Building a Gate-Leg Card Table

Tackling curved rails and inlaid legs

by Frank M. Pittman

Tapered legs with fine inlays, curved rails and light proportions give this gate-leg card table a delicate look. A knuckle joint built into the rear apron allows the left rear leg to swing back and support the flip top when fully opened. The deep reddish-brown color of the 50-year-old air-dried cherry used for the top and legs blends perfectly with the mahogany crotch veneer on the curved rails.

About 10 years ago I promised my wife I would build her a card table. Needless to say, after a decade of watching me "research" the problem, she had almost given up hope, and so she was especially delighted when I presented the gate-leg card table shown at left.

Tables such as these, with tapered legs and string inlay, are often attributed to the 18th-century furniture designer George Hepplewhite, but my research suggests that this association may not be entirely accurate. Hepplewhite's principle claim to fame is a book of furniture designs, *The Cabinet-Maker and Upholsterer's Guide,* published by his wife Alice in 1788, two years after his death. And although the tables illustrated in this book have the same light proportions and similarly tapered legs, none have the same balance of uncluttered lines and graceful curves that enhance the table shown here. Fortunately, I can avoid attributing the table's design to a particular style by crediting a former teacher of mine, Walter B. Nalbach, with its inspiration. Nalbach built a pair of tables similar to this in the 1930s, and with his permission I measured them and incorporated a few minor design changes of my own, such as running the string inlay on all four faces of each leg and inlaying the bell flowers on two faces of each leg instead of just one (see the photo at left).

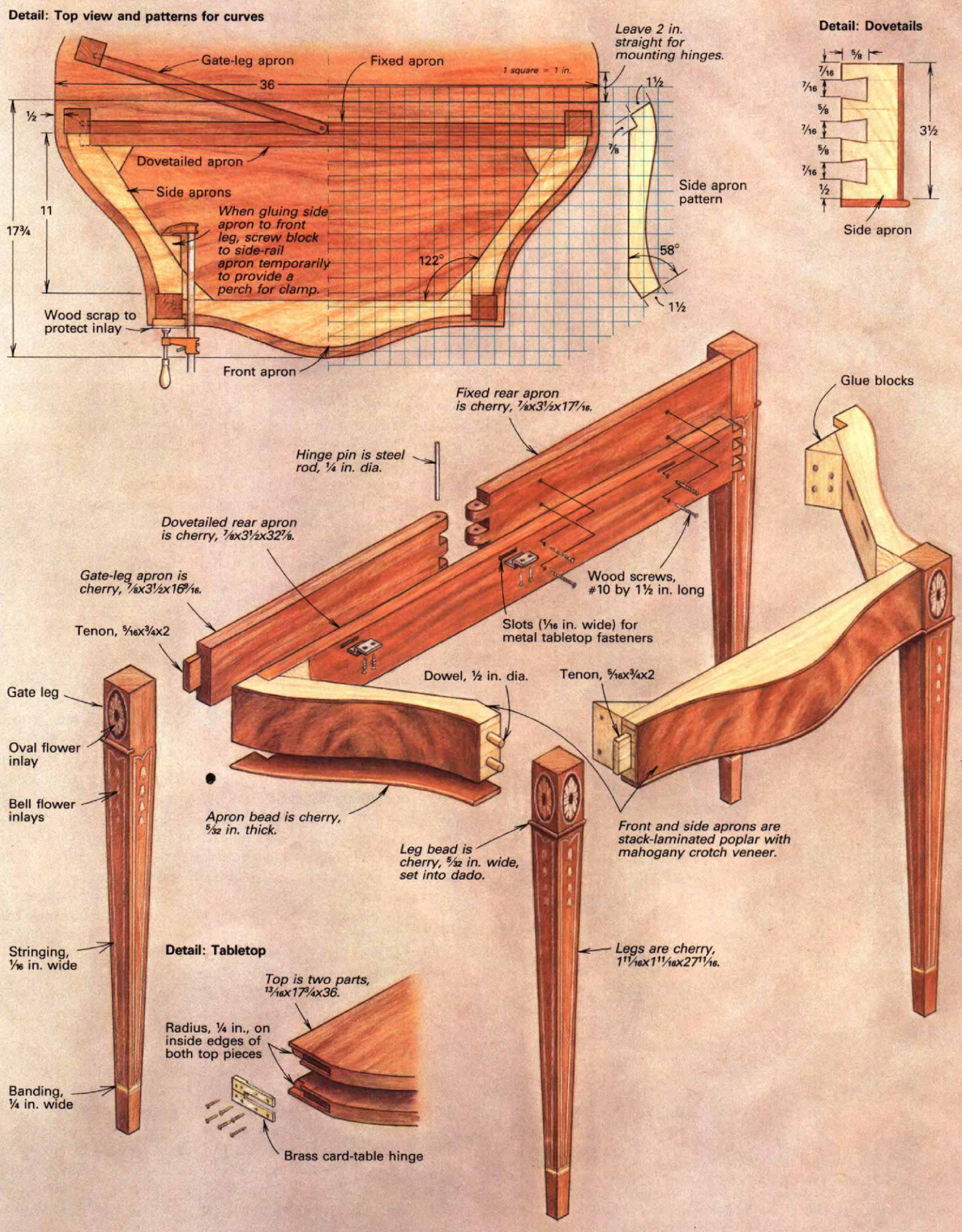
My table is from cherry, with crotch mahogany veneer on the aprons. The legs require 6 bd. ft. of ⅝ stock, which is enough for the table's four legs plus one extra for checking the tool setups for the many machining operations involved with the inlays. The top requires 11 bd. ft. of well-matched ¼ stock. You'll also need an additional 2 bd. ft. of ¼ cherry for the back apron, which is actually a three-part construction that includes an inner apron dovetailed into the side aprons and the two-part knuckle-joint gate-leg mechanism that supports the hinged top when open. The cherry apron beads can be made from leg or top scraps. The front and side aprons are stack-laminated poplar, bandsawn to shape and then veneered. I used about 10 bd. ft. of ¾-in.-thick poplar for the laminated blanks.

