

No. 666,819.

Patented Jan. 29, 1901.

J. K. REYNARD.

PERMANENT COPY OF SOUND RECORDS OR THE LIKE.

(Application filed Feb. 5, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1

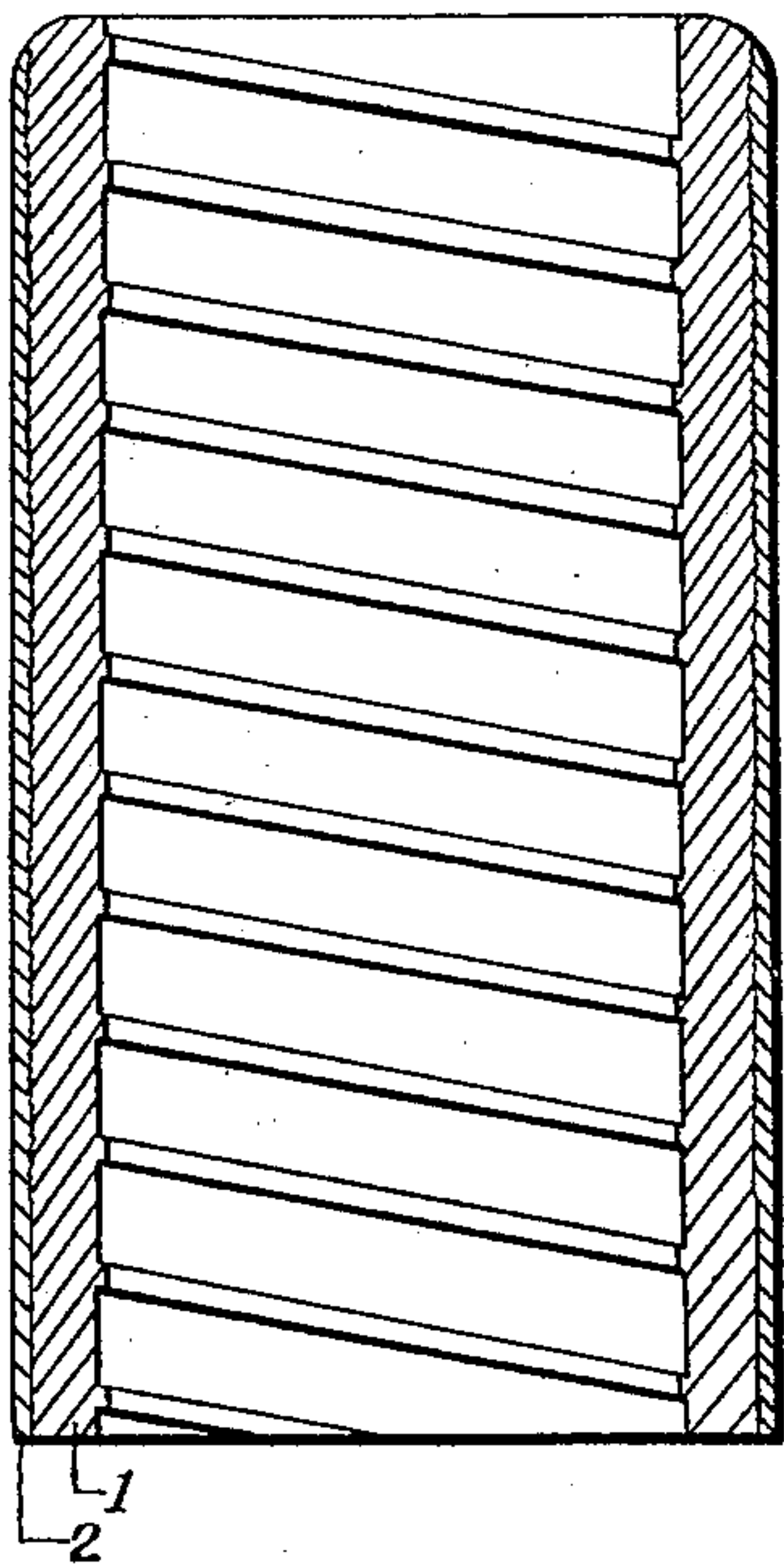


Fig. 2.

