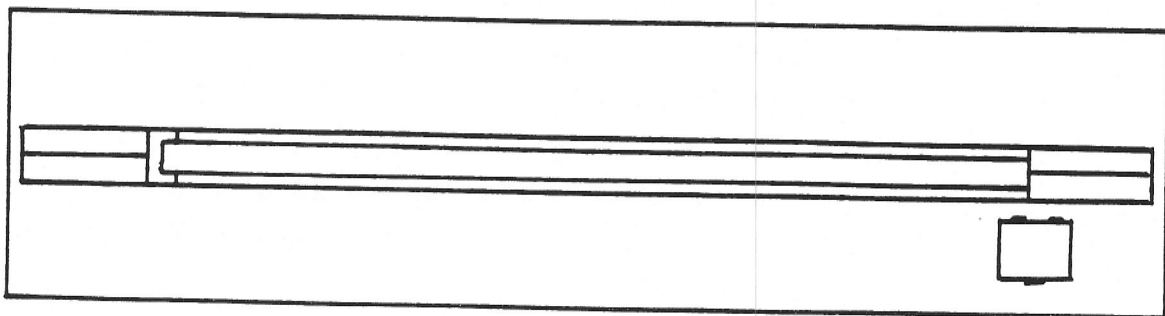
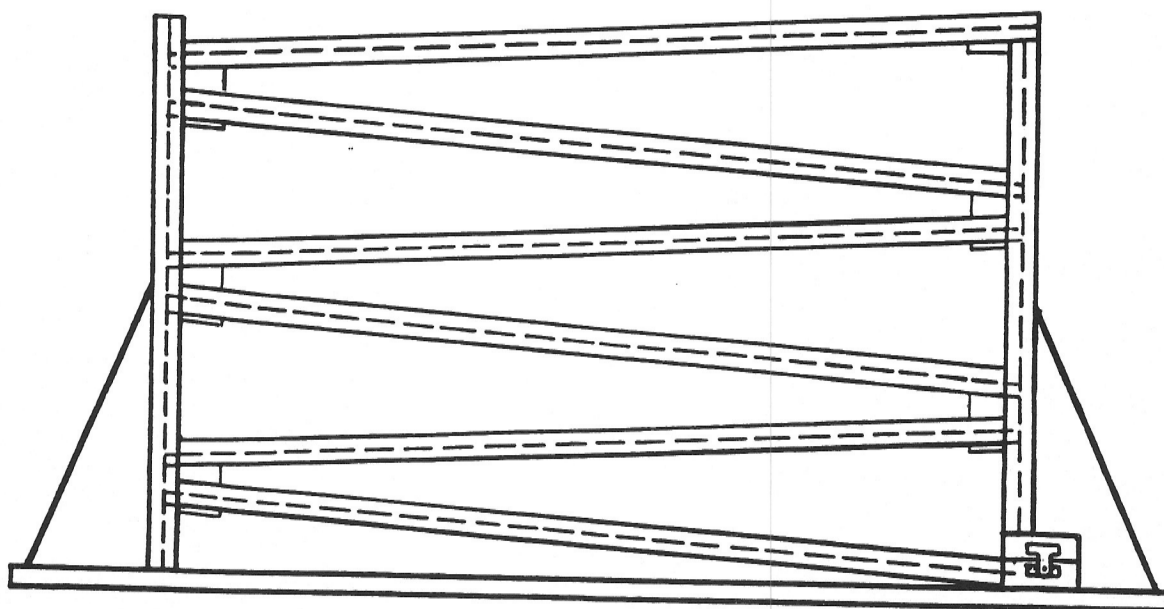


### BALL ROLL TRACKING TOY

This large toy is great for tracking. The shiny steel ball rolls down the ramps slowly enough for the child to watch its progress. It's also fun to anticipate the movement of the ball by blocking a ramp with a hand or finger.



TOP VIEW



FRONT VIEW

Considerable detail is given in text and drawing to simplify construction. A table saw and sander are required, and a drill press would be handy. It makes sense to make four or eight of these toys at one time.

BALL ROLL TRACKING TOY

Materials needed for four toys:

- 20 linear feet of 1" x 8" clear wood, either sugar pine, mahogany, maple, or other. Buy in lengths or multiples of 2 feet in length
- One piece birch plywood: 33" x 32" x 1/2"
- One piece birch plywood: 12" x 18" x 1/4"
- One piece fir plywood: 23-3/8" x 18" x 1/2"
- One piece scrap wood: 28-3/8" x 1" x 3/4"
- Two pieces scrap wood: 18" x 2" x 3/4"
- Four chrome-plated steel ball bearings: 1" in diameter
- Elmer's Carpenter Glue
- One brass hinge as detailed on drawing, page 14
- 1/2" x #17 brads
- One brass catch as detailed on drawing, page 14
- 4 screws: 1" x #6
- Varathane or equivalent gloss varnish

Tools needed:

- Drill press
- Table saw
- Sander
- Hammer
- Ruler
- Square
- Brush
- Screwdriver

## BALL ROLL TRACKING TOY

### CUTTING SUGGESTIONS

To make four Ball Roll Tracking Toys, buy 20 linear feet of 1" x 8" clear grade wood (actual thickness is  $\frac{3}{4}$ "); may be sugar pine, mahogany, or maple. Buy in lengths of two feet or multiples of two feet. Be sure every piece is flat, as cupped, warped, or twisted stock will not work well. You also need a piece of  $\frac{1}{2}$ " plywood 33" x 32" and a piece of  $\frac{1}{4}$ " plywood 12" x 18" (birch preferred).

Equipment needed for this job includes: a table saw with normal crosscut and rip blades and dado blades; and a powered belt sander (#100 grit belt). A drill press to straight-drill the twenty  $1\frac{1}{8}$ " diameter holes would be helpful.

