CHAPTER XV

RETURN AND FACE MITERS

This chapter treats of the method of obtaining patterns for miters between sheet metal moldings. The patterns are developed by the parallel method described in previous chapters. Any profile or shape may be used, and in order to illustrate the application of the principles underlying the development as applied to moldings, a number of practical problems are presented.

Square Return Miter.—In Figure 134 is shown the illustration of a square return miter, such as would be

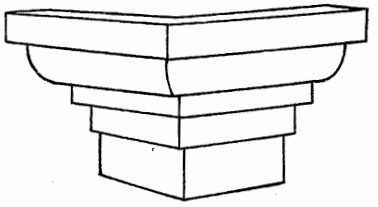

Figure 134.—Square Return Miter.

employed when a molding was made to return around the corner of a building. Figure 135 shows two methods of obtaining the pattern, known respectively as the long and the short method. The short method is the rule generally employed by the sheet metal worker, but can only be used when the miter is one of 90°; that is, a square miter. The long method can be used for obtaining the patterns for a miter between moldings, no matter what angle is required.

To develop the pattern by the long method, proceed as

follows: First draw a full-size detail of the profile or section, the dimensions being taken from the section

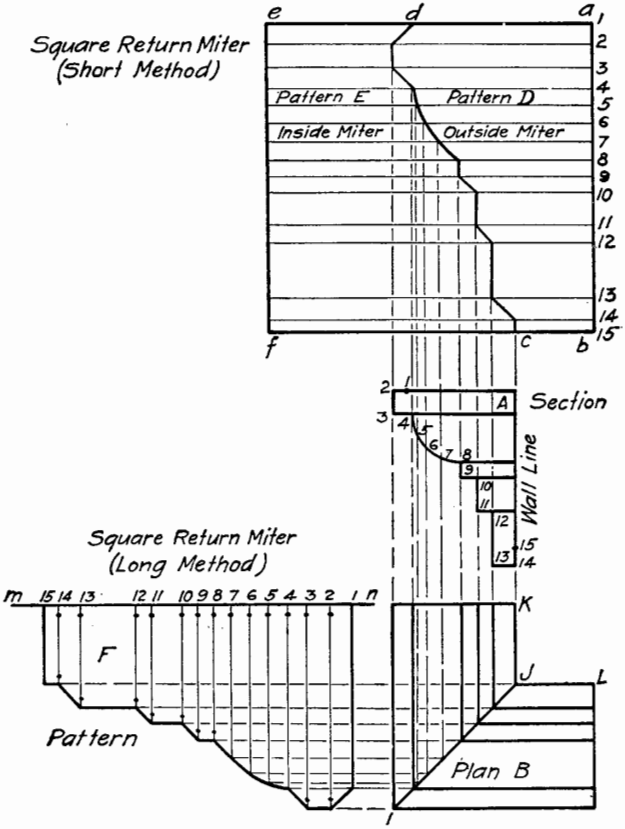

Figure 135.—Long and Short Methods of Obtaining Pattern for Square Return Miter.

shown at *A* in Figure 135, which is drawn to a 2-inch scale; but any other profile may be used if desired. Divide the curve into a number of equal spaces, placing a suffi-

cient number of points on the curve, so that the outline of the pattern may be traced with accuracy. Number these points, also the corners of the molding, as shown by the figures *1* to *15*. Next, draw the plan *B* as shown, and bisect the angle *KJL* by the line *J1*, which will give the required miter line.

From the various points in section *A*, draw vertical lines intersecting the miter line in plan *B*. At right angles to *JK* draw the stretch-out line *mn;* upon this line place the stretch-out of the section, as shown by the

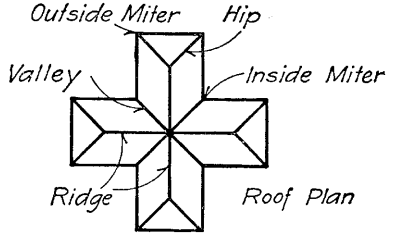

Figure 136.—Plan of Hipped Roof, Showing Outside and Inside Miters.

figures *1* to *15*. From these points on the stretch-out line draw vertical lines, which are intersected by horizontal lines drawn from similar numbered points of the miter line *J1* in the plan *B*. The outline of the pattern is then traced through the points thus obtained, and the lines upon which bends are to be made are marked by small circles or dots, as shown on the completed pattern at *F*.

