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WOODWORKER'S JOURNAL

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**Arts & Crafts
Bedside Table**

page 44

5th
**Annual
Turners'
Challenge**
page 30

**Fold-up
Router
Table**

It mounts right to
your shop wall!
page 52

SAVE MONEY!

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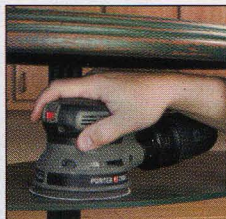
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Woodworker's Journal Features

September/October 2008

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52 Wall-mounted Router Table

By Chris Marshall

Save space in your small shop with a router table that attaches to the wall, then flips up when you're done using it.



58 \$100 Shop Table

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30 Tiny Turnings

By Betty Scarpino

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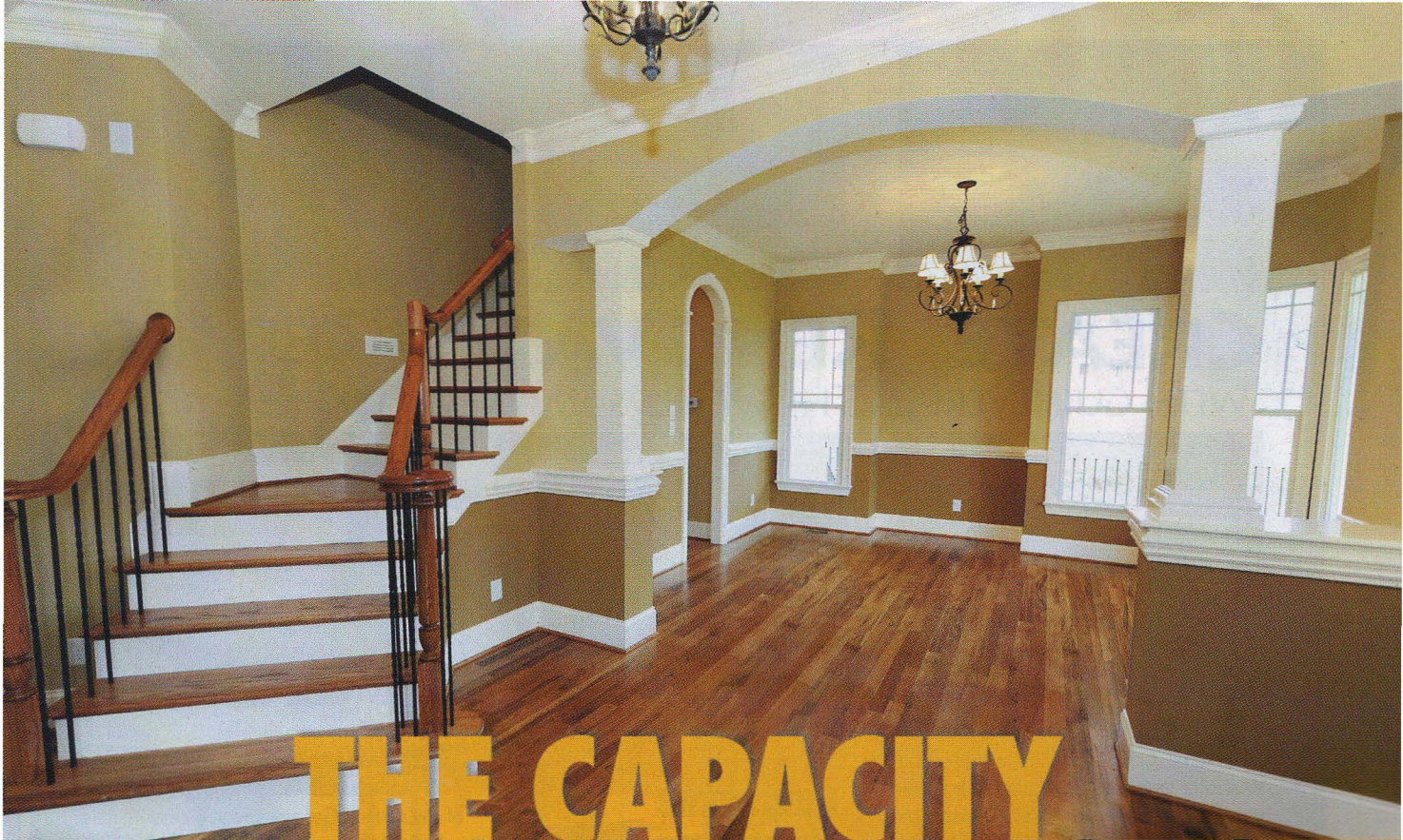
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By Sandor Nagyszalanczy

A classic Arts & Crafts style bedside table displays elegant cloud-lift aprons, ebony plugs and splines and a breadboard top.



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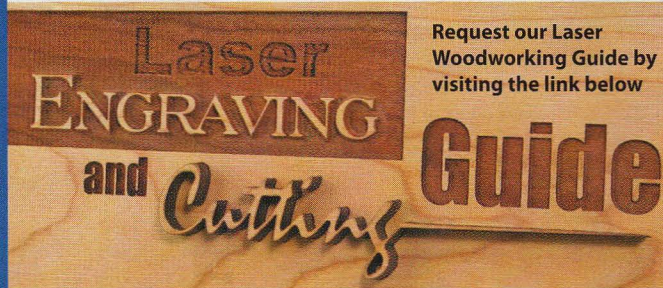
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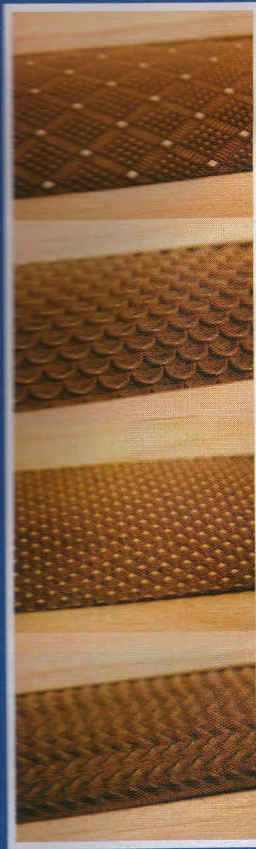
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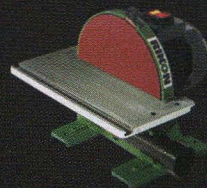
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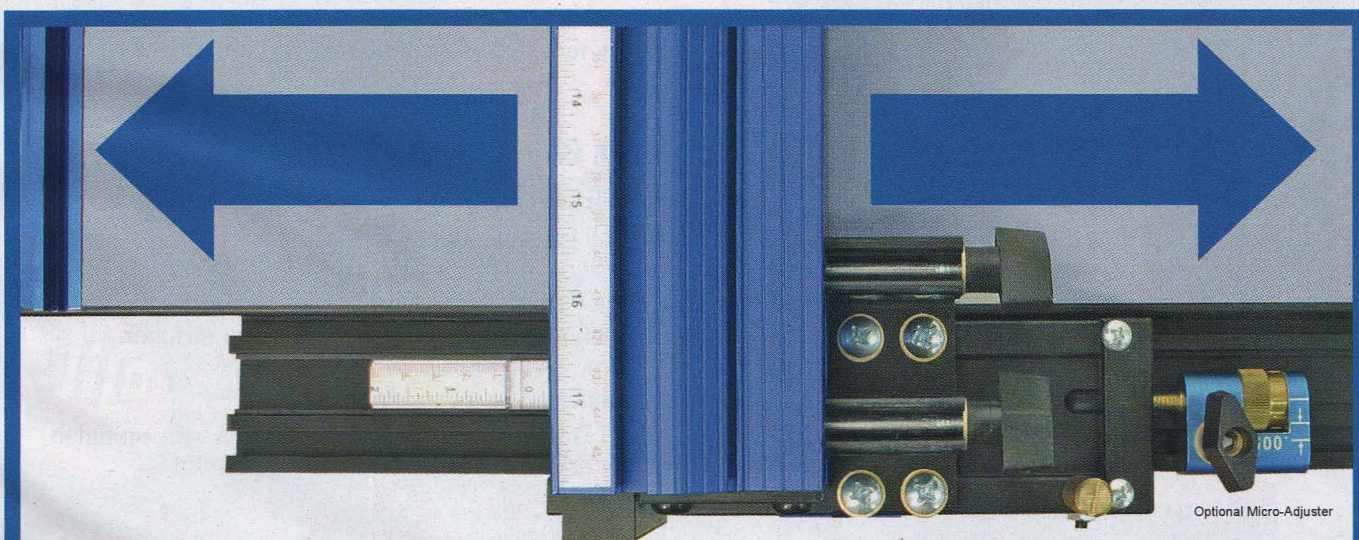


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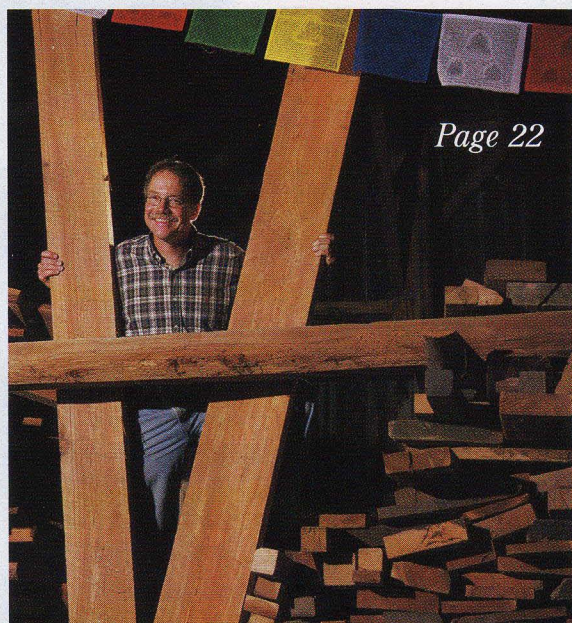
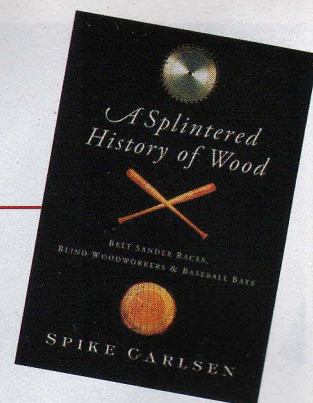
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Woodworker's Journal Departments

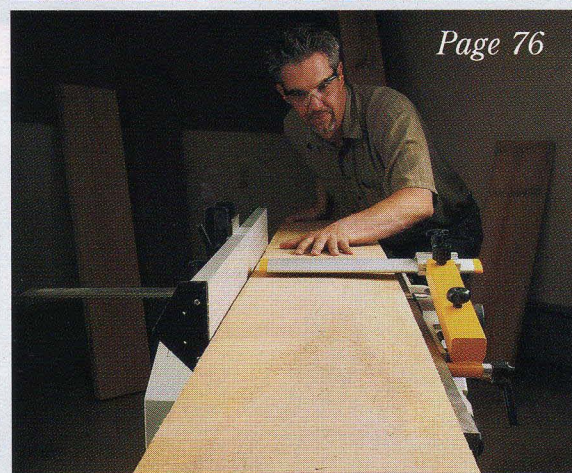
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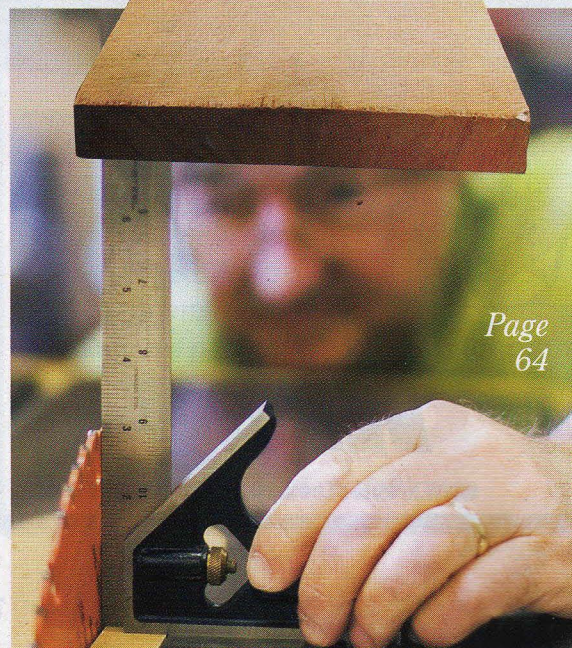
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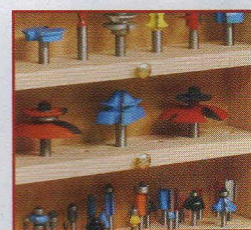
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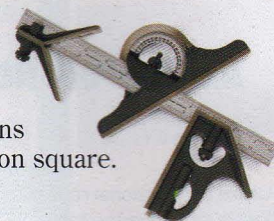
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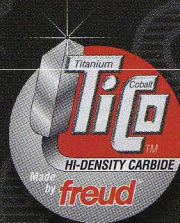
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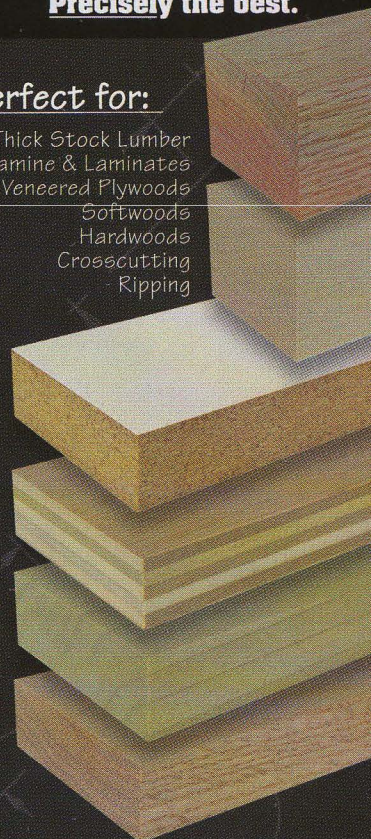
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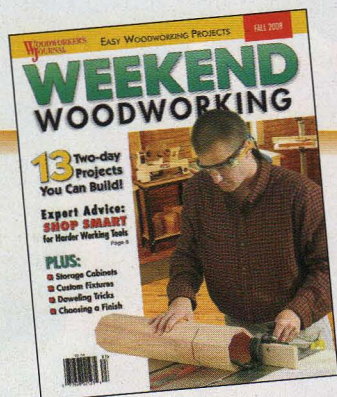
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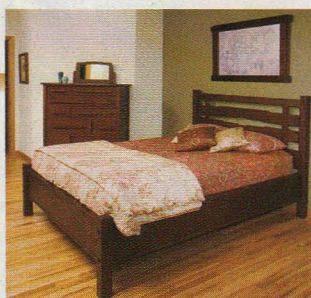
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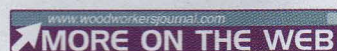
*Woodworking is fun,
So say you: Can you say it
in a true haiku?*



Woodworker's Journal eZine, our online-only woodworking magazine, will be hosting a woodworking haiku poetry contest this fall. Sign up for the free version at www.woodworkersjournal.com and watch for details. (If you then upgrade to Premium, you'll have even more fun, including woodworking quizzes in every issue).



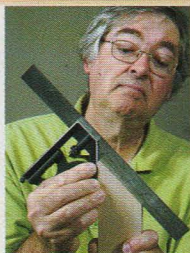
More on the Web ... Previous components of our Greene & Greene style bedroom set included a Bed and a Dresser. (You'll find the Bedside Table on page 44 of this issue.) As a bonus, we've posted downloadable versions of these earlier plans on our website. Visit us at woodworkersjournal.com.



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Quik-Link ... Great tool information in the magazine and quick navigation to even more info online are a winning combo. Just visit the **Quik-Link** section of our site at woodworkersjournal.com to find out more about the combination squares (page 64) or What's In Store products (page 90) featured in this issue.



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This Woodworker Cuts Both Ways

They say that confession is good for the soul. I hope that is true. In our last issue, I fessed up about the true nature of tool testing. This issue, I have one more thing to admit ... I have become fascinated with woodturning. I've

"Just about everything about turning is backwards when compared to flat-woodworking."



My very first turned bowl — made from butternut.

got a lot to learn about turning (which diminishes my enjoyment not one whit), but one thing I have already discovered has been a real revelation: When it comes to woodworking, there exists a great divide. There is flat-work (you know, cabinetry, furniture-making, etc.) on one side of the canyon and

woodturning on the other. Both are technically woodworking, but they are very different in both execution and technique. For most of my life, I have stood firm in the flat woodworking camp. I made cabinets with my father. I made guitars (which even though they are very curvy, are indeed flat-woodworking ...) on my own. I've made furniture and custom cabinetry in my own studio. And I've loved every bit of it.

But a while ago, I bought a lathe, and that has led me to venture across that great divide, and now I am standing with a tenuous foot in each camp. You may

My first attempt at green-turning black walnut.



ask, "what are the big differences?" Well, just about everything about woodturning is backward when compared to flat-woodworking. In flat-woodworking, you mostly move the wood across the cutter, be it table saw, router table or whatever. In woodturning, you spin the wood and hold the cutter up against it. In flat-woodworking, you get best results with well-dried wood. Turners often prefer green — by that, I mean wood right off the stump — over kiln-dried stock. And while there are many precision turners out there, speaking for myself, the final shape of a turned piece is likely to not be finalized until I'm done sanding.

It may be that the key difference between flat-woodworking and woodturning is in the creative process. The left brain/right brain divide may well be the genesis of the canyon I am uncomfortably straddling.

I admit all of this to help introduce part of this issue. Our fifth annual woodturner's challenge is featured on page 30. (You can see by the examples on this page why I was not selected for the challenge ...) Betty Scarpino, our turning expert, decided that tiny objects would be the goal of this year's event. What you will find on those pages are not big, not at all flat, but absolutely amazing — I confess.

Featured Author: Betty Scarpino

Betty Scarpino is our undisputed turning guru. With pieces in the Smithsonian's Renwick Gallery in Washington D.C. and the Museum of Arts & Design in New York, her expertise is a matter of record. In addition to being an exceptionally talented turner, Betty is a great teacher and top-flight writer to boot. When I was searching the nation to find a great woodturner for our magazine pages, Betty's name was on the top of everyone's recommendation list. We are very lucky to have her appear in every issue as part of our gang.

— Rob Johnstone



SEPTEMBER/OCTOBER 2008

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EDITORIAL INQUIRIES

ROB JOHNSTONE

rjohnstone@woodworkersjournal.com
763-478-8255

JOANNA WERCH TAKES

jtakes@woodworkersjournal.com
763-478-8303

CHRIS MARSHALL

cmarshall@woodworkersjournal.com
614-746-2985

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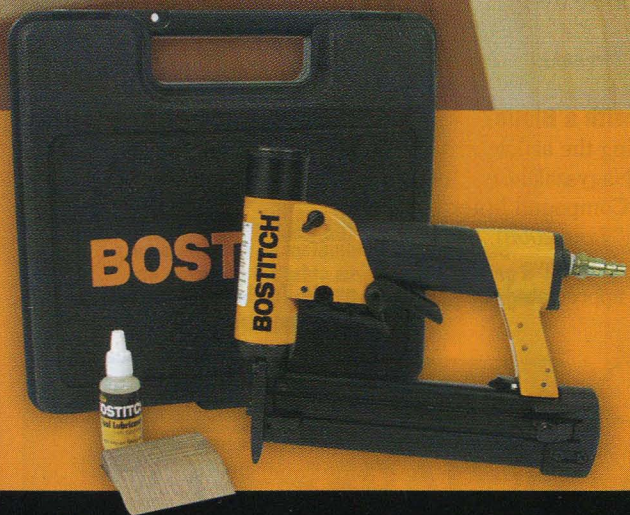
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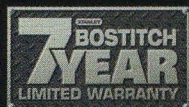
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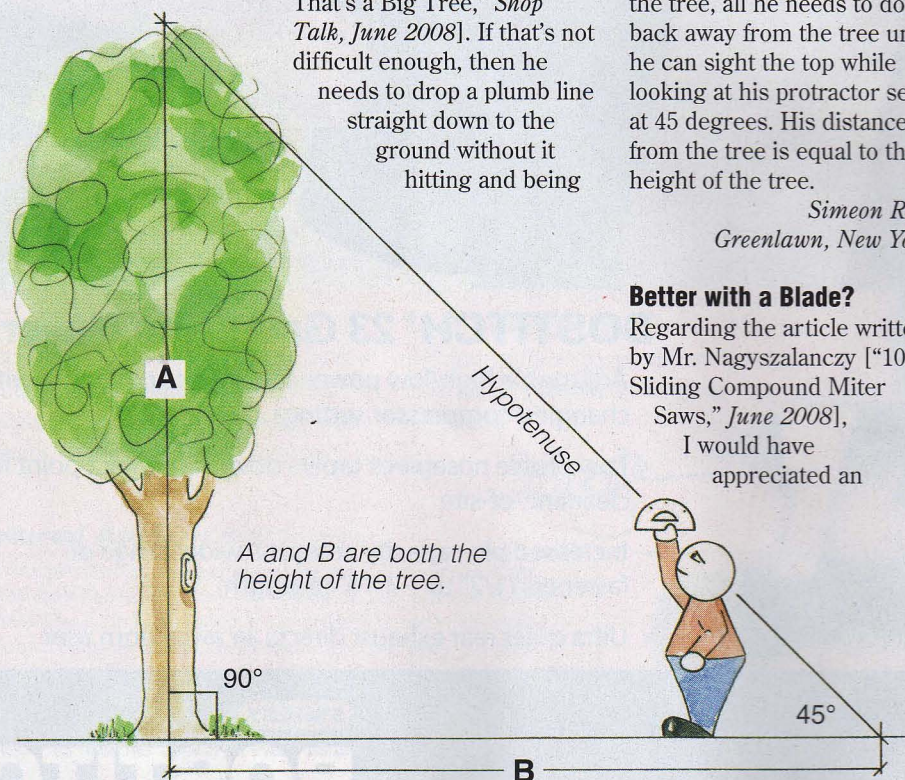
Good Work Mr. Steiner

Thanks for your article on "Trucks for Tots" [*Shop Talk*, June 2008]. Your article brought back great memories of my high school years and one of my greatest learning experiences: building Toys for Tots with instructor Vernon Pack at Ogden High School in Ogden, Utah. I still use the lessons learned from Mr. Pack regularly. Mr. Steiner may not know today what his impact will be on his students, but for me it was a turning point in my life. Keep up the good work, Mr. Steiner, you are changing lives.

*Scott Dixon
Roy, Utah*

The "Right" Triangle

Pity poor professor Matt Ritter making that difficult climb to the top of the eucalyptus tree ["Now, That's a Big Tree," *Shop Talk*, June 2008]. If that's not difficult enough, then he needs to drop a plumb line straight down to the ground without it hitting and being



deflected by any one of those big branches. Had he paid more attention to the teacher during his ninth-grade geometry class, he would have remembered something special about a triangle with one right angle.

If the hypotenuse of this triangle meets each of the two sides at a 45 degree angle, then the two sides are equal in length.

To measure the height of the tree, all he needs to do is back away from the tree until he can sight the top while looking at his protractor set at 45 degrees. His distance from the tree is equal to the height of the tree.

*Simeon Ross
Greenlawn, New York*

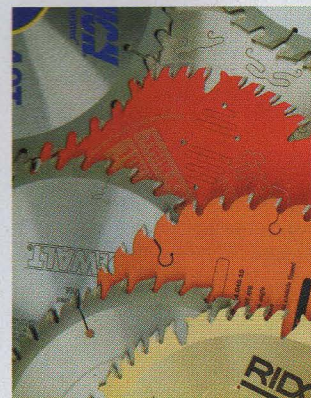
Better with a Blade?

Regarding the article written by Mr. Nagyszalanczy ["10" Sliding Compound Miter Saws," June 2008],

I would have appreciated an

additional rating section when an aftermarket blade was added to each of the saws. I, for one, haven't used a blade that came with the saw since my first compound miter saw. I did thoroughly enjoy the article, and the tool reviews are always a first look in the magazine.

*Zane Bowerman
Meridian, Idaho*

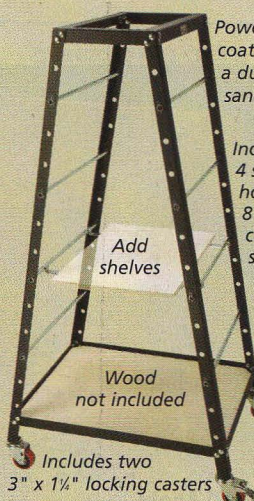
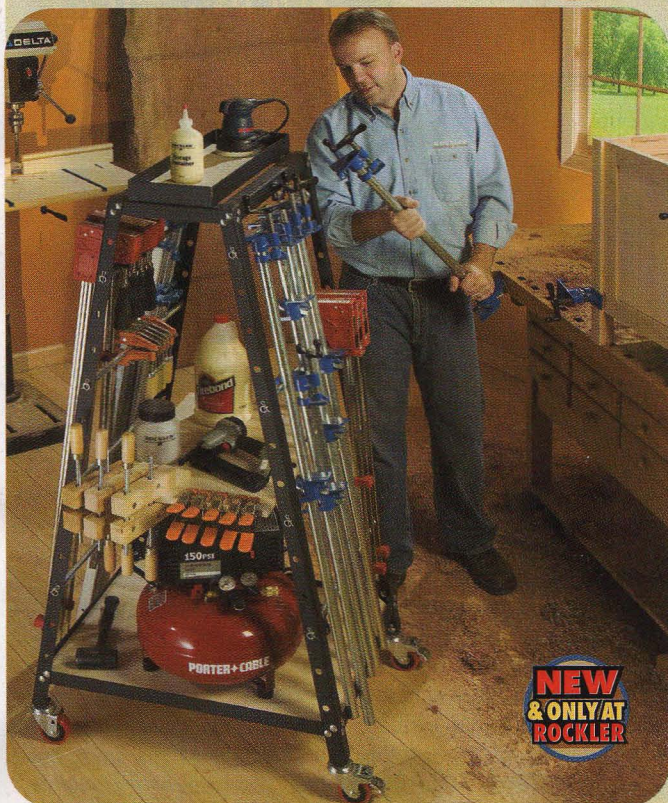


Lovely Tool Chest ... Or Not

Just finished the June 2008 issue, and I was very pleased with the chestnut tool chest article ["Dovetailed Tool Chest"]. I believe I will build one. In particular,

Continues on page 16 ...

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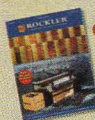
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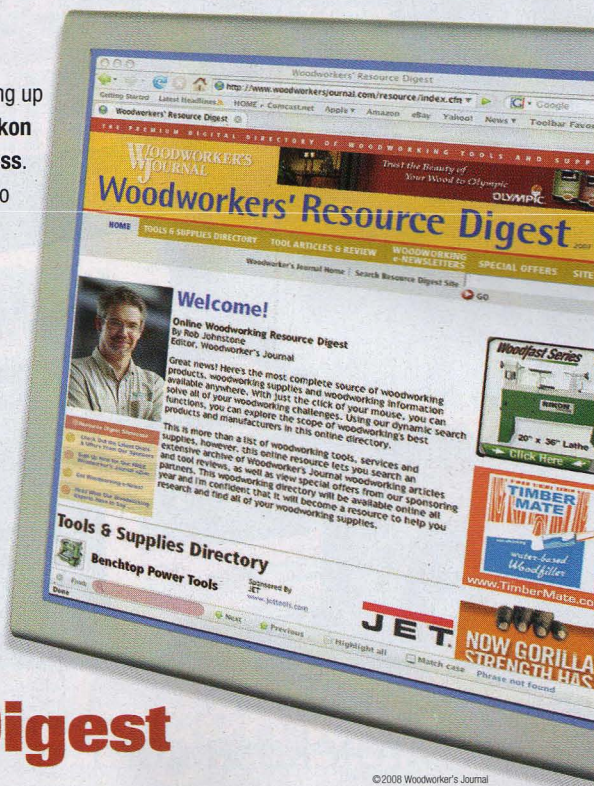


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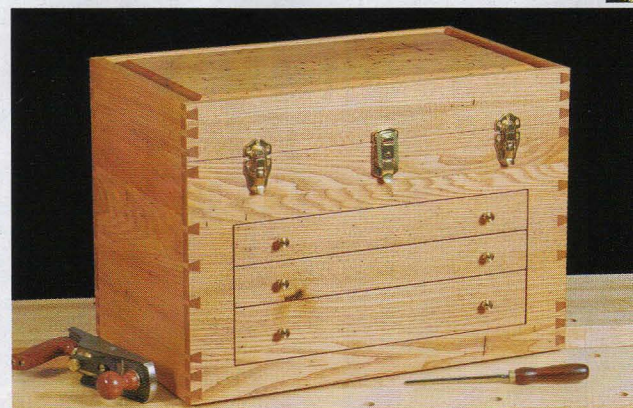
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the graphics were superb! That exploded view was so helpful in visualizing the whole project. Keep up the good work.

*Richard Bayer
Chester, New York*

What is the big deal about worm-eaten chestnut wood? I personally do not like worm-infested wood of any kind. I plan on building Chris Marshall's tool chest, but I'm going to use worm-free red oak, which is my wood of choice when I build anything.

*Charles F. Krauss
Augusta, Kansas*



"Greenies" Again ...

I just read the letters in the June 2008 issue ["The Great Green Debate Continues"] about some column that referred to "green-ness" ["How 'Green' Is Your Woodworking," April 2008]. I'm concerned about the future of my descendants. I'm afraid that when the true

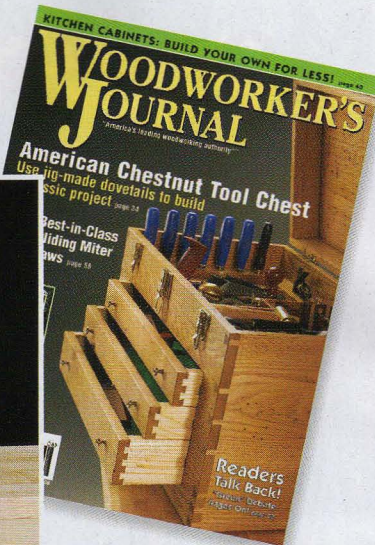
nature of the global warming scare is made known to them, they will be aghast at our ignorance and folly and dismayed by the social and economic destruction that our "erring on the side of caution" will surely cause.

*George McClellan
San Gabriel, California*

Those folks "chirping and singing" about "Chicken Littles" are much like the grasshopper in the proverb about the ant and the grasshopper, are they not?

Stewardship is not about us — it is about our kids and their kids.

*Rich Donahue
Huachuca City, Arizona*



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(Circle No. 85 on PRODUCT INFORMATION form)

For me, there was a correlation between your "Are Woodworkers Recession-Proof?" ["The Woodworker's Journal," June 2008] and "How Green is Your Woodworking?" in the previous issue.

The mere mention of recession brought back memories of my youth during the 1930s. No one is recession-proof, not even the "Greenies." A depression would see "Greenies" cutting trees for food money, hunting wild game for food and doing anything else necessary to exist. A deep recession or

depression would certainly curb many appetites for the exotic.

I think we all should follow WJ's editor's advice: Be frugal!

