CHAPTER XII

PARALLEL LINE DEVELOPMENT

Practical workshop problems, such as arise in every day practice, in which the patterns are developed by means of parallel lines, will now be presented. This method is used in laying out patterns for elbows, tee joints, roof gutters, skylights, cornices, etc. All of the problems should be carefully studied and the patterns drawn accurately. Unless the drawings are exact, they are of no value. There are certain fixed principles that apply to developments by this method, and the following rules should be carefully observed by the student and workman:

1. A plan and elevation must first be drawn, showing the article in a right position, in which the parallel lines of the solid are shown in their true length.

2. The pattern is always obtained from a right view of the article in which the line of joint or intersection is shown.

3. A stretch-out, or girth line, is always drawn at right angles to the parallel lines of the articles, upon which is placed each space contained in the section or plan view.

4. Measuring lines are always drawn at right angles to the stretch-out line of the pattern.

5. Lines drawn from the points of intersection on the miter line in the right view, intersecting similarly numbered lines on the stretch-out, will give the desired pattern.

Two-Pieced Elbow.—Figure 111 demonstrates the method of developing the patterns for a two-pieced 90° elbow.

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First draw the elevation *ABCDE7*. Then below the elevation describe a circle representing the profile or plan, shown at *F*. As each half of the pattern is symmetrical, draw a line through the plan *F*, and divide the upper half of the circle into a number of equal parts, as shown from *1* to *7*.

From these points perpendicular lines are drawn intersecting the miter line *C-7* as indicated. Then at right

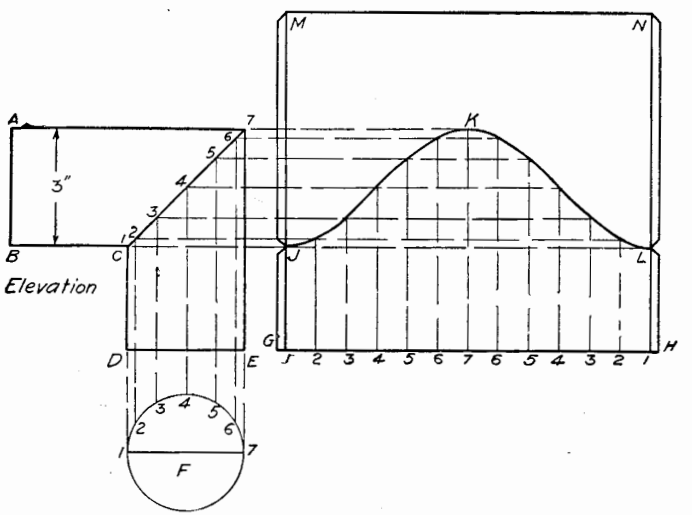

Figure 111.—Patterns for Two-Pieced 90° Elbow.

angles to the lower arm of the elbow *E-7*, draw the stretch-out line *GH*, and upon this line step off twice the number of spaces indicated in the plan, which will give the circumference of the elbow, as shown by the points *1-7-1* on the line *GH*. From these points and at a right angle to *GH*, measuring lines are erected and intersected by like numbered lines drawn at a right angle to the cylinder from similar numbered points of intersection on

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the miter line *C-7* in the elevation. A line traced through points thus obtained will be the pattern for the lower arm of the elbow, as shown by *GHLKJ*.

The manner of laying out the pattern for the upper arm of the elbow may need some explanation. The irregular curve traced through the points of the pattern is the only one required for both pieces of the elbow. The stretch-out of both pieces being of equal length, extend the outer lines of the pattern to *M* and *N* as pointed

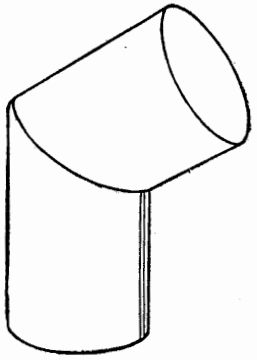

Figure 112.—Round Conductor Elbow.

out, and make *JM* and *LN* equal in length to the long side of the upper arm as shown by *A-7* in the elevation. Draw a line from *M* to *N;* then *JKLNM* will be the pattern for the upper arm of a two-pieced elbow. Allowances for seaming or riveting must be added as indicated. This method of development is applicable to any pieced elbow, no matter what angle is required.

Conductor Elbow.—An article often required to be made up from tin plate, sheet copper, and galvanized iron, is a round conductor elbow, shown in Figure 112. It is usually made at other than a right angle, to allow for drainage purposes.

