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- Step by Step construction instruction.
- A complete bill of materials.
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- How-to photos with instructive captions.
- Tips to help you complete the project and become a better woodworker.



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Arts & Crafts Dining Room Chairs



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A Set of Arts & Crafts Styled Dining Room Chairs



This Gustav Stickley-inspired set of chairs incorporates several elements of his Craftsman style: quartersawn oak, housed tenons, pyramid plugs and leather upholstery.

There's a well-founded belief among woodworkers that chairs are the most challenging projects to build. While that's true, the simple lines of these classic Craftsman-inspired pieces are well within the scope of most hobbyists' abilities. That's due, in large part, to the overriding philosophy behind their original inspiration, the Arts & Crafts movement. In the early 1900s, the Arts & Crafts philosophy swept Britain and the Americas, inspiring woodworkers to recreate the simplicity and function of medieval craftsmanship while adapting it to modern living.

Our chair is a prime example of the pieces Gustav Stickley created after 1905, under the influence of noted architect Harvey Ellis. For a brief bit of time, Ellis worked for Stickley's *The Craftsman* magazine. During that short period, these two friends refined the earlier versions of Craftsman furniture and developed the look the world has come to admire: taller, more slender pieces that combine style and function.

Selecting Stock

While Gustav Stickley almost exclusively used quartersawn white oak, the same cut of red oak is quite acceptable. We settled on quartersawn red oak here because the lumber supplier had some excellent stock featuring dramatic ribbon effects.

The grain in a standard plain sawn board is tight at the edges and can be quite wide down the center. A quartersawn board, on the other hand, features tight grain across its entire width. This makes for a very stable piece of lumber. Whichever species you choose, let it acclimate to the humidity of your shop for at least a week before milling it to size.

Begin with the Back

The first step in construction is to lay out and cut the back legs (pieces 1) to size and shape. The legs are cut from 1½" thick by 3" wide stock. If possible, start with 8/4 rough stock and plane it until you reach the correct thickness.

Historical Fact:

Stickley and Ellis

A match made in heaven, or maybe just the midwest. Gustav Stickley and architect Harvey Ellis were flint and steel for each other ... creating the seminal spark of the American Arts & Crafts movement.

