

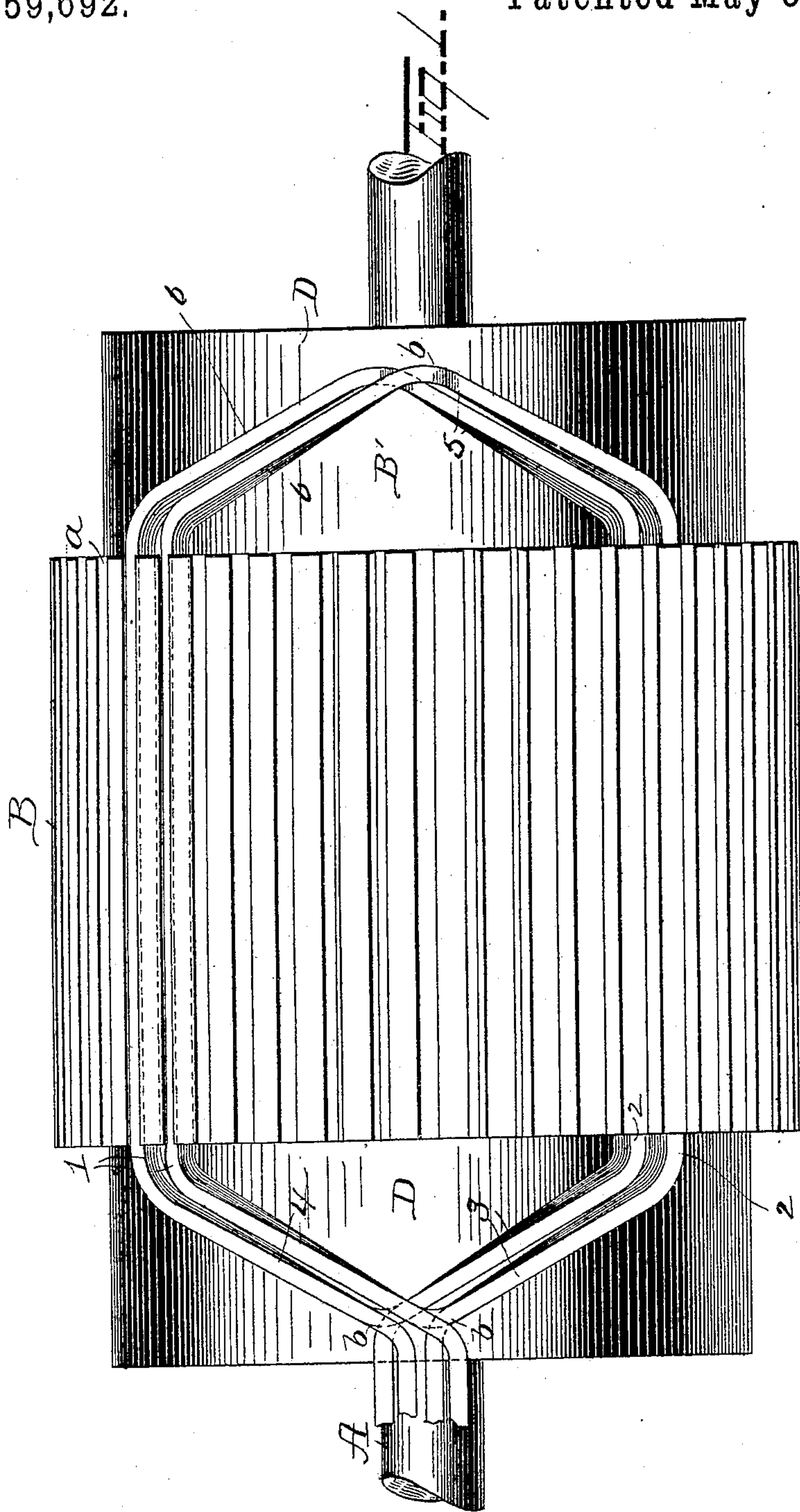
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5 Sheets—Sheet 1.

J. P. B. FISKE & H. A. LITTLEFIELD.  
ARMATURE FOR ELECTRIC MOTORS AND DYNAMOS.

No. 559,692.

Patented May 5, 1896.



