Pan Corners
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The sheet metal worker is so often called upon to make all sorts of pans that a consideration of the different kinds of corners that can be formed will not be here out of place. The unprofessional workman, too, occasionally wants to make a pan to hold some odds and ends that are lying about the bench or shop, and he should find no trouble in forming the simpler kinds of corners as explained in this chapter.

The strongest kind of pan corner that can be formed is probably that known as a “double lap,” a sketch of which is shown, and also the pattern, in fig. 1. The pattern for one corner only is given, as the setting out for each corner will be exactly the same. On account of the double lap it will be seen that there are two thicknesses of sheet metal at the corner, one of the being turned inside the pan and the other outside. The only marking out that is necessary is to add the depth of the side on to the size of the bottom, the corner or diagonal line being cut along as indicated. It is a good plan to cut the points off the flaps as shown by the shaded part. If made of light tinplate, the flaps can be soldered down after the sides are bent up, and if of strong sheet iron, riveted as seen in the sketch. Without the iron is very strong, such as 16 or 14 gauge, there is no need to pound holes in the plate before bending as the rivets can be drawn right through with the upset.

In fig. 2 the same method of jointing the corners as just explained is followed; but in this an edge is folded over along the top of the pan and used for gripping the two flaps, besides strengthening the edge of the sides. If the edge is also left on the flaps, one can be turned under and the other over the side edges, as seen in the sketch. There is no need to rivet this corner, or even solder it, without the pan is required to hold a liquid.
Fig. 3 shows a pan corner that is formed by bending over a single lap and riveting. Allowance is made on the pattern for an edge to fold over all round the top of the pan. The corner of the plate will be cut away, as seen by the shaded part on the pattern. If the top of the pan is to be wired, it will be as well to notch the lap slightly larger, as seen by the dotted line. Holes for rivets, if required, will be punched in the plate, as shown on the pattern.

A pan with a knocked-up corner is illustrated in Fig. 4. In cutting the corner of the pattern, care should be taken that a single edge is allowed on one side, and a double edge on the other. If the pan is to be wired along the top edges then notice must be taken that the laps are properly notched before bending. If the knock-up is required to be on the inside of the pan instead of the outside, then the edges for the knock-up should be folded over in the reverse direction, so that the double edge will come on the inside of the pan.
The pan corner sketched in Fig. 5 shows the method of doubling up the sheet metal to form a solid, or what is sometimes call a “pig’s-ear” corner. If it is required to form a pan with the sides square to the bottom, without wire or edge around the top, then there will be no need to cut the pattern at all, the corner being formed by bending along the dotted lines, as shown on the pattern.

All the above methods of forming a pan corner are applicable to pans having sloping or tapered sides, the various allowances for jointing being put on after the net pattern is marked out, as explained below.

Tapered Pan with Solid Corners

This kind of pan shown in Fig. 6 is of the baking-tin order; but the method of forming the corners can be adopted in all cases where it is necessary to have a pan that will be liquid-tight at temperatures above the melting point of solder.

A pan may have an equal overhang all round, or its ends may overhang the bottom more or less than the sides do. We will set out a pattern for each case, taking a pan with equal taper for sides and ends first.

Suppose a pan is 12 in. by 9 in. at the top, 9½ in. by 6½ in. at the bottom, and 2 in. deep. The distance that the top projects over the bottom will be found by deducting the length of the bottom form the length of the top and dividing by two.

\[
\text{Overhang} = \frac{12 - 9\frac{1}{2}}{2} = 1\frac{1}{4} \text{ in.}
\]
To get the length down the side all we need do is to set out a right-angled triangle with height 2 in. and base 1 ¼ in.; the third side, or hypotenuse, will then give us the length down the side of pan. Or, without setting out the triangle, the required length can be calculated.

\[
\text{Side length} = \sqrt{2^2 + (1\frac{1}{4})^2} = 2\frac{3}{8} \text{ (nearly)}. 
\]

