## CHAPTER XI

### PITCHED COVERS AND FLARING ARTICLES

The problems in this chapter are some of the many articles made by the sheet metal worker in which the patterns are developed by the radial method described in Chapter X.

In Figure 102 is shown a sheet metal can, cylindrical in form, with a pitched cover inclosing the top. These cans

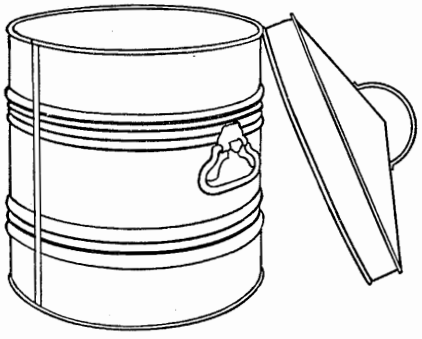

Figure 102.—Sheet Metal Waste Can with Pitched Cover.

are made from tin and galvanized iron, in a variety of sizes and for different purposes. The pitch of the cover can be varied at the pleasure of the workman.

The rim of the cover can also be made flaring in shape and fitted to the inside of the article in the same manner as the one-quart pail cover shown in Figure 84. As the sheet metal worker is often required to construct cans and tanks that will hold a given quantity, the following table

is presented, giving the size, diameter, and height for cans from 1 to 200 gallons in capacity.

DIMENSIONS OF CANS AND TANKS

| Gallon | Diameter | Height |
|---|---|---|
| 1 | 6¾ | 6¾ |
| 2 | 8½ | 8¾ |
| 3 | 9 | 11½ |
| 5 | 10½ | 13¾ |
| 6 | 11½ | 13½ |
| 8 | 13½ | 13½ |
| 10 | 13½ | 16½ |
| 15 | 15½ | 19 |
| 20 | 17½ | 19½ |
| 20 | 16 | 23 |
| 25 | 18 | 23 |
| 30 | 18½ | 26½ |
| 35 | 18½ | 30½ |
| 40 | 18¾ | 34 |
| 45 | 19½ | 35 |
| 50 | 20½ | 35 |
| 55 | 21¼ | 36 |
| 60 | 22 | 37 |
| 65 | 22½ | 38 |
| 70 | 23 | 40 |
| 75 | 23½ | 40 |
| 80 | 24½ | 40 |
| 85 | 25 | 40 |
| 90 | 24½ | 45 |
| 95 | 25 | 45 |
| 100 | 26 | 45 |
| 125 | 27½ | 50 |
| 150 | 29 | 52½ |
| 175 | 30 | 57½ |
| 200 | 30¾ | 64 |

The waste can, Figure 102, shows the pitched cover having a straight rim 1½ inches wide fitted over the outside of the body. This style of cover is generally used when constructing flour cans and receptacles for waste material of various kinds. The body of the can is 12 inches in diameter. The height is 14 inches. The ma-

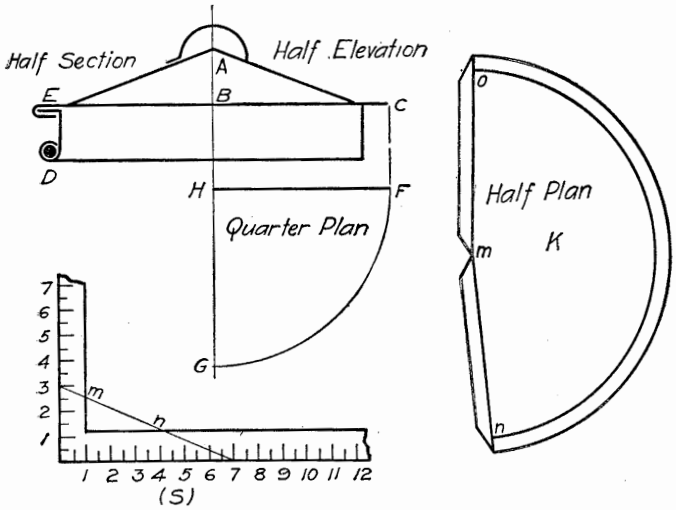


Figure 103.—Development of Pattern for Pitched Cover: *s*, Section of Steel Square and Method of Use in Laying Out Pattern.

terial used is No. 26 galvanized iron and a No. 8 wire is inclosed in its upper edge. An edge ¼ inch in width is used for the grooved side seam, and the bottom is attached to the body by a double seam in the usual way. The body is strengthened by several ogee beads. Tinned malleable iron handles are placed in position on the side as shown in the illustration.