Witnesses  
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*G. F. Downing*

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*By H. A. Symon*  
Attorney

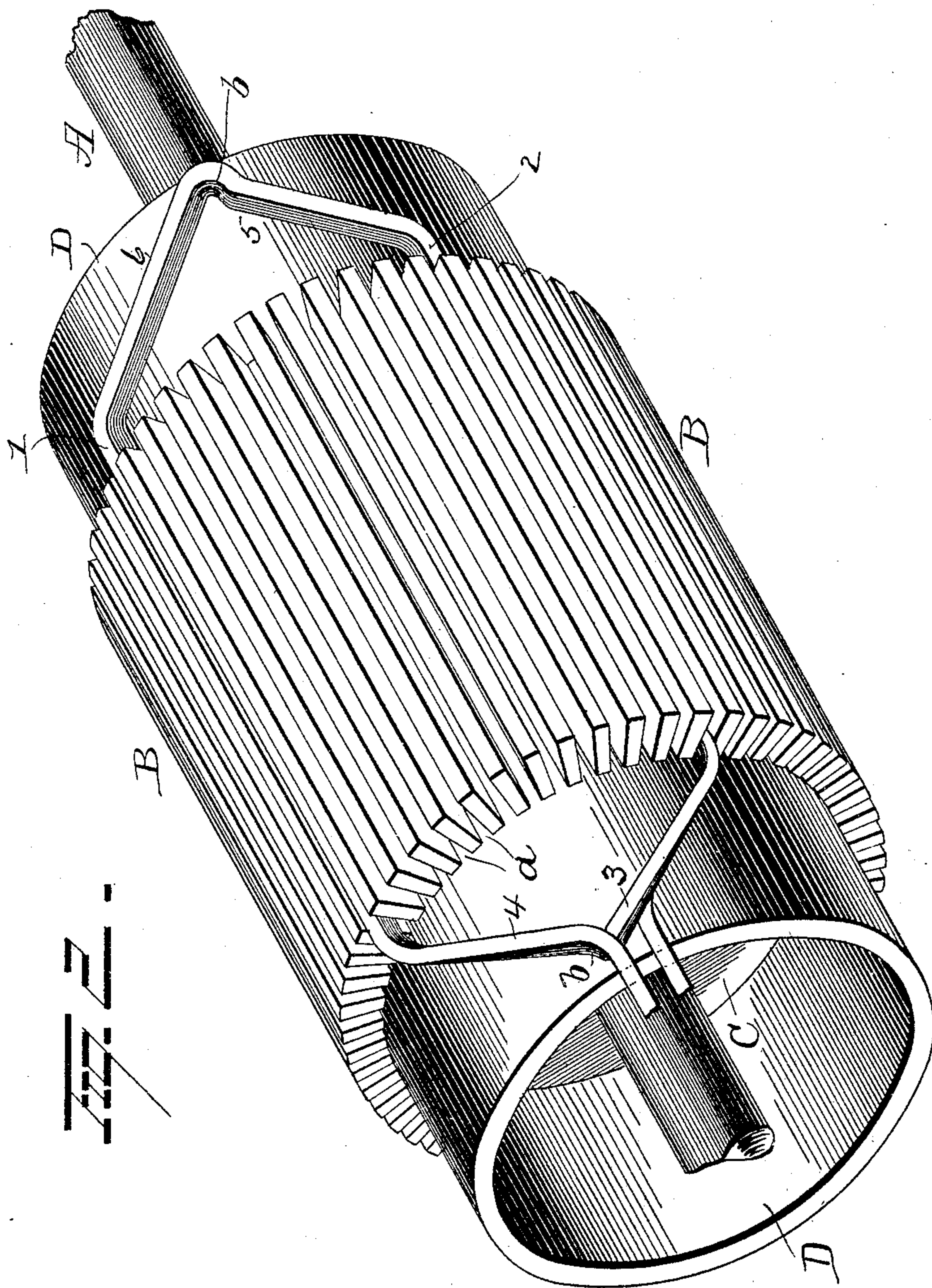
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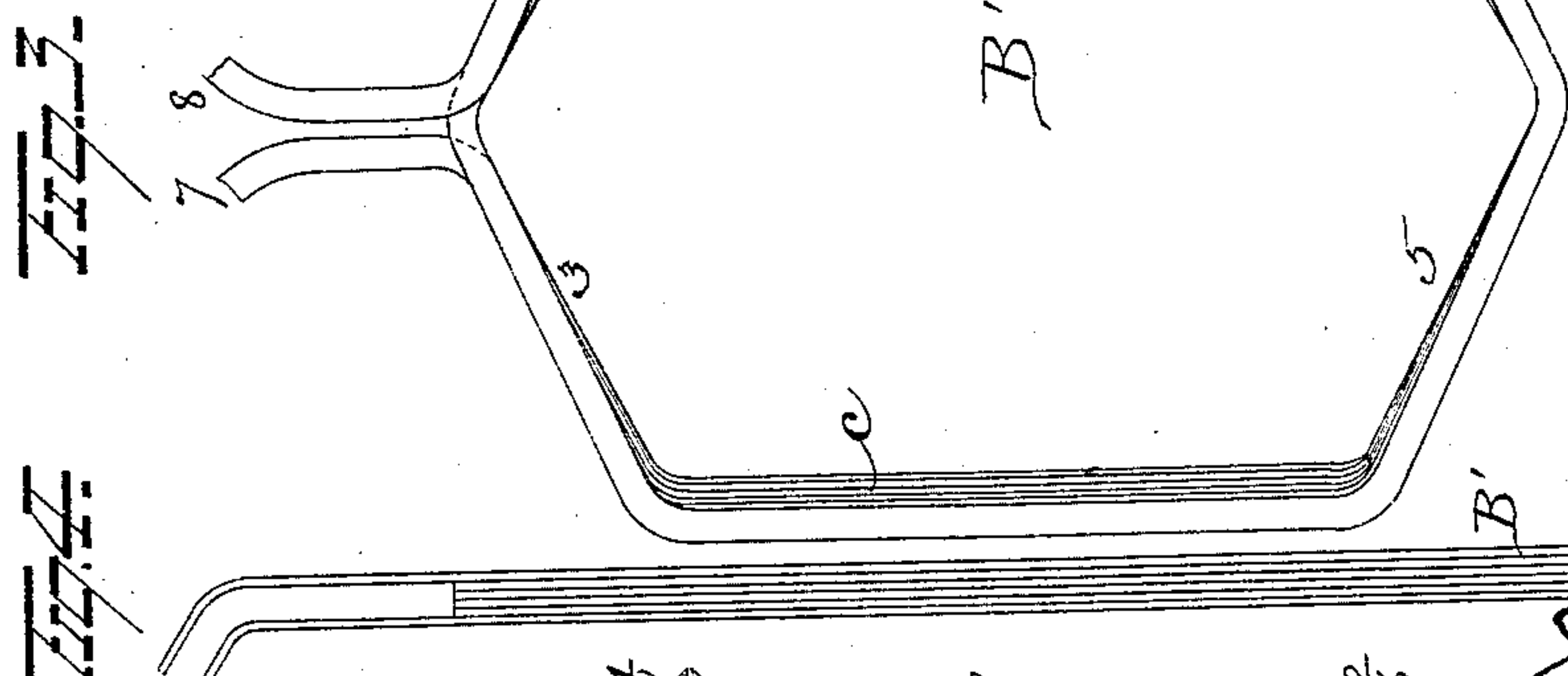
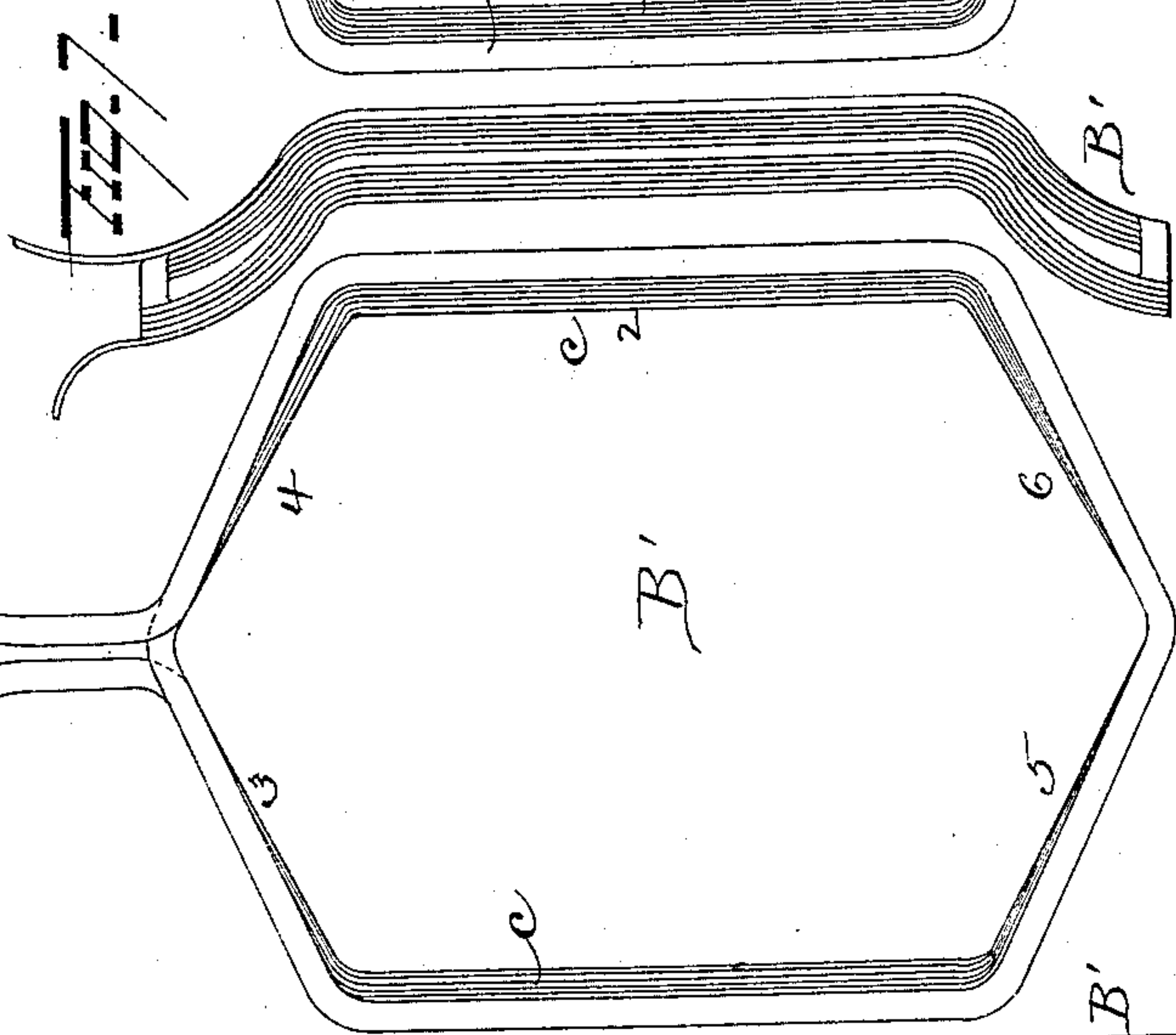
