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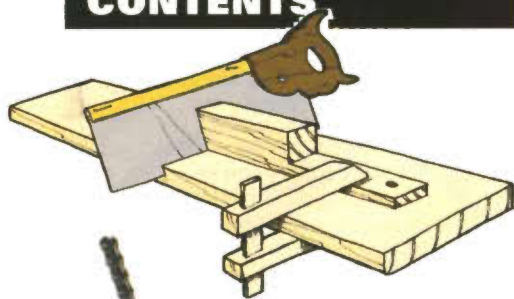
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CONTENTS

SHOP & TOOL



Page 20



Page 30



Page 56



Page 33

SAFETY NOTE

SAFETY IS YOUR RESPONSIBILITY. Manufacturers place safety devices on their equipment for a reason. In most photos you see in *Popular Woodworking*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy us. Think about each procedure you're going to perform beforehand. Think ahead.

SAFETY FIRST!

Tried & True

Six Essential Benchtop Jigs by Graham Blackburn . . . 20
Gain accuracy and convenience from these simple jigs.

Business End

Home Shop Tax Write-offs by Mark Battersby 24
It's not what you make, it's what you keep.

Tool Talk

Mortiser & Tenoner by R.J. DeCristoforo 28
A dynamic duo for making this versatile joint.

Put Your Mortiser to Work by R.J. DeCristoforo 30
Optimize your benchtop mortiser with our practical machine stand and special mortising jigs.

\$1,000 Shop by R.J. DeCristoforo 48
Who says you can't assemble a respectable shop for \$1,000? Here's how to get the most for your money, without sacrificing quality.

Consumer's Choice Awards compiled by Stacey King . . 56
Learn what your fellow woodworkers' favorite tools and machines are. Our survey respondents have selected their top choices in equipment that's passed the toughest test of all — it works for them.

PROJECTS

PullOut™ Plans

Gyroscope by Ralph Wilkes 33
This amusing and educational toy from the past will also be fun to put together.

Nostalgic Jelly Cupboard by Andy Schultz 41
Return to days gone by, "preserved" by our project that provides an unbeatable course on the basics of fine cabinetmaking.

PullOut™ Plans

Ferris Wheel Caddy by R.J. DeCristoforo 54
Organize those wandering fasteners and elusive small parts in this handy, attractive caddy that's built from scrap wood.

COLUMNS

Turnings 4

Infeed/Outfeed
Readers respond 6

Tricks of the Trade 8

Wood Types
"Ironwood" 10

News & Notes 12

New Product Releases . . 16

Dovetales
Women & woodworking 18

Ask the Experts
Tech Q&A 26

Resource Directory 63

Classifieds 68

Index of Advertisers 71

Cartoon Contest 71

Out of the Woodwork
Could more hardware stores supplant the United Nations? . 72



Page 18

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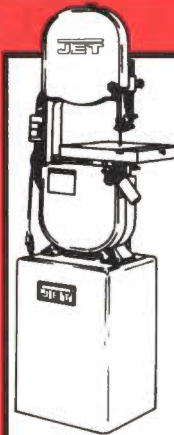
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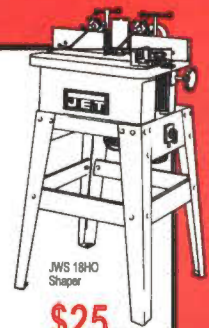
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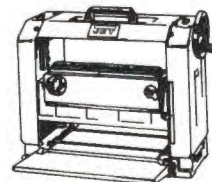


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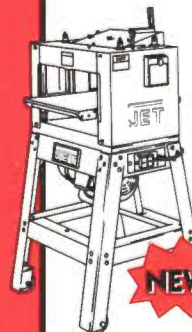
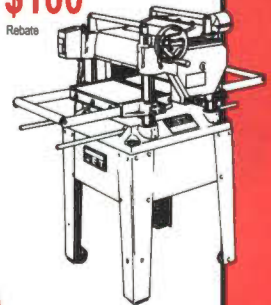
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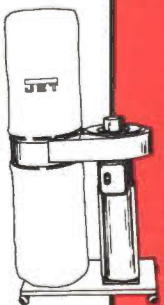
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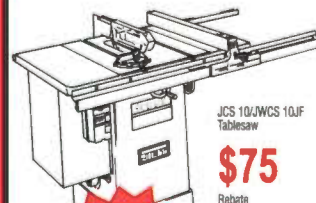
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4 Popular Woodworking

TURNINGS

Welcome Woodworker



The family of *Popular Woodworking* readers has gotten a lot larger with the addition of subscribers from *Woodworker* magazine, which was recently merged with *Popular Woodworking*. So, to all you *Woodworker* subscribers, I'd like to extend an extra warm welcome. Do stay with us long enough to understand why 200,000 other woodworkers read *Popular Woodworking*.

I'm a woodworker who's spent the better part of my adult life working in and managing custom cabinet and furniture shops. I've met many of you and know we have a lot in common — we're frugal and practical, and we expect a dollar's worth when we spend a dollar. Since I respect that, I see my job as giving you your dollar's worth, and then giving you a little more. Just so you know what to expect, let me explain.

I like to say *Popular Woodworking* gives its readers *real projects* and *real techniques* that they can *actually use*. We lead you through projects in the most practical, straightforward way possible. When we tackle complex projects, we let you in on professional shop building techniques that simplify the process without sacrific-

ing quality. Some call this getting the most bang for the buck. We look for great results from simple approaches. At this magazine, we're cabinetmakers who later became editors, not vice versa.

We've read and enjoyed some of the practical projects and techniques we found in *Woodworker*, just as you have. And you'll be glad to know that some of your favorite writers have a new home here at *Popular Woodworking*, while some of your regular columns are now part of *this magazine*. We're introducing you to *Popular Woodworking's* readers by featuring the results of *Woodworker's* "Consumer's Choice Awards." The results presented are the opinions of surveyed *Woodworker* readers.

Again, an enthusiastic welcome to all you *Woodworker* subscribers. Put on your shop apron and stay awhile. We want you to be an active part of this group!

Stephen Sherry

In-Shop Seminars

Cincinnati area readers continue to make evening visits to the *Popular Woodworking* shop to get their hands on the latest new products, learn techniques, and get expert advice from leading woodworking equipment suppliers.

Bosch came to town recently, and it was almost like having an old friend visit. Quality Bosch power tools have been on my bench since I started working wood professionally in the late 1970s. Chris

Carlson of Bosch brought along a new plunge router with a host of sweet features, including soft start and variable speeds. Everyone also had a chance to check out Bosch's new quick change system for switching out jigsaw blades.

Adam Chafe of Black & Decker stopped by with the VersaPak™ cordless show. The VersaPak concept makes a lot of sense for the cordless crowd. Why should we have to buy a battery and charger every time we purchase a new tool? He also set up the new line of Black & Decker benchtop woodworking machines for hands-on tryouts. Band saws, router/shapers, table saws and woodworking-specific drill presses are all part of the package.

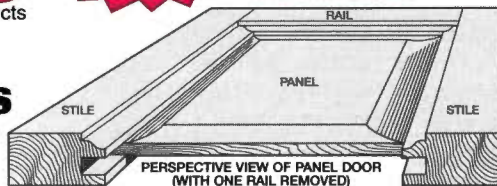


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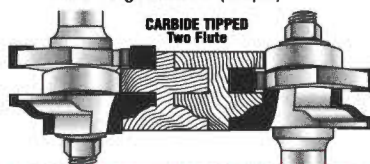
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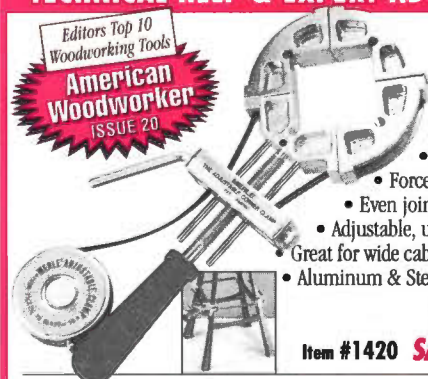
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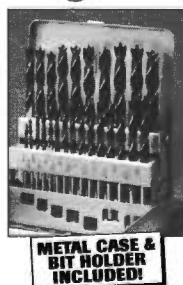


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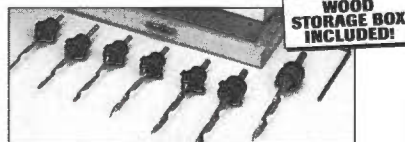
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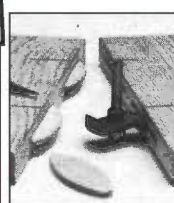
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We welcome your comments and questions, pro or con, about articles we publish or anything else on your mind that's related to woodworking. We'd also like to see color pictures of what you're building. Send your input to: Infeed/Outfeed, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207. You also can e-mail us at Wudworker@AOL.COM or on CompuServe at Bruce Woods, 75463,3377. Letters may be edited for publication.

E-Z Hold™ II Clamp Correction

Thank you for featuring our "Jorgensen®" E-Z HOLD™ II Bar/Spreaders in the new products section of the January 1996 issue. However, in describing the conversion from a clamp to a spreader, incorrect information was given. It is not the advancing handle which should be removed from the bar. Instead, the sliding head (no handle/no label) is removed and placed on the opposite end of the bar.

Michael F. Watkins
Adjustable Clamp Company

We're Blushing. . .

Just wanted to drop a note to say how much I enjoyed your magazine. I was in the bookstore browsing through the

woodworking magazines. I picked up one that was well put together but very overwhelming. I got the feeling that I needed 5,000 square feet of shop space or every woodworking tool available before I could start a project. Others just bored me.

Popular Woodworking #87, November 1995, was a nice surprise. Your magazine did not bore nor scare me away. I enjoyed the letters, "Tricks of the Trade" and the woodworking projects. What I really enjoyed was seeing the article "Evolution of an Entryway" by Sal Maccarone. I felt this appealed to a woodworker with a little more experience than your weekend woodworker. *Popular Woodworking* explained both ends, from the "Shaker Firewood Box"

Forstner Found

I may have a reference for C. Gordon Emerson's request for help in locating a manufacturer of an adjustable Forstner type bit (#87, November 1995): Robert Larson Company, Inc., 33 Dorman Ave., San Francisco, CA 94124; (415) 821-1021 or (800) 356-2195; fax (415) 821-3786.

I picked up a data sheet at the Atlanta (IWF) Show in '94. Adjustable bits come with two sizes for each bit: 22-50mm and 34-80mm. These bits are made in Austria.

made in one weekend to the more challenging project, "Evolution of an Entryway."

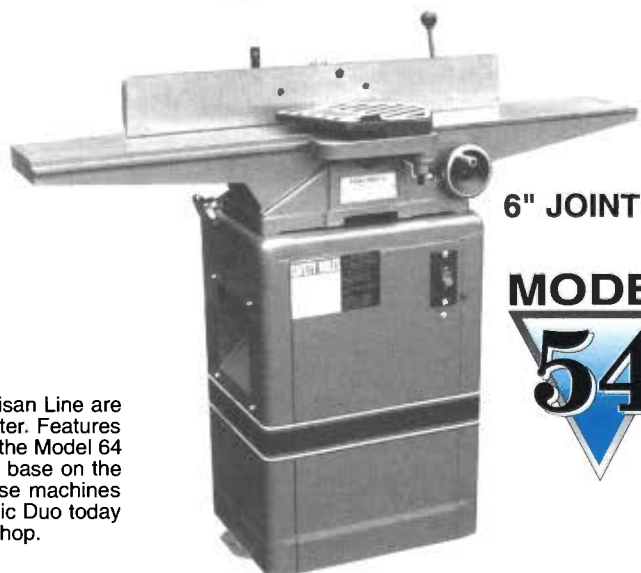
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54

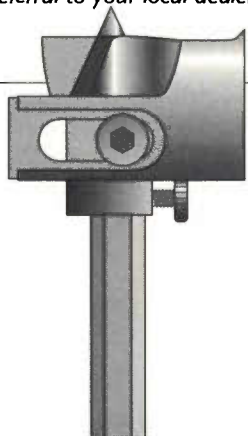
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Sorry, I do not have pricing data. They're expensive if I remember correctly. Hope this helps, Mr. Emerson.

Paul E. Rising
perising@erinet.com

ED. — Looks like Paul found it. Larson's offers a Stern brand adjustable universal bit which seems to match Mr. Emerson's photo. The bits, available in high carbon steel or carbide tipped, retail from \$133 to \$308.95. You may contact Larson's for a referral to your local dealer.



Save My Board!

My problem, unbeknownst to me at the time, began eight years ago on my honeymoon. While driving through the redwood forest in California, I had the opportunity to purchase a beautiful and unique slab of myrtlewood (kiln dried) approximately 22" x 50". It was an incredible bargain for such a piece.

The problem lies in what to do with it. The less attractive side's surface is smooth and flat, but to me is rather blah. The other side is very appealing in its uniqueness, but the practicality of using this side is questionable, due to the fact that instead of having a smooth flat surface, this side is broken up much like a topographical map, with four or five small plateaus making up the usable surface area.

A coffee table was the original destiny for the piece, with the base being an equally unique and attractive gnarled black walnut burl weighing in excess of 50 pounds. But, as I've mentioned, the minimal, usable surface area presents a problem.

Another consideration I've had was to make a wall hung clock, thermometer humidity gauge and barometer set. Another was to cut letters for a business and attach to the slab, but...

I'd appreciate your opinion on what I might do to best utilize this unique piece of natural resource. This piece also has a sentimental value.

Incidentally, both the slab and the walnut base were finished with a lacquer finish five or six years ago to preserve them regardless of what their final duties become. Thank you.

Mitch Wolfe
Goldendale, WA

ED. — Gauging from your description, it's a tough decision. As you point out, the board isn't very practical because of the lack of flat surface. If the piece needs to be more practical, I'd recommend you go with the glass top. If you do, I further suggest the glass be an oval shape that complements the form of the myrtlewood.

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Don't Pick Up Strangers

The other day I inadvertently picked up a screw cup with my dust collector. When I did not hear it come through to the bag, I disconnected the power and unscrewed the plate to gain access to the impeller rotor. I thought all I was retrieving was the cup, but I got several bag ties, some sheet metal and two largish pieces of aluminum foil.

The cup was undamaged (amazing), and since performing this very minor surgery the blower has been at least half-again peppier than it had been before I opened it. Be sure to wipe the gaskets clean before reassembling. The moral of this story is that the few minutes it takes to clear the junk away from the impeller will be very rewarding.

*Hugh Foster
Manitowoc, Wisconsin*



Not Just Hot Air

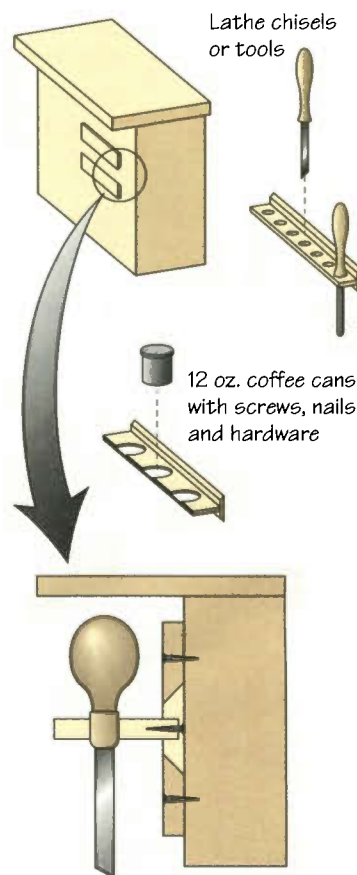
Believe it or not, if you exhale into any water-based can of paint, stain or other finish (I've only tried this in water-based, it may work on oil-based also), just before sealing the lid, it displaces the oxygen in the can and stops the usual film from forming on the surface of the liquid.

*Adam Blake
Tipp City, Ohio*

SPACE, THE STORAGE FRONTIER

Almost all workbenches have an overhang on both ends or the front. This area is frequently wasted, but I found a good use for the room.

*Ron Pavelka
Orange, California*

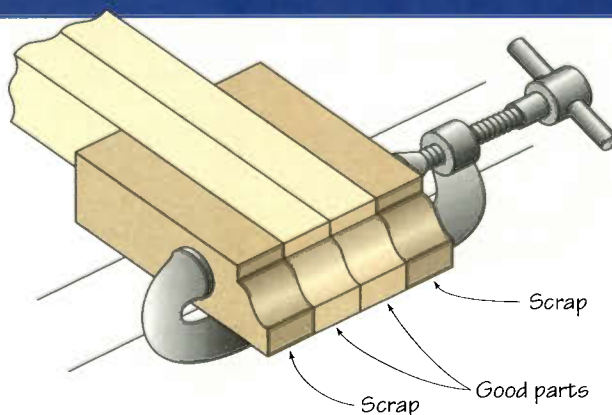


MEANS TO A PERFECT END

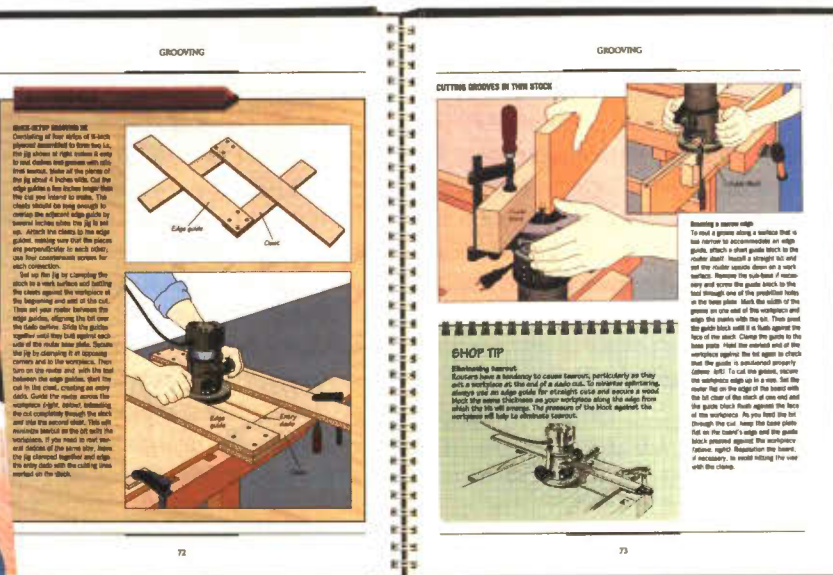
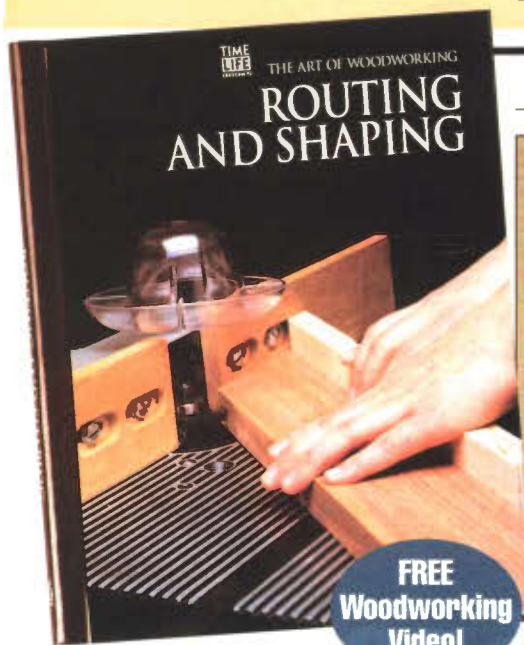
If the ends of fairly narrow pieces of stock have to be routed to a moulding profile, it's difficult to keep the cutter in line. Because of the minimal surface to provide guidance for the router bearing or fence, the cutter may wander and ruin the work.

You can get clean cuts on the good parts by clamping scrap pieces on the outside edges. This provides the enlarged bearing surface necessary. Should the cutter wander at start or finish, the damage will be on the scrap wood, leaving the good parts perfect.

*Percy Blanford
Stratford, England*



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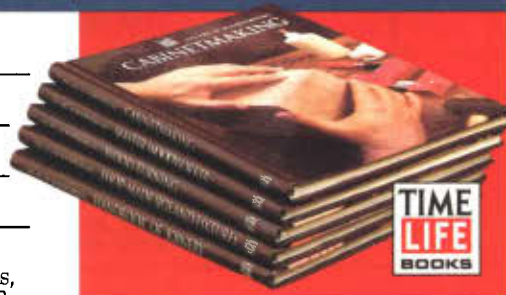
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Eastern Hophornbeam

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Rare, tough and versatile, eastern hophornbeam is a domestic "ironwood" that will outlast most other hardwoods in even the most grueling applications. For woodworkers intent on using small amounts of one of the sturdiest home-grown hardwoods you can find, eastern hophornbeam is unparalleled.

General Description

Competition for the marketing term "ironwood" puts a species like eastern hophornbeam (*Ostrya virginiana*) in con-

fusing company, among 13 different North American species to be exact. Ask lumber dealers quite specifically for eastern hophornbeam when ordering. A hornbeam, by the way, was a particularly tough piece of wood once used to yoke working oxen together.

Eastern hophornbeam grows primarily in our Northeastern states along the Canadian border, as well as several hundred miles into Canada. The tree favors well-drained upland soils and steep slopes and is very shade tolerant. These

trees grow relatively quickly and are rarely found in pure stands of their own. This growth pattern keeps them from attaining heights greater than 40 feet and trunk diameters of more than 12 inches. But this also means growth rings are very narrow and tightly packed, which contributes to hophornbeam's best characteristics. The tree gets the prefix to its name from its seed fruit, which closely resembles true hops.

The lumber from eastern hophornbeam trees is exceedingly hard, strong,

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straight-grained and quite dense. It is also fairly heavy. Its sapwood is creamy white and often occupies about half the diameter of a trunk. The heartwood is brown to dark brown. In use, the wood has better than average stability. If used green, hophornbeam is a good candidate for bending, with a slightly better than average ability to resist splitting. Traditional uses of eastern hophornbeam include tool handles, levers, mallets, rollers for heavy equipment, cams, cogs, chopping blocks and small turnery items.

Working Properties

Eastern hophornbeam is a moderately easy hardwood to work, but very sharp tools are a must. In power planing, this is particularly true to prevent tearing the surface. Fortunately, if there is tearing, it's usually shallow and easily repaired with a sharp scraper.

Other basic shaping processes — ripping, cross-cutting and sanding — are problem-free. In fact, all three processes yield very good results. Routing and shaping can cause a little tearing in the

wood. To avoid this, slow down the rate at which you would normally feed the stock into the knives.

Lathe work with eastern hophornbeam is particularly satisfying. The wood comes off in smooth, dust-like shavings. The resulting surface usually requires very little sanding. And the most intricate details are possible.

Boring operations will require a little extra time. That's because the wood's density tends to make a drill bit heat up fairly quickly. This boring difficulty is particularly troublesome when fastening hophornbeam with nails or screws. Properly sized pilot holes are an absolute must with this wood.

Finishing

Finishing eastern hophornbeam will depend largely on its use. In a tool handle that will see heavy use, you can skip finishing altogether. The oils from your hands will quickly seal the outer surface. Also, unfinished tool handles are less likely to cause blisters.

Overall, oils seem to be the best finish-

es for this wood. Linseed and tung will seal the wood well and allow what little character there is to show through. Of course, paints, varnishes, shellacs and waxes will also work.

Availability

The biggest problem with eastern hophornbeam is that it's hard to find. Only small, old-time hardwood dealers keep it on hand for the farmers and craftsmen who know its value. This means it's rarely available outside its native habitat. When you can find it, the price is generally around \$3 per board foot.

Available lengths are rarely more than eight feet and widths are seldom greater than eight inches. But clear, straight-grained 4/4 lumber is the norm.

So if you need a tough, long lasting wood for some small project, eastern hophornbeam is the "ironwood" for you. Even if you have to go into the woods and cut the tree yourself, it will be worth it. **DW**

Ken Textor, a contributing editor for Popular Woodworking, works wood in Arrowsic, Maine.

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GREETINGS

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12 Popular Woodworking

NEWS & NOTES

Tim "The Tool Man" Allen Takes on Tools

Tim Allen added to his success as Tim "The Tool Man" Taylor on ABC's *Home Improvement* by writing best-sellers and starring in hit movies. Now he's taking on the business that inspired his popular series — hardware. The **Tim Allen Signature Hammer** premiered in hardware stores and gift catalogs last fall, and more tools may follow pending the hammer's success.

Some people may ask what's so special about the hammer, with so many competitors out there. With a retail price of \$29.95, it's neither the Nova nor the BMW of hammers, nor does it have any gizmos. But Allen did give special attention to helping design the hammer that bears his name and trademark grunt "RRR."

After consulting with different tool manufacturers, he decided Hart Tool Company, which specializes in professional hammers, could provide the quality he was seeking. Allen helped make some design changes to an existing head, and added a hatchet handle. Bob Hart, co-owner of Hart Tools, said the company has used the hatchet handle on larger hammers for about eight years, and that it works well on Allen's 12-ounce hammer. He added, "It really has a good balance to it. The hammer head itself is balanced right through the center, instead of being real nose heavy." As final touches, a water-based lacquer for a natural finish and high-polished steel were applied. *Voilà*, the Tim Allen Signature Hammer was born.



Allen sees the hammer as an icon of the fun and purposefulness of the do-it-yourselfer who creates his/her own projects. "It's the spirit in which I created my comedy, and the spirit in which I've utilized that on *Home Improvement*," he told *Popular Woodworking*. "It's a piece of all this excitement that *Home Improvement* has about putting a lot of interest back into doing do-it-yourself stuff."

Besides being able to create and produce his own tool line, Allen hopes to eventually use it as a constant source of income for charities. "I kind of got the idea from meeting Paul Newman, who has this line [Newman's Own] that he uses the proceeds to encourage his philanthropy. And I said I love the charity work that I'm doing, and it would be great to have an outside source of income for this, not only my own income," he said.

If the hammer becomes a success, Allen hopes a screwdriver set and perhaps a drill will follow ("more power!"). Eventually, there may be an entire home starter kit of Tim Allen signature tools. But for now, Allen's going to take his time. "I want to go very slowly, and see how the hammer works, see how everybody likes that, and see how I like getting into this business."

ED. — If you can't find the Tim Allen Signature Hammer in your local store, you can receive more information by calling (800) 736-0718.

— by Cristine Antolik

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14 Popular Woodworking

NEWS & NOTES

Delta Int'l Agrees to Purchase Biesemeyer Manufacturing

Delta International Machinery Corp. has announced plans to acquire Biesemeyer Manufacturing Corp., maker of precision T-Square® Saw Fence Systems. Biesemeyer will continue to operate under its own name as a subsidiary of Delta. At press time, the acquisition was not finalized.

"We believe Biesemeyer will make an excellent addition to our woodworking accessories line," said Delta President Nevin J. Craig. "I'm confident that with our resources, we can grow the business and continue manufacturing products in the Biesemeyer tradition."

Tim O'Connell, Delta's accessory marketing manager, said the purchase would not affect the availability of Biesemeyer products to other machinery manufacturers. The Biesemeyer fence system will be built into Delta's saw line as an optional accessory, and there are no plans to replace the Delta Unifence system.

"We see this as offering the customer a choice between the two best fence systems in the world. We'll let them decide which they prefer," O'Connell said.

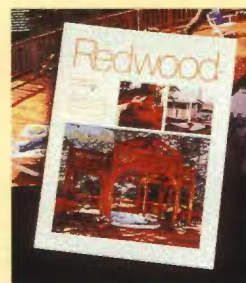
William Biesemeyer, who co-founded the company in 1980, will retire as president, while Roger Thompson, the other co-founder, will continue as vice president, reporting to Nevin Craig.

Literature for Woodworkers

Several associations are offering literature free or at a miniscule cost to inform woodworkers on products, projects and the history of the industry.

The California Redwood Association is distributing an idea-starter for outdoor projects in a 12-page color brochure. The *Redwood Landscape Architecture* booklet features decks, trellises, gazebos, fences, pools, and other projects. It also discusses redwood's properties and shows grades and sizes suitable for landscape applications. The booklet suggests beam and joist spans, hardware, nailing patterns, and finishes.

