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- Step-by-step construction instruction.
- A complete bill of materials.
- Construction drawings and related photos.
- Tips to help you complete the project and become a better woodworker.

Shaker Tall Clock



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SHAKER TALL CLOCK

The Shaker Tall Clock is an heirloom piece that will repay your weeks or months of dedicated woodworking with untold years of satisfaction. A clock built by Shaker Erastus Rude inspired this version, which has been changed to accommodate modern woodworking techniques. The Rude clock can still be seen at the Shaker Museum in Old Chatham, New York.

The clock features an eight-day movement, which sounds its Westminster chimes on the quarter hour, and strikes its four-note gong on the hour.

We used cherry for the clock, but you may choose another wood like walnut, mahogany or figured maple.

With a project of this complexity, it's *not* a good idea to start by cutting all your lumber to the exact sizes listed in the Bill of Materials. You should cut the parts as you go along. The clock has three separate sections that must fit together perfectly, so you'll need to vary the size of some parts to accommodate small errors that creep in during construction. As we go through the construction steps, we'll note the critical parts and explain how to adjust the sizes to fit.

The Waist

We started with the waist so that we could adjust both the hood and base to fit. Cut the waist sides (A), the waist stiles (B), the waist top and bottom rails (C and D) and the waist back rails (E) to the sizes shown in the Bill of Materials. Note that the rail lengths given in the Bill of Materials include the $\frac{3}{8}$ in. long tenons (see Fig. 1). The waist back (G), door (H) and molding (F), are cut to fit after the waist is assembled.

Mortise and tenon joints are used in the front framework around the door opening, while a tongue-and-groove joins the front framework to the sides. The two rails at the top and bottom of the back tie the case together.

Now, cut the mortises and tenons for the front frame. Use a router to establish the $\frac{1}{4}$ in. wide by $\frac{3}{8}$ in. deep mortises in the stiles, and square them up with a chisel. Then cut the tenons on the table saw with a dado blade. Make them a little shorter than $\frac{3}{8}$ in. so they don't bottom out in the mortises.

With the dado blade still in the table saw, establish the $\frac{1}{4}$ in. by $\frac{1}{4}$ in. grooves that are $\frac{1}{2}$ in. from the outside edges of the

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
Waist/Hood Support			
A	Side	3/4 x 7 1/8 x 38 1/4*	2
B	Stile	3/4 x 2 5/8 x 38 1/4	2
C	Top Rail	3/4 x 3 3/4 x 8 1/8*	1
D	Bottom Rail	3/4 x 9 x 8 1/8*	1
E	Back Rail	3/4 x 2 x 11 7/8	2
F	Molding	1 1/8 x 1 1/4**	as req'd
G	Back	1/4 x 11 7/8 x 32 3/8	1
H	Door	3/4 x 8 x 26 1/8***	1
I	Movement Seat Support	3/4 x 6 5/8 x 7 1/4	2
J	Movement Seat	3/4 x 3/4 x 11 1/8	2
K	Dial Mount Support	3/4 x 1 1/2 x 17	4
L	Guide	1/2 x 1 x 3 1/2	2
M	Dial Mount	1/4 x 12 1/8 x 17	1
N	Chime Mount Spacer	3/4 x 1 1/4 x 4	2
O	Chime Mount	3/4 x 4 x 6	1
P	Hood Back	1/4 x 13 1/2 x 19 5/8	1
Base			
Q	Front	3/4 x 15 1/4 x 16 1/8	1
R	Side	3/4 x 15 1/4 x 9 3/8	2
S	Back	1/4 x 15 3/8 x 13 5/8	1
T	Back Rail	3/4 x 2 x 15 3/8	1
U	Front Filler	1 x 3 x 14 5/8	1
V	Side Filler	1 x 3 x 7 3/8	2
W	Bottom	1/4 x 8 5/8 x 15 1/8	1
Hood****			
X	Top	1/4 x 8 1/2 x 15 1/2	1
Y	Side	3/4 x 8 1/8 x 18 3/8*	2
Z	Dial Frame	1/4 x 12 3/4 x 18 3/4	1
AA	Gallery Front	3/4 x 5 9/16 x 16 1/4	1
BB	Gallery Side	3/4 x 5 9/16 x 8 7/8	2
CC	Column	3/4 dia. x 15 5/16 long**	4
DD	Back Rail	3/4 x 2 x 15 1/2	1
EE	Front Collar	3/4 x 2 1/2 x 16 1/4	1
FF	Side Collar	3/4 x 2 1/2 x 9 1/8	2
GG	Molding	7/8 x 1	as req'd
HH	Spacer	1/2 x 3 9/16 x 8 1/8	2
II	Cockbead	3/32 x 3/16**	as req'd
JJ	Curved Cockbead	3/32 x 3/16**	as req'd
KK	Wing	1/4 x 1 1/2 x 21	2
Door			
LL	Upper Rail	3/4 x 5 7/8 x 13 3/4*	1
MM	Lower Rail	3/4 x 1 3/4 x 13 3/4*	1
NN	Stile	3/4 x 1 3/4 x 14 9/16	2
OO	Glass	Have cut to fit	1
PP	Retainer	1/4 in. quarter round**	as req'd
Hardware			
QQ	Dial		1
RR	Movement and Hands		1
SS	Chimes		1
TT	Butt Hinge	1 1/2 x 1 1/4**	2
UU	Offset Hinge	2 1/4 x 2 1/2**	2
VV	Lock		2
WW	Escutcheon		2
XX	Leveler		4