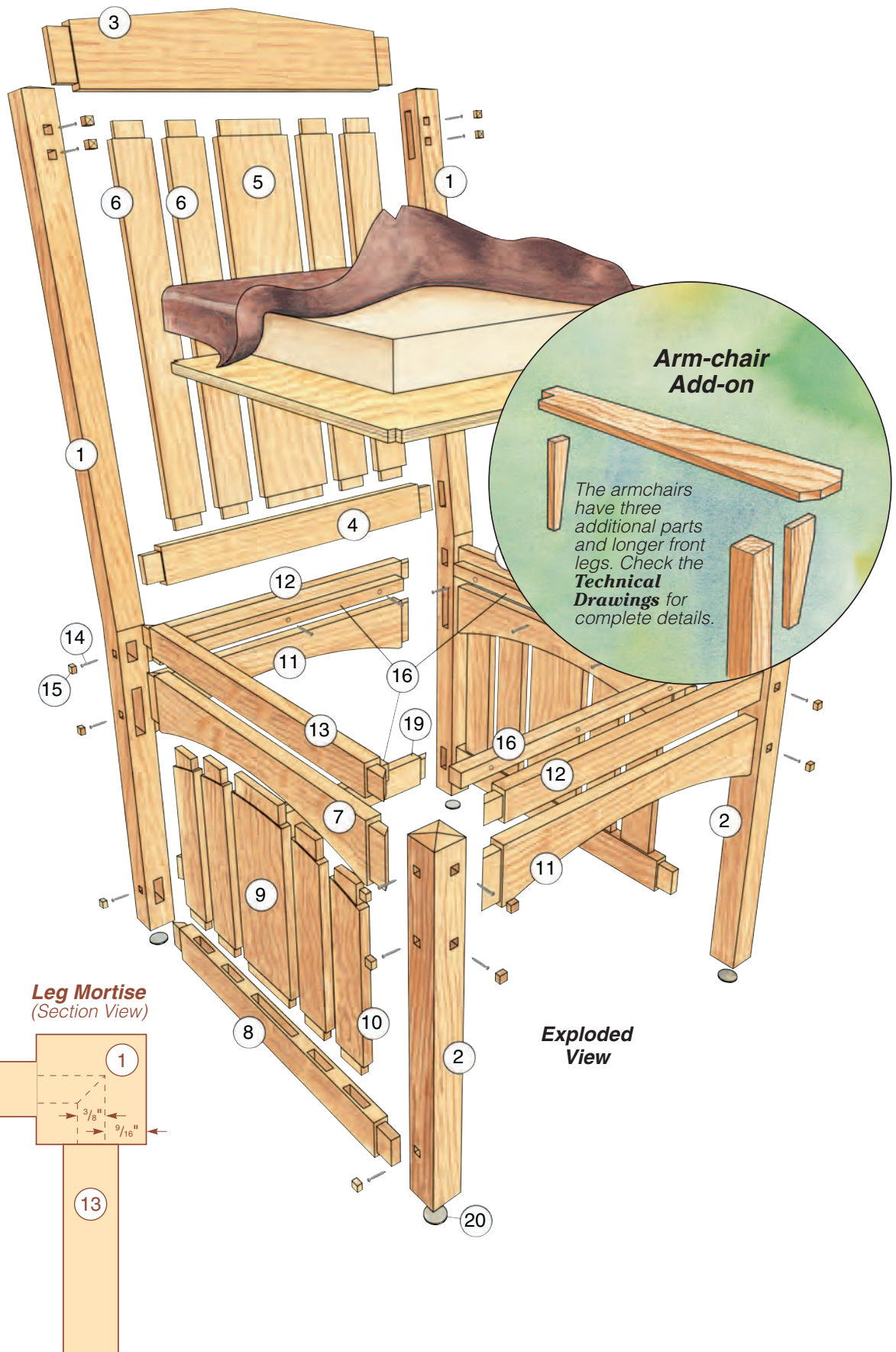


Stickley

Ellis

Follow the profile on the *Technical Drawings*, page 70, to lay out the back legs, then bandsaw them to shape. Next, slice the front legs (pieces 2) from the same 1½" stock. Belt-sand all four faces of each leg, then refer to the *Elevation Drawings* to establish





MATERIAL LIST

	T x W x L		T x W x L
1 Back Legs (2)	1½" x 3" x 42¼"	11 Front and Back Arched Rails (2)	¾" x 3" x 18⅝"
2 Front Legs (2)	1½" x 1½" x 17⅝"	12 Front and Back Seat Rails (2)	¾" x 1½" x 18⅝"
3 Backrest Top Rail (1)	¾" x 3½" x 18⅝"	13 Side Seat Rails (2)	¾" x 1½" x 18⅝"
4 Backrest Bottom Rail (1)	¾" x 2" x 18⅝"	14 Tenon Screws (20)	#6 x ⅝"
5 Backrest Center Slat (1)	½" x 4" x 18⅝"	15 Tenon Screw Pegs (20)	¾" x ¾" x ½"
6 Backrest Exterior Slats (4)	½" x 2" x 18⅝"	16 Seat Support Cleats (4)	¾" x ¾" x 15⅝"
7 Side Arched Rails (2)	¾" x 3" x 18⅝"	17 Plywood Seat (1)	¾" x 17¼" x 17¼"
8 Side Bottom Rails (2)	¾" x 2" x 18⅝"	18 Cleat Screws (12)	#6 x 1¼"
9 Side Center Slats (2)	½" x 4" x 10¼"	19 Back Bottom Rail (1)	¾" x 2" x 18⅝"
10 Side Exterior Slats (8)	½" x 2" x 10¼"	20 Leg Pads (4)	1" Dia.

Making Mortises Mechanically: Is It Time To Make The Move?

