



Wall Cupboard

Design and Construction



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July 2006

Reference: "The Pine Furniture of Early New England" by Russell Hawes Kettell

Introduction: In my search for a small cupboard for reproduction, I reviewed numerous furniture books in my home library. I was struck by one particular piece in the above reference by Kettell. It was the right size and shape for the space. Also it would accommodate building a pair, one for each side of the fireplace.

The cupboard is shown on pages 138-139 of the reference and is described as a free-standing pine "wall cupboard with an unusually heavy cornice, feet simple, but very effective". Unfortunately, there is no reference to the dimensions or any other details of construction or finish.

I quickly sent a letter to Longfellow's Wayside Inn, Sudbury, MA, the cited location of the cupboard. I asked about the overall dimensions and other details regarding the piece. The reply was disappointing— "unfortunately, this piece did not survive the fire of 1955".

There was only one option now—estimate the dimensions from the one source of information, the black and white photograph on page 139. This picture shows the front view only, with other objects in the picture which help gage the size the piece. There are also pewter plates, cups, and pitchers on the shelves of the cupboard which gave additional clues. I was not very scientific about this measuring process and did not use any fancy mathematics or perspective geometry. I simply guessed at sizes of objects and iteratively derived an approximate scale of 58 mm equal 25 inches. I finally decided on the following set of overall dimensions;

75 11/16 inches high

25 1/4 wide

13 1/2 deep

The Design: Having decided the overall dimensions, I began the detail design along with sizing of each component. With the help of dividers and the scale derived above, I was able to calculate the width of cupboard stiles, door length and width, cornice molding depth, etc. Other design details to work out included:

- How the carcase will fit together
- Joint method for connecting the cupboard stiles to sides
- Shape of cornice molding

- How the paneled door is assembled
- How upper cupboard stiles connect to the upper rail
- Molding shape/size on inside perimeter of upper cupboard
- Details on the back panel
- Cabinet Door Catch design

I will be describing and illustrating my approach to these design elements.

Building Stages for the Pine Cupboard: The major stages of the construction of this piece, in sequence, are:

1. Side fabrication including shelf rabbets and dados for back panel and front stiles. This also includes foot shaping.
2. Upper Plate, Cabinet Base, Shelf fabrication
3. Carcase assembly. This includes the tall sides, the upper plate, cabinet base, and intermediate shelves
4. Fabrication and installation of lower cabinet stiles
5. Fabrication and installation of upper cupboard stiles and upper cupboard rail. This includes mortise and tenon joints for stiles and rail connection.
6. Cornice molding construction and attaching to the carcase
7. Panel door assembly and fitting of brass hinges
8. Back panel construction and fitting to carcase
9. Fabrication and installation of wooden door catch
10. Final sanding and finishing

I will describe each of these stages in the following text, and will include supporting design illustrations and actual construction pictures.



