TOOL TEST!
Plate Joiner Shootout

SPECIAL OUTDOOR PROJECT ISSUE!

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Convertible Super Shed

TRELLIS with a TWIST

Craftsman Coat Rack

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Nº 272

AUGUST HOME PUBLISHING COMPANY

EDITOR'S NOTES

Puzzled looks and even a few *more* comments than usual — that was pretty much the norm in our shop recently.

Most of the comments had something to do with moonshine and stills, which is understandable if you look at the photo above.

But just to set the record straight, there's nothing illegal going on here. Those curved pieces of copper are climbing supports for a cedar trellis that's featured in this issue.

Now there's nothing tricky about making just *one* of these climbing supports. You simply bend flexible copper tubing into a free-form squiggle. The challenge was figuring out how to make *seven* of them with the same graceful, S-shaped curves.

BENDING JIG. After experimenting a bit, we came up with a simple solution — the shop-made bending jig that's shown above.

This jig has two jaws with scalloped edges that squeeze the tubing between them. By clamping the jig together, the flexible copper tubing conforms to the shape of the jaws. The result — seven perfectly matched climbing supports.

BACKYARD BUILDING. There's another project in this issue where the concept of making identical parts plays a key role — a "convertible" backyard building. This project is designed with a number of identical-size components that serve as the wall panels for the building.

These wall panels fit into openings in the post-and-beam structure of the building. Because they're all the same size, the wall panels are *interchangeable*. So by moving the panels from one opening to another, you can quickly and easily convert the building for a different purpose altogether.

Say for example that the building starts out as a playhouse. When your kids outgrow it, simply rearrange the walls to convert it into a storage shed, potting barn, or even a screened porch.

The point is, that unlike some backyard buildings I've seen, this is one structure you'll never outgrow. Instead, you just reconfigure it to match your changing lifestyle.

Tim

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WORKBENCH

VOLUME 58 NUMBER 4

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WORKBENCH (ISSN 0043-8057) is published bimonthly (Feb., April, June, Aug., Oct., Dec.) by August Home Publishing Company, 2200 Grand Ave., Des Moines, IA 50312.

Subscription rates: Single copy, $4.99. One-year subscription (6 issues), $22; two-year sub., $33; three-year sub., $44. Canadian/Intl., add $10 per year. Periodicals postage paid at Des Moines, Iowa, and at additional offices.
"USPS/Perry-Judd's Heartland Division automatable poly."
Postmaster: Send address changes to *Workbench*, PO Box 37272, Boone, IA 50037-0272.
Printed in U.S.A.

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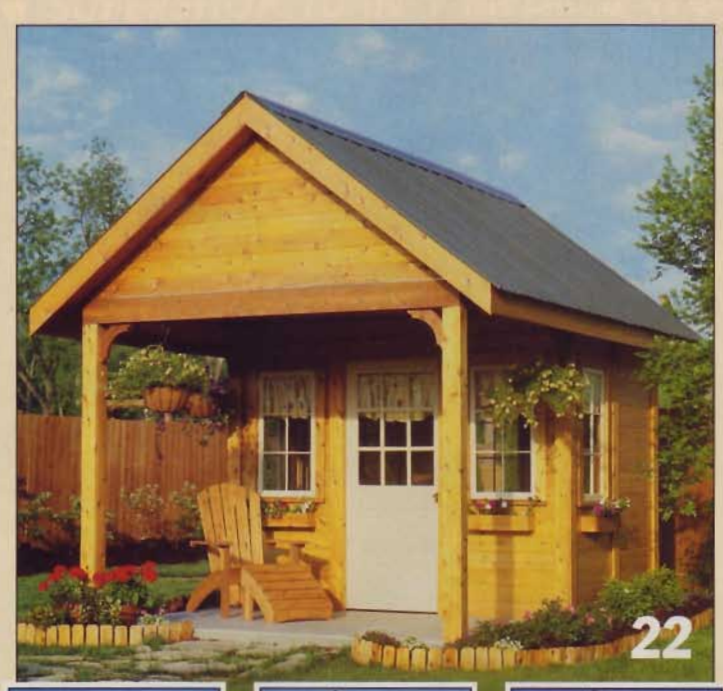



SCREENED PORCH


POTTING BARN

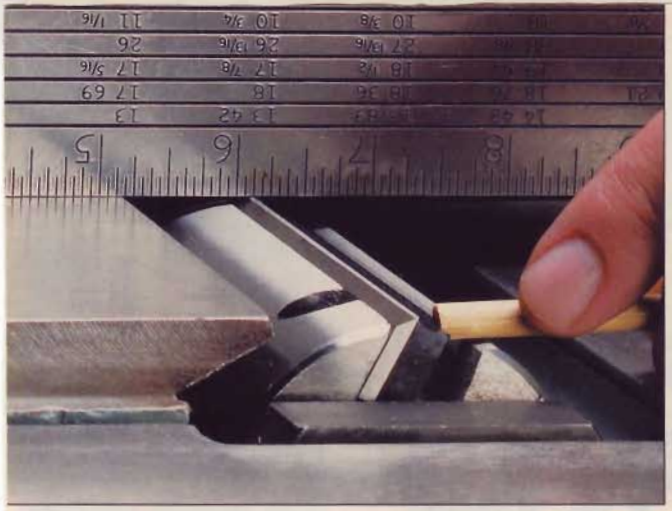

STORAGE SHED

Contents

WORKBENCH™ August 2002

FEATURES

DEPARTMENTS



Questions & Answers

Jointer Setup and Technique

Q *When jointing the edge of a board, I frequently run into a problem. The jointed edge is straight and smooth, but the board always seems to end up a little bit narrower at one end. What's the cause of these tapered cuts?*

John McAleese
Pittsburgh, PA

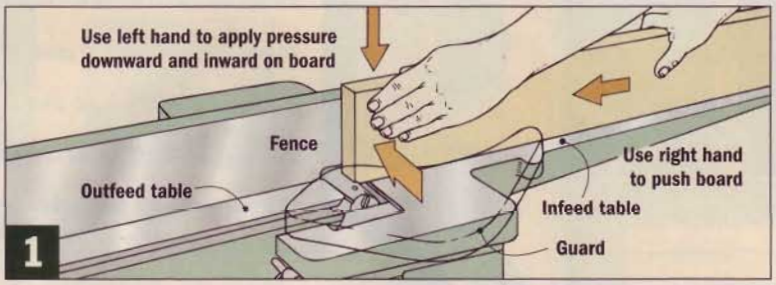
A It could be a combination of things. The place to start is with the jointer setup.

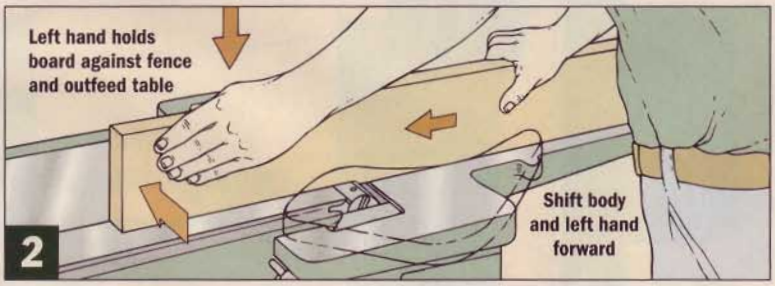
SETUP. To avoid a tapered cut, it's important that the knives are at the same height as the outfeed table when they're at the highest point of their arc. To check, set a long straightedge on the outfeed table and rotate the cutterhead by hand, as shown above. (I use a dowel to avoid nicking my fingers on the sharp knives.)

The knives should make a faint tick as they graze the straightedge. If not, use the adjusting mechanism to raise or lower the table. If the outfeed table isn't adjustable (most are), then adjust the height of the knives.

TECHNIQUE. Another common problem that can produce a tapered cut is applying uneven pressure on the board. To ensure accurate results, push the board forward with your right hand and use your left hand to apply pressure in *two* directions: downward against the infeed table and sideways against the fence *(Fig. 1)*.

As the end of the board slides past the cutterhead and onto the outfeed table, take a step forward and smoothly shift your left hand to the front of the board *(Fig. 2)*. Continue to apply pressure against both the infeed table *and* the fence as you complete the cut.





Horsepower: Continuous vs. Developed

Q *I'm thinking about buying a band saw. One I'm considering has a 1 1/2 hp motor. Another one says it "develops" 2 1/2 hp. Why is one that much higher even though they're priced about the same?*

Jason Hupp
San Bernadino, CA

A There are really two horsepower ratings for motors: *maximum developed* and *continuous-duty*. But you can't accurately compare the two.

Like the name implies, maximum-developed hp is a rating for *peak* operation. It's the maximum power a motor can reach when pushed to its limit. The problem is that a motor can only maintain this maximum level for a very *brief* time before it begins to stall or the motor's reset switch trips and shuts off.

Continuous-duty hp, on the other hand, is a more realistic rating because it tells you how much horsepower a motor can *safely* generate for *extended* periods.

A better way to compare two different motors is by checking the amp ratings of both. As a rule, the higher the amps, the more powerful the motor.

Polyurethane: To Thin or Not to Thin?

Q *I used to thin Polyurethane before applying it. But recently, I've noticed some containers say "Do Not Thin." Should I stop doing this?*

Justin Bainbridge
Paducah, KY

A First of all, some of the *fast-drying* polyurethanes on the market are quite thin to begin with, so they aren't meant to be thinned. Usually, the manufacturer's information on the can will tell you whether the finish can be thinned.

If you're working with a *heavy-bodied* polyurethane, thinning it with mineral spirits is a good idea. A thinned coat of polyurethane dries quicker than a full-strength coat. This means you can apply several thinned coats in a shorter amount of time. Of course, you'll have to build up the finish with more coats.

When using a thinned polyurethane, first clean the wood's surface with a tack cloth to remove dust. Then, for the first coat, I mix one part polyurethane with one (equal) part paint thinner. Wipe this on with the grain using a soft pad, and allow it to dry before sanding.

Then to build up the finish quicker, I increase the strength of the polyurethane mixture for all additional coats (approximately three parts poly to one part thinner). Usually two to three additional coats of this mixture will provide a tough, durable finish.

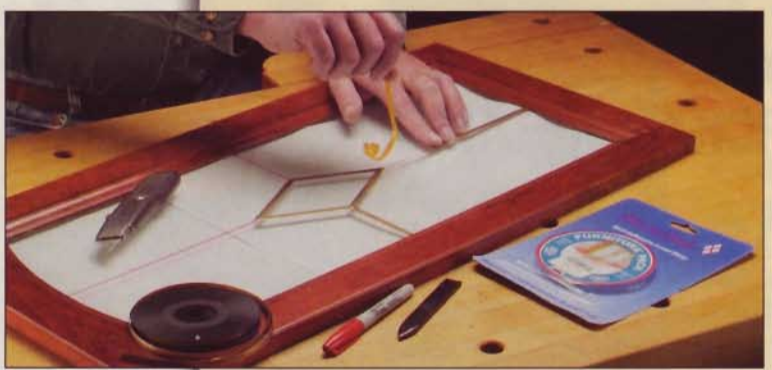
A Quick Way to Create Leaded Glass

Q *How can I duplicate the leaded-glass look for my kitchen cabinet doors that you showed in your April 2002 issue?*

Steven Doullarheid
Sarasota, FL

A To create a traditional-looking leaded glass panel quickly, I applied a self-adhesive lead strip called Decra-Led *(see photo below)*. Decra-Led can be found at most glass stores.

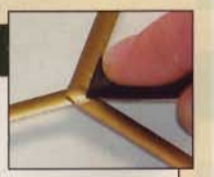
Start by drawing a pattern on the back of the glass with a washable marker. (I used a diamond-shaped pattern for the glass shown below.)



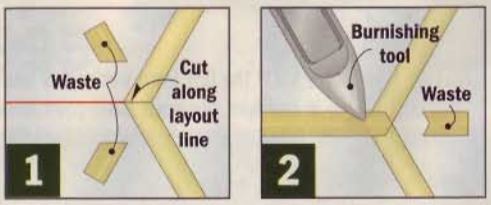
Next, cut four small strips of Decra-Led for the diamond with scissors and remove the paper backing. Press the strips against the glass with your fingers and smooth the edges using the burnishing tool that's supplied with the Decra-Led.

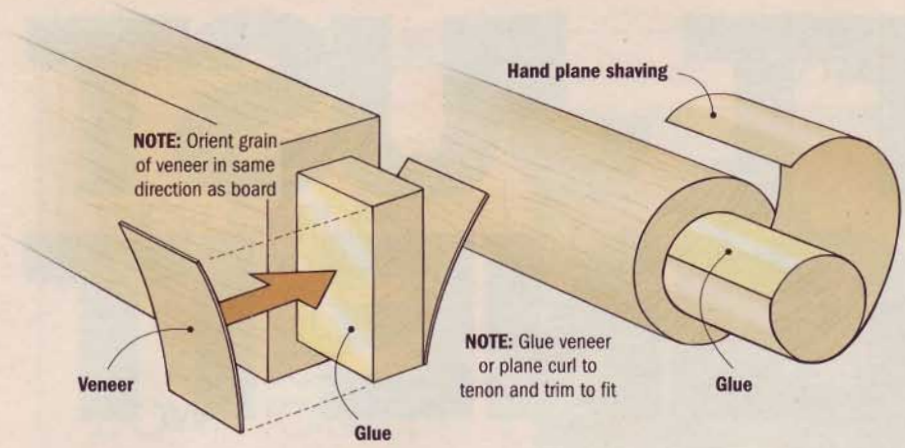
Then overlap the strips on the tips of the diamond *(see below)* and cut the ends to fit against the door frame. Finish up by wiping off the marker lines.

"SOLDER" JOINT



To create the look of a solder joint, start by overlapping the strips forming the diamond. Next, cut straight across where the strips intersect and remove the waste *(Fig. 1)*. Now lay down a long strip that overlaps the joint and smooth the edges with the burnishing tool. Then cut off the waste to create the bead *(Fig. 2)*.





Repairing Loose Tenons

Q *Can you tell me a good way to fix a loose-fitting tenon?*

Becky Hines
Lawrence, KS

A That really depends on whether the loose-fitting tenon is round or if it's square.

A simple fix for a round tenon is to glue on a shaving from a hand plane *(above left)*. Then sand the tenon to fit snugly in the mortise.

For square tenons, glue a thin piece of wood veneer to each cheek. Gluing veneer to both cheeks ensures that the tenon will be centered in the mortise *(above left)*. For a strong glue joint, be sure to orient the grain in the same direction. Once the glue dries, trim the tenon to fit snugly in the mortise. Be careful not to trim off too much or you'll have to start over.

You Have QUESTIONS... We Have ANSWERS!

If you have a question about woodworking or home improvement, write it down and mail it to us at:
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Please include your name, address, and daytime phone number (in case we need to contact you). You can also reach us online at either:
editor@workbenchmag.com or by sending your woodworking or home improvement questions to one of our forums: www.woodnet.forums.net

If we publish your question, we'll send you a handsome and fashionable *Workbench* cap.

Tips & Techniques

FEATURED TIP

Crosscutting Bowed Boards

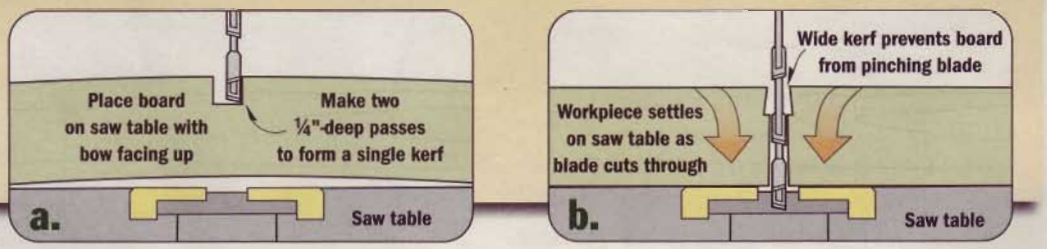
When it comes to crosscutting a board to length, I really appreciate my sliding compound miter saw. But cutting a bowed board always made me a bit nervous, at least until recently.

That's because a bowed board often rocks back and forth on the saw table, so it's hard to make a controlled cut. Worse yet, the workpiece can pinch against the sides of the blade as you make a cut, causing a dangerous kickback.

Fortunately, there's a simple trick that will help reduce the chance of this happening. Start by placing the board on the saw table so the bow faces up *(Detail a below)*. Then make a couple of shallow passes (about a 1/4" deep), overlapping them to form one wide kerf. Now make a full-depth cut all the way through the board *(Detail b)*.

As the saw blade cuts completely through, the board will "settle" a bit so it sits flat on the saw table. But it won't pinch the sides of the blade. The wide kerf provides the extra clearance that's needed to prevent the blade from binding. The end result is a safe, controlled cut.

Mark Weaver
Austin, TX



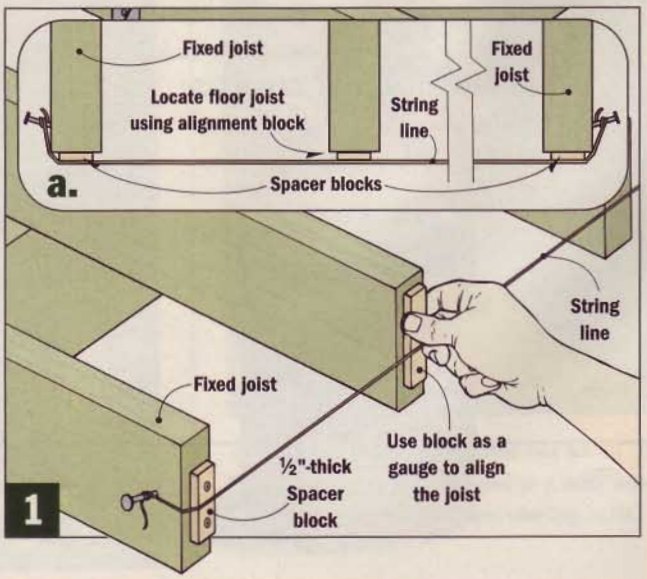
Handy Deck-Building Tip

When building a free-standing deck, it makes sense to use a string line to align the ends of the floor joists. The only problem is it's easy to accidentally "bump" the string out too far, which throws off the alignment of the other joists.

My solution is to stretch a string across a couple of spacer blocks attached to the fixed joists *(Figs. 1 and 1a)*. This creates a gap between the string and the final location of the other joists.

To locate each of these joists, use another block of the same thickness as an alignment gauge. When the joist is properly positioned, you should be able to slip the gauge into the gap without deflecting the string.

Robert Myers
St. Louis, MO



Division Made Easy

Quite often I need to lay out lines on a workpiece that divide it into a number of equal-size parts. To do that quickly and accurately — without a lot of mathematical calculations — I use a simple trick.

Say you want to divide a $2^3/_4$"-wide board into three equal parts. Start by hooking a tape measure over one edge of the board (anywhere along its length). Then angle the tape measure across the board until an increment that's easily divisible by three aligns with the opposite edge of the board (3" in this case). Now simply lay out lines at every 1" increment (1" and 2") to divide it into three equal parts.

John Barnett
Seattle, WA

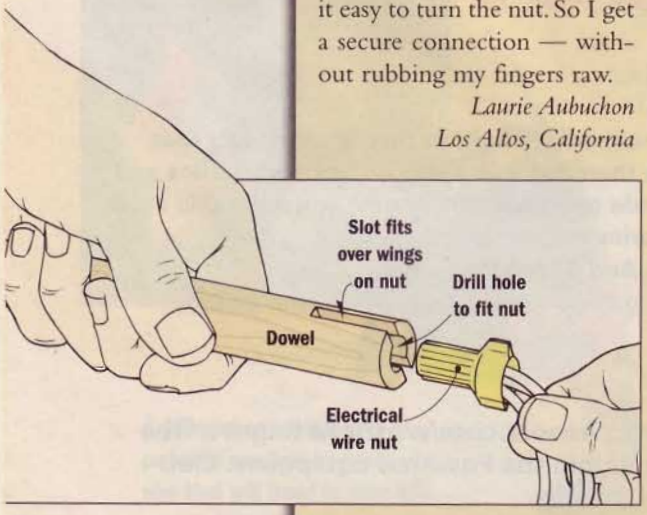
Wire Nut Wrench

Installing electrical wire nuts can be a pain. It's hard to get a good grip on them, and twisting the nuts on the ends of the wires wears out my fingers.

To simplify the job, I use a wrench made from a wood dowel, as shown in the drawing below. There's a hole drilled in the end of the dowel that fits over the wire nut. And a slot cut in the end slips down over the "wings" of the nut.

Rotating the dowel makes it easy to turn the nut. So I get a secure connection — without rubbing my fingers raw.

Laurie Aubuchon
Los Altos, California



Drywall Dust Catcher

The dust produced when drilling holes in drywall is a nuisance to clean up. So to catch the dust before it falls to the floor, I tape an open envelope to the wall.

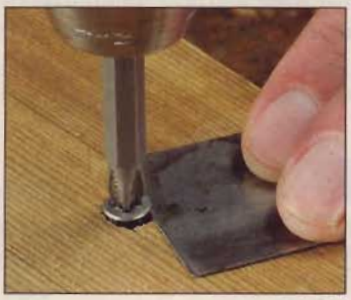
Henry Jorgensen
Columbia, MD

Fast Fix for Stripped Screws

If the threads on a screw are stripped out, it can spin and spin without backing out of the hole.

A quick way to remove it is to gently pry up on the screw head with a putty knife, backing out the screw at the same time.

Todd Frank
Sacramento, CA



SHARE YOUR TIPS, JIGS, AND IDEAS

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Include your name, address, and phone number. You'll receive $75-$250 and a *Workbench* hat if we publish your tip.

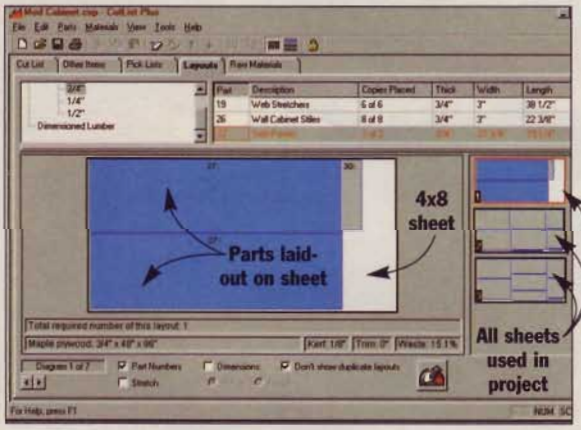
For a free woodworking tip every week via e-mail, go to WoodworkingTips.com.

CutList Plus Simplifies Stock Layout

Getting the absolute most out of every sheet of plywood or board often means spending hours drawing cutting diagrams. That is unless you use a panel optimizer program.

There are a lot of these computer programs to choose from, but the one I'm sticking with is CutList Plus from Bridgewood Design.

Here are just a few of the things the software can do to make your shop more efficient.



- Create cutting diagrams for sheet goods and dimension lumber.
- Create a shopping list and project cost estimate.
- Track your lumber inventory and automatically adjust it based on your projects.
- Print labels for project parts.
- Group parts into sub-assemblies.
- Print your cut list, shopping list, and cutting diagrams.

Best of all, the program is easy to learn. If you can type in part names and dimensions, the software will take it from there.

Another feature I really like is being able to quickly change materials for a project. As soon as the changes are made, the software creates new lists, diagrams, and cost estimates based on your changes.

CutList Plus is available in *Standard*, *Professional*, and *Commercial* editions, ranging from $24.95 to $97.95. Visit www.CutListPlus.com to order the software.

ONLINE Extras

If you like the articles in this issue of *Workbench*, be sure to check out these related project plans, woodworking tips and techniques, tool reviews, and product information at:
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- Cutting Diagrams for the Planter Box and Trellis
- Dewalt Cordless Plate Joiners
- Craftsman's Detail Biscuit Joiner
- Lamello's Top 20 Plate Joiner

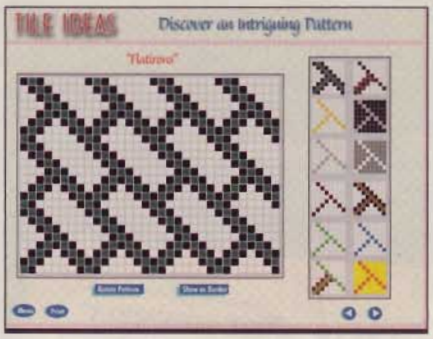
Search for DIY Info at GrowingLifestyle.com

Using an online search engine to find do-it-yourself or home improvement articles is a hit-and-miss proposition at best. Some of what you find may be helpful, but some will have absolutely nothing to do with your search.

One Web site I came across recently, though, goes a long way toward streamlining searches on home improvement topics. The site is www.GrowingLifestyle.com.

In essence, this site is a huge road map that will point you only to relevant Web sites on the subjects of *Home Improvement*, *Gardening*, *House Keeping*, and *Pests*.

I use the site frequently to keep up on home improvement and gardening information. And I almost always find something of interest on my first search. In particular, I've had good luck finding ideas for my basement renovation, including designs for a new laundry room.



► **The *Tile Ideas* CD-ROM has a *Pattern Explorer* that lets you see several tile patterns in a variety of colors.**

Try Your Tile Ideas On-screen Before You Try Them on the Wall

A couple of years ago, if you wanted to design your own custom tile pattern for a kitchen or bathroom, you'd probably have to resort to a box of crayons and a sheet of graph paper.

Today, thanks to Jim Bass, there's a better way.

Jim authored an interactive CD-ROM called *Tile Ideas* following his own tile designing adventure. The software is distributed through Bassworks Multimedia.

The software includes a huge gallery of images for inspiration and three interactive design features.

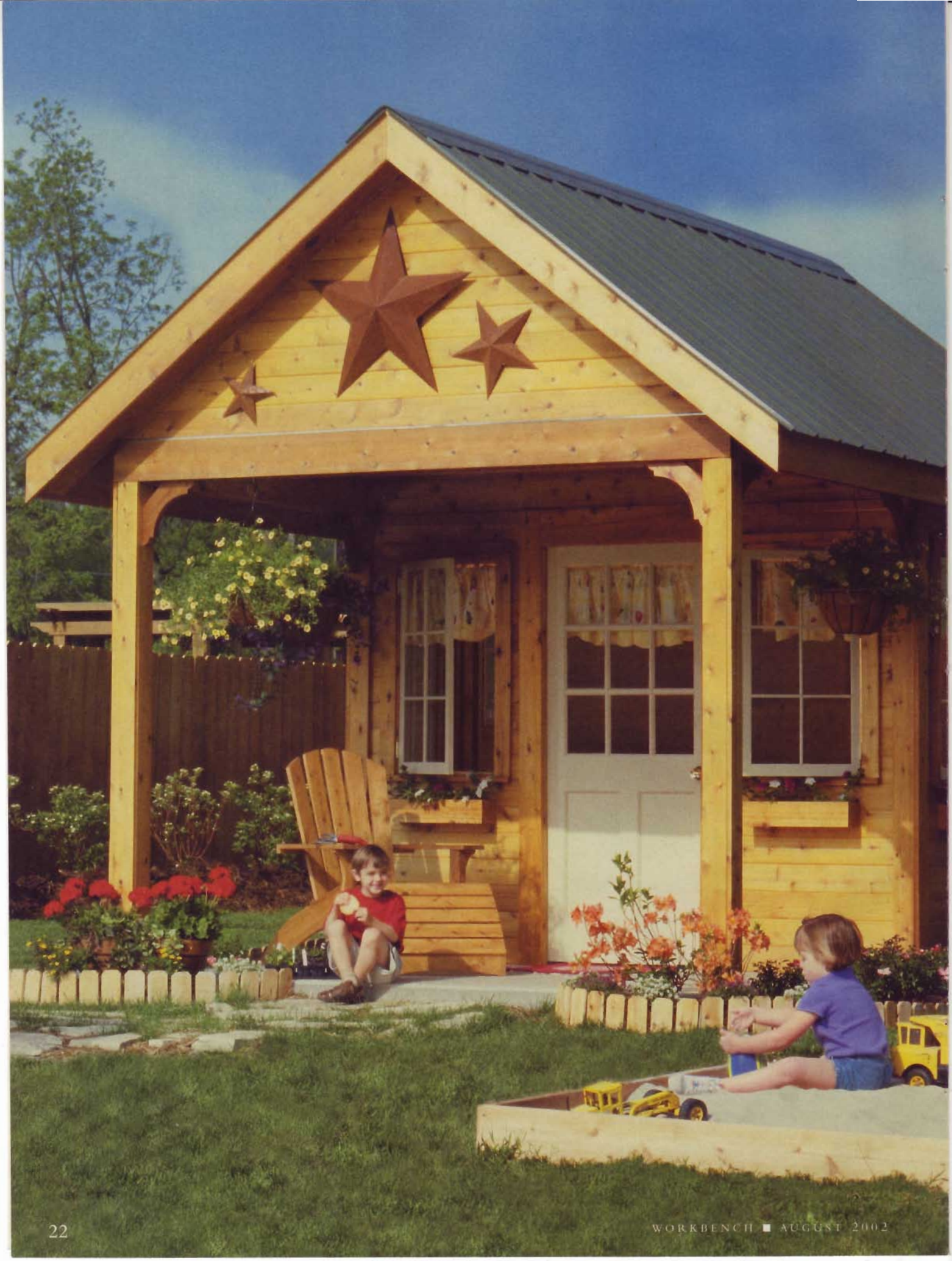
In the *Pattern Explorer*, you can look through countless patterns offered by leading tile companies. The software lets you try the patterns in several different configurations until you find one you like.