The development of the pattern by the short method, in which no plan is required, is shown by pattern *D*. After the profile has been drawn in its proper position, as shown at *A*, the stretch-out line may conveniently be drawn either above or below the drawing of the profile. In this case it was drawn above, as shown by the vertical line *ab*. Upon this line place the stretch-out of the pro-

file, and number the points in the usual manner, shown by the figures *1* to *15*. From these points at right angles to the stretch-out line, draw measuring lines, which intersect by vertical lines drawn from similar numbered points on the profile *A*. A line traced through the points thus located will complete the pattern, which is similar to pattern *F*, that was obtained from the plan and developed by the long method.

Outside and Inside Miters.—For the purpose of illustrating the difference between an outside miter and an inside miter, a sketch of a roof plan, representing a hipped roof, is shown in Figure 136. When constructing moldings and gutters, the workman is often required to develop patterns for miters returning around the outer and inner angles of a roof. Miters for the outer and inner angles are called outside and inside miters, and are placed as shown in the sketch. Pattern *D*, shown by *abcd* in Figure 135, is the pattern for an outside miter, while the opposite cut, shown by *defc*, is the pattern for an inside miter. It will be seen that both patterns are produced by a single miter cut, and it is important to know that this is also true when developing patterns for miters at any angle.

Octagon Return Miter.—Figure 137 shows the method of obtaining the pattern for an octagon return miter, and is also applicable for miters at any angle. The octagon miter is often employed in the construction of roof finials and cornices, and also frequently occurs in moldings and gutters passing around parts of a building octagonal in form.

The pattern for an octagonal return miter is developed from a plan view of the molding by the long method shown in Figure 137, which is drawn to a 2-inch scale. First draw a full size section of the molding shown at *A*, taking the dimensions from the scaled drawing. Next extend the wall line of the profile and draw the octagonal

angle of 135°, shown by *mno,* which will represent the wall line in the plan *C*. Bisect the angle *mno* and draw the miter line *RN*. The curve in the profile is divided into a number of equal spaces and the points numbered as shown by the figures *1* to *15* in section *A*. From all

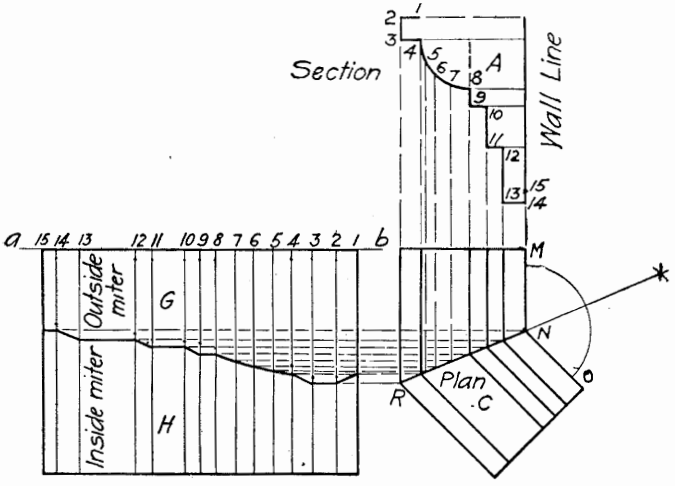

Figure 137.—Pattern for Octagon Return Miter.

points on the profile draw vertical lines intersecting the miter line *RN* in the plan.

The stretch-out of the molding is now placed upon the line *ab,* which is drawn at right angles to the wall line *MN* in the plan. Measuring lines are drawn from these points, which are intersected by horizontal lines drawn from similar numbered points on the miter line. A line traced through these intersections will complete the pattern, as shown at *G*. Should an inside miter be required, the opposite cut of pattern *G* is used, as shown by pattern *H*.

