

6 GREAT  
PROJECTS

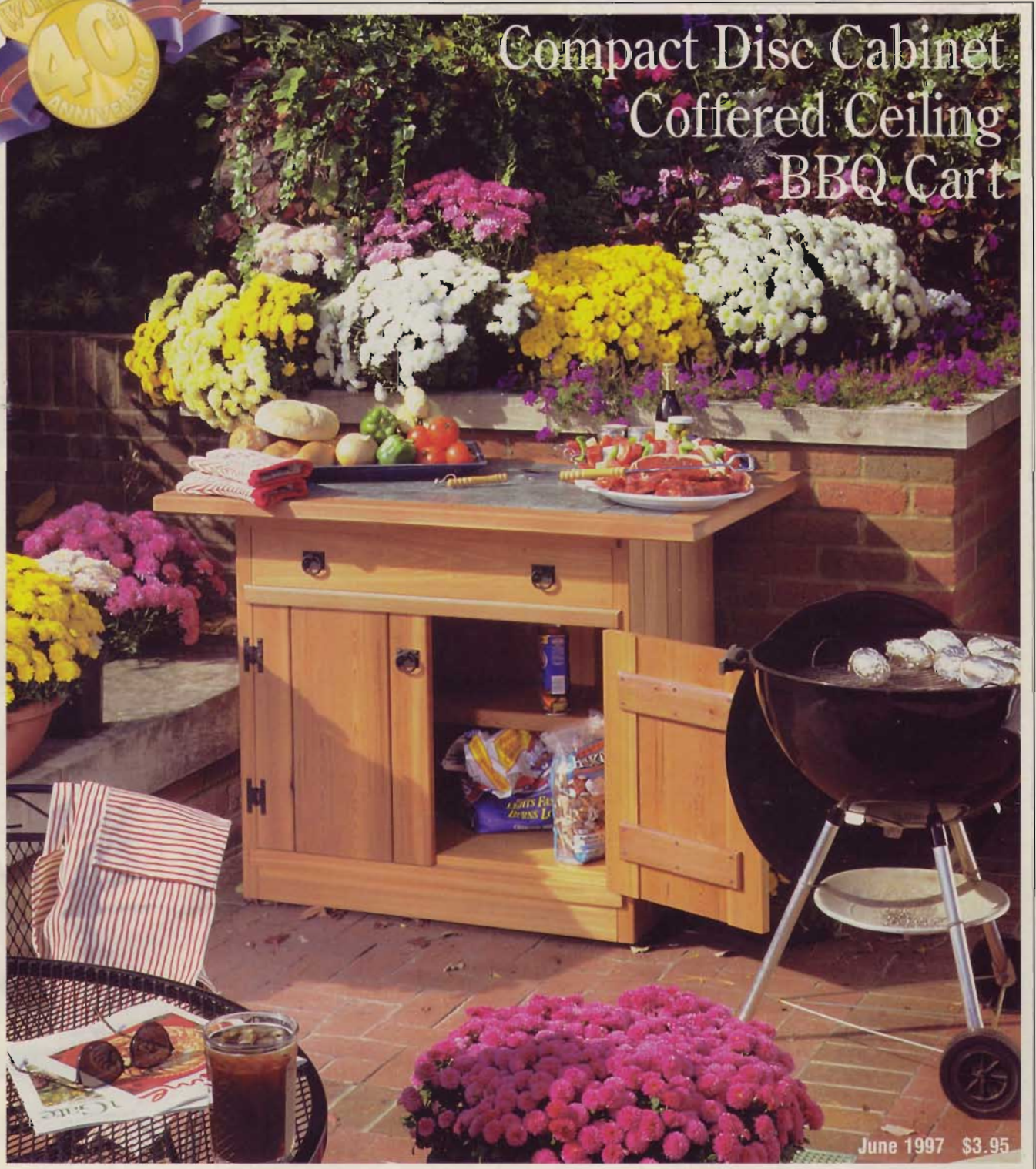
BOOKENDS ■ TRADITIONAL SHUTTERS ■ STEP TOOL BOX

# WORKBENCH®

THE ORIGINAL HOME WOODWORKING AND IMPROVEMENT MAGAZINE



Compact Disc Cabinet  
Coffered Ceiling  
BBQ Cart



June 1997 \$3.95

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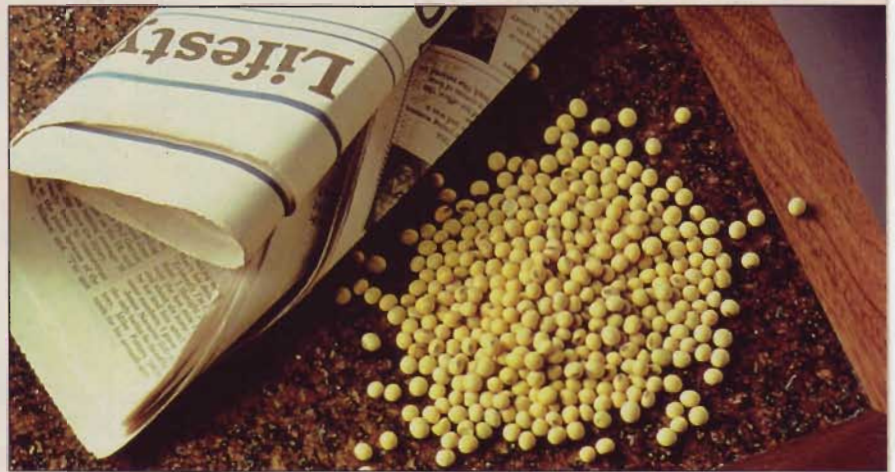
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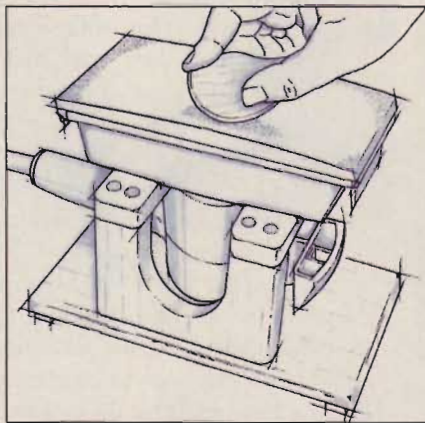
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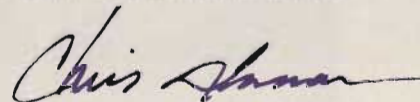
This is the third issue of the new *Workbench*. Believe me, I've gotten more than my share of mail these past few months. I'm excited that most of you like the changes and feel the magazine is heading in the right direction. A letter from Chris Horn, a reader in

At its core, *Workbench* has been and always will be primarily a woodworking magazine that brings you a variety of both easy and challenging projects. When I say woodworking I include furniture, tips and techniques, and home improvement projects like deck building, constructing a garden tool shed, and adding a dormer.

What we're trying to do is improve on what *Workbench* has been so that it serves your needs better. That means more detailed illustrations and photography than ever before. More step-by-step information to assure readers who are unfamiliar with a technique that they can successfully complete the project. And finally, more projects you can actually build with the tools you have.

As many of you know, this is not the first time *Workbench* has adopted a new look and shifted formats. In fact, the covers at left don't even come close to showing all the changes that have taken place over the past 40 years. What the covers do say is that change has always been part of *Workbench's* growth and success.

Even more important than change, however, is the quality of *Workbench* readers. You are the magazine's most valuable resource, and the reason it goes in the mail and on the newsstand every two months. It's important that your voices are heard. Keep the letters coming — good and bad — and we will work hard to make every issue of *Workbench* better than the last.



Chris Inman, Editor

**Safety Reminder:** Woodworking and home improvement are rewarding hobbies. But there is risk of injury. Use the guards and read the manuals that come with your tools and equipment. And if you're uncertain about a technique, find an alternative with which you are more comfortable. Please take safety seriously.

## WORKBENCH

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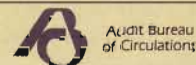
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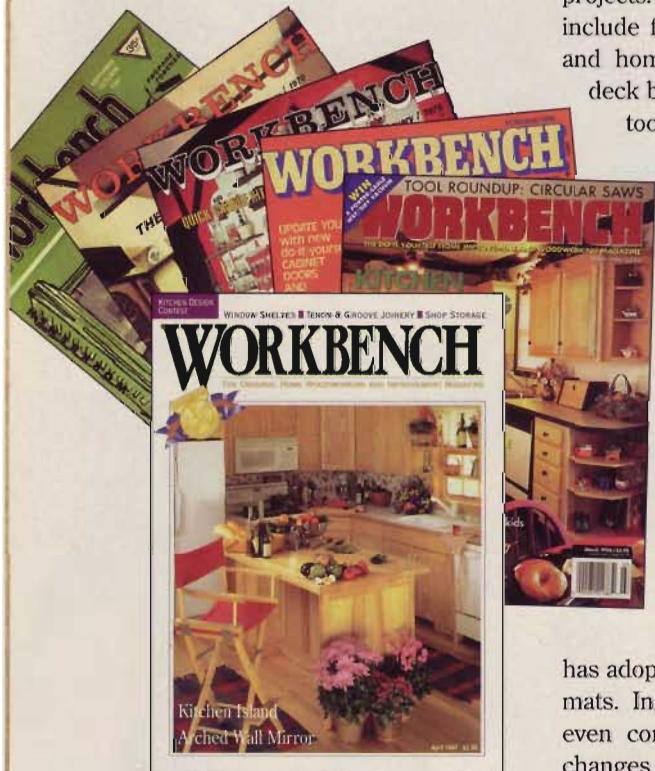
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Blythewood, SC, is typical of most of the mail: "Kudos on the new *Workbench* magazine. I have to be honest. I had all but decided not to renew my subscription, but changed my mind when the latest edition arrived. The old *Workbench* had changed a lot over the years, and, while its eclectic content was somewhat interesting, I no longer found it satisfying. I love the new format, especially the greater focus on woodworking. Congratulations."

On the other hand, we've received letters from several long-time subscribers who are unhappy with the changes. Some have wondered why the magazine was changed at all.

# Questions & Answers

## Electrical Outlets

**Q** *At the local hardware store, they have inexpensive electrical outlets in a bin, and also individually wrapped ones on the shelf that cost several times as much. Are the inexpensive ones safe?*

*Brian Greene  
Long Beach, CA*

**A** Electrical outlets that look identical at first glance can actually have significant differences that explain the difference in price, according to my sources at Leviton Manufacturing. You may be comparing outlets with different amperage ratings, or even different grades of electrical outlets.

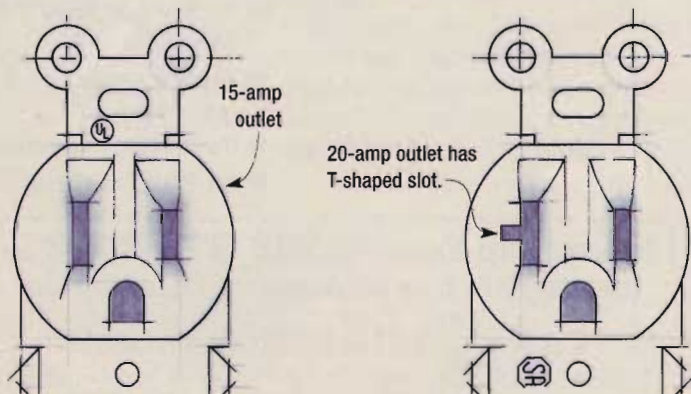
The drawings show the subtle visible difference between an outlet rated for a heavy-duty 20-amp circuit, and the more common 15-amp variety. The 20-amp outlet is more expensive because of its beefier internal components, as well as the fact that it is less commonly used.

You may be surprised to learn that there are different grades of electrical outlets. Most manufacturers produce three grades: for residential, commer-

cial, and industrial use. A residential outlet would not stand up to the punishment an outlet endures in a hospital, chemical plant, or steel mill. That's why industrial units have nylon faces and backs instead of the thermoplastic used on residential outlets. They also have heavy straps that won't bend after decades of hard use. But spending the extra money for industrial strength simply isn't necessary for residential use.

Your assurance of safety in electrical products is their listing by an independent testing agency. In the United States, look for the Underwriter's Laboratories (UL) symbol. The Canadian counterpart of UL is the Canadian Standards Association (CSA), and in Mexico, it's Normales Oficial Mexicana (NOM). As long as the electrical device carries the appropriate logo, it should be safe when properly wired.

You should match the rated capacity of the outlet to the breaker for the circuit, and use the appropriate wire size. For example, a 15-amp outlet goes on circuits with a 15-amp breaker and uses 14 gauge wiring. The 20-amp outlet gets paired with a 20-amp breaker and utilizes 12 gauge wire.



## SHARE YOUR QUESTIONS

If you have a question about woodworking or home improvement, we'd like to see if we can answer it for you. Just write down your question and mail it to **WORKBENCH Q&A**, 2200 Grand Ave., Des Moines, IA 50312. Please include your name, address and daytime phone number in case we have any questions for you. If you like, Fax us at (515) 283-2003 or send a message to us at [workbench@workbenchmag.com](mailto:workbench@workbenchmag.com) on the internet.

## Skip A/C Wrap

**Q** *When the air-conditioning season is over, some neighbors wrap their outdoor condenser units in plastic. Others don't. Who's right?*

*Mark Hughey  
Atlantic City, NJ*

**A** Wrapping up the condenser can trap moisture inside the unit, and accelerate rust and corrosion. Leaving it open permits air to circulate freely. So even though the condenser may get wet during the off-season, it will dry quickly.

But there are a couple of preventive maintenance chores you can do every autumn to prolong the life of your condenser unit. After disconnecting the power, remove the metal shroud and clean out any leaves or debris. To prevent water from pooling, make certain that the drain pan holes and tubes are clear. If necessary, unclog them with a length of wire.

## Slippery Steps

**Q** I recently painted my back porch and outdoor steps with a semi-gloss exterior paint, but now the treads of the steps get dangerously slippery when wet. I don't like the looks (or high price) of anti-slip tape. Any suggestions?

*Peggy Serviss  
Kansas City, KS*

**A** Scuff-sand the steps, mix a sand-finish additive into your paint, and recoat the treads. Available at most paint and hardware stores, the additive is a dry, fine-textured volcanic product compatible with either oil or latex-base paints. Follow label directions (the usual proportion is eight ounces of sand per gallon), mixing it thoroughly. Stirring the contents of your container every so often during application makes certain that the sand remains evenly suspended in the paint.

## Hot Tub Location

**Q** What are the considerations I should weigh between putting a hot tub indoors, in my basement, for example, as opposed to putting it outdoors on my patio?

R. L. Guinan  
Santa Clara, CA

**A** Placing a hot tub inside your house will release a lot of moisture into the air, increasing your home's humidity.

When your tub's top is off and the water is hot, this humidity could actually reach the point of condensing and dripping on the walls.

Obviously, humidity won't be a problem outdoors. An outdoor tub is much easier to drain, but you can expect your tub to age faster due to the sun and weather, and your electric bill will be substantially higher.

Ultimately, the decision for the location of your hot tub will be based on aesthetics and available space.



Undercutting ensures concrete will anchor post. Make hole 3 times bigger than post, and 6" deeper than the frost line.

## Setting Posts

**Q** I set a wooden mailbox post in concrete at my old house, but I really wasn't impressed with its sturdiness. I'm getting ready to build a fence at our new house, and would like your advice on how to get stronger results.

Jim Holly  
N. Muskegon, MI

**A** To get a super-sturdy post, you need to do some smart digging and use the right concrete mix.

Plan on making the top of the hole three times the diameter of the post (about a foot across for a 4" x 4" post, for example). Then, undercut the hole as shown in the drawing. This acts like a three-dimensional dovetail to lock the post in place. Dig 6" deeper than the frost line in your area (ask at your home center), and put in a few shovelfuls of gravel for drainage. Instead of regular concrete, buy sacks of a fast setting mix specially formulated for installing posts.

## A Fast, Accurate Way To Trim Doors

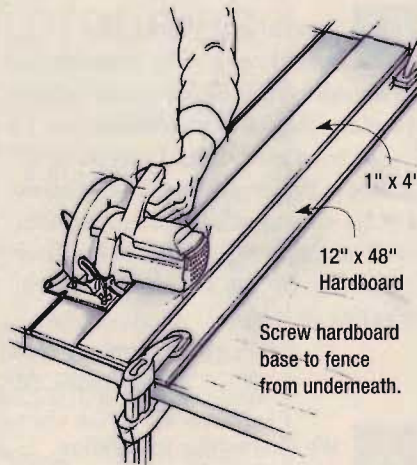
**Q** We had some new carpet installed, and now some of the doors rub. How do I trim the doors without splintering the faces?

J. Bednar  
Plano, TX

**A** You'll get great results with the jig shown in the drawing. It's easy to build and simple to use. Start with a 12" x 48" strip of 1/4" thick hardboard. Glue and screw the hardboard to a straight 1" x 4" fence that's also 48" long. Make sure the screws are countersunk far enough so they won't scratch your door.

With the shoe of your circular saw against the jig's fence, trim the hardboard. Now the edge of the jig shows the exact cutline your saw will make.

To use the jig, first mark the ends of the line you want to cut on the door. Next, clamp the jig in place, aligning the edge of the hardboard with the marks. Set your circular saw to cut only 1/16" deep into the door, and make an initial pass. This cut



scores the wood fibers to prevent splintering. Then set your blade to project about 1/2" through the door, and trim it to size.

You can make a cutting guide like this to any length you want, or even make one for your router to use as a dado jig. Just remember that the jig is sized for a specific blade. That's why it's a good idea to label the jig, so you don't have to guess which blade to pick the next time you want to use it.

## Wood Thickness

**Q** Your articles sometimes refer to wood in thicknesses like 8/4. What does that mean, actually?

Pat McCormick  
Pensacola, FL

**A** Lumber is often designated by "quarters," which refers to the number of quarter inches in the thickness of the rough stock. After the wood is surfaced, the lumber is sold in the familiar thicknesses shown in the chart below.

In writing, the thickness is shown with a slash mark separating the two numbers (8/4, for example) and without the inch mark. In conversation, you say "eight-quarter" stock.

Standard Hardwood Thicknesses:

Quarters	Rough	Surfaced
3/4	3/4"	9/16"
4/4	1"	3/4" to 25/32"
5/4	1 1/4"	1 1/16"
8/4	2"	1 3/4"

## Repairing Popped Nails In Your Ceiling

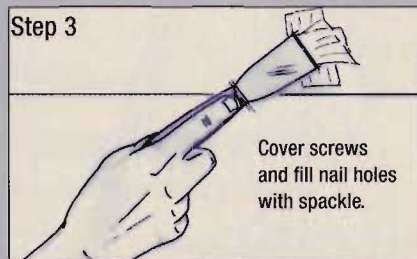
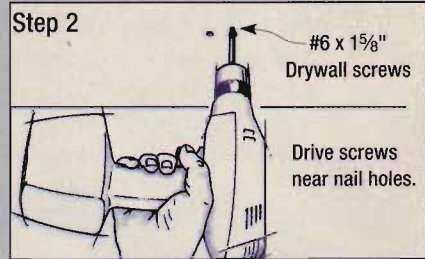
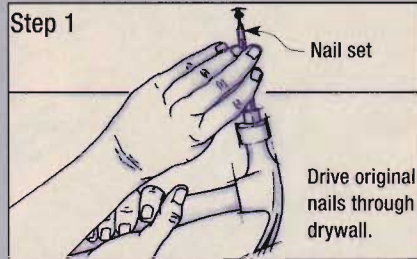
**Q** Our house is two years old, and the nails in the ceiling in some areas are popping out, making noticeable bumps in the texture. The texture is sprayed on and very rough. Do you have any suggestions for repairing the holes and matching the texture? I would like to fix just the holes without painting the whole ceiling.

Carl Anderson  
St. Louis, MO

**A** Don't bother repairing the texture without first addressing the root of this problem.

To begin, you may need to scrape away existing texture at the problem sites. If the nails are protruding, try to remove them. If they won't come out, hammer them through the wall-board, using a nail set.

Drive drywall screws near the nail holes, making sure that you hit a joist. Next, cover up the nail holes and screw heads with spackle.



As for the texture, there's a spray-on product by Homax called Spray Texture that's available at many paint stores. It comes with three tips for spraying different patterns, one of which may match your ceiling. Call (800) 729-9029 for more information.

Experiment on a piece of cardboard to get a feel for applying the spray texture. To get a better blend with your existing ceiling, feather out the texture from the repair site. When the texture dries, you'll probably need to paint the entire ceiling.

## Hot Water Noises

**Q** I have a forced hot water heating system with fin tube baseboard heating. At night, I hear an annoying gurgling and rumbling of water in the baseboard unit. What can I do to silence this annoyance?

Janet Makson  
Lansing, MI

**A** A forced hot water heating system is a closed system. Once it is filled with water, it rarely needs any more.

On the boiler, you'll find a temperature and altimeter gauge. If the altimeter reads 10 or more when the temperature is 180° or above, your noise problem is caused by low water level in the system. The solution is a new automatic feed valve or an adjustment to your current one.

You may need to hire a home heating specialist for replacements or adjustments. Incidentally, the reason it seems to happen only at night? The house is quiet at night so you can hear it better.

## How To Repair Squeaky Floors

**Q** Several spots in my floor squeak, and other than serving as an advance warning system against burglars, they're very annoying.

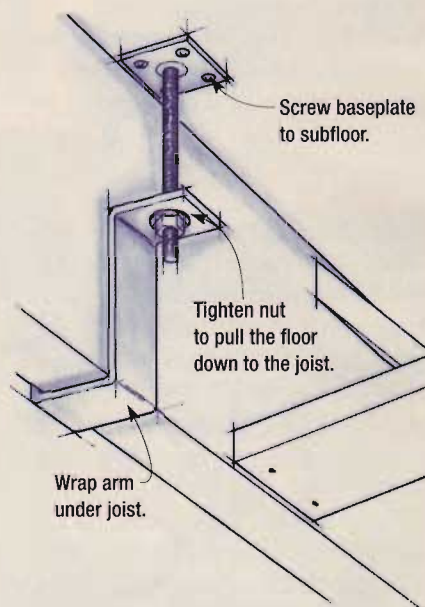
I've tried everything I can think of to fix the problem — nailing or screwing the floorboards down to my joists, even adding wedges between the floor and joists. Do you know of any more effective systems?

Drew Eveland  
Minneapolis, MN

**A** We share your frustration. You've tried most of the traditional methods of dealing with squeaks, but they are not always effective, as you've discovered.

A recently-introduced product called Squeak Ender takes a new approach to solving this problem. The drawing shows you how it works.

One advantage of this product is that you do not have to remove floor coverings to use it. For best results at pinpointing the location of squeaks, recruit someone to walk on the floor



while you work under the joists. If the Squeak Ender doesn't work in one location, you can unscrew it and move it to a new spot. Squeak Enders are priced at \$6.99 each. Call E&E Consumer Products at (800) 323-0982 for more information.

# Shop Tips

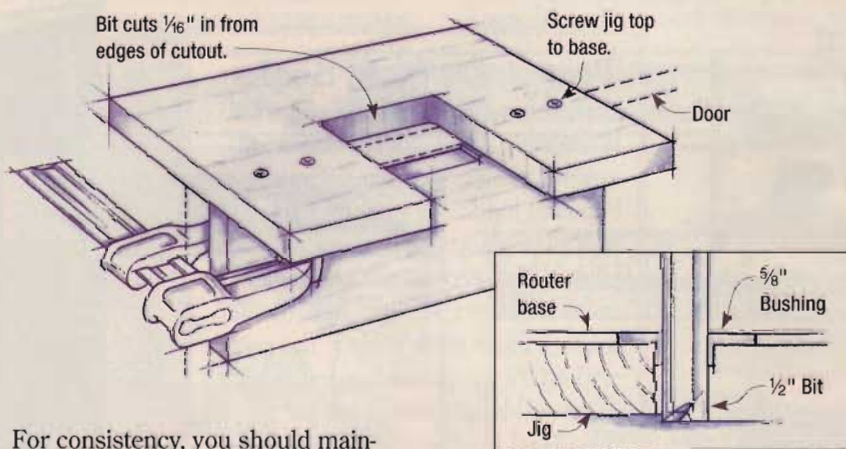
## Door Hinge Routing Jig

I was installing new interior doors in a friend's house, and came up with this jig for cutting hinge mortises with a router and straight bit.

Size the opening in the jig  $\frac{1}{16}$ " larger than your hinge on all three sides. Place a  $\frac{5}{8}$ " bushing (outside measurement) in your router, along with a  $\frac{1}{2}$ " straight bit. The bushing can be purchased at a tool supply store.

Adjust the cutting depth of the bit to match the thickness of your hinge (usually about  $\frac{1}{8}$ "). As you move the router within the opening, it will rout the mortise.

If the hinge has square corners, clean up the mortise corners with a chisel. Be sure to test out the jig on some scrap wood (the same thickness as the door) for size and depth.



For consistency, you should maintain the same router position every time you use the jig — don't rotate the router as you work. This method cancels out the potential for error caused by a bushing that is not perfectly concentric with the bit.

As you use the jig, move the router clockwise to outline the mortise, then remove the waste in the center.

*James A. Johnson  
Brunswick, OH*

## Sander Cradle

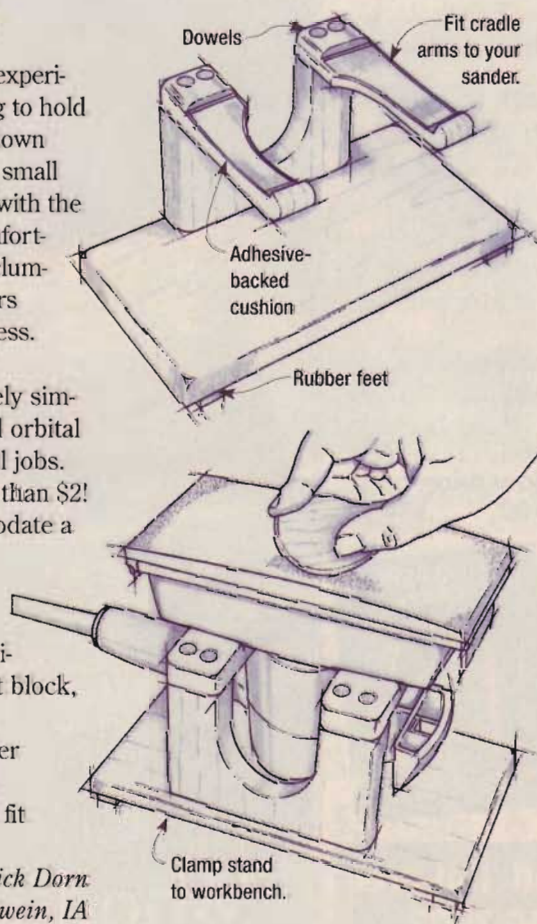
For years, I've observed my inexperienced shop students struggling to hold a heavy orbital sander upside down with one hand while running a small piece of wood over the sander with the other. At best, the job is uncomfortable and tedious; at worst, it's clumsy and ineffective. A few sanders have been dropped in the process.

To fix the problem, I finally designed and built an extremely simple stand to cradle an inverted orbital sander while performing small jobs. And the whole thing cost less than \$2!

I built my stand to accommodate a Porter-Cable Model 505, the same model we've used for nearly three decades. The primary parts include two horizontal arms, a vertical support block, and a flat base.

The stand supports the sander without creeping or excessive vibration. Adapt my drawing to fit your sander.

*Dick Dorn  
Oelwein, IA*



## Driving Stakes

Driving wood stakes into dry soil is a tough job. If your soil has a high clay content, it can become a nearly impossible task.

You can solve this problem by first hammering a steel rod into the ground to create a pilot hole. A piece of cold-rolled steel rod (check at your hardware store) about  $\frac{3}{4}$ " to 1" in diameter is ideal if you have a number of stakes to drive. If you're doing only a few holes, a length of galvanized pipe will substitute. Rip your stakes slightly larger than the pilot hole for a snug fit.

*Laurie Aubuchon  
Los Altos, CA*

## SHARE YOUR TIPS, JIGS, AND IDEAS

If you have a unique way of doing something, we'd like to hear from you. Just write down your tip and mail it to WORKBENCH Shop Tips, 2200 Grand Ave., Des Moines, IA 50312. Please include your name, address and daytime phone number in case we need to reach you. If you like, Fax us at (515) 283-2003, or e-mail us at [workbench@workbenchmag.com](mailto:workbench@workbenchmag.com) on the internet. We'll pay you \$50-\$150 if we publish your tip.



## Removing Glue

I was refinishing an old chair, and ran into some trouble with the glue that remained on the rung tenon and in the socket in the leg.

Fortunately, some wood glues remain water soluble, even after many years. I wrapped the glue-encrusted tenon with a wet rag, and stuffed another rag in the socket.