Figure 1: Overall Design Model

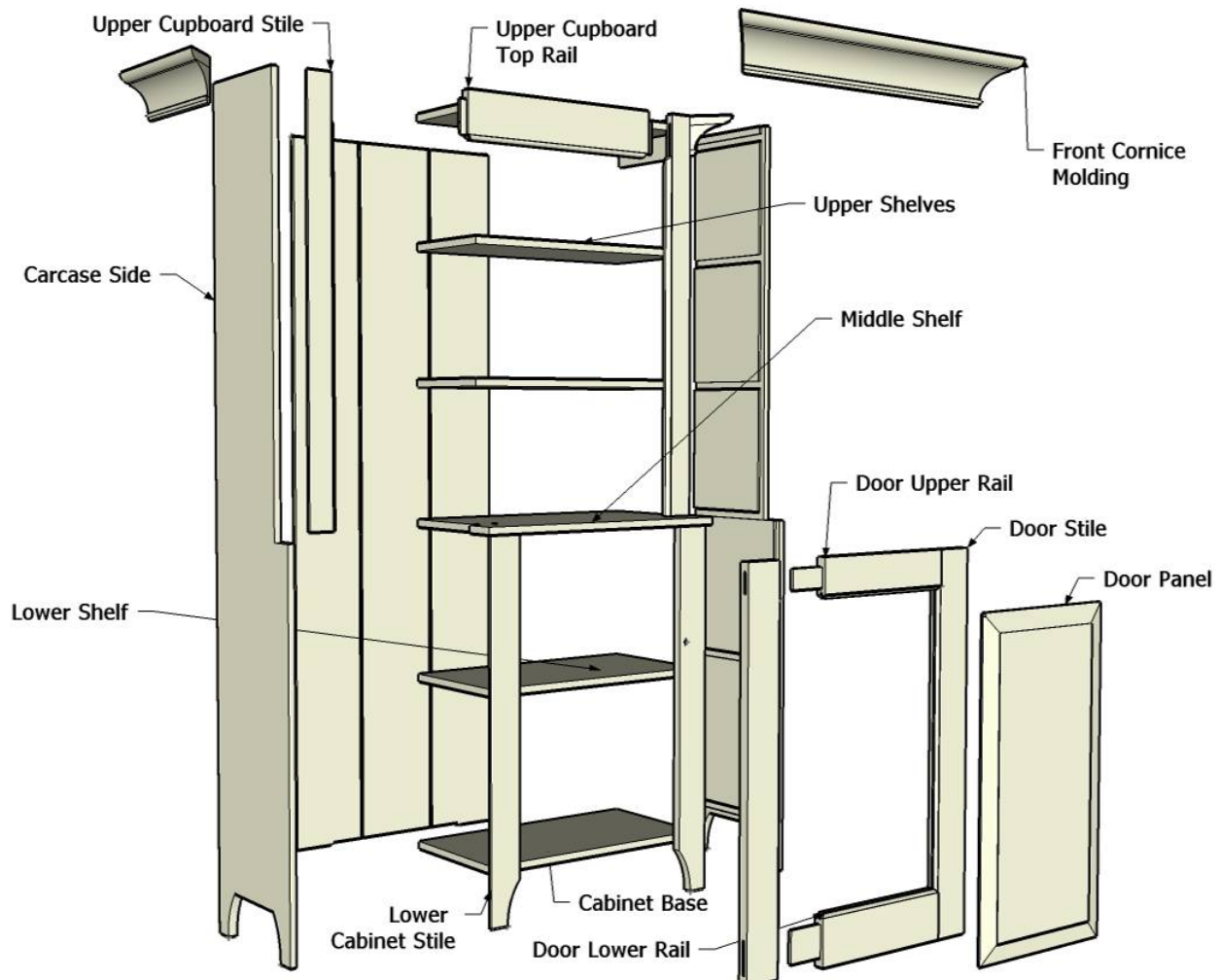


Figure 2: Exploded View

Materials: I chose clear sugar pine for the lumber. In the San Francisco area, I can buy this “rough” in various thicknesses and ample widths. I can easily get 13/16 inch from the 4/4 stock after running through the thickness planer. I also use a hand plane on all surfaces after the thickness planer. This is extra work but pays off in the finishing process. In this piece, there are many exposed surfaces, so all four sides of thick-nessed lumber requires hand planning or other flattening method.

Carcase Sides: I’m accustomed to fastening carcasses with dovetail joints. However, in this case, I chose simple dados in the sides for fastening the top and bottom plates and also the shelves (with glue and nails). See detail illustrations on the next page.

Note that 1/4" deep dados are sized and positioned to hold the shelves and top plate (3/4 thickness). In addition, the two sides have 9/16"W by 1/4"D rabbets for the front stiles and also 3/8" D by 9/16 W rabbets to house the back panel. The simple shaped feet can be cut with a jig saw with the rough edges filed smoothly.

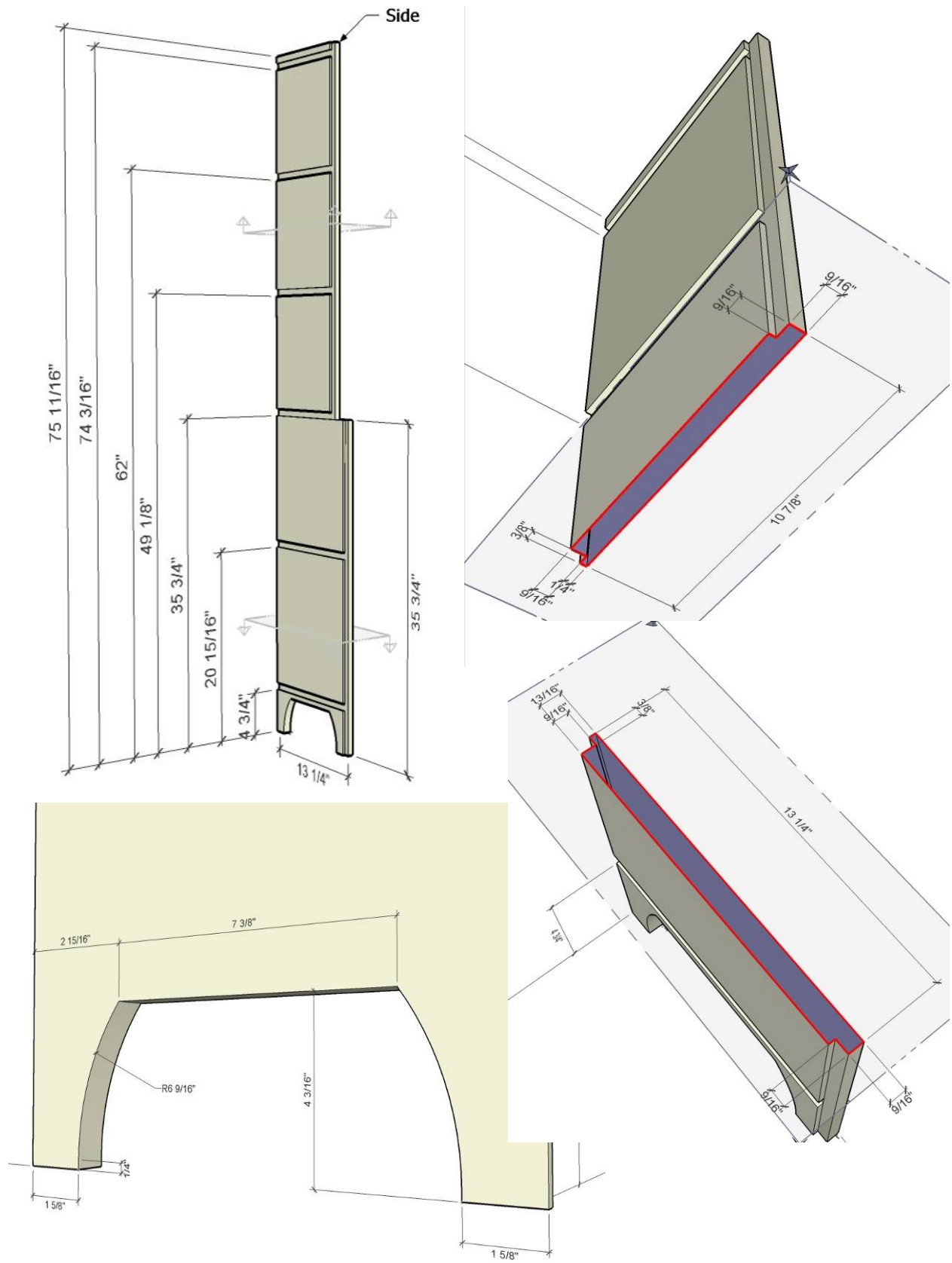


Figure 3: Carcase side details



To create the shelf grooves, I clamped a pair of carcass sides back to back. Then clamped a straight edge as a fence for the router. This ensured aligned grooves while expediting the routing work.

