.

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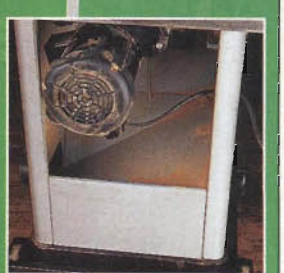
Delta Unisaw

Street Price: $1,550
Weight: 450 lbs
Made in: USA
Tilt: Left and Right
Motor: 3 HP, 12.4 amps
Top: 27" X 40"
Blade size: 10"
Blade Included: Yes
Warranty: 2-year
Phone: 800-438-2486
www.deltawoodworking.com



By placing the dust port in the back of the cabinet and steeply slanting the metal floor to the port, Delta's Unisaw takes advantage of the saw blade's velocity to help expel sawdust to a collector.

The European style Unifence has a number of helpful features such as a low and high position fence; large, comfortable handle; adjustments for square and an easy-to-read cursor.

This heavy one-piece cast trunnion, when paired up with its massive trunnion brackets, is an ultra solid design, good for many years of vibration-free sawing. The Powermatic and Bridgewood have similar assemblies.

General 350 & 650

Street Price: $1,850
Weight: 472 lbs
Made in: Canada
Tilt: Left (650) and Right (350)
Motor: 3 HP, 13.7 amps
Top: 28" X 36"
Blade Size: 10"
Blade Included: Yes
Warranty: 2-year
Phone: 819-472-1161
www.general.ca

Crosscutting Capabilities

In my opinion, the miter gauges on these cabinet saws all suffer from inherent design flaws. I find them inaccurate and awkward because of their small body and single guide bar and their small cutting capacities. None of the miter gauges had less than .008" play between the miter bar and the miter slot. Grizzly does provide adjustment screws in their miter bar. Still, the problem becomes more and more apparent when trying to use the miter gauge to cut long and/or wide stock.

Pushing a workpiece across the saw table with a miter gauge bears no likeness to carrying it through the blade on a sliding table. Safety, accuracy, and capacity are all greatly improved with a sliding table. The Hammer and the Rojek come standard with a sliding table, and the Laguna has it as an option.

Left-tilt vs. Right-tilt

Nearly all of the cabinet saws here now come in left-tilting blade models. The only time tilt is a safety concern is when beveling a narrow strip between a right-tilting blade and the fence. For a safer and cleaner cut, you want the bevel of the workpiece on the "upper" side of the tilted blade. With a right-tilting saw, you just move the fence to the left of the blade, but there is only about 12" to 15" of capacity out there. So a left-tilt saw does give you the most options for "ripping" bevels. When you add a sliding table into the equation, though, it is best to have a right-tilting saw for crosscutting bevels.

Bridgewood BW-10-LTS

The Bridgewood had a hefty feel, which was surprising in light of its price. The heavy box trunnion assembly and wide sector gears operated smoothly. That heft may be why it ran with a little less vibration than some of the other saws. The polished tabletop and 10" extension wings measured out dead flat in both length and width. I didn't care for the heavy chamfer at the front of the main table that left sharp corners exposed where the extension wings met, but overall the fit and finish were good. The throat plate fit snug and the end caps on the fence rails were a nice touch. The blade guard assembly was less than 3/32" thick, and the pawls were loose enough in their fit to interfere with cutting. The HDPE sides on the fence were the thickest of the Biesemeyer clones at 5/8" thick. Access slots

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Grizzly G1023SL

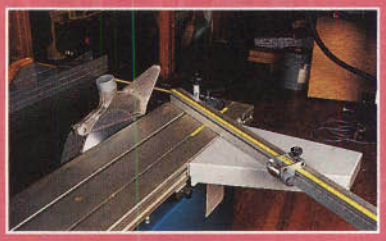
Street Price: $895*
Weight: 467 lbs
Made in: Taiwan
Tilt: Left
Motor: 3 HP, 18 amps
Top: 27" X 40"
Blade Size: 10"
Blade Included: No
Warranty: 1-year
Phone: 800-523-4777
www.grizzly.com

To address a universal miter gauge challenge (that miter gauge bars are often loose in their slots), Grizzly added adjustment screws to their bar to take up most of the slack.

*Grizzly's listed price of $895 does not include extension tables, included in the price of other saws in this review. With extension tables, the Grizzys'price would be about $1,155.