Cut the 1" x 8" stock into 2-foot lengths (approximately), making 10 pieces in all. From two of the 2-foot lengths, cut four pieces  $7\frac{1}{2}$ " long. Then cut each down the center to make eight pieces  $3\frac{3}{8}$ " x  $7\frac{1}{2}$ ". Finally make a diagonal cut on each of the eight pieces (see detail on page 8). Glue these triangular pieces in pairs to make eight end braces.

The remaining eight pieces of 1" x 8" x 2' stock are to be cut lengthwise to make four  $1\frac{5}{8}$ " strips (from each piece). The result will be 32 pieces that measure  $\frac{3}{4}$ " x  $1\frac{5}{8}$ " x  $23\frac{7}{8}$ " (approximately). (See detail on page 8.)

Using the dado blade(s), cut a slot  $1\frac{1}{8}$ " wide x  $\frac{3}{8}$ " deep down the length of each of the 32 strips. The resulting cross-section of these runway strips will be as shown in detail #1, page 9. It is important to make this dado cut accurately so final assembly can be made neatly.

Cut four of the slotted runway pieces to  $15\frac{1}{4}$ " length, and four to  $15\frac{1}{8}$ " length. These will be the upright pieces.

Cut four of the slotted runway pieces to  $23\frac{11}{16}$ " length. Trim the ends at  $5^\circ$  as shown in detail #2, page 9. These will be the bottom runway pieces.

Cut out corner pieces as shown in detail #3, page 9. Maintain the  $5^\circ$  angles as shown in detail #4, page 9.

The remaining 20 slotted runway pieces are to have a hole  $1\frac{1}{8}$ " in diameter drilled through at one end of each piece in the center of the runway as shown in detail #5, page 10. Use either an expansive bit or a  $1\frac{1}{8}$ " power wood boring bit to drill the holes.

### BALL ROLL TRACKING TOY

At the same end where the hole has been bored, carefully trim the ends at a  $5^{\circ}$  angle on all 20 slotted runway pieces as shown in detail #6, page 10.

Take four of the 20 pieces above and cut the opposite end square at  $23-9/16$ " length as shown in detail #7 on page 10. These are the top runway pieces.

The remaining 16 slotted pieces are to be cut to  $23\frac{1}{4}$ " in length as shown in detail #8 on page 10.

Then the end opposite the hole is to be trimmed off at a  $5^{\circ}$  angle as shown in detail #9, page 11.

Finally, the corner pieces are to be cut out as shown in detail #10 on page 11. The  $5^{\circ}$  angle is to be maintained on the cutting as shown in detail #11, page 11.

Cut out 20 pieces of  $1/4$ " plywood to the size shown in detail #12; four to size in detail #13, and four to size in detail #14. These are gusset pieces.

### ASSEMBLY JIG FOR RUNWAY FRAME - See page 12

To assemble the pieces you cut out so the ball will roll properly, it is strongly recommended that an assembly jig be made. It can be made quickly of scrap wood.

Use a piece of  $1/2$ " or heavier plywood that is  $23-3/8$ " x 18" or larger. This makes the base for the jig.

Along one of the  $23-3/8$ " edges nail a bottom strip of wood that protrudes  $1/2$ " or so above the surface of the plywood. Best results are obtained if the plywood, with bottom strip attached, is fastened to the workbench.

Nail two alignment pieces that are  $3/4$ " x 2" x 18" onto the plywood at  $90^{\circ}$  to the bottom strip of wood and  $24-3/8$ " apart. These will align and space the two upright pieces.

Make scrap wood spacers as follows: two -  $3/4$ " x  $1-5/8$ " x  $3-3/8$ " for the vertical spacers; one -  $3/4$ " x  $1-5/8$ " x  $1-3/4$ " for the bottom spacers; one -  $3/4$ " x  $1-5/8$ " x 6" cut off on the top as shown in detail F on page 12.

To use the assembly jig, place a  $15\frac{1}{4}$ " upright piece on the inside of the left hand  $90^{\circ}$  to alignment piece; place the  $15\frac{1}{4}$ " on the inside of the right-hand alignment piece. The slots in both pieces should be facing each other.



### BALL ROLL TRACKING TOY

Place two 3/4" or 1" wide strips of cellophane tape on the plywood jig base and under the upright pieces. This is to keep the glue that joins the runway pieces and the upright pieces from gluing the ball roll frame to the plywood jig base.

### CONSTRUCTION SUGGESTIONS

Place the 3/4" x 1 1/2" x 1-3/4" spacer piece alongside the right-hand upright piece with the 1-3/4" dimension parallel with the upright.

Apply Elmer's Carpenter Glue or equivalent to both ends of a bottom piece and place the tongue ends into the upright slots with one runway and resting on the spacer piece. If your cutting has been reasonably accurate, the tongues will fit neatly; if not, a little adjustment will be required.

Leaving the 1-3/4" spacer in place, apply glue to both ends of one of the 20 runway pieces that have a hole in one end and a tongue on the other. Then lay the 5" spacer on top of the bottom runway piece with the wide end butted against the right upright as shown in detail G on page 13. Then place the 3-3/8" spacer alongside and against the left upright as shown. Now put the runway piece on top of the left and the right spacers.

Apply glue to the bottom gusset piece and fasten in place with 1/2" x #17 brads. Then apply glue to a side gusset piece and fasten in place with brads.

As the gussets are nailed in place, the 3-3/8" spacers are leapfrogged on up with the top gusset helping to hold the top runway in place. It is a good idea to strengthen the toy by putting a 1" x #6 screw down from the end of the top runway into the left upright.

After the glue has set for half an hour, remove the runway frame, stand it up and test it.

## BALL ROLL TRACKING TOY

### ASSEMBLY OF COMPONENTS

Cut four pieces 8" x 32" from the 1/2" x 33" x 32" piece of plywood. Sand them overall.

Sand and screw a runway frame to one of the 1/2" x 8" x 32" plywood pieces, centering length and width. Glue and screw a triangular brace at either outside end of the runway frame. Make sure the frame is reasonably perpendicular.

