

(No Model.)

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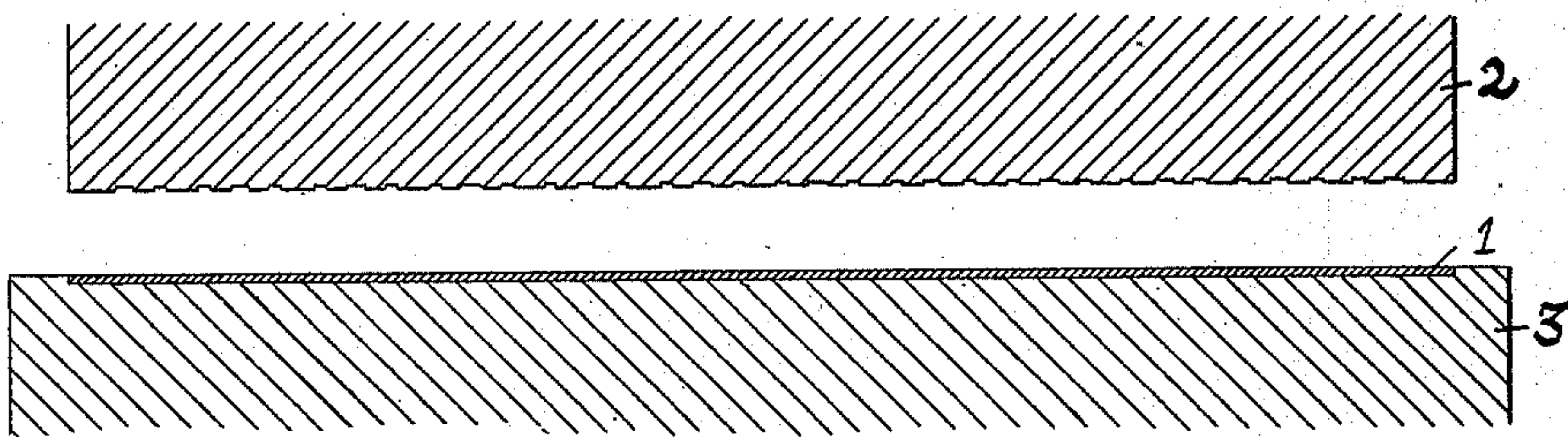
A. W. PAULL.

ART OF FORMING SHEET METAL ARTICLES.

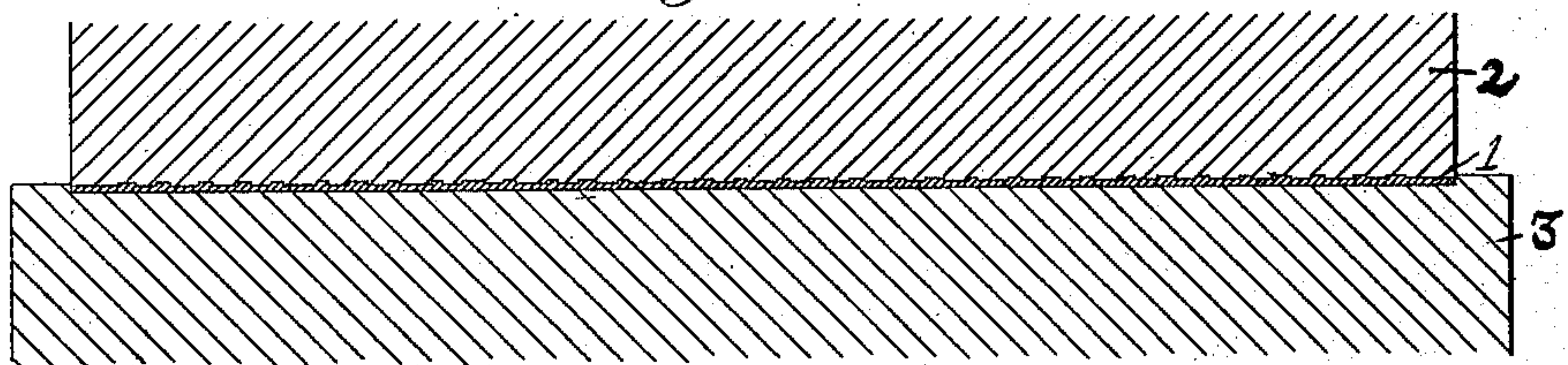
No. 413,374.

