Building a Chest-on-Chest

A simple method for framing carcases with solid sides

by Carlyle Lynch

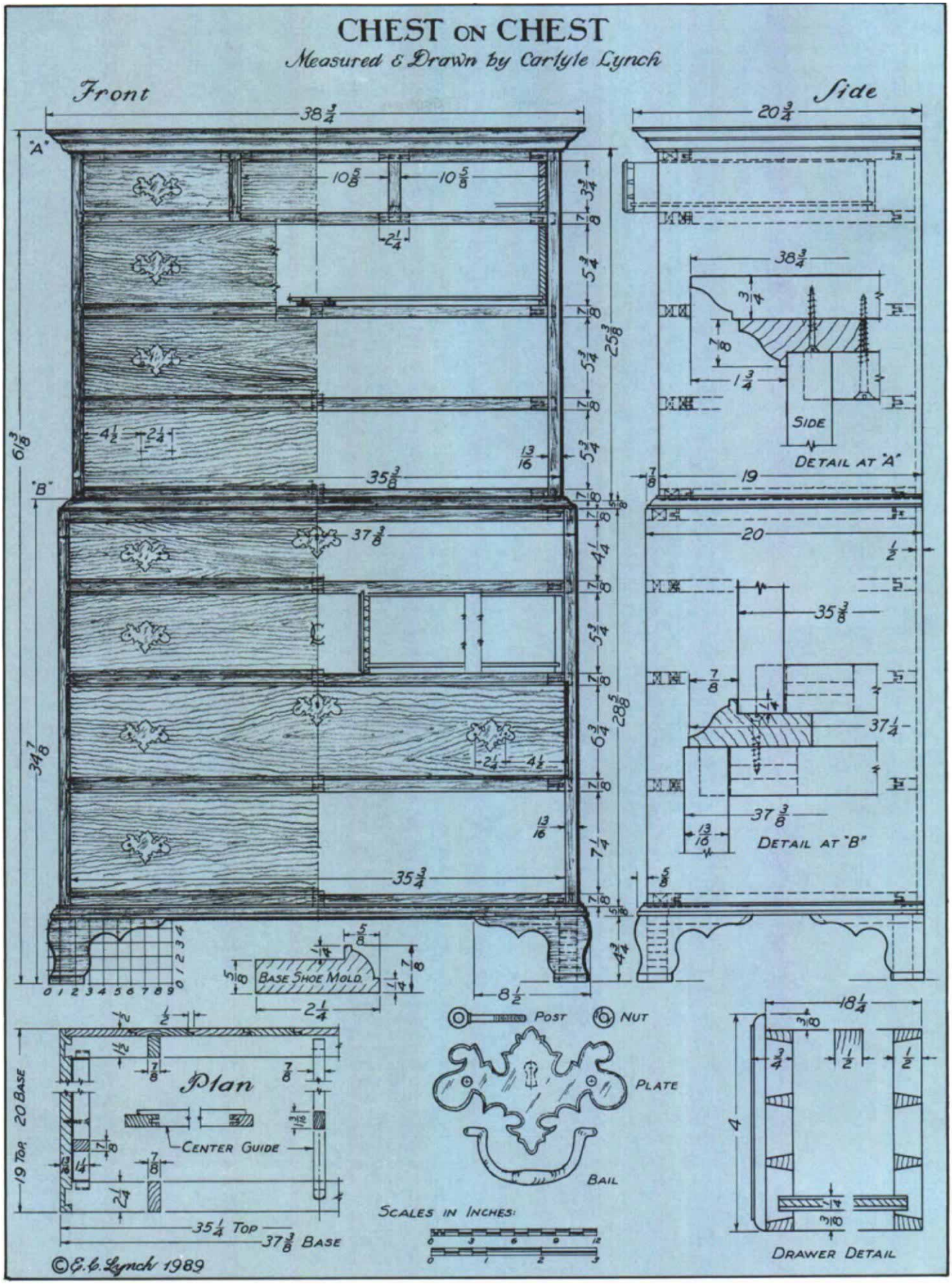
Pleasing proportions combine with a simple, unadorned design to give this chest-on-chest a friendly, informal feeling. In the 40 years since it was made, the Appalachian white pine has aged to a dark honey color.

A peek inside one of the chests shows why the solid-wood sides have aged without splitting. The horizontal rails are mortised and glued into the sides but the joints between the drawer runners and rails are not glued. The runners are cut short, to give the sides room to shrink, and fastened at the center with a single screw.

