Boston Bombé Chest

Bulging drawer fronts are all shaped at once

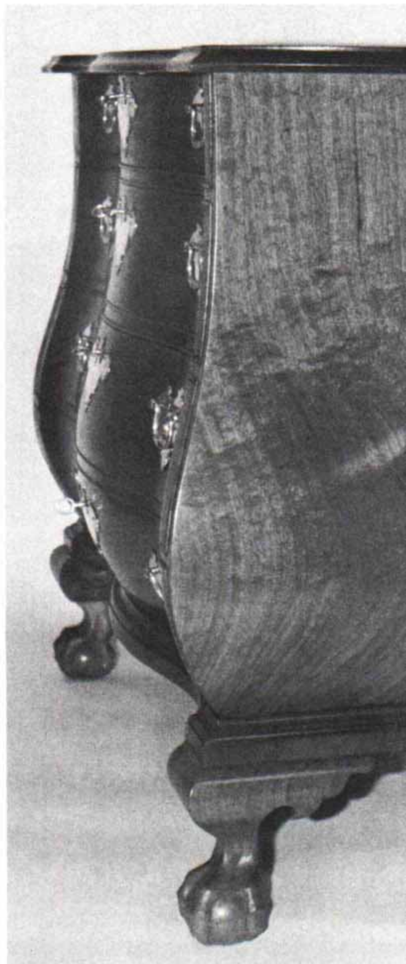
by Lance Patterson

More than 50 pieces of American bombé furniture made in the last half of the 18th century still exist. Surprisingly, all were built in or around Boston. The kettle-shaped bombé form (the term is derived from the French word for *bulge)* is characterized by the swelling of the lower half of the carcase ends and front, with the swell returning to a normal-size base. This shape is, I think, directly related to English pieces such as the Apthorp chest-on-chest, which was imported to Boston before 1758 and is now at that city's Museum of Fine Arts. Bombé was popular in England for only 10 to 12 years, but remained the vogue in Boston for nearly 60 years.

In America, the carcase ends were always shaped from thick, solid planks of mahogany. In Europe, the ballooning case ends were most often coopered—3-in. to 4-in. pieces of wood were sawn to shape, glued up, contoured and then veneered. Instead of veneering, the Americans worked with solid wood. I think the magnificent grain patterns of this shaped mahogany are a major attribute of Boston furniture. The bombé form, I believe, also shows the enthusiasm that 18th-century cabinetmakers must have felt when wide, dear mahogany first became available to them.

There was also an evolution in the treatment of the case's inside surfaces and, consequently, in the shape of the drawers. On the earlier pieces, the case ends are not hollowed out and the drawer sides are vertical. Some transition pieces have lipped drawer fronts, the lip following the curve of the case. The fully evolved form has hollowed-out ends and drawers with sides shaped to follow the ends. Some of the later pieces have serpentine drawer fronts.

I will describe how I built a small bombé chest with four shaped drawers, ball-and-claw feet and a serpentine front. I didn't take step-by-step photos while building, so I'll have to



Patterson's bombé chest, based on an 18th-century design, has four dovetailed drawers and ball-and-claw feet. Side view, right, shows shape of serpentine front.

