Building a Stand-up Desk

It all hinges on your router

by Charles Prowell

My grandfather was a cabinetmaker, and my father a carpenter, so most of my designs spring from the handcrafted techniques of the cabinetmaker pitted against the practicality of the carpenter. When a San Francisco, Calif., securities analyst ordered a stand-up secretaire desk, my forebearers began arguing over veneers versus glue-ups and inlays versus profit margins, even before the customer could explain how difficult it is to sit at a desk for 10 hours a day. His only stated requirements were that the desk be 30 in. deep, have a lift-up top and accommodate his 5-ft., 7-in. frame. The rest was up to me.

Because I had been mulling over designs for a stand-up desk for years, I quickly worked up a prototype and preliminary drawings, all the while trying to balance my forefathers' concerns for craftsmanship and profit with some of my own prejudices, such as a fondness for wooden hinges. Deciding on a desk frame of California walnut inlaid with quilted maple accent strips was easy for me because I liked the impact of the quilted maple grain and the contrast between the light wood and the dark walnut. The top would be Peruvian walnut because of its rich color and warp-resistant straight grain.

The final design is basically an oversize lap desk fitted into rabbets routed in the legs of the base, which is mortised and tenoned together; the sculpted caps on top of the legs hide the rabbets and endgrain. Tapering the legs creates a more delicate appearance. The desk is doweled together after being fit with pigeonholes and a drawer. The last and most challenging task was to fit the wooden hinges to the top, which would form the slanted writing surface.

Photo: Madeline Schnapp

This stand-up secretaire desk features inlaid accents and wooden hinges, as well as ample storage, pigeonholes and a drawer. The joinery and detail work are easily accomplished with a router.

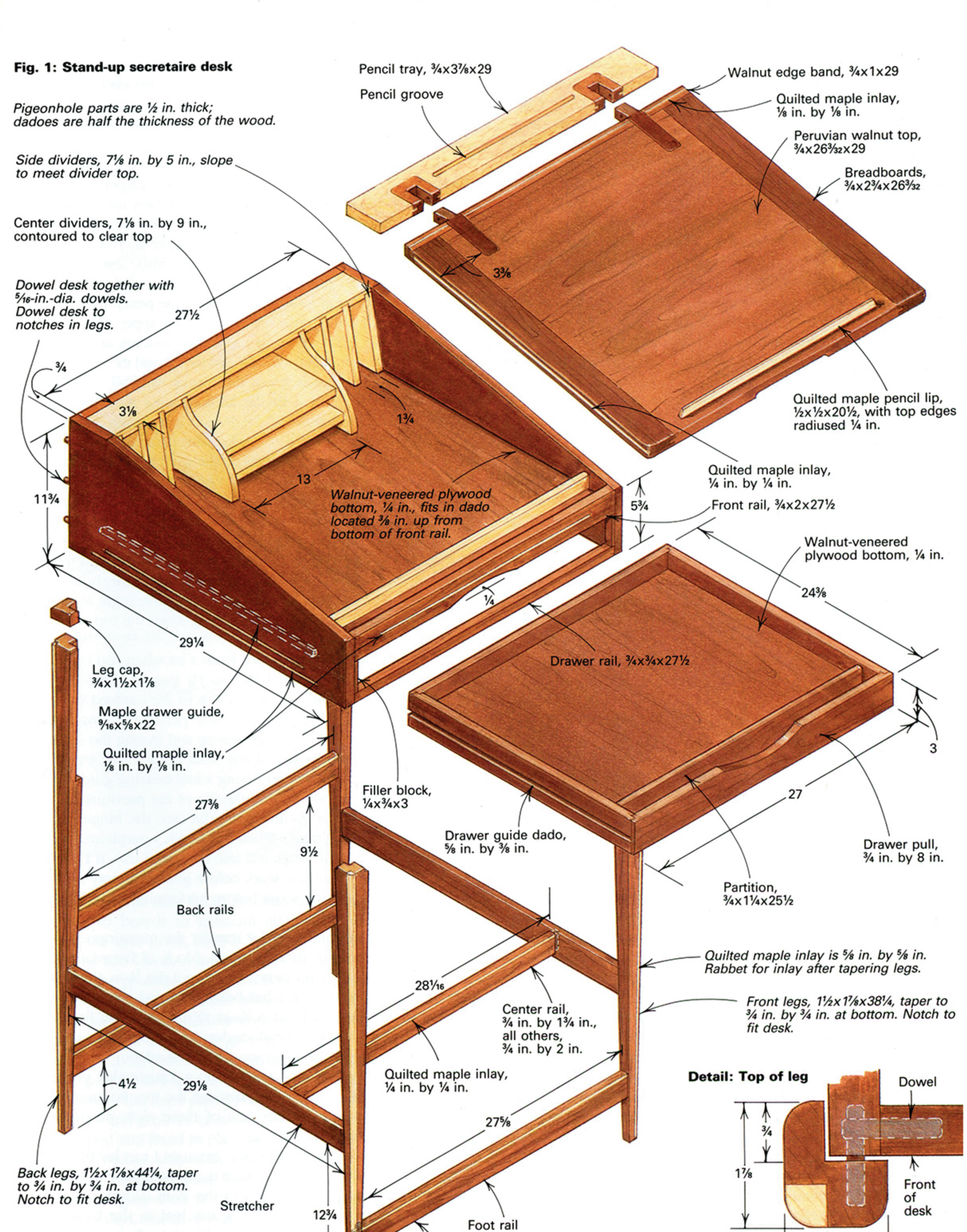
Routing the joints–My construction techniques are straightforward and rely heavily on a hand-held router guided by a stock router-mounted fence, a straightedge with stop blocks or bearing-guided bits, such as rabbet and roundover bits. These guides provide maximum control, versatility and quick yet effective cuts. I used three routers for the various jobs this desk entailed: a Makita #3612BR 3-HP plunge router for mortising the legs, plunge cuts and the heavy work; a Milwaukee #5660 1½-HP router for straight rabbets and grooves for inlay and shaped edges; and a small Porter-Cable #309 laminate trimmer for detail work. If you don't own a variety of routers, you can cut the joints with a single table-mounted router or modify my methods to suit your equipment.

