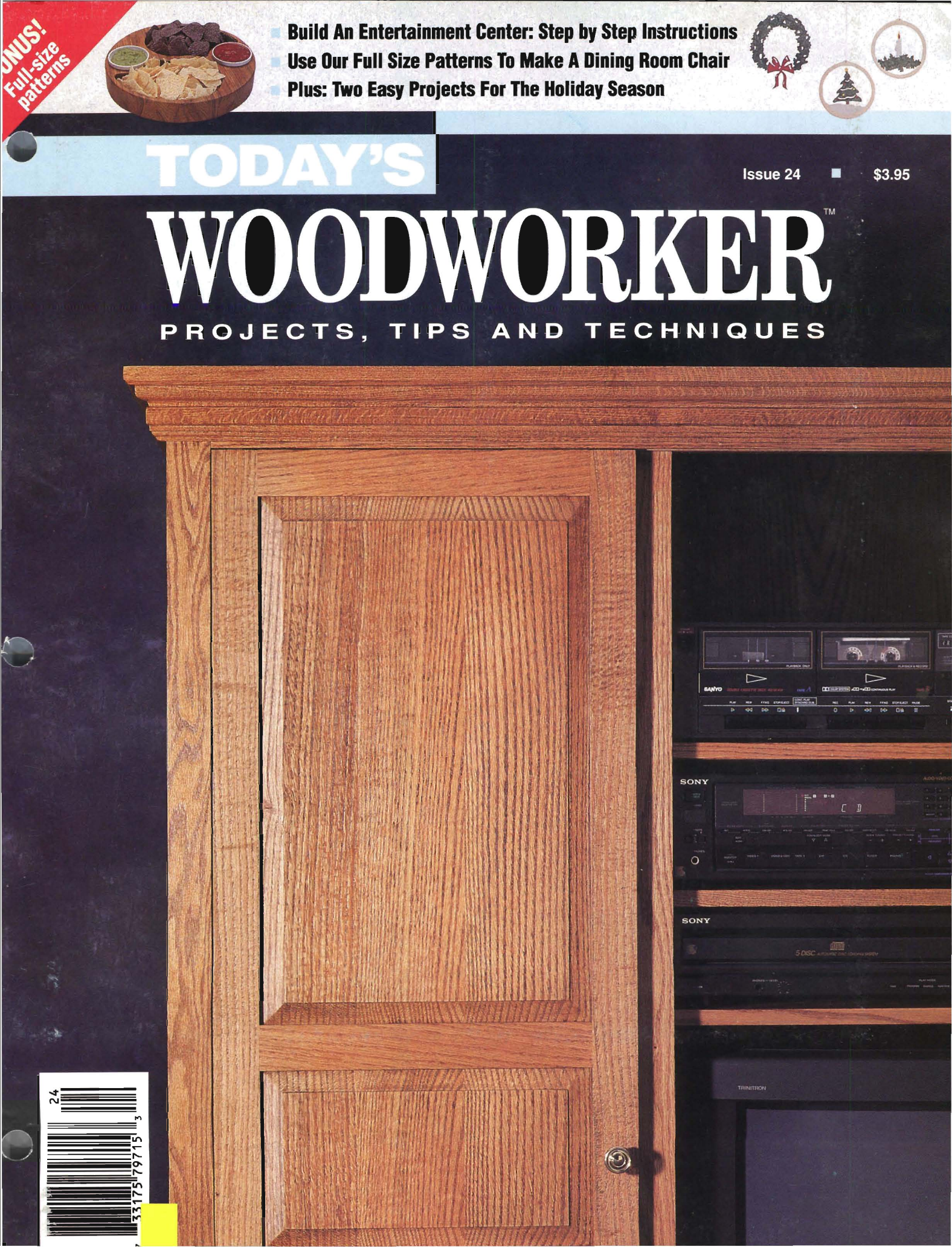
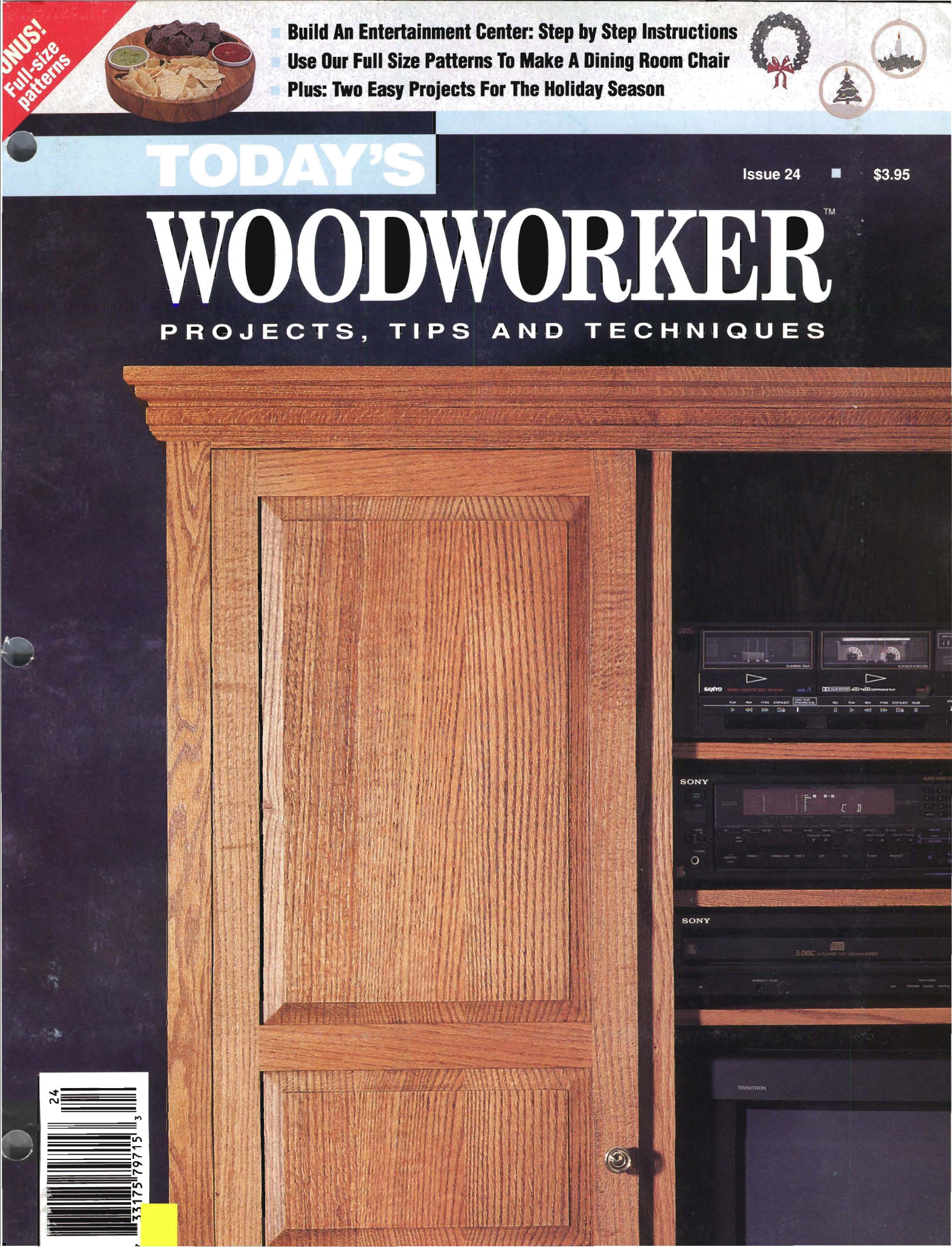
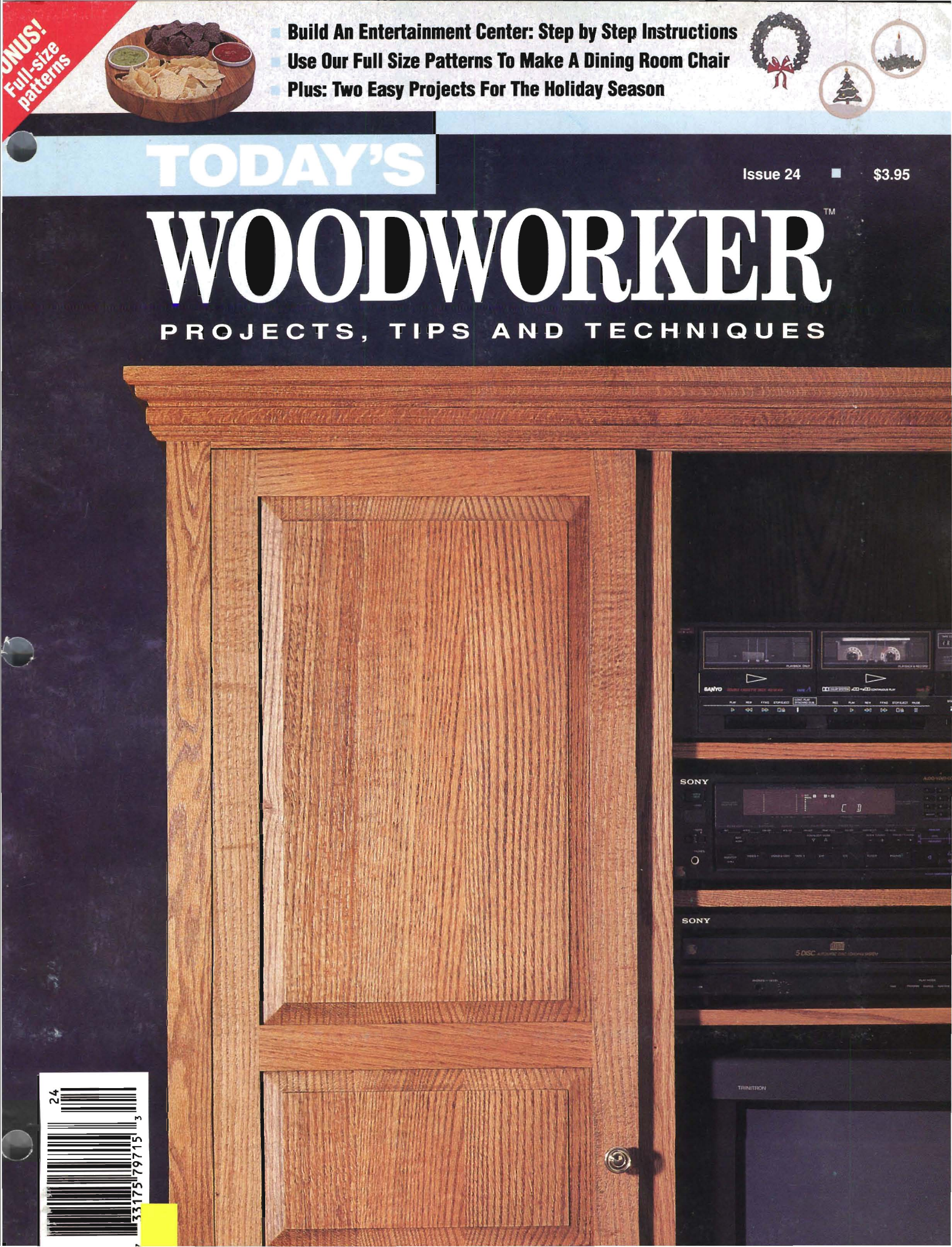




BONUS!
Full-size
patterns

- **Build An Entertainment Center: Step by Step Instructions**
- **Use Our Full Size Patterns To Make A Dining Room Chair**
- **Plus: Two Easy Projects For The Holiday Season**

TODAY'S

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PROJECTS, TIPS AND TECHNIQUES

Issue 24 ■ \$3.95

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TODAY'S WOODWORKER™

PROJECTS, TIPS AND TECHNIQUES



8 Cherry Dining Chair

By Chris Inman

As promised, here's the perfect chair to compliment the extension table featured in the September issue.

22 Holly Ornaments

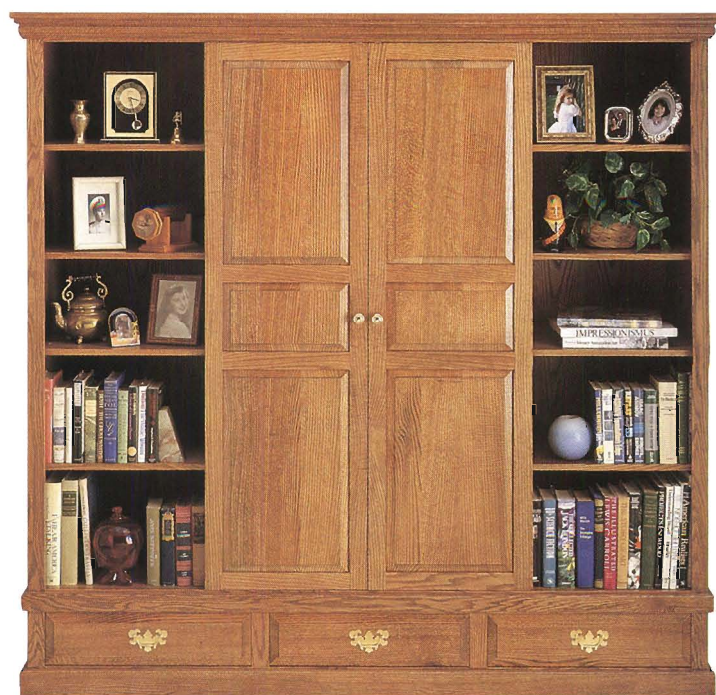
By David Larsen

Warm up the scroll saw. Six easy to make tree ornaments are featured in this issue's full size pattern insert.

20 The Chip and Dip Serving Tray

By Larry Stoiaken

Glue up a blank on Friday night and you'll be wrapping this great last minute gift by Saturday afternoon.



13 Entertainment Center for Two

By Rick White

Where's the TV? Where's the stereo system? Don't worry, this project was designed to have two distinct personalities.

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How you've helped us define the mission of the magazine.

4 Tricks of the Trade

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6 Techniques

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23 Finishing Thoughts

A safety check on shop solvents.

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.

LARRY N. STOIAKEN
Editor in Chief

JOHN KELLIHER
Art Director

CHRISTOPHER A. INMAN
Executive Editor

STEVE HINDERAKER
Associate Art Director

NANCY A. GREGORY
Production Manager

JEFF JACOBSON
Technical Illustrator

GORDON HANSON
Copy Editor

DAN JACOBSON
Project Designer

ANN ROCKLER JACKSON
Publisher

JIM EBNER
Director of Marketing

DEB HOLM
Circulation Coordinator

NORTON ROCKLER
RICK WHITE
STEVE KROHMER
Editorial Advisors

HUGH FOSTER
BRUCE KIEFFER
JERRY T. TERHARK
Contributing Editors

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ON THE LEVEL

4th Anniversary Issue!

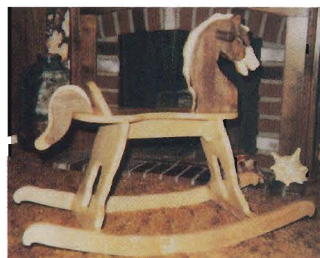
Can it be? Four years old already? With this issue, Today's Woodworker completes another year of publishing. All of us here would like to extend our heartfelt thanks to you, our readers, for your continuing support and guidance. As is the case in woodworking, producing a magazine and getting the final product just right requires a fair share of patience and experimentation. To that end, after every issue we send out a large number of surveys and carefully pour over the responses. The Calendar, Gallery and Yesterday's Woodworker all bit the dust as a result of your comments on these surveys, making more room for what has been clearly defined as our mission; more projects, more tips and more techniques.

This issue features the project that has been the most requested on our surveys, the Entertainment Center. As we held our meetings to fine tune the design of Rick's project, art director John Kelliher made the point that sharing

some of the options we were considering on this project might be very helpful to readers. That's what's behind **Design Options**, the new department in this issue. If anything has become clear from our surveys it's that readers (*like Don and Joseph; see photos below*) like to take our basic designs and modify them to their own taste or space requirements. Please take a moment to drop us a line on this department idea and let us know if you'd like to see more in the future.

Congratulations to executive editor Chris Inman and contributing editor Bruce Kieffer, who both won awards at this year's Northern Woods exhibition of woodworking. Chris entered the bed he made for issue 16 while Bruce entered a beautiful cedar strip canoe.

The holidays will soon be upon us. Please remember that if you run out of time in the shop a gift subscription to Today's Woodworker will be appreciated by any woodworkers on your list.



Lonesome Dovetail, by Don Place of Columbus, Ohio. "My granddaughter Melissa loves it!"



Step Stools by Joseph Pleban of Naples, Florida. "I liked the design so well I made two!"

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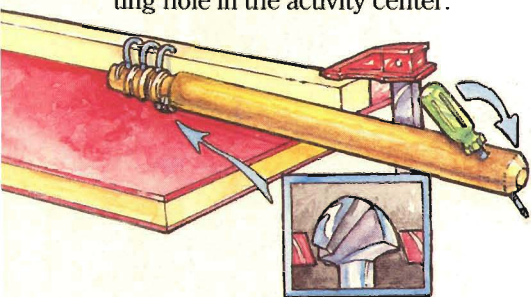
Activity Center Twist

About a year and a half ago my daughter-in-law surprised us with a ten pounder. When I babysat the little guy I noticed that he likes going around the house beating on things, and remembered the activity center in your September 1989 issue. I used scraps of walnut and maple for the project, but when it came to turning threads on the screw I balked. The best price I could find for the tap and die set was 40 big ones.



