

(No Model.)

4 Sheets—Sheet 1.

A. W. PAULL.

DRAWING CORRUGATED CUPS OF SHEET METAL.

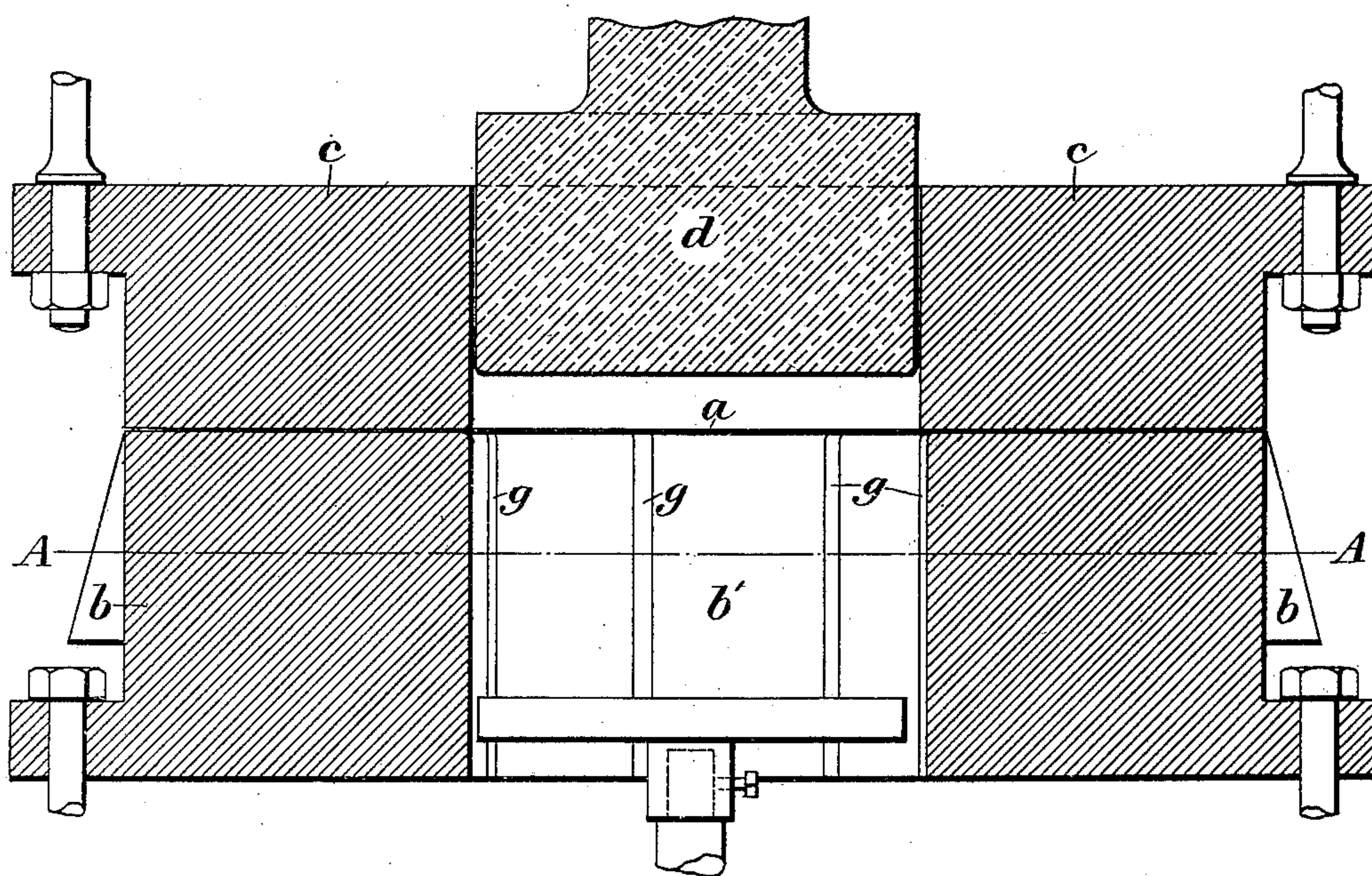
No. 353,426.