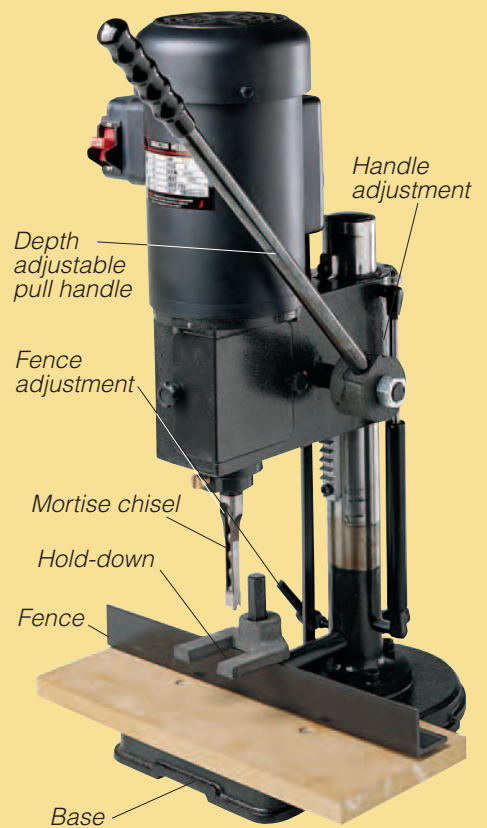
There's no great secret to cutting the stopped mortises used in this project. Since the dawn of the 20th century, advances in power tools have made the process a whole lot easier. The original Arts & Crafts builders would have bored out most of the mortise with a bit and brace, then finished the cuts with finely sharpened chisels. Now there is a new generation of easy-to-use mortising machines. Once you count the number of mortises in each chair and multiply by four, perhaps you'll conclude there is a new mortising machine in your future.



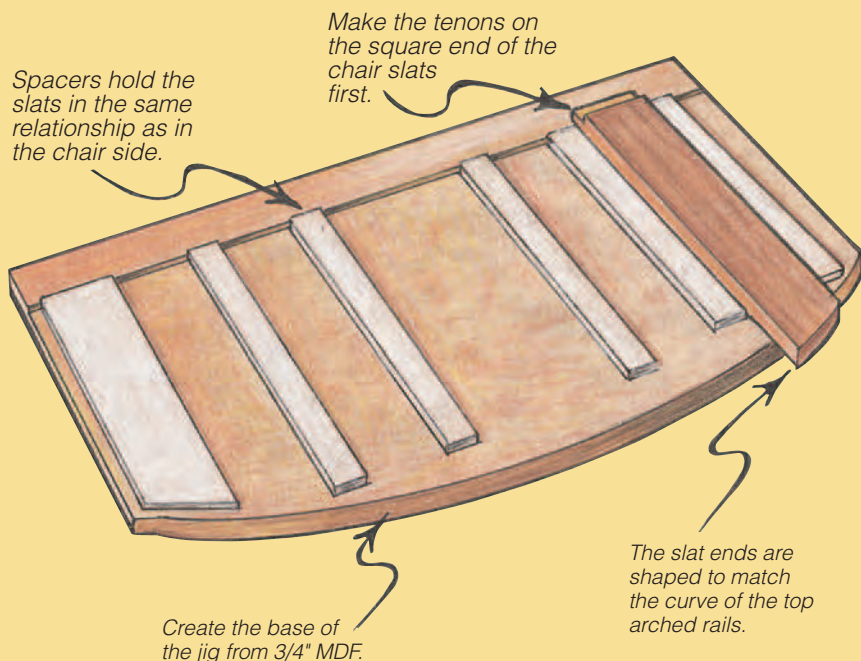
Drilling square holes is a snap with a mortising machine. Here's how it works: an auger-like drill bit is housed inside of a square hollow chisel. Available in many standard sizes — and able to form mortises in hard and soft wood — these machines are true time savers.



A lever locks the fence on this model in place. A hex nut secures the U-shaped hold-down. The key advantage of a mortising machine over a mortise attachment on your drill press is the longer stroke of the machine, allowing for deeper one-step mortises.