Remove top of plunger.

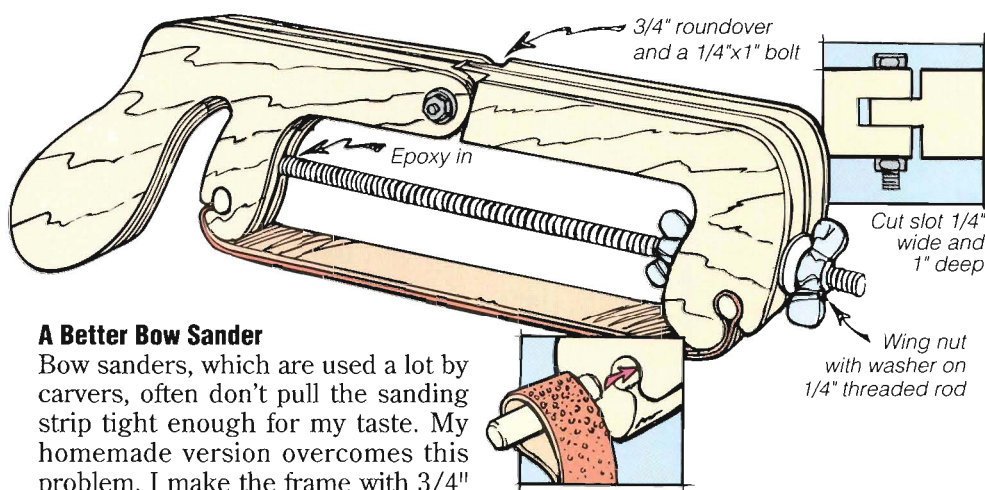
Here's what I did, and I'm quite proud of my solution. I went out and bought a plunger for \$1.75. Then I cut off the threaded portion of the rubber part and glued it in a snug fitting hole in the activity center.



To lengthen the threaded area on the handle, I created a little jig for the router. I took a piece of 1x4 and clamped it to my router table after driving three 6d finishing nails and giving them a slight bend to fit in the existing handle threads. I then drilled a hole near the end of the handle, and stuck a small screwdriver in to make it easy to turn. I used a 3/16" core box router bit that fit in the threads and turned the handle until I had about 4" of threads. This method worked great and I still have my 40 bucks.

James A. Johnson
Brunswick, Ohio

Ingenious Homemade Tools



A Better Bow Sander

Bow sanders, which are used a lot by carvers, often don't pull the sanding strip tight enough for my taste. My homemade version overcomes this problem. I make the frame with 3/4" plywood and use a 1/4" diameter threaded rod for my tensioning device. For the sanding strip, I take a 3" x 21" sanding belt, make a small cut 1" in from the edge, and rip the outside 1" from the belt. Then I wrap each end around a 1/4" dowel, place them in the frame holes and simply turn the thumbscrews on the tensioning rod to get the sanding strip as tight as I want.

John E. Rynbrandt
Zeeland, Michigan

Dowel Hole Digger

The hardest part of repairing furniture with broken dowel joints is removing the old dowels. Sometimes I just cut them flush and drill new holes, but often the remaining piece comes out while drilling, creating another problem. Digging out the dowel with a chisel only succeeds in messing up the hole.

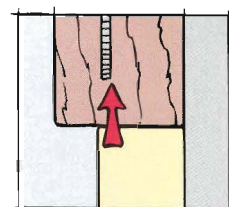
My solution is to grind the sharp corners off the cheapest 1/4" chisel I can find, making it roughly elliptical for about 1 1/2" back from the cutting edge. This tool can excavate even the most difficult dowels as long as they are 5/16" in diameter or larger. To use this tool, drill a quarter inch hole in the center of the broken dowel and dig vigorously until you've removed the rest of the waste. After using this custom chisel a couple of times, you'll be convinced that simple ideas really are the best of all.

Bill Flemming
Beaver Dam, Wisconsin

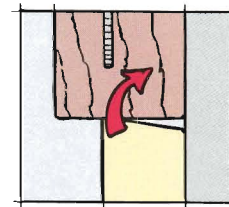
Understanding Push Rod Physics

When ripping wood on a table or radial arm saw, a push rod that matches the width of the cut makes the operation much safer. The force you apply with a narrow push stick and the opposite force from the spin-

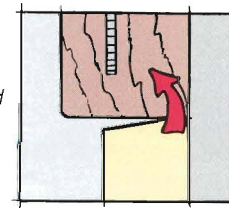
Sizing your push stick to the width of the cut will make for a safer rip.



Better yet, add a slight bevel to help keep your board against the fence.



But watch the bevel's direction or you'll force the board away from the fence.



ning blade tend to twist the wood away from the fence. An easy way to avoid this problem is to use a wide push stick that rides against the fence and contacts the workpiece in line with the kerf.

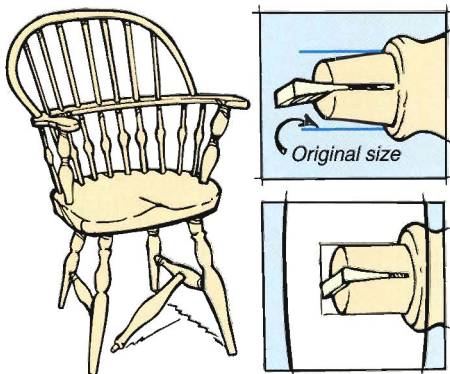
Arnold Benson
Houston, Texas

A Question of Style

Working Around The Clock

When I'm hired to do work by the hour I use an electric clock to keep track of my time, but probably not how you'd think. I set the clock at 12:00 and plug it in when I start working, then I unplug it when I stop. This way, I keep track of all the time I spend on a job, whether it's 15 minutes or 20 hours.

*Carl Weckhorst
St. Paul, Minnesota*



Tenacious Tenons

I've fixed a lot of chairs lately and have found that the main reason chairs get loose and break is because the mortise and tenon joints loosen up. When a tenon goes all the way through, it's often pinned or wedged, so I thought, why can't tenons be wedged when the ends are hidden?

I began cutting a kerf in the tenons, and adding glue and a short wedge in this slot. As I push the tenons into their mortise and apply clamping pressure, the wedge is driven into the kerf. The tenon expands in the hole to create an extremely tight fit.

*SSGT. Jeff Williams USMC
MCAS Beaufort, South Carolina*

Today's Woodworker pays from \$35.00 (for a short tip) to \$150.00 (for each issue's "Pick of the Tricks") for all Tricks of the Trade published. Send yours to Today's Woodworker, Dept. T/T, Rogers, MN 55374-0044.

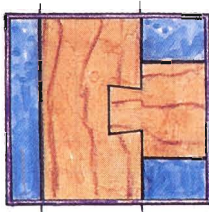
The design stage of a project, particularly one as large as the Entertainment Center, brings up a lot of questions. Should we go contemporary or traditional? What type of doors will work best? What kind of moulding should we recommend? What about the joinery? And, should it be set up as a built-in or free standing unit? Some of these options are limited by the room in which the piece will be placed, while others are a matter of personal taste. For instance, even though we decided to use sliding doors on Rick's "dual purpose" cabinet, there were other strong contenders.

What About Tambour

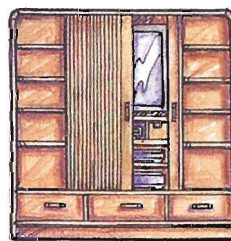
Right up to the final drawings, there were several staff members pushing for a contemporary design, featuring tambour doors and frameless Euro-style construction. Given the door size, you'd have to make your own tambour, but the result would be a sleek cabinet front with no exposed hardware. This alternative requires adding false walls in the cabinet for hiding the tambour when the doors are open.

Joinery Choices

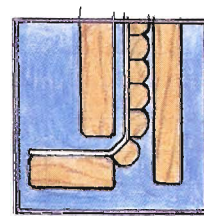
If you selected European construction, you'd also need to beef up the cabinet joinery to make up for the loss of the face frame, and then add 1/4" hardwood banding to cover the plywood edges. The corner moulding shown above, which is used where the sides meet the top, is created from 1 1/4" stock with a 1/4" dovetail tongue machined along each edge. The top is then rounded over while the inside is chamfered. Along with the corner mouldings, you'll want to consider leaving the shelf dados behind and going with sliding dovetails. Besides creating more strength, the exposed joinery contributes to the overall contemporary styling.



Besides creating more strength, the exposed joinery contributes to the overall contemporary styling.



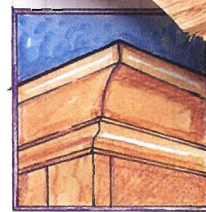
Contemporary styling would feature tambour and exposed joinery.



Since tambour requires a false wall, adjustments to the basic measurements would be necessary.

Moulding Alternatives

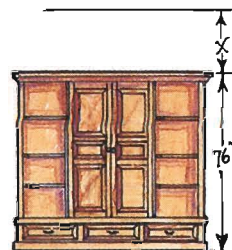
If you do prefer the traditional look over the contemporary option just discussed, there are still some design choices left to cover. The stacking approach that Rick used to make his crown moulding (see page 19) is not particularly difficult or expensive, unless you're a little short on router bits. If that's the case, you may want to consider purchasing



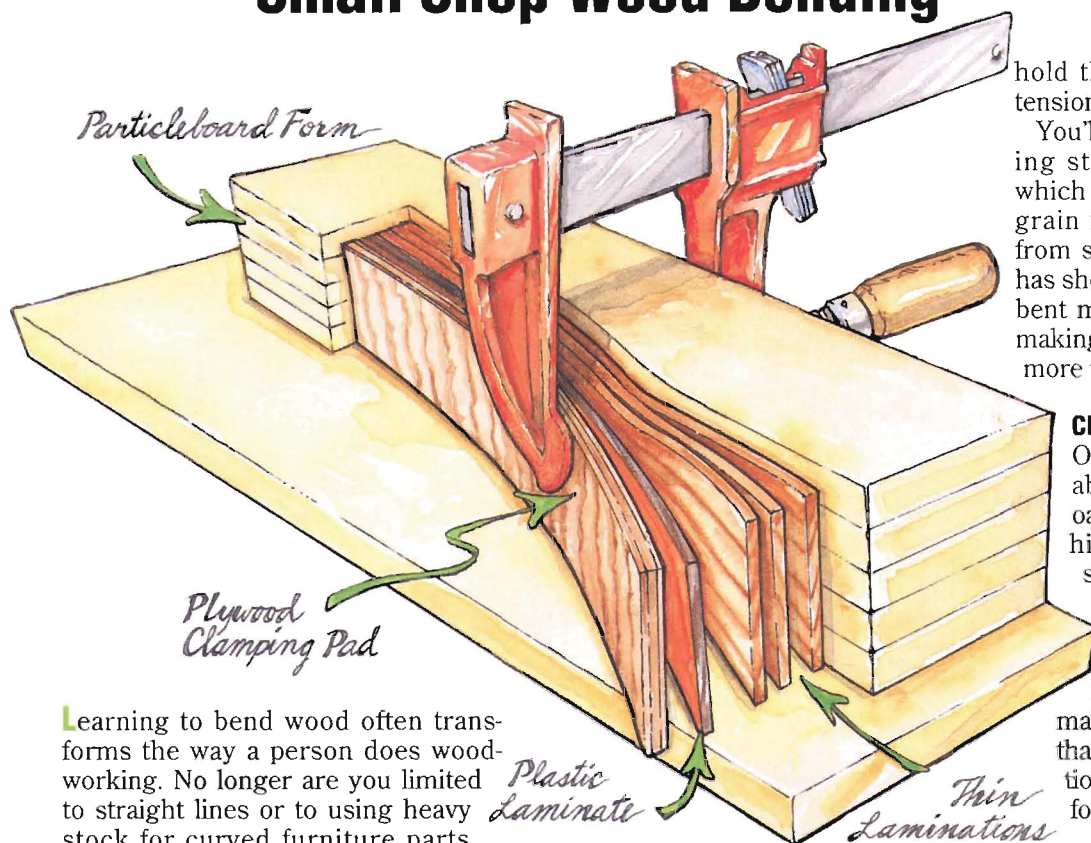
If you're short on router bits or time, you can purchase the moulding for the entertainment center.

your moulding at a local lumber yard. There are many styles available that will work well.

Likewise, you may have a room that calls for a built-in. In this case you'll want to make sure that your moulding reflects existing architectural detailing in the room and that the alterations to your plan take into account the space between the top of the cabinet and the ceiling.



Small Shop Wood Bending



hold their curved shape due to the tension created by the dried glue.

You'll be surprised at the outstanding strength of bent laminations, which results from having the wood grain follow the bend. A curve cut from solid wood, on the other hand, has short grain in the bend, and steam bent material often has grain runout, making these alternatives weaker and more prone to splitting.

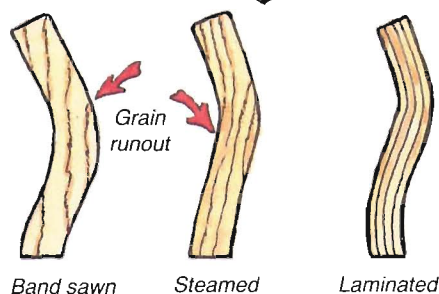
Choosing Your Wood and Glue

Of the many wood species available to woodworkers, ash, white oak, walnut, birch, hackberry and hickory are among the best for steam bending. With bent lamination, however, your species options open up considerably without affecting your success rate. Cherry, red oak and mahogany are examples of woods that work very well for bent laminations but aren't particularly suitable for steam bending.

Choosing the right glue is also important when making a bent lamination. Yellow glue will work, but its setting time is so fast it rushes the operation. In addition, the plastic nature of yellow glue causes the laminations to creep against each other as the wood struggles to straighten out over time, making for a bumpy and irregular finished product. The best choice is a urea formaldehyde glue such as *Weldwood* (available from woodworking suppliers). This slow setting glue restricts creep after it

Learning to bend wood often transforms the way a person does woodworking. No longer are you limited to straight lines or to using heavy stock for curved furniture parts. And even though the experts continue finding new ways to bend wood, it's the simplest method that remains the most reliable, especially for the home shop.

Bent lamination has been around a long time, but with improvements in modern glues it has become a popular technique among small shops and large furniture manufacturers alike. The technique is simple: glue thin strips of wood together while pressing them against a form. The strips



With bent laminations, you'll avoid the grain runout problems that often weaken steam bent material and curves cut from solid wood.



Figure 1: Glue the particleboard form together with the smooth piece in the middle, then rout the others to match with a flush cutting bit.



Figure 2: For resawing, clamp a V-block fence to your hand saw table to guide your thicker stock. Always use a push stick during this operation.



Figure 3: Begin clamping at the deepest curve, then work out from there. Vary the clamp positions so that the entire lamination is under pressure.

European Door Slides

By Al Wolford

dries and allows less spring back than yellow glue. For laminations that contact water or sit outdoors use waterproof resorcinol glue.

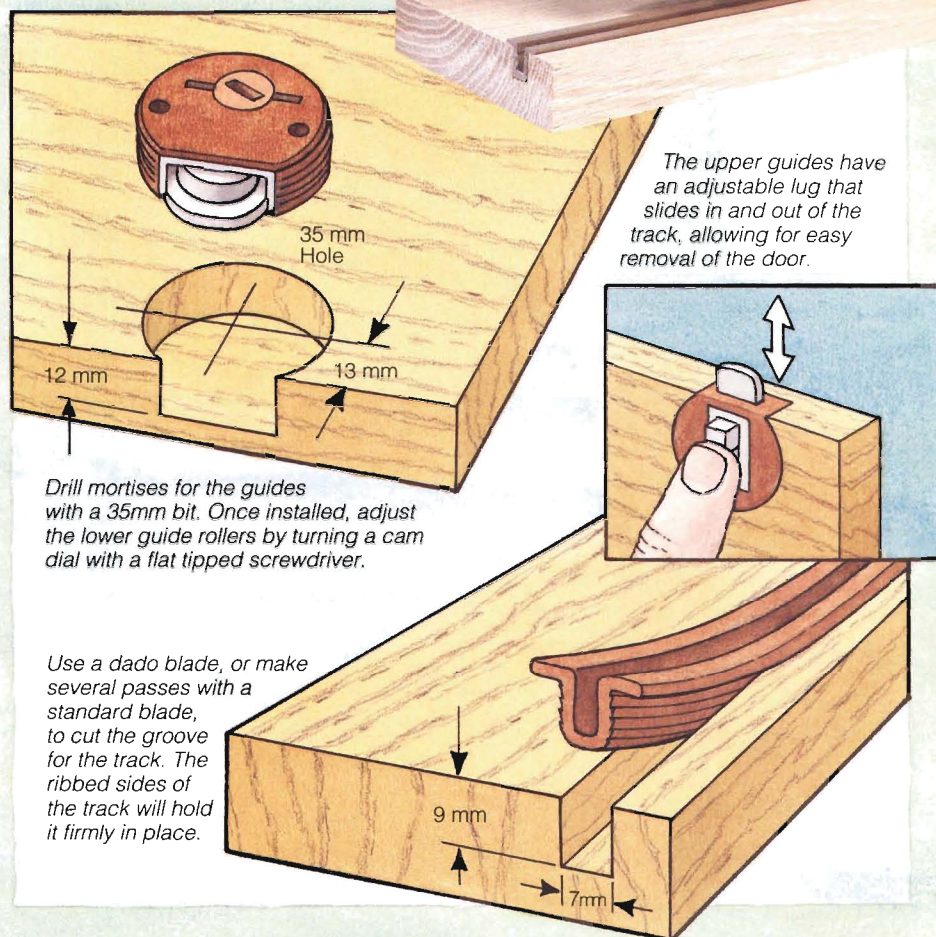
The Bending Form

To make a bending form, cut one edge on a piece of particleboard to the desired curve, then smooth the edge thoroughly. Then, use this curve as the pattern for the rest of the particleboard pieces. Use enough particleboard to form a stack slightly taller than the width of the lamination. Cut the curves a little fat with a band saw, then glue them together with the smooth piece in the middle. Use a flush cutting bit to rout the others (See Figure 1), then add a base and coat it all with wax to keep the laminations from bonding with the form.