With its modest proportions and uncluttered design, the chest-on-chest in the top photo at right can easily find a place in most of today's homes. Standing only 1 in. over 5 ft. tall, the chest has a friendly, unthreatening scale unlike many of its 7-ft. tall period counterparts that nearly graze contemporary ceilings and dominate an entire room. Judging by the clean lines, the good proportions and the shape of the bracket feet, this double chest was probably based on designs made by Thomas Elfe, whose work delighted the people of Charleston, S.C., during the mid-18th century.

This chest was built to the plan on the opposite page 40 years ago by furnituremakers at Virginia Craftsmen, of Harrisonburg, Va., who have built reproduction furniture for many historical restorations. To avoid the problem of split sides, a common ailment of antique furniture, the designers at Virginia Craftsmen came up with a simple way to build carcase frames that allows the sides to expand and contract freely. To accomplish this, the rails that run side to side between the drawers are tenoned and glued into mortises in the sides, while the runners and center guides that run front to back within the case are tenoned, but not glued into the rails. These "dry" joints allow the sides to expand with increased humidity. In addition, the runners and guides are cut ¼ in. short to leave a ⅛-in. gap at each end, as shown in the bottom photo at right. These gaps provide space for the sides to shrink in drier conditions. Each runner is screwed to the center of the case side with a single 1¾-in.-long, #8 flat-head screw to keep the runners from ever sagging and to resist any tendency for the sides to cup or bow.

Building the base chest—Begin construction by gluing up the base unit sides and cutting them to size as shown in the plan. Then, run a ½-in. by ½-in. rabbet on the inside rear edges for the backing. Next, make the front and back rails, drawer runners and center guides that make up the carcase framework. As you can see by the detail in the lower left on the plan, the top and bottom rails, both front and back, are dovetailed into the sides, while the other six rails that run between the drawers are mortised into the sides with double tenons. Bandsaw the dovetails on the ends of the top and bottom rails and mark the sockets from the rails onto the top and bottom edges of the sides. Saw and chisel out the sockets by hand. Cut the double tenons on the ends of the other rails with the


CHEST ON CHEST
Measured & Drawn by Carlyle Lynch
Front
Side
Plan
Post
Nut
Plate
Bail
Scales in Inches:
Drawer Detail
Detail at "A"
Detail at "B"
Base Shoe Mold
Center Guide
19 Top 20 Base
35 1/4 Top
37 3/8 Base
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dado blade on the tablesaw, and mark the case sides for the mortises to receive these tenons. You can chisel the double mortises entirely by hand or speed up this process by drilling out most of the waste with a Forstner or brad-point bit on the drill press. You might notice that the drawer rails on the chest in the top photo on p. 76 are all dovetailed into the sides. This is a possible variation, but when drawing the plan, I chose to go with the double tenons because they are easier to make and quite adequate for this application.

Next, cut the hardwood runners and guides to length. The runners and guides have ½-in.-long tenons on both ends that fit into mortises on the inside edges of the rails. The detail in the lower left corner of the plan shows how the center guides lap over the top of the rails. Determine the length of these parts by measuring the actual width of the rails and sides, but don't forget that you want a ⅛-in. gap at each end to allow the case sides to contract. I cut the cheeks on the tablesaw with a rip or combination blade first, and then change to the dado blade to remove the waste and establish the shoulders. It's a good idea to tenon the runners so their top surfaces will be about 1/32 in. higher than the rail to ensure that the drawer sides slide on the runners and not on the front rails.

The ¼-in.-wide by ½-in.-deep mortises on the inside ends of the rails that receive the runners can be made by cutting a stopped dado on the tablesaw. The mortises for the guides in the center of the rails can either be made with a router, drilled and chiseled square, or chiseled entirely by hand. After dry-assembling to inspect the joints for a good fit all around, take the framework apart and reassemble it with the rail tenons glued into the mortises in the chest sides. Clamp the carcase together across each rail and check the case for squareness before placing it to dry on a flat surface.

