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Craftsman Style Rocking Chair

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Craftsman Style Rocking Chair

Start with a classic design, meld fine machine joinery with a few hand tool operations, and you have a beautiful introduction to Arts & Crafts chairmaking. This will be an involved project, but there's no reason to fear its construction. Most of the joint cutting can be done by ordinary shop machines with excellent results, and the handwork amounts to fine paring and fitting.

Arts & Crafts style furniture developed in the late nineteenth century, beginning in England and migrating to America where it became better known as the Craftsman style. Other names, such as Mission furniture, were also commonly used to market this style of furniture. Craftsman designs were characterized by simple, economical lines, dramatically diverging from the Victorian frilliness of the previous era. By 1900 the Arts & Crafts Movement was a dominant force in American furniture and lighting design, pottery, architecture and the decorative arts.

Gustav Stickley became the standard bearer of the Arts & Crafts Movement in the United States, developing a line of furniture that exemplified the ideals of simplicity and quality craftsmanship, while remaining within economic reach of the middle class. Other notable American figures in this movement were architects Frank Lloyd Wright, Louis Sullivan and Charles and Henry Greene and lighting artist Louis C. Tiffany.

UNDERSTATED ARTISTRY

In reaction to the cruel industrial practices of the 1800's, Craftsman artisans strived to maintain the finest elements of creative handwork while selectively using modern machinery to best advantage. Blending the two methods relieved workers of repetitious, unskilled work so they had time for more individualized, expressive woodworking tasks.

The rocking chair detailed in this article is a hybrid of several arts and crafts designs that were popular at the turn of the century. The lines are less severe than the originals, and the various components in the chair aren't as heavy. All these changes make the chair more pleasant to sit in.

Cutting and Mortising the Legs

Chairs are subject to incredible stress from all the movement a person goes through while sitting. People lean, tip back, swivel and manage other contortions that make designing chairs difficult and risky. All of this makes chair design and construction a specialized branch of woodworking.

The main structural components of this rocking chair are the back legs. These are the heaviest pieces in the design and support the rest of the chair. All the legs receive a number of mortises which, in this design, are square to the leg profiles. The legs also have tenons on their ends for joining them with the arms and rockers.

Following the *scale drawings* on page 98, cut the back legs (pieces 1) out of wide 1¼"-thick stock and then

clamp them together to belt-sand their front edges to a smoothly matching profile. To sand the back edges of the legs, install a 3"-diameter drum sander in your drill press and clamp a pivot block 11 3/16" away from the drum (see *Figure 1*). Slowly feed the legs into the gap between the sander and the pivot block to reduce the stock to its finished size and to make the two edges of each leg parallel. Make sure you feed the wood against the rotation direction of the drum to maintain control.

Once the back legs are sanded, lay out the six mortises in each back leg and the four mortises in the front legs (pieces 11) as shown in the *Back* and *Front Leg Elevations* on page 98. The mortises include joints for the crest rail (piece 2), the lower rail (piece 3), the seat support rails (pieces 4, 5 and 6) and the stretchers (pieces 8, 9 and 10).

Figure 1: *Create uniformly sized and smoothed curves by pushing the stock between a V-block and a sanding drum mounted in a drill press.*

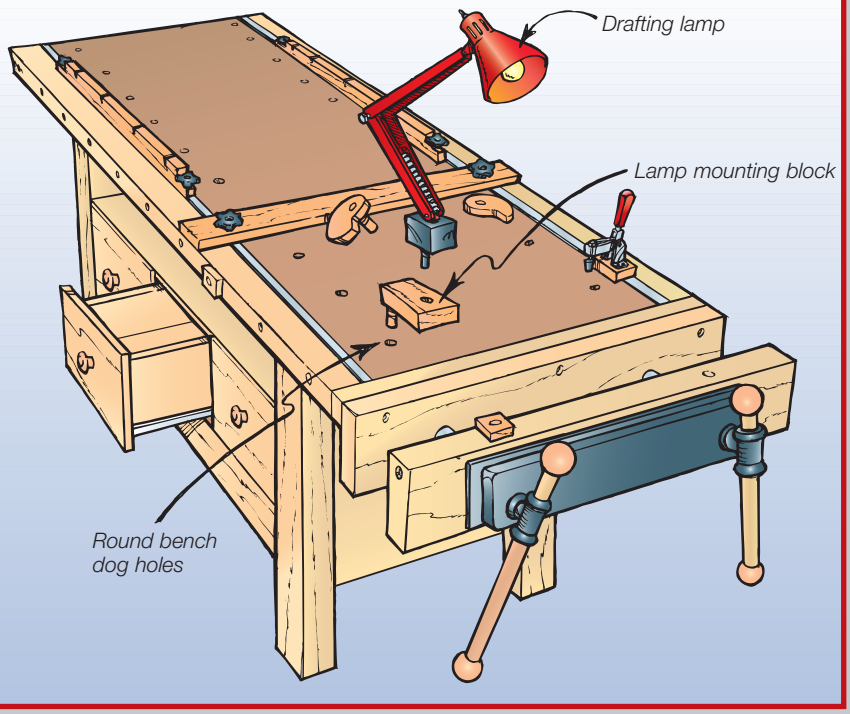
Don't lay out the mortises for the arms until later, when the front tenons are made and the exact slope of the arms is apparent. The 1/2"-deep mortises are cut squarely into the legs with a router, a 1/2" straight bit and an edge guide, and then the rounded ends of the mortises are squared with a 1/2" chisel. With one exception, the mortises for the rails and stretchers are centered on the legs, but be sure to note that the legs are 1¼" by 1¾", requiring two settings of your edge guide to keep the bit centered. The exceptions are the two mortises for the back seat support rail. For these, the center of the router bit is positioned 1/2" in from the back edge of the two back legs.

