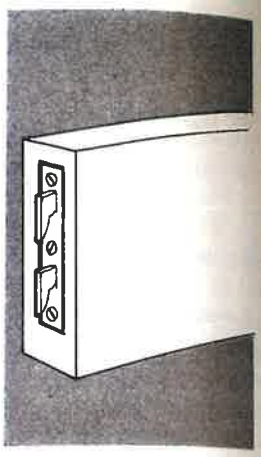

metal bed rail fasteners are
lengths of 4" and 6".

relatively standard struc-
lve no unusual construc-
eds normally consist of a
tboard, and a pair of side
for Traditional furniture
. Fig. 48-2.
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1 mortise-and-tenon or
owever, for most full-size
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o receive half of the fas-
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ble, the rail hook is in-
lot in the post and pushed

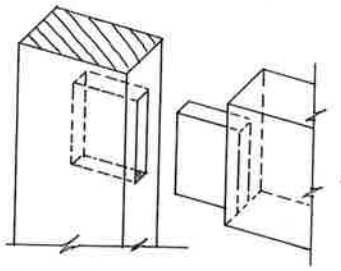
LEG-AND-RAIL CONSTRUCTION 49

Most tables and chairs and the stands for many chests and cabinets feature leg-and-rail construction (sometimes called *frame construction*). Fig. 49-1. The simple table base consists of four legs and four rails (aprons) with the rails normally joined to the legs just under the tabletop. Sometimes lower rails, called stretchers, are added for extra strength. In small tables, a drawer is often added directly under the top or under a lower shelf, or a shelf-and-drawer are installed between the table legs.

Kinds of Leg-and-Rail Joinery

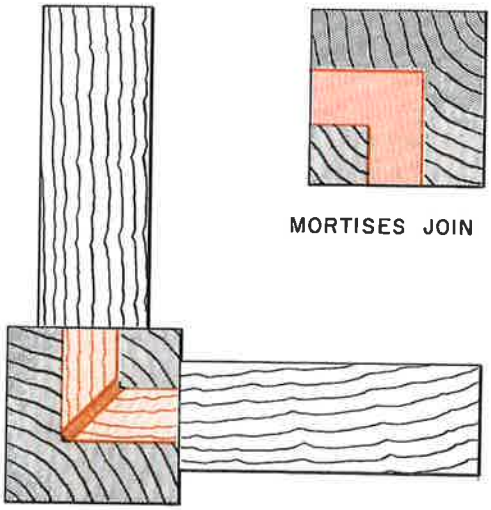
The traditional method of joining a leg to a rail is with a blind mortise-and-tenon joint. Fig. 49-2. With this method the mortises are cut from the two interior, adjoining surfaces of the legs so that the mortises meet. Then the tenons are cut and mitered at the end to make maximum use of the mortise opening. There must be slight clearance between the ends of the tenons so that they will not bind. Fig. 49-3.

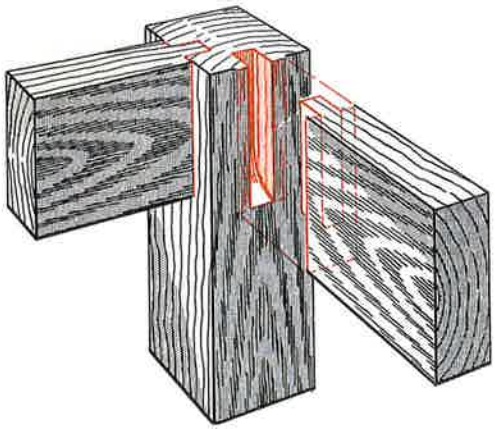
49-1. This table is a good example of leg-and-rail construction.



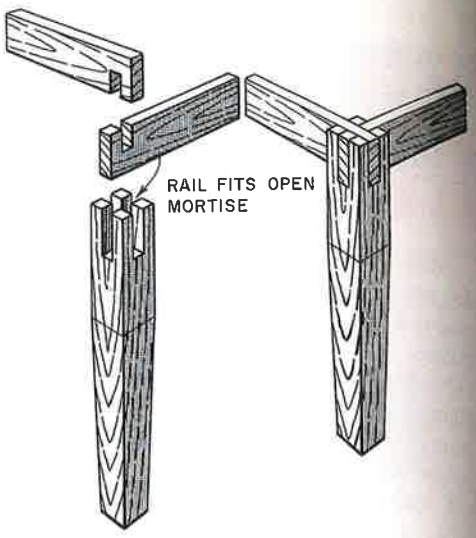
49-2. A blind mortise-and-tenon joint.

49-3. The mortises are cut from the adjoining surfaces so that they meet. The tenon is mitered on the end for a glue pocket and to keep the tenon from binding and causing a crack between the shoulder of the tenon and the face of the leg.

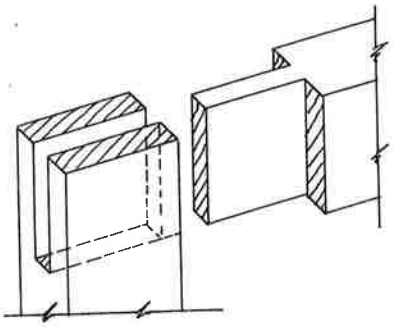




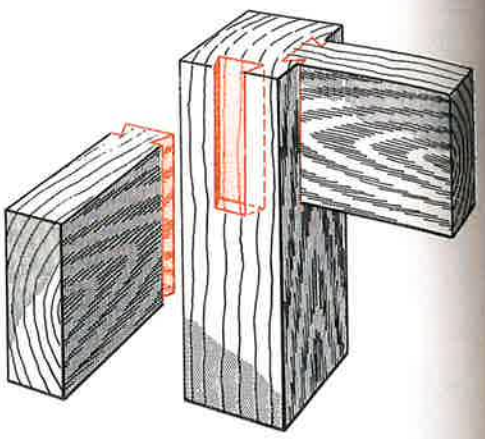
49-4. This open mortise with a stub tenon is satisfactory only for light construction.



49-6. An open mortise-and-tenon joint with edge-lap rails.



49-5. An open mortise-and-tenon joint.

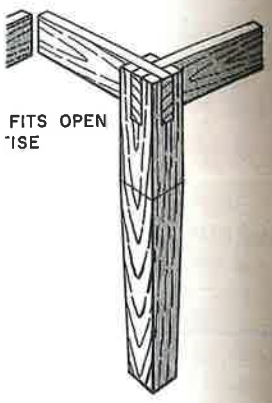


49-7. Dovetail dado joint for legs and rails.

Another mortise-and-tenon joint that may be used is the open mortise with a stub tenon. The advantage of this construction is that the mortise can be cut on a circular saw and the tenon can be cut on the same saw or with a router or shaper. Fig. 49-4. An adaptation of this joint is the open or slotted mortise and tenon with edge-lap rails. Figs. 49-5 and 49-6.

Still another possible construction is the dovetail dado joint. Fig. 49-7. This is a good lock joint. It can be used with a metal corner brace for simple furniture that can be "knocked down" for storage or shipping.

Not many years ago it would have been considered poor construction if legs and rails were not fastened together with mortise-and-tenon joints. Today, however, many makers of fine custom furniture no longer use this joint for leg-and-rail construction. Instead, a butt joint strengthened with two or three dowels is common.



ıe-and-tenon joint with edge-
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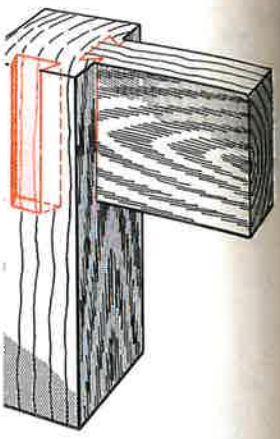

ıdo joint for legs and rails.

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fine custom furniture no
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three dowels is common.