Shelves, Upper Plate, and Cabinet Base: The shelves, upper plate, and cabinet base are of the same pine material but thickened to $\frac{3}{4}$ ". Both sides of these components should be planed before assembly in the carcass. The middle shelf is the transition piece from the lower cabinet to the upper cupboard, and has extending ears that overhang the bottom cabinet. See shelf and plate sizing below.

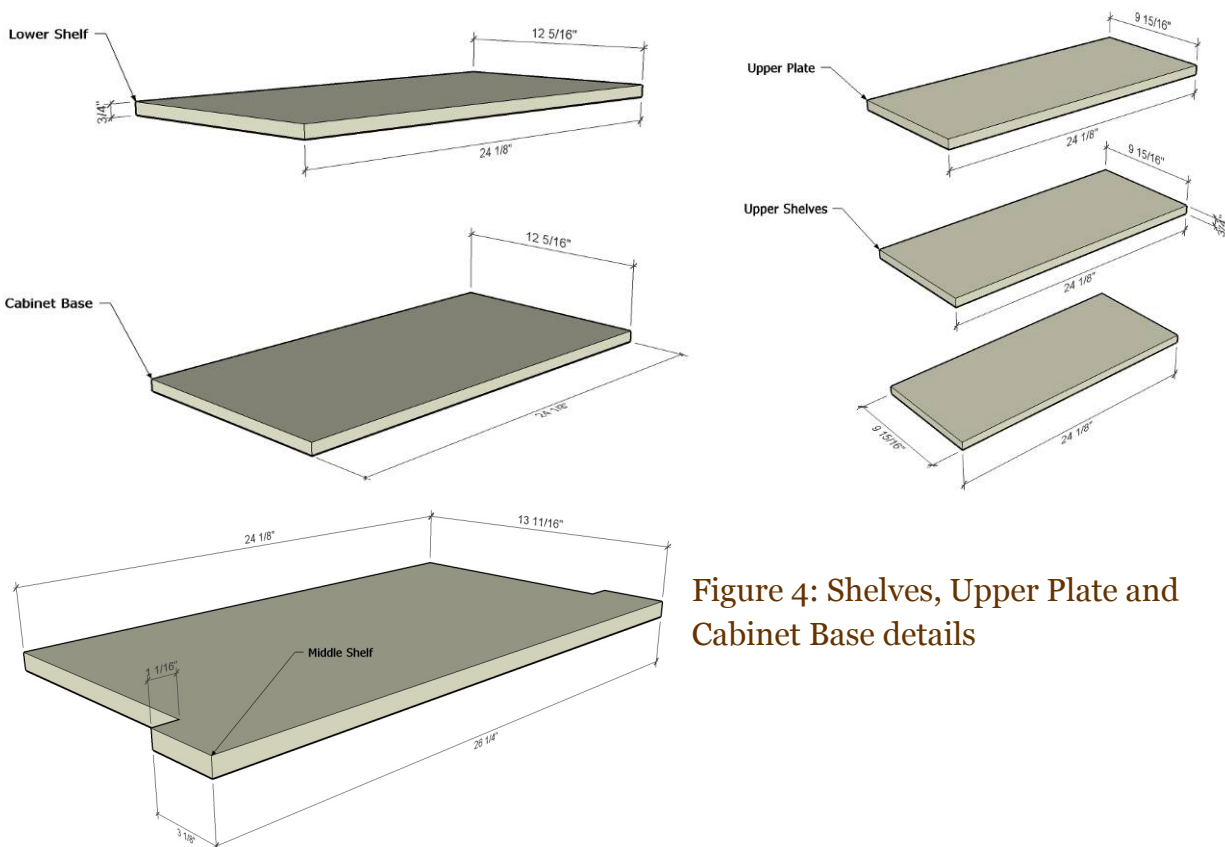


Figure 4: Shelves, Upper Plate and Cabinet Base details

Carcase Assembly: After testing the shelf joints, the eight pieces can be glued and nailed. Glue can be used the full length of the dados since there is no cross-grain expansion issue. I like to use a longer setting type of PVA glue for these large difficult assemblies. Or, in this case I selected a hot hide glue, since I find this easier to clean up joint squeeze-out. After assembly, carefully check the diagonal dimensions of the carcass to ensure squareness.



Lower Cabinet Stiles: See design illustrations on next page. The lower cabinet stiles have a $9/16 \times 9/16$ rabbet for fitting into the rabbets in the carcass sides. Therefore in a side view of the cabinet, you see only $1/4$ inch width of the stile. To me, anything wider than $1/4$ inch spoils the side view. Next the feet are shaped with a band saw or jig saw. After test fitting (you may need to shave the joints with a rabbet plane) the stiles can be glued and nailed to the carcass sides.