Hammer K3

Street Price: $3,490
Weight: 595 lbs
Made in: Austria
Tilt: Right
Motor: 3.6 HP, 12 amps
Top: 39" X 44"
Blade Size 10" & 12"
Blade Included: No
Warranty: 2-year
Phone: 800-700-0071
www.felderusa.com



A 50" format-sliding table, side extension and a long crosscut fence (with flip stop) make up a package that will spoil you for any other crosscutting method!

There is no problem getting full access to change blades or adjust the riving knife on the Hammer. The access door under the sliding table slides open easily in its own track.

for removing the bolted-on sides are under the fence. Dust collection was not very effective. I had to regularly open the large access door and rake the accumulated sawdust into the port. The dust deflector, at only 4" long and 2½" wide, let a lot of dust shoot around the working parts of the saw.

Delta Unisaw

Since 1937! Even though over the years this saw has evolved into what we have today, very little has changed internally. This means that you can get parts and service for this saw just about anywhere. This is also the saw, except for the Euro models, that has been the model for the rest. Somehow Delta has been able to keep the price reasonable and still make it in the U.S. The Unisaw had a fair fit and finish with few sharp and rough edges. The top was out .015 in winding, but when I loosened the bolts and shimmed between the top and the cabinet, it flattened out fine.

When I started it up, it had that familiar loud CLUNK that I've heard on my Unisaw for 18 years. I think it is a matter of adjusting a stop collar on the elevating shaft. There are a number of nice touches on this saw. You get two wrenches: one for holding the arbor and the other for removing the blade. Brackets and hooks are also included for storing the miter gauge, rip fence and wrenches. It was also the only saw that came with a 230-volt plug on an 8' cord ready to go. To my mind, the blade guard was pitiful, with no way to have it stay up when working around the blade. A little notch barely held it up, but only with the throat plate off. On the other hand, the large plastic motor cover snaps on and off easily and has a foam seal around the edges that helps with dust collection.

General 350 and 650

I enjoyed the Canadian made General table saw because of its overall feeling of quality. All its parts, bolts and manuals came thoughtfully wrapped in heavy plastic and reusable ziplock bags.

This saw is delivered with the extension wings already attached and shimmed level, the motor cover on, the power switch attached and the adjustment wheels installed. I did move the switch from the right to the left side where I prefer it. The blade guard assembly is of the same familiar design but done to higher standards. It's stiffer and has slotted metal sides on the 1" wide blade cover. The blade cover will rest above the blade out of the way for measurements. As seen in the photo, the trunnion is a heavy cast one-piece box design enclosing the blade area and dampening vibration from the motor and blade. Biesemeyer licenses their fence to General, so it is just like the original with Baltic birch and laminate faces. It came straight and true, which is good because the faces are not removable. The miter gauge has a heavy cast head but is the same dimensions as the others in this test. The miter bar had play in the slot, but it was closer to .005" than .010" The cabinet floor is inclined but to the side, which proved to be inefficient in collecting sawdust. Considering the tight box around the blade and the small opening at the bottom, it would not be a huge leap to port the dust more efficiently.

Grizzly G1023SL

At first I thought that the advertised price of $895 was quite a bit less than the other table saws, but then I realized that it did not include the typical longer rails and

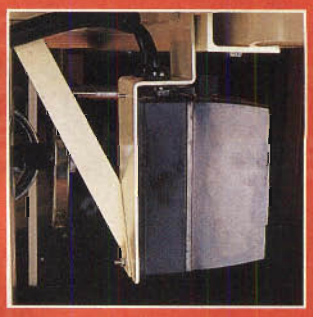
Shop Test continues on page 88 ...

(Circle No. 145 on PRODUCT INFORMATION form)

(Circle No. 48 on PRODUCT INFORMATION form)

JET JTAS-10XL 50

Street Price: $1,500
Weight: 468 lbs
Made in: Taiwan
Tilt: Left and Right
Motor: 3 HP, 14.5 amps
Top: 27" X 40"
Blade Size: 10"
Blade Included: No
Warranty: 2-year
Phone: 800-627-4538
jettools.com



Sturdy is the watchword for cabinet saws. JET's extra mounting bracket adds stability and strength to their power switch.

extension table that are standard on the other cabinet saws. Still, it is the least expensive and you can get it without the extended capacity, which makes it $260 less. With that said, this is a solid cabinet saw that will suit the needs of many woodworkers.

Even with the short rails you would want to get or make a side extension table. The fence "drops" down a bit when it reaches the end of the table at 16", a problem that could easily be eliminated with an extension table.