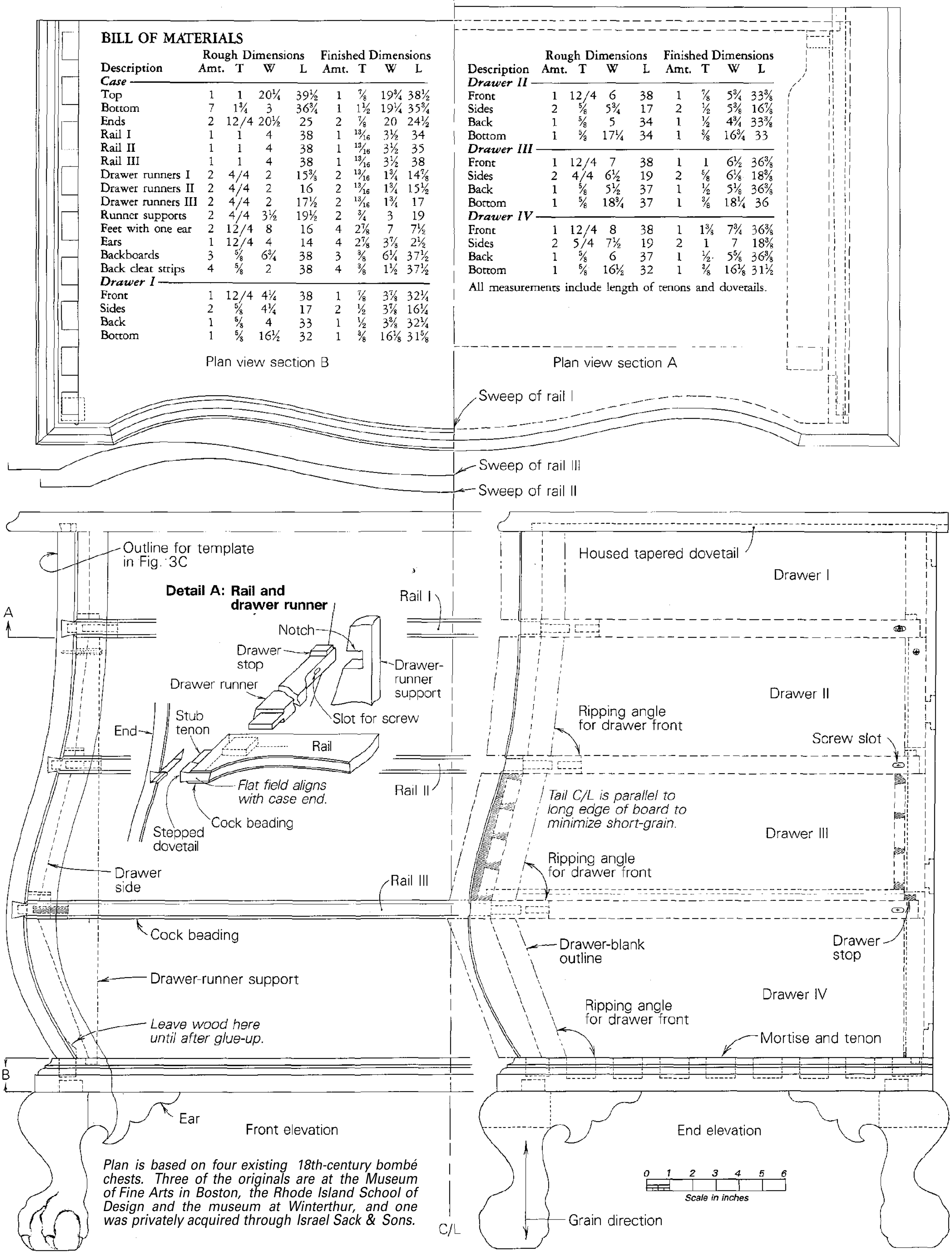
Photos this page: Lance Patterson

Fig. 1: Patterson's plans for a Boston bombé chest

BILL OF MATERIALS

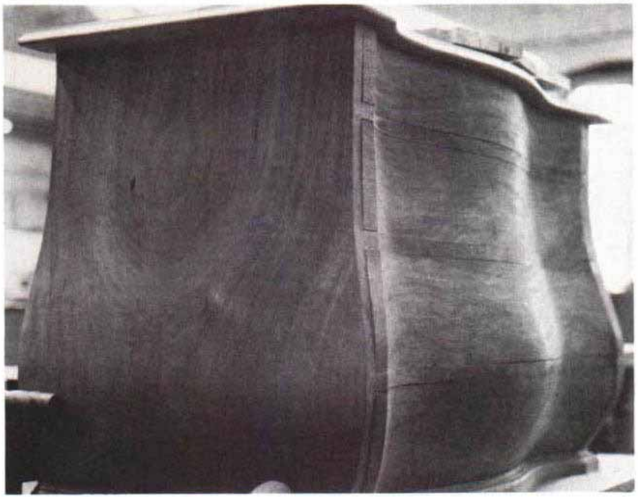
Description	Rough Amt.	Rough T	Rough W	Rough L	Finished Amt.	Finished T	Finished W	Finished L
Case								
Top	1	1	20 1/4	39 1/2	1	7/8	19 3/4	38 1/2
Bottom	7	1 3/4	3	36 3/4	1	1 1/2	19 1/4	35 3/4
Ends	2	12/4	20 1/2	25	2	7/8	20	24 1/2
Rail I	1	1	4	38	1	13/16	3 1/2	34
Rail II	1	1	4	38	1	13/16	3 1/2	35
Rail III	1	1	4	38	1	13/16	3 1/2	38
Drawer runners I	2	4/4	2	15 3/8	2	13/16	1 3/4	14 7/8
Drawer runners II	2	4/4	2	16	2	13/16	1 3/4	15 1/2
Drawer runners III	2	4/4	2	17 1/2	2	13/16	1 3/4	17
Runner supports	2	4/4	3 1/2	19 1/2	2	3/4	3	19
Feet with one ear	2	12/4	8	16	4	2 7/8	7	7 1/2
Ears	1	12/4	4	14	4	2 7/8	3 7/8	2 1/2
Backboards	3	5/8	6 3/4	38	3	3/8	6 1/4	37 1/2
Back cleat strips	4	5/8	2	38	4	3/8	1 1/2	37 1/2
Drawer I								
Front	1	12/4	4 1/4	38	1	7/8	3 7/8	32 1/4
Sides	2	5/8	4 1/4	17	2	1/2	3 7/8	16 1/4
Back	1	5/8	4	33	1	1/2	3 3/8	32 1/4
Bottom	1	5/8	16 1/2	32	1	3/8	16 1/8	31 5/8
Drawer II								
Front	1	12/4	6	38	1	7/8	5 3/4	33 3/8
Sides	2	5/8	5 3/4	17	2	1/2	5 3/8	16 7/8
Back	1	5/8	5	34	1	1/2	4 3/4	33 3/8
Bottom	1	5/8	17 1/4	34	1	3/8	16 3/4	33
Drawer III								
Front	1	12/4	7	38	1	1	6 1/2	36 3/8
Sides	2	4/4	6 1/2	19	2	5/8	6 1/8	18 3/8
Back	1	5/8	5 1/2	37	1	1/2	5 1/8	36 3/8
Bottom	1	5/8	18 3/4	37	1	3/8	18 1/4	36
Drawer IV								
Front	1	12/4	8	38	1	1 3/8	7 3/4	36 3/8
Sides	2	5/4	7 1/2	19	2	1	7	18 3/8
Back	1	5/8	6	37	1	1/2	5 5/8	36 3/8
Bottom	1	5/8	16 1/2	32	1	3/8	16 1/8	31 1/2