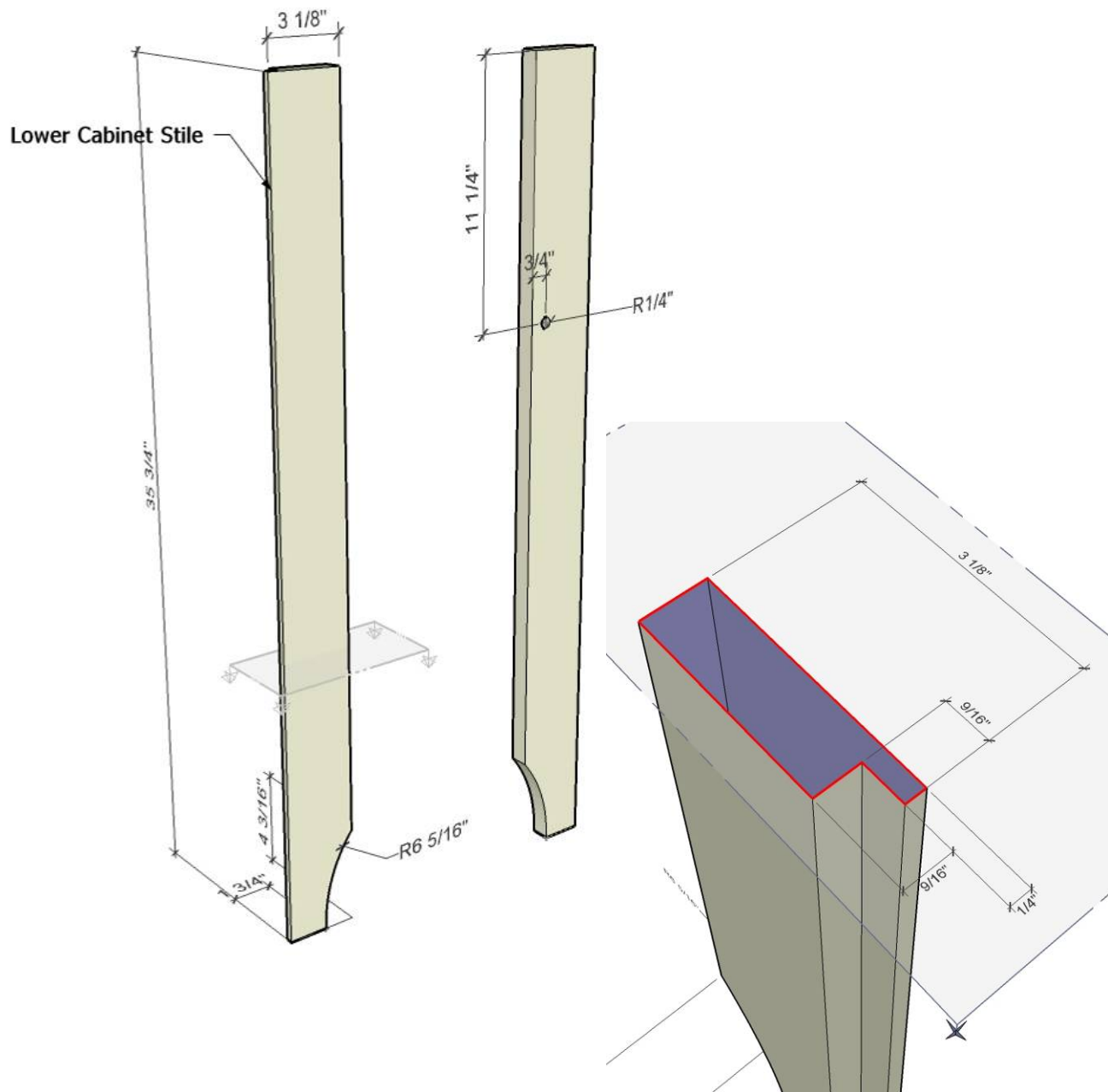


Figure 5: Lower Cabinet Stiles

Upper Cupboard Stiles and Rail: I chose to connect the Upper Cupboard Stiles to the Upper Rail with mortise and tenon joints. See details below. After test fitting the mortise and tenon joints, the stiles and rail can be glued and nailed to the carcass.