After all the mortises are routed, begin cutting the through tenons on the top of the front legs. The arms slope from the front legs to the back legs at a 5° angle, so you must cut the tenon shoulders to establish this angle. Lay out the tenons' side shoulders at a 5° angle, and then connect these lines

QuickTip

Holder for a Drafting Lamp

Here's a great way to add some task lighting to virtually any workbench equipped with bench dog holes. Just take a piece of 2 x 4 and drill two holes several inches apart. One should fit the lamp base, while the other should be the same diameter as a bench dog. Glue a dowel into the second hole and you can mount an articulated desk lamp anywhere on the benchtop. The hinged arm on the lamp allows you to adjust the light right where you need it most.



across the front and back leg faces.

Pivot your table saw's miter gauge to 85° for cutting on the left side of the blade, and raise the blade 1/8" above the table surface. Cut one sloped shoulder on each leg, and follow this with multiple passes over the blade to remove the waste for the tenon. Now swing the miter gauge to its opposite 85° setting and repeat the tenon cutting process on the other side of the stock. To cut the remaining two shoulders on each leg, straighten the miter gauge to 90° and tilt the blade to 85°. Cut one set of shoulders with the miter gauge on the left side of the blade and the other set on the right side of the blade. In both cases repeatedly pass the stock over the blade to complete the tenon in side-by-side passes. Clean off the saw marks on the tenons with a wide chisel.

The front leg tenons pass through the arms and are topped with a pyramid design. This design, intended to highlight the skill of Stickley craftsmen, became a trademark during the Arts & Crafts era. The pyramid can be cut with a sharp handsaw and a wide chisel. Lay out a line on all four sides of both front legs 1/4" down from the top and center a line on the top of the legs from the front edge to the back. Use your handsaw to rough in the angled cuts from the line on top of the legs to the line on the long sides. Now begin paring thin shavings off the four sides of the pyramid to get the desired shape.

Forego cutting the bottom tenons on both the front and back legs for now. Later, you can scribe the tenon shoulders to the specific curve of the rockers. This technique will be described in detail later.

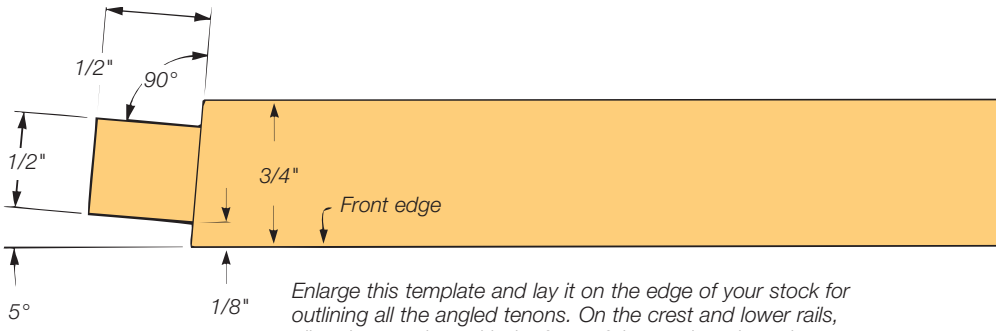
Making the Crest and Lower Rails

The next major chair components are the crest rail (piece 2) and the lower rail (piece 3). Rip the rails to their finished width from 1½"-thick stock. Lay out the curves and the mortises for the slats (pieces 12) on the bottom edge of the crest rail and on the top edge of the lower rail as shown in the *Crest Rail Drawing* on page 98, and lay out the angled tenons at each end of these pieces using the *template* shown above. Be sure to align the front edge of the template with the front edge of the stock.