Because of the curved aprons and the intricacies of the inlays, the first step in building this table is to make full-scale drawings to work out the details in actual size. You'll need patterns for the curved parts anyway, and so you might as well prepare them ahead of time. In addition, if you buy the oval flower inlays and the banding that trims the lower leg as I did, you should have them on hand before beginning the project. I got my inlays from Constantine, 2050 Eastchester Road, Bronx, N.Y. 10461; the banding is catalog #B3 and the ovals are #IW562. Stringing is traditionally made from holly, maple or satinwood. I was lucky enough to have a piece of ¼ satinwood, which I sawed into 1/16-in-wide inlay strips.

Legs, banding and stringing—Begin by ripping the five $1^{11}/_{16}$-in.-sq. leg blanks from the ⅝ stock Crosscut the blanks to finished

Photo this page: Gary Weisenburger

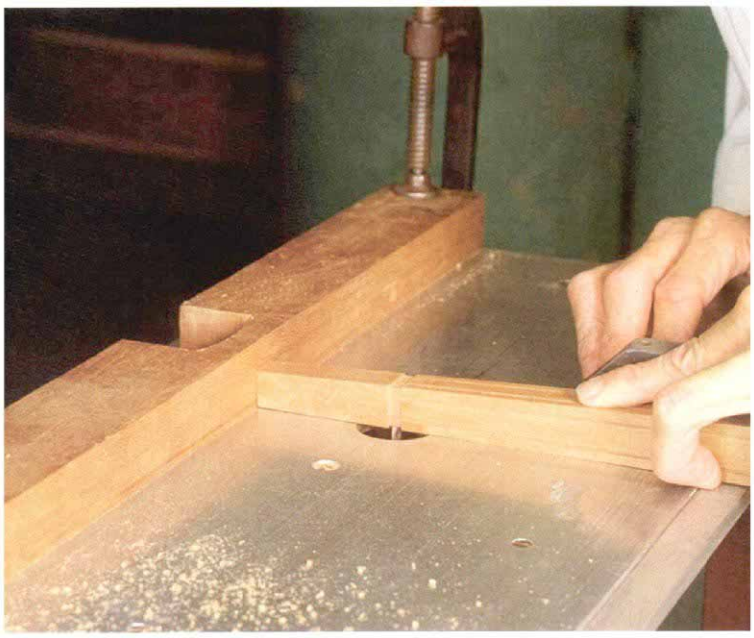
Fig. 1: Gate-leg card table



length, and then taper each side using a jig that holds the leg at a slight angle as it's passed through the tablesaw. As you can see in figure 2 on the facing page, the taper begins 4 in. below the top of each leg and extends to its base, which is only ⅝ in. sq. After tapering, each leg requires five separate operations to cut the grooves for the inlays. The legs must also be mortised to receive the apron tenons and dadoed for the lower apron bead that runs across the legs, but it's best to do these operations after constructing and veneering the aprons to ensure these joints are located properly.

You should cut the banding grooves around the bottom of the legs first because they make handy stops for the long stringing grooves that you will cut next. This bit of wisdom comes from hindsight; I cut the stringing grooves first, as you can see in the photo below. But more importantly, the photo shows how I routed the banding grooves on the tapered legs with the aid of a miter gauge, even though the router table had no miter gauge slot; I simply ran the gauge's bar along the table's front edge with the router table fence clamped parallel to the front edge to locate the grooves. I set the miter gauge angle to compensate for the legs' taper by making test cuts on the fifth leg and measuring up squarely from the bottom of the leg until the groove ran parallel to the bottom.