*Jim Andersen
Big Timber, Montana*

My attached cartoon was done in April of this year before reading any of your articles, editorial letters, comments, etc. My point is, "Global warming is a debate, not a conclusion."

*David R. Young
Richmond, Virginia*

CHICKEN LITTLE'S GREAT, GREAT GRANDSON



THE EARTH IS WARMING !
THE EARTH IS WARMING !

Hint to the editor: these letters do not offer anything to what you are calling a "debate." Printing them is just lazy journalism.

*Robert A. Speir
Falls Church, Virginia*

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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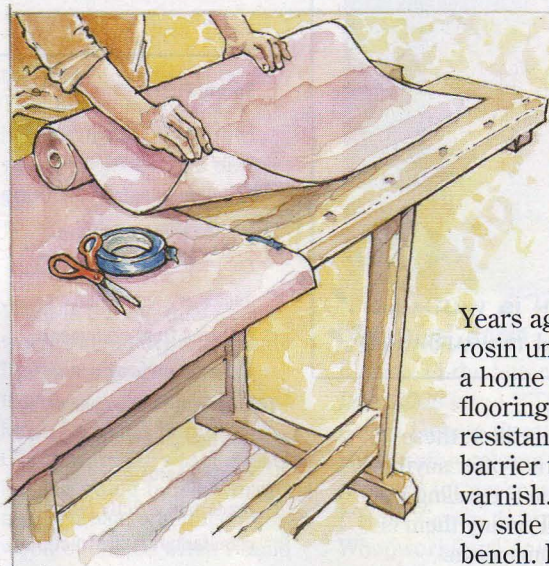
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(Circle No. 2 on PRODUCT INFORMATION form)

Re-use Household Items in the Shop



Rosin Up that Workbench

A good workbench should last a lifetime, so it's worth the effort to keep it clean. Here's how I protect mine during finishing and glue-ups.

Years ago, I bought a roll of pink rosin underlayment paper from a home center. You'll find it in the flooring section. It's quite water-resistant and provides a good barrier to glue, paint, stain and varnish. I lay two short pieces side by side and tape them down to the bench. If the paper is still in good shape when I'm through, I save it for the next messy job. A roll of rosin paper is cheap, and it seems to last forever.

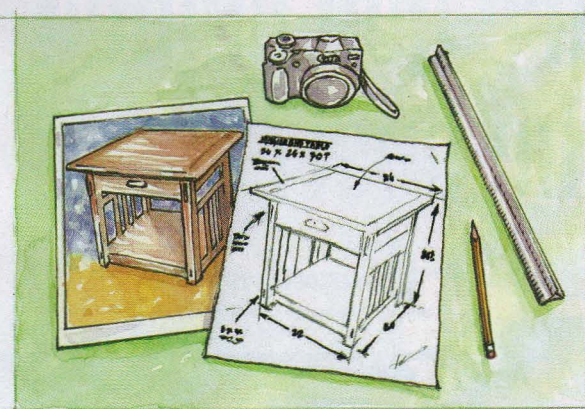
*Serge Duclos
Delson, Quebec*



Quick Curves with Sockets

Sockets not only keep your machine bolts tight, they also make handy templates for drawing small arcs and circles. If you need an exact radius, be sure to measure the socket's outside diameter with a caliper first. It's also important to hold the pencil at a consistent angle while tracing around the socket; otherwise the curve you draw won't be a perfect arc.

*Bob Kelland
St. John's, Newfoundland*



Oblique Drawings in a Flash

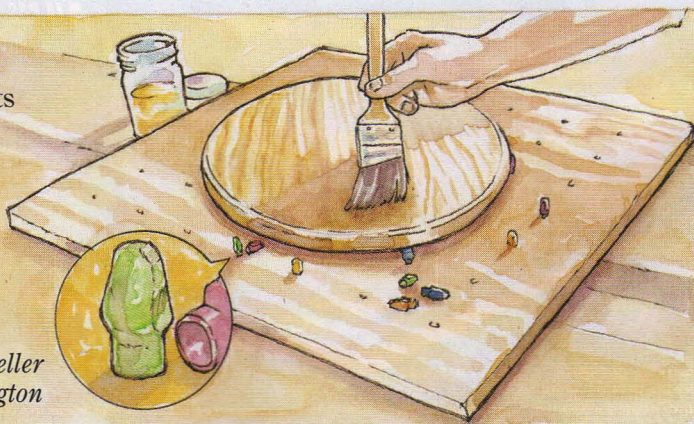
I'm not a whiz at the drafting table, but here's my secret for making oblique perspective drawings without a T-square and triangles. Take several digital photos of your project from different angles until you get one that matches the degree of perspective you want. Print out the photo. Now, lay a piece of vellum or thin office paper over the photo and trace the project to create a master drawing. Add your construction notes and dimension lines, and you're all set.

*William Kennedy
Mumford, New York*

Soft-touch Finishing Board

Here's a good way to elevate small panels or projects while applying finish. I drill a grid of 3/8"-diameter holes in a piece of scrap plywood and stick pencil erasers in the holes. The erasers suspend your workpiece so you can finish around the edges, and the soft rubber tips won't scratch the wood or newly applied finish. Reposition the erasers as needed to suit the shape of the part you're finishing.

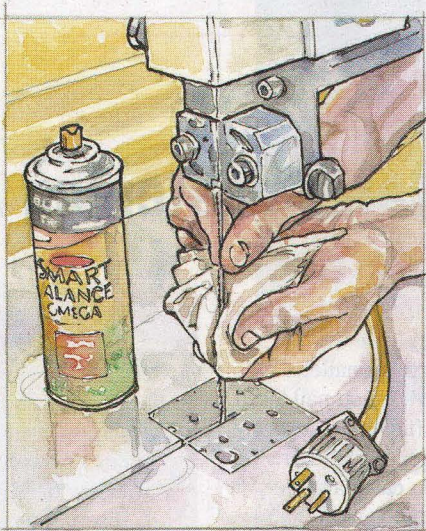
*Leland Keller
Chattaroy, Washington*



For Blade Lube, Check the Pantry

Ordinary cooking spray does a lot more than keep food from sticking. I spray some on a rag and wipe down my band saw blade between uses. The spray makes the blade cut more easily and protects it from rust. It even helps keep wood pitch from sticking and gumming it up. Be sure to keep peace with your spouse and return the can to the kitchen when you're finished with it — or better yet, buy a can for the shop.

Michael Gaule
Metairie, Louisiana



Put a Lid on Your Dust Collector

In a busy shop, dust settles on every horizontal surface, including the top bag of your dust collector. Whenever the collector is turned on and the bags inflate, all that dust on top gets blasted into the air. To prevent this from happening, hang a cardboard box upside down over the dust collector. String it from the ceiling. This "lid" only has to be large enough to allow good airflow to escape the top bag, and it will keep airborne dust from settling on the fabric. Plus, it won't interfere with emptying the bottom bag.

Dick Ayers
Barron, Wisconsin



WINNER!

In addition to our standard payment (below) Serge Duclos of Delson, Quebec, will also receive

a Stanley/Bostitch CPACK3 Combo Kit

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:

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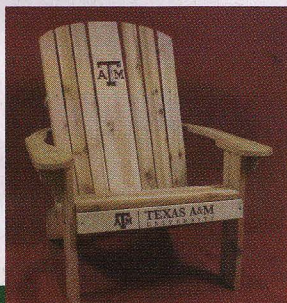
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(Circle No. 36 on PRODUCT INFORMATION form)

THIS ISSUE'S EXPERTS

Cliff Paddock is director of product management for Freud.

Gary Blanchette is director of product development for Stanley-Bostitch, where **Dr. Edward Sutt** — who has a Ph.D. in designing nails — is also known as “Dr. Nail.”

George Vondriska is the proprietor of The Wild Earth School, where he teaches woodworking, and is a contributing editor to Woodworker's Journal.

Contact us by writing to “Q&A,” Woodworker's Journal, 4365 Willow Drive, Medina, MN 55340, by faxing us at (763) 478-8396 or by e-mailing us at:

QandA@woodworkersjournal.com

Please include your home address, phone number and e-mail address (if you have one) with your question.

Dr. Nail's Fastening Advice

Q When I use my pneumatic nailer, I'm not sure how much nail/brad depth is sufficient to securely hold two pieces together. How do you calculate the gauge/length versus the thickness of the wood to ensure secure attachment?

Amy M. Nielsen
Maple Valley, Washington

A A good rule of thumb is to use nails that are three times as long as the thickness of material you are joining. For example, if you are securing a 3/4"-thick board, you would want to use a 2 1/4" length fastener. If the thickness of the substrate to which you are fastening your board won't allow for this length of fastener, simply add the thicknesses of the two boards you are securing together and then subtract 1/4" to allow for countersinking.

A general guideline for fastener gauge would be to use a 15- or 16-gauge fastener with 5/8" thick or greater stock, an 18-gauge fastener for 1/4"- to 5/8"-thick stock and a 23-gauge pin for stock a 1/4" thick or less. Typically the lower the gauge, the better the holding power, but this larger fastener can sometimes cause splitting — dependent on how close the fastener is to the edge of the board and the species of the wood itself. The best thing to do is to run a trial with some scrap pieces of wood to determine what size works best.

— Gary Blanchette and
Dr. Edward Sutt



Nailer depth setting vs. the thickness of your wood: A good rule of thumb is to use fasteners three times the thickness of your wood.

Q I have a 12"-diameter table saw blade that “sings” every time I turn on the saw. The longer the saw runs, the higher the pitch

gets. I haven't run a board through the saw because I'm not sure if this blade is safe.

William Holland
York, Pennsylvania

RECALL NOTICES!

A recall is in effect involving **model number DW744 DeWalt Jobsite Table Saws** with date codes ranging from 200715 to 200740. The pivot bracket on the saw can separate, which can misalign the blade and the fence and cause kickback, posing a laceration hazard. For more information, visit www.dewalt.com or call 888-742-9178.

A recall is in effect involving **part number 81600 Paslode “Tall Red” Fuel Cells for Framing Nailers** with “best-use-before” dates of August 9, 10 and 11, 2009, and manufactured dates of February 11, 12 and 13, 2008. The fuel cells can leak fuel, posing a fire hazard. For more information, visit www.paslode.com or call 800-222-6990.

A recall is in effect involving **Cabot Composite Deck Cleaner #3502**. One of the components can react with metal foil residue on the packaging, releasing heat and chlorine gas and posing a fire and inhalation hazard. For more information, visit www.cabotstain.com or call 877-755-3336.

A Saw blades can have excessive vibrations or “sing” for many reasons. Usually, it is an indication that a blade has lost its tensioning. As for the safety of the blade, we would not recommend using any blade that is in less than perfect condition. Safety should be your principal concern.

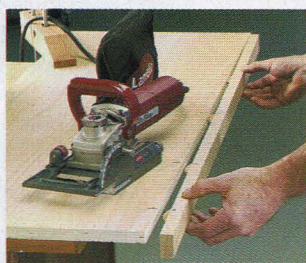
— *Cliff Paddock*

Q I recently had to repair an exterior wood storm door and thought it was a perfect excuse to try a biscuit joiner. I disassembled the door and found that it was held together with hardwood dowels. After replacing the dowels, I was wondering if there is any rule of thumb as to when to use dowels or biscuits.

*Tom Chadwick
Glen Rock, New Jersey*

A I'd look at a couple of things. Are you trying to reinforce the joint or simply align the parts? Because of the deep penetration you can get by inserting long dowels, they'll provide more joint shear strength than biscuits. My

primary application for biscuits is as alignment aids. However, dowels can be much fussier to work with. You can't beat the side-to-side adjustability and ease of installation with biscuits.



Aligning wood banding to plywood is one good use for biscuits, but, they're not ideal for high shear strength applications.

A second consideration is the size of the parts you're assembling. Even the #0 biscuit — the smallest conventional size — needs a slot about 2" long. This won't work on a face frame with 1½"-wide rails. The more recent face frame biscuits, and other specialty sizes, can help solve this problem, provided you've got a machine that can cut the smaller slots they require.

— *George Vondrisk*



WINNER! For simply sending in his question on biscuits vs. dowels, Tom Chadwick of Glen Rock, New Jersey wins a **Steel City Tools 65115 Mini Dust Collector**. Each issue we toss new questions into a hat and draw a winner.

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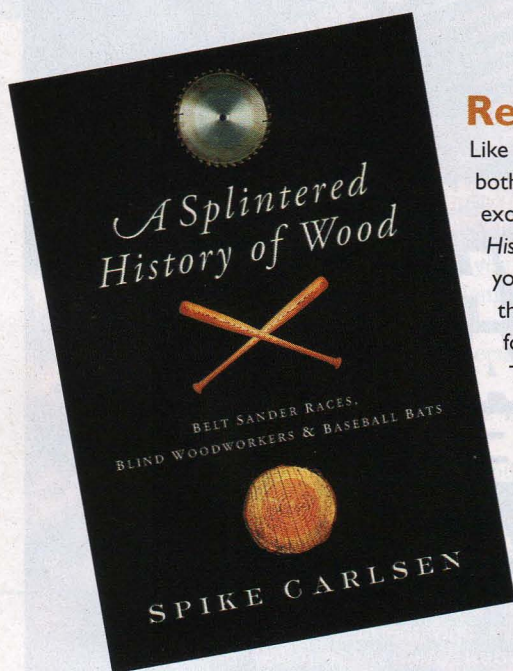
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Wood's Splintered History: Grand Xylariums



Read All About It!

Like history? Like wood? WJ editors like both, and we thought you'd enjoy this excerpt from Spike Carlsen's *A Splintered History of Wood*. Elsewhere in the book, you can read about belt sander races, the (birch) Spruce Goose, wood as the foundation of civilization and more. The book is published by Collins and priced at \$24.95 (ISBN: 9780061373565).

From the book *A SPLINTERED HISTORY OF WOOD* by Spike Carlsen. Copyright (c) 2008 by Spike Carlsen. Reprinted by permission of Collins, an imprint of HarperCollins Publishers.

How Much Wood

Would a Wood Collector Collect?

Gary Green has encountered alligators, snakes, and needle-shooting cacti in pursuit of his pastime. He's slid off mountains, been caught trespassing, and walked six miles after slashing a tire in the middle of nowhere.

And what does he have to show for all this? Thousands upon thousands of pieces of wood, each about the size of your hand, each smoothly sanded, each different. Welcome to the world of wood collecting.

For Green, his xylarium, or wood collection, started while he was splitting firewood one day in 1992. He began wondering what the woods would look like planed down. By the end of the day, he had 10 nice small samples.

He continued to collect; with the purchase of another collection, his total jumped to 6,000-plus.

Green is not alone in his passion. The International Wood Collector's Society (IWCS), founded in 1947, has over 1,100 members in 50 states and 35 countries, including Estonia and Iceland.

It's a bottomless hobby. With as

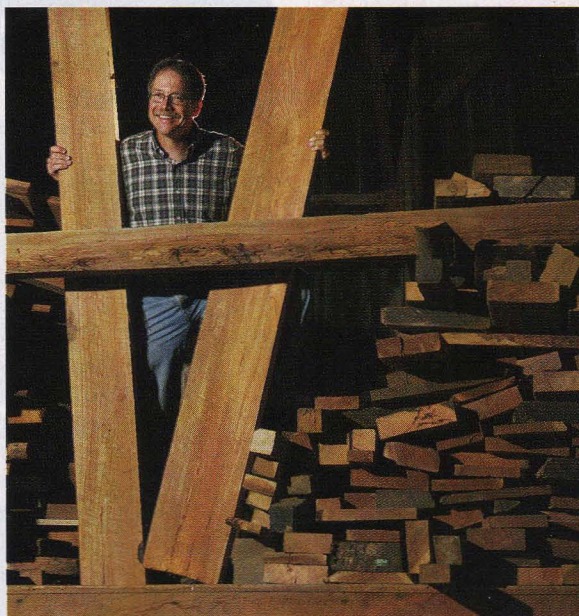
many as 80,000 species of trees on the planet, a person gathering one wood a day would still require 219 years to amass a complete collection. Even Richard Crow of England, who has what most consider to be the world's largest private collection, has only (only!) 7,000 species; less than 10 percent of the woods nature has given us. This from a man who has collected for 50 years; whose family has been in the lumber business since 1795. Most collectors use a varied approach: they'll field-collect some, buy some, trade some and cut some out of larger boards.

Though standard specimens 1/2" x 3" x 6" are little bigger than a Hershey bar, large collections take up a cumulatively large amount of space. Green began storing his collection on the walls of his office, ran out of walls (and discovered that samples faded in sunlight), and now stores most in plastic tubs. An

English collector who lives in a small flat collects specimens as cross-sections on microscope slides. Some display their samples like books on a shelf. Ralph Cox echoes the words of many in saying, "My wife thinks I have too much wood, but I really don't."

Many IWCS members are woodworkers and choose to display their collections as objects they've created: forests of 2" high trees, bowls, rice-size goblets, quilts, pens, spoons, lapel pins, carved boxes and thimbles. One collector has whittled 2,000 dolphins; another has turned 1,100 different eggs from 1,100 different species. Maps with countries, states, or even counties crafted from woods native to that area are popular.

Shop Talk continues on page 24 ...



Scott Phillips, host of "The American Woodshop" and co-host of "The American Homeshop" TV shows is just one of many woodworkers who are also serious wood collectors, as described in this excerpt from Spike Carlsen's new book.

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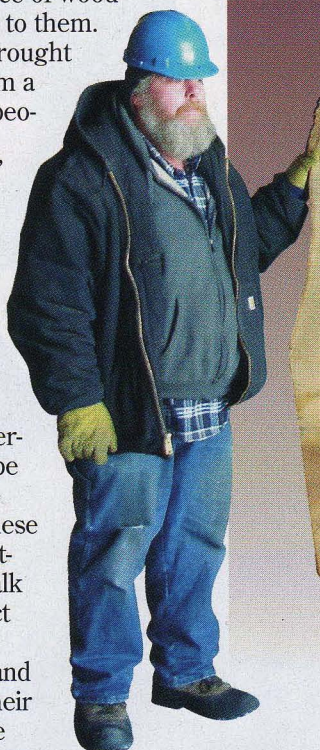
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Brian Baker, who turns saucers out of specimens — 800, all different species — explains “Most [woods] were pleasurable, with good aroma, turnability and polish, but there are some I hope to never turn again, like *Toxicodendron radicans* – poison ivy.” Woodcarving teacher Norm Satorius has a different brand of chilling story. He once told his students to bring in a piece of wood that meant something to them. An older gentleman brought in a piece of wood from a hanging tree. “Some people in class would not even touch the wood,” Satorius explains. “It was a plain piece of oak, unremarkable in color and grain, but laden with history of a rather grave nature.”

While this all may seem to edge upon fanaticism, it’s no different from any other type of collecting.

[And] if you think these collectors have a daunting array of woods, walk into the Forest Product Laboratory (FPL) in Madison, Wisconsin, and ask to take a look at their wood collection. There you’ll find not dozens, not hundreds, not thousands, but tens of thousands of wood specimens — 100,000, to be exact.

Alex Wiedenhoef, an FPL botanist, ruminates: “I worked here for a long time thinking this was the duller place on earth, because basically the wood collection is drawers and drawers of little blocks of wood. It’s the world’s largest wood library, and like a regular library, if you don’t know how to read, it is the duller place on earth. It’s not until you start reading the blocks that you realize what an amazing place it is. The more you learn about this stuff, the more interesting it is.”



Got Wood?

How about it, readers? Are you wood collectors, too? Send in a photo of your most unusual wood specimen (like this giant slab of American Chestnut) — and tell us your name, where you hail from, the name of your species and any interesting story behind it. We’ll post these as part of our “More on the Web” feature to accompany an upcoming issue.

Send your photos to
contentcoordinator@
woodworkersjournal.com.

The FPL wood collection, born in 1910, was initially headed by a woman, Eloise Gerry. Oversight of the FPL collection was dominated for the next 70 years by a succession of men with long tenure.

Bohumil Kukachka’s [1945-early 1970s] hiring is legendary, though only to inveterate wood geeks. During his interview for the position of wood anatomist, Kuky casually plucked three unmarked specimens of wood off [Arthur, 1914-1948] Koehler’s desk and proclaimed, “Ah, Chilean woods. *Nothofagus*, *Laurelia*, and *Aextoxicon*.” He was hired on the spot.

At the start of Koehler’s tenure, the collection stood at only a few thousand samples, mostly domestic. By the time he left, the collection stood at about 11,000 (greatly reduced in a subsequent housecleaning). Koehler put the field of wood anatomy on the map by helping solve the crime of the century, the Lindbergh kidnapping crime. [WJ Editor’s Note: The wood as key to this mystery is described in detail elsewhere in the book.]

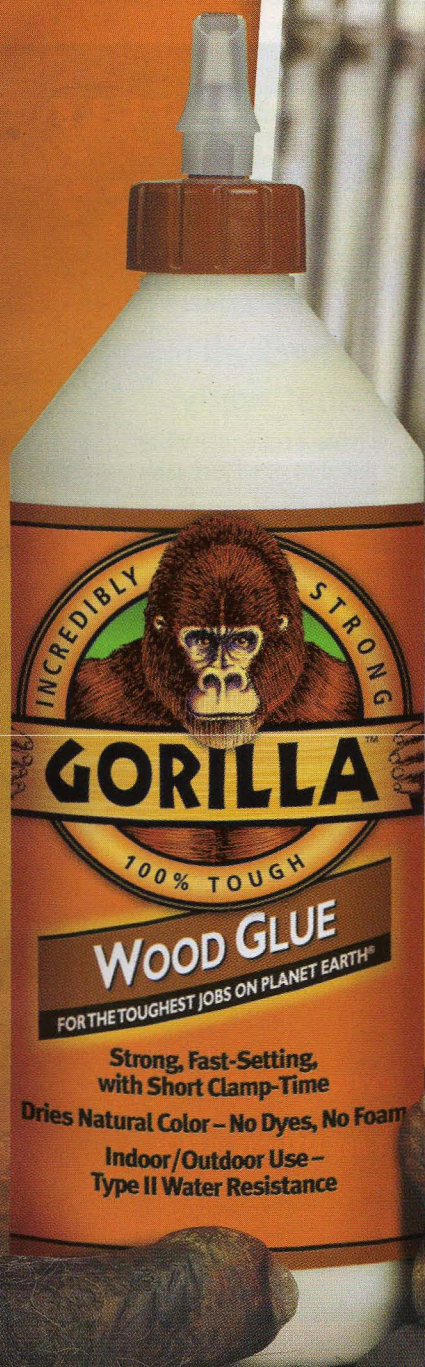
By the time Regis Miller [1970-2000s] stepped on the scene, the collection had more than tripled in size due in part to the acquisition of the 5,500-specimen Samuel J. Record (SJR) wood collection from the School of Forestry at Yale, the world’s largest collection. The collection included the critical herbarium sheets: samples of the leaves, seeds, flowers and other “soft” material of the trees from which the wood was harvested. (Herbaceous material is critical, since the woods of many trees are anatomically identical, and true differentiation can be determined only by leaves, seeds and so forth.)

Also scattered about the FPL offices are dozens of mammoth tree “rounds” from the Jesup collection. They’re much (much) larger than the standard-size wood sample but not nearly as large as they were originally. “In the 1860s, this guy had the foresight to cut 5-foot-long-boles from the trunk of every type of tree that grew in the United States. And he got ‘em all,” explains Miller, wearing the omnipresent 10x magnifying loupe around his neck. “Back then you could just chop down whatever you wanted. Today, even if you could do that, it would cost you a fortune.”

So how much wood could a wood collector collect? Keep counting.

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Sparking a Few Old Memories

What's This?

Buck Buechner sent in this tool belonging to his friend **Len Wilbur**. Neither **Sturgeon Bay, Wisconsin**, man could identify the item with its 1 1/4"-diameter round opening.

Know what it is? Send in your answer for a chance to win a prize!



The Lamplighter

You're too young, but [the mystery tool from *Stumpers*, June 2008] is for lighting a gas lamp/light. The top tip held a flint, and the trigger oscillated the wheel on the flint to create a spark. The tool's 8" length kept the hair on the back of your hand safe. Better than the old wood matches, but if you did away with them, what would we stuff into oversized screw holes?

I'd email you, but I am still back in the gaslight age.

*Chuck Gaw
Wheaton, Illinois*



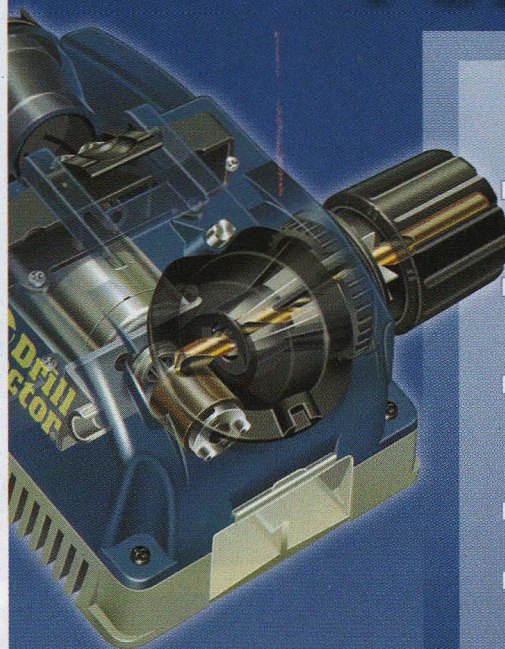
In Like Flint

Chuck is, indeed, correct about the tool sent in by **John Premo** of Western Springs, Illinois, as were most of our correspondents. Readers like **Ralph Merrill** of Sacramento, California, called it "a 'striker' or 'lighter.'" The pointed end is hollow, and a small flint was dropped

into it. A cap was screwed onto it to maintain pressure on the flint."

"The flint," said **Lanny R. Black** of Canton, Ohio, "rides on the outer edge of the abrasive perimeter that you see. When you pull the trigger, the wheel turns about a quarter of a turn in one direction, and the flint riding on the

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This mystery tool
lights a spark — as
readers like Ralph Merrill
said, it's "just like a Zippo."

wheel causes the spark to light the gas."
Larry W. Laughman of Manheim,
Pennsylvania, elaborated, "It can be
used to light a gas grill or anything that
requires a spark to ignite."

David Seagroves of Anchorage,
Alaska, remembers: "I used a striker
like this to light gas burners in tobacco
barns. The gas was turned on, and as
fast as you could go from one burner to
another, about 16 burners, you would
use this striker to light them."

Bill Needham of Morris, Illinois,
recalls yet another use — with some
more information. He says the striker
"was used to reach inside a hole in the
headlights of automobiles to light the
acetylene flame that gave off the light.
The old ones were later used to light
acetylene torches in earlier welding
shops. Today, the small portable tanks
sometimes used for refrigerant-tubing
work are sold as B size and MC size
tanks. The MC stands for Motor Car
size. B stands for Bus."

Want even more information, more
precisely related to the striker tool
itself? As **Bill Woods** of Kaufman,
Texas, notes, "it was made in Germany
by Hawhay."

We'll let **William Thompson** of
Woodbury, New York, conclude: "This
tool has been passed down along with
others from my grandfather to his son,
and from him to me, and I will give it to
my son, and hopefully keep it up till
God knows when."

—Joanna Werch Takes

If you have the answer to this issue's
mystery tool, send it to Stumpers, c/o
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Medina, Minnesota 55340. Or send an
e-mail: stumpers@woodworkersjournal.com

WINNER!

Bill Needham of
Morris, Illinois, wins
a **Porter-Cable 1 3/4
Peak HP Router**
(Model 690LR). We toss all the Stumpers
letters into a hat to select a winner.

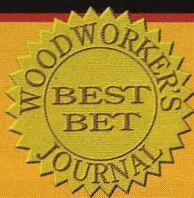


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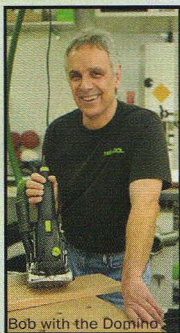
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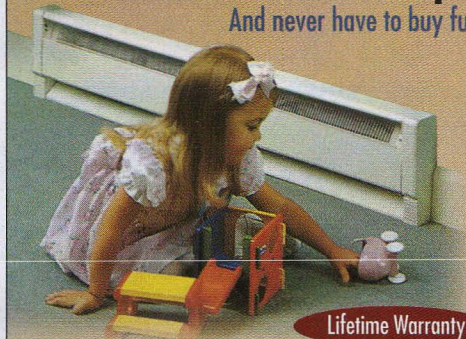
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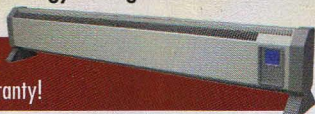


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Tiny Challenges for Four Turners

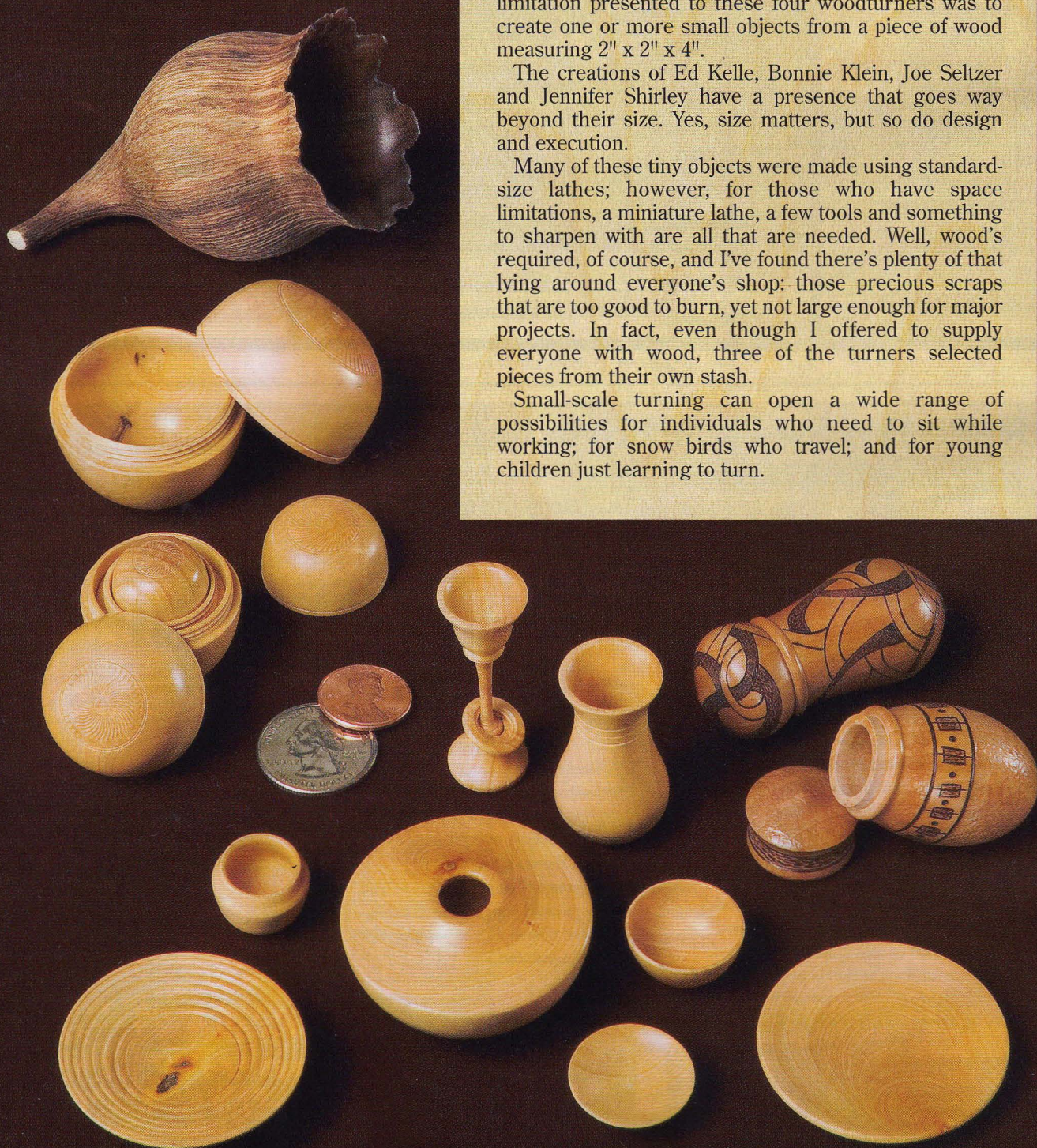
By Betty Scarpino

Size matters: large turnings command attention; small objects draw the viewer in to hold and to touch. The limitation presented to these four woodturners was to create one or more small objects from a piece of wood measuring 2" x 2" x 4".

