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(See page 38)

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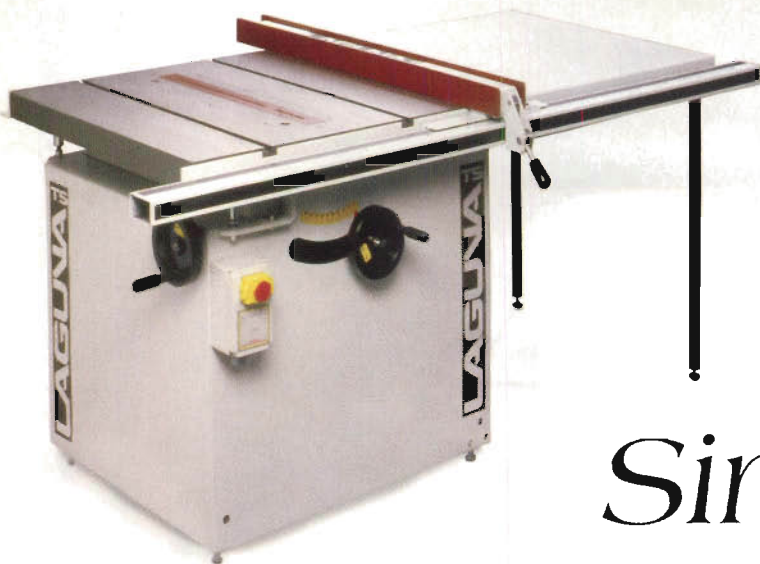


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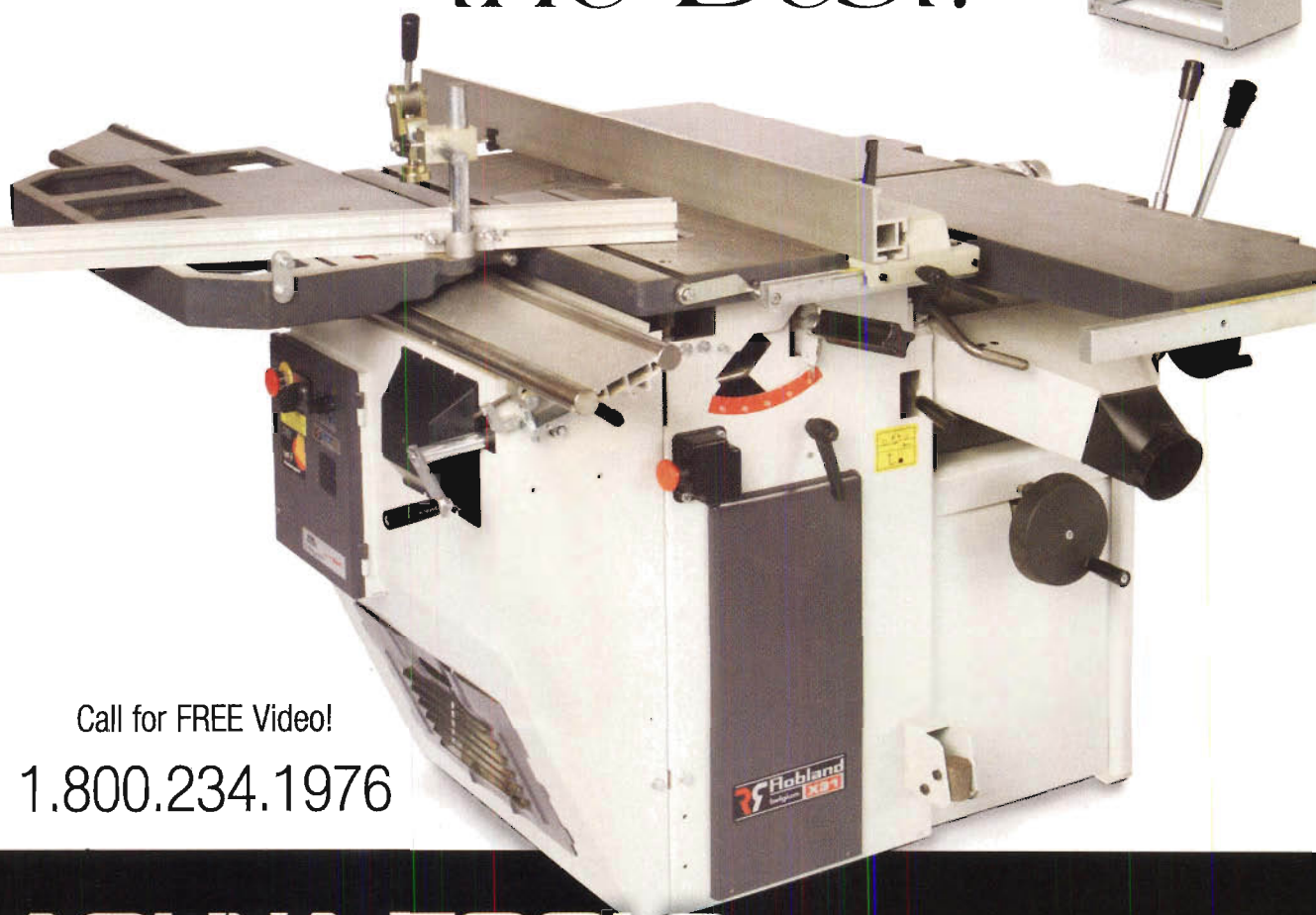


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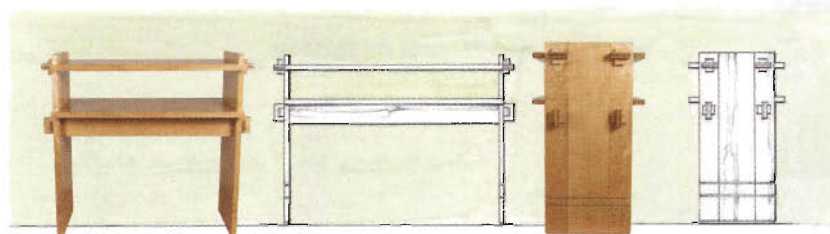
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Features

March/April 2004

Volume 28, Number 2



28 Harris Lebus Library Bureau

By John English

British traditions from the Arts & Crafts era are an integral part of this reproduction piece, which boasts a chamfered crown, muntins and splayed feet.

Page 48

38 Eastern Shore Chest

By Bill Hylton

Bill wrote the book (*Router Magic*) on advanced routing techniques. With an historic piece as inspiration, he shares some tricks up his sleeve for template routing, tombstone panels, sliding dovetail joints and more.

48 A Table Design Revisited

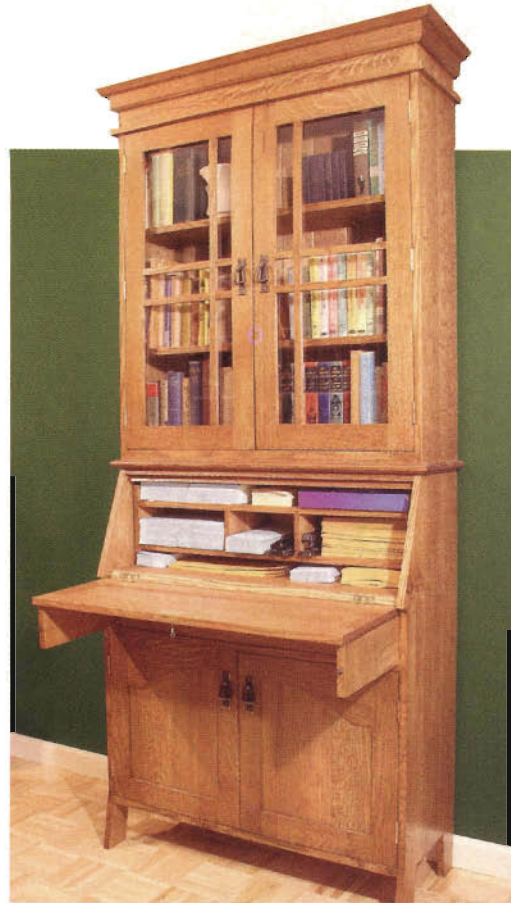
By Ian Kirby

Why'd he make it like that? Ian Kirby walks through the decision-making process that leads to a great design.

51 Inlaid End Tables

By Linda Haus

Easy-to-make details combine to create beautiful results. Granite tops protect against heat, while the inlaid maple strips and ebony plugs add an Arts & Crafts aura to these tables.



Page 28



Page 51



Page 38

Woodworker's Journal Departments

March/April 2004

Volume 28, Number 2



Page
20

Page
60



Page 20



Page 24



Page 76

Woodworkers

8 Editor's Note

Turning to safety — at the lathe and in the shop.

10 Letters

Keep the law off my saw!

14 Questions & Answers

Frame saws, oil stain and saw blades.

18 Tricks of the Trade

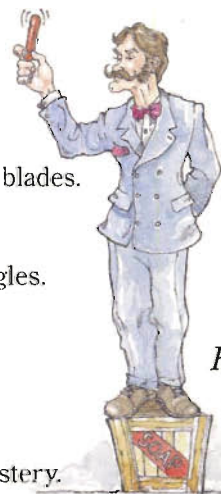
Plumb bobs for compound angles.

20 Shop Talk

Roots: Nakashima's influence.

22 Stumpers

Pulling together to solve a mystery.



Page
10

Techniques

16 Hardware Hints

Historical hardware from Gustav Stickley.

Page
16

24 Woodturning

Steve Blenk demonstrates barley twist turning.

60 Techniques

Inlays are simple with power tools.

100 Finishing Thoughts

Waxes and oils: best ways to use basic finishes.



Tools

64 Today's Shop

Sandor Nagyszalanczy on the new drilling options.

76 Tool Preview

Ellis Valentine reviews three sanders.

83 What's In Store

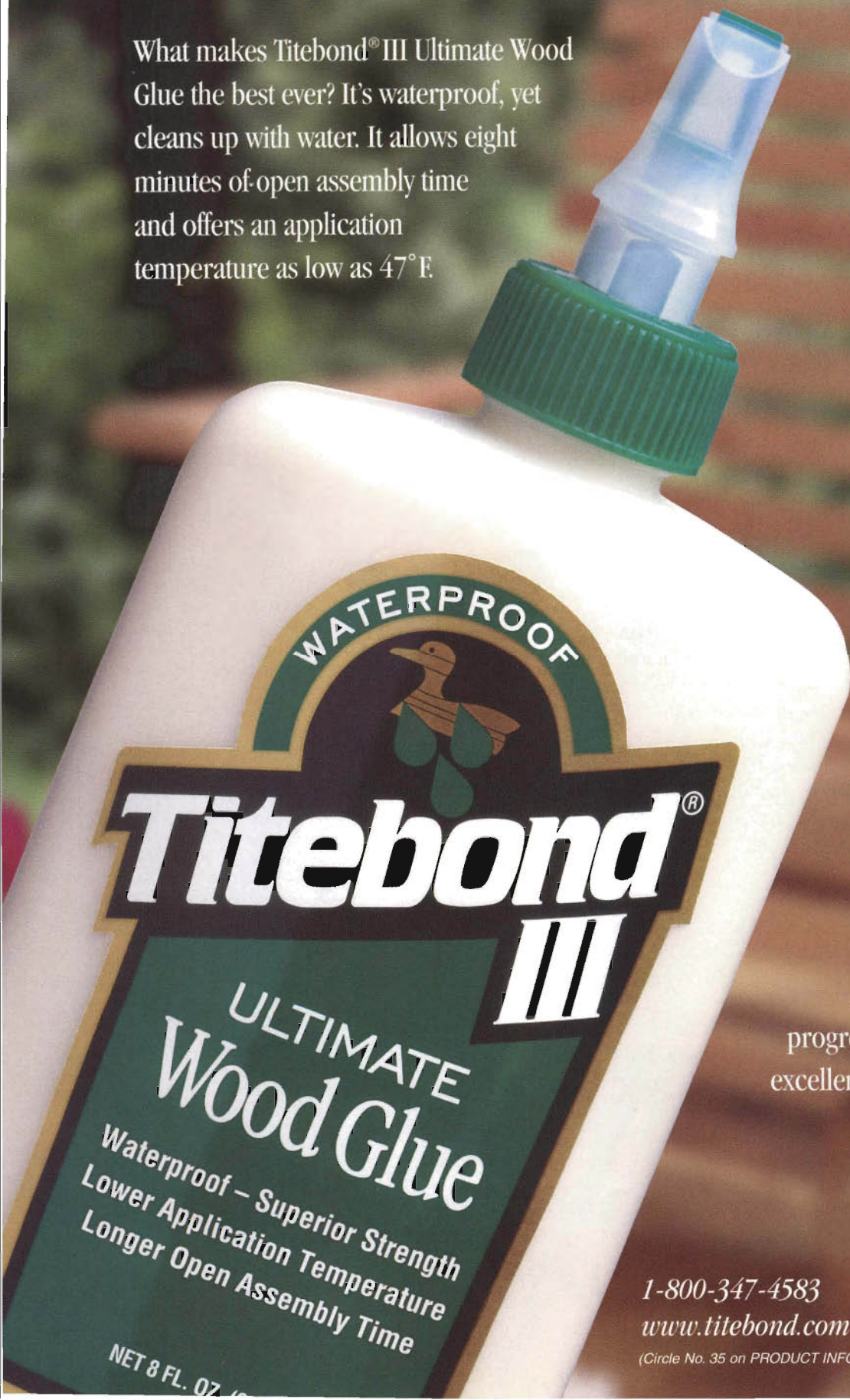
Tool features that make your life easier.

88 Tool Review

Chris Marshall tests six sharpening systems.

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Better Lat(h)e Than Never

My shop has a new addition, and so does editor Rob Johnstone's. Both of us purchased a lathe in recent months, and we're rarin' to start turning. But, being that we're both middle-aged (old), safety-minded (paranoid) adults (well, me more than him), we're proceeding with caution. Maybe that's because, sitting where we do, we tend to hear more horror stories than the average woodworker — woeful dirges of damaged digits and scary scar stories cross our desk with increasing frequency.

And I think I know why.

When I was coming up, taking shop in school (Fairfax H.S., class of '69) was not an option, it was a requirement. And shop teachers do a great job of ramming safety protocol down students' throats. I'm not sure I'm a better woodworker for the experience, but there are certain safety procedures I always follow in the shop, most without even thinking about them. Newcomers to our hobby, often raised on a diet of books and videos, have heard the drill, but let's face it safety protocol doesn't make for the most fascinating reading, and sometimes it gets short shrift.

That's where Steve Blenk, the *Journal's* newest contributor, comes in. Rob and I have known Steve for some years, but last summer, during the big Anaheim woodworking show, we had the chance to see him in action, amazing woodworkers of all ages

and experience with his turning techniques. Later that year, on a visit to the great Northwest, Rob hooked up with Steve again and reported that "in half an hour flat," Steve managed to completely alter his view of the turning world. Rob came back and said, "we have to start a turning column, right away ..."

"Why now?" I asked.

"Because" Rob explained, "turning is getting really hot. Lathes are now available in virtually any size you can imagine. Women see turning as the perfect entry into woodworking and are coming on board in increasing numbers and because, well, because ..."

"Because it would be great for both of us to have a world-class expert with 30 years of experience at our beck and call?" I offered.

"Well, yes, there's that ... But we'll share any advice he gives us with our readers. Everybody wins ... it's a great idea!"

Actually, Rob didn't have to work too hard to get me to agree. I talked with Steve, and he assured me that our reader's lungs and faces (safety!) will remain at the top of his list of turning topics. Look for his latest offering on page 24 and send any turning questions you may have to our attention. We'll see to it that they find their way to Steve.



Steve Blenk, our new contributor, with his son Robbie.

Larry N. Storker

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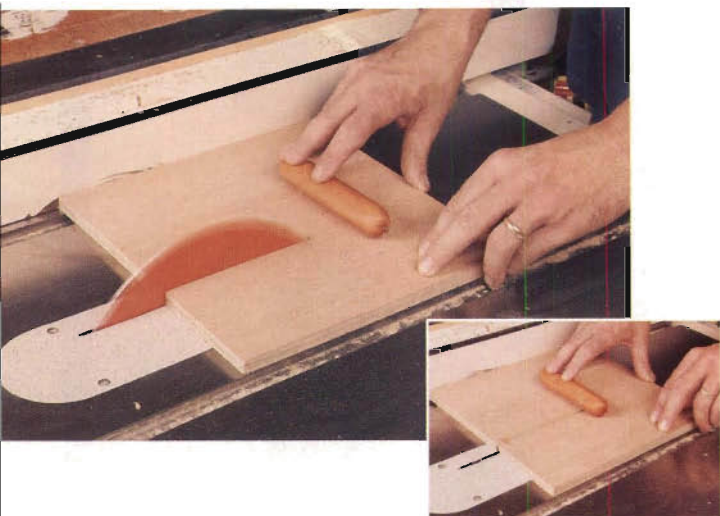


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Climbing on the SawStop Soapbox



Lead, Don't Legislate

Where in the hell does Dr. Stephen Gass get off thinking legislating the sale of his SawStop brake unit product is in anyone's best interest? ("Can 30,000 Saw Accidents Be Avoided?," *Shop Talk*, December 2003)

I'll admit it's a worthy goal to want to increase the safety of table saws, and I'm not against that in any way. As a builder of custom furniture, I spend a fair amount of time around my table saw (20 years and still 10 fingers!). But to force manufacturers to buy his product using legislation is flat-out wrong! If Dr. Gass's product is so great, why doesn't he find creative ways of helping manufacturers understand the benefit to adding it to their products? Or better yet, get his own saw on the market and show the other manufacturers a better tool!

I am so tired of everyone who thinks they have a better way for me to conduct my business trying to legislate my behavior to achieve their goals. If Dr.

Gass wants to feel great about himself in the five years he states in the article, make a positive change. Show me why I should trade in my old JET and buy his new safer saw. Show me how I can work safer and more efficiently because of this product. But please, don't tell me or the manufacturers what we/they have to do, because we'll all dig in our heels and say no! This country is a leader today because people like Dr. Gass were able to show the world better ways of doing things, not because we are the best legislators!

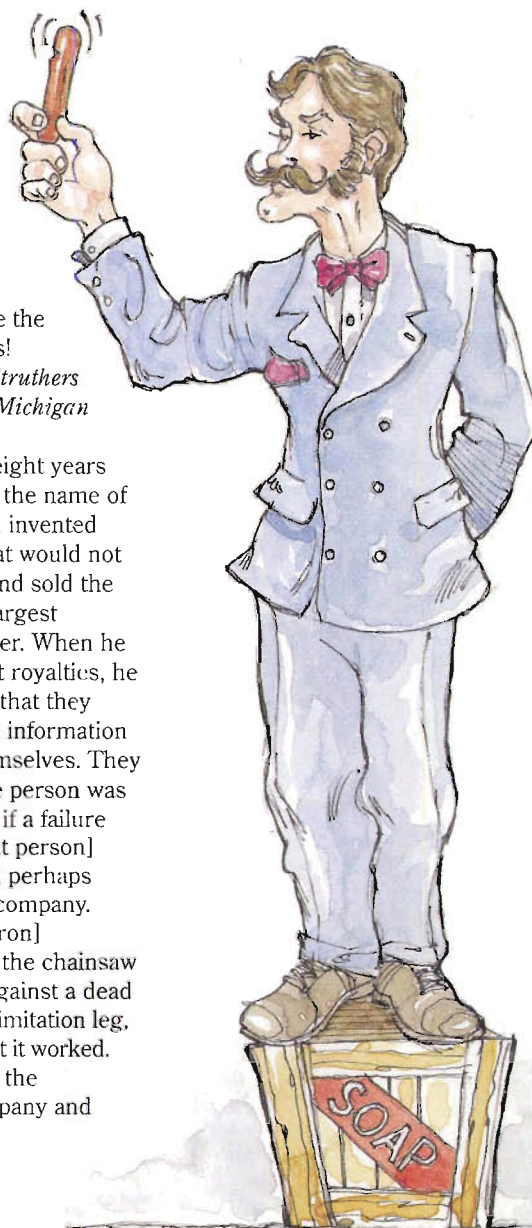
*Clinton J. Struthers
Midland, Michigan*

About five to eight years ago, a man by the name of Gerald Doiron invented a chainsaw that would not cut a person and sold the rights to the largest chainsaw maker. When he inquired about royalties, he was informed that they purchased the information to protect themselves. They believed if one person was in an accident if a failure occurred, [that person] would sue and perhaps bankrupt the company.

[Gerald Doiron] demonstrated the chainsaw by putting it against a dead chicken or an imitation leg, and proved that it worked.

I agree with the chainsaw company and

am not interested in buying a saw where people would disregard safety and feel that it is failsafe, this can lead many to forget the safety issues in woodworking. I have been in woodworking for many years and have learned my lesson. I lost my uncle when he worked in a chair manufacturing plant and a shaper knife went into his body. He died a few days later. They believed that it



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was safe, and yet the knife came loose and pierced his body.

*Eugene Gemborys
Gardner, Massachusetts*

If Mr. Glass is so interested in safety, why doesn't he go after the bureaucrats with something like a federal mandate for all bumpers on all vehicles to be the same height above ground? This would prevent injuries many times over the saw safety device. Oh, I see, he is only pushing the Consumer Products Safety Commission because he holds the patent on the device. Sort of one-sided and self-serving as I see it. One failure of the electronics, and a tort lawyer would bankrupt him anyway.

*Glenn MacRill
Houston, Texas*

Tips on Smoking Blades

I am responding to the answer to Mr. Brian Pearce (*Questions & Answers, December 2003*) on why his 60-tooth carbide-tip saw blade was smoking when cutting oak or maple.

I am a retired finish carpenter in Washington state and still do a lot of woodworking. I think that besides having the right blade for crosscutting or ripping, you also need a blade with a wider offset as found with an ATB (alternate tooth bevel). I also prefer a negative hook for clearing the blade — especially for ripping, or even

crosscutting, a thicker piece of stock — with your narrow kerf saw blade used for only narrow/thinner stock.

I found out this rule when I was an apprentice cutting off solid door stock, and my blade would burn and wander in the door.

Also, buying a higher quality blade and keeping it sharp always helps.

*Randy Odell
Vancouver, Washington*

The cause of the blade burning the oak, etc. may be due to blade selection as Cliff Paddock suggests, but I suspect it is more likely due to poor saw tuneup. The blade and miter gauge slot or fence may not be parallel.

*Randy L. Wolfe
Owensboro, Kentucky*

Dovetail Masterpieces

Mr. Ian Kirby's articles on dovetails ("More Dovetail Lore," *October 2003*) are masterpieces. However, honing a perfectly sharp chisel and aligning the removal of the wood between the tails and pins on both sides of the board is tricky.

I use a much faster method, and get the same results: using a fine-tooth scroll saw, I cut out between the pins and tails and finish cutting at the pin side with a coping saw. If necessary to smooth out the area more, I use a fine or medium metal file.

*Menachem Shiff
Kadima, Israel*

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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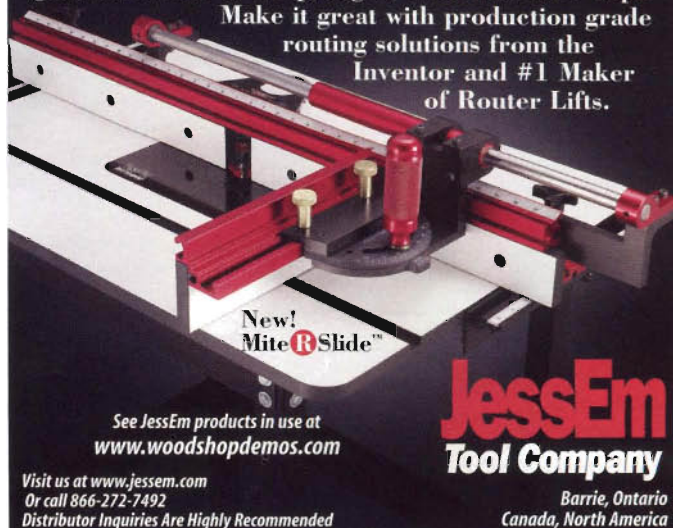
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THIS ISSUE'S EXPERTS

Stephen Shepherd is a furniture maker and woodworking historian based in Utah.

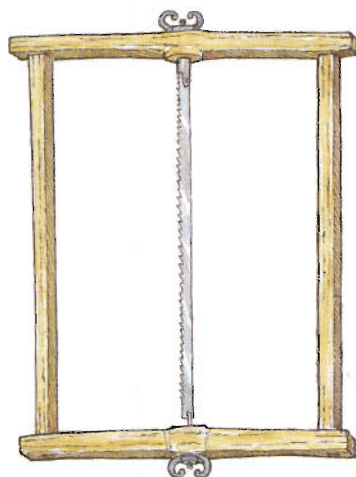
Michael Dresdner is a nationally known finishing expert and the author of *Wood Finishing Fixes: Quick Answers to Over 175 Most Frequently Asked Questions*, from Taunton Press.

Chuck Olson is the director of sales and marketing for The Olson Saw Company.

Q

I am a weekend warrior woodworker with a passion for hand tools. My questions are these: What is a frame saw? What are its uses?

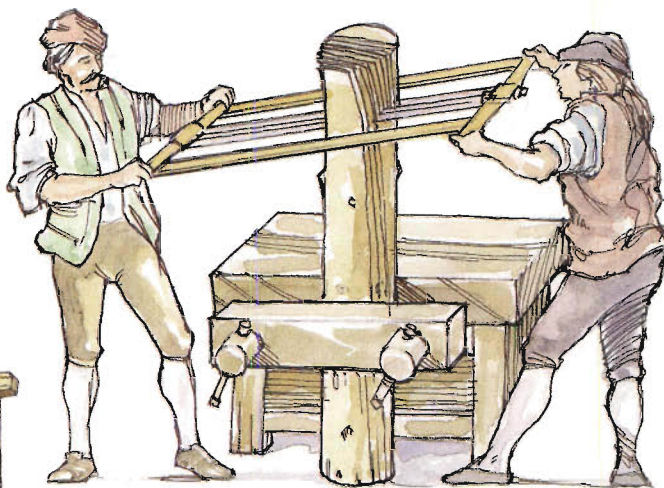
Sean Nies
Buffalo, Minnesota



A Before the advent of hard carbon, steel, rigid saw blades that could be supported and used from one end, such as the handsaw, most early saw blades had to be held taught within a framework. The earliest versions in ancient Egypt and Asia were the enclosed style frame saw (above). The frame and tension prevents the blade from buckling.

The blade is mounted in the center of the frame: on one end to a stationary post and on the other end with a mechanical tightening device like a wedge or turn screw. The work's size is limited by the distance between the blade and the arms of the frame on either side.

The frame saw was later used in Europe, then in North America, in various



Frame saws have been used for many centuries. For instance, a multiple-blade version was used for making veneer, as illustrated in the 1774 French publication "L'art du Menuisier Ebeniste."

sizes. Large pit or trestle saws were used to rip boards. Smaller versions were used by chairmakers to cut gentle curves on arms or rockers; by wheelwrights to cut the curved felloes (rims) of wagon wheels; and by coach makers to cut curved parts for wagons and carriages.

— Stephen Shepherd

Q

I have tried several times to use spray oil stain, and it flies on in gobs and splatches. I let it dry two hours and do it again, with the same result. When I use the same oil stain in a can, wipe it on, let it soak 10 minutes, and wipe it off, I get good results. What do you say?

Ed Jansen
Norwalk, California

A

"There is more to life than increasing its speed." — Mahatma Gandhi
When there is a choice between speed and good results, opt for patience and quality. In this case, that

means using the wipe-on and eschewing the spray.

If you must use an aerosol stain, make certain that you shake the can adequately (at least 60 seconds of vigorous shaking AFTER the ball bearing starts rattling around). Keep the tip clean and test the spray first on scrap. A poorly agitated can, or a slightly clogged tip, can mean gobs and splatches. Spray from about 8" away, and make sure you can get an even pattern on scrap before using it on your project.

— Michael Dresdner

Q

Could somebody please tell me if there is a standard numbering system for scroll saw blades? Some patterns call for a #2 or a #5 or whatever, but it seems every blade manufacturer is slightly different. The teeth per inch vary as well as the thickness, etc.

Al Prevedel
Rock Springs, Wyoming

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



A The blade numbering system of 8/0 to #12 was developed years ago and is based on jeweler's saw blades. The relationship between the numbers and the thickness and teeth of these blades was closer than it is on today's fretsaw blades.

Still, a #2 blade from one manufacturer should fall pretty close to a range from

Check the dimensions of a scrollsaw blade if you're having difficulty choosing based on the number.

another manufacturer. Specifics like teeth per inch will vary among manufacturers: that's how those of us in the cutting tool industry differentiate our blades. If you're having

problems choosing blades based on their numbers, another good option is to compare the actual dimensions of the blades.

— Chuck Olson



WINNER! For simply sending in his question on spray vs. wipe-on finishes, Ed Jansen of Norwalk, California wins a **Bosch 1590EVSK Jigsaw.**

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Stickley Hardware: Old World Traditions

By Joanna Werch Takes



Gustav Stickley 1858-1942

If you've been reading *Woodworker's Journal* for a couple of years, you may remember that we named Gustav Stickley the "woodworker of the 20th century" — noting how his influence has inspired woodworkers up to and including Norm Abram. For Stickley, construction and decoration were inseparable — which meant he was picky about his hardware.

He respected the ancient crafts, and filled his factory with metalsmiths trained in Old World traditions. His workshops made and offered hardware in a variety of metals — iron, copper, brass and pewter — as well as, sometimes, in wood.

Round or pyramid-shaped wooden pulls were less expensive



The riveted, hammered copper strap hinges on this sideboard (circa 1905) are one example of the metal hardware produced in Stickley's factory for showier pieces.



Living history: Hardware originally designed by Gustav Stickley is still available today, exclusively from Rockler Woodworking and Hardware (800-279-4441).



The wrought-iron ring pulls on this five-drawer vanity are an example of another style, and another metal, that Gustav Stickley offered.



Gustav Stickley used wooden hardware for functional pieces (like this sewing stand) that were in less public areas of the house.

for his customers, and were used more frequently in "non-public" areas of the house like the kitchen or bathroom. Showier rooms generally had hand-hammered copper or iron hardware for pulls and hinges. Strap hinges were a predominant style, while the pulls tended to be of the ring bail variety.

The iron was in the Old World "armor bright" finish, while the copper and brass went through

a firing method that produced a texture, but were left unlacquered. Just as Stickley believed in letting age darken the wood in his pieces, he also said, regarding hardware, that age and exposure were the only agents "required to produce beauty and variety of tone."

For today's woodworker completing a Mission style project, the hardware is the final touch — both functional and decorative.

photos left and below courtesy of Craftsman Auctions Lambertville/David Rago and Jerry Cohen

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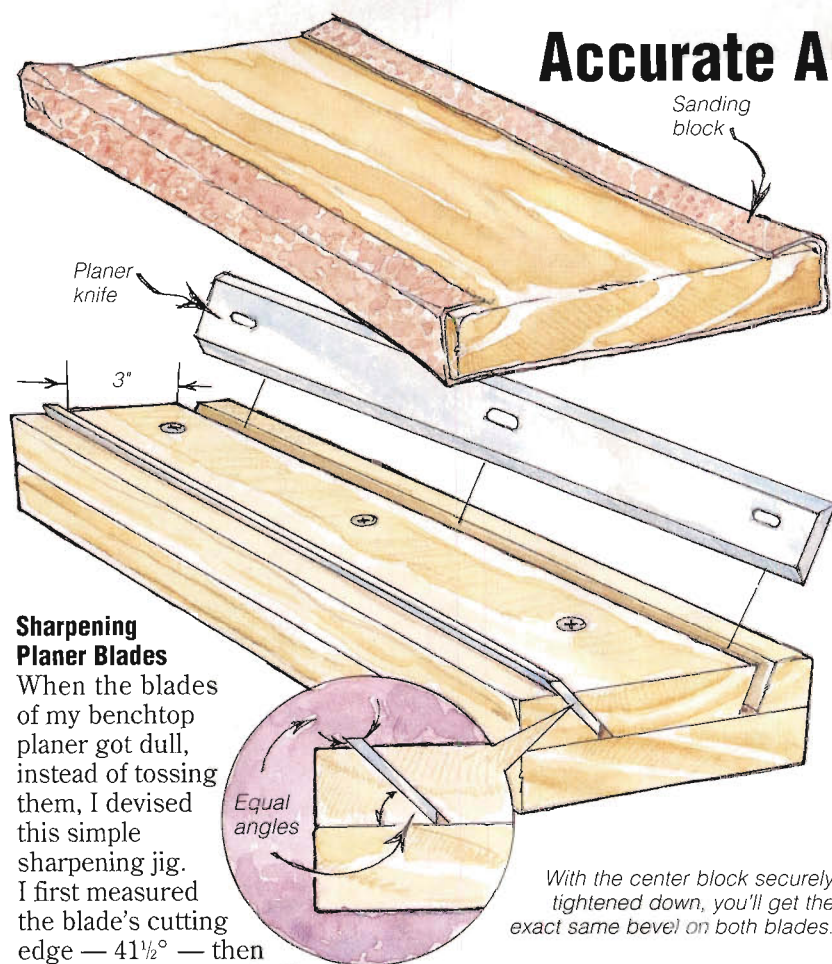


Available at The Home Depot.®

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Accurate Angles



Sharpening Planer Blades

When the blades of my benchtop planer got dull, instead of tossing them, I devised this simple sharpening jig. I first measured the blade's cutting edge — $41\frac{1}{2}^\circ$ — then made the jig shown in the sketch. Screwing the center block down locks both blades securely in place.