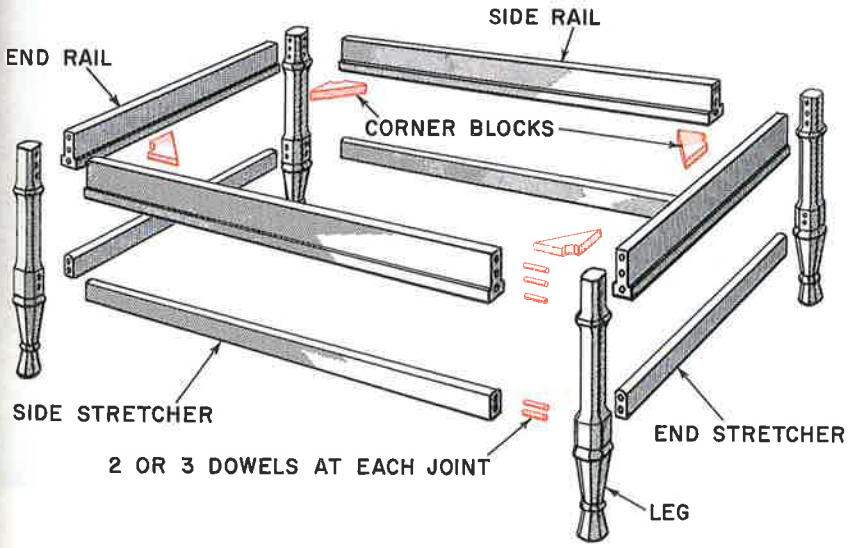
A strong wood corner block installed with screws, or a metal corner block, is used for strength. The whole unit is held together with a good adhesive. Fig. 49-8.

There are several good reasons for the change. First, with improved adhesives and good corner blocks, the dowel corner is just as strong as the mortise-and-tenon corner. Second, the dowel corner is much quicker and less expensive to produce. This can easily be seen if we compare the time required to make a layout and cut a mortise and tenon with the time required to cut a butt joint and install two or three dowels. The difference in labor costs is tremendous. Third, reinforced dowel leg-and-rail construction saves material since the extra length needed for tenons is eliminated. Finally, leg-and-rail construction in which the leg and rail are not at right angles to each other is extremely difficult with the mortise-and-tenon joint. In contrast, with dowels the construction is far simpler. Fig. 49-9.

The important point in doweled leg-and-rail construction is to make sure that the holes are spaced accurately and that they are bored exactly at right angles to the edge of the leg and into the end grain of the rail.

49-8(a). This coffee table has butt joints reinforced with dowels.

49-8(b). This exploded view shows the table's leg-and-rail construction. Note how much simpler this is than using mortise-and-tenon joints.



49-9. Butt joints with dowels are used on this chair. Note that the corners are not square. The corner blocks are grooved to increase the holding power of the glue.

Installing a Lower Shelf

If a lower shelf is to be installed in a table, one of several methods can be followed. The simplest way is to fit the shelf between the legs and then to install a dowel at each corner. Fig. 49-12. Another method especially successful on square, straight, and tapered legs is to cut a corner dado on the legs and then cut off the corners of the shelf to fit into this corner dado. Fig. 49-13.

Installing a Drawer

On many smaller tables made by leg-and-rail construction, a drawer is installed directly under the top as an added storage convenience. Fig. 49-10. This requires a modification of the rail construction. Fig. 49-11. Sometimes the front of the drawer completely replaces one of the rails. Then an interior web frame, with an exposed front edge of the same material as the drawer front and rails, is installed. This frame supports the drawer and also is used to install the drawer guides. For smaller drawers, an opening is cut in one of the rails into which the drawer fits. Then some type of drawer guide is fitted between the two rails.

49-10. A Chippendale table with a drawer and drop leaves.

ıls are used on this chair.
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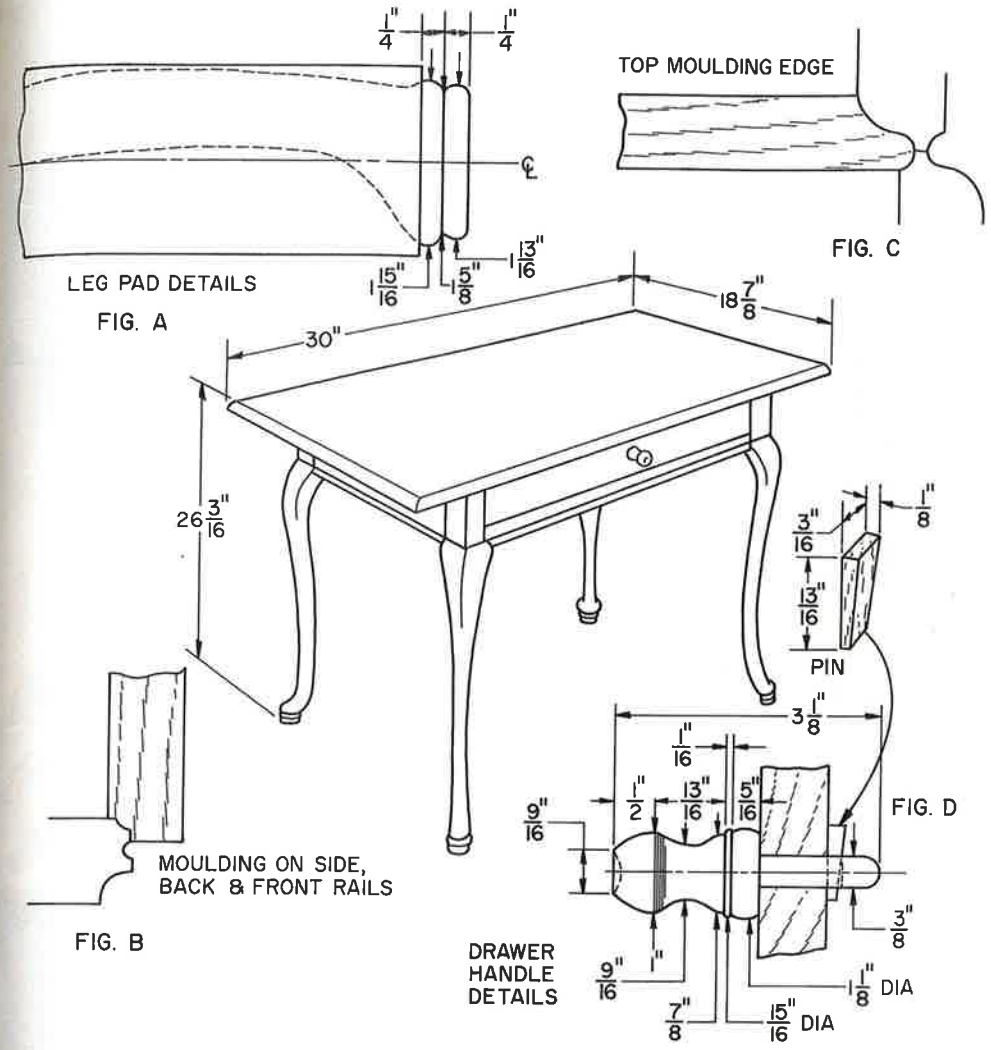
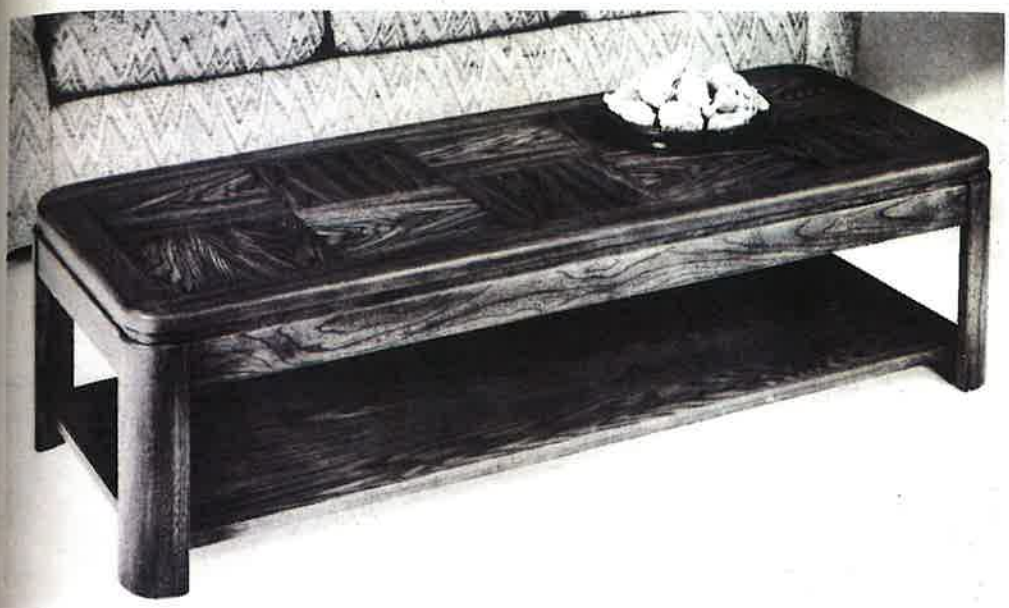