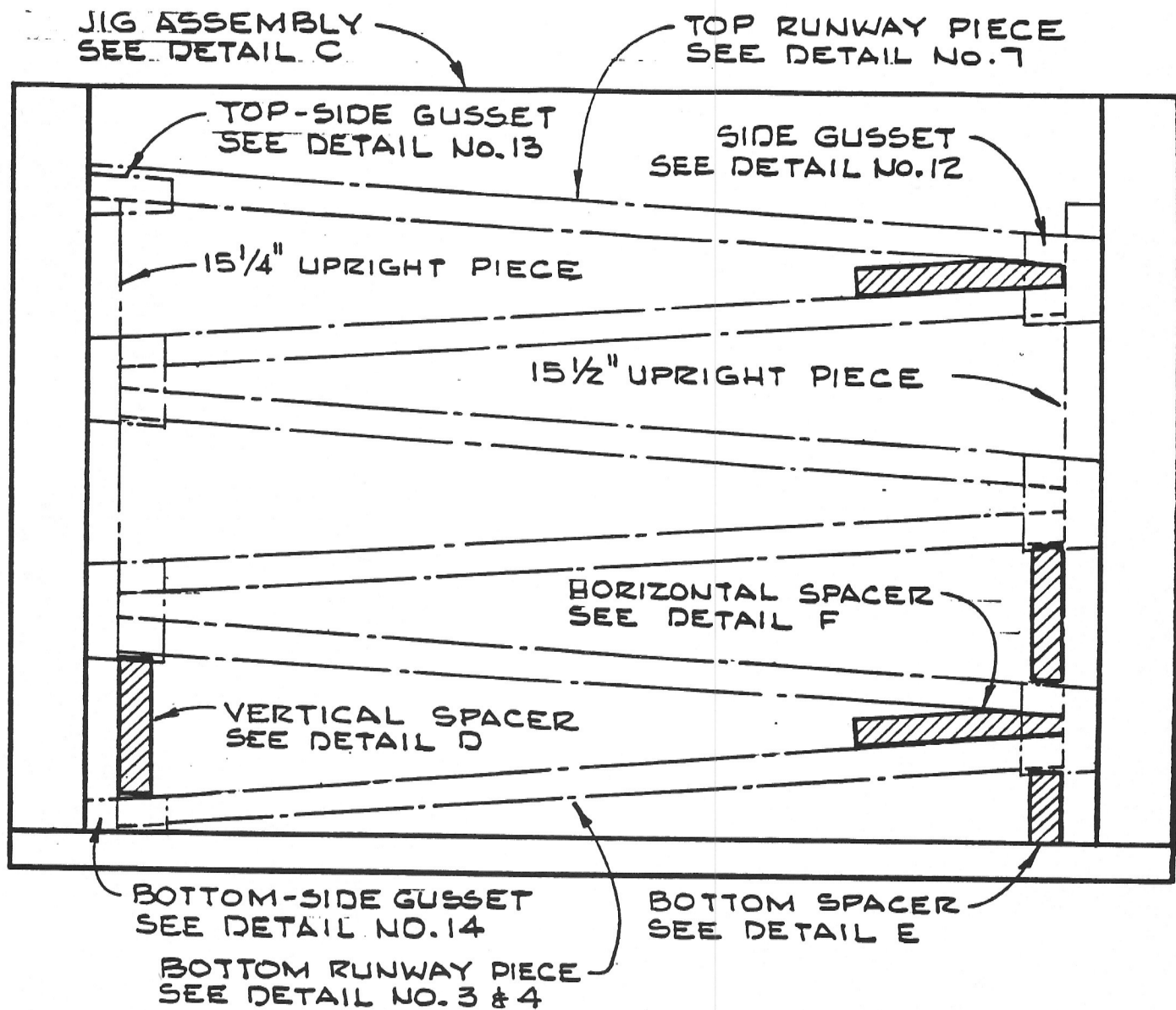
Varnish with two coats of Varathane or equivalent.

### THE BALL TO BE USED

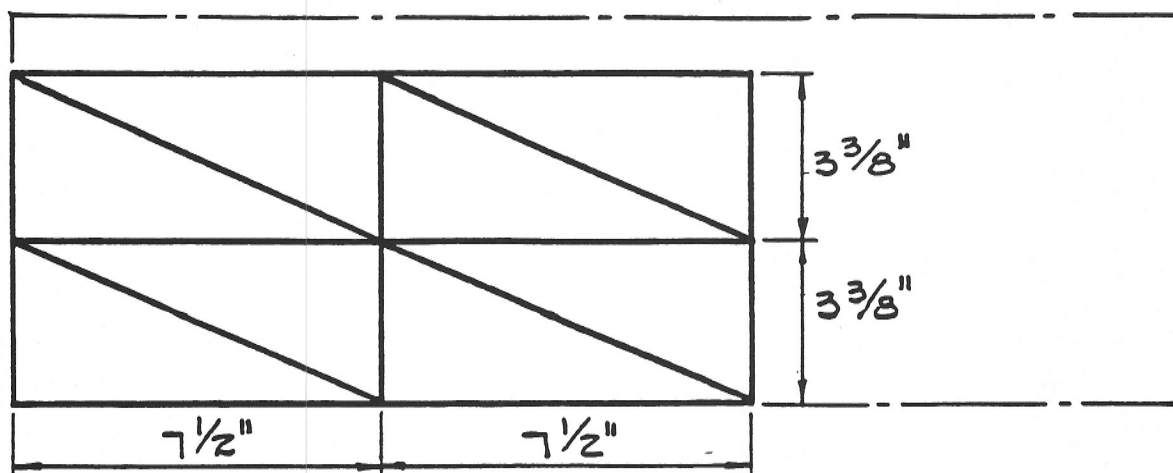
Considerable review and consideration went into the selection of size and material of the ball. The ball recommended is a chrome-plated steel ball bearing one inch in diameter. Any bearing company will sell these balls, but if there is no local bearing outlet or if a local automotive parts company can't get these bearings for you, write to any of the Berry Bearing Company service centers (see listing on the next page). Request a box of four 1" chrome-plated steel ball bearings at \$3.50 per box. U.P.S. charges can be determined ahead for about 10 ounces per four balls and all charges can be prepaid for quick service.

