

H. D. MILLER.  
METHOD OF TREATING METALS.  
APPLICATION FILED OCT. 12, 1907.

936,650.

Patented Oct. 12, 1909.

4 SHEETS—SHEET 1.

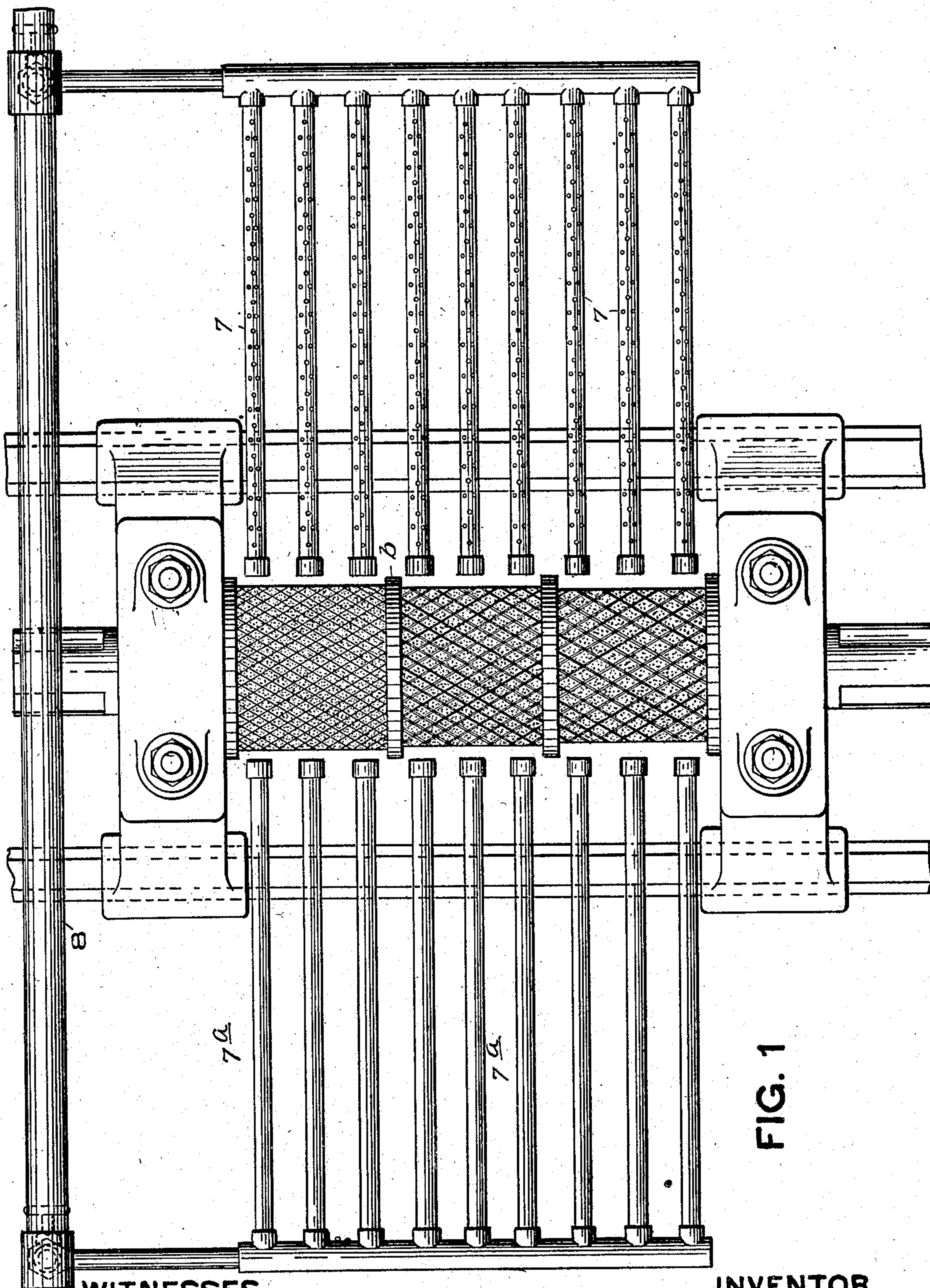


FIG. 1

WITNESSES.