Template Tenoning: Easier Than It Looks!



Use a routing jig and a flush trimming bearing bit to cut the gentle arc onto each chair slat, as shown at left. To start the tenons on the curved tops of the side slats, use a 3/8" piloted rabbeting bit, as shown at right.



We made the curved tops of the side slats with this simple jig. The spacers hold the slats in position while you form the curves on their tops. Before clamping them into the jig, cut the tenons on the bottom end of each slat on your table saw. Now run a flush trimming bearing bit around the curved end of the jig to create the gentle arc on the top of each slat. Move to your router table and use a 3/8" piloted rabbeting bit to form the cheeks on the curved ends of the slats. Finish the tenons by notching their shoulders on the bandsaw.



and mark the locations of the leg mortises. These mortise locations (see *Figure 1*) create right and left chair pieces. Now is the time to make the pyramid details on the top of the legs. See the *sidebar* on the next page to learn the technique.

The backrest of the chair is comprised of two rails (pieces 3 and 4) and five vertical slats (pieces 5 and 6). The rails are joined to the back legs with mortise and tenon joinery, just as the slats are joined to the rails. Cut these pieces to size. Form mortises and tenons as required, following the *Technical Drawings*.

Building the First Subassembly

With the backrest rails and slats milled, there's only one detail to address before you can complete your first subassembly. Following the profile shown on the *Technical Drawings*, lay out the angular cut on the top edge of the backrest top rail, then trim it to shape on your bandsaw. Belt-sand the saw marks until they are gone, then

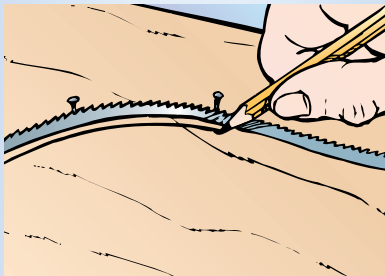


Figure 1: Mortise and tenon joinery is the key to this chair's durability. Different mortise locations create right and left chair parts. Some of the tenons are mitered to meet inside the uprights.

Quick Tip

Drawing a Smooth Curve

An old bandsaw blade works wonderfully for drawing smooth curves. Drive nails at key spots along the waste side of the curve, then bend the blade against the nails to draw the final curve.



give the rails and slats a thorough sanding to 180 grit.

Dry fit the slat tenons in the rail mortises and, when everything fits perfectly, glue and clamp them together (see *Figure 2*, page 72). Make sure the subassembly is perfectly flat and square when you tighten the clamps, then set the backrest aside to dry.

The Four Arched Rails

Perhaps the most challenging aspect of this chair is forming the side subassemblies. Each of these is composed of an arched top rail (pieces 7), a flat bottom rail (pieces 8) and five slats (pieces 9 and 10).

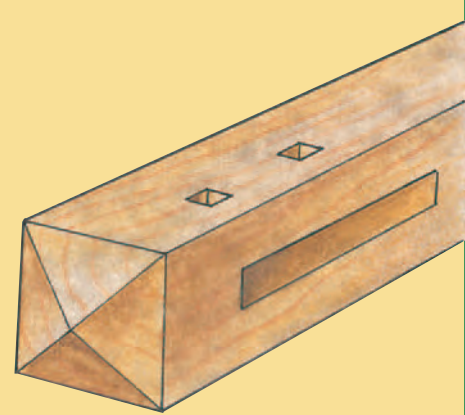
After cutting these parts, along with the final two arched rails (pieces 11) to the dimensions shown on the *Material List*, follow the *Technical Drawings* to lay out the mortises in the side arched rails.

Pyramids: The Great ... and the Small

In a reflection of the medieval origins of his style, Stickley often softened the tops of his chair legs by milling mild chamfers that met to form a four-sided pyramid. You can duplicate this effect by setting a sharp, fine tooth, crosscut blade to 15°, then using your table saw's miter gauge to help you make these cuts. If your saw table is too big for the crooked back leg to lie flat, simply raise the blade, reverse the piece, and run the gauge in the



opposite slot. To make the small pyramid plugs, sand long thin pieces of stock on your stationary sander with the miter gauge set at 15°. Then trim them to length with your bandsaw.



