·BUILD·IT·BETTER·YOURSELF·
WOODWORKING PROJECTS

Outdoor Furniture

Contents

An Introduction to Outdoor Furniture

If you've ever made a picnic table or a planter, you know that the art of making "outdoor" furniture is unique, different from any other type of woodworking. The methods and techniques are a careful blend of cabinetry and carpentry — a finished outdoor furniture project looks like a piece of furniture, but it's built like a house.

The reason for this, of course, is the weather. Out of doors, your project has to survive extreme changes in temperature and humidity. When building outdoor furniture, you have to plan ahead for the distortion and decay that happens when wood gets hot, cold, or wet. And — this is just as important — you have to provide a way for the wood to shed the rain and dry quickly to prevent as much of that distortion and decay as possible.

Outdoor Furniture Joinery

Water tends to collect wherever two pieces of wood join together. Consequently, outdoor furniture has as few joints as possible, and those joints are usually very simple — butt joints, lap joints, maybe an open mortise and tenon. This *decreases* the surface area of any board that is in direct contact with other boards. In other types of woodworking, the purpose of joinery is to *increase* the board-to-board surface area, so that you get a stronger glue bond.

Outdoor furniture joints are also cut with a good deal more "slop" than what you may consider acceptable. A good outdoor lap joint should have 1/16"-1/8" of slop to allow the wood to swell in wet weather, and to let it dry out when the rain stops. Again, this is in direct contrast to other forms of woodworking, where a sloppy joint will be a weak joint because the glue won't bond properly to all the surfaces.

One reason that you can safely use sparse, sloppy joinery in outdoor furniture is that the parts are rarely glued together. Out in the weather, wood expands and contracts enough to break even "waterproof" glue bonds. Only small parts that barely swell and shrink, such as screw plugs and dowels, can be successfully glued in place. Larger parts must be held together with hardware — nails, screws, and bolts. As in carpentry, it is the hardware, rather than the joinery, that holds the finished project together.

Another reason is that the joinery does not contribute much to the overall strength of the project. Strength is provided by *design* — two adjoining parts are often braced with a third part. Again, this is similar to carpentry, where a builder always tries to "complete the triangle" to make the structure stronger and more rigid. If the parts properly brace each other, a sloppy joint won't wobble or work itself loose.

When it comes right down to it, the joinery in outdoor furniture has little to do with holding the project together. The joints simply make the pieces fit in such a way that they won't collect water. Hardware and design do the actual "joining."

Outdoor Furniture Materials

While it's important to keep the wood in an outdoor furniture project as dry as possible, water is not the enemy. Wet wood is just as strong as dry. But wood that gets wet and *stays wet* becomes a fertile breeding ground for bacteria. The bacteria digest the wood fibers, reducing them to dust. This is what causes the wood to decay and rot.

If you can prevent the bacteria from growing, you can keep the wood strong — even though it stays soaked. Certain types of wood resist bacterial growth, and will last longer out in the weather than other varieties. In order to make your outdoor furniture projects last, it's important to *pick the right wood*. No matter how carefully you make the joints, the areas where the parts touch will tend to collect water.

Absolutely the best woods to use are the tropical varieties, in particular *teak* and *mahogany*. These woods are saturated with natural oils that either repel the water or make the wood fibers inhospitable to bacteria. These oils are part of the tree's natural defense against the moist, humid environment of the tropical rain forests.

Unfortunately, because teak and mahogany have to be imported, they are expensive. There are several domestic varieties that are almost as rot-resistant as the tropical woods and are somewhat less expensive. These are *redwood, cypress,* and all types of *cedar.*

Of these, the best is *Atlantic white cedar* (sometimes called "juniper"). White cedar becomes even more rot-resistant *after* it's cut and cured. In the early 1800's, shingle-makers along the east coast "mined" fallen cedar trunks from swamps and bogs. They found that the dead trees made better quality, longer-lasting shingles even though they had been buried in mud for scores of years. White cedar is also one of the few woods that is resistant to the ravages of salt water. It's a bit hard to find — particularly in the West — but if you live on a coast, it may be worth the search.

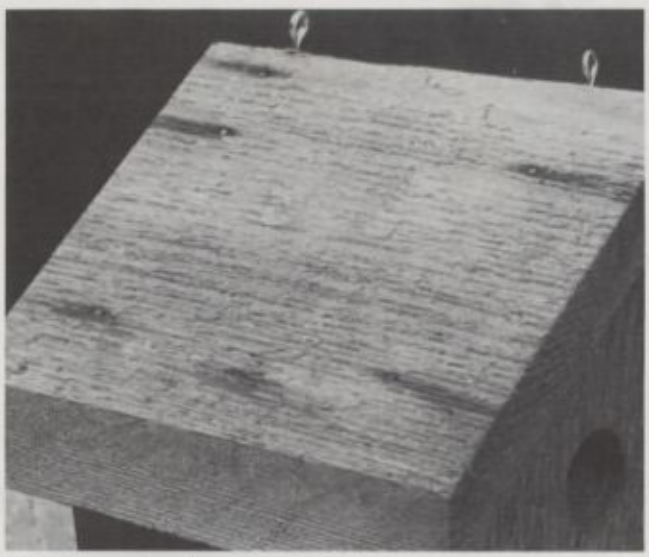
The least expensive alternative for most of us is *pressure-treated lumber.* This is domestic pine that has been poisoned with various preservative chemicals, so that bacteria won't grow in it. To make sure that the wood is poisoned all the way through, it's placed in a "retort" or pressure chamber. All of the air is pumped out, taking with it most of the moisture in the wood. Then the retort is flooded with preservative and pressurized to at least 175 pounds per square inch. This drives the chemicals deep into the wood.

When purchasing pressure-treated lumber, there are two things to look for. First of all, some pressure-treated lumber is more rot-resistant than others. Treating mills work with different solutions of preservatives, and consequently some wood retains more preservatives than others. The American Wood Preservers Bureau (AWPB) has a rating system for the degree of "retention," and most mills stamp this rating onto their lumber. A rating of LP-2 indicates low retention; this wood should *not* be used in direct contact with the ground or water. For wood that sits on or in the ground, you need a rating of LP-22 or better. (See Figure 1.) For most outdoor furniture projects, LP-2 lumber is adequate. However, if the project will rest on the ground or in an extremely wet location, use LP-22.

Secondly, pay attention to what *species* of wood you're buying. This, too, should be stamped on the lumber. Not all woods are well-suited for pressure-treating. Southern yellow pine, red pine, and ponderosa pine all retain preservatives well. Douglas fir, spruce, white pine, and most domestic hardwoods do not. Don't be fooled by lumber that's labeled "southern pine." This is not southern yellow pine; it's just another name for white pine.

Once you've chosen a rot-resistant wood to build your outdoor furniture project, you'll then need to select rust-resistant hardware. Not only does water create a fertile environment for bacteria; it also promotes the corrosion of many metals. Common nails and untreated hardware

***1**/Look for the AWBP stamp on pressure-treated lumber. A rating of LP-22 or higher means the wood can be used in direct contact with the ground.*



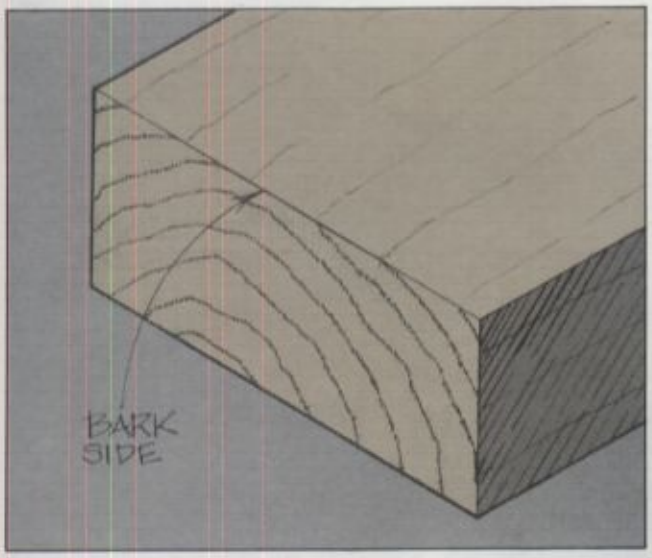
***2**/Common nails and hardware corrode in the out of doors, staining your project. Use galvanized or plated hardware instead.*

will rust quickly, staining the wood with long, dark streaks. Eventually, the nails and hardware will disintegrate. (See Figure 2.) Look for nails and hardware that have been "galvanized." This means that the metal has either been dipped or plated with a zinc alloy to resist corrosion. Most common screws are made from zinc chromate, a material that won't rust when exposed to *fresh* water. However, if the project will be used near salt water, purchase brass or stainless steel screws.

A Few Tips for Making and Finishing Outdoor Furniture

As you build outdoor furniture, here are a few general tips to help make the work a little easier and the finished project last a little longer:

- When you place boards side by side, as on a table top, leave ⅛"-¼" space between each board to allow the wood room to swell and shrink. Wood will expand up to ¼" *across the grain* for every 12" of width. Expansion with the grain is negligible.
- If you attach the board with nails, drive each nail at a slight angle. Vary this angle back and forth with every nail. This "hooks" the parts together.
- Whenever possible, try to orient a board so that the "bark side" faces *up* in the completed project. (See Figure 3.) This helps the lumber shed water.



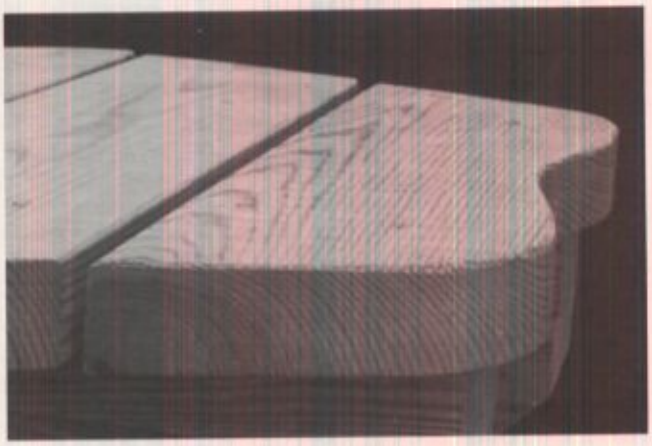
***3**/Assemble projects so the boards are "bark side" up, wherever possible. This helps shed water and prevents cupping. To decide which side of a board is the bark side, look at the end grain.*

- If at all possible, never attach a board with the end grain facing up, exposed to the rain. Cap it, turn it on a lathe, or cut it at an angle to help the end of the board shed water.
- Seal the bottom ends of legs with melted paraffin wax or spar varnish to keep them from soaking up water.
- On those few occasions where you need to glue a small piece in place, use waterproof epoxy or resorcinol glue. Epoxy usually dries clear, and resorcinol cures to a dark brown.
- If you intend to apply a preservative stain or paint to the project, apply the first coat *before* you assemble the parts. This ensures that *all* the surfaces will be coated.
- You can paint or stain pressure-treated lumber, but it's wise to wait a month or so and give the wood a chance to dry out. There's no need to keep it in your shop while it dries; the lumber will dry well enough for painting out in the sun.
- Avoid finishing outdoor furniture with polyurethane. Most brands of poly-U dry too hard to expand and contract with the wood when it's placed out of doors. After a year or so, the finish will peel off. Use spar varnish or a 1:1 mixture of spar varnish and tung oil instead.
- If you plan to finish your outdoor furniture project, cedar and cypress accept finishes better than other species. Redwood, white pine, and sugar pine are also good choices for finishing. Western yellow pine and hemlock are okay if the surface is prepared and primed properly. Southern yellow pine, fir, and larch are not good choices. They may cause the paint to peel and crack after relatively short exposure to the weather.
- The denser a wood is, the harder it is for that wood to accept a finish. For that reason, avoid wood with wide bands of dense "summerwood" (summer growth). These are the dark lines in the annual rings. If the summerwood is present in narrow stripes, with wide bands of lighter "springwood" (spring growth) in between, then you can be relatively sure the wood will take a finish well.
- Quartersawn and rift-sawn boards take a finish much better than plain-sawn. However, few lumberyards carry quartersawn or rift-sawn stock anymore. When you do find it, it's very expensive. To make the finish last longer on plain-sawn boards, turn the bark side up or out, where it will be exposed to the weather. The finish adheres better to the bark side of plain-sawn boards than it does to the pith side.

Round Picnic Table and Benches

Round picnic tables are so much more conducive to good conversation than ordinary picnic tables. Each person sitting at the round table has an unobstructed view of everyone else. Consequently, no one feels left out or ignored. Unfortunately, most round picnic tables have a drawback that sometimes disturbs the conversation. Usually, each bench seats *two* people. If someone wants to sit down or get up, at least one other person has to move.

This particular table and bench set solves that problem. Each person has a bench all to himself. There's no need to beg anyone else's pardon if you need to get up for a moment. And there are *eight* seats, so there should be no lack of seating, even for large gatherings.



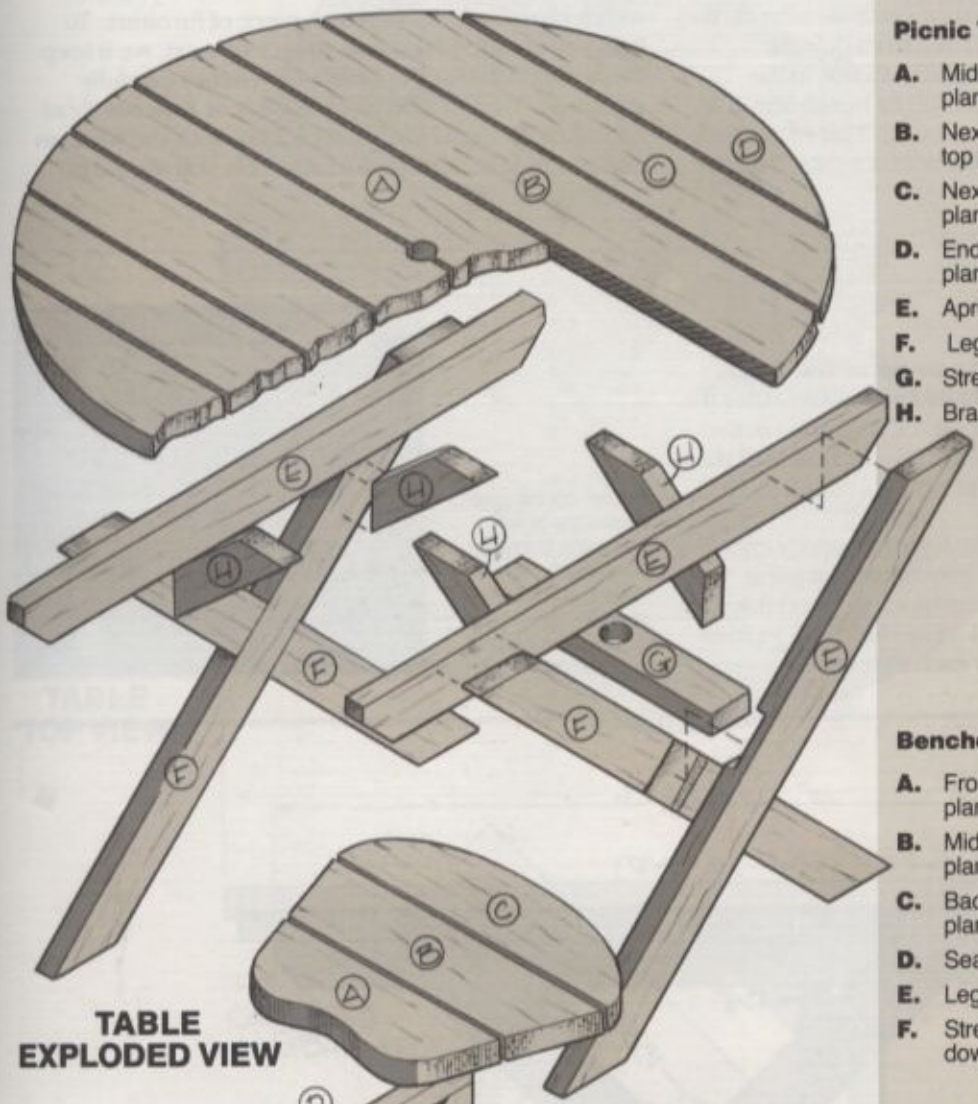
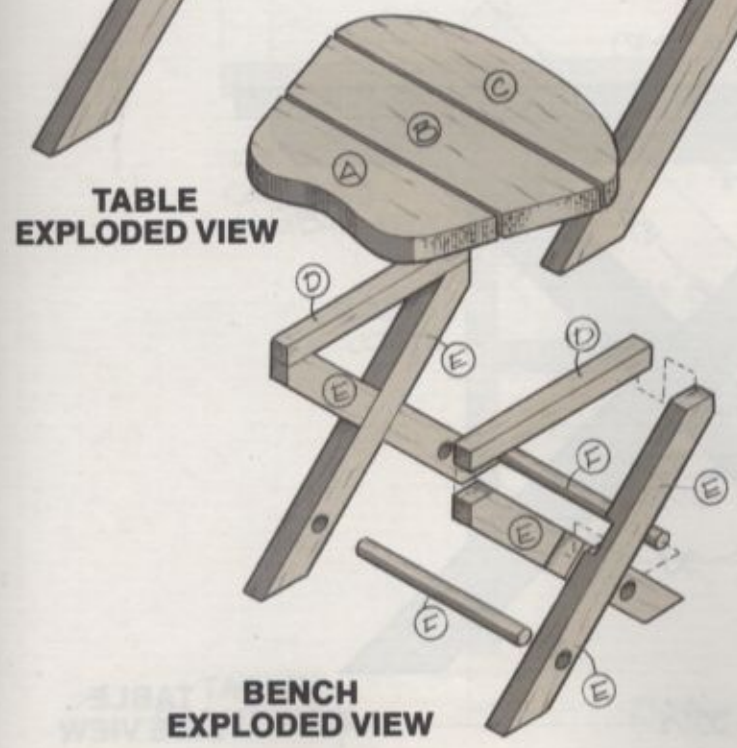


TABLE EXPLODED VIEW



BENCH EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

Picnic Table

A.	Middle top planks (2)	1½" x 5½" x 45¾"
B.	Next-to-middle top planks (2)	1½" x 5½" x 44¾"
C.	Next-to-end top planks (2)	1½" x 5½" x 40"
D.	End top planks (2)	1½" x 5½" x 30½"
E.	Aprons (2)	1½" x 2½" x 41¾"
F.	Legs (4)	1½" x 3½" x 44¼"
G.	Stretcher	1½" x 3½" x 18⅛"
H.	Braces (4)	1½" x 2⅜" x 12½"

Benches (8)

A.	Front seat planks (8)	1½" x 5½" x 17⅛"
B.	Middle seat planks (8)	1½" x 5½" x 21¼"
C.	Back seat planks (8)	1½" x 5½" x 21¼"
D.	Seat braces (16)	1½" x 1½" x 14½"
E.	Legs (32)	1½" x 3½" x 21 ¹¹⁄₁₆"
F.	Stretcher dowels (16)	1" dia. x 12½"

HARDWARE

Picnic Table

⅜" x 3½" Carriage bolts, washers, and nuts (8)
⅜" x 4" Lag screws and washers (4)
#14 x 2½" Flathead wood screws (16)
10d Decking nails (1 lb.)

Benches (8)

#14 x 2½" Flathead wood screws (64)
#10 x 1¼" Flathead wood screws (32)
10d Decking nails (1½ lbs.)
8d Finishing nails (32)

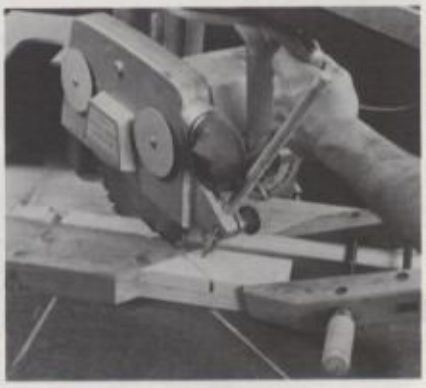
1 *Cut the parts to size.* To make the picnic table with all eight benches, you'll need to purchase ten 2 x 6s, 8′ long, twelve 2 x 4s, 8′ long, and six 1″-diameter dowels, 4′ long. Be very picky when you select the wood. You're going to be sitting and eating on those boards. You want them to be fairly clear and free from defects.

Rip and cut all the parts to the sizes shown in the Materials List, with the exception of the bench legs. Cut these parts at least 22⅜″ long or longer. This extra stock will give you room to make all three miter cuts that have to be made on this one part.

You'll find that this project goes faster if you work on both the table and the benches at the same time for the first few steps. However, to avoid getting the parts mixed up, start making neat stacks of cut stock, so you know which board belongs to which piece of furniture. To help you decide which part to pick up next, we'll keep the instructions for the table and benches carefully separated. They will be labeled *Table* or *Benches*. Read each step through before proceeding with the work, so that you're sure what part or assembly you should be working on.

2 *Miter or chamfer the ends of the legs, aprons, and table braces.* *Table:* Miter the ends of the legs and table braces at 45°, as shown in the working drawings. Also, cut off the lower corners of the aprons. This will keep you from bumping your legs against sharp corners.

Benches: Miter the ends of the legs. The upper ends must be cut twice, forming an arrowhead-like point. To help speed this step, attach a stop block to your table saw or radial arm saw. (See Figure 1.) Use this block to automatically position the stock for each miter cut.



1/Miter-cut the upper ends of the bench legs twice, to form a point. A stop block helps you position the stock on the saw with no need to measure over and over again.

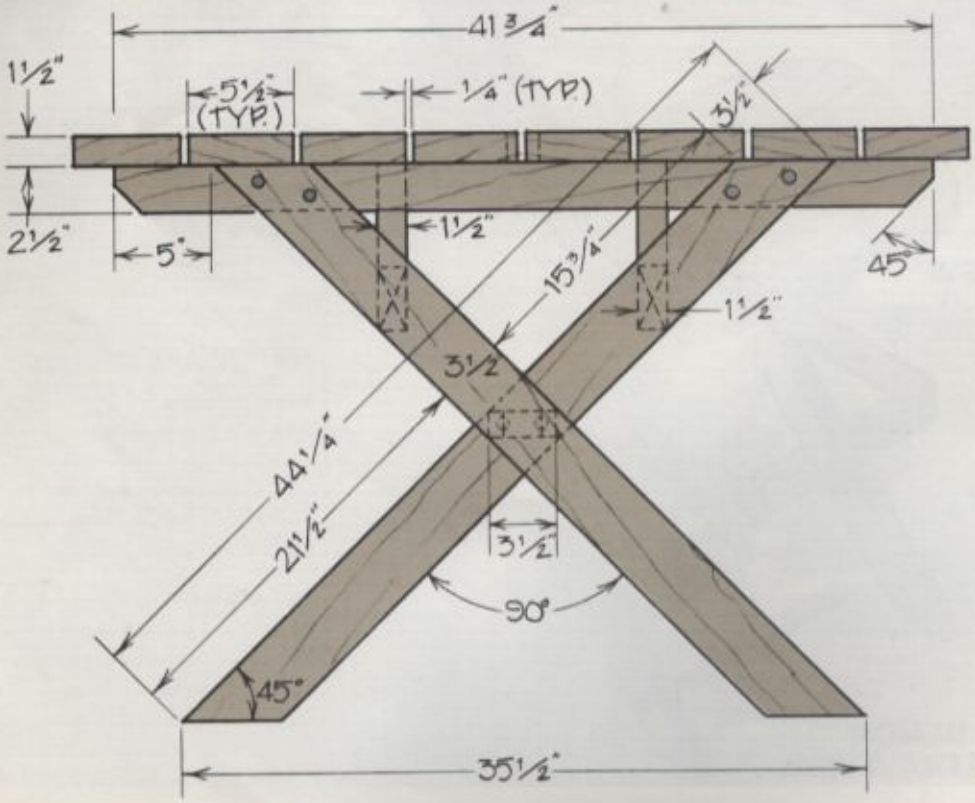


TABLE SIDE VIEW

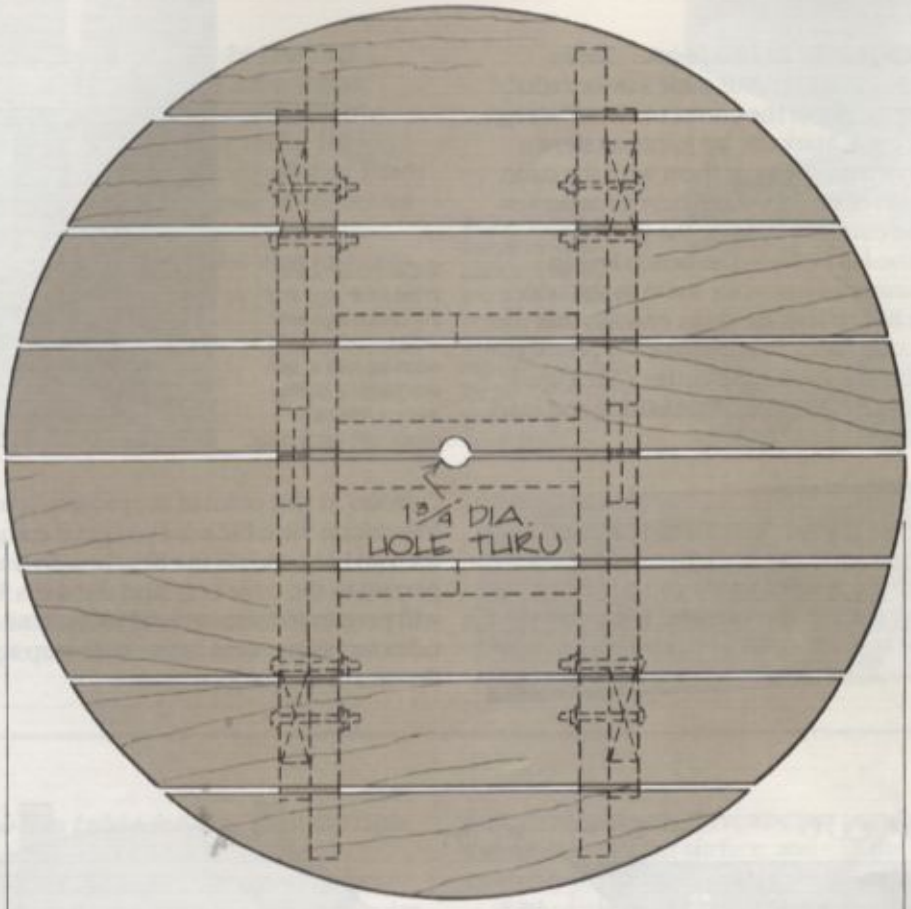


TABLE TOP VIEW

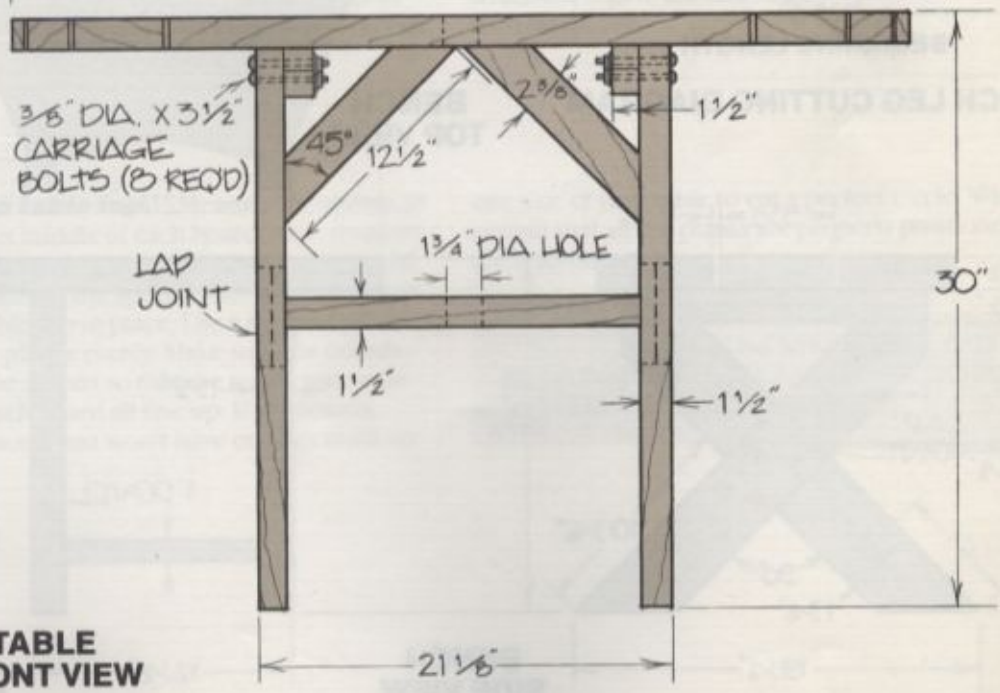
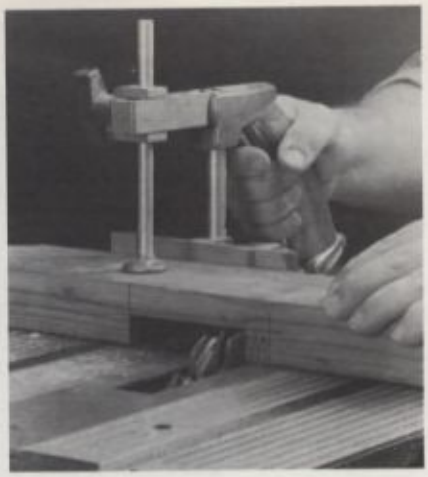


TABLE FRONT VIEW

3 *Cut the lap joints in the legs.* *Table:* Mount a dado cutter on your table saw or radial arm saw. Adjust the height of the cutter to cut ¾" deep, halfway through a 2 x 4. Mark the lap joints, as shown on the working drawings, then cut them with the dado. Because of the width of the lap, you'll have to make several passes over the cutter to remove the waste.

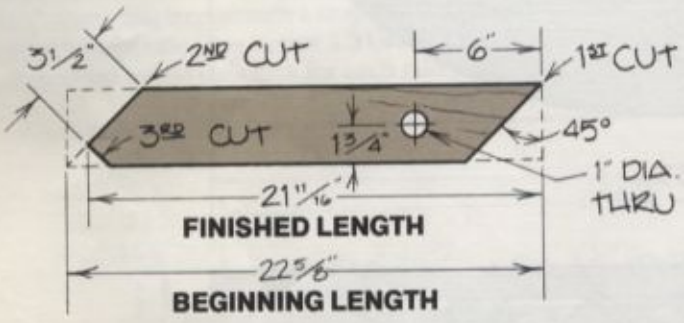
Benches: Make the lap joints in the bench legs in much the same manner as you made them in the table legs. However, the bench legs are short enough that you can easily set up a stop block to automatically position the stock before you run it over the cutter. (See Figure 2.) This will save you the trouble of measuring and marking all 32 bench legs.



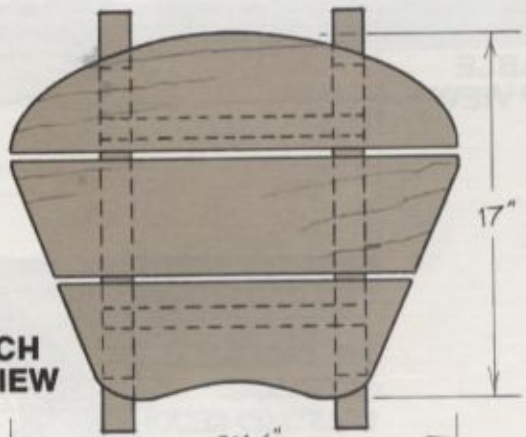
2/*Cut the lap joints in the table legs and the bench legs with a dado cutter. Make each lap joint in several passes, cutting away a little more waste with each pass.*

TRY THIS! If you make the lap joints on your radial arm saw, cut the stock by pushing the motor and cutter *away* from you. If you pull it towards you, the dado cutter will tend to climb the stock.

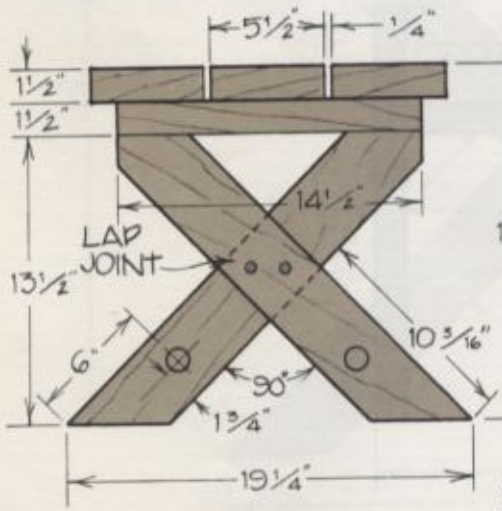
Note: At this point in the project, it makes more sense to work on the table until you get it completely assembled, then go back and do the benches. So the next few steps pertain to the table only, and the steps following those will pertain to the benches. We won't combine instructions for both pieces in the same step again until we near the end of the project.



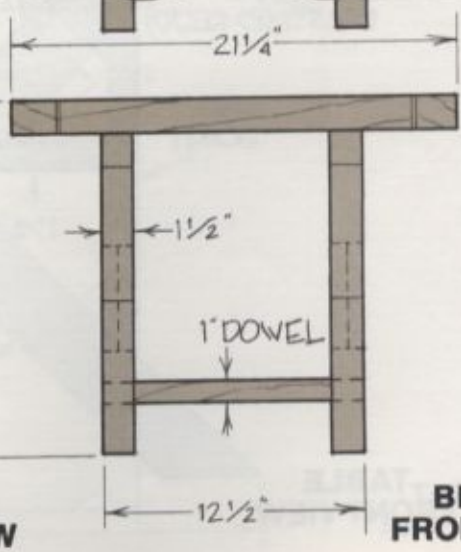
BENCH LEG CUTTING DIAGRAM



BENCH TOP VIEW



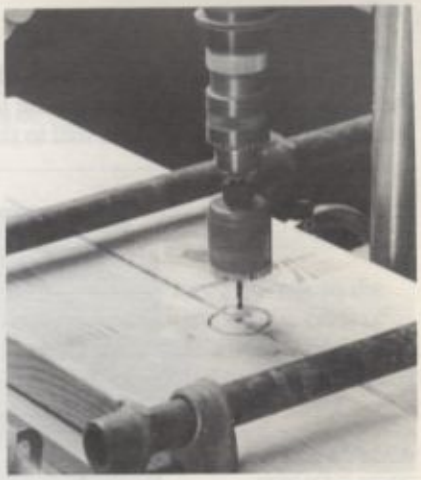
BENCH SIDE VIEW



BENCH FRONT VIEW

4 Cut a hole for an umbrella in the top table planks and the table stretcher.

Clamp the two tabletop middle planks together with a ¼" spacer in between. With a holesaw, drill a 1¾"-diameter hole between the two planks, equidistant from both ends. (See Figure 3.) Also, drill a hole in the center of the stretcher. Later on, after you've assembled the table, you can use these holes to mount a large umbrella in the table.



3/Clamp the two middle tabletop planks together and cut a 1¾" hole between them with a holesaw. After you mount the planks on the table, you can use them to hold an umbrella.

5 Sand the table parts.

Sand all the parts of the table to remove any rough spots on the wood. If you plan to paint or stain the completed project, now would be a good time to apply the first coat.

6 Assemble the table frame.

Put the table legs together to form two Xs, or "sawbucks." Clamp the upper ends of the legs to the aprons, where shown in the working drawings. Drill ⅜"-diameter holes through the legs and aprons and bolt them together.

Carefully position one end of the stretcher so that it's centered in the lap joint on one of the leg-apron assemblies where the legs cross. Temporarily nail the legs to the stretcher. Don't drive the nails home, so that you can pull them out easily. Have a helper stand up both leg-apron assemblies on a flat surface, and nail the unattached assembly to the other end of the stretcher.

Remove the nails one by one and replace them with lag screws. Drill pilot holes for the screws, then drive the screws through the lap joints and into the stretcher. These lag screws serve double duty. Not only do they attach the legs to the stretcher, they secure the legs to each other.

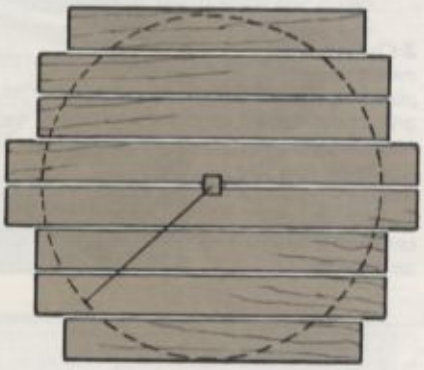
7 Attach the table top.

Measure the aprons to find the exact middle of each board. Also, measure all the table top planks to find the middle of each board. Starting at the middle of the aprons with the middle top planks, tack the table top in place. Use a scrap of ¼"-thick stock to space the planks evenly. Make sure the boards are centered on the aprons so that the marks you made at the middle of each board all line up. If the boards aren't properly placed, you won't have enough stock on one side of your table to cut a perfect circle. When you're certain that all the planks are properly positioned, drive the nails home.

TRY THIS! Use spiral decking nails to attach the planks to the frame. These are designed so that they won't pull loose.

8 Saw the shape of the table top.

Tack a small scrap of wood over the umbrella hole in the middle of the tabletop. Put a nail in the scrap, centered over the hole. Use the nail as the pivot for a string compass, and mark a circle with a radius of 22⅞" on the top planks. (See Figure 4.) Cut this circle with a sabre saw. After you've sawn the circle, remove the scrap that you nailed to the table top. Sand away the saw marks with a belt sander.



4/Nail the table top planks to the table frame, then mark the round shape with a string compass.

TRY THIS! If you're making this project from pressure-treated lumber, take it easy when you cut the top with a sabre saw. This sort of lumber is wetter than most, so the saw blade binds, heats up, and snaps easily. Let the blade cool down every few minutes.

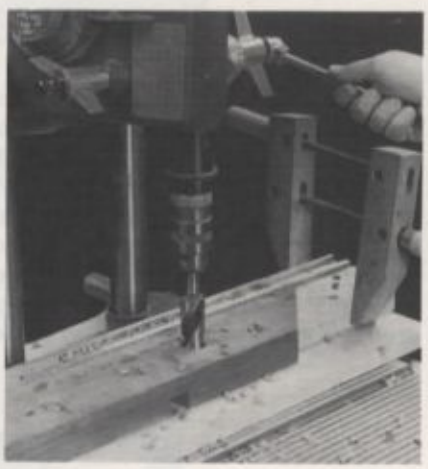
9 Brace the legs to the table top.

Tack the table braces in place underneath the table. These braces should run between the legs and the next-to-middle top planks. After the braces are positioned properly, remove the nails one by one and replace them with 2½" long wood screws. (See Figure 5.)

5/Attach the table braces to the underside of the table with 2½" long wood screws.

10 Drill holes for the stretchers in the bench legs.

Drill a 1"-diameter hole in each bench leg, near the bottom. These holes must be placed exactly the same on all 32 legs. To position the holes easily, without a lot of measuring, make a simple jig that will hold the legs in the same place on your drill press, every time you drill a hole. (See Figure 6.)



6/So that you drill the stretcher holes in exactly the same place on every leg, make a simple jig to automatically position the stock on your drill press.

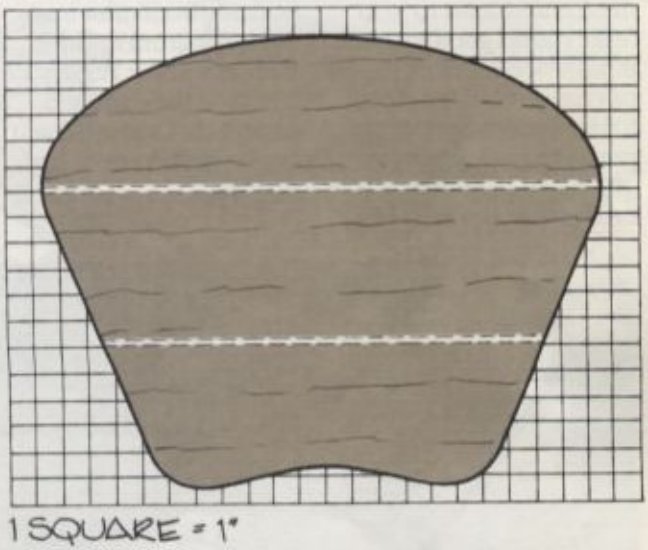
11 ***Sand the bench parts.*** Sand all the parts of the bench, just as you did the table parts. Once again, if you plan to paint or stain the completed project, now would be a good time to apply the first coat.

12 ***Assemble the bench frames.*** Put the bench legs together to form sawbucks, in the same manner that you put the table legs together. Drive 1¼"-long wood screws through the lap joints, so that the legs won't come apart. Attach the seat braces to the tops of the legs with 2½"-long screws. Arrange the leg-brace assemblies in pairs, and insert stretcher dowels in the holes in the legs. Arrange the parts so that the ends of the dowels are flush with the outside surfaces of the legs. Secure the stretchers in the legs by driving finishing nails through the legs and into the dowels.

13 ***Saw the shapes of the seat planks and attach them to the frames.*** There are two ways to saw the shapes of the seats, depending on what tools you intend to use. If you're using a sabre saw, simply nail the planks to the frames, trace the seat pattern onto the planks, and cut out the shape with the saw. This is virtually the same method you used to make the tabletop.

However, if you have a band saw, the technique is a little different and a little easier. Temporarily tack the seat planks to just *one* bench frame, centering the planks on the frame. The seat planks must be spaced ¼" apart, just as the tabletop planks were spaced. Enlarge the seat pattern, and trace it onto the tops of the planks. Then remove the planks and cut out the shapes on a band saw.

Use this first set of shaped seat planks as templates to mark the others. Saw the remaining planks and sand the edges to remove the saw marks. Then nail the planks to the seats with decking nails.



BENCH SEAT PATTERN

14 ***Round all the corners and apply a finish.*** *Table and Benches:* Round all the hard corners and edges on both the table and the benches. Pay particular attention to the tabletop and the seats. The edges of these planks should be very smooth to the touch. You'll find that a Surform® tool or a small block plane helps speed this chore.

After all the corners of the table and the benches have been rounded, apply a finish if you have decided the project needs one. Because of all the surfaces and tight crevices in the table and the benches, you'll find it much easier to use a paint sprayer to coat the completed outdoor dining set.

Sunlover's Chaise Lounge

For some people, the summer just wouldn't seem right without an outdoor chaise lounge. There's no better way to read a book or soak up the rays — or both — than lounging around on a chaise. This chaise has all the requirements to help make yours a good summer. It has wheels, so that you can easily move the piece to the sunniest spot in the yard. The back adjusts to 20°, 40°, or 60°, so you can catch those rays just right. It also lays flat, so that you can roll over and take a snooze on your stomach.

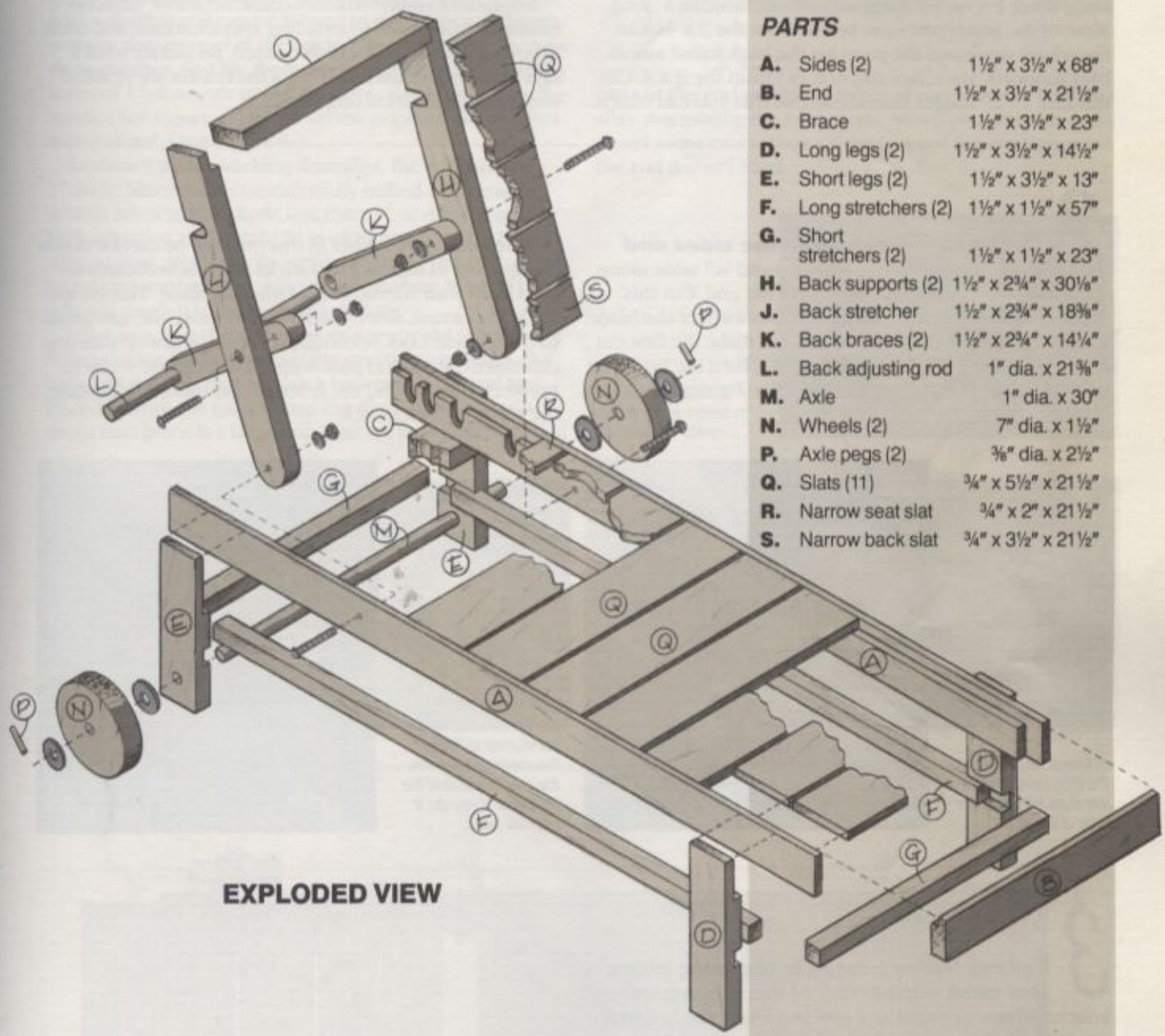
For additional comfort, this chaise is built to the same dimension as a standard-sized 23" x 72" cushion for outdoor furniture. These cushions are available from most mail-order department stores, such as Sears or Penney's. Purchase the color and pattern that suits you, and lay the cushion on top of the slats.

Materials List

FINISHED DIMENSIONS

PARTS

A.	Sides (2)	1½" x 3½" x 68"
B.	End	1½" x 3½" x 21½"
C.	Brace	1½" x 3½" x 23"
D.	Long legs (2)	1½" x 3½" x 14½"
E.	Short legs (2)	1½" x 3½" x 13"
F.	Long stretchers (2)	1½" x 1½" x 57"
G.	Short stretchers (2)	1½" x 1½" x 23"
H.	Back supports (2)	1½" x 2¾" x 30⅛"
J.	Back stretcher	1½" x 2¾" x 18⅜"
K.	Back braces (2)	1½" x 2¾" x 14¼"
L.	Back adjusting rod	1" dia. x 21⅜"
M.	Axle	1" dia. x 30"
N.	Wheels (2)	7" dia. x 1½"
P.	Axle pegs (2)	⅜" dia. x 2½"
Q.	Slats (11)	¾" x 5½" x 21½"
R.	Narrow seat slat	¾" x 2" x 21½"
S.	Narrow back slat	¾" x 3½" x 21½"



EXPLODED VIEW

HARDWARE

⅜" x 3½" Carriage bolts with washers (4)
⅜" Stop nuts (4)
#14 x 2" Flathead wood screws (8)
#14 x 3" Flathead wood screws (20)
1" Flat washers (4)
12d Nails (4)
8d Finishing nails (½ lb.)

1 ***Cut all the parts to size.*** To make this chaise lounge, you'll need four 2 x 4s, 8′ long; one 2 x 8, 8′ long, three 1 x 6s, 12′ long; and two 1″ dowels, 4′ long. Most of the frame parts can be cut from the 2 x 4s. Cut the wheel stock and the parts for the back frame assembly (supports, stretcher, and braces) from the 2 x 8. Cut the axle 1″-2″ longer than shown, so that you can trim it to fit when the time comes. Don't cut the slats yet; wait until after you've assembled the frame.

Important note: Ordinary construction or "dimension" lumber is not milled to exacting specifications, and often times parts have to be custom fitted, no matter what it says in the Materials List. This is the reason we've asked you to hold off on cutting the slats.

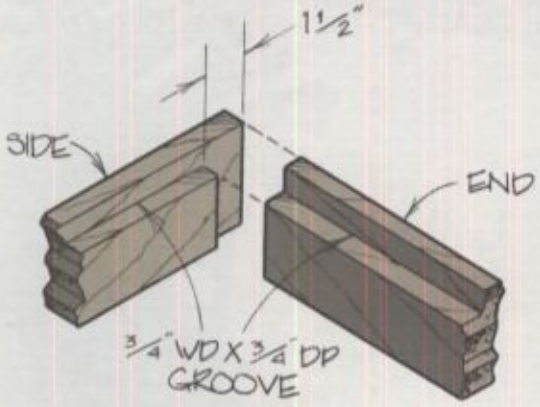
2 ***Cut the long rabbets in the sides and end.*** Cut a rabbet ¾″ deep and ¾″ wide along the inside top edges of the sides and the end. Cut this joint on your table saw, making two passes over the blade. Adjust the blade and the rip fence, and make the first cut in the face of the stock. (See Figure 1.) Turn the board on its edge, and make the second cut. (See Figure 2.)

When cutting a rabbet in this manner, be careful of two things. First of all, use push sticks and featherboards to help keep your hands clear of the saw blade. This is especially important, since you have to remove the saw guard to make these cuts. Secondly, set up your saw so that you can make the second pass without leaving the waste in between the saw and the fence. If you make this mistake, the waste will kick back.

***1**/Make the rabbets in the sides and end in two cuts. First, cut the face of the stock…*

***2**/Then cut the edge. On the second cut, be careful not to leave the waste in between the saw blade and the rip fence. If you do, it will kick back.*

3 ***Cut the frame joinery in the legs, sides, and back supports.*** Mount a dado cutter on your table saw or radial arm saw and adjust the height to cut halfway through the thickness of a standard 2 x 4, or ¾″ deep. Carefully mark the dadoes and end rabbets in the legs, sides, and back supports. Cut each joint, making several passes over the cutter to remove all the waste. Remember that the sides should be *mirror images* of each other.

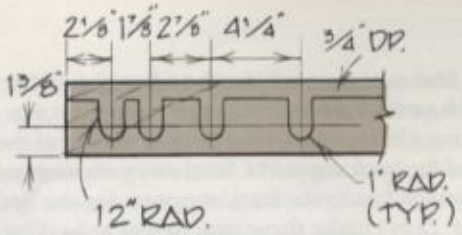


FRAME JOINERY

4 ***Make the back stop notches in the sides.*** This chaise is designed so that you can adjust the back to four different positions. To do this, the back adjusting rod can be moved to one of four different stops or notches cut in each side. (See Figure 3.) To make these notches, first lay them out on the sides. Then drill a series of 1"-diameter holes, ¾" deep, to rough out each notch. (See Figure 4.) Clean up the edges of the notches with a chisel. (See Figure 5.)

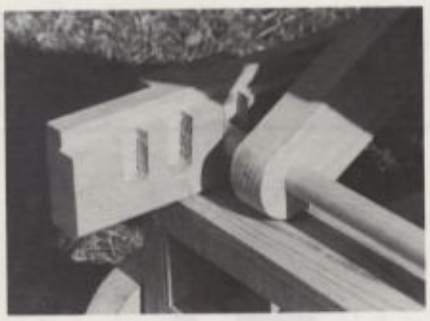
As shown in the working drawings, the notches are 1" wide. Since most commercially milled 1"-diameter dowels are actually a little less than 1" in diameter, the back adjusting rod should fit in each notch with a little slop. At least, that's the theory. In building the chaise, we found that the practice was another matter. Most of the notches needed to be enlarged slightly.

Note, too, that the end notches are curved slightly. When the back adjusting rod fits into these notches, the back lays flat. Because the back braces and the rod are folded up into the back frame, the path of the rod as it drops into place is a large arc. This arc is so large that you can cut the end notches straight, if you want to. Then, after assembling the back frame, you'll probably have to chisel some extra stock off the sides of these notches so the rod doesn't bind.

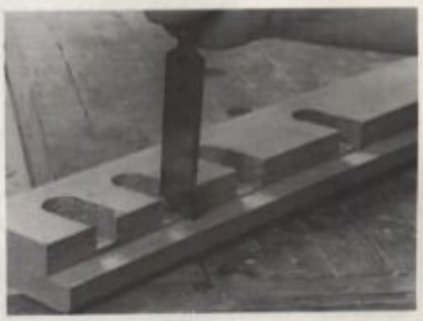


BACK STOP NOTCH LAYOUT

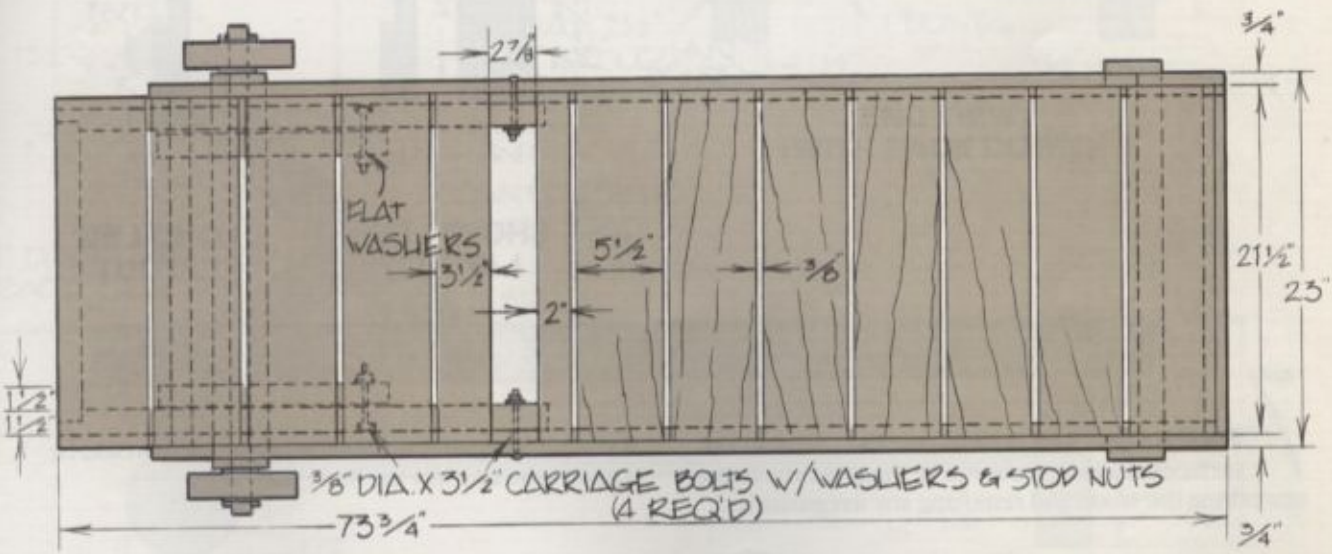
4/To make each notch, drill a series of 1" holes, ¾" deep...



3/The four notches in the ends of the sides allow you to adjust the back to four different positions. (One notch is hidden behind the brace.)



5/Then clean up the edges of the notch with a chisel.

