

Build a Greene & Greene Side Table

Pinned and plugged joints add beauty and strength

BY GARY ROGOWSKI

Simple is beautiful, so they say. But I also know that simple and beautiful together are challenging to achieve. This became apparent when I set out to reproduce this Greene and Greene side table, which embodies the details and construction techniques practiced by the prolific furniture-making brothers Charles and Henry Greene in the early 20th century.

The table base is assembled with pinned mortise-and-tenon joints; square ebony plugs decorate the pinned joinery;

breadboard ends keep the tabletop flat; and the piece features a cloud-lift motif.

Although the construction details are fairly simple, the challenge lay in translating the beauty of the table from photograph to the real thing. At first, I made a scale drawing from the photo, but the table looked oversize and chunky. To overcome my dilemma, I built a full-scale mock-up out of cardboard. This took only a few hours of slicing pieces of cardboard and assembling them with hot-melt glue. If a part seemed too big, I cut it down and rebuilt the model.

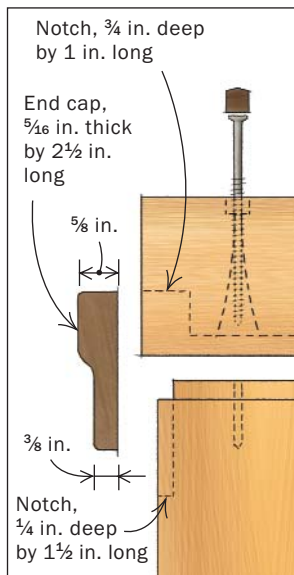
For the tabletop, the aprons, and the stretchers, I chose a thickness of 1 in., which matched the strong appearance of the legs. When I was happy with the look of the cloud lift, I made a template for it out of ¼-in.-thick medium-density fiberboard (MDF) and then transferred the shape to my cardboard aprons. After I drew the breadboard ends on the cardboard top, the design felt and looked right. Now it was time to mill some wood.

Cut mortise-and-tenons first

The table is assembled with mortise-and-tenon joinery that is pinned and plugged. Thick legs provide ample room for the mortise-and-tenon joints from the aprons and stretchers without having them run into each other. All eight mortises for the aprons are the same size, and the tenons are haunched on top. The four mortises for the side stretchers also are the same size, but the tenons are not haunched.

The first step is to mill the legs to final dimension. Once the legs are complete, cut and fit the aprons and the side stretchers. These pieces





Ebony plugs in breadboard ends, $\frac{3}{8}$ in. square by $\frac{1}{4}$ in. long

Top panel, 1 in. thick by 24 in. wide by 31 $\frac{1}{2}$ in. long (including tongues)

Breadboard ends, 1 in. thick by 2 $\frac{1}{2}$ in. wide by 24 $\frac{1}{2}$ in. long

Screws, 3 in. long

Tongues, $\frac{5}{16}$ in. thick by $\frac{5}{16}$ in. long

Aprons, 1 in. thick by 4 in. wide

Apron tenons, $\frac{3}{8}$ in. thick by 3 $\frac{3}{16}$ in. wide by 1 in. long, with 1-in.-wide by $\frac{3}{8}$ -in.-long haunch

Aprons are inset $\frac{1}{4}$ in.

Ebony plugs in legs, $\frac{5}{16}$ in. square by $\frac{1}{4}$ in. long

Groove, $\frac{3}{8}$ in. wide by $\frac{7}{8}$ in. long

Pins, $\frac{1}{4}$ in. dia. by $\frac{3}{4}$ in. long

Wood buttons, $\frac{3}{4}$ in. thick by $\frac{7}{8}$ in. wide by 1 $\frac{1}{4}$ in. long

Pins, $\frac{1}{4}$ in. dia. by 2 in. long

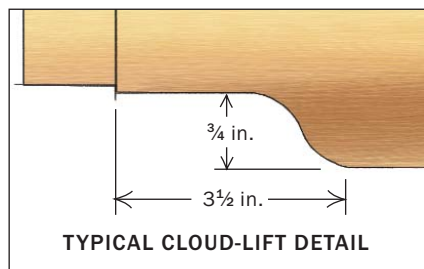
Ebony plugs in side stretchers, $\frac{3}{8}$ in. square by $\frac{1}{4}$ in. long

