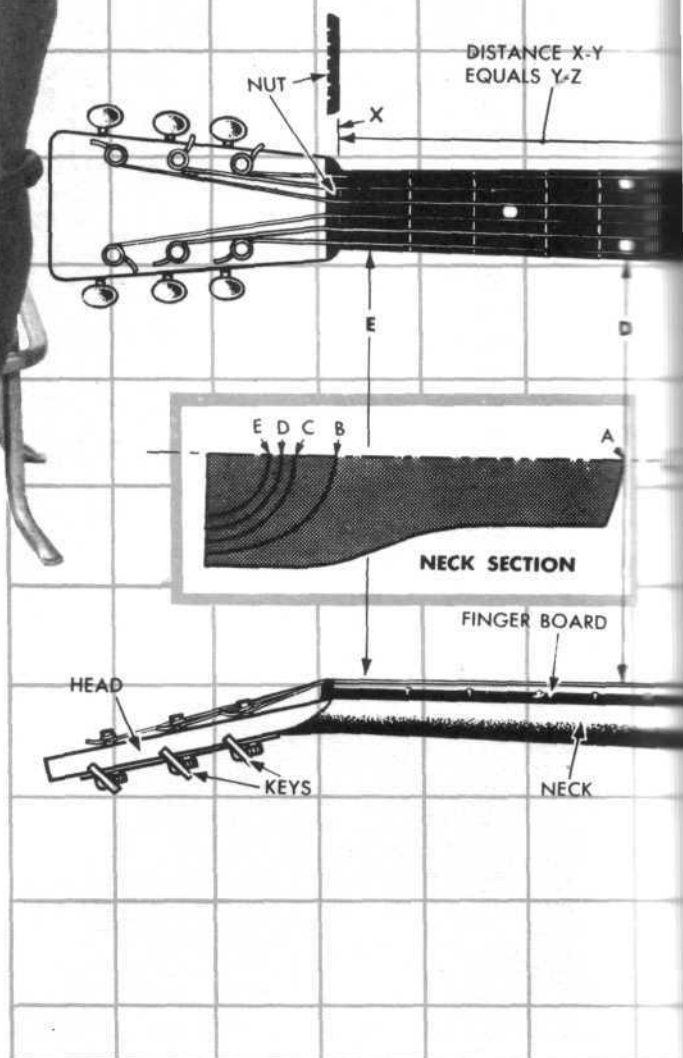


Handmade guitar in a true "folk" shape

By AJAY HAND

Join the guitar boom with
a quality instrument you
can make yourself

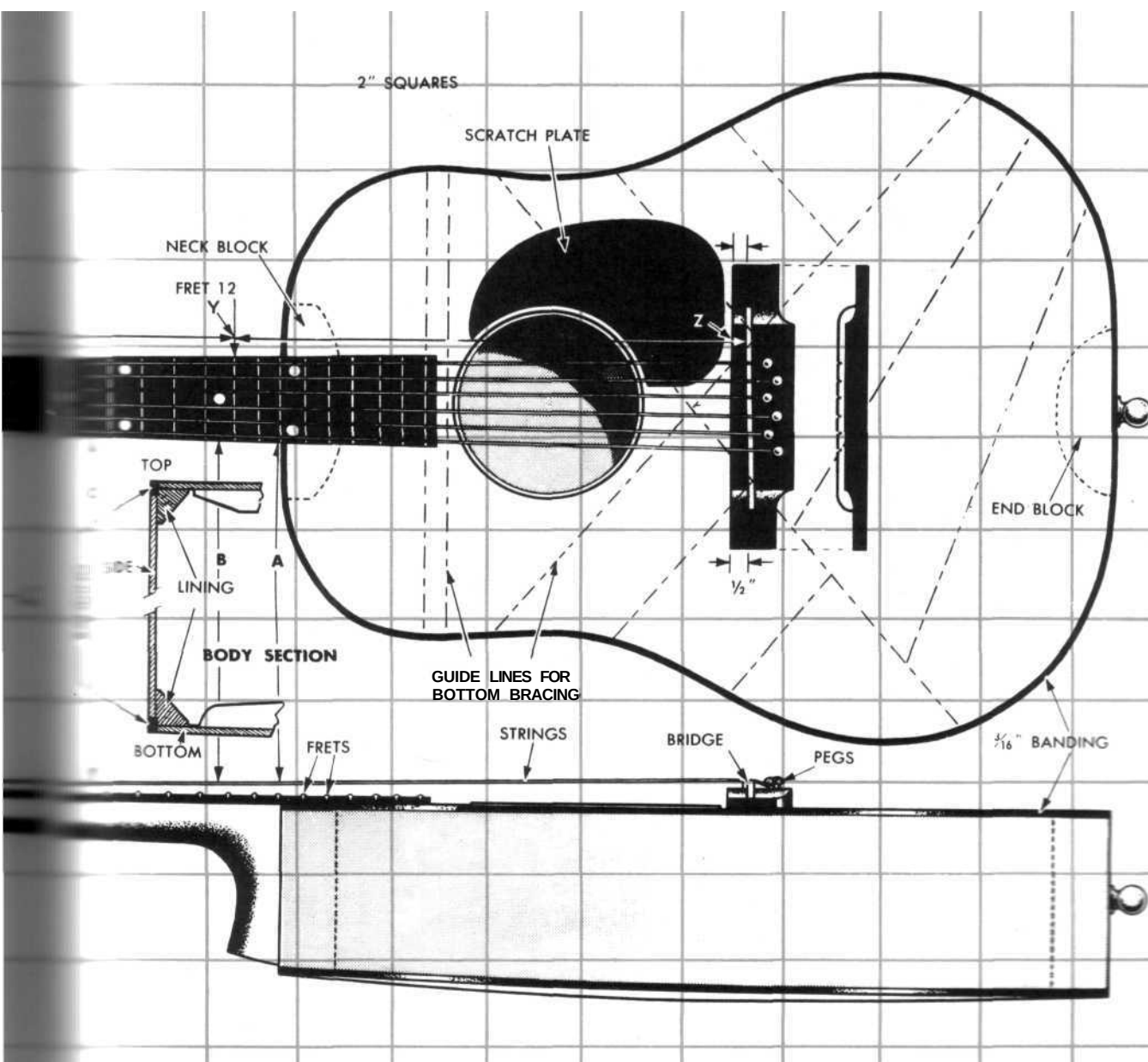


• WHAT MAKES THIS a good guitar? For one thing, the materials. The top is fine-grain spruce and the other parts are Honduras mahogany—both "musical grade" woods. Cheap models may use gumwood, birch veneer, etc., usually covered with a heavy coat of finish that is too thick for good sound.

Another quality feature is the large-size authentic "folk" shape. The size provides volume,

and the shape at the "waist" lets you string the instrument "heavy" if you wish. In addition, the neck joins the body at the fourteenth fret instead of the twelfth, allowing easier fingering low on the neck.