For the truly adventurous, there's the *Pattern Designer*. In here, you can create your own patterns in infinite color combinations and arrangements. This feature definitely brought out my imaginative side. Though it didn't take long to realize that what looked great in my imagination wouldn't look so hot on the floor!

Order the CD-ROM online at www.TileIdeas.com. The cost is $19.99 plus shipping and handling.

▲ **Visit the *Image Gallery* on the *Tile Ideas* CD-ROM for design inspiration, or just to see some stunning tile work.**

▲ **Log on to TileIdeas.com for a preview of the program, ordering info., and tech support.**



A Classy, Convertible Backyard Building

At last! A backyard building you'll never outgrow. Its flexible design lets you build it one way — then reconfigure it as your needs change.

If this backyard building was an automobile, it would be a convertible. That's because it can be easily changed from one type of structure to another — all in a matter of hours. (Okay, so it takes a little longer than the old ragtop.)

'V' FOR VERSATILITY. Even so, it's an amazingly versatile building. Say it's built initially as a playhouse, as shown at left. When the kids outgrow it, you can convert it into a screened porch, a potting barn with a breezeway, or even a storage shed *(photos at right)*.

INTERCHANGEABLE PANELS. The key to making this work is a unique system of interchangeable wall panels. These panels are like building blocks that fit into openings in the structure *(Inset Photo below)*.

Depending on the type of building, there are several panel options to consider. You can put a window in the panel, or install siding all the way up to make a solid panel. You can even buy entry doors or screen doors and substitute them for wall panels.

POSTS & BEAMS. No matter how you configure the walls, the underlying structure stays the same — a system of interlocking posts and beams that gives the building its traditional timber-framed appearance. The beams transfer the weight of the roof to the posts. This means the openings for the wall panels don't require any additional support. It also means that the panels can be built with lightweight frames, so they're easy to move around.

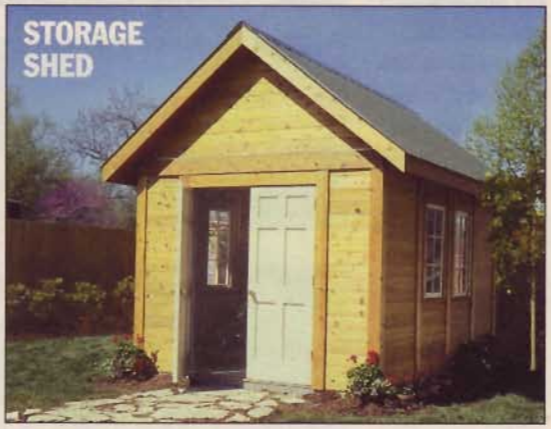
▲ **Interchangeable wall panels make it easy to change from one type of building to another.**

METAL ROOF. Besides the posts and beams, another distinctive thing about this backyard building is its metal roof. The corrugated metal sheets that make up the roof are easy-to-install, maintenance-free, and extremely attractive, as well.

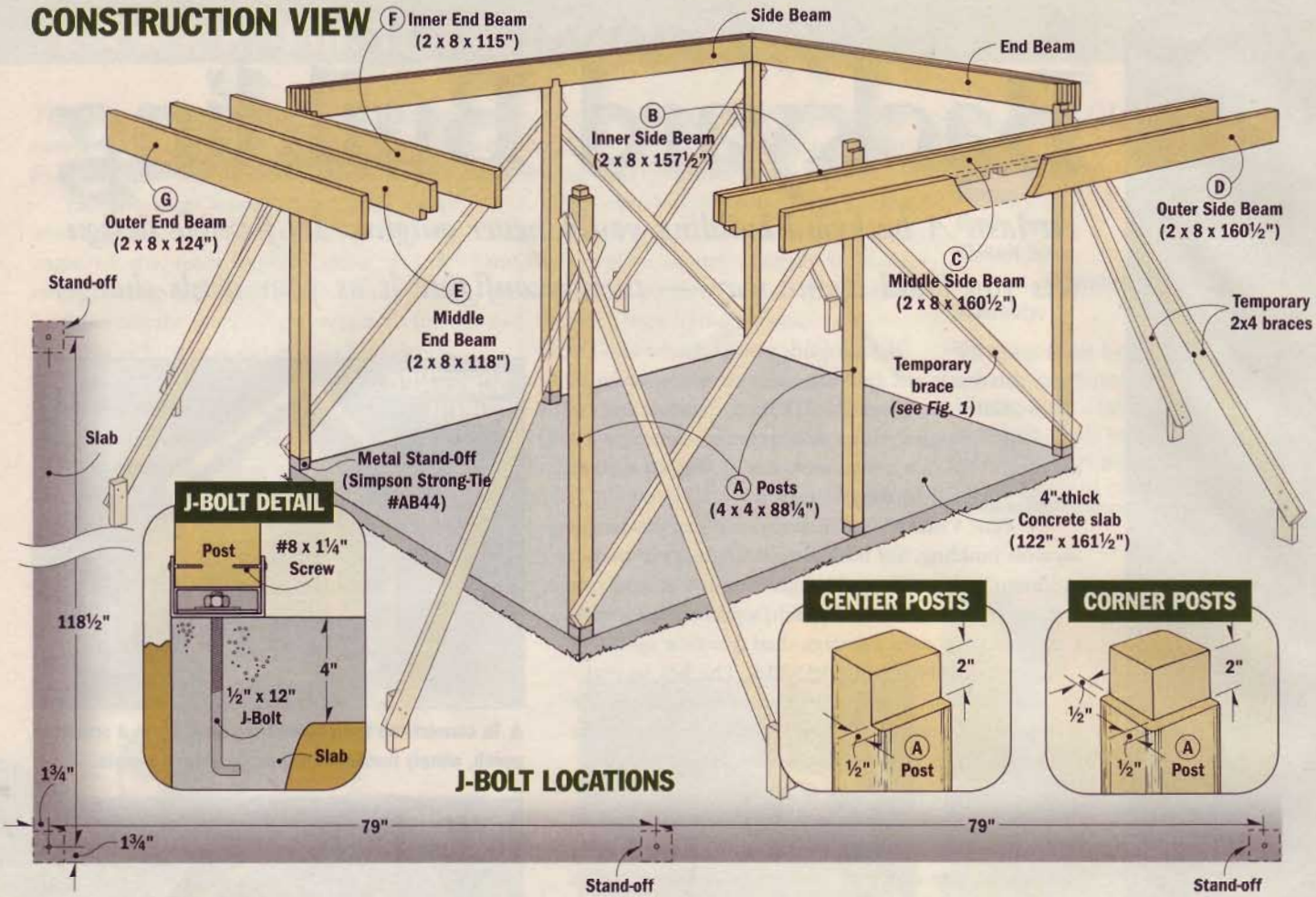
FINISH. One last note. I applied several coats of a waterproof sealant for a protective finish. Using a natural color for the siding and a shade darker stain for the posts and beams creates a nice contrast.

▲ **To convert the front half of the building to a screened porch, simply install store-bought screen panels.**

▲ **Or, enclose the front of the building to use as a covered potting area. Access is provided by an open breezeway.**



▲ **Wide double doors and two narrow wall panels transform the building into a spacious storage shed.**



▲ **Adjustable metal stand-offs let you "fine tune" the location of the posts. They also raise the posts off the slab to prevent rot.**

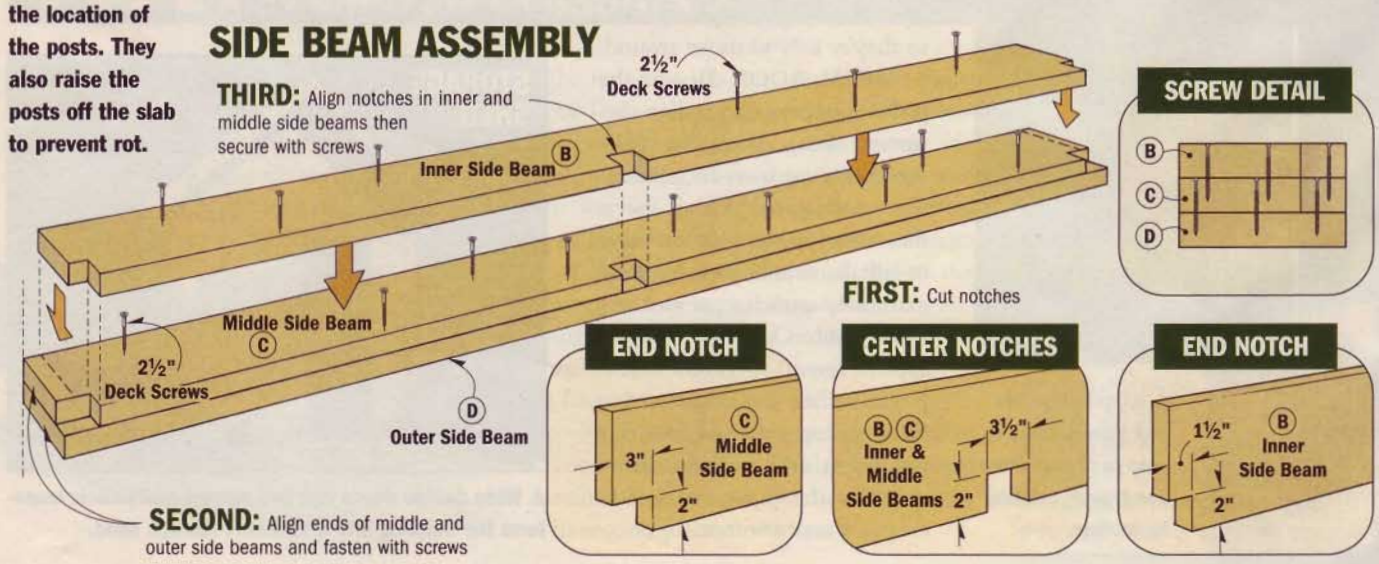
POSTS & BEAMS

The heart of this building is a system of interlocking posts and beams *(Construction View)*. Each post is connected to a metal stand-off *(shown at left)* anchored in a concrete slab.

SLAB. To speed up construction (and to give my back a break), I hired a contractor to pour the slab. Costs for this will vary, so get several bids. (My cost for a 4"-thick, 122" x 161½" slab was $500.)

One thing that's important for your contractor to know is the location of the six J-bolts that are used to secure the metal stand-offs *(J-Bolt Detail and J-Bolt Locations)*. So before the concrete sets up, be sure the bolts are installed as shown.

The next day, or when you can't scuff the concrete, install the stand-offs and finger-tighten nuts on the J-bolts. They'll be tightened securely *after* the final post adjustments.



PERMANENT POSTS. Now you can get started on the posts. There are six permanent posts. Later, intermediate posts, which can be removed, will divide the openings between the permanent posts.

The posts (A) are cedar 4x4's that are notched to hold the beams, *seePost Details*. You'll need to notch both outside faces of the corner posts. A single notch in the outside face of the center post is all that's needed.

BUILD THE BEAMS. At this point, you can set the posts aside and concentrate on the beams. As you can see in the *Construction View*, there are two long side beams (B, C, D) and two shorter end beams (E, F, G). The beams are built up from three cedar 2x8's. Notches in the boards create pockets for the posts.

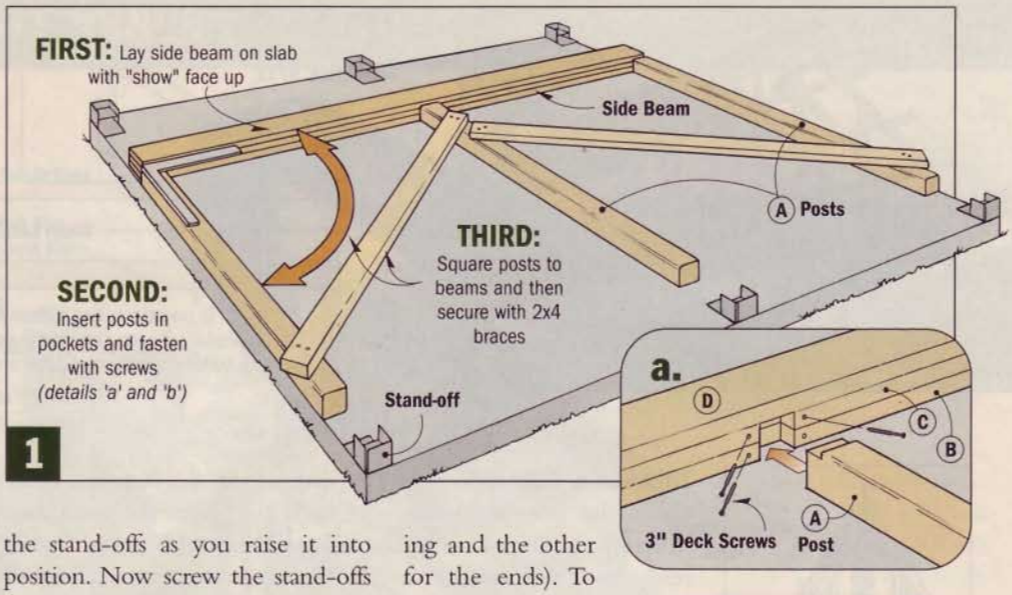
One thing to be aware of is the length of these boards vary, and so does the size of the notches. Also, not every board is notched. So before making any cuts, be sure to study the *Notch Details* in the *Side Beam Assembly* (page 24) and the *End Beam Assembly* illustrations, below.

ASSEMBLE SIDE BEAMS. For accurate alignment when assembling the side beams, I used the sequence shown in the *Side Beam Assembly*. This also prevents the screw heads from showing on the outside faces of the beams. Note: The end beams are assembled later.

ASSEMBLY. Now it's time to assemble the posts and beams. It's easiest to do this on the slab *(Fig. 1)*. With the "show" side of the beam facing up, slide the posts into their pockets and fasten them with screws. Then square the posts to the beam and attach temporary braces across the posts.

ERECT THE SIDES. Even with the braces, erecting the sides can be a challenge. They're heavy and awkward to handle. So round up some help. Also, make sure to have extra braces and stakes on hand to hold the sides upright.

When everything is ready, stand up the first side, setting the posts into the stand-offs as you raise it into position. Now screw the stand-offs to the posts on three sides. (Leave the "flap" on the fourth side open for final adjustment). Then plumb the posts and brace them from front to back and side to side.



TIE IN END BEAMS. After repeating this process for the second side, the structure is "tied" together with the end beams — one board at a time *(End Beam Assembly)*. Here again, use the sequence shown so you won't see the screw heads on the outside of the beam.

FINAL POST ADJUSTMENTS. All that's left to complete the post-and-beam structure is to adjust the final locations of the posts. Ideally, the posts should be the same distance apart at the top as the bottom. This ensures that all the openings are square and identical in size.

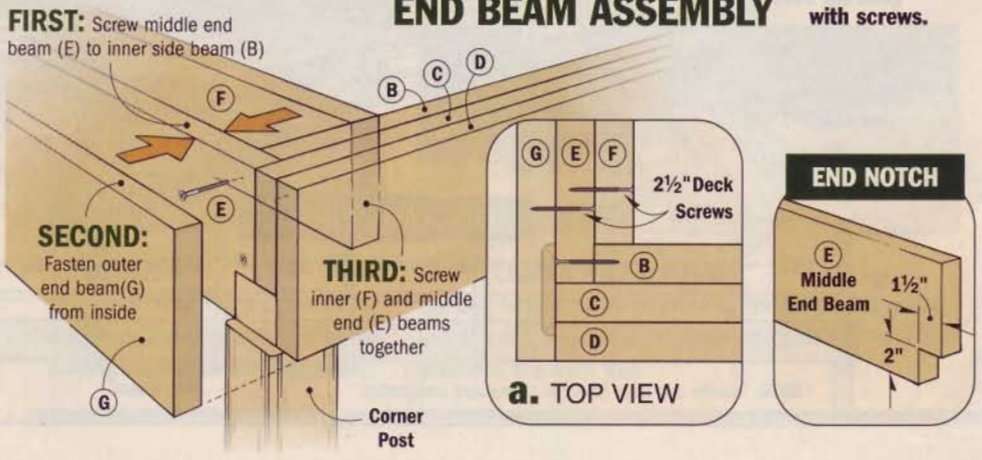
To accomplish that, I used two boards as spacers (one to position the posts on the sides of the building and the other for the ends). To determine the length of the spacers, measure between the tops of the posts and then subtract $\frac{1}{8}$". This takes into account the thickness of the stand-offs at the bottom of the posts. (I cut a $75\frac{3}{8}$"-long spacer for the sides and a $114\frac{7}{8}$"-long spacer for the ends.)

Before using the spacers, check one of the corner posts for plumb again, and use it as a reference post. (It doesn't matter which one.) Then tighten the stand-off for the reference post, fold up the metal flap, and screw it in place.

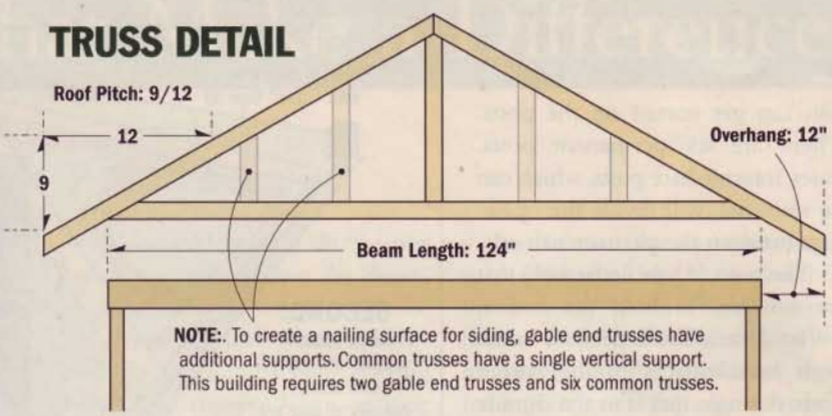
Now it's just a matter of using the spacers to establish the distance between the reference post and the two nearest posts *(see Margin photo)*.

▲ To accurately determine the final location of the posts, use a board as a spacer. Then tighten the stand-offs, fold up the "flap" and fasten it with screws.

END BEAM ASSEMBLY



TRUSS DETAIL



▲ **A long 2x4 tacked to the end beam and staked in the ground makes a handy "leaning post" for the trusses.**

TRUSSES & PURLINS

Once the post-and-beam structure is complete, it's ready for the roof. The underlying structure of the roof consists of pre-built trusses and long purlins *(Construction View below)*.

When purchasing the trusses, there are three things you need to know: the pitch, beam length, and overhang, as shown above.

LAYOUT. The first step is to lay out the location of the trusses on the side beams *(Truss Layout Detail)*. One thing to note is the location of the end trusses. To allow for the siding that's added later, these trusses are set back 1¼" from the outer face of the end beams *(Gable End Detail)*.

The trusses are relatively easy to handle. Still, it pays to get some help to lift them onto the beams. For now, stack them against a temporary support, as shown at left.

INSTALL TRUSSES. To install the trusses, start by aligning them with the layout marks and toe-screw them to the side beams. This will hold them in place until you add permanent bracing.

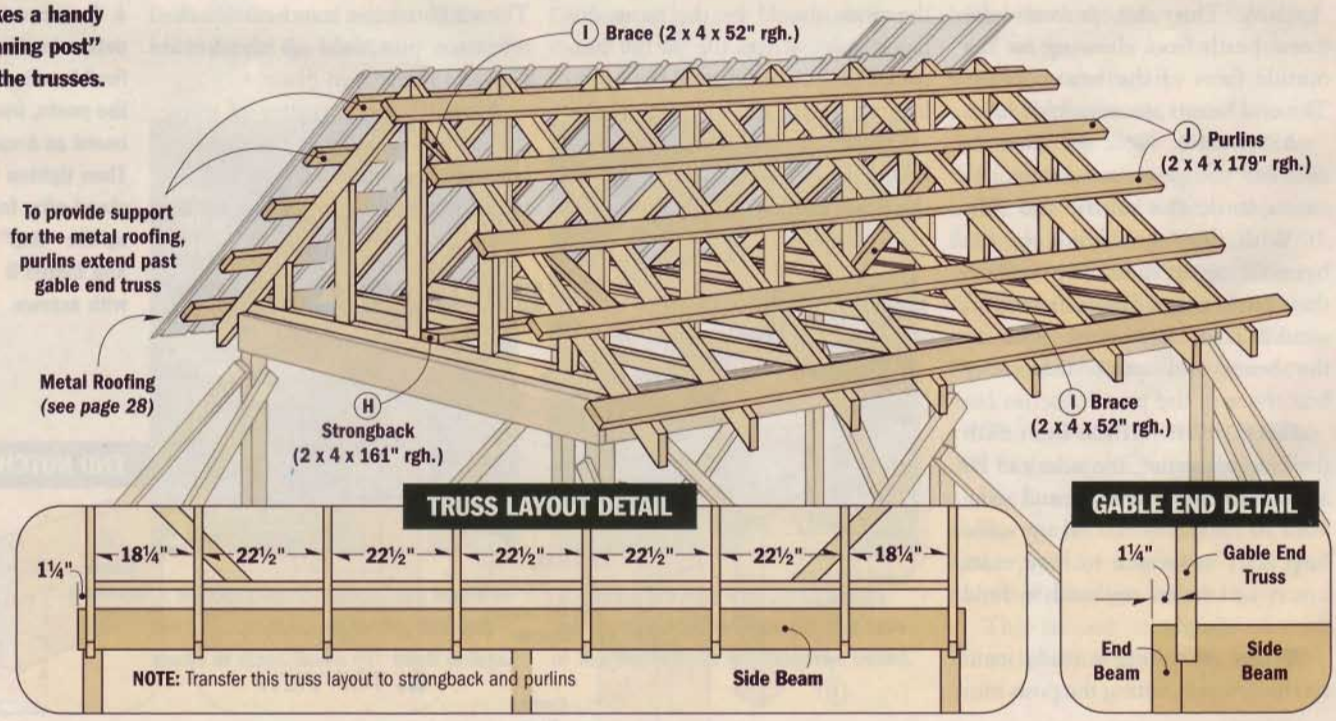
To brace the trusses, start by installing a long 2x4 called a strongback (H) that runs across the bottom of the trusses, as shown in *Figure 2*. Cut the strongback to length so it fits flush with the outside of the end trusses. Then slide it into position and fasten it with screws at each truss.

The next step is to add a couple of 2x4 diagonal braces (I) to hold the end trusses plumb. Each brace is mitered to fit against the end truss and strongback *(Figs. 2a and 2b)*. Screw the top end of the brace to the end truss first. Then plumb the truss and screw the bottom of the brace to the strongback.

PURLINS

All that's left to complete the basic structure of the roof is to add the purlins (J). These are long 2x4's that run across the tops of the trusses

TRUSS CONSTRUCTION VIEW



(Fig. 3). Besides adding rigidity to the trusses, the purlins provide a mounting surface for the metal roof.

PURLIN LENGTH. The length of the purlins depends on two things: the roof overhang and the type of roofing material. Check out the sidebar below for an easy way to determine the length of the purlins.

INSTALL PURLINS. After cutting the purlins to length, it's time to attach them to the trusses. An easy way to locate the purlins is to use one of them as a story stick.

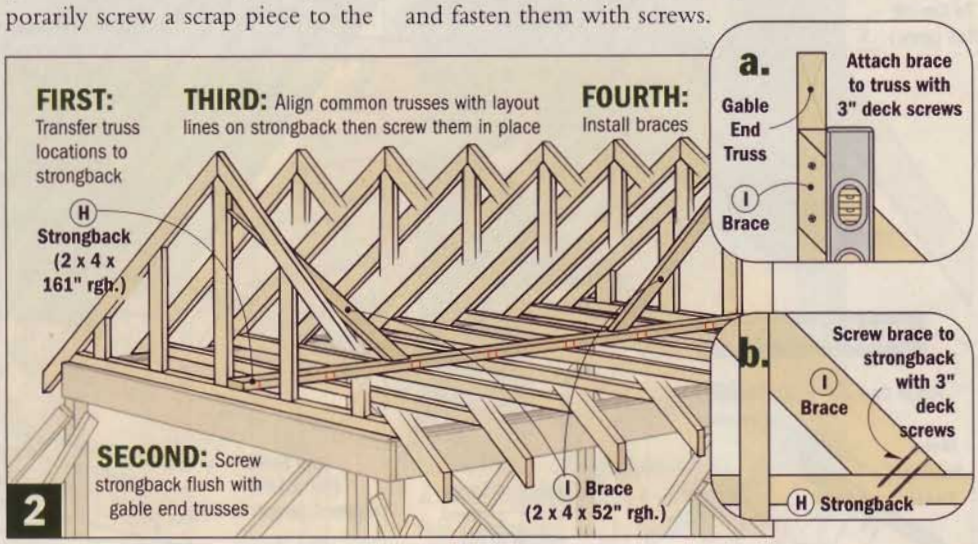
To do this, set a purlin against the strongback so it extends an equal distance past each end truss. Then transfer the locations of the trusses to the purlin. This then becomes your story stick. Use it to transfer the truss locations to the other purlins.

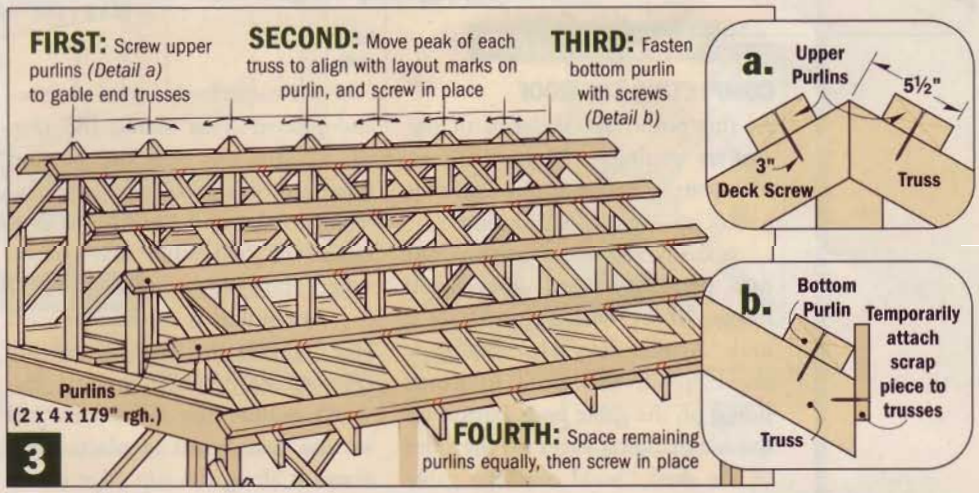
Now you're ready to install the top purlin near the ridge. To create a nailing surface for a metal ridge cap (added later), it sits down from the ridge a bit *(Fig. 3a)*. With that in mind, align the layout marks on the purlin with the two end trusses and fasten it with screws at both points.

As for the trusses in between, you'll probably need to pull or push on the peaks to make them align with the layout marks on the purlin. Then drive screws through the purlin into each truss.

With the top purlin in place, the next step is to add the bottom purlin. As you can see in *Fig. 3b*, it's set in from the ends of the trusses. This way, it won't get in the way of the fascia when it's installed. To position this bottom purlin, temporarily screw a scrap piece to the trusses. Then set the purlin against it, align it just as before, and screw it in place.

Finally, space the purlins in between an equal distance apart and fasten them with screws.