The creations of Ed Kelle, Bonnie Klein, Joe Seltzer and Jennifer Shirley have a presence that goes way beyond their size. Yes, size matters, but so do design and execution.

Many of these tiny objects were made using standard-size lathes; however, for those who have space limitations, a miniature lathe, a few tools and something to sharpen with are all that are needed. Well, wood's required, of course, and I've found there's plenty of that lying around everyone's shop: those precious scraps that are too good to burn, yet not large enough for major projects. In fact, even though I offered to supply everyone with wood, three of the turners selected pieces from their own stash.

Small-scale turning can open a wide range of possibilities for individuals who need to sit while working; for snow birds who travel; and for young children just learning to turn.



Most small turnings require the use of miniature or small-scale turning tools. But don't worry, they're easily available through woodturning catalogs and at woodworking stores. When it comes to tiny turnings, it's helpful to select a fine-grained wood. Excellent fine-grained species are boxwood, dogwood, pear, persimmon, holly, hard maple and many of the exotics. But don't forget to consider the branches of larger trees. For example, if I want to use ash wood for a small turning, I might harvest a small branch from a large tree. The growth rings will be closer together and finer-grained, helpful for small-scale turnings.

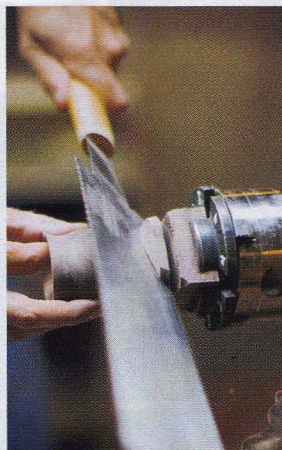
The ability to see well is of paramount importance. I recommend those magnifying lenses that fit on a person's head. They're sort of like wearing a pair of reading glasses, but easier to use when working at both medium and close distances. They're a standard fashion accessory for Bonnie, as well as for many other turners! I have my own pair.

Ed Kelle

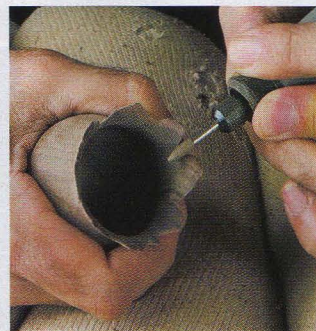
Ed began turning in 2003 after he first saw a lathe being used at the Long Island Woodworking Show. Ed



Ed Kelle



Ed Kelle's love and understanding of nature translate well to the objects he makes, like this tiny walnut wood "blossom."



says, "I was mesmerized by the curls rapidly coming from the bowl." After frustrated attempts using a poorly running larger lathe, he purchased a JET® mini-lathe and began making small-scale objects.

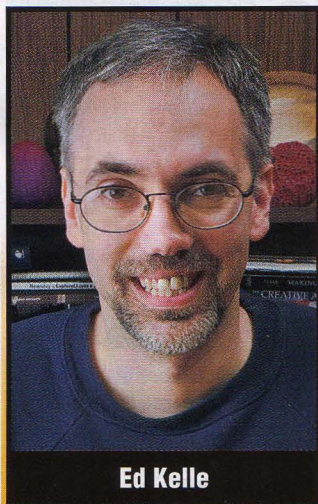
Ed sometimes uses small-scale tools, but generally he relies on standard turning tools for most of his work. For hollow vessels, he made his own small-scale hollowing tools.

I first met Ed a few years ago when I acquired a set of Ed's nested acorns boxes. They are made from cherry wood, with the tops textured and darkened. They looked like the real thing! The use of texture and detail on a small scale are two elements Ed uses to draw viewers into his work: "people can't help wanting to pick them up. They step closer and then see the details that are present."

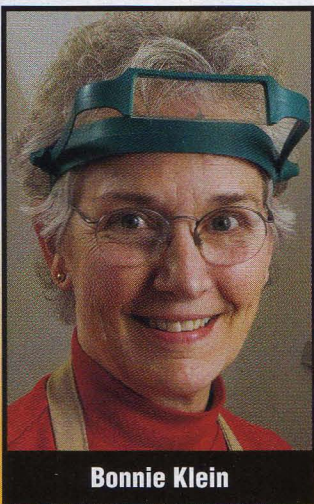
Ed has a background in fine art, painting, drawing, sculpture and photography. He says, "Visual arts teach you the importance of concentrating on your subject, as there are no casual glances." He believes that form is the most important element in turning, and studying the art of other media can increase a person's knowledge base and visual skills.

He's not afraid to incorporate ideas from other fields and utilize skills from all areas of his life into his woodturning endeavors. He's made furniture, sculpture and jewelry boxes, often using the lathe for the beginning phases of his work.

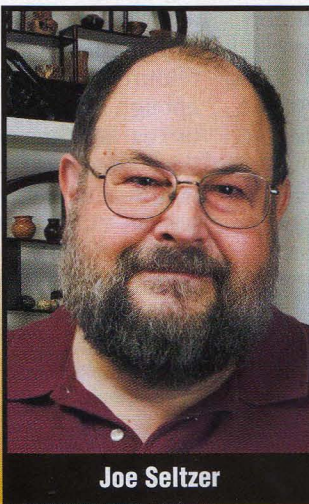
Ed's "blossom" is made from walnut and measures 2" x 2" x 3 1/2". It is very thin, giving it the lightweight feeling of a real blossom. Ed textured the outside using



Ed Kelle



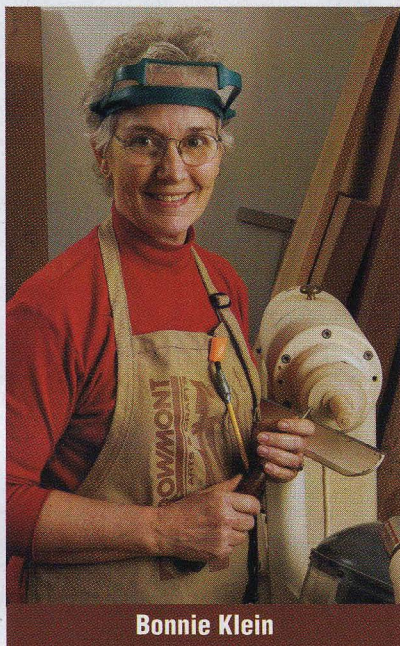
Bonnie Klein



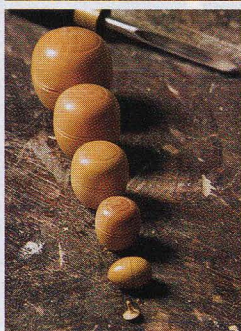
Joe Seltzer



Jennifer Shirley



Bonnie Klein



There is more to Bonnie Klein's boxes than first meets the eye: nested together with the lids off, the top of each box is the same height — but each box is still just the right amount smaller or larger than the next.

corresponding base. Lined up, they show Bonnie's skill in tool control and her eye for detail. The surprise inside is a miniature top. It spins, perfectly.

Bonnie volunteers a lot of her time teaching youngsters how to turn. She travels with 10 lathes, tools and wood in the back of her van to teach classes. At the American Association of Woodturners' annual symposium, Bonnie heads up a program where a bank of lathes is set up, and each child has a volunteer mentor to assist. They make a preplanned project and take it with them when finished.

Bonnie's advice: it's more important for the tools to be in proportion to your workpiece than to the lathe. Higher RPMs will produce smoother surfaces right off the tools, provided they are used correctly.

Joe Seltzer

Joe was one of the first people I thought of when the idea of highlighting tiny turnings was presented to me. Joe likes small turnings and

a Dremel® tool and bleached the end of the stem with two-part wood bleach.

Ed suggests that anyone who is interested in learning how to turn should take a few hands-on lessons. As a three-year member of the Long Island Woodturners himself, he finds there is always someone who can offer help or insight.

Ed now teaches woodturning, and generally holds lessons at his students' shops. It's easier to teach students in their own shops because Ed can evaluate their equipment to determine if problems stem from lack of technique or from machines and tools.

Bonnie Klein

In 1989, when I attended my first woodturning symposium, Bonnie was one of the lead demonstrators. I was totally mesmerized by her skill at woodturning, her ability as a demonstrator and her enthusiastic, positive personality. Hard to imagine, but she's gotten even better!

Last year, I saw Bonnie's presentation on how she prepares animal bone for use in her woodturning. The small boxes and jewelry made from this bone look like ivory! To say the least, she likes to experiment with turning unusual materials.

Bonnie is known in the turning world for having pioneered the field of small-scale turning. She developed the Klein lathe in 1986, then followed that with the Klein threading jig in 1992. She has written a book and produced many videos.

It's an understatement to say that Bonnie loves the creative process. In her words, she is "addicted to discovery, progress and the fact that perfection is forever elusive, but as I strive for it, yesterday's challenges become the basic skills of tomorrow."

Bonnie's nested boxes are made from boxwood, coveted for its superior turning properties, as well as its lovely color and texture. It's not enough that the boxes all have lids: each lid is threaded and screws to its



Joe Seltzer



Joe Seltzer likes being able to carry a dozen of his tiny turnings — many of which he gives away — around in his pocket.

has a vast collection of small-scale objects, all less than 7" in size. As a hobby, he also turns miniatures.

Joe started turning in 1998. Although he had been collecting for years, he didn't initially try turning himself because he thought he would hate sanding. Well, he does hate it, but with small pieces, sanding is minimal. He joined the Bucks Woodturners chapter of the American Association of Woodturners in 1995. They had a loaner lathe he borrowed, and he took a few lessons. He got hooked.

Now, a number of his friends have collections of his work, which pleases him greatly. He derives pleasure from turning and then giving.

Joe's favorite woods are boxwood and pink ivory because they turn so well. He also likes highly figured woods or those with a sharp contrast of sapwood and heartwood. Joe decided to use boxwood for this project. The piece he selected had two attractive knots, so he incorporated them into the finished pieces. He turns most of his objects endgrain-fashion, so that the stem of the goblets have the strength of the long grain. I love the way the grain pattern on the small plate subtly follows the curve of the plate's edge.

Joe is a professor of management at LaSalle University in Philadelphia. His profession has little to do with turning or collecting, which is his hobby and passion. He is the vice president of the Collectors of Wood Art and also VP of his local chapter of woodturners. He's on the steering committee of an event called Echo Lake, held every other year. A group of woodturners get together to turn, create and let ideas flow between participants. This year, they held their 10-year retrospective at the Wood Turning Center in Philadelphia.

Joe's advice for people interested in turning small items is to buy some small tools. He likes the Klein gouges and scrapers and the Sorby mini-turning tools. Scrapers can be ground to different radii. Attach the



Jennifer Shirley

Jennifer Shirley couldn't resist decorating her mini canteens. She used a wood burner for the designs and added texture with an electric engraver, modified by inserting a dull tip into the end.

wood to the lathe using a faceplate with a waste block or use a chuck with small jaws.

Jennifer Shirley

Jennifer has two lathes, a full-size General and a JET mini-lathe. Years ago, her son, Weston, learned how to turn using her mini-lathe. Jennifer works in a one-and-one-half car garage converted to a studio.

Jen primarily uses native Indiana hardwoods, often rescuing timber that might otherwise find its way to a fireplace or landfill. The wood she used for her spice canteens is pear wood, given to her by a friend ... actually, given to her by two friends. I live about two miles from her in Indianapolis, and a little over a year ago, I helped myself to a couple of those small pear wood logs stacked in her backyard, sawed them up and dried them. I gave a hunk back to Jen for this project. It's a lovely wood to work!

An educational grant from the American Association of Woodturners allowed Jen to attend a turning class at the Arrowmont School of Arts and Craft in 2002. In 2006, she studied for a week at the Appalachian Center for Craft. Learning new skills helped Jen launch her own career as a teacher.

Jennifer is in regular demand at Marc Adams Woodworking School as a studio assistant. This year, she will teach her first class there,

a weekend session on embellishing turned objects.

Jen's initial thought for this project was to make two decorated hollow forms; however, after remembering some little chili containers that Alan Lacer brought to a class at Marc Adams, Jen decided to make her own version, calling them spice canteens. Her recent interest and activity in cooking has introduced her to a variety of new spices.

The piece of pear wood was just large enough to make two canteens. She hollowed them with a mini hollowing tool made from a piece of drift key and a tiny HSS cutter, brazed on with silver solder. Jen enjoys the challenges of making her own small-scale turning tools.

The canteens are ready to fill with your favorite blend of spices, tuck into your pocket or purse and head to your favorite restaurant or pub!

Jen has always been intrigued with tiny objects and miniatures that resemble their larger counterparts. When she was a kid, she loved Matchbox® toy cars and wished she could fit inside them. She sums up her participation in this challenge by saying, "the world of turning small-scale is very exciting and challenging, and this project was really a treat to be involved with!"

Betty Scarpino and her stash of pear wood reside in Indianapolis. The pear wood is well hidden from the stray eyes of visiting woodturners!

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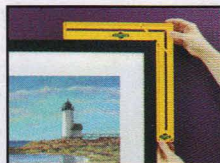
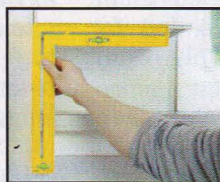
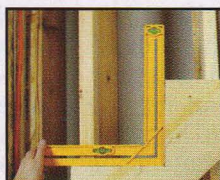
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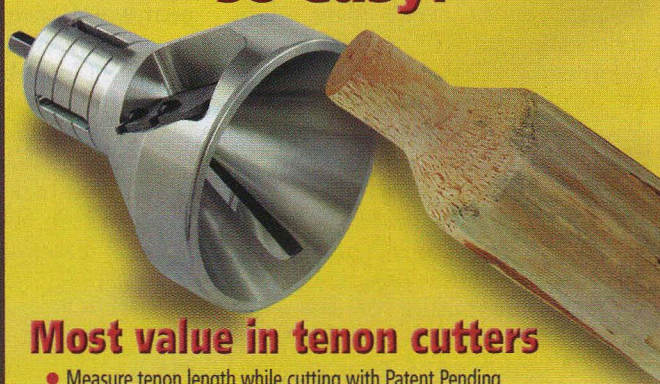
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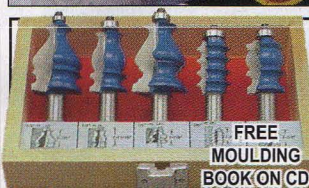
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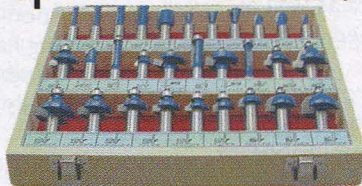


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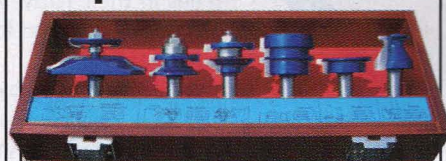
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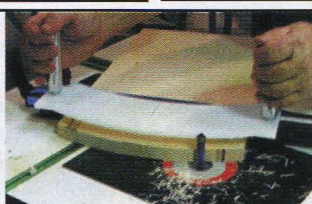


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African Imposter?

By Tim Knight

This lovely African mahogany has rich coloration complementing its tight-grained appearance. But is it really a mahogany?

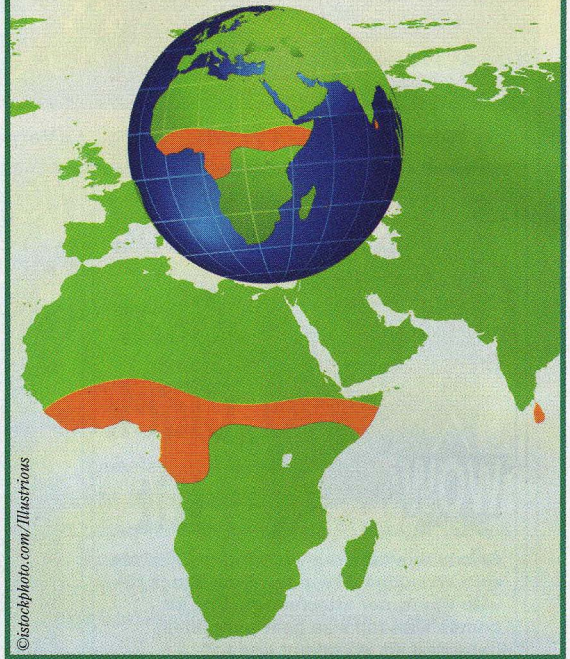
African mahogany is a name applied to a variety of species of African hardwoods in the genus *Khaya*. Each of the species are adapted to different conditions, and these conditions range from the tropical rainforests of the West Coast to the sub-Saharan dry lands of east Africa. Although in the same family as the American mahoganies (*Swietenia* spp.), scientists have long debated whether the African varieties are true mahogany. African mahogany can grow to heights exceeding 115 feet, with diameters exceeding five feet. Some of the species are widely planted as shade trees in their native Africa as well as Asia. Some are valued for medicinal purposes by natives.

Mahogany was first used by Europeans as early as Cortez: it is recorded that he used mahogany to repair his ships. By 1750, American mahogany was widely used, and by 1880 exploitation of natural stands led to the search for alternatives. Exportation of African mahogany to America and Europe began around 1890 and has increased in volume ever since. United States imports of African mahogany increased almost fivefold from 1991 to 1998: from about 144,000 cubic feet in 1991 to about 710,000 cubic feet in 1998.

The bulk of the timber shipped in the past consisted of two species of African mahogany (*K. ivorensis* and *K. anthotheca* from the Ivory Coast, Gabon and Nigeria). These were the more tropical species and were low to moderate in density and pale to medium-red in color. As these species became more difficult to find, more recent exports have turned to *K. grandifolia* and *K. senegalensis* which are native to the Sudan, Uganda and French Guinea. They are generally more dense and darker in color and more closely resemble their American counterparts.

Due to very slow initial growth, pests and high costs, past attempts to establish plantations of African mahogany were not very successful. However, improved techniques through research, and concentration on *K. senegalensis*, has led to the establishment of this species in numerous plantations in Sri Lanka, Malaysia and, more recently, in the dry tropics of Australia. Around 1,235 acres of plantations have been established in Sri Lanka, with plans to increase

Khaya gradifoliola
and *K. senegalensis*



that by 500 acres each year. Similar efforts are underway in the other countries mentioned.

African mahogany is suffering from the same pressures as other tropical hardwoods in that over-exploitation and mismanagement is leading to a dwindling supply. Although the United States is the top importer of African mahogany, China will soon overtake that position as much furniture manufacturing has moved to that country. Hopefully, efforts to establish sizable acres of plantations will reduce pressures on the naturally occurring stands remaining.



African mahogany was the hardwood selected for Sandor's bedside table on page 44.



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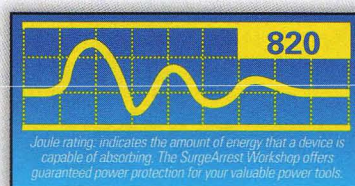
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Wood You Like to Know?

Exploring the Structure and Properties of a Complex Material

By Ian Kirby

Because the wood in most workshops exists primarily as lumber, purchased dimensioned and planed, it's easy to forget that each piece originally came from some part of a living tree. Perhaps even less obvious is that the qualities that prompted your

purchase in the first place — color, grain, luster, weight, hardness — are open to explanation, one that begins at the cellular level. In the first article of a two-part series, I will discuss some details of wood anatomy and function knowable only through study by a powerful microscope and relate them to what can be seen by the naked eye and a 10x hand lens.

The Growing Tree: Roots, Trunk, Leaves

A tree has three parts, each with a particular function.

The **roots** secure the tree in the ground and take in groundwater containing mineral salts from the soil.

The **trunk** transports this solution, called *sap*, from the roots to the leaves; it stores food; it holds the living *cell* layers essential to the growth of the tree; and it provides rigidity to the crown — the



smaller branches and twigs on which the leaves grow. The **leaves** absorb carbon dioxide from the air, give off oxygen and by *photosynthesis* enrich the sap with sugars which are passed down the inner bark and used to promote growth.

(Italicized words appear in the Glossary on page 41, for ease of reference or, in some cases, expanded explanation.)

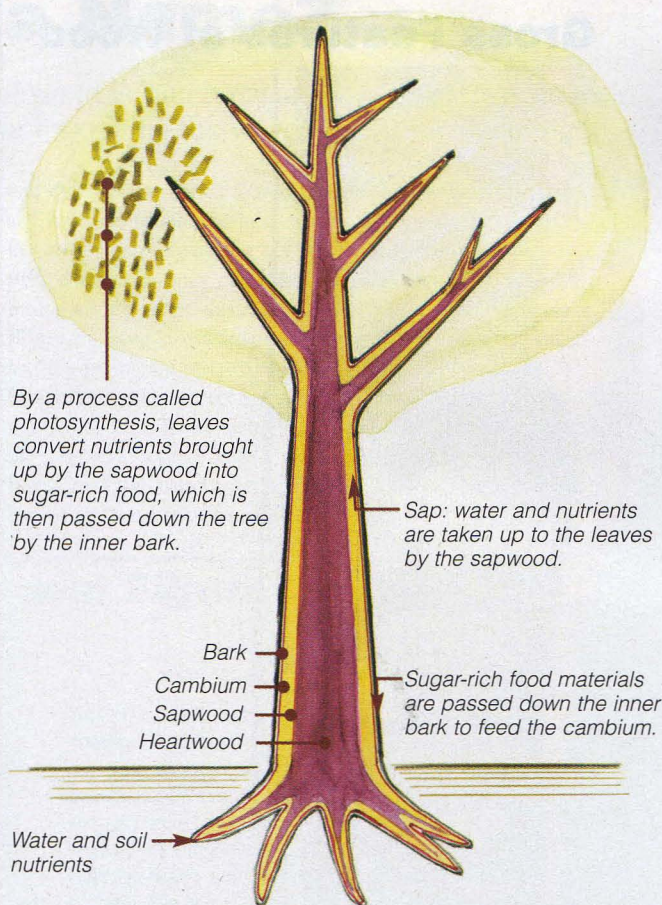
Wood Formation

Just below the bark is a microscopically thin layer of living cells called the *cambium* that sheathes the tree from ground to crown. The cambium cells grow and divide. One half of the cells make either wood or *bark*; the other half remain in the cambium to grow and divide again. New cells on the inside of the cambium become one of the woody elements. Cells on the outside become bark, which is divided into two layers. The inner bark carries the sugar-rich sap down from the leaves to feed the cambium and roots. The outer bark protects the fragile cambium from invasion by insects, fungi, animals and extremes of heat and cold.

Variable Growth

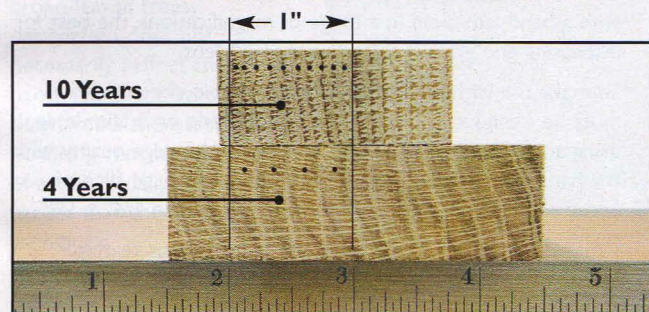
Despite the woodworker's ardent hopes to the contrary, trees do not exist to provide us with useable, straight-grained flat material — and many of its growing characteristics attest to this contrariness. For instance, due to a host of factors, including soil, weather and the proximity of other trees, trees do not grow at the same rate.

Some trees grow in a spiral form. You can observe this in the surface cracks on a wooden utility pole. The rate of spiraling varies. Many large tropical trees will spiral



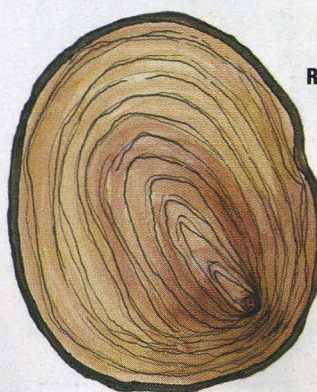
in one direction for, say, six growth periods, then spiral in the opposite direction for several more. Laminating the trunk in this way must surely increase its resistance to stress, but it also poses problems for the woodworker when machining the converted board.

If for some reason the felled tree shows asymmetric growth — the heart being closer to one edge rather than centered — it is usually discarded. Boards made from it are prone to sudden breaking, and it distorts beyond use as it dries.



Differential growth rate: In the photo above, the bottom piece of oak grew one inch in four years; the top piece took 10 years to grow the same amount. One result is a very different grain pattern on the surface. The bottom piece will display lines wide apart; the upper piece close together.

Examples of Variable Growth



Reaction Wood: compression/tension wood. In hardwoods, tension wood formed in the large area away from the off-center heart shrinks in length and machines leaving a wooly surface. In softwoods, this same area makes compression wood. It also shrinks considerably (10 - 20 times normal) and is dangerously brittle.

Gross Features of Wood



The board of English yew (left) shows off its dark heartwood clearly against the sapwood.

The sapwood on the board of poplar (right) is indistinguishable from the heartwood. The edge with the bark on is called the waney or live edge. Don't be fooled by the color on the other edge. Poplar often displays strong colors in random places in the heartwood. We don't know why.

Sapwood and Heartwood

After five to 10 years of growth, the wood in the center of all trees undergoes a chemically complex change. In most trees, the transition from *sapwood* to *heartwood* is obvious because of the color change. In some, the pale color of the heartwood is hardly distinguishable from the pale color of the softwood. The chemicals that cause the change are difficult to identify and are known collectively as *extractives*.

Tyloses occur during this transition phase, although not in all species. They appear as glistening, fine film material that blocks the vessels. What happens is that a thin membrane that was once a part of the vessel wall collapses through tiny apertures called *pits* into the cavity of the vessel due to pressure differences in the tissue.

Growth Rings

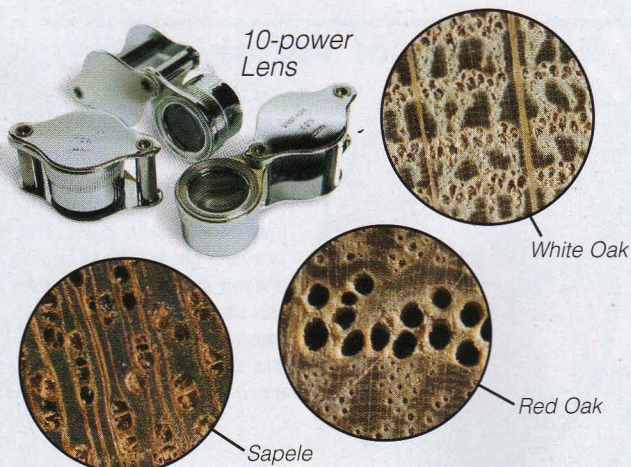
The vessels of many tree species that grow in temperate regions where there is a distinct growing and resting period form a *growth ring* clearly seen on the transverse section. We call these trees *ring porous*.

Some temperate region species, such as birch, poplar and sycamore, as well as most tropical hardwoods, such as mahogany, are *diffuse porous*. That is, the vessels appear in random fashion throughout the growth period.

Grain, Texture and Figure

Some confusion surrounds what is meant by grain, texture and figure when used to describe the wood surface. A good guide is that grain refers to the wood fibers relative to the length of the tree on the faces and edges of a piece of timber. Texture is the relative size and variations of the elements. Figure refers to the pattern on a board caused by the arrangement of the different elements and the nature of the grain.

Looking Closely to Understand Wood



Studying wood with the naked eye is called gross inspection.

The next level of viewing easily available to woodworkers is with a hand lens. Sold in a range of magnifications, the best for inspecting end grain is a 10-power (10x) lens.

To make the various elements clearly visible, the end grain must be cleanly cut. I sharpened a new blade on a trim knife using an 8000 waterstone and confirmed the edge quality with the hand lens. It's not necessary to remove a large slice of tissue since the area you will look at is less than 1/4" x 1/4".

What is necessary is that the blade cuts without tearing.

The features of the wood are described on page 43.

Consider a 10x lens a necessary member of any tool kit. Use it to inspect the cutting edges of plane blades, chisels, router bits and saw teeth, and check joint lines, surface tearout, dings and scratches.

What's In a Name?

Understanding what makes up the structure of wood is much easier if you have words to name the features that we can see. This glossary explains the words and their meanings.

Annual Ring: seasonal growth that is highly visible in RING POROUS hardwoods, especially oak and ash.

Bark: the skin of the tree outside the CAMBIUM; divided into living inner bark and dead protective outer bark.

Cambium: a layer of tissue that is the source of cells that grow and divide to form the wood and bark of a tree.

Cell: the basic structural unit of wood, consisting of an outer wall surrounding a central cavity.

Diffuse Porous: a type of hardwood tree that forms vessels of roughly the same diameter throughout the growing season.

Extractives: complex chemical substances that form during the transformation of SAPWOOD cells into HEARTWOOD cells; they darken the wood and make it less porous.

Fiber: hardwood cells formed in the latter part of the growing season in ring porous wood that gives the tree strength; characterized by thick walls and a small cavity.

Fusiform Initials: mother cells in the CAMBIUM that grow and divide to form vessels, fiber and parenchyma in hardwoods and a variety of tracheids in softwoods.

Growth Ring: increment of wood added during a single growth period. In temperate regions, the growth period is usually one year; in which case the growth ring may be called an ANNUAL RING. In tropical woods, growth rings may not be discernible or are not annual.

Hardwood: timber from broad-leaved trees; designation does not necessarily reflect the hardness of the wood.

Heartwood: the older, nonliving central wood of a tree, usually darker and harder than the younger SAPWOOD.

Inclusions: any material that plugs a vessel, notably gum, resin or tyloses.

