

(No Model.)

F. J. CLAMER.
METHOD OF COATING METAL ARTICLES.

No. 494,668.

Patented Apr. 4, 1893.

Fig. 1.

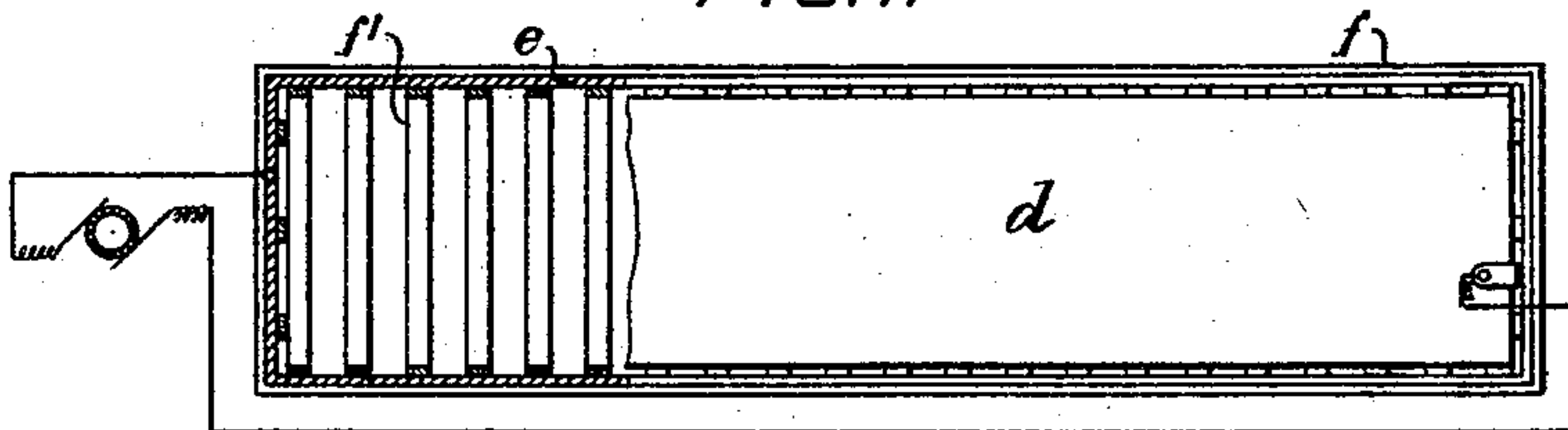


Fig. 2.

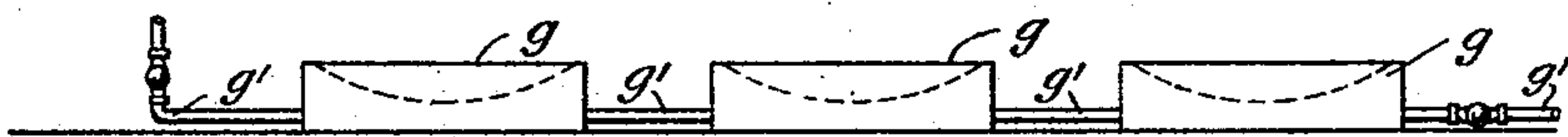


Fig. 3.