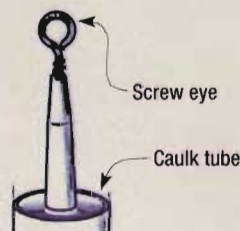
After about 20 minutes, I gently scraped away the softened glue without damaging the underlying wood.

The water will make the wood swell slightly, so let the parts dry thoroughly before regluing and completing the repair.

*Allan Kirch  
Birmingham, MI*

## Tube Storage

Here's a method for capping tubes of caulk and adhesive that provides a storage system while also keeping the contents fresh.



Simply turn an appropriately-sized screw eye or hook into the nozzle and hang the tube on a nail or pegboard fixture. This system works with tubes of all sizes, so you'll need to buy an assortment of screw eyes. But their small cost is offset by the savings in products that don't dry out—plus the convenience of being able to easily find the tube you need.

*Lare Austin  
Springfield, MO*

## UNFINISHED TO FINISHED IN HALF THE TIME



Now wood finishing is twice as fast, twice as easy with Minwax® Polyshades®. That's because Polyshades® combines stain and polyurethane in one. Stain to add rich color and enhance wood's natural grain, and polyurethane for



long-lasting protection and a warm luster.

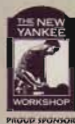
Polyshades comes in a variety of colors, and can be used over raw wood or even previously finished wood, without having to strip away the old finish. Polyshades. A beautiful finish in a lot less time.

## STAIN & POLYURETHANE IN ONE



Makes And Keeps Wood Beautiful™

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## Dye Tracks Leak

Here's an easy method for detecting a leak between the tank of a toilet and the bowl. After the last flush of the night, put some water-soluble dye (like food coloring) into the toilet tank. If the water in the bowl is tinted in the morning, you have confirmed the problem.

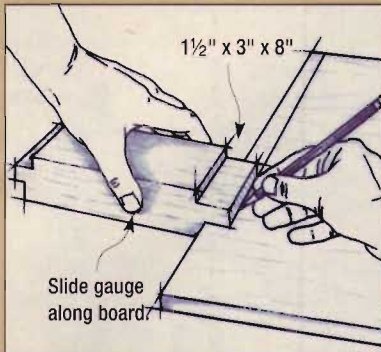
To repair it, drain the tank by shutting off the water supply to the toilet and then flushing. Lift the flapper ball to inspect the valve seat — it should be smooth and clean. Wipe a plastic valve seat with a cloth; gently scrub a metal one with a scouring pad. You may also need to replace the flapper ball itself.

*Anthony J. Ruggieri  
West Warwick, RI*

**Editor's Note:** This technique will help you detect leaks at other points. Carefully inspect the tank bolts, the coupling nut at the ball cock connection, and the gasket between the tank and bowl. A flashlight and mirror make this task easier.

## Marking Gauge

I took a piece of 1½" thick hardwood and made a marking gauge with fixed settings at the dimensions I use most often in the shop: ¾", 1½", ¾", and 1".



I cut all the rabbets ½" deep, using the dado blade in my table saw. For safety, I did all the machining on a 12" length of stock, then cut the gauge free as the final step.

*Philip Brazier  
Bristol, England*

## Saw Tuneup

All power equipment requires periodic maintenance for top performance. Here are some tune-up procedures for the table saw:

- Drive belts — check tension, and alignment between pulleys. Consult your owner's manual for adjustment instructions.
- Tabletops and unpainted surfaces — wipe on a good coat of floor wax, then buff it off after drying. This prevents rust and keeps surfaces smooth.
- Fence and miter gauge — check with a square for parallel or 90° angles between blade, fence, and stops. Follow manufacturer's instructions for adjustments.
- Gears and bearings — blow out dust to prevent them from tightening up. Vacuuming also helps. When recommended, lightly oil bearings or motor after cleaning, or lubricate with powdered graphite.

*Duane Weber  
Pahrump, NV*

## Hammering Help


In the February, 1997 Q&A column, one reader suggested putting a piece of cardboard against the wall to protect it from hammer tracks when nailing molding into place. I use a different method to protect the molding itself.

Buy some inexpensive pine or cedar shims at your home center, and nail through a shim into the molding. The


shim will cushion any stray hammer blows without marring the molding.

Countersinking the nail into the molding releases the shim. Re-use a shim until it splits into pieces. Avoid splitting hardwood molding by drilling pilot holes through the shim and molding.

*Jason Beers  
Parkville, MO*




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\*Patent Pending

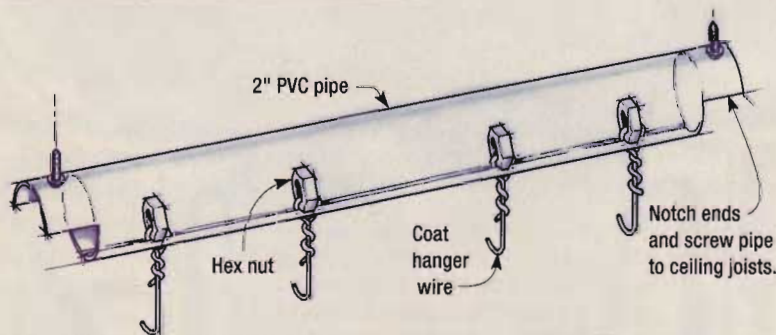
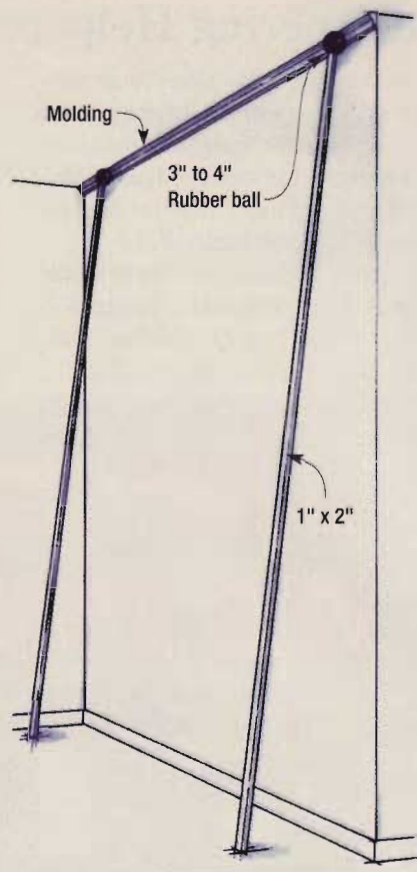
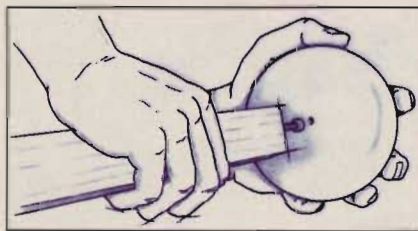
## Molding Helper

I was installing some crown molding recently, and couldn't find a helper to hold up the end of a long piece.

I solved the problem by attaching a rubber ball to the end of a 1" x 2". Get a firm rubber ball about 3" or 4" in diameter. Drive half the length of a 3" screw into the end of your lumber, then screw the ball into place (you may need to drill a pilot hole into the ball). The spring of both the 1" x 2" and the ball held the molding gently but securely in position while I worked.

In addition, this extra hand never gets tired or needs a coffee break.

*Doug Steward  
Portland, OR*



## Quick And Easy Overhead Storage

My boss introduced me to a clever little setup for hanging all kinds of small, lightweight shop items — brushes, extension cords, rolls of tape. It helps organize stuff that usually gets lost in a drawer or jammed on a peg.

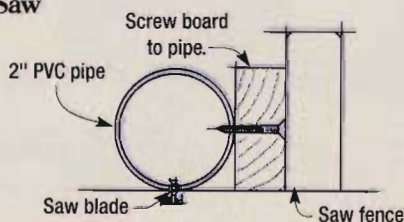
This system also takes advantage of the space that we tend to use the least: the area over our heads. The

basis of this rig is simply a piece of 2" PVC plumbing pipe in which a saw kerf has been cut lengthwise to form a slot. Hooks were jury-rigged from spare hex nuts and coat hangers. Notches at the ends allowed me to screw the pipe to the ceiling joists.

*R.B. Himes  
Vienna, OH*

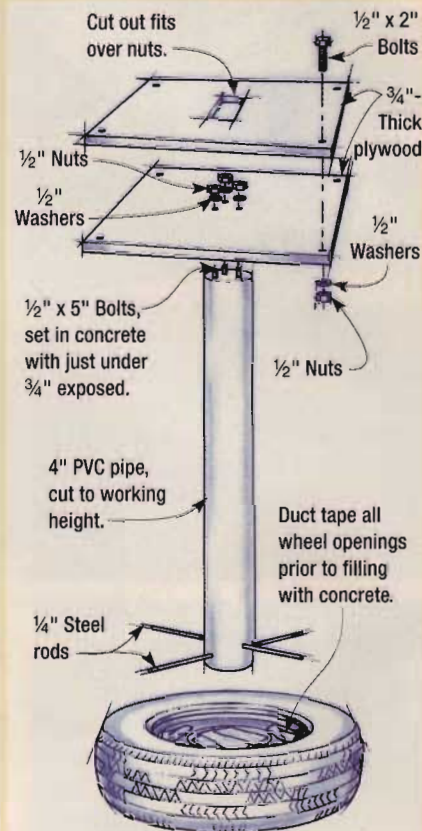
### Editor's Note: Cutting PVC on a Table Saw

The PVC pipe for the Overhead Storage tip needs a kerf, but ripping round material can be dangerous. Rest a board alongside the PVC and screw them together. The board stabilizes the PVC while you cut a kerf.



## Utility Stand

This tool stand combines super-stability while using a minimum of floor space. I have found that this stand works great for supporting a grinder, but you could adapt it to a variety of other uses in your shop.



Start with a discarded donut, the undersized spare tire and wheel that comes with many compact cars. Using duct tape, seal all the openings in the wheel. Cut 4" PVC pipe to your working height. Thread two 1/4" steel rods through holes near the bottom of the pipe, and center the pipe in the wheel. Using concrete, fill the wheel and the PVC pipe.

Set three 1/2" x 5" bolts in the concrete, threads pointing up. Allow just a shade under 3/4" of each bolt to protrude. Mount the bottom platform to these bolts. Finally, attach the upper platform. Notice that the upper platform has an opening in the center to accommodate the bolts.

*Erwin V. Cohen  
Orlando, FL*

# Over The Fence

## Art Meets Craft at Northern Woods

Northern Woods is the annual exhibition of items crafted by members of the Minnesota Woodworkers' Guild. The latest show, held October 17 to 20, 1996, served two purposes. First, it gave Guild members an opportunity to display and compare their work. Second, it gave the general public a rare glimpse of the high-quality art and craftsmanship of the area's amateur and professional woodworkers.

The canoe built by Don Grandbois of Minneapolis earned the Most Technically Accomplished award. The canoe, which is over 18 ft. long, is made from aspen veneer with ash trim.

The small photo is a detail of the hand carved design on the top of a five board bench crafted by Pat Juettner of Eagan, an amateur wood-

worker for ten years. To give you an idea of the extraordinary level of craftsmanship at the Northern Woods show, this impressive entry did not win an award.

On the other hand, Ross Peterson of Hanover walked away with three awards for his sideboard — Best in Show, People's Choice, and the Peer Award, given by fellow exhibitors.

The subtle curves in the top were hand-sawn and then planed by hand. Ross has worked as a structural and ornamental ironworker for 17 years.



## Furniture Classes in Scenic Maine

The Center for Furniture Craftsmanship offers twenty-four different workshops in furniture making and related woodworking skills, taught by a faculty of outstanding professional craftsmen. Located in the coastal village of Rockport, Maine, the center is an ideal place to combine vacation with avocation.

Courses vary in length from a weekend with finisher Bob Flexner to a 12-week intensive course co-taught by the center's director, Peter Korn, and Lynette Breton, a professional woodworker with 20-years' experience. Most courses are one- and two-week workshops scheduled from June through October. The 12-week intensive takes place in winter.

This year, two of England's most respected craftsmen will cross the Atlantic to give workshops at the center. Alan Peters will offer a two-week, intermediate/advanced level workshop on carcass construction with an emphasis on traditional hand skills. Master carver Chris Pye will teach



Peter Korn, the director of the Center for Furniture Craftsmanship, demonstrates the use of a spokeshave while a student watches.



consecutive week-long courses in ornamental relief carving and incised letter carving for novice and intermediate level carvers.

Peter Korn, the center's director, is the author of the book *Working with Wood*, published by Taunton Press. He writes, "The excitement with which beginners approach the most mundane skills revitalizes my own sense of wonder at the miracle

of craftsmanship. Practice is the most essential component to mastering craftsmanship."

Tuition is \$430 for one-week classes, \$790 for two-week. For further information or a 1997 workshop catalog, contact The Center for Furniture Craftsmanship, 25 Mill St., Rockport, ME 04856, or phone (207) 594-5611.

## Habitat For Humanity Builds Dreams

Since its founding in 1976, Habitat for Humanity International (HFHI) has worked to eliminate poverty housing and homelessness wherever it can. So far, the group has been responsible for building approximately 40,000 houses worldwide, providing safe and affordable shelter to over 250,000 lucky people.

HFHI utilizes volunteer labor and tax-deductible donations of money and materials to build or renovate simple, decent houses.

A unique aspect of the program is that the homeowner is considered a partner in the construction process. And these future homeowners invest hundreds of hours of their own time and sweat building their home and the houses of others.

The local Habitat affiliate sells the home at no profit to the homeowner-partner. And a no-interest loan keeps the mortgage reasonable. The monthly payments from the home-



Habitat for Humanity volunteers work in partnership with the future homeowner to create safe and affordable housing.



owner go into a revolving Fund for Humanity to build more houses in the community and worldwide.

To find out more about Habitat for Humanity and to learn about projects going on in your area, call (912) 924-6935 or toll free at (800) HABITAT.

## Home Safety

Home Safe and Sound is an appropriate title for this free, public service guide with magazine-quality articles and illustrations. Each issue offers readable and interesting articles on topics like children's safety, home security, and first aid.

Reviewed by a board of national safety experts, a typical edition might include articles on home decorating safety, child-proofing your home, water purification, and safety at school.

To receive a copy of this full color, 42 page guide, send \$1.50 for shipping and handling to Home Safe & Sound, Free Offer, PO Box 6960, Villa Park, IL 60181.



## Springtime Seasonal Inspection

Now that the weather has warmed up a bit, it's a good time to perform your home's annual exterior inspection.

Maintaining your home's exterior is as important as spring cleaning and interior household repairs.

Detecting a potential problem early and correcting it will save you aggravation and money in the long run. ABTco of Roaring River, NC, a siding manufacturer, suggests the following checklist to help you with your annual exterior inspection:

- Brick or concrete — seal any surface cracks, and cut away any shoots growing into the wall.
- Hardboard siding — caulk any joints that have opened up, and repaint as needed.
- Plywood siding — check for flaking paint, exposed seams, and mildew. Recaulk and paint as necessary. Mildew needs to be thoroughly removed before painting.
- Wood siding — scrape away any

loose paint, then prime and repaint exposed surfaces.

- Synthetic stucco — look for signs of water penetration, especially on or near ceilings, all around windows, at

sills and floor lines.

Also inspect roofs, gutters, downspouts, chimneys, windows and doors. Required repairs should be performed promptly.



## Low-Cost Indoor/Outdoor Plans

Many people know that the Western Wood Products Association (WWPA) is a source of authoritative information on lumber building materials.

After all, WWPA is the largest association of lumber manufacturers in the United States. Its standard grading rules assure lumber purchasers of consistent quality within the various grades, regardless of the mill that produced the lumber.

But a lesser-known facet of the Association's operation is its series of plan sheets that show you how to build a number of useful and decorative projects for your



The Western Wood Products Association offers a wide variety of plans for indoor and outdoor projects. A plan sheet for this gazebo is \$2.

home and yard. And the reasonable cost of the plans can't be beat — for example, a wood deck design kit is only 50 cents, and none of the plans are more than \$2.50 each.

Indoor projects include a room divider, a mobile baking center, a workbench, and storage ideas for your garage and other areas.

Moving outdoors, you can get plans for fences, planters, a doghouse, and arbors.

To get a full list of available plans, write to WWPA at Yeon Building, 522 SW Fifth Avenue, Portland, OR, or call (503) 224-3930.

## Ultraflush Toilet



Pressure-flush toilets — long used in commercial buildings — are now available for residential installation.

The \$316 Gerber Ultraflush pictured above complies with Federal 1.6 gal/flush guidelines. But it offers advantages over gravity toilets, including a larger water surface area and more thorough flushing action.

For more information, call Gerber Plumbing Fixtures at (847) 675-6570.

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Patricia Nelson taught herself woodworking and now enjoys spending her retirement making boxes, turning bowls, and building furniture.

## Woman Gets Her Place in the Shop — Finally

When Patricia Nelson of Long Beach, Washington tried to enroll in high school shop class 55 years ago, no amount of begging and pleading would persuade the school to accept her. So she taught herself woodworking.

Today the retired nurse spends her days in her shop, turning bowls on her lathe, building boxes, and collecting exotic wood that floats ashore from across the ocean.

"It used to be that when my husband and I went into a hardware store and I said, 'I want a saw,' they'd turn to

my husband." She admits that men her age were brought up in a different time, and is glad to see that attitudes are changing now. Today, she feels women are more accepted in the shop.

When her husband died three years ago, she bought a house with a huge detached shop that was fully loaded with woodworking equipment. The house came furnished and she tried to talk the seller into taking the furniture and leaving the tools, but he wouldn't. So she sold the furniture and bought her own tools.

Now her shop, complete with planer, lathe, band saw, and other tools, is witness to her commitment. She's particularly fond of her box-joint jig.

While Patricia enjoys the challenges of woodworking, she also thinks it's a pity that more people don't appreciate the opportunity it provides. "You can do things on the computer, but it's not like working with your hands."

Would she recommend woodworking for women today? "Absolutely," she says without hesitation. "If people want to do something, they can."

## *It's not the elements that ruin most decks. It's rotten advice.*



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WHERE TO GET IT.™

# Traditional Shutters

*Years ago, while on a visit to New England, I had the good fortune to have a tour guide who is very interested in historic homes. We covered a lot of territory, and saw some*

truly memorable architecture. Among the things that stuck with me the most was the widespread use of exterior shutters. Of course, the shutters on these old houses actually served a purpose at one time. At night, or when bad weather struck, they were closed to help keep warm air in, and rain, snow, and wind out.

Today, shutters aren't as common, and when they are used it's usually for decorative reasons only.

For a long time I've been considering adding shutters to my home. I wanted to steer away from the louvered designs that are available at most building supply stores. Instead, I came up with several options, eventually deciding on a classic frame and raised panel design. You'll find two other options that were in the running on pages 24 and 25.

## Design and Wood Choices

Window size determines the correct proportions for a shutter's height and width. So, except for the stock thickness, the dimensions of my shutters will probably be different from what you build for your house. The techniques and sequence for building them are the same, though.

Height is easy — size your shutters so that they are as tall as the window opening, as shown in the photo. But determining their width takes a bit more thought.

In theory, each shutter should be half the width of the window's opening — the 16"-wide shutters I



built look right at home with my 32"-wide windows.

But if I had a wide picture window, I would have kept the maximum shutter width at 16". It's a matter of personal taste, but I think that shutters much wider than that can start to look clumsy and overwhelming.

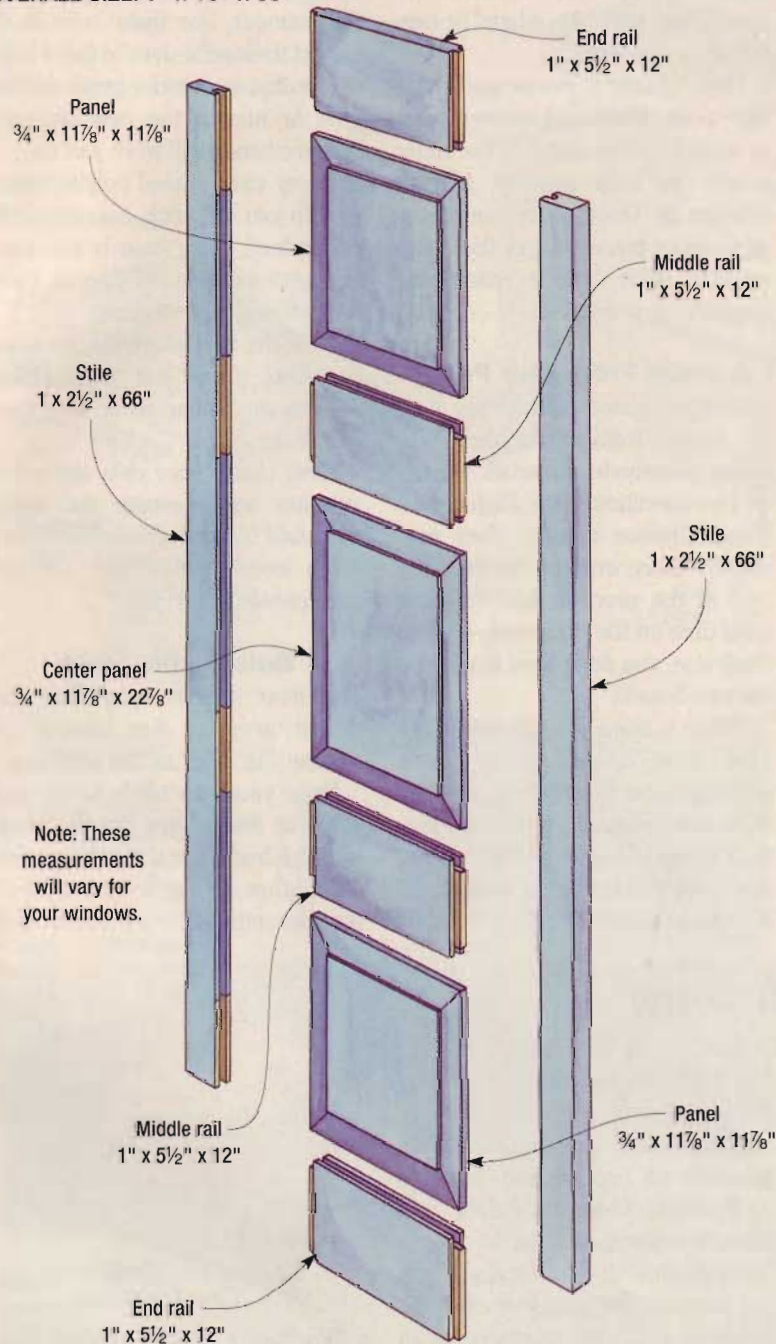
You'll need weather-resistant wood that's at least 1" thick. I selected clear, vertical-grain (quarter-

sawn) cedar lumber that was actually milled as premium  $\frac{5}{4}$  decking material. I splurged on this premium material not for looks, but for longevity. Compared to plain-sawn lumber, vertical-grain boards don't move as much with humidity changes. Therefore, paint adheres better and joints are less likely to pop open. Because of the joinery involved in this project, I don't recommend treated lumber.

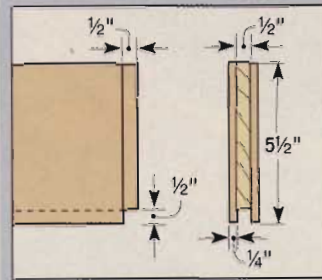


# Frame & Panel Shutter Construction View

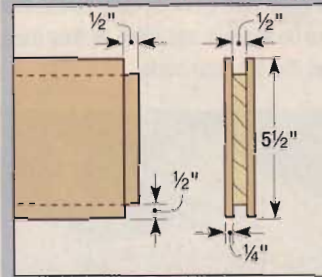
OVERALL SIZE: 1" x 16" x 66"



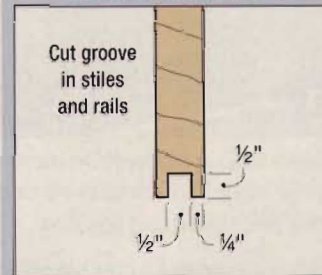
## End Rail Detail



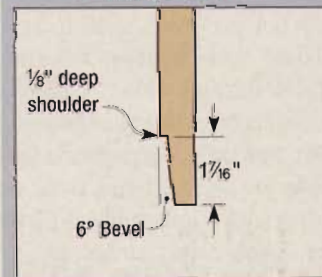
## Middle Rail Detail



## Groove Detail



## Panel Detail



### Getting Framed

To keep things simple, I made my shutters as dimensionally consistent as possible. The only dimensions that change are the lengths of the stiles and the lengths of the center panels. These measurements vary to fit the height of the windows of my house.

If your decking stock is milled to 1" thick, you can start cutting the frame rails and stiles right away

(see the Frame and Panel Shutter Construction View). The length of the rails includes an extra 1" for the 1/2" long tongue on each end.

After cutting your frame stock to size, install a 1/2" dado blade in your table saw and prepare to cut the tongues and grooves on your stock (see the End Rail, Middle Rail, and Groove Details above).

Plow the grooves in the appropriate edges of each rail and stile

### What You'll Need (per shutter shown)

#### Lumber

- 6 1/2 bd. ft. of 5/4 #2 Cedar
- 5 bd. ft. of 3/4" #2 Cedar

#### Hardware

- (6) #10 x 3 1/2" Screws (stainless steel or deck)
- (6) Non-corrosive spacers



1 For consistent grooves, keep steady pressure on the rails and stiles as they pass over the 1/2" dado blade.



2 Clamp a scrap wood face to the saw fence to avoid having the blade score the fence during the tongue cutting operation.

first (Figure 1). I always make test cuts in scrap material until I'm absolutely sure the blade is centered on the stock.

Now clamp a protective wood face to the fence, and screw a piece of straight scrap wood to the miter gauge to help prevent tearout (Figure 2). Once again, cut plenty of practice pieces to get the setup exactly right before machining tongues on your rails.

### A Word From Our Panel

Although I chose to make my shutter panels from cedar, there are some man-made materials worthy of consideration (see Engineered Panel Options below). They may require more work on the finishing end of the process, but they can save time on the front end — given their size, you don't have to glue up narrow boards.

When it comes to adhesives you also have a choice to make, although you should limit yourself to water resistant adhesives since this is an exterior project. If you don't mind the mixing hassle and the cost, resorcinol or a two-part

epoxy will assure that what you have joined together, no storm shall put asunder. For those who don't expect their adhesives to last a literal eternity, an exterior-grade yellow glue or one of the new one-part polyurethanes will work just fine.

In my case, I used polyurethane glue to join 3/4" thick, narrow, vertical grained cedar boards into panels. After sanding the panels, I got ready to cut them to size.

With the procedure I'm about to describe, you'll get great-fitting results, no matter what size your panels are.

First, clamp your rails and stiles together and measure the openings. Add 7/8" to each measurement (both length and width), and cut your panels to this size.

### Raising the Field

The next step is to outline the raised area of the panels, or "define the field" as the pros say.

Raise your saw blade to 1/8" and set your fence, then cut the kerfs into the front surface of your panels (Figure 3). You'll want to tweak the saw settings for a perfect fit, so

## Engineered Panel Options

Traditionally, frame-and-panel construction has been used to accommodate movement in solid wood panels. But today many engineered materials offer the dimensional stability that solid wood panels lack.

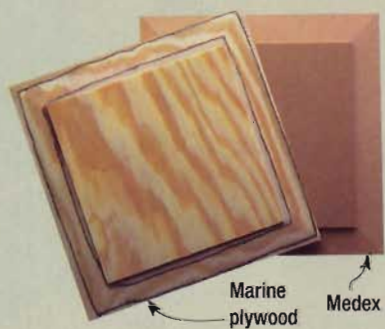
Marine plywood and some types of Baltic or Finnish birch plywood are suitable candidates for panel material in your shutters. When you go shopping for these products, specify panels with no internal voids and phenolic resin glue (look for telltale dark brown glue lines).

There's also another alternative for areas of the country that don't suffer from climate extremes or chronic high humidity. It's an exterior-grade MDF (medium-density fiberboard) called Medex, produced by the Medite Corp. of Medford, Oregon.

The company doesn't recommend Medex for raised panels or other projects that leave the core exposed, but a spokesman said it's possible to protect the material against moderate climates and modest moisture levels.

To do this, first sand any standing fibers from the edges or bevels. Then seal those surfaces with epoxy, spar varnish, or an oil-based polyurethane. After a light scuff sanding, apply a primer coat on all surfaces, followed by a top coat of exterior oil-base enamel. These are wise guidelines to follow for finishing the marine plywood as well.

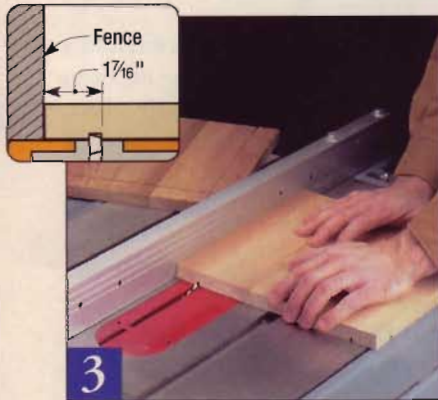
The Medite Corp. spokesman also suggests rounding over any sharp corners, because the film of any sealer or top coat along a sharp edge is more likely to crack.



