

No. 883,327.

PATENTED MAR. 31, 1908.

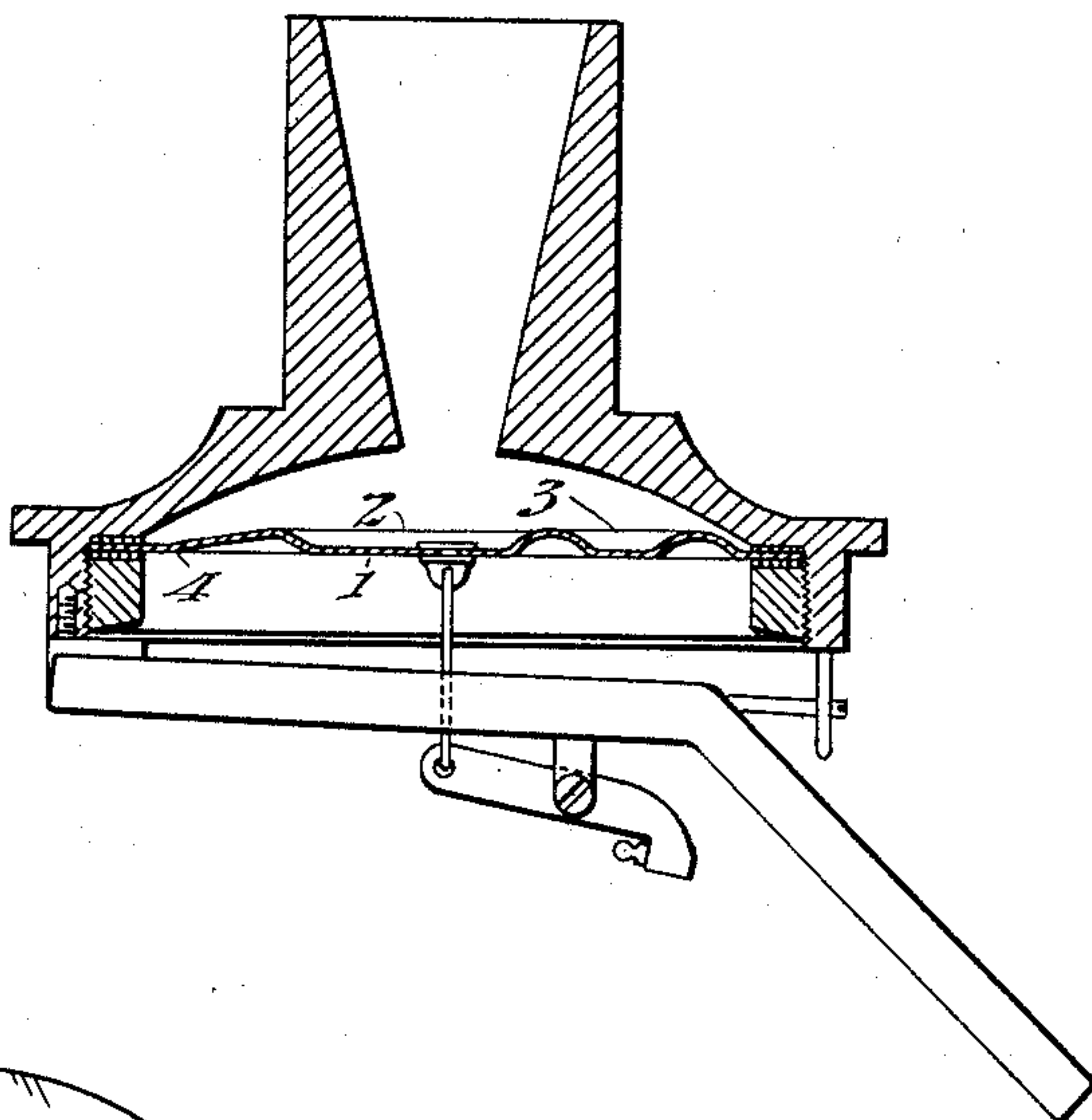
W. H. MILLER.

DIAPHRAGM.