Patented Nov. 30, 1886.

*Fig.1.*

*a*

*Fig.2.*



*Witnesses.*

*A. L. Gill*

*W. H. Corwin*

*Inventor.*

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*By his attys*

*Bakerwell & Kerr*



(No Model.)

4 Sheets—Sheet 2.

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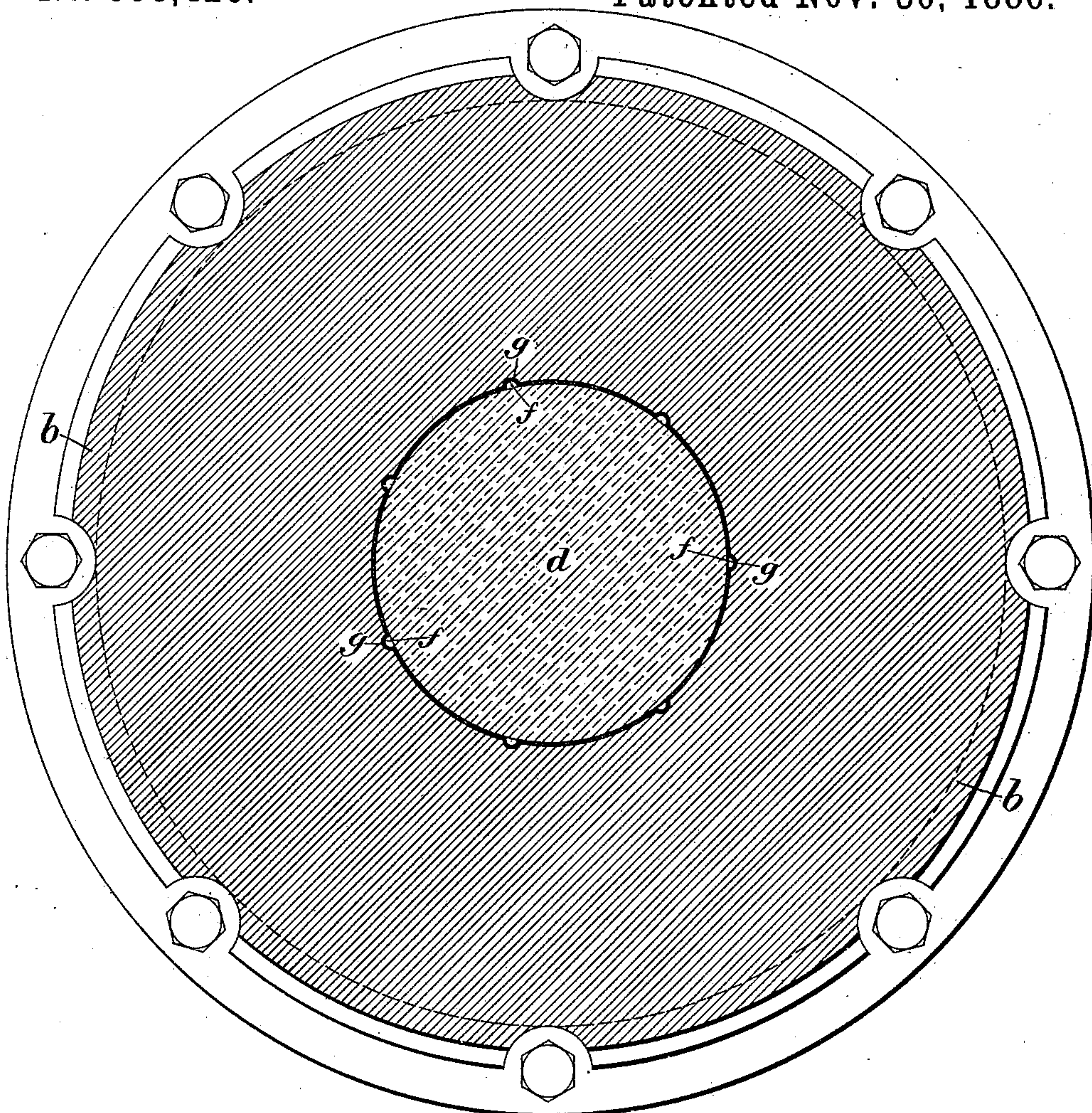


Fig. 3.