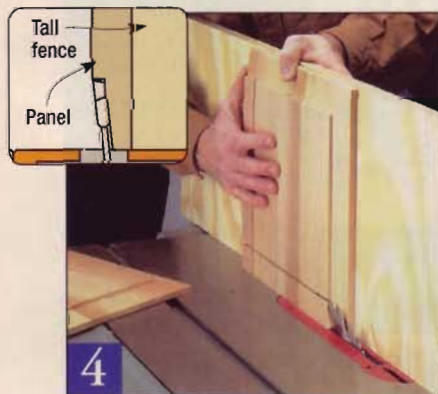
Working with Medex does have one potential drawback. Like tempered hardboard, Medex is a reconstituted panel made by compressing shredded wood fibers together with a binder resin. Machining it produces a very fine dust that can irritate your skin and lungs. Always protect yourself by hooking up a dust collector to your table saw, wearing a long-sleeved shirt and a dust mask or respirator, and properly ventilating your shop.

plan on making several practice runs on scrap stock before cutting into your actual panels (see the Panel Detail on page 21).

Beveling the panel edges is not done just because it's attractive. The angle of the cut also controls the depth the panel reaches in the frame grooves.



Using a standard saw blade, make four 1/8" deep cuts to define the raised area of the panels. Refer to the detail for fence setting.



Build a tall fence to support the panels as you cut the 6° bevels. Set the blade height just shy of the raised field.



Applying caulk to the panel seams will prevent water from reaching vulnerable areas of your shutters and causing them to rot.

Before you go any further, however, build a 12"-tall auxiliary fence for the table saw to support the panels during the cuts (Figure 4). Tilt your blade 6°, and make a test cut. Fit the beveled test panel edge into the groove of a rail or stile. Ideally, you want the panel edge about 1/16" shy of the bottom of the groove. Adjust the rip fence to fine-tune the fit of the panel. It took me a few tries to get it just right.

Even with a perfectly tuned saw, you'll probably have to sand blade marks and raised fibers off the bevels before you finish the panels.

### Putting It All Together

To give your shutters the best possible protection against the elements, I recommend brushing on the primer and the first coat of exterior enamel paint before assembly. This way you'll be sure to cover the places that will soon be inaccessible.

Before touching a brush to wood, however, dry fit all the parts and mark the tongue-and-groove joints — priming and painting in these areas will impair the glue bond.

After priming and painting the separate pieces, go ahead and glue them together. Treat the shutters like traditional floating panel assemblies, gluing only the frame joints and leaving the panels unglued.

When the glue has cured, I suggest you caulk the seams around the panels (Figure 5). I caulked both the front and back of the shut-




Improve the appearance of the caulk by wetting a rag and dragging it along each seam under the light pressure of your finger.

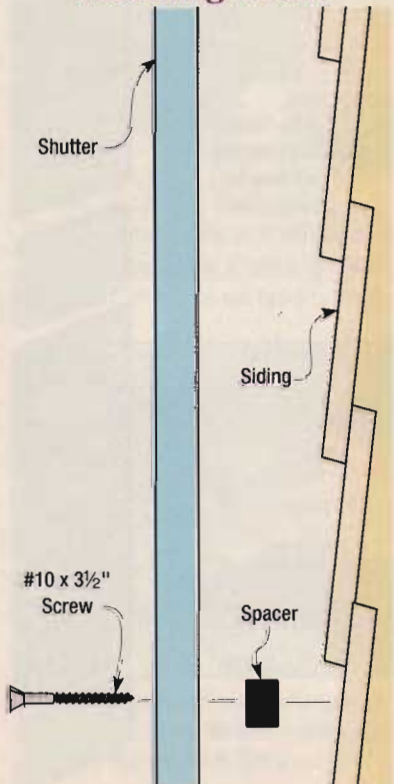
ters to prevent water from seeping into the grooves — a common place for rot to occur. Silicone caulks provide the most flexible bond, but you can't paint over them. Therefore, I used a hybrid silicone/latex caulk that's paintable. You can wipe the caulk into an unobtrusive bead with the tip of your finger and a wet rag (Figure 6).

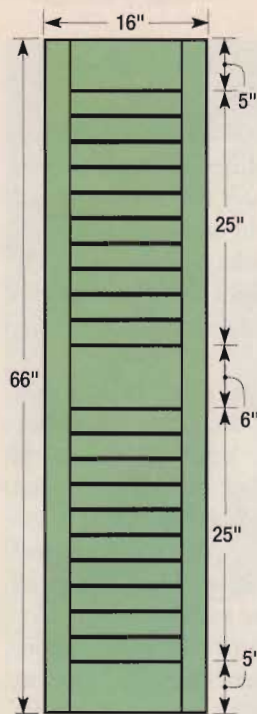
Now you can apply the final coat of paint, and then mount the shutters on your house. Use stainless steel screws or corrosion-resistant deck screws. The tannic acid in the cedar will react with ordinary steel screws and leach black stains all over your fine woodwork.

I also recommend using rubber or some other non-corrosive spacers to offset the shutters from the wall (see the Mounting Detail). The air flow will help the back of the shutters dry out after a rain.

Since you can't completely avoid having places where water will collect, the best thing is to plan for the deluge and do your best to protect your materials. That, and a little luck, will rank your shutters with the best in New England. 

### Mounting Detail





# Shiplapped Shutters

When I see these shutters, I can't help thinking of Nantucket and other historic seafaring towns of the Northeast coast. And it's more than the nautical name for the overlapping joint — it's also because this style is common in that area.

The basic construction is similar to the frame-and-panel shutters I made. All the tongues, grooves, and rabbets can be completed with a table saw and a 1/2" wide dado blade. The rails and shiplapped pieces are held to the stiles with tongue-and-groove joints. You just machine grooves in the rails and stiles, then form a tongue on both ends of the rails and shiplapped pieces (see Joinery Detail #1). Note that the tongues on the

shiplapped pieces are flush with the back of the stock.

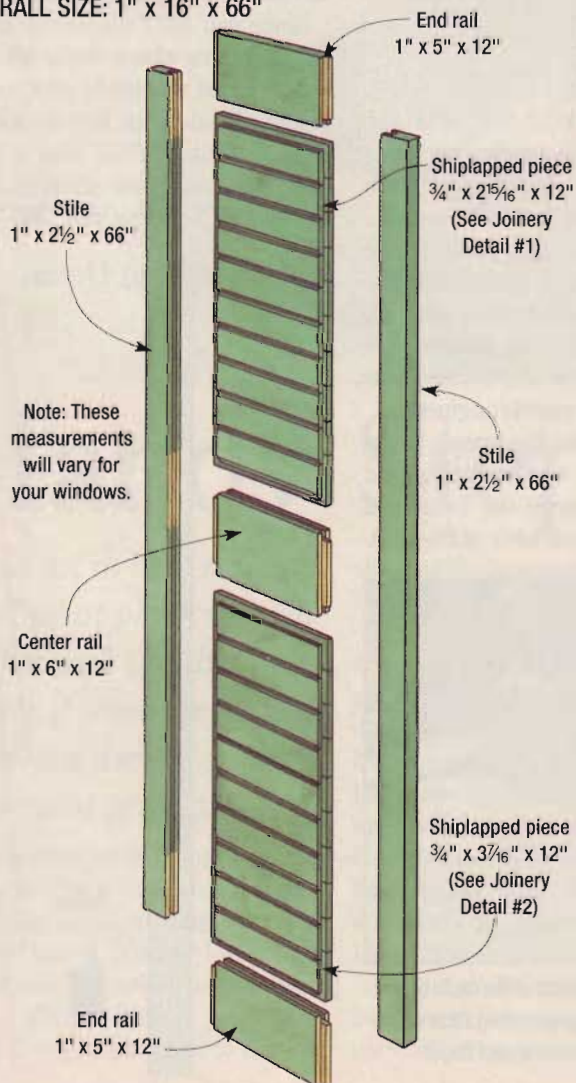
As for the rabbets, all the shiplapped pieces require the same treatment, except for the pieces located above a rail (see Joinery Detail #2).

After machining the joints, switch to a standard blade and chamfer the exposed edges (see the Chamfer Detail). Next, prime and first coat the pieces, but stay away from the rail and stile joint areas — raw wood is best for getting good glue adhesion.

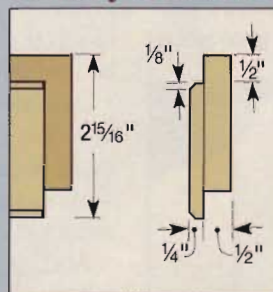
At assembly time, glue the rail and stile joints, but leave the shiplapped pieces unglued so they can float in the grooves with changes in moisture.

## Construction View

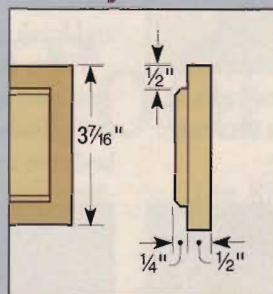
OVERALL SIZE: 1" x 16" x 66"



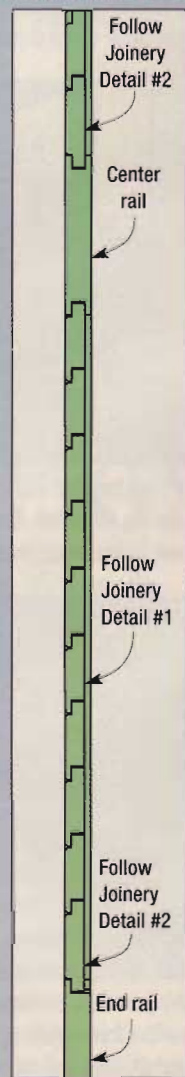
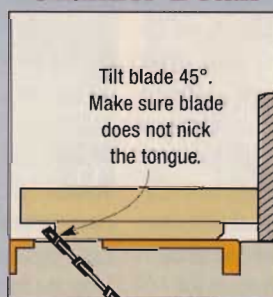
## Joinery Detail #1 Section View



## Joinery Detail #2



## Chamfer Detail



# Batten Style Shutters

The easiest of the three shutter designs I considered is this one. Common to many older colonial homes, it's made up of four boards, called battens, held together by three cleats running across the back. Some crude versions are just nailed together, but I recommend screwing the cleats to the battens.

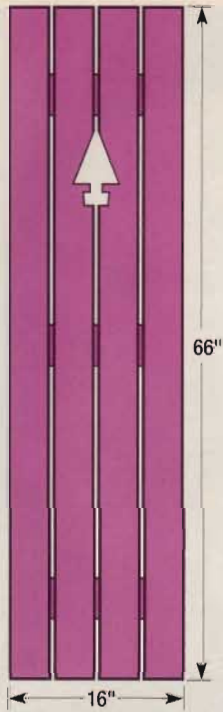
You can make this shutter with undecorated battens. But for an eye-catching upgrade, my plan calls for cutting a pine tree silhouette into the battens. A saber saw is the best tool for this job — most band saws simply don't have the throat depth to reach the design's location.

Cutting the two halves in separate battens, and then assembling them next to

each other in the shutter, creates a complete silhouette. This method avoids the hassle of cutting the pattern into the middle of one wide board, although you can do it this way if you prefer.

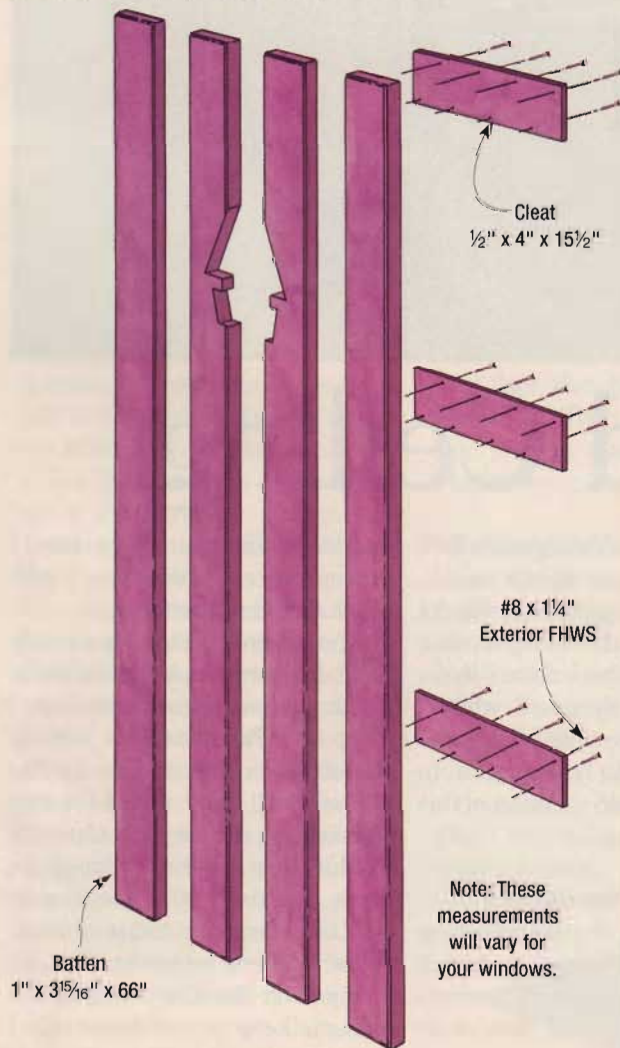
Using the pattern at right, lay out half the pine tree on one batten, and the other half of the tree on the neighboring batten. Make sure the two layouts are drawn the same distance from the ends of the battens.

Chamfer the front edges of the battens (see the Chamfer Detail). Then seal the boards by applying the primer and first coat of paint. After the paint dries you can screw the shutters together (see the Assembly Detail).

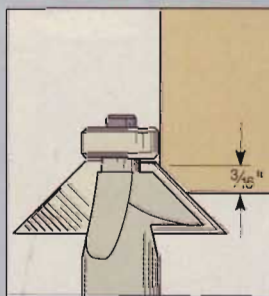


## Construction View

OVERALL SIZE: 1½" x 16" x 66"

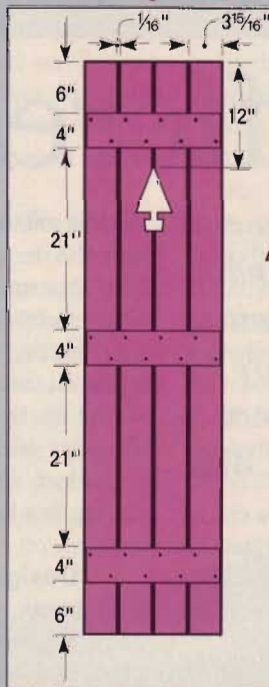


## Chamfer Detail



Full size tree pattern: Photocopy this pattern for tree cut-outs.

## Assembly Detail





# A Coffered Ceiling

*I had to pay my dentist a visit recently, and while standing in the lobby nervously waiting for the elevator before my appointment, I happened to glance up at the ceiling. Wow,*

was I ever impressed. This ceiling had a pattern of shallow steps that surrounded a sunken panel. The effect was like a shadow box picture frame.

Unfortunately, the elevator did arrive and I had to face the hair-

raising sounds of the dentist's drill and the feel of a lighter wallet. But, after my appointment, I spent time studying the lobby ceiling (and getting some curious looks from the security guard while I was at it). By the time I left, I was already working on a plan to reproduce a basic variation of this ceiling in a home.

## Design Variations

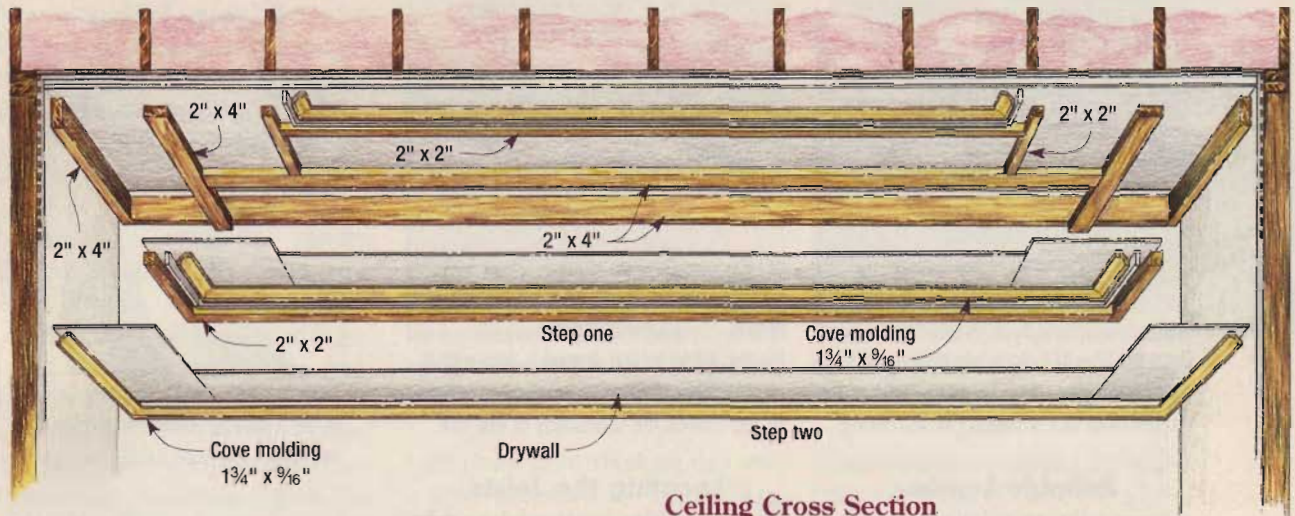
As you can tell, the lobby ceiling had an impact on me. In fact, it shattered my long held assumption that ceilings are just unre-

markable, flat expanses of space. I learned later that this type of ceiling has a name: coffered.

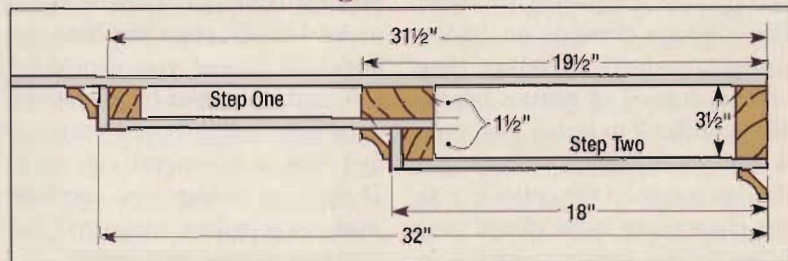
The coffered ceiling I eventually built has two steps that differ in width but have the same amount of drop (see the Coffered Ceiling Construction View and the Ceiling Cross Section at right). If you choose, you can vary any elements of this design — the width of the steps, the drop from one step to another, even the number of steps. What I've done is only an example.

If you do consider changing the design, keep in mind one tip I

## Coffered Ceiling Construction View



Ceiling Cross Section



learned from a decorator friend. She told me that the most pleasing designs maintain the shape and proportions of the room. If your room is square, for example, make the sunken panel square. If your room is rectangular, make the sunken panel area of your ceiling a rectangle, keeping it proportional with the overall size of the room.

I found it helpful to draw a plan of the room to scale, and then sketch the ceiling layout. With a drawing, you can plan exactly how wide and long to make each step. This is especially helpful if you have an L-shaped or some other irregularly-shaped room

### Before You Begin

There are lots of things to like about this ceiling, but one feature I know you'll appreciate is that all the materials and tools are available at your local building center. I do suggest, however, that you recruit a helper — someone to lend a hand hoisting the drywall into position.

I also recommend building a pair of T-braces to support the dry-

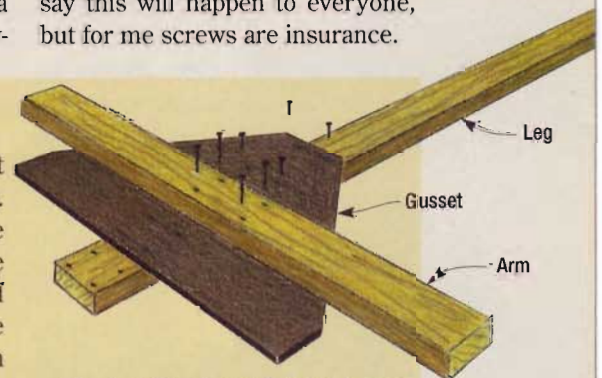
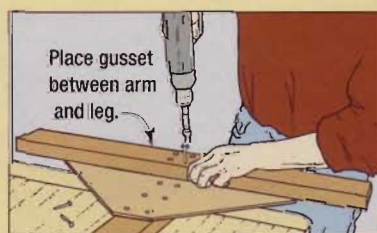
wall (see Building A T-Brace). T-braces will relieve the strain on your shoulders and give you more freedom to drive screws into place.

By the way, I highly recommend using  $1\frac{5}{8}$ "-long drywall screws for this project. Years ago, I nailed drywall to a ceiling, only to have the nails pop out over time. I can't say this will happen to everyone, but for me screws are insurance.

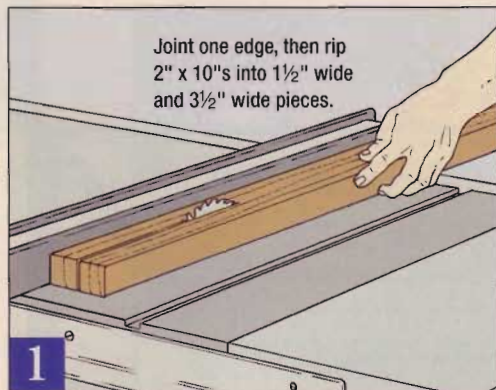
## Building A T-Brace



Build each T-brace using straight 2" x 4"s and some scrap hardboard. Cut the leg  $\frac{1}{2}$ " longer than the height of your room, and cut the arm 3-ft. long. Trim the hardboard gusset to shape and join the three pieces together with construction adhesive and drywall screws.



The height of your braces is perfect for installing drywall on the ceiling. But you'll need to saw off the bottom end of each leg as you work your way onto the steps of your coffered ceiling. I suggest keeping your braces  $\frac{1}{2}$ " longer than the height of the ceiling area you are working on.

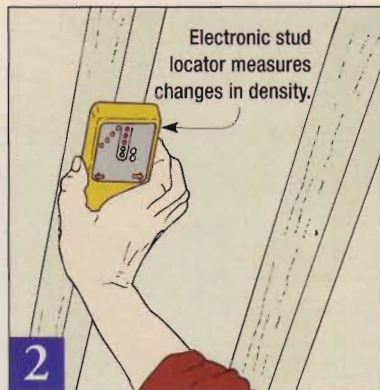


Once the 2" x 10" stock has acclimated to your house, joint one edge of each piece and rip them into widths needed for the ceiling.

### Reliable Lumber

Successfully completing a project like this one depends on having straight, well-dried lumber. Any twisted, cupped, or warped boards will be difficult to install. And even if you can straighten them out on the day you build the coffered ceiling, chances are the stock will warp more in the future, resulting in crooked edges on the ceiling steps.

In my experience, 2" x 2"s and 2" x 4"s are often warped. Even though dimensional stock in these sizes is called for in this project, I purchased 2" x 10"s instead. After setting them in the house for a couple of weeks — so they had time to adjust to the temperature and humidity levels — I jointed one edge on each plank and ripped them into the 1½" and 3½" widths needed for the project (Figure 1). This is the best way I know of to get straight stock that has less chance of warping down the road.



Finding joists behind drywall is easy with a stud locator. The density of plaster, however, diminishes the usefulness of this tool.

### Locating the Joists

Finding hidden joists can be a little tricky. Luckily, once you have the first joist located you should be able to find the rest by measuring in 16" increments. I must warn you that this is a general rule only. There's no telling how carefully your homebuilder measured out the placement of each joist.

To begin your detective work, make an educated guess as to the direction the joists run in your room. There are no hard and fast rules to guide you here, unless you know which are the load-bearing walls — joists run from one load bearing wall to another.

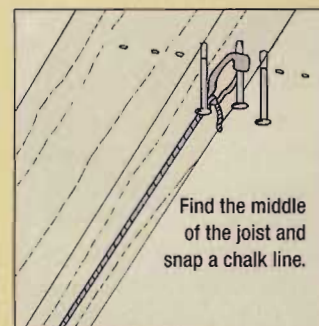
When I begin a project like this, I usually assume that the joists run across the width of the room. I'm not always right, but this seat-of-the-pants logic has proven true more often than not.

Having guessed at their general direction, use an electronic stud locator to find the first joist (Figure 2). If you don't have one of these gizmos, or if you have plaster ceilings and walls that confuse the stud locator, you'll have to find a joist the

## Finding the First Joist



Tap the ceiling with a hammer to locate a joist by sound, then drive a nail until it hits solid wood.



Continue driving nails, but closer together, to find the center and edges of the joist.

old fashioned way: with a nail and hammer (see Finding the First Joist). Don't worry about putting holes in the ceiling; they're easy to fix or cover up.

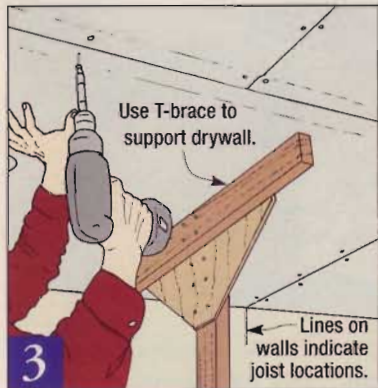
After locating the center of one joist, snap a chalk line along its full length, and extend the line for about 8" down the walls using a pencil and a level. You need to add the lines to the walls because the ceiling line will not remain visible for long. Mark the wall lines with a "J," for joist.

Now you can use the ceiling line as a reference for marking the other joists at 16" intervals. Again, extend the lines down the wall each time and mark them with a "J." I do recommend driving a nail into the ceiling at each line to make sure a joist is actually there — remember, nobody can guarantee that every joist was positioned perfectly.

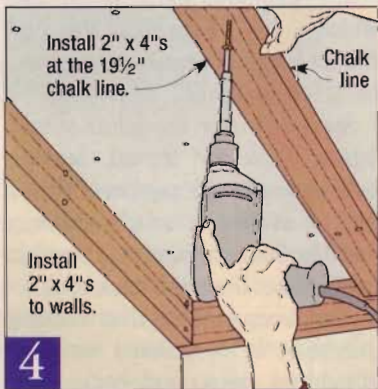




Next, locate the wall studs around the room using a stud locator or the hammer and nail procedure. In this case, however, you won't have to snap chalk lines. But do draw a line about 8" long at the top of the wall to identify every stud location. Mark these lines with an "S," for stud.



Use T-braces to support the drywall used for covering the original ceiling. Drive screws every 12", making sure to hit the joists.



Mount the framing lumber to the ceiling and walls with construction adhesive and 3" drywall screws or toggle bolts.



Screw drywall to the first step frame. Also, be sure to add drywall to any support bridges on the ceiling for the second step.

Before going any further, take a look at your original ceiling. If it's in bad shape, which was the case in my dining room, simply cover the old drywall or plaster with  $\frac{3}{8}$ " drywall. There is no need to tear out the old ceiling unless it has let loose from the joists, or the joists themselves are in bad condition.

Screwing up new drywall should secure the original ceiling to the joists (Figure 3). It also offers a fringe benefit — the rows of screwheads conspicuously identify the joist locations.

### Making the First Step

To make a coffered ceiling like mine, begin by snapping more chalk layout lines. Measure out  $19\frac{1}{2}$ " from each wall and snap a line. Then snap another line  $31\frac{1}{2}$ " from each wall. You can see where this is going by looking at the Ceiling Cross Section on page 27.

Now you can mount the framing lumber to the ceiling. I used construction adhesive on all the framing, and 3" drywall screws wherever a piece crossed a joist or stud. For any frame pieces that do not cross the joists or wall studs, you'll want to use toggle bolts instead of screws to ensure a strong installation (see Installing Toggle Bolts).

First mount  $2" \times 4$ 's to the walls around the room so they butt tightly against the ceiling (Figure 4).

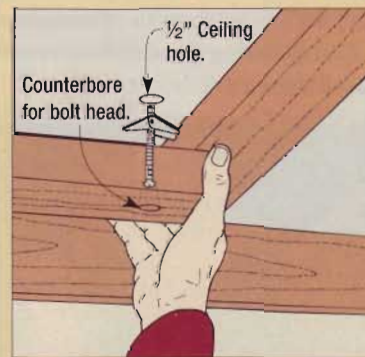
Next, cut  $2" \times 4$ 's for the full length of the ceiling and install them flush with the chalk line you snapped  $19\frac{1}{2}$ " from the wall (Figure 4 again). Cut more  $2" \times 4$ 's to fit between the lumber you just mounted and install them flush with the other two chalk lines at  $19\frac{1}{2}$ ".