*Pattern for a Pitched Cover.*—Figure 103 shows the method of obtaining the pattern for the pitched cover,

which is in the form of a complete cone and is made in two pieces. First, draw the half elevation as shown by *ABC*. Make *AB* equal to the altitude and *BC* equal to one-half the diameter of the cover. With *BC* as radius and *H* as center, describe the arc *FG*; then *HFG* will represent a one-quarter plan view of the cover. With *m* as center and radius equal to *AC*, describe the arc *no* of the half pattern *K*. On this arc, step off twice the number of spaces contained in the one-quarter plan, then draw lines from *no* to *m*, and add laps for seaming, as shown.

After the edges have been turned on the bar folder, the two pieces are formed by hand and joined together with a grooved seam. The cover is now flanged and seamed to the rim, as shown at *E*. These operations are fully described in Chapter IX. The rim of the cover is simply a circular band of metal, having the lower edge wired and the upper edge burred, as shown at *D* and *E*, Figure 103.

*Use of Steel Square.*—Although the drawings for this problem are to be made on the drawing board, in actual practice many workmen lay out the pattern by means of the steel square and dividers directly upon the sheet metal, without the use of any drawing. This short method can be used for developing the patterns for cones and pitched covers of any diameter or height.

Assuming that a pitched cover 14 inches in diameter and 3 inches high is to be made in two pieces, to obtain the pattern by this method proceed as follows: At *S* in Figure 103 is shown the section of a steel square. Place one point of the dividers on the vertical arm of the square at *3*, which is the height of the cover, and the other point at *7*, which is one-half the diameter; the distance shown by the line *mn* will be the true radius with which to describe the stretch-out arc of the pattern. With a radius equal to *3-7*, and with any point, as *m* in

the half pattern, as center, describe the arc *no*. To find the length of the stretch-out of the full pattern, multiply the diameter 14 by 3.1416, which will equal 44 inches. Set the points of the dividers 1 inch apart, and step off 22 spaces on the arc *no*. Draw lines from *n* to *m* and *o* to

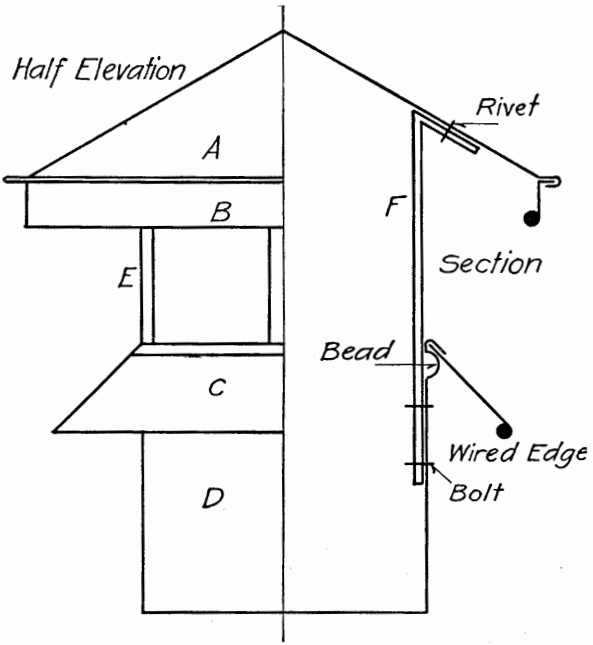


Figure 104.—Half Elevation and Details of Round Ventilator Head

*m*, and add laps for seaming, which will complete the one-half pattern for the cover.

