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WOODWORKER'S JOURNAL

December 2002
Volume 26, Number 6



Top 10

Super router add-ons

INSIDE! Complete
router roundup

5 Great table saw jigs

**Polyurethane
what's best...**
The oil versus
water debate
rages on

See page 58



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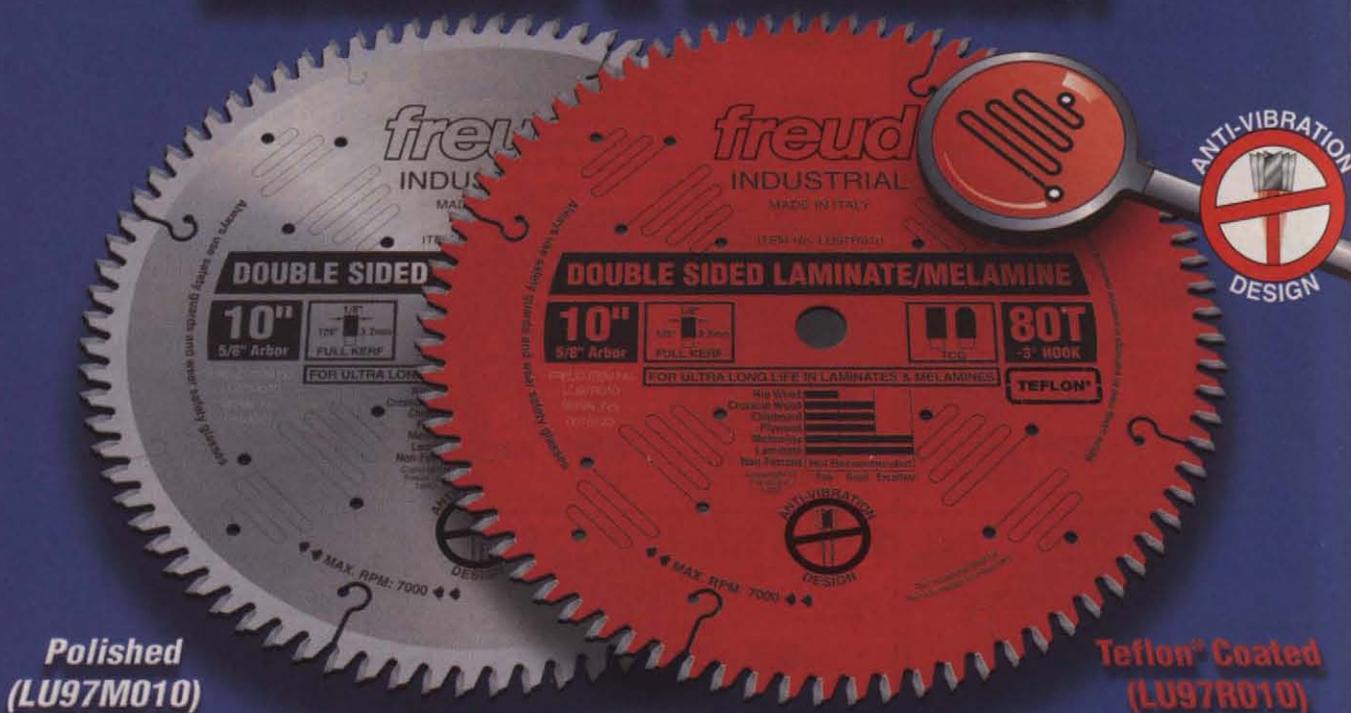
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Features

November/December 2002  Volume 26, Number 6

28 Bombé Jewelry Box

By J. Petrovich

A swollen chest describes the box — and your pride after building your own slot mortise jig and carving covers on the table saw.



Page 28

34 Greene & Greene's Robinson Table

By Mike McGlynn

An Arts & Crafts aficionado finally gets a chance at the designers' elegant pedestal table with its beautiful, exposed wooden slides.

43 Kitchen Island

By Rick White

Our contributing editor builds an island of gastronomic delight with a nod to an old-fashioned butcher's table.



Page 43

51 Table Saw Basics (Part III)

By Ian Kirby

Master teacher Ian Kirby's table saw series comes to a conclusion with a variety of jigs for this versatile shop workhorse.



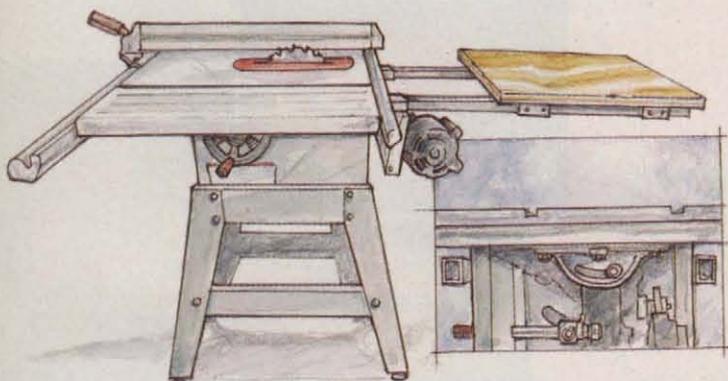
Page 51



Page 34

Woodworker's Journal Departments

November/December 2002  Volume 26, Number 6



Page 12

Woodworkers

- 08 **Editor's Note**
Survey time: meet your fellow woodworkers.
- 10 **Letters**
Replacing those rechargeables.
- 12 **Tricks of the Trade**
Template sanding: accurate and easy.
- 16 **Questions & Answers**
Contractor's saws leave their mark on miters.
- 22 **Shop Talk**
We host a panel at the Furniture Society — and report on the rest.
- 94 **Stumpers**
Ready? Set your saws ... and identify the next mystery tool.

Techniques

- 30 **Cutting Coves Into a Box**
A unique take on an old technique.
- 34 **Advanced Template Routing**
Not for the faint of heart!
- 58 **Finishing Thoughts**
Oil or water: Michael Dresdner covers the debate on polyurethanes.



Tools

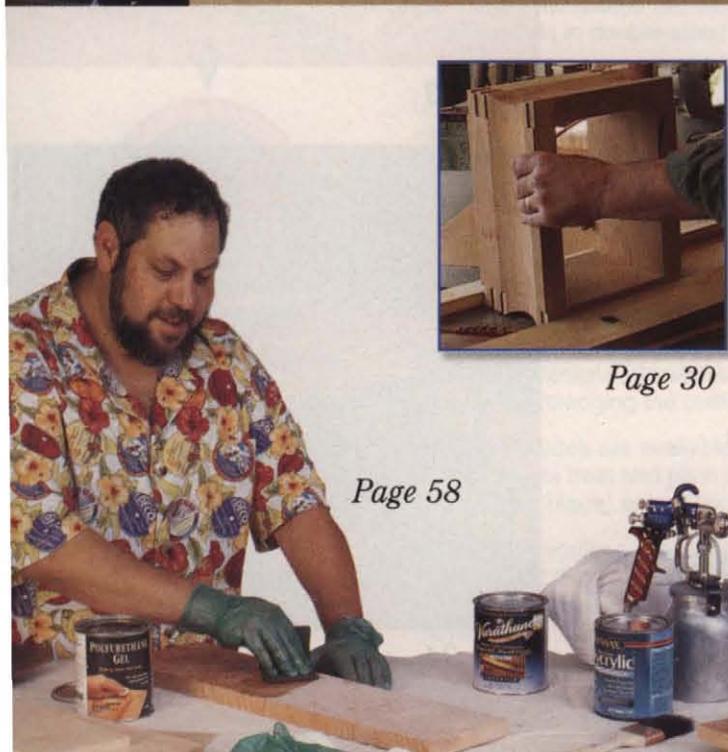
- 64 **Today's Shop**
Bill Hylton's top 10 router accessories. (Maybe even more!)
- 76 **Shop Test**
Chris Marshall examines some state-of-the-art router features.
- 86 **Shop Journal** 
Laguna's LT14 band saw; a tool that endures.
- 90 **What's In Store**
New tools come with cool "extras."



Page 34



Page 30



Page 58

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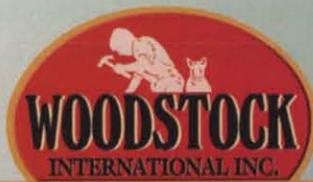


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Who's Woodworking?

It's hard to believe, but the end of another year is in sight — and what a great year it's been for *Woodworker's Journal*. A record number of readers chose to become subscribers to our magazine — making 2002 the best year in our 26-year history. A big thanks to all of you for making our fantastic growth this year possible.

Our recent completion of a major readership survey means I can also "introduce" you to some of your fellow readers: you're about 57 years old, mostly married (85 percent) and, contrary to the popular image of woodworkers, not all retired (36 percent are, but 56 percent are still employed full-time). Your "home places" are spread out pretty evenly

across the country. About half of you (49 percent) have been woodworking for 20 years or more, and during this past year, you've been building furniture (59 percent), shop jigs and fixtures (51 percent) and outdoor projects (46 percent). I guess it's no surprise, then, that our features and project articles were in a dead heat with the *Jigs & Fixtures* department as your favorite reads (81 percent of you indicated that you read these sections regularly). What is a bit of a surprise in 2002 is that only five percent of our readers are women.

Now that's a number I'd like to see change — not just among the readers of *Woodworker's Journal*, but among woodworkers in general.

Woodworking isn't, and shouldn't be, a "boys' club." In fact, we're taking steps to combat that image — one of the great things that happened in 2002 was the *Journal's* associate editor **Joanna Werch Takes** leading a panel discussion at the Furniture Society's annual conference. Her topic for this gathering of some of America's most prominent furniture builders was "Women Woodworkers." Joanna's article about this well-attended session appears on *page 22* of this issue, but I hope that's not the end of the discussion.

I'd like to hear from you, especially the five percent who are paving the way for women to come aboard one of the most enjoyable and fulfilling hobbies to be found. What are the roadblocks? How have you overcome them? Somebody please help me understand why, when it comes to women and woodworking, my favorite hobby seems to be keeping company with the dregs of daily activity — like taking out the trash or cutting the grass?

Larry N. Stoiaken

A record number of readers chose to become subscribers to our magazine — making 2002 the best year in our 26-year history.

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Rechargeable Debate

Frugal Options

In *Questions and Answers*, August 2002, Ed Huck asked about internal rechargeable batteries. He was advised to dispose of the drill, as batteries were not replaceable. I live in Wichita, Kansas, and know of two locations here where these batteries are available. The Black & Decker customer service center here has changed batteries for me a number of times.

Nowadays, labor costs exceed the cost of replacing tools, so repair shops are scarce. Wichita has several repair locations that are very reasonable in cost. Lucky us.

*Milton Tucker
Wichita, Kansas*

Editor's Note: To locate Black & Decker customer service centers, visit online at blackanddecker.com/customerservice or call 800-544-6986.

I found your short article on light duty drills with dead batteries interesting. I have run into the same problem. Being frugal, I have been able to repair these tools and return them to full power.

I open the unit up to determine which battery size is used inside. I then obtain the batteries from an electronics store. Then I build a new battery pack with the new batteries and install it. When I finish, I dispose of just the old battery pack, and the drill or screwdriver is ready for several more years of use. It takes about an hour to repair one



drill and costs about \$8 for a six-battery pack. The tools required are a screwdriver and soldering iron.

*James Hargreaves
Concord, California*

WJ Responds: The point of my Q&A response was that non-removable battery pack type cordless screwdrivers aren't DESIGNED for easy battery replacement. That doesn't mean that the batteries can't be replaced. You could have a repair shop perform the job, if you can find one that'll do it (my local shop discourages such repairs). However, it's almost always more expensive to have the batteries replaced than it is to buy a new tool.

Alternatively, a handy person, with the right skill and experience, can replace the cells inside the tool him- or herself. But when you add the cost of buying new batteries to the time and hassle of taking the tool apart and soldering the new batteries together, and compare it with the relatively low cost of a new cordless screwdriver, is the job really worth the trouble? For example, I just bought a new Black & Decker cordless screwdriver for \$12. Let's say

In the August Q&A department, we directed readers to call the Rechargeable Battery Recycling Corporation to learn how to properly recycle NiCad batteries. Unfortunately, we listed the wrong phone number: The correct number is 800-822-8837.

that (according to Mr. Hargreaves' experience), it would cost me about \$8 to replace the cells. That means I'd be "saving" \$4! My time is definitely worth more than that!

There's also an important caveat and a warning to doing the job yourself: It's unlikely, but possible, to overheat a battery cell during soldering and cause it to burst — a dangerous and messy possibility!

— Sandor Nagyszalanczy



Against the Rails

First, let me say I love your magazine and read it cover to cover each time. I have found it very helpful many times. In the August issue, your "Pick of the Tricks" (*Tricks of the Trade*) said to use fence rails to lift the saw. My Craftsman table saw has a large sticker on the fence rails that states, "Do not lift by the fence rails."

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.

I'm sure many other saws state that. We have purchased a wheel kit to move our saw around and push it by its base, not the fence rails.

Bev Polmanteer
Eloy, Arizona

High School Memories

I read in your August 2002 *Stumpers* article about the circular saw sharpener and patent by Carleton Philips and William Sanford. Bill Sanford was my Painted Post (New York) High School science instructor, teaching biology, chemistry and physics. I remember he gave my dad one of his early sharpeners, which Dad used for years. Bill was quite an inventor. When I was in high school (1948 - 52), he had developed Day-Glo, a fluorescent, high-visibility material. At that time, he was selling this fabric to hunters and others who needed the bright orange and fuchsia colors for safety. He used to have this stuff hanging out the third floor science lab windows. He was a great teacher.

Jack Voggenthaler
Blairsdon, California

Corrections

The web site address listed for Ingersoll Rand air compressors in the August

2002, *Questions and Answers* was incorrect. The correct URL is www.air.ingersoll-rand.com.

An article on the Mafell Duo-Dowel System in the August 2002 *What's In Store* incorrectly stated that "a variety of bit sizes is available, from 3/16" up to a maximum of 1/4". The standard version of the tool, however, comes equipped with 5/16" drill bits.

Sitting Pretty

Thanks to John English for resurrecting the *Child's Adirondack Chair and Settee* in the September/October 2001 issue. I have made several settees in both cypress and cedar. As you can see below, Maya and her special friend are enjoying their settee as they wait for lunch: peanut butter and jelly plus a bowl of milk.

Charles Albertson
Ripley, Tennessee



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

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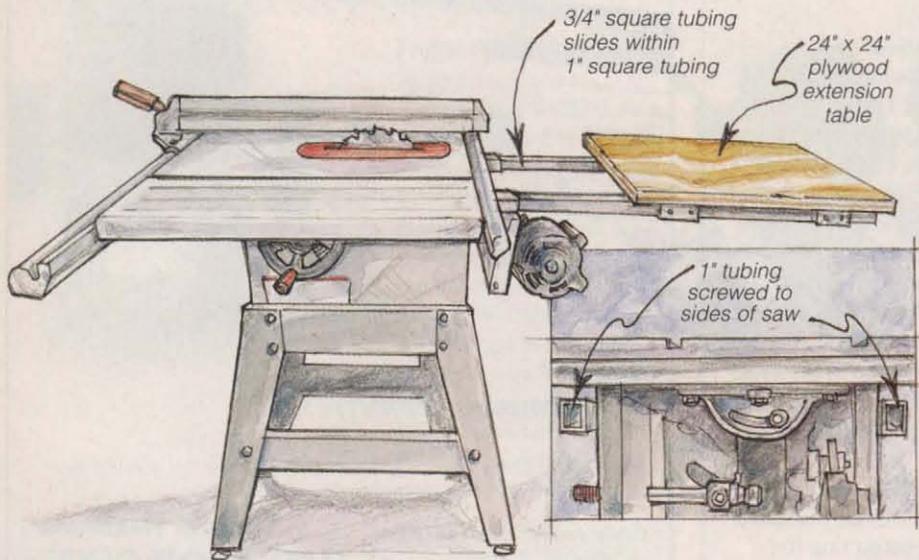
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Power Tool Enhancements



Capturing Chuck Keys

I always had to hunt around for the key to my drill press until one day I got smart: I went out and bought a “key return” — a light chain with a spring return. I attached the metal case to the post of my drill press with a large hose clamp and drilled a hole in the flattened end of the chuck key for the key ring. I just wish I’d thought of this little trick a few years ago!

*Robert Clements
Bay City, Michigan*

Table Saw Extension

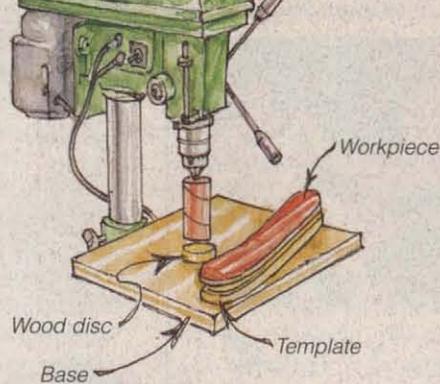
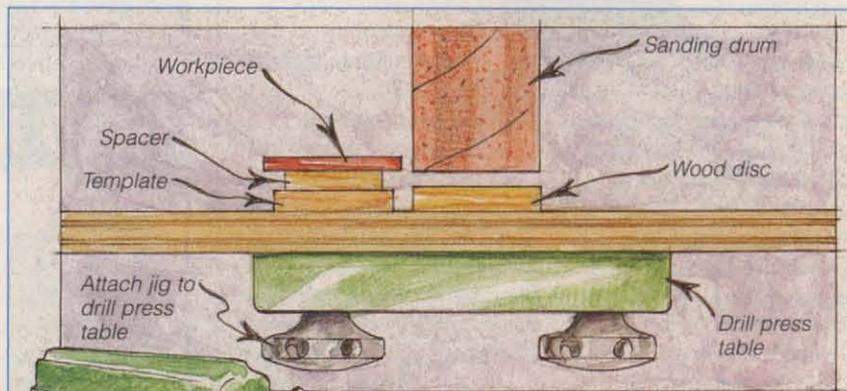
After many years with a radial arm saw, I finally bought a 10" table saw and immediately discovered a weakness: whatever I was sawing went off the end of the table onto the floor. My answer was to make a sliding 24" x 24" plywood extension table attached to square aluminum tubing, as shown in the sketch above. When it's not in use, I slide the table out and hang it on the wall. When sawing heavy or extra-long stock, you may need to put a support under the extension table. For greater rigidity, increase the weight of the aluminum tubing.

*Ron Watkins
Manteca, California*

Table Saw Gear Lubricant

I had a problem with sawdust sticking to the oil on the gear and screw mechanism of my table saw, making it awkward to raise or tilt the blade. The solution was to thoroughly clean the gears and then spray them with silicone. This keeps the gears free from sawdust, reduces wear and prevents rust. I also sprayed the arbor housing in front and behind the blade to prevent gum buildup.

*Walter France
Lithia Springs, Georgia*



Edge Sanding Template

I devised this simple jig to sand the edges of a number of identical parts made out of thin stock. I first cut out a wooden disc, the same diameter as my sanding drum and sleeve. I nailed this disc to a plywood base and, after

**PICK
OF THE
TRICKS**

positioning the disc directly under the sanding drum, clamped the base to the drill press table as shown.

To sand the duplicate parts, I taped the stock to be shaped (cut slightly oversize) to a spacer that in turn was attached to the template with double-sided tape. I've since discovered that, if the stock is extra thin, I can stack several pieces and do them all at once. Not only is this faster, but the “sandwich” effect makes for a smoother, more even finish.

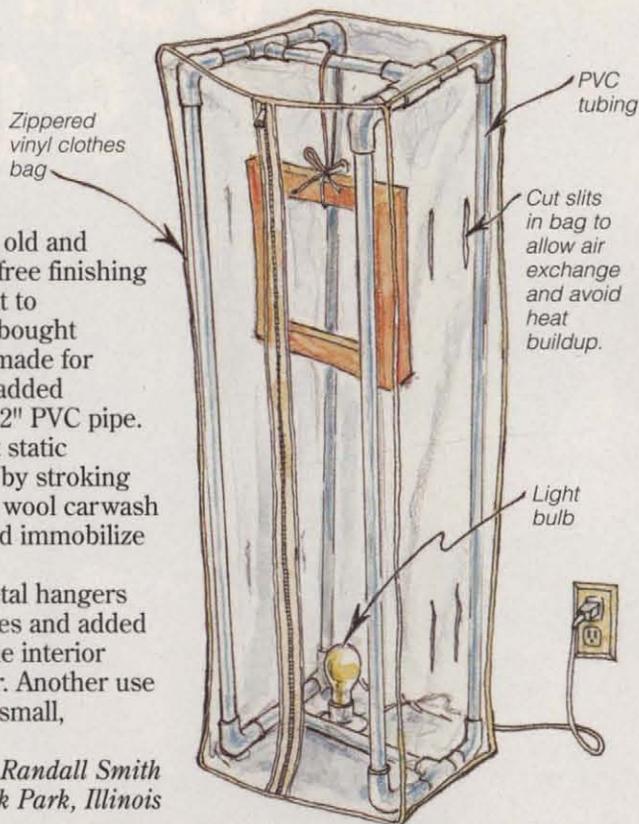
*R. B. Himes
Vienna, Ohio*

Dust-Free Finishing

Because my house is old and drafty, finding a dust-free finishing environment was next to impossible. Finally, I bought a vinyl zippered bag made for hanging clothes and added a frame made with 1/2" PVC pipe. I also discovered that static electricity, generated by stroking the vinyl sides with a wool car wash mitt, would attract and immobilize lurking dust.

I installed some metal hangers for the finished articles and added a lightbulb to keep the interior warm in cold weather. Another use for this rig is to cure small, glued-up parts.

Randall Smith
Oak Park, Illinois



WINNER!

In addition to our standard payment (below) R.B. Himes will also receive a Delta 22-580

portable two-speed finishing planer 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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Glue Creep and Scorched Miters

THIS ISSUE'S EXPERTS

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

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

Q My new contractor's saw is a big improvement over the tiny benchtop saw I owned previously, with plenty of power for ripping and crosscutting the materials I use most often. But, when I tried recently to rip some maple with the blade tilted at 45°, I found that the stock was harder to push and that the sawn edges were rough and scorched in places. This happens with other materials as well, and it seems to be worse with thicker woods.

Am I doing something wrong, or is there some adjustment I can make to correct this problem?

*Felicity Campbell
Oxnard, California*

A The problem you are experiencing is related to a shortcoming in the design of the contractor's saw itself. You may be able to minimize the problem, but it will be difficult to eliminate entirely.

The problem occurs mainly because the motor is attached to a bracket that is cantilevered out the back of the machine. As you tilt the blade, the weight of the motor exerts a twisting force, or "torsion," on the trunnion-and-blade-arbor assembly, causing the blade to "heel" slightly, so it is no longer in perfect

alignment with the rip fence. The blade's teeth enter and exit the cut in slightly different planes and, as a result, the sides of the teeth rub against the work. This is the source of the roughness and burning you observed.

You may be able to correct some of the misalignment by "supertuning" your saw. This involves determining the amount of offset between the front and back teeth when the blade is tilted, and then compensating for it by shimming either the front or back attachment points where the trunnion assembly is bolted to the underside of the table.

Saw manufacturers could engineer saws to resist the twisting force of the motor, but most consumers wouldn't be willing to pay the additional cost. Meanwhile, contractor's saw owners are

left to their own devices and creativity.

— *Ellis Walentine*

(Editor's Note: Check out Ian Kirby's mitering jig, see page 55, in this issue for a solution to this problem.)

Q This is a question for Michael Dresdner regarding his article "Working With High-tech Adhesives" in your August 2002 issue.

You refer to "glue creep" relative to PVA adhesives. What is glue creep?

I have been plagued for years with a ridge developing under the finish along a glue line on glued up panels. Is this due to glue creep and not wood movement as everyone tries to tell me?

*Urie McCleary Jr.
Springville, California*

Ripping a long accurate miter on a contractor's saw is a problem: whose fault is it ... the operator's or the saw's?



continues on page 18 ...

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A PVA adhesives, such as Titebond®, actually stretch over time if they are subjected to a continuous load. This stretching is called “glue creep.” Given enough time and load, the joint can eventually fail. That’s why we use rigid adhesives, like those explained in the article, on structural items such as laminated beams. Glue creep is not usually a factor, however, on most furniture.

The glue ridge you’re experiencing is not glue creep. It could come from wood movement, but only if you joined two boards with different moisture contents. More likely it is due to



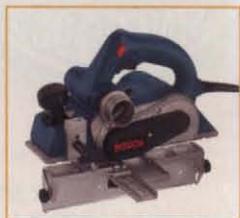
Glue creep is not a guy who sells you bad glue, but joint movement under stress. Swelled glue joints are a separate problem altogether.

swelling of the PVA glue joint once finish is applied. Here’s what happens:

If there is too much glue in a joint (an ideal glue line is only two mils thick), or if the glue line has not had enough time to fully cure, solvents in your finish can cause the resins in the glue to swell. That in turn makes a ridge of glue that only shows up after the finish is applied, since the finish solvents cause the problem.

The bottom line: Start with accurately fitted joints, apply glue sparingly, get the parts assembled quickly, clamp with sufficient pressure to reduce the size of the glue line, and wait a lot longer before applying finish. When you can’t do a quick assembly, pass on PVA’s and instead choose one of the high-tech adhesives that has a longer open time.

– Michael Dresdner



WINNER! For simply sending in his question on glue creep, Urie McCleary Jr. of Springville, California wins a Bosch 1594 hand-held planer. Each issue we toss new questions into a hat and draw a winner.



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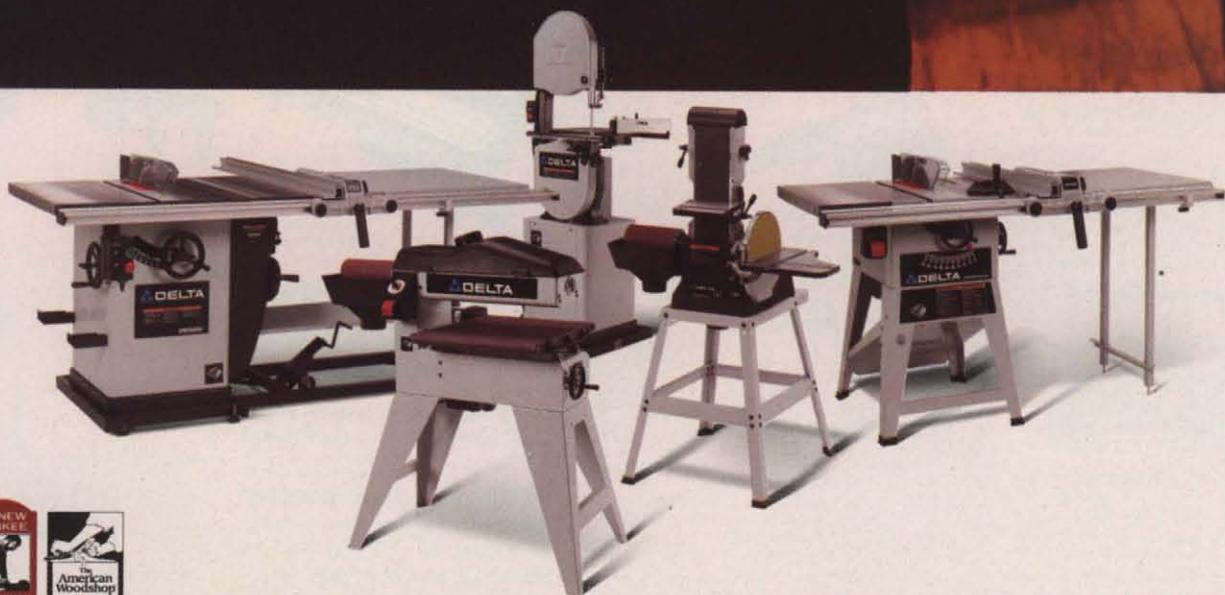
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The Furniture Society: Prairie Roots, Progressive Thoughts



Katherine Ortega's "Shoe Valet" was included in *The Right Stuff* exhibit of upholstered furniture accompanying the conference.