After removing the clamps, place the chest facedown on a padded bench and measure diagonally across the carcase to double-check that it's square before installing the backing boards. The chests get a good deal of their rigidity from the back that is nailed to the rabbets in the rear edges of the sides and to the top and bottom rails. If you choose to use solid, vertical ship-lap for the back, as specified in the plan, this is another place you must allow for wood movement. The first board should be nailed only to the rabbet in the edge of the side. The second board should overlap the first, but should not be pushed up tight to it. Use ⅛-in. spacers to hold the boards apart and nail the second board to the top and bottom rails near the overlap so it holds the first board tightly to the back rails. Then, the third board is lapped over the second board and nailed near this joint to hold it in place. By only nailing one edge of each board and leaving a ⅛-in. gap between boards, they are free to expand or contract. Continue in this way across the back and then end with a narrow board, no more than about 3-in.-wide, and nail it to the rails where it laps the previous board *and* to the rabbet in the side.

Making and installing the moldings and feet—Now you'll need to make the moldings that give a little style to the piece and provide transitions from one element to the next. There are three shoe moldings: A quarter-round at the bottom of the base chest, and two ogees, one at the top of the base chest and one at the top of the upper chest. All the moldings are made from 2 ¼-in. by ⅞-in. stock and you'll need about a 7-ft. length of each molding shape. First, shape the profile on the edges with a molding plane or shaper and then saw out the ¼-in.-deep recess behind the profile. Miter the two base chest moldings to fit, and then glue and screw them to the rails and runners. The ogee molding for the top of the base is set in about ⅛ in. from the chest's edges; since this molding retains the upper chest, it is the gauge for determining the top unit's dimensions. Cross-grain splines are in order to reinforce these wide miters. You'll need to screw a ⅝-in.-thick filler

BILL OF MATERIALS

Amt.	Description	Dimensions	Comments
Base Chest			
2	Sides	13/16 x 20 x 28⅝	
5	Front rails	⅞ x 2¼ x 36¾	35¾ s/s
5	Back rails	⅞ x 1½ x 36¾	35¾ s/s
10	Drawer runners*	⅞ x 1¼ x 16½	15½ s/s dry mortise
4	Drawer center guides*	⅞ x 1 3/16 x 18½	15½ s/s
1	Dust bottom**	¼ x 16¾ x 34⅝	Nail on
1	Back	½ x 36¾ x 28⅝	Ship-lapped boards, ½-in. lap
1	Top shoe mold	⅞ x 2¼ x 38	Miter, hold back ⅛ in.
2	Top shoe molds	⅞ x 2¼ x 21	Miter front corners
1	Bottom shoe mold	⅞ x 2¼ x 39	Miter
2	Bottom shoe molds	⅞ x 2¼ x 21	Miter
3	Back filler strips	⅝ x 1¼ x 34¼	Base and upper chests
6	Ogee foot pieces	⅞ x 4¾ x 8½	Or two pieces, ⅞ x 4¾ x 28
2	Back foot pieces	⅞ x 4¾ x 8½	
1	Drawer front	13/16 x 4½ x 36¼	⅜-in. lips on top, sides
2	Drawer sides	½ x 4⅛ x 18¼	
1	Drawer back	½ x 4⅛ x 35½	
1	Drawer front	13/16 x 6 x 36¼	
2	Drawer sides	½ x 5⅝ x 18¼	
1	Drawer back	½ x 5⅝ x 35½	
1	Drawer front	13/16 x 7 x 36¼	
2	Drawer sides	½ x 6⅝ x 18¼	
1	Drawer back	½ x 6⅝ x 35½	
1	Drawer front	13/16 x 7½ x 36¼	
2	Drawer sides	½ x 7⅛ x 18¼	
1	Drawer back	½ x 7⅛ x 35½	
4	Drawer bottoms**	¼ x 17¾ x 35	
14	Drawer center strips*	5/16 x ⅞ x 17¼	Base and upper chests
8	Foot-attachment blocks	⅞ x ⅞ x 5½	
	Corner glue blocks	As needed, see text	