Chuck a 3/8" Forstner bit in your drill press and adjust the drill to bore 1/2" into the bottom edge of the crest rail. Now drill four holes into each mortise area to remove the bulk of the waste, then readjust the drill press bed to perform this same operation on the narrower lower rail. Once the drilling is complete, square the ends of each mortise with a sharp 3/8" chisel and pare the mortise walls clean.

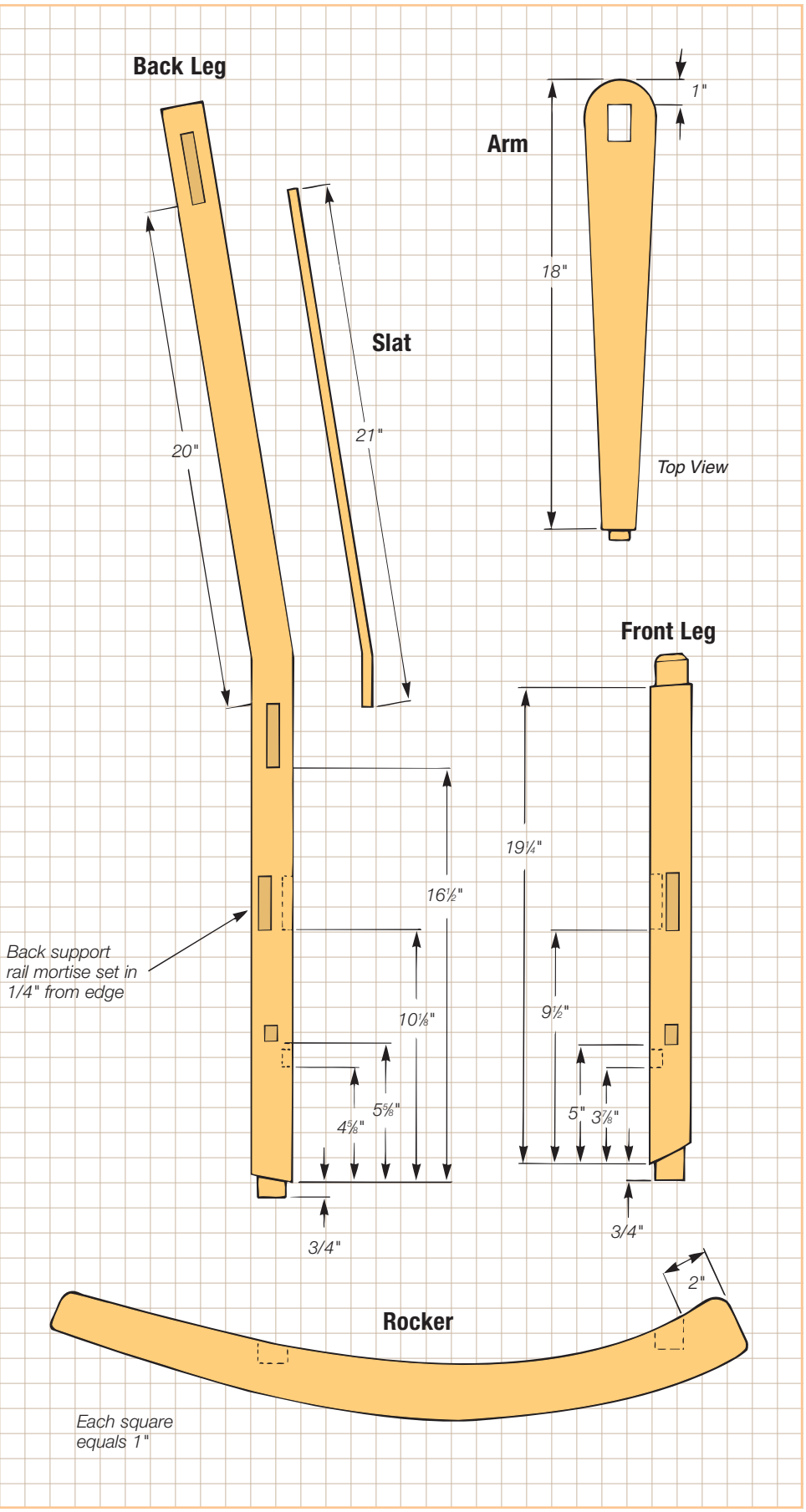
Due to the widening of the chair from back to front, the pieces connecting the back legs or the front legs join the legs at a 5° angle. Since all the mortises are routed squarely into the legs, the 5° angle must be accommodated by the tenons, and the first step in this process

Figure 2: *Use the* drawing *below to lay out all the angled tenons in the project. Hollow out the rail mortises with a 3/8" drill bit, then clean up the mortises with sharp chisels.*



Enlarge this template and lay it on the edge of your stock for outlining all the angled tenons. On the crest and lower rails, align the template with the front of the stock and cut the tenons prior to band-sawing the curve.