### STORAGE BOX FOR THE BALL

A handy storage box can easily be made using the cut-off pieces from the upright slotted runway pieces. Construction detail and hardware sources for the storage box are all shown on page 14 of this plan. Location of the box on the toy is shown in the front view on the first page of this plan.



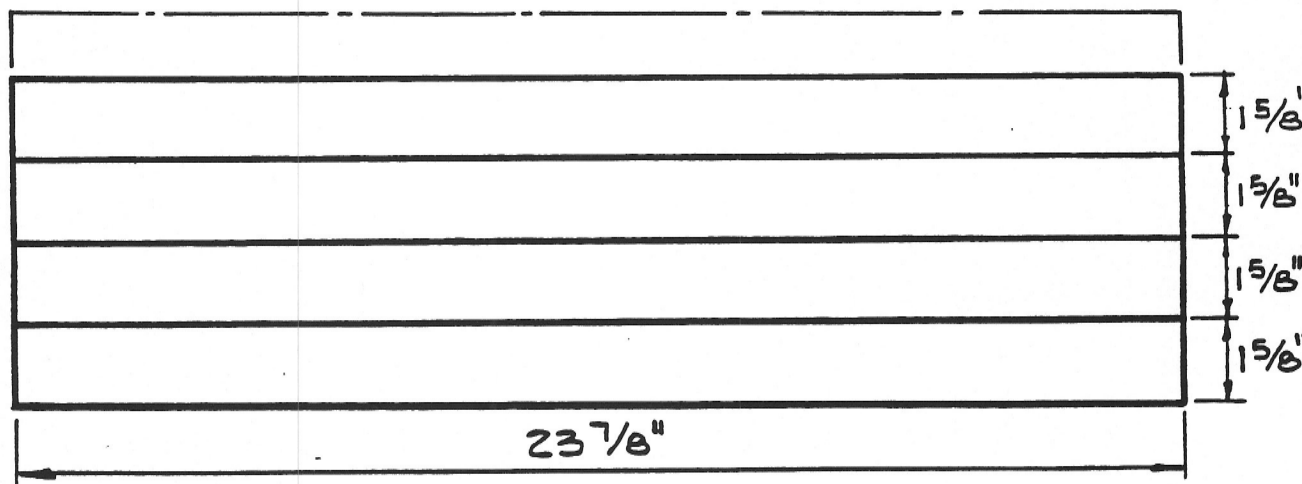
DETAIL G  
PLAN SHOWING ASSEMBLY OF RUNWAY FRAME  
USING JIG AND SPACERS



### DETAIL A

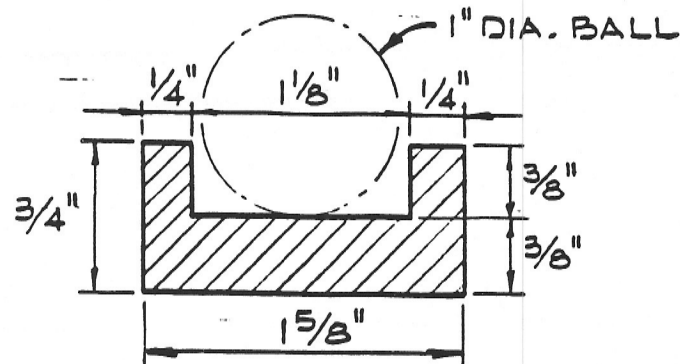
CUTTING SCHEME OF A 1"x8"x24" BOARD (2 REQ'D)  
TO MAKE A TOTAL OF 16 TRIANGULAR PIECES  
(8 PIECES PER BOARD AS SHOWN)

NOTE: BOARD DIMENSIONS ARE NOMINAL  
ACTUAL THICKNESS OF BOARD IS 3/4"