Follow the same procedure for installing lumber at the  $31\frac{1}{2}$ " lines, only this time use  $2" \times 2$ 's.

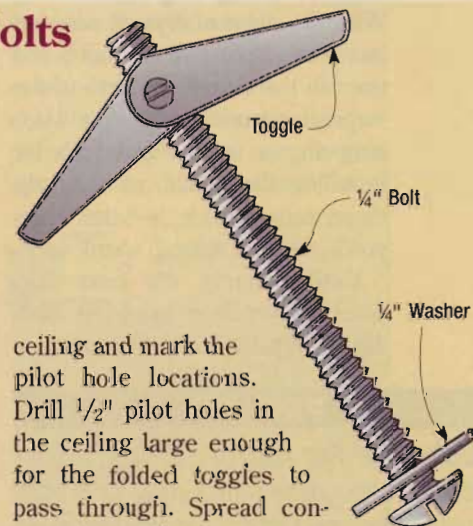
Be sure to consider all the locations that drywall joints will occur, and install additional  $2" \times 2$ " lumber at these points. I call these pieces support bridges. Also, the widest step in my ceiling is 18", which is about the maximum span you can expect from  $\frac{1}{2}$ "-thick drywall without sagging. If your steps get any wider than this, be sure to add extra supports at the middle of the span.

Once the initial framework is in place you can begin cutting and installing the drywall for step one (Figure 5). As you're holding each piece of drywall in position, always align one edge with the edge of the  $2" \times 2$ 's at the  $31\frac{1}{2}$ " line. These are the edges that will remain exposed on your completed ceiling.

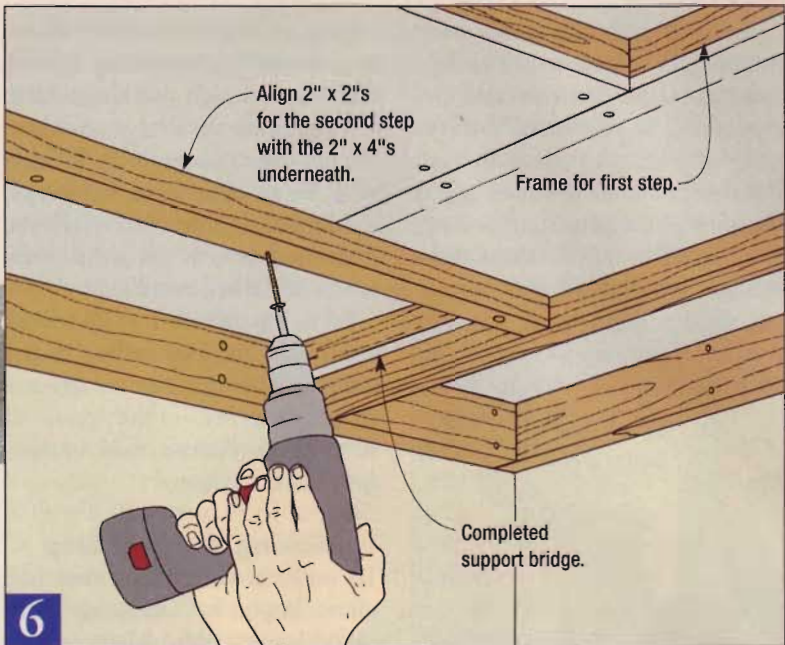
### Installing Toggle Bolts



To install the toggle bolts, first drill counterbored pilot holes every 2-ft. in the frame pieces. Make sure the counterbores are deep enough for the bolts to reach through the ceiling. Next, position the frame pieces on the



ceiling and mark the pilot hole locations. Drill  $\frac{1}{2}$ " pilot holes in the ceiling large enough for the folded toggles to pass through. Spread construction adhesive on the framing lumber, then slip the bolts into the pilot holes. Spin the toggles onto the bolts, and secure the assemblies to the ceiling.



6 After completing the first step, install the framing lumber for the second step. You can see how adding drywall in the bridge levels the first step with the wall framework.

Once the drywall is solidly in place for step one, screw 2" x 2"s on top of the 2" x 4"s at the 19 1/2" line (Figure 6). Be sure to align the back edge of each 2" x 2" with the edges of the 2" x 4"s underneath. Now cover step two with drywall.

To wrap up this phase of the project, cut 2" wide strips of drywall and cover the edges of each step (Figures 7 and 8).

### Taping Drywall

With the strips of drywall screwed into place, nail metal drywall beads over all the outside corners of the steps. I recommend using 1 1/4"-long ring or spiral shank nails for installing the beads, as the grip these nails provide is better than you'll get from smooth shank nails.

Until recently, my next step would have been applying bedding compound to the corners —

bedding compound is a mixture that builds up thicker and dries faster than ordinary joint compound. A professional taper, however, gave me a terrific tip on working with metal beads. He covers each edge of the metal bead with fiberglass joint tape. The additional tape makes for a stronger seam along edges that often crack over time. And the tape improves his ability to blend the raised bead into the drywall.

Cover all edges of the metal beads as well as the remaining drywall joints with fiberglass tape, including the inside corners of all the steps.

Now mix a batch of 90 minute joint compound for your bedding coat. This stuff hardens quickly, which allows you to apply a second coat in the same day. The one drawback is that it's difficult to sand.

Spread it over the joints with a taping knife or trowel, leaving behind a smooth surface (Figure 9). To avoid too much sanding, you'll be better off applying two thin coats rather than one thick coat.

Also, keep in mind that working overhead is very hard on your shoulders, neck, and back, so if you're not used to this kind of strain, take your time and work in short sessions.

### PRO TIP

#### Table Saw For Narrow Strips

Instead of struggling with a utility knife and straightedge, you can cut narrow drywall strips quickly and with less breakage using a table saw and an inexpensive steel blade. A 7 1/4" circular saw blade is ideal for this operation.



7 Cut narrow strips for covering the edges of each step. The traditional method calls for using a utility knife and a metal straightedge.



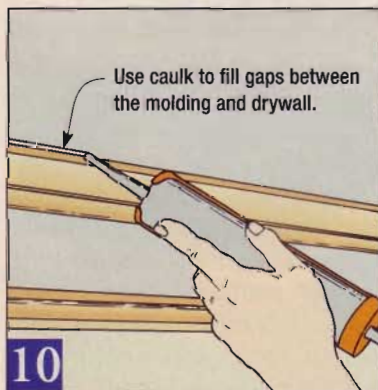
8 Screw the strips of drywall to the edges of the frames. Make sure the bottom edge of each strip is flush with the step.



After nailing metal corner bead to the steps, cover all the drywall joints and the edges of the metal bead with fiberglass tape. Use a trowel or taping knife to apply the bedding coat.

Sand the rough spots of the first coat with an 80 grit silicon carbide sanding screen. After cleaning up the sanding dust, apply standard joint compound (the stuff commonly available in five gallon plastic buckets from building centers) to all the joints for the second coat.

Sand the second coat with a 120 grit silicon carbide sanding screen before applying a third coat using the same standard joint compound. Feather out the third coat to blend the joints into the drywall as best you can. Sand as necessary with the 120 grit screens and fix any flaws before moving on to install the cove molding. I always use a 500-watt work light to search for imperfections in the final coat.



After installing the cove molding, fill any gaps in the corners, or between the molding and drywall, with paintable latex caulk.


### Cove Molding

The challenge when installing cove molding most often centers around the joints. How do you get two moldings to come together as seamlessly as possible?

In this case, the answer is a technique called coping. Coping the cove molding at the corners makes for great looking joints, and it's easy to do (see Coping the Cove).

Install one piece of cove molding (with square cuts at both ends) along an edge of step one. Secure the molding with 4d finishing nails. Now, working clockwise, cope the second piece of molding to butt up against the first piece. Cut the other end of the second piece to length. Nail the second piece to the step and proceed with the third piece. The fourth piece is the trickiest, since it must be coped at both ends.

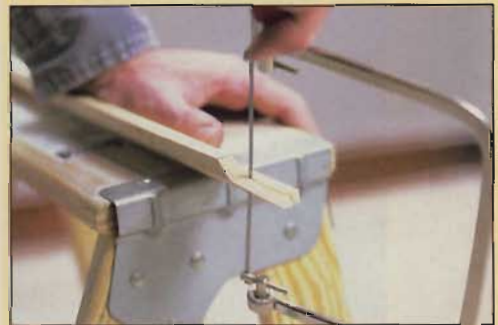
Install all the molding, then fill any gaps in the joints, or between the molding and the drywall, with paintable caulk (Figure 10). After the caulk dries, prime and paint the ceiling and the moldings — there are lots of opportunities for using more than one color on this project.

It's hard to imagine how all this began with a visit to my dentist. I guess it just proves that inspiration for home improvement projects can come from the unlikely sources. 

## Coping The Cove



To begin coping a joint, hold the molding at the angle it will maintain once it's installed, and cut the end at a 45° angle. Do not cut the piece to length right away.



Cut along the profiled edge of the miter, tilting your coping saw a few degrees. Back cutting removes wood that might interfere with the fit of the joint.



You can refine the coped profile with files and sandpaper. A half-round bastard file, a rat-tail file, and 100-grit sandpaper will all come in handy.



Cut the molding to length and secure it to the edges of the steps with finishing nails. Use a nail set to bury the nail head below the surface, then fill the holes with putty.



# BBQ Serving Cart

*Nothing says summer like a backyard barbecue. Even now, if I shut my eyes, I can catch the faint smell of briquettes and hickory chips, hear the crackle of ice in a tall glass of*

freshly made lemonade, and taste the butter dipped Iowa corn.

My family always made a big deal out of backyard barbecues. And I've managed to carry on the

tradition. My grill is more than adequate for the cooking I do, but one of my frustrations has been the lack of an outdoor workcenter. I've never had a suitable surface for food preparation, or even a good place to set the food before it goes on the grill. Earlier this spring, however, I decided to fill this gap by building a BBQ serving cart.

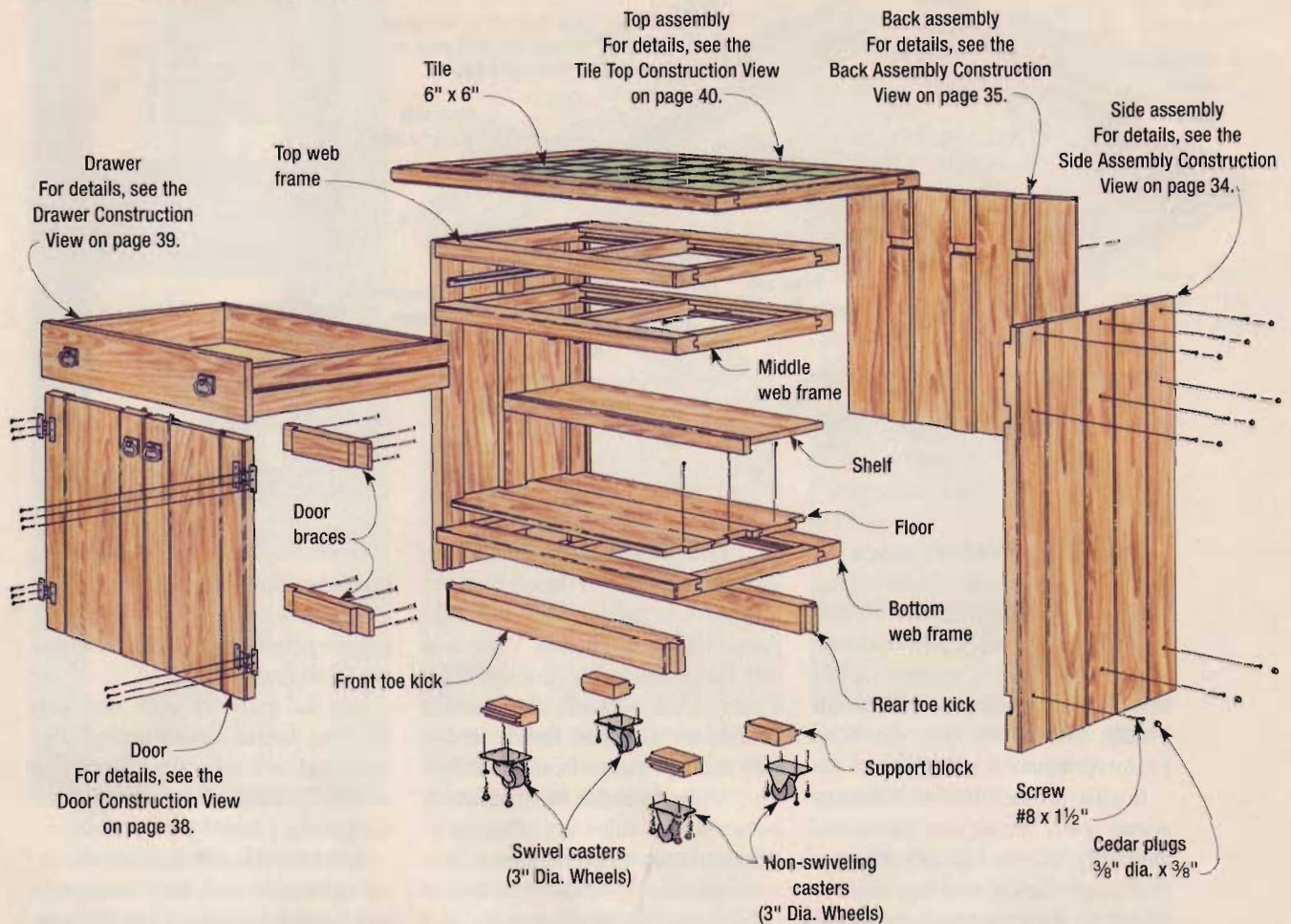
The cart I made is much more than an on-deck circle for food about to go on the grill. It also

serves as a storage cabinet for charcoal, wood chips, lighter fluid, cooking tools, and other barbecuing supplies. Since it's on wheels, the cart can be rolled from the grill to the picnic table with ease, and into the garage during lousy weather.

I don't want you to think this cart isn't made for the outdoors, though. The construction allows for the natural expansion and contraction of the wood, and the use of water-resistant polyurethane glue ensures the durability of the cart's joinery.

# BBQ Serving Cart Construction View

OVERALL SIZE: 30<sup>3</sup>/<sub>8</sub>" x 48<sup>5</sup>/<sub>8</sub>" x 36"



Note: The wrought iron hardware used in the BBQ Serving Cart can be ordered from Crown City Hardware, 1-800-950-1047.

Hinges. . . . . #98E-F  
Pulls. . . . . #1022-I

## Choosing Materials

The right glue and construction techniques will prolong the cart's lifespan, but selecting the proper wood is just as important.

During the early planning of this project, redwood was my wood of choice. After a call to a local lumberyard for pricing, I realized I had better come up with a new first choice. Sticker shock led me to #2 cedar. Although it is not as durable as redwood, Western Red Cedar is naturally resistant to decay and can be finished to look a lot like redwood. If left unfinished, the cedar will age to an attractive grey color.

Although #2 cedar contains knots, I purchased plenty of 3/4" and 2x lumber so that I could cut around the worst of them. If you are even more pennywise than I am, you can build the cart using treated pine.

I'm sure one feature caught your eye right away when you first saw the BBQ cart: the tile top. Tile will withstand lots of abuse from the weather while providing an ideal surface for setting food, dishes, and utensils. I also think the tile is attractive. I hope you do too.

Contrary to what you may believe, laying tile is a rather simple process. The top for my BBQ cart

## What You'll Need

### Lumber

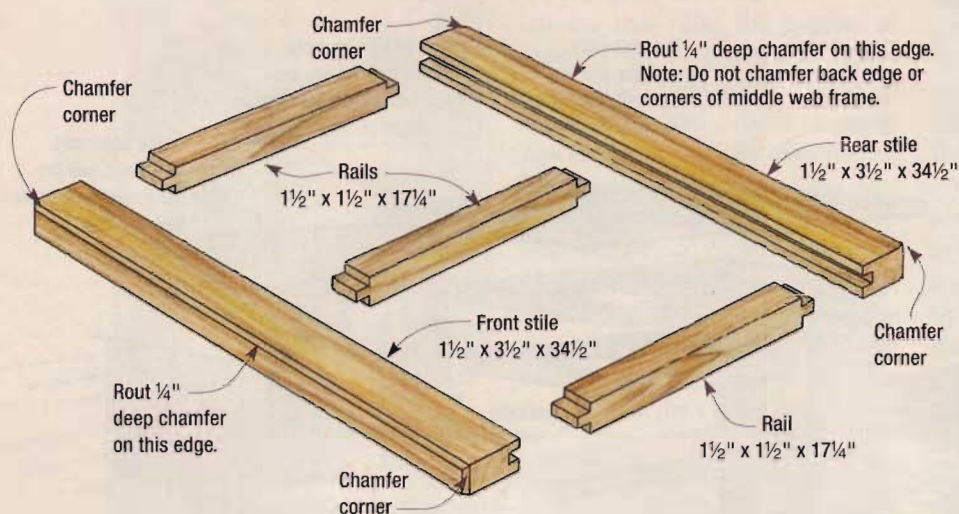
- 35 bd. ft. of 3/4" thick #2 W. Red Cedar
- 60 bd. ft. of 2" thick #2 W. Red Cedar
- 4 bd. ft. of 1" thick #2 W. Red Cedar

### Hardware

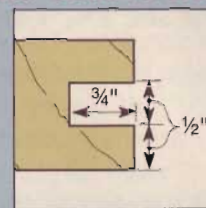
- (2) Roller catches
- (50) #8 x 1 1/2" Flat head deck screws
- (25) #8 x 1 1/4" Flat head deck screws
- (4) 3" Casters (2 swiveling/2 non-swiveling)
- (4) Wrought iron bail pulls
- (2) Pairs of wrought iron hinges — "H" style
- (2) 3/4" Aluminum angles — 24" long
- (4) Shelf support pins — 1/4" shaft
- (28) Tile squares — 6" x 6"

is sized to fit 6" x 6" tile with just the correct amount of gap around each tile for the grout. If you choose tile of a different size, you may have to alter the size of the top slightly.

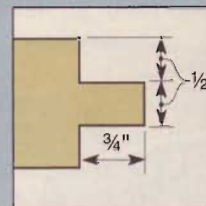
## Web Frame Construction View



### Stile Groove Detail



### Rail Tenon Detail



### Building Web Frames

The best way to begin building the BBQ cart is by making the internal frames. I've often heard cabinet-makers call frames without panels of this type "web frames," although I don't know why (see the Web Frame Construction View).

In this project, the web frames serve many important functions. Primarily, they act as the skeleton that holds the cabinet together. In addition, they support the floor, separate the drawer from the doors, and become an attractive detail on the exterior of the cart.

Because the web frames are identical, I built all three at the same time. I always try to take the time-saving advantage of as many common machinery set-ups as possible.

Cut stock for the web frame rails and stiles to size, then cut a groove into each stile with your table saw and a 1/2" dado blade (see the Stile Groove Detail).

Machine the tenons using a 3/4" dado blade (see the Rail Tenon Detail). Be sure to clamp a protective wood face to the fence during this procedure, and support the stock with the miter gauge.

When you've completed the tenons, glue up the frames. Take a long look at each one for squareness — any inaccuracy will affect every upcoming step of this project.

### The Sides and Back

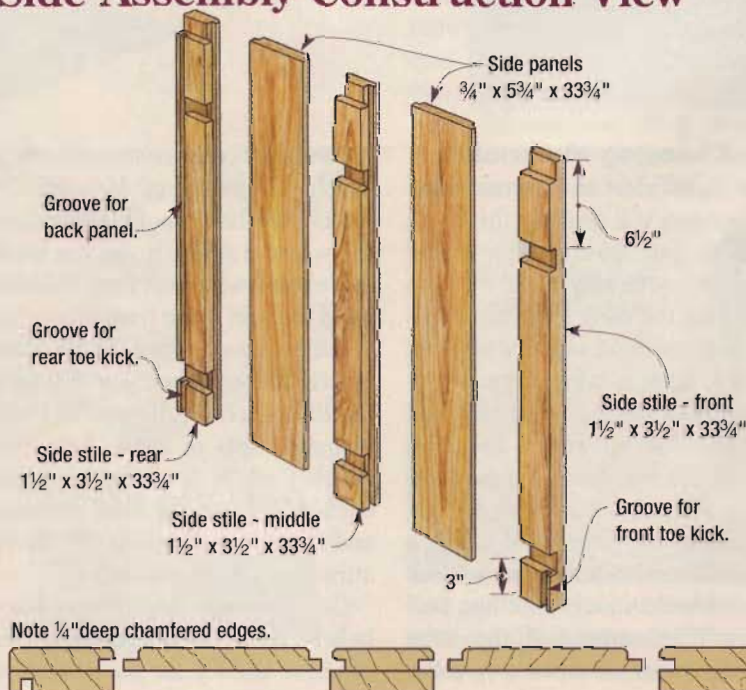
The construction of the cart's sides and back is unique (see the Side Assembly Construction View and the Back Assembly Construction View). In a nutshell, the narrow boards are fastened tightly to the web frames. These I call the stiles. The wide boards, or panels, in between the stiles are allowed to float and adjust for changes in seasonal moisture. The construction provides the same advantages as a frame-and-panel assembly.

Once the cart is completed, however, the side and back look like they're made with tongue-and-groove paneling, because all edges are flush and chamfered.

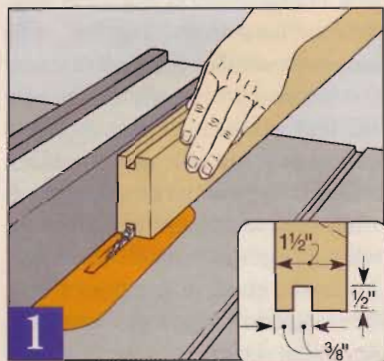
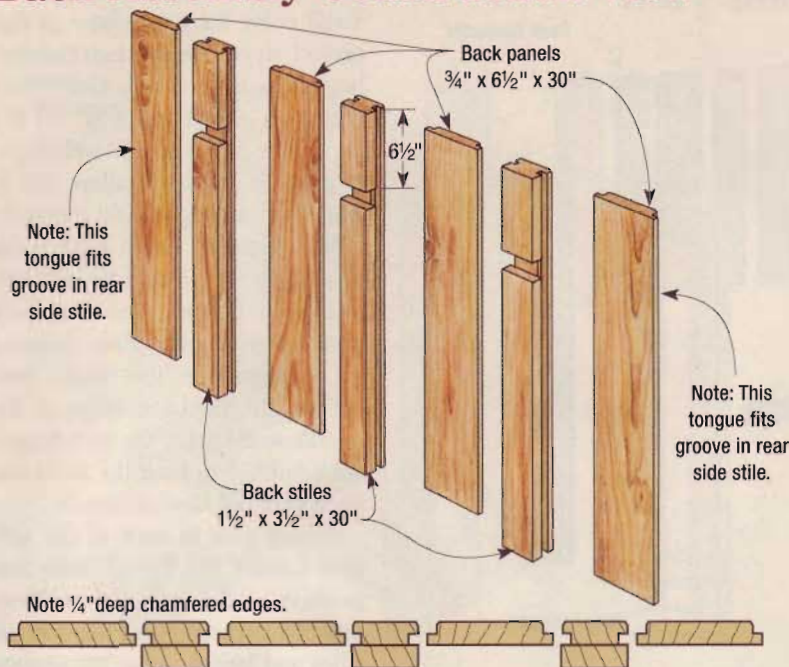
Just as you did with the web frames, begin constructing the sides and back by cutting the pieces to size. To avoid gluing up stock for the panels, I found wide boards.

After cutting the lumber, mock-up each side and back assembly and label the pieces. This will help you organize the machining steps

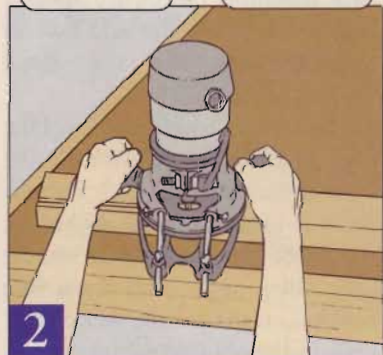
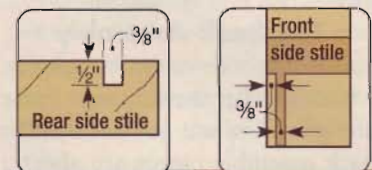
### Side Assembly Construction View



## Back Assembly Construction View



To cut offset (non-centered) grooves in the stiles, you need to make both passes with the same face of the stock against the fence.

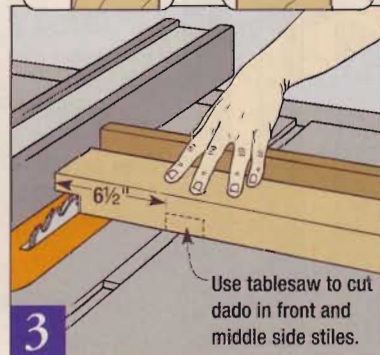
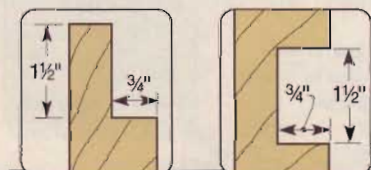


Use a 3/8" straight bit to rout 1/2" deep full length grooves in the rear side stiles, and short grooves in the front side stiles.

yet to come — I hope I'm not the only one who has ever made a cut in the wrong board.

Now install a 3/8" dado blade in your table saw and prepare to cut grooves in the edges of all the stiles (Figure 1). Be sure to note that the grooves aren't centered. Some stiles require only one groove while others need a groove in each edge.

In addition to the grooves in the edges of the stiles, there are a few more grooves to complete. The rear stile of each side assembly must be



Cut rabbets at the top of each side stile. Then cut the dado for the middle web frame in only the front and middle side stiles.

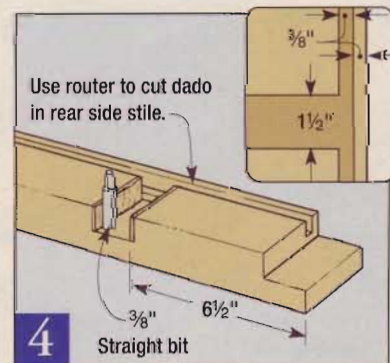
grooved along its entire length to join the side assemblies to the back assembly and rear toe kick (Figure 2). You can machine these grooves with your router, a 3/8" straight bit, and an edge guide. Using the same set up, you can also rout a short groove in the front stile of each side assembly for the front toe kick.

After completing the grooves, return to your table saw, with the 1/2" dado blade still installed, and cut rabbets along the edges of each panel to form the 3/8" thick tongues (see the Side Assembly Construction View and the Back Assembly Construction View).

### A Few More Details

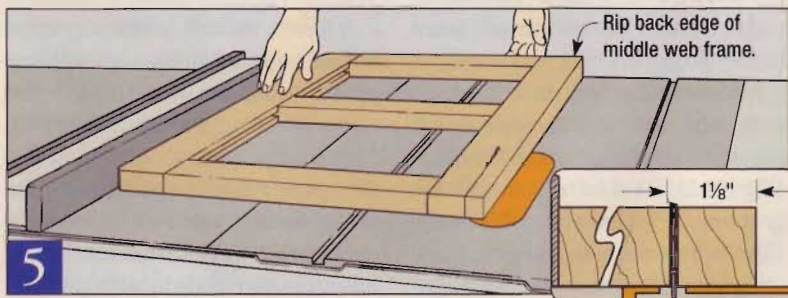
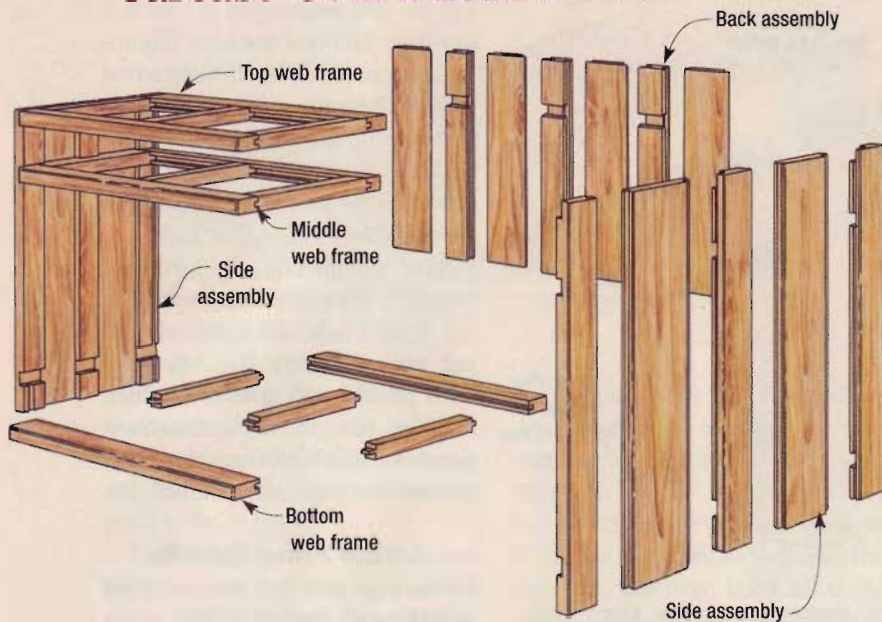
To support the web frames, I cut rabbets and dados in the stiles. Cutting the rabbets and most of the dados is easily done on the table saw with a dado blade (Figure 3). But for the dados in the rear stiles of each side assembly that will support the middle web frame, I recommend using a router (Figure 4). This way, you can avoid cutting into the panel grooves. Hog out the waste with your router, keeping about 1/16" away from the layout lines. Finish the dado with a chisel.