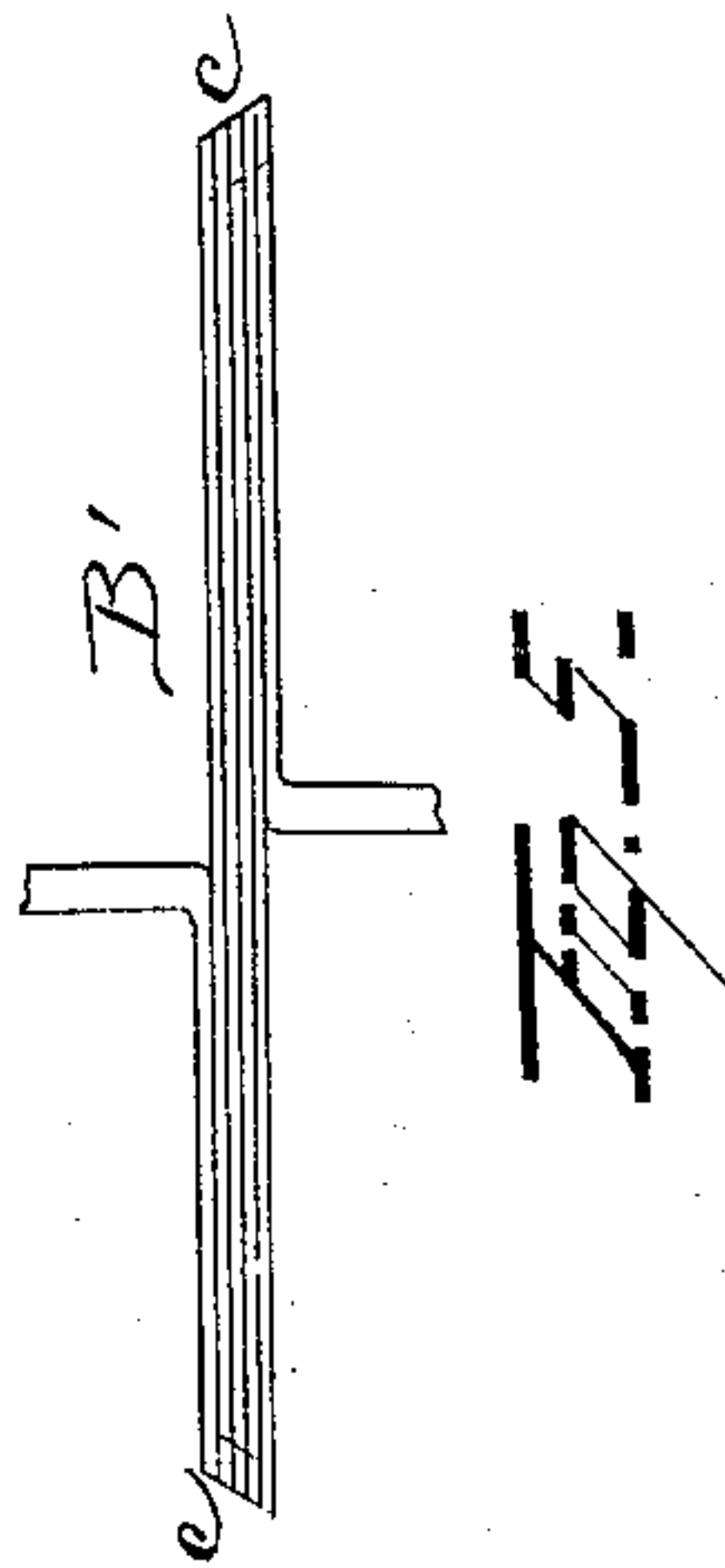
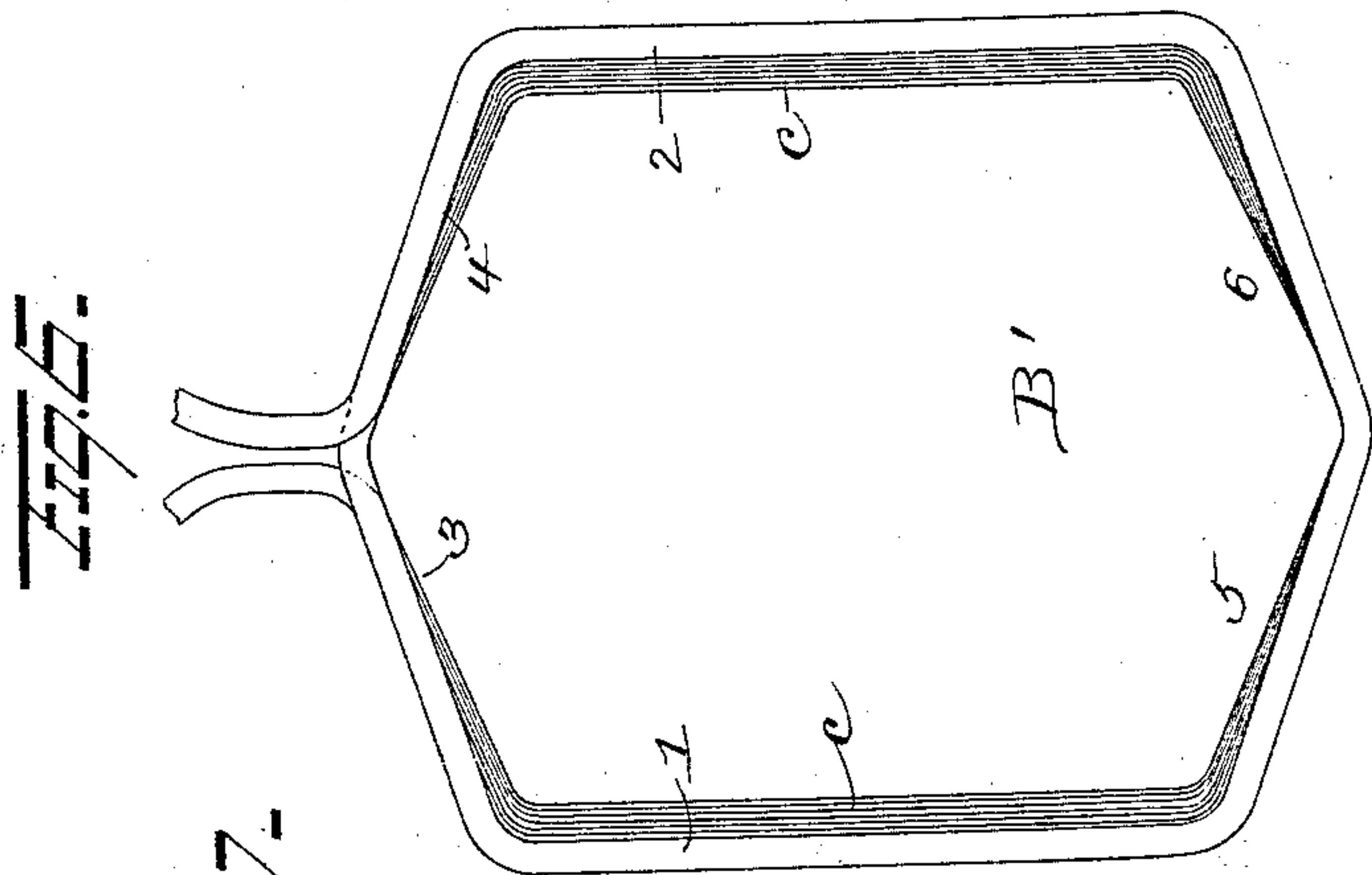
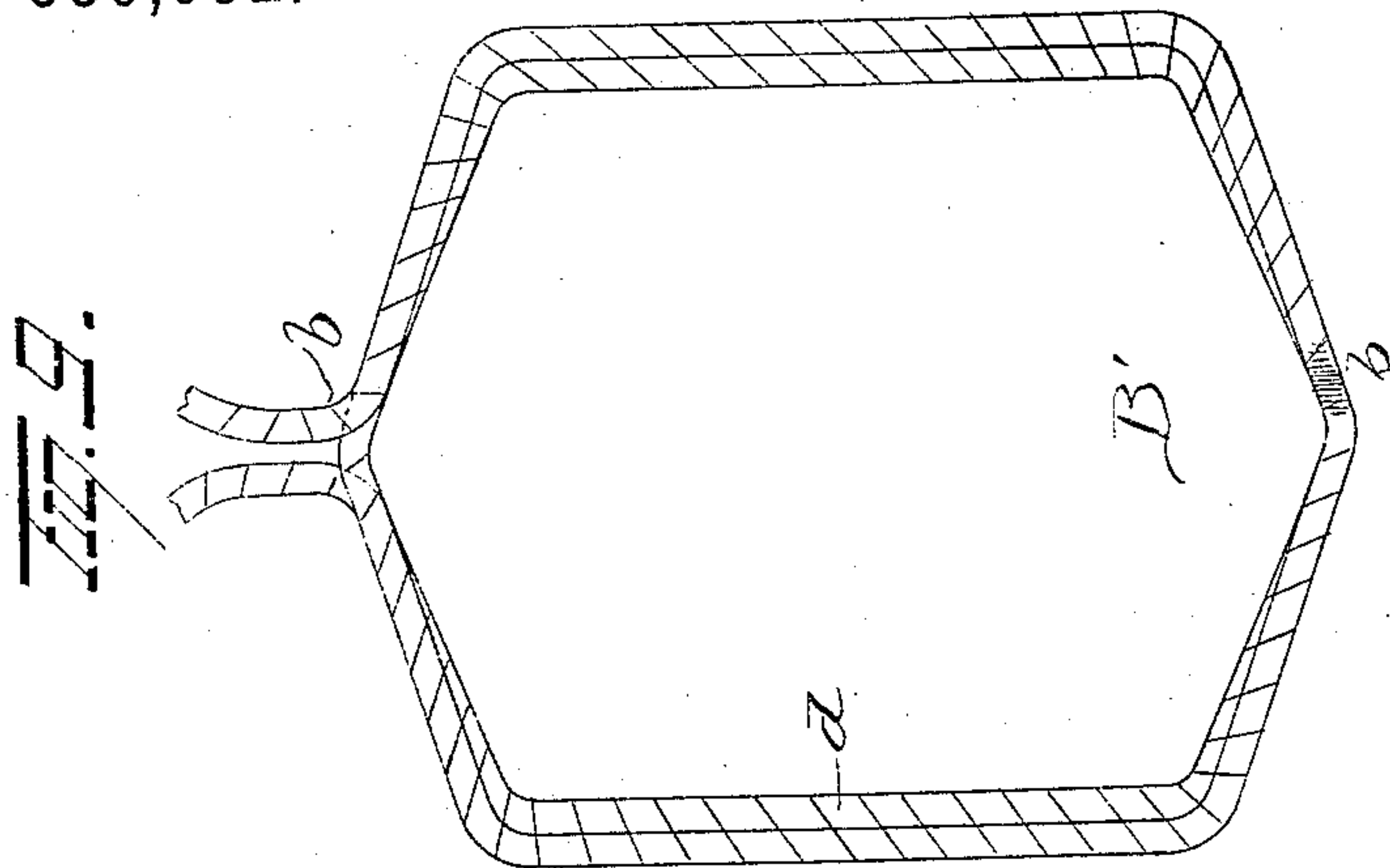
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