

No. 679,358.

J. F. BRADY.  
STEAM TURBINE.

Patented July 30, 1901.

(No Model.)

(Application filed Dec. 18, 1899.)

2 Sheets—Sheet 1.

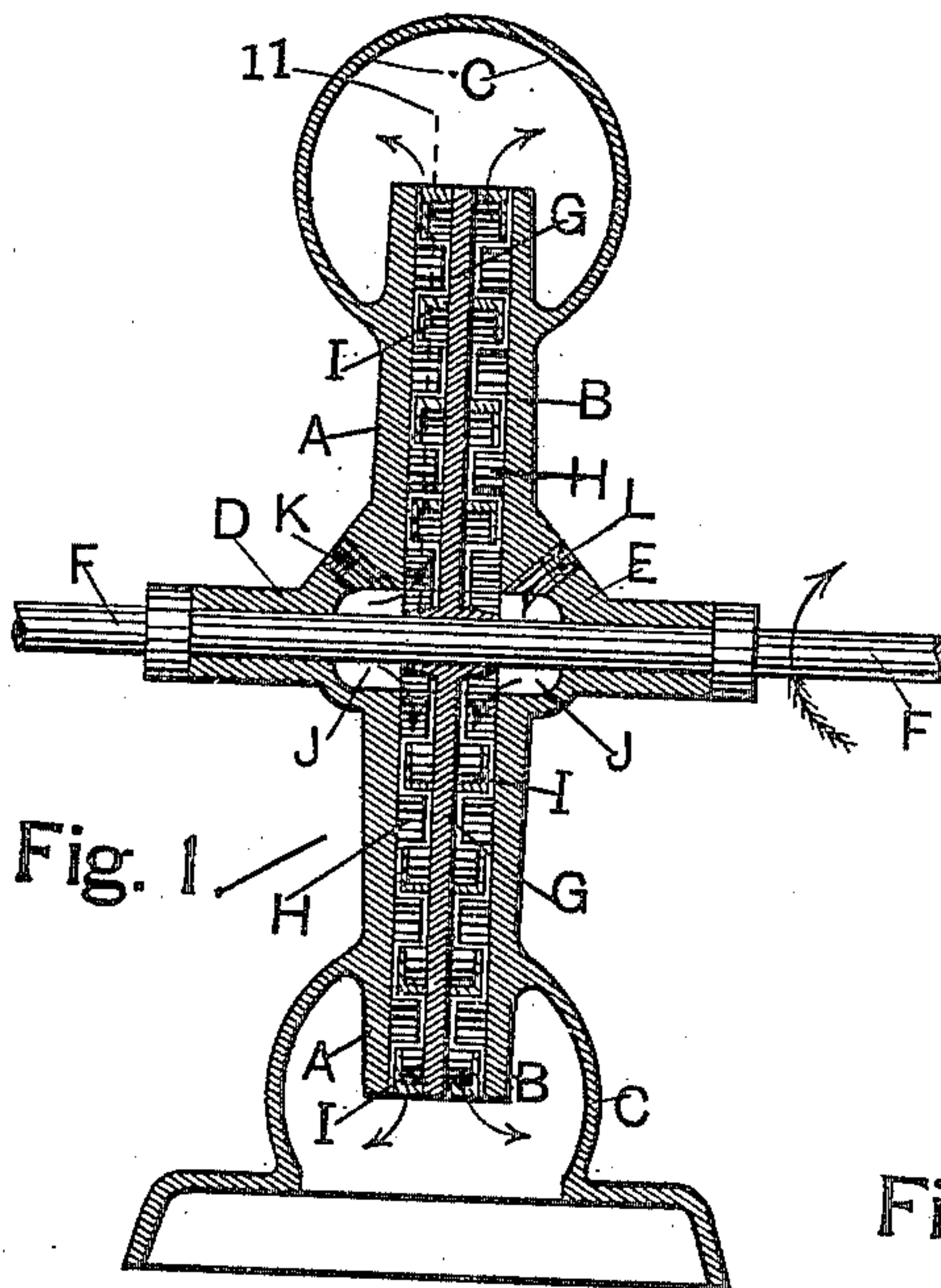


Fig. 1

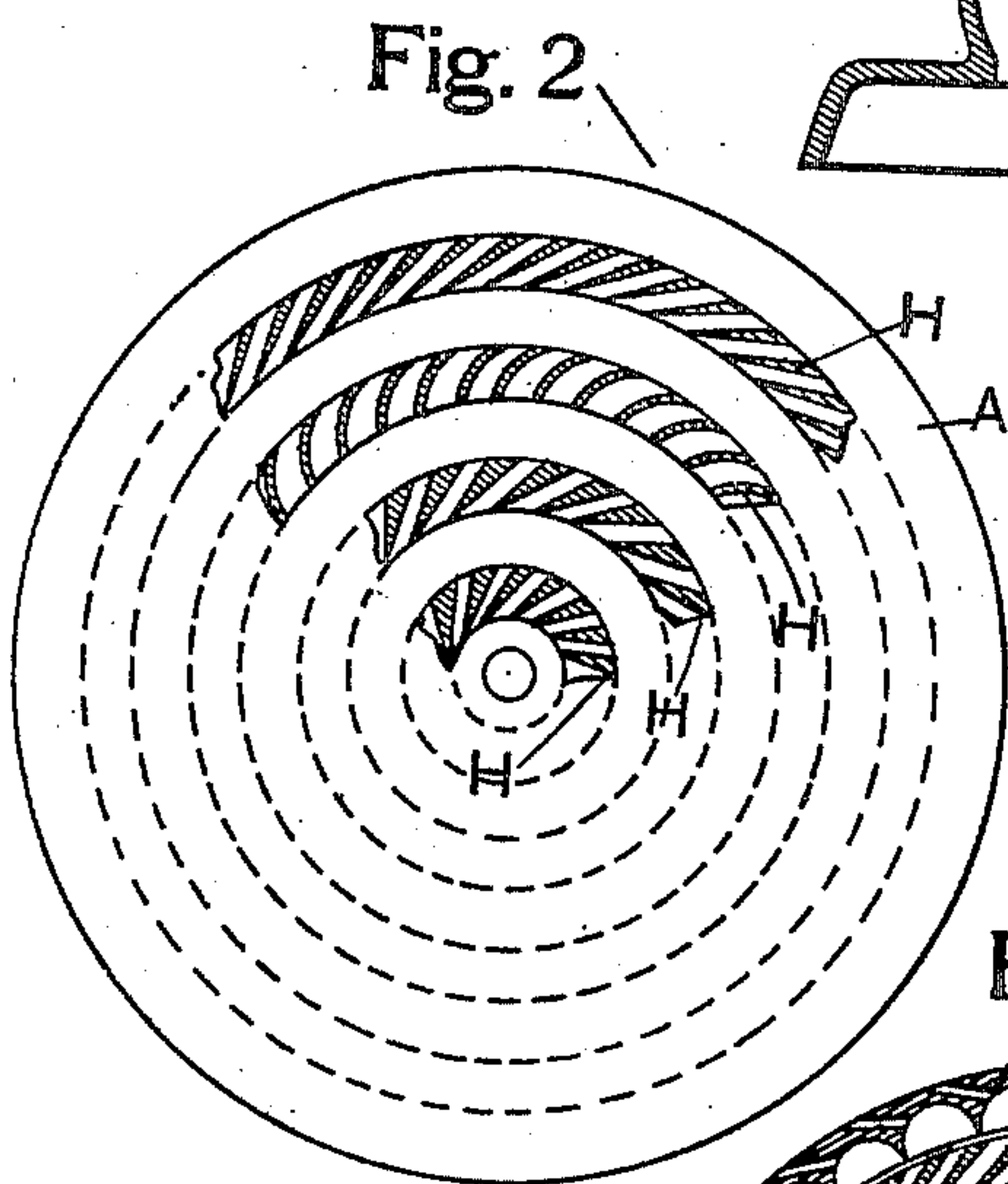


Fig. 2