Parenchyma: cells mainly involved with food storage

and distribution; light-colored tissue when viewed through a hand lens; distributed in a variety of very specific patterns in certain species, making it a good recognition factor.

Pith: the soft, spongy central cylinder of tissue in the trunk, branches and twigs about which the first growth takes place.

Pits: a thinning in the side wall of the cell that allows water to flow from TRACHEID to tracheid.

Photosynthesis: the synthesis of complex organic materials needed as food from carbon dioxide, water and inorganic salts, using sunlight as the source of energy, aided by chlorophyll.

Rays: plate-like thin layers of tissue that extend out radially; serves for food storage and conduction.

Ray Initials: mother cells in the CAMBIUM that grow and divide to make rays in both hardwoods and softwoods.

Reaction Wood: abnormal wood that comes from a tree with a severe off-center PITH, usually caused by severe curvature or leaning.

Ring Porous: type of hardwood tree in which vessels formed at the beginning of the growing season are much larger than vessels laid down at the end of the season.

Sap: fluid that carries nutrients and water to various parts of the tree.

Sapwood: younger, softer, living outer portion of wood that lies between the CAMBIUM and the HEARTWOOD; less durable, and usually lighter in color than the heartwood

Silver Grain: the emergence of ray tissue on the surface of a board.

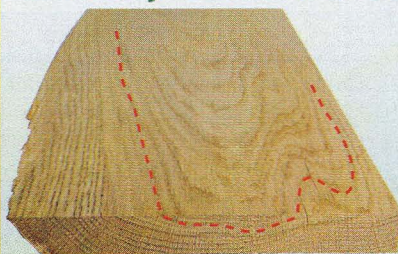
Softwood: timber taken from a needle-bearing tree; designation does not necessarily reflect the softness of the wood.

Tracheids: elongated cells that serve for support and upward conduction of sap. See PITS.

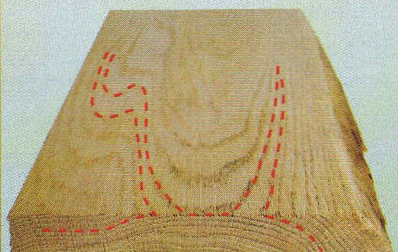
Tyloses: film-like material found in the heartwood vessels of some hardwoods; forms regularly in white oak.

Vessels: specialized tubular structures in hardwoods for conducting sap upward.

Grain, Texture and Figure



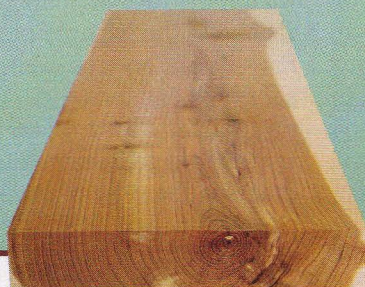
This is the same board photographed from one side, then the other. In each case, you can trace the lines of the rings from the end to the surface. The board was milled from the outer edge of the tree. The arched grain on the surface is called cathedral figure.



This piece of oak is from the center of the tree. The rays are easily seen as they break the surface. The effect is called silver grain.



The growth rings in this piece of softwood show the center of the tree going out to sapwood. Clearly visible is how the end grain gives way to long grain.



Softwoods and Hardwood

Trees are popularly divided into *softwoods* (needle-leaved) and *hardwoods* (broad-leaved).

It's believed that softwoods preceded hardwoods on our planet, because their structure is simpler and more primitive. Unlike hardwoods, inspecting softwoods with a 10x lens doesn't reveal much more than can be seen by gross inspection. Closer inspection, however, shows important similarities: both of them are composed mainly of cellulose, and both go through a sapwood to heartwood growth phase.

Elements in Softwood

The cells in the cambium which divide and form wood tissue are initials, so-called because they initiate the formation

The cambium is a microscopically thin layer of living cells that sheathes the tree from ground to crown. The cambium cells grow and divide. Half of the new cells make either wood or bark; the other half remain in the cambium. New cells on the inside of the cambium become one of the woody elements (fiber, parenchyma, rays, etc). The outside cells become bark.

of the specialized progenitor cells after cell division.

There are two types of initials: *fusiform initials* and *ray initials*.

In a typical softwood, the fusiform initial makes only one type of element called a *tracheid*. Tracheids come in varying types and comprise the vast bulk of softwood. In the main, they are 80 to 100 times longer than their diameter. They also vary greatly in wall thickness, depending upon when they are deposited during the growing season. In this way, they perform the tasks of transport and support.

Ray initials in softwood are complex, because they can function to store and provide food for some time in the growing season after other elements have completed their growth. Most rays are only one cell wide and not visible by gross inspection.

Elements in Hardwood

In hardwood, the fusiform initial makes three different elements called *vessels*, *fiber* and *parenchyma*. The ray initial is responsible for only one element, *rays*.

Each element plays a specific role in the tree, and each is sufficiently well-defined that it can be identified with the aid of a 10x hand lens when viewed on a transverse section.

Vessels conduct water and nutrients from roots to leaves. They are long tube-like elements with thin walls and large cavities. Although each vessel is short, they are connected in vertical series and can extend for quite some distance up the tree.

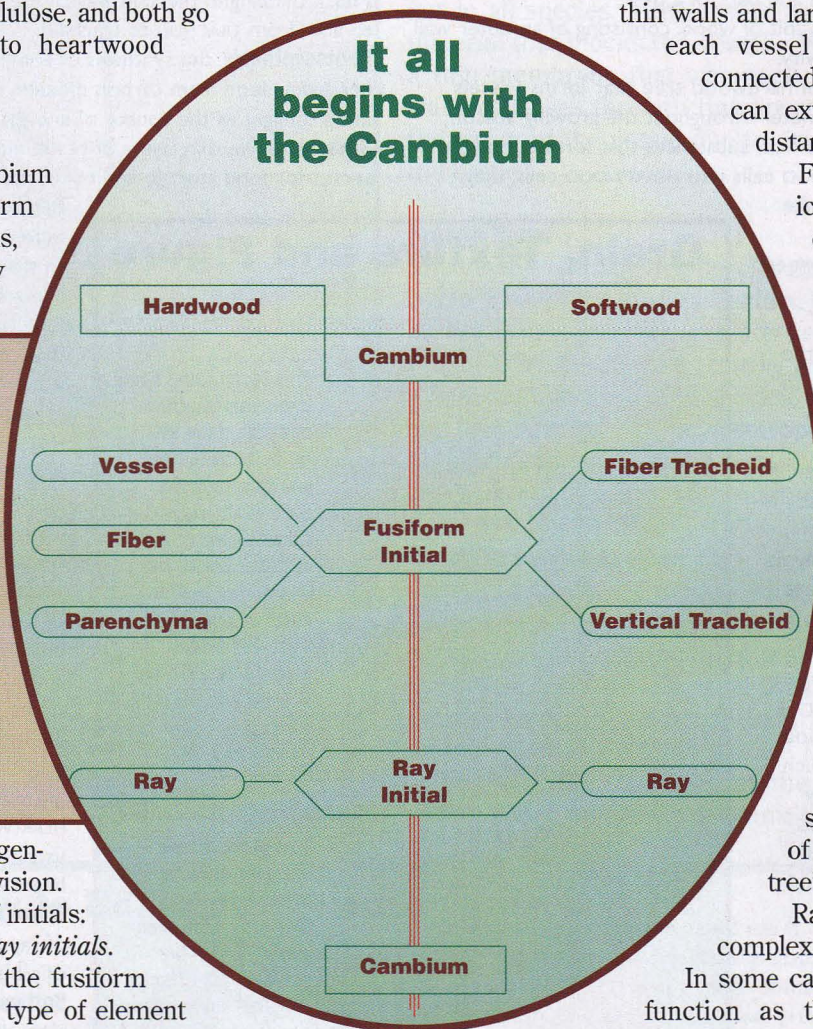
Fiber is the mechanical or support element of the wood. It's laid down in the later part of the growing season. You can describe this element as the reverse structure of a vessel. It's short and has a pointy end, a thick wall and a small cavity that isn't visible with a 10x lens.

Parenchyma is essentially storage tissue. It's deposited vertically in different species in a variety of ways throughout the tree's growing season.

Rays are the most complex of the four elements.

In some cases, they continue to function as the growing season progresses to provide or store food. Their size, shape and number varies enormously according to species. In a few species, such as poplar and willow, the rays are only one cell wide and therefore not visible. In the majority of species, rays are easily visible. Rays in oak are relatively huge structures, hundreds of cells high and tens wide. Seen on the transverse section, rays radiate outward like spokes on a wheel. When you split a log, it generally splits along a series of rays. You can then see them on the split side of the log in their front elevation or as a plate.

It all begins with the Cambium



Reading the End Grain

Because the four elements found in hardwoods —vessels, fiber, parenchyma, rays — are uniquely represented in each species, the ability to analyze these differences is the key to being able to identify the type or species of any wood. As an introduction to wood identification, I've chosen three well-known and widely used species: red oak, white oak and African mahogany.

■ **Vessels:** It is the earlywood large vessels that form the concentric rings. These are the large-cavity, thin-walled transport elements needed at the onset of the spring/summer growth period. They typically get abruptly smaller, although in both oaks they continue to be made and used throughout the growing season.

The major difference between the oaks is that vessels are free of any inclusions in red oak, whereas the vessels in white oak are plugged with tyloses. (We will see the effect of these when we look at utilization in Part 2.)

Vessels in mahogany are smaller and consistent in size. Some are arranged in twos and some in threes. The white deposit in some vessels is a common feature and is likely some form of gum deposit.

■ **Parenchyma:** In both oaks the parenchyma is the tissue that surrounds the large vessels. It's easy to see in white oak because of its white color and typical flame-like shapes; in red oak, it's a shade of brown, and entirely surrounds the smaller vessels, which are much easier to see than in white oak. Parenchyma is very sparse in mahogany, visible only as the light-colored edges of some of the vessels.

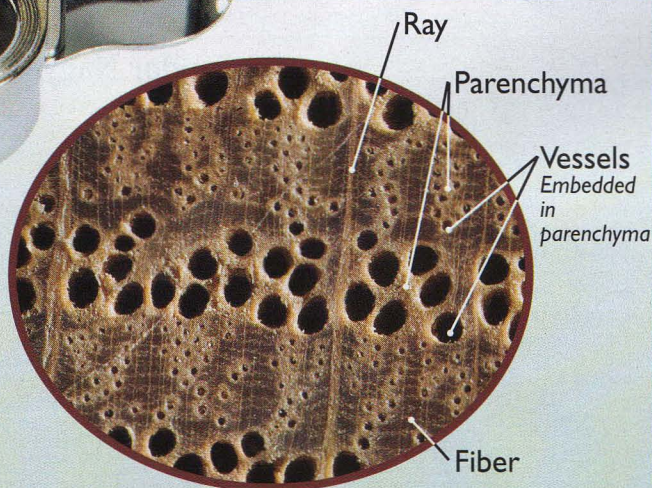
■ **Fiber:** The fiber in each photo is the dark background material. At this low magnification it's never possible to see the thick-wall, small-cavity elements as separate items. In both oaks, you will see very thin light-colored lines running horizontally through the fiber. This is parenchymatous material.

In mahogany, fiber is the red ground that is neither rays nor vessels.

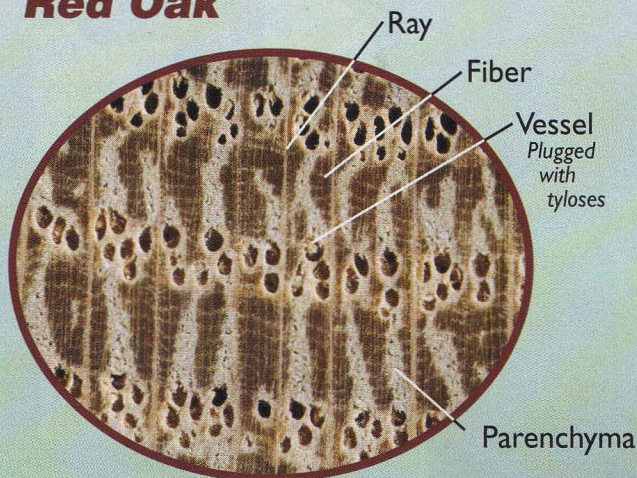
■ **Rays:** In each photo, the rays are the lines running more or less vertically. They are profuse in white oak, less so in red oak. In both oaks, there are very fine rays between the larger ones.

In mahogany, the rays are more or less the same thickness. They are little more than two-vessel diameters apart, and they bend around the vessels.

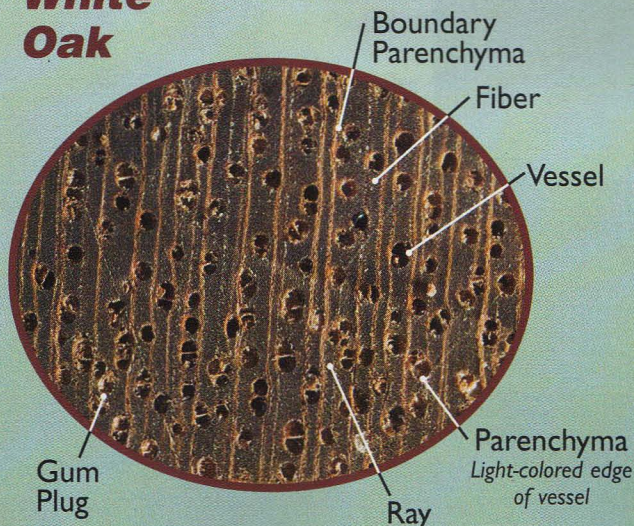
Ian Kirby is a master woodworker, wood scientist and designer. He is a regular contributor to Woodworker's Journal.



Red Oak



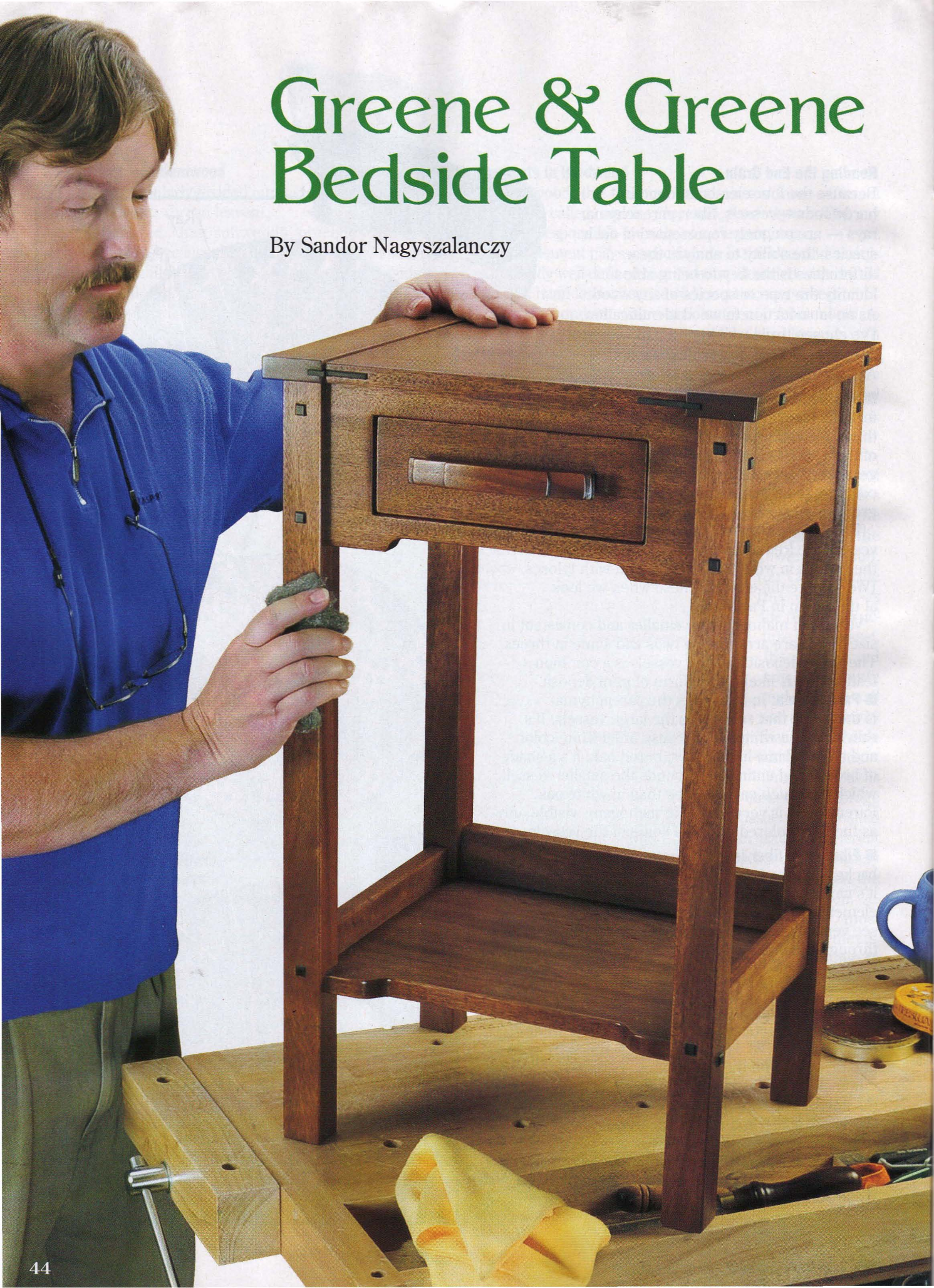
White Oak



African Mahogany

Greene & Greene Bedside Table

By Sandor Nagyszalanczy



Our author takes up the torch lit by former contributing editor Mike McGlynn (at right) and completes the third piece of Mike's Greene & Greene-inspired bedroom set. It's a fitting tribute to the memory of this gifted woodworker.



In the February 2006 and April 2007 issues of *Woodworker's Journal*, former contributing editor Mike McGlynn showed us how to build the first two pieces of a stunning Greene & Greene style bedroom set he designed: a chest of drawers and a bedstead. Sadly, Mike passed away last spring, leaving me the task of completing the set with the bedside table presented in this article.

With its square legs, bread-boarded top, cloud-lift-cut aprons and shelf and classic Craftsman-style details like square ebony plugs and splines, the table is harmonious with the proportions, details and overall flavor of the other bedroom pieces Mike created. It's also a practical and attractive stand-alone piece. I built the table from straight-grained African mahogany, using both 8/4 and 4/4 stock, but Honduras mahogany is just fine, too (that's what Mike used for the other bedroom pieces).

Built either as part of the bedroom set or as a stand-alone piece, the bedside table, left, is an attractive project. Square holes for the stylish ebony plugs that decorate the table are easily made with a square-chisel mortising setup in a drill press (as shown at right).

Starting with the Legs

The table's simple square-section legs are all cut from a straight-grained piece of 8/4 stock, planed down to 1½" thick. After jointing one edge of the stock, rip each leg to a little less than 1⅞", then thickness-plane it exactly 1½" wide. Re-joint the stock before ripping each of the other three legs. Now match the grain of each pair of front and back legs, and mark the ends and sides of all four legs to show their orientation relative to the assembled table — up, down, front, back and side.

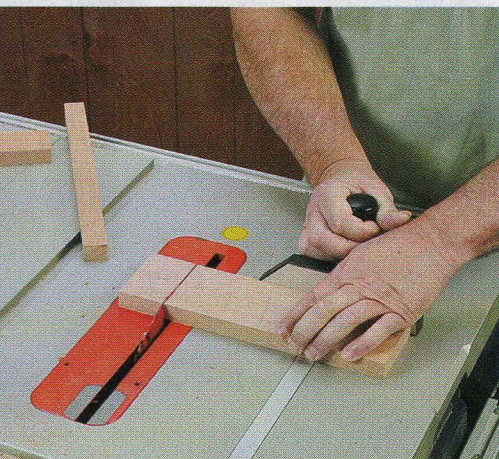


The markings will help prevent mistakes during the subsequent machining operations.

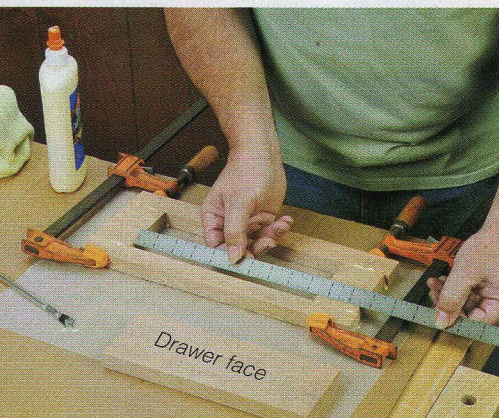
Next, chop the square holes for the table's decorative plugs. The layout of plugs is shown in the *Drawings* on page 47. You can chop these out with a sharp chisel, but it's far easier to make them using a hollow mortising chisel setup in a drill press (see *photo*, below). Clamp a fence to the drill press table to keep the sides of the holes square to the edges of the legs, and bore each square hole a little more than 1/8" deep. Finally, round over the edges of the legs with a 1/8"-radius roundover bit in a handheld router or on the router table.

Making the Aprons

As shown in the *Drawings*, the legs are joined by a wide apron that also holds a single drawer. Start by planing enough 4/4 stock down to 3/4" thick for the table's aprons. Cut three of the four aprons 5½" wide: two that are 10" long for the sides and one 13"-long apron for the back. For the front apron, start with a workpiece that's 6¼" wide x 13¾" long. Mark a cabinetmaker's triangle across the entire face, then rip the board into three strips, as shown in the *Drawings*. Take the wider center section and crosscut it



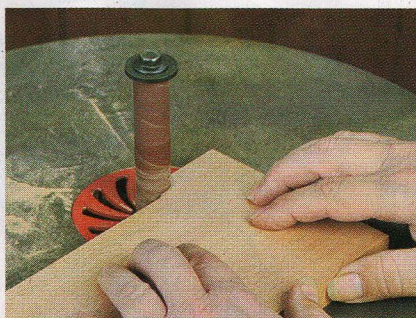
For a perfect grain pattern, the front apron and drawer face are cut from the same board: Rip strips from the top and bottom edges first, then cut off the ends of the remaining piece and trim the drawer face to final size.



The four pieces that surround the drawer are glued back together to form the table's front apron. The author uses a rule to make sure the final distance between the end pieces is a bit greater than the width of the drawer face.

into three pieces, as shown in the top left photo, to create a blank for the drawer face and the short sections of apron on either end of the drawer. Now trim the drawer face blank down to its final size of $9\frac{7}{16}$ " long and $3\frac{3}{16}$ " wide.

Glue the remaining four pieces together to form an apron that will surround the drawer face and provide a perfect grain match (see bottom left photo). After this assembly dries, scrape off the excess glue and trim the front apron to its final $5\frac{1}{2}$ "-wide, 13"-long size. Make sure to leave the strip above the drawer opening 1" wide and center the drawer opening side-to-side.



An oscillating spindle sander quickly refines and smooths the concave portions of the "cloud-lift" profiles cut on the lower edges of the apron members and front edges of the shelf.



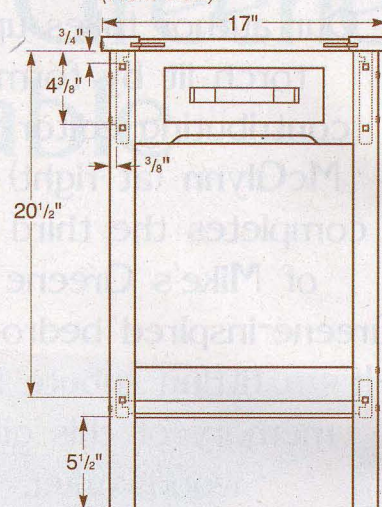
Using a dado blade stack in the table saw, the author cuts a rabbet on three edges of the table's lower shelf, as well as the grooves in the stretcher members that will support the shelf.

Next, plow a $\frac{1}{4}$ "-wide, $\frac{5}{16}$ "-deep groove on the inside face of each apron member, spaced $\frac{3}{8}$ " from the top edge. This groove will secure the cabinetmaker's buttons that attach the table top. Now mark the lower edge of the front and both side aprons with the "cloud-lift" shape shown in the *Drawing* on the next page. Cut the profile out, using either a band saw or jigsaw, and sand the cut edges smooth. Use an oscillating spindle sander or drum sander to smooth the cloud-lift's concave areas. Then, round over the outside face of the cloud-lift edges using the $\frac{1}{8}$ " round-over bit. Also run the bit around the front of the drawer face and drawer opening in the front apron.

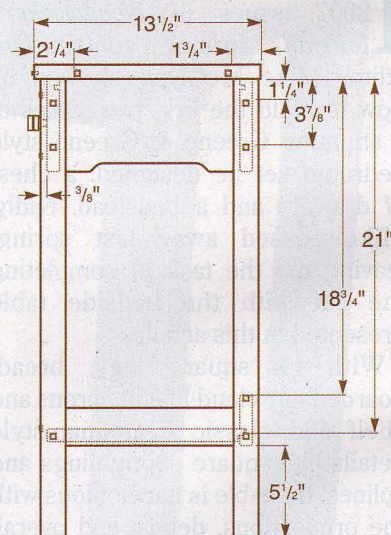
Milling the Stretchers and Shelf

The bedside table features a handy low shelf, great for holding books, magazines, tissues and so forth. (I adapted the design from the shelf on a writing desk the Greene brothers

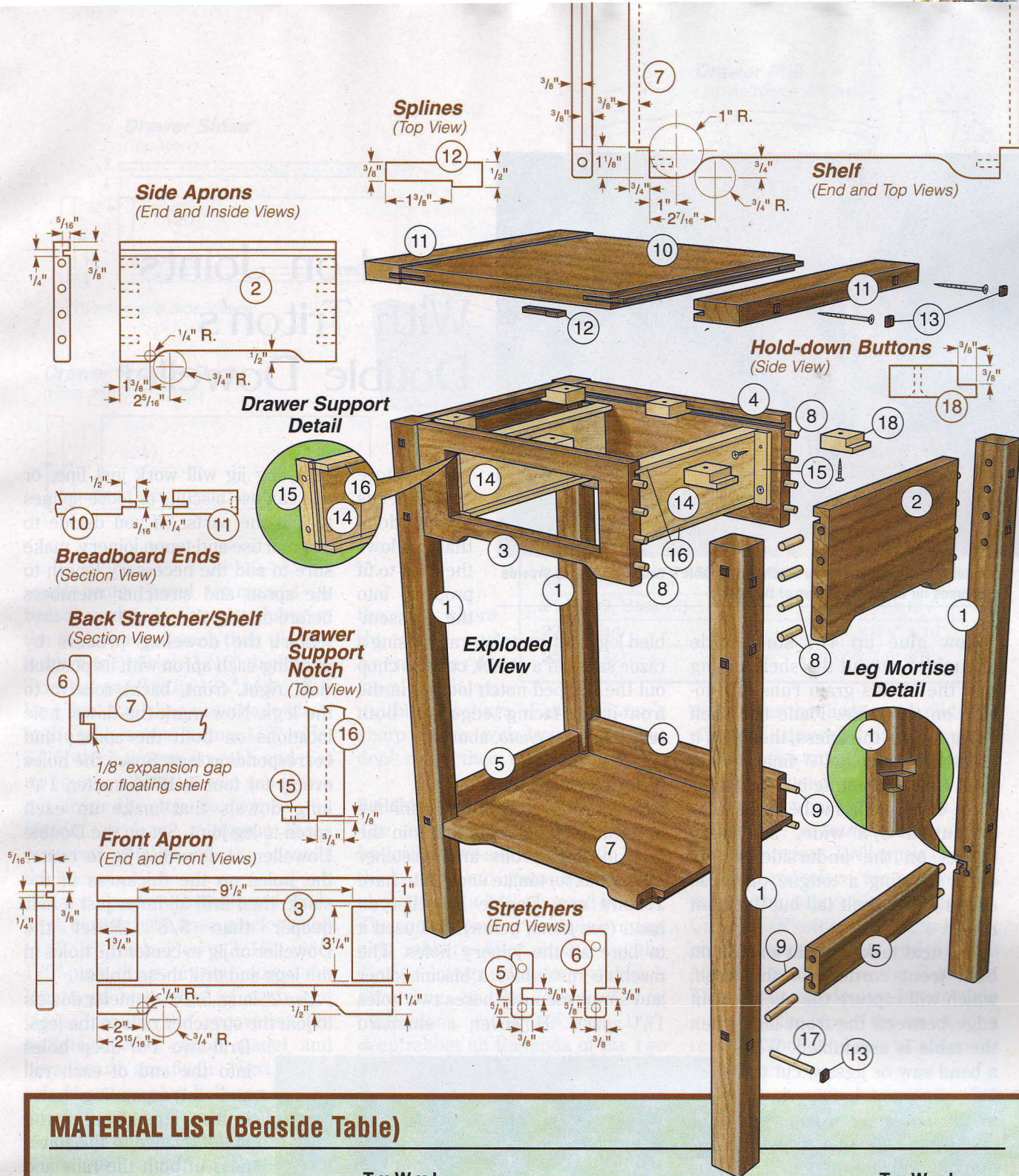
Bedside Table Elevation (Front View)



(Side View)



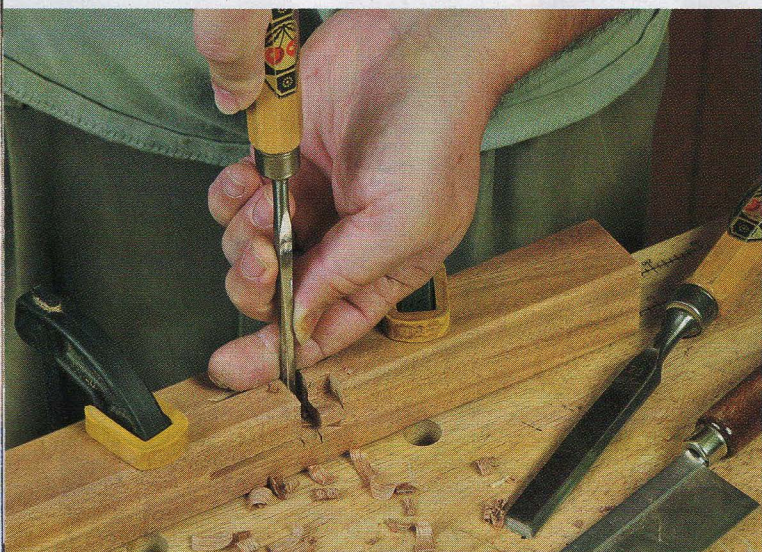
created for the William T. Bolton house in Pasadena, California.) Stretcher rails support the shelf at the sides and back edge via a tongue-and-groove joint. The joint provides a solid connection in the $\frac{3}{4}$ "-thick stock. Plow a $\frac{3}{8}$ "-wide, $\frac{3}{8}$ "-deep groove on the inside face of each rail, $\frac{5}{8}$ " up from the bottom edge (see bottom photo). Make the groove just a hair wider and deeper than $\frac{3}{8}$ " x $\frac{3}{8}$ " to allow the shelf's tongue to slide into it easily. Round over all long edges of these rails with the $\frac{1}{8}$ " roundover bit.