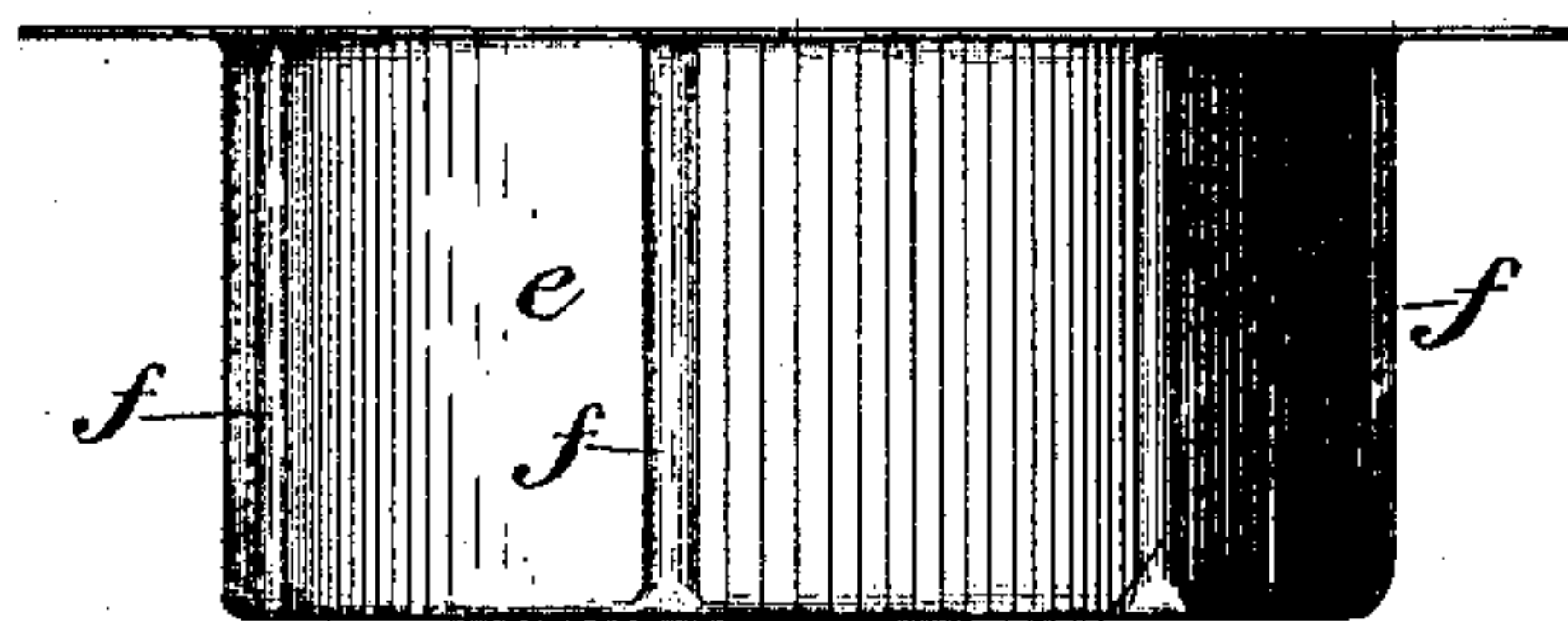


Fig. 4.

Witnesses

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*Parkwell & Sons*



(No Model.)

