No. 873,297. PATENTED DEC. 10, 1907.

R. CHILLINGWORTH.

PROCESS OF PRODUCING HOLLOW SHEET METAL ARTICLES.

APPLICATION FILED AUG. 15, 1900.

2 SHEETS—SHEET 1.

Fig. I

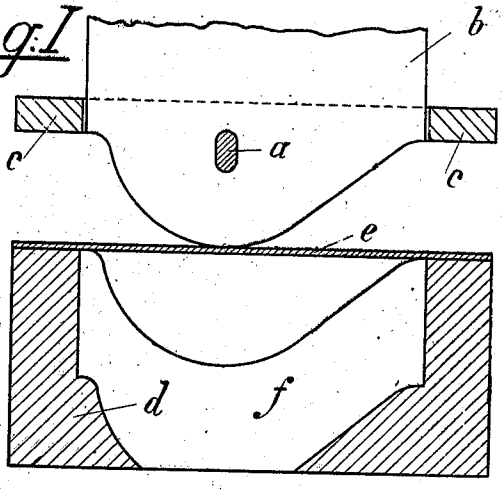


Fig. II

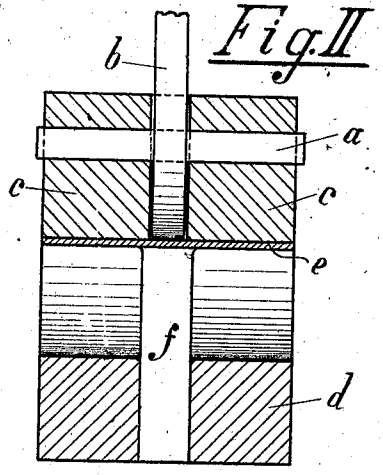


Fig. III

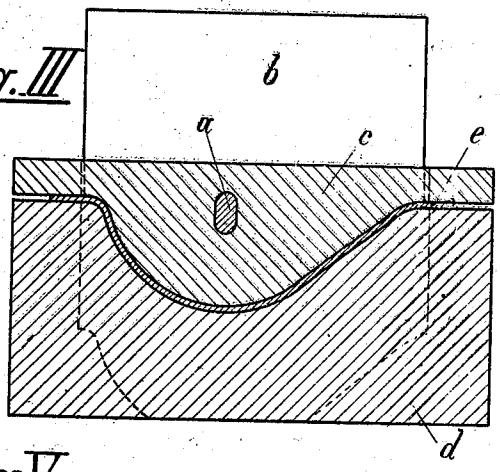


Fig. IV

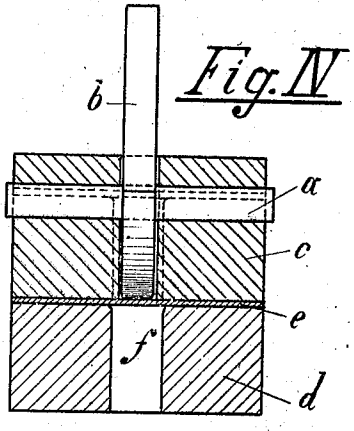


Fig. V

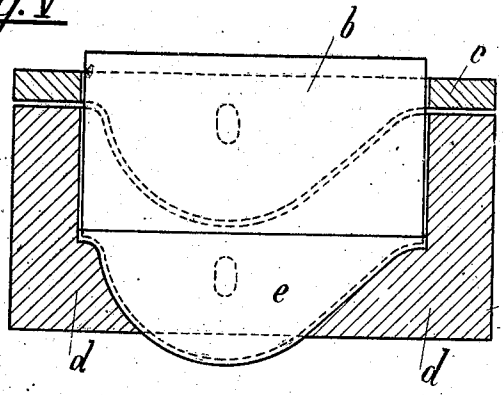
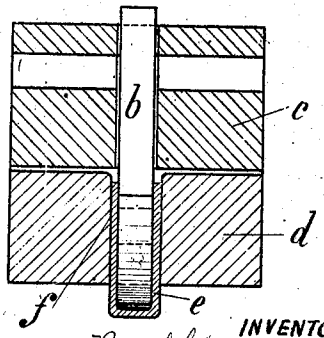


Fig. VI



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APPLICATION FILED AUG. 15, 1900.