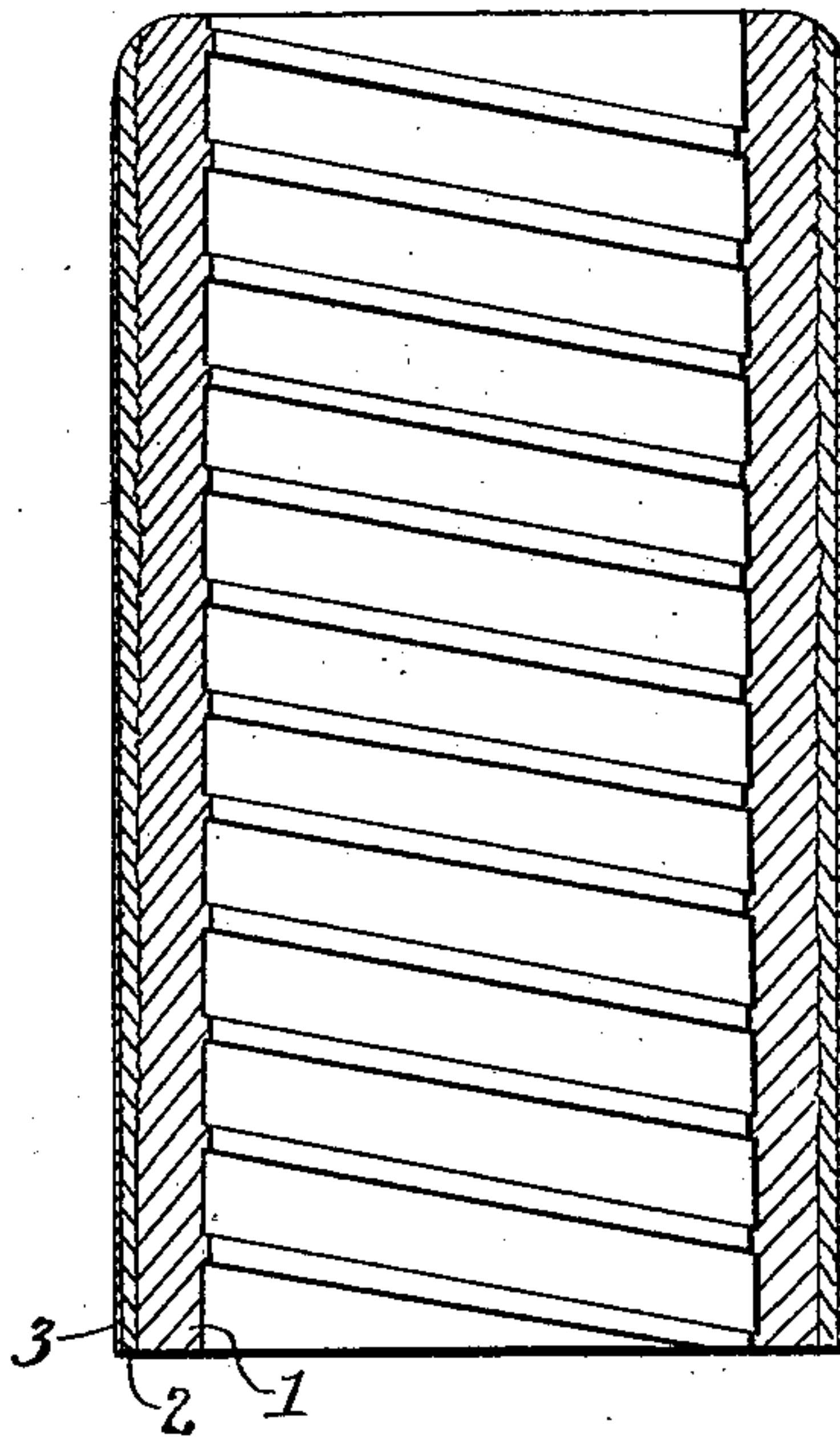
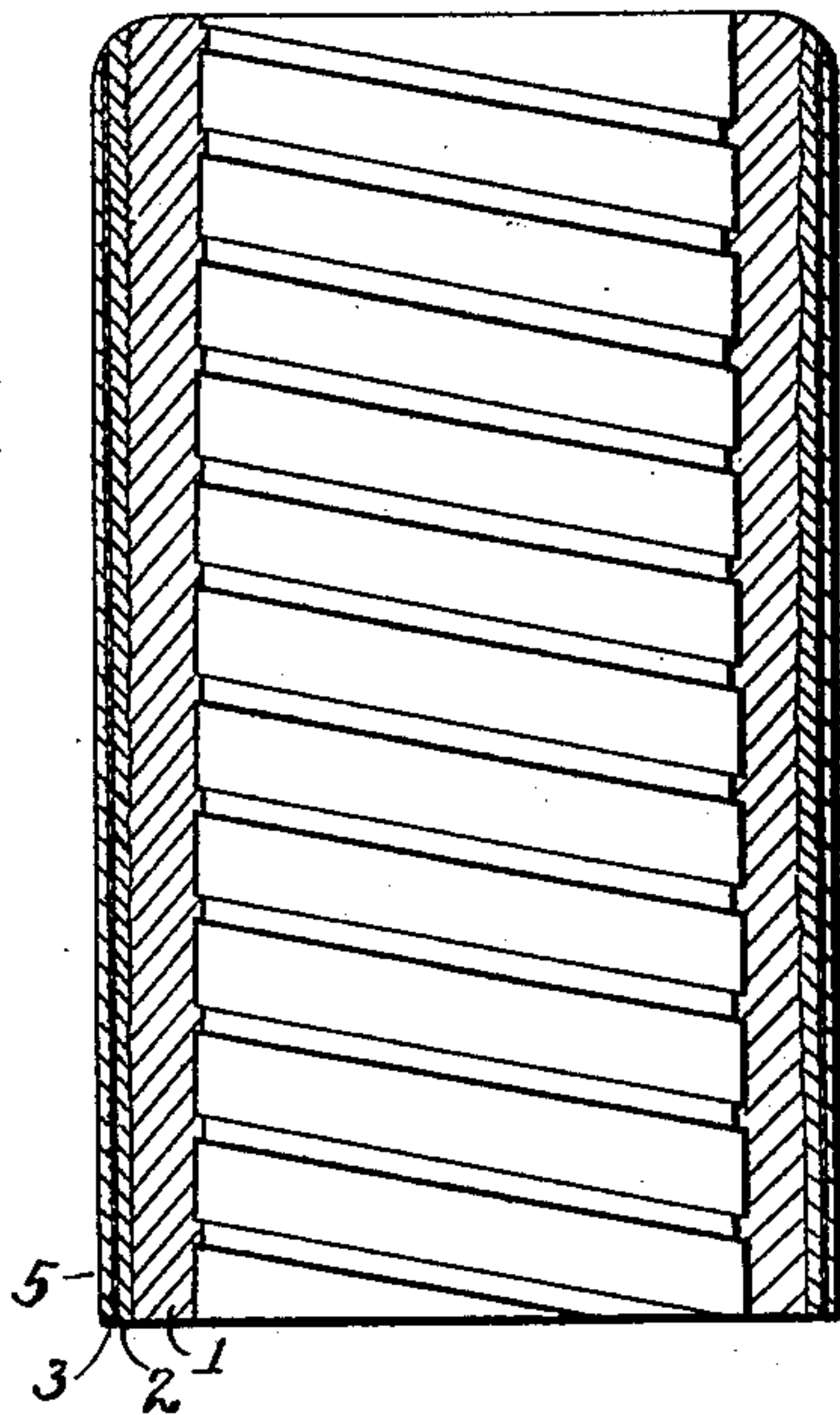
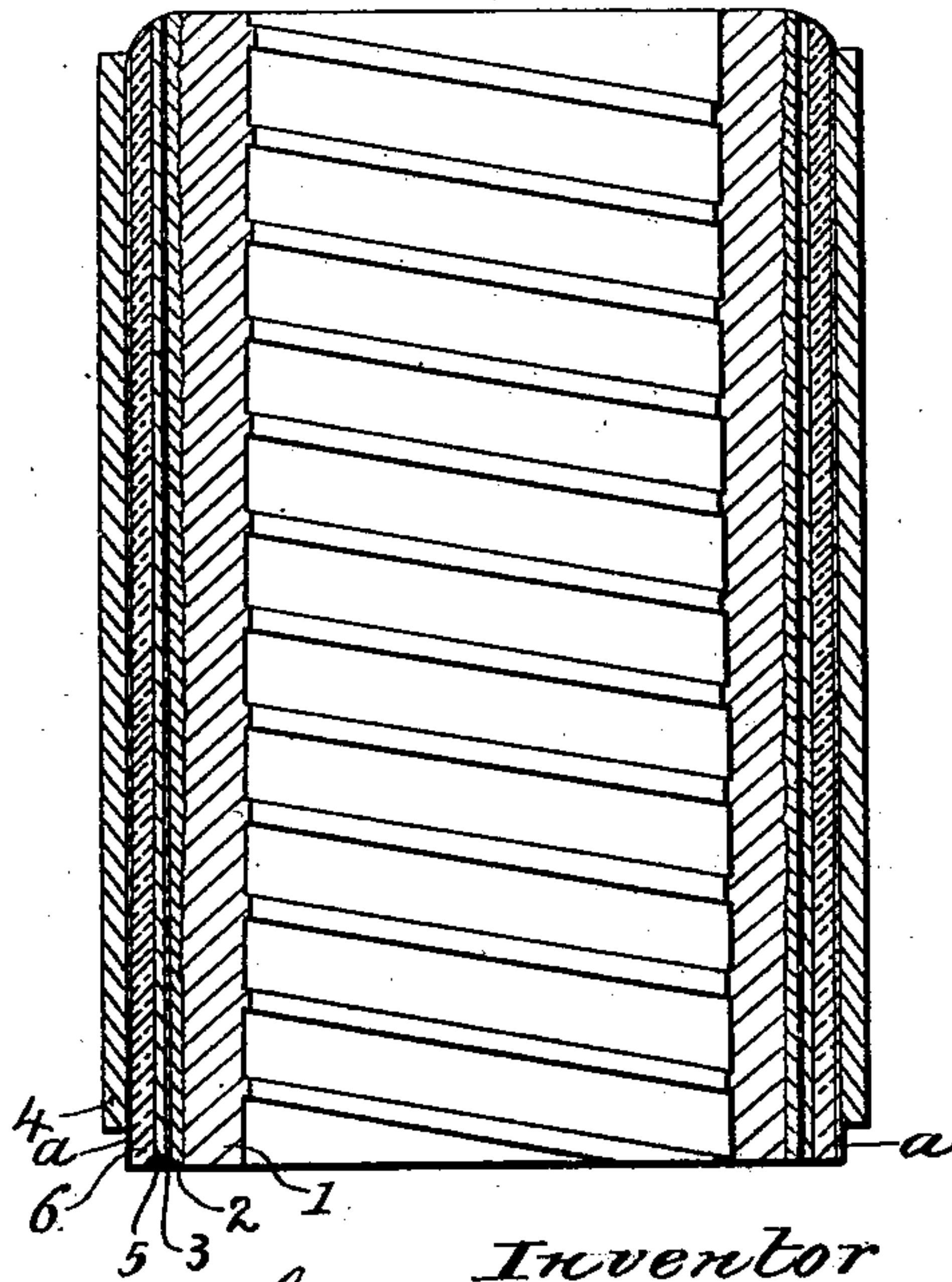