* Includes tongue or tenon

*** As dimensioned, door with 3/8 in. x 3/8 in. rabbet allows 1/16 in. all around for fit.

**** As dimensioned, hood includes 1/8 in. allowance for fit over hood support.

in, radius cove, it's easiest to use a wood hollowing plane, a combination plane, or a shaper.

However you make the molding, put it aside until after the next step, assembling the waist.

Assemble Waist

First, make a dry run and assemble all the parts without glue. Hold the frame together with clamps and fit the sides into the frame grooves and locate the back rails. If all the parts fit and the case is square, take a measurement and cut the waist back. Then give all the parts a good sanding, and start on the assembly of the waist. You'll need to glue and assemble the frame first. Be careful to keep it square during the glue-up. When that's dry, glue the sides into the frame and screw the back rails in place. After that assembly is dry, scrape off the excess glue, sand the case, and miter the molding to fit. Also apply the waist back, using screws. You can also glue up stock for the door and cut it to fit the opening. A rabbeting bit on the router table will form the 3/8 in. by 3/8 in. lip all around the door. A 3/16 in. roundover bit will shape the outside edge of the door.

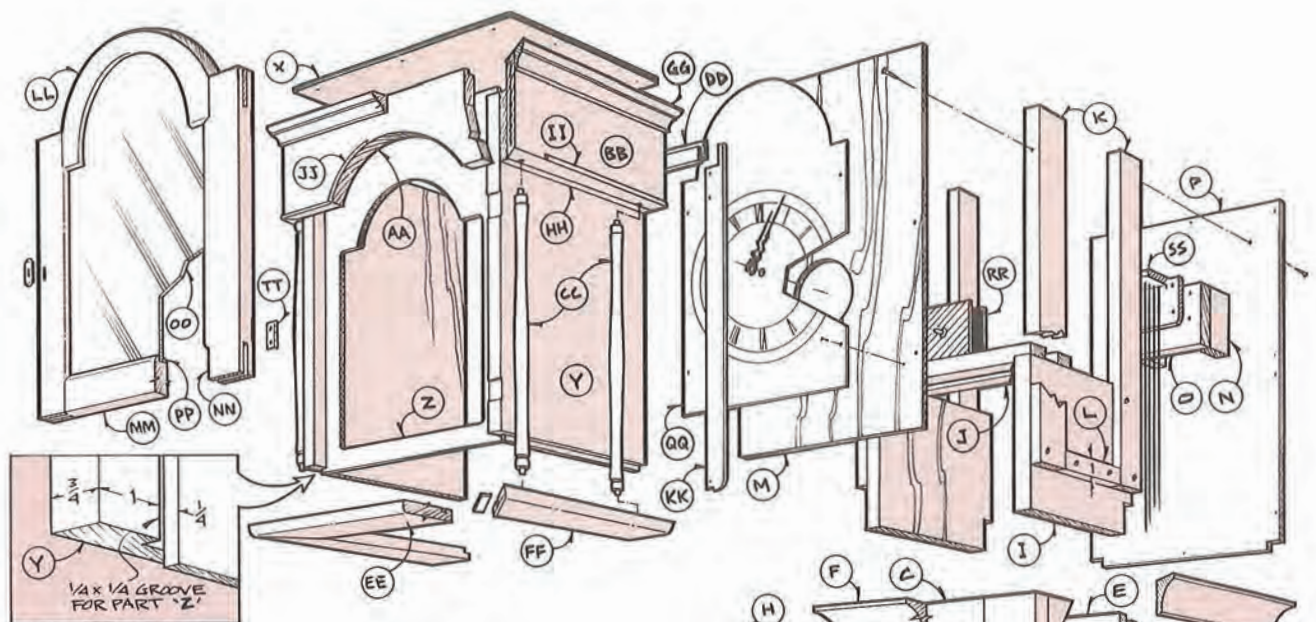
Make and Assemble Base

The base is a splined miter construction. Before you start, check the outside dimensions of the completed waist to see if it agrees with the elevation drawings. If not, now is the time to figure in any changes, for even a 1/32 in. discrepancy will cause problems. To insure a good fit, it's best to take the critical dimensions of the base from the completed waist.

