Redwood Picnic Table ■ Appalachian Dulcimer ■ A Birdhouse for Turners

TODAY'S WOODWORKER™

Issue 15 ■ $3.95

PROJECTS, TIPS AND TECHNIQUES

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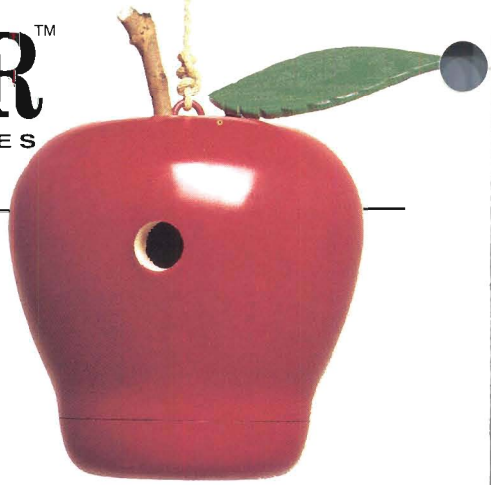

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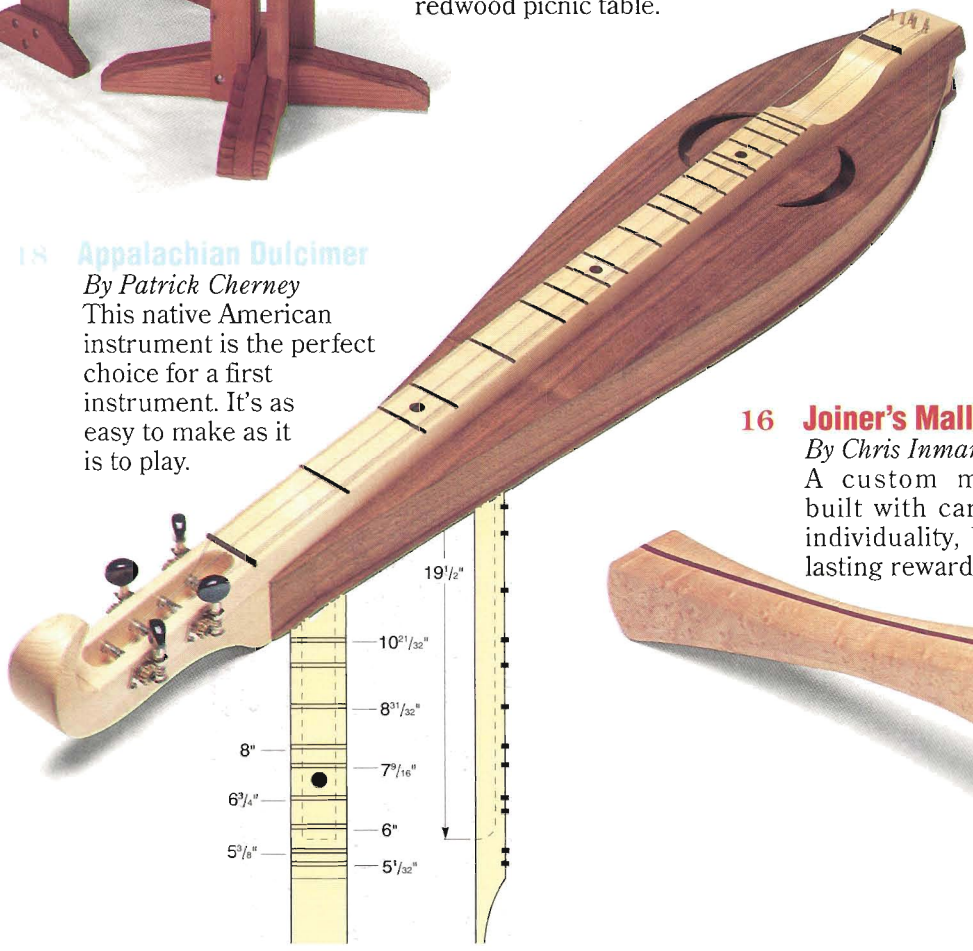

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Clear exterior finishes can significantly extend the life of outdoor furniture if you know which ones to use.

Safety First
Learning how to properly operate power and hand tools is essential for developing safe woodworking practices. For purposes of clarity, necessary safety guards have been removed from the equipment shown in some of the photos and illustrations in Today's Woodworker. We in no way recommend using this equipment without safety guards and urge readers to strictly follow manufacturer's instructions and safety precautions.

MAY/JUNE 1991

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Router Redux

The router table project featured in our Jan/Feb 1991 issue continues to pull in a significant portion of our recent mail. Here are two key questions:

- Why no cutout in the fence? Because Chris Inman and Rick White (our resident woodworkers) prefer to use auxiliary fences on their tables with cutouts sized to the bit.
- Why no guard over the bit? Again, it can be found on the auxiliary fence. As noted on the table of contents page (Safety First), we like to leave our guards off during photo sessions so the task at hand is clearer. We shouldn't have left it off the material list, however, and neither should you. The Woodworkers' Store *(21801 Industrial Blvd., Rogers MN 55374)* carries an inexpensive guard as well as the knobs used to hold down the platform.

Congratulations to Leonard Danson *(see page 5)*. Keep those tricks and photos coming —you may be our next prize winner!

Larry N. Stoiaken

I must say that Rick White and his group of woodworking experts have designed an attractive router table (Issue 13, page 8) that is functional, handy for storage, mobile and seems precisely built. But where is the cutout in the fence? I have seen a lot of router tables and have built a couple myself and those have cutouts for edge routing. With a cutout in the fence (piloted or not) a cutter will be more than 50% covered, making it safer. At the same time, the cutting action pulls the work snug to the fence. When flipping the pages of that issue to Frank Martin's wastebasket on page 20, I was shocked to see a totally exposed cutter in Figure 1, fingers in jeopardy, with the work between the cutter and the fence. The feed direction is right but the cutter can pull the work into it, which can make splinters of the wood and cause severe injury or loss of some digits. I know because when I was a novice this type of set up almost got me! Finally, I would like to say I enjoy your magazine and the many fine articles you feature.

Raymond L. Solner
Mokena, Illinois

TW responds: *As noted above, some woodworkers prefer to use auxiliary fences with their router tables. However, the illustration you mention on page 20 does show an unsafe approach. The photo above demonstrates a better way to cut those bevels and our auxiliary fence as well. In addition, please note the following two corrections for the router table. On page 11, the material list should be corrected so that piece 18, listed as 9", is 8". Likewise, pieces 22 and 23, listed as 6¾", should be 5¾".*

In Issue 13 there is a Trick of the Trade about using an old pole lamp as an in-line switch for your tablesaw and other machines. This is a very dangerous practice. Some shop equipment draws 20 amps or more to start and runs at 10 to 20 amps. Most of the old switches are not rated for this much current and are not spark proof. You know how sawdust builds up everywhere. There is a very good chance for fire with these old switches. Replace the switch with a newer switch rated for the amperage and sealed so it won't start a fire, and then this is not such a bad idea.

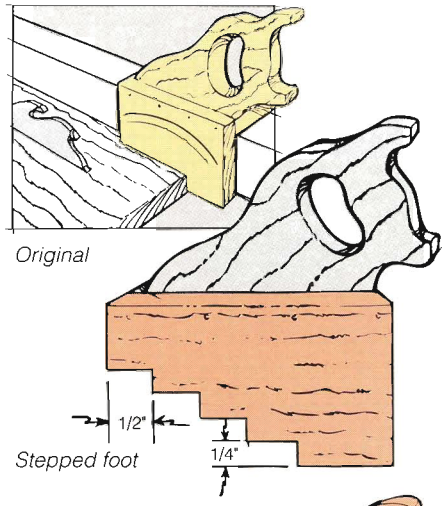
Robert Hawkins
Denver, Colorado

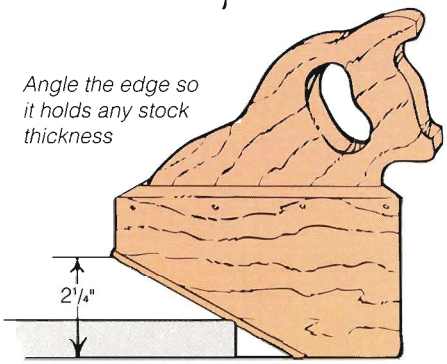
TW responds: *Good point Robert. We'll pass your sound advice on to Robert Wendel, who submitted that trick.*

We've completed your stool for children, featured in Issue 11, page 16. Our boys love it! Luckily, my husband made a template for the routing of the handles, since my sister already wants one. We tore apart an old ash table top and made the stool out of that.

Debra K. Heskin
Norwich, North Dakota

Sanding and Finishing





Push Handles: Final Chapter

The push handle I've used with table saws for twenty years was published in Issue 10. Then in issue 14 an improved version by C. E. Wardell was published showing a stepped foot design. I was intrigued with the Wardell version of the push handle and built one within hours of receiving my copy of Today's Woodworker. It worked fine and eliminated some of my assorted push handles.

Both of our push handles, however have the same flaw. They are designed to hold work down that is a standard thickness. Odd thicknesses rattle under both versions.

Thanks to the publication of the stepped foot design, I went back to the shop and refined both push handles by cutting a straight, elongated angle on the leading edge. I then glued soft rubber onto the angle and found that I can now firmly hold any stock thickness to the tablesaw.

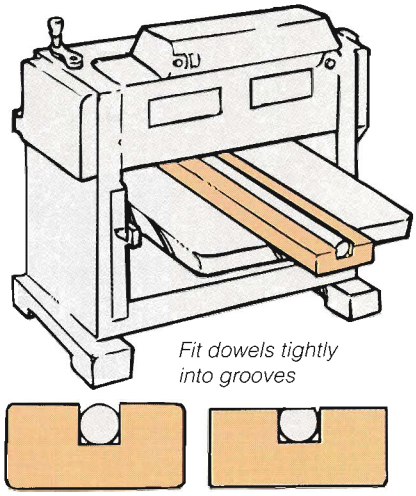
Dick Dorn
Oelwein, Iowa

Perfectly Centered Counterbore

If you counterbore a bolt head or nut, you'll get a more concentric hole by using a counterbore with a pilot that's the same size as the hole.

These counterbores are available in a variety of cutter and removable pilot sizes from Midwest Supply Co. *(1742 East 6th St., Tulsa OK 74104)*, an industrial supply distributor, or from Union/Butterfield *(6625 Jarvis St., Chicago IL 60648)*. When ordering be sure to ask for an aircraft type counterbore with 1/4" diameter shank. Inquiries to Union/Butterfield will be referred to the nearest distributor.

Paul Muratet
Tulsa, Oklahoma

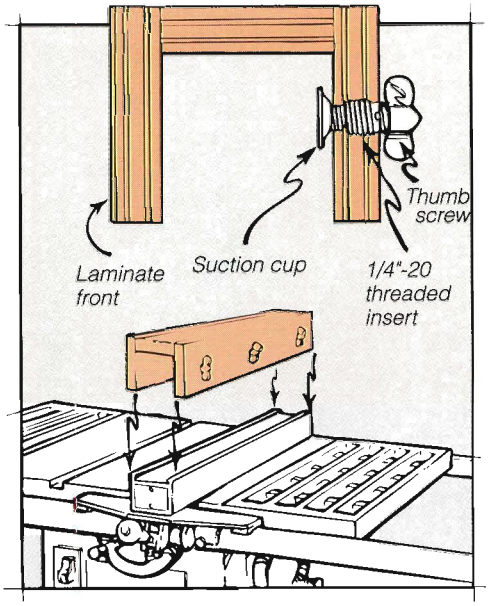


Planing Dowels

I recently built a wall cabinet requiring me to glue 3/16" dowels vertically to the stile. Holding them in place while gluing them was a problem so I made a jig to plane a flat tangent on each dowel.

Starting with a piece of square stock as long as the dowels, I cut a groove to the exact width and depth as the diameter of the dowel. Next, I pressed a dowel into the groove and put the assembly through my planer until the right size flat area was achieved. Leaving the machine set at this height, I quickly planed the rest of the dowels.

Mike Cyr
Fall River, Massachusetts



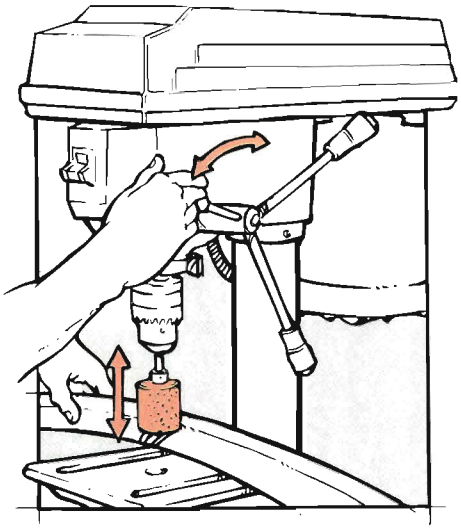
Dado Work Auxiliary Fence

A while back I was cutting rabbets on my tablesaw and, as most woodworkers do to protect their fence when it comes up against the blade, I attached an auxiliary wooden fence to the primary fence. Usually, the auxiliary fence is screwed to the primary fence, but I didn't want to drill holes into my new Vega fence so I came up with a very simple alternative.

My auxiliary fence surrounds the Vega fence, but leaves a good 1/2" gap on the backside. I installed three 1/4"-20 threaded inserts along the back wall of the auxiliary fence, then screwed in 1½" long thumbscrews. Next, I epoxied a suction cup onto the end of each thumbscrew to prevent marring the Vega fence. Now I can attach and remove my auxiliary fence quickly, without leaving marks, and I don't have to drill any holes in my saw fence. I laminated the face of the auxiliary fence so the stock travels easily.

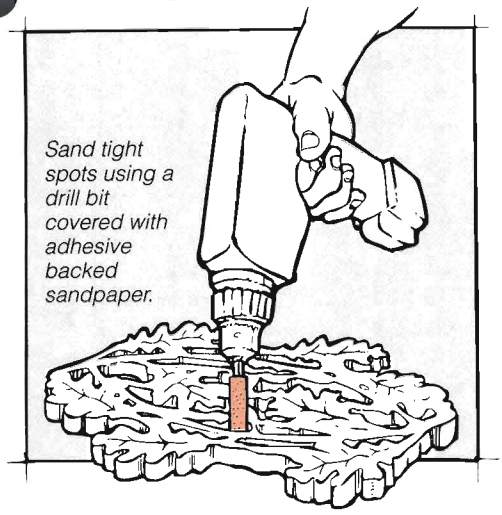
Tim M. Cartwright
Columbus, Ohio

Today's Woodworker *pays from $20.00 (for a short tip) to $100.00 (for an elaborate technique) for all Tricks of the Trade published. Send yours to Today's Woodworker, Dept. T/T, Rogers, MN 55374-0044.*



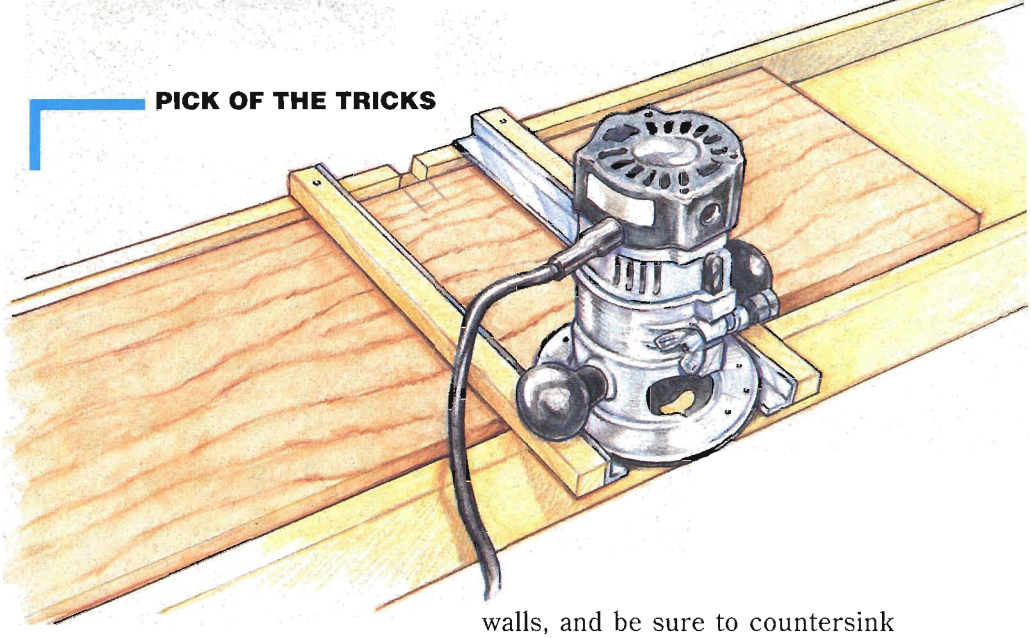
Two Sanding Techniques

In my experience, drum sanding inherently leaves score marks on the work piece. If you do your drum sanding on a drill press or other machine with a quill, the marks can be removed by simply moving the drum up and down slightly during the final sanding, leaving a smooth finish.



