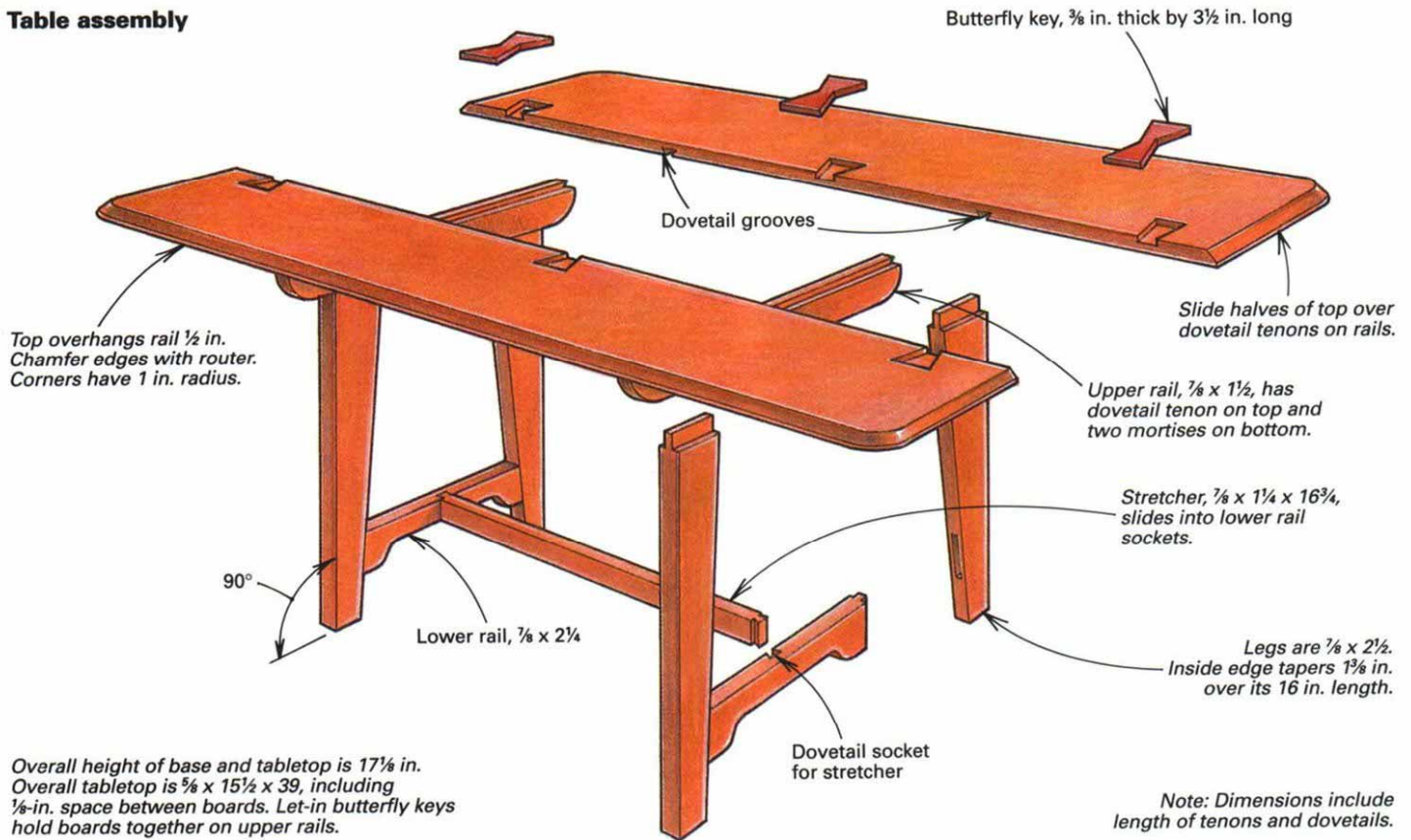


Low Tea Table Highlights Joinery

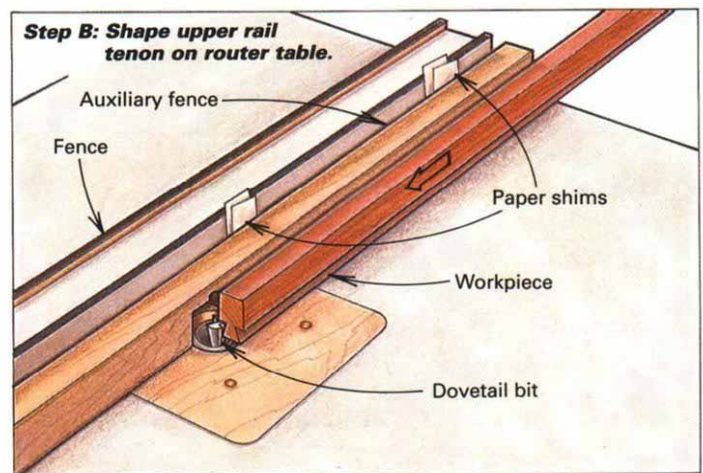
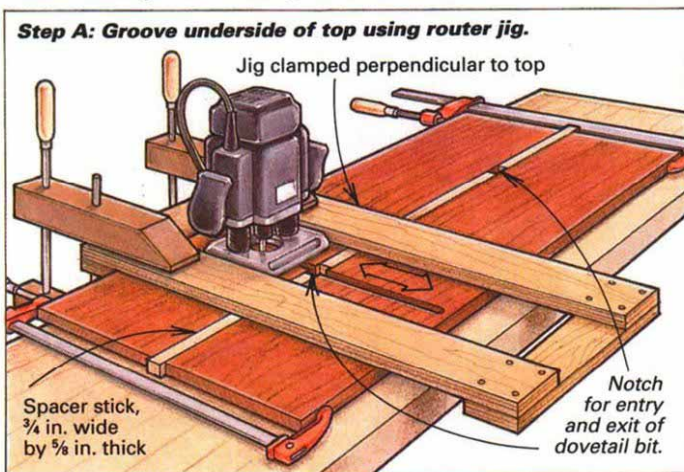
Sliding dovetails and butterfly keys make strong connections

by C. Michael Vogt

Table assembly



Router setups for sliding dovetails



I find the dovetail an appealing joint, both aesthetically and structurally. Although its traditional use in carcass and drawer construction is well known, a sliding version of the dovetail can be used to connect furniture components such as tabletops to their bases. I relied on sliding dovetails to join a top to two upper rails in the walnut table shown in the photo at right. And I used a more visible variation of the dovetail, butterfly keys, to connect the halves of the tabletop. The table is quite easy to build, but because its joinery is pre-eminent, the table requires craftsmanship with both machine and hand tools. I'll describe the router setups I used to cut the sliding dovetails, and I'll also explain how I inlaid the table's butterfly keys (see the box on p. 46).

Designing a table for tea

When I made the table for a juried craft show, I knew it would be displayed near Japanese pottery. So when I designed the table, I envisioned it for drinking tea while seated on the floor. I borrowed traditional details, such as sliding dovetails, but I was also influenced by modern work—that of the late George Nakashima. I purposely left a 1/8-in. space between the halves of the top, so I could inlay butterfly keys the way Nakashima did in his altars and tables. The keys are bold and functional. In my table, they join two matching boards; in Nakashima's work, they stabilize checks in large slabs of wood (for examples, see *FWW*#79, p. 99).

Because the table's components and overall form are simple, its material and manufacture are pronounced. I built the original table from walnut (see the photo above), but when built from oak, the table takes on an almost Craftsman-like look. And though this table is small, you can use the same joinery techniques to make larger and more robust pieces. However, if you build a table for heavier use, such as a coffee or end table, I suggest you move the legs closer to the ends of the top to reduce the cantilever and make the table more stable.