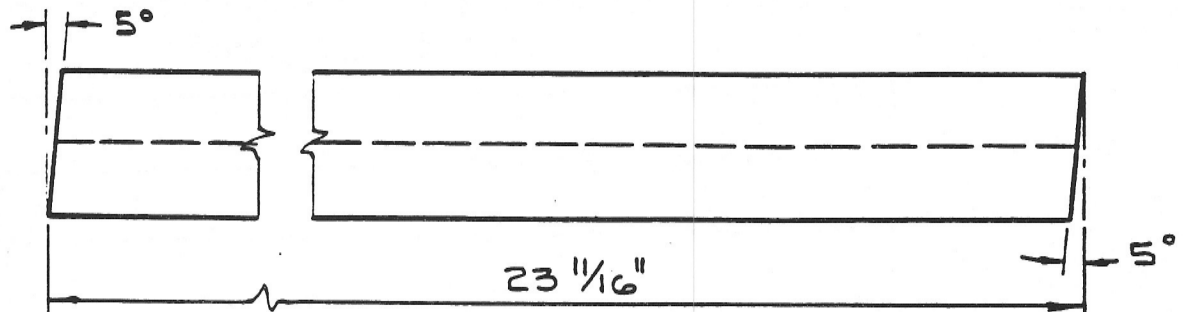


### DETAIL B

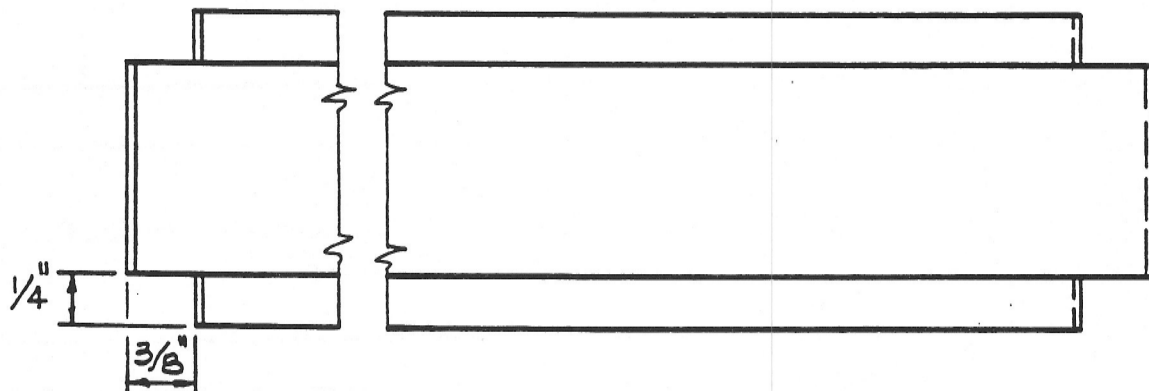
CUTTING SCHEME OF A 1"x8"x24" BOARD (8 REQ'D)  
TO MAKE A TOTAL OF 32 PIECES 3/4"x 1 5/8"x 23 7/8"  
(4 PIECES PER BOARD AS SHOWN).



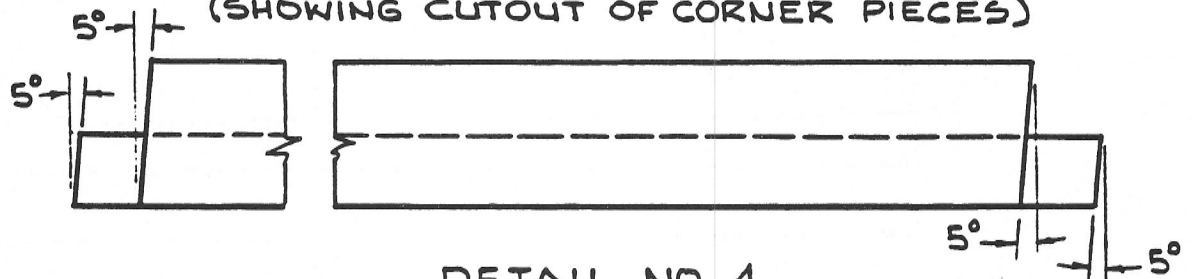
DETAIL NO. 1  
CROSS SECTION OF RUNWAY STRIP



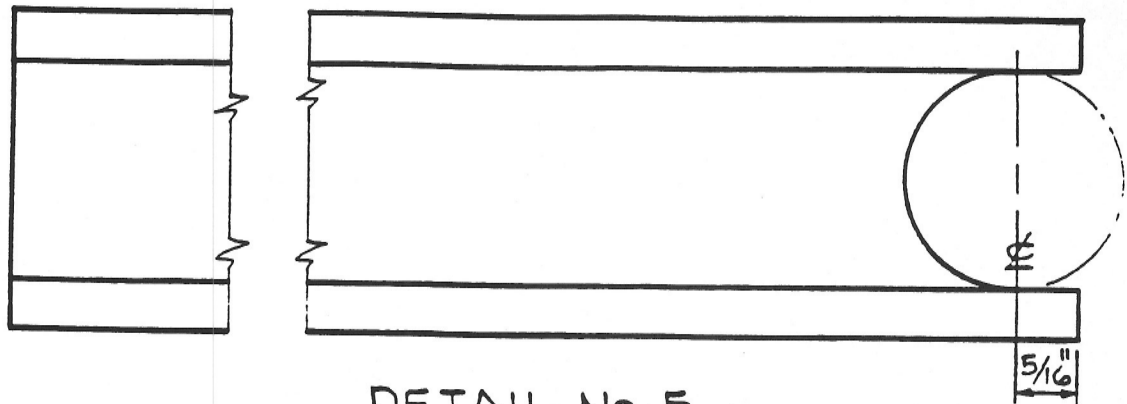
DETAIL NO. 2  
SIDE VIEW OF BOTTOM RUNWAY  
(BEFORE CUTOUT OF CORNER PIECES)



DETAIL NO. 3  
TOP VIEW OF BOTTOM RUNWAY  
(SHOWING CUTOUT OF CORNER PIECES)

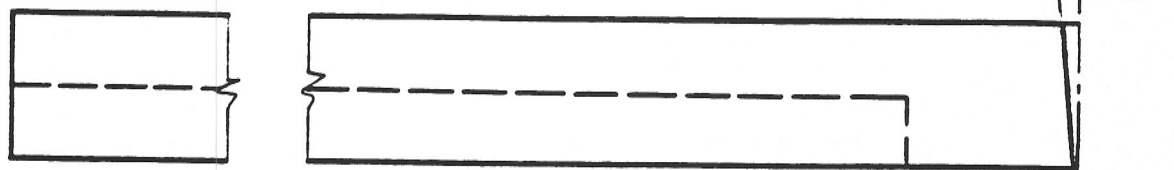


DETAIL NO. 4  
SIDE VIEW OF BOTTOM RUNWAY  
(AFTER CUTOUT OF CORNER PIECES)



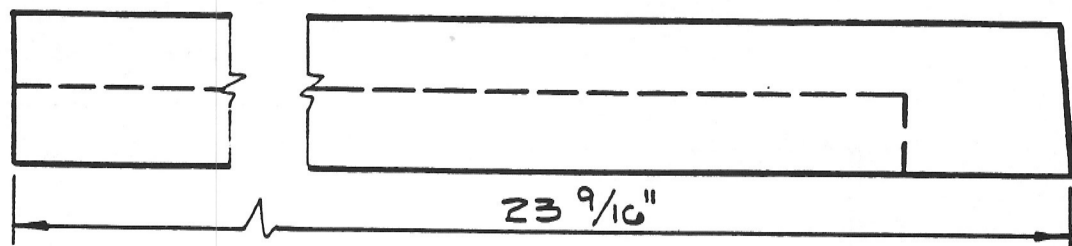
DETAIL NO. 5

RUNWAY STRIP SHOWING HOLE CUTOUT DETAIL  
(20 REQUIRED)