*Round Ventilator Head.*—A ventilator head which is used for a variety of purposes, and with equal efficiency as the top for a smoke jack or a ventilator cap, is shown in Figure 104. The proportions are varied somewhat by

different workmen. The rule usually employed is to make the upper hood *A* and the lower flange *C* twice the diameter of the pipe *D*. The supports *E* and *F* are generally made from band iron, riveted to the hood and pipe as shown in the drawing. The straight flange *B* is merely a band of metal, having the lower edge wired and the upper edge attached to the top in a similar manner as the rim of the pitched cover described in this chapter.

The drawing, Figure 104, is made to a scale of 3 inches to the foot, and represents a ventilator having a 6-inch

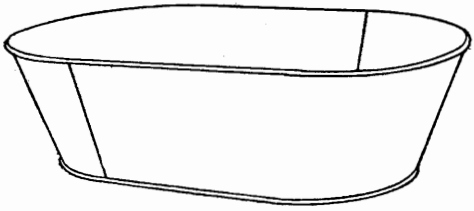

Figure 105.—Oblong Flaring Pan with Semicircular Ends.

opening. The half-section shows the construction and method of assembling the different parts.

To construct the ventilator, first draw the elevation full size, making it four times larger than the scaled drawing. The lower flange *B* has an inclination of 45° and the pitch of the upper hood *A* is at an angle of 30°. Since the upper hood is simply a flat cone, and the lower flange the frustum of a cone, the development of their patterns needs no explanation, as the method has been fully described in Chapter X.

*Flaring Oblong Articles with Semicircular Ends.*—Figure 105 shows a finished view of a flaring oblong pan with semicircular ends. The body is made in two pieces, having a wire inclosed in the top edge and the bottom double seamed in the usual manner. Articles of this form are made in various sizes and for different purposes.

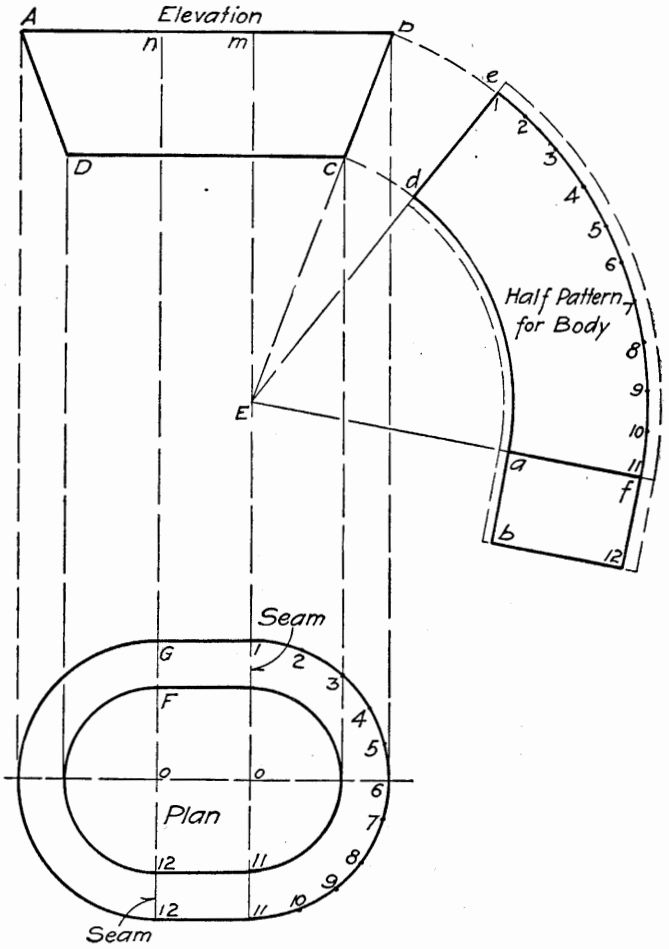


Figure 106.—Pattern for Oblong Flaring Pan with Semicircular Ends.