I made the long, straight grooves for the stringing with a Dremel tool fitted with a router-base attachment and guide. My dentist helped me acquire a few carbide dental burrs (Pennwalt #559, from Health Co International, 1 Field Lane, Orchard Ridge Corporate Park, Brewster, N.Y. 10509; 914-277-4074), which I used to cut the 1/16-in.-wide grooves. (See *FWW* #83, pp. 62-64 for more on this method.) To cut the ¾-in.-radius grooves at the top of the stringing pattern, I made a ⅛-in.-thick Plexiglas fixture that has a ⅛-in.-dia. hole in the center of each of the arcs (see the top photo at right on the facing page). A pivot pin screwed through the router-attachment base is inserted into each center hole in turn and the Dremel tool is pivoted to cut the arcs. I used a pair of dividers with a dowel taped to one leg to locate the fixture on the surface to be inlaid, as shown in the top photo at left on the facing page. When the fixture was aligned so the arcs began at the ends of the straight stringing grooves and met at the centerline of the leg, I clamped the fixture to the leg and cut the grooves.



The author routs the banding groove in a leg by running the miter gauge bar along the router table's front edge. The router-table fence, which locates the cut, is clamped parallel to the table's front edge.

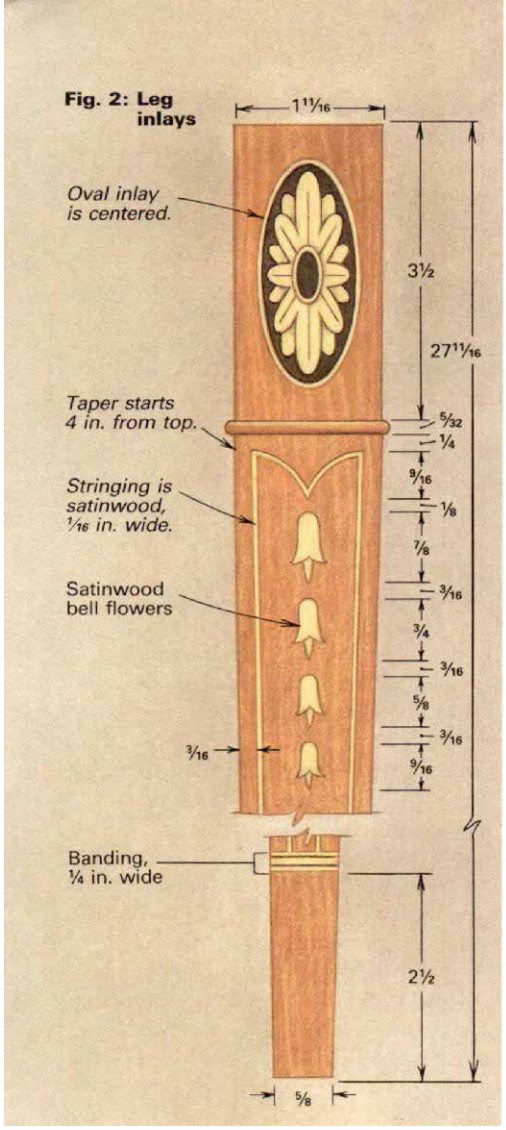
After cutting the banding and stringing grooves, I ripped out the thin satinwood strips. When I got around to fitting the curved stringing sections, I discovered that satinwood is too brittle to bend well, and so I had to soak the stringing in water for several minutes and then bend it over a hot pipe mounted on a soldering iron. The soaking and heating had to be repeated several times to achieve the desired bend, and even then I broke several pieces. I cut and fit all the stringing for one leg surface at a time, including miters at the corners, and then glued the pieces in right away so I wouldn't lose them. The stringing expands slightly when it absorbs glue; so you should press the pieces into the glue-filled grooves as quickly as possible. The expansion holds the pieces so tightly that there is no need to clamp the stringing. After all the stringing is applied, I glued the banding strips into their grooves at the base of the legs. Before inlaying the flowers, I sanded the stringing and banding flush using 100-grit paper on a sanding block,