The fence is a Biesemeyer clone with 1/2" thick easily removable sides. The stubby locking handle had some sharp edges and was not very pleasant to use, but I did find the thin red hairline cursor easy to adjust and distinguish from the rule markings. The blade guard assembly was the thinnest of the lot, at about 1/16" thick. The quality, fit and finish of the Grizzly was easily on par with the other lower cost cabinet saws. As with the other saws, I don't see the reason for a chamfer on the front edge of the table, although this one was 1/4" instead of 3/8". On a positive note, Grizzly delivered one of the best instruction manuals, with more good information on making internal adjustments to the saw assembly than I have ever seen in a saw manual.

Hammer K3

It was awesome working with the format-sliding table on the Hammer. There is literally no resistance and no play. It comes right up to the blade for dead-on cutting accuracy. With its center T-slot, the sliding table is a great platform for attaching hold-downs and jigs for all types of crosscutting, ripping and joinery operations. To cut full-size sheet goods an additional side support — or, better yet, an outrigger option (a pivoting arm that supports a table added to the side of the slider)— is recommended. Removing and replacing the sturdy crosscut fence is quick. It goes back on square to the blade, and the measurement scale will be indexed correctly. The Hammer's blade cover and riving knife were the most elegant of all the saws tested. Its blade cover is quickly attached and removed from the steel riving knife by way of a top slot. Additionally, the cover is transparent and also has a dust port at the back. The motor starts up slowly and has electronic braking that stops the blade in about three seconds. Power switches are located at the front and are outfitted with large emergency stop buttons. There is also one on the side of the cabinet and a safety switch that won't allow the saw to be started while the blade access door is open.

A weak point on this saw is its rip fence. It is very lightweight aluminum and does fine for work of smaller dimensions, but it is not substantial enough to resist the sideways forces while cutting larger work. There is no cursor; instead, measurements to the blade rely on aligning the edge of the fence head over a rule.

This is the only saw in the review that does not use the typical 5/8" arbor. Instead, it is 30 mm with two 9 mm braking pins. Most blade suppliers will rebore blades you have and can make blades to fit. Shocking as it may sound, this saw, and all saws in Europe, will not accept dado heads.

JET JTAS-10XL 50

This white cabinet saw looks good in my shop. Seriously, the JET does have a nice powder coated paint job. Add chromed hand wheels and a polished top: now you've got a real looker!

The tabletop saw was flat in length and width with the extension wings needing about .004" shims to bring them up level, and the wings were milled exactly even in length with the top. The front of the main table is heavily chamfered, leaving sharp corners where the wings

Shop Test continues on page 92 ...

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U.S. Patent No. US 6,267,527, U.S. Patent No. D456,700

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(Circle No. 40 on PRODUCT INFORMATION form)

meet the top. The instruction manual, parts list and even an inspection sheet were done well. JET was the only manufacturer to give tolerances and test results for runout in the arbor flange, trunnion alignment and arbor travel. The trunnion assembly also demonstrated a hefty clunk when started, almost exactly like the Unisaw. It also had excessive play between the sector gear on the trunnion and the worm gear on the elevating shaft. JET also uses a Biesemeyer clone fence with 1/2" HDPE sides that needed heavy shimming. The cursor was a bit fat already, and the magnification made it more difficult for precise placement on the rule, but I did like the feel and size of the fence handle compared to many of the other table saws. Adding end caps on the fence rails was a nice touch.

Laguna TS

This saw is made in Bulgaria by ZMM Stomana, a tool manufacturer specializing in metalworking machines since 1945 and woodworking machines since 1989. Laguna Tools contracted with them to make a table saw that incorporated both Euro and U.S. features. The saw is available with the 50" format-sliding table for an extra $1,200. Look at the weight of this cabinet saw in the details ... everything about it is heavy-duty. The cabinet is 4mm thick (nearly

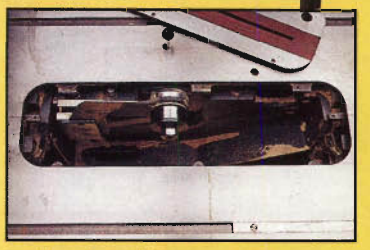
Shop Test continues on page 94 ...