The dimensions of the pan shown in the illustration are as follows: Top 11x15 inches, bottom 8x12 inches, vertical height 4¼ inches. The method of developing the pattern is shown in Figure 106.

Draw the elevation *ABCD* according to the given dimensions; next, draw the plan of the top and bottom, the semicircular ends being struck from the centers *o* and *o*, with the radii *oF* and *oG* equal to one-half the width of the top and bottom. Divide the outer arc into a convenient number of equal spaces, as shown from *1* to *11*. From *o* erect the perpendicular line *om*, then extend the

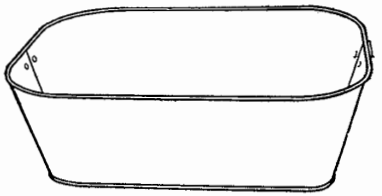

Figure 107.—Oblong Flaring Pan with Quarter-Circle Corners.

line *BC* in the elevation until it intersects the line *om* at *E*, which is the center with which to describe the arcs of the pattern. With *E* as center and radii equal to *EB* and *EC*, describe the arcs *da* and *ef*. Now, from any point on the outer arc, draw a line from *e* to the center *E*. Starting at point *1*, step off the stretch-out of the pattern, making it equal in length to the semicircle, as shown from *1* to *11* in the plan. From point *11*, draw a line to the center *E*, intersecting the lower arc at *a*. Then at right angles to the line *11a* draw the lines *11-12* and *ab*, making them equal to the straight side of the plan, as shown by the figures *11* and *12* in the plan.

This completes the pattern, with the exception of the allowances for seaming and wiring. Since these allowances differ in no way from those of preceding prob-

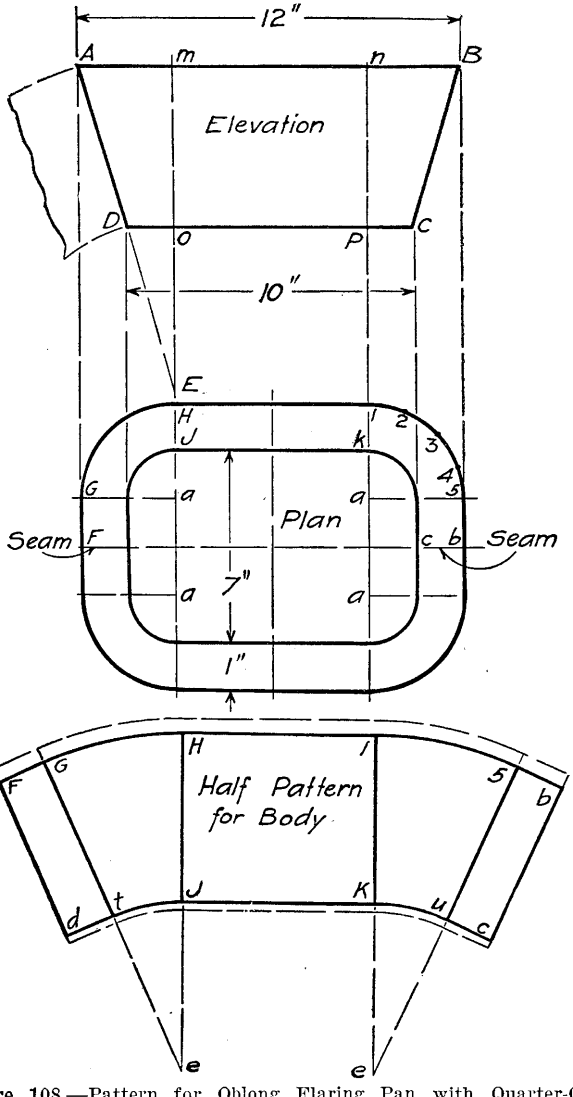


**Figure 108.**—Pattern for Oblong Flaring Pan with Quarter-Circle Corners.

lems, they need no further explanation. The pattern for the bottom is laid out by merely adding an allowance for double seaming to the outline of the bottom shown in the plan view.