A third feature is the construction. The top is braced with special "fan" bracing instead of the simpler symmetrical bracing. With fan bracing, you get extra strength where the "string loading"



handmade guitar, continued

is heaviest. Without it, your guitar may be fine in the treble or in the bass, but rarely in both.

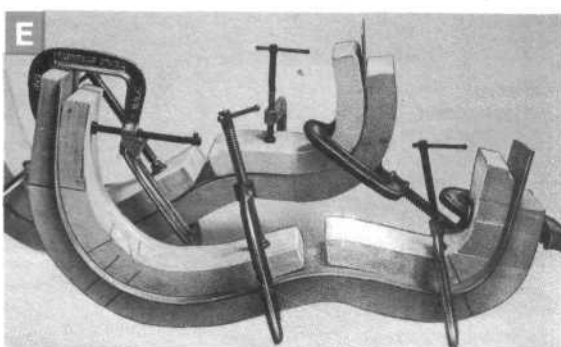
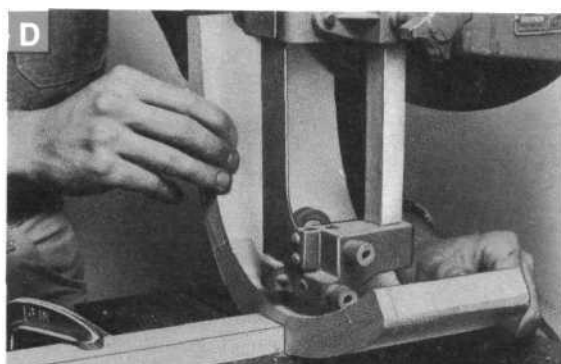
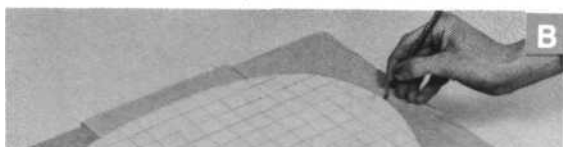
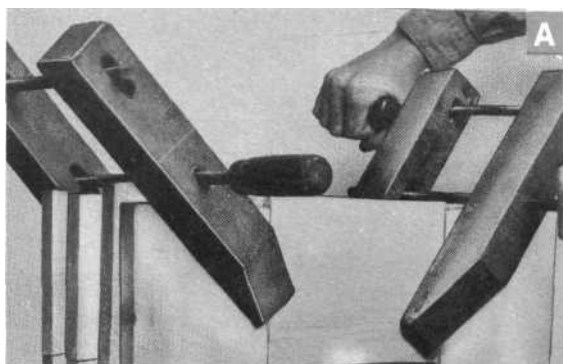
Finally, the cost is kept down by eliminating the banding and purfling often used to ornament commercial guitars and which have no effect on the musical quality.