Anatomy of a Cabinet Saw

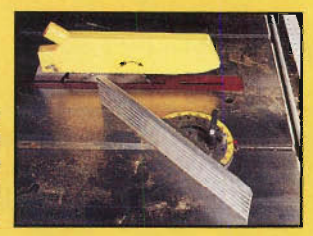
A basic cabinet saw is a study in calculated simplicity. Ample power, robust construction and built-in accuracy are terms that describe the essential cabinet saw. Not every feature of every saw will be identical, especially when it comes to the European imports, but the internal workings of your saw are not as complicated as you might imagine.

Laguna TS

Street Price: $2,295
Weight: 617 lbs
Made in: Bulgaria
Tilt: Right
Motor: 3.6 HP, 30 amps
Top: 31½" x 38"
Blade Size: 10" & 12"
Blade Included: No
Warranty: 1-year
Phone: 800-234.1976
www.lagunatools.com



Looking through the cavernous 6¾" X 24¾" opening, you can see this saw's large one-piece trunnion assembly. In addition to its main task, it encloses the blade and directs sawdust to the bottom dust port.



This miter gauge puts all of the rest to shame! A heavy cast body, adjustable long aluminum fence and positive pinned detents every 15 degrees are all design improvements.

3/16") all around. The main top is two solid halves divided down the middle at the blade. The left side can be removed for the sliding table.

The box type trunnion assembly is massive. The arbor flange is machined, not stamped, and is 3" in diameter. Even the arbor nut and long arbor wrench weighed in heavy. The throat plate on the Laguna is twice as long and twice as wide as most of the other saws, allowing plenty of room for blade access. The throat plate also has a replaceable center insert, milled in phenolic, and comes with one extra for either dado or zero clearance. A Biesemeyer type rip fence is supplied on this saw, too, but with 1/2" replaceable phenolic faces. These also needed shimming to make the fence suitable for accurate ripping.

The dust collection is very efficient, both below and above the table. I found the addition of levelers on the cabinet a good idea for stabilizing the saw.

Powermatic 66

The Powermatic 66 has long been the saw that many woodworkers aspire to. It has represented, deservedly so, the high end of U.S. cabinet table saws in both quality and price. Powermatic was one of the first manufacturers to polish their casti-iron tops, use the heavier one-piece cast trunnion, and offer left-tilting in a cabinet saw. They also use a 3/4" arbor on the pulley and bearing end but turn it down to 5/8" for the blade end. My saw's top was within tolerances for flatness, but the extension wings needed some paper shims to bring them up to level. The tilt and elevation adjusters had a satisfying smoothness about them. Powermatic's T-square fence is so heavy it will give you a workout taking it on and off, but there is a feeling it is going to last through the roughest of treatments and still perform well. The faces on the fence are Baltic birch with laminate and they are removable via access through the bottom of the fence tube. Powermatic uses a large, lightweight molded plastic motor cover that is secured at the top and slides in to the motor opening. It is easy enough to remove for interior access. The dust port on this saw is located in the back of the saw like the Delta Unisaw, but the floor is not inclined and it has a more difficult time keeping up with dust removal. The small front access door is a plus, as it allows a quicker way inside the cabinet for either pushing sawdust toward the port or recovering that dropped arbor nut.

Rojek PK 300V

The Rojek is the most different looking saw of the bunch in this test. The 7' rolling table guide rail on the left side sticks out 7" in the front and a lot in the back. It took some time to get used to operating the saw around this feature, but in short order I felt comfortable and actually safer. The fit and finish is high quality with no rough or sharp edges and good paint. The main cast-iron top is narrow but is supplemented with a sliding table to the left and a stamped steel extension table to the right. The size proved adequate for every kind of cutting except for full-size sheet goods. The extension table could use a leg to give it support at the right rear. Like the other Euro saws, the Rojek has appealing safety features: soft start, motor braking, a usable guard assembly and superior dust collection. It does use a 5/8" arbor and will even accept a dado set.

The light duty Euro rip fence was not in the same league as the Biesemeyer types, but I found it was sturdy enough, locking parallel with little flex under heavy loads. It has a micro-adjuster as a bonus but like the Hammer, there is no cursor.

The modest sized but versatile 16" X 22" rolling table takes

Shop Test continues on page 96 ...

crosscutting to new levels. The table glides smoothly and effortlessly, with no play. It comes with a long crosscut fence, built-in sliding extension, two flip stops and an eccentric hold-down. The fence can be mounted at the front or the rear of the table. I kept it at the rear, where it allowed a 53" wide cut compared to 23" at the front. If you need to cut large panels, I strongly suggest upgrading to the optional larger table with outrigger ($375). Removing and installing the crosscut fence was easy enough. There is a positive stop to return the blade to square, but no way to register the rule for the blade except to re-measure. The company said they were working on a solution.