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Figure 113 shows the elevation and plan view of a two-pieced conductor elbow, the circle representing the plan or profile being 3 inches in diameter. Draw the elevation and let *DEF* be the required angle. The miter line of a

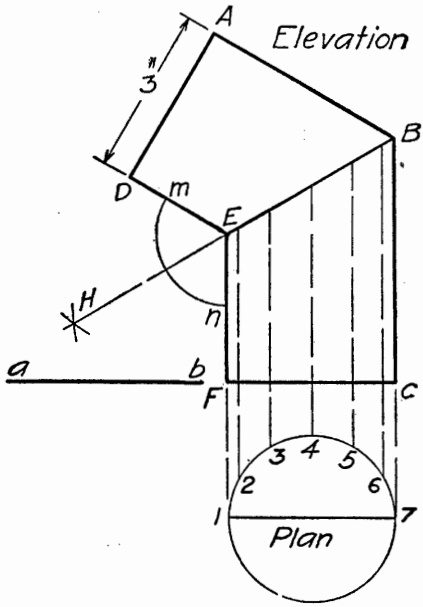

Figure 113.—Elevation and Plan of Two-Pieced Conductor Elbow.

two-pieced elbow is always found by bisecting the angle and is obtained as follows:

With *E* as center and any convenient radius describe the arc *mn*. With a slightly larger radius and *m* and *n* as centers, describe two arcs, intersecting at *H*. Then draw the line *HB*, which is the bisector of the angle *DEF*, and *EB* is the required miter line of the elbow.

The upper half of the plan is spaced into a number of equal parts, and from these points vertical lines are

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drawn, intersecting the miter line *EB* in the elevation. The stretch-out line as shown by the line *ab*, is now drawn at right angles to the lower arm of the elbow, and the patterns for both arms are laid out in the same manner as the 90° elbow. This development is shown fully in Figure 111 and the workman should have no trouble in completing the problem.

Pipe and Roof Flange.—A roof flange used by plumbers and sheet metal workers when flashing around vent

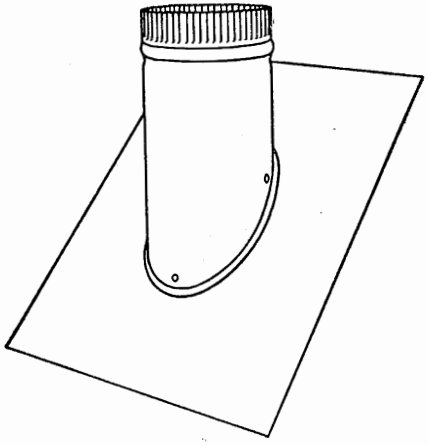

Figure 114.—Pipe and Roof Flange.

pipes and stacks that come through the slanting sides of a roof, is shown in Figure 114. As may be seen by the illustration, the roof flange is merely a flat plate of metal which is seamed to a cylinder or pipe having one end cut at an angle equal to the pitch of the roof.

Figure 115 shows the method of developing the pattern for the pipe and the opening in the roof plate. First draw the roof line *BC* at an angle of 45°, which will show the pitch of the roof. Then draw a side view of the

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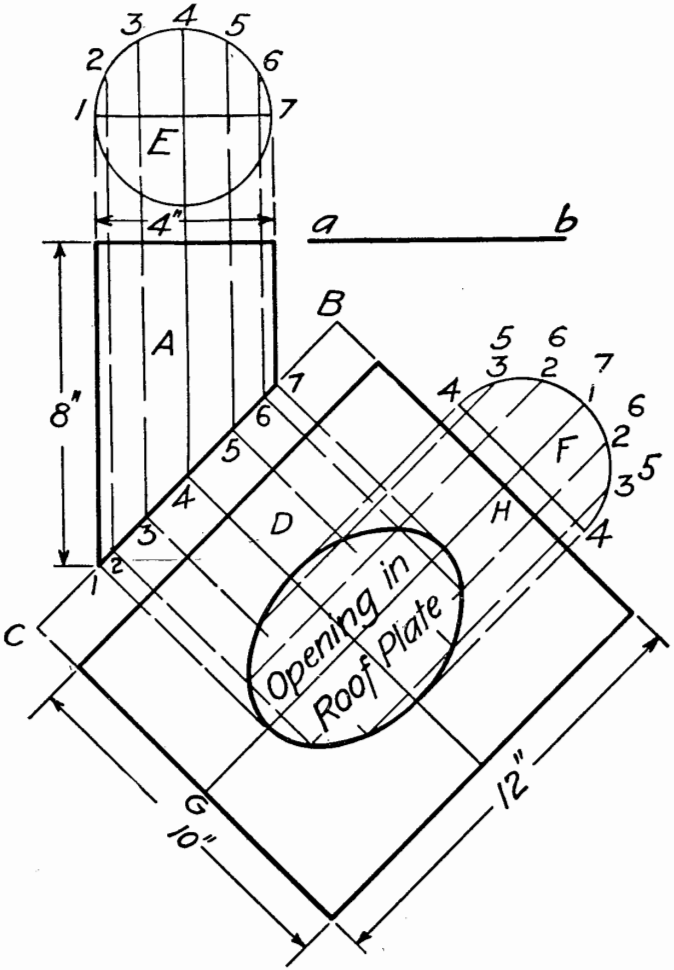

Figure 115.—Method of Obtaining Pattern for Pipe and Opening in Roof Plate.