49-11(a). Drawing of a Queen Anne occasional table with a drawer.

Chair Construction

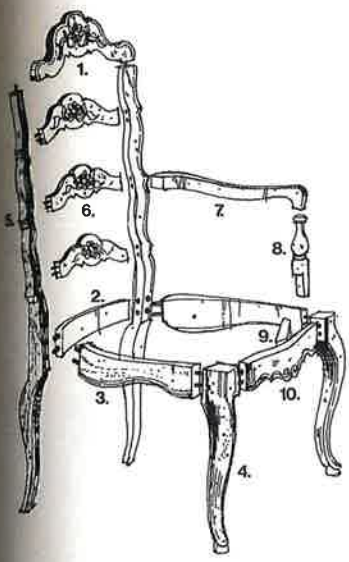
Most wood chairs are made with leg-and-rail construction. Chair construction is the most difficult job in furniture work. There are several reasons for this. Rarely is any part of the chair at a right angle to the next. The front of the chair is wider than the back. The back legs are arched or angular. The distance across the top of the back legs is greater than the distance across the bottom. The wood seat is contoured or upholstered. The back rungs or cross supports are frequently made in a slight arc shape for comfort. Fig. 49-14. Because of these difficult construction problems, it is said that a cabinetmaker who can build a chair well can build any other product with ease. Fig. 49-15.



49-13. The bottom shelf of this table is installed with corner dadoes.

49-11(b). Leg and drawer details of the table.

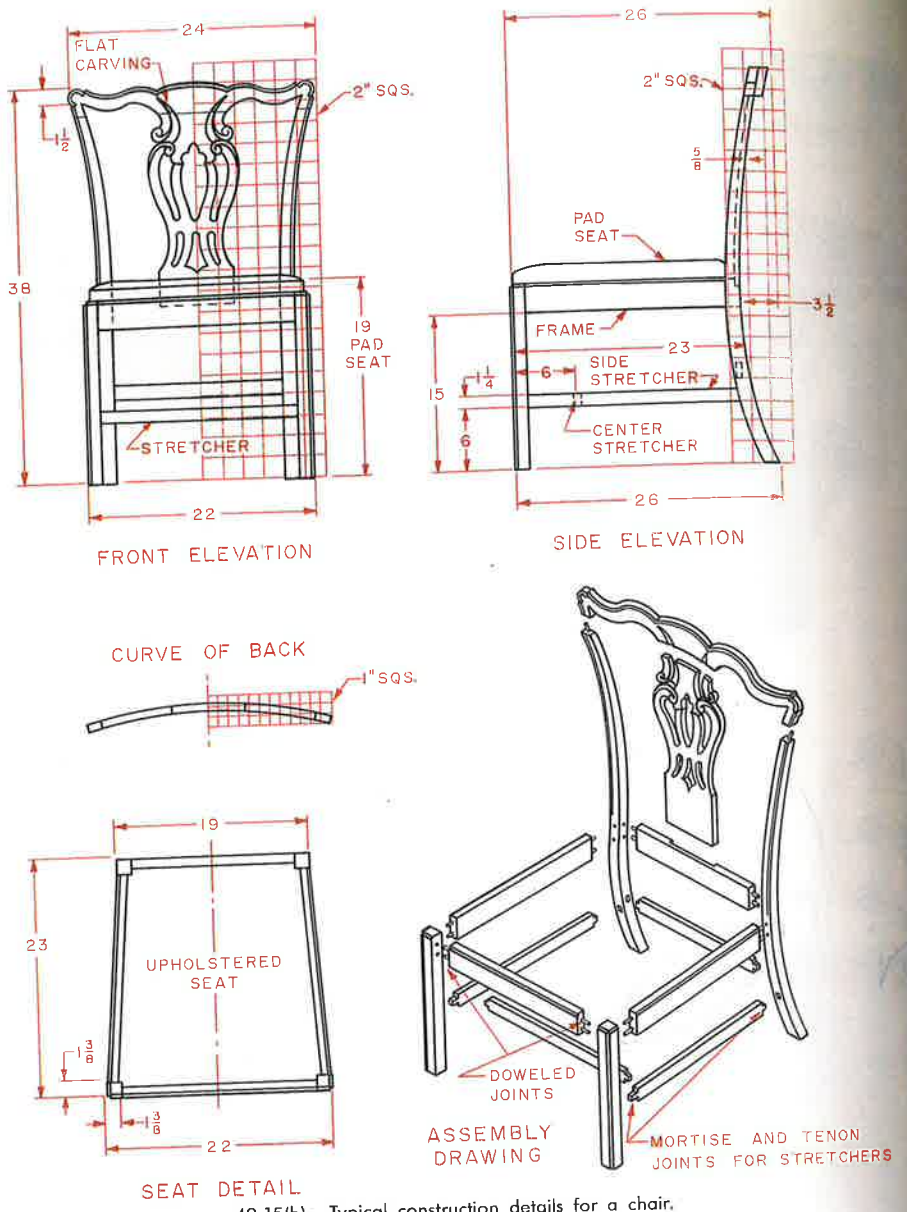
l at each corner.



1. Top Rail
2. Back Rail
3. Side Rail
4. Front Post
5. Back Post
6. Back Splat
7. Arm
8. Stump
9. Corner Block
10. Front Rail

49-14. Parts of a typical Traditional chair.

49-15(a). After studying this unit, you will see why chairs are so complicated to make.

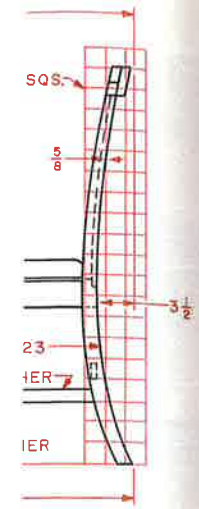


49-15(b). Typical construction details for a chair.

Joints

Most chairs and some tables with leg-and-rail construction are designed with the front wider than the back. The back of the typical chair is from 1½" to 3" narrower than the front. If a dowel joint is used, the ends of the side rails must be cut at an angle. The dowels are installed in the rails at the same angle.