Conclusion

Each of these cabinet saws has its special features and drawbacks. It would be great to take the best features and put them together for a perfect saw!

When it comes to picking one of these saws, I lean toward the European offerings. Safety, accuracy, versatility and value are my driving factors. For safety, there is currently no comparison on U.S. saws to European standards. You can actually eliminate kickback — the number one cause of accidents on the table saw — without interfering with common table cutting tasks, by using the riving knife/blade cover combination. Efficient dust collection, soft starting, braking motors and safety switches additionally contribute to safety.

For accuracy, versatility and safety, the sliding table, once used, is a revelation. The woodshop has no better way to crosscut accurately. This becomes especially apparent when crosscutting long, wide or heavy work. A surprise to me was how much ripping I could also do on a format table like the Hammer. As mentioned, the sliding table is also versatile as a platform for jigs and joinery.

Rojek PK 300V

Street Price: $2,390
Weight: 487 lbs
Made in: Czech Republic
Tilt: Right
Motor: 3.6 HP, 15.5 amps
Top: 32" X 19"
Blade Size 10" & 12"
Blade Included: No
Warranty: 1-year
Phone: 800-787-6747
www.tech-mark.com

The well thought-out and efficient dust port not only connects directly to the blade shroud (under the table) but also has a junction to connect the hose to the blade cover.

The 4" diameter scoring blade precedes the main blade, making a shallow cut that virtually eliminates tearout in the most difficult of materials.

In my view, (and if you can afford it), the Rojek is a great value. It has, without a doubt, the most useful standard woodworking features, especially in the areas of safety and accuracy.

Kelly Mehler is a cabinetmaker and table saw expert located in Berea, Kentucky. His completely updated The Table Saw Book *is currently available from Taunton Press and is on sale at* www.kellymehler com.

Powermatic not only provides one of the best built blade guard assemblies, but they actually make it fairly easy and quick to remove and to put back in place. The best of a *traditional*, but awkward design.

Powermatic 66

Street Price: $1,900
Weight: 520 lbs
Made in: U.S.A.
Tilt: Left
Motor: 3 HP, 17 amps
Top: 28" X 38"
Blade Size: 10"
Blade Included: No
Warranty: 1-year
Phone: 800-627-4538
www.powermatic.com

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Shop Fox® stretches out

Rip capacity doubles

Shop Fox®, the brand from Woodstock International, has repackaged its Left Tilt Cabinet Saw to expand its ripping capacity. The new W1677EXT1 package offers a 52" rip capacity — up from 26" in the previous configuration — while their W1677EXT2 package has 50" of rip capacity.

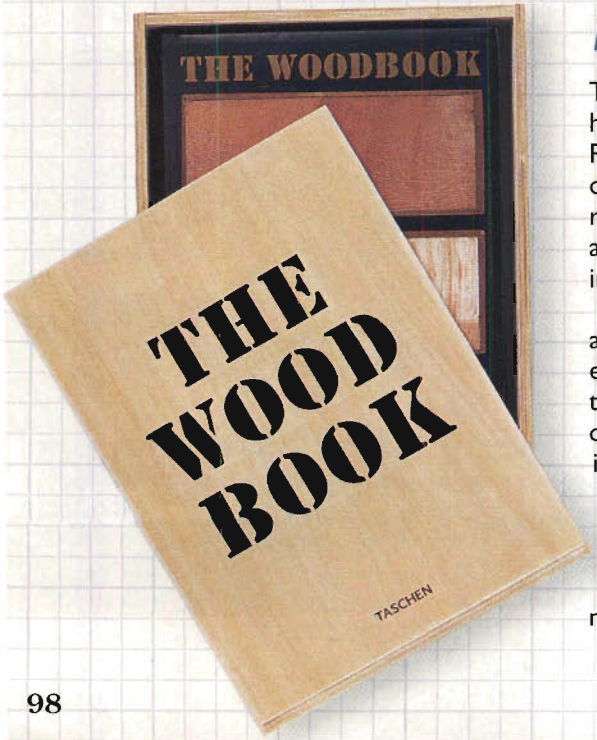
"We're adding the packages," says Phil Spinelli of Woodstock, "because we've had so many requests from both dealers and consumers for a 50 - 52" version of this saw."

