Fine WoodWorking July/August 1991

Building a Trestle Table

Draw wedges make self-tightening joints

by James Merritt Dunlap

A trestle table is one of the earliest examples of knockdown furniture. But like other easy-to-move knockdowns, it tends to become loose and wobbly the longer it's used and the more its wood moves due to seasonal humidity changes. So, when a client asked me to build a large, solid-black-cherry dining table that he could disassemble and take to his Alaskan cabin, I decided to improve the traditional trestle design by adding self-tightening joints. I figured these joints would be especially important in Alaska, where even permanently fixed joints loosen because of wood movement caused by extremes in humidity. The indoor relative humidity can be near 0% during our dry, subzero winter and jump to almost 100% during summer's arctic rainy season, which is similar to the monsoon season in the tropics. In these conditions, a black-cherry board that's 12 in. wide in winter predictably swells up to 12⅜ in. in summer and then shrinks back the following winter. To avoid problems created by such drastic wood movement, I built the table shown above with self-tightening, shallow-tapered, loose-wedged tenons, which the Dutch developed in the 1600s. When the long tenons securing the stretcher to the trestles become loose, slightly jarring the table causes the slick shallow-pitched wedges to fall farther into their mortises and tighten the joints.

As you can see in figure 1 on p. 40, the trestle posts are pinned to the apron assembly with wood slide bolts. The slide bolts' long center tenons extend through mortises in the posts and aprons, and are wedged to draw the pieces together. Each slide bolt also has two shorter blind tenons that extend through the post and partway into the apron. These tenons hold the apron down on the trestle post and keep the top from rocking. Although not visible in the photo above, the trestles themselves also rely on wedges to hold their two parts (post and base) together. The post, or vertical portion of the trestle, has a large tenon that goes all the way through a mortise in the trestle base, as shown in figure 1. But since the grain of the post runs vertically and that of the base runs horizontally, these parts could not be glued together. So to secure the post to the base, I angled the ends of the mortise so it was wider at the bottom and inserted a wedge on both sides of the tenon. These wedges effectively turn the tenon into a large dovetail, and they can be driven in deeper if the post tenon shrinks in dry weather.

Conditioning wood to predict its movement—The black cherry for this project came to Alaska by boat, and it absorbed moisture along the way. After receiving the shipment, I jointed, ripped and planed the parts slightly oversize (about ¹⁄₁₆ in. thicker and ⅛ in. wider than the dimensions in the drawings), and stickered them in the shop for six weeks. This conditioning allowed the wood's moisture content to reach equilibrium with my shop's dry winter air. Although the wood was as dry as it would get, the rainy season would cause it to swell the full ⅜ in. per foot across the grain, as I mentioned earlier. This meant I had to leave more than ⅛ in. of space on each side of the trestle posts' 10½-in.-wide bottom tenons; proportionately less space had to be left around narrower tenons. Conversely, if I had conditioned the wood and built the table

Photo above: Greg Martin; drawings: Aaron Azevedo

This black-cherry trestle table has adjustable joints for easy transport to an Alaskan wilderness cabin. If the tenoned stretcher becomes loose, wiggling the table will cause the low-pitched draw wedges to drop in their mortises and tighten the assembly.

To enlarge the trestle-base mortise *for the wedged tenon, Dunlap clamps a guide to the base at the wedge angle and cuts until the sawteeth touch the blocks at the ends of the guide. After sawing along each side of the mortise, he chisels out the waste.*

during the rainy season, I would have anticipated an equal amount of shrinkage by winter, and I would have made the joints tight. Conditioning wood for the top was especially crucial since warping can accompany wood movement. If the top boards had warped between the milling and glue-up operations, I would have remilled the boards to make them flat and true.

Gluing up the tabletop—When sorting the random-width boards, I selected the top boards based on color, figure and flatness. I then laid out the boards in the order they would be glued together, making sure the direction of their annual rings alternated to minimize distortion from warping. Next, I marked across their joints to indicate the top face of each board, and then ripped the boards parallel and jointed their edges. When jointing the edges, I alternated holding the top or bottom face of each adjacent board against the jointer's fence; this compensates for any discrepancies if the jointer fence isn't absolutely square to the bed. To make an even finer glue joint, I handplaned a single thin shaving from each machined edge to remove jointer marks.