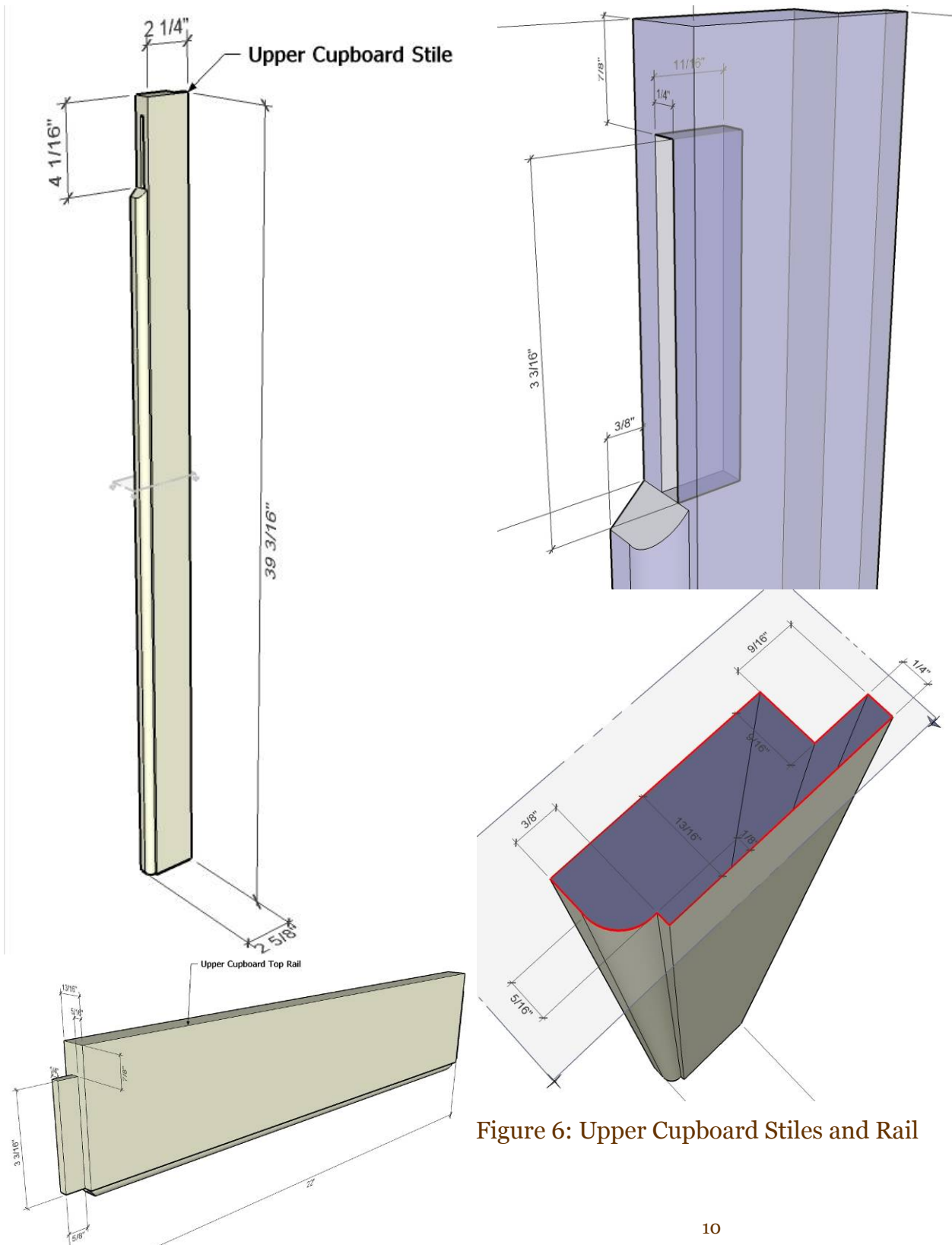


Figure 6: Upper Cupboard Stiles and Rail



Cornice Molding: I built up the cornice molding from three different layers of stock. The top cap layer is $\frac{13}{16}$ " thick and has a $\frac{3}{4}$ " radius on the front edge. The second layer is fabricated from $\frac{10}{4}$ stock and requires a cove shape with $2\frac{1}{2}$ " radius. I cut this cove on the table saw with a skewed fence. The third layer at the bottom of the molding is a small $\frac{1}{4}$ " bead on top of a $\frac{9}{16}$ by $\frac{1}{2}$ rectangular shape. I glued these layers together before mitering, first the top layer onto the large second layer, then the following day; glued the small beaded piece to the bottom of the second layer.

The front piece of the molding can be glued the full length of the upper cupboard rail. However, side pieces should be glued at the miter joint and only a short distance on the carcass side because of cross-grain issues. I used screws to connect the end molding pieces to the carcass side. Since the top plate is located down $\frac{3}{4}$ " from the top of the carcass side, there is a convenient space for these screws. Use oversized shank holes to allow for expansion/contraction.

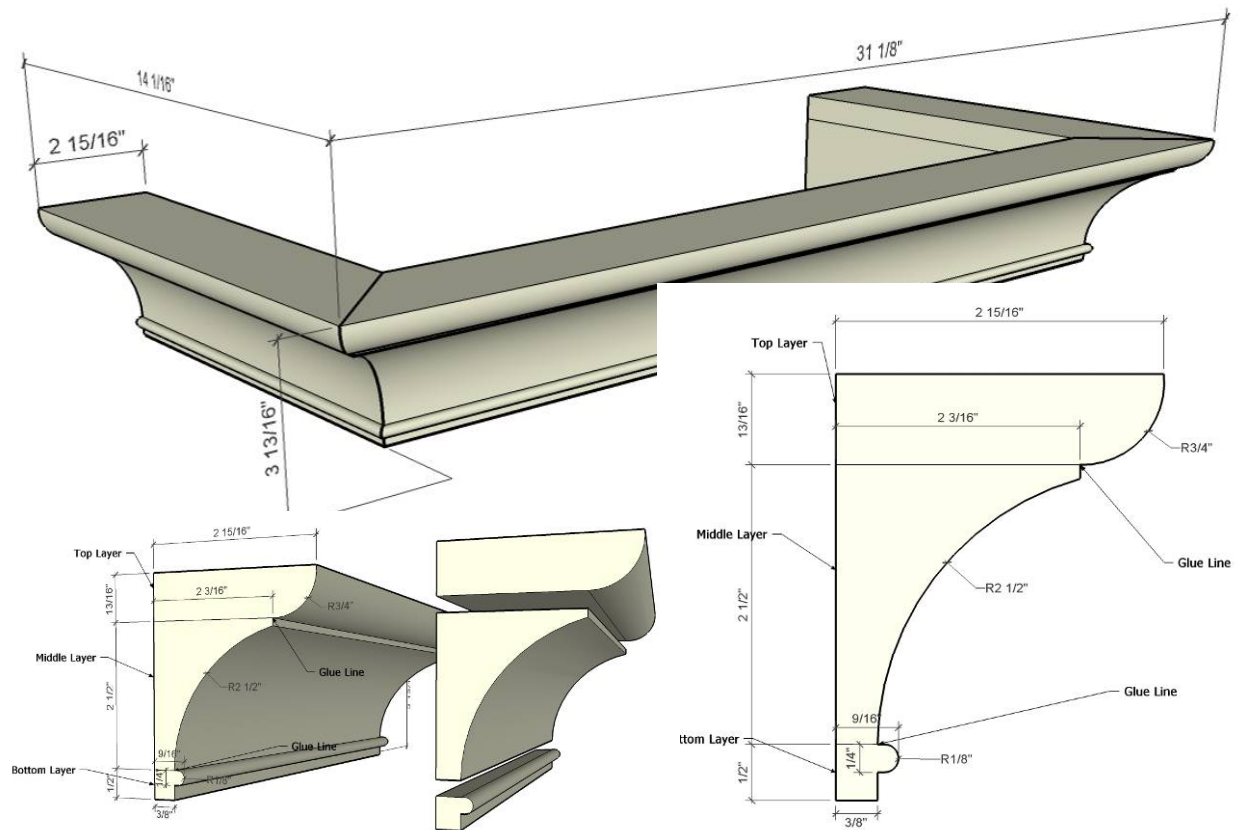


Figure 7: Cornice Molding and Three Layers





Cupboard Door: Typical mortise and tenon joints are used for the door frame. For strength, the rail tenons go all the way through the stiles. A 1/4" thumbnail molding is provided on the inner perimeter surrounding the panel. Miter joints are carefully cut on these molding edges. The 1/4" grooves for housing the solid pine panel are 3/8" deep.

