

18th-Century Pennsylvania Secretary

Part I

A pair of dovetailed boxes outfitted with drawers and doors make up the bulk of this period piece

BY LONNIE BIRD

In relation to 18th-century design, aesthetics and joinery, I don't restrict myself to building absolute reproductions. Before building a piece, I study several related examples and combine the best design elements to come up with a piece that's my own. And I don't copy mistakes. If a door proportion doesn't work or a glue block was attached cross-grain, I'll make the necessary changes. I want my furniture to capture the spirit of period furniture without the shortcomings.

Build the lower case

Stripped of its drawers, feet and molding, the lower case is simply a box joined with half-blind dovetails. When laying out the joint at the top, keep in mind a couple of key points. First, begin the joint with a tail, which will hide the rabbet for the back boards. Second, the slope on the case sides begins 12 in. from the back edge. Mark the slope location and end the joint with a half pin.

Although you can use a jig to cut and fit the dovetails, I prefer the slight irregularities associated with a hand-cut joint. I use a router freehand to cut away the waste between the pins, then I use a chisel and mallet to square the inside corners between the pins. Finally, I scribe the tails from the pins and saw them by hand. The result is a joint with a handmade look but without much time or fuss.

The next step is to lay out the writing surface, the drawer dividers and the lid slope. The writing surface is positioned 11 in. below the top. Once the feet are attached to the case, the writing surface will be approximately 30 in. from the floor. Next, lay out the drawer placement. I think drawers look best if they graduate, meaning they gradually increase in height. To