While doing some recent scrollwork I encountered a problem sanding inside curves. Emery boards for filing fingernails work very well for tight spots, but the cat's meow is using adhesive backed sandpaper wrapped around the shank of a long drill bit, which is chucked in a drill or mounted in a lathe. As the paper wears, simply peel off the used portion, and away you go!

Stephen M. Blaisdell
Naugatuck, Connecticut



Router Bench For Dado Cuts

This router set-up makes dadoing panels a snap. The bench consists of a long wooden trough with aluminum tracks suspended over the top. The tracks, which support a router as it passes over the panel, are fastened at right angles to the trough walls and extend 6" beyond the front of the bench so that the router is fully supported as it exits the workpiece.

The aluminum tracks are set to fit my router base and I reinforce them with wood strips for extra rigidity. The base of the trough must be very flat and true —a good choice is a solid core bi-fold door panel. The front and back walls extend exactly the same height above the trough base in order to keep the dado depth consistent as the router passes over the bench. I position the walls one inch above the trough base since I normally dado 3/4" thick panels. Use flathead screws to secure the aluminum tracks to the strips and the walls, and be sure to countersink them completely or they will interfere with the movement of the router. You might need to file the top of the screws to remove any burs that would drag against the router base.

Once the tracks are installed use your router and a 3/4" straight bit to cut the notches in the walls. The notches are then used to position a panel in the jig. Slip the panel into the trough and line up the dado location with the notch. Clamp the panel to the base and adjust the depth of cut on the router, then make your dado. It's possible to mount several tracks on the trough and then rout different size notches at each position for aligning dadoes of varying widths. A bench of this type will also work well as a cutoff jig for use with your portable circular saw.

Just set the bench across two saw horses and you're ready to dado some panels.

Leonard J. Danson
Ithaca, New York

Win A Beautiful Joiner's Mallet

Leonard Danson's trick of the trade was unanimously chosen by our panel of woodworking judges as this issue's favorite submission, and we're sending him an Incra Jig and Right Angle Fixture for his terrific idea. Our mail bin has been filled these past few weeks with all sorts of innovative tricks, and we're looking forward to seeing even more. If you have an answer to a common shop problem, a special jig or clever technique, help out the rest of us.

For our next issue we'll select another favorite and send out Chris Inman's beautiful mallet featured on page 16 in this issue. So get going and put pen to paper...we'll need your trick by June 15th.

A Table For Four ...With A View

This inviting redwood picnic set is the perfect size for small, intimate gatherings on your deck.

By Rick White

Summer is nearly upon us, and as the temperature rises I'm getting anxious to spend as much time as possible outdoors. That means it's time to clean up the barbeque, sweep off the deck and think about my first project of the season, a picnic table and benches.

Most picnic sets are designed for larger groups of people. They're big and bulky, and when it comes to Memorial Day or July 4th celebrations, they're perfect. But most of us, when you think about it, spend our summer evenings with four or fewer people, and ideally this calls for a smaller, more intimate table. The design I came up with makes no pretension about handling large crowds, fits easily on my deck and provides a perfect view of my backyard.

A pedestal table allows lots of room for knees and no one ends up straddling a leg. My picnic set is made with redwood for its exceptional resistance to harsh weather conditions and for it's beautiful color.

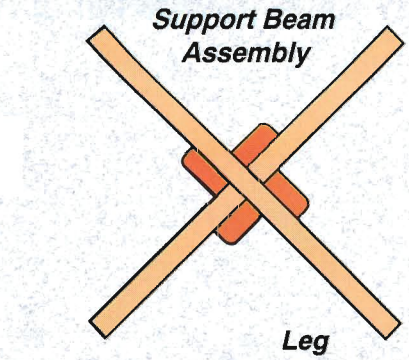
The base is very sturdy while still being simple to construct. The joinery is simple, requiring only a couple of half laps in the base and spline joints for the top. Most concealed joints, like mortises and tenons, would eventually come apart due to humidity changes and stress on such soft wood.

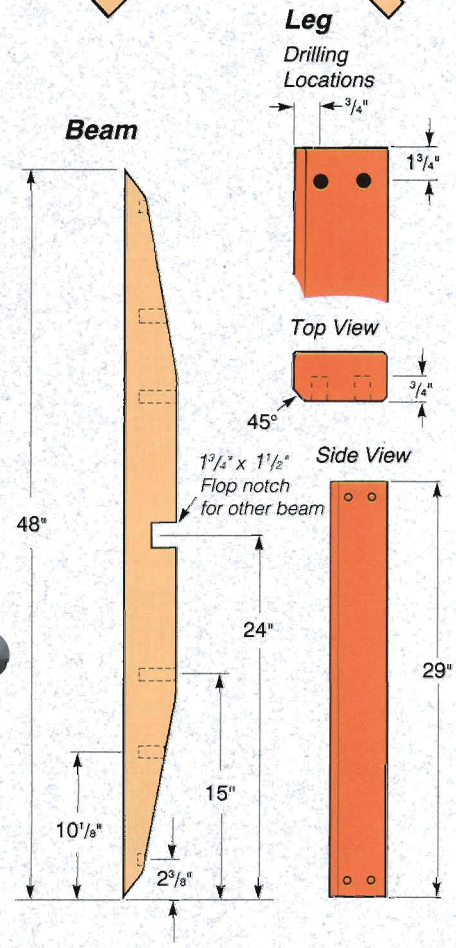
Redwood is available at most local lumberyards, and cedar can be substituted if you prefer. The table and four benches require 18 eight foot 2" x 4"s, one eight foot 2" x 6" and two six foot 1" x 4"s. You'll also need a quantity of non-corrosive wood screws, lag screws and washers as specified in the material lists on pages 8 and 11.

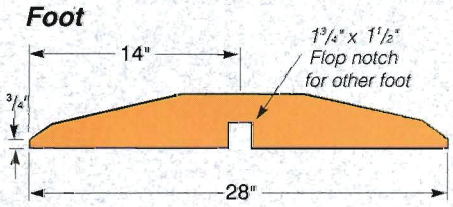
Constructing the Pedestal

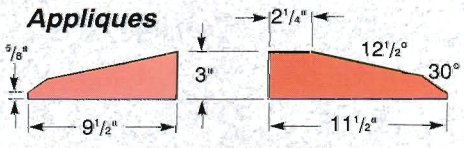
Begin building the table from the bottom and work upward. The patterns on page 7 outline the four pedestal feet and detail the construction of the base. Be sure to remember that all the lumber sizes are nominal, meaning that a 2" x 4" is actually 1½" x 3½" so always measure your stock to check it against the measurements in this project. Each foot is comprised of a 2" x 4" core sandwiched between two smaller 1¼" thick pieces. Begin by cutting two 2" x 4"s to a length of 28" for the foot cores (pieces 1), then cut four 2" x 4"s to a length of 11½" for the left foot appliques (pieces 2) and four more 2" x 4"s to a length of 9½" for the right foot appliques (pieces 3). In two passes, rip the applique pieces to a thickness of 1¼". At this time it also makes sense to cut the four foot pads (pieces 4) so they're ready to glue onto the assembly later.

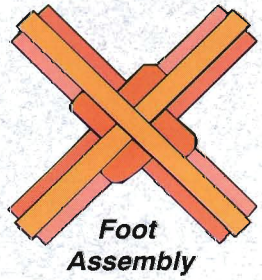
Cut the two table support beams (pieces 5) to a length of 48" and layout the half lap joint at their midpoint **(See Elevation at right)**. While you're at it, cut the half laps on the foot cores, remembering that for each pair, one member is notched on its top edge, while the other is notched on its bottom edge. Mount a 1/2" wide











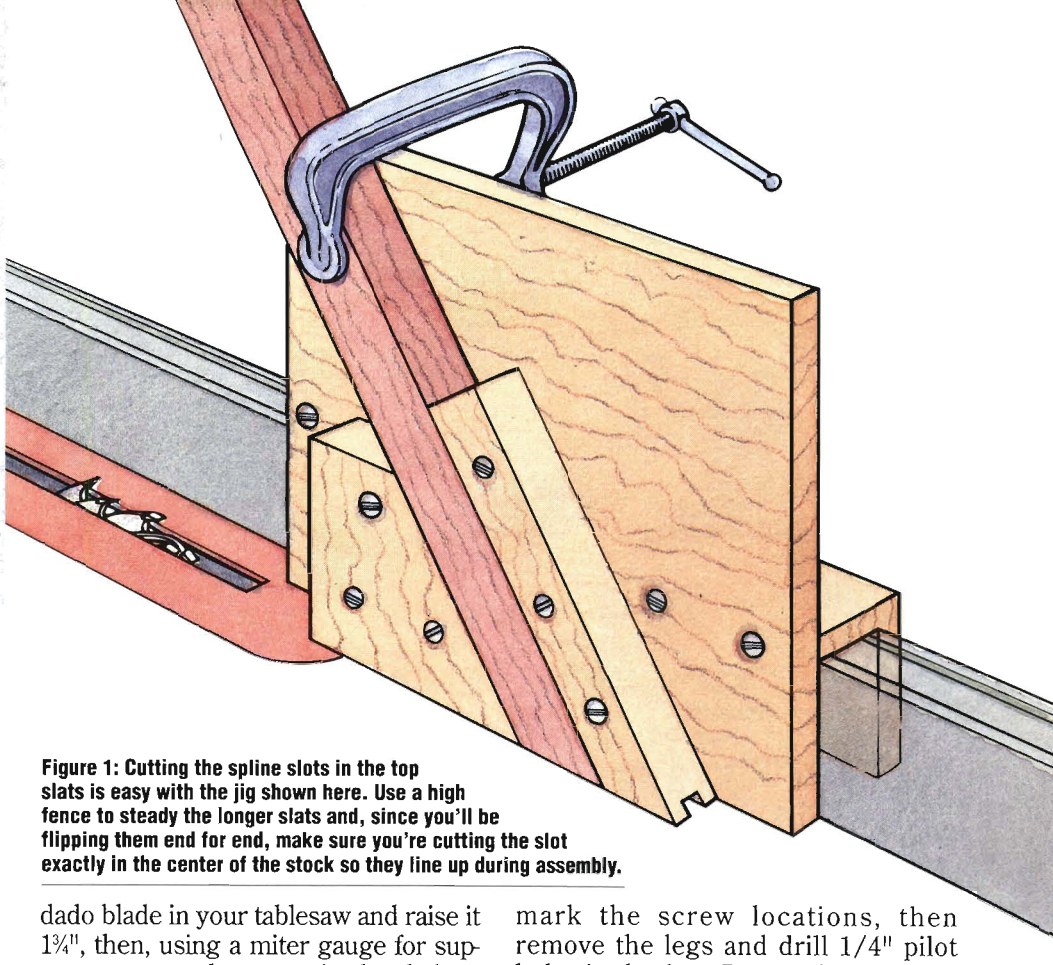


Figure 1: Cutting the spline slots in the top slats is easy with the jig shown here. Use a high fence to steady the longer slats and, since you'll be flipping them end for end, make sure you're cutting the slot exactly in the center of the stock so they line up during assembly.

dado blade in your tablesaw and raise it 1¾", then, using a miter gauge for support, remove the waste in the dadoes by taking three passes with each piece. A snug fit is best for these joints.

One edge on the foot cores, the appliques and the support beams must now be cut at an angle on the bandsaw. Follow the elevations at left to layout each of these angles and, once the shapes are cut, belt sand the surfaces smooth. Next, rout a 3/16" roundover on the bottom edges of the beams, the top edges of the two foot cores and the outside top edge of the foot appliques.

The foot core and beam pieces are now ready for assembly. Epoxy is an excellent waterproof glue that provides a long set up time and good gap filling properties, making it the best choice for this application. Mix only the amount you can use in a short period of time, then spread it into the half laps. Secure the half laps by driving two non-corrosive screws up into each joint.

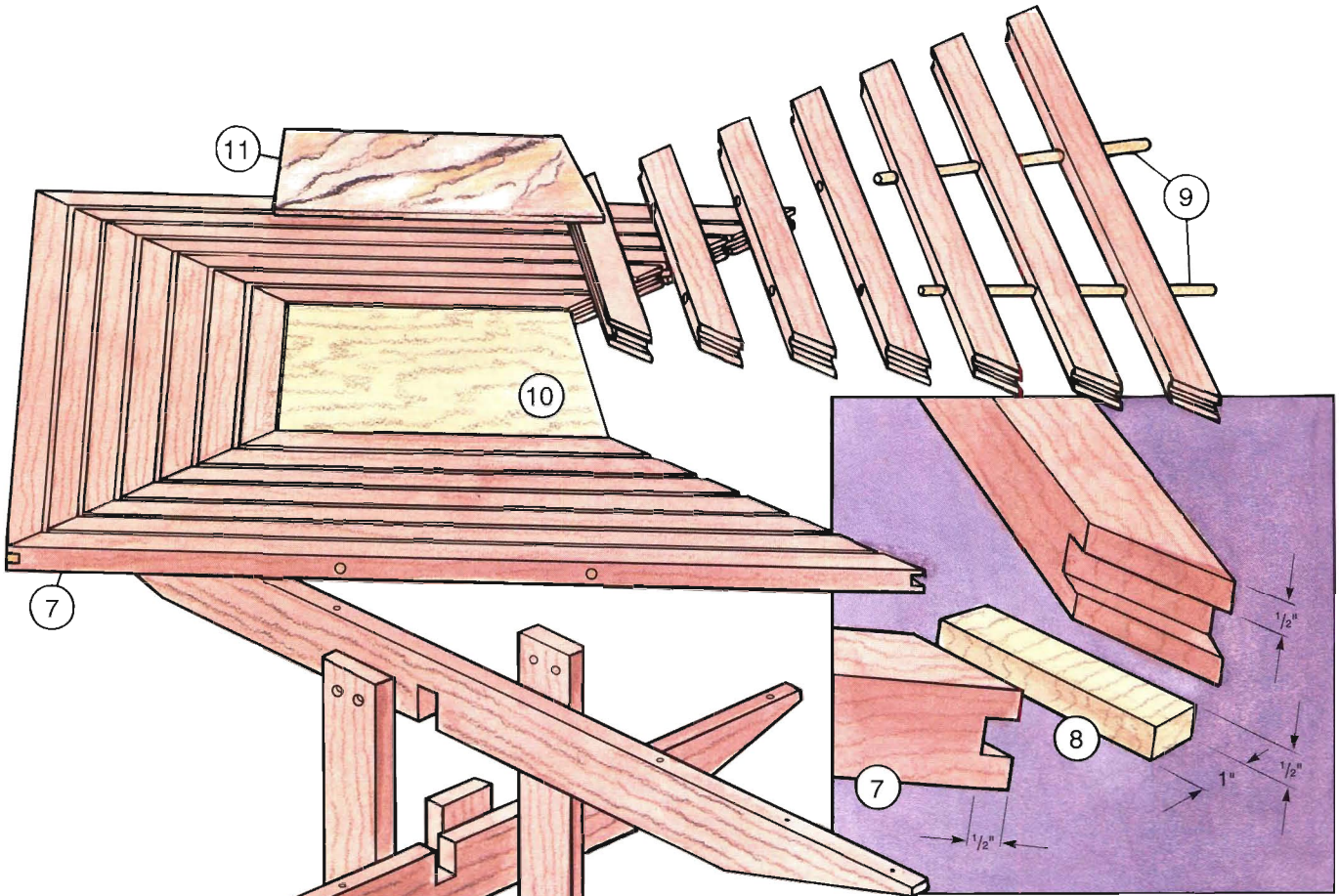
For the legs (pieces 6) cut four 2" x 4"s to a length of 29", and rout a 1/2" chamfer on one edge of every leg. Now prepare the legs for joining with the foot and beam assemblies by drilling counterbored pilot holes at the locations indicated on the leg elevations shown at left. First drill 1/2" deep by 3/4" diameter counterbores and follow with 5/16" pilot holes. Slip the legs into position with the feet to mark the screw locations, then remove the legs and drill 1/4" pilot holes in the feet. Repeat this last procedure with the legs and the beams.

