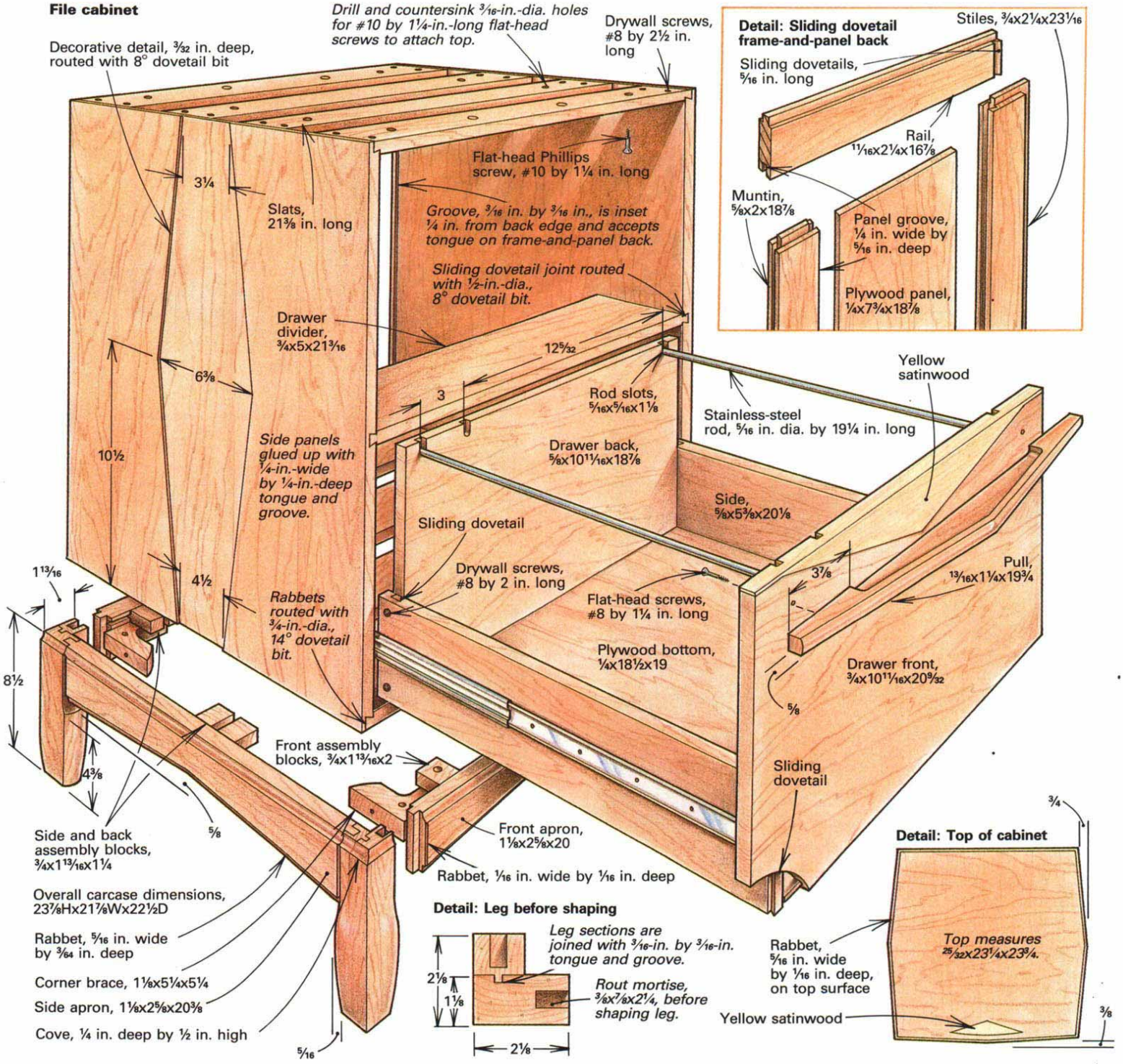
Building a File Cabinet

Router techniques for joinery and decoration

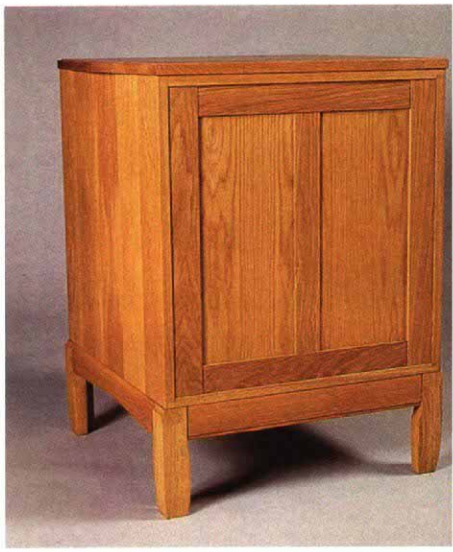
by Pat Warner



Most file cabinets look like department-store safes. My file cabinet started out as a chunky rectangular box, but I softened the lines and made it visually interesting by adding a separate base with shaped legs and by introducing a theme of triangles, which appear in many elements of the cabinet. The triangles first appear in the satinwood inlays in the drawer fronts and top, and the design is repeated in the shape of the top's edge, in the drawer pulls and in the shapes cut from the aprons on the base. Rabbets routed into the aprons and top and recessed opposing-triangle accents routed into the sides create shadow lines that reinforce these triangular designs. This is one of those rare projects that I wouldn't change if I were to build it again, but if you think it looks difficult, you could ignore most of the detail work, thereby simpliiying construction, and still produce a good-looking, functional piece.

Building this file cabinet, shown in the top photo, is also a great learning project; it includes basic woodworking skills and is a tour de force of router techniques. The carcase is a simple white oak box that is joined with router-cut dovetailed rabbets, tongues and grooves, and sliding-dovetail joints. Designing the joints for the frame-and-panel back, shown in the bottom photo, was a challenge because each element is in a different plane. Although the back is unnecessarily complicated, it creates an extremely rigid carcase and makes the cabinet attractive enough to be used away from a wall. I decorated the drawers, which are joined with sliding dovetails, by routing a contrasting triangle of satinwood into each drawer front. Both drawer inlays and a satinwood triangle inlaid into the separate top were fitted by a process called complementary template