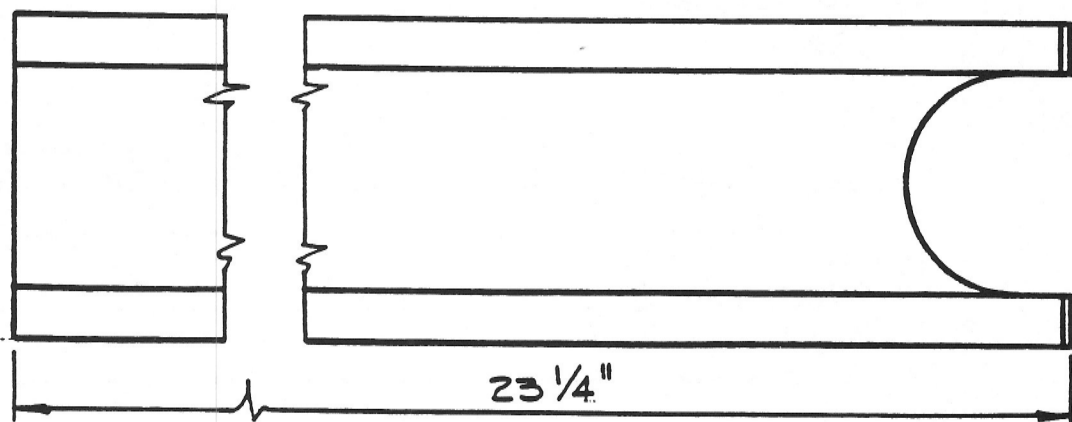
DETAIL NO. 6

SIDE VIEW OF RUNWAY SHOWING 5° TRIM @ HOLE END



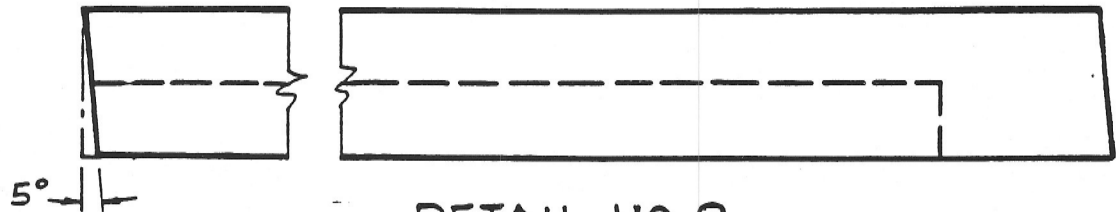
DETAIL NO. 7

SIDE VIEW OF TOP RUNWAY PIECE  
(4 REQUIRED)



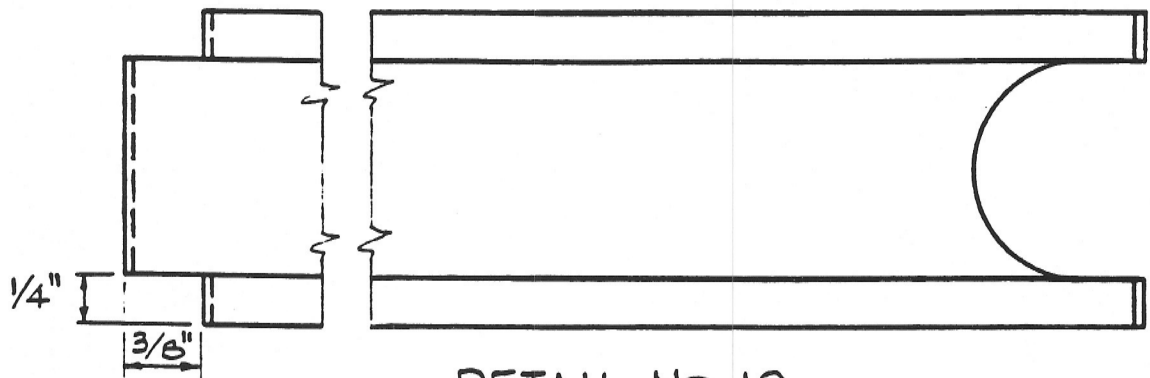
DETAIL NO. 8

TOP VIEW OF THE REMAINDER OF RUNWAY PIECES  
SHOWN BEFORE TRIMMING END OPPOSITE HOLE  
(16 REQUIRED)