In spite of the delicate-seeming nature of any stringed instrument, a guitar is not difficult to make. The most critical aspect is the selection of materials, and all the materials mentioned here

are available in "musical-instrument grade." Prices will vary between suppliers, and the cost of the finished instrument will also depend on how much you wish to pay for a fingerboard and tuning keys, plus the cost of a commercial bridge if you decide to buy one rather than make your own.

See complete step-by-step photographs below.

STEP A. Glue up a 20 x 24-in. open rectangle of pine 1 x 6s, six layers thick, and interlap the corners. From this thick assembly you will cut the bending forms. Next, make up a 1-in.

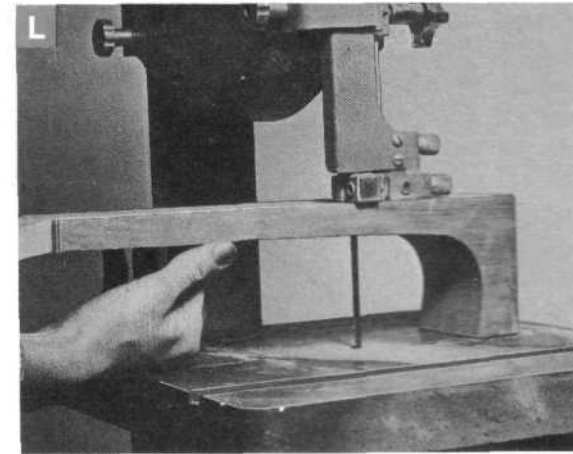
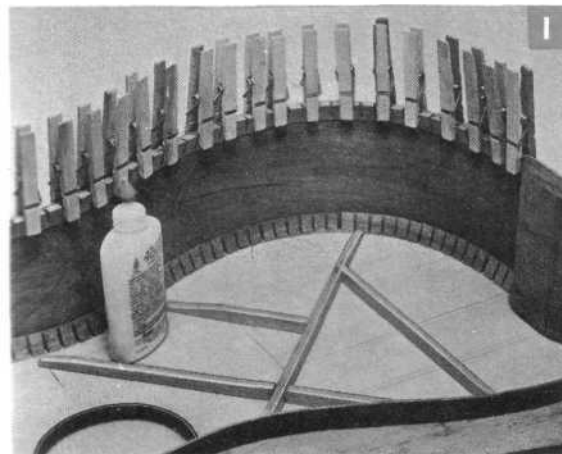
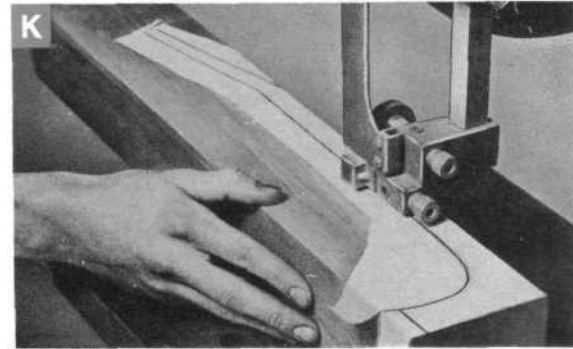
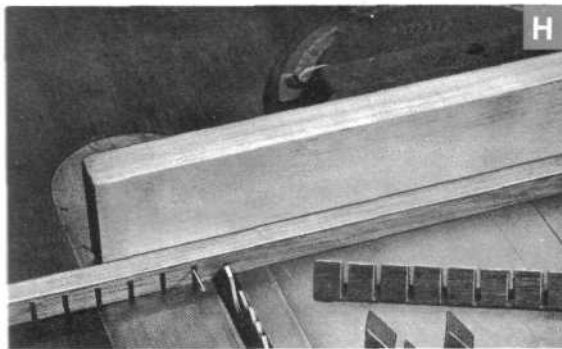
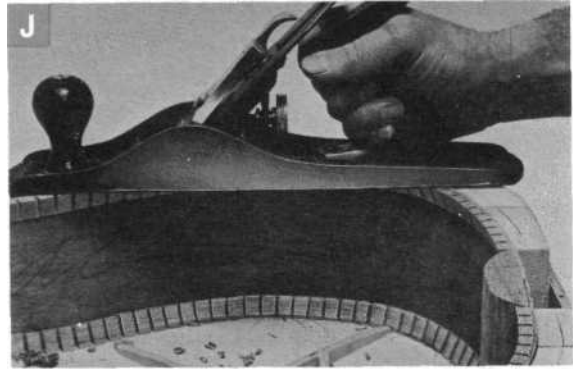
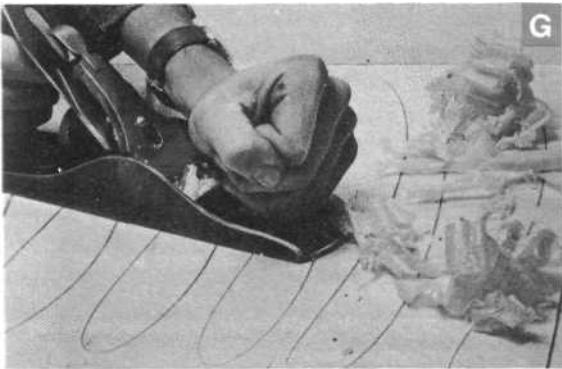