routing: A router with a bushing or ball-bearing piloted bit is guided by a master template to simultaneously create complementary working templates. These templates then guide the router to create perfectly matching pieces that fit together snugly. (For more on this technique, *see FWW #75,* pp. 59-61.)

For maximum accuracy, I also used a template and a ball-bearing guided bit to shape many of the cabinet pieces, such as the overhanging sides and the front edge of the top and aprons. I usually assemble my own piloted bits by adding a bearing with an inside diameter matched to the shank of the router bit and an outside diameter suited to the job at hand. As a safety precaution, be sure that the cutting diameter of the bit is greater than the inside diameter of the bearing and that at least ¾ in. of the bit's shank is chucked in the router's collet. If the shank is long enough, I sometimes stack two bearings on the bit for greater depth of cut, to cover the shank on longer bits and to ensure solid contact with the template. A drop of Locktite (available from auto-supply stores) on the bearing's inner race will hold it in place. I bought my bearings from Valley Chain and Gear (1320 Grand, San Marcos, Cal. 92069) and the router bits from Paso Robles Carbide (731C Paso Robles St., Paso Robles, Cal. 93446) and MLCS Ltd (Box 4053, Rydal, Pa. 19046).



Above: This white-oak file cabinet was made with a variety of router shaping and joinery. Its boxy appearance is softened by recurring triangular designs that appear in the inlaid drawer fronts and the top, in the shape of the aprons and overhanging top edges, and in the routed detail on the side panels.

Right: The author created this complicated frame-and-panel back, joined by sliding dovetails, as a personal design challenge. All the elements of the back are in different planes to create interesting shadow lines. A simple panel back can be substituted to ease construction.