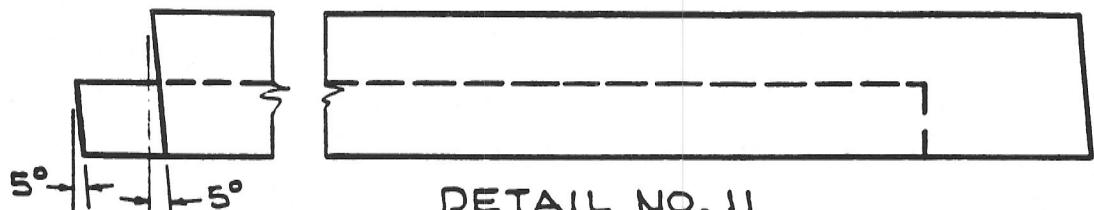
DETAIL NO. 9

SIDE VIEW OF RUNWAY SHOWING 5° TRIM @ OPPOSITE END OF HOLE



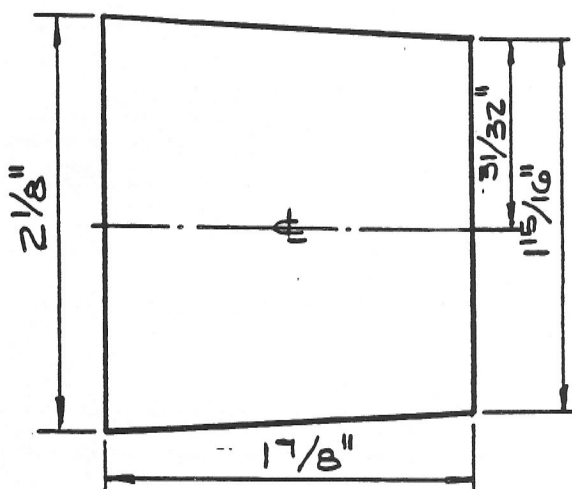
DETAIL NO. 10

TOP VIEW OF RUNWAY SHOWING CUTOUT @ OPPOSITE END OF HOLE

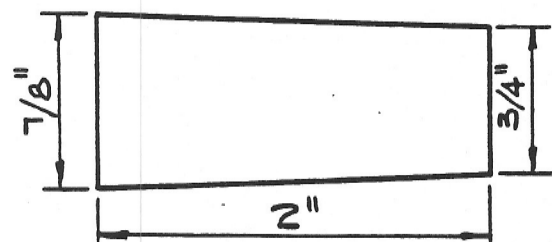


DETAIL NO. 11

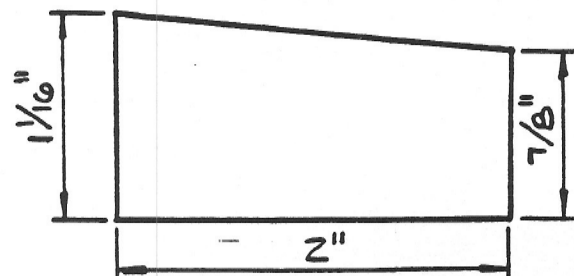
SIDE VIEW OF RUNWAY AFTER CUTOUT OF CORNER PIECES



DETAIL NO. 12  
SIDE GUSSET  
(20 REQUIRED)

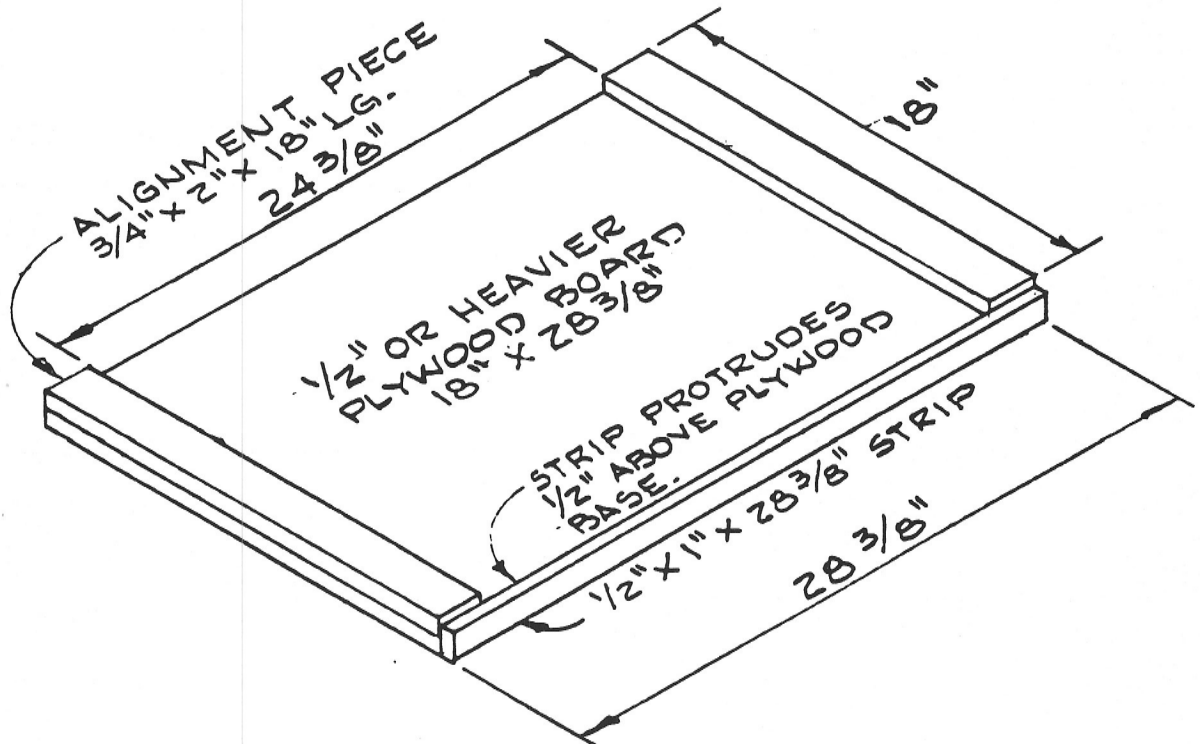


DETAIL NO. 13  
TOP - SIDE GUSSET  
(4 REQUIRED)

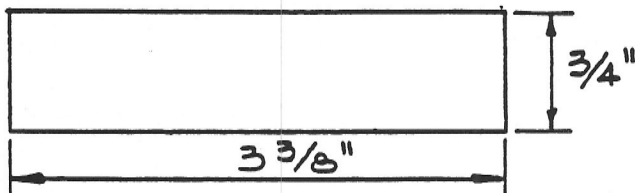


DETAIL NO. 14  
BOTTOM - SIDE GUSSET  
(4 REQUIRED)