Start by cutting the base side fillers (V) to the size listed in the Bill of Materials. Also cut the base front filler (U) to thickness and width, but leave it a little long. Then clamp the side fillers in place on the waist and hold the front filler in place against the front of the waist while you mark the precise length on one end. Use a knife or sharp scribe to get a clean, fine line. When cut to length, that front filler also becomes the guide for establishing the miters on the base front (Q).

The base front is first cut to thickness and width, and left a couple of inches long. Using test pieces, adjust your table saw blade for a perfect 45-degree miter. Establish the miter on one end of the front, then use the front filler as a gauge to establish the length of the miter. With the table saw turned off, put the base front and the front filler on the saw table, with the filler between the saw blade and the base front. By holding the filler block against the edge of the base front, you can adjust the miter to the same length. The filler should be the same length as the point-to-point distance on the inside face of the front.

Next, cut and miter the base sides (R), and cut to size the base back rail (T), the base bottom (W), and the base back (S). The back rail is rabbeted and notched on the table saw in the same



way as the waist rails made earlier. Also in the base sides and front, cut $\frac{1}{4}$ in. wide by $\frac{1}{4}$ in. deep grooves for the base bottom and the $\frac{1}{8}$ in. wide by $\frac{3}{8}$ in. deep spline grooves. When preparing the splines themselves, make sure that the grain direction agrees with the sides, as shown in Fig. 2.

With all the pieces cut, you're ready to sand the parts and assemble the base. But now is the time to make one more check to make sure the waist will fit properly inside the base. If it does, screw the front and two side fillers in place, and glue up the base. Slide in the bottom and attach the base back rail with screws. Web clamps work well for holding the assembly together.