MATERIAL LIST (Bedside Table)

	T x W x L
1 Legs (4)	1 1/2" x 1 1/2" x 27 1/4"
2 Side Aprons (2)	3/4" x 5 1/2" x 10"
3 Front Apron/Drawer Face (1)	3/4" x 6 1/4" x 13 3/4"
4 Back Apron (1)	3/4" x 5 1/2" x 13"
5 Side Stretchers (2)	3/4" x 2 1/4" x 10"
6 Back Stretcher (1)	3/4" x 3" x 13"
7 Shelf (1)	3/4" x 11 3/4" x 14 1/2"
8 Apron/Leg Dowels (32)	5/16" diameter x 1 1/4"
9 Leg/Stretcher Dowels (12)	5/16" diameter x 2"

	T x W x L
10 Top Center Panel (1)	11/16" x 13 3/8" x 13 1/2"
11 Breadboard Ends (2)	13/16" x 2 1/4" x 13 1/2"
12 Splines (2)	3/16" x 1/2" x 2"
13 Plugs (24)	3/16" x 3/8" x 3/8"
14 Drawer Side Supports (2)	1/2" x 3 1/16" x 10 3/4"
15 Drawer Support Ends (4)	3/8" x 3/4" x 3 9/16"
16 Drawer Runners (4)	1/4" x 1" x 10 3/4"
17 Leg/Shelf Dowels (2)	1/4" diameter x 2"
18 Hold-down Buttons (6)	19/32" x 1 3/4" x 1 1/2"



Dead-on Joints With Triton's Double Doweller

One more chore needs to be done that allows the shelf to fit properly into the assem-

doweling jig will work just fine, or you can use biscuits or loose splines to join the parts. (If you decide to use mortise-and-tenon joinery, make sure to add the necessary length to the apron and stretcher members before cutting them out.)

It's necessary to chisel out a notch in the table's two rear legs, to provide clearance for the back corners of the shelf.

Now glue up 4/4 stock wide enough to cut out the shelf, noting that the shelf's grain runs side-to-side on the table. Plane the shelf down to 3/4" thickness, then trim it to its 11 3/4" wide, 14 1/2" final dimension. Use a rabbeting bit in a router (or a dado blade in the table saw) to cut a 3/8"-wide, 3/8"-deep rabbet on the underside of the shelf, creating a tongue on three edges of the shelf (all but the front edge).

The next task is to cut a notch on both front corners of the shelf, which will capture the shelf's front edge between the front legs when the table is assembled. With a band saw or jigsaw, cut the 1 1/8" x 3/4" notches as shown in the *Drawings*. Keep your cuts clean and square, as the notches will show.

The shelf's front edge is cut with a variation of the cloud-lift shape so that it harmonizes with the aprons and lends the table more visual interest. Mark the shelf with the lift design, and cut it out using a band saw or jigsaw. Smooth and round over this edge, as you did on the lower edges of the aprons.

bled legs and stretcher rails: Using a razor saw and a chisel, cut and chop out the stepped notch located in the front-inside-facing edges of both rear legs (see *photo*, above).

Doweling the Joints

Now it's time to drill holes for the 5/16"-diameter dowels that join the legs to the aprons and stretcher rails. I was fortunate enough to have Triton's new Double Doweller on hand (see *photo*, below), so I used it to bore all the joinery holes. The machine resembles a biscuit joiner and simultaneously bores two holes 1 1/4" apart). However, a standard

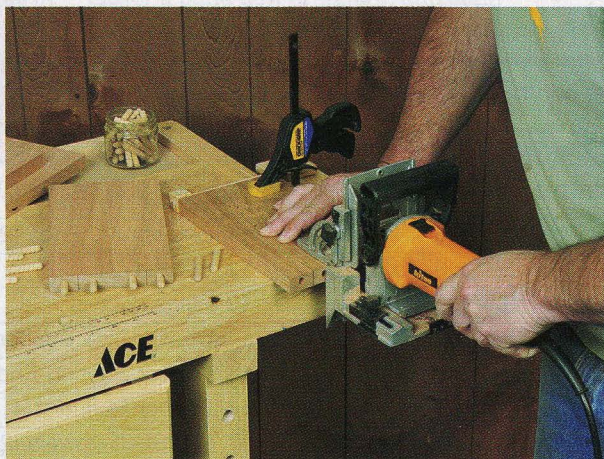
Start the doweling process by marking each apron with its position (left, right, front, back) relative to the legs. Now mark the dowel hole locations on both the aprons and corresponding legs. Space the holes evenly for four 5/16"-diameter, 1 1/4"-long dowels that make up each apron-to-leg joint. Set up the Double Doweller or doweling jig to center the holes on the thickness of the stock, then drill all holes just a hair deeper than 5/8". Reset the Doweller or jig to center the holes in the legs and drill these holes.

Use 2"-long, 5/16"-diameter dowels to join the stretcher rails to the legs:

Drill two 1 1/16"-deep holes into the end of each rail and corresponding holes in the legs. Center the holes relative to the thickness of both the rails and legs, and locate them so the bottom edge of each rail ends up 5 1/2" from the bottom end of the legs.

Fabricating the Top

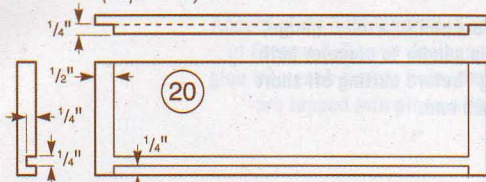
The bedside table's top is designed to match the top on Mike's dresser. It's a classic Greene and Greene design, featuring a solid



To bore the holes for the dowels that join the apron, stretchers and legs together, the author used the Triton Double Doweller machine.

Drawer Sides

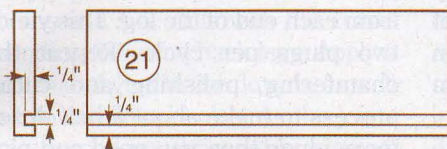
(Top View)



(Section and Side Views)

Drawer Front & Back

(Front and Side Views)



Drawer Pull

(Top and Section Views)



MATERIAL LIST (Drawer)

	T x W x L
19 Face (1)	3/4" x 3 3/16" x 9 7/16"
20 Sides (2)	1/2" x 3" x 10 1/2"
21 Front, Back (2)	1/2" x 3" x 8 3/4"
22 Bottom	1/4" x 8 3/4" x 10"
23 Pull (1)	1 1/4" x 7/8" x 6 1/2"

wood center panel terminated by breadboard ends. Start by gluing up the top's center panel, then planing it down to its final 11/16" thickness. Trim the panel to its 13 3/8" wide, 13 1/2" long final size, then use a dado blade in the table saw to form a 1/2"-wide, 3/16"-thick tongue on each end. Set up your saw blade so you can take a cut from the top face, then the bottom, to leave a tongue that's centered relative to the panel's thickness.

Make the two breadboard ends next, cutting each from stock planed to 13/16" thick. Plow a 3/16"-wide, 1/2"-plus deep groove down the length of one edge of each end piece, locating the groove so the bottom of the center panel and breadboard are flush. Next, cut a pair of square plug holes on the ungrooved edge of each end piece, located as shown on the *Drawings*.

Now, drill a pair of close-spaced 5/32"-diameter holes down through the plug holes at both ends of each breadboard. Use a small file to turn each pair of holes into a short slot. The slots are for screws that secure the ends to the center panel, yet allow the cross-grain-joined parts to expand and contract.

To complete the top, use a chisel to chop out a small slot for the decorative spline at the front edge of

the top where the panel and breadboards meet, as shown in the *Drawings*. Ease the top's sharp edges with sandpaper, but don't round them over.

Building the Drawer

The small drawer for this project is basically a five-sided box, with 1/2"-thick sides cut from Baltic birch plywood and a 1/4" plywood bottom. The corner joints are simple overlapping rabbets. After cutting out the 3"-wide drawer sides, front and back according to the *Material List* dimensions, cut a 1/2"-wide, 1/4"-deep rabbet on the ends of the two 10 1/2"-long drawer sides. Now plow a 1/4"-deep groove on the inside face of all four parts, spaced 1/4" up from the bottom edge, to accommodate the drawer bottom panel. Size the width of the groove so it fits the 1/4" ply you're using (1/4" ply can range from 3/16" to just slightly under 1/4" in thickness). Cut the drawer bottom to size, then sand all the parts and assemble the drawer. Capture the bottom in its grooves first, without glue, then glue and nail the rabbet joints that secure the front and back to the sides.

Next, make the drawer support

assemblies that house and guide the slide-out drawer. Each support requires two runners and two ends, cut from hardwood, and a side support cut from 1/2" plywood. Glue and nail the parts together, as shown in the *Drawings*. Drill a pair of holes in each end piece for screws that secure the supports to the aprons. Cut an 1/8"-wide, 3/4"-deep rabbet on the forward-facing end of each support, as shown in the *Drawings*. This allows the drawer face to slide in beyond the face of the apron, for a recessed look, and acts as a stop for the drawer.



A rotary rasp chucked in a die grinder makes quick work of sculpting the curved sides of the table's drawer pull.



Using a plywood jig screwed to a miter gauge, the author uses a strip sander to chamfer both ends of a square "log" before cutting off short square plugs from each end.

shaped burr (see bottom *photo*, page 49). After roughing out both sides of the pull, use a sharp curved cabinet

scraper to refine the shape, then finish with sandpaper, working from coarse to finer grits.

Forming Plugs and Splines

There are a total of 24 plugs that decorate the table: 20 on the legs and four on the top's breadboard ends. To make the plugs, start by cutting a 3/8" x 3/8" "log" from African blackwood or ebony (to match those on Mike's bedroom set), then shape and slice off the individual plugs. Trim both ends of the log square using a smooth-cutting, fine-toothed crosscutting blade, then put a small 45° chamfer all around the edges of each end of the log. An easy way to do this is to make a 45° angle jig out of plywood

and use it with a benchtop strip or disc sander (see left *photo*, above). Give the ends a quick polish using a flap sander chucked in the drill press, then cut off a 3/16"-long plug from each end of the log. This yields two plugs per cycle. Repeat the chamfering, polishing and cutoff process to make about a half dozen more plugs than you need and pick the best-looking ones for the table.

The two L-shaped splines, which adorn the front corners of the top, are cut from a 3/16"-thick, 1/2" x 2" piece of blackwood or ebony using the band saw or scrollsaw. Use a strip sander or sanding block to put a small chamfer on the outside-facing edges of the splines, and flap-sand the splines smooth.

Sanding and Finishing

Before proceeding with finishing, it's important to dry-assemble the entire table to see that it fits together properly. Use clamp pads and don't over-tighten the clamps, to prevent denting the wood. Then, use a rubber or dead-blow mallet to gently take it apart.

To get a clean, even finish, it's best to sand and finish all the mahogany parts before gluing the table together. Start sanding with 120-grit paper, then 180-grit and finally 220-grit. Wipe the wood down with distilled water applied with a sponge or damp cloth to raise the grain. When the wood dries, re-sand lightly with 240-grit paper. If you want the table to match the rest of Mike's bedroom set, stain the mahogany using a blend of Lockwood red and brown mahogany aniline dyes. Wear rubber gloves to keep moisture from your fingers from smudging the dye. Then, apply two coats of satin wipe-on polyurethane finish.

Shaping the Drawer Pull

The table's complex-shaped drawer pull matches the pulls on Mike's dresser. Cut out a blank from 8/4 stock planed down to 1 1/4" thick, then transfer the curved shape and angled ends of the pull onto the blank and cut it out with a band saw. The pull's profile is shown in the *Drawing* on page 49. A strip sander is helpful for smoothing the stepped sections of the top, but you can use files and sanding strips just as well. With a sharp chisel and/or a knife, create a slight curve on the ends of the stepped face of the pull. Next, shape the concave curved sides of the pull, either with a carving gouge, or if you've got a steady hand, with a die grinder fitted with an oval-



As with the original two pieces of this set, all the table parts are stained and finished first, prior to assembly. Glue-up is done in two stages: First, each pair of side aprons and stretchers is glued up with a pair of front and rear legs into a subassembly, as shown here. The subassemblies are then glued together.

Accent plugs and decorative splines are characteristic of Greene & Greene designs. After carefully applying glue into each square hole, the ebony decorative plugs are tapped into place with a plastic-faced mallet.



Assembling the Lower Frame

Putting the bedside table together is done in several steps. Assemble the legs, aprons and stretchers/shelf in two steps: First, glue up the side aprons and side rails with the corresponding front and back legs. Apply a thin coat of glue to the dowels, as well as into the dowel holes. As the joints are clamped up, thoroughly wipe off glue squeeze-out from the finished surfaces with a damp cloth or sponge.

Next, glue the subassemblies together with the front and back aprons and rear stretcher rail: Lay one

drawer box with it centered side to side. Center the pull, side to side, and locate it slightly above the center of the drawer face. Drive a pair of 2"-long, #8 washerhead screws through pilot holes from the inside front of the box through the drawer face and into the pull.

Now slip the drawer support assemblies in between the front and rear aprons, on either side of the drawer opening and temporarily clamp them in place. Slide the drawer into its opening, then unclamp and slide each support inward until its runners engage the drawer box loosely. Adjust the supports so the drawer is centered in the opening and slides in and out smoothly. Secure the supports by driving a pair of 1"-long #6 screws through each end of its ends (see photo at left).



Mount the drawer support assemblies by first clamping them to the aprons so they keep the drawer centered and sliding smoothly, then screwing them in place.

subassembly on an old towel on the workbench (so the wood doesn't get dented or scratched) and glue the aprons and rail in place. Slide the shelf into its groove in the side and rear rails (no glue), then glue the other subassembly in place. Apply clamps to draw the framework together. Then carefully drive the 1/4" dowels through the holes in the front legs and into the front corners of the shelf.

After removing the clamps, you're ready to install the drawer assembly. First, screw the drawer box, drawer face and pull together. Set the face flush with the bottom of the

Installing the Top and Plugs

Assemble the top next by applying glue to only 3" to 4" of the tongue-and-groove joint closest to the rear edge of the center panel and breadboard ends. Clamp the parts together, making sure that the back edges of the panel and breadboards are flush. Drive a 2 1/2"-long, #8 pan (or washer) head screw into the slotted holes in each breadboard, driving them just enough to pull the tongue-and-groove joint tight. Check the assembly for flatness, then drive the two splines into the slots at the front of the top with a rubber mallet.

Apply glue only to the part of the spline that seats into the center panel slot, so the spline won't split out when the center panel expands or contracts.

Install all the decorative plugs on the legs and top next. Apply a few drops of glue into each square plug hole, then carefully drive a plug in (chamfered side up) using a plastic-faced mallet, leaving each plug a little more than 1/16" proud of the surface (see top photo).

Cut the six hold-down buttons to size and shape from scrap stock, and bore a pilot hole through the center of each one. To mount the top, set it upside down on a towel-covered workbench, then place the inverted table on top of it. Center the table side to side and adjust the front of the top so it overhangs the front legs by 3/8". Lightly clamp the table and top together, then set the six hold-down buttons into the apron slots: one each into the front and back aprons; two into each side apron. Screw all six buttons down using 1"-long, #6 screws. Now flip the table over, clean any dust or grime from the surface, and give the whole table a fresh coat of paste wax applied with a fine plastic abrasive pad or #0000 steel wool. As you stand back and admire your completed project, don't forget to say a quick "thanks" to Mike.

Sandor Nagyszalanczy is a furniture designer/craftsman. He is also a writer/photographer and regular contributor to Woodworker's Journal. His books are available at: www.sandorsworkshop/Books.com

Wall-mounted



Router Table

By Chris Marshall

If your shop's floor space is limited, here's one way to make some room: hang your router table on the wall. This drop-down design will give you full routing capability without ever touching the floor.

When my wife and I bought our first house, I finally had a place to set up a "real" shop. It was a one-car garage, stuffed with our car, trash cans, a mower and bicycles. Floor space was so cramped that there was hardly room for a bench, the table saw and me, let alone other stationary tools. So, my router table had to adapt to the space. It amounted to a piece of countertop hinged to the wall, and it rested on a 2x4 brace. Not much for looks, but it worked, and equally important, it flipped up to stay off that tiny floor.

I've got a lot more floor space now, but I still hate to waste it. So, the project you see here is my high-tech evolution of that first router table ... and this one is WAY better! It features a full-size 24" x 32" laminated tabletop that rests on a pair of removable support arms during use. When not needed, it tips up and tucks into a cabinet that's just 12" deep. Even your router and plate have a dedicated storage spot: they slide into a pair of dadoes between the shelf dividers. I souped mine up with Freud's SH-5 Fence so I'd have dust collection and micro-adjust features. You could easily adapt any router fence you have, or build one instead. My fence mounts on T-tracks, but bolts run through long slots in the table or a series of holes would work, too. You don't even have to remove the fence to close

the table up; just slide it back, lock it in place, and it tips right into a cabinet cubby. I bored a hole through the cabinet wall for my shop vac hose and added an on/off switch with a plug for my router cord. If you like what you see, here's how to add this space saver to your shop.

Starting with the Table

The table's center area is a sandwich of 1/2"- and 3/4"-thick MDF covered with plastic laminate. To make the core, cut the bottom (piece 1) to size, according to the *Material List* dimensions on page 55. Cut the

top core (piece 2) about 1/4" larger in both dimensions, and glue the two pieces together. Using a flush-trim bit with the bearing riding on the bottom core, trim the top core to match it. Now, cover both faces with oversized pieces of plastic laminate (pieces 3) and rout them flush.

There are a number of ways to make the router plate cutout in the tabletop. Here's how I did it: I fixed Rockler's plate installation template to my tabletop with double-faced tape (see the *Drawings*, next page, to locate the cutout position). Then, with a 1" O.D. rub collar and a 1/2"

This full-size router table stows in the space of an average wall cabinet and tips down for quick, easy setup. No base is needed.

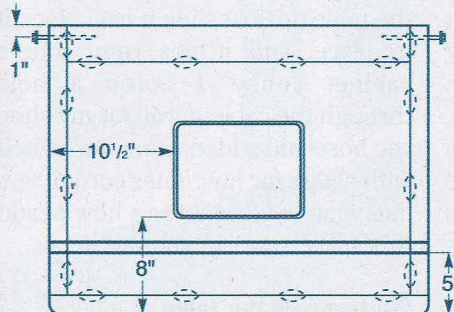
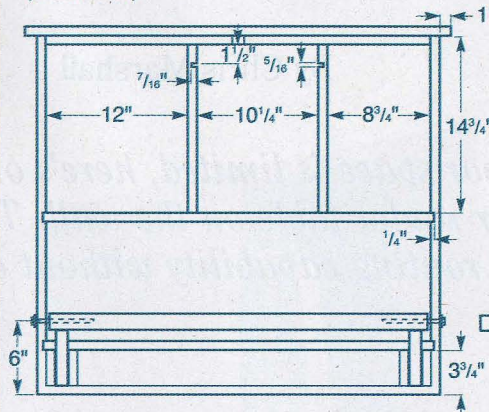


upcut spiral bit installed in my plunge router, I routed down through the cutout area to remove the center waste piece. The offset between the rub collar and bit will also create a 1/4" lip for supporting the router plate. Switch to Rockler's piloted pattern bit to create the shallow plate recess. Carefully set the bit depth to match the thickness of the router plate, and test the cut on a piece of scrap. Once the correct depth is dialed in, rout around the inside of the plate template to finish up the cutout (see *photo*, below).

The front, back and side edging (pieces 4 through 6) give the table a sturdy finished edge, but they also help stiffen the MDF core and provide a sturdier substrate for securing the pivot bolts. Mill your edging pieces from hardwood stock, and attach them to the core with pairs of #20 biscuits (pieces 7), spaced evenly around the core.

Wall-mounted Router Table Carcass Elevations

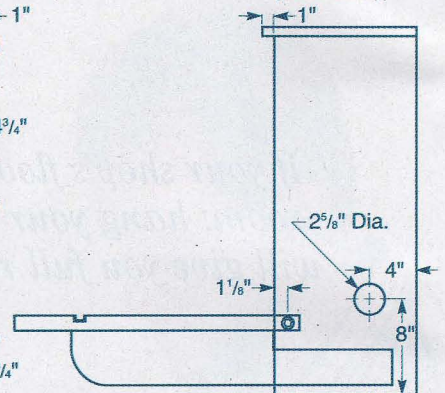
(Front View)



Router Table Elevation

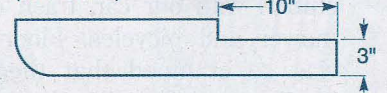
(Top View)

(Side View)



Support Arm Elevation

(Side View)



Fit the support arms so that they have a bit of "slip room." Keep seasonal humidity variations in mind when you do so.



The author milled the router plate opening using rub collars, a spiral bit and pattern bit in tandem with Rockler's plate installation template (left photo). He mounted a Freud precision fence to the table with aluminum T-track, T-bolts and lock knobs (center photo). The table pivots on a pair of lag screws driven into deep holes made with a doweling jig to keep them centered and true (right photo).

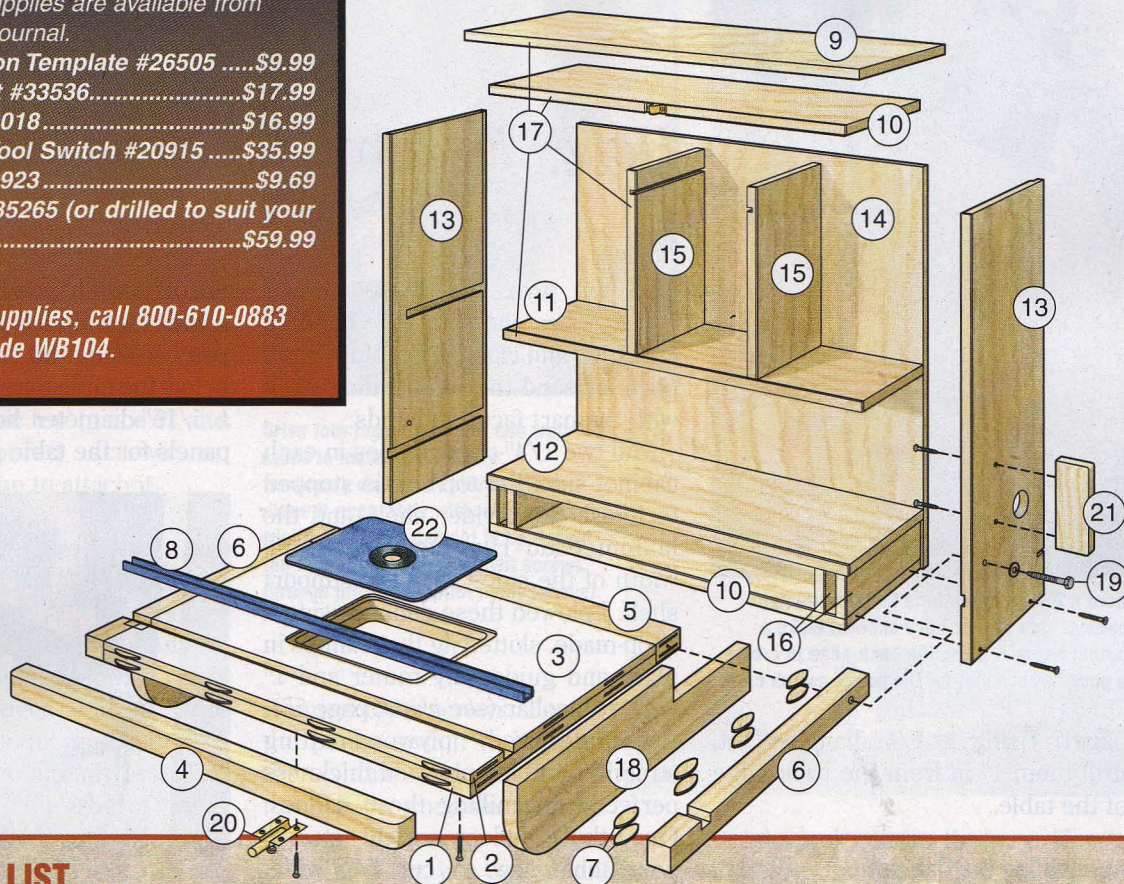
Router Table Project Supplies

The following supplies are available from Woodworker's Journal.

Plate Installation Template #26505\$9.99
 1/2" Pattern Bit #33536.....\$17.99
 Miter Track #63018.....\$16.99
 Safety Power Tool Switch #20915\$35.99
 Barrel Bolt #30923.....\$9.69
 Router Plate #35265 (or drilled to suit your router).....\$59.99

To order your supplies, call 800-610-0883 and mention code WB104.

Exploded View



MATERIAL LIST

	T x W x L		T x W x L
1 Table Core, Bottom (1)	3/4" x 19 1/2" x 29"	12 Support Shelf (1)	3/4" x 11" x 33"
2 Table Core, Top (1)	1/2" x 19 1/2" x 29"	13 Sides (2)	3/4" x 11 3/4" x 30"
3 Laminate (2)	1/16" x 19 1/2" x 29"	14 Back (1)	3/4" x 33 1/2" x 30"
4 Front Edging (1)	1 3/8" x 1 1/2" x 32"	15 Dividers (2)	3/4" x 9 7/8" x 14"
5 Back Edging (1)	1 3/8" x 3" x 29"	16 Braces (4)	3/4" x 3" x 11"
6 Side Edging (2)	1 3/8" x 1 1/2" x 22 1/2"	17 Banding	1/4" x 3/4" x 222 1/2"
7 Biscuits (32)	#20	18 Support Arms (2)	1" x 4 5/8" x 27"
8 Miter Track (1)	1" x 36"	19 Pivot Bolts, Washers (2)	5/16" Dia. x 4"
9 Top (1)	3/4" x 13" x 36"	20 Barrel Bolt (1)	2" x 1" Brass
10 Subtop, Bottom (2)	3/4" x 11" x 32 1/2"	21 Power Switch Mount (1)	3/4" x 2 3/4" x 6"
11 Divider Shelf (1)	3/4" x 9 7/8" x 33"	22 Router Plate (1)	1/4" x 8" x 11" Aluminum

Insert a pair in the joint between the back and side edging to help reinforce these joints. Radius the corners of the front edging on your band saw, sand these curves to refine them, and glue and clamp all the edging in place. When the glue dries, plane or sand the edging joints flush and ease the sharp edges with a 1/8" roundover bit.

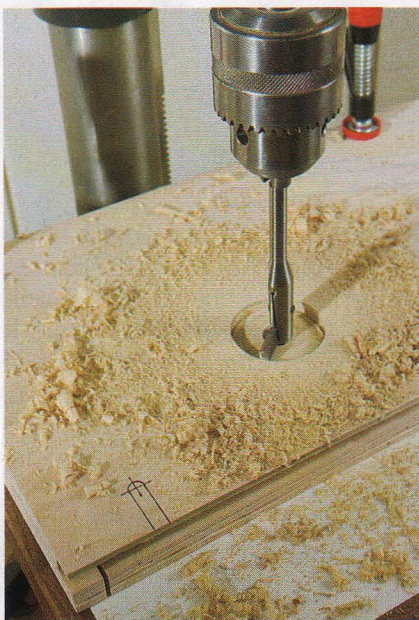
At this stage, your table is nearly done, but you still have a few tasks left to do. Cut a 1/2"-deep, 1"-wide dado slot across the table for the



Plowing stopped and through dados in the cabinet sides was easy work, using a slotted router jig to guide a 1" O.D. rub collar and undersized 23/32" plywood-cutting bit.

aluminum miter track (piece 8), and screw it in place. Then, figure out how you'll mount your router fence. I routed dado slots for 10" lengths of T-tracks, squared up the ends and mounted the tracks with screws.

Finish up table construction by boring 3"-deep pilot holes for the 5/16" x 4" lag screws (pieces 19) that will serve as pivot "hinges." I used a doweling jig to ensure that these holes would be perfectly square and centered on the table's thickness (see right photo, previous



Bore a 2 1/4"-diameter hole through the right cabinet side for vac hose access. Make a cutout below it along the back edge to create a pass-through slot for the power switch cord.

page). Using a 1/4"-diameter bit, drill them 1" in from the back edge of the table.

Assembling the Cabinet

Next up for assembly is the plywood cabinet. Notice in the *Drawings* that each cabinet component with a "show" edge (pieces 10 through 13, 15 and 16) will receive a strip of solid-wood banding (piece 17) to

Handy Features, Foolproof Installation

hide the plys. Cut these carcass parts to size and apply the banding with glue and clamps. Carefully rout, plane or sand the the banding flush with the part faces and ends.

Mill two 1/4"-deep dados in each cabinet side; the top one is stopped to house the divider shelf, and the bottom dado runs across the full width of the sides to fit the support shelf. I plowed these dados using a shop-made, slotted jig that clamps in place and guides my router and 1" O.D. rub collar (see *photo*, page 55). An undersized, plywood-cutting straight bit fit my plywood thickness perfectly for milling these dados. Once those dados are cut, step to your table saw to cut 1/2"-wide, 3/4"-deep rabbets along the back inside edges of the side panels to fit the back panel a bit later.

Refer to the *Drawings* again to locate the big hole in the right side panel for your shop vac hose and the smaller slot just below it to fit the

on/off switch power cord for your router (see top left *photo*). That way, you can keep the cord in the cubby below the table for easy access. Bore a 5/16"-diameter hole in both side panels for the table pivot bolts.



Playing cards make good spacers around the support arms when installing the inner braces. You want the arms to slide in and out easily from season to season.

When installing the dividers, be sure to check their spacing using the router plate. It should slip in and out of the divider dados without binding.



It's finally time to bring the cabinet carcass together. Start by gluing and brad-nailing two braces (pieces 16) to the side panels, just below the support shelf dados. Shorten the right brace length to 10 1/2" first so it will clear the power cord cutout. Glue and clamp the subtop, divider and support shelves and bottom panel between the side panels, reinforcing each of these joints with counterbored flathead wood screws.

You can also install the dividers (pieces 15) after milling a dado along the inside face of each to fit your router plate. Make these dados 7/16" deep and 5/16" wide. Slip the dividers into position, and

drive screws down through the subtop and up through the divider shelf to secure them. With the dividers done, prepare a piece of solid stock for the top (piece 9) and drive counterbored screws up through the subtop to attach it.

Fitting the Support Arms

Follow the layout shown in the *Drawings* to make the two cabinet support arms (pieces 18) from 1"-thick, dimensionally stable stock. Ease the part edges, and slide the arms into place in the cabinet next to the braces you've already installed. They should fit with a bit of "give" beneath the support shelf. If you're building this project during the winter, allow a little more room by taking a few shavings off the bottom edges of the support arms at the jointer. Once summer rolls around, the arms may expand across the grain, and you don't want them to fit too tightly at that time.

You still have two remaining braces to install, which will complete the support arm slots in the cabinet. Again, you'll want to provide a bit of side-to-side clearspace between the braces and support arms. I inserted three playing cards on each side of the arms at both the front and back cabinet openings to act as spacers. Slide the inner braces into place, and attach them to the support shelf and bottom with counterbored screws (see right *photo*, facing page).