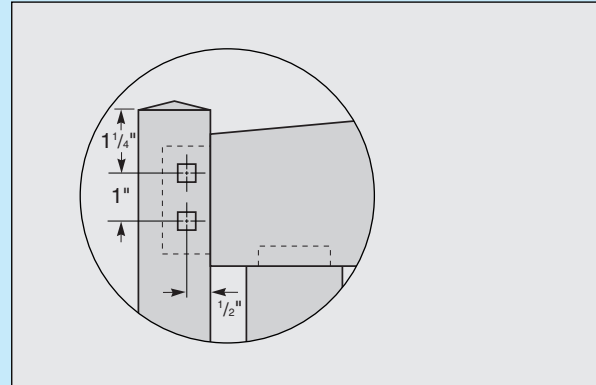
It's essential that assembly takes place on a flat, stable surface and that each component is checked for squareness and plumb as the clamps are tightened.



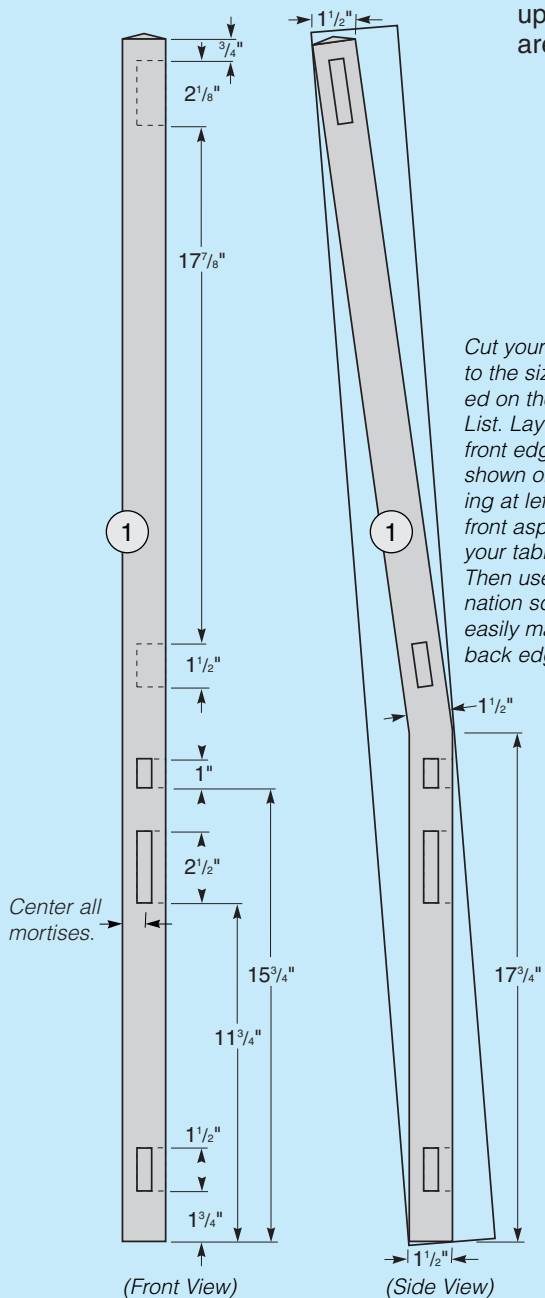
Plug Locations

All of the flush sanded plugs are centered over their tenons. See the exploded view on page 66 to identify where the flush sanded plugs are placed.

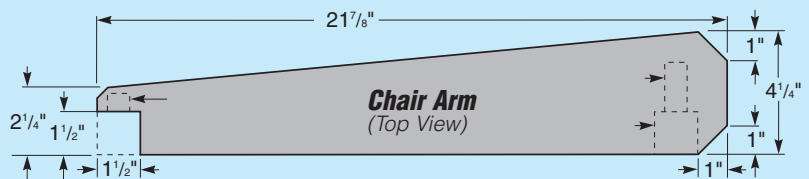
The four pyramid shaped plugs which decorate the upper aspect of the chair legs are placed as shown at right.