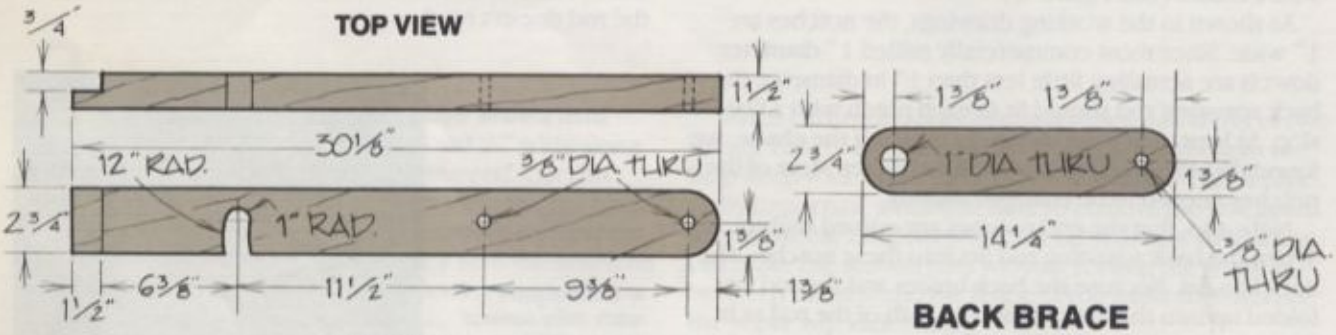


TOP VIEW (WITH BACK DOWN)

5

Cut the shapes of the back supports and back braces. Using a band saw or a sabre saw, round both ends of the back braces, and the lower ends of the back supports. Sand away any saw marks.

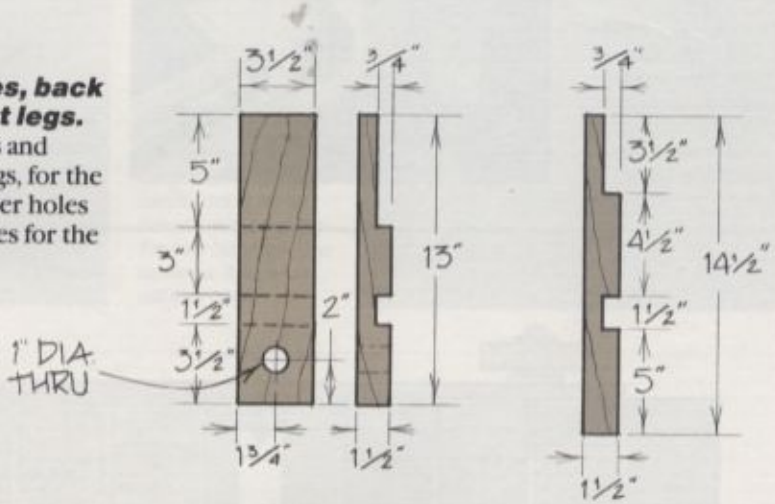
Lay out the notches in the back supports for the back adjusting rod. *Don't* make these notches straight. The arc is sufficiently small so that the adjusting rod won't just bind up when you try to swing it into the notches. It won't fit into straight notches at all. Mark the arcs, using the location of the bolt holes (where you will attach the back braces to the supports) as a pivot. Drill 1"-diameter holes through the boards to make the base of these notches, then remove the rest of the waste from the notches with a band saw or sabre saw.



BACK SUPPORT DETAIL

6

Drill the holes needed in the sides, back supports, back braces, and short legs. Drill 1"-diameter holes through the back braces and short legs, where shown in the working drawings, for the back adjusting rod and the axle. Drill ⅜"-diameter holes through the sides, back supports, and back braces for the pivot bolts.



7

Finish sand the frame parts. Sand all the surfaces of all the parts you've made for the frame, smoothing the wood and removing any irregularities.

If you plan to paint or stain the chaise, now would be a good time to apply the first coat.

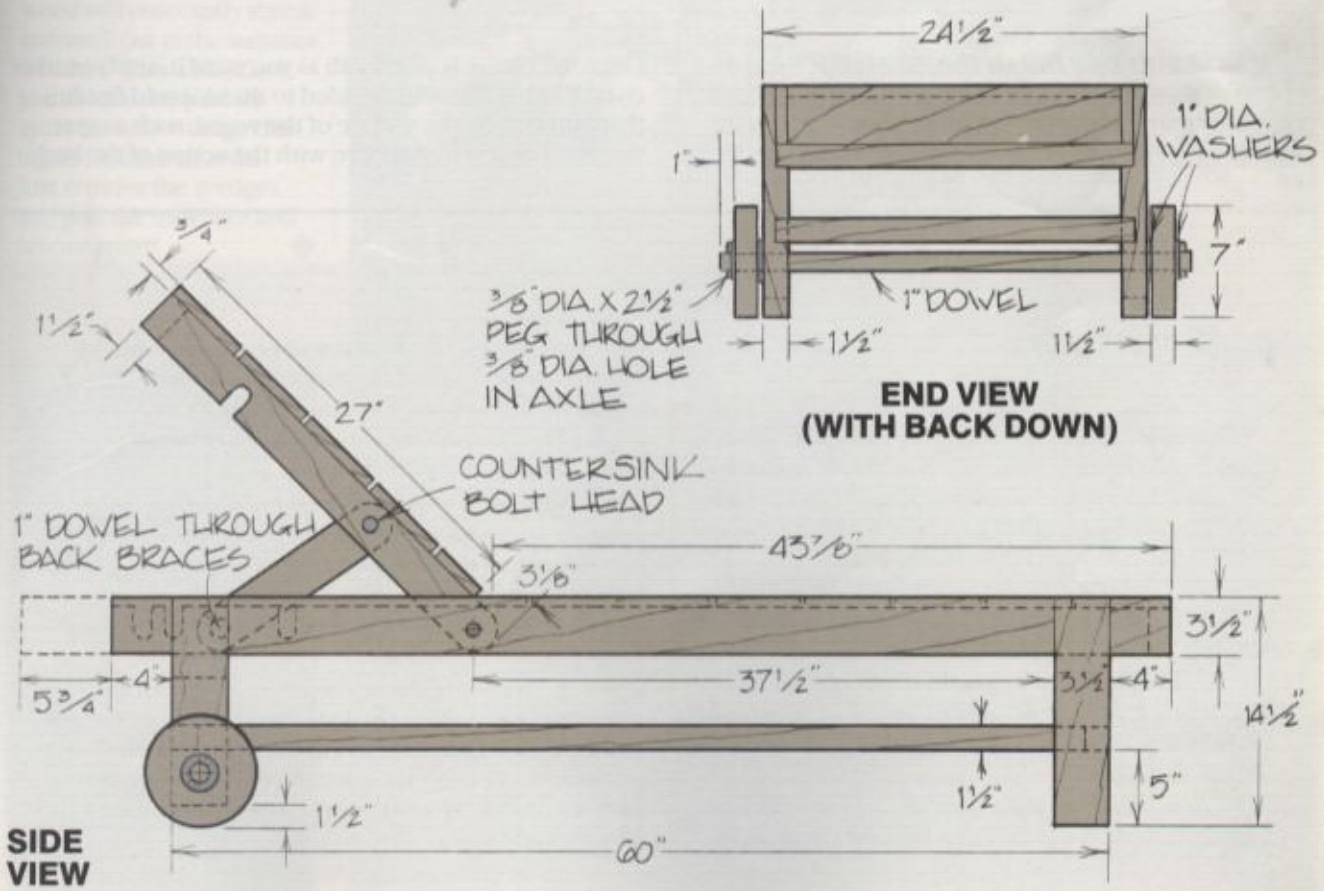
8 ***Assemble the chaise frame.*** Nail the short stretchers to the long stretchers, making a rectangular frame. Attach the sides to the end with 3"-long wood screws. Then clamp the legs and the brace in place, joining the stretcher frame and the side-end assembly. When you're satisfied that all the parts are properly positioned and square to each other, secure the legs and the brace with screws. Use 2"-long wood screws wherever you're joining long grain to long grain, such as the leg-to-side joints, and 3" long screws wherever you're joining long grain to end grain, such as the leg-to-brace and leg-to-stretcher joints.

9 ***Assemble the back frame.*** Join the back supports to the back stretcher with 3"-long wood screws. Put the back adjusting rod through the 1"-diameter holes in the back braces and carefully position the braces along the rod. The braces should be 2¼" from the ends of the rod. Keep the braces in place by driving a finishing nail through the end of each brace and into the rod.

Bolt the back frame to the chaise frame, and secure the bolts with stop nuts. The special nuts will keep the bolts from coming loose when you adjust the position of the back. Tighten the nuts so that the joints just begin to bind.

WARNING! The nuts and bolts that hold the back to the chaise *must* be tight enough so that if you adjust the position of the backrest and let go before you have the back brace in place, the backrest will not fall down. They shouldn't be so tight that they prevent you from moving the backrest, but they should be tight enough so that the parts bind slightly. This will prevent you from accidentally mashing your fingers. The tightness of these nuts and bolts may have to be readjusted periodically.

Bolt the brace-rod assembly to the back frame in the same manner that you attached the back frame to the chaise frame. Check the action of the back, and make sure that the adjusting rod fits easily into all the stop notches. If it binds at any position, remove some stock from the sides of the appropriate notches with a rasp or a chisel.



10 Attach the slats to the frame.

Measure the distance between the sides and across the back supports, all along the length of the frame. Don't be alarmed if the distance varies as much as ¼" in spots. This is a common problem when you build with dimension lumber, no matter how carefully you pick your stock. Construction grade lumber is often very wet (as much as 30% moisture content), and the wood constantly changes shape as the water evaporates in your shop.

Cut the slats to fit the frame, and tack them in place with finishing nails. Nail the back slats to the back supports, but be careful *not* to nail them to the sides. *Don't* drive the nails home just yet. First, check the action of the back to be sure the slats don't interfere. Also, check that the spacing of the slats is even and adjust their positions, if needed. When you're satisfied that everything fits and works as it should, drive the nails home and set them slightly below the surface.

11 Attach the wheels to the chaise.

Cut out the wheels with a band saw or sabre saw, and drill 1"-diameter holes through the middle. Insert the axle through the axle holes in the short legs. Place 1"-diameter washers on either end of the axle, then the wheels, then another set of washers. (These washers prevent the wooden wheels from rubbing against the pegs and legs.)

Mark the outside edge of the outside washers, on either end of the axle. Measure 1" out from these marks to mark the trimmed length of the axle. Disassemble the washers, wheels, and axle from the chaise, and trim the axle to length. Drill the ends for ⅜"-diameter pegs. (These peg holes should be 1/16" beyond the marks for the outside edge of the washers. This will give the wheels a little play on the axles, but not too much.)

Apply a little paste wax to the inside of the holes in the wheels to help them turn smoothly. Then reassemble the axle, wheels, and washers. Glue the pegs in their holes with waterproof glue to keep the wheels on the axle.

12 Sand and finish the chaise.

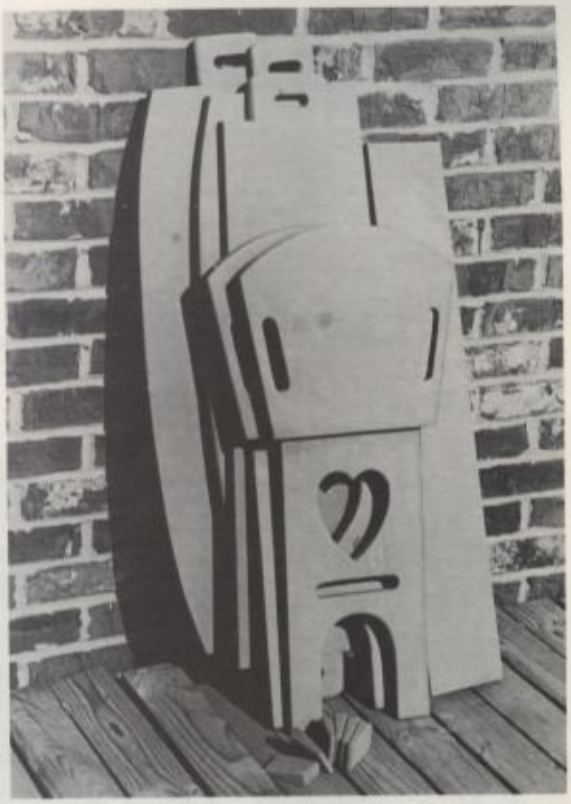
Sand the completed chaise lounge, rounding any hard edges. Pay particular attention to the slats — you want these to be as smooth as possible when you rest on them. Once the chaise is as smooth as you want it, apply another coat of finish, if you've decided to do so. Avoid finishes that build up on the surface of the wood, such as spar varnish. These will interfere with the action of the back.

Avoiding Splinters

Splinters are the bane of outdoor furniture projects. Outdoor furniture is more likely to throw splinters than any other type of woodworking project because it's left out in the weather where new checks and splits — the defects in wood that throw splinters — develop constantly. You cannot absolutely "splinter-proof" your outdoor furniture. However, you can decrease the risk of splinters by following a few simple guidelines:

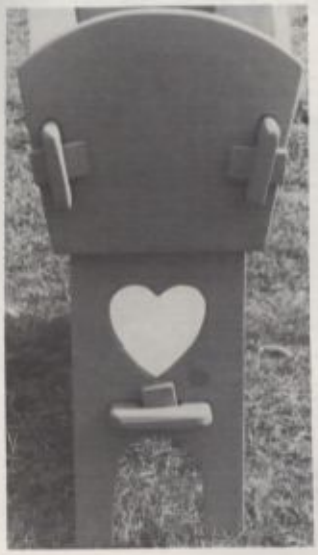
- *Use a good grade of lumber.* Choose stock that is relatively free from defects — cracks, case hardening, loose knots, any irregularity where water can soak into the interior of the wood.
- *Sand the end grain smooth.* Next to defects, a board is most likely to throw splinters from a cut end. Sand the end grain that will be exposed on the finished project perfectly smooth. Water will run off sanded end grain, since it cannot cling in the saw marks. There is less swelling at the cut ends, and fewer checks and splits develop.
- *"Break" or round over all hard corners and edges.* After you've completed the project, round the corners with a rasp, block plane, or sandpaper. Rounding the corners helps the water to run off and helps absorb impacts so that the wood is less likely to chip or split.
- *Store your outdoor furniture in an outdoor environment.* Store outdoor furniture on a covered patio, in your garage, or in a storage barn. If you bring it inside your home, the extreme change in temperature and humidity will distort the wood and cause it to check and split.

Knock-Down Planter



The wedged mortise and tenon was a favorite device of many country cabinetmakers. There was little chance that furniture made with these joints would fall apart. If the piece seemed a little wobbly, you just knocked the wedges in a little tighter to "snug up" the parts.

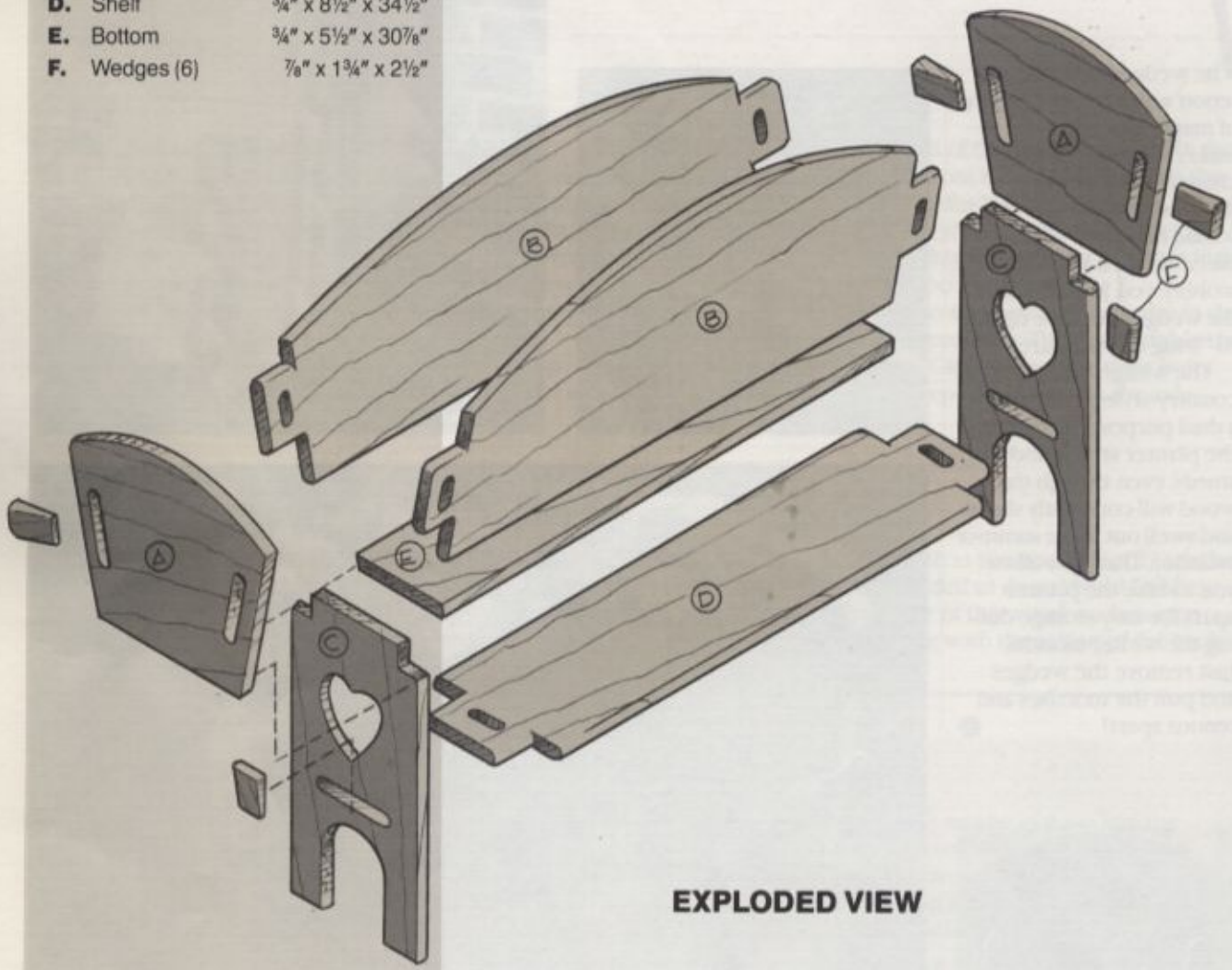
The wedges in this country-style planter serve a dual purpose. They keep the planter strong and sturdy, even though the wood will constantly shrink and swell out in the summer weather. They also allow you to take the planter apart for easy storage during the winter months. Just remove the wedges and pull the mortises and tenons apart!



Materials List

FINISHED DIMENSIONS

A.	Ends (2)	¾" x 11¼" x 13"
B.	Sides (2)	¾" x 11¼" x 36"
C.	Legs (2)	¾" x 8½" x 18"
D.	Shelf	¾" x 8½" x 34½"
E.	Bottom	¾" x 5½" x 30⅞"
F.	Wedges (6)	⅞" x 1¾" x 2½"



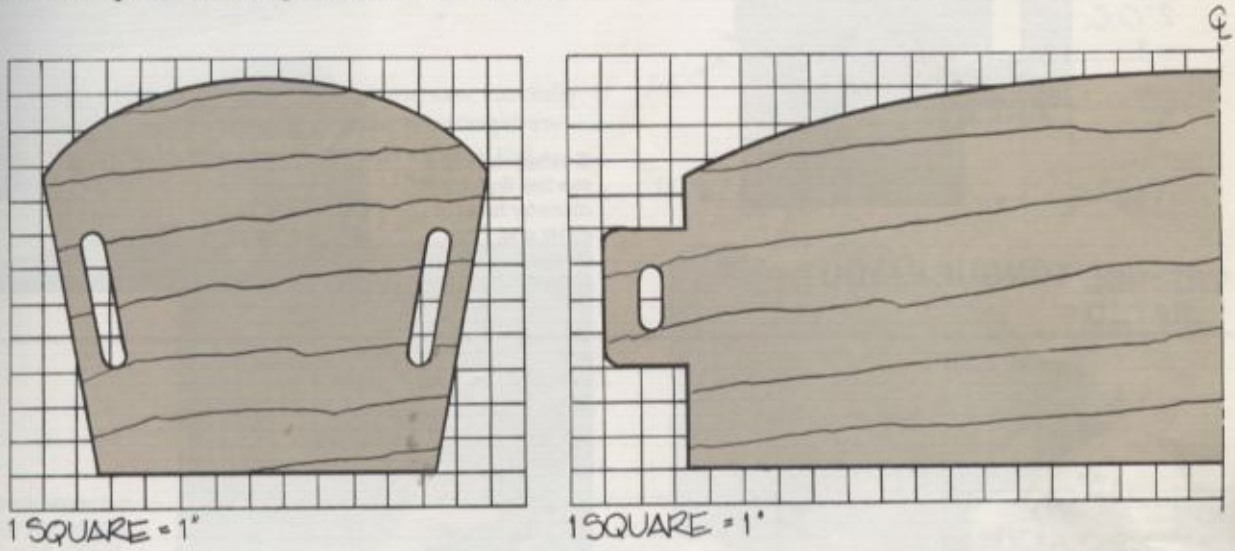
EXPLODED VIEW

HARDWARE

#10 x 1¼" Flathead wood screws

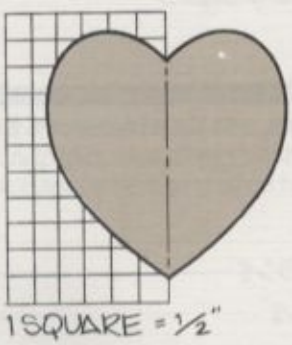
1 ***Cut all pieces to size.*** Rip and cut all the parts to the sizes shown in the Materials List. You may wish to wait before cutting stock for the wedges; these small parts can be cut from the scraps you'll generate when you cut the other parts to shape.

2 ***Cut the shape of the pieces.*** Enlarge the patterns and trace them on the various parts that need to be shaped — ends, legs, and sides. Also, lay out the tenons on the sides and shelf. Cut the tenons and curved shapes with a band saw or sabre saw.



SIDE PATTERNS

3 ***Cut out the hearts in the legs.*** To cut out the hearts in the legs, make a "piercing cut." First, drill a ½" diameter hole *inside* the heart, in the waste. Insert the blade of a sabre saw in this hole, then cut up to the pattern line. (See Figure 1.) Follow the pattern line with the saw, staying to the *inside* of the line.

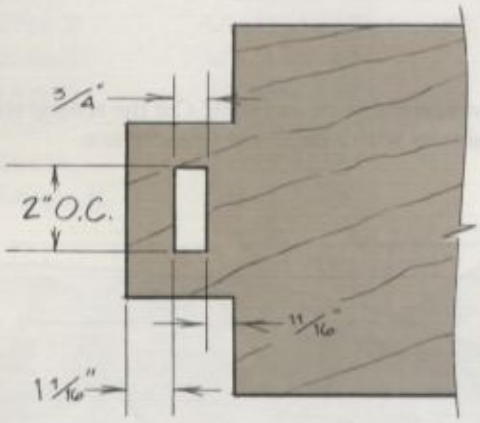


HEART PATTERN

***1**/To make a piercing cut, first drill a hole in the waste so that you can insert the saw blade. Then cut out from the hole.*

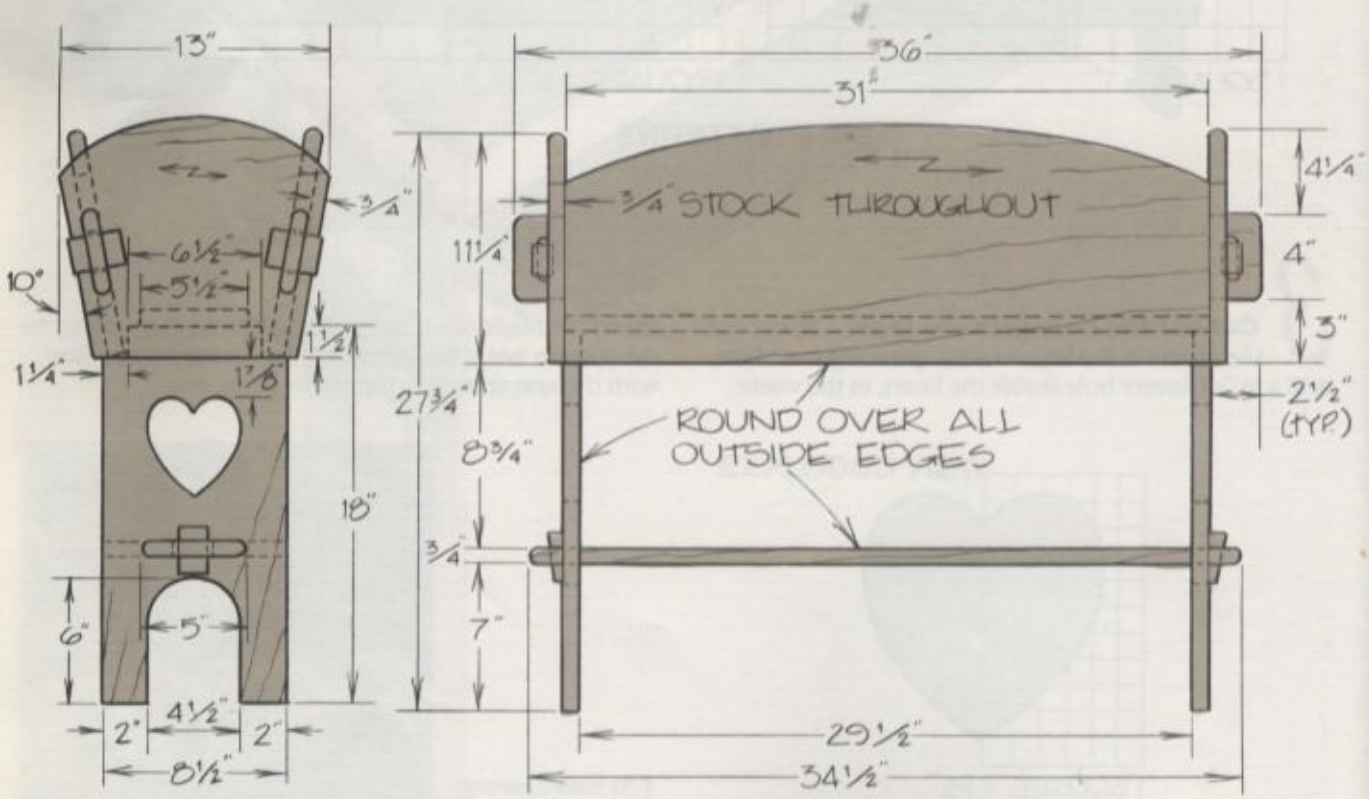
4 ***Make the mortises and wedge-slots.*** Carefully lay out the position of the mortises and the wedge slots on the various parts. Note that the wedge slots are positioned so that the *inside* edge of the wedge slot will be 1/16" inside the *outside* surface of the leg or end when the two pieces are assembled.

Drill ¾" diameter holes at either end of each mortise or wedge-slot. Then remove the waste between the holes with a sabre saw. (See Figure 2.) Clean up the inside edges of the mortises and slots with a rasp.



TONGUE LAYOUT

***2**/When making a mortise, first drill ¾" diameter holes at either end. Then cut out the waste between the holes.*

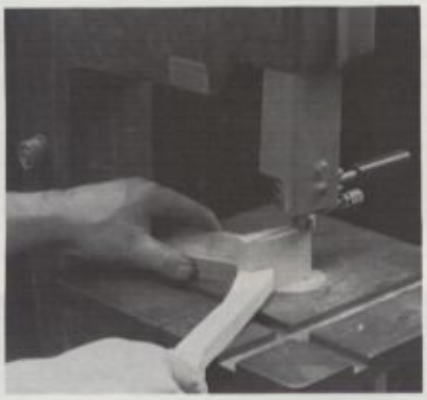


END VIEW **FRONT VIEW**

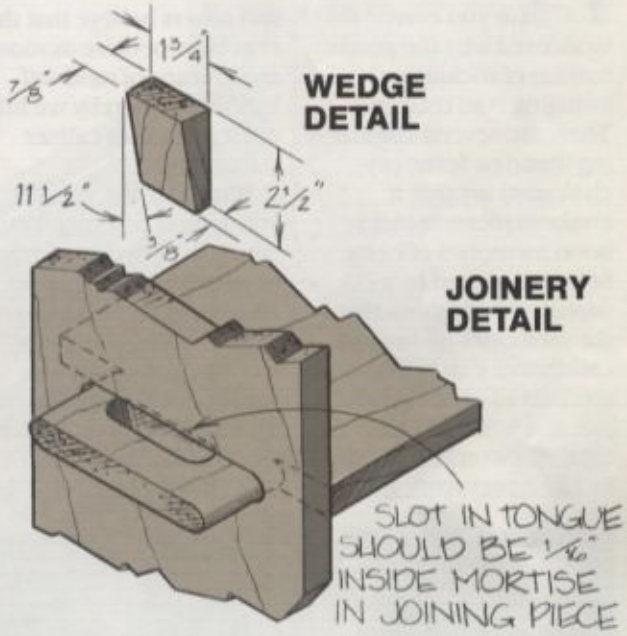
5 ***Fit the tenons to the mortises.*** With a rasp or chisel, round the edges of the tenons to fit the mortises. (See Figure 3.) You may also wish to enlarge the mortises somewhat with a rasp. The fit should be fairly loose, with about 1/16" of "slop."

3/With a rasp and chisel, round the tenons to fit the mortises.

6 ***Make the wedges.*** On a band saw, carefully taper the wedges as shown in the working drawings. Use a push stick to keep your hands clear of the blade. (See Figure 4.)



4/When cutting the taper in the wedges, use a push stick to keep your hands clear of the band saw blade.

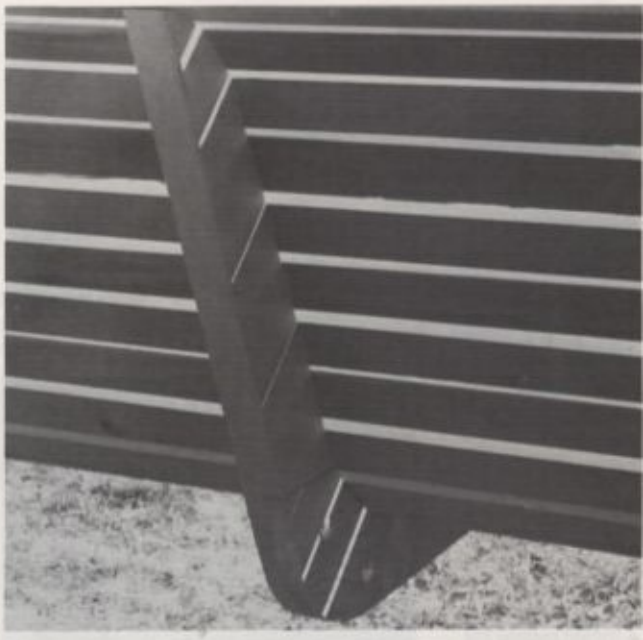


7 ***Attach the ends and the legs.*** Carefully center the legs on the inside surfaces of the ends, and clamp the two parts together. Test assemble the sides to the ends, to make sure that the sides don't hit the legs. When you're certain that all the parts will fit together properly, attach the legs to the ends with screws.

8 ***Sand and assemble all the parts.*** With a rasp and sandpaper, round over all the edges of all parts, *except* those edges where two parts butt against one another. Insert the tenons into the mortises and wedge them in place; then rest the bottom on the tops of the legs, between the two ends.

9 ***Finish the planter.*** Although it's not necessary, this planter looks great with a "milk paint" finish — the milk paint enhances the "country" design. To make an outdoor milk paint, thin exterior latex 1:1 with water. Disassemble the planter; paint the latex on; then wipe the wood down with a damp rag before the paint dries.

Contoured Porch Swing



Have you ever wondered why the gentle motion of rocking or swinging is so relaxing? There are several fascinating theories. Some psychologists say that it awakens pleasant childhood memories of being held and rocked by a parent. Others think that the memories go beyond childhood; that the motion reminds us of being held safe and warm in our mother's womb, rocked by her movements. And still others believe that the regular, repetitive motions are a means of mild self-hypnosis, whereby we lull ourselves into a calmer state of mind.

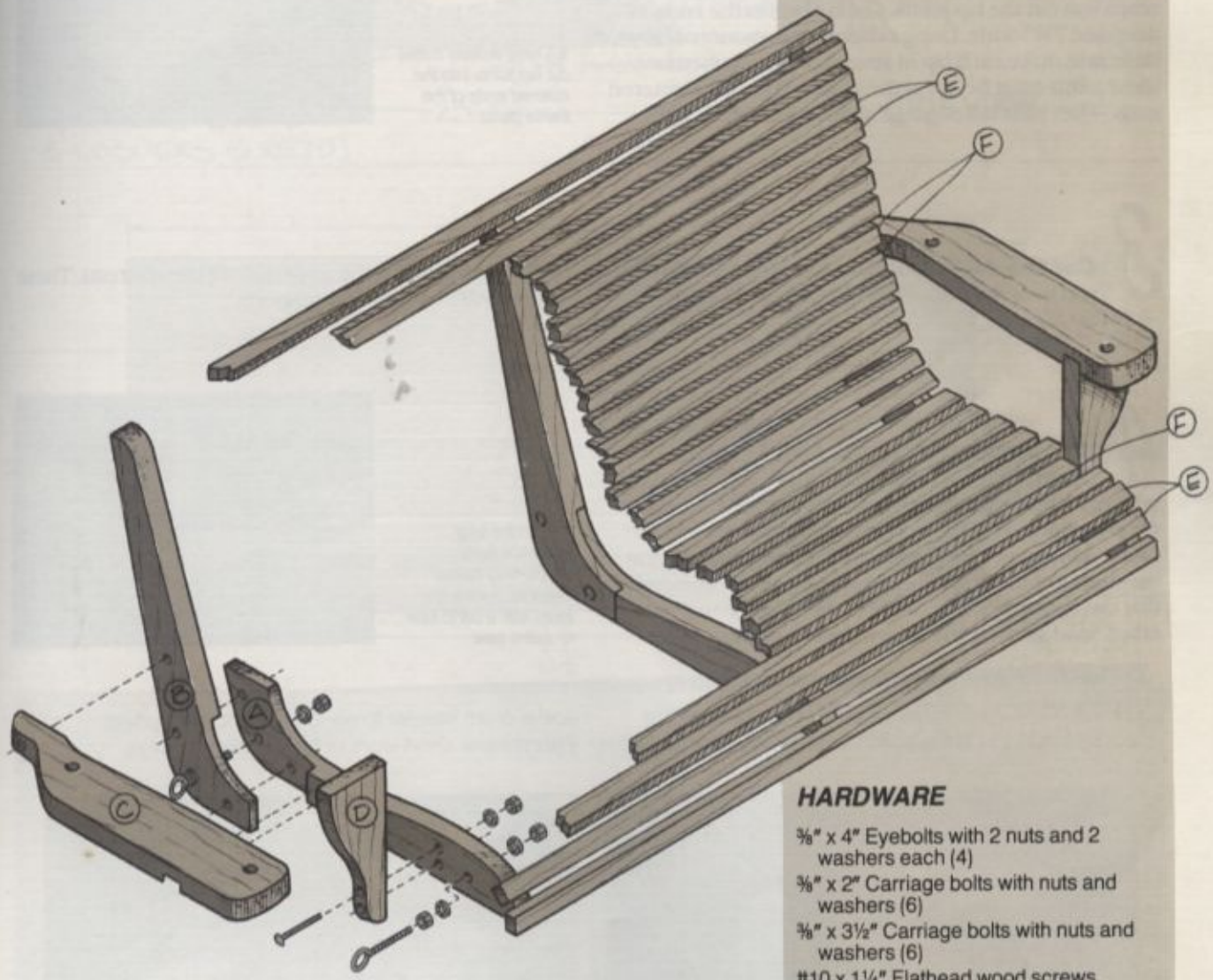
Whatever the reasons, swinging *is* relaxing. This particular porch swing is more relaxing than most because it's contoured to fit your body. The frame parts hold the slats in a gentle, comfortable curve. There are no hard flat surfaces or sharp angles to disturb your reverie.

Materials List

FINISHED DIMENSIONS

PARTS

A.	Seat frame (3)	1½" x 5⅝" x 23½"
B.	Back frame (3)	1½" x 6¼" x 25¼"
C.	Armrests (2)	1½" x 4¼" x 22"
D.	Arm supports (2)	1½" x 4¼" x 10½"
E.	Long slats (19)	¾" x 1½" x 60"
F.	Short slats (3)	¾" x 1½" x 58"



EXPLODED VIEW

HARDWARE

⅜" x 4" Eyebolts with 2 nuts and 2 washers each (4)
⅜" x 2" Carriage bolts with nuts and washers (6)
⅜" x 3½" Carriage bolts with nuts and washers (6)
#10 x 1¼" Flathead wood screws (6 dozen)
#14 x 3" Flathead wood screws (4)
Porch swing chain set, with 5' leaders
2" S-hooks (6)
⅜" Screw hooks (2)

1 ***Cut the frame parts to size.*** Cut the seat and back frame parts from 2 x 8 stock. Don't contour them at this time, just cut them to length and miter one end at 80°. Also, cut the armrest and arm support parts to length from 2 x 6 stock.

2 ***Cut the lap joints that join the seat and back frames.*** Lap the mitered ends so that they form an inside angle of 100°, and their outside edges are flush. Mark the pieces where they cross to guide you when you cut the lap joints. Cut rabbets in the ends, ¾"-deep and 7¼"-wide. Using a dado cutter mounted on your table saw, make each lap in several passes. Remember, these joints must be cut at the same angle as the mitered ends — set your miter gauge at 80°. (See Figure 1.)

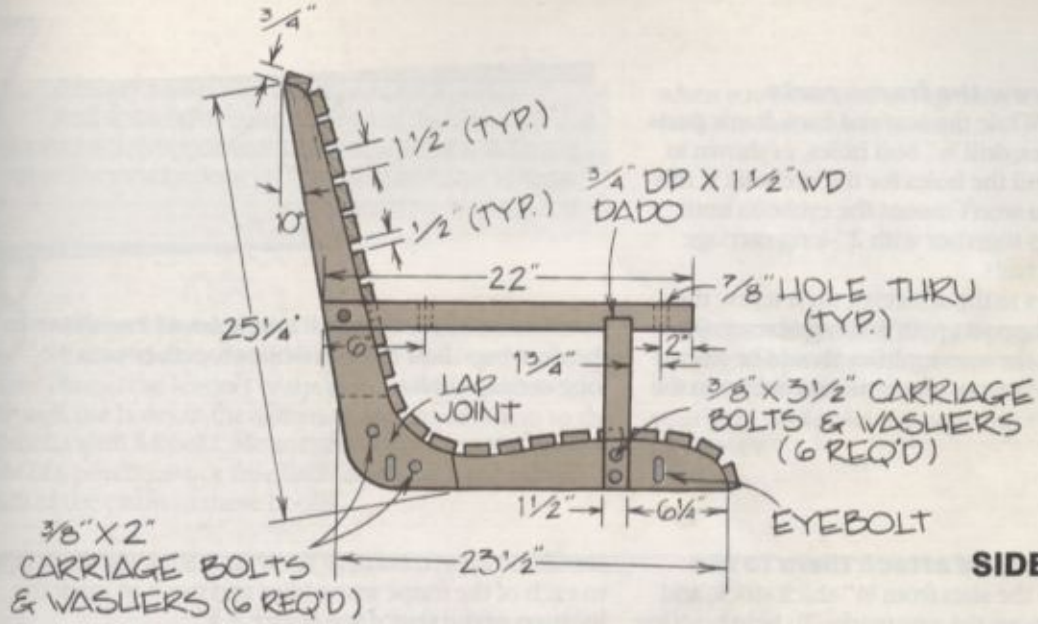
1/Using a dado cutter, cut lap joints into the mitered ends of the frame parts.

3 ***Cut the dadoes in the armrests.*** While you have the dado cutter set up, cut ¾"-deep, 1½"-wide dadoes in the underside of the armrests. These dadoes will hold the arm supports.

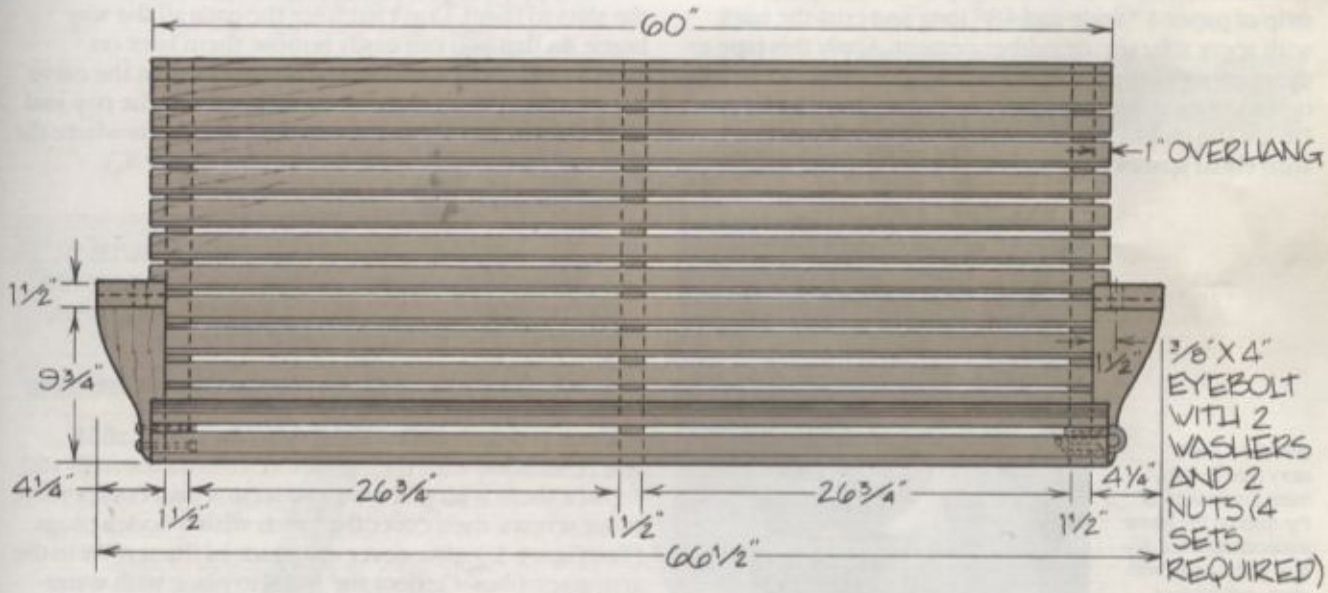
4 ***Cut the shapes of the frame parts.*** Temporarily attach the seat and back frame parts with nails. Enlarge the patterns for these parts and trace them on the stock. Then cut the contours with a band saw or sabre saw. (See Figure 2.) While you're at it, cut the shapes of the armrests and arm supports. Remember that the two armrests should be mirror images of each other. Sand all parts to remove the saw marks.

2/With the seat and back parts temporarily nailed together, cut the contours with a band saw or sabre saw.

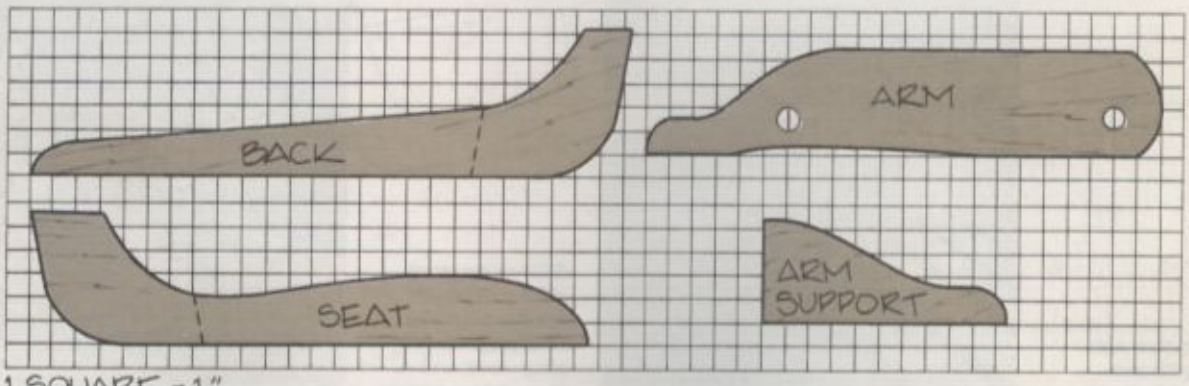
TRY THIS! Use a disc sander to sand the convex curves on the porch swing frame parts... and a drum sander to sand the concave curves. This makes short work of the sanding chores.



SIDE VIEW



FRONT VIEW



SWING PATTERNS

5 Bolt and screw the frame parts together.

While the seat and back frame parts are still nailed together, drill ⅜" bolt holes, as shown in the *Side View*. Also, drill the holes for the eyebolts at this time, even though you won't mount the eyebolts until later on. Bolt the parts together with 2"-long carriage bolts and remove the nails.

Drill the chain holes in the armrests, then screw the armrests to the arm supports with 3"-long screws. Once again, remember that these assemblies should be mirror images of each other. Position the arm assemblies on the frame assemblies; then drill bolt holes where shown in the drawings. Bolt the assemblies together with 3½"-long carriage bolts.

TRY THIS! When you install each bolt, put a flat washer over the threaded end, then a lock washer, and finally a nut. The *lock washer* will keep the nut from working loose.

6 Cut the slats and attach them to the frame.

Rip the slats from ¾"-thick stock, and joint the edges to remove the saw marks. To help position the slats on the frame, make a paper "story tape". Cut a strip of paper 1" wide and 48" long and coat the back with spray adhesive or rubber cement. Apply this tape to the contour of the frame, then trim it to the exact length of the contour. Remove the tape and measure its length. Divide the length into twenty-two 1½"-wide sections, with equal spaces between each section. (The spaces should be *approximately* ½" wide.) Stick the story tape to each of the frame assemblies and use it to mark the location of the slats. (See Figure 3.)

Once the assemblies are marked, temporarily nail the slats to them. Don't hammer the nails all the way home, so that you can easily remove them later on. Start by attaching a middle slat, somewhere in the curve between the seat and the back. Next, attach the two end slats. Finally, fill in with the rest. Use short slats where the arm assemblies bolt to the frame. (See Figure 4.)

TRY THIS! Use *finishing* nails when temporarily attaching parts, prior to bolting or screwing them together. Finishing nails leave smaller holes, and they aren't as likely to split the wood.

Once you have nailed the slats to the frame, and you're satisfied with their position, remove the nails and replace them with screws. Countersink *and* counterbore these screws, then cover the heads with wooden plugs. (See Figure 5.) Also, cover the heads of the screws in the arm assemblies. Cement the plugs in place with waterproof glue.

3/*Make a paper story tape to help mark the position of the slats on the frame assemblies. Stick this tape to the wood with spray adhesive or rubber cement.*

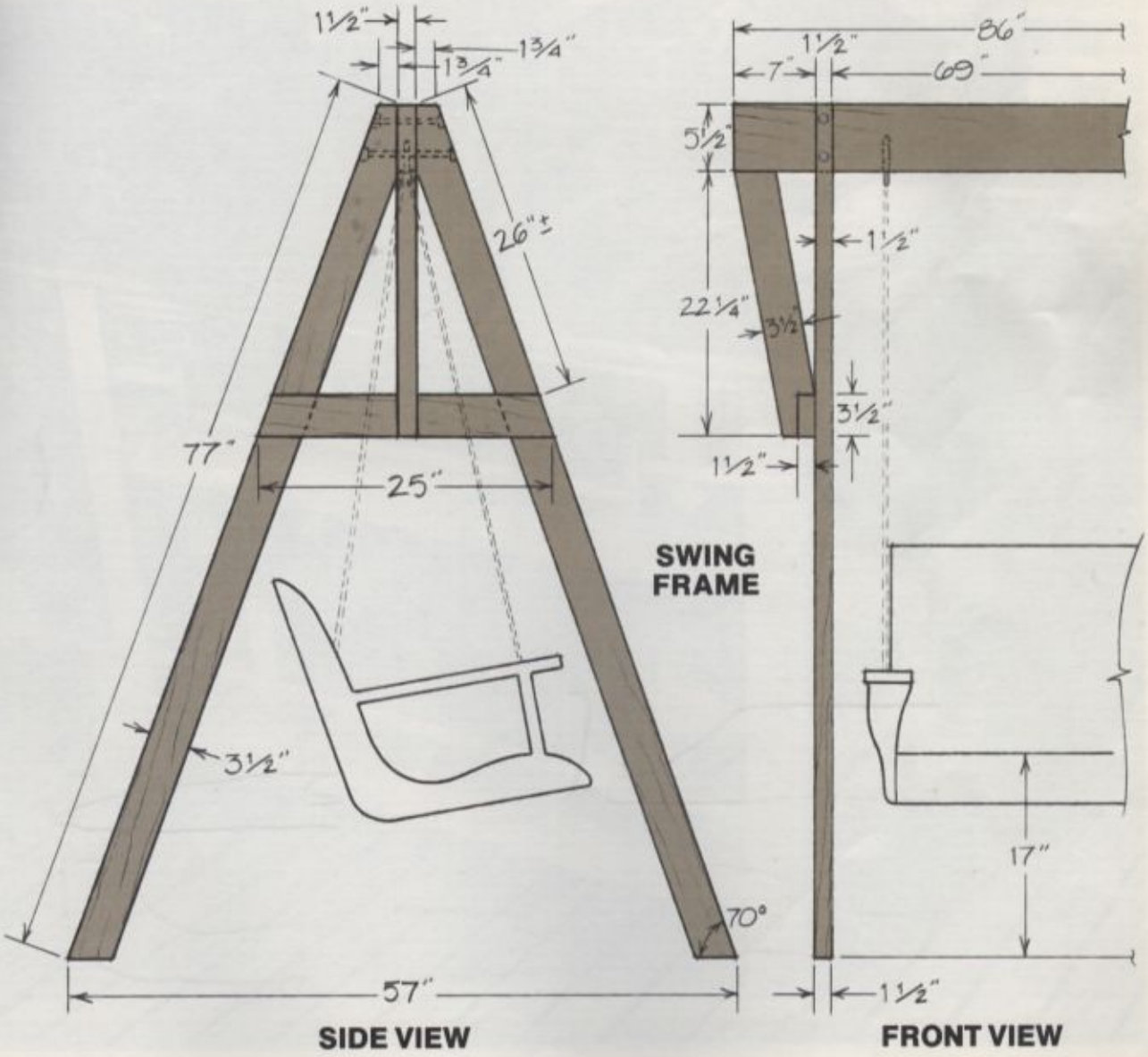
4/*Use short slats where the arm assemblies bolt to the frame.*

5/*Cover the heads of the screws with wooden plugs. Cut these plugs from scrap wood, and cement them in place with waterproof glue.*

7 ***Finish sand the completed swing.*** Round over the hard corners of the armrests and any other sharp edges that might rub you the wrong way when you sit on the swing. Sand the wooden plugs flush with the surface of the slats.

8 ***Mount the swing.*** Attach eyebolts to the frame where shown in the *Side View* and *Front View*. Thread the leaders of the porch swing chains through the holes in the armrests, and attach them to the eyebolts with S-hooks. Mount screw hooks to the underside of a porch joist or tree limb, and attach the other ends of the chain to these hooks.

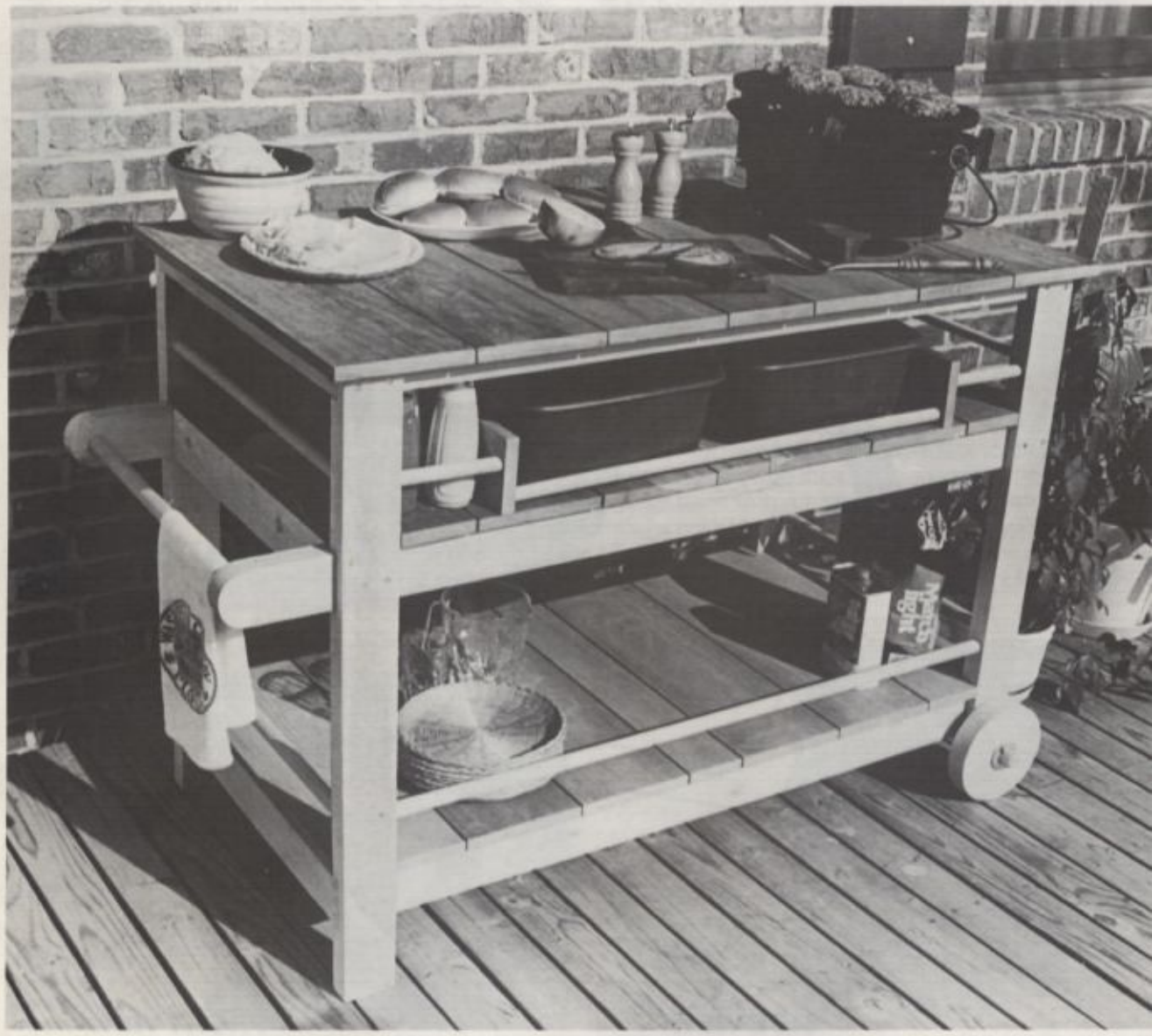
Option: If you don't have a porch or a tree from which to hang the porch swing, make a simple frame from 2 x 4's and 2 x 6's, as we show here. Position the frame in your yard, and stake it down with #4 rebar so that it won't blow over.