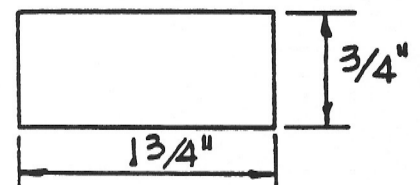




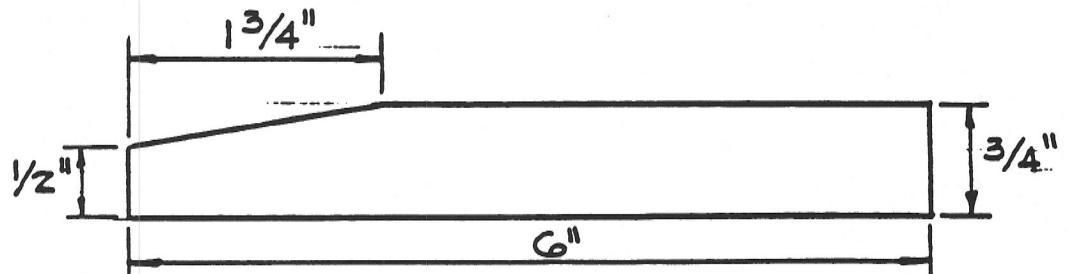
DETAIL C  
JIG ASSEMBLY



DETAIL D  
VERTICAL SPACER  
(2 REQ'D)

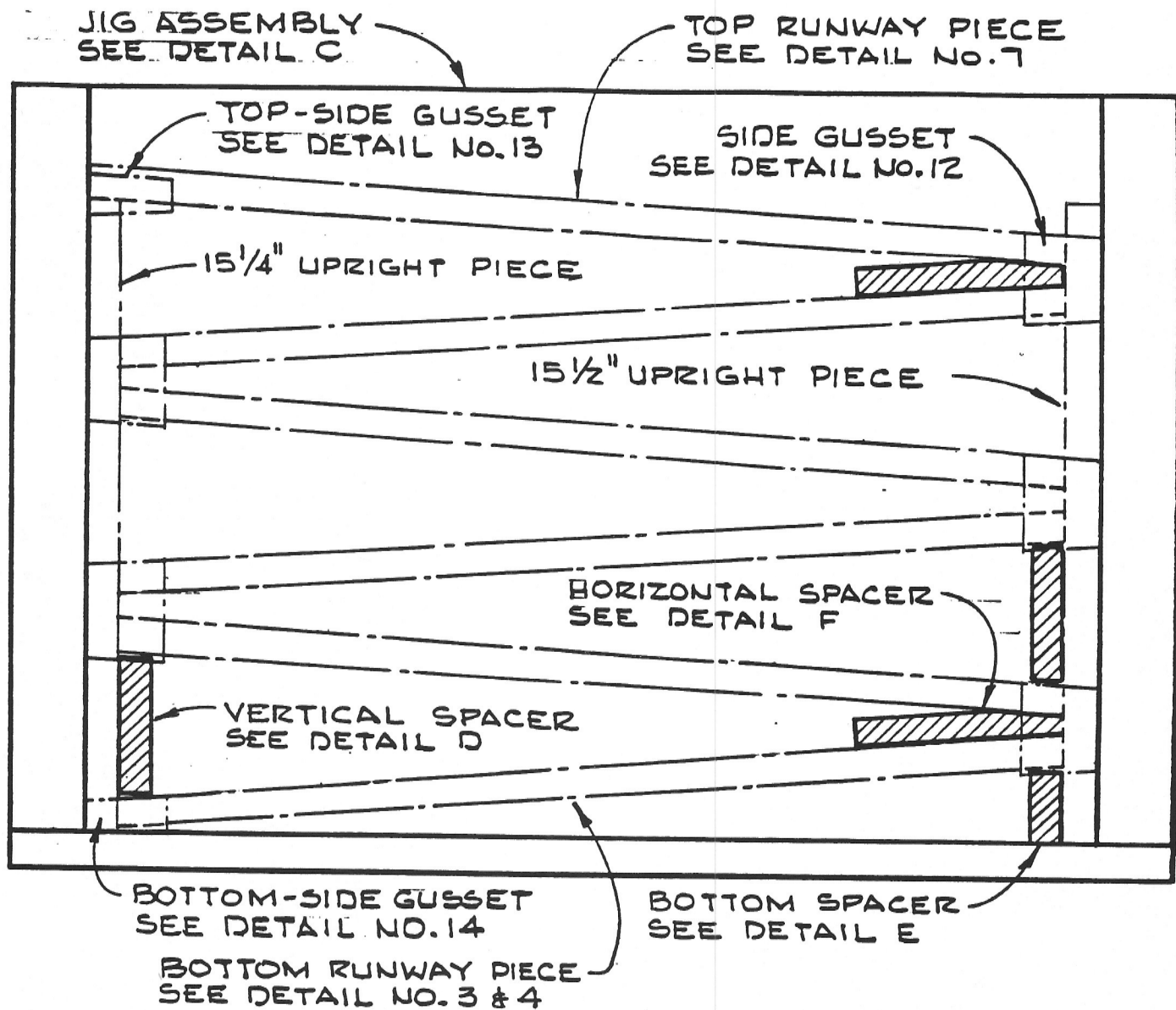


DETAIL E  
BOTTOM SPACER  
(1 REQ'D)

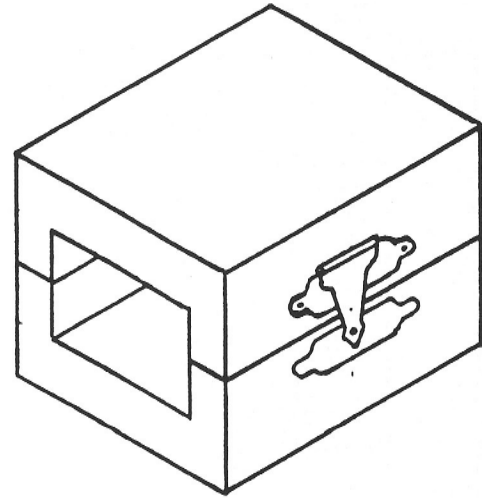


DETAIL F  
HORIZONTAL SPACER  
(1 REQ'D)

NOTE:  
ALL SPACERS  
ARE 1 5/8" WIDE



DETAIL G  
PLAN SHOWING ASSEMBLY OF RUNWAY FRAME  
USING JIG AND SPACERS



BALL STORAGE BOX