WJ Hosts Unique Panel

Women Woodworkers Take Center Stage

This past summer's Furniture Society conference in Madison, Wisconsin, was chock full of fascinating furniture, interesting people and lively sessions — including one on "Women Woodworkers," which I had the pleasure of moderating. Rockler Woodworking and Hardware and JET Equipment and Tools sponsored the session, during which panelists Bonnie Bishoff, Gwen Marshall and Carol Reed



Furniture makers and educators Alan Peters (left), John Makepeace (center) and Jere Osgood (right) received this year's Awards of Distinction from the Furniture Society.

shared their thoughts and experiences.

Bonnie, a studio furniture-maker who works in collaboration with husband J.M. Syron; Gwen, who worked in construction before teaching woodworking to high school kids; and Carol, an ecclesiastical furniture-maker and router specialist known as The Router Lady™, took different paths to their careers. This highlighted a concept from my introduction: that social and legal changes dating back to the 1970s made it easier for women to get into woodworking, and those who were among the first to do so are in their prime today.

In addition to discussing their own experiences, Carol had also gathered information from several other women woodworkers, and Gwen focused on the work of her high school students. Topics covered in the panel discussion and while responding to questions from the audience included sharing shops with men, the response of potential clients



WJ associate editor Joanna Werch Takes, far left, enjoyed moderating a Furniture Society Conference session on Women Woodworkers with panelists Carol Reed, Bonnie Bishoff and Gwen Marshall (left to right).

to women furniture-makers and, particularly, the need for education — for both men and women, and particularly at the high school level. "My point is to encourage you to save all the school programs you can," Carol said, "It's a legacy you need to pass on to your

daughters and sons." Variety at Conference Education was also covered in a conference session dealing with post-secondary woodworking and furniture programs, while other sessions dealt with reproduction furniture, traditional Japanese woodworking,

sustainable wood, ecclesiastical furniture, sketching and acrylic paint, among others. A field trip to Taliesin, a home designed by Frank Lloyd Wright, tied in with a session on the work of the Prairie designer — and with the theme of the conference: Prairie Roots, Progressive Thoughts.

Close to five hundred people attended this year's conference, which is put on by a Society whose members include studio furniture



Robert Erickson's "Crane Chair" was part of *The Right Stuff* exhibit.

Shop Talk continues on page 24...

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— Rob Johnstone, Editor
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"Anonymous Donor," a public art installation of locally harvested willow, was the work of Susan Churchill, Tor Faegre and Kevin Earley.

"Jacob's Ladderback Chair" (below) is by Steven Spiro, a Wisconsin furniture maker.

was the buzz of the conference.

I couldn't attend everything, of course, but by the end of the three-day conference

makers, educators, gallery owners, hobbyists and people with an interest in furniture. Several shows accompanying the conference highlighted the furniture itself, including juried shows on casework pieces and upholstered furniture, gallery showings of work by University of Wisconsin-Madison students and Chicago and Wisconsin furniture makers, and a members gallery.

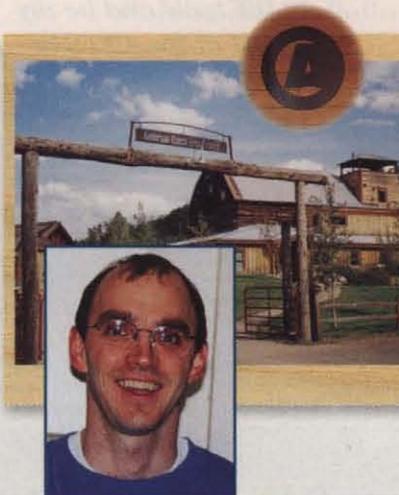
A public art installation sculpture of locally harvested willow was constructed in front of the conference buildings, with participants welcome to take a hand at either harvesting or building.

And, there's more: keynote speakers like Mira Nakashima Yarnall discussing the legacy of her father George Nakashima's style and business, an auction which raised over \$24,000 for the Furniture Society, and "Slide Wars" show-and-tell with good-natured critiques. Bill Stumpf's keynote speech on the need for preserving regional design ethics in furniture

I was exhausted — in a good way — from so much information. I was even too tired to dance to the all-female swing band, although I thought this nontraditional group was a nice fit with the topic of my panel. Fellow furniture-makers, Bonnie had said during the panel, are the nicest guys she's ever met, but still, today, "As a woman furniture maker, you get a little extra attention. You're not as lost in the masses."

To find out more about the Furniture Society and next year's conference in Philadelphia, visit www.furnitureociety.org or call 434-973-1488.

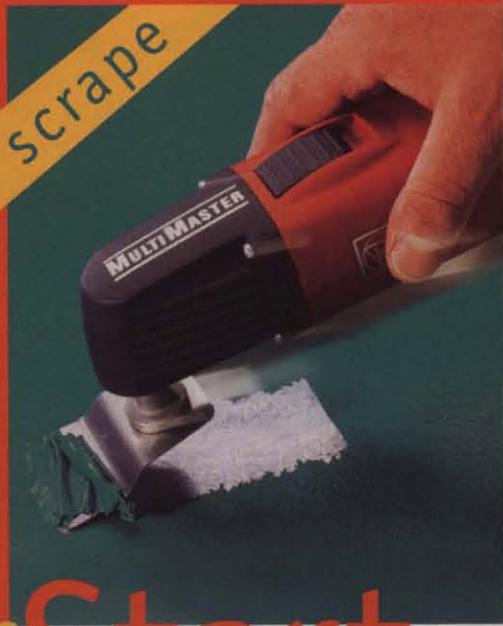
— Joanna Werch Takes, *Woodworker's Journal* associate editor



25th Anniversary Sweepstakes Winner!

Michael McCray, winner of the *Delta/Woodworker's Journal* 25th Anniversary Power Tool Sweepstakes, had to leave his new Limited Edition UniSaw prize at home during his all-expenses paid visit to the Anderson Ranch. We sent contributing editor John English along to record Mike's adventures. Look for details (along with a profile of new woodworking program director Susan Working) next issue. In the meantime, visit www.andersonranch.org for class schedules and sign-up information.

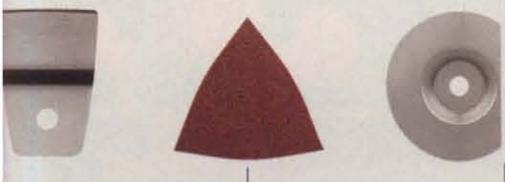
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Delta's beginner and intermediate woodworking tools are changing their name: it's now Delta Shopmaster.

going to be using the saw for six hours every evening, you might want to step up to a contractor's saw or even our Unisaw."

The Delta Shopmaster subbrand, which will roll out this fall, currently has 46 sku's, while the Delta Industrial subbrand has over twice that many. Although Delta will continue to introduce new tools throughout its lines, Pete noted that the vast majority of the tools in both subbrands are those already in stock.

The Delta Shopmaster subbrand will be available through the same outlets as Delta Industrial tools. "We have great distributors," Pete said. "Rebranding is an exercise that should make it easier for them to match the right tool to the right user."

For more information, visit www.deltamachinery.com or call 800-438-2486.

A New Identity

Delta Starts a Subbrand

Like musicians who want to reach out to new audiences, some of Delta's tools are changing their name. All of the tools manufactured by the 83-year-old company will keep the word "Delta" in their name, but those targeted to beginning and intermediate users will be known as Delta Shopmaster, while the tools aimed at professionals or highly advanced hobbyists will be called Delta Industrial.

"We wanted to make it easier for the end user to understand what the appropriate product is for the particular application," Delta vice president Pete Chatel said. Packaging and collateral information will indicate the range of tools, and which is appropriate for which job. If you're just doing occasional projects and applications, Pete said, "the \$99 [Delta Shopmaster] table saw might be the correct product for you. If you're

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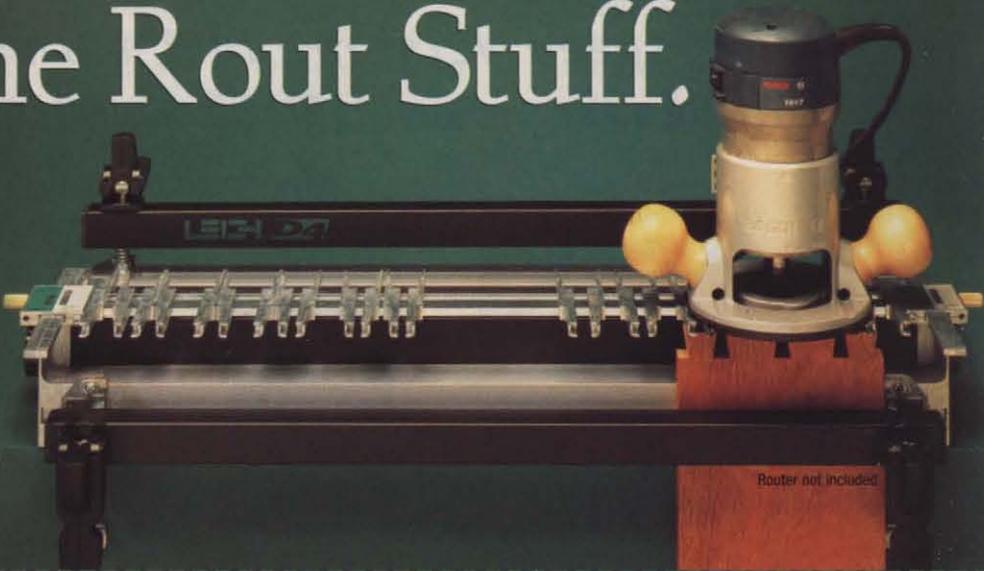
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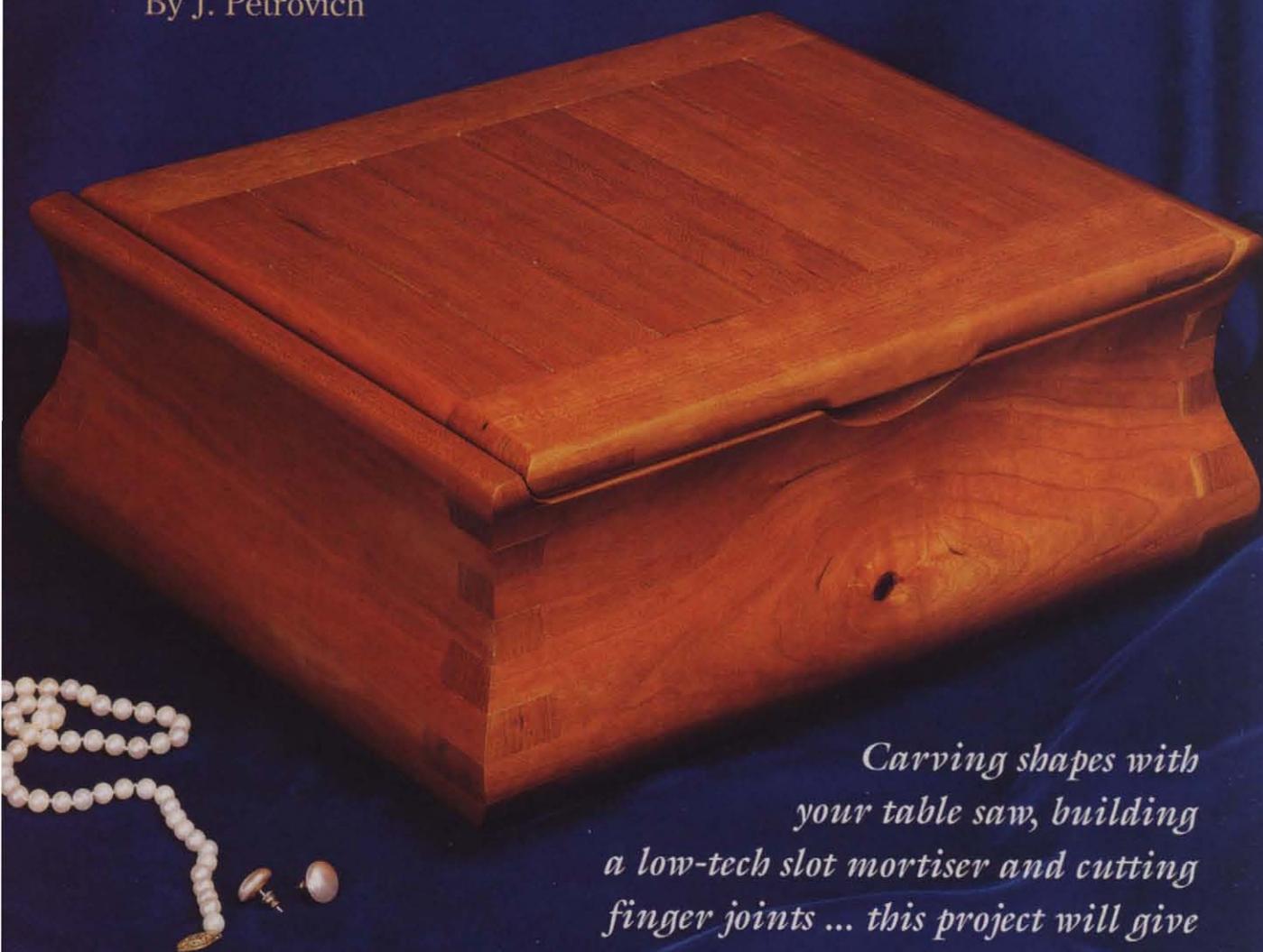
Go ahead, build another basement underneath your current one. There's no priming. There's no worrying the hose will come

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Bombé BOX

By J. Petrovich



*Carving shapes with
your table saw, building
a low-tech slot mortiser and cutting
finger joints ... this project will give
you a woodworking workout.*

The idea for this little chest grew out of a personal fondness for the bombé shape and a pedagogical crisis. About a dozen years ago, I was teaching an advanced cabinetmaking class at a community college. Traditionally, my third year students were required to produce a final project during the last month of class. On the first day of their last month, the shop lost all of its three-phase power, save to three table saws. The maintenance crew at the college was less than hopeful of a speedy repair.

In a moment born of desperation and inspiration, and tempered with a large dose of blindingly good luck, I was able to lay out the requirements for a new final project that we re-dubbed "table saw composition." This small jewelry box was the result.

Key Points Before the "Gee-whiz" Machining

While cutting the curve of the box at the table saw is the "gee-whiz" part of the project, there are several critical points before the shaping occurs. Because the sides of the box rise above the front and back, the top of the sides need to end in a finger. For this project I used 5/4 stock with a 6" dado stacked to cut 1/2" joints. Starting with a space at the bottom of the sides meant that the 5" wide stock would end with a finger. See the *Elevation Drawings* on the following page for details. My choice of finger joints for this box was part aesthetic and part engineering. Aesthetically, the visibility of the joints helps to emphasize the "S" curve of the chest. From an engineering standpoint, the box is stronger than it really needs to be.

Begin by selecting your stock for the front, back and sides (pieces 1 and 2) and cutting them to the dimensions found in the *Material List* on page 30. Then grab your dado set and prepare to make the finger joints. If you are new to making finger joints, the *sidebar* below will get you going in the right direction. Novice or pro, testing your setup with scrap wood is more than just being prudent. Once the sides and front and back are machined and fitting well, you can move on to the fun stuff.

Shaping the Sides

Shaping wood on the table saw requires a bit of patience and a little imagination. Patience, to make the repeated cuts required to safely mold wood in this fashion ... and imagination to forecast the shape of the arc that the blade will cut. With this modified ripping process, instead of feeding the wood directly into the blade, the wood is fed in at an angle controlled by auxiliary fences.

To start, sketch the desired profile onto an end of one of the boards. Use this profile to help align the auxiliary fences to the blade. From the outfeed side of the saw and with the blade raised, sight along the table at the arc of the blade and think of it as a cutting profile (see the photos on the following page). What you are after is the angle that best matches the profile sketched on the end of the board.

Once the angle is "sighted-in," securely clamp the two auxiliary fences to the saw table. The resulting "chute" should be snug against the box sides, but not restrictive.

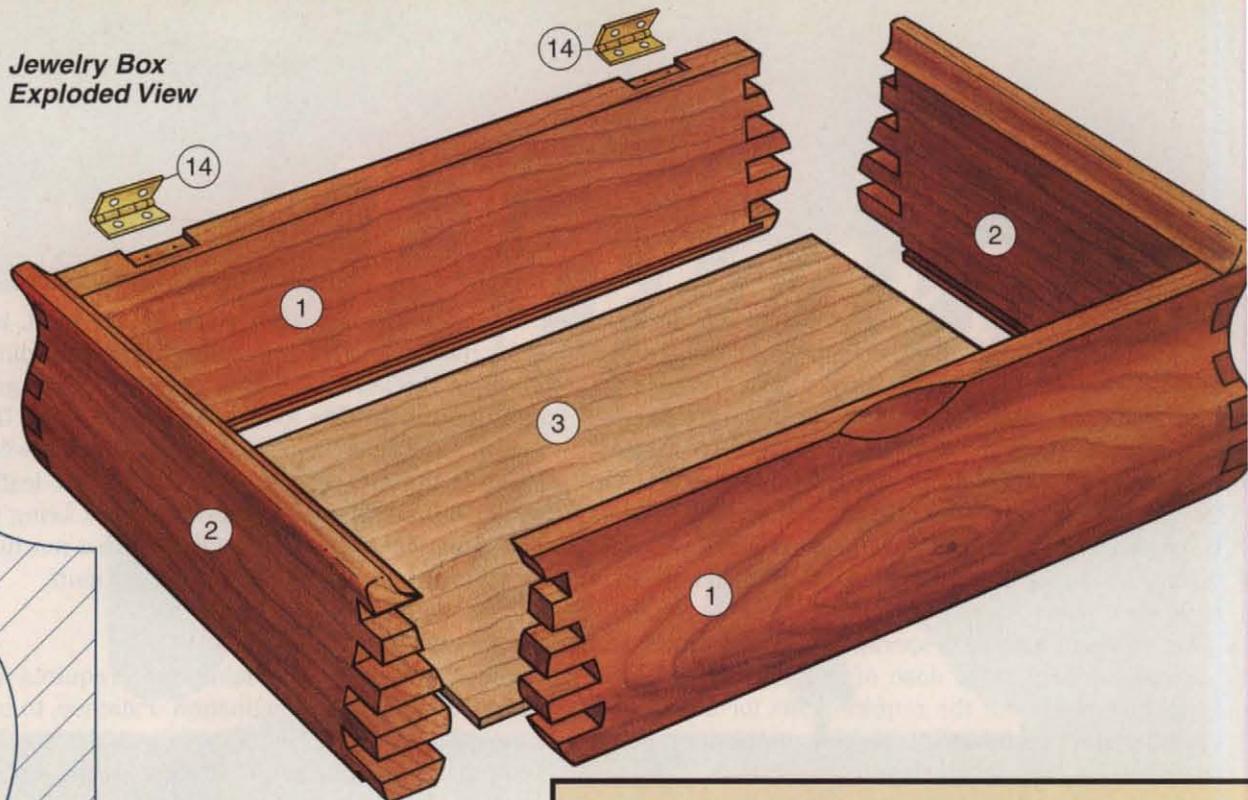
Table Sawn Finger Joints: Quick Refresher Course

Finger joints (aka box joints) are simple to make, nice to look at and very durable. Use a jig (shop-made or manufactured) to form the fingers. The author chose to make a one-time jig using a backer board mounted to his miter gauge. To make your own, cut an opening (using the dado setup prepared for the finger joints) to accept a registration pin into the backer board. In this case, the pin should be 1/2" X 1/2" X 1 3/4". Glue the pin into the opening and reposition the backer board so that the pin is moved to the right of the dado head, twice the width of your dado cut (in this case 1"). Now secure the jig to your miter gauge. This may take some tweaking to get exactly right. You are now ready to make your finger joints. Using scrap lumber to make test cuts is the next step in successfully completing the task. One handy trick for making the sides of this box is to clamp one of the completed front or back pieces onto the registration pin and then use it to help register the first cut on the end pieces.

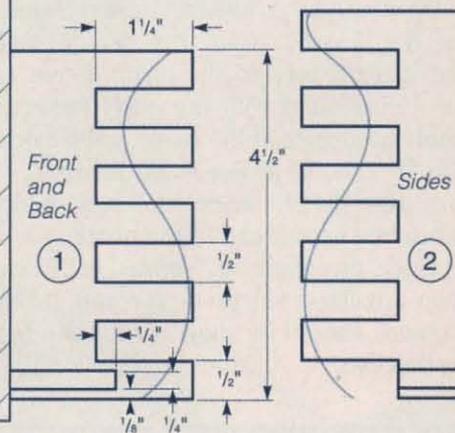


Using a registration pin mounted in a backer board, the author made a "one-time" finger joint jig for his table saw.

Jewelry Box Exploded View



Front, Back and Sides Finger Joint Detail (Inside View)



Molded Side:
Full-sized

MATERIAL LIST

	T x W x L
1 Front and Back (2)	1 1/4" x 5" x 12 7/8"
2 Sides (2)	1 1/4" x 5" x 10 1/8"
3 Bottom (1)	1/4" x 8 1/8" x 10 13/16"
4 Lid Rails (2)	3/4" x 1 5/8" x 11 25/32"
5 Lid Stiles (2)	3/4" x 1 11/16" x 9 7/8"
6 Lid Muntins (5)	3/4" x 1 11/16" x 6 5/8"
7 Tray Fronts and Backs (4)	3/8" x 1 1/4" x 10 1/2"
8 Tray Sides (4)	3/8" x 1 1/4" x 7 1/2"
9 Tray Handle (2)	3/8" x 1" x 10 5/8"
10 Tray Bottoms (2)	1/8" x 7" x 10"
11 Small Tray Front and Back (2)	3/8" x 1 1/4" x 7 1/2"
12 Small Tray Sides (2)	3/8" x 1 1/4" x 5 1/2"
13 Small Tray Bottom (1)	1/8" x 5" x 7"
14 Brusso Hinges (2)	Brass, 90°

How to Shape the Box Sides on the Table Saw

Creating the classic bombé curve on this box begins on the table saw. The author used auxiliary fences placed at an angle to the saw blade to guide this process. The box is machined while dry fitted together so that the corners of the box are shaped along with the faces of the sides, front and back.

The key to this process is to remove only a small amount of material with each pass over the blade.



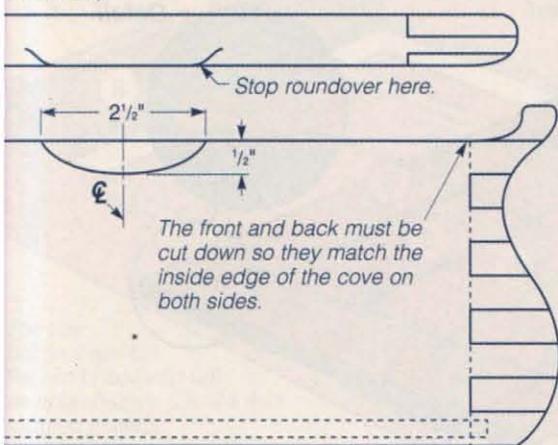
Two views of the same cut, from overhead and "looking down the chute" (inset). Determine the fence angle using the "line of sight" method.



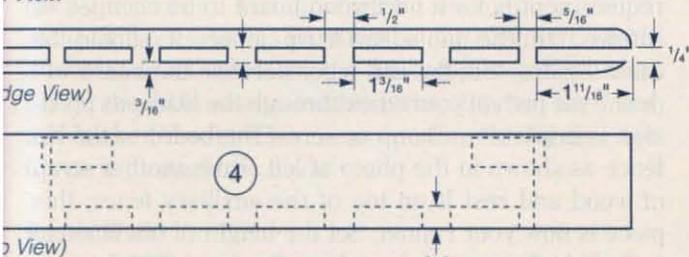
With the angle established, raise the blade 1/16" with each successive pass. Continue until you have the desired curve on all four faces.

Bombé Jewelry Box Machining Details

Front View)



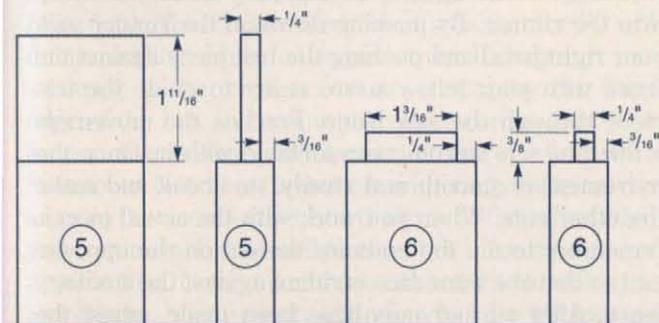
Lid Rail



Top View)

Lid Stile and Muntin Tenon Detail

(Top and Edge View)



Because the ends of the box sides need to be shaped to the same profile, I shaped the box as a unit. If the box's joinery is snug, clamping it during the molding process is not necessary. If the joinery's fit is a bit loose, however, a clamp or two will tighten the joints.

Now set the height of the blade at a little over $1/32$ " above the table. If you feel uncertain about your angle and how it will look as you mold the sides, use a test piece. When you're satisfied with the test piece, shape the box. Make each pass or cut about $1/16$ " deep and use a slow feed rate. Don't be too concerned about burning the wood with this slow rate of feed. Continue making passes on all four sides of the box until you have formed the desired profile. To remove the material at the bottom of the profile, use the table saw with the blade tilted. To finish shaping and to smooth the sides, I used a hand plane and scraper for the convex shaping and coarse sandpaper with a shaped sanding block. Final sanding includes more of the same ... a lot more!

Next, let in the bottom (piece 3) of the box. I typically used a $3/16$ " straight bit in my router table and made two cuts per groove just to be sure I could properly accommodate undersized plywood. On the back and front, this is a blind operation (you cannot observe the bit cutting the wood directly). Start and stop the cut in exactly the same place by marking the router table or fence with start and stop marks to correspond with marks on the front and back. On the sides, it is a simple through-groove.

Making the Lid

To complement the bombé sides of the box, I wanted a lid that had some shape to it — enough to embellish the curve of the sides. This lightly arched frame-and-panel construction was the result. Emphasizing the linear aspect of the lid, I made lid rails, stiles and muntins (pieces 4, 5 and 6) ripped from 6/4 plain-sawn stock, resulting in faces showing quartersawn grain.

The joinery used is open mortise and tenon. These are easily made at the table saw with a shop-made tenoning jig. The approach is decidedly "low-tech." The first



The lower bout of the S curve is started by slicing an angled cut at the bottom edge of the box, as shown in the inset.