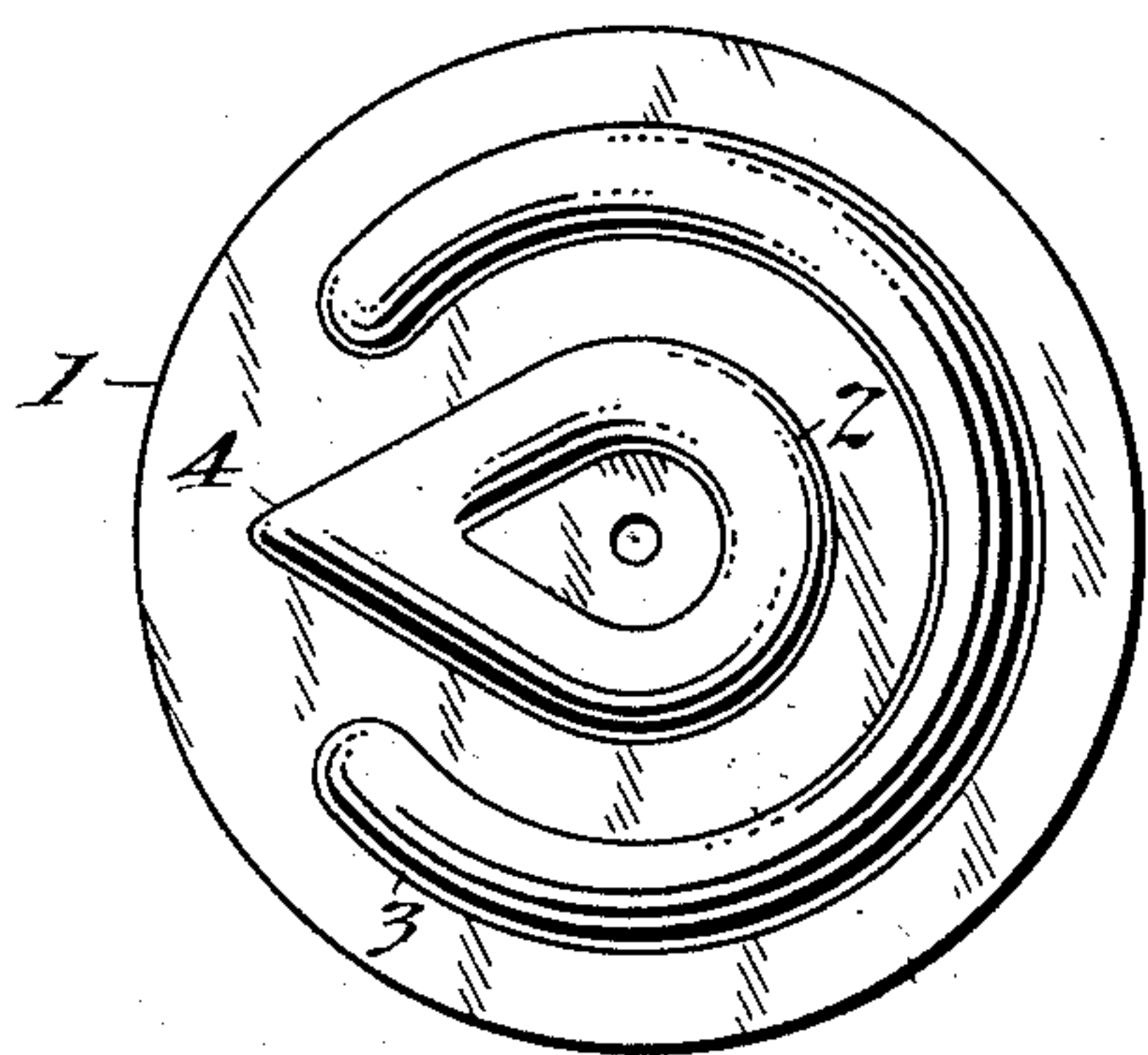
APPLICATION FILED SEPT. 24, 1906.

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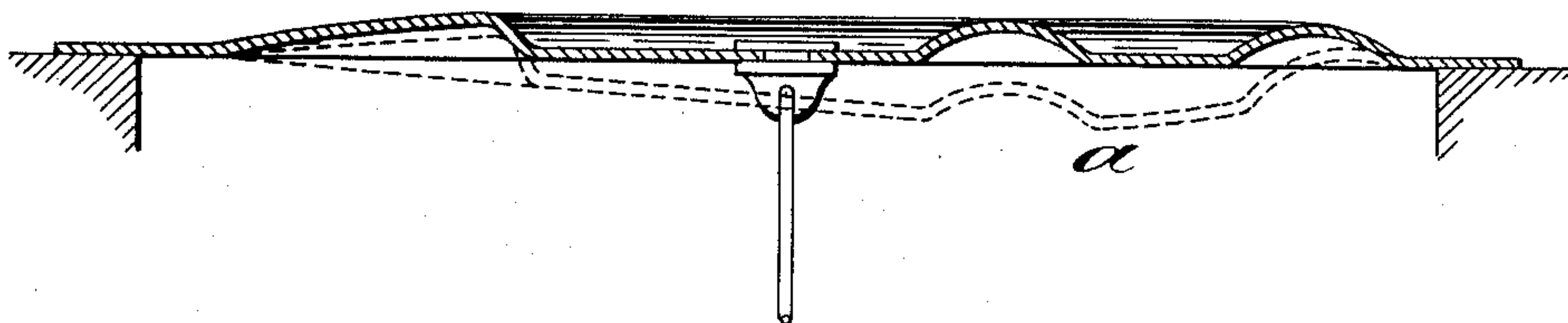
*Fig. 2*