Now mix a new batch of epoxy and spread it on the legs where they join the feet and beams. Place the legs into position and secure the joints with lag screws (pieces 12), remembering to put a washer on each one. Spread epoxy on the eight foot appliques as well and clamp them to each side of the foot core pieces. Clean up as much glue as possible with a damp rag and later, when the glue has dried, scrape off any remaining epoxy residue.

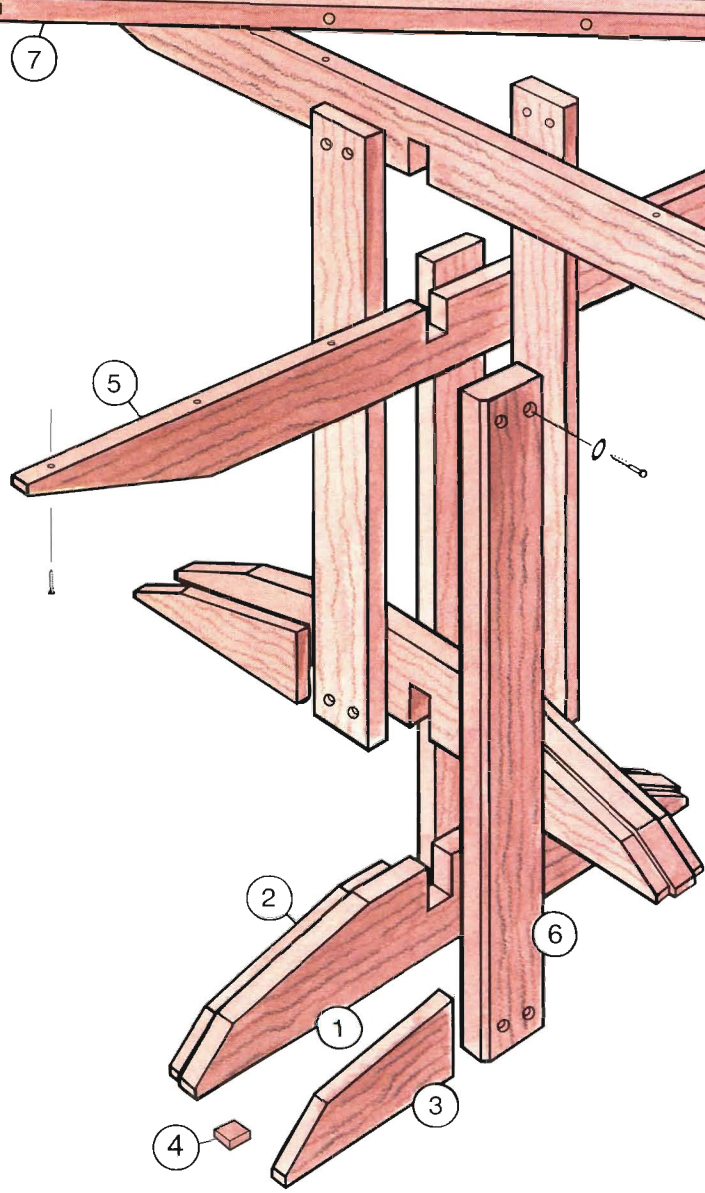
Machining the Table Top

You'll need 64 lineal feet of 1½" by 1½" stock (pieces 7) to make the seven frames of the top. Each frame is joined at the corners with splines (pieces 8), and the frames are then joined to one another with dowels (pieces 9). The center frame is filled with a colorful piece of marble backed by 1/2" thick plywood.

Rip 4 eight foot 2" x 4"s into 1½" square stock for the slats that make up the top. Once this is done, roundover all the edges on the eight foot long strips with a 3/16" radius bit. Next, begin mitering the pieces to length with a power miter box, a tablesaw or a radial arm saw. Follow the



Spline Detail



MATERIAL LIST (Table)

	T x W x L
1 Foot Cores (2)	1½" x 3½" x 28"
2 Foot Appliques (Left) (4)	1¼" x 3" x 11½"
3 Foot Appliques (Right) (4)	1¼" x 3" x 9½"
4 Foot Pads (4)	1/4" x 1½" x 2"
5 Support Beams (2)	1½" x 3½" x 48"
6 Legs (4)	1½" x 3½" x 29"
7 Top Slats (28)	1½" x 1½" (for lengths, see pg. 9)
8 Splines (28)	1/2" x 1" x 2" (White Oak)
9 Dowels (8)	3/4" x 14" (White Oak)
10 Plywood Base (1)	1/2" x 12¾" x 12¾"
11 Marble Center Piece (1)	3/8" x 12" x 12"
12 Lag Screws (16)	5/16" x 2"

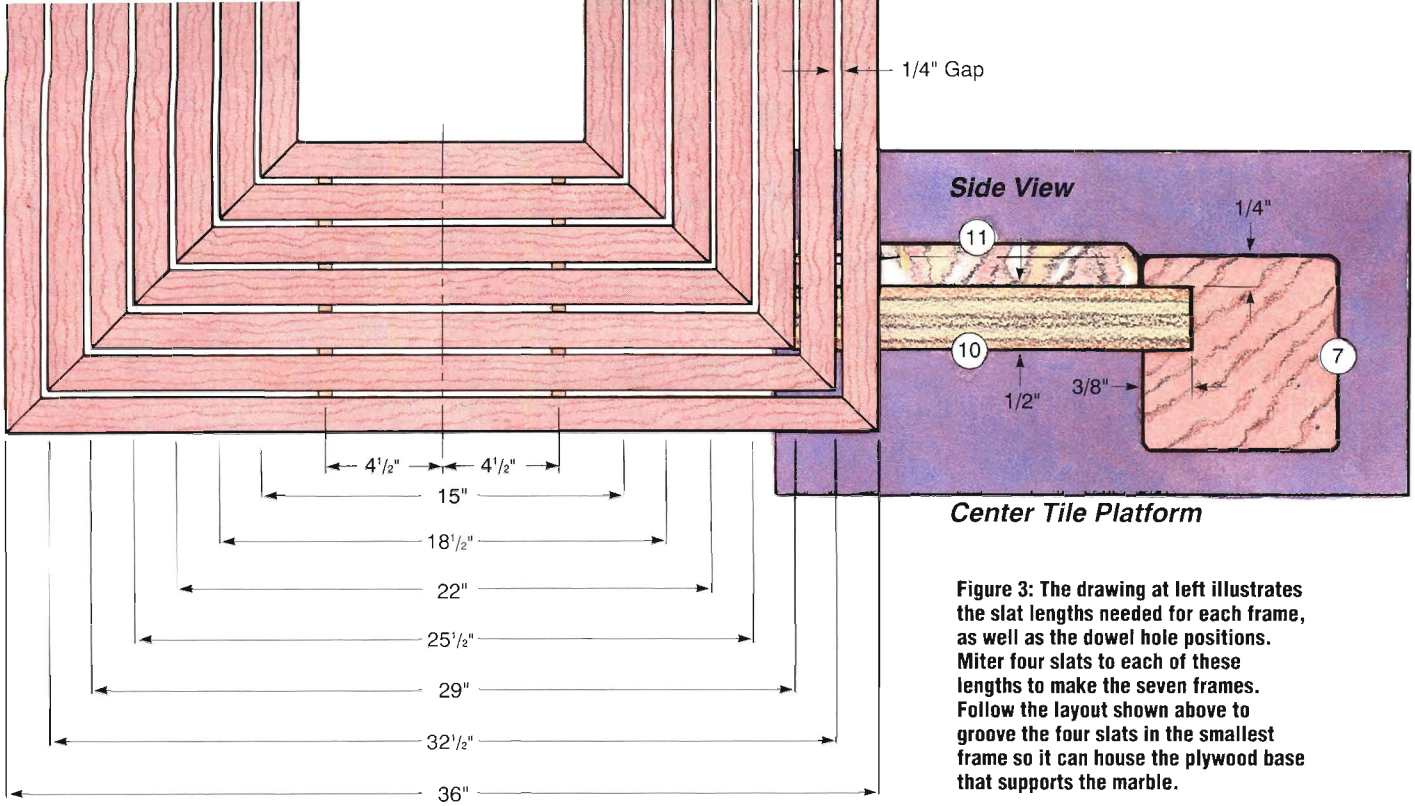


Figure 3: The drawing at left illustrates the slat lengths needed for each frame, as well as the dowel hole positions. Miter four slats to each of these lengths to make the seven frames. Follow the layout shown above to groove the four slats in the smallest frame so it can house the plywood base that supports the marble.

measurements shown above in the top elevation to cut four slats of equal length for each frame.

The slats are splined together at their mitered ends to give the top extra rigidity and to minimize any gaps that might occur due to the effects of humidity. A typical tablesaw jig for this operation is shown in **Figure 1** on page 7. The jig, which looks like a lower case "h" from the end, is made of plywood to wrap over the rip fence. Cut two pieces of 2" x 4" scrap to the shapes shown in the drawing and screw them to the jig at a 45° angle for supporting the slats as they pass over the blade.

Install a 1/2" wide dado blade in your tablesaw and raise it 1/2". Now clamp the rip fence so the face of the jig is 3/4" from the center of the blade and you'll get perfectly centered dadoes.

Next, drill two 3/4" holes into every slat for inserting the dowels that reinforce the top assembly. Chuck a 3/4" diameter bit in your drill press and, to insure accuracy, make the alignment jig shown in **Figure 2**. The jig is simply a 1½" x 12" fence screwed to a piece of scrap 1" x 8". Clamp the jig to your drill press table so the center of the bit is 3/4" from the fence. Draw lines on the drill press fence 4½" to the left and right of the bit's center and put center lines on the longest edge of each slat. Match the center line of the slat with the mark on the left side of the fence and drill the first hole, then slide the slat to the right to align the marks and drill the second hole.

The slats for the smallest frame must be grooved on their inside edge to house the plywood base (piece 10) that supports the marble (piece 11). Set up a 1/2" wide dado and raise it to 3/8". Plow the groove so it's setback 1/4" from the top surface of the slats (**See Figure 3 above**).

The splines (pieces 8) are made of white oak for strength and weather resistance. Rip a 1/2" x 6" x 20" long oak board into 2½" wide strips. Next, cut the strips into 1" long pieces. You'll notice that the grain runs the short way on these splines, which is correct for this application. If the grain of the splines runs parallel with the joint they are much more likely to break. You'll need a total of 28 splines.

The dowel rods (pieces 9) are also made of white oak. Cut four 36" dowels in half and sand them vigorously with 100 grit paper to slightly reduce their size so they fit into the slat holes easily. Now chamfer one end of every dowel with a belt sander.

Figure 2: Once the drilling jig is clamped to the drill press table, align the center mark on the slat with the left line on the fence to drill the first hole. Next, slide the slat along the jig to line up its center line with the right location mark on the fence and drill the second hole.

Top Assembly

Assembling the frames isn't difficult at all if you make yourself the special framing jig shown in **Figure 4** on the next page. Make four blocks from scrap 2" x 4" material, cutting each block 3½" square. Mark the center of the blocks and drill a 1½" diameter hole through each one. Next, cut in from two sides to form a 90° inside corner. Place one of these blocks outside each corner of a frame and use a band clamp, running around the entire assembly, to pull the frame and blocks tight.

Glue up each frame by spreading epoxy in the spline grooves and on the mitered ends of the slats. Next, put the splines in place and assemble the frame. Now set up the band clamp and corner blocks to pull the frame together while

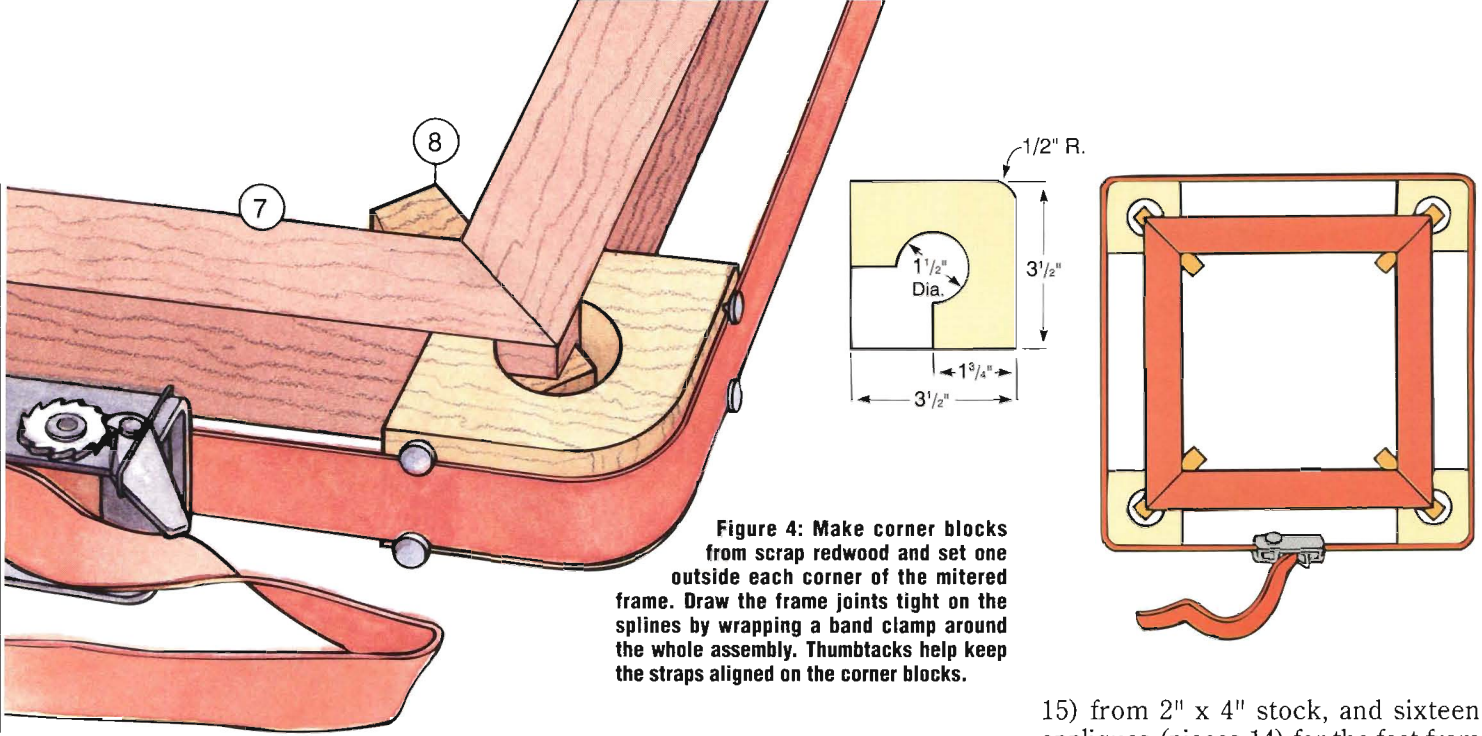


Figure 4: Make corner blocks from scrap redwood and set one outside each corner of the mitered frame. Draw the frame joints tight on the splines by wrapping a band clamp around the whole assembly. Thumbtacks help keep the straps aligned on the corner blocks.

the glue dries. Check for squareness by measuring diagonally across each frame, adjusting the frame until the two measurements are equal. Remember that the plywood base (piece 10) for supporting the tile should be installed at this time in the smallest frame.

The top is designed with 1/4" gaps between each frame. In order to maintain this spacing make a bunch of 1/4" thick spacers to place between the frames while you drive the dowels through the holes. Put some epoxy in the holes in the smallest and largest frames, then lay all the frames and 1/4" spacers in sequence on your bench. Tap the chamfered ends of the dowels into the frames and continue until they contact the plywood center plate. Once all the dowels are driven, turn the assembly over and pin the dowels in every frame with a 1¼" long brad. Drill pilot holes before driving the brads and, after countersinking them slightly, fill the hole with wood putty to minimize the effects of moisture. Finally, cut off the ends of the dowels and sand them flush with the outside frame.