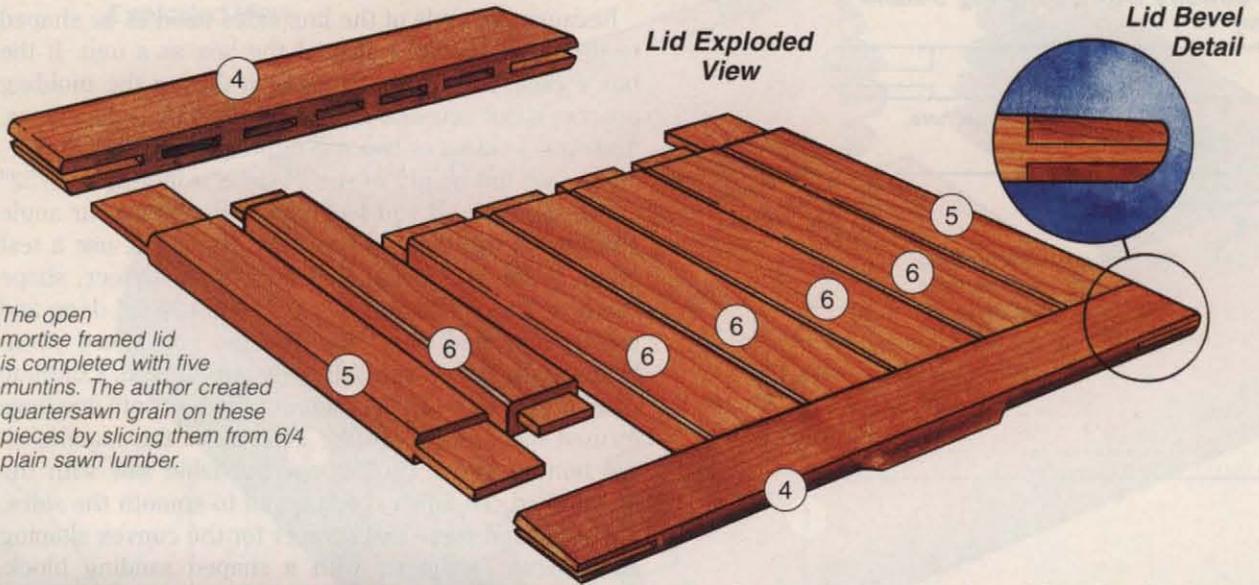


Finish the box's elegant shape by planing, scraping and sanding.



The author used a wide collection of hand tools and sanding blocks to bring the bombé box to its final shape.

Lid Exploded View



The open mortise framed lid is completed with five muntins. The author created quartersawn grain on these pieces by slicing them from 6/4 plain sawn lumber.

requirement is for a hardwood board to be clamped or screwed to the table saw's rip fence. It should be carefully dressed, flat and true. Because the board will define the path of your stock through the blade, its precision is important. Clamp or screw the board to the rip fence as shown in the photo at left. Take another scrap of wood and rest it on top of the auxiliary fence; this piece is now your runner. Set the height of the blade to the width of the frame member, allowing 1/32" extra.

Next, lay out the mortises and tenons as shown in the *Elevation Drawings on page 31*. After adjusting the fence to cut the first pass on the stiles' open mortises, take a piece of scrap wood of the same dimension and rest it on its end against the auxiliary fence and clamp it to the runner. By pushing down on the runner with your right hand and pushing the test piece against the fence with your left, you are ready to guide the test piece through the saw blade. Practice the movement a few times to become comfortable with it. Once the movement is smooth and steady, go ahead and make the other cuts. When you work with the actual pieces, remember to flip the ends for the cut on the opposite end so that the same face is riding against the auxiliary fence. After all four cuts have been made, adjust the fence to make the remaining cuts.

With the open mortises cut to size, you're ready to cut the rails' tenons. Again, a test cut or two saves time and wood. Line up the blade with the edge of one of the mortise pieces — as though you wanted to enlarge the mortise by the width of the saw blade. Using the clamp and runner, make a test cut on scrap lumber. If the cut is satisfactory, make the four cuts necessary to establish the first side of all four tenons. Repeat the procedure for the second cut on the opposite side of the tenon. To establish the clean straight line at the tenon shoulder, I used the miter gauge and a standoff block clamped to the rip fence. Remember that the depth of cut necessary to remove a tab from one side is less than the other.

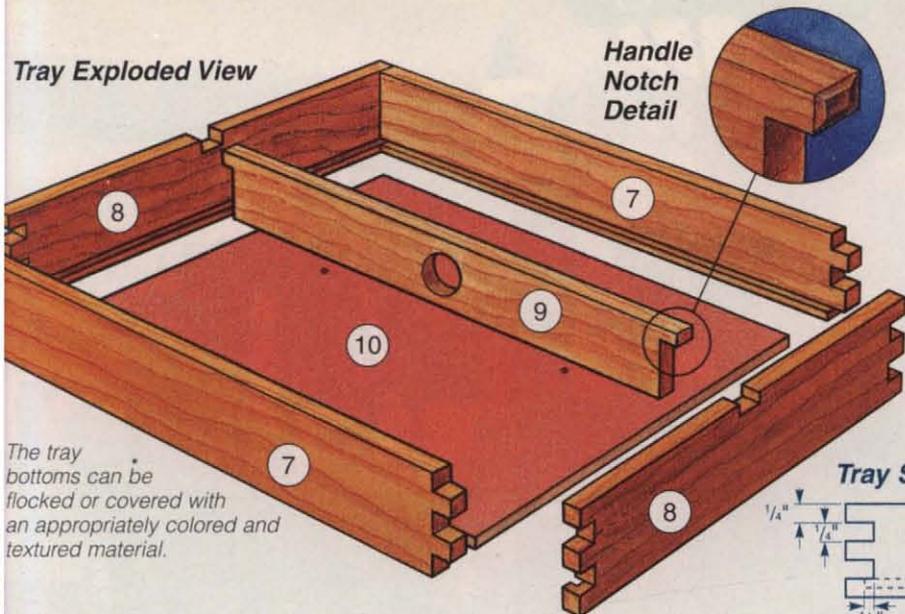


The author used a low-tech mortising jig to make his open mortise joints. This is a basic approach that is accessible to any woodworker.



Using a stand-off block to register the cut and his miter gauge for safety, the author machined tenons onto the ends of the muntins.

Tray Exploded View



The tray bottoms can be flocked or covered with an appropriately colored and textured material.

Cutting the tenons on the individual muntins requires the same process. The mortises for the muntins are cut at the drill press with a Forstner bit and cleaned up with a mortising chisel. With the lid assembled as a unit, I used the table saw to establish the slope on the front and back of the lid. This means putting the lid on edge to run it through the blade.

Router Work

As the lid of the box is oversized, both the lid and the box will require routing. For the lid, which should be routed as a unit, I used a roundover bit. The top of the box sides require a cove, which is done with the box disassembled. Next, cut down the front and back so they meet the cove cut perfectly (see the *Elevation Drawings*). This creates a recessed area that the lid will fit into, adding subtly to the box's overall shape.

Letting in the small access cove, shaping the front edge of the box and easing the edges comes next. The access cove is done with a cove bit and the lid with a roundover. Note that the bottom edge radius stops at the edge of the access cove, starts again at the other edge and continues. It's a small feature, but I like its sense of organization. Now you can assemble the box with glue and clamps, taking plenty of time to be sure it's square.

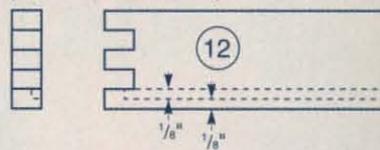
Trois Trays

As this box does duty as a jewelry box, there are three trays to construct to hold various jewels, gems and trinkets. They use finger joints at the corners (you're a pro now!) and flocked or fabric covered bottoms. They are all mostly made out of 1/4" thick hardwood and can be produced in short order. Cut the parts (pieces 7 through 13) to size. Set up another finger joint jig and test fit the corners. Use this setup to form the handle notches, too. See the *Drawings* above for all your machining details. Rout in the groove for the bottoms and you are almost done. I drilled a hole in the handles of the large trays to make them easier to grip.

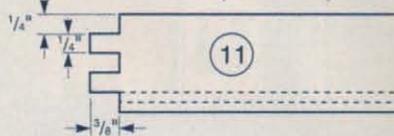
Handle Notch Detail



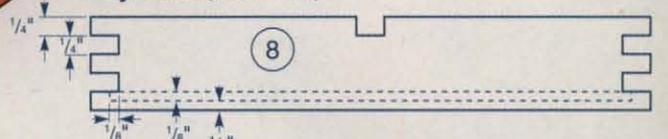
Small Tray Side (Front and End Views)



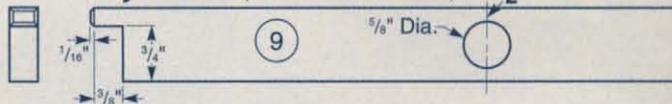
Small Tray Front & Back (Front View)



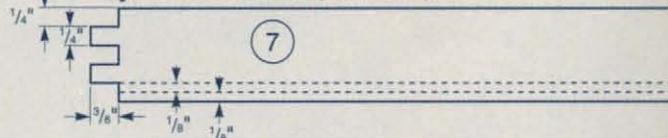
Tray Side (Front View)



Tray Handle (Front and End Views)



Tray Front & Back (Front View)



Finishing Up

Mounting the lid requires some sturdy hardware. Brusso makes a sturdy but discreet 90° stop hinge (pieces 14) that is easy to mortise in and perfect for this project.

Finally, the finish. Sand everything to 220 grit or finer. Use a quality oil finish, carefully rubbing it down with steel wool between coats. I was interested in producing a grain-enhancing sheen more than a shine.

Over the years I have made several of these small chests. No two are identical. But all of them retained the drama and beauty inherent to the bombé style.

J. Petrovich is a furniture designer and maker from Salinas, California. This is his first article for the Woodworker's Journal.

Not so much a specific style of furniture, bombé is more a description of a shape. French for "swollen," bombé-shaped furniture appears to swell and subside almost organically.





Building the Robinson Table

By Michael McGlynn

Graceful and lovely to look at, but demanding and rigorous to build, this Greene and Greene inspired dining room table will test your skills.

Over the years, I've built dozens of Greene and Greene pieces, but I had never found the opportunity to try my hand at one of their pedestal dining tables. My chance arrived when an old friend decided his card table no longer cut it as a dinner table for a family of four.

There are two main examples of Greene and Greene pedestal tables: the Robinson table and the Gamble table. Both have a pedestal that is heavy, with a timber frame and sculptural look; tops that are not quite round, but not square; and massive exposed wood slides. These features are remarkably beautiful, but are also, as I quickly discovered, very challenging to build. My inspiration for this project was the Robinson table. For the top and rim materials I selected even colored and grained mahogany. The mahogany for the base should be as straight grained as possible. And you need to select the wood for the slides extra carefully. If possible, it should all come out of the same plank, so the

density is the same throughout all of the slide components. As always, purchase your stock and rough cut it to size well ahead of when you will begin machining, so it has time to adjust to your shop.

Beginning with the Base

Although complex looking, the base is composed entirely of right angles and mortise and tenon joinery. The most difficult aspect of it is shaping the feet, slide rails and brackets.

The first step in constructing the base is to mill all the pieces to their correct dimensions, following the *Material Lists* on pages 37, 39 and 41. Keep an eye out for any unexpected twisting that may take place at this point — especially in the long rail members, as it may interfere with the smooth operation of the slides.

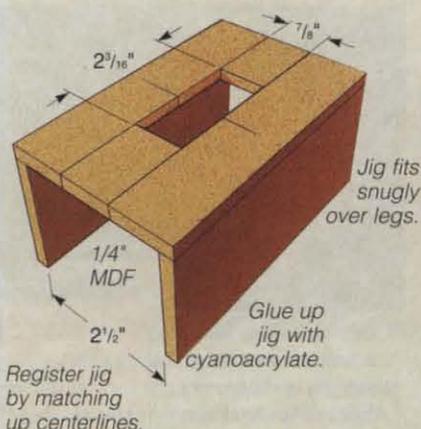
Laying out the joints and plug holes comes next, and it is the most confusing step in the construction of the base. I lay out one part (such as a foot or upright) completely, and then mark out all other like parts with a joint or plug centerline and, if

need be, an orientation mark. This method works very well for me, as I use my multi-router to cut the majority of these joints. Re-measure at least twice — it can save you a lot of heartache later on. (I incorrectly laid out and cut the lap joint in one of the rails — which I had already shaped — ruining six hours of work.)

Form your tenons and mortises now, while the stock is sticked up. The lap joint between the slide rails and uprights is a very simple, yet extremely precise joint requiring patience and a light touch. These joints are easily visible and need to be tight. The best way to ensure precision is to dry assemble each side of the base and take measurements directly at the top of the uprights. First, I cut the notches at the top of the uprights, then I follow with precision chisel cleanup. I cut the slide notches last, as it is their edges that will show the most where they intersect the uprights.

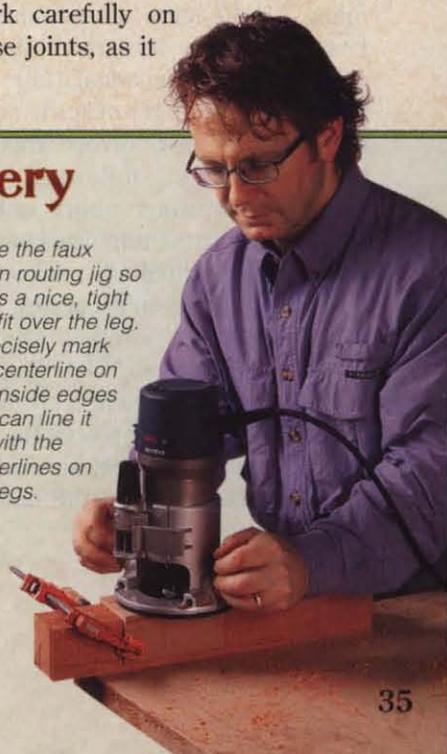
Work carefully on these joints, as it

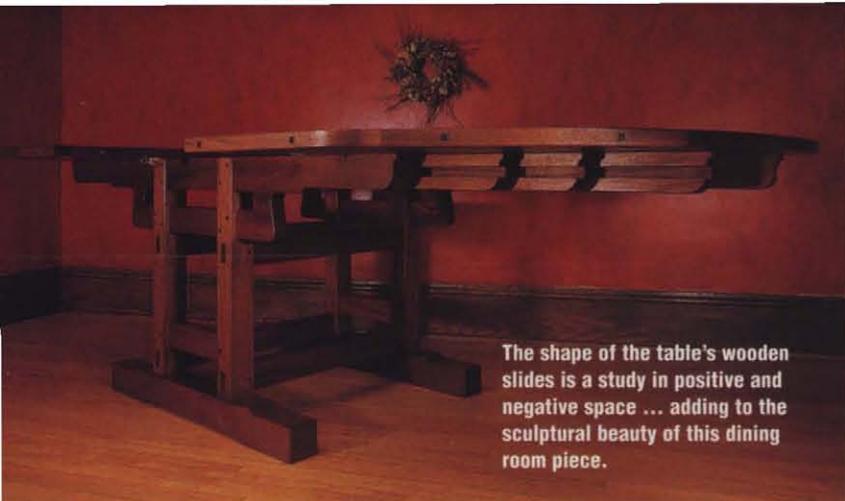
Faux tenon routing... beautiful trickery



To rout these mortises, use a solid carbide 1/4", downspiral bit with a 5/16" (3/8" o.d.) rub collar. Like the other plug holes, I cut them 3/16" deep and cleaned up the corners with a chisel.

Make the faux tenon routing jig so it has a nice, tight slip fit over the leg. I precisely mark the centerline on the inside edges so I can line it up with the centerlines on the legs.





The shape of the table's wooden slides is a study in positive and negative space ... adding to the sculptural beauty of this dining room piece.

is difficult to get a perfect fit on two lap joints at the same time, which is what is necessary.

Before you begin profiling the base parts, the faux tenon mortises and plug holes need to be cut. Double check your layout — now is not the time to drill a hole in the wrong place. The plug holes are cut with a mortise chisel in a drill press, while the false mortises are cut using the shop-made jig shown on the previous page.

Making the Templates

Profiling the feet, slide rails, and brackets involves making complicated and precise templates that you will most likely never use again. However, this is the only way to get the multiple parts with the precision required.

I made my templates out of 1/4" MDF and used the table saw for as many of the cuts as possible to ensure accuracy. It is critical that all curves be symmetrical, fair and true. Run your finger over the edges to test for bumps or divots. Make all the templates following the *Elevation Drawings* above and at right. Again, these templates ensure your success or failure ... take your time and build them accurately.

The last step before you proceed to rounding over and detailing out the base pieces is to cut a groove in the slide rails. These pieces (as well as eight of the 12 slides) have a 1/8" deep groove to accept the back of the T-rails.

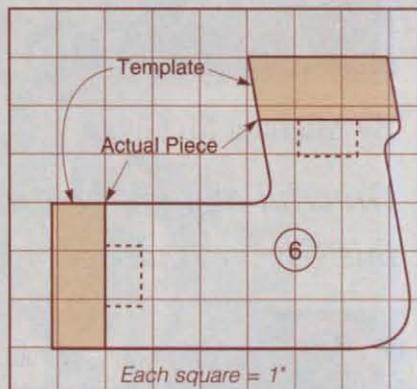
Before I start to round over and detail the base pieces, I like to raise the grain of all pieces with water and give them an initial sanding to 120 grit. Pay especially close attention to the template routed areas, as you must smooth out a bit of unevenness between the passes.

Rounded edges and softened corners are part of the distinctive Greene and Greene look, and it is important to take your time with these details. The first step is to do a complete roundover of all the appropriate edges with a 1/8" radius roundover bit. Just make sure you don't round over any of the tenon or lap joint shoulders. Once they are done, go over all of them with sandpaper to blend them perfectly.

Before I proceeded to assembly, I raised the grain once again and carefully sanded everything with 220 grit sandpaper. Now is the time to decide whether or not the table will be stained. It is far easier to

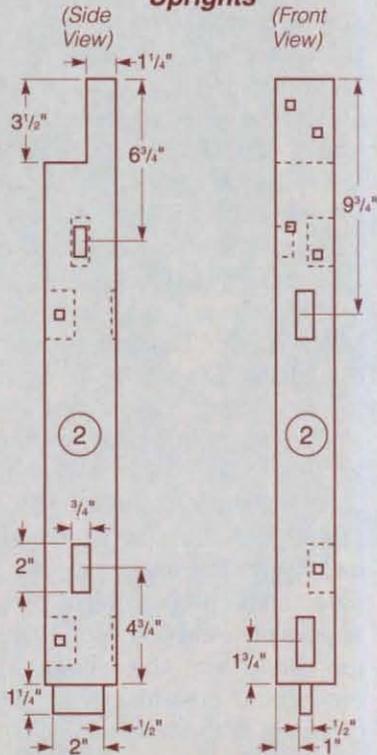
Bracket

Template and Machining Details



Attaching the brackets is the one operation where a little "slop" is acceptable. In order to slide the brackets onto their floating tenons when assembling the base, the tenons need to be just a bit undersized.

Uprights



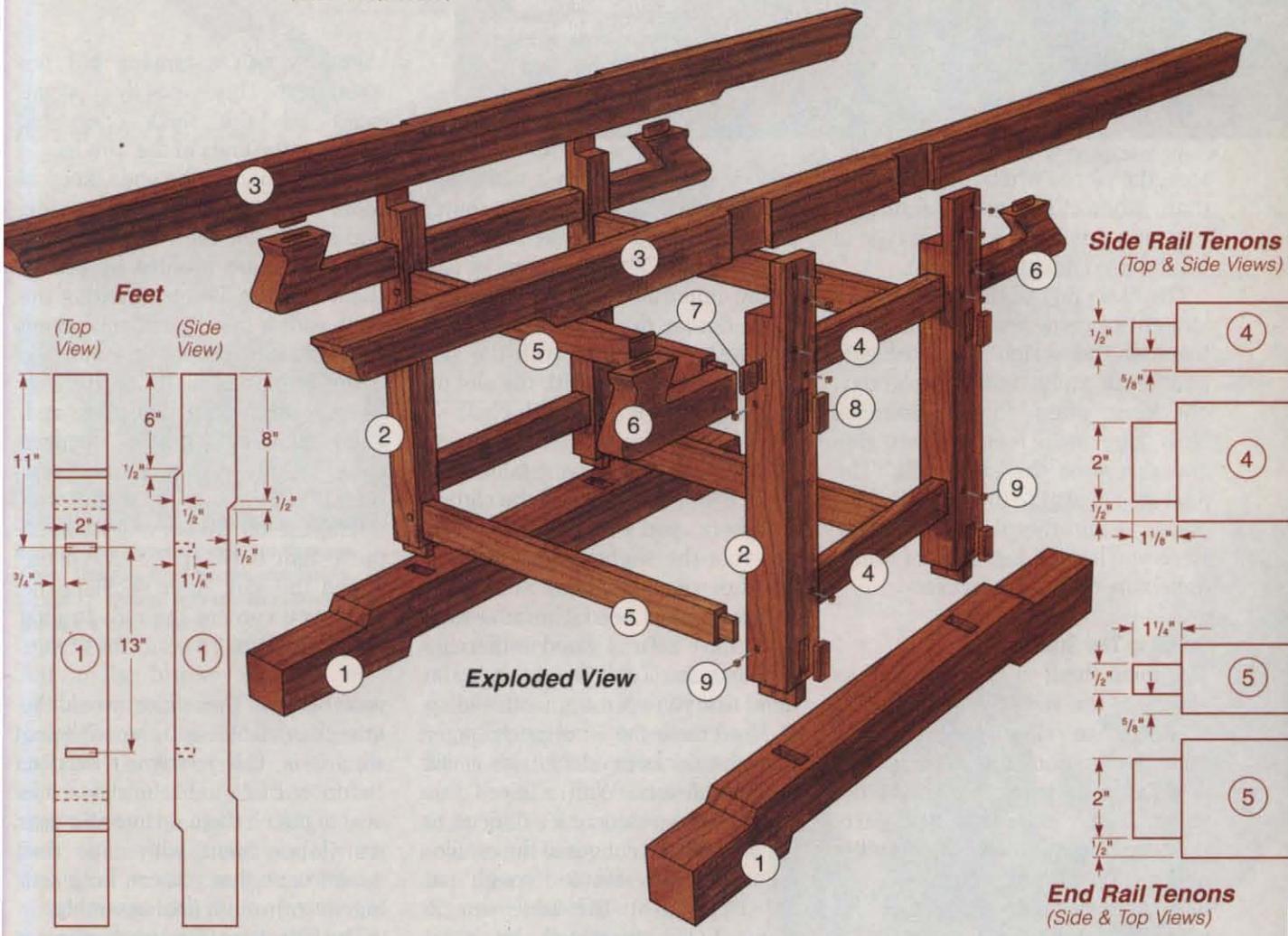
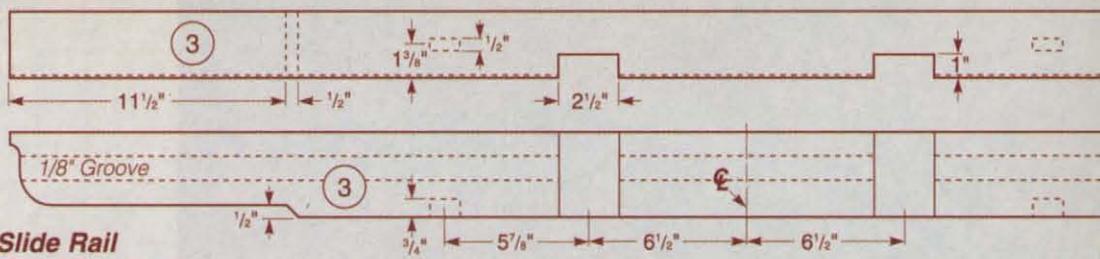
Taking the next step in template routing

The feet and a couple of other parts of this table are too thick to be template routed in a single pass. To solve this problem, the author devised a slick, two-step process. First, attach the template guide to the stock and, using a pattern routing bit (bearing at the shank of the bit), shape the foot, reaching slightly past the centerline of the stock (see drawing at right). Next, switch to a flush trimming bit (bearing at the end of the bit), flip the stock over, and use the already routed shape to guide your cut.



The first cut, using a template as a guide, allows you to shape more than half the thickness of the foot accurately.





Flip the foot over and switch to a flush trimming bit, and you can complete the shape of the foot using your previously routed profile to guide the router bit.

MATERIAL LIST BASE

	T x W x L
1 Feet (2)	4" x 3 1/2" x 35"
2 Uprights (4)	3" x 2 1/2" x 26 1/4"
3 Slide Rails (2)	3 1/2" x 2 3/4" x 61"
4 Side Rails (4)	3" x 1 3/4" x 12 3/4"
5 End Rails (4)	3" x 1 3/4" x 27"
6 Brackets (4)	1 3/4" x 4 3/4" x 6 1/2"
7 Floating Tenons (8)	1/2" x 1 1/4" x 1 1/2"
8 Faux Tenons (8)	3/4" x 2" x 3/8"
9 Ebony Plugs (60)	3/8" x 3/8" x 5/16"



The bold use of Asian influenced timber frame construction stands in stark contrast to sparsely placed delicate ebony plugs.

stain the pieces when they are apart than when they are assembled. I stained this table with one coat of water-based aniline dye stain.

The assembly of the base is very straightforward. Start by bringing together the uprights and the side and end rails with an epoxy, checking often for squareness. Next, glue on the feet, and then glue and screw on the slide rails. The final step is to glue the brackets into place, using the floating tenons. Here you'll need just a bit of "slop" to be able to fit the brackets.

Building The Slides

The main thing to keep in mind as you build the slide assembly is that it needs to slide freely. Every milling operation in its construction is going to release tension in the wood, which will make the parts want to warp minutely. So you must mill and fit, mill and fit, and mill and fit. Patience is indeed a virtue, and you will be rewarded for it.

The slides consist of interlocking T-slotted slide members and T-rails, along with stop blocks and closing plates. The best place to start is with the slotted slide members.

Begin by milling the pieces to size, making sure you give them time to adjust before final dimensioning. As I learned the hard way, it is best to profile the ends of the slotted members before you mill out the T-slots. Double-face tape the template into position, and use a template bit in a router table.

Cutting the T-slots into the sliding members comes next. The first step is to waste away most of the center

groove with passes on a table saw. Then use a T-slot cutter in a router table, making two passes to complete the shape. There is one vitally important thing to keep in mind during this process: you are making six members with the slot on one side and six with the slot on the other! Mark them with chalk so you don't end up with four slide sets that all work on the same table side.

Once you have shaped the sliding members, you can flip them over and rout the slight groove in eight of the twelve. The innermost members don't need it because they won't have a T-rail glued to them.

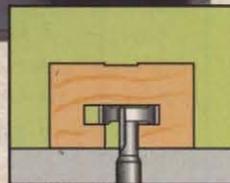
Milling the T-rail is next. Keep in mind that you want a smooth sliding fit. Don't make the T-rail much longer than the necessary length as it will tend to distort. With a piece this small in cross-section, it's difficult to get an accurate cut out of the profile.

For the best results, rough cut the T-profile on the table saw to about 1/16" oversized, let it sit overnight to straighten any resulting twist, and cut to size.

You should now have 12 slotted members and T-rails that will fit



After plowing a simple groove into the slide member, expand the T-slot with a router bit. (An Amana 45662.)



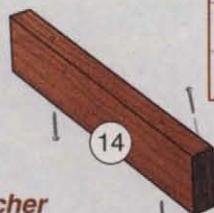
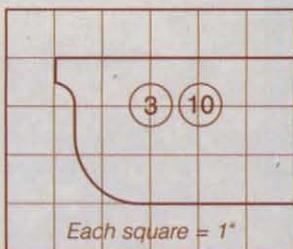
together with a tapping but not a sliding fit. This is exactly what you need for the next operation: profiling the ends of the T-rails.