Figure 3: *Align the arm mortise with the front leg tenon and rest the arm on the shoulder. Lay out the rear joint where the arm intersects the back leg.*



is cutting the tenon shoulders.

Cutting the angled shoulders on the crest rail and lower rail is easily done on the table saw. Attach a 16"-long scrap-wood auxiliary fence to your miter gauge and set your blade to a 5° angle. Put your miter gauge in the slot to the left of the blade and cut off the end of the wood fence at a 5° angle, then repeat this process on the right side of the blade to cut the other end of the fence. The ends of the fence now serve as guides for cutting the tenon shoulders.

With the back side of the crest rail facing down, line up the right tenon shoulder line with the cut-off end of the fence (with the fence on the left side of the blade). Adjust the height of the blade so the teeth just reach the cheek line on the rail stock and pass the rail over the blade. Flip the stock around and cut the matching shoulder on the other end. Now make these two cuts on the lower rail.

Cut the shoulders on the front face of the rails by lowering the blade so the teeth just reach the cheek, and then follow the procedure you just used for the first set of shoulders.

The next step in forming the tenons is cutting the cheeks on the band saw. Set the rail stock on edge and feed the wood slowly into the blade, staying just outside the layout lines. Be careful to stop cutting when you reach the shoulder kerf. Cut both cheeks on each tenon, and then nip off the pointed bit of waste material that remains at the end of the tenon.

Now cut the shoulders on the top and bottom edges of all the tenons using a handsaw and chisel. Remember that these cuts follow the 5° angle of the shoulders. With a handsaw, cut into the stock 1/8" and then remove the waste with a chisel. Once the edge shoulders are formed on each tenon,

smooth the tenon cheeks with a sharp 1" chisel. Check the fit of the tenons in their mortises occasionally as you work.

Cut the rail curves on the band saw using a medium-toothed 1/2"-wide blade. Cut just outside the layout lines, then belt-sand the backs of the pieces smooth. Chuck a drum sander in the drill press and clamp a V-block to the bed to uniformly smooth the inside curves of the rails.

The top edge of the crest rail can now be cut on the band saw to its curved profile. Lay out the curve (shown at right) and cut just outside the layout line. Carefully remove the ridges with a belt sander.

Creating Seat Supports and Stretchers

Rip all the seat support rails (pieces 4, 5 and 6) and the lower stretchers (pieces 8, 9 and 10) to width on the table saw, and then cut them to length.