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half of the circle is divided into a convenient number of pipe *A* and its section, indicated by the circle at *E*. One equal parts, and from these points parallel lines are drawn, intersecting the roof line *BC* as shown.

We are now ready to develop the pattern for the pipe *A*, which is a cylinder having one end cut at an angle of 45°. Draw the stretch-out line *ab* at right angles to the vertical side of the pipe, and obtain the pattern in a manner similar to the development of the lower arm of the two-pieced elbow shown in Figure 111.

The pattern for the opening in the roof plate is developed in the following manner:

First draw lines at right angles to the roof *BC* from the points *1* to *7*. Then at right angles to these lines

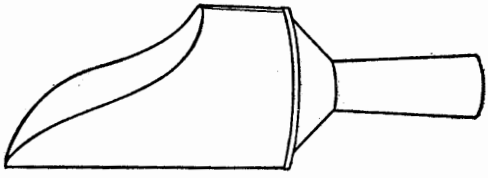

Figure 116.—Common Hand Scoop.

draw the line *GH* through the center of the roof plate *D*. On the line *GH* place half of section *E* as shown by *F*, and divide the half circle into the same number of equal spaces to correspond to the half-section *E*. From these points in *F* draw lines parallel to *GH*, intersecting similar numbered lines that have been drawn from the points on the line *BC*. A line traced through the points thus obtained will be the pattern for the opening in the roof plate.

Hand Scoop.—A typical hand scoop, commonly used, is represented in Figure 116. The illustration shows that the body is in the form of an intersected cylinder, and the handle and the brace are the frustums of two right

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cones. This problem, as presented, will require the development of patterns by both the parallel line and radial methods. In the construction of the patterns no prin-

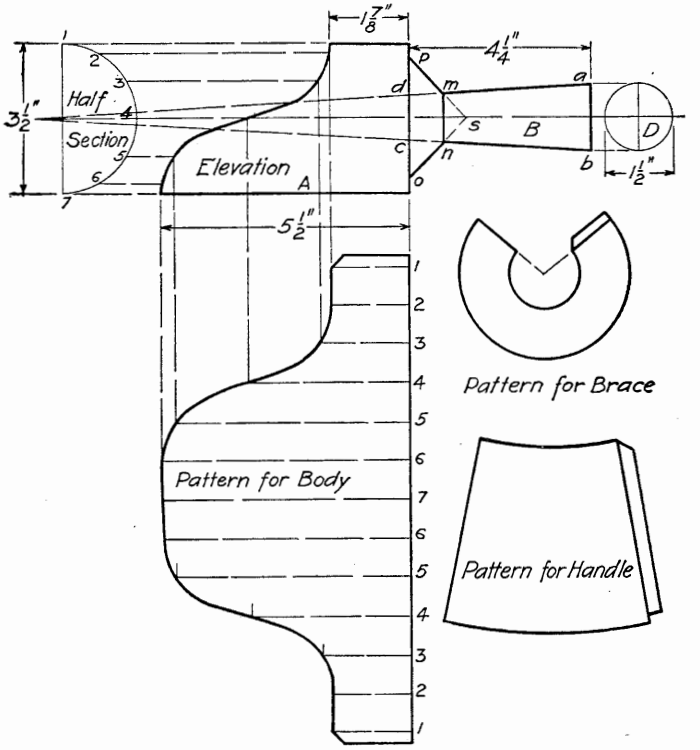

Figure 117.—Patterns for Body, Brace, and Handle of Hand Scoop.

ciples are employed other than those used in previous problems already given in this course.

To obtain the patterns, first draw the side elevation and half section to the dimensions shown in Figure 117. Divide the half section into a number of equal spaces, as

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shown from *1* to *7*, and from these points draw parallel lines intersecting the curved edge of the scoop as indicated. This curved edge can be drawn to any angle or shape at the pleasure of the workman.

To obtain the pattern for the body of the scoop, draw the stretch-out line *1-7-1*, upon which step off twice the number of spaces contained in the half section. From these points on the stretch-out line draw horizontal lines, which are intersected by vertical lines drawn from similar numbered points on the curved edge of the scoop, shown in the elevation. A line traced through these points will give the pattern for the body, to which laps are added for a ⅛-inch grooved seam. The scoop handle *B* is the frustum of a cone, shown by *abcd*, which is soldered to the center of the flat back of the scoop.

The conical brace is shown by *mnop*. The patterns for the brace and handle are shown in the drawing, and the method of development has been fully described in previous problems. The pattern for the back is simply a flat circular piece of metal, equal in diameter to the body of the scoop, to which allowances are added for seaming. The pattern for the end of the handle is a circular piece of metal, equal in diameter to the large end of the handle, shown at *D*. This disc is cut from the flat metal by means of a hollow punch of the required size. It is then placed in the opening and soldered in position.

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