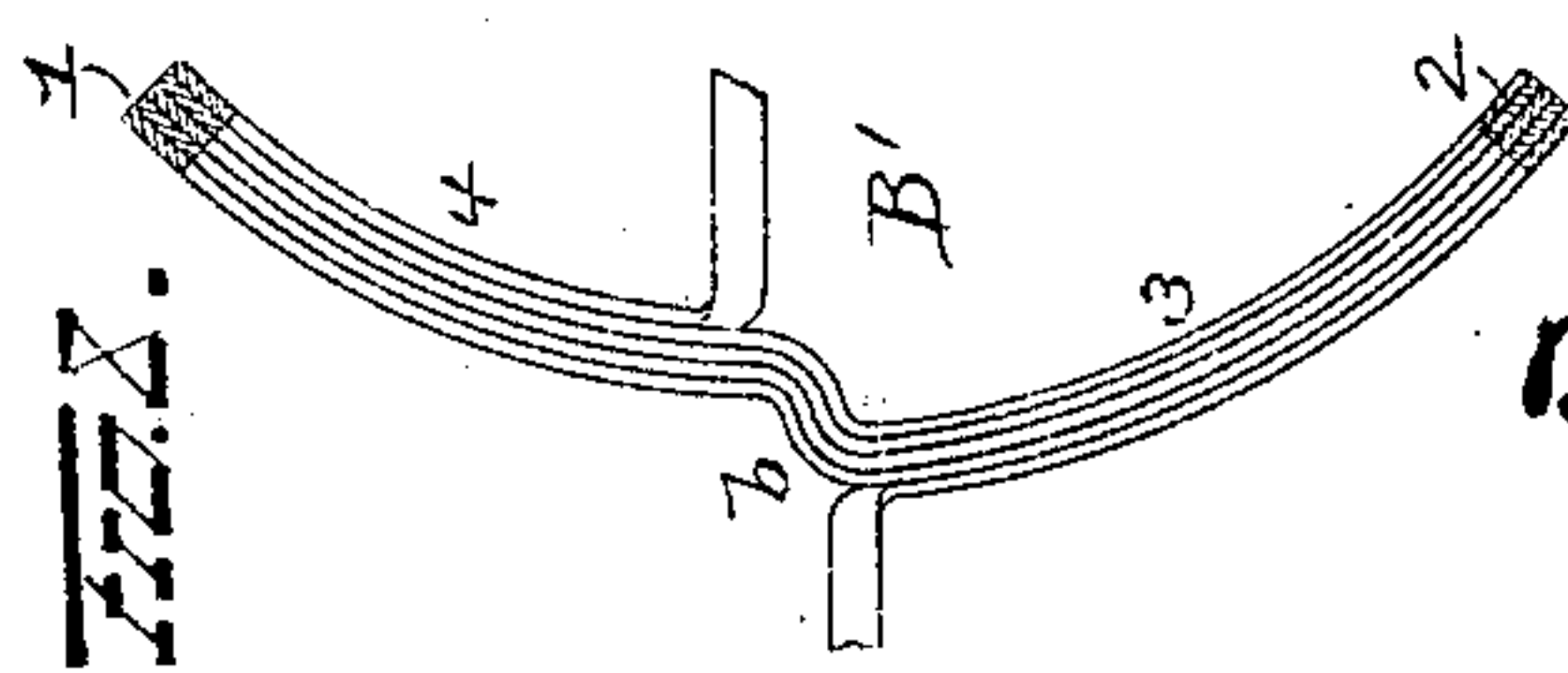
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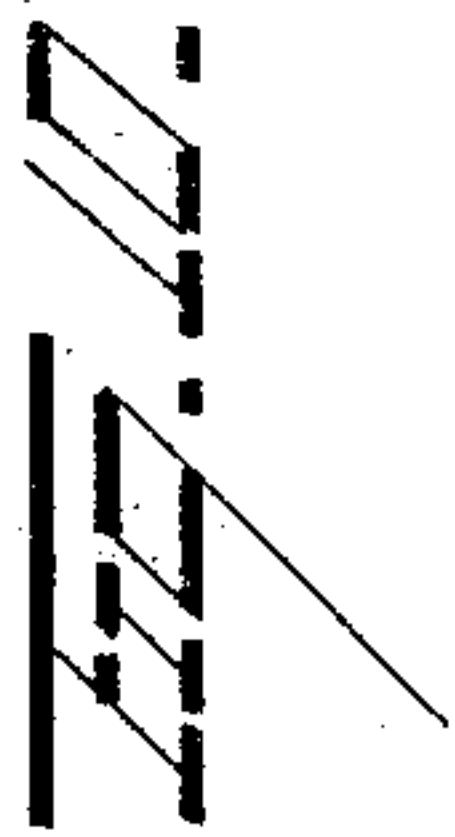