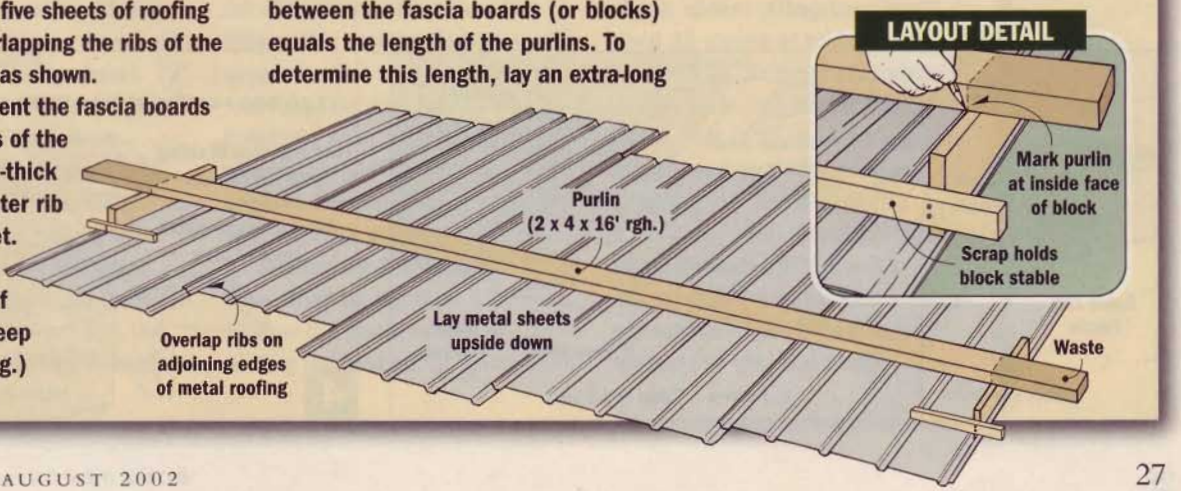
DETERMINING LENGTH OF PURLINS

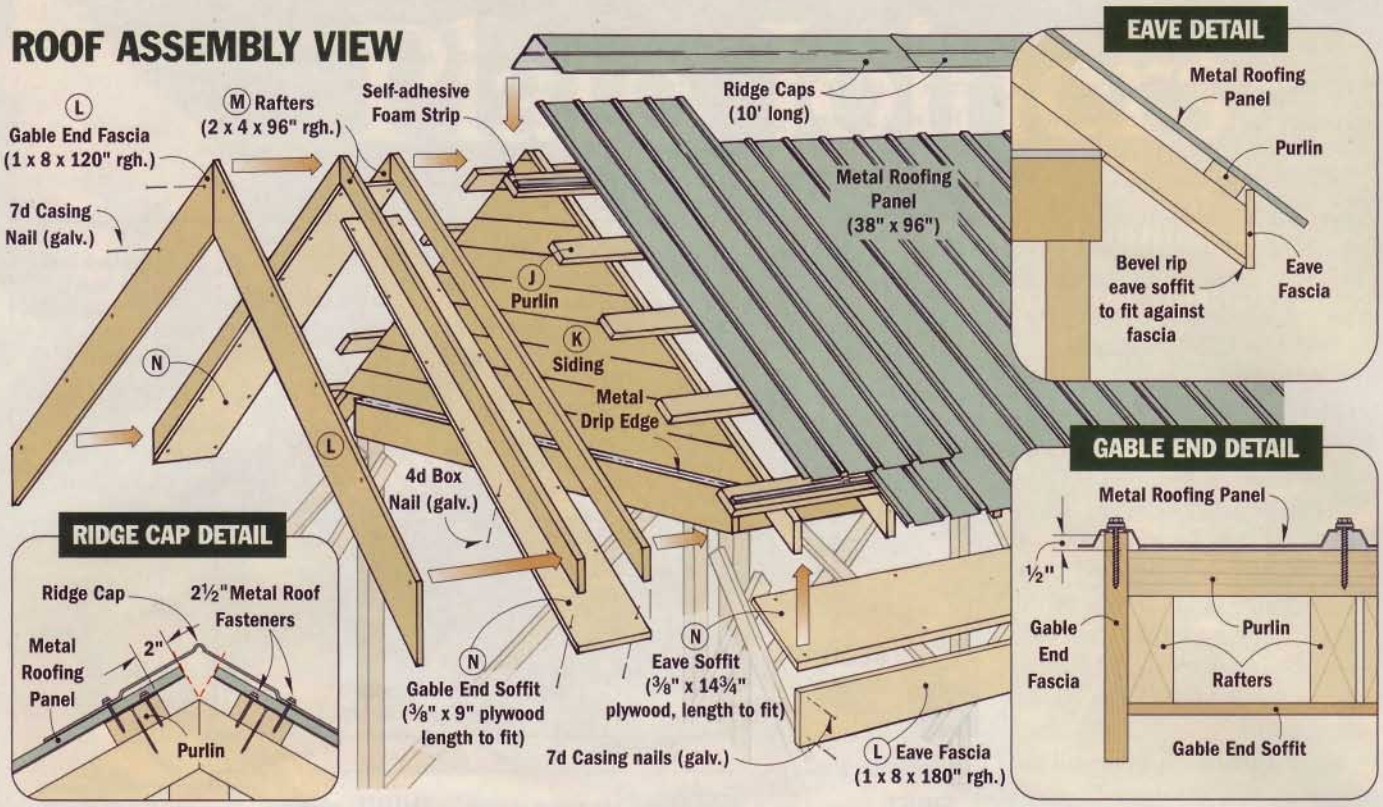
The easiest way to determine the length of the purlins is to "mock up" one side of the metal roof on a flat surface.

Start by laying five sheets of roofing upside down, overlapping the ribs of the adjoining pieces, as shown.

Next, to represent the fascia boards on the gable ends of the roof, insert a $^3/_4$"-thick block into the outer rib of each end sheet. (A scrap of wood tacked to each of the blocks will keep them from tipping.)

Once the roof is installed, these fascia boards will butt up against the *ends* of the purlins. This means the distance between the fascia boards (or blocks) equals the length of the purlins. To determine this length, lay an extra-long 2x4 across the blocks and mark it as shown below. Now just trim this purlin, and all the others, to that length.





COMPLETING THE ROOF

At this point, the skeleton of the roof is complete. Now you can turn your attention to the skin that covers it — the metal roofing.

Actually, the metal roof is just one part of several interrelated things. To see what's ahead, take a look at the *Roof Assembly View* above. You'll also need to install siding on the gable ends, button up the overhanging eaves on the sides of the shed, "build out" the gable ends, and install soffits underneath.

START WITH THE SIDING

To eliminate a lot of unnecessary cutting and fitting later on, it's best to start with the siding.

For a rustic look, I used tongue-and-groove cedar siding (K) *(Fig. 4)*. As you can see, the bottom board sits on a metal drip edge fastened to the end beam. This drip edge will shed water that collects where the beam and siding meet.

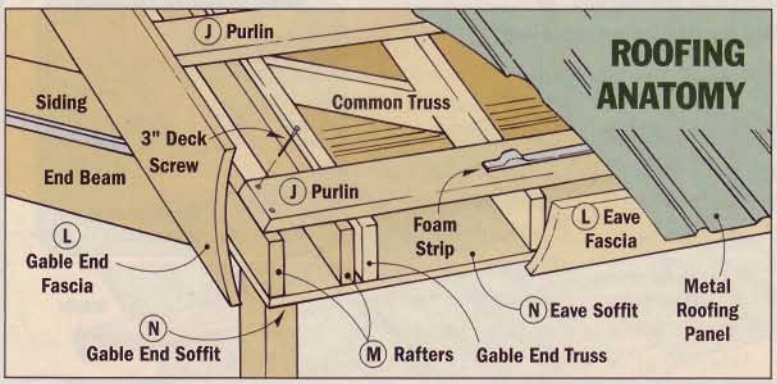
The siding is mitered at each end to follow the angle of the roof *(Fig. 4)*. Fortunately though, this won't require any fancy cuts. Just set the first board in place, mark across it along the top edge of the truss, and then miter the siding about ½" shy of the mark.

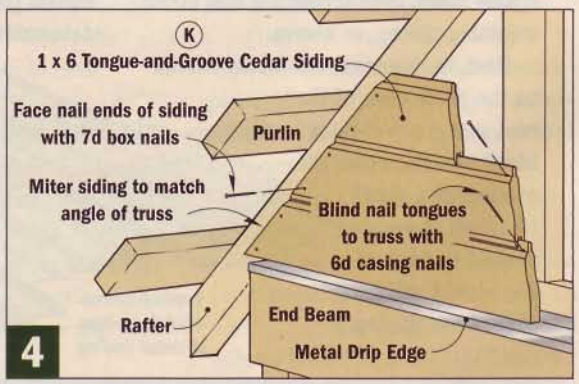
To save time when laying out the rest of the miters, I set up a "relay" from one piece of siding to the next. Here's the idea. The distance between the "long" and "short" tips of the miters on any two adjacent pieces of siding is the same. So by setting them edge to edge, you can quickly transfer the location of the miters from one piece to the next. The cutoff from the first piece of siding makes a handy angle gauge for laying out the rest of the miters.

FASCIA FOR EAVES

After siding both gable ends, the next step is to install the fascia to cover the ends of the trusses.

The eave fascia (L) is made of cedar 1x8's that are cut to length to fit flush with the ends of the purlins. As you can see in the *Eave*





Detail, the top edge of the fascia has to stick up above the trusses so it will fit tightly against the roof. An easy way to accomplish that is to clamp scrap pieces across the purlins, butt the fascia boards up against them, and then nail them in place.

INSTALL RAFTERS & SOFFITS

At this point, you're almost ready to install the plywood soffits. But first, to provide a mounting surface for the soffits, you'll need to install four 2x4 rafters (M) on each gable end (two for each pitch). Miter the rafters to fit against the eave fascia and also against each other at the peak. Then screw them to the purlins *(Roofing Anatomy)*.

SOFFITS. Now you're ready to add the soffits (N). Start by ripping long strips of $^3/_8$" plywood for the gable ends. Then bevel both ends of each strip to fit against the eave fascia and also at the peak where the strips come together.

After nailing the soffits to the rafters on the gable end, the eave soffits are made in a similar way. Only this time, all that's needed is to rip a bevel on the *outer* edge where they fit against the fascia.

GABLE END FASCIA BOARDS

The next step is to install fascia (L) on the gable ends of the roof. Here again, these are cedar 1x8's. Only this time, they're mitered to length to fit at the peak and flush with the outside of the eave fascia.

Just a note here. These fascia boards stick up above the purlins by $^1/_2$". This creates a lip that will register the outer rib on the metal roofing *(Gable End Detail)*. With that in mind, position the fascia boards and nail them to the outer rafters.

A TIN ROOF WITH STYLE

Now it's time to add the metal roofing. I chose this type of roofing for three reasons — it's lightweight, maintenance free, and looks great.

The metal roofing comes in long sheets with "ribs" that run the entire length of each piece. The 8 ft.-long sheets I bought are 38" wide with ribs spaced 9" apart. To install this roofing, you'll also need to pick up some special fasteners and strips of foam, as explained above. (Metal roofing and supplies are available at most home centers.)

A word of caution: Wear gloves to work with this stuff. The sharp edges can give you a wicked cut.

GETTING STARTED. The first step is to apply foam strips to the top and bottom purlins only, then lift the first sheet up on the roof. Next, fit the outer rib over the lip formed by the fascia board and position the sheet 2" above the top purlin *(Ridge Cap Detail)*. Then screw the sheet in place. As you work your way across the sheet, drive screws through the ribs into the purlins below. Don't screw into the ribs that align with the upper purlin yet though. They'll be fastened when a metal ridge cap is added later. Also, leave the inside rib loose for now — it will be used to register the next sheet.

▲ **To ensure good results, install the metal roofing one sheet at a time and check the alignment as you work.**

Before adding another sheet, be sure to check the alignment of the first sheet. Ideally, the inner edge of this sheet is parallel with the gable fascia on the far end. This way, the outer rib in the *last* sheet of roofing will fit over the fascia with no problem. To check the alignment, measure from the edge of the sheet to the fascia — at the top *and* the bottom *(Fig. 5)*. If the measurements match, the sheet is correctly aligned. If not, adjust the position of the second sheet.

This sheet is fastened the same way. Once again, be sure to check the alignment before adding the next sheet. Then repeat this process to complete the roof.

CAP THE ROOF. To seal the roof, I installed a V-shaped metal cap across the ridge. This cap is only available in 10 ft. lengths, so it'll take two overlapped pieces to cover the ridge *(Assembly View)*.

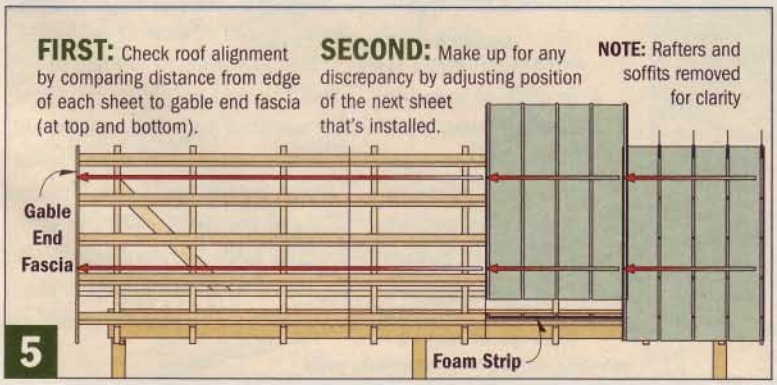
You'll need to climb up on the roof to install the cap. Be careful to walk only over the purlins where the roof is supported. Then screw the cap to the upper purlins on both sides, using the same fasteners as before.

FOAM & FASTENERS

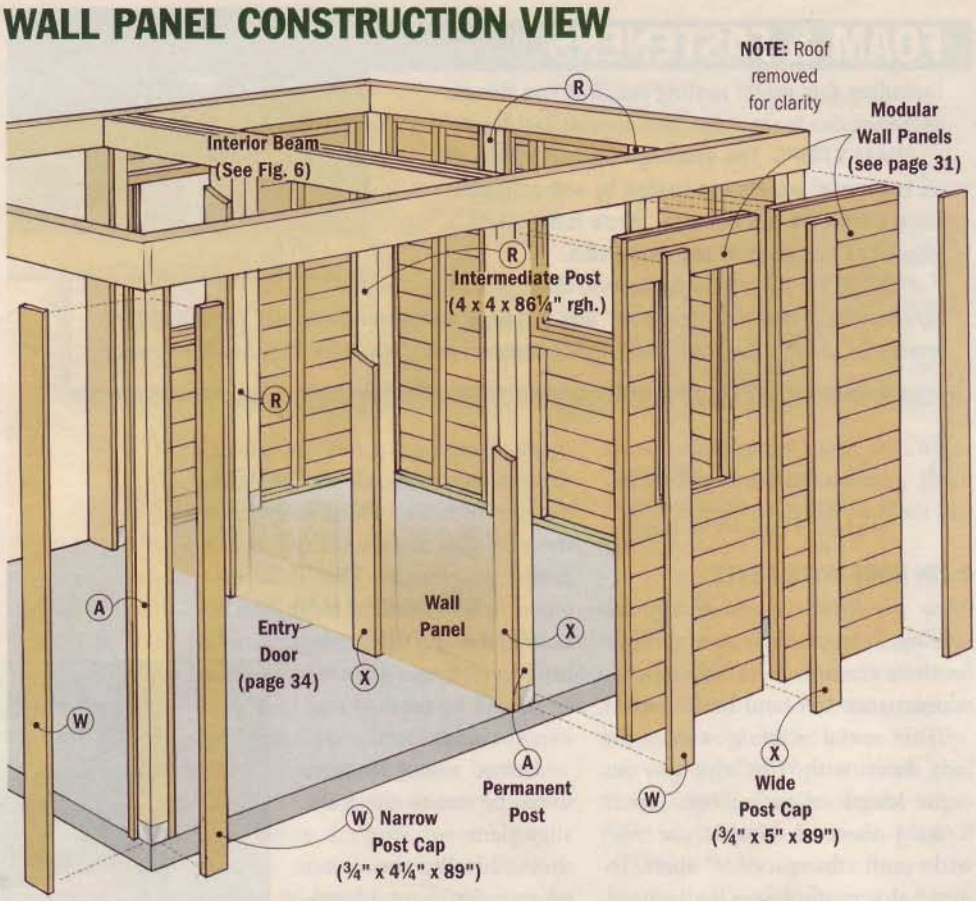
Installing this metal roofing requires two things: self-adhesive foam strips and special fasteners.

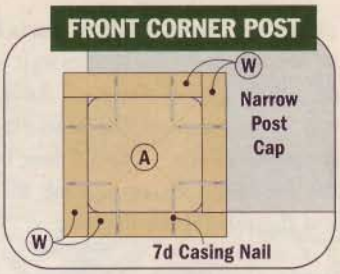
FOAM STRIPS. The openings formed by the ribs on the metal panels are sealed by self-adhesive foam strips. As you can see, these foam strips follow the contours of the metal ribs.

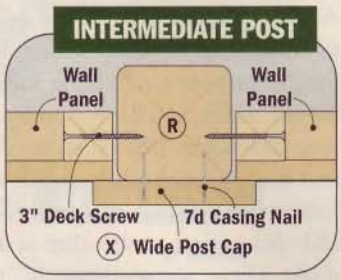
FASTENERS. As for the fasteners, they're hex-head screws with a tapered "rain cap" and a rubber washer underneath. Installing the screws so they're just snug (not tight) compresses the washer and seals out water.

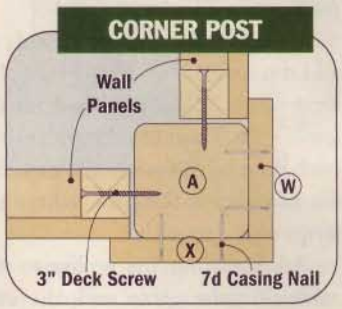


WALL PANEL CONSTRUCTION VIEW









MAKE IT MODULAR

The building blocks of this structure are the modular wall panels *(Construction View above)*. These panels fit into openings formed by installing one (or more) intermediate posts (R) between the permanent posts. I decided to enclose the back half of the building and leave the front half open. This meant installing a single intermediate post on each side and two posts for the front and back wall.

INTERIOR BEAM. To "tie in" the posts for the front wall, I added an interior beam that spans between the sides of the building.

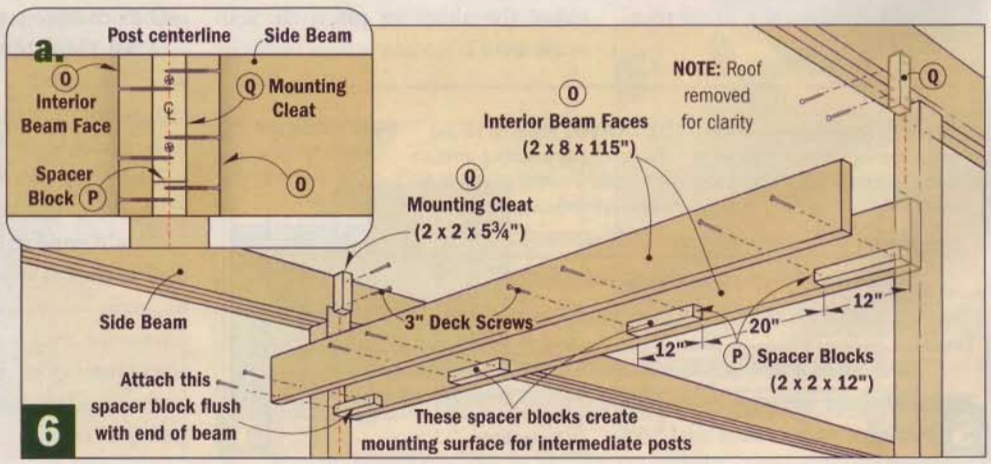
As you can see in Fig. 6, this beam consists of two cedar 2x8 faces (O) with spacer blocks (P) sandwiched between. After screwing the beam together, slide it over a mounting cleat (Q) attached to the side beam, as shown in the photo below. Then fasten the beam to the cleat with screws.

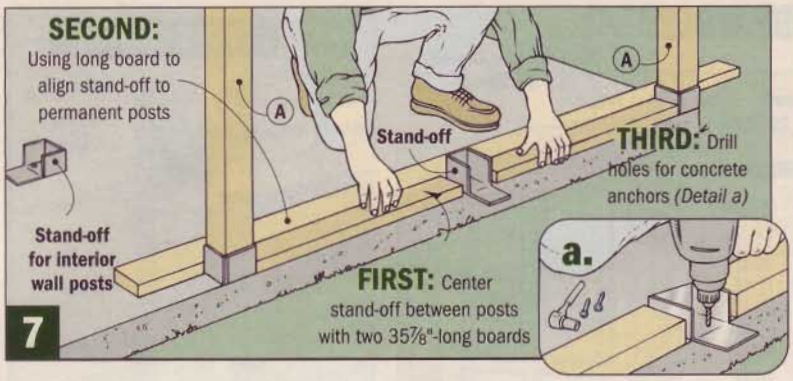
INSTALL POSTS

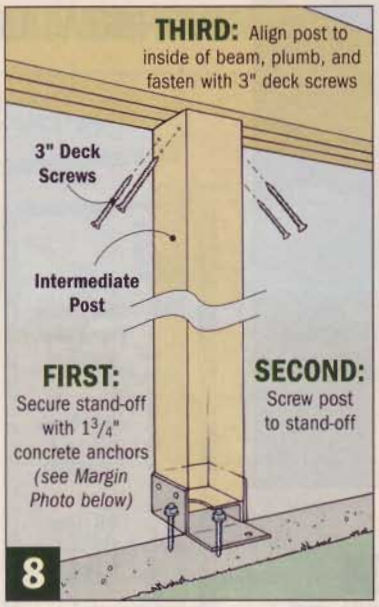
Just like the permanent posts, the intermediate posts (R) are cedar 4x4's that sit in metal stand-offs. But these posts butt up against the beams, so they're shorter.

The location of the intermediate posts is important. To make the wall panels interchangeable, all of the posts must be 36" apart. So once again, I used two boards as spacers to position the stand-offs *(Fig. 7)*. As before, to allow for the thickness of

▲ **All that's needed to install the interior beam is to fit it over a mounting cleat and fasten it with screws.**







▲ **The concrete anchors used to secure the metal stand-offs are tapped into holes drilled with a masonry bit.**

the metal stand-offs, cut the spacers ⅛" shorter than the width of the opening (35⅞"). Also, a handy way to ensure proper wall alignment is to butt the stand-off against a board set against the back of the posts.

Each stand-off is secured with concrete anchors, which are easy to take out if you decide to remove a post *(Margin Photo)*. After drilling holes for the anchors *(Fig. 7a)*, install the stand-offs. Then fasten each post to the stand-off, plumb the post, and toe-screw it to the beam *(Fig. 8)*.

MODULAR WALL PANELS

At this point, you can build the wall panels to fit the openings. There are two types of wall panels: one with siding all the way up and the other with a window opening *(see illustrations at right)*.

FRAME. Each panel starts out as a 2x2 frame with a cedar top plate (S) and panel studs (T). To resist rot, the bottom plate (U) is made from pressure-treated material.

Notice that the window panel also has two horizontal rails (V). Together with two studs, they form the rough opening for the window.

After screwing the frame together, it's just a matter of adding the siding (K). Here again, I used tongue-and-groove cedar siding.

CEDAR CAPS

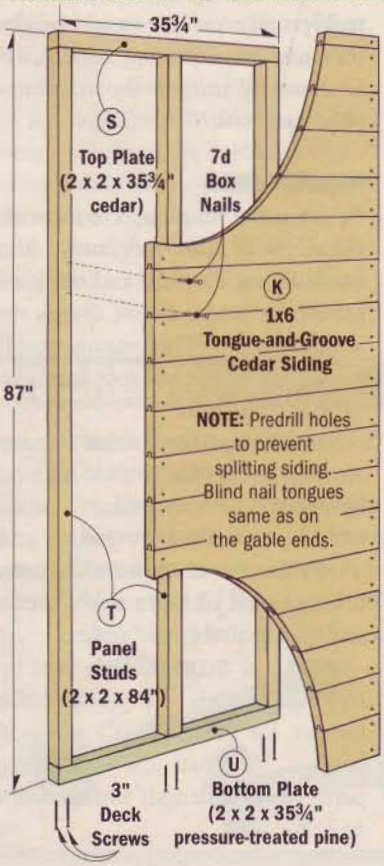
Before installing the wall panels, I attached ¾"-thick cedar post caps to the posts *(Construction View.)* These caps make the posts appear thicker. Plus, they form an overhanging lip for the wall panels to fit against *(Post Details)*.

The post caps are identical in length. But some of them are ¾" *narrower* than others. To see why, take a look at the *Post Details* on page 30. Notice how the narrow (W) and wide post caps (X) all work together to make the exposed faces of the posts *appear* to be the same width, regardless of their location.

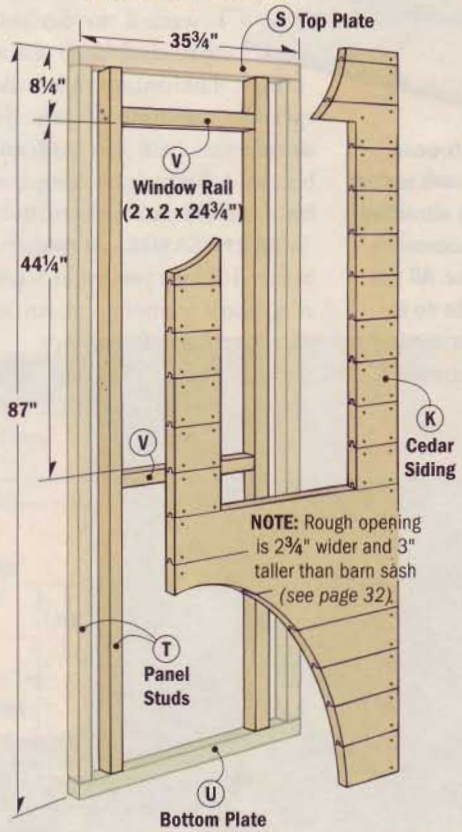
INSTALL WALL PANELS. After nailing on the post caps, set each panel into an opening and fit it against the caps. Shim each panel so it's centered between the posts and then screw it to the posts.

One last note. To make installation easy, the wall panels are sized to be ⅜" shorter than the height of the opening. This means there will be a small gap between the panel and the beam. The gaps were fine with me, but you can just as easily cover them with a trim strip.

WALL PANEL W/ SIDING ONLY



WINDOW PANEL



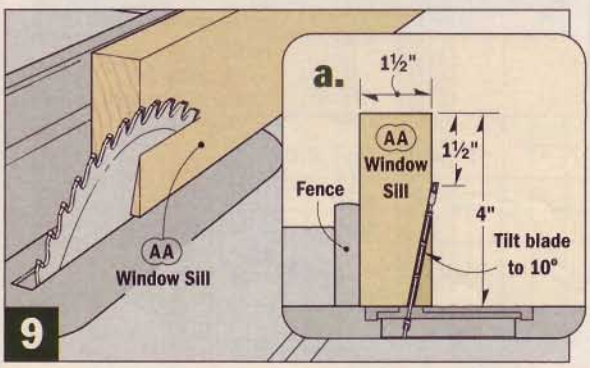
▲ A six-pane barn sash makes for an attractive, yet inexpensive window. All you need to do is build a window jamb around it.

WINDOWS: AN OPEN & SHUT CASE

With the wall panels in place, it's time to install the windows. To provide plenty of ventilation, I wanted to be able to open and close the windows. The only problem is that *operable* windows (with jambs already installed) can cost quite a bit. So I began checking around for a less expensive alternative.

BARN SASHES. It wasn't long before I found just what I needed at a home center — barn sashes that cost about $26 apiece.

The sashes I used (shown above) have six glass panes. These sashes are tall enough that they sit fairly low in the wall panel. This way, even small kids can see out the window. If you prefer to have more usable space on the inside of the wall (say for a potting bench), I'd recommend using a shorter, four-pane barn sash.



WINDOW JAMB

As its name implies, a barn sash comes with the *sash* only (the wood frame, dividers, and the glass panes). In other words, there's no window jamb. This means you'll need to build a window jamb to surround the sash.

As you can see in the *Window Assembly* above, the jamb is nothing more than a wood frame that's assembled with butt joints and screws. To prevent the window from binding, each jamb is sized to create an ⅛" gap all the way around.

HEAD & SIDE JAMBS. Start by ripping enough ¾"-thick cedar lumber for the head (Y) and side jambs (Z). Then crosscut these jamb pieces to length and set them aside for now.

WINDOW SILL. The bottom of the jamb is formed by the window sill (AA), which is ripped to width from a cedar 2x6.

To shed water, there's a wide bevel on the top surface of the window sill. An easy way to accomplish that is to tilt the blade on a table saw and rip a bevel, as shown in *Figures 9 and 9a.*

In addition to the bevel, there's also a groove in the bottom of the window sill near the outer edge *(Sill Detail).* This groove acts as a drip edge that prevents water from wicking inside. A single pass on the table saw is all that's needed to cut the groove.

The next step is to cut a notch in each end of the window sill *(Sill Detail).* These notches form "ears" that wrap around the outside of the wall. These ears also serve as a ledge for the window casing that's added later.

An easy way to cut the notches is to make two passes on the table saw, stopping just short of the inside corner. Then complete the cut with a hand saw.

SHOP-MADE WINDOW CLOSURE

This shop-made window closure does two things. First, it locks the windows when they're closed. It also props the windows open so they don't swing in the wind.

As you can see, the closure has a long, metal arm that's used as a prop. By fitting one of the holes in the arm over a metal pin, it props the window open in one of three different locations. To lock the window, swing the arm against it and fit the hole near the handle over a second "lock" pin.

The window closure is made of aluminum stock, which is available at most home centers.