I generally rout in a left-to-right direction when facing the work, against the clockwise rotation of the bit so the router is pulled into the work. When cutting across the grain to form tenons, however, I start routing in the same direction as the bit rotation. With this operation, known as climb-cutting, I make light cuts, a maximum of ⅛ in., and remove a small section along each edge to prevent tearout, before finishing the cut in the normal left-to-right direction. Climb-cutting can be dangerous, because the router tends to self-feed and may get out of control, so you may want to start out with a ¹⁄₁₆-in.-deep cut.

Building the base frame–To ensure a matching grain pattern on the front legs, I rough out both pieces by ripping a walnut 2x4 down the middle. Because the legs extend to the top of the tapered desk, the front legs are naturally shorter than the back legs. After dimensioning the leg stock, lay out the mortises, measuring up from the bottom to accurately locate the joints at the correct height. The legs are not trimmed to final length until the carcase is test-fitted to the base.

I rout all mortises with a plunge router, using a ½-in.-dia. bit set

Fig. 1: Stand-up secretaire desk



Drawings: Kathleen Creston

to a final cutting depth of ½ in. and a router-mounted fence fitted with stop blocks to control the length of the mortise. Because the router fence needs a straight surface to run against, I don't taper the legs until after cutting the joints. The fence and stop blocks are also used to rout the ¾-in. by 1-in. stopped rabbet needed to fit the legs to the carcase. Next, the legs are tapered on three sides, as shown in figure 1 on the previous page. You could taper the legs with a jig on a tablesaw, but I prefer to rough-cut them on the bandsaw and then true them up with a handplane.

Once the tapers are satisfactory, I rout a ⅝-in. rabbet along the outside corner of each leg for the maple inlay with a ball-bearing guided rabbet bit. The inlay is glued proud of the leg and belt-sanded flush after the adhesive cures. The belt sander is a concession to the miserable working qualities of quilted maple, which is very difficult to plane without tearout. I radius the inlaid corner with a ⅝-in. roundover bit and the other three corners of the leg with a ⅜-in. roundover bit.