For a copy, send a dollar to Dept. LAC6, California Redwood Association, 405 Enfronte Dr., Suite 200, Novato, CA 94949.



Fein Power Tools, celebrating 100 years since inventing the world's first power tool in 1895, is offering a newsletter highlighting the history and future of the power tool industry. To obtain a copy, send a self-addressed, stamped, legal-size envelope to:

Newsletter Office, Fein Power Tools Inc., 3019 West Carson Street, Pittsburgh, PA 15204.

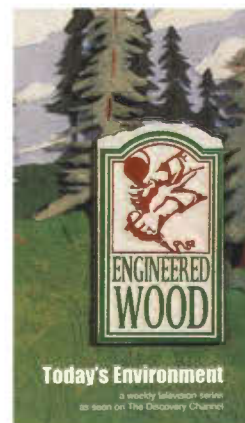
Redwood Landscape Architecture shows beautiful projects for the outdoors surrounding your home.

Free Video Demonstrates the Benefits of Engineered Wood

Not too long ago, the Discovery Channel's television program, *Today's Environment*, aired a segment on engineered wood [particleboard and medium density fibreboard (MDF)] for use in furniture and cabinets. Now the **PB-MDF Institute** is offering free video excerpts from the program which focuses on the environmental friendliness of products made with engineered wood.

A brochure, *Engineered Wood: Essential Ecology*, also is available free of charge. It describes engineered wood's benefits for today's environmentally conscious consumer.

For your free copy, call or write the PB-MDF Institute at 18928 Premiere Court, Gaithersburg, MD 20879; (301) 670-1752. Additional videos cost \$3.50 each; and the first 50 brochures are free.



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As you'd expect, the cast iron table tilts to allow bevel cutting. But what you

might not expect is the fact that the adjustable steel stand also tilts forward to give you a better view of the job, and just the right angle for comfortable operation.

This one's ready to test drive right now at your Delta dealer. If you're ready to cut circles around the rest, call us for the dealer nearest you. Delta International Machinery Corp., 800-438-2486. In Canada, 519-836-2840.

Delta is proud to nationally fund these two PBS programs for woodworkers. The New Yankee Workshop hosted by Norm Abram and The American Woodshop with Scott Phillips.



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DeWalt's new lines of heavy duty wood-boring bits and cobalt-steel jigsaw blades are impressive additions to the woodworking accessory category.

The wood-boring bits feature angled offset cutting wings that DeWalt designed to drill holes twice as fast, remove chips quicker to reduce binding, and produce more holes per battery charge in cordless drilling.

The jigsaw blades feature a patented cobalt-steel-reinforced tooth configuration, providing increased cutting contact for precision cuts, longer life and a superior finish.

The blades also offer true and perpendicular cuts with minimal "blow out" on the bottom of the cut.

For more information, contact DeWalt Industrial Tool Company at (800) 433-9258 or circle #160 on the Resource Directory Coupon.



Put This In Your Pipe...

If your dream is making your own briar pipe but you think it's a little

beyond your abilities, this Stemco™ kit is for you.

It includes *Pimo's Guide To Pipe-Crafting At Home*, with 119 illustrations (used for 20 years to instruct pipe makers), and a pre-bored briar block, complete with a fitted vulcanized rubber stem.

The kit is available for \$25, plus \$3 postage, by writing to Stemco, Butternut Lane, P.O. Box 2043, Manchester Center, VT 05255; (802) 362-3371, or circle #162 on the Resource Directory Coupon.



*Batteries Included

Dremel has revamped the Moto-Tool and pulled the cord off to increase its versatility. The new 7.2-volt MultiPro 7700 is a two-speed, cordless rotary tool powered with a three-hour battery pack. Operating at 7,500 or 15,000 rpm, the MultiPro 7700's 25-piece accessory collection offers a variety of functions including cutting, polishing and cleaning in a wide range of shop and household applications. The tool is equipped with a collet nut that accepts Dremel accessories up to a 1/8" shank, with additional collets for 1/32", 1/16" and 1/32" shanks.

The MultiPro kit retails for about \$55 and is available at all leading home centers and hardware stores. For more information, contact Dremel at P.O. Box 1468, Racine, WI 53401 or circle #161 on the Resource Directory Coupon.



Baby It's Warm Inside

Space-Ray Infrared Gas Heaters has introduced an economical and easy to install residential gas heater for hard-to-heat areas such as garages, workshops and enclosed barns.

The new series of compact, unitized 111" long Cold Blocker™ heaters are available in natural and propane gas versions. The heaters offer energy efficiencies ranging up to 84.5 percent, and fuel savings from 30 to 50 percent or more.

The Space-Ray Cold Blocker retails at \$649. For more information, call (800) 438-4936 or circle #163 on the Resource Directory Coupon.



Sharp Idea, Gritty Solution

Norton, the world's leading manufacturer of abrasives, is now offering the Norton Waterstones® system, the first made in the United States.

The stones, available in 220, 1,000, 4,000 and 8,000 grit, are engineered to work together. Norton says the grit progression allows the user to produce a near mirror finish in a very short time.

The set retails for about \$160. Norton is also offering two combination grit stones, the 220/1,000 for \$29 and the 4,000/8,000 for \$49.95.

For more information, contact Norton at One New Bond Street, P.O. Box 15008, Worcester, MA, 01615-0008, or circle #164 on the Resource Directory Coupon.



Aln't That a Kick In the Pants!

For the contractor (or space challenged woodworker), Delta International Machinery offers the Sidekick 10" sliding compound miter saw.

At 59 pounds with stand, the Sidekick offers a lot of saw for its weight. The collapsible stand includes built-in left and right table extensions producing a 59" working platform.

The saw is powered by a 13 amp, 5,000 rpm motor, and can make a 3 3/8" x 11 1/2" cut at 90 degrees. Other features include a carbide-tipped 10" x 40 tooth blade and an electronic blade brake.

The Sidekick lists for \$696, but will retail for about \$550. To locate a Delta distributor near you, call (800) 438-2486 or circle #165 on the Resource Directory Coupon.



Popular Woodworking Back Issues

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July '95	Mission style coffee table; mortising jigs for your router; french provincial corner cupboard; kids' chairs and table set; fundamentals of spindle turning; kit furniture review.
May '95	Router bit basics; walnut buffet; sportsman's desk; carving luxury cars; finishing with wax; country farm table; authentic wooden drum.
March '95	Preparing stock; traveling lawn chair; flap-top table; T. Rex whirligig; cedar-lined hope chest; pier table.
January '95	Handkerchief table; toy chest; legless coffee table; corner computer desk; how to co-op your shop.
November '94	Carve a loon; library steps; a chest for silver flatware; carving sailor sam; using the tormek grinder.
September '94	Hope chest; deck furniture; jewelry box; cantilevered rocking horse; bit storage cabinet; revolving bookcase; dual biscuit joinery.

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May '94	Turned spice canister; cedar blanket chest; tambour wall desk; woodworker's V-block; contemporary desk; nail storage cabinet; nautical flower box.
March '94	Sewing and knitting box; planer stand; carving in the blue whale; walking canes; table saw power feed; walnut quilt rack.
January '94	Doll cradle; carving King Lear; child's sleigh; lathe ornaments; beehive octagonal clocks; crayon battleship.



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May '90	Captain's bed; centering tools; child's toybox/chair; computer security cabinet; cutlery box; candlestick.
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SCROLL SAW CREATIONS

About five years ago, Nancy Vincent saw a puzzle box in a craft magazine that captured her imagination. So she dropped a hint to her husband that she'd like a scroll saw to make her own. Today, her interest in puzzle boxes has grown into a small but satisfying cottage industry, Vincent Creations, Inc., that cranks out about 200 to 300 boxes a year. Her expertly cut and finely painted creations sell for \$20 to \$25 each.

Nancy now has more than 30 designs of the tiny puzzle boxes available, which are evidence of her talents — an eye for detail and steady handwork. From cute animals to elegant Victorian houses to popular holiday items, most of the boxes measure about 3" x 2", with miniature pieces that are about the size of a dime or smaller following each box's theme.

Nancy's biggest production expense is time. She figures she only earns about five dollars an hour, but says she enjoys her work.



The material costs are miniscule; each box usually requires $\frac{1}{8}$ "-thick and $\frac{1}{16}$ "-thick pieces of plywood and a $\frac{1}{4}$ "-thick piece of poplar. The three pieces are cut out with a reverse-tooth blade to prevent tear-out. Then the poplar's center is cut away, leaving the box's sides. The plywood bottom is glued to the poplar; and the lid is attached with a screw at the top.

The tiny puzzle pieces, ranging from people to animals to small objects, are cut from the poplar's scrap. "The trick is having enough wood to hold onto," Nancy says, demonstrating how the pieces are traced onto the poplar close together, with the last piece by itself surrounded by extra wood, before being cut. However, even with a little wood left and a .015" blade, a lot of patience and skill are needed to cut out the tiny pieces. The cutouts are sanded and primed, then painted down to the last detail with oil-based acrylics.

Nancy is modest about her talents — she claims they're strictly inherited. But besides a few art classes in high school, her painting and scroll saw skills were self-taught.

Soon entering its third year, Vincent Creations has added holiday ornaments, three-dimensional pictures and earrings to its line of wooden crafts, which add variety to Nancy's work. The earrings complement the boxes, which can be worn as necklaces suspended on a cord.

Most of Nancy's creations are sold by "word of mouth," but



Nancy demonstrates how she cuts out the miniature puzzle pieces.



it seems that word is spreading. From her Cincinnati-based home, Nancy has sold pieces from Florida to Canada. The Christmas season is especially busy — she stops taking orders by November 1 to guarantee a timely delivery. And now her sister occasionally helps out on the sander to fill her orders on time. Yet despite her busy schedule, Nancy says she likes her work, "It's something I enjoy doing, and it's fun. When it's no longer fun, that's when I'll stop."

ED. — For more information, Vincent Creations, Inc., can be contacted at 5672 River Road, Cincinnati, OH 45233; (513) 941-6728.



The Secret to Threaded Inserts

It's good to see a women's column. I get a lot of wood magazines, and have been disappointed at seeing so few women in the pages.

In my house, I do the woodworking and my husband does the cooking. I'd rather build a bookcase than cook dinner anytime.

My question for the column is about threaded inserts. I was working on a project that needed them, so I bought some. It looked simple enough to install one, but I tried several methods in scrap wood and couldn't put them in straight, so gave up and used wood screws.

What's the secret for installing threaded inserts straight?

Carol Bathrick
Bethel, CT

by **Cristine Antolik**

WOMEN READERS!

Whether you design and create your own projects, or help your spouse in the shop, this is your forum! If you have a woodworking question or concern, would like to share your project ideas, or are seeking advice on tools or finishing, I'd love to hear from you! Drop a letter to Dovetales, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207 or you can send e-mail to Wudworker@AOL.COM.



Sticky Sap Solution

I need finishing advice! I painted a newly built, pine Adirondack chair with exterior acrylic enamel and now I see sap coming through, all sticky and black! How do I correct this problem? I also noticed a lot of sap had bled out of an outside window trim piece and seems too sticky to really scrape off. How do I proceed?

Stacie Blake
Huntington, VT

Well, before you apply paint, you should seal the wood with shellac. After that dries, you can paint the project as you always have. For the pieces you've already painted, scrape off as much sap as you can or sand down the areas where sap is bleeding. Then spot seal these areas with shellac, and repaint. Good luck!

— Cristine

I'm so glad you're enjoying our column! As for the secret to installing threaded inserts straight, first make sure your starter hole is just over the diameter of the insert, minus the threads. Start the insert slowly and allow the threads to guide themselves into the hole. As the lead thread starts to bite the side of the hole, apply more pressure on the opposite side to prevent it from pulling down. The longer the screwdriver, the better your perspective on "straight" will be. If you're doing a number of inserts, a simple right angle jig or holding a try-square near the screwdriver will help a lot. — Cristine

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Essential Jigs, Secret Weapons

These simple benchtop accessories will make your joinery more exact.

If you were introduced to woodworking through the medium of the table saw and the router, you're probably accustomed to using these tools to produce fairly exact work. Apart from requiring less effort to use than many traditional hand tools, modern power tools are also capable of fine adjustment and accurate use. Calibrated fences, graduated depth stops and other built-in guides all help to produce consistently straight and square work. The notion of something sawed or cut by hand being as accurate as something passed across the table saw, supported by accurately aligned fences and miter gauges, can seem impossible to anyone who hasn't spent years practicing such a skill.

This perceived difficulty of obtaining comparable accuracy is what discourages many people from using hand tools. If you have the idea that you simply won't be able to do the job to a high enough standard, you're likely to abandon the attempt in spite of the attractions of using a beautifully made wooden hand tool, with its romantic associations to the exquisite work of yesterday's craftsmen.

Even a cursory look at fine furniture made before the popularity of electric tools is not enough to convince most people that accuracy was far from unattainable. But the general assumption is that it was achieved only after long years of grinding apprenticeship, and the slow development of hand skills few people today have the time to learn. It is, however, only partly true that many of the exquisite antiques we classify today as Chippendale, Hepplewhite, Sheraton, Empire, etc., were the results of years of accumulated hand skills. What is not generally understood is that their creators relied not only on "crude" hand tools and years of skill, but they commonly employed a whole range of jigs

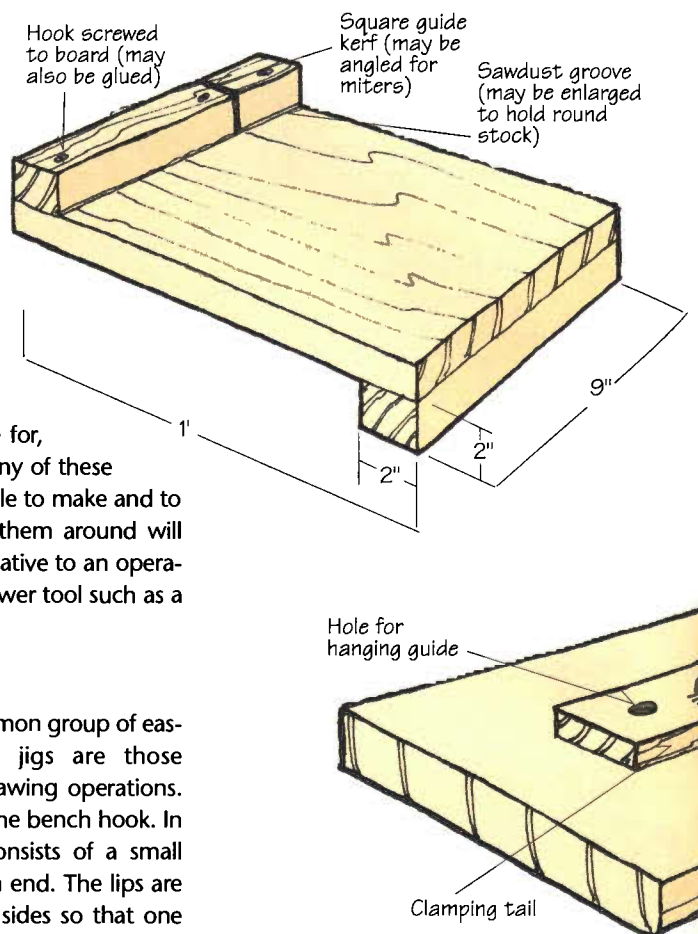
and accessories. These items guaranteed levels of accuracy every bit as fine as we strive for, and expect, today. Many of these jigs are extremely simple to make and to use. Having a few of them around will often provide an alternative to an operation on a stationary power tool such as a table saw.

Sawing Jigs ►

Perhaps the most common group of easily made hand tool jigs are those employed in various sawing operations. Chief among these is the bench hook. In its simplest form it consists of a small table with a lip at each end. The lips are arranged on opposite sides so that one lip "hooks" onto the benchtop and the other forms a stop against which the work may be held securely (*diagram 1*). It's chiefly used to secure a small workpiece while being sawn without having to clamp the piece. A flat board, 9" wide x 12" long, with 2" square lips is easily made. Somewhat different proportions may also work well and can make use of whatever scrap is handy when making the jig.

Experience will soon demonstrate certain advantages that minor changes can offer, such as making the back hook (the piece against which the work is held) somewhat larger and perfectly true in relation to the bed of the bench hook. If a perfectly perpendicular (both to the plane of the bed and the back of the hook) saw cut is made through this hook down to the level of the bed, the bench hook will serve as a reliable square cut-off guide for the saw when trimming short pieces. This can be easier and safer than running very short pieces through the table saw. Similarly, if the end of the back hook is made perfectly square, the side

Diagram 1: Bench Hook



of the bed can be used as a small shooting board to trim short sections, and the square end of the hook will function as an exact stop.

Logical extensions of this idea include extra kerfs made in the back hook to guide differently angled cuts, including regular and irregular miters. This is a very common use for the bench hook. Consequently, position any nails or screws only in places where such guide kerfs aren't likely to be made. Remember that if the hook is attached only with such fasteners rather than being glued in place along its entire length, a kerf made outboard of the end fastener will allow the last piece of hook to fall off! In any event, a clearly marked line indicating the fasteners' positions may save you the embarrassment of trying to cut a guide kerf through a hidden fastener.

Some people prefer bench hooks with relatively thin hooks. These allow easy clamping of stop blocks, which are very

by Graham Blackburn

Diagram 2: Miter Box

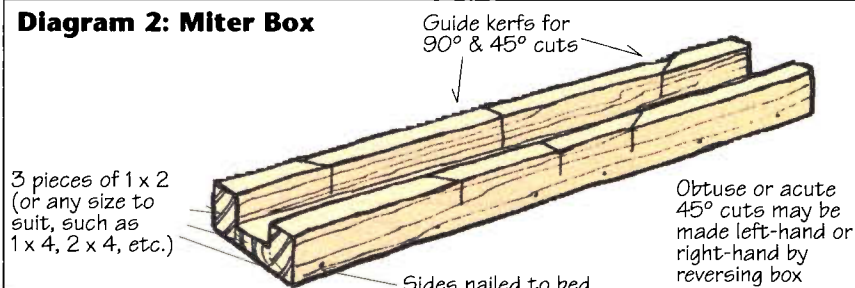
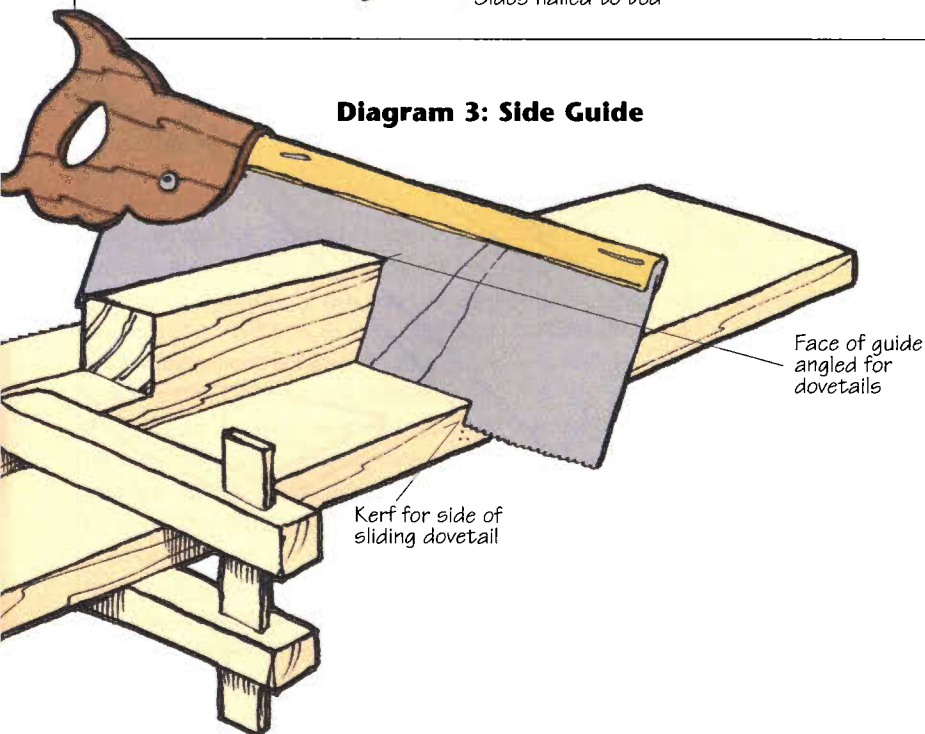


Diagram 3: Side Guide



useful for repetitive cutting of similar lengths when the same guide kerf is used.

If there is a particular operation that you repeat often, a bench hook with a marked, or even graduated, hook can save a lot of time. For example, I keep my bench hook marked so that I can saw the short dowels needed for dowel joinery to the same length without having to measure or mark the dowels every time.

The bench hook can, of course, be constructed so that either end may be hooked over the bench, thus providing you with two beds and a different selection of guiding kerfs. Undercutting the back hook (before attaching it to the bed) will prevent the workpiece from being forced away from the hook by a buildup of sawdust. If undercut sufficiently, it may also prove helpful for holding smaller round dowel stock securely against the hook.

Small, custom-made miter boxes are often overlooked aids to hand sawing.

While the large metal versions with clamps and scales are expensive collectors' items largely superseded by chop saws, a simple miter box (diagram 2) nailed together from scraps of one-by-two and provided with a carefully laid-out kerf or two can be a very effective way of making exactly angled cuts in small stock, especially in pieces too short to run safely through the table saw.

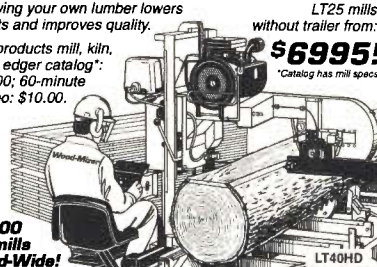
To make angled cuts in stock that's too large or unwieldy to be held in a miter box or run through the table saw, use the simple side guide. Every shop used to have one of these for cutting the sloping sides of sliding dovetails in wide stock (diagram 3), but its use isn't limited to the angles required by dovetails. The side guide is simply a block of wood that the end of the backsaw is held against to ensure the required angle. The guide's other end is made thinner so that it may be conveniently clamped to the workpiece.

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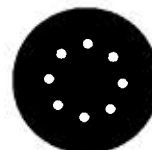


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Planing Aids ►

In the same way that a push block can be indispensable to a power jointer, certain devices are equally useful when using hand planes. A well sharpened plane can be considerably handier to use on small stock or short, odd-shaped workpieces than an 8" jointer, but attempting this work freehand is something even the most skilled old-time craftsmen rarely risked.

The most useful accessory to a hand plane is a shooting board (*diagram 4*). This easily made jig ensures the accuracy of the surface being planed. The most common form is designed to make edge-planing easy and accurate. The work is held (or clamped) on the board against a stop, and the plane is used on its side. The squareness of the plane's stock or body guarantees the squareness of the edge.

Shooting boards can be made to any length that's practical for the work at hand. By altering the position or angle of the stock, different tapers or angles can be achieved. Their use isn't limited to side grain; using a suitably constructed shooting board to trim end grain not only ensures a finished flat surface difficult to achieve freehand when planing small pieces, but also removes the need to position waste pieces behind the workpiece to avoid splintering off the rear of the cut.

Trimming the ends of compound work can be particularly frustrating if you try to match the compound angles using fences and miter guides on the table saw. However, by providing a shooting board with appropriate wedges (*diagram 5*), or by using a shooting board with adjustable stops, this chore can be made very easy.

Planing miters by hand can often result in losing the perfect fit of the miter because the end becomes slightly rounded or otherwise planed out of the correct shape. The miter jack (*diagram 6*) solves this problem. The jack is held in the bench vise, and the work is held in the jack so the surface to be planed protrudes slightly above the surface of the jack's jaws. It's common to protect the jaws by gluing a thin piece of card to their top surface, over which the

Diagram 4: End View of Shooting Board

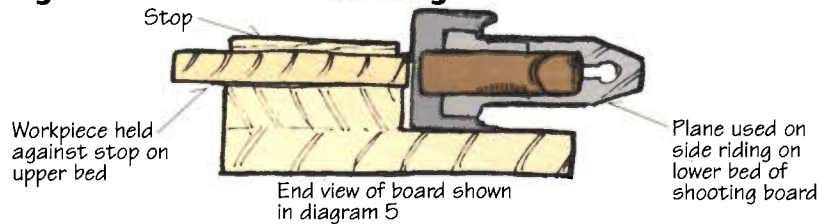


Diagram 5: Shooting Board with Wedges (A & B) for Trimming Compound Miters

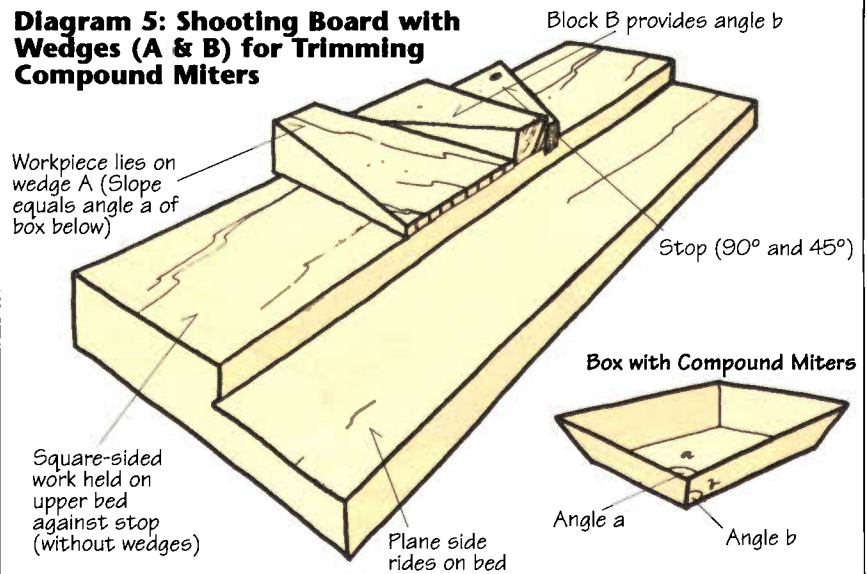
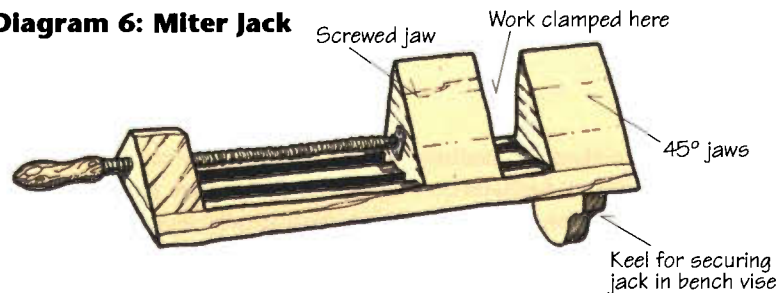


Diagram 6: Miter Jack



plane is then run, automatically planing the miter's surface to an exact 45-degree angle.

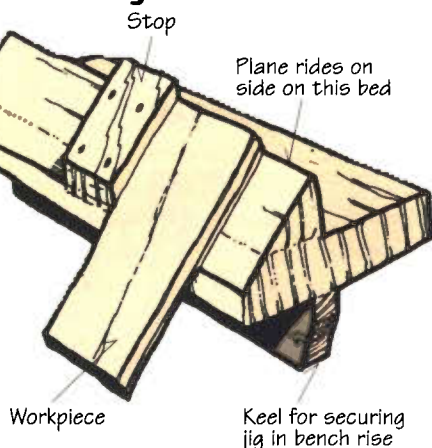
Somewhat more problematic is how to trim the ends of tall miters. There is, however, a special shooting board designed specifically for this job known by the quaint name of "donkey's ear shooting board" (*diagram 7*). It too is held in the bench vise, with the workpiece being held or clamped to it. Accuracy is guaranteed, with no skill needed other than the ability to push the plane.

