(No Model.) 2 Sheets—Sheet 1.

A. W. PAULL & G. F. BUTTERS.

DRAWING SHEET METAL ARTICLES.

No. 344,457. Patented June 29, 1886.

Fig. 3.

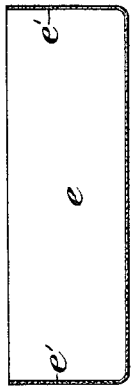

Fig. 4

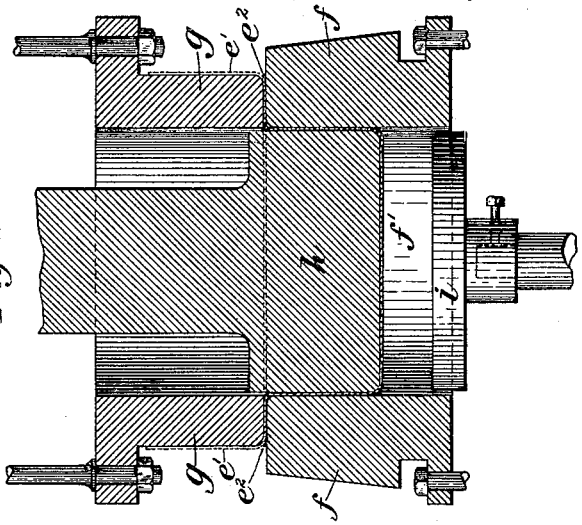

Fig. 1.

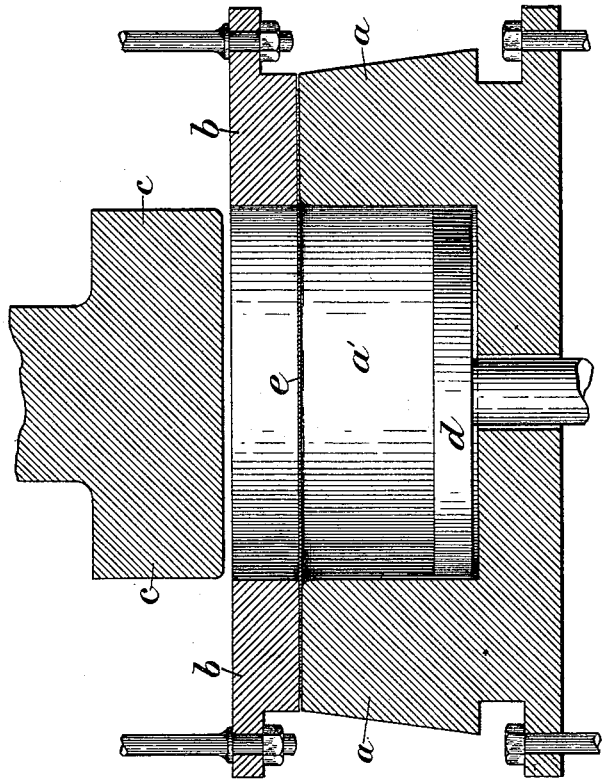

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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DRAWING SHEET METAL ARTICLES.

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Fig. 6.

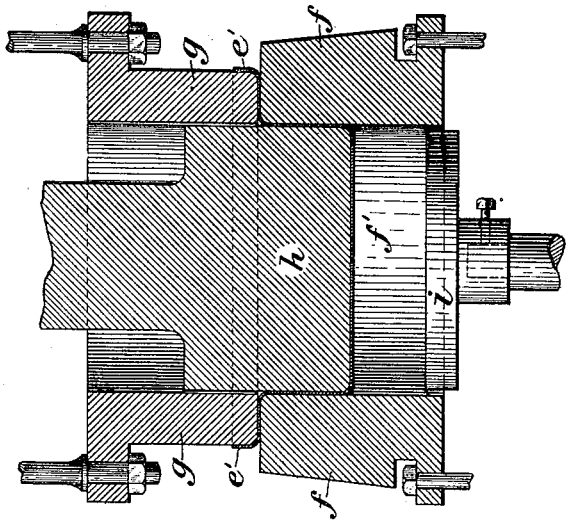


Fig. 5.

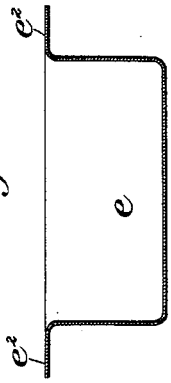
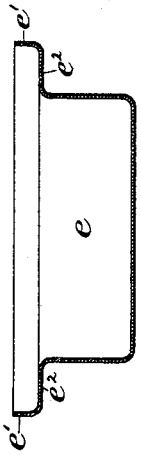


Fig. 7.



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UNITED STATES PATENT OFFICE.

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DRAWING SHEET-METAL ARTICLES.

SPECIFICATION forming part of Letters Patent No. 344,457, dated June 29, 1886.

Application filed April 23, 1886. Serial No. 199,902. (No model.)

To all whom it may concern:

Be it known that we, ARCHIBALD W. PAULL and GEORGE F. BUTTERS, of Wheeling, in the county of Ohio and State of West Virginia, have invented a new and useful Improvement in Drawing Sheet-Metal Articles; and we do hereby declare the following to be a full, clear, and exact description thereof.

The object of our improvement is the production of deep cup-shaped articles of sheet metal having a horizontal flange without seam or joint, by drawing the same from a flat blank or piece of sheet metal.