Flower inlays—My table required eight sets of satinwood bell flowers. Each set has four flowers that diminish in size from top to bottom, and so I needed 32 flowers in all. To streamline the process of cutting out the flowers, I glued up a stack of nine pieces of satinwood veneer with a piece of paper between each layer so the stack could be easily separated later. The ninth layer gave me an extra set of flowers just in case. Then I made a photocopy of the full-size inlay drawing and glued it to the top of the veneer stack. After cutting out the flowers with a scroll saw, I sanded and filed each stack to final shape and then inserted a sharp knife (you could also use a razor blade) on the paper glueline to pop the veneer layers apart (see the bottom photo on the facing page).

Inlaying the 32 separate flowers isn't difficult, but it is slow work. It's not something you can whip out in a couple of hours; so realize up front that you have to take your time. To begin, place one of the large flowers carefully on the centerline of the leg and trace around it with a sharp pencil; do one flower at a time. I use my Dremel tool with a router base to clear out most of the wood, and then I clean out the tight corners and final fit each flower with a knife and a small chisel. For both the routing and the final fitting, I use a lighted magnifying glass (the kind that clamps to a tabletop and that jewelers often use). I've found that if I'm satisfied with the way an inlay looks through the magnifying glass, it really looks great without magnification. Fit one flower at a time and then glue it in place with a clamp and waxed-paper-covered block. By the time you've inlaid one flower on each leg, the first leg will be dry enough to unclamp so you can inlay its next flower. The six oval inlays at the top of the legs are fitted the same way as the flowers.

After all the inlaying is complete, finish-sand the legs through 220-grit. Make sure that all traces of dried glue have been sanded away. I thought I had done a thorough sanding job, but when I sprayed on the first coat of lacquer, several glue smears showed up and I had to resand all of these areas. You can locate dried glue before finishing by wetting the wood's surface with water: glue residue will show up as light-colored areas.

Veneered front and side aprons—The front and side apron blanks are made by stack laminating ¾-in.-thick yellow poplar to the following sizes: one 3½x4½x21½ front apron; and two 3½x3½x15 side aprons. Use the gridded drawings of the front and side aprons in the detail in figure 1 on the previous page to make full-size templates for laying out the curves on each blank. When you bandsaw the curves keep the cuts as clean as possible, because the waste part of each apron will be used to clamp the veneer to the apron. Sand or scrape out any slight irregularities in the apron



Left: *Pittman uses a set of dividers with a dowel taped onto one leg to locate the plastic template for cutting the curved stringing grooves.* ***Right:*** *The arc is cut with a Dremel tool fitted with a screw that is inserted in one of the template's holes. The screw allows the bit to be pivoted through the ¾-in.-dia. arc.*