Building the base and the tabletop

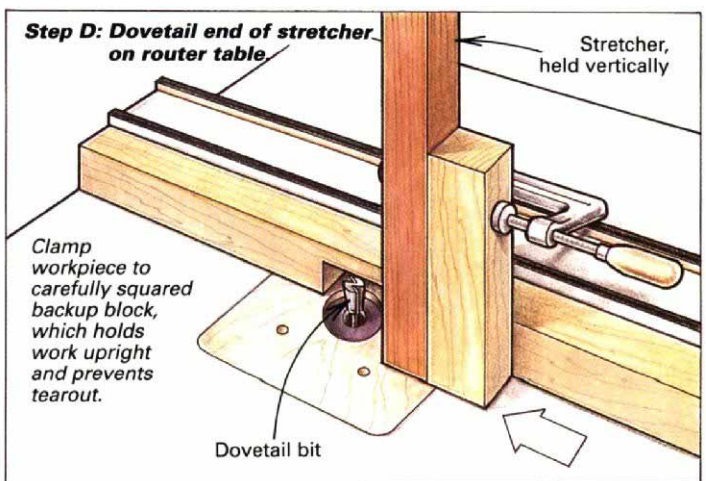
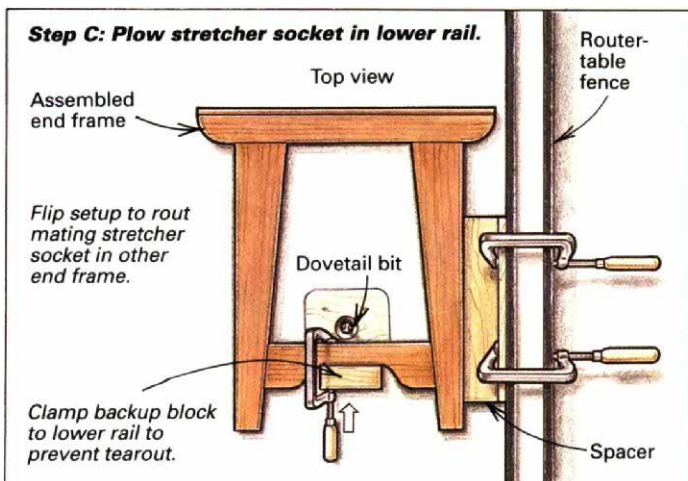
The tabletop is supported on a base, which is just two end frames (see the drawing on the facing page). Each end frame consists of a pair of legs connected by lower and upper rails. The lower rail has tenons on each end that enter mortises in the sides of the legs; the upper rail has two mortises on its underside that slip over tenons on the tops of the legs. Full-length dovetail tenons on the tops of the upper rails slide into stopped grooves in the underside of the top. Three butterfly keys join the halves of the top and lock them onto the base's sliding dovetails. Finally, a stretcher spans between the two end frames, joining the lower rails.



The elegance of simplicity and craftsmanship—Tico Vogt made this table for a craft show exhibiting Japanese pottery, so he designed the walnut table just 17 in. high for floor-seated tea drinkers. To further reflect Oriental lifestyle, he used simple components and traditional joinery.

Selecting stock—The low tea table is a nice project for book-matching resawn 8/4 stock for the top. The base looks best made from straight-grained wood, so the components' shapes will be emphasized. After you have resawn stock for the top, let the boards move around with stickers between them for a week so that they will be flat when you work them. Plane the boards a bit over 3/8 in. thick, and crosscut them a few inches longer than their final length. Rip out all the base pieces, and plane them to 7/8 in. thick. Also, saw a few extra 6-in.-long by 1 1/4-in.-wide pieces for testing the fit of the sliding dovetails.

Legs and rails—It's tempting to use biscuits instead of tenons to join the end frames. However, when I built a biscuited mock-up, I concluded the weaker plate joints compromised the integrity of the project. So go with the mortises and tenons. First saw the top rails to their final length, but wait to saw the curve on their ends until the dovetail tenons have been shaped (see the top photo on p. 47). Next crosscut the legs and bottom rails with enough length for their tenons. Then bandsaw (or taper-rip with a tablesaw and jig) the angled inner faces of the legs, and plane off the sawmarks. Use a tablesaw to cut the end tenons, and then angle the tenon shoulders by hand with a chisel. Waste the mortises with a router, and square them with a chisel. Once you've dry-assembled the joints, bandsaw the profile on the underside of the bottom rails.



A jig for routing the top's dovetail grooves—To plow the top's dovetail grooves, I relied on a spacer stick and a jig. First make up a $\frac{3}{4}$ -in.-wide spacer as thick and as long as the top with 1-in. notches where the grooves will go (this is the entry point for the router bit). Clamp the two halves of the top around the spacer. Squarely mark off the ends for length, and mark centerlines for the keys. Next transfer your cutoff lines to the underside and measure in from them to layout the centers of the grooves. With a handplane, flatten the boards. Then set up the router jig shown in step A on p. 44. With a dovetail bit set to $\frac{1}{4}$ in. deep and dropped into the notch in the spacer, rout a groove in each direction, stopping $\frac{3}{8}$ in. from the edges. Lift the router when the bit is over the notch, so you can make the second groove. Also groove a piece of scrap for test-fitting. Finally sand away any fuzzy edges left by the router.