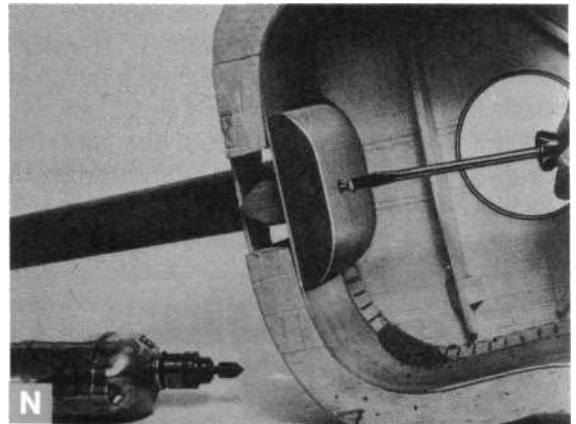
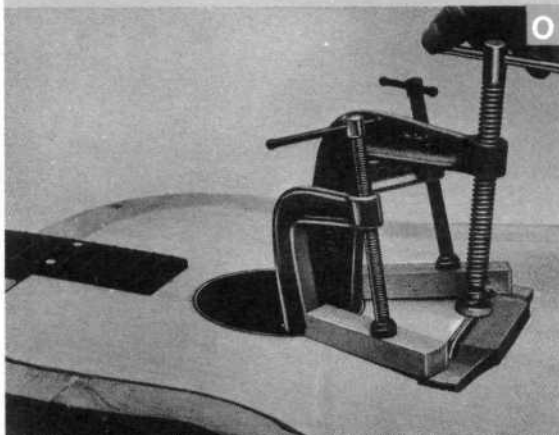
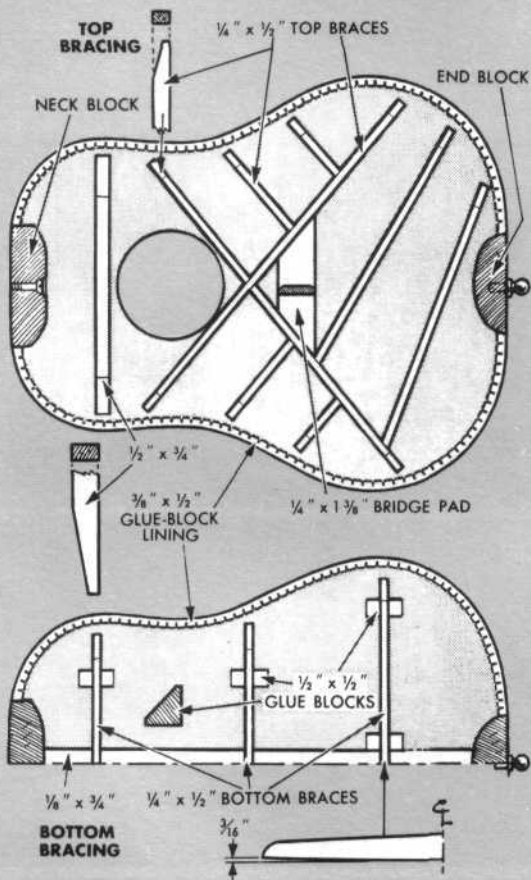
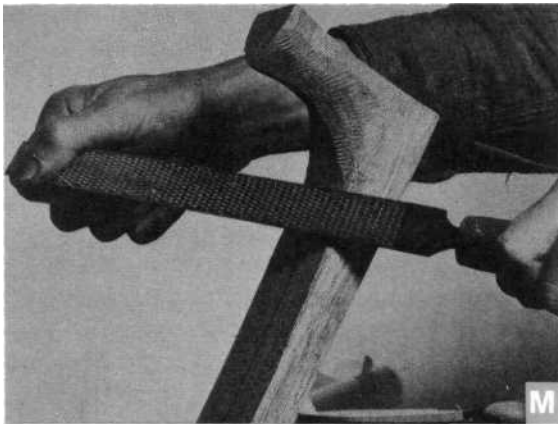
grid on a sheet of cardboard and enlarge the outline of the guitar, picking it up from the drawings. Then cut out the grid pattern to form a full-sized template for making the forms.