All measurements include length of tenons and dovetails.



Plan is based on four existing 18th-century bombé chests. Three of the originals are at the Museum of Fine Arts in Boston, the Rhode Island School of Design and the museum at Winterthur, and one was privately acquired through Israel Sack & Sons.

Don Burkey



Vivid grain patterns are exposed when thick mahogany is shaped. Making the board's bark side convex yields a hyperbolic figure, as in the author's chest, above; cutting into the other side produces elliptical patterns, shown in the photo on p. 56.

illustrate some operations with photos of Jerry de Rham building his bombé desk at Boston's North Bennet Street School, where I teach. His version is of the basic bombé form: the front is not serpentine, but bulges to match the ends.

It's unclear how early cabinetmakers made the shaped drawers, but it probably was done by trial and error, then angle blocks and patterns were made for future reference. There are graphic methods for figuring the angles, and mathematical methods are quick and accurate, too, as explained in the box on p. 57. The same techniques can be applied when designing anything with canted sides and ends, such as a cradle, dough box, or splayed-joint stool or table.

The first step in any project of this scope is to make full-size orthographic drawings, primarily to facilitate making patterns for shaped parts. This also helps you work out joinery dimensions, and preview the actual size and look of the piece. In developing drawings, I like to gather information from all the sources I can find. I know of four original chests similar to mine—one was privately acquired through Israel Sack & Sons, and the others are at the Museum of Fine Arts in Boston, the Rhode Island School of Design, and Winterthur. Measured drawings of the chest at RISD can be found in *Masterpieces of Furniture* by V.C. Salmonsky (Dover Publications). After building the chest, I revised my drawing by adding ½ in. to the bottom drawer height. Because this drawer recedes from the common viewing angles, it appears narrower than it is. Usually I follow the rule of thumb that drawer height plus rail height should equal the height of the next lower drawer.

The wood for my chest was a 12/4 plank of South American mahogany, 12 ft. by 22 in., and a 4/4 mahogany board, 40 in. by 21 in., with secondary parts of poplar. For effective use of grain, the symmetry of the ends and the continuity of the front are the most important considerations. I laid out the ends book-fashion, with the bulge toward the wider annual-ring pattern (figure 2). Either face of the plank can be used as the outside; both elliptical and hyperbolic annual-ring patterns are beautiful. I chose the bark side of the plank, producing a hyperbolic pattern at the bulge, as shown in the photo at left. De Rham's desk shows the characteristic elliptical pattern of the heart face, best seen in the photo on p. 56.

To avoid conflict between the long grain and the cross grain around the case, and to eliminate applied moldings, I departed from traditional construction. I used a thick mahogany bottom with the base molding cut into it. Thus the end base molding is end grain, but so is the molding on the top's end, and there's a lot of end grain in the serpentine front molding as well. I especially like end-grain molding.