In the same way that the shooting board takes advantage of the squareness of the plane's body to guarantee a square cut when planing long edges, an

adjustable guide clamped to the side of the plane can be made that will produce a consistent angle other than one of 90 degrees. The guide is no more than an angled strip fixed to the side of the plane. So, when it's held against the side of the workpiece, the plane's iron contacts the surface to be planed at the required angle. Although such guides can be quickly made from scrap as the need arises, various manufacturers have produced adjustable metal guides that may be quickly and securely clamped to the side of Stanley-type metal planes.

One last planing jig that deserves mention is the sticking box. Few people are interested in making their own window sash anymore (although rabbeted

Diagram 7: Donkey's Ear Shooting Board

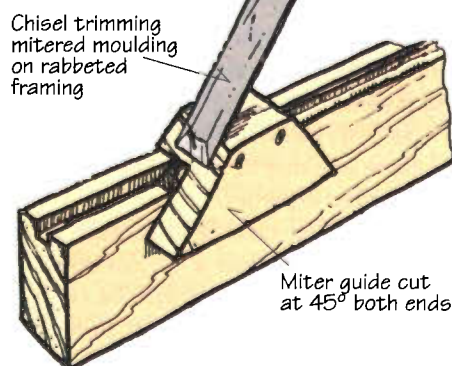


sash bars may be needed for pieces that include glazed doors); but the sticking box, once commonly used in the production of such items, is very useful for planing other workpieces too narrow or small to be conveniently run through the table saw, across the jointer, or even held in the vise for hand planing. The simplest form consists of a grooved bed to hold the narrow workpiece and a brad or small nail to function as a stop to hold the end of the workpiece. Secured this way, surprisingly small sections can be planed or even moulded.

Chiseling Guides ▼

A chisel may be thought of as a plane iron without a body. As such, it is entirely a freehand tool, lacking even the sole of the plane's stock to guide it. While it is this very freedom for which the chisel is designed, occasions do arise when what has to be chiseled requires a perfect accuracy difficult to achieve unaided. One very simple device is

Diagram 8: Chisel Miter Guide



the chisel miter guide (*diagram 8*). A short length of scrap is provided with an accurate miter at each end and is then attached on one side to another short length of scrap. When this second piece is clamped to a workpiece, the back of the chisel may be slid down the face of the mitered piece to trim a small 45-degree miter. This guide is commonly used at the corners of frame-and-panel work, mitered mouldings, mitered rabbets, framing, and, of course, sash work.

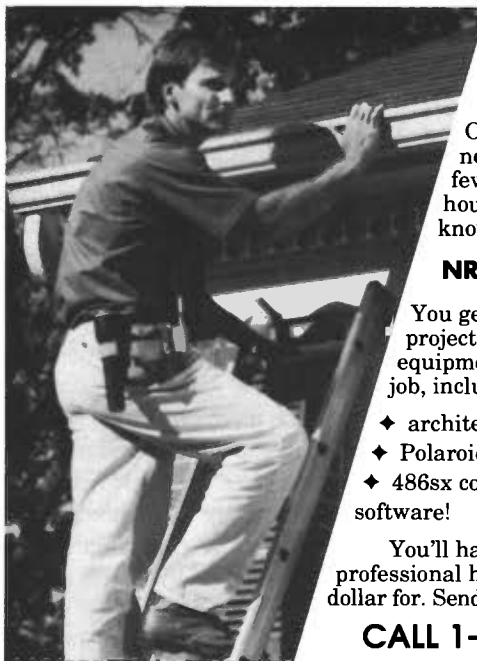
Boring Guides

A hand drill or a brace and bit can be particularly difficult to use with accuracy. Power boring in the shop is usually done on the drill press, whose (usually adjustable) table helps assure accurate holes. Hand tools can be especially useful when it isn't convenient or even possible to bring the work to the drill press; but when used in awkward situations, such as underneath a tabletop or on the interior of some cramped casework, accuracy can be annoyingly elusive.

An extremely simple guide, however, can be made in a matter of moments, especially if you have a drill press. All that's needed is a short length of scrap pre-bored to accept the size of bit you intend to use. The end of the bored scrap piece should be made perfectly square (or to the angle required), and is slipped over the bit and held against the work surface. You must, of course, make sure the bit used is long enough to penetrate both the guide and the work to the depth required, and a mark or two may be necessary to align the guide properly. However, by simply holding the guide to the work, the hole will be bored accurately. This type of guide can even be used with an electric drill. Simply bore the hole in the guide large enough just for the shank of the bit.

So before you dismiss hand cut joinery as beyond your skills, stock your shop with some jigs, which will become your secret weapons against inaccuracy. **PW**

Graham Blackburn is a contributing editor for Popular Woodworking.



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How to Deduct Shop Space. . .

Get that tax form to work for your home woodworking business expenses.

If you're either working at home or operating a home-based woodworking business, many of your expenses are tax deductible — and most of them are not. Not so surprisingly, the ever-vigilant Internal Revenue Service devotes quite a bit of attention to home businesses.

First of all, no woodworker is automatically entitled to deduct the expenses of using his or her home for business purposes. However, if those expenses are attributable to a portion of the home (or a separate structure) used exclusively and on a regular basis as a place of business, expenses may be deducted — subject to limitations and restrictions.

The tax rules define a place of business as either the principle place of any business carried on or as a place of business that's used by patients, clients or customers in meeting or dealing with the taxpayer in the normal course of business. The exclusive use requirement is not met if the home space is used for both business and personal purposes.

An unusual exception to the above rule relates to what our lawmakers call a "wholesale or retail seller," a person whose dwelling is the sole fixed location of the trade or business. In this case, the ordinary and necessary expenses allocable to the space within the dwelling unit that's used as a storage unit for inventory are tax deductible, provided such space is used on a regular basis and is a specifically identifiable space suitable for storage.

Closer to our homes, the U.S. Supreme Court has ruled that determining whether a portion of the home is the woodworker's principle business location requires comparing that location to all of the places that the woodworker actually does business. This is because only the most important, consequential or influential location can be the principle location under our present rules. Presumably, however, with a shop as an all-important base of operations, selling at various shows wouldn't preclude a tax deduction for the home shop.

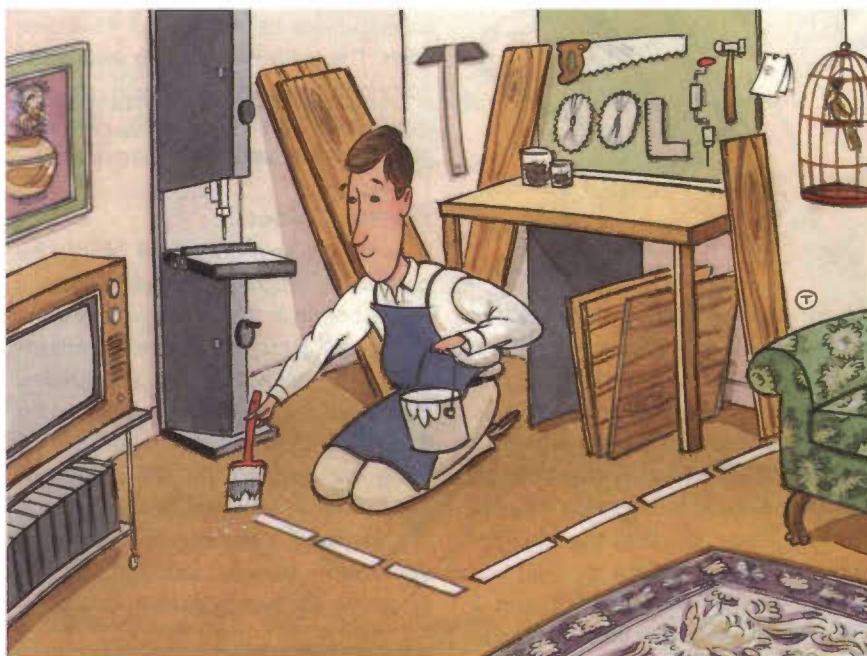


ILLUSTRATION BY GEORGE THOMPSON

The Supreme Court has also ruled that, while the ultimate determination of principle location depends upon the facts and circumstances in each situation, two primary steps must be followed. Step One involves analyzing the relative importance of the functions performed at each business location. Thus, if the nature of the woodworker's business requires meeting with customers or clients, the place where that contact occurs must be given great weight. Step Two is used if Step One doesn't result in a clear-cut answer. In Step Two, the amount of time spent in the home business location must be compared to the time spent in each of the other places where business is conducted.

The Supreme Court decision that came up with those two steps also gives the IRS another tool with which to deny home shop (or office) expense deductions. Quite simply, the Court noted that, in some situations, after applying these two steps, it may be concluded that the individual has *no* principle place of business.

Fortunately, most woodworkers have a specific area of their home that's used

solely for the purposes of carrying on a trade or business. However, even with a qualifying shop, studio or home office, there's a limit to just how much may be claimed as a tax deduction.

Under our tax rules, the home shop (or office) deduction is limited to the total income from the activity — reduced by any expenses of that activity that may be deductible regardless of whether there's a qualifying home shop. In other words, regardless of whether a home shop exists, such expenses as taxes and mortgage interest may be deductible. With a home shop, a portion may be deductible as a home office expense and the balance as a personal itemized deduction.

A woodworker is denied a business deduction for basic local telephone service charges on the first phone line in his or her residence. Additional charges for long distance calls, equipment, optional services (e.g., call waiting) or additional telephone lines may be deductible home shop business expenses.

Any deduction disallowed because it would create or increase a net loss from the woodworking business may be carried over to future years, subject to the

same limit in the carryover years.

To illustrate, consider the case of John Dowel. As a full-time teacher, John also operates a woodworking business in which an IRS-qualified home shop is used. We'll assume that 25 percent of the general household expenses are allocable to the home shop. The figures would then look like this:

Gross income		\$25,000
Home Shop expenses:		
Total	Home Shop Portion (total x .25)	
Interest & property tax	\$8,000	\$2,000
Insurance, maint., utilities . . .	\$2,000	\$500
Depreciation	\$6,000	\$1,500
Total home shop expenses		\$4,000
Other business expenses not related to the home shop (e.g., supplies, wages, advertising, etc.)		\$24,000
Total expenses		\$28,000

Interest and property taxes are deductible by anyone who itemizes his or her personal deductions. Thus, our tax laws separate them from those expenses which may only be deducted by a business in order to come up with the amount of any tax loss.

To determine the limitations of the deductions, John must apply both the deductions allocable to the business and the deductions for taxes and interest allocable to the business (\$24,000) and use of the home (\$2,000, for a total of \$26,000) against the total income from the activity (\$25,000) to determine the limitations of the business loss deduction. Because the limitation amount (negative \$1,000) is zero or less, John has a business loss of \$1,000. He also may carry forward the unused \$2,000 of business-related expenses to a later tax year — again subject to the limitation.

Many woodworkers may be employed by someone else or others may be "employed" by their own woodworking businesses (or other businesses), and still maintain a home shop or office. Employees are permitted to claim a tax deduction for home shop and office expenses — albeit limited and subject to the restrictions and ceilings placed on personal itemized deductions.

For employees to qualify for the home shop deduction, they must meet the requirements already mentioned. In

addition, the exclusive use of the home shop must be for the convenience of the woodworker's employer. And that does not mean renting the home (or a portion of it) to the employer. The IRS and the courts have frowned on this tax dodge.

Generally, an employee's home shop expenses must be taken as a miscella-

neous itemized deduction subject to the two percent floor on Schedule A of Form 1040. Those doing business as sole proprietors, of course, can use Schedule C of Form 1040 (Schedule C-EZ may not be used).

On a more positive note, our tax rules permit individuals, employees or woodworking business owners who use their homes as their principle place of business to deduct transportation expenses that would otherwise be classified as nondeductible commuting costs. Unlike someone who must get up and commute to the place of business, the employee with a home woodworking shop using the home as his or her principle place of business is permitted to deduct the cost of transportation, that is, going from that place of business to a customer or client, or merely running business errands.

One warning about substantiating any expenses for a home shop. To claim any tax deduction, a woodworker must be able to prove that the expenses were, in fact, paid or incurred. According to the IRS, the following expenses which are deemed particularly susceptible to abuse must generally be substantiated by adequate records or sufficient evidence corroborating the woodworker's own statement: expenses related to travel away from home (including meals and lodging), entertainment expenses,

business gifts, and expenses related to the use of so-called "listed property."

The availability of depreciation deductions for "listed property" is restricted. This term embraces automobiles and other forms of property that lends themselves to personal use (airplanes, trucks, boats, etc.), especially computers and peripheral equipment, cellular telephones and similar telecommunications equipment.

That's right, not only must the portion of the home be used exclusively and regularly as a home shop, but the computers used for that home shop must also meet the tests required of "listed property," property that may be subject to abuse of our tax rules.

Unless this listed property is used predominantly for business (i.e., more than 50 percent), depreciation deductions must be determined using an alternative method. These rules also apply to any portion of the cost of purchased "listed property" that the woodworker chooses to expense or immediately write off under Section 179 of the tax law. Thus, if the more than 50 percent use test for "listed" equipment isn't satisfied in the year the property is placed in service, the property won't qualify for the first-year expensing election.

Tax laws, of course, are changeable and, in part, driven by politics. Among those tax rule changes that have been proposed is one which would permit deductions for certain expenses if the individual conducts essential administrative or management activities at home regularly because there's no other location to perform those activities.

In the meantime, and regardless of whether that loosening of the home office expense rules becomes a reality, every woodworker can benefit from the existing tax deduction for the use of a qualifying home shop.

All you have to do is follow the rules. **PW**

Mark E. Battersby is a tax and finance writer, lecturer and advisor from Philadelphia. He has been writing trade and consumer publications for more than 20 years.

ASK THE EXPERTS

Since we are constantly working to improve your knowledge (and frequently our own) by looking to experts for advice, this new column will ask the industry pros who make up our editorial advisory board your questions on any woodworking-related topic. To "prime the pump," we've asked some of our board members to address the questions they're most frequently asked. Hope you learn from their answers! Send your questions to Ask the Experts, Popular Woodworking, 1507 Dana Ave., Cincinnati, OH 45207 or Wudworker@AOL.COM.

"How Many Amps is Your Tool?"

Using amperage as a yardstick for measuring the "power" of a power tool is like comparing apples to oranges. It's quite easy to make a high amperage power tool by simply producing an inefficient motor. Amperage is a measure of energy consumption, much like miles per gallon for a vehicle. No one discusses high performance sports cars in terms of their fuel economy. Instead you hear terms such as horsepower and torque.

What a power tool user really wants to know is "How much power am I applying to my work?" Unfortunately not all manufacturers list this data. Most European manufacturers will provide both input watts as well as output watts. Input watts is simply amperage stated in a different way. Output watts is a measure of mechanical power and is the actual power the motor produces. This can be converted into horsepower by dividing the output

"What Type of Router Do You Recommend?"

Clearly many factors affect such an important decision, and no router will please everyone or perform all tasks. However, if I had to be satisfied with just one, it would be hard to beat a variable-speed plunge router in the 1½ to 2 horsepower (hp) category.

Modern plunge routers perform a greater variety of tasks than their fixed-base counterparts, primarily because

their bit can be plunged straight into a workpiece and smoothly retracted at the end of the cut. This feature is highly desirable for mortises, stopped dadoes, curve and circle cuts, and even freehand lettering or designs.


Some machines include fine-depth adjustment, which adds precise control

for inlays, edge forming, dovetailing and similar operations.

Select a tool that feels comfortable in your hands, and don't buy one sight unseen.

I favor electronic variable speed because it allows more control with large or small bits, and provides soft-start to prevent "jerking" of the router at

start-up. I often find myself doing general routing in softwoods at lower speeds



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watts by 746. Unfortunately, amperage cannot be converted into output watts, and if output wattage isn't listed, comparing tool power becomes difficult.

Also be aware that horsepower can be tinkered with by rating the horsepower from input watts rather than from output watts. Another tactic is to rate the horsepower as maximum horsepower, which is at the motor's stall

point. At stall point the motor is drawing much more amperage than it is rated for and the motor is being damaged.

What a power tool user really wants to know is "How much power am I applying to my work?"

Given the lack of information provided by tool manufacturers, your best alternative is to try the tool out on your own project. Listen to the motor, does it

sound strained? Does the speed of the tool drop sharply? Is there a lot of fire around the brushes? These are all good indications that you'll need a bigger motor from the manufacturer, or you need to try another manufacturer's product.

Chris Cable is president of Fein Power Tool and is a native Pittsburgher. His free time is spent with his family.

simply because of the lower noise level generated by the tool — a fringe benefit.

Some woodworkers demand machines in the three-plus horsepower category, but for home hobby wood-working I've never needed that kind of power, and thus prefer a smaller, lighter tool. Most 1½ - 2 hp plunge routers accept ¼" and ½" bits, which make them versatile enough for virtually any task.

I've used my 2 hp for large mortises, stile and rail joints, and even occasional raised panels when properly fixtured and guarded in a table.

Select a tool that feels comfortable in your hands, and don't buy one sight unseen. Look for smooth plunging, easy access to controls, and sufficient power rating for all-around service. Choose a router that meets these criteria, and

regardless of brand, it will be a tool that you will look forward to working with for many years to come.

Chris Carlson is the senior product manager for Bosch and Skil. He is a native of Chicago and enjoys working on antique motorcycles and automobiles.

Continued on p. 71.

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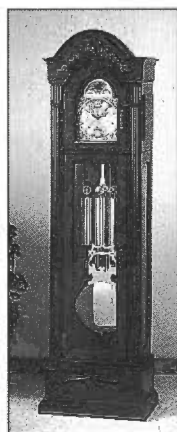
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Mortise & Tenon Made Easy

Machining mortise and tenon joints just got simpler with a benchtop hollow chisel mortiser and new tenoning jig.

Hollow Chisel Mortiser: It's Always Ready

For what seems a lifetime, I've produced the classic mortise joint and its variations with a mortising attachment for a drill press. I have no complaints and never had reason to enter the debate about whether or not the arrangement was harmful to the machine's mechanism. However, I have regretted that leaving the setup for such use wasn't possible, since the tool had to be available for many other operations. Now, thanks to the acquisition of Delta's relatively new hollow chisel mortiser, I've eliminated the nuisance and time required for setup and breakdown; but convenience isn't the whole story here. The machine is designed and engineered exclusively for mortising, and it comes through in quality fashion.

The benchtop unit's size is deceptive. It weighs only about 47 pounds, yet incorporates features usually found on larger, industrial tools, like a rack and pinion system for raising and lowering the head and a dovetail-way slide device that's easily adjustable. As a result, cutting action will always be smooth and precise. A unique feature is a gas-filled "head stabilizer," or piston, that provides a counterbalance for the downward thrust and eases return strokes.

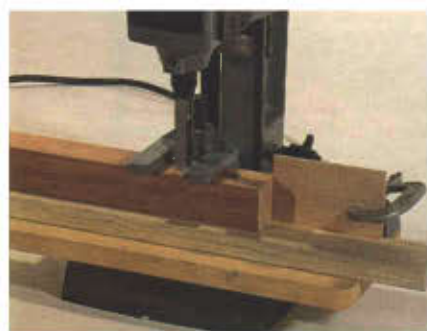


Photo 1 This "small" tool is a capable mortising machine that's ready to perform whenever you are. An extra-long, multi-positional handle is a plus factor when doing tough cutting jobs.

The unit's design is borrowed from the arbor press used in metal working. Its stout steel arbor, combined with a long handle for good leverage, allows this small mortising machine to turn 32 pounds of downward force into 320 pounds. Though you may be able to get slightly greater downward pressure using a drill press mortising attachment, the gearing on this benchtop mortiser allows the entire cut to be made in one 90 degree motion of the handle, while the drill press may require a 360 degree turn of the handle to complete the same cut.

Basic capacity is 4", less the included hold-down, but this can be increased to almost 6" by adding an extra-cost height attachment. It handles mortising chisels up to 1/2" x 1/2" with 5/8" diameter shanks. It also provides a 5" stroke that's more than adequate for stopped or through mortises. A simple, vertical stop rod, used to control the depth of cuts, is particularly handy when forming multiple, similar mortises.

Delta's good design is indicated by several features. The unit works with chisels that encase "short" bits. However, by removing a spacer on the shaft above the chuck, "long" bits that you might have on hand because of working with a drill press accessory, as I have, can also be used in this machine.

The chisel and bit installation method makes it easy to provide the critical clearance between the cutting lips of the bit and the points of the chisel. The chisel is initially placed so a gap of 1/16" to 3/16" is between it and the bushing it fits in. The gap is closed after the bit has been slipped into place and locked in the chuck, thus providing the essential cutting-end arrangement. The tool is designed for bench-mounting, so it should be bolted to a solid surface. Placing it near the edge of a bench allows the head to be rotated outboard



Photo 2 A hold-down, reversible for wide work, keeps parts secure when retracting the chisel. The wood table is on the small side, but a longer piece of plywood can be substituted if necessary. The cast iron fence is drilled so a wood facing can be attached.

so, in a sense, capacity can be increased from the chuck to the floor; this is handy should you need to mortise into the edge of a door, for example. Power is supplied by a 1/2 HP, induction-type motor turning a 3/8" capacity chuck at 3400 RPM. The hollow chisel mortiser's catalog price is \$380; but, as seems to be the tool-buying rule these days, shop around and you might get it for much less.

(See "Put the Mortiser to Work," the next article in this issue, where we delve more deeply into the functions of the

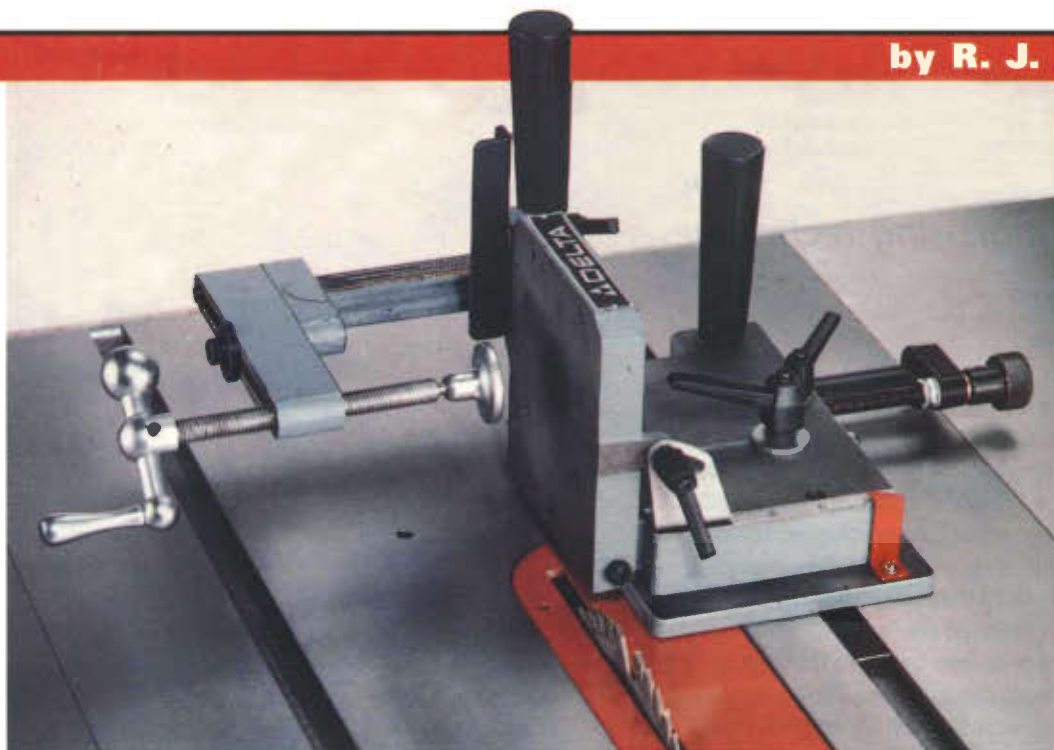


Photo 3 The Delta tenoning jig is a solid tool with adjustment mechanisms that guarantee accuracy. Two full-grip handles provide for keeping the operator's hands well away from the blade.

hollow chisel mortiser, demonstrating its basic and some of its not-so-basic functions. We'll also give details on building a stand for this workhorse or other "benchtop" tools.)

Tenoning Jig: "New and Improved"

Delta, knowing the hazards of hand-holding stock on end while moving it past the saw blade, has always offered a tenoning jig. A recently introduced version makes the phrase "new and improved" justifiable. Besides added features, it weighs and costs about one-third less than the original model (*photo 3*).

The tool has a fixed cast iron base supporting a top-side unit that's adjustable laterally by means of a threaded rod. It also features a work-support fence that includes a clamp screw with a generous hand crank. The unit sits on a $\frac{3}{8}$ " x $\frac{3}{4}$ " guide bar, which suits the table slots on Delta machines but may not be right for other units. It's possible to custom-make a suitable bar, but adding it would require disassembling the jig. I'd suggest to Delta in future redesigns to secure the standard bar from the bottom rather

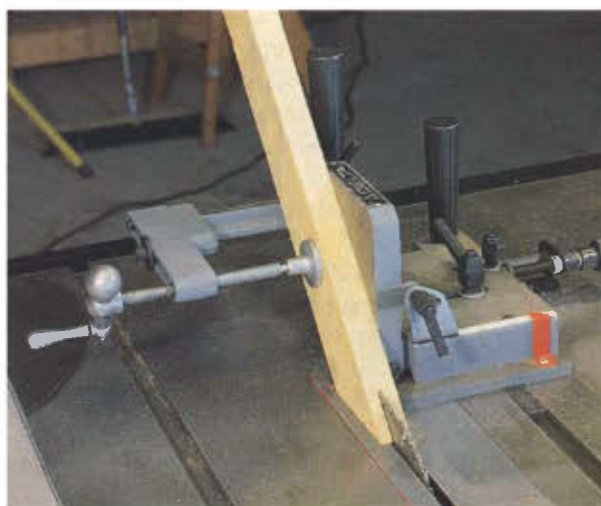


Photo 4 An adjustable backstop can be set for angles up to 45 degrees. Thus, the tool can be set up to form tenons on miter cuts and, as shown, for producing spline grooves.

than the top of the subbase. Then a substitute would be fairly easy to install.

The tool is designed to be fully adjustable and has features that make it quite versatile. For example, the fence can be tilted to about 75 degrees, making angled tenons possible, and an adjustable backstop allows tenons to be formed on mitered stock. A bonus — use the same setup to form spline grooves in miters (*photo 4*). If you make sure that the same surface of each component is against the fence, the groove doesn't have to be centered exactly.

The jig is listed as being able to handle stock as thick as $3\frac{3}{4}$ ". That's accurate for Delta table saws, but may not apply to other machines. Much depends on the

distance between the miter gauge slot and the saw blade on your saw. Maximum tenon-shoulder width depends on that dimension, but testing on another machine showed that while capacity was lessened, it wasn't enough to void using the tool for most furniture applications.

This tool isn't especially challenging to assemble, but it is critical to follow instructions in the owner's manual for initial adjustments. This doesn't take long and is the way to go for the smooth, accurate sawing. It retails for about \$100. **PW**

R.J. DeCristoforo is a contributing editor for Popular Woodworking.

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Put the Mortiser to Work

Build a work station, then learn basic and advanced mortising techniques.

By R.J. DeCristoforo

If you read the previous article, "Tool Talk," you're probably already hungry for a hollow chisel mortiser. We discuss its advantages over using accessories for the drill press to form classic mortise and tenon joints. The machine is an independent tool that should be bolted to a solid surface for efficiency and safety. It can be fastened to an existing workbench, but there it can interfere with other work, unless you mount it only when it's needed, a method that somewhat thwarts the practicality of the dedicated machine concept.

A better idea is to secure it to its own bench so it will be truly "independent," and ever-ready for its joinery functions. The work station project we designed (*diagram 1 with photo inset*) is straightforward and compact, needing little more room than the machine itself. The setup provides considerably more work-support than the tool's table, and small drawers are incorporated for handy storage of accessories. Once organized, the setup provides for efficient production of standard mortise and tenon joints and, with a special V-block jig, can be used to form the variations that are often required for furniture projects (*photos 1 & 2*).