When profiling the ends, keep in mind that six are for the left side, and six are for the right side. The T-rail ends are profiled by sliding them into the T-slots, marking the ends with a pencil, trimming them oversize, and reinserting into the T-slot with about 1/16" protruding. Then, clamp them into place and, using the already profiled member as a template (see photo, next page), rout them to shape with a template bit. To prevent blowout, put a shim between the ends of the T and the slot. After profiling the ends, you can cut the rails to final length, and you're ready for fitting.

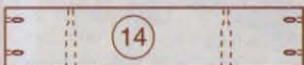
In a perfect world, all of the members of the slides would be interchangeable. But, wood being what it is, this just won't happen. Before starting to fit the slides, it is best to match them up into four sets and label them with tape and a marker so that you can keep sets together through final assembly.

The first step of fitting is to pair the T-rails with the 1/8" deep grooves. This will take a little sanding and scraping of the T-rail sides. The next step is to raise the grain and thoroughly sand everything, including the inside of the T-slot. Sanding the inner faces of the T-slot takes care of any minute vertical warp; sanding the underside faces of the T-rail takes care of any horizontal warp. When testing, it is important to press fit the T-rail into its proper groove, as this will show you the true horizontal alignment and spacing. Be patient at this stage. The fit you want is a nice, smooth slide without a hint of binding.

Slide Profile Template



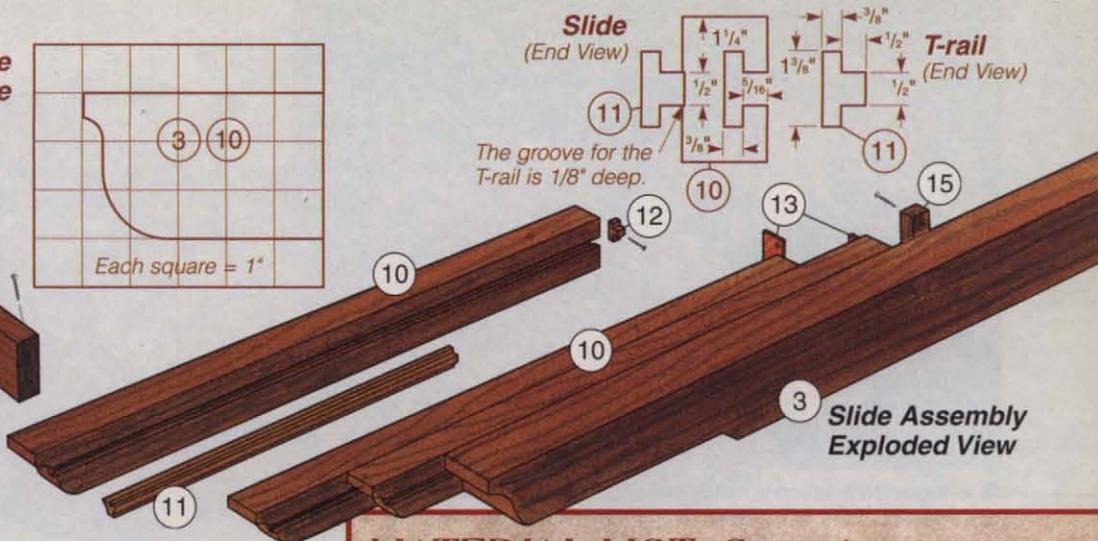
Slide Stretcher Pocket Hole Locations (Inside View)



Brass closing plates are mounted as shown above. Also note the T-shaped stop blocks (pieces 12) secured with screws in the T-slots next to the closing block.

Slide (End View) and **T-rail (End View)**

The groove for the T-rail is 1/8" deep.



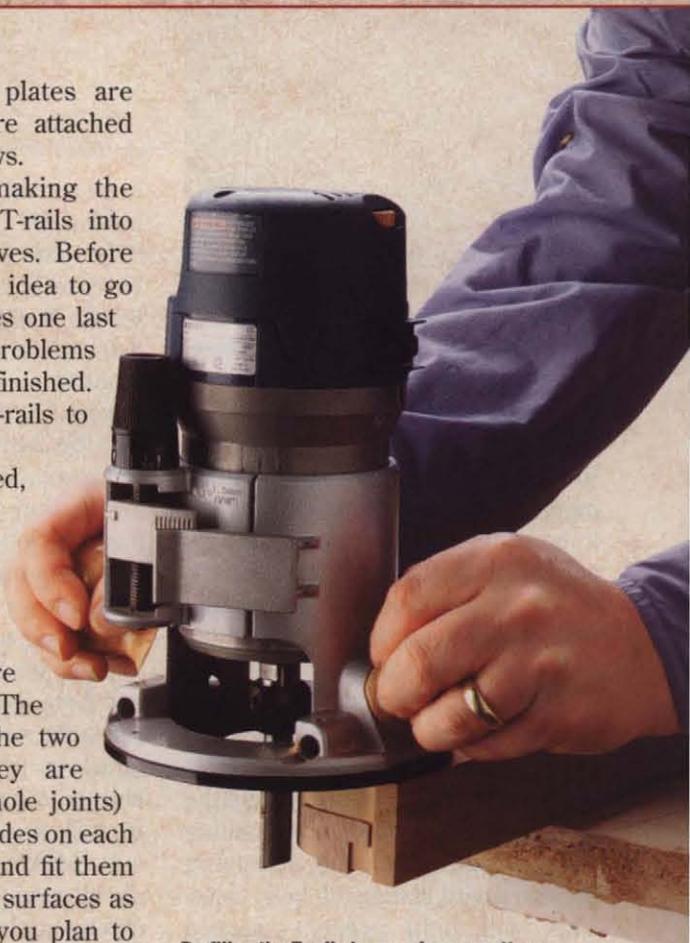
MATERIAL LIST SLIDE ASSEMBLY

	T x W x L
10 Slides (12)	3" x 1 3/4" x 30"
11 T-rails (12)	1 5/16" x 1" x 20"
12 Stop Blocks (12)	1" x 1 3/8" x 7/8"
13 Closing Plates (8)	2 1/2" x 1 1/4" x 1/8"
14 Slide Stretchers (2)	1 1/4" x 2 3/4" x 14"
15 Center Stop Blocks (2)	1" x 3" x 1/2"

screws. The closing plates are made of brass and are attached with countersunk screws.

The final step to making the slides is to glue the T-rails into their appropriate grooves. Before doing this, it's a good idea to go over the fit of the slides one last time; better to catch problems now than when you're finished. Don't forget to glue T-rails to the outer slide rails.

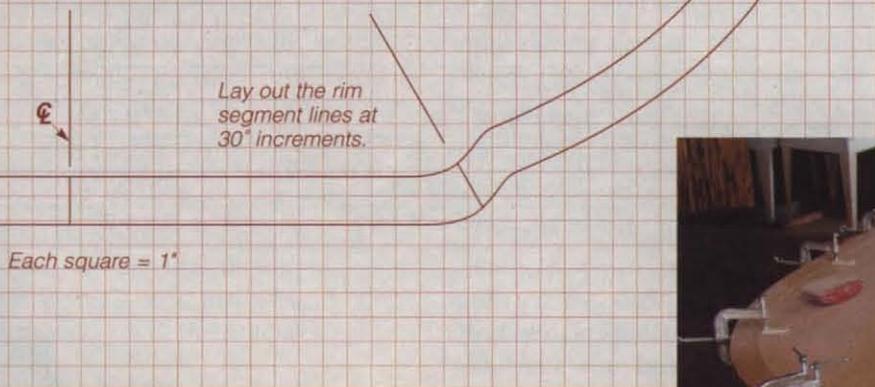
After the glue has dried, slip all of the slide members into their proper places on the base, install the stop blocks and closing plates, and make sure the slides work well. The slide stretchers join the two banks of slides. They are attached (use pocket-hole joints) to the two innermost slides on each end of the table. Cut and fit them now, and prepare their surfaces as you did the slides. If you plan to stain the table, you can then disassemble all pieces, stain them, and set them aside.



Profiling the T-rails is one of many pattern routing tasks required in the building of this project. Here the author uses the shape of a T-slotted slide member to guide the router as he shapes a T-rail end.



To make perfectly accurate mating templates requires patience and perseverance. Think of the template making process as a meditative experience, (similar to that of sleeping on a bed of nails).



NOTE: Building the templates used to shape the table's top elements is perhaps the most significant challenge of this project. Use the drawings at left as a starting point for the three templates you'll need: one for the top, one for the inside edge of the rim and one for the rim's outside edge. The top and the inside rim edge template should mate perfectly. This is done by aligning the edges of the templates, marking the areas where they touch (by doing so, they actually hold the templates apart) and then carefully sanding those spots. These areas where the templates touch will get larger and larger as the templates become more accurate. This process took the author the better part of three days to complete.



Clamping the rim to the tabletop is a significant task. Affixed with epoxy and located horizontally with the aid of multiple small splines, this is the most visible joint on the entire table project.

Making The Top

I prefer to have the rough-cut top wood sitting in my shop for at least a month before I mill it to final dimensions for glue-up. The top has very little secondary structure — such as an apron — and needs to end up as flat as possible.

Your first step is to joint and plane the boards to $1\frac{1}{16}$ ". After thickening, lay out your boards on a benchtop and arrange them to achieve both the best grain pattern and even board widths. Then joint, rip, and joint your boards to width.

With your boards cut and jointed to size, lay out the two top halves and the leaves. Mark the leaves and tops for biscuit joints and cut. After cutting the biscuit joints, glue up the top and leaves with epoxy, taking care to equalize the clamping pressure with clamps on both faces. This will help prevent warped panels. Once the glue has dried, sand the tops and leaves to a uniform 1" thickness with a wide belt sander.

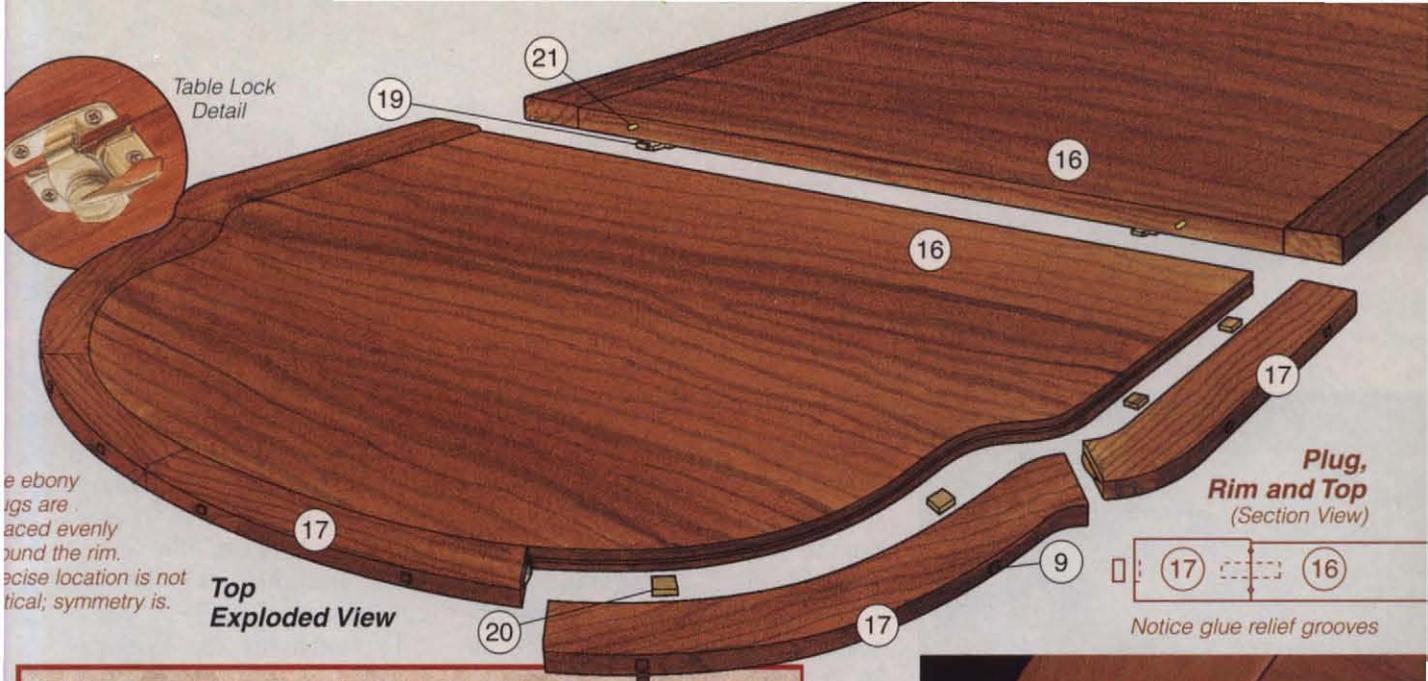
As you did with the base, you will now need to spend a bunch of time making very precise templates for the top and the outer and inner rim edges. While they will help you achieve a perfect job, it is likely you will only use them once. The keys to the top templates are symmetry, smoothness, and perfectly interlocking joints. The *Drawing* above will help, but you will still need to carefully smooth the template and check its symmetry by tracing one side onto onion skin and flipping it over to see if it matches the other side. Make minute corrections and check again. It is best to make all three templates at the same time.

All aspects of these templates are very important, but the gapless fit between the top template and the inner rim edge template is the most

critical aspect to a good job. To put this into perspective, I spent the better part of three days making and fitting these templates.

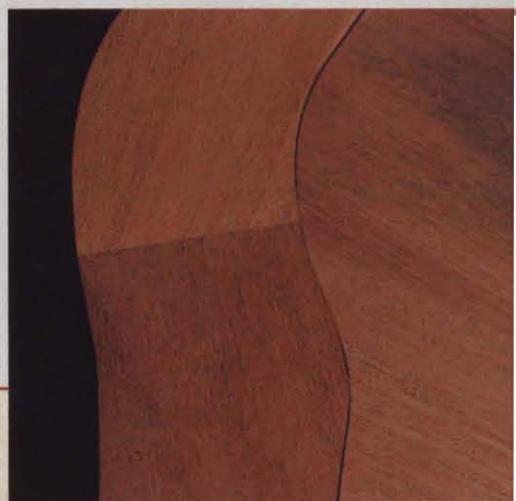
Once you have your templates made, you can rough cut your tops to shape, double-face tape and clamp your template into place, and rout the top to shape.

It is now time to move on to the rim. Mill the rim stock to $1\frac{1}{16}$ ", taking care to keep the stock as flat as possible. The *Drawings* will indicate the sizes and angles of the pieces that make up the rim blanks. When cutting the pieces for the rim blank, take extra care to get the end angles right on, as even a half-degree mistake can make a huge



MATERIAL LIST Top

	T x W x L
16 Tops (2)	1 x 31½" x 56"
17 Rim Material (1)	1½" x 4½" x Varies
18 Leaves (2)	1" x 31½" x 24"
19 Table Locks (2)	Brass
20 Splines (32)	¼" x 1" x 7/8"
21 Leaf Pins (6)	Brass



The joint between the tabletop and the border must be without visible gaps. Accurate template work is the only way to achieve such a long continuous joint.

difference. Once satisfied with the fit, you can biscuit joint the ends and glue them up with epoxy. As is obvious from the drawing, it's critical that you place the biscuits where they won't be exposed when the outside is routed to shape. When the glue has dried, clean up both faces and sand to 120.

Using the two rim templates, trace the inside and outside lines on the blank rims and then band saw to within 1/16" of the inside line. Leave the outside rough for now. After carefully taping and clamping the inside template down, rout the inside rim edge with a template bit. When both inside edges have been cut, the outside edge can be cut 1/16" oversize on the band saw.

I spent quite a bit of time thinking about how to attach and align the rim with the top. I finally decided to use a spline system in conjunction with glue relief grooves to get the strength I wanted without producing any glue squeeze-out at the top surface/rim joint.

With the help of a scrap piece of rim material to check alignment, rout a groove in the tops with a 1/4" three-wing cutter. Then, using the same bit in a router table, rout the rims with a corresponding groove. When used with a spline, the rim should be flush with the bottom and stand 1/16" proud of the top. The groove should stop just short of the center joint.

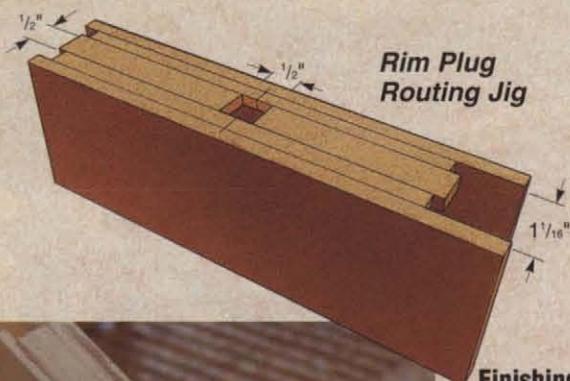
It is easiest to cut the glue relief grooves now, before you start fitting the rim to the top. I do this — very carefully — with a utility knife.

To ease the process of fitting the rim, which involves holding the rim against the top a number of times, I glued some short pieces of spline material in place so that when I pushed the rim in place I didn't have to worry about holding it up.

The fit between the rim and top must be perfect. My motto for this type of fitting is "slow and cautious." At this point in the process, if you decided to leave your table natural, the rims can now be glued on, using

the splines, epoxy, and a lot of clamps. If your table is to be stained, it is far better to complete building the rims and stain them, along with the top, before the rim is glued into place. Without the rim glued in place, you will need to temporarily affix it so you can rout the outer edges and cut the plug mortises. The best way to do this is to accurately locate the plug mortises and use those holes to sink #6 screws. The screws need to be sunk at least 5/16" below the surface. Only after routing the rims to size should you make the rims for the leaves.

I made the rim plug mortises with a combination of router template, guide-down spiral bit jig and a chisel.



Routing the mortises into the rim for all of the ebony plugs is achieved using a small clamped-on jig. The router is outfitted with a 1/4" bit and a 3/8" o.d. rub collar.

Finishing

There are two different finishes used on this table: catalyzed lacquer on the majority of the table, and Sam Maloof's oil on the slides. I used three coats of oil, which makes for a slippery finish that can be renewed as needed. The base, top, and leaves are all sprayed with four coats of catalyzed lacquer with careful sanding and buffing between coats.

After the oil on the slides had cured for several days, I buffed out all the surfaces with a fine Scotchbrite® pad and gave all the parts several coats of paste wax.

Final Assembly

The final assembly of the table involves four steps: First, install the leaf pins; second, install the table latches; third, install the slides and fourth, screw down the top.

I prefer to install two leaf pins per edge, so that if some seasonal vertical movement occurs you can still put the leaves together. I use

brass pins and sockets as they look nicer and last longer. I install them using a centerline indexing drill jig.

Lay the tops and leaves upside down on a padded bench and attach the table latches. It is important that the latches work in all possible leaf configurations and do not interfere with the slides or the base. The slide members can now be slid into place and their stop blocks and closing plates installed.

To attach the top to the slides I laid the top upside-down on a padded surface and latched it together. With the help of a couple of friends, I set the base upside-down onto the top. After much measuring, I marked the slide screw holes by dropping a screw in each of them and tapping with a hammer. Before removing the base to drill the screw holes, I carefully marked the base position with tabs of masking tape. After drilling the screw holes, I screwed the top to the slides with 3", #8 flat-head screws onto which I had threaded a #6 washer. This combination of washer, screw and oversize hole allows the screws to rock slightly with seasonal changes.

Plugs Before Guinness

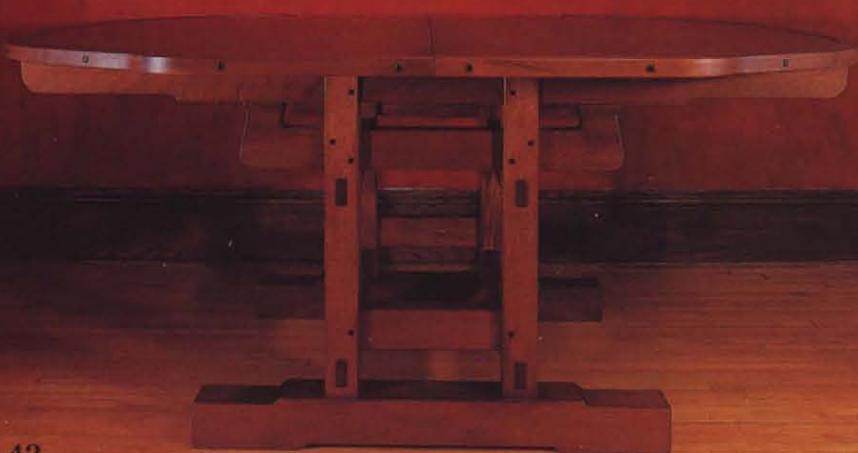
Now, before you can go and have that celebratory Guinness, there is one last amazingly time-consuming step that needs to be done — making and installing the 72 ebony plugs. My procedure for making these plugs has been discussed at some length in previous articles, so I won't go into it in depth here. The basics are to mill a 3/8" by 3/8" stick, sand and buff the end to a dome, cut it off, and repeat. To install the plugs, slightly bevel the inside end, put a drop of glue in the hole, and tap it gently into place with a hammer.

Contributing editor Mike McGlynn builds furniture for a living in Minneapolis, Minnesota.

My jig for the plug mortises (shown above) indexes off the centerline for each plug, so you will need to carefully lay out the centerlines. The last steps before staining are to round over the rim edges with a 1/8" roundover bit, flush up the ends of the rims with the top and leaf edges, raise the grain, and give it a pass with 220 grit sandpaper.

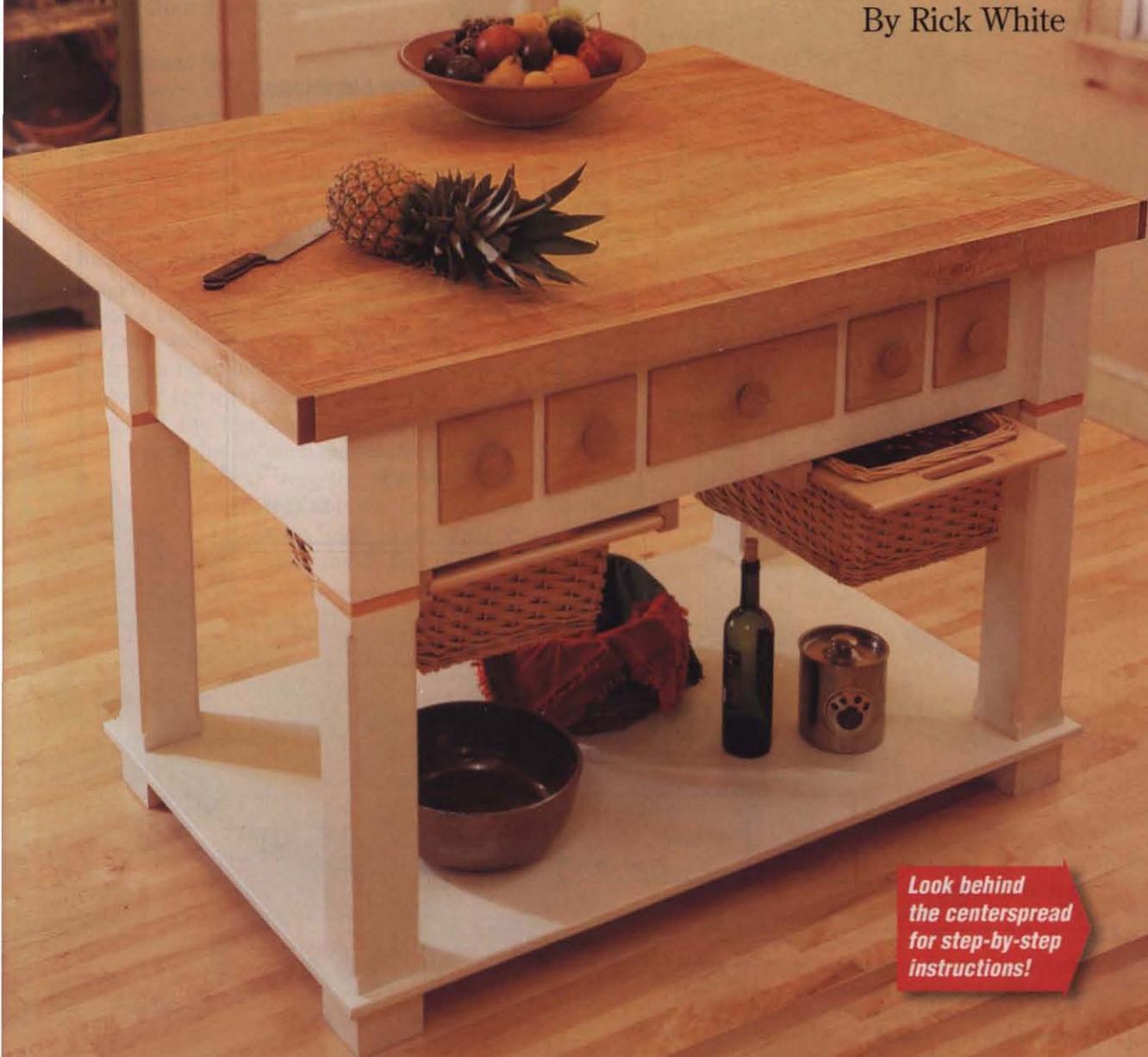
When the staining is complete, the rim can be glued into place. The temporary screws can be used to great effect for clamping purposes.

Details, such as exposed end grain on the faux tenons and the mirror image symmetry of the overall design, join together as a harmonious ode to the Greene brothers' legacy.



Classic Kitchen Island

By Rick White



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

ollow legs and a hard maple wrap-around top combine
give the impression of an old-fashioned butcher's table.
The right tools and a weekend or two in the shop are all
you need to complete this classic kitchen workstation.

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Kitchen Island

Kitchen islands are just wonderful. A counter height work surface where you can also eat, featuring ample storage as well as being darn good to look at. This project is reminiscent of an old-fashioned butcher's table, but is a lot easier to build because the top is a slick built-up assembly rather than a heavy chunk of solid hard maple. Let's get started by building the project from the top down.