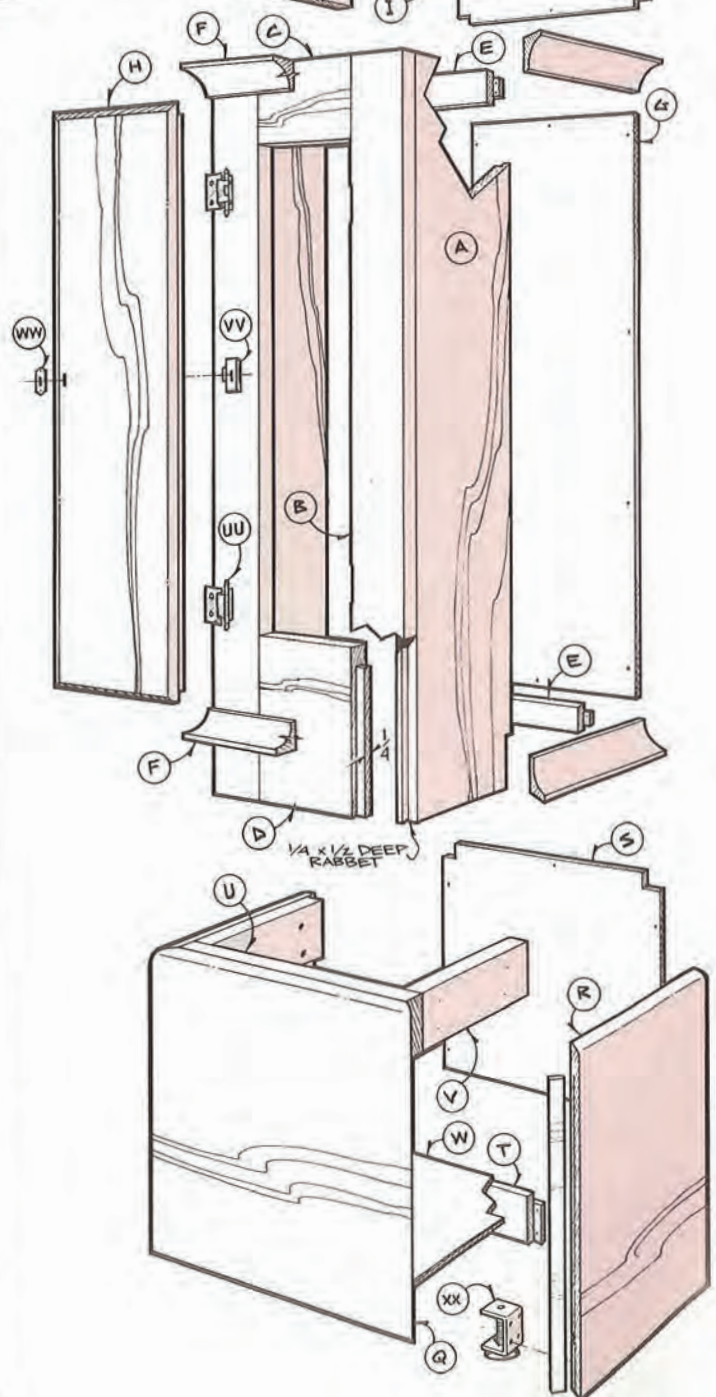
After the glue dries, remove the clamps and clean up any glue squeeze-out. Then give the base another sanding, slide the waist into it and screw the two sections together.

With the two parts together, it's a good idea to install the four levelers (XX) so that moving the clock won't chip the base.

Install Hood Support Pieces

Before moving on to the hood itself, it's best to first install the parts that are attached to the waist and that support the movement and detachable hood, which slides on from the front. These are the four dial mount supports (K), the two guides (L), the two movement seat supports (I), and the two movement seats (J). First, cut the parts to the sizes in the Bill of Materials, then establish $\frac{3}{4}$ in. wide by $2\frac{1}{2}$ in. long notches in the movement seat supports, as shown in the exploded view, and screw them in place. The notch fits over the waist back rail. Then cut $\frac{1}{4}$ in. deep by $4\frac{5}{8}$ in. long notches on two of the dial mount supports, and $\frac{1}{4}$ in. deep by 4 in. long notches on the other two dial mount supports. The longer notches are on the supports toward the front of the clock, and allow you to freely position the two movement seats.

With the notches cut, screw the dial mount supports and the guides in place. Note that because of the grain direction, you should use oversize screw holes on the hood guides to allow for seasonal wood movement. Part L is centered between parts K. The movement seats are made and screwed in place as shown on the section view. Also cut the dial mount (M) from $\frac{1}{4}$ in. plywood. There's a $2\frac{1}{4}$ in. radius cutout that's centered $6\frac{3}{4}$ in.



up from the bottom edge of the dial mount. The hole allows access to the movement with the dial (OO) removed.