Instead of edge-gluing all the boards at the same time, I glued up four panels of two or three boards each, and then glued the four panels together later. Because my workbench top has a slight twist, I ripped and jointed straight edges on three identical cauls and placed them on the workbench. Then I eyed across the cauls and shimmed under them until they created a flat surface for gluing up the top boards. To keep glue squeeze-out from sticking everything together, I covered the cauls with tape. When the glue was dry, I planed the panels to just slightly thicker than the top's 1¼ in. final dimension, and glued the four panels together. By assembling the top from four machine-surfaced panels, I had only three joints to hand-scrape and sand.

Making the apron assembly—To keep the large tabletop flat and to prevent it from sagging in the middle, I stiffened it with an apron assembly. The side aprons are tenoned to the end aprons, and three cross frames are tenoned to the side aprons. These are not knockdown joints; each joint is glued and has two diagonally wedged tenons. I made the tenons so they would protrude ¼ in., and then cut them flush with the face of the apron after gluing up the apron and inserting the wedges.

If you chisel the through mortises by hand, as I did, you should chop in from both sides to help keep the mortises square and to avoid splitting out the apron's surface when you come through. I filed all mortises slightly larger on the outside so the wedge could spread and lock the tenon, and I handsawed a diagonal kerf for the wedges the full length of each tenon. After grooving the end aprons and cross frames to receive the cabinetmaker's buttons for attaching the top (see figure 1), I assembled the apron dry to check that all the joints fit. When everything came together as it should, I disassembled the parts and set them aside. Before I could glue the apron together, I still needed to mortise the end aprons and two of the cross frames to receive the slide bolts that join the trestles to the apron. But first I built the trestles.

Joining the trestle post and base—To make the 11⅛-in.-deep through mortise in the trestle base, I contemplated using the traditional coach builder's method: drilling from one side with a hand brace and long bit. However, you risk bit deflection if you bore from only one side, and so I chose the speed and accuracy of a drill press, and bored in from both edges. After setting a right-angle fence and depth stop on the drill press, I drilled the haunch