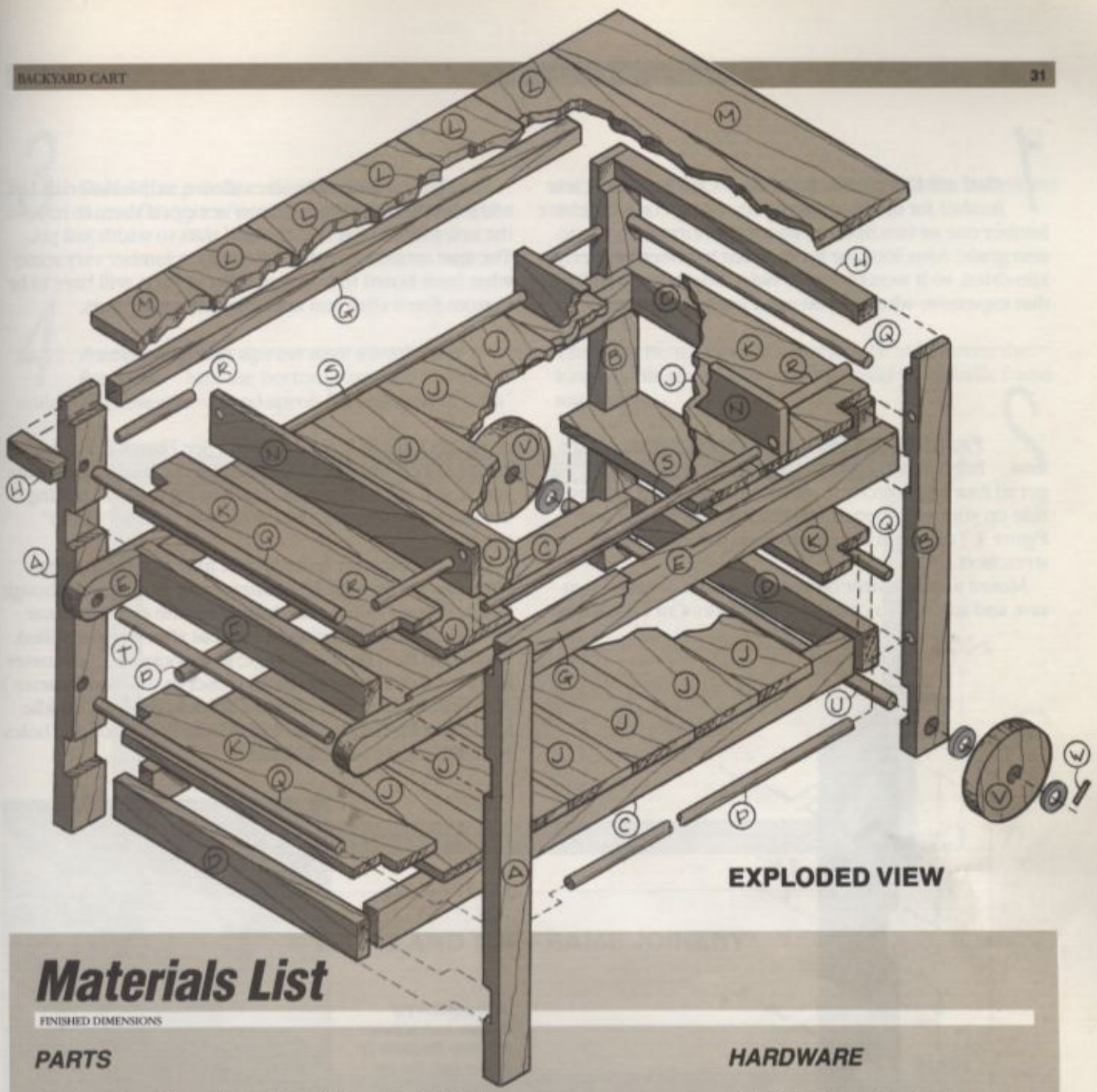


Backyard Cart

No matter what the area of your home, if you spend any time there at all, you need a workstation to make it truly livable. In a kitchen, you need countertops. A workshop requires a workbench; a bedroom, a dresser. Even in the backyard, it helps to have a good cart.

This backyard cart is designed to serve many different functions. Standing next to a barbecue grill, it becomes an outdoor kitchen. In the garden, it's a potting table. If you're in the midst of an outdoor building project, it's a portable workbench. Not only does it offer a big work surface, there are drawers and shelves for storage. And it can be rolled around like a wheelbarrow to wherever it's needed.





EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

A.	Long legs (2)	1½" x 3" x 35¼"
B.	Short legs (2)	1½" x 3" x 33¼"
C.	Long bottom stretchers (2)	1½" x 3" x 45"
D.	Short stretchers (3)	1½" x 3" x 23½"
E.	Long middle stretchers (2)	1½" x 3" x 52½"
F.	Shortest stretcher	1½" x 3" x 22"
G.	Long aprons (2)	1½" x 1½" x 45"
H.	Short aprons (2)	1½" x 1½" x 23½"
J.	Middle shelf slats (10)	¾" x 7¼" x 25"
K.	End shelf slats (4)	¾" x 5½" x 25"
L.	Middle top slats (5)	¾" x 7¼" x 28"
M.	End top slats (2)	¾" x 6½" x 28"
N.	Dividers (2)	¾" x 4" x 25"
P.	Long bottom rails (2)	¾" dia. x 44"
Q.	End rails (4)	¾" dia. x 24"
R.	Short middle rails (4)	¾" dia. x 6⅞"
S.	Long middle rails (2)	¾" dia. x 30¼"
T.	Handle	1" dia. x 22½"
U.	Axle	1" dia. x 30½"
V.	Wheels (2)	7" dia. x 1½"
W.	Pegs (2)	⅜" dia. x 2"

HARDWARE

12d Galvanized nails (¼ lb.)
6d Finishing nails (½ lb.)
#10 x 1¾" Flathead wood screws (30)
1" Flat washers (4)
4½" x 11½" x 13½" Plastic tubs (4)*

*If this size tub is not available, you may have to buy something similar and adjust the height of the middle shelf and the position of the dividers to fit.

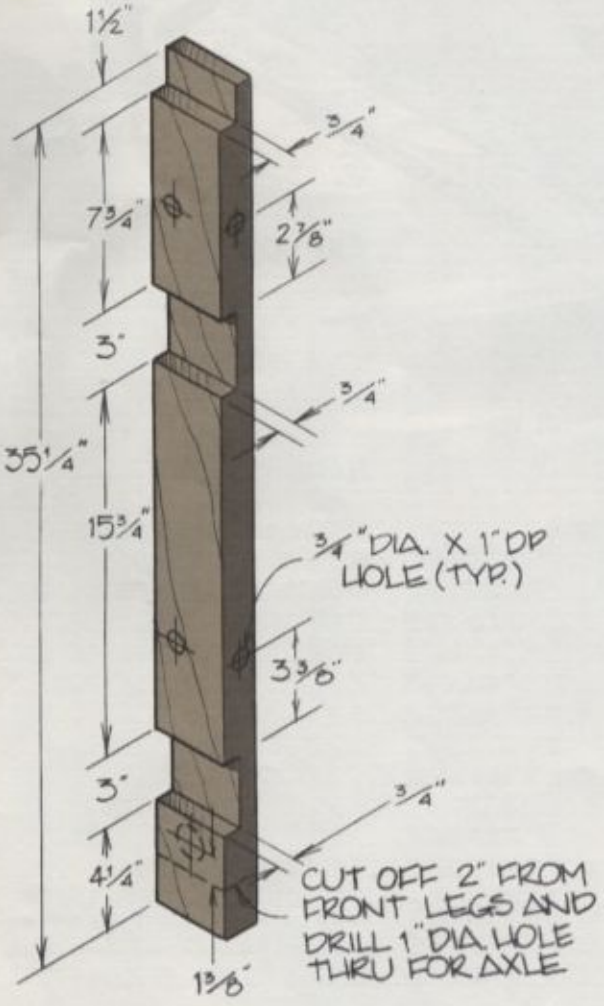
1 ***Cut all the parts to size.*** Choose good, clear lumber for the legs, stretchers, and aprons. Purchase lumber one or two notches above the normal construction grade. Also, look for lumber that has been properly kiln-dried, so it won't warp or twist. You'll find it isn't all that expensive when all you need are small amounts.

Cut all the parts to the sizes shown in the Materials List, and joint the boards where you've ripped them to remove the saw marks. Don't rip the end slats to width just yet. The true measurements of dimension lumber vary somewhat from board to board, and these parts will have to be custom fitted after you nail down the other slats.

2 ***Fashion the legs and stretchers.*** Carefully mark the dadoes and rabbets on the legs. To get all four legs exactly the same, line them up side by side on your workbench and mark across them. (See Figure 1.) Also, mark the dadoes on the long middle stretchers.

Mount a dado cutter on your table saw or radial arm saw, and adjust it to cut a ¾"-deep dado. Cut each dado or rabbet joint in several passes. (See Figure 2.) If you use a radial arm saw, cut by pushing the blade *away* from you. If you cut with the normal sawing motion, pulling the blade toward you, the cutter will tend to "climb" the stock.

Drill 1"-diameter holes for the axle in the short legs. (You can get by with 1"-diameter axle holes, even though you're using 1"-diameter dowels for the axles, because most large dowels shrink somewhat after they're milled. You'll find that, on the average, store-bought 1"-diameter hardwood dowels are actually closer to 15/16" in diameter.) Also drill 1"-diameter *stopped* holes in the long middle stretchers for the handle, and ¾"-diameter stopped holes in all the legs to hold the rails.



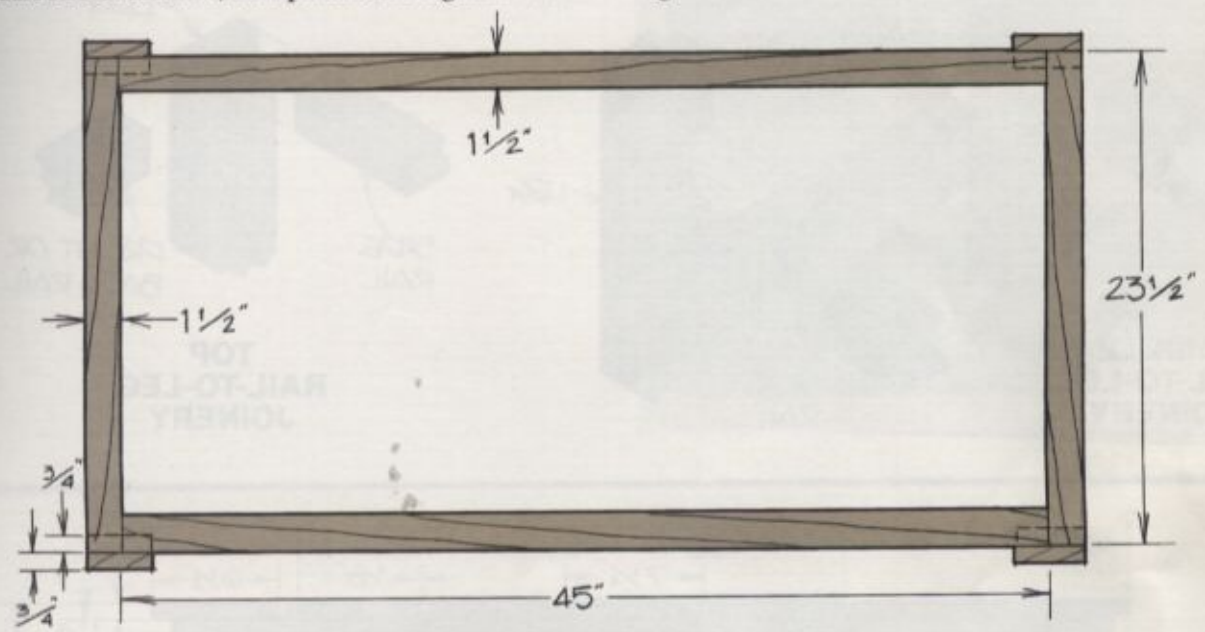
LEG LAYOUT

***1**/To position the dadoes and rabbets precisely the same on all four legs, line the legs up side by side and mark them all at the same time.*

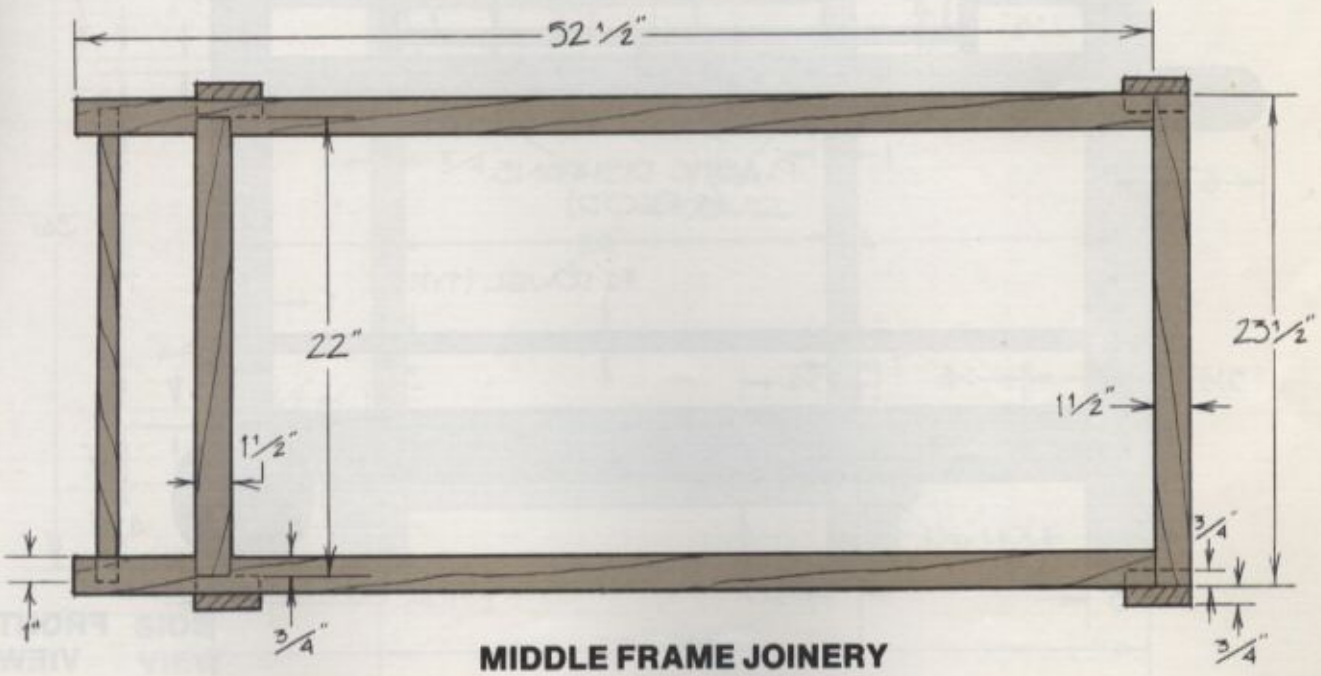
***2**/Cut the dadoes and rabbets with a dado cutter. Each joint will require several passes over the cutter.*

3 ***Sand the parts.*** Sand and smooth the surfaces of the parts you have made. Do not round the edges just yet. Do that later, after you have assembled the project.

4 ***Assemble the apron and stretcher frames.*** Nail the bottom stretcher frame, middle stretcher frame, and apron frame together with 12d nails. Be sure to insert the handle in between the long middle stretchers *before* you nail the middle frame together.



BOTTOM AND TOP FRAME JOINERY

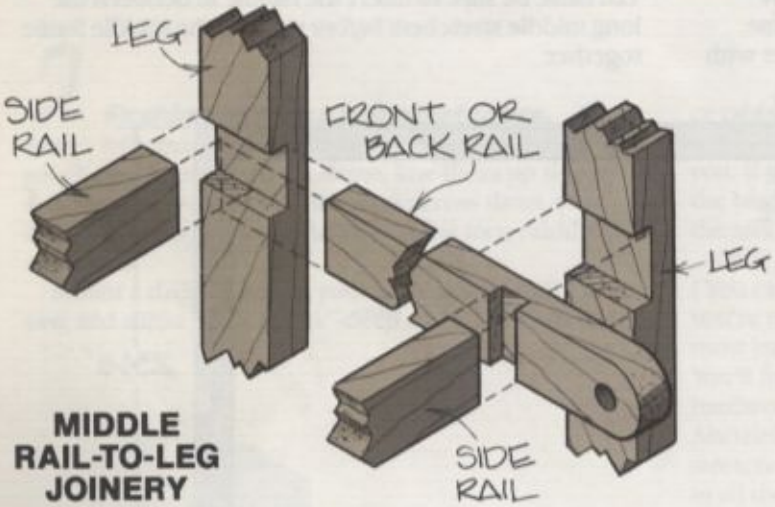


MIDDLE FRAME JOINERY

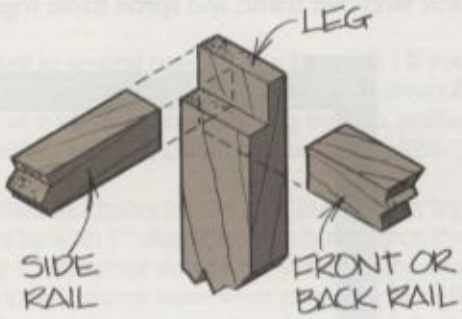
5 ***Attach the legs to the frames.*** Dry assemble the legs to the frames. Clamp them in place temporarily; *do not* screw them in place just yet. Square up the assembly, adjusting clamps as needed.

When the legs are square to the frames, remove the right long leg, and insert one long bottom rail and two end rails in their respective holes in both legs. Clamp the leg back in place. Repeat, removing the left short leg. When all the rails are in place — except for middle short rails and middle long rails — attach the legs to the frames with screws.

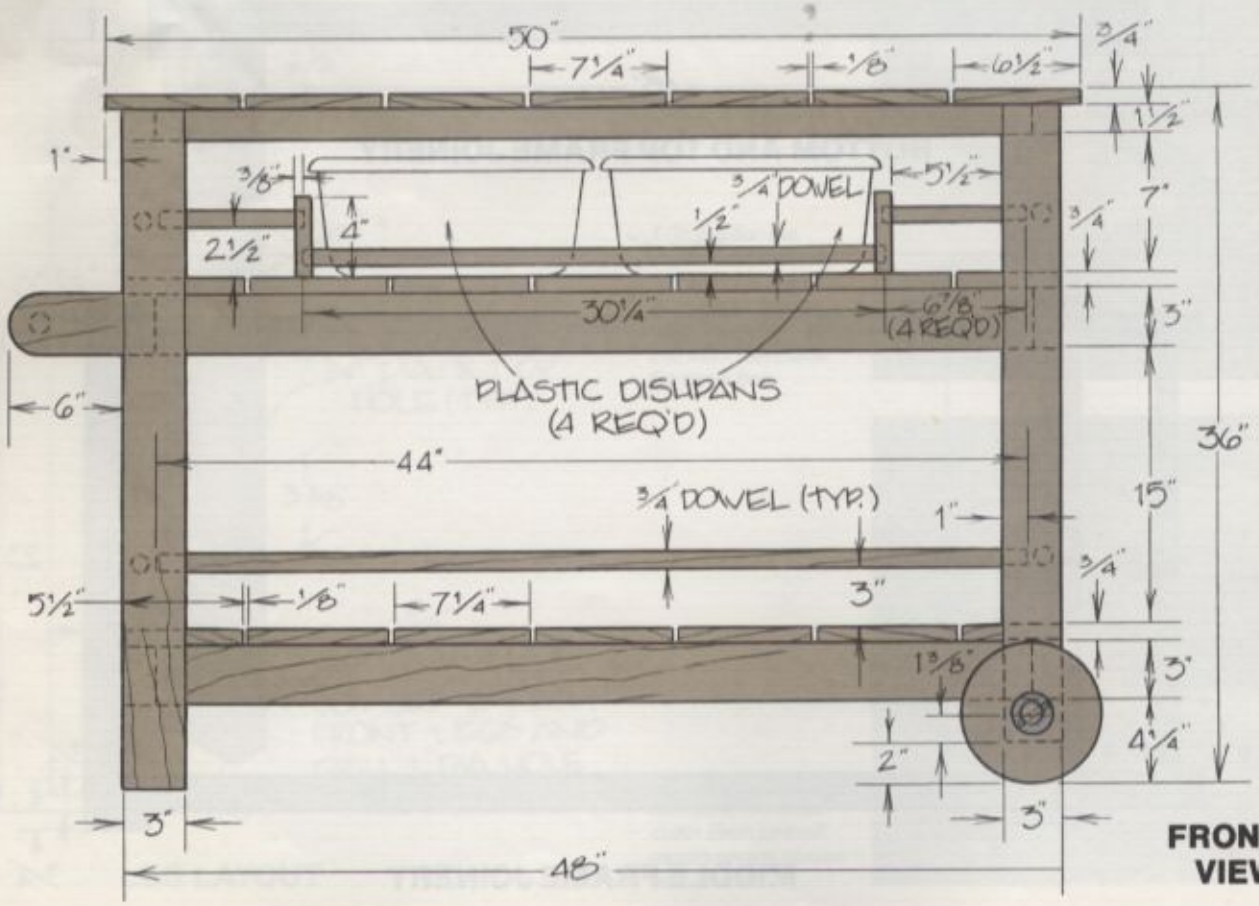
Note: Don't try to install the short middle rails and the long middle rails at this time. Wait until after you've nailed the slats in place.



MIDDLE RAIL-TO-LEG JOINERY



TOP RAIL-TO-LEG JOINERY

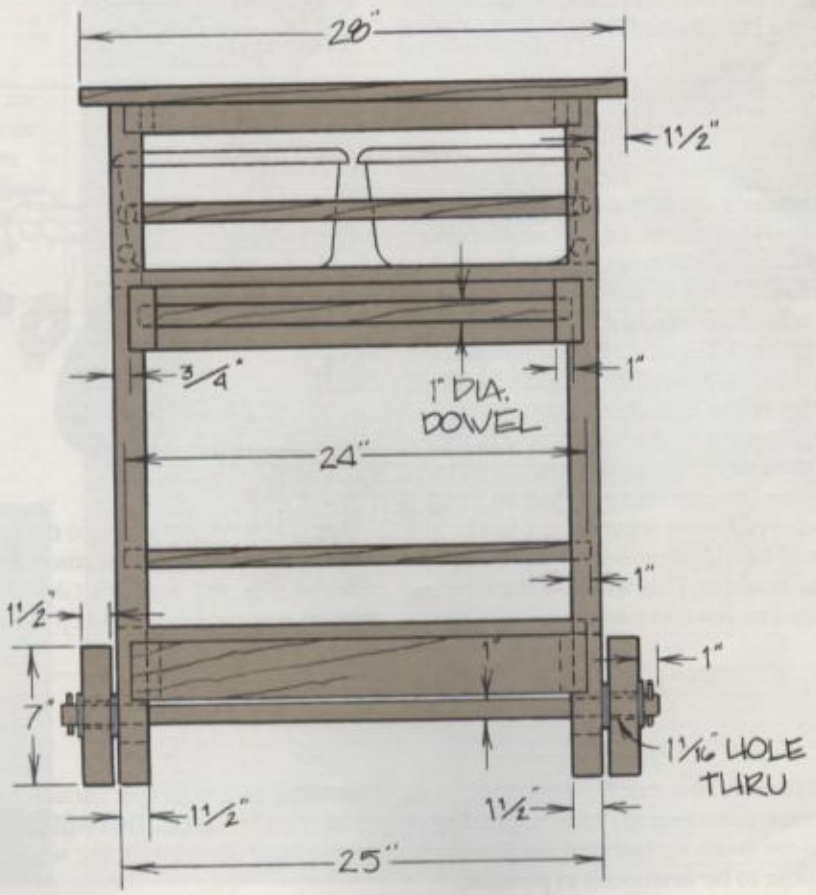


FRONT VIEW

6 *Attach the slats to the frames.* Lay the middle shelf slats and the middle top slats in place on the frame, carefully spacing them out as shown in the working drawings. Measure the distance spanned by the middle slats, and from that calculate the true width of the end slats.

Rip the end slats to width, and notch the end shelf slats to fit around the legs. Lay the slats in place to check their fit. When you're satisfied that they fit properly, nail all the slats in place with galvanized finishing nails.

TRY THIS! Nailing the slats toward the middle of the cart may be difficult because the long stretchers or aprons will give with each blow of the hammer. To prevent this, hold a small anvil or heavy metal "nailing block" under the frame part.



SIDE VIEW

7 ***Install the dividers and remaining rails on the cart.*** Drill ¾"-diameter, ⅜"-deep stopped holes in the dividers, where shown in the drawings. Insert the short middle rails in their holes in the legs, then put the dividers in place. Cock the dividers to the right or left so that you can install the long middle rail, then straighten them up again after the rails are in place. Finally, fasten the divider-and-rail assembly in place by driving screws up through the middle shelf into the dividers. (See Figure 3.)

TRY THIS! If you have trouble installing the middle rails, enlarge the holes in the divider to 13/16"-diameter. For some reason we had trouble with one side, but not the other.

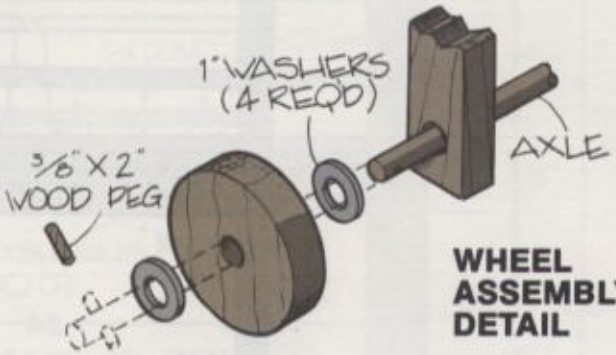
***3**/Secure the dividers in place with screws. Drive these screws up from underneath the shelf.*

8 ***Install the drawers.*** The long middle rail is closer to the shelf in order to allow you to install drawers in the patio cart. This is extremely simple: Just place standard-size plastic tubs between the dividers! The rails are low enough so that you can slip the tubs in and out easily, but high enough to prevent them from falling out when you roll the cart around.

TRY THIS! Drill ⅛"-diameter holes in the bottoms of the tubs to prevent them from filling up with rainwater.

9 ***Mount the wheels on the cart.*** Cut out the wheels with a band saw or sabre saw, and drill 1"-diameter holes through their centers. Insert the uncut axle stock through the axle holes in the short legs. Place 1" washers on either end of the axle, then the wheels, then another set of washers. (These washers prevent the wooden wheels from rubbing against the pegs and legs.)

Mark the outside edge of the outside washers, on either end of the axle. Measure 1" out from these marks to mark the length of the axle. Disassemble the washers, wheels, and axle from the cart, and cut it to length. Drill the ends for ⅜"-diameter pegs that secure the wheels. (These peg holes should be 1/16" beyond the marks for the outside edge of the washers. This will give the wheels a little play on the axles, but not too much.)



WHEEL ASSEMBLY DETAIL

Apply a little paste wax to the inside of the holes in the wheels to help them turn smoothly. Then reassemble the axle, wheels, and washers. Glue the pegs in their holes with waterproof glue to keep the wheels on the axle.

10 ***Sand and finish the cart.*** Sand the completed cart, rounding any hard edges. Pay particular attention to the work surface and the handle — you want both of these to be as smooth as possible.

Finish the cart with spar varnish or a 1:1 mixture of spar varnish and tung oil. This will prevent spilt drinks and grease from discoloring the wood.

Outdoor Display Shelves

Are you looking for a way to get your small potted plants up off the deck where they won't get kicked around? Do you have some knick-knacks that you'd like to display out of doors? Do you need an attractive stand for a lamp or two when you entertain on your patio? These light-weight shelves could be just what you need.

As designed, this project has three small shelves. However, you can easily add more shelves or make them longer, if you need to. You can also adjust the spacing between the shelves to accommodate larger or smaller items. Change the plan to suit yourself; you'll find it's quite adaptable.

Materials List

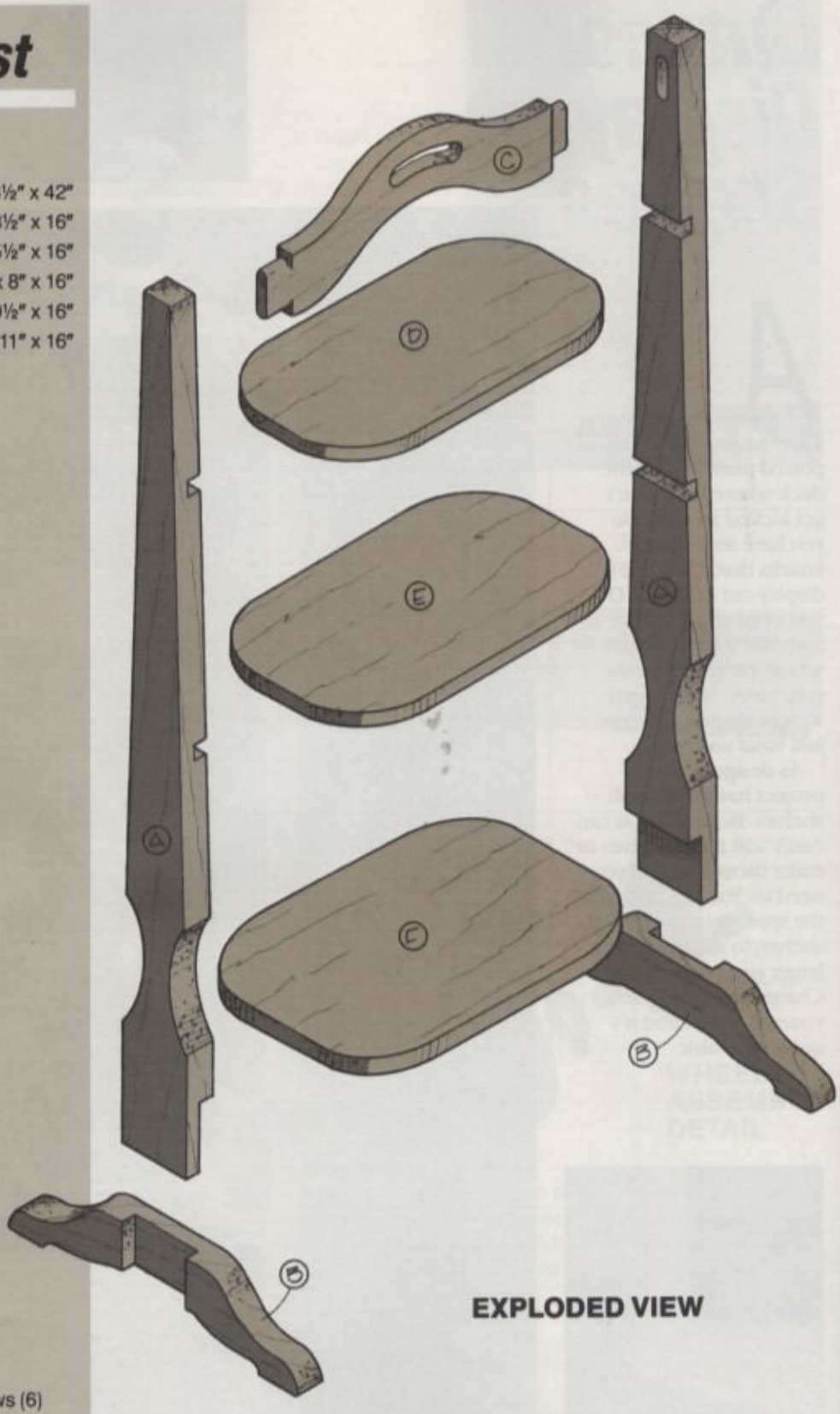
FINISHED DIMENSIONS

PARTS

A.	Supports (2)	1½" x 3½" x 42"
B.	Legs (2)	1½" x 3½" x 16"
C.	Handle	¾" x 5½" x 16"
D.	Top shelf	¾" x 8" x 16"
E.	Middle shelf	¾" x 9½" x 16"
F.	Bottom Shelf	¾" x 11" x 16"

HARDWARE

#10 x 1¾" Flathead wood screws (6)
#10 x 1¼" Flathead wood screws (4)



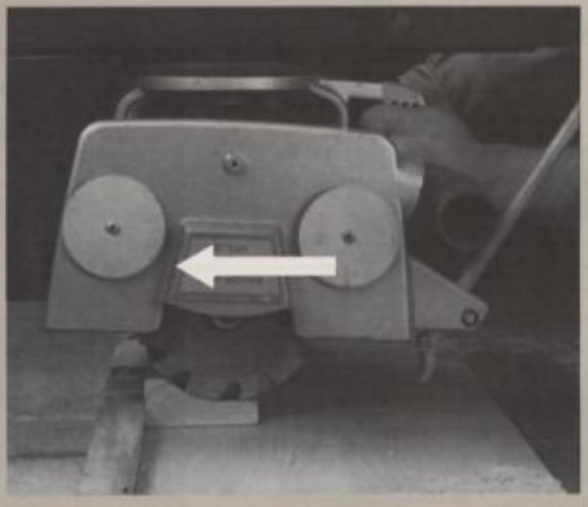
EXPLODED VIEW

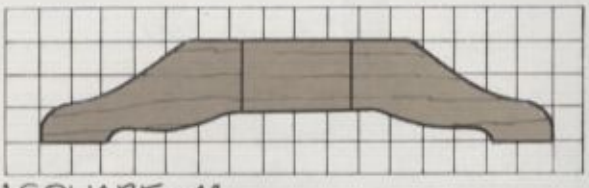
1 ***Cut all the parts to size.*** Cut the parts to the size shown in the Materials List. The legs and supports can be cut from 2 x 4 stock, the shelves and handle from 1 x 12 lumber.

2 ***Cut the joinery in the legs and supports.*** Enlarge the patterns for the feet, and trace them on the stock. Lay out the supports. However, *do not* cut the shapes just yet. The joinery must be cut before you shape the parts.

Mount a dado cutter on your table saw or radial arm saw, and adjust the height to cut ¾" deep. Make the dadoes and the lap joints in the parts, taking care to cut both supports and both legs exactly the same. To cut the lap joints, you'll have to make several passes with the cutter.

TRY THIS! If you mount your cutter on a radial arm saw, you'll find it much easier (and safer) to cut by pushing the saw *away* from you. If you cut with the usual motion, pulling the machine towards you, the cutter will want to "climb" the board.





PATTERN FOR FEET

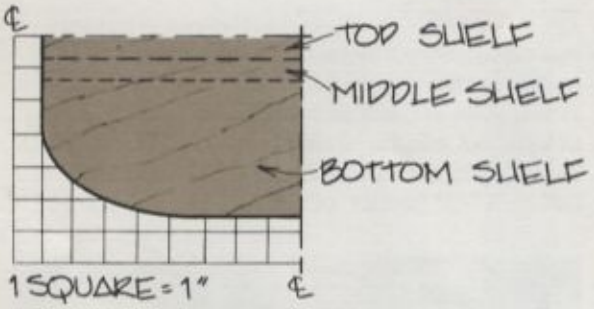
TRY THIS! If you don't have a drill press, you can easily cut these mortises with a hand-held router, a straight bit, and an edge guide. Mount the bit in the router, and adjust the edge guide so that the slot you cut with the bit will be centered in the face of the 2 x 4 stock. Rout each mortise in several passes, cutting ⅛"-¼" deeper with each pass.

Make the mortises near the top ends of the supports on your drill press. Drill a series of ¾"-diameter holes, ¾" deep to "rough out" the mortises, then clean up the edges with a chisel. (See Figure 1.)

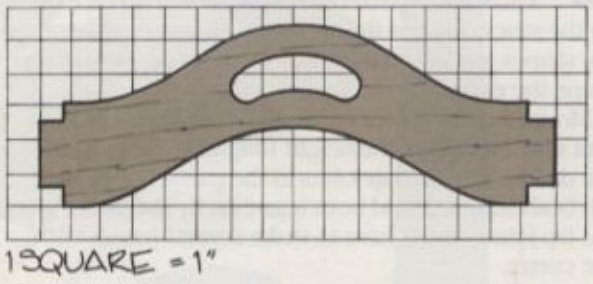
***1**/To make the mortises for the handle, first drill a series of holes. Then clean up the edges with a chisel.*

3 ***Cut the shapes of the legs, supports, shelves, and handle.*** With a band saw or sabre saw, cut out the shapes of the various parts. With a chisel and a rasp, round the edges of the tenons on the handle so that they fit the mortises. (See Figure 2.) Sand the sawn edges of all the parts to remove the saw marks.

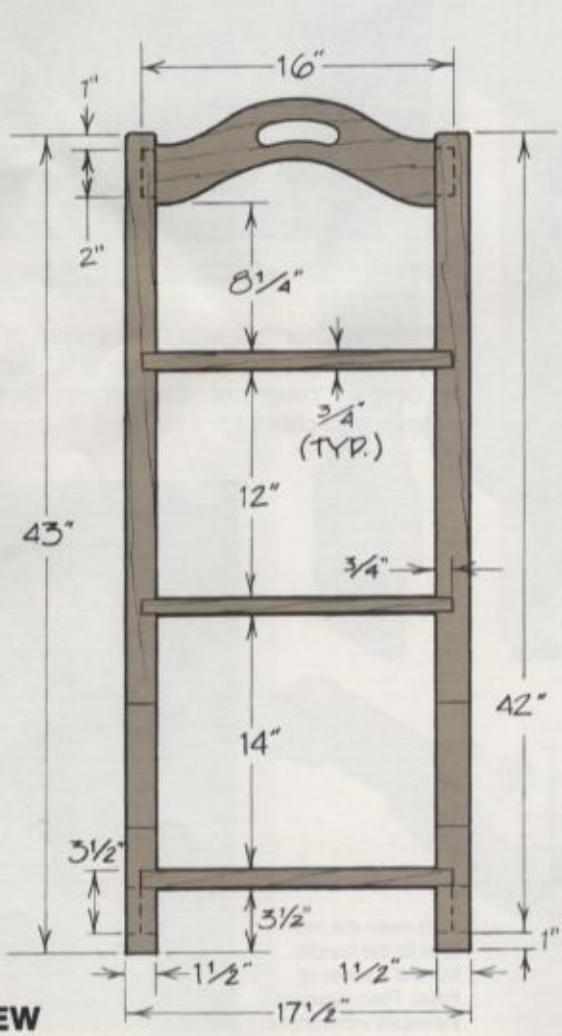
2/With a chisel and rasp, round the edges of the tenons on the handle to fit the mortises.



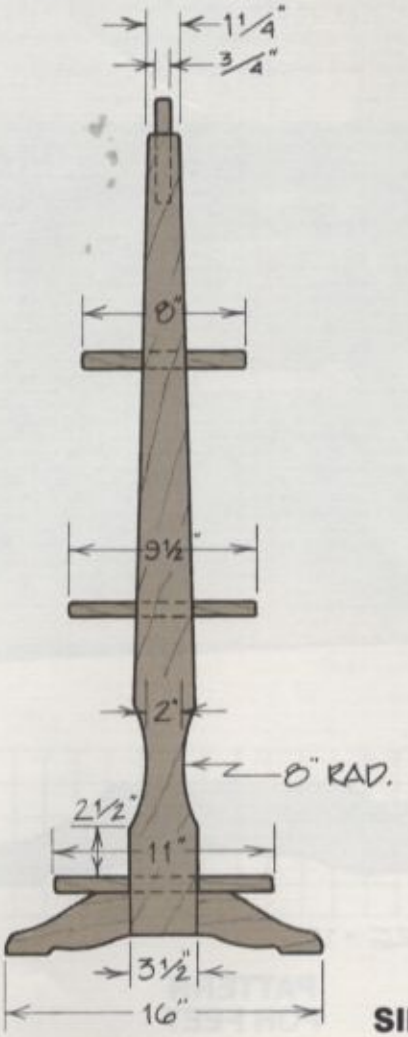
SHELF PATTERN



HANDLE PATTERN



FRONT VIEW



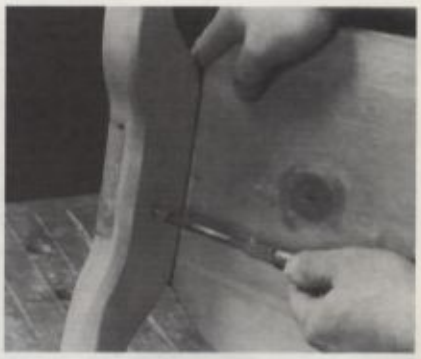
SIDE VIEW

4 ***Cut the handle opening.*** Drill 1"-diameter holes at either end of the handle opening. Then cut away the waste in between the holes with a sabre saw. Round over the edges of the opening with a router or a rasp so that it fits your hand comfortably.

5 ***Seal the wood inside the joints.*** Paint the surfaces inside the mortises, dadoes, and lap joints with spar varnish to seal the grain and prevent any water damage. Also, seal the end grains of the handle and shelves where they will be inserted into the joints.

6 ***Assemble the stand.*** Insert the tenons of the handle in the support mortises; then slide the shelves in place in the dadoes. Attach the shelves to the supports with screws — one screw per joint. (There is no need to screw the handle in place; it will stay put once the shelves are attached securely.) Counterbore *and* countersink the screws, then cover the heads with wooden plugs.

Attach the legs to the supports with screws. Drive these screws from the *inside* of the legs. (See Figure 3.)



3*/Screw the legs to the supports from the "inside," so the screws won't show.*

7 ***Sand and finish the project.*** Round all the "hard" corners and edges with a rasp and sandpaper to give the piece a soft, country look. Stain the project, if you want; then apply a 1:1 mixture of tung oil and spar varnish. Give all exposed end grains a second coat to make sure they're completely sealed.

Rust-Resistant Hardware

Throughout this book, we recommend "rust-resistant" or weatherproof hardware. The Materials Lists often call for "galvanized" fasteners, but you actually have a bigger choice than that.

Galvanized — There are two types available: plated (or "coated") and "hot-dipped." Of the two, hot-dipped hardware is far superior in its ability to weather the elements.

Brass — Brass will not corrode when exposed to *fresh* water. However, it may disintegrate around salt water. Other drawbacks: It's a soft metal, and the screw heads are easily stripped. It's also expensive. Avoid "brass-plated"; this is not weatherproof.

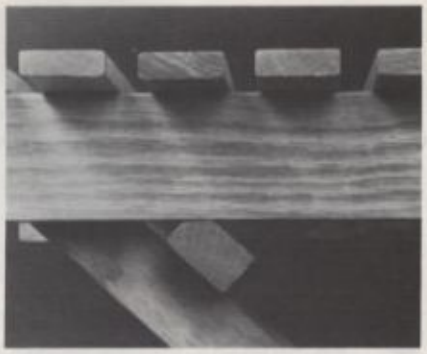
Bronze — Bronze is a hard metal, and it will stand up to both fresh water and salt water. However, it is very expensive. Bronze hardware is available through marine supply stores. Do not purchase "bronze-plated"; this is not weatherproof.

Stainless steel — This is in the same category as bronze. Stainless steel is hard and stands up to both fresh water and salt water. It's slightly less expensive than bronze.

Zinc- or cadmium-plated — These two terms are, for most woodworkers' purposes, synonymous. Zinc/cadmium-plated hardware is rust-resistant but not really weatherproof.

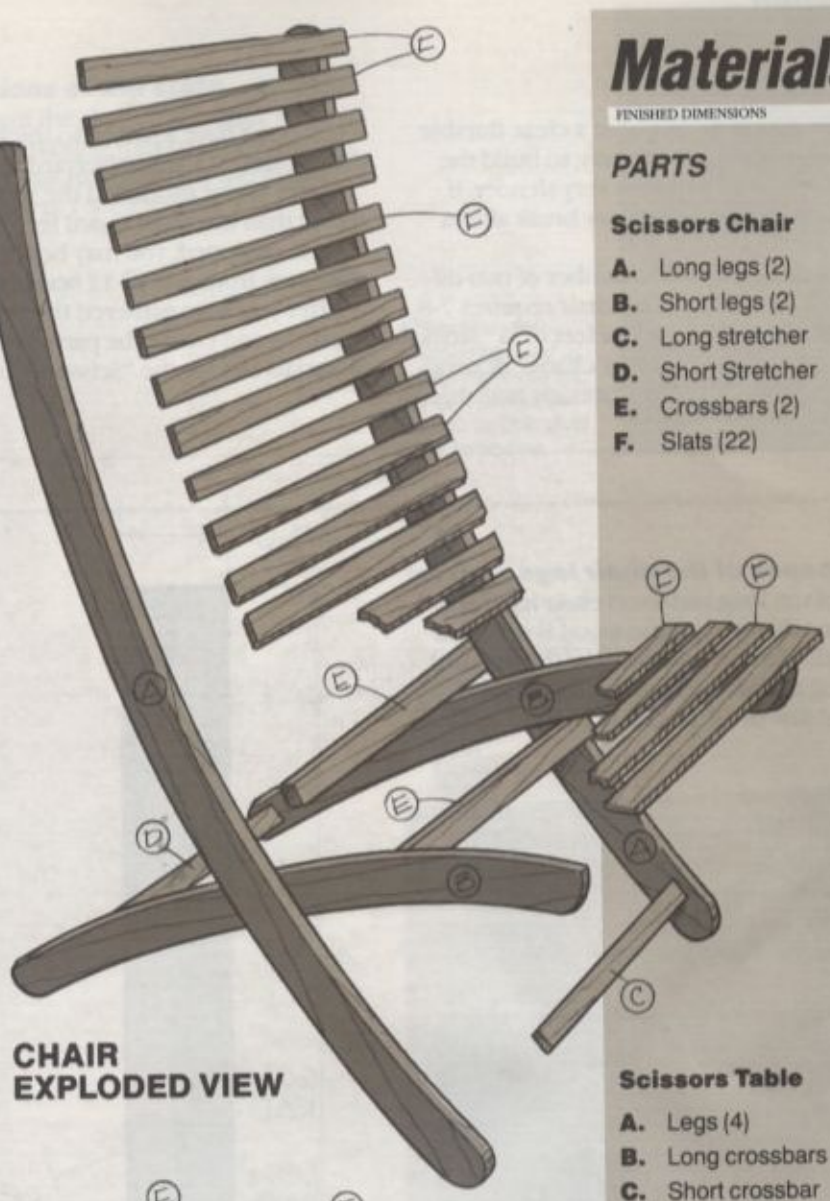
Avoid hardware that has been "blued," "japanned," or "chrome-plated." These treatments make the metal resistant to corrosion, but not weatherproof.

Scissors Chair and Table



It's hard to imagine why this particular style of outdoor furniture has come to be known as "scissors" furniture. It does not fold up like a pair of scissors; there is no pivot or hinge-pin. Instead, the furniture pulls apart in two pieces, then one piece slides inside the other. It's more like "sword-and-scabbard" furniture.

Whatever you want to call it, the elegant table and chair you see here can be packed up in a small, easy-to-store bundle; then set up again in next to no time. They were built by Jeff and Sandra Walker, who manufacture "casual furniture" in Ravenna, Kentucky, at their business, "Oak Arts."



CHAIR
EXPLODED VIEW

TABLE
EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

Scissors Chair

A.	Long legs (2)	¾" x 6 13/16" x 46¾"
B.	Short legs (2)	¾" x 3⅞" x 33¾"
C.	Long stretcher	¾" x 1¼" x 15"
D.	Short Stretcher	¾" x 1¼" x 13⅛"
E.	Crossbars (2)	¾" x 1⅜" x 18"
F.	Slats (22)	⅜" x 1⅜" x 19½"

Scissors Table

A.	Legs (4)	¾" x 1⅜" x 19⅜"
B.	Long crossbars (3)	¾" x 1⅜" x 15"
C.	Short crossbar	¾" x 1⅜" x 13⅛"
D.	Aprons (2)	¾" x 2¼" x 19⅜"
E.	Slats (10)	⅜" x 1⅜" x 19½"

HARDWARE

Scissors Chair

#10 x 1¾" Flathead wood screws (16)
4d Finishing nails (88)

Scissors Table

#10 x 1¾" Flathead wood screws (16)
4d Finishing nails (40)
¼" x 1¾" Carriage bolts (2)
¼" Flat washers (4)
¼" Stop nuts (2)

Making the Chair

1 ***Cut all parts to size.*** Choose a clear, durable hardwood, such as oak or mahogany, to build the scissors chair. The individual parts are very slender. If you make them from softwood, they may break after a short time.

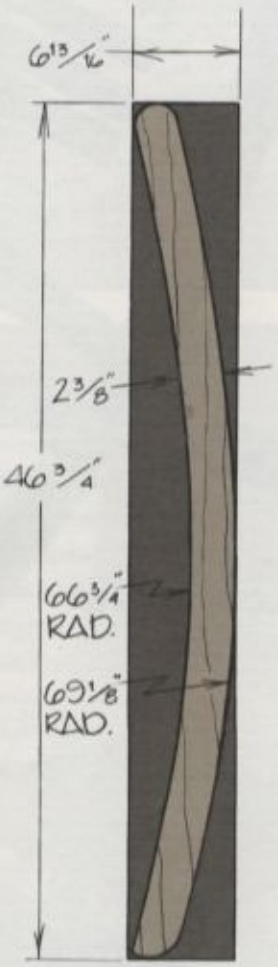
In addition, you'll need hardwood lumber of two different thicknesses — ¾" and ⅜". The chair requires 7-8 *square* feet of ¾" stock, and 5-6 *square* feet of ⅜" stock. (This estimate is approximate, and may change depending on the widths and lengths of the materials available.) If you don't have a planer to thickness the stock, have it thicknessed at the lumberyard.

Note: We've estimated the wood needed in square feet rather than the usual board feet. Depending on how your shop is equipped, you may be able to resaw and plane this stock from just 10-12 *board* feet of lumber.

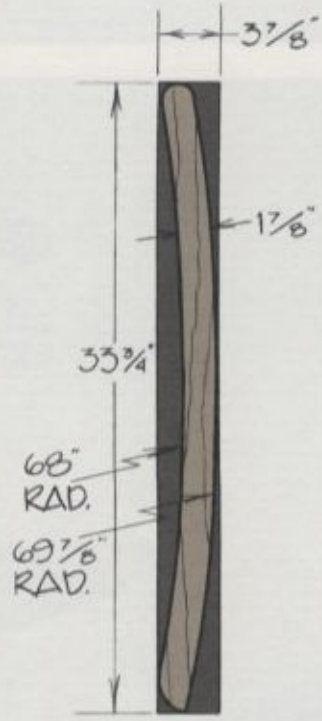
After you have gathered the thicknesses of stock you need, rip and cut all the parts to the sizes shown in the Materials List for the "Scissors Chair."

2 ***Cut the shapes of the chair legs.*** Lay out the shapes of the long and short chair legs on ¾" stock. Be certain that the grain of the wood is oriented parallel to the length of these parts, so that the finished legs will be as strong as possible. Cut out the shapes of the legs with a band saw or sabre saw, then sand away the saw marks.

TRY THIS! To save time when marking and cutting the legs, stack the pieces of stock on top of each other, making two "pads" — one for the short legs and one for the long legs. "Pad saw" each of these stacks, cutting two legs at once.



LONG LEG CUTTING DIAGRAM

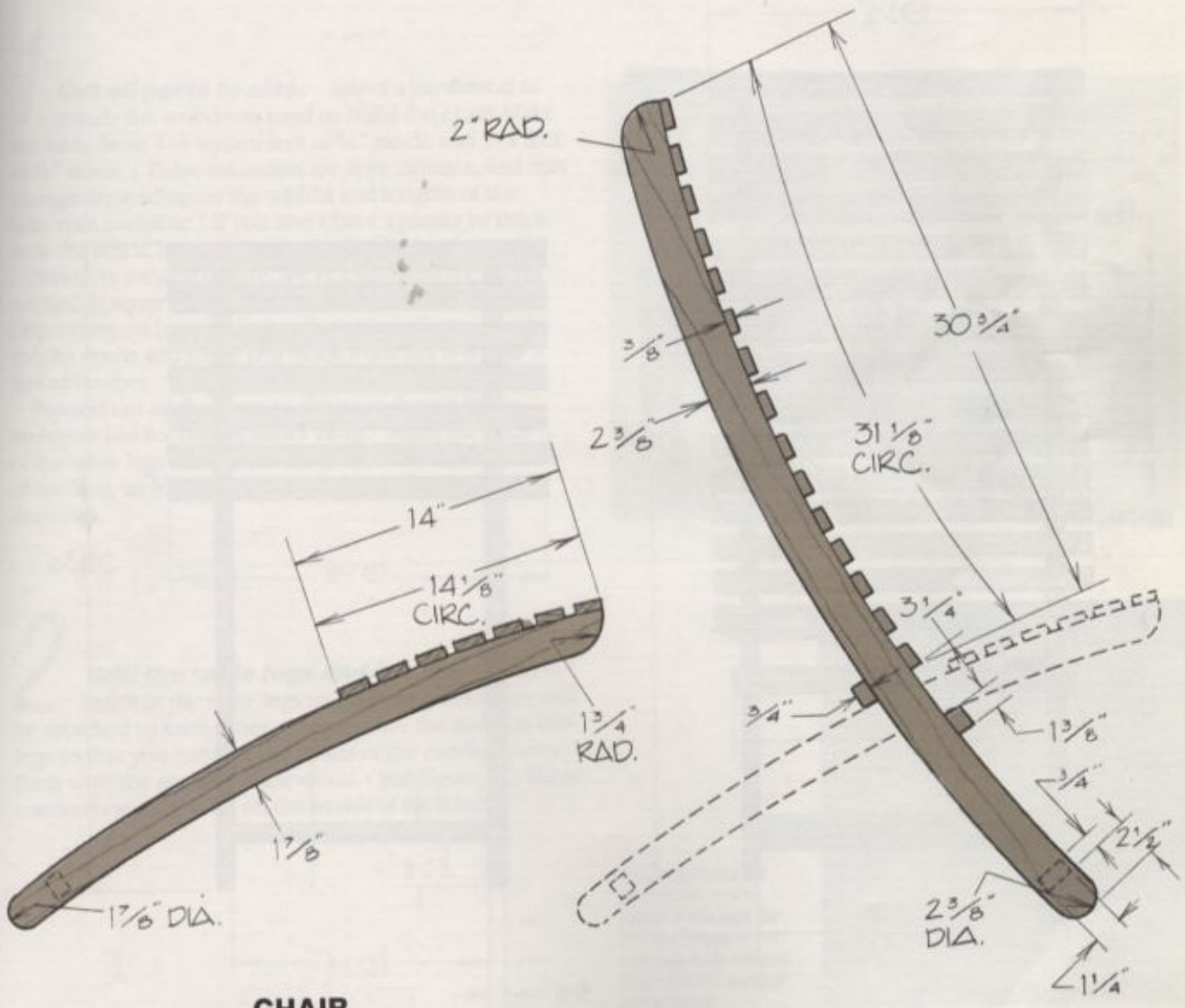


SHORT LEG CUTTING DIAGRAM

3 ***Sand all parts.*** Sand the parts, carefully rounding hard edges and corners. This will not only make the furniture more comfortable, it will help prevent splinters.

4 ***Mark the positions of the slats.*** Carefully mark the positions of the slats on the chair legs. Do this *before* you start assembling the parts, so that you can mark both legs at the same time, and get the marks exactly the same on both parts. (See Figure 1.)

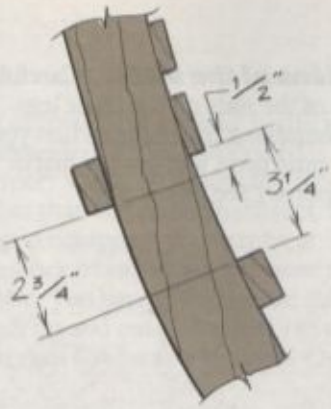
1/Sandwich the matched legs and aprons together, then mark the position of the slats on both parts at the same time.