Amt.	Description	Dimensions	Comments
Upper Chest			
2	Sides	13/16 x 19 x 25⅜	
5	Front rails	⅞ x 2¼ x 34¾	33¾ s/s
5	Back rails	⅞ x 1½ x 34¾	33¾ s/s
10	Drawer runners*	⅞ x 1¼ x 15½	14½ s/s
2	Drawer stiles	⅞ x 2¼ x 4¾	3¾ s/s
4	Drawer runners*	⅞ x 2¼ x 15½	14½ s/s
2	Drawer side guides*	½ x ⅞ x 16	Glued to wide runners
3	Drawer center guides	⅞ x 1 3/16 x 17½	14½ s/s
1	Top shoe mold	⅞ x 2¼ x 38	Miter
2	Top shoe molds	⅞ x 2¼ x 20	Miter
1	Dust bottom**	¼ x 16¼ x 32½	Centered to fit within molding on base chest
1	Top	¾ x 20¾ x 38⅞	Mold three edges
1	Back, ship-lapped	½ x 34⅝ x 25⅜	Random width, vertical
3	Drawer fronts	13/16 x 4 x 11⅛	⅜-in. lips on top, sides
6	Drawer sides	½ x 3⅝ x 18¼	
3	Drawer backs	½ x 3⅝ x 10⅜	
3	Drawer bottoms**	¼ x 9⅞ x 17¾	
3	Drawer fronts	13/16 x 6 x 34¼	
6	Drawer sides	½ x 5⅜ x 18¼	
3	Drawer backs	½ x 5⅜ x 33½	
3	Drawer bottoms**	¼ x 18 x 33	

Hardware: 17 polished-brass pulls, 2¼-in. bore; 7 matching escutcheons; 7 mortise or half-mortise drawer locks, 1¼-in. selvage to key pin; available from Ball and Ball, 463 W. Lincoln Hwy., Exton, Pa. 19341. 1½-in. and 2-in., #8 flat-head wood screws; 42, ½-in., #3 brass flat-head wood screws.

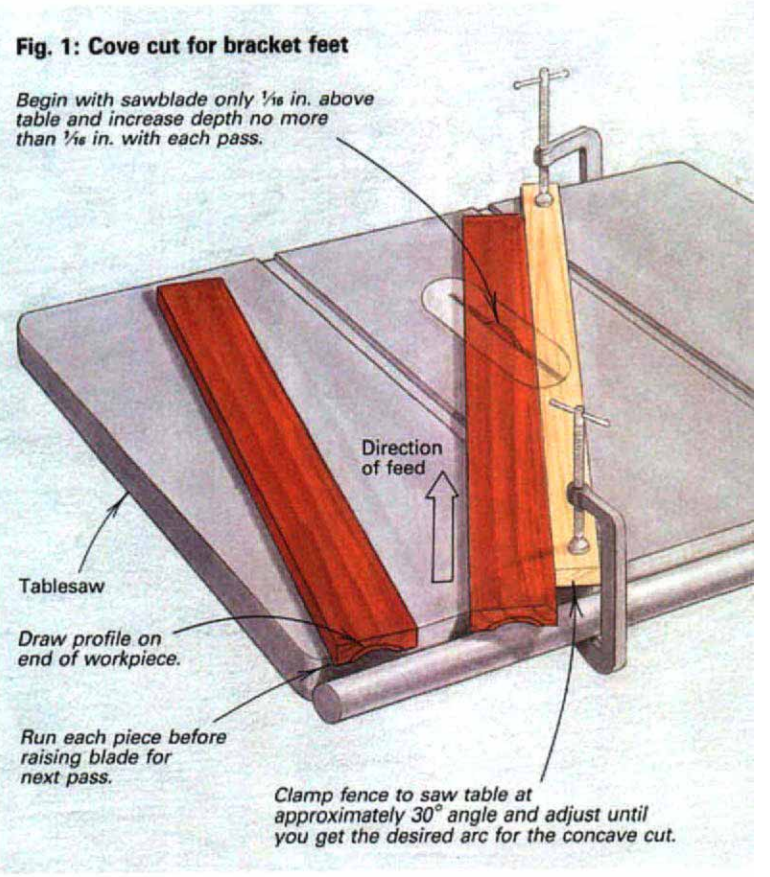
All wood is white pine except where noted.
s/s = shoulder-to-shoulder
* Hardwood
** Plywood

strip along the back rails, flush with the molding ends, to complete the perimeter for each set of moldings. These strips fill the gap at the back of the chests and cover the ends of the backing boards.

To make the shaped bracket feet, you'll need two 7/8x4 3/4x28 boards. The boards are shaped to the ogee profile and then cross-cut into six 8½-in.-long sections. Two of these sections are mitered together to form each front foot. The remaining two shaped sections are each dovetailed at a right angle to a 7/8x4 3/4x8½ flat piece to form the rear feet. To make the concave shape, run the boards diagonally over the tablesaw blade, taking very light, repetitive cuts using the setup shown in figure 1 at right. Begin cutting with the blade exposed only about 1/16 in. above the table and raise it about 1/16 in. for each consecutive pass. Draw the desired profile on the end of one of the boards and as you approach the line, adjust the angle of the fence to get the cove cut that you're after. When the cove is complete on both pieces, use a jack plane to make the top curve. Sand the sawmarks from the cove and smooth the top curve before cutting the boards into the six 8½-in. lengths that make up the feet.