The fence accompanying the W1677EXT1 is the extra heavy-duty Shop Fox Classic, while the top of the line Shop Fox fence comes with the W1677EXT2. This fence (shown above) is high quality aluminum alloy and locks securely at both ends of the table. It operates on an all ball bearing guide system and has a T-slot on the top to attach hold-down or anti-kickback devices.

Besides the rip capacity, the 10" saws also come with 3 HP TEFC motors, extra heavy-duty trunions, triple belt drives, and heavy-duty balanced hand wheels. Jumbo miter gauges and laminate covered insert tables are also featured.

The suggested retail price for the W1677EXT1 is $1,395, while the suggested retail for the W1677EXT2 is $1,450.

Find out more at 800-840-8420 or visit www.shopfox.biz.



A Beauty of a Book — In a Box

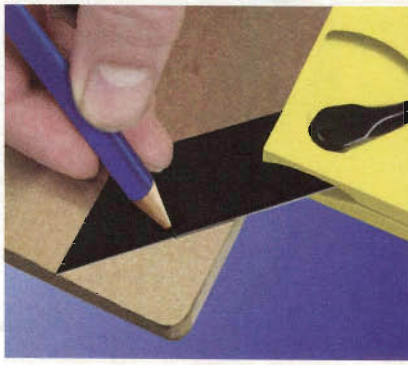
This book is a beauty. Taschen, the publisher of *The Wood Book*, has compiled a stunning reprint of the specimen pages from Romeyn Beck Hough's *American Woods*. For each of the hundreds of trees included, three different cross-section cuts of wood are represented (radial, horizontal and vertical). Originally, Hough had assembled actual specimens of woods on card stock to include in the 14-volume work he published between 1888 and 1913.

The reprint doesn't include actual samples — but it's as close as you're going to get to a lot of the trees, which are now either extremely rare or extinct. From Engelmann and MacDonald oak to sea grape and pigeon plum, *The Wood Book* contains information on the tree, its habitat and the properties of its wood. Also included in this special edition are lithographs by Charles Sprague Sargent of the leaves and nuts of most trees.

The $75 list price on *The Wood Book*, including a wood presentation box, looks pretty reasonable, especially when compared to the $35,000 total that Hough's original volumes now trade for. *For more information, visit* www.taschen.com.

World's first 3-dimensional Try Square

With the M3•Square, British company M-Power Tools says it has succeeded in developing a groundbreaking three-dimensional try square. They're calling it the world's first. The M3•Square, available through several U.S. distributors, has features like an integral bevel gauge with a locking lever that lets you transfer preset angles from one workpiece to another. A pencil-mounted scribe which attaches to the try square blade via a thumbscrew allows you to to mark both the width and thickness of a workpiece at the same time, without moving the square. You can also use the scribe as a marking gauge on your stock. Winged sections flaring out from one axis of the square give it the capability of marking rounded components with premolded edges (things like skirtings, kitchen countertops, etc.).



The M3•Square is tested to within a tolerance of 1/100th of one degree during manufacture and, while they don't recommend dropping or bumping it, M-Power realizes that a square is a tool which takes its share of hard knocks. Directions for both a quick reset and a full disassembly for resetting the square back to a true right angle come with the tool. The M3•Square sells for around $40. *For more information, call 44-870-162-0698 (England) or visit* www.m-powertools.com.