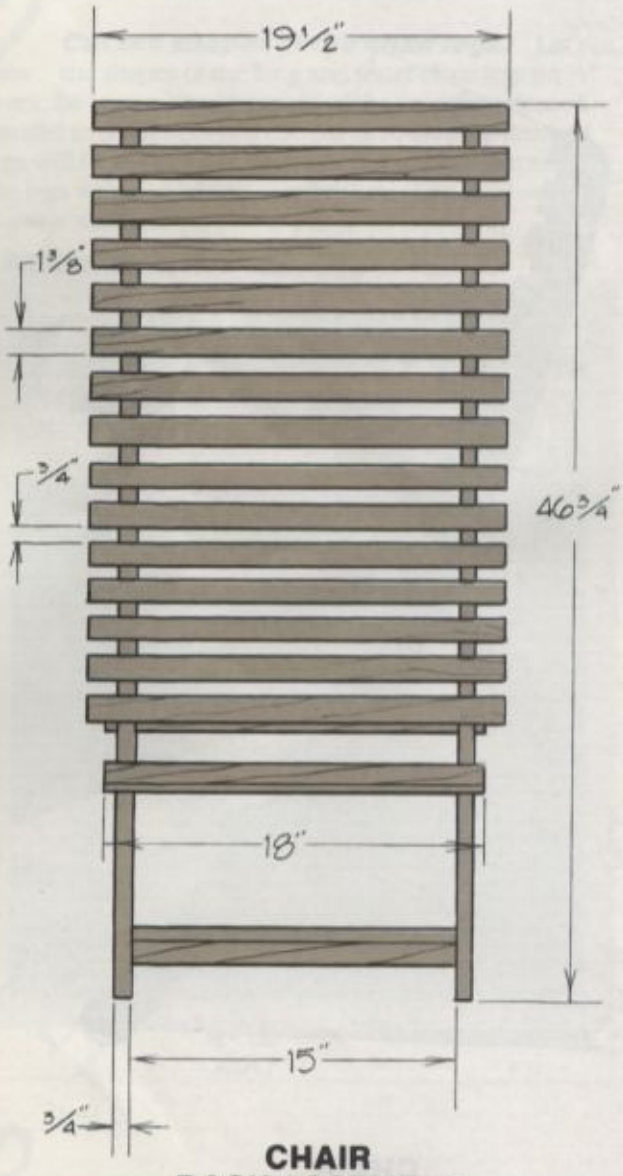
CHAIR SHORT LEG SIDE VIEW

CHAIR SIDE VIEW

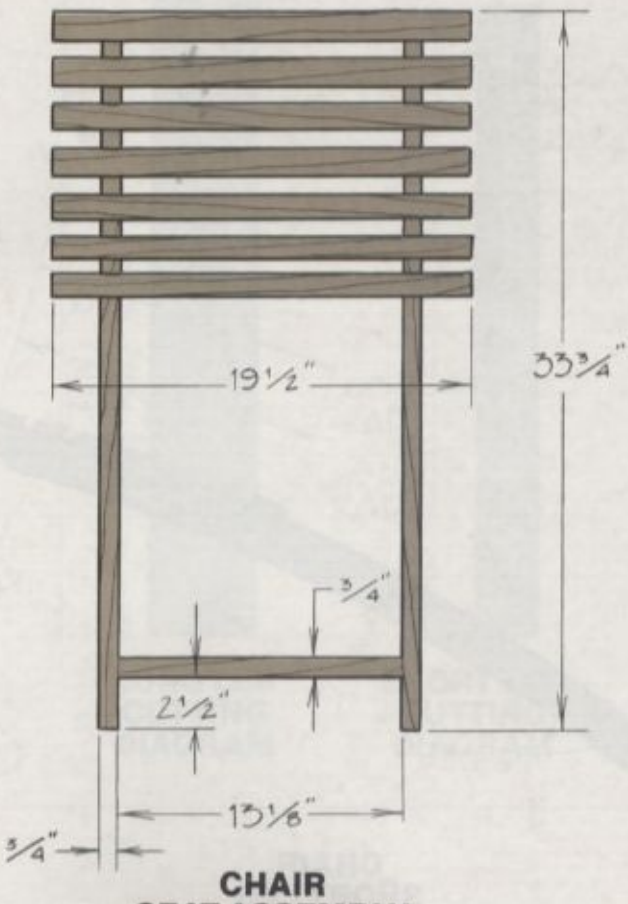
5 *Assemble the crossbars and stretchers to the legs.* Screw the crossbars to the legs, where shown in the *Crossbar Placement Detail*. Countersink the screws so that the heads are flush with the surface of the wood. If you wish, you can cover the screw heads with wooden plugs so that you don't see them at all. After you've attached the crossbars, screw the stretchers to the chair legs.



CROSSBAR PLACEMENT DETAIL



CHAIR BACK ASSEMBLY LAYOUT



CHAIR SEAT ASSEMBLY LAYOUT

6 ***Nail the slats in place.*** Nail the slats to the chair legs where you've marked them. If you can find 4d galvanized finishing nails, use them. If you can't, order special aluminum or stainless steel nails from a marine supplier.

7 ***Apply a finish to the completed chair.*** If you've built this project from a domestic hardwood, such as oak, it's particularly important that you seal the grain. These woods will decay faster out of doors than the usual "outdoor" woods, like redwood and cedar. Apply spar varnish, or a 1:1 mixture of spar varnish and tung oil.

Making the Table

1 ***Cut all parts to size.*** Select a hardwood to match the wood you used to build the chair. Make the table from 3-4 square feet of ¾" stock, and 3-4 feet of ⅜" stock. (These estimates are approximate, and may change depending on the widths and lengths of the materials available.) If you don't have a planer to thickness the stock, have it thicknessed at the lumberyard.

Note: As we said before, we've estimated the wood needed in square feet rather than the usual board feet. Depending on how your shop is equipped, you may be able to resaw and plane this stock from just 6-8 *board* feet of lumber.

Rip and cut all the parts to the sizes shown in the Materials List for the "Scissors Table." Miter the ends of the table legs at 45°; and chamfer one corner on one of the long table crossbars, as shown in the working drawings.

TRY THIS! While you're cutting the table parts, you may also wish to cut a 4" long "bite" out of one slat. Later on, use this as the *top* slat in the project. It will form a convenient "handle" with which to carry the table.

2 ***Drill the table legs and aprons.*** Drill ¼" holes in the table legs and aprons where they will be attached to each other. Counterbore the holes in the legs so that you can sink the heads of the carriage bolts flush with the surface of the wood. (See Figure 2.) These counterbores must be on the *inside* of each leg.

***2**/Counterbore the pivot holes on the inside of the legs, so that the heads of the carriage bolts will rest flush with the surface of the wood.*

3 ***Sand all parts.*** Sand the parts, carefully rounding hard edges and corners. As we said before, this will not only make the furniture more comfortable, it will help prevent splinters.

4 ***Mark the positions of the slats.*** Carefully mark the positions of the slats on the table aprons. Do this *before* you start assembling the parts, so that you can mark both aprons at the same time, and get the marks exactly the same on both parts.

5 ***Assemble the crossbars and stretchers to the legs.*** Screw the crossbars to the legs, where shown in the *Side View*. Countersink the screws so that the heads are flush with the surface of the wood. If you wish, you can cover the screw heads with wooden plugs so that you don't see them at all.

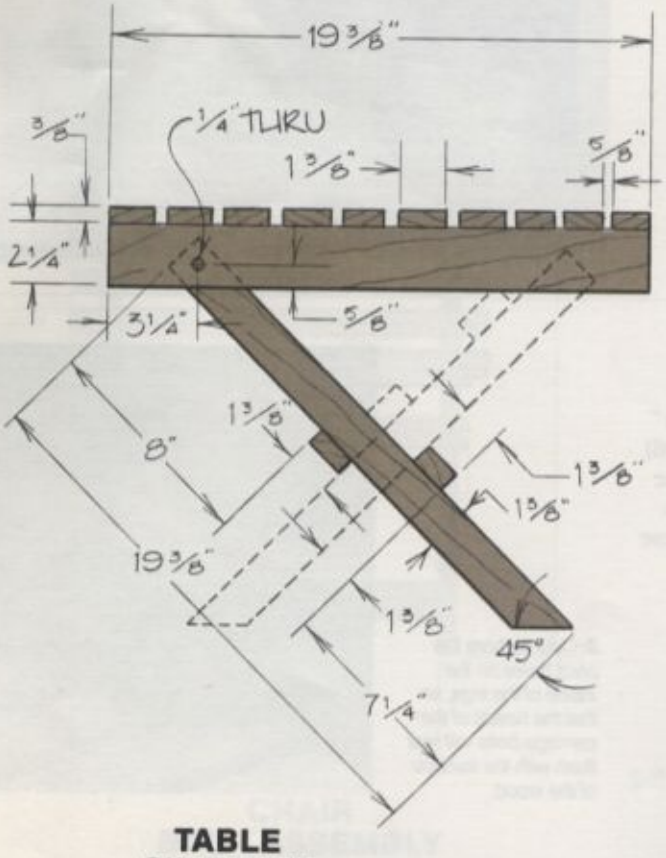


TABLE SIDE VIEW

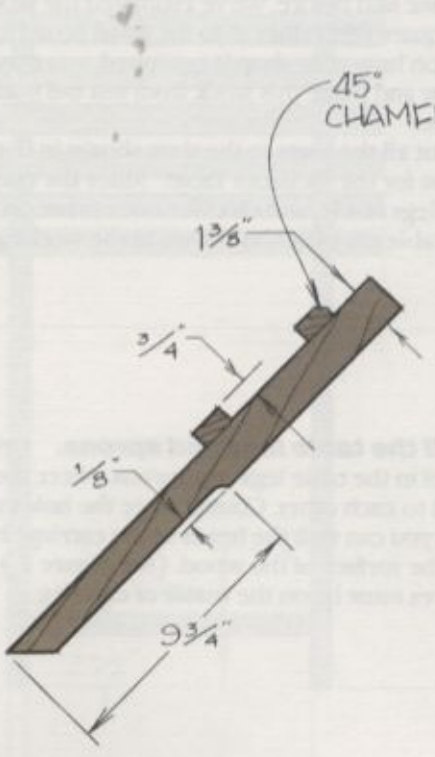


TABLE FREE LEG SIDE VIEW

6 ***Bolt table legs to the aprons.*** Attach the folding table legs to the aprons with carriage bolts. Seat the carriage bolts with a blow of a hammer. Place a flat washer between the two wooden parts to keep them from rubbing, and secure the bolt in place with a stop nut to keep the bolt snug.

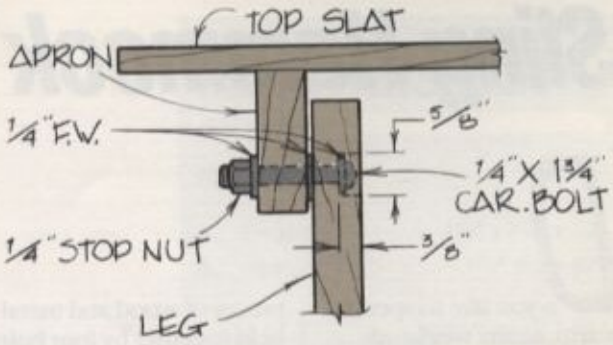


TABLE PIVOT JOINT DETAIL

7 ***Nail the slats in place.*** Nail the slats to the table aprons where you've marked them. Use 4d galvanized finishing nails, or special aluminum or stainless steel nails from a marine supplier.

8 ***Apply a finish to the table.*** Finish sand any parts that may still need sanding, then apply a finish to match the chair. Once again, if you've built this project from domestic hardwoods, be sure to seal the grain.

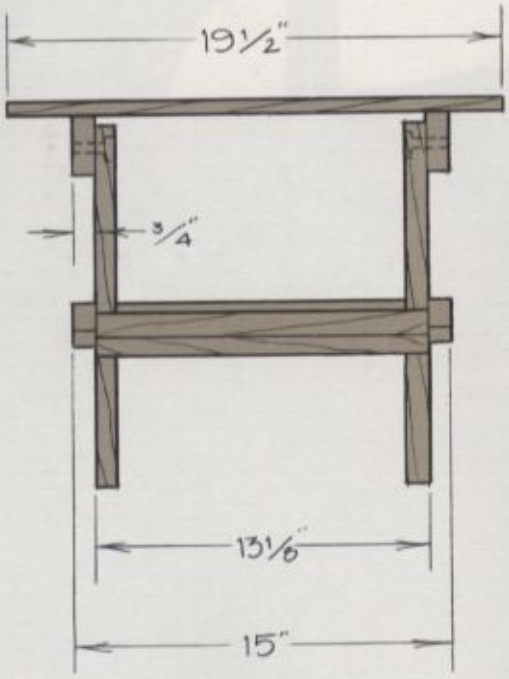


TABLE FRONT VIEW

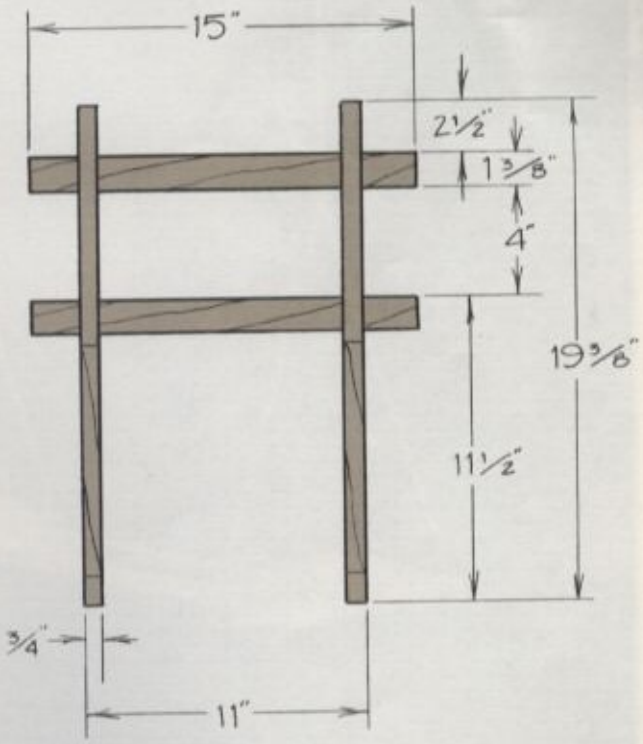
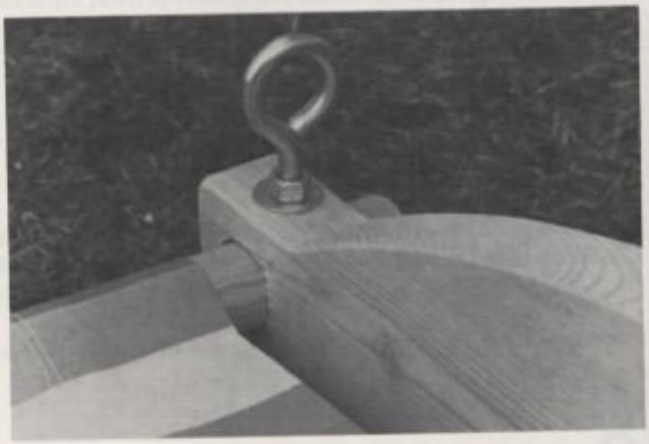


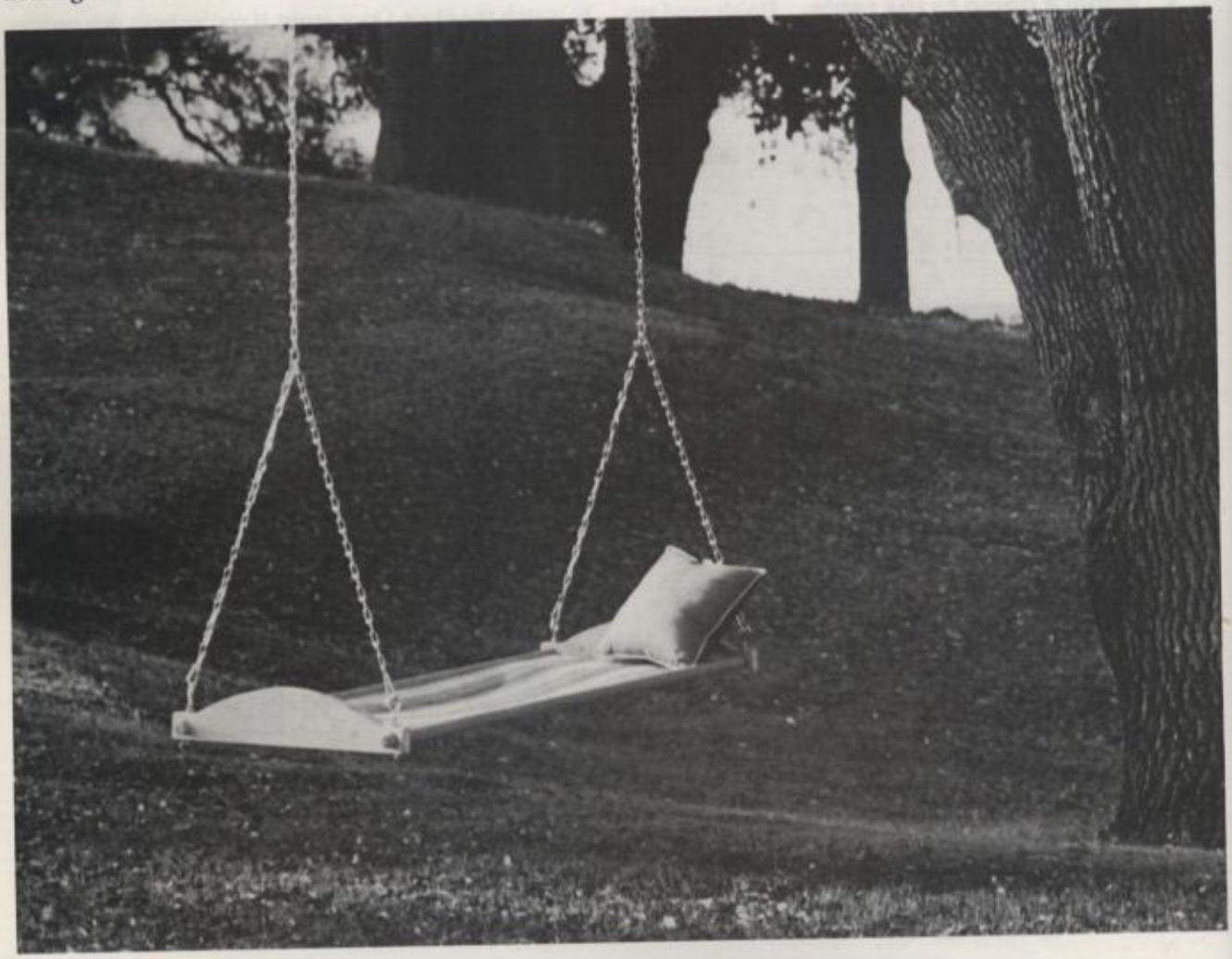
TABLE FREE LEG ASSEMBLY LAYOUT

Sling Hammock

Do you like to spend warm, sunny weekends flat on your back, napping some, reading some, and generally enjoying the good weather? Here's a simple project that will help make those lazy Saturdays and Sundays more enjoyable — and it won't take up much of your weekend snooze time to complete it.

This sling hammock is nothing more than four pieces of wood and metal held together by four bolts. You can knock this project out in two or three hours, even counting the trip to the building supply and fabric stores! Most of the time invested is in sewing the canvas "sling." And, if you're clever, you can con someone else into doing that while you're waiting for the finish to dry on the wooden parts — and taking a nap.



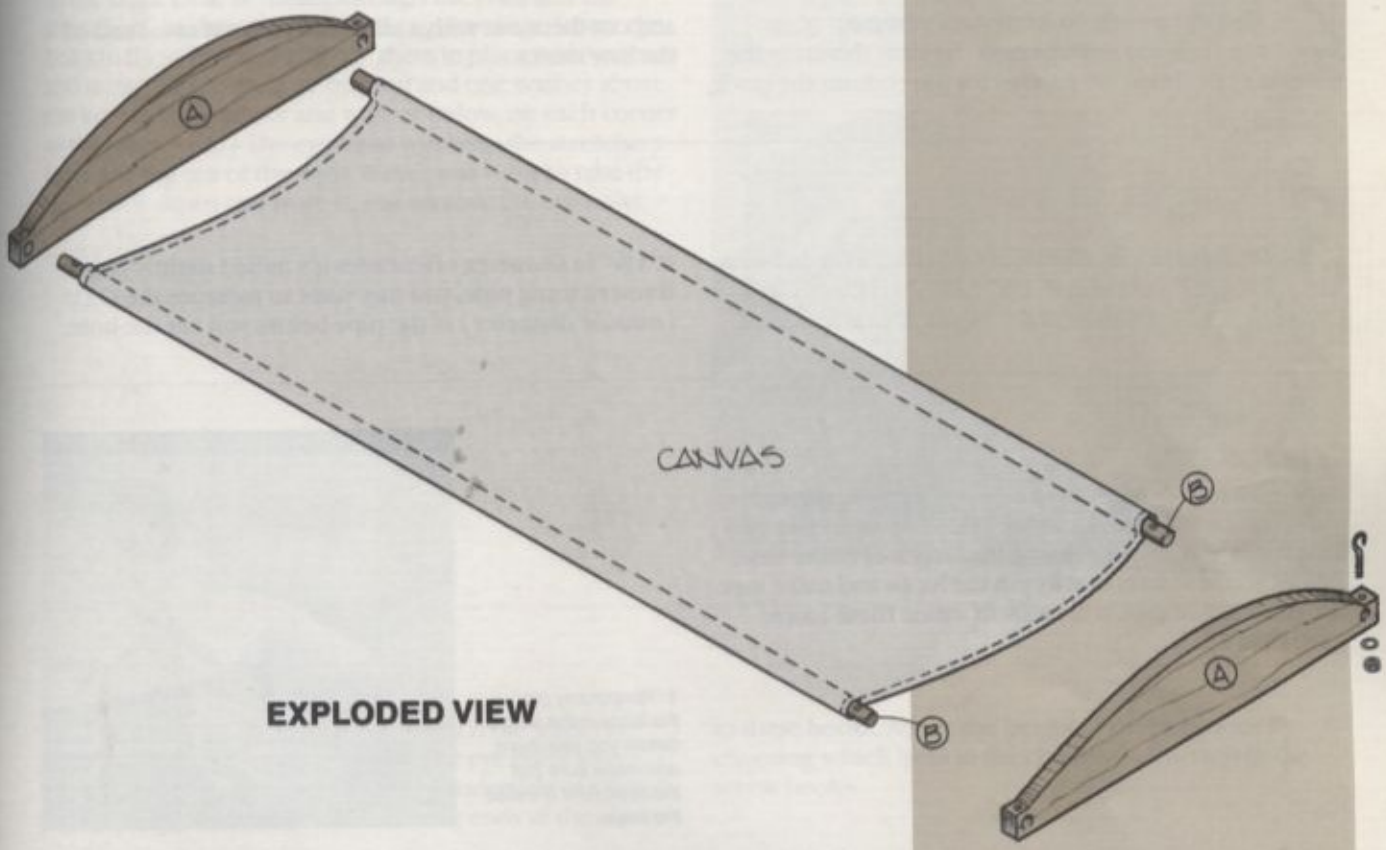


Materials List

FINISHED DIMENSIONS

PARTS

A.	Ends (2)	1½" x 7¼" x 30"
B.	Stretchers (2)	1¼" dia. x 82"



EXPLODED VIEW

HARDWARE

36" Wide heavy canvas (2½ yards)
⅜" x 6" Eyebolts with 2 washers and 2 nuts each (4 sets)
2" S-hooks (4)
Porch swing chain set, with 5' leaders

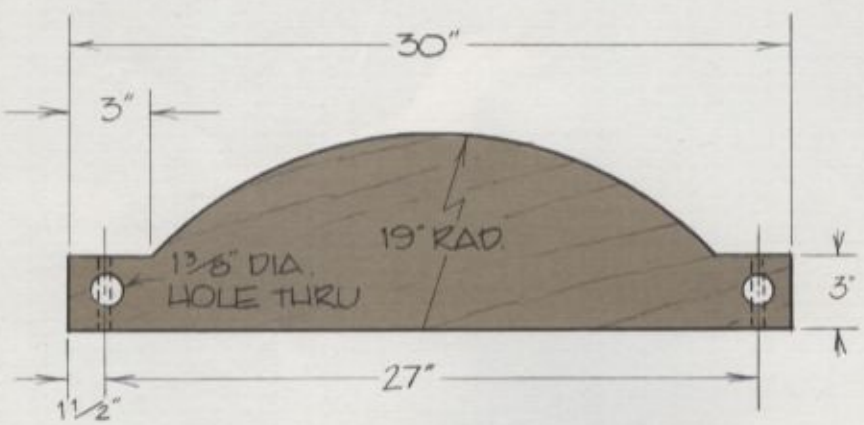
1 ***Carefully choose your materials.*** Before you purchase your materials, consider carefully: Who is going to use this hammock? Who is likely to lay in it? As designed, the project uses ordinary "closet pole" for the stretchers. This is fairly strong material; if you have a large closet in your house and lots of clothes hanging in it, you know that closet poles can support a lot of weight. We don't recommend, however, that you use closet pole for the stretchers if this hammock will be used consistently by someone over 180 pounds. Instead, use 1" I.D. steel pipe. This is available at most plumbing supply stores.

2 ***Cut all parts to size and shape.*** Cut the ends and stretchers to the sizes shown in the Materials List. Trace the pattern for the ends on the stock, and cut them out with a sabre saw or band saw. Sand off the saw marks.

3 ***Drill holes in the ends for the stretchers.*** Using a holesaw, drill 1⅜" holes in the ends for the stretchers. Even though the closet pole is specified at 1¼" in diameter, oftentimes it's milled slightly larger. If you're using pipe, you may want to measure the O.D. (outside diameter) of the pipe before you cut the hole.

4 ***Sew a cloth sling.*** Sew a sling for the hammock from duck canvas. The sling must have two long loops of material running the length of either side. Before you sew, temporarily pin the loops and make sure the stretcher or pipe will easily fit inside these loops. (See Figure 1.)

***1**/Temporarily pin the loops in the sling before you sew them, and make sure that the stretchers fit inside the loops.*



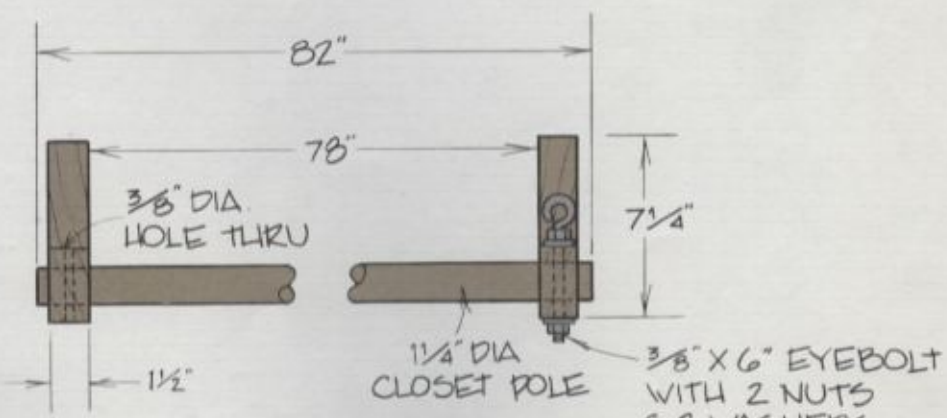
END VIEW

5 ***Sand and finish the parts.*** Finish sand all the wooden parts. If you wish, apply a paint, varnish, or stain. Let the finish dry for at least 48 hours before assembling the hammock.

6 ***Assemble the hammock.*** Slide the stretcher into the loops along the sides of the sling, then slide the ends of the stretchers into the holes in the ends. Drill ⅜" holes through the ends and the stretchers, as shown in the working drawings. Insert eye bolts in these holes, and fasten them in place with washers and nuts. (There must be one nut and one washer above the wood, and one nut and washer below, on each corner of the hammock.) The eye bolts will keep the stretchers from pulling out of the ends. If ever you want to take the hammock down and store it, just remove the eye bolts.

TRY THIS! Since you have to put two nuts on each eye bolt, one above the wood and one below, look for eye bolts that are threaded all the way up the shaft. If you can't find them, you may have to cut your own threads with a die.

7 ***Hang the hammock.*** Attach the leaders of the porch swing chains to the eye bolts with S-hooks. Mount screw hooks on the underside of a porch joist or tree limb, and attach the other ends of the chains to these hooks. Adjust the height of the hammock by choosing which links in the chains you'll attach to the screw hooks.



SIDE VIEW

Garden Bench

Not too long ago, sociologists studied New York City parks, to find out which ones were used the most and why. The study clearly showed that some parks were used much more than others, and the reason will surprise you. It isn't anything you'd expect, such as location, number of people nearby, or landscaping. No, the parks that were used the most were those that had the most available *seating*.

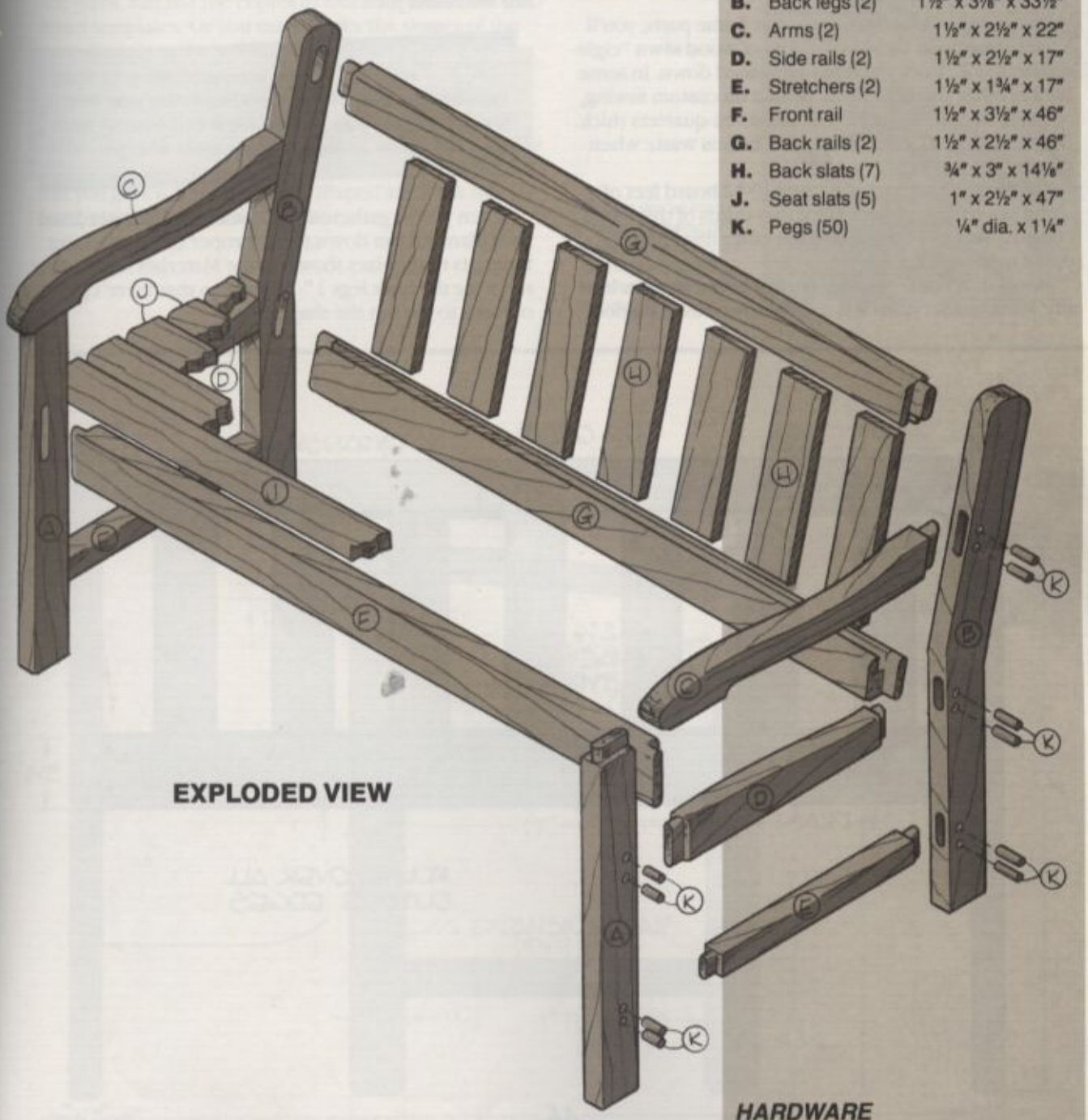
That same logic applies to your own backyard. You'll enjoy the gardens and the flower beds that you worked so hard to plant if you have someplace to *sit down* and enjoy them. To that end, here's an elegant garden bench.

Materials List

FINISHED DIMENSIONS

PARTS

A.	Front legs (2)	1½" x 2½" x 25½"
B.	Back legs (2)	1½" x 3⅞" x 33½"
C.	Arms (2)	1½" x 2½" x 22"
D.	Side rails (2)	1½" x 2½" x 17"
E.	Stretchers (2)	1½" x 1¾" x 17"
F.	Front rail	1½" x 3½" x 46"
G.	Back rails (2)	1½" x 2½" x 46"
H.	Back slats (7)	¾" x 3" x 14⅛"
J.	Seat slats (5)	1" x 2½" x 47"
K.	Pegs (50)	¼" dia. x 1¼"



EXPLODED VIEW

HARDWARE

#10 x 2" Flathead wood screws (20)

1 *Cut the parts to size.* Choose a good hard wood (not necessarily a hardwood) for this bench. The mortise-and-tenon joints will not hold up in soft wood. Mahogany is a good choice; Atlantic white cedar (juniper) is a good softwood to use, since this it is harder than most. Cedar and redwood will *not* work well; these woods are too soft.

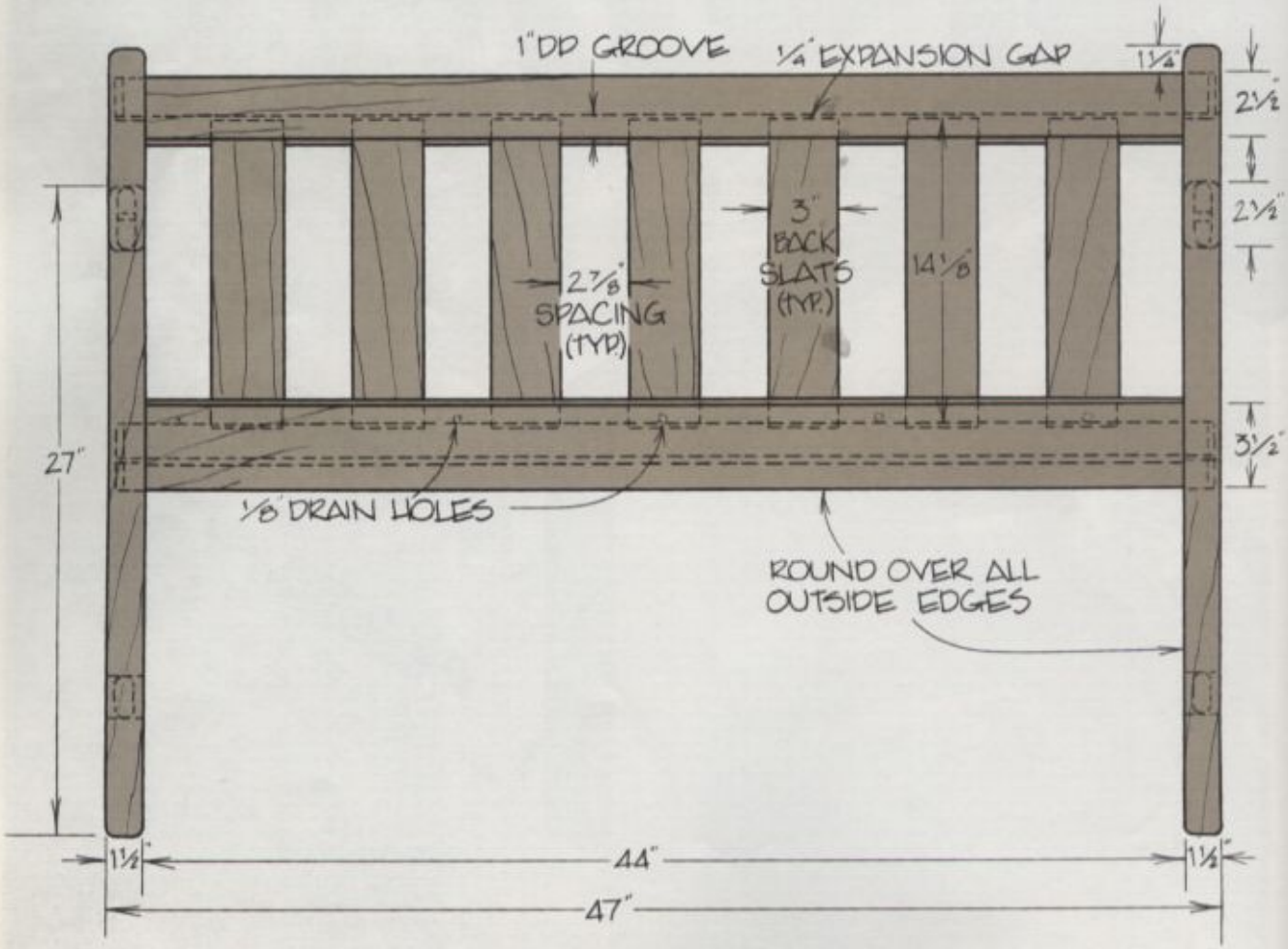
For the legs, stretchers, and other frame parts, you'll need to purchase 18-20 board feet of wood sawn "eight-quarters" (2" thick), and have it planed down. In some lumberyards, particularly those that do custom sawing, you may be able to get lumber cut seven-quarters thick. If you can find it, buy it. There will be less waste when the wood is planed down to 1½".

For the seat and back slats, buy 10-12 board feet of wood sawn five-quarters. Have two-thirds of this wood planed down to 1" thick, and the other third planed down to ¾" thick.

Note: Don't take our estimates of board feet too literally. Most lumberyards sell their hardwoods in random lengths and widths. Depending on the wood selected, our estimates may be too little or too much. When you purchase the lumber, choose the boards yourself and give some careful thought as to what parts you will cut from each board. This way, you can cut down on the waste. *The smart woodworker buys his lumber by the board, not the board foot.*

> TRY THIS! When you purchase your wood, take these plans with you and have the people at the yard figure your needs. Most of the better lumberyards provide this service free of charge.

When you've gathered all the materials you need, and have planed them down to the proper thicknesses, cut the parts to the sizes shown in the Materials List. Cut the stock for the back legs 1"-2" long, so that there's plenty of room to cut out the shapes.



FRONT VIEW

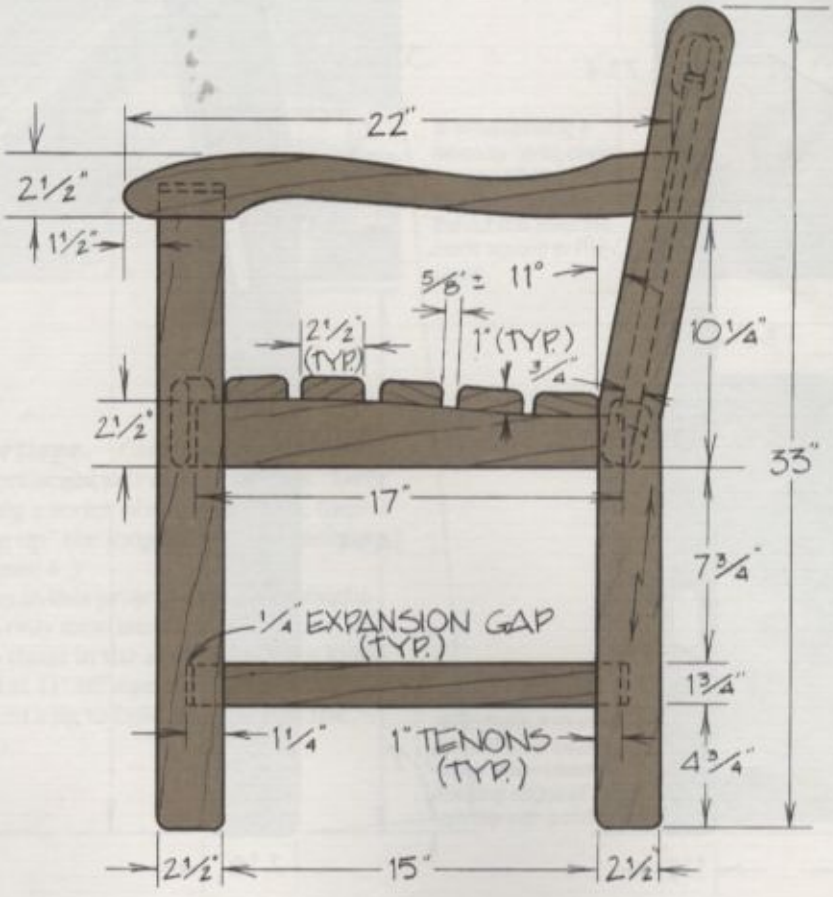
2 *Make a template for the side frame assemblies.*

Draw up the *Side View* full size. You don't have to put all the measurements on it, but you will need the dotted lines. Use this full-scale plan to mark the shapes of the back legs, arms, and side rails. This can be done in one of two ways. You can photocopy the full-size plans, and use the copies to make cardboard or hardboard templates. Or you can transfer the shapes of the parts directly to the wood, using carbon paper. (See Figure 1.)

Once you've marked the shapes of the individual pieces, tape or glue the full-size plans to a piece of plywood. This will serve as a template — something for you to compare your work to as it progresses — to make sure that you get each part properly shaped and both side frame assemblies exactly the same.

Note: If you're an experienced woodworker, you may wish to omit this step. However, beginners and woodworkers who have limited experience fitting angled mortise and tenon joints, will find that a template helps to ensure accuracy.

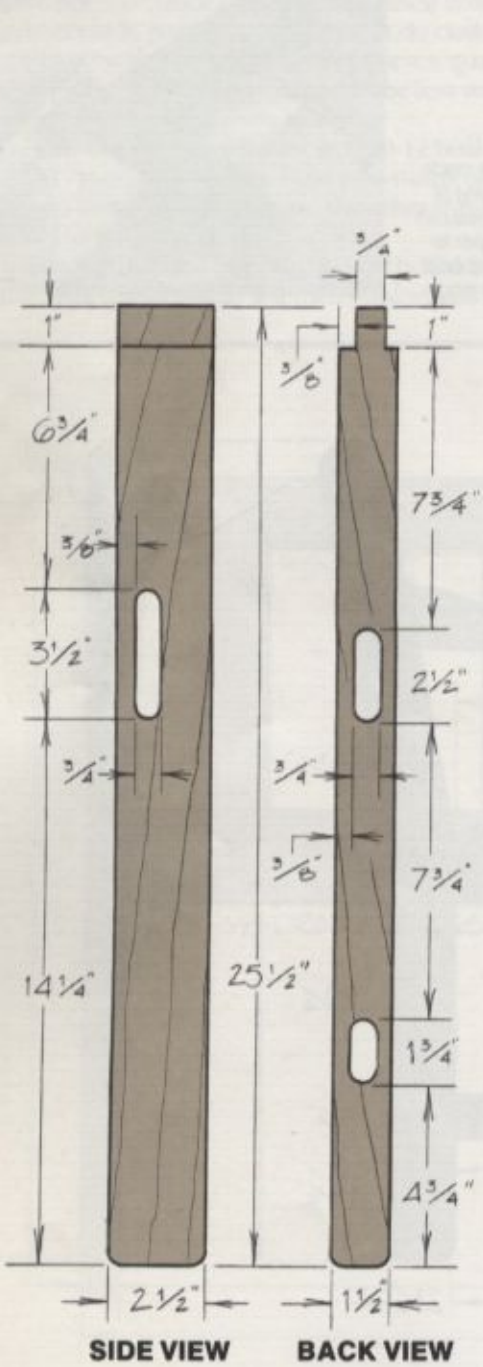
***1**/Once you've made a full size drawing of the Side View, you can use carbon paper to transfer the shapes of the parts to the wood.*



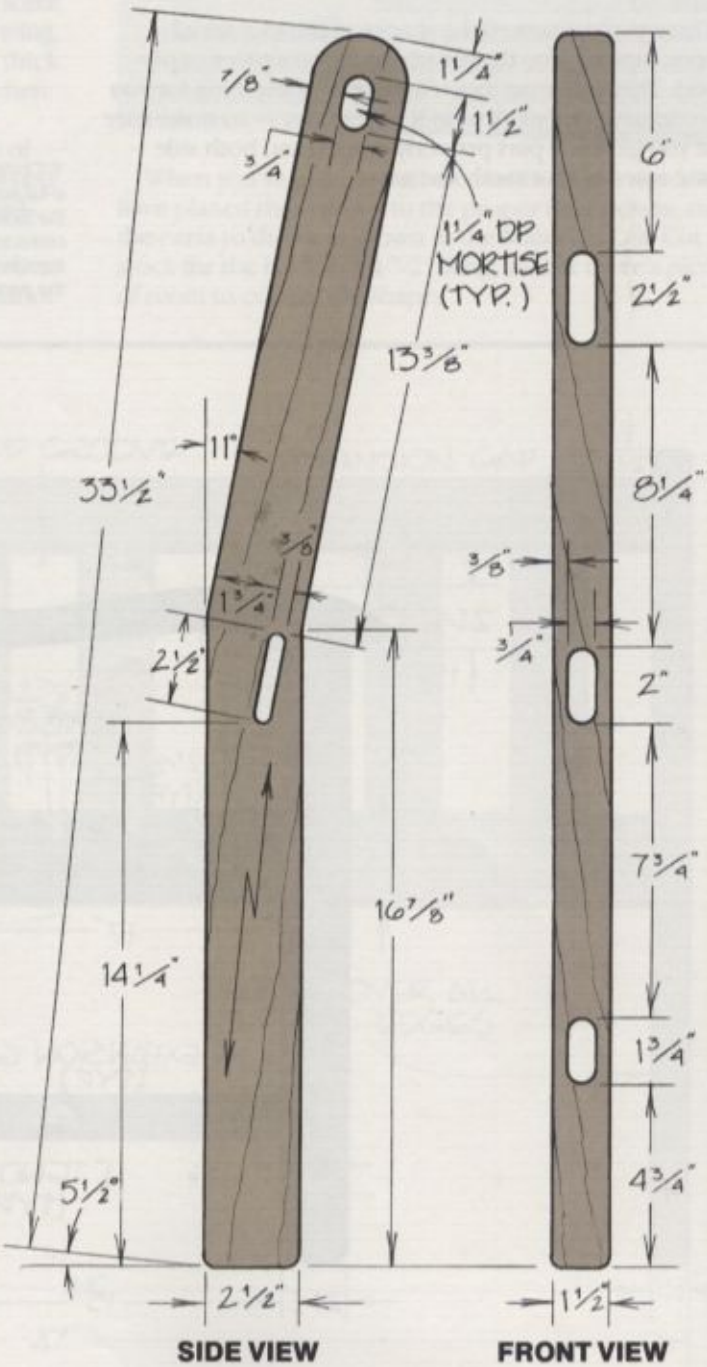
SIDE VIEW

3 ***Cut the shapes of the back legs.*** Using a band saw or sabre saw, cut out the back legs, then sand away the saw marks. *Do not* cut the shapes of the other parts at this time. Normally, it is much easier to make the joinery in a board *before* you cut an irregular shape. However, the back legs are one exception to this rule. The shapes must be cut before the joinery.

TRY THIS! To shape the back legs precisely, cut a little wide of the marks, then sand up to them.



FRONT LEG LAYOUT



BACK LEG LAYOUT

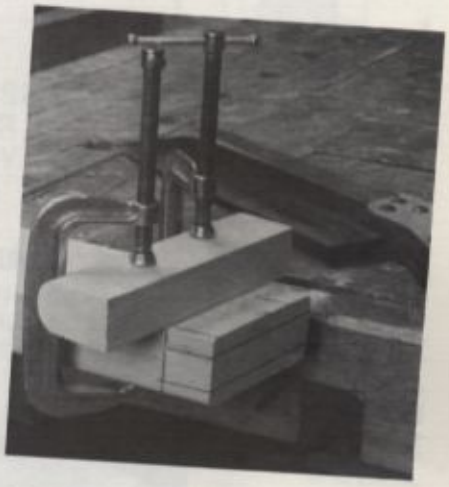
4 Cut all the tenons. Using your full-size template, mark tenons on the arms, front legs, side rails, and stretchers. Also, measure and mark the tenon on the front and back rails.

You can cut out these tenons using a variety of methods. In fact, you'll probably want to use a combination of methods, since some work better on one type of tenon than another. The easiest way to cut the tenons is with a dado cutter mounted on your table saw or radial arm saw. Simply pass the wood across the cutter, flip the board, and make an identical cut on the other side. You can use stop blocks to help properly gauge the length of the tenons. (See Figure 2.) This method works best for the ordinary, square tenons at the ends of the side rails, upper back rails, stretchers, and front legs.

If you wish to use your saw blade to cut the tenons, make a single cut to mark the shoulders. Make several more cuts through the waste, to cut the waste up into small, easily removed blocks. Then remove the waste with a chisel. You'll find that the extra cuts through the waste also keep you from removing too much stock and making the tenon too thin.

For tenons that are cut at an angle, such as those at the ends of the arms, you could use either a dado cutter or a saw blade. But this requires that you change the angle of the cuts twice (11° to the left, then 11° to the right), and both those cuts must be precise. You'll find that it's much easier to get the precision you need with a hand saw and a little patience. Clamp a block to the wood to start the cuts at precisely the right points, and to help hold the saw square to the stock. (See Figure 3.) To remove the waste, cut perpendicular to the first cuts with the saw. Cut a little wide of your mark, then pare the tenon down to its finished dimensions with a chisel.

2/*Most of the tenons in this project can be cut with a dado cutter. Use a stop block to properly gauge the length of each tenon.*



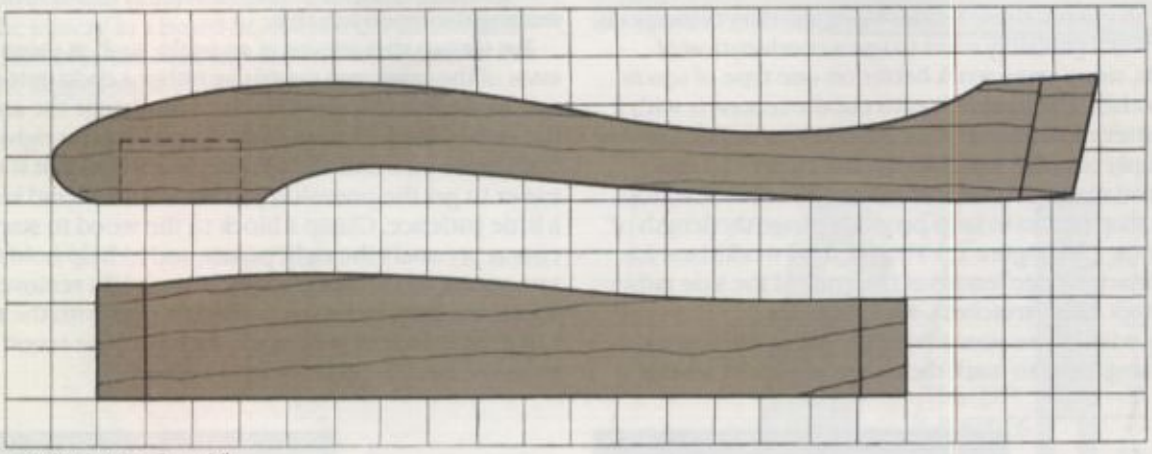
3/*When sawing a tenon by hand, clamp a scrap block to the stock to help guide the cut and keep the blade square to the wood.*

5 Drill the mortises. Carefully mark the positions of the mortises as you did the tenons. "Drill" each mortise by making a series of stopped holes, then flattening or "cleaning up" the long sides of the mortises with a chisel. (See Figure 4.)

Most of the mortises in this project are fairly straightforward to make. The only mortises that require any special consideration are those in the arm-to-back leg joints. These must be drilled at 11° off square. Tilt the table of your drill press, or build a jig to hold the wood at the proper angle.

4/*To make a mortise, first drill a series of holes. Then clean up the long edges of the mortise with a chisel.*

6 ***Cut the remaining shapes and joinery.*** Cut out the shapes of the arms and side rails with a band saw or sabre saw. Sand away the saw marks. With a dado cutter, make the long groove in the back rails. Don't drill the drainage holes yet; you don't need to do that until after you assemble the bench.



ARM AND SEAT PATTERNS

7 ***Fit the tenons to the mortises.*** Round the corners of the tenons with a rasp and chisel to fit the mortises. (See Figure 5.) Custom fit each tenon to its mortise, and mark them carefully so that you know what part joins to another.

***5**/Round the tenons with a chisel and a rasp to fit the mortises.*

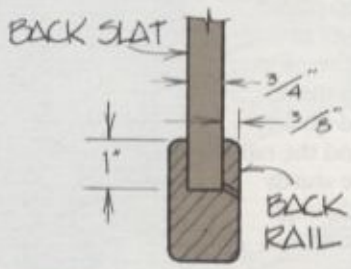
Temporarily assemble the parts to make sure they all fit properly. There should be some slop in the joints, but not much. The entire bench frame should stand up on its own, with no need of clamps to hold it together. When you're satisfied that everything fits properly, disassemble the parts.

TRY THIS! If you wish, you could square the corners of the mortises to fit the tenons, instead of rounding the tenons to fit the mortises. Squaring the corners requires a very sharp chisel.

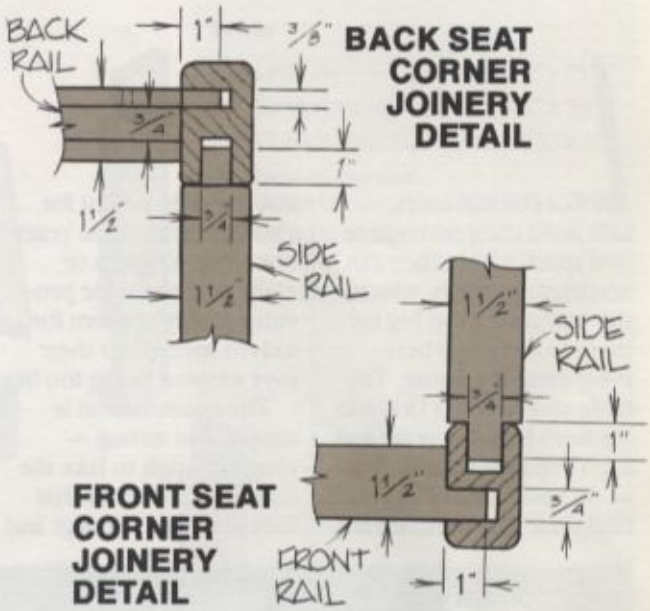
8 ***Finish sand all the parts.*** Finish sand the flat surfaces of all the bench parts. Be careful not to round any corners or edges; you don't want to do that until *after* the bench is permanently assembled. If you've decided to paint or finish the bench, apply the first coat to all the disassembled parts, including the mortises and tenons.

9 ***Assemble the bench frame and back slats.*** Reassemble the two side frame assemblies. Lay each one out on the full-size template to help square the parts to each other. When everything is properly positioned, clamp it all in place on the plywood board. Then drill peg holes — two holes per joint — and insert the pegs. Glue each peg in place with waterproof glue.

After assembling the side frames, fit the front and back rails, and back slats into place. Before you peg the joints, check that the back slats are spaced evenly. When you're satisfied that they are, peg the slats in the rails. (This requires only two pegs per slat, one at the top and one at the bottom of each board.) After the back is pegged, peg the rails at the corners. Like the joints in the side frames, the corner joints require two pegs each.



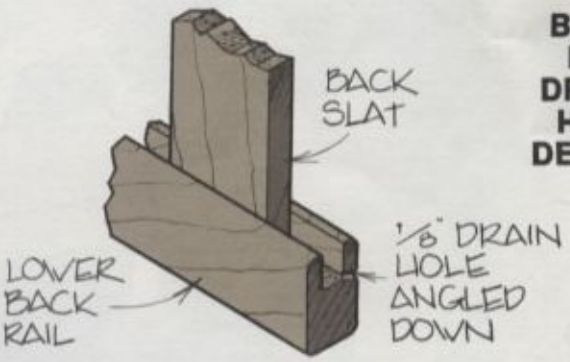
SLAT-TO-RAIL JOINERY DETAIL



BACK SEAT CORNER JOINERY DETAIL

FRONT SEAT CORNER JOINERY DETAIL

10 ***Drill drainage holes in the lower back rail.*** The groove in the lower back rail will tend to fill up with water unless you provide for drainage. Drill a ⅛" hole through the back side of the rail and into the groove between each slat, as shown in the *Back Rail Drain Hole Detail*. This will let the water out of the groove.

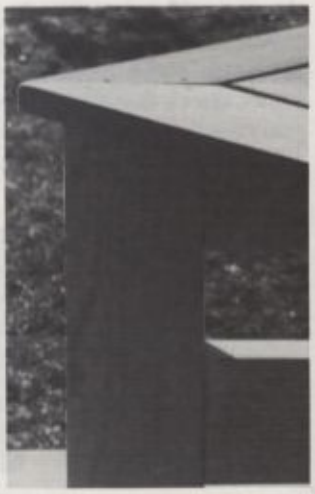


BACK RAIL DRAIN HOLE DETAIL

11 ***Attach the seat.*** Position the seat slats, spacing them out evenly. Tack them in place temporarily with finishing nails, and check the spacing again. If you're satisfied, remove the nails one by one, and replace them with #10 x 2" flathead wood screws. Counterbore and countersink the screws, then cover the screw heads with wooden plugs. Glue these plugs in place with waterproof glue.