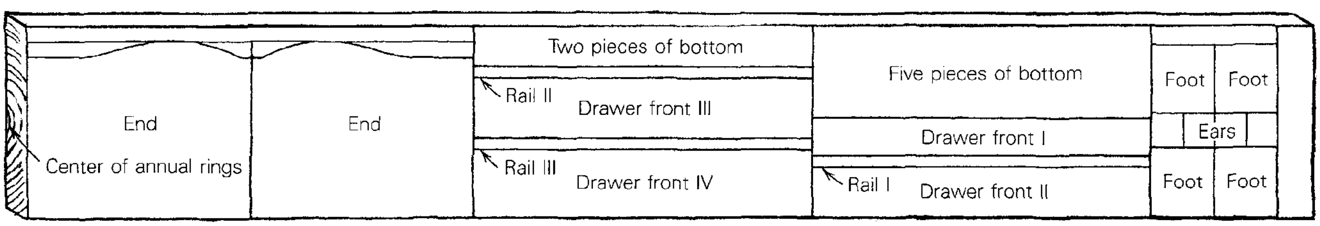
To shape the chest, first rough-saw all the parts according to the rough stock list on p. 53. Note that the final dimensions differ considerably in many cases, but the parts should be cut oversize to ensure that they can be shaped with the setups shown in figure 3. Next, rip the front pieces for the three lower drawers at the angles shown on the side-elevation drawing in figure 1 so that they can be canted to provide the necessary thickness for the serpentine shape. Mark out the rails from the centerline and bandsaw them to shape.

I shaped the front as a unit, the method I recommend for any serpentine or oxbow casework. Mount the drawer fronts and rails on the benchtop jig shown in figure 3A, made with two 2-in. wide supports cut to match the rail and drawer-front profile. I tack-glued the parts to each other at the ends and added two bar clamps for support during shaping.

Using the full-size patterns, trace profile shapes on all four edges of the assembly. These lines, with the bandsawn rails, are your guides for the compound curves. With a large, shallow gouge, I first roughed out the concave areas and then the flat fields at the ends. Now spokeshave to the profile lines, using a square from the end surface to check the front. I used a bandsawn three-dimensional pattern, shown in figure 3C, to draw the line of the corner in to where the flat fields meet the serpentine shape. The rest of the front was shaped from this line. I did most of the gouge work across the grain, following up with spokeshaves, cutting from high to low in various directions. I sawed an inch off the handle of my No. 151 round-bottom spokeshave to reach all the concavities.

The front should be symmetrical and free of lumps,

Fig. 2: Plank-cutting diagram

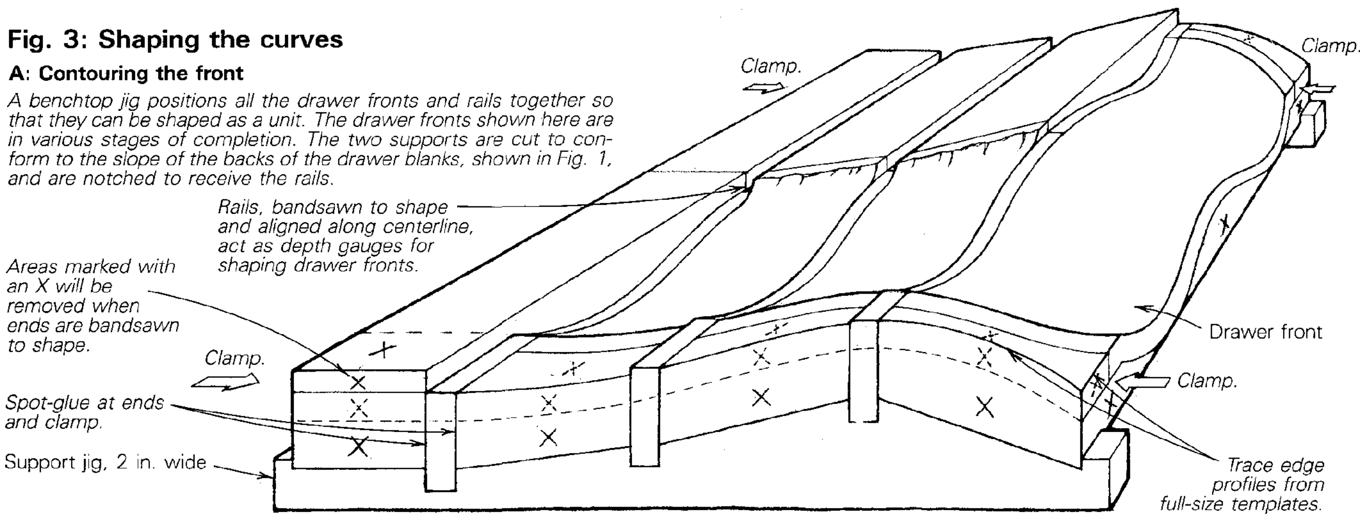


Most of the major parts were cut from a 12/4 South American mahogany plank, 12 ft. by 22 in. The case ends were laid out book-fashion with the bulge toward the wider annual ring pattern.