Fig. 3.



Witnesses
W. R. Edelen.
[Signature]

Fig. 4.



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Fig. 5.

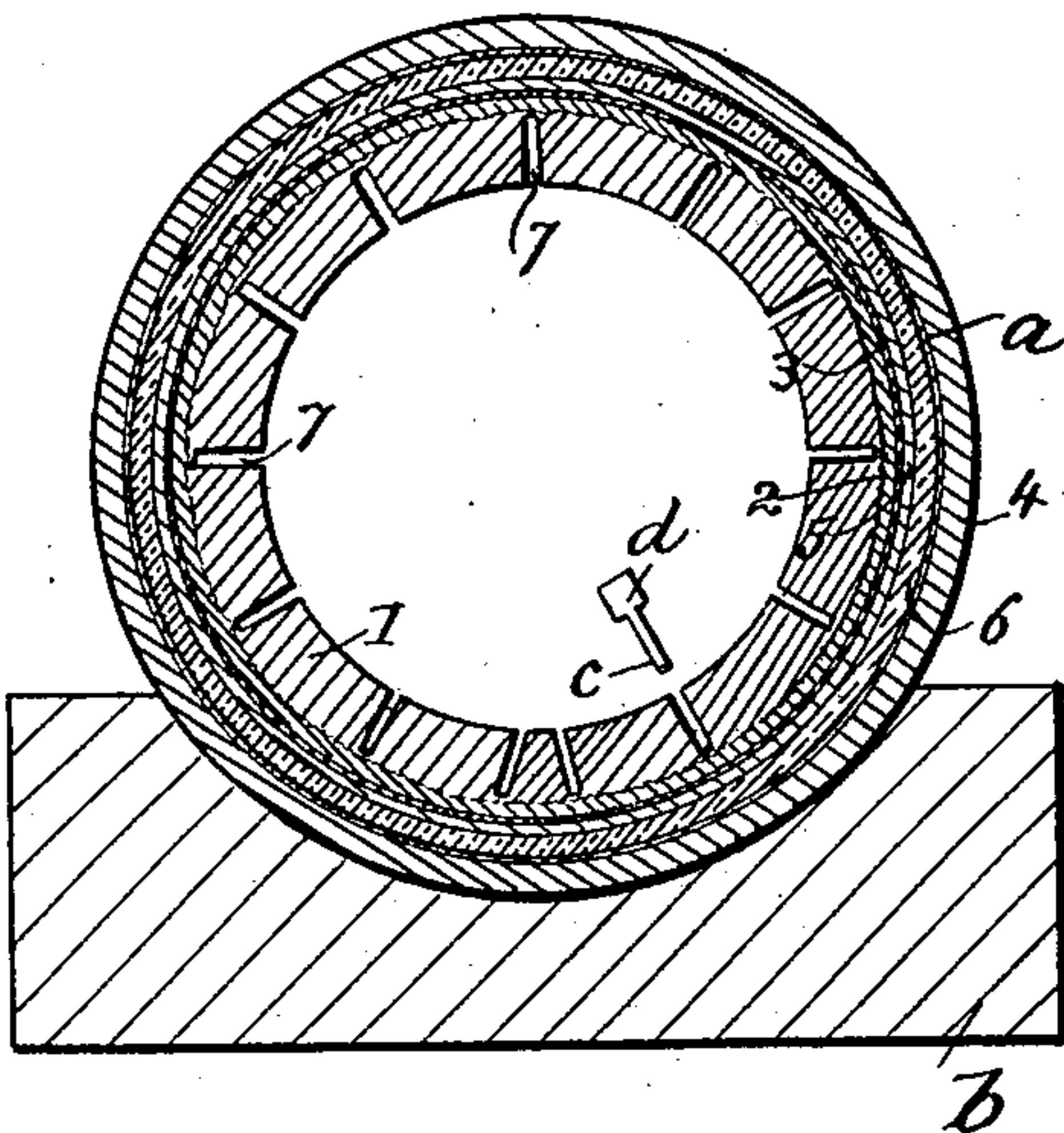


Fig. 6.