*Fig. 1*



*Fig. 3*



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Francis D. Lewis  
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*Inventor:*  
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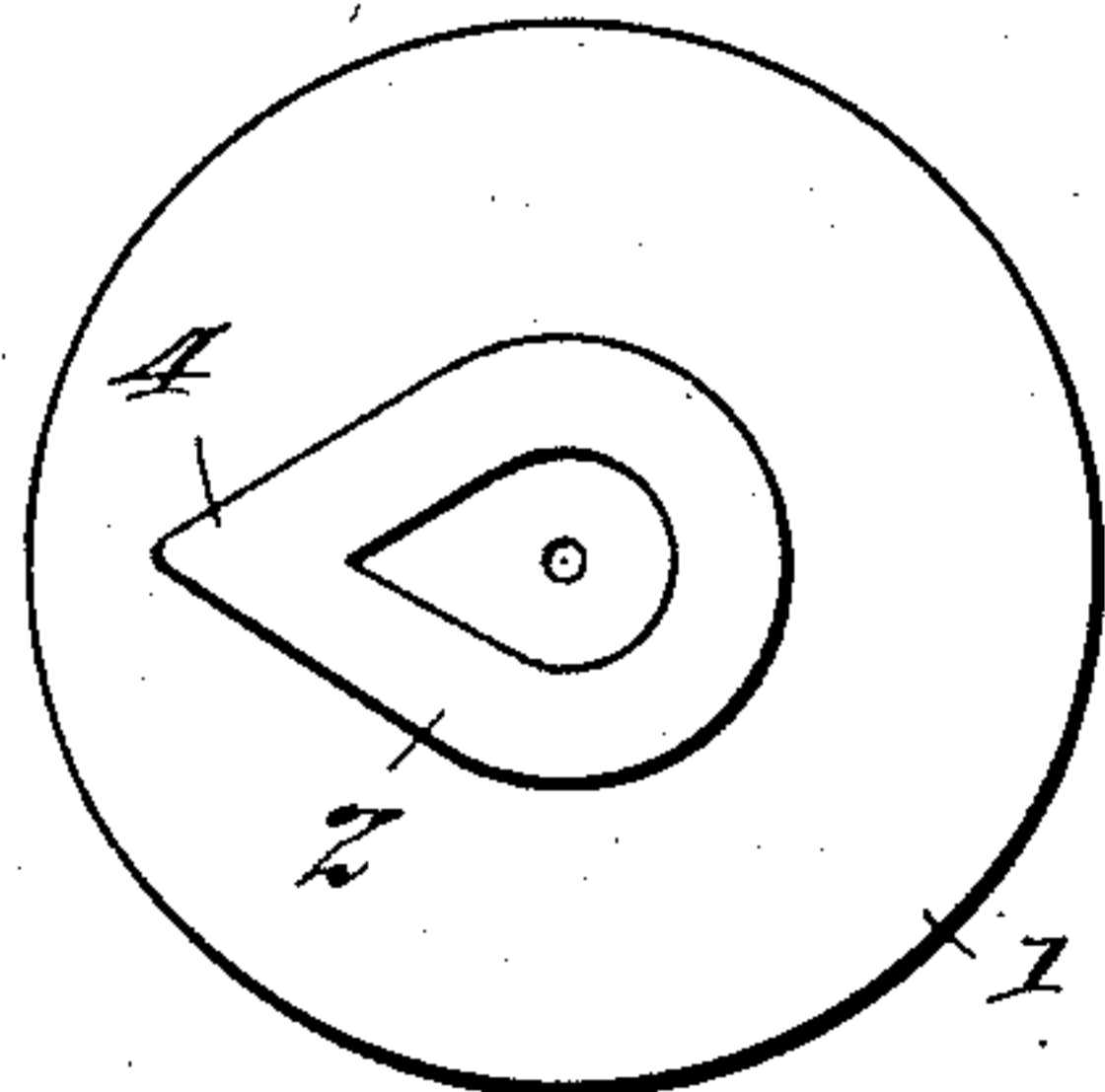
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W. H. MILLER.  
DIAPHRAGM.

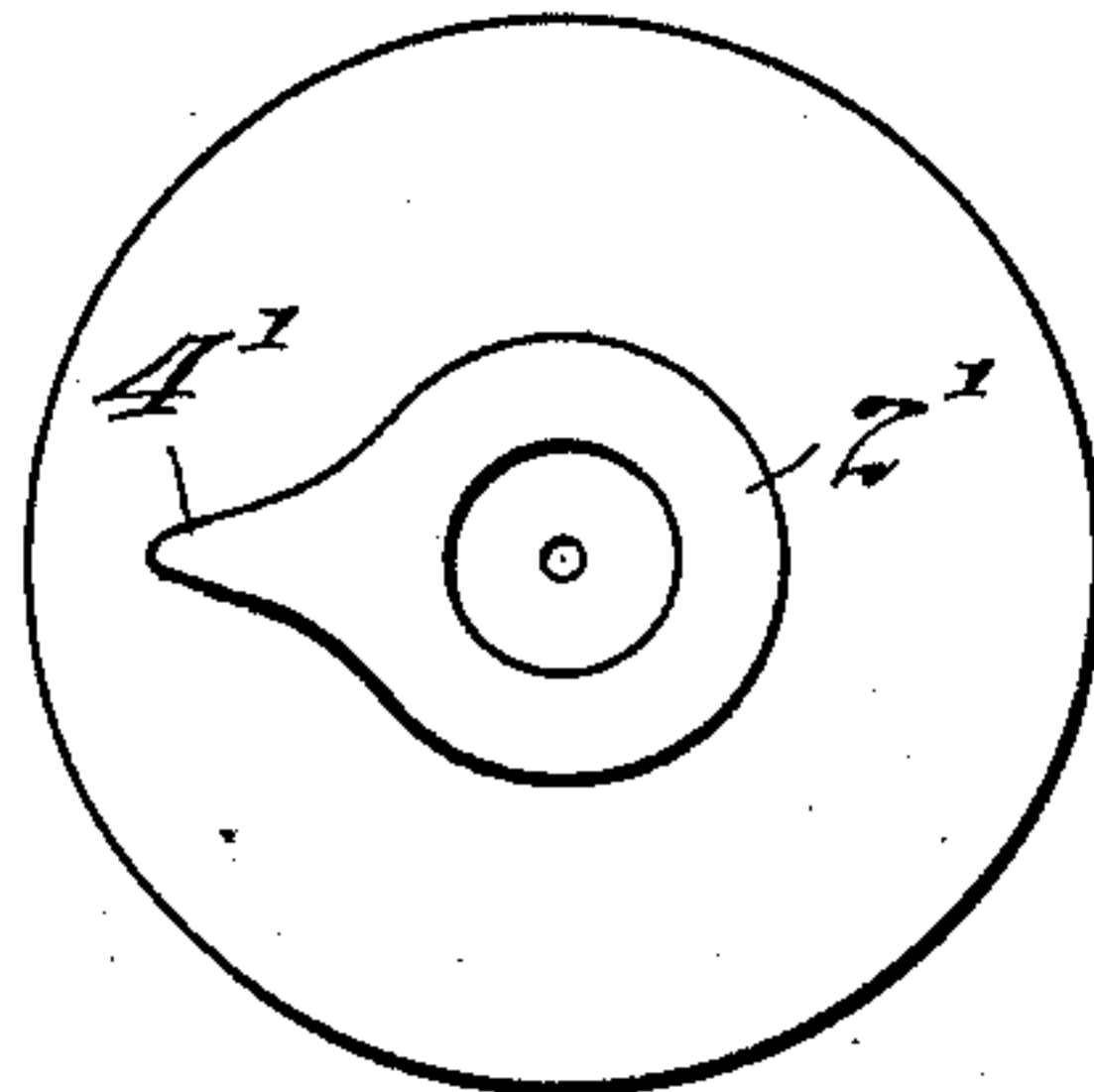
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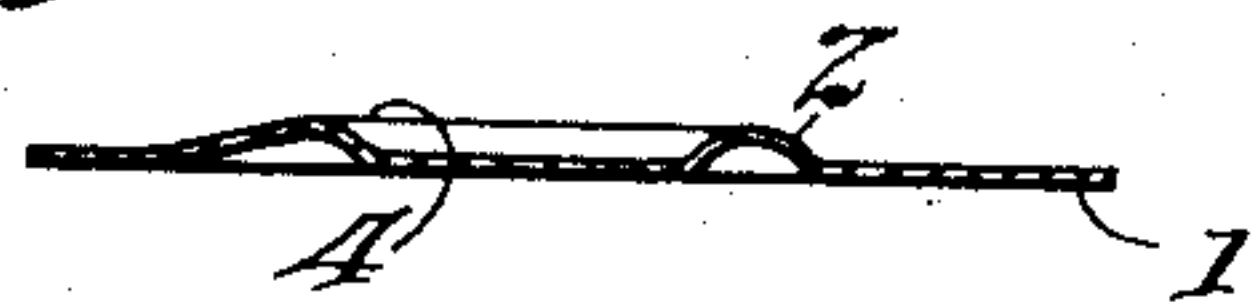
*Fig. 4*