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*W. A. Borish*

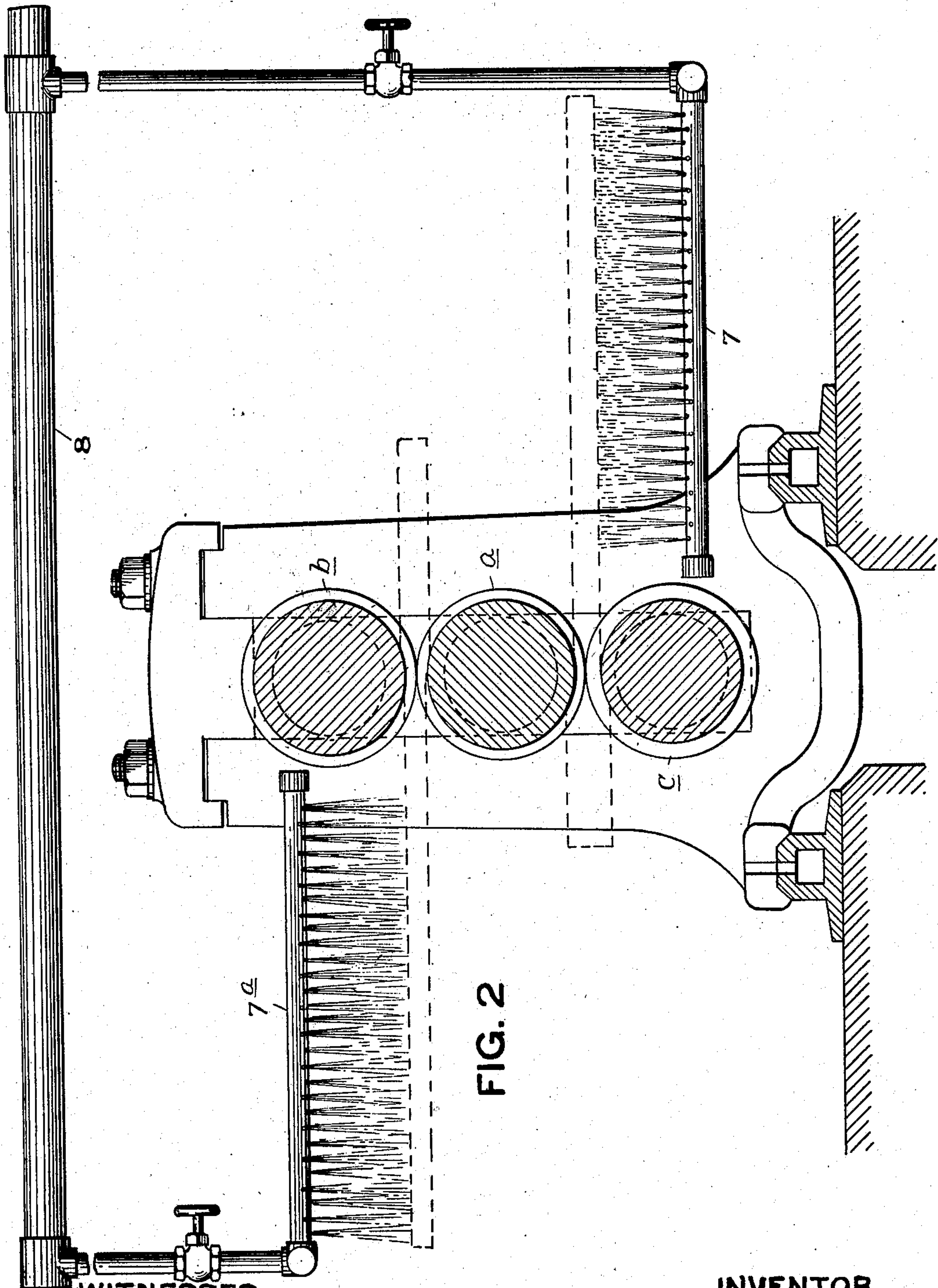
INVENTOR.