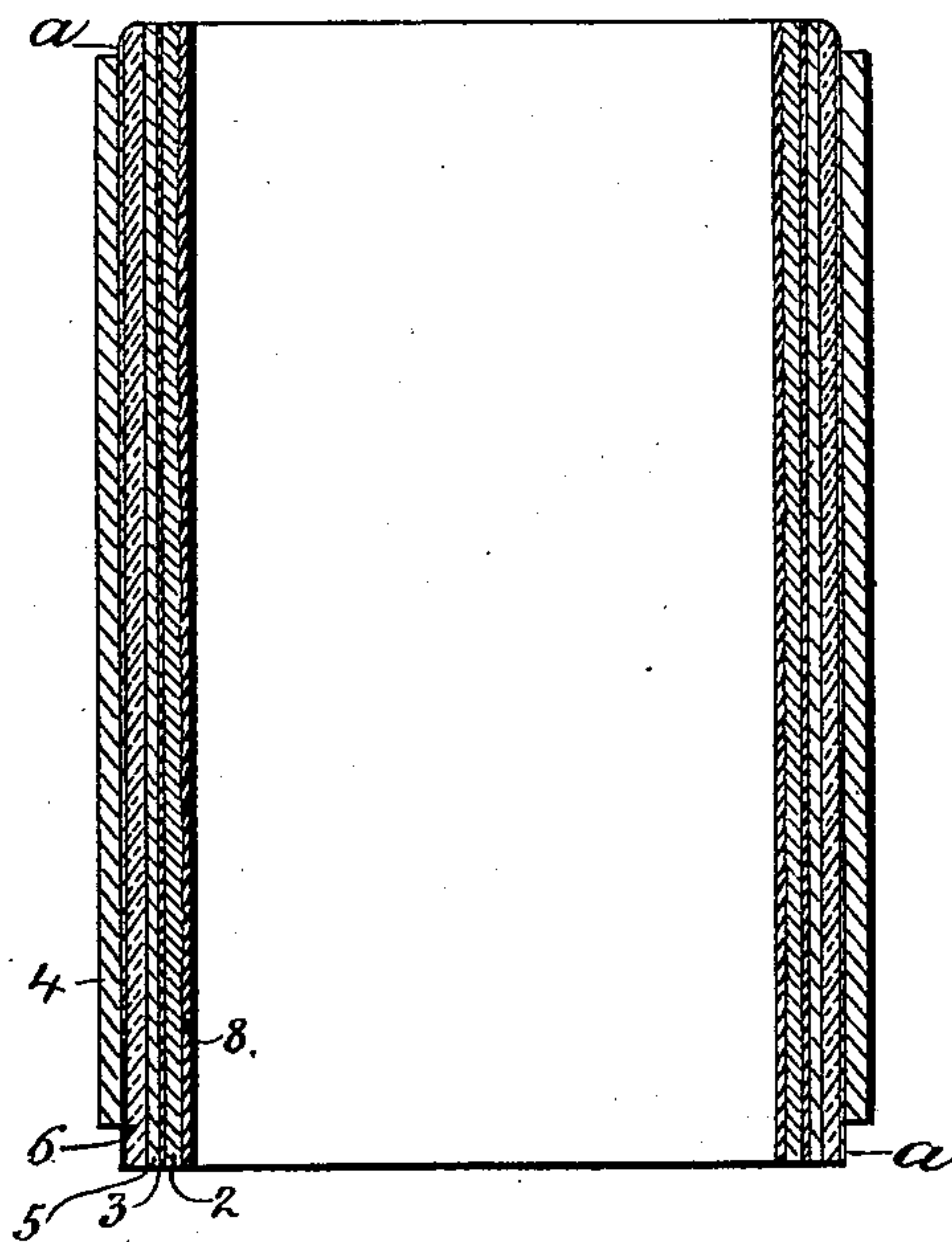


Fig. 7.