Patented Oct. 22, 1889.

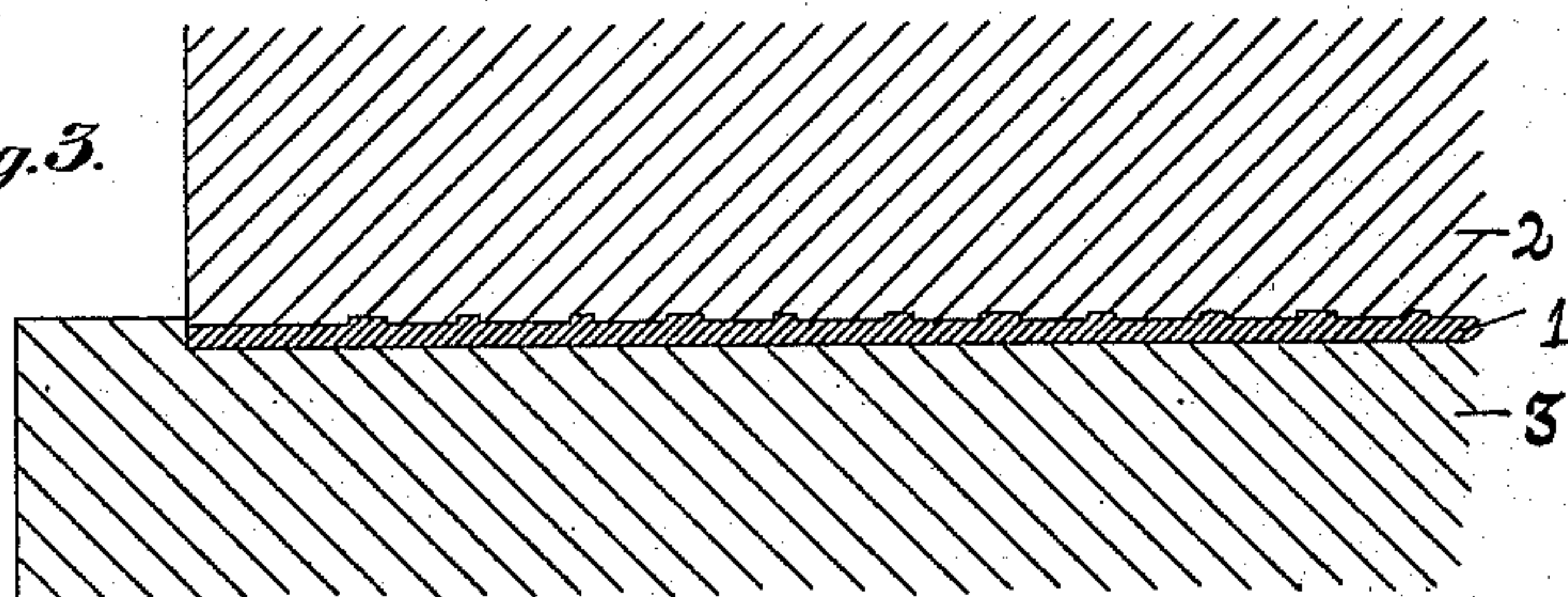
*Fig. 1.*



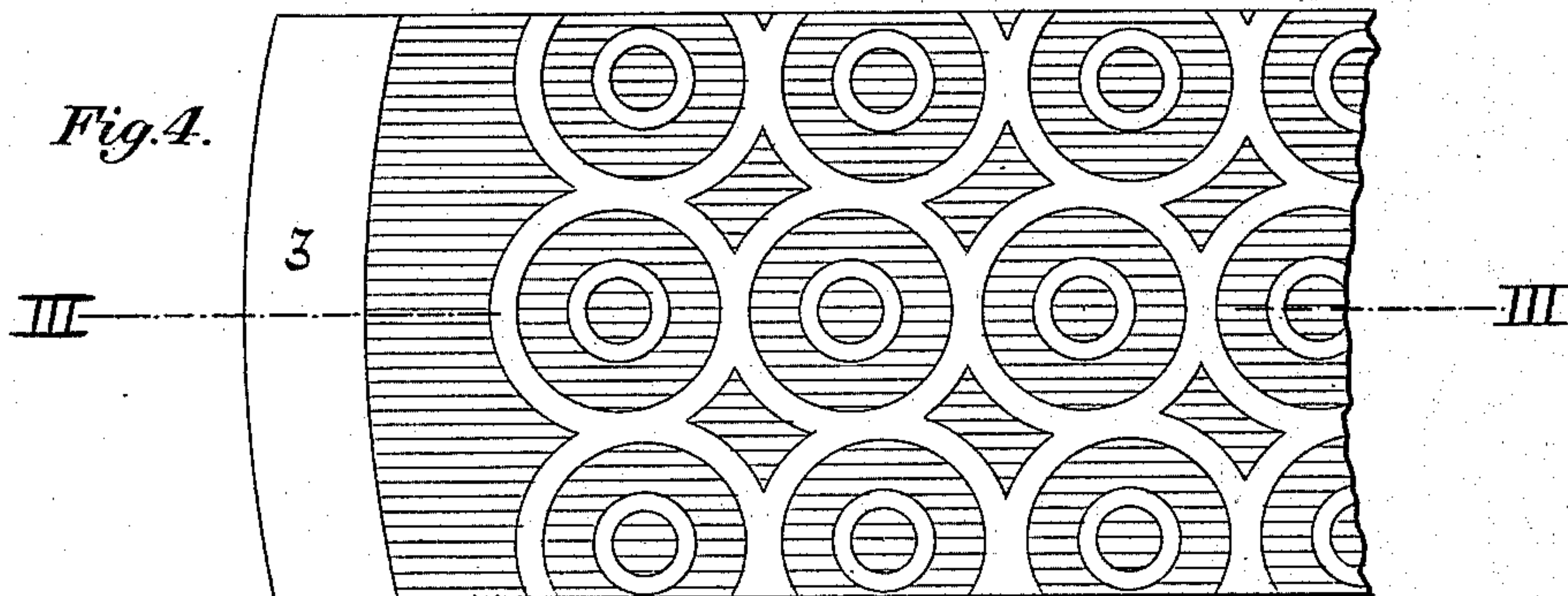
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



WITNESSES.

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*H. L. Gill*

INVENTOR.

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*his Attorneys.*



(No Model.)