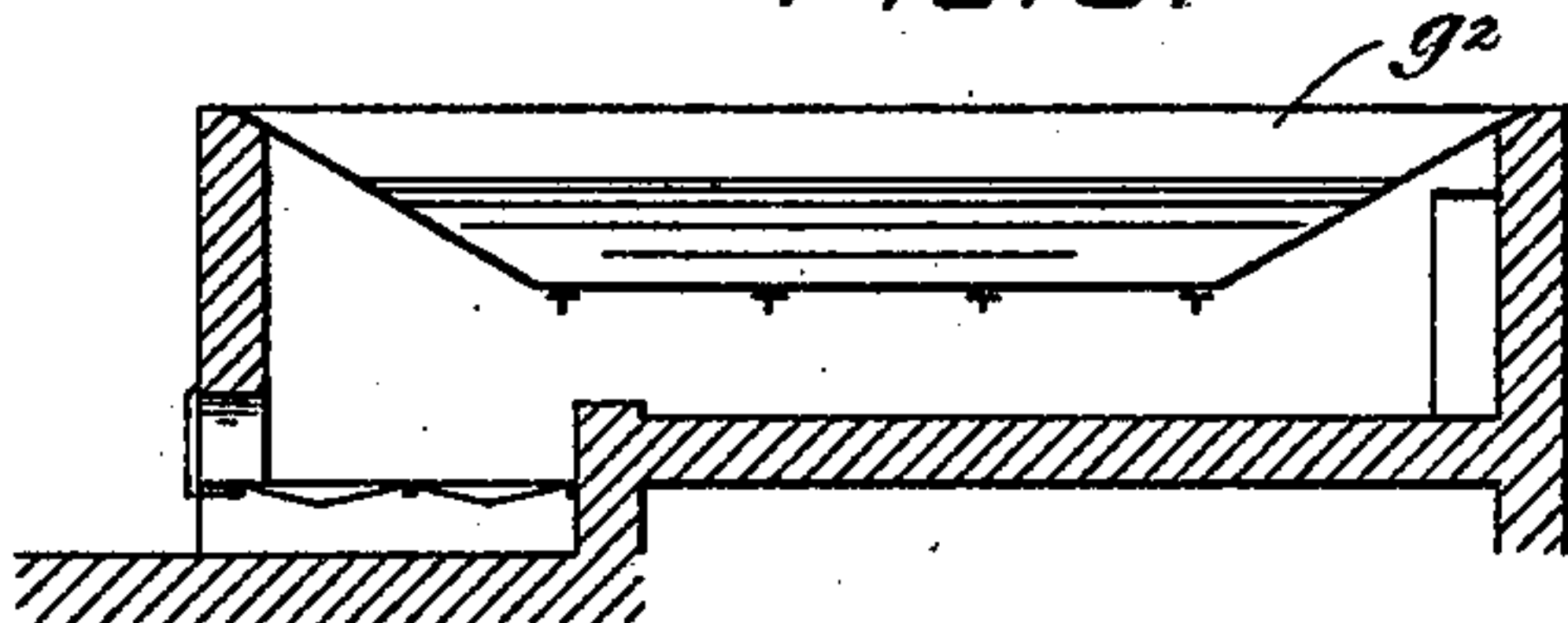


Fig. 9.