To sharpen, wrap an abrasive sheet around a 11" X 6" piece of smooth, $\frac{3}{4}$ " stock and rub the cutting edges of both blades simultaneously. I get the best results by using a series of medium to fine emery cloths, followed by 400 and 600 grit wet/dry sandpaper. This produces a razor sharp, mirror-like finish. This jig is equally useful for joiner knives.

Dan Reeve
Swanville, Maine

Matching Dado Cuts

Anyone who uses stacking dado cutters soon discovers that "x" inch stock may not exactly match your "x" inch dado setup.

Instead of trying to adjust the dado cutter with shims, I've found that it's a lot simpler to make a series of trial cuts in scrap hardwood using standard combinations of cutters — $\frac{5}{16}$ ", $\frac{3}{8}$ ", $\frac{7}{16}$ ", etc. Then you can use these "gauges" to plane the stock to the exact size to fit a particular dado slot.

Jason Landers
Abingdon, Illinois

Drilling Compound Angles

Drilling holes in my first Windsor chair seat, freehand, seemed a recipe for disaster so I adapted my drill press as shown. With the hinged plywood leaf, two protractors and a pair of plumb bobs, I can drill a compound angle with confidence.

I drew my protractors with a CAD program, but ready-made plastic ones would work equally well. You could also substitute large nuts for the plumb bobs.

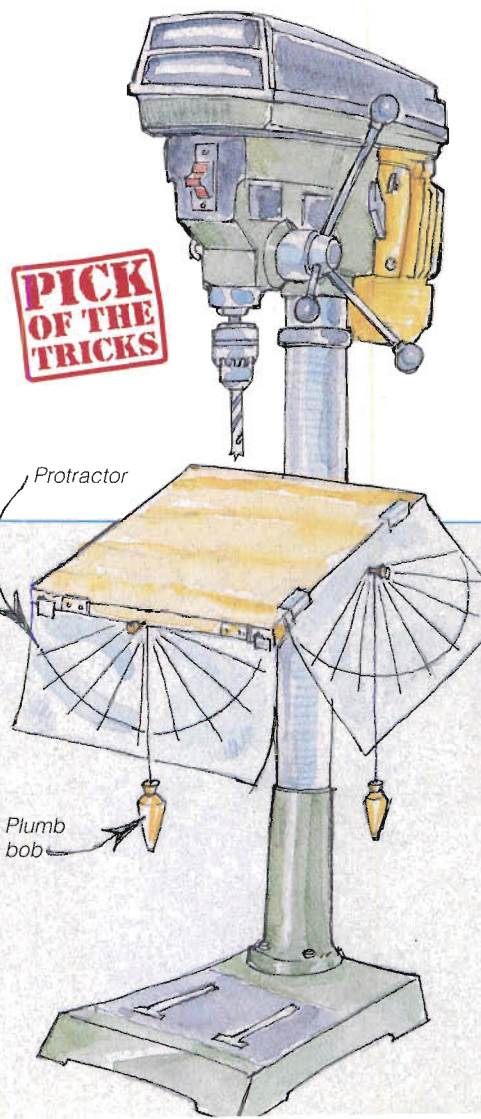
Lorne Davidoff
Stouffville, Ontario

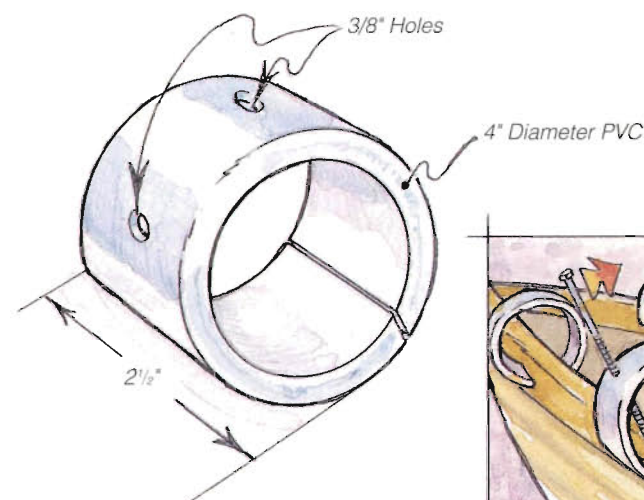
Cleaning Glue-ups

I used to have trouble removing all traces of glue from inside corners. My solution is to take a regular glue brush (also called a flux brush) and trim the bristles to a length of about $\frac{1}{4}$ " with a razor knife.

After wiping up most of the squeeze-out with a cloth, I dip the shortened brush in water and work the remaining glue out of the nooks and crannies. It helps to rinse the brush out frequently.

Donald Cooper
Carnegie, Oklahoma





Dirt-cheap Pipe Clamps are Easy on Fingers

Short sections of PVC pipe make good clamps, but they tend to be a little hard on the fingers — especially when you're using the larger size ones. My trick is to drill holes and insert 5/16" x 6" (or longer) bolts. Now you can easily open and gently close the clamp as needed.

Bill Bynum
Clermont, Florida



WINNER!

In addition to our standard payment (below), Lorne Davidoff of Stouffville,

Ontario will also receive a **Drill Doctor VersaSaw** for being selected as the "Pick of the Tricks" winner. We pay from \$100 to \$200 for all tricks used. To join in the fun, send us your original, unpublished trick. Please include a photo or drawing if necessary. Submit your Tricks of the Trade to *Woodworker's Journal*, Dept. T/T, P.O. Box 261, Medina, MN 55340. Or send us an e-mail: tricks@woodworkersjournal.com

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The Souls of Trees — And Woodworkers



George Nakashima's Conoid pieces, like the walnut bench at left and chairs below, and the freeform style in the Redwood Root Coffee Table, were hallmarks of his style.

Photos from Nature, Form and Spirit; Abrams, 2003



Dad's Designs ...

... Daughter's Devotion

Woodworkers who don't know the name George Nakashima are like painters unaware of Jan van Eyck — they're missing out on a master. Luckily, several eye-opening opportunities will be available in the next few months, chief among them a book written by Nakashima's daughter, apprentice and heir to his design studio, Mira Nakashima.

"Nature, Form, and Spirit," published by Abrams Books, is filled with intimate photos of the family at their Pennsylvania studio, George Nakashima's designs, and his furniture and architectural projects. Besides being the first time many of these photos have appeared, the book is also a unique opportunity to get Mira's perspective on her father's

continuing influence on design and on the philosophy that has guided both his and her work. The Nakashimas' reverence for nature prompted George to create unorthodox methods of construction in order to use wood to its fullest potential.



Those of you who for some reason fail to check out this book (ISBN #0-8109453-6-3) can try to make it to the exhibition it's timed to coincide with: George Nakashima, Woodworker: A Retrospective, at the Mingei International Museum in San Diego until May 30. Several pieces of George's work will be on display.

For more information on the exhibit, call 619-239-0003 or visit www.mingei.org.



Mira Nakashima's (seated in 1952) new book describes her father's woodworking and architectural influence — on her and on the 20th century.

Exploring the Roots

More Travels with LiLi

Woodworker's Journal apprentice LiLi Jackson's trip to Peters Valley Craft Education Center in Layton, New Jersey, took her back to the roots of woodworking: the tree. As part of her assignment to explore woodworking schools across the country, LiLi enrolled in Peters Valley's "Trees and Wood" class.

Through classroom lectures and visits to forests, she learned about tree biology, including growth and grain patterns. Instructors for the class included a botany and plant ecology professor, Gregory McGee, and a treen maker, Barry Gordon. The perspective of both made for an interesting class, LiLi said. The class would look at a tree in the forest and say, "this part would make a really good handle" because of the biological growth pattern, she explained.

A trip to a sawmill, where students milled their own stock for walking sticks, and creation of wooden utensils (in case you were wondering, a treen is a wooden food utensil) in the school's shop rounded out LiLi's class.

According to center director Ken Pierson, the campus hosts other woodworking classes, including one on building kayaks. For more info, call 973-948-5200 or visit www.pvcrafts.org.



Peters Valley Craft Center holds classes in woodworking as well as pottery, painting, fiber arts and more.

Photos by Terry Paul Photography; story by Ian Campbell

A Woodworker's Journey From Thought to Completion



Horses Pete and Ted brought the logs to an LT70 Wood-Mizer sawmill on the edge of the forest. After wintering in a drafty old barn, the lumber was at 18% moisture content in the spring. It spent the summer air-drying in Barry's shop to an 8% level.

Barry Dart's woodworking project started with a standing white pine. The Mariposa, Ontario, woodworker figured it was easier to ask forgiveness than permission from the heirs of Queen Victoria, whose land deeds to early Canadian settlers saved "only unto herself all mines of gold and silver and the white pine trees."

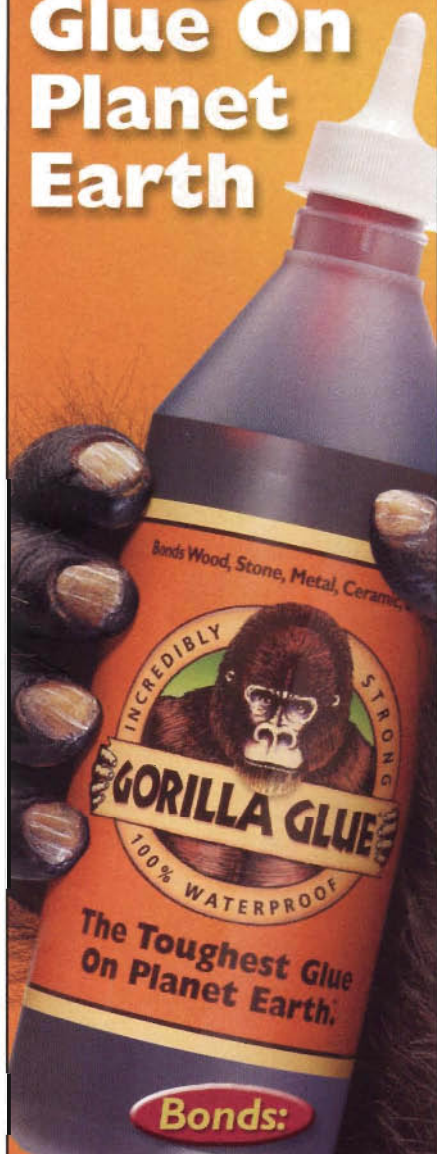


Barry's dovetails are invariably done by hand. Door frames are mortised, tenoned and pinned in the traditional manner. The finish is historically accurate. Yet Barry, like most woodworkers, has a passion for power tools. He puts his DeWalt collection to good use for jobs that don't need to be done by hand to meet his standards.



In Mariposa, one popular piece of furniture is called a "back-to-the-wall cupboard." Barry has studied this form at museums, antique shops and private collections, and has completed many measured drawings. He has crafted several variations and identifies it as one of his most satisfying projects.

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Pulling Out the Answer

What's This?



Joe Wilkinson of Happy Camp, California inherited this tiny tool from his grandfather. It's 3 1/4" long, with no name marked on it. **Know what it is?** Send in your answer for a chance to win a prize!

If you have your own woodworking mystery tool (or the answer to this issue's entry), send it to Stumpers, c/o Woodworker's Journal, P.O. Box 261, Medina, Minnesota 55340. Or send us an e-mail: jtakes@woodworkersjournal.com

Like Pulling ... Teeth?

I believe that [the mystery tool from *Stumpers*, December 2003] is an extractor of some sort. My first thought was that it would be one helluva tooth extractor, but since this is *Woodworker's Journal*, I will simply state that it is a levered nail extractor. Anyway, my teeth hurt just looking at that devilish device.

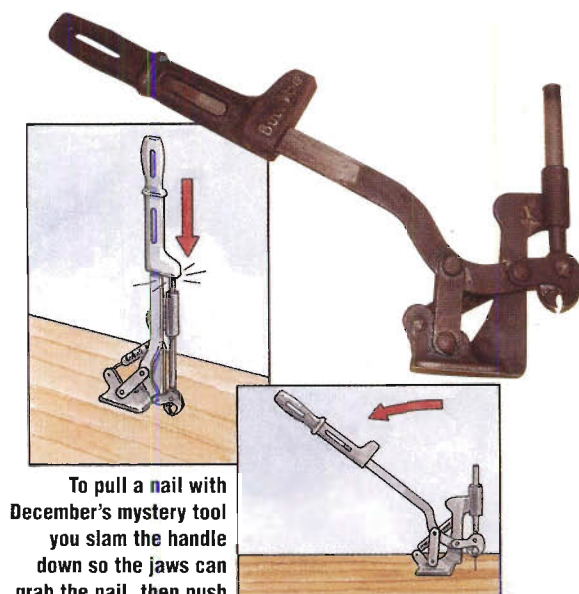
Stephen C. Kleinatland
Lake Hopatcong, New Jersey

Telling It Straight

Dental details aside, Stephen is correct: the mystery tool submitted by **Bill Hopcraft** of Millington, New Jersey, is a nail puller. Specifically, as **Don Fry** of Charlottesville, Virginia, pointed out, a "Bulldog" nail puller, patented on March 1, 1898 by Grammes & Sons L.F. of Allentown, Pennsylvania.

"The jaws open and are positioned on either side of a nailhead," explained **L. Terry Downs** of Marietta, Georgia. "Then the sliding portion of the handle is used as a hammer, striking the top of the rod connected to the jaws," said **Rob Griffith** of Roscoe, Illinois. "The handle is a sleeve on a shaft," continued **Jim Shumar** of Winchester, Virginia. "When it strikes, the jaws of the 'pincher' are driven below the surface of the wood and close tightly around the underside of the nailhead."

Finally, according to **Dave Kautz** of Upperco, Maryland,



To pull a nail with December's mystery tool you slam the handle down so the jaws can grab the nail, then push it back for extraction.

"Extraction is completed by pulling the sliding handle up and pushing down in a manner similar to that of a claw hammer." "That flat part on the base of the tool is to give leverage when you swing the handle," said **Antonio C. Mesquita** of Newburgh, New York.

The process, said **Elsie Bult** of North Catasauqua, Pennsylvania, "went quicker using this tool than a crowbar and a hammer." Another advantage? "With this tool, you don't have to tear apart a good stud to get out a nail," according to **Seamus Daley** of Parker, Colorado.

Wanda VanHorn of East Canton, Ohio, notes that "the railroad had a similar tool for

pulling spikes." "The jaws on the smaller pullers had two teeth, and the larger ones three or four," said **Dennis Fullerton** of Converse, Texas, who pulled spikes from an old railroad in Panama.

In both cases, noted **Billy Ralston** of Glasgow, Kentucky, "The straight pull didn't bend nails, so they were easier to straighten for reuse." Billy worked as a roustabout for a building crew in 1944 - 45. At that time, "because of the war effort and expense, all nails were straightened and sorted by size every day for reuse" — thus creating a lot of work for this tool.

— Joanna Werch Takes



WINNER! Amy Nielsen of Maple Valley, Washington wins a Delta 36-412, 12" Dual Bevel Miter Saw. We toss all the Stumpers letters into a hat to select a winner.

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WHY CHINA NOW

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By 2007, China is expected to have 500 million cell phone users.⁵



ALGER

How to Turn a Single Barley Twist

By Steve Blenk



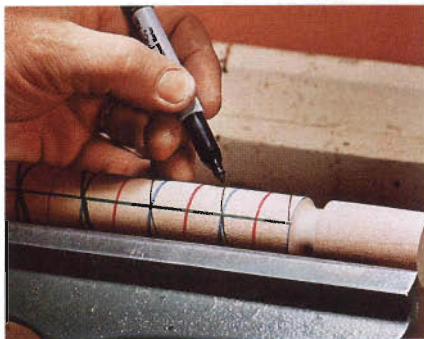
Despite the stories, I'm really no more twisted than the next turner. But occasionally I do add a little class to turned spindles by carving spirals. It's not as tough as it looks, and is quicker than you'd think. You can do it without routers or complex jig setups, and it introduces an eye-catching historical element to your work.

A common twist we see in British and American furniture turning is the barley form. This generally takes a single or double twist format and is very distinctive. It lends itself well to any straight or slightly tapered section of a spindle turning.

To lay out a single barley twist, turn your spindle profile and leave it slightly proud over diameter — the extra will sand off during your finishing process. Design your turning with a cove or V-cut at either end of the spiral section to allow for easier finish cuts on the ends. Using your calipers, transfer the diameter of the spindle as a segment length to the area or section you wish to spiral. Repeat this process along the entire length to be carved. If it's a tapered section of the spindle, reset the calipers for each segment. You should wind up with a spindle that has segments marked the length of the proposed spiral.



It all starts with layout. You can't make the progressive cuts shown above without drawing the spiral first. For the single twist above you'll need a 1:1 pitch. Use the diameter of the stock as your first dividing lines (blue). Divide those segments again in half (red), then mark two horizontal (green) lines exactly 180° opposed from one another. Now you can draw the spiral (black).



With stock between centers, lay out and mark your spiral. Here the author uses a black marker to create a 1:1, single twist ratio.



The barley twist is started by using a dovetail saw with a depth stop clamped in place. Rotate the stock toward you by hand.

The Pitch

Pitch is one of the variables we can play with on a spiral. To run a single twist, we'll set the pitch (ratio of length to rotation) at 1:1. This means there will be one diameter's worth of length for each full rotation of the spiral. To set the pitch, divide each diameter segment you have laid out in half by running a pencil on the turning. You now have two segments for each diameter of length.

Once you have the segments marked out, use your tool-rest to mark out two lateral lines 180° apart (on opposite sides) along the length of what will be the spiral. (See the photo at left.) If your lathe lacks indexing, you can use two opposite drive center spurs as indicators for where to draw your lines, or use your calipers set to just touch the O.D. (the touch points will be 180° apart).

Woodturning continues on page 26 ...

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Once the spiral or twist has been incised with the dovetail saw, break the cut open with a flat chisel. The author uses a variety of carving chisels and gouges to pare the waste from the twist.



After a sufficient quantity of stock has been pared away, switch to a sweep or concave chisel. Invert it and continue to remove wood. It begins to shape the rounded upper edge of the spiral.

Starting The Spiral

You should now have rectangular sections marked along the length of the work. To draw your single spiral, simply choose one set of these boxes and run a diagonal line from corner to corner on each successive box. Note: this is also where you decide if your spiral is to be left- or right-hand. If you lay it out away from you starting at the tailstock (right) end, it will be right-hand. If you mark your layout away from you starting at the headstock (left) end, it will be left-hand.

Next, use a dovetail or tenon saw with a depth stop clamped to the blade (top photo, previous page) to cut the line of the spiral down to depth. For a single barley twist I recommend 1/3 the total diameter

of the turning. Cut along the line to the depth of the stop, rotating the spindle by hand as you go. Keep your saw vertical, and cut on the top of the spindle to keep your angle consistent. You will cut the width of the saw's kerf that makes one complete circuit of the turning for each diameter of length it travels.

Carving
I use several very sharp carvers' chisels to pare the waste quickly from the spiral cut's edges. You can even rest the chisel on the tool-rest and rotate the turning carefully by hand to speed removal. I use a flat chisel to "break the cut open," and

Sanding

If your lathe will run at low speeds, you can sand the spiral under power. Start with 80-grit or so to remove chisel marks, but be careful not to oversand and ruin your form. (Remember that extra



For fluted spirals, you can also use a rasp to remove wood and shape the bottom of the cut.

dimension you left? Here's where it disappears.) Roll or fold your paper (old belt material works well) and allow the abrasive to follow the spiral under power. Reverse the lathe as well if possible. Work through the grits down to 220 or so, both under power and stationary. Keep at it to get all saw marks and torn grain. With care, the result will be a good, even barley twist. A little practice, and it will become a quick job.

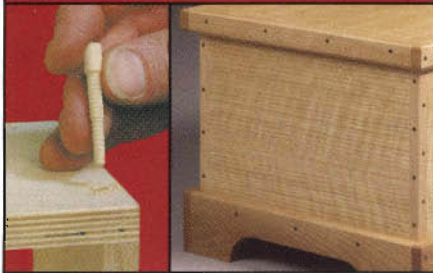


As with most woodworking endeavors, sanding is one of the final steps before finishing. Strips of sanding belts can be folded and used for this purpose.

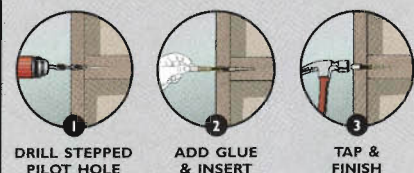
Once you get the idea, keep experimenting. There are no end of variations on the spiral concept: open, fluted, multiple starts, you name it. Balusters and newels, furniture, or small craft items can all be spiralled. If you would like a graduate course in the process, try Stuart Mortimer's book on the subject: *Techniques of Spiral Work*.

Woodworker's Journal's Steve Blenk is a Washington state professional woodturner.

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Harris Lebus

This eye-catching reproduction piece displays many of the signature aspects of the British Arts & Crafts style, including a chamfered crown, muntins in the glazed doors, gentle arches in the paneled doors, solid sidewalls and splayed feet.

Library Bureau

By John English

Daniel Prentice was born in 1881 in Middlesex, England. He went to work for the Harris Lebus Furniture Company in his teens and was trained as a French polisher. His best friend, Harris Lebus, Jr., was the eldest son of the owner, who died in 1907. For the next seven years the new team, a gifted craftsman and a rising

business star, influenced a design environment largely inspired by the doctrines of Ruskin, Morris and Rennie Mackintosh. In doing so, they produced some of the most memorable production pieces in the British Arts & Crafts movement.

Unfortunately, Daniel died on the battlefield in 1915. Despite the loss, his partner carried on and the Harris Lebus Company continued to thrive. Sadly, their emphasis on Arts & Crafts pieces almost completely disappeared after the First World War.

Project Features

The original library bookcase was issued in 1910, the heyday of the Lebus-Prentice partnership. It stood 83" tall by 38½" wide and displayed many signature aspects of the British Arts & Crafts style: a chamfered crown, muntins in the glazed doors, gentle arches in the paneled lower doors, solid sidewalls and splayed feet to add stability to the piece.

This piece is built as two separate units — a bookcase on top of a desk, or bureau. While the tongue-and-groove back in the bookcase replicates the original Lebus design, I confess I cheated on the bureau's invisible back. There, I used a more modern solution — Baltic birch plywood.

As with the original, the sides of the bureau are cut from glued-up panels of solid oak. You'll need to make these an inch or so longer and wider than the listed dimensions, to

allow for trimming to shape. The final dimensions can be found in the *Material List* on page 31.

The stock selection here is worth noting. Be sure the quartersawn white oak boards you select for the side panels are long enough for both the bureau and bookcase sides at the same time. (You'll need two blanks ¾" x 15⅞" x 83¼") With the grain pattern running the entire height of the finished piece, you will achieve a sense of visual continuity.

Side Panels

To add strength and stability to the panels, the edges of the boards which make up the sides are profiled with alternating tongues and grooves. See the *Elevation Drawings* on page 31 for construction details. Mill them with a ¼" dado head in your saw. Set the fence to center the cuts by running scrap through, making sure it's the same size as the workpieces. Form the grooves 1/16" deeper than the length of the tongues to allow for a tight joint, while providing an escape channel for excess glue and air.

Glue and clamp the panels and, after the glue cures, clean up any excess along the joints with a cabinet scraper. Crosscut the panels to produce two bureau side blanks and two bookcase side blanks (pieces 1 and 2). Joint their back edges to ensure a good appearance and a straight edge, and you're ready to lay out some cuts.



This photo of one of the many versions of the Harris Lebus library bureau was taken by Artfurniture, a British web-based antiques dealer which had it for sale in the spring of 2003 on their web site, www.artfurniture.co.uk

Basic Table Saw Joinery



Figure 1: The cuts which reveal the desk sides are made on the table saw to keep them straight, and then finished with a saber saw.

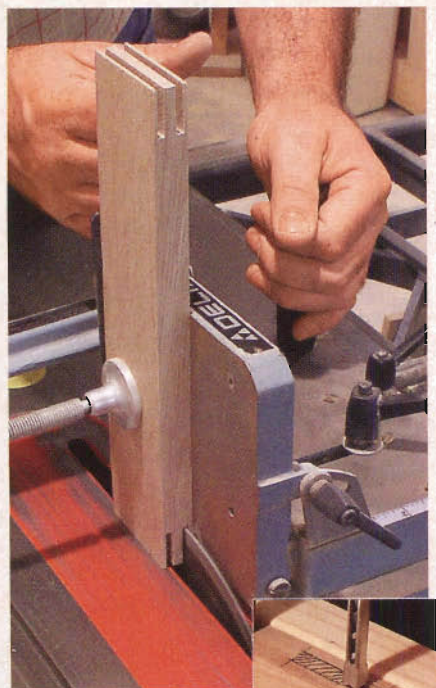


Figure 2: The author used a mortising machine (inset) and a tenoning jig to create the joinery in the drawer support frame.

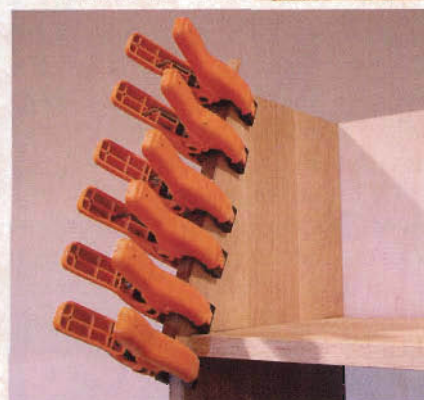


Figure 3: Establish vertical grain on the slant of each bureau side by gluing a strip of oak in place with 3-way clamps.

Lay out the bureau sides according to the *Drawings* at right, then make as many of the cuts as possible on your table saw, as shown in *Figure 1*. A tapering jig helps with the angled cuts, and the stopped cuts are made by raising the saw blade through the piece. Complete the process with a saber saw, then sand the cuts clean.

Plow three stopped dadoes across the inside face of each side using a router and straightedge and rip the rabbet for the back on the table saw, running the cut through the back legs (see *Drawings* at right).

Glue up blanks for the top and bottom shelves (pieces 3 and 4) and trim to size. On the table saw, bevel the front edge of the top shelf at 20°. The drawer support frame is made up of two stiles and two rails (pieces 5 and 6) and employs mortise and tenon joinery (see *Figure 2*). Glue and clamp the subassembly, checking for square as you do. When the glue is dry, cut notches in the front edge of it and each of the shelves. These notches will allow the shelves to fit properly in their stopped dadoes.

Attach the upper door stop (piece 7) to the underside of the top shelf with glue and screws driven up from the bottom.

Assemble the shelves and frame to the bureau sides with glue and clamps. While there won't be much movement, I still recommend gluing only the front half of each dado. The substantial 1/2" thick bureau back (piece 8) will keep the joints from spreading to the rear: install the back with pneumatic 18 gauge brads, or predrill for standard 4d finish nails.

The Fall Front Supports

After the glue dries on the bureau assembly, cover the exposed end grain on the two 20° slopes with solid oak banding (pieces 9). This is ripped from the edge of a board, then glued in place (see *Figure 3*).



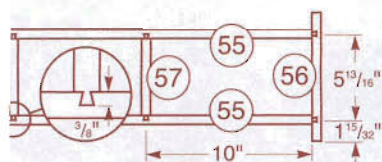
Figure 4: The vertical grain on the ends of the drawer supports is a T-molding ripped from the edge of a board and glued into a dado.



One of the most interesting aspects of this project is the fall front — a horizontal door which drops down to form a desktop — which rests on two sliding supports (pieces 10). After they're cut to shape, the end grain on the front edge of each is covered by a T-molding (piece 11) which sits in a dado. When applied to end grain, this approach provides a lot more gluing surface than standard edge banding.

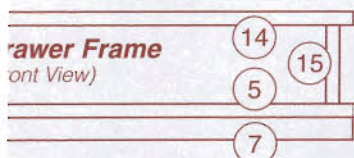
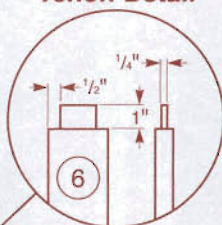
Create the molding on the edge of a board using a rabbeting bit in your router or a dado set in the table saw, then rip it to size. Use a tenoning jig (see *Figure 4*) or a high auxiliary fence to mill the dadoes, then glue and clamp the T-molding in place. Sand the edges after the glue dries.

The built-in stops on the supports must be reinforced with screws (pieces 12), or they'll eventually shear across the grain. I used some hardware store steel to create the large square washers (pieces 13) for these screws, an addition which will add years of use to these supports. Cut the washers to size and countersink the screw heads. Then apply finish to both supports, because after installation, they're impossible to reach.



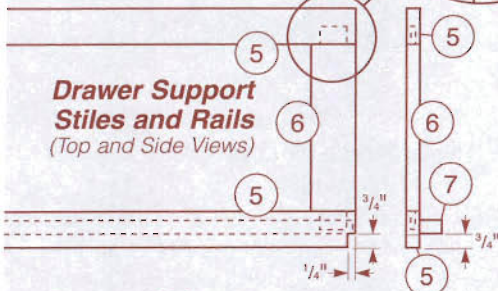
Pigeon Hole Assembly
(Front View)

Drawer Support Tenon Detail

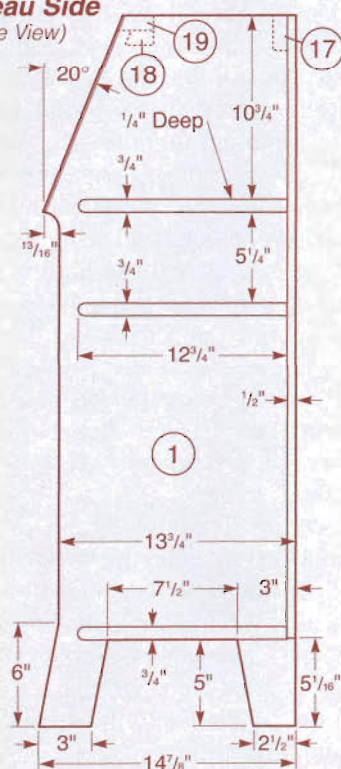


Drawer Frame
(Front View)

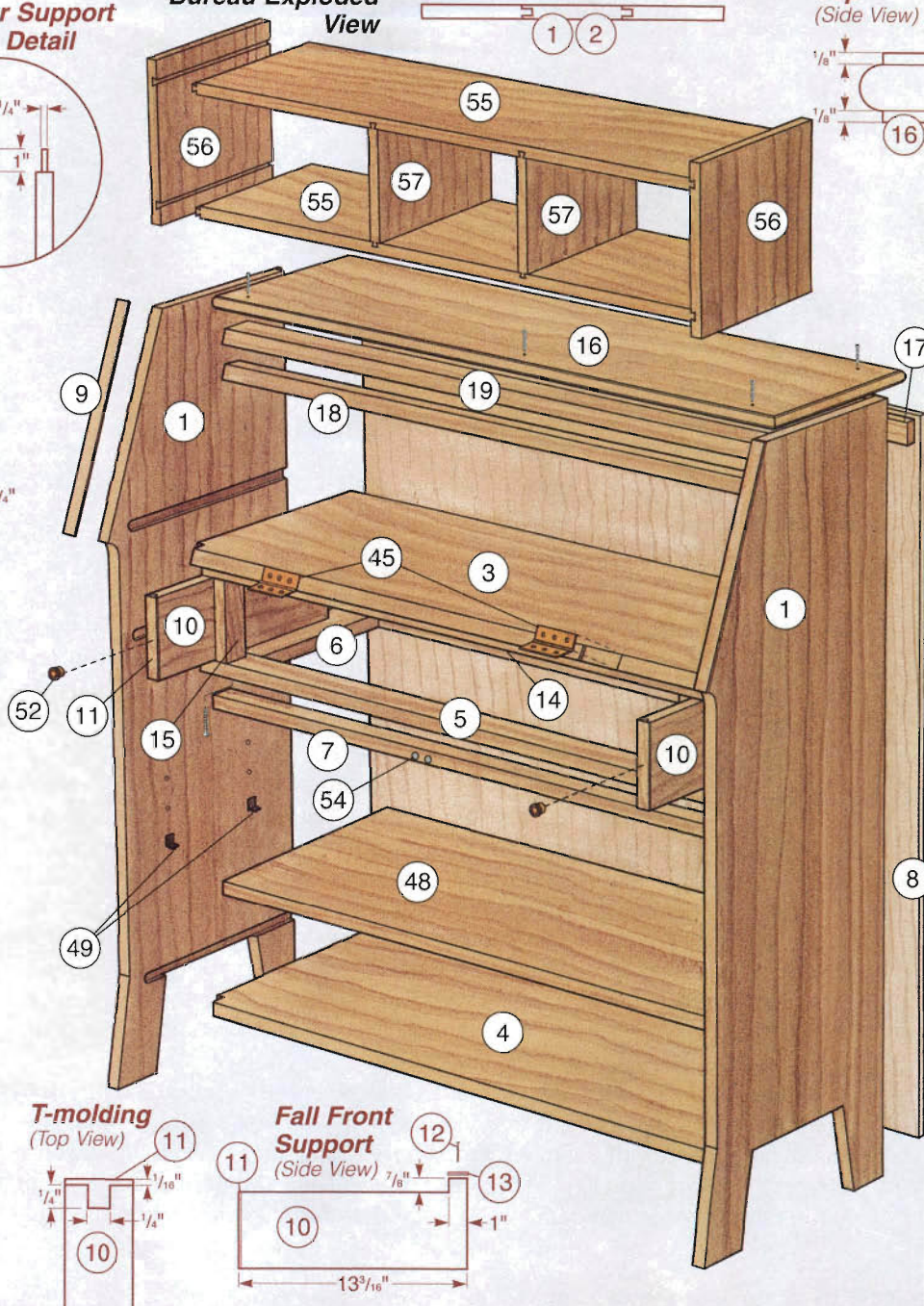
Drawer Support Stiles and Rails
(Top and Side Views)



Bureau Side
(Inside View)

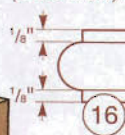


Bureau Exploded View

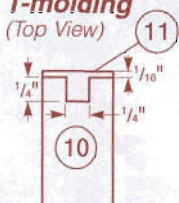


The author glued up the side panel blanks using tongue and groove joinery.