Molded Gutter.—In Figure 138 is shown a finished view of a molded face gutter, or eave trough miter. This is simply a square return miter, and it is immaterial what

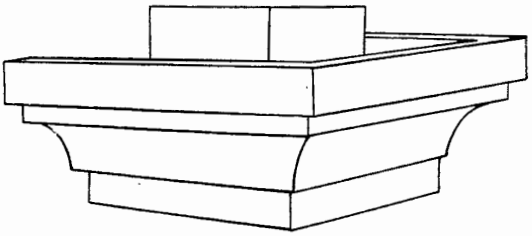

Figure 138.—Molded Face Gutter, or Eave Trough Miter.

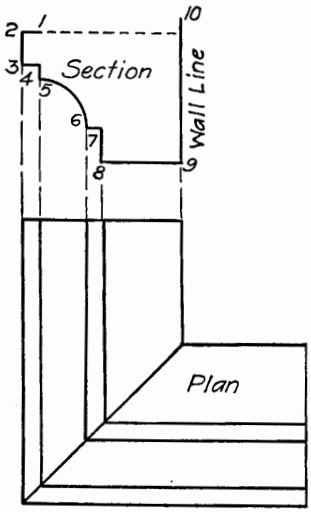

Figure 139.—Section and Plan of Molded Face Gutter.

profile or shape the gutter has,—the method of developing the pattern is the same.

In Figure 139 is shown a 2-inch scale drawing giving

the section and plan view of a molded face gutter, for which a square outside miter pattern is to be developed by the short method shown in Figure 135. Place the stretch-out line either above or below the section, and omit the plan when making the full-size drawing.

Octagon Gutter Miter.—The next exercise for practice is the octagon gutter miter shown in Figure 140, which

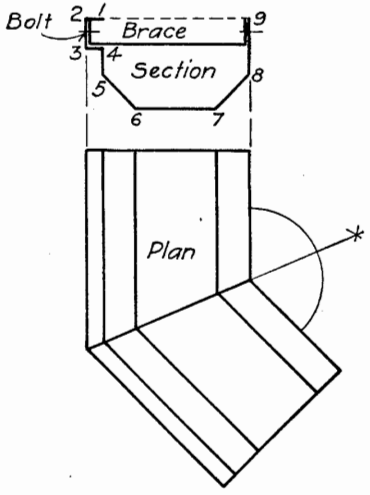

Figure 140.—Section and Plan of Octagon Gutter Miter.

is also drawn to a scale of 2 inches to the foot. In this drawing the section and plan are given of an octagon gutter forming a miter at an angle of 135° in the plan. Draw the section and plan as shown. Number the corners on the section and draw vertical lines intersecting the miter line in the plan. At right angles to the wall line draw the stretch-out line, and develop the pattern in the usual manner.