4 Sheets—Sheet 3.

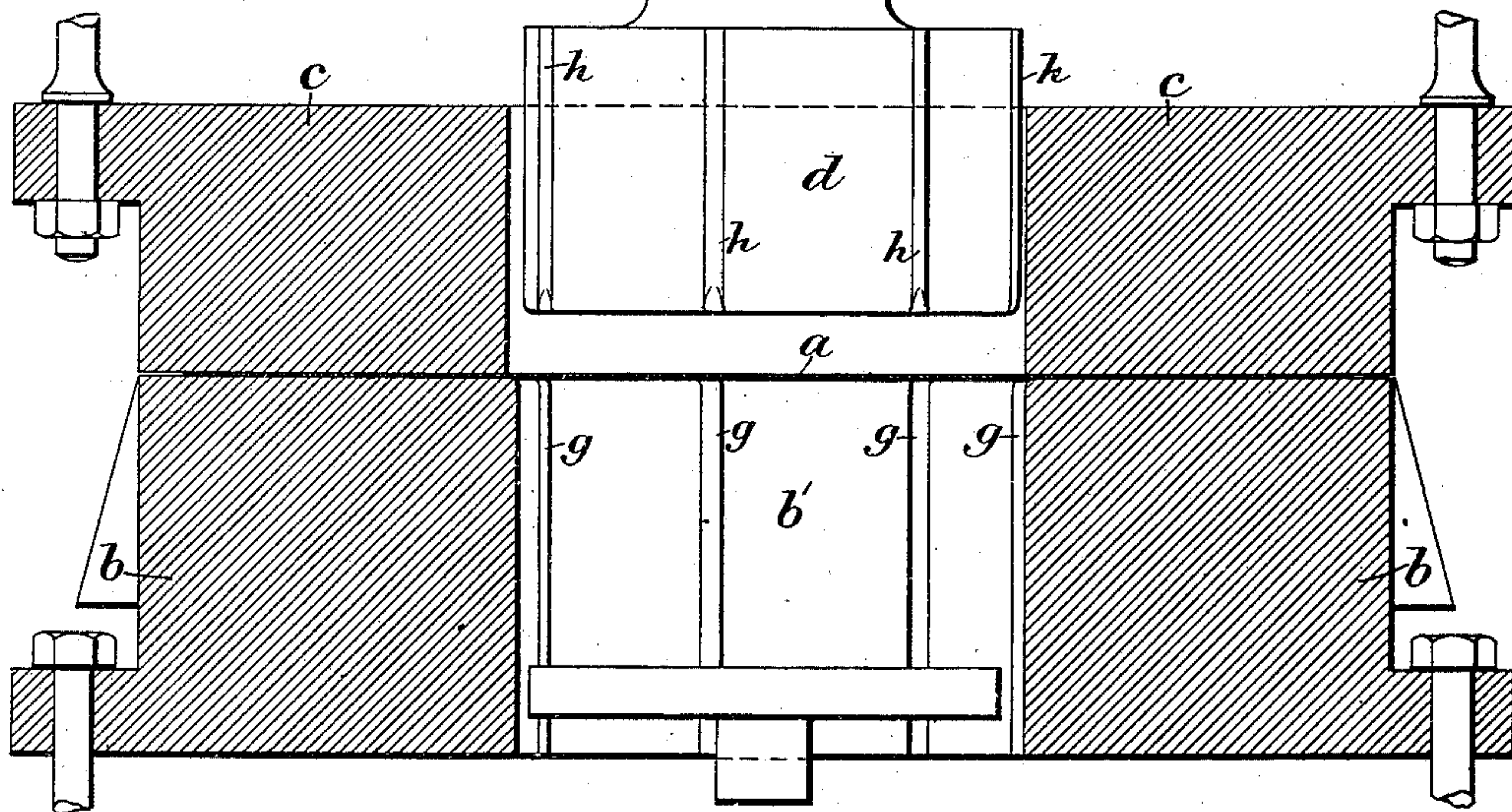
A. W. PAULL.

DRAWING CORRUGATED CUPS OF SHEET METAL.