Chair Leg

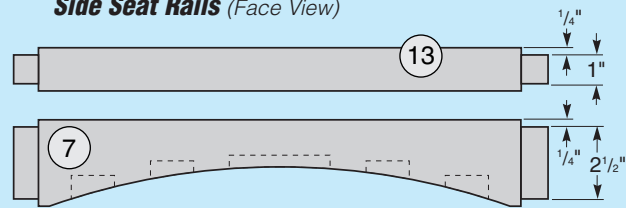


Cut your leg blank to the size indicated on the Material List. Lay out the front edge as shown on the drawing at left. Slice the front aspects on your table saw. Then use a combination square to easily mark the back edge.

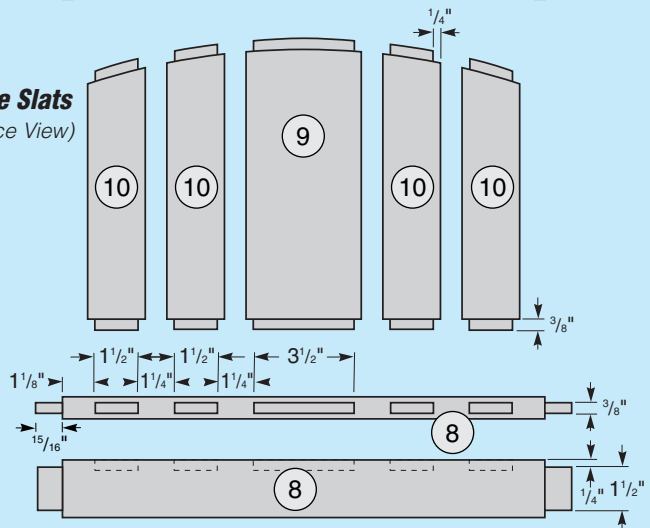


Chair Arm (Top View)