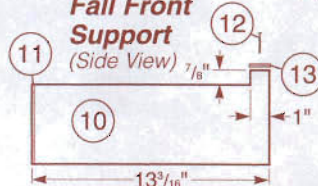
Bureau Top
(Side View)



T-molding
(Top View)

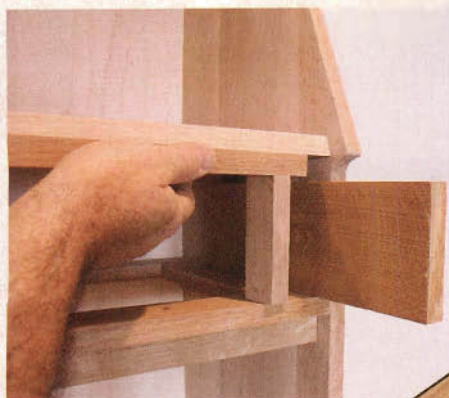


Fall Front Support
(Side View)



Material List (Bureau)

	T x W x L		T x W x L
1 Bureau Sides (2)	3/4" x 14 7/8" x 41 1/2"	11 T-moldings (2)	5/16" x 3/4" x 4 1/4"
2 Bookcase Sides (2)	3/4" x 10" x 40 3/4"	12 Fall Front Support Screws (2)	#8 x 1 5/8"
3 Bureau Top Shelf (1)	3/4" x 13 1/4" x 33 1/2"	13 Fall Front Support Washers (2)	1/8" x 3/4" x 1"
4 Bureau Bottom Shelf (1)	3/4" x 13 1/4" x 33 1/2"	14 Drawer Frame Top Rail (1)	3/4" x 1 1/2" x 33"
5 Drawer Support Stiles (2)	3/4" x 2" x 33 1/2"	15 Drawer Frame Stiles (2)	3/4" x 1 1/2" x 4 3/8"
6 Drawer Support Rails (2)	3/4" x 2 1/2" x 11 1/4"	16 Bureau Top (1)	3/4" x 11" x 36"
7 Upper Door Stop (1)	3/4" x 1 1/4" x 33"	17 Bureau Top Cleat (1)	3/4" x 1 3/4" x 33"
8 Bureau Back (1)	1/2" x 33 13/16" x 36 7/16"	18 Fall Front Door Stop (1)	3/4" x 1" x 33"
9 Bureau Edge Bandings (2)	3/32" x 3/4" x 12 3/4"	19 Top Rail (1)	3/4" x 1 3/4" x 33"
10 Fall Front Supports (2)	3/4" x 5 1/8" x 13 1/8"		



**Fall Front
Support Detail**

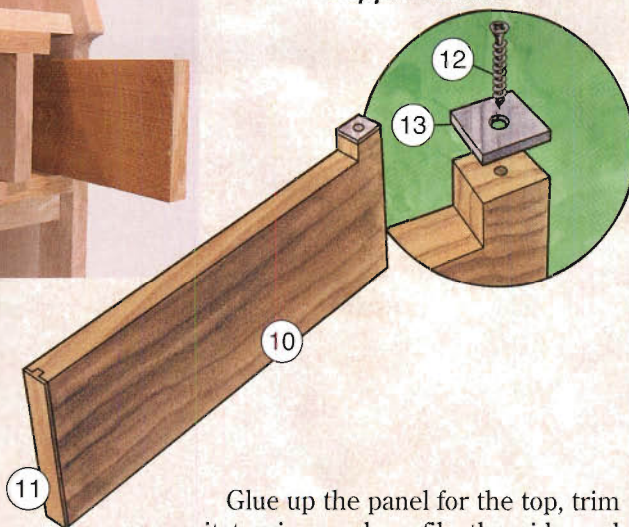


Figure 5: A three-part frame captures the fall front supports against the bureau sides. Be sure to reinforce the stops on the fall front supports with a screw and a small steel plate to combat wear (detail at right).

Wrapping Up the Bureau Carcass

The fall front supports are held in place by a frame which surrounds the large pencil drawer. This frame is composed of a top rail (piece 14) and two short stiles (pieces 15). Cut these parts to size, dry fit them in the opening and adjust as necessary. Screw and glue them together and position the two fall front supports in place, then screw and glue the drawer frame in the opening, as shown in *Figure 5* above.

The bureau top (piece 16) is supported by the sides and also by a cleat (piece 17) attached to the plywood back. Cut this cleat to size and install it flush with the top of the plywood, using predrilled and countersunk screws and glue.

Glue up the panel for the top, trim it to size, and profile the side and front edges (refer to *Figure 6* below). I shaped mine with a bearing-guided beading bit in my hand-held router.

Two moldings need to be attached to the underside of the bureau top before the top can be installed on the carcass. These pieces of straight stock — a door stop (piece 18) and a top rail (piece 19) — both get a 20° bevel ripped along one edge. After cutting them to size and creating their bevels, dry fit all parts to check their fit and to mark their locations. Sand both pieces and attach the rail to the top and the stop to the rail, using glue and screws (predrill and countersink the holes). With that done, you can secure the top to the bureau using a dozen 2" screws (predrill and countersink the holes), driving them down through the top.

Figure 6: The edge of the bureau top is profiled on its top and bottom with a bearing-guided beading bit.

Moving on to the Bookcase

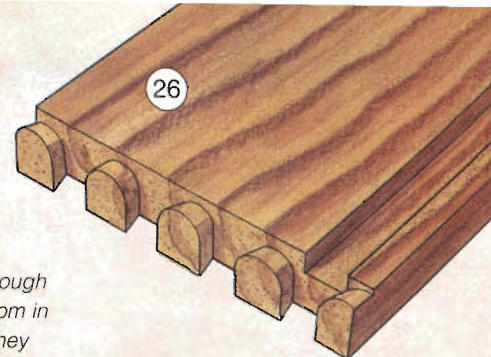
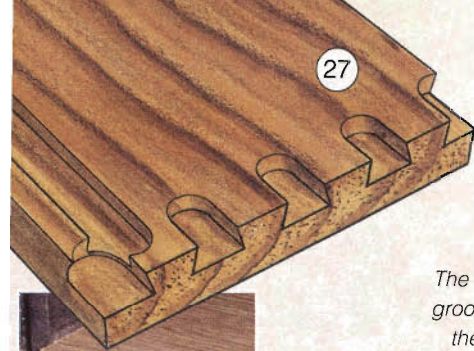
The Bookcase Carcass

It's a good idea to complete the bookcase carcass next. That will allow you to build all the doors at the same time. The blanks for the sides of the bookcase (pieces 2) were glued up earlier, so the next step here is to match them to the bureau sides for a continuous grain pattern. After trimming them to size, lay out and mill two sliding dovetails in each side (see *Figure 7*, inset), noting that the top dado is farther from the end of each board than the bottom one. Glue up panels for the bookcase top and bottom (pieces 20 and 21) and trim to size. Sand the panels, then mill a sliding dovetail on each end of each panel (see *Figure 7*). As always, I recommend testing the setup on scrap.

Use a bearing-guided rabbeting bit to mill the rabbet on the back edge of each of the bookcase sides, top and bottom. Then assemble the bookcase with glue and clamps, making sure it is square and flat as you go.

After the assembly dries, glue and clamp three thin strips (pieces 22) to the bottom of the bookcase (see *Figure 8*) to keep things stable when you place it on the bureau.

Note that the back of the bookcase is a series of narrow boards (pieces 23, 24 and 25) which are given a tongue and groove treatment. The two outside boards are different widths than those in the field, to accommodate hidden tongues and grooves. After dry-fitting, use a chamfering bit to ease the edges where the boards will meet inside the bookcase (see *Figure 9*).



Pencil Drawer Dovetail Details

The dovetailed pencil drawer sides (right) feature a through groove for the drawer bottom. The grooves for the bottom in the drawer front and back (left) are stopped before they emerge, for aesthetic reasons.

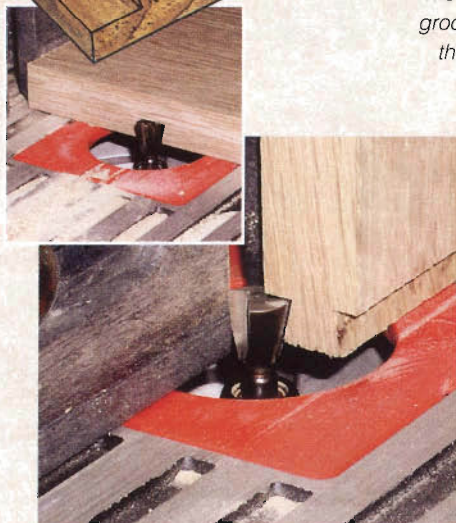


Figure 7: The bookcase carcass is assembled with sliding dovetail joints which the author milled with a 1/2" 14° bit in his router table.



Figure 8: Three spacers under the bookcase provide a solid, stable footing when it sits on top of the bureau and gets screwed in place.

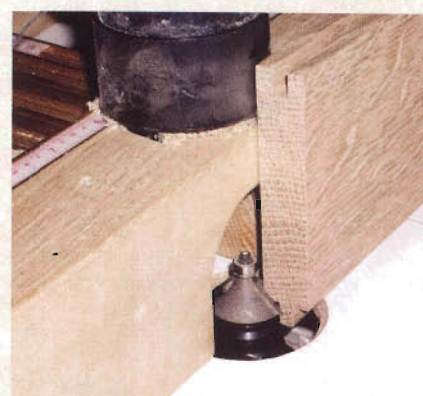


Figure 9: After fashioning tongues and grooves on the boards for the bookcase back, gently chamfer the visible (inside) edges.

Install the back boards with screws driven through pre-bored, countersunk holes into the wide rabbets you milled earlier in the back edges of the bookcase components. Don't use glue: they have to be free to move.

Building The Bureau Drawer

This is a heavy-duty drawer designed with dovetail joinery to last a century or more. Cut the sides, front and back (pieces 26 and 27) to size, then use a commercial dovetailing jig to create the half-blind joinery in the corners, as shown in the *Detail Drawings* above. Plow stopped grooves in the drawer front and back, and through grooves into the sides, to accommodate the drawer bottom (piece 28). Assemble the drawer with glue and clamps, but don't glue the bottom in its grooves, to allow for movement.

Building The Bureau Doors

Two arch-top doors dress out the bureau and hide the details of what you choose to store in the bureau. The components include two arched

top rails, a pair of straight bottom rails, four stiles and two glued-up panels (pieces 29 through 32).

After cutting all the parts to size, lay out the arches on the top rails (see the *Elevation Drawings* on page 36). Band saw the rails to shape, then tape them together to drum sand the curves. Use a bearing-guided rabbeting bit to plow grooves in all of the door stiles and rails for the panels, as shown in *Figure 10*.

Glue up stock for the two door panels and plane it to thickness. Now dry clamp the components together and use them as templates to lay out the shapes of the panels on your blank (see *Figure 11*). Extend the dimension of the panels by adding 3/8" to the marked out shape on the top, bottom and side. (so they'll be captured by the stile and rail grooves). Next, band saw the panels to their final shape.

Glue and clamp the doors together, making sure that the panels are not glued into their grooves. After the glue cures, dry fit them in the opening and make any minor adjustments required for a perfect fit.

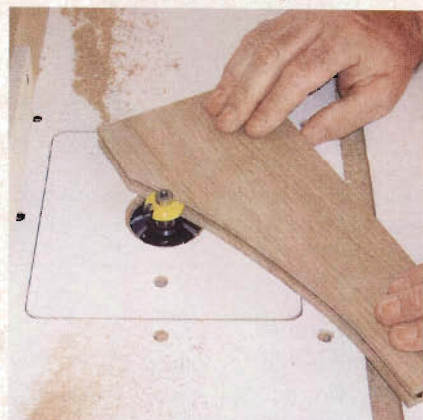


Figure 10: Plow the grooves for the panels in the curved door rails using a bearing-guided rabbeting bit.



Figure 11: Dry clamp the doors together and use them as templates to mark the shape of the panel. Add 5/16" all round for the groove.

Fall Front, Crown and Doors

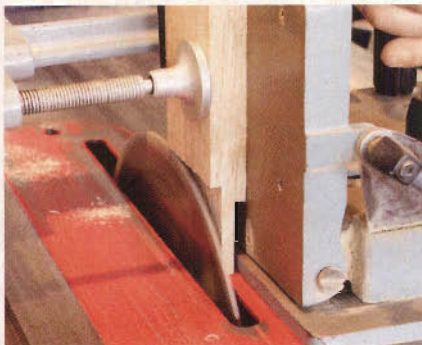


Figure 13: A tenoning jig makes quick work of the uneven cheeks on the bookcase door rails: one cut is 3/8" deeper than the other.



Figure 14: Trim the shoulders on the bookcase door rail mortises to size using a dado head in the table saw.

The Fall Front

The fall front is made up of two stiles, two rails and a panel (pieces 33 through 35). After cutting these pieces to size, plow a groove centered on the inside edge of each of the four frame components, using a bearing-guided rabbeting bit (see the *Drawings* on page 37). Adjust the bit height to create tongues on the ends of the stiles, then dry fit the frame.

The panel becomes the writing surface, so it is built to fit the frame as tightly as possible. This means there is very little room for movement: it needs to be cut from a kiln-dried quartersawn board with very tight grain.

Mill the panel to size and use your bearing-guided rabbeting bit to form a rabbet on all four edges. Test the fit and make adjustments before gluing and clamping the fall front together. Check for square as you apply clamping pressure, and only apply glue on the stile/rail joints.

The Bookcase Crown

The first element in the built-up crown molding is a backer (piece 36) which is glued and screwed in place. Drive the screws up through the bookcase top into pre-drilled, countersunk holes.

A large chamfered molding (piece 37) caps the built-up crown. Rip one edge to 35° on the table saw, rip the molding to width, then miter it to fit and attach it with glue and screws. The screws are driven from the inside into pre-drilled, countersunk holes.

Attach the bookcase top rail (piece 38) next. Two screws secure it to the sides, while glue and clamps attach it to the underside of the bookcase (see *Figure 12*). These screws will eventually be covered.

The second chamfered molding (piece 39) is ripped to size and shaped with a bearing-guided chamfering bit. Miter it to length and glue and clamp it in place.

A third molding (piece 40) completes the crown. It's a square piece of stock which is mitered and glued in place at the top of the door opening and the sides of the case.

The Bookcase Doors

Building the glass inset doors is the most complex phase of construction in this project. Begin by cutting all parts to the dimensions shown in the *Material List*. The first operation is the creation of tenons on the ends of all four rails (pieces 41). The cheek on one side of each tenon is 3/8" deeper than that on the other, as shown in *Figure 13*. Trim the shoulders flush with the shorter cheek using a dado head in the table saw (*Figure 14*).



Figure 15: The small mortises for the muntins in the bookcase doors are chopped with a 1/4" chisel chucked in the mortising machine.

A bearing-guided rabbeting bit chucked in a table-mounted router makes the rabbet on the inside edge of each rail and stile (pieces 42). Then it's time to fire up the mortising machine to chop the two mortises in each stile.

Figure 12 : Secure the bookcase top rail to the carcass with glue, clamps and a couple of screws, which will eventually be covered.

Hard-to-find Hardware

These supplies are available from **Woodworker's Journal**.

Mission Pulls* #62935\$14.59

Butt Hinges (pair)** #32782.....\$4.99

Brass Knobs*** #35295.....\$1.99

Glass Retainer (pack)† #28530.....\$2.29

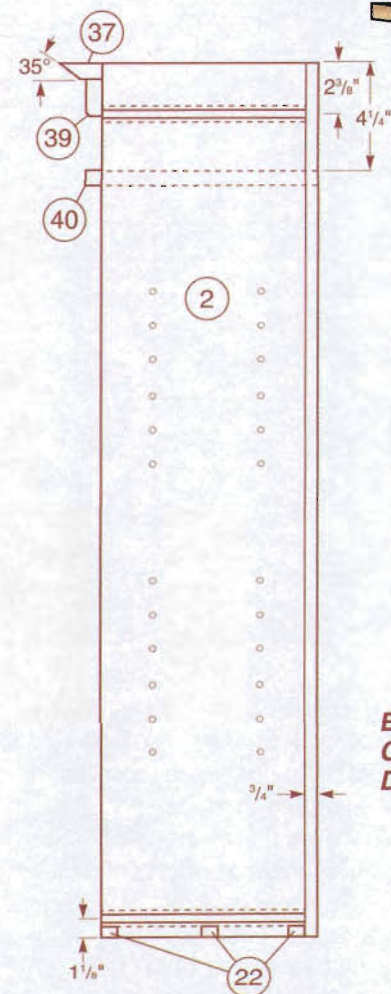
*Four required. **Six required. ***Two required. †Three required.

To order your supplies, call 800-610-0883
and mention code W4043.

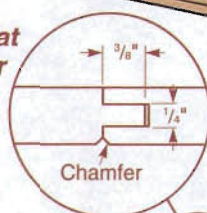
Crown Assembly Detail

Bookcase Exploded View

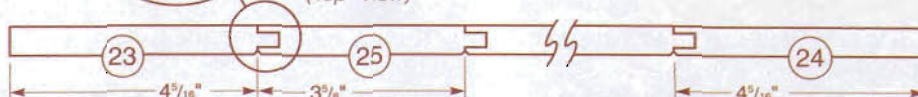
Bookcase Side (Inside View)



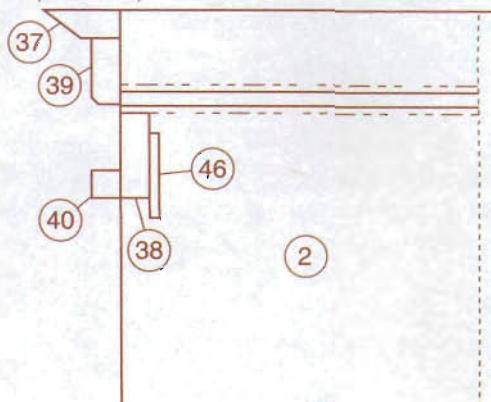
Back Slat Chamfer Detail



Bookcase Back Assembly (Top View)



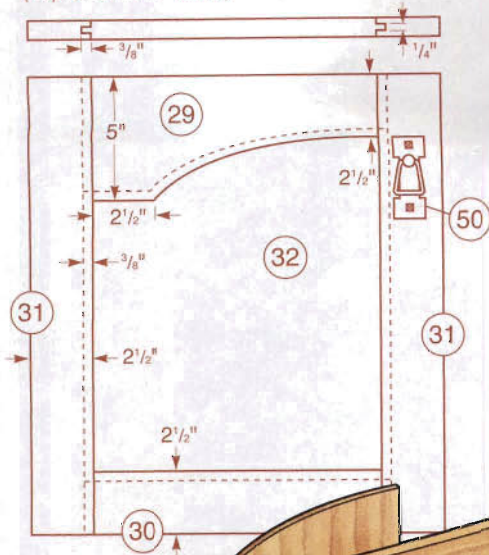
Bookcase Molding and Rail Assembly (Side View)



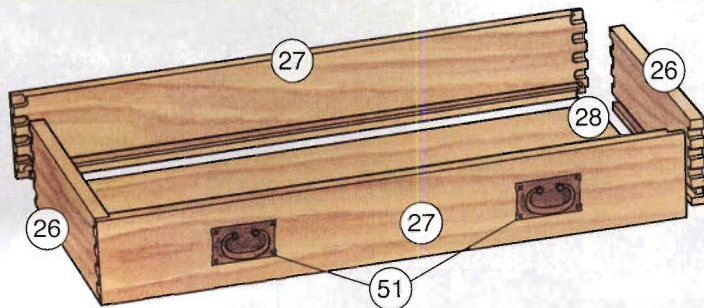
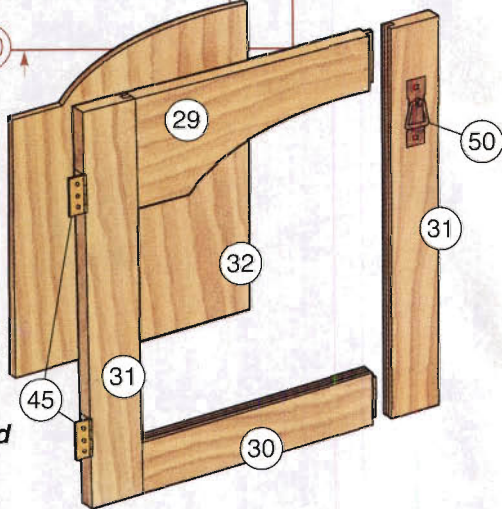
Material List (Bookcase)

	T x W x L
20 Bookcase Top (1)	3/4" x 10" x 33 5/8"
21 Bookcase Bottom (1)	3/4" x 10" x 33 5/8"
22 Spacers (3)	3/4" x 1/2" x 33"
23 Left Bookcase Back Slat (1)	3/4" x 4 11/16" x 37 7/8"
24 Right Bookcase Back Slat (1)	3/4" x 4 5/16" x 37 7/8"
25 Field Bookcase Back Slats (7)	3/4" x 4" x 37 7/8"

Bureau Door (Top and Front Views)



Bureau Door Exploded View



Pencil Drawer Exploded View

Dovetail Layout

MATERIAL LIST (Drawers and Fall Front)

	T x W x L
26 Pencil Drawer Sides (2)	3/4" x 4 3/8" x 12 1/2"
27 Pencil Drawer Front & Back (2)	3/4" x 4 3/8" x 29 7/8"
28 Pencil Drawer Bottom (1)	1/2" x 12 1/2" x 28 7/8"
29 Top Bureau Door Rails (2)	3/4" x 5 1/2" x 12 1/4"
30 Bottom Bureau Door Rails (2)	3/4" x 2 1/2" x 12 1/4"
31 Bureau Door Stiles (4)	3/4" x 2 1/2" x 18 1/4"
32 Bureau Door Panels (2)	1/2" x 12 1/4" x 14 1/8"
33 Fall Front Stiles (2)	3/4" x 2 1/2" x 7"
34 Fall Front Rails (2)	3/4" x 2 1/2" x 33"
35 Fall Front Panel (1)	1/2" x 7" x 27 1/4"
36 Crown Backer (1)	3/4" x 2" x 33"
37 Large Chamfered Molding (1)	3/4" x 2" x 63"
38 Bookcase Top Rail (1)	3/4" x 2 1/4" x 33"
39 Small Chamfered Molding (1)	3/4" x 1 3/4" x 58"
40 Square Molding (1)	3/4" x 3/4" x 58"
41 Bookcase Door Rails (4)	3/4" x 2 1/2" x 14 1/2"
42 Bookcase Door Stiles (4)	3/4" x 2 1/2" x 34 5/8"
43 Long Bookcase Door Muntins (2)	1/2" x 3/4" x 31 1/2"

Assembling the Final Details

If you dry fit the tenons to the mortises, you'll see that there's a small amount of material on either side of each mortise that still has to be removed. A rabbeting bit set for a 1/2" cut takes care of the material at the end of the workpiece. You can chop the waste from the other side using your mortising machine.

Chop the six small mortises in each door for the muntins (pieces 43 and 44) next (as shown in *Figure 15*, page 34). Then create matching offset tenons on the ends of the muntins by nibbling away the waste on your table saw. Use the same setup to create the half-lap joints in the muntins.

Dry fit all the door components, then glue and clamp each door together. After the glue cures, sand the doors and trim to fit the opening.

This is a good time to install the fall front, bureau and bookcase doors. They require a dozen simple brass butt hinges (pieces 45). Chop all 24 mortises, predrill for the screws and set the doors. Use one steel screw in each hinge: you'll have to remove them during finishing, and the brass screws are too soft to remove and reinstall.

Glue and clamp the bookcase's upper doorstop (piece 46) in place before you set that pair of doors. This is just a thin piece of stock that helps the doors line up properly.

Adding Shelves and Hardware

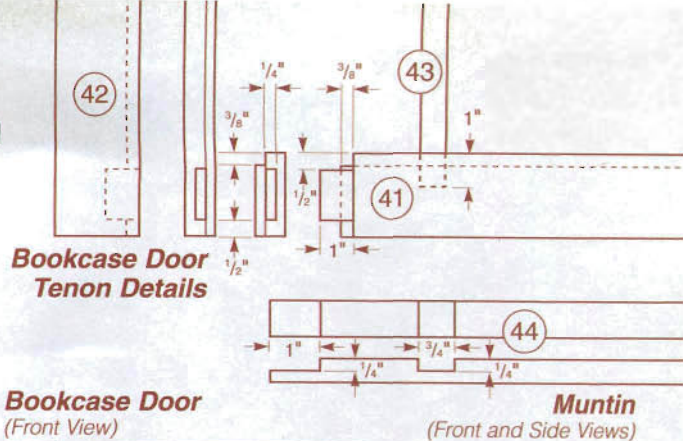
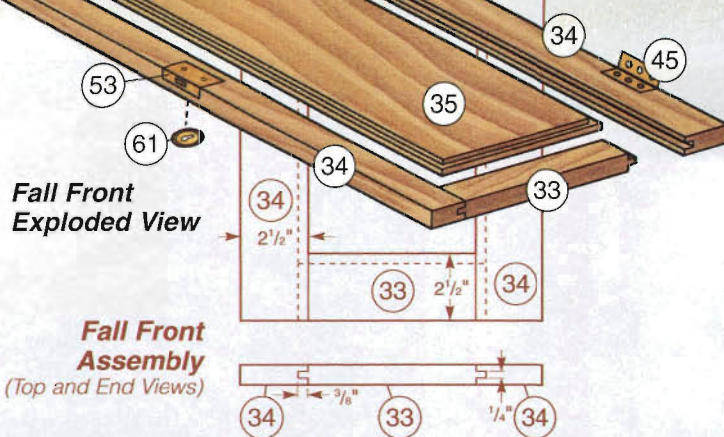
Cut the two bookcase shelves (pieces 47) and the single bureau

shelf (piece 48) to size. For stability and strength, I edge-glued two or three boards for each and used biscuits to align them.

The shelves are installed with adjustable shelf supports (pieces 49) which are seated in 1/4" holes. Use a template to ensure uniformity or the shelves will wobble.

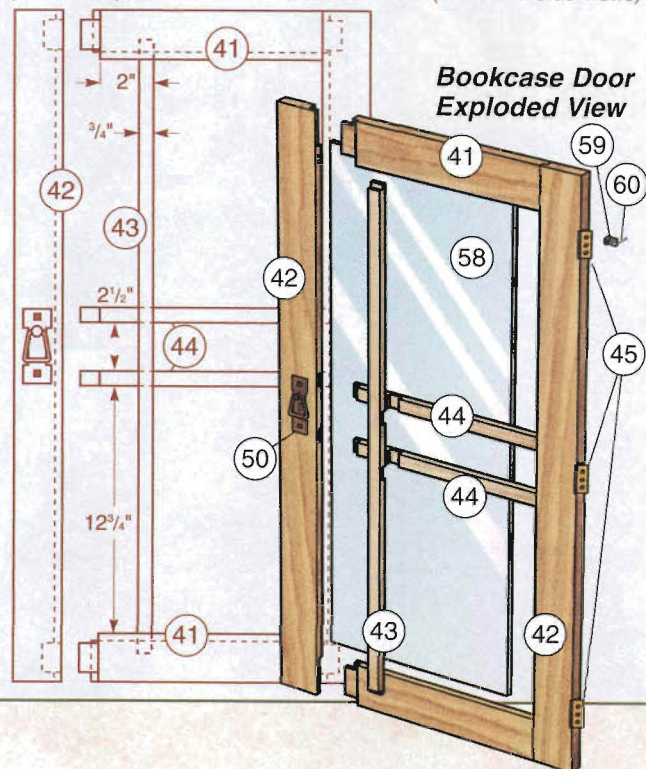
I went with Arts & Crafts handles (pieces 50) and pulls (pieces 51).

Install a pair of small brass pulls (pieces 52) to operate the fall front supports. These are attached with screws, instead of machine bolts. A simple cam lock (piece 53) keeps the fall front secured, and the key acts as a handle. Wrap up the hardware installation by equipping the four doors with magnetic or mechanical catches (pieces 54).



(Doors and Pigeon Holes)

	T x W x L
44 Short Bookcase Door Muntins (4)	1/2" x 3/4" x 13 1/2"
45 Brass Butt Hinges (12)	2" x 1 3/8"
46 Bookcase Doorstop (1)	1/4" x 2 1/2" x 33"
47 Bookcase Shelves (2)	3/4" x 8" x 33"
48 Bureau Shelf (1)	3/4" x 11" x 33"
49 Adjustable Shelf Supports (12)	1/4", Brass
50 Door Handles (4)	Arts & Crafts style
51 Drawer Pulls (2)	Arts & Crafts style
52 Fall Front Knobs (2)	Brass
53 Cam Lock (1)	Brass
54 Catches (4)	Magnetic or friction
55 Pigeonhole Top & Bottom (2)	5/8" x 8 1/2" x 32"
56 Pigeonhole Ends (2)	5/8" x 8 1/2" x 8 3/4"
57 Pigeonhole Dividers (2)	5/8" x 8 1/2" x 5 13/16"
58 Glass (2)	1/8" Thick, cut to fit
59 Glass Retainers (12)	5/8" x 5/8" x 1"
60 Retaining Molding Screws (12)	3/4" x #6, Brass
61 Escutcheon (1)	Brass



The Pigeonholes

The last item to build for this project is the removeable pigeon-hole assembly that serves to keep all your paperwork hidden from view. This assembly is comprised of a top and bottom, two ends, and two dividers (pieces 55 through 57).

After all of these parts have been planed to the right thickness and trimmed to size, chuck a 1/2", 14° dovetail bit in your router and set the depth of cut to 5/16". Plow two dovetailed dadoes in the top, the bottom and each of the ends (see *Drawings* on page 31 for details).