STEP B. Trace the outline of the guitar on the glued-up form. It takes three cuts on the bandsaw to produce the two bending forms. First, make a cut 1.5 in. *outside* the template outline. Next, make an entry cut at the center of the large end and run around 1.5 in. *inside* the template line. Finally, make a cut precisely on the template line. Screw a block of scrap wood to

the end of the outside form across the entry cut to hold it together. Cut the inside form into four quarters. Using a rasp and block plane, smooth the surfaces of the form so they won't crease the sides during the bending operation.

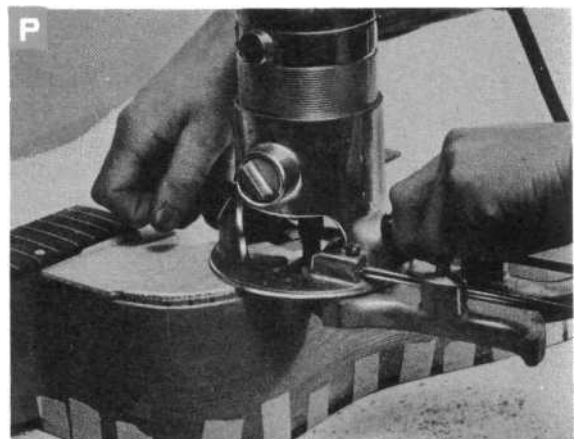
STEP C. Although the top of the guitar is absolutely flat, the bottom is bowed slightly. To achieve the proper profile divide the outside form into five equal vertical sections, and starting from the lower end, mark the depth at the end of the first section 4.625 in. At the second, the depth should be 4-11/16 in.; the third is 4.5 in.; and the





fourth, the one nearest the neck, is 4.25 in. Strike a curve through these depth location points, and plane down the bending form to the proper profile. At this point, cut the outside form into two pieces, and provide a screwed-on block at the neck end, as you did at the large end. These blocks are required because, from time to time, you will have to take the form apart, but it must be possible to put it back together in precisely the same shape. *With these blocks in place*, now cut a 3-in. section out of the outside form in the exact center of each end. You'll work through these spaces when putting on the neck, end blocks, end knob, etc.