To make the flower inlays, the author glued up a stack of veneers with paper between each layer, cut the flowers from the stack and then separated the inlays with the tip of a knife.

curve, and then screw temporary blocks to each end of the waste portion of the apron blank to ensure perfect alignment when clamping the veneer. I recommend using backed veneer if you can find it because it is much easier to handle than single-ply crotch mahogany. I bought book-matched crotch mahogany veneer backed with poplar veneer from Cummings Veneer Co., Box 49, New Albany, Ind 47150. Cut the veneer so it overhangs about ¼ in. on both edges of the blank. Then glue the veneer to the outer face of the apron, clamp the waste half of the blank over the veneer with C-clamps and let it dry overnight. The next day, unclamp the aprons and trim the overhanging veneer with a sharp knife.

As you can see in the detail in figure 1, the ends of each side apron must be trimmed to length at a *58°* angle from the straight back side. Because of the difficulty of cutting tenons on these angled ends, the side aprons are doweled into the front legs. In addition, a notch must be cut at the back end of each side apron to square off an area to receive the dovetailed rear apron. Make the 58° parallel end cuts using the miter gauge on the tablesaw and with the blade tilted 32° from its usual 90° position. Then lower the blade and make the 58° cut on the inner face of the side apron to form the notch that will house the rear apron. Return the blade to its square position and complete the notch by standing the apron on its back end and supporting it with the miter gauge. After notching both side aprons, raise the blade and trim the front ends of both side aprons in a similar manner, with the aprons standing on their front ends, to form a flat area to join with the glue blocks, as shown.

The tenons that join the front apron to the legs must be cut in two steps because of the curve on the apron's face. Trim the apron to length first, allowing for the ¾-in.-long tenons. Then, on the tablesaw, cut the tenon shoulder and cheek on the apron's back side with its flat side down. The apron can't be flipped over and run facedown because of the curve and so the top shoulder and cheek must be cut from above with the radial-arm saw. I made the tenons 5/16 in. thick and centered them on the apron's squared-off ends.

When locating the mortises and the dowel holes in the front legs, keep in mind that the aprons are set back ⅛ in. from the corner of those legs. I bored the ½-in.-dia. dowel holes in the front ends of the side aprons on the drill press by damping a wood hand screw to the back end of the apron to provide a "foot" to stand it up vertically on the drill-press table. Then I used another hand screw as a leg to support the upper portion of the angled apron. I inserted commercial dowel centers into the holes to locate the mating holes in the legs. To complete the front legs, locate and cut 5/32-in.-wide by 3/16-in.-deep dadoes on the outside surfaces of each leg to receive the bead that runs around the bottom of the aprons.

Rear aprons—The three-pan rear apron consists of a long inner apron dovetailed to the side aprons, and two short aprons that are tenoned into the rear legs and joined at the middle with a knuckle

Photos except where noted: Jim Boesel

joint, or wooden hinge. The apron that's joined to the fixed rear leg is screwed and glued to the long dovetailed apron, while the other is tenoned to the gate leg and allowed to pivot to support the tabletop when the flap top is open.

To determine the length of the dovetailed apron, dry-assemble the front legs with the front and side aprons, and then while holding the joints together tightly, measure the exact distance between the notches in the back ends of the side aprons; don't forget to add the length of the dovetails. The detail in figure 1 on p. 61 shows the layout for the hand-cut dovetails I used on my table.

When making the two-part outer rear apron, don't cut the parts to exact length; leave each about 2 in. too long until after you've cut and fit the hinge. There's no reason to be intimidated by the idea of making a wooden hinge. Simply lay out the interlocking fingers directly on both hinge parts and mark the areas to be cut. Set the tablesaw blade at the same height as the thickness of the parts, and while holding the workpiece vertically and supported by the miter gauge (fitted with an auxiliary fence), make repeated cuts to remove the waste.

Before rounding over the corners to form the knuckles, put the two parts of the hinge together and use the drill press to bore the ¼-in.-dia. hole for the steel hinge pin, as shown in the photo below. Drill clear through the hinge assembly so you can easily remove the pin when trial-fitting. You'll trap the pin at final assembly by gluing a dowel plug in the bottom of the hole. After drilling the hole, take the hinge apart and use a disc or edge sander to round over the corners that form the hinge's barrel; replace the pin and make sure the gate-leg apron swings through 90°, even when the fixed apron is held tightly to the dovetailed rear apron.