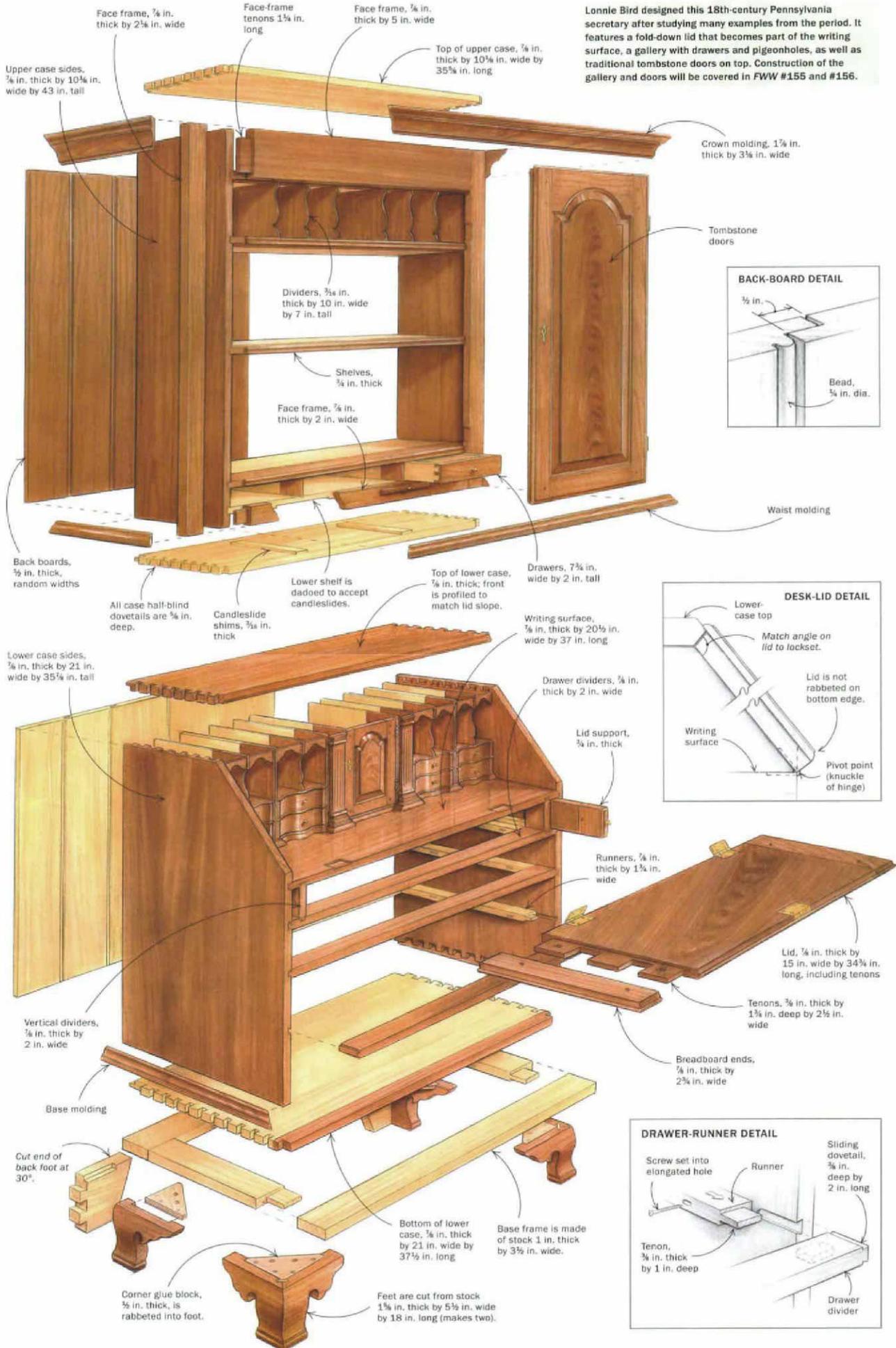


During the 18th century, building a secretary was often considered the culmination of a cabinetmaker's skill. But for years I've taught inexperienced undergraduates to build the secretary seen on these pages. The key to building a large, complex piece, such as this reproduction of a Pennsylvania desk—with more than 100 parts and nearly that many joints—is to break down the process into small, easy steps. This secretary, like all casework, is just a series of boxes fitted within larger boxes. The moldings, curves, feet and other details are easily made but embellish the box, making the completed piece visually stimulating.

In this article—Part I of a three-part series—I'll focus on building the upper and lower cases. Subsequent articles will walk you through the process of outfitting the gallery with drawers and pigeonholes and then building and hanging tombstone doors on the upper case. Although I have a great appre-

Watch it on the web
Get a tour of the finished piece
at finewoodworking.com.

Lonnie Bird designed this 18th-century Pennsylvania secretary after studying many examples from the period. It features a fold-down lid that becomes part of the writing surface, a gallery with drawers and pigeonholes, as well as traditional tombstone doors on top. Construction of the gallery and doors will be covered in FWW #155 and #156.