Fig. 3: Shaping the curves

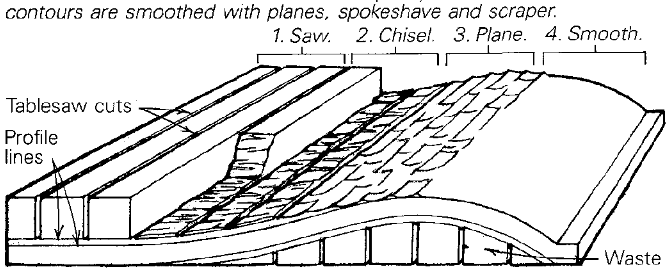
A: Contouring the front

A benchtop jig positions all the drawer fronts and rails together so that they can be shaped as a unit. The drawer fronts shown here are in various stages of completion. The two supports are cut to conform to the slope of the backs of the drawer blanks, shown in Fig. 1, and are notched to receive the rails.



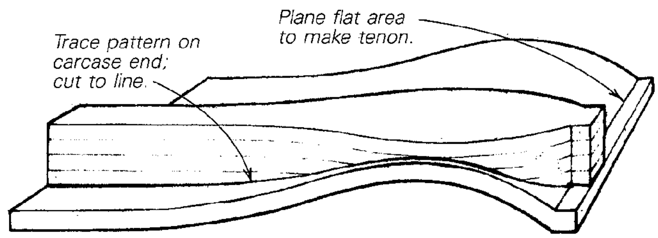
B: Shaping the ends

Carcase ends are rough-shaped by making tablesaw cuts every 2 in. about ¼ in. short of the profile lines traced on the edges. These parallel sawcuts allow the waste to be removed quickly with a wide chisel. The contours are smoothed with planes, spokeshave and scraper.



C: Matching the curves

Three-dimensional pattern, bandsawn to match chest outline in Fig. 1, allows you to draw a fairly accurate pencil line over the contoured surface to define the corner where the case ends meet the front.



smoothly curved in all directions. The final scraping and adjusting of the field lines can't be done until the case and drawers have been assembled, yet before the cock beading is carved. The gouge work goes quickly and is fun. It's important to stay relaxed, and I try to keep a rhythm to my mallet blows. Hollow the backs of the drawer fronts individually, but leave enough flat area at both ends to pass each piece over the tablesaw, to mark out the dovetails, and to check for any movement after shaping. If there is any winding or other movement, first plane it out of the back of the drawer front, thus making a reference surface for correcting edges and ends.

Now put the front assembly aside, and turn to the case ends. Cut them to their finished width of 20 in., but leave the length and thickness rough. With the flat patterns, trace the shape of the long-grain edges. Rough out the contours by making tablesaw cuts about every 2 in., as in figure 3B. I stopped the cuts about $\frac{1}{4}$ in. away from the profile line to allow for the inevitable movement: the top of my ends cupped outward, though I suspect that the bulge prevented significant cupping at the bottom. The sawcuts allow the bulk of the waste to be chiseled away quickly, after which it's best to let the wood settle for a couple of days. Then plane the inside areas near the top and bottom edges flat and parallel, and retrace the pattern. Now scrub-plane across the grain down to the line, and finish up with smooth plane and spokeshaves. Place the three-dimensional pattern over the contour and trace the profile of the long edges. Bandsaw the ends to shape, and true up the top and bottom edges.

To join the case, first attach the ends to the top with housed tapered dovetails. When fitting the joint, I tapered the square side of the half-dovetail with my shoulder plane because I don't have a dovetail plane that will taper the angled side, as is usually done. Otherwise I used traditional methods of sawing, wasting with a chisel, and cleaning up with a router plane. When drawn home, these joints establish the width of the case, and thus locate the mortises in the base.