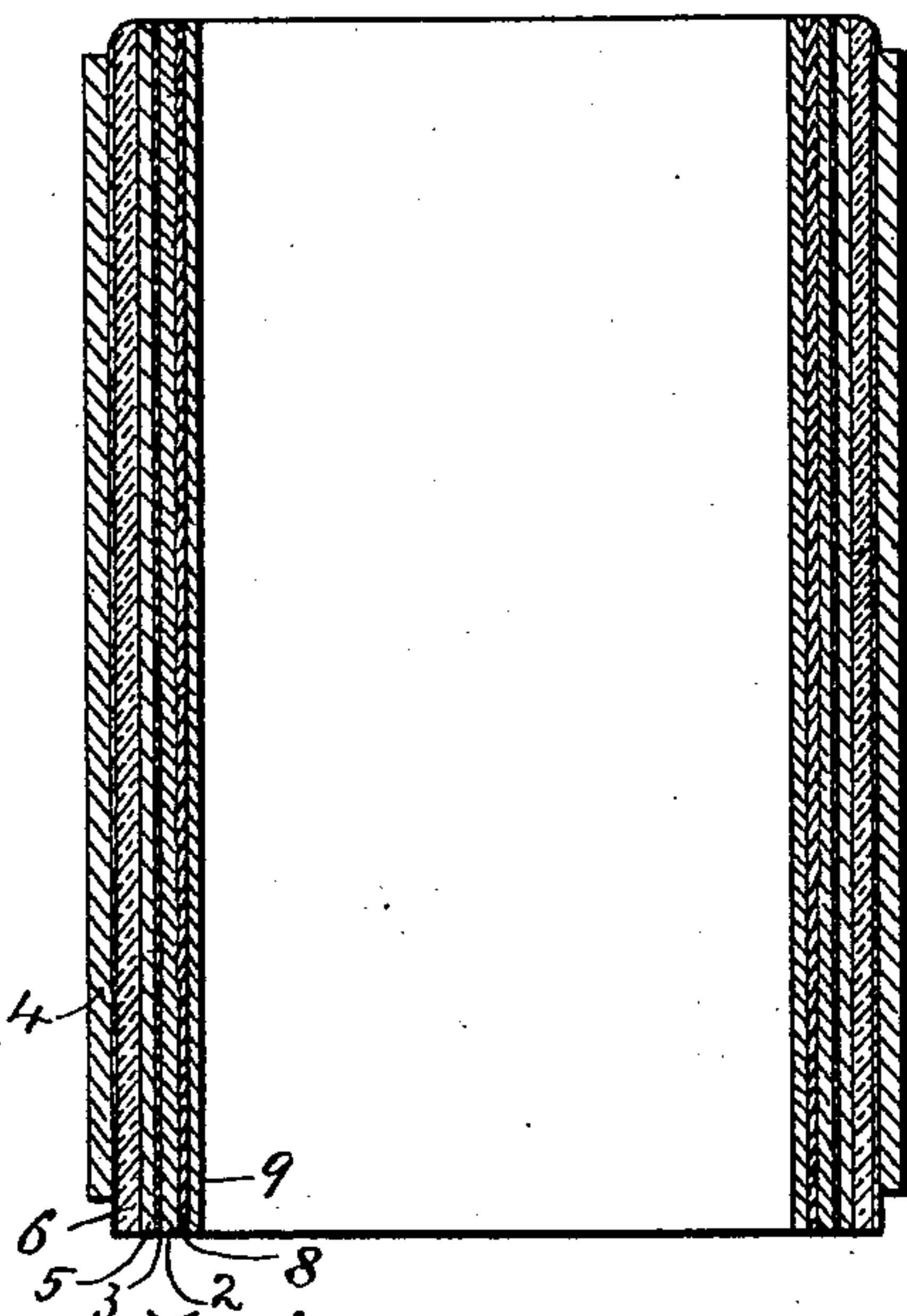
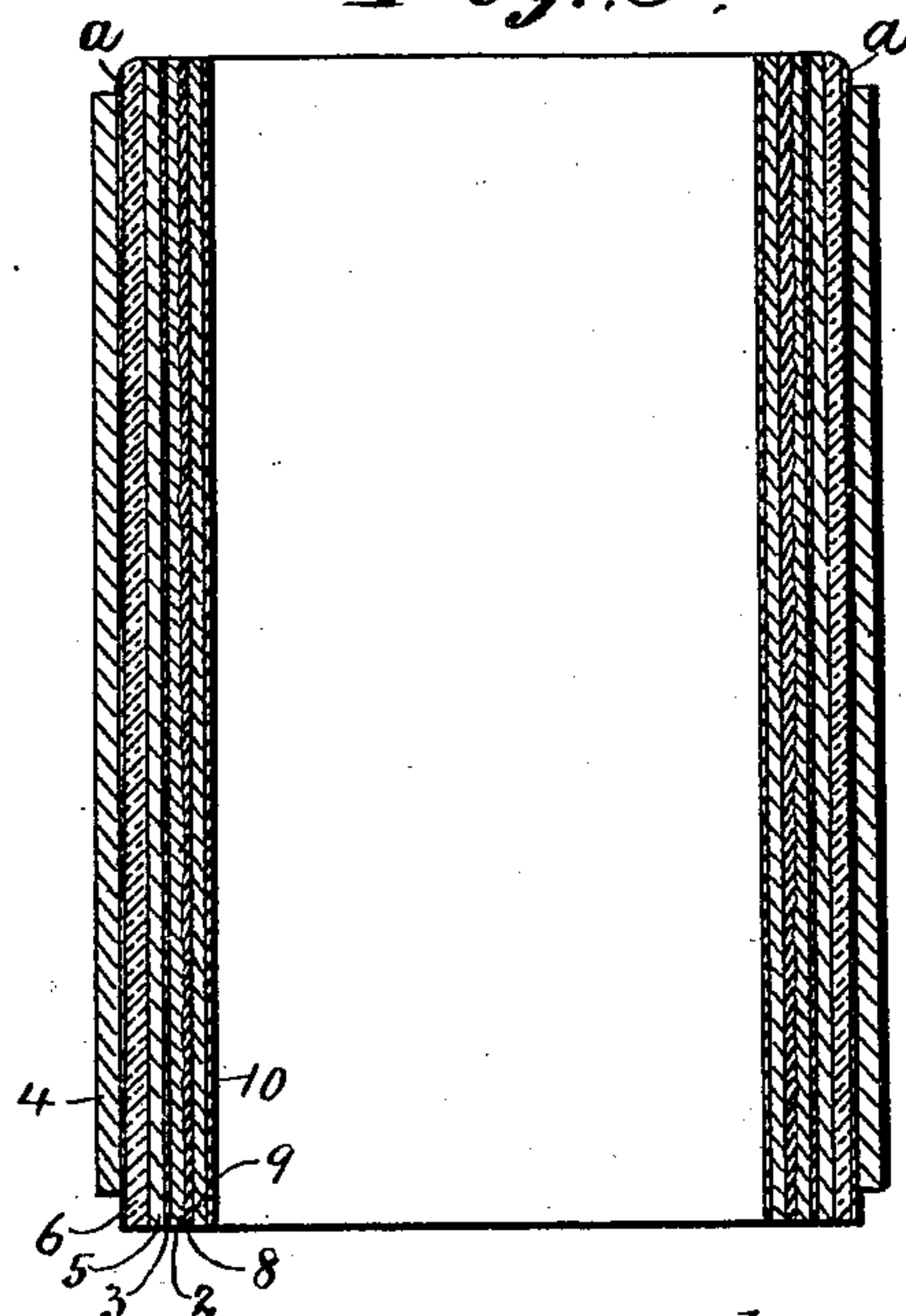


Fig. 8.



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3 Sheets—Sheet 3.

Fig. 9.