2 SHEETS—SHEET 2.

Fig. VII

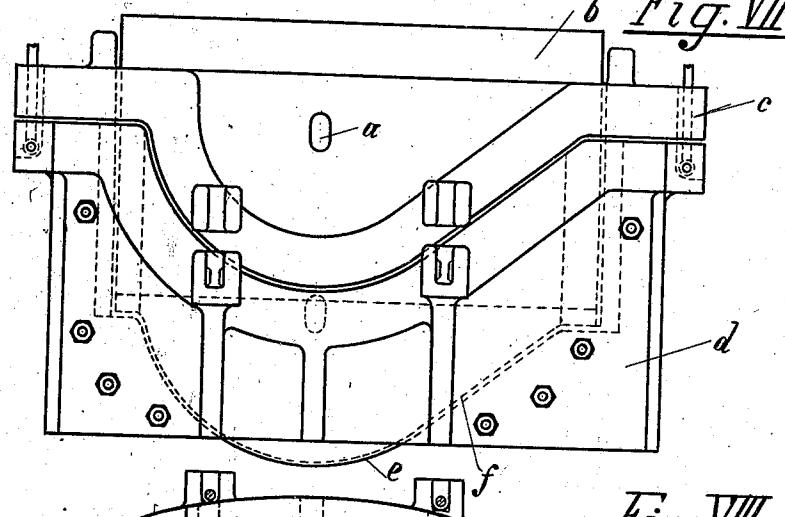


Fig. VIII

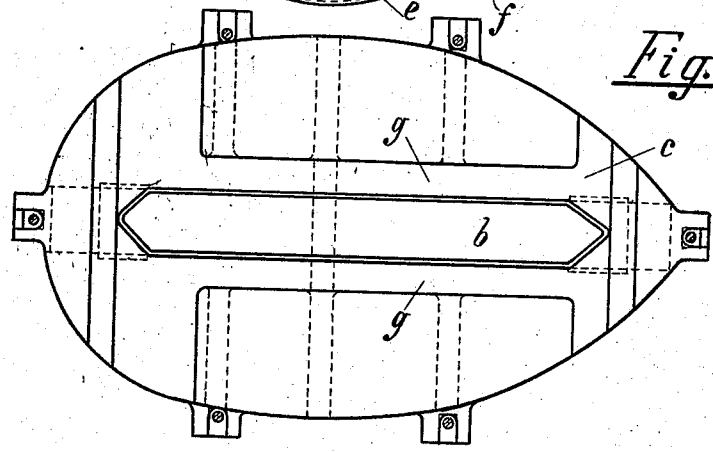
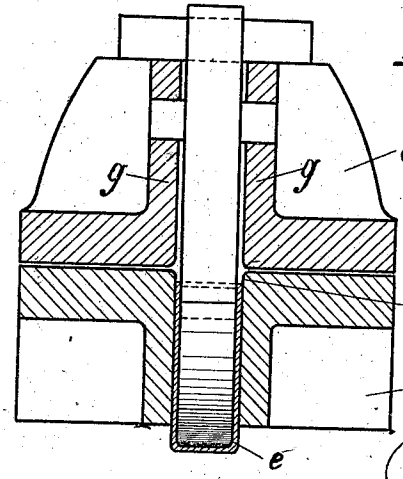


Fig. IX



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RUDOLF CHILLINGWORTH, OF NUREMBERG, GERMANY.

PROCESS OF PRODUCING HOLLOW SHEET-METAL ARTICLES.

No. 873,297. Specification of Letters Patent. Patented Dec. 10, 1907.

Application filed August 15, 1900. Serial No. 26,905.

To all whom it may concern:

Be it known that I, RUDOLF CHILLINGWORTH, a subject of the German Emperor, residing at Nuremberg, Kingdom of Bavaria, Germany, have invented Improvements in Processes for Producing Hollow Sheet-Metal Articles, of which the following is a description.

This invention relates to an improved method or process of producing shell or trough shaped cases or articles of sheet metal and consists in first bending a sheet of metal without drawing or stretching the same, and thereafter subjecting the sheet to a drawing or stretching action until it is brought into the shape of the desired article.