2 Sheets—Sheet 2.

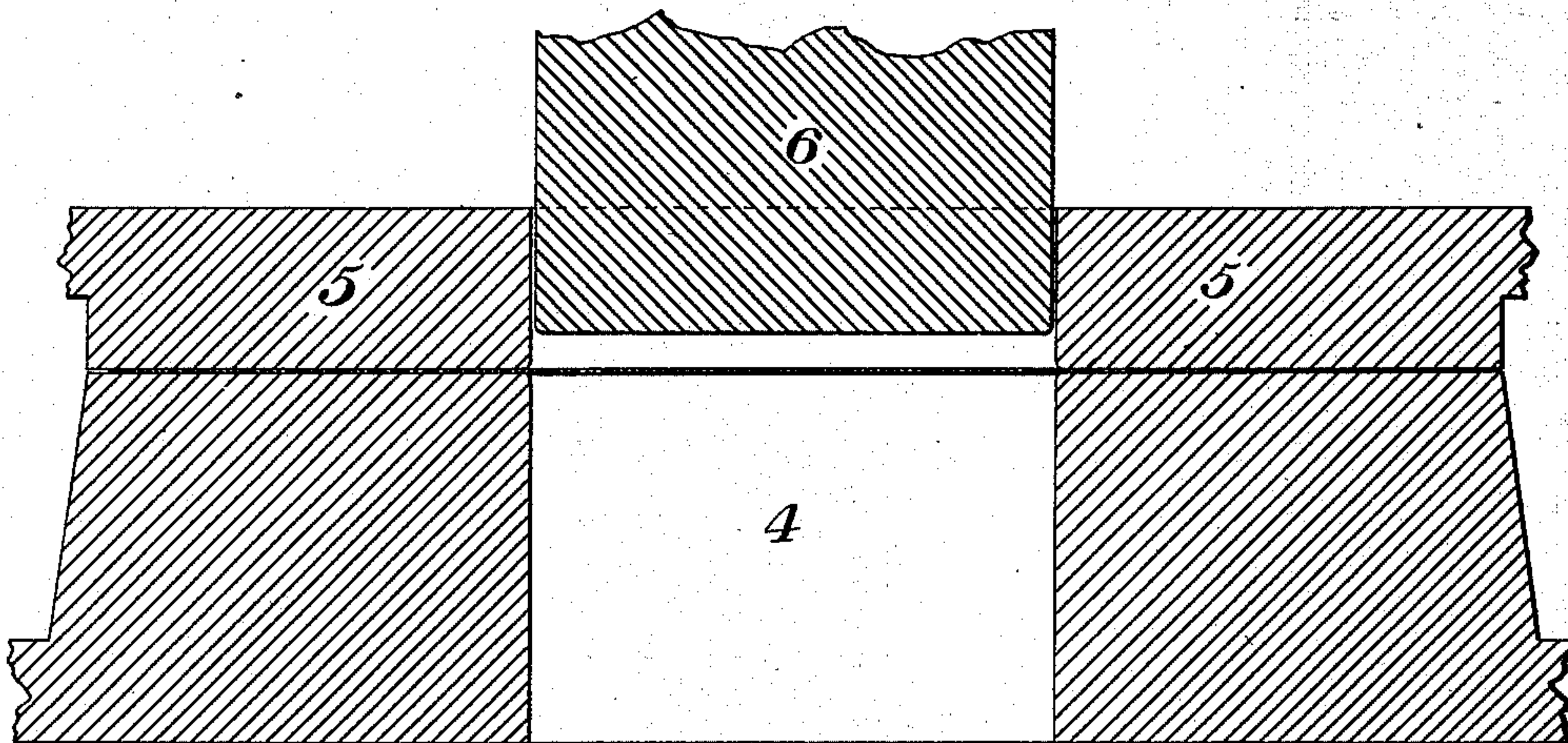
A. W. PAULL