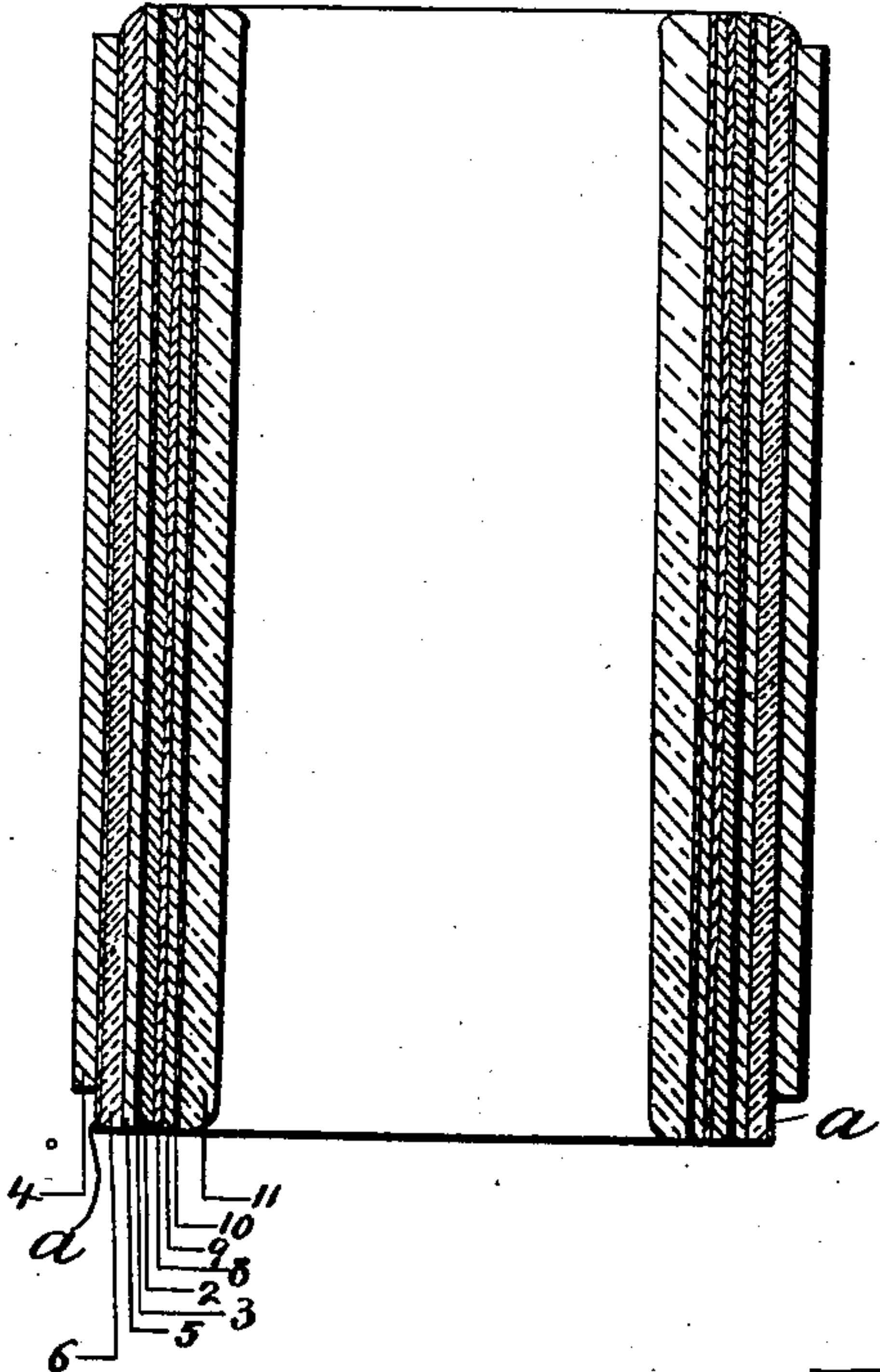


Fig. 11.

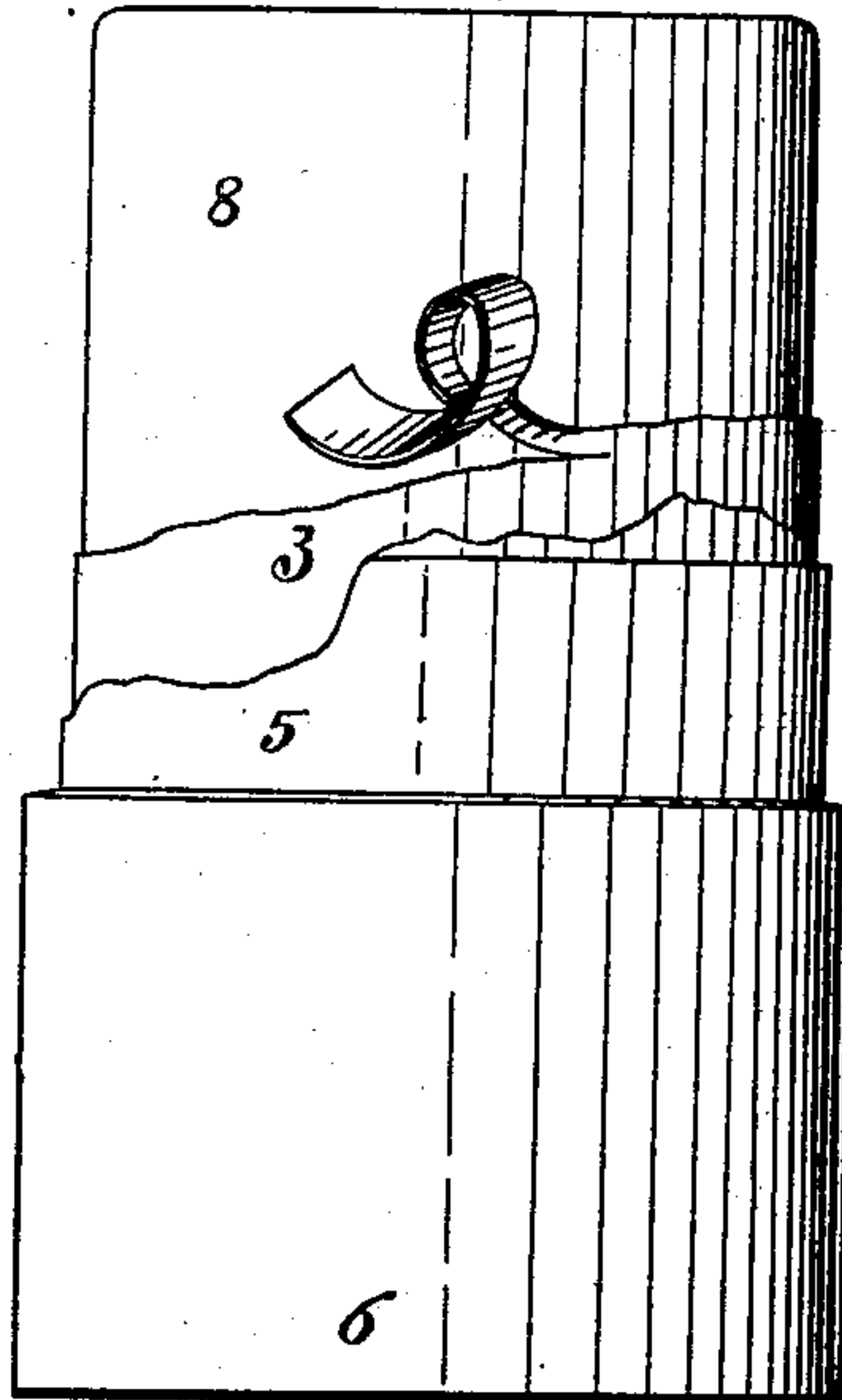
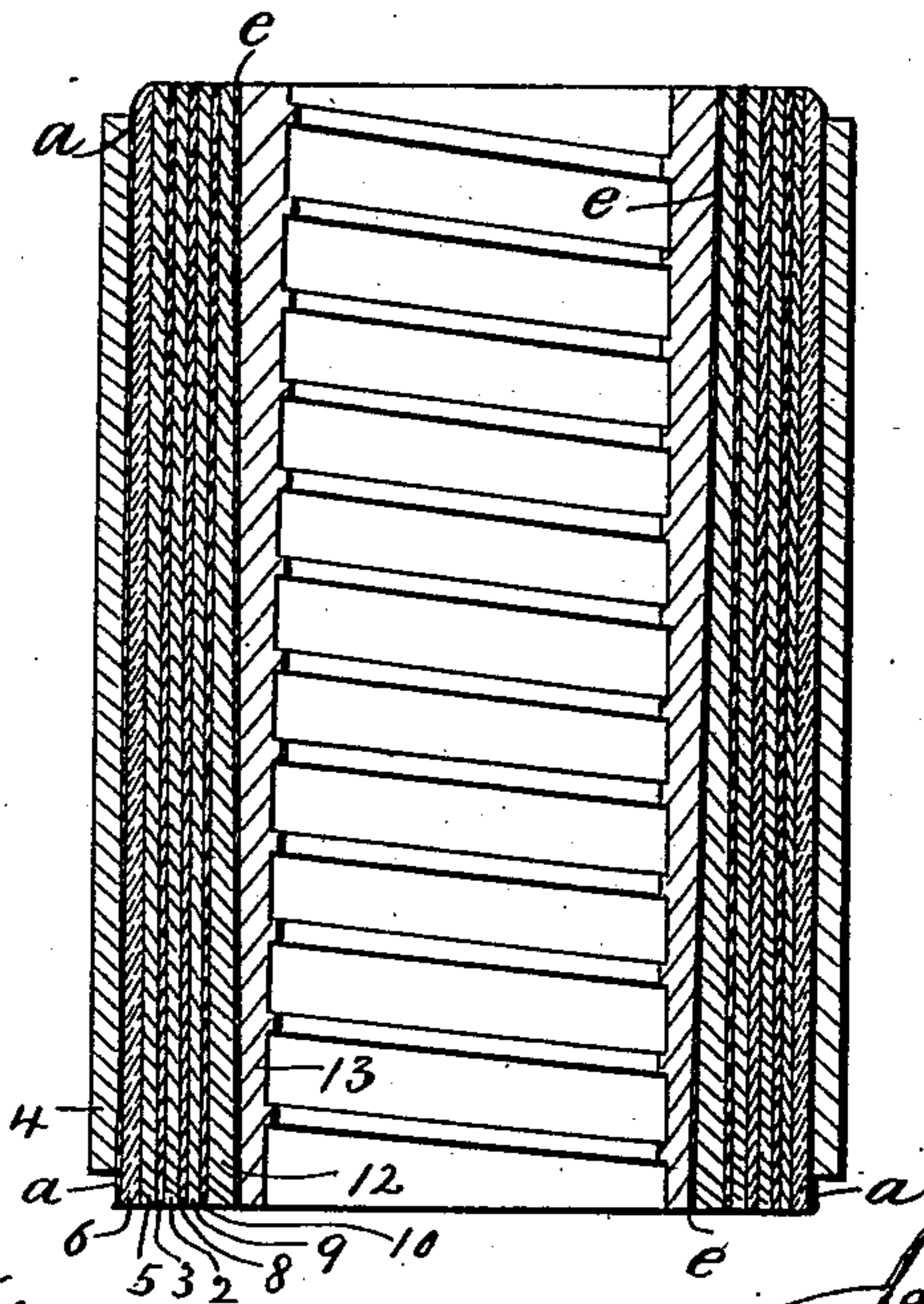