Now, take four of the pieces, and miter one end of each to make the front feet; cut the dovetails on the remaining two shaped pieces and the flat back pieces that go together to make the rear feet. After cutting the joints, bandsaw out the shapes and glue the pairs together, reinforcing the joints with stacks of corner blocks to avoid the cross-grain problems you'd have with one vertical grain glue block. The feet are screwed to the bottom runners and rails of the chest through two 7/8x7/8x5½ blocks glued to the top inside edge of each foot. After the feet are in place, nail a ¼-in. plywood dust bottom to the bottom rails and runners. The base chest is now complete except for the drawers, which should be built all at once after both the top and bottom carcases are complete.

Fig. 1: Cove cut for bracket feet



Building the upper chest—The dimensions for the upper chest are derived from the frame formed by the base's top molding. Since it nestles into the lip of this molding, the top unit doesn't require any bottom molding of its own. The construction of the upper chest is identical to the base, except for the absence of the bottom molding, the addition of the top board and some framing for the three small upper drawers. This framing consists of two vertical stiles between the small drawers that are mortised and glued into the two top front rails, and four wide hardwood runners mortised into the rails behind the vertical stiles. The lower runners carry the drawers and have ½-in. by ⅞-in. strips glued to their surface to act as side guides. The two upper runners are called kickers and keep the drawers from tipping when pulled out.

After the upper chest is assembled, the remaining ogee shoe mold is mitered and screwed to its top runners and rails, and the ⅝-in. spacer is screwed along the back rail as with the other moldings. Again, just as on the base, nail a ¼-in. plywood dust bottom to the upper chest. Cut this dust bottom undersize and center it on the chest's bottom so it will fit within the frame formed by the ogee molding around the top of the base.

Drawers and hardware—Build the drawers according to the detail on the plan. The sides are joined to the front with half-blind dovetails with a ⅜-in. setback on the top and sides. The back is joined to the sides with through dovetails. During assembly, the ¼-in. bottom is inserted into grooves that are ⅜ in. up from the bottom edge of the sides, front and back. If you use solid wood instead of plywood for the bottom, be sure to allow room in the grooves for cross-grain expansion.

After the drawers are glued up, saw and chisel a notch out of the bottom of each back to fit over the center guide. Then, as a track for the guides, each drawer gets two 5/16-in.-thick hardwood strips screwed to its bottom. To ensure accurate placement of these strips, insert one of the drawers into its opening until the front is against the face frame, and center the drawer side to side. Now, hold the guide strips alongside the center guide from below the drawer and drive three small brass screws down through the drawer bottom to hold each strip in place. Remove the drawer from the chest, unscrew the guide strips and put a spot of glue on the guide strip near each screw hole before replacing the screws.

When the guide strips are all in place on the upper chest drawers, you can screw the top board in place. Cut it to size to allow a 1¾-in. overhang on both sides and the front, and run the same ogee profile you used for the molding along the three overhanging edges. Fasten the top to the upper chest with eight 2-in.-long, #8 screws up through the top rails and runners—one near each corner and one 2½ in. each way from the center of the runners. Countersink and slot the screw holes in the runners to let the top expand front to back.

Brass pulls, escutcheons and drawer locks are available from Horton Brasses, Nooks Hill Road, Box 120F, Cromwell, Conn. 06416, or Ball and Ball, 463 W. Lincoln Highway, Exton, Pa. 19341. However, if you are so inclined, the backing plates can be easily bandsawn from sheet brass (available from a hobby supply store) using a fine-tooth metal-cutting blade running at your normal woodworking speed. Unless you also want to venture into casting brass, you can buy the posts and bails from Horton Brasses or Ball and Ball.

Carlyle Lynch was a Broadway, Va., designer, cabinetmaker and retired teacher. He passed away shortly after writing this article (see his obituary on p. 114). His drawings have appeared regularly in FWW *and are available from Garrett Wade, Lee Valley Tools and Woodcraft Supply.*

Drawing: Kathleen Rushton