*Harry D. Miller*  
*by James K. Baskett*  
*his attorney*

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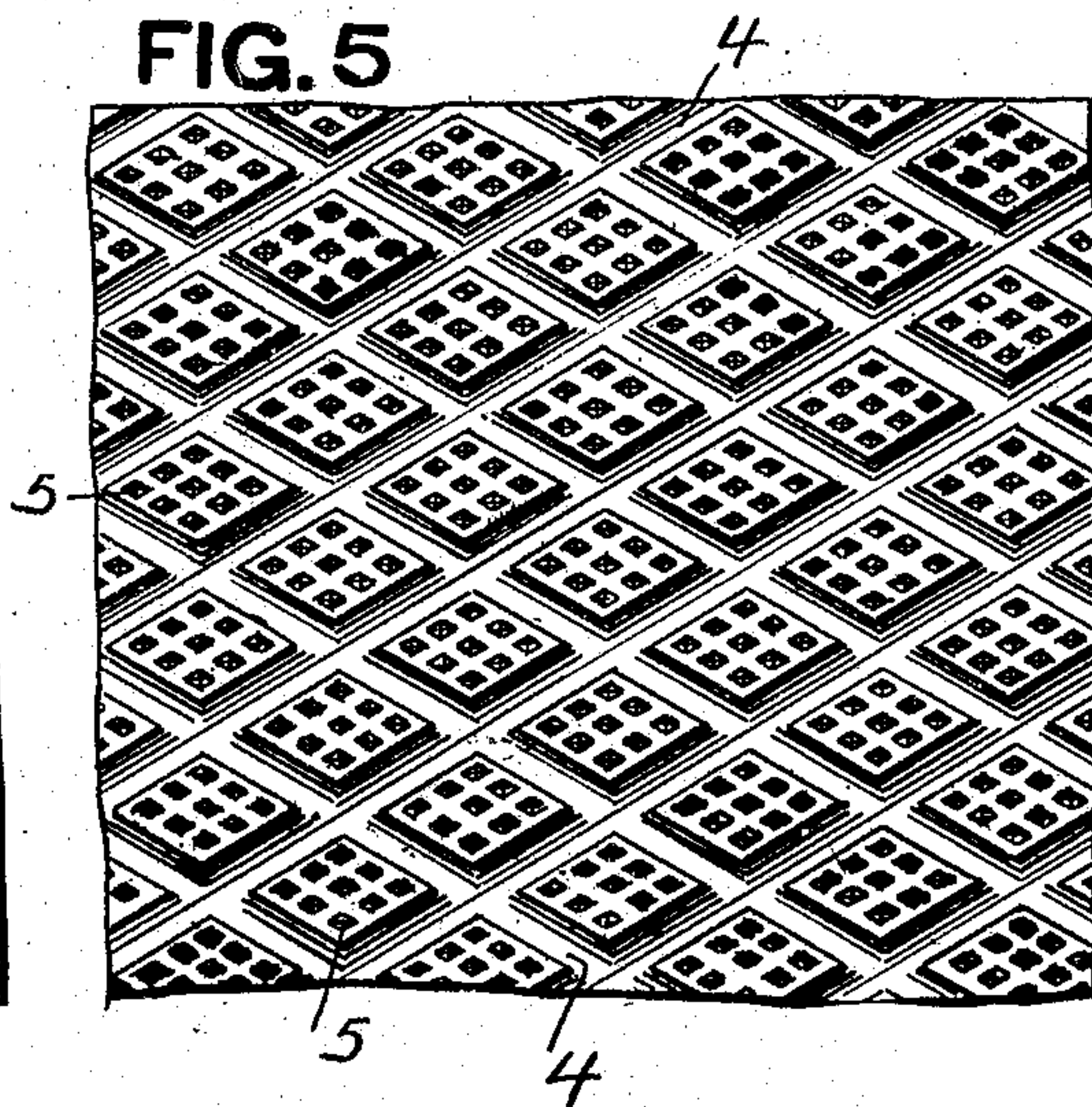