I routed 1/4" deep, 45° chamfers on many edges of the cart. Chamfer the top front edge, the top back edge, and corners of each web frame (except for the back edge of the middle web frame). In addition, chamfer the front edges of the back and side assembly pieces (see the Construction Views).



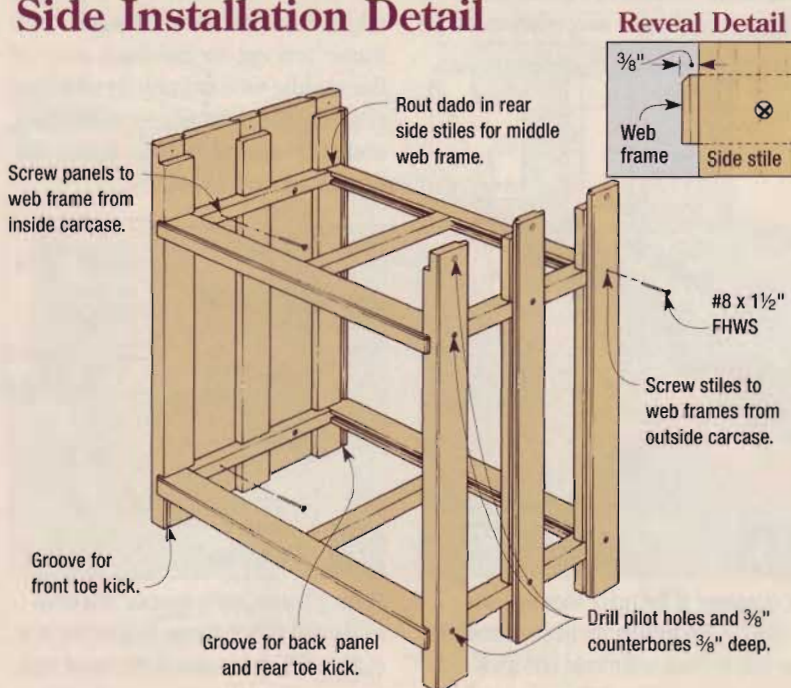
To form the dados in the rear side stiles for the middle web frame, rout out the bulk of the waste, then chisel to the layout lines.

## Carcase Construction View



**5** You need to cut the middle web frame  $1/8$ " smaller than the top and bottom web frames. Rip it to size on your table saw, removing the stock from the rear of the frame.

## Side Installation Detail



## The Side Assembly

You'll enjoy the next phase of this project since this is when the cart begins to take shape. But before you rush ahead, rip  $1/8$ " off the back edge of the middle web frame (Figure 5). This will allow you to install the back assembly correctly.

Now you can begin joining the side stiles to the middle and bottom web frames (see the Side Installation Detail). Bear in mind as you position the stiles that, except for the back edge of the middle web frame, the web frames stick out  $3/8$ " in both the front and back (see the Reveal Detail).

Spread glue in each of the side stile dadoes and clamp them into position on the web frames. Next, drill counterbored pilot holes in the stiles and loosely drive the screws. Use deck screws or stainless steel screws to prevent rusting. The loose screws allow you to maneuver the stiles a bit while sliding the panels into place. After installing the panels, seat the screws in the stiles.

To firmly hold the panels in place, while still allowing them to move with changes in seasonal moisture, I screwed them at the center only. Working from inside the assembly, drill pilot holes through the web frames into the panels. Be sure to use a stop collar on the bit to prevent an unsightly accident.

## The Back Assembly

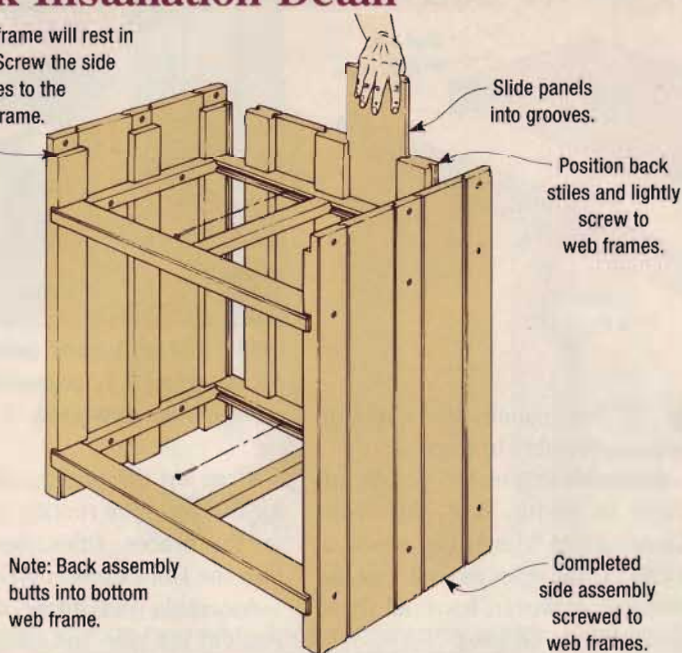
Unlike the side assembly pieces, which overlap the top web frame and go all the way to the floor, the back assembly pieces are shorter and butt into the top and bottom web frames (see the Back Installation Detail).

Aside from this, all aspects of the back assembly installation are the same as the side assembly installation you just completed. As before, add a little glue to the dadoes in the back stiles and clamp them into position on the middle web frame. Drill the counterbored pilot holes and loosely screw the stiles down. Now slide the panels into the stile grooves — the panels at each end



## Back Installation Detail

Top web frame will rest in rabbets. Screw the side assemblies to the top web frame.



slide into the grooves in the rear side stiles. Now drive the stile screws the rest of the way and move on to secure the panels.

You can improve the cart's stability by adding the top web frame. Spread glue in the side stile rabbets and slip the top web frame into place. Drill counterbored pilot holes in the stiles and drive the screws, then work from inside the cart to secure the panels. You don't have to do anything along the back.

### The Toe Kicks and Floor

Below the bottom web frame sits a pair of toe kicks — one for the front of the cart and one for the back (see the Carcase Construction View).

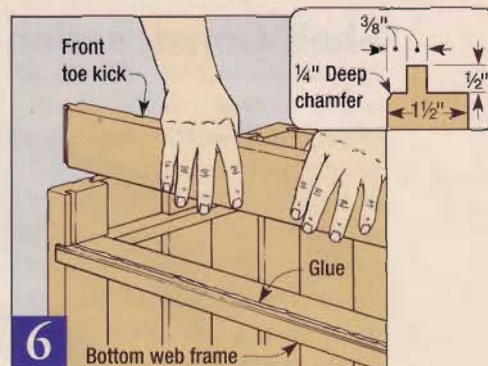
To make the toe kicks, first cut

stock to size, then machine a tongue at both ends of each piece (Figure 6). Follow the table saw procedure you used when cutting tongues on the web frame rails.

Chamfer the front end of each toe kick, then turn the carcase upside-down and spread glue in the grooves as well as on the bottom web frame. Ease the toe kicks into position and clamp them to the bottom web frame.

Installing the BBQ cart floor was a bit unusual since I had to cut the ends of each piece to fit around the side stiles (see the Floor Construction View).

Before fitting the pieces in the carcase, however, I suggest machining shiplap joints on the



Turn the cart upside-down to install the front and back toe kicks. Test-fit, then glue and clamp to the frames.

edges of each floor board (see the Shiplap Detail). The shiplaps prevent gaps from appearing as the boards shrink during the course of a year. You will not want to glue these joints together.

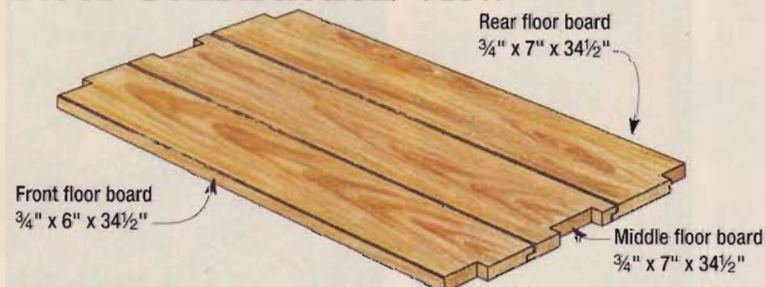
Now cut the boards to length and notch the ends to fit around the side stiles (see the Floor Notching Detail). I cut the notches with a saber saw.

Position the floor boards in the carcase, and drill a countersunk pilot hole about 1/2" from the end of each board (see the Floor Notching Detail again). Drive screws to secure the boards to the bottom web frame.

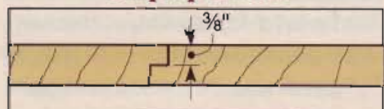
You can now drill counterbored pilot holes and screw the back stiles to the floor (Figure 7).

I hid the screws in all the stiles by filling the counterbores with cedar plugs. I made my own plugs using a drill press and a 3/8" plug cutter. After gluing in the plugs, sand them flush with the surface.

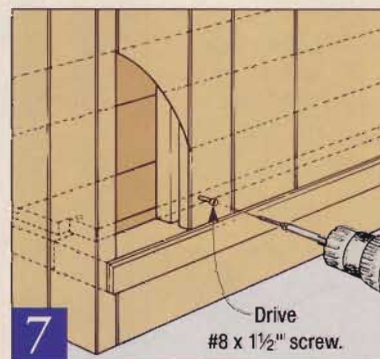
## Floor Construction View



### Shiplap Detail

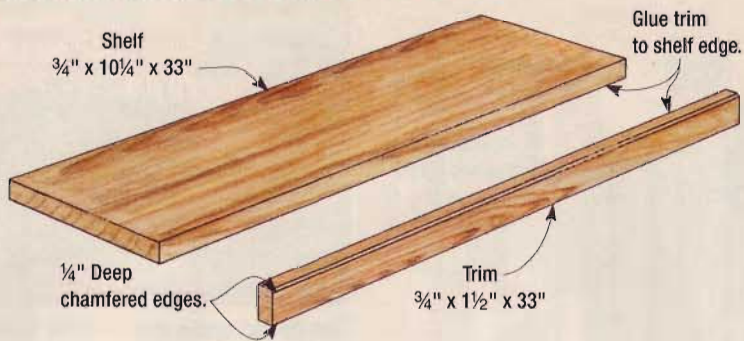


### Floor Notching Detail



Drive screws through counterbored holes in the rear stiles into the floor. Fill the counterbores with shop-made 3/8"-dia. plugs.

## Shelf Construction View



Shelf  
3/4" x 10 1/4" x 33"

Glue trim  
to shelf edge.

1/4" Deep  
chamfered edges.

Trim  
3/4" x 1 1/2" x 33"

### Adding the Shelf

Fortunately, making the shelf for this cart is a little easier than making the floor — the shelf doesn't need to be notched.

I glued up stock for the shelf and added a piece of trim to its front edge (see the Shelf Construction View). The trim strengthens the shelf so it can carry a load without sagging. After cutting the shelf to length, chamfer the front edges.

Now lay out and drill the 1/4" holes in the stiles for the shelf support pins (Figure 8).

### Building the Doors

The doors are constructed much like the side and back assemblies. I didn't have boards wide enough

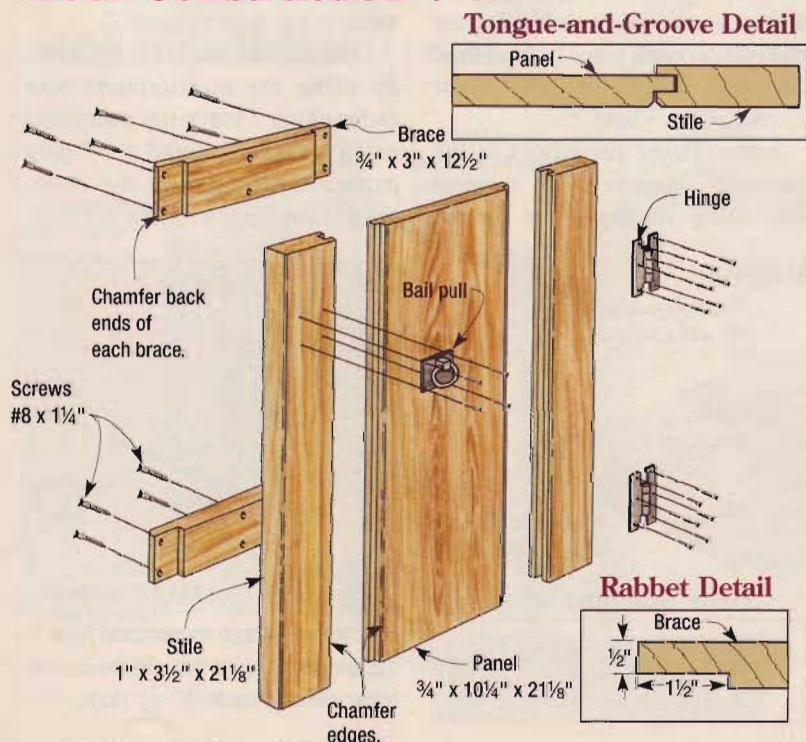
for the door panels, so I glued up two boards edge to edge.

After cleaning up the panels, cut them to width (see the Door Construction View). Cut stock to width for the stiles as well. For the moment, however, leave all these pieces a little bit long.

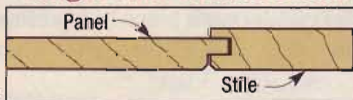
Next, using your table saw and 1/2" dado blade again, machine the tongue-and-groove joints (see the Tongue-and-Groove Joint Detail).

The stiles and panels are held together with braces. By rabbeting their ends, the braces fit snugly against the stiles and panel of each door (see the Rabbet Detail). Use your table saw and 1/2" dado blade to cut the rabbets as you did earlier on the side assembly stiles.

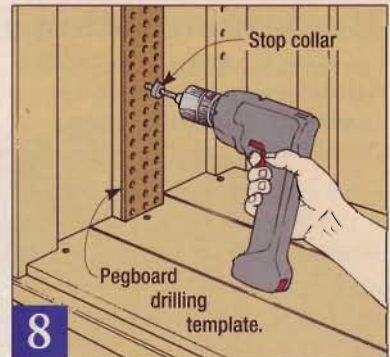
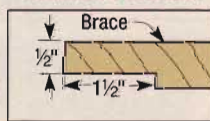
## Door Construction View



### Tongue-and-Groove Detail



### Rabbet Detail



8 Drill 1/4" shelf peg holes 3/8" deep starting 10" off the floor. A 1/4" pegboard template makes accurate spacing easy.

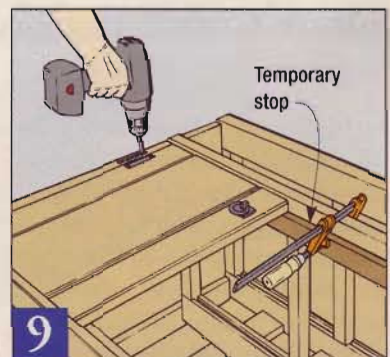
Wrap up the preliminary steps for the doors by routing chamfers on the braces, stiles, and panels (see the Door Construction View).

Assemble the doors much as you did the side and back assemblies on the web frames. Butt the door stiles into the rabbets in the braces, and drill countersunk pilot holes. Loosely drive the screws, and add the panels. Screw each panel at its center to each brace.

### Installing the Doors

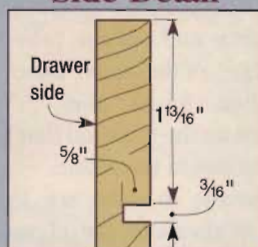
Laying the cart on its back makes door installation a cinch. The cart's floor acts as a door stop at the bottom, and I clamped a temporary stop to the middle web frame to support the top of the doors (Figure 9).

Ideally, the doors should have 1/16" gaps all around. Trim them to size. Once they're situated, screw in your wrought iron hinges and bail pulls. Then remove the temporary door stop, and install roller catches to hold the doors shut.

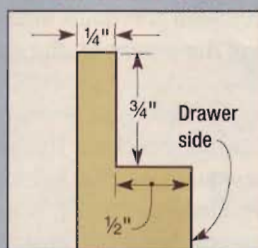


9 With the cart on its back, clamp a temporary stop to the middle web frame. Fit the doors with 1/16" gaps all around, then install the hinges.

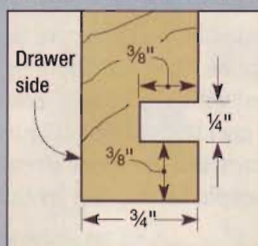
### Side Detail



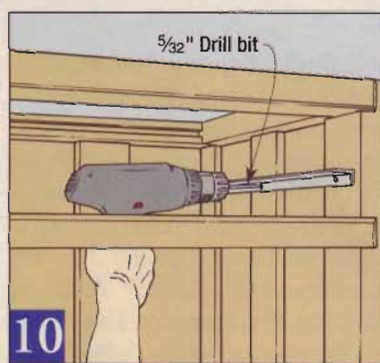
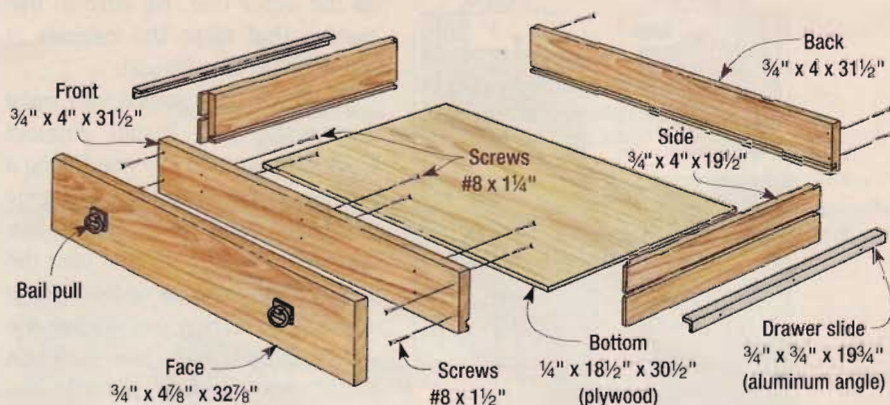
### Rabbit Detail



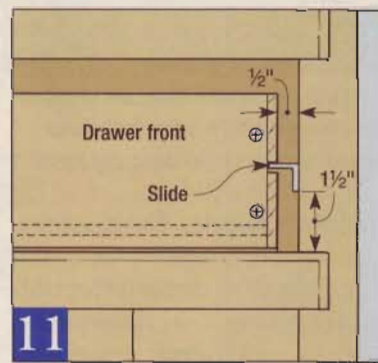
### Bottom Groove Detail



## Drawer Construction View



Butt each drawer slide against the back of the cart and drill three holes that align with the center of each side stile.



Installing the slides 1 1/2 inch above the middle web frame will allow 1/8 inch of clearance underneath the drawer.

### Building the Drawer

I've found the drawer handy for storing hot pads, spatulas, and other outdoor cooking supplies. I made the drawer face, front, back, and sides with cedar, and used 1/4 inch thick exterior grade plywood for the bottom (see the Drawer Construction View). The joints are rabbets reinforced with screws — about as simple as I could get.

Use the measurements shown above as a guide. To get the best fit, yours will probably be a little different. Be sure to make the drawer 1 inch narrower than the opening to allow for the drawer slides.

Cut all your pieces to size except the bottom and the face. Then, using a standard saw blade, cut a groove in each side for the drawer slides (see the Side Detail).

Install a 1/4 inch dado blade to cut rabbets at the ends of the sides (make several passes), and grooves for the bottom (see the Rabbit Detail and the Bottom Groove Detail).

Clamp the drawer parts together and measure for the drawer bottom. Now add the bottom to the assembly. While you have everything together, drill countersunk pilot holes at the rabbet joints for the screws.

Disassemble the drawer so you can apply glue to each rabbet joint. Then reclamp the drawer assembly and start the screws. Be sure to square up the drawer before driving the screws all the way.

### Installing the Drawer

Although my drawer slides appear unconventional, they work great for this application. They won't rust, bind, or cost you an arm and a leg. You can purchase 3/4 inch aluminum angle at most hardware stores.

Cut the aluminum to length with a hacksaw, and use a file to soften any sharp edges. Drill three countersunk screw holes into each strip, locating the holes so they meet the side stiles (Figure 10).

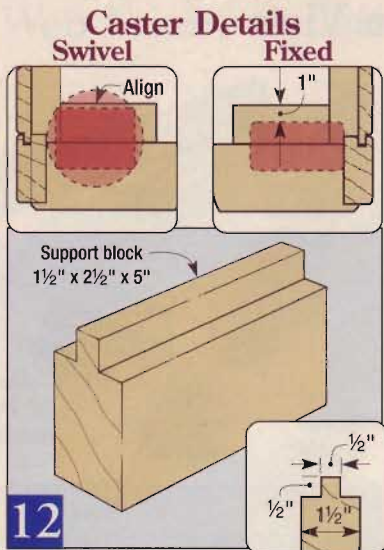
Screw the aluminum to the stiles making sure they remain consistently 1 1/2 inch above the web frame (Figure 11). This way, you'll get about 1/8 inch of clearance between the bottom of the drawer and the web frame.

### Completing the Drawer

The only missing piece of the drawer is the face. Measure your drawer opening and cut the face so you get a 1/16 inch gap all around.

With the drawer box in the carcase, temporarily secure the face to it using double-faced carpet tape. The tape gives you some flexibility for adjusting the face before you drill pilot holes and screw the face to the box (see the Drawer Construction View again).

Wrap up your work on the drawer by installing the wrought iron bail pulls. Later, after you apply a finish, rub paste wax on the slides and in the grooves — the drawer will float in and out like a charm.



Form a tongue on each block, and glue them into the corners of the bottom web frame. Screw the casters to the blocks and frame.

### Adding Blocks for Casters

One of the features I like most about this BBQ cart is its portability. By putting it on casters I can move it conveniently around my patio, or into the garage when the weather looks bad.

Since swivel casters are expensive, I mounted them to one end of the cart only, and installed less

expensive non-swiveling casters on the other end. Be sure to use casters that raise the cabinet at least 1/2" off the ground.

To attach the casters, you must first make and install support blocks (Figure 12). By machining a tongue on the blocks you can glue them into the grooves in the bottom web frame. With this joint the blocks will easily carry the weight of the cart. When positioning the swivel casters, make sure they can rotate 360° before driving the screws (see the Caster Details).

### Building the Tile Top

Every successful tile job begins with a solid, dependable base. I made the core of my base from two pieces of exterior grade plywood — a 3/4" thick upper panel and a 1/4" thick sub-panel (see the Tile Top Construction View). And, to improve its appearance, I surrounded the plywood with a cedar frame.

Cut plywood for the upper panel, and rip enough cedar for the frame. Next, use your table saw and a 1/2" dado blade to rip the grooves in the frame pieces (see the Frame Joint

Detail). After plowing the grooves, clamp a protective wood face to the saw fence and cut the rabbets on the edges of the upper panel. This operation forms the 1/2"-thick tongues on the plywood that fit into the grooves in the frame.

Once the tongues are formed, you can measure the plywood to get an accurate length for the rails and stiles. Cut them to length, then reinstall the dado blade and machine the tenons on the ends of the rails.

Glue the rails and stiles to the upper panel, checking the assembly for square as you tighten the clamps. Once the frame is assembled, you can easily get an accurate measurement for the sub-panel. Glue and screw the sub-panel to the underside of the upper panel.

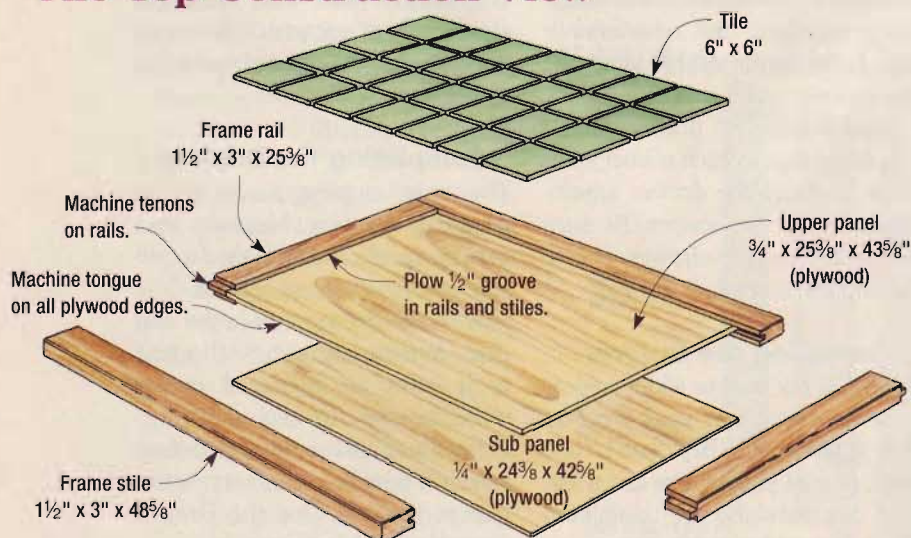
Because this assembly will be covered with tile, I chose to screw it to the cart from above (Figure 13). This provides the most strength in case people lift the cart by the top.

### Finishing

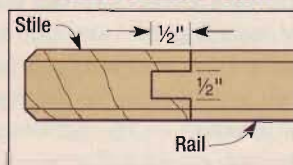
There are lots of outdoor wood finishes, and most will give you fine results. But whatever product you choose, you can expect to redo it every few years. I applied several coats of Flood CWF Outdoor Finish. According to the building center staff, I should apply another coat next year, and then a coat every two years after that.

But this cart will serve up a lot of delicious meals before it needs its next coat of finish.

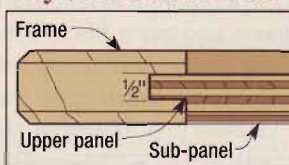
## Tile Top Construction View



### Frame Joint Detail



### Plywood Joint Detail



Make sure the base for the tile is centered on the cart. Drill countersunk pilot holes, then drive screws into the top web frame.

# Laying The Tile

Technically speaking, laying tile requires a different set of skills from the rest of the BBQ cart project. So far, you've exercised your woodworking muscles, but now you need to switch gears.

Begin by spacing tiles along one end and one side of the base (Figure 1). You can buy spacers if you want, although I used a ruler to lay out my tiles. Check your layout with a framing square to keep the pieces in each branch of the "L" square to each other. Once you have the tiles evenly spaced, draw reference lines so you can reposition the tiles after spreading the adhesive.

Before going any further, protect the cedar frame by covering it with masking tape. The next step is messy, so the few minutes you spend now will definitely save you from some aggravation later.



**1** Set your tiles along two edges of the base. Use a framing square to keep the layout square as you space the tiles evenly.

## Spreading Mortar

Now, using a special notched trowel, spread a 1/8"-thick layer of "thin set" mortar on the plywood in the outlined "L" area (Figure 2). A small trowel will come in handy for reaching into corners. You can buy the trowels and mortar from your local tile supplier.

After spreading the mortar, use the notched edges of your trowel to create ridges in the mortar. The ridges provide a better bonding and leveling surface for your tile.

Now lay the tiles into the mortar, and use a slight twisting motion as you apply pressure. Typically, you have about 1/2-hour working time.

Spread out more mortar for a few more tiles, and press the tiles into position (Figure 3). Work



**2** Protect the frame with tape, then spread the mortar with the trowel. Form ridges in the mortar with the notched edges of the trowel.



**3** Place the tiles into the mortar with a small amount of pressure. Once the "L" is covered, continue working in small areas.



**4** After the mortar sets, fill the gaps with grout. Force the grout into the gaps by pushing the float diagonally across the tile.



your way across the base, then let your mortar set up for about 48 hours after placing the last tile.

## Filling with Grout

The grout makes even more of a mess than the mortar, so be sure the masking tape is still covering the top of the frame.

Mix the grout powder with a latex additive, and spread it onto the tile with a float. (Both the additive and the float are available from your tile supplier.) Force the grout into the spaces, working diagonally across the tiles (Figure 4).

When you're finished spreading the grout, wipe off the excess with a sponge and clean water (Figure 5). You'll want to clean the tiles several times as the grout begins to cure.

Allow another 48 hours drying time, then use an old toothbrush to apply a sealer on the grout lines. This is important given that the tiles will be outside. Once the sealer dries, the cart is ready for your first cookout.