Making the Benchtop

Start by cutting the base piece. Be careful when establishing the distance between the dadoes required for the partitions since this space must accommodate the base of the mortiser (*diagram 1a*). Next, cut the two partitions and the ends. The width of these components must be exact since, after the tops are added, the total height of the benchtop must equal the height of the tool's base plus $\frac{3}{4}$ ". Install the partitions with glue and 4d nails; the ends with glue and 4d finishing nails. The tops, after being rabbeted, are added to the assembly with glue and 4d finishing nails.

Shape the riser from a piece of hardwood, being sure that its thickness is exactly $1\frac{3}{4}$ ". Install it with glue and three #8 x $1\frac{1}{2}$ " flathead screws run up through the base's underside.

The drawers aren't fancy, but they serve the purpose. Cut all parts to size (*diagram 1b*) and then attach the bottom, back and front to the sides with glue and 1" brads. Be sure to bore a centered, 1" finger hole through the drawer front before assembly.

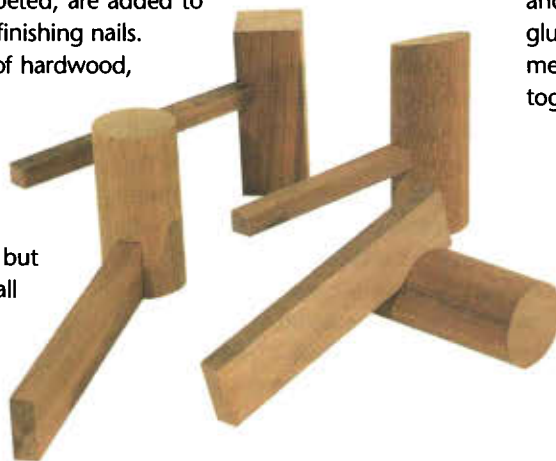


Photo 2 The addition of a V-block jig makes it easy to form mortises in round stock. A typical application is cutting a mortise in a round leg to receive a square or rectangular rail or stretcher.

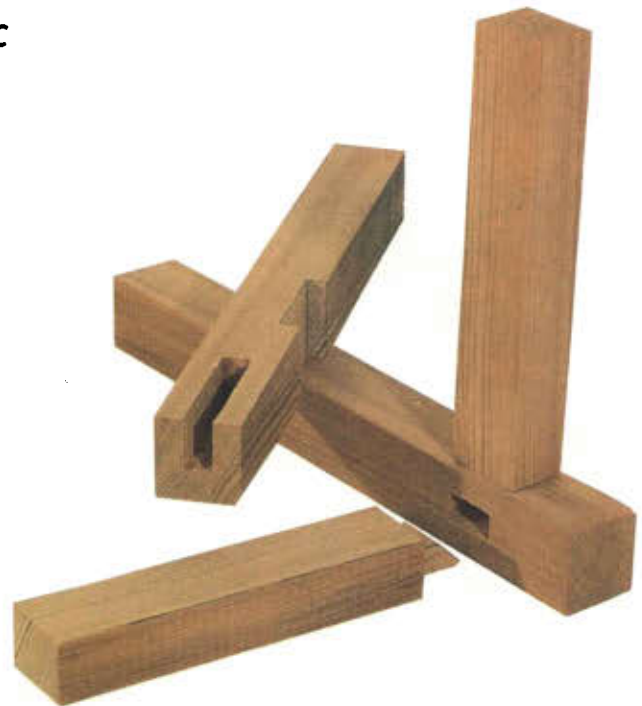


Photo 1 Conventional stopped or through mortises, side mortises, slots, and so on, are done in routine fashion, with the special bench providing much more work-support than the machine's table.

The Stand

Start the stand (*diagram 1c*) by cutting the eight pieces for the legs to overall size and then tapering the bottom ends. The slanted cuts can easily be formed with a tapering jig on the table saw, or by using a scroll saw or band saw. Assemble the two-piece legs with glue and 6d finishing nails. The next step is to make the two top braces and attach each to a pair of legs with glue and 6d finishing nails. Cut the four rails to size and start assembly by attaching the end rails, then adding the front and back rails. These parts are attached with glue and 4d finishing nails. An alternate method would be to put the four rails together as a subassembly before installation.

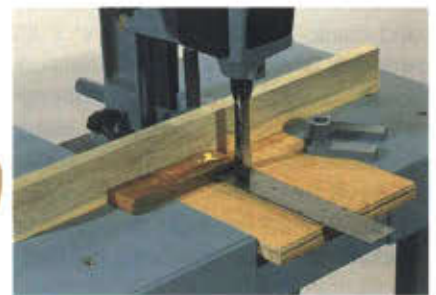
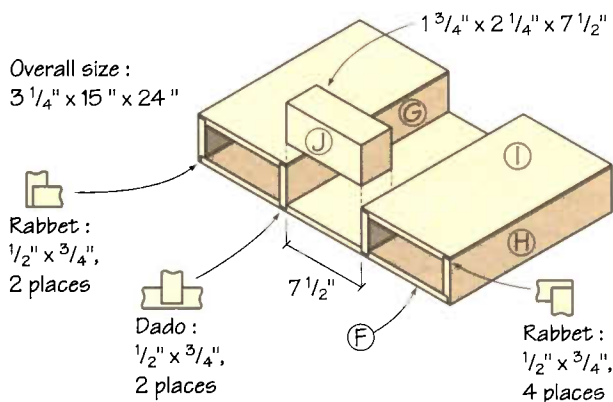


Photo 3 The first step when setting up for any mortise is to be sure the angle between the side of the chisel and the fence is 90 degrees. It's a good idea to check this alignment as you go when doing a considerable amount of cutting. Note the centered insert is easily replaceable.

Diagram 1a



Right: A bench for the hollow chisel mortiser makes it a truly "independent" tool. The project requires little room and can be mounted on casters for easier mobility. Be sure that casters, if used, are the locking type.



Diagram 1b

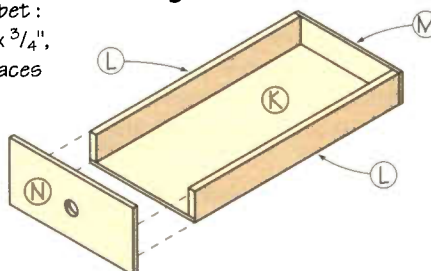
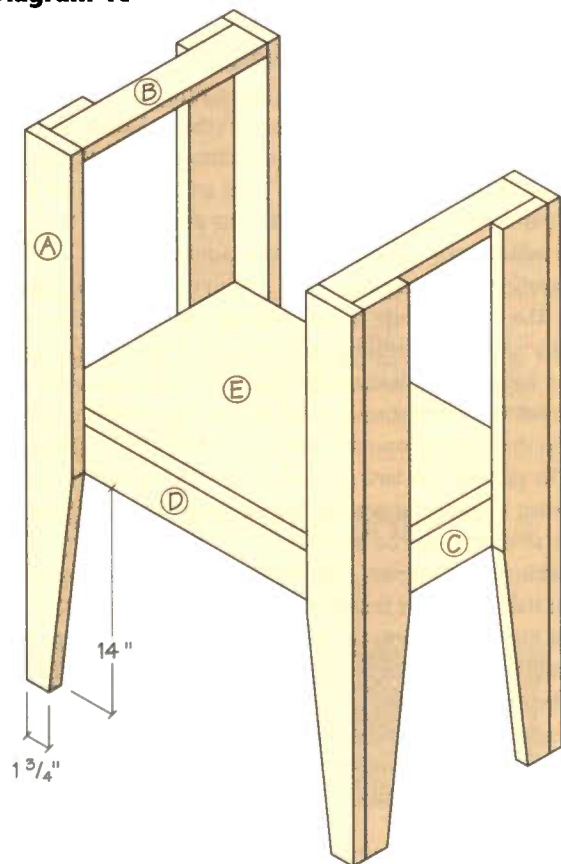


Diagram 1c



Schedule of Materials:

Stand

No.	Key	Item	Dimensions	Notes
8	A	Legs	3/4" x 3" x 32"	Lumber
2	B	Braces	3/4" x 2 1/4" x 13"	Lumber
2	C	Rails	3/4" x 2 1/2" x 13"	Lumber
2	D	Rails	3/4" x 2 1/2" x 19"	Lumber
1	E	Shelf	3/4" x 13" x 20 1/2"	Plywood

Mortising Bench

1	F	Base	3/4" x 15" x 23 1/2"	Plywood
2	G	Partitions	3/4" x 2 3/4" x 15"	Lumber
2	H	Ends	3/4" x 3" x 15"	Lumber
2	I	Tops	3/4" x 8 1/4" x 15"	Plywood
1	J	Riser	1 3/4" x 2 1/4" x 7 1/2"	Hardwood

Drawers

2	K	Bottoms	1/4" x 6 3/4" x 12"	Plywood
4	L	Sides	3/4" x 1 1/2" x 12"	Lumber
2	M	Backs	1/4" x 1 3/4" x 6 3/4"	Plywood
2	N	Fronts	1/4" x 3 1/4" x 8 1/4"	Plywood



Photo 4 Cutting a traditional mortise. The hold-down should rest on the work, not be forced against it. Note the clamped stop block, in place to gauge the length of the mortise.



Photo 5 Side mortises are accomplished by placing a strip of wood between the work and the fence. The chisel cuts into both pieces. The extra-wide fence is a wood facing that is attached to the regular fence. Holes in the fence provide for the addition.



Photo 6 The V-block jig set up on the benchtop.

The final step is to add the shelf, using glue and #7 x 1¼" flat-head screws.

The stand is secured to the benchtop with glue and #10 x 1¼" flathead screws through the underside of the braces. Finishing is optional. The project can be protected with several applications of sealer and left natural or can be coated with spray paint, as I did. Secure the machine with a pair of ⅝" x 3" bolts and nuts. Use flat washers and lock washers under the nuts.

At Work

Mortising will be accurate only if you make sure of the alignment between the chisel and fence before you start a job. Checking can be done with a square as shown in *photo 3*, or by moving the fence forward until the back of the chisel is flush against it. Misalignment is revealed when a mortise has staggered edges.

The bulk of the waste when mortising is removed by the bit, but corners are squared by the chisel, which is why this type of work requires more downward pressure than simple drilling. The force required will vary depending on the density of the wood, but let good judgment prevail. Cutting should be consistent, with wood chips spewing freely through the relief slot in the chisel. It's a good idea when making deep cuts to retract the chisel frequently so waste won't clog in the cavity.

Always lock the hold-down so it rests on top of the work. This is necessary so the work will stay put when you retract the chisel. Sometimes it's necessary to place a backup below the work to raise it so the hold-down will be effective (*photo 4*). This is also important when cutting a through mortise because the backup will be damaged, which is why the project provides for an easily replaceable insert.

Side mortises (*photo 5*), whether they're stopped or through, are done by allowing only part of the chisel to penetrate the edge of the work. To keep the work from moving and to prevent damage to the fence, a strip of wood is placed between the work and fence so that, in effect, the chisel is making a full cut.

Variations

Mortise and tenon joints aren't restricted to square stock. The square cavities can be formed on round stock, even into the corners of square components. What you need to do this, and what we've designed into the mortising bench, is the V-block

jig shown in *photo 6*. The jig replaces the conventional fence arrangement, positioning the work in the correct position. Construction details for the jig are shown in the PullOut™ Plans. The V-block itself can be made by beveling one edge of two pieces of 3½"-wide material to 45 degrees or by sawing a "V" down the center of a piece that's 7"-wide.

In either case, the "V" is attached centrally to the base component with glue and #9 x 1¼" flathead screws. The best way to shape the hold-down is to cut a piece of hardwood to over-all size and then bore a 1" hole to form the end of the slot. Next, saw away the waste and, with the part on its side, make a cut to reduce the height of the fingers to ¾".

It's a good idea to make the checking gauge that's detailed in the PullOut Plans so the jig can be positioned accurately on the benchtop, as demonstrated in *photo 7*. After you've determined that the chisel is square to the fence, remove the fence and place the jig so the gauge is snug in the "V" while it "embraces" the chisel. Then, after locating the position of the attachment holes, drill ⅝" pilot holes through the jig's base and the benchtop. Enlarge the holes in the jig's base and in the benchtop to ½". The holes in the benchtop are for ⅝" threaded inserts. The base's holes, being ½", are a bit oversize for the ⅝" bolts that secure the jig, but this is to allow some "play" for minor adjustments when the jig is mounted.

Operational procedures, feed pressure and such, stay the same. The only change is the method used to position round work for accurate mortising (*photo 8*). To keep cuts consistent, mark a longitudinal line on the work that can be followed by the chisel. Radial mortises can be formed by using a stop block to keep the work in position while you rotate it for subsequent cuts. To picture the latter, imagine what you would have by removing a triangular wedge from a round post so the square corner of a shelf can be inserted.

Mortising into corners of square stock is a basic procedure, except that slow feed is required when starting the cut to keep the bit from wandering before it is firmly seated (*photo 9*).

In all, the V-block technique advances square-hole operations beyond the basics of conventional mortising. We believe you'll spend lots of time using your mortiser and its stand, but not nearly as much time as you would have with a drill press attachment. **DW**

R.J. DeCristoforo is a contributing editor for Popular Woodworking, and is a woodworking and tool authority.



Photo 7 The gauge is used to accurately establish the position for the V-block jig. The text explains the procedure to follow.

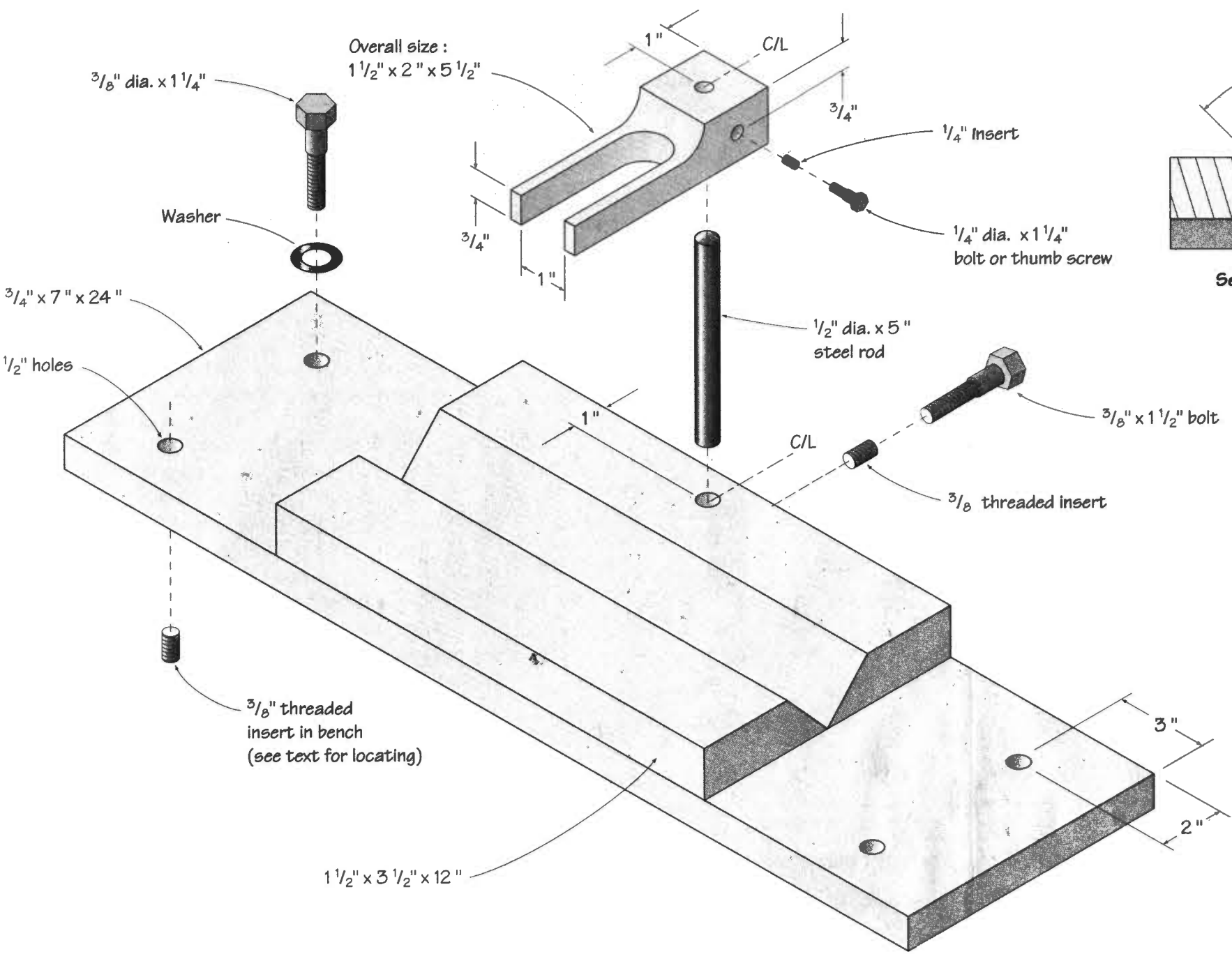


Photo 8 Mortising is done in a fairly routine fashion. The difference is that the work, cradled in a V-block, is round. A strip of wood, tack-nailed across the "V," is used to gauge the length of the mortise.

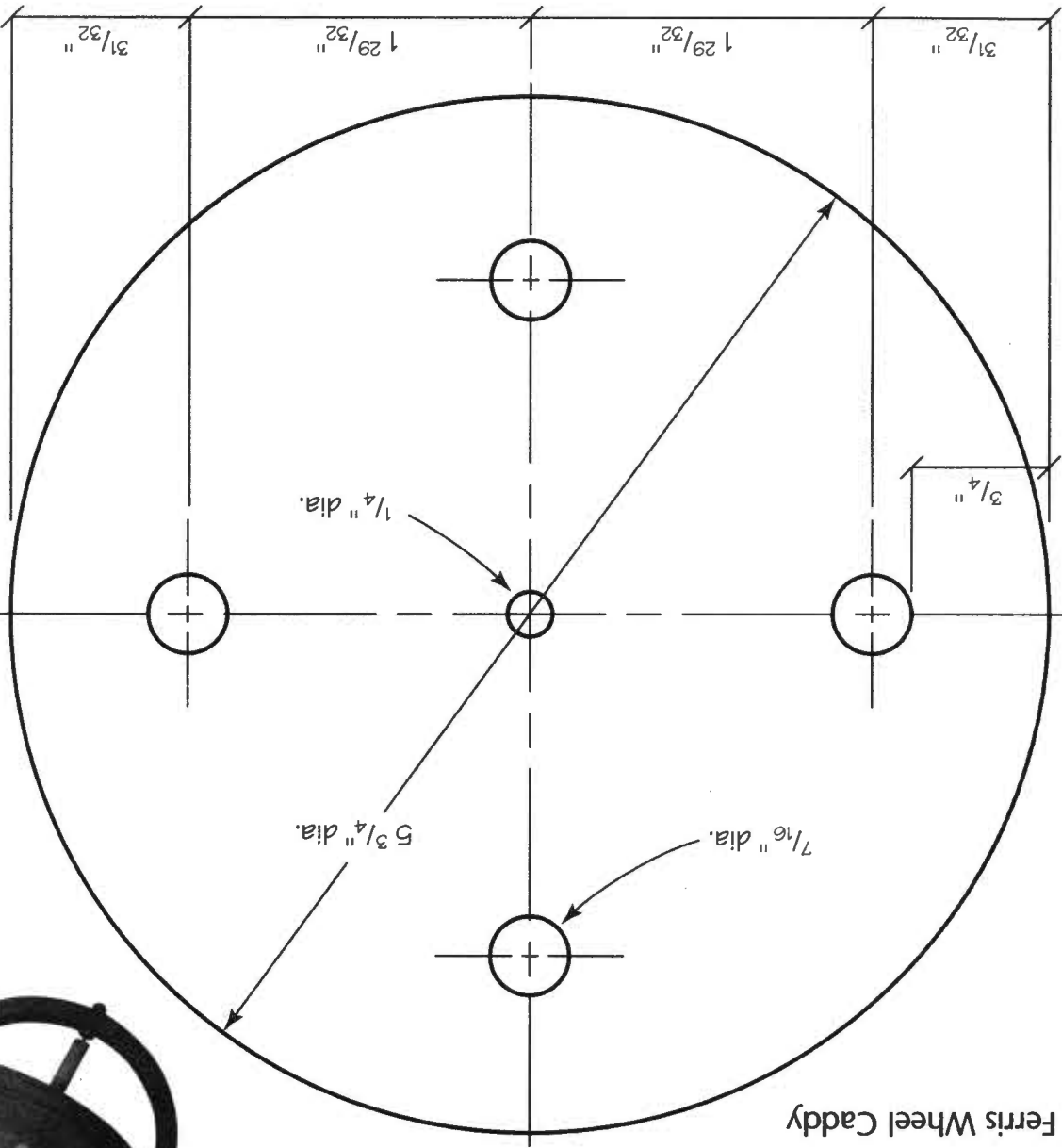
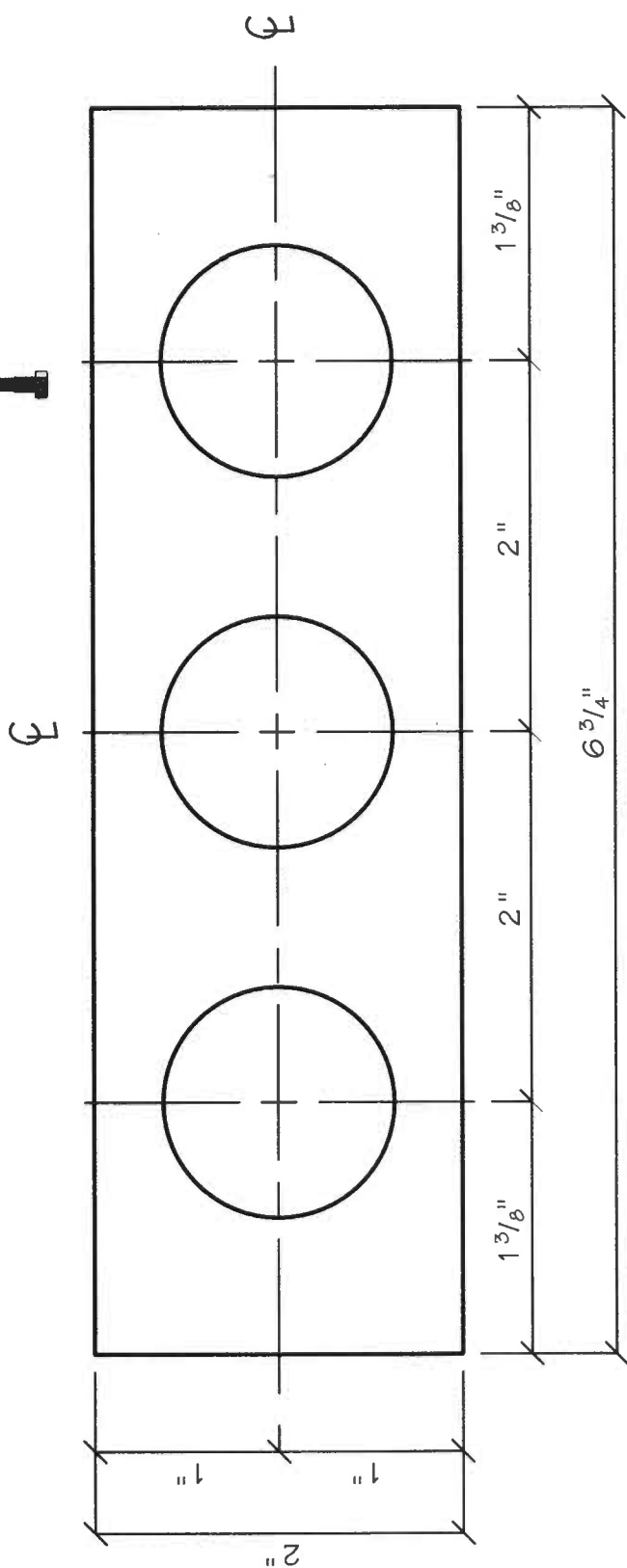


Photo 9 Mortising into the corner of square stock is also feasible. Start the cut very slowly to avoid allowing the bit to wander off the corner.

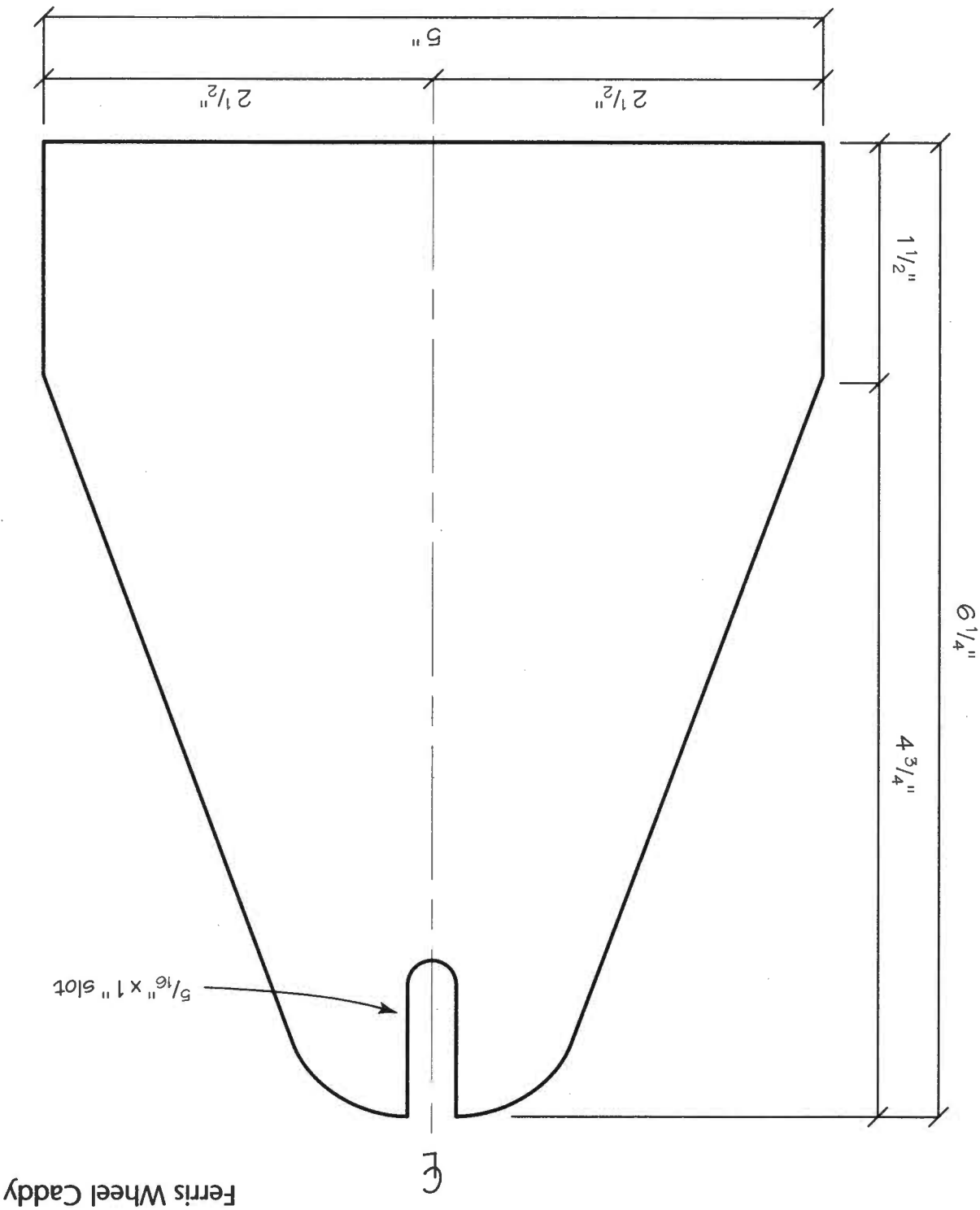
Mortise Jig



Ferris Wheel Caddy



Ferris Wheel Caddy



Ferris Wheel Caddy



Carefully open staples to remove plans, then bend them closed again.
 Mortise Jig 34
 Ferris Wheel Pattern 33, 35, 40
 Gyroscopic PullOut Project inside

Give This Gyroscope a Go

Learn a little about physics while playing with this high-tech top!