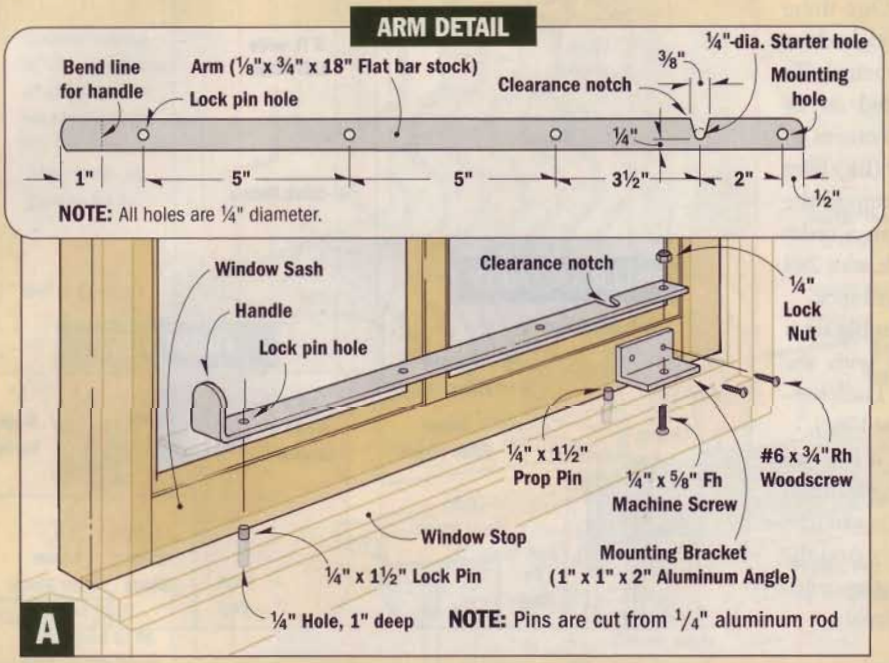
ARM. To make the arm, start by cutting a piece of flat, aluminum bar stock to length with a hack saw *(Arm Detail)*. Then lay out and drill all the holes (three to fit over the pins and one for the mounting bracket).

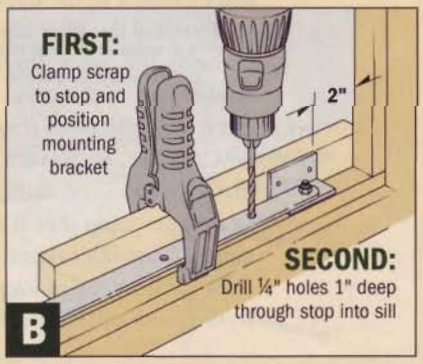
While you're at it, cut a wedge-shaped notch in the edge of the bar. It provides clearance for the "prop" pin. I also rounded the corners of the arm with a file and sandpaper and then bent the end in a vise to form a handle.

MOUNTING BRACKET. The next step is to add the mounting bracket, which is cut from a length of aluminum angle *(Figure A)*. You'll need to drill two holes in one "leg" of this angle to attach it to the window. A single hole in the other leg accepts a machine screw that secures it to the arm.

INSTALL PINS. All that's left is to cut the two metal pins from an aluminum rod and install them in the window stop. An easy way to locate the pins is to use the holes in the arm as drilling guides. To do this, open the window and clamp a scrap against the stop, as shown in *Figure B*. (The scrap acts as a "stand-in" for the window, which would get in the way of the drill otherwise.) Now just drill the holes and tap in the pins.

Finally, fasten the mounting bracket to the window with screws.





ASSEMBLY. Now you're ready to assemble the window jamb. Start by fitting the head jamb between the two side jambs and then screwing the pieces together to create a U-shaped assembly. Then fit the side jambs into the notches in the window sill (flush with the bottom) and fasten them with screws.

HINGES, STOPS, & CASING

Once the jamb is completed, the biggest part of getting the windows ready for installation is taken care of. Now all that's left is to add the hinges, window stops, and the casing.

INSTALL HINGES. It doesn't take long to hinge the window to the jamb, especially if you use no-mortise hinges like those shown at right. These hinges eliminate the time-consuming task of cutting mortises. Plus, they're self-aligning for a fast, accurate installation.

WINDOW STOPS. Once the window is hinged to the jamb, you can add the stops (BB). These are ½"-thick strips of cedar that prevent the window from swinging in too far. Rip the pieces to width so they fit against the window and flush with the inside edge of the jamb. Then nail the stops in place.

ADD CASING. All that's left to do before installing the windows is to add the window casing (CC). It's made from cedar 1x4's that are butted against each other and nailed to the outer edge of the window jamb.

INSTALL WINDOWS. Now it's just a matter of setting each window into its opening. Shim the window as needed so it sits level. Then nail the casing to the wall panel to secure the window.

LOCK & PROP. Finally, I made a simple mechanism for each window that props it open and locks it when it's shut. *(See sidebar above.)*

▲ To save time and effort, I used no-mortise hinges for the windows. These 3" hinges, manufactured by the Stanley Tool Company, are available at most home centers.

INSTALL AN ENTRY DOOR

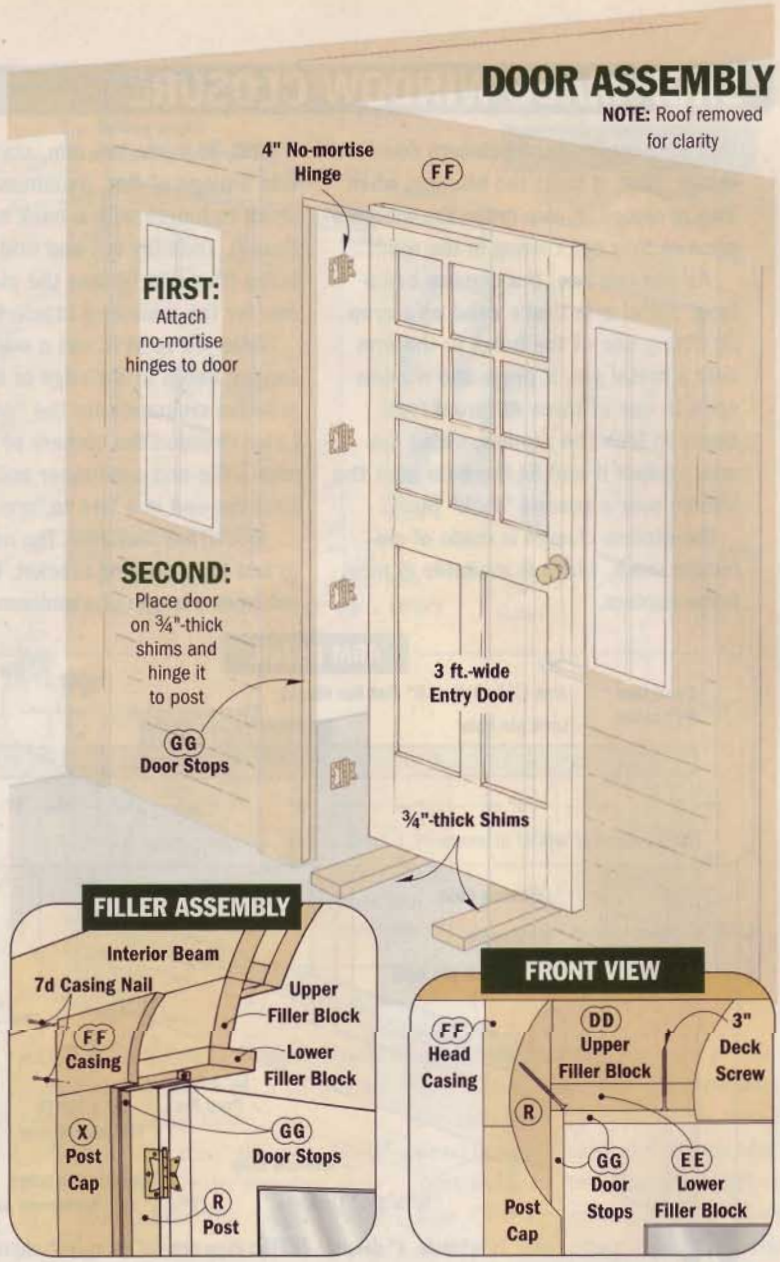
When it comes to installing an entry door, the identical-size openings between posts really comes in handy. A 3 ft.-wide door (which is actually 35¾") should fit just right into any of the openings.

As you can see in the *Door Assembly* drawing, I used a fir door with nine glass panes. Here again, no-mortise hinges make for a quick installation. Only this time, I used four 4" hinges to support the weight of the door. To provide clearance underneath the door, I shimmed it with ¾"-thick scraps while installing the hinges.

FILLER ASSEMBLY. One thing to note is that a standard height door (80") is shorter than the opening. To enclose this space, I added an L-shaped filler assembly. It consists of an upper (DD) and lower (EE) filler block *(Filler Assembly)*. I ripped the upper block to width from a cedar 2x6. As for the lower block, it's a 2x4 that's screwed to the upper block.

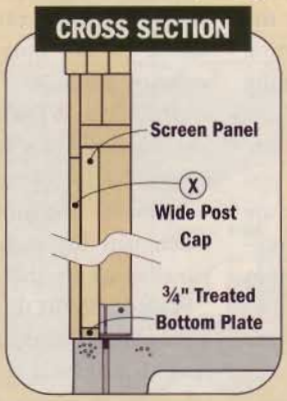
To install the filler assembly, set it between the posts, flush with the outside face of the beam. Then toe-screw it to the posts *(Front View)*.

CASING & STOPS. Now all that's left is to add casing and door stops. The casing (FF) is a cedar 1x8 nailed to the filler assembly. And the stops (GG) are ¾"-thick strips nailed to the posts and filler assembly.

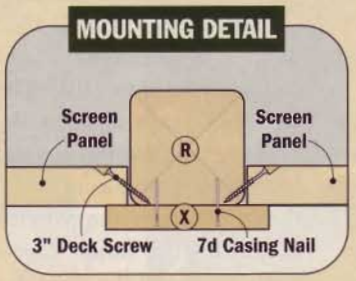


OPTIONAL SCREENED-IN PORCH

It's easy to add a screened-in porch. Just install intermediate posts and pre-built, 3 ft.-wide screen doors in the openings.



To prevent rot, it's a good idea to screw a strip of ¾"-thick pressure-treated pine to the bottom of each fixed screen door *(Cross Section)*. There's no need to do this for an operating screen door.



The screen doors are installed just like the wall panels. Nail a wide post cap (X) to the outside face of each post *(Mounting Detail)*. Then fit the screen doors against the caps and screw them to the posts.

Here again, you'll need to add a filler assembly above the doors. But a screen door is about 1" taller than an entry door, so the filler assembly isn't as tall. I made mine out of two 2x4's. After installing the filler assembly, add casing and stops as before.

▲ **Pine car siding with pre-cut tongue-and-groove joints conceals the trusses and creates an attractive ceiling.**

▲ **The curved brackets that form a transition between posts and beams are installed with 3" deck screws.**

FRONT PORCH DETAILS

For a final touch, I added a ceiling and some decorative wood brackets to the porch.

INSTALL CEILING

In addition to covering the roof structure, the ceiling keeps birds from building nests in the trusses.

I used 1x6 pine car siding with pre-cut, tongue-and groove joints for the ceiling. It's an inexpensive, attractive material that's easy to install.

To provide a nailing surfaces, the car siding is installed perpendicular to the trusses. The only problem is there's no place to nail the *ends* of the boards. The solution is to screw a 2x4 to the top of the interior and end beams. As you can see in the upper photo at left, it lies flat on the beams.

Now it's just a matter of installing the ceiling (HH) boards. As you nail each board in place, it's a good idea to check if it's parallel with the side beams. Here again, measure the distance between the edge of the board and the side beam (at both ends of the board). Then make up for any discrepancies in the two measurements by making slight adjustments in the position of the next board.

ADD CORNER BRACKETS

To create a transition from the beams to the posts, I added some decorative curved brackets (II).

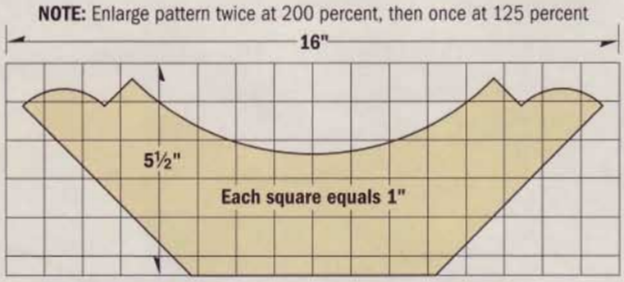
After trying several different shapes for the brackets, I decided on the one shown in the *Pattern* at left. Enlarge the pattern on a photocopy machine, and attach it to a 2x6 with spray adhesive.

A miter saw makes quick work of mitering the ends of each bracket. Then cut it to shape with a band saw.

After sanding the edge smooth, it's just a matter of drilling mounting holes in the bracket. Then install the brackets, as shown in the lower photo at left.

CORNER BRACKET PATTERN

NOTE: Enlarge pattern twice at 200 percent, then once at 125 percent



NOTE: Corner brackets are cut from 2 x 6 cedar stock

MATERIALS & HARDWARE

POSTS & BEAMS

A (6) Posts (cedar)	4 x 4 x 88¼"
B (2) Inner Side Beams (cedar)	2 x 8 x 157½"
C (2) Middle Side Beams (cedar)	2 x 8 x 160½"
D (2) Outer Side Beams (cedar)	2 x 8 x 160½"
E (2) Middle End Beams (cedar)	2 x 8 x 118"
F (2) Inner End Beams (cedar)	2 x 8 x 115"
G (5) Outer End Beams (cedar)	2 x 8 x 124"

ROOF SYSTEM

H (1) Strongback (fir)	2 x 4 x 161" rgh.
I (2) Braces (fir)	2 x 4 x 52" rgh.
J (10) Purlins (fir)	2 x 4 x 179" rgh.
K Siding (cedar tongue & groove)	1 x 6 x 338 lin. ft.
L Fascia (cedar)	1 x 8 x 70 lin. ft.
M (8) Rafters (fir)	2 x 4 x 96" rgh.
N Soffits (soffit plywood, 3 full-size sheets)	⅜" x 48" x 96"

*Also needed: 2 pre-made gable end trusses & 6 common trusses

WALL PANELS*

O (2) Interior Beam Faces (cedar)	2 x 8 x 115"
P (4) Spacer Blocks (cedar)	2 x 2 x 12"
Q (2) Mounting Cleats (cedar)	2 x 2 x 5¾"
R (6) Intermediate Posts (cedar)	4 x 4 x 86¼"
S (9) Top Plates (cedar)	2 x 2 x 35¾"
T (32) Panel Studs (cedar)	2 x 2 x 84"
U (9) Bottom Plates (pressure-treated)	2 x 2 x 35¾"
V (10) Window Rails (cedar)	2 x 2 x 24¾"
W (12) Narrow Post Caps (cedar)	¾" x 4¼" x 89"
X (9) Wide Post Caps (cedar)	¾" x 5" x 89"

*Parts listed are for 5 window panels & 4 solid-sided panels

WINDOWS & DOORS*

Y (5) Window Head Jambs (cedar)	¾" x 2⅝" x 22¼"
Z (10) Window Side Jambs (cedar)	¾" x 2⅝" x 43¾"
AA (5) Window Sills (cedar)	1½" x 4" x 29¾"
BB Window Stops (cedar)	½" x 1" x 55 lin. ft.
CC Window Casing (cedar)	1 x 4 x 48 lin. ft.
DD (1) Upper Filler Block (cedar)	1½" x 4¾" x 36"
EE (1) Lower Filler Block (cedar)	2 x 4 x 36"
FF (1) Door Casing (cedar)	1 x 8 x 34½"
GG Door Stops (cedar)	¾" x 1¾" x 17 lin. ft.
HH Ceiling (1 x 6 T&G pine car siding)	1 x 6 x 114 lin. ft.
II (6) Corner Brackets (cedar)	2 x 6 x 16" rgh.

*Parts listed are for 5 windows & 1 entry door

HARDWARE & SUPPLIES

- (12) Stand-offs (Simpson Strong-Tie #AB44)
- (6) ½" x 12" J-bolts w/Nuts
- (96) #8 x 1¼" Screws for Stand-offs
- (20) Self-Adhesive Foam Roof Strips
- (10) 38" x 96" Metal Roofing Panels
- (2) 10' Metal Ridge Caps
- (260) 2½"-long Metal Roof Fasteners
- Metal Drip Edge (30 lin. ft.)
- (24) 1¾"-long Concrete Anchors
- (5) Six-Pane Barn Sashes (22" x 41¼")
- (5 pairs) 3" No-mortise Hinges
- (2 pairs) 4" No-mortise Hinges (for one entry door)
- (1) 3'0" Exterior-Grade Entry Door
- (5) ¾" x 18" Aluminum Bars
- (5) 1" x 1" x 2" Aluminum Angles
- (10) ¼" x 1½" Aluminum Pins
- (10) #6 x ¾" Rh Screws
- (5) ¼" x 1" Fh Machine Screw
- (5) ¼" Lock Nuts
- 10 lb. #8 x 3" Deck Screws
- 2 lb. #8 x 1½" Deck Screws
- 10 lb. 7d Box Nails (Galvanized)
- 5 lb. 6d Box Nails (Galvanized)
- 2 lb. 6d Casing Nails (Galvanized)
- 3 lb. 4d Box Nails (Galvanized)
- 3 lb. 7d Casing Nails (Galvanized)
- 3 lb. 2½" Deck Screws

Craftsman-Style Mirrored Coat Rack

With styling from the Craftsman era and joinery from the modern age, this is a project you'll be proud to hang your hat on.

This mirrored coat rack looks as though it was hand-built generations ago. And with its quartersawn white oak, beveled mirrors, and tall, Mission-style coat hooks, it's easy to see why.

What you can't see, though, is that it's built using the latest "generation" of joinery — beechwood biscuits and glue.

BENEFITS OF BISCUITS

I chose biscuits for this project over more traditional techniques, such as mortise and tenon, because biscuits offer so many advantages.

For instance, by using biscuits I avoided the precise layout, drilling, and chiseling that goes along with mortise and tenon joinery. That's because every joint is an ordinary butt joint that's reinforced with the proper size biscuit. All I had to do was simply cut the pieces to size, cut the biscuit slots, and assemble the coat rack.

As simple as it sounds, and it really is that simple, the biscuits add a great deal of strength to a typical butt joint.

The plate joiner techniques I used in this coat rack are highlighted on the next few pages. And once you have these fundamental techniques down, you'll be amazed how many projects you can use them on.

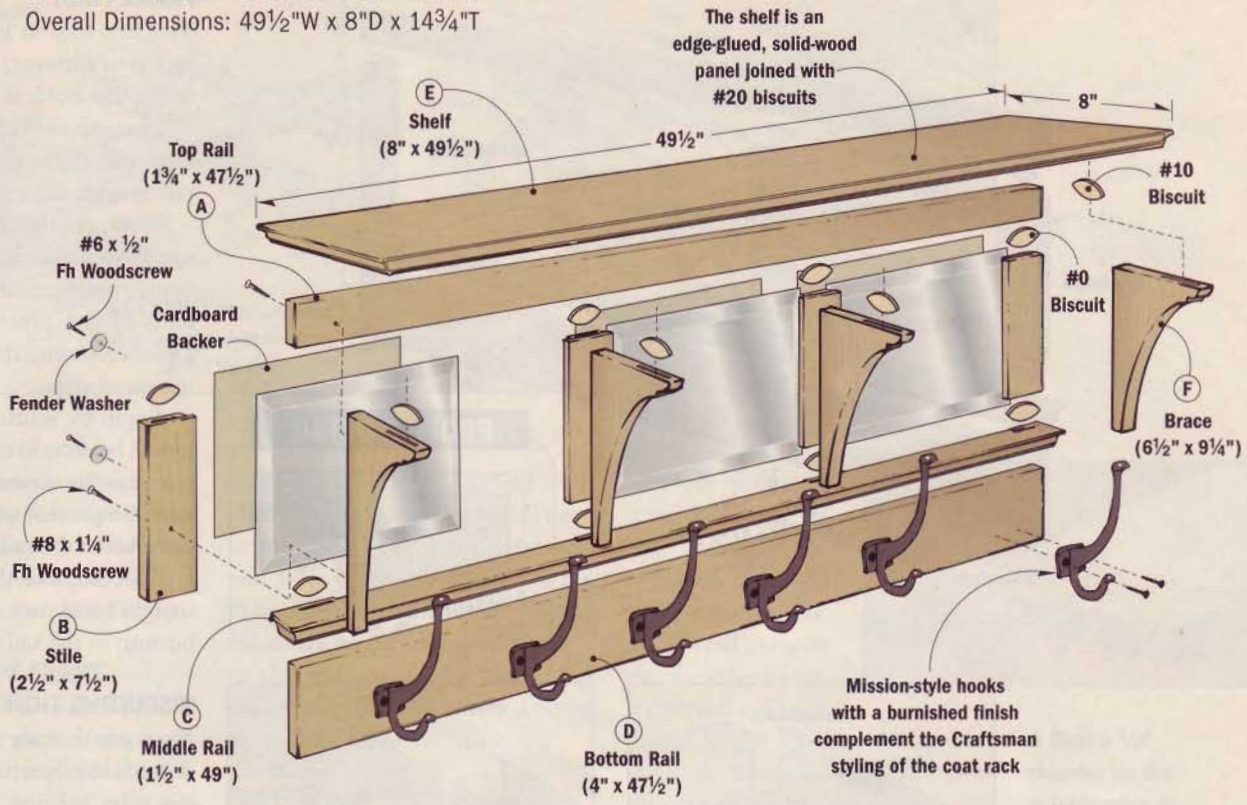
MATERIALS

In the spirit of the Craftsman styling of the coat rack, I decided to use quartersawn white oak for this project. In the photo above, you can see how the swirling rays that are characteristic of quartersawn white oak stand out beautifully from the straight-grained wood.

Now take a look at the curved shelf supports. Notice how the rays in the grain of the white oak follow the graceful curves of the braces? It took

COAT RACK CONSTRUCTION VIEW

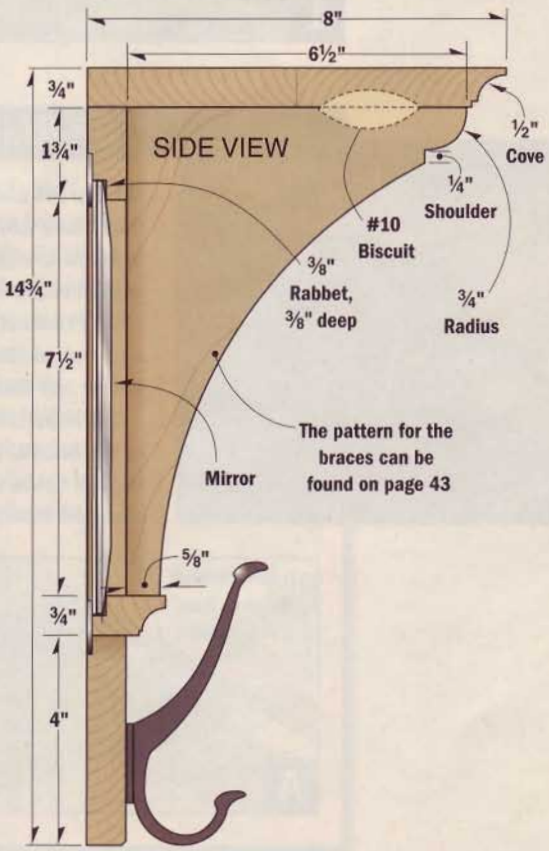
Overall Dimensions: 49½"W x 8"D x 14¾"T



NOTE: All stock is ¾"-thick quartersawn white oak

NOTE: Mirrors are ¼" thick with a 1"-wide bevel on all edges

► **The Misson-style coat hooks (Part No. 123877) are available from Woodcraft Supply Corporation. To order, call (800) 225-1153.**



a little extra time to select the perfect stock to produce this effect, but the end result was well worth the effort.

All told, this coat rack consists of about 9 bd. ft. of lumber. Though it's a good rule of thumb to buy about 20 percent more stock than you'll need to account for waste and best grain selection.

Another "traditional" touch to this coat rack are the long, burnished coat hooks. Although they're brand new, they still have an aged look that matches the project nicely.

Also, notice how the Mission-style hooks are carefully positioned so that, not only are they an equal distance apart, but one pair of hooks aligns precisely the same way in front of each mirror.

MATERIALS LIST

COAT RACK

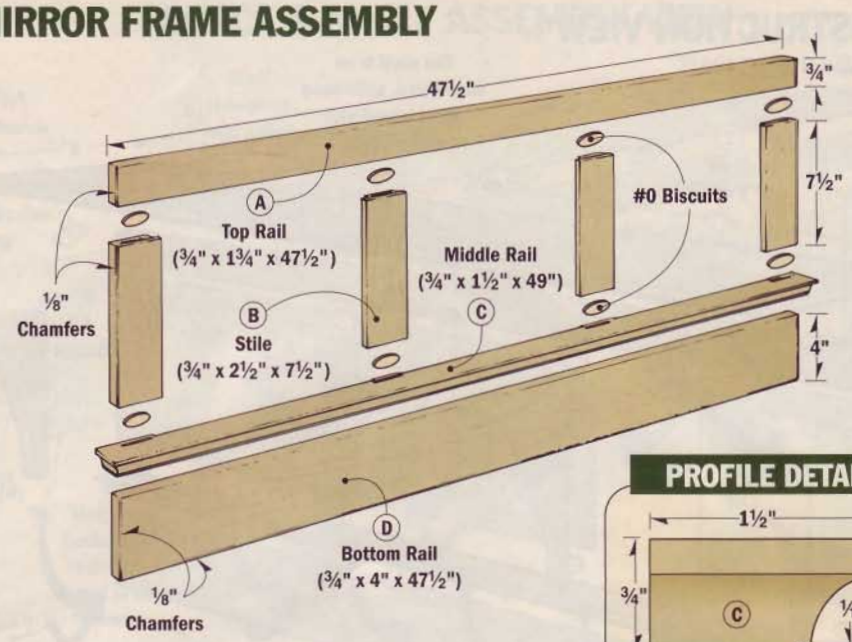
A	(1) Top Rail	¾" x 1¾" x 47½"
B	(4) Stiles	¾" x 2½" x 7½"
C	(1) Middle Rail	¾" x 1½" x 49"
D	(1) Bottom Rail	¾" x 4" x 47½"
E	(1) Shelf	¾" x 8" x 49½"
F	(4) Braces	¾" x 6½" x 9¼"

NOTE: Coat rack requires nine board feet of ¾"-thick lumber

HARDWARE & SUPPLIES

(8) #8 x 1¼" Fh Woodscrews
(12) 1"-dia. Fender Washers
(12) #6 x ½" Fh Woodscrews
(6) Mission-style Coat Hooks
(3) Beveled Mirrors
(2) 1¾" x ¼" x 1½" Flush-mount Clips
(3) Cardboard Backers
Spray-Mount Adhesive for Pattern
#0, #10, #20 Biscuits

MIRROR FRAME ASSEMBLY



FRAME FIRST

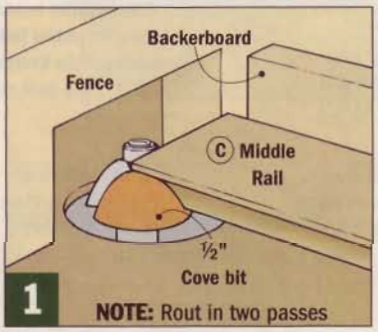
The first step in building the coat rack is to construct the rail-and-stile frame that holds the three mirrors.

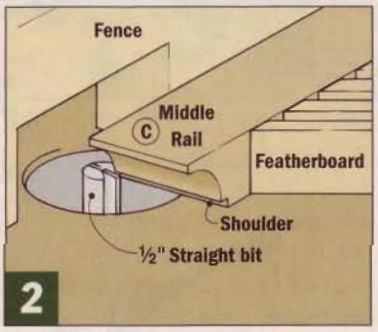
First, cut the top rail (A) and the four stiles (B) to size. Then set these pieces aside for a moment.

Next, cut the middle rail (C) to size. Now you're ready to rout a decorative profile on the front edge and ends of the piece *(see the Profile Detail)*. Routing this profile is done in several steps.

Begin by routing the cove. This should be done in two passes to avoid burning the wood. Use a backerboard to prevent tearout as you rout the ends of the rail *(Fig. 1)*.

To complete the profile, use a straight bit to rout a shoulder on the bottom of the rail *(Fig. 2)*.





BISCUITING THE FRAME

Now you're ready to cut the biscuit slots in the mirror frame. Because the stiles are just 2½" wide, only the smallest standard size biscuit (#0) will fit this joint.

Although these joints seem similar, there are actually two different plate joiner techniques used for cutting the biscuit slots.

TOP RAIL TO STILE BISCUITS / FACE FRAME JOINT

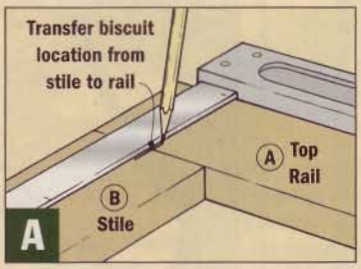
The top rail and stiles of this coat rack form a face frame joint, where end grain (in the stiles) is joined to edge grain (in the rail). This type of joint requires reinforcement to make a strong connection. Biscuits are a good way to add that additional reinforcement without having any visible hardware, such as screws.

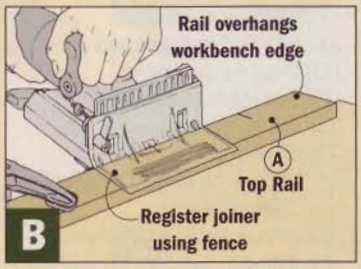
One important consideration here is the size of the biscuit. The narrow stiles don't have enough space for anything but the smallest standard biscuit size — a #0 biscuit.