Set a fence on your router table to create the sliding dovetails on the ends of the top, the bottom and the dividers. Dry fit the assembly to ensure that the dividers line up with

the front. When it fits, glue and clamp the top and bottom to the ends and install the dividers.

The Finish and the Glass

I applied one coat of dark walnut oil, which brings out the flake in the quartersawn white oak and gives the piece a dose of instant antiquity. Follow up with three coats of natural finish.

After moving the piece to its permanent location, attach the bookcase to the bureau with six large brass screws. This is a safety consideration: the bookcase might tip if it isn't secured to the bureau.

I recommend tempered glass (pieces 58) for this project. The glass is held in place with small wooden retainers (pieces 59 and 60).

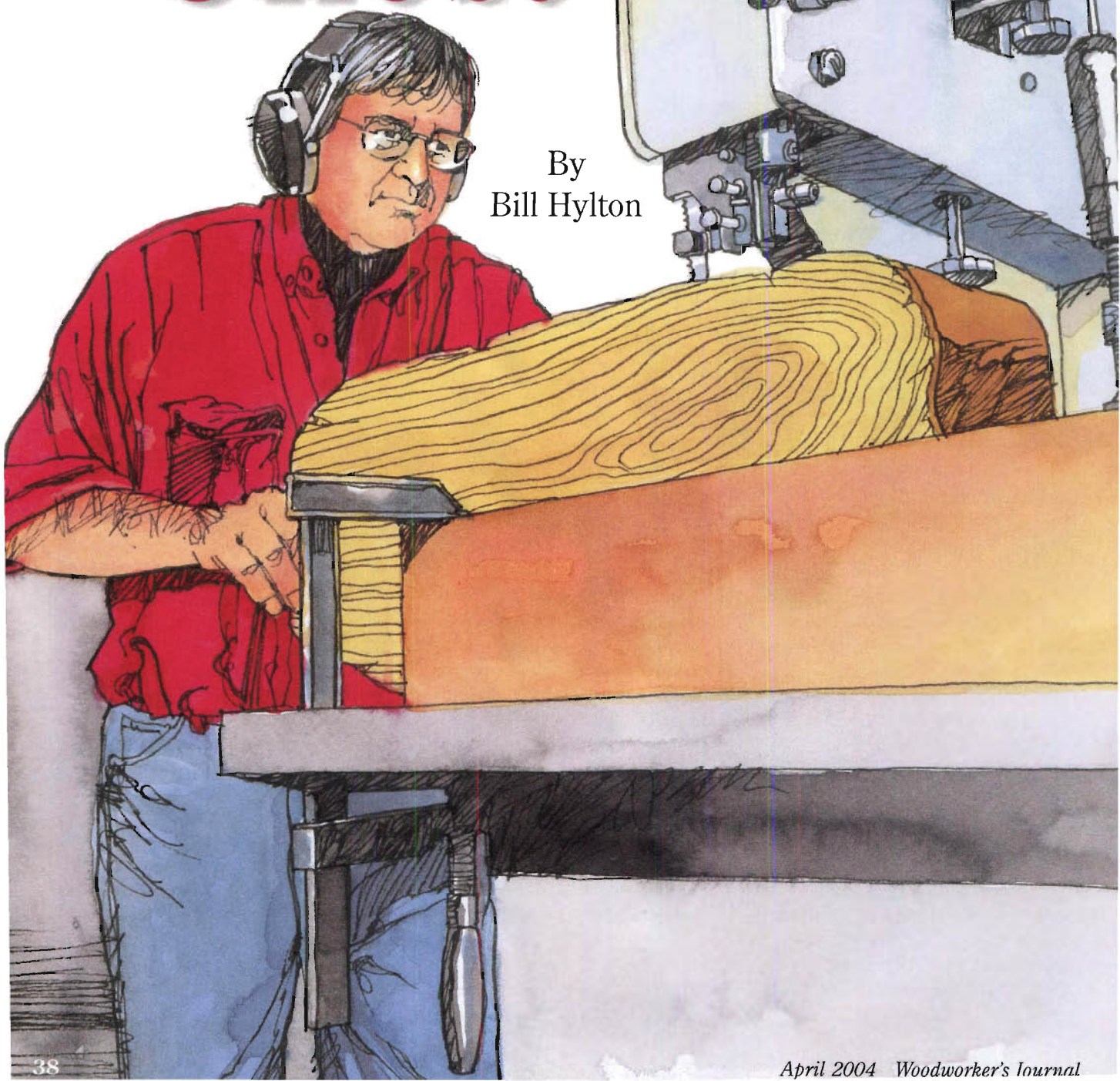
On the router table, mill a rabbet on the end of a wide board, rip and crosscut the retainers to size and chamfer the top edges with a sander. Apply a bead of clear silicon adhesive/sealant to each of the rabbets in the backs of the doors: this gives the glass an even bed, so it won't crack. Secure each pane with predrilled, countersunk brass screws driven through the wooden retainers. Don't over-tighten the screws. Mount the lock escutcheon (piece 61) and you're done.

With a century of history behind it, this heirloom quality piece should give your family at least another century of fond memories.

John English is a former editor of Woodworker's Journal.

Eastern Shore Chest

By
Bill Hylton



The perfect project for expanding the possibilities of your router. There's cope and stick joinery, sliding dovetails, panel raising and a few flutes just for fun.

This lidded chest has been one of my dream projects for about six or seven years, ever since I saw the archetype in the Museum of Early Southern Decorative Arts in Winston-Salem, North Carolina.

I made a step in the construction direction a couple of years later. I was creating a book about furniture construction (*Illustrated Cabinetmaking*, published by Reader's Digest Books; ISBN 0762-1018-30), and used it as the basis for a drawing showing how a frame-and-panel chest is made.

To do this, I got overall dimensions from the museum. Using a photo, I worked out the dimensions and made educated guesses as to the joinery and construction of the base, the chest bottom and the back. Using a CAD program, I drew up the plans for the chest below.

I call it the Eastern Shore Chest because the archetype was built (around 1760) in the part of Virginia that's on the eastern shore of the Chesapeake Bay. My chest is in no way a reproduction or a duplicate of the museum piece. For example, I used cope and stick joinery, unknown in the 1700s, to construct the frame-and-panel assemblies. I also used power tools and some some eye-popping walnut — skipping the blue, white and red paint of the original museum piece.

Planning and Shopping

This is an ideal project for contemporary, router-cut cope and stick joinery. So I knew from the get-go that I wasn't going to construct the front, back and end assemblies with mortise and tenon joints. If you happen to have *Illustrated Cabinetmaking*, you can compare the drawings on page 231 with the drawings here. I changed the construction of the base frame, the style of the breadboard ends on the lid and the molding profiles.

The most obvious departure from the original chest is the wood and finish. The museum piece, I mentioned, is painted. I prefer natural wood, and what better way to highlight the panels than with highly figured stock? My choice was walnut, as it's a native species that might have been used in the 1700s to make a chest like this.

But I opted to use a less costly secondary wood — poplar — for parts of the chest that would not show. This was a common practice in the 1700s, and still is today. The back assembly, chest floor, back frame member and feet are all poplar.

In a half-day trip to Hearne Hardwoods, I found an astonishing variety of figured and straight-grained walnuts to choose from. I got the poplar at a local sawmill. While I was shopping, I ordered a pair of hand-forged fish-tail hinges from Dave Fisher of Fisher Forge (610-562-5425) and I bought cut nails — 3d and 4d fine finish nails — from Tremont Nail Company (800-842-0560).



Into the Shop ...

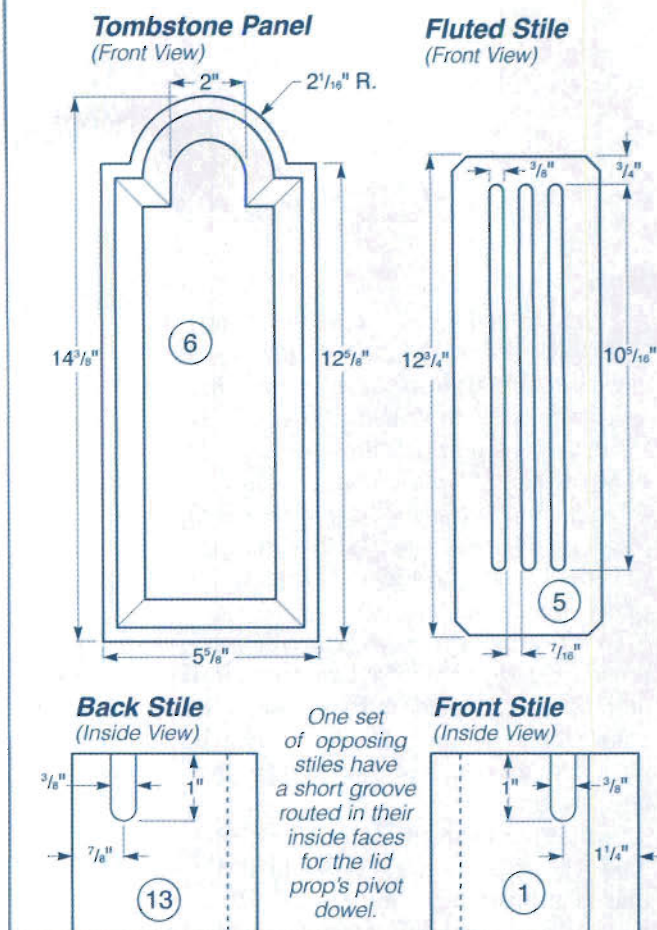
My first job was to redraw the plans, incorporating the changes I wanted to make. Then I prepared a cutting list and, from that, estimated the amount of stock I'd need. I typically start a project by roughing out all the parts. This means that I lay out the parts on my stock. Then I crosscut, joint and plane the stock to rough dimensions. To me, that's about 1" longer, 1/8" or 1/4" wider, and about 1/8" thicker than their finished size. I stack up the parts with stickers between them and allow them to acclimate to my shop. There usually is enough of a margin for reflattening a board that develops a modest bow, cup or twist. (Mild twisting did occur with one of my lid boards.)

When my wood was ready, I started with the frame-and-panel assemblies, moved on to the base and then assembled the chest body and mounted it on the base. The lid and moldings were made and installed last.

Before dressing out the working stock, I prepared some poplar and made test cuts with the cope and stick bits and with the panel raiser. I wanted to establish the settings I'd need for the appearance that suited me. As it turned out, to get the panel profile I wanted, I had to cheat the system.

The geometry of panel-raising bits is inflexible. The width of bevel I wanted was 3/4", rather than the standard 1". From Freud, I got a bit (#99-511) to produce the width of bevel I wanted, but the 25°- to 26° bevel angle was steeper than I'd have preferred. My test cuts demonstrated that to get the fillet I wanted around the raised field, I'd have to add 1/16" to the thickness of all my stock. And, of course, that meant cutting the sticking profile a little deeper, too. Consequently, the rails and stiles are 13/16" thick while the panels are 11/16" thick.

I labeled the final set of samples and saved them for use in setting the bits for the working cuts.



The next step was to prepare the frame stock and panels. The latter was easy, a matter of dressing the parts to 13/16", ripping them to width, and crosscutting them to length. The panel blanks were a slightly different matter.

Building the Chest Body

Construction of the chest body is largely a straightforward frame-and-panel project. In brief, you cut the parts to width and length. Rout the copes, then the sticking. Raise the panels and assemble. There are a few departures in this particular chest, and at least one in the way I generally prefer to do things.

Veneering Basics



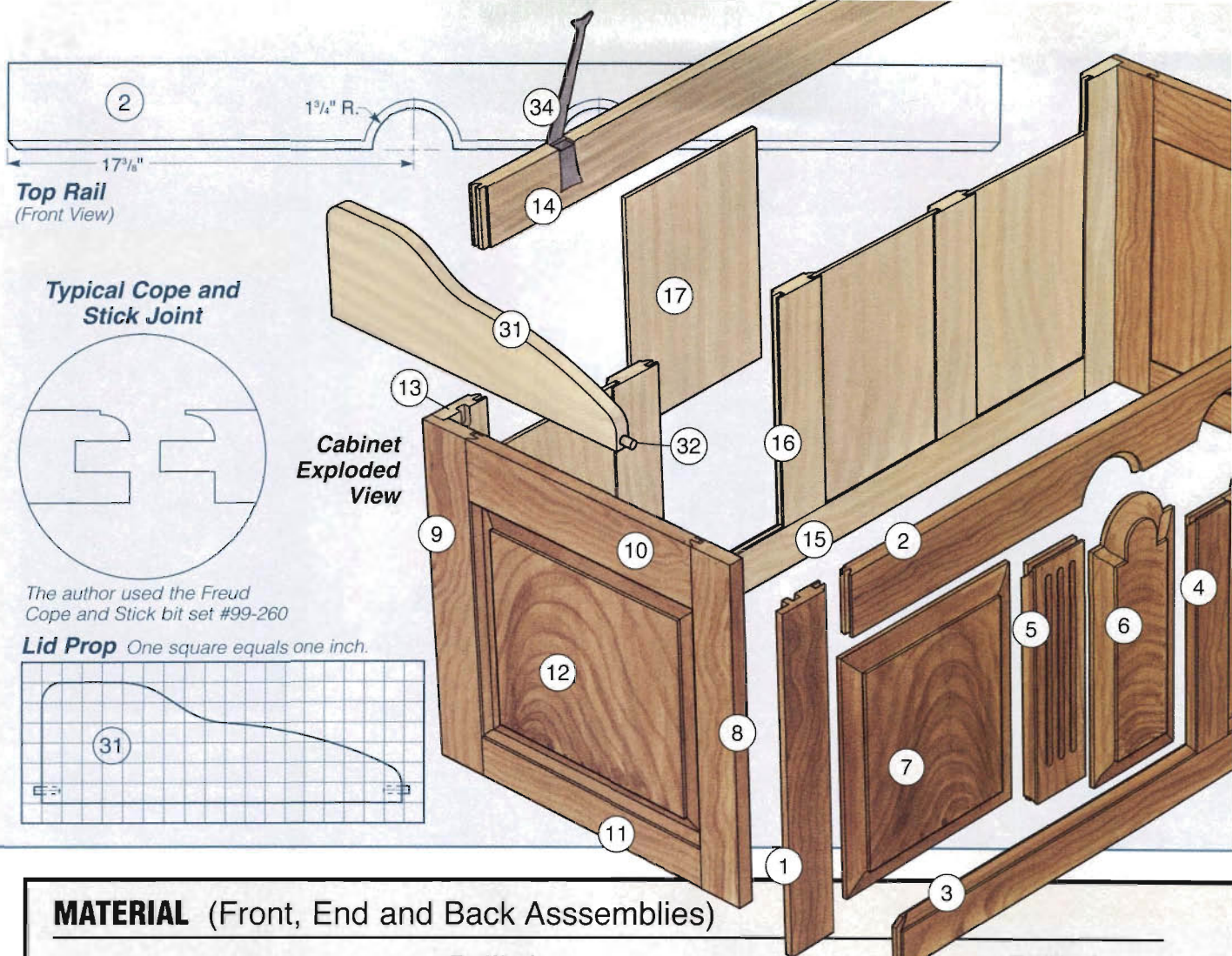
The author attached highly figured, shop-made, veneer to plain sawn walnut panels. Apply glue to the panel only. Note that the panel is sitting on a plywood caul protected by wax paper.



Put the veneer onto the glued panel and prepare to clamp it up between a sandwich of plywood cauls protected from the excess glue by layers of wax paper.



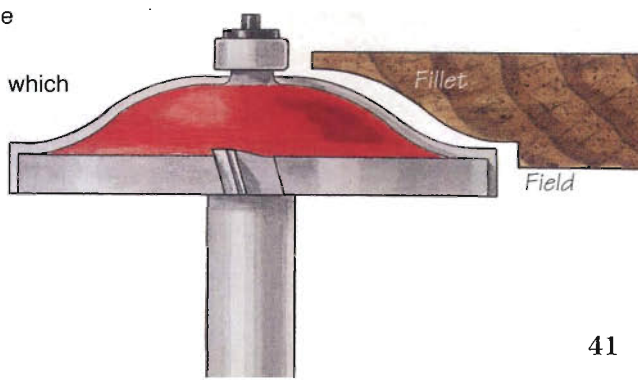
Use plenty of clamps to ensure that sufficient pressure is applied across the clamping cauls. Allow plenty of time for the glue to cure: at a minimum, overnight.

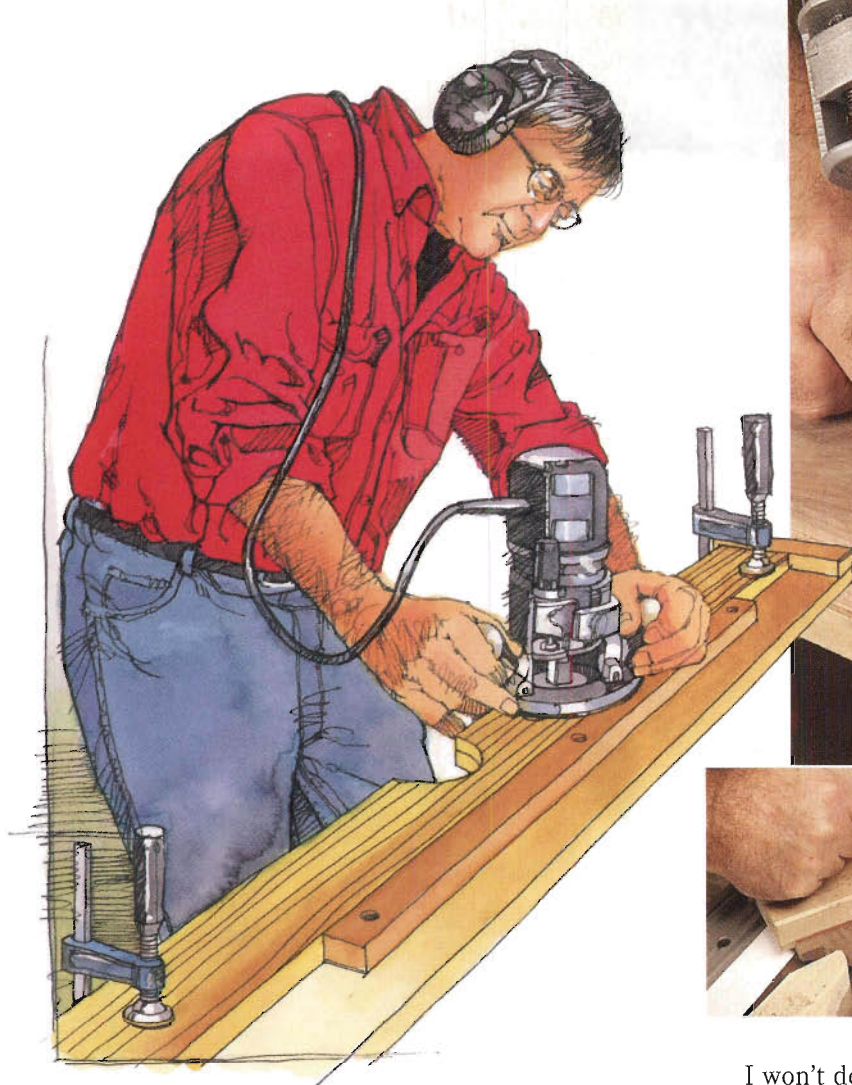


Old World Panel Geometry Requires Careful Stock Selection

When you look at a raised panel cabinet, the size of the field (the flat center plane) as it relates to the bevel's width (or fillet) helps create the "look" of the piece. And, of course, the fillet also has to be balanced against the widths of the stiles and rails. Getting the right "look" can be a tricky business!

Most standard panel raising bits form a 1" fillet. The original cabinet which mine is based on has 3/4" fillets, made with a hand plane. To achieve a 3/4" wide bevel on my cabinet's raised panels, I used a Freud #99-511 bit. To create the exact fillet I wanted, using that specific bit, I had to size my stock to the exact thicknesses: 13/16" for the stiles and rails and 11/16" for the raised panels.





The tombstone panels (and the rail that receives them) require some template routing. When raising the curved ends of the panel, use a safety block to apply downward pressure.

Departures from the Norm

One of my idiosyncracies with this type of project is that I like to allow the stiles (just the full-length ones, obviously) to run long. It's one less alignment to make during assembly, when things can seem a little frantic. Instead, I allow some excess to project past the rails. After the glue's dry and the clamps are off, I trim off the excess and at the same time square the assembly.

In this chest, you have some intermediate stiles, which must be coped, and a front top rail that must be contoured for the tombstone panels. The two small cutouts can be roughed out with a jigsaw, then routed to match a template. Do this before routing the copes and the sticking. In addition, you have the flutes to cut into the two stiles that flank the tombstone panels.

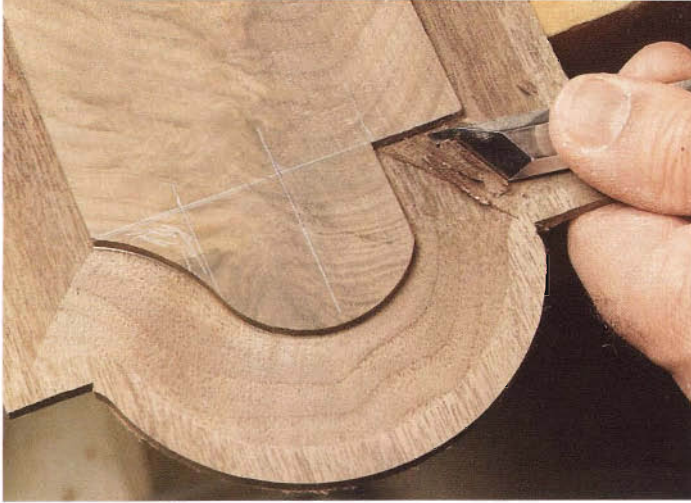
But the panels represent the biggest departures from the norm. What I wanted in the panels was highly figured grain. I also wanted to book-match the pairs of panels, especially on the chest front. What I opted to do, with some help from a friend with the right tools for the job (specifically, a 20" band saw and a drum sander), was to resaw a block of my expensive stock into veneers. I milled stock for the panels from straight-grained walnut, then glued a leaf of veneer to each.

I won't detail how to resaw on the band saw. Suffice it to say that if your resaw capacity isn't 12" to 13", you can resaw a 6" to 7"-wide block and book-match the leaves as they come off the block to form wider veneers for the panels.

Once you have the veneers cut, they must be surfaced. Planing veneers can be perilous, even when they are straight-grained. Surfacing curly, burl or crotch-grain veneers is best done on a wide belt sander or drum sander. Using my friend's drum sander, I was able to smooth the face and back of each leaf at the same time and reduce to a thickness of just under 1/8".

The conventional wisdom is that you must veneer both the face and the back to balance the panel. (If you don't, the panel is likely to warp.) Here, the panels are completely trapped in their frames so it isn't absolutely necessary to veneer the panel backs. I didn't.

Veneering panels for the chest requires a dozen or so clamps (including some deep-throated ones), a couple pieces of 3/4" plywood, MDF or melamine, and some waxed paper. Apply yellow glue to the panel, not the veneer, then place the veneer on the glue. Spread waxed paper on one plywood clamping board, set the panel on it, cover it with more waxed paper, then add the second clamping board. (Waxed paper prevents squeeze-out from gluing the panel to the plywood.) Apply your clamps.



After squaring up the inside corners of the field with your bench chisels, switch to skew chisels (first right and then left) to finish the fillet.

Disappearing Veneer Seams

Be mindful of how raising the panels will parse their thickness. You need a 1/4" thick tongue, and you need the raised field to be the thickness of the veneer. The seam between the substrate and the veneer will show if it falls on the bevel. I raised the panels before the final thicknessing, sneaking up on the "disappearance" of the seam from the bevel. Then I thickness sanded the panels to get the proper tongue dimension and to reduce the thickness of the raised field.

Raising a Tombstone Panel

The two tombstone panels on the chest front require some extra work — some of it hand work — to shape and raise. To begin, make a template to shape the two panels (after they've been veneered). I made mine of 3/4" MDF, and mounted 1/4" thick fences to locate the panel. After cutting the rough contour on the top of a panel, I set it on my template, clamped it securely, then used a router and flush-trimming bit to rout it

to match the template. Of course, the tight inside corners had to be pared square with a chisel.

Raise the panel on the router table next. Because of the arch, you can't use the fence to raise the top edge, but you can — and should — use it when raising the side and bottom edges. To reduce tearout, do the top edges first, then do one side, the bottom, and the second side. Now comes the hand work. (Relax ... the panels are small, and there are only two of them.)

Lay out the inside corners on the raised field and at the shoulders of the tongue that borders the bevel. Draw a line across the outside corners of the raised field. Then drop perpendicular lines from the arch to this shoulder line. The line at the tongue can be sketched freehand.

With your bench chisels, cut away the inside corners of the raised field. You want square, straight shoulders. That done, use a small rule and a utility knife to slice a line from the inside corner of the field to the inside corner at the edge of the panel. This is the juncture between the planes of the bevel. You must pare the bevels to this line, sloping to match the rest of the bevel. For this work, you need a pair of skewed chisels, one angled left, the other angled right.

Gluing up a complicated piece like this is no easy task, but the author helps walk you through it with step-by-step instructions starting on the next page ...

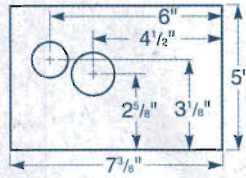


Getting to the Assembly



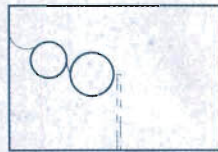
Lay out the centerpoints of the concave arcs on each blank, measuring from the bottom and the beveled edges. Then use appropriately sized Forstner bits ($1\frac{1}{8}$ " and $1\frac{1}{2}$ " respectively) to bore holes at these spots.

1



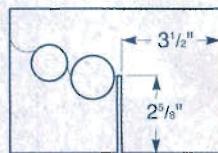
Next, trace the pattern onto each face, using the holes to orient the pattern. Remember that there are left and right, as well as end and front pieces.

2



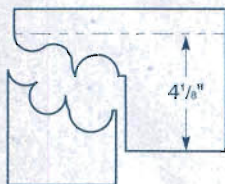
Cut the vertical shoulder on the table saw. This way, you'll get a straight cut of a consistent height on each blank. White pencil or chalk is easier to see on walnut than a regular pencil line.

3



Use the band saw to cut the convex arcs, freeing the waste (which is the perfect size to use as glue blocks later, when attaching the feet). Sand the saw marks smooth using a drum sander on your drill press.

4



Assemble the units one at a time. The end units are easy, since each is composed of only two rails, two stiles, and a panel. The front and back units are more involved, so a dry run is essential. Make sure the parts go together easily, your alignment marks are in place and all your clamps are at hand. Here's my assembly sequence:

- Apply glue with a small brush to the stub tenon on the center stile and push it into the top rail. Use a center mark on the stile and align it with a mark on the rail. Apply a clamp to seat the stile.
- Fit the panels in place. No glue, of course.
- Apply glue to the flanking intermediate stiles and fit them to the rail. Apply clamps to seat and hold them.
- Install the remaining panels.
- Remove the clamps and tip the assembly up so glue can be applied to the stub tenons on the three stiles.
- Fit the bottom rail onto the assembly. Use center marks to align the rail without having to slide it (to keep glue out of the groove so it won't stick to the panel).
- Apply glue to the rail ends and fit the full-length stiles.
- Extend long clamps across the assembly at each rail, then reapply clamps across the assembly at each stile.

That's it. Once the units all are assembled, trimmed, and sanded, cut the rabbets that join them. You also need to cut a stopped dado in the front and the back for the lid prop. That done, assemble the four units to form the chest body.

Building the Base

The base frame, upon which the chest body rests, is a flat frame formed of three pieces of $5/4$ walnut (the front and two end members) and one piece of $5/4$ poplar (the back member). The back joins the ends with mortise and loose tenon joints. The ends and front are joined with splined miters. Mill the stock, cut the parts, cut the joints, and glue your frame together.

More involved to make are the feet. Each is an assembly, consisting of two shaped faces, joined end-to-end in a miter joint and reinforced with a triangular glue block. The assembled feet are simply glued to the underside of the base frame at the corners.

Begin constructing the feet by making a cardboard pattern, using the *Drawings* at left. Note that the faces for the ends of the chest are $1/2$ " narrower than those on the front. The back faces are simple poplar blocks.

Cut the blanks to size next. First, mill the stock to $7/8$ " thick and rip it to width. Then cut a 45° bevel on one end of each piece. While you can trace the contour of the bracket on the blank, cut to the line on the band saw, and smooth the edges, I took a different tack. First, I laid out the centerpoints of the concave arcs on each blank, measuring from the bottom and the beveled edges. At the drill press, I used Forstner bits to bore holes at these spots (see *photo*, top left). This ensured

that the arcs would be consistently sized and placed. After tracing the pattern onto each face, I cut the vertical shoulder on the table saw. This way, I got a straight cut of a consistent height on each blank. On the band saw, I cut the convex arcs, freeing the waste. (Use as glue blocks later, when attaching the feet.)

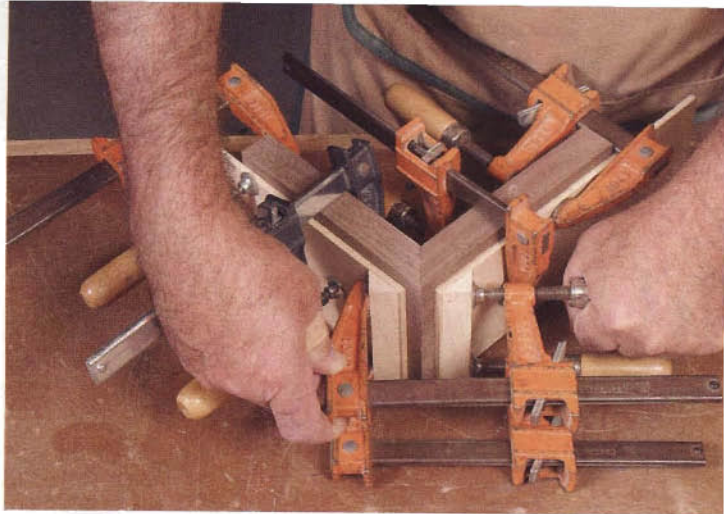
After sanding the contoured edges (use a drum sander chucked in your drill press), rip the excess from each face. I glued the feet together in two stages — assembling the miters first, then adding the glue blocks. As you do this, be sure to create the assemblies you need (i.e., glue a right front face to a left side face). Complete the base by gluing the feet to the frame.

Mounting a Body on a Base

Once the chest body and the base assembly are glued up, you can join them. Set the chest body bottom up on the bench or assembly table. Apply a bead of glue to the edges, then align the base on it. I marked the center of the body and the base and lined up the two marks, making sure the back edge of base was flush with the plane of the chest back. Apply a couple of clamps to hold things, then drill pilot holes and drive 12 4d cut nails through the base into the edges of the body.

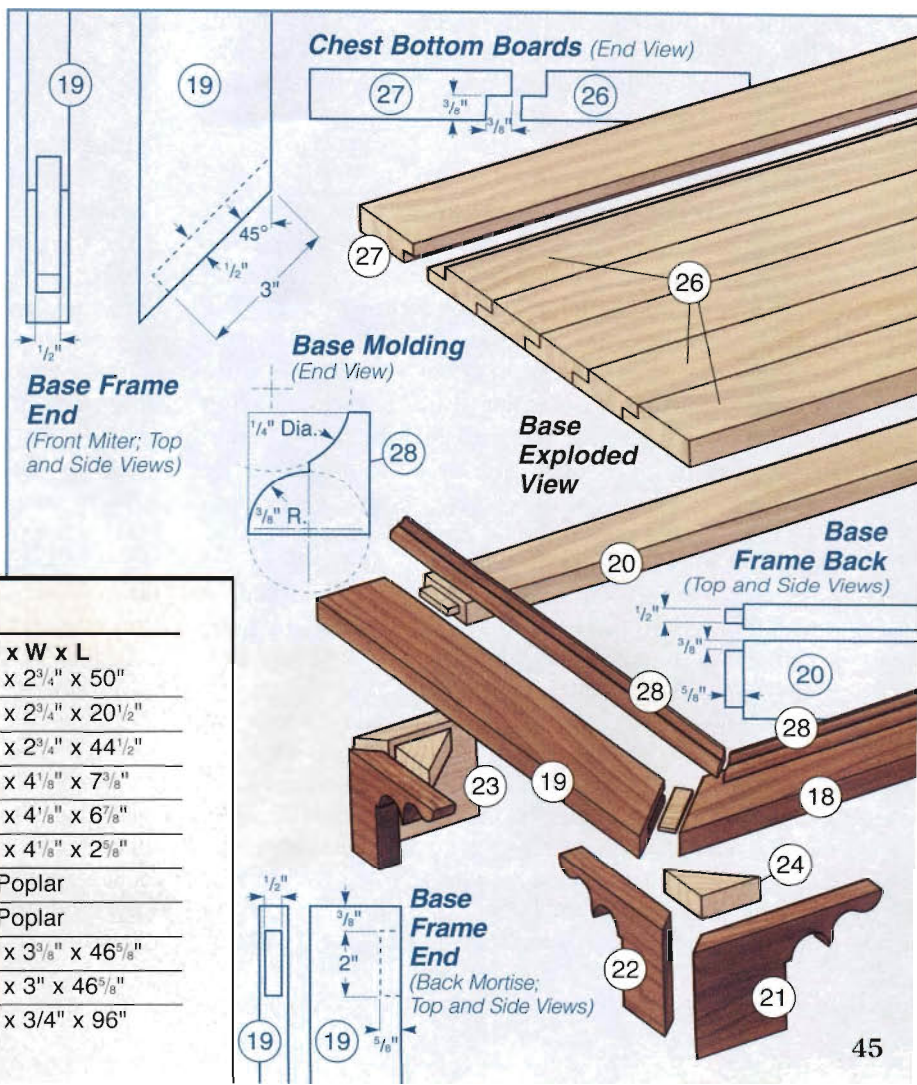
Make and install the chest floor next. I used random width strips of poplar, thickened to 3/4", for this. Cut shiplaps on the edges and fit the strips one by one to the chest. Install the strips with 3d cut nails, as shown in the *drawing*.