By Ralph S. Wilkes

My neighbor and I, both well into retirement years, share a common interest in woodworking. He's in my shop or I'm in his several times a month. One day, I was surprised to find him sitting on the floor of his shop, hovering intently over a toy gyroscope spinning in front of him. Feeling the need for an explanation, he told me that his wife had just found his childhood toy while housecleaning.

We took turns spinning it while talking about how this toy has come a long way in its practical applications. The principle that a spinning wheel tends to resist movement from its axis has many applications in modern science and technology — as in some compasses, auto pilots, and stabilizers in airplanes, ships and spacecrafts. In this way, the gyroscope can serve as an excellent learning tool. But it also has the fun of a toy, as it can be enjoyed without understanding the physics involved.

Back in my own workshop, I played with the idea of making a larger version of this little toy, which is originally about the size of a tennis ball. Why not make it several times larger, turning it on the lathe?

Since that day, I've made several of these in various sizes — some from solid stock, some laminated. While I've never broken one made from solid stock, the laminated stock is stronger and the glue between laminations adds weight to the rotor disc, which makes it spin longer.

I chose cherry — but maple, oak, walnut or any other hardwood would do as well. For the laminated stock, I had some $\frac{3}{4}$ " x 8" stock planed to $\frac{5}{16}$ " thick.

To avoid some minor defects in the stock, I laid out and band sawed the three 8" circles, then glued them together with the grain of the outside plies running at a right angle to the center one. I applied several clamps and left them for a day. Of course, if perfect, the pieces could've been glued and clamped as 8" squares, then sawed to shape in one operation.

After your 8" circle is cut, mount it on a small diameter lathe faceplate. Smooth the outer edge and both faces with the appropriate lathe chisels, leaving a thickness of at least $\frac{3}{4}$ ". Make a shallow groove at the center of the rim. This serves more than a decorative purpose, as it also centers the drill holes for the two pivot bolts. Sand all surfaces while operating the lathe at low speed, finishing with very fine paper.

Use the parting tool on the face side to start the cut of a $\frac{3}{8}$ " thick ring to be removed from the turning, going at least half way through (*photo 1*). Then cut part way through from the back side to meet the first cut. If your tool rest won't adjust for this, clamp a temporary wood rest to the lathe table to support the lathe tool. Keep the cut as narrow as possible, $\frac{1}{4}$ " or so, to maximize the gyroscope rotor's diameter.

Before severing the ring, apply a French polish finish. Take a pad of soft cloth in the palm of your hand, pour a little boiled linseed oil on it, and float a similar amount of white shellac in the center. Apply this to the turning while rotating it by hand until the entire surface is covered.

Operating the lathe at low speed, hold the cloth against the ring to burnish the finish. The heat from friction soon dries it. Several applications may be needed, but don't apply the shellac and oil while the lathe is running. Centrifugal force will leave a trail of French polish on the wall, ceiling and yourself. When almost separated, you can snap off the outer ring or you can operate the lathe at low speed. Cautiously guide the parting tool with one hand until the ring separates, and catch it in the other hand.

With a drum sander, smooth the inside edge of the ring (*photo 2*). Sand by hand as needed, and apply French polish by hand to the inside of the ring. With the disc still on the faceplate, operate the lathe to smooth the edge and do any final sanding on the front and back. Mark the center of the face for drilling, using a pointed lathe chisel. Then apply French polish to all exposed surfaces. After removing, sand and polish the portion of the back which had been hidden by the faceplate.

Lay the ring on a flat surface so the grain runs horizontally when using solid stock. If you laminate, the grain of the middle ply should be horizontal. Place the disc in the center with an equal margin all around and lay a rule vertically across the center mark to locate holes for the bearing bolts. Center punch and drill these $\frac{1}{4}$ " holes through the rim (*photo 3*). Then drill a $\frac{1}{2}$ " hole through the disc for a dowel which serves as an axle (*photo 4*).

The $\frac{1}{2}$ " dowel is cut $1\frac{1}{4}$ " shorter than the inside diameter of the ring. Center punch both ends for drilling. To hold the dowel and to assure straight drilling while using a drill press, make a $\frac{1}{2}$ " hole through a scrap of two-by-four. Insert the dowel in this before drilling holes for the #8 finishing nails which serve as bearing points. Using a $\frac{3}{32}$ " drill, make these holes about $1\frac{1}{2}$ " deep.

Drive the nails into place and cut off the heads, leaving about $\frac{3}{8}$ " exposed. Then grind or file them to a point.

Next drill a $\frac{1}{8}$ " threading hole for the starting cord through the dowel about 2" down from what will be the upper end of the dowel (*diagram 1*). Then insert the dowel in the disc to the midpoint, securing it with a drop of glue. For a neat appearance, the faceplate screw holes should be on the underside of the disc.

The $\frac{1}{4}$ " bearing bolts may be either brass or steel. Brass bolts are neater in appearance and easier to drill. Use a $\frac{1}{4}$ " x 1" roundhead stove bolt on the bottom and a $\frac{1}{4}$ " x $1\frac{1}{2}$ " bolt at the top (*diagrams 1 & 2*).

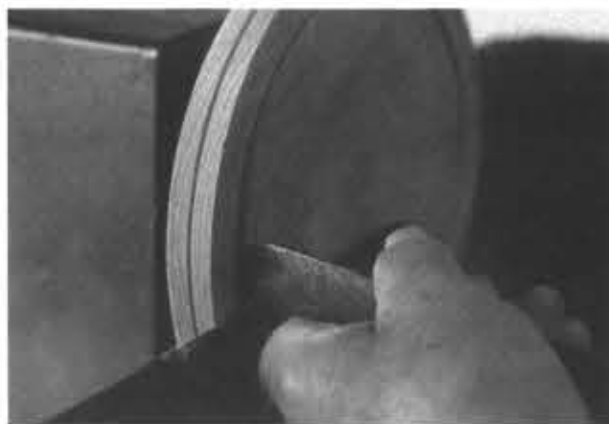


Photo 1 Operating the lathe at low speed near the end, cut most of the way through.



Photo 2 With a drum sander on the drill press, sand the inside of the ring until smooth. Then apply French polish by hand to this surface.



Photo 3 Mark opposite sides of the ring where the grain in either center ply or in solid stock runs tangentially. Drill $\frac{1}{4}$ " holes for the pivot bolts.



Photo 4 Drill a $\frac{1}{2}$ " hole in the center of the disc (rotor), making sure that it's at a right angle to the disc.

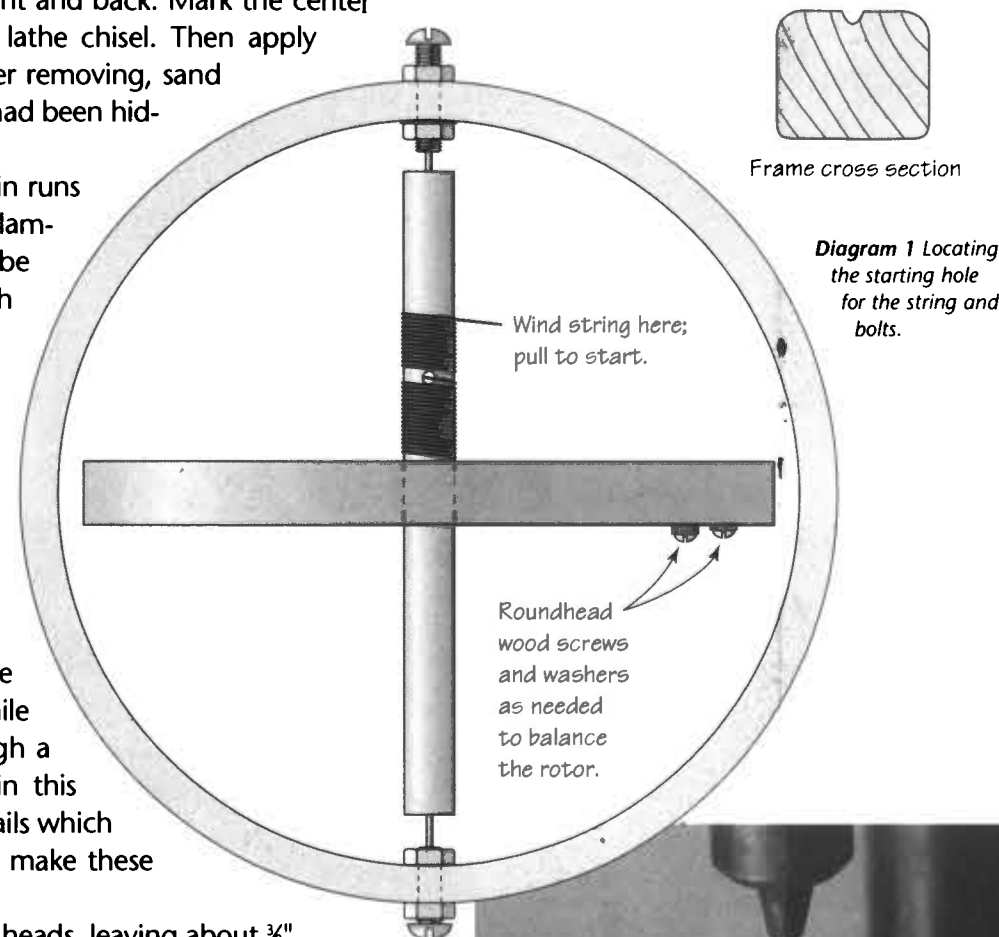


Diagram 1 Locating the starting hole for the string and bolts.

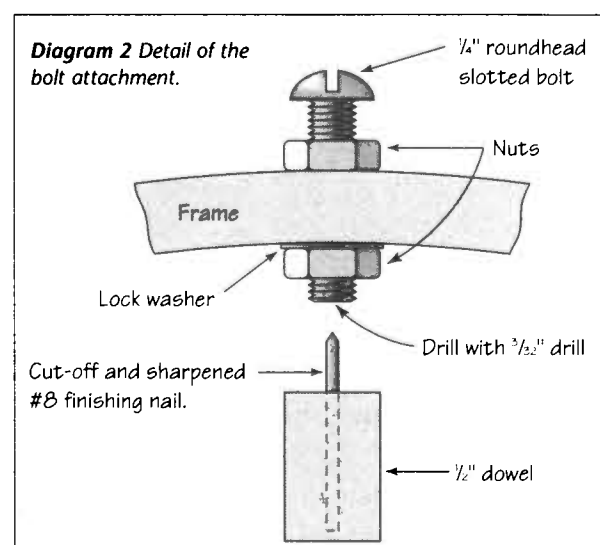


Diagram 2 Detail of the bolt attachment.

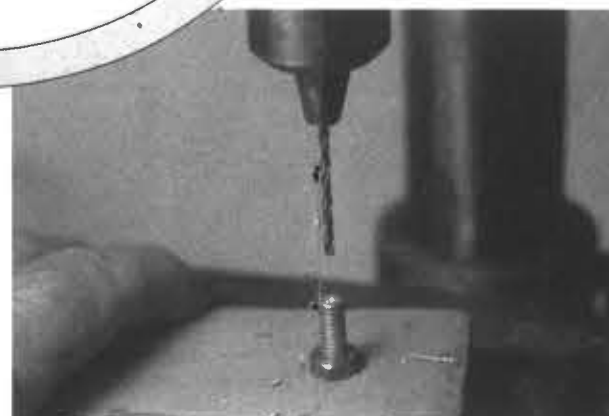


Photo 5 Put each of the bearing bolts through a $\frac{1}{4}$ " hole in scrap stock. Hold with a nut turned down tightly, and drill the bearing hole about $\frac{1}{4}$ " deep with a $\frac{3}{32}$ " drill. It's advisable to center punch before drilling.



To hold bearing bolts while drilling, drill a $\frac{1}{4}$ " hole through a piece of $\frac{1}{2}$ " or $\frac{3}{4}$ " scrap stock (*photo 5*). Insert a bolt in this and tighten two nuts on it to lock it so it won't back off. Center punch, then drill a $\frac{1}{4}$ " hole about $\frac{1}{4}$ " deep in the end. Remove, then repeat the process with the other bolt.

Assemble the gyroscope, using a nut on each side of the ring, as shown. A lock washer is optional. With the rotor in place, apply a drop of oil at each bearing. Then adjust the longer bolt until the rotor turns smoothly.

Check the rotor balance by laying one end portion of the ring on the edge of the workbench and spinning it by hand. As it stops, place a chalk mark on the topmost part of the edge. Repeat this several times (*diagram 3*).

If a pattern develops, weight the light side of the rotor with a round-head wood screw inserted in one of the holes left by the faceplate screws. If this isn't sufficient, place washers on the screw or drill screw holes closer to the edge.

Use a suitable cord about 36" long to set the rotor spinning. A shoelace works well for this, preferably the round kind.

On a carpeted surface, the gyroscope will run quietly and smoothly, with the outer ring remaining stationary. It will run much longer, up to a minute or more, on a smooth concrete or wood surface where the outer ring is also free to revolve. Because of the size of this gyroscope, it should be used on a floor, not a table top.

Whether you're looking for a working model for describing the physical properties of the universe, or just want to play, a toy gyroscope could be a turn for the better.

Ralph S. Wilkes is a retired business manager/treasurer of Keuka College in New York. Woodworking is his hobby.

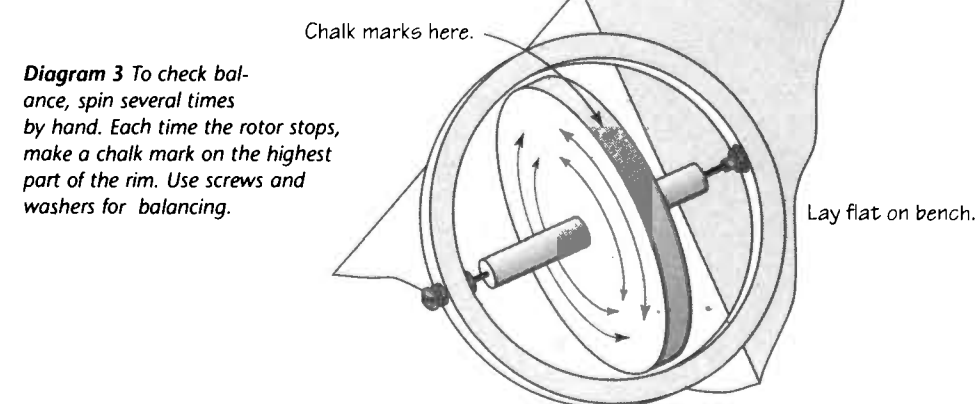


Diagram 3 To check balance, spin several times by hand. Each time the rotor stops, make a chalk mark on the highest part of the rim. Use screws and washers for balancing.

Nostalgic Jelly Cupboard

Tips and techniques for successful face frame cabinet construction.

By Andrew Schultz



When I was a boy in the 1950s, my family and I would spend spare summer hours harvesting the wild plums that grew on the bluffs near our Schuyler, Nebraska home. Then, after an afternoon of rolling down hills, throwing stones and making noise, my brother, sister and I would spend a sweaty evening of forced labor helping my mother put up the bounty, making jelly. I suspect she would say we children did little but complain, but I remember those evenings as hard work.

To store the jelly, Mom had bought a little cupboard at a yard sale. Our job was to take the jelly jars downstairs and put them in the cupboard. Where were child labor laws in those days?

The cupboard was painted bright green — John Deere green, the locals would say. It was a sturdy, straightforward little piece that resembled the farmers who came into town for Saturday haircuts and supplies — kind of square, stocky and solid.

I'd forgotten all about that cupboard until my sister asked if I'd build one for her. She even sent me a drawing from a brochure she got at one of those unpainted furniture stores.

Looking at the advertisement, I was swept away by memories of those green hills and the taste of that jelly. So I resolved to build several of these little cabinets for nothing more than nostalgia. It's funny the directions that memories can take you.

Selecting the Wood

This is a plain little cabinet with no pretensions to art. I'm sure my mother's cupboard was pine under its many layers of paint, so choose what you will.



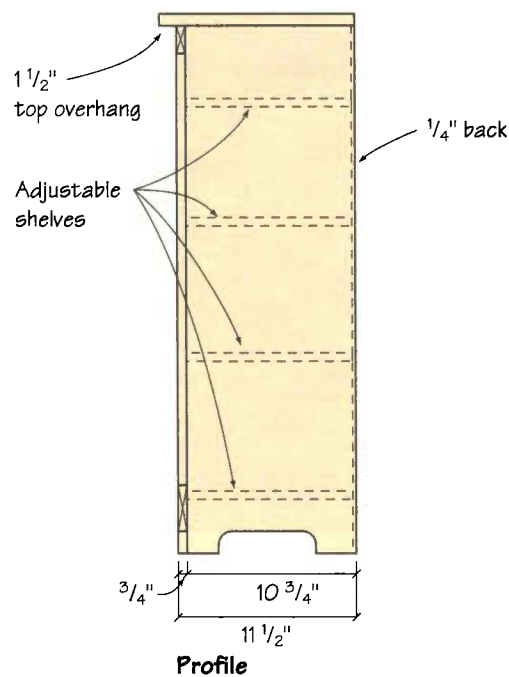
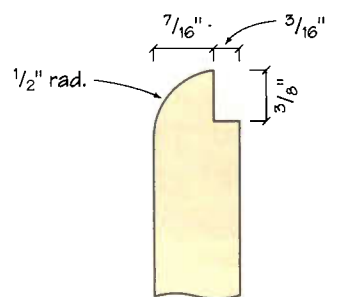
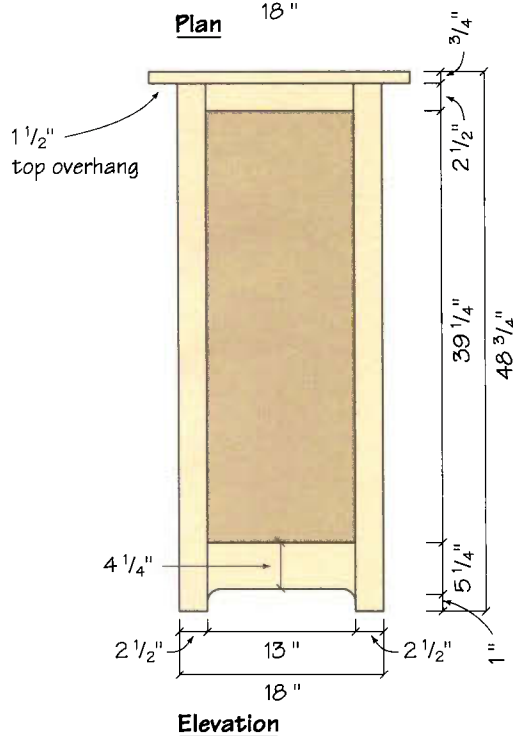
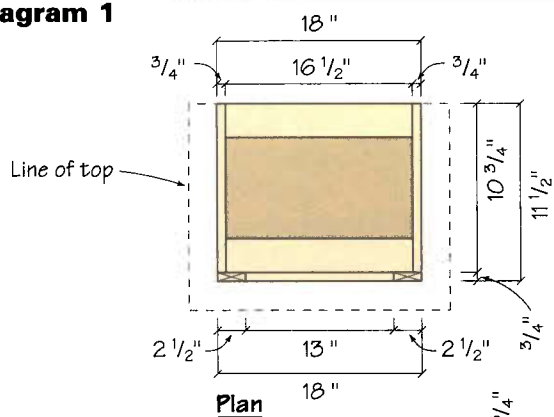
My sister wanted to paint hers, so I built her carcass and face frame of poplar and used some picturesque bird's-eye maple for the unpainted door, shelves and top.

I made one each of poplar, oak and cherry. To my eyes, the oak looks best. In the final analysis, cherry seems to be a more formal wood not suited for work-a-day pieces such as this. I think an all-maple piece would be quite lovely, though.

You'll need about 20 board feet of hardwood for the carcass, face frame and door, plus a 20" x 42" sheet of 1/4" hardwood plywood (in the same species as the carcass and door), and three small panels of the same for door panels.

Milling

Regardless of how fine a woodworker you are, I suggest that you take stock preparation very seriously. In all but barrels and bowls, square stock is the foundation of good woodworking. A

Diagram 1

little extra attention to the basics here pays big dividends when the project nears completion.

Building this little cupboard is really a primer on cabinet-making. Generally speaking, cabinets are just boxes, square and true. Once you succeed with this project, a box with a face frame and door, you'll know you can redo your whole kitchen or build that big entertainment center you've been dreaming about. But to build square boxes, you must have square stock, and so I reiterate, take stock preparation seriously.

First examine the stock to be milled and note any splits, checks, warps or other infirmities. You'll want to deal with these flaws in some fashion, either cutting them out, planing them flat or repairing them.

Next locate each highly visible part. In this project, these will be the carcass sides and the top. Reserve the best figure, color and grain for these most noticeable parts. Now find the straightest-grained stock for the face frame and door frame. Make the shelves from the remaining material.

Before you begin milling, check all your machinery for sharp cutters and blades and to see that fences and other accessories are square. Now rough cut all pieces to final length, plus an inch.

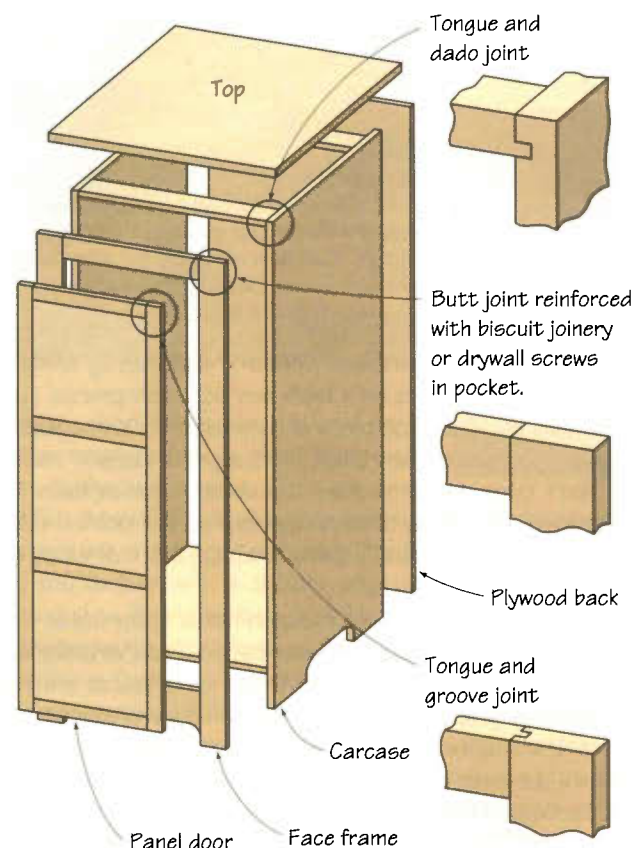
Next, face and edge joint two adjacent surfaces square and

Schedule of Materials: Nostalgic Jelly Cupboard

No.	Item	Dimensions	Notes
1	Top	3/4" x 13" x 21"	Oak
2	Carcass sides	3/4" x 10 3/4" x 48"	Oak
1	Bottom shelf	3/4" x 10 3/4" x 17"	Oak
3	Shelves	3/4" x 10 3/4" x 16 1/2"	Oak
2	Stretchers	3/4" x 3" x 17"	Oak, incl. tenon
1	Top rail	3/4" x 2 1/2" x 13"	Oak
1	Bottom rail	3/4" x 5 1/4" x 13"	Oak
2	Stiles	3/4" x 2 1/2" x 48"	Oak, incl. tenon
2	Door stiles	3/4" x 1 1/2" x 39 3/4"	Oak
4	Door rails	3/4" x 1 1/2" x 11"	Oak, incl. tenon
1	Back panel	1/4" x 17" x 48"	Oak plywood
3	Door panels	1/4" x 11 3/8" x 12 1/8"	Oak plywood

Total hardwood in board feet	18.15
Plus 10% waste	19.97
Total plywood in square feet	8.5
Plus 10% waste	9.35

Diagram 2



true on each workpiece. Rip a parallel edge to size plus $\frac{1}{8}$ " on the table saw on each workpiece, then joint that edge smooth, to size, and square to the face jointed surface.

Finally, surface all wood to thickness. As a final step, once all the materials are milled to thickness and width, cut all the carcase members to final length. I always crosscut one end square before cutting to final length against a stop block because my initial crosscuts on the radial arm saw are liable to be out of square. (Remember, I'm cutting rough lumber at this stage.)

Once you make this initial square cut, mark the squared end with a pencil line to indicate the other end that will need the final cut. When I'm cutting a long workpiece that extends out from my sled, I put a support board on the table's surface to make sure the workpiece is steady. I'll also clamp a stop block to the table saw's extension table to assure that the carcase sides are all cut to exactly the same length.

Joinery and Shaping

You have already accomplished the first important task of good cabinetmaking — producing perfectly milled materials. That is, materials all exactly the same length, width and thickness with all of their edges and surfaces at 90 degrees to one another.

Because you've taken extra care in stock preparation, joinery will be easy. Joinery for cabinetmaking is essentially simple any-

THREE POCKET JOINTS

It's given that no matter how you look at 'em, pocket joints are not fine woodworking. My mother used to say that morality was how you behaved when no one was looking. Some woodworkers believe the same sentiment applies to their craft — they think that "real" woodworkers don't use wood screws, and metal detectors

are one of the primary determinants of high-quality cabinetry. They find pocket joints and biscuit joinery slightly beyond the pale. And drywall screws, well, heavens. They're not kosher, they're way over the line, they're...

If pocket joints are a sin, then I have

hours of confessing to do before I meet my maker. Pocket joints are practical, useful, straightforward, and as far as I'm concerned, you could probably add the whole Boy Scout credo without straining credulity. Being the prosaic sort of fellow that I am, I use them without



Photos A, B, & C One way to cut the pocket is to drill the screwhole first, marking where the drill bit emerges from the wood. (Make sure you know which face will show, and drill through the opposite side.) Then use a chisel to pare away the pocket.

Diagram 3

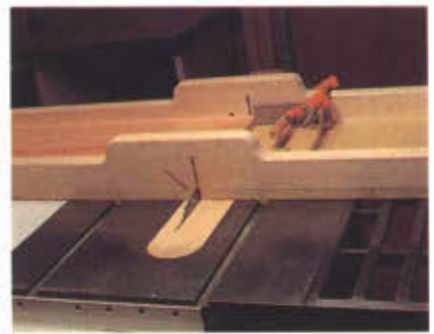
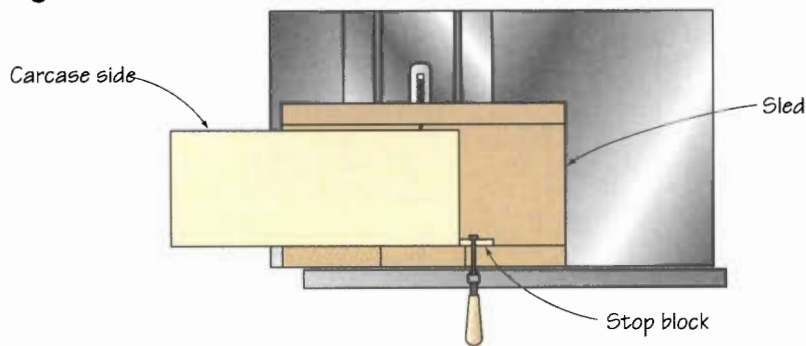


Photo 1 By using a stop block and repeat passes, 1/4" dados are easily cut with a regular saw blade. (See also "\$1,000 Shop," diagram 1, in this issue.)

way. Most cabinet joints consist of rabbets and dados in the carcase (some woodworkers just use biscuit joinery, which is quicker, but I still prefer some variation of the dado joint), stile-and-rail joinery in the doors, and dovetails for the drawers.

Another variation for face frame attachment is to use a pocket joint, which is detailed in *"Three Pocket Joints"* (see the bottom of the previous page). But thanks to the biscuit joiner, people use the pocket joint less frequently.

As this project has no drawers, it has no dovetails, and since it also makes only incidental use of the pocket joint, most of our joinery is really quite elementary (*diagram 2*).