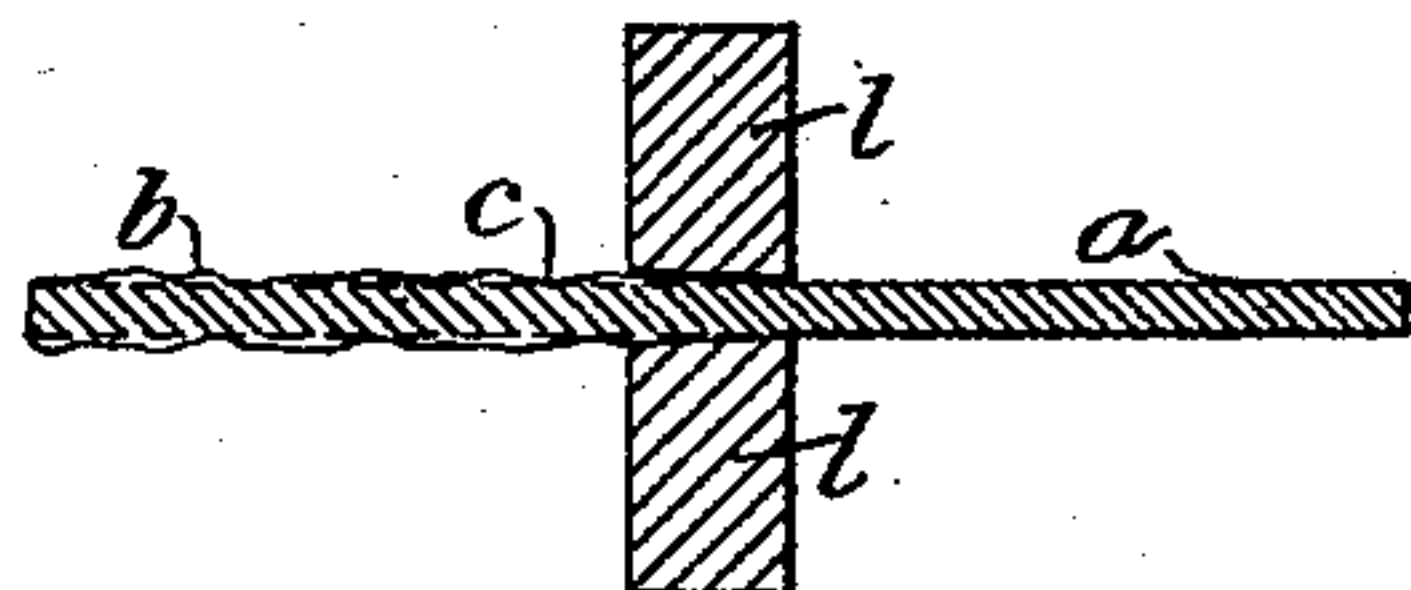


Fig. 4.

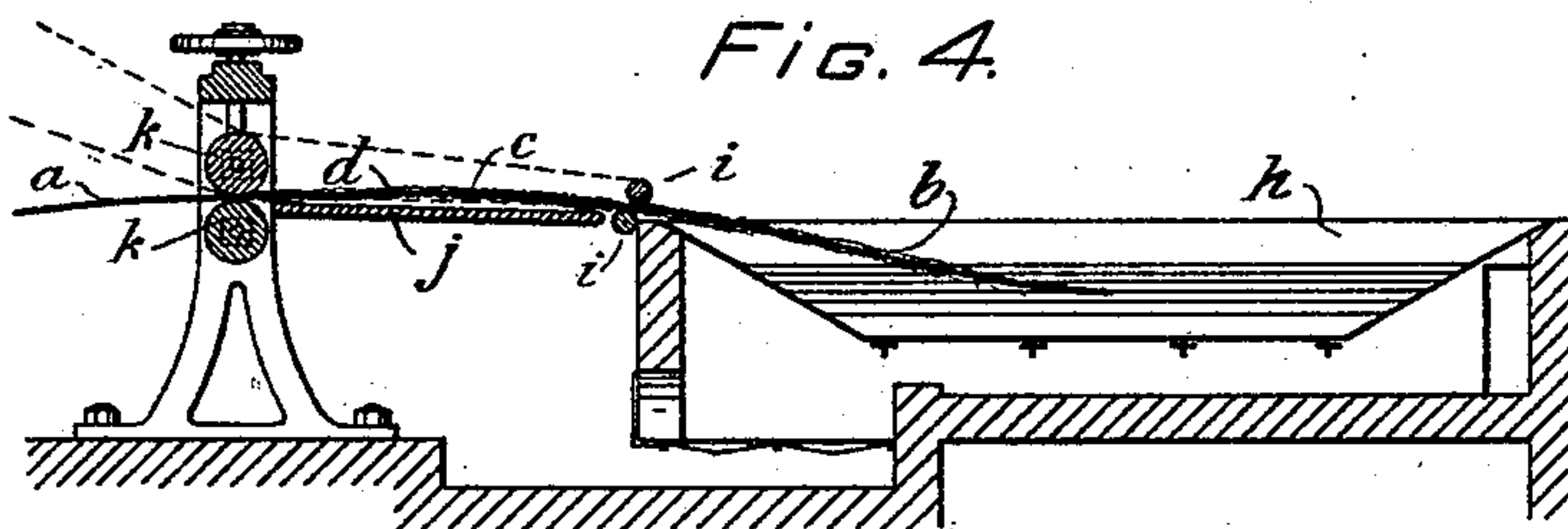


Fig. 5.