I like to use my band saw for cutting tenons. I use the table saw for beveling the door panel (11 degree angle). The stile mortises are drilled (from both sides) with a conventional 1/4" round bit. Then I square-up with mortise chisel. See cross section of door stile and panel to the left.

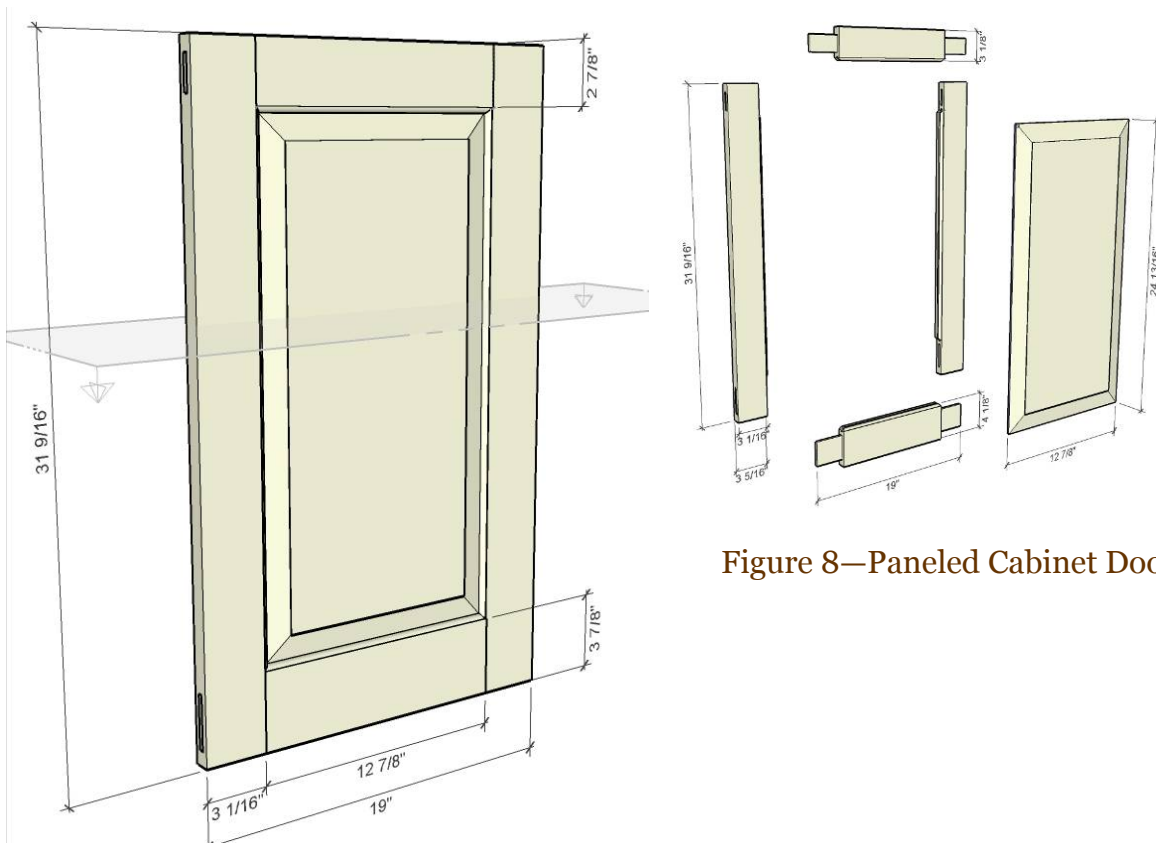


Figure 8—Paneled Cabinet Door

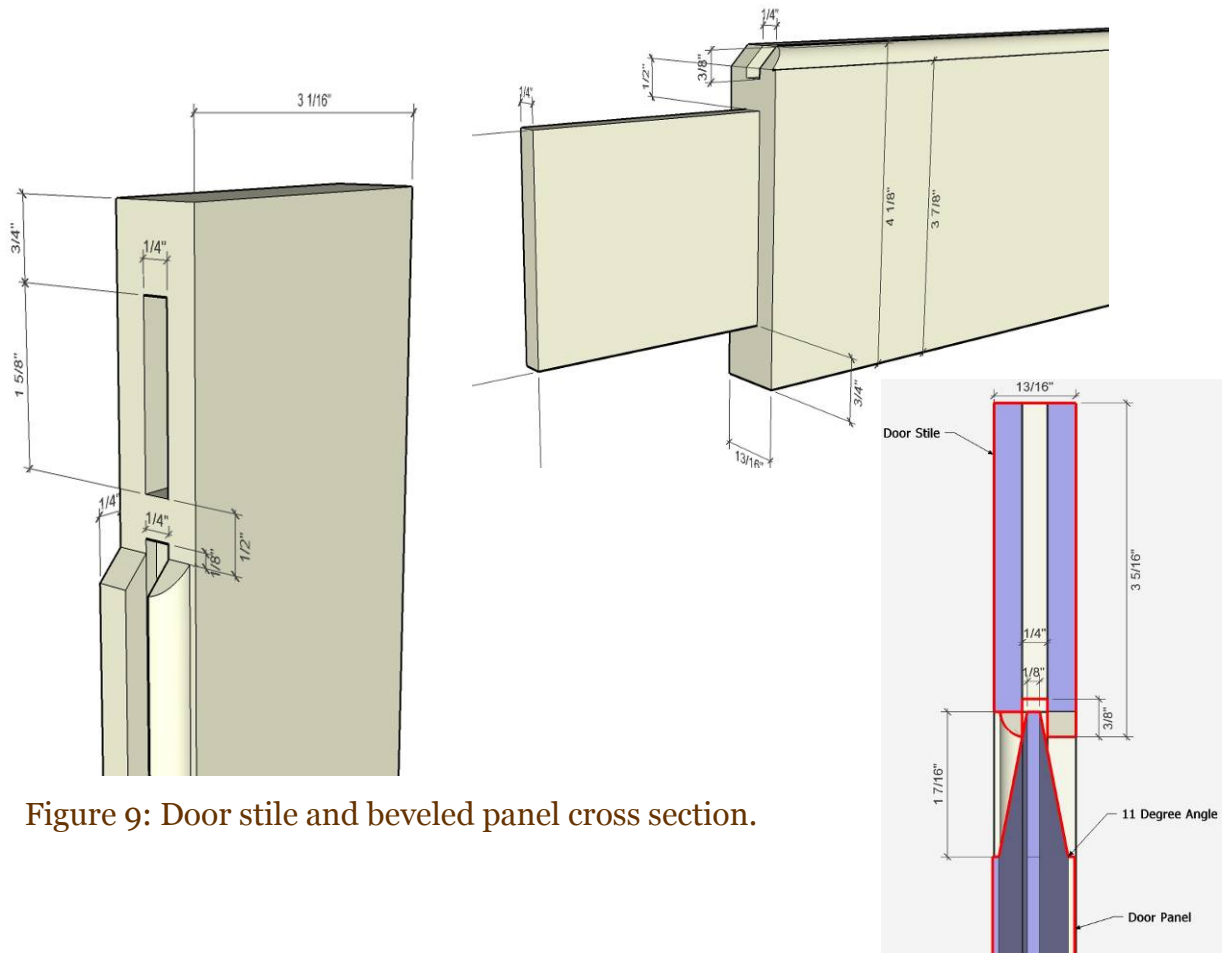


Figure 9: Door stile and beveled panel cross section.