For a mortise-and-tenon joint, the tenons for the side rails must be cut at the proper angle. The best way to do this is to



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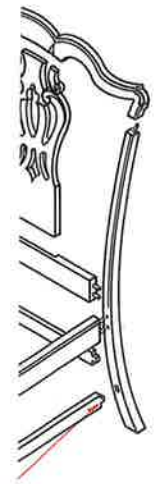

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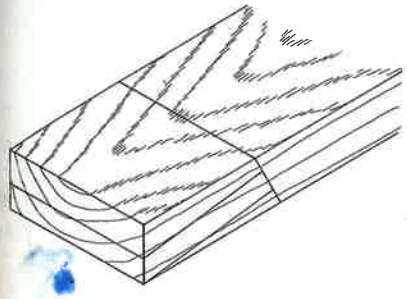
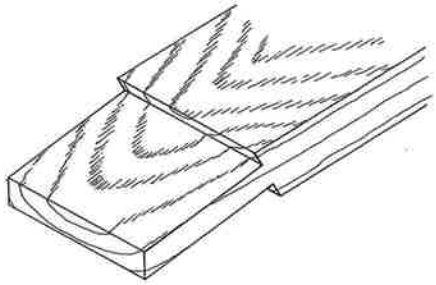
ails must be cut at the
best way to do this is to

first make a layout of the rail with the correct angles for the shoulder and cheek cuts. To do this, adjust a sliding T bevel to this angle. Then transfer the angle to the blade of the table saw. Adjust the fence so that the distance from the left edge of the blade to the fence is equal to the length of the tenon. Hold the piece against the miter gage with the end of the rail against the fence and make the first shoulder cut. Then transfer the miter gage to the other side of the saw blade and reverse the position of the fence. Adjust for correct length of tenon and make the second cut. The cheek cuts are made with the blade at the same angle. Adjust the fence so that the distance from the right side of the blade to the fence will remove the correct amount of material from one side of the tenon. Adjust the blade height so that it equals the length of the tenon on one side. Make the first cheek cut. Then readjust the fence and the height of the blade slightly before making the second cut. Use a guard or tenoning jig for this procedure. (See Unit 26.) Fig. 49-16.

If a blind mortise-and-tenon joint is required, the tenon must be reduced in width to fit the mortise. This can best be done with hand tools.

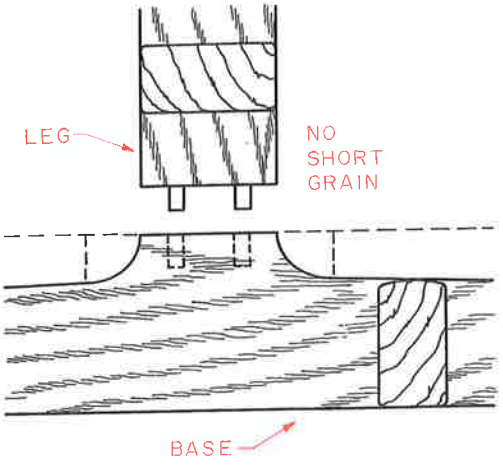


49-16(a). Layout of a tenon at an angle.

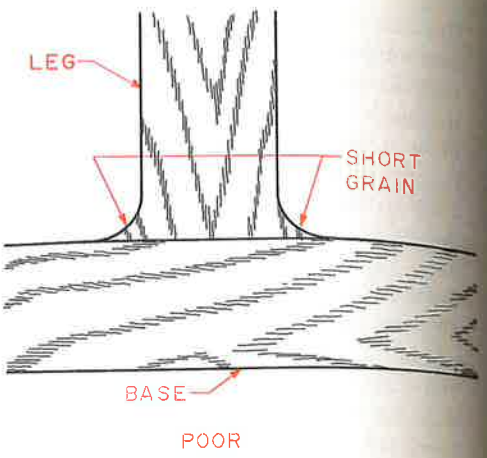


49-16(b). The completed tenon.

49-17. This table has sculptured joints.



49-18(a). The correct way to make a sculptured joint.



49-18(b). The incorrect way of making the joint. Can you see why this is poor practice?

Some Contemporary tables and chairs have sculptured leg-base or leg-rail assemblies. Fig. 49-17. This design has a smooth curve between the two adjoining parts. In planning this type of joint, make sure that there is not a short-grained area that can easily be damaged. Fig. 49-18. Some extra material should be left on both the leg and the base so that the final shaping can be done after assembly.

TABLETOPS 50

The tops for most tables, desks, and many chests are made as a removable part that is installed after the other construction is completed. Fig. 50-1. There are many different methods of constructing such tops. The method to choose depends to a large degree on the kind of top, the quality of construction, and the design.

Kinds of Tabletops

Softwood Plywood

The simplest way to build a tabletop is with plywood. Choose plywood of an adequate thickness, usually 3/4". The major problem in using plywood is that the exposed edges must be treated. Fig. 50-2.

LEGS, POSTS, AND FEET 48

Legs, posts, and feet are among the most distinguishing features of furniture. Fig. 48-1. They provide one of the quickest ways to identify furniture styles. *Legs* are the basic vertical structure of most tables and chairs. *Posts* are similar to legs but longer. In chair construction, for example, the front supports are usually called legs and the back supports posts. Sometimes these terms are used interchangeably. The term *post* is always used to describe the vertical supports for beds. Fig. 48-2. *Feet* are the supports under chests, cabinets, and some desks. Fig. 48-3. Legs, posts, and feet can be made of solid lumber or laminated materials. These items can also be purchased in matched sets of wood, metal, or plastic for many different styles, finishes, and lengths.

48-1(a). The chair in this picture and those in (b) through (d) are similar in size and function but not in appearance. Leg shape is the major design feature of each. The French Provincial chair shown here has graceful cabriole legs.

48-1(b). The Queen Anne style chair also has ca
ole legs, but the curves are more pronounced

48-1(c). This Italian Provincial chair features tap
legs.

48

Queen Anne style chair also has cabri-
t the curves are more pronounced.

Italian Provincial chair features tapered
legs.

48-1(d). The straight, square legs at the front of this chair identify it as Contemporary.

48-3. The feet are made separately and attached to this chest-on-chest.

48-2. A four-poster bed.

Common Leg and Foot Shapes

Common shapes of legs and feet for cabinet construction include the following.

Square, Straight Legs

The square, straight leg is the simplest to make and is commonly found on Contemporary furniture. Fig. 48-1(d). The leg is made of either solid or laminated stock, by the method described in Unit 25.

Square, Tapered Legs

The square, tapered leg is made in several designs. For example, legs with tapers on only the two inside surfaces are popular. The inside taper gives a feeling of lightness to the total design. Fig. 48-4. Square legs tapered on all four sides are found on many Traditional and Provincial furniture pieces. The square Italian Provincial leg, for example, has a taper on four sides with a graceful recess or molding just below the rail or apron. Fig. 48-5.

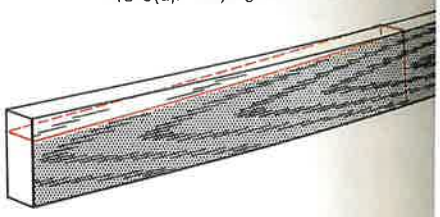
48-4. This table has square legs tapered on the two inside surfaces. The taper makes the legs appear to be at a slight angle.

Reeding or fluting often is a part of the design.

To make tapered legs, first square up the legs. Lay the four legs side by side and mark the position at which the taper is to start. Then square a line around all four sides of each leg. Next determine the amount of stock to be removed at the foot of the taper. Set a gage to this amount and mark a line across the lower end of the leg on the two opposite sides, if all four sides

48-5. This Italian Provincial desk has the grac tapered legs characteristic of this furniture style

48-6(a). Laying out a taper.



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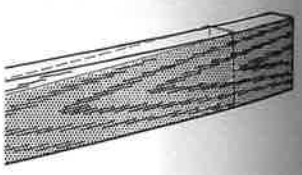
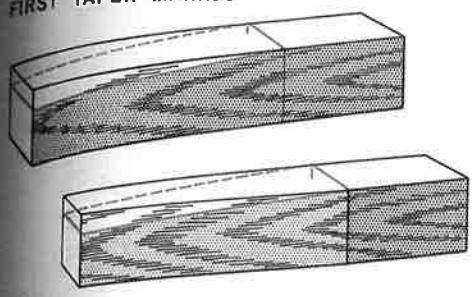
Provincial desk has the graceful ıracteristic of this furniture style.