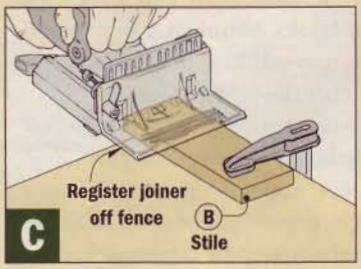
To lay out the slot locations for the biscuits, center a line on the width of each stile. Then transfer those marks onto the rail *(Fig. A)*.

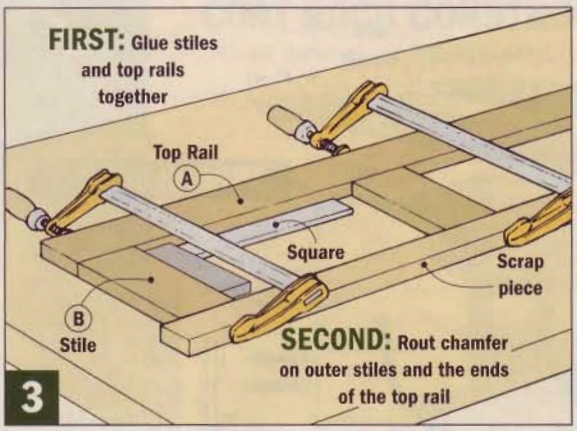
Now clamp the rail to the workbench with the edge hanging over the bench *(Fig. B)*. Set the fence on your plate joiner so the blade is centered on the thickness of the stock. Then cut a biscuit slot at each mark.

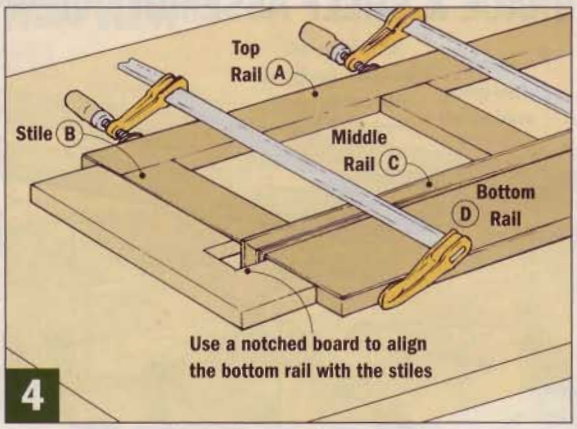
To cut the slot in the stiles, clamp each stile to the bench, slightly overhanging the end *(Fig. C)*. Then use the same fence setting to cut a slot.











The first technique joins the top rail to the stiles *(Top Rail/Stile sidebar)*. The second technique is used for the joints between the middle rail and the stiles *(Middle Rail/Stile sidebar)*.

ASSEMBLING THE FRAME

After the biscuit slots are cut in the stiles and rails, dry assemble the frame to check that all the pieces align.

Once you're satisfied with the results of the dry run, you can glue and clamp the stiles to the top rail.

Note: Don't attach the middle rail at this time. Use a scrap piece to apply even pressure to the bottom of the stiles *(Fig. 3)*.

The reason the middle rail is left off for now is because you still need to rout a $^1/_8$" chamfer on the two end stiles and the ends of the rail *(Margin Photo)*. Leaving the middle rail off allows you to rout all the way to the bottom of the stile. After routing the chamfers, glue and clamp the middle rail to the frame.

BOTTOM RAIL

While you're waiting for the glue to dry, cut the bottom rail (D) to size. Then rout a $^1/_8$" chamfer on the ends and the bottom edge of this piece. Leave the top edge square where it butts against the middle rail.

Now you can glue this piece to the frame. One problem here is that, because the middle rail extends past the edge of the frame, you can't use a straightedge to align the bottom rail to the frame assembly. My solution was to use a board with a notch cut out of it to align the bottom rail to the stiles *(Fig. 4)*.

By the way, you don't need biscuits here because this joint is strong enough, and alignment is as simple as clamping the pieces on a flat surface.

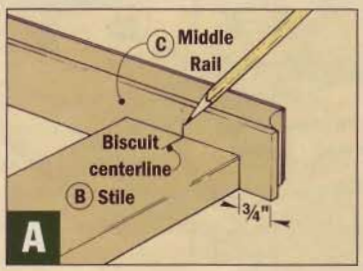
▲ Rout a $^1/_8$" chamfer on the outside edge of each end stile before adding the middle rail.

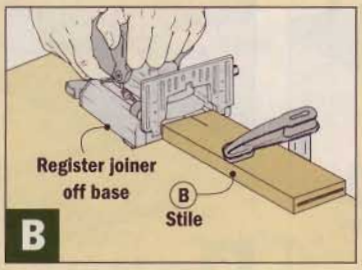
MIDDLE RAIL TO STILE BISCUITS / T-JOINT

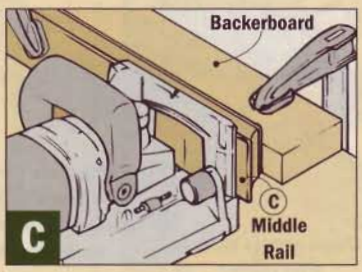
Where the stiles are joined to the middle rail is a T-joint. In this type of joint, slots are cut in the end grain of one piece (the stiles) and in the face grain of the adjoining piece (the middle rail). Just as with a face frame joint, this connection needs reinforcement to strengthen the weak end-grain connection.

This is another place where you'll have to use #0 biscuits because of the narrow stiles. To lay out the biscuit locations, center a line on the width of each stile and transfer the marks onto the middle rail *(Fig. A)*. Now clamp the stiles to the bench and use the base of the plate joiner to position the slot *(Fig. B)*. (Most plate joiners are designed to center the biscuit slot in $^3/_4$"-thick stock when registering off the base of the joiner this way.)

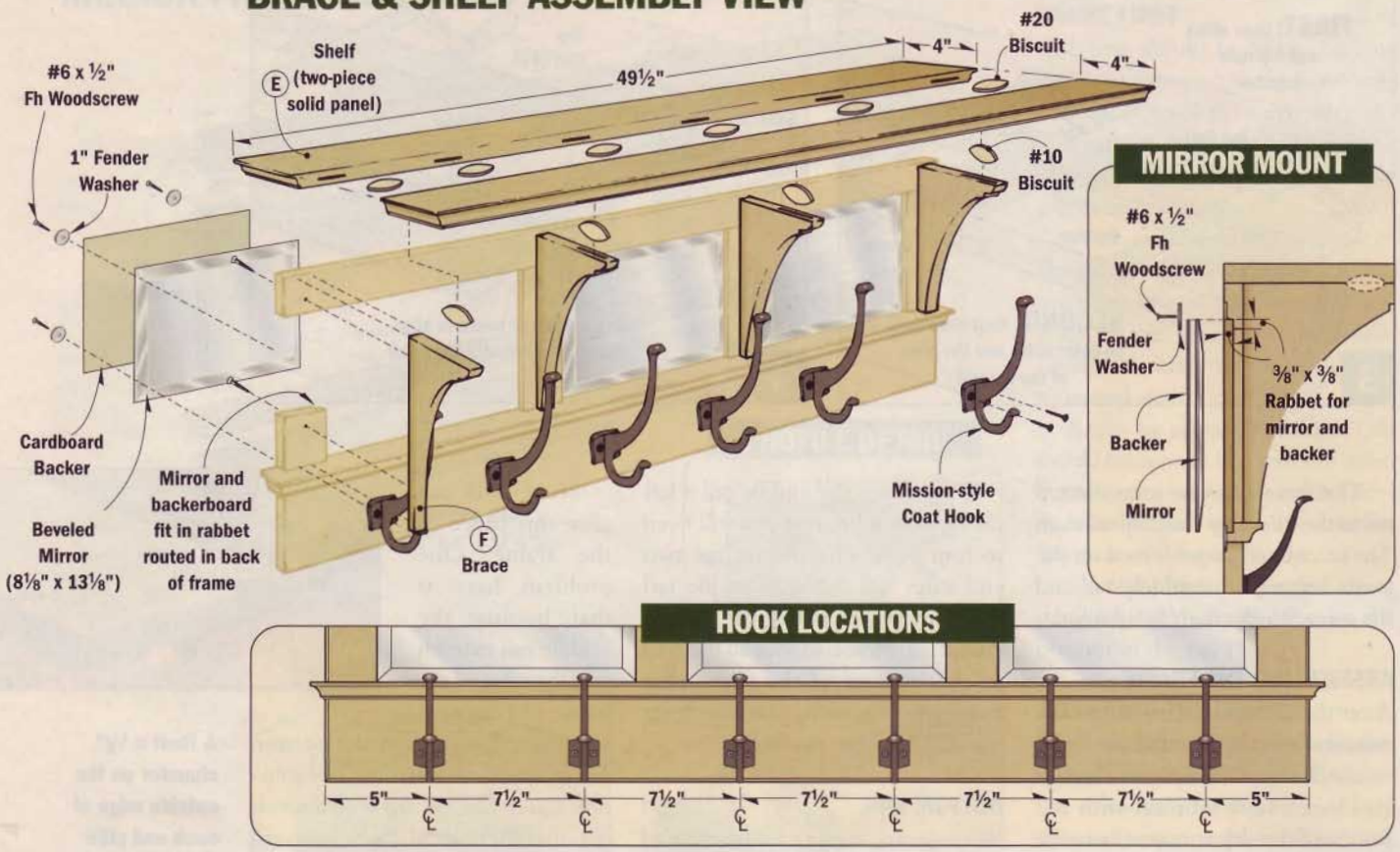
The middle rail doesn't provide much clamping area. So, to cut the slots in the rail, clamp a backerboard to the bench and clamp the rail to that *(Fig. C)*. Then rest the base of the joiner on the workbench and cut the slots.







BRACE & SHELF ASSEMBLY VIEW



▲ **Use a chisel to square the corners after routing with a rabbeting bit.**

MAKE WAY FOR THE MIRRORS

Now that the frame is built, it's time to get it ready to hold the three beveled mirrors. The mirrors rest in rabbets in the back of the frame and are held in with fender washers that nest in shallow pockets *(Mirror Mount Detail above)*.

The first step is to cut a rabbet around the openings in the back of the frame. The rabbets need to be deep enough to hold the mirror and a cardboard backer *(Fig. 5a)*.

I used a router and a rabbeting bit for this *(Fig. 5)*. Then I used a chisel to square up the round corners left by the bit *(Margin Photo)*.

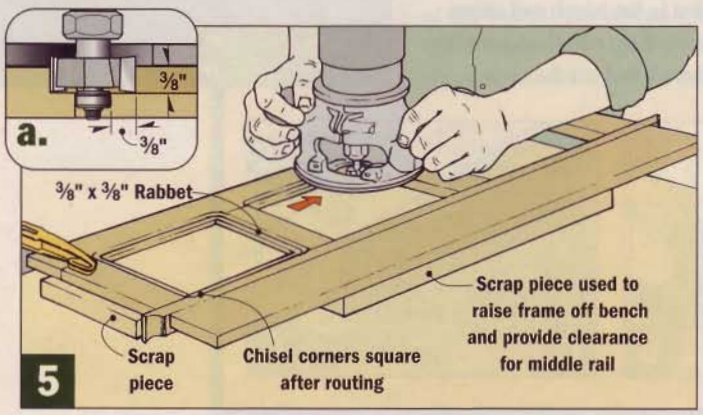
The next step is to make the shallow pockets for the fender washers to nest in. The washers I used have a 1" diameter, so cutting the pockets was as simple as drilling them with a Forstner bit.

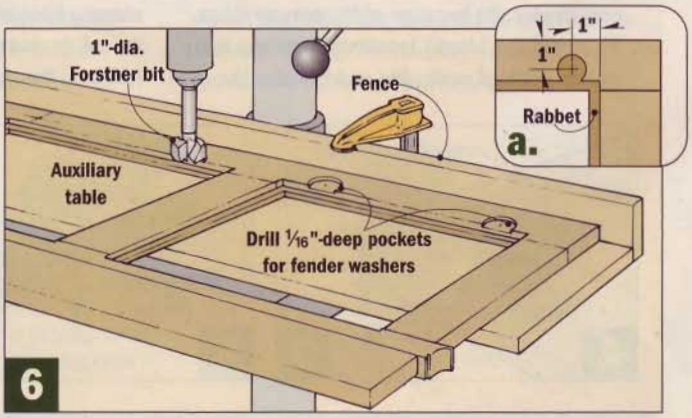
You can drill the pockets on the drill press, as shown in *Figure 6*. One problem you'll find here is that, when you flip the frame around to drill the bottom pockets, the middle rail won't let the frame sit flat on the drill press table. This is easy to overcome by raising the frame off the drill press table with a couple of thick scrap blocks.

BUILDING THE SHELF & BRACES

The top shelf (E) on the coat rack is a solid-wood panel made by edge-gluing two boards together. Although this edge-to-edge joint is plenty strong, I used biscuits to keep the boards aligned when I applied clamping pressure to them *(see the sidebar on the next page)*.

After gluing up the shelf, the next step is to rout a decorative profile





on each end and the front edge. This is the same profile as on the middle rail, so you can follow the same steps to rout it *(see page 40)*.

MAKING THE BRACES

Now you're ready to make the four braces (F) that will support the shelf. These braces do a lot more than just hold up the shelf. The sweeping arc of the braces and the rounded top corner make them as decorative as they are functional.

The biggest challenge with these braces is to make them as identical as possible. The best way to do this is to gang cut them — that is, fasten them together with double-face tape and cut all four pieces at once.

Start by taping the blanks together into a block. Then apply a paper pattern to one of the outside faces with spray adhesive. Note: Use the pattern at the top of this page, copied twice at 200 percent, to make a full-size pattern for the braces.

The first cut I made was on the table saw using a 1/4" dado blade *(Fig. 7)*. By using a dado blade, you'll get a much cleaner, flatter shoulder than would be possible with a single blade. Then finish cutting the braces on the band saw, as shown in *Figure 8*.

SHAPING & SANDING

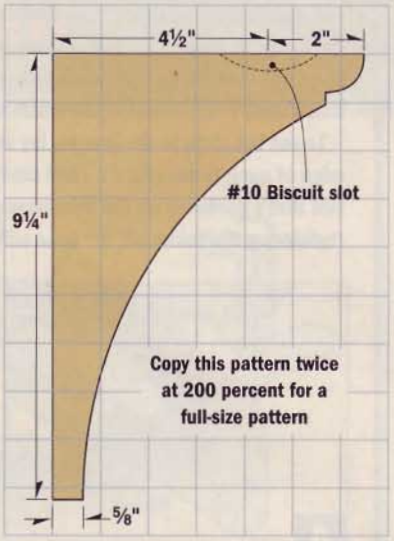
While the braces are still taped together is a good time to start filing and sanding them to final shape.

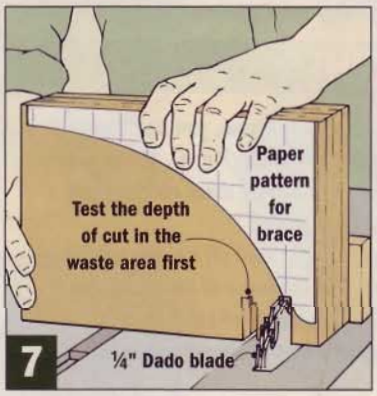
Using a file works well for shaping the small arc at the top of the braces. Then use a sanding stick for the finishing touches.

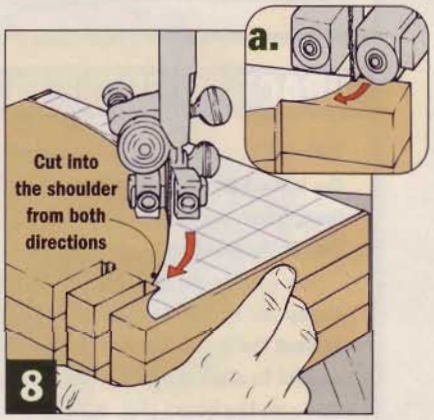
To sand the large curve, a drum sander chucked in a drill press is a good choice. Most drums aren't tall enough for a 3"-thick block, though.

So my solution was to separate the braces into two blocks of two and sand them that way. Be careful not to round the corners at the bottom of the braces, as it's sure to show up on the finished coat rack.

BRACE PATTERN







TOP SHELF BISCUITS / EDGE-TO-EDGE JOINT

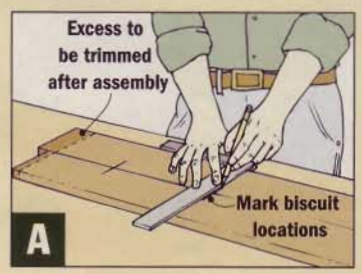
Solid-wood panels, like the top shelf of this coat rack, don't require the extra strength of biscuits. But what biscuits do offer a glue-up like this is accurate alignment.

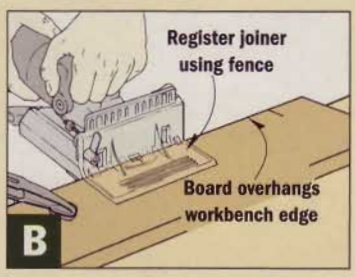
By gluing biscuits between the boards of a solid-wood panel, it's much easier to keep the faces of the pieces perfectly aligned as you apply clamping pressure.

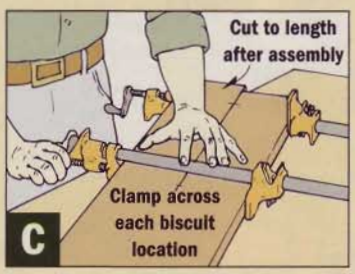
Laying out the biscuit slot locations on the workpieces is as simple as setting the panel pieces edge to edge, just as they'll be glued together, and marking a line across the joint onto both panel pieces *(Fig. A)*. Once the biscuit locations are marked on the workpieces, you can cut the slots in both boards.

First, extend the edge of the workpiece over the edge of the bench. Then use the fence to align the cuts in the thickness of the board *(Fig B)*.

Now cut a #20-size slot at each mark. Then cut matching slots on the other boards. After cutting all the slots, you can add biscuits and then glue and clamp the panel together *(Fig. C)*.



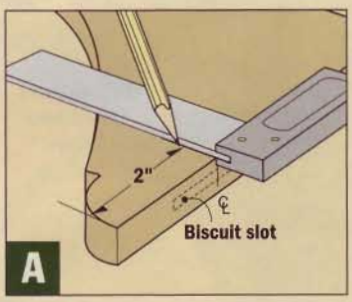


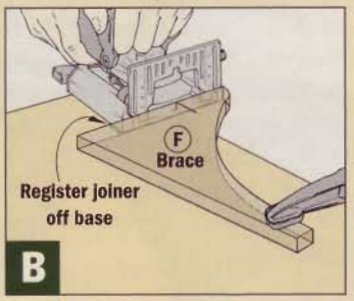


BISCUITING THE BRACES

Cutting the biscuit slots in the braces is the first of two steps to complete the brace to shelf joint. The second part, cutting slots in the shelf, must be done after the braces have been attached to the mirror frame. Cutting those slots is explained in the *Brace to Shelf* sidebar below.

To cut the slots in the braces, lay out the biscuit slot 2" from the front edge of each brace *(Fig A)*. Then clamp each brace to the bench and cut a slot that's centered on the thickness of the board *(Figure B)*. Here again, registering the joiner off the base will center the blade in ¾"-thick stock.



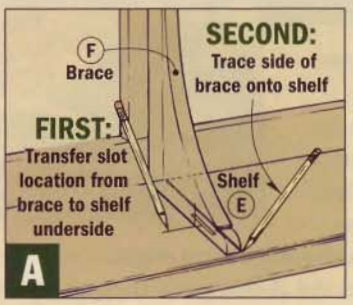


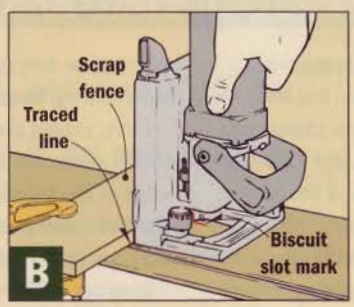
BRACE TO SHELF BISCUITS

With the braces glued and screwed to the mirror frame, you can transfer the biscuit layout marks from the braces to the shelf *(Fig. A)*. At the same time, trace the edge of the brace *opposite* the biscuit mark on the shelf. This is the line you'll use to position the plate joiner.

Now align a scrap fence on the line you just traced off the brace and clamp the scrap securely in place. Then butt the base of the plate joiner against the scrap fence and make a vertical plunge into the shelf. Be careful to align the tick mark on the joiner with the biscuit mark you made on the board *(Fig. B)*.

Now move the scrap fence to the next brace location and repeat the process to cut biscuit slots for the the remaining braces.





BISCUIT THE BRACES

Now that all the parts of the coat rack are made, you can lay out and cut the biscuit slots that will join the braces to the shelf when you get to the final assembly.

First, lay out and cut the biscuit slots on the braces following the procedure in the *Biscuiting the Braces* sidebar at left.

When those slots are cut, the next step is to attach the braces to the mirror frame with glue and screws, as shown in *Figure 9*.

BISCUIT THE SHELF

The final piece of the coat rack is the shelf. Before this can be attached, though, it needs to have biscuit slots cut in it to match those in the braces. The *Brace to Shelf Biscuits* sidebar explains how to do this accurately.

FINAL ASSEMBLY

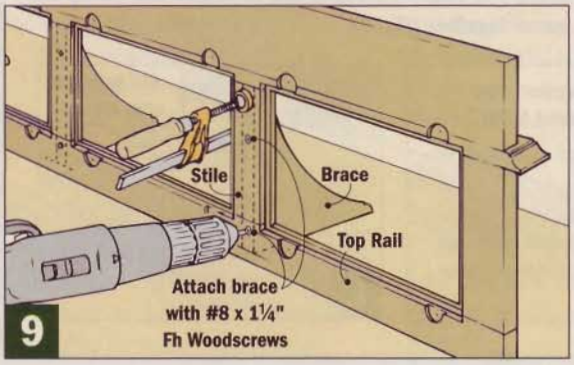
Gluing the shelf to the frame and brace assembly is the next step. Start by spreading glue on the edge of the top rail. Then put glue on the top of each brace and in the biscuit slots.

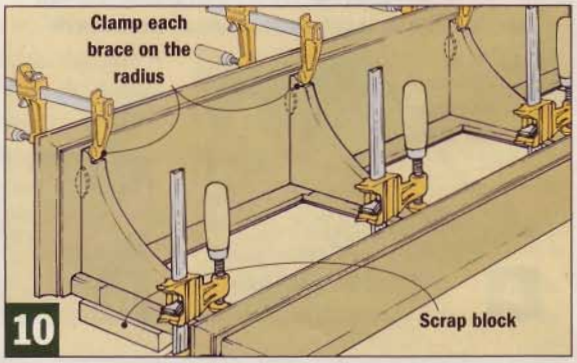
Now squeeze a bit of glue into the biscuit slots on the shelf. Finally, place biscuits in the slots on the braces and clamp the pieces together, as shown in *Figure 10*.

A FINE FINISH

When it came time to apply a stain and finish to the coat rack, I wanted a combination that would "age" the project while still showing off the beautiful figure of the white oak.

Ultimately, I decided to apply one coat of Watco's Black Walnut stain and three coats of Watco Natural Danish Oil finish.





The stain gave the oak a medium brown color that made the coat rack look like an heirloom. The oil finish added a light sheen that really accentuates the ray flecks in the grain while not "out shining" the mirrors.

COAT HOOKS

After your finish has had plenty of time to dry, you can add the Mission-style coat hooks.

Position the hooks using the dimensions in the *Hook Locations* drawing on page 42. Notice how these dimensions place a pair of hooks at the same place in front of each mirror pane. The vertical placement of the hooks is intended to align the very bottom of the hook with the bottom of the rail. Mount the hooks with the screws provided.

HANGING HARDWARE

Next comes the hanging hardware. For simplicity's sake, I used extra-thin flush-mount hanging clips *(see the Margin Photos)*. These two-piece, interlocking clips are designed so one piece attaches to the coat rack, the other to the wall. Then the rack just slides into place.

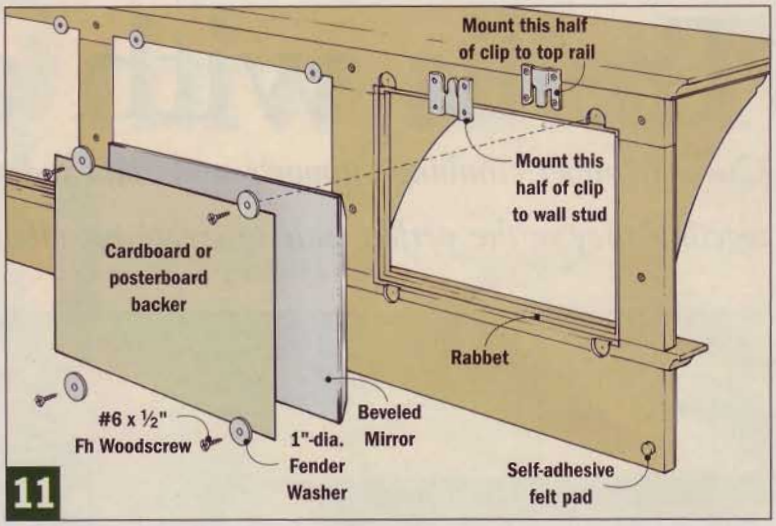
One word of caution here. Because of the weight of this coat rack, you'll need to fasten it securely to the wall. For a strong, safe installation, find the wall studs in the area where you're planning to hang the coat rack. Then position the mounting hardware on the coat rack so they land on those studs.

Also, these mounting brackets stand away from the back of the coat rack by about 1/8". To keep the mirror from tilting, add a couple of self-adhesive felt pads to hold the bottom of the rack away from the wall.

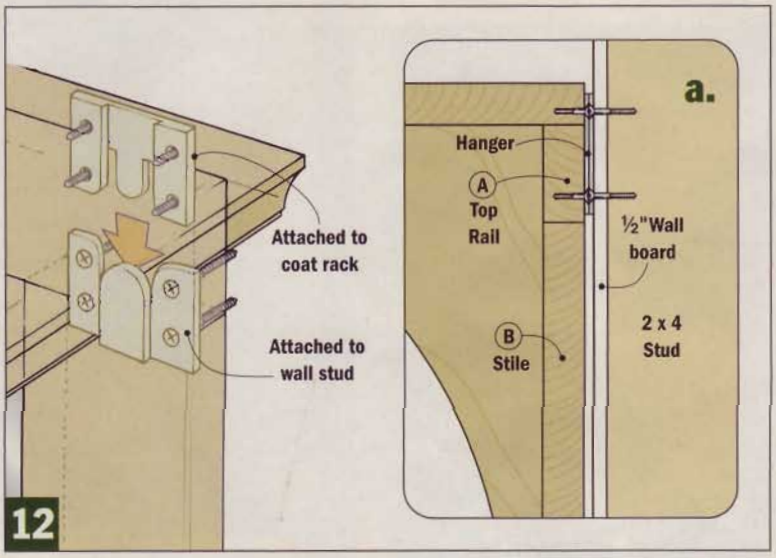
MIRROR INSTALLATION

Finally are the three beveled mirrors. You can have these custom made at just about any local glass and mirror shop (check your local Yellow Pages under "Glass.")

I used 1/4"-thick mirrors with a 1"-wide bevel on all four sides. The mirrors cost me about $60 and took two weeks to be made.



▲ **Fender washers and woodscrews make securing the mirrors simple. The washers are available at any hardware store.**



▲ **Flush-mount hanging clips from Rockler (item #29975) offer easy, secure installation of the coat rack.**

To mount the mirrors, place them in the rabbets, along with a backer. Then hand tighten a woodscrew through each of the fender washers until the mirror and backer are secure.

FINAL REFLECTIONS

Once this coat rack is mounted on the wall, it's sure to receive lots of praise from visitors. They'll notice the beautiful grain of the quarter-sawn white oak, the "antique" hooks, and the beveled mirrors. In fact, they may be so taken by the coat rack that they altogether miss their own reflections looking back at them.

Of course, it's up to you whether to let them in on how easy it was to build — thanks to simple wood biscuits and a plate joiner.

▲ **This Craftsman-style coat rack, resting on a well-used workbench, resembles a scene from bygone era. The hidden joinery, however, is latest generation.**

Trellis with a Twist

Curved copper climbing supports and solid cedar construction . . . together they're the perfect pair to create an all-in-one planter and trellis.

How do you turn an ordinary planter into a project that's sure to attract attention? Simple. Build it out of cedar and attach a trellis with curved copper climbing supports.

Cedar and copper are excellent choices for outdoor projects. They're attractive, weather-resistant, and reasonably priced — not to mention easy to work with. For example, a shop-made bending jig makes quick work of shaping copper tubing into the S-shaped climbing supports *(see page 50)*.