Before continuing with the legs, rout the tenons on the frame rails and stretchers, as shown in figure 1. To cut ½-in. tenons for the mortises, I set a ball-bearing guided, ½-in. rabbet bit to cut ⅛ in. deep. Run the bearing against the end of a rail to cut one tenon cheek. The rail is then flipped over and the operation repeated for the other cheek. To compensate for the leg taper, I angle the shoulders of the tenons ¹⁄₁₆ in. with a chisel. The ⅜-in. tenons for the center rail are routed in the same manner. Then, rout the rails with a bearing-guided ¼-in. rabbet bit and install the inlays as shown in the drawing.

After routing the mortises for the center rail, assemble the piece and glue the stretchers and legs together to form the left and right sides. Then, I glue in the rails and clamp up the assembled base on a flat surface, and leave it to dry while I work on the carcase.

Carcase construction–The sides, back and top are glued up from several strips of walnut. The sides will be identical if you clamp them together and bandsaw them simultaneously, then clean up the edges with a handplane. The side pieces can be fit into the leg rabbets and used as templates to mark the height and angle for trimming the legs with a fine handsaw. If you want to further emphasize the caps on the legs, you can sand or carve a slight chamfer around the top of the legs to create a reveal.

The back, front rail and drawer rail are now cut out as shown in figure 1. Note: The upper edge of the front rail is ripped at a slight angle to align with the tapered sides. After routing a dado in the front rail for the walnut-veneered plywood bottom of the pigeonhole compartment, I dry-fit the front rail to the sides. Then scribe the dado location from the front rail onto the side pieces, carrying the layout lines onto the back piece, and rout the dado. After sawing the lower edge of the front rail to the curve shown to counterbalance the drawer's finger pull, I dowel the carcase together. Don't forget to position the bottom into its dadoes before gluing up. After the carcase dries, glue filler blocks to the sides to eliminate the gap formed between the carcase and the drawer when the rabbeted legs are glued to the carcase. Next, rout out the quilted-maple pencil tray as shown, using a ½-in.-dia. cove bit and a router-mounted fence, then glue and clamp it to the carcase.

Figure 1, on the previous page, shows how I dowel the carcase into the rabbets cut in the legs. Even though the base has been glued together, the legs can still flex enough to allow the carcase and protruding dowels to drop into place. Apply glue to the dowels and rabbets, and clamp the assembly together.

Carcase detailing–You can make any style drawer you want. Because I prefer router joinery, I cut lapped rabbets for the corners. The joints also cover the dadoes holding the drawer bottom. A small curve, ¾ in. high by 8 in. wide, bandsawn on the top edge of the drawer front serves as a finger pull. After gluing a partition for a pencil tray inside the drawer, rout the drawer sides to fit the maple guides screwed inside the carcase.

The ½-in.-thick maple pigeonhole dividers are installed in dadoes routed in the divider top. The side dividers taper from 3⅛ in. to 5 in., top to bottom, while the center dividers have an S-curve profile to accommodate the paper shelves and to fit under the closed top. The stopped dadoes for the paper shelves are routed with a straightedge guide and a stop block, while the through dadoes in the divider top are guided simply by a straightedge. After gluing the divider top to the underside of the pencil tray, glue the paper shelves to the center dividers. I then apply a thin film of glue to the top and bottom of the center dividers and slide this assembly into position between the divider top and the plywood bottom. The side dividers between the divider top and the plywood bottom are installed in a similar fashion, using temporary spacer blocks between the bottom of the dividers to maintain alignment.

My top is based on a breadboard construction, which works fine in California, where humidity levels are fairly constant; you might want to avoid this construction if the humidity fluctuates significantly in your area, because the resultant wood movement will ultimately break the glue joints. Inlays, like those on the top of my desk, are optional. If you want to use inlays, you can cut grooves as shown in figure 1, with a straight bit and router-mounted fence or with a slotting bit and an oversize guide bearing. You should, however, rip the upper edge of the top to the same angle as the side taper, to prevent the hinge from binding when the top is closed.