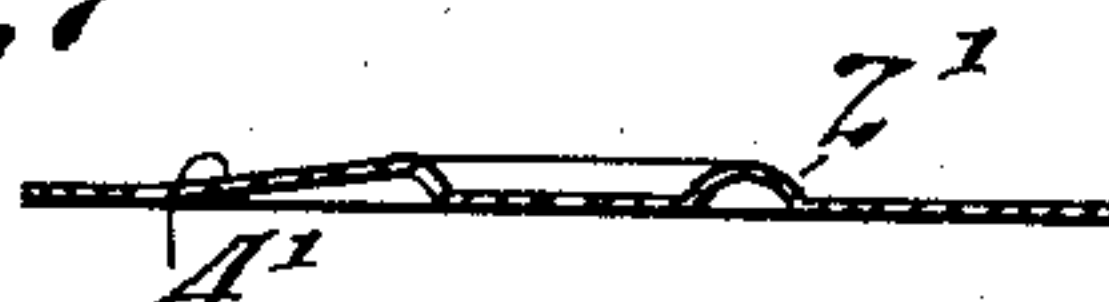
*Fig. 6*



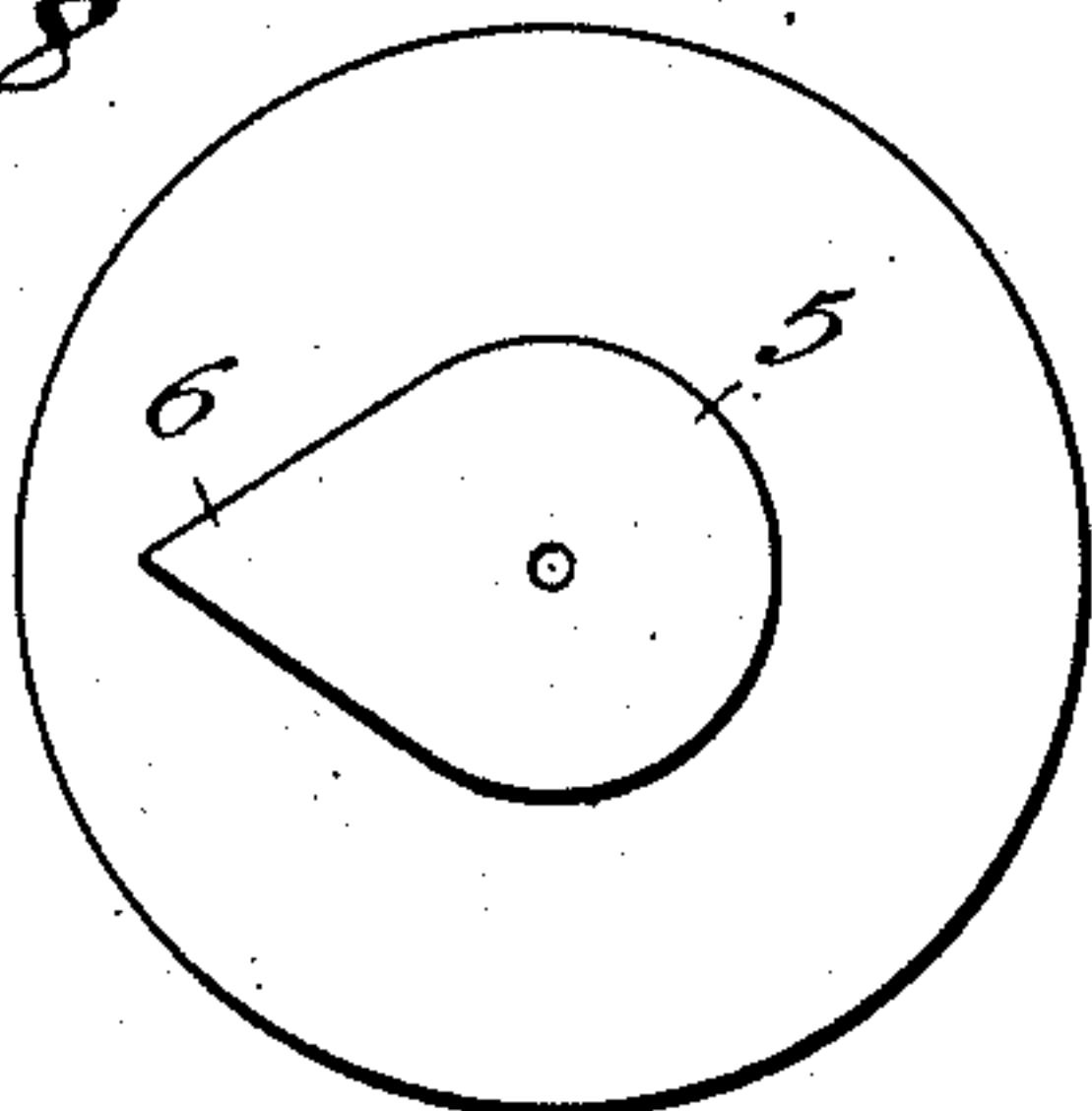
*Fig. 5*



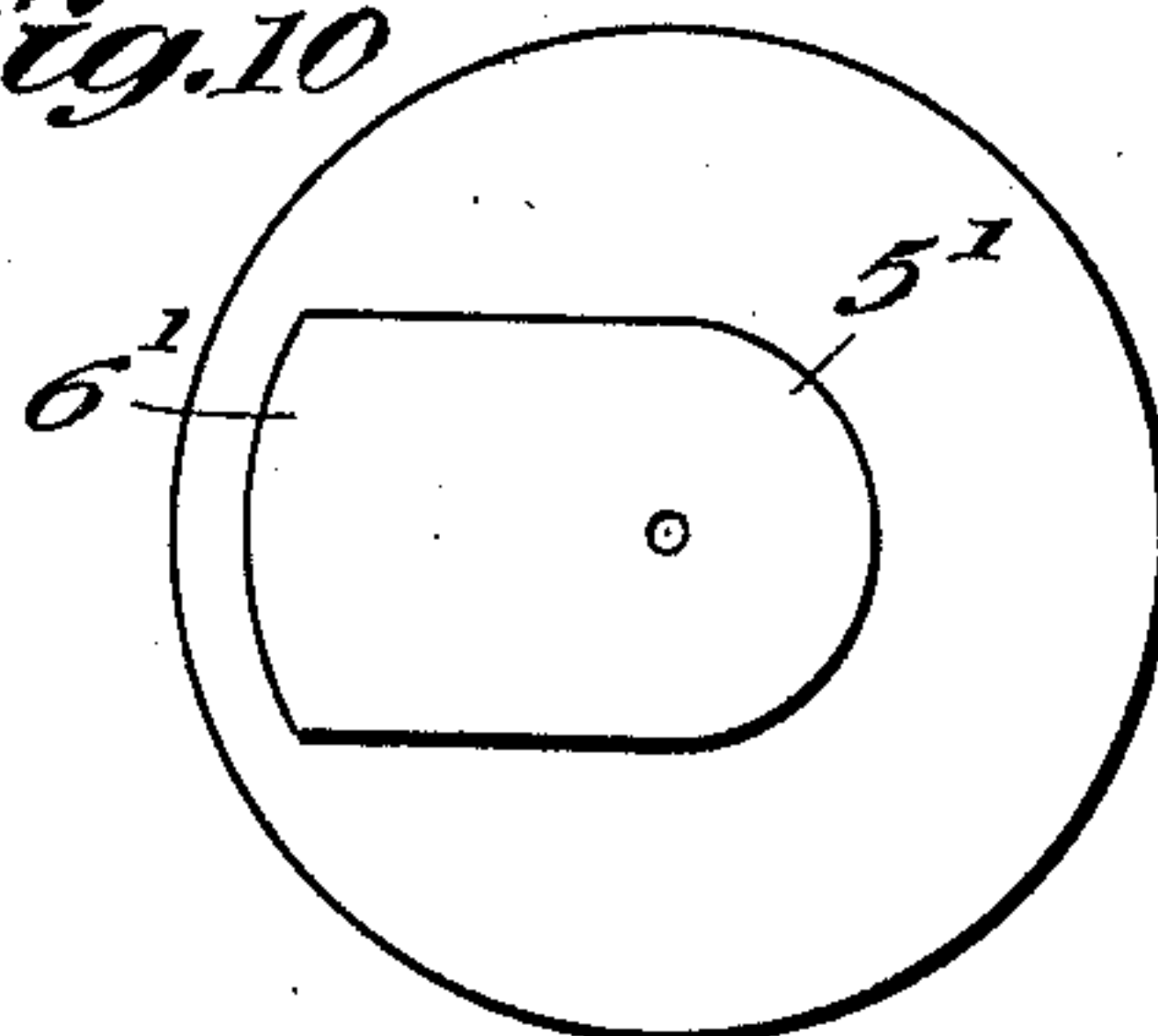
*Fig. 7*



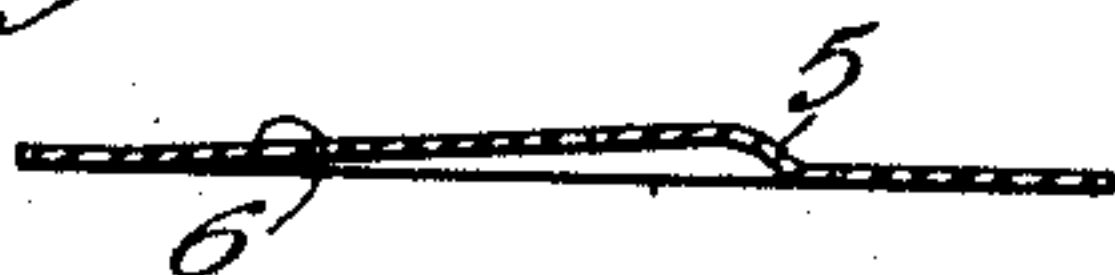
*Fig. 8*



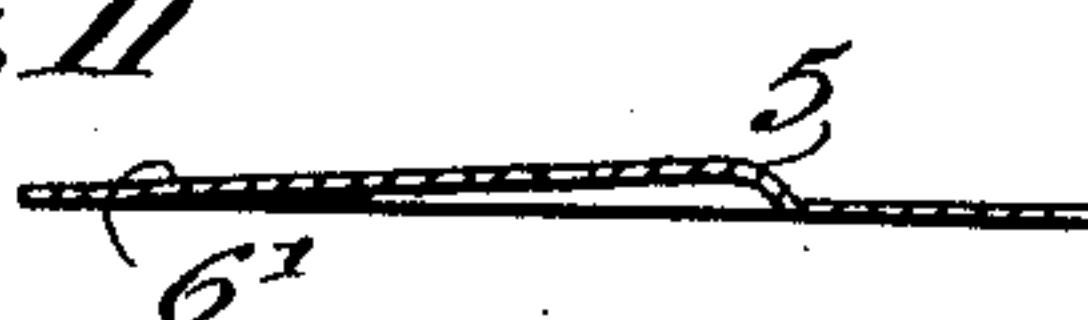
*Fig. 10*



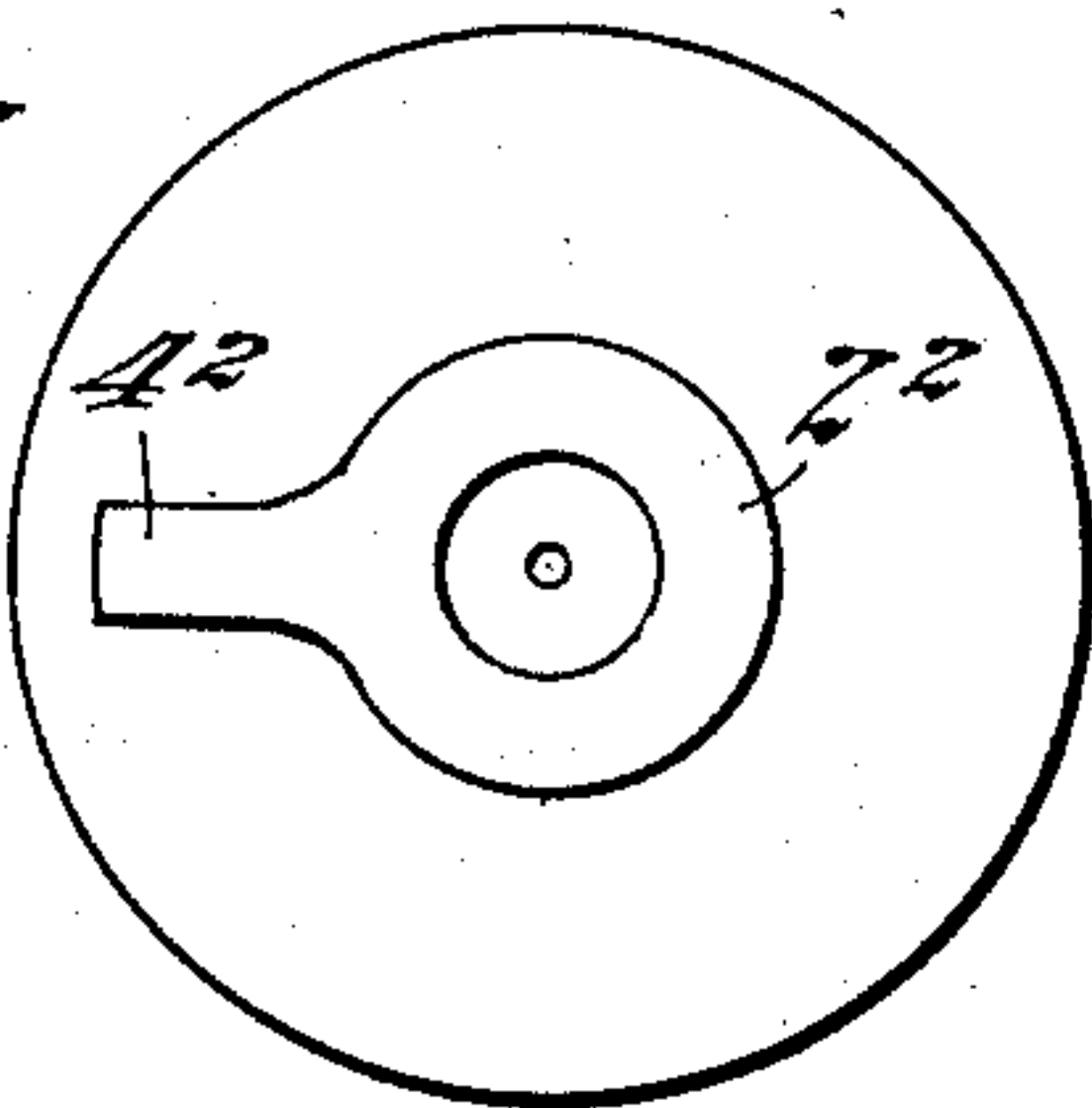
*Fig. 9*



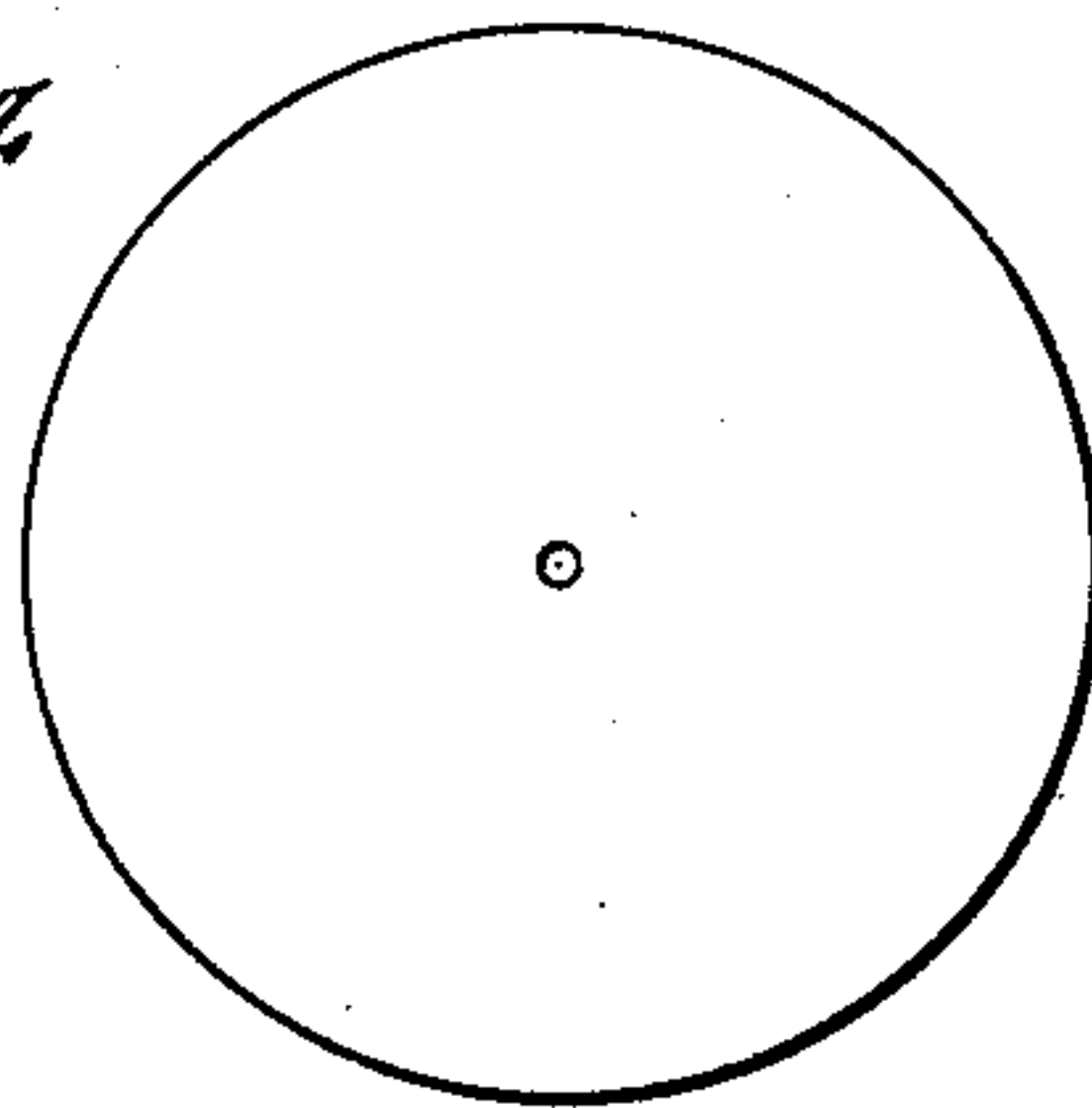
*Fig. 11*



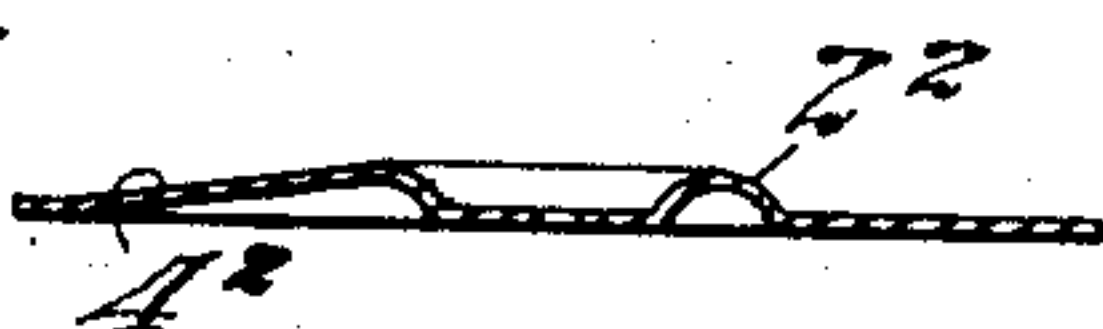
*Fig. 12*



*Fig. 14*



*Fig. 13*



*Fig. 15*



*Witnesses:*