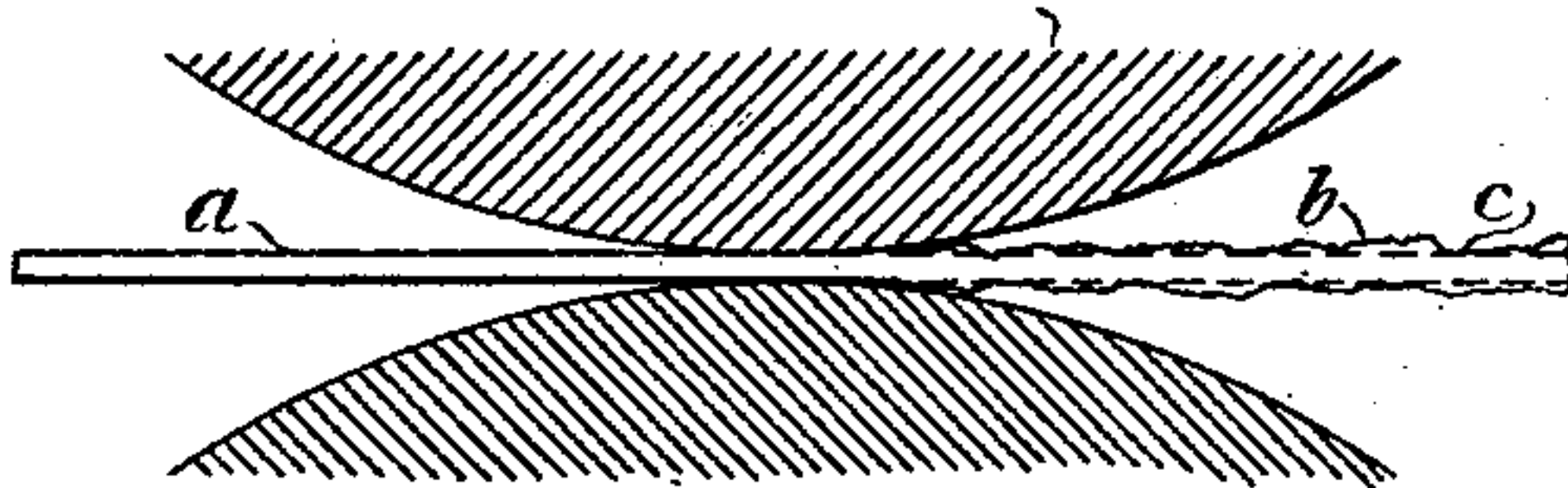


Fig. 6.