While you're working on the chest, make and fit the lid prop. A till was a common feature of chests like this, and the till lid doubled as a prop for the chest lid. You'd open the chest lid, lift the till lid just past perpendicular, then lower the chest lid against its corner. I didn't include the till, but I did adapt the till lid as my lid prop.



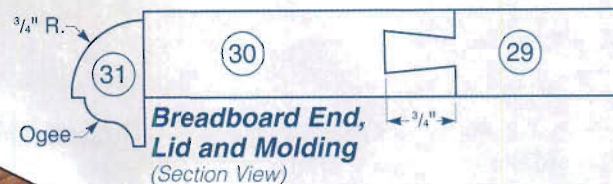
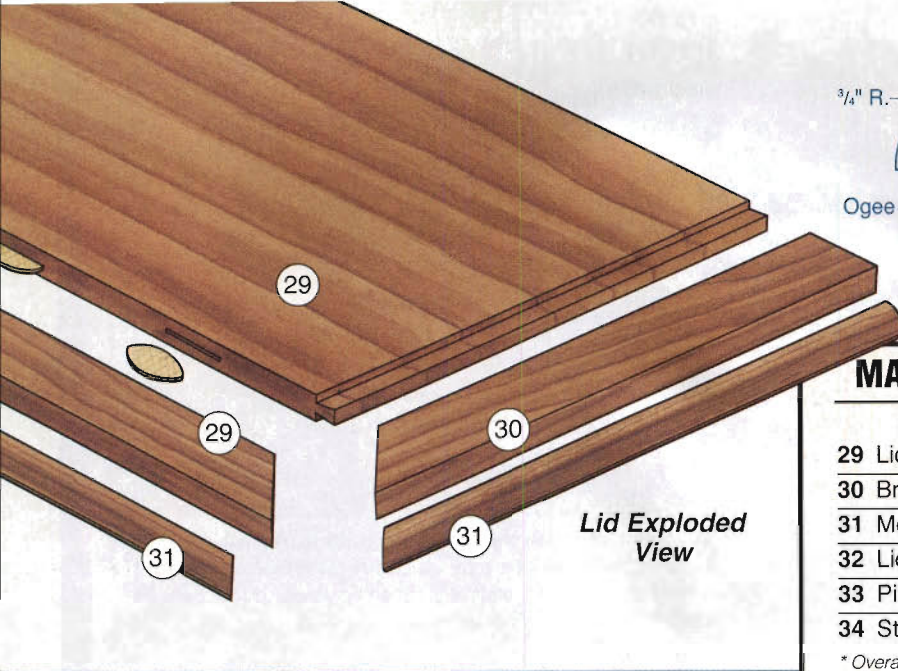
The author made some handy clamping cauls to help hold the mitered foot joint firmly. The triangular blocks are glued to 1/4" plywood. The plywood is clamped to the foot blank and pressure is applied to the triangular blocks. Easy and effective.

Cut the prop and trim it to just fit between the front and back of the chest. Bore a hole into each end for a pivot dowel and drive a dowel into each hole, trimming as necessary so they'll drop into the dados cut for the purpose easier. Shape the prop however you like, but leave it about 6" wide at the back end, so it can support the lid. That corner can be trimmed after the lid is hinged to the chest.



MATERIAL LIST (Base)

	T x W x L
18 Base Frame Front (1)	7/8" x 2 3/4" x 50"
19 Base Frame Ends (2)	7/8" x 2 3/4" x 20 1/2"
20 Base Frame Back (1)	7/8" x 2 3/4" x 44 1/2"
21 Bracket Front Feet (2)	7/8" x 4 1/8" x 7 3/8"
22 Bracket End Feet (4)	7/8" x 4 1/8" x 6 7/8"
23 Bracket Back Feet (2)	7/8" x 4 1/8" x 2 5/8"
24 Blockings, Front (2)	5/4 Poplar
25 Blockings, Back (2)	5/4 Poplar
26 Chest Bottom Boards (5)	3/4" x 3 3/8" x 46 5/8"
27 Chest Bottom Board (1)	3/4" x 3" x 46 5/8"
28 Base Molding (1)	3/4" x 3/4" x 96"



MATERIAL LIST (Lid)

	T x W x L
29 Lid* (1)	7/8" x 19 7/8" x 50"
30 Breadboard Ends (2)	7/8" x 2 5/8" x 19 3/4"
31 Molding (1)	3/4" x 1 1/4" x 90"
32 Lid Prop (1)	3/4" x 6" x 17 7/8"
33 Pivots (2)	3/8" Dia. x 1 1/4" dowel
34 Strap Hinges (2)	Wrought iron

* Overall size: After ripping the front edge off, the length is trimmed to 44 3/4"

Some Fancy Router Work

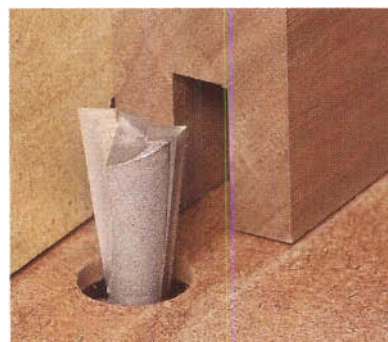
For the base molding, I used a cove and bead profile that I created on the router table using a 3/8" radius roundover bit and a 1/2" diameter roundnose bit. I formed the profile on both edges of a long strip of walnut, then ripped them from the blank. One was crosscut to yield the two end strips. Miter the ends and glue them to the chest and base.

A Lid with Breadboard Ends

The lid is a broad panel with breadboard ends, mitered at the front and square at the back. The molding along the front edge and across the ends has a quarter-round profile, with a Roman ogee below it forming the lip. The lid is hinged to the chest with hand-forged fishtail hinges.

Breadboard ends help prevent the broad panel from cupping and also make it easier to attach the lid molding across the ends, since you end up with a long-grain to long-grain glue joint. The joinery presents the challenge. The breadboard end is crossgrain, so gluing it securely to the end of the lid virtually guarantees the panel will buckle in humid conditions and split in dry ones. My workaround was to use an unglued sliding dovetail to mount the ends to the panel. Since the ends are joined to the lid at the front with miters, I could glue them there. Here's how I made the lid.

I started with 5/4 stock, face-jointing and planing it to 7/8" thick. I cut the two breadboard ends and set them aside. Next I edge-glued boards to form a panel 19 7/8" wide and 50" long. I ripped the panel to exactly 17 1/8". The 2 5/8" strip that you end up with (1/8" is lost to the cut) will be mitered and become the front edge that joins the breadboard ends. Finally, I cut equal amounts from either end of the panel, reducing its length to 44 3/4".



After plowing a 5/16" groove centered on the edge of the breadboard ends (to remove most of the waste), the author formed a 3/4" deep dovetail groove.

Cutting Sliding Dovetail Joints

Rout a centered dovetail groove in one edge of each breadboard end. Use a 1/2" 7° or 8° dovetail bit, and make the groove exactly 3/4" deep. It's beneficial to use a 5/16" straight bit to rout a centered groove first. This eliminates as much waste as possible before switching to the dovetail bit and forming the dovetail groove.

When you cut the grooves, also cut the same groove in a gauge made of the same stock as the breadboard ends. (Use the scrap crosscut from the panel, for example.) The gauge should be about 4" long.

The next process is to cut a mating dovetail on both ends of the panel. Don't touch the bit as you change over the table setup. You need to use the same height setting for the tail that you did for the slots. Just shift the fence to house all but an edge of the bit. Make setup cuts on your scraps of the lid stock, sneaking up on the width of dovetail that fits the grooves you've already cut. When the fence setting is perfect, cut a dovetail across each end of the lid.

Now miter the breadboard ends and the strip ripped from the panel. The ends are easy, but the panel strip must fit just right. The miter-to-miter distance must exactly match the shoulder-to-shoulder length of the lid. I mitered one end of the strip, then clamped it to the panel to mark the opposite end.

Sliding dovetails are the perfect joinery choice when wood movement is an issue.

To help align the mitered element with the lid when regluing it to the lid, I used biscuits. After mitering the ends, I clamped the strip in place and marked biscuit locations. Then I cut the biscuit slots.

Assemble the lid. First, drive the breadboard ends onto the dovetails. No glue, remember. I had the front strip clamped to the panel — no glue — while I did this. Then I removed the strip, spread glue along it sedge and on the miters, and remounted it. I clamped clamping cauls for flat miters to the lid as I did this, so I could apply a clamp perpendicular to each miter.

Lid Molding

The lid molding consists of two profiles routed on the same piece of wood. Because it's easier to glue and clamp it to the lid while it's square, I held off routing the large quarter-round profile until after the molding was glued in place. But I did rout the Roman ogee profile before mounting it.

I routed the ogee on both edges of a strip about 3" wide and 52" long. Then I ripped the strip into two 1½"-wide strips. Halve one strip, miter the ends, and glue them to the lid.

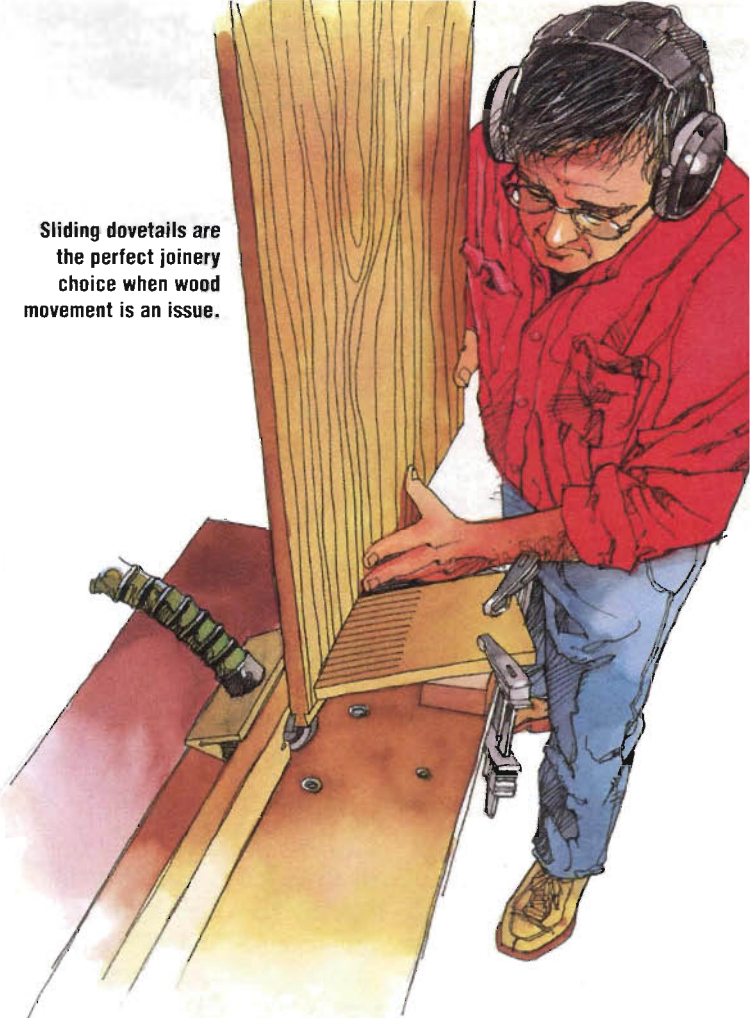
After the glue is dry and any squeeze-out cleaned up, rout the quarter-round with a ¾"-radius roundover bit. The pilot bearing will hang below the profile, so you must use an edge guide to control the cut.

When you are done, sand the molding well to remove mill marks.

Finishing Touches

The hand-forged hinges I chose look great and work well. The leaf that mounts to the lid is 16" long, and the one that mounts to the chest has a right-angle bend. It sits on the top edge of the back and extends down the inside face. To accommodate the barrel, the chest leaf must be recessed into the chest back. Form a notch in the top rail that's about 1/2" deep.

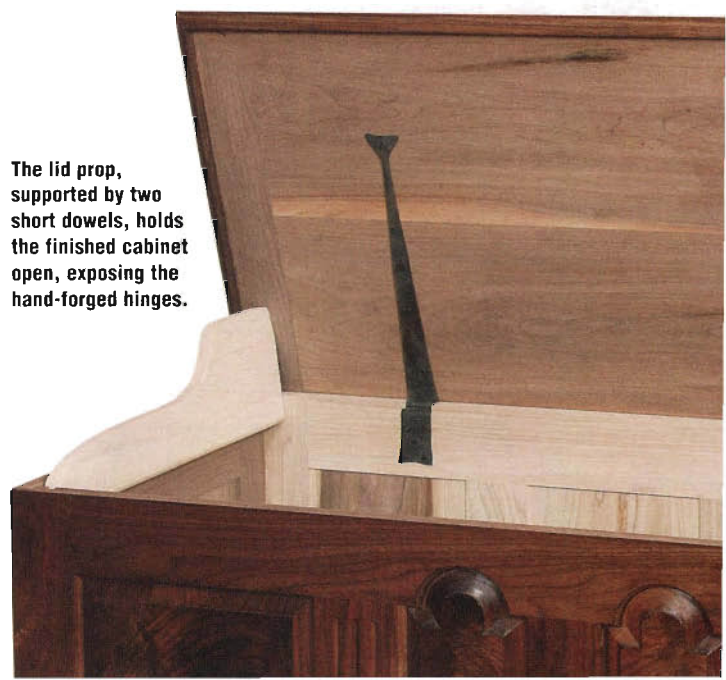
Mount the hinges to the lid first. Line them up on the underside with the hinge pins parallel to the edge. (It may not be perfectly square, but that's the charm of handmade hardware.) Then screw them in place. Set the lid and hinges on the top back edge of the chest and mark along the hinges in the chest edge. Cut the notches. I found I could set the lid in place, with the hinges down in the notches and the prop holding the lid open. It stayed that way, freeing my hands for drilling pilots and driving the remaining screws.



The finish I used was multiple coats of Waterlox. I brushed on the first and second coats, then applied subsequent coats with a soft, lint-free cloth. I used fine steel-wool between coats, and cleaned up dust and debris with tack cloths.

This dream project was a long time in the works, but I have to say it was well worth the wait.

Bill Hylton is a regular contributor to the Woodworker's Journal and the author of several woodworking books.



The lid prop, supported by two short dowels, holds the finished cabinet open, exposing the hand-forged hinges.

A Table Design Revisited

By Ian Kirby



Ian Kirby made this table about eight years ago. Each day it holds the “New York Times.” The featured joinery is tusk tenons, but the focus is on why it was made a particular way rather than how to make it: in other words, a design critique.

If, as they say, real estate is all about “location, location, location,” then furniture design is all about “proportion, proportion, proportion.” And, if it’s solid wood furniture you’re dealing with, then it’s all about “selection, selection, selection!”

Proportion starts with the entire piece. The proportion of the wood parts and what’s in between. In “designer speak,” we call this the form and the space. You have to be as diligent about designing the space as you are about the wood. If you are not, then you only design half of the piece. Proportion goes on to be more detailed with the relationship of one part to another — a leg to a rail, a frame to a panel. The detail becomes deeper still with the proportions of patterns — exposed joinery, dovetail tails to pins, door and drawer handles — and it gets especially detailed when dealing with the proportions of patterns on veneered furniture.

As for the small table here, you can judge for yourself the relationship of form and space from the

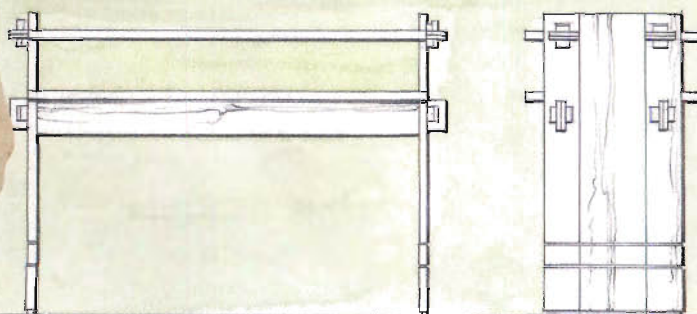
drawings and photographs. However, what I want to focus on is the practical application of proportion when it comes to choosing the wood for the various parts.

Selecting the Wood

The table is made of quartersawn oak. Although the small pile of boards I started with were all recognizably from the same species, their similarity ended there. As with any pile from which you have to select wood for parts, color, growth rate and grain pattern vary. These characteristics can even vary from one end of a board to the other, and they most certainly vary from one side of the board to the other. These variations add complexity when you have to convert that pile of boards into the order the cold, sterile line drawing sets out for you to follow.



No matter how simple the orthographic drawing looks on paper from its front elevation, the real thing is always more complex because of the third dimension. The drawings at left were modified as stock selection, joint-making and assembly progressed.



Top Boards

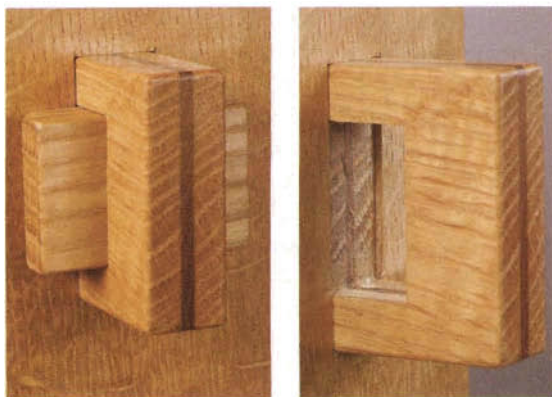
My pile contained one outstanding looking board. It clearly had to be the highly visible top, but cut in two and joined it would make neither the width nor quite the length I had drawn for the top board. Increased width we can take care of, but increased length eludes us as woodworkers. Comes now the first compromise. The length as drawn wasn't critical, so I reduced it because using this singularly attractive top board was more important than sticking rigidly to the drawing.

Another of my boards had an equally powerful silver grain — the flashy marks where the ray tissues are exposed on the surface in quartersawn stuff. But neither the darker color nor the growth rate was remotely a match with the top board. I now had to decide whether to use the prime board on each side of a center strip of the darker board or sacrifice a little of the prime board width and put the darker material on each edge. I chose the latter to follow the architecture of the table, using the width of the end boards as the guide, and split the darker board to go at each side to make the overhang. Between the darker outer strips and the lighter center board, I inserted a near-black veneer of American walnut to emphasize the change from one piece to the other.

When boards don't match well, a deliberate display of that fact is preferable to a failed attempt to disguise it. Here the veneer delineates the proportion of the parts and underlines the design intent.

End Boards

The ends presented less of a problem than the top. Since you never see them both together, they don't have to be a look-alike pair. However, they have the joints as



I made the 1/8" cut for the black walnut insert on a table saw. Arguably it might have looked better as a 3/32" insert, but I didn't have a 3/32" blade. Form follows function? It doesn't — and never did! Form follows economy. Either way, the purpose is served: the weak lines of the growth rings are reinforced against the sheer stress of the wedges.

It only takes a thin line of veneer to form a boundary which acts to contain the differences of color and grain between the parts while retaining the overall proportion. You might say the veneer keeps the pieces together — separately!



While expanding the width of tabletop, I explored at least two options. Demonstrated in the drawings at left, it is the same amount of wood, different layouts.

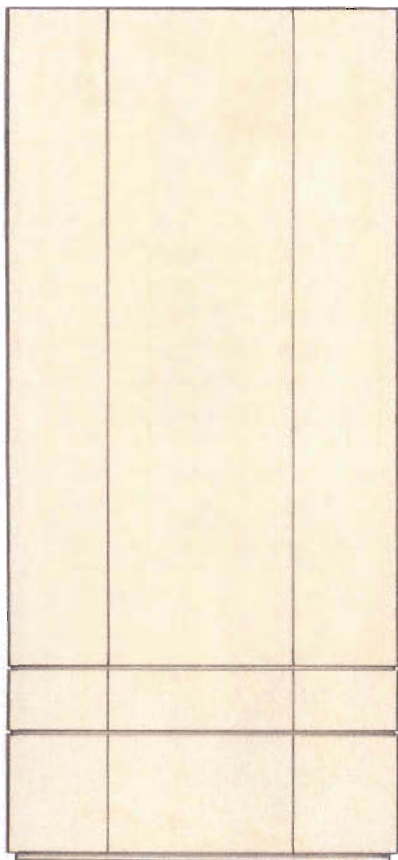
part of their makeup. Once again, to relate the material to the architecture of the piece, I wanted a center panel that would sit between the top tusk tenons. This offers an elegant, uninterrupted rectangle flanked by two narrower rectangles in which the protruding joints sit. The three pieces are again divided by a fine line of walnut veneer that helps to define each rectangle.



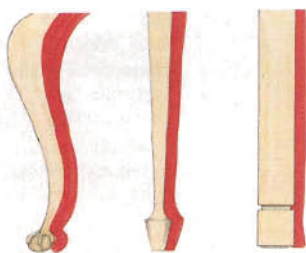
The uninterrupted center board flanked by the joint-bearing boards creates strong vertical elegance. The end grain overlay of the shelves connects strongly to the tusk tenons.



Creating highlights and shadows by applying a molding is like putting icing on a cake. Getting the same effect by removing instead of adding wood is equally powerful and not as intrusive. The ends of legs must be grounded in some way. The rebate around the bottom casts a soft shadow on the floor.



Clean drawings help you best decide where to put the saw cuts on the pedestal end.



Like the pedestal end, the square leg on the right gets a visual foot through a saw cut.

Design Detail

The walnut strips in the center of the tenons (see *photo*, page 49) relate to the fine lines between the boards. However, it's there for a more important reason than an association with the veneer lines. It's used because the straight grain of the oak in the tusk tenon is very weak. Unless the tusks are made extra long, it would take very little pressure for the driven wedges to push out the end grain. So that I could control the proportion of the tenon and relate it to the whole structure, I reinforced it with a 1/8" thick strip of walnut with the grain going at right angles to the oak.

I initially considered using oak as the reinforcing piece but chose the more dramatic effect of walnut to give the fine veneer lines in the top and ends a more secure place in the overall composition of the piece. Without this stronger detail they would have looked insignificant — even marginal.

Finishing to Retain the Wood Color

For this sort of work, my finish of choice is usually beeswax. I spend a lot of time and effort selecting parts for any piece of furniture because, without recourse to stains, there is no place to hide if the selection is less than good.

Before the finish was applied, however, I put the four pieces together to check the tusk tenons and view the assembly. Somehow, it didn't feel right. I knew it wasn't the slight design concession I had made in length to use the best material for the top that was bothering me, it was the ends. They were bare and incomplete, yet they followed the drawing directions. Believe me, that end proportion was neither a hasty nor an unconsidered decision — but nonetheless it was dull and incomplete.

Highlights and Shadows From Moldings

If furniture design is exemplified by proportion, it is underscored by highlights and shadows. We do this underscoring with moldings. They add dimension, but their real task is to give definition by the interplay of highlights and shadows. Some form of molding was needed to complete the ends because the piece needed shadow lines of the right size, in the right place.

Except on edges we think of moldings as the addition of material. In this case, I got the results I wanted by removing material. The two saw kerfs were made with a flat top tooth blade. The shadow created by the moldings provides the end panels with a grounding — a foot, if you will — something like the claw and ball of Chippendale or the spade foot of Sheraton on a leg that lets you know that the foot isn't forgotten. The "legs" on my table are known as pedestal ends, but an observer needs confirmation that they know how to stand on the floor. A furniture piece needs something at the bottom to "ground" it. Legs, in nature, have feet. Even trees flair out into a buttress.

Although the saw kerfs are cut across the three vertical rectangles, they don't stick out like applied moldings and therefore don't diminish the overall proportion of each rectangle. Indeed, they provide a visual bonus because they convert the three rectangles to nine rectangles, which makes an attractive pattern as a result of simple line and shadow.

Postscript

I look at my work after a while through fresh eyes to see if it holds up to what I set out to deliver. A second time around, I would have made the tusk tenons smaller. As they are, they're too big. They could lose one third of their volume and still be in scale. As for the rest, the overall proportion and proportion of the parts, I'm content. I'll live with the joint size as the Mark Two oak table just isn't high on my "To Do" list.



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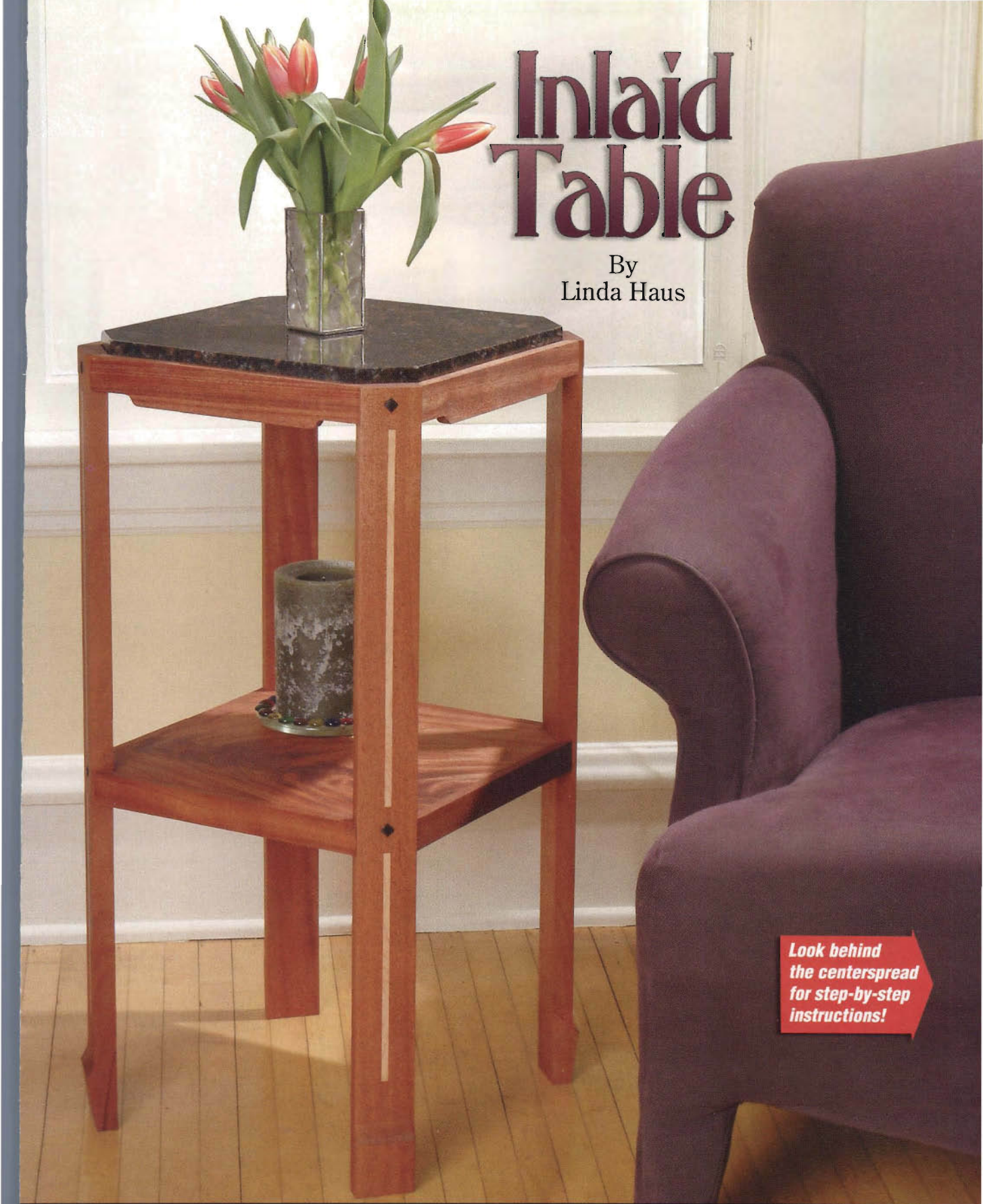
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Inlaid Table

By
Linda Haus

Look behind
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for step-by-step
instructions!

An otherwise ordinary end table design moves from elementary to elegant by employing surprisingly easy inlay and veneering techniques. Turn the page to learn the secrets.

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Arts & Crafts End Tables

Inlays and veneer can take a simple table to the next level.

By Linda Haus

I just wanted a place to set a steaming hot cup of coffee while reading the paper. One thing led to another, and the results are these end tables. The granite tops are impervious to heat, and the height keeps them above the level that a pooch's nose can easily reach — important safety factors in my home. I chose straight grained mahogany for the structural members of the table. Hard maple strips and ebony plugs create the accents that call the Arts & Crafts movement to mind.

Extra Thick Leg Blanks

To begin the project I used 1 $\frac{3}{4}$ " thick mahogany, cut to the length and width of the legs (pieces 1) as my starting point. Then I resawed a 1/2" thick slice from each leg blank (see *photo* below). The 1/2" stock is used to make the aprons (pieces 2 and 3). If you cut all the leg blanks from one board and slice the apron stock from the leg blanks, the grain and figure will be consistent ... so important with a natural oil and wax finish.

Plane the saw-marked face of the pieces smooth and step over to your jointer for a bit more machining.

Jointer Magic

As I demonstrated in the February 2004 issue of the *Journal* (Techniques: "Making Tapered Legs on a Jointer"), jointers can be a nifty way to shape stock and cut down on sanding. Set the infeed bed of your jointer to remove a 1/4"

cut. Stick a piece of masking tape on the fence 2 $\frac{3}{4}$ " back from the center of the knife roller. That is where you will stop your cut on each leg, to create uniformly shaped feet. Test your setup by making practice cuts using scrap lumber trimmed to the proper



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dimensions. This is a one-pass cut, so your jointer knives need to be sharp. I use a push block with a handle over its top to keep my back hand completely safe (see *photo* below, right). The top end of the leg pushes past the far end of my outfeed table at the conclusion of the cut. This allows me to simply push down on the top end to lift the foot end clear of the cutter. When you are satisfied with the cut you are making, go ahead and shape all four legs.

Now mark a line to describe the angled shape of each foot. Create each foot's angle on a disc sander — a simple way to get great results (*photo*, below left).

More Machining

In a nod to the Greene brothers, the upper aprons (pieces 2) have a cloud lift cut onto their bottom edge. I formed the shape on my band saw (using an 1/8" blade) and then stacked the aprons for their final sanding ... to ensure uniformity. Miter the ends of all the aprons and set them aside. While you're at it, make all eight corner blocks (pieces 4). They are identical in shape, but the four lower blocks will have a couple of additional holes predrilled into them. You'll drive screws up through these holes to secure the shelf.



First, the author uses a one-cut jointer trick to do the majority of the machining on the legs (below). It's a simple but sophisticated technique. Next, shape the feet by sanding an angle on the remaining lower leg stock (above).



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Inlay made simple: Square up the ends of your inlay grooves with a mortising machine (or attachment on your drill press). For the complete process, turn to "Techniques" on page 60.