I made the case bottom from seven pieces, $36\frac{3}{4}$ in. by 3 in. by $1\frac{3}{4}$ in., ripped from waste sections of the plank. The thickness lets you shape the base itself, rather than having to use applied moldings. The moldings on the top and base are cut on a spindle shaper, as are the rabbets in the ends. I grind my own cutters. Nine tenons join each end to the base, allowing a lot of grain to run through to the molded edge. There is a short-grain problem inside the case ends between the tenons, so leave extra wood here until after glue-up to prevent a crumbled edge.

Rails on 18th-century Boston cases are typically 4 in. to 6 in. wide, with secondary wood often joined to the primary wood. I rhink that $3\frac{1}{2}$ in. to 4 in. is wide enough to keep the rails straight. Assemble the case dry, position the rails (aligning the center marks), and cut them to length. Slide the rails in on the stub tenons, scribe the stepped dovetails and cut the mortises for the runners in the rails (figure 1, detail A). The case is ready to be glued up. To avoid friction between parallel edges, the dovetails joining the top and ends must be slid in individually before the rails and base are added.

Glue blocks or screws usually support the runners in bombé cases. To provide support while allowing movement, I used a vertical strip of poplar, notched to support each runner, at the back of the chest. Stub tenons hook these two vertical supports to the base, and screws through slots hold them at the top. The runners are screwed to the case ends

Drawing this page: Lee Hov

through slots at the back. De Rham used oak supports and fastened them both top and bottom with screws, as shown in the photo at right. I didn't glue the runner tenons in until later, after some finish had been applied to the inside of the case.

Notched vertical members support drawer runners at back.

Bevel dovetails are needed for the lower three drawers, since both their sides and fronts are angled. As discussed in the box on the facing page, cut the drawer parts to length at the proper end and bevel angles, and then before shaping the drawer sides, cut the dovetails. Next, to fit each drawer front into the case, position it over its opening and scribe the curve of the case ends onto the dovetail pins from inside the case. Trim the pins to the scribe line to get the drawer front started in the opening and to check the fit. Then trim the rest of the drawer front to the pins. The grooves for the drawer bottoms are cut on the shaper wherever possible; the rest is done by hand. Assemble the drawers and plane the drawer sides down to the curve of the drawer-front ends. The drawer bottoms are solid wood, with the grain running from side to side and three sides beveled from underneath to fit the grooves.

With the case on its back, block up the drawers flush with the rails. I established the line of the corner between the flat fields and the serpentine shape by running a compass along the curve of the ends. Scrape the entire front to smooth all the contours, taking care to leave the flat fields at a uniform width that is crisp and clean. Then, after removing the drawers, use a scratch stock to make most of the cock beading on the rails and the case ends. The scratch stock will have to be adjusted for the middle rail, because of the angle of its face. The beading at the corners is carved.

The back of the chest is made of wide and narrow horizontal boards with overlapping rabbets. The narrow boards are screwed into the rabbets at the case ends, but the wide boards are free-floating and can move.

Jerry de Rham, a student at North Bennet Street School, scrapes his desk front smooth. Note the alternate traditional design—the front is not serpentine, but matches the curve of the sides.

The grain runs vertically in the feet and their ears. I bandsawed each foot with one ear as part of it and the other ear applied. This uses a little more wood, but it eliminates half the glue joints, and the grain match, of course, is perfect. The feet are stub-tenoned to the base, and I put a screw through a sloppy hole in each ear into the base. The feet are carved as large as possible in the 12/4 pieces. (For an article on how to carve ball-and-claw feet, see *FWW* #10, pp. 58-59.) The side toes are angled slightly forward, but the tips of the claw extend to the diagonals of the square blank. I also keep the knuckles of the rear, side and front toes different distances from the floor, to avoid a box-like appearance. The bones of each toe get progressively longer as you go back from the nail, and the number of knuckles is anatomically correct. The ball itself and the claws are smooth, but I left tool marks on the rest of the foot up to the ankle. The case is designed so that the line formed where the flat field ends and the serpentine shape begins runs across the base molding and around the transition as a miter corner, and ends at the point representing the fetlock. I think knee carving suits this design if the mahogany is highly figured. But if the wood is straight-grained, as mine was, then a less fancy style is better.

Bombé chests deserve the best traditionally made hardware: I spent more money for the hardware than for the lumber. My thin cast brasses with separate posts are from Ball and Ball, 436 W. Lincoln Highway, Exton, Pa. 19341. I shaped a pine block to help bend the plates. To seat the posts properly, I drilled post holes perpendicular to the tangent of the curve, then I adjusted the bails to fit the posts. I used #0 by ¼-in. round-head brass screws to attach the keyhole escutcheons, so they are easily removable. All the locks needed 1⅛ in. to the selvage. I used a slant-top desk lock on the lowest drawer and made strike plates for all the locks.