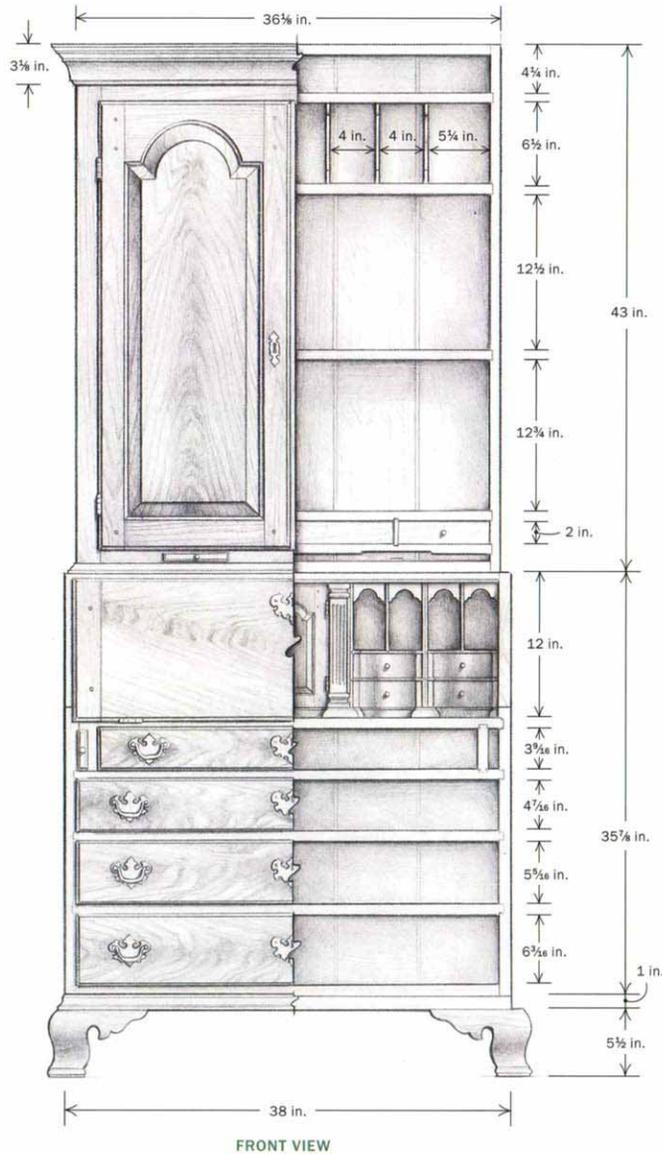
The 18th-century aesthetic

My eye has always been drawn toward the stylistic elements of American period furniture. But rather than make exact copies, I prefer to make subtle changes within the parameters of the style. Before building a piece, I study several related examples (other Pennsylvania secretaries, for instance) and borrow the best elements, such as the foot from one piece and perhaps the door from another. For example, the serpentine gallery on this secretary is common to many Pennsylvania secretaries, and the foot is a somewhat unique version from another Pennsylvania antique.

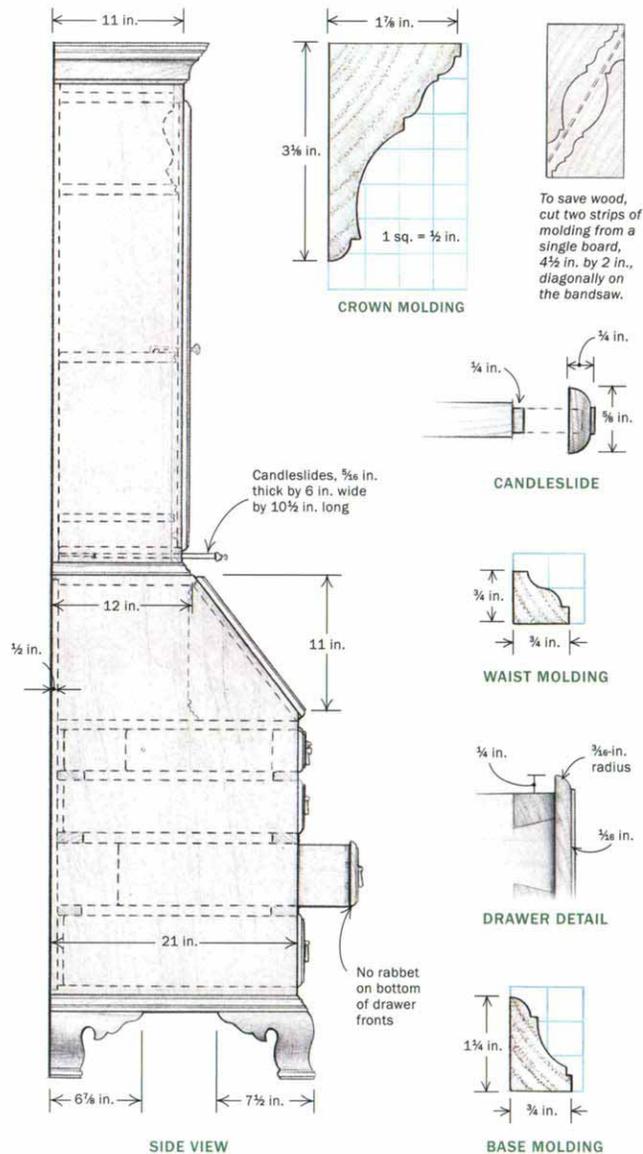
If I'm not comfortable with an original proportion, I change it. In my mind, no matter how fine the workmanship or dramatic the figure in a door panel, if proportions are clumsy, the piece isn't successful. To ensure that the piece looks balanced, I use one of several proportioning systems. I've measured enough antiques to be convinced that period craftsmen used them, too. The golden rectangle and ratios of whole numbers are very useful.

On this piece, for example, I chose the popular tombstone panel for the gallery's prospect door and divided the height by the golden ratio (1.618) to determine the width. The top drawer in the gallery measures 2 in. by 6 in., a ratio of whole numbers; and the drawer below it graduates by $\frac{1}{4}$ in., roughly the thickness of the divider.

Using design elements from related examples allows me to keep in harmony with the Colonial cabinetmakers from a specific geographical region while building a piece of furniture that is distinctly my own.



FRONT VIEW



SIDE VIEW

Drawings: Bob La Pointe

Old style, new methods

It's difficult to improve on many 18th-century joinery techniques. Dovetails are still the best choice for constructing drawers and case-work, and no modern joinery method comes close to the strength of a door frame joined with pinned mortise-and-tenon joints. But a closer look at many antiques reveals that 18th-century craftsmen did not always choose the best construction methods to allow for seasonal movement. You'll often find drawer runners that were simply nailed to the sides of case-work and ogee feet that were thin facades held together with a cross-grain glue block. Such practices have resulted in split case sides and cracked feet.