Wrap-around Top

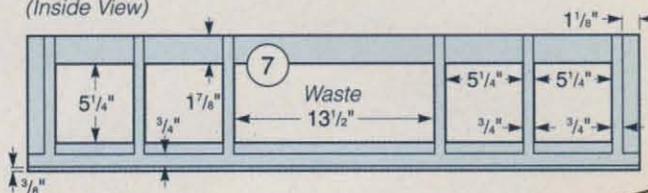
To achieve the butcher block look and strength, I began by cutting two pieces of birch plywood (pieces 1) and glued and screwed them together to form the core. Next, I selected attractively figured hard maple lumber to glue up for the top (piece 2). Even though I purchased 3/4" S-4-S lumber, I still took the time to make sure the edges were dead straight with a pass on the jointer. I glued up the top, and must admit that I took it to a cabinet shop to have it sanded smooth and flat on a wide belt sander. You can do it yourself with a plane or hand-held belt sander ... but I was in a hurry. Once the top was flat and smooth and trimmed to size,

I glued the top edges (pieces 3) in place, which provides an illusion of thickness. The end caps (pieces 4) were the next item that added to that illusion. Cut them to size and then plow a stopped groove on their inside faces (as shown in the

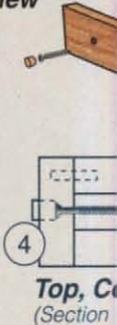
MATERIAL LIST Top Assembly

	T x W x L
1 Core (2)	3/4" x 40 1/8" x 52 1/2"
2 Top (1)	3/4" x 40 1/2" x 52 1/2"
3 Top Edges (2)	3/4" x 2 1/4" x 52 1/2"
4 End Caps (2)	3/4" x 2 1/4" x 42"

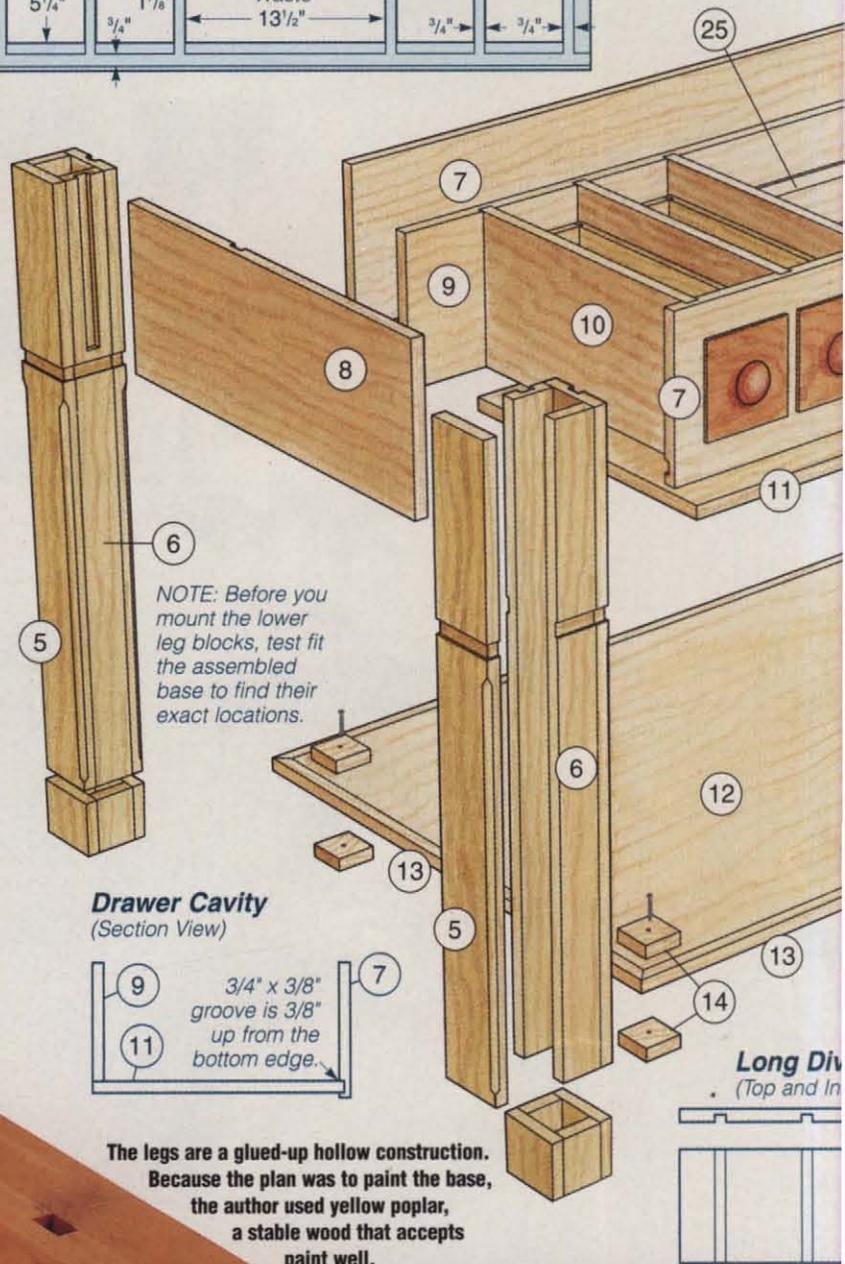
Front
(Inside View)



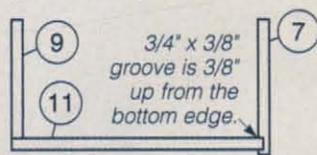
Top Explod
View



Top, C
(Section



Drawer Cavity
(Section View)



The legs are a glued-up hollow construction. Because the plan was to paint the base, the author used yellow poplar, a stable wood that accepts paint well.



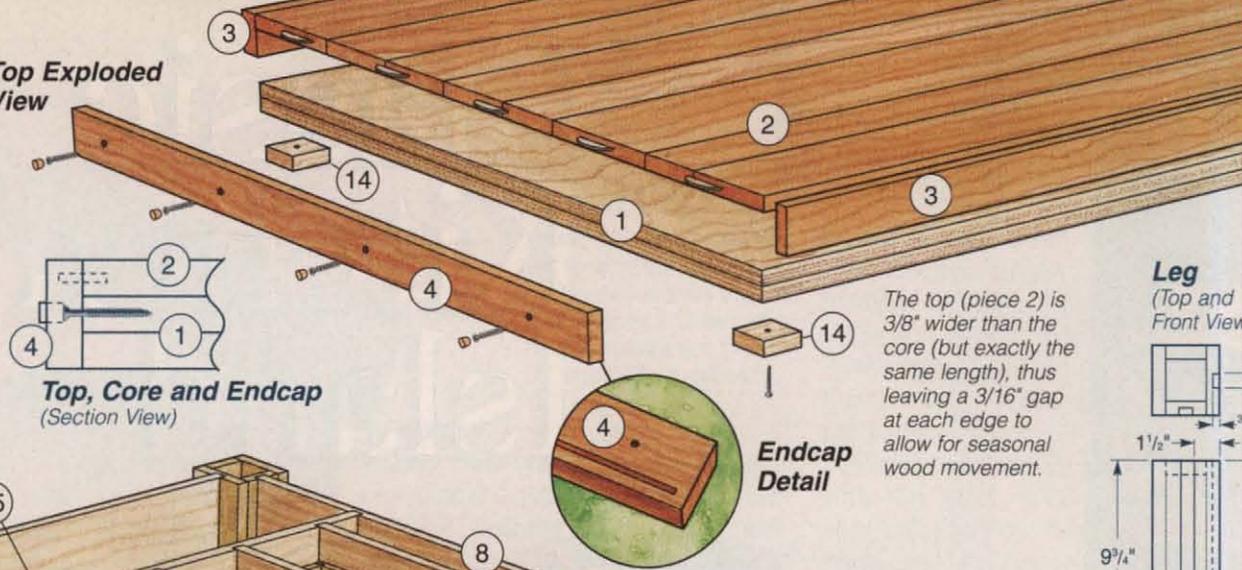
Buy a qualifying machine and we'll reimburse you \$100 in **COLD HARD CASH** when you purchase any additional JET, Powermatic, or Performax machine. Or up to \$50 when you buy accessories.



Assembly

T x W x L
3/4" x 40 1/8" x 52 1/2"
3/4" x 40 1/2" x 52 1/2"
3/4" x 2 1/4" x 52 1/2"
3/4" x 2 1/4" x 42"

Top Exploded View

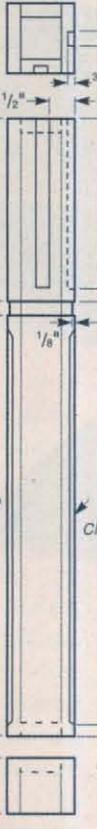


Top, Core and Endcap (Section View)

Endcap Detail

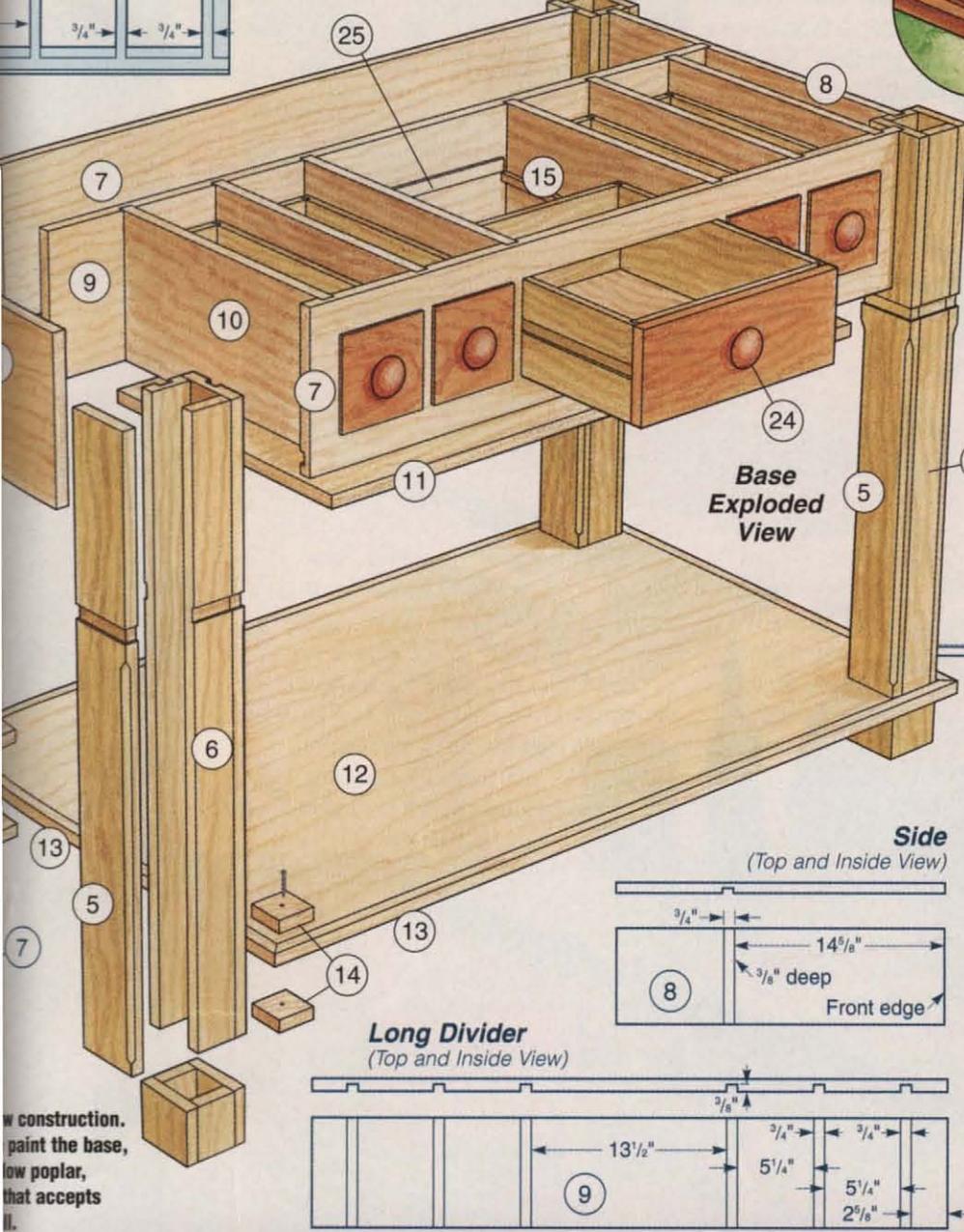
The top (piece 2) is 3/8" wider than the core (but exactly the same length), thus leaving a 3/16" gap at each edge to allow for seasonal wood movement.

Leg (Top and Front View)



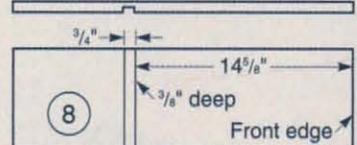
Leg Block Locations (Bottom View, Core)

TIP: To locate the top leg blocks, flip the top over and position the base on it, using the measurements at lower right as a guide. Mark the position, account for the thickness of the leg stock, and temporarily screw the blocks in place. Verify the fit before securing the blocks with glue and screws.

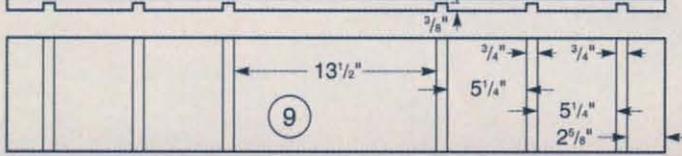


Base Exploded View

Side (Top and Inside View)



Long Divider (Top and Inside View)



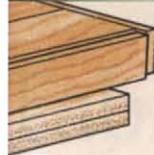
MATERIAL LIST Base Assembly

	T x W x L
5 Leg Staves (8)	3/4" x 3 3/4" x 33"
6 Leg Fillers (8)	3/4" x 2 1/4" x 33"
7 Front and Back (2)	3/4" x 9" x 41 1/2"
8 Sides (2)	3/4" x 9" x 23 1/2"
9 Long Divider (1)	3/4" x 7 7/8" x 44"
10 Short Dividers (6)	3/4" x 8 1/4" x 16"
11 Bottom (1)	3/4" x 16 7/8" x 33"
12 Shelf (1)	3/4" x 30" x 48"
13 Shelf Trim (1)	3/4" x 3/4" x 17"
14 Leg Blocks (12)	3/4" x 2 1/4" x 2 1/2"
15 Drawer Slides (10)	3/8" x 3/4" x 16"

Construction. Paint the base, low poplar, that accepts

\$100 in COLD
ET, Powermatic,
y accessories.

TWO GREAT DEALS.



Before laminating the top, establish straight, square edges by jointing the hard maple stock.

Drawings at left) Now slice biscuit slots into the top to match the grooves you just plowed. The biscuits must not stick out farther than the depth of the endcap grooves, or you'll have a big problem. Glue the biscuits in place, and make sure there are no excess glue drops to harden and get in the way.

Put the top onto the plywood core: there needs to be a gap of at least 3/16" between the core and the sides of the top, but the biscuited ends of the top must match the core exactly. Put the endcaps onto the top with the biscuits nestled in their grooves. DO NOT GLUE THIS PIECE ON! Drill counterbored screw holes through the endcaps and screw them to the core. This allows the laminated top to expand and contract with seasonal humidity without fracturing. Plug the screw holes, sand the top smooth, and set it aside for a bit.

The Basic Base

There is nothing tricky about the construction of the base unit. Begin by creating the legs from the staves and fillers (pieces 5 and 6). Cut them to size, then glue and clamp together. Their hollow construction will come in handy later. Once the glue has cured, sand them smooth and trim them exactly to length on the table saw. Go ahead and cut off the feet, and set them aside. Now use the table saw to reveal the little

decorative dado around the barrel of the leg. (See the *Elevation Drawings* for these details.) I used a router in my router table to plow the grooves into the upper faces of the legs. I then squared up the ends of the grooves so they were ready for the front, back and sides (pieces 7 and 8). Finally, I used

my router and a large chamfering bit to form the decorative bevels on the legs. Cut the remaining sheet stock parts (pieces 9, 10, 11 and 12) to size. There are a number of dados and grooves to be cut into these pieces, and I formed them all on the table saw with a dado head installed. Again, the *Elevation Drawings* will locate the details for you.

I cut openings for the drawers in the face of the front after I had formed the dados and groove in its back face. Miter the shelf trim (piece 13) around the shelf (glue and finish nail it securely), and cut the leg blocks (pieces 14) and drawer slides (pieces 15) to size, but set them aside for the time being.

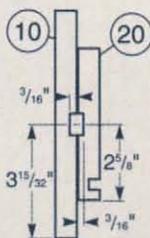
Now it's time to assemble the base. I glued and clamped it together on my work table with the legs pointed up in the air. That helped me align the upper edges of all the dividers, front, back and sides evenly. It was my plan to paint this unit, so a finish nail here and there was no cause for worry. You might want to hold off on attaching the feet until you get it into your kitchen: that way it will clear a 30" door (don't ask

how I found the glue has cured glue the drawings

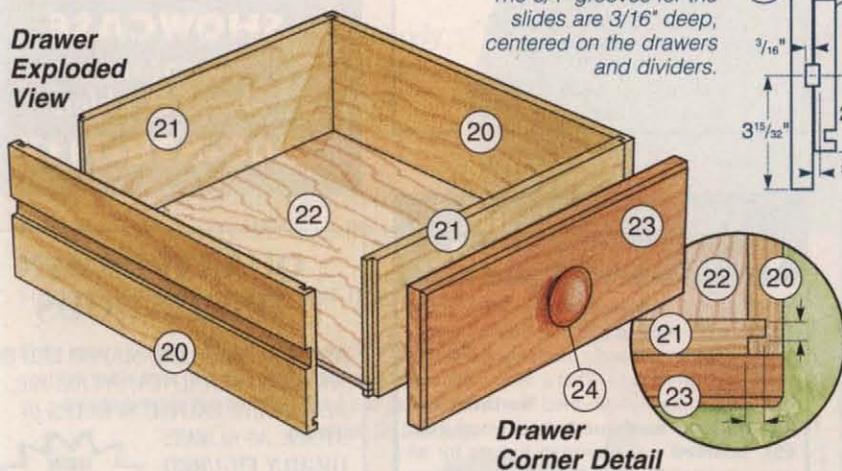
The Drawers
The simple construction of these drawers is a matter of production. I machined all the drawers (pieces 16 through 26) and took advantage of the table saw on the table saw pieces at the test their joint base. When I put them up. No (pieces 24) to the faces to the with screws. I sanded the smooth and p coats of clear on the drawers inside and out the drawer (pieces 25) to the drawer tion. I painted the base unit with oil-based ena

Drawer Slide Locations

The 3/4" grooves for the slides are 3/16" deep, centered on the drawers and dividers.



Drawer Exploded View



MATERIAL LIST Drawers

	T x W x L
16 Drawer Sides (8)	1/2" x 5 1/4" x 15 3/4"
17 Drawer Fronts and Backs (8)	1/2" x 5 1/4" x 4 3/4"
18 Drawer Bottoms (4)	1/4" x 4 3/4" x 15 1/4"
19 Drawer Faces (4)	3/4" x 5 1/4" x 5 1/4"
20 Large Drawer Sides (2)	1/2" x 5 1/4" x 15 3/4"
21 Large Drawer Front and Back (2)	1/2" x 5 1/4" x 13 1/2"
22 Large Drawer Bottom (1)	1/4" x 13 1/2" x 15 1/4"
23 Large Drawer Face (1)	3/4" x 5 1/4" x 13 1/2"
24 Drawer Pulls (5)	2" Dia.
25 Spacers (5)	Trim to fit
26 Baskets (2)	Wicker, optional

ANY WAY YOU CUT IT.

Get a FR when you on the b

around the leg. (See the drawings for these details.) I used a router in my workshop to machine the grooves in the ends of the legs. The ends of the legs were ready to be glued and sides were ready to be glued. Finally, I used a router to form the grooves in the remaining legs (pieces 12) to size. The grooves to be cut in the table are shown in the *Elevation*

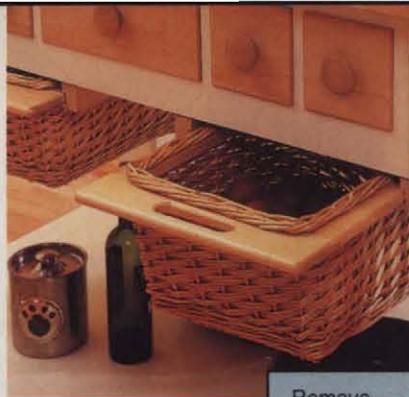
view of the face of the table. I cut a groove in its top (pieces 3) around the perimeter and cut the leg pieces (pieces 15) to size.

I glued and clamped the legs to the table with the legs. I sanded the upper sides evenly. I finished with a nail here and there to get it into your workshop (don't ask

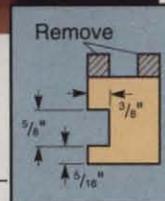
how I found that out). Once the glue has cured, go ahead and glue the drawer slides in place.

The Drawers and Last Details

The simple corner joints on these drawers call for a bit of production woodworking. I machined all the drawer parts (pieces 16 through 23) at once and took advantage of each setup on the table saw to do all similar pieces at the same time. I dry fitted the drawers to test their joinery and to see how they fit into the base. When I was satisfied, I glued and clamped them up. No problem! I mounted the drawer pulls (pieces 24) to the drawer faces before I mounted the faces to the drawers with screws. Then I sanded them all smooth and put two coats of clear finish on the drawers, inside and out. Use the drawer spacers (pieces 25) to adjust the drawer registration. I painted the base unit with white oil-based enamel so



If you choose to use the optional wicker baskets, re-machine the supplied hangers to match the inset drawing at right.



In addition, I added some optional sliding baskets to store spuds and onions.

With that done, the only thing left was to screw it to the floor and get ready to start cooking. After all, I like to eat almost as much as I like to woodwork.

Contributing editor Rick White is a long-time woodworker and frequent project builder for Woodworker's Journal.

Form the island's feet by cutting them off of the glued-up legs. Most of the machining on this project can be completed on a good table saw.



LIST Drawers

	T x W x L
Sides (8)	1/2" x 5 1/4" x 15 3/4"
Fronts and Backs (8)	1/2" x 5 1/4" x 4 3/4"
Bottoms (4)	1/4" x 4 3/4" x 15 1/4"
Faces (4)	3/4" x 5 1/4" x 5 1/4"
Drawer Sides (2)	1/2" x 5 1/4" x 15 3/4"
Drawer Front and Back (2)	1/2" x 5 1/4" x 13 1/4"
Drawer Bottom (1)	1/4" x 13 1/2" x 15 1/4"
Drawer Face (1)	3/4" x 5 1/4" x 13 1/2"
Pulls (5)	2" Dia.
Spacers (5)	Trim to fit
Baskets (2)	Wicker, optional

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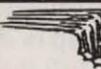
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Table Saw Basics (Part III)

By Ian Kirby

In this last installment of my three part series on the table saw, I'll describe several jigs for making joints and shaping furniture parts.

In the June and October issues earlier this year, I demonstrated the versatility of the table saw by describing four fundamental operations: ripping solid wood; crosscutting solid wood; cutting manufactured sheet material (MSM); and shaping solid wood and MSM.

In each of these operations the workpiece is guided by the saw fence or, in the case of crosscutting, it's held against the miter gauge fence, which in turn is guided by a slot in the table. There is, however, another range of operations that extends the versatility of the table saw even more. Here, the workpiece is held firmly in place on a structure to preserve the correct relationship between it and the saw. This piece is typically called a jig, and the saw fence guides the jig rather than the workpiece.

The jigs described here are used in one of three ways:

- To hold the workpiece while an uncommon cut is made (a taper jig to cut a taper on a leg).
- To make multiple identical parts, which can then be used to make a more complex jig (a pattern sawing jig to cut 45° right triangle buttresses to make a 45° bevel jig).
- To hold a workpiece so that an angle cut can be made with the blade in its normal 90° position (a bevel jig that holds the workpiece at 45°).

Techniques

A jig must hold the workpiece securely and in the right place while allowing you to move it past the saw blade.

Building jigs to these standards requires three techniques:

- fixing stop blocks in the right places;
- driving screws into MDF, particleboard, and plywood;
- squarely joining fences and baseplates.

Ian Kirby uses a variety of jigs to increase the versatility of his table saw. The five jigs demonstrated in this article provide the building blocks of useful and practical jig building.

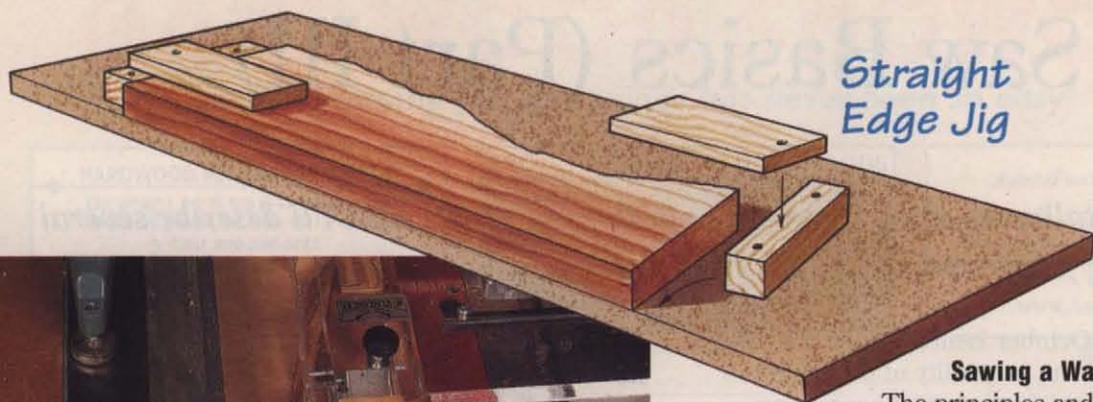
Fences and stop blocks position the workpiece on jigs. Generally, all you need is a couple of #6 screws to fasten them to a baseplate or fence. When you know a jig part is permanent, apply glue before assembly.

Driving Screws into Jig Parts — Because of the anatomy of MDF and particleboard, a screw driven into the edge has little holding strength and usually splits it. The solution to joining baseplates and fences is to use buttresses made of plywood, which hold edge-driven screws very well.

Another problem with MDF is that it tends to bulge at the exit hole of a drill bit. The solution is to countersink any such deformation to ensure flat mating surfaces.



Straight Edge Jig



Sawing a Waney Edge Straight

The principles and utility of a basic jig are well illustrated when you have to rip a straight line on a board of which neither edge is straight. The photo at left shows a piece of English yew with a waney edge and sapwood on one side and a curved band saw cut on the other. Either edge can be cut straight along any line you choose by hanging it over the straight edge of a baseplate.

The workpiece is held on a 3/4" thick baseplate with stop blocks and hold-downs. If the desired sawn edge is difficult to gauge by eye, snap a chalk line on the workpiece to help you position it on the baseplate. Hold the stop blocks tight to the ends of the workpiece and screw in place. Make them 1/16" less than the thickness of the workpiece so that when the hold-downs are screwed down onto the stop blocks, the workpiece is firmly held. Because this is a one-time cut, it's not worth the time and effort to hold the workpiece with toggle clamps.

To make the cut, set the saw fence to the width of the baseplate and extend it fully across the table. Use the splitter, top guard, and push sticks during the cut. If you want to make the second edge parallel to the first, remove the workpiece from the jig and rip the second edge on your table saw.

Leg Taper Jig

This jig cuts repeat taper cuts on two sides of a square leg for a table or chair. Taper-cutting is not an

Elements of a basic jig: a baseplate, two stop blocks, and two hold-downs are all you need to straighten an uneven edge (above). Use push sticks and focus on the contact line between the jig and saw fence when ripping. The resulting cut (inset) is a straight and square machined edge.



Spreading glue — The best tool for spreading glue is a 3" short nap, trim paint roller, available with its own plastic tray. Start by squeezing enough glue for the job into the tray. Load the roller as you would with paint, but lightly. The roller enables you to completely cover the surface with a controlled amount of glue. The glue thickness should be just enough to transfer and wet the surface of the joining piece with no squeeze-out. To preserve the roller and tray, seal in a zip-lock bag, ready for future use.

Tools, Materials and Parts

You can cut most of what you'll need on a table saw, although a chop saw is useful. You'll also need measuring tools: straightedge, squares, sliding bevel, and a rule or tape. Two cordless drills are useful, one with a countersink and pilot-hole bit, the other with a screwdriver bit. A nailer will substitute for screws in most situations making assembly easier and faster. A hammer and glue roller are often required, but clamps are essential — they become a second pair of hands.