Side stretchers, 1 in. thick by 3 in. wide

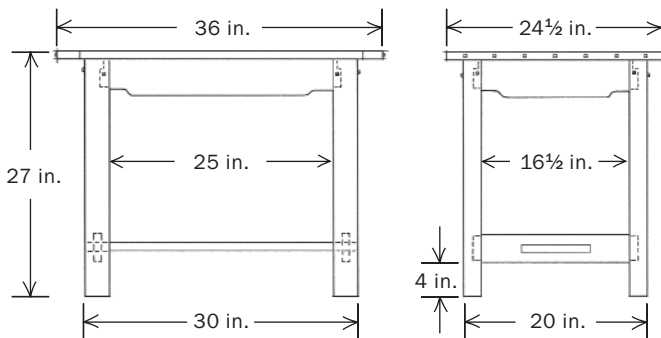
Center-stretcher tenons, $\frac{3}{4}$ in. thick by 7 $\frac{1}{2}$ in. wide by 1 $\frac{3}{4}$ in. long

Legs, 1 $\frac{3}{4}$ in. thick by 2 $\frac{1}{2}$ in. wide by 26 in. long

Center stretcher, 1 in. thick by 9 $\frac{1}{8}$ in. wide by 30 in. long



Side-stretcher tenons, $\frac{3}{8}$ in. thick by 2 $\frac{7}{8}$ in. wide by 1 in. long



MAHOGANY SIDE TABLE

Cloud lifts and ebony plugs decorate the piece. A signature Greene and Greene detail is the breadboard ends, which help keep the solid tabletop flat. Pinned mortise-and-tenon joints keep the table rigid yet allow for seasonal movement.



Shape the aprons and assemble the sides

Cut the cloud lift with a template and router table. Rout the cloud-lift motif on the aprons after cutting and fitting the apron tenons in the leg mortises.

should be cut and fitted before shaping the cloud lifts. The tenons can be cut on the tablesaw or on the router table. Fine-tune with a shoulder plane until you achieve a sweet fit.

Cut the through-mortises in the side stretchers—The center stretcher isn't absolutely crucial for the strength of the table, but it is an important visual element. The center stretcher is connected to the two side stretchers with pinned through-mortise-and-tenons. To allow the center stretcher to expand and contract as needed, the holes in the tenons are elongated, and no glue is used in the joint.

Cutting the through-mortises in the side stretchers requires removing a lot of wood, so it's best to do this in steps. First, remove most of the waste on the drill press with a brad-point bit sized slightly smaller than the mortise. Use a fence to keep the bit centered in the workpiece, and clamp a piece of scrapwood to the table under the exit point of the bit to prevent any blowout on the bottom of the workpiece. Next, set up your router table with a 3/4-in.-dia. straight bit and make a series of passes to clean out the rest of the mortise. To set the length of cut, clamp stops onto the router-table fence. Finally, square up the mortise ends with a chisel.

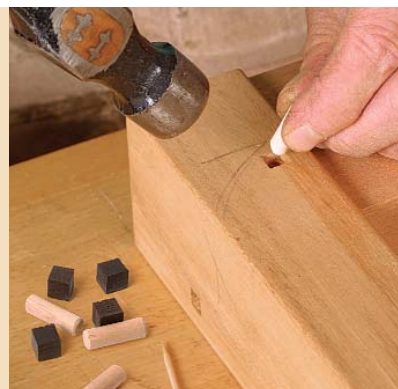
Shape the cloud lift

Once all of the joinery on the table base has been cut (except for the tenons on the center stretcher), you can shape the cloud-lift pattern on the aprons. Shaping always comes after joinery so that you can utilize the flat faces and edges for measuring and indexing your cuts. Use a template to trace the cloud lift on each end of the aprons, then rough-cut the shape on the bandsaw. Cut close to the line, within 1/16 in., then use the template as a guide to rout the final shape.