12 ***Sand and finish the assembled bench.*** Sand all the pegs and screw plugs flush with the surface of the wood. Round the corners and edges of the bench, and do any necessary touch-up sanding. Then apply a finish, if you've decided you want one.

Children's Picnic Table and Benches



Indoors or outdoors, kids need their own space — a space where they can accomplish things, where the world isn't too big for them to handle, where everything is kid-size. The table and benches that you see here help to create just such a space out of doors — on your deck or in your backyard. The benches are just the right height for children from three years old on up to seven or eight. And the table provides plenty of room for kids to spread out their toys without being too big.

The construction is simple, but strong — tough enough to take the sort of punishment that kids dish out. The legs and stretchers are joined by interlocking lap joints. The seat and tabletop planks serve double-duty as diagonal braces that reinforce the frame. If you make them from good-quality woods, you'll find the table and benches are sturdy enough to last through several childhoods.

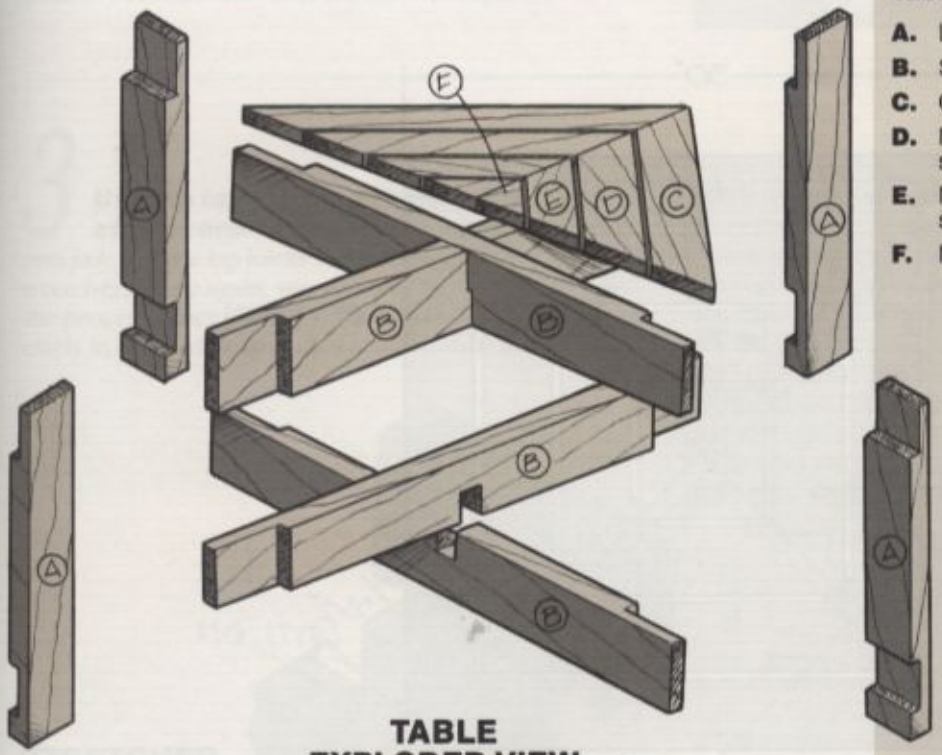
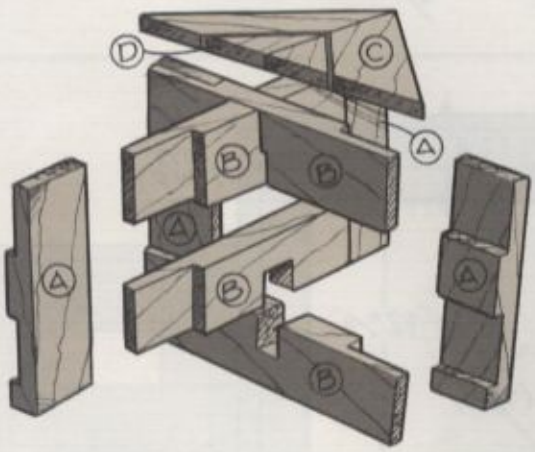


TABLE EXPLODED VIEW



BENCH EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

Table

A.	Legs (4)	1½" x 3½" x 21¼"
B.	Stretchers (4)	1½" x 3½" x 39¾"
C.	Outside slats (4)	¾" x 3½" x 30"
D.	Next-to-outside slats (4)	¾" x 3½" x 22½"
E.	Next-to-middle slats (4)	¾" x 3½" x 15"
F.	Middle slats (4)	¾" x 3½" x 7½"

Benches (2)

A.	Legs (8)	1½" x 3½" x 11¼"
B.	Stretchers (8)	1½" x 3½" x 16"
C.	Outside slats (8)	¾" x 3½" x 13"
D.	Middle slats (8)	¾" x 2¾" x 5½"

HARDWARE

Table

#10 x 1¼" Flathead wood screws (16)
#12 x 2½" Flathead wood screws (2)
6d Finishing nails (¼ lb.)

Benches (2)

#10 x 1¼" Flathead wood screws (16)
#12 x 2½" Flathead wood screws (2)
6d Finishing nails (¼ lb.)

1 ***Carefully choose your lumber.*** Give some careful thought to the type of lumber that you will use to build this project, particularly if it is to be used by toddlers. Avoid pressure-treated lumber, since this wood is saturated with toxic chemicals. Choose an untreated, clear softwood, free of any defects that might throw splinters.

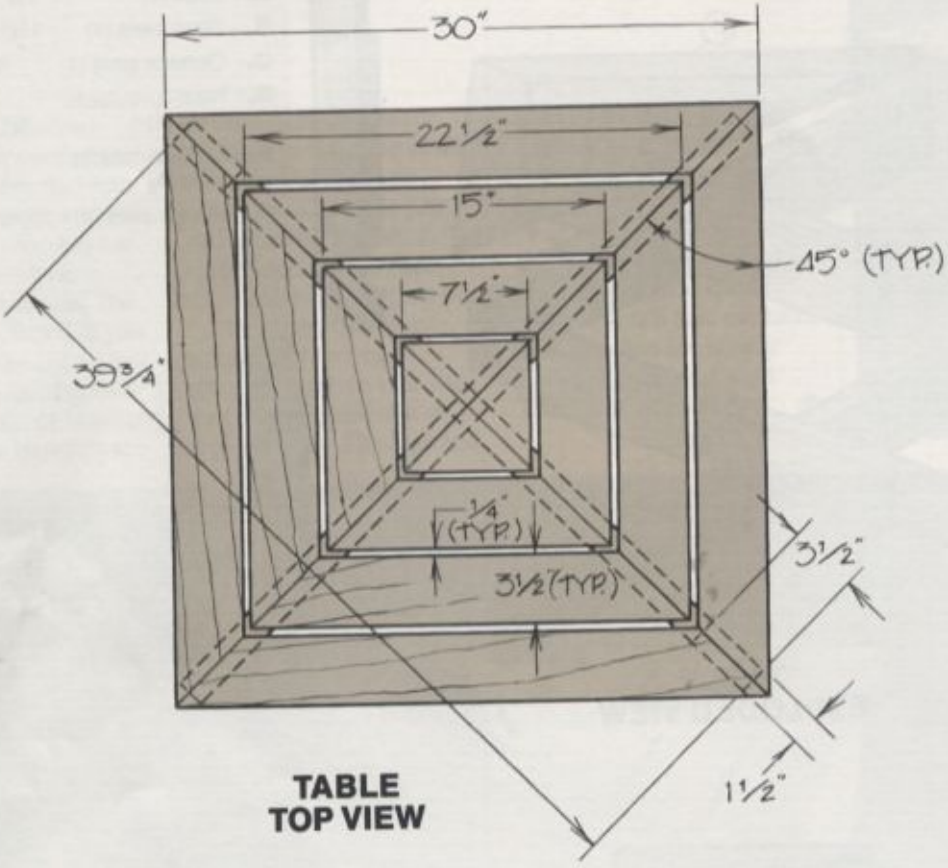


TABLE TOP VIEW

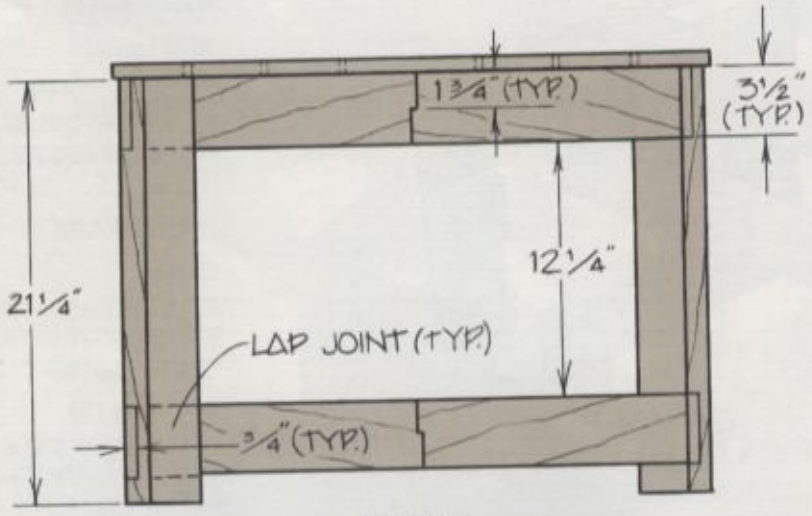


TABLE SIDE VIEW

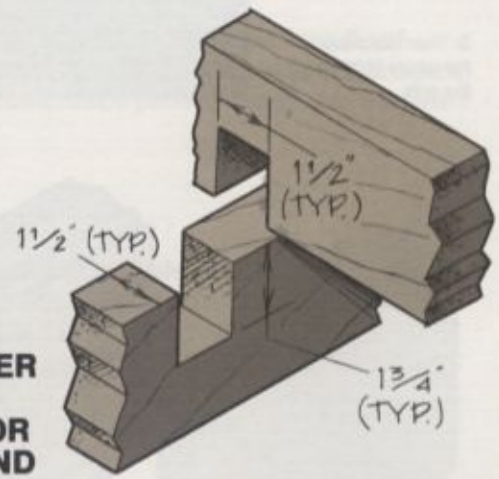
2 ***Cut the legs and stretchers to size.*** The legs and stretchers for this project are made from 2 x 4 stock. To make one table and two benches you'll need approximately six 2 x 4s, 8′ long. Two more benches (making four altogether) require two more. Cut these parts to the sizes shown in the Materials List.

TRY THIS! To speed the cutting process, attach a stop block to the fence of your table saw or the backstop of your radial arm saw. This will help you gauge the length of identical parts, with no need to measure each one.

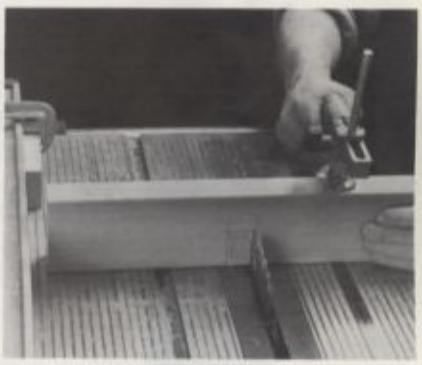
3 ***Cut the lap joints in the middle of the stretchers.*** Using your table saw or radial arm saw, cut the lap joints in the table and the bench stretchers. Here again, you can use stop blocks to speed the process. Since the lap joints must be centered precisely in the middle of each stretcher, you can use a stop block to position the stock for the two *outside* cuts that mark the edges of the lap.

Adjust the height of the saw blade to cut exactly halfway through the *width* of the 2 x 4 stock. Make your first cut, turn the board, and make the second. (See Figure 1.) After you have made all the outside cuts in all the stretchers, remove the stop block. Cut away the waste between the outside cuts by making repeated passes over the saw blade.

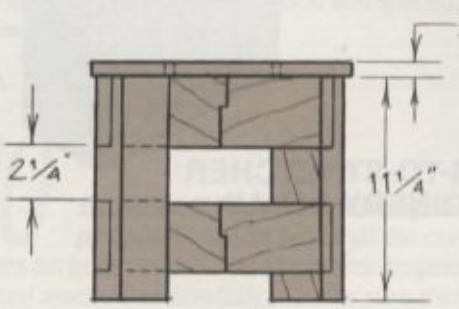
You can also use a dado cutter to make these joints. But only if the dado cutter will cut 1¾″ deep.



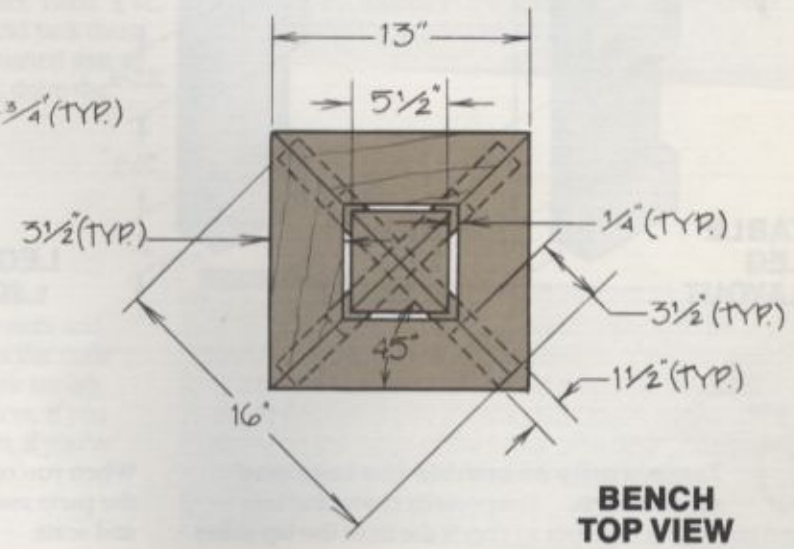
STRETCHER JOINERY DETAIL FOR BENCH AND TABLE



1/Use a stop block to automatically position the stretchers to make the outside saw cuts on the lap joints in the middle of the stretchers.



BENCH SIDE VIEW

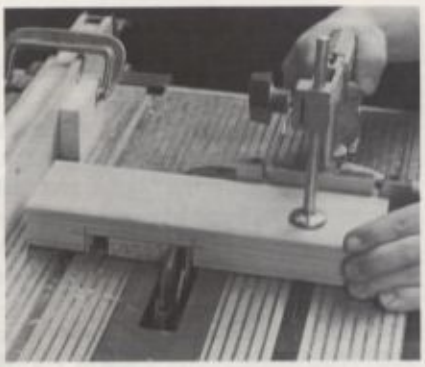


BENCH TOP VIEW

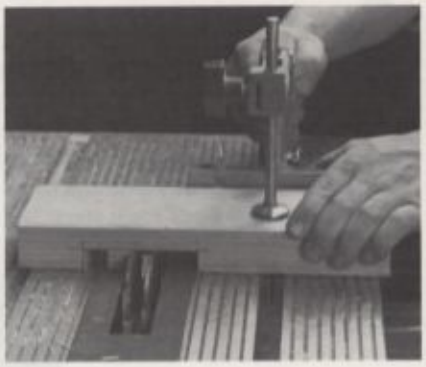
4 ***Cut the lap joints in the legs and in the ends of the stretchers.*** It's easiest to cut these lap joints with a dado cutter mounted on your table saw or radial arm saw. Once again, cut the stock for both the table and the benches, and use a stop block to make the repetitive cuts all the same.

Adjust the height of the dado cutter to cut halfway through the *thickness* of a 2 x 4. To make the lower lap in the legs, position the stop block to make the first outside cuts, 2″ from the bottoms of the legs. Cut all the legs, and readjust the stop block to make the other outside cut, 5½″ from the bottoms of the legs. (See Figure 2.) Remove the stop blocks and cut away the waste in between the cuts. (See Figure 3.)

To cut the laps in the upper ends of the legs, and both ends of the stretchers, you only need to position the stop block once. Make a single outside cut, 3½″ from the ends; then saw away the waste.



2*/You can also use stop blocks with a dado cutter. For the lap joints near the bottom of the legs, make the first outside cut, reposition the block, and make the second.*



3*/Then cut away the waste in between the cuts.*

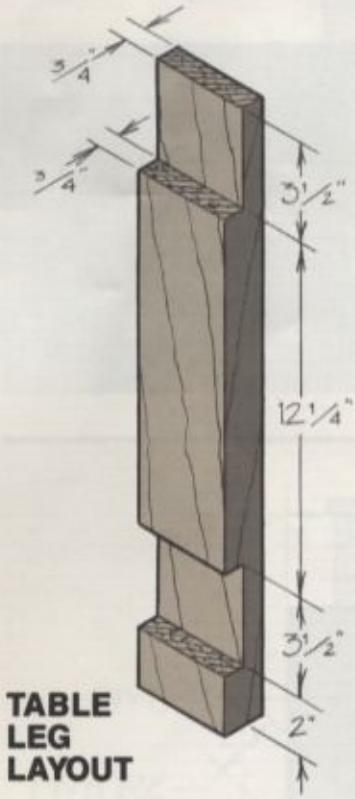
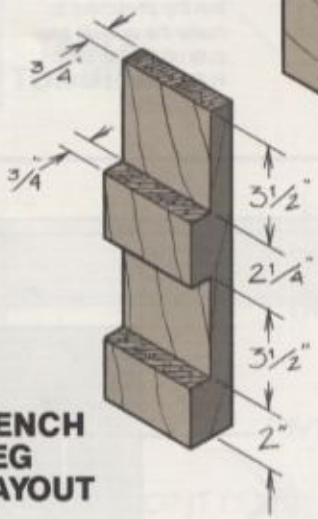
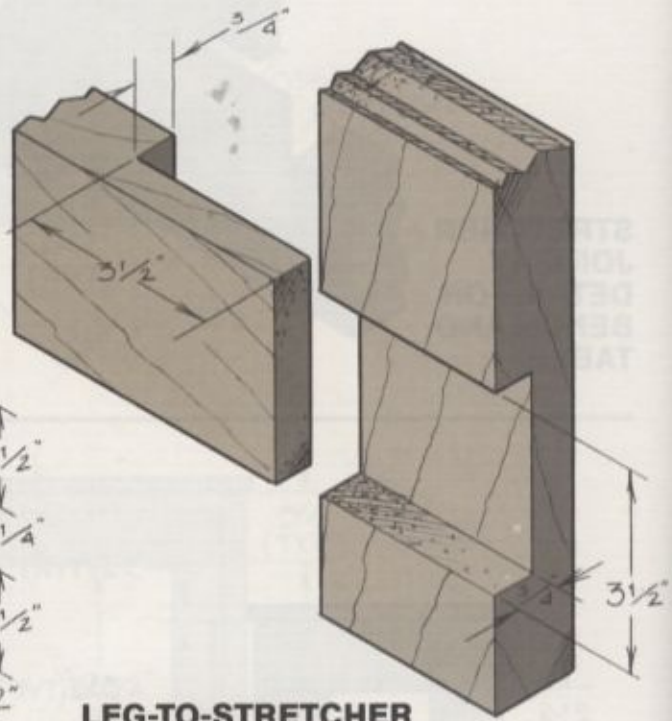


TABLE LEG LAYOUT



BENCH LEG LAYOUT



LEG-TO-STRETCHER JOINERY DETAIL

5 ***Temporarily assemble the legs and stretchers.*** Temporarily clamp the legs and stretchers together to check the fit of the lap joints. When you're satisfied that the joints all fit properly, leave the parts assembled while you cut and fit the table top and seats.

6 ***Cut the slats for the table top and the seats.*** You can rip and cut all the slats for a table and two benches from a single 1 x 12, 12′ long. (To do this, you have to "alternate" on the miter cuts, to avoid wasting material.) If you're making four benches, purchase two 1 x 12s, 8′ long. Rip and join the stock to make long strips 3½" wide.

Set up your saw for the miter cuts. After you set the saw to make 45° miters, and *before* you cut good stock, cut four pieces of scrap. Each piece of scrap must be exactly the same length and mitered on both ends. Put them together to form a square to check if the miter is true. When you adjust the saw to increase or reduce the angle of a miter, move the arm or miter gauge just ¼°-½° at a time.

4/Stop blocks are also useful when making miter cuts. Use them to gauge the length of the slats.

When the saw is properly adjusted, cut the slats to length, mitering the ends at 45°. Like all the parts in this project, you can use a stop block to help make repetitive cuts. (See Figure 4.) As you cut, put the parts in place on the frame assemblies to check the fit.

7 ***Finish sand all the parts before final assembly.*** Disassemble the table and benches, and sand the unassembled parts to remove any irregularities in the wood, and to make them smooth and clean. If you plan to paint or finish the table and benches, apply the first coat before you reassemble the parts.

8 ***Assemble the table and bench frames.*** Fasten the frames back together with flathead wood screws. Use #10 x 1¼" screws for the lap joints in between the legs and the stretchers, and #12 x 2½" screws for the lap joints in the middle of the stretchers. Once the table and the bench frames are assembled, sand the lap joints to make sure the ends of the stretchers are flush with the outside edges of the legs.

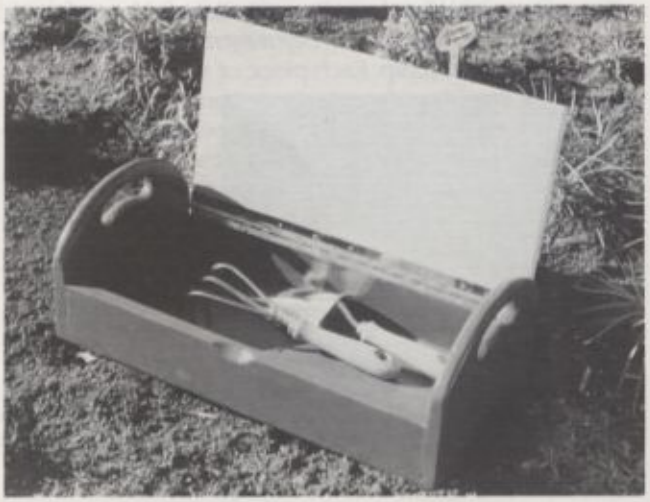
9 ***Attach the slats to the tops of the table and benches.*** Make sure the stretchers in each frame are absolutely square to each other. Then position the slats on the top of each frame, and tack them in place with finishing nails. When you're satisfied that all the slats are properly positioned and spaced, drive the nails all the way home.

TRY THIS! Drill pilot holes in the slats for the nails, especially in the smaller pieces. This will help to keep them from splitting.

10 ***Sand and finish the completed project.*** Round over all the corners and edges on both the table and benches. Inspect the completed assemblies carefully to make sure there are no rough areas, or parts that could throw splinters. If you find any, sand them down. Then apply a finish, if you've decided to use one.

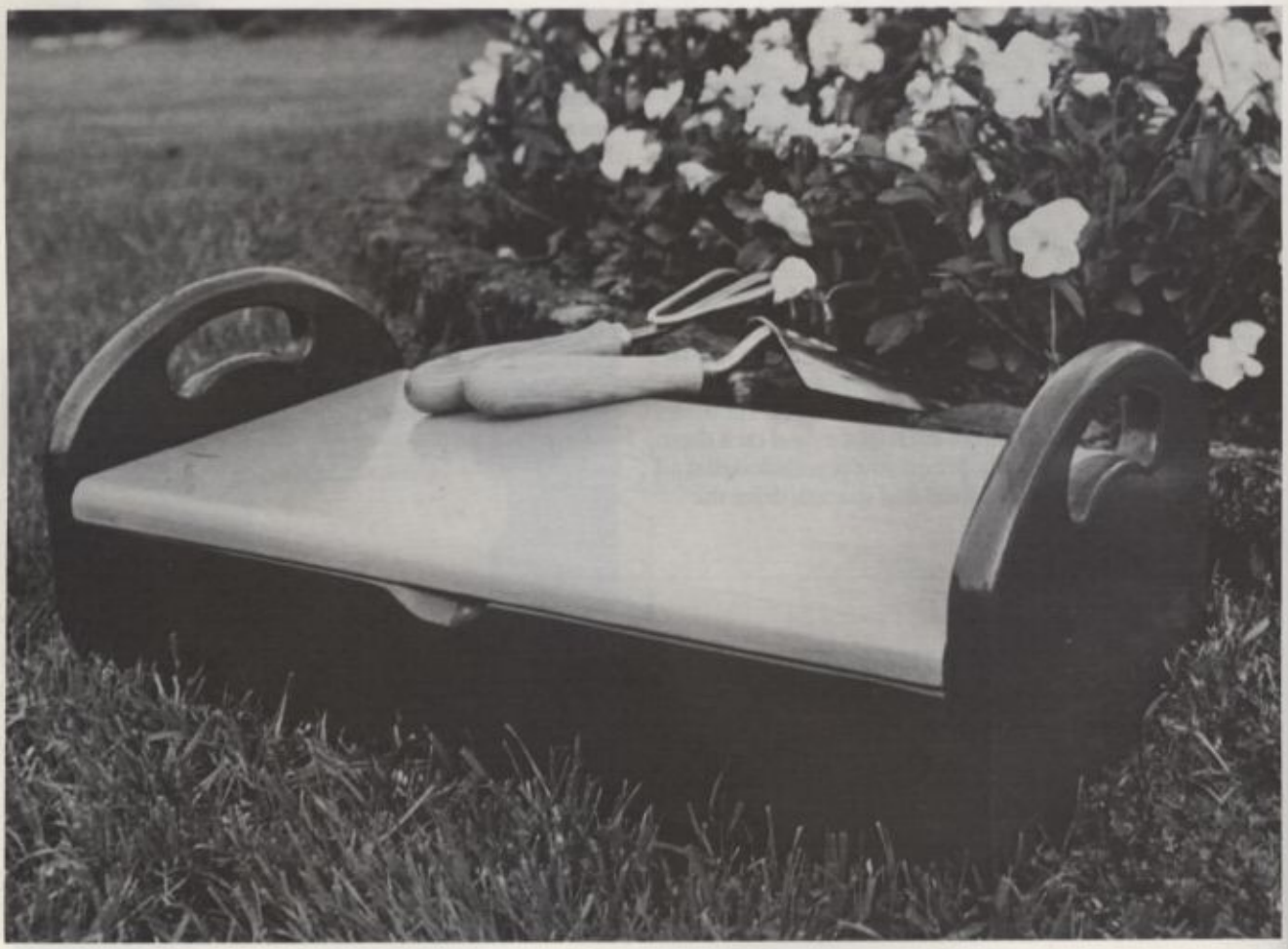
TRY THIS! If this project is going to be used by toddlers, think twice before applying a finish. *All* outdoor finishes and paints are toxic, to some degree. If you think a child might decide to chew on the edge of the table, take heart that most raw softwoods have lots of fiber and trace amounts of Vitamin C.

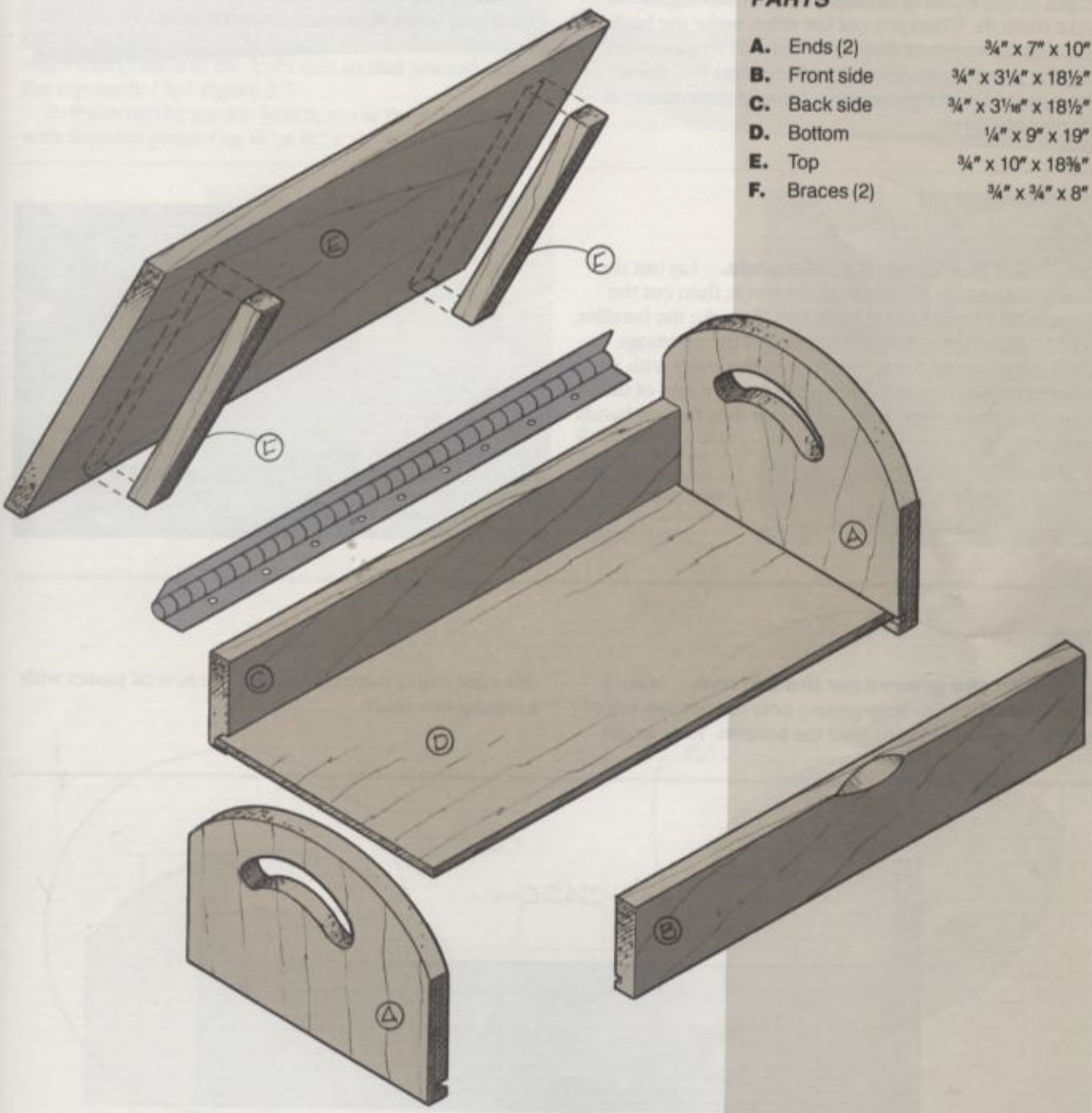
Gardener's Kneeling Bench



As every gardener knows, gardening is hard on the knees. It has its rewards, but in May, when your knees feel like they've been through the Inquisition, it's difficult to console yourself with flowers you'll enjoy in June or the tomatoes you'll reap in July.

Here's a quick project that will spare you some needless agony. It's a simple box that keeps your knees off the ground, and prevents the rocks from drilling holes in them. What's more, the box doubles as a tool caddy for hand tools.





EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

A.	Ends (2)	¾" x 7" x 10"
B.	Front side	¾" x 3¼" x 18½"
C.	Back side	¾" x 3⅛" x 18½"
D.	Bottom	¼" x 9" x 19"
E.	Top	¾" x 10" x 18⅜"
F.	Braces (2)	¾" x ¾" x 8"

HARDWARE

1½" x 18⅜" Piano hinge and mounting screws

#10 x 1¼" Flathead wood screws (1 dozen)

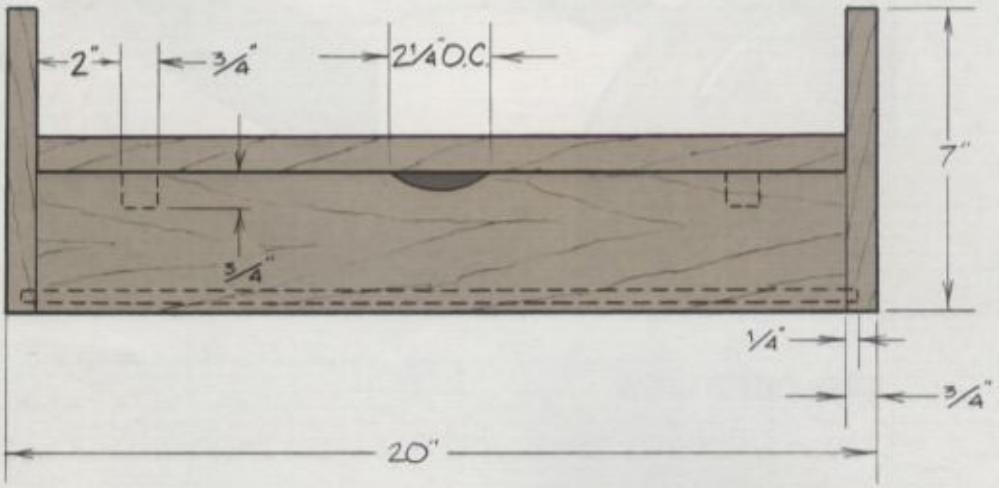
1 ***Cut all the parts to size.*** Before you cut the parts, consider what tools you want to store and carry in this bench. You may have to adjust the length or the width of the sides and bottom slightly to make them fit. When you cut the sides, make the back side slightly narrower than the front side to accommodate the piano hinge. Our piano hinge was 3/16" thick. Yours may be slightly thicker or thinner, depending on the manufacturer.

TRY THIS! You can eliminate the braces if you glue up a board for the top that's wide enough to allow you to run the grain from *side to side*. This will give you a little more room for tools.

2 ***Cut the shapes of the ends.*** Lay out the pattern for the sides on the stock, then cut the shape with a band saw or sabre saw. To make the handles, drill 1"-diameter holes at either end of the openings. Then cut away the waste in between the holes with a sabre saw. (See Figure 1.) Round over the edges of the handles with a router or a rasp so that they fit your hands comfortably.

1/To make a handle opening, first drill 1" holes at either end. Then cut out the waste with a sabre saw.

3 ***Cut the groove for the bottom.*** Make a ¼"-wide, ¼"-deep groove near the bottom edge of the ends and sides, to hold the bottom. You can cut this joint with a dado cutter, or make several passes with a regular saw blade.



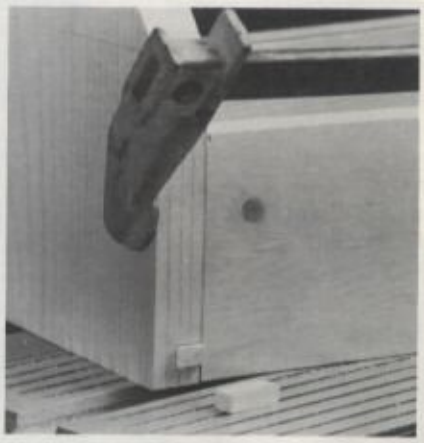
FRONT VIEW

4 ***Assemble the bench.*** With the bottom in place, attach the ends to the sides, using waterproof glue and flathead wood screws. Screw the braces to the underside of the top, centering them so that they won't rub when you open and close the top. Then hinge the top to back side of the bench. With a chisel, cut a slight indentation in the front side so that you can open the top easily. (See Figure 2.)

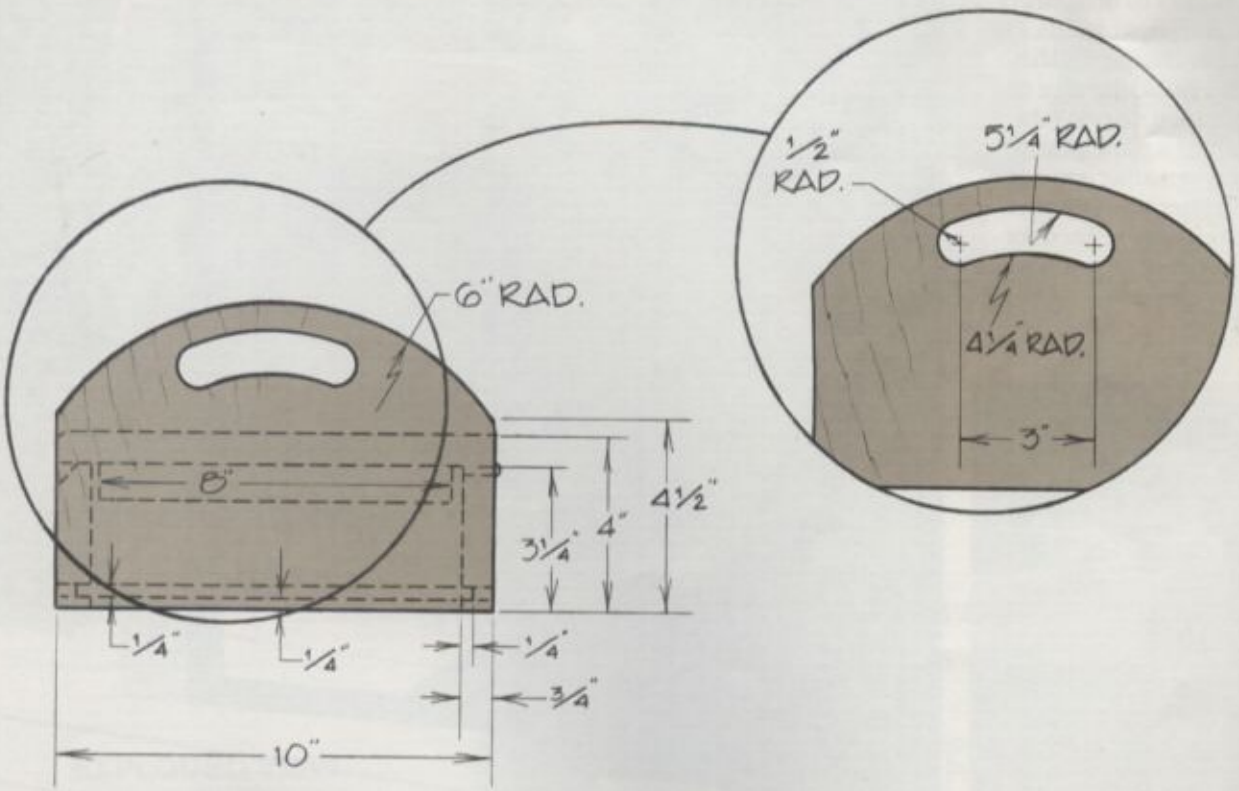
To finish up the garden bench, cover the screw heads with wooden plugs. Cut ¼" x ¼" x ½" wooden blocks to fill the bottom groove, where it shows on the back and the front of the project. (See Figure 3.) Fasten these plugs and blocks in place using waterproof glue. Finally, paint or stain the bench to suit yourself.

TRY THIS! For a little added comfort, glue a scrap of outdoor carpet to the top of the bench.

***2**/Chisel a small indentation in the top edge of the front side. This will make it easier to open the top.*



***3**/Fill the ends of the grooves that show with small wooden blocks. Fasten these blocks in place with waterproof glue.*



SIDE VIEW

Shrub Planter

Large planters add a refined touch to your deck or patio, creating the atmosphere of a formal garden. Properly arranged, they may be used to accent a door or gate; set apart areas of a large deck to create more intimate, private spaces; or just add shade and greenery to an otherwise barren expanse of wood or concrete.

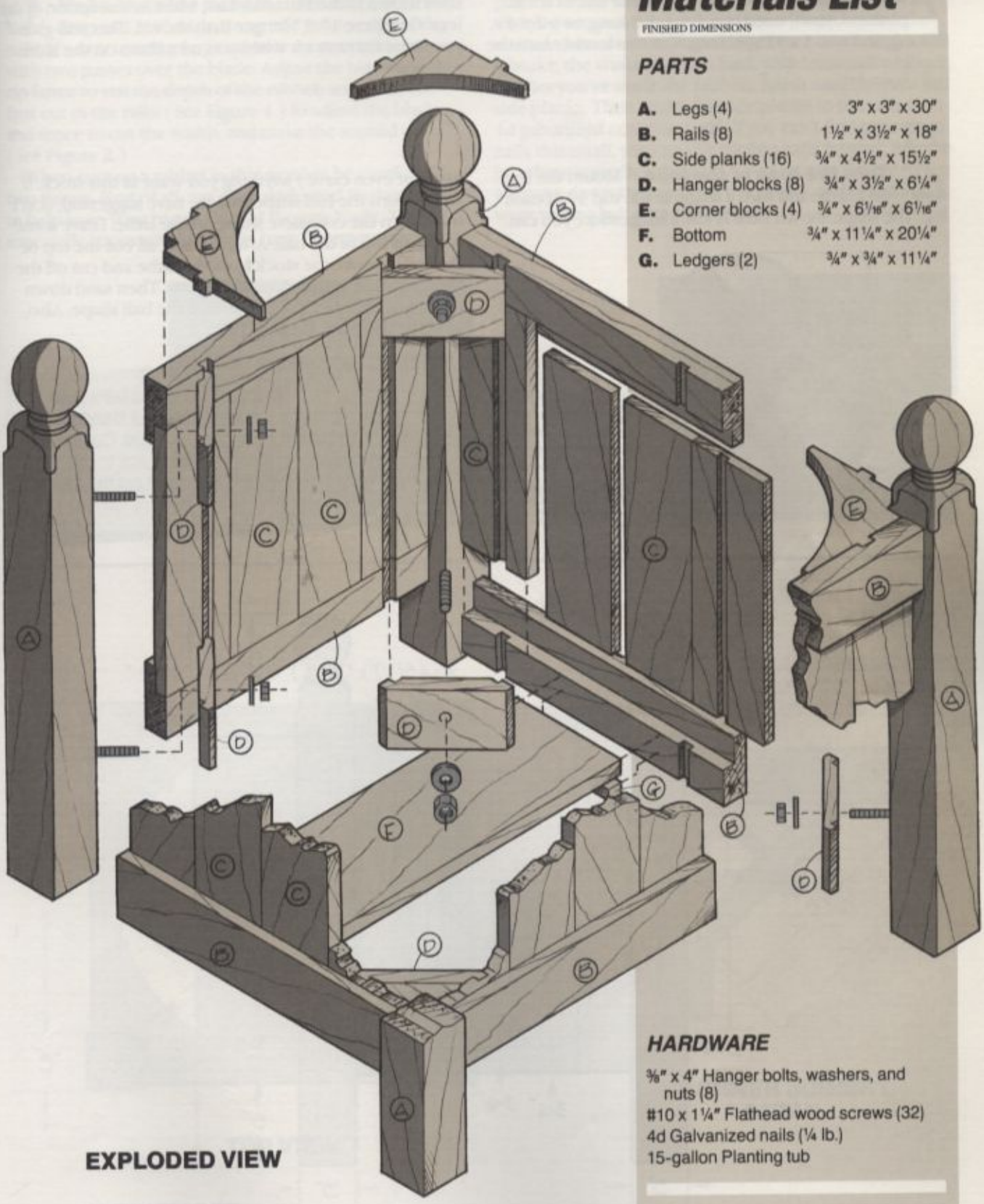
The planter you see here is designed to hold a standard 15-gallon planting tub — large enough for shrubs and some small trees. If you wish, you can stretch the dimensions of the planter to hold larger tubs and larger plants. Or you can change the shape to fit a particular area or accommodate two tubs, side by side. The design is very versatile; you can easily alter it to suit your needs — or the needs of the shrub or tree you wish to pot.

Materials List

FINISHED DIMENSIONS

PARTS

A.	Legs (4)	3" x 3" x 30"
B.	Rails (8)	1½" x 3½" x 18"
C.	Side planks (16)	¾" x 4½" x 15½"
D.	Hanger blocks (8)	¾" x 3½" x 6¼"
E.	Corner blocks (4)	¾" x 6 1/16" x 6 1/16"
F.	Bottom	¾" x 11¼" x 20¼"
G.	Ledgers (2)	¾" x ¾" x 11¼"



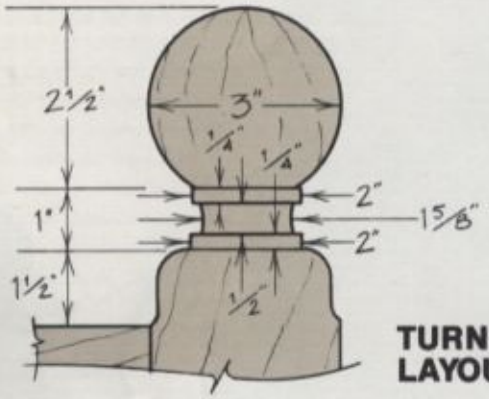
EXPLODED VIEW

HARDWARE

⅜" x 4" Hanger bolts, washers, and nuts (8)
#10 x 1¼" Flathead wood screws (32)
4d Galvanized nails (¼ lb.)
15-gallon Planting tub

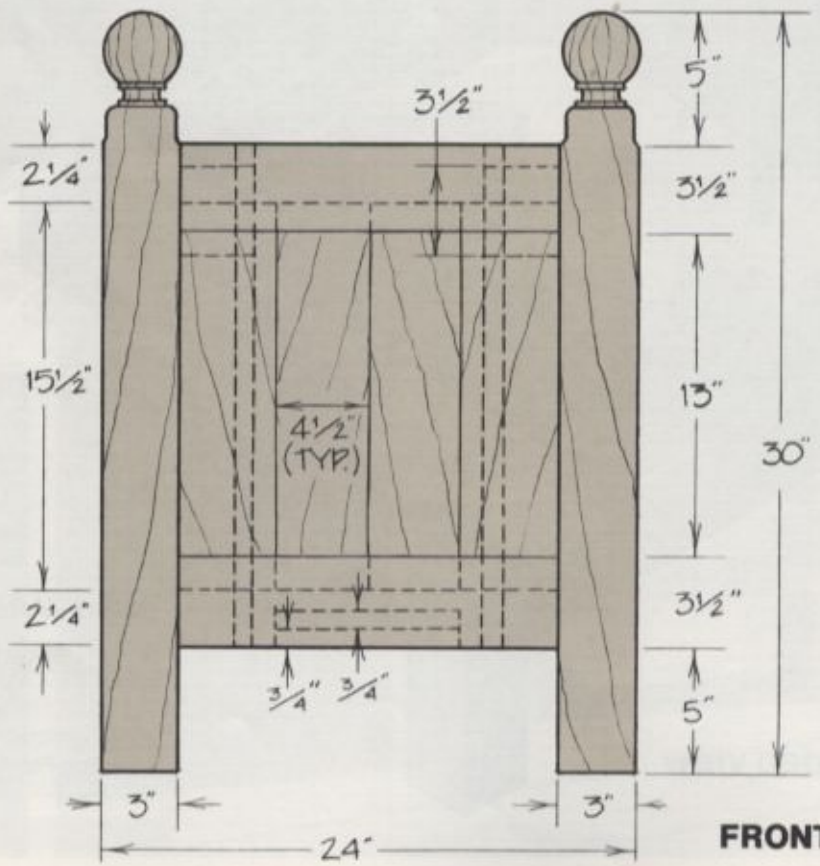
1 ***Cut the parts to size.*** To make one of these planters, you'll need one 4 x 4, 12′ long, two 2 x 4's, 8′ long, and two 1 x 12's, 8′ long. Cut this lumber into the sizes shown in the Materials List, with the exception of the legs. Cut these 1″-2″ longer than shown. This will give you some extra stock when you turn them on the lathe.

2 ***Turn the tops of the legs.*** Mount the legs on a lathe and turn a shape in the top 5″ of each leg. The shape shown here is just a suggestion; you can turn (or even carve) anything you want in this stock. If you do turn the ball shape that we have suggested, don't try to turn the complete shape on the lathe. Leave some waste on top of the ball. After turning all but the top of the ball, remove the stock from the lathe and cut off the waste with a band saw or coping saw. Then sand down the top of the turning to complete the ball shape. Also, sand the flat portions of the legs.



TURNING LAYOUT

TRY THIS! If you don't have a lathe, cut a shape in the top of the legs with your band saw, using a "compound cutting" technique. Cut the design in one face; tape the waste back to the stock; turn it to an adjacent face and cut the same design again.



FRONT VIEW

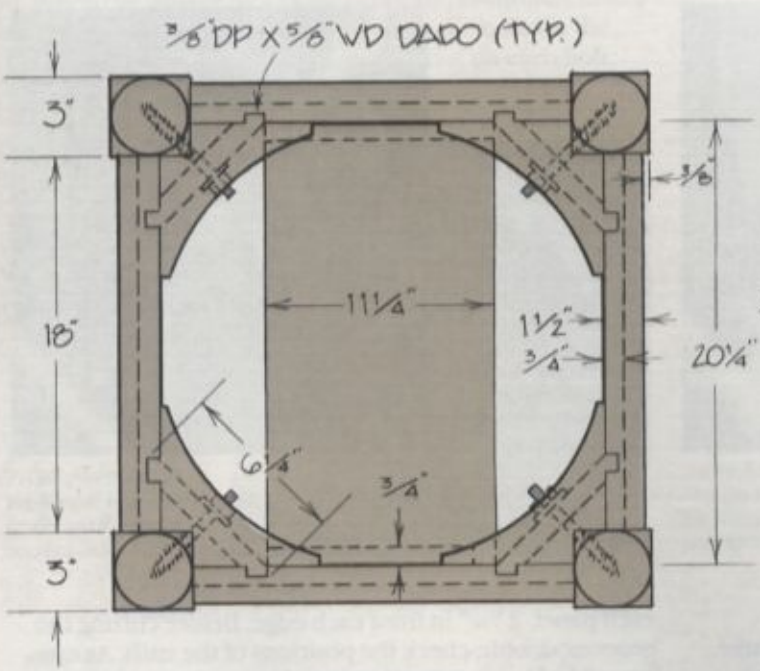
3 ***Make the side panels.*** Cut a rabbet ¾" deep and 1¼" wide along one inside edge of the rails. It's easy to make large rabbets on your table saw with two passes over the blade. Adjust the blade and the rip fence to cut the depth of the rabbet, and make the first cut in the rails. (See Figure 1.) Readjust the blade and fence to cut the width, and make the second cut. (See Figure 2.)

When cutting a rabbet in this manner, be careful of two things. First of all, use push sticks and featherboards to help keep your hands clear of the saw blade. This is especially important, since you have to remove the saw guard to make these cuts. Secondly, set up your saw so that you can make the second pass without leaving the waste in between the saw and the fence. If you make this mistake, the waste will kick back with tremendous force.

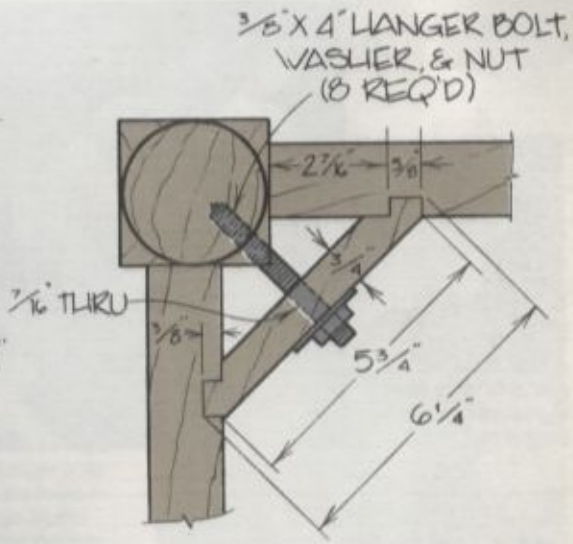
After you've made the rabbets, finish sand the rails and side planks. Then attach the side planks to the rails with 4d galvanized common nails. If you can't find galvanized nails this small, you can use roofing nails instead. Be careful where you place the nails. Later on, you'll need to cut a groove down the length of the panels, and you don't want to hit a nail with the cutter.

1/Make the rabbets in the rails in two cuts. First, cut the depth of the rabbets...

2/Then cut the width of the rabbets. On the second cut, be careful not to leave the waste in between the saw blade and the rip fence. If you do, it will kick back.



TOP VIEW



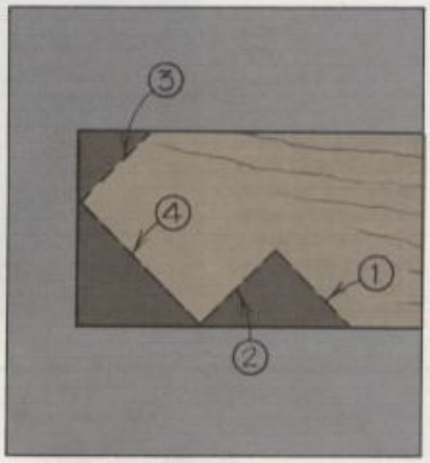
CORNER JOINERY DETAIL

4 ***Make the hanger blocks.*** The legs and the side panels are held together with hanger blocks. These are not only easier to make than the traditional mortise-and-tenon joints, but they give you the option of making this project into a *knock-down* planter, one that you can store away during the winter.

To make the hanger blocks, first drill 7/16" holes through the center of the face of each block. Then make four bevel cuts across the ends of each block, all at 45°. (See Figure 3.) To make these cuts, set your table saw to cut at 45°, and position the rip fence so that you can use it as a guide. Start cutting by making one side of a V-groove near the ends of all four blocks. Make a pass, then flip each block end-for-end, and make another. Readjust the position of the fence and cut the other sides of the grooves in all the blocks. (See Figure 4.)

After you've cut the grooves, cut a narrow bevel and a wide bevel across each end. This will complete the shape of the hanger blocks. (See Figures 5 and 6.) Once again, use the rip fence as a guide, and flip the blocks end-for-end so that you make identical cuts in each end.

Important note: The rip fence must be positioned very accurately for these last two cuts. If the fence is too close to the blade on either cut, you'll shorten the block on the second-to-last pass. The last pass of the last cut will be off, making the block asymmetrical.



***3**/To make the hanger blocks, you'll have to make four bevel cuts in each end of each block. Make the cuts in the order shown, and use the rip fence to guide all the cuts.*

***5**/After cutting the V-grooves, make the narrow bevel cuts on the ends of the blocks.*

***4**/First, make two cuts at 45° to form V-grooves near the ends of the blocks.*

***6**/Finish the blocks by cutting the wide bevels. The rip fence must be positioned very accurately when you make these last two miter cuts. You want a double miter on each end of each block, but you don't want to shorten the blocks when you make these cuts.*

5 ***Cut the hanger grooves in the side panels.*** With a dado cutter or a router, make two ⅝"-wide, ⅜"-deep grooves on the *inside* faces of each panel, 2 7/16" in from each edge. Before cutting the grooves, double-check the positions of the nails. As mentioned before, you don't want to hit a nail with the cutter.

6 ***Assemble the legs, side panels, and hanger blocks.*** Carefully measure and mark the locations of the hanger bolts, as shown in the working drawings. Drill pilot holes for these bolts in the inside corners of the legs. To drill these holes at the proper angle (diagonally, at 45° from the two "inside" faces of the legs), tilt the worktable of your drill press or make a cradle to hold the legs. (See Figure 7.)

Turn the lag end of the bolts into the legs. The easiest way to install a hanger bolt, if you've never done it before, is to put a nut onto the threaded part of the shaft, and use this nut to turn the bolt into the leg. After the bolt is installed, remove the nut.

Now comes time to make a decision: Do you want this project to be a *knock-down* planter, or do you want to assemble it permanently? If you want to assemble it permanently, screw the hanger blocks in place in the grooves in the side panels. If not, just place them in the grooves. The tension from the hanger bolts, after you attach the legs, will hold the blocks in place.

TRY THIS! Assembling the legs, side panels, and hanger bolts *without* screwing the blocks in place is a task that will try the patience of a saint. If you don't have six extra hands, tack the blocks in place with finishing nails, then remove the nails after you attach the legs.

When the hanger blocks are properly positioned, install the legs with the hanger bolts through the holes in the hanger blocks. Put a flat washer and a nut on each bolt, and tighten the nuts. (See Figure 8.)