Routing dovetail tenons on the upper rails—A router table is great for shaping dovetail tenons on the upper rails. To get the tenons to fit the tabletop grooves perfectly, use the practice pieces. First make an auxiliary fence (see step B on p. 44), so you can micro-adjust the cut. Set the bit the same height above the table as the groove is deep. Run each side of a scrap piece, top down, along the auxiliary fence. Then use shims of paper between the fences to fine-tune the width of the dovetail. When the tenon slides snugly into the test groove, use the same router-table settings, and repeat the cut on the actual rails. Test their fit.

To allow for expansion, square the ends, so the tenons are $\frac{1}{16}$ in. shorter than the grooves in the top. Then use a chisel to carve a

round shoulder on each end. The arc on the tenon ends should match the semicircle of the stopped router groove. Again, sand away any fuzz, and wax the sides of the dovetail tenons. Next rip the spacer board to $\frac{1}{8}$ in. wide. Slide the top boards onto the rail tenons, drop in the spacer and clamp the top together. With the rails in place under the top, secure the assembly on the bench, and check for flatness. (I handplaned the boards diagonally to eradicate a small amount of cupping in my top.) Now saw out the butterfly keys, and size and cut their mortises (see the box below).

Assembling the end frames—Once the keys have been fit, take the top apart. Then glue and clamp up the end frames. When the glue is dry and you've scraped and sanded the frames clean, install the top, so you can measure the length of the center stretcher. Measure shoulder to shoulder on the lower rails, and add $\frac{1}{2}$ in. for the $\frac{1}{4}$ -in. dovetail tenon on each end. Next dismantle the top. Place each end frame on the router table, as shown in step C on p. 45, to plow the sliding-dovetail socket on the inside of the lower rail. Use the router table to shape tenons on the ends of the stretcher similar to how you dovetailed the rails. A carefully squared backup block clamped to the stick as you run it vertically past the bit keeps it straight and stable (see step D on p. 45).

Installing the stretcher and butterfly keys—The real pleasure of building this table comes from assembling the last few joints. First chamfer the bottom edges of the stretcher dovetails. Next put the top back together with the spacer, slide in the frames and glue

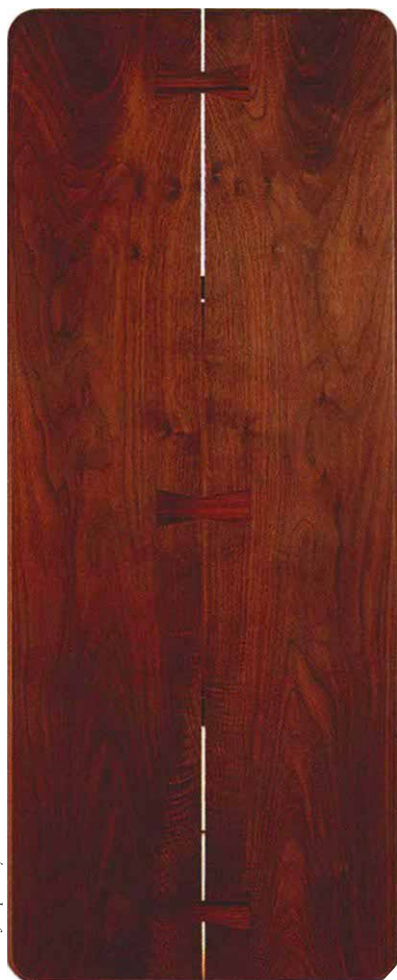
Making and inlaying butterfly keys

When making the walnut tabletop shown in the photo at left, I chose rosewood for the butterfly keys. And when I built the table in red oak, I used cherry keys (see the photo at right below). In both examples, I had purposely saved small scraps of contrasting wood for the butterflies.

Bandsawing keys: George Nakashima slightly beveled the edges of his butterflies, but because my table's keys are

shallow, I just cut the edges square. First, I make a butterfly pattern and trace its shape as many times as will fit on a scrap block. Second, I bandsaw the block to divide the patterns, which leaves me with stacks of keys. Third, I bandsaw the butterfly shape (see the center photo below). Fourth, I slice off individual keys to roughly $\frac{3}{8}$ in. thick. Fifth, I plane and sand away sawmarks from the faces. Finally, I squarely chisel and file the edges to the line. Because the keys vary slightly

Photo: Joseph Levy



Cherry butterflies—Vogt bandsaws a stack of keys from a block of cherry.