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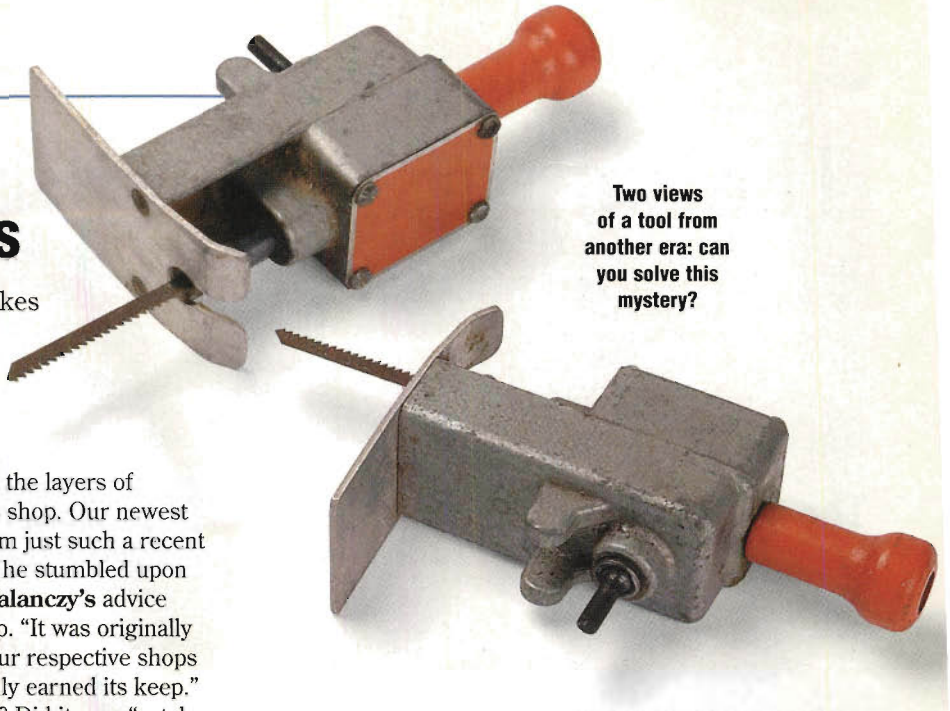
Shop Digs

By Joanna Werch Takes



Two views of a tool from another era: can you solve this mystery?

Spend some time and you can peel back the layers of history, even in an average woodworker's shop. Our newest mystery tool, pictured at right, comes from just such a recent "dig." Editor in chief Larry Stoiaken says he stumbled upon this relic while following **Sandor Nagyszalanczy's** advice *(see page 30)* about cleaning up your shop. "It was originally my dad's and has been hanging around our respective shops for years and years, though it's never really earned its keep." Does anyone remember when it was new? Did it ever "catch on"? If you ever put one of these tools to use, let us hear from you. Don't hold back on the details!

As for **Jeff Hower's** mystery machine from the *December 2002* issue, as I said then, letting you know that the tag included the patent numbers 1669047 and 1759257 would have gone a long way to helping you figure out, as **Matthew Herz** of Branchport, New York, did, that "the tool is a strapbinder."

"Before the days of nylon bands and stretch wrap," explains **John Larson** of Beaverton, Oregon, "boxes that required more durable sealing than the paper tapes of the day were neatly and securely bound up with wire using this device."

Art Sulenski of Bakersfield, California, said, "we used it to bale newsprint in bundles for the local newspaper," while **John Emenegger** of Vancouver, Washington, noted, "It was widely used by the fruit and produce industry, and by others shipping wooden crates or heavy cardboard boxes." **Merlin J. Jesperson** of Spokane, Washington, noted that it was even used for some "packages of heavy, flat material (lumber, steel, etc.)."

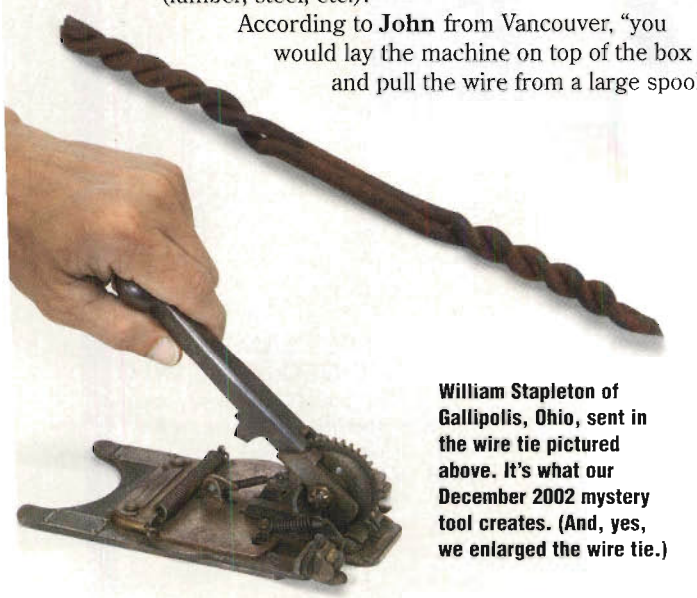
According to **John** from Vancouver, "you would lay the machine on top of the box and pull the wire from a large spool over the top and around the box." Then, says **Leonard Orders** of Spartanburg, South Carolina, "The wire ends are caught by clamps at each side of the front end of the machine. As the handle is raised and moved forward, the clamps expand outward, pulling the wire tight." **James Jamison** of Anderson, South Carolina, concludes, "When you pull the lever back, it tightens and twists the wire and then cuts the wire loose from the wire roll."