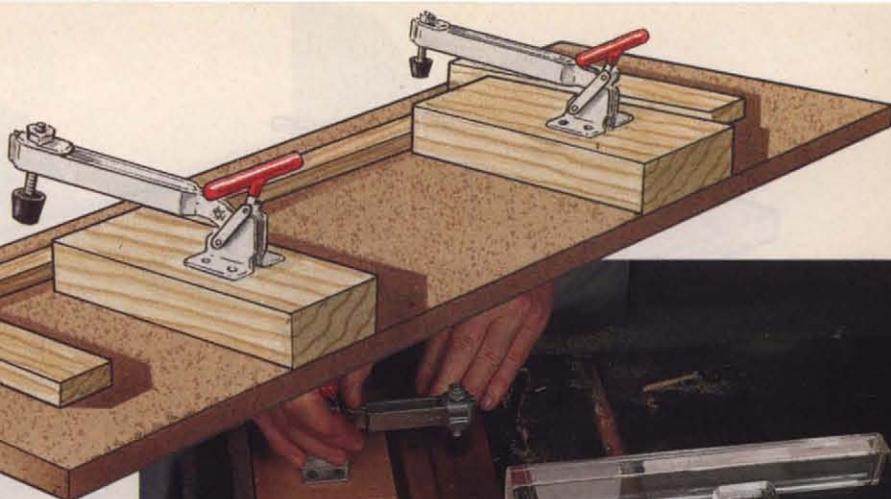
Baseplate — the starting piece when making a jig. It's the part that sits on the saw table and rides against the saw fence. Usually made of MDF or particleboard.

Fence — the part the workpiece gets clamped to or against. Usually made of MDF or particleboard, but can be soft solid wood, such as poplar or basswood.

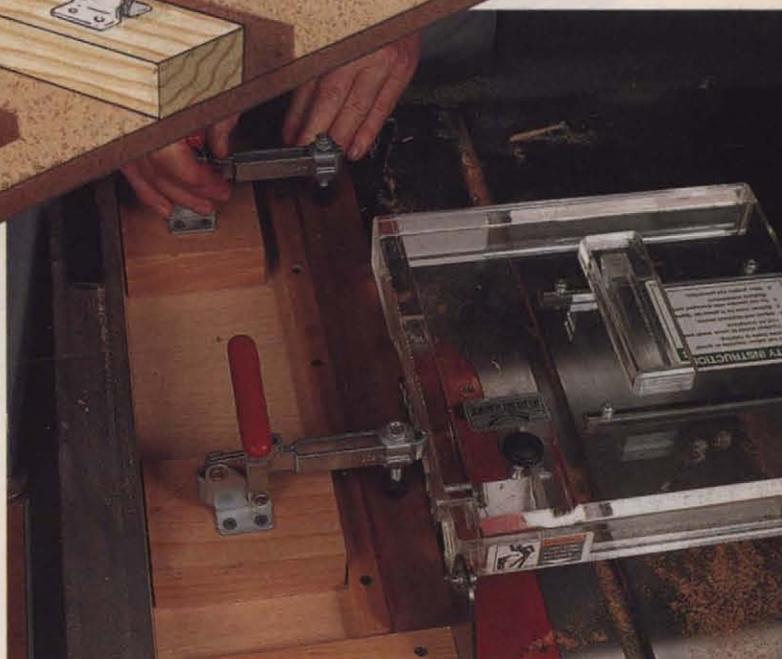
Buttress — the part that supports the fence at the correct angle. It may be a right angle, 45°, or anything in between. Usually made of 3/4" plywood screwed to the baseplate and fence. **Stop block** — part used to locate workpieces when pattern sawing or legs when taper sawing. Usually made of a soft solid wood, such as poplar or basswood.



Taper Jig



This leg taper jig comprises a baseplate, a fence, two stop blocks, and two toggle clamps. You can only taper two faces of your stock with this jig.



You can taper two adjacent faces with a single jig setup. If you want to taper all four faces, you'll need to move the jig fence, or make a second jig.

Arguments for a 45° Bevel Jig

To saw a 45° angle on the edge or end of a workpiece using a table saw, you have two options:

- tilt the blade to 45° and pass the wood as you would for ripping, or
- leave the blade vertical and clamp the workpiece to a 45° bevel jig. The jig method is superior for several reasons. Whether you are a table saw beginner or old hand, pushing a clamped-up jig past the blade guarantees greater control and safety.

everyday task, and this jig is so simple that it takes little time to relocate the fence and stop block for another set of tapers, or to make a new version of the jig. The jig shown above is basically a more elaborate version of the “quick-and-dirty” straight-edge jig.

Mark the taper you want on the workpiece, then position it on the baseplate, hanging the excess wood over the edge. Next, clamp the workpiece and baseplate together so you can easily position and fix the fence and stop blocks.

Attach the fence to the baseplate so it's tight to the back of the leg. I used 3/4" poplar. Screw the stop blocks into place at each end; note they will *not* be at right angles to the edge of the baseplate, because the workpiece is aligned with the taper. By now you'll realize that the effectiveness of this or any other “repeat-cut” jig relies on all of the pieces being the same dimension so that they will be securely confined by the fence and the stop block(s). Mount the toggle clamps on 2 x 4 material and adjust them so they hold the workpiece down tight. Make a trial pass with the saw turned off to confirm the clamps are located inboard of blade, guard, and saw.

Jig Fundamentals

A table saw jig holds the workpiece and guides it past the saw blade so that it can be cut in some particular way. Making jigs invites you to be creative. Because there's no single best way to make jigs, you can adapt materials and construction methods to the job at hand and the tools you own. It's important to understand, however, that jigs are a means to an end, not an end in themselves. A jig may be likened to a working drawing and, like a drawing, it is job-specific. Avoid making widely adjustable jigs to accept workpieces of widely varying sizes. Adjustability usually compromises one or more of

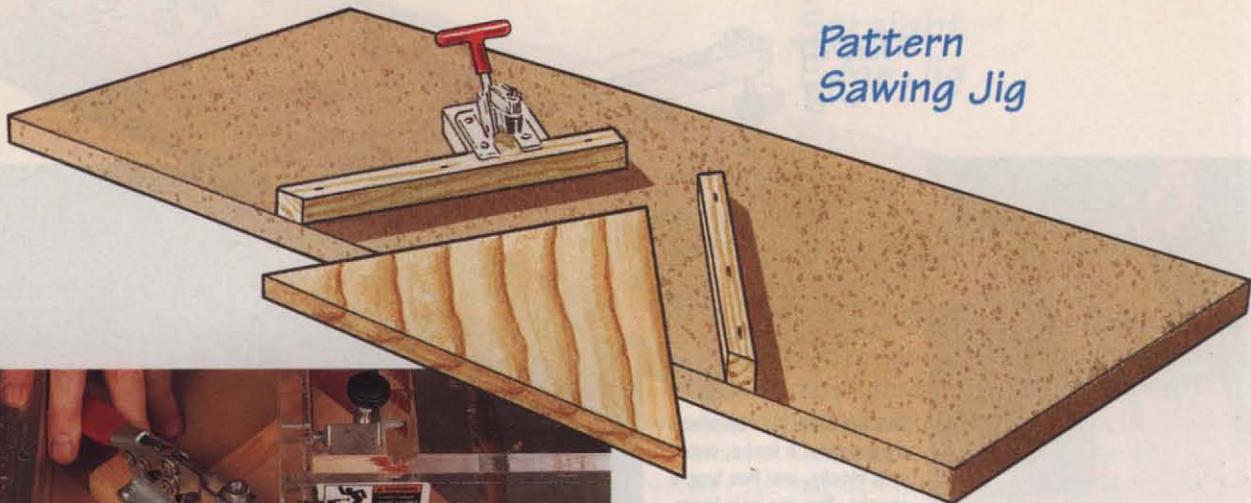
the requirements listed below.

Besides, universal jigs are often large, unwieldy, and consume storage space. Here are six requirements of a good job-specific jig:

- it must be easy and inexpensive to make;
- it must be accurately made;
- it must not deflect or shift in use;
- it must be guided by the saw fence or table slots.
 - it must provide a way to securely clamp the workpiece;
 - it must guard the saw blade throughout the operation.

— Ian Kirby

Pattern Sawing Jig



Another argument is greater accuracy. If the workpiece isn't dead flat, cutting with a tilted blade and a distorted workpiece will not give you the accuracy required for miter cuts. However, because any distortion of the workpiece is removed when it is clamped to the fence, the result is an accurate cut. Also, the sawn surface is unmarred by stops and starts and changes in hand pressure associated with a tilted blade and a free-hand cut.

The closing argument is that a jig avoids the fuss of measuring the blade angle to confirm that it is tilted to 45°, then checking again to make sure it has been returned to vertical for normal cutting.

Making the 45° Bevel Jig

Making the buttresses — Start by making the 3/4" thick plywood square buttress blanks that will be cut in two on the diagonal using a simple pattern sawing jig (*above left*). Position the first stop on the baseplate at 45° using a combination square. Attach it with screws or nails and glue. Position the second stop using a square blank as a guide. Position the blank so that the saw cut is short of the diagonal by about 1/8" rather than dead on. This ensures that when you load the "falling blank" into the jig, you will produce a buttress that's exactly the size of the first one. Fix a toggle clamp in place, making sure it's not in the path of the saw blade. Saw three buttresses. Cut off the two 45° top corners using a chop saw or your table saw. The resulting flats let you clamp each buttress to the baseplate of the 45° bevel jig and, using gentle hammer taps, position it exactly prior to screwing.

Constructing the bevel jig — Square layout lines across the baseplate where the buttresses will go. Locate the end buttresses so the fence overhangs by 2" on each end to provide room to clamp the workpiece in place. Align the 45° buttresses on the baseplate, using the back edge as a register. Drill



This pattern sawing jig (*above*) was used to make the buttresses for the 45° bevel jig (*above, right*). To complete your jig, use a combination square (*left*) to position the first stop at 45° to the edge of the baseplate of the pattern sawing jig.



Next, use a square buttress blank to position the second stop. Screws are fine, but in this example, an air nailer makes fixing parts quick and easy.

45° Bevel Jig



clearance holes through the baseplate on the layout lines and countersink both sides to create flat mating surfaces.

Roll glue on the bottom edge of one buttress and clamp it to the jig base. Make it square, with the angled corner flush against the edge where the fence will go. Drill pilot holes in the buttress, then screw in place. Glue, clamp, and screw the remaining buttresses the same way.

Position the jig fence on the angled edges of the plywood buttresses, using the saw table as a surface plate. Draw layout lines, drill clearance holes, roll on glue, and screw the fence in its final position.

Once the fence is assembled, plane off the bottom corner to make sure it sits above any debris that could prevent the baseplate from sitting tightly on the saw table.

Using the 45° Bevel Jig

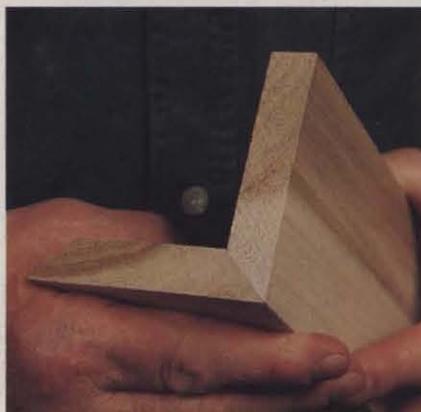
When mitering the long edge of your workpiece, clamp both ends of the workpiece to the fence, with the bottom edge referenced to the saw table. Set the table saw's fence to width, extended fully across the table. Set the blade height, checking that there can be no contact with the clamps. Push the jig forward with a steady, continuous motion to produce a smooth surface.

When sawing bevels on the ends of the workpiece, you must screw a stop block to the jig fence. Make it at least an inch square so you'll be able to clamp the workpiece to the stop block as well as the fence.

This jig also saws an excellent spline miter joint. To saw the spline slot in the miter, just turn the workpiece over in the jig and lower the blade so it is captured within the edge of the workpiece.



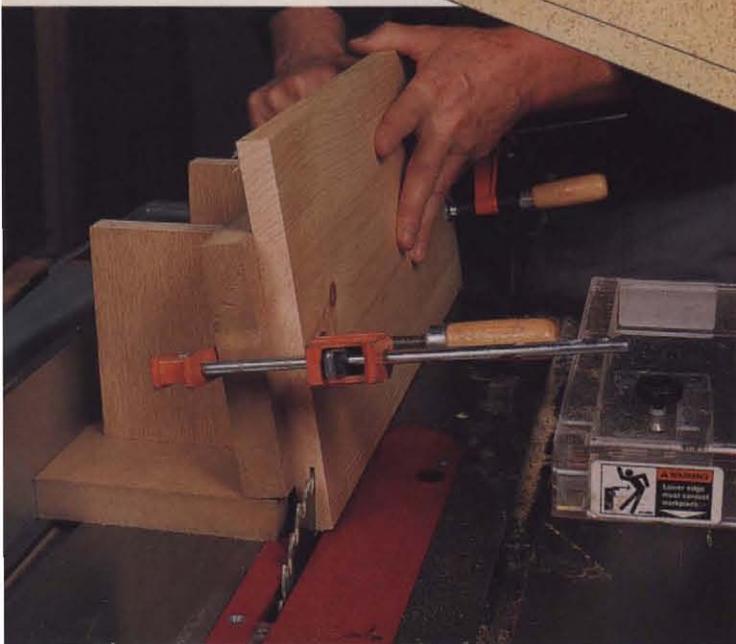
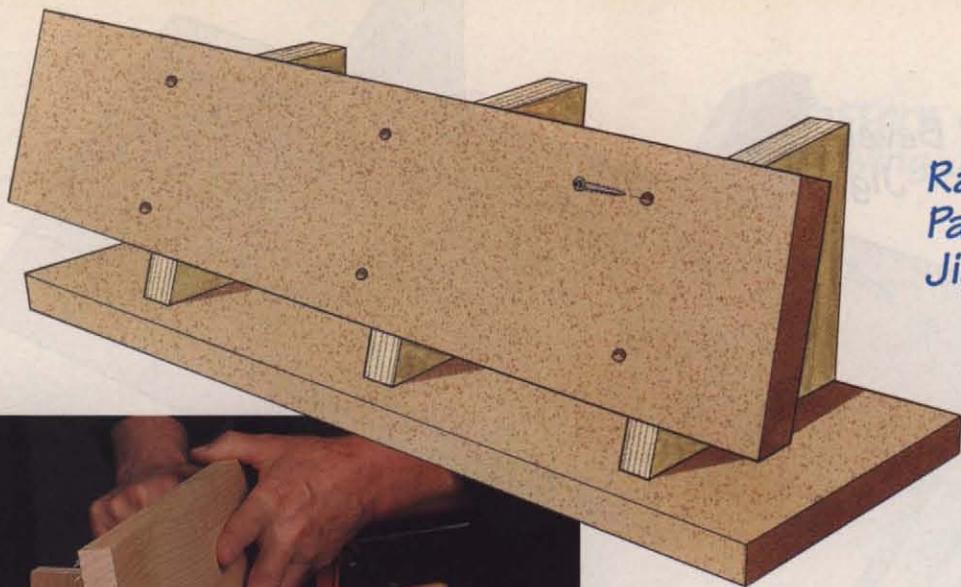
With the workpiece clamped to the jig's fence (above), advance the jig past the saw blade as in a normal ripping operation. Keep your hands safely away from the blade. The proof of the jig's accuracy is in the resulting tightly fitting miters (right).



Clamping the workpiece to a flat fence removes any distortion and maximizes accuracy. Another advantage of the jig is that it avoids the fuss of changing and measuring blade angle.



Raised Panel Jig



Clamp the panel to the jig and saw the bevel. The fence location determines the bevel thickness. After you cut the bevels on all four edges of the panel, lay it flat, lower the blade and cut the boundaries of the field. (The flat rectangular center of the panel.)



Make the tapered buttress by setting a square blank on the baseplate of a pattern sawing jig. Position the blank with a fence and two end stops, and hold with a toggle clamp. Guard the blade and advance the jig with a push stick.



Raised Panel Jig

This jig enables you to saw the molding on the edges of a raised and fielded panel. The advantage of sawing rather than using a router bit is that you can make the cut at any angle and to any depth. You, not the router bit, design the panel proportions. Using a coachmaker's rebate plane, such as a Record 010, its easy to prepare the sawn surface for polishing.

Making the raised panel jig — To determine the angle of the buttresses and the fence, draw the panel detail at full size. Set a sliding bevel from the drawing and lay out the angle on one of the rectangular buttresses blanks. Clamp the blank to the baseplate of your pattern sawing jig, aligning the overhang to the marked line, and use it to locate the fence and two stop blocks as you did to build the buttresses for the 45° bevel jig. Attach a toggle clamp to hold the blank in place, and you're ready to saw the buttress taper.

Construct the raised panel jig using the same techniques as for the 45° bevel jig.

Using the raised panel jig — To attach the panel correctly to the fence, use the saw table as a guide. Clamp the panel at each end, set the table saw's fence to width and extend it fully across the table. To saw the boundaries of the panel's center field, set the saw blade to height, and make the cuts with the panel flat on the saw table. It matters not whether you saw the center field cuts or the bevel cuts first.

If you combine this jig with the tenoning jig described in "Machine Cutting Mortises and Tenons" (*Woodworker's Journal*, April 2002), you can easily make a complete frame-and-panel door using only the table saw to form the pieces.

Ian Kirby is a master of the British Arts & Crafts tradition and author of "The Accurate Table Saw — Simple Jigs and Safe Setups."

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Polyurethane: Oil-based or Waterborne

By Michael Dresdner

Wildly popular among hobbyist woodworkers, polyurethane is durable, easy to apply, and comes in both waterbased and oil-based versions. Some accept it grudgingly, calling it “plastic-looking,” while others embrace it as the greatest thing since sliced bread.

Like many finishes, polyurethane is named for its primary resin, though some cans labeled “polyurethane” also contain other resins. Resin is what remains behind to form a film once the solvent has evaporated. The resin defines the nature of the coating. In general, polyurethane or urethane resins (the terms may be used interchangeably) provide finishes with good durability, including resistance to heat, abrasion, chemicals, stains, and solvents. Polyurethane is tough enough for kitchen tables and cabinets, bathroom vanities, walls, doors, floors, all types of furniture and virtually any woodworking project. Woodworkers mainly use either oil-based or waterborne polyurethanes. Both have good qualities, but they are very different in many ways, giving rise to a hotly debated disagreement over which is superior.

Oil-based Versus Waterborne

The primary differences between the two relate to how they are made. Oil-based, whose proper name is “oil-modified urethane,” is produced

by reacting common finishing oils, like linseed oil, with a chemical that causes the oil to form larger molecules. A good rule of thumb is that larger molecules mean more durable finishes. The result is something that looks and acts like oil-based varnish, but is tougher. Polyurethane gel is simply a thicker version of the same thing.

Waterborne polyurethane is an emulsion of resins in water and solvent. It dries fast and behaves more like lacquer than varnish. As a result, it benefits from a different application technique than oil-based, but there are also differences in durability, odor, flammability, safety, and even appearance. Let's compare the two in each major performance category.

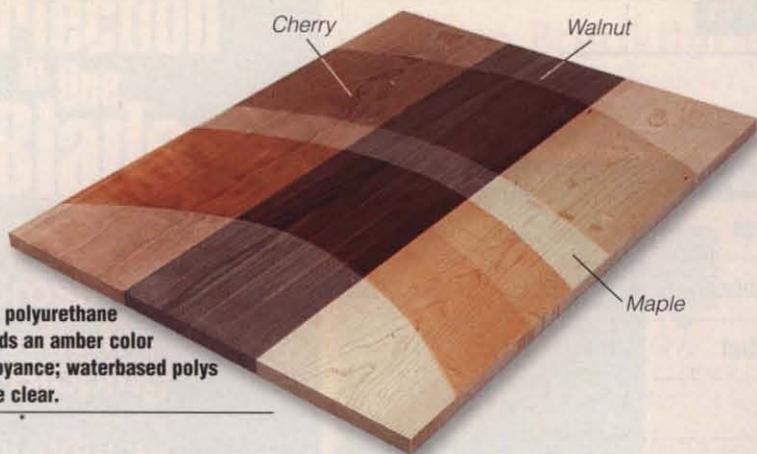
Durability

Oil-based polyurethane wins this one hands down. It has better heat, abrasion, chemical and solvent resistance than its water-based cousin, and for a very good reason. Most waterbased polyurethanes are actually a mixture of two or more resins, usually acrylic and polyurethane. Acrylic resin has properties similar to lacquer, including its susceptibility to some strong solvents, chemicals and heat.

It is added to the finish for

Oil-based and waterborne polyurethanes differ in durability, odor, flammability, safety and appearance — which is why there's a debate over which one is superior.





Oil-based polyurethane (front) adds an amber color and chatoyance; waterbased polys (back) are clear.

two reasons: acrylic is less expensive than polyurethane resin, and it brings better brushing and spraying properties to the mixture.

The combination of the two resins puts waterbased polyurethane somewhere in between lacquer and oil-based polyurethane on the durability scale. Exactly where depends on how much of the mixture is acrylic resin and how much is polyurethane. Some brands are largely polyurethane, while others are mostly acrylic, so there can be significant differences from brand to brand. The question is, how much polyurethane is in your polyurethane?

Drying Time

This one goes to the waterbased side of the scoreboard. One coat of oil-based polyurethane will take several hours before it is dry to the touch, but most waterbased versions will get there in 10 minutes. The faster setup time means it is easier to get a dust-free finish with waterbased polyurethane.



Odor, Cleanup and Safety

Once again, waterbased comes out ahead. It emits less offensive odor and cleans up with soap and water. Oil-based polyurethane smells more, and uses mineral spirits for cleanup. Most oil-based polyurethanes are flammable, whereas none of the waterbased ones are. Perhaps worse is that oily rags can be spontaneously combustible, so just in case, lay them out one layer thick to dry prior to disposing of them.

Appearance

Beauty is in the eye of the beholder, so this category has no definite winner, but there are obvious differences in how the two types look. Oil-based polyurethane is amber and will add subtle color to wood, while waterbased is clear and adds no color at all. This is especially noticeable on light woods, like maple, which stay white under waterbased polyurethane but get amber with oils. The flip side is that oils penetrate into wood better, resulting in greater chatoyance, or shimmer and depth, than you'll get with waterbased. Oil-based polyurethane looks richer and more vibrant, especially on dark

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Characteristics	Oil-based	Waterborne
Durability	Excellent	Good to very good
Dry to the touch	Several hours	10 to 20 minutes
Odor	Substantial	Low
Flammable	Yes	No
Cleanup / safety	Mineral spirits rags may be spontaneously combustible	Soap and water rags are safely disposable
Appearance	Amber, good chatoyance	Clear, sometimes cloudy, gray, or pale
Best applicators	Natural bristle brush, nylon abrasive pad, spray gun	Synthetic bristle brush, paint pad, spray gun

and highly colored woods, where waterbased coatings can look pale or washed out.

There are two other characteristics unique to waterbased coatings that exacerbate appearance problems. Waterbased polyurethane can bridge over 180 grit or coarser sanding scratches, leaving minute air spaces below the finish in the scratches. These can make the finish look pale and cloudy unless the raw wood has been sanded to 220 grit or finer. On some woods, such as poplar and oak, certain waterbased coatings can draw extractives from the wood that react with the polyurethane, turning it slightly gray. You can get around both these problems by sealing the raw wood first with Zinsser SealCoat. It provides an excellent sealer coat under waterbased polyurethane and makes the wood look better to boot.

Application

Wiping on oil-based polyurethane will give you a thin, woody finish with no brush or spray marks, but waterbased does not work well as a wipe-on. You can brush or spray both types of polyurethanes, but

each works best with a different applicator, method, and spray technique. Here are some guidelines to get you started.

Wipe-on: Use either gel or liquid oil-based polyurethane straight from the can without thinning it. Dip a fine nylon abrasive pad into the polyurethane and scrub it onto the surface of the wood. Wipe off all the excess before it dries.

Apply one coat per day. Three coats will afford adequate protection, but you can add more for a deeper looking finish.

Brush/paint pad: Use a natural bristle brush with oil-based polyurethane, and thin each coat about 10 or 15 percent with mineral spirits. Thinning will help you get a smooth, bubble-free finish. Waterbased coatings require synthetic bristle brushes, since natural bristles will splay and go limp in water. I find that on flat surfaces, however, a paint pad works better. It coats faster, creates fewer air bubbles in the finish, and allows you to apply thinner coats, which makes waterbased coatings level better. Apply a minimum three thin coats of either type of polyurethane.

The primary differences between oil-based and waterbased polyurethanes relate to how they are made.

Oil-based, whose proper name is "oil-modified urethane," is produced by reacting common finishing oils, like linseed oil, with a chemical that causes the oil to form larger molecules. A good rule of thumb is that larger molecules mean more durable finishes.

Spraying: Thin oil-based polyurethane 50 percent with acetone, not mineral spirits. Spray an extremely light mist coat onto the wood, let it dry for about 10 minutes, then spray a very light wet coat. The fast-drying acetone will cause the mist coat to get tacky. This tacky coat will help the thin wet coat hang without running or dripping.

Spray unreduced waterbased polyurethane through a small fluid tip (.040" to .050"), applying very light coats. The surface will look as if it is not wet enough and has a slight orange peel texture, but resist the impulse to spray heavier. Leave it overnight and it will level out. Spraying too heavily will result in a rough texture as well as drips and runs on vertical surfaces. Spray at least three or four thin coats of either type.

Michael Dresdner is a nationally known finishing expert, woodworker and contributing editor for the Woodworker's Journal. His newest book, Painting and Finishing, is now available from Taunton Press.

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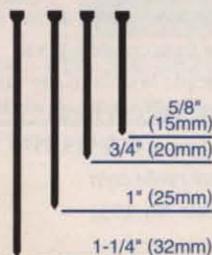
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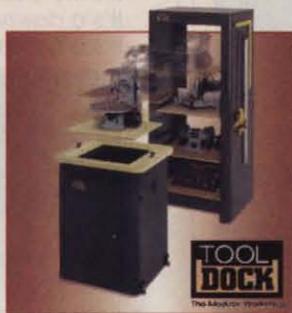
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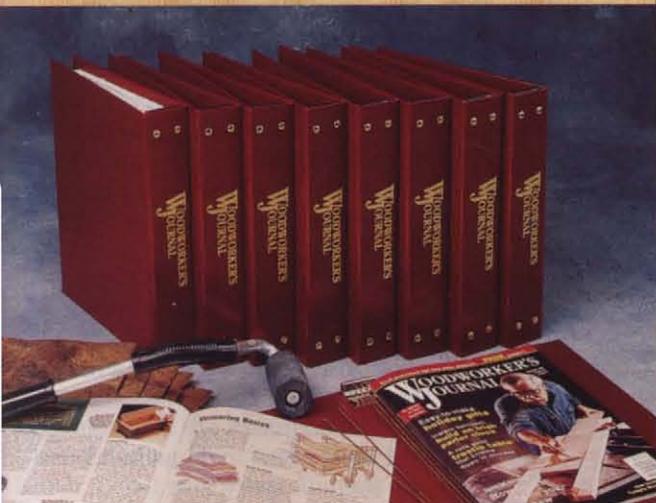
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My Top Ten Favorite Router Accessories

By Bill Hylton

Woodworking tool catalogs are chockablock with gizmos and accessories hyped as the *ne plus ultra* of the realm. Each one is destined to transform you into a master craftsman. No skill or practice required!

Well, you know many — if not most — are cheesy widgets of little real value. But you've got a router or two and a rackful of bits. And you have a desire to expand your capabilities. What router gadgets can you invest in that will have substance and value over the long term?

I've been using routers in woodworking for a good long time, and I have an opinion or two on this. What follows is my list of the Top Ten Router Accessories. (OK, I fudged the number a little, but my auditor said it was permissible, so long as I was up-front about it.)

The list isn't just 10 accessories, it's 10 categories of accessories. You get more stuff that way.

1: Personal Safety

The top accessory on my list, without question, is personal safety gear. Routers are gawdawful noisy. They spew chips and dust

everywhere. Yet all too many woodworkers fail to buy and use appropriate accessories to protect their hearing, vision, and lungs. These aren't expensive, and you can get them at a home center or hardware store.