**5** As the grout dries, wipe off the excess with a sponge and clean water. Repeat this many times to clear away the dried film.



# Compact Disc Cabinet

*Like most people who grew up listening to music on vinyl albums, I dug in my heels when compact disc recordings entered the scene. Eventually, the great sound CDs offer won*

me over. Now, my album collection sits in cardboard boxes, waiting for Judgment Day, while I have stacks of CDs in need of a good home.

It would have been simple enough to go out and buy one of the dozens of ready-made CD racks, but like most woodworkers I'm constantly seduced by the song that goes, "hey, I can make this myself!"

So, going enthusiastically forward like I always do, I began

sketching out ideas. The cabinet I designed and built holds over 30 CDs, and multiples of this cabinet can be stacked to create even more storage space. Although I did not intend for my project to hang from the wall, you could easily adapt it for this purpose. If you do mount the cabinet on the wall, I recommend using heavy-duty wall anchors to support the weight — the cabinet is deceptively heavy.

To complement its high-tech contents, my cabinet sports some new technology of its own. For parts of the project I used a bio-composite material made with recycled newspapers, soy protein binders, and natural colorants. Called Environ, it comes in a variety of colors, some having the mot-

tled look of granite. It machines like hardwood, and holds a routed edge beautifully. If you're interested in learning more about this material, take a look at *Synthetic Stone* on page 46.

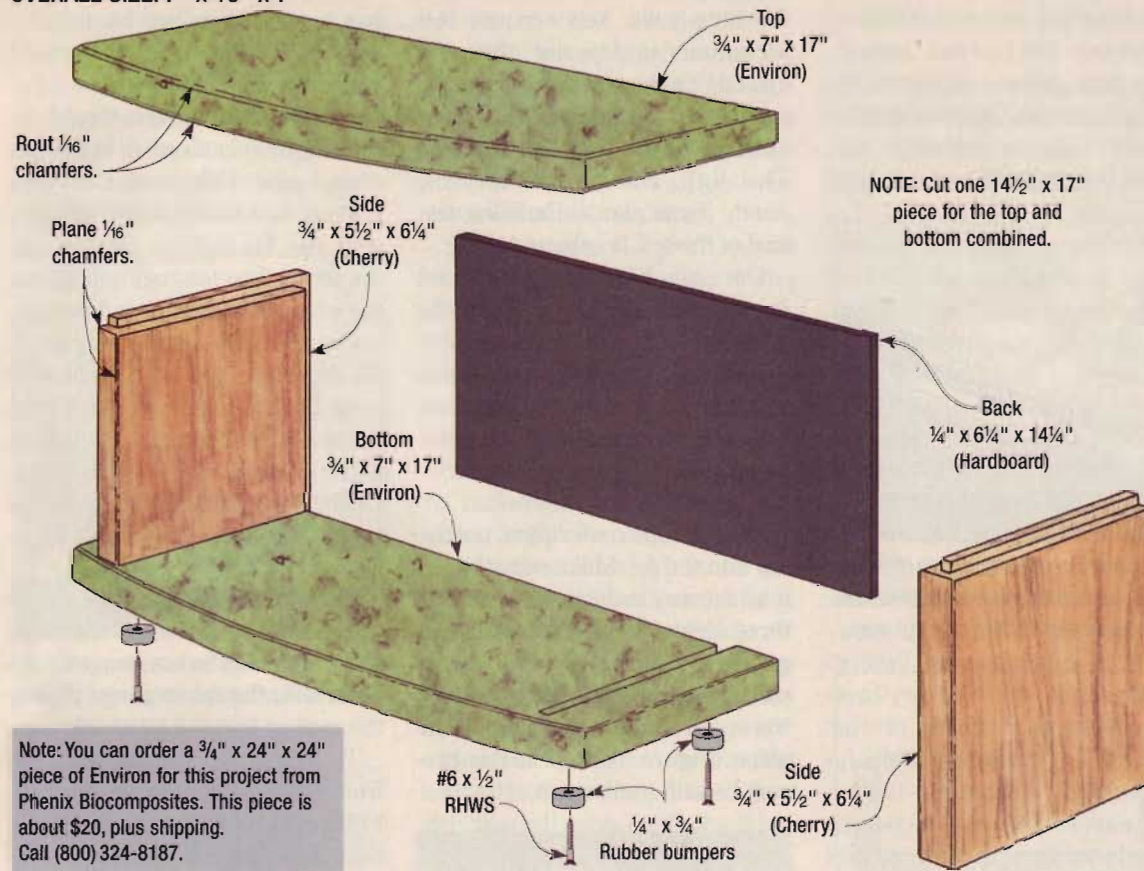
On the other hand, if you're not interested in trying out some Environ, but still want to build this CD cabinet, you can substitute any hardwood and still end up with a great-looking cabinet.

## **Machining the Environ**

Making the top and bottom comes first in this project, and they are the pieces I thought were perfect for my experiment with Environ (see the Compact Disc Cabinet Construction View). I think the result supports my hunch.

# Compact Disc Cabinet Construction View

OVERALL SIZE: 7" x 16" x 7"

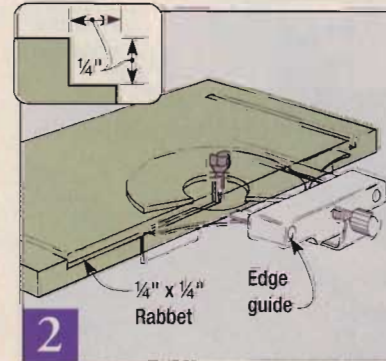
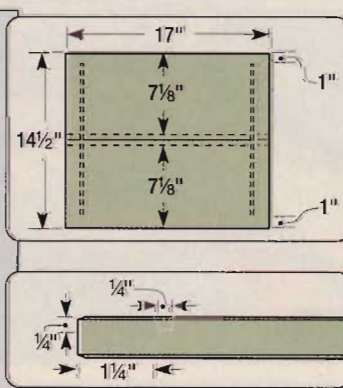
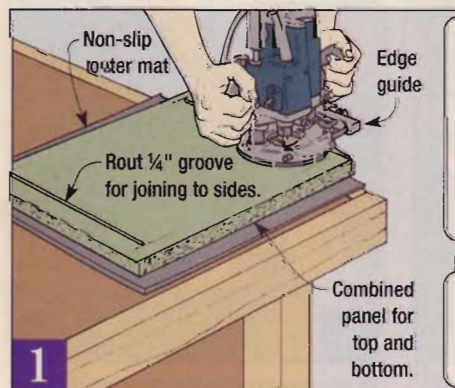


As I was getting underway, it occurred to me that machining the top and bottom combined as one piece would be more efficient (Figure 1). Cut your Environ to size, then chuck a 1/4" straight bit in your plunge router. Attach an edge guide to the router base and plow the two grooves in the panel. These grooves will be used to join the top and bottom to the sides.

Now rip the panel into two pieces 7 1/8" wide and use the same bit to rout a rabbet along the back edge of each piece (Figure 2). The rabbets will house the back of the cabinet. Make sure the rabbet meets the grooves with square corners. If necessary, clean up these intersections with a chisel.

For the curved front edges on the top and bottom, I wanted a

wide, gentle arc. Working with a compass, and then a small trammel set, proved to be inadequate. Neither of them gave me the radius I was after without requiring unreasonable steps — I think the trammel beam might have reached across the street into my neighbors' living room, and fine people though they are, they're not that neighborly. Instead I used

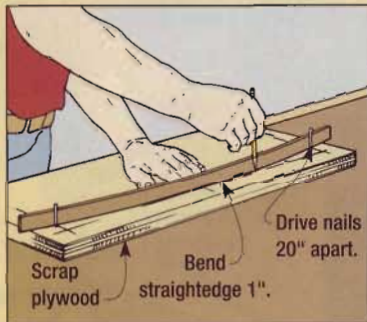


Since the rabbet in the top and bottom are stopped at each end, you'll want to use a router to do the machining.

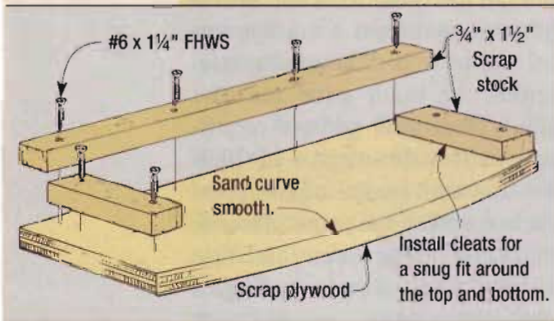
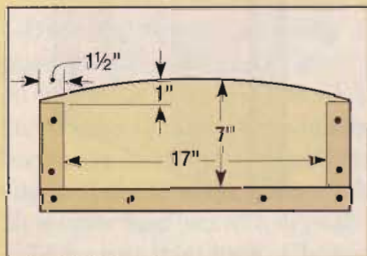
1 Cut one panel for the combined size of the top and bottom, then use your router to plow out the grooves. After completing the grooves, rip the panel into pieces 7 1/8" wide.

## Building The Jig

I wouldn't call myself a stickler, but having the top and bottom match perfectly was important to me. To guarantee their uniformity, I made a jig for shaping the curved front edge of each piece.



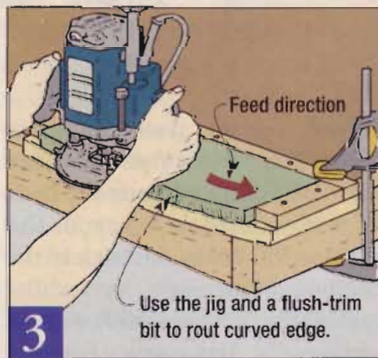
Shape the arc by bending a piece of flexible wood (or a metal straightedge) between two finishing nails. Position the nails 20" apart.



an old millwork trick: bending a flexible piece of wood between two finishing nails. You can use this technique to lay out the arcs directly on the workpieces, or you can make a routing jig to have absolute consistency (see Building The Jig). The jig is especially handy if you plan on building several of these CD cabinets.

Once you have the jig made, set the top into position and trace the arc onto it. Do the same for the bottom. Now carefully cut just outside the lines with a band saw. This will remove most of the waste so you can make a light, chatter-free pass with the router.

To make the router pass, put the top into the jig. Make sure the top is all the way in the jig, touching all three cleats. Next, with a bearing-guided flush-trim bit chucked in your router, trim the remaining waste off the front edge of the piece (Figure 3). Repeat this procedure with the bottom.



Clamp the jig to your workbench, slip the top or bottom into position, and rout its front edge with a flush-trim bit.

## Choosing Sides

Environ's faux-granite appearance has a great look, but I wanted to add a little contrast by using solid cherry for the sides.

Cut the sides to size, then form the tongues centered on both ends of each piece (Figure 4). Clamping a wood face to the fence will prevent the blade from cutting into the fence. The tongues will fit into the grooves in the top and bottom.

Check to see that the tongues fit the grooves — you want the fit to be snug, but not tight. Next you'll need to cut a rabbet along the back edge of the sides for the back (Figure 5). Unlike the stopped rabbets in the top and bottom, these rabbets go from end to end.

The front of each tongue needs to be cut away to form a shoulder (Figure 6). For safety, support the sides with the miter gauge during the cuts.

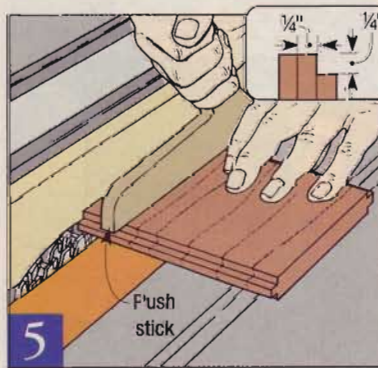
To blend with the curve of the front edge on the top and bottom, I chose to bevel the front edge of each side (Figure 7). Replace the dado blade with a standard saw blade, tilt the blade 13°, and set the fence so the blade splits the inside corner of each piece.

Besides cutting the back from 1/4" tempered hardboard, the last machining step is routing chamfers on the top and bottom panels (Figure 8). I also used a hand plane to form similar chamfers on the front edges of the sides.

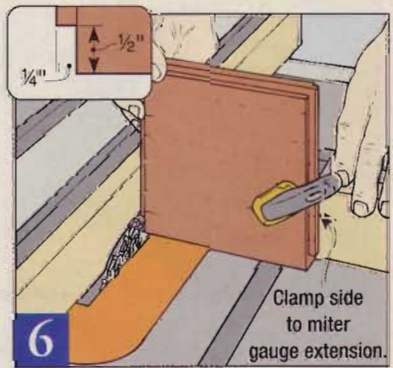
And there you have it: five easy pieces for one CD cabinet.



Form tongues on the ends of the sides using a 1/4" dado blade. Be sure to protect the fence by clamping on a wood face.



Leave the table saw setup unchanged to cut a 1/4" x 1/4" rabbet along the back inside edge of each side.



After completing the tongues and rabbet, raise the blade to 1/2", and stand each side on edge to cut the front shoulder.



## Getting to the Finish

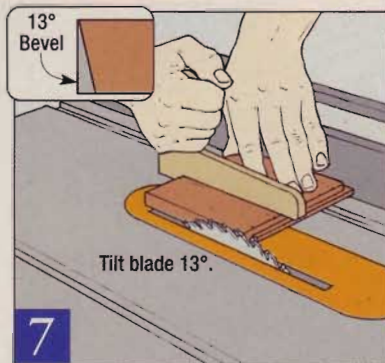
Normally, at this stage of the game I'd be ready to glue everything up, then apply the finish. Finishing Environ, however, takes some extra care, so I recommend finishing the pieces for the CD cabinet separately before gluing them together.

Like many composite panels, Environ is more porous than most solid woods, especially at its edges. This makes it harder to get a good build up with a top coat. Most common finishes will soak in and leave a low sheen surface. Since I wanted a high gloss finish that makes the material look like polished granite, I had to jump through a few hoops (see *Finishing Secrets For Environ*).

I finished the cherry sides with a coat of cherry oil stain, then several coats of General Finishes wiping varnish. The hardboard back got two coats of flat black paint.

## Final Assembly

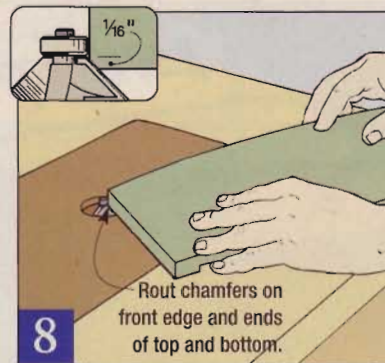
Once all the finish had thoroughly cured, I checked to see that none of it had dried on any of the gluing surfaces, like the tongue-and-groove joints and the rabbit joints.



For the front edge of the sides to match the curved top and bottom, rip a 13° bevel with the blade splitting the inside corner.

I did pause here, thinking this was a little backward — usually I'm scouting for excess glue that will interfere with my finish.


After cleaning up a few spots, I set about assembling the cabinet. Yellow (aliphatic resin) glue performs fairly well on Environ, but the manufacturer recommends using one-part polyurethane adhesives to get the best results. Polyurethane adhesives form a hard, stable glue line, and they expand as they cure, filling pores in the material. You'll have to allow a little more clamping time than with yellow glue, though. And, if



Chuck a 45° chamfering bit in your router table and chamfer the front edges and both ends of the top and bottom panels.

you pre-finish the cabinet parts like I did, you'll want to take extra care when clamping the pieces together. I used scraps of soft cloth under wood clamp pads, and clamped the pieces with only light pressure.

Holding the back in the rabbets while the glue dries is easy if you drive a few brads — screws would be a better idea if you plan to mount the cabinet to a wall.

For now, a pair of these cabinets has solved my CD storage problems. But I just got a notice in the mail offering me 10 CDs for a penny, so I don't think my victory over clutter will last long. 

## Finishing Secrets For Environ

The secret to getting a shiny high gloss finish on Environ, according to Bob Smith at Phenix Biocomposites, is a high-solids acrylic finish that's roll-coated on and cured with ultraviolet light.

While that's fine for a big professional shop, it's not a very good solution for small-time users like me and you. For a price, Phenix can supply Environ with the acrylic finish already applied to the face. Of course, you'll still have to deal with the edges. But they also suggested a couple other solutions.

I experimented with a two part polyurethane product with 65%-solids called "Sadoplast." It's made by Chemcraft International (800) 724-6839. Chemcraft recom-

mends calling them for the name of a dealer near you. I used Sadoplast on the Environ for the CD cabinet and the Bookends. But I frankly don't think I would use this product again. I don't think that this finish built up much faster than standard finishes to warrant its high price plus the hassle of mixing the catalyst.

If you're not after a high gloss look for your project, you can stick to using conventional finishing products. Standard varnish or polyurethane will work fine on Environ, but you will need to apply five or six coats. Environ is so porous that it soaks up the first few coats of finish as fast as you can brush them on.

Whatever finish you choose, apply an equal number of coats on all surfaces. Otherwise, warping may occur, giving your cabinet some unwanted curves.





# Synthetic Stone

*The experiments were not going well. And if you had heard what the Rho-Delta group was up to, you wouldn't have been surprised. They were attempting to make structural*

lumber out of shredded newspapers. It sounds like a fraternity prank — the loony scheme of a bunch of crackpots with too much time on their hands.

But you might have started to take them seriously when you realized that Rho and Delta are the Greek letters for R and D, short for research and development. It's an appropriate name for a group of scientists, all former professors from Mankato State University, working to turn clever ideas into businesses.

Mike Reibel, a Rho-Delta member, saw some possibilities amid these experiments. Instead of calling it a failed structural material, he reasoned, let's call it a successful decorative product. He also suggested adding soy flour as a binder.

As a former engineering and physics teacher who also has farming in his background, Mike owns a unique perspective on developing environmentally-friendly, agriculturally-based products.

Further tests proved the value of his ideas. Food-grade soy flour helped produce a durable panel without relying on a toxic binding agent that includes formaldehyde (remember *that* smell from your high school biology lab?). This breakthrough gave birth to a product named Environ, and a new company, Phenix Biocomposites.

## Mix, Mash & Mold

Environ is composed mainly of recycled newspapers and food-grade soy flour. The panels are available in ten rich colors and thicknesses ranging from 1/8" to 1". Virtually all the raw materials



Photo by Steve Jurek

for Environ are collected or harvested within 50 miles of the Phenix manufacturing plant in St. Peter, Minnesota.

After making sure the newspapers meet the company's composition and cleanliness standards, a pulverizing mill transforms yesterday's news into a fluff that looks like cellulose insulation. Ink is not removed from the paper since that would require harsh bleaching chemicals that are hazardous to use and can generate toxic waste.

The edible soy flour is blended with the newspaper pulp, then a precisely brewed soup is added. The recipe for the soup consists of water, dyes, and other ingredients, including a wax that keeps the particles from sticking to the press.

To achieve the granite look, two separately dyed batches are blended, partially dried, and eventually reach the press. There, pressure and heat forms a pair of 3-ft. x 6-ft. panels.

Once the Environ exits the press, it dries slowly to reach an equilibrium moisture content of 6% to 10%. This is equivalent to the moisture level of kiln-dried hardwoods.

### Growing A Market

The story of Environ is much more than engineering, chemistry, and physics. It is also a success story in marketing, for both the raw materials and the finished product.

For example, the farmers who grow the soybeans that go into Environ are more than suppliers — they're also members of a co-op that owns part of the Phenix manufacturing operation. When the company sells more product, the market for their soybeans increases.

And on the distribution side, Phenix constantly searches for creative ways to use Environ. The material has become popular for making plaques and awards, interior signs, store fixtures, statue bases, pens, desk and table tops, and even flooring accent strips.

To meet current demand, 50 employees work two shifts in a

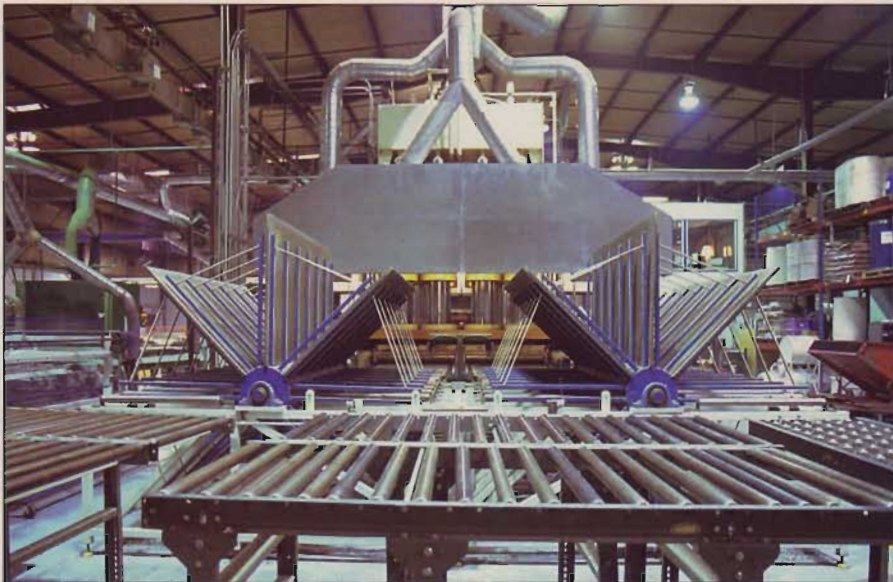


Photo by Scott Jacobson.

Each of the two cooling racks picks up and holds three sheets of Environ after they exit the press. The next steps — surface sanding and edge trimming — produce uniform panels.

40,000 square foot building, manufacturing one million square feet of panels per year.

But construction is already underway for a 150,000 square foot plant, and additional production capacity will take a quantum leap to 45 million square feet per year — equivalent to covering 355 miles of two lane Interstate highway.

Not all of the production will be Environ, however. Phenix will begin manufacturing a panel to compete with medium-density fiberboard, and is poised to begin marketing new floor tiles based on Environ technology. There's also a solid surface product made with recycled plastics under development.

### Putting Environ To Work

Given the newspaper content of Environ, it's no surprise that it machines a lot like lumber.

Although Environ is 1½ times harder than oak, it can easily be sawed, drilled, routed, and sanded. Join it to itself or solid wood with screws, nails, dowels, biscuits, or glue. You can use yellow glue (aliphatic resin), but polyurethane adhesive is recommended.



Photo by Scott Jacobson.

Environ is finish-sanded with 180-grit paper. A 3-ft. x 6-ft. panel goes through this sanding station every 30 seconds.

Environ has about the same structural strength as medium-density fiberboard, but its main feature is good looks, not brawn.

One of the quirks of Environ is its aroma. Although it doesn't have the nose-burning sting of formaldehyde, it has an earthy scent that fills the workshop. But Phenix is experimenting with pine and cedar scents to resolve this smelly shortcoming.

To find out more about Environ, contact Phenix Biocomposites at (800) 324-8187.





# Classic Bookends

*Building the compact disc cabinet gave me the chance to get acquainted with Environ. I liked the results so much that I immediately began thinking about another project using*

this material. It didn't take long before I realized how perfectly the faux granite appearance would be for a pair of bookends. So I decided to draw up a simple design that I could complete in a day or two.

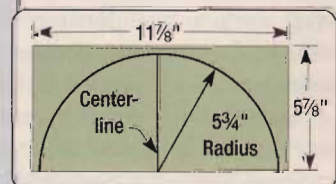
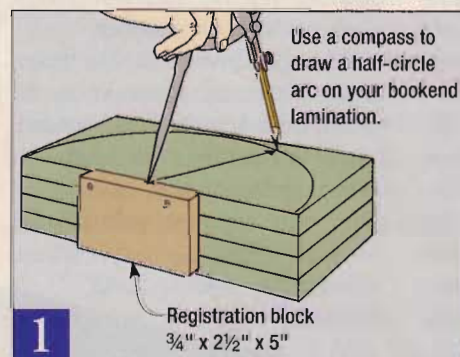
The design I settled on calls for gluing four pieces of Environ into a laminated block (see the Bookend Construction View). This stack provides the weight that a good pair of bookends must have to be effective for supporting the world's great literature. Or, in my case, a collection

of home improvement guides and the Far Side cartoon series.

Screwing a registration block to the bottom edge of the top piece makes it easy to align the other three pieces (Figure 1). For a good bond, I brushed polyurethane glue onto the mating faces, then clamped the stack between a pair of

plywood cauls. I wasn't worried about clamping dents, because Environ's a hard material, but the cauls helped spread the clamping pressure more evenly. I did my glue-up one evening so I could work on the bookends the next day.

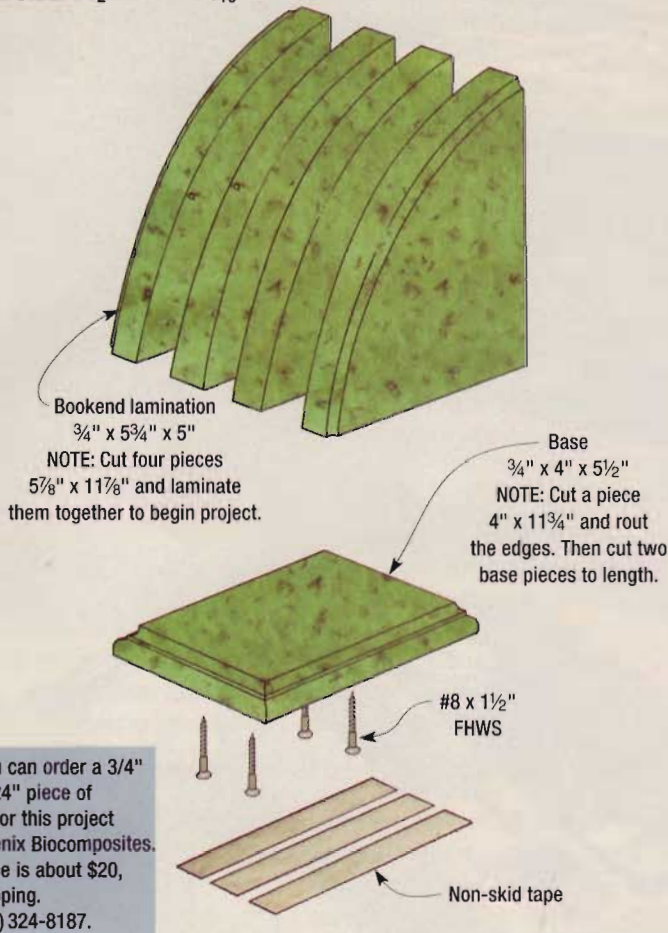
Starting out the following morning, I removed the registration block and used a compass to lay out a semicircle (Figure 1). Then I hand-sawed the block to shape. Don't toss the corner cut-



Scrap wood screwed to the top piece in the lamination helps align the stack during the glueup, and supports the compass while you draw the arc.

# Bookends Construction View

OVERALL SIZE: 5 1/2" x 4" x 7 3/16"



offs into the trash — they're ready-made sanding blocks (Figure 2).

After smoothing the curved face of the lamination, rout a shallow cove along those edges (Figure 3).

Now you can use a band saw to cut two equally sized quarter circles from the block (Figure 4). A miter gauge will help guide the cut so the surfaces are reliably square.



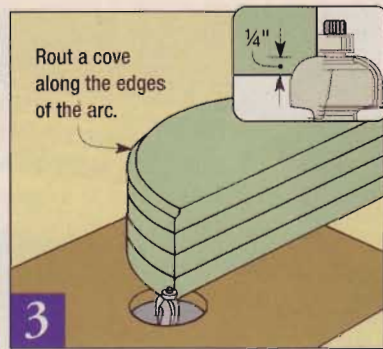
Sand the curve starting with 80-grit paper and finishing with 220-grit. Tape the paper to the block or use an adhesive-backed sheet.

Sand the bookends thoroughly, then set them aside and begin work on the bases. I cut one long piece of Environ for the two bases, and routed a classical profile along all four edges (Figure 5). Next, I cut the two bases to length.

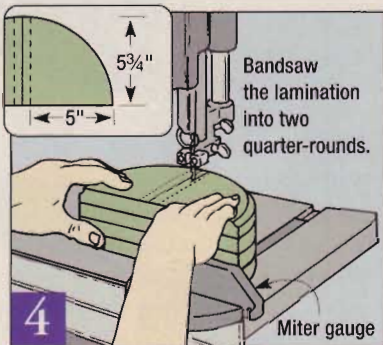
Drilling four countersunk pilot holes into each assembly is the final machining step (Figure 6). Afterward, you can glue and screw each base to the quarter-rounds.

Finishing the bookends to a high gloss was a time-consuming process. Even with two coats of sanding sealer, I had to brush on five or six coats of varnish — I lost count — to get the build-up I needed to rub out to a high-gloss luster. (Also see *Finishing Secrets For Environ* on page 45.)