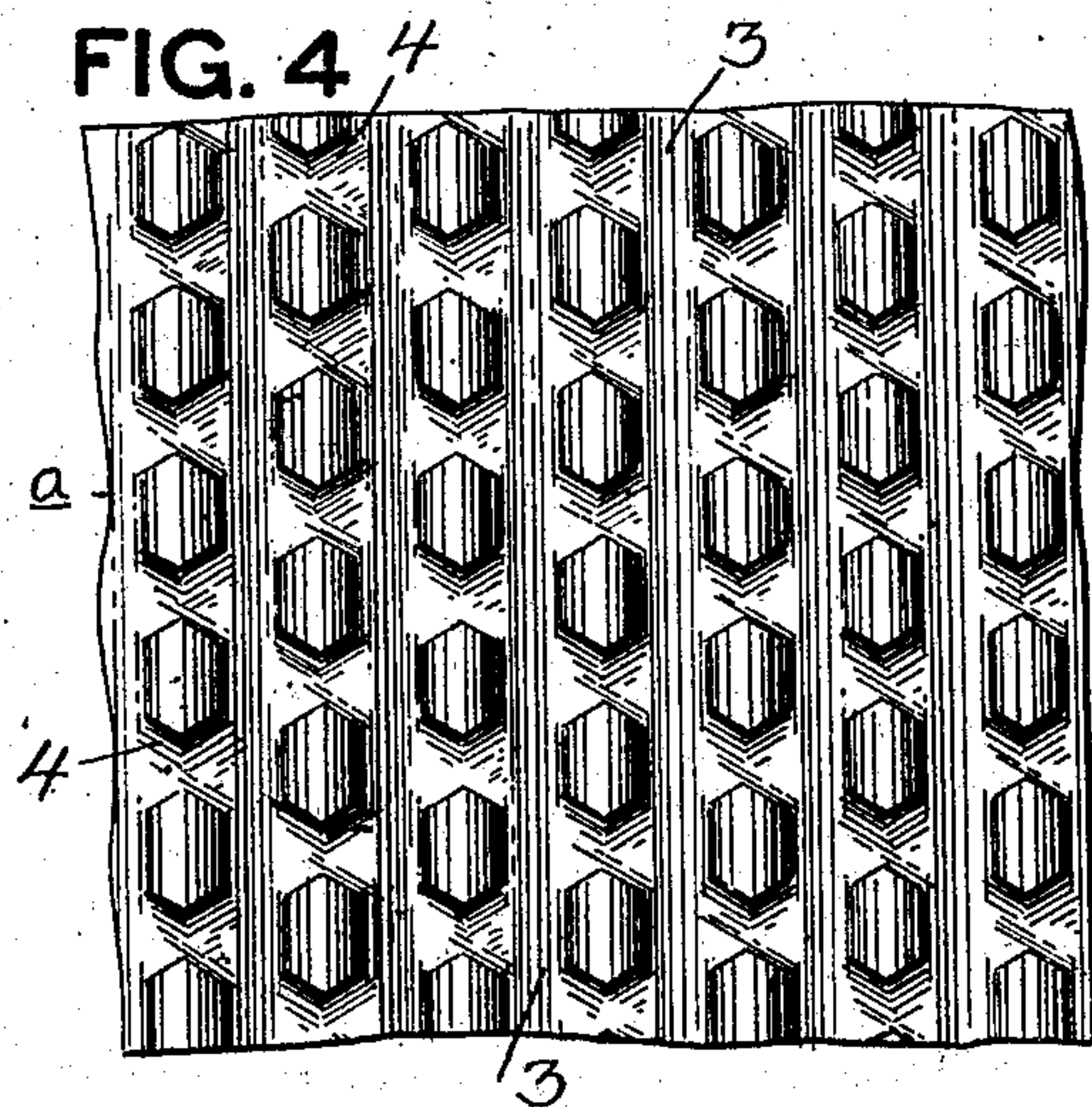
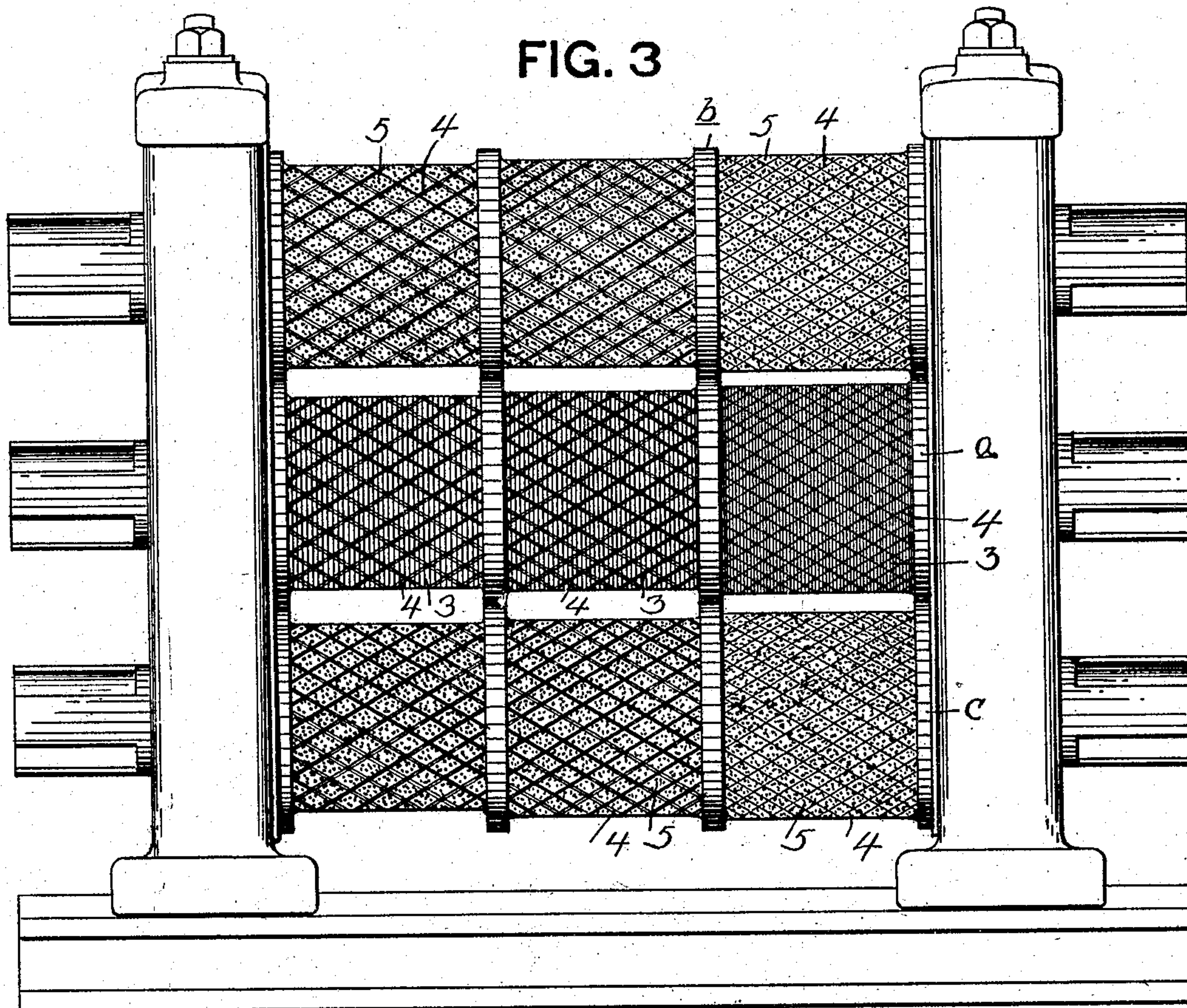