Completing Construction

The hard work is nearly finished on this job! At this point, give the cabinet a thorough sanding up through the grits to 180 while the back panel is still off. Cut a power switch mounting plate (piece 21) from spare solid stock, and attach it to the right side of the cabinet with



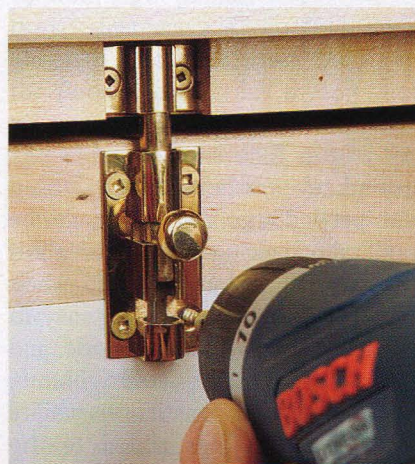
Drive four lag screws into two wall studs to install the cabinet. A temporary wall cleat allows you to place it accurately without a helper (right). Once the cabinet is up, mount the table by driving the pivot screws through pre-drilled pilot holes (above).

counterbored screws. Fasten the power switch to it. Feed the short "female" cord through the cord slot into the bottom cubby area.

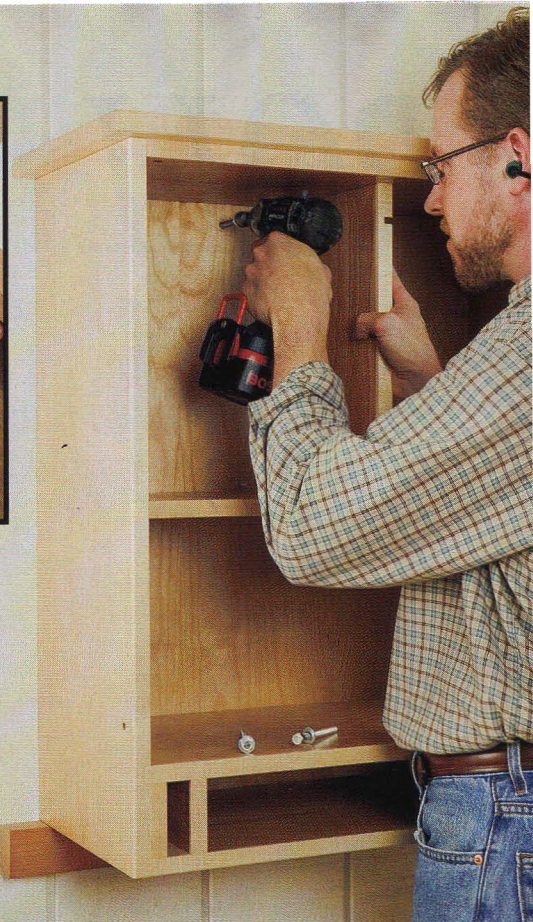
At this point, you can cut and sand the back panel (piece 14) and install it in its rabbets with glue and screws. Fill all the screw counterbores with matching plugs, and sand them flush. Wrap up by applying a durable topcoat to the bare wood surfaces.

Installing the Project without Stress

It might seem logical to mount the table in the cabinet, then hang the whole works on the wall, but don't do it like this. The table just adds



A barrel bolt holds the table up and out of the way when not in use. Notch the subtop banding to fit the receiving end of the hardware.



weight and gets in the way. Here's how to go about it: first, determine the working height you'd like for your table; about waist high works well for me. Locate the two closest wall studs to your installation spot, and screw a long cleat temporarily to them to support the cabinet bottom. Drill pilot holes for four 5/16" x 4" lag bolts through the back panel, spaced 16" apart. Now, tip the cabinet into position on the cleat, extend the pilot holes into the wall studs, and sink the lag screws and washers. Attach the table by resting it on the support arms and driving the pivot bolts home (see inset *photo*, top). Unscrew the cleat. Finally, chisel a notch into the subtop edge so you can install the barrel bolt latch (see center *photo*).

Now, pull up a shop stool right where a big ol' floor-style router table would sit and take a load off. When that second wind hits, just plunk your router into place and you'll be ready to give your new drop-down table a workout!

Chris Marshall is Woodworker's Journal's field editor.

ROLLING SHOP

By George Vondriska

One sheet of plywood, one day in your shop and about a hundred bucks gets you a hardworking, multitasking shop table.



I refined Charlie and Joni's design with a keep-it-simple attitude in mind, looking for ways to make the tables even more versatile. Charlie and Joni's table saw is surrounded by an aircraft carrier-sized outfeed table system. Mine is not. That's why I made the tables the same height as my table saw so I could use them for support when cutting large sheets or ripping long boards. I added a drawer for storage and a magnetic strip that keeps small tools handy. A power strip provides a place to plug in portable power tools. With an eye toward economy, I worked on the table's dimensions until I could get all the parts for one table out of one 4 x 8 sheet of plywood. Butt joints, glued and screwed, keep the joinery simple.

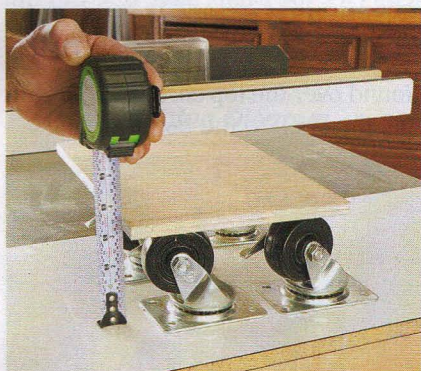
I used BC pine plywood from a home center for my tables. You can certainly upgrade to cabinet-grade plywood, but I don't think it's necessary.

These simple tables have served my students and me very well for a number of years. They're lightweight but strong. Although not designed for heavy chopping jobs like hand-cut dovetails, they're a great work surface for a dovetail jig.

My friends Charlie and Joni own a residential cabinet shop that churns out lots of cabinets each year. A few years back, I noticed that they don't have any traditional workbenches in their shop. Instead, they use a fleet of rolling shop tables. Heavy-duty casters make it easy to roll the tables

around, even when they're loaded with parts. Large assemblies can be handled by pairing a couple of tables (or more) side by side. And when floor space is required, it's easy to roll the tables off to one side and open up some real estate. I was intrigued by the versatility these simple tables added to the shop, and I decided to make some for my own shop.

TABLE



Determine the height of the casters by bridging all four with a piece of scrap and measuring from the table to the bottom of the scrap. Record this measurement.

You've Got Options

This article will show you how to build a table that includes a drawer, but the drawer isn't required. The material that goes into the drawer could be used, instead, to make an intermediate shelf. Or you can skip the shelf and the drawer altogether. At the end of the article, you'll see other ways you can "trick out" these tables, along with the price tag for each optional upgrade.

Getting Started

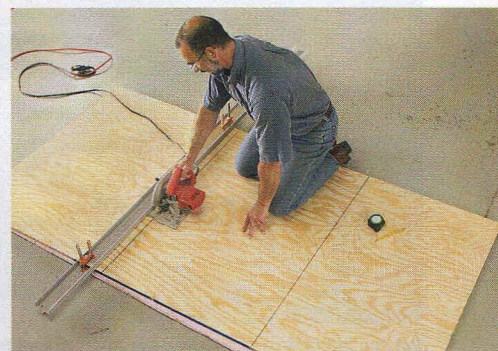
Buy the casters before starting to build. You'll need to measure their exact height (see *photo*, left) to determine the final leg length.

Next, crosscut the plywood into three slabs, 36", 32" and 28" wide (bottom right *photo*). Here's one of the easiest ways to do this: lay a sheet of foam insulation board on the floor, and then lay the plywood on top of it. Mark the cut locations and clamp a steel stud in place to guide your circular saw. You're just rough-cutting at this stage, so you don't need to be too particular about precise dimensions. Obviously, with the saw kerf, each piece will be slightly undersized. That's OK. You should, however, make sure the cut is perpendicular to the edge.

Pay careful attention to these instructions and cutting diagram to make sure you can get all the required parts from one sheet.

Moving from Slabs to Parts

Using your table saw, cut the following parts from the slabs: rip a 19 1/4"-wide piece from the 36"-long slab, a 20"-wide piece from the 32"-long slab and a 6 1/2"-wide piece from the 28" slab.



Rough-cut the plywood into three slabs using a steel stud as a guide. Set the blade depth so it barely penetrates the foam board on the floor.



Locate the fence for ripping the leg parts by measuring to the outside of the saw blade (see inset). This automatically compensates for the width of the blade in each cut.

Making the Legs

First, do the calculations to determine the length of the legs. Carefully measure the height of your table saw. From this number, subtract the height of your casters plus $1\frac{1}{2}$ ", which allows for two thicknesses of plywood. This takes into account the thickness of the top and caster braces. Since plywood is slightly less than $\frac{3}{4}$ " thick, you'll get a table that's a tiny bit lower than the top of your table saw — perfect for outfeed support.

Rip the wide and narrow leg pieces (pieces 1 and 2) to width. Note that the widths given in the *Material List* are nominal, not the actual width. Your leg parts will end up slightly narrower. If you add up the widths of all eight leg pieces, you get 19", which doesn't include saw kerfs. You'll be able to get all the leg pieces from the $19\frac{1}{4}$ "-wide piece by setting the rip fence so the dimension reads to the outside of the blade (see top

inset *photo*), not the inside as you normally do. This technique allows you to get the widest possible parts for the legs. *These are the only parts that require measuring this way.*

After the leg pieces are ripped, glue and brad-nail the wide piece to the narrow one to make a corner. Mark the parts with the approximate location of the final leg-length cut so you don't put any nails there.

Square one end of each leg and cut them all to finished length (bottom left *photo*). Using a $\frac{1}{4}$ "-diameter roundover router bit, ease the outside corners of all four legs.

Building the Frames

The top and bottom frames are identical in size. Make the frames by ripping six of the short and long frame pieces (pieces 3 and 4) from the 20" x 32" slab and two from the 7" x 28" slab. Crosscut the parts to finished length.

Drill pocket holes in the four parts you'll use for the top frame, three pockets in each piece (top right *photo*). Pocket screws will be used to attach the top later. If you don't have a pocket-hole jig and are willing to live with screws showing in the top, you can fasten the top by simply screwing down through it to the upper frame.

Assemble the frames (bottom right *photo*). The long frame pieces overlap the short pieces.



Drill pocket screw holes in the four pieces of the top frame. You'll use these holes to attach the top later, during assembly.

Joining the Legs and Frames

Glue and screw the frames to the legs (see top *photo*, page 62). Cut the bottom shelf (piece 5) from what remains of the 32" plywood slab. Round over the top corners. Glue and nail the shelf to the bottom frame.



Assemble the frames by gluing and brad-nailing the frame together, then secure the joints with countersunk screws, keep them square.

Adding Braces and Casters

Rip a strip for the caster braces (pieces 6) from the 28" slab. Cut one end at 45 degrees. The only way to get all four pieces from the strip is by cutting them so angled sides face



Cut the leg blanks to finished length after squaring one end. When assembling the legs, mark the approximate finished length so you don't put nails there.

Rolling Shop Table Supplies

The following supplies are available from Woodworker's Journal.

18-in. Magnetic Tool Holder

#81281 \$17.99

26-in. Drawer Slides

#21361 \$22.99

Kreg Bench Clamp

#29974 \$34.99

To order supplies, call 800-610-0883 and mention code WB105.

Additional Supplies:

These supplies can easily be found at a local home center or lumberyard.

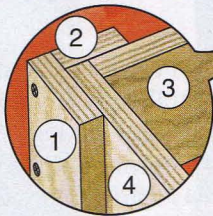
3/4" x 4' x 8' BC Plywood \$28

2 1/2" Locking Casters (4) \$6 (each)

1/4" x 1 1/2" Lag Screws/washers (16) ... \$1

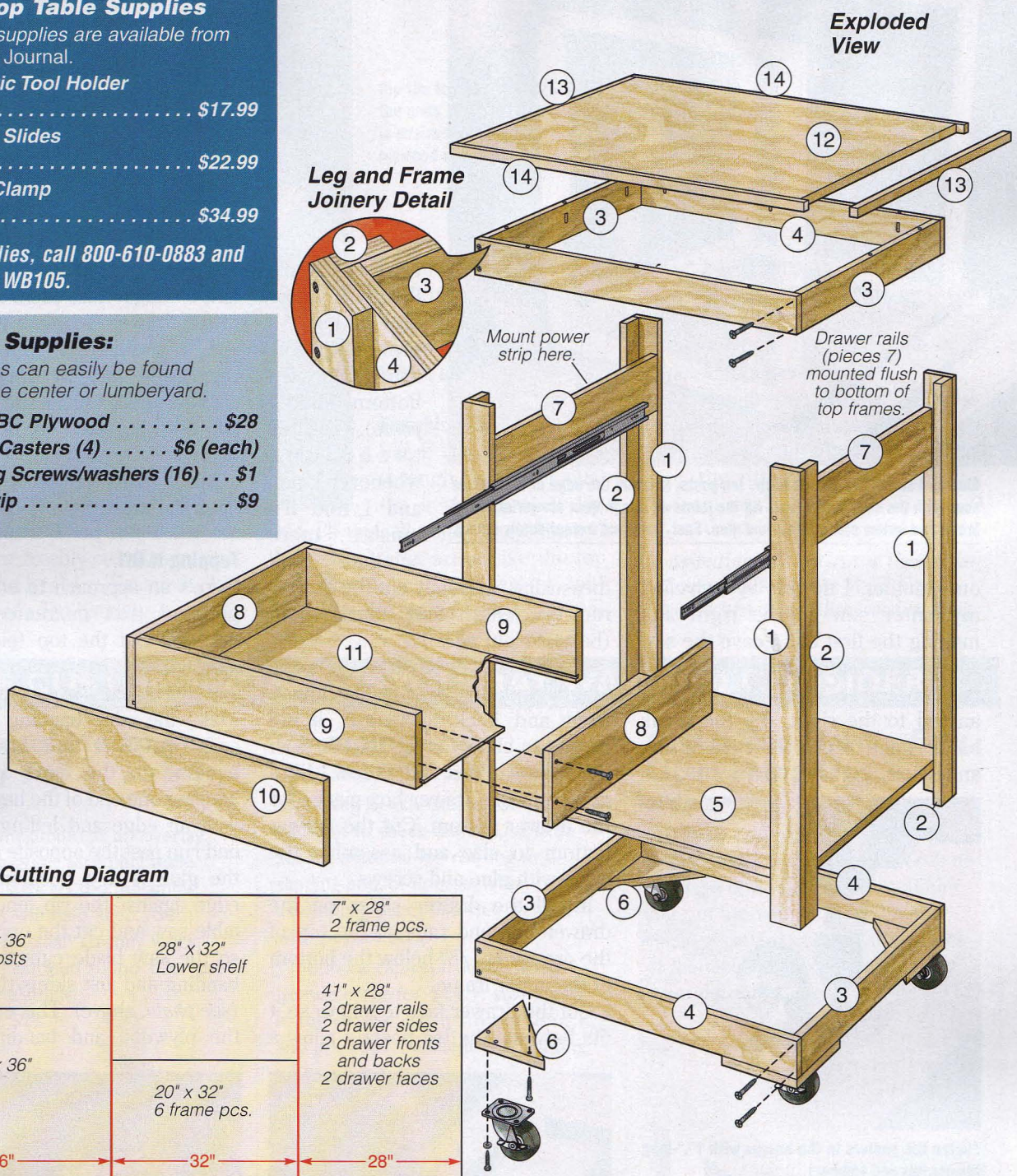
Multi-plug strip \$9

Leg and Frame Joinery Detail



Mount power strip here.

Drawer rails (pieces 7) mounted flush to bottom of top frames.

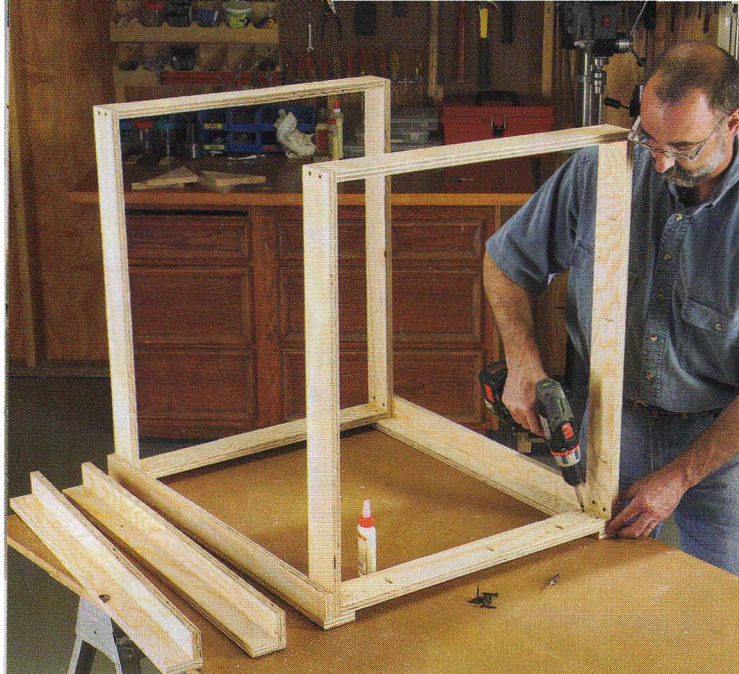


Plywood Cutting Diagram

19 1/4" x 36" Leg posts	28" x 32" Lower shelf	7" x 28" 2 frame pcs.
28 3/4" x 36" Top	20" x 32" 6 frame pcs.	41" x 28" 2 drawer rails 2 drawer sides 2 drawer fronts and backs 2 drawer faces
36"	32"	28"

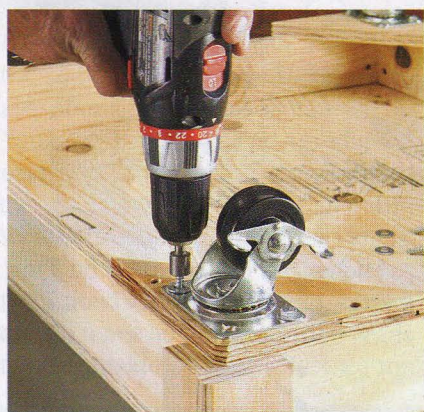
MATERIAL LIST

	T x W x L		T x W x L
1 Wide Leg Pieces (4)	3/4" x 2 3/4" x 36"	8 Drawer Sides (2)	3/4" x 5" x 26"
2 Narrow Leg Pieces (4)	3/4" x 2" x 36"	9 Drawer Front, Back (2)	3/4" x 5" x 25"
3 Short Frames (4)	3/4" x 3" x 25 1/2"	10 Drawer Face (1)	3/4" x 5 1/2" x 27 3/8"
4 Long Frames (4)	3/4" x 3" x 31 1/4"	11 Drawer Bottom (1)	1/4" x 25" x 25 1/2" Hardboard
5 Bottom Shelf (1)	3/4" x 27" x 31 1/4"	12 Top (1)	3/4" x 28 1/2" x 32 3/4"
6 Caster Braces (4)	3/4" x 4 3/8" x 28"	13 Short Edge Banding (2)	3/4" x 3/4" x 28 1/2" Pine
7 Drawer Rails (2)	3/4" x 5" x 27"	14 Long Edge Banding (2)	3/4" x 3/4" x 34 1/4" Pine



Glue and screw the frames to the leg posts, keeping the edge of the frames even with the ends of the legs. All the joints on this project are variations of bread-and-butter screw joints and glue. Fast, easy and exceptionally strong.

one another. I do this by swiveling my miter saw to the right and making the first cut. Leave the saw where it is and flip the blank. Cut the brace free. With the saw still angled to the right, flip the blank back again to cut the next brace, and so on.



Fasten the casters to the braces with 1½"-long lag screws and washers.

Glue and screw the caster braces to the bottom of the lower frame. Secure the casters to the braces with short lag screws and washers.

Making the Drawer

Rip the drawer rails, sides, front, back and face (pieces 7 through 10) from what's left of the 28" slab.

Fitting the drawer rails between the legs is a perfect application for

transferring length instead of taking a measurement with a ruler (see bottom middle photo). I use this technique whenever I can, and I find it's much more

accurate than measuring. Carefully cut the drawer rails to length and install them (bottom right photo).

Cut the drawer sides to the same length as the slides. Cut the drawer front and back to length, being careful to allow for the thickness of the drawer sides and slides. Mill a groove in the drawer box pieces for the drawer bottom. Cut the drawer bottom to size and assemble the parts with glue and screws.

Install the drawer slides on the drawer box and rails so the top of the drawer is 1/8" below the bottom of the upper frame.

Cut the drawer face to length so it fits between the leg posts. I allow a

3/32" gap per side between the face and the legs. Ease the front corners of the drawer face with your router and 1/4"-diameter roundover bit. Screw and glue the drawer face to the drawer box, from the inside out, allowing the face to project 1/4" below the drawer box. This provides a handy finger grip you can grab to open the drawer.

Topping It Off

Here's an approach to edge-banded plywood that guarantees perfect corners. Cut the top (piece 12) to length from what remains of the 36"-wide slab, but leave it overly wide. Make the edge banding (pieces 13 and 14). Glue and brad-nail the banding to the ends of the top, keeping one end of the banding flush with an edge and letting the other end run past the opposite edge. After the glue is dry, position the flush edge against the rip fence on your table saw and cut the opposite edge so the saw blade cuts through the banding and just skims the plywood (see photo, above). This ensures that the plywood and banding will be



Mark, don't measure, to ensure a perfect fit of the drawer rails between the leg posts.



Glue and screw the drawer rails in place, holding them tightly to the bottom of the upper frame.



Rip the top to width after fastening the banding to the ends. Cutting the banding and plywood together is easier than cutting the banding to fit after the plywood is sized.

Round over the top and bottom corners of the banding. Center and screw the top to the frame and legs.

Finishing Up

Sand the entire table through the grits to 180.

On a shop project like

perfectly flush. Then rotate the top and, with the freshly cut edge against the fence, cut it to size. Fasten the last two pieces of edge banding.

this, I'll typically only apply finish to the heavy traffic areas, like the top. But there's nothing wrong with finishing the entire project if you

prefer. I used furniture oil on the top, but poly or any other durable finish you have on hand will do just as nicely. Fasten the magnetic tool holder and power strip.

Now, take a gander at the upgrade options shown below to see how you can soup up this cart ... or the others you're bound to make soon!

Contributing editor George Vondriska is the proprietor of the Wild Earth School, where he teaches woodworking.

THREE CUSTOM UPGRADES YOU MAY WANT TO CONSIDER

Glue-Proof Melamine Overlay Top

Add \$10.00

A piece of melamine as an overlay top makes a great assembly table. Glue won't stick to the melamine surface. This will help keep your plywood tops clean so they work smoothly as outfeed support for the table saw. Melamine costs about \$28 per sheet at a home center. One sheet will make three tops.

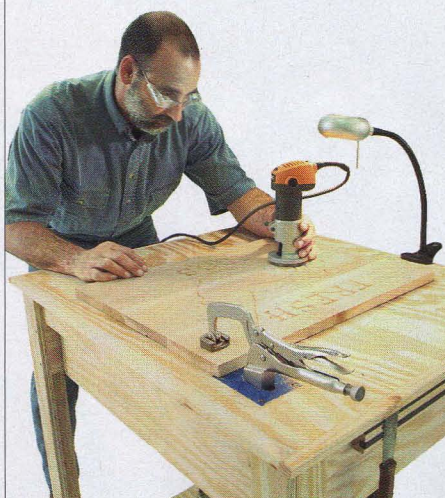


Clamping Light

Add \$35.00 (clamp), \$14.00 (light)

The Kreg Bench Clamp Kit is a great addition to these tables. Use it to secure material for routing or sanding and, of course, when assembling parts, like face frames, with pocket screws.

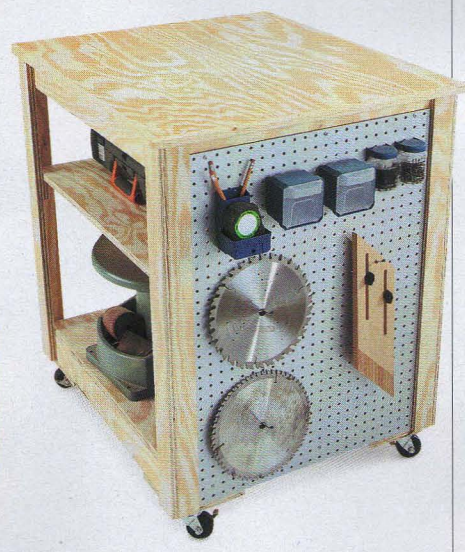
I found a clip-on halogen light at a home center for \$14. It stows away in the drawer when I'm not using it, and provides excellent task lighting when I need it.

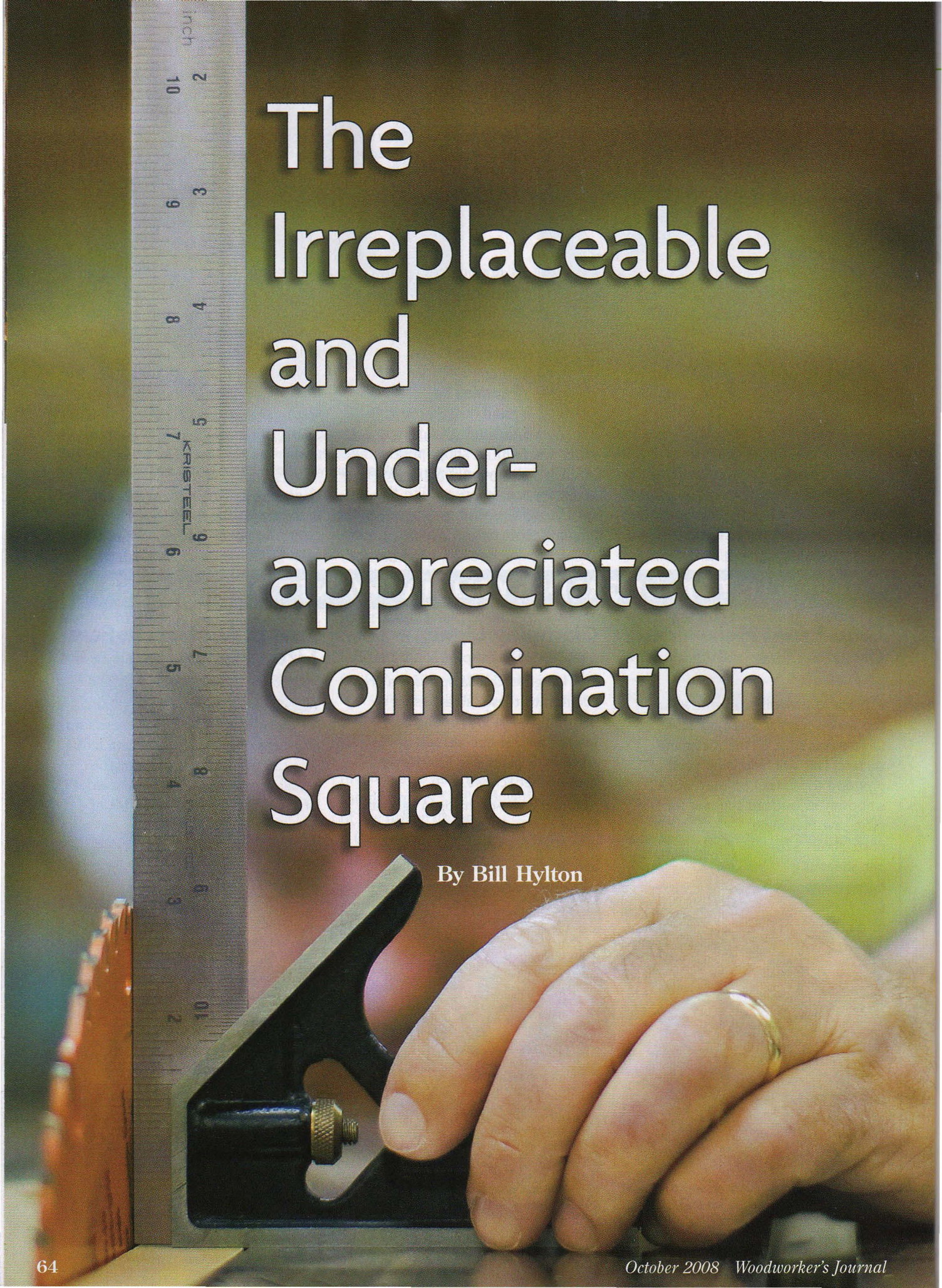


And if You Have a Few Little Hang-Ups

Add \$5.00

Pegboard is inexpensive — about \$15 for a 4 x 8 sheet. And there's no shortage of hooks, holders and bins you can use with pegboard. If you install pegboard on both short sides of the table, you'll only use 1/3 of a sheet per table.





The Irreplaceable and Under- appreciated Combination Square

By Bill Hylton

A combination square is usually one of the first tools a woodworker acquires. Without dispute, it is "the" essential layout and setup tool.

The sort of combination square you have says a bit about you as a woodworker. The first one I used — for a couple of decades, at least — was a 1940s Craftsman I got from my dad. I used it for home improvement and construction projects and furniture-making work without much thought about its accuracy or about all the different uses I had for it.

About 15 years ago, I retired it in favor of a Starrett I bought second-hand — a four-piece set with a 24" blade. I hadn't used this square long before I realized ... well ... it wasn't square. And then I discovered a hidden benefit of owning a premium square: the manufacturer will fix it! I mailed it to Athol, Massachusetts, and in a week, the postman brought it back. Good as new!

In short order, I got a second Starrett, a new one with a 12" blade. It was an admission that a 24" blade is really too long for most work. Some time later, conceding

that even the 12" blade is too long for close work, I got a 4" square, all top-drawer and a bit pricey.

But wait a minute here. Let's think "practically" for a moment. For about 15 bucks, you can buy a combination square that's virtually a duplicate of my old Craftsman. In addition, you can buy a 6" Craftsman square and a 16" Craftsman square, each for about the same \$15. Why would I instead spend \$250?

It's a fair question. What makes one combination square worth \$70 more than another? Are the differences significant to a woodworker?

To explain it — to myself as much as to you — I doubled back on myself, doing an inventory of what I do with combination squares (see the series of *sidebars*) and surveying the marketplace (read on).

Combination squares have many practical applications in woodworking. Accuracy becomes more and more important as your projects' sophistication increases.