Fig. 1: Exploded view of trestle table

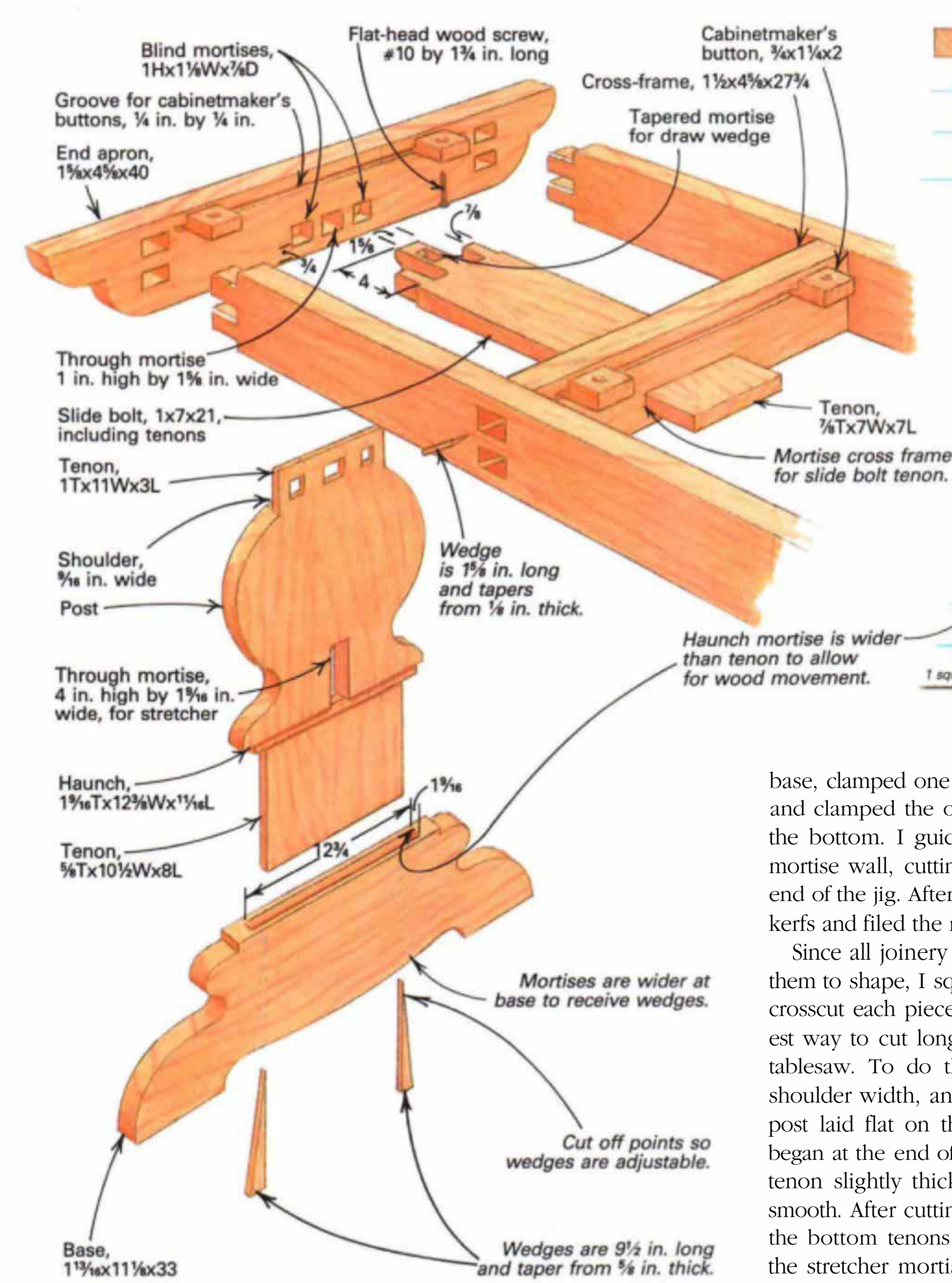
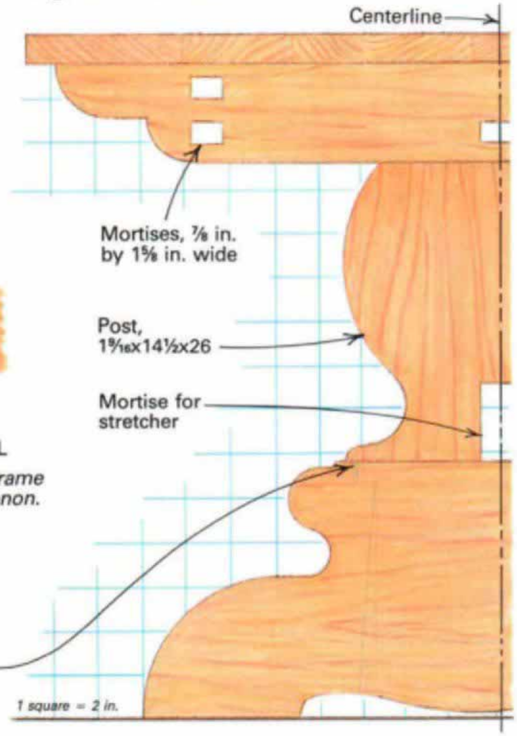


Fig. 2: End view



mortise first. I used a 1-in.-dia. bit for this shallow mortise, and overlapped each hole until most of the waste was removed. Then I squared off the ends and sides with a chisel. I drilled the ⅝-in.-wide through mortise from each side of the base piece in a similar manner, using a ½-in.-dia. brad-point bit that was long enough so the holes would intersect in the middle. Although the undersize bit allowed for ⅛ in. of deflection, the holes met perfectly.