Back Panel: I chose a shiplap joint with $\frac{1}{4}$ " bead as the construction for the back panel. This allows expansion/contraction cross grain. The back is $\frac{3}{4}$ " stock of approximately three equal widths. The back panel sits in the rabbets of the carcass sides. I use standard wood screws to fasten the back to the carcass (no glue). I connected at three places—the top plate, middle shelf, and cabinet base.

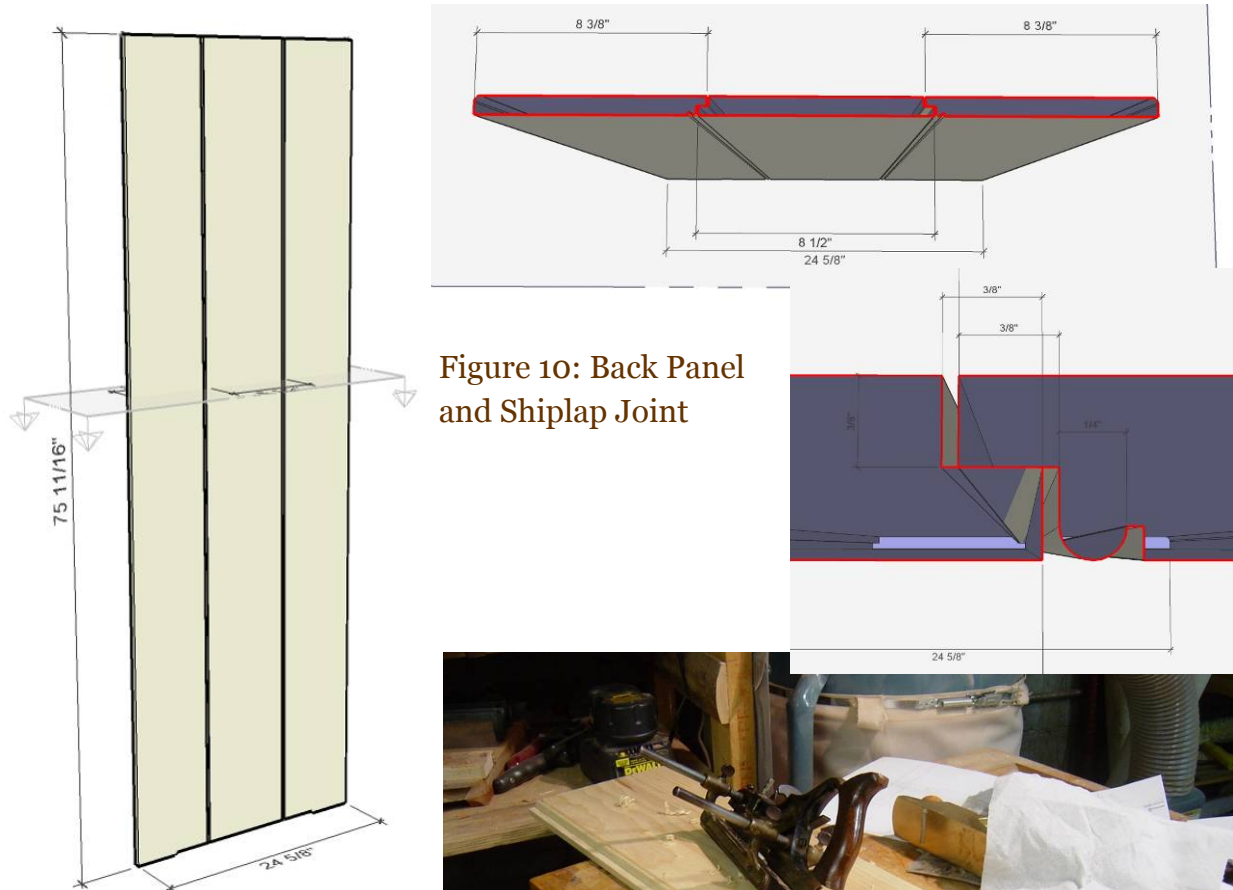
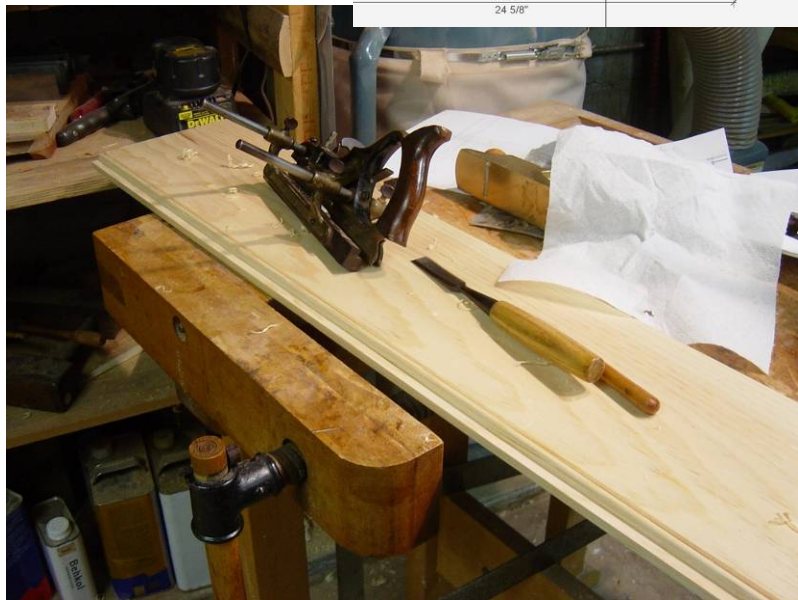


Figure 10: Back Panel and Shiplap Joint

Cabinet Catch: I used maple stock to fashion a somewhat complex cabinet catch. I believe the catch in the original piece was much simpler, perhaps with a single screw holding it in place on the lower cabinet stile. I was not comfortable with the look or feel of the simpler design. The shaft, also maple, is round with square ends. These square ends fit into square holes of the lever arms. The front lever arm is glued on the shaft, but the rear lever arm remains loose and is prevented from slipping off the shaft by a small pin. The rear lever arm rides up on a wedge shaped slip of wood glued to the inside face of the stile.



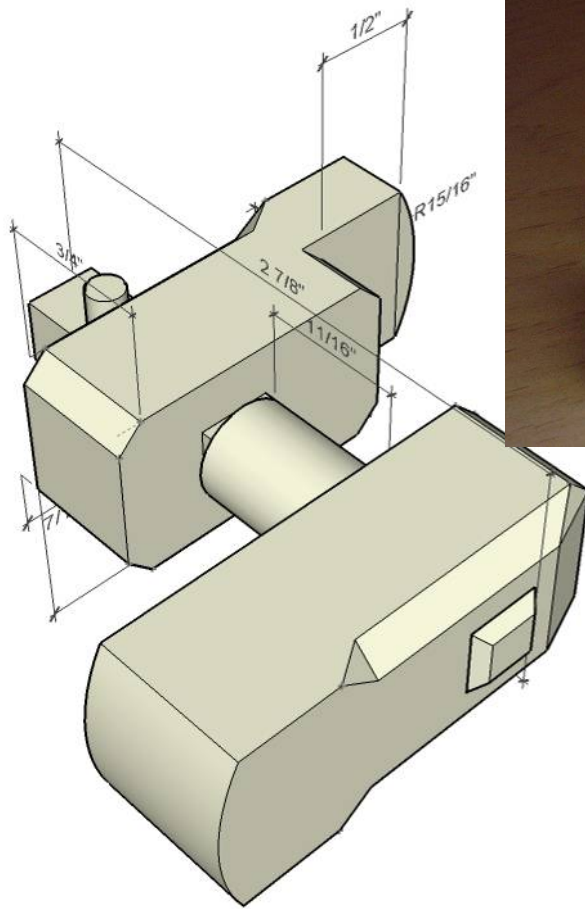


Figure 11: Cabinet Catch

Hardware: I used Ball & Ball H19-078 Brass H hinges for the cabinet doors. These are 1 1/2" wide by 4" long.

Finish: In Kettle's book he briefly discusses furniture finishes of the period. He states, "In many of the taverns and the finer houses, however, there was used, from very early times, a dull red stain—Indian Red, or Venetian Red pigment mixed with skimmed milk— that sank far into the grain of the wood and became permanent". This was part of my motivation for using milk paint in a Barn Red color.

After final sanding, I applied two coats of milk paint from The Old Fashioned Milk Paint Co., Inc. I used a 2 to 1 mixture, water to milk paint powder. I can't emphasize enough the importance of a high quality surface preparation prior to application of milk paint. This finish is extremely sensitive to minor scrapes, scratches, glue spots, etc. These blemishes seem to be emphasized and highlighted by milk paint. Therefore,

it is very important to remove any residual glue squeeze-out on the surface, and to carefully sand out any anomalies on the wood surface.

After each coat of milk paint, I lightly sanded with 320 paper then rubbed again—with some force— 4/0 steel wool. I also applied one coat of General Finishes ARM-R-SEAL oil and urethane topcoat, satin. After drying overnight, I again used 320 paper and 4/0 steel wool. Then I finished off with a coat of wax.

I found foam brushes to work better for me with both the milk paint and the General finish. Also, while sanding and rubbing the milk paint coats, I removed more of the finish in areas that would receive more wear—e.g., edges of shelves and stiles.