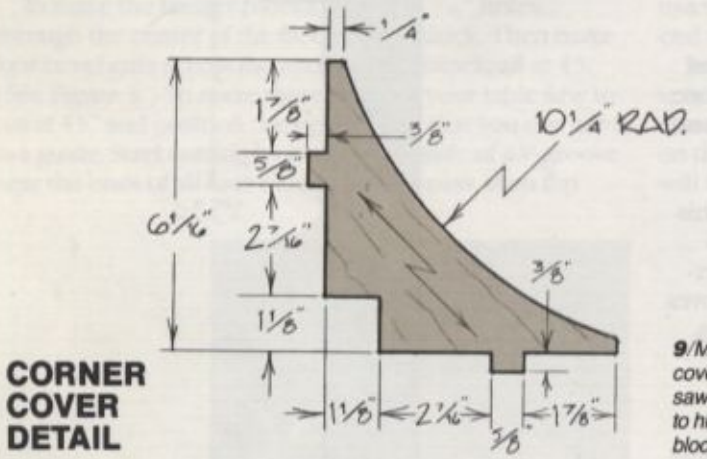
HANGER BOLT LOCATION DETAIL

***7**/Drill pilot holes for the hanger bolts diagonally into the inside corners of the legs.*

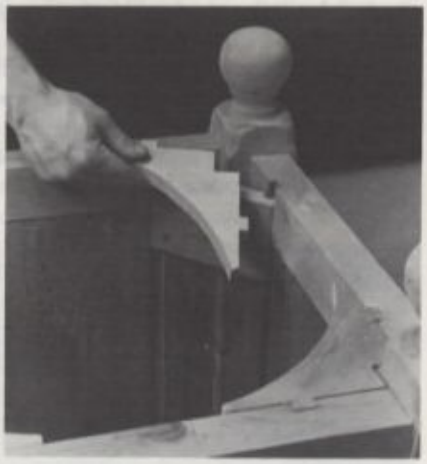
***8**/To attach the legs, put the hanger bolts through the holes in the hanger blocks and tighten the nuts.*

7 ***Attach the bottom to the planter.*** Screw the ledgers to the inside surfaces of two opposing side panels, where shown in the working drawings. Lay the bottom in place, across the ledgers. If you've opted to permanently assemble this project, you may wish to nail the bottom to the ledgers.

8 ***Install the corner covers.*** To hide the hanger bolts and to give the planter a finished look, make "corner covers." Lay out the shapes of these covers on ¾" thick stock, paying careful attention to the grain direction shown in the working drawings. Then cut out the shapes on a band saw or scroll saw. You'll probably have to do a little custom fitting to get each block to seat properly. When you've fitted the blocks, just lay them in place if you're making a knock-down planter. Nail them to the upper corner blocks if your planter is permanently assembled. (See Figure 9.)



CORNER COVER DETAIL



***9**/Make corner covers on a band saw or scroll saw to hide the hanger blocks and bolts.*

Precautions for Pressure-Treated Lumber

Most pressure-treated lumber is saturated with the preservative Chromated Copper Arsenate, or CCA. As we mentioned in the introduction, this chemical poisons the lumber, preventing the growth of bacteria that would otherwise rot the wood. Unfortunately, what is poisonous to bacteria may also harm other forms of life — namely you and your family. If you use pressure-treated lumber in your outdoor furniture projects, you should take a few precautions.

CCA is an arsenic compound that chemically bonds with the wood under pressure. It gives off no fumes, and cannot be dissolved once it is bonded. Consequently, it won't "leech" out of the wood, and there is little chemical residue on the surface of a finished project to come in contact with people, pets, and plants. However, many of the craftsmen and builders who work with pressure-treated lumber regularly report rashes, watery eyes, itching, violent sneezing and other irritations. This probably comes from breathing the CCA-saturated sawdust, or cutting into the wood and being exposed to minute amounts of chemicals that haven't completely bonded.

When you work with pressure-treated lumber, wear long sleeve shirts and long pants, eye protection, and a dust mask to protect your skin, eyes, and lungs from exposure to CCA. If possible, do all sawing and sanding out of doors, where the sawdust will blow away in the wind. Wash all exposed areas of your skin before eating or drinking. If you happen to get a splinter, remove it *immediately*. Splinters from pressure-treated lumber can be much more irritating than the normal variety.

After you complete the project, carefully clean up all scraps and sawdust. Dispose of these in a local landfill or bury them yourself. *Never burn the scraps.* Pressure-treated lumber gives off poisonous gases when it's burned.

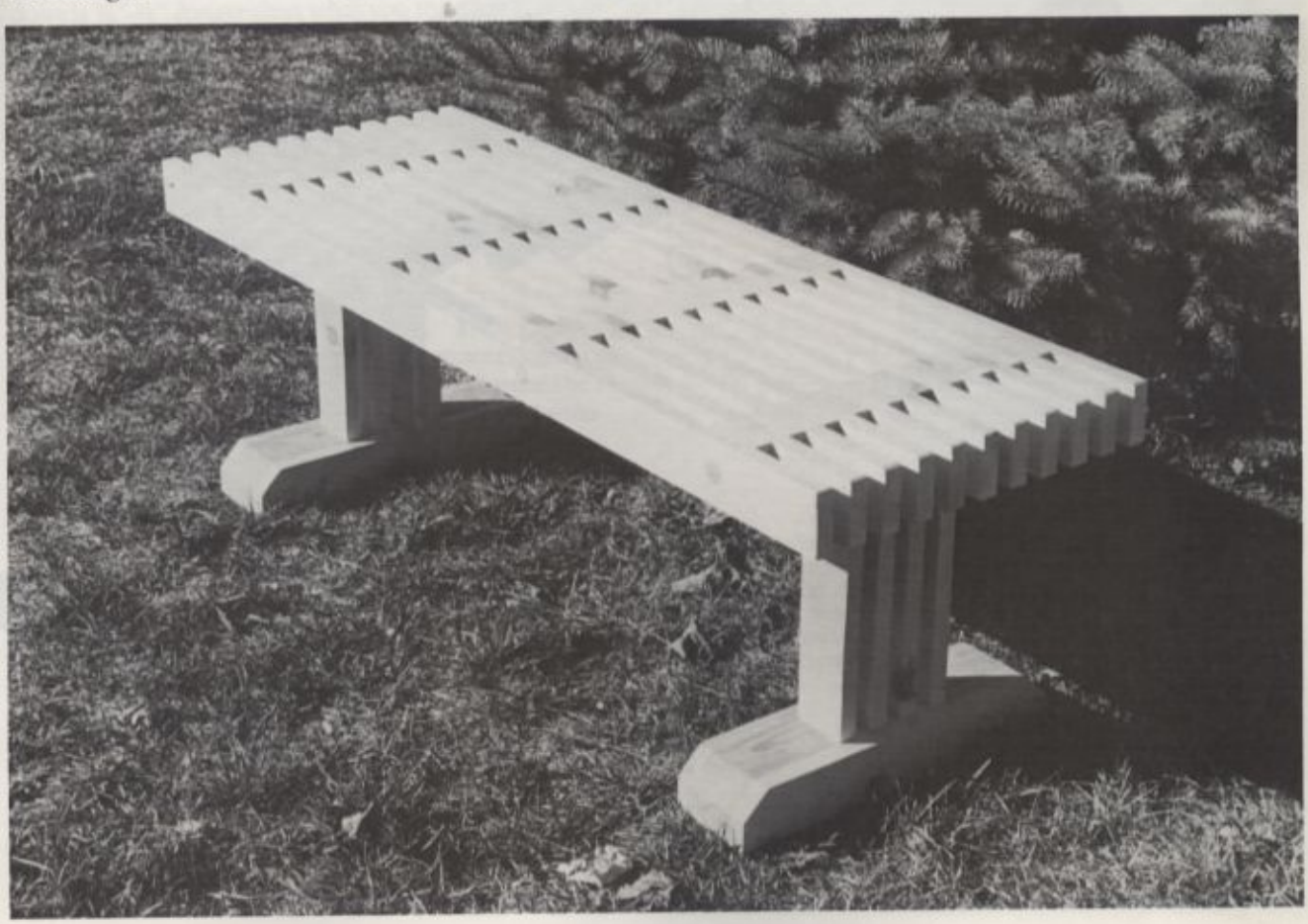
Hose down the completed outdoor furniture or let it sit through several rainstorms before you allow small children and pets to use it. This washes those fresh cuts where you may have exposed some unbonded CCA, and rinses away the chemical. *Never* let the wood come in contact with food or drinking water, no matter how many rainstorms it's been through.

Finally, avoid working with lumber that is treated with creosote or pentachlorophenol (usually called "penta"). Neither of these chemicals bond with the wood. They will leech out over time, poisoning the surrounding area. Creosote has been linked with cancer, and penta is chemically similar to the infamous "Agent Orange" used in Vietnam.

Duck Board Benches and Tables

They call them "duck boards" because water runs right off them. The individual boards in these unique assemblies are set on edge and spaced apart so that they won't trap moisture. The rain just goes right through duck board furniture. But the boards are close enough to each other to make a comfortable bench or a useful table. *You* won't fall through.

As you can see, the construction is wonderfully simple. All you need to do is rip a few boards and drill a few holes. And the design is as versatile as the construction is simple. Depending on the dimension of the bench top or table top, and its height above the ground, the duck boards can be used for long or short benches, low tables, workstations, even children's furniture.

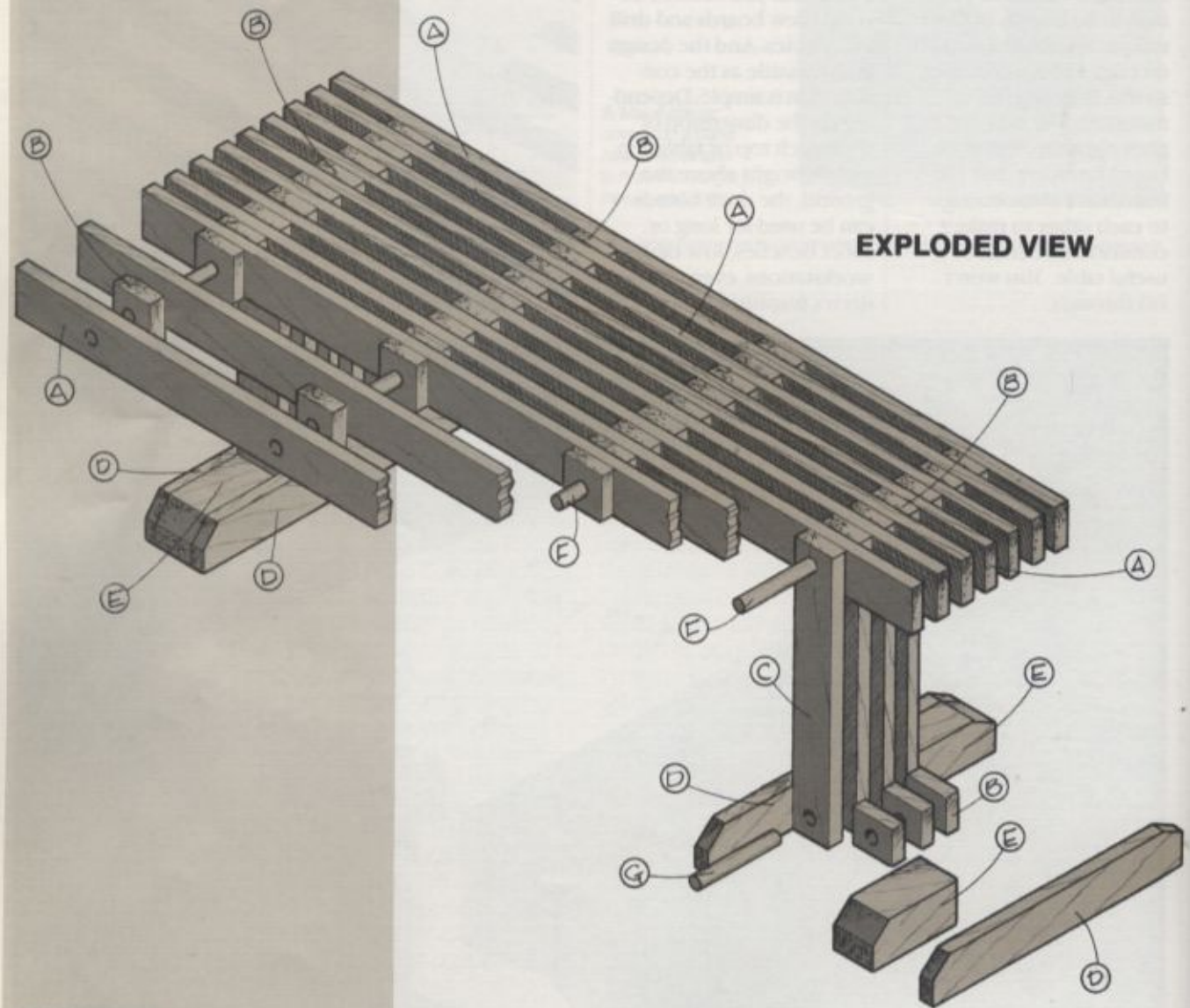


Materials List

FINISHED DIMENSIONS

PARTS

A.	Duck boards (11)	¾" x 2½" x 48"
B.	Spacers (46)	¾" x 2½" x 2½"
C.	Legs (8)	¾" x 2½" x 16"
D.	Feet (4)	¾" x 2½" x 15¾"
E.	Foot blocks (4)	2½" x 2½" x 5¼"
F.	Seat dowels (4)	1" dia. x 15¾"
G.	Foot dowels (2)	1" dia. x 5¼"



EXPLODED VIEW

HARDWARE

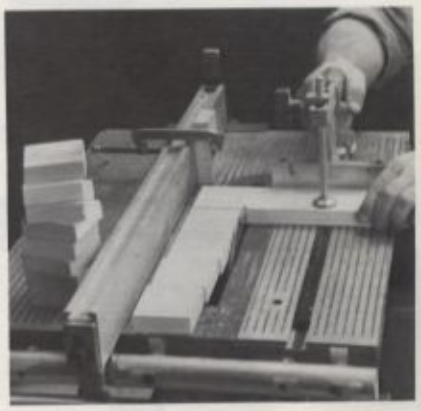
8d Galvanized finishing nails (¼ lb.)

1 *Adjust the design to your own needs.* Decide what sort of outdoor furniture you'd like to make with these duck boards. Here's a chart to help show you some of the possibilities:

Length	Width	Height	Possible Uses
18"–24"	12"	10"–12"	Footrest, step-stool, seating for children
18"–60"	15"–18"	16"–18"	Seating for adults
24"–36"	18"–36"	20"–22"	Coffee table, table for children
36"–60"	30"–36"	28"–30"	Table for adults

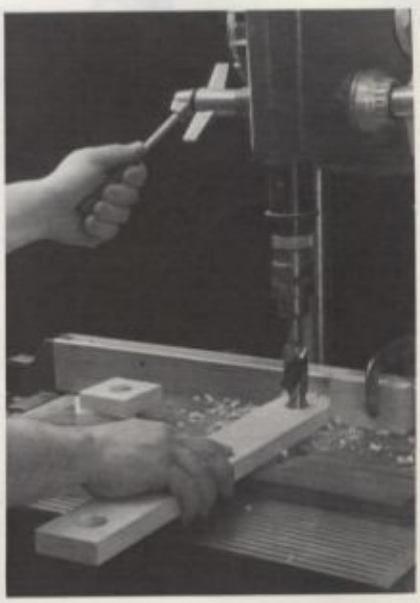
2 *Cut the parts to size.* Cut all the *dimension lumber* to size first. Don't cut the dowels to length until you have made the other parts. The reason for this is that dimension lumber (which is what you get when you buy softwood at a lumberyard or building center) is not always precisely milled. The boards you buy may be a little thicker than ¾". On most projects, this wouldn't make any difference. But on this one, when you stack up so many layers of stock, even a little variance in the thickness can add up to a big mistake in the finished project. Cut the dowels only after you've cut the other pieces, stacked them up, and measured the stack. Then cut the dowels ¼"-½" *longer* than what you think you'll need. You can cut off the extra length later, after you assemble the project.

Since so many of these parts are identical, use a simple mass production technique when cutting them to length. Attach a stop block to the backstop of your radial arm saw or the rip fence of your table saw, and use this to gauge the length of the pieces as you cut them. That saves a lot of measuring. (See Figure 1.)

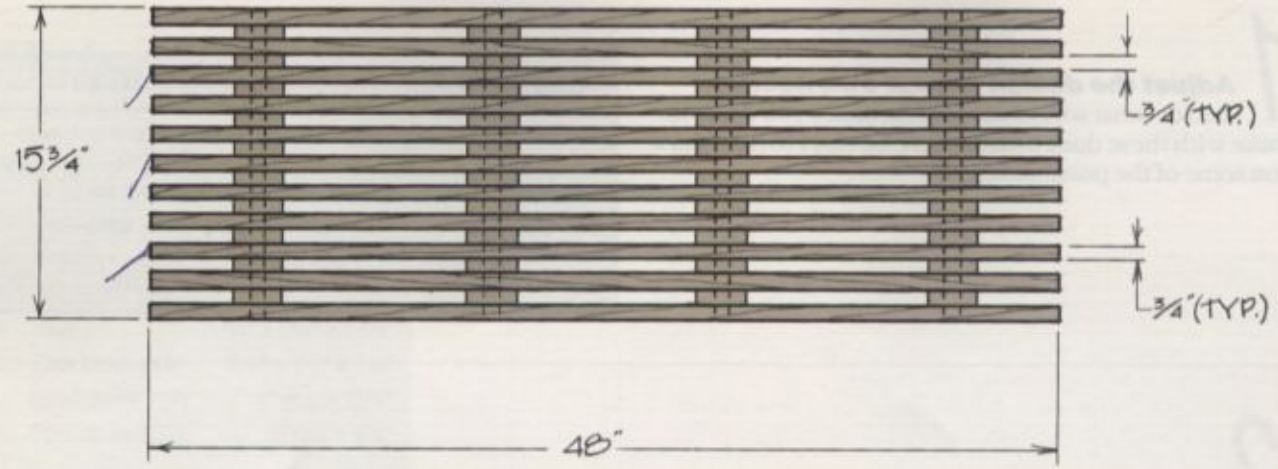


***1**/When you use a stop block on a table saw, position the block forward of the blade. You can use it to gauge the length of a cut, but it shouldn't be in actual contact with the wood when you're cutting. If it is, the wood will bind and kick back.* (Saw guard removed for clarity.)

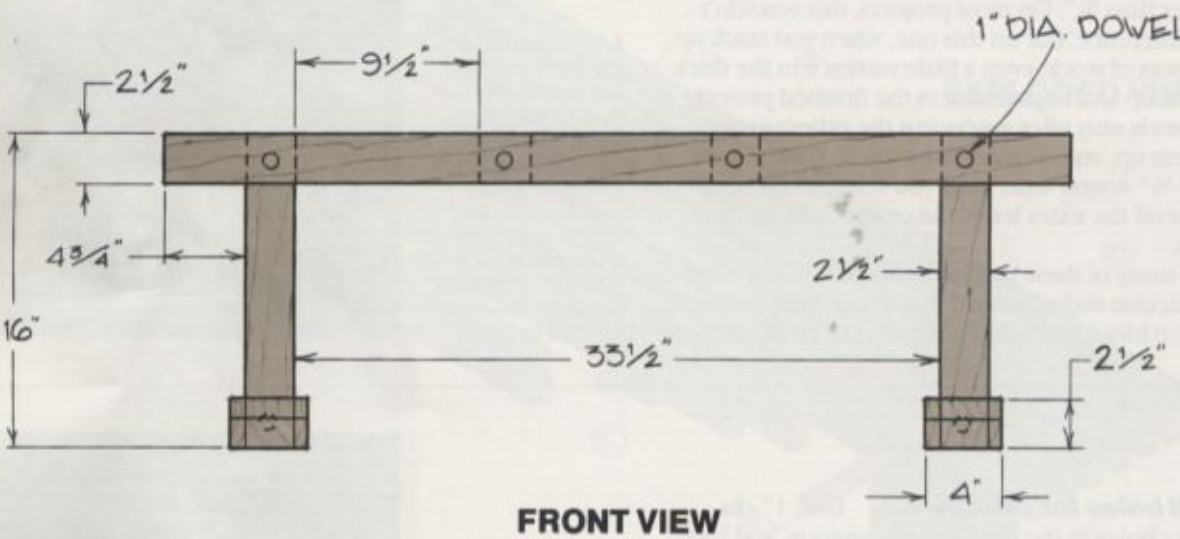
3 *Drill holes for the dowels.* Drill 1"-diameter holes in the duck boards, spacers, and legs, for the dowel. Be very careful when you measure the positions for these holes — they *must* be placed accurately, or the project will be difficult to assemble. Use stop blocks on your drill press to help position the holes accurately. (See Figure 2.)



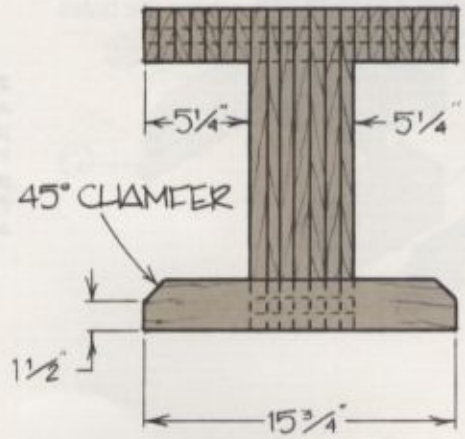
***2**/Clamp a fence and a stop block to your drill press to make a "jig" to help position the holes in the legs and spacers accurately.*



TOP VIEW



FRONT VIEW



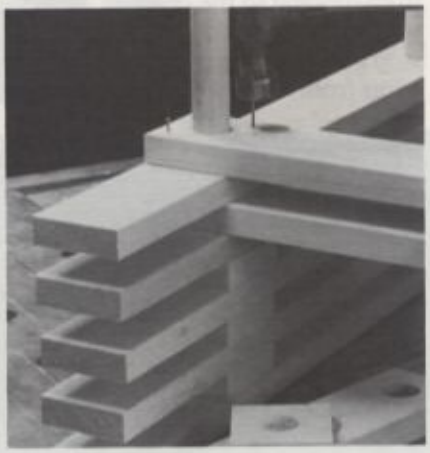
SIDE VIEW

4 *Assemble the duck boards, legs, dowels, and spacers.* Begin to stack the parts, as shown in the *Exploded View*. Put a little dab of waterproof glue in between each of the parts as you stack them. This won't be enough to keep the project together, but it will prevent the spacers from turning on the dowels after the project is assembled.

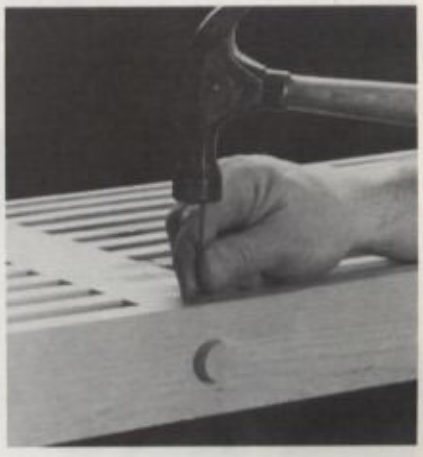
When you fit the legs in place, make sure that they're square to the duck boards. Nail them to the assembly with galvanized finishing nails. (See Figure 3.) This will keep the legs from pivoting on the dowels.

When you've finished assembling these parts, clamp the duck boards together with bar clamps. Squeeze them together tightly, but not too tightly. Drive galvanized finishing nails through the edge of the outside duck boards, and into the dowels. (See Figure 4.) These nails will serve as "keepers," locking the boards together on the dowels.

TRY THIS! To hide the nails, drive them from the *underside* of the duck boards.



***3**/As you assemble the project, nail the legs to the duck boards. This will hold them square to the seat, and prevent them from pivoting on the dowels.*



***4**/After assembling the seat and legs, drive nails through the outside duck boards and into the dowels. This will keep the assembly together.*

5 *Attach the feet and foot blocks.* Cut and sand the foot dowels flush with the legs. Test fit the feet and foot blocks to the legs, and mark them for position. If the duck board stock is thicker than ¾", the blocks may have to be shortened slightly. When you're satisfied the parts will fit properly, cut chamfers in the upper outside corners of the feet and foot blocks.

Nail the feet to the legs and spacers first. Be sure to keep the feet square to the legs, and parallel to the seat. Then nail the foot blocks in place, between the feet.

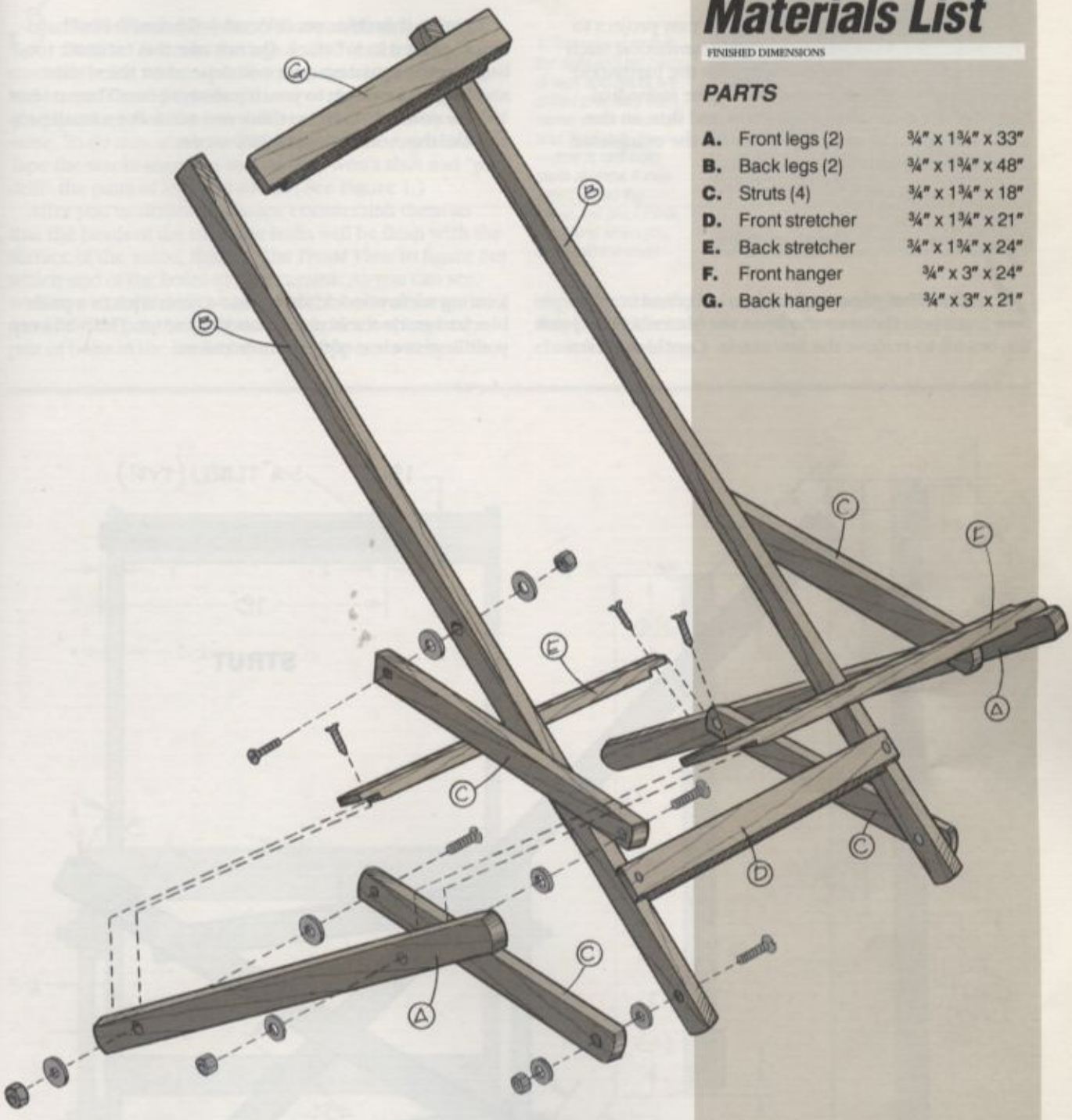
TRY THIS! As you're doing some of this nailing, you'll find that a small anvil or "nailing block" comes in handy. Hold the anvil on the opposite side of the feet from the nails, and it will prevent the boards from giving when you pound with a hammer.

6 *Chamfer the edges and finish the project.* Rout or plane a small chamfer on all the outside edges and corners of the completed duck board table or bench. Sand the top of the bench perfectly flat, and finish sand any other parts that need it. If you wish to apply a finish to the bench, use a paint sprayer. You'll find it almost impossible to get a brush between the duck boards.

Rocking Sling Chair

Here's an unusual outdoor sling chair: It rocks! It doesn't rock in the same way that a rocking chair rocks, tipping back and forth. But this chair produces a very similar motion, because of the unusual way the legs are joined by the tie bars. All of the joints pivot, so that the legs — and the chair — move. These pivoting joints also make it possible for you to fold the rocking sling chair into a neat, flat package for storage.

The chair is quick and easy to build, too. The framework is nothing more than a few sticks with holes in them. These sticks are held together with machine bolts, flat washers, and stop nuts. The flat washers keep the sticks from rubbing so the chair will "rock" smoothly. The stop nuts keep the pivot joints from loosening.



EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

A.	Front legs (2)	¾" x 1¾" x 33"
B.	Back legs (2)	¾" x 1¾" x 48"
C.	Struts (4)	¾" x 1¾" x 18"
D.	Front stretcher	¾" x 1¾" x 21"
E.	Back stretcher	¾" x 1¾" x 24"
F.	Front hanger	¾" x 3" x 24"
G.	Back hanger	¾" x 3" x 21"

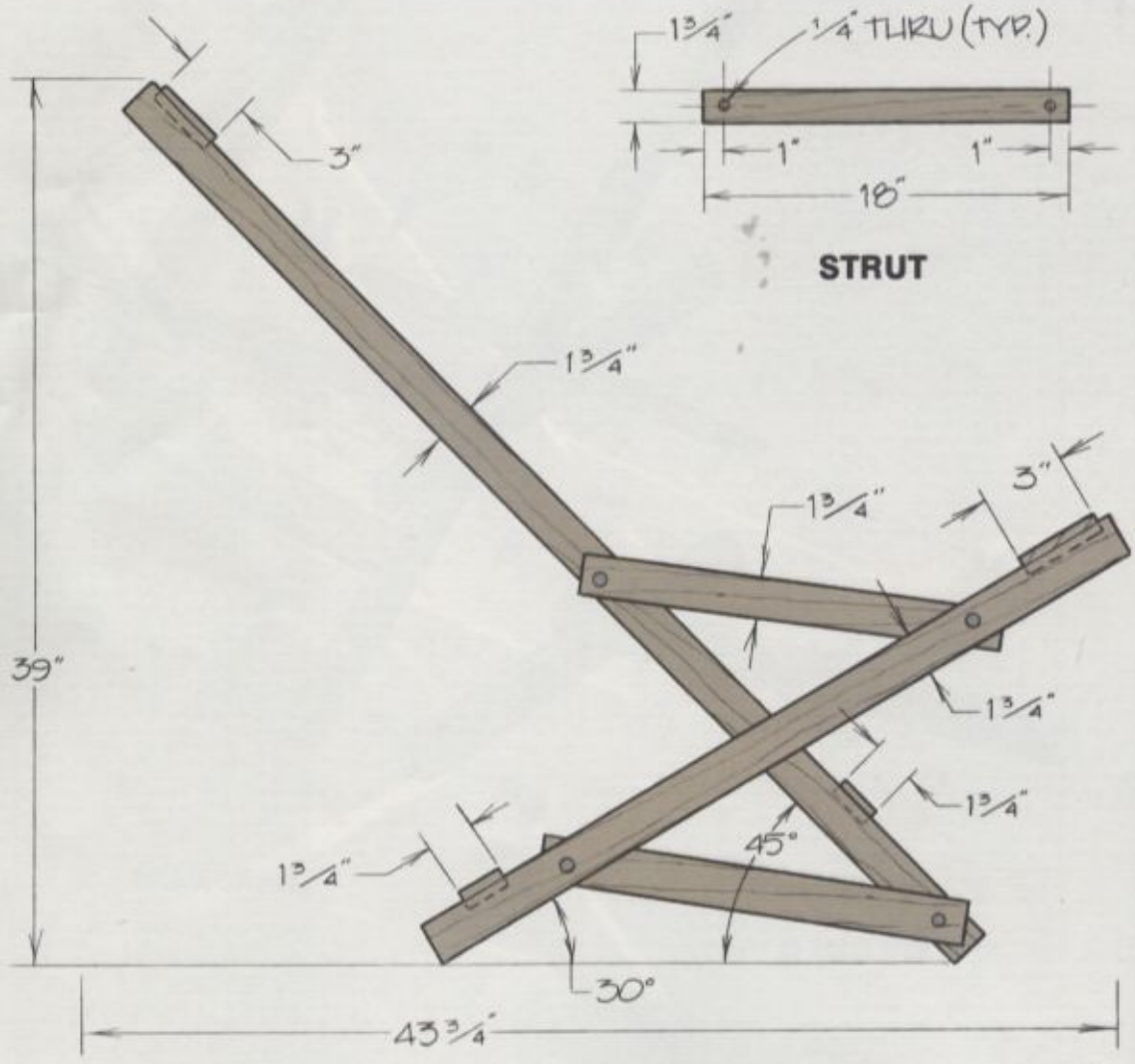
HARDWARE

¼" x 2" Flathead machine bolts (8)
¼" Flat washers (16)
¼" Stop nuts (4)
#10 x 1¼" Flathead wood screws (16)
Heavy canvas (2 yards)

1 ***Select the wood.*** This is an easy project to make, but it must be made from *hardwood,* such as mahogany or oak. Not only that, but the hardwood must be clear and free from defects. The individual pieces of the chair are fairly narrow and thin, so the wood has got to be strong in order for the completed project to hold out.

To make this chair, you'll need 4-5 board feet of hardwood, planed to ¾" thick. Do not take this estimate too literally; the actual amount will depend on the widths and lengths available to you. It's always best to buy at least 10% *more* stock than you think you need. For a small project, like this, you may want 20% more.

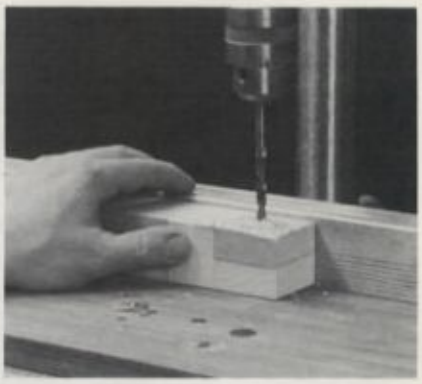
2 ***Cut the pieces to size.*** Rip and cut the parts to the sizes shown in the Materials List. Joint the boards to remove the saw marks. **Caution:** When jointing narrow stock, always use a push stick or a push block to guide the board across the jointer. This will keep your fingers clear of the jointer knives.



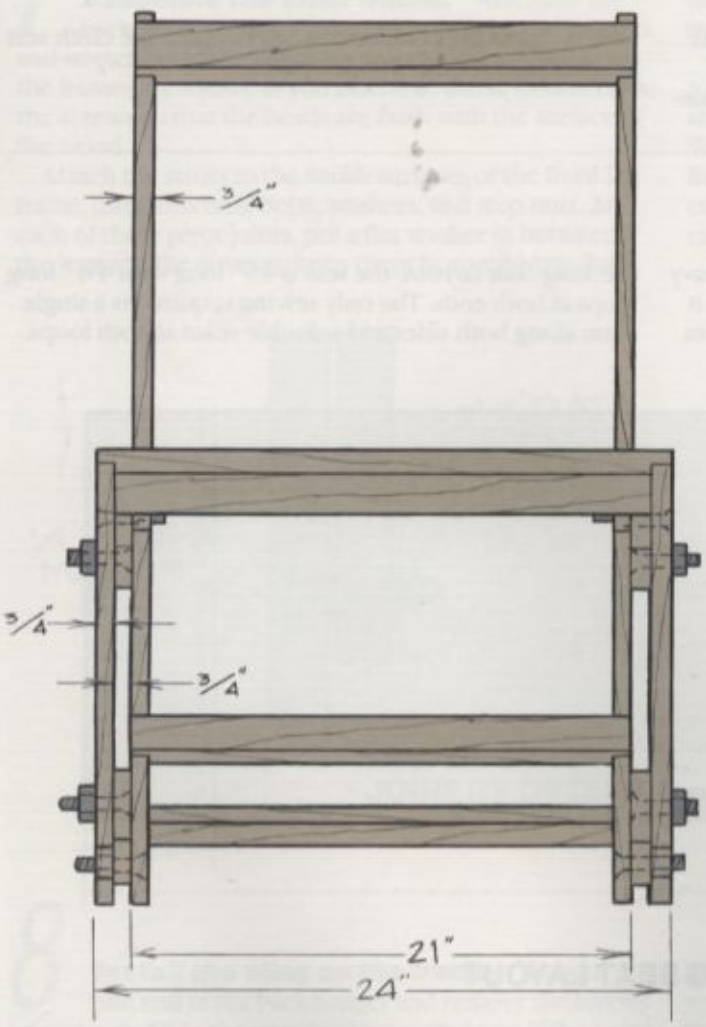
3 *Drill the holes for the machine bolts.*

Drill ¼" holes in the legs and struts for the machine bolts, where shown in the drawings of the legs and struts. These parts are paired — right and left — and it's important that the pairs all be drilled precisely the same. To do this, stack the pairs up, right on top of left. Tape the stacks together so that they won't shift and "pad drill" the pairs of legs and struts. (See Figure 1.)

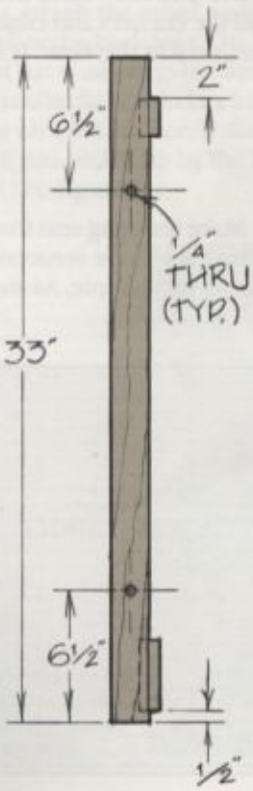
After you've drilled the holes, countersink them so that the heads of the machine bolts will be flush with the surface of the wood. Refer to the *Front View* to figure out which end of the holes to countersink. As you can see, with two exceptions, the heads of the bolts all face *inward*. The only bolts whose heads face outward are a pair of bolts in the back ends of the upper stretcher. It's important that the bolts be facing the right direction. If they aren't, the stop nuts will prevent the completed chair from folding.



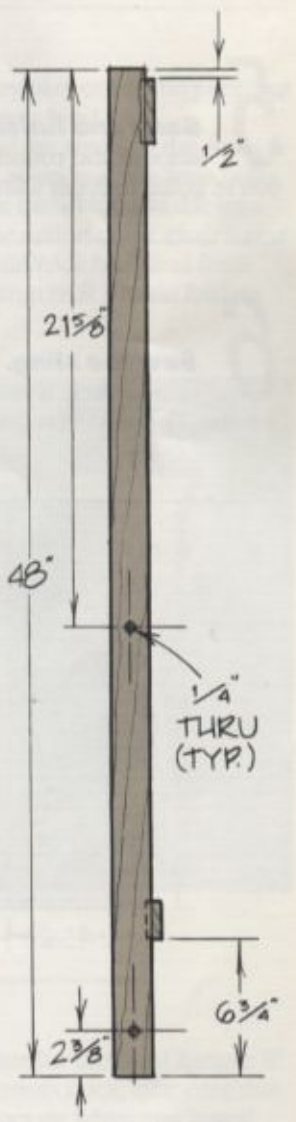
1/To make sure that the right and left pairs of legs and struts are drilled precisely the same, stack them up and "pad drill" them — that is, drill both parts at once. If they aren't drilled the same, the pivot joints may bind when you try to fold the chair.



FRONT VIEW

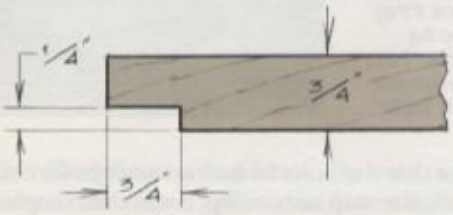


FRONT LEG

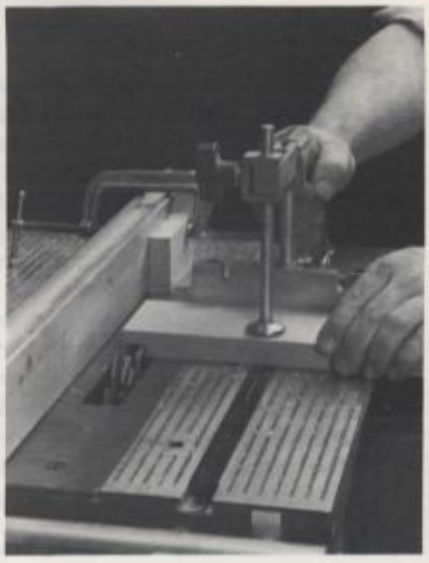


BACK LEG

4 ***Cut the rabbets in the ends of the stretchers and hangers.*** Mount a dado cutter in your table saw or radial arm saw, and cut ¾"-wide, ¼"-deep rabbets in both ends of the stretchers and the hangers. Use a stop block to help gauge the width of the rabbets and to make them all the same. (See Figure 2.)



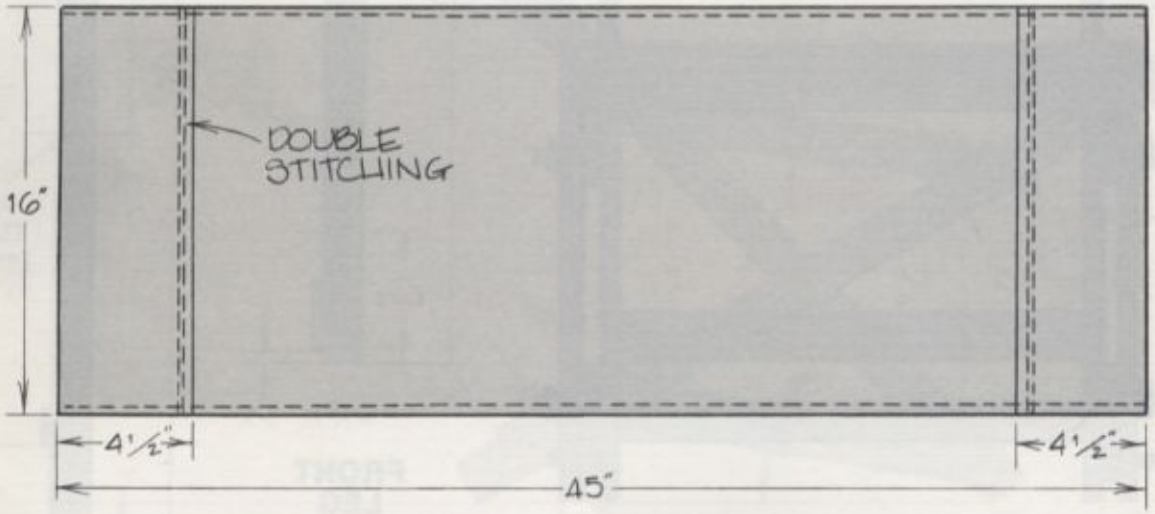
STRETCHER/HANGER JOINERY DETAIL



2*/Use a stop block to cut the rabbets in the ends of the hangers and stretchers precisely the same.*

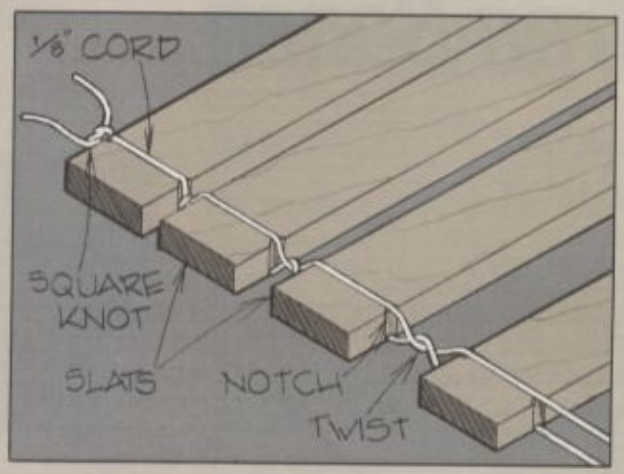
5 ***Sand and finish the parts.*** Sand the parts smooth and round all the corners and edges. If you're going to apply a finish, do it at this time. It's impossible to finish the completed chair because the cloth seat fits over some of the wooden parts.

6 ***Sew the sling.*** Make the sling seat from heavy canvas duck. If you can't sew, have someone do it for you. The sewing required is very simple. As shown in the *Sling Seat Layout,* the seat is 45" long with 4½" long loops at both ends. The only sewing required is a single seam along both sides and a double seam at both loops.



SLING SEAT LAYOUT

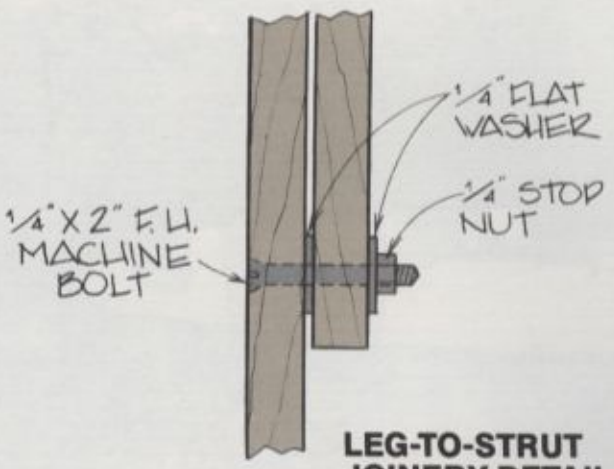
TRY THIS! If you don't have the skills or the inclination to make a canvas sling, you can make one out of woven wooden slats instead. Cut 28 *hardwood* slats, ⅜" x 1½" x 16". "Break" the corners of the slats with sandpaper or a block plane, slightly rounding them. With a rasp, notch the edges of the slats near the ends where cords will cross. Then "weave" the slats together with four ⅛"-diameter, 8' long cords. Use two cords on each side of the wooden-slat sling, twisting them together and winding them around the slats where you have made the notches. Leave a little extra cord (about 1') at both the top and the bottom of the sling, to tie it to the hangers.



7 ***Assemble the chair frame.*** Assemble the back leg and front leg frames, attaching the hangers and stretchers to the legs with wood screws. Check that the frames are square as you assemble them. Countersink the screws so that the heads are flush with the surface of the wood.

Attach the struts to the *inside* surfaces of the front leg frame, using machine bolts, washers, and stop nuts. At each of these pivot joints, put a flat washer in between the legs and the struts to keep them from rubbing. Turn the nuts tight enough to take any play out of the joint, but not so tight that the legs and struts bind.

Next, attach the other ends of the struts to the *outside* surfaces of the back legs. Once again, use machine bolts and put flat washers in between the struts and the legs. When you've finished, check the action of the chair frame. Resting on a flat surface, it should rock back and forth easily. If you pick it up by the hangers, it should fold up easily. (See Figure 3.)

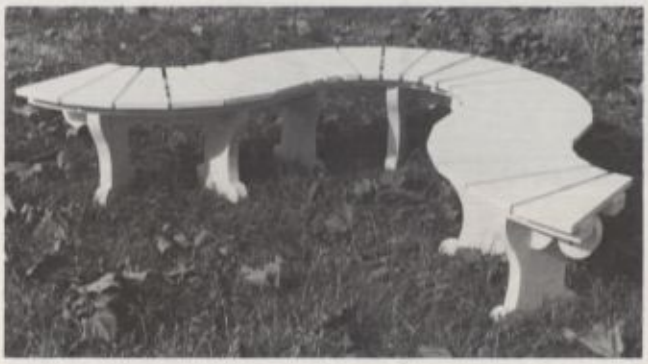


LEG-TO-STRUT JOINERY DETAIL

3/To fold up the chair frame, pick it up by the hangers and bring the hangers together.

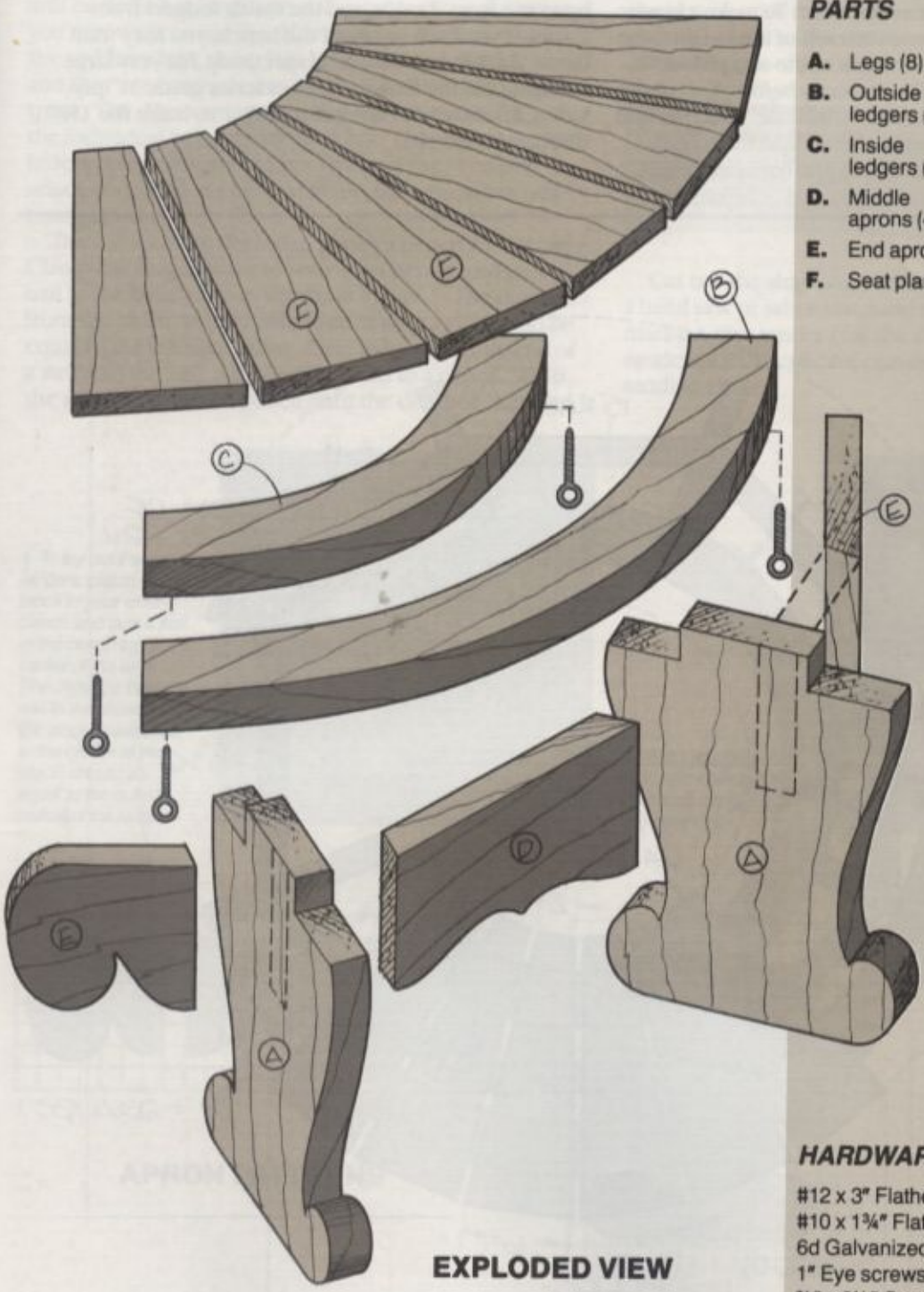
8 ***Install the sling on the frame.*** Loosen one end of the back hanger and remove the screws completely. Slide the sling in place so that one of the loops is around the hanger. Replace the screws in the back hanger, and repeat this procedure for the front hanger. If you've made your sling out of canvas duck, take care that the colored side of the cloth faces up when you install the sling on the chair frame.

Tree Bench



There are few pieces of outdoor furniture that are as magical as the classic "tree bench." A simple, scalloped bench girding a tree seems to turn an ordinary yard into a formal garden. It conjures up visions of ladies in long gowns and dapper gentlemen sharing the shade and each other's company. It invites you to sit a spell and just listen to the wind rustle the leaves. There is a hint of romance about a tree bench, and a promise of tranquility.

This particular tree bench is actually four separate benches. Each bench curves through 90° of a circle. The benches can be hooked together in a ring, or a variety of other configurations. Not only can you arrange the benches to circle a tree, you can make them follow the contours of a walkway or a garden.



EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

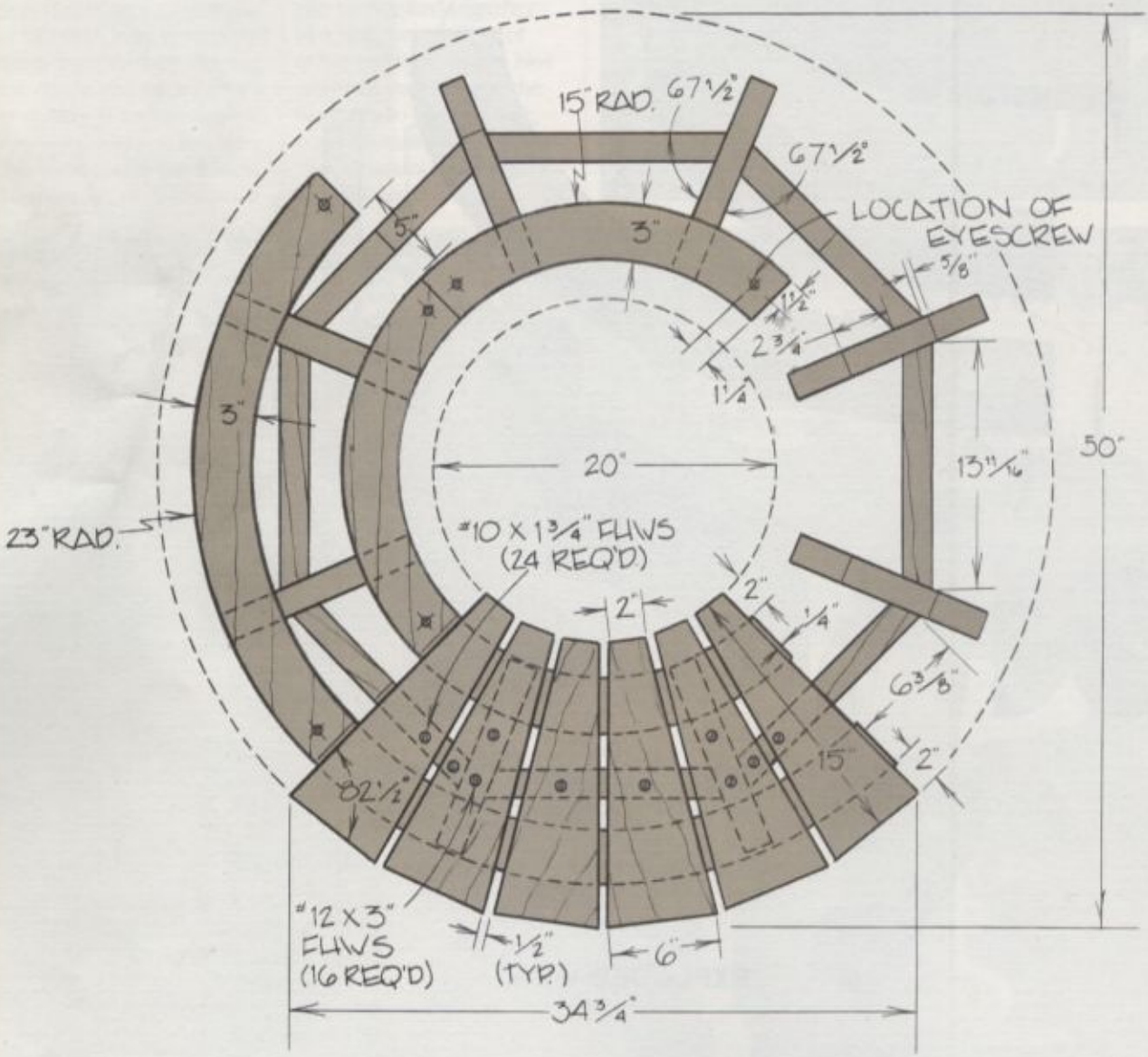
A.	Legs (8)	1½" x 11" x 14¼"
B.	Outside ledgers (4)	1½" x 8½" x 32½"
C.	Inside ledgers (4)	1½" x 6½" x 21¼"
D.	Middle aprons (4)	1½" x 5¼" x 13¹¹⁄₁₆"
E.	End aprons (8)	1½" x 5¼" x 6⅜"
F.	Seat planks (24)	¾" x 6" x 15"

HARDWARE

#12 x 3" Flathead wood screws (64)
#10 x 1¾" Flathead wood screws (24)
6d Galvanized common nails (½ lb.)
1" Eye screws (16)
⅜" x 3½" Carriage bolts (16)
⅜" Flat washers (16)
⅜" Stop nuts (16)

1 *Cut all parts to size.* As shown in our plans, this bench will encircle a small- to medium-sized tree. If your tree is larger than 12" in diameter, you may want to enlarge the benches somewhat. To make a bigger bench, you'll need to increase the radii of the ledgers, the length of the aprons, and the width of the seat planks. To make sure that everything fits correctly *before* you cut the wood, make a new *Top View*, drawn to scale. There should be at least a 3" gap between the bench and the tree.