STEP D. Once the sides are bent, you will want to keep the assembly in the form throughout most of the rest of construction. Therefore, the inside forms must be narrowed by about $\frac{1}{8}$ in., so they won't interfere with installation of the glue-block lining. An easy way to do this is to clamp



a scrap of wood so that one end is 5/8 in. from the bandsaw blade, then run the four pieces of the inside form through. Be sure to allow for the taper of the outside form. Notice in the photo that the ends of the form pieces have been rounded. This is to reduce the chance of marring or splitting the sides while they are being bent.

STEP E. Although the bending form is, in theory, symmetrical, it's a good idea to key each part of the inside form to its location against the outside form, as shown by the registry marks. If your materials came rough-sawed, as is likely, you must either plane them smooth by hand or take them to a shop which has a planer. The job is quite simple by hand. First, plane away all the obvious saw marks. Then mark over the entire surface of the stock with a soft pencil, and plane away the pencil marks (see photo G, showing planing the top). Continue until the sides and bottom and top are all down to 1/8 in. maximum—preferably 3/32 in. for good playing quality. It's important that you plane both sides smooth. (If you are working with rosewood, do not use a power planer. This wood has such a wild grain that it might shatter, and you'll be safer taking it down to thickness with a scraper.)

To prepare the sides for bending, make a tank by bending up the four sides of a 5-ft. length of aluminum flashing, fill it with water and place it across two burners of the kitchen stove. The boiling water will permeate the wood quickly so that it bends easily. Weight the side pieces down to hold them submerged. Then, working rapidly, take one side out of the water and place it in the outside form. Press it down into the form and put the inside form blocks against it, pressing them down with your knees and hands until the clamps will reach. Once they are locked up, adjust the inside form blocks until the register-marks line up, and set the locked form aside to dry for 48 hrs.

STEP F. The spruce for the top and the mahogany for the back each come in two pieces, usually matched. They must be glued together to form the two wide sheets. To make this butt joint, lay a layer of wax paper on a piece of plywood to avoid sticking, then apply glue along the edges, pull them tight together, and staple the two halves to the plywood. A tracing of the template will show where you can safely staple—the waste around the edge plus the hole area in the top. *Important:* If there is a difference in fineness of grain from one edge of a piece of spruce to the other, be sure to put the edge with the finer grain in the center.

STEP G. Edge-grain spruce has a tendency to chip when you plane it. For that reason, keep the set of the blade thinner than paper-thin. Work the spruce down to 3/32 in. thick, keeping it uniform by the method mentioned for planing the side pieces. Be sure that both sides are smooth, since reverberation inside the box is encouraged by smooth surfaces.

STEP H. The lining is actually a succession of triangular glue blocks which form the joint between the sides and the top and bottom. To make them, fasten a wood facer to your miter gauge and drive a brad into it about 1/2 in. from the kerf. Make the first cut almost through the depth of 3/8 x 1/2-in. stock, then hook that cut over the brad to achieve the proper spacing and make another cut. After cross-kerfing the lining strips, set the blade at an angle to rip the stock into triangular cross section. The mahogany for the glue-block lining comes from the scrap left over after cutting the neck. Rip a sufficient number of strips for the lining, but be sure you leave enough material for the end block and the neck block. To assemble the body, bring the two bent sides together while still clamped in the forms. Overlap the ends of the mahogany, then attach the end blocks that hold the sides of the form in place. Next, after removing the 4-part inner form, cut away the scrap that overlaps, and glue the end block and neck block in place. From now on, the assembly will stay inside the outer form until the top is installed.

STEP I. Fasten the lining to the side first, using ordinary clothespins to hold it. Notice that the tiny corner blocks are handled in flexible strips, bending the thin remainder of stock around curves. If the strip should break, no harm is done as long as there is virtually continuous lining. Glue the bracing on both top and bottom before securing these pieces to the body. Many guitar experts consider the bracing of the top to be the most critical single phase of construction because of the "string-loading" variances, bass to treble. Follow the layout of the drawing exactly, making sure that the top is absolutely flat throughout the process. Hold the bracing in place while the glue dries by means of weights and clamps. After the glue dries, use a small plane to taper the ends and round off the corners. Note that the heavy brace at the neck end is double thickness and double width. (The bracing is of spruce; end block and neck block are of mahogany; bridge pad is maple.) Unlike the top, the bottom is bowed, and the bracing is symmetrical. Cut the three braces and mark each with a center line.