To finish the chest, I gave it one very thin wash coat of orange shellac, to set up the grain for its final sanding, then used boiled linseed oil. If applied in very thin, hand-rubbed coats, linseed displays the grain with depth, clarity and warmth. I don't thin oil greatly with turpentine (never more than 1 part turpentine to 20 parts oil), nor do I apply soaking coats. I don't think these methods significantly increase penetration, and I suspect that not all of the oil oxidizes, so you risk bleed-out problems. I do add a little Japan drier. I store my oil in a colored glass bottle placed in direct sunlight—I think this helps polymerization and drying. It is most important to apply the oil in the thinnest layers possible and to give it adequate time to oxidize between coats. Each coat should be rubbed hard to build up enough heat to force the oil into the pores and to level the surface. Carvings and moldings should be brushed vigorously to remove excess oil. Instead of waxing, I prefer to build up the oil slowly to a high gloss.

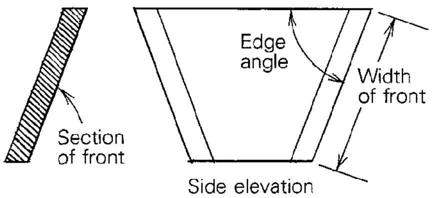
Like most 18th-century furniture, each Boston bombé piece is a complete design in itself, independent of its environment. It has character and warmth which are a joy to live with. Its shape continually invites you to run your hand over its curves, or even to tickle its carved feet. □

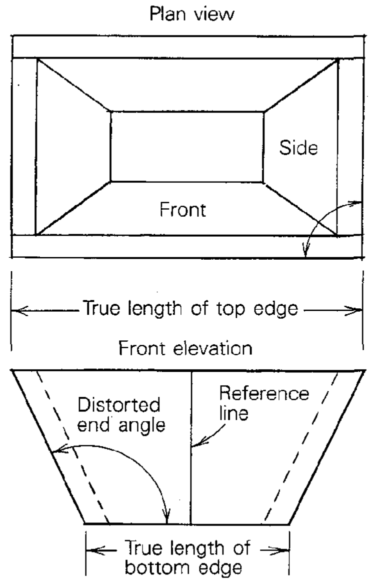
Lance Patterson is a cabinetmaker and shop instructor at the North Bennet Street School in Boston, Mass.

Photos this page: Brad Mayo

How to make slope-sided boxes

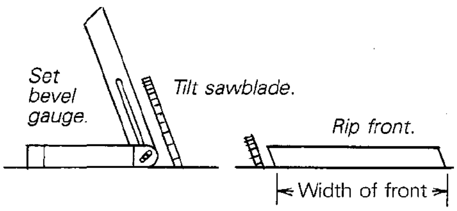
Plans for slope-sided boxes, such as the drawers in the bombé chest on p. 52, aren't in the perspective we're used to. In a front-elevation drawing, the front measures less than its true height because it is tilted out of the plane of the drawing. Here is a method for reading tilted plans, laying the pieces out, and setting the tablesaw to cut the elusive angles involved. In this particular hopper, the front and the back could be cut with the same saw settings, but for clarity, let's consider just the front.



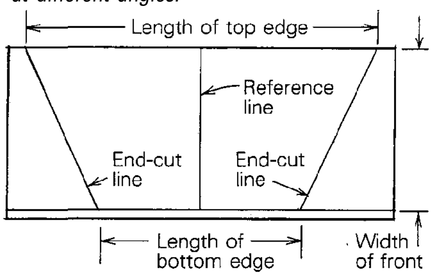


With no math at all

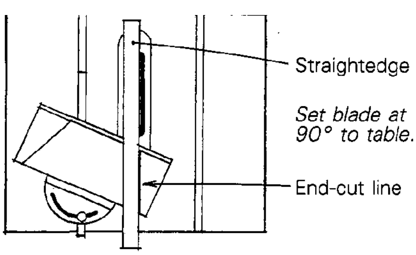
1. The side elevation, above, shows the true cross section of the board that will be the front of the hopper. Use a bevel gauge to transfer the edge angle to the tablesaw, then rip the front to width.



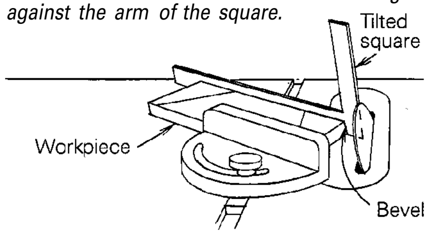
2. The end angle shown in the front elevation is distorted, but the drawing does show the true length of the top and bottom edges. Measuring out from a perpendicular reference line, transfer the edge lengths to the workpiece. Then connect the edges to draw the true end-cut lines. This method also works for asymmetrical pieces—where end-cut lines are at different angles.