Constructing the carcase-All carcase parts were milled to ¾ in. thick from 4/4 white oak and then cut to the dimensions in the drawing. The sides were glued up with tongue-and-groove joints to ensure flat, even pieces during clamping. I cut the tongues and grooves on a router table using a ¼ -in. rabbeting bit for the tongues and a 3/16-in.-thick three-wing slot cutter for the grooves. To center the slots and tongues, I made cuts in two passes, one from each face of the piece. I cut the tongues to be about 0.005 in. shy of the bottoms of the ¼ in.-deep grooves, to allow space for trapped glue and to prevent the tongues from bottoming out.

Rather than install a solid subtop and bottom, I used a series of slats joined to the sides with dovetailed rabbets that are glued and screwed. The slats eliminate normal carcase glue-up and simplify milling operations. Also, they can be cut from random widths of lower-quality stock, and they let you install components one at a time, at a comfortable pace.

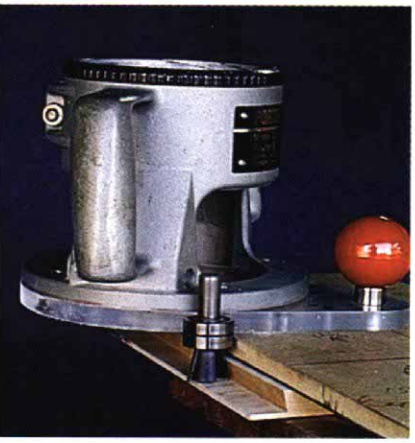
My slats are 4 in. to 6 in. wide, crosscut as shown in the drawing. The single-face dovetail that joins the slat to the side is half of a sliding dovetail cut with a ¾-in.-dia., 14° dovetail bit in a table-mounted router set to take a ½-in.-deep cut. I clamped the slat on end to a sliding fence attachment and adjusted the fence so the bit cut ¼ in. into the inside face of the slat. (See "Routing Sliding Dovetails," *FWW* #79, p. 57, for more on this technique.) I then drilled and countersunk two 11/64-in.-dia. holes in each end of the slat, for #8 by 2½-in.-long bugle-head drywall screws. The sharp twin-threaded screws are virtually unstrippable when screwed into 5/32-in.-dia. pilot holes drilled into the sides. I lightly chamfered the

Photos this page: Sandor Nagyszalanczy; drawing: David Dann

edges of the slats and drilled 3/16-in.-dia. holes in the subtop planks for the 12, #10 by 1¼-in.-long flat-head Phillips screws that secure the top. No allowance need be made for wood movement because the grain is oriented in the same direction for the top, subtop, bottom and sides.

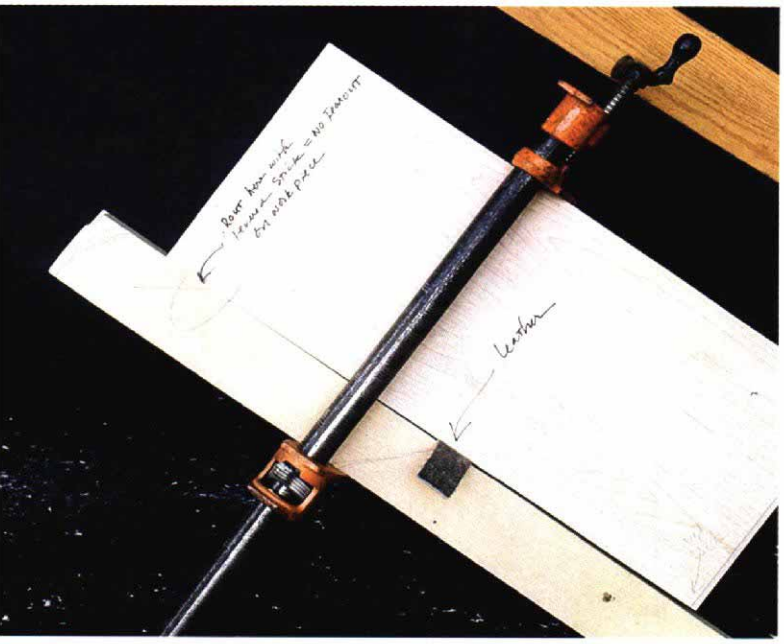
I cut the mating dovetail rabbet in the sides with a hand-held router controlled by a template and a bearing-guided bit. I used the same dovetail bit as on the slats, but with a 1.125-OD bearing mounted on the bit's ½-in.-dia. shaft. The template was positioned on the side panel and the depth of cut was adjusted so that the dovetailed slat end fit into the dovetailed rabbet in the side panel, as shown in the drawing. This setup is a trial-and-error process that should be practiced on scrap stock. Take light cuts and test the fit after each pass with one of the dovetailed slats until it is perfect. Then measure the fence setup on the practice piece and transfer it to the cabinet side. The offset-knob router subbase, shown in the top photo below, adds stability to this operation, particularly at the ends of the cut where only one-fourth of a regular router base would be on the template. (This subbase is available from Trendlines, 375 Beacham St., Chelsea, Mass. 02150.) I used a technique I call spring-clamping to secure some ¾-in.-thick material to the edge of the side panel to prevent tearout, as shown in the bottom photo below.