Routing wooden hinges–You'll learn a lot when you make your first wooden hinge. I know I did, so I'll suggest some improvements I've come up with. Three major steps are involved in routing wooden hinges: making and fitting the pencil-tray hinge leaves; making and fitting the top hinge leaves; and mating the leaves together. Starting with the pencil tray, rout out a 1⅞-in.-sq. mortise ¾-in. deep with a straight bit. Using a ball-bearing guided, ½-in. rabbet bit, rout a recess around the top of the previous cut, then rout a keyway using a ³⁄₁₆-in. slotting bit (see the hinge detail in figure 2 on the facing page). When fitted with a purpleheart spline, the keyway secures the hinge leaf into the pencil tray. If I could do it over again, I'd do all this work before gluing the tray on, bandsawing away most of the waste before performing any routing operations.

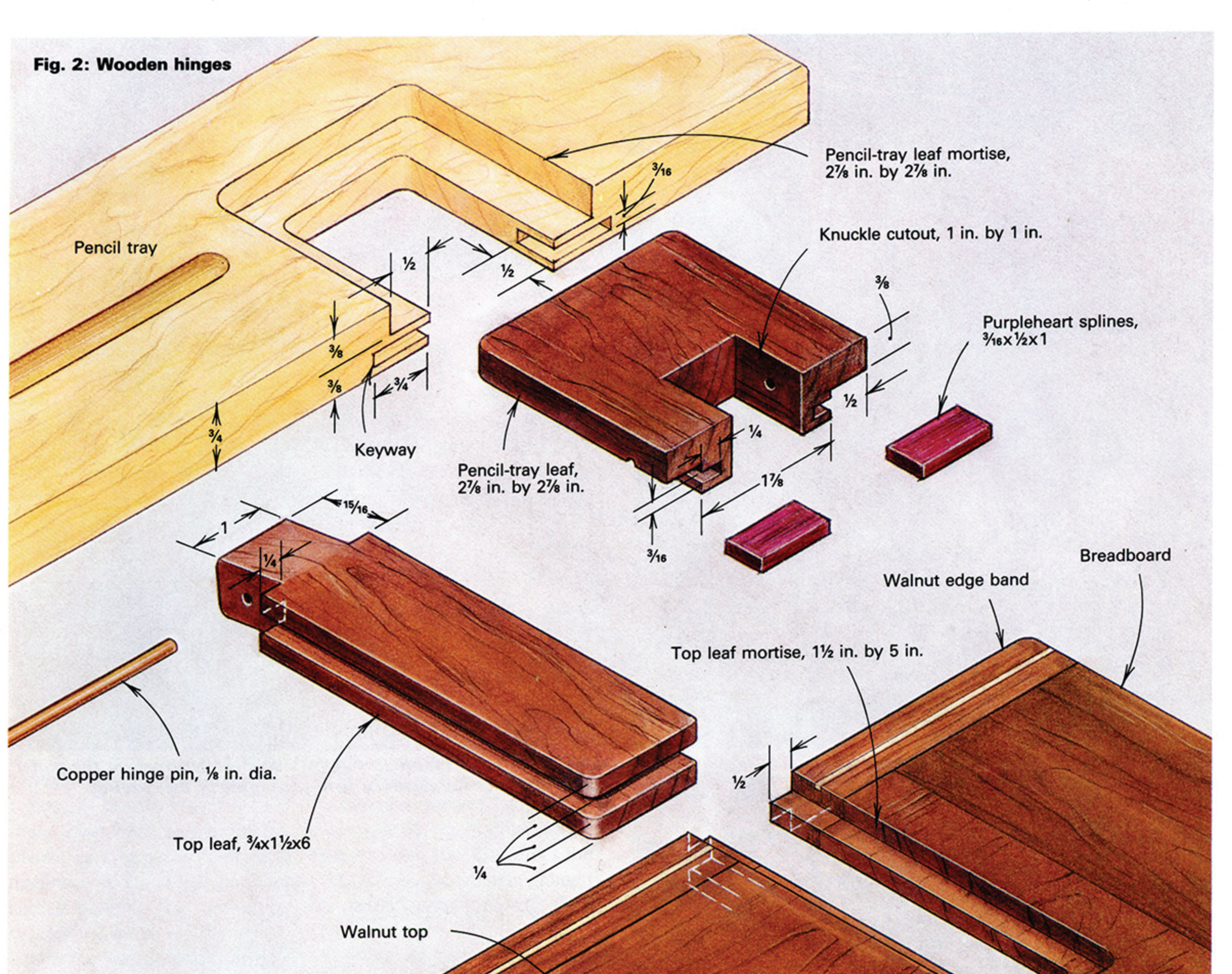
To make the pencil-tray leaf, I transfer the measurements from the pencil-tray mortise to a 2⅞-in.-sq. block of Peruvian walnut. Clamping this block in my bench vise, I rout the ⅜-in.-deep rabbet around the bottom with the ball-bearing guided ½-in. rabbet bit, then rout the keyway slot with a ³⁄₁₆-in. slotting bit. After fine-tuning the fit on a bench-type Dremel sander, I scroll-saw a 1-in.-sq. cutout for the hinge knuckle and sand over the edges.