Resaw your stock into thin pieces and plane the surfaces if necessary (See Figure 2). You could use veneer, although this requires lots of glue to bond so many thin layers, and often results in uneven surfaces. For the back splat in the chair article on page 8, stock was resawn to 5/32" thick then planed to 3/32".

Mix the urea formaldehyde glue according to the directions, then coat the mating surfaces of the wood. Place your laminations in the form, then back up the wood with a layer of plastic laminate and 1/4" thick bending plywood. The back up pieces help spread the clamping pressure evenly throughout the laminations. Use clamps to pull the wood into the deepest curve of the form, then work out from there. On taller forms be sure to stagger the clamps to get even pressure (See Figure 3).

Let the laminations sit overnight so there's no doubt the glue is dry. When you release the clamps the bend will spring back a little, which will become a predictable feature as you gain experience. This is a reliable technique for bending wood in gentle curves and, as you explore possibilities with it, you'll learn more about the habits and characteristics of various wood species.



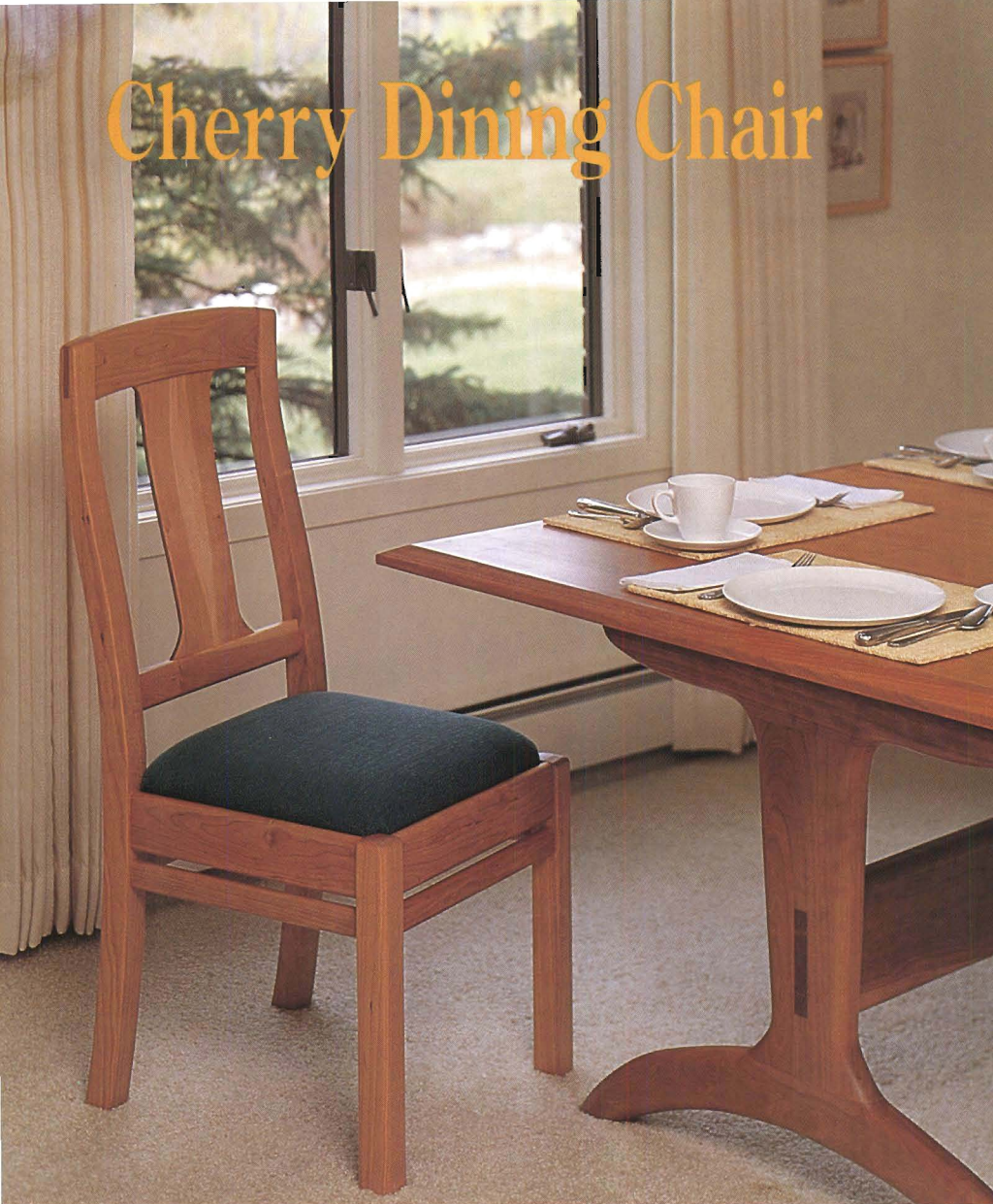
Considering how elegant the sliding doors look on our entertainment center (see page 13), it's a wonder this hardware isn't used more often. Perhaps it's because woodworkers only think of the klunky, oversized tracks and big wheels commonly found on closet doors.

Whatever the reason, put that notion behind you. Hafele, a German-based company, has developed new cabinet hardware for sliding doors that's easy to install, easy on the pocketbook, and makes opening the doors virtually effortless. Once installed, the plastic track and nylon rollers are hardly noticeable, and the door operation is completely silent.

Hafele's hardware is ideal for sliding doors sharing the same track or, with the addition of a second track, for bypass doors. The track easily press fits into dadoes at the top and bottom of the cabinet opening, and ribbing on the sides of the plastic extrusion holds the track tightly in place.

Installing the guide rollers in a door is simply a matter of drilling four 35mm holes. Once the holes are drilled, just press the guides into place and set the door in the lower track. All the guides have adjustments to help you plumb the door to the cabinet and improve the door's tracking. The guides are rated to carry a hefty 44 lb load.

Cherry Dining Chair



By Chris Inman

Chairmaking has an undeserved reputation for difficulty. While you do have to consider the special stresses chairs are subject to, there are plenty of solutions that those who have gone before us have figured out. Furthermore, if you have a chair plan in hand, the difficult part is already removed.

As beautiful as this chair is in its own right, it also serves an additional purpose. In our last issue (September/October 1992) we featured a cherry dining room extension table and promised a chair design to complete the set. The chair in this article is designed to go with the table. Both pieces have similar lines and complement each other exceptionally well, however, either project will stand on its own if you choose not to make the *matching set*.

If you're concerned about the upholstered seats, let me put your mind at ease. Not only is this an uncomplicated chair to cover, but step by step instructions are provided on page 11 to help you work through this part of the project. There are also many good books on the subject, which you may find very helpful. And finally, if you have an itch to build the chair but don't want to tackle the upholstery, there are craftspeople everywhere who do this for a living and would gladly cap off your fine work with their own.

One technique you might not have tried before that's used in constructing this chair is bent lamination. This is the process of face gluing several thin boards together while they're pressed in a form. When the glue dries the assembly retains the shape

Whether you set your sights on building eight for a dining room or just want one for a bedroom, try your hand at chairmaking. Chances are it's a whole lot easier than you've been led to believe.

of the form. This process is detailed in *Techniques* (see pages 6 and 7), and the bending curve is shown on the **full size pattern** between pages 12 and 13. It's about the easiest way to bend wood and learning the technique will open up new doors for your woodworking designs.

The material list describes the supplies you'll need for one chair. If you plan to build a set of six or eight chairs, be sure to multiply your supply list by that number, and remember to multiply your material fudge factor by the number of chairs you plan on building. To build one chair you'll need a total of 6 board feet of 1 $\frac{3}{4}$ " thick lumber for the legs and 6 board feet of 3 $\frac{3}{4}$ " thick stock for the rest.

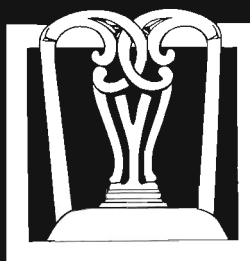
Start With The Legs

Once you have the legs cut to shape and the mortises routed away, your chair will be well on its way. Begin working toward this goal by making a 1 $\frac{1}{4}$ " thick plywood template for the rear legs (pieces 1). To make the template cut out or copy the drawings of the rear leg shown on the **full size pattern**, then tape the two sections together and glue them to a piece of 1 $\frac{1}{4}$ " plywood. Next, staying about 1 $\frac{1}{16}$ " outside the pattern, cut the plywood with a band saw. Now make a very accurate template by filing and sanding the plywood right to the pattern line.

The next step is to make the mortise layout openings in the template. Remove most of the waste at the mortise positions shown on the pattern by drilling through the plywood, then use a chisel, file and sandpaper to refine the openings.

With the rear leg template completed, prepare your leg stock for all four legs. First plane your lumber to 1 $\frac{3}{4}$ " in

The term **splat**, referring to the thin back rest piece in a chair, first came into use during the Queen Anne period. In their earliest forms, splats were very ornate, with highly curved edges, pierced fretwork designs and detailed carvings or inlay work. Splats developed in conjunction with another design innovation called the spoon back, which describes a chair back that fits the curve of the human spine.



a scraper and sander to smooth them until they match perfectly.

The four legs have reached their basic form, so now it's time to cut the mortises. Layout the mortises on the legs using your rear leg template and the drawings in the full size pattern insert. (Note: the legs must mirror each other.) Next, chuck a 3/8" bit in your drill press and bore out most of the waste in each mortise to a depth of 3/4" (See Figure 2), with the exception of the crest rail mortises which should be drilled all the way through. Because of the angle on the lower part of the rear legs, use a hand held drill for clearing out the side stretcher mortises. Once the mortise waste is drilled out use a chisel to finish the job.

Cutting Tenons

With the legs ready for assembly you now need to make the seat rails (pieces 3), stretchers (pieces 4 and 5), back support rail (piece 6) and the crest rail (piece 7). Cut 3/4" thick lumber for the rails and stretchers to

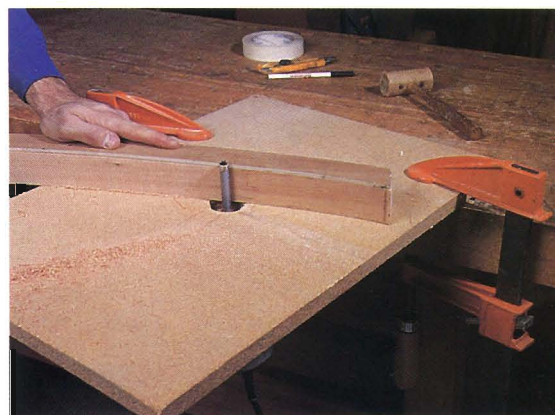


Figure 1: Cut out a slightly oversized rear leg on a band saw, then secure your plywood template to the stock with two side tape. Next, rout the leg to its finished size with a flush cutting bit.

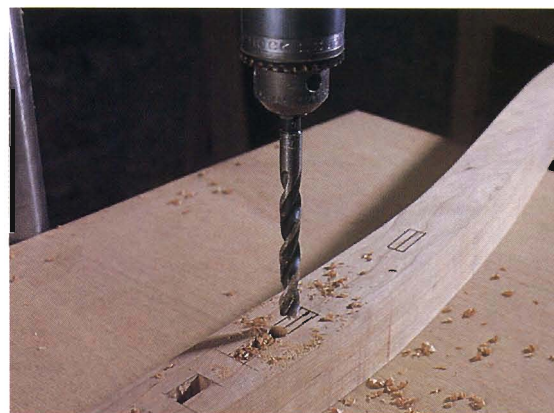
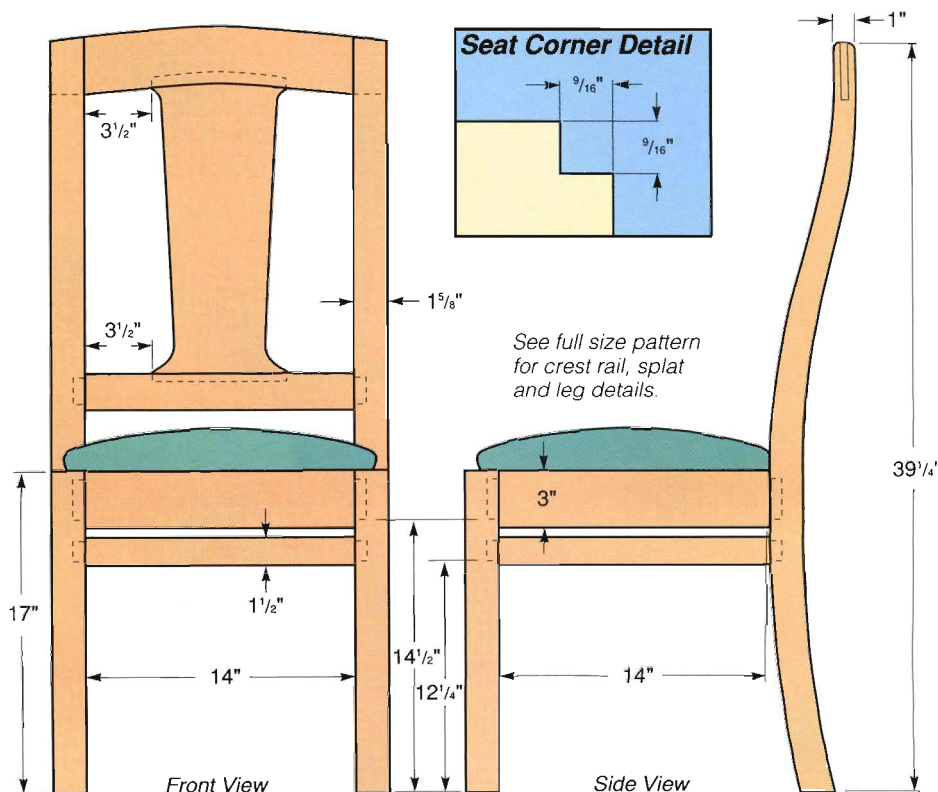
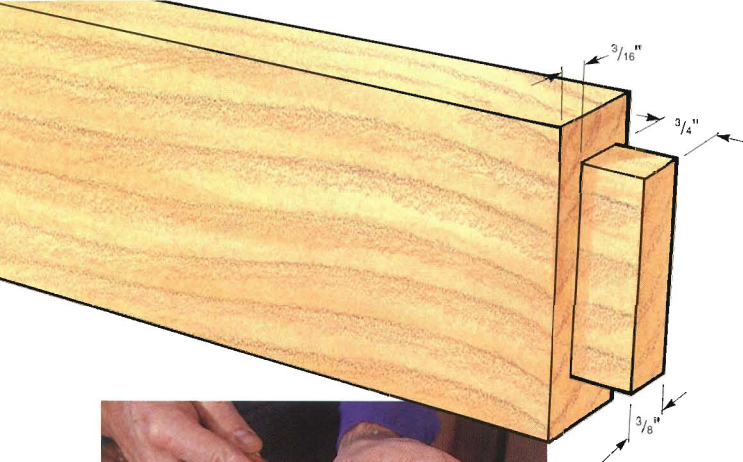


Figure 2: To make the mortises, first remove the bulk of the waste by drilling several holes with a 3/8" bit, then clean up the holes with a chisel.

thickness, then rip enough wood for the two front legs (pieces 2). On the rest of the plank trace the shape of the template twice for the two rear legs. Now band saw around the rear legs, cutting about 1/16" from the line as you did when making the template. You'll remove the excess in a few minutes with a router.

The effort you spent making the plywood template will now pay off by helping rout the rear legs to final shape. Secure the template to the inside face of one of the rear legs using two sided tape, making sure that the cherry evenly overhangs the plywood all the way around. Next, set up your router table with a laminate trimming bit that has a cutting length of 2" (available from *The Woodworkers' Store*). Rout the first leg by running the template against the bit's bearing, then repeat the procedure for the second leg (See Figure 1). Now clamp the legs together and use





Tenon Detail

Although the rail and stretcher sizes vary, the basic tenon cutting operation remains the same. Cut the cheeks on a table saw, remove the edge waste with a hand saw, and pare the shoulders with a chisel.