ART OF FORMING SHEET METAL ARTICLES.

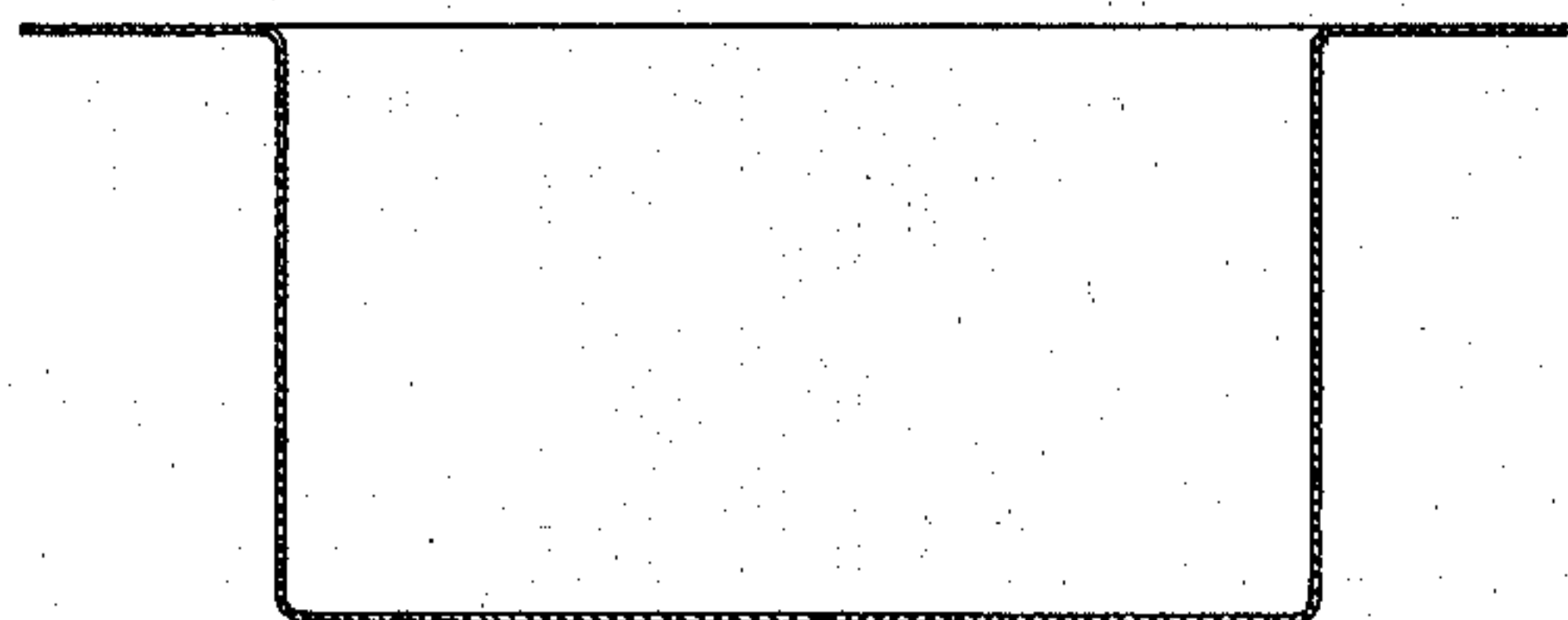
No. 413,374.