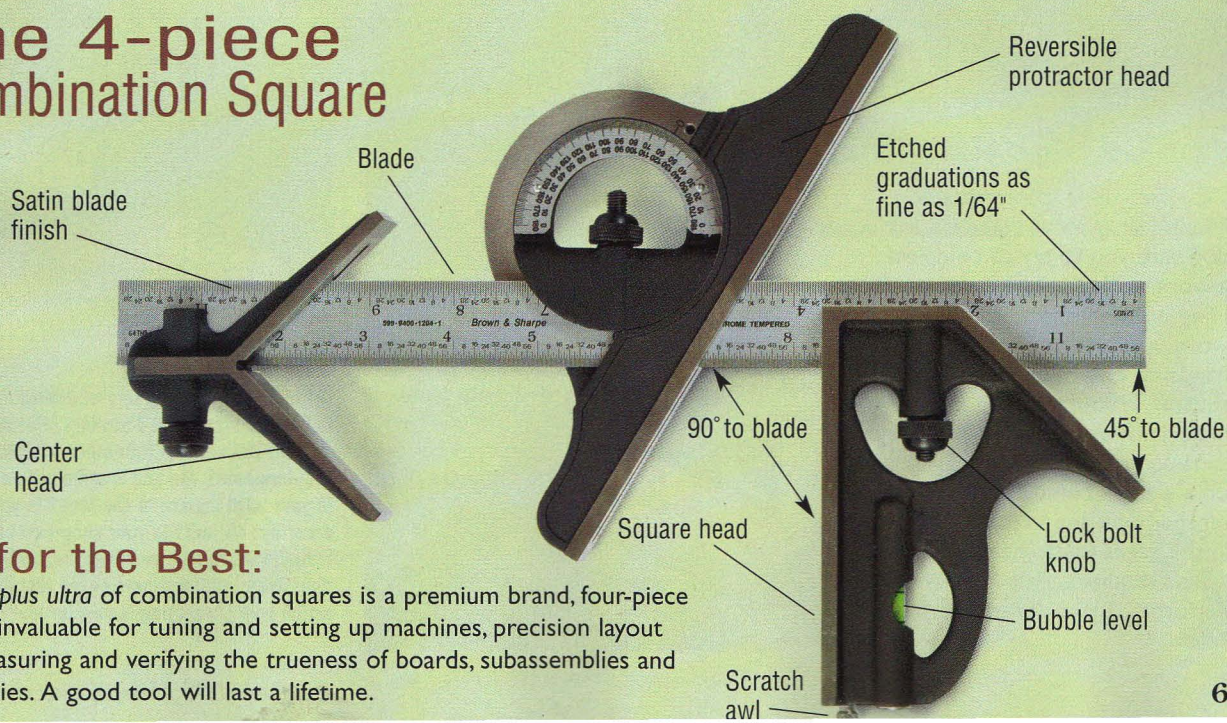
The options before you are legion. You have to look online to appreciate what all is available. Hardware stores and home centers carry an array of models targeted at tradespeople and DIYers. Woodworking tool retailers stock two or three configurations, hitting low, medium and premium price points. But machinists' tool retailers go way beyond that. One online retailer lists about 600 items from about a dozen manufacturers in the combination square category.

The Basic Combination Square

The basic tool consists of a head, called a "square head" despite its polygonal shape, and a 12" metal ruler, called a "blade," that's graduated, usually with a different scale on each edge. A special bolt in the head engages a groove centered in one face of the blade, so you can slide and lock the head along the blade.

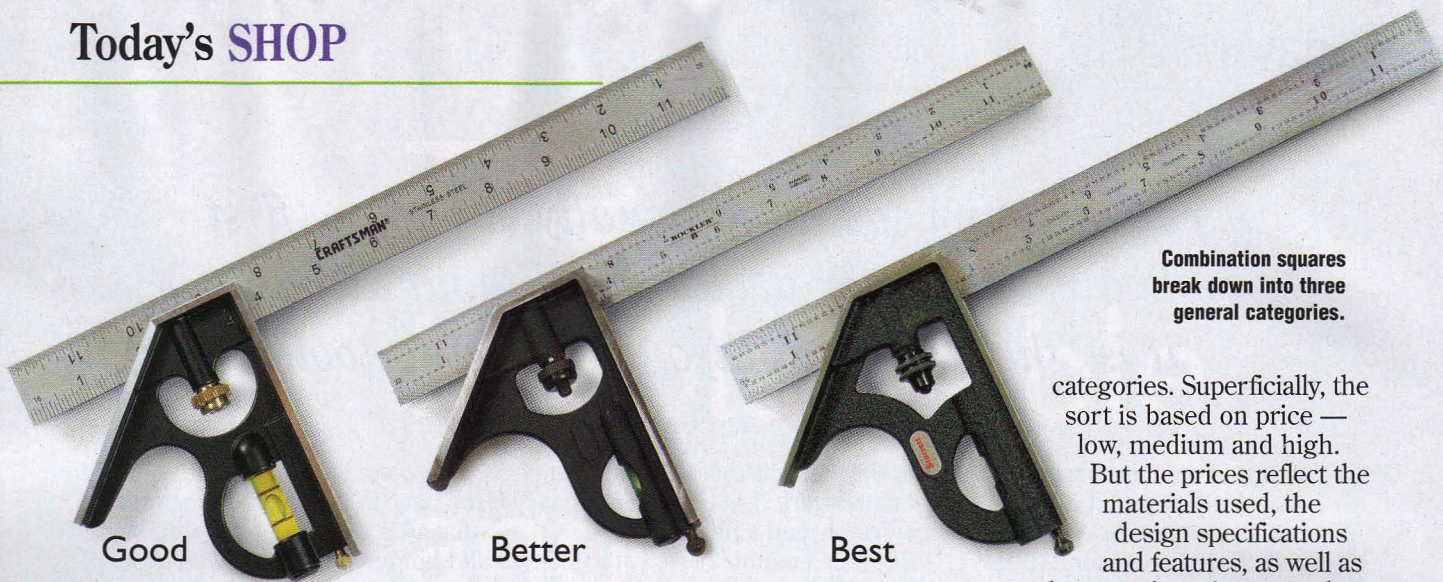
Today's Shop continues on page 66 ...

The 4-piece Combination Square



Go for the Best:

The *ne plus ultra* of combination squares is a premium brand, four-piece set. It's invaluable for tuning and setting up machines, precision layout and measuring and verifying the trueness of boards, subassemblies and assemblies. A good tool will last a lifetime.



Combination squares break down into three general categories.

Because the groove is centered, you can switch the orientation of the graduations by pulling the blade out of the head, turning it end-for-end, and reinserting it. You can also roll the blade over, but to do that, you have to spin the lock bolt 180° to accommodate the repositioning of the groove.

The head has three ground reference faces: one parallel to the blade, a longer one perpendicular to the first (and thus to the blade), and the third at 135° to the first (and thus at 45° to the blade).

Incorporated into the head is a bubble level so you can check for both level and plumb with the tool. A small scratch awl usually is held in a bore atop the head; this works better for marking metal than wood.

This is the combination square a carpenter uses. Every tradesperson has one, too. And DIYers gravitate to such squares, as do many woodworkers.

A machinist is likely to have a more sophisticated version of this square, made with different materials, different finishes and different graduations. He'll have two additional heads: a center head and a protractor head. A square purchased with all three heads is known as a four-piece set.

Variations include models with longer blades and downsized models with 4", 6", or 7" blades.

Three Categories

Combination squares, it seems to me, sort themselves into three

categories. Superficially, the sort is based on price — low, medium and high.

But the prices reflect the materials used, the design specifications and features, as well as

the manufacturing procedures.

Manufacturers generally focus on a single category, rather than producing squares at each level.

Rather than go out to collect and evaluate tools from every single manufacturer, I sampled. I got combination squares from Stanley and Craftsman, two well-known inexpensive brands, and from L. S. Starrett and Brown & Sharpe, two highly regarded premium brands. I also got medium-priced squares from Gladstone, Rockler and Highland Woodworking.

In the low-end category are the two-piece squares sold at hardware stores, home centers and lumberyards. Brands include Stanley, Craftsman, Empire Level, Johnson Level and Swanson. On average, they sell for \$10 to \$20.

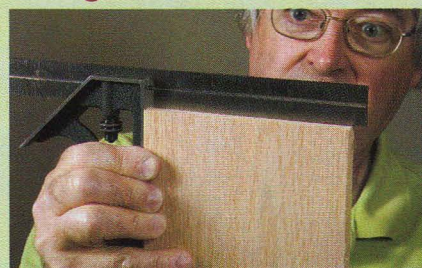
Today's Shop continues on page 68 ...

Combo Squares: Don't try woodworking without one!

Stock Preparation

Why are combination squares irreplaceable? Well, come on, I double-dog dare you to try to complete a woodworking project without one. I find it nearly impossible to even begin work in the shop without putting my hands on one of my combination squares. From preparing stock to initial layout, all the way to squaring up subassemblies to mounting a project on a wall — combination squares are off the hook and in my hand. Here, and in the pages following, are some of the tasks I require this shop stalwart to perform ... I know there are more!

— Bill Hylton



Critical to success in any woodworking project is to have stock that's straight, flat and true. How do you know if your stock meets the requirements? You use a combination square. Is your edge square to the face? Is your miter a perfect 45° cut? Is your chop saw creating a dead square end when you cut off? Your combination square is the test against which your machining is measured.

A SAW BY ANY OTHER NAME, WELL, IT'S JUST NOT A SKILSAW.®

The original circular saw. 80 years and it just keeps cutting better.



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Great tools become common place, part of the workforce, a part of you. And there's not many job sites or workbenches where you won't find a circ saw. And you can thank Skil for that. Now the original circular saw just got better with LaserX2 technology, a two beam laser system that guarantees the perfect cut, everytime. With a powerful 13 amp motor, Grip-Right™ handle, Anti-Snag lower guard and of course the quality and innovation Skil's famous for, and you've got a saw ready for the next 80 years. Go to skiltools.com for more details on the 5755-01, and all the tools to complete your next project... with Skil.

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(Circle No. 80 on PRODUCT INFORMATION form)

Widely used by construction workers, tradespeople and DIYers, these are practical tools, subjected to job site conditions, designed for construction demands. One of the givens is reasonable expendability: Drop it off a roof or step on it and you shrug and just buy a new one. Their accuracy may be iffy and their scales a skosh coarse, but they work well.



A cast-iron head is essential for long-term accuracy, but it's more expensive to produce. The die-cast zinc head from a trade/consumer-grade square (right) is lighter weight and softer.

The heads usually are die-cast aluminum or zinc. The blades are stamped — graduations and all — from a blank, an operation that leaves burrs on the ends and even the edges. Typically, the graduations are 8ths and 16ths on one side of the

blade, 16ths and 32nds on the other. Having the most common scale on both sides obviates the need to turn the blade over.

There are variations at this level, but not accessories. If you want a longer blade, you can get a separate square with a 16"-long blade. But you can't buy just a blade.

The top category comprises premium combination squares manufactured primarily for metalworking. Brands include L.S. Starrett, Brown & Sharpe, Mitutoyo, PEC, SPI, and Fowler. Typical prices range from \$75 for a two-piece square up to \$170 or more for a four-piece set. Prices vary according to the specs of what you buy.

The high-end brands give you choices. Sure, you can buy a two-piece set off the shelf. But you can also specify the head (or heads) that you want, as well as the blade graduations, finish and length.

A square head can be cast-iron or forged-and-hardened steel. The latter is more durable and is often the preference of metalworkers. It's also more expensive — about \$10 or so more. In a woodshop, the cast-iron head is just fine, and it'll be more durable than a die-cast metal head.



A lock bolt with a tabbed washer that slides onto flats ground onto the bolt and locks into the head is easiest to use. When the blade is removed, the bolt assembly drops — it won't fall completely out — and frees the tabs from the head, allowing the bolt to be rotated. You can do it without really looking. Lock bolts are used on Starrett and Rockler squares.

Depending on the woodworking you do, you can supplement the square head.

A center head is a V-shaped casting with ground reference faces inside the V. A slot for the blade aligns one edge directly in the vertex. A lock bolt allows you to adjust the head and lock it at any spot along the blade.

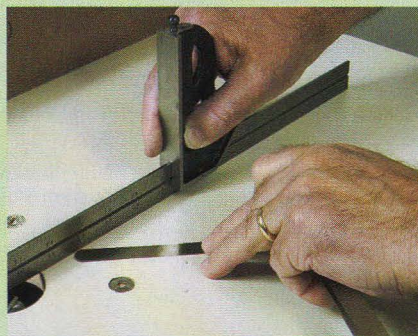
You use this head, as its name suggests, to locate the center of a round — a large dowel, for example, or a turned blank. Hold the reference faces against the round and scribe a line along the blade. Turn the round slightly and scribe a second line. The center is where the lines intersect.

Combo Squares: Don't try woodworking without one! Machine Tune-ups

Improve your productivity (and shop-time satisfaction) by keeping your woodworking machines properly aligned. A precision combination square is essential for periodic alignment checks and machinery tune-ups.



You can check your table saw's table and blade alignment with a combination square. It's a two-step process.

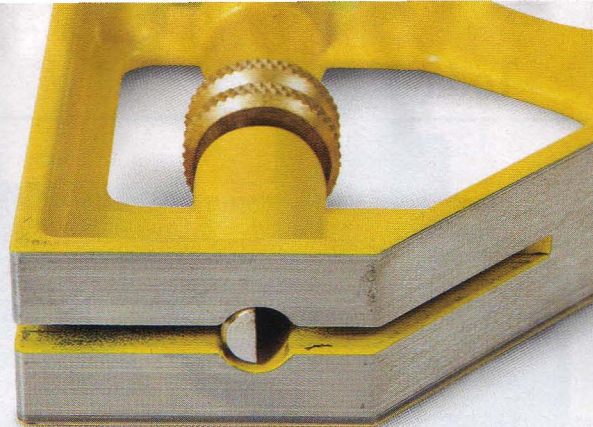


Check the flatness of your router tabletop with a long bladed combo square and a slip feeler gauge. This tabletop is dead flat.

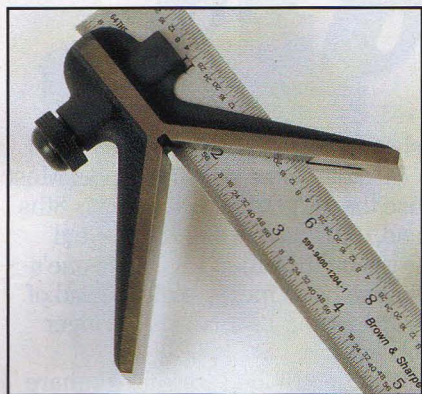


Verify the set of your jointer knives and the infeed and outfeed table alignment. Often overlooked, this task improves results.

On low-end squares, the lock bolt rotates freely in its bore once the blade is removed. When you reinsert the blade, you have to visually align it — which makes the process balky.



A protractor head enables you to lay out lines at precise angles. Two styles are available. The reversible head has ground reference faces on both sides of the blade, while the nonreversible has this shoulder on one side. Both heads are cast-iron.



The center head is a feature that is most commonly found on more expensive and higher quality combination squares.

Either protractor head is fully adjustable with a revolving turret graduated from 0° to 180° in both directions. Either can be positioned anywhere along the blade.

Consider the blade next. A premium blade, first of all, is slightly thicker (3/32" vs. 5/64" for blades in other categories) and thus stiffer. It's machined from bar stock, hardened and tempered. The graduations are first cut with a CNC machine, then acid-etched to enhance their definition. After it's ground to final length, the blade is chromed (or satin-chromed), and the graduation marks are darkened.

You do have a choice of blade finish, as I mentioned. The standard finish, which is what I've got and am content with, is polished chrome. But the matte-like satin-

chrome finish is non-glaring and easier to read. Had I realized, at the time I bought my Starrett, that this finish was available, I would have chosen it, even at a higher price.

Premium blades are made in several standard graduation schemes. The 4R graduation is probably most useful for woodworking, having 8ths and 16ths on one side, 32nds and 64ths on the other. The 16R graduation has 32nds and 64ths on one side, 50ths and 100ths on the other. Metric has mm and .5mm on both

Today's Shop continues on page 70 ...

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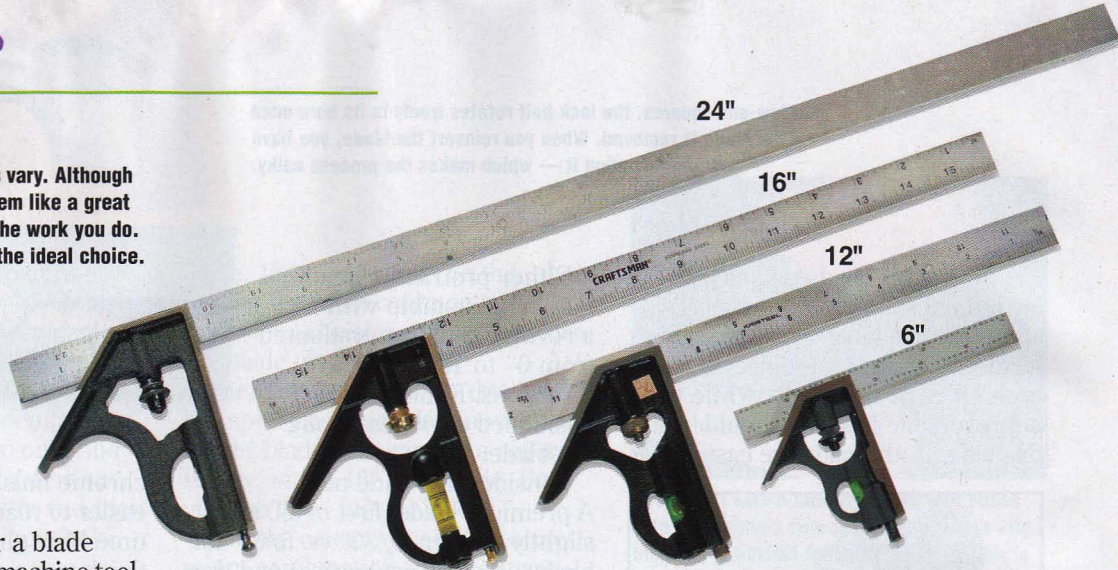
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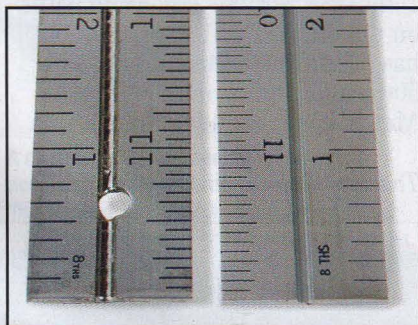
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Combo square blade lengths vary. Although a really long blade might seem like a great idea, think carefully about the work you do. Sometimes a short blade is the ideal choice.



sides, while English/metric has .5mm and 32nds plus mm and 64ths.

Lastly, you can opt for a blade longer than 12". Most machine-tool makers offer 18" and 24" blades. Starrett has 36" and 48" as well, though they are frighteningly expensive — jumping from about \$90 for a 24" blade to \$235 for the 36" to well over \$400 for the 48".



Cut to size and graduated in a single mighty blow, the blade of a low-cost square (left) has burrs along its ends and edges. The machined blade (right) of a premium square features crisp, etched graduations and a low-glare, non-tarnishing satin-chrome finish.

Mid-priced Squares

Finally, there's the mid-range category, populated with tools labeled Chicago Brand, Gladstone, and General Tool, as well as the branding of retail chains such as Rockler. Almost all are manufactured in China or India. They are priced between the high- and low-end squares, averaging about \$45 to \$50 for a two-piece set and \$75 to \$100 for a four-piece set.

Sometimes these squares are presented for what they are — better than hardware store squares but not as good as premium squares. But sometimes, indirectly — by implication — they're presented as being premium tools. The truth is, they are in-betweeners.

Like the low-end combination squares, what you see is what you get: no choices. Most have satin

chrome blades, though the Gladstone has a polished blade. Most use the 4R graduation, which is 8ths and 16ths on one side, 32nds and 64ths on the other. But Gladstone's square has a metric scale instead of 64ths. And a 12" blade is it; longer blades aren't available.

Highland Woodworking's square is only available as a four-piece set. Its protractor head is nonreversible.

Though the heads are cast-iron and the blades nicely machined, there's evidence of skimping on the details. The blades all were 5/64" thick, a 64th shy of the thickness of premium ones. Because the heads are nicely machined for the blade's thickness, you can't use a (longer) premium blade.

Today's Shop continues on page 72 ...

Combo Squares: Don't try woodworking without one! Setup Tasks

Setting up for individual cuts often calls a combination square into play — on the table saw, router table and many other tools.



For square crosscuts, set the miter gauge square to the blade. Set the combination square's blade against the miter gauge and the square head flat against the saw plate.



Adjust the miter gauge for a 45° cut using just the head of the combination square. Just take the blade out and put the head on the fence and the blade. Avoid the saw's teeth.



Thanks to the square head's broad edge, a combination square stands on its own beside a router bit, freeing your hands to adjust the bit up or down.

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Premium brands like Brown & Sharpe and Starrett give you a choice of blade finishes — satin chrome (left) or polished (right). The difference between them is readability.

of practical stuff. Knowing what you are getting is a significant factor in building a functional, sensible, practical tool collection ... and doing it economically.

can get a price that better fits your budget.

Don't reject the in-betweeners. Those I sampled are accurate, quite versatile, and reasonably easy to use. If you can't handle the tool before the purchase, just be sure you can return it. Again, check its accuracy first thing, and return it if it's out. But also try removing, turning and reinserting the blade. If it isn't easy, if you can't do it repeatedly without a hitch, consider returning for a different design.

In the end, I'm comfortable with my \$250 investment in combination squares. I knew enough to buy a good brand of square, but I had no idea of the choices available. I would have opted for the glare-free satin chrome finish on the blade. And I'm thinking seriously about getting a 36" blade for laying out sheet goods and large panels.

Bill Hylton is a woodworker, author and a frequent contributor to Woodworker's Journal.

The easy, reliable adjustability of the premium squares is missing, too. With most top-end squares, you can slip the blade from the head, rotate the lock-bolt without even looking at what you're doing, roll the blade over, and reinsert it. Just that quickly. Because the process is quick and reliable, you're inclined to take advantage of this feature regularly. And the accuracy of your layout work improves as a result.

What I found with the in-betweeners was that I had to pay attention to what I was doing to reorient the blade. Even then, I had trouble with the Highland square.

My Final Analysis

Delving into combination squares has been worthwhile; I learned a lot

Essential criteria in selecting a combination square are:

- Accuracy
- Versatility
- Ease of use
- Durability.

The low-end squares I sampled aren't bad at all. They're certainly economical. If your budget is really tight, look closely at as many different brands as you can before buying. Check its accuracy first thing, and return it if it's out. Buying a second square with the longer blade is worth consideration too.

The high-end squares do meet all the criteria, but cost inevitably is a factor. If you aspire to the best, shop online and price the tool you want from makers like PEC, Mitutoyo and SPI to see if you

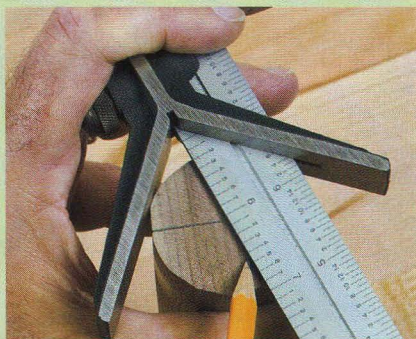
Combo Squares: Don't try woodworking without one!

Layout and Measurement

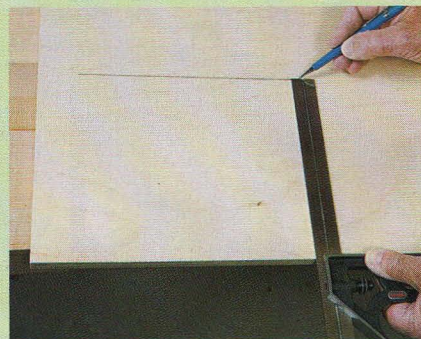
You won't find a more versatile or accurate tool for layout. The blade's etched graduations allow precise measuring and marking. The head is designed to register reliably against an edge. The adjustability of the head along the blade enhances the tool's capabilities.



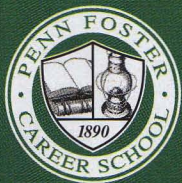
Marking out for square cuts is the most basic task for a combo square. But, you also can use the standard square head to lay out a 45° line.



Extremely useful in turning, and in a number of other types of woodworking, a center head allows you to divide a round in half.



A combo square serves as an extra-long marking gauge. Hold the head against the workpiece and a pencil against the blade's end.



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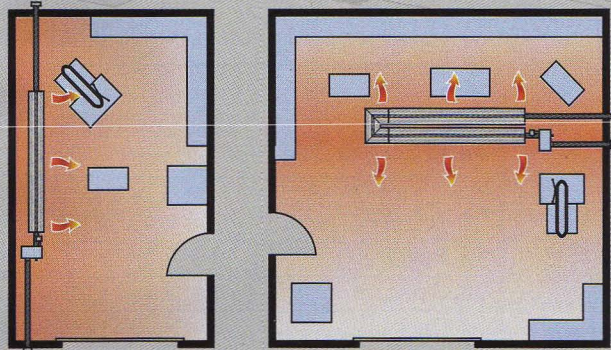
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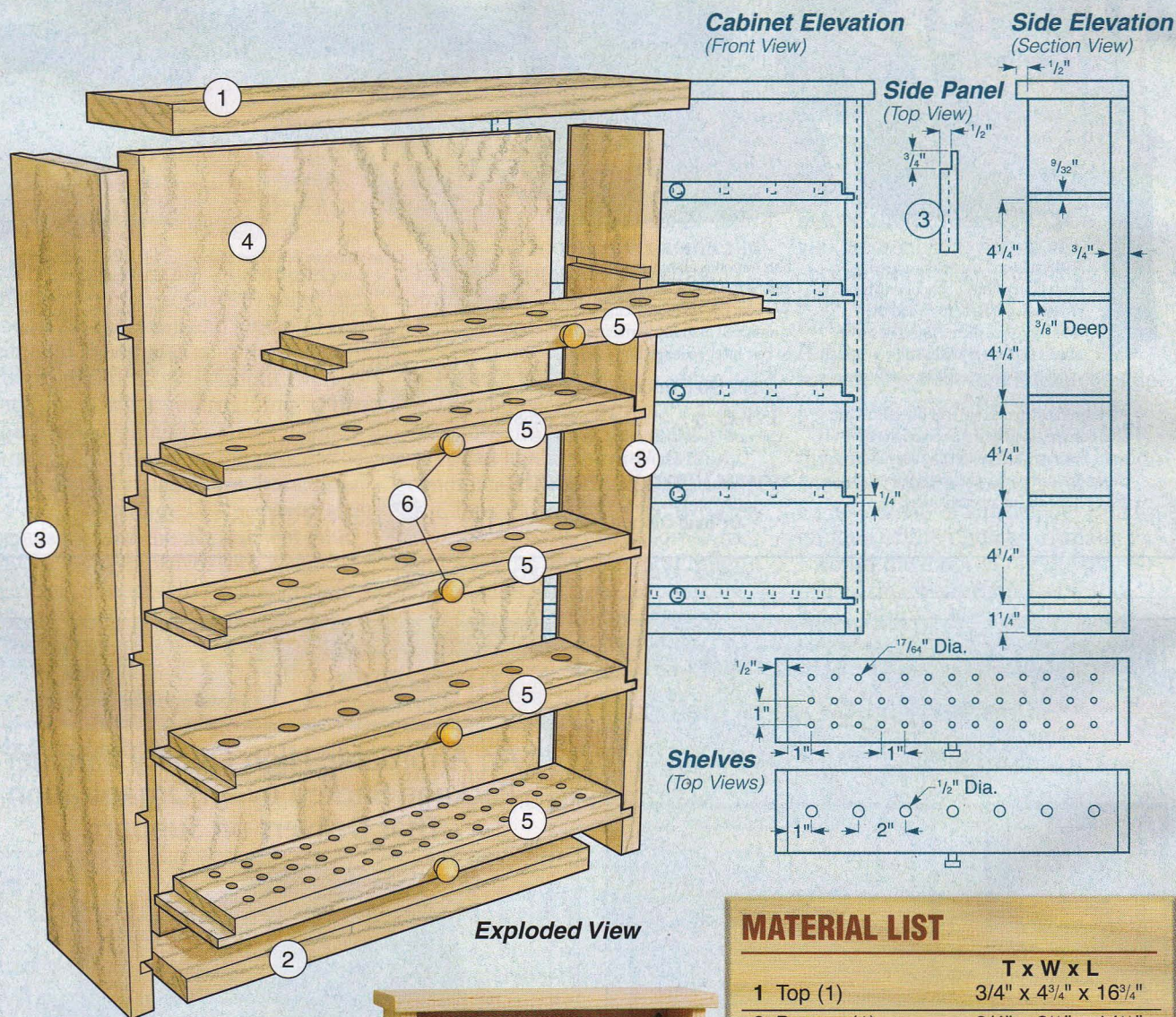
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Router Bit Cabinet with Pull-out Shelves

By Chris Marshall



Here's a perfect companion project to the Wall-mounted Router Table on page 52. With this cabinet located in plain sight on the wall, you can corral all your bits into one place, near your router table. The cabinet has five removable shelves that store twenty-eight 1/2"-shank router bits and thirty-nine 1/4" bits. Or drill the shelf hole arrangement differently to suit your collection. You could change the dimensions and add more shelves if you've got a really big herd of bits.



MATERIAL LIST

	T x W x L
1 Top (1)	3/4" x 4 3/4" x 16 3/4"
2 Bottom (1)	3/4" x 3 1/2" x 14 1/4"
3 Sides (2)	3/4" x 4 1/4" x 22 1/2"
4 Back (1)	3/4" x 15 1/4" x 22 1/2"
5 Shelves (5)	3/4" x 3 1/2" x 15"
6 Knobs (5)	3/4" Dia. sash style

Constructing the Cabinet

Start building by cutting the top, bottom, sides and back (pieces 1 through 4) to size. The side panels have five 3/8"-deep shelf dados. I cut mine 9/32" wide to give the 1/4"-thick shelf tongues a bit of "slip" space. A shim, installed between the outer blades of my dado set, gave me just the cutting width I needed for a good fit.

Store your router bits where they'll be easy to see and reach — right on the wall. This easy-to-build shop fixture stows more than five dozen bits!

Mill the dados using your miter gauge, outfitted with a long auxiliary fence as a backup board. As you can see in the top *photo* at right, I used a simple crosscutting jig made up of two miter gauges attached to a long fence board. That way, I could set a stop block to step off the five dado locations. Mill each dado on both side panels before setting up the next cut so the shelves will line up properly.

Notice in the *Drawings* at left that the sides each have a 1/2"-wide x 3/4"-deep rabbet along the back edge to fit the back panel. Reset your dado blade and cut these dados now.

I took an unconventional approach to assemble my cabinet. Instead of making a "box" from the parts and then installing the back to square it up, I attached the sides to the bottom with counterbored screws, slipped a spacer board temporarily into place where the top would go, and glued and screwed the back panel into its rabbets (see center *photo*). The top came last. It's attached to the sides with glue and more counterbored wood screws. Position it flush with the back and with a 1/2" overhang around the sides and front. Cap your screw counterbores with matching wood plugs glued into place. Chisel or saw them off nearly flush, then shave them down the rest of the way with a sharp block plane.

Making the Shelves

The final construction step is to build your shelves (pieces 5). Cut five blanks to size, and set up your dado blade to cut 1/2" x 1/2" rabbets on their ends. Make sure to back these cuts up with an auxiliary scrap fence on the miter gauge to prevent splintering.