Figure 3: Paring the tenon shoulders until they're flush all around ensures a perfect fit.

the dimensions in the material list, keeping in mind that these lengths include the tenons.

Once the pieces are cut to size, set aside the crest rail for a moment and cut the tenons on the other chair parts. Install a 3/4" dado blade in your table saw and raise it 3/16". Clamp a clearance block to the fence to keep the operation safe, and set the fence so the block is in line with the blade. It's wise to make a few test passes so you're sure the cuts are square and the tenons fit the mortises. Now cut tenons on both ends of each piece except for the side stretchers (pieces 5), which have machine cut tenons on the front end only.

To cut the crest rail tenons, reset the fence 1 1/4" from the dado blade and make several passes to remove the cheek waste. These tenons will reach through the open ended mortises at the top of the rear legs.

The tenons aren't complete until the edge shoulders are cut with a hand saw and trimmed with a sharp chisel. Carefully cut each shoulder a little fat, then use a chisel to shave the shoulders flush (See **Figure 3**). On the crest rail, cut the bottom edge only.

Put together the legs and seat rail for each side of the chair and, while these pieces are assembled, position the side stretchers on the assemblies. Mark the angled rear shoulder on each stretcher and layout the 3/8" thick tenons, then use a hand saw and chisel to cut the tenons (See **Figure 4**).

The finished crest rail has a mild curve on its top and bottom edges that picks up a similar shape on the table stretcher. This shape is shown on the **full size pattern**, which you can either photocopy or cut out and trace onto your crest rail stock. Use a band saw to cut the crest rail to shape, then sand the edges smooth.

The crest rail and back support rail house the back splat (piece 8) in 5/16" wide by 1/2" deep grooves. These grooves are easily routed with a 1/4" slot cutter by making two passes that are slightly offset from each other. Draw lines on the rails to indicate the length and width of the grooves (see **elevation**) on the appropriate edge of each piece. Make the first pass so the bit cuts along the top of the 5/16" groove layout, then lower the cutter to widen the slot to the full 5/16" area. Square the ends of the slots with a 1/4" chisel.

Right now the chair parts are all quite sharp, but the completed chair will feel more comfortable if the edges are rounded. To accomplish this, install a 3/8" radius roundover bit in your router table and rout the edges of all the stretchers and rails, as well as the front corner of the front legs. On the grooved edges of the

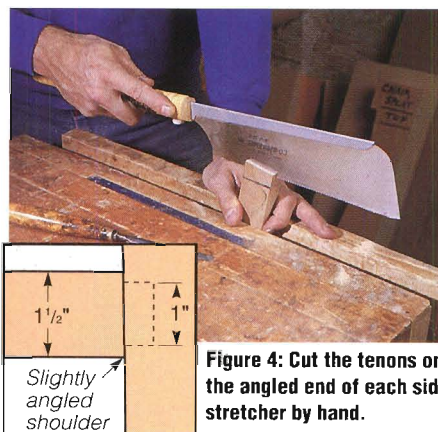


Figure 4: Cut the tenons on the angled end of each side stretcher by hand.

crest rail and lower back support cut a slight chamfer with a hand plane. Now thoroughly sand all the chair pieces to 120 grit.

Assembling The Chair

Most of your chair parts are made and ready for assembly now. The one piece you've completed but don't want to assemble is the crest rail, which you'll add after the splat is installed. Collect all your chair pieces and set your glue bottle nearby. The best procedure for assembling the chair is to first glue up each side so that you have a right and left sub-assembly. Then, after the glue dries, join the two sides with the front and back rails and stretchers, and the lower back support. Building the chair in sections helps make the assembly easier to clamp. Be sure to cleanup any glue squeezeout with a chisel after it sets up to a rubbery consistency.

As we all know, chairs are subject to extraordinary stress, and one way of reinforcing them is to add corner blocks (pieces 9) to each leg and seat rail joint. Cut four pieces of 3/4" stock to size, then tilt your table saw blade 45° to miter the ends of each block. Before installing the blocks, drill a counterbored pilot hole through the bottom edge of each piece so that later you'll have a way to screw the seat to the chair. Now drill countersunk pilot holes into the mitered ends of the corner blocks and screw them to the inside corners of the seat structure, leaving a 1/2" reveal (See **Figure 5**).

It's a good idea to install the seat support strips (pieces 10) at this time as well. Rip enough stock to make the four strips, then miter them to length to fit between the corner blocks on the inside of the seat rails. Drill countersunk pilot holes in the strips and screw them 1/2" from the top edges of the rails.

Making the Splat

The splat looks like a solid wood that has been bent in a steaming process. But actually it's made up of three thin layers that are laminated together. This method of curving wood is called bent lamination, and is described in *Techniques* on pages 6 and 7.

The splat is 7" wide, but most band saws can only resaw wood up to 6", so it's best to work with narrower stock

THREE STEP UPHOLSTERY



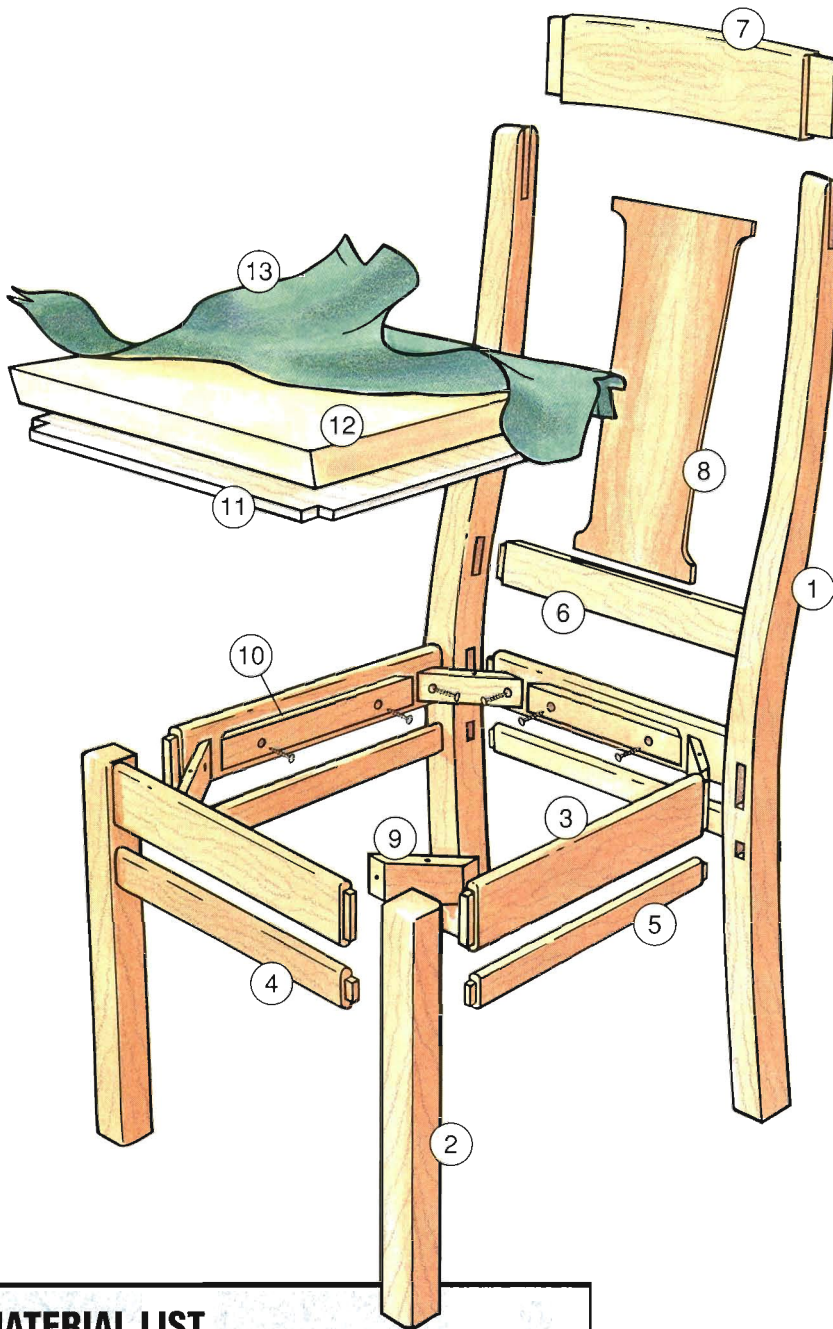
Step 1: Cut your 2" thick high density foam on a band saw with the table tilted at 30°. Cut the foam so that its smaller face equals the size of the plywood seat.



Step 2: Pull the side flaps around the seat first, continuously shooting in staples along the fabric. To keep the padding smooth, be sure to adjust the tension in the fabric as you go.



Step 3: Pull the corner flaps toward the center of the seat and staple them, then pull the front and back flaps around while making sure to get a crisp crease in each corner.



MATERIAL LIST

	T x W x L
1 Rear Legs (2)	1½" x 1½" x 40"
2 Front Legs (2)	1½" x 1½" x 17"
3 Seat Rails (4)	¾" x 3" x 15½"
4 Stretchers (2)	¾" x 1½" x 15½"
5 Side Stretchers (2)	¾" x 1½" x 16"
6 Back Support Rail (1)	¾" x 2" x 15½"
7 Crest Rail (1)	¾" x 4" x 17½"
8 Splat (1)	5/16" x 7" x 15½"
9 Corner Blocks (4)	¾" x 1½" x 4"
10 Seat Support Strips (4)	¾" x 1½" x 11"
11 Seat (1)	3/8" x 15¼" x 15¼"
12 Foam Cushion (1)	2" x 17" x 17"
13 Fabric (1)	24" x 24"

Cutting the fabric properly makes the upholstering steps go a lot easier. Trim the fabric to a 24" x 24" square, then remove the corner waste to the dimensions shown at right. Next, make the corner flap cuts. The fabric edges with the flaps should be used on the front and back edges of the seat.

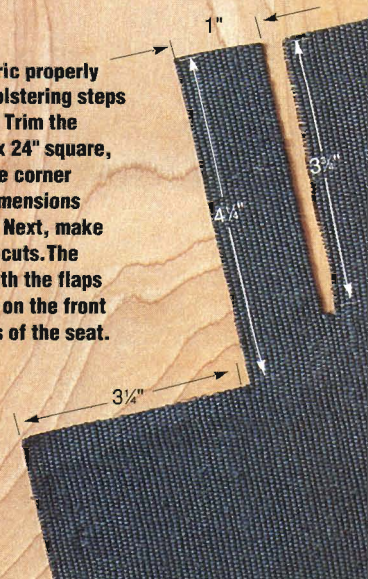
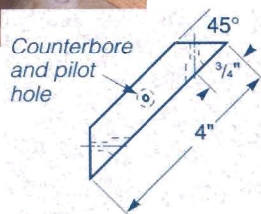




Figure 5: Corner blocks ease excessive stress on a chair and serve as a base for securing the seat.



now and join it after the bending process to get the required width. Begin by resawing a 1 3/4" thick by 3 3/4" wide plank into six 5/32" thick pieces. Choose wood that highlights the chair with a special grain pattern or coloring, like the sapwood streak in this chair. As the pieces are cut keep them numbered so you can reorder them later.

Now separate the pieces into two piles. Place pieces 1, 3, and 5 in one pile and set the even numbered pieces in the second pile. Later, when you glue the two halves of the splat together, piece 1 will mate with piece 2, and so on, creating a bookmatched joint for the splat.

The laminations are cut, but you need to smooth the surfaces so they bond well with the adhesive. The best gluing surface is one that's planed, either with a hand plane or with a planer and a special backup board. The backup board supports the relatively weak laminations and enables the machining of such thin material. Cut a 3/4" thick piece of plywood to about 8" by 21" and use two sided tape to secure the number 1 and 2 laminations to the panel. Be sure to use two or three strips of tape under each lamination or else the pressing action of the bed rollers will cause an irregular planing pattern. Plane both sides of the first pieces to just under 1/8" in thickness, and follow with the remaining two pairs of laminations. The combined thickness of each separate stack of numbered pieces should equal 5/16".

Now it's time to make a particle-board lamination form like the one described in the *Techniques* article following the curve shown in the **full size pattern**. Cut and rout the stack of form pieces, then bond them

together with yellow glue. Next, mix the urea-formaldehyde glue according to the manufacturer's directions and spread it on one stack of cherry laminations. Set the laminations in the form and add the backer strips (See **Figure 6**), then pull the strips into the form with clamps. Allow the lamination to dry overnight, then work on the second stack.

Once the two halves of the splat are removed from the form, cleanup the glue and joint the mating edges. Join the two halves of the splat together with yellow glue and bar clamps.

The front profile of the splat is shown on the **full size pattern**. Cut out or photocopy the shape and trace it onto the splat, then cut the splat to shape with a band saw. Check the fit of the splat in the back support and crest rail grooves, and make any adjustments. Sand the splat thoroughly once you're satisfied with the fit, then install the splat in the the back support groove. Finally, glue the crest rail to the rear legs. Leave the splat unglued to allow seasonal movement.

With the chair assembly completed, there's a little edge routing left before applying the finish. First trim the tops of the rear legs with a hand saw so they continue the curve established by the crest rail, and trim the front legs so they're flush with the seat rails. Next, use your router and a 3/8" roundover bit to ease the top edges of the rear legs and the top front edges of the front legs.

Finishing Up

Since this chair and the table in the last issue were designed as a set, you should use the same finish on both of



Figure 6: To even the clamping pressure on the thin laminations, use backer strips of plastic laminate and bending plywood or untempered hardboard.

them. A hand rubbed penetrating oil is unmatched as a finish for cherry. Rub in four coats of the oil and topit off with a coat of paste wax to create a beautiful, rich patina. When the finishing is done turn your attention to choosing a fabric for the seat and learning something about upholstery.

The first step toward upholstering the chair is to cut out the plywood seat (piece 11). Once the fit is good, notch the corners (see seat corner detail on page 9) and rout the top edges with a 1/4" roundover bit. Relieving the plywood edges will prevent the wood from tearing the fabric and make for a more comfortable seat. Now visit your local do-it-yourself upholstery shop to select some heavy duty foam and a durable fabric.

The steps for covering a simple chair seat are described on page 11. Cover all the seats, then secure them to the chairs by driving a screw up through each corner block and into the plywood seat.

If you've built the table you now have the perfect chair design to complement it. A set like this could well be a crowning ensemble for any dining room or, the chair alone could make an ideal accent for a bedroom or study. Either way, you've probably realized by now that chairmaking is just another branch of woodworking, and not nearly as difficult as you might have believed.

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

Bookmatching sapwood in the splat makes for an interesting and unique highlight on the chair.



An Entertainment Center For Two

Slide open the doors and you'll find room for all your TV and stereo components. Close them again and suddenly the whole room will take on a different feel.

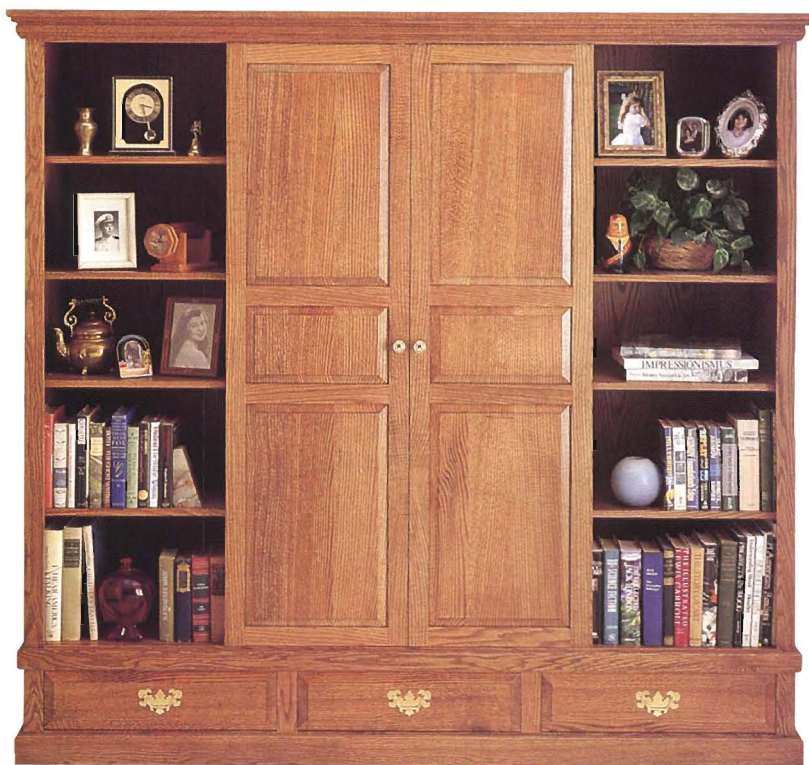
By Rick White

Why do I call this the entertainment center for two? Simple—it evolved from two very separate projects. On the one hand I wanted a high tech looking entertainment center for my television and stereo components. On the other hand, I was looking for a cabinet to display my family photos, collectibles and favorite books. Most of the cabinets I see these days lean too much toward one function or the other. I wanted a piece that would give me the best of both worlds. In short, a piece that would serve as the focal point of my living room, both for entertainment and decoration.