For speed and safety, I made a holding jig for template-routing the cloud lifts (see the top photo at left). Make the



Assemble the table sides. Apply glue to the tenon cheeks and the mortise walls and then assemble each side separately, checking to make sure they go together square and true.



PIN AND PLUG THE JOINTS

Drive in a dowel with glue below the area chiseled square (top). Cover the squared hole with an ebony plug. Bevel the top of the plug on four sides with a chisel (bottom). A piece of veneer placed under the chisel protects the table leg from damage as you pivot the chisel upward on its bevel edge.



Make the stretchers and assemble the base



Dry-fit the base and measure for the center stretcher. A piece of wood between the bottoms of the legs (above) prevents them from bowing inward. Then center the stretcher and mark for the tenon shoulders (below).



router cut downhill on the end grain to prevent blowout. If cut properly, it will take only a bit of sanding with 180- and 220-grit paper to clean up the edges. The long edges of the aprons can be scraped or planed where needed, and the corners are rounded first by chamfering with a block plane and then sanding lightly.

Drill and chop for the square plugs

The mortise-and-tenons are pinned for strength and are capped with square ebony plugs. It's easier to drill and square up the holes before assembling the table. Chuck a $\frac{1}{4}$ -in. brad-point bit in the drill press and drill about $\frac{1}{4}$ in. into the legs where the plugs will be roughly centered in the tenon. Then square up each hole with a chisel. If your squaring is a little off, don't worry. The square plug stock is made a hair oversize and will fill up any little indiscretions. The holes for the pins will be drilled after table assembly.

Now's a good time to sand the parts because it's much simpler to do before assembly. On this table, I planed, scraped, and sanded all of the parts, except for the inside faces of the aprons, which I simply handplaned. Leaving any tool marks will make the piece worth more someday on *Antiques Roadshow*.

Glue up the two side assemblies

This table is easier to glue up in sections, beginning with the side assemblies (legs, aprons, stretchers). But before you break out the glue bottle, test the fit of all parts with a dry run. Dry-assembling any piece is not just a good idea—it's the law in my shop. I know it's hard to stop the building momentum, but just a few minutes of



Glue up the base.

Clamp one side of the table to a workbench to help support the project during final glue-up.

Pins secure the unglued through-tenon. Drive a dowel through the stretcher and cap it with a square ebony plug. No glue is necessary to hold this joint together.

planning and practice will keep your pulse rate nice and low and make for smoother glue-up.

First, pull out all of the clamps and clamping pads that will be required and run through the sequence to determine where you need to apply pressure. When you're satisfied with the fit, assemble the parts with glue. Once the clamps are on, check the legs with a straightedge to make sure they are flat and square. If the assemblies are out of square, adjust the clamp pressure as needed. Plane the aprons flush to the tops of the legs after the glue dries.

Pin and plug the joinery—When the assembled table sides are dry, drill for the pins everywhere you made square holes for the

Attach breadboard ends to the tabletop



Cut a groove in each breadboard end. Center the groove in the board but reference all of the related cuts off the top side of each workpiece.



Rout a stopped groove for the ebony end caps. Cut a deep groove in the edge of the breadboard end and a shallow groove in the tabletop panel.



Rout the tongue. Creep up on the fit by routing just shallow of the final fit on both sides. Then fine-tune the fit with a shoulder plane.

Fit the tongue-and-groove joint. Handplane a slight concave on the breadboard ends to create a tight spring joint.

ebony plugs. Drive the pins below the surface of the legs with a drift pin. Now you're ready to add the ebony plugs. You can prepare the plug stock ahead of time; just remember that the project requires two sizes of pins and plugs. Mill the plugs square but a bit oversize on the tablesaw, then fine-tune the fit with a block plane. Before cutting off each square plug, chamfer one end of the ebony stock.

The plugs are glued in place with some help from a hammer. When you're driving in a wood plug, you can tell that it's gone far enough when blows from the hammer make a pinging sound. Finally, bevel the plugs to a pyramid with a chisel.