Fig. 10.



Witnesses.

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UNITED STATES PATENT OFFICE.

JAMES K. REYNARD, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE
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PERMANENT COPY OF SOUND-RECORDS OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 666,819, dated January 29, 1901.

Application filed February 5, 1900. Serial No. 4,004. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES K. REYNARD, of Newark, New Jersey, have invented a new and useful Improvement in Permanent Copies of Sound-Records or the Like, which is fully set forth in the following specification.

This invention relates to permanent or indestructible copies of surfaces containing minute irregularities, such as sound-records; and it consists in the employment of certain steps that are of great advantage in producing such copies commercially, and particularly in the method of building up a substantial yet faithful matrix, in building up a substantial celluloid structure containing the permanent copy, and in the improved matrix and permanent copy produced by the novel steps of my improved process.

Briefly stated, the new process is as follows:
The matrix is first formed in any approved manner, but preferably as hereinafter described. It is then mounted, preferably in a manner to be described, for convenience in handling, after which it is separated from the master. The permanent or indestructible copy is then formed by first coating the surface of this matrix with a thin film of liquid or semiliquid celluloid, which ultimately constitutes the outer surface of the permanent copy, next placing on this celluloid film when dry a film of some suitable adhesive material, such as chromatized gelatin, and then coating the surface of this adhesive film with a second celluloid film. These alternate steps may be repeated, if desired. A convenient support or backing may be supplied to this built-up structure, and the matrix and its mounting are finally removed.

The application of this invention is not limited to any particular shape of article to be copied, but will be described at length as applied to producing a permanent copy of the ordinary cylindrical sound-record for graphophones, (or phonographs.) It will be best understood by reference to the accompanying drawings, in which—

Figures 1 to 10 are sectional views, and Fig. 11 an elevation, illustrating the successive steps and showing the films or layers considerably exaggerated.

The matrix is by preference formed as follows: I first coat the master 1 with a thin film 2 of some suitable material that will not injuriously affect the material of which the master is composed and that can receive and retain a true copy in reverse of the minute irregularities to be copied. I prefer a solution of gelatin, preferably chromatized gelatin. This coating is allowed to dry gradually and evenly, so as to leave a uniform film 2 over the whole surface to be copied. (See Fig. 1.) This constitutes the true matrix and is a hard horny film of great toughness. When this film 2 is thoroughly dry, it is exposed to the sunlight, which gives it a somewhat-clouded appearance, the actinic rays hardening it. The matrix has then to be supplied with a mounting. Where gelatin is used, I find it convenient to coat the gelatin film with a varnish, as shellac 3, (see Fig. 2,) and when this coat 3 is dry I apply a coating of some suitable material, such as wax, hereinafter referred to, after which the whole structure is fitted with a metal holder 4 for convenience in handling. (See Fig. 4.) The shellac serves a threefold purpose. It clasps the gelatin film closely and truly to the surface of the master and prevents it from blistering off and from warping or wrinkling when removed from the master, the alcohol in the shellac affects the gelatin film, rendering it slightly elastic and less brittle and liable to crack, and the wax mixture of which the backing for the matrix is preferably formed will adhere to shellac more readily than to the gelatin. A second coat of shellac may be applied, if desired. For a reason to be explained later I find it convenient to apply to the matrix a first coat 5 of fine wax, (see Fig. 3,) and then a thicker layer 6 of a mixture of beeswax and rosin in equal proportions. (See Fig. 4.) This outer coat 6 is turned to a true cylinder, wrapped with a strip of paper *a*, Fig. 4, and fitted neatly into a metal cylinder 4. After the complete matrix is thus built up the original master is broken away or otherwise removed. This may be done conveniently, as shown in Fig. 5, by cutting from the interior of the original master grooves 7, that reach nearly but

not quite through its wall to the matrix. For this purpose I place the metal cylinder containing the master and the complete matrix in a seat *b* to prevent it from slipping and then use a saw whose cutting portion *c* is much thinner than its back *d* and is of a depth less than the thickness of the wall of the original master, the rib *d* preventing it from cutting too deep, so as to injure the matrix. I cut upon the inner side of the master two adjacent grooves, so as to remove a V-shaped piece. This "keystone" being thus removed, I saw other grooves on either side of this notch and readily remove the intervening portions of the wall of the original master, taking care to brush off all particles of dust, &c., from the matrix-surface. This matrix is now available for producing copies, permanent or otherwise, in any desirable manner from any suitable material.

One of the purposes of the present invention is to produce a celluloid copy more substantial than those hitherto produced.