Today, craftsmen who choose to work in 18th-century styles must make choices about how far they will duplicate the work of the period. Because I want my furniture to have the look and feel of the originals, I work diligently to reproduce more of the lines, proportions and details. This often requires a great deal of painstaking handwork, such as planing and scraping surfaces or sawing dovetails by hand. But I don't feel a compulsion to duplicate the construction techniques that lead a piece to self-destruct.

This is why I fasten drawer runners with screws driven through elongated holes. And, if necessary, I beef up the construction a bit. For example, I added the dovetail dividers at the back of the lower case to help withstand the pressure of an upper case loaded with books. The result is a piece of furniture that's true to the style without some of the shortcomings.

achieve proportional sizes I use arithmetic progression, a system in which a constant (X) is added to a drawer opening (A, B, C) to create the next. For example, $A + X = B$, $B + X = C$, and so on. In this case X is $\frac{7}{8}$ in., the dimension of the drawer divider.

Next, lay out the the starting and ending points of the lid slope based upon the lid position when closed. After careful layout of the slope, saw away the excess corner with a bandsaw and cut to the layout line with a flush-trimming router bit. First, clamp a straightedge along the layout line to guide the router bit. To avoid tearout, use a spiral bit and cut with the grain.

After cutting the slope on the case sides, transfer the angle of slope to the edge of the top. Dry-fit the top to one of the sides, then mark the slope on the end grain of the top. Set the tablesaw blade to an angle that corresponds to this layout line, then rip the slope on the edge of the top. Afterward, turn over the top and rip the edge a second time to bevel the underside of the case top. Then smooth away the saw marks with a bench plane. The last step before glue-up is to mill a rabbet for the back boards along the inside edges of the top and sides.

Because of its large scale and the numerous tails and pins, gluing together a box this size can be quite a handful. To avoid panic, it's best to prepare by doing a dry run, checking for square as you go. After the dry run, use a mallet to tap the joints partially open; keeping the assembly partially intact makes glue-up much easier. Apply glue only to the pins with a small brush, and drive the joints home. After ensuring that the box is square, leave it on a flat surface until the glue dries.

Ready the lower case for drawers

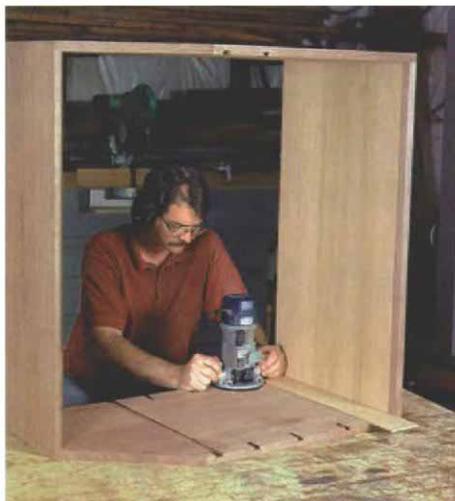
The next step is to install the dividers, the drawer runners (which also serve as kickers) and the writing surface. The dividers are joined to the case sides with sliding dovetails, and the back edges of the dividers are mortised to accept tenons on the runners. The tenons at the back ends of the runners are dry-assembled with a $\frac{1}{8}$ -in. gap at the tenon shoulder. As the case sides expand and contract seasonally, the gap allows the tenons to slide freely in the mortises.

Fasten each runner to the case with a pair of screws. Using this method, the drawer runners serve as battens to help keep the wide case sides flat. To allow for movement in the case sides, elongate the screw holes in the runners. The writing surface is joined to the case sides with a sliding dovetail for the first 2 in. and a shallow dado for the remaining width.

Before beginning the next step, decide how many drawers you would like (or how many dovetails you want to cut). Original Pennsylvania secretaries typically had four, five or seven drawers, and many antiques used small drawers to support the lid. You can also divide the second row into two drawers.

After milling the stock for the dividers, the drawer runners and the writing surface, begin the joinery by routing dovetail sockets

PARTITIONING THE CASE



Dovetailing for the dividers. Templates guide the router as it cuts sliding dovetails to accept the dividers. Using the same template on both sides ensures that the dividers go in square.