*Oblong Article with Quarter-Circle Corners.*—Another application of the processes of double seaming and wiring is the construction of a flaring article having straight sides and quarter-circle corners. Since problems of this form frequently occur in the sheet metal trades, the construction and method of developing the patterns should be thoroughly mastered by the student and workman. The common form of this article is shown in Figure 107. The body is made in two pieces; the top edge is wired and the bottom attached by a double seam. The method of obtaining the pattern is shown in Figure 108.

First draw the plan and elevation in accordance with the dimensions shown on the drawing. The quarter-circle corners of the top and bottom are struck from the four centers shown by *a* in the plan, the radius of the arcs for the corners of the bottom, as shown by *aj*, being 1½ inches. Draw the perpendicular lines *am* and *an*, then extend the side *AD* of the elevation until it intersects the line *am* in the point *E*, which gives the height of the cones, portions of whose frustums are to form the corners of the finished article. Next, by the line *Fb*, divide the plan into two equal parts, then divide one of the outer quarter-circles into a convenient number of equal parts, as shown by the figures *1* to *5*.

To lay out the half-pattern for the body, first draw the line *H1* equal in length to *H1* in the plan, and at right angles to this line draw the lines *He* and *le*, equal in length to *AE* in the elevation. Make *HJ* and *1K* equal to the slant height of the side shown by *AD* in elevation. Then with *e* and *e* as centers and radii equal to *eK* and *e1*, describe the arcs *1-5* and *Ku*, also the arcs *HG* and *Jt*. Starting at points *H* and *1*, step off the stretch-out

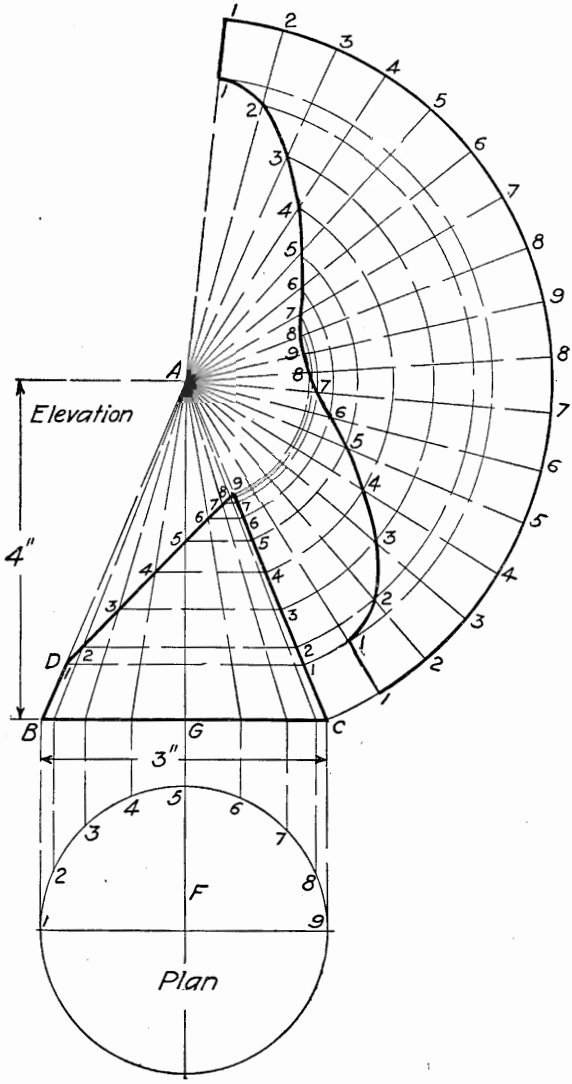


**Figure 109.**—Method of Obtaining Pattern for the Frustum of a Right Cone.

of the arcs of the pattern, making *1-5* and *11G* equal in length to the quarter-circle shown in the plan by the figures *1* to *5*.