The frame-and-panel back is held in place by 3/16-in.-sq. slots that I routed with a bearing-guided, 3/16-in. two-wing groove cutter. I positioned the slots ¼ in. from the back edge of the carcase, on the inside edges of the sides and rear slats. Then I routed the optional opposing triangular detail in the cabinet sides, shown in the drawing on p. 44, with a bearing-guided, ½-in.-dia., 8° dovetail bit in a hand-held router set for a 3/32 in. deep cut and guided by a template. Before beginning work on the back panel, I routed the sliding dovetails for the drawer divider. In a single pass, rout the 5-in.-long dovetail ways on the horizontal centerline of the side panels with a ½-in.-dia., 8° dovetail bit mounted in a hand-held router controlled by a template and guide collar. Cut the dovetail pins with the same bit on the router table using the sliding fence attachment as previously described, only this time rout dovetails into both faces of the divider.



Left: The offset-knob router subbase, shown here with the router removed, increases surface area on the template for a more stable operation. The dovetail bit shows the correct setup for routing the dovetailed rabbet on the side panel.

Below: When routing the dovetail rabbets, a small piece of leather, clamped between the panel and scrap, levers the scrapwood tightly to the panel to help prevent tearout. This is a handy trick when a template interferes with clamping a scrap closer to the cut.



Backing up the cabinet—To finish the carcase, feel free to make the back any way you want. If the cabinet will be against the wall, a simple plywood panel may satisfy you. A more attractive solution would be ordinary frame-and-panel construction. Those with a more masochistic bent may decide to duplicate the sliding-dovetail frame-and-panel back that I developed, shown in the bottom photo on the previous page. To create interesting shadow lines, the rails, stiles, muntin and panels are all in different planes. This means the joinery must be offset to the rear of the panel. Although I show dimensions for the components of the back panel, you should dry-assemble your carcase and then cut these components to fit the opening in your particular carcase. After constructing the frame-and-panel back, as shown in the drawing, I routed a continuous 3/16-in.-sq. tongue around its perimeter. The tongue is 3/16 in. from the outside face of the stiles so that the entire back will be set into the carcase 1/16 in., to produce yet another shadow line. All the parts, including the back edges of the carcase, were lightly chamfered

I began assembling the carcase by temporarily clamping the two sides to one of the slats, forming a U-shaped assembly. Line up the top rear slat to the rear of both side panels and clamp it in place. Using the predrilled holes in the slat as a guide, bore the 5/32-in.-dia. pilot holes into the sides for the #8 screws. Remove the clamps, and then glue and screw the slat in place. I used a 90° brace to clamp the slat in place before screwing, to ensure the carcase was square. After gluing and screwing all the slats on one end, turn the carcase over, sparingly glue up the upper half of the tongue on the outer edge of the back panel and the lower half of the slot in the carcase to avoid squeeze-out, slide the back into place, and begin assembling the opposite end starting with the rear slat. Finish up the carcase by gluing the drawer divider in place. Again, sparingly apply glue to the last half of the socket and the front half of the tenon. From start to finish, it took me about an hour to put the carcase together. But because of the step-by-step assembly, I didn't feel like I needed eight hands to control all the clamps, clamping pads and furniture components involved in carcase glue-up.