Installing the writing surface. The writing surface slides into dados cut into the case sides, and 2-in. sliding dovetails at the front hold it in place.



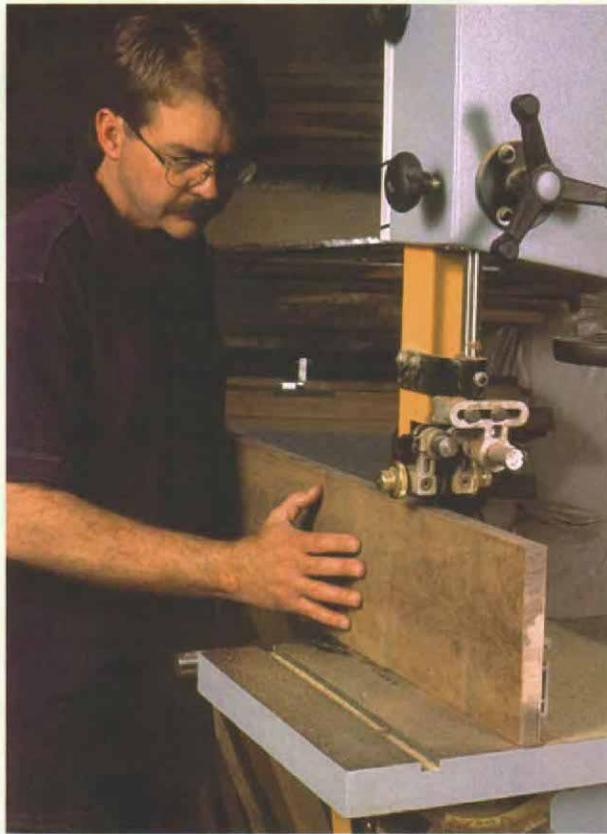
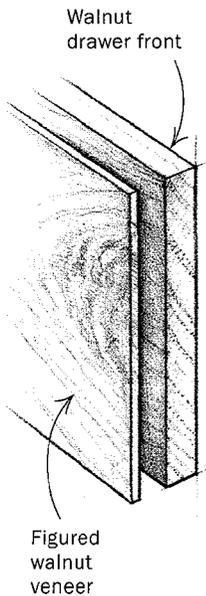
A final push. Use a pipe clamp to slowly slide the dovetail into place, adding a touch of glue at the end.



Drawer supports. Runners are tenoned into the drawer stretchers, which are dovetailed to the case sides. The runners, which also serve as kickers, are left short and screwed to the case sides through elongated holes to allow for seasonal movement.

VENEERING DRAWER FRONTS

Resawn drawer fronts match perfectly. Bird chooses a nice piece of crotch wood and resaws drawer fronts on the bandsaw.



into the case sides. To ensure uniformity, guide the router with plywood templates that register from the bottom of the case. Because I've built this secretary before, I have templates for each divider and the writing surface. But you can use one large template and reduce it in size for each series of cuts.

Cut each dovetail socket $\frac{3}{8}$ in. deep by 2 in. long. Each setup requires four cuts, two on each side at the front and back. The exception is the writing surface, which has dovetails at the front but

not at the back. There, the joint is completed with a dado ($\frac{3}{16}$ in. deep by $\frac{7}{8}$ in. wide) to support the wide writing surface.

After routing the case sockets, cut the dovetails on the corresponding dividers to fit. Fitting the dividers can be tricky. But if you use the same dovetail bit mounted in the router table and are careful with the setup, it becomes much easier. First, mount a tall auxiliary fence on the router table to help support the stock. Then set the bit height to precisely $\frac{3}{8}$ in., the depth of the sockets. Bury the bit in the fence to create a zero-clearance opening, and you're ready to begin.