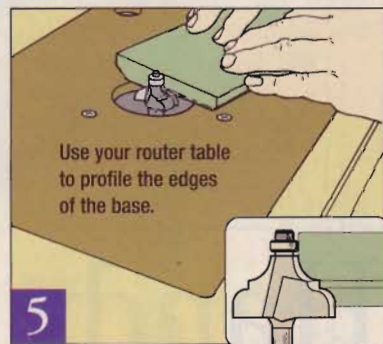
To give the bookends a little more staying power, I added a few short strips of non-skid tape to the underside of each base.



Rout the curved edges with a 1/2"-radius cove bit, making a couple of shallow passes to avoid any tear out.



Lay out two quarter-rounds of equal length, then use a miter gauge to ensure square band saw cuts.



Rout the combined base piece with the decorative bit of your choice. (I used a cove-and-bead bit). Then, cut the two bases to length.



Drill countersunk pilot holes before gluing and screwing a base to each quarter-round bookend. Use #8 x 1 1/2" screws.



# Handy Step Tool Box

*When I read an article recently about what physicists call chaos theory, I couldn't help but wonder if someone coined the phrase during a home improvement project. It can*

be as simple as hanging a ceiling fan, installing a bath faucet, or just nailing up some molding, but odds are the tool or fastener I need will be the one I left behind in the shop.

The obvious answer is to haul every tool I might need to the job

site. But that's a waste of time. And I just have more to trip over.

Thankfully, I finally came up with a solution that has made this problem a lot easier for me to handle. I call it the step tool box. It's big enough to hold the tools and hardware I need for on-site home improvement jobs, and gives me a handy place to sit or stand while I'm working. I also like to use it as a platform for holding stock while I'm cutting or drilling.

Best of all, building the step tool box doesn't require much time, material, or money.

## The Right Materials

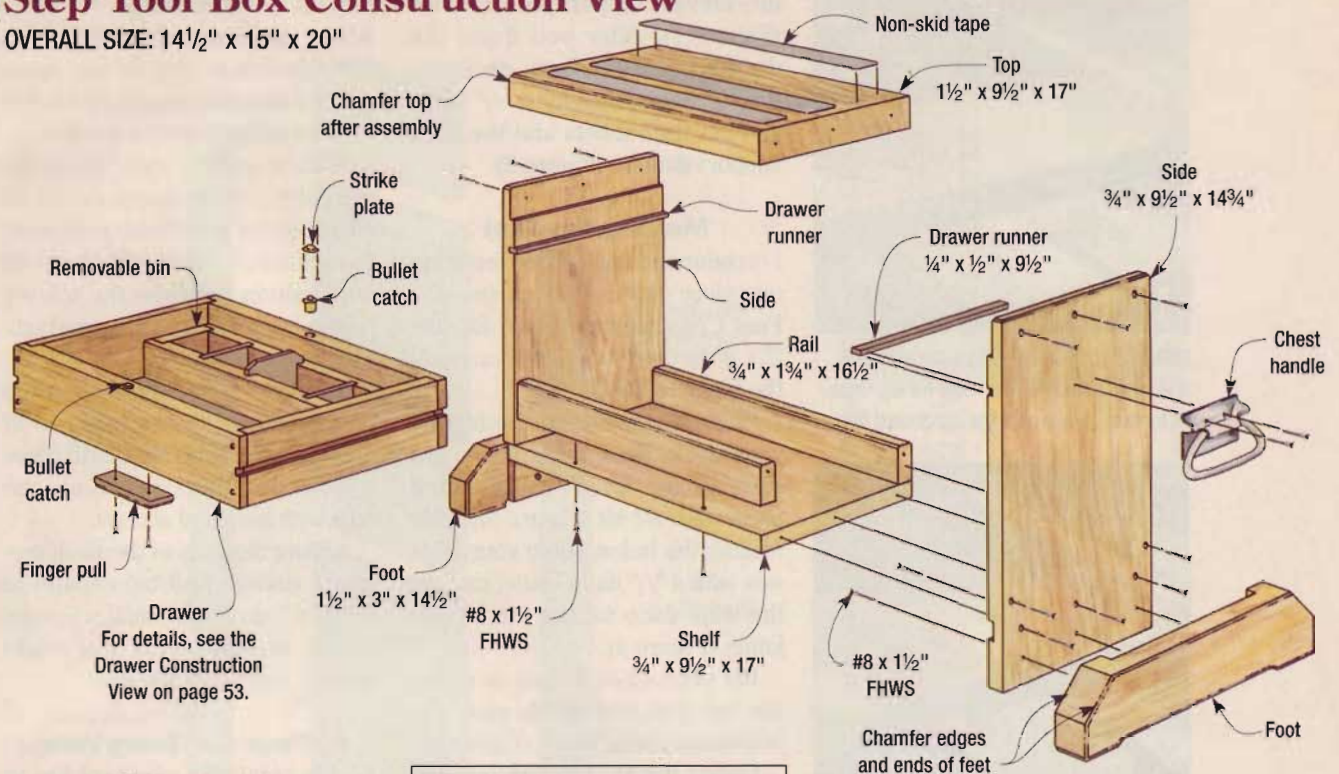
This is a utility project that's likely to get kicked around a bit, so there's no sense using pricey high-grade lumber.

My "pine will do fine" motto for shop fixtures works here, but since you'll be counting on the step tool box to support your weight occasionally, stay away from boards with large, loose knots or any other serious defects.

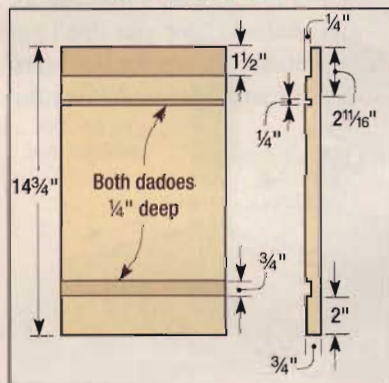
I started by cutting the best material for the sides. You can cut pieces from a 1" x 12" and rip them to width, or glue up the panels from

# Step Tool Box Construction View

OVERALL SIZE: 14½" x 15" x 20"



## Side Detail



## What You'll Need

### Lumber

- 8 bd. ft. of 1" x 12" Pine
- 5 bd. ft. of 2" x 8" Fir
- 2 sq. ft. of ¼" Hardboard

### Hardware

- (40) #8 x 1½" Flathead screws
- (2) Chest Handles
- (2) Bullet Catches — 12mm
- (5) Lin. ft. of 2" Non-skid tape

## WORKBENCH PROJECT SUPPLIES

### STEP TOOL BOX

A kit has been assembled for this project that includes the bullet catches with strikes and escutcheon pins, chest handles, screws and non-skid adhesive tape. Order number 3303100. . . . . \$15.95

To Order Call (800) 311-3994

## PRO TIP

### Grain Makes a Difference

The most stable, warp resistant boards have annual rings that are perpendicular to the surface. This grain orientation, called quartersawn, makes boards that are less influenced by changes in moisture than plain-sawn lumber. Quartersawn boards usually show a very straight, parallel grain figure.

Quartersawn board

Plain-sawn board

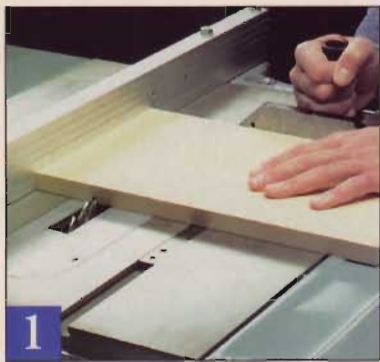
narrower boards. Even though it's a little more work, I like the second method. My preference is to rip quartersawn sections from wide boards, and glue them into panels (see the Pro Tip at right). Due to the orientation of the tree's growth rings in the board, quartersawn panels are less likely to shrink, swell, or cup as much from changes in humidity than plain-sawn boards of the same width.

While you're at it, cut enough quartersawn stock for the shelf as well. In fact, you can also make a panel from 2x stock for the top following the same method. Simple edge to edge butt joints will work

fine for gluing up all of these narrow boards into panels. I prefer using standard yellow carpenter's glue for this kind of joinery.

Don't make the mistake of wiping up the glue squeeze out with a wet rag. You'll only make a mess. Instead, let the glue dry to a rubbery consistency, then remove it with a scraper or chisel. Sand the panels after the glue hardens, then put the shelf and top aside. For now, concentrate your effort on the side panels (see the Side Detail).

Get ready for the next step by outfitting your table saw with a ¼" dado blade. You need the dado blade to cut narrow slots for



**1** Install a 1/4" dado blade in your table saw and plow a dado in each side for the drawer runners. Make sure the hardboard fits.



**2** Switch to a 1/2" dado blade and make several passes to cut the wide dado at the top end of each side. Then cut the shelf dadoes.



**3** Lay out the feet on a 6 1/8"-wide blank, then bore 5/8" diameter holes through the stock to form the curve at the ends of the instep.



**4** To form the wide dado, first make two passes to define the ends of the dado, then remove the waste between the first cuts.

the drawer runners in each side (Figure 1). After you finish the drawer runner dadoes, exchange the 1/4" dado blade for a 1/2" blade and cut the rabbets and the shelf support dadoes (Figure 2).

### Making the Feet

I recommend making the feet from one piece of 2" x 8" stock (see the Feet Construction View). Rip the 2" x 8" to 6 1/8" wide, then crosscut the blank to 14 1/2" long.

Begin by laying out the feet on your stock. Next, form the curved ends of the instep using a drill press and 5/8" bit (Figure 3). After drilling the holes, equip your table saw with a 3/4" dado blade, and cut the wide dado for the foot-to-side joints (Figure 4).

Rip your stock in half to create the two feet, and nibble away the remaining instep waste (Figure 5).

Layout the 45° corners (see the Foot Detail), and cut them with your table saw (Figure 6). Sand the feet thoroughly and rout a chamfer along the outside edges.

### Assembly

Before glue starts flowing, take a few minutes to dry fit the joints and to drill countersunk pilot holes where required for the screws.

With a project this small the assembly really happens all at once. Spread glue in the side panel dadoes for the shelf, slip the shelf into position, and drive the screws. Now put glue in the side panel rabbets and add the top.

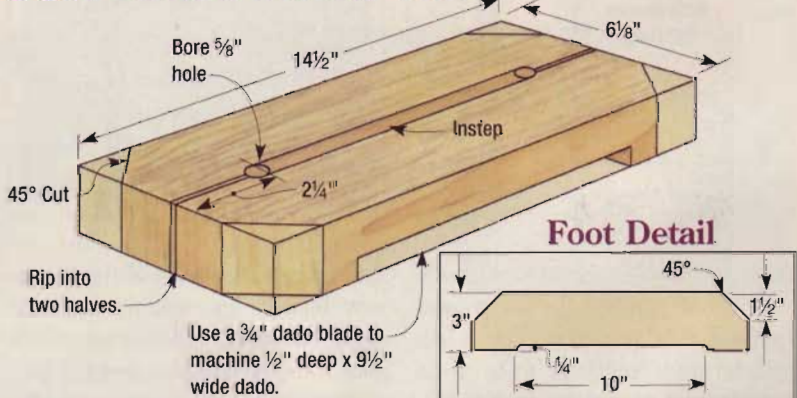
Glue and screw the feet to the box, then cut the two rails and fit them into the assembly. Drill countersunk pilot holes and secure the rails with glue and screws.

Adding the rails to the shelf creates a storage well big enough to hold a cordless drill, jigsaw, router, or other tools you might need to carry to a job site.

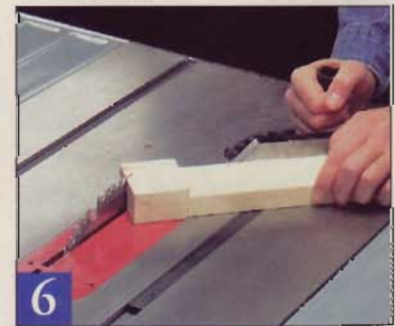
### A Place For Everything

At this point, the step tool box is ready to function as a tool carrier and a platform. But you don't yet have suitable storage for hardware and other small items. Adding the

## Feet Construction View



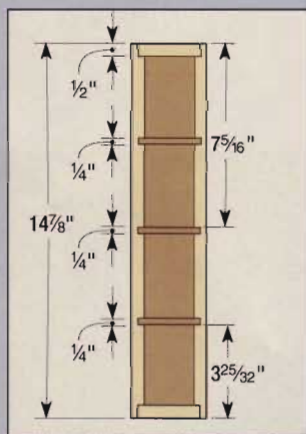
**5** Rip the two feet from the blank, then stand the pieces up and cut away the waste that remains in the insteps.



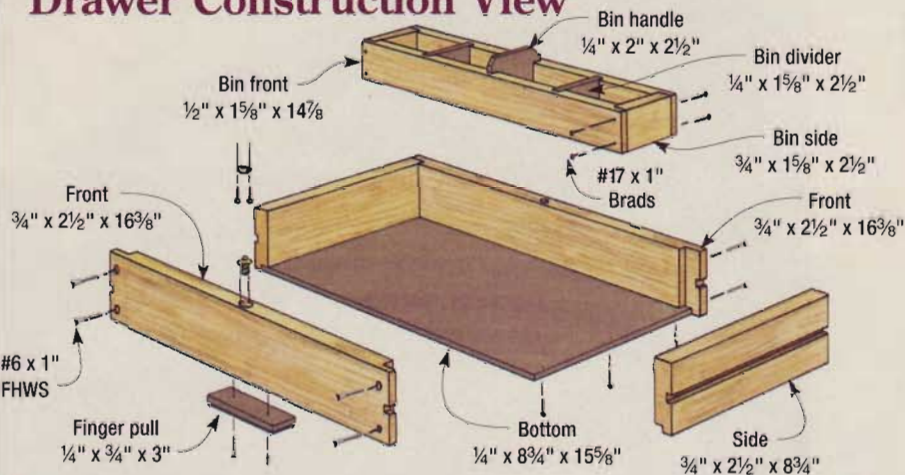
**6** Turn your miter gauge 45° and make the corner cuts on each foot. Chamfer the ends and edges of the feet with a router.



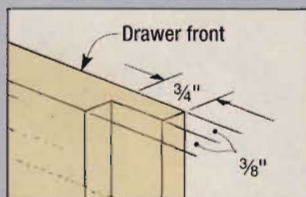
## Bin Detail



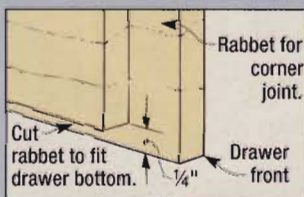
## Drawer Construction View



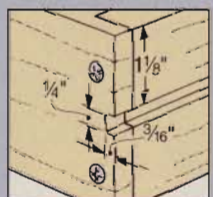
## Rabbet Detail



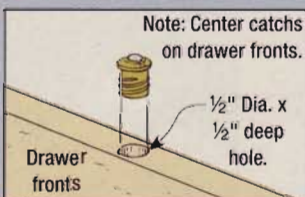
## Bottom Rabbet Detail



## Groove Detail



## Bullet Catch Detail



storage drawer, with its removable bin, will take care of that.

Simple rabbet joinery is all that's needed for the drawer corners (see the Rabbet Detail). As for the bottom, normally I'd support it in grooves in the drawer walls. But for this drawer I just rabbeted the sides and fronts to get the greatest depth (see the Bottom Rabbet Detail) — don't worry, this is plenty strong.

Cut the drawer sides and fronts to size and complete the rabbets. Then glue and screw the drawer together, and cut the hardboard bottom to fit.

Once the bottom is installed with glue and nails (you'll need to drill pilot holes in the hardboard), cut the groove in each side for the drawer runners (see the Groove Detail). Next, cut hardboard for the finger pulls and the drawer runners as well. Glue the runners into the step tool box sides. As for the finger pulls, glue and screw them to the bottom edge of each drawer front.

The drawer is designed to open from either side of the step tool box, a convenient feature that requires a pair of spring-loaded bullet catches. Drill a pilot hole in each

drawer front and screw in the bullet catches (see the Bullet Catch Detail). Mount the strike plates to the underside of the top.

Building the removable bin involves the same simple rabbet and dado joinery you've used in the rest of this project (see the Bin Detail). To get the 1/2" stock for the bin, you can resaw it or plane it from thicker stock. You can also purchase 1/2" thick molding stock from many lumberyards.

Make the bin just as you did the drawer. The only difference is the additional dados needed for the hardboard dividers, and the use of brads for holding the rabbet joints instead of screws.

## Wrapping Up

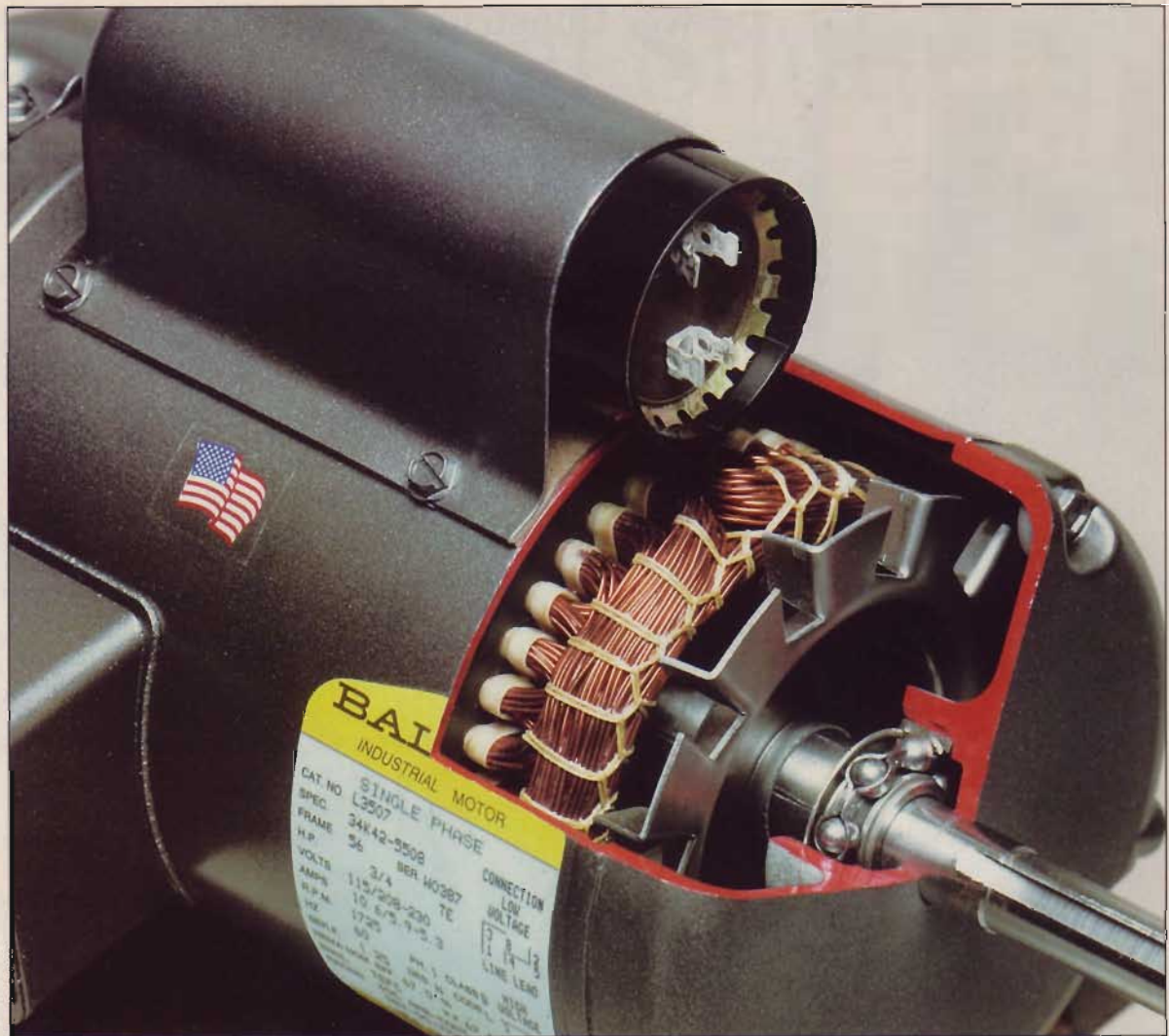
Now all that's left to do is to check the fit of the drawer. If all goes well, rout a chamfer around the top of the step tool box. Give the project a final sanding, and apply either polyurethane or regular varnish for a tough, protective shell.

As finishing touches, I mounted carrying handles on the step tool box sides, and applied non-skid tape to the top and feet.

All it takes is one trial run to prove what a handy problem-solver the step tool box is. Although I admit it has had a couple of unfortunate side-effects.

For starters, I have fewer excuses for being disorganized — I just hate to give those up. Second, I've had to muster some self-discipline and return the step tool box to my shop whenever I complete a job. Failing to put tools back where they belong, I've discovered, leads me back to my original problem — the chaos of hardware-filled coffee cans and forgotten tools. 





# Demystifying Motors

*Lately, I've noticed that my woodworker's brain is a lot like my shop — more than a little unkempt, and always too small for everything I try to fit inside it. Even though some things get*

less than their due attention, I did notice when the motor on my old table saw suddenly “retired” a few weeks ago.

A replacement motor was in order, but I've always been a little confused by the fine print of motor ratings and features. After I did some digging, though, I found a

reliable set of standards and features that can tell me whether I'm getting my money's worth. And I also began understanding the basic principles of a single-phase induction motor — the kind that powers most small-shop woodworking machinery.

## Wild Horses

The first thing I discovered was that the horsepower rating is the sound-bite of motor specifications. Not only does it present an incomplete picture of a motor's quality, it's not always subject to a fixed, independent standard of interpretation. Some manufacturers make

optimistic claims that don't necessarily hold up in the shop. Even worse, this lone number obscures two key factors: the motor's ability to increase its output in response to the demands made on it, and the potential for damage if those demands repeatedly exceed the motor's intended use.

For a sort of reverse analogy, picture a track athlete who can sprint 100 meters on level ground in ten seconds. If he tries to cover the same distance up a steep incline at the same pace, he'll have to develop additional muscle, heart, and lung capacity. More realistically, he'll have to negotiate

the grade at a slower pace.

An induction motor is different from the runner in two ways. First, the motor's speed is fixed by the number of poles in the stator and by the pulse cycle of the electrical source. Therefore, it can't slow down to compensate for the increased load. Second, the motor can generate additional torque simply by drawing more current, an option the sprinter doesn't have.

So far it sounds good — the motor can beef up instantly when it's got a bigger job to do. But there's a catch. The motor won't sustain that power level continuously without generating exces-

sive heat, the culprit in most motor failures. This is one of the most basic tradeoffs in motor performance, and defines the difference between a "continuous-duty" rating (power that can be safely generated for extended periods) and a "maximum developed horsepower" rating (a peak level the motor can generate only intermittently without overheating). The peak horsepower can be two to three times higher than the continuous horsepower. I think of that burst of power as a team of wild horses that can pull your wagon out of a steep ravine, but isn't necessary for a steady trip cross-country.

The bottom line is this: if a

machinery or motor manufacturer phrases horsepower claims with the word "Develops . . ." it's a virtual certainty that the number given is not a continuous-duty rating and shouldn't be compared with one.

In any event, the motor's amperage rating, shown on the nameplate, is a more reliable indicator. It states the actual current draw of the motor at a given voltage level and temperature rise.

Essentially, horsepower ratings indicate what's coming out of a motor. Amperage ratings reveal what's going into it (electrical current), with higher numbers indicating a more powerful motor.

## Induction Motor Basics

If you've ever noticed the way poles on magnets repel and attract each other, you're already halfway to understanding how induction motors work.

Induction motors rely on two types of magnets — a free-spinning permanent magnet (the rotor), and a fixed electromagnet (the stator).

The stator, a metal cylinder wrapped with windings of copper wire, needs electrical current passing through it to become magnetically charged. Inside the stator are its magnetic poles — stations that transmit current to the rotor. There are usually two or four poles, sometimes six, always arranged in pairs mounted opposite each other.

The rotor resembles a squirrel cage, and has no direct connection to a source of electrical current. Supported on a bearing-mounted steel shaft, it nests inside the stator.

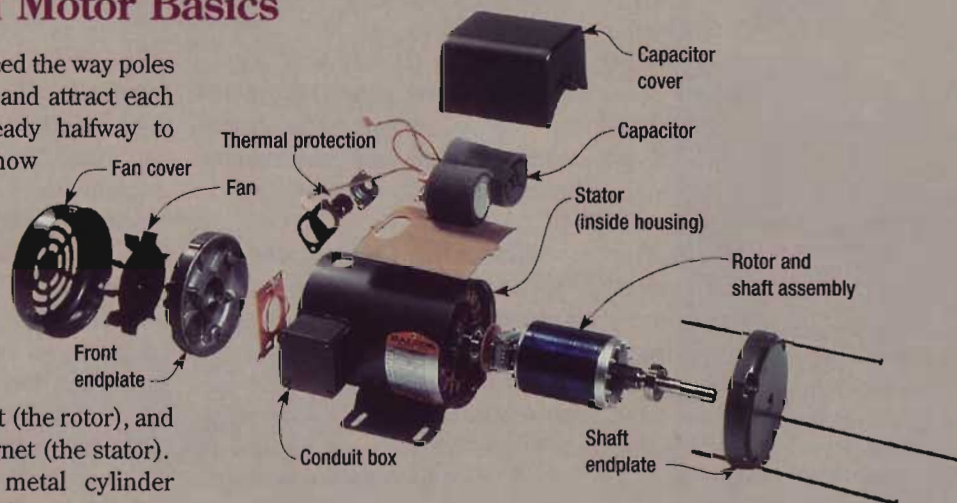
As electrical current flows through the stator windings, the poles become magnetically charged, one negative and one positive in each pair. In response, the rotor will make a partial revolution as its "poles" (the bars in its cage)

repel the like charge and seek the opposite charge in the stator poles.

Theoretically, the rotor should stop turning once the unlike charges find each other, but the equilibrium doesn't last. Since this is an AC motor (alternating current), the current flow is changing direction repeatedly, reversing the charge of each stator pole from negative to positive and back again. This generates a rotating magnetic field inside the stator, and the constantly changing polarity both pushes and pulls the rotor in hot pursuit as it produces its own current. It's sort of like a dog chasing its own tail, except the motor won't get dizzy and crash into your coffee table.

These are called induction motors because the current in the rotor is "induced" or generated by the stator's rotating magnetic field, not provided through wiring or another direct connection.

The speed is fixed by the number of poles in the stator and the cycle frequency (per second) of the alternating current. With the 60-cycle power in the U. S., a two-pole motor will turn one complete revolution for each full pulse cycle, or 3,600 times per minute. Under load, the speed actually drops to around 3,450 rpm. The same current pulse will turn a four-pole motor only half a revolution, yielding a no-load speed of 1,800 rpm and a rated speed of 1,725 rpm.

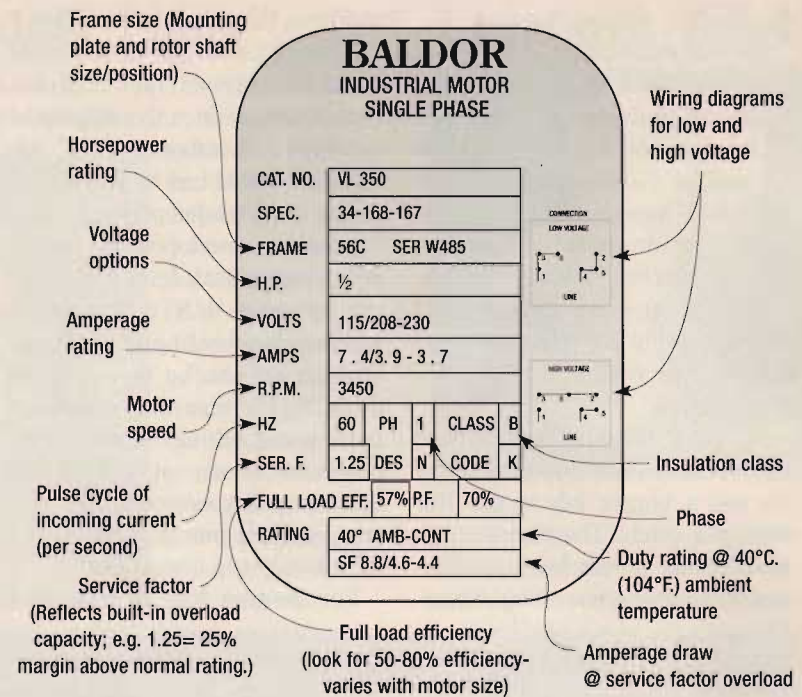


## Heavy Metal

Though other factors are involved, what best determines a motor's actual power output and resistance to temperature rise are the amounts of iron and copper in its rotor, stator, and windings. These materials conduct current and act as a thermal sink for the heat created by the flow of electricity.