*Frank D. Lewis*  
*Delos Holden*

*Inventor:*

*Walter H. Miller*

*by*

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# UNITED STATES PATENT OFFICE.

WALTER H. MILLER, OF ORANGE, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## DIAPHRAGM.

No. 883,327.

Specification of Letters Patent.

Patented March 31, 1908.

Application filed September 24, 1906. Serial No. 335,878.

*To all whom it may concern:*

Be it known that I, WALTER H. MILLER, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Diaphragms, of which the following is a description.

My invention relates to diaphragms and more particularly to phonographic diaphragms such as those used in recorders and reproducers.

The object of my invention is the production of a diaphragm which will produce improved results especially in the reproduction of sound, such as greater loudness and purer quality.

Reference is hereby made to the accompanying drawings of which

Figure 1 is a plan view of the preferred form of diaphragm; Fig. 2 is a vertical section of a phonograph reproducer containing the diaphragm of Fig. 1; Fig. 3 is an enlarged sectional view illustrating the flexure of the diaphragm under the influence of the reproducer stylus, the amount of flexure being greatly exaggerated; Figs. 4 and 5 are respectively a plan and section of a modification of my invention; Figs. 6 and 7, 8 and 9, 10 and 11, 12 and 13, and 14 and 15 are similar views of other modifications.