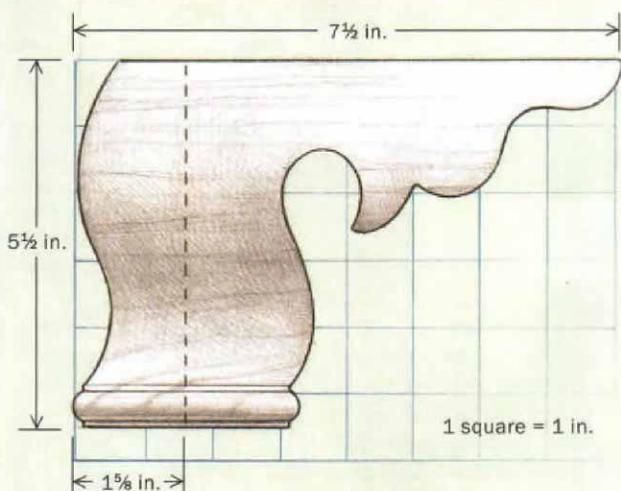
Cut the dividers to length. For greatest accuracy, first square one end of the milled stock, then position a corner of the stock into a socket and mark the opposite end. One measurement should work for all of the dividers. If the case sides have warped slightly, the dividers will force them back into position when they are installed. Cut the dividers to final length with the help of a stop.

Now make one last adjustment to the router table: the position of the fence, which determines the thickness of the dovetail. Although the joint is glued, there's really no long-grain surface contact for a strong bond, so a very snug fit is necessary to hold the joint firmly. In fact, I use soft blows of a mallet to drive each dovetail into its socket. To ensure accuracy, use a test block and adjust the router fence until the fit is snug. Once you're satisfied with the fit of the test block, rout the ends of the dividers.

Afterward, lower the bit to $\frac{3}{16}$ in. and rout dovetails on each end of the writing surface. Then cut the writing surface $\frac{3}{16}$ in. shorter on each end, leaving the dovetails on the front edge.

The next step is to mortise the back edges of the dividers to accept the tenons on the runners. Then cut the tenons to fit the mortises. Remember to subtract $\frac{1}{8}$ in. at the rear tenon to allow the case sides to move. To ensure this system works as it should, cut the

MAKING BRACKET FEET



Feet are mitered, splined and cut to shape. With the blade set to 45°, the mitered ends of the foot stock are cut to accept a hardwood spline (left). Before assembly, feet are bandsawn to shape (right).

rear tenons for a slightly loose fit and rub paraffin wax on each tenon before assembly. Finally, drill a pair of holes in each runner for the screws that fasten them to the case sides.

Begin assembly by installing the dividers at the front of the case. First apply a thin coat of glue to the dovetails and slide the dividers into position. Then apply glue to the front tenons on the runners and slide them into the mortises from the back of the case.

The last step is to install the dividers at the back. Remember to apply glue to the dovetails but not to the mortise-and-tenon joints. Finally, screw the runners to the case sides. To keep the slides flat, the screws need to penetrate deep into the case.

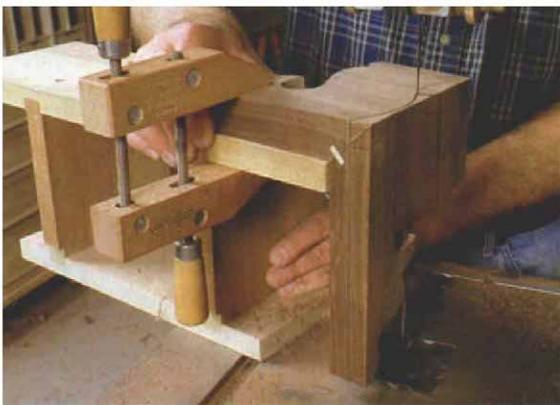
Slide the writing surface into the dadoes in the case sides. Because there is so much friction, apply glue only at the dovetail and use a pipe clamp at each end to coax the joint together.

Build the large drawers

The large drawers are typical in their construction: half-blind dovetails in the front and through-dovetails in the back. The bottoms are thin, solid panels with beveled edges that slip into dadoes from the drawer back. Orienting the grain from side-to-side will allow expansion to occur at the back.

Traditional drawer fronts were lipped or flush with a cockbead. Also, drawer fronts are a great place to show off crotch wood; I bandsawed a crotch plank into veneer and glued it to each front with a vacuum press. This method ensures that all of the fronts match. If you choose to use a lipped drawer front, begin by milling the fronts oversized— $\frac{7}{16}$ in. longer and $\frac{3}{16}$ in. wider than the opening. Then mill a $\frac{1}{4}$ -in. rabbet around the sides and top. No rabbet is used along the bottom edge. Now check the fit of the front within the opening. There should be approximately $\frac{1}{16}$ in. total clearance at the top and $\frac{1}{16}$ in. total on the sides. Next, mill the drawer sides and back so that they correspond to the size of the drawer front inside the rabbet. After dovetailing the parts, shape a $\frac{3}{16}$ -in. thumbnail profile around the perimeter of each drawer front.