Center the pedestal on the overturned top and mark three screw locations in each support beam where they solidly cross the frames (see elevation on page 7). Use a 1/2" diameter bit to counterbore these positions. Since the width of the beams vary from one screw location to another, drill your counterbores deep enough to leave 1" of stock remaining from the bottom of the hole to the top edge of the beam. Now drill 1/8" pilot holes through the beam and 1/2" into the top. Join the assemblies with #10-2" non-corrosive wood screws. It's also convenient at this time to glue and pin the foot pads (pieces 4) onto the bottom of each foot core.

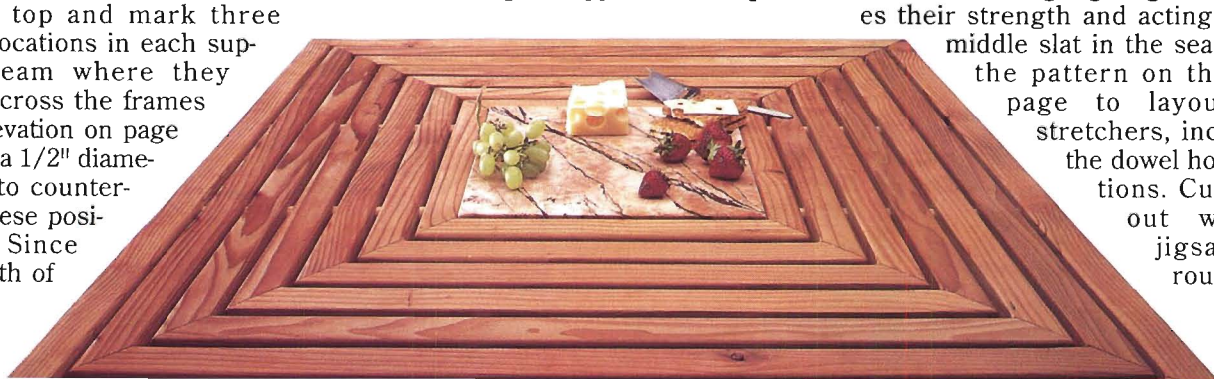
Set the table upright to install the marble. Run a thin bead of silicone caulk on the plywood where it meets the redwood frame, and add four evenly spaced dollops of caulk on the interior area of the plywood. Set the marble in place, wipe away any squeeze out with a damp rag and let the caulk dry overnight.

Building the Benches

The benches are designed in a trestle style that incorporates many of the same elements as the table. As you did with the table, make the feet and support beams first. The patterns for these pieces are on page 11, so go ahead and cut out eight feet (pieces 13) and eight support beams (pieces 15) from 2" x 4" stock, and sixteen appliques (pieces 14) for the feet from 3/4" redwood. Roundover all the top edges of the feet, the outside top edges of the appliques, and all the bottom edges of the beams with a 3/16" radius bit. Prepare the beams and feet for joining the legs by drilling 1/2" deep by 3/4" diameter counterbores as shown in the elevation drawings on page 11. Follow the counterbores by drilling 5/16" pilot holes. Each beam also requires two 1/2" diameter by 1¼" deep counterbores on the bottom edge for securing the outside slats in the seat assembly (see page 11). Follow these counterbores with 1/8" pilot holes.

All the legs (pieces 16) are chamfered on their bottom edges and notched at the top to join with the stretchers. Cut the legs to length and chamfer their bottom edges on the tablesaw. Layout the notches following the elevation on page 11 and remove the waste with a jigsaw. Lay the feet and beams on the legs, then drill the pilot holes and join the pieces together with lag screws (pieces 20). Use epoxy to adhere the appliques to each foot.

The stretchers (pieces 17) span between the legs, giving the benches their strength and acting as the middle slat in the seats. Use the pattern on the next page to layout the stretchers, including the dowel hole locations. Cut them out with a jigsaw and roundover



the top and bottom edges with a 3/16" radius bit. Slip the stretchers into the leg notches and equip your portable drill with a 1/4" bit. Now extend the center lag screw hole from each support beam into the stretchers for 2".

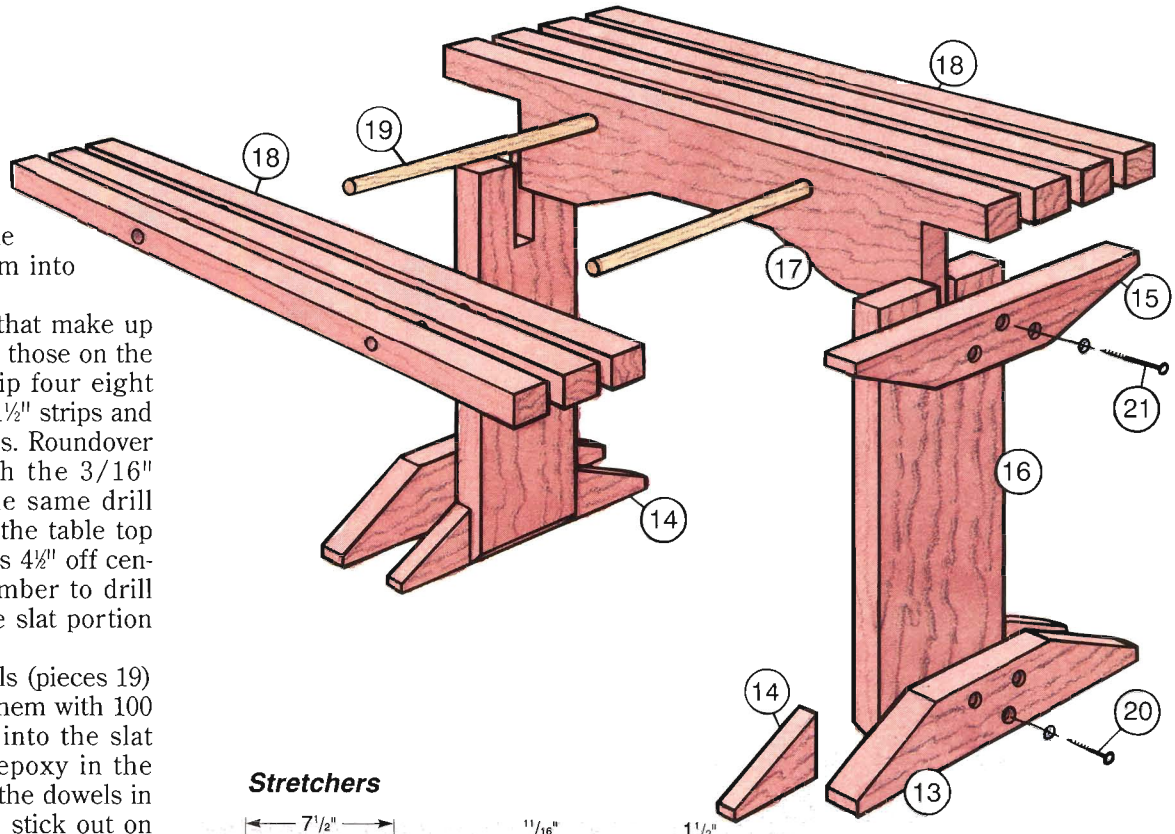
The slats (pieces 18) that make up the seat are the same as those on the table top, so you can rip four eight foot 2" x 4"s into 1½" x 1½" strips and cut them into 24" lengths. Roundover all the slat edges with the 3/16" radius bit. Now use the same drill press jig you made for the table top and drill two dowel holes 4½" off center on each slat. Remember to drill these holes through the slat portion of each stretcher also.

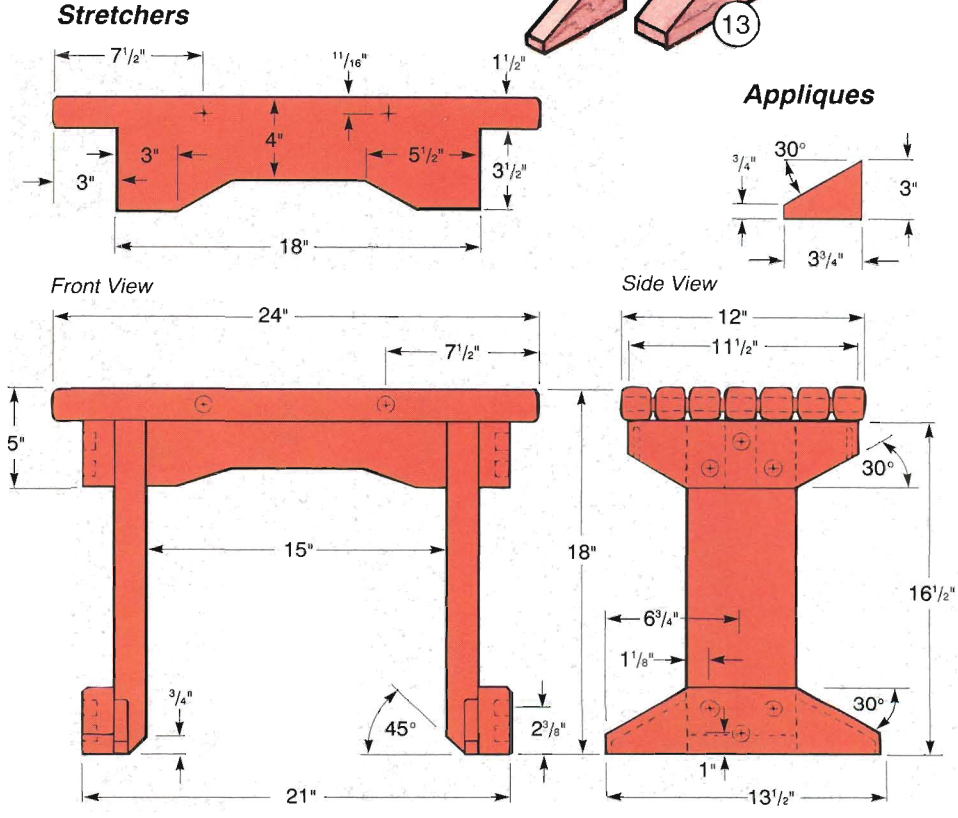
Cut two 13" long dowels (pieces 19) for each seat and sand them with 100 grit paper so they slip into the slat holes easily. Now put epoxy in the stretcher holes and slip the dowels in place, leaving about 5¼" stick out on each side. Wipe the glue from the dowels and add two more slats on both sides of the stretcher. Be sure to use 1/4" spacers between every piece and pin these slats with brads. Now put epoxy into the holes in the two outside slats and mount them onto the dowels. The finished width of the seat should be 12". When the glue is dry, cut off the ends of the dowels and sand them flush with the slats.

Set the seat assembly onto the legs, dropping the stretcher tenons into the notches and securing the joints with 3" lag screws (pieces 21). Now flip the entire bench over and drive #10-2" wood screws (pieces 22) through the beams into the outside slats to completely secure the seat to the leg assembly.

Redwood, as it ages, turns from its original red color to silvery grey. The only way to maintain the original reddish tone is to color the wood with an exterior product like *Cabot* or *Olympic* stains. For those who like the natural aging color, it's still a good idea to finish the wood with a clear wood preservative to extend the life of the material. Finishes like *Clear Wood Finish-UV* work well for this type of application.

Rick White, a professional woodworker, serves on the editorial advisory board of Today's Woodworker





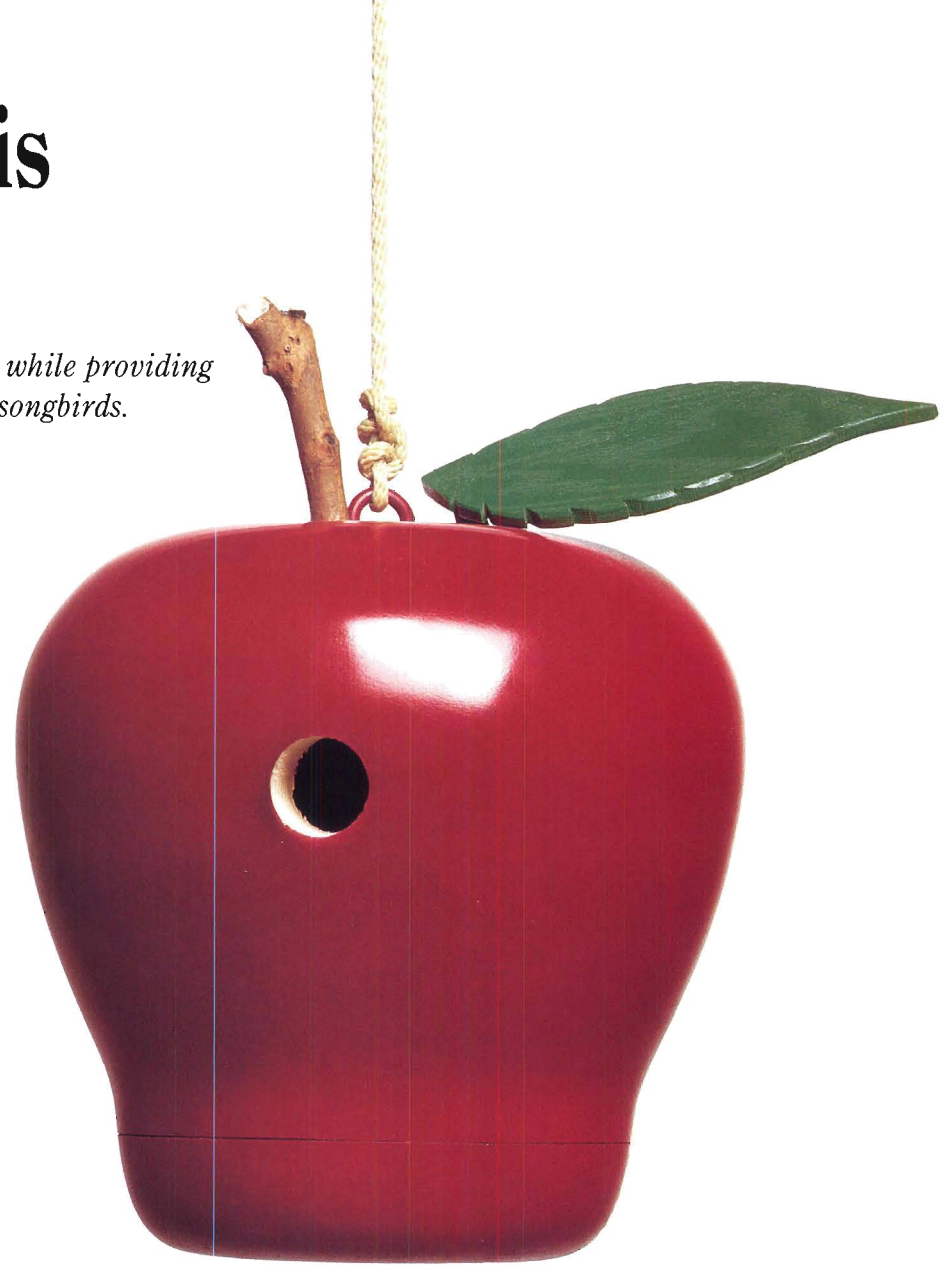
MATERIAL LIST (Four Benches)

	T x W x L		T x W x L
13 Feet (8)	1½" x 3½" x 13½"	**18** Seat Slats (24)	1½" x 1½" x 24"
14 Appliques (16)	3/4" x 3" x 3¾"	**19** Dowels (8)	3/4" x 13"(W. Oak)
15 Support Beams (8)	1½" x 3½" x 11½"	**20** Lag Screws (40)	5/16" x 2"
16 Legs (8)	1½" x 5½" x 16½"	**21** Lag Screws (8)	5/16" x 3"
17 Stretchers (4)	1½" x 5" x 24"	**22** Wood Screws (16)	#10 - 2"

This Turning is for the Birds

Add a bit of whimsy to your backyard while providing a new home for a family of wayward songbirds.

By Jeff Jacobson



If you like turning as much as I do you'll have a great time with this colorful apple birdhouse. Laminated construction allows you to hollow the house before it's mounted on the lathe and, once you're ready, turning the pine is a breeze.

As winter recedes and crocuses begin pushing their way through thawed soil, songbirds chatter wildly to announce their annual arrival, bringing color and music to our reawakening world. What better way for woodworkers to prepare for spring than to build a new home for our favorite visitors.