Veneered Shelf

Like inlaying, veneering has the reputation of being tricky and hard to do. Not the way I do it. Cut the shelf and its veneer (pieces 5 and 6) to size. To achieve best results, cut the veneer piece a full 1½" large overall. Apply yellow glue to one side of the shelf and one face of the veneer and allow it to dry completely. Then place the shelf (glued side face up) on a solid work surface and place the veneer (glued-side face down) on top of it. Get a regular household iron (most shops have one), set it to "high" and allow it to get fully hot. Now simply iron the veneer to the plywood shelf. Start the process at the center of the shelf and move in a circular motion to the edges. That's it. To trim the excess veneer, I used a shop knife from the back of the shelf to avoid tearout.

The decorative inlay and ebony plug steps come next. They are not required, but I think they really "make the piece." For instructions on my "simple as pie" inlaying method, read the *Techniques* article elsewhere in this issue. I used a mortising machine to make the plug mortises and to square up the inlay grooves. Don't cut the inlay or plugs (pieces 7 and 8) until your grooves and plug mortises are machined. With the method I use, matching the inlay and plugs to the groove and mortises only makes sense.

I used the same logic when it came to the granite top (piece 9). There is no give in granite and you can't "sand it down a bit" if it's too big to fit. So don't order your granite until after the table is made and assembled. Then fit a template to the opening and give that to the folks making your granite top. (There are many countertop companies who fabricate granite these days, but if you can't find a local supplier, use the source noted above.)

Assembling the Table

Although at first glance assembling this table may appear to be a walk in the park, it does require attention to detail. Because the smallish



corner blocks do the lion's share of the joinery work, it's easy to get the assembly out of square. Exactly mark the positions of the corner blocks and then glue and screw all eight blocks in place, dead square to the legs' edges. The four corner blocks with the extra holes are placed in the lower position. Attach two legs to their upper and lower aprons with glue and screws (in effect creating a "side" assembly). Note that the upper aprons are flush to the top of the legs and the bottom aprons are proud of their corner blocks by the thickness of the veneered shelf. Check for square, then duplicate the process and allow the glue to cure. Finish the assembly by securing the remaining four aprons and shelf. Again, allow the glue to cure. When all is square, install the ebony plugs and sand the project all the way through 320-grit paper. I gently rounded or "broke" all of the exposed edges after the manner of Greene and Greene furniture. (Now is the time to make your top template and order the granite top.)

As a final touch, I recommend three coats of natural Watco® oil or a like product, followed by a rubdown of wax. Attach the felt pads (pieces 10) to the bottom of the feet and add a few more to keep your granite from wobbling, and you're ready to put that coffee on and grab the paper!

Linda Haus is a former production woodworker who regularly contributes projects and techniques articles to the Woodworker's Journal.

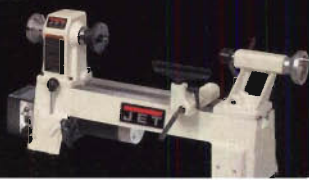


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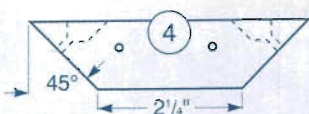
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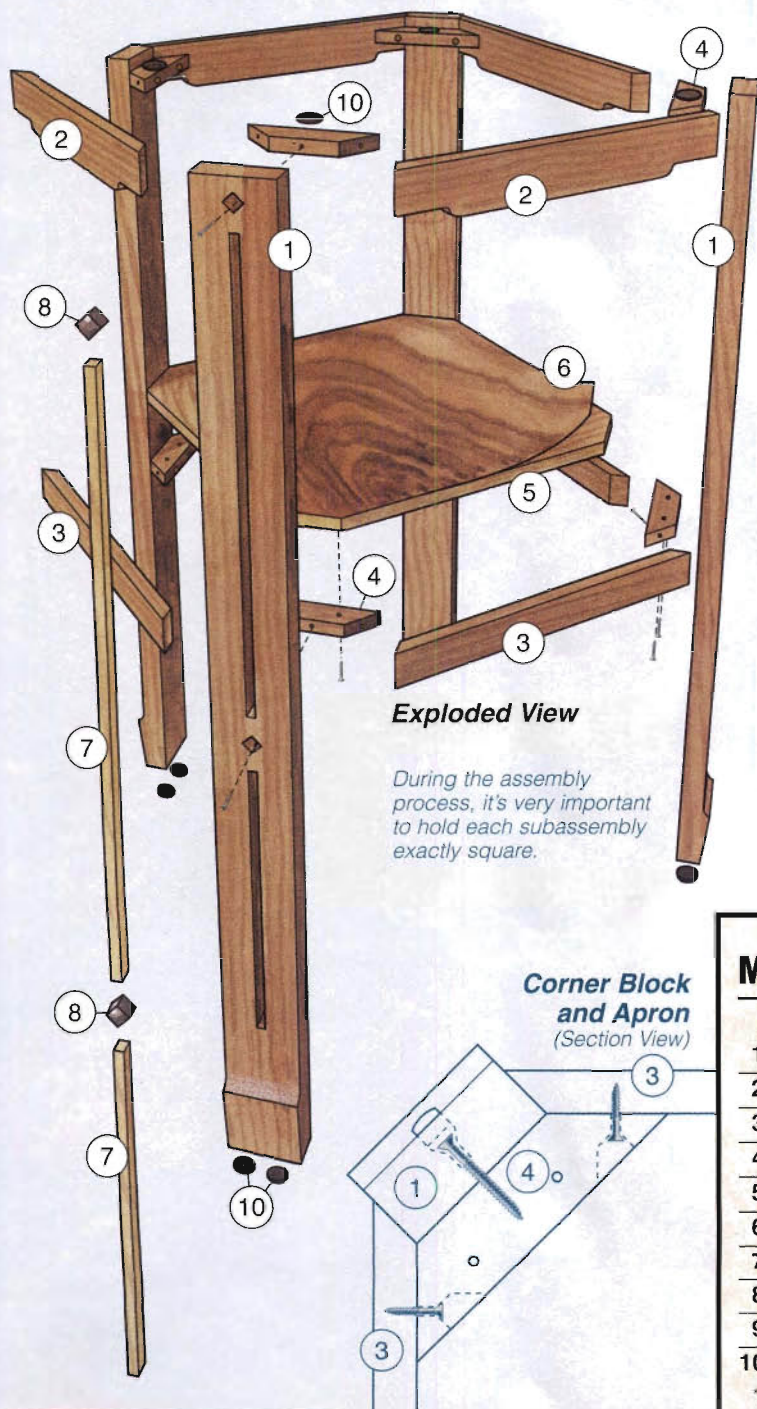
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Corner Block (Top View)



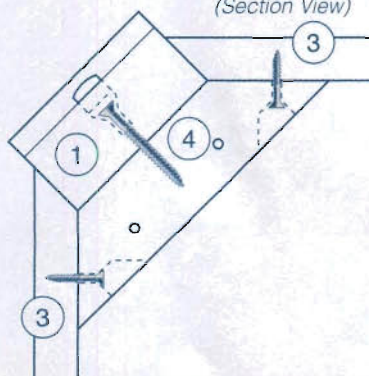
The top holes are bored only on the lower shelf blocks.



Exploded View

During the assembly process, it's very important to hold each subassembly exactly square.

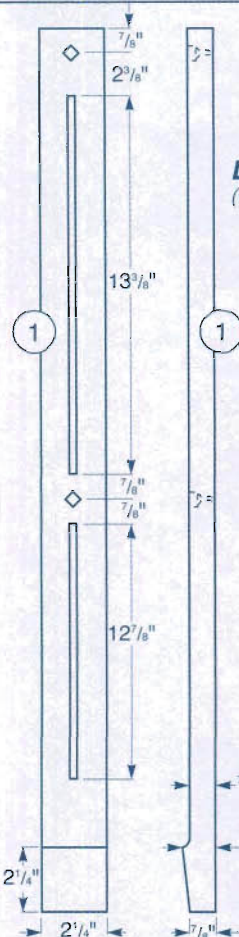
Corner Block and Apron (Section View)



Upper Apron Full-size (Cloud Lift Detail)

2

Leg (Front and Side Views)

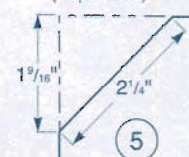


Plug Detail (Side View)



Note: The plugs are sanded and polished to form a domed top.

Shelf Corner (Top View)



MATERIAL LIST

	T x W x L
1 Legs (4)	1 1/8" x 2 1/4" x 30 3/4"
2 Upper Aprons (4)	7/16" x 1 3/4" x 11 7/8"
3 Lower Aprons (4)	7/16" x 1 1/4" x 11 7/8"
4 Corner Blocks (8)	3/4" x 1" x 11 7/8"
5 Shelf (1)	1/2" x 14" x 14"
6 Shelf Veneer (1)	1/16" x 14" x 14"
7 Inlay Material (1)	1/4" x 1/4" x 96"
8 Plugs (8)	3/8" x 3/8" x 3/8"
9 Granite Top* (1)	3/4" x 14" x 14"
10 Felt Dots (12)	1/8" x 3/4" Dia.

*Order the granite top only after the table is built.

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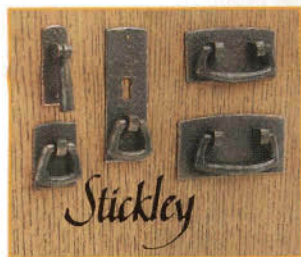
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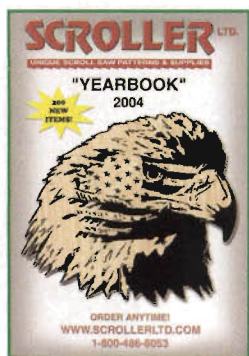
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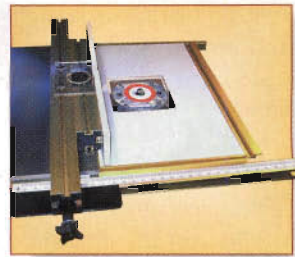
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Tackling the Inlay Fear Factor

By Linda Haus

Decorative inlay, an age-old technique that enhances the appearance of woodworking projects, was used on the end table in this issue's gatefold project (page 51). Unfortunately, some woodworkers shy away from inlaying because they think it's too difficult and time-consuming. It's not, if you follow Linda's simple approach.

The heart of decorative inlay is in the use of contrasting but complementary species of wood. Done well, the contrasting textures and colors will create beautiful designs that highlight shapes and shadows. The Arts & Crafts end table featured elsewhere in this issue was milled from mahogany. I chose a strip of very plain hard maple (light colored with little visible grain or figure), broken by ebony plugs to contrast with the rich red mahogany. The maple strips are long slender rectangles like the legs, and the plugs, although square, were turned 45° to appear diamond shaped. Both accents were chosen to enhance the look of the piece ... and the approach I used is easy to duplicate.

Jigs and Power Tools: The Perfect Combo

After the legs were cut to size and the basic shape completed, the plug mortises and inlay grooves are chopped and plowed. To cut the grooves, I built the jig shown at left to hold the legs securely in place while I guided a router exactly down the center of the leg (I used a trim router ... but the jig can accommodate any size router).

Using a mocked up leg made from scrap lumber, I tested the cuts and laid out where I wanted to start and stop each groove. (There are two per leg.) Once I marked the jig with these starting and stopping points, I was ready to rout. I formed two 1/4" wide by 1/4" deep grooves on each leg. As you know, the end of a groove formed by a router is rounded. I wanted my inlay strips to be rectangular, so the grooves had to be squared up at each end. I could have done it by hand, but I had already decided to chop the plug mortises with a mortising machine, so I simply slapped a 1/4" mortising chisel into the machine and squared up all 16 groove ends (per table) in a snap.

Now it was on to the plug mortises. As mentioned,

I used my mortising machine to chop the 3/8" square holes which accept the ebony plugs.

Then I drilled pilot holes through the legs — centered in the mortise holes — because the plugs actually hide screws that attach the table's corner blocks to the legs. Beautiful and practical.

A simple shop-made jig holds the table leg and helps make the inlay grooves. Note the markings indicating where to start and stop the router cuts.



These pieces capture and guide the router during the cuts.

These pieces capture and secure the leg in the center of the jig.

This jig's job is to hold the leg securely and guide the router exactly down the center of the leg as it cuts. You can adjust the jig to fit a standard router or trim router. Test your setup on a leg blank mocked up from scrap wood.

Making the Inlay and Plugs

I formed the grooves and plug mortises before I made the inlay strips and plugs for a very good reason ... I just hate to do things twice. By forming the grooves first, I was able to cut the maple inlay strips to fit them perfectly ... the first time. Likewise with the plugs.

Ripping skinny little pieces of hardwood on the table saw can be dangerous if you don't take the proper precautions. For starters, be sure to use a zero-clearance insert. Plane oversized 1/4" thick slabs of maple and rip the strips to width using a good push stick. Cutting them to length is no problem by comparison.

Making the plugs is very similar. First, I buy or create some 3/8" thick ebony. Plane or sand its thickness to exactly match the mortises you chopped. In the same manner as the maple inlay strips, carefully rip a couple of 3/8" wide sticks. Now for the fun part. With a piece of fine sandpaper, gently dome both ends of the sticks. I use a buffing wheel to polish those ends to create a nice low luster. Then I turn to my band saw, equipped with a miter gauge, to crosscut the plugs from each end. Repeat this process until you have plenty of plugs.

Glue the inlay strips in place with a mean amount of yellow glue and sand them smooth after the glue cures (I use a scraper, followed by a random orbit sander). That's it; now you're ready to assemble the table. The plugs, which hide key assembly screws, go in at the end.

Machine Inlays

The inlay work for this table was done completely by machines. There's no tricky hand tool work. The results: Complementary inlays and accent plugs that enhance the whole design. They create an elegant end table with a graceful look, achieved using simple and accessible techniques.

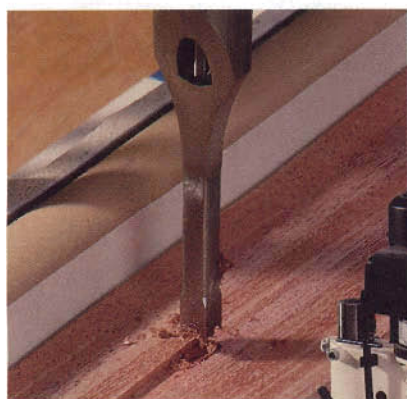
Inlay grooves are plowed with a jig-controlled router.

Grooves are squared up on the mortising machine.

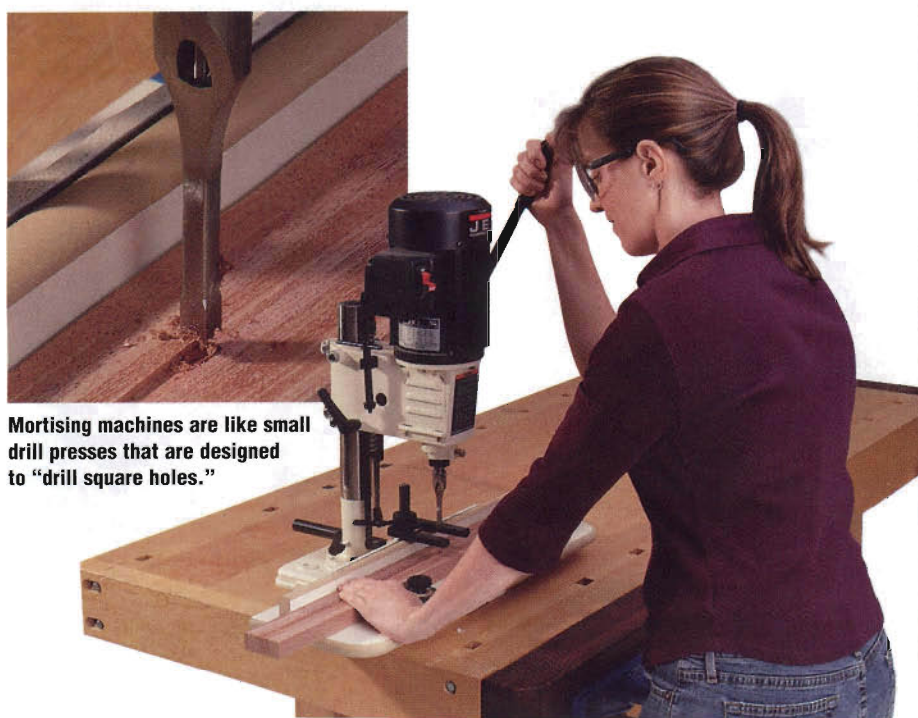
Plug mortises are formed using a mortising machine.

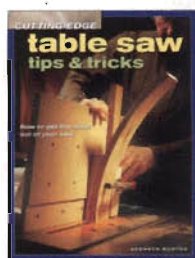
Foot begins with a radius formed on the jointer.

Foot completed on a disc sander to form its angle.



Mortising machines are like small drill presses that are designed to "drill square holes."





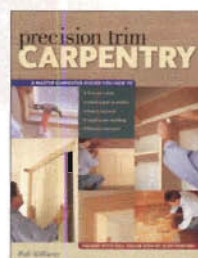
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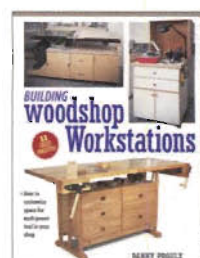
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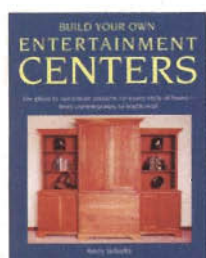
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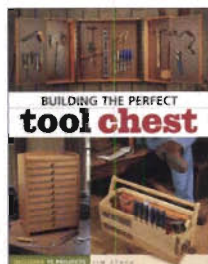
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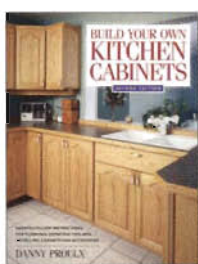
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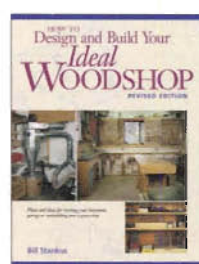
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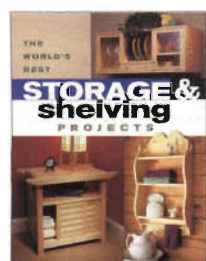
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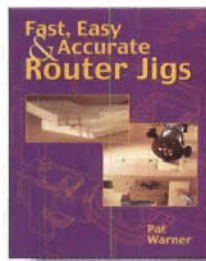
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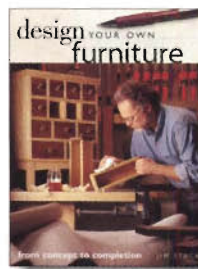
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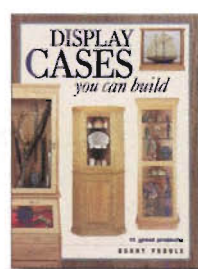
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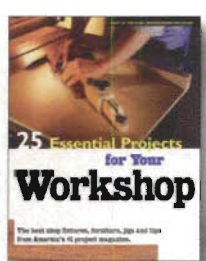
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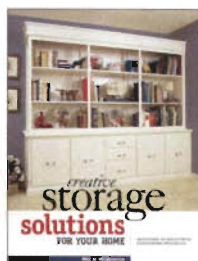
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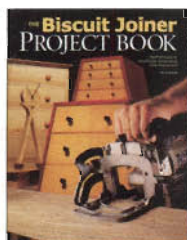


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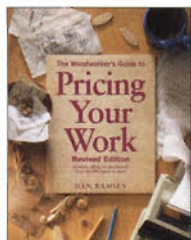


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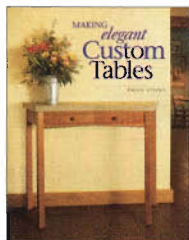
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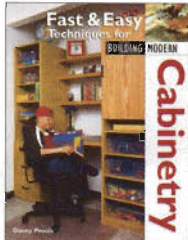
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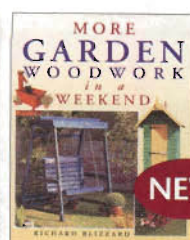
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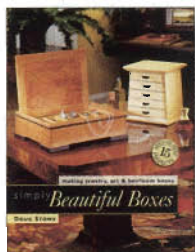
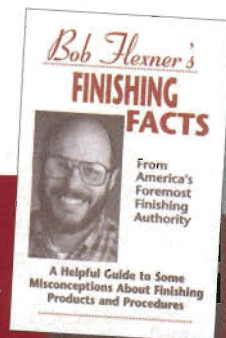


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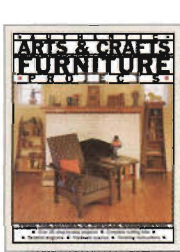
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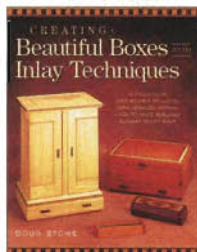
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Twist Drill Bits

By Sandor Nagyszalanczy

Whether you're using a drill press, corded power drill, cordless battery-powered drill or hand drill to bore holes, there's a good chance that it has a twist drill bit chucked up in it right now. Twist drill bits are, by far, the most common accessory used by do-it-yourselfers and woodworkers for all manner of drilling tasks — mounting hinges, putting up shelves, hanging light fixtures, or assembling cabinets.

Unlike Forstners, augers and spade bits limited to drilling wood, versatile twist bits will quickly bore clean, precise holes in a wide range of materials, including plastics, nonferrous metals (aluminum, brass, copper, etc.), iron and steel, as well as hardwoods, softwoods, plywood and composite materials, like Masonite® and particleboard. Twist bits are also affordable and come in a wide range of diameters, from hair-thick to 1" diameter and even larger. As in most machine tools and accessories, the last few years have seen a torrent of new twist drill styles and types, some designed for general use, some for specialized boring tasks.

Hardware stores and woodworking and machinist's supply catalogs now feature so many different kinds of twist drill sets that buying bits can be awfully confusing. Are high-speed steel bits best, or should you spend the extra cash and spring for a set of cobalt or titanium-nitride-coated bits? Are split-point bits better than standard points, or are stepped-point bits a better choice?

The following article will attempt to familiarize you with the many



aspects of twist drills, including bit sizes, materials and coatings, and point styles. We'll also explore some twist bits designed for specific tasks, such as accurately mounting hardware or drilling pilot holes for tapered cabinet screws. We'll even look at some new twist bits that claim improved performance when used with cordless drills.

Twist bits come in many sizes, including fractional, metric, lettered and more. The chart below provides a sampling of the variety of twist bits available.



Bit Sizes and Sets

Unlike those cute elastic-cuffed slippers they give you at swank resorts, when it comes to drill bits, one size definitely doesn't fit all. Twist bits come in many sizes, including fractional, metric, lettered, numbered and more (photo above). It's far more economical to buy in sets, rather than individually. The exception to this is when you need, say, a single odd-size bit or extra large or extra small bit for a specific

job. The question is, which sets do you really need?

For everyday shop drilling tasks, you'll definitely want to purchase a basic set of fractional-sized twist drills. Sets come in several different size ranges, as shown in the *chart* below. A big 29-piece set will prepare you for the majority of wood shop drilling tasks. Fractional-sized twist drills are also available up to 1½" or more in diameter, but these are expensive and primarily

designed for metalworking. Better quality sets come in handy metal index boxes that keep all the bits organized and prevent them from getting lost or knocking about.

Although a good quality set of bits can be pricey, it's a very practical purchase — in my own shop, I keep a 29-piece set on my drill press table (photo on page 66), and a smaller 13-piece set with my

Today's Shop continues on page 66 ...

Twist Drill Bit Sets

Fractional

7 pc. set: 1/8" to 1/2" Dia. in 1/16" increments.
13 pc. set: 1/8" to 1/2" Dia. in 1/32" increments.
13 pc. set: 1/16" to 1/4" in 1/64" increments.
25 pc. set: 1/8" to 1/2" in 1/64" increments.
29 pc. set: 1/16" to 1/2" in 1/64" increments.

General hole drilling tasks: setting screws, mounting hardware, running wiring, fitting dowels & pegs, etc.

Metric

19 pc. set: 1mm to 10mm in .5mm increments
25 pc. set: 1mm to 13mm in .5mm increments

Drilling holes for European hardware and fasteners.

Left-hand

15 pc. set: 1/16" to 1/2" in 1/32" increments
29 pc. set: 1/16" to 1/2" in 1/64" increments

Drilling into broken screws and fasteners when removing them.

Lettered

A (.234") to Z (.413")

Precision holes for metalworking or for tapping 5/16" to 1/2" threads.

Large-number wire gauge

#1 (.228") to #60 (.040")

Precision holes in metalworking or tapping 1/4" or smaller threads.

Small-number wire gauge

#61 (.039") to #80 (.0135")

Small holes for jewelry, model making or tapping very small threads.



The author keeps a 29-piece fractional twist drill set at the ready by his drill press. The large selection can handle almost any woodworking challenge.

cordless drills. The big set has all the bit sizes you're likely to need for practically any drilling job. For example, when boring holes for dowels, it's not uncommon for a 1/4" dowel to require a 15/64"-

or 17/64"-diameter hole. You'll also need specific fractional-sized drill bits when making pilot holes for production-type screws with non-tapered shanks. For best results, you need to size the bit to suit not only the screw size, but also the type of wood — hard or soft (see *chart* on the next page).

Fractional drills may be the most commonly used kinds of bits, but they're far from the only type available. The *chart* on page 65 shows several of the other kinds of twist drill sets you can buy from machinist's supply catalog companies. If you work with European hardware, or need to tap holes in metal or plastic for metric sized bolts, it's essential to have a set of metric sized drill bits (1mm to 10mm or 13mm) on hand. Left-hand bits spin in the opposite direction of standard bits, and are designed specifically for boring into ruined fasteners, when removing them. If you work



Cobalt drill bits (the dull gold bit above) are heat-treated and generally last longer than regular HSS bits (shown below the cobalt bit).

extensively with metal or plastics and routinely tap holes for fractional sized machine screws or bolts under 1/4" in size, you'll welcome a set of large-numbered bits (#1 - #60 wire gauge), as shown in the photo below left. A lettered set of bits (A to Z sizes) is perfect for machine work and thread tapping holes for bolts between 5/16" and 1/2" in size. And a petite index of small-size numbered drills (#61 to #80 wire gauge) is perfect for model making, jewelry work, and other Lilliputian-sized jobs.

Bit Materials and Coatings

Just like fine kitchen knives, pool cues or dreadnought guitars, not all twist bits are made the same. The cheapest bits, made from questionable grades of carbon steel, won't stay sharp as long and won't perform as well as bits made of better quality metals, such as high-speed or cobalt steel. Another way that twist drill bit manufacturers improve the performance of twist drill bits is to treat them with oxides or coat them with titanium nitride.



To make easy work of tapping holes (1/4" or smaller) in either metal or plastic, a set of large-numbered wire gauge bits is just the ticket.

High-tech Coatings



Ferrous oxide (left), black oxide (center) and titanium nitride (right) are all coatings for HSS steel bits. The coatings reduce heat buildup and help resist rust.

High-speed Steel

Twist drill bits manufactured from high speed steel (usually marked "HSS") are a good choice for general shop drilling tasks. High-speed steel bits stay sharp up to 10 times longer than carbon steel bits. Better yet, HSS can withstand the high temperatures created when drilling thick metal without overheating, which can draw the bit's temper and ruin it (a rainbow of colors at the tip indicates overheating). Uncoated HSS bits are a bit more expensive than carbon steel bits, but definitely worth the price difference if you plan to use your twist drills for more than just boring wood and plastic.

Cobalt Steel

Twist bits made from heat-resistant cobalt steel can last many times longer than regular high-speed steel bits, especially in demanding applications where heat buildup is a problem, as when drilling hardened steel. Cobalt bits are a dull gold color (see the gold bit in the photo page 66 upper right) because of a special heat treating process where the bits are baked

in an oven which hardens them to between 65.5 to 67 on the Rockwell C hardness scale. Unlike coated bits (keep reading...), you can sharpen solid cobalt twist bits without reducing their performance. Cobalt twist drills are considerably more expensive than HSS bits, but tend to be more brittle and less flexible. Therefore, they're best reserved for difficult metal-boring tasks.

Oxide Finishes

Giving a twist bit a black oxide or ferrous oxide finish gives a regular HSS bit additional tempering and stress relief, thus reducing friction and enhancing performance. Heat treating also increases a bit's surface hardness, which not only increases the bit life, but allows it to run at higher RPM and at faster feed rates with less heat buildup. A black oxide or light gold-colored ferrous oxide finish (see the bits above left) also inhibits the formation of rust, which makes these bits popular with carpenters who work with wet lumber. The advantages and nominal extra cost of oxide-finished twist bits make them

more desirable than plain HSS bits for general woodshop drilling tasks.

Titanium Nitride Coatings

Titanium nitride ("TiN" for short) coated bits have a distinctive rich gold color (see the right-hand bit in the photo at left), which is said to dissipate heat and help bits last up to seven times longer than uncoated HSS bits. The TiN coating increases the hardness of the surface of bits (up to a whopping 82 on the Rockwell C scale!) and adds self-lubricating properties. This makes TiN bits terrific for drilling both ferrous and nonferrous metals, as well as nonmetallic abrasive materials, such as Wonderboard. Unfortunately, TiN bits can't be resharpened without destroying the micro-thin coating on the point (it's likely that by the time the bit needs resharpening, the coating has already been worn away). Like cobalt steel bits, TiN-coated bits are best reserved for tough metal-drilling tasks, since the coating does little to enhance drilling performance in wood and nonmetallic materials.

Today's Shop continues on page 70 ...

Pilot Hole Diameters (straight shanked screws)



Screw Size	Pilot holes for hardwoods	Pilot holes for softwoods	Hole for countersinking screw heads
#4	5/64"	1/16"	1/4"
#6	7/64"	3/32"	3/8"
#8	1/8"	7/64"	3/8"
#10	9/64"	1/8"	1/2"
#12	5/32"	9/64"	1/2"
#14	11/64"	5/32"	1/2"

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Chris Marshall, *Woodworker's Journal*, February 2004

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Workbench, December 2003

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Standard pointed bits (left) are ground at 118°, while split-point (right) have faces ground at 135°. The author considers the split-point bits a better all-around choice.

Point Styles

A basic twist drill works by using a pair of cutting edges (called lips) to shave a thin layer of material off the bottom of the hole as the bit spins. The design of these lips, as well as the shape of the entire point, significantly affects the way a twist drill performs. Commonly available twist bits feature several different point styles, some made for general use, others for handling a limited range of materials and applications.

Standard and Split-point

The degree of a drill point's angularity determines how easy or difficult the bit is to start, as well as how aggressively the bit bites into the material being drilled. Standard bits with a 118 degree point (sometimes called "mechanic's bits") are good for general-purpose drilling jobs and offer satisfactory results in a wide variety of materials. These bits also center very well in existing holes, allowing you to enlarge them easily, say when the hole you've just drilled for a screw or dowel is just a skosh too small. However, in order to prevent a bit from "skating" (wandering or skipping around) when drilling metal or other hard materials, you must create a dimple using a center punch. To prevent skating with

larger bits — say 5/16" and up — it's best to drill holes in two stages, starting with a smaller hole, then enlarging it to full size.

Today, more and more do-it-yourselfers and woodworkers prefer the split-point design of 135 degree bits (see right-hand bit photo in above left.) This special grind offsets the cutting edges from one another, enabling them to cut aggressively while significantly reducing the tendency to skate and wander. It also allows drilling the hardest materials without center punching or predrilling a centering hole. In my opinion, 135 degree split-point bits are a better choice than 118 degree bits for all-around shop drilling tasks for holes 1/2" and smaller. Whether you choose 118- or 135-degree bits, you'll get the best performance by keeping all your bits sharp; see the sidebar on page 74.



To get a nice, clean, large hole, use a two-step process. First, drill a small pilot hole. Next, use a stepped-point bit to bore the desired hole diameter, using the pilot hole to keep the bit centered as you drill.



Point styles are one of the variable features to choose from when considering which twist bit is right for a specific task.



Stepped-point

Sold as "Pilot Point®" bits by DeWalt (and once sold as "Bullet" bits by Black & Decker), stepped-point bits have a tip that looks like a very short twist drill that's about half the diameter of the bit's shank. (See center bit photo above) This point not only prevents the bit from skating around when starting a hole, but makes it easier to center a bit on a pencil mark or center-punched dimple. A stepped point also helps keep the bit from veering off-center when drilling thick materials and causes a bit less damage on the underside of the stock when drilling completely through the material.