The central challenge of cabinetmaking as compared to furniture making is that you are working bigger. If you're used to fussing with jewelry boxes and other small projects, the tasks of joinery may seem more difficult in cabinetmaking because the workpieces are generally larger. It's more of a challenge to maintain the same quality you produce in smaller projects when you're hefting huge plywood payloads, but some tricks will help you accomplish this task.

A 1/4" dado can be achieved without a dado set by using a simple two-step process on a table saw sled. This process also makes dados on a large piece of material more manageable (*diagram 3*). Raise the saw blade so it's approximately 1/4" above the sled's table. Next, measure the dado's location from an inside tooth of the saw blade to the appropriate point on the sled's fence. At this point, I clamp a square block of wood to use as a stop.

At this point, your cuts will establish not only the inside surface of the sides, but also right and left. So if you've designated an outside top and bottom, make sure you're cutting dados in the proper places. Next, position the workpiece firmly against the fence and stop block. Turn on the table saw, and advance the sled, cutting the dado's first pass. Then pull the sled back out of the turning saw blade's reach, move the workpiece slightly, and slide a 1/8" wafer of wood between the workpiece and stop block. With the workpiece firmly against the fence and the stop block and spacer in place, make a second pass. Now your dado is complete (*photo 1*).

THREE POCKET JOINTS (continued)

shame and freely admit to my dependency on them.

So now that I'm out of the closet, let me see if I can lure you into experimentation. Here are three ways I've cut pockets.

One, drill the exit holes out through the side, then bang out a pocket with a chisel and mallet (*photos A, B & C*). Cheap, *n'est pas?*

Two, bore the pocket with a Forstner bit on the drill press (*photo D*). Cant the workpiece between two supporting fences and make sure you use a stop block to prevent the workpiece from taking off as the bit first bites into the wood.

Three, if you're planning to build a lot of face frames and cut lots of pockets, the commercially available pocket guides make a swift two-step process of the pocket joint (*photos E & F*).



Photo D I cut pockets for hidden drywall screws with a Forstner bit in the drill press. Note that I clamp a stop block to keep the workpiece from moving as the bit first bites into the wood. The wood has a tendency to self-feed without this stop block.



Photos E & F Commercially available jigs make quick work of pocket joints when producing them in quantities of ten or more.

Photo 2 You can buy hole-drilling jigs that allow you to drill parallel rows of holes for shelf-supporting pins, but I just use a piece of $\frac{1}{4}$ " Masonite® pegboard to space the holes. You wouldn't want to drill hundreds of holes through each pegboard hole, but for the three jelly cupboards I was making, it worked fine.



Photo 3 Rout the leg shape on the bottom end of each cupboard side. I trace the pattern with a pencil, and cut it out with a jigsaw about $\frac{1}{8}$ " proud of the drawn line. Then I rout it smooth using a pattern bit and the pattern clamped in position.



Photo 4 Part of my strategy in woodworking is to use low-tech tricks to get high-tech performance, if I can manage it. Here I use sheets of Post-it® notes as a means of getting a fine fit to the tongue and dado joint in the jelly cupboard's carcass. Three Post-it® notes are about $\frac{1}{4}$ ".



In my shop, this is the quickest way to cut accurate dados in larger workpieces, but, as the saying goes, there are many roads to Mecca. So too with woodworking. Equally reliable, but perhaps not as quick and certainly a little fussier for setup, is routing the dados with a straight edge and a template guide mounted on the router base plate's bottom.

Moreover, most workpieces are considerably larger in cabinetmaking than these for our little cupboard. Using a bigger sled, crosscutting the dados using the rip fence as the guide or routing are all viable means of dealing with joinery in large work.

Next, rout the rabbet for the plywood panel along the back edge of the carcass sides. I performed this operation on my router table with the workpiece riding against a fence. But you could use the router as a portable tool with the workpiece clamped to the workbench, too. The rabbet is now $\frac{1}{4}$ " square.

When drilling shelf pin holes in a cabinet, it's easier to accomplish this task prior to assembly. You can buy something called a shelf pin drilling jig that helps align the holes for the shelf pins, but I prefer to save a few bucks and make my own from some $\frac{1}{4}$ " Masonite® pegboard. It's simply a 12" x 30" rectangle of pegboard with a 30" length of 1" x 1" hardwood screwed to one face of the pegboard along one edge.

Photo 2 shows how to clamp and drill through the jig to assure parallel holes. Use depth stops on your drill bit to be certain you don't drill through the workpiece. (Shelf holes on the

outside of a project are still considered bad form here in Nebraska, but we don't keep up with the coastal trends.)

As a last piece of work on the carcass sides, make a pattern as shown in **Diagram 4**. This pattern will work for both left and right sides if used on the inside of one piece and the outside of the other. A similar pattern will be used later for the face frame. I prefer to use medium density fiberboard (MDF) for jigs and patterns, but any piece of hardwood or even void-free plywood can be used to make this piece.

Screw a cleat on the pattern blank like you did with the pegboard, then draw the shape you want to rout on the MDF. Band saw the shape, then sand to size and shape on a drum sander mounted in the drill press.

Now place the pattern in position and draw the shape on the carcass side. Use a saber saw to cut out the recess, staying about $\frac{1}{8}$ " from the line on the waste side of the carcass side. Then clamp the pattern in position and rout the shape with a pattern bit mounted in your router (**photo 3**).

I rout the tongues for the dados on the bottom shelf and the two crossmembers at the carcass's top. I perform this operation on the router table with the workpiece riding against a fence.

Since this is the adjustable part of the rabbet and dado joint, I'm really careful about getting the dimensions of the tongue just right by removing single sheets from pads of Post-it® notes as a means of whittling away at the tongue (**photo 4**).

Before assembly, I fill, stain and sand all the oak workpieces, including the $\frac{1}{4}$ " oak plywood. In my experience, filling the grain on an assembled project is a frustrating proposition, and getting the grain-filling gunk out of corners and crevices just wastes time.

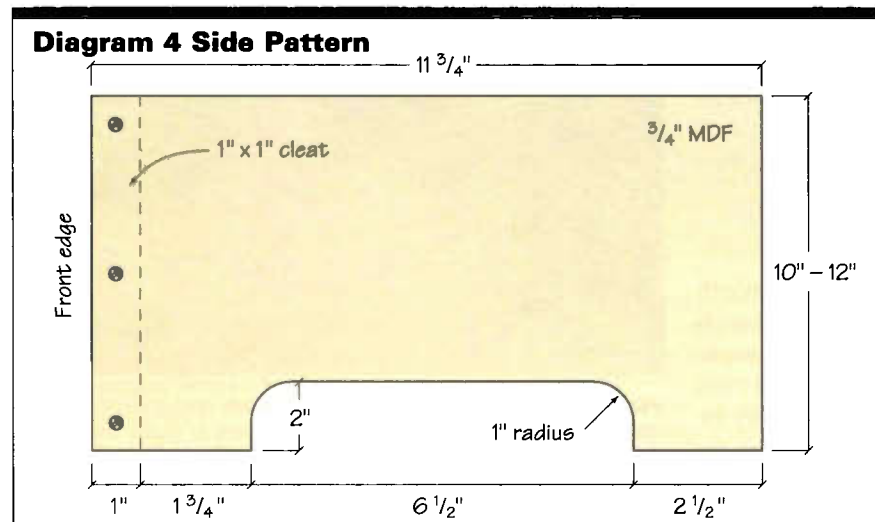




Photo 5 Assemble the jelly cupboard face frame, making sure you clamp it square. Check for square by measuring diagonally across inside corners. The measurements should be exactly the same. Reposition the clamps if they're not square. Be fussy with this, as an out-of-square cabinet is more useless than yesterday's lottery ticket.

Carcase Assembly

I prefer to assemble the carcase prior to building the face frame and door. By doing this I can modify face frame proportions to remedy aesthetic as well as practical construction problems that are only obvious once the carcase is assembled.

A second important task in good cabinetmaking is assembling the carcase square. An out of square cabinet sticks out worse than big ears on a bad haircut. So spend some time thinking about how you're going to clamp up, check for squareness, etc., and remedy any problems ahead of time.

Dry clamp the carcase a time or two without glue to make sure you know what you're doing. Be careful placing your clamps, as even a slight misplacement can cant the carcase slightly. I like to use right-angle blocks to help assure square members. To check this most accurately, measure diagonally across the carcase's internal opening. The measurement should be the same, corner to corner.

Once you've thought out all contingencies, unplug the phone or turn on the answering machine, take the dog out for an evening walk, and turn on the television for the kids. Then glue-up the joint components and assemble the carcase.

Be careful with the glue and pre-plan where squeeze-out can happen. Don't wipe squeeze-out on any visible surface, as you'll only smear a very noticeable layer of stain- and finish-impervious glue across a wider area of wood. Instead, wait until the squeeze-out reaches the three-fourths dry stage, then cautiously trim it away with a chisel or knife.

Building the Face Frame and Door

After the glue dries completely, hand plane the joints smooth with a block plane. Now lay the carcase on your workbench and check to see that the face frame members are appropriately sized and proportionate to the carcase. Make final trims to the face frame members if needed. Then cut the joinery for the face frame (*photo 5*). I biscuit-joined all the butt joints for the face frame.



Photo 6 Clamp the face frame in position and hand plane it to an exact fit so that the biscuit joints are cut exactly where they should be cut.

After the face frame has been assembled and the glue is dry, clamp it to the carcase and plane the frame for a good fit (*photo 6*). Then cut biscuit joints into the carcase and face frame (*photo 7*). Now glue and clamp the assembly.

Next, tackle the door. Measure the opening in the face frame and adjust your door measurements so that the door you make is $\frac{1}{2}$ " wider and longer than the opening. Adjust where the stiles go so it's pleasing to the eye, and be sure to leave an extra $\frac{1}{2}$ " in length for the $\frac{1}{4}$ " stub tenons on each end of the horizontal rails if you need to cut them shorter. I use a $\frac{1}{2}$ " shanked Woodtek® tongue and groove cutter for doormaking (model 881-135). Essentially it's two cutters, one above and one below a bearing, and it reliably chews out a fine-looking tongue $\frac{1}{4}$ "-thick and $\frac{1}{4}$ "-long. You need to make sure the tongues are cut in the center of the workpiece. Since they are cut only on the rails' narrow ends, you have to follow the workpiece with a pushstick to keep it square to the fence as you're routing it (*photo 8*).

I always try to cut joinery so one of the mating joint members is automatic. In this fashion, I only have the other portion of the joint to fuss with to get a perfect fit. So it is with this tongue and groove joint. Having cut the tongues, now I need to fuss with the grooves to get my perfect fit. This is how I do it: I chuck a $\frac{1}{4}$ " straight bit in my router table and elevate it to cut about $\frac{1}{4}$ " deep. Next I rip a saw-kerf down the center edge of all the stiles and rails on the table saw to remove much of the waste.

After ensuring that the router is cutting exactly on center, I rout a test piece and adjust the depth of cut until I arrive at the exact fit I need. Finally, I rout all the workpieces with a wing-



Photo 7 I use a combination of biscuit joinery and drywall screws through the upper and lower carcase members to secure the face frame to the jelly cupboard carcase. Here I'm cutting the biscuit joints in the jelly cupboard face frame. See "Three Pocket Joints" to learn how I cut pocket joints for the drywall screws.



Photo 8 Cut the tongues for the rails of the door by routing them against a fence on a router table. The push stick helps keep it square to the fence.

SOURCES LIST

Ready-made doors available from:
Conestoga Wood Specialties, Inc.
 245 Reading Rd.
 East Earl, PA 17519-0158
 (800) 964-3667

Decore-ative Specialties, Inc.
 4414 N. Azusa Canyon Rd.
 Irwindale, CA 91706
 (800) 367-3009 (California)
 (800) 729-7277 (North Carolina)

shaped featherboard clamped to the table, which forces the workpieces firmly against the fence. Incidentally, it's easy to get confused and rout grooves on both edges of the top and bottom rails as you do with the two middle ones. So make sure you clearly mark those edges you want to remain ungrooved.

Now assemble the frame-and-panel door without the panels and check it against the opening in the face frame. If it slips through, you've got a problem. It should be $\frac{1}{2}$ " wider and longer than the face frame opening.

While you have it dry assembled, measure how big the $\frac{1}{4}$ " plywood panels should be. I like them to fit fairly snug, which is possible because they're plywood. If you've made hardwood panels because you can't abide plywood or you simply misunderstood the instructions, make sure the panels fit loosely enough to allow for expansion and contraction.

Now cut the plywood panels no more than $\frac{1}{16}$ " smaller than needed. If a bookmatched grain pattern is in the plywood, try to center the pattern in the panel, even moving the rails' spacing to accommodate the figure. The center panel on the oak jelly cabinet, for example, is larger than the other two to accommodate a nice bit of figure.

Cut the plywood panels to size, glue-up the tongues on the rails, and slip them in place on one stile. Make sure you put the plywood panels in place in the correct order and right side up. It's nasty to discover one panel is upside down after the glue has hardened. Alternately, you can buy ready-made doors like the one shown in **photo 9** (see "Sources List").

After the glue sets, plane any irregularities until they're unnoticeable, and trim as needed. Then cut rabbets $\frac{3}{8}$ "-wide and about $\frac{3}{16}$ "-deep around the door's inside edge. Round over the square outside edge of the door with a $\frac{1}{4}$ " radius roundover bit.

Next mount the door on the face frame with brass offset hinges. Once the door swings sweetly and opens and closes appropriately,

Diagram 5 Fastening the Top

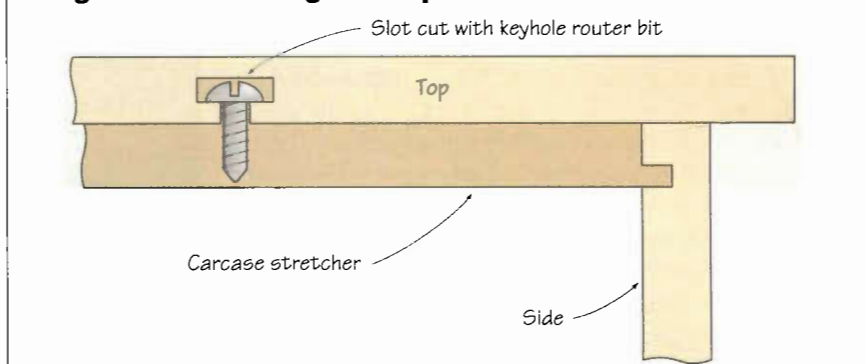


Photo 9 Those of you with more gumption than spare time may want to buy the door ready-made. I bought the one pictured above with the idea that I'd show one cupboard sporting a store-bought, raised panel door, but the door-making was so easy I decided to build all three the same.

remove it and the hardware, then begin sanding. Bevel all sharp edges with a block plane and attach the top to the carcase. I cut two keyhole slots for screwheads to float (**diagram 5**) and fasten with two other screws through the back stretchers at the top of the carcase and into the top. This allows the top to contract and expand without tearing the cabinet apart or buckling and bowing during the summer humidity.

After sanding through 180 grit, vacuum all the sawdust from the carcase, door, top and shelves. Use a tack cloth to pick up the microscopic dust, then stain as desired.

The oak cabinet was already finished with a Golden Oak stain from Colonial. I chose a red mahogany stain from the same company for the cherry cupboard, and I just finished the maple door, shelves and top of the painted cabinet with polyurethane. I finished all three jelly cupboards with five coats of polyurethane, sanding between coats, then finally rubbed out the last coat and finished with wax.

This little cupboard brings back vivid memories for me. I can smell the plums and see the kitchen. Every time I open the door, I can just hear my Mom say, "Andy, Andy, come back for another load of jelly!" **PW**

Andrew Schultz is a freelance writer and former associate books editor of the Taunton Press.

A \$1,000 WOR

A little clever shopping can go a long way.

By R. J. DeCristoforo

When Steve Shanesy, *PW*'s enterprising editor, called and broached the idea of a \$1,000 workshop, I was still on my first cup of coffee, so my sleepy reaction was "Gad!" But you don't ignore an editor's suggestion, even if it's a dreary morning and you're not really awake.

After my initial, probably unintelligible, response, I snapped-to and agreed to research the project — and surprised myself. It is feasible to assemble a practical woodworking shop with respectable tools for about \$1,000 — if you shop, and shop again, and look for sales, and get the most out of what you buy by making accessories, and capitalizing on techniques that reduce "extra-cost" items.

But first of all, what is a "practical woodworking shop"? The ideal, of course, would include a satisfying complement of tools that enable the operator to produce projects in a straightforward manner. When cost is a major concern, the equipment won't include industrial-quality tools, just one piece of which, a table saw for example, would bust the budget. On the other hand, settling for bargain counter stuff would result in an unhappy environment. The number of tools considered to be necessary can be affected by individual needs or desires, but that's another story. (I have a friend whose shop consists of a portable circular saw that's used when he's not on the golf course.) Our aim is considerably higher than that, and thus our shop should include an assortment of power tools and hand tools, on-hand and ready for household chores, outside jobs and in-the-shop projects.

Choices in Terms of Function

All woodworking projects follow a fundamental strategy. A sawing machine, in this case a table saw (photos 1, 2 & 3), is used to size material, whether lumber or plywood panels, for project components.

Generally, the next step is joint configuring. A dadoing tool would be nice to have; but since we're cost-conscious, we work with what we have, forming dados and grooves by

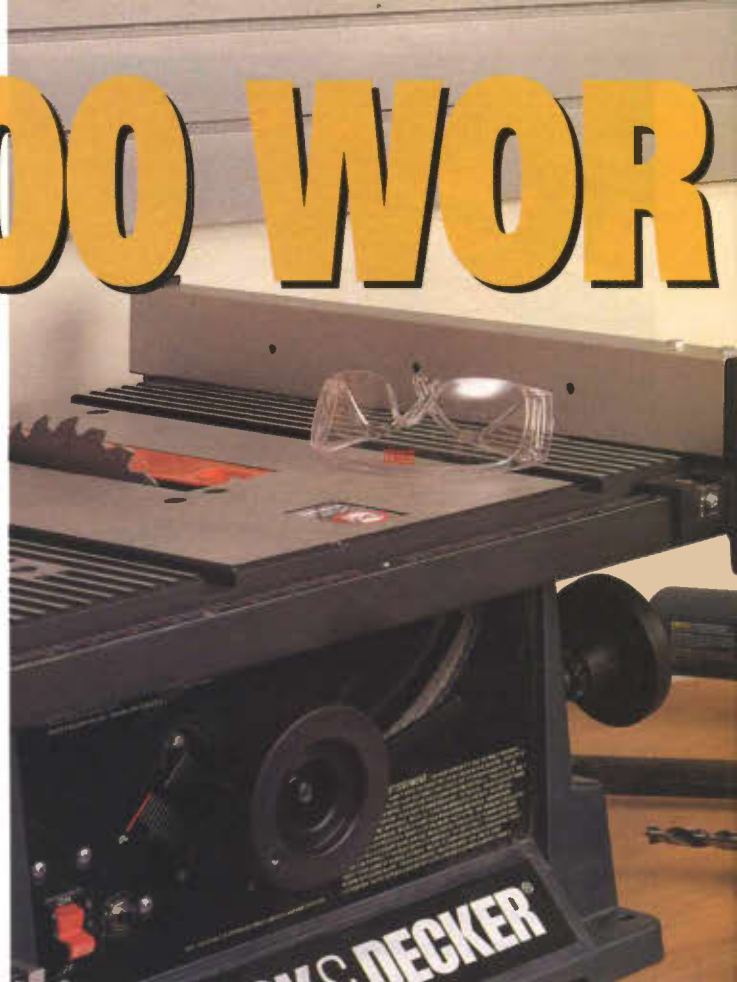


Photo 2 Moving up, price wise, provides for more power and larger tables; often, cast iron tables as opposed to aluminum. Special deals often include steel legs.



Photo 1 The major sawing tool for the \$1,000 workshop is a benchtop, 10" table saw. Even the lowest-price units have the power and capacity to rip, crosscut and cut 45-degree bevels on two-by-four stock.



making repeat passes. The first two passes define the width of the cut; slightly overlapping passes remove the remaining waste. Rabbits are formed with two passes. The first one determines the depth and width of the cut; and the second, with the stock on edge, removes the waste (*diagram 1*).

Forming tenons for the classic mortise and tenon joint is a routine table saw application, but since they're usually milled

KSHOP?



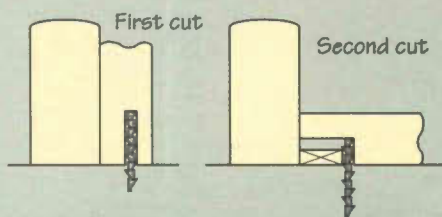
PHOTO BY RON FORTH PHOTOGRAPHY

Tool	Basic Function	What to Look for	Prices:	LOW	HIGH	HAPPY CHOICE
Table saw	Sizing material, joinery	Bench type: 10" size, 1½ to 2 HP	\$130	\$500	\$350	
Drill press	Drill various materials, drum sanding, some joinery	Bench type: 8"-10" size, ⅓ to ½ HP, 4-5 speeds	100	250	115	
Cordless drill	"On location" drilling, power small accessories like brushes, sanders, burrs	¾" size: 7.2V, variable speed, reversing	60	200	80	
Palm sander	Smoothing operations	¼ sheet size: 11-14,000 orbits per min.	40	75	40	
Portable router	Joinery, decorative operations	Plunge type: 1.5 to 2 HP, spindle lock, 20-25,000 rpm	55	250	180	
Drill bits	Drilling in wood	Brad point type: 4- to 5-piece set	20	40	20	
Saber saw	Curve cutting various materials, piercing	Scroller type preferred: ⅓ HP, variable speed	45	160	80	
Wood chisels	Paring, joinery touch-up	Min. set ¼", ½", ¾", 1" sizes	15	40	30	
Hammer	Nail driving and removing	16-oz. claw (wood or metal handle is a personal preference)	—	—	15	
Flex tape	Measuring	8" to 12" length, locking mechanism	—	—	10	
Screwdriver	Drive or remove screws	8- to 10-piece set: various sizes for slotted and Phillips head screws	20	50	30	
Hand plane	Smoothing, touch-up work	10" to 12" bench type	20	50	30	
Backsaw	Hand joinery	12" to 16": back spline	10	30	12	
Adjustable square	Marking at 90 and 45 degrees	12" blade minimum	15	40	17	
Clamp fixtures	Clamping assemblies	Kit for mounting on ½" pipe	6	10	14 (2 sets)	
TOTALS			\$561	\$1,720	\$1,023	

Diagram 1

You can work with just a saw blade to form some joints until you decide to add a dadoing tool.

2 - pass rabbet



Repeat pass - dado or groove

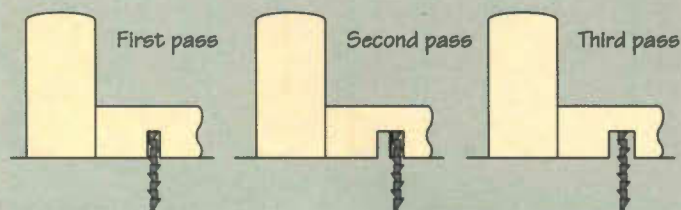


Diagram 2

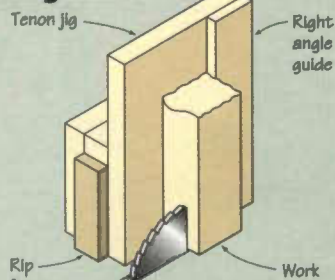


Photo 3 Higher priced units might include special features like an attached sliding table and, possibly, extensions. Not all the accessories shown here are included in the basic price of this unit.



on the end of narrow pieces, rails and stretchers and such, it isn't safe to hand-hold them while feeding past the blade. The answer, other than a more costly commercial jig (see "Tool Talk" in this issue), is to provide your own accessory, like the one suggested in **diagram 2**. This jig moves smoothly on the rip fence and has a guide to ensure that the work, clamped to the face of the jig, will be maintained in a vertical position while your hands are safely away from the blade.

Drilling

I consider a drill press (**photo 4**) to be the second most important power tool. In addition to its patent hole-drilling capabilities, it serves as a power source for items like drum sanders, rotary files and burrs. It also can provide companion mortises for the tenons cut on a table saw. The idea is to use a bit that matches the thickness of the tenon to drill x-number of overlapping holes, and then to remove remaining waste with a chisel. Since the rectangular cavity will have semicircular ends, the tenon must be shaped to suit (**diagram 3**).

For this application and other wood-boring chores, such as drilling holes for dowels, it's best to work with brad point bits (**photo 5**). The center points on the bits not only help prevent the bits from wandering, but also make it easy to contact a location mark, while perimeter spurs sever surface fibers, ensuring clean holes.

A portable drill is needed for work that can't be done on a stationary tool. There's a price choice here. Cordless units (**photo 6**) cost more than their corded cousins, so if you don't object to the umbilical cord you can save some dollars and apply them elsewhere or to supplies like nails and screws.

Photo 4 A drill press is the #2 power tool. Sizes are listed as twice the distance between chuck and column. A 10" tool, for example can drill at the center of a 10"-wide board.



Photo 5 Brad point bits are excellent tools for boring in wood. A 5-piece set will include 1/4", 3/8", 1/2", 5/8" and 3/4" sizes.



Photo 6 Basic features of battery operated drills are fairly similar; variable speed, clutch and reversing are common. Many lower cost electric drills provide variable speed and reversing.

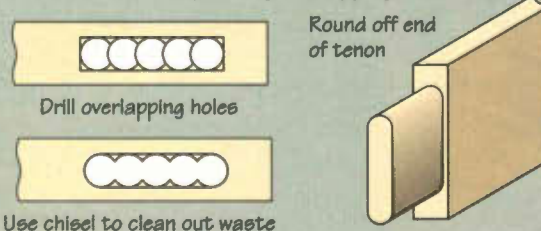


Photo 7 The scroller feature on some saber saws contributes to easier sawing of intricate curves and patterns.



Diagram 3

You can form mortises without extra-cost equipment by drilling overlapping holes.



Curve Sawing

A saber saw takes over when a project has other than straight lines. We've allowed about \$80 for a scroller unit (**photo 7**)—the blade can be rotated independently of the body (a nice feature but not critical). Opt for a nonscroller and you will have as much as \$30 to apply to another, or an additional, tool—perhaps a table that allows the saw to be used somewhat like a scroll saw?

Diagram 4 The ideal accessory for a backsaw is a miter box that you can make.

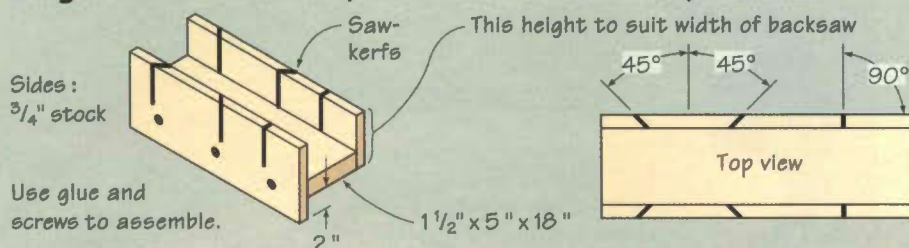


Photo 8 The portable router has become a major woodworking tool. You can reduce cost considerably by opting for a unit that lacks a plunge feature.



Decorative Cuts, and More

The portable router (*photo 8*) is today's "in" tool, and its status is justified. In addition to its uses for decorative work on edges, it has become a major tool for basic and advanced joinery like the mortise and tenon and dovetails. We've allowed quite a bit of the budget for a plunge type, but cost can be reduced as much as 50 percent if the plunge is omitted. This is money that can be used for a table so the router can function like a small shaper, or for a collection of router bits.

Handsawing

Many types of handsaws are available, but to supplement power equipment, a backsaw is a good choice (*photo 9*). It is used to hand cut some joints and to square and miter ready-to-use materials like mouldings. You can ensure accuracy for the latter application if you carefully make a miter box to suit the saw (*diagram 4*). Assemble the project, and then use a combination square to mark the cutlines. Hold a strip of wood in line with the marks to hold the saw in vertical position as you form the kerfs. (For more benchtop handsaw jigs, see "Tried & True" in this issue.)