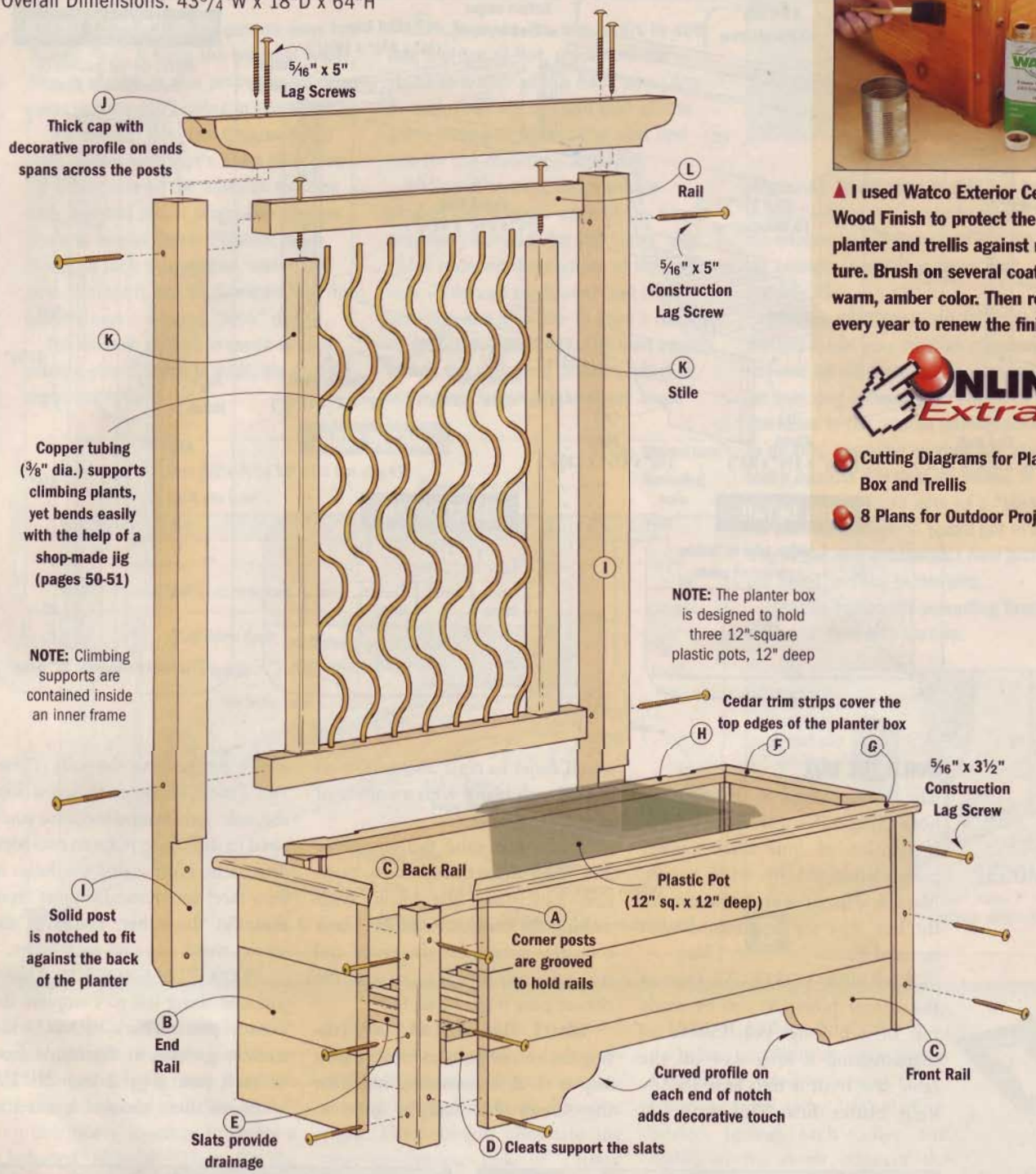
COPPER LATTICE. If you want a different look for this project, there's also a copper lattice version. Notice how the diamond-shaped grid *(shown below)* fits into the trellis like a picture in a frame.

FINISH. Regardless of which version you build, you can apply an outdoor finish to maintain the warm look of cedar *(see page 47)*. Another option is to let the cedar and copper weather naturally.

▲ **As an option, build the trellis with a copper lattice to create a more traditional look** ***(turn to page 53)*****.**

CONSTRUCTION VIEW

Overall Dimensions: 43 3/4"W x 18"D x 64"H



▲ I used Watco Exterior Cedar Wood Finish to protect the planter and trellis against moisture. Brush on several coats for a warm, amber color. Then reapply every year to renew the finish.

ONLINE Extras

- Cutting Diagrams for Planter Box and Trellis
- 8 Plans for Outdoor Projects

MATERIALS & HARDWARE

PLANTER BOX

A	(4) Corner Posts (cedar)	2" x 2" x 15 3/8"
B	(6) End Rails (cedar)	1 1/16" x 5 1/8" x 12 1/4"
C	(6) Frt./Bk. Rails (cedar)	1 1/16" x 5 1/8" x 39 1/2"
D	(2) Cleats (cedar)	1 1/16" x 1 1/2" x 39"
E	(13) Slats (cedar)	3/4" x 1 1/2" x 12 3/4"
F	(2) End Trim (cedar)	3/4" x 2 3/8" x 16 1/2"
G	(1) Front Trim (cedar)	3/4" x 2 3/8" x 43 3/4"
H	(1) Back Trim (cedar)	3/4" x 2 3/8" x 43 3/4"

TRELLIS

I	(2) Posts (cedar)	2 3/4" x 2 3/4" x 54 1/2"
J	(1) Cap (cedar)	3 1/2" x 3 1/2" x 45"
K	(2) Frame Stiles (cedar)	1 1/2" x 2" x 35"
L	(2) Frame Rails (cedar)	2" x 2 1/4" x 30 1/2"

HARDWARE

- (12) 5/16 x 5" Construction Lag Screws
- (28) 5/16 x 3 1/2" Construction Lag Screws
- (48) #8 x 1 1/2" Fh Exterior Woodscrews

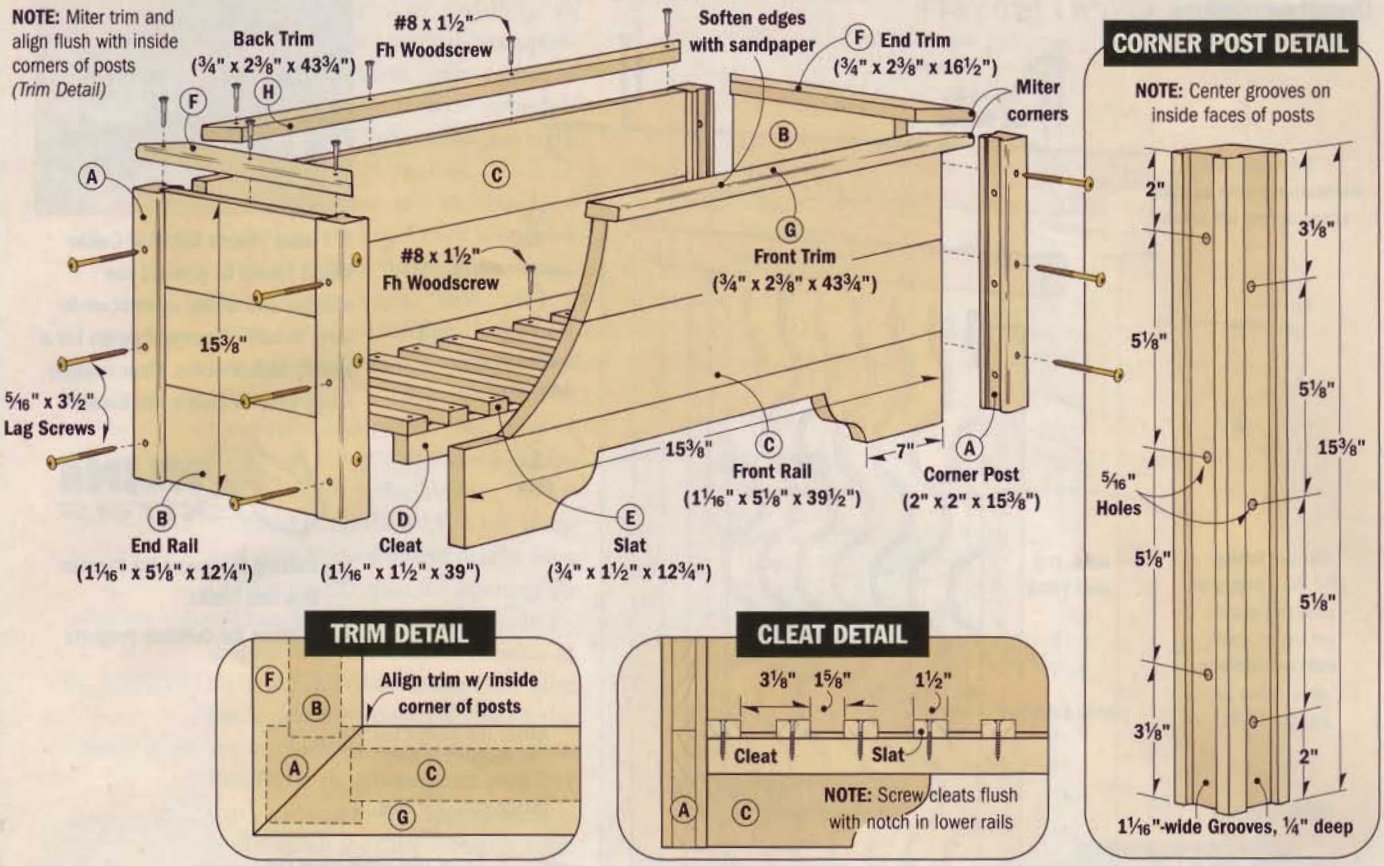
BENDING JIG (pages 50-51)

(7)	Copper Refrig. Tubing	3/8" O.D. x 54"
(2)	Faces (hardboard)	1/4" x 8" x 37"
(2)	Jaws (maple)	1/2" x 8" x 37"

(12) #8 x 1/2" Fh Woodscrews

COPPER LATTICE TRELLIS (page 53)

(4) Stiles & Rails (cedar) 1 3/16" x 1 1/4"-10 lin. ft.
(22) Copper Refrig. Tubing 3/8" O.D.-40 lin. ft.



BUILD THE BOX

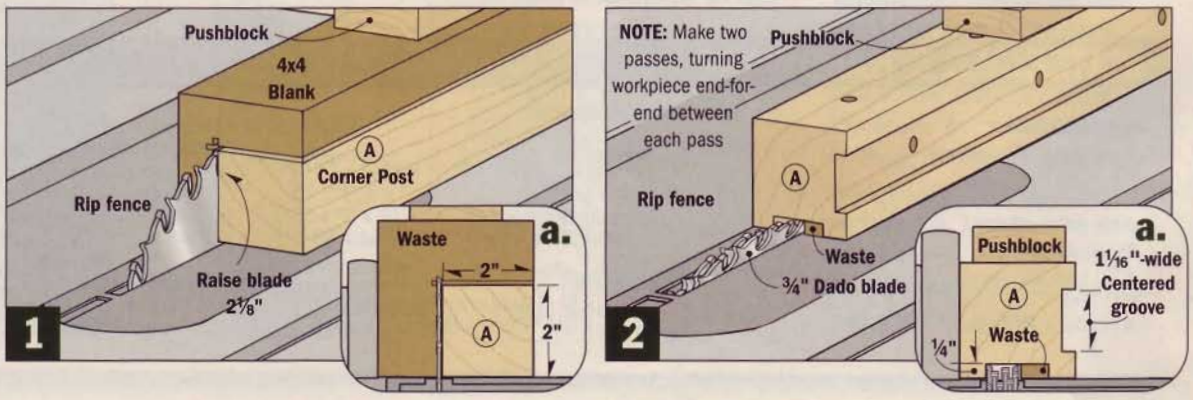
The planter box is designed to hold three 12"-square plastic pots. It consists of four thick corner posts connected by wide panels. Narrow slats serve as the bottom of the box. The top is trimmed with mitered pieces *(Assembly View)*.

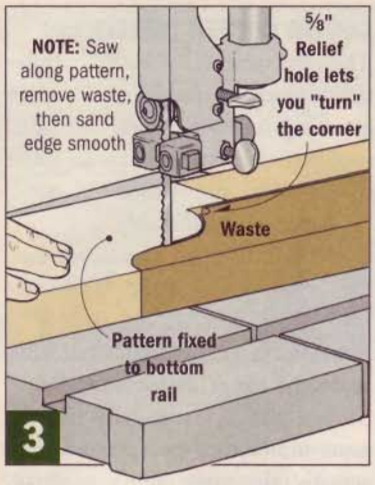
CORNER POSTS. All four of the corner posts (A) can be made out of a 6'-long 4x4. Instead of maneuvering a long 4x4 on the table saw, I cut it into four 15⅜"-long blanks first. This makes it much easier to rip a 2"-square post out of each blank with a couple of cuts on the table saw.

To do this, raise the saw blade 2⅛" high and set the fence to position and guide the blank. After making the first cut, rotate the blank a quarter turn, reset the fence and make the second cut to remove the corner post *(Figs. 1 and 1a)*.

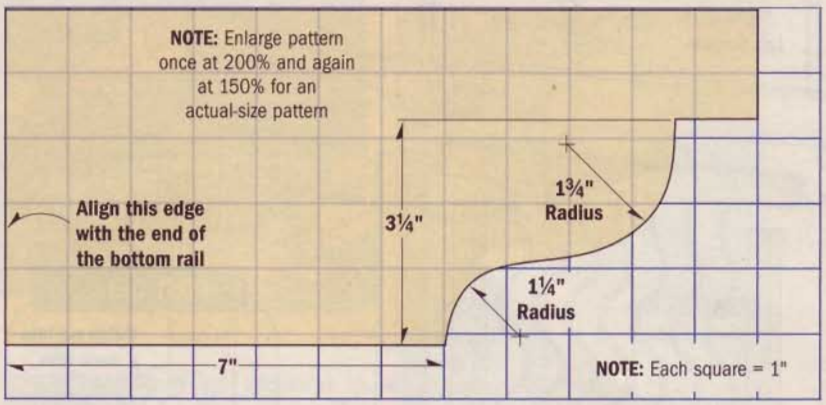
DRILL THE HOLES. After cutting the corner posts to size, the next step is to drill mounting holes for the screws that will be used to secure the posts to the rails *(Corner Post Detail)*. In order to screw into the rails from both directions, you'll need to drill these holes in two adjacent faces. Notice that the holes in one face are vertically *offset* from those in the other. This way the screws won't run into each other.

PLOW THE GROOVES. There's just one thing left to complete the corner posts. That's to cut wide, shallow grooves in the inside faces of each post *(Figs. 2 and 2a)*. The width of these grooves is sized to





OGEE PROFILE PATTERN



match the thickness of the rails. The grooves are centered on the thickness and width of the corner posts.

A quick, accurate way to cut these grooves is to use a dado blade mounted in a table saw. It's best to set up the table saw by making a test cut in a scrap piece that's the same width and thickness as the posts.

Start by sliding the rip fence into position so the blade is *roughly* centered on the thickness of the test piece. Now lock the fence and make your first pass. Then without moving the fence, turn the piece end-for-end and make a second pass to widen the groove.

At this point, check the fit of the rail in the groove. If it doesn't fit, nudge the fence *away* from the blade and make two more passes. Once you're satisfied with the fit of the test piece, go ahead and cut the grooves in the posts.

PANELS. The corner posts are connected with solid wood panels on the front, back, and both ends of the planter. Each panel consists of three rails stacked edge-to-edge *(Assembly View)*. The goal is for the combined width of the three rails to match the height of the corner posts. To accomplish that, I started with 6"-wide cedar deck boards ($1^1/_8$" thick). Then I ripped a narrow strip from each edge to end up with $5^1/_8$"-wide rails (B, C).

So why not just rip one edge of the deck boards? Because the top edges are rounded over. By ripping both edges, it produces a clean, square cut where the rails meet.

A DECORATIVE PROFILE. Before attaching the rails, there's one more thing to do. That's to cut a decorative notch in the bottom edge of the lower front and back rails. To do this, use a photo copy machine to enlarge the pattern above. Then after attaching the pattern to the rail with spray adhesive, cut the notch with a band saw and sand the edge smooth *(Fig. 3)*.

ASSEMBLY. Now it's just a matter of assembling the planter box. After clamping it together, use the holes in the posts as guides to predrill holes in the ends of the rails. Then install the lag screws.

CLEATS & SLATS. The flower pots sit on slats installed in the bottom of the planter box. Long cleats (D) screwed to the bottom front and back rails create ledges to support and attach the slats (E) *(Cleat Detail)*. I used a simple spacer block to position the slats *(Margin Photo)*.

CAPPING IT OFF. Finally, to cover the top edge of the planter, I added trim strips (F, G, H) made from $^3/_4$"-thick cedar *(Trim Detail)*. These strips are mitered to length.

▲ A 1⅝"-wide scrap block creates consistent spacing when installing the bottom slats.

CONSTRUCTION LAG SCREWS

These heavy-duty construction lag screws are ideal for outdoor projects like this planter and trellis.

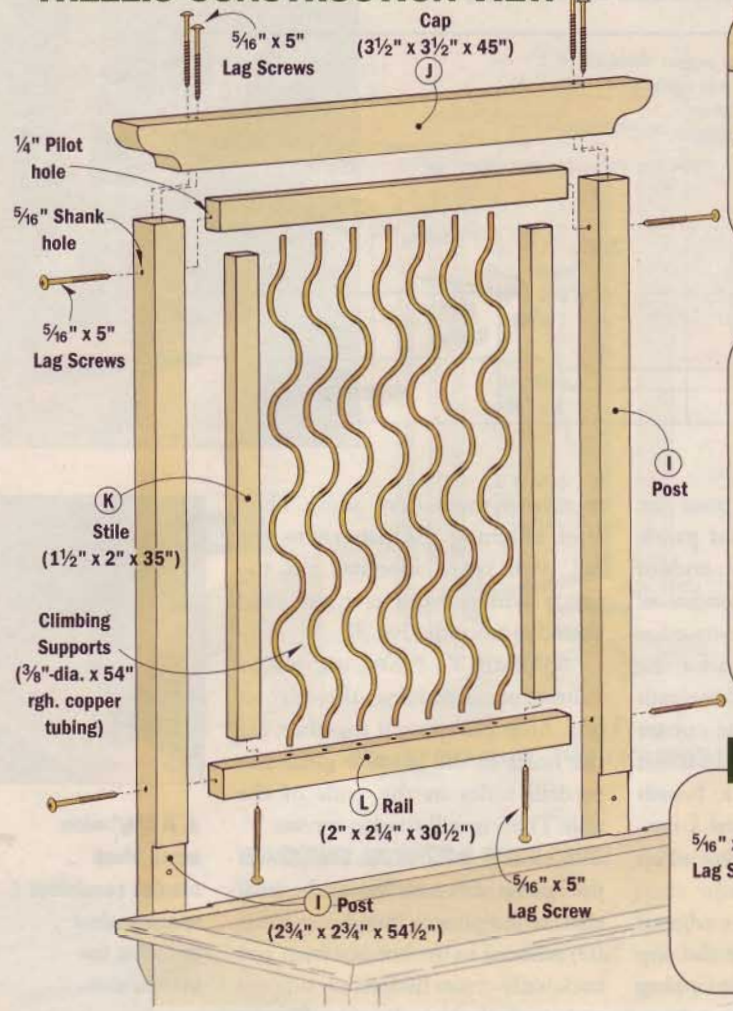
CERAMIC COATING. One reason is they have a thick ceramic coating that resists corrosion. This means you don't have to worry about a rusty screw staining the wood.

THREADS. Also, the threads are cut extra-deep, which gives them plenty of holding power in softwood like cedar.

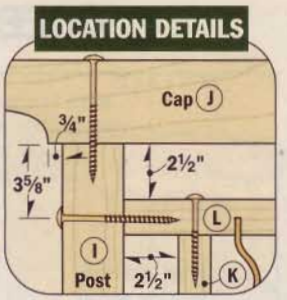
DECORATIVE HEADS. Finally, the large, round screw heads provide a decorative touch. And the bronze color of the screws complements the cedar.

These screws are available at most home centers. A special star bit is included with the screws. Prices range from about $7 for a box of 25 screws ($3^1/_2$" long) to $28 for a box of 75 (5" long).

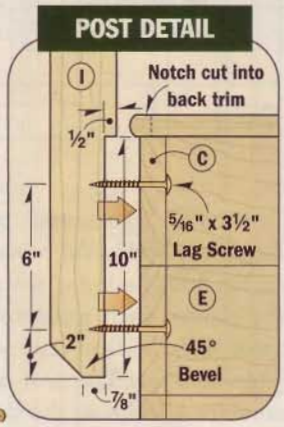
TRELLIS CONSTRUCTION VIEW



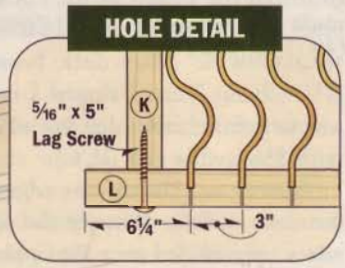
LOCATION DETAILS



POST DETAIL



HOLE DETAIL



CURVED COPPER TRELLIS

The thing that really sets this planter trellis apart are the curved copper climbing supports. These S-shaped supports are contained by an inner frame that fits inside a large, U-shaped outer assembly.

POSTS. The first step in building the trellis is to make the outer assembly. It consists of two solid posts (I) and a thick cap (J) that spans across the top *(Construction View)*.

At a glance, it may look like the posts and cap are the same size. But actually, the posts aren't as thick. They're 2¾" square, which means you'll want to rip them to size from 4x4's.

Start by raising the blade to about 2" high and then make an initial pass the entire length of a 4x4 along one edge. Next, without changing the height of the blade, turn the 4x4 end-for-end and make a second pass to complete the first cut *(Figs. 4 and 4a)*. Now repeat this series of cuts on an adjacent edge to make each post.

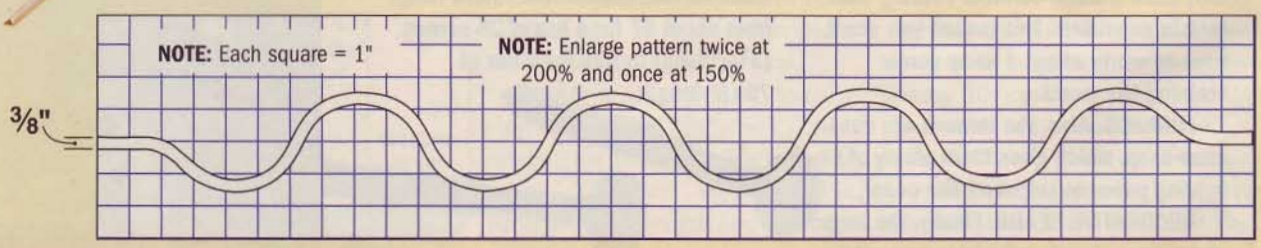
The next step is to cut a notch on the posts so they'll fit onto the planter box. The depth of the notch is sized so that the posts sit

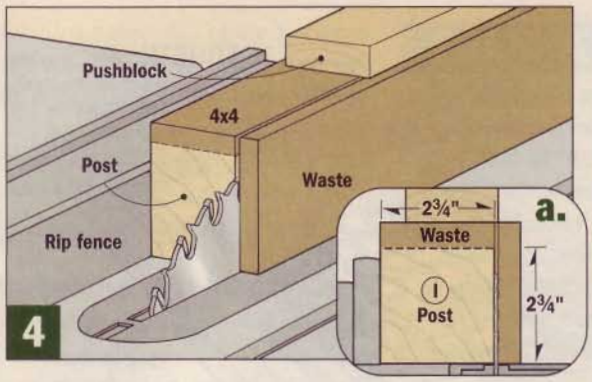
SHOP-MADE BENDING JIG

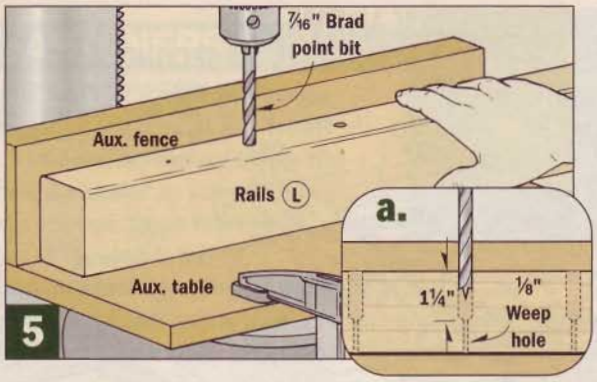
To give the trellis a "twist," I used ⅜"-dia. flexible copper tubing for the climbing supports *(Margin Photo, above right)*. The challenge is bending the copper so the curved shapes are identical from one support to the next.

To accomplish that, I used a simple bending jig. It consists of two scalloped jaws made of ½"-thick hardwood that are sandwiched between two ¼" hardboard sides. A fixed jaw is screwed to the sides. The other jaw isn't attached. It's removeable to allow you to insert the tubing *(Jig Assembly)*.

In use, the copper tubing is squeezed between the two jaws. Since copper is quite soft, it conforms easily to the hills and valleys of the jaws. There's nothing critical about the shape of the jaws. After experimenting a bit, I decided on the shape shown below.







flush against the back of the planter *(Post Detail)*. A band saw makes quick work of cutting this notch. Note: You'll cut a corresponding notch in the back trim a little later.

There's one more thing to do to complete the posts. That's to cut a bevel on the bottom of each post. This creates a clean-looking transition from the posts to the back of the planter *(Post Detail)*. Again, a band saw works well for beveling the posts.

CAP. The cap is a full-size 4x4 with a decorative profile on each end. The profile matches the one on the bottom rails of the planter. This means you can use the same pattern as the one shown on page 49. After attaching the pattern, it's just a matter of using a band saw to cut the ends of the cap to shape and then sanding the edges smooth.

INNER FRAME. At this point, you can set the posts and cap aside while you work on the inner frame. It provides a rigid structure for the climbing supports.

Notice that the stiles (K) and rails (L) of this frame differ in width *and* thickness from each other. This will create small reveals and nice shadow lines once the frame is assembled *(see Reveal Detail, page 52)*.

With the pieces sized, the next step is to drill holes in the rails that will hold the climbing supports *(Hole Detail)*. The drill press works best for this. To make it easier to fit the supports in place, I drilled oversize (7/16") holes *(Figs. 5 and 5a)*. I also added "weep holes" in the *bottom* rail only to allow water to drain.

CLIMBING SUPPORTS. There are a couple reasons I chose copper for the climbing supports. Not only does it provide plenty of support for climbing plants, but an attractive bluish-green patina will also develop once the copper is exposed to the weather.

To form the flexible copper into individual S-shaped supports, I used a shop-made bending jig *(explained in the sidebar below)*.

▲ Copper tubing bends easily, making it ideal for this project. Coils of the tubing can be found at home centers and hardware stores.

Notice the two lines are 3/8" apart – the same diameter as the copper tubing. Removing the material between the lines will prevent the jaws from closing tight and crushing the tubing.

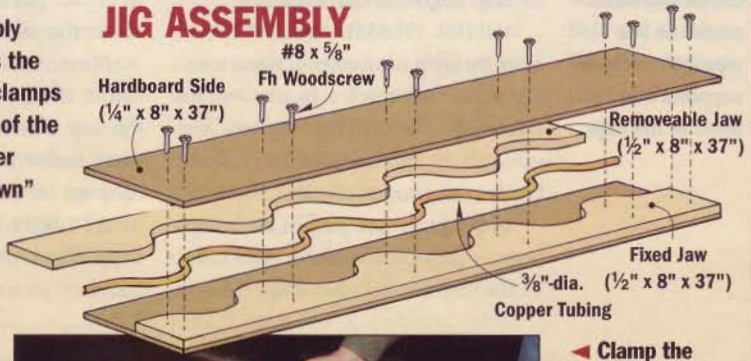
After enlarging the pattern, use spray adhesive to attach it to an 8" x 37" piece of 1/2"-thick hardwood. Then band saw along both lines to remove the material.

To use the bending jig, first insert an extra-long piece of flexible tubing (54" rgh.) between the sides. Just make sure an equal amount of tubing sticks out both ends of the jig. Once you have the tubing inserted, slide the *removeable* jaw back in place between the sides.

The next step is to apply clamping pressure across the jaws. As you tighten the clamps alternating from one end of the jig to the other, the copper tubing will be slowly "drawn" into the jaws of the jig. That's why you start with an extra-long piece of tubing with waste on both ends.