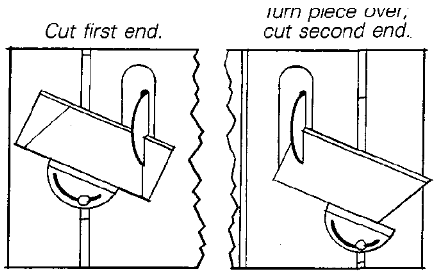
3. With a straightedge, set the miter gauge so the end-cut line is parallel to the blade.



4. As shown in the plan view, above, the cut has to be at 90° to the beveled edge of the workpiece, not at 90° to the face. To determine this tilt angle, place a carpenters' square flat against the beveled edge of the workpiece and crank the blade over until it lies tight against the arm of the square.



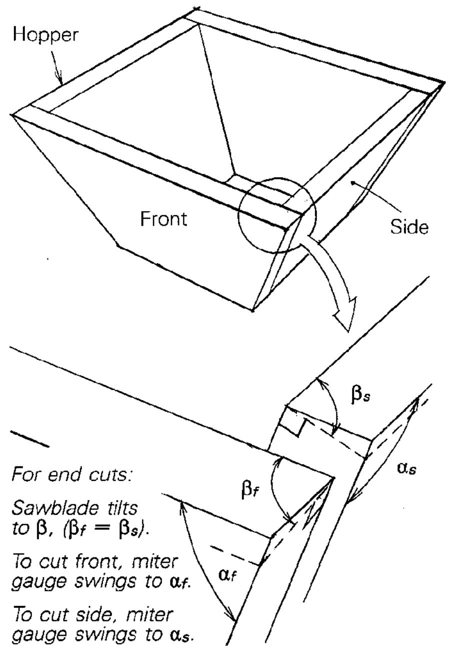
5. Lower the blade to a safe height and cut to the line. If the piece is symmetrical, you can switch the miter gauge to the other side of the blade, turn the work over, and saw the other end. If asymmetrical, repeat steps 3 and 4. Repeat all five steps for the other sides.

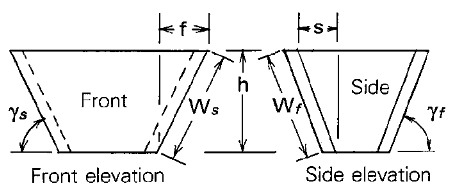


The problem of the hopper joint is traditionally solved by projection and measurement on full-size drawings. Lance Patterson derived the mathematics at right from the graphical method, then picture-framer Jim Cummins devised the no-math method shown above. For a photocopy of Patterson's mathematical proof, send a self-addressed stamped envelope to Hopper, c/o *Fine Woodworking,* Box 355, Newtown, Conn. 06470.

The ends of hopper pieces are cut at compound angles by tilting the sawblade and setting the miter gauge. You can use trigonometry to calculate the tangents of the angles, then from the tangents set a bevel gauge with which to set the saw, as follows.

Here's the math





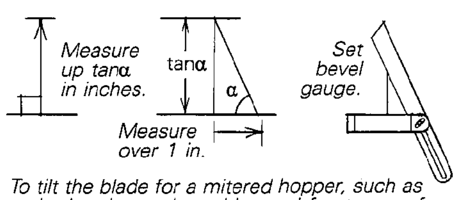
On full-size elevation drawings, measure to 1/32 in. or better:

h = hopper height
f = front 'overhang'
s = side 'overhang'
W_f = width of front face
W_s = width of side face

Now calculate γ_s, *the edge angle of the side:* $\tan\gamma_s = h \div f$. *Calculate* γ_f, *the edge angle of the front:* $\tan\gamma_f = h \div s$.

Then $\tan\alpha_f = W_f \div f$ *and* $\tan\alpha_s = W_s \div s$.
And $\tan\beta = \tan\gamma_f \div \cos\alpha_f$, *or* $\tan\gamma_s \div \cos\alpha_s$.
Or $\tan\beta = h\sqrt{f^2 + W_f{}^2} \div (f \cdot s)$.

Having figured the tangents, you can look up the actual angles in trigonometric tables, punch them on a scientific calculator (arctan or tan-1), or directly set your bevel gauge as below:



To tilt the blade for a mitered hopper, such as a shadow box, when sides and fronts are of equal thickness: $\beta_m = (180° - \beta) \div 2$.