If you use a cockbead, make and fit the drawers first. Carefully fit each drawer with a plane, then mill a shallow rabbet around the drawer perimeter.



Quick jig helps profile the feet. With the feet clamped to an elevated jig, rough out the side profile of the feet on the bandsaw.

Next, miter the beaded strips and apply them to the rabbets with glue and small cut nails. Make certain that you are satisfied with the drawer fit before beginning the cockbead process. Any fitting after the cockbead has been applied will spoil the profile of the bead.

Use a single plank for the lid

The secretary's lid is hinged to the writing surface and folds down to become part of the writing surface. Measuring more than 1 ft. deep and 3 ft. across, the lid is an ideal place to use a prized, figured plank. In fact, I never use more than one board for the lid because any seam would be a distraction. To keep such a wide plank from warping, use breadboard ends.

Begin by milling the plank and the breadboard ends to thickness. It's important to flatten the stock before milling it. If your jointer will not accommodate such a wide plank, you can use a long handplane instead. After milling, lay out and cut three mortises, 2 in. deep by 3 in. wide, in the breadboard ends. Next, cut the tenons on the ends of the lid for a friction fit within the mortises.

To allow for seasonal movement, apply glue to the center joint and leave the two outer joints dry. Wood pins will hold these joints tight while allowing for movement. When laying out the pins, offset the hole in the tenon $\frac{1}{2}$ in. closer to the shoulder. This pulls the breadboard end tight against the tenon shoulder. Bore the hole in the tenon, then elongate it with a small file. After assembly, the pin can slide freely in the elongated hole as humidity changes.

To assemble the lid, apply glue to the center mortise-and-tenon joints at each end. A couple of pipe clamps will hold the joint closed while the glue sets. Afterward, drive the wood pins through the four outer joints and trim the pins flush with the lid surface.

After assembly, cut a $\frac{1}{4}$ -in. rabbet along the ends and top edge of



Follow the glueline. Once the first profile has been cut, simply follow the exposed glueline to make sure the two sides match.

MAKING CROWN MOLDING



Cove cutting the crown molding. Using a cove cutter, the triangular stock is adjusted along a fence until the entry and exit points line up. Temporary fences are clamped into place, guiding the stock as the cove is cut. Take light passes, raising the blade slightly after each cut.

the lid. Leave the lower edge of the lid square to achieve a flush fit with the writing surface. Slope the rabbet along the top edge to match the angle of slope on the lid lock.

Make the feet next

For this piece you can choose between flat or ogee bracket feet. Flat bracket feet are authentic to the period and easier to construct than the ogee bracket feet. They also are a good option if you prefer a simpler look. (For more on making flat bracket feet, see *FWW* #97, pp. 72-75.)

To make ogee feet, begin by building the base frame to which the feet are attached. The frame is 1 in. thick and fastens to the bottom of the case. After the feet are attached to the frame, a strip of base molding is mitered and applied over the base frame.

To determine the length and width of the base frame, measure the case and add $\frac{1}{16}$ in. to the front and sides. Frame corners are joined with mortise-and-tenon joints, and the entire assembly is glued along the front edge of the desk. The rest of the frame is attached with screws to allow for seasonal movement. Once the frame has been attached, trim it flush to the case using a flush-trimming bit in the router.

The ogee feet at the front are constructed with miters and splines. The back feet are joined with half-blind dovetails. Once the joints have been cut, bandsaw the bracket outline and glue the foot halves together (see the photos on pp. 52-53).

Bandsaw the ogee contour into the face of each foot. This method is fast and requires very little handwork. But first you'll need to build a simple stand to support the foot on the bandsaw table while sawing.

After bandsawing the feet, remove the saw marks and smooth the curves with files and a scraper. A #5 carving gouge works well for refining the bead at the foot. Then cut a stopped rabbet along the top edge of each foot, long enough to accept a triangular glue



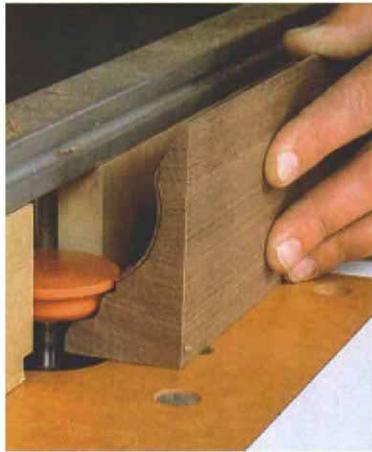
block. The feet are fastened to the base with a pair of screws driven through the glue block. Finally, complete the base by attaching the strip of molding around the front and sides of the case.