"I could still do it in my sleep," confesses Norman Baird of Toledo, Washington, who worked as a shipping clerk during his college days.

G.E. "Buddy" Kluppel of Richmond, Texas, said the picture in the December issue "brought back a flood of memories" of using the tool at his father's business 50 years ago. Judging again from the patent dates of May 8, 1928, however, it appears that the tool itself is closer to 75 years old.

That patent, for a "wire-tying machine," was filed by Parvin Wright and Alec J. Gerrard — of the Gerrard Company noted on the tool itself. **Gary Dry** of Sturbridge, Massachusetts, provided a condensed history of this company. "Gerrard was acquired by U.S. Steel Corp. in 1936 and became the Gerrard Steel Strapping Division, Chicago, Illinois. Since spun off — they are now Gerrard & Co. — they were providing these devices at no charge to customers who bought the strapping wire from them."

"I strapped many a box with mine," says John Larson. "I hope Jeff gets to do the same with his."



William Stapleton of Gallipolis, Ohio, sent in the wire tie pictured above. It's what our December 2002 mystery tool creates. (And, yes, we enlarged the wire tie.)

WINNER! *For taking the time to respond to Stumpers, Matt Erickson of Brook Park, Minnesota, wins the* ***Makita 14.4V 6337DWDEX, 1/2" MFORCE cordless driver drill kit which includes a pair of Mechanix Wear Gloves****. We toss all the Stumpers letters into a hat to select a winner. If you have a question or answer, send it to Stumpers Dept., Woodworker's Journal, P.O. Box 261, Medina, Minnesota 55340. Or send us e-mail:* jtakes@woodworkersjournal.com

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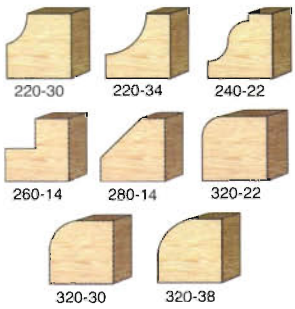

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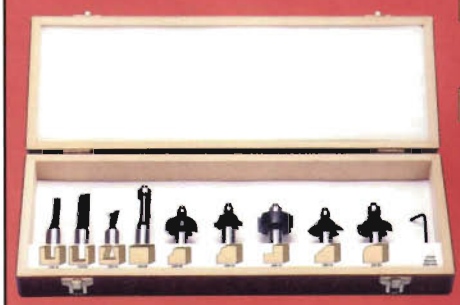

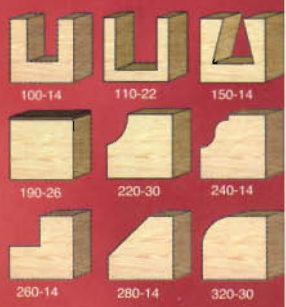

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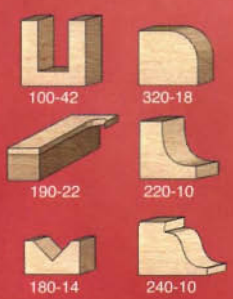

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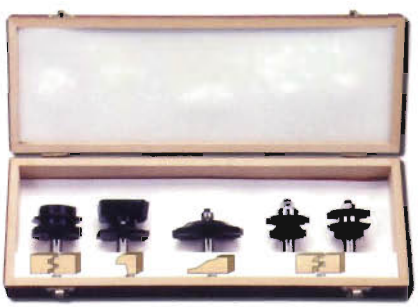

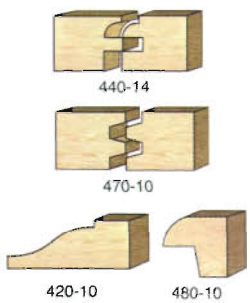

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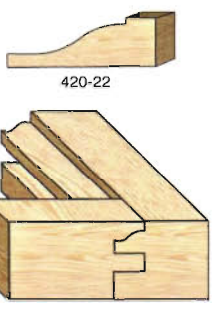

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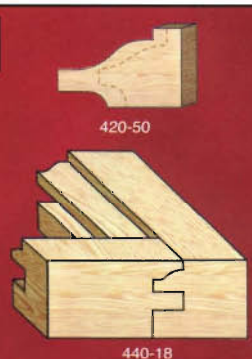

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