I wondered for awhile if I actually needed to build two separate pieces, and considered a lot of different approaches during the design stage (see *Design Options on page 5*). Luckily, I came across some unique hardware that satisfied both requirements of the design. As the photos at right illustrate, my entertainment center takes on two very different personalities, depending on whether it's open or closed—and that's exactly what I was after.

The sliding door hardware allows my raised panel doors to ride on almost invisible rollers in an inconspicuous plastic track. Best of all, this hardware is easy to install and inexpensive to boot (see *Hardware Hints on page 7*). After the door challenges were solved, I concentrated on the drawers and shelves. I sized the drawers alongside the VCR compartment to hold compact discs and added lots of additional storage room for both video and audio tapes in the bottom drawers. All but one of the shelves in each side unit are adjustable for displaying books, photos and collectibles.

The entertainment center is very sturdy—in fact, I've been kidded that it would be the safest place in the house during an earthquake. And if you've priced units of this quality you



This entertainment center offers the best of both worlds. With the unique sliding doors in their closed position the cabinet displays your favorite collectibles, and when the doors open a sleek layout of electronic components is revealed.



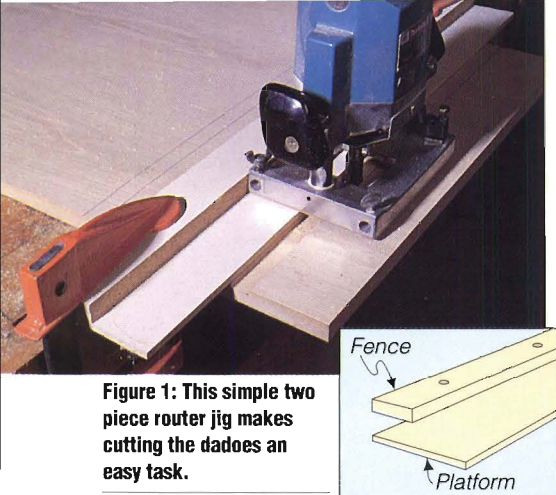
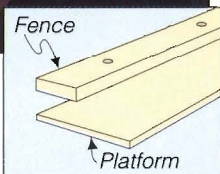


Figure 1: This simple two piece router jig makes cutting the dados an easy task.



know they go for upwards of \$3,000. Well, that's a lot of money, but thankfully for woodworkers we can pare that down to the cost of materials, which in this case top out at around \$800. If this is still too steep, consider some shop made drawer slide alternatives. By cutting out the drawer slides you can trim the material cost down by another \$200 or so.

The entertainment center took me about 50 hours to build and required 5 sheets of 3/4" thick plain sawn oak veneer plywood, 2 sheets of 1/4" oak plywood and one half sheet of 1/2" Baltic birch. I also used 55 board feet of solid 3/4" oak, 20 board feet of which was rift sawn for the door and drawer panels. A few scraps came in handy for the hidden cabinet parts. All the hardware used is available from The Woodworkers' Store (612-428-3200).

Cutting Your Plywood Panels

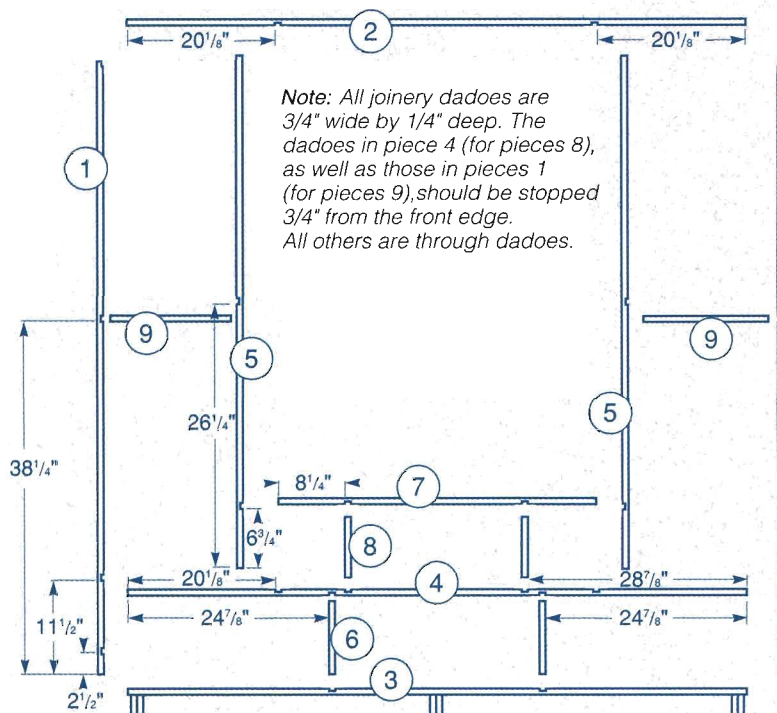
Unless you have a large shop with auxiliary table saw supports, cutting plywood is best done as a two man job. Get a friend to help you cut all the large panels to size (pieces 1-9) from four sheets of 3/4" oak plywood. Once all the plywood is cut to size begin laying out the dados as shown in the **elevation drawings at right**.

Cutting dados in plywood panels is a perfect task for a router and a straight edge jig. The jig shown in **Figure 1** takes just a few minutes to make and will save you lots of time. Make the basic jig, then chuck a 3/4" straight bit in your router. Next, run the router along the jig fence to trim the platform to width. Now you have a precise edge for aligning the jig with your dado layouts. For each dado, align the platform edge with your layout line and rout 1/4" deep.

The sides and upper dividers have additional grooves for the shelf standards (pieces 10). The plastic stan-

MATERIAL LIST

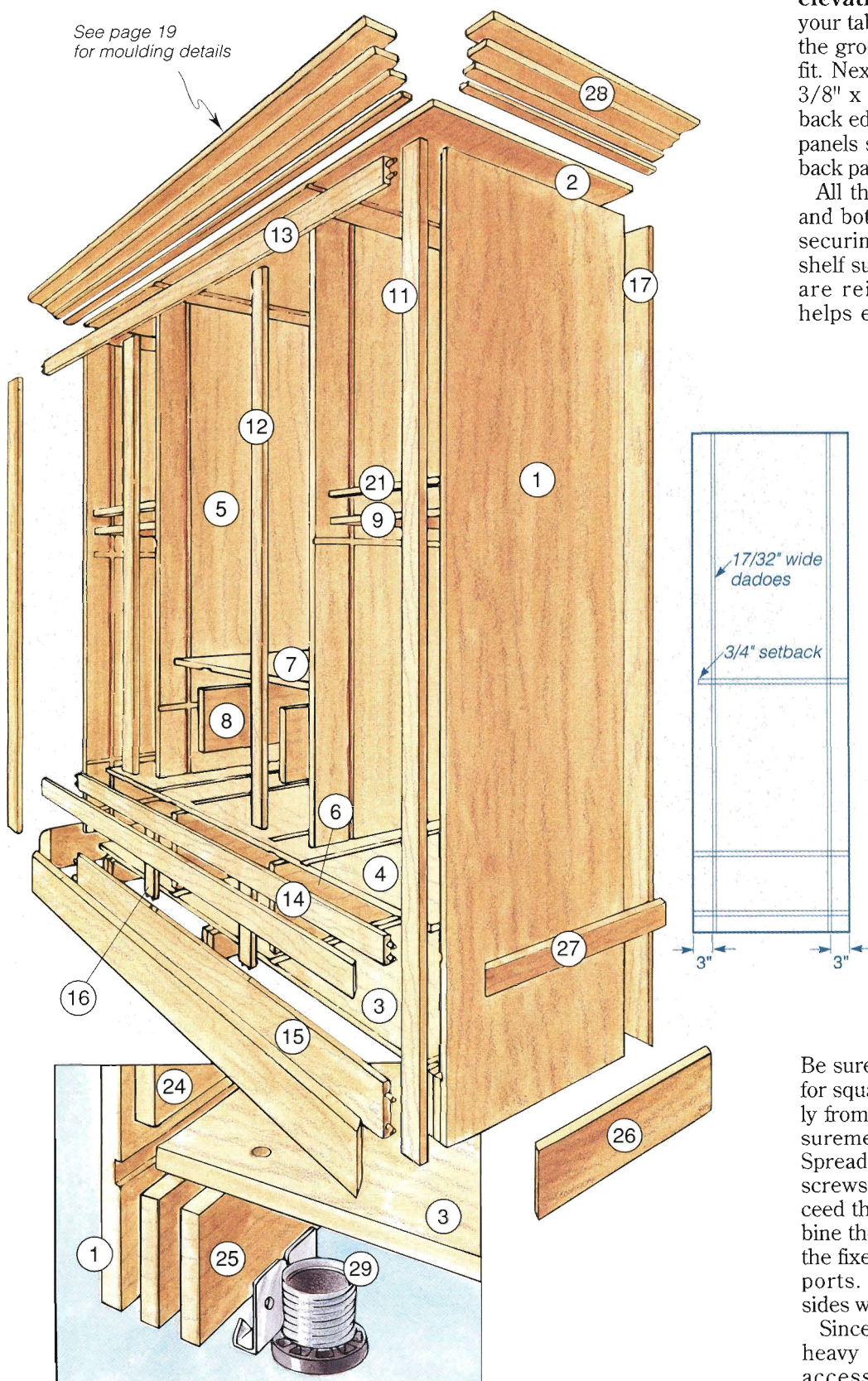
	T x W x L
1 Sides (2)	3/4" x 23 3/4" x 76"
2 Top (1)	3/4" x 23 3/4" x 76"
3 Bottom (1)	3/4" x 23 3/4" x 76"
4 Middle Platform (1)	3/4" x 23 1/2" x 76"
5 Upper Dividers (2)	3/4" x 22 3/4" x 63 1/2"
6 Lower Dividers (2)	3/4" x 23 1/2" x 7"
7 TV Shelf (1)	3/4" x 22 1/2" x 34 3/4"
8 TV Shelf Supports (2)	3/4" x 22 1/2" x 7"
9 Fixed Shelves (2)	3/4" x 22 1/2" x 20 3/8"
10 Shelf Standards (10)	Brown plastic
11 Side Stiles (2)	3/4" x 2" x 76"
12 Upper Divider Stiles (2)	3/4" x 2" x 62"
13 Top Rail (1)	3/4" x 3 1/4" x 73"



14 Middle Rail (1)	3/4" x 2 1/2" x 73"
15 Bottom Rail (1)	3/4" x 3 1/4" x 73"
16 Lower Divider Stiles (2)	3/4" x 2" x 6 1/2"
17 Back (2)	1/4" x 20 1/2" x 72 3/4"
18 Back (1)	1/4" x 35" x 72 3/4"
19 Dowels (1 bag)	3/8" x 2"
20 Door Track (2)	Brown plastic
21 Banding (6)	1/4" x 3/4" x 1/4"
22 Small Shelves (8)	3/4" x 22 1/2" x 19 3/8"
23 Large Shelves (2)	3/4" x 22 1/2" x 34 3/4"
24 Drawer Filler Strips (8)	5/8" x 6 1/2" x 22 3/4"
25 Base Supports (6)	3/4" x 2 1/2" x 23 3/4"
26 Baseboard Moulding (1)	3/4" x 3" x 135"
27 Middle Moulding (1)	1/2" x 2" x 135"
28 Crown Moulding (1)	3" x 1 5/8" x 135"
29 Leveler Glides (6)	Heavy duty

(continued on page 17)

See page 19
for moulding details



Leveler Detail

dards I used were the friction fit type that require a $17/32$ " wide groove (see **elevation drawings**). You can use your table saw and a dado blade to cut the grooves, but be sure to get a snug fit. Next, use a rabbeting bit to rout $3/8$ " x $1/4$ " rabbets along the inside back edge of the sides, top and bottom panels so that later you can install the back panels (pieces 17 and 18).

All the dado joints in the sides, top and bottom, as well as the dados for securing the upper dividers and the shelf supports to the middle platform, are reinforced with screws. This helps eliminate the need for lots of long bar clamps during the assembly and improves the cabinet's resistance to racking. Use a $1/8$ " bit to drill five pilot holes evenly spaced along each dado, then turn the panels over and drill $3/8$ " diameter by $1/4$ " deep counterbores at each pilot hole.

Assembling The Carcase

I've said this before, but it's always worth noting when working on a large project. The key to a successful assembly is organization. If you have all the parts, tools, glue and clamps ready to go, you're halfway home.

The best way to approach this assembly is to work in sections. First glue the upper dividers to the TV shelf and top in one section, then join the middle platform and bottom to the lower dividers.

Be sure to check these subassemblies for squareness by measuring diagonally from corner to corner—if the measurements match the unit is square. Spread glue in the dados and drive screws in the pilot holes as you proceed through the assembly, then combine the subassemblies with the sides, the fixed shelves and the TV shelf supports. Fill the counterbores in the sides with $3/8$ " oak face grain plugs.

Since my floor is uneven, I installed heavy duty levelers (pieces 29) with access holes through the bottom panel so I can adjust the levelers from above. First install the base supports (pieces 25) then drill $3/8$ " access

holes through the bottom panel (see exploded view detail). Now install the levelers directly below the access holes.

The Face Frame

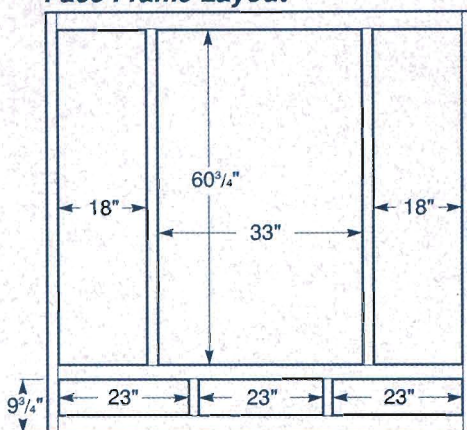
Screws and dado joints are perfect for joining the plywood panels of the entertainment center together, but they don't completely prevent the carcass from racking or leaning to one side. The way to overcome this grim possibility is by attaching a rigid face frame. Go ahead and cut your face frame stock (pieces 11-16) from 3/4" thick oak, and pull out your doweling equipment for the next joinery step.

Doweling is about the easiest method of joinery for the frame, and I prefer using the *Dowl-it* jig for a simple job like this one. Butt the frame pieces together as shown in the elevation drawing above and make two marks about 1" apart that span each joint line. Use the *Dowl-it* to drill 3/8" diameter by 1 1/16" deep holes into each member at the marks.

Since the upper divider stiles (pieces 12) aren't part of the main face frame you can go ahead and glue them directly to the front edge of the upper divider panels. One more preliminary step before assembling the frame is to cut the grooves in the top and middle rails for the door track (piece 20) following the specifications in *Hardware Hints*.

Once the dowel holes are drilled and the track grooves are cut, begin assembling the face frame. Squirt glue in the dowel holes and spread a little on each fluted dowel

Face Frame Layout



(pieces 19), then draw the assembly together with pipe clamps. Be sure to wipe off any glue squeezeout right away with a damp cloth. When the glue is dry and the joints are sanded flush, glue the frame to the carcass.

Gluing the large frame to the carcass can be a challenge, especially if you don't have enough clamps. I came up with a unique way of using the scraps from my plywood cuttings to press the frame down on the carcass (See Figure 2). By wedging the strips between the project, which I raised on a pair of sawhorses, and the ceiling, I created an effective clamping system. I used the few clamps I do have to position and hold the frame at each corner.

Cover the remaining exposed plywood edges on the TV shelf, the supports and the fixed shelves with banding (pieces 21). Cut the banding to length for each edge and, when the clamps are free from the frame assembly, glue the strips to the exposed plywood edges.

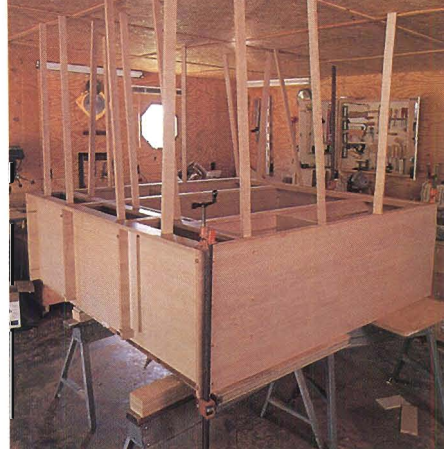


Figure 2: Once the pieces are cut and the dowel holes are drilled, assemble the face frame. Gluing the frame to the carcass can be a challenge, but with a little ingenuity you can get by with just a few clamps.

I used to be nervous when using a belt sander to sand banding flush with a plywood panel. It was just too easy to sand too far and go right through the thin veneer on the plywood surface. But once I learned a clever shop tip the problem was solved. I scribble a pencil line back and forth along the joints, then belt sand the solid wood until I begin to erase the lines on the plywood. The banding is always even with the panel and I never ruin the veneer anymore.