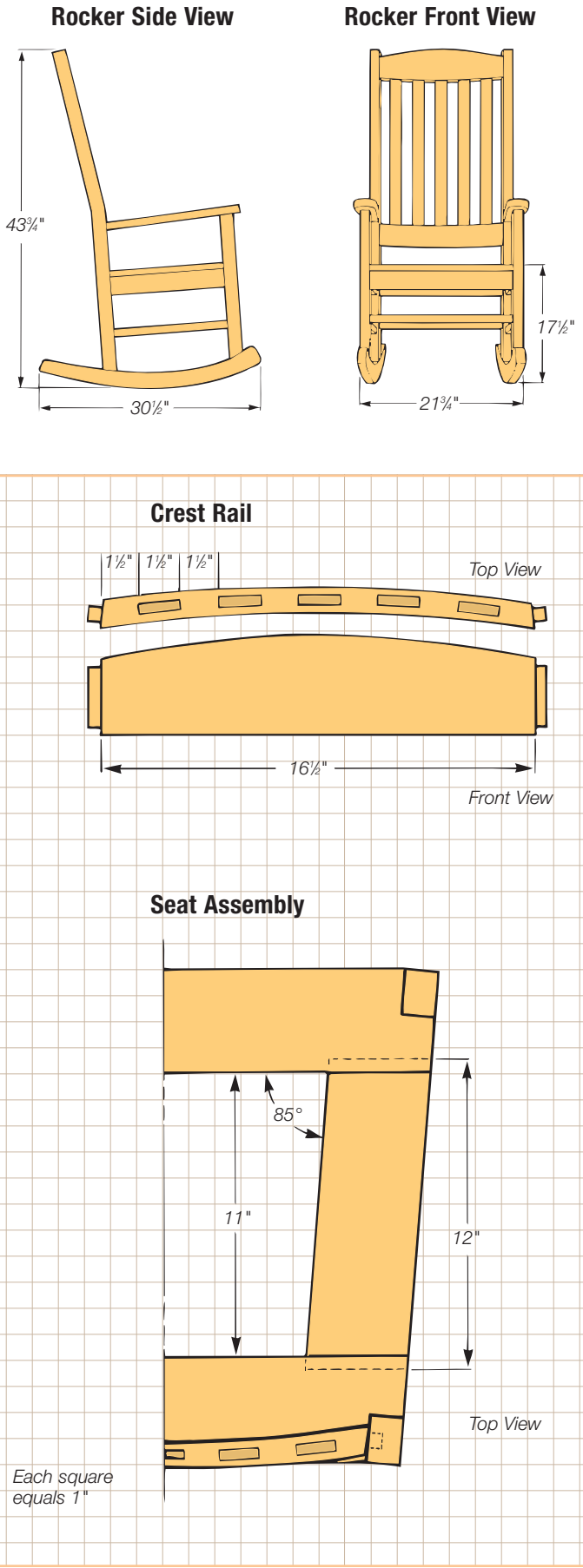
On the rails and stretchers crossing between the back or front pairs of legs (pieces 4, 5, 8 and 9), lay out the angled tenons using the template on page 97. Cut the shoulders on these pieces just as you did earlier on the crest rail and lower rail. Cut the cheeks on the band saw, and use a handsaw and chisel to cut the edge shoulders. Fit the tenons in their mortises after smoothing the cheeks with a sharp chisel.

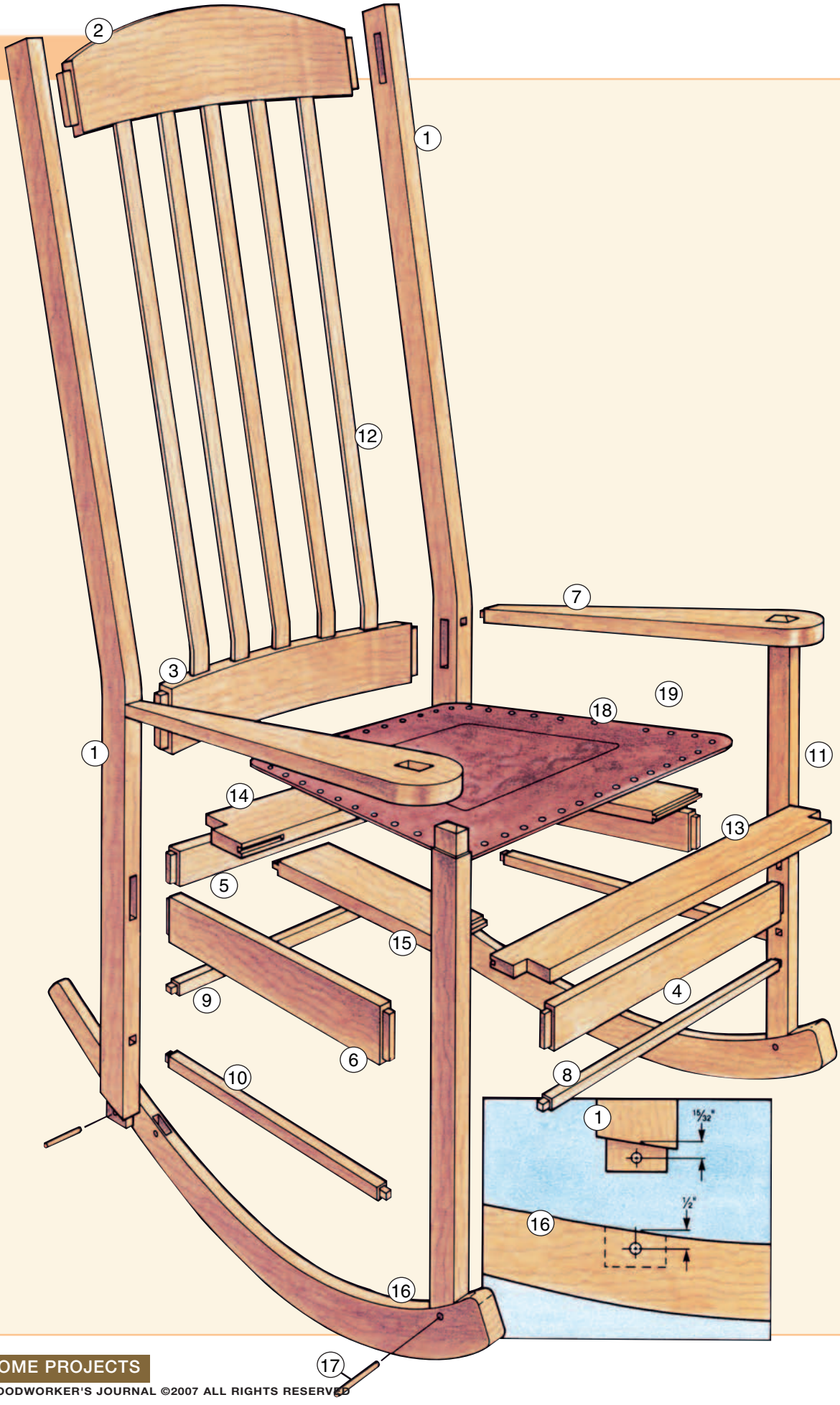
The rails and stretchers spanning the sides of the chair (pieces 6 and 10) enter the legs at a 90° angle and therefore do not need specially angled tenons. Clamp a 3/4"-thick spacer block to your table saw fence, keeping the block forward of the blade. Reset the blade to 90° and clamp the fence 1¼" away. This will allow you to cut 1/2"-long tenons. Rest the stock in your miter gauge, butting one end of the piece against the spacer block. Now cut the square shoulders, making additional passes over the blade to form the tenon cheeks. Repeat this procedure for all four pieces, and cut the edge shoulders in the same way. Carefully smooth the cheeks with a chisel, refining the tenons until they fit snugly into their mortises.