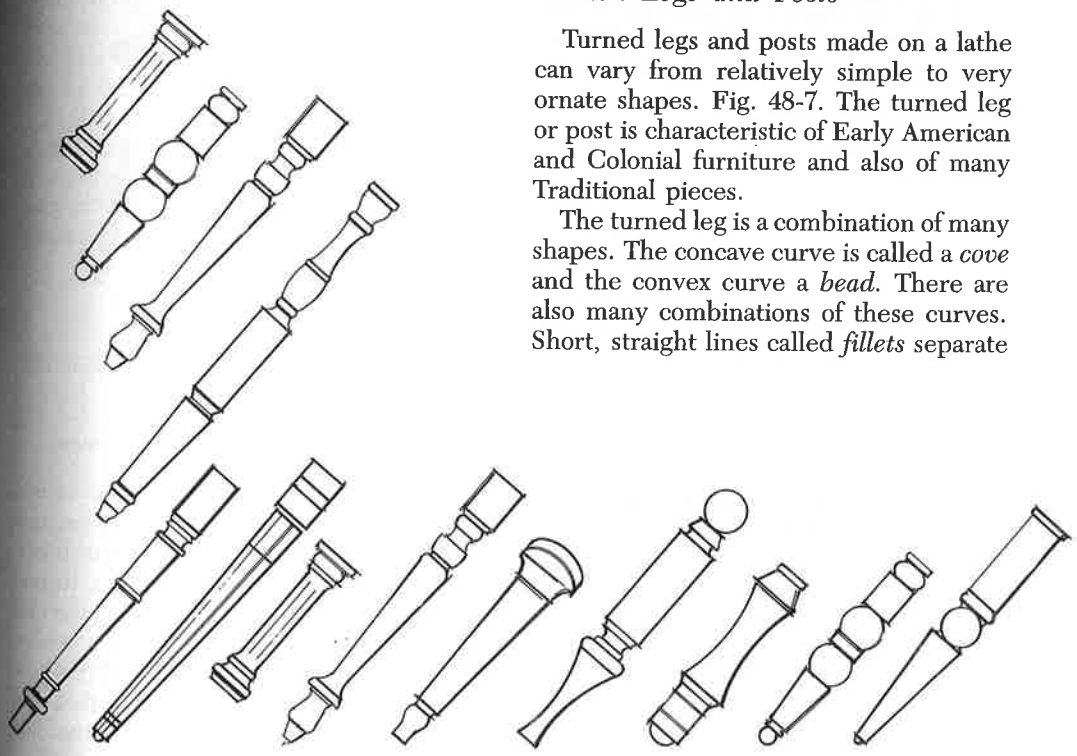
Laying out a taper.





48-6(b). When the taper is to be cut on two adjoining surfaces, one side should be laid out and cut before the second layout is made. In the lower drawing, the first taper has been cut. The piece has been turned on its side and the second taper marked.

48-7(a). A few examples of the various styles of turned legs.



are to be tapered. If only two sides are to be tapered, mark the line across one side. Draw a line along each side to indicate where the taper is to be cut. If tapers are to be cut on adjoining surfaces, the first cut would remove the layout lines on the adjacent side. Therefore make the first cut *before* laying out the taper on the adjacent side. Fig. 48-6.

Cut the taper with a radial-arm or circular saw. Plane the tapered surface smooth and true. After the one or two sides have been cut, do the other one or two the same way.

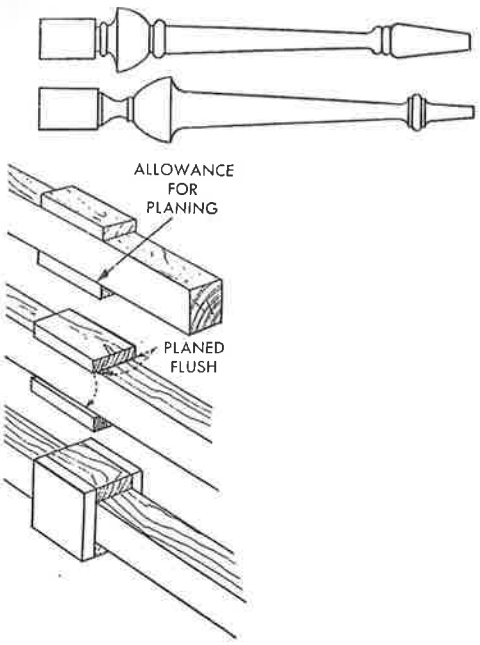
Round, Tapered Legs

The round, tapered leg is often a commercial product made of wood, plastic, or metal. The legs usually have brass ferrules with a self-leveling base and come with metal brackets for attaching them.

Turned Legs and Posts

Turned legs and posts made on a lathe can vary from relatively simple to very ornate shapes. Fig. 48-7. The turned leg or post is characteristic of Early American and Colonial furniture and also of many Traditional pieces.

The turned leg is a combination of many shapes. The concave curve is called a *cove* and the convex curve a *bead*. There are also many combinations of these curves. Short, straight lines called *fillets* separate



48-7(b). If a portion of the leg must be larger than the rest, glue two pieces of the same kind of wood at the proper location. Then plane to exact thickness and glue two more pieces on the remaining two sides.

different parts of the turned leg. Tapered surfaces may be short or long. All of these elements may be combined with a short section of a square leg.

If two or more identical turned legs are needed for a custom-made chair or table, it is advisable to use some kind of template or, better still, a woodturning duplicator on a hand wood lathe. See Unit 37.

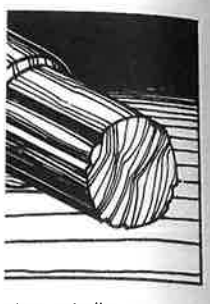
A compression joint can be used for installation of turned legs and rungs in Early American and Traditional furniture. Fig. 48-8. The end of the spindle is turned a few thousandths of an inch larger than the hole size. Then it is slightly reduced in diameter by running the wood through rollers which actually compress the wood fibers. The wood remains compressed as long as it doesn't take on moisture. After glue is applied and the end is inserted in

48-8(a). The compression spindle makes a permanent joint for turned parts.

48-8(b). Compression joints were used to assemble this Windsor armchair.

the hole, the moisture in the glue causes the wood to expand back to its original size, making an extremely strong bond.

Another method of fastening a turned leg to a chair seat is to cut a slot in the end of the leg. Fig. 48-9. Then cut a wedge equal to the width of the slot. If the hole in the chair seat goes all the way through, place the dowel end of the leg in the hole



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and then drive the wedge in from the top to expand the dowel. If it is a blind hole, place the wedge in the slot and drive the dowel in from the bottom of the seat. As the wedge comes in contact with the bottom, it will expand the dowel, making a tight fit.

Cabriole Legs

The cabriole leg is characteristic of eighteenth-century furniture. It was originated by French designers who liked its S shape, and it is still found in much of the furniture made today, particularly Queen Anne and French Provincial.

Cabriole legs can vary greatly in shape. English designs emphasize the knee, as shown by Queen Anne furniture, while the French call attention to the graceful foot and ankle. Fig. 48-1(a & b). The leg is made with a square top if it is to be attached to a rectangular or square table or chair. It is made with a cat face top if it is to be used on a circular or oval chair. A *cat face* is a large rabbet cut out of the top of the leg to fit against the inside of the rail.

At first glance, the cabriole leg appears quite difficult to produce in the shop. However, this is not so if an accurate pattern is made and the correct steps are followed.