Stepped-point bits are great for drilling large holes in two steps (see photo below), with the first hole drilled the same diameter as the size of the larger bit's tip. However, they aren't a good choice to enlarge an existing hole slightly, since the bit won't align readily. Their complex tip geometry means that sharpening isn't an option; once the point is damaged or dull, the bit must be replaced. To make their bits last longer, DeWalt finishes their Pilot Point® bits with ferrous oxide (see coatings, section).

Brad Point Bits

If quickly drilling perfect, tearout-free holes in wood is your goal, it's hard to beat the clean drilling performance of brad point bits. (Left bit, photo above.)

A brad point's sharp central point allows the bit to be positioned with great accuracy and eliminates skating as the hole is started. The

Today's Shop continues on page 72 ...

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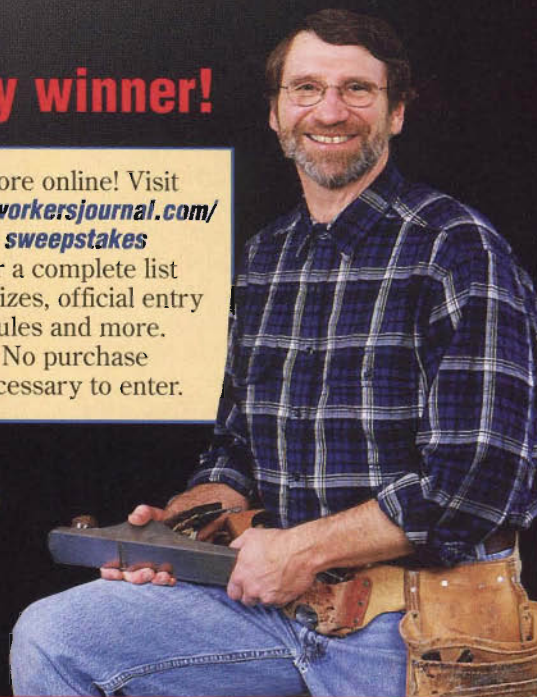
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bit's raised side spurs score the wood around the circumference of the hole, providing a very smooth cut and reducing chipping on the top surface of the work, as well as reducing splintering where the bit exits the underside of the stock.

On the down side, these bits are strictly for drilling wood, soft plastics, and solid-surface materials such as Corian™. And remember, like stepped-point bits, brad points aren't a good choice for enlarging existing holes, as they won't center properly.

Sometimes referred to as "dowel bits," brad points come in a wide range of sizes, ranging from 5/64" to 1" in diameter (see photo above). Well-stocked woodworking supply houses even offer brad points in 1/64" fractional increments. Brad points come in many different grades, from the cheapest carbon steel bits, to high-speed steel bits (best for general woodshop use) to TiN-coated and carbide-tipped bits suitable for demanding production shop applications (photo, right). Brad point bits can only be resharpened with a needle file or fine stone, a difficult procedure to execute properly.

Brad point bits have advantages for woodworkers, but cannot be used in metalworking or with other hard materials.



Shank Styles

While most of the differences between twist drills have to do with materials and point design, the shank — the part of a bit that fits into the chuck — is another factor worthy of consideration. Most bits have smooth, cylindrical shanks that are the same diameter all the way up. This gives a bit lots of rigidity — a good thing when boring holes in difficult materials. But in some drilling situations, bits with reduced-diameter, flatted or hex-shaped shanks are a better choice.

Reduced-diameter Shanks

Twist bits with a variety of point styles are available with reduced-diameter shanks, where bits between 3/8" and 1/2" diameter have their shanks stepped down to a 3/8" diameter (or even 1/4"). Referred to as "Silver & Deming" bits (in machinist's supply catalogs), reduced-shank bits are convenient for use in hand and power drills fitted with 3/8" (or 1/4") capacity chucks.

Flatted Shanks

Another bit shank style that makes twist drills more "user-friendly" is the flatted shank. Also called "No-Spin" shanks (in DeWalt's



Sometimes called dowel bits, brad point bits are available in TiN coating and with carbide tips, but their cost in these forms makes them impractical for non-professionals.

terminology), these feature three flats ground on the shanks of bits larger than 3/16". The flats provide a drill chuck's jaws a very firm grip and prevent the bit from spinning in the chuck when the drill stalls, say when you hit a knot in pine. A major complaint of many DIYers, spinning can quickly ruin a bit by galling its shank, making it difficult to chuck properly again. Flatted shanks are especially useful when working with larger bits in a keyless chuck, as such chucks are more difficult to tighten than traditional keyed chucks.



Bits with their shank diameter "stepped down" allow a drill with a smaller chuck to accept large diameter drill bits.

Hex-shanks

Yet another handy shank configuration, 1/4" hex-shank or "quick-change" bits, have hexagonal shanks designed to work with quick-release magnetic or spring-loaded accessory chucks. These accessory chucks also accept screwdriver bits and drilling accessories, and can make work with a cordless drill very handy: You can drill a pilot hole, then quickly change to a driver bit and set screws in a flash. Hex-shank bits also work in standard drill chucks and aren't subject to bit spin, just like bits with flatted shanks (see text above). You can buy hex-shank bits in ready-to-use sets, or you can buy hex-shank adapters that work with all styles of twist bits.



Tapered bits (with optional countersink collars) must be matched to the correct size cabinet screws. Not for use with straight-shanked screws.



Extra long "aircraft bits" can be just the ticket if you find regular bits are too short.

Special Drill Bits

Special Twist Drills

General-purpose twist drills come in a number of special sized sets (numbered, lettered, etc.), great for jobs like mounting metric fasteners or for making holes for tapping screw threads (see the *chart* on page 65). But there are times when these bits won't do the trick, and it's time to reach for a specialized type of twist bit.

Tapered Drills

Made primarily for drilling pilot holes for traditional tapered cabinet woodscrews, tapered drills have shanks that go from thick to slender and come to a fairly sharp point. The holes these bits create give the threads of tapered wood screws good "bite" along their entire length. This not only produces strong connections, but decreases the chances of screws stripping out or snapping. (To develop full holding strength, it's important that hole depth matches the depth of the screw's penetration into the work.) Tapered bits are NOT the right choice when drilling pilot holes for straight-shanked production screws (see *Pilot Hole Dia. Chart*, page 67).

Tapered drills are sized specially for different-sized screws — #4, #8, etc. A typical set (photo, above) for

all the typical cabinet screws you're apt to use in a small shop would include #6, #8, #10 and #12 tapered bits. Most sets also include removable countersinks that slide onto the shank of each tapered bit, as well as stop collars that allow you to set the exact depth of the countersunk hole.

Extra Long Bits

Most twist drills you buy in sets or individually at hardware stores are "jobber length" drills (e.g. a 1/4" bit is about 4" long) which have enough length to do most average boring jobs. But there are certainly occasions when longer bits are called for. (Photo, above right)

Referred to as "aircraft drills" in machinist lingo, extension drills come in several lengths — 6", 12", and even 18" long — in most common sizes (bellhanger bits, made for carpentry and electrical work, are even longer). Extra long bits are a blessing when you need to bore a hole through very thick material or when you're working in cramped quarters where shorter bits don't provide enough reach.

Quick-drilling Bits

The Vermont American Tool Company's new XTEND and Sidewinder series drill bits are both designed to drill holes more quickly than regular bits (photo below). They both feature aggressive starting points and shanks with a fast helix angle (think tighter corkscrew), to rapidly eject material from the hole. According to Vermont American, their XTEND

Today's Shop continues on page 74 ...

XTEND bits (with their fast helix or tighter corkscrew) are designed to get the most efficient use from cordless drills. Compare the Xtend bit helix to the gold cobalt standard twist (inset).



Self-centering "Vix" bits are one of the most useful drill bits in any cabinet shop.



Keeping Your Twist Bits Sharp



To get the best performance out of bits with standard (118°) or split (135°) points, you should sharpen them occasionally, rather than wait for them to get really dull and burn and send up smoke signals with every hole. Unless you're experienced at sharpening drill bits by hand, a motorized drill sharpener is a good investment. These specialized machines reshape and sharpen a bit's cutting edges at the tip. Sophisticated models, such as the "Drill Doctor" shown here, handle both 118° and 135° bits between 3/32"- and 1/2"- (or even 3/4"-) diameter, as well as carbide-tipped masonry bits.

— Sandor Nagyszalanczy

series bit's "Speed Geometry" supposedly uses less battery power when run in a cordless drill, and will bore up to four times more holes per charge than standard twist bits. In my own informal testing, the bits definitely penetrated even hardwoods, like oak and maple, quickly and with less effort than regular twist bits. However, they were a bit "grabby" when drilling softwood lumber and left holes that were very rough — not much of a concern if you're doing construction projects, but I wouldn't choose them for fine finish work.

Self-centering Bits

For perfectly aligned hinges, latches and other hardware, nothing beats drilling screw holes with a self-centering bit (see photo above). Also known by the brand name "Vix® bits," self-centering drill bits surround a standard twist drill bit with a retracting, spring-loaded sleeve. The sleeve's tapered end fits snugly into the chamfered mounting screw holes found on most hardware, to guide the bit as the hole is drilled. The bits come in several sizes, each made to work with one or two standard screw sizes (#6, #8, etc.). You can even buy 1/4" and 5mm self-centering bits, designed to work with templates used when drilling multiple holes for adjustable shelf support pins.

Stepped Bits

A stepped drill bit is like two bits in one, with a smaller diameter drill at the tip (like a stepped-point bit's tip, only longer), attached to a larger diameter shank. With



a stepped bit, you can drill two holes at once: A smaller pilot hole for a screw, and a larger hole for recessing the screw's head below the surface of the work. Stepped drills are also perfect bits for drilling pocket-holes for joining face frames with screws using a special jig (photo above).



Stepped bits are the key to pocket-hole jigs, but are useful in other operations, too.

You can also use these bits when drilling freehand with a portable drill; however, care should be taken to keep the bit straight and running true to avoid snapping off its delicate tip.

Sandor Nagyszalanczy is a woodworker and author of several books, including The Homeowner's Ultimate Tool Guide, from Taunton Books.

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A Tale of Three Sanders

By Ellis Walentine

Nothing beats a random-orbit sander for fast-cutting, swirl-free sanding performance. It's no wonder they have become the most popular finishing sanders in both hobbyist and professional shops. But, all random-orbit sanders are not created equal, and they aren't equally suited to every sanding task. My recent test of three new 6" random-orbit sanders from Festool and Bosch confirmed that.

These sanders represented the two distinctly different categories of sanders: right-angle and inline. Right-angle sanders are built like angle grinders, with a powerful barrel-grip motor connected at right angles to the sanding pad via a helical bevel gear. They're ideal for heavier sanding jobs, where the main objective is stock removal. Because of their gear train, right-angle sanders are noisier and vibrate more than inline sanders, and you have to work harder to control them. Also, since their motors are in the barrel handle, they can generate an uncomfortable amount of heat with extended use.

Inline (or direct-drive) sanders, which are available in both pistol grip and palm grip varieties, are better suited to finish sanding. They have vertically mounted motors coupled directly to the sanding pad by way of an eccentric casting in the base. Inline sanders aren't as powerful as right-angle models, but they're quieter and better balanced. They also produce far less vibration — a major plus when you have a lot of sanding to do.

In recent years, the lines between sander types have blurred as manufacturers have built more versatility into these tools, making

These 6" random-orbit sanders from Festool and Bosch will tackle almost any sanding job, but no one sander does everything best.



their latest right-angle models more civilized and their inline models more aggressive. But, as my recent test of Bosch's right-angle model and two variations of Festool's inline sanders showed, they haven't closed the gap yet. My test proved to be a study in contrasts between beguilingly similar yet, in the end, very different tools.

Festool ETS150/3 EQ, ETS150/5 EQ

Festool's ETS 150 EQ finishing sanders are identical pistol grip sanders that differ only in the size of their orbit, or stroke. The ETS 150/3 EQ, with its 3mm orbit (about 1/8"), is intended for fine finish sanding with very low abrasion, while the ETS 150/5 EQ, at 5mm (3/16"), is intended for more aggressive stock removal.

The first thing I noticed was how ergonomically friendly these sanders were: nicely balanced and, at about 4 lbs., lighter in weight than I expected. The grip feels comfortable and natural, whether you're using one hand or two; and the vibration is so minimal that you can guide the sander by just holding the cord lightly — no jumpiness at all. That's something you can't do with most right-angle sanders, or, for that matter, with many of the other pistol grip and palm grip sanders on the market.

Dust extraction is a major feature of the ETS 150 EQ sanders. Both models have Festool's patented "Jetstream" dust extraction system, designed to improve dust pickup and extend abrasive life.

In the "Jetstream" concept, the motor fan gently blows air out of

Tools by the Numbers

Festool ETS150/3 EQ, ETS150/5 EQ

Amps2.6
Weight4 lbs
Orbits Per Min. ...8,000 – 19,000
Orbit Diameter(1/8", 3/16")
Pad Diameter5.91"
Abrasives9-hole hook & loop
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A look under the hood of Festool's nearly identical sanders reveals the components of the "Jetstream" dust extraction system. The onboard wrench is convenient for pads-changing.

the center hole in the sanding pad, sweeping the dust toward the eight smaller uptake holes near the outer edge of the pad. From there, it's blown out through the dust port into the waiting passive dust bag.

Festool claims that their Jetstream concept makes abrasives last 30% longer. Without extensive testing, all I can say is that they definitely stay cleaner than those of other random-orbit sanders I've used on the same materials. Another innovation I liked was the detachable power cord — a component of the ETS150 EQ's "Plug-It" system that it shares with similarly equipped Festo tools. The cord has a twist-lock plug that connects to a socket in the rear of the sander, making it easy to replace if damaged and easy to switch back and forth between tools without having a gaggle of cords everywhere.

After testing the ETS150/3 EQ and ETS150/5 EQ, I had difficulty figuring out why Festool makes two models that are so similar. The differences in aggressiveness, overall performance and surface quality are perceptible, but certainly not dramatic. If I could buy only one of these sanders, it would probably be the ETS150/5 EQ. At lower speeds, it sands almost as smooth as the ETS150/3 EQ; and at higher speeds, with coarser paper, you can get the job done slightly faster.

Nonetheless, I felt that each of these sanders is an unqualified, professional grade success —

delightful to use, and a noticeable step up from the less expensive, palm grip models common in most shops.

Bosch 1250DEVS

Of all the random-orbit sanders I've ever tested, the new Bosch 1250DEVS 6" right-angle sander is probably the most powerful. I think that, armed with the right abrasive, this sander could grind the barnacles off a boat; yet, because of its dual-mode operation and variable speed control, it is capable of a fair degree of precision and finesse as well — at least for a sander of this type and power.

Ergonomically, the 1250DEVS leaves a few things to be desired, but it's surprisingly comfortable for a sander of this body style. Its beefy 6.5-amp motor is enclosed in a tapered barrel-grip handle with an "ambidextrous" (i.e., interchangeable,

left or right) outrigger handle for two-handed operation. The sander also has a soft rubber gripping surface on the head of the sander, should you choose to place your other hand there instead.

The on/off switch isn't ambidextrous, though, so lefties will find it awkward to switch the 1250DEVS on and off. And, the rear-mounted variable speed dial is inconvenient for lefties and righties, since you need to free up a hand to adjust it.

There are times when even two hands aren't enough to tame this beast: In rough-sanding mode, with the speed cranked all the way up, I had trouble controlling the tool on flat work. I imagine this maximum setting is intended mainly for applications like auto body grinding or buffing, or where only part of the pad is actually in contact with the work. It's nice to have that kind of power when you need it, though.

The rough mode setting locks the pad to the driveshaft, so its rotation is actually driven by the motor, instead of merely being induced by the oscillations of the pad, as with most other

In recent years, the lines between sander types have blurred as manufacturers have built more versatility into these tools, making their latest right-angle models more civilized and their inline models more aggressive.

continues on page 78 ...

Tools by the Numbers

Bosch 1250DEVs

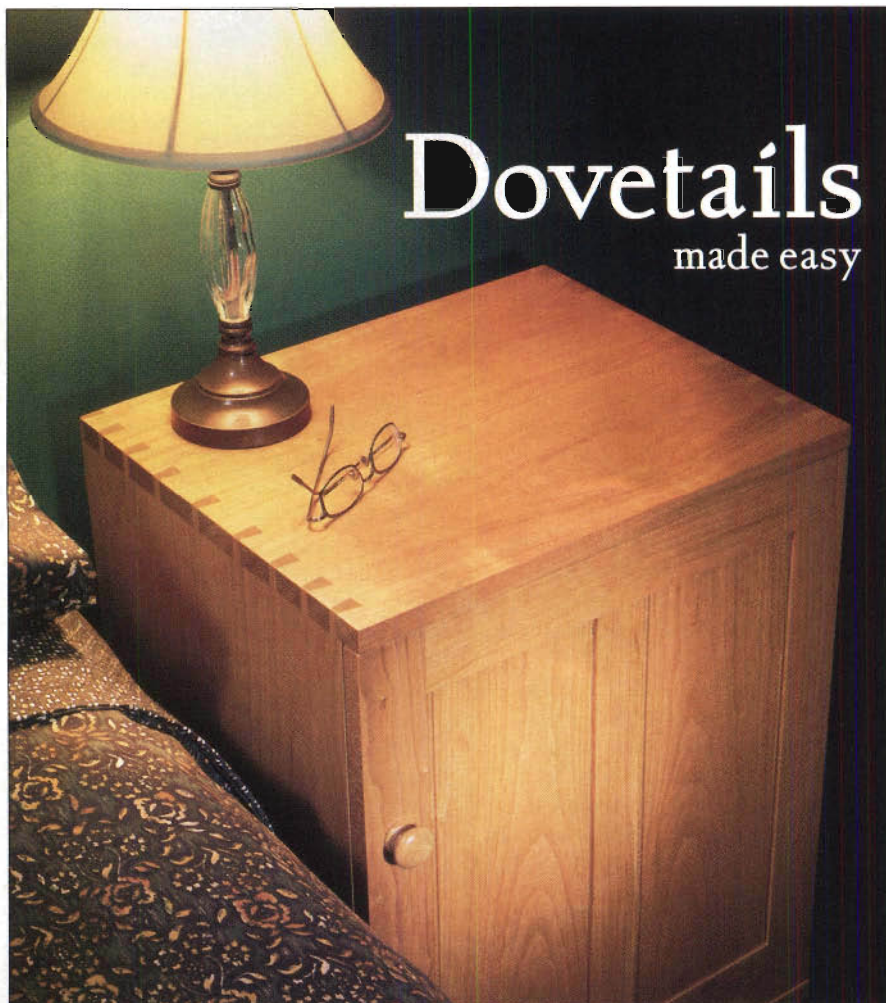
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The 1250DEVs's mode selector switch lets you choose between "rough" (driven) mode for coarse sanding and "fine" (freewheeling) mode for less aggressive sanding.



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random-orbit sanders. The pad rotation is what makes the sanding action so aggressive, even though the orbit size is only 3/32". This direct drive feature, combined with Bosch's "constant response circuitry," makes it virtually impossible to slow this tool down.

In fine sanding mode, and at lower speeds, the 1250DEVs is much more civilized. I was able to scuff-sand a delicate lacquer finish with 320-grit sandpaper with no sand-throughs or control problems. Because of the weight of the motor, you do need to support the back end of the sander, which requires some attention; and, because of the geared design, you need to be prepared for a fair amount of vibration.

Dust collection is optional on the 1250DEVs. The sander has a molded plastic tube to evacuate the dust, but no filter bags or hose fittings are included. The 1 3/16" diameter port is easy enough to connect to a vacuum hose adapter, though, and vacuum extraction through the six-hole pad works very efficiently.

Bosch offers three sanding pads of different thickness or durability — soft, extra soft and hard — for different jobs. You can also choose from a variety of buffing and polishing accessories that are well suited to the direct-drive sanding mode of the 1250DEVs.

Although it would not be my first choice as a finishing sander, Bosch has successfully pushed the envelope of right-angle, random-orbit sanding with the new 1250DEVs.

Ellis Valentine is a freelance editor and webmaster of WoodCentral.com and Woodfinder.com.



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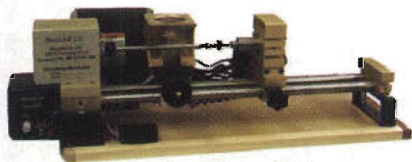
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No.	Source	Page	No.	Source	Page
1	Airware America	82	59	Magnate	81
4,3	Amana Tool Corp.	87,93	61	Maple & Birch.com	68
5	Armor Craft	81	62	MasterGage Corp.	81
6	Arrow Fastener Company	12	63	Micro Jig	69
73	Aztec Steel Buildings	86	64,65	Miller Dowel Co.	27,58
7	Badger Hardwoods	68	66	Modine HVAC&R Division	81
8	Beall Tool Company, The	80	68,67	Mule Cabinetmaker Machine	58,86
9	Berea Hardwoods	25	69	Murray Bros.	81
10	Better-Built	12	70	Niagara Lumber	68
	BrandNew	82	71	Olson Saw Company	97
11	Bristol Valley Hardwoods	68	72	Olympic Interior	59
13,12	Briwax	58,99	74	Oneida Air Systems, Inc.	97
	Bunk Bed Specialties	58	75	Osborne Wood Products	95
	Bygone Workshop	80	77	Polymeric Systems	81
	Central Boiler	80	78	Porter-Cable	2
15	Cherry Tree Toys, Inc.	97	29	PriceCutter.com	101
16	CMT USA	69	79	PROXXON Tools	95
17	Colonial Saw	11	80	Quality Web Alliance (LASERKERF)	81
18	Country Accents	12	82	Red Hill Abrasives	81
	Country Home Products	87	85,84	Rockler	
20	Craftsman Tools	103		Woodworking & Hardware	58,98
21	Creative Woodcraft	80		Rockler.com	15
22	Cupboard Distribution	82	87	Rousseau Co.	91
23	Cutting Edge	80	88	Routerbits.com	81
	David Warren Direct	80		Routermania	99
24	Delta Machinery	3	89	Panel Pro®	99
25	DeWALT	27	90	Screw Products, Inc.	80
26	Diamond Machining	15	91	Scroller, Ltd.	58
27	Donjer Products Corp.	80	92	ShopBot	86
28	Drill Doctor	91	93	Simp'l Products	92
30	Eagle America Corp.	80	95,94	Smithy & Co.	87,91
	Engraving Arts	80	96	Specialty Furniture	80
31	Eureka	80	97	Stairways, Inc.	81
32	F&W Publications	62,63	98	Tech Mark, Inc. (Rojek)	19
33	Fein	84	99	Tormek USA	27
34	Festool	75	102	U.S. Buildings	82
35	Franklin International	7	100	U-Bild Woodworking	80
36	Fred Alger	23	101	United Gilsonite Laboratories (ZAR®)	25
37	Freud	9	103	Viel Tool, Inc.	86
38	Furniture Medic	101	104	Waterlox Coatings Corp.	84
39	General International	99		West Penn Hardwoods	69
40	Gilmer Wood	69	105	Wilke Machinery Co.	86
41	Gorilla Glue	21	118	Williams & Hussey Machine Company, Inc.	94
43,42	Gougeon Bros.	68,95	106	WILTON	13
44	High Noon Woodworks	81	107	Winfield Collection	58
45	Home Depot (RIDGID)	17	108	Wood River Veneer	82
46	HTC Products	97	109	Wood-ply Lumber	69
47	HUT Products	68	117	Wood-Write, Ltd.	80
48	Japan Woodworker	81	110	Woodline USA, Inc.	85
49	JessEm Tool Co.	11	112	Woodturners, Inc.	82
50	JET Equipment & Tools	52,57	113	Woodworker's Choice (TWC)	80
	JET Equipment & Tools	53 - 56	114	Woodworker's Depot	97
51,52	JET Equipment & Tools	79,104	116,115	Woodworkers Source	58,69
54	Klockit	27	188	Woodworker's Journal eZine	12,94
55	Kreg Tool Co.	99	145	Win Norm's Shop Sweepstakes	71
56	Laguna Tools	4		Women in Woodworking	98
76	Legacy Woodworking Machinery	81			
	Leigh Industries, Ltd.	78,92			
57	Leon Hyatt	81			
58	Librawood	81			
118	MacBeath Hardwoods	68			

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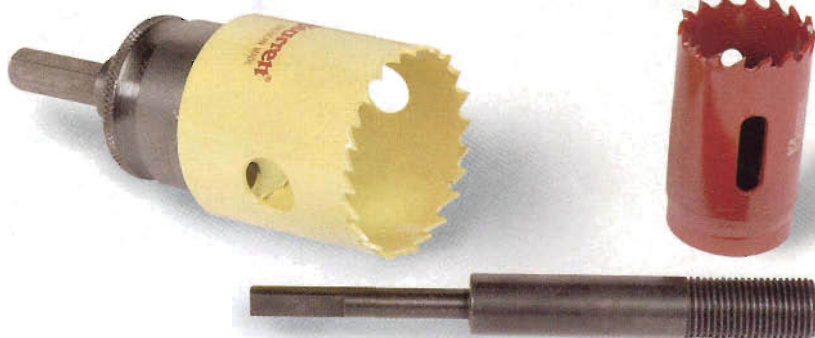
A Second Chance Hole Saw

If you've ever drilled a hole — and then decided it was in the right place, but just needed to be a little bit bigger — you'll appreciate the new Hole Saw Guide Adapter™ from Intromark Incorporated. This tool takes the place of the pilot drill bit in your hole saw. A smaller hole saw, the same size as the existing hole, fits into the threaded end of the Adapter. This acts as a guide — eliminating the need for an additional jig.

The Hole Saw Guide Adapter fits almost all standard hole saws and can be used on any surface that can be cut by a hole saw. Suggested retail price is \$20, according to Intromark Incorporated, which is affiliated with the Invention Submission Corporation. *You can call them at 800-851-6030 or find them on the web at www.isc-online.com.*



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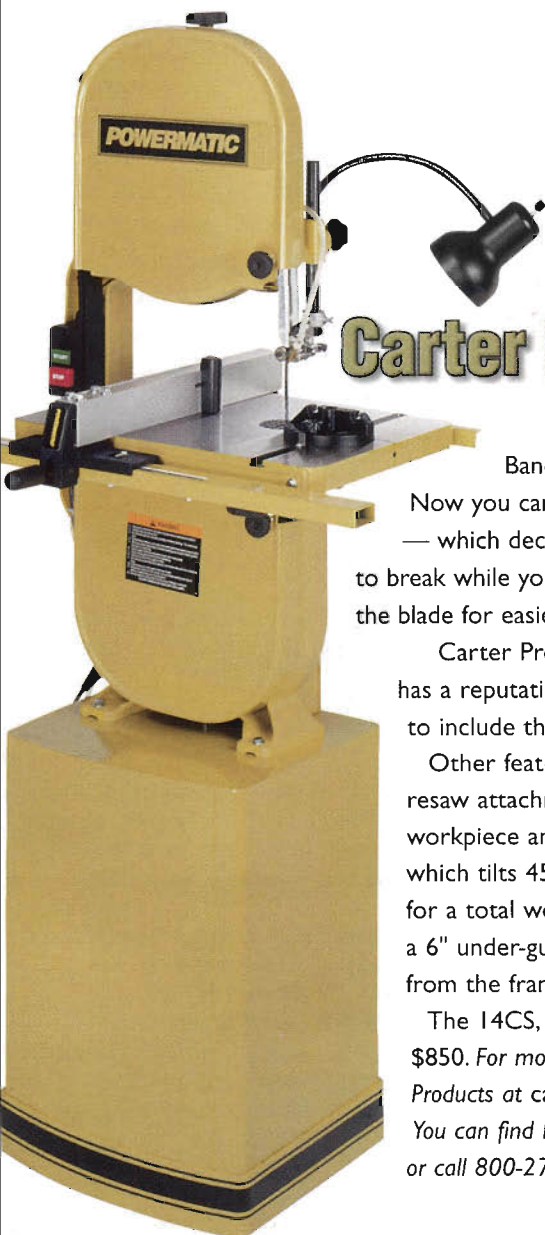
Carter Helps Relieve the Tension

Powermatic has decided to include Carter Product's Quick Release Bandsaw Tension Toggle as standard equipment on their new I4CS band saw. Now you can simply flip the toggle arm to de-tension the blade when it's not in use — which decreases stress and increases its life. It means that the blade is less likely to break while you're using it, as well. You can also use the Quick Release to pre-tension the blade for easier installation when it's time for replacements.

Carter Products president Peter Perez says of the partnership that "Powermatic has a reputation for producing the very best. We are pleased that they have decided to include the Quick Release as an important feature on their new saw."

Other features of Powermatic's I4CS include T-square style rip fence with steel resaw attachment, built-in 60 watt halogen lamp to illuminate the blade and workpiece and built-in 4" dust port. The cast-iron table has a 15" x 15" section which tilts 45° right and 10° left, and a fixed 15" x 5" extension for a total working surface area of 15" x 20". There's a 6" under-guide cutting capacity, with 13½" clearance from the frame to the blade.

The I4CS, with standard Quick Release, sells for \$850. For more information, you can find Carter Products at carterproducts.com or call 888-622-7837. You can find Powermatic at www.wmhtoolgroup.com or call 800-274-6848.



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Also on the front of the saw are the miter locking system, miter detent override and miter adjustment knob. Scales which mark regular and complementary angles assist in setting miters, as do the 10 positive detent stops. Stops at 31.6° left and right help out in flat-cutting crown moldings.

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against the fence. The fences and standard extensions can expand 37 1/4" from either side of the saw.

The 4410's upfront controls also include a four-position adjustable handle and a lock-off switch which works with a right- or left-hand grip. An electric brake will stop the standard 72-tooth, thin-kerf, carbide-tipped blade in less than five seconds. The saw has a 15 amp, 4,600 rpm motor with 3 HP maximum and comes with a dust bag and wrench set. Suggested price is \$559.

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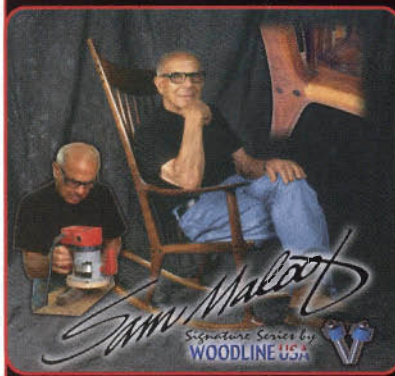
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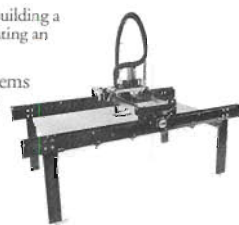
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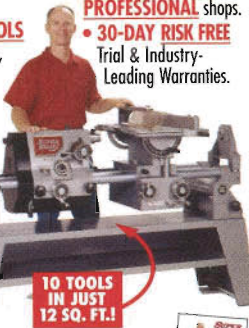
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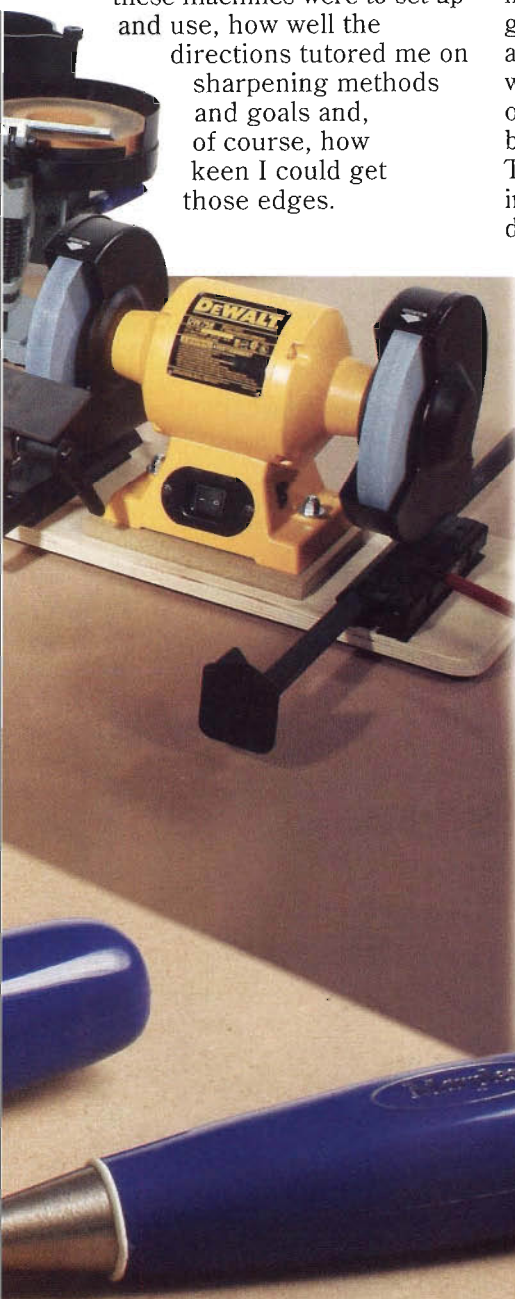
Power Sharpening Systems

By Chris Marshall

Razor-sharp hand tools are a joy to use but can be a bother to keep that way. Believe it or not, sharpening can be both easy and quick if you add some power to the process. Here's a bench full of options that will get your tools scary sharp in no time.