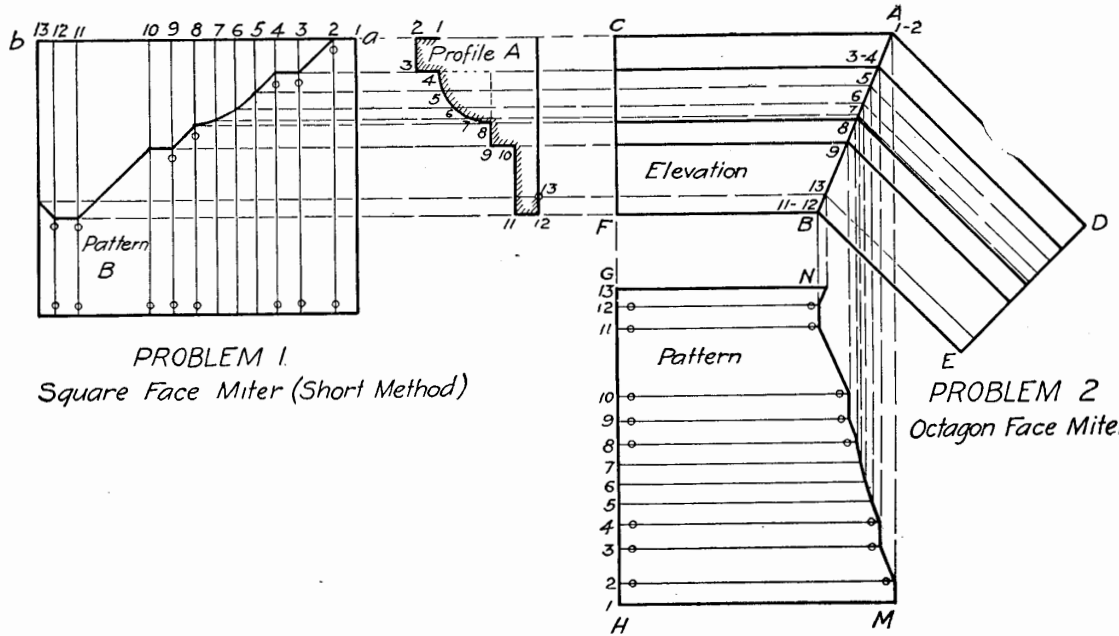

Figure 141.—Face Miter Problems: 1, Pattern for Square Face Miter; 2, Pattern for Octagon Face Miter.

Face Miters.—The method of developing the pattern for a face miter is shown in Figure 141. This process is employed when developing the patterns for miters in panel moldings, picture frames, and gable moldings, also to obtain the miter cut when the return molding of a dormer window butts against a mansard roof or other inclined surface. As may be seen from the drawing, the method of development is similar to that described for the return miter, Figure 135. The only difference is in the position of the stretch-out line *ab* in the pattern for the square face miter shown at *B*. In this case the stretch-out line is placed in a horizontal position at the left of the profile, while the stretch-out for the square return miter, Figure 135, is placed in a vertical position above the profile.

When developing the patterns for moldings, the sheet metal worker must always be careful to place the stretch-out line in its proper position, or, instead of having a face miter as indicated in Figure 141, he will have a return miter, as shown in Figure 135.

In Figure 141 two problems in face miters are presented and the drawings are made to a scale of 3 inches to the foot. Problem 1 shows the method of obtaining the pattern for a *square face miter* by the short method. Draw the profile *A*, and place the stretch-out line *ab* to the left of the profile. The operations in the development of the pattern are the same as described in Figure 135, and need not be described further.

Problem 2, Figure 141, shows the development of an *octagonal face miter*. The patterns for face miters at other than a right angle are developed by the long method, and the miter line is found in the elevation. In problem 2 the elevation is shown at the right of the profile.

First draw the required angle *CAD*, which is bisected in the usual manner to obtain the miter line *AB*.

Next, from the various points on the profile, draw horizontal lines intersecting the miter line as shown. At right angles to the line *BF* in the elevation, draw the stretch-out line *GH*. Upon this line place the stretch-out of the profile shown by the figures *1* to *13*. Measuring lines are now drawn from these points, which are intersected by lines drawn from similar numbered points on the miter line. Through the points thus obtained trace the pattern *GHMN*.

Molded Panel.—The development of the face miter described in previous problems leads naturally to the problem of the molded panel, shown in Figure 142.

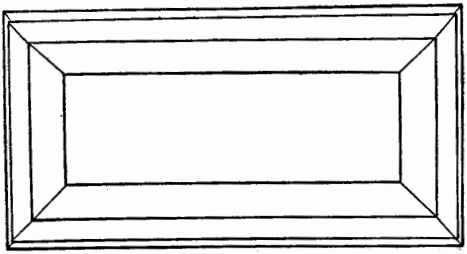

Figure 142.—Oblong Molded Panel.

The method of obtaining the pattern for an oblong panel is shown in Figure 143. First draw a section of the panel mold *A*, as indicated by the shaded portion of the drawing. Then divide the curve into a number of equal spaces and number each point on the section, as shown by the figures *1* to *8*. Through these points draw lines parallel to *EB*, intersecting the miter line *mB* as shown. From the points thus obtained on the miter line, draw lines parallel to *BC*, intersecting the miter line *nC*. At right angles to *BC* in the elevation, draw the stretch-out line *ab*, upon which place all of the divisions contained in the profile *A*. Through the points on the stretch-out line, draw horizontal measuring lines, which

intersect by vertical lines drawn from similar numbered points on the miter lines mB and nC in the elevation. A line traced through the points of intersection will complete the pattern for the ends of the panel. This is the