Muffs are the most common hearing protectors. A good pair of passive muffs is all you need. Look for the noise reduction

rating (NRR) on the package: the higher the number, the better the protection. And if you enjoy having the radio in the shop, muffs like Peltor's Worktunes are appealing ... they are true passive hearing protectors with a built-in radio.

Eye protection isn't limited to geeky goggles or safety glasses. These days, you can find a growing array of lightweight, comfortable and stylish protective eyewear. Look for a notation on the label that the product meets or exceeds the ANSI Standard Z87.1 1989.

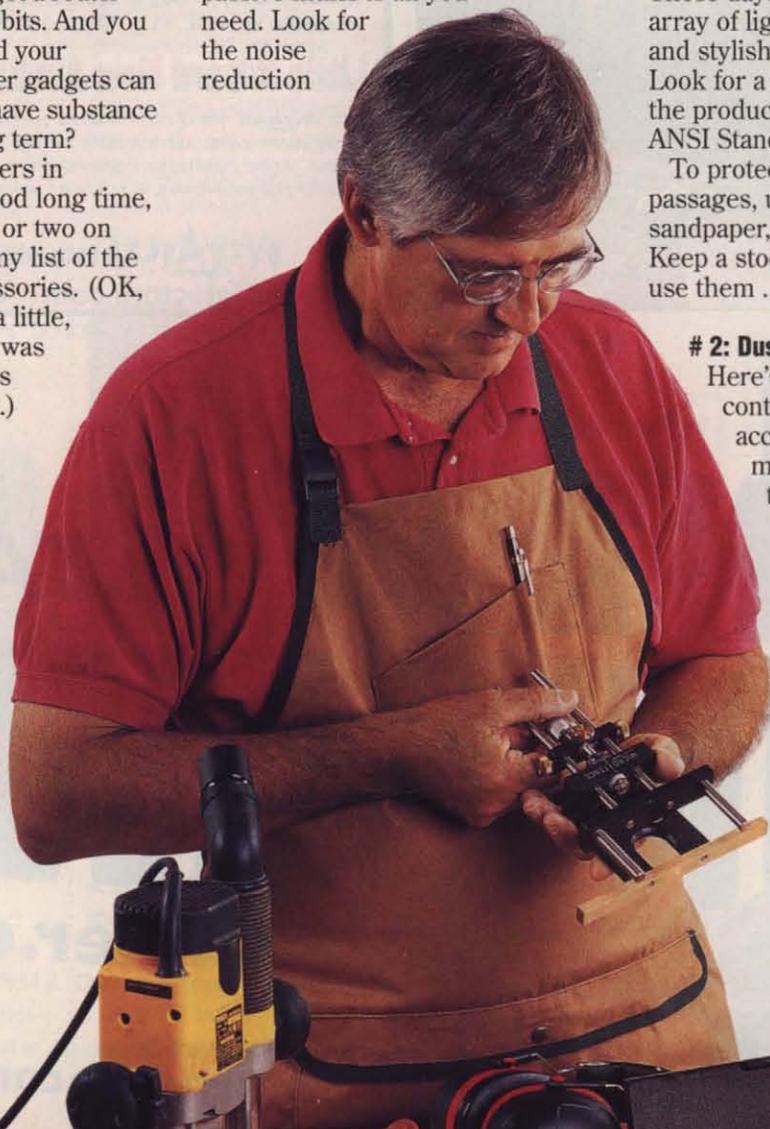
To protect your lungs and nasal passages, use a dust mask. Like sandpaper, masks are consumables. Keep a stock of them on hand, and use them ... every time.

2: Dust Control

Here's a two-tier plan for controlling dust: get an accessory to capture as much of it as possible at the source, and supplement that with cleanup accessories.

A very few routers have dust collection integrated into them.

A practical accessory, which fits many (but not all) routers, is Leigh's vacuum attachment. This spring-loaded chip





Personal safety accessories include hearing and eye protection. Hearing protection, left to right: Over-and-Out electronic hearing protectors, \$64.99 from Woodcraft; AOSafety Professional Hearing Protectors, about \$28.00 at hardware stores and home centers; Peltor Worktunes, \$69.99 from Rockler. Eye and respiratory protection, left to right: AOSafety sanding, drywall, fiberglass respirator; AOSafety Cool-Max respirator; AOSafety X-Factor eyewear; AOSafety eyeglass protectors (about \$4.00); AOSafety impact goggles. All AOSafety products are available at hardware stores and home centers.

3: Setup

Superb tool handling won't compensate for using the wrong diameter bit. Or for setting the cutting depth inaccurately. Or for setting the tool guide out of square or slightly off the mark. So good setup tools are essential.

A 6" steel rule, graduated in 8ths and 16ths on one face, 32nds and 64ths on the other, is a good starting point. We all use a tape measure for rough layout, but it's a poor choice for close, accurate setup work. You can spend a lot more for a rule, but Lee Valley's \$5 pocket rule has everything you need, including accuracy.

For cutter setup, try the Veritas tool-setting gauge. Designed primarily for setting a table saw's blade, this die-cast tool works just as well on a router or router table. It has clearly marked 1/8" steps on one end, 1/4" steps on the other.

Striving for greater precision, woodworkers sometimes use dial calipers. Made for machinists, these usually expensive instruments are accurate to the thousandth. Now Highland Hardware has an affordable dial caliper that's calibrated in fractions. It's first-rate for measuring stock thickness, bit diameters, dado widths and depths and other setup work.

Another unique tool is the setup square designed and actually made by router wizard Pat Warner. (Warner even signs and dates his tools; I love it!) It's very simple: a piece of hardwood

(cherry or walnut), rabbeted on the bottom, with aluminum "blades" — one 4^{5/8}" long, the other 9" long and mounted at right angles to the rabbet's shoulder. You'll find that they're very precise.

Warner designed the square to serve his own needs: positioning templates, marking (with a layout knife, a pencil, even a felt-tip pen), squaring jig fences, doing machine



Accessories for controlling and capturing dust include the PSI air cleaner with remote control, \$239.00 from Penn State Industries; dustpan (\$13.99) and bench brush (\$8.99) from Rockler; shop apron, \$12.95 from Lee Valley; and the router vacuum attachment, \$35.50 from Leigh Industries.

pickup is mounted like an edge-guide. It sucks up all the chips generated when routing dovetails or rabbets or when profiling edges — some of the messiest operations.

But you do more jobs than these, and at the end of the day, you've got chips on your pants and shoes and all over the floor. Worse, the finest particles are floating in the shop air and infiltrating your lungs with every breath.

Deal with it! First, wear an apron to keep your clothes clean. Lee Valley's apron is ample in size and adjusts to fit most adults. The best feature, to me, is the flap that keeps sawdust out of the main pockets. Next, get a big ol' dustpan and brush. Use it every day. Address that fine floating dust with an air cleaner. Many different brands and models are available. A good one is the multi-speed Penn State Industries AC620, which has two-stage filtration and a timer, so it will run for a set period after you leave the shop. It comes with a remote, too.

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For accurate setup, you can buy accessories like a dial caliper, \$36.99 at Highland Hardware; a setup square, \$50 from Pat Warner; a 6" pocket rule, \$4.95 from Lee Valley, or a tool-setting gauge, \$24.50 from Lee Valley.



Keep your router — and your cuts — stable with accessories like the Pat Warner offset baseplate, \$25; the Rousseau offset baseplate, \$31; and the Rousseau 8" round baseplate, \$27.

tool setup. Having two blades allows you to measure from either end, making it perfect for lefties. You can even clamp it to the work as a guide or stop.

4: Stability Accessories

All too often, we router users get cavalier when doing edge work. We forget that when we're rounding over an edge, the router is mostly off the work. We forget how easy it is to screw up the cut.

A simple accessory — the offset baseplate — can give your router better footing, and help you get a better grip on it to boot. The father of this device is (again) Pat Warner, who makes them for most brands and models, including some laminate trimmers. The typical plate is a roughly triangular piece of 3/8" thick clear acrylic with a comfortable knob. But the plates are scaled to fit particular models. Yours arrives with mounting-screw holes drilled and countersunk (and a set of the correct screws), ready

to mount. Any plate is available with a counterbored bit opening for PC-style template guides or a 1 3/4" bit opening for general use.

An interesting variation is the offset plate sold by Rousseau. This large plate has a removeable insert to accommodate PC-style template guides. It incorporates a simple edge guide. One size plate fits all routers, and you drill the mounting screw holes.

A related plate from Rousseau is an oversized circle, also with a removeable insert. No offset, but by expanding the router's footprint, it helps stabilize the tool.

5: Edge Guide Accessories

The accessory that expands your router's capabilities the most is an edge guide. My favorite is the Micro-Fence. I have only one, but I can use it on several different routers. That's because it's adaptable to most router brands and models, even laminate trimmers.

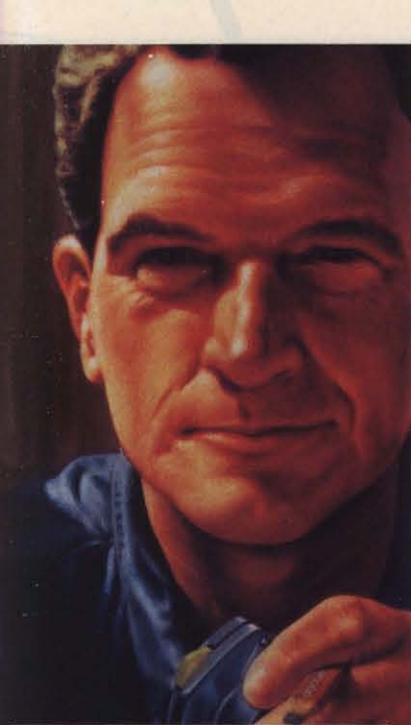
The heart of the device is the patented micro-adjuster, which literally is accurate to the thousandth of an inch. What a difference that can make in your woodworking. For example, you really can cut dados that are perfectly sized. Cut an undersized dado with the guide "zeroed out." With a dial caliper, measure — in thousandths — the width of the dado and the thickness of the piece that's to fit into it. Subtract the width from the thickness, add in a couple or three thou for glue. Now dial in that difference on the edge-guide's adjuster, make a second pass, and you'll have a dead-nuts-perfect fit.

This capacity makes the Micro-Fence ideal for routing mortises, sliding dovetails and all sorts of other joinery. It's great for inlay work, because you can cut grooves that really match the dimension of any decorative band (which are notorious for being off-dimension).

More than just an edge guide, the Micro-Fence system has many optional attachments. There are two circle-cutting accessories, one for radii between 1/2" and 3", and a second for radii 3" up to as much as 6 feet(!). The large circle jig can be transformed into an ellipse



An edge guide is the accessory which adds the most capability to your router. Both shown here are from Micro-Fence: the edge guide at left is \$159.95; the Circle Jig Complete is \$159.95.



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cutter. An inexpensive interface allows the circle cutter to be used with Tru-Grip's Pro-Ftr, thus applying micro-adjustability to that clamp-on guide.

6: Clamp-on Guide Accessories

For years, I used whatever board or plywood strip was handy as a router guide for cutting dadoses and grooves. But having a dedicated guide with built-in clamps is pretty seductive.



Some of the clamp-on guides which have seduced the author are, from left, the Veritas power tool guide with traveler 100" Guide, \$89.00 at Lee Valley; and the Tru-Grip Pro-Ftr (4-foot), \$59.99; Tru-Grip router baseplate, \$27.99; and Tru-Grip stop block, \$14.99, all from Tool Crib of the North.

(Especially now that I've had the chance to use a couple of the current models!)

The best-known clamp-on tool guides are made by Griset Industries under the Tru-Grip brand name. Tru-Grip guides are aluminum extrusions, available in several lengths, with integral cam-

action clamps. The clamps grip the edges of the work; you can apply this guide to a workpiece that's dogged to your benchtop, for example.

The newest Tru-Grip model is the Pro-Ftr series (pronounced pro-footer), available in nominal 2-foot, 4-foot, and 8-foot lengths. The Pro-Ftr is wider and has T-slots incorporated in it for stops and slides.

The Veritas power tool guide has the advantage of being a two-piece assembly. Either section will stretch across an MDF sheet. Joined together, they'll span the sheet end-to-end. Two 1"-capacity clamps fit a track on the underside of the guide.

7: Circle-Cutting Accessories

Cutting circles is easy with a router, but it needs some help from a trammel.

Small circles — diameters from 7½" down to 1" — are exactly what the Jasper Audio Model 400 is designed to produce. The trammel is a baseplate, one with more holes that a wheel of Swiss cheese. A few are mounting screw holes; pick out the ones that work for your plunge router and mount it (an assortment of screws is provided). The jig is calibrated for use with a ¼" straight bit, and all those pivot holes step through the cutting range in 1/16" increments.

If large-radius arcs are what you're after, I'd recommend either of two adjustable trammels. Both provide a clear acrylic plate to which you mount the router, and a pivot block that you screw to the



Some circle-cutting accessories to help your router get around are the Woodhaven Giant Circle Jig, \$89.99; Rousseau Circle-Cutter, \$70.00; and Jasper Audio Model 400, \$39.95.

work. An arm attaches to the plate and passes through the pivot block. You set the cutting radius by measuring from the bit to the pivot, then tightening a plastic knob to lock the adjustment.

The Rousseau unit has a two-piece arm: You can use either the 2-foot or the 3-foot rod, or you can couple them for cuts up to 10 feet in diameter. The Woodhaven unit uses an aluminum extrusion for the arm, and it can make cuts from 15" up to 100" in diameter. A pencil-holder is included with the unit, so you can draw circles as well as cut them.

8: Template Work Accessories

Template work is virtually the exclusive province of the router. If you are going to get the most out of your router for duplicating parts, cutting joints, and creating decorations and inlays, you've got to use templates. The accessories you need are template guides and pattern bits.

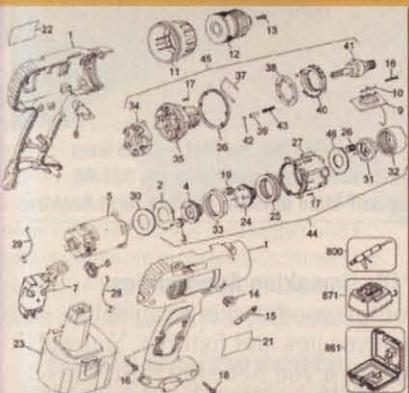
Template guides are widely available and inexpensive. Brass guides look spiffy and

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Templates require accessories like the Paso Robles Carbide template bit set, \$185 from Pat Warner or Paso Robles Carbide; or the Lee Valley brass template guide set, \$15.75.

cutting edges are more forgiving of inadvertent contact with them than with steel guides.

Pattern bits have bearings mounted on their shanks (as opposed to their tips). Paso Robles Carbide has a unique five-bit template set, which provides sensible capabilities for the serious router woodworker.

The usual routine is to cut the workpiece to within 1/8" of the template contour, then rout it to perfectly match the template. The difficult part is cutting close to the line without cutting beyond it. To be safe, we usually err toward the waste side, leaving a lot more than 1/8" for the router to trim. That makes for a heavy cut, which dulls bits quickly and increases the risk of tearout.

The PRC set has two bits with slightly oversize bearings. These do the heavy labor of reducing the workpiece contour to within 1/16" of the template. You then use one of the set's flush-cutters to make a clean final pass.

9: Joint-cutting Accessories

You probably expected the joint-cutting accessories to be right near the top of the list. The truth is that some joint-cutting essentials are near the top: the edge guide, the clamp-on guide, and even template accessories. But you may want to try some joint-specific accessories.

The primary one has to be the dovetail jig. A very good starting point is an inexpensive half-blind jig. You should be able to get one for less than \$75, complete with dovetail bit and template guide.

The plunge router is an excellent tool for cutting mortises.

Depending upon how you are accessorized, a dedicated mortising jig may be a worthy buy. Woodhaven makes a simple but effective device. It has two adjustable fences attached to an oversized baseplate. You adjust the fences to trap the workpiece between them and to position the bit for the cut.

For routing oddball dado widths, look at a jig called "Dial-A-Dado." The jig has an eccentric baseplate on a square guide plate. Turning the eccentric plate moves the bit in relation to the reference edge. You make a first cut with the jig zeroed out, then turn the router to dial in the width increase you want to cut on the second pass.



Accessories for making your own jigs include UHMW and other plastics from Rockler or your local plastics dealer; Baltic birch plywood and MDF from your local supplier; toggle clamps and plastic knobs. Prices vary by size and style.



Some joint-specific accessories are the Dial-A-Dado from Rockler and Woodcraft, \$39.99; the mortising jig, \$39.99 at Woodhaven; or the half-blind dovetail jig, \$69.99 at Rockler.

10: Jigmaking Accessories

Router woodworking inevitably involves jigs and fixtures. You will benefit if you have the right stuff on hand to make jigs when you need them. Start with pieces of strong, flat, rigid materials like high-quality plywood and MDF, clear acrylic, tough phenolic, and lubricious UHMW plastic. For jigs with adjustable elements, get a selection of plastic wingnuts, levers, knobs and toggle clamps.

To me, metal wing nuts and wooden cranks mark a makeshift jig. If it's a keeper, why not style the jig a bit and make it easier to use? There are three basic types of plastic knobs: those with threaded studs, those with blind threaded inserts, and those with through inserts. Within each type there are dozens of styles, ranging from tiny knobs up to bulky handgrips.

The toggle clamp can be a labor saver, a practical clamping solution, or a safety device. In fact, sometimes it's all three. Unlike screw-action clamps, toggle clamps aren't inconvenient or time-consuming to use. At a flick of your wrist, a toggle clamp will snap closed, clinching a workpiece in place.

Bill Hylton writes regularly for Woodworker's Journal, covering tools and accessories and how to best use them.

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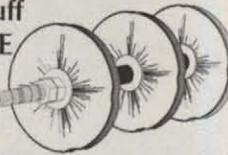
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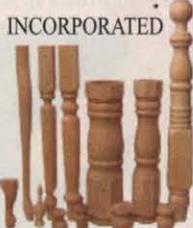
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No.	Source	Page	No.	Source	Page
1	Airware America (Power Visor).....	72	73	McFeely's (square drive screws).....	91
2	Akeda Jigs (dovetail jig).....	19	74	Micro Jig, Inc. (GRR-Ripper System).....	69
3	All Pro Tools (routers).....	93	75	Mini Max (band saw).....	81
4	Amana Tool Corporation (router bits).....	95	76	Miracle Steel Structures (steel buildings).....	73
	American School of Lutherie (guitar making class).....	73	77	Modine HVAC&R Division (garage heaters).....	75
88	American Steelspan (steel buildings).....	78	78	Mule Cabinetmaker (rip fence).....	9
6	Arrow Fastener Company (brad nail gun).....	61	79	Murray Brothers Supply, Inc. (plans & patterns).....	72
7	Ashman Technical Ltd. (tools).....	72	80	Newton Woods (hardwoods).....	50
8	AussieFan Tom's Exotic Timber (hardwoods).....	50	81	Niagara Lumber (hardwoods).....	50
9	Badger Hardwoods of Wisconsin (hardwoods).....	50	82	Nick's Equipment Sales (surface sander kit).....	73
10	Baker Products (portable band sawmills).....	88	83	Northland Forest Products (hardwoods).....	50
11	Barren Creek Clocks (clock plans).....	73	84	Nyle Corporation (dry kiln systems).....	93
12	Baxter Creek Tools (Sander Sitter).....	91	85,86	Oldham Saw (router bits, saw blades).....	9,57
13	Beall Tool Company, The (turning supplies).....	72	87	Olson Saw Company (saw blades).....	91
14	Berea Hardwoods (pen turning kits).....	69	89	Oneida Air Systems (dust collectors).....	88
15	Better-Built Corporation (portable sawmill).....	92	90	Osborne Wood Products, Inc. (table legs).....	71
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	Brand New (branding irons).....	72	92	Polymeric Systems, Inc. (epoxy putty stick).....	73
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A Router Revolution Takes Shape

By Chris Marshall

If you haven't bought a router since the Reagan administration, you're in for a real treat next time up. New routers are powerful, versatile and comfortable to use, and they're quieter than ever. Manufacturers tell me that, next to cordless tools, woodworkers are buying more routers than any other tool type. And it stands to reason. No tool better deserves the jack-of-all trades title. Routers perform at least a half dozen different tasks with equal finesse.

Recently I asked those in the know from today's leading router manufacturers to help me create an "A" list of hot new routers. (Check the box on the top of the next page for contact information.) The company reps also bent my ear about where router developments have gone in the past 18 months or so and pointed me to those trends and features that are truly worth your tool dollars. Some even dropped a few hints about what we might see on the router horizon within the next year. If you're hankering for a new router this Christmas or just beginning to shop for one next year, here's the scoop on what I've learned.

Table Manners

Hang a router under a table and it becomes a decent shaper. But it doesn't take much experience with a router table to discover the hassles of using an inverted router. Bits can be frustrating to change

and inconvenient to adjust. Knobs and switches are just tougher to find without looking underneath the table each time. And compressing the spring on a plunge router when it's upside-down is about as easy as giving a cat a bath.

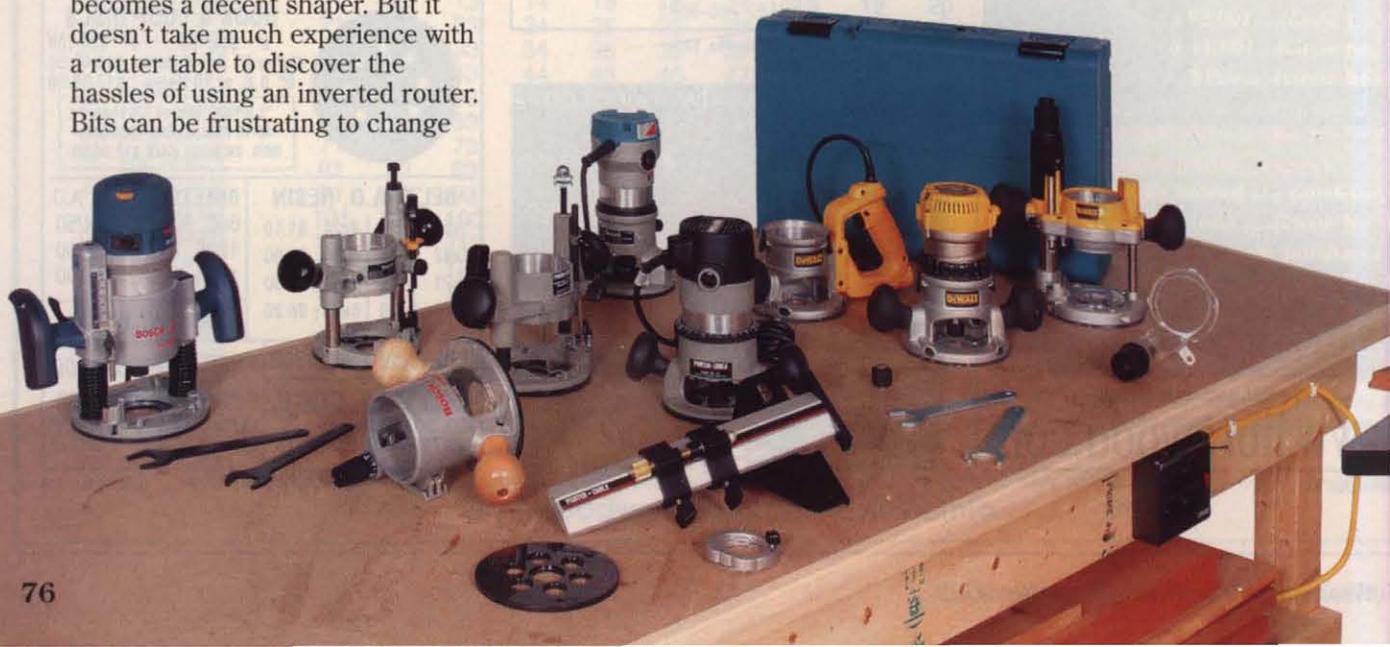
Thankfully, some new routers are being designed with router table use in mind. Bosch's big 1619EVS plunge router, for instance, comes equipped with a system for overriding the plunge mechanism so the tool behaves like a fixed-base router. The plunge lever has a flip-out lock that keeps the lever disengaged, and the plunge spring can be locked when fully compressed so the motor slides freely on its posts. Depth adjustments happen by

locking the depth stop rod into a keyhole in the base turret and raising and lowering the router with the fine adjust knob. The tool morphs back into a plunge router in seconds by simply deactivating these overrides. This router and several other models also come with a large extension knob for depth adjustment so you can change bit heights without groping under the table to find the control.

Milwaukee's 5615 BodyGrip™ router takes a northerly approach to router table adjustments. On this model, you can slip a hex-head T-wrench or even a socket wrench down through the tabletop and adjust the bit height from above the table rather than below. What a brilliant idea. You'll need to drill an extra hole through the tabletop or insert plate to make this feature work, but it's definitely worth the effort.

Quick-change Artists

The best way to change bits on a fixed-base router is to pull the motor out, but the process can be a chore. On older fixed-base routers and even some new



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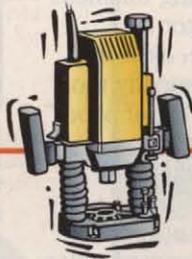
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locks in this lineup include the Fein RT-1800, DeWalt's DW618, the Porter-Cable 9290 and Bosch's 1619EVS. Lockable spindles are small niceties, but they're worth a check on your list of must-have features for a new router.

Getting a Better Grip

Milwaukee discovered that countertop installers and cabinetmakers were "palming" the motors of their routers for better control instead of gripping both handles. An unconventional handling style, for sure, but one that became the genesis for Milwaukee's 5615 BodyGrip™ router, the first router equipped with a contoured overmold on the base for gripping the motor body instead of the handle.

Shop Test continues on page 78 ...

models, the thumbscrew knob locks can be painful to twist. Small screw styles don't provide enough leverage to clamp the motor securely in the base without grabbing a pliers. Then you have to spin the motor out of the base and search for a couple of wrenches to loosen the collet nuts. Too much hassle for me.

I know I'm not alone here. Manufacturers are listening closely to our gripes and are making bits easier to change. More and more models now have buckle-style lever locks instead of thumbscrews. Bosch pioneered this feature almost five years ago, and every major tool label is adopting the concept in one form or another. Basically, a cam lever tightens or loosens the motor in the base with one finger flip. Once you try the buckle, I'll wager you'll want to pitch your old router on this basis alone.

Plenty of new fixed-base routers still have bases and motors that twist together on spiral threads, but I'm impressed with the more in-line approach several companies are taking for extracting motors from bases. Both the Milwaukee routers featured here, as well as the Bosch 1617EVS and DeWalt's DW618 fixed-base allow you to pull the motor straight out (or nearly

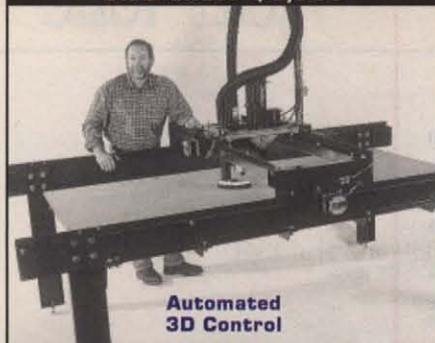
so) without rotating the motor. There are some slight differences in how you actually do this, but generally the process involves flipping the buckle loose, pushing one button or squeezing a couple of clips and sliding the motor free. These in-line configurations make motor removal a breeze.