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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

FIG. 7.

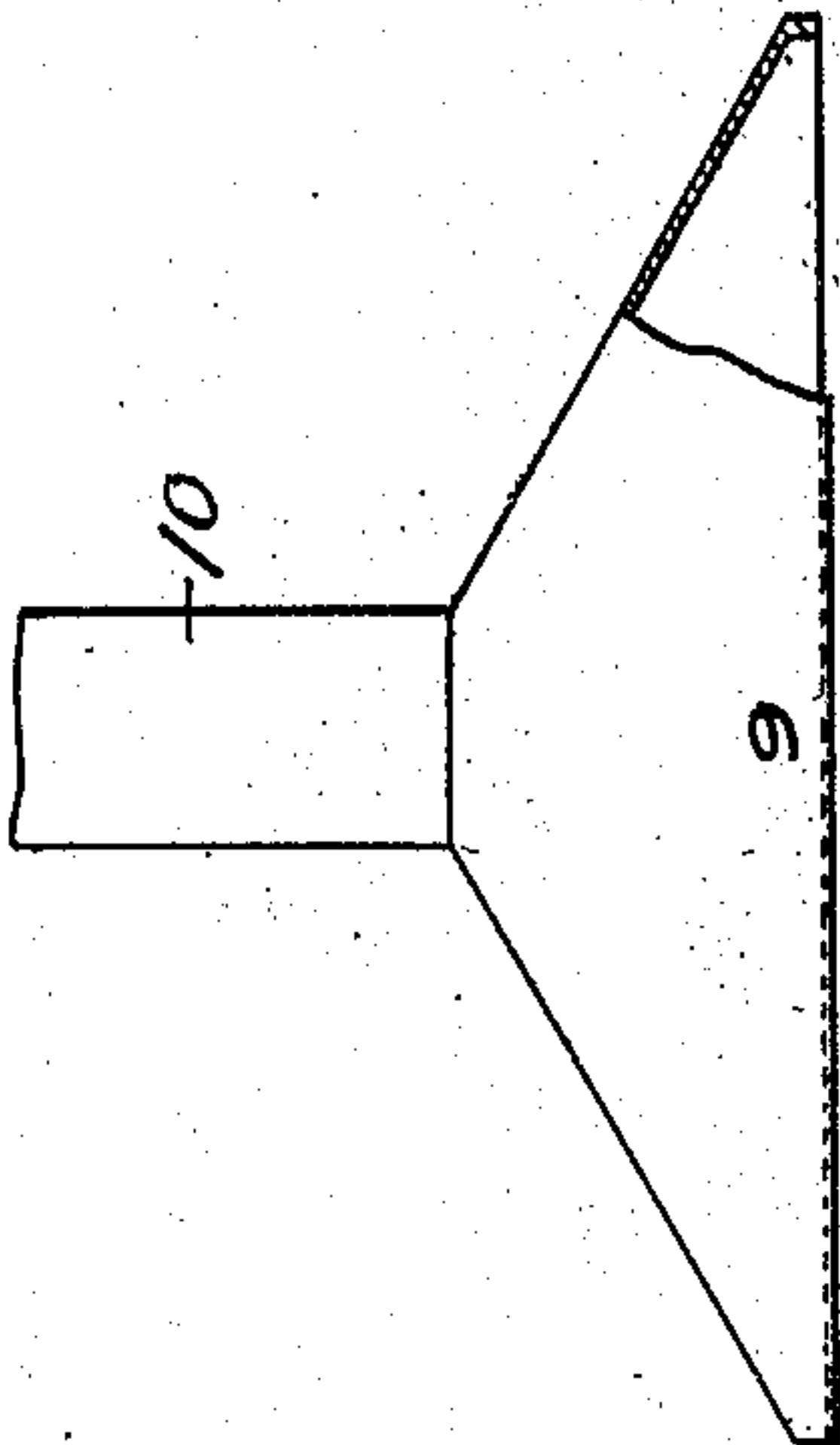
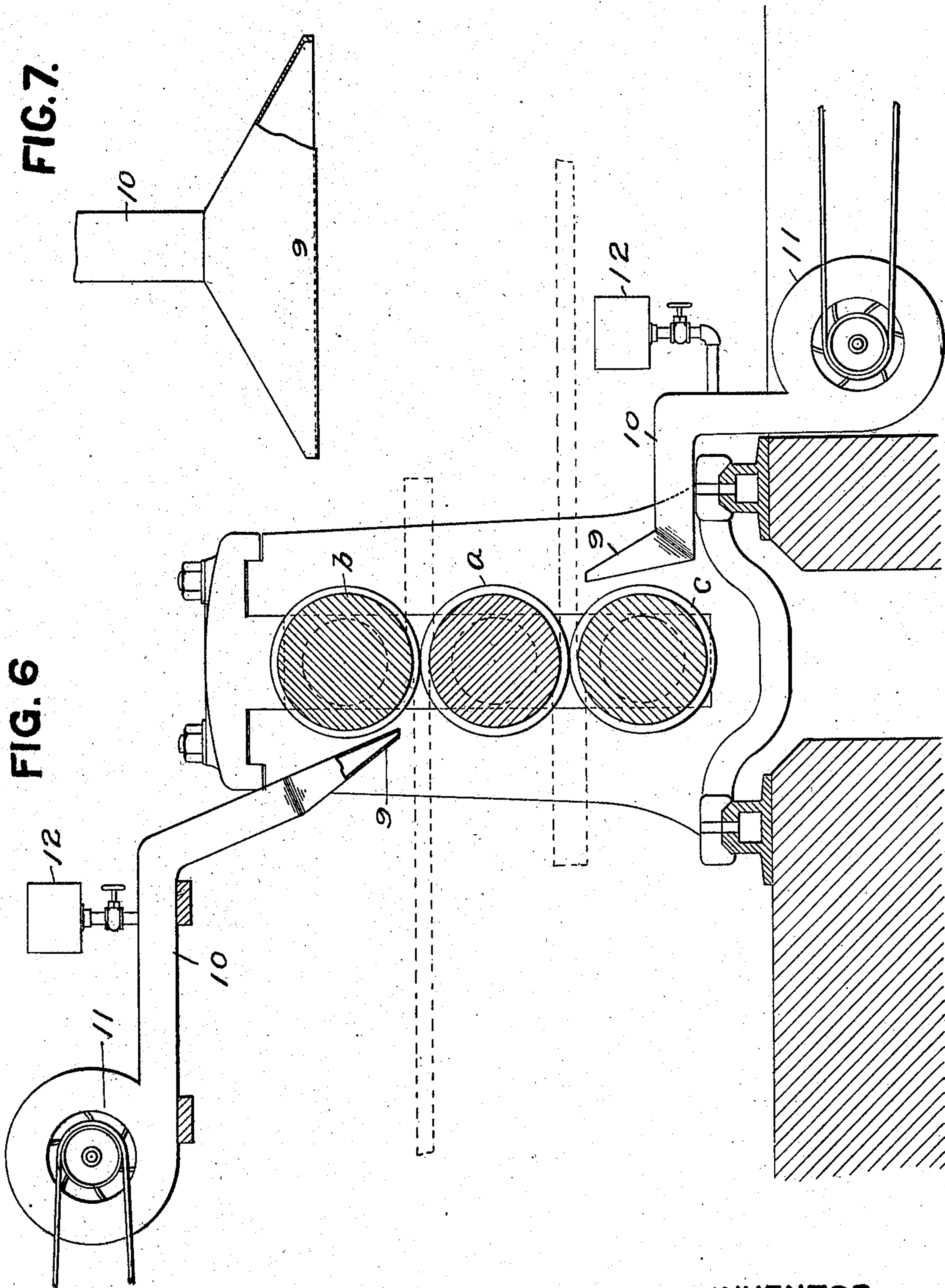