Making the Slats

Cut the five slats for the back rest (pieces 12) from 4/4 material. Rip five strips 1½" wide and lay out the slat profile on the edge of each strip. Cut the 7/16"-thick slats on the band saw with the same medium-toothed, 1/2"-wide blade you used earlier, staying outside of the lines so you can sand down to the finished dimension.

Belt-sand the front of the slats so they're even and smooth. Now use the drum sanding setup on your drill press to sand the back sides of the slats to a uniform thickness of 3/8". Again, make sure to sand against the drum's rotation.





MATERIAL LIST

		T x W x L
1	Back Legs (2)	1¼" x 5" x 46"
2	Crest Rail (1)	1½" x 4" x 17½"
3	Lower Rail (1)	1½" x 3" x 17½"
4	Front Support Rail (1)	3/4" x 2½" x 20 3/16"
5	Back Support Rail (1)	3/4" x 2½" x 17½"
6	Side Support Rails (2)	3/4" x 2 ½" x 16¼"
7	Arms (2)	1" x 3" x 18½"
8	Front Stretcher (1)	3/4" x 1" x 20 3/16"
9	Back Stretcher (1)	3/4" x 1" x 17½"
10	Side Stretchers (2)	3/4" x 1" x 16¼"
11	Front Legs (2)	1¼" x 1¾" x 21⅜"
12	Slats (5)	3/4" x 1½" x 21"
13	Front Seat Rail (1)	3/4" x 4" x 21 11/16"
14	Back Seat Rail (1)	3/4" x 4" x 19 9/16"
15	Side Seat Rails (2)	3/4" x 4" x 12"
16	Rockers (2)	1¼" x 5" x 30½"
17	Dowel Pins (4)	1/4" x 2"
18	Leather Seat (1)	16" Rectangular
19	Upholstery Tacks (1)	Pack of 100; Antique Finish

Assembling the Chair

By this time you've made most of the parts of the chair. Those parts that are left—the arms, rockers and the seat—are made after the main structure is assembled.

Gather together all the pieces you've made so far and organize them into three groups. The first group should include all the parts that make up the back of the chair, including the back legs, the crest rail and the lower rail, the slats, the back seat support rail and the back stretcher. The second group should include the parts for the front of the chair, which are the front legs, the front seat support rail and the front stretcher. The final group includes the side seat support rails and the side stretchers.

Dry-assemble all the parts in the back and, once everything fits properly, spread glue in all the mortises of the crest rail and the lower rail and insert the slats into position. Now apply glue in all the mortises of the back legs and on the tenons of the rails and stretcher. Slip the right leg onto the crest rail and lower rail tenons, then add the seat support rail and the stretcher. Pull the left leg onto the assembly and check for squareness by taking each diagonal measurement from the crest rail to the lower rail. When the spans are equal, the unit is square. Clamp the assembly and let the glue dry.