Making the Hood

Start work on the hood by cutting to size the sides (Y) and forming the $\frac{1}{4}$ in. wide by $\frac{1}{4}$ in. long tongue on the bottom edge of each (see Fig. 3). Then trim the tongue back $1\frac{1}{4}$ in. from the front edge of the sides, much like a stopped dado. Also cut the $\frac{1}{4}$ in. wide by $\frac{1}{4}$ in. deep dial frame groove 1 in. back from the front edge of both sides (see exploded view detail). Next, prepare stock for the front collar (EE) and side collars (FF). Cut the pieces to thickness and width, but leave each several inches long to allow for mitering. Also establish the $\frac{1}{4}$ in. wide by $\frac{1}{4}$ in. deep grooves in the collars for the dial frame and hood sides (see Figs. 2 and 3). Note that the dial frame groove is $\frac{1}{4}$ in. from the inside edge of the front collar, but that the grooves in the side collars for the tongue on the hood sides is $\frac{1}{2}$ in. from the inside edge. You'll need to use a chisel to remove the small triangle where the grooves meet.

Before making the splined miter for the collar, it's a good idea to again check to make sure things will fit, and make any adjustments needed. The hood slides on and off from the front, so you need the $\frac{1}{8}$ in. clearance we allow.

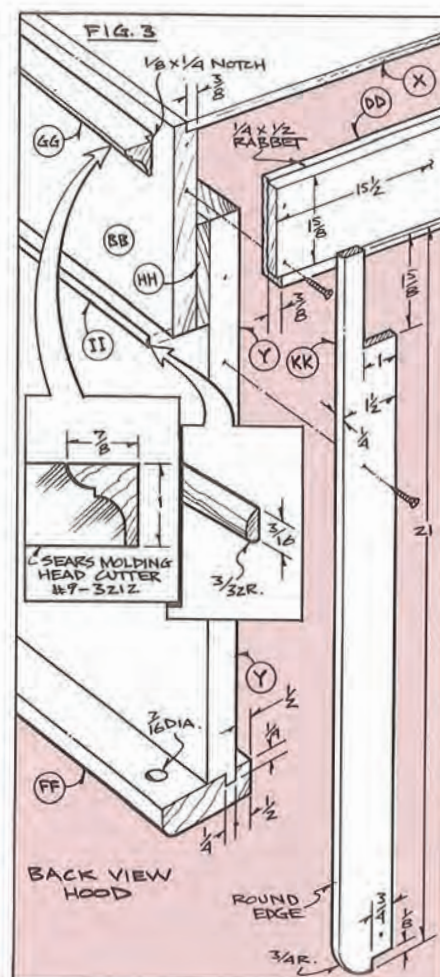
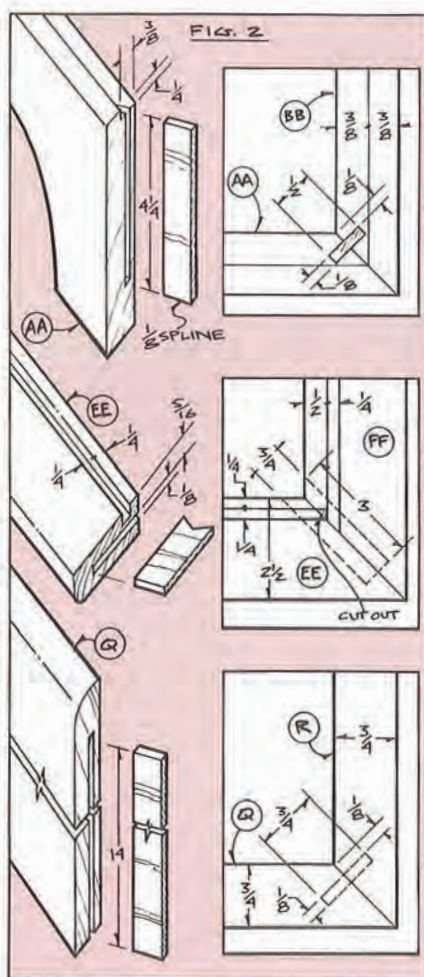
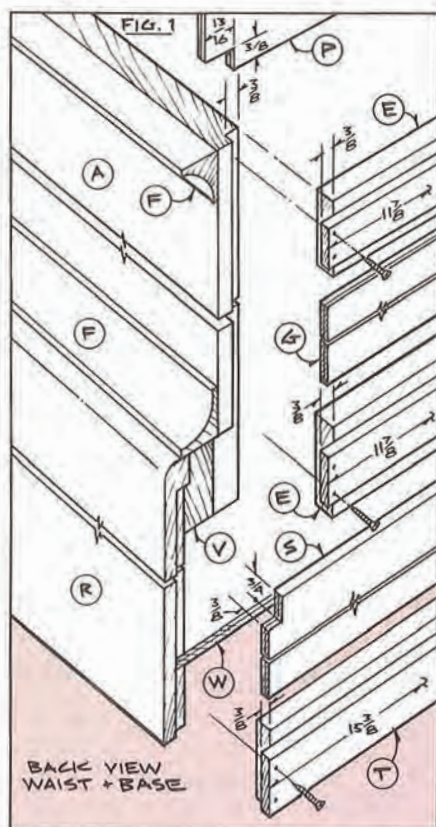
Miter and spline the collar pieces and glue them together. Now make the spacers (HH), the gallery front (AA) and sides (BB). Again work from the completed case to adjust for any errors. Use a band saw to cut the radius in the gallery front. Then cut the 1/4 in. wide by 3/8 in. deep rabbets in the gallery for