FIG. 6.



WITNESSES.

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# UNITED STATES PATENT OFFICE.

HARRY D. MILLER, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO MILLER NON-CORROSIVE METAL COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## METHOD OF TREATING METALS.

936,650.

Specification of Letters Patent.

Patented Oct. 12, 1909.

Application filed October 12, 1907. Serial No. 397,119.

*To all whom it may concern:*

Be it known that I, HARRY D. MILLER, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Method of Treating 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 plan view of apparatus which may be employed in the practice of my invention; Fig. 2 is a side elevation of the same partly in section; Fig. 3 is a front elevation; Figs. 4 and 5 are detached views of portions of the surface of the rolls; Fig. 6 is a side elevation partly in section of a modification; and Fig. 7 is a detached view of the nozzle.

My invention relates to a method of increasing the durability and non-corrosiveness of steel and other metals, and it consists in applying a cooling medium to the surface of a heated metallic body to stiffen the surface, and then compressing this surface, as is hereinafter more fully set forth.

Although I do not desire to limit myself to any specific means for stiffening the surface of heated metal preparatory to its compression, I will now describe apparatus which may be employed in the practice of my invention.

In the drawing I show a three-high stand of rolls, *a*, *b*, and *c*, the surface of which may be roughened by cutting thereon any desired pattern, such as, for instance, the pattern shown in Figs. 3, 4, and 5, which is composed on the middle rolls *a*, of the annular grooves 3 and the cross grooves 4, and on the upper and bottom rolls, of the cross grooves 4 and the diamond shaped recesses 5.

In Figs. 1, 2 and 6 I show apparatus which may be employed in applying a fluid medium to the faces of the bloom, plate, or other shape of metal, as it passes through the roughened rolls prior to the compression of the surface thereof. This apparatus may consist of rows of horizontal perforated pipes 7 and 7<sup>a</sup> which are connected with the supply conduit 8, the parts being so arranged as to distribute the required fluid over the roughened surface or projections, formed by the pattern on the rolls, as the metal leaves the various passes between the same.

In Figs. 6 and 7, I show nozzles 9 com-

municating by the conduits 10 with the fans 11. Communicating with the conduits 10 are receptacles 12 adapted to contain the liquid cooling medium.

The operation of my method as it may be practiced with this apparatus is as follows: The bloom, plate, or other shape of metal, having been brought to a rolling heat in a suitable heating furnace, is given several passes between the rolls *a*, *b*, and *c*, which form projections on the surface of the metal. As these projections are formed, and as the piece of metal emerges from the pass, the surface of the projections is chilled by contact with the cooling medium issuing from the pipes 7, 7<sup>a</sup>, or nozzles 9, which stiffens the same. By thus forming the face of the metal into a series of ribs and pyramidal projections, the area of the surface which is exposed to the action of the cooling medium is greatly increased, and the rapidity and extent of the action greatly facilitated. When a surface skin of required thickness has been formed in this manner, the metal is carried to the finishing rolls and given one or more passes, while the body of the metal is still hot, and before the stiffened skin has had time to lose the characteristics imparted to it by the fluid blast, or spray of air, or other cooling medium. The effect of these operations is to condense the surface skin of the metal, rendering it more compact and durable with increased non-corrosive properties.

I do not desire to limit myself to any specific fluid medium, as air, steam or other gas, fluids, liquids, hydrocarbons, or solutions of chemical compounds may be employed. For example, I have used with great advantage in certain cases a solution of potassium bichromate. Other solutions having similar effects on the heated surface of the corrugated plate may also be used.

Although I have described rolling and have shown and described particular roughening rolls having a definite pattern marked thereon, and although I have shown and described apparatus for applying the fluid medium to the metal, I do not desire to limit myself to the roughening of the metal or to the use of any specific apparatus, nor do I desire to limit myself to rolling, as stamping, pressing, or squeezing may be substituted for the rolling process. Moreover, it is not necessary that the roughening and the



application of the fluid medium should be simultaneous or immediately successive in point of time, as we may first roughen or corrugate the sheet, then reheat it, and then  
5 apply the fluid medium to establish a surface skin.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

10 1. The method of treating metals consisting in first roughening the surface of the heated metal, then applying a cooling medium thereto, and finally compressing the roughened surface to a substantially smooth  
15 surface, while the metal is still hot.

2. The method of treating metals consisting in forming ridges or projections on the surface of the heated metal, applying a cool-

ing fluid medium thereto, and compressing the projections to a substantially smooth 20 surface, while the body of the metal is still hot.

3. The method of treating metal consisting in heating the same, applying a cooling fluid to a roughened surface thereof to rapidly chill and stiffen the said surface and 25 finally compressing the stiffened surface of the metal while the interior portion of the same is still hot.

In testimony whereof, I have hereunto set 30 my hand.

HARRY D. MILLER.

Witnesses:

M. A. BARTH,  
M. A. KELLER.