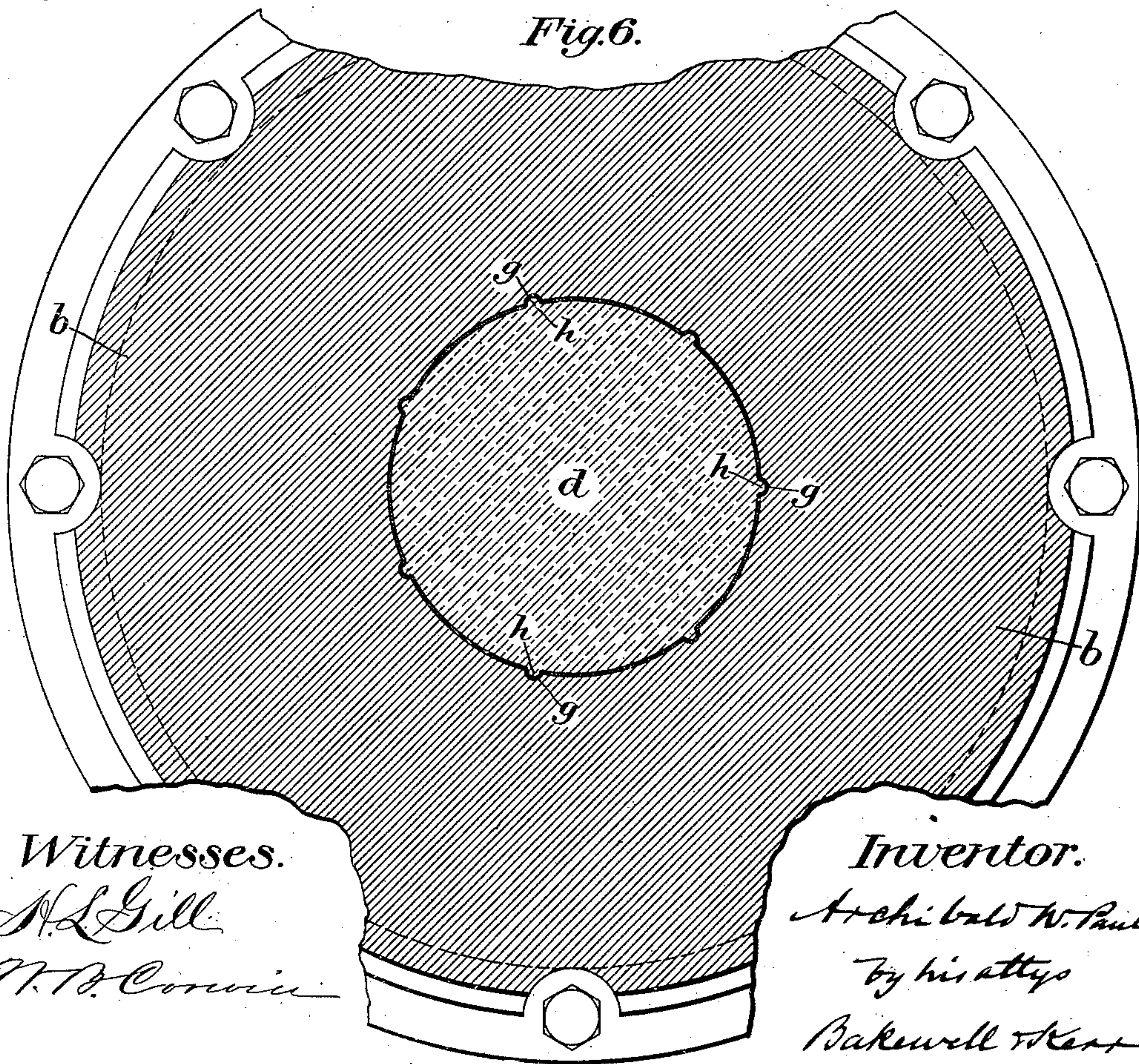
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*Fig. 5.*



*Fig. 6.*



Witnesses.  
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(No Model.)