Once the lower case has been finished, you can install the gallery—which I'll explain in the the next issue of the magazine—or begin work on the upper case.

Build the upper case

Begin by measuring the top of the lower case to determine the dimensions for the upper case. Subtract 1 in. from the depth and $1\frac{7}{8}$ in. from the width, providing space for a transitional molding. The molding helps keep the upper case in position. Next, subtract an additional $\frac{7}{8}$ in. from the depth for the thickness of the face frame. Now cut half-blind dovetails to join the top, bottom and sides to create a box. After dry-fitting the dovetail joints, rout the dadoes that support the shelves. You'll have to disassemble the case to cut the dadoes that are close to the corners of the base.

The proximity of these dadoes to the corners requires use of the router table and a fence. I also use the router table to cut rabbets along the inside edge of each side, providing a recess for the back



Finish the job at the router table. Once the cove has been cut, an inverted cutter trims the top profile in a single pass. A small lipped roundover finishes off the crown molding.



Attach the molding. While traditional period pieces were often face-nailed, Bird installs the crown molding using unseen screws set into elongated holes.

boards. Finally, apply glue to the half-blind dovetails, assemble the case and check it for square.

While the glue sets, begin working on the face frame. Many antique secretaries feature a pair of candlesticks in the bottom rail of the frame. These drawerlike shelves provided a place to set candlesticks for light while working. Although obviously not necessary today, the candlesticks provide reverential detail to the desk. Make the openings for the slides using stop cuts on the tablesaw.

When milling the stock for the face frame, add an extra $\frac{1}{16}$ in. to the width of each stile to allow the frame to overhang the case. After the face frame has been applied to the case, it is quick work to trim the stiles flush with a router.

Once the basic case has been assembled, slide in the $\frac{3}{4}$ -in.-thick shelves from the back. The shelves that fit behind the upper and lower rails are glued to the rails. I embellished the front edge of the remaining shelves with a pair of beads, but a simple chamfer will also soften the hard edges. After the shelves are in position, slide the vertical partitions in place.

The drawers use typical construction: dovetail joinery and a bevel-edged bottom panel. Because they close flush, fit them with a sharp plane after assembly. A small block glued to the underside of the shelf works as a drawer stop.

Make the crown molding from solid stock, if possible

Although the crown molding can be built up of separate strips, solid stock is easier to apply to the case. Also, shaping a piece of solid stock avoids potential mismatched color and grain that can occur from built-up moldings.

To shape the crown molding, rip a length of rectangular stock diagonally on the bandsaw and then cut the large cove on the table saw. To avoid excessive scraping and sanding to remove saw marks, I shaped the cove with a special cutter available from CMT (part No. 800.523.11). This unique tool is part of a crown-molding set I designed that also includes inverted router bits for shaping the small thumbnail and ovolo that flank the cove.

After shaping, miter the front molding to length, then miter the

returns. If necessary, fine-tune the joint by making minor adjustments to the angle of the miter on the returns. Although fitting the miter joint precisely may seem tedious, it's actually quite easy with a chopsaw outfitted with a fine-tooth miter blade. On many old desks, the moldings were simply face-nailed, but I prefer a cleaner look. The molding is fastened from the inside with screws. I drill elongated holes in the case sides for the screws at the returns. This method allows the case to contract independently of the molding. To keep the miters tight, apply glue to both members of the joint.

Both upper and lower cases use $\frac{1}{2}$ -in.-thick shiplapped back boards. The boards are simply nailed to the rabbets in the cases and back edges of shelves and dividers. I always install the back boards after the finishing process, because it makes it easier to apply finish to the inside of the case.

At this point, the case is not quite done, but you begin to see how the finished piece will look. All that's left is to install a gallery in the lower case and hang doors on the upper case. In subsequent issues, I'll discuss building galleries and tombstone doors using detailed examples that fit the secretary seen here. □

Lonnie Bird builds period furniture in Dandridge, Tenn., where he also conducts woodworking seminars.



In the next two issues, Bird will tell you how to install the gallery and build the tombstone doors.