Shelves and Drawers

By now the basic structure is complete and your entertainment center is taking shape. The next step is to make the removable parts of the project: the drawers, doors and shelves. Start by cutting the remaining sheet of plywood into the adjustable shelves (pieces 22 and 23). Cut the plywood to size then rip more 3/4" solid wood banding to cover the front edge of each shelf. Glue on the banding and sand it flush with the plywood using

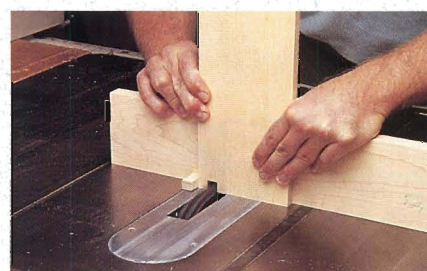
FINGER JOINTS REVISITED



Step 1: Install a 1/2" dado blade in your table saw and screw a tall fence to your miter gauge. Make sure the gauge is square to the blade. With the blade raised 9/16", make one pass.



Step 2: Glue a 1/2" x 9/16" x 2" piece of scrap in the dado and reposition the fence 1" further to the right on the miter gauge. Make a another pass, which should leave a 1/2" gap between cuts.



Step 3: Position your drawer front against the fence and slide it against the scrap to make your first cut. Next, slip the dado in the stock onto the scrap and make the second cut.

the method described above.

I wanted my drawers to last, so I made them with finger joints. It's an easily repeatable joint that only requires a table saw and dado blade. The basic steps for making the jig and cutting the joint are outlined below, and once the fence is made, you can produce an unlimited number of boxes.

Begin working on the drawers by cutting all the parts to size from your sheet of 1/2" Baltic birch plywood (pieces 30, 31, 34 and 35), then cut the fingers joints. Next, use a 1/4" dado blade to cut 1/4" deep grooves in the drawer walls for housing the drawer bottoms (pieces 32 and 36). Make the cuts 1/4" from the bottom edge of each piece. After this is done, cut the bottoms to size and assemble the boxes, always making sure to check for squareness.

Raising Panels

Raised panels are a dominant feature on my entertainment center. They create a stately, classic appearance, and to help further this impression, I chose rift sawn red oak for the panels. Rift sawn wood has dramatic graining and is very stable, making it ideal for frame and panel construction. There are several methods for making raised panels, but most require special machinery or cutters. Since I don't have any of these things I raised the panels with a table saw, as described in the short article on page 18. Before moving on, however, glue and clamp the rift sawn stock into two long panels, then cut these panels apart to yield the individual door panels (pieces 41 and 42). Also, from another piece of rift sawn lumber, cut enough stock for

the lower drawer faces (pieces 37). Now follow the **steps on page 18** to raise the panels.

Completing the Drawers

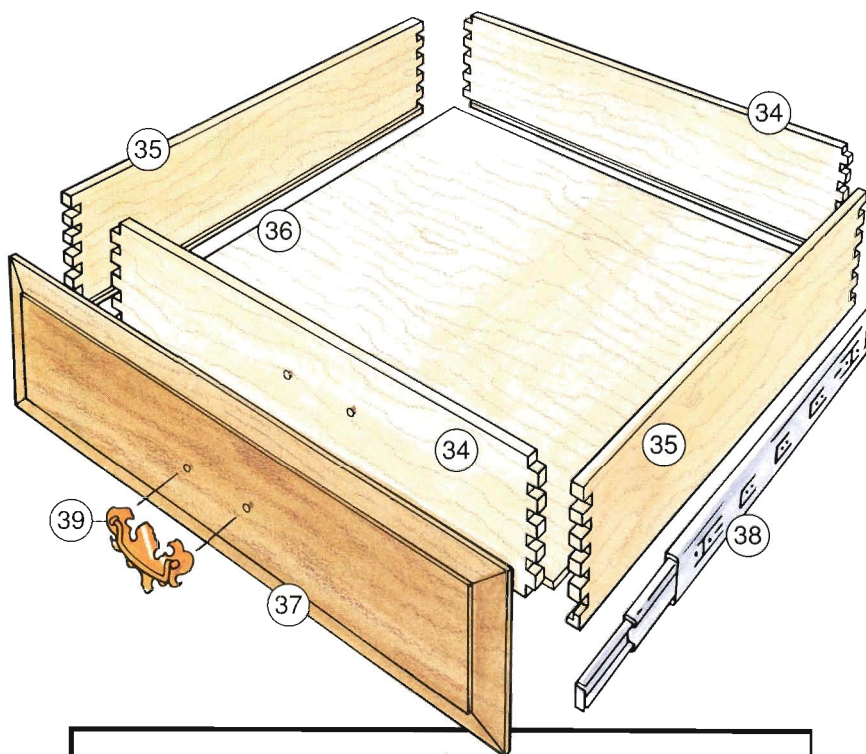
Once the lower drawer faces are raised, cut the upper drawer faces (pieces 33) to size, then screw all the faces to the drawer boxes. Next, move on to fitting and installing the drawers in the cabinet. Accuride drawer slides (pieces 38) are easy to install, but because this is a face frame cabinet, drawer filler strips (pieces 24) must be added for all the drawers. Cut the strips to size, then screw them to the carcass walls behind the face frame stiles. Now screw the slide members to the filler strips

and the box sides following the instructions included with the packages. Remember to install the slides so the front edge of the drawer faces sit flush with the surrounding face frame. Wrap up the drawer making process by drilling holes through the drawer faces and fronts for the pulls (pieces 39 and 40) —I bought longer screws for the pulls that could reach the extra stock thickness.

Making the Doors

You've raised the door panels already, so now it's time to tackle the door frames. Rip 3/4" thick stock for the stiles and rails (pieces 44, 45 and 46) and crosscut the pieces to length.

Now plough grooves in the edges of



MATERIAL LIST - DRAWERS

	T x W x L
30 Upper Drawer Front and Back (4)	1/2" x 6 1/4" x 7"
31 Upper Drawer Sides (4)	1/2" x 6 1/4" x 21 1/2"
32 Upper Drawer Bottoms (2)	1/4" x 6 1/2" x 21"
33 Upper Drawer Faces (2)	3/4" x 6 1/4" x 7 7/8"
34 Lower Drawer Fronts and Backs (6)	1/2" x 6 1/4" x 22"
35 Lower Drawer Sides (6)	1/2" x 6 1/4" x 21 1/2"
36 Lower Drawer Bottoms (3)	1/4" x 21 1/2" x 21"
37 Lower Drawer Faces (3)	3/4" x 6 3/8" x 22 7/8"
38 Drawer Slides (5 sets)	Accuride #3832 (22")
39 Lower Drawer Pulls (3)	Brass (3" boring)
40 Upper Drawer Pulls (2)	Brass (2 1/2" boring)

(continued on page 18)



Step 4: After the last cut in the drawer front, set the mating drawer side into place tightly against it and cut the fingers on this second piece. Work your way around each drawer in this fashion.

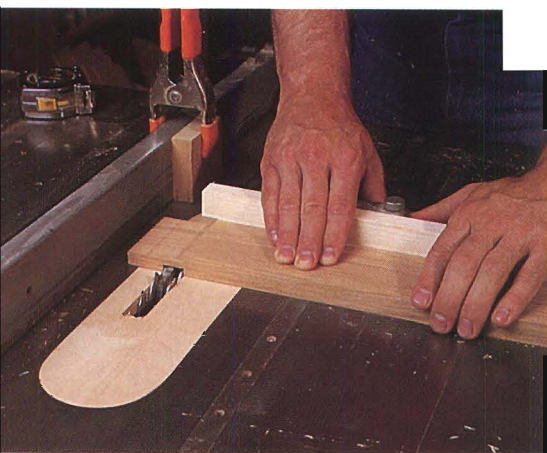


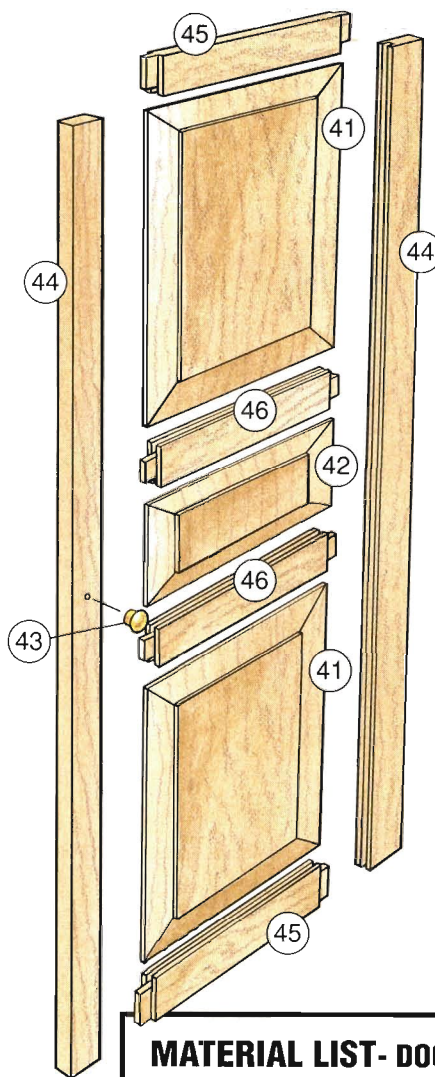
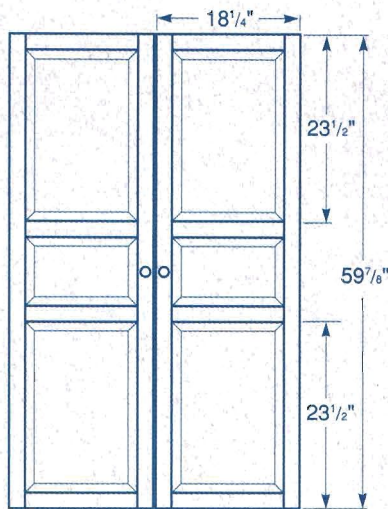
Figure 3: Use a 1/2" wide dado raised 1/4" to cut the tenon cheeks. For safety, be sure to clamp a clearance block to the fence.

the stiles and rails to serve as mortises for the joints and for holding the panels in the doors. Set up your table saw with a 1/4" dado blade and raise it 1/2", then clamp the fence 3/16" from the blade. Cut all the grooves, and remember that the middle rails require a groove in both edges.

Switch to a 1/2" dado blade and prepare to cut the rail tenons. Clamp a clearance block to your fence and move the fence to align the block with the edge of the blade (See Figure 3). Make sure the stock completely clears the block before contacting the blade. Raise the blade 1/4" and cut a tenon on a scrap piece of 3/4" stock. Check the fit of the tenon in a groove, and make any adjustments for a snug fit. Once you're satisfied with the fit, proceed with cutting all the tenons.

You're getting close to gluing up the doors, but first you have to cut rabbets on the back of the door panels so they'll fit in the frame grooves. Use your dado blade to cut 3/4" wide by 1/8" deep rabbets along all the panel edges. Check the fit of one edge and, when it's right, proceed with the rabbeting. When all the panels are ready, test fit the door assemblies. Make sure all the joints are tight and the panels fit in the grooves without being too tight or too loose. While the doors are together, mark a line across each joint as an alignment reference. When you get to the real assembly you'll be able to easily realign the pieces.

If everything goes well during the trial run, collect your glue and clamps for the assembly. Spread glue in the grooves only at the joint locations, and put a drop or two at the center of



RAISED PANELS

Begin raising the door panels by cutting four shoulders on the face of each piece with your table saw as shown in Step 1. Raise the blade 1/8" and clamp the fence 1 1/2" away. Make the cross grain cuts first. Once these cuts are finished, move the fence 1/2" closer to the blade and make the same cuts in the drawer faces.

To get the cleanest angle cut possible I take two passes. The first pass removes most of the waste, and the second pass just grazes the surface removing the last 1/32" or so of the wood. This procedure usually leaves a smooth surface that requires very little sanding.

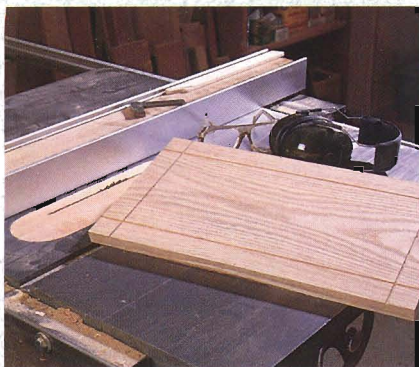
Angle your blade 12° and raise it so the teeth reach the shoulder kerfs in the door panels. Clamp the fence 5/16" from the blade and cut across the end grain edges of the panels, then cut the long grain edges as shown in Step 2. Now move the fence 1/32" closer to the blade and trim the panels to their final shape. Follow the same procedure with the drawer fronts, but adjust the blade height and fence position to get the same results. When you're done raising the panels, sand the pieces to remove any burns or saw blade marks.

each panel edge—gluing the panel in this way will keep it centered in the frame while still allowing freedom of movement to either side of the bond.

Sand the door frames flush after you take off the clamps, then completely sand the doors to 180 grit and test their fit in the cabinet. With the door resting on the middle rail there should be a gap of about 1/8" from the top of the door to the top rail. If the gap is slightly more, the adjustments on the door hardware should compensate for the difference. After fitting the doors properly, lay them upside down on your bench and drill the 35mm holes for installing the

MATERIAL LIST- DOORS

	T x W x L
41 Large Door Panels (4)	3/4" x 15" x 22 1/4"
42 Small Door Panels (2)	3/4" x 15" x 8 5/8"
43 Door Knobs (2)	1 1/4" Diameter (Brass)
44 Door Stiles (4)	3/4" x 2" x 59 7/8"
45 Top and Bottom Rails (4)	3/4" x 2" x 15 5/8"
46 Door Middle Rails (4)	3/4" x 2" x 15 5/8"



Step 1: Set the blade height at 1/8" and clamp the fence 1 1/2" away to make the shoulder cuts in the door panels.



Step 2: With the blade tilted 12° and the fence 5/16" away, raise the end grain edges of the panel first, then the long grain edges.

door hardware (see *Hardware Hints*), however, don't install the hardware until after the finish is applied to the doors.

The Carcase Mouldings

The shell of the entertainment center is completely built now, but adding a few decorative mouldings will dress it up tremendously. The baseboard (piece 26) and middle moulding (piece 27) are simply pieces of solid stock with routed edges (see the full size drawings at right). Once these pieces are routed, miter the mouldings to fit around the front and sides of the cabinet. I installed the mouldings with glue and small brads, then after staining and sealing the wood came back to putty in the nail holes.

The crown moulding (piece 28) is composed of four individually routed pieces that are glued together to form a stacked lamination. I routed the edges of four boards that were each 12' long. The bits I used to rout the boards are shown at right. Next, I ripped each of these boards to different widths and glued them together to form a crown moulding. I tried to

keep the glue squeeze out to a minimum, especially on the front of the moulding, and used a damp rag to clean up any squeezeout right away. When the glue dried I mitered the crown moulding to fit around the entertainment center and used 6d nails and glue to install it. Like the other mouldings, I came back later to putty the holes.

Wrapping Up The Project

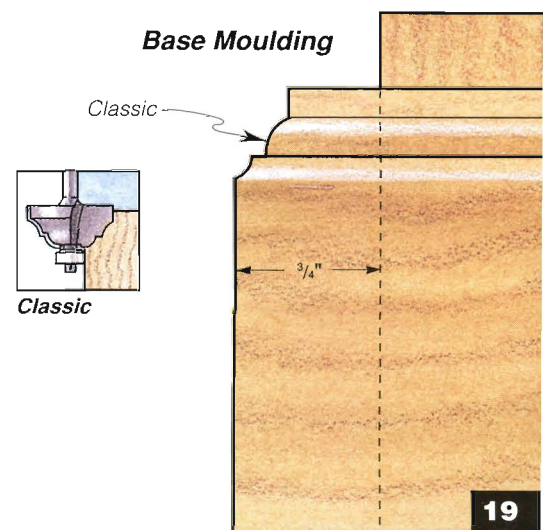
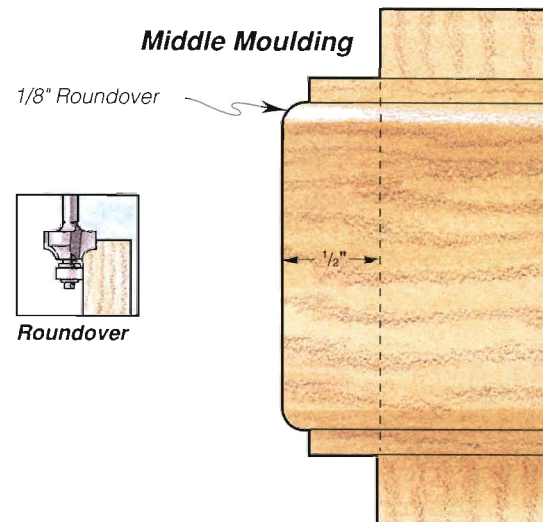
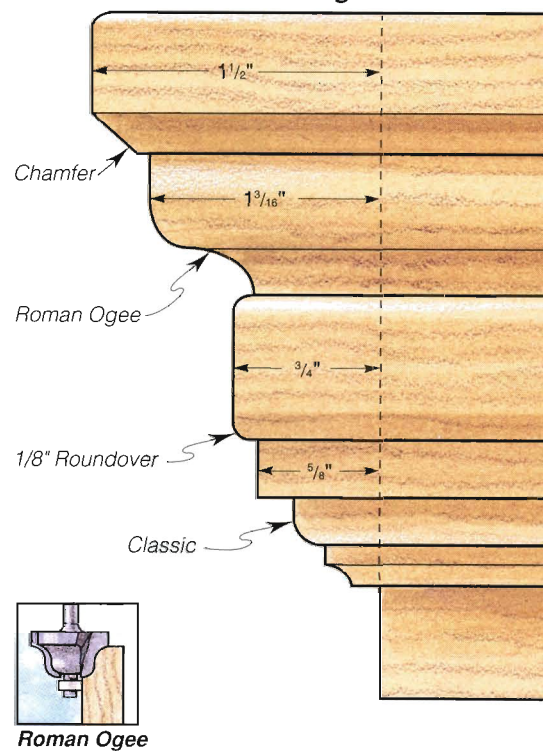
By now you should be as proud as punch looking at the work you've done. The last 50 hours in the shop have been busy and rewarding, and you're going to have a lot to show for it. Cut the back panels (pieces 17 and 18) to fit each of the three entertainment center sections, then check the fit of the back pieces and set them aside for sanding and finishing.