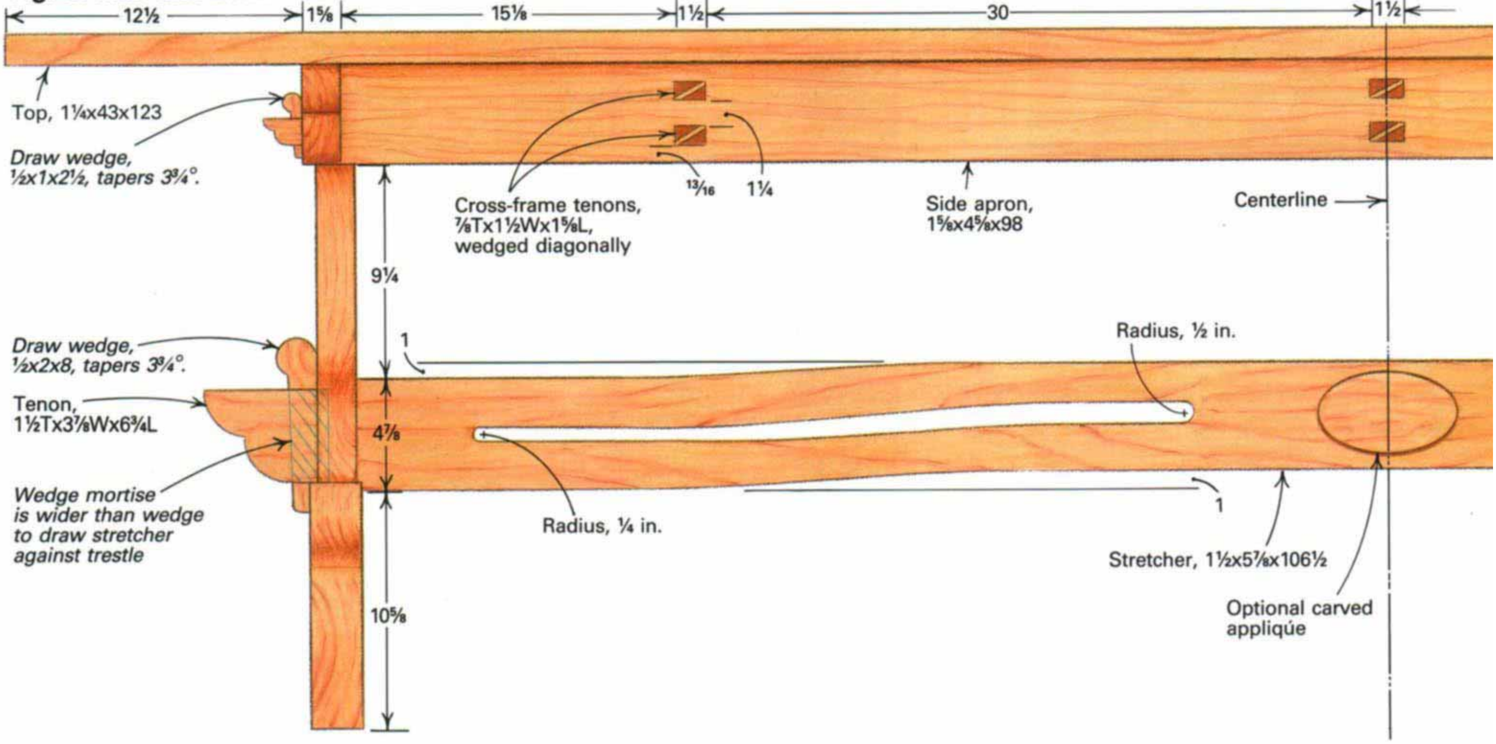
After chiseling and rasping the inside of the mortise fiat, square, smooth and to size, I angled its ends to receive the wedges that are driven in on each side of the tenon to form a dovetail in the mortise and to lock the tenon securely. I used the shopmade jig, shown in the photo at right on the previous page, to guide my handsaw when cutting the 3¾° mortise angle.

The jig consists of two 3-in.-wide by 24-in.-long pieces of softwood with a 1 13/16-in.-thick hardwood block screwed between them at each end. To use the jig, I simply slipped it onto the trestle base, clamped one end even with the end of the mortise on the top and clamped the other end 28/32 in. from the end of the mortise on the bottom. I guided the side of my handsaw's blade against the mortise wall, cutting until the sawteeth reached the blocks at each end of the jig. After removing the jig, I chiseled to the bottom of the kerfs and filed the mortise smooth so the wedges would slide easily.

Since all joinery on the posts should be done before bandsawing them to shape, I squared up the stock for the posts, and ripped and crosscut each piece to 14½ in. wide by 26 in. long. I think the easiest way to cut long tenons accurately is with a dado blade on the tablesaw. To do this, I set the dado-blade height to the tenon's shoulder width, and made multiple passes over the cutter with the post laid flat on the saw table and guided by the miter gauge. I began at the end of the tenon and cut to the shoulder, and I left the tenon slightly thick so I could handplane it to size and scrape it smooth. After cutting the top and bottom tenons on both posts, I fit the bottom tenons to the mortises in the bases. Finally, I chiseled the stretcher mortises in the posts. I made these through mortises 4 in, wide to leave room for the 3⅞-in.-wide stretcher tenon to expand. When assembling the base and post, I drove the two 3¾° wedges into the joint alongside the tenon. If the joint loosens over time, it can be tightened by tapping the wedges. These wedges are each ⅝ in. wide by 9½ in. long, and they taper from ⅝ in. thick. They should be scraped smooth so they slide easily. Before final shaping and assembling the posts to the bases, I made the slide bolts and cut the mortises for them in the tops of the posts, the apron ends and the two cross frames.