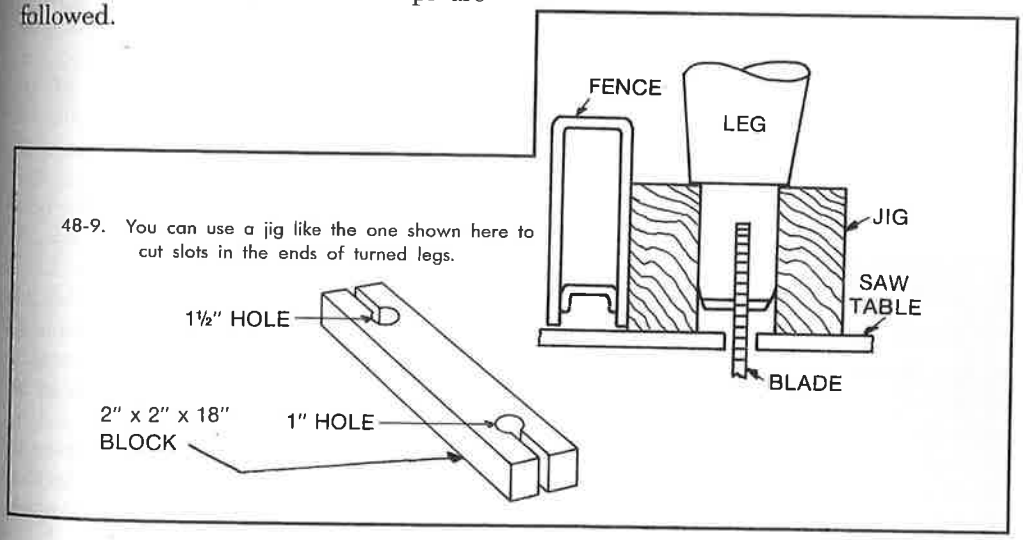
• *Cabriole Leg—French Style*

The best way to make the French-style cabriole leg is first to develop an accurate pattern on a piece of heavy cardboard. Then select a piece of stock thick enough for the leg design. If the leg has a rather pronounced S, it may be necessary to glue up pieces to provide the added stock needed at the curves. In this case, it is important to match the grain at the protruding sections.

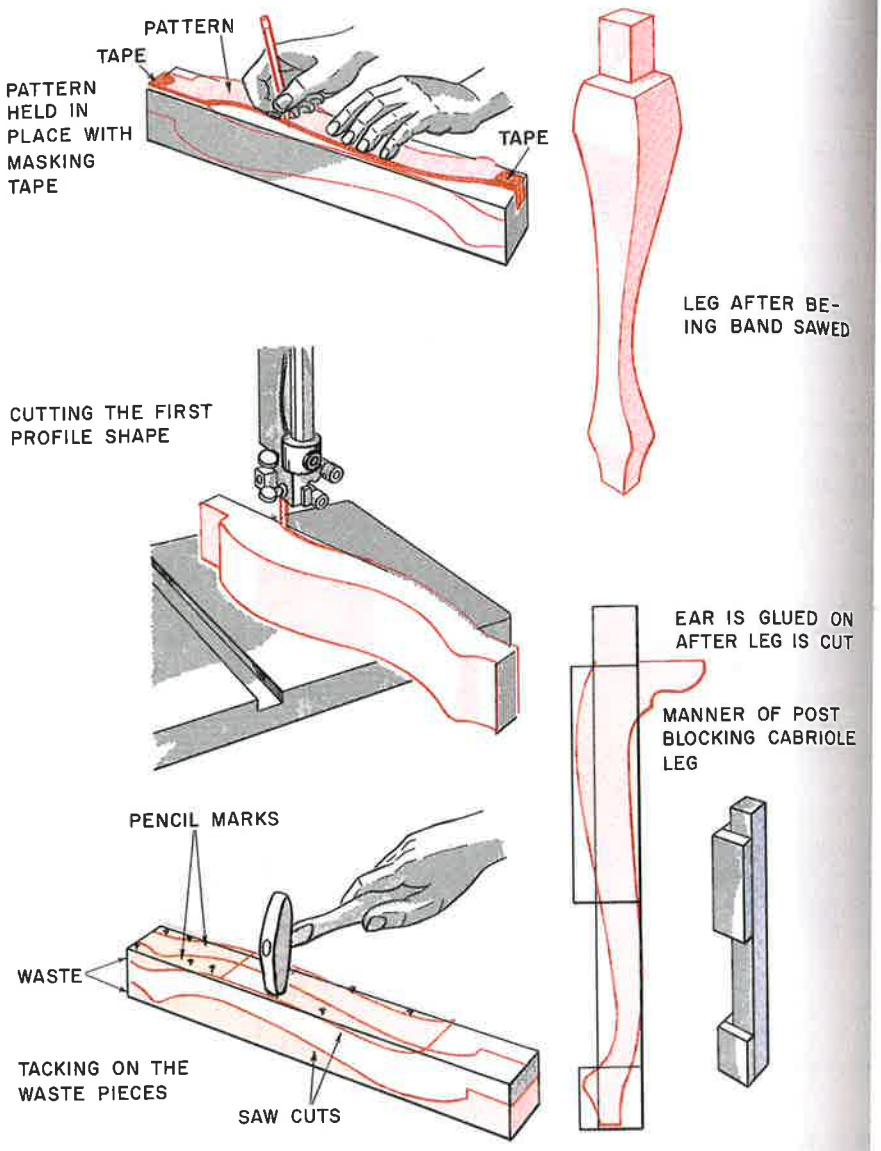
When the stock is ready, trace the design on the two adjoining surfaces. On the band saw make two cuts to form one side of the profile. Save these two pieces of waste stock and nail them back on in such a way that they will not interfere with the cutting and also will not be a part of the finished leg. Then cut from the other layout line to complete the leg. Fig. 48-10.

A second method of doing the cutting is to make the first two cuts almost up to the end of the stock, leaving about 1/4" of unfinished cut. This will support the waste stock when it is turned over to make the second two cuts. Then the waste material is cut off by hand.

After the leg is rough cut to size, it must be smoothed and sanded.



48-9. You can use a jig like the one shown here to cut slots in the ends of turned legs.



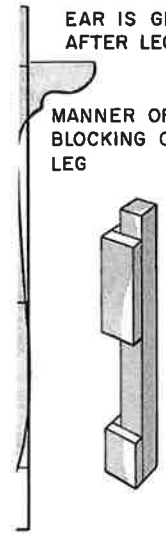
48-10. Steps to follow in laying out and cutting a cabriole leg.

• *Cabriole Leg—Queen Anne Style*

The Queen Anne leg has a very pronounced knee which requires a rectangular piece large enough for the heavy curved portion. Fig. 48-11. While it is possible to begin with solid stock, it is better to produce the rough material for each leg from three pieces of stock of the rect length. Fig. 48-12. Additional rial may be needed to add ears (win the upper part of each leg.

Design the pattern for the leg. Tr on hardboard or heavy cardboard. Cu pattern (template) to shape and san

LEG AFTER BEING BAND SAWED



abriole leg.

pieces of stock of the corg. 48-12. Additional materded to add ears (wings) to of each leg.

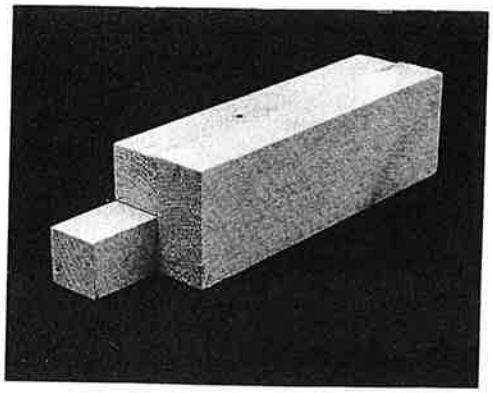
pattern for the leg. Trace it r heavy cardboard. Cut the ate) to shape and sand the

48-11. The cabriole legs on this chest are similar to those described in this section.