4 Sheets—Sheet 4.

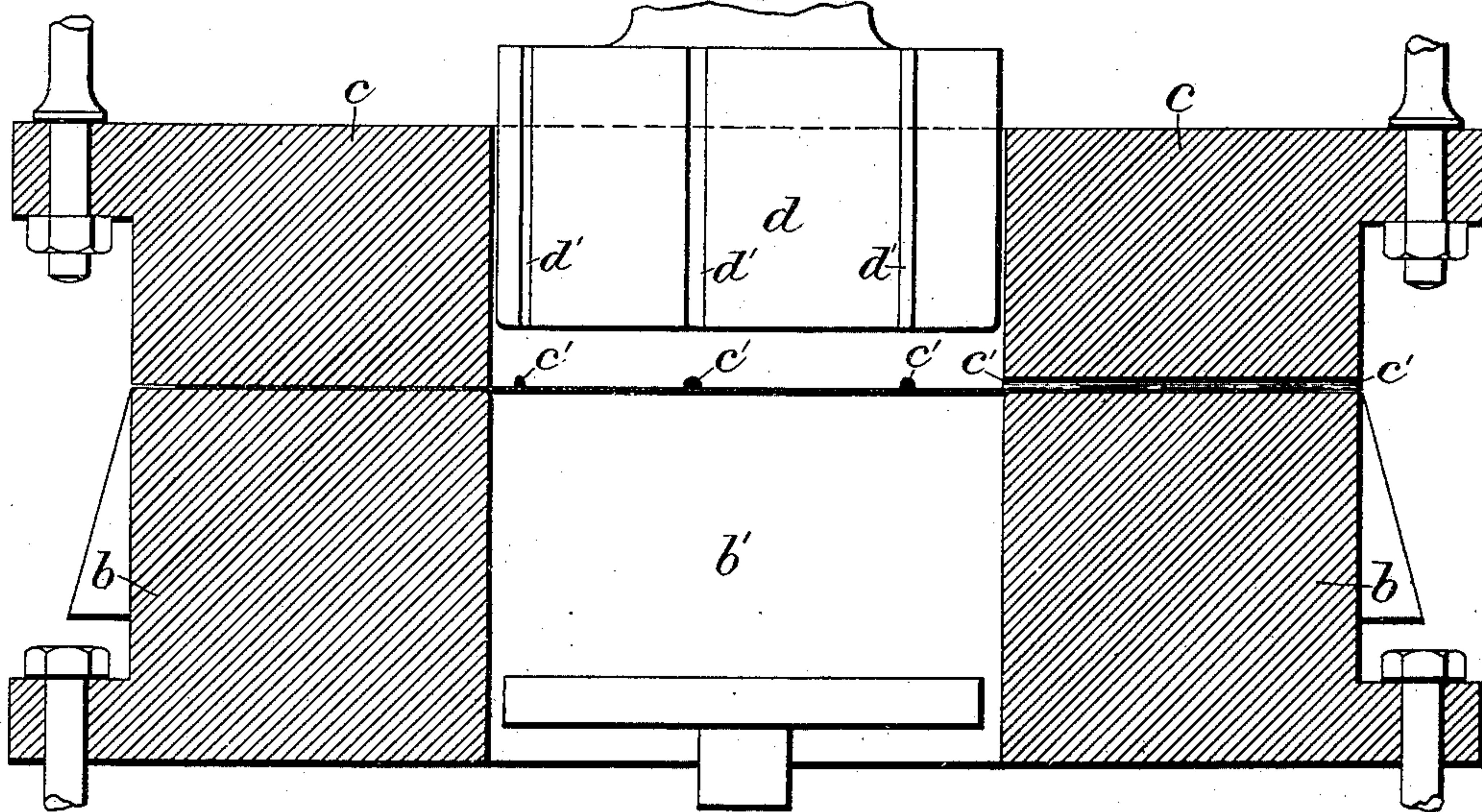
A. W. PAULL.

DRAWING CORRUGATED CUPS OF SHEET METAL.