Since I enjoy turning I began thinking about a birdhouse that can be made on the lathe. There aren't many of these designs around, but I think I've come up with a pretty unique alternative to the traditional four walls and a roof. My apple design is easy to build and is always a pleasure to see hanging from a tree limb in my backyard. Keep in mind that you'll need a lathe with at least a 12" swing capacity.

Some of you might be concerned about the bright red paint I've used on the birdhouse, but don't worry. I called Elsa Thompson, the publisher of *Bird Watcher's Digest*, who referred me to the book *Songbirds in Your Garden*, by John K. Terres. According to Mr. Terres, applying a wood preservative to the outside of the birdhouse will prolong the life of the structure, and after letting it dry for three to four days you can paint the house any color you wish.

One additional point that experts all agree on when it comes to building a birdhouse is to leave off the perch, which tends to attract less desirable bird species.

Laminating the Blank

The birdhouse is made of pine, which has reasonable exterior durability and is readily available from local lumberyards. Other choices include cedar and redwood, but neither of these turn very well. Painting the house should enable the pine to stand up against the effects of sunlight and foul weather for quite a few years.

The turning blank is made up of seven pieces cut from a twelve foot 2" x 12". Each piece, except for the outside two, has its center portion removed so that when the birdhouse is assembled the inside will be hollow. The lengths and widths of the pieces are graduated in size to make the turning easier. The corners of the middle piece (piece 1) are cut away, leaving a 1½" long extensions for mounting the birdhouse assembly onto the lathe's drive center (see elevation on page 16). The outside pieces (pieces 4) and those immediately inside them (pieces 3) have vertical edges ripped at a 45° angle.

As much as possible, cut around the knots in the plank (especially large, loose knots), although knots

in the interior area of the five inside pieces of the birdhouse (pieces 1, 2 and 3) will be cut away when you hollow each piece.

Layout the hollow area on the five interior pieces as shown in the elevation drawings on page 14, then drill a 1/2" hole into the waste in order to insert a jigsaw blade. Remove the waste areas with the jigsaw and a fine cutting wood blade.

The birdhouse is assembled using Resorcinol glue, which is completely waterproof. Spread a liberal amount on both sides of the five interior pieces and on the inside face of the outside pieces. Stack the seven slabs in order and set them upside down on two bar clamps (**See Figure 1**). This aligns everything perfectly. Use additional clamps around the assembly as needed. Resorcinol is a slow setting glue, so put the birdhouse aside for a full day before mounting it on the lathe.

Figure 1:
Clamp the birdhouse together by turning the assembly upside-down and setting it onto two bar clamps. Add more clamps as needed.

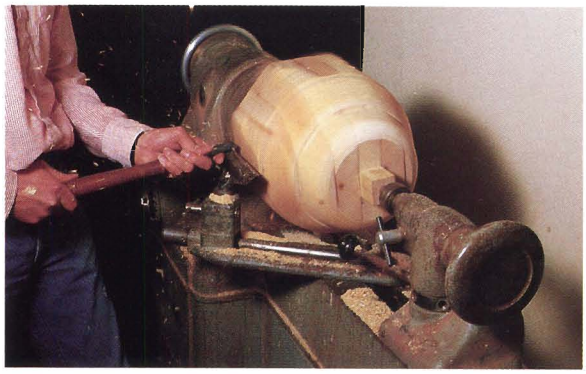


Figure 2:
Use a large roughing gouge and run the lathe at a very low speed to turn the blank into the apple shape.

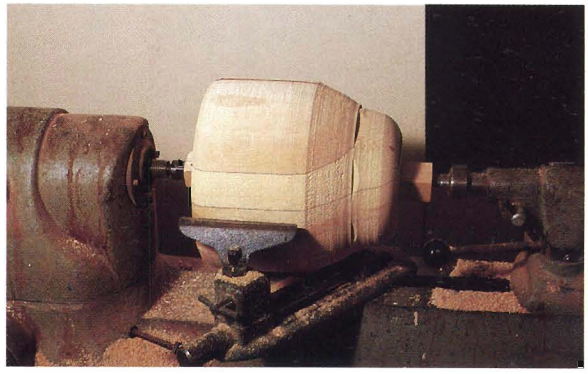


Figure 3:
The wall is thinnest at the shoulder near the bottom of the apple, so it's important to keep this area marked to prevent overcutting.

Turning the Birdhouse

Find the center point on the top and bottom extensions of the birdhouse assembly so that the blank can be mounted on the lathe. Before mounting, however, remove the four corners on the lower section of the birdhouse with a handsaw. This just quickly reduces the amount of material you'll need to remove during the turning. Mount the birdhouse on the lathe and begin turning the blank into a cylinder with a large roughing gouge (**See Figure 2**). Continue using a large roughing gouge to taper and round the cylinder into the apple shape, but be careful not to cut away too much material at the shoulder near the bottom end of the apple (**See Figure 3**). Use a skew chisel for the final clean-up pass, then sand the apple through 150 grit.

The size of the entry hole in a birdhouse is critical to attracting specific species. I want to attract nuthatches, chickadees and titmice, so I drilled a 1¼" hole. A larger or smaller hole will attract other bird types, possibly even nuisance birds that you'd rather not have around. Steady the apple in your lathe and drill the 1¼" entry hole squarely into one outside lamination (piece 4) with a holesaw. Now, cut a 1/16" deep line 1½" from the bottom of the birdhouse with the tip of your skew chisel. This will serve as a cutting line for separating the bottom from the apple —a necessary feature on all birdhouses for cleaning out the old nest each spring.

Make a few pencil marks across the skew cut line to help you realign the parts later. Support the birdhouse with one arm while it's still mounted on the lathe and begin cutting the bottom off the apple. Use a very sharp handsaw (preferably a Japanese saw) and follow the kerf to guide the saw straight across the apple. Cut a few inches at a time, rotating the apple when the blade breaks through to the hollow inside. Once the bottom is separated from the apple body, take a few passes with a hand plane to fit the two pieces together again.

With the bottom set in place on the apple (remember to align the pencil marks you made across the kerf), drill four counterbored pilot holes for #8-2" screws through the bottom and up into the side walls of the house. Drill these holes at a slight angle to keep the screws solidly within the thickness of the walls. Secure the two parts together with weather resistant screws, then file and sand the joint smooth. Now drill several 1/4" holes into the side and bottom of the apple (see elevation drawings on page 14) to allow for air circulation and water drainage.

Cut off the top and bottom extensions and smooth these areas with a small disc sander. Now drill a 1/4" hole through the top of the apple and install the eye bolt. Slip a washer onto the bolt before inserting it in

the hole, then add a second washer and the nut inside the birdhouse.

Birdhouse Details

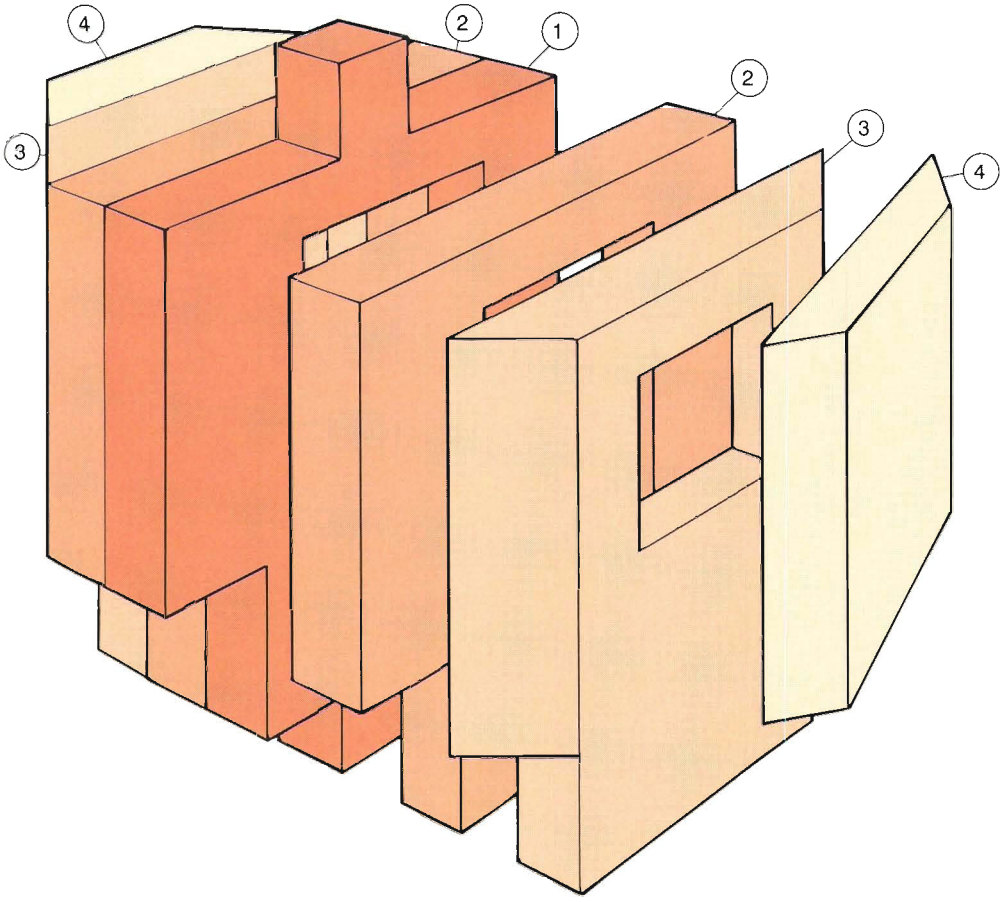
Use a bandsaw or coping saw to cut out the leaf (piece 5) from 1/4" thick white oak following the pattern on the next page. Next, drill a shallow 1/2" diameter hole near the base end of the leaf and epoxy a 2½" long by 1/2" diameter dowel into it. The stem (piece 6) is a small branch from a lilac bush in my backyard. Find a dry branch in your yard that's a little bigger than 1/2" in diameter. Now drill angled 1/2" holes in the top of the apple to hold the leaf and the stem. These hole positions are completely arbitrary, so do whatever you feel looks best. Shave one end of the stem to fit in the hole, but don't glue either piece to the apple just yet.

Finishing the Apple

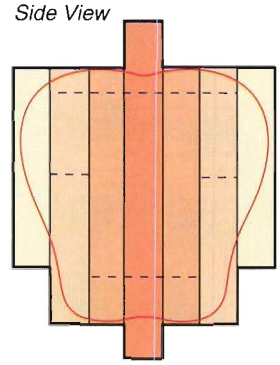
Coat the outside of the birdhouse, leaf and stem with a penetrating wood preservative to repel water and reduce the chance of mildew forming on the damp wood. Products for decks and outdoor furniture, like *General Finishes Outdoor Oil*, are perfect for the first soaking coat on the apple. Set the birdhouse aside for at least four days so the oil hardens and dries thoroughly.

High gloss enamel paint is the best weather resistant finish. It's harder than satin paint or any clear finish and tougher against the effects of ultraviolet light. I used spray paint, so I stuffed the entry hole with tissue before applying two coats of red to the apple, and painted the leaf a nice forest green.

Once all the parts are painted,



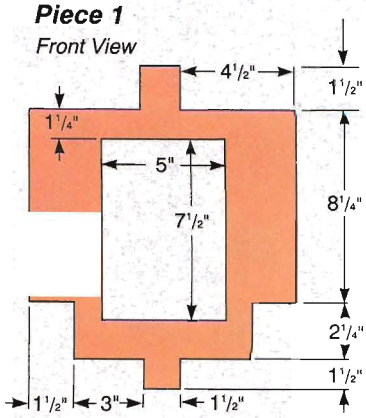
Side View



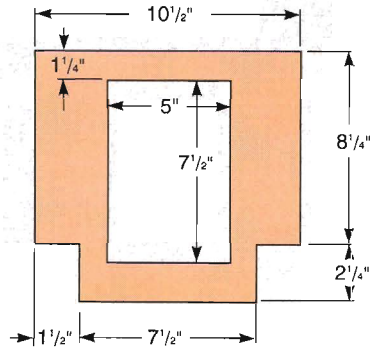
MATERIAL LIST

		T x W x L
1	Middle (1)	1½" x 10¼" x 13½" (Pine)
2	Body #1 (2)	1½" x 10¼" x 10½" (Pine)
3	Body #2 (2)	1½" x 10¼" x 10½" (Pine)
4	Outside (2)	1½" x 7½" x 8¼" (Pine)
5	Leaf (1)	1/4" x 4½" x 8" (Pine)
6	Stem (1)	3/4" x 3" (Branch)
7	Eyehook (1)	2" long (Brass)

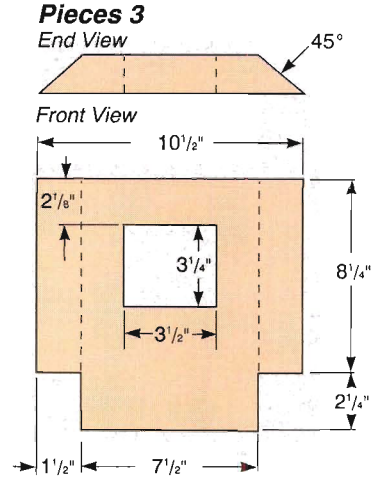
Piece 1
Front View



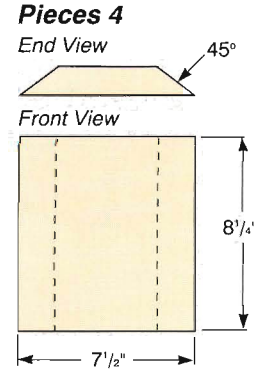
Pieces 2
Front View

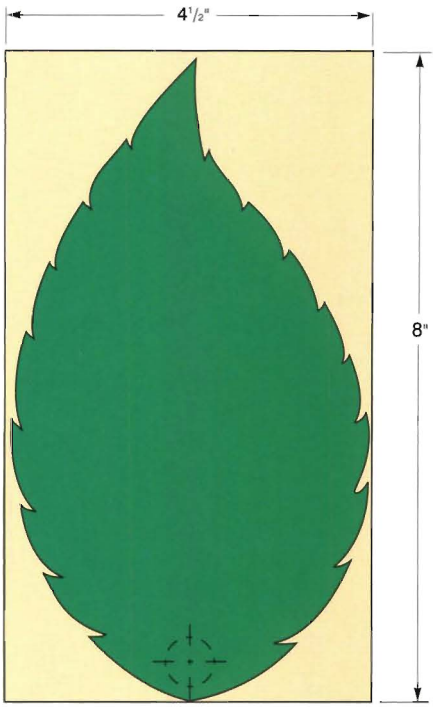


Pieces 3
End View
Front View



Pieces 4
End View
Front View





Make the leaf from 1/4" thick white oak and drill a 1/2" diameter by 1/8" deep hole at the mark near the base end in which to epoxy a dowel.

remove the bottom and squeeze a thin line of silicone caulk around the rim of the apple, then reattach the bottom. This will prevent any water from leaching into the birdhouse and prematurely rotting the wood. Now epoxy the leaf and stem into their holes on top of the birdhouse. Leave the completed birdhouse in the garage for a couple weeks to insure that all fumes from the paint are gone.

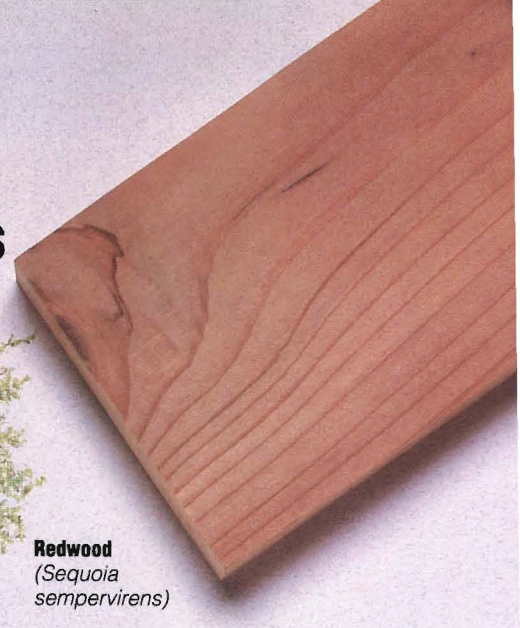
Experts advise that the best way to hang a birdhouse is with two strings, tying them from the eyehook to a tree limb so the house is eight to fifteen feet off the ground. Tying the strings about eighteen inches apart on the limb reduces the amount of sway. You should also be sure to turn the entry hole away from the prevailing winds and place the house in a shaded area. Doing all these things will surely make life much more comfortable for the feathered residents of your newly built backyard summer home.