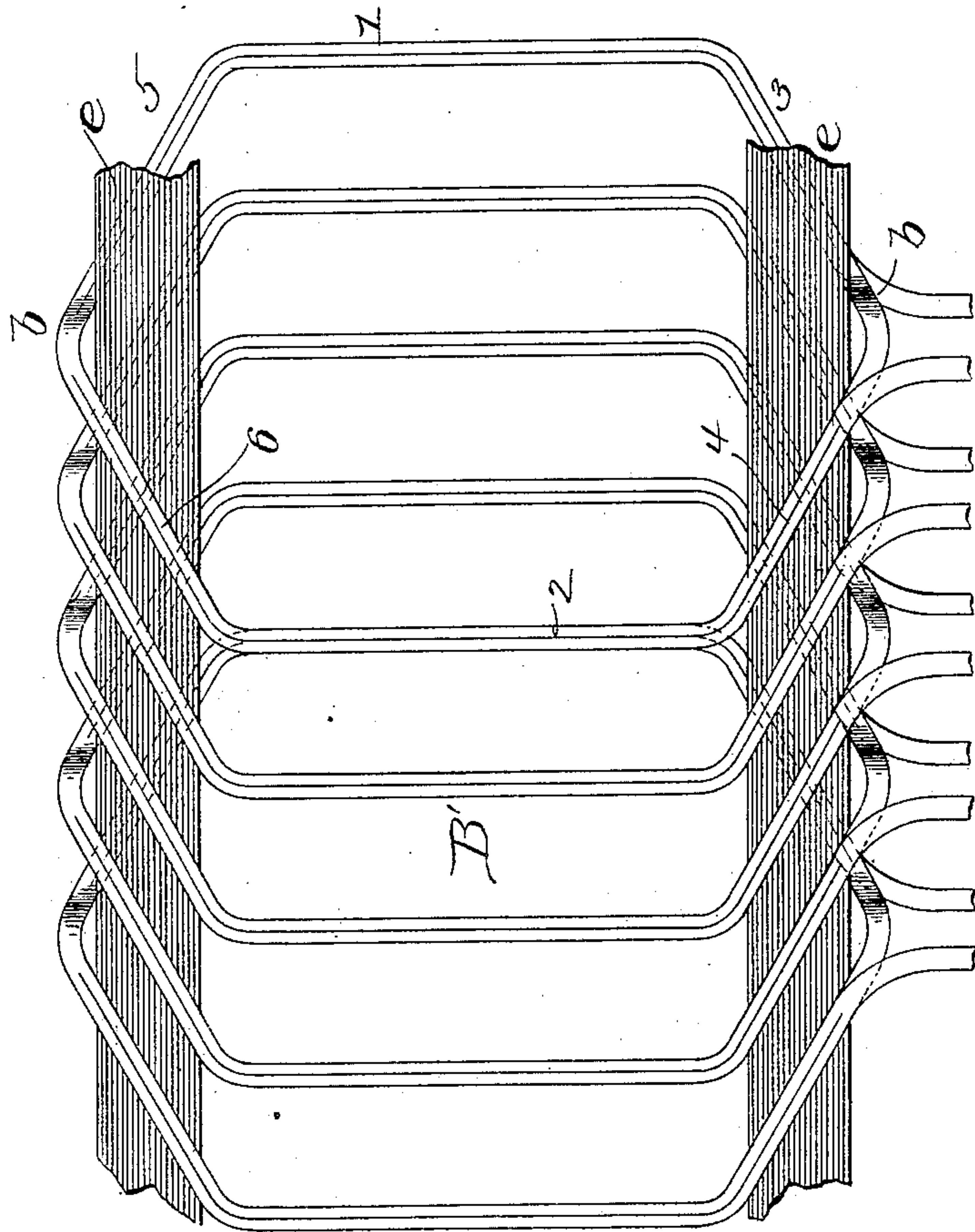
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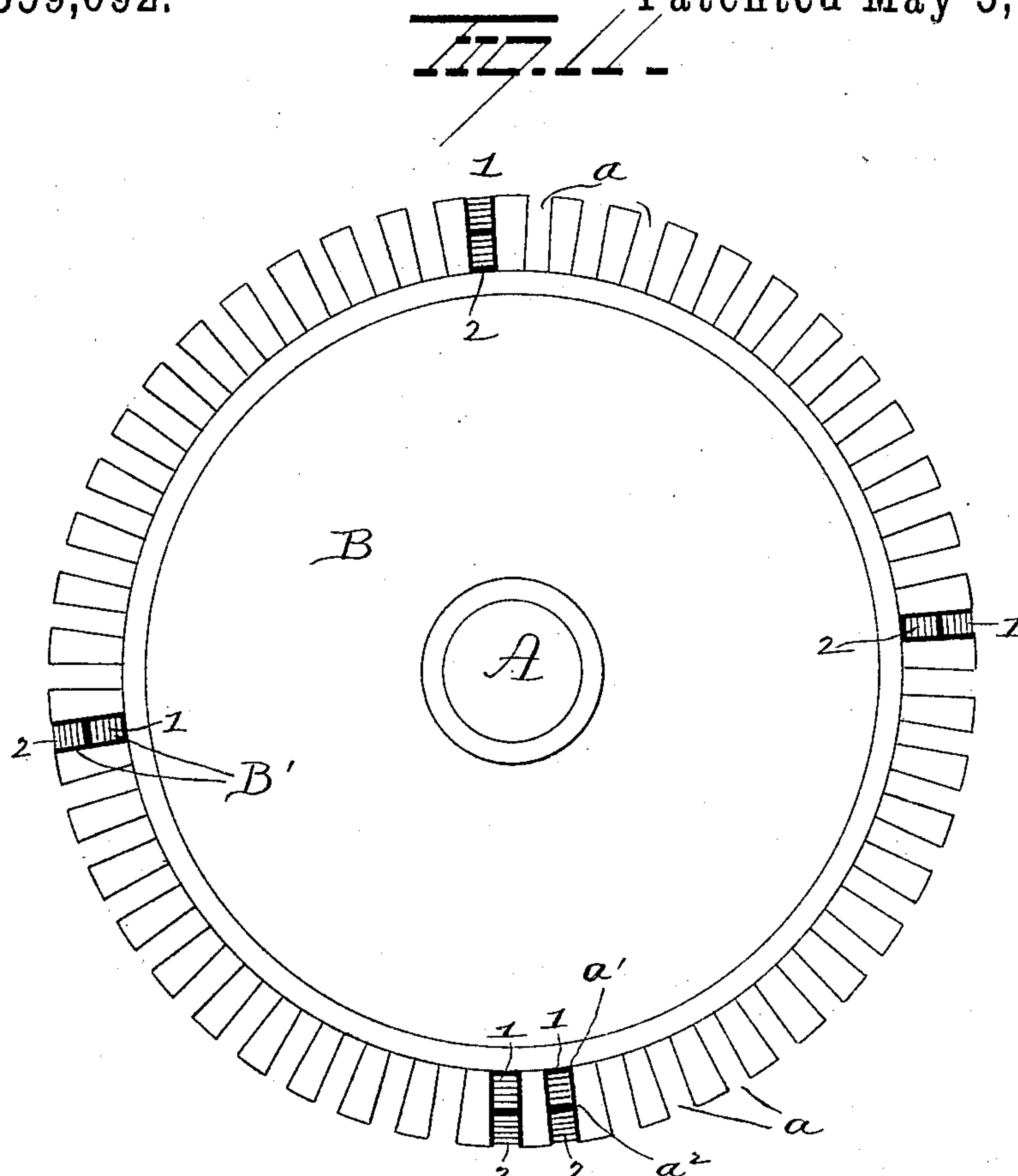
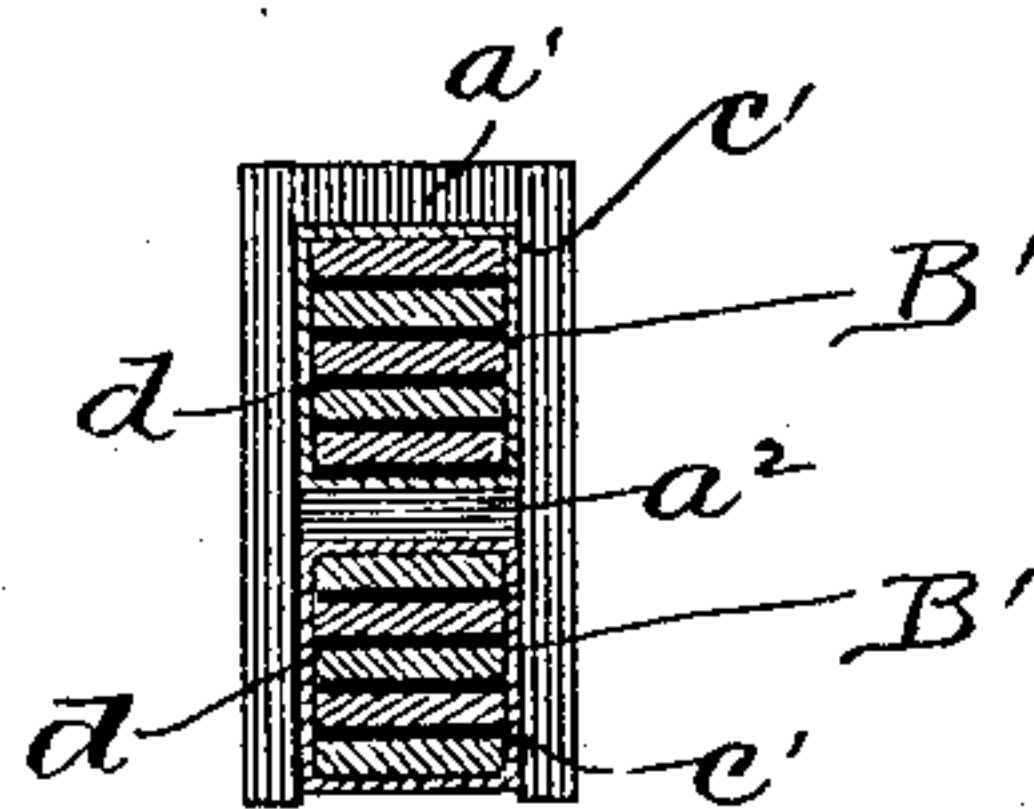