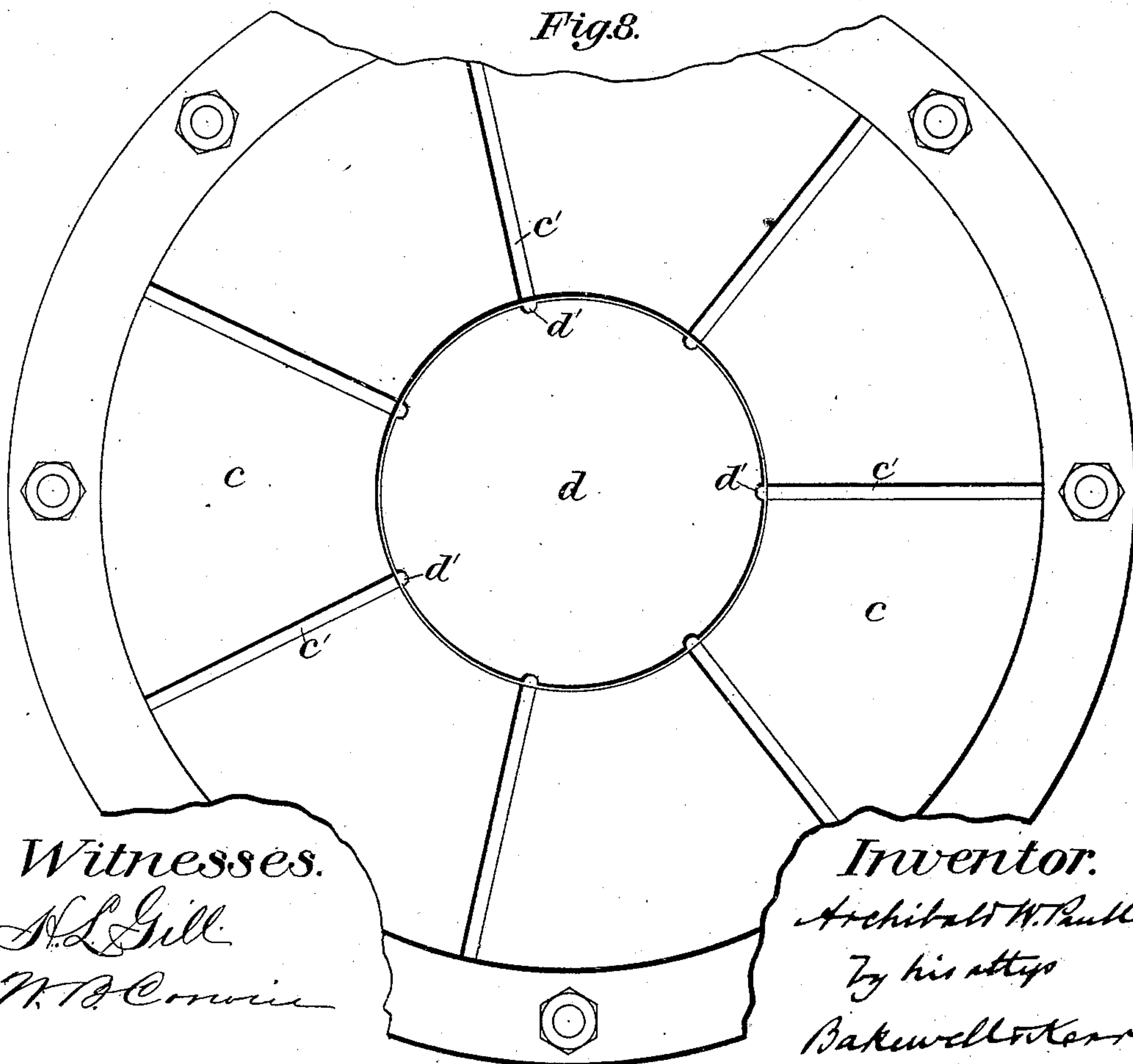
No. 353,426.

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*Fig. 7.*



*Fig. 8.*



*Witnesses.*  
*N. L. Gill*  
*N. B. Corwin*

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*Archibald W. Paull*  
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# UNITED STATES PATENT OFFICE.

ARCHIBALD W. PAULL, OF WHEELING, WEST VIRGINIA.

## DRAWING CORRUGATED CUPS OF SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 353,426, dated November 30, 1886.

Application filed August 16, 1886. Serial No. 210,966. (No model.)

*To all whom it may concern:*

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

My invention consists in an improved method of and means for forming sheet-metal articles with longitudinal ribs, grooves, or corrugations.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying drawings, in which—

Figure 1 is an edge view of the blank to be drawn and corrugated. Fig. 2 is a vertical section of a die, ring, and plunger. Fig. 3 is a horizontal section on the line A A of Fig. 2, but with the plunger depressed. Fig. 4 is a view of the blank after being acted on by the machine shown in Figs. 2 and 3. Figs. 5 and 6 are vertical and horizontal sectional views of a modification of the machine. Fig. 7 is a cross-section of another modification of the machine. Fig. 8 is a bottom view of the clamping-ring and the plunger shown in Fig. 7.