When the hinge is complete, cut both parts of the hinged apron to length, allowing ¾ in. at each end for the leg tenons. Instead of centering the rear leg tenons as on the front apron, I made them flush with the back surface of the aprons to give the mortise a larger setback in the gate leg. Finally, locate and cut a mortise in each rear leg so that the hinged apron's inside face is flush with the face of the leg.

The hinge-pin hole is drilled through the two-part rear apron after an end-to-end finger joint is cut on the two parts, but before the vertical corners are rounded over to form the hinge barrel.

The front and side aprons can now be finish-sanded to 220-grit in preparation for assembly. However, before gluing up the table base, use the front and side aprons as patterns for bandsawing the 5/32-in.-thick cherry that is glued to the bottom of the aprons to form the bead. Make sure the front edges will protrude about ⅛in. and round over these edges with a finger plane or small-radius router bit. Also, round over some of the scrap from the curved pieces to make the short sections of bead for the legs.

Gluing up the base and attaching the top—Because of the unusual construction of the base, I glued it up in several steps. First, I glued the two hinged aprons to the rear legs and the side aprons to the front legs. In order to damp the side aprons, I had to screw blocks to the inside of the aprons temporarily, as shown in the detail in figure 1 on p. 61. After the side apron/front leg assemblies were dry, I glued the front apron and the dovetailed back apron in place. Then I cut, fit and screwed in the corner glue blocks. Next, I glued and screwed the fixed rear apron/leg assembly to the dovetailed apron and attached the gate-leg assembly by inserting the hinge pin into the knuckle joint (after plugging the bottom of the hole with a short dowel). Finally, I glued the apron beads in place, and fitted the small leg beads into the dadoes and glued them in place.

As you can see in figure 1, I used metal clips to secure my tabletop to the aprons. These tabletop fasteners, which hold the solid top to the aprons while still allowing it to expand or contract, are available from most woodworking mail-order companies and in some hardware stores. With the table standing on all four legs, it's easy to rout the slots with a 1/16-in.-wide, winged slot-cutting bit; of course, you need to buy the clips first so you know how far the slots should be from the upper edge of the aprons.

Construction of the two-part tabletop is very straightforward. The ¾ stock is planed to 13/16 in. thick and then glued up to make two pieces about 20 in. wide by 37 in. long. When these top blanks are dry, the glue squeeze-out is scraped from the joints and the mating (hinged) edge of each blank is cleaned up on the jointer. Then apply double-faced tape to the surface of one blank, and place the other blank on top, taking great care to perfectly align the mating edges. The top's shape is then drawn on the upper surface from a full-scale pattern and both pieces are bandsawn out at the same time. With the two tabletop halves still stuck together, sand the sawn edges to finished shape. Then you can separate the two halves and use a router with a ¼-in.-radius bit to round over the inside mating edge of both top pieces to provide clearance when the top is opened and closed.

I bought my card-table hinges from Wise Co., 6503 St. Claude Ave., Arabi, La. 70032 (catalog #H05A). I had to grind down a ½-in.-wide high-speed steel router bit to cut the 15/32-in.-wide mortises in the edges of the tabletops to receive the hinge leaves. I recommend that you use steel screws for fitting the hinges initially and then replace them with brass screws at final assembly. At this point, you can place the assembled top on the base, screw the tabletop fasteners to its underside and check that the top and gate leg both open and close as they should.

Finally, disassemble the tabletop from the base and the hinges from the tops and apply the finish. I used spray lacquer, rubbing between coats with 400-grit paper and smoothing the final coat with 0000 steel wool to produce a satin sheen. □

Frank Pittman teaches furniture design and construction, as well as wood technology and guitarmaking, at Western Kentucky University in Bowling Green. The Cabinet-Maker and Upholsterer's Guide, *by George Hepplewhite, is available from Dover Publications Inc., 31 E. 2nd St., Mineola, N.Y. 11501.*