Put them together in a vise and plane the 3/16-in. bow into all three so that they will impart a uniform bend to the bottom. To increase the glue line and to prevent the bottom braces from buckling, use spruce corner blocks, as shown in the drawing.

STEP J. Glue the top in place using weights or clamps to hold it while the glue dries. Another method of "clamping" is to tape the top down with strips of masking tape (the bottom can't be added until the neck is attached). To make sure that the lining is level with the sides, run a plane along the blocks after the glue is dried and plane down until a shaving of the side is removed. Support the plane at both ends across a curve to keep it at right angles to the sides. Plane the end blocks flush, also.

STEP K. Shaping the neck takes a little time and should be worked on concurrently during the construction of the body. In order for it to seat properly, the neck must be absolutely square at the end. After squaring up, run a center line down the top and lay out the plan symmetrically to maintain the square end. The actual length of the neck is governed by the dimensions of the fingerboard you buy. Ninety-nine times out of a hundred, it will be the popular 25.625-in. scale and you can follow the drawing exactly, leaving about 13.75 in. of flat before you turn down for the head. Draw the profile of the neck on paper, cement it to the side of the mahogany block and run it through the bandsaw.

STEP L. With the plan of the neck laid out on the top, you can make the rest of the rough cuts on the bandsaw. Be especially careful when the supporting end goes off the saw table, and remember at all times to work symmetrically to a center line which is precisely perpendicular to the squared end.

STEP M. Rasp, coping saw, surface-forming tool, plane, spokeshave, drawshave and very coarse sandpaper are some of the tools you can use to shape the neck. Follow the cross sections in the section detail of the main drawing. Be sure to mark a center line down the "belly" of the neck as a guide. When the neck is roughed out, glue the fingerboard to it. *It must be positioned with the 14th fret exactly at the squared end.* When the glue is dry, work the neck down to shape and smoothness, leaving only final sanding.

STEP N. Fasten the neck on with two 2-in. No. 12 steel screws, countersunk. This is a critical joint, so be careful. Drill through the neck block with a shank-size bit, and continue into the neck

with a core-size bit. Apply glue to both surfaces then wax the screw and draw it up tight. Be sure the center line of the neck is in perfect alignment with the center line of the top. If you discover that it's slightly out of line, shim up one side or the other with thin strips of mahogany, making sure that both sides of the shim are coated with glue.

STEP O. There is only one really critical dimension in the entire construction of the guitar the distance from the 12th fret to the "saddle" must be exactly the same as that from the nut to the 12th fret. Locate the bridge so that the center of the slightly angled saddle meets this requirement. Follow the clamping method shown, using small blocks of wood on the top with another block located inside the box between the bracing, so that clamping is hard between the bridge and the bridge pad. To install the tuning keys, place the nut in position and use a strong thread as a guide to notching the nut, lining up the stringing and positioning the holes for the pins in the bridge. Fasten the thread to the proper peg for the top string, then stretch it tight over the nut and down along the finger board to the saddle. Keep it parallel to the edge of the fingerboard, about 1/16 in. in from the edge. Mark the point where this thread hits the bridge. Next, follow the same procedure to position the bottom string. Then determine the locations for four remaining strings spaced equally between the top and bottom. File shallow string notches in the nut and drill the holes for the pins in the bridge. (Since the pins are tapered, you may want to fit them to the holes with a tapered reamer.)

STEP P. The banding is inset into the rim of the body. A router is the best tool for cutting the rabbet for the banding, but if you work carefully you can do the job with hand cutting tools. Use plastic, black-dyed maple or ebony for the banding. Cut it a little bit oversize, then boil it to permit easy bending and seat it with glue. Strips of masking tape will hold the banding in place while the glue dries. Sand the banding flush, then turn the tiny wooden knob and glue it in place at the exact center of the end.

The finish you put on your guitar is a matter of personal taste. Commercially made instruments usually have stain, wood filler and many coats of rubbed lacquer. If you love the texture of wood, however, you may prefer clear penetrating resin sealer—the sort of thing they use to finish flooring. The latter was used on the guitar shown in the photographs. After finishing, apply the thin plastic scratch plate with contact cement.