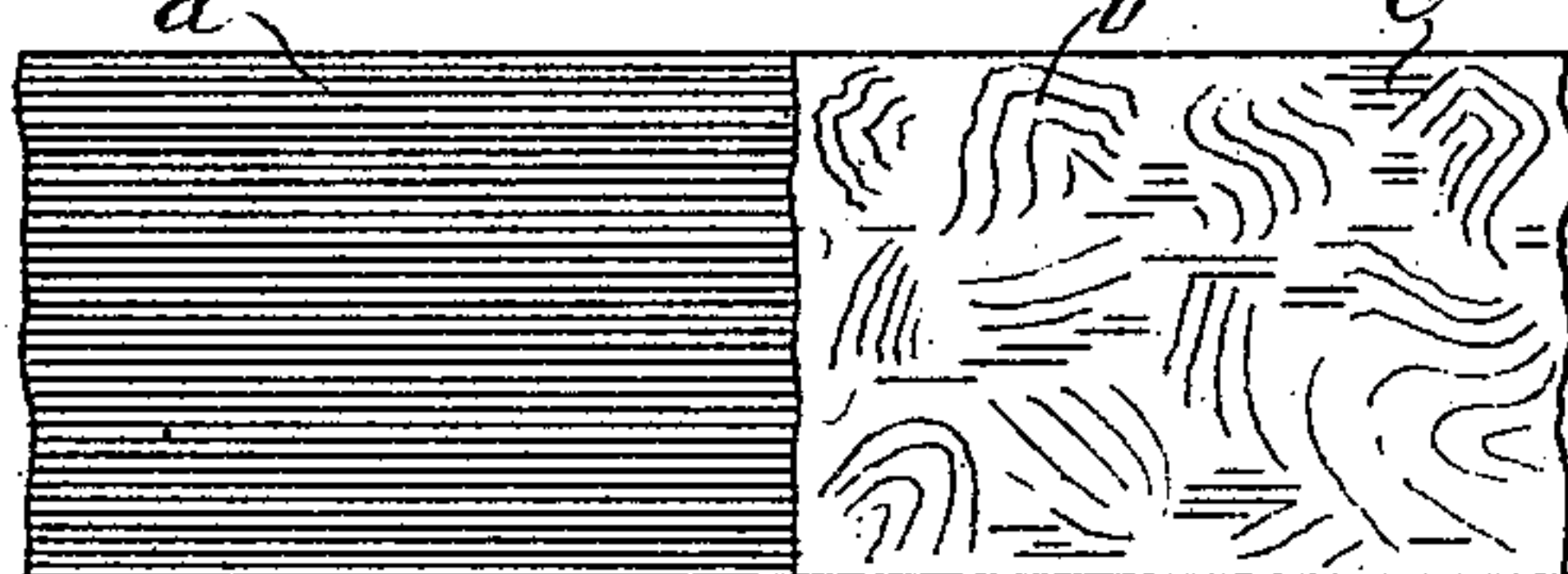


Fig. 7.

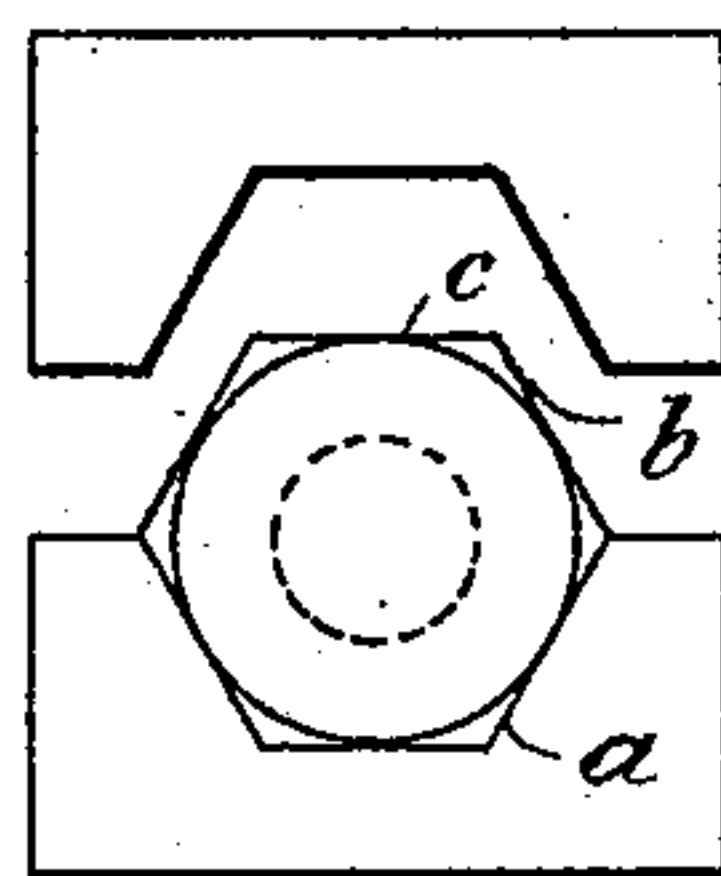


Fig. 8.