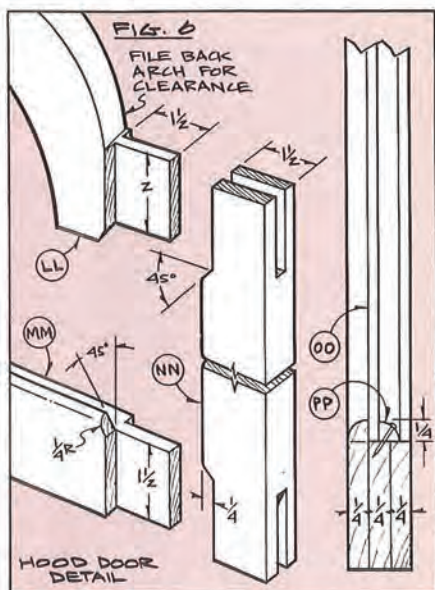
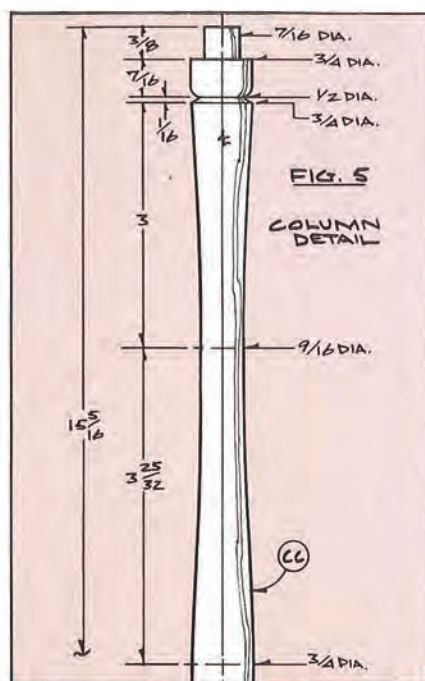
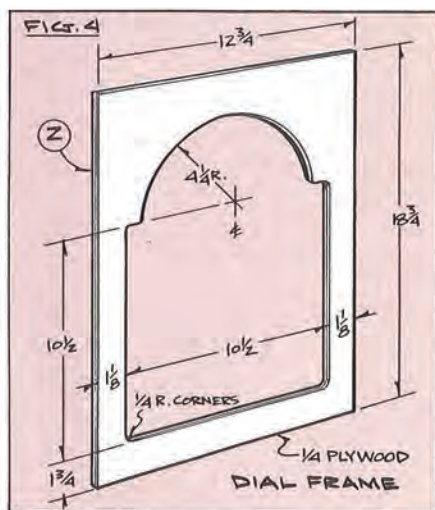
the top (X), and establish the splined miters as shown in Fig. 2. Now glue the three gallery parts together. Also cut the dial frame (Z), as shown in Fig. 4, and the back rail (DD).