Cut the various parts to the sizes you have decided upon. Miter the ends of the aprons at 22½°. All of the bench parts can be made from ordinary construction lumber, even the curved ledgers. Our outside ledgers were cut from 2 x 10s, and the inside ledgers from 2 x 8s. If you have enlarged the bench, you may want to use 2 x 12s and 2 x 10s, respectively. For very large benches, cut the ledgers from exterior grade ¾" plywood. Sandwich two pieces together to make the 1½" thickness required.



TOP VIEW

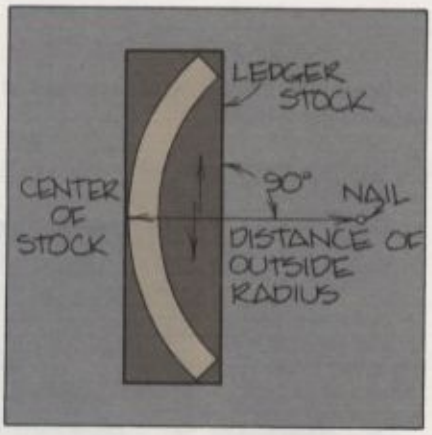
2 *Cut the shape of the frame parts.*

Enlarge the patterns for the legs and aprons, and trace them on the stock. If the tree that these benches will encircle has large, spreading roots above the ground, you may want to use the *Alternate Leg Pattern*. Unlike the ordinary legs, these legs have only one outside "foot", and they are contoured to follow the shape of a large tree trunk. The disadvantage in using the alternate legs is that the individual benches are unstable. They can't be used unless they're assembled in a circle. If the need ever arises, you wouldn't be able to use the benches in other configurations.

Trace the arcs of the ledgers with a pencil and string. Clamp the ledger stock to your workbench, and tack a nail to the bench top as shown in Figure 1. The distance from the nail to the *outside* edge of the stock should be equal to the outside radius of the ledger. Tie one end of a string to the nail, and the other end to a pencil. Wrap the string around the pencil until the distance between the nail and the pencil is the same as the outside radius. Using this arrangement as a giant compass, trace the outside arc. (See Figure 2.) Wrap some more string around the pencil, until the distance between the nail and the pencil is equal to the inside radius, and trace another arc. Mark the ends of the ledger so that its arc is a full 90°.

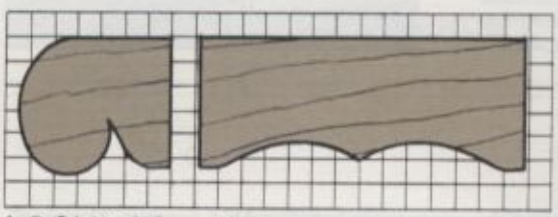
> TRY THIS! Lay out just one inside and one outside ledger. After you cut them out, use them for templates to lay out the other ledgers.

Cut out the shapes of the legs, aprons, and ledgers with a band saw or sabre saw. Sand the parts to remove the saw marks. A disc sander (for the convex curves) and a drum sander (for the concave curves) make short work of these sanding chores.

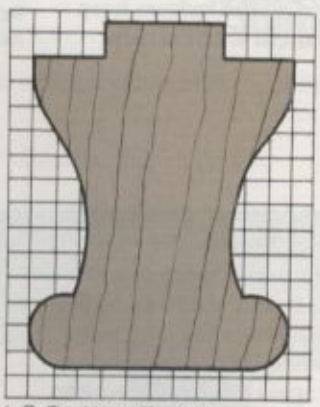


***1**/To lay out the ledgers, clamp the stock to your workbench and tack a nail in the bench top at the center of the arcs. The distance from the nail to the outside of the stock (measured at the center of the stock) should be equal to the outside radius of the ledger.*

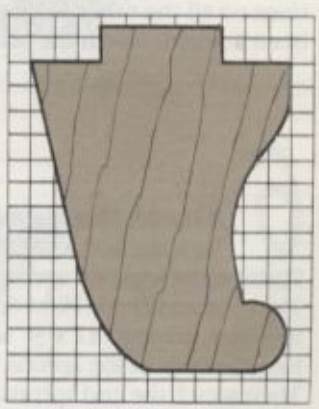
***2**/When you mark the arcs, take care to hold the pencil straight up and down.*



APRON PATTERNS



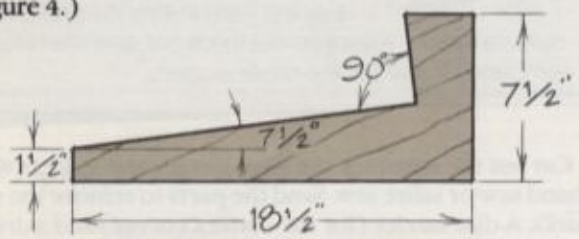
LEG PATTERN



ALTERNATE LEG PATTERN

3

Cut the seat planks. Cut the seat planks to length from 1 x 8 stock. Each plank must be along two opposite edges. To cut this taper, make a simple tapering jig that will cock the planks at 7½° as you pass them through your table saw. Cut *one* edge of all 24 planks. (See Figure 3.) Then cut the second edge, using a piece of waste from the first series of cuts as a spacer to hold the planks at the correct angle. (See Figure 4.)



TAPERING JIG LAYOUT

***3**/Use a tapering jig to taper one edge of the seat planks. Refer to the* Tapering Jig Layout *to see how to make this jig from a piece of scrap wood.*

***4**/When you taper the second edge, use the scrap from the first taper cut as a spacer in the jig to hold the stock at the proper angle to the blade.*

4

Apply a primer to the parts. It's traditional to paint a tree bench white. If you're going to paint your bench, apply a primer at this time. This will seal *all* the surfaces.

5

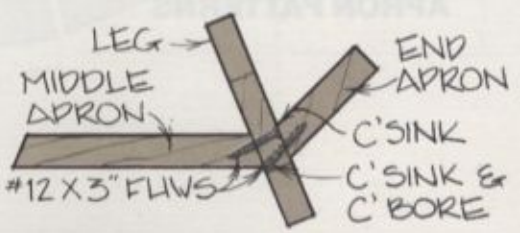
Assemble the bench seats. Carefully position one inside and one outside ledger on your workbench, spacing them 5" apart. To help gauge and hold this spacing, cut 5" long scraps of 1 x 1 and tack them to your workbench. (See Figure 5.) Lay out six seat planks on the ledgers, spaced as shown in the *Top View*. Mark the positions of the planks on the ledgers, then use these marked ledgers as templates to mark the plank positions on all the other ledgers. When all the ledgers have been marked, attach the planks to them with 6d nails.

***5**/Tack small scraps, 5" long, to your bench top to help space the inside and outside ledgers apart. Use additional scraps on the outside of the outside ledger and the inside of the inside ledger to keep the ledgers in place.*

6

Attach the legs and aprons to the seats. Turn the seat assemblies over, bottom sides up. Position the legs and aprons on them, as shown in the *Top View* and *Front View*. Screw the middle aprons to the legs first, driving #12 x 3" screws through the legs and into the ends of the aprons. Countersink the screw heads. Then attach the end aprons, once again driving the screws through the legs and into the aprons. Counterbore *and* countersink these screws. Refer to the *Leg-to-Apron Joinery Detail* for the proper positioning of these screws.

Turn the bench over, and attach the seat to the legs by driving #12 x 3" screws through the seat planks and into the tops of the legs. Finally attach the seat planks to the top edge of the aprons with #10 x 1¾" screws. The positions of these screws are shown in the *Top View*.



LEG-TO-APRON JOINERY DETAIL

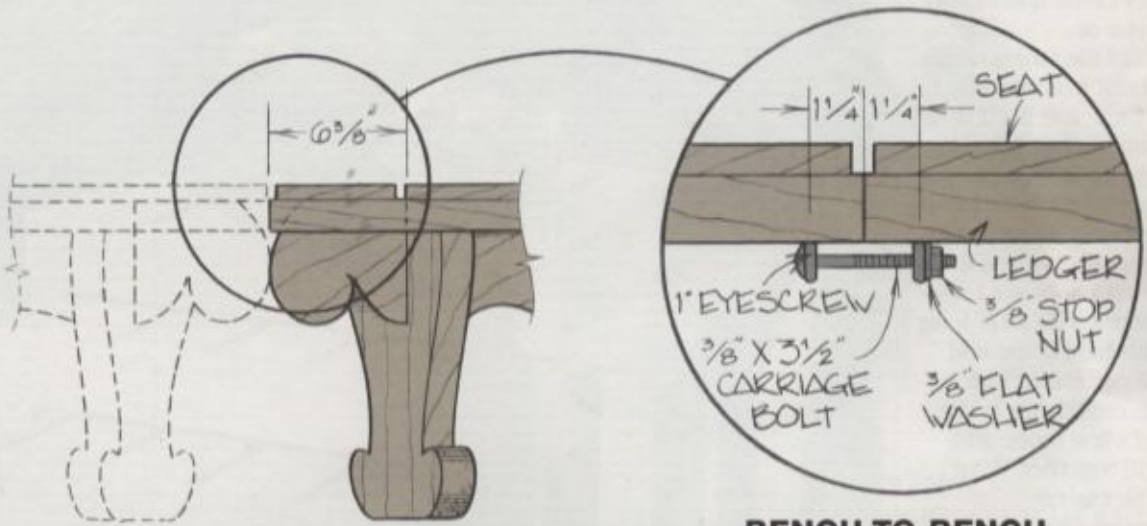
7 ***Paint the benches.*** Paint all the completed benches, taking care to apply paint in between all the spaces. Apply at least two coats.

TRY THIS! Because of all the spaces and irregular surfaces on these benches, it will cut your painting time in half if you use a paint sprayer.

8 ***Bolt the benches together.*** Install eye screws in the underside of the ledgers, where shown in the *Top View* and *Bench-to-Bench Joinery Detail*. Each screw must be placed in *exactly* the same position, near each end of each ledger — 1¼" in from the end, centered in the board.

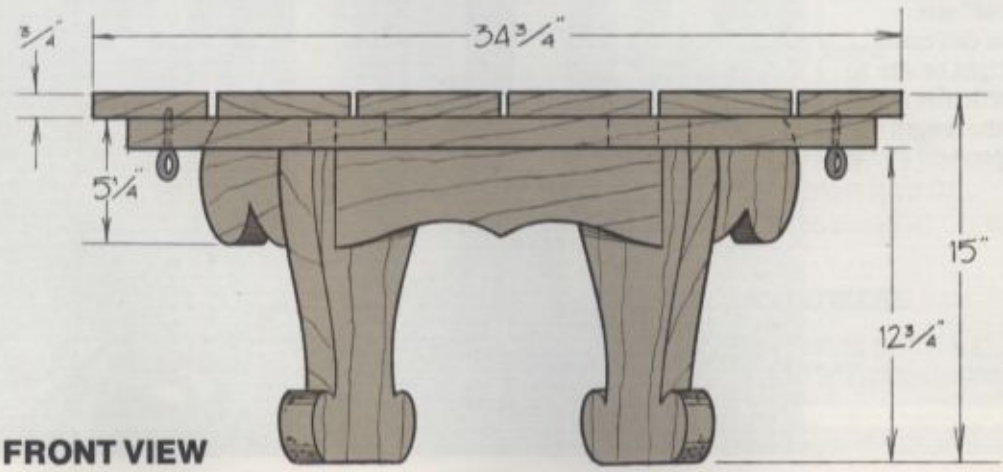
Place the benches end-to-end in whatever configuration you want. Insert a carriage bolt through the adjoining eye screws, as shown in Figure 6. Secure each bolt in place with a stop nut. This will keep the nuts from loosening up.

***6**/Use eye screws and carriage bolts to hold the benches together, as shown. Secure the carriage bolts in place with stop nuts, so that the nuts won't loosen up over time.*



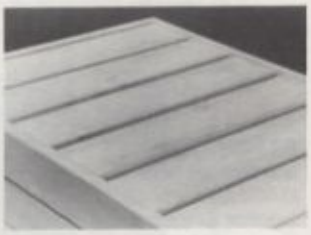
ADJOINING ENDS

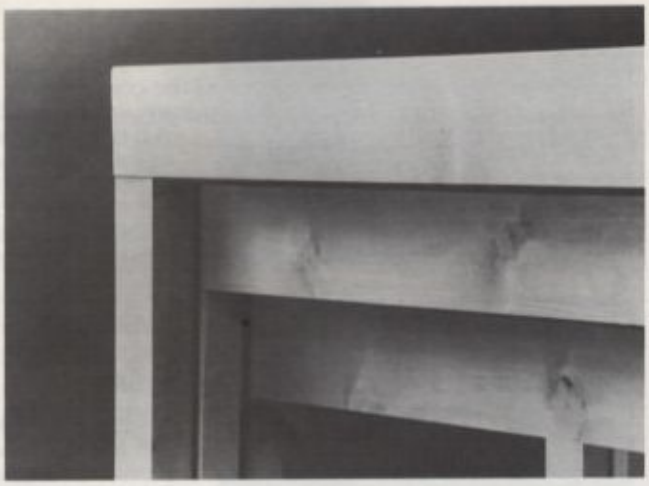
BENCH-TO-BENCH JOINERY DETAIL



FRONT VIEW

Nesting Tables

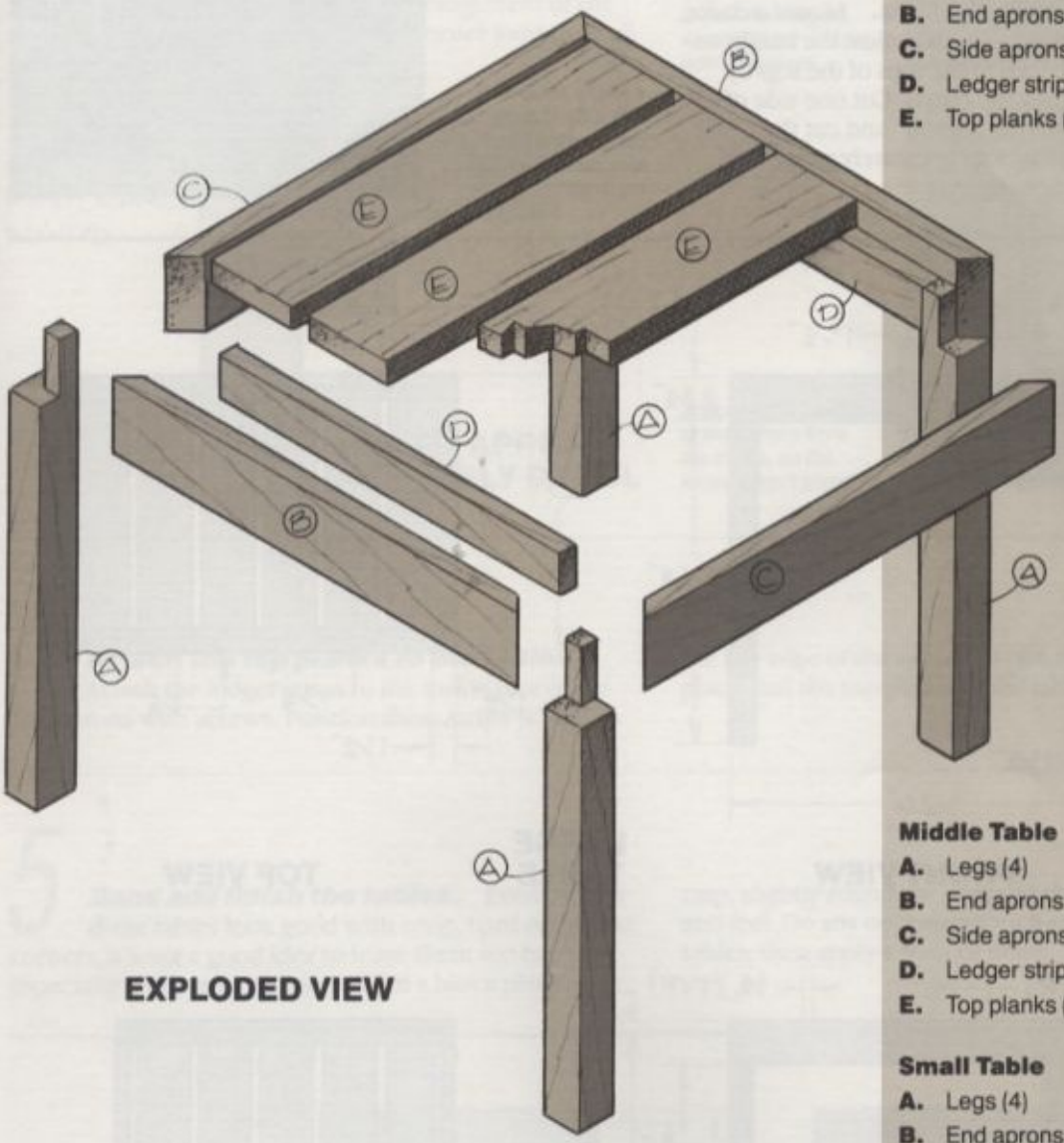




What better place for tables to "nest" than out of doors, on your patio or deck? These three small nesting tables fit inside each other, so they won't take up much space when you don't need them all. But they come apart easily when you do.

Each of the tables can be easily built from standard 1 x 2, 1 x 4, and 2 x 2 dimension lumber. It's also quick to build; you can put together all three tables in an afternoon. To make this project as shown you'll need two 1 x 2s, six 1 x 4s, and three 2 x 2s, all 8′ long. You only have to rip and cut the parts; miter a few boards; cut tenons in the ends of a few more; and put it all together. What could be easier?

It's a versatile project, too. You can build these tables any size you need. As shown here, the tops are "coffee table" height and "side table" size. However, you can easily adjust the height or size to your own particular needs. Just change the length of the legs or aprons.



EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

Large Table

A.	Legs (4)	1½" x 1½" x 23¼"
B.	End aprons (2)	¾" x 2¾" x 26"
C.	Side aprons (2)	¾" x 2¾" x 18"
D.	Ledger strips (2)	¾" x 1½" x 23"
E.	Top planks (6)	¾" x 3½" x 16½"

Middle Table

A.	Legs (4)	1½" x 1½" x 20¼"
B.	End aprons (2)	¾" x 2¾" x 22"
C.	Side aprons (2)	¾" x 2¾" x 18"
D.	Ledger strips (2)	¾" x 1½" x 19"
E.	Top planks (5)	¾" x 3½" x 16½"

Small Table

A.	Legs (4)	1½" x 1½" x 17¼"
B.	End aprons (2)	¾" x 2¾" x 18"
C.	Side aprons (2)	¾" x 2¾" x 18"
D.	Ledger strips (2)	¾" x 1½" x 15"
E.	Top planks (4)	¾" x 3½" x 16½"

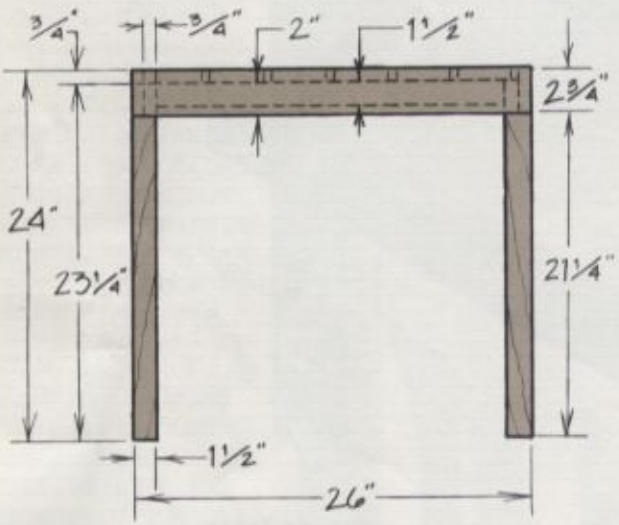
HARDWARE

6d Finishing nails (1 lb.)
#10 x 1¼" Flathead wood screws (48)

1 ***Cut all the parts to size.*** As you cut, carefully organize the parts so that you have one stack for the large table, another for the middle table, and so forth. Miter the ends of the aprons at 45°.

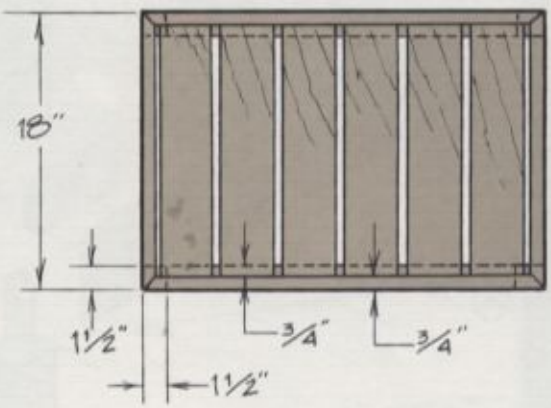
2 ***Cut the tenons in the legs.*** Mount a dado cutter on your table saw, and adjust the height to cut ¾" deep. Cut the tenons in the tops of the legs by making several passes over the cutter. Cut one side of the tenons first, then turn the legs 90° and cut the second side. Use a stop block to accurately gauge the length of each tenon. (See Figure 1.)

1/Make the tenons with a dado cutter, using a stop block to accurately gauge the length.

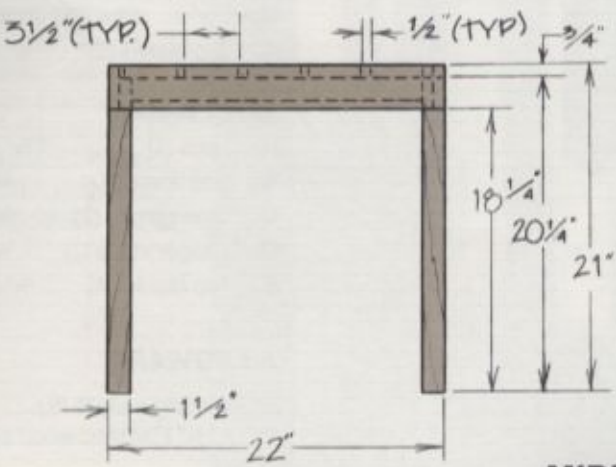


FRONT VIEW

LARGE TABLE

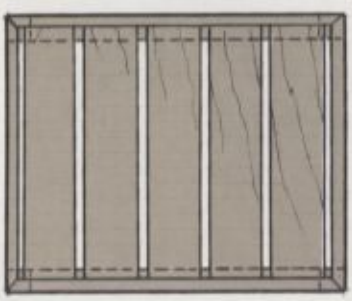


TOP VIEW



FRONT VIEW

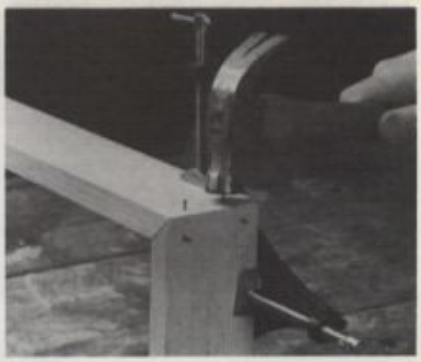
MIDDLE TABLE



TOP VIEW

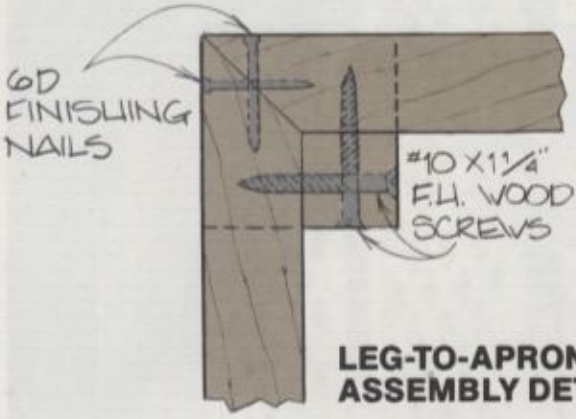
3 ***Assemble the legs and aprons.*** The aprons are assembled like picture frames. To hold them together at the corners, drive finishing nails in from *both* sides. (See Figure 2.) Take care that the nails are positioned so they won't hit one another.

Attach the legs to the assembled aprons by driving the screws in from both sides, just as you did with the finishing nails. (See Figure 3.) This arrangement of the nails and screws will reinforce each corner joint from all possible directions.



2/*Nail the mitered aprons together from* both *directions.*

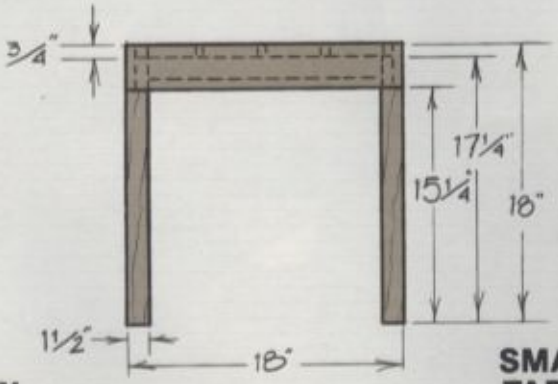
3/*Screw the tenons to the aprons from the* inside, *so the screws don't show.*



LEG-TO-APRON ASSEMBLY DETAIL

4 ***Attach the top planks to the tables.*** Attach the ledger strips to the inside face of the side aprons with screws. Position these strips ¾" below the top edge of the aprons. When the ledger strips are in place, nail the top planks to the table assemblies.

5 ***Sand and finish the tables.*** Even though these tables look good with crisp, hard edges and corners, it's not a good idea to leave them *too* hard — especially if you have children. With a block plane or a rasp, slightly round the edges so they have a softer look and feel. Do any necessary touch-up sanding on the tables; then apply a stain or finish.



FRONT VIEW

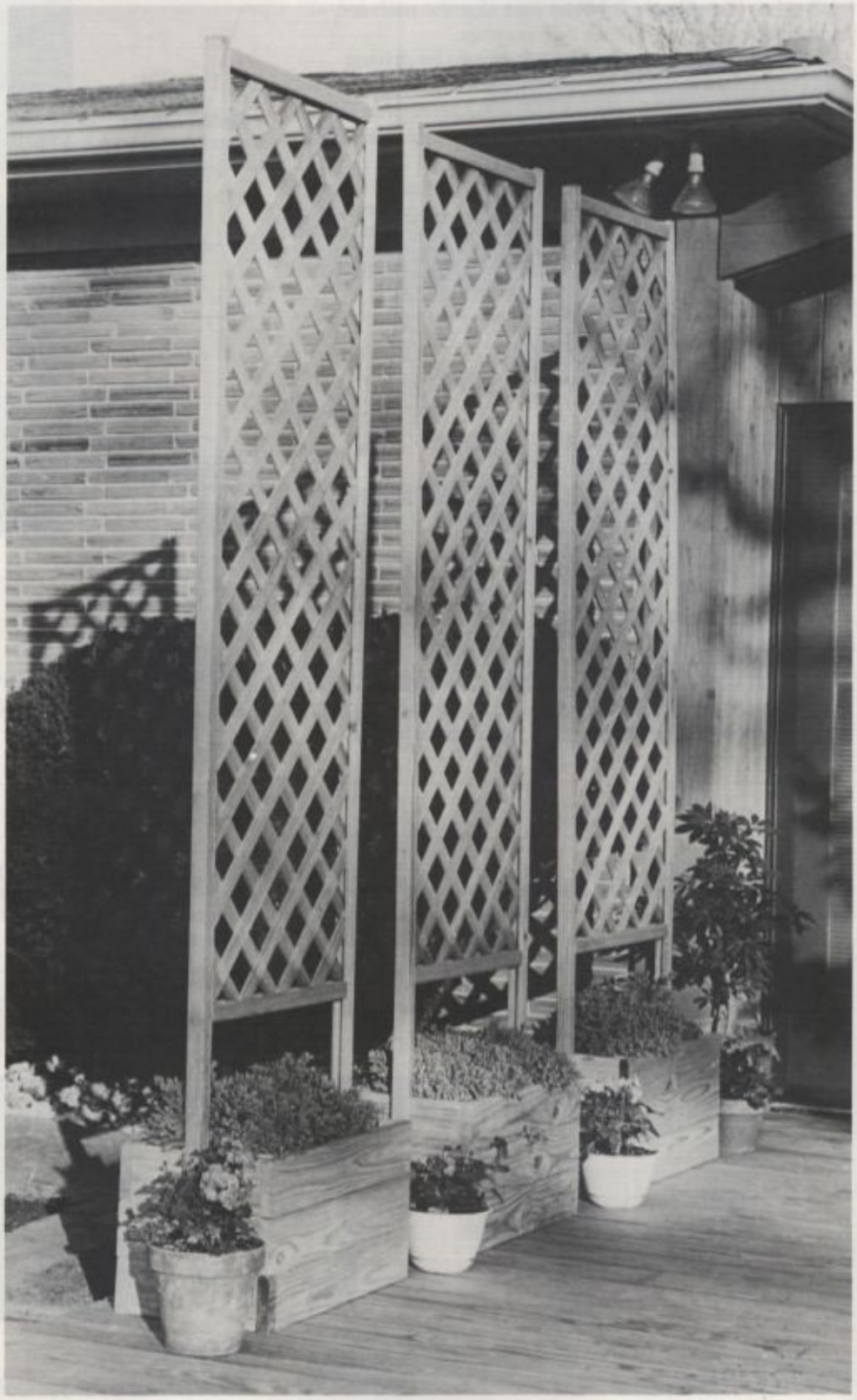
SMALL TABLE

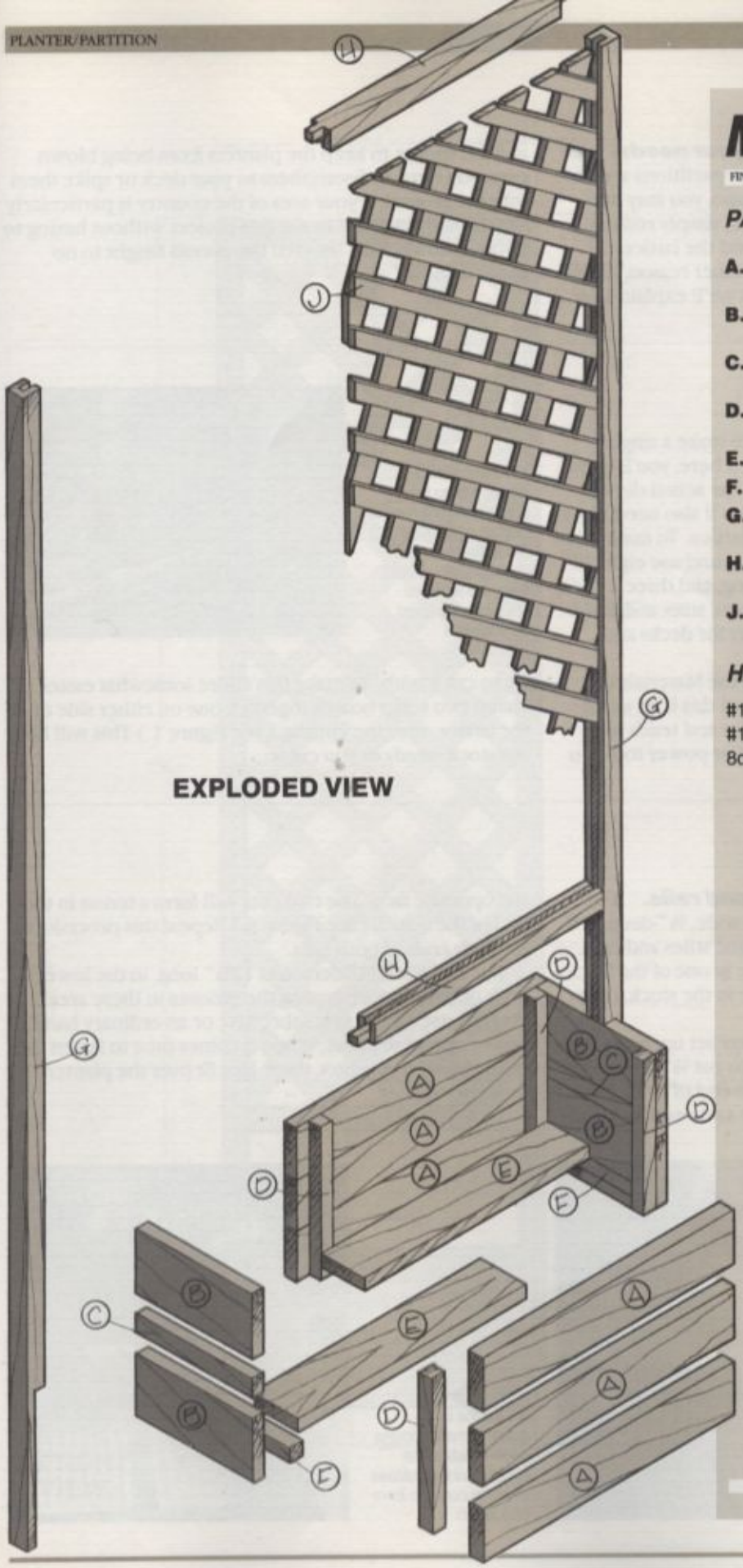
TOP VIEW

Planter/Partition

Would you like a little extra privacy from your neighbors when you're out of doors? Some extra shade? A screen from the wind? Would you like to partition one area of your deck off from another?

This "planter/partition" can provide or do all of those things. It's a simple concept, nothing more than a box with a lattice-work trellis attached to it. The box holds two standard 10" clay pots. When the pots are filled with earth, they weigh the planter/partition down, and help to keep it from blowing over. The upright trellis provides privacy and shade. If you grow climbing plants in the pots, the trellis will fill up with greenery. This, in turn, will provide you with more privacy, more shade, and a more pleasant outdoor environment.





EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

A.	Front/back planks (6)	1 1/16" x 4 1/4" x 24 1/8"
B.	Top/bottom end planks (4)	1 1/16" x 5 1/2" x 11 1/8"
C.	Middle end planks (2)	1 1/16" x 1 3/4" x 11 1/8"
D.	Corner blocks (4)	1 1/16" x 1 1/16" x 12 3/4"
E.	Bottom planks (2)	1 1/16" x 4" x 22"
F.	Bottom supports (2)	1 1/16" x 1 1/16" x 9"
G.	Trellis frame stiles (2)	1 1/2" x 1 1/2" x 96"
H.	Trellis frame rails (2)	1 1/2" x 1 1/2" x 24 1/8"
J.	Lattice	1/2" x 24" x 72"

HARDWARE

#10 x 1 3/4" Flathead wood screws (6)
#12 x 2 1/2" Flathead wood screws (4)
8d Finishing nails (1/2 lb.)

1 *Adjust the design to suit your needs.* As we designed them, these planter/partitions are 96" high. If you have a cover over your patio, you may not want them that high. To shorten them, simply reduce the length of the trellis frame stiles and the lattice.

You may want them shorter for another reason. At 96" high, the lattice catches the wind. As we'll explain later in this chapter, to keep the planters from being blown over, you need to fasten them to your deck or spike them into the ground. If your area of the country is particularly windy, or if you want to use this project without having to fasten it down, then shorten the overall height to no more than 72".

2 *Cut the parts to size.* To make a single planter/partition, as we show it here, you'll need three 10' lengths of "5/4 decking." (The actual dimensions are 1 1/16" thick x 5½" wide.) You'll also need three 2 x 2s, 8' long, and a 2' x 6' sheet of lattice. To make a set of three, as shown in the photograph, purchase eight 10' lengths of decking, eight 2 x 2s, 8' long, and three 2' x 6' sheets of lattice. You can find all of these sizes and materials wherever you buy treated lumber for decks and patio covers.

1/When cutting lattice, clamp two scrap boards together, one on either side of the lattice, near the cutline. This will help keep the material from coming apart as you cut it.

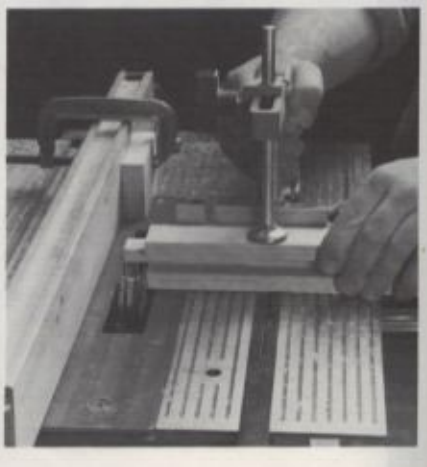
Cut the parts to the sizes shown in the Materials List. If you need to cut the lattice, you'll find this is an awful chore. The lattice bounces and wiggles and tends to come apart no matter what hand tool or power tool you try to cut it with. To make this chore somewhat easier, clamp two scrap boards together, one on either side of the lattice, near the cutline. (See Figure 1.) This will hold the stock steady as you cut it.

3 *Cut joinery in the stiles and rails.* The lattice is held in place by a ½"-wide, ¾"-deep groove that runs the length of the frame stiles and rails. Using a dado cutter, make this groove in one of the faces on the 2 x 2 stock. Center the groove in the stock. (See Figure 2.)

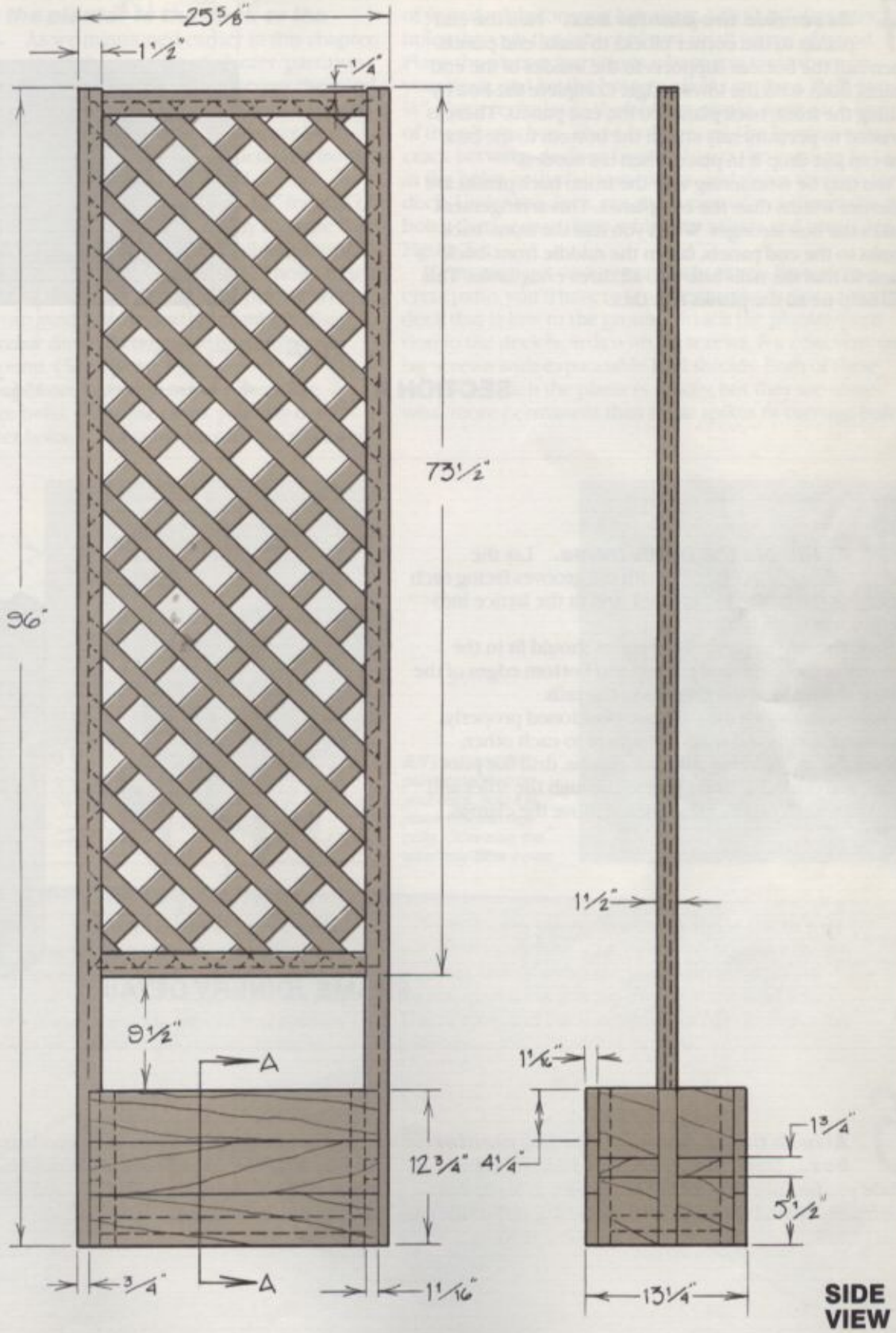
While you still have your dado cutter set up, make the tenons in the rails. Adjust the cutter to cut ½" deep, then cut a ¾"-wide, ½"-deep, rabbet in the end of a rail. Turn the rail over and repeat the cut in the same end, but on the opposite face. The two cuts will form a tenon in the end of the board. (See Figure 3.) Repeat this procedure for both ends of both rails.

Cut lap joints, ¾" deep and 12¾" long, in the lower ends of the stiles, removing the grooves in these areas. You can use a band saw, sabre saw, or an ordinary hand saw to cut these joints. When it comes time to fasten the trellis frame to the box, these laps fit over the planter box assembly.

2/With a dado cutter, make a groove down the length of the stiles and the rails.

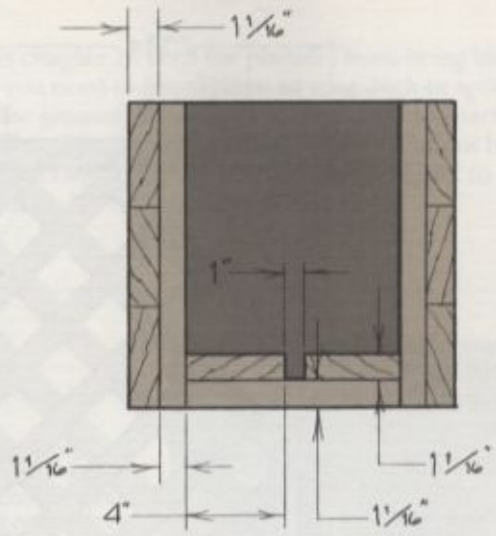


3/Use the dado cutter to make tenons on the ends of the rails. Make two passes over the cutter to form one tenon.


25 5/8"
1 1/2"
1/4"
73 1/2"
96"
9 1/2"
A
A
12 3/4"
4 1/4"
3/4"
11/16"
1 1/2"
1 1/16"
1 3/4"
5 1/2"
13 1/4"
FRONT VIEW
SIDE VIEW

4 ***Assemble the planter box.*** Nail the end planks to the corner blocks to make end panels. Then nail the bottom supports to the insides of the end panels, flush with the lower edge. Complete the box by nailing the front/back planks to the end panels. There is no need to permanently attach the bottom to the box; you can just drop it in place when it's needed.

You may be wondering why the front/back planks are different widths than the end planks. This arrangement makes the box stronger. When you nail the front/back planks to the end panels, fasten the middle front/back plank so that the nails bite into all three end planks. This will help tie all the planks together.

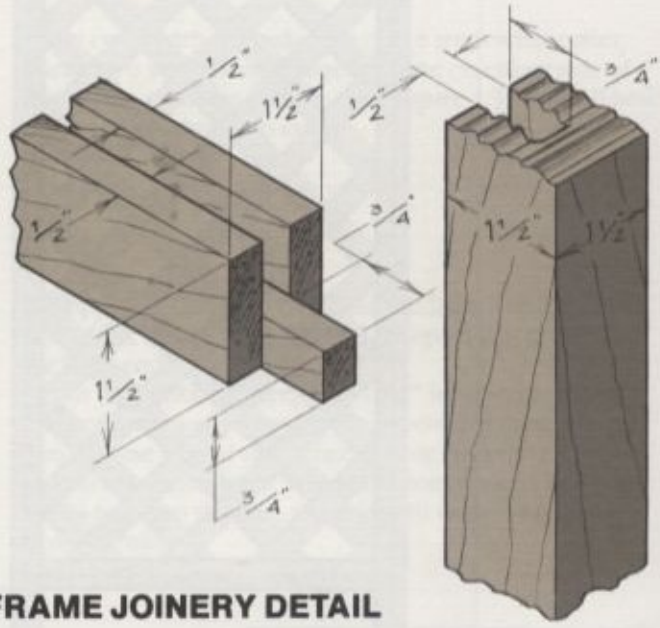


SECTION A

5 ***Assemble the trellis frame.*** Lay the stiles on a flat surface with the grooves facing each other. Put the lattice in between, and fit the lattice into the grooves in each stile.

Slide the rails in place. The tenons should fit in the grooves of the stiles, and the top and bottom edges of the lattice should fit in the grooves in the rails.

Make sure that all the parts are positioned properly, and that the rails and stiles are square to each other. Secure the trellis frame with bar clamps, drill the pilot holes, and drive 2½" long screws through the stiles and into the tenons on the rails. Then remove the clamps.



FRAME JOINERY DETAIL

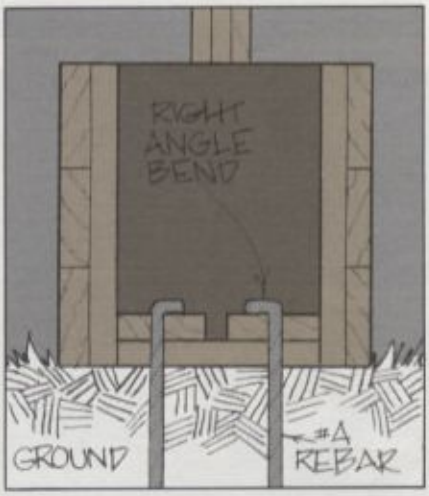
6 ***Attach the trellis frame to the planter box.*** Have a helper hold the frame upright while you position the planter box under it. Make sure the frame is plumb in relation to the box, and the stiles are centered on the end panels. Then clamp the frame to the box with C-clamps or wood clamps. Fasten the trellis frame to the planter box with 1¾" long wood screws, and remove the clamps.

7 *Secure the planter to the deck or the ground.* As we mentioned earlier in this chapter, you may want to attach the completed planter/partition to your deck or stake it to the ground to prevent the wind from blowing it over. This does not have to impair the portability of the project; you can secure the planter/partition in such a way that you can still easily detach it from the deck or the ground and move it around.

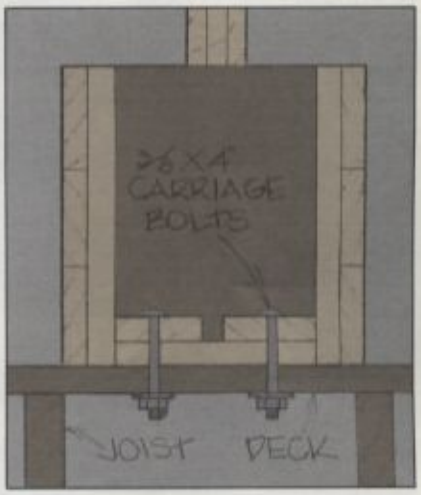
To secure the planter to the ground, use 18" lengths of #4 concrete reinforcing rod, or "rebar." Buy the type that has a small bend at one end, or have the building supply store put bends in them for you. Drill two ½" holes in the bottom planks near each end. Arrange the planter where you want it in your yard, lay the bottom planks in place; then drive the rebar down through the bottom planks and into the ground. (See Figure 4.)

To secure the planter/partition to your deck, use ¼" x 4" carriage bolts. (In some cases, you may need longer or shorter bolts. It's best to measure the thickness of your deck before you buy them.) Drill ¼"-diameter holes through the center of two small scraps of wood. Place the planter/partitions where you want them on your deck, and lay the bottom planks in place. Drill two ¼"-diameter holes in the bottom planks, near each end of the planter box. These holes should be located over a crack between decking boards. Insert the carriage bolts in the holes in the bottom planks, and down through the deck. Under the deck, put the scraps of wood over the bolts, then secure them with flat washers and nuts. (See Figure 5.)

If you can't get under your deck, or you have a concrete patio, you'll have to try other methods. For a wooden deck that is low to the ground, attach the planter/partition to the deck boards with lag screws. For concrete, use lag screws with expandable lead shields. Both of these methods attach the planters solidly, but they are somewhat more permanent than rebar spikes or carriage bolts.



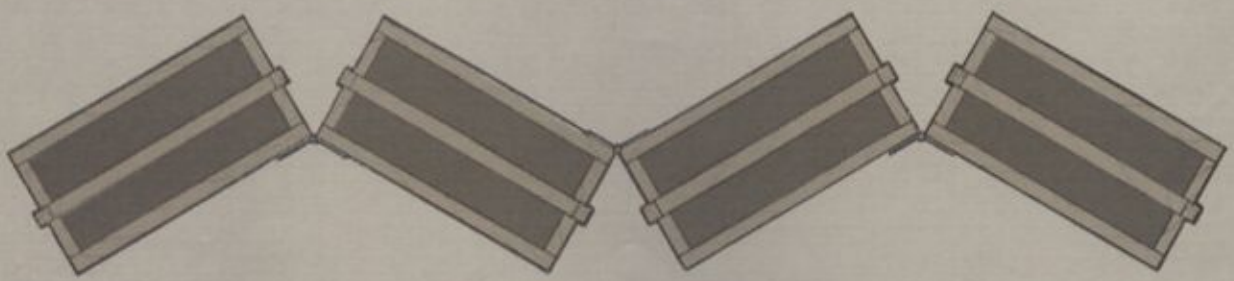
4/If you place the planter/partition in your yard, stake it to the ground with rebar.



5/If you place the planter/partition on your deck, hold it in place with carriage bolts. Otherwise, the wind may blow it over.

TRY THIS! There are two things you can do to make the planter/partitions more stable in a stiff breeze *without* staking or bolting them down. The first is to make the planter boxes wider, so that they hold more pots. This adds weight and surface area to the base. However, it also takes up more patio space.

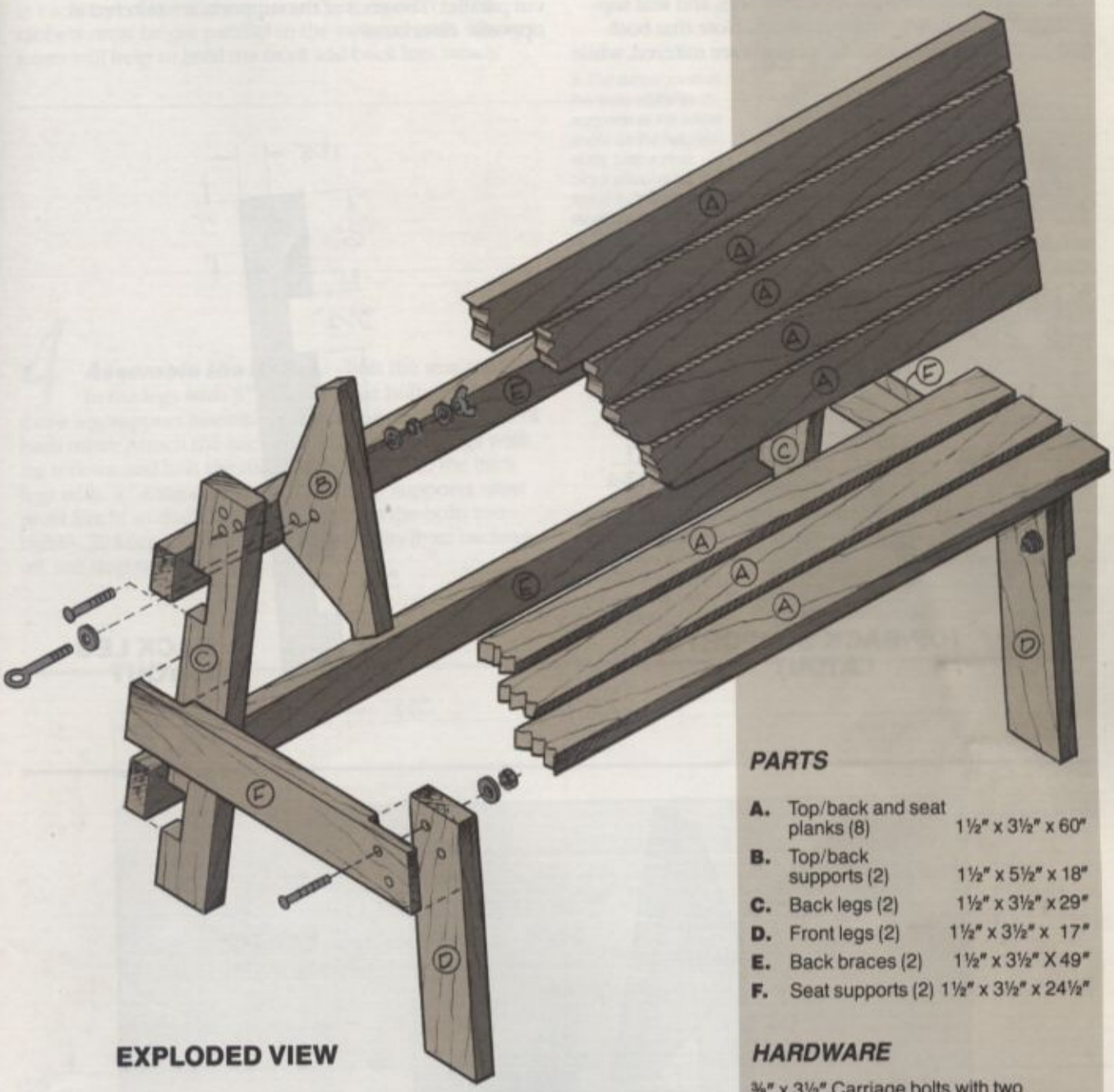
To make the planter/partitions more stable *without* increasing their size, hinge the planter boxes together with 3" strap hinges. Then arrange the planter/partitions in a zig-zag or staggered line. The hinges *and* the arrangement help to make the entire assembly harder to tip over.



Garden Table/Bench

This unique outdoor furniture project serves two purposes: With the back tilted vertically, it's a decorative garden bench. Tilt the back horizontally, and it becomes a table with a bench seat. And if you happen to make *two* of these table/benches, you can hook them together in the table position to make a full-size picnic table.

We've designed this table/bench to be both easy and inexpensive to make. With the exception of the back/top supports, the entire project is made from 2 x 4s, and held together with decking nails and carriage bolts. The only "fancy" pieces of hardware are the eye-bolts that lock the back/top in the bench or table positions.



EXPLODED VIEW

Materials List

FINISHED DIMENSIONS

PARTS

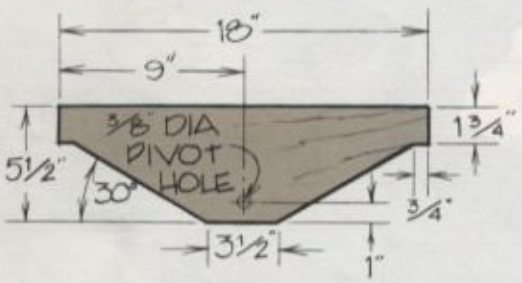
A.	Top/back and seat planks (8)	1½" x 3½" x 60"
B.	Top/back supports (2)	1½" x 5½" x 18"
C.	Back legs (2)	1½" x 3½" x 29"
D.	Front legs (2)	1½" x 3½" x 17"
E.	Back braces (2)	1½" x 3½" X 49"
F.	Seat supports (2)	1½" x 3½" x 24½"

HARDWARE

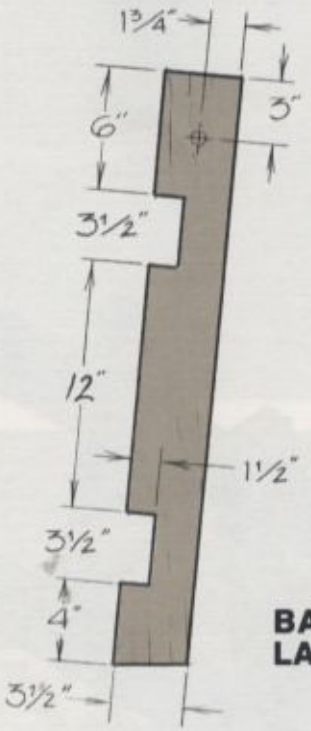
- ⅜" x 3½" Carriage bolts with two washers and two stop nuts each (2 sets)
- ⅜" x 3" Carriage bolts with washers and nuts (8 sets)
- ⅜" x 3" Lag screws and washers (8 sets)
- ⅜" x 5" Eyebolts with two washers and one wing nut each (2 sets)
- 10d Decking nails (¼ lb.)