Making the slide bolts—I've never seen any joint between a table apron and trestle post like my three-tenon slide-bolt connection, but it's a very effective knockdown joint. As you can see in figure 3 on the facing page, the apron end sits on the shoulder of the post's top tenon, and the slide-bolt tenons pin these two parts together. To allow for swelling, the two outer mortises in the apron are ¼ in. wider than the tenons, although the tenons fit tightly against the top and bottom of the mortises. The outer mortises in the post are the

Fig. 3: Half side view



same size as the slide-bolt tenons since grain, and therefore wood movement, run in the same direction. The center tenon fits snugly in mortises in both the post and the apron, preventing the apron from sliding side to side. The other end of the slide bolt has a ⅞-in.-thick by 7-in.-wide tenon, which fits through a mortise in the apron's cross frame. This tenon's narrow shoulder is 4 in. from the cross frame so that the bolt can be slid back to disassemble the post and apron.

I chiseled the triple mortises in the post and aprons first, and then cut and fit the tenons to them, because it's easier to accurately cut tenons to size. All three mortises go through the post tenon, but the outer mortises in the apron are only ⅞ in. deep. The mortises are ¾ in. above both the post-tenon shoulder and the bottom edge of the apron. To ensure an accurate layout, I made a ⅛-in.-thick plywood pattern of the slide-bolt tenons, based on the dimensions in figure 1 on the facing page. I then used the pattern to mark the tenons on the slide bolts and to mark the mortises on the post tenon. After cutting out the mortises on the post tenon, I held it up to the apron and marked through the mortises onto the apron. Then I chiseled out the apron mortises, enlarging the two outer blind mortises by ¼ in. side to side as mentioned earlier. Next, I traced the tenons on the slide bolt, sawed the tenon sides and chiseled from both surfaces to remove the waste.

After assembling the end aprons and post tenons with the slide bolts to check the fit, I scribed each center tenon where it emerged from the apron's outer face. Then I disassembled the pieces and laid out the tapered mortises for the draw wedges in the slide-bolt tenons. These mortises should extend ⅛ in. beyond the scribed line to ensure that the draw wedge (which I'll soon describe) will force the trestle-post tenon and apron tightly against each slide bolt's shoulder. To complete the slide bolts, I cut the large tenons on their inner ends, and chiseled their mortises in the center of the mating cross frames.

With all the joinery complete, I routed the posts, bases and stretcher to shape with templates (see figures 2 and 3 above). First, I made a half pattern and flopped it on either side of the centerline to trace the shape on a routing template. Then I clamped each workpiece to its template and routed each to shape using a straight bit and guide collar. You could just bandsaw and spokeshave the parts to shape, but routing them ensures accuracy. Mark the stretcher tenons for the wedge mortises as you did the slide-bolt tenons; these wedges will pull the trestles against the stretcher's shoulders.

Making the self-tightening draw wedges—Because the self-tightening feature of the table depends so much on loose wedges, they must be fitted carefully. I cut the 3¾°-angle stretcher wedges from ½-in.-thick stock, and used them to fine-tune the angles of the mortises. The wedges should fit well enough to drop automatically and tighten the table; so file the draw-wedged mortises until they're as slick as an Alaskan ice cube. To help get a perfect fit, I dusted the wedges with chalk (gunstock makers use soot) and slid them into their mortises. This rubbed the chalk into the grain on the high spots on the wedges and mortises; when I blew off the loose chalk, I could see where I needed to file. I repeated this procedure until the surfaces were mated and the chalk was even everywhere. If you use this chalk method, don't forget to clean off the chalk before applying finish to the pieces.

I finished the table with a mixture of tung oil, boiled linseed oil and turpentine. The first coat was a 50/50 mixture of tung and linseed oil to which I added two parts of pure gum turpentine for deep penetration. I allowed 48 hours of drying time and then applied a topcoat of one part tung oil and one part turpentine. I also carved a ram's head and glued it to the stretcher to decorate the otherwise plain table.

Six trestle benches accompany the table. I made two as long as the table is wide to be used at the table's ends, and four about 4 ft. long for use on the long sides. Like the table, the benches have draw-wedged joints, a similarly curved stretcher and trestles the same as the table's trestle posts, but without the base. When I delivered the table and benches on Memorial Day, 14 people were eager to help me assemble the pieces so they could sit around and enjoy the day's feast. □

James Dunlap is a professional woodworker in Anchorage, Alaska.