Jeff Jacobson is the technical illustrator with Today's Woodworker and an avid woodturning enthusiast.

TODAY'S WOOD

Fungi Fighters

When building outdoor furniture you really have just two choices —you can paint most any wood and expect it to last for years, or you can build with species having high resistance to decay, such as redwood, cedar and cypress. Too often people choose ordinary woods for exterior use, finishing them in a penetrating oil, only to be disappointed when their project quickly deteriorates. If you have doubts, try a little experiment. Build two stools — one out of redwood and the other from birch —and set them outside. You'll soon notice the birch stool decaying while the other stool develops a beautiful patina. Why do some species resist decay while others go to pieces?



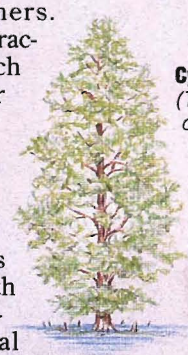
Redwood
(Sequoia sempervirens)

Cedar
(Thuja occidentalis)

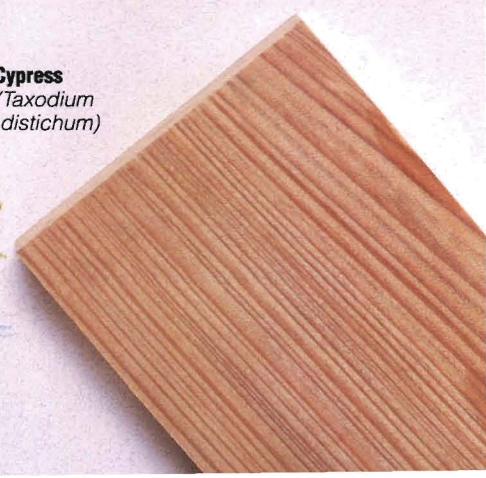
The answer is found deep in the wood cells where decay is caused by fungi spores, a simple form of plant life found virtually everywhere in our air and water. Fortunately, certain species are less hospitable hosts than others. These woods have unique extractives in their heartwood which are capable of repelling or killing fungi.

In the absence of these extractives, fungi quickly gets into the wood and actually dissolves the cell walls to begin the rotting process. As long as conditions for growth are present, fungi will continue destroying the internal structure of the wood. Necessary ingredients for fungi growth include a moderate temperature, oxygen and moisture. If any of these conditions aren't met, fungi growth will subside or stop altogether. In fact, some species avoid decay by repelling water, thus depriving fungi of one essential element for growth. It's important to remember that sapwood is generally more prone to decay, even in circumstances less favorable to fungi growth, because it lacks the fungi-fighting extractives found in heartwood.

Resistance to decay means, of course, that the process is slowed down. Unfortunately, it's never eliminated. All species differ in the type and concentration of their extractives, and this significantly influences their rates of decay. Some of the best decay resistant woods, such as teak and mahogany, are expensive and difficult to find. If you need a hardwood with reasonable exterior qualifications, white oak is a good choice. However, all woods eventually decay as their protective extractives weaken. The difference is that species like cypress, redwood and cedar last a generation, while most woods barely survive one season.



Cypress
(Taxodium distichum)



Handcrafting A Joiner's Mallet

One of the special joys of woodworking is creating your own hand tools.

By Chris Inman

A woodworker's mallet is a very personal tool. We learn their subtleties of weight and balance so that the slightest tap can accomplish just what we need from a chisel or carving gouge. After many years of service, with a handle darkened by sweat and glue and the scars of time, the mallet begins to feel like an extension of our hand.

Mallets purchased from a store do everything you expect of them in a practical way, but they lack an undefinable quality that's so evident in a handmade tool. Given the years of service that a mallet provides, the time it takes to make one is well worth the effort.

Among domestic wood species, maple is the best choice for a mallet. It's very hard and dense, so it withstands repeated blows against chisel handles. Many exotic species are even harder than maple, so they also work well for this application. Padauk, for example, is hard and stable and, because of its beauty, makes an excellent accent wood.

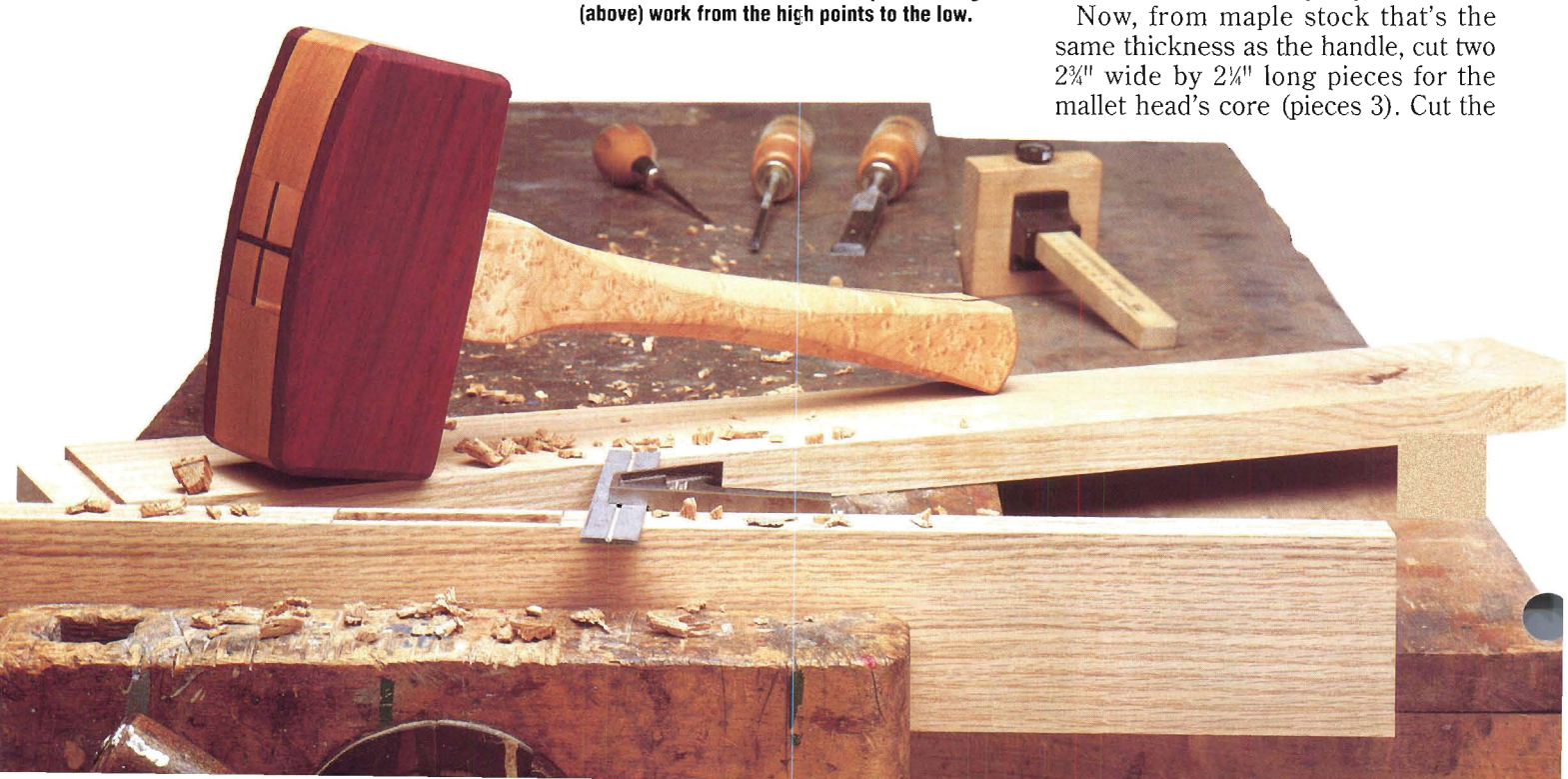
The mallet's head (pieces 3 and 4) is built around the end of the handle (pieces 1 and 2). Laminating the mallet in this way is much easier than trying to mortise a hole completely through the head, and still results in a very strong assembly.

To make the handle, glue the pieces of maple (pieces 1) to each side of the padauk strip (piece 2). If you have a little bird's eye maple around, use it to really make this a special piece. Padauk, as with many exotics, is an oily wood and sometimes doesn't bond well with yellow glue or hide glue. Therefore, just to be on the safe side, use epoxy to prevent any possibility of delamination due to oil in the padauk. Another advantage of epoxy is that it remains somewhat flexible after it's dried, giving the mallet more resiliency when delivering a heavy blow (glues that are brittle will crack with this kind of shock).

A comfortable handle is the key to a successful mallet. To reduce tearout while spokeshaving (above) work from the high points to the low.

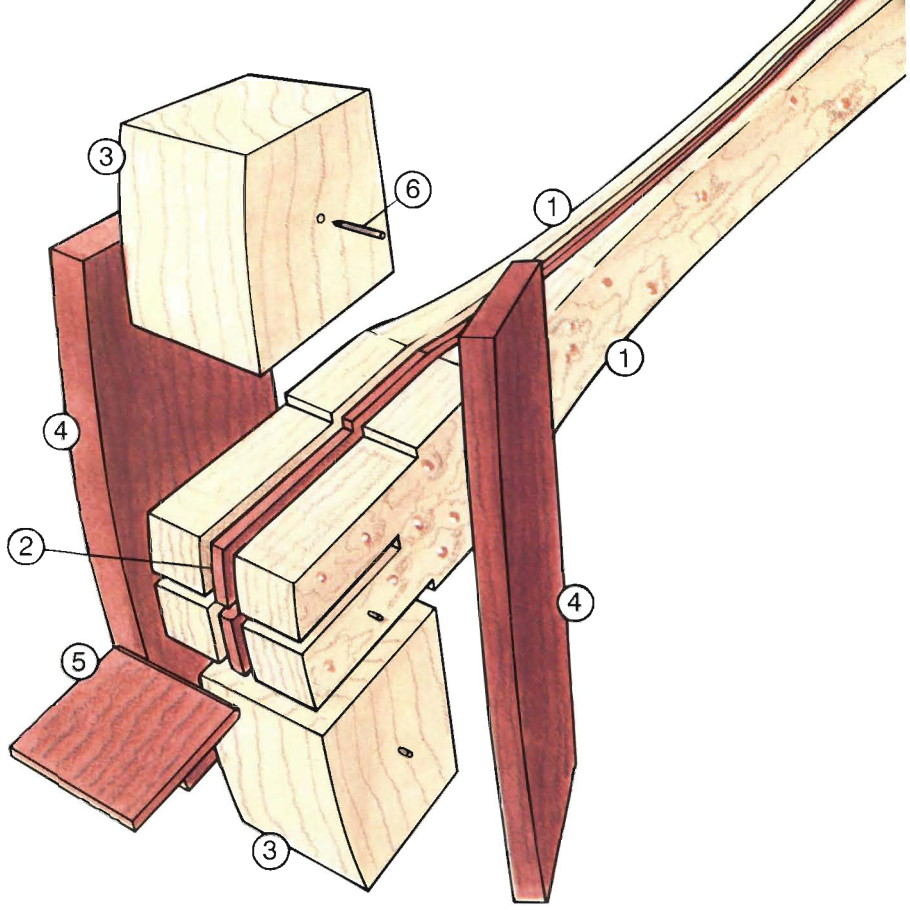
Once the glue dries, rip the handle to a width of 1¾", then layout the handle pattern shown on page 17. Next, cut a shoulder 2¾" from the top end of the handle to positively position the two core pieces (pieces 3) of the head during the final glue up. To do this, raise your tablesaw blade to 1/8", clamp a set up block to the rip fence and position it 2¾" from the far side of the blade. Pass the handle over the blade a number of times to cut the shoulder and complete the tenon. Clean up the saw marks on the tenon with a sharp 1" chisel, then use a bandsaw to cut the wedge kerf and shape the handle. Take a few strokes with a spokeshave to chamfer the grip until it fits comfortably in your hand.

Now, from maple stock that's the same thickness as the handle, cut two 2¾" wide by 2¼" long pieces for the mallet head's core (pieces 3). Cut the



MATERIAL LIST

	T x W x L
1 Maple Handle (2)	3/4" x 2" x 13⅛"
2 Padauk Strip (1)	1/8" x 2" x 13⅛"
3 Maple Cores (2)	1⅝" x 2¾" x 2¼"
4 Padauk Faces (2)	1/2" x 3" x 6"
5 Padauk Wedge (1)	1/8" x 1⅝" x 2"
6 Brads (6)	#17 - 1/2"



outside edge of each piece (the striking faces of the mallet) at a 3° angle.

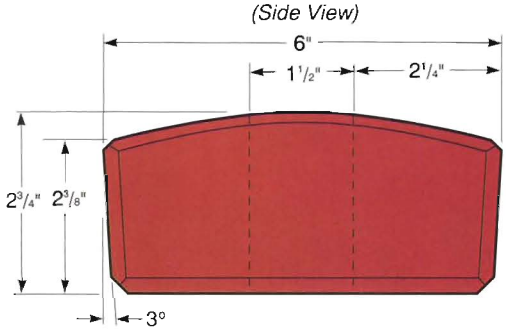
The padauk faces (pieces 4) measure 2¾" wide by 6" long and have ends cut at a 3° angle to match the core. From padauk scrap, also cut a 2" long by 1⅝" wide by 1/8" thick piece for the wedge (piece 5). Belt sand one end of the wedge to a blunt point so it will enter the kerf easily.

Assembling the mallet is a sloppy task given all the glue that's involved, especially when the pieces begin sliding around. But you can prevent the sliding by driving three small brads just slightly into each padauk face and then, using a wire cutter, cutting off the brad 1/8" above the surface. Press the core pieces and the handle into position on top of one padauk face, then press the second face on the other side of the head. The nails will indent the wood, preventing the pieces from slipping around when the glue is added.

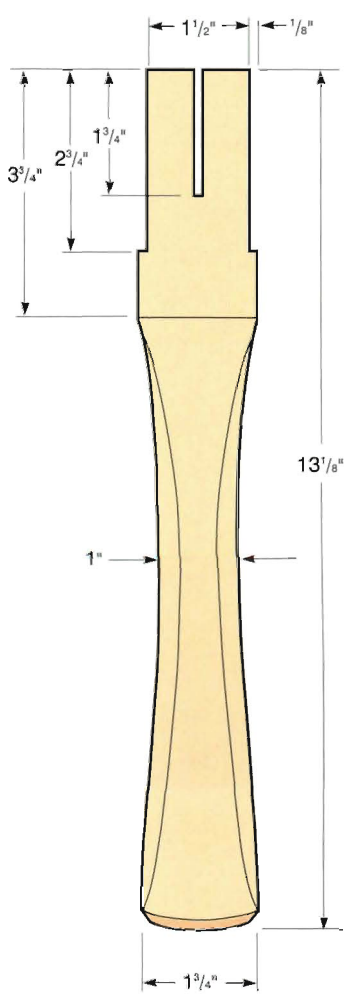
Now disassemble the mallet, spread epoxy on all the joining surfaces, and clamp the pieces back together. Be sure to adjust one clamp to lightly hold the maple core sections against the handle, but be careful not to clamp too tightly or you won't be able to insert the wedge. Put a little epoxy on the pointed end of the wedge and drive it into the top of the handle. You'll have plenty of squeeze out, so have a few damp rags ready for cleaning up the excess glue.

The next day, belt sand the pieces in the head lamination flush and scrape off any glue residue on the mallet. Bandsaw the curved top on the head and sand this cut smooth. Now use a block plane to chamfer all the long grain edges of the head and

Head
(Side View)



Handle
(Side View)



a chisel to chamfer the cross grain edges. Chamfer the end of the handle too. Use a palm sander with 100 grit paper to remove belt sander marks and ease all the corners. Once you're satisfied with the feel of the tool, apply two coats of a penetrating oil finish and you're ready to go to work.

You'll find that using a special mallet like this one adds to your enjoyment of woodworking and makes you appreciate even more the skills involved in our craft. Ten years from now, when you reach for this mallet after cutting hundreds or thousands of joints, you'll realize how profoundly these few hours in the shop have affected your work.

Chris Inman is the associate editor of Today's Woodworker magazine and a professional woodworker.