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*Fig. 5.*



*Fig. 6.*



WITNESSES:

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INVENTOR,

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# UNITED STATES PATENT OFFICE.

ARCHIBALD W. PAULL, OF WHEELING, WEST VIRGINIA.

## ART OF FORMING SHEET-METAL ARTICLES.

SPECIFICATION forming part of Letters Patent No. 413,374, dated October 22, 1889.

Application filed April 10, 1889. Serial No. 306,733. (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 the Art of Forming Articles of Sheet Metal, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view of dies adapted to form a pattern on sheet metal in the practice of my invention. Fig. 2 is a similar view showing the dies in engagement with the metal. Fig. 3 is a view similar to Fig. 2, showing a portion of the dies on an enlarged scale. Fig. 4 is a plan view of a portion of the stationary die, showing the embossed sheet in place thereon, the section plane of Fig. 3 being on the line III III of this figure. Fig. 5 is a vertical sectional view of dies which may be used for drawing the metal sheet after it has been embossed by the dies shown in the preceding figures. Fig. 6 is a vertical sectional view of the product of the dies of Fig. 5.

Like symbols of reference indicate like parts in each.

My invention relates to an improvement in the art of drawing sheet-metal articles; and its object is to enable drawn articles to be ornamented with patterns of various forms at little cost compared with the expense of ornamenting the finished article by means of dies or by hand-work.

In a prior application, Serial No. 305,247, I describe and claim, broadly, an improvement consisting in embossing or forming upon or in sheet metal a pattern, and then drawing the embossed metal within suitable dies, which bring it to the form of the article required without destroying the pattern.

My present invention is a specific or subordinate improvement on the method of said application; and it consists in forming on the metal preparatory to drawing it an impressed or embossed pattern in a peculiar manner, whereby I am enabled to produce new and very beautiful ornamental effects on the finished article.

In the practice of my invention I form a pattern by stamping or pressing on the sur-

face of a metal sheet or blank, the dies (which are preferably steel dies) being for this purpose formed so as to impart to the whole or to part of the pattern an actual compression, and thereby to reduce or harden the substance of the parts of the sheet so compressed. This mode of embossing is distinguished from that mode in which the metal is shaped by bending between patterned dies or rolls, the patterns on which are counterparts of each other. In forming the pattern by use of such dies or rolls the metal is simply bent or shaped, but its substance is not reduced, as in the method of the present application.

As a convenient and very effective means for embossing the metal sheet in the practice of this invention, I prefer to employ two dies or stamps, one of which (preferably the bed-die) is made with a smooth surface, while the face of the other is provided with a suitable pattern by grooves or sunken parts cut or otherwise formed thereon. In using the dies the metal sheet is put on the bed-die and the moving die is caused to strike or press upon it, thereby compressing and reducing in thickness those portions of the sheet which are beneath or opposite to the projecting parts of the moving die, while those parts of the metal immediately under the sunken or cut portions of the moving die are not so much affected. While such dies are desirable, because they are easy to manufacture, it is not necessary that the lower die should be flat. Thus I have found that in the use of a flat die in conjunction with a figured die slight concavities or arches are apt to form on the surface of the sheet resting on the flat die directly beneath the depressed portions of the moving die, and therefore without substantially affecting my method the bottom die may be provided with small projections or ridges corresponding to the positions of such concavities, the essential and peculiar feature of the method being that the pattern is formed on the sheet by actual compression and reduction of the metal, whereby its substance is changed in density. Nor is it essential that the depressed portions only of the pattern should be compressed or densified, since by properly shaping the dies it is possible to obtain good results by compressing all the parts of the pat-