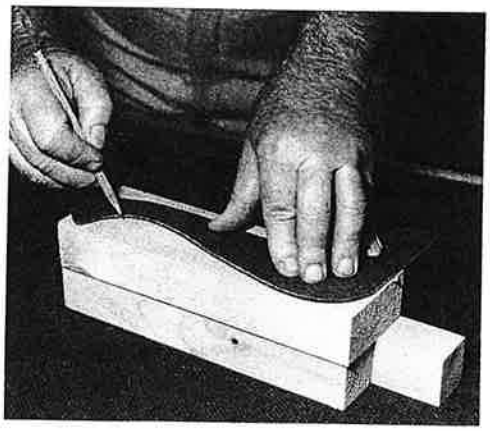
edges. Place the pattern on the adjacent sides of each leg so that the curve is away from the corner posts. Fig. 48-13.

Make two cuts on the band saw from one side of the material. Save the waste pieces and tape them back together. Fig. 48-14. Turn the leg a quarter of a turn to the adjacent side and make the next two cuts to complete the rough shape of the leg. Fig. 48-15. Now use rasps, files, and other forming tools to shape the leg completely.

On many Queen Anne legs, an ear must be added to the sides. Cut the material large enough for each ear and then dowel the ears to the legs, but do not glue them in place. Fig. 48-16. Shape the ears using a band saw and forming tools. Then glue the ears to the legs. Shape the legs to complete the finished profile. Fig. 48-17. As a final step, hand sand.

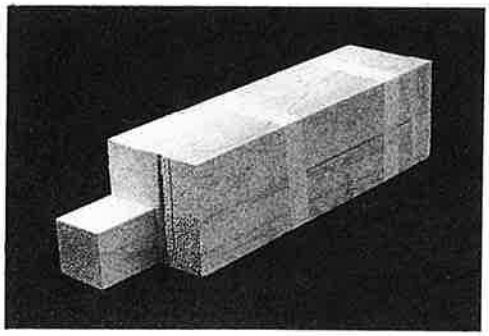


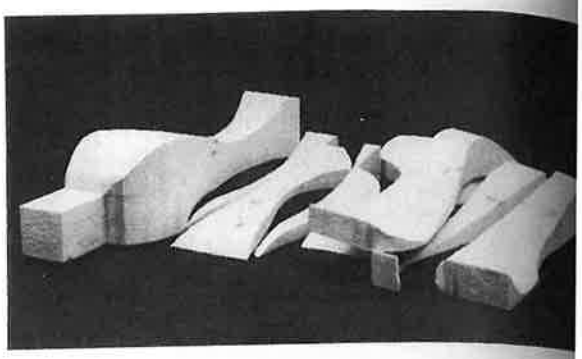
48-12. Glue up three pieces for each of the four legs. Here the longest piece (the corner post) is 1½" × 1½" × 12". One of the shorter pieces is 1½" × 3" stock, and the other is 1½" × 3" stock.



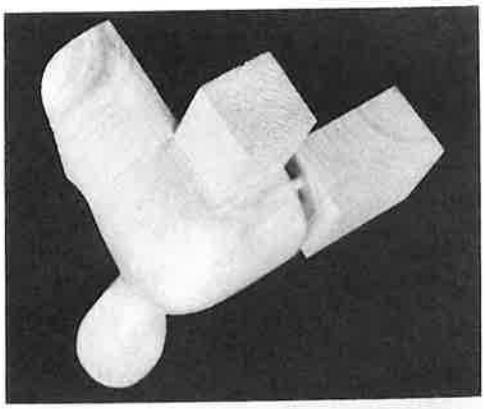
48-13. Tracing the design on the adjacent surfaces. Note that the template is larger than the stock at the top. Two ears will be added to each leg, and extra material will be needed for these.

48-14. The first two cuts have been made and the parts taped together with masking tape.



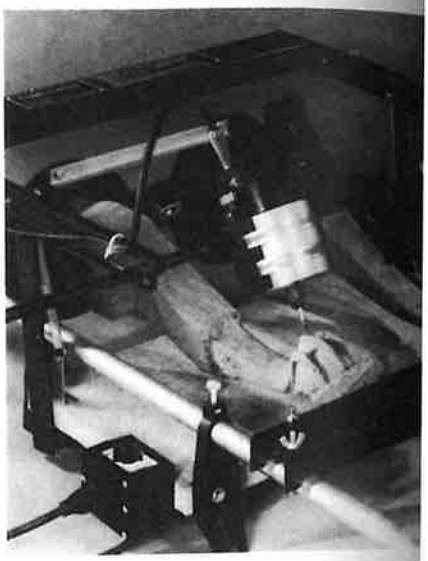


48-15. The second two cuts have been made. The rough shape of the leg can now be seen.



48-16. This shows how the ears are attached to the leg. On the right side, you can see the rectangular ear and the dowels used to join it to the leg. The ear on the left has already been cut, shaped, and glued in place.

48-17. The leg has been shaped and sanded. It is ready for attaching and finishing.



48-18. Some cabriole legs end in a carved foot, such as that of a lion or an eagle. Th best be done with a carving attachment on a

Some cabriole legs have carved To insure uniformity, these can be with a carving attachment on the ro Fig. 48-18.

Flat Bracket Feet

Flat bracket feet are used on pieces of Traditional furniture. Th can be four separate units or a singl (plinth). Fig. 48-19.

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t Feet

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eparate units or a single base
48-19.

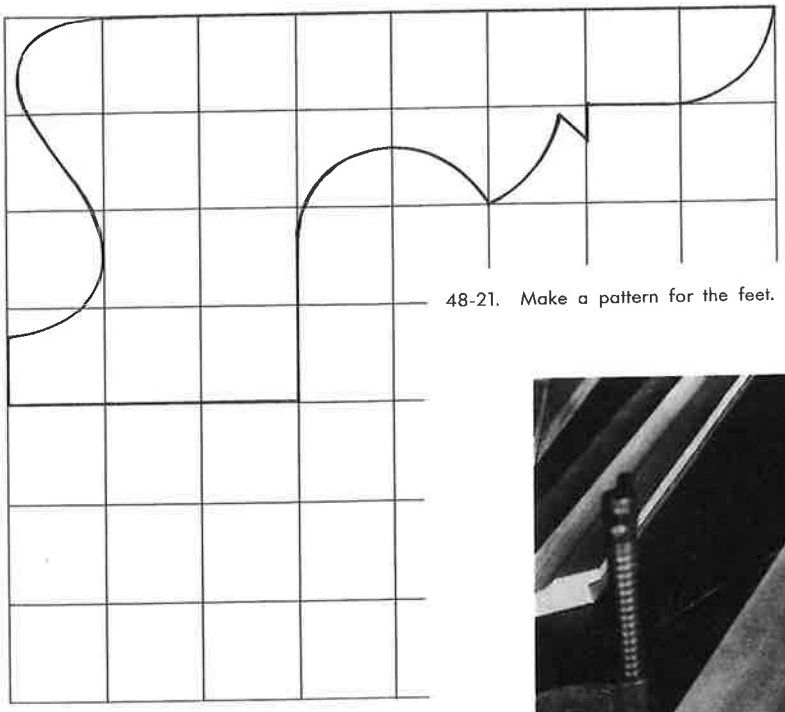
48-19. Flat bracket feet are used as a plinth for this small chest.

First, design the shape of the feet. Select the correct kind of wood of the right thickness and width. If the feet are made as a single base, the length must equal the perimeter of the unit. Rough cut the material into four parts—two for the front and back and two for the sides. Use the design to make a pattern of cardboard or hardboard. Trace the pattern on the material and cut to shape on a band saw or jigsaw. Cut each part to exact length. Then miter the corners and strengthen with splines. Add corner blocks to attach the base to the cabinet.

Ogee Bracket Feet

Ogee bracket feet with double curves, or two S-shaped curves, are widely used on Traditional furniture, particularly of late eighteenth-century design. Fig. 48-20. There are two methods of constructing

48-20. A dresser with ogee bracket feet.