To form the top-leaf mortise, I set up a straightedge guide so I can rout a ½-in. slot 4½ in. long through the top. Routing rabbets on both the top and bottom face of these slots produces the tongue shown on the facing page.

The top leaf is also easy to make, because I can lay the walnut block on top of the cutout and trace it, allowing an extra inch for the knuckle. I cut the groove with the ¼-in. slotting bit in my Porter-Cable router after clamping the leaf in the bench vise. After the knuckle is cut to a 1-in. width, the edges are softened on the sander.

Drilling the hinge-pin holes presents the greatest danger of ruining the work. While aligning the two leaves, I cut and adjust

Fig. 2: Wooden hinges



the knuckles for a snug fit all around and clamp the fitted hinge between two boards to maintain alignment. After locating the hinge on the drill press, bore a ⅛-in.-dia. hole through the pivot point of the two leaves. A drill press is essential for a straight bore; otherwise, the procedure becomes hopelessly random.

Proper hinge action entails assemblying and disassemblying, each time sanding the knuckles until the movement is satisfactory. My hinge uses a copper hinge pin to reduce any chances for chemical reaction between the pin and the resins in the wood. Next, the purpleheart splines are glued into position and then the leaf is glued to the fixed pencil rail. With a thin glueline applied to the tongues and grooves (a miniaturist's syringe helps here), the top is slipped and fitted in place on its leaf.

Pieces of walnut, shaped by a ¾-in. roundover bit and sanding, cap the legs. Pencil trays are formed with strips of quilted maple, as shown in figure 1 on p. 75. I thought I was finished with the decorative inlays, but after evaluating the piece, I decided to rout ⅛-in. grooves in the sides and front and install quilted maple strips. I rounded the ends of the strips with a file to match the router bit's profile. The strips were installed proud of the surface and later block-planed and belt-sanded flush.

The finish–I do all of my sanding before putting on any finish; once I start finishing, I don't sand. I sand all surfaces working progressively from 80-grit paper to 220-grit, then I give the surfaces a lighter sanding with 400-grit and a final, quick rubdown with 600 grit. At this stage, the wood is as smooth as glass and ready for my favorite finish: a mixture of ⅓ thinner, ⅓ linseed oil and ⅓ polyurethane. This mixture is heated by placing the can containing the finish in a pot of boiling water after it has been removed from the stove. This mixture is brushed on liberally, allowed to dry for 30 minutes or so, then wiped dry. I build up to six coats, allowing 24 hours between coats, then top the piece off with a coat of paste wax. The wax is a lot like putting on a coat in 50° weather: You don't really need it, but it makes you feel better.

Once the desk was completed, all that remained was a final critique, a process endured in the wake of my forefathers' passing with the completion of every job. I imagined an analysis by my grandfather, searching for flaws, and my father, questioning the profitability with his usual "Time is money, boy." □

Charles Prowell owns and operates Charles Prowell Woodworks, building custom furniture in Sebastopol, Calif.