The same numerals of reference are used to designate corresponding parts in the several views.

In using all forms of diaphragms shown I propose to connect the reproducer stylus with the geometrical center of the diaphragm. The diaphragms are, however, unsymmetrical as regards their rigidity or resistance to flexure, the resistance being greater on one side of a median line than on the other; that is, the diaphragm is stiffer on one side of said line than on the other. The effect of such construction is that the stress applied by the stylus to the center of the diaphragm produces the greatest amplitude of vibration at a point at one side of said center, instead of at the center as in symmetrical diaphragms. The point at which the greatest amplitude of vibration occurs I term the acoustical center of the diaphragm.

The unequal rigidity, stiffness or resistance to flexure referred to may be produced in a variety of ways, as for instance by adding additional material to the diaphragm, or by denting or stamping the material of the

diaphragm as illustrated in the drawing. The latter is considered preferable as it does not increase the weight of the diaphragm. The material used may be sheet metal such as aluminium, steel, copper, etc. or fiber treated in such a manner as to prevent attack by moisture, and in fact a great variety of materials may be used.

Referring now more particularly to the diaphragm of Figs. 1 to 3, the same consists of a circular plate 1, stamped with two grooves or elevations 2 and 3. The groove 2 which is nearest the center is in the shape of a circle with a lateral extension 4. The point of this extension appears to act as a hinge or pivot for that part of the diaphragm which falls within the outline of the elevation 2 when stress is applied to the geometrical center of the diaphragm, thus producing an amplified movement of certain parts of the diaphragm which are diametrically opposite the extension 4 as indicated in Fig. 3 wherein the point of greatest amplitude or acoustical center is located at about the point *a*. It should be understood that the depth of the grooves 2 and 3 is greatly exaggerated in the drawing. These grooves may be of the width shown but are ordinarily quite shallow, as for example in a diaphragm whose diameter is one and five sixteenths inches the groove may be about three one-hundredths of an inch in depth. The groove 3 is in the form of an incomplete circle the break in the circle being adjacent the lateral extension 4. This groove or rib prevents any buckling of the diaphragm. Its ends should not approach too near the inner rib 2 in order that the diaphragm may not be weakened; that is, there should be substantially the same amount of material between the ends of the rib 3 and the extension 4 as between the rib 3 and the circular portion of the rib 2.

The diaphragm of Figs. 4 and 5 is similar to that of Fig. 1 except that the rib 3 is dispensed with.

The diaphragm of Figs. 6 and 7 is the same as that of Figs. 4 and 5 except a slight difference in the shape of the rib 2' and lateral extension 4'.

In the diaphragm of Figs. 8 and 9 the stiffened portion is in the form of a circle 5 having a lateral extension 6. In this form the outline of the stiffened portion is the same as that of Fig. 4, but the whole body of



material is struck up instead of merely a groove.

The diaphragm of Figs. 10 and 11 has a struck up portion 5' with a lateral extension 6'.

The diaphragm of Figs. 12 and 13 is similar to that of Figs. 6 and 7 except in the shape of the extension 4<sup>2</sup> which projects from the circular rib 2<sup>2</sup>.

The diaphragm of Figs. 14 and 15 is a flat plate whose section is the form of a wedge as shown, the thickness gradually increasing from the right hand side or edge of the diaphragm toward the left.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. A diaphragm having a perforation at its geometrical center and having an acoustical center at a substantial distance therefrom, substantially as set forth.

2. In a device of the class described, the combination with a circular diaphragm whose acoustical center is at a substantial distance from its geometrical center, of a stylus connected to said diaphragm at its geometrical center, substantially as set forth.

3. In a device of the class described; the combination with a stylus, of a diaphragm stiffened in such a way that stress applied to its center by said stylus produces the greatest amplitude of vibration at a point at a substantial distance from said center, substantially as set forth.

4. A circular diaphragm provided with a perforation at its center and stiffened in such a way that stress applied to its central portion produces the greatest amplitude of vibration at a substantial distance from said central portion, substantially as set forth.

5. In a device of the class described, the combination of a diaphragm having stiffening means applied to its central portion and extending farther from the center of the diaphragm in one direction than in the opposite direction and so shaped as to produce its greatest stiffening effect along a line pass-

ing through said center, and a reproducer stylus connected to said diaphragm at its center, substantially as set forth.

6. In a device of the class described, the combination of a diaphragm which has greater stiffness or resistance to flexure on one side of a median line than on the other, and a reproducer stylus connected to the center of said diaphragm, substantially as set forth.

7. A diaphragm having a central stiffened portion whose outline is a circle with a lateral extension, substantially as set forth.

8. A diaphragm having a central stiffened portion in the shape of a circular groove or rib with a lateral extension, substantially as set forth.

9. A diaphragm having a central stiffened portion whose outline is a circle with a lateral extension, and an incompletely circular stiffened portion surrounding the same, substantially as set forth.

10. A diaphragm having a central stiffened portion whose outline is a circle with a lateral extension, and an incompletely circular stiffened portion surrounding the same, the break in said circle being adjacent said lateral extension, substantially as set forth.

11. A diaphragm having a central stiffened portion in the shape of a circular groove or rib with a lateral extension, and an incompletely circular groove or rib surrounding the same, substantially as set forth.

12. A diaphragm having a central stiffened portion in the shape of a circular groove or rib with a lateral extension, and an incompletely circular groove or rib surrounding the same, the break in said circle being adjacent said lateral extension, substantially as set forth.

This specification signed and witnessed this 22nd day of September 1906.

WALTER H. MILLER.

Witnesses:

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DELOS HOLDEN