Fig. 2.



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# UNITED STATES PATENT OFFICE.

JONATHAN P. B. FISKE, OF ALLIANCE, OHIO, AND HOWARD A. LITTLEFIELD,  
OF LYNN, MASSACHUSETTS; SAID LITTLEFIELD ASSIGNOR TO SAID FISKE.

## ARMATURE FOR ELECTRIC MOTORS AND DYNAMOS.

SPECIFICATION forming part of Letters Patent No. 559,692, dated May 5, 1896.

Application filed December 14, 1894. Serial No. 531,808. (No model.)

*To all whom it may concern:*

Be it known that we, JONATHAN P. B. FISKE, of Alliance, in the county of Stark and State of Ohio, and HOWARD A. LITTLEFIELD, of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Armatures for Electric Motors and Dynamos; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to an improvement in armatures for electric motors and dynamo-electric machines, and more particularly to an improved winding therefor and the method of making the coils composing the same.

One object of the invention is to produce a simple and efficient form of winding and to so construct the armature core or drum as to facilitate the assembling of the coils thereon in a satisfactory and economical manner.

A further object is to construct an armature-winding in such manner that it shall be comparatively cheap to manufacture and be thoroughly satisfactory, not only from an electrical but also from a mechanical standpoint.

A further object is to construct an armature-winding in such manner and so assemble it upon an armature core or drum that a damaged coil can be readily replaced without an excessive amount of labor.

A further object is to construct an armature-winding in such manner that the ends of the coils will overlap and be so disposed on only two parallel planes or surfaces that they may be separated by heavy sheets of insulating material.

A further object is the production of a simple, cheap, and efficient method of making our improved coils.

With these objects in view the invention consists in the method of making an armature-coil, consisting in winding it so as to have parallel side portions and end portions connecting the side portions, and then bending the coil at the juncture of the end portions, so as to cause one side of the coil to be disposed in a different plane from the other side.

The invention also consists in certain other

steps in the method of making our improved coil, as hereinafter set forth, and pointed out in the claims.

The invention also consists in the combination, with an armature core or drum having annular extensions at its ends, of a series of coils disposed on said core or drum and having their ends disposed on said annular extension.

The invention also consists in the combination, with an armature core or drum, of a series of coils located thereon and having their ends projecting beyond the same and annular extensions secured to said core or drum and supporting the projecting ends of the coils.

The invention also consists in the combination, with an armature core or drum, of a series of overlapping coils placed thereon and having their ends projecting beyond the ends of said core or drum and an annular extension projecting from each end of the core or drum and supporting the projecting overlapping ends of the coils.

The invention also consists in the combination, with an armature core or drum, of a series of coils arranged thereon and having ends projecting from the ends thereof in a direction concentric with the axis of the core or drum, and an annular flange or extension of the core or drum for supporting said projecting ends of the coils; and the invention also consists in certain novel features of construction and combinations and arrangements of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of the armature core or drum with two coils in place. Fig. 2 is an isometric view showing one coil in place. Fig. 3 is a plan view of a coil before the ends are bent or offset. Fig. 4 is a side view, and Fig. 5 is an end view, of the same. Fig. 6 is a plan view of a coil having the bent or offset ends. Fig. 7 is a side or edge view, and Fig. 8 is an end view, of the same, the latter also showing the manner in which the coil is bent to cause it to conform to the contour of the armature core or drum. Fig. 9 is a view of a completed coil. Fig. 10 is an enlarged view showing the manner of inserting the sheets of insulating



material between the projecting overlapping ends of the coils. Fig. 11 is an end view of an armature core or drum, showing four coils in place. Fig. 12 is a detail view.