The apparatus for carrying out the invention consists of a matrix which is open on two opposite sides and the cross section of which is formed like the bottom of the case to be produced; it consists further of a matrix or die shaped correspondingly and composed of two parts. The matrix has, at least the same width as that of the sheet to be used for producing the case, and the surface-lines standing perpendicularly with respect to the middle plane of the matrix are rectilinear. In the matrix is also provided a recess having the same shape, width and depth as the metal article to be produced. The parts forming the die are arranged adjustably within each other, however they may also firmly be connected with each other. The inner adjustable part has the size of the hollow space of the case to be produced and fits into the cavity of the matrix. Such an apparatus is shown in the accompanying drawings, in which,—

Figure I is a sectional elevation. Fig. II is a transverse section, showing the parts in the position assumed at the beginning of the operation. Figs. III and IV are views similar to Figs. I and II respectively showing the parts in position assumed at the completion of the preliminary bending. Figs. V and VI are similar views respectively showing the position of the parts assumed after the completion of the article. Fig. VII an elevation of a modification. Fig. VIII a plan view of the same, and Fig. IX a transverse section.

The die consists of two parts "*b*" and "*c*" connected with each other by means of a bolt *a* or the like. Said parts are placed perpendicularly above the matrix *d* and form, jointly, with their lower surfaces the matrix which serves for the preparatory pressing of sheet *e* (Figs. I and II). Sheet *e* placed on the upper edge of the matrix, is pressed by die *b*, *c*, when the latter descends into the matrix and is there shaped like the latter (Figs. III and IV).

As can be seen, especially from Figs. I and II the matrix has in its center a downward projecting recess *f* which serves after the preparatory pressing of the sheet, as a draw-opening and into which fits, accurately, central part *b* of the die which part must be separated from die *c* after bolt *a* has been removed. Therefore, the outer die *c* remains in its position, while the central part *b*, which acts now as a draw-die, is moved further downward and draws sheet *e* out in the form of a shell corresponding to the shape of the die and of the draw-opening (Figs. V and VI).

The apparatus represented in Figs. VII to IX consists of the two parts *b* and *c* forming the die, said parts being connected with each other by means of bolt *a*. The matrix *d* consists of two molds which are reinforced by ribs and screwed together and which inclose between each other the draw-opening *f*. Said matrix shows, like the outer part *c* of the die and like the metal sheet which has to be transformed, an oval outline so that when the sheet metal is, at first, made to undergo a preparatory pressure and then drawn, a shell is obtained the upper edge of which lies about horizontally. The outer part *c* of the die is further provided with guide-ribs *g* for the draw-die and carries on its circumference several projecting nose-pieces into the recesses of which engage the guide-bolts provided on the circumference of matrix *d*.

The mode of producing cases by means of the new process is the following: In the first place, the metal sheet is subjected in the hollow mold or matrix to a preparatory bending only in such a manner that it is bent only in the vertical plane so that the surface-lines standing perpendicular with regard to a transverse plane are straight or rectilinear. Thereupon the middle piece, which retains its form unchanged, is pressed down in a second working operation, and after bolt *a* has been removed into the recess of the matrix by means of the adjustable part *b* of the die; those parts adjoining the middle-piece laterally being hereby pressed into the aperture, they are bent upwardly and constitute then the parallel sides of the metal case.

The present process has important advan-

tages over those processes heretofore known to me. When this process is used it is possible to avoid the occurrence of cracks in the sheet metal during the pressing and drawing. The worked piece being pressed, at first, only in a vertical plane, it is thereby not subjected to any strain which might cause cracks. Considering, further, that the piece prepared during the first working operation is bent up, during the drawing, solely around the edges of the draw-die, this operation also does not present any danger of the sheet being torn.

I claim as my invention:—

The hereindescribed method of forming trough shaped articles of sheet metal which consists in first bending the entire sheet of metal into the curved form of the curved part of the finished article so that all surface lines perpendicular to a transverse plane are straight or rectilinear, sustaining a portion of said curved part of the finished article, and simultaneously drawing the remainder of the blank so that all surface lines are parallel to each other and to the transverse plane, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

RUDOLF CHILLINGWORTH.

Witnesses:

GEORG SCHMIDT,

CONRAD WÖRNER.