The size of the bottom is first marked out, and the side length added by marking A B on the pattern Fig.7 equal to a b on the triangle. The overhang is then set along the sides—that is, B C is marked off equal in length to b c. The points C C are joined up to A, and what we might call the net pattern is now complete; for if the piece C A C be cut out and the sides of the pan bent up the two lines A C, A C will coincide; hence, whatever method of forming the corner is adopted the allowance for jointing must be additional to the net pattern. In this case we want to keep the corner solid by doubling up the sheet to form a flap, which will be folded over on the end of pan. For the flap to turn over on the end and come flush with the top edge of pan, it is manifest that he angle of the flap must be equal to the angle of the end, and whatever construction is followed to obtain the cut of the corner is with the object of arriving at this result. Two methods can be used, and we will show both-one in this case and the other in connection with a pan of unequal overhang.

Again referring to Fig.7, bisect the angle C A C, which, in this case of equal overhang, is simply done by drawing the diagonal line A E. With centre A and radius A B, describe the arc of circle marked B D; then, if a line be drawn from C to touch the arc, the point F on A E will be determined, and thus the shape of the top of flap. To accurately draw the line C F, it is not a bad plan to take centre C and radius C B, and thus mark the point D on the arc; then join D to C, and so obtain F.
The allowance for wiring must be added on as shown, and if the sheet is fairly strong, it will be as well to cut the top of the flaps a little lower, and thus avoid the wiring being lumpy where it runs over the flaps.

To obtain the shape of the part to be cut away at the other three corners, without the trouble of marking each out separately, a good plan to follow is to cut out the shaded part as shown, and use this as a template to mark off the other corners.

**Pan with Unequal Tapering Sides**

Suppose it is required to make a pan whose dimensions are 19-½ in. by 13 ½ in. at top, 18 in. by 10 in. at bottom, and 2 in. deep. Then the overhang of the sides will be.

\[
\frac{13\frac{1}{2} - 10}{2} = 1\frac{3}{4} \text{ in.}
\]

And that for the ends

\[
\frac{19\frac{1}{2} - 18}{2} = \frac{3}{4} \text{ in.}
\]

The lengths to add on to the bottom for the sides and ends can be calculated as in the previous case, or obtained by setting out as in Fig.8.

Towlines are drawn square to each other, and the depth of the pan marked up, and the two overhangs along, the lengths of the side and end being obtained from the slant lines. On the pattern it will be seen that these lengths are set out by making \(AB = a\ b\) and \(AD = a\ d\).

The overhang of the side must now be put on to the end and the overhang of the end added to the side.

That is \(DC\) must be made 1 ¾ in. long and \(BE\) ¾ in. Now, if the setting out is done correctly so far, the lines \(AE\) and \(AC\) should be equal in length; hence this always gives a
check as to the correctness of the work. In bending up, it should be remembered that the lines A C and A E coincide to form the corner, so that for the top of the pan to be level for the part to be cut away. Bisect the angle C A E by describing two arcs of circles with equal radius from the centres E and C, intersecting in H, thus obtaining the line H A. Decide now whether the flap has to be folded on the end or side, for whichever it has to be turned on will fix the angle of the top line of the flap. In this case the flap is arranged to be folded over on the end. With centre C, and any convenient radius, describe the arc P O N, then cut off O N equal to O P by drawing an arc with O as centre and O P as radius. Join C to N, and produce the line until it cuts A H in F. Join E to F, and thus the part to be cut away is determined. If the flap is to be folded on to the side of pan, then a similar construction will have to be gone through, commencing with point E. This is shown in dotted lines.

It will be seen that in the case of a pan of unequal taper the shape of the corner cut on the pattern depends upon whether the flap is to be turned over on to the side or the end, and if cut to suit one will not fit on the other. The shaded part on the pattern can be used for a template to mark the other corners, as in the previous case.

**Double-Flap Solid Corner**

A pan whose sides are square or tapered may have its corner formed by a double flap, as shown in Fig.9. This is no stronger than the single flap Fig.5, but gives a little better appearance to the pan, and is more conveniently made by machinery.