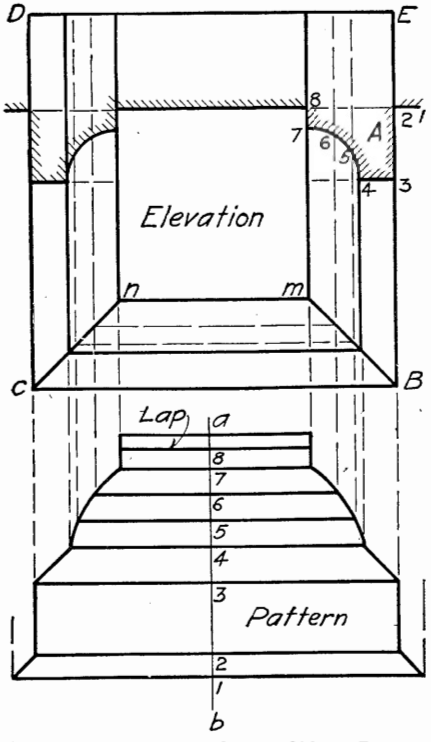

Figure 143.—Pattern for an Oblong Panel.

only pattern necessary for the construction of the problem, for the same miter cut is also used for the long side of the panel.

Roof Finial.—The sheet metal worker is often called upon to provide the apex of a hipped roof or tower with

an ornamental finish made from galvanized iron or sheet copper. A plain fitting so used is shown in Figure 144 and is called a roof finial. The body, square in form, is made in four pieces, and is commonly used to provide a finish at the apex of a square tower, or as an ornament in cornice construction.

The method of laying out the pattern for a square finial is shown in Figure 145, which is drawn to a scale of 2 inches to the foot. The profile can be changed to

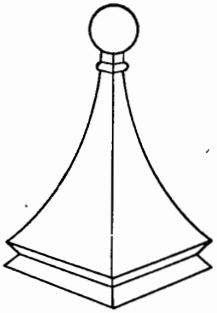

Figure 144.—Square Roof Finial.

any shape, but the development would be the same in every case.

First draw the center line AB and construct the elevation shown at D, the ball C being 3 inches in diameter. Divide the profile into a number of equal spaces and number the points, as shown by the figures *1* to *10*. The finial being square in form, the sides are joined together at an angle of 90°, and the miter on the corner is simply a square return miter, for which the pattern can be developed by the short method in the following manner:

Place the stretch-out of the profile D upon the center line AB, which is extended below the elevation. At right angles to AB draw the measuring lines, which are inter-

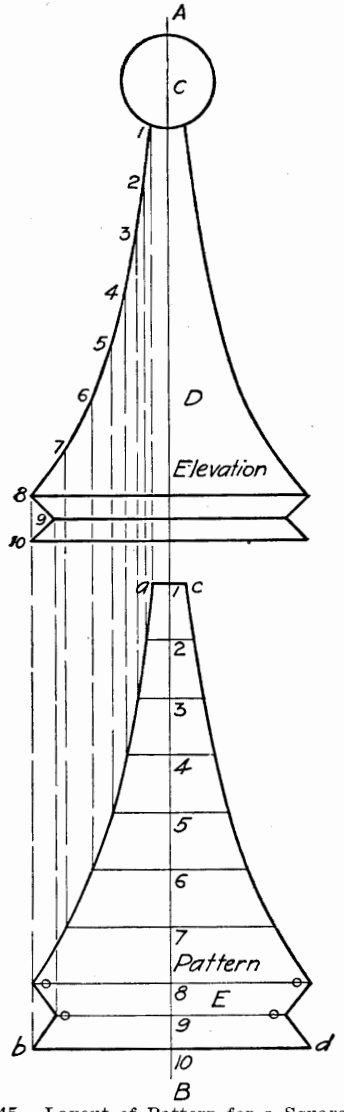

Figure 145.—Layout of Pattern for a Square Finial.

sected by lines drawn from similar numbered points in the elevation. Now, measuring from the center line, transfer these points to the opposite side of the pattern

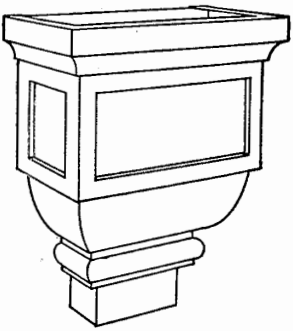

Figure 146.—Ornamental Conductor Head.