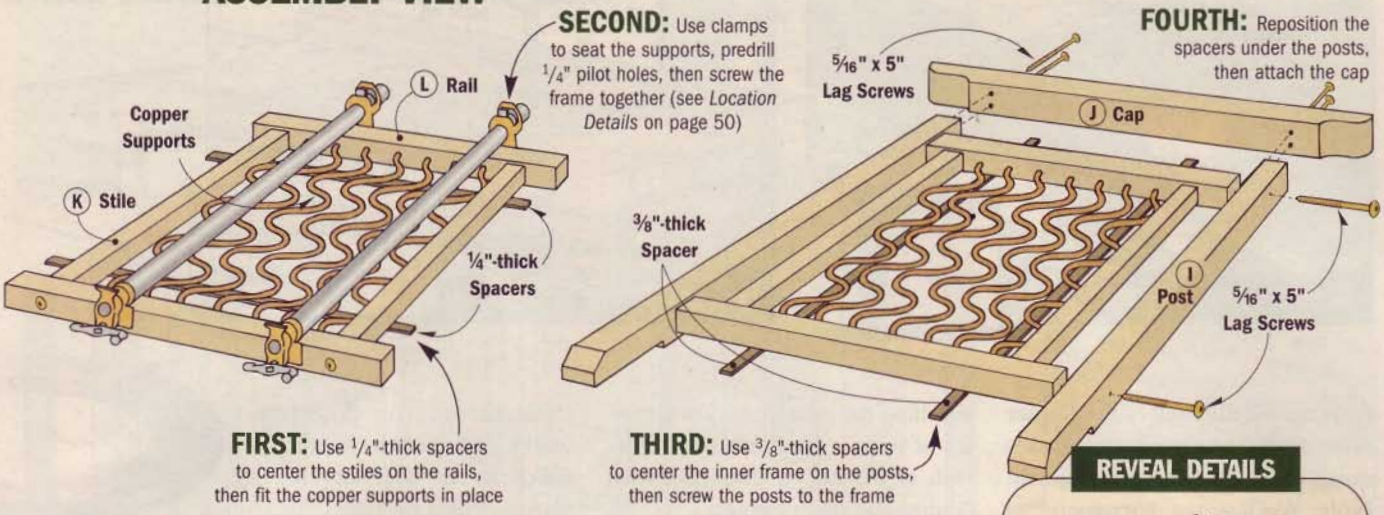
Once the *removeable* jaw is flush with the sides, stop applying pressure. Finally, before removing the clamps, trim the copper tubing flush with the ends of the jig with a hack saw.

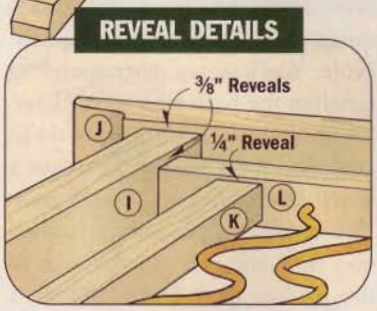
JIG ASSEMBLY



◀ Clamp the two jaws of the jig together, drawing the copper tubing between them to form S-shaped climbing support.

ASSEMBLY VIEW





FITTING IT ALL TOGETHER

The next step is to put all of the parts of the trellis together. This involves a two-part assembly sequence. First, the copper supports are captured inside the inner frame. Second, the inner frame is attached to the outer assembly.

This is a bit trickier than it sounds. Not only do you have to fit all seven of the curved supports into the holes in the rails, but you also have to get the frame pieces to fit together while maintaining the proper reveals in the process.

Fortunately, there's a simple solution. The trick is to use spacer strips to help align the frame pieces.

INNER FRAME & SUPPORTS. Start by laying the stiles across a couple of 1/4"-thick spacer strips *(Assembly View)*. This centers the stiles on the thickness of the rails and creates the proper reveals.

Next, push one end of each support as far as you can into the holes in the bottom rail. Now set the top rail into position and slowly start wiggling the opposite ends of the supports into the top set of holes *(see Margin Photo)*. It takes some patience to get all of them in place. Finally, use two pipe clamps to draw the frame together and seat the supports in the holes *(Assembly View)*.

While the inner frame is clamped up, go ahead and predrill the screw holes. Then fasten the frame together with screws.

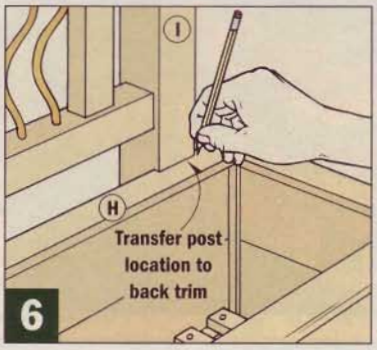
OUTER FRAME. With the inner frame and supports assembled, it's time to add the posts and cap. To do this, first remove the clamps. Then use spacer strips (3/8" thick this time) to center the rails on the posts. Now screw the inner frame to the posts.

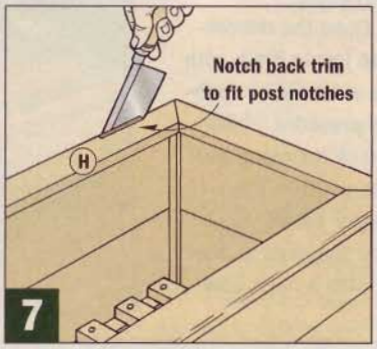
Next, use the same spacers to center the posts on the thickness of the cap. Then screw the cap to the posts, following the spacing shown on page 50 *(Location Details)*.

ATTACH THE TRELLIS. Once that's done, the trellis is ready to be attached to the planter. There are a few steps involved here. For starters, the back trim is notched so the posts will fit tight against the back of the planter. To do this, center the trellis on the planter box, then mark the locations for the notches on the back trim *(Fig. 6)*.

Now temporarily remove the trellis and use a hand saw to cut the notches *(Fig. 7)*. Finally, lift the trellis back onto the planter and screw it in place from inside the box, as shown below.

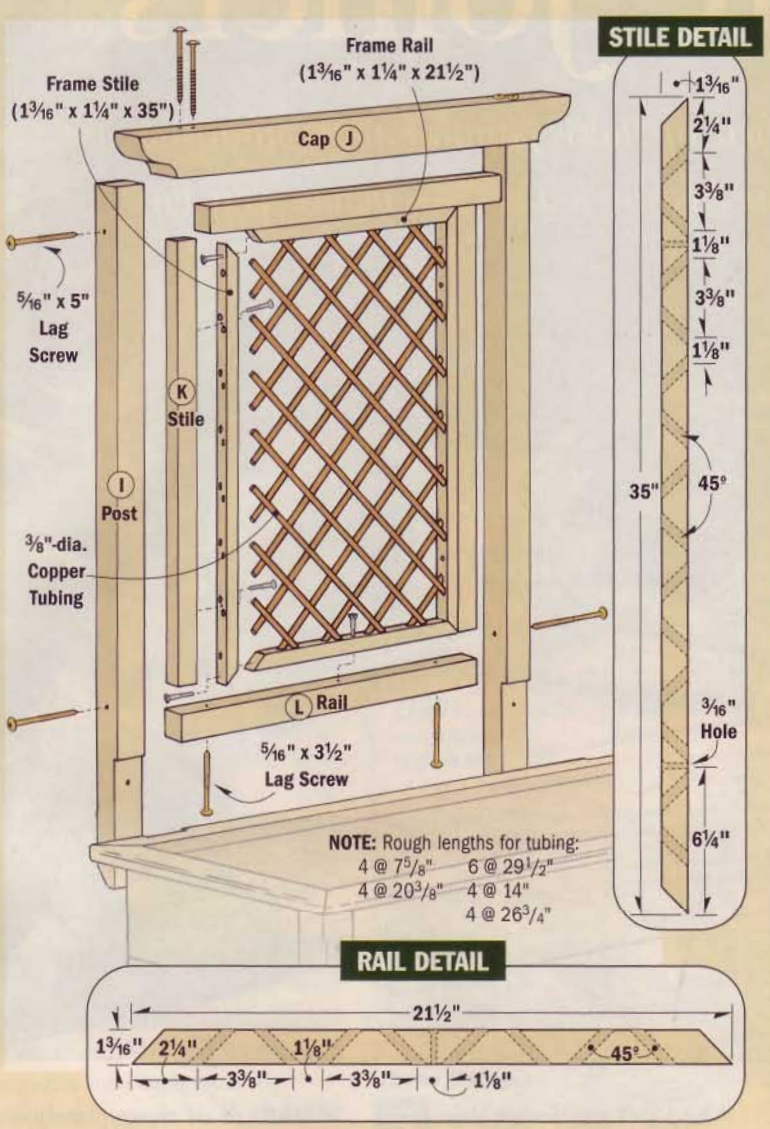
▲ **Use spacers to center the frame pieces as you wiggle the copper supports into the holes in the rails.**



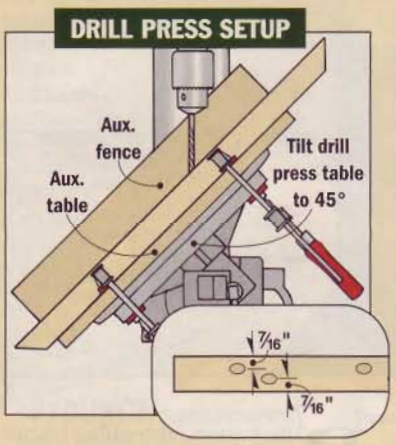


▲ **Attach the trellis posts to the planter box from the inside with four 3½"-long construction lag screws.**

COPPER LATTICE TRELLIS



▲ With a criss-crossed copper lattice, this planter box and trellis really take on a different look.



For a more traditional look, you may want to build a trellis with a copper lattice. Here again, the climbing supports are made up of $^3/_8$"-dia. copper tubing *(various lengths)*. Only this time, the tubing is surrounded by a mitered frame that fits inside the inner frame of the trellis *(see drawing above)*.

CEDAR FRAME. The wood frame for the lattice is made from $1^3/_{16}$"-thick cedar that's ripped $1^1/_4$" wide. Then the frame pieces are simply mitered to length as shown in *Rail and Stile Details*.

DRILL ROWS OF HOLES. Once you have the frame pieces made, the next step is to drill pairs of angled holes in each piece to hold the copper supports. If you take a look at the *Details* above, you'll notice that each pair of holes alternates at opposite 45° angles.

Also, the centerpoints of one set of holes are offset from the others. This way the criss-crossed supports won't hit each other.

I found the best way to drill the holes was using a setup on the drill press table *(Drill Press Setup)*. To position the workpiece (and to prevent chipout), clamp a fence and an auxiliary table to your drill press table. Then tilt the table to 45°.

Now it's just a matter of drilling the first set of holes. Then turn the piece end-for-end and drill the second set.

ASSEMBLY. To assemble the lattice, start by screwing the mitered frame together. Then cut the supports to rough length, as shown above. (Altogether, you'll need 22 pieces of tubing.)

Now slip the supports in place from outside the frame. I found it works best to fit the supports in one set of holes first, then go back and do the other set.

To complete the copper lattice, screw the frame to the trellis. This will cover the holes so they aren't noticeable. It also captures the supports so they don't move.

WORKBENCH®

PLANTER AND TRELLIS

Issue 272 Volume 58 Number 4 April 2002

MATERIALS LIST

PLANTER BOX

A	(4) Corner Posts (cedar)	2" x 2" x $15\frac{3}{8}$"
B	(6) End Rails (cedar)	$1\frac{1}{16}$" x $5\frac{1}{8}$" x $12\frac{1}{4}$"
C	(6) Frt./Bk. Rails (cedar)	$1\frac{1}{16}$" x $5\frac{1}{8}$" x $39\frac{1}{2}$"
D	(2) Cleats (cedar)	$1\frac{1}{16}$" x $1\frac{1}{2}$" x 39"
E	(13)Slats (cedar)	$\frac{3}{4}$" x $1\frac{1}{2}$" x $12\frac{3}{4}$"
F	(2) End Trim (cedar)	$\frac{3}{4}$" x $2\frac{3}{8}$" x $16\frac{1}{2}$"
G	(1) Front Trim (cedar)	$\frac{3}{4}$" x $2\frac{3}{8}$" x $43\frac{3}{4}$"
H	(1) Back Trim (cedar)	$\frac{3}{4}$" x $2\frac{3}{8}$" x $43\frac{3}{4}$"

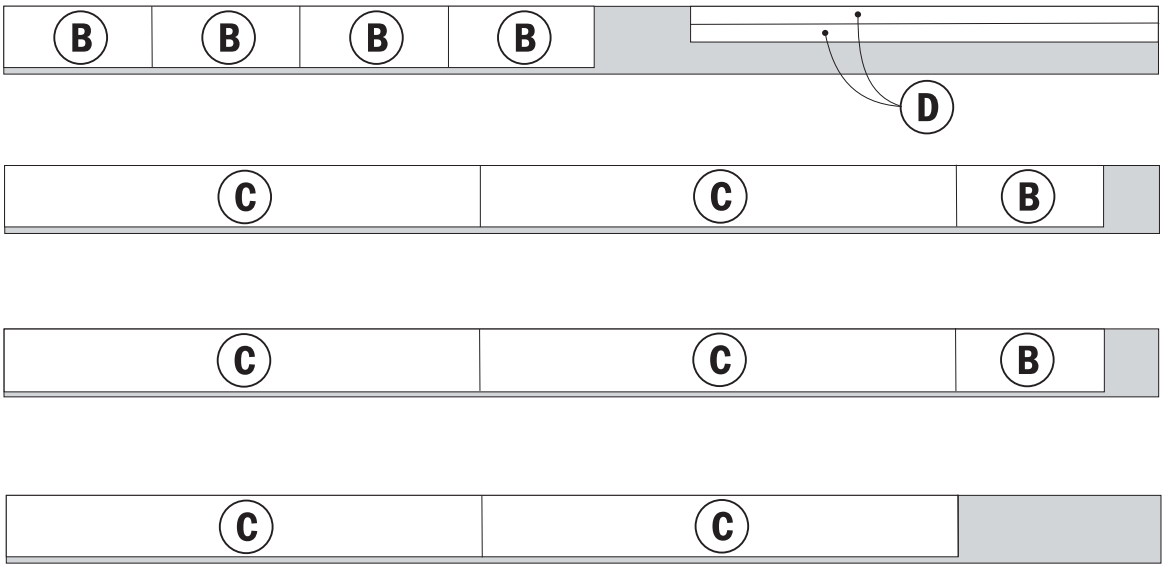
TRELLIS

I	(2) Posts (cedar)	$2\frac{3}{4}$" x $2\frac{3}{4}$" x $54\frac{1}{2}$"
J	(1) Cap (cedar)	$3\frac{1}{2}$" x $3\frac{1}{2}$" x 45"
K	(2) Frame Stiles (cedar)	$1\frac{1}{2}$" x 2" x 35"
L	(2) Frame Rails (cedar)	2" x $2\frac{1}{4}$" x $30\frac{1}{2}$"

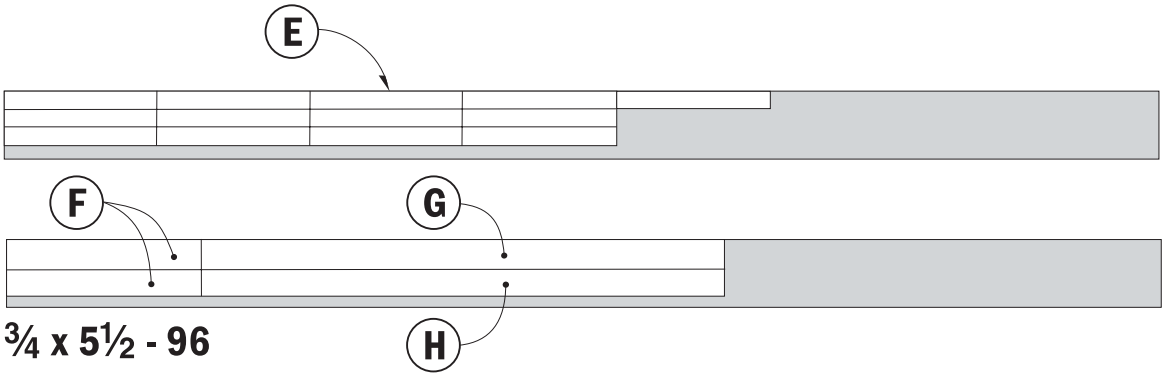
HARDWARE

- (12) $\frac{5}{16}$ x 5" Construction Lag Screws
- (28) $\frac{5}{16}$ x $3\frac{1}{2}$" Construction Lag Screws
- (48) #8 x $1\frac{1}{2}$" Fh Exterior Woodscrews
- (7) Copper Refrig. Tubing $\frac{3}{8}$" O.D. x 54"

CUTTING DIAGRAM

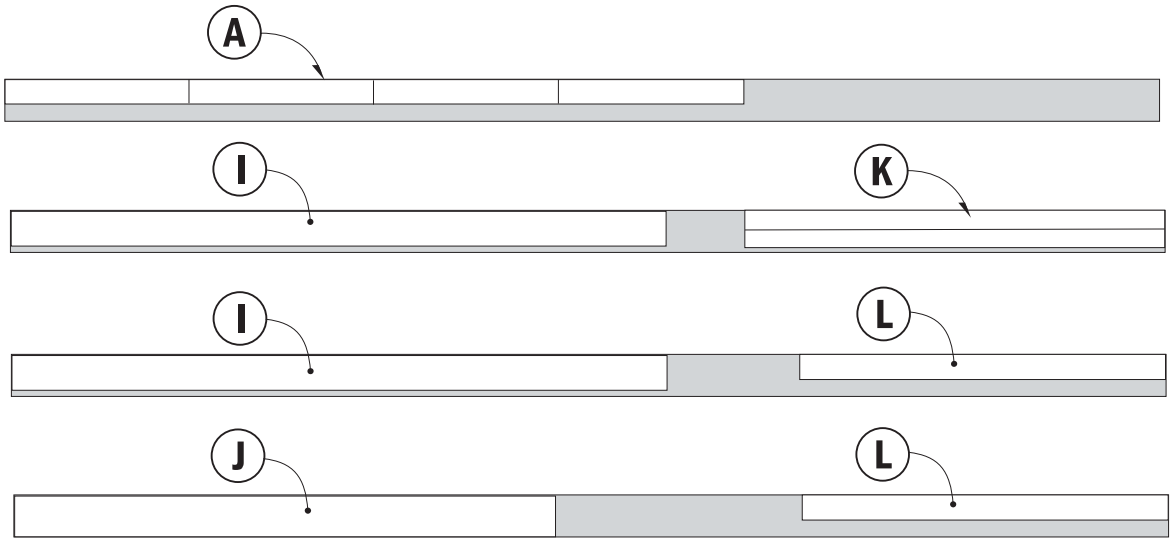


1⅛ x 5½ - 96

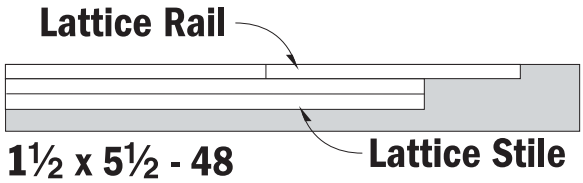


¾ x 5½ - 96

Issue 272 Volume 58 Number 4 April 2002



3½ x 3½ - 96



1½ x 5½ - 48

Plate Joiners

Find out which of these popular tools qualifies as the best of the biscuit joiners — before you buy.

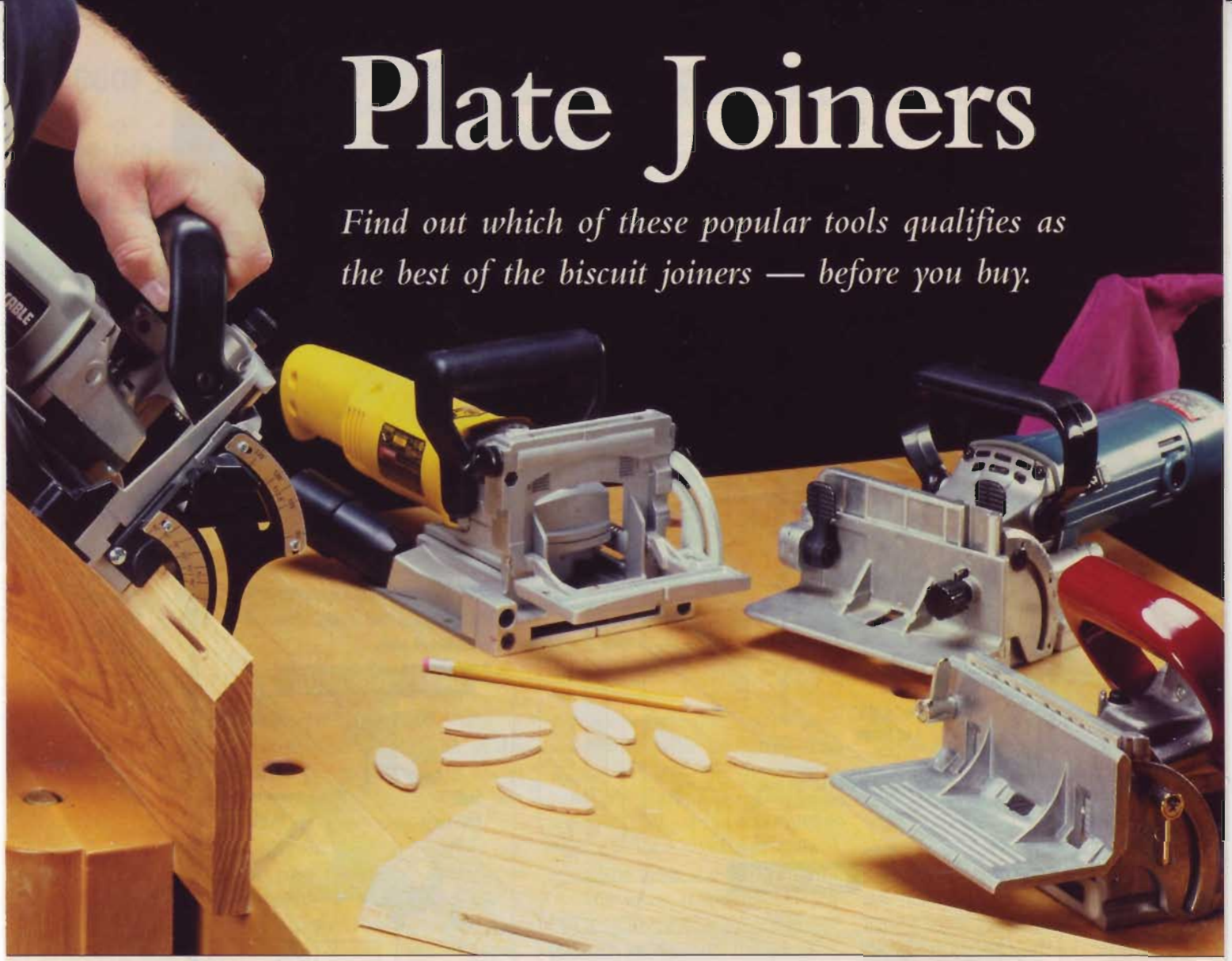


Plate joiners (also called biscuit joiners) have been available in the United States for about 25 years now. And lately, more and more woodworkers I know are adding this tool to their list of "must-haves" for the wood shop.

One look at what these tools can do for any project, and it's clear to see why plate joiners are becoming so popular.

Using a plate joiner and a wood biscuit creates a joint that approaches the strength of a mortise and tenon joint, but without all the precise layout and cutting. And few other joinery techniques are as versatile as plate joinery. It's hard to imagine a joint where you couldn't use biscuits for a strong, easy, and invisible connection.

And let's not forget alignment. Nothing beats a biscuit for taming mitered corners that have a tendency to slip out of alignment as soon as you clamp them together. The same goes for glued-up panels. With a few biscuits glued into the edges of the boards, you won't have to worry about the pieces shifting up or down.

Simple, strong, versatile, and invisible. What's not to like?

WHAT MAKES A GOOD JOINER?

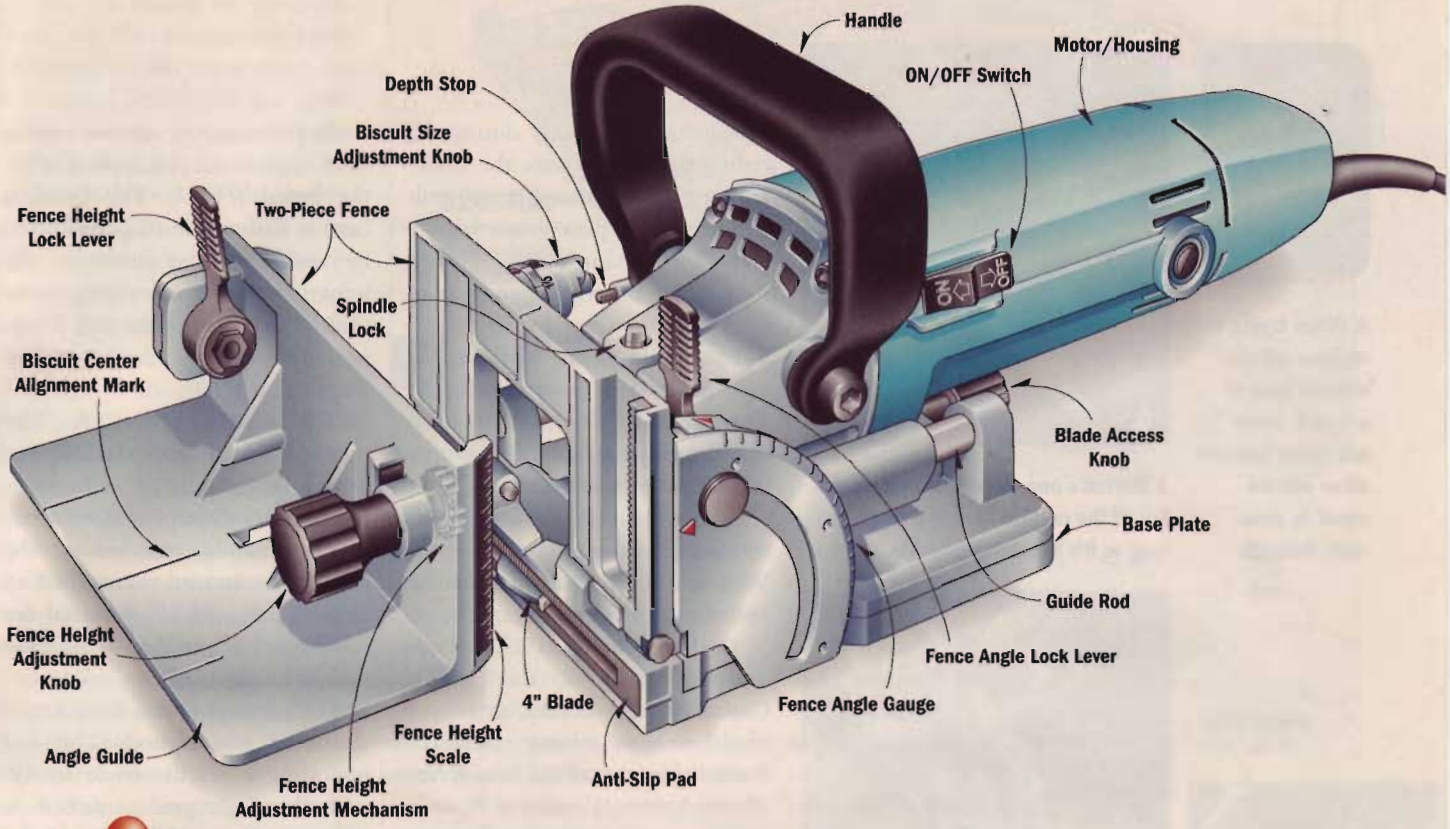
Okay, so you're sold on the idea that plate joinery can make strong joints quickly and easily. Now you just need to know what makes one joiner better than another. In a word, the fence. Why is the fence so important?

Well, all of these plate joiners will cut a slot in the edge of a board with absolutely no problem. In fact, based solely on this type of cut, we couldn't recommend one tool over another. But, when cutting slots in bevels or miters, or joining face frames, it became clear that the fences on these joiners are not created equal.

The difference lies largely in how the fences register on a workpiece. We also found major differences in the ease of adjustment and accuracy of the fences.

Of course, there are other important factors, such as how well a joiner grips a workpiece while making the cut. (Imagine trying to cut a slot in the end of a piece of stock only to have the joiner "slip" and cut

ANATOMY OF A PLATE JOINER



ONLINE Extras

- DeWalt Cordless Plate Joiners
- Craftsman's Detail Biscuit Joiner
- Lamello's Top 20 Plate Joiner

through the edge of the workpiece.) Other aspects that affected our opinion of these machines were things like sight lines, registration marks, and ergonomics.

On the following two pages, there are comparisons of the types of fences on these tools, including how they are adjusted. There are also descriptions of the different "anti-slip" devices that we found on these joiners. Then, in the descriptions of the individual tools, we'll cover the other highlights and lowlights of each one.

Finally, we'll tell you which plate joiners received our recommendations and why. And there's also a report card so you can see exactly how we graded each tool in the categories we considered.

HOW WE TESTED

▲BEVELED END JOINTS

These challenging cuts showed us which tools were easiest to set up and had the most versatile fences.

▲T-JOINTS

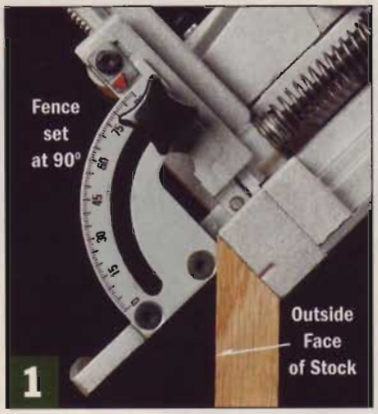
This joint let us try the joiners in a vertical position while using the mating workpiece for alignment.

▲ MITERED FRAME JOINTS

Cutting biscuit slots in mitered frame pieces made out of hard maple revealed which "anti-slip" devices provided the best grip.

Details That Make a Difference

▲ When trying to register off the outside face of a board, some one-piece fences allow narrow stock to pass right through.



▲ DeWalt's one-piece fence can register off the outside face of a board as long as it's at least 2½"-wide.

▲ When working with narrow stock, DeWalt's fence must register off the inside face of the board.