Cut and fit the center stretcher

To size the center stretcher, you first have to dry-fit the base with the long aprons clamped in place. Put a spacer between the bottoms of the legs that is the same length as the long apron (from shoulder to shoulder) to keep the legs from bowing inward. Rest the center stretcher over the side stretchers, then mark the location of the tenon shoulders directly on the workpiece.

Once the shoulder-to-shoulder dimension of the center stretcher



has been determined, establish the tenon shoulders on the table-saw and cut away the cheeks using the router table. I put 1/16-in. shoulders on the sides of the tenons to conceal any inconsistencies in the fit. These shoulders can be cut on the bandsaw and finished with a chisel. Finally, use a shoulder plane to fit the through-tenons. When fitting a tenon, check it for shiny spots after each test fit. These spots indicate where the tenon is rubbing against the wall of the mortise. Plane a little off these spots until the joint fits perfectly. Finish the tenons by chamfering the ends with a block plane.

Last, rout the cloud-lift patterns on the center stretcher at the router table with the cloud-lift template.

Finish assembling the table base

Final assembly should be done on a flat surface. Once again, dry-fitting the parts is essential before getting out the glue. Put the long aprons into their mortises on one side. Then install the center stretcher. Line up the other side assembly and put all of the tenons into place. Once the base has been glued up, check it for square across its diagonals and adjust as needed.

After the glue dries, stand the table on all four legs and hammer the pins into the mortise-and-tenons on the stretcher system and on the long aprons. Then glue in the ebony plugs on top of the pins.

Shift your sights to the breadboard ends

When gluing up the tabletop, make sure the boards are aligned for looks and grain direction. Milled to the same thickness as the top, the breadboard ends are 1/2 in. longer than the top is wide. The ends attach with a tongue-and-groove joint and screws set in slotted holes.

On the router table, cut the groove in the breadboard ends first. Then cut the tongue on the top using a plunge router. I sneak up on a good fit by routing the tongue close to size and then using a shoulder plane to fine-tune the fit. Don't force this fit or you'll split the breadboard end along the groove.

Once the breadboard ends are fitted onto the tongues, drill holes for the screws. Elongate the screw holes (making them wider as you move out from center) so that the tongue can shrink and expand inside the groove. Use the tang (handle end) of a 1/4-in. round-saw file to ream the hole from the inside. Similar to the pinned and plugged leg joinery, the screw holes in the breadboard ends are squared for ebony plugs.

Another detail to these Greene and Greene style breadboard ends are the shaped ebony caps on the sides of the breadboard end joints, which mimic a spline. These caps are set into stopped grooves cut in the breadboard ends as well as the tabletop. The caps are glued only to the top panel. That way, as the top expands and contracts, it will move inside the breadboard ends and disguise the movement of the top panel (see the top left drawing on p. 37). These stopped grooves are cut on the router table before the parts are assembled, using the same fence setting used for cutting the grooves in the breadboard ends.

Last, handplane a slight concave on the groove side of the breadboard ends. This creates a spring joint to hold the ends tightly to the tabletop. During assembly, apply glue only to the center 2 in. of the tongue. Then drive 3-in.-long screws through the elongated holes. Once the parts have been assembled, plug the screw holes with ebony and chisel the square plugs into pyramids.

The tabletop is fastened to the base with wood buttons that fit into slots on the inside of the table aprons about 1/2 in. down from their top edges. Make sure the buttons have room to move back and forth in their slots to accommodate any wood movement.

If you've planed, scraped, and sanded all of the parts ahead of time, the table should be ready for a finish. I used three coats of garnet shellac rubbed out with rottenstone for an even, durable coat. □

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DECORATE THE BREADBOARD ENDS WITH PLUGS AND CAPS



Drive screws through the breadboard ends. The holes on either side of center should be elongated to allow the panel to expand and contract.



Apply the ebony plugs and end caps. Glue the ebony end cap only to the tabletop panel so that it can move freely in the breadboard end.