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UNITED STATES PATENT OFFICE.

FRANCIS J. CLAMER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE
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METHOD OF COATING METAL ARTICLES.

SPECIFICATION forming part of Letters Patent No. 494,668, dated April 4, 1893.

Original application filed March 29, 1892, Serial No. 426,866. Divided and this application filed July 12, 1892. Serial No. 439,750.
(No specimens.)

To all whom it may concern:

Be it known that I, FRANCIS J. CLAMER, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Method of Coating Metal Articles, for which I filed an application for Letters Patent of the United States, Serial No. 426,866, under date of March 29, 1892, of which the following is a divisional specification.

My invention has relation to an improved method of coating articles of iron or steel, such as plates, bolts, wire and other articles of hardware with lead or analogous material.

The principal object of my present invention is to provide an economical and expeditious method of producing a non-oxidizable coated metal article, that is, a metal article completely, smoothly and permanently coated with lead or analogous material or materials and such an article as has prior to the application of the coating thereto certain material or materials applied to the same in order to create an affinity between the coating and the article so that the latter may absorb a portion of the former and so that in the application of the coating to the article and the subsequent drawing, rolling, forging, pressing or hammering of the same, the pliability as well as the yielding or expansible properties of the article may be appreciably increased without in the least affecting the strength of the finished article.

My invention consists of the improvements in the method of producing coated metal articles hereinafter described and claimed.

The nature, scope and general characteristic features of my invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof; and in which

Figure 1, is a top or plan view of an electrolytic cell in which rust and oxide may be removed from articles to be coated. Fig. 2, is a side elevation of several tanks employed as heated baths for cleansing and washing the article. Fig. 3, is a sectional elevation of an externally heated vat in which the washed articles are treated preparatory to the reception of

the coating of lead or analogous material. Fig. 4, is a sectional elevation of an externally heated vat or kettle in which a coating of molten lead or similar metallic material may be applied to the cleansed and treated or prepared article and also showing means for converting the molten coating into a fibrous state under pressure. Fig. 5, is a diagrammatical view, illustrating the effect produced by the application of pressure to the article having the coating of lead or analogous metallic material applied thereto. Fig. 6, is a top or plan view of the coated article illustrated in Fig. 4. Figs. 7 and 8 are views, illustrating the effect produced by forging the coating of lead, tin, zinc or analogous metallic material after application to the metal article; and Fig. 9, is a view illustrating the effect produced by drawing a coated wire through die-plates.

According to my invention a metallic article coated with lead or other metallic material is rendered dense or fibrous and the coating completely and uniformly covers the article, as is shown at *a*, in Figs. 4, 5, 6, 7 and 8, in contradistinction to an article in which the coating is crystalline, as is indicated at *b*, and consequently porous as at *c*.

An article produced according to my invention is impervious to or protected from the corrosive action of the atmosphere and of various liquids and gases, because the continuous, imporous coating protects it from the same, whereas an article provided with a crystalline coating is readily oxidized and subject to corrosion under similar circumstances as stated, because liquids and gases are afforded free access to the same by reason of the existence of the pores or uncoated portion *c*. Moreover, an article made according to my invention presents a metallic luster, while an article having a porous surface or a crystalline coating applied thereto presents a dull unsightly appearance as well as a rough and irregular surface; and moreover, according to my invention a strong affinity exists between the coating and the metal of the article and thus through such affinity the coating becomes a part of the metal or base of the article, thereby rendering the finished or coated metal article, fibrous and absolutely rust

proof or non-corrosive under the influence of the atmosphere and gases or liquids.