Measuring

A flex tape (*photo 10*) is used for initial measuring and for other chores like setting a table saw rip fence a particular distance from the saw blade. Since plywood panels measuring 4' x 8' are common materials, the tape should be a minimum of eight feet long. Most units have a locking mechanism so the tape can be held in extended position, and might have a clip for holding the tool on your belt.

Marking lines perpendicular to an edge or at a 45-degree angle are jobs for a combination square (*photo 11*). Since the blade is removable, it can also be used as a 12" (or more) rule. Most units have a bubble in the head which can be used as a level; a removable scriber (stored in the handle) for marking wood or metal is also a common feature.

Waste Removal

There are many chisel designs, often with names that designate them for a particular application; but for our shop, a set of four or five "wood chisels" ranging in size from 1/4" to 1" is the best choice (*photo 12*). Chisels are used for carving and, in a more practical vein, for chores like removing waste from drilled mortises, paring a tenon for a precise fit, and cleaning out slots and grooves.

Hand planes, "smoother" types, are generally viewed as finesse tools, used to true edges or remove a smidgen of mate-

Photo 9 Backsaws have different length blades with little variations in price. A stiff blade and small teeth make them suitable for fine sawing.



Photo 10 Flex tapes are made with 1/2"- or 3/4"-wide blades. The minimum length for a woodworker is eight feet.

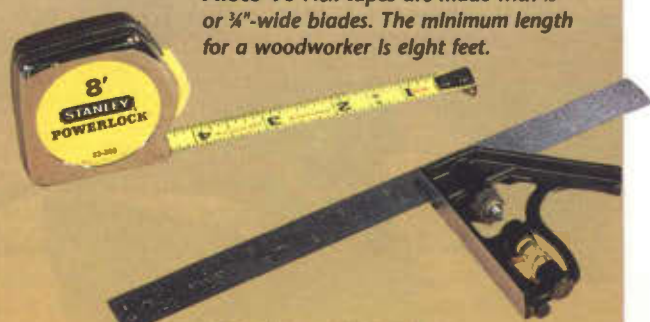


Photo 11 A combination square is needed for layout work. The blade can be removed from the head and used as a rule.



Photo 12 Sets of wood chisels contain four or five pieces. Essential sizes are 1/4", 3/8", 1/2" and 3/4".



Photo 13 The bench plane is used for finesse work, like removing a see-through shaving, and for cruder jobs, like smoothing a rough board.





Photo 15 A 16-ounce claw hammer is a good choice for general shop use.

rial to bring a board to precise width, but they can do more. While the general practice is to cut with the grain, many workers smooth a rough board or reduce its thickness by planing diagonally across the grain, finishing with the grain, and finally sanding. There are many types and sizes of hand planes — “jointer” types can run as long as 24". Our shop includes a 10" to 12" “bench” plane (*photo 13*) for general applications.

Sanding

It's feasible to prepare material by hand for finishing, but our shop plan includes a pad sander like the one displayed in *photo 14*. Palm sanders, usually orbital designs, are easy to control, work fast and result in super smooth surfaces. Their small platens accept one-quarter of a sheet of sandpaper that are secured with a clamp of some sort. Some units accept cut-to-size, pressure sensitive, adhesive-backed paper that's just pressed into place. For a little more money, you could also



Photo 14 A palm-grip orbital sander will make you happy when preparing wood for finishing.

use hook & loop paper (more commonly known as Velcro™). For a little extra money, a random orbit sander would be a smart upgrade.

Assembly

You can't do much without a hammer (*photo 15*) and a set of screwdrivers (*photo 16*). Hammers are a personal choice; mostly relating to whether the handle should be wood, steel, or fiberglass. Many construction workers opt for wood because it isn't cold to the touch in inclement weather and it's replaceable. Other than that there's weight and head design. A 16-ounce claw hammer will drive or remove any nail you're likely to use in the shop.

Screws common in a woodshop are slotted or have the Phillips cross-slot design. Thus a screwdriver set should include both types of drivers, and in various sizes. It isn't difficult to find a set of as many as 20 tools for the \$30 we've allotted. Look for generous-sized, ridged or textured handles that allow you to apply adequate torque and make the tools easier to grip and turn. A “stubby” in the set, used for driving screws in tight areas, is a plus factor.

Many assemblies are held together with clamps while the glue dries, which is why the list includes two sets of clamp fixtures. That's not enough, really, since the fact is you can never have too many clamps, but it's a beginning. If you manage to save money in some area, extra clamps would be a good way to use the excess. Clamp fixtures are used with ordinary plumbing or black pipe, so with an assortment of pipe-lengths you can make clamps of various lengths.

Also, there are improvisations, fixtures you can make to substitute for store-bought items. Two examples are detailed in *diagrams 5 and 6*.

SOURCES

Abbey Tools
1132 North Magnolia
Anaheim, CA 92801
(800) 225-6321

Bosch Power Tool Corp.
One Hundred Bosch Blvd.
New Bern, NC 29562
(312) 286-7330

CMT Tools
310 Mears Blvd.
Oldsmar, FL 34677
(800) 531-5559

Constantine's
2050 Eastchester Rd.
Bronx, NY 10461
(800) 253-WOOD

Craftsman (Sears)
20 Presidential Dr.
Roselle, IL 60172
(800) 377-7414

Delta International Machinery Corp.
246 Alpha Dr.
Pittsburgh, PA 15238
(800) 438-2486

DeWALT
626 Hanover Pike
Hampstead, MD 21074
(910) 716-3544

Donnelly & Duncan (Stanley Tools)
One Office Pkwy.
East Providence, RI 02914
(401) 431-1177

Freud
218 Feld Ave.
High Point, NC 27264
(800) 334-4107

Garrett Wade
161 Avenue Of The Americas
New York, NY 10013
(800) 221-2942

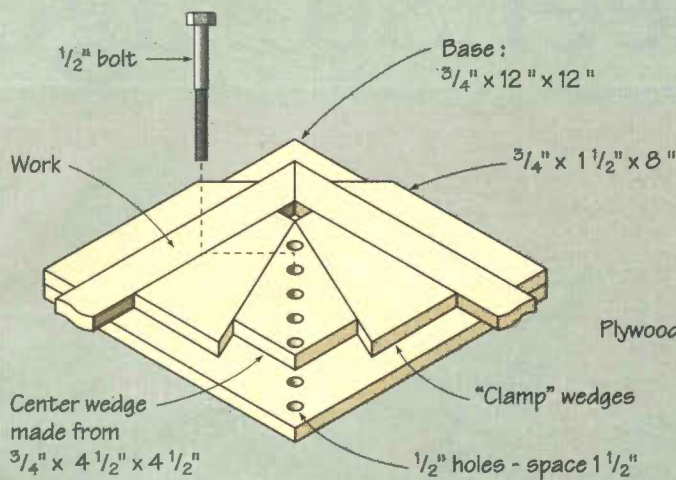
Harbor Freight Tools
3491 Mission Oaks Blvd.
Box 6010
Camarillo, CA 93011
(800) 423-2567

Hiltachi Power Tools U.S.A., LTD.
4487 E. Park Dr.
Norcross, GA 30093
(404) 925-1774

International Tool Corp.
2590 Davie Rd.
Davie, FL 33317
(800) 338-3384

Leichtung Workshops
4944 Commerce Pkwy.
Cleveland, Ohio 44128
(800) 321-6840

Makita
14930 Northam St.
La Mirada, CA 90638
(714) 522-8088

Diagram 5

A jig of this type provides a clamping arrangement for miter joints.

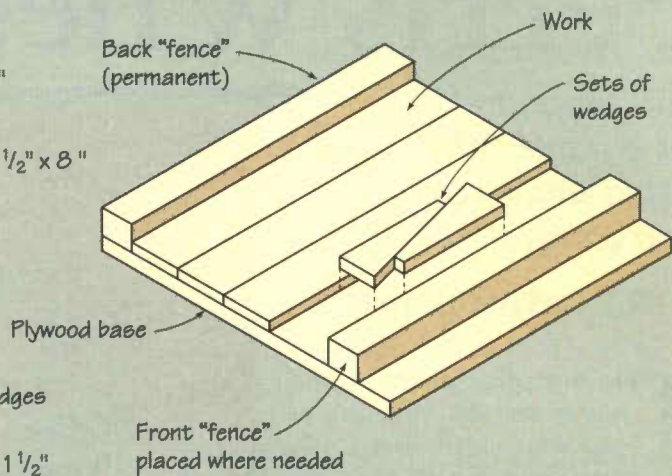
Diagram 6

Photo 16 A set of screwdrivers should include sizes for both common and Phillips head screws.



Photo 17 Sawhorse brackets are a small investment. Provide some two-by-fours and you can quickly make stands to support long work or a plywood-panel benchtop.

Finally, since a bench of some sort is needed, we suggest two pairs of sawhorse brackets (**photo 17**). These, plus about 24 lineal feet of two-by-fours, will provide two stands for supporting long work, or that can be spanned with a sheet of plywood as a temporary workbench.

The chart on the opening pages was compiled after researching many manufacturer and wood-worker supply catalogs. Be aware that there is a difference, often substantial, between a list price and a retail price. As we said to begin with, shopping is the answer to lower prices — also, sales! As I was writing this, I received a Sears catalog that showed a \$120 benchtop drill press on sale for about \$100. Twenty dollars isn't a fortune, but it can pay for clamps, or some wood and glue, or plenty of nails and screws.

R.J. DeCristoforo, a contributing editor, has written more than 30 books, including Jigs, Fixtures and Shop Accessories.

McFeeley's
1620 Wythe Rd.
Lynchburg, VA 24506
(800) 443-7937

MLCS, Ltd.
P.O. Box 4053
Rydal, PA 19046
(800) 533-9298

Penn State Industries
2850 Comly Rd.
Philadelphia, PA 19154
(800) 377-7297

Porter-Cable
4825 Highway 45 North
Jackson, TN 38305
(800) 487-8665

Ryobi
5201 Pearman Dairy Rd.
Anderson, SC 29622
(803) 226-6511

Seven Corners Hardware
216 West 7th St.
St. Paul, MN 55102
(800) 328-0457

Skil Corporation
4300 W. Peterson Ave.
Chicago, IL 60646
(312) 286-7330

Tool Crib of the North
P.O. Box 14040
Grand Forks, ND 58208
(800) 358-3096

Tools on Sale
216 W. 7th St.
St. Paul, MN 55102
(800) 328-0457

Trendlines
135 American Legion Hwy.
Revere, MA 02151
(800) 767-9999

Whole Earth Access
822 Anthony St.
Berkeley, CA 94710
(800) 829-6300

Wilke Machinery Co.
3230 Susquehanna
York, PA 17402
(800) 235-2100

Woodcraft Supply Corp.
210 Wood County Industrial Park
Parkersburg, WV 26102
(800) 225-1153

The Woodworkers' Store
21801 Industrial Blvd.
Rogers, MN 55374
(800) 279-4441

Woodworker's Supply
1108 North Glenn Rd.
Casper, Wyoming 82601
(800) 645-9292

Ferris Wheel Storage

***Save space and
get organized by
taking small parts
on a carnival ride.***

by R.J. DeCristoforo

The ferris wheel caddy is a great way to store the small parts in your shop, such as screws, nails and other hardware. Plus, it's a fine way to recycle 35mm film canisters that would otherwise be thrown away. (If you don't collect your own, the containers are available from camera stores, either at small cost or gratis.)

Make the layout (see PullOut™ Plans) for the discs on a piece of $\frac{1}{4}$ " x $5\frac{3}{4}$ " square hardboard and then, to produce two identical parts, attach it with double-sided tape to a similar piece. Separate the pieces after you've cut and sanded them to circular form.

The “sandwich” method is also the way to form the four shelves. Use a Forstner bit or a hole saw in a drill press to form the 1¼" holes. Be sure the parts are held firmly together and clamped securely to the table. Use a backup block to eliminate splintering when the cutting tool breaks through.

Diagram 1 shows how I set up to bore the seats for the dowel pivots. Clamp the backup and the stop to the drill press



For storing small items, 35mm film containers are ideal, and the ferris wheel concept makes them easily accessible. Contents can be identified with labels or by attaching a sample to each container with a daub of epoxy.

Diagram 1 Drilling for the dowel pivot

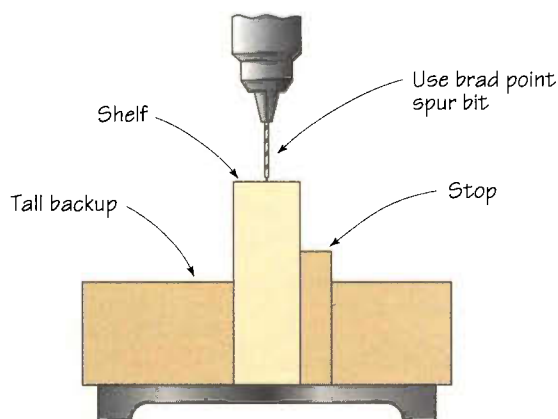
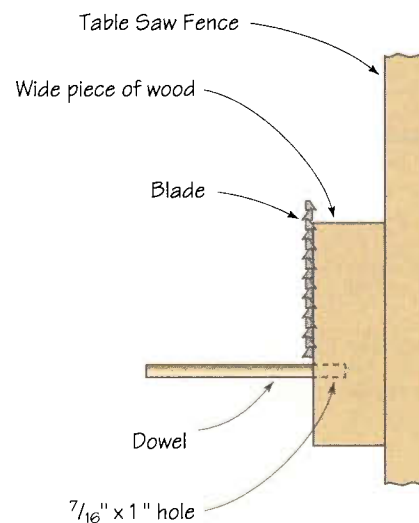


Diagram 2 How to saw dowel rods safely

Overhead View



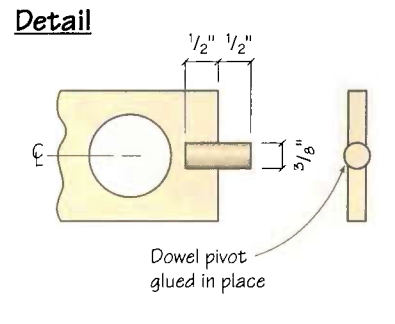
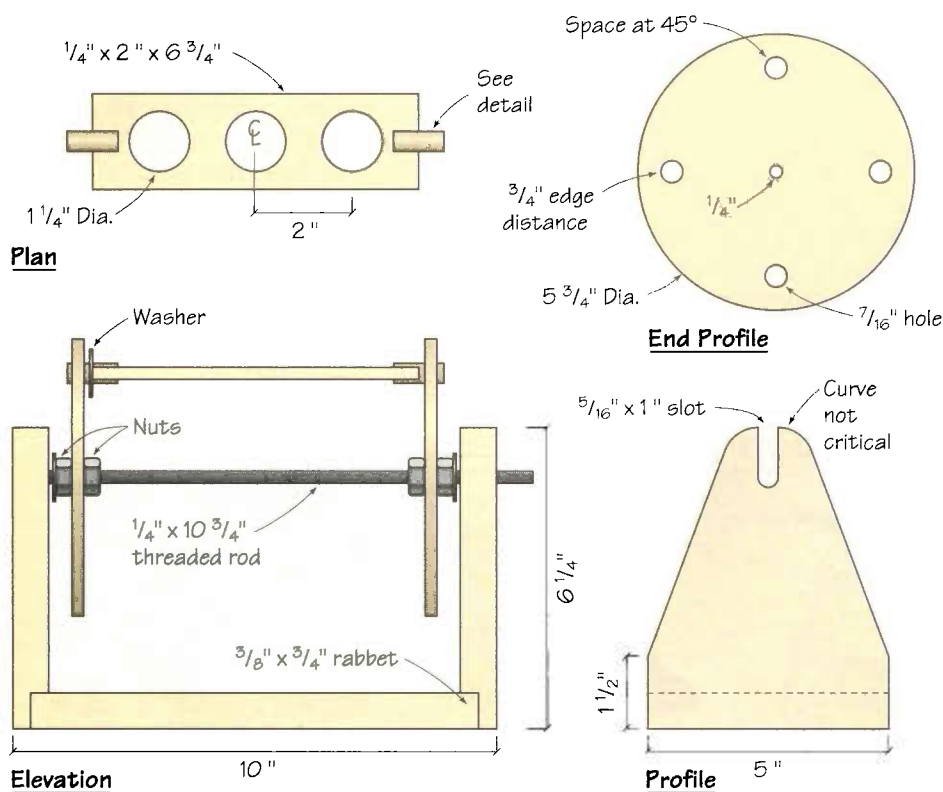


table so the shelves and the chuck will be on a common, vertical centerline. Be sure to use a brad point bit; other types might wander enough to spoil accuracy.

The dowel pivots can be cut to length by hand, but for accuracy, I prefer to use a method like the one illustrated in **diagram 2**. The same idea can be used on a band saw but the dowel must be gripped firmly so the blade won't spin it.

Glue the pivots into the shelf ends, then proceed to make the base and ends of the ferris wheel support. All parts are $\frac{3}{4}$ " thick and can be made from the material of your choice. Assemble the parts with glue and either nails or screws.

Start assembling the wheel by threading the inside nuts onto the threaded rod. Then add the disks and the outside nuts. Allow enough distance between the disks so the shelves can be inserted. Then, adjust the position of the nuts so they will grip the disks firmly while allowing enough space for the shelves to swing freely. Don't forget to install the washers that are shown in the assembly drawing.

A dowel can be substituted for the threaded rod, but the disks would have to be glued in place and that wouldn't allow for any adjustment of the wheel assembly. **PW**

R. J. DeCristoforo, a contributing editor to *Popular Woodworking*, writes about and works with wood from his home in Los Altos Hills, California.

Know Your Drilling Tools

Different style drill bits are designed for specific purposes, although some are interchangeable. From left to right below:

The **twist drill** is designed primarily for metals, with a standard 59 degree angle at the tip. Although the recommended angle for wood is 45 degrees, the twist drill can still be used in the woodshop.

A **brad point spur bit** features a lead point to center the hole and side spurs to shear the grain on the hole edge. This design prevents wandering during the cut and is designed for use with wood, including end grain.

The two **spade bits** shown are both designed for use in wood, quickly drilling holes of larger diameter than the average twist or spur bit drill.

The **hole saw** uses a twist drill as a centering device for the cylindrical saw blade. The hole saw is commonly used when a large diameter, shallow hole is required.

The **Forstner bit** has the advantage of cutting a clean, flat-bottomed hole at almost any angle, with neither drift nor wandering.





CONSUMER'S

Readers sing the praises of their favorite tools.

Compiled by Stacey King

Stationary Power Tools

BEST TABLE SAW

Delta Unisaw 10"



Delta has been manufacturing its Unisaw 10" tilting arbor saw for more than 50 years. It offers 3 or 5 HP models that operate at 4,000 rpm. The saw features a 20" x 27" cast iron table with extension wings, a triple V-belt drive and lubricated-for-life ball bearings. For safety, the saw includes a drive mechanism contained in a steel cabinet and a see-through blade guard with splitter and anti-kickback fingers. Some models are equipped with the T-square Uni-fence® saw guide. The Unisaw retails for between \$1,700 and \$2,000.

HONORABLE MENTIONS:

Craftsman 10"

Ryobi 10" BT-3000

BEST JOINTER

Craftsman 6"



Sears Craftsman® provides a 1 HP jointer with a three-blade, 3" diameter cutterhead that delivers 4300 rpm. The jointer comes with a 36" bed and offers a 6½" cut width. The spring-loaded blade guard provides safety, and the adjustable cast iron guide fence is center-mounted for accuracy. It's available through the Craftsman Power and Hand Tools catalog. Its list price is about \$400.

HONORABLE MENTIONS:

Delta 6"

Grizzly 6"

BEST PLANER

Delta 12"



The Delta 22-540 12" portable planer with full 15 amp motor has a Poly-V belt and a solid steel two-knife ball bearing cutterhead that raises and lowers on four ground columns. The planer's feed rate adjusts according to the load to customize planing for each piece. It can accommodate stock from ¼" to 6" thick and as much as 12" wide. Double-edged, reversible knives guarantee twice the cutting life. The planer retails for about \$450.

HONORABLE MENTIONS:

Craftsman 12" Benchtop

Ryobi 12" Benchtop

BEST LATHE

Shopsmith



Shopsmith's lathe is part of the multi-purpose Mark V Model 510, a compact machine that performs five functions, including those of a table saw, disc sander, boring machine and drill press, as well as a lathe. Powered by a 1½ HP motor, the lathe operates at between 700 and 5,200 rpm. A two-position lathe tool rest is provided for more versatile positioning when turning. Shopsmith also provides an entire line of lathe accessories, including faceplates, screw centers, tailstock chuck arbors and tailstock live centers. The Shopsmith Mark V Model 510 system retails at about \$2,500.

HONORABLE MENTIONS:

Craftsman

Delta 46-700

CHOICE AWARDS

As every woodworker knows, beautiful and demanding projects can't be completed with just any old tool. The tools of our trade should be comfortable and reliable woodshop companions, allowing us to concentrate less on frustrating tool shortcomings and more on developing our craft.

Thanks to a number of your fellow woodworkers who took the time to voice their opinions, we now present the tools that they chose as their favorites. Woodworkers from Hawaii to Maine responded to our Consumer's Choice Awards by voting for their favorite tool brands and models in 28 categories.

Choices were based upon price, quality, durability, ease of operation, available accessories and ease of repair.

The following tools received the most votes in their respective categories. Honorable mentions are those tools that came closest to the top picks. Detailed information on all tools appear in the chart on the last two pages.

BEST DRILL PRESS

Delta



With 12 speeds from 250 to 3,000 rpm, the Delta 16½" 17-900 drill press is capable of handling a wide variety of materials, including woods, metals and plastics. Position-locking depth stop guarantees accuracy and repeatability. The drill press also features a swivel type 12" square tilting table with side ledges and diagonal slots for clamping. It retails for about \$370.

HONORABLE MENTIONS:

*Craftsman 8"
Grizzly
Jet*

BEST BAND SAW

Delta 14"



Delta manufactures 14" band saws in four models, including saws that cut both wood and metal. With motors operating up to 1,725 rpm, the saws feature 14" x 14" cast iron tilting tables and remote control micrometer adjustment for ball bearing blade support. The saws include a chip chute for safety and convenience, and lower blade guides that support the blade to within ¼" of the table work surface. The 14" band saws come with an enclosed or open stand, either a ½ or ¾ HP motor, and offer double sealed, lubricated-for-life ball bearings. They retail for between \$500 and \$750.

HONORABLE MENTIONS:

*Craftsman 12"
Grizzly 14"*

BEST SCROLL SAW

Craftsman



Sears Craftsman® offers variable-speed and 16" single-speed scroll saws. The saws have a 7/8" blade stroke and cut up to 2" thick at 90°. The Contractor Series 20" variable-speed saw has a 16" x 16" cast iron table and metal workpiece hold-down foot, and features a 20" deep throat for work up to 40" in diameter. It retails at \$400. The 16" single- and variable-speed saws deliver up to 1,700 strokes per minute and offer a 16" deep throat for work up to 32" in diameter. They retail for \$120 and \$160.

HONORABLE MENTIONS:

*Delta
RBI Hawk*

BEST MITER SAW

DeWALT



The DW705 is a 12" compound miter saw with an electric brake, head lock down and spindle lock. The saw has a stainless steel miter scale with nine positive stops and an automatically retracting lower guard. Equipped with a 13 amp motor and 100 percent ball bearings, it operates at 4,000 rpm and comes with a 32-tooth carbide blade and blade wrench. The saw retails for about \$385.

HONORABLE MENTIONS:

*Craftsman
Hitachi C8FB*

Hand-held Power Tools

BEST RADIAL ARM SAW

Craftsman



The Craftsman® 10" Contractor Series 1½ HP radial arm saw features a blade guard that raises when crosscutting and mitering, yet prevents wrong-way feed when ripping. The saw has a maximum rip capacity of 26" with a 15½" crosscut capacity, and cuts wood up to 3" thick at 90 degrees. Anti-kickback pawls and a rivening knife prevent wood binding. The saw includes a three-piece, 40" x 27" work table for large woodpieces. It retails for about \$450.

HONORABLE MENTIONS:

Delta
DeWALT

BEST SPINDLE SANDER

Ryobi

Ryobi's OSS450 29-pound oscillating spindle sander is designed for finishing curves and contours that can't be reached with belt or disc sanders. It operates at 2,000 spindle rotations per minute and oscillates 58 times a minute on a ⅝" patch to prevent woodburns. The sander includes ½" and 1" drums, with four other sizes available, and features on-board storage for all six drums. It retails for about \$175.

HONORABLE MENTIONS:

Craftsman
Grizzly G1071

BEST ROUTER

Bosch



The Bosch 1613EVS electronic plunge router is powered by a 2 HP motor that operates at six speeds from 12,000 to 22,000 rpm. Electronic variable speed circuitry provides soft-start operation and maintains the selected speed under load. A quick-release system allows for easy template guide changes. The tool offers a tight grip with a self-extracting collet system, and comes equipped with ¼" and ½" collet chucks and a collet nut wrench. The router retails for about \$220.

HONORABLE MENTIONS:

Craftsman
Porter-Cable

BEST CIRCULAR SAW (TIE)

Craftsman



Craftsman® offers a full line of circular saws that feature a no-load speed of 5,000 rpm, a contoured, textured handle for better balance and grip, and knob controls for easier bevel and depth of cut adjustment. The saws deliver a maximum depth of cut of 2⅝" at 90 degrees. Each features a side sawdust ejection, a trigger switch with lock off, and die-cast aluminum blade guards for long wear. The line also includes standard and worm-drive industrial models. The saws retail between \$50 and \$140.

Skilsaw



The Skil® line of Skilsaw® circular saws features several models, including a heavy-duty saw for "builders and remodelers" that has an electronic brake to stop the blade in two seconds. The Skil HD5658 has a 13 amp motor, operates at a no-load speed of 5,400 rpm, and can make up to 2⅝" cuts at 90 degrees. The saws are available in other models, including a worm drive model with a 40-tooth alloy steel combination blade. All Skilsaw models feature ball bearing construction and steel or aircraft quality aluminum feet. Retail prices for the saws begin at \$100.

HONORABLE MENTIONS:

DeWALT
Porter-Cable

And the Winners Are...

From the readers who entered our survey, we randomly chose three winners of some of the top tools. Congratulations goes out to...

Leonard Hill of Lincoln, Nebraska, who has won a Craftsman model 23615 16" scroll saw.

Randall Prescott of Belchertown, Maryland, who has won a Makita model 6201 DWHE cordless drill/driver.

W.D. Sanger Jr. of Garland, Texas, who has won a Bosch model B4301 jigsaw.

Hand-held Power Tools

BEST CORDLESS DRILL

Makita



Makita offers a wide variety of cordless drills and driver-drills with battery power, including 4.8, 7.2, 9.6 and 12 volts. The new driver-drills feature a comfortable T-bar handle configuration which has a spring-steel clip for hanging the drill on a belt or nail apron. Most of Makita's driver-drills are reversible and feature variable speed with high and low gear selection (0-370 rpm low, 0-1150 rpm high), a keyless chuck and six-stage clutch. The drills retail for between \$50 and \$200.

HONORABLE MENTIONS:

*DeWALT
Black & Decker*

BEST ELECTRIC DRILL

Black & Decker



Black & Decker offers a full line of corded drills, including $\frac{3}{8}$ " or $\frac{1}{2}$ " and single or variable speed models. All drills are reversible for backing out screws and jammed bits. The line also includes high torque drills with hammer action, three new ergonomically designed compact drills for increased comfort, and $\frac{3}{8}$ " and $\frac{1}{2}$ " drills with keyless chucks. The drills retail for between \$35 and \$90.

HONORABLE MENTIONS:

*DeWALT
Skil*

BEST PALM SANDER

Porter-Cable



This Porter-Cable 330 finishing sander weighs less than four pounds and operates at 12,000 orbits per minute. It features ball-bearing construction, a solid metal frame, rubber posts to isolate vibration and flush sanding on all four sides. The sander also includes a $4\frac{1}{2}$ " x $4\frac{1}{2}$ " pad that will accept adhesive-backed or standard sandpaper. It retails for about \$70.