1) Scribe the outline of the key with a knife or an awl.

and clamp in the stretcher. Then apply a thin even coat of glue on the mating surfaces of the keys and butterfly mortises. Tap the keys home, and use cauls and clamps to distribute pressure. Although the keys go against the wisdom of no cross-grain construction, I've never had any problems. For extra insurance, you can drive a screw up from the bottom into the center of each butterfly before you allow the table to dry overnight. Because the butterfly mortises are $\frac{1}{32}$ in. shy of the key thickness, beltsand or scrape the keys flush to the table surface once the glue has cured.

Finishing touches—Keep the spacer in place while you saw and rout the top to its final shape. (The spacer protects the inner edges from tearout and gives the router bit a continuous surface to bear against.) First scrape the entire table surface, or use a random-orbit sander because they work particularly well for smoothing the crossing grains of the keys and top. Next cut the tabletop to final length using a crosscut box on your tablesaw. Then round the four corners with a sabersaw, and chamfer the top edge all around with a router. (The beveled edge makes the top look thicker, and it's easier on the elbows.) Finally pop out the spacer, and hand-sand all the parts. For a finish, wipe on a mixture of oil and varnish.

A Tokyo furniture-store owner once saw my table at a gallery. He picked it up and examined it closely. Then he placed it on the floor, and kneeling on the top, racked the table back and forth. His nod of approval made all the careful joinery well worthwhile. □

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Rounding off the dovetail tenons—After shaping the upper rails' dovetails on his router table, the author uses a $\frac{1}{2}$ -in. straight chisel to trim the ends. Rounding the ends ensures that the dovetail tenons fit the stopped grooves in the underside of the top. Next Vogt will bandsaw the curve marked on the rail.

in size, I number each, so I can match the keys to their butterfly mortises later.

Cutting butterfly mortises: I individually mark out keys rather than use a pattern because even minute differences between key sizes or shapes will be apparent in their fit to the mortises. So I lay a key on a location line on the tabletop, clamp it in place and follow these steps to scribe and mortise the butterfly shape:

1) Using an Exacto knife (or an awl), I carefully scribe the outline of the bottom of the butterfly, making sure the bevel of the knife stays tightly to the key's edge (see the

photo at right on the facing page). Then I remove the key, so I can deepen the lines.

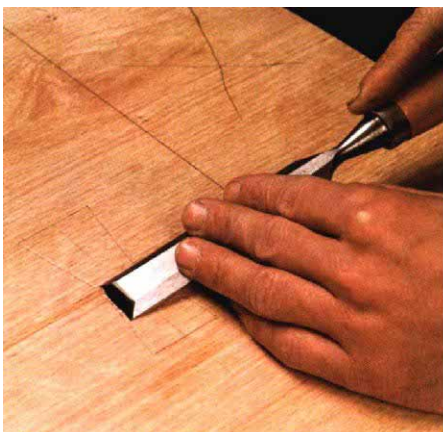
2) Using a razor-sharp flat chisel, I carve a shoulder all around the outline, as shown in the photo at left below. The shoulder prevents tearout from the router.

3) Using a plunge router, I waste most of the butterfly cavity to a depth of the thickness of the key less $\frac{1}{32}$ in. I work a $\frac{1}{4}$ -in. bit as close to the outline as I dare (see the center photo below).

4) Using chisels, I pare the rest of the way to the outline. A $\frac{3}{4}$ -in. straight chisel works

well at squaring the edges (see the photo at right below), and a chisel with its tip ground to a point nicely cleans up the butterfly's corners.

Insetting keys: To inlay the keys, I first number the mortises to match each key. I fit the keys tightly to allow for shrinkage; it should take a bit of force to start them. To help, I chamfer the bottom edges so that they will just ease into the mortises, but I don't drive them into the top just yet. Once I have fit all the keys to their mortises, I set them aside. Later, when I'm assembling the table, I tap the butterflies home with a mallet. — C.M.V.



2) Carve a shoulder around the outline with a chisel.



3) Plunge-rout the mortise with a $\frac{1}{4}$ -in. straight bit.



4) Pare to the line, and clean up the corners with chisels.