1 *Cut all the parts to their proper size.* Cut the parts to the sizes shown in the Materials List. Miter the ends of the back legs, front legs, and seat supports at 85°, as shown in the drawings. Note that *both* ends of the front legs and the supports are mitered, while one end of the back is cut square and the other mitered. Furthermore, the mitered ends of the front legs must be cut parallel. The ends of the supports are mitered in opposite directions.

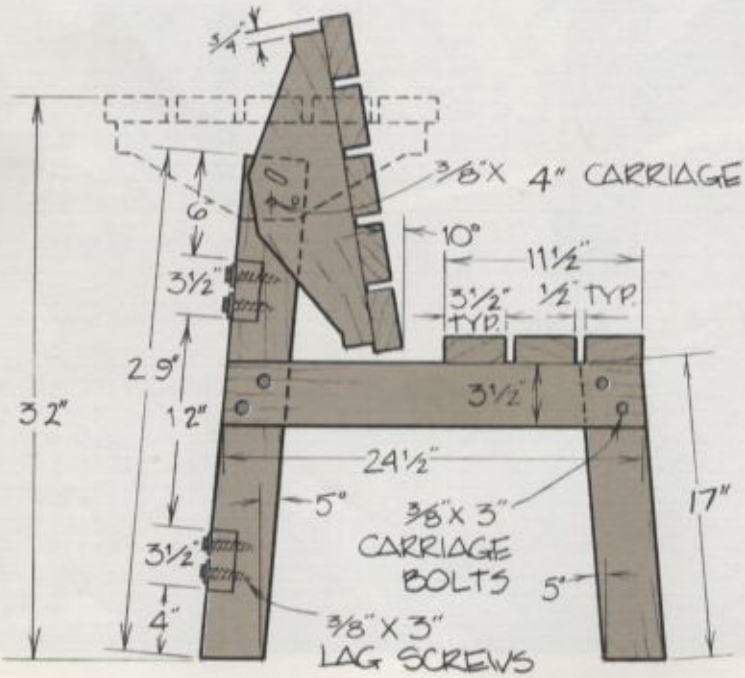
2 *Shape the back legs and the back/top supports.* Cut the 1½"-deep, 3½"-long notches in the back legs using a band saw or sabre saw. Also, cut out the shapes of the back/top supports. Drill ⅜" pivot holes in the legs and the supports. *Do not,* however, drill the lock holes just yet.



TOP/BACK SUPPORT LAYOUT



BACK LEG LAYOUT



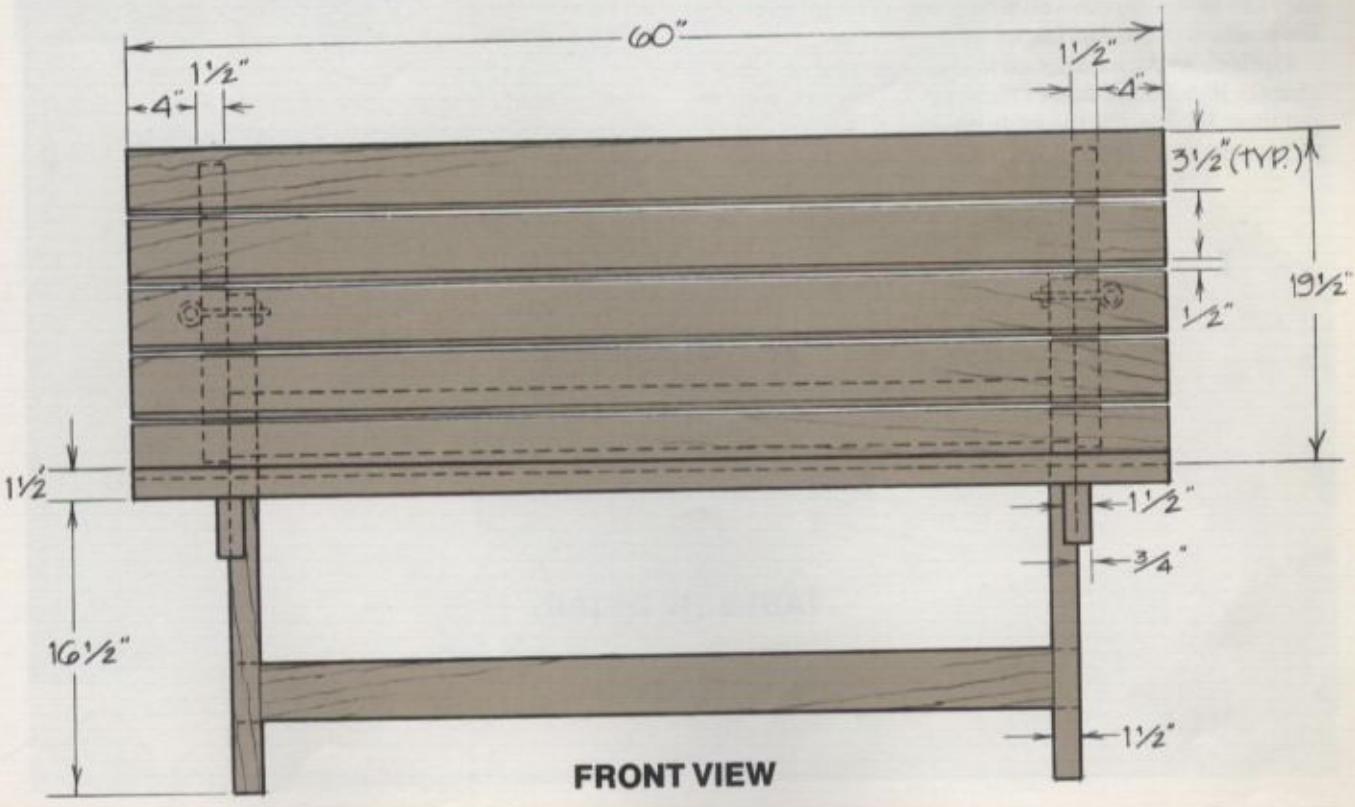
SIDE VIEW

3 ***Cut the rabbet joints in the seat supports.*** Using a dado cutter, cut rabbet joints in each end of the seat supports. (See Figure 1.) The rabbets must be cut parallel to the mitered ends. These joints will help to hold the front and back legs steady.

1/Cut rabbet joints in the ends of the seat supports at the same angle as the mitered ends. Use a stop block attached to the fence to gauge the length of the rabbets.

4 ***Assemble the frame.*** Bolt the seat support to the legs with 3"-long carriage bolts. Remember, these leg/support assemblies should be mirror images of each other. Attach the back braces to the back legs with lag screws, and bolt the top/back supports to the back legs with 4"-long carriage bolts. These supports must pivot freely, so don't tighten the nuts on the bolts too tightly. To keep the nuts on the pivot bolts from backing off, use stop nuts. (See Figure 2.)

2/Use stop nuts on the pivot bolts. These special nuts will not work loose when you change the position of the top/back.



5 *Attach the top/back and the seat planks.*

Clamp the top/back support in a horizontal position. Then nail the top/back and the seat planks in place. Use a spacer made from scrap wood to get the planks properly positioned. Remember, the spiral decking nails that we recommend are made to stay put. (See Figure 3.) They will be hard to remove if you make a mistake — even if you don't drive the nails all the way into the boards.

***3**/Attach the planks to the frame with 10d decking nails. These spiral nails "screw" into the wood when you hammer them in, so they stay tight.*

6 *Install the "lock pins."*

Place the assembled table/bench on a flat, level surface. Using a carpenter's level, adjust the position of the top/back so that it's perfectly horizontal; then clamp it in place. About 1½" above the pivot bolts, drill ⅜"-diameter holes through the back legs, then through the supports.

Loosen the clamps, and readjust the position of the top/back so that it's in the bench position, 10° off vertical. Tighten the clamps again to hold it in place. Using the lock holes in the legs as pilots, drill another set of lock holes through the supports. (See Figure 4.) Remove the clamps, and insert eyebolts as "lock pins" in the lock holes. Hold the eyebolts in place with wing nuts, so that they can be easily removed whenever you want to change the position of the top/back.

***4**/You should make two sets of lock holes in the supports, but only one set in the legs. Use the holes in the legs as "pilots" to drill the second set of holes in the supports.*

Option: As we mentioned in the beginning of this chapter, if you make *two* of these table/benches, you can put them together in the table position to make a full-size picnic table. However, you'll need to make two simple "ties" to hold them together. As shown in the working drawings, these ties fasten to the top/back supports, underneath the table tops.

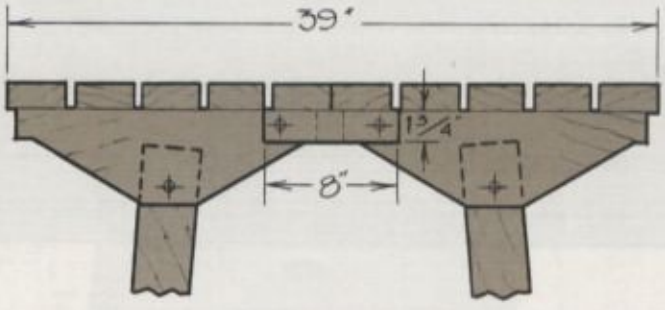
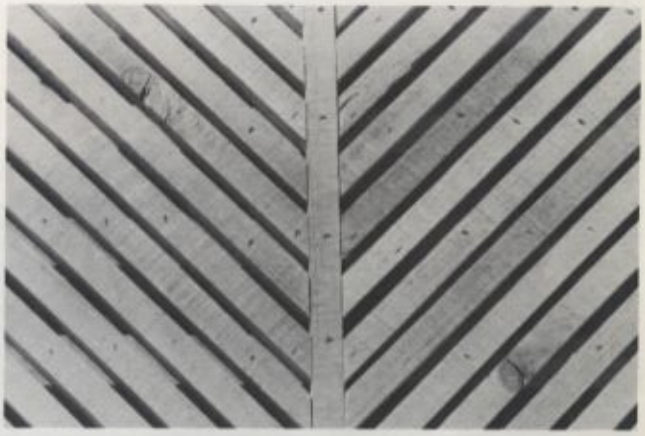


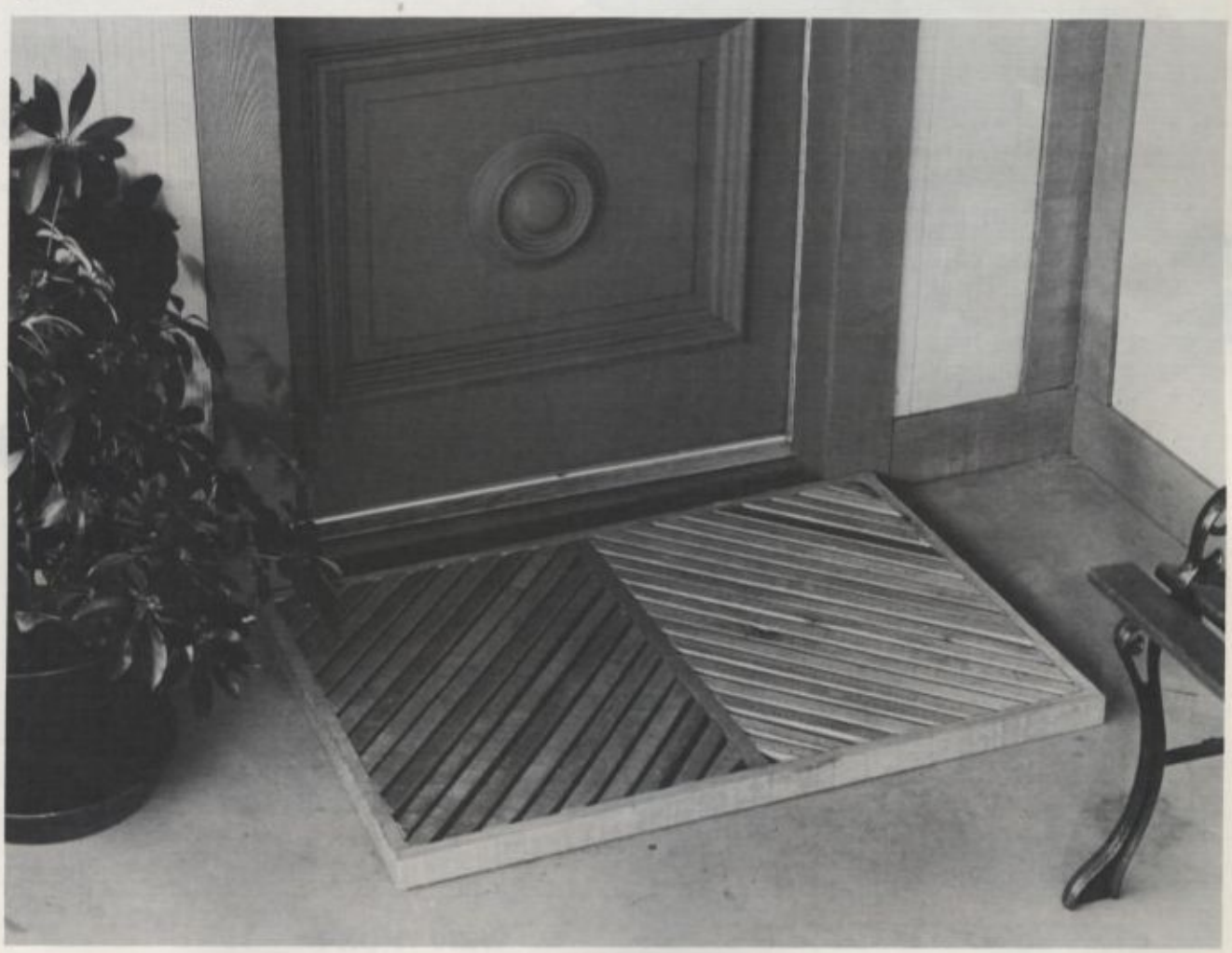
TABLE TIE DETAIL

Cedar Doormat

Make a doormat from cedar wood? Sure — what better material is there for an item that gets so much abuse? Wood is durable, attractive, and easy to clean. The corners and edges of the rough-cut boards make effective scrapers that remove the dirt from your shoes. The dirt falls between the boards where it remains out of sight until you pick up the mat and sweep it away. To clean the mat, just hose it off.

This project has other uses besides wiping your feet. Lay it under an outdoor spigot or fountain to prevent the ground from getting muddy. Make a rustic walkway by setting several mats end-to-end. You can even make a patio by arranging a number of mats on a level bed of sand and gravel.





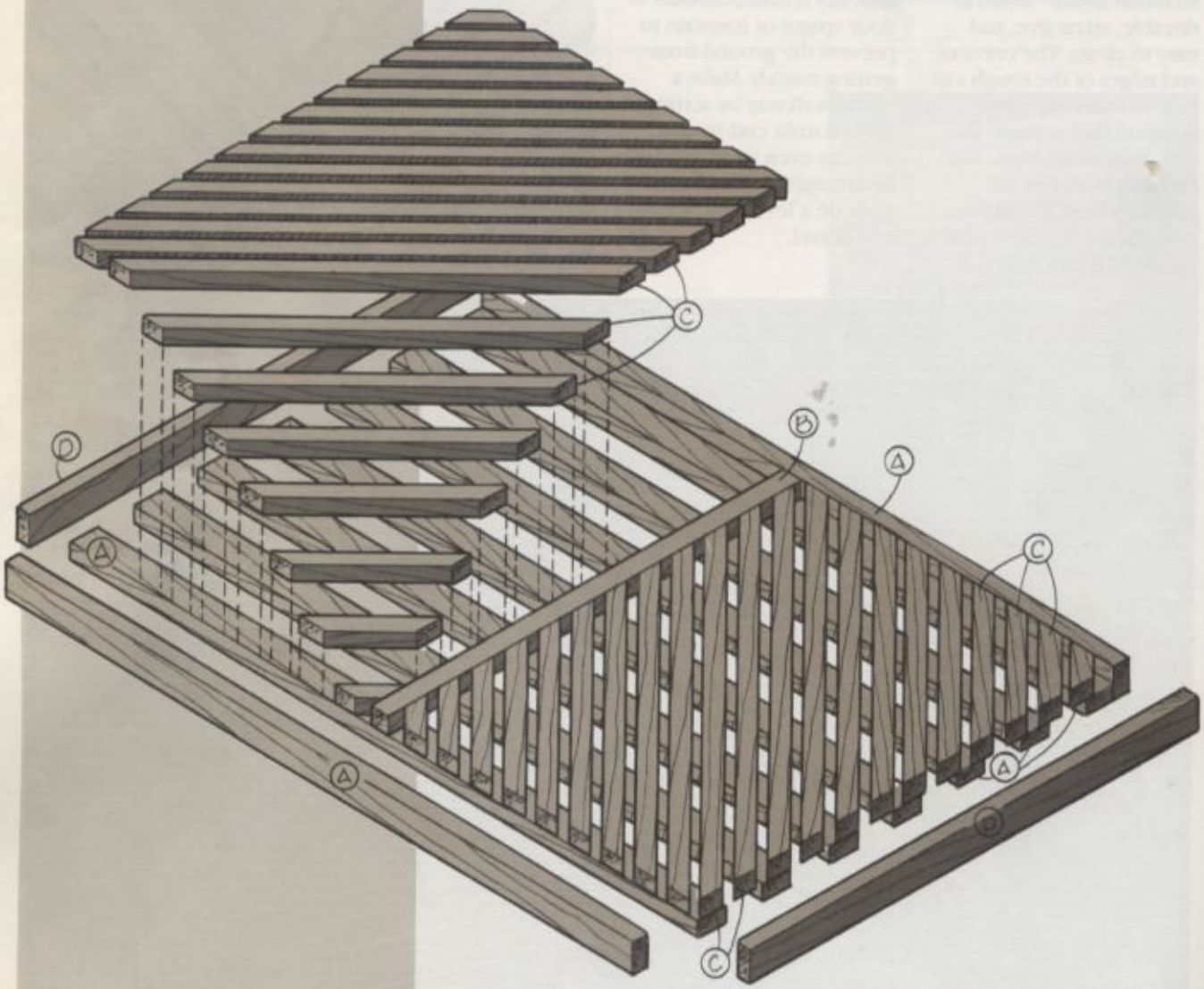
Materials List

FINISHED DIMENSIONS

PARTS

A.	Rails (9)	¾" x 1½" x 34½"
B.	Crossmember	¾" x 1" x 22½"
C.	Diagonals (total length)	¾" x 1" x 720"*
D.	Stiles (2)	¾" x 1½" x 24"

**This includes sufficient stock for waste.*



EXPLODED VIEW

HARDWARE

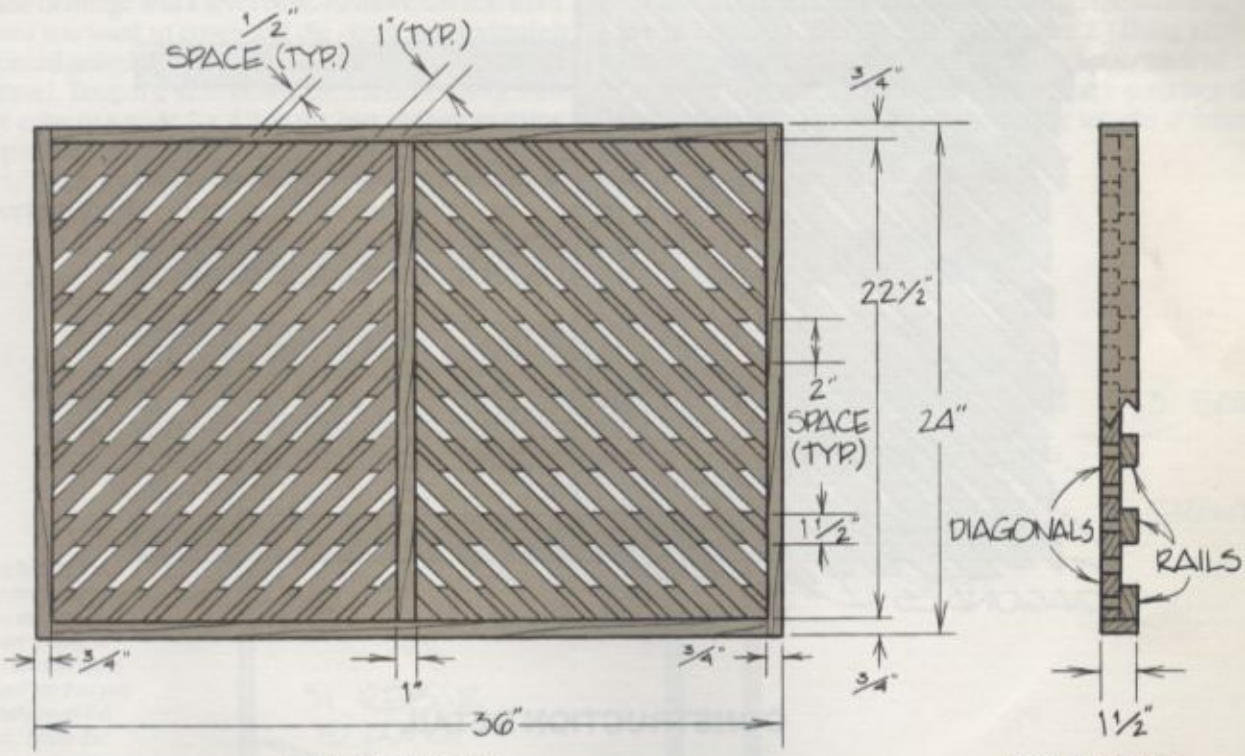
4d Galvanized nails (¼ lb.)
8d Galvanized nails (¼ lb.)

1 ***Cut the parts to size.*** Choose the wood you want to use for the mat. Since the parts are narrow and relatively small, you may be able to make the mat from the scraps left over from a fence or deck project. However, no matter what wood you use, make sure that at least one face of the boards is *rough-cut*. This rough surface makes a better scraper and removes the dirt from your shoes more effectively than wood that has been surfaced smooth on both faces. This is why we recommend that you use cedar — western red cedar is commonly sold with one face rough-cut.

Rip and cut the rails, stiles, and crossmember to the sizes shown in the Materials List. Rip the total length of stock you'll need to make the diagonals, but don't cut the diagonals to length just yet.

2 ***Assemble the base rails and crossmember.*** Carefully lay out the seven *base* rails on a large scrap of plywood or particle board. To keep them in place, temporarily tack both ends of each rail to the scrap. Lay the crossmember in place and fasten it to the base rails with 4d nails.

TRY THIS! If you're making more than one of these mats for a walkway or a patio, you may want to make a plywood *template*. Instead of tacking the rails to a plywood scrap, nail blocks of wood to the plywood to position the rails and keep them in place while you build each mat. This will not only save you the trouble of tacking and untacking the rails; it will ensure that all the mats you make are exactly the same size.



FRONT VIEW **SIDE VIEW**

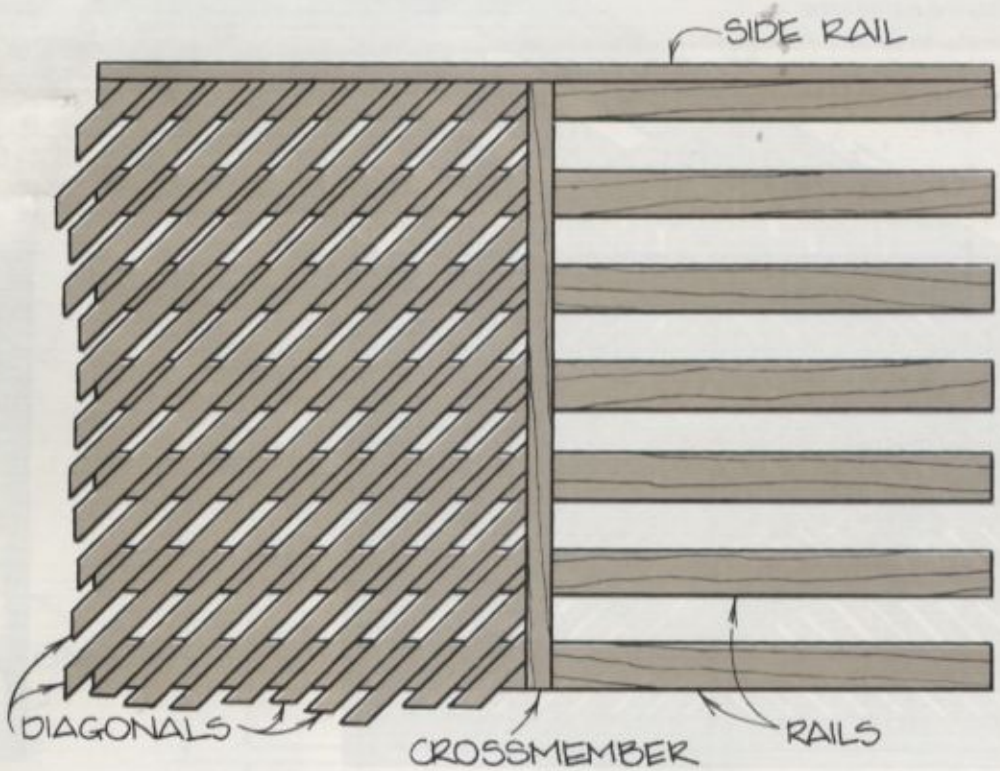
3 *Attach one side rail to the rail/crossmember assembly.* Attach *one* side rail (it doesn't matter which one) to the assembly with 8d nails. The rough-cut face should be turned to the *outside*. Don't attach the other side rail until after you've cut and trimmed the diagonals.

TRY THIS! If you wish, use 8d spiral decking nails to attach the side rails and stiles. These will not pull out as easily as common nails. However, you'll have to drill pilot holes for these decking nails to prevent them from splitting out the brittle cedar stock.

4 *Attach the diagonals to the rail/crossmember assembly.* Miter one end of some diagonal stock. Lay it in place on the assembly with the mitered end butting against the crossmember or side rail and the rough-cut face *up*. Mark the length, then cut the diagonal ¼"-½" *longer* than what you need, mitering the other end. Tack the diagonal you have just cut to the rails with 4d nails.

Repeat this process for all of the diagonals. (After you attach a few diagonals, you can remove the nails that tack the rails to the plywood scrap.) The ends of the diagonals should hang over the rails, as shown in the *Construction Detail*. Don't worry that the diagonals are too long or that they're uneven; they won't be after you trim them. When you've tacked all of the diagonals in place, and are sure that they are positioned properly, drive the nails home.

TRY THIS! Use a scrap of ½"-thick lumber as a gauge to help space the diagonals evenly.



CONSTRUCTION DETAIL

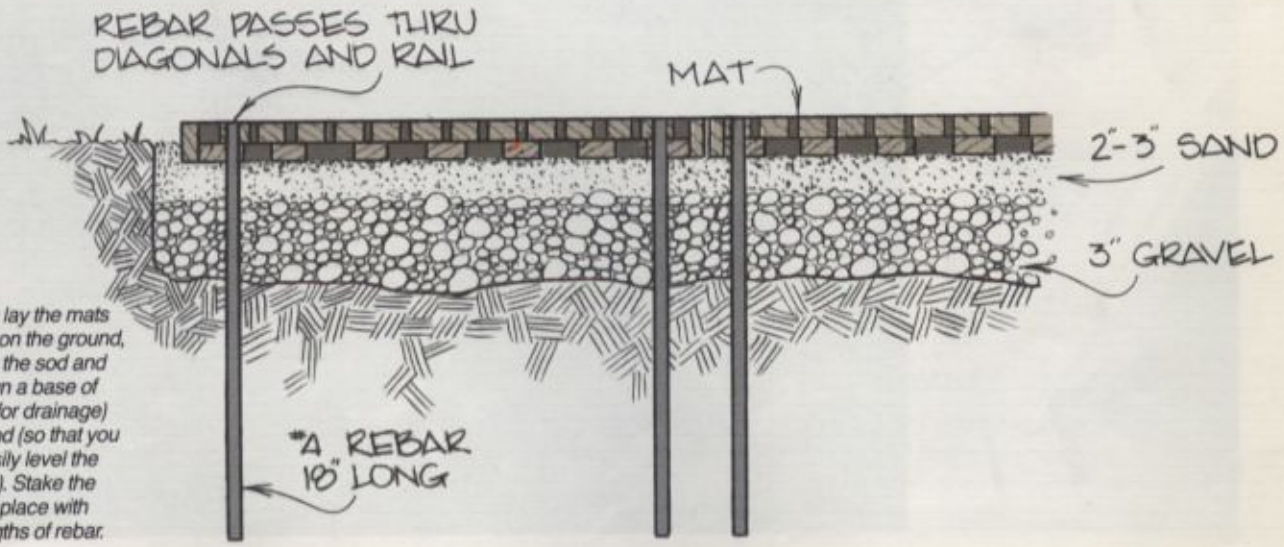
5 ***Trim the diagonals.*** With a long straightedge, mark the over-long, uneven ends of the diagonals to trim them flush with the ends and edges of the rails. Cut the diagonals to their proper length with a circular saw. (See Figure 1.)

***1**/Trim the diagonals after you attach them to the base rails. This way, the ends of the diagonals will all be even. A straightedge, clamped to the mat, provides a guide or a "fence" for the saw and ensures a straight cut.*

6 ***Attach the remaining side rail and the stiles.*** Attach the remaining side rail to the assembly with 8d nails. Then attach the stiles. Remember, the rough-cut faces should be turned to the *outside*.

7 ***Lay the mats in place (optional).*** If you're laying the mat directly on the ground, or if you're making a walkway or a patio from the mats, you'll need to provide drainage and a level base. Remove the sod from the area you want to cover, and dig down approximately 6″. Spread gravel 3″ deep, then 2″-3″ of sand on top of the gravel. Tamp the sand down, then level it with a trowel or the edge of a wide 2 x 4. Lay the mat or mats in place on top of the sand, and fill in around the edges with more gravel. The mats should be set in the ground, with their top surface slightly above the surface of the ground.

To keep them from shifting, drill ½″-diameter holes near the corners of the mats, through the diagonals *and* the base rails. Drive 18″ lengths of #4 "rebar" (reinforcing rod) through the holes, down through the sand and gravel, and deep into the soil. (See Figure 2.) Using a scrap of rebar as a giant nail set, "set" the upper ends of the rebar so that they are slightly below the top surface of the mats. If you hit a rock with one of the lengths of rebar, cut the rebar off flush with the mat.



***2**/If you lay the mats directly on the ground, remove the sod and put down a base of gravel (for drainage) and sand (so that you can easily level the surface). Stake the mats in place with 18" lengths of rebar.*

Adirondack Chair

Perhaps one of the most comfortable pieces of outdoor furniture that you can build is the classic "Adirondack" chair. You're tilted back, face to the sky, almost cradled by the chair. It's hard to get up, and after a while you think: Why would you ever want to? Adirondack sitting is to ordinary sitting what a peaceful sigh is to everyday breathing.

This particular Adirondack chair has a few features that make it even more comfortable. The back is rounded and the seat is contoured to fit your body. The arms are big and wide to give you ample room to set a drink or a book within easy reach. And there is plenty of space between the arms to accommodate you and a few dozen pillows.

Materials List

FINISHED DIMENSIONS

PARTS

A.	Back legs (2)	1½" x 5½" x 36"
B.	Front legs (2)	1½" x 3½" x 21½"
C.	Back braces (2)	1½" x 3½" x 26¼"
D.	Stretcher	1½" x 3½" x 25½"
E.	Upper back support	1½" x 5½" x 21"
F.	Arms (2)	¾" x 7¾" x 30"
G.	Arm braces (2)	1½" x 2¾" x 7"
H.	Lower back support	¾" x 4¼" x 25½"
J.	Back slats (7)	¾" x 3¼" x 35½"
L.	Back seat slat	¾" x 4" x 25½"
M.	Seat slats (8)	¾" x 1½" x 25½"

EXPLODED VIEW

HARDWARE

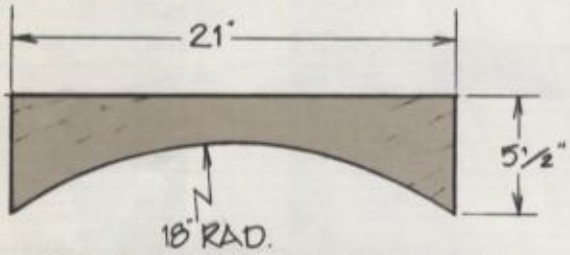
#12 x 2½" Flathead wood screws (28)
#10 x 1¾" Flathead wood screws (59)

1 ***Cut all the parts to size.*** This is an inexpensive project to build. To make one chair, you'll need one 2 x 4 x 12', one 2 x 6 x 8', and two 1 x 12 x 8's. Rip and cut the stock to the sizes shown in the Materials List, except for the back slats. Cut these parts ½"-¾" *wider* than shown. This will give you some cutting room when it comes time to taper the slats.

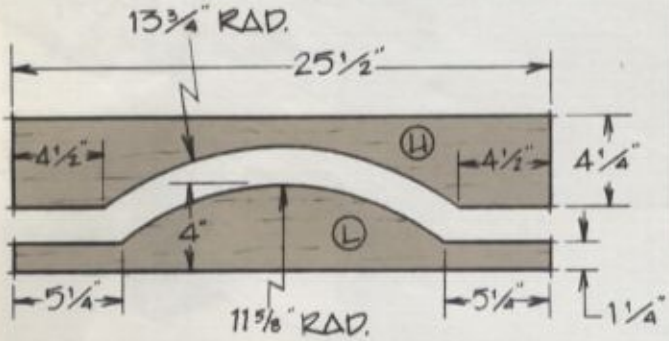
2 ***Cut the shapes of the parts.*** Miter the ends of the back braces and the back legs, as shown on the working drawing. The back braces are cut at 55°, and the back legs at 30°.

Enlarge the patterns for the arms, arm supports, and back legs. Trace these patterns on the stock. Also, scribe the arcs for the upper back support, lower back support, and back seat slat.

Once you've traced and scribed all the cutlines, cut out the shapes of the parts with a band saw or sabre saw. Sand away the saw marks.

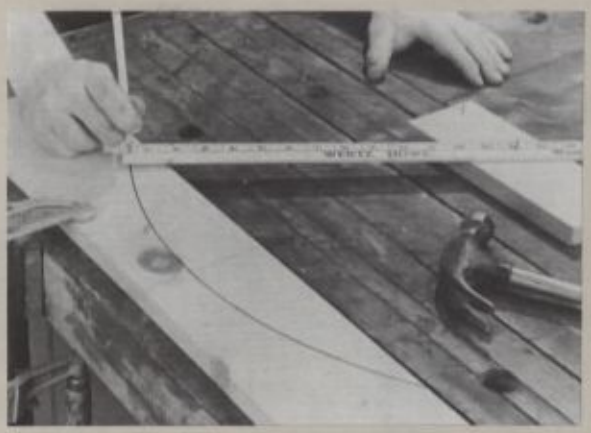


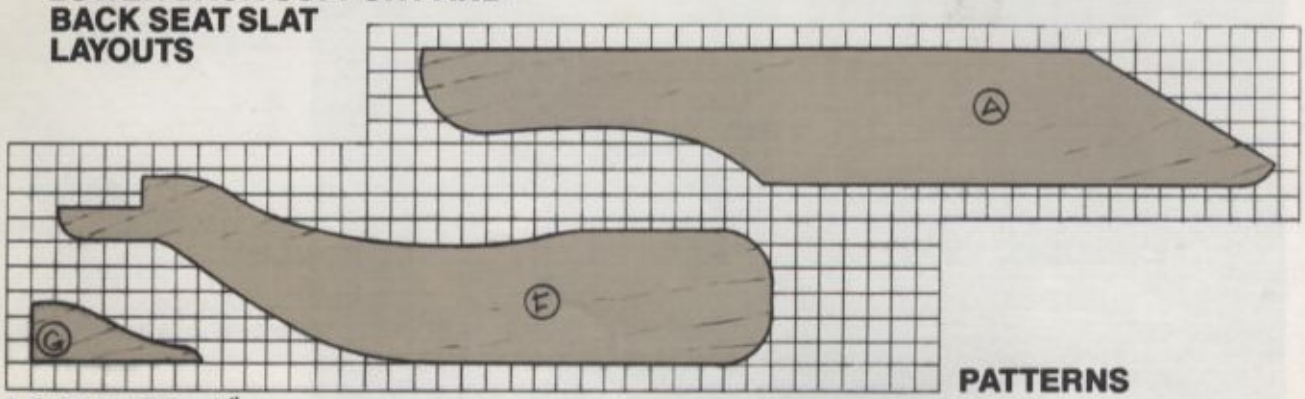
UPPER BACK SUPPORT LAYOUT



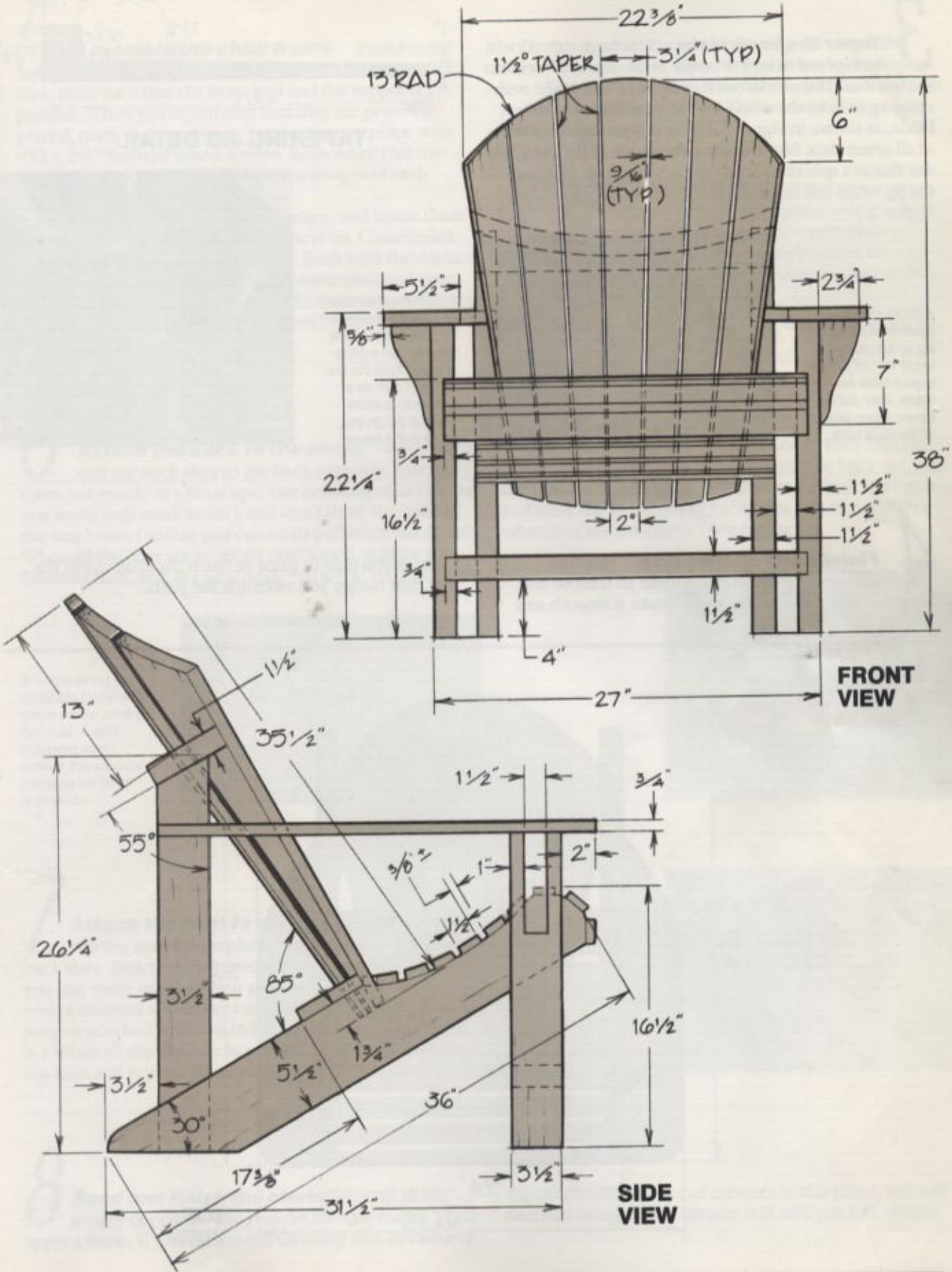
LOWER BACK SUPPORT AND BACK SEAT SLAT LAYOUTS

TRY THIS! You can scribe the arcs on the back supports and seat slat with a compass made from string, but you'll find it easier and more accurate to make yourself a "compass stick." A compass stick is nothing more than a long, thin board — a wooden yardstick is ideal. Drill small holes at ¼" intervals along the length of the board. To use this as a compass, put a finishing nail through one of the holes in the compass stick, measure along the stick from the finishing nail to another hole, and insert the sharp end of a pencil through that second hole. Then swing the arc.

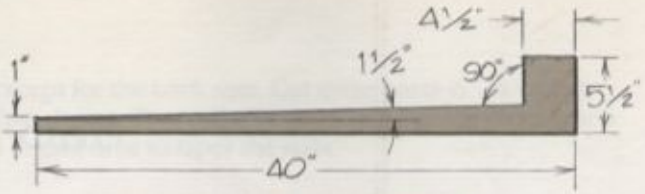




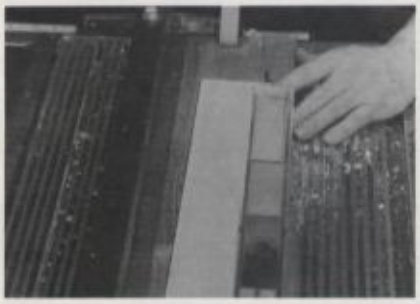
PATTERNS


22 3/8"
13" RAD
1½° TAPER
3¼" (TYP)
6"
9/16" (TYP)
5½"
2¾"
⅜"
7"
¾"
22¼"
16½"
38"
1½"
1½"
1½"
2"
¾"
1½"
4"
27"
FRONT VIEW
1½"
13"
35½"
1½"
¾"
55°
⅜"±
1"
2"
1½"
26¼"
85°
3½"
16½"
1¾"
5½"
3½"
36"
30°
17⅜"
3½"
31½"
SIDE VIEW

3 ***Taper the back slats.*** The back slats should be tapered from 3¼" wide at the top to 2" wide at the bottom. This works out to a taper of 1½°. Make a tapering jig to hold the wood 1½° off parallel to the saw blade, as shown in Figure 1. Using this jig, taper one side of all seven slats. Save the scrap from one of the cuts, and use this as a spacer to hold the slats at the proper angle in the jig when you taper the other side of the slats. (See Figure 2.)



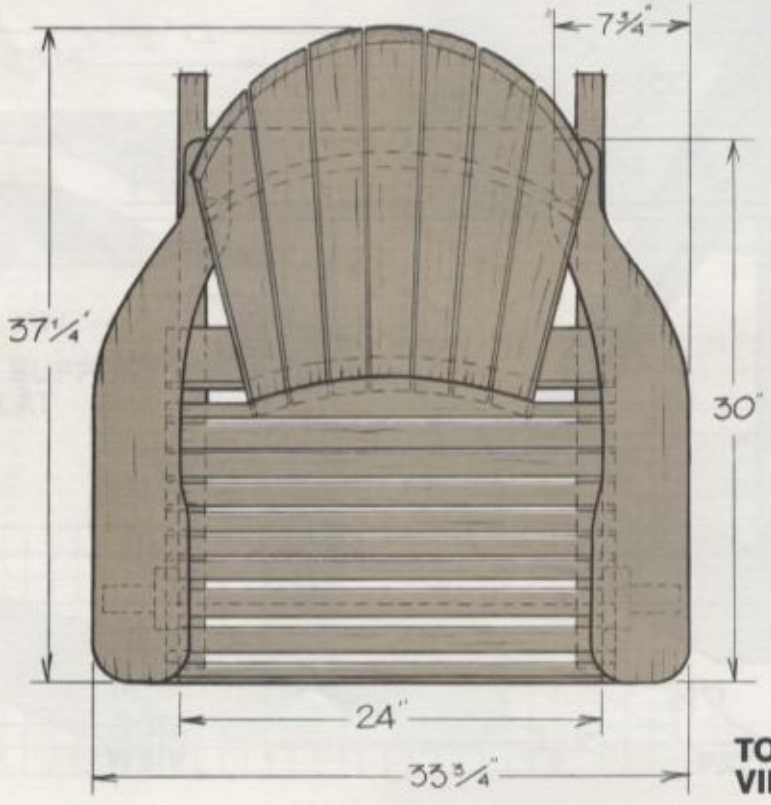
TAPERING JIG DETAIL



***1**/From a scrap of wood, make a tapering jig to hold the wood 1½° off parallel to your table saw blade. Then cut the tapers in one side of all the back slats.*

***2**/Turn the slats over, and cut the tapers in the other sides of the boards. Use a piece of waste from the first series of cuts as a spacer to hold the wood at the proper angle to the blade.*

4 ***Finish sand all the parts.*** Sand the unassembled parts of the chair to remove any irregularities in the wood, and to make it smooth and clean. If you plan to paint or finish the chair, apply the first coat before you assemble the parts.



TOP VIEW

5 ***Assemble the chair frame.*** Position the front legs and the back leg supports on the back legs. Make sure that the front legs and the supports are parallel. When you're satisfied that they are properly placed, mark their positions. Fasten them in place with #12 x 2½" flathead wood screws. Remember that the two leg assemblies should be mirror images of each other.

Put the arms and arm braces in place, and fasten them in position, using the same type of screws. Countersink all the screws, so that the heads are flush with the surface of the wood. If you wish, you can countersink and counterbore the screws. Later, you can fill these counterbores with wooden plugs to hide the screw heads completely.

Tie the leg-and-arm assemblies together with the stretcher, upper back support, and lower back support. Use #12 x 2½" screws to attach the upper back support and the stretcher, and #10 x 1¾" screws to attach the lower back support.

TRY THIS! When assembled, you'll find that this is a large project, too large to fit through doors less than 30" wide. To save yourself from a potential headache, do your assembly outside or in your garage.

6 ***Attach the back to the chair.*** Temporarily nail the back slats to the back supports, spacing them out evenly in a fan shape. Use finishing nails (so that you make only small holes), and don't drive the nails all the way home (so that you can easily pull them out again). When all the slats are properly positioned, replace the finishing nails, one at a time, with #10 x 1¾" wood screws.

After the slats are securely fastened to the supports, drive a small finishing nail into the middle back slat, near the bottom. Use this nail as the pivot for a string compass, and mark the curve of the back. (See Figure 3.) With a sabre saw, cut the curve. (See Figure 4.)

3/Use a string compass to mark the curve on the back of the chair. A stick compass won't work in this situation, because the back is bowed.

4/Cut the curve in the top of the back with a sabre saw.

7 ***Attach the seat to the chair.*** Temporarily nail the seat slats in place, just as you did with the back slats. Tack them in place with finishing nails so that you can easily readjust their positions, if necessary. Several of the slats will either have to be shortened to 24" long or notched to fit around the front legs. (See Figure 5.) When all the slats are in position, remove the finishing nails and replace them with screws.

5/When positioning the bottom slats, you'll have to cut a few of them short or notch them to fit around the front legs.

8 ***Sand and finish the chair.*** Round all the freshly cut edges, and remove the saw marks. Then apply a finish, if you've decided on using one. Because of the enormous number of crevices in this piece, you will find that using a paint sprayer will save you lots of time.

Outdoor Finishes

There is a wide variety of exterior paints, stains, and clear finishes to choose from when you finish your completed outdoor furniture project. At first glance, the sheer number of choices may seem bewildering. However, selecting the right finish is simple once you understand those few *important* differences between finishes.

How a Finish is Made

Most finishes are a mixture of two components: *pigments* and *vehicles*.

Pigments are what give a paint or a stain its color. The pigment chemicals change from finish to finish, depending on the color — or lack of it. When choosing a finish, the pigments deserve little consideration, as long as you buy a reputable brand and can be sure the colors won't fade.

Vehicles are much more important. This is what bonds the pigment to the wood — and keeps it there, through all sorts of weather. Vehicles are usually oils, resins, or emulsions. They have many characteristics, such as coverage, penetration, drying time, and so on. But the most important is the *hardness*.

Generally, the harder the vehicle dries, the better the finish will wear. Softer vehicles are easily abraded by wind and rain, and the finish becomes thin. However, a soft vehicle has its advantages. It easily expands and contracts with the wood through changes in temperature and humidity. Hard-vehicle finishes are brittle, and they may chip or "peel" when the wood breathes. The rule of thumb is to choose a soft vehicle if you live in an area where the difference in average summer and winter temperatures is more than 30°F. If the temperature is more constant, you can use finishes with harder vehicles.

Paints

Outdoor paints have enough pigments mixed into the vehicle to make the mixture opaque. When the paint dries, all you can see is the color, not the wood.

Linseed oil paint — Hardness rating: Soft. Despite the soft vehicle, many painters consider this to be the best paint for the money, especially in northern climates.

Alkyd resin paint — Hardness rating: Medium to hard. Alkyd is a soybean product that can be used in almost any environment except where there are extreme differences in temperature and humidity.

Latex emulsion paint — Hardness rating: Medium to hard. This type of paint has become very popular because it's so durable and easy to clean up. It's a good general-purpose paint, but it will peel easier than other types in a wet environment.

Epoxy resin paint — Hardness rating: Very hard. This paint is most useful in an industrial environment when you need a coating that is resistant to chemicals. Too hard to be used on wood in humid climates.

Stains

Stains are mixed just like paints, only there's less pigment and more vehicle. There's enough pigment to tint the finish, but not enough to make it opaque. After the stain dries, you can still see the wood grain through the vehicle.

Linseed oil stains — See comments under "Paints."

Alkyd resin stains — See comments under "Paints."

Latex emulsion stains — See comments under "Paints."

Varnish stains — Hardness rating: Medium. Varnish is a blend of resins from various trees: chinawood, gum, and tung. Can be used in most environments, but may not dry well in high humidity.

Polyurethane stains — Hardness rating: Hard. Polyurethane is a synthetic resin made from petroleum. Very durable, but too hard to use in environments when there are wide swings in temperature and humidity. May decay in sunlight, unless there is an ultraviolet (UV) light blocker or absorber added.

Tip: Because stains are just thin paints, many professional painters save money by mixing their own stains from paints. A good, standard recipe is one part paint, one part thinner, and one part "conditioner." Use linseed oil as a thinner for oil paints, and water for latex paints. Conditioners for both oil and latex paints are available at most paint stores.

Clear Finishes

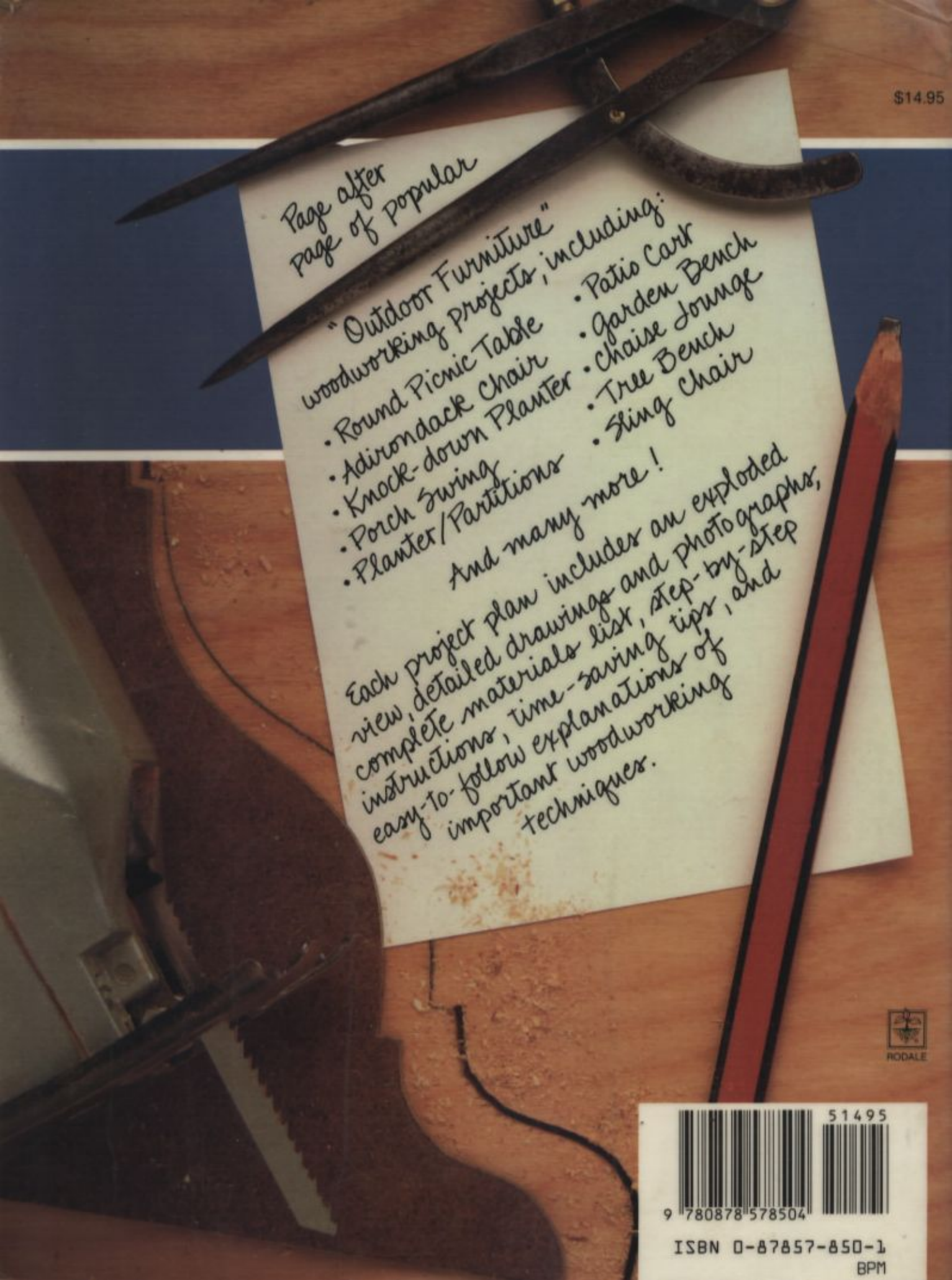
Clear finishes are vehicles without pigments. They may slightly darken the wood but they do not change the natural color. There are two basic types: *coating* and *penetrating*. A coating finish clings to the outside of the wood, covering the surface. A penetrating finish soaks into the wood, bonds with the cells, and protects it from the inside out. There is no hardness rating for penetrating finishes, since they do not form a coat.

Varnish — See comments under "Stains."

Polyurethane — See comments under "Stains."

Tung oil — Hardness rating: None, after one coat. Soft to medium after two or more coats. Tung oil is often one of the components of varnish. Versatile — can be both a penetrating and a coating finish. First application soaks into the wood; successive applications coat the wood. Some craftsmen mix tung oil 1:1 with spar varnish to make a wipe-on "penetrating varnish." Can be used in all climates.

Wood Sealer — Hardness rating: None. This product penetrates deep into the wood, preserving it *and* sealing it against moisture. (Ordinary wood preservatives do not seal the wood.) Consists of a fungicide (usually butyl carbamate) in a blend of vehicles. Can be used in all climates. Preserves the look of raw wood.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