48-21. Make a pattern for the feet.

48-22(a). Cutting a cove (concave curve) on the circular saw.

these feet. The easier method is with a circular saw. This method is described here:

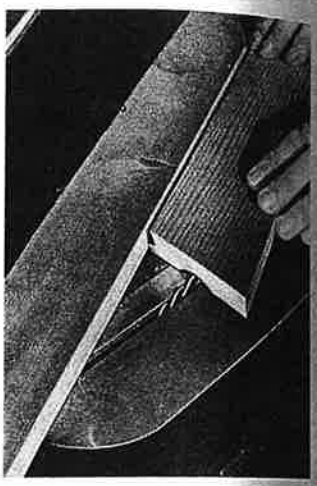
Lay out the design of the feet on a piece of squared paper. Fig. 48-21. Select stock that is thick enough to provide for the double curve. Usually a minimum of 1¾" stock is needed. The stock must be from 4" to 6" in width and long enough to produce the four feet. For the feet shown in this series, a piece 1¾" x 5⅝" x 60" is needed to produce two front feet and two simpler back feet. The front feet are designed with the double curve on both parts. The back feet (where the furniture will stand against the wall) do not need the curved shape on the back portion.

Clamp a wood fence to the table of the saw at an angle as described on page 303 ("Cutting Coves"). Adjust the fence so that there will be a 3/4" flat near one edge and a wider flat near the other. The wider flat must later be shaped with a small plane or other edge-cutting tool to form the second curve. Cut the first curve by making several passes, as described in Unit 26. The saw blade should be raised about 1/16" to 1/8" after each pass until the right depth is reached. Fig. 48-22.

Now cut the stock into six equal lengths, each slightly longer than needed for the finished feet. Four pieces are needed for the two front feet and two pieces for the two back feet.

Rough out the double curved shape of each foot using a small plane or other forming tool. Carefully sand the double

e feet.



cove (concave curve) on the circular saw.

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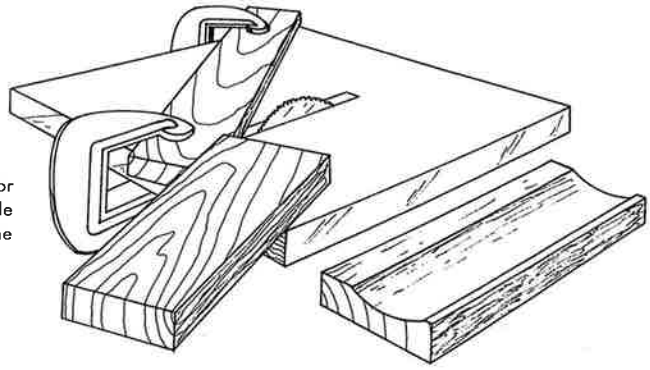
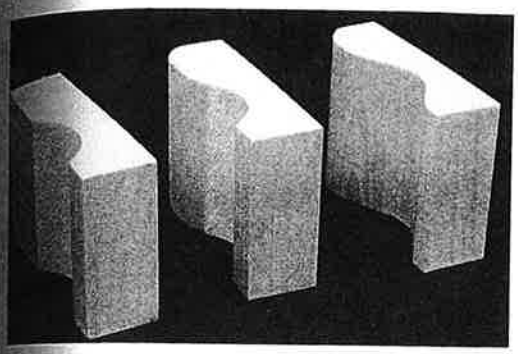


48-22(b). Cut the concave curve for the ogee foot by raising the saw blade about 1/16" to 1/8" for each cut until the desired shape is reached.

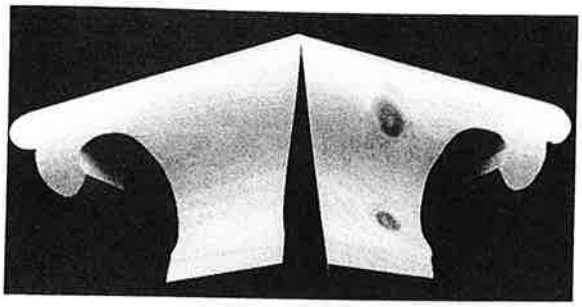


48-23. From left to right: concave curve rough cut on the saw; convex curve rough shaped with edge-cutting tools; wood sanded to final shape with machines or with shaped sanding blocks and abrasive paper.

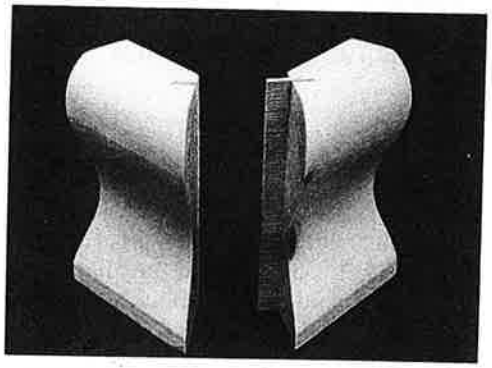
S curve until it is smooth and even. Fig. 48-23. Make sure that all parts are identical in shape. Cut miters on each of the four parts for the front feet. Do not cut miters on the back feet.

Use the paper pattern to make a template of cardboard or hardboard. Trace the pattern on the *back* surface of each part for the two front feet. Cut the designs with a sharp 1/4" blade on the band saw. Fig. 48-24. Shape and sand the surfaces until smooth.

Cut gains for a spline on the lower portion of each miter, making sure that the saw cut does not go through to the concave curved portion of the feet. Insert hardwood splines. Glue up the front feet, making sure the miter is tight. Fig. 48-25.

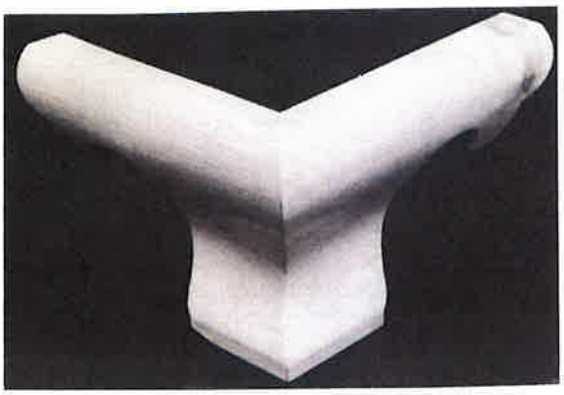


48-24. Parts of the front foot cut to final shape. Note the mitered corners.



48-25. An example of a spline in a miter joint.

Finally, sand the feet using power or hand sanding equipment. Fig. 48-26. Make sure the two front feet are identical in shape and appearance.



48-26. Finished ogee bracket front foot.

48-27. This is a section of the back foot showing how the flat bracket is attached.

The back feet do not need the curved shape on their back portion because that piece will stand against the wall. Instead, a flat bracket is attached to the side piece of each back foot. Cut a rabbet in the side piece to receive the bracket. The bracket is attached with glue and wood screws. The screw heads are countersunk and covered with plugs. Fig. 48-27.

Reeding and Fluting

Reeding and fluting are decorative cuts on legs and posts. *Reeding* is a series of equally spaced convex (curved out) divisions on a leg or post. Fig. 48-28(a). *Fluting* is exactly the reverse of reeding; namely, a series of equally spaced concave (curved in) divisions. Fig. 48-28(b). Both processes are done in the same general way except that a differently shaped cutting tool is used.

48-28(a). The legs on this oval end table are a good example of reeding.

Turned Legs

If the reeding or fluting is done on a turned leg, it is necessary to have a fluting jig or wood lathe to hold the leg and to divide the circumference into an equal number of parts. The fluting jig is really a small lathe in which the work is held. The cutting is done on a shaper, drill press, or portable router. A drawing of the fluting jig is shown in Fig. 48-29. This jig has an indexing head with 24 holes, which allows 4, 6, 8, 12, or 24 divisions around a leg. Note that the indexing head is held in place with a nail.