tern. After having been embossed in this manner, the blank is subjected to drawing in suitable dies—such as are commonly used in the art—and by which it is transformed into  
 5 a shaped or finished article. The action of such dies on the embossed metal does not tear or destroy the metal or efface the pattern. On the contrary, the pattern remains distinctly visible in the drawn article, its prominent portions  
 10 are smoothed and polished by frictional contact with the dies, while the depressed portions, not having been brought into contact therewith to such degree, retain the peculiar appearance imparted to them by the original  
 15 compression in the stamping or pressing dies. The friction of drawing is taken up by the prominent and thicker portions, and the fact that the depressed portions are hardened and densified by the original stamping and embossing of the sheet not only materially qual-  
 20 ifies the appearance of the pattern, but also prevents flattening and obliteration of the prominent portions, and keeps the metal from creasing or wrinkling and thus blurring the  
 25 pattern in a manner apt to occur when it is not produced in the manner which I have described.

As explained in the specification of my said application, Serial No. 305,247, by reason of the  
 30 stretching and elongation of the metal in the process of drawing, the pattern originally impressed on the blank will be changed in outline by the drawing operation; and it is therefore desirable to so shape the parts of  
 35 the pattern that when modified by the drawings they shall be of the exact form and size required.

In Figs. 1, 2, 3, and 4 of the accompanying drawings, 1 is the metal sheet. 2 and 3 are  
 40 the dies for stamping or impressing the pattern on the metal sheet, the stationary die 3 being preferably smooth, and the moving die 2 being provided with a pattern.

In Fig. 5, 4 is the matrix of the drawing-die, 5 is the clamp or ring, and 6 is the moving die or plunger.

It will be understood that my invention is not limited to the use of apparatus of any particular form, or to any special style or  
 50 form of pattern. It is applicable to the manufacture of drawn articles of various forms made from sheet metal of any kind.

The advantages of my invention will be appreciated by those skilled in the art.

55 By the use of my method I am enabled to produce at trifling cost sheet-metal articles, such as lamps, lanterns, cups of various forms, and a great variety of other articles provided with beautiful patterns, which could

not be economically and practically produced  
 60 in any other way. Indeed, my method often cheapens the manufacture of such articles, because it dispenses with the necessity of burnishing the article after it has come from  
 65 the last set of dies.

The saving in the cost of producing the pattern by my method will appear when it is considered that after metal has been drawn into an irregular shape it is extremely difficult to be embossed, and that such embossing  
 70 must then be performed at great cost by hand-work, or by the use of specially-constructed and very expensive dies. The cost of embossing the metal before it has been reduced into final shape is small, and my method is  
 75 therefore inexpensive.

Aside from the advantages which I have already noted, my method possesses a further advantage in that the embossing of the sheet causes the prominent portions alone of the  
 80 pattern to come into contact with the dies, and thus materially reduces the area of the sheet exposed to frictional contact in drawing. From this cause the drawing is made easier, and articles of greater depth and width  
 85 can be drawn than is otherwise possible.

I claim—

1. An improvement in the art of forming articles of sheet metal, which consists in impressing a preliminary pattern on the metal  
 90 sheet by reduction of the substance of the metal on the lines of the pattern between suitable compressing-surfaces, and then drawing the metal so compressed between suitable dies, whereby is formed an article of drawn  
 95 metal having a compressed surface pattern modified in configuration and appearance by the drawing action of the dies, substantially as described.

2. An improvement in the art of forming  
 100 articles of sheet metal, which consists in subjecting a sheet-metal blank to compression between a forming surface or die having a pattern formed thereon and a second surface or die having a substantially smooth face,  
 105 whereby a compressed and reduced pattern on one side only of the sheet is formed, and then drawing the patterned portion of the blank within suitable dies, whereby a sheet-metal article having on its surface a pattern  
 110 modified by drawing action of the dies is formed, substantially as described.

In testimony whereof I have hereunto set my hand this 5th day of April, A. D. 1889.

ARCHIBALD W. PAULL.

Witnesses:

W. P. POTTER,  
 THOMAS W. BAKEWELL.