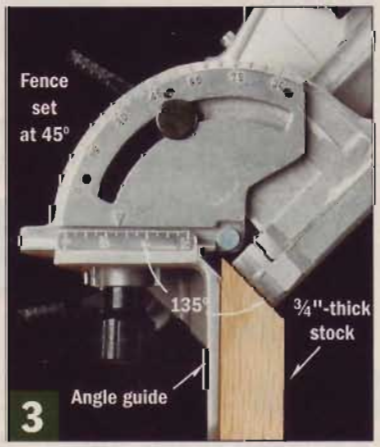
Fences

We discovered quickly during our testing that fences were the distinguishing factor among these tools. The fence of a plate joiner is especially important when cutting bevels and miters. When making these cuts, the fence has to provide a secure hold on the workpiece to prevent the tool from moving. We also preferred fences that easily accommodated different widths and thicknesses of boards.

The seven tools we compared in this test have three types of fences. We found strengths and weaknesses with almost all of the fences.

ONE-PIECE FENCE. This type of fence, found on the DeWalt, Craftsman, and Ryobi, gives you two choices for joining miters. The first is to register off the outside face of a workpiece, as shown in *Figure 1*. This generally works fine, but can be a bit "tippy."

One other limitation to this fence type has to do with board width. As you can see in the *Margin Photo*, the wide opening in two of these fences (the DeWalt and Craftmsan) lets any board narrower than 2½" slip through the fence.



▲ Makita's fence "traps" the board in the 135° position. However, this only works in stock that's ¾" thick or less.

▲ When working with thick stock, the tip of the miter prevents the face of the joiner from touching the board.

In that case, the second option is to register off the *inside* face of the board *(Fig. 2)*. The problem here is that any misalignment will be visible on the *outside* of the joint. (The inside faces are guaranteed to line up since the tool is registered on them while cutting the biscuit slots.)

TWO-PIECE FENCES. The Lamello, Freud, and Makita plate joiners are equipped with two-piece fences. One part of the fence is permanently attached to the joiner. The second part, called an angle guide, can be removed for some types of cuts *(see the Anatomy drawing on page 55)*.

For joining miters, these fences also offer two options. The first option is to set the fence to 45° with the angle guide attached, as shown in *Figure 3*. This "traps" the workpiece and holds the joiner securely during the cut.

This design does have one serious limitation, though. *Figure 4* shows what happens when you try to use this configuration on a board that's thicker than ¾". The "tip" of the miter holds the joiner away from the board.

For thicker stock, the solution is to remove the angle guide and use the joiner fence to register off the inside face, just like the one-piece fence, shown in *Figure 2*.

TWO-STAGE FENCE. Porter-Cable's fence is best described as a two-stage design (which is different than the *two-piece* fences covered earlier).

The first stage adjusts from 0° to 90°. In this stage, it functions just like a typical one-piece fence. However, unlike regular one-piece fences, this fence provides a positive hold on even the narrowest boards.

The second stage allows the fence to adjust from 90° to 135°.

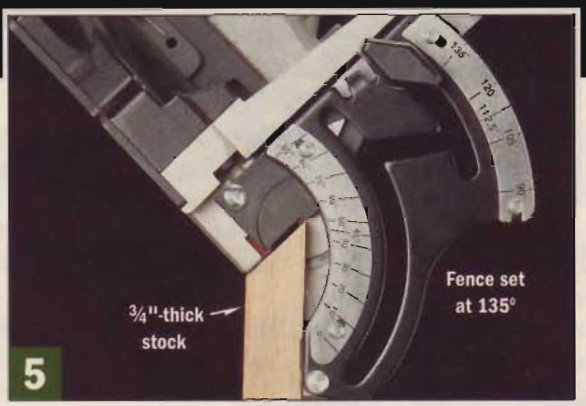
Using this setup, the two-stage fence "traps" the workpiece, much like a two-piece fence *(Figure 5)*. But what's better about this fence is that it's not limited to $^3/_4$"-thick stock *(Figure 6)*.

HEIGHT & ANGLE ADJUSTMENTS. One final consideration that affected our opinions of all the fences we looked at is how easy it is to set the angle or height of the fence precisely.

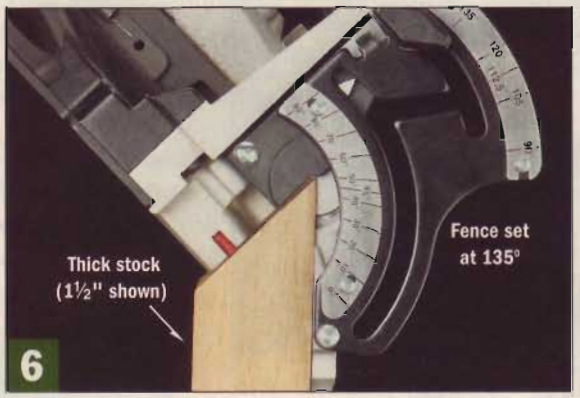
The two-stage fence of the Porter-Cable has the best adjustment qualities overall. The height and angle scales are clearly marked, which makes alignment easy. And a fine-threaded jackscrew allowed for exact height adjustments *(see the photo on page 58)*.

We also liked the rack-and-pinion height adjustment on the Makita(*see the Anatomy drawing on page 55*). This fence adjusts quickly, stays square, and locks down solidly.

The fences on the Freud, Lamello, and Ryobi plate joiners are moved up and down by hand, which is a less refined adjustment system.



◀ Porter-Cable's two-stage fence adjusts from 0° to 135° and works on boards of any width or thickness.



◀ Thick stock is no problem for the two-stage fence, even when set at 135°.

Anti-Slip Devices

It's important that a plate joiner doesn't "slip" as you plunge the blade into a workpiece. The reason this "slippage" happens is simple. As the joiner plunges forward, the spinning blade makes contact with the wood and drives the tool in the direction opposite of the blade rotation causing the tool to slip.

Each of these plate joiners has some device to help control slipping. Some are better than others.

One such device is a pair of anti-slip pins. These are designed to "bite" into the workpiece *(Fig. 7)*. The pins can be retracted so they don't scratch a workpiece on a visible surface. These generally work well. One weakness of these pins, though, is their placement. Notice how far apart they are? They offer no hold when working with narrow stock.

A second type of anti-slip device is the abrasive strip used by Porter-Cable *(Fig. 8)*. This doesn't have the same gripping power as pins, but it does cover the entire face of the joiner, so it engages even the narrowest stock.

Lamello's silicone pads *(Fig. 9)* had one of the best grips in the group. Unfortunately, this design has the same limitation as the pins — they're spaced too far apart to do any good on narrow workpieces.

Ryobi covered the face of their joiner with a material similar to a router mat *(Fig. 10)*. This held the joiner quite well. However, one of our testers said the material made it difficult for him to know when the tool was set firmly against the workpiece.

◀ Anti-slip pins, such as on the DeWalt, are effective only on wide boards.

◀ Porter-Cable's abrasive strip provides a passable grip on any size workpiece.

◀ Lamello's silicone pads grip boards well, provided the board is wide enough.

◀ Similar to a router mat, Ryobi's anti-slip material is effective, though a bit "squishy."

★★★★½ MAKITA 3901

At a Glance:

Price:	**$170**
Motor:	**5.6 amps**
Fence type:	**Two-piece**
Biscuit Sizes:	**0, 10, 20, Simplex, Duplex, Max**
Warranty:	**1 year**

Virtues: Rack-and-pinion height adjustment; Easy-to-use controls; Compact size; Mid-range price.
Vices: Unpainted alignment marks; Below average anti-slip.
Verdict: The best tool in this price range.

The Makita 3901 takes third place and Top Value honors in this test, thanks largely to some thoughtful features built into this tool.

First are the large tensioning levers and knobs on the fence. These are handy when making frequent setup changes. Also, the two-piece fence on the Makita uses a rack-and-pinion height adjustment, which holds the fence parallel to the blade and makes fine-tuning the fence a snap.

On the downside, the alignment marks on this joiner are difficult to see. We also noticed that the anti-slip pad on this tool did allow the joiner to move just a bit if we didn't hold the tool firmly against the board.

Nonetheless, the Makita 3901 plate joiner is our choice for *Workbench Top Value* for its overall balance of quality and price.

★★★★½ DEWALT DW682

At a Glance:

Price:	**$165**
Motor:	**6.5 amps**
Fence type:	**One-piece**
Biscuit Sizes:	**0, 10, 20, Max**
Warranty:	**1 year**

Virtues: Good fit & finish; Rack-and-pinion height adjustment; Very reasonably priced.
Vices: No detents on angle gauge; One-piece fence lacks versatility.
Verdict: A solid tool at a competive price. You can't go wrong with this one.

Although the DeWalt DW 682 didn't win one of the top three spots, we still consider it an excellent tool.

The one-piece fence of this tool is well marked with graduations of $^1/_{16}$" on height scale and 1° increments on the angle scale. Adjusting the height of the fence is accurate and quick thanks to the rack-and-pinion mechanism.

The contoured barrel and well-placed trigger switch make the joiner comfortable to operate.

Where this joiner lost a few points was in its angle gauge, which could be improved with detents. It also has an "open" fence that limits its ability to handle narrow stock *(see Details That Make A Difference, page 56)*. Despite a few weaknesses, this moderately priced joiner is a solid performer and a sensible buy.

★★★★½ CRAFTSMAN PROFESSIONAL

At a Glance:

Price:	**$170**
Motor:	**6.5 amps**
Fence type:	**One-piece**
Biscuit Sizes:	**0, 10, 20, Max**
Warranty:	**1 year**

Virtues: Rack-and-pinion height adjustment; Easy-to-read scales and alignment marks.
Vices: Poor trigger design; No detents on angle gauge; Top knob doesn't feel as natural as a handle.
Verdict: Costs more than the DeWalt with more shortcomings.

This tool is essentially a clone of the DeWalt with a few key differences, related mostly to ergonomics and comfort.

First, Craftsman opted for a knob rather than a handle on top of the joiner. The knob doesn't offer the control that the handle does.

Secondly, we noticed it was easy to inadvertently turn this joiner on when we picked it up because of the large trigger on the underside of the barrel.

Finally is the barrel itself. The lack of contouring and the thick barrel make it hard to get a comfortable grip on the tool.

The Craftsman's fence uses rack-and-pinion height adjustment, which is accurate and allows quick adjustments. However, the fence lacks detents for angle setting. And like most one-piece fences, it won't support stock narrower than about $2^1/_2$".

★★★★★ FREUD JS102

The Freud JS102 is a solidly-built, affordable plate joiner that performs well once you get used to a few of its idiosyncrasies.

First off, the two-piece fence displayed a tendency to rack when the tensioning lever was released. Correcting the rack was easy enough by comparing the two scales on the front of the fence, but we'd prefer a fence that doesn't rack in the first place. We also noticed that the fence came loose and moved slightly during a couple cuts.

It also bothered us that there is no alignment mark on the side of the base to center the blade in the thickness of a board.

In spite of that, this joiner is quite capable of cutting accurate biscuit slots, as long as you're diligent about checking and rechecking the setup as you work. At this price, it may be worth the effort.

At a Glance:

Price:	**$125**
Motor:	**5 amps**
Fence type:	**Two-piece**
Biscuit Sizes:	**0, 10, 20, Simplex, Duplex, Max**
Warranty:	**1 year**

Virtues: Good fit & finish; Easy to read scales; Affordable price.
Vices: Fence racked easily during adjustment; Awkward power switch.
Verdict: A few oddities, but still a capable, affordable joiner.

★★½★★ RYOBI JM81

Despite finishing last, we do have a few positive things to say about the Ryobi JM81.

The shape of this joiner makes it surprisingly comfortable to grip. Also, this joiner accommodates our tendency to hold the tool by the fence with a plastic grip rail on the front of the fence. Other features we liked were the closed fence design that supports narrow stock, and marks that show how wide and deep a slot will be cut for each biscuit size.

Still, this fence has a few weaknesses. For instance, a single knob locks the height *and* the angle adjustments. So they can't be adjusted independently. Secondly, the alignment marks on the angle scale are difficult to read.

Priced at under $100, this would be a good tool for a budget-conscious, occasional user.

At a Glance:

Price:	**$98**
Motor:	**6 amps**
Fence type:	**One-piece**
Biscuit Sizes:	**0, 10, 20**
Warranty:	**2 years**

Virtues: Affordable; User friendly.
Vices: Crude fit and finish; Fence adjustments are cumbersome.
Verdict: An inexpensive tool for the occasional woodworker.

Final Recommendations

EDITOR'S CHOICE

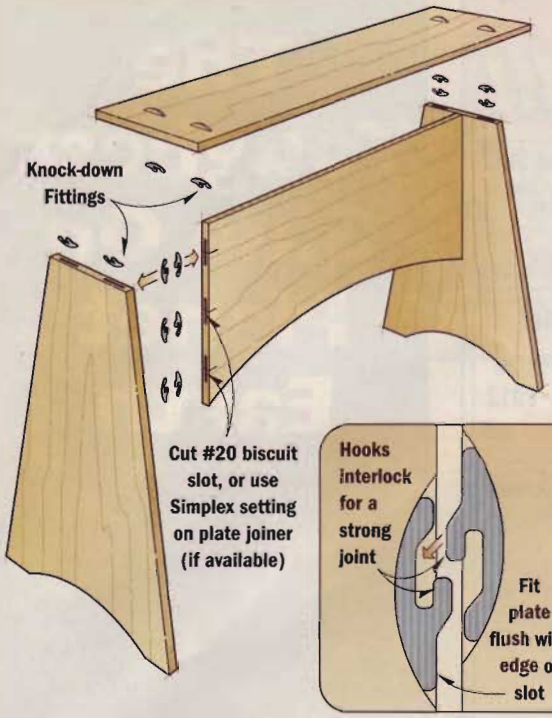
For sheer versatility and top-notch performance, the Porter-Cable has no equal in this group of tools. The elaborate fence, comfortable barrel design, and fine height adjustment mean this plate joiner has almost no weaknesses. The Porter-Cable 557 is a bit higher priced than most of its competitors, but it's worth every penny.

Model	Height Adj.	Angle Adj.	Ergonomics	Fit & Finish	Anti-Slip	Visibility	Blade Change	Score
PORTER-CABLE	A	A	A	A	B	A	A	A
LAMELLO	C+	C+	A	A	A	B+	B	B+
MAKITA	B+	A	B+	B+	B-	B	A	B+
DEWALT	B	B	B+	B+	B	A	D+	B-
CRAFTSMAN	B	B	B	B+	B	A	D+	B-
FREUD	D+	B+	B	B	B	B	D	B-
RYOBI	C	C	B+	C	A	B+	C+	C+

TOP VALUE

Makita's 3901 offers the perfect combination of performance and price to take Top Value honors in our plate joiner test.

While basic in design, this is a capable tool with excellent setup and performance characteristics.



4 Fantastic BISCUIT FASTENERS

Here's a close-up look at four specialized fasteners that will make your plate joiner more versatile than ever.

Knock-Down Fittings

One of the most interesting plate joiner fasteners I've found is a Simplex fitting manufactured by the Lamello Company. It consists of two aluminum plates that are epoxied into oval slots cut with a plate joiner. The plates hook together to create a strong interlocking joint.

This makes these unique fasteners ideal for all types of knock-down furniture and even shop projects such as the sawhorse shown above.

The first step to installing this knock-down fitting is the same as when you're using a wood biscuit. Just set the depth adjustment on the plate joiner to cut a slot for a regular #20 biscuit. You can also use the designated Simplex setting if your plate joiner has one. Then cut matching slots in the pieces that will be joined together.

To install the fittings, insert one plate in each slot. If you're installing a lot of fittings, I suggest you get one of the specialized insertion tools that's also manufactured by Lamello *(see photos at left)*. The tool makes inserting the fittings much easier than tapping them in place.

Either way, you'll need to permanently secure the fittings in the slots. After carefully spreading epoxy into the slots and inserting the plates, simply remove the insertion tool and use its flat edge to push the plate flush into the slot. The only part that should be exposed is the interlocking "hook" portion of the plate.

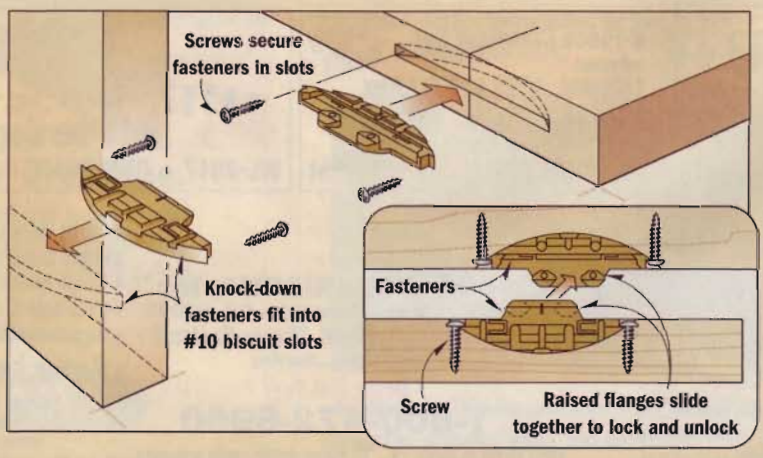
SOURCE: Colonial Saw (item #166101), call 909-390-5465 or visit their Web site: www.csaw.com.

► A specialized insertion tool (item #166110) makes installing the fittings easy. With the plate in the tool *(Photo a)*, line up the registration mark on the tool with the layout line *(Photo b)* for dead-on centering.

SCREW-IN METAL FASTENERS

Here's another type of knock-down plate joiner fastener that's screwed into biscuit slots — not glued. It consists of two metal halves that fit into #10 biscuit slots. Raised flanges on each piece lock tightly together and unlock by simply sliding the pieces parallel to each other.

SOURCE: Lee Valley (item #00S21.10), call 800-871-8158 or check out www.LeeValley.com.



Biscuit Hinges

It's hard to imagine a hinge that's easier to install than these Lamello Duplex hinges.

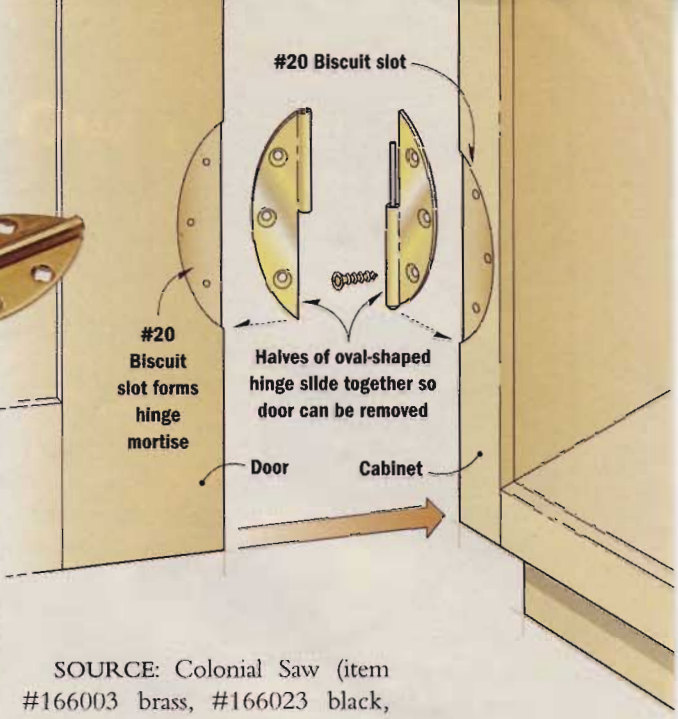
By cutting a single slot with a plate joiner, the blade makes two identical oval-shaped mortises — one in the door and another in the cabinet side or face frame. Then the two halves of the hinge are screwed into the mortises, as shown at right.

Depending on the type of door you're installing, the setup for cutting the mortises will vary.

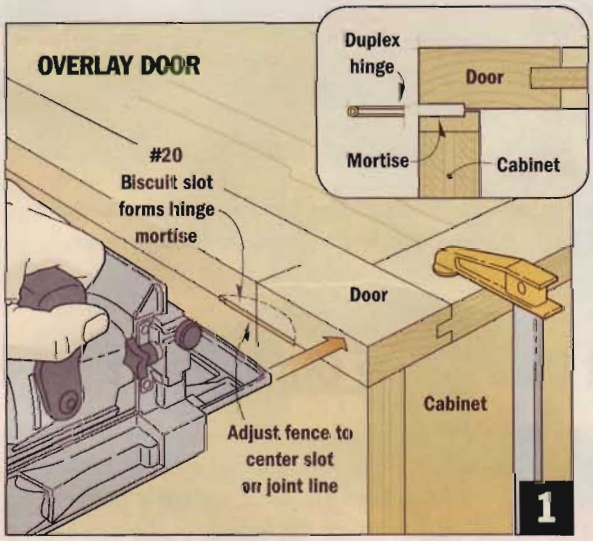
OVERLAY DOOR. To cut the mortises for an overlay door, start by adjusting the height of the fence on the plate joiner so the slot is centered on the joint line. Then with the door clamped in position, make a single plunge cut to form mortises for both halves of the hinge *(Fig. 1)*.

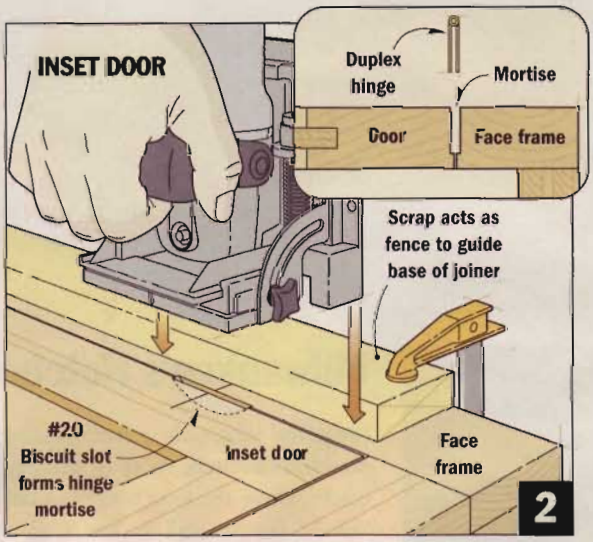
INSET DOOR. Cutting the matching mortises for an inset door is a little bit different.

To start, you'll have to remove the fence and use the base of the plate joiner as a reference. Next, position the door and add a scrap piece as a wood fence to guide the base of the joiner. The goal here is to center the plate joiner exactly on the joint line and make a single cut to form both mortises *(Fig. 2)*.



SOURCE: Colonial Saw (item #166003 brass, #166023 black, #166013 nickel), call 909-390-5465 or visit www.csaw.com.



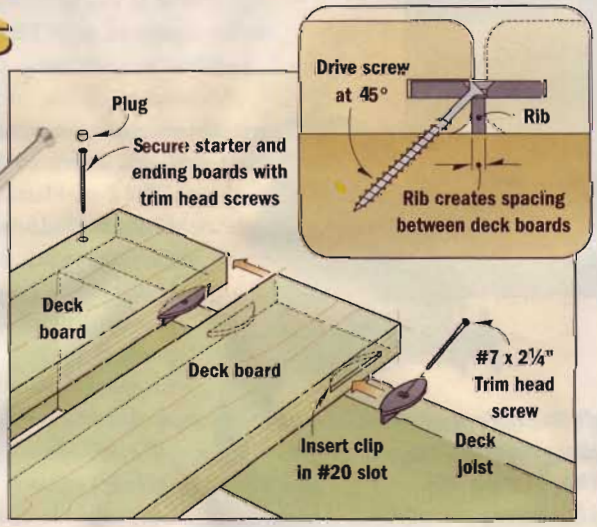


Deck Board Clips

Hidden deck fasteners are great because, well, they're hidden.

One of the easiest to install that I've found are these plastic EbTy deck board clips. The reason they're so easy is because they can be fastened from above into #20 biscuit slots and then screwed in place. The only exception are the starter and ending boards, which are held in place with screws only. A bead of construction adhesive run across each joist helps secure the boards.

SOURCE: Rockler Woodworking (item #30424), call 800-279-4441 or online at www.Rockler.com.



WORKBENCH APPROVED

Tools & Products

Laser Line Generator: Compact, Precise, Affordable

▲ **The Laser Line Generator from Strait-Line, pictured with the included carrying case.**

My chalk line has been retired. In its place is the new Laser Line Generator from Strait-Line Marking Tools.

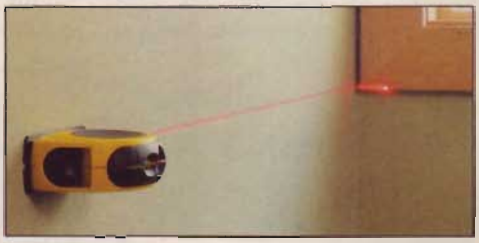
About the size of a standard tape measure, the Laser Line Generator is powered by two AA batteries. And with a price of about $60, it means laser precision is no longer exclusive to professionals.

There's a whole lot more to this tool than just a cool red line, though. What makes the Laser Line Generator really useful is its ability to cast a line past uneven surfaces and around corners *(see the photo at right)*.

Another nice feature is that the laser doesn't get obscured as you work around it. I recently had to cut through a concrete floor, which is dusty business. A chalk line would have disappeared in a cloud of dust as soon as I started cutting. But the Laser Line Generator cast a line through the dust that I could follow along the length of the cut.

The Laser Line Generator is also ideal for installing trim, wallpaper, or even hanging pictures. On the base of the laser are two metal anchor pins that are used to attach it to the wall. There are also level vials on the top of the tool so you can be sure you're setting the line level and plumb.

Look for the Laser Line Generator in hardware stores and home centers, or visit the company's Web site, www.Strait-Line.com to find a retailer in your area.



▲ **The Laser Line Generator offers affordable precision in a tape-measure-size package.**

Milwaukee's Hatchet Cuts Where Others Can't

▲ **Milwaukee's Hatchet is a powerful cordless reciprocating saw that will bend to your will.**

For some jobs, only a reciprocating saw will do. Unfortunately, most of those jobs are in spaces where the long body of a conventional "recip" saw doesn't fit too well and where electrical outlets are scarce at best.

Of course, if you're lucky enough to be equipped with The Hatchet cordless reciprocating saw from Milwaukee Tools, neither of those inconveniences will slow you down in the least.

The Hatchet is Milwaukee's 18-volt cordless reciprocating saw that features a six-position pivoting handle. When pivoted to 90°, the saw fits easily within a standard stud cavity.

The Hatchet also includes features such as a keyless blade clamp, variable speed control, orbital action, and a soft-grip handle pad. Another included feature is Milwaukee's exclusive reversible battery that lets you attach the battery to the tool in two different ways, depending on which configuration will best fit within the space you're working in.

In use, this saw provided plenty of power for cutting everything from PVC plumbing to galvanized pipe, 4x4 fence posts, and even small tree limbs.

The pivoting handle really won me over when I was cutting galvanized pipe inside a cramped utility closet.

The Hatchet sells for around $250 and includes one 2.4 amp-hour battery, rapid charger, and a carrying case.

Look for Milwaukee's Hatchet reciprocating saw at hardware stores, home centers, and online tool retailers.

For more information, call 262-781-3600 or log on to www.mil-electric-tool.com.

► Black & Decker's new belt sander is a powerful and affordable option when the job calls for heavy sanding.

Black & Decker's Affordable Belt Sander

Belt sanders are the meat eaters of portable sanding. Nothing can match a good belt sander for its ability to remove maximum material with minimum effort. Unfortunately, belt sanders can be expensive ($150 is about the starting point). For someone who will only use a belt sander occasionally, that's a steep price.

Recently, though, Black & Decker introduced a new belt sander that will meet the needs *and* the budgets of most DIY'ers quite nicely.

The Black & Decker BR400 is a 3" x 21" belt sander driven by a 6.0 amp motor.

I tested the BR400 in a variety of situations. First, I used the sander to remove the finish from some door trim that needed refinishing. The light weight of the sander, its compact size, and the trigger lock made this tedious task much more bearable.

I also took the opportunity to try the BR400's inversion clamps. These clamps allow the sander to be attached upside down to a flat worksurface. This way, you can bring the work to the sander instead of the other way around. I found this to be a great help when working with odd-shaped pieces such as the support bracket shown in the photo below.

The sander also has great belt tracking and changing features.

For about $65, this is a tough deal to beat. Look for the BR400 in hardware stores, home centers, and online tool retailers. Visit www.BlackandDecker.com for more information.

▲ Black & Decker's belt sander can be flipped on its top and clamped to a work surface for greater control when shaping parts.

Vintage "2-Speeder"

Built in the early 1900s, this two-speed, cast-iron drill press is a forerunner of today's benchtop models.

Woodworking tools change constantly. But sometimes, the more things change the more they remain the same.

This two-speed antique drill press is a perfect example. Made of cast-iron by the Champion Blower and Forge Company of Lancaster, Penn., it's driven by a flat leather belt that runs across a system of pulleys.

The belt transfers power from a ¼-hp motor to the spindle. To change drilling speeds, simply reposition the belt on the pulleys. After adjusting the belt, a pair of center pulleys attached to the column are pivoted up to apply tension. These pulleys also keep the belt aligned.

Like today's benchtop drill presses, the bit is raised and lowered with a feed handle on the side of the column.

To see more vintage tools, visit *Craftsmanship Gallery* at WorkbenchMagazine.com.