Music from the Woodshop

Building an Appalachian dulcimer is the perfect introduction to learning the luthier's art.

By Patrick Cherney

It's a commonly held belief that building a stringed instrument is a formidable task, only to be undertaken by a master luthier. However, with a few basic tools, building a beautifully voiced Appalachian teardrop dulcimer is certainly within everyone's reach.

Appalachian dulcimers are folk instruments native to the southeastern mountainous regions of the United States. They vary in size and shape, the number of strings, types of wood, and many construction details. In fact, there are nearly as many design variations as there are dulcimers —there really is no "right" way to build one. Making do with materials at hand was often the only available approach. Some very fine dulcimers were made of wood from old barn doors, strung with braided mule hair.

Selecting Your Material

I chose walnut for the body of the instrument, maple for the fingerboard and used ebony for the frets (I salvaged the ebony from an old piano). The body of the instrument is 1/8" thick walnut, which is available through mail order companies if you don't have a thickness planer. 1/8" thick, A2 grade veneer core plywood could also be used. Guitar machine tuners range in price from $8.00 to upwards of $180.00 per set. These, along with strings, picks, and an assortment of instruction books can be found at your local music store. In the tradition of mountain dulcimer makers, I made the string anchors from a piece of braising rod, after removing the flux with a wire brush —"making do".

Once you've gotten all the material cut to the sizes specified in the material list, you can begin building your dulcimer. You should note that, before any assembly, I sand and polish the parts starting with 150 grit sandpaper and working up to 600 grit silicon carbide paper without using lubricants.

Start with the Body

Begin building the dulcimer by cutting the angled slots in the neck and bottom blocks (pieces 1 and 2). Start with pieces longer than the finished blocks to make the slot cutting operation safer, then cut them to length later. Use a good crosscutting blade that leaves a 1/8" kerf.

For the slots in the bottom block, set the blade at a 30° angle and raise it to a height of 1⅛" (**See Figure 1**). Clamp the rip fence 1/32" from the blade and cut two kerfs in the block. Now clamp the fence 1⅞" away from the blade, flip the block over and cut off the upper corners at the same 30° angle. To cut the slots in the neck block, set the blade at a 5° angle and 3/4" high. Reset the fence 1/32" from the blade and cut the slots, as you did earlier. Check the fit of the ribs (pieces 3) in the slots and, if they're loose, make very thin wedges about 3/4" long and 1½" wide to take up the slop. Don't force the wedges too tight or you may split the

The dulcimer is the perfect introduction to the world of music because it's such a simple instrument to play and so easy to make.

If ever there was a true American melting pot instrument, the Appalachian dulcimer qualifies. It was born of many cultures as settlers reached back to recreate the sound of stringed instruments from the old countries. Overshadowed by fiddles and banjos in the first half of this century, dulcimers became an "endangered species" for a time, but fortunately, they were rediscovered during the folk music revival of the 60s.

block. Use yellow glue to secure the ribs into the bottom block, then bend the ribs and carefully glue them into the neck block.

Next, trace the rib and block assembly onto the back (piece 4) holding the pencil vertically against the rib as shown in **Figure 2**.

Since the pencil point is offset about 3/16" from the rib you'll end up with a nice reveal. However, you don't want an overhang where the back butts against the neck (piece 12), so lay out this line flush with the top of the neck block. Cut out the back on a bandsaw and sand all the edges except the neck end round. Now glue the rib and block assembly to the back, using some heavy books or lumber for clamping weight.

When the glue dries, begin the process of reinforcing the dulcimer with braces fitted internally on the back. Start with a 1/4" x 1/2" x 24" piece of pine (piece 5) and lay it across the dulcimer body about 5 inches from the bottom block. Mark the length and angle of the cuts using the upper inside edge of the ribs as guides (**See Figure 3**). Cut the brace to length and divide the piece in thirds. Now use a pocket knife to taper the two outer thirds from 1/2" in the middle down to 1/8" at the ends. Leave the center third 1/2" wide. Make three more braces in the same manner, spacing all the braces five inches apart. Glue the four braces in place using weight to press the joints tightly together (any gaps occuring between the braces and back will adversely affect the sound quality of the instrument). At this time add nine evenly spaced glue blocks (pieces 6) along each joint where the back meets the ribs. Press each glue block into place and rub it back and forth until the glue tack holds it firmly.

Upper glue blocks are installed in much the same way, but hold a flat piece of scrap across the body to ensure that the blocks are flush with the top edges of the ribs. To make sure that everything is flush along the top edge, glue a sheet of 120 grit sandpaper to a 4" x 11" piece of scrapwood and rub it across the top of the ribs and blocks to level all the surfaces.

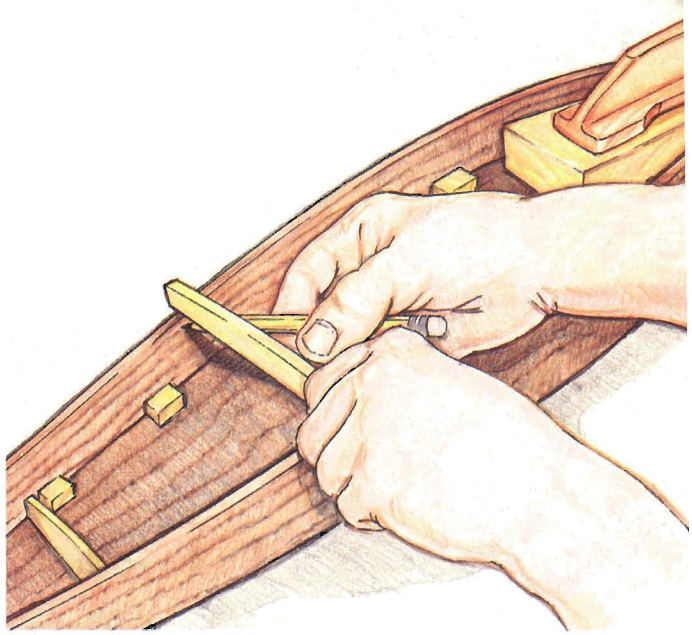


Figure 3: For a perfect fit hold each brace above its installed position to mark the small angle where it meets the ribs. Glue the braces in place using plenty of weight to hold them down.

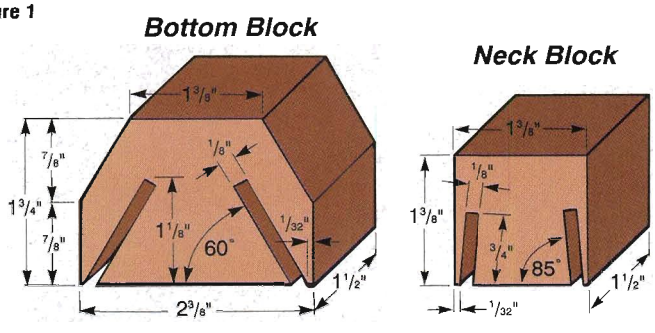
Constructing the Belly

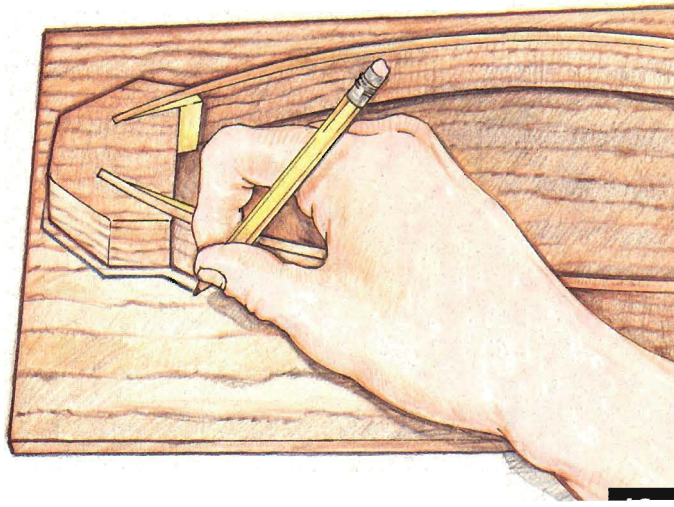
With the dulcimer body now beginning to take shape, you can turn your attention to making the top, or belly. Before anything else, the first step is to joint the inside edges on the two belly sides (pieces 7). Now set them exactly 3/4" apart on your bench and carefully trace on the shape of the back. Cut the top curves on a bandsaw and sand the edges round, just as you did earlier on the back.

The two halves of the top are joined

Figure 2: Set the rib and block assembly on a piece of 1/8" thick walnut stock and carefully trace around it with a pencil, holding the shaft of the pencil flush against the ribs to create the back's reveal.

Figure 1





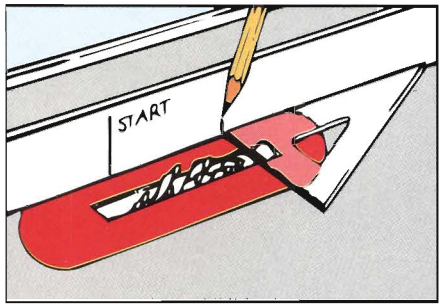


Figure 4: Raise the dado 1/2" to mark the start and stop points on the fence, then begin relieving the fingerboard with the starting marks aligned.

at the ends with short belly spacers (pieces 8), which create a long gap in the top of the dulcimer. This gap is important for your new instrument as it allows the body to vibrate more freely, giving the dulcimer the bright sound that makes it so unique. Make the belly spacers by jointing one edge on a piece of 1/8" thick walnut scrap and ripping it 3/4" wide. Now cut two pieces 2" long and set them between the belly halves.

Center the fingerboard blank (piece 9) on top of the four belly pieces and carefully draw your two sound holes. You can make them any shape you want; just keep in mind that to get the right sound, they should not be any wider than an inch. In addition, be sure you don't get too close to the edges of the top and stay between the braces. Now drill a 1/4" hole into the waste area of the sound holes so you can thread a coping saw blade through the walnut. Attach the coping saw frame to the blade and cut the sound holes. As much as possible, try keeping the top pieces supported by a table during these cuts. Sand and polish the sound hole edges smooth, but don't round them. Once the sound holes are finished, glue the belly halves and the two spacers together. Span the joints with tape to clamp the pieces while the glue sets.

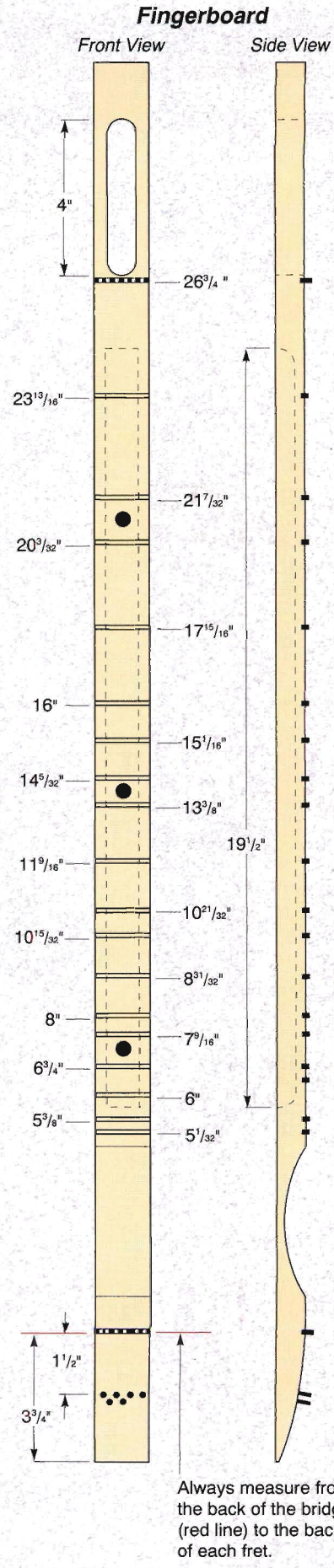
Make the Fingerboard

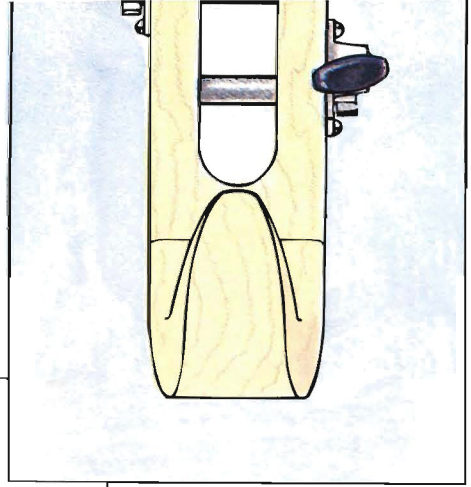
The fingerboard (piece 9) is made of hard rock maple for durability and for contrast against the walnut. To help transmit vibrations into the dulcimer's body, the underside of the fingerboard is relieved to a depth of 1/2". Install a 3/4" wide dado blade in your tablesaw and raise it 1/2". Now set the rip fence 11/16" from the center of the blade. The relief groove is stopped at both ends, so mark the rip fence to show the entrance and exit points of the blade (**See Figure 4**) and mark the fingerboard to show the ends of the groove. Now lower the blade to 1/4" and drop cut the first pass through the maple, starting and stopping the cut when the lines on the fingerboard are even with the lines on the fence. Make a second pass with the blade raised to a 1/2" to complete the operation.

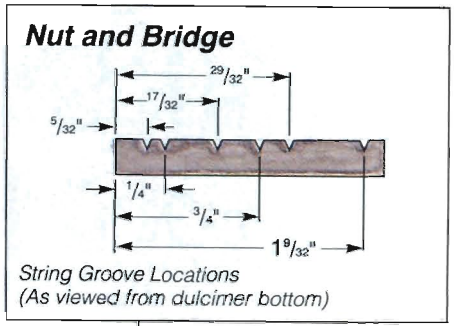
Layout the fingerboard's fret pattern by drawing lines on both sides of each groove location, the peg channel and the strum hollow, as shown at right. Before cutting out the peg channel, drill four 1/4" diameter by 1 3/16" deep holes for the machine tuners, alternating them from the left and right. These are the requirements for the tuners I used, however, please be sure to check your hardware specifications as it may require different hole sizes or drilling positions. Make the 4" long peg channel by drilling 5/8" diameter holes at each end of the layout and connecting the holes with coping saw cuts. File and sand the opening smooth.

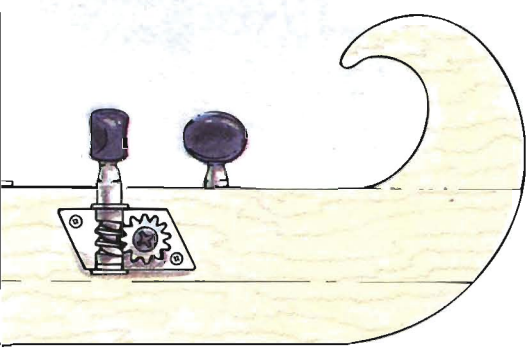
Saw out the concave strum hollow and taper the end of the fingerboard on a bandsaw, then smooth the ridges with a drum sander. Cut the 1/8" deep grooves that hold the frets, nut and bridge on your tablesaw, using a very fine toothed crosscutting blade that leaves a 1/8" kerf. Make each cut between the fret location lines you drew earlier. Take your time here to make sure all the grooves are accurately spaced and cut.