Like letters of reference indicate like parts in each.

In making a cup-shaped article of sheet metal by the drawing process, a flat blank, *a*, usually of circular shape, is used. This blank is clamped firmly over the cylindrical cavity or matrix *b'* of a die, *b*, of an ordinary drawing-press by means of a clamping-ring, *c*, and while thus held is acted on by a plunger, *d*, which, descending upon the middle portion, forces it down into the matrix *b'*, drawing the clamped edge to a greater or less extent from between the clamping-faces into the die. This operation transforms the wide flat blank *a* into a cup, *e*, of much less diameter. The tendency of the metal during the process of thus contracting its diameter is to fill out, or rather to be contracted no more than the die-surface compels it. I have found that if a longitudinal groove is formed in the matrix of the die the metal will fill it, and thus produce a longitudinal bead or rib, *f*, on the side of the cup.

Taking advantage of this tendency, I use it to make a longitudinally-corrugated ribbed or grooved cup by making any desired number of grooves *g* in the surface of the die *b*. Then, when the plunger *d* forces the blank *a* down into the matrix *b'*, the metal fills the grooves *g*, and the result is a longitudinally-ribbed cup, *e*. By making the grooves *g* close enough a cup having closely-connected corrugations may be produced.

Any desired number of the ribs *f*, from one upward, can be made in the cup.

It is apparent that instead of making grooves *g* in the die, I can produce practically the same effect by making ribs—that is, I produce grooves in the cup, instead of ribs on it, the surfaces between such grooves being merely ribs of greater or less width. In the cases just described the surface of the plunger *d* is smooth. This, however, is not necessary, because, as shown in Figs. 5 and 6, the plunger may be shaped to conform to the opposed surface of the die *b*. In this instance the plunger *d* has ribs or beads *h*, or grooves, as the case may be, which are counterparts of the grooves *g*, or ribs on the surface of the die. This form of plunger will draw the metal over the grooved or ribbed surface of the die *b*, and will not interfere with the formation of grooves or ribs on the article.

In Figs. 7 and 8 I show how the vertical surface of the die *b'* may be plain, and the ribbed, grooved, or corrugated shape be imparted to the cup by the ring. In this instance the under surface of the clamping-ring *c* is ribbed or grooved, as at *c'*, and the surface of the plunger *d* is correspondingly formed, as at *d'*, so that the grooves, ribs, or corrugations which are imparted to the metal by drawing it from the under surface of the ring *c* may be preserved when it passes between the faces of the die and plunger. By this means longitudinal ribs, beads, or corrugations can be imparted to drawn sheet-metal cups. These cups can, if desired, be made with a flange of greater or less diameter by stopping the plunger at the proper point, or they may be made without flanges. The corrugations strengthen and ornament the article and are useful for other purposes.

The article produced can be used as a uten-



sil, or as a packing-case for putting up various articles of merchandise, or as a blank in the manufacture of other articles.

5 If a deep cup is desired, the method described in Letters Patent No. 343,390, granted on June 8, 1886, may be used, such part of the apparatus therein as may be necessary to the particular purpose of this case being constructed in accordance herewith.

10 In such case the corrugating should be done at the last drawing, when the press is working on the cup-shaped blank, as otherwise the corrugations may be obliterated.

What I claim as my invention, and desire to 15 secure by Letters Patent, is—

1. The method of making longitudinally grooved, ribbed, or corrugated sheet-metal

cups, which consists in drawing the same in a die over a grooved, ribbed, or corrugated surface, substantially as and for the purposes described. 20

2. The combination, in a drawing-press, of a die having a cylindrical matrix, a clamping-ring, and a plunger provided with a ribbed, grooved, or corrugated surface over which the 25 metal is drawn by the action of the plunger, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 21st day of June, A. D. 1886.

ARCHIBALD W. PAULL.

Witnesses:

W. B. CORWIN,

THOMAS B. KERR.