The setting out of the pattern is very similar to Fig.7. The overhang D C (Fig.9) is first measured down and the angle A O C divided into four equal angles by dividing the arc K M into four equal parts and drawing the lines O N, O b and O F. The length O B is next cut off equal to O C. The compasses are then fixed at O, stretched out to D, and the arc D E drawn; the point E being determined by cutting off C E (as shown by the arc D P E) equal to C D. A straight line is drawn from C to E, and where this intersects the line O F will give the point H. To finish, the line O R is made equal in length to O H.

For a pan with unequal tapering sides the construction would be a little different, but from what has been said in connection with Fig.8 there should be no difficulty over this. After the four corners of the sheet are cut,
the bisecting line of the corner should be placed on the hatchet stake, as shown in Fig 10, and the sheet bent down on each side. Then the sides and ends should be turned down on a square head or pan stake, as seen in Fig 11, care being taken that the bottom is kept at its proper size, and that its edges are straight. On the same stake the corner flaps can be closed together Fig. 12; the greatest care being exercised that the flaps double up along their centre lines. They should now be slightly bent over on the hatchet stake. The hammering down of the flaps will be done as seen in Fig. 70, and as this is the crucial test of the quality of the sheet metal, and of the operator’s skill, some judgment must be exercised in the hammering, or the flap will fracture near the root. To assist in avoiding the breaking of the metal, it should be seen that the flap is fairly well closed together near the root, before proceeding to turn it over. In light sheet metal the mallet must be used carefully, as there is the danger also of the corner of the hatchet or pan stake cutting through the metal.

For wiring, the edge of the sheet can be bent over the hatchet stake and the wire slipped in and tucked by the use of the mallet and hammer on the pan stake.
Pan with Moulded Sides

The making up of a pan with moulded sides, as shown in Fig.14, is not a difficult matter if the pattern for the cut corner is marked out as accurately as possible. This can be done as seen in Fig.15.

For a square or rectangular-shaped pan (Fig.14), there is a special method which we will show first and then afterwards explain a general method that will apply to all cases for pans of the regular polygon shape, such as hexagonal, octagonal, etc.

In all cases the first thing to do is to set out the shape of the moulding (Fig.15), and divide the curved parts up into a number of equal divisions.

The pattern for the corner of a square or rectangular pan can be marked out by first drawing two lines at right angles, and setting along each of these the girth of the moulding by taking the lengths of the numbered parts on the moulding section. Lines square to the girth lines are then drawn from each numbered point, and the length of these cut off equal to that of the line drawn through the same numbered point on the moulding section up to the measure line. Thus, to give one example, the line marked 66 on the pattern will be the same length as the line 66 on the moulding shape. When all the required distances are marked along the pattern lines, the points are carefully joined up, and thus the corner-cut obtained. It should be observed that any part of the moulding section which is straight will also have straight lines corresponding to it on the corner-cut of pattern.

The general method will apply to all cases, no matter how many sides the pan has or what is the shape of the moulding. It consists in drawing a base line (Fig.15), and setting off a joint line at an angle equal to $360^\circ$ divided by twice the number that the pan has sides. Thus, if the pan has four sides, as in the above case, the joint line will make an angle of $45^\circ$ with the base line. To cut off the pattern lines to their required lengths, they will be made equal to the lengths of the correspondingly numbered lines running between the base and joint lines.
All the joint lines for pans having from four to ten sides are shown in Fig. 15, and also the shape of cut for the end of one side of an octagonal pan. This being eight-sided, the angle of joint line will be 22.5°.

$$\frac{360}{8 \times 2} = \frac{45}{2} = 22\frac{1}{2}^\circ$$

The lines are measured between base and joint, and their lengths set up from the girth line on pattern, the thick dotted line thus representing the cut for one side of an octagonal pan. In setting out the pattern for a complete pan of this description, the best plan to follow is to first mark out the shape of the bottom, set along the girth, and then proceed to obtain the shape of corner-cuts as explained above.

In shaping the sides of a moulded pan to the required form, it is necessary to be as accurate as possible, if the edges of the moulding are to fit together properly at the corners.