Recently I put six motorized sharpening systems to the test on a variety of tool blades. The mix of dull edges included those on lathe and carving tools, bench chisels, plane irons and jointer knives. I was curious to see how easy these machines were to set up and use, how well the directions tutored me on sharpening methods and goals and, of course, how keen I could get those edges.



On four of the systems, a synthetic whetstone does the work. Water cools the stone and creates a slurry of metal particles and abrasive that speeds up the sharpening process. Sharpening happens slowly but controllably. Two systems operate like conventional dry-wheel bench grinders. Dry-grinding produces a fresh edge more quickly than wet-grinding, but you run the risk of drawing temper out of the steel by overheating it during sharpening. The Veritas system uses sandpaper instead of abrasive wheels in a dry-grinding fashion. With that said, here's the "grind" on each machine.

Delta 23-710 Sharpening Center

If you can't decide between wet- versus dry-grinding, don't fret: Delta gives you both options with the 23-710. The system features a 120-grit aluminum oxide wheel on one end and a 1,000-grit whetstone on the other. The dry grinding wheel revolves at standard bench grinder speed, while the whetstone is stepped down to 400 rpm. Each wheel is outfitted with an adjustable tool rest for setting a range of blade bevel angles. The larger tool rest can be mounted on either wheel — alongside the dry wheel for use with the guard tipped up or in front of the whetstone. I found it more useful for wet grinding.

Having the option of both a dry, coarse-grit wheel and a fine whetstone adds practicality to this machine. The white wheel is a full 2" wide, which makes it easy to grind the initial square edge and remove nicks on your widest bench chisels and plane irons. However, it grinds too aggressively for refining bevels and edges. If you're working on carbon steel chisels or plane irons, beware. Bear down on the steel and it'll turn blue in an instant, a sign that the temper is gone. Save this wheel for rough work only.

As a whetstone sharpener, the Delta performs admirably. The stone is large enough to provide broad, horizontal contact surfaces — a nice feature for sharpening longer jointer or planer knives. The tool rest is fully adjustable with knobs for setting bevel angles and working height. Allen screws lock all the settings once you've got the rest dialed in. I really appreciated the spokeshave-style sliding tool holder that fits on the large rest. A pair of knurled lock knobs hold chisels and plane irons securely while you slide the apparatus left and right for sharpening. The water tank drips on the stone to keep things cool, and its volume is sufficient to sharpen most tools without refilling.

At a street price of \$169, Delta offers good value here. You won't be able to sharpen complex bevels or curved edges easily with this system, so look elsewhere for tuning up those carving tools and lathe gouges. It could use a larger tool rest with finer adjustment capability in front of the dry stone.

Tool Review continues on page 90 ...

Delta 23-710 Sharpening Center



Delta 23-710

Street price: \$169
Grinding speed: 400 - 3,450 rpm
Wheel grits: 120-1,000
Best for sharpening: chisels, plane irons, jointer/planer knives
Phone: 800-438-2486
www.deltawoodworking.com

If you have jointer and planer knives to sharpen, Delta sells an accessory knife-grinding attachment for \$75.

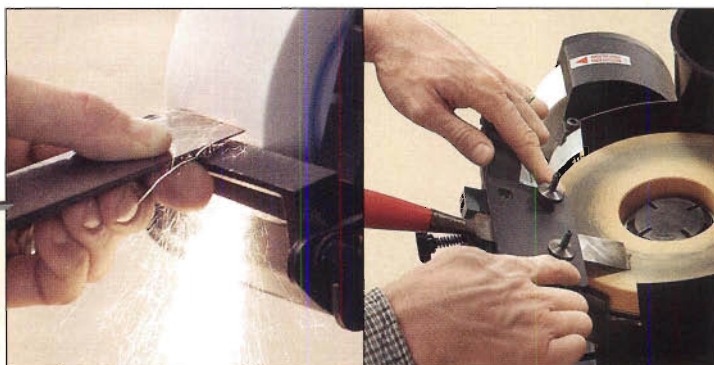
Makita 9820-2 Electric Sharpener

Makita's sharpener features a 7^{7/8}" diameter, 1,000-grit whetstone that spins horizontally at 560 rpm. In this configuration, the stone cuts conventional flat-grind bevels. A water tank above the stone provides drip-feeding with a valve that adjusts the water flow.

The machine comes with a substantial cast-iron tool rest and knife-sharpening jig. Other manufacturers offer similar tool rests as accessories, but it's a good standard-issue item here. The rest adjusts vertically on a pair of threaded posts, and you can tip the platform to different bevel angles with a spring-loaded adjuster screw. The sharpening jig is long enough to hold jointer blades

Makita 9820-2

Street price: \$289
Grinding speed: 560 rpm
Wheel grit: 1,000
Best for sharpening: jointer/planer knives
Phone: 800-462-5482
www.makitatools.com



Delta provides a wide 120-grit aluminum oxide wheel for grinding away nicks or changing bevel angles (left). The author finds it too coarse for sharpening softer carbon steel blades. A tool holder holds chisels and plane irons held fast during sharpening on the finer whetstone wheel (right). It rides on the larger tool rest.

or planer knives under 15". Five adjustment screws in back set the blade projection, and four screws on top hold the blade in place. Once I got everything set — which took a while — sharpening happens by sliding the jig back and forth.

The jig resurrected my nicked jointer knives without difficulty. Bevels were flat and smooth, and the edges were sharp.

Aside from sharpening jointer and planer knives, the 9820-2

comes up a bit short on versatility. You can use the tool rest for sharpening any flat-edged blade, but the knife jig isn't designed to hold other blades. I ended up using a speed square hooked over the edge of the tool rest to support my chisels and plane irons and keep them square to the stone. The knife jig would be much more useful if it were modified to hold hand tool blades.

Makita 9820-2 Electric Sharpener



Makita's knife-sharpening jig has five adjustment screws in back to set the blade projection of jointer and planer knives. Micro-adjust knobs below allow for precise height adjustments. Sliding the jig back and forth sharpens bevel edges on jointer and planer knives.

If you have deep nicks to remove from your edges, consider buying Makita's 60-grit stone for this tool. Removing nicks with the stock 1,000-grit whetstone is no quick task. You can also buy a 6,000-grit stone for final honing and deburring.

With a little creative jig building, the Makita could become a better general-purpose sharpener. You'll have to be the judge if its price tag merits the extra effort.

Oneway Wolverine Grinding Jig

While it's possible to sharpen lathe tools with ordinary slip and flat stones, the process takes a good eye, a steady hand and plenty of experience. Most woodturners I know would rather spend their time at the lathe sharpening their turning skills instead of at the bench sharpening the tools. Thanks to an innovative system from Oneway, you can sharpen those complex bevels and curved edges quickly and easily without spending a fortune.

For around \$160, the Wolverine Grinding Jig converts your 8" high- or low-speed bench grinder into a dedicated lathe tool sharpener. The heart of the system consists of a pair of bases that mount under the grinding wheels. Two tubular rests slide into the bases and lock in place with cam levers. One rest is an adjustable platform, intended for grinding scrapers or rough-grinding chisels and plane irons. The other rest has a vee-socket for cupping the handles of gouges and parting tools.

Oneway recommends swapping your gray grinder wheels for aluminum oxide wheels to cut down on heat build-up and conserve tool steel. Buy two grit grades for coarse and fine grinding. The wheels aren't included in the basic price. Oneway sells the wheels, or you can buy them from most woodworking suppliers.

Tool Review continues on page 92 ...

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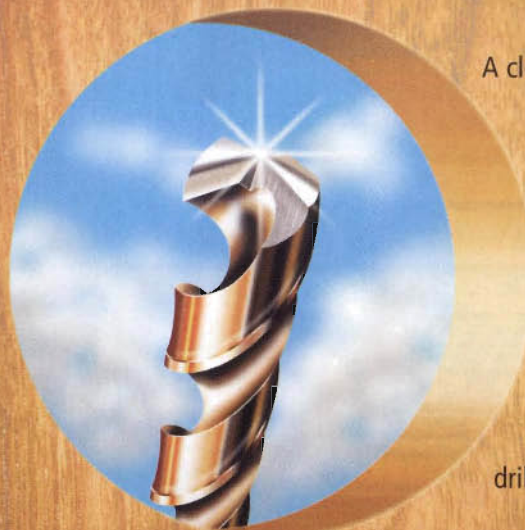
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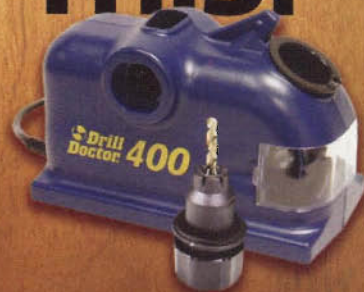
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Here's how the basic system works: To sharpen lathe scrapers, you tilt the platform base to the bevel angle you prefer and slide or rotate the tool against the wheel. It refines the bevel and forms the necessary edge burr. For sharpening gouges with conventional grinds, slide the V-arm in or out with the tool in the pocket until the cutting bevel aligns with the stone. Sharpening is a simple matter of twisting the tool handle. The rest indexes a consistent bevel angle for you. It's a no-brainer to use, even on the first try.

Many turners prefer to regrind gouges so the corners of the cutting bevel are further back. To make these side grinds, Oneway offers a Vari-Grind jig that holds the gouge at a steeper bevel angle and pivots on a leg in the V-arm. Swinging the tool handle from side to side in the jig grinds the deeper profile.

I found it surprisingly easy to do.

There's an accessory for sharpening skew chisels as well. This one mounts in the V-arm rest and holds the chisel at a 70° angle to the left or right of the stone. Flipping the tool between pockets on the jig and from one face of the blade to the other sharpens both facets of the bevel.

The Wolverine components are made of heavy-gauge steel and should last more than one lifetime of turning. The instructions are adequate to get you started, and the price seems paltry for the time and effort you'll save sharpening those tricky curved edges by hand. For



The Wolverine V-arm rest (left) holds gouges by the tail for refining conventional curved grinds. Sharpening is as easy as twisting your wrist. With Oneway's Vari-Grind attachment (right), deep side grind profiles on bowl and spindle gouges are no problem to maintain. Swing the tool handle left and right with the attachment's pivot leg in the V-arm to follow the blade's curved cutting edge.

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Oneway Wolverine

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Recommended wheel grits: 54/80
Best for sharpening: lathe chisels, gouges, scrapers, parting tools
Phone: 800-565-7288
www.oneway.on.ca



lathe tools, this system answers a turner's sharpening prayers.

Veritas Mk.II Power Sharpening System

Veritas puts a new twist on power sharpening with the Mk.II. Instead of water- or dry-grinding wheels providing the cutting action, Veritas spins adhesive-backed abrasive sheets on thin metal platters like a record player. The machine comes with two 8" diameter platters and four starter sheets of abrasive in 80-, 150-, 320-, and 1,200-grits. The 80- and 150-grit sheets mount to both faces of a 4mm-thick platter, and the two finer-grit sheets stick to a 3mm platter. Trust me — it matters which is which.

The Mk.II is best suited for sharpening flat-edged chisels and plane irons, although I'm told the

Tool Review continues on page 94 ...

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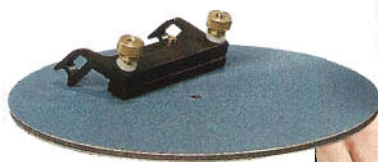
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TOOL REVIEW

Veritas Mk.II Power Sharpening System

Veritas Mk.II

Street price: \$299
Grinding speed: 650 rpm
Platter grits: 80, 150, 320, 1,200 (psa abrasive disks)
Best for sharpening: chisels, plane irons
Phone: 800-871-8158
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R&D department is working on a jig that will sharpen jointer and planer knives. (You can use the tool for sharpening curved edges or other complex blade geometries, but it's trickier and more of a freehand technique.) Chisels and plane irons clamp inside a tool holder that rides on a rod-shaped tool rest. The rest adjusts up and down, which tilts the blade for grinding bevels ranging from 15° to 45°. A single thumbscrew controls the height of the tool rest, and a scale shows you the bevel angle.

Using the tool rest this way requires the blade to project a correct distance from the tool holder. Veritas makes it easy to register the proper extension with an included jig. You also get a gauge to check your blade's current bevel angle before sharpening it. Once you're comfortable with the setup, it takes just a few minutes to ready the machine for sharpening. The only system more intuitive to use than the Veritas was the Wolverine Jig.



A blade holder for chisels and plane irons fits over the tool rest rod (left). Sliding the holder back and forth speeds the cutting action. Once the primary bevel is established using coarse abrasives on the thick platter, the thin platter hones a perfect 1° micro-bevel (right).

Proper sharpening involves first lapping the back blade face smooth and flat. You use the thin platter and fine abrasives for this step, holding the blade freehand against the spinning platter. Once the blade back is polished smooth, you switch to the tool holder on the rest for bevel grinding. To form or refine the primary bevel, use the thick platter with coarse grits. But the real genius of this system happens with the thin platter. Swapping platters to the finer 320- and 1,200-grits tips the blade down 1° to create a perfect micro-bevel. It's a design feature that works flawlessly.

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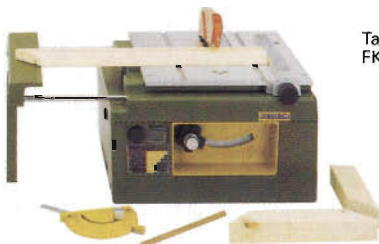


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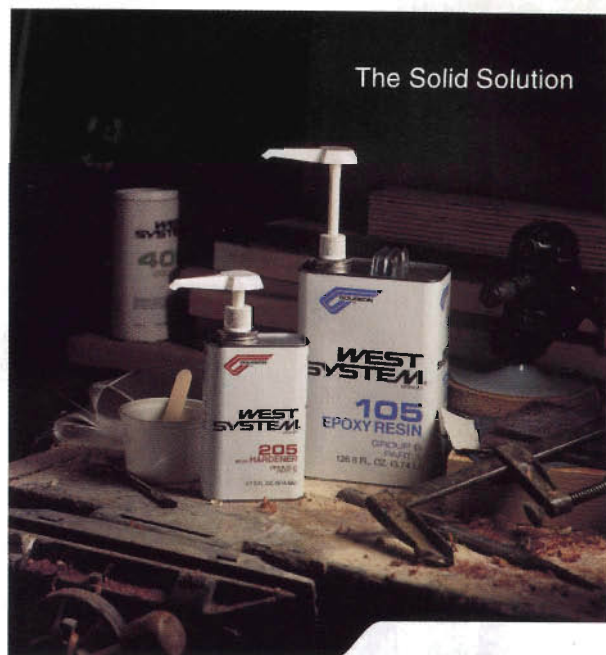
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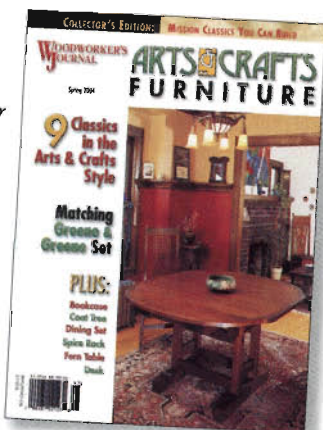
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TOOL REVIEW

Woodcraft Water Stone Grinder

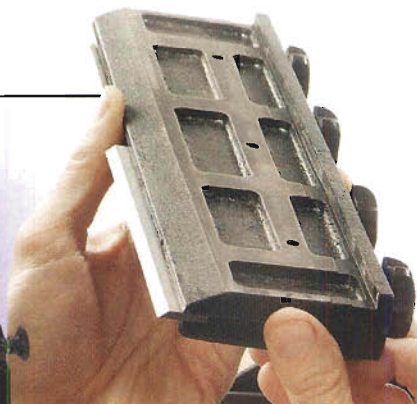


Undoubtedly you'll have to replace the abrasives more often on the Mk.II than you'd need to change a whetstone or dry wheel on another machine. However, the abrasives are reasonably priced at less than \$5 a pop.

Long story short, this machine is thoughtfully engineered, quick to learn and produces edges that are sharp enough to shave with. It also comes with a great manual that covers tool setup and general sharpening procedure. Even at nearly \$300, it's a steal.

Woodcraft Water Stone Grinder

Woodcraft's whetstone sharpener is similar in design and function to the Makita 9820-2 at about a third the



Despite a rocky start, Woodcraft's knife-sharpening jig (left) whipped my dull, nicked 6" jointer knives back into shape. I used the accessory tool rest (right) for sharpening chisels and plane irons. You'll need to fabricate a jig to keep blades square to the stone and held at an even projection.

Woodcraft Grinder

Street price: \$90
Grinding speed: 420 rpm
Wheel grit: 1,000
Best for sharpening: chisels, plane irons, jointer/planer knives
Phone: 800-225-1153
www.woodcraft.com

price. It has a 7" diameter, 1,000-grit wheel that spins at 420 rpms. There's a gravity-fed water tank on top and a wastewater tank behind the machine to collect the runoff. This second tank is a nice convenience and one the Makita should have, too.

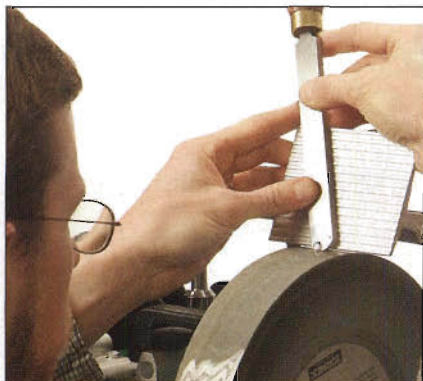
The sharpener comes with a steel tool rest that pivots to different bevel angles using two knobs on the ends. At just 1 1/8" wide, it's too narrow to provide enough bearing surface for supporting chisels or plane irons. I'd be afraid of tipping blades off the rest and accidentally changing the bevel angle.

I replaced the standard rest with Woodcraft's planer/jointer jig. It adds about \$37 to the sticker price, but it's an improvement you'll want to make right off the bat. The larger rest is cast-iron with a pair of micro-adjust posts to set the height. The knife holder that rides on the rest looks and works like Makita's, but it's a couple inches shorter. You can still sharpen planer or jointer knives up to 12".

The knife jig was a bit disappointing at first. A coat of paint on the mating surfaces of the rest and knife holder

Tool Review continues on page 98 ...

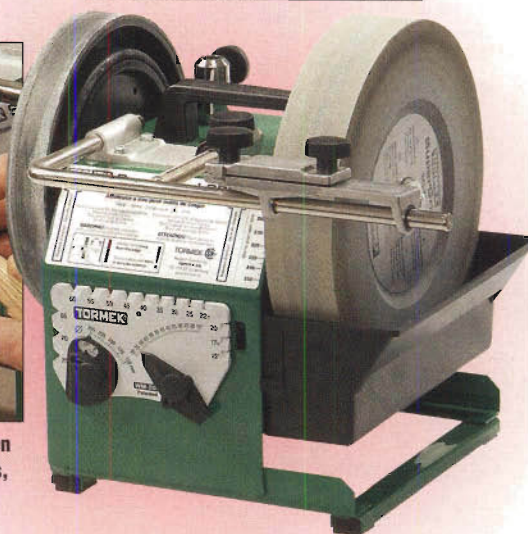
Tormek SuperGrind 2006



Tormek's innovative two-position rest (left) and optional accessories make it possible to sharpen both flat and curved bevels. It's also a honing center. A large leather wheel polishes flat bevels, while a contoured accessory wheel (right) hones fluted blades, like this carving gouge.

Tormek Supergrind 2006

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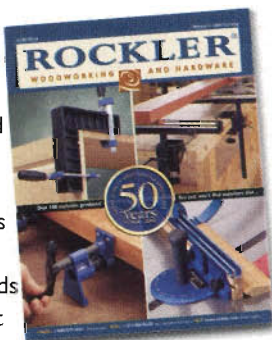
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made the action rough. Once I stripped off the paint, the holder slid better on the rest.

Woodcraft's knife holder isn't made for sharpening chisels or plane irons. You'll have to fabricate your own guide jig for keeping these blades square to the stone.

I also noticed that the machine's plastic housing isn't as sturdy as the Makita's. Sliding the knife holder back and forth made the base flex, which caused the machine to shift on the bench occasionally as I sharpened.

In the end and with the better rest, the Woodcraft produced smooth, sharp edges on my jointer knives. It can also be coaxed to sharpen chisels and plane irons with a little ingenuity. On the basis of price alone, this machine offers decent value. However, I'd pay more for a step up in fit and finish.

Tormek SuperGrind 2006

If you're looking for one machine to satisfy all your sharpening needs, take a close look at the Swedish-made Tormek. On the basis of sheer versatility, it's leagues ahead of the other sharpeners here.

Mounted on one side of the machine, there's a 10" aluminum oxide wheel that spins at just 90 rpm. The lower third of the stone sits in a water bath. Abrasives pull water up and over the stone for continuous cooling. Whether you are sharpening carbon or harder high-speed steel, it's simply impossible to overheat the metal, although sharpening happens more slowly. The stone can be dressed to 220- or 1000-grit in a matter of seconds to ready it for either grinding or sharpening operations.

Unlike other sharpeners with platform-style rests, the Tormek uses a rod that fits into a pair of horizontal or vertical mounts.

"The Wolverine components are heavy-gauge steel and should last more than one lifetime of turning. For lathe tools, this system answers a turner's sharpening prayers."

—Chris Marshall

In the vertical position, it pitches blades against the direction of wheel rotation for faster cutting action, while horizontal mounting orients blades with the wheel's rotation for more delicate work. A micro-adjust knob on the rest makes fine-tuning the edge angle easier.

The SuperGrind comes with a jig for sharpening

chisels and plane irons. Or you can buy nine other specialized jigs for sharpening virtually any tool with an edge — straight or curved. The jigs are sold separately as well as grouped into systems for cabinetmaking, woodturning, carving and home maintenance. They all work in tandem with the same tool rest.

On the other side of the grindstone, the Tormek includes a large leather honing wheel. With this helpful feature, there's no need to switch to a finer stone or strop for deburring and final polishing. You can also buy a smaller profiled honing wheel attachment for polishing the inner flutes of gouges and carving tools.

It was easy to get my bearings with the Tormek in a few hours' time, thanks to a thorough hardcover manual and instructional video. The machine performed without glitches, and the resulting edges were impressively sharp. Curved edges were no trickier to sharpen than flat edges with the right jig. At nearly \$400 plus accessories, this system certainly isn't priced for everyone. But I'll venture to guess you won't be disappointed in the investment.

Chris Marshall is a Woodworker's Journal contributing editor. He builds projects and tests tools on a regular basis.



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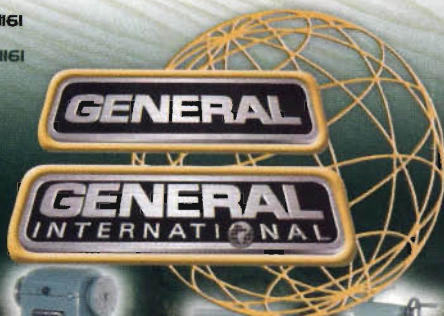
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What's up with Oils and Waxes

By Michael Dresdner

Are oils and waxes really finishes? Why choose one over the other? Our expert talks about what's right and wrong with these two common choices.

Many woodworkers turn to oils or waxes for their first attempt at finishing, and for good reason. They are easy to apply, give almost foolproof results, require no applicators beyond a rag, and leave wood looking both rich and natural. Turners especially love them because they adapt perfectly to finishing wood still turning on the lathe.

If there is one Achilles' heel these popular finishes suffer from, it is their lack of durability. You would probably not choose a simple oil or wax finish for a bar top or kitchen table that will be assaulted with scratches, hot coffee pots or strong solvents, but they are perfect for bookcases, jewelry boxes, turnings, picture frames, blanket chests and a host of similar objects.

While a wax finish can go on any type of wood, avoid putting oil (or Danish oil) on aromatic cedar or any of the dalbergia woods (rosewood, cocobolo, tulipwood). These woods contain an antioxidant that will prevent the oil from curing.

Wax

Sold in liquid, paste and solid stick forms, waxes are formulated in a host of colors. You'll find them in clear, amber, a range of wood tones, and even white, which can be used to create limed or pickled effects. Some waxes are softer, some are harder, but even the hardest waxes are softer than lacquers and varnishes. The fact that they are soft means they offer very little protection against scratches and wear. Of the ready-to-use paste waxes, one of the hardest, and also one of my favorites, is Briwax (rhymes with "dry wax") from England.

Waxes are derived from a variety of mineral, vegetable and animal sources. As a finish, waxes don't penetrate wood, but rather sit atop it. They will prevent it from oxidizing (turning gray), but don't particularly

enhance the wood. In other words, once a coat of clear wax dries on the wood, it will look like freshly cut, but unfinished, wood.

In its natural state, wax is a solid at room temperature. Liquid or paste wax typically contains some solvent, and the wax "cures" as the solvent evaporates. Virtually all waxes will dissolve in mineral spirits or naphtha, which is handy to know should you ever need to remove wax, either from wood or on top of a finish. Most waxes melt at very low temperatures, so they don't offer much in the way of heat resistance. However, they do shed water, which helps them resist food and drink spills. You can apply wax over any other finish and it will give the surface a soft sheen and smooth feel, but don't put other finishes over wax.

To apply liquid or paste wax, simply rub it on, and wipe it off. I like to apply paste wax with Scotchbrite® pads or fine steel wool, then wipe with paper shop towels. If you wipe the wax off immediately, it will leave a dull sheen as it dries.

For more shine, let it dry, then buff it with a soft cloth.

Oils (top) and waxes are great finishes for novice and expert woodworkers alike. One important safety note: Oily rags can indeed spontaneously combust. They must be COMPLETELY dried before they can be thrown away.



Oil Advantages

When I was young, we would put a spot of oil on brown bag paper, then hold it up to the light. The oiled section let more light in, making the paper translucent. Paper is made from trees, so it is no surprise that oil will do the same thing to wood. In fact, one of oil's strongest advantages is that it penetrates into wood, curing in and among the surface fibers. This is because oil is made of molecules small enough to seep down into the wood rather than merely sit on top. As a result, oil makes wood look richer and more translucent without adding a film on the surface.

There are two decidedly different types of oils that woodworkers use: drying and non-drying oils. Drying oils will change from liquid to a solid film when exposed to oxygen in the air. Nut oils (linseed, tung, etc.) are

drying oils, but vegetable (peanut, olive) and mineral oils are non-drying. Edible mineral oil is popular on food contact items, like cutting boards. However, non-drying oils stay wet indefinitely, and will wash off when the board is scrubbed with soap and water. Because they do not dry to a solid film, non-drying oils are considered a wood treatment, but not a finish.

The most common and least expensive of the drying oils is linseed oil. It will dry by itself, but it does so slowly. To speed things up, formulators add heavy metal salt "driers" to raw linseed oil, which causes it to cure faster. The result is called "boiled linseed oil," in spite of the fact that it is never boiled. Tung oil dries a little bit faster than linseed oil on its own, but it too is sometimes modified to cure more quickly.



Watco®, the granddaddy of Danish oil finishes, is more durable than oil or wax, but just as easy to apply.

The best method I have found for applying oil is to flood it onto the wood, adding extra to keep the surface wet in areas where the oil is quickly absorbed. After 10 minutes, wipe off everything that has not been absorbed. Don't add solvent.

For a smoother, richer finish, repeat the process, this time sanding the oily wood with fine wet-and-dry sandpaper. This will create a slurry of oil and wood dust, filling tiny pores and leaving the surface even smoother.

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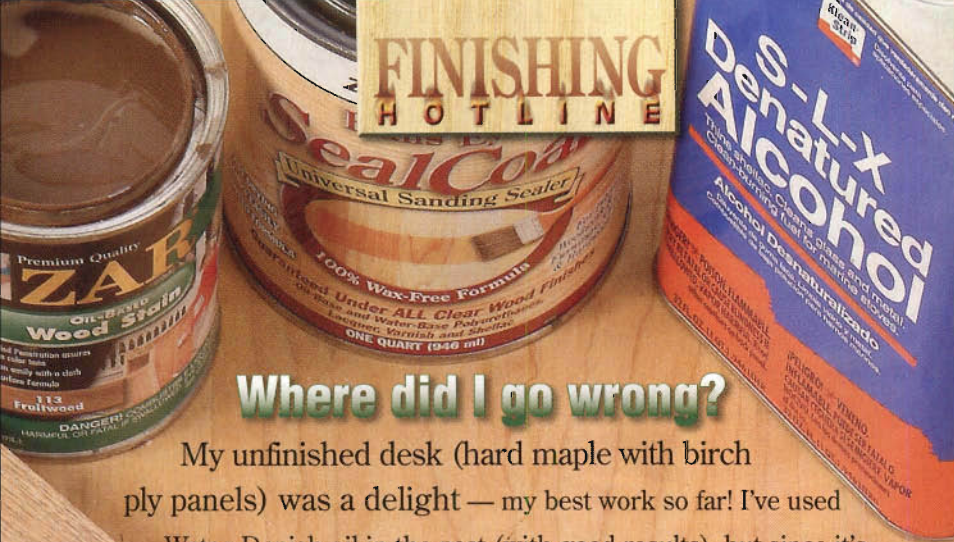
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FINISHING THOUGHTS



You can create a classic limed oak look by applying white paste wax and wiping it off, leaving extra in the corners and recesses. Above, a brown wax darkens wood.

Where did I go wrong?

My unfinished desk (hard maple with birch ply panels) was a delight — my best work so far! I've used Watco Danish oil in the past (with good results), but since it's no longer available, I used Deft Danish oil in light walnut.

The results are awful — blotchy and uneven, especially on the solid maple parts. Can I salvage my project?

Jack Lunsford
Phoenix, Arizona



Let me start by putting to rest the false, but persistent, rumor that

"Watco is no longer available." It is, in fact, widely available.

Watco "Natural" makes wood look great without adding any substantial amount of color, and as a result, goes on uniformly. However, tinted Danish oil, no matter what brand, acts more like stain. Some woods will blotch when stained, but you can minimize that by using wood conditioner, or by pre-sealing. This works with any oil-based stain as well as with tinted Danish oil.

Sand all surfaces (plywood and solid) in the same way and up to the same grit. Test the coating or stain first on scrap wood of BOTH species that has been sanded along with the project. Often, proper sanding will solve the problem. If not, you'll find oil-based wood conditioner

on the same shelf as oil-based stains. Flood the conditioner onto the wood, then wipe it all off.

Stain while the wood is still wet. If you prefer to pre-seal, I recommend Zinsser SealCoat™. Flood it onto the raw wood and wipe it off immediately, but work quickly and in small sections, since it dries very fast. In this case, let the SealCoat dry completely (about two hours) before staining. Both processes will give you uniform, but lighter, color. To intensify the color, add another coat or two after the first one has dried.

For your desk, try more coats of the same color finish for a darker, but more even, coloration. If it is still not satisfactory, strip the piece with paint remover and start over.

— Michael Dresdner

Danish oil

What goes on as easily as oil and also makes wood look terrific, but dries quicker and is more durable? Danish oil, often lumped in as an oil finish, is actually a thin oil and varnish mixture. The oil helps bring out wood's beauty, while the varnish resin offers somewhat more protection against chemicals, heat, scratches and stains than either oil or wax.

Typical of this group is Watco[®], both the oldest and best-selling. Many woodworkers create their very first finish using Watco, and return to it frequently. It comes in a variety of colors as well as natural (clear). The directions on the can are excellent: apply it liberally to the wood, let it soak in for 15 minutes, reapply, then wipe off the surface.

Use Watco either as a one-coat penetrating finish, or to add as many subsequent coats as you like. Applied no more than one coat per day, you can build up a finish as thick, beautiful, and durable as varnish, with no brushes to clean or brush marks to rub out. The good news is that a multi-coat Watco finish is durable enough for most anything you make, even kitchen cabinets or a dining room table.

Michael Dresdner's latest book, *Wood Finishing Fixes: Quick Answers to Over 175 Most Frequently Asked Questions*, is available from Taunton Press.

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