Now it's time to select a finish. I stained my oak cabinet a medium brown color by mixing Minwax's special walnut stain with equal amounts of their natural stain. After the stain dried for two days I sprayed on two coats of clear lacquer. If you don't have the facilities for spraying, brush on a polyurethane or varnish finish. Finally, add the door tracks, shelf standards and reinstall the drawer slides to the carcase. Press the door rollers and guides into the holes on the back of the doors. Screw on the drawer pulls and door knobs (pieces 43) and move the cabinet into place. Adjust the entertainment center's levelers with an Allen wrench, then pop the drawers and doors into their tracks. Use a flat head screwdriver to adjust the drawer rollers until they move effortlessly.

As I filled the entertainment center with my stereo and TV, and set out some of my favorite books and photos, I was amazed at the distance I had come. The design of the cabinet, with its two sliding doors, fulfilled the project requirements perfectly. With the doors pushed to the side the center compartment took on the look of a professional studio, and with the doors pushed to the center, my collectibles became the focus of the room. In either case, the door positions never looked awkward or interfered with the dual purposes of the cabinet.

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

Crown Moulding



The Chip and Dip Serving Tray

Need a last minute gift? Here's a weekend project that's a breeze to make with the template provided in our full size patterns.

By Larry Stoiaken

When you're pressed to the wall for a last minute gift idea, turn your creative energy toward a template routing project. They're fast and easy, and once you have the template you can make as many as you want. The music box and cribbage board in our September issue demonstrated how templates speed production time, and the serving tray featured here is another good example.

You'll need a 1/2" diameter straight bit with a cutting length of at least 1 1/2" to cut the outside shape of the serving tray, and a plunge router with some decent umphh for the inside cuts. You'll also need a 5/8" outside diameter bushing attachment so your router can follow the template. Any number of wood species will work for the tray, although open grained woods like oak are more difficult to clean thoroughly. The serving tray takes about 4 board feet of 3/4" thick lumber and the cost depends on the wood you choose.

Glue Up The Blank

Begin making your serving tray blank by crosscutting the lumber into 14 1/2" long pieces, then joint one edge on each piece. Next, rip your stock into eighteen 2 1/8" wide strips.

The product you use to glue up the strips depends on the wood you choose, however the adhesive should be water resistant. My first serving tray was done in teak, which is an oily wood and therefore difficult to glue. Resorcinol is waterproof and overcomes the bonding problems common to oily woods, but to further ensure a good bond I quickly rubbed each piece with lacquer thinner to remove any surface oil prior to applying the glue. For my second tray, which was made with walnut, I used waterproof Titebond II glue.

Before spreading the glue, check the ends of the strips to see that the grain patterns are layed out randomly. Anytime the end grain continues from piece to piece the likelihood of cupping increases. Spread your glue on all the mating surfaces and, if

using Resorcinol, allow the strips to stand apart for 5-10 minutes. Now use bar clamps to draw the strips together, using two on the bottom and one on top to keep the blank perfectly flat. I try to keep the bars from touching the wood in order to avoid the black stains that result when glue reacts with metal. Once the glue dries, flatten the blank surfaces with a plane or belt sander, then sand the blank smooth to 150 grit.

Make Your Template

Now that your blank is ready, turn to the center of this issue and cut out the **full size pattern** to make your routing template. Use an adhesive like 3M's Spray Mount to glue the pattern onto 1/4" thick hardboard cut to a 13 1/2" square.

After drilling an access hole in each cutting area, use a saber saw to remove the waste, staying 1/16" inside the line. Now use a drum sander to sand the cutouts to their lines. This step takes time, but having a perfect template is the key to this



project. When the template is ready, test fit your dip bowls, which should fit sloppily now. (NOTE: Our pattern is sized for 3½" custard cups available for under \$1.00 each at Pier 1 Imports. To find the store closest to you, call 800-447-4371.)

Since the blank will be machined from both sides, it's important to find the exact center. The best way to do this is to cut the blank into a perfect square and draw pencil lines from corner to corner. The intersecting lines indicate the center of the blank. If your stock is 3/4" thick, your blank should be 13½" wide, although it's fine if yours is a little off. Just be sure to measure the width prior to making your crosscuts so you can trim the blank to an exact square.

Drill countersunk holes in the four corners of the template and screw it to the top of the blank. Be sure to align the hole in the middle of the template with the crossed lines on the blank. You can rotate the template as much as you like, as long as the center doesn't move.

Start Your Routers

Clamp the blank securely on your workbench, then replace your router base plate with a 12" square piece of 3/8" thick plastic or plywood to get a more stable platform during the routing process. Next, install a 1/2" straight bit and a 5/8" bushing in your plunge router. The best way to rout the cavities is to take 1/2" deep passes starting in the center of the waste areas and make ever increasing

circles until you reach the template edge (See Figure 1). Continue routing in this manner to a depth of 1½".

Once the cavities are routed, remove the template and use a compass to draw a 13" circle on the back. Now band saw the outside shape of the piece, staying about 1/16" from the line (See Figure 2). Next, remove the oversized base plate and bushing from your router and install a circle cutting jig. It's important that the distance from the edge of the bit to the mounting hole on the jig is exactly 6½". Nail the jig to the center of the tray and begin routing the outside edge with a 3/4" deep pass (See Figure 3). Rout slowly and work in a steady motion, but don't go so slow that you burn the wood. Continue working your way down until you reach the top surface.

Wrapping Up

The only detail left is to ease all the sharp edges with a piloted 1/8" roundover bit. Following this step, I sanded the cavities to 150 grit, then sanded the entire tray to 220. If your routing was steady and your template was smooth, sanding should be a quick and easy step. Since the tray will be used for serving food, finish it with Rockler's Salad Bowl Finish (available from The Woodworkers' Store). It's a safe, non-toxic finish that holds up well through repeated washings. Once the finish dries, wrap your gift and scratch off one name from your gift list.

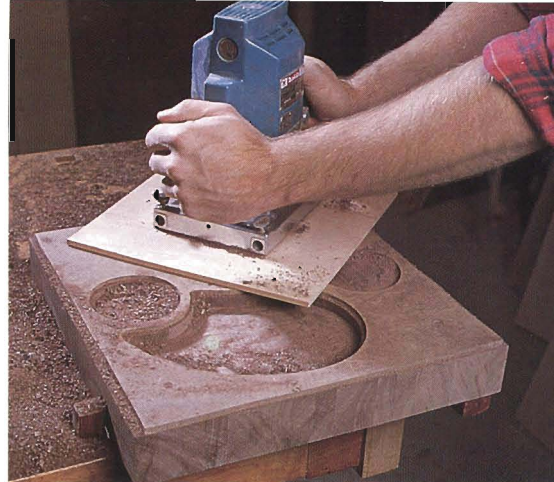
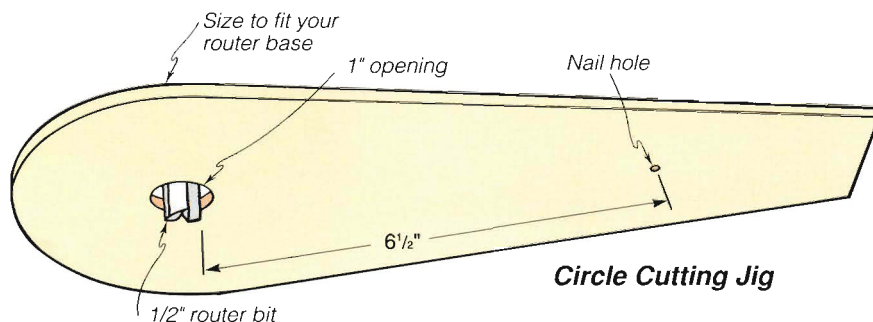


Figure 1: Before routing the waste from the tray, make a larger router base that will span the openings. After attaching this new base and a 5/8" bushing, hog out the material in 1/2" deep passes. Be sure to remove the chips frequently.



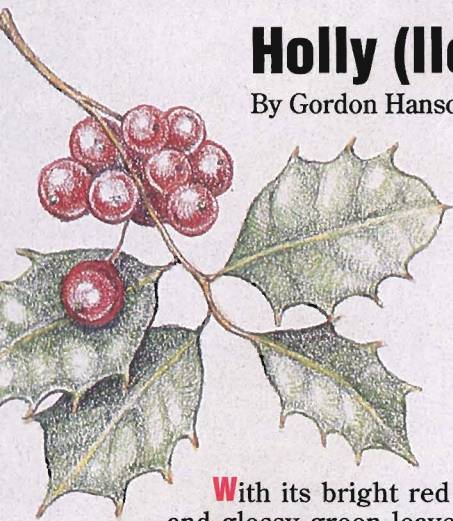
Figure 2: Once the chip and dip cavities are routed to a depth of 1½", turn over the blank and use a compass to layout the outside perimeter of the tray. Next, cut the tray out with a band saw, but stay about 1/16" outside the line.



Figure 3: To finish the outside edge use a circle routing jig. Define the radius of your circle on the jig, then nail the jig at this point to the center of the tray. Make two passes to rout the full depth.

Holly (*Ilex opaca*)

By Gordon Hanson



With its bright red berries and glossy green leaves, holly branches have been tied to the holiday season for generations. Its use as a garland or centerpiece evokes the good cheer enwrapping us all at this time of year. But even the good nature of holly can be twisted, as evidenced by Charles Dickens' famous character Ebenezer Scrooge. In *A Christmas Carol*, Scrooge, whose cynical mind sees everything good with the holidays as bad and corrupt, finds a nasty use for holly. "If I could work my will," said Scrooge indignantly, "every idiot who goes about with Merry Christmas on his lips should be boiled with his own pudding, and buried with a stake of holly through his heart."

Perhaps after his transformation, Scrooge would have found a more festive use for holly—such as scroll sawn tree ornaments for the holidays. Holly trees, typically having a relatively narrow trunk diameter, produce timber in sizes most suitable for smaller items. You'll be able to decorate your holly ornaments with bright

and cheerful colors since the wood's close grain accepts paints and stains exceptionally well. The wood has very little grain pattern and it can be polished to a beautiful luster.

Holly is one of the whitest of all woods—resembling ivory in color. In fact, its brilliant white color has even earned holly a place as an ivory substitute for piano keys. Ironically, holly's whiteness also makes it an easy wood to dye black to serve as an ebony substitute—a common use for this species. Interestingly enough, the wood must be harvested in the winter-time to preserve its pure white color, otherwise blue streaks may occur. After aging for a while, holly sometimes develops a light tan coloring.

Many of the great European windmills, marvels of engineering for their time, made careful use of specific woods for various components. For instance, the huge blades designed to catch the wind were made from lightweight yet durable fir; huge, strong timbers like ash, elm and sycamore, were used for structural beams, while oak's elasticity made it the wood of choice for the enormous wheels serving as gears inside the mills. Because of holly's density and smoothness, which makes it hard to break and resistant to wear, it served as the gear teeth attached to the oak wheels.

Holly is ideal for detail work like carving, turning and scroll sawing because it holds shapes well. Scroll sawing, for example, produces delicate profiles that are prone to breaking. Holly holds up under these circumstances better than



Ornaments by David Larson

many woods because of its close grain character. Moldings made from holly also hold their detail well.

Very sharp cutting edges are required when working with holly, which has a noticeable blunting effect on tools. While not apparent to the naked eye, holly has an irregular grain structure—a feature that causes cutting edges to dull quickly. Moreover, holly expands and contracts dramatically and tends to warp even after kiln drying. For these reasons it's best to avoid the use of wide boards, whereas small pieces don't present a problem. A word to the wise is to drill pilot holes for all nails and screws. You're sure to avoid some deep frustration and overheating by doing so. If you're a steam bending enthusiast, holly is not a good choice. The internal structure of this species has rendered it nearly impossible to bend.



See Full Size Patterns



The ornaments here were made with 1/4" thick holly and cut on a scroll saw with a 2/0, 23 teeth per inch blade. Small detail holes for eyes and buttons, as well as entry holes for the saw blade, were drilled with variously sized brads. The ornaments are finished with paint and sprayed with Deft lacquer to create a reflective sheen for the Christmas tree.

You'll want to spare your holly ornaments from outdoor use since this wood is not weather resistant and will likely decay. But indoors, when used to adorn your family Christmas tree, your homemade decorations will last for generations and become traditional family favorites, and that's guaranteed to take the "bah humbug" out of anyone!



FINISHING THOUGHTS

Shop Solvents

The move toward water based finishes and safe strippers has focused much attention on the use of solvents and their effect on the environment. While water based products are definitely the way of the future, the complete transition will take time. Meanwhile, properly using and storing solvents will remain an important issue for the small shop.

For instance, how many of us realize that solvent vapors pose a substantially greater risk than the liquid? Knowing facts like this will make everyone safer.

Mineral spirits is a distilled petroleum byproduct used as a thinner, wax and grease remover and brush cleaner. It will reduce viscosity, permit deeper penetration and promote quicker drying of oil-based finishes. Its drying time falls between slow drying turpentine and fast drying naphtha. This solvent has little or no odor, making it hard to detect excessive buildup of fumes. Fortunately, mineral spirits is one of the safest solvents to use.

Turpentine, a resin made from pine trees, is used as a thinner, cleaner and grease remover. Because of its slow drying time, turpentine is preferable to mineral spirits in some circumstances. Turpentine has a strong, unpleasant odor. Limited skin contact is generally safe except for people with allergic sensitivities. However, it is highly combustible—even to the point of spontaneous combustion. Never keep old turpentine soaked rags around—not even immersed in water.

Naphtha is known for its quick drying properties, which is convenient but also increases the risk of flammability. Here's a rule of thumb: If a solvent dries quickly, it generally has a low flash point with a high

flammability risk. Don't use extremely flammable solvents like naphtha and lacquer thinner indoors because vapors can easily travel to pilot lights. Naphtha is commonly used for cleaning wax and oil residue, and thinning or rubbing down shellac patch sticks.

Lacquer Thinner is a solvent mixture that varies from brand to brand.

It's generally best to use the same brand of thinner and lacquer together to ensure compatibility. Lacquer thinner's strong odor makes it very unpleasant to use. When added to lacquer, it gives more coverage, uniformity of gloss and freedom from blushing.

Lacquer thinner also promotes deeper penetration and faster drying. Like naphtha, avoid using this solvent indoors due to extreme flammability.

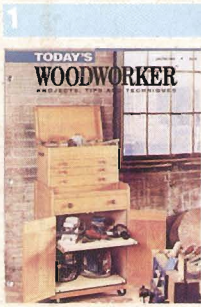
Methanol works very effectively as a thinner for shellac and alcohol-based stains, but it's highly corrosive to metal and existing finishes. Although it works well, this is one of the most dangerous solvents. For the sake of your safety and to limit corrosion, you may want to substitute ethanol for thinning or isopropanol (rubbing alcohol) for surface cleaning. Methanol, along with methylene chloride, poses a special problem for safe handling. Typical charcoal respirator filters are unable to block the vapors of both of these solvents. When you buy a respirator, check to see if it is effective against these vapors. Never assume all respirators work the same.

Keep these brief descriptions in mind for they will surely help you maintain a safer shop. In our next issue we'll feature a specially constructed, fire code rated cabinet meant for storing shop solvents and finishes. Remember, safety always pays.

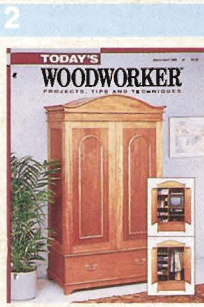


Look familiar? If so, you're like a lot of us who fail the shop hazards test. This month we're talking about solvent safety, and in our next issue we'll feature a fire safe storage cabinet.

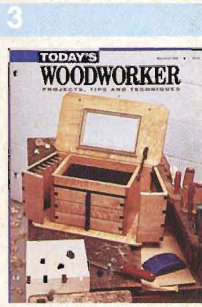
FREE binder with any six back issues!