Spindle locks are another feature that make for speedy bit swaps. Depressing one button on most spindle lock designs parks the spindle, so bit changes require only one wrench. Although the technology isn't new, spindle locks are becoming increasingly common. Routers sporting spindle

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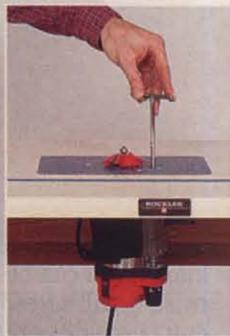
SHOP TEST

Tom Smith, woodworking business unit manager at Milwaukee, explains that the company took a "clean sheet of paper" approach when designing this tool. Instead of simply mimicking other successful router styles, Milwaukee designed the tool from the ground up in the way routers

actually get used in production situations. Even the hook-and-loop strap that holds your hand against the overmold is a novel innovation — it comes straight from the camcorder industry.

So how well does it all work? With one hand strapped to the motor and my other hand on the handle, routing felt more controlled and secure to me. The effect feels like you are actually steering this tool and not simply hanging on. I'll admit that the grip takes a bit of getting used to, but it's sure to please the pros. Try one on for size, if you get the chance, and see what you think.

Other subtler handle tweaks are happening as well. Chris Carlson, senior woodworking product manager at Bosch, says the horn-shaped handles on its 1619EVS were specially designed to help distribute the tool's weight over all 10 fingers for better gripping control. DeWalt's D-handle base for the DW618, as well as both Milwaukee routers, come with knob handles that can be mounted in two or three different configurations, depending on your handling preference. DeWalt has also increased the knob proportions and covered them with soft rubber overmolds to minimize vibration and user fatigue.



Bosch's 1619EVS and Milwaukee's 5615 Bodygrip are designed to take the hassle out of bit height adjustments in a router table. An extension knob on the Bosch attaches to the micro-adjust knob and makes this control easy to find without cramping your neck. The BodyGrip can be raised and lowered entirely from above the table with a wrench, thanks to a hex fitting inside the router base.

Managing the Muscle

I've always felt unnerved by routers that throttle up to full speed the instant I flip the switch, especially when the tool twists in my hands at the same time. If you'd like a router with better motor manners, choose one with soft-start and variable speed. Most of the routers in this sampling come with both features.

Shop Test continues on page 80 ...



Milwaukee's tactile grip on the 5615 came straight from the suggestion box of professional users. A direct grip on the motor column seems to lend more control than grabbing both smaller handles, and your hand stays put with a hook-and-loop strap.

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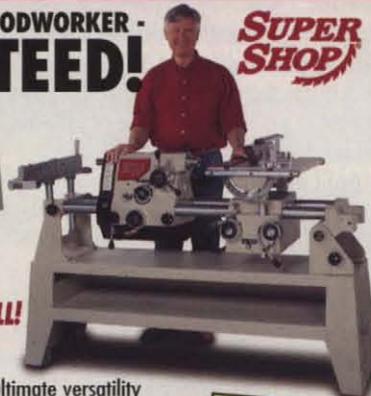
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The depth stop rod on Bosch's 1619EVS doubles as a height control for router table use when it's locked into a keyhole slot in the depth turret. With these parts engaged, the rod raises and lowers the router using the fine-adjustment knob.

Soft-start circuitry delays the motor's start-up time by a second or two so the tool doesn't jerk to life, a phenomenon the manufacturers often call torque twist. You'll really appreciate soft-start for those freehand applications when you're spinning a large bit, because the tool revs up the bit gradually rather than dragster style. Variable speed comes in handy for routing with panel-raising bits or other large cutters that operate most efficiently and safely at lower speeds. If all you do is small bit work, however, variable speed and soft-start probably aren't worth the extra money.

Electronic feedback control is another relatively new motor enhancement that's finding its way into more mid- to large-HP routers. Essentially, a computer chip monitors the torque being applied to the spindle under load and allows the motor to draw more amps to maintain constant bit speeds. The benefit here is that you can work at an even feed rate without bogging down the motor.

Speaking of milder motor manners, you'll be astonished at how quiet these new routers are. I won't advocate skipping the earmuffs, but your neighbors may ask where you've moved the Lear jet once that old router goes away. The tool reps all attribute lower decibels to better fan designs and improved airflow inside the motor case. Both factors help reduce the whistling and whine. New fan blade configurations also cool more efficiently, which is part of the reason why router HP ratings continue to increase. Super-cooling allows these universal motors to draw more amps without overheating. Higher amperage produces longer and larger sustained horsepower peaks.

Breathing Easier

Bosch's 1619, the Makita RF1101, Fein's RT-1800 and the plunge base of DeWalt's DW618KIT all come with some provision for dust collection. The DeWalt plunge base channels chips and dust up through an oversized plunge column, while the other routers whisk away debris through a plastic hood that fastens to the router base. At present, router dust collection doesn't produce surgically clean routing, but it's a huge step in the

Bits cut most effectively and safely when a motor can be set to a specific speed range. Variable-speed control makes the task as easy as rotating a dial. Makita's RF1101 motor comes with a cross-reference chart next to the speed dial for correlating dial markings with RPMs.



Spindle locks turn bit changes into a convenient one-wrench operation. Typically the lock engages by pushing a button.

right direction and a feature you'll appreciate, especially if you don't have a dust-collecting fence on your router table.

Pitch the Cord

About a year and a half ago, Porter-Cable unveiled its model 9290 cordless router, and it has been receiving respectable reviews by the pros ever since. This tool is powered by the company's 19.2-volt rechargeable battery, the same

Shop Test continues on page 82 ...



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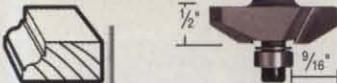
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Slip the 19.2-volt battery onto Porter-Cable's 9290 cordless router, and you're ready to rout — in the middle of a field if need be. No need for an outlet here until recharge time.

battery that drives a full line of other cordless Porter-Cable tools. When I queried the manufacturers about the single biggest router innovation in recent years, several ranked this router at the top of the list.

The 9290 spins at a single speed of 23,000 RPMs. Its 600-watt motor is comparable in power to a router around 1 HP, but company spokesperson Todd Langston assured me that it should be able to tackle any routing task that a 1½ HP router can muster. The tool comes with a 1/4" collet and the old 690 thumbscrew-style base, although the motor pack will fit any of three different newer 690 bases. On a full charge, Porter-Cable says that the battery should have sufficient run time to mill 100 feet of oak with a 1/2" roundover bit before needing a recharge. I didn't test the claim, but I can say it packs enough oomph to spin mid-size bits without laboring.

Still, the 9290 has a higher price tag than other comparably sized corded routers. Is it worth the extra money?

Shop Test continues on page 84 ...

The Router Horizon

Looking to the future, new router offerings will continue to arrive. Milwaukee is promising a 3½ HP version of their BodyGrip style unit, and others are also hinting of new models in the wings. Two new routers have come along in recent months that help provide a glimpse of future trends. The new variable speed, 3¼ HP Australia-based Triton looks like the offspring of R2D2, with its squat motor and compact knobs perched high on beefy posts.

As you might guess from the photos at right, working this unit from the topside is a bit ungainly. But two clever features make it a winner in table-mounted applications: First, it has a winder-operated, rack-and-pinion, micro-adjustable system for setting the depth-of-cut; and, second, it has one-wrench, above-the-table bit changing. The Triton has two modes: plunge and "winder." Turn the mode selector to "unlock," and it's a plunge router with a plunge-lock lever and a two-position depth-stop turret. Turn the selector to "lock," and the hand-grip becomes a "winder." Squeeze the winder's lock-ring and turn it to raise and lower the motor on the posts. Release the lock-ring to hold the elevation. A separate micro-adjust knob raises or lowers the bit in superfine increments. Wind the



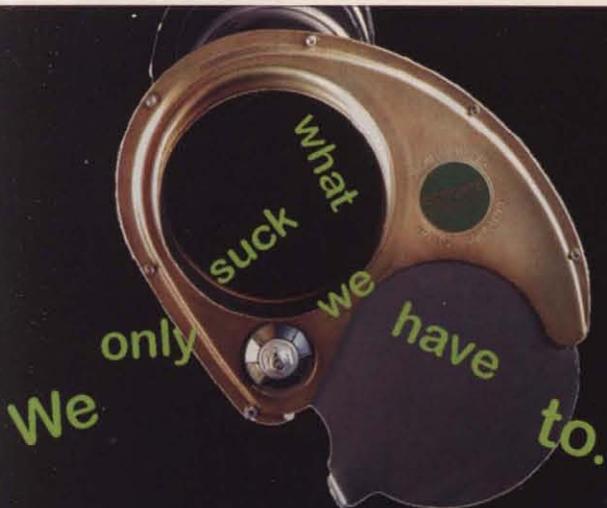
The Triton is a winning table-mounted unit. At left, one-wrench, above-the-table bit changing and at right, a winder-operated, rack-and-pinion system for setting depth-of-cut.

motor as far as it will go into the base, and the collet projects a good 3/4" beyond the router's base. At the same time, a spindle lock automatically engages and a cover over the power switch locks. The collet is above the table now, and only one wrench is needed to loosen it. Because the switch cover is locked, you can't turn on the router, even if you tried. Likewise, if the switch is on, the router cannot be plunged to bit-changing depth.

Ryobi's new RE180PL 2 HP, soft-start electronic variable speed plunge router, with 1/2" and 1/4" collect capability, features the Accu-Stop® micro-adjustable depth stop, which adjusts in 1/64" increments for all the retired engineers out there. At a price point of \$99, Ryobi is bound to turn some heads with this new machine, especially since it carries a two-year limited warranty. Like the Triton, Ryobi's new unit allows for easy, one-wrench bit changes.



Ryobi's new 2 HP, variable speed plunge router will be available at Home Depot this fall, for under \$100.



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It's handy to rout without having to flip a cord out of harm's way, and the tool is reasonably quiet, well balanced and amply powered for average routing tasks. A spare battery and a buckle-style base would make it a better value. Given Porter-Cable's solid reputation for great routers, your budget may have to be the deciding factor here.

All-in-one Kits

If you just can't decide between buying a mid-sized fixed-base or plunge router, a kit may be the solution you need. Porter-Cable started this packaging option years ago, and Bosch, Makita and recently DeWalt have followed suit with top-notch kits. Basically, you get one motor pack that fits into a fixed base and plunge base. Several of these kits come with

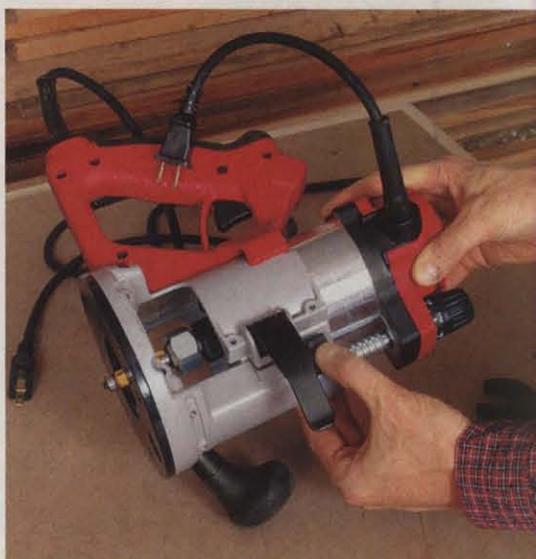
1/2" collets, edge guides and additional baseplates with larger bit openings. DeWalt sells an optional D-handle base as well. A kit provides you maximum versatility and better value than buying two or three separate tools. Mount the fixed base in your router table and use the plunge base for all other freehand operations, and you might just be set for the next couple of decades of routing with one tool purchase.

What's Ahead

Across the brand lines, manufacturers aren't letting many cats out of the bag about next year's new routers. The competition is too stiff to be generous with R&D secrets. What the reps will say for sure is that routers will continue to become more accurate, versatile and simpler to use. Look for improved dust collection accessories, smoother controls and better handling ergonomics. Routers will also continue to follow the path forged by computers: more power with less weight in smaller packages. Speaking of power, have routers hit the horsepower ceiling with today's 3 1/4 HP models? The verdict was mixed on this question, but it seems routers could get even gutsier, provided the tradeoff isn't poor handling.

Expect to see a continued surge in multi-base router kits but, surprisingly, not more cordless routers.

Improvements in battery technology and user demand will pull this bandwagon. I suspect cordless routers will eventually come in a rainbow of tool colors,



Fast motor removal means easier maintenance. Milwaukee's new 5619 D-handle features a linear release mechanism that allows the motor to pull straight out rather than spiral free. Flip the buckle, push one button, and pull the motor out. Simple.



There's no need to choke on chips and dust if you buy a router outfitted with dust collection. DeWalt's DW618 plunge base draws debris up through an oversized plunge column. The Fein RT-1800 comes with a clear plastic extraction hood that screws to the base. Both dust collection styles have fittings that connect to a vac hose.

but Porter-Cable gray will probably be your only cordless option — at least for the coming year.

Contributing editor Chris Marshall is an Ohio writer and woodworker who covers tools and occasionally builds projects for Woodworker's Journal.

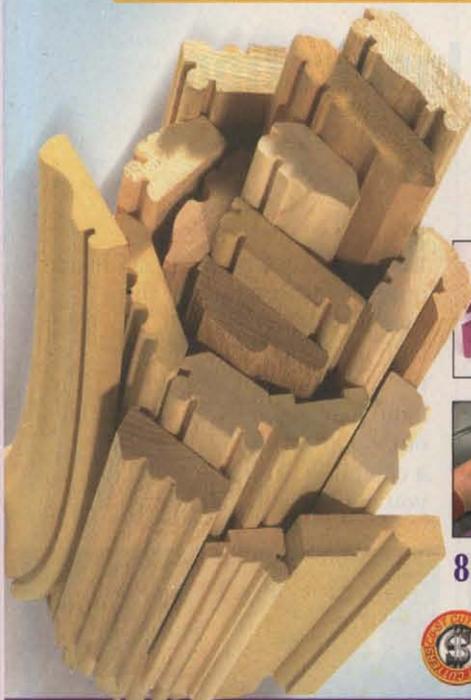


Buckle-style cam locks on many of today's new router bases provide more positive locking pressure around the motor than the old thumbscrew tighteners. One flip is all it takes to lock or release the motor.

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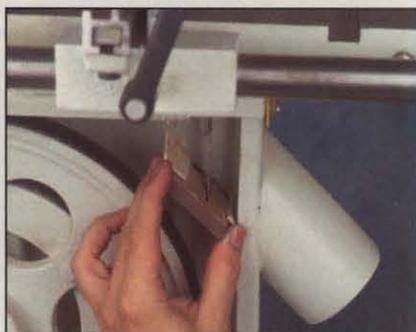
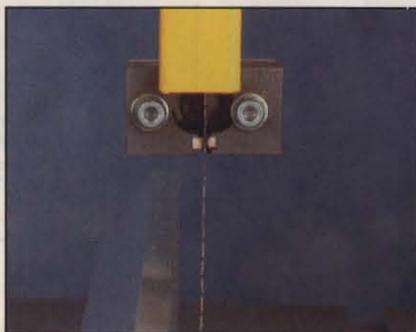
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Laguna LT14: Determined Inspiration

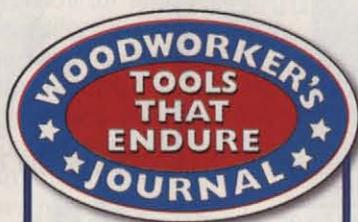
By Rob Johnstone

When Laguna Tools introduced their 14" band saw, we were impressed with its focus on substance and power and its affordable price. After using it in our shop for a year, *Woodworker's Journal* heartily recommends Laguna's LT14 as a great addition to your shop.

Day-to-day woodworking is one quarter inspiration and three quarters determination. It is labor with a capital L. And if you're like me, you love it. The Laguna LT14 band saw is made for day in, day out woodworking ... work with a capital W. And it is a machine you could easily fall in love with.



Laguna's ultra modern ceramic blade guide contrasts with its low-tech but highly effective plywood dust baffle. Quality and practicality are the watchwords of this tool.



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Curious Combination

If you stand back and look at the LT14, its European style — with a tapered vertical column and various subtle angles — is evident. When you examine it closely, it is a unique combination of practical design features, some almost crude in their presentation, which contrast strongly with its state-of-the-art ceramic guide blocks and gutsy, almost over-the-top, tensioning system. This curious combination of features works in concert to present an eminently practical and category leading design. It is a 14" band saw, but it works like a much larger tool. The 220v motor is part of that equation, but here is a case where the individual features add up to a sum greater than the whole.

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the heavy-duty aspect of the tool is the tensioning system. It, too, would be at home on a much bigger saw. It is easily able to properly tension the 1" wide band saw blades that make resawing so much easier. (The narrowest blade you can put on the saw is 1/16" ... quite



This band saw's well-balanced and very heavy flywheel obscures its powerful tensioning system.

a range!) The rip fence provided with the saw is strong, if not beautiful. I used it to resaw (although I prefer a point fence for that task), and it worked great. The miter gauge is similarly effective and without frills. One area where the saw was a real standout was dust collection. With the combination of a large dust port designed to work with gravity and a metal shroud joined with a clever plywood baffle and door plate, dust collection was simply superior: Very important as you resaw.

A Proven Winner
Laguna's LT14 has power and versatility to spare and a wonderful blend of elegant and no nonsense features. From resawing to scrollwork it is an excellent saw. For these reasons and more, *Woodworker's Journal* is pleased to select the Laguna LT14 as a "Tool that Endures".



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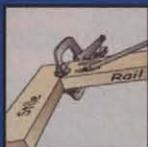


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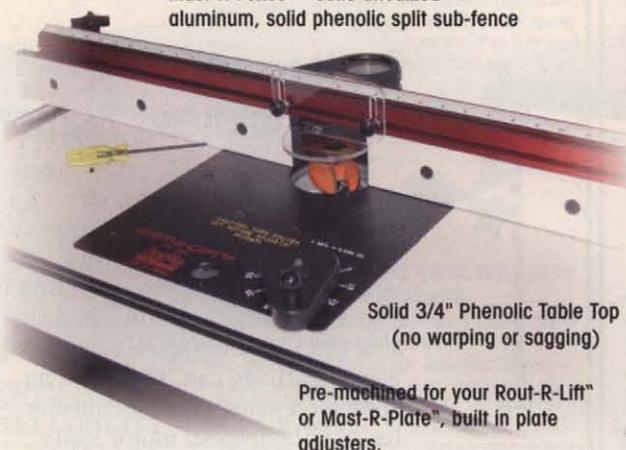
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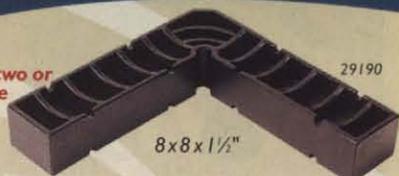
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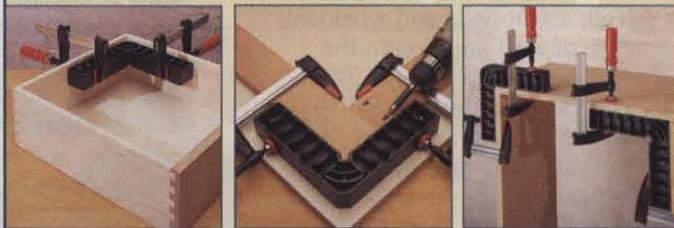
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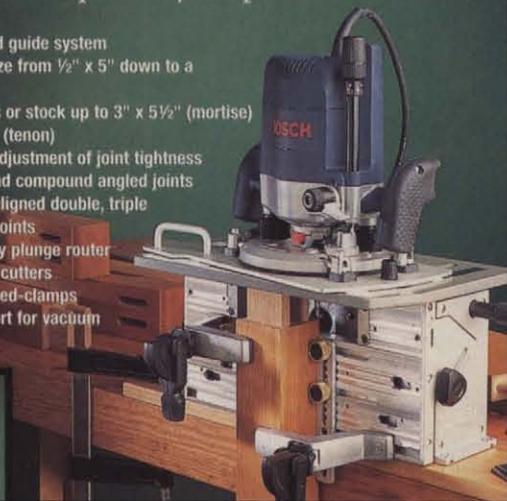
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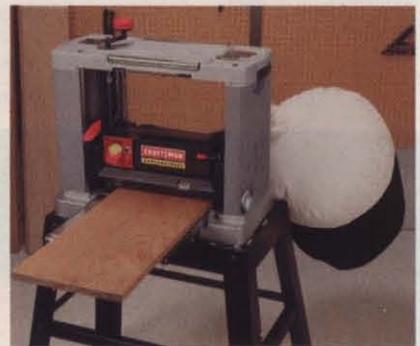
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Ryobi's 9.6-volt Drill/Radio kit (Model HP962R2) comes with a three to six-hour battery charger to recharge one of the two included batteries (while the other one is in the drill). A 24-position clutch helps eliminate screw stripping, and the drill features variable speed, a keyless chuck, two double-ended bits and a built-in level. The unit also serves as a storage center that can even be wall-mounted — screws and hanging hardware are included. The entire unit is coated with a no-slip texture, and it sells for \$49.97 at The Home Depot. The HP962R2 comes with a two-year limited warranty and a 30 day, no-risk satisfaction guarantee. *For more info, call 800-525-2579 or visit www.ryobitools.com.*



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Bosch Introduces Cordless Jigsaws

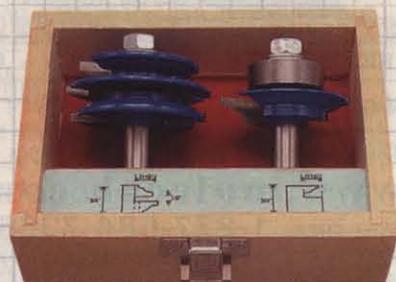


Bosch Power Tools is making a strong statement in the cordless jigsaw market with its introduction of three new models — a 14.4-volt, an 18-volt and a 24-volt saw. All three tools offer the company's new One-Touch tool-free blade changing system: just push the blade in with one hand until it clicks, and remove it by using one

finger to move a small lever that ejects hot blades. The saws (models 52324, 52318 and 52314) have the largest cutting capacity of any cordless jigsaw available: combined with the right Bosch-tang blades, they will cut up to 2³/₄" in wood or 5/16" in steel. An external fan cools the Bosch-built motor, an efficient powerhouse with lightweight magnesium gear housings. All three jigsaws also feature a die-cast aluminum foot, a removable plastic workpiece protector and an electric brake. Street price for the saws, which will be available by year's-end, will range from \$189 to \$249. For more info, call 877-267-2499 or visit www.boschtools.com.

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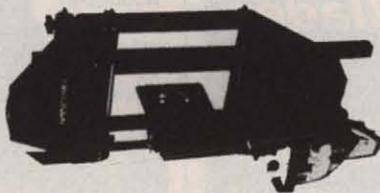
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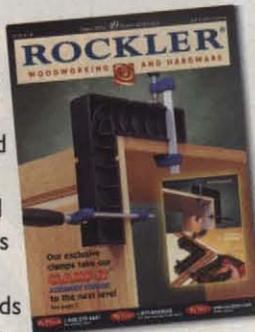
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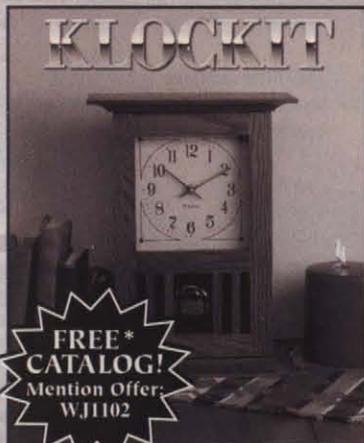
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Getting Set

By Joanna Werch Takes

According to some definitions, you might call our latest mystery tool a mystery “machine” — although slightly different from the one canine cartoon sleuth Scooby Doo’s friends drive.

This one belongs to **Jeff Hower** of Altamont, Missouri and is “the only one I have ever seen,” Jeff says. He — and we — want you to identify it. Your clues: it’s about 4" wide and 7¼" long when the handle’s not extended. With the handle stretched out, it’s about a foot long. Hot dogs out there among you tool identifiers will also want to know that stamped into the frame are the words: “The Gerrard Company Inc., Patent Model TA pending, Chicago-New York-Seattle-Portland, San Francisco-Los Angeles-New Orleans.”

A tag riveted to the frame also instructs owners in “Care of Machine”: “Clean weekly with Gasoline,” it says; “Oil All Moving Parts.” If I told you what the tag with the patent number and model number said on it, though ... well, it would be like those meddling kids unveiling the bad guy at the beginning of the episode instead of the end.

Instead, it’s much more fun to sniff out the answer on your own, as you did with the mystery tool sent in by **Arif Ulku** of Grosse Pointe Woods, Michigan (belonging to his uncle, **Pat Stanley**), and pictured in the August *Stumpers*.

Cliff Lago of Washington Court House, Ohio, actually has one of these tools. “I found mine over 20 years ago in an old barn in southern Ohio,” he said. While he didn’t know what it was, he did know it was “dated Dec. 23, 1873.”

A machine for putting the set in band saw blades.



In the 1800s, if you wanted your band saw blades to be “set” in their ways, you would use this tool. Place the blade on the anvil and trip the hammer for it to impact and set the tooth, says L.G. “Jerry” Staton of Havelock, North Carolina, who got his info from the Saw Sets and Vintage Saw Tool Museum at <http://sawsets.com>.



This little machine is our latest mystery tool: start your machinations now to figure out what it is.

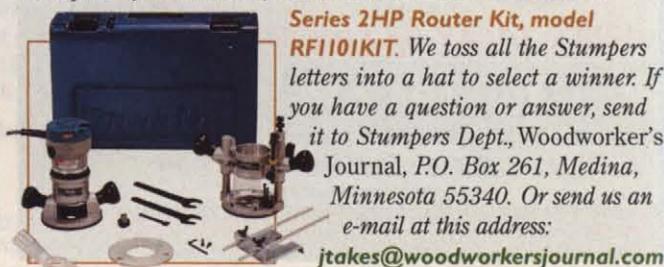
In 1873, Roswell F. Cook of West Potsdam, New York, patented his “Improvement in Saw Sets.” Over half a century later, as **Norman MacDonald** of Ketchikan, Alaska, told us, the tool was “the same as we used to use in a small shipyard in the 1940s. We filed our own band saw blades, and this tool put the set in the teeth. When the crank was turned, it moved the blade two teeth, then the teeth were fitted and the crank turned again for the next tooth to file.”

The purpose of this band saw setting machine, explained **Steven Sampson** of Wilbraham, Massachusetts, was “to bend the sharpened teeth of the saw blade sideways in alternating directions to prevent the teeth from binding.”

Steven also knew that A.E. Cunningham of Worcester, Massachusetts — the manufacturer of Arif’s tool — was making band saw sets based on the Cook patent in the 1890s. That fits in with the discovery by **Dennis Rood** of Clarksville, Arkansas, of an 1895 Charles A. Strelinger and Co. book of tools, supplies and pictures, which “states that ‘This is one of the simplest and best tools in the market. By simply turning the crank, it will set from 75 to 150 teeth per minute, and it will set every tooth alike.’” In the book, Dennis said, the tool’s price was listed at \$7.

Perhaps the best person to explain how the tool worked is Roswell Cook himself. In his patent application, he wrote, “When the lever is moved back, it raises the hammer until it passes the dead-point, when the hammer springs farther back, so that its heel comes in contact with the flat portion of the spring, and is held in a raised position. A slight forward movement of the lever starts the hammer downward again until it passes the dead-point, when the spring completes the downstroke with a sudden blow.”

WINNER! For taking the time to respond to *Stumpers*, **Steven Sampson** of Wilbraham, Massachusetts wins a **Makita 100**



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