From points *5* and *G*, draw lines to the centers *e* and *a*, and at right angles to these lines, draw the lines *GF* and *td* on the left, and *5b* and *uc* on the right, equal in length to one-half the straight end of the pan, shown by *FG* in the plan. Connect these points and add laps for wiring and seaming. The pattern for the bottom is found by merely adding to the outline of the bottom shown in the plan, the allowance required for the double seam.

*Pattern for Frustum of Right Cone.*— The problems in radial developments up to this point have been what we might call articles in the form of a cone and the frustum of a cone having the upper and lower bases parallel or in the same plane. When constructing flaring roof collars, gutter outlets, and various articles in the form of a cone having the upper or lower end cut by a plane other than parallel to its base, the development is somewhat different.

Figure 109 shows the method of developing the pattern for the frustum of a right cone cut by the plane represented by the line *D9*. First draw the elevation of the cone *ABC*, and directly below it the plan view *F*. As both halves of the cone are symmetrical, it will be necessary to divide only one-half of the outline of the plan *F* into equal spaces, as shown by the figures *1* to *9*. Next represent the cutting plane *D9* by a line drawn at an angle of 45° with the base line *BC*, making the point *D* one inch from *B*. From the various points in the plan erect lines intersecting the base of the cone from *1* to *9*. From these points on the base line, draw radial lines to the apex *A*, intersecting the line *D9* as shown. From these points of intersection on the line *D9*, and at right angles to the axis line *AG*, draw lines as shown intersecting the side of the cone *AC*.

Then using *A* as center with *AC* as radius, describe

the stretch-out arc. From *1*, draw a line to the apex *A*, and starting from point *1*, step off on the arc twice the number of spaces shown in the plan *F*, by the figures *1-9-1*. From these points draw radial lines to the apex *A*. Then, using *A* as center, with radii equal to the various points which are shown in their true length on the

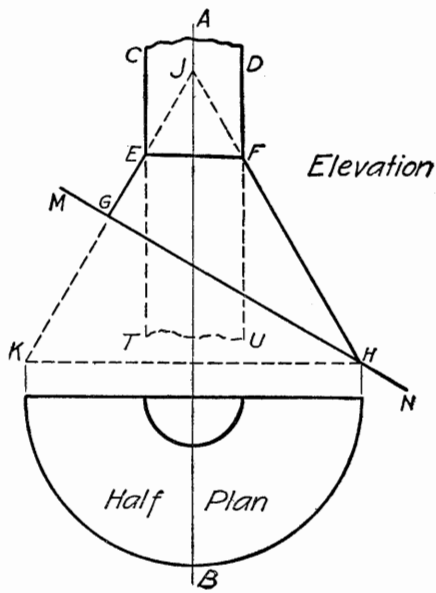


Figure 110.—Half Plan and Elevation of a Flaring Roof Collar.

line *AC*, draw arcs intersecting similar numbered radial lines in the pattern. The irregular curve is now traced through points thus obtained, which completes the desired development.

*Flaring Roof Collar.*—The principles used in developing the pattern for the intersected cone shown in Fig-

ure 109 are applicable, no matter at what angle or point the bases of the cone are intersected. The workman will apply these principles in developing the pattern for a flaring roof collar shown by *EFGH* in Figure 110. A roof collar of this kind is commonly used by plumbers and sheet metal workers to secure a watertight joint when flashing around stacks and vent pipes that extend through the pitched roof of a building.

First, draw the center line *AB* and then draw the roof line *MN* at an angle of 30°. Next draw the outline of the vertical pipe shown by *CDTU*, and make the upper base of the collar *EF* at any convenient distance from the roof line. At a proper angle, draw the side lines of the collar through the points *EF* extended until they meet at the apex *J*. Next draw the horizontal line *HK*, and extend the side line *JG*, intersecting the line *HK* at *K*, as shown by the dotted lines. Then *JKH* will represent a right cone which is cut off on the lines *EF* and *GH*. The pattern is now developed in the same manner as the previous problem.