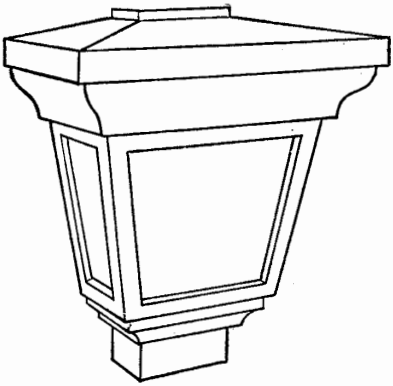

Figure 147.—Conductor Head with Inclosed Top.

by means of the dividers. Trace a line through the points thus obtained, completing the pattern for one side of the finial, shown by *abdc* at *E*.

Conductor Heads.—When a conductor pipe is used to drain a roof where the outlet extends through a parapet wall, the connection should be made by means of a conductor head. The object in using a conductor head is that if the down spout should become obstructed in any manner, the water will overflow from the conductor head, leaving the roof outlet clear, which will prevent the water from backing up and flooding the roof.

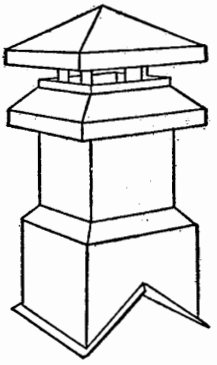

Figure 148.—Square Ventilator.

Figure 146 shows an ornamental conductor head having a flat back, the outer corners being mitered in the usual manner. Another form of head, having an inclosed top, is shown in Figure 147. There is no limit to the various designs that can be made at the pleasure of the workman.

The miters on the outer corners of the conductor heads shown in the illustrations are simply square return miters, and the patterns are developed by the short method described in the previous problem.

Square Ventilator.—The method of development used in obtaining the pattern for the roof finial, Figure 145, can also be applied in developing the patterns for the

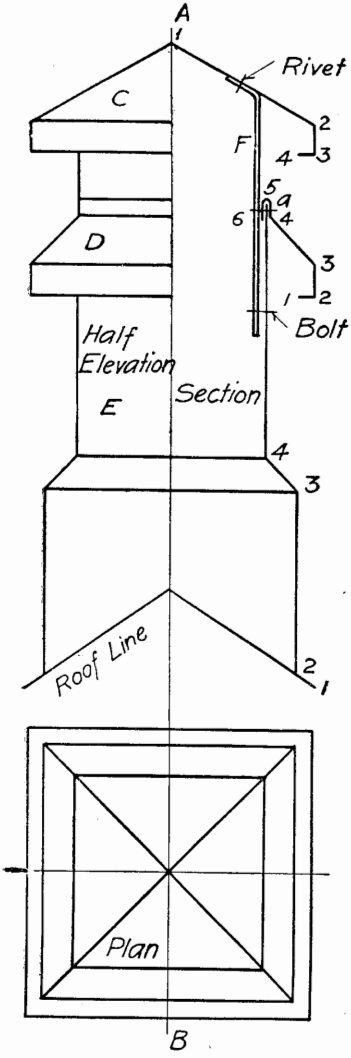

Figure 149.—Half Elevation, Section, and Plan of a Square Ventilator.

square ventilator shown in Figure 148. These ventilators are usually made from sheet copper or galvanized iron, and are largely used in skylight construction and ventilating work.

In Figure 149 is shown the half elevation, also the half sectional and plan view of a square ventilator, which is drawn to a scale of 3 inches to the foot. As in the preceding problem (Figure 145), the first step is to construct the proper elevation, but in actual shop practice the half sectional view is all that is required for the development of the different patterns. Let *C* represent the hood of the ventilator and *D* the flange, which is joined to the square base shown at *E*.

The half sectional view shows the profile of the different sections, also the method used in joining the flange and base, which is shown at *a*. The position of the band-iron brace used in connecting the hood and base of the ventilator is shown at *F*. After the full-size elevation has been drawn, omit the plan view, and develop the patterns for the hood, flange, and base of the ventilator by the short method shown in Figure 145.