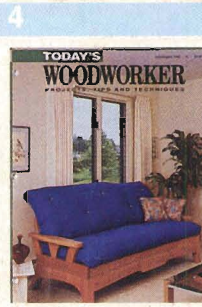
A rolling tool cabinet, rotating end table, wall mounted shelf, tips for buying used tools and more.
Issue 1\$3.95



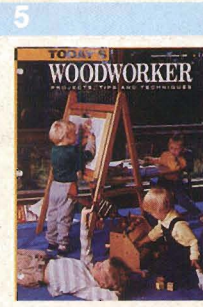
An armoire, curio shelf, wedge tenon magazine rack and installing European hinges.
Issue 2\$3.95



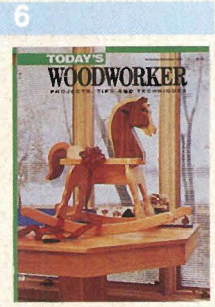
Jewelry box, turning figured wood, a folding Adirondack chair, drawer slide options plus more.
Issue 3\$3.95



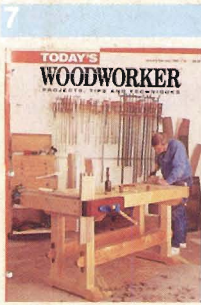
A futon sofa bed, cedar-lined blanket chest, antiquing techniques and using knock down fittings.
Issue 4\$3.95



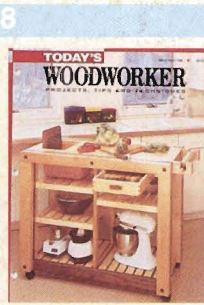
An easel, children's activity center, folding footrest, model airplane and framing with inlay.
Issue 5\$3.95



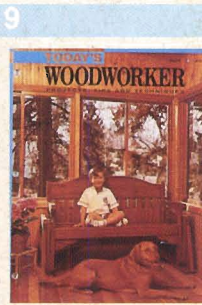
Modern pedestal table, a classic rocking table, a classic rocking horse, holiday ornaments and mixing your own finishes.
Issue 6\$3.95



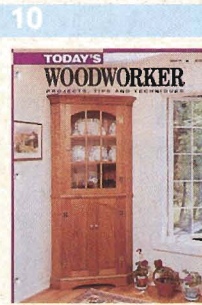
A European style workbench, turned stamp holders, heart-shaped bandsaw box and a breakfast tray.
Issue 7\$3.95



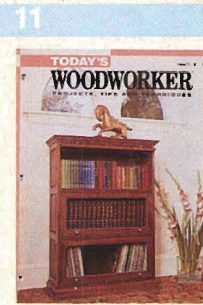
The kitchen work station, Shaker candlestand table, baker's rolling pin, a step stool and more.
Issue 8\$3.95



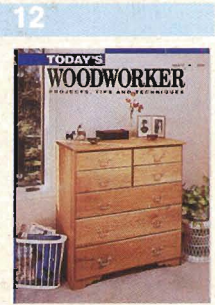
A porch glider for two, continuous grain box, Chippendale mirror frame, shellac repairs and spoon carving.
Issue 9\$3.95



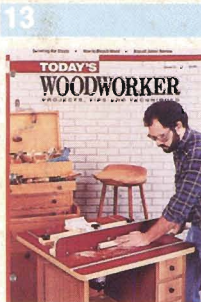
Classic corner cabinet, a bent lamination fishing net, a white oak trivet using a scrollsaw and more.
Issue 10\$3.95



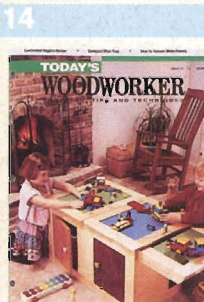
A stately barrister's bookcase, spinning string tops, a kid's step stool and an inlay banded desk tray.
Issue 11\$3.95



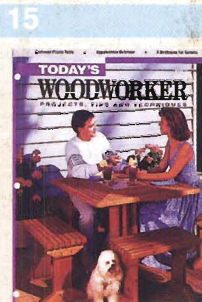
Uncomplicated butternut bureau, a Shaker inspired swivel mirror, and deep-reach hand screw clamps.
Issue 12\$3.95



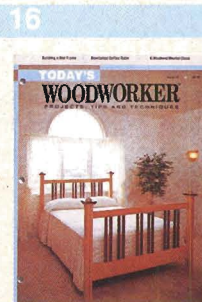
A precision router table, building a set of swiveling bar stools and tips on buying a new biscuit joiner.
Issue 13\$3.95



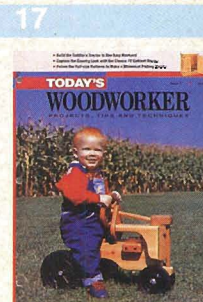
Building a craftsman style rocking chair, a brightly colored toybox, and a nifty compact disc holder.
Issue 14\$3.95



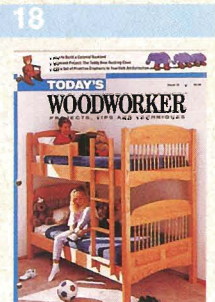
A picnic table for four, a birdhouse project for turners, making a simple dulcimer and a stylish joiner's mallet.
Issue 15\$3.95



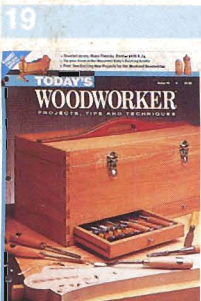
Crafting a maple bedframe, a dovetailed coffee table and a contemporary mantel clock.
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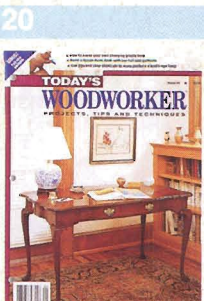
A country TV cabinet, an elegant bureau caddy, the angler's mobile and a toddler's tractor.
Issue 17\$3.95



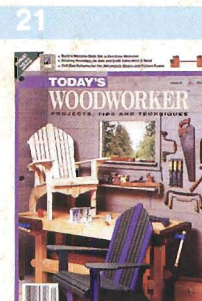
Plans for a sturdy bunk bed, crafting folk elephants, a child's Teddy Bear chair and a Shaker table.
Issue 18\$3.95



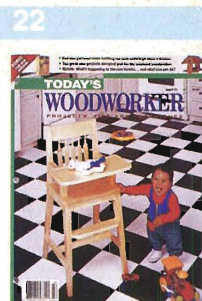
Craftsman's toolbox, a swinging cradle, turned salt and pepper shakers and building a simple bookcase.
Issue 19\$3.95



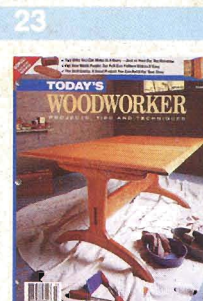
Making a Queen Anne desk with cabriole legs, carving a grizzly bear and production tips for a table lamp.
Issue 20\$3.95



Adirondack Chair and deck set for weekend woodworkers. Plus, a scroll saw project and a beautiful sofa table.
Issue 21\$3.95



A classic tavern mirror, a high chair for the ages, a beautiful display case and a weekend bird feeder.
Issue 22\$3.95



Build a contemporary dining room table, plus a drill bit cabinet for your shop and three weekend gift projects.
Issue 23\$3.95

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Full-Size Patterns™

- Open staples carefully, remove pattern and fold staples back in place.
- Use graphite paper (available at most art supply stores) or cut and trace the pattern onto your stock.



Dining Room Chair; including the rear leg, front leg, crest rail, splat and laminating form for the splat.

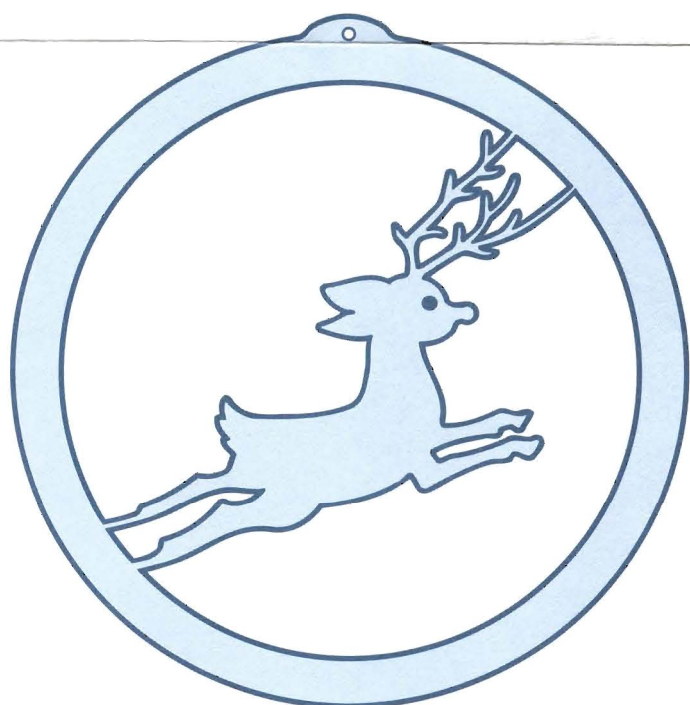
Tree Ornaments; including the candle, Christmas tree, snowman, reindeer, angel and wreath.



Serving Tray; the pattern you'll need to make your template.

**TODAY'S
WOODWORKER™**

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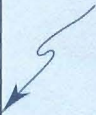
Tree Ornaments



**Pattern
for Splat
Laminating
Form**

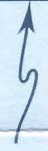
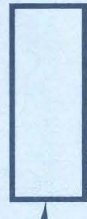
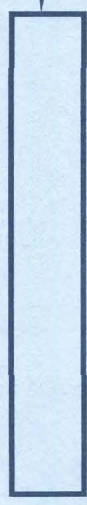
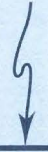
Splat
8

Center line



Alignment line

3/4" deep

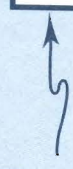


3/4" deep

Rear Leg
lower half

1

Through
mortise



Rear Leg
upper half

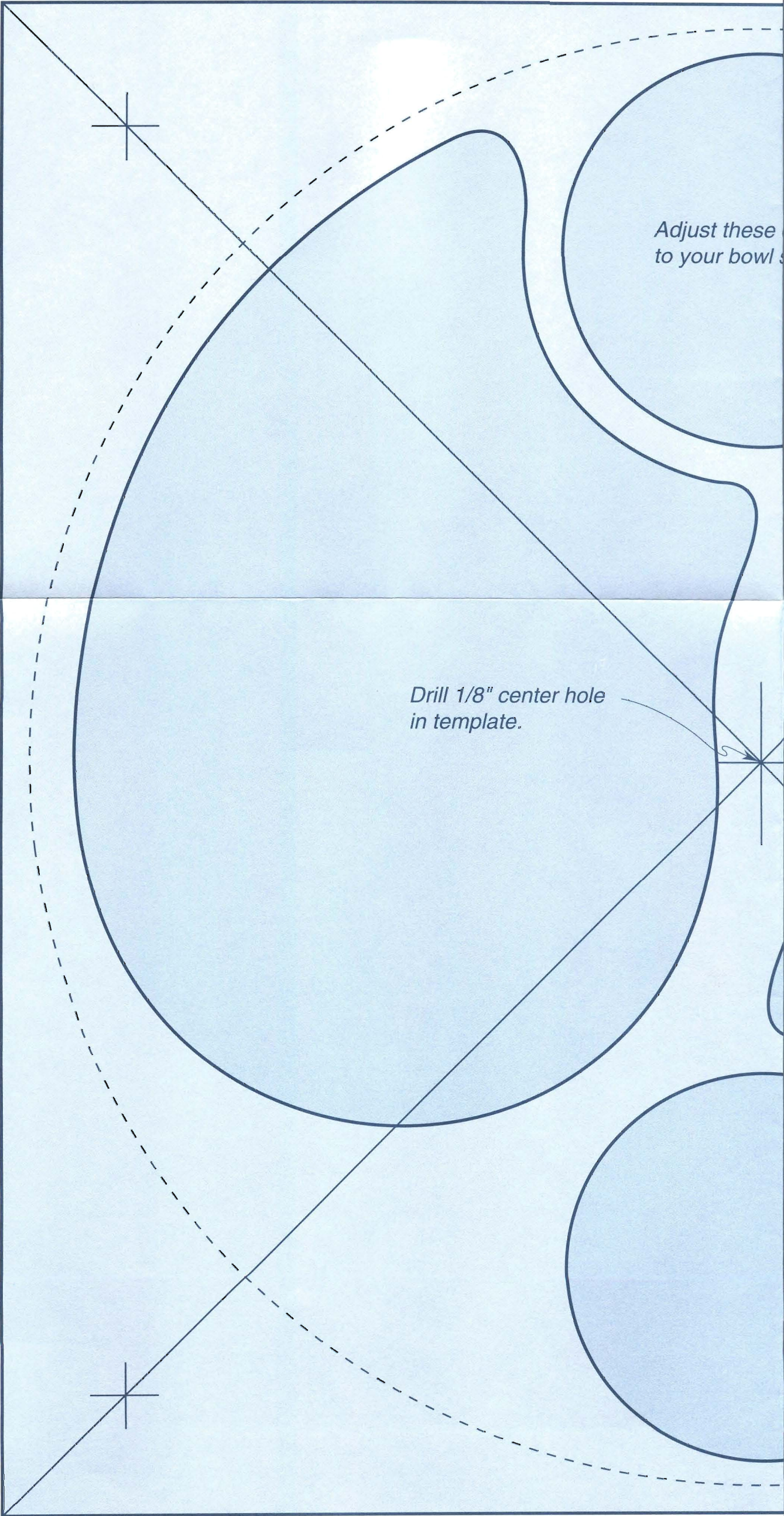
1

3/4"

*Cut around rear leg
patterns, then use the
alignment lines to
accurately tape
them together.*

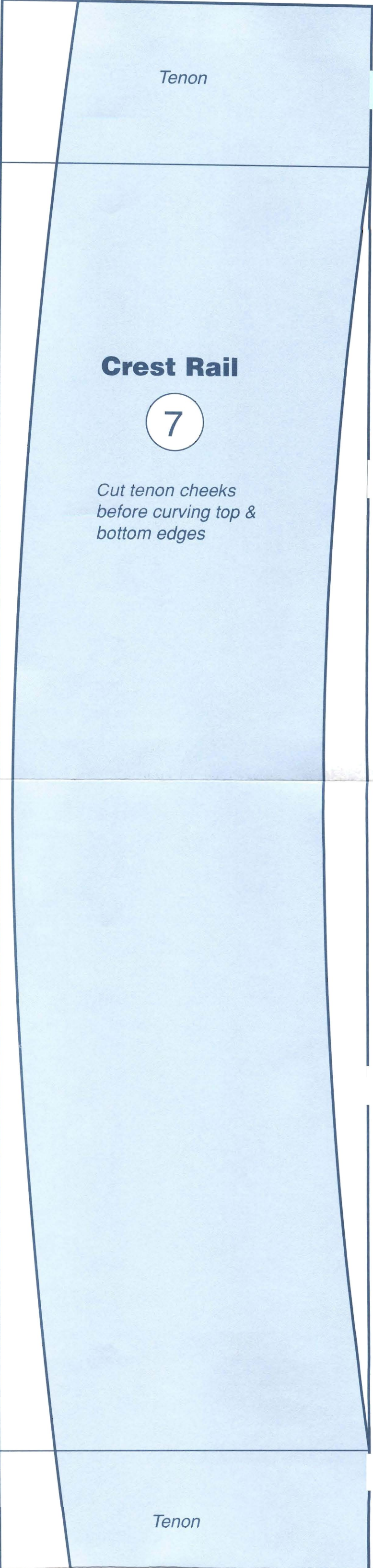
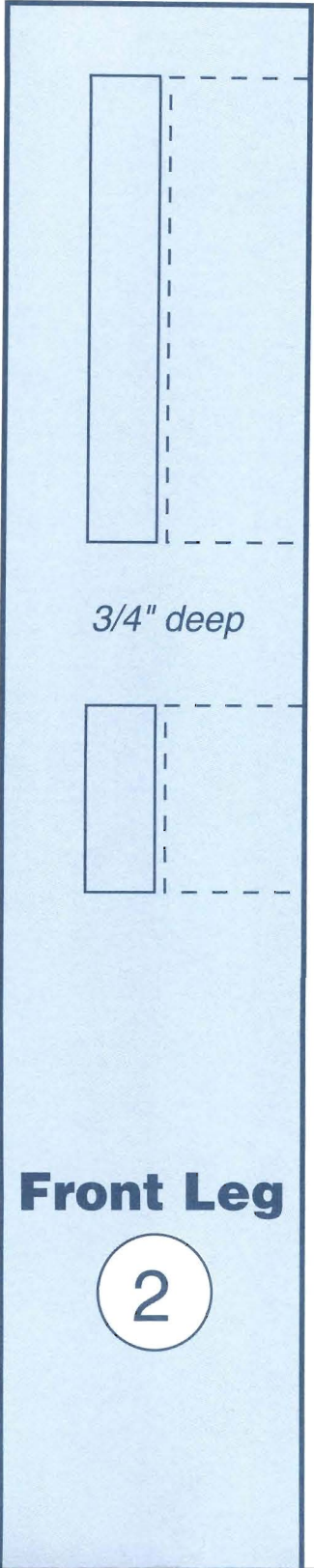
Alignment line

Serving Tray Temp



*Adjust these
to your bowl s*

*Drill 1/8" center hole
in template.*



deep

Dining Room Chair

Plate Pattern