In practice it has been found after costly experiments that it is exceedingly advantageous that an affinity be created of the coating for the metal article, and it has been found that this result can be attained by the application of a suitable proportion of phosphorus with or without other ingredients to the surface of the metal article. This phosphorus may be applied by immersing the articles in a bath of phosphor-lead or phosphide of lead or other salts containing phosphorus may be mixed with suitable or appropriate solvents and then applied in the form of a bath to the metal article. By these means excellent results can be obtained, because the phosphorus gives rise to a strong affinity between the coating and the metal article to which the same is applied.

A metallic article having a continuous and uniform coating of dense imperforate or fibrous lead or similar metallic material may be produced according to my invention in the following manner:—After the article has been covered with a coating of molten lead or analogous metallic material or materials, it is rolled or drawn as illustrated in Figs. 4, 5, and 9 or hammered as illustrated in Figs. 7 and 8 or otherwise forged with the result that the coating is converted into a fibrous, dense or imperforate state or condition and the coating is thus distributed uniformly, smoothly, completely and permanently over the entire surface of the metal article.

For the sake of a further explanation of my invention, I will describe in connection with the drawings a practically efficient method for the production of lead coated iron roofing plates, and from such description others skilled in the art of coating metals will be enabled to understand and practice my invention in its application to other metals, such as steel without the exercise of invention. The iron roofing plate *d* is mounted upon the insulating ribs *f'*, and is constituted the anode and a metallic lining *e*, the cathode, in an electrolytic vase or cell *f*, containing an acid electrolyte, comprising preferably water acidulated with sulphuric and fluorhydric acids. The ensuing electrolytic action thoroughly cleanses the surfaces of the iron plates and removes all oxide or oxides therefrom. The proportion of acid employed in the electrolytic bath varies and will depend upon the quality and condition of the iron plates. However, good results have been attained by the employment of five (5%) per cent. by weight, more or less, of sulphuric and fluorhydric acids. After the plate *d* has been electrolytically cleansed in the manner hereinbefore described, it is washed in a series of tanks *g*, containing preferably water acidulated with fifteen (15%) per cent., more or less, by weight of

hydrochloric acid and heated to a temperature of about 110° Fahrenheit by means of steam pipes *g'*, or in any preferred manner. The chemically cleansed and washed plate is then immersed in an externally heated kettle *g*², containing a bath. The object of this bath is to create in the article an affinity for the coating of lead or analogous material, and the principal constituent or active element of this bath is phosphorus. In the present instance the phosphorus is employed in a solution of phosphide of lead; however, other compounds of phosphorus and their corresponding or appropriate solvents may be employed. The plate is then immersed in an externally heated vat or kettle *h*, containing molten lead or analogous material, sal-ammoniac, phosphorus and arsenic with or without borax or other similar flux, which permeates the pores of the plate by reason of the previous treatment of the same in the phosphorous bath. The plate is drawn from this vat or kettle *h*, by means of feed rolls *i*, and is covered with a porous crystalline lumpy coating *b*. The plate *d*, is then allowed to traverse the guides *j*, and is delivered between squeeze or pressure rolls *k*, which not only serve to reduce the gage thickness and pliability of the plate, but also to convert the porous crystalline lumpy lead into a smooth and permanent imperforate, fibrous, imporous and dense state or condition.

In the manufacture of coated wire according to my invention after the application of the hereinbefore described coating thereto, the wire is passed through die-plates *l*, in any preferred manner, whereby the coating is rendered dense and fibrous as has been hereinabove described.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

The herein described method of coating a metal article with fibrous or imporous lead or analogous material, which consists in cleansing the article by making it the anode in an electrolytic cell, then washing and cleansing the article in baths containing water and hydrochloric acid, then applying to the article phosphor-lead or phosphide of lead to create an affinity of the metal for the coating subsequently applied thereto, then coating the article with lead or analogous material and then subjecting the coated metal article to pressure, whereby the pliability and yielding or expansible properties of the finished coated metal article are enhanced without affecting the strength thereof.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

FRANCIS J. CLAMER.

Witnesses:

THOMAS M. SMITH,
RICHARD C. MAXWELL.