Building the base—Because of the weight of a full file cabinet, the base had to be rugged. I added stout corner braces to my mortised-and-tenoned base to resist the abuse of even the most ruthless mover. To beef up the base and allow it to protrude beyond the carcase (5/16 in. on the sides and front and 1/16 in. in the back), I made the aprons, legs and corner braces from 1 1/8-in.-thick white oak, as shown in the drawing on p. 44. Although I could have mitered the leg sections together for a better grain match, I glued them together with a tongue-and-groove joint for easier assembly and a more precise fit, matching the pieces as well as I could. I glued up three 24-in.-long L-shaped units with 2 1/8-in.-wide outside faces from the 1 1/8-m.-thick stock. Cutting these units in half yielded six 12-in.-long legs. Although the legs will be a little long, the extra

Photos this page: Patrick Warner

length provides a safe handle for the machining operations you will perform before cutting the legs to their finished length of 8½ in. I used one of the extra leg blanks to experiment with designs and the other for testing machine setups.

Before shaping the legs, rout an open, ⅜-in. centered mortise, ⅞ in. deep by 2¼ in. long, into each 1⅛-in.-wide face on all the legs. To avoid vibration and deflection, I made multiple passes with a single-flute ⅜-in. bit chucked in a table-mounted router. Then, starting at the top of the leg, I routed 5/16 in. off the same face of the leg with a flush-trimming bit and a template to create the 4⅛-in.-long section at the top of the leg. Now, using the same bit and a template with a 20-in. radius on its guide edge, shape the bottom of the leg on the edge you just shaped. I repeated that radius cut on both outside faces of the leg, first jigsawing the basic shape and then dressing up the face on my 4-in. edge sander. Finally, I hand-sanded a 1¾-in. radius onto the lower portion of the mortised face edge.

Dimension the aprons, according to the drawing, before routing the ⅜-in.-thick by 9/16-in.-long tenons with a bearing-guided rabbeting bit. Again, I ran a bearing-guided flush-trimming bit against a template to rout the triangular recess into the bottom edge of the front and side aprons. Next, rout the 5/16-in.-wide by 3/64-in.-deep rabbet on the face of each apron with a bearing-guided rabbeting bit. I also used a bearing-guided bit to rout a 1/16-in.-sq. rabbet at the tenon shoulder of each apron to provide another shadow line.

With a bearing-guided two-wing groove cutter, rout 3/16-in.-sq. slots on the inside face of each apron, to accept the tongued assembly blocks that fasten the base to the carcase (see the drawing on p. 44). Sand all the members and glue up the frame. After assembly I routed a ¼-in.-deep cove along the top edge of the front and side aprons, as well as the tops of the legs, with a bearing-guided ½-in.-radius cove bit, to blend the lines of the base into the carcase. I used very light climb cuts on the leg tops, moving the router from right to left to avoid end-grain tearout. But a safer technique is to stop the cut just shy of the leg edge and finish up the detail with sandpaper wrapped around a l-in.-dia. dowel. Next, cut the corner braces and tongued assembly blocks, as shown in the drawing, and attach the front assembly blocks in place with #12 screws. To allow for wood movement, use pairs of blocks, spaced a screw width apart, on the sides and back. Locate the corner blocks so their holes or slots line up with the access holes in the corner braces. Then turn the carcase upside down, position the base upside down on the carcase and transfer the location of the holes in the assembly blocks to the bottom slats. Drill 5/32-in-dia. pilot holes in the slats and fasten the base to the carcase with #12 by 1¼-in.-long round-head sheet-metal screws. Note that the carcase is fixed in front so that all movement will occur at the back, where the screws slide in the slots formed by the paired blocks.