The three reference points are made with ebony violin pegs that you can purchase at most musical instrument stores. Drill 5/16" holes at the points indicated in the fingerboard elevation drawing at right, and glue



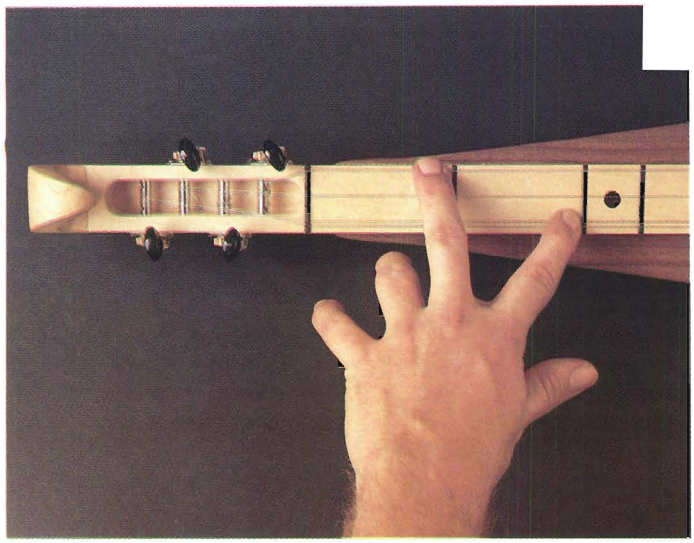




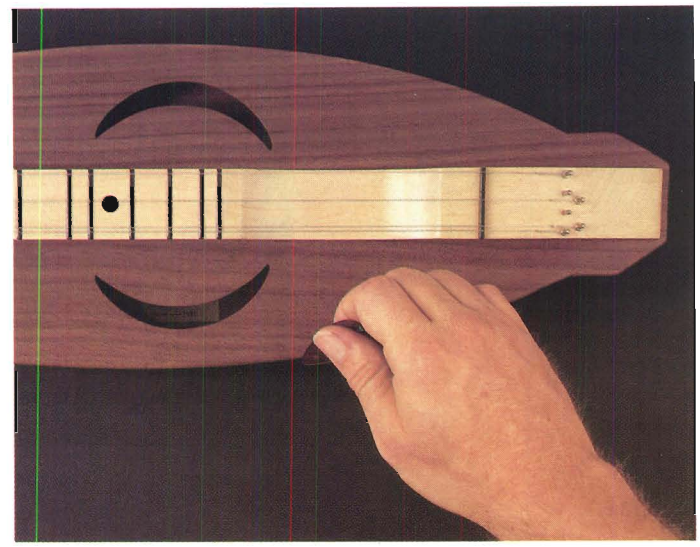


MATERIAL LIST

	T x W x L		T x W x L
1 Bottom Block (1)	1½" x 1¾" x 2⅜" (Walnut)	9 Fingerboard (1)	3/4" x 1⅜" x 36" (Maple)
2 Neck Block (1)	1½" x 1⅜" x 1⅜" (Walnut)	10 Frets (18)	1/8" x 1/4" x 1⅜" (Recycled Ebony)
3 Ribs (2)	1/8" x 1½" x 29¼" (Walnut)	11 String Anchors (6)	1/8" x 3/4" (Brass Rod)
4 Back (1)	1/8" x 6½" x 31" (Walnut)	12 Neck (1)	1⅜" x 1¾" x 6" (Maple)
5 Back Braces (4)	1/4" x 1/2" x 20" (Pine)	13 Scroll (1)	1⅜" x 1⅝" x 1⅝"(Maple)
6 Glue Blocks (36)	1/4" x 1/4" x 1/2" (Pine)	14 Nut & Bridge (2)	1/8" x 3/8" x 1⅜" (Ebony)
7 Belly (2)	1/8" x 3" x 31" (Walnut)	15 Machine Tuners (4)	available at music stores
8 Belly Spacers (2)	1/8" x 3/4" x 2" (Walnut)	16 Strings (4)	13 gauge (3); 20 gauge (1)



Once you've completed your dulcimer, find a friend who plays guitar or violin and have them help you tune it. The index finger of the left hand can be used to play a melody on the first string, or you can form chords, as shown above.



The right hand is used to strum the instrument. You'll find dulcimer picks at your local music store. Hold them softly as you strum all four strings in a rhythmic motion. As you gain experience, try a little finger picking as well.

the pegs in place. Cut off as much of the extra pegs sticking out of the fingerboard as possible with an offset dovetail saw. Sand the pegs flush with the top of the fingerboard and take some time now to sand and polish the entire piece.

Cut the frets (pieces 10) to fit tightly into the grooves and glue them in place. Use the sandpaper board you made earlier to level the frets at a uniform height of 1/32". Now protect the fingerboard with masking tape on either side of each fret and round the top edges with fine files and sandpaper. Cut the ends of the frets even with the sides of the fingerboard, and use a fine mill file to bevel the ends at a slight angle.

String Anchors

The string anchors (pieces 11) are made from a length of 1/8" diameter brass brazing rod, which can be purchased at a welding supply or well stocked hardware store. Remove the white flux compound with a wire wheel and polish the rod with very fine sandpaper. Next, cut six 3/4" long pieces from the rod and file the tips to a rounded profile.

Now, at a ten degree angle from the slope of the fingerboard, drill four 1/8" diameter by 3/8" deep holes for the string anchors. Evenly space the holes across the fingerboard, 1½" beyond the groove you made for the bridge. Drill another two holes 1⅞" beyond the bridge (see elevation drawing on page 20). Now tap the string anchors into the holes, leaving 3/8" protruding.

Scroll and Neck

Lay the fingerboard on the dulcimer body so its tapered end is flush with the outside edge of the bottom block. Now draw a line on the underside of the fingerboard at the outside edge of the neck block. Position the neck blank (piece 12) up to this line and glue it to the fingerboard. Align the scroll blank (piece 13) with the end of the fingerboard and glue it in place. Lay out the shapes for these two pieces (see exploded view on page 21) and cut them with a coping saw or scroll saw. Since both of these pieces serve decorative functions, this is a nice place to add your own customized touch to your instrument. Feel free to "express yourself" with the design, particularly with the scroll. Once the pieces are cut to shape, blend them together with files and sandpaper.

Nut and Bridge

Put the nut (piece 14) into its slot near the peg channel and lay a penny up against it. Use the penny as a spacer to set the depth of cut for the string notches. Rest the point of a pencil on the penny and glide the two along the nut to make an even line. This line indicates the bottom of the string notches. For the bridge do the same thing, using three pennies in a stack. Now remove the nut and bridge from the dulcimer and clamp them in a vise to layout the string spacing (see elevation detail on page 21). Use a fine three corner file to notch the pieces to the lines, then sand the top edge so the notches are about 1/32" deep.

Final Assembly

Glue the fingerboard assembly to the belly halves, belly spacers and neck block, using weights to hold it in place. Blend in the edges of the top and back where they meet the neck, then sand and polish the entire dulcimer. Apply the varnish (not a penetrating oil) of your choice, following the manufacturer's instructions. When the finish has thoroughly dried, install the tuners and the strings. Strings may be installed two different ways. The most common is to place the first and the second string 3/32" apart with the others spaced evenly across the fingerboard. The alternative is to place all four strings an equal distance apart.

For dulcimers, there are many tunings, all of which are correct. I tune the first three strings to A below middle C on the piano, and the fourth string to F below middle C. The first two strings are fingered as one, and the other two are usually left open and strummed as drones.

The word dulcimer is a combination of the Latin "dulce" meaning sweet, and the Greek "melos", which means song (or melody). Most musicians agree that the dulcimer is one of the easiest of all stringed instruments for beginners to play, and I think you'll find that it's one of the most pleasant sounding instruments you've ever heard. "Sweet melody" just about describes it.

Patrick Cherney is a woodworker and luthier who specializes in stringed instrument repair.

Choosing An Exterior Finish

By Jerry T. TerHark

It's time to think about finishing that deck furniture you've been building all winter in the basement. First, get it out of your shop to a well ventilated area. Hopefully you can do this. I have a friend who built a boat in his basement and, come spring, was stuck with a project too large for his doorway. He still insists that he wanted a larger door to his shop anyway.

I'm often asked about finishes for outdoor furniture, and most people want to know which type of clear finish lasts the longest. The answer really begins with knowing what contributes to early failure of a finish. The three principal causes are sunlight, moisture, and poorly choosing and applying materials.

Natural finishes are less durable than paint, which usually lasts three to four years. Clear finishes, on the other hand, must be renewed annually, and some need recoating every six months. The message is, don't expect clear finishes to wear like paint.

Sunlight is the ever present enemy of a finish. In the first stage of a finishes life, sunlight provides a valuable service. The resins in varnish and paint polymerize (join together molecularly) in the presence of heat, air, and sunlight to form solid films. This is how finishes dry. The problem is that polymerization continues long after a finish feels dry, resulting in an ever hardening, increasingly brittle film. This brittleness makes the film less tolerant to dimensional changes taking place in the wood, leading to a cracked and flaking finish.

The influence of sunlight on paint is not nearly so great as with clear coatings because the pigment particles in paint prevent most of the destructive light from reaching the resin. The embrittlement process in paint is, therefore, extended over a longer period of time. Because the pigment limits the amount of light reaching the resins, paint also slows structural changes in the wood more than any clear finish.

Moisture represents the next offender, contributing both to finish breakdown and wood damage. Water penetrates under the coating, usually through hard-to-seal end grain, promoting the formation of blue stain and mold. This results in an unsightly appearance. The effect of water-saturated wood on a clear finish is equally disastrous. The coating loses its adhesion and peels, leaving exposed wood where more water can enter, continuing the deterioration process.

The Solutions

Older varnishes, as they disintegrated over a prolonged time span, developed a very fine crazing pattern, followed by an even finer crumbling stage. This took a very long time and kept the finish intact throughout most of the aging process. On the other hand, modern synthetic varnishes generally remain free from crazing and stay glossy much longer than the old products, but tend to crack, curl and scale badly as they deteriorate. Unfortunately the old varnishes aren't available today, although marine spar varnish, intended for use on boats, is about the closest equivalent.

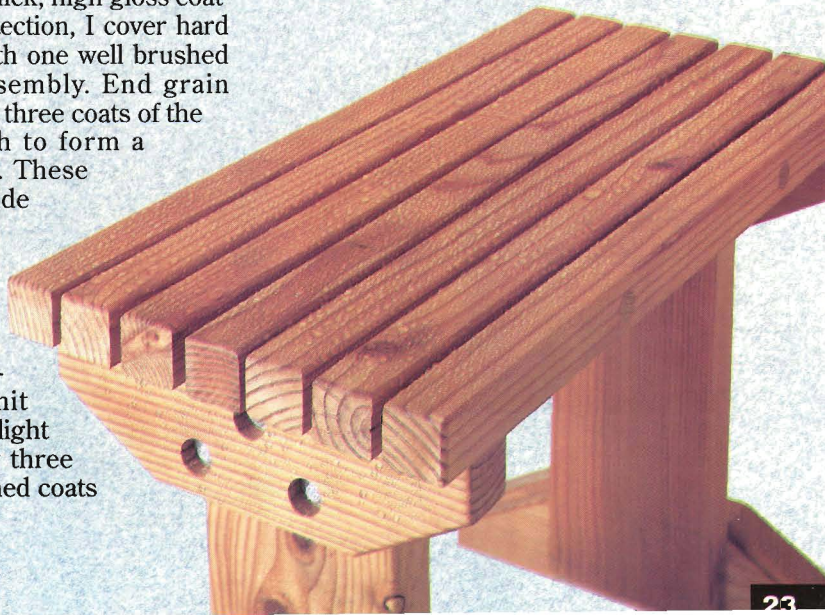
My choices of clear finish are either marine spar varnish or a high quality penetrating finish that builds to at least a thin film. Spar varnish covers the wood with a thick, high gloss coating. For best protection, I cover hard to reach areas with one well brushed coat prior to assembly. End grain areas need two or three coats of the varnish (enough to form a continuous film). These precautions provide the best protection from failures caused by moisture seeping under the varnish film. To limit the effects of sunlight you should apply three or four well brushed coats of spar varnish, allowing plenty of drying time between each coat.

Many finishers suggest using a penetrating oil finish. These are easy to apply but give little protection against dings and dents, and they degrade quickly, although refinishing is simply a matter of applying another coat. You'll have to sand the surface slightly to remove any dirt or grime first, but this is a lot easier than stripping the whole piece. Another drawback is that penetrating finishes don't protect you from slivers either.

The look of a penetrating oil is very appealing and, if you're willing to live with their limitations, they can make for a good finish. One brand that I particularly like is *Clear Wood Finish* because it develops a surface film with the clarity of a natural finish. Remember to recoat the project annually, and it will hold up best if kept away from harsh direct sunlight.

Before applying any finish, make sure the wood is good and dry —wood that is too wet will not let the finish adhere the way it should. Finally remember to finish a piece on all surfaces so that water will not penetrate.

Jerry TerHark lectures nationwide on wood finishing and heads the Dakota County Technical College's wood finishing program.



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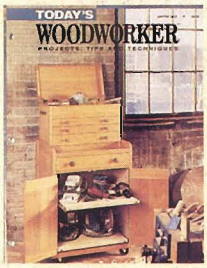

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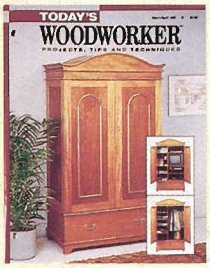

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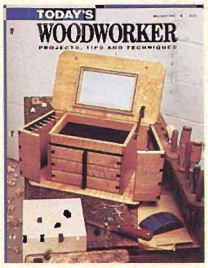

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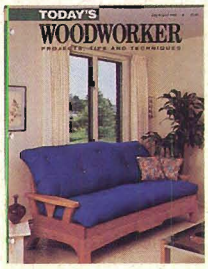

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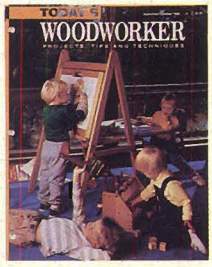
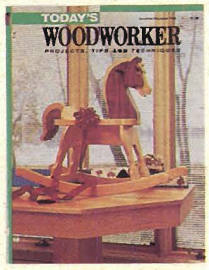


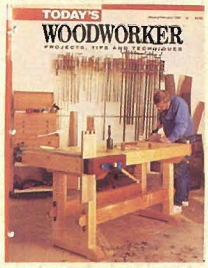
An easel, children's activity center, folding footrest, model airplane and framing with inlay and more.
Issue 5 .....$3.95

6



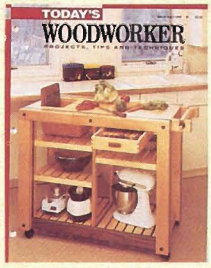
Modern pedestal table, a classic rocking horse, holiday ornaments and mixing your own finishes.
Issue 6 .....$3.95

7



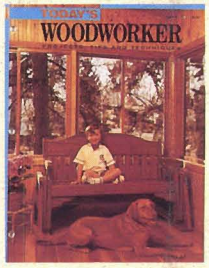
A European style workbench, turned stamp holders, heart-shaped bandsaw box and a breakfast tray
Issue 7.....$3.95

8



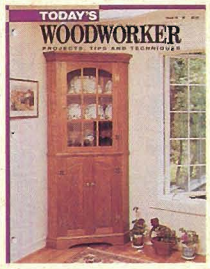
The kitchen work station, Shaker candlestand table, baker's rolling pin, a step stool and more.
Issue 8 .....$3.95

9



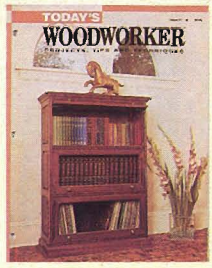
A porch glider for two, continuous grain box, Chippendale mirror frame, shellac repairs and spoon carving.
Issue 9 .....$3.95

10



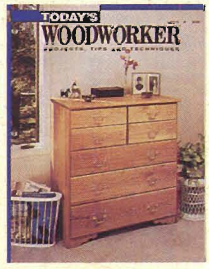
Classic corner cabinet, a bent lamination fishing net, a white oak trivet using a scrollsaw and more.
Issue 10.....$3.95

11



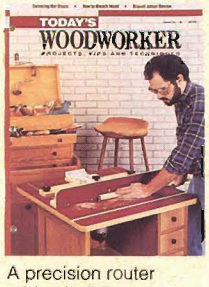
A stately barrister's bookcase, spinning string tops, a kid's step stool and an inlay banded desk tray.
Issue 11 .....$3.95

12



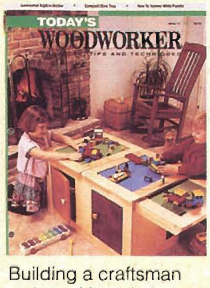
Uncomplicated butternut bureau, a Shaker inspired swivel mirror, and deep-reach hand screw clamps.
Issue 12.....$3.95

13



A precision router table, building a set of swiveling bar stools and tips on buying a new biscuit joiner.
Issue 13 .....$3.95

14



Building a craftsman style rocking chair, a brightly colored toybox, and a nifty compact disc holder.
Issue 14 .....$3.95

To order back issues, binders or Craftplans™, please use the order form on page 12.

NEXT ISSUE:

The July/August 1991 issue will feature a beautiful maple and padauk bed and a coffee table constructed with bandsawn dovetails. Don't forget, we want to show your best work, so send us your Reader's Gallery photos.