Assembling the front section is much easier since there are a lot fewer parts. Spread glue in the leg mortises and on the tenons of the front seat support rail and the stretcher. Draw the legs onto the stretchers, check for squareness and clamp the assembly for a couple hours.

After the glue on the front and back assemblies dries, put glue in the mortises for the side seat support rails and the stretchers. Insert these pieces into the back leg mortises, then glue the front assembly onto their other ends. Set the chair aside to allow the glue plenty of time to dry.

Building the Seat

The four pieces of the seat (pieces 13, 14 and 15) are 4" wide, so rip enough 3/4"-thick material to this width, leaving the pieces overly long for the moment. The two side pieces are joined to the front and back pieces by mortise and tenon joints, however, since the seat is tapered from front to back, the joints form an 85° angle.

Cut each piece to length, remembering that all the crosscuts must be made at an 85° angle. Once cut to length, stop-mortise the front and back pieces for the joints using the dimensions shown on page 99. This can easily be done on the router table with a stop block on the fence. Mount a 3/8" straight bit in the router, raise the bit 1/2" above the table and adjust the fence so the bit cuts exactly down the center of the 3/4"-thick seat pieces. Clamp a stop block 4⅜" beyond the bit and then rout the four mortises.

Next, form the tenons on the seat side rails. Remove the router from the router table and add the edge guide to its base. Install a 1/2" straight bit and set it to cut 3/16" deep. Adjust the edge guide to limit the cut to 1/2" in width. Following the angled end of each side piece, rout one side of the tenon and then flip the piece over to make the second cut. When the joints fit properly, glue the seat together and use the inside diagonals to check for squareness. Sand the seat flush when you remove the clamps, and notch each corner of the seat to fit around the legs as shown in the *Seat Assembly*

Drawing on page 99. Run a bead of glue along the seat support rails and clamp the seat into position. By gluing the seat to the rails, the overall strength of the chair will increase tremendously.

Forming Arms and Rockers

The arms (pieces 7) are cut from 1"-thick material, which must be planed from thicker stock. Rip two pieces of 1¼"-thick oak to 3" in width and cut them 20" long. Try to find highly figured stock for these pieces, as they'll show off the chair more than any other single component. Mill the stock down to 1" thick.

Lay out the through mortise location on the front end of both arms. The mortises must be cut at a 5° angle to allow the arms to slope properly. To do this, tilt your drill press table 5° and install a 3/8" bit in the chuck. Now bore through the mortise area to remove the waste, being sure to drill around the perimeter of the mortise first so you get the slope properly laid out. Once the bulk of the material is removed, clean up the mortise with a sharp chisel, being careful to preserve the 5° angle.

Rest the right arm on the outside shoulder of the front leg tenon and align the arm mortise with the tenon. The arm is now positioned as it will be when installed, sloping 5° to the back leg. Put a mark on the arm where it intersects the back leg. In addition, draw lines on the leg indicating the top and bottom of the arm. Now lay out a 1/2"-high by 3/4"-wide mortise on the back leg, centering it between the arm intersection marks and across the width of the back legs. At the mark you just made on the arm's edge, lay out the angled tenon, using the angled tenon *template* shown on page 97. Repeat this process on the left arm.

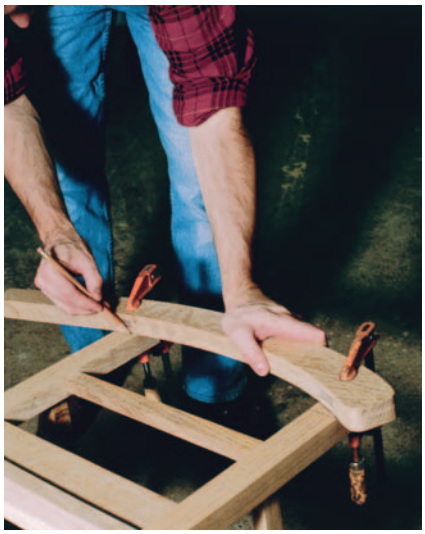


Figure 4: *Position the rocker on the legs, then trace the curve to lay out the tenon shoulders accurately.*

Drill out the bulk of the waste in the 1/2"-deep mortises with a 1/2" bit, then square the walls with a sharp chisel. Cut the angled tenons on the arms using the table saw and long miter gauge fence, just as you earlier cut the other angled tenons. Once the tenons are formed, layout the shape of the arm on the stock and cut this profile on the band saw. Belt-sand the edges smooth. Next, cut the tenon side shoulders and edges with a handsaw and chisel, paring down the shoulders and the cheeks for a perfect fit. Put glue on all the mortises and tenons and slip the arms into place on the chair. Use clamps to draw the arms tightly against the back legs.