Make up the cock beading (II and JJ) from thin stock. Use a block plane and sandpaper to round both edges of $\frac{3}{16}$ in. thick stock that's about 2 in. wide. Then rip off the $\frac{3}{32}$ in. wide pieces. Ripping thin and narrow stock is tricky. It's best to back up the cut with a temporary table surface of $\frac{1}{4}$ in. plywood. Clamp the plywood to the saw table, and raise the blade through it. That way the thin stock will be supported through the cut, and won't be sucked into the table saw insert.

Now, steam bend a section of cock beading onto the gallery. It's best to start with the section a little long, bend it in place on the gallery front and let it cool. Then remove the clamps, cut the miters and glue the cock beading in place. That allows you to take your time with the miters. If you don't have a steam box, you can boil the section in a pan of water. About 15 minutes should be more than enough time.

Before gluing up the hood, turn the columns (CC) (see Fig. 5) and drill the $\frac{7}{16}$ in. diameter by $\frac{3}{8}$ in. deep holes in the collars and the gallery and spacer assembly. Also cut the top to fit, and make up the molding (GG) using a molding head cutter in the table saw (Sears cutter no. 9-3212). With that done, you can assemble the hood. Note that the gallery sides are glued to the hood spacers, which are screwed to the hood sides from the inside. Use elongated screw holes to allow for seasonal wood movement. The dial frame isn't glued in the groove, but is left free to float.





The hood molding is applied around the completed hood, but is notched at the back so the hood wings (KK) can run by. The wings are 1/4 in. thick stock and notched to fit around the hood back rail and over the waist molding (F). The wings are screwed to the gallery sides and the hood side collars.

Make the Door

The tombstone door uses slip joints at the corners for a strong but simple joint (Fig. 6). First make up the stiles (NN) and the upper and lower rails (LL and MM). Then cut the slip joints using a tenon jig and a dado blade in the table saw. Note that the slip joint is cut on the upper rail along the whole width of the workpiece before it's shaped into the arch, which is done on the band saw. The top and bottom radii are given on the front elevation view. Smooth the band saw cut with files or sandpaper before moving on.

Next, form the 1/4 in. radius roundovers and the 1/4 in. wide by 1/2 in. deep rabbets in the stiles and rails. You'll need a bearing-guided rabbeting bit in the router to form the rabbet along the curved upper rail. Then use a sharp chisel to miter and pare back the roundovers as shown. If you've never done this before, you may want to practice on some scrap before working on the door.

Before gluing up the door, dry-fit the parts to make sure

everything fits snugly, but not too tight. If you have to force the parts together, use a file to adjust the size. Remember that the glue will swell the wood slightly when you do the glue up. It's also a good idea to have the door glass (OO) on hand. A local glass shop will cut it to size. The parts package for the clock includes a flexible plastic retainer strip (PP) and brads.

Finishing Up

Before finishing, mortise for and mount the hood door butt hinges (TT) and the waist offset hinges (UU). The locks (VV) are flush mounted, but you'll need to cut notches in the waist stile and hood side so the latches will catch. Then mount the escutcheons (WW).

For a finish, we used tung oil, which is durable and easy to apply (see Tung Oil on page 21). The clock should be well sanded up to 220- or 320-grit paper and all dust removed with a tack rag. Tung oil requires three or four coats.

The movement (RR) has built-in clamps that fit over the movement seat. With the movement in place, it's an easy matter to locate the dial, which is screwed to the dial mount.

The back (P) is cut to fit with the hood in position over the waist. Cut the chime mount spacers (N) and the chime mounts (O), and fasten the chimes (SS) to part (O) before assembling the spacers and the mount to the back.



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