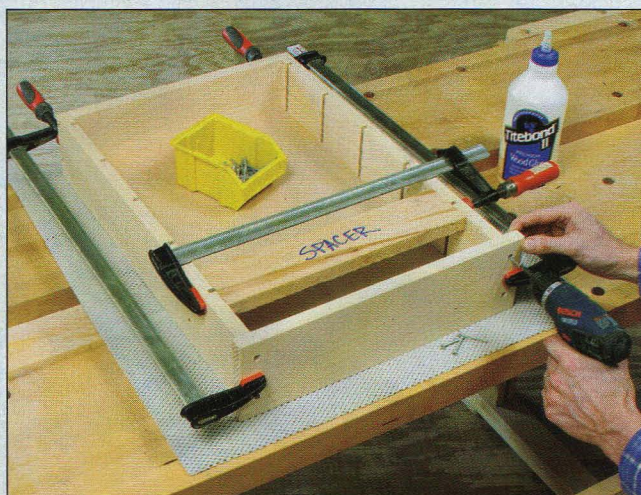
Drilling all those 1/2"-deep bit holes is tedious, but you'll want the holes to line up neatly, so bore them carefully. I drew a grid pattern on each shelf and used a piece of scrap as a fence clamped to my drill press table (see bottom *photo*). Mark the fence to locate the center of the bit, then align your grid lines with it when drilling. Reset the fence for each row of holes to ensure that the rows are straight and parallel. I used a 17/64" bit for drilling the smaller holes and sanded my 1/2"-diameter holes slightly wider. That way, the bits slip in and out no matter how much the wood swells.

Screw a knob (pieces 6) to each shelf, add a couple of coats of finish, and mount the cabinet to a wall stud with three long deck screws. Hide them behind the first, third and fifth shelves. Now load the cabinet up, and your bits will be easier than ever to find.

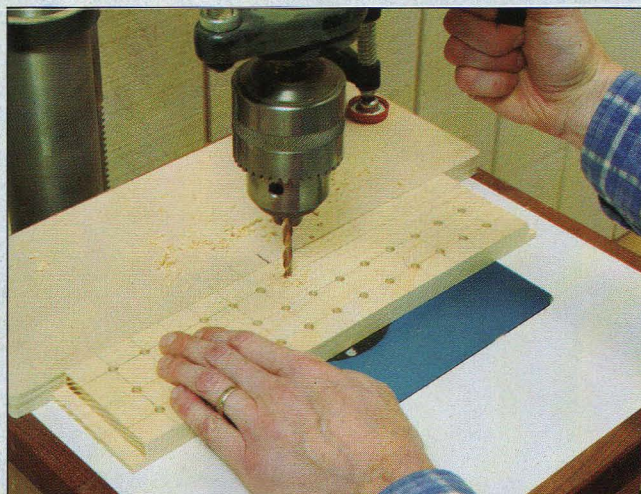
Chris Marshall is Woodworker's Journal's field editor.



The author used a simple crosscutting jig made from two miter gauges and a long fence to cut the shelf dados. A stop block sets each dado position. Cut the dados on both side panels before resetting the block.



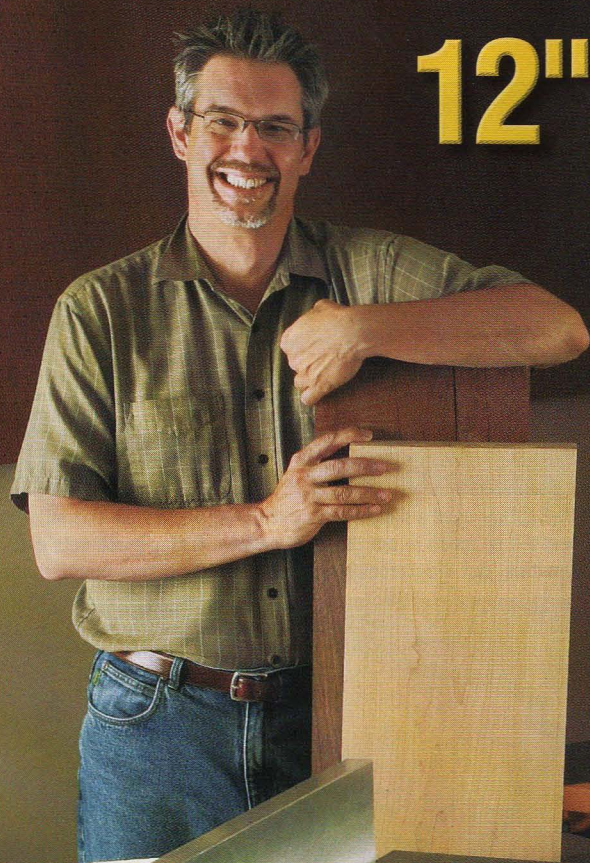
Bring the cabinet parts together with glue and counterbored wood screws. A scrap spacer took the place of the top panel so the author could assemble the other parts first, then finish up with the top.



Drill the bit shank holes to a depth of 1/2". Space the holes 1" apart for 1/4" bits and 2" apart for the larger size. Clamp a fence to your drill press table and mark it for the bit's center. It'll speed the process of drilling all those holes and keep the rows parallel and straight.

12" Jointer/Planer Combos

Rob Johnstone



Combining a jointer and a planer in the same machine just makes sense. The knives are the same type, planing and jointing are often two sides of the same coin ... so why aren't these tools more common in our shops?

Combination machines are not a new concept by any stretch of the imagination. The idea of using the same motor and frame to power a couple of different applications has a commonsense appeal that is right up many woodworkers' alleys. However, these machines are rare in U.S. woodshops.

Here in the U.S., if you could talk to most woodworkers and ask them about a combination woodworking machine, the picture that would come to mind is the Shopsmith Mark V. And while that particular tool has a faithful following, many of whom would rather lose a body part or a beloved pet rather than give up their Mark V, its reputation in the craft is that it does a couple of things well, and other tasks in a sub-optimum manner. In other words, dedicated machines (for example, table saws, drill presses, disk sanders, etc.) will outperform their combo machine counterparts in almost all cases. (Shopsmith owners take note: I am reporting here, not editorializing. Please keep your complaint letters professional.)

Across the pond in Europe, combination woodworking machines are an entirely different kettle of fish. Companies like Felder, Rojek, Robland and Laguna have built sophisticated combination machines that perform at unquestionable levels of excellence. These machines combine various components: for example, a planer/jointer in concert with a table saw or mortising appliance. There might also be a shaper and even a panel saw combined with a table saw and almost any other mix-and-match combo you can think of. I don't think I would be wrong in asserting that in Europe, a woodworker would find it odd to purchase a machine that did just one task. Here, of course, it is just the opposite situation. I could speculate as to the reason, but I would just be guessing. Having been reared in a traditional American shop, I grew up suspicious of combination machines — European or otherwise. But when I really started to consider the benefits of combination machines, I had to admit that my prejudice was without merit. This is especially true when it comes to jointer/planer combination machines.

The Perfect Marriage

Leaving aside for the moment all the other considerations involved in the combo machine discussion, when it comes to the planer/jointer, there is little room for argument regarding its practicality.

Shop Test continues on page 78 ...

How Wide is Your Planer (So why do you only have a 6" jointer?)

To properly use a planer, one face of the wood must be flat and out of wind (not twisted) before you start. So the first step in planing wood is face-jointing. You can do this with a hand plane, but most of us prefer a jointer for the task. Curiously, most planers on the market are 12" wide or more. On the other hand, most jointers in home shops are 6" or 8" wide — with the 6" version predominating. Face-jointing a 12"-wide piece of wood on a 6" jointer is a pain in the woodshop. The same is true of 8"- or 10"-wide stock. It can be done, but if it were me, I'd just rip the stock narrower and go from there. Imagine if you had a 12" jointer to go with your 12" planer ... life would be a bed of roses (or at least of woodchips).

Twelve-inch jointers are expensive, and even the benchtop models of planers are not cheap. But by combining both tools into one, you have a more practical stock-surfacing system at a price that can be very competitive. Do you need to face-joint 12" stock regularly? Perhaps not, but what about 8" or 10"? If your answer is "yes," a 12" combo planer/jointer may be in your future.



Preparing a 12" wide piece of lumber for planing using a 6" jointer is tricky. For that reason alone, a 12" jointer is a very practical tool.



Common to both of these planer/jointers was a cutter guard mounted on an adjustable arm. The guard slides back and forth to cover the exposed cutters, depending on the cut and fence setting.

There is much to be said when it comes to having a jointer that has as wide a cutting head as your planer. Indeed, planing is a task that can't really be done well without a good jointer. And as your stock gets wider with more exaggerated cupping, bowing and twisting, face-jointing becomes even more important. With all that said, it is clear that the concept of putting both functions into the same tool is a good one. But how does it work in reality? When you blend both machines,

do you lose functionality that we have come to expect in the dedicated machines? Is the execution as good as the theory? That is what I set out to discover in this shop test.

A Tale of Two Machines

To test these questions out, I brought two planer/jointer machines into my shop, purchased a variety of roughsawn hardwood in various widths and thicknesses and started making woodchips. The machines, a JET JJP-12 (\$1,999) and Laguna's A175003 (\$1,495), from their new Platinum series of tools, are typical of the genre. At a casual glance, these floor-standing, stationary tools look very similar to your run-of-the-mill jointer. The metal cabinets are a bit bulkier and the infeed/outfeed tables a bit shorter than you would expect, but neither to a large degree.

Shop Test continues on page 80 ...

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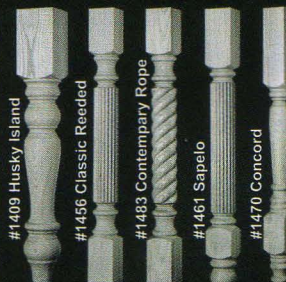
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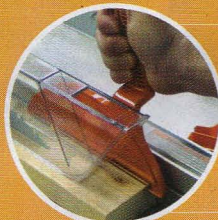
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The fences on both of these machines were a bit underwhelming. Again, made of extruded aluminum stock, they are not up to the standards I am used to on

Shop Test continues on page 82 ...

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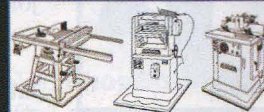
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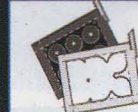
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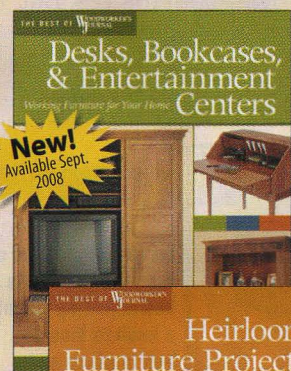
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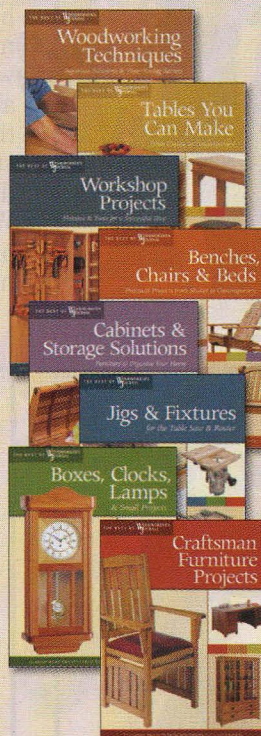


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The 4-Step Conversion

Converting the JET planer/jointer from one task to the other is completed in four easy steps. First, release the table locks.

1



Next, using the handle, lift the tabletop into its upright position where it will lock in place automatically.

2



Third, flip the dust collection hood over into its planer position.

3



the good quality 6" and 8" jointers I have used over the years. There is nothing fancy about how they are attached to the machines. The Laguna has a key-way collar bolted to the cabinet that captures a polygonal steel bar; the JET has a hefty sheet metal housing that's slotted to accept stud bolts topped off with L-shaped ratchet knobs. Adjusting the fences square to the table was putzy, and I felt the need to check the fence's adjustment regularly. To be fair, although neither fence was really to my liking, they both performed perfectly. I edge-jointed hundreds of lineal feet of hardwood stock, and I got consistently square, smoothly cut edges.

Infeed and Outfeed Tables

The cast-iron tables on the Laguna tool were machined and polished to near perfection. The JET's tables were also of very good quality. Both tools came with the tops properly aligned; no adjustment was needed. In both cases, the tables were shorter than I would have expected them to be. There are 6" and 8" jointers with much longer tables. Longer tables provide more control when you are edge- or face-jointing long and heavy pieces of lumber. So, I was concerned about my ability to handle large stock on these machines. I purchased some hard maple planks, 2" thick by 11½" wide and 10 feet long. They were big monsters and very heavy. The short story is that I had absolutely no problem with the face-jointing task. Even without the benefit of an auxiliary roller stand, I was able to hold the stock flat to the outfeed table and control the cut without undue difficulties. The same was true of the edge-jointing operation. Would I prefer a longer outfeed table? The answer is yes. But once again, the tools both performed very well, even with those huge timbers I was surfacing.

Shop Test continues on page 84 ...

Fourth, adjust the planer bed to the thickness of your wood and flip the drive roller switch. Simply reverse these steps to go back to jointing.

4



On the infeed face of the planer, there is a bed adjusting wheel, a knob to lock the bed in place and a handle to engage the drive roller. The drive roller should be switched off when the machine is in its jointing configuration.

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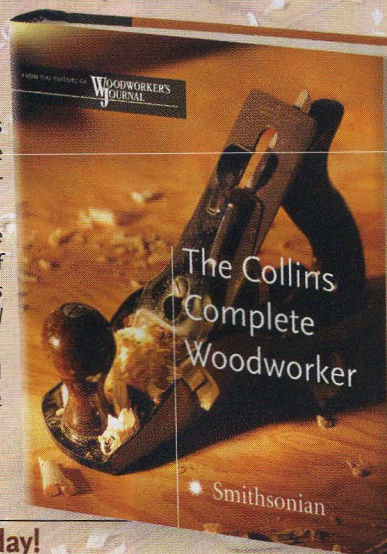
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Quick Conversion

It took me less than a minute to switch the machines from their jointer configuration to the planing setup. (And about the same to switch them back — I did not time that procedure.) One tip I have for anyone considering these machines is to have a sufficiently long dust collection hose on the tool. When you switch over from one task to the other, you need to take the hose off and move it from one end of the machine to the other. If the hose is too short, something has to move, either the machine or the dust collector. And one other obvious point: you absolutely need dust collection with these tools.

Conclusion

So what are the answers to the questions that spurred this article? Do these combination machines perform as well as the concept would dictate? In my experience, the answer is yes. Both of the machines I used performed at a superior quality level and met or exceeded my expectations. The only caveat I have, and it is very slight, is that you need sufficient infeed and outfeed space for the tool. That is true of a dedicated jointer as well, but it is a consideration.

Are there negatives to these machines? Well, you do need to flip the tops up and the dust collection over before you can move from jointing to planing. But I did not find that to be an onerous task at all. Both of these machines, and I believe it to be true across the category, require a 220-volt circuit,

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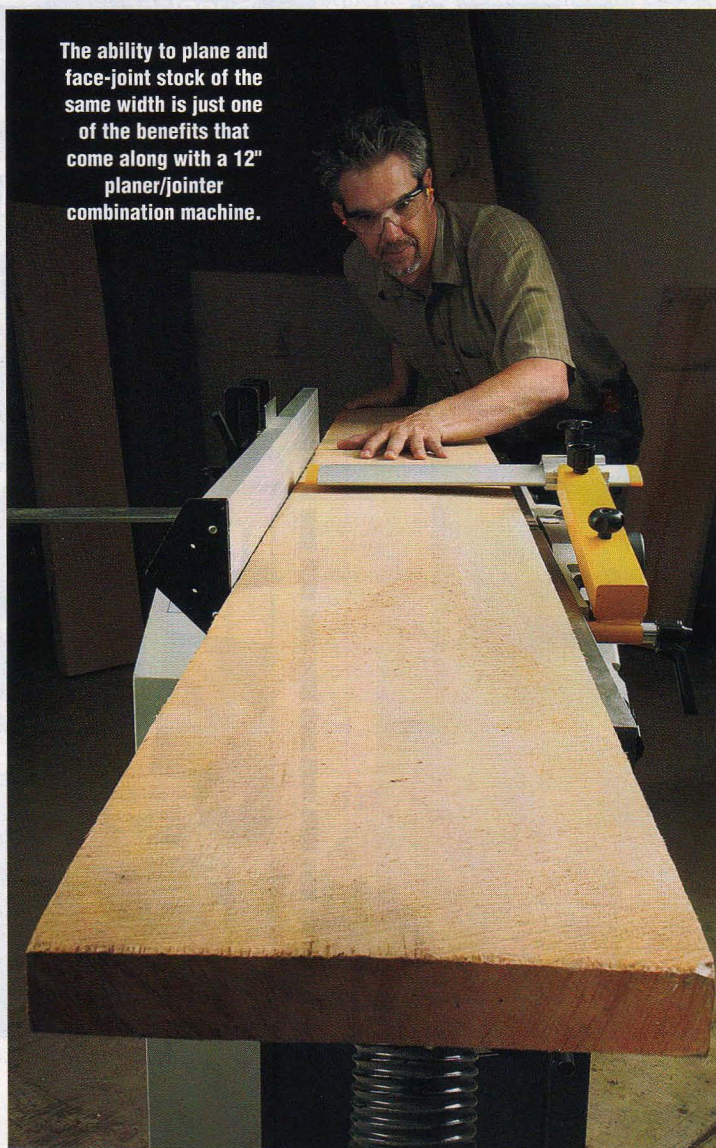
but that is also true of my 8" jointer. These tools are not cheap, but when I combine the price of my 8" Delta jointer and my 13" RIDGID planer, it comes to around \$2,200. And 12" dedicated jointers generally come in right at the two-grand mark. So in my mind, the cost is at worst a push, or actually leaning towards being in favor of the combo machines.

After all the pros and cons are considered, I feel completely comfortable recommending these machines to my fellow shop rats. Would I have one in my shop? In a heartbeat.

As in any other tool purchase, personal preference is an important factor. Before I had the opportunity to put these tools through their paces, I would have had reservations about them. They were outside of my experience. With this comparison under my belt, they will be in serious contention should I find myself in the market for either a planer or a jointer. It's just common sense.

Rob Johnstone is editor in chief of Woodworker's Journal.

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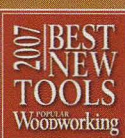
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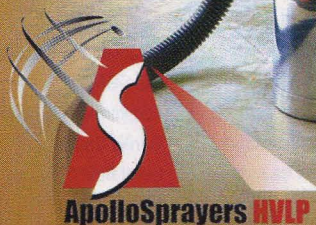
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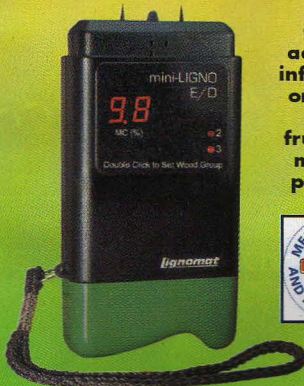
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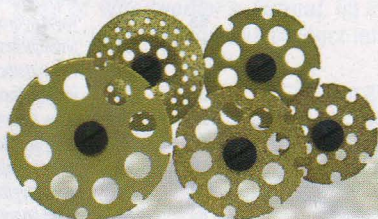
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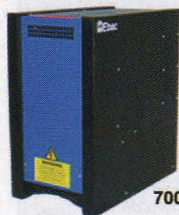


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With the **CarveWright Woodworking System** from LHR Technologies, you can design a project on your computer and make it happen on the CarveWright, which routs, cuts, carves and joints. It automatically selects the correct bits for your process. The 15" x 18" x 26" CarveWright is priced at \$1,899.99.



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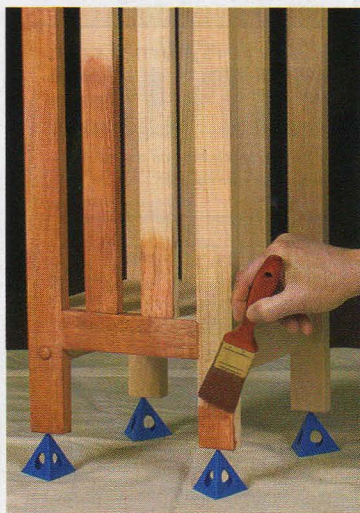
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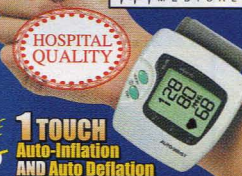
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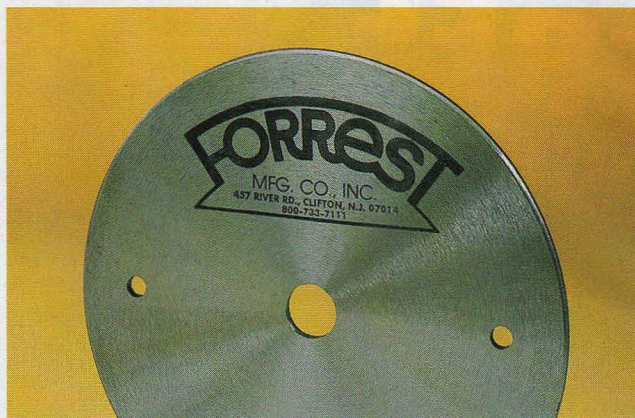
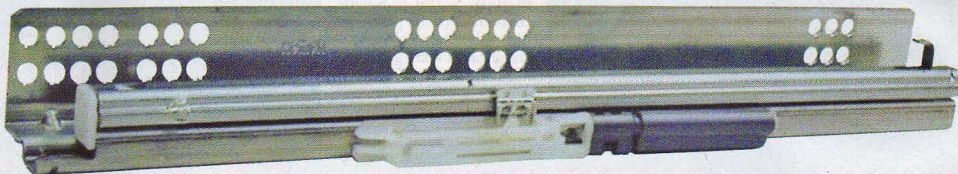


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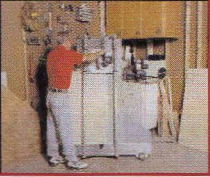
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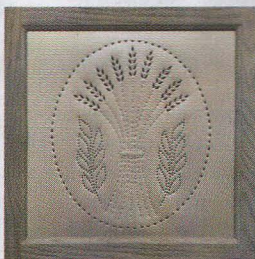
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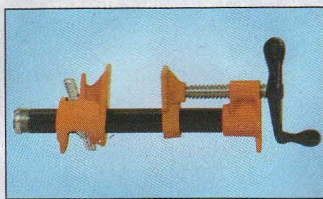
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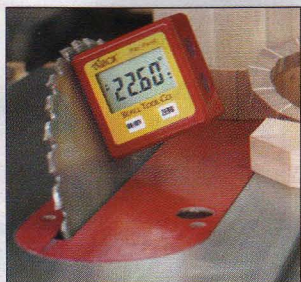


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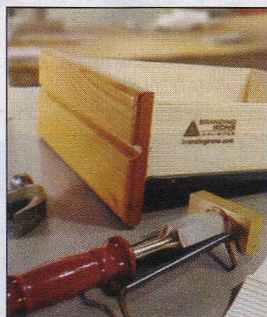
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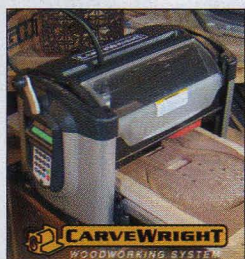
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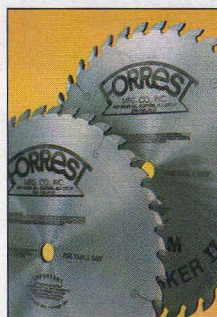


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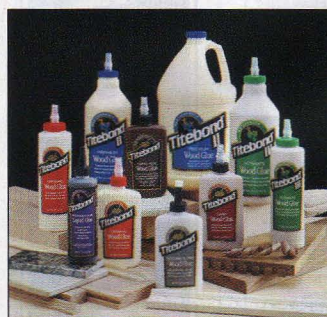
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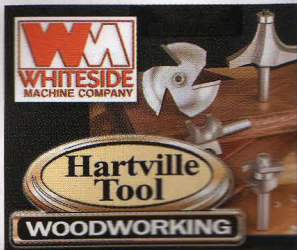


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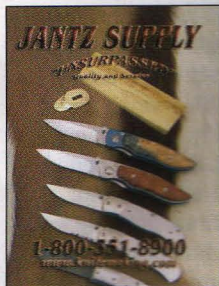


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Knot that Big of a Problem

By Michael Dresdner

ABOUT MICHAEL DRESDNER

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

When not writing about woodworking, he's an active community theater participant.

Contact us by writing to "Finishing Hotline,"

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Please include your home
address, phone number and
e-mail address (if you have one)
with your question.

Q I am making furniture out of a knotty European beech (*Fagus sylvatica*) and would like to incorporate certain knots in the finished design. Some of the knots are up to three inches in diameter, but they're not loose. One in particular is open enough to see through. How would you suggest I secure these knots and fill the knotholes in order to prevent them from loosening in the future?

Michael Salley
Scottsdale, Arizona

Michael Responds: Secure knots you suspect could work loose by flooding them with thin cyanoacrylate (CA)

adhesive. Fill any large gaps, holes or cracks with epoxy — either clear or colored to match or contrast with the knot. Tape the back side of open holes to keep the epoxy from dripping out. Do all this before you begin your normal sanding sequence so that during sanding, you sand off any glue that gets on the surrounding wood.

Q My stained, solid oak kitchen table has a milky white circle caused by placing a hot bowl of soup on the table. How can I remove this white area without having to refinish the whole table? I would like to apply a spar varnish over the existing finish.

Joe Watson
Milton, West Virginia

Michael Responds: Start by cleaning the surface with either mineral spirits or TSP on nylon abrasive pads, wiping up the resulting slurry until it wipes clean. Sand lightly, then wipe the top with a cloth dampened with denatured alcohol. Make it damp, not fully wet, or it could damage the finish. Damp means "about as wet as a healthy dog's nose." A couple of swipes should remove the white marks and leave the table ready to recoat. Spar varnish would not be my first choice for recoating a kitchen table, because most spar varnishes are simply too soft. I think you will get better wear with oil-based polyurethane.

Q I have an antique oak secretary's cabinet that was painted with several coats of paint. I used stripper to remove most of the paint and have tried sanding the remainder. I can't seem to get all the paint out of the pores of the wood although I've sanded and sanded. What do you suggest now?

Isobel Rambo
Pequea, Pennsylvania

Knots can be attractive, but they must be secured with CA glue if they're loose. Fill empty knotholes or voids with colored epoxy.



You can remove all the paint embedded in oak's large pores with paint stripper and patience.

Michael Responds:

I suggest you reverse course. By now you have discovered that, thanks to its large pores, trying to sand paint off oak is an exercise in frustration. Your problem is that you removed only most of the paint with the stripper when you should have removed all of it.

The key is to keep the stripper wet, as long as that takes, until all of the paint is softened and loosened. Then,

using a stiff bristle brush, scrub until all the paint is out of the pores. By stopping your chemical stripping regime too soon, you gave yourself a passel of problems,

but there's nothing stopping you from backing up. Strip the piece again using a strong paint remover, and this time, be patient. Don't take off the stripper until all the paint has been dislodged from the pores, even if that means adding more stripper to keep the wood wet until the job is completely done.



WINNER! For simply sending in his question regarding removing a white circle on oak, Joe Watson of Milton, West Virginia, wins UGL's ZAR Wood Finishing Kit. Each issue we toss new questions into a hat and draw a winner.

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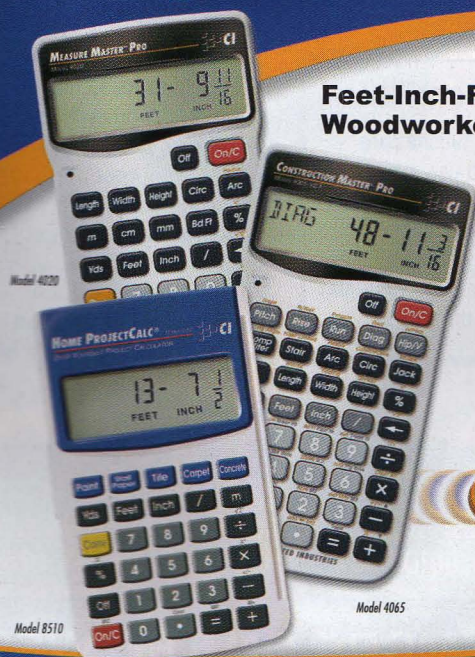
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Wipe On, Wipe Off

LOOKING FORWARD TO A WIPEOUT



Polyurethane gel, Danish oil and wipe-on poly, as well as standard oil-based polyurethane used unreduced and straight from the can, all work great as wipe-“off” finishes.

The three most common ways to get finish onto wood are to spray; use a handheld applicator such as a brush, paint pad or roller; or wipe. In this segment, I'll focus on wiping — the easiest and most foolproof method.

Danish oil, teak oil and many wipe-on oil-based gel and liquid polyurethanes are sold as wipe-on finishes, but that's really a misnomer. It would be more accurate to call them wipe-off coatings, because the key to good results is not how you put them on the wood, but the fact that you wipe all the excess finish off.

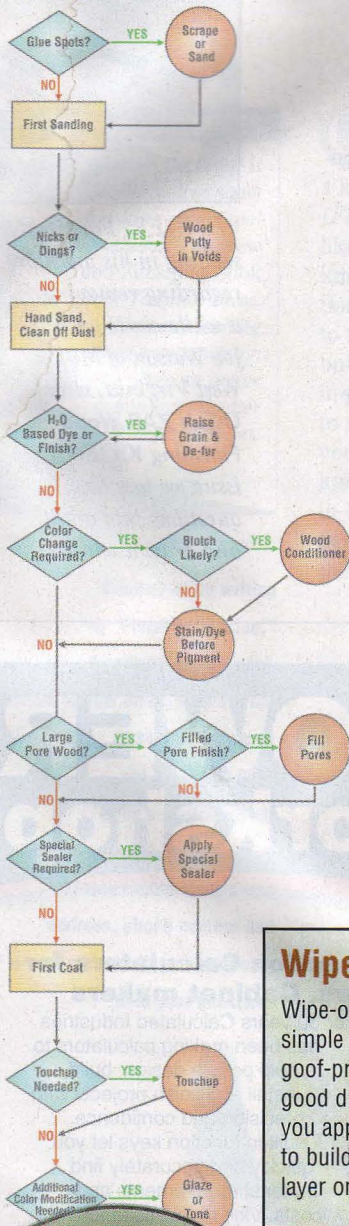
Take Danish oil, for example. You flood it on liberally, let it soak in a bit,

then wipe off everything that was not absorbed by the wood. You can do the same with wipe-on liquid or gel polyurethane, or for that matter, with any oil-based liquid varnish or polyurethane, whether labeled “wipe-on” or not. My favorite method is to dip a gray nylon abrasive pad into the finish, scrub it onto the surface making sure it gets down into the pores, then wipe it off evenly with blue paper shop towels. Do that once a day until you have as many coats as you need.

Once wiped, a very thin coating is left that dries fast and is too thin to pick up airborne dust or show brush and rag marks. Because oils cling so well and spread so thin, oil-based finishes leave a thin film each time you wipe them on and off, even after the wood is well sealed. That allows you to build multiple thin coats, considered ideal in the world of finishing, with very little effort and virtually guaranteed, perfect results.

— Michael Dresdner

Start



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Doesn't Stain Skin	✓	✓
Bonds Most Materials	✓	
Bonds Oily / Exotic Woods	✓	
Lower Cost – Better Value	✓	
Longer Usable Shelf Life	✓	

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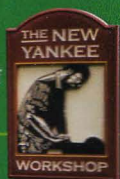


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