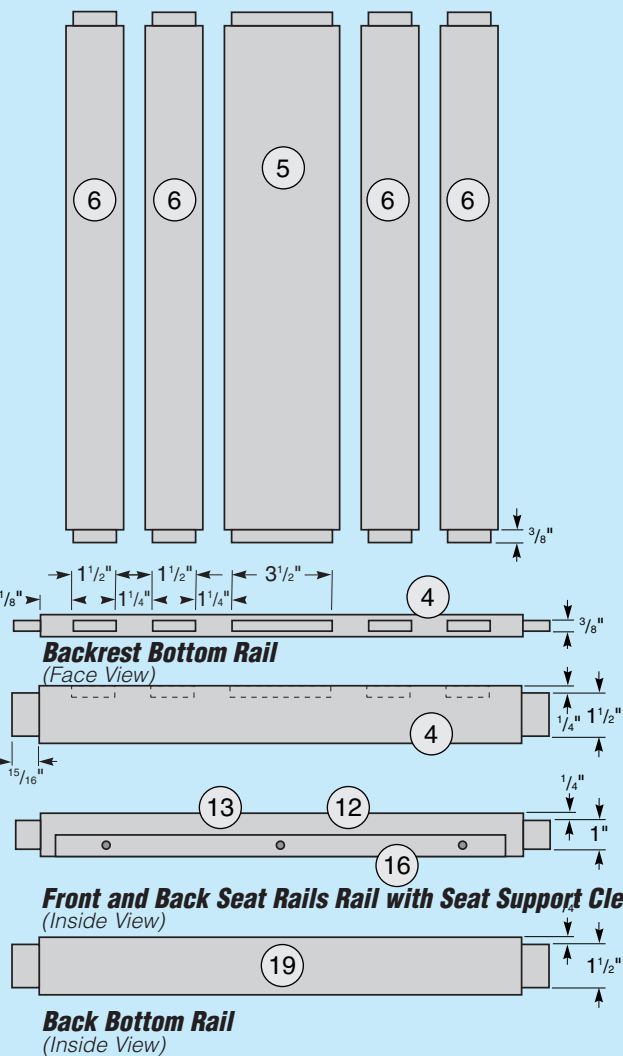
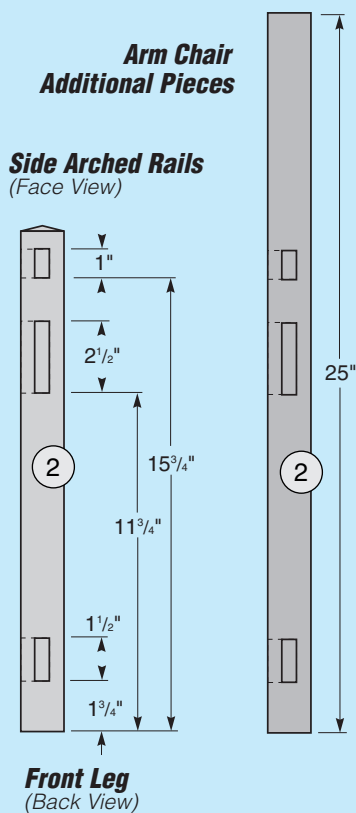
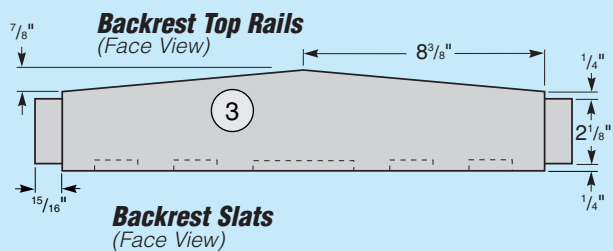
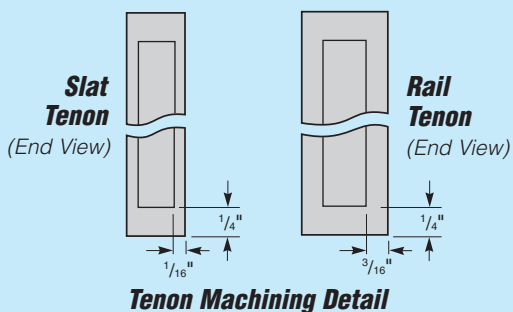
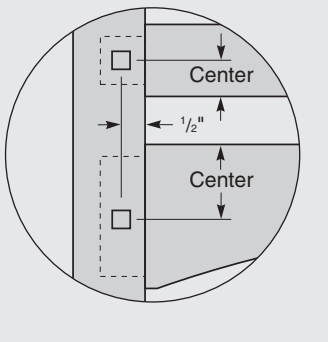
Side Seat Rails (Face View)



Side Slats (Face View)



Side Bottom Rail (Face View)



Upholstery Basics:



To complete your seats, trim the leather to a 24"x 24" square. Then, on the rough side of the leather, mark a 3 3/4" square in each corner. Next, mark a 1" strip diagonally from the inside marked corner to the outside edge of the leather. Trim on your lines to create the shape shown above.



Cut 2" thick high density foam on your bandsaw with the table set at 30°. The smaller face of the foam should match the size of the plywood. Round over the plywood edges.



Gently pull the side flaps up and secure the leather with staples. Keep the tension across the seat even. Pull the strip up snugly and staple as shown below. If the corner is too bulky, you may need to trim a bit of foam.



Chop these mortises, then make a full-sized pattern for the arched profile. Trace the shape onto all four of the chair's curved rails, and band saw them to shape. Clean up the cuts with a drum sander chucked in your drill press.

Follow the procedure shown on page 68 to mill the curved tenons on the top of the side slats. Create the bottom rails and arched rails with mitered tenons as indicated on the *Drawings*. The tenons on the bottom rail penetrating the front leg are not mitered. When they fit snugly, glue and clamp them together, checking to be sure they are flat and square. While the glue dries, mill mitered tenons on the final two arched rails and the four seat rails (pieces 12 and 13).