HONORABLE MENTIONS:

*Black & Decker
DeWALT*

BEST BELT SANDER

Porter-Cable



The line of Porter-Cable belt sanders features a dust collection system with swiveling collection bag and a quick-release lever for changing belts. Machined aluminum metal housings allow for longer lasting, cooler running sanders. The variable speed 3" x 21" sander (model 352VS) operates from 850 to 1,300 SFPM, and retails for about \$175. The 3" x 24" and 4" x 24" sanders (models 360 and 362) operate at 1,500 SFPM and retail for about \$216 and \$230.

HONORABLE MENTIONS:

*Bosch
Craftsman*

BEST BISCUIT JOINER

DeWALT



DeWALT's DW682K heavy duty plate joiner kit is equipped with retractable steel anti-slip pins and preset depth stops. The integral fence has rack and pinion height adjustment, tilts from zero to 90 degrees and allows location on either face of a miter joint. The biscuit joiner operates at 10,000 rpm and includes a six-tooth carbide blade, dust bag and deflector, vacuum adapter, and torx screwdriver. It retails for about \$250.

HONORABLE MENTIONS:

*Freud
Porter-Cable*

BEST JIGSAW

Bosch



As well as four-speed orbital cut settings with 5 amp motors, both the barrel-grip 1584VS and top-handle 1587VS offer 1" stroke lengths and variable speed control.

The saws operate between 500 and 3,100 spm. Four-position orbital function is available for choosing the ideal blade motion for the material. The Clic™ toolless blade change method allows quick and easy blade changes. The jigsaw comes with a zero- to 45-degree tilting footplate for bevel cuts. The saws retail for between \$160 and \$190.

HONORABLE MENTIONS:

*Craftsman
Black & Decker*

Hand Tools

BEST BENCH PLANES

Stanley

Stanley's bench planes have been produced for 125 years using the original "Bailey design" that includes a kidney-shaped hole for easier adjustment of the cap iron and a single piece Y-lever that won't spread when the cutting iron is advanced. They offer fully adjustable depth of cut, mouth opening, and lateral position of the cutting iron to prevent blade chatter and chip clogging. Available for \$50 to \$60.

HONORABLE MENTIONS:

Craftsman
Lie-Nielsen®
Record

BEST BLOCK PLANES

Stanley

Stanley's block planes are fully adjustable for depth of cut and mouth opening to minimize vibration. Lateral blade adjusting levers help prevent gouging of workpieces. Available for \$30 to \$35.

HONORABLE MENTIONS:

Craftsman
Lie-Nielsen®
Record

BEST JACK PLANE

Stanley

These planes are designed for rough planing of all but the longest workpieces. They're available with a 14" base and 2" blade or a 15" base and 2½" blade. Available for \$65 to \$75.

HONORABLE MENTIONS:

Craftsman
Record

BEST HAMMER

Stanley

Stanley's hammers are contractor grade with high carbon polished steel and octagon-shaped heads. The face is Rim-Tempered™ to reduce chipping, and the handles are available in hickory, steel and graphite. They are available for \$15 to \$25.

HONORABLE MENTIONS:

Estwing
Plumb



PHOTO BY RON FORTH PHOTOGRAPHY

BEST CHISELS

Stanley

Stanley's bevel-edged chisels have precision machined hard, alloy steel blades that hold a keen edge without getting too brittle for use. The handles are made of wood, polymer or shatter-proof butyrate. They retail from \$9 to \$20.

HONORABLE MENTIONS:

Craftsman
Marples
Sorby

BEST CROSSCUT SAW

Stanley

Stanley offers two crosscut saws. The Short Cut®, with teeth sharpened on both leading and trailing edges, and the Professional Performance Pro, with chrome-nickel alloy steel and back-stripped blade. They retail for \$17 and \$18.

HONORABLE MENTIONS:

Craftsman
Disston

BEST BACKSAW

Stanley

With a heavy steel back for balance, this tenon saw with universal teeth is bevel-edged for accurate cutting. It is equipped with lacquered wood handles and 10" or 12" blades with 13 teeth per inch. The saw retails for \$16.

HONORABLE MENTIONS:

Disston
Craftsman

BEST DOVETAIL SAW

Stanley

This 10", 15 TPI fine dovetail saw achieves a smooth, narrow kerf, and offers a mahogany handle designed for a comfortable grip. It retails for about \$11.

HONORABLE MENTIONS:

Craftsman
Dozuki

BEST ABRASIVES

3M

3M offers a wide variety of products for sanding wood. Sheets are available in aluminum oxide, garnet, emery and waterproof silicon carbide in grades from very fine to extra course. They retail from about \$2.40 to \$4.50. Sponges combine two sanding grades on one sponge and can be rinsed and reused. They retail for about \$2. Sanding pads, customized for stripping, wood refinishing or metal refinishing, retail for about \$1.89.

HONORABLE MENTIONS:

Klingspor
Norton

Category/ Model	Suggested Retail Price	Motor	RPM	Max Cut	Dust Collection	Special Feature	Comments
TABLE SAW							
Delta 36-820 10"	1,000	3 HP	3,450	3½"	Yes	Delta Unifence	
Craftsman 29886 10"	500	1½ HP	Not avail.	3½"	No		
Ryobi BT3000 10"	540	2¾ HP	4,800*	3½"	Yes	Benchtop	
		* No load speed					
JOINTER							
Craftsman 23221	450	1 HP	4,300	3 @ 6½"	No	36" bed length	
Delta DJ-37-190	450	¾ HP	4,800	3 @ 6"	Yes	46" bed length	
Grizzly G1182	375	1 HP	5,000	3 @ 6"	Opt	47" bed length	
PLANER							
Delta 22-540	410	15 amp	8,000	2 @ 12"	No	Max cut height- 6"	Benchtop
Craftsman 23373	500	2 HP	8,000	2 @ 12½"	Opt	" " " - 6"	Benchtop
Ryobi AP12	410	14 amp	8,000	2 @ 12¹⁄₁₆"	Opt	" " " - 6"	Benchtop
LATHE							
				(Capacity)			
Shopsmith Mark V	2,500	1½ HP	700 – 5,200	N/A			Multi-use tool
Craftsman 22816	250	½ HP	875 – 3,450	12" x 36"			Benchtop
Delta 46-700	430	¾ HP	500 – 2,000	12" x 36"		Swiveling headstock	Benchtop
DRILL PRESS							
				(Capacity)			
Delta 17-900	380	¾ HP	250 – 3,000	8½" throat		3½" quill travel	½" chuck
Craftsman 21317	400	¾ HP	200 – 3,630	8½" throat		3½" quill travel	¾" chuck
Grizzly G1201	445	¾ HP	150 – 2,470	8½" throat		5" quill travel	¾" chuck
Jet JDP-17MF	390	¾ HP	200 – 3,630	8½" throat		4¾" quill travel	½" chuck
BAND SAW							
Delta 28-245	740	½ HP		14"	Yes	10°/45° l/r table tilt	6½" resaw
Craftsman 24835	330	½ HP		12"	Yes	10°/45° l/r table tilt	6" resaw
Grizzly G1019	295	¾ HP		14"	N/A	10°/45° l/r table tilt	6" resaw
SCROLL SAW							
			(Strokes P/M)				
Craftsman 23615	160	⅝ HP	500 – 1,700	16" throat/ 2" capacity	No	45°/0° l/r table tilt	Benchtop
Delta 40-560 Type 2	200	⅝ HP	850 – 1,725	16" throat/ 2" capacity	No	45°/0° l/r table tilt	Benchtop
RBI Hawk 16	799	⅝ HP	350– 1,450	16" throat/ 2" – 18" capacity	No	45°/45° l/r table tilt	Floor model
POWER MITER SAW							
			(Max. cross)	(Max. miter)			
DeWALT DW 705	360	13 amp	2½ x 7½	2½ x 5½	Attached bag	Compound saw	12"
Craftsman 23520	220	15 amp	2½ x 5½	2½ x 4¼	Vaccum port	Compound saw	10"
Hitachi C8FB2	600	9.5 amp	2½₆ x 12	2½₆ x 8²¹⁄₂	Attached bag	Sliding compound	8½"
CIRCULAR SAW							
			No load rpm	Max cut depth @ 90°		Max cut depth @ 45°	Blade size
Craftsman 10824	60	11 amp	5,000	2½"		1¾"	7¼"
Skil HD5657	95	13 amp	5,500	2½"		1¾" (50°)	7¼"
DeWALT DW364	150	13 amp	5,500	2½₆"		1¾"	7¼"
Porter-Cable 9743	130	15 amp	5,800	2½₆"		1¹³⁄₁₆"	7¼"

Category/ Model	Suggested Retail Price	Motor	RPM	Max. Cut	Dust Collection	Special Feature	Comments
RADIAL ARM SAW			<i>Max. cross</i>	<i>Max depth @ 90°</i>			
Craftsman 19633	500	1½ HP	15½"	3"	No	40" x 27" table	10" floor model
Delta 33-990	659	1½ HP	12¾"	3"	Yes	42" x 24¾" table	10" floor model
DeWALT * (The Original) 3,968		3 HP	16"	4½"	Yes	46" x 33"	14" floor model
*Though DeWALT received an honorable mention in the radial arm saw category, the company no longer manufactures a radial arm saw. The Original Saw Company purchased the patterns and rights and is now marketing industrial level radial arm saws.							
ROUTER			<i>RPM</i>	<i>Collet Size</i>			
Bosch 1613EVS	215	2 HP	12,000 – 22,000	¼", ½"		Plunge model, max depth 2"	
Porter Cable 690	150	1½ HP	23,000	¼", ½"		Fixed base, depth adjustment range 1¾"	
Craftsman 17473	110	2 HP	15,000 – 25,000	¾"		Fixed base, depth adjustment range 1½"	
SPINDLE SANDER			<i>Drum length</i>	<i>Stroke length</i>			
Ryobi 05S450	170	½ HP	4½"	¾"		½", 1" drums, standard	
Craftsman 22590	150	½ HP	4½"	¾"		½", 2" drums, standard	
Grizzly G1071	495	1 HP	5", 6" & 9"	1½"		10 standard drum sizes	Floor model
CORDLESS DRILLS			<i>RPM</i>	<i>Chuck type</i>			
Makita 6012HDW	150	9.6 volt	400 & 1,100	¾" keyed		10 clutch settings	
DeWalt DW972K-2	188	12 volt	450 & 1,400	¾" keyless		16 clutch settings	
Black & Decker BD2300	68	9.6 volt	300 & 700	¾" keyless		6 clutch settings	
ELECTRIC DRILL			<i>No load rpm</i>				
Black & Decker 1000	55	4 amp	0 – 2,500	¾" keyed		Variable speed, reversing (VSR)	
DeWALT DW106	70	4 amp	0 – 2,500	¾" keyless		VSR	
Skil HD 6525	70	4.2 amp	0 – 2,500	¾" keyed		VSR	
PALM SANDER			<i>Orbits P/M</i>	<i>Pad size</i>			
Porter-Cable 333	80	1.7 amp	12,000	5"	Yes (canister)	Hook & loop pad	Random orbit
Black & Decker BD5100	60	2.8 amp	10,000	5"	Yes (canister)	Hook & loop pad	Random orbit
DeWALT DW421	80	2 amp	12,000	5"	Yes (canister or port)	Hook & loop pad	Random orbit
BELT SANDER			<i>Feet P/M</i>	<i>Belt size</i>			
Porter Cable 362	230	7 amp	1,300	3" x 21"	Yes (bag)		
Bosch 1273 DVS	230	10.5 amp	1,550	4" x 24"	Yes (bag or port)		
Craftsman 11713	80	7 amp	1,300	3" x 21"	N/A		
BISCUIT JOINER			<i>Fence adjust.</i>	<i>Depth stops</i>			
DeWALT DW682K	240	6.5 amp	90 – 180° stop @ 45°	4	Yes (bag or port)	Rack and pinion fence	
Freud JS102	195	5 amp	90 – 180° stop @ 90°, 135°	6	Yes (bag or port)	Anti-kickback blade	
Porter Cable 556	150	5 amp	90 – 180°	3	N/A		
JIGSAW			<i>Strokes P/M</i>	<i>Stroke</i>			
Bosch 1584VS	150	5 amp	500 – 3,100	1"	Chip blower		
Craftsman 27251	140	4.5 amp	0 – 3,000	1"	N/A		
Black & Decker 7568	45	3.5 amp	800 – 3,200	1½"	N/A		

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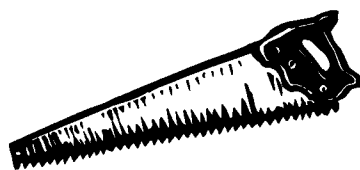
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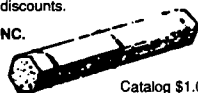
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ASK THE EXPERTS

Continued from p. 27.

The Truth About Cordless Battery Memory

In today's hi-tech world, many areas of misconception or confusion are prevalent about many of the products available. One of these areas relates to the nickel cadmium (Ni-Cad) batteries that power many of the top manufacturers' cordless power tools. The misunderstanding concerns the battery "memory" and its potential effect on tool performance.

"Memory," is the tendency of Ni-Cad batteries to remember the amount of work they performed in previous cycles and to give up only that amount of energy on following cycles (technically referred to as voltage depression).

Most major cordless power tool manufacturers, including Makita, have taken steps to ensure that their cordless product lines don't experience

memory problems. To eliminate the memory effect, tools were redesigned to be sensitive to minor voltage changes, and contamination of the battery electrodes during the manufacturing process was eliminated.

Bottom line — don't try to "correct"

Don't try to "correct" memory by entirely discharging the battery pack before recharging.

memory by entirely discharging the battery pack before recharging. This could, in fact, cause permanent damage, such as a lower energy capacity and shortened life span, exactly what you are trying to prevent.

Bill Austin is advertising manager for Makita U.S.A., and has been with the company for the past 14 years. He graduated from California State Long Beach with a B.S. in Industrial design. Bill also enjoys classic cars and breeding and racing thoroughbred horses.

INDEX OF ADVERTISERS

Abbey Tools	7
Adams Wood Products	4
Al-Len Pattern Co	26
Arrow Fasteners	2
Betterway Books	70
Constantine's	12
Delta Int'l Machine Corp.	15
Econ Abrasives	26
Fein Power Tools, Inc	19
Forrest	Cvr 3
G & W Tools	14
Grizzly Imports, Inc	Or227
HTC	10
JET Equipment & Tools	3
Klockit	27
MLCS	5
Makita U.S.A., Inc.	13
Mobile Dimension Saw	14
NRI	23
Pootatuck Corp.	27
Powermatic	6
Red Hill Corp.	21
Ryobi America	Cvr 4
Terrco Inc.	2
TimberKing	12
Time Life Books	9
Video College of Woodworking	14
Wagner Electronic Products	4
Wildwood Designs	12
William Alden	11
Woodcraft Supply	21
Wood-Mizer Products	21

CAPTION the CARTOON

sponsored by **BOSCH**



#17

Submit your caption(s) for this issue's cartoon on a postcard to **Popular Woodworking, Cartoon Caption #17, 1507 Dana Ave., Cincinnati, OH 45207**. The entry deadline is February 20, 1996. Entries will be judged by the editorial staff. A winner and two runners-up will be chosen.

The winner will receive the Bosch 2 hp Electronic Variable Speed Plunge Router, Model B1450. Features include: microfine bit depth adjustability from any plunge position, a quick-change template guide system that eliminates the need for a screwdriver, shaft lock requiring only one wrench for operation, self-releasing collet for sure bit gripping and ease of bit change, electronic variable speed providing controlled, soft starts and constant rpm. The 11 amp motor operates at 12,000 to 22,000 rpm.

The two runners-up will each win a one-year subscription to **Popular Woodworking**.



The winner of our "Caption the Cartoon Contest #15"

from the November issue and recipient of the Bosch Electronic Variable Speed Plunge Router is:

Gordon Schremser, from Chillicothe, Ohio.

The runners-up receive a one-year subscription to Popular Woodworking:

Michael Betz, from Mattawan, Michigan, for:
"It's not my fault, Dad! You didn't lock the shop door!"

Rick Rhone, from Cogan Station, Pennsylvania, for:
"I hope you don't mind if I stand on this crate!"



#15

"Mom says mess production always happens in your shop."

Hardware Stores

Brotherhood's in Aisle 4. . .

No matter how urbane the locale or remote the outpost, every time I enter a hardware store I get the feeling that most, if not all, of the world's problems could be solved right there in the tool section if we could just find the right piece of hardware and apply a little elbow grease.

There's something downright disarming about hardware stores. Somehow ethnic tensions and bickering seem to die down somewhere in the nuts and bolts section. By the time ancient enemies reach the hand tool aisles, they're practically sashaying hand-in-hand past the store's racks of riches.

I used to live in a little town, Beaver Crossing, Nebraska, famous for its artesian well waters and its main eatery, the Beaver Cafe; but it's also known for Jerry's Hardware, a mecca for tool buffs from all across Seward County. Though Jerry and Geraldine Bohaty have long since gone to their rewards, during their tenure, the store became a sort of demilitarized zone for the remarkable divisions that can spring up in a town of 400.

Beaver Crossing had at least 17 different religious sects at that time, everything from rabid fundamentalists and card-carrying Catholics to fervent atheists and chanting moonies. Religion, or lack of it, intruded on almost every human interaction in town. To get your car fixed down at Christian Service Station, you had to read their tracts. More than once I narrowly escaped having to "testify" before they'd sell me the parts to repair my mower.

Non-believers were well-represented in town, too. Across the road from Christian Service was the only other gas station in town, Amazon Amoco. Yup, an all-woman service station where chanting and meditating were inexpensive alternatives to major repairs. (I don't disparage such things — I actually preferred the ladies, but Amazon Amoco didn't handle mower parts, so I spent most of

my time with the Christian boys.)

We also had our own mix of militant farmboys who buried stockpiles of survivalist gear and canned goods in the woods by the river. And the Purple Cow motorcycle club regularly cruised the single street or parked their bikes at the bar run by Dr. Death, a huge ex-professional wrestler with tatoos and a glare that could curdle vinegar.

As you can see, quite a mix of people lived in that town, and naturally, frictions arose. But Jerry's Hardware remained separate — a place where tolerance was practiced and information was free. I learned how to thread pipe and weld aluminum. I was taught how to fix a Moen faucet and cut glass. And I even learned how to get along with my fellow man, no matter how zany his ideas or dishonorable his pursuits.

You see, there was an atmosphere of trust in that store that I've since found duplicated in other hardware stores. It's a trust with a firm basis in fact.

You know you're in the store for a purpose — you're actually going to improve the world a bit, even if it's only by fixing a dripping faucet. Consequently, you realize the nut one aisle over is there for the same thing. It builds trust.

This trust can be spectacular. When I moved to Newtown, Connecticut, I had to buy a wheelbarrow to do some landscaping in our new yard. I couldn't get it in our old car, so I went back into the hardware store to borrow a wrench to disassemble it. I'd been in town for two weeks; this was the first time I'd been in the store and Newtown is largely a bedroom community for New York City. The

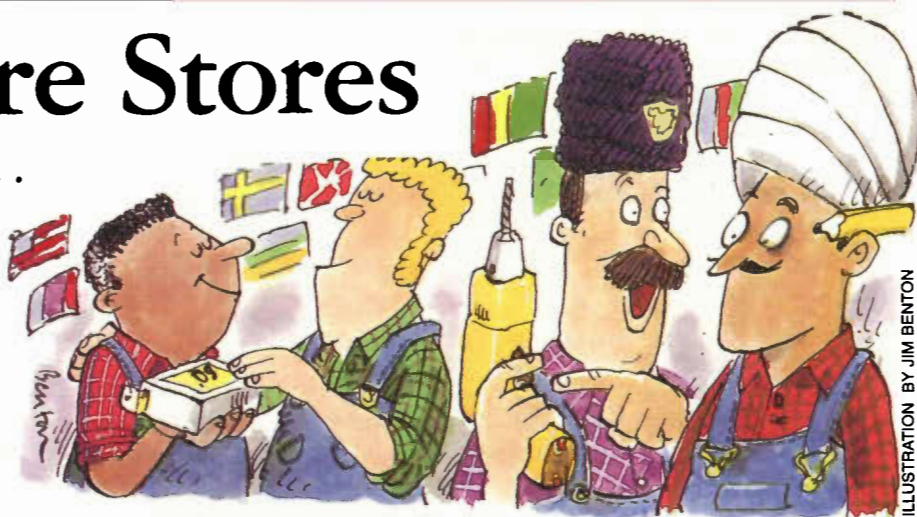
store's owner said, "Ah, why bother? Here, take my van, it's the new Voyager sitting outside," and he tossed the keys to me. I was stunned, but had enough sense to head for the van. I'd walked about ten paces when he said as an afterthought, "You *are* from around here, aren't you?" Where else in the universe besides a hardware store might this happen?

Once in Copenhagen, Denmark, I found what was called a *sol uhr*, a sun dial meant to be put on a pedestal in the garden, that was perfect for my dad. I didn't have the cash for the dial and my credit card was maxed out, so I thought I was out of luck; but the hardware store owner said, "I'll take your check." Unbelievable. Ten thousand miles from home, this guy takes my personal check for \$82 — and he didn't even ask to see my driver's license.

I talked to a vendor at one of the woodworking shows about this topic. He said he's never had a bad check. "None of us have," he said, and his arm made a sweeping gesture that encompassed all of the vendors in the huge hall. "There's something special about people who work with their hands. You can trust them. They believe in hard work."

Our politicians spend a lot of money on foreign aid and peace summits, and we jaw a lot about politics and religion. I say we cut the talk and build hardware stores and lumberyards instead. Write your congressman. **DW**

Andy Schultz is a freelance writer and cabinetmaker, and was an associate woodworking books editor for The Taunton Press.



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Hitachi 8-1/2"x60T5/8"	\$179	\$109
DeWalt 8-1/2" & Ryobi 8-1/2"x60T5/8"	\$179	\$109
Delta 9"x80T5/8"	\$204	\$119
Ryobi-Makita & all 10"x80T5/8"	\$207	\$129
DeWalt, Makita, B&D, Hitachi 12"x80T1"	\$229	\$139
Ryobi-Makita 14"x100T1"	\$266	\$179
Hitachi 15"x100T1"	\$277	\$189

For good general purpose cuts use Woodworker II 30T & 40T or Woodworker I. Use small stiffener where possible.

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This trim and crosscut ALL PURPOSE blade gives scratch-free polished cuts on all materials RIP or CROSSCUT UP TO 2".

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- THIN KERF: Saves 1/3 wood loss on each cut, radial or table. Feeds easy when used for moderate rip and crosscut on table saw. Reduces "JUMP IN" for better "PULL CONTROL."
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- Our STIFFENER STRONGLY RECOMMENDED AGAINST outside blade for best cuts. Made and serviced in U.S.A. for your benefit.

	LIST	SALE
14"x60T1" 1/8"K	\$224	\$159
12"x60T1" 5/8" 1/8"K	\$198	\$139
10"x60T5/8" 3/32"K	\$162	\$129
9"x60T5/8" 3/32"K	\$156	\$119
8"x60T5/8" 3/32"K	\$150	\$109

NEW!

8-1/4"x60T5/8" 3/32"K	\$150	\$109
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With this one ALL PURPOSE blade you can RIP & CROSSCUT 1"-2" ROCKHARDS and SOFTWOODS resulting in a SMOOTH AS SANDED surface. PLY-VENEERS of OAK and BIRCH will crosscut with NO BOTTOM SPLINTER at moderate feed rates.

	LIST	SALE	10%	20%
DOUBLE HARD and 40% STRONGER C-4 CARBIDE				
Ends blade changing				
Ends scratchy saw cuts				
Ends second-step finishing				
Ends cutting 1/16" oversize to allow for RESURFACING				
BUY AND SHARPEN 1 BLADE INSTEAD OF 3				
5/8" holes, boring thru 1-1/4" add \$7.50. Larger at Time Basis—Shipping \$4.50				
WOODWORKER II	LIST	SALE	10%	20%
14"x40T1"	\$215	\$149	\$134	\$119
14"x30T1"	\$195	\$139	\$125	\$111
12"x40T1"	\$183	\$129	\$116	\$103
12"x30T1"	\$162	\$119	\$107	\$ 95
10"x40T1/8" or 3/32"	\$156	\$119	\$107	\$ 95
30T 1/8" or 3/32"	\$135	\$ 99	\$ 89	\$ 79
9"x40T	\$146	\$109	\$ 98	\$ 87
30T	\$125	\$ 99	\$ 89	\$ 79
*8-1/4"x40T 3/32"	\$136	\$ 99	\$ 89	\$ 79
8"x40T 3/32"	\$136	\$ 99	\$ 89	\$ 79
30T	\$115	\$ 89	\$ 80	\$ 71
7-1/4"x30T 3/32"	\$112	\$ 69	\$ 62	\$ 55
**6"x40T 3/32"	\$136	\$ 89	\$ 80	\$ 71

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WOOD® Magazine test, Sept. '93, pg. 45

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The Proof Is In the Cutting

Both Woodworker II blades performed very well, whether cutting through butter-soft 3/4"-thick pine or iron-hard 1 1/4"-thick ash. The 20° positive hook angle and 15° alternate top bevels give the blades an aggressive attack; we maintained a brisk, uniform feed rate while ripping a variety of woods on the powerful Unisaw and experienced no discernible resistance or slowing. On the smaller saws, switching to the thin-kerf blade allowed very similar feed rates, again with barely noticeable resistance.

Although we've used blades that cut faster, their cut quality couldn't touch what we got with the Forrest blades. On solid stock, ripped edges came off our saws **jointer-finished**, smooth and slick with no visible teeth marks—good enough to edge-glue without additional machining. Crosscuts came out crisp and clean with no fuzzing or tiny splintering. The Bottom Line

Performance of the Woodworker II is impressive enough that you could bolt this versatile, general-purpose blade on your saw and use it for virtually all of your cutting operations.

SHOP TEST, Woodworker's Journal
Nov./Dec. '95 pg.78

NEW DELUXE DADO-KING!



C-4 Carbide Tips — 4 on each chipper with special negative face hooks.

	LIST	SALE	10%	15%
6" D. 5/8" Bore NEW	\$299	\$269	\$242	\$229
8" D. 5/8" Bore	\$321	\$289	\$260	\$245
10" D. 5/8" & 1" Bore	\$389	\$349	\$314	\$297
12" D. 1" Bore	\$499	\$449	\$404	\$382

(Bore up to 1-1/4" Add \$25 — Plus \$5.50 S&H)

DURALINE HI-A/T FOR TABLE & RADIAL SAWS

ALL FLAT FACE

5/8" HOLES. Boring up to 1-1/4" \$7.50 extra. Larger holes—time basis. Shipping \$4.50.

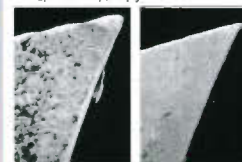
Faster feed rates & absolute splinter control. Stops splintering on OAK/BIRCH PLY VENEERS & MELAMINE.

SIZES AVAILABLE	LIST	SALE	SIZES AVAILABLE	LIST	SALE
7-1/4"x60T3/32" K	\$149	\$129	12"x100T1-1/8"K	\$253	\$215
8"x80T1/8" & 3/32" K	\$202	\$169	14"x80T1"	\$232	\$197
9"x80T1/8" & 3/32" K	\$207	\$179	14"x100T1"	\$266	\$226
10"x80T1/8" & 3/32" K	\$207	\$159	16"x80T1"	\$262	\$223
12"x80T1-1/8"K	\$212	\$181	16"x100T1"	\$294	\$243

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Standard C-2 Carbide (below, left) and FORREST still sharp Oxidation and Corrosion Resistant Sub-Micron C-4 Carbide (below, right). Each shown after cutting 3,500 feet of MDF. Similar results obtained cutting particle board, melamine, and plywood.



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