To enable others skilled in the art to make use of our invention, we will now describe it by reference to the accompanying drawings, in which—

Figure 1 is a vertical section of the dies and plunger by which the first step of our improved method is effected. Fig. 2 is a view of the blank of sheet metal. Fig. 3 is a view of the same after being acted upon by the dies and plunger shown in Fig. 1. Fig. 4 is a sectional view of the dies and plunger for performing the second step of our improved method. Fig. 5 is a view of the blank after being acted upon by the dies and plunger shown in Fig. 4. Fig. 6 is a view of a set of dies and plunger performing the same operation as that performed by those in Fig. 4 in the production of a cup-shaped article having a wide horizontal flange with a vertical flange at the outer edge of the blank, as shown by Fig. 7.

Like letters of reference indicate like parts wherever they occur.

In Fig. 1, *a* indicates the die, which is placed on a suitable bed-plate; *b*, the clamp or holding ring; *c*, the plunger, and *d* the vertically-moving bottom of the die, the purpose of which is to raise the article, so that it can be removed from the die.

The die, clamping-ring, and plunger are mounted in the usual way in the ordinary drawing-press, and separate movements are given to the clamping-ring and plunger by means of cams on a shaft mounted above in the frame of the machine. so that when the blank *e* is placed upon the upper surface of the die *a* over its cavity *a'*, the clamping-ring *b* shall first descend and clamp the edge of the blank, as shown in Fig. 1. The plunger *c* then descends and forces the blank down into the die-cavity *a'*, drawing its edge from between the clamping-faces of the die *a* and ring *b*, and giving it the cup shape shown in Fig. 3. The plunger and ring are then raised, and the flanged blank is discharged from the die by means of the vertically-moving bottom *d* the usual way. This operation constitutes the first step of our improved method, being the same as is practiced in drawing-presses of this description.

Owing to the fact that it is necessary to clamp the entire surface of the edge of the blank which is to form the flange *e'*, in order to prevent the material from buckling, it is possible to form only a shallow cup, because, if the surface of the blank which is clamped is wide, the friction is so great that the plunger will tear or punch out the thin sheet metal. On the other hand, if a narrow clamping-ring is used, and the edge of the blank projects beyond its outer side, such projecting edge will buckle as soon as the drawing pressure of the plunger is exerted upon the metal blank, and this buckle will prevent the metal from being drawn from between the clamping-surfaces, and will cause the thin sheet metal to tear or be punched out by the plunger. The blank shown in Fig. 3 is then submitted to the operation of the dies and plunger shown in Fig. 4, which are shown in the position they occupy when the plunger has completed its stroke. In this figure, *f* indicates the die, *f'* the die-cavity, *g* the clamping-ring, *h* the plunger, and *i* the vertically-moving discharging-bottom of the mold.

The position of the blank when placed on the die *f* is shown by dotted lines, and its position and form at the completion of the stroke of the plunger *h* are shown in full lines.

The die, plunger, and ring are used in an ordinary press, as described with reference to the construction shown in Fig. 1. The clamping-ring *g* first descends, enters the cup-shaped blank, and clamps the outer circle of its unflanged portion on the surface of the die *f*

around the cavity f', while the flange e' extends up parallel to the side of the ring, and is not clamped, but free. The plunger h then descends upon the central portion of the blank and forces it down into the cavity f', drawing the metal from between the clamping-faces of the die f and ring g. This movement of the blank draws the flange e' down, reducing its height around the corner of the ring g and between the clamping-faces of the die f and ring g. The length of movement of the plunger h will depend upon the width which is desired to be given to the horizontal flange e^2. When the metal is drawn to this extent, the downward movement of the plunger ceases. The plunger h and ring g are then retracted, and the article is discharged from the mold by means of the vertically-moving bottom i. The result of this operation is a drawn thin sheet-metal blank, having a deep cup, e, and a horizontal flange, e^2, as shown in Fig. 5. Such a blank has not, to our knowledge, been before drawn out of thin sheet metal.

In Fig. 6 we show a set of dies and plunger similar to those shown in Fig. 4, illustrating the operation of producing a blank having a deep cup, a horizontal flange, and a vertical flange at the outer edge of the horizontal flange, as shown in Fig. 7. The operation is the same as that described with reference to Fig. 4; but the downward movement of the plunger h is arrested before the flange e' is entirely drawn between the clamping-faces of the die f and the plunger g.

The articles thus produced can be used in the manufacture of pans, basins, and similar articles. Usually the flange e^2 is used for the purpose of wiring and giving a finish to the edge of the article.

The blank shown in Fig. 7 may be used in forming lantern-feet and reflectors and other shapes, which can be given it in a drop or other press.

Heretofore such articles have been made of several pieces soldered or seamed together. Our method enables us to produce such articles rapidly and cheaply in one piece.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The method of making deep cup-shaped articles of sheet metal having a horizontal flange without seam or joint, which consists, first, in drawing a blank of thin sheet metal into a cup shape, and then clamping the edge of the unflanged portion and forcing the central unclamped portion into a die, thereby forming a cup, and drawing the metal from between the clamping-faces until the vertical flange of the first cup is drawn down between the clamping-faces into a horizontal flange extending out from the edge of the cup, substantially as and for the purposes described.

2. The method of making cup-shaped articles of sheet metal having a horizontal flange on the cup and a vertical flange on the horizontal one, which consists, first, in drawing a flat blank of thin sheet metal into a cup shape, and then clamping the edge of the unflanged portion and forcing the central unclamped portion into a die, thereby forming a cup, and drawing the metal from between the clamping-faces until the flange of the first cup is reduced to the height of the desired outer vertical flange, substantially as and for the purposes described.

In testimony whereof we have hereunto set our hands this 25th day of February, A. D. 1886.

ARCHIBALD W. PAULL.
GEORGE F. BUTTERS.

Witnesses:
W. B. CORWIN,
THOMAS B. KERR.