Preassembly Details

While mortise and tenon joinery is extremely strong, a dining chair is subject to a lot of use and movement. To help prevent the joinery from ever loosening up, most of the tenons are locked into their mortises with short screws driven through the shoulders into the mortise walls. These screws (pieces 14) are set below the surface in their own small mortises, then plugged with square hardwood pegs (pieces 15). Locate all 20 of these small mortises on the *Exploded Drawings*, page 66, then chop them to size.

Four cleats (pieces 16) support the plywood seat (piece 17). Cut these to size, then refer to the *Technical Drawings* for the locations of the screws (pieces 18) that will hold them in place. Pre-drill countersunk



Figure 2: Glue up the subassemblies of the back and chair sides. Make sure they are flat and square. After the glue has cured, move on to the final assembly.

pilot holes for these screws, then cut the back bottom rail (piece 19) to size and mill mitered tenons on its ends (see *Technical Drawings*). Sand all the chair elements to 180 grit before starting the final assembly procedure.

Assembling the Chair

There's a logical order to the assembly process: you'll work from the back to the front. Begin by laying out all the parts

Historical Fact:

Green Wood Chairs

Years ago, chairs were often made of green or partially air-dried wood. To keep the rungs from loosening over time, chair makers would heat them in an oven to dry them out before forming the tenons. Later, as the legs seasoned, the mortises would shrink tightly around the drier tenons, making the joints even stronger.

Quick Tip

Transferring Gridlines

Oftentimes you may need to enlarge a project grid drawing to full size. Instead of spending considerable time and effort actually drawing out the grid itself — a tedious process — try using a pattern cutting board, available in the sewing section of most variety stores. You can find them in 3 x 5 ft. folding cardboard sizes with a 1" grid already printed on a white background. Tape vellum or thin copier paper over the pattern board so you don't draw directly on the grid, and make your full-sized sketches. This way, you can use the pattern board over and over again.

and subassemblies, so you're not searching for pieces while reaching for clamps. Dry-fit everything to make sure there are no problems before you start gluing. If you need a hammer to close any joints, they're fitting too tightly. Refine them as needed before going on with assembly.

Lay one of the back legs on its side, then glue the seat back subassembly, the back seat rail, the back arched rail and the back bottom rail snugly in place. Turn them upside down and glue their tenons into the mortises in the other back leg, clamping the entire subassembly so it is flat and square. Drive home the four small screws in the top, front screw mortises. Let the glue cure before moving ahead.

When the glue is dry, lay the back subassembly on its back and glue the two side subassemblies in place, along with the two side seat rails. Working quickly now, glue the front seat rail and arched rail into the front legs, then glue and clamp the front subassembly to the sides. Snug up your clamps and stand the chair on a flat, level surface before tightening them. Make sure that everything is square and true as you apply pressure, then drive home the rest of the small tenon screws.

After the glue dries, plug all the screw holes. The easiest way to do this is to rip a long piece of stock to the thickness and width of the plugs, then trim them a little longer than you need them. Four of the plugs

are sanded to small pyramids and glued in place. The rest are glued in place and sanded flush. Level the legs if needed (see below) and move on to finishing.

Finishing Thoughts

After a final sanding, we applied Bartley's dark walnut stain, then sealed it with three coats of a compatible low luster finish. Polyurethane is a good choice, because it's rugged enough to endure the constant handling and use of a dining room chair. Another good topcoat choice would be lacquer, if you're set up to spray it.

Stickley's seats were often upholstered in soft, brown leather. After all this hard work on the chair frames, it would be a fitting final touch for your chairs, too. For instructions on completing that task, refer to the *sidebar* on the preceding page. When you're done, screw the seat support cleats in place and attach the plywood seat to them with screws. Stick a felt pad (piece 20) to the bottom of each leg, and you're ready to start seating guests at your celebration dinner party.

On a level surface, check to see if your chair rocks. If it does, make a line exactly the same distance up from the surface on all four chair legs. Sand carefully to the lines, and your chair will sit flat.