If you've ever overfed a piece of wood into a blade or cutter, you know it's possible to stall a motor by exceeding its torque limit. But between that abrupt limit and the motor's normal load range, there's a wide expanse where continued peak demand will create more heat than the motor is designed to withstand. Every time a motor gets in that elevated temperature range, the coating of clear enamel insulation on the copper windings degrades. If the periods of overheating are frequent or severe, the insulation can eventually melt or even burn, ruining the motor.

Better-quality motors have adequately sized windings that offer a wider margin of protection against heat damage. They also have some form of thermal overload protection. These devices act like circuit breakers that trip an overheated motor off and can't be reset until it cools down. Wood shop motors




should have only manual (pushbutton) thermal protectors. Automatic-reset types can turn machines on again without any warning.

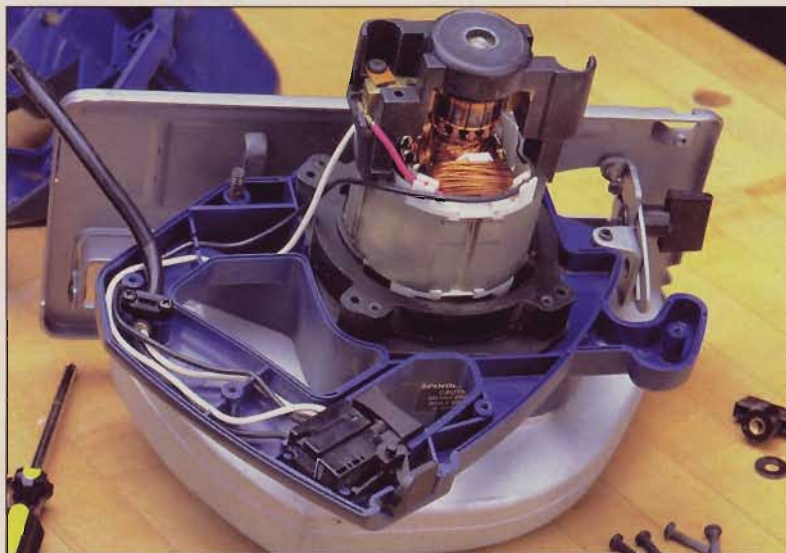
### Checking References

The nameplate reveals a lot about a motor, but the warranty can also be a clue to quality. Sometimes there's fine print there about the motor's intended application or an exclusion for commercial use. If you're shopping for equipment,

ask specifically about the warranty on the electricals, since it may differ from the coverage on the machine itself.

Also, look for independent certification. Most U.S. manufacturers comply with National Electrical Manufacturers Association (NEMA) standards, so there's less room for stretching performance claims. North of the border, look for the Canadian Standards Association (CSA) symbol.

In addition, check for a certification stamp from Underwriters Laboratories. UL listing means that an electrical product has met that agency's standards for safe design and operation. They don't test motors for actual power output, but by running them both at and beyond their rated amps and measuring the temperature rise, they answer the question indirectly. If the motor maintains its rated amperage under a continuous load and stays within the designated temperature range, the test confirms that the output is a continuous horsepower rating. Translation: There's room for the motor to run intermittently at higher peak levels, without dangerously overheating. 



Used in portable and bench top power tools, universal motors pack more punch per pound than induction motors, but aren't designed to withstand long run times. Power ratings are in amps; any horsepower ratings are likely to be for peak hp, not continuous.

# Your Ten Point Checklist: Choosing An Electric Motor

Although you should expect to see higher price tags on better-quality motors and the machines equipped with them, it's not always as simple as "You get what you pay for."

**1** If you're comparing horsepower between motors or machines, make sure both ratings are for continuous-duty use, not maximum developed horsepower.

**2** Ignore guideline #1, sort of. For a clearer picture of the motor's output, check the amperage and full load efficiency ratings on the nameplate. The higher the amperage number, the more powerful the motor is.

**3** The motor should have its own thermal overload protection to safeguard against damage from overheating, even if the machine's on/off switch is also protected. The reset function should be manual only, never automatic.

**4** Determine whether the motor is rated for continuous or only intermittent use. Intermittent-duty motors are designed for run times under 60 minutes, and will likely have shorter service lives than industrial-quality motors. They're fine for home shop use if you let them rest between tough workouts. Don't be confused by the nomenclature — an intermittent-duty motor can still have a

continuous-horsepower rating, even though the insulation, windings, and air circulation won't be on par with those of a continuous-duty motor.

**5** A TEFC (totally enclosed, fan-cooled) motor housing will cost more but will fare better in a wood shop. You'll pay less for an open, drip-proof enclosure, but wood dust can accumulate inside and interfere with the motor's internal switches, electrical contacts, and even bearings. Explosion-proof motors have totally sealed housings so the electrical arcs inside can't ignite vapors. Except for use in dedicated finishing rooms or spray booths, their extra cost usually isn't warranted.

**6** The best motors feature sealed, prelubricated ball bearings on both the load end (where the pulley mounts) and idler end of the rotor shaft. Less expensive motors will have ball bearings on the load end only and a metal sleeve bearing downstream.

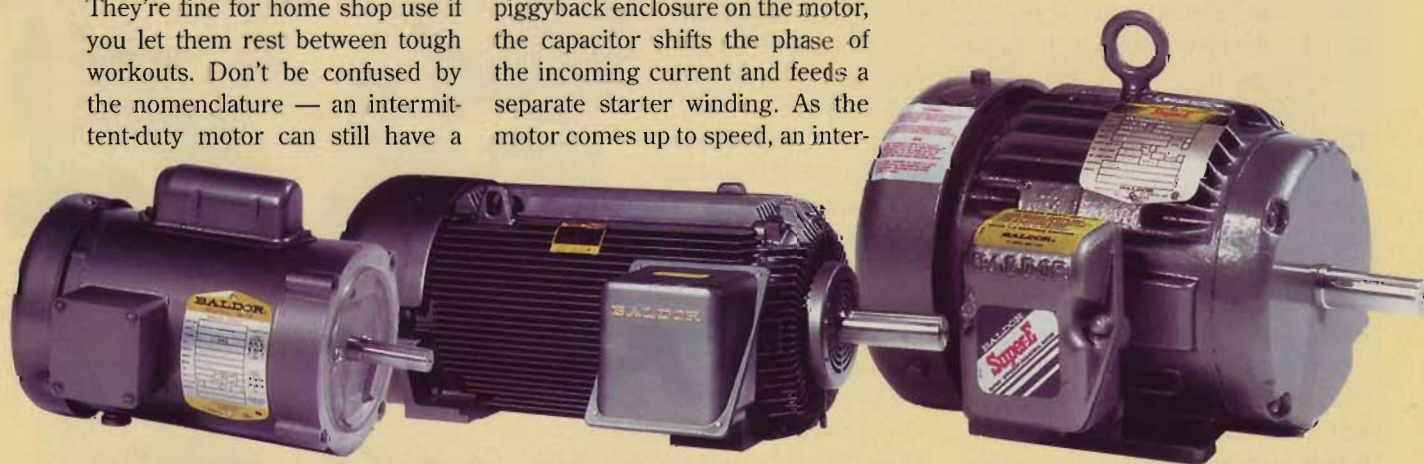
**7** Look for a capacitor-start, induction-run motor, the most common for wood shop applications. Usually housed in a small piggyback enclosure on the motor, the capacitor shifts the phase of the incoming current and feeds a separate starter winding. As the motor comes up to speed, an inter-

nal centrifugal switch opens, shutting off current to the starter winding. Avoid split-phase motors. Their low starting torque makes them too anemic for use in woodworking machines.

**8** Make sure the motor's frame size and baseplate are compatible with the mounting plate on your machine. In the United States, the National Electrical Manufacturers Association (NEMA) sets standards, but imported motors will often have equivalent sizes.

**9** This may seem obvious, but make sure the motor's rpm rating (either 1,725 or 3,450) is appropriate for the machine. Drill presses, lathes, and band saws typically get the slower motors, while table saws, jointers, and planers run with the higher-speed powerplants. Check the manual or ask the tool manufacturer.

**10** Check the nameplate for the insulation class rating, stated as the letter A, B, H, or F, in ascending order of resistance to heat. Class B insulation is adequate for most shop motors; a Class A rating may indicate that the motor is designed for intermittent use only.



Thanks to Baldor Motors and Drives, Marathon Electric Mfg. Corp., and the American Association for Vocational Instructional Materials for their help with this story.

# New Tools

## Sears Craftsman Utility Cutters

Making straight cuts in a variety of tough materials is an easy job for these Sears Utility Cutters. You can use them for square cuts on rope, vinyl tile, garden hose, carpet,

leather, and many other materials around the home. In the garden, you can cut flowers and prune branches.

Unlike using a utility knife, this tool offers more control. And that means faster, more dependable results.

The cutters are available in two sizes — with 2½" or 3⅞" blades. And one of the best features is that you never have to sharpen the blades. Three Phillips head screws allow you to quickly replace the blade and the plastic anvil. A metal loop on the padded handles keeps the spring-loaded cutters safely shut for convenient storage.

The large size retails for \$24.99, and the small cutters are \$19.99 at Sears stores. A package of three replacement blades and one anvil is less than \$10.



## Weller Self-Igniting Torch

To light an ordinary propane torch, you hold the cylinder in one hand, turn the valve with your other hand, and strike the sparklighter with your (oops, ran out of hands).

With the Weller self-igniting torch, you can forget about matches, lighters, or sparklighters. One finger on the push-button switch fires up the torch for soldering, sweating pipes, paint removal, and many other jobs. It burns propane, propylene, and MAP. The Weller QuickFire torch (without gas) is about \$15 at hardware stores.

## DeWalt Debuts Feature-Packed Tools

DeWalt's new power tool lineup includes four machines with innovative features designed to produce more accurate results in the shop and on the job site.

For example, DeWalt engineered its 12½" heavy-duty thickness planer to minimize snipe — the scalloped cut that usually occurs at each end of a planed board. An extra-rigid head that resists deflection plus large infeed and outfeed tables help accomplish this goal.

The 20" variable-speed (300 to 1750 strokes per minute) scroll saw utilizes a double parallel link arm system to minimize vibration while improving the quality of the cut. It also features a convenient no-tool blade change system. The machined table tilts 45° right and left.

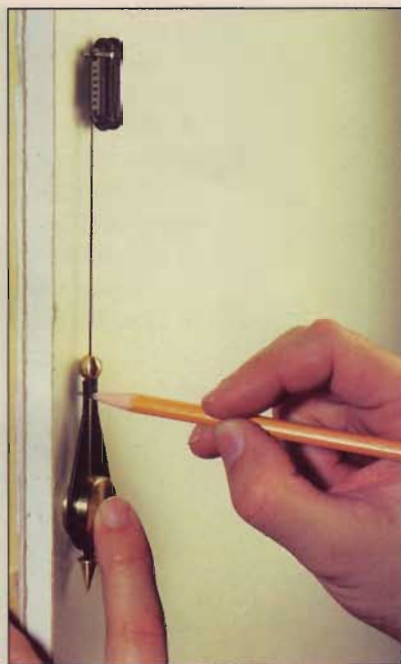
The double bevel sliding compound miter saw also does a right and left tilt that enables you to cut bevels in either direction — a feature that really comes in handy when

you're working with long pieces of trim. At 90°, the saw has a crosscut capability of 12". The extra-high fence lets you hold trim pieces vertically, including molding up to 5¼".

The 10" table saw is perhaps the most interesting tool in the entire group. The tabletop measures a generous 26½" x 19¼", but its cast aluminum construction keeps the weight of the saw at only 64 pounds. Even though it's portable for job site use, this tool has big capabilities. The fence is supported by a patented pair of rack-and-pinion telescoping rails with a ripping capacity of 24½" to the right of the blade and 16" on the left side.

The planer, scroll saw, and miter saw are scheduled for release in May, 1997, with the table saw following in July, 1997.





## Veritas Flat-Bob

Plumb bobs are almost always round, and that creates a problem where they are most commonly used — next to a wall. The plumb bob rolls around endlessly, and holds the string so far from the wall that it's virtually impossible to know where to mark.

The Veritas Flat-Bob solves those problems with a design that's certain to give you more accurate results in rough and trim carpentry, wallpapering, and plumbing.

To use the Flat-Bob, unwind as much of the braided nylon string as you need from the windlass, and hang it from a nail. The  $3\frac{3}{4}$ " long ABS plastic body has a flat brass insert that hugs the wall and centers quickly. Then make a pencil mark on the wall through the slot in the body.

And the folks at Veritas didn't stop when they had a tool that worked well. They also made it easy to store. When you're finished using it, rewind the string and snap the windlass into the slot in the Flat-Bob's body. There's even a tip cover that protects the brass point from damage in your toolbox.

The Flat-Bob retails for \$9.95. To order, call Veritas/Lee Valley Tools at (800) 871-8158.

## Pole Scrapers

When I first heard about Red Devil's Pole Scrapers, I'll have to admit that I was skeptical. I liked the idea of having both my feet planted firmly on the ground while scraping paint outside or removing wallpaper. Yet at the same time, the idea of a putty knife on a stick seemed a bit silly.

But when I got my hands on these tools, I changed my mind fast. Comparing a putty knife to these heavy-duty scrapers is like comparing a skateboard to a 4x4 pickup truck. The beefy 3"-wide blades are made of thick high-carbon steel with almost zero flex. The highly-polished finish looks great, and is also practical — the material you are scraping won't stick, and clean-up is easy.

You can choose a flat scraper (about \$11) or one with a bend in the blade (about \$12). The bent version is handy for overhead work, like scraping peeling paint from soffits.



The black plastic handles are tapped to accept a threaded broom handle or extension pole. For durability, a metal ferrule reinforces this connection point. Finger indentations on the handles give you a non-slip grip when you work without a pole.

Red Devil Pole Scrapers are available at hardware and paint stores, or call (800) 4A-DEVIL.

## Grinder Also Handles Sanding Jobs

Small hand-held grinders are widely misunderstood due to their name. You probably associate a grinder with metal work, yet these under-appreciated tools are capable of much more work in your shop.

As sanders, they provide unparalleled power for carving and contouring curved surfaces. Why tediously chisel a chair seat, for example, when you can sculpt it better with a grinder and coarse sandpaper?

Bosch has a new entry in the rapidly growing field of portable grinders. It is designed for easy handling and operation, and its 7-amp motor has enough power to tackle heavy-duty work. The Bosch model 1346A will accept grinding or sanding wheels up to  $4\frac{1}{2}$ " in dia. and rotate them at 11,000 rpm.

The grinder features a paddle switch with a soft-grip actuator for better control and

comfort. The two position side handle gives you a variety of working positions to suit the job at hand.

With precision-made heat-treated gears and a ball-bearing motor rated at 1.4 hp, this grinder is designed for long life.

The Bosch model 1346A Paddle Switch Grinder retails for about \$89 at hardware stores and home centers. For more information, call Bosch at (800) 301-8255.



## New Bits Hit the Target

Vermont American has introduced fast-cutting hole saws with a plug-ejecting arbor, plus a new line of drill bits especially engineered for use with cordless drills. I tested them both, and got impressive results.

Whenever I've installed deadbolt locks in the past, I always checked that there were no children around. And it wasn't for just the usual safety concerns — I also wanted to make sure that they didn't expand their vocabulary by hearing me curse at the wooden plug that always got stuck inside the hole saw.

Vermont American's new hole saws and arbor have upgraded my lock-installation performance from a marginal "R" rating to a family-friendly "G". The bimetal hole saw cuts aggressively and has deep gullets that help eject chips for faster and cooler cutting.

But the real star of this show is the Plug Out arbor that fits all standard hole saws. When you cut the hole, it acts like a standard arbor. But when you're fin-

ished cutting the plug, you put the metal cup of the saw into the hole, slightly wedging it against the wall of the hole. Then, switch your drill into reverse, and the left-handed threads on the arbor shaft push the plug clear of the bit.

Vermont American's Sidewinder drill bits feature an additional clearance relief machined along the bit's shaft. That reduces friction against the side of the hole — which means more holes per battery charge. Sizes range from 1/16" to 1/2" in 1/64" steps. The bits are available at hardware stores, or call Vermont American at (704) 735-7464.



Vermont American hole saws cut fast, and the Plug Out arbor uses your drill's reversing power to eject the wood from the cup. The Sidewinder bit (below) gives you more holes per battery charge.



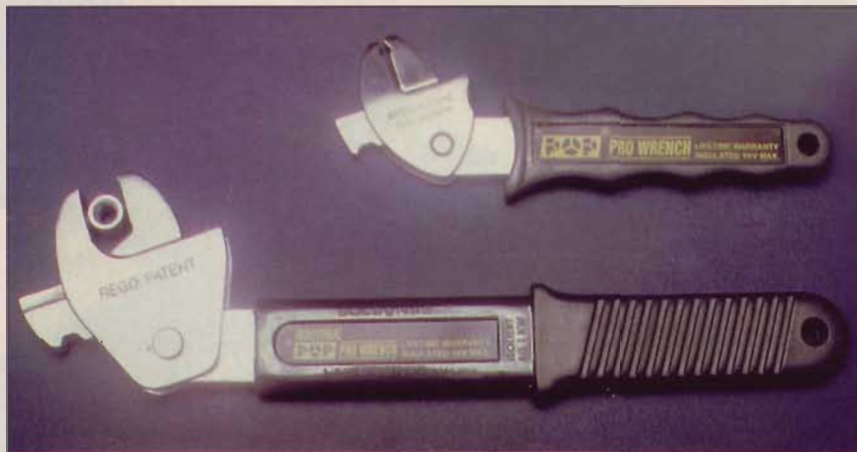
## Wrenches Self-Adjust, Grip Tightly

It seems that quite a few inventors are obsessed with creating the ultimate self-adjusting wrench. And most of the time, their ideas nearly work.

But every so often, I discover a tool, like the Pop Pro wrench, that's a solid performer. To use it, you open the jaws with your thumb, then let the spring-loaded mechanism close on the flats of the nut or bolt — SAE or metric.

The harder you push on the wrench's handle, the tighter the jaws grip. The Pop Pro Wrench handles square and hex heads from 1/4" to 7/8", and the larger Industrial Pop Pro self-adjusts from 5/8" to 1 5/8". Both are covered by a lifetime warranty.

Order directly from SK Enterprises by calling (914) 562-1111. The small wrench is \$23.95; the large size is \$42.95; plus shipping.



## Snips Work Fast

When I needed to make long cuts in tough materials like sheet metal or vinyl siding, I had to choose between the long blades of tinner's snips and the more powerful cutting action of compound-action snips.

The new Multi-Master long blade snips from Wiss combine the best of these two tools. The 3" blades are twice as long as those on ordinary cutters. And you retain the mechanical advantage of compound action, which multiplies your hand's force by five times.

The Wiss Multi-Master snips retail for about \$17 at hardware stores and home centers.





# Home Products

## Brass That Doesn't Tarnish

Engineers at Weiser Lock have apparently found a new solution to the tarnishing problem that has always plagued door hardware. In the past, there was little a homeowner could do to maintain the bright factory-finish. Use and the elements inevitably wore off the clear coating that was traditionally employed to protect the metal. The result was tarnishing, flaking, and pitting.

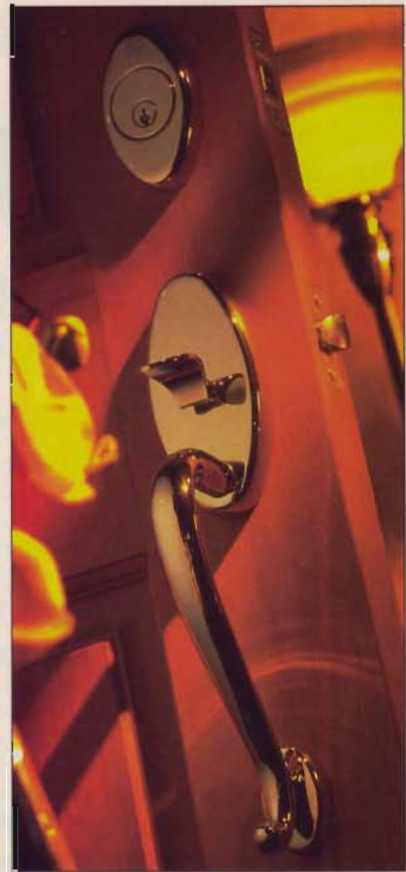
But now, Weiser uses a new technology to bond a finish to its solid brass hardware. The company claims that the finish becomes virtually inseparable from the product.

The bonding process, called Low Temperature Arc Vapor Deposition, was developed to protect the Space Shuttle during reentry into the

earth's atmosphere, when temperatures can reach several thousand degrees. Laboratory tests show that the finish — called Weiser Lock Brilliance — is so tough that the company offers a lifetime warranty on its bright appearance as well as the components of the lock.

Another benefit is the environmental friendliness of the process. The company says that no volatile organic compounds are used, and no hazardous or toxic wastes are produced.

The finish is shown here on the Prestige Aurora Entryset, which retails for less than \$100. It has a lever-operated handleset and matching 1" deadbolt. For more information and the names of local dealers, call Weiser at (800) 677-5625.



## Cabinets Have Old-Southwest Charm

The bleached-white pine doors of Canac's Mesa cabinets are sandblasted to simulate years of weathering by the wind and desert sand.

This design is one of five new cabinet styles in Canac's Native American collection. Three of the styles are made of pine; the others

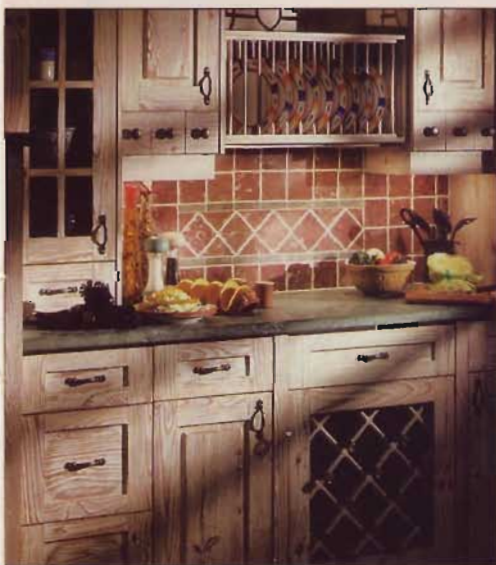
are maple. The available colors also echo the theme of the American Southwest. With names such as Adobe, Buckskin, and Stagecoach Green, the colors help carry the cabinets' rustic image.

The choices continue with door hardware and drawer construction. One option — hammered hardware — has a hand-worked antique look that complements the appearance of the cabinets. And you can select either all metal drawers or wooden drawers with metal glides.

When you look past their weathered exterior, you see that these cabinets feature modern construction methods (without face frames) and rugged European hinges.

To obtain more information and the location of the nearest Canac showroom, call (800) 226-2248.

When you rub your hand over the solid pine fronts of these Canac cabinets, you'll feel the grain of the wood exposed by sandblasting.



## Flex-O-Liner

If you ever wanted to create a water garden or fountain but were skeptical about the labor and expense of excavating your yard, try a Flex-O-Liner in a wooden half barrel. The inexpensive (less than \$25) plastic insert measures 23" at the base, is 15" high, and its pleated sides automatically adjust for a custom fit in your barrel. Call the Henta Corporation toll free at (800) 473-4682.



## Portable Grill Gives You BBQ To Go



The Kingsford Barbecue Bucket lets you have your food to go. It features durable porcelain on steel construction for resistance to rust and heat.

Whether you're setting up a tailgate party, grilling burgers at a picnic site, or fixing dinner at the campground, you'll appreciate the convenient features built into the Kingsford Barbecue Bucket.

To get this grill going, you simply light a crumpled sheet of newspaper placed in the vented base. This functions like a flue, directing the heat upward to quickly ignite the charcoal without the hazard or expense of lighter fluid.

The base, which also serves as an ash collector, stows away inside the bucket for easy transport. And a sturdy handle makes carrying the grill an easy one-handed job. The 14" dia. grill is large enough to cook food for a family of four. The Barbecue Bucket sells for less than \$40. For more information or the name of a local dealer, call the manufacturer, Porcelain Metals Corporation, at (800) 585-4745.

## Little Generator

The compact design and light weight (22 pounds) of the new Coleman Powermate 1000 generator make it easy to take power virtually anywhere you go.

The generator has an output of 850 watts. That's enough to run equipment such as lights, a TV set,



A portable generator, such as the Powermate 1000, is handy for recreational use, emergencies, and those times when you need power beyond the reach of an extension cord.

or a compact refrigerator. It will also power many of your portable electric tools. But don't plan to use it for heavy-duty electric tools — 850 watts will handle tools rated up to only 7.1 amps.

The generator also provides 70 amps of 12-volt DC power that you can use to jump-start a vehicle with a dead battery.

An automatic throttle on the generator adjusts engine speed to produce only the level of power required. As a result, the generator is quieter and uses less fuel. Protective circuitry detects overload and reverse polarity situations, and cuts power to prevent damage to electrical equipment.

The list price for the Powermate 1000 generator is \$449. For more information, contact Coleman at (800) 445-1805.

## Pocket Doors Increase Usable Space

Whether you're building a new house or remodeling your current home, you should check out the advantages offered by sliding interior doors that disappear into pockets inside your walls.

Pocket doors eliminate swinging door arcs, and that space savings means that you can actually use more of the floor area in your rooms and hallways. You can use a pocket door to create a grand entrance between a dining room and kitchen, or to gain valuable space in bathrooms and bedrooms.

Pocket Door Frame Kits from L. E. Johnson Products provide years of maintenance-free operation, and can be installed by the do-it-yourselfer. Track, header, and mounting hardware is included. You provide the door — either new or a recycled swinging door. Kits for standard-sized doors range from \$66-\$72. For a free brochure, call L. E. Johnson at (800) 837-5664.



Pocket doors eliminate the dead space required by swinging doors. This increase in usable floor area maximizes your options for arranging furniture.



### Key To Security

Supra Products, the company that makes lock boxes for real estate agents, now has KeySafe for homeowners. The box can be screwed to a wall, and has a combination that is easy to set and change. You can store keys for children, guests, contractors, or for when you can't find your own keys. KeySafe is \$29.95, plus shipping. To order direct, call (800) 225-2974.

## Metallic Laminates Are a Hot Look

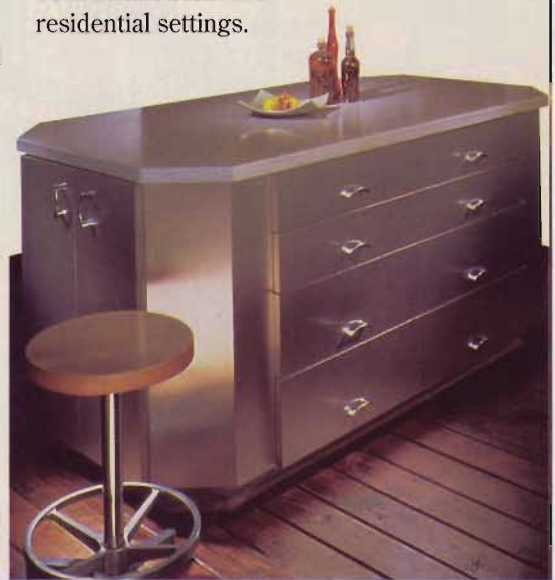
Wilsonart International has a line of 32 metal laminates that can create dramatic looks and decorative accents. Designed primarily for vertical interior applications, the sheets range from highly polished brass and mirror-look chrome to bronze and black aluminum. A variety of geometric and irregular textures add further visual appeal.

Some residential uses include decorative edging and accents, cabinetry, appliance fronts, backsplashes in kitchens and bathrooms, and wall covering.

All of the metallics can be cut and machined with standard woodworking equipment. A protective thermosetting resin protects the metal against damage from oxidation, humidity, and abrasion.

The mirror-look metallic panels have several advantages over glass mirrors — including lighter weight and shatter resistance.

Call Wilsonart's Customer Service Hotline at (800) 433-3222 to request a copy of their 12-page Decorative Metals brochure. It illustrates the full range of available colors and textures, as well as examples of uses in both commercial and residential settings.



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# Oak Vengeance Panels

In about 1580, a woodcarver in Salisbury, England landed a coveted commission from Christopher Weekes. The wealthy patron needed 20 panels for the wainscoting in his family's home. But plain raised panels wouldn't do. Even ordinary carved panels didn't meet his goal.

When the chips were cleared away, Mr. Weekes had exactly what he wanted. Working in a style called Renaissance Romaine, the woodcarver had created 20 unique pieces of art in English brown oak.

Every 11¼" × 18" panel has a different exaggerated, grouchy face with chubby cheeks. But the unflattering likenesses are not due to any shortcoming of the carver's art. Instead, the Romaine style is considered a forerunner of cartooning — and each distorted face is a caricature of an adversary of Mr. Weekes.

Through these panels, we fondly recall the Weekes family. But their foes, as planned, suffer a nameless and grotesque immortality.

The panels are now on public display in the Salisbury House, a 42-room Tudor-style mansion/museum in Des Moines, Iowa.