If a sheet of ordinary celluloid be softened, as by steam, and pressed against the matrix, it tends to break down the minute irregularities to be copied, and small particles of foreign matter or even of air would prevent the celluloid from entering into intimate connection and receiving a true copy, and, besides, the heat would in many cases affect the matrix. If celluloid in a solution be flowed upon the surface of the matrix to an appreciable thickness, the volatile medium (ether or alcohol) evaporates so rapidly that an outer crust is formed, while the inner mass retains its semi-fluid consistency for a long time and ultimately dries with great unevenness, forming a spongy porous structure. The last portion to dry is that next the matrix, which should form the true record-surface, and under these circumstances it presents a pitted "small-pox" appearance, and finally it has been found impracticable to build up a celluloid structure by repeated deposits of film, for the reason that as each deposit dries the film so formed draws away from the one beneath it for want of sufficient cohesion. I therefore proceed as follows: I first flow over the surface of the matrix 2 (or otherwise apply, as by dipping) a solution of celluloid, (preferably with a suitable thinner, such as the ordinary cement filler sold on the market, being about a one-per-cent. solution of celluloid,) forming an exceedingly-thin film 8, Fig. 6, which eventually constitutes the outer or record surface of the permanent copy. This film 8 is so infinitesimally thin and delicate that it bears on its exposed face (away from the matrix) a practical duplicate of the irregular surface of the matrix. In other words, its thickness is less than the height or depth of the minute irregularities to be copied. After it is thoroughly and evenly dried this celluloid film 8 is coated with a film 9 (see Fig. 7) of some suitable adhesive material that can be handled readily, (preferably a so-

lution,) that will adhere faithfully to celluloid, and that has substantially the same coefficient of expansion as celluloid. The chroma- 70
tized-gelatin solution has all these properties and may be advantageously used. This second or adhesive film 9 is almost as thin as the celluloid film 8, bearing on its exposed face to some extent a reproduction of the 75
matrix. I then flow the celluloid solution (this time by preference somewhat stronger—say a ten-per-cent. solution) on the film 9, forming a second celluloid film 10, which is allowed to dry as before. (See Fig. 8.) These alter- 80
nate steps may be repeated, if desired. The structure thus built up by alternate films of celluloid and gelatin is practically to all intents and purposes a homogeneous celluloid structure. It may be provided with a back- 85
ing in any convenient manner, as by pouring into the cylinder around a central mandrel melted wax, beeswax, rosin, &c., 11, (see Fig. 9) or the interior of the celluloid structure may be coated with a beeswax and rosin mix- 90
ture 12, which is reamed out to a predetermined taper, after which an ordinary soap-mixture cylinder 13, turned to the same exterior taper, is wrapped with a blank *e* of paper or the like of the proper shape and size 95
and then inserted into the celluloid structure. The beeswax and rosin mixture is best for the filling between the tapered soap-mixture cylinder and the celluloid cylinder, since it is homogeneous, fusing readily at a low tem- 100
perature, is easily handled, and has about the same coefficient of expansion as the celluloid. The wrapping *e* prevents friction in inserting the tapered cylinder and if of paper is a non-conductor of heat between the 105
soap material and the wax mixture. Last of all the matrix is removed and the permanent copy is finished and ready for use. The metal cylinder 4 is first removed and the paper *e* unwrapped, then the built-up cylinder (see 110
Fig. 11) is placed on a mandrel, and the beeswax and rosin coat 6 is turned off with a knife until the lighter-colored fresh wax 5 gives warning that the celluloid is being approached. This layer 5 is pulled off by hand, 115
and finally the shellac and gelatin films 3 and 2 are readily peeled off.

In general, all solutions should be strained from impurities and all air-bubbles removed, the article should be of approximately the 120
same temperature as the solution that is being applied, and the temperature should remain as uniform as possible throughout the entire process. It is necessary that each film or coating should dry thoroughly and evenly. 125
If it dry too fast, it is liable to pull away from the surface beneath it, and if it dry too slowly it may dry unevenly and become warped or wrinkled. An even temperature is more readily maintained by having a warm room. 130

When the original that is to be copied is other than a cylinder, of course appropriate changes will be made, as in the shape of the metal holder for the matrix, if one be em-

ployed. Of course the wax backing of the matrix will not be turned to a cylinder, and equally of course the mounting for the celluloid copy will not be made of the tapered cylinder described. I do not limit myself to the exact steps described, as I have merely set forth the best methods. Parts of my invention may be used to the exclusion of other parts without departing from the spirit of my invention.

I claim—

1. The herein-described process of forming a permanent or indestructible copy, which consists in first coating the original master with a solution of some suitable material that can receive and retain a true copy in reverse of the minute irregularities to be copied, then coating this film when dry with a suitable varnish, next providing this varnish with a suitable backing, then removing the original master from the matrix so built up, afterward coating this matrix-surface with alternate films of celluloid solution and of some suitable adhesive substance, next applying a suitable backing for this built-up celluloid structure, and finally removing the matrix, substantially as described.

2. The herein-described process of forming a permanent or indestructible copy, which consists in first coating the original master with a gelatin solution, next coating this gelatin film when dry with shellac, next providing this shellac with a suitable backing as a wax mixture, then removing the original master from the matrix so built up, afterward coating this matrix-surface with a film of a thin celluloid solution, then coating this celluloid film when dry with a thin film of gelatin solution, next applying a second celluloid film to the gelatin film, then applying a suitable backing for this built-up celluloid structure, and finally removing the matrix, substantially as described.

3. The method of forming a permanent copy, consisting of depositing on a suitable matrix alternate films produced thereon by the evaporation of a celluloid solution and a solution of some suitable adhesive material, and then applying a suitable backing to support this built-up celluloid structure, substantially as described.

4. The method of forming a matrix or reverse copy, consisting of first forming on the surface to be copied a film resulting from the evaporation thereon of some suitable material, next varnishing this film, and then applying to the varnish a suitable backing, substantially as described.

5. The method of forming a matrix or reverse copy, consisting of first forming on the surface to be copied a film resulting from the evaporation thereon of a solution of chromatinized gelatin, next applying to this film a coating of shellac, and then applying to the shellac a suitable backing as a wax mixture, substantially as described.

6. The method of building up a permanent or indestructible copy of a sound-record or the like, consisting in first applying to the surface to be copied a thin solution of celluloid, next applying to this celluloid film when dry a solution of some suitable adhesive material as chromatinized gelatin, and then applying to this adhesive film when dry a stronger solution of celluloid and letting it dry, substantially as described.

7. The method of building up a permanent or indestructible copy of a sound-record or the like, consisting in first applying to the surface to be copied a solution of celluloid, next applying to this celluloid film when dry a solution of some suitable adhesive material, and then applying to this adhesive film when dry a solution of celluloid and letting it dry, substantially as described.

8. The herein-described matrix, consisting of a film of gelatin, a backing of some suitable material, and an interposed layer of varnish uniting them, substantially as described.

9. The herein-described built-up celluloid sound-record, the same consisting of alternate films of celluloid and of a suitable adhesive material, and containing on its outer surface irregularities corresponding to sound-waves.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JAMES K. REYNARD.

Witnesses:

VICTOR H. EMERSON,
FRANK L. CAPPS.