Making the drawers-The drawers consist of a full-height front and back joined by sliding dovetails to half-height sides, which help reduce the weight of the drawers and conserve wood. The bottom slides into grooves on all four edges. To withstand heavy loads, I chose 18-in. Accuride #C3800 drawer slides with a load rating of 75 lbs., which I bought from Cabinet Hardware Manufacturing Co., 14560 S. Marquardt Ave., Santa Fe Springs, Cal. 90670. The slides require ½-in. clearance between each drawer side and the carcase, and so flanged, flush-inset drawer fronts work well. One caution: when measuring for the drawer compartments, allow ½-in. clearance for the hardware based on the inside dimensions of the carcase and not the drawer fronts; otherwise, the hardware won't fit properly.

Cut all drawer parts to size and then rout the sliding dovetails using the same ⅜-in.-dia., 8° dovetail bit set to take a ⅜-in.-deep pass for all joints. Again, although the drawing shows my drawer component dimensions, be sure to make adjustments as necessary to fit your actual carcase. I left 3/64-in. clearance on the sides of my drawers and a little bit more, about 1/16-in. clearance, on the top and bottom to prevent the drawers from sticking when their fronts expand. Also, leave at least ½-in. clearance between the drawer backs and the carcase back, because a carcase of this size can move as much as ¼ in, with changing humidity levels.

Using the previously described technique of complementary routing to make templates, inlay the full-thickness yellow-satinwood triangles into the drawer fronts. Now rout the 5/16x5/16xl⅛ rod support slots into each drawer front and back, as shown in the drawing on p. 44. The three slots are spaced 15 5/32 in. and 12 5/32 in. apart so the rods can support either legal- or letter-size suspended file folders. The location of the slots is critical for smooth movement of the file folders, and so I suggest setting up the cuts first on a piece of scrap. To hang the file folders, I bought some 5/16-in.-dia. stainless rod at the junk yard, cut it to length, and dressed it by chucking it in the drill press set at its slowest speed and buffing it with 320-grit silicone-carbide paper and 0 steel wool. Finally, rout the groove for the ¼-in.-thick plywood bottom; be aware that the groove is 3/16 in. deep on the sides and back, but ⅜ in. deep in front.

To assemble the drawers, first apply glue to the front sockets and to the pins on the front of the sides and then slide these pieces together. The plywood bottom slides into its grooves until it reaches the end of each drawer-front groove. The extra depth of this groove allows the bottom to slide past the front of the drawer back, which is then slid into position without glue. Pulling the bottom into the groove in the drawer back still leaves 3/16 in. of the bottom in the front groove so that the bottom is supported on all four sides. Now screw the sides to the back, as shown in the drawing. When finishing the piece, I removed the back and bottom, leaving these pieces and the inside of the carcase unfinished to minimize the outgasing of solvents within the cabinet.

The finger grips for the applied pulls are routed into oversize stock with a bearing-guided ¼-in.-radius core-box bit and a template before the triangular-shaped pull is bandsawn. Sand the front edge to the correct radius, using a coved piece of scrap as a sanding block, and then cut the pull to length. Locate the centerline of the pull 1⅛ in. below the top of the drawers and secure the pull with three #8 by 1½-in.-long flat-head screws.

Topping off the cabinet—I made the separate slab top of 25/32-in.-thick white oak about 6 in. wider than the finished top is deep because I shaped and then ripped a strip from the back of the top and glued it to the front, to hide the edge of the satinwood inset. After gluing up the top, rout the satinwood triangle into its front edge using the same template and procedure as for the drawer fronts. Then using a template with a 60-in. radius, rout an arc across the back edge of the top. Rip a 2-in.-wide strip from the back and, using the same template, rout the complementary arc across the front edge of the top. Now glue and clamp the strip ripped from the back edge to the front edge. Finish shaping the top using a flush-trimming bit in a hand-held router guided by a template to cut the triangular edges on the sides and front (see the drawing). I routed a 5/16-in.-wide by 1/16-in.-deep detail around the edge of the top with a bearing-guided rabbeting bit. Sand the top's edge to a ⅞-in. radius with a piece of coved scrap and secure it to the carcase with 12, #10 by 1¼-in.-long flat-head screws. I finished the cabinet with three coats of Watco oil and wet-sanded the final coat.

Patrick Warner teaches classes on router techniques and making jigs and fixtures. For more information, contact the author at 1427 Kenora St., Escondido, Cal. 92027.