Now that the basic chair is made you can move on to make the rockers. Cut two rockers (pieces 16) out of 1¼"-thick material following the *Rocker Scale Drawing* on page 98. Clamp the two rockers together to sand their bottom edges smooth, ensuring the two pieces match exactly. Now pass the rockers over the drum sander to smooth their inside curves. Mark the position where the rock-

QuickTip

Moisture Meter Prevents Surprises when Buying Air-dried Lumber

Your local sawmill may be a great source for inexpensive lumber, but moisture can be a problem if the mill doesn't kiln-dry its stock. Most small mills pile up logs and store them out in the weather. When they rip them into boards, they usually store these green boards outside in unprotected stickered stacks. Even if the lumber gets stored out of the elements, be sure to bring a moisture meter with you, and crosscut a board a few inches in from an end to test it. Don't test the exposed ends, which dry faster than areas deeper in the board. Ideally, lumber used for furniture projects should have no more than 12% moisture content.

Figure 5: *Re-create this symbol of superior craftsmanship from the Arts & Crafts era using a 1" chisel, a tenon saw and your hand tool skills.*

ers intersect the legs as shown in the *elevation drawings*.

Set the chair on its left side and lay the right rocker onto the legs, as shown in *Figure 4* on the previous page. Align the marks you just made on the rocker with the points of intersection on the legs (see the *drawings*). Holding the rocker in place, trace the curve of the rocker onto the legs and outline the position of the legs on the rocker. Flip the chair over and repeat this process for the other rocker.

Lay out the leg tenons below the shoulder lines following the *elevation drawing* on page 98. Using a dovetail saw, make straight cuts close to the shoulder lines, then pare the shoulders with a chisel to match the curved lines. Cut the side shoulders and edges with the dovetail saw.

On the rockers, lay out the mortises between the lines you traced off the leg positions. When you drill out the waste with a 1/2" bit, drill 3/4" deep at the shallow end of each mortise and drill slightly deeper as you follow the rising curve of the rocker. If you do this you'll end up with nice, flat-bottomed mortises that easily fit the tenons. Clean up the walls with a chisel.

Drill a 1/4" hole through the center of the four mortises on the rockers (see *exploded view detail* on page 100) and then mount the rockers onto the leg tenons. Use an awl to mark the center of these holes onto the tenons, then remove the rockers. Now drill a 1/4" hole through each tenon 1/32" above your awl mark.

Put glue on the tenons and in the mortises and drive the rockers onto the legs. Now chamfer the ends on four lengths of 1/4" dowel rod and drive these into the pin holes at each joint—the offset holes will draw the joints tightly together so clamps won't be necessary. Cut off the dowels flush.

Cut off the top of the back legs 1" above the crest rail, then saw and chisel the ends into pyramid shapes as shown in *Figure 5*. Sand the entire chair to 180 grit.

Applying Finish

Arts & Crafts furniture was traditionally finished with a fumed ammonia process. Ammonia causes woods high in tannic acid, like oak, to darken considerably, and the longer the wood is exposed to the fumes the darker it becomes. Controlling this process requires a fair amount of experience and a plastic tent or other enclosure to contain the fumes (see page 8 for more on ammonia fuming). If you'd rather not fume your chair, modern stains and dyes can closely duplicate the colors that result from ammonia fuming. Watco Danish Oil Finish in medium dark walnut matches the tone of the traditional craftsman colors closely. You can easily darken or lighten the color by using other shades of this product. Apply one coat of Watco Oil and let it dry for a couple of days, then follow with two coats of tung oil finish or satin varnish to complete the finishing process.

Figure 6: *Trim the leather to lap onto the side rails by 1" and 2" on the front and back rails. To prevent splitting, drill pilot holes for the nails 1" apart.*

Adding a Leather Seat

The leather seat is held to the chair by upholstery nails, which have large, dome-shaped heads. First trim the leather with a sharp razor blade to overlap the seat opening by 1" on the left and right sides and by 2" on the front and back. After lightly coloring the freshly cut edges with a brown stain, begin securing the leather by driving one nail in the center of each side (see *Figure 6*, above). Work toward the corners from these points, installing more nails and leaving about 1/2" between the heads. Hide any discrepancies by varying the spacing.

All that's left to do now is find a quiet corner of your home to place this classic rocker. By making this chair you have fulfilled one of the original precepts of the Arts & Crafts Movement; that is, combining the best of hand and power tool techniques in order to create quality furniture that is pleasant to build, unpretentious and sturdy enough to last for generations.