5 In the various figures of the drawings, except Fig. 9, we have shown the coils with the tape wrapping (hereinafter referred to) omitted for sake of clearness of illustration of the invention, a completed coil with the tape covering being shown in Fig. 9.

10 A represents the armature-shaft, and B the armature core or drum thereon, the latter being of the "drum" type. The armature or drum B is iron and made in its face with a number of grooves  $a$ , having insulating-lining  $a'$  parallel with its axis for the reception of the armature-coils B'. To each end of the core or drum B a head C is secured, and from said heads annular flanges D project, said heads and flanges being preferably made of cast-iron. The flanges D are concentric with the axis of the drum or core and project from the ends of the latter in line with the bottoms of the longitudinal grooves  $a$ , thus forming, in effect, annular extensions of the drum or core, the purpose of said flanges or extensions being to support the ends of the armature-coils which project beyond the ends of the drum or core, as more fully explained farther on.

30 In constructing our improved coil we take a flat metallic ribbon (although round wire might be employed) and coil it on a suitable former to make a six-sided figure having parallel straight sides 1 2 and converging end portions 3 4 and 5 6. The long side portions 1 2 are intended to lie in two grooves in the core or drum, located ninety degrees apart in a four-pole machine. For a machine having a different number of poles the number of slots covered would of course be different and also the number of degrees apart of the respective sides of the coils. Each coil is of course a continuous conductor with as many turns per coil as is necessary for the machine under construction. The ends 7 8 of the coil are suitably connected with a commutator or with adjacent or opposite coils, as the case may be.

50 By reference to Fig. 1 it will be observed that the portions 3 4, composing one end of the coil, project over one of the annular flanges or extensions D and lie on different planes or surfaces located at different distances from the armature-shaft. The necessity for this will be readily seen when it is noticed that the coils must overlap or pass over or by each other, and by causing one part 3 of the end of a coil to lie on a different surface or plane from the other part 4 one part 3 of another coil will underlie the portion 4 of the first coil and so on throughout the series of coils, so that in the finished winding the ends of the coils will be disposed only on two planes or surfaces. The same remarks also apply, of course, to the ends of the coils at the opposite end of the armature core or drum. It will also be observed, by reference

to Fig. 2, that one straight or long side of a coil is disposed in the bottom of a slot  $a$  in the core or drum B, and that the opposite side of the coil is located in the upper or outer part of the slot  $a$ , and the remaining portion of each slot will be occupied by one side of another coil, (with interposed insulation  $a^2$ ,) as shown in Fig. 11. One side of each coil must therefore be disposed in a different plane from the other side, but both sides of a coil will be disposed parallel with the axis of the core or drum.

80 In order to cause the respective sides of a coil to lie on different planes, or, in other words, at different distances from the axis of the armature, the ends of the coil are bent or offset at the juncture of the converging parts 3 4 and 5 6 thereof, as at  $b$ , but in practice we prefer to cover or wrap the coil with insulating-tape before thus bending or offsetting them.

When the coil is first made, the flat ribbon will be coiled one layer upon another with interposed insulation  $c'$ . It is necessary, however, to give the side portions 1 2 a slant, or, in other words, to make them inclined in cross-section, as at  $c$ , Figs. 3, 5, and 6, in order that the coil can properly enter the slots in the core or drum, the radial walls of which slots are practically ninety degrees apart. When the coil has been thus far completed, it will be covered with tape  $d$  and bent or offset at  $b b$ , as and for the purpose above explained. The coil will then be bent, as shown in Fig. 8, so as to cause it to conform to the surface of the armature core or drum, when it will be ready to be placed in position. The overlapping portions of the ends of the coils will be insulated from each other by means of strips of insulating material  $e$ , Fig. 10, and as one portion of the end of each coil is disposed a different distance from the axis of the armature than the other a heavy insulating-sheet can be readily placed between the overlapping portions of the ends of the coils.

Our improvements are simple and result in the production of an armature which is cheap to construct, easy to repair, and very effectual in the performance of its functions.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination with an armature core or drum having annular extensions at its ends, of a series of coils disposed on said core or drum and having their ends disposed on said annular extensions, substantially as set forth.

2. The combination with an armature core or drum, of a series of coils located thereon and having their ends projecting beyond the ends of said core or drum, and annular extensions secured to said core or drum and supporting the projecting ends of the coils, substantially as set forth.

3. The combination with an armature drum or core, and coils mounted thereon and extending beyond the ends thereof, of exten-



sions secured to the drum or core and supporting the projecting ends of the coils, substantially as set forth.

4. The combination with an armature drum  
5 or core, of a series of overlapping coils placed thereon and having their ends projecting beyond the ends of said core or drum, and annular extensions projecting from the ends of said drum or core and supporting the projecting overlapping ends of the coils, substantially  
10 as set forth.

5. The combination with an armature drum or core, of a series of coils arranged thereon and having ends projecting beyond the ends  
15 thereof in a direction concentric with the axis of the core or drum, and an annular flange or extension on each end of the core or drum for supporting said projecting ends of the coils, substantially as set forth.

20 6. The combination with an armature drum or core having a series of longitudinal slots, of a series of overlapping coils disposed in said slots and having ends projecting beyond the ends of the core, and flanges extending  
25 from the ends of the drum or core for supporting said projecting ends of the coils, substantially as set forth.

7. The combination with an armature core or drum and flanges secured to the ends thereof, of a series of coils located on the drum or  
30 core and adapted to overlap, the ends of said coils projecting beyond the ends of the drum or core and said coils being so formed that one half of each end of each coil will lie against said flanges and the other half of each end of  
35 each coil out of contact with said flanges, substantially as set forth.

8. The combination with a slotted armature-core, of heads secured thereto, annular flanges projecting from said heads, and counterpart  
40 detachable coils disposed within the slots in the core and having end portions supported by said flanges, substantially as set forth.

In testimony whereof we have signed this specification in the presence of two subscrib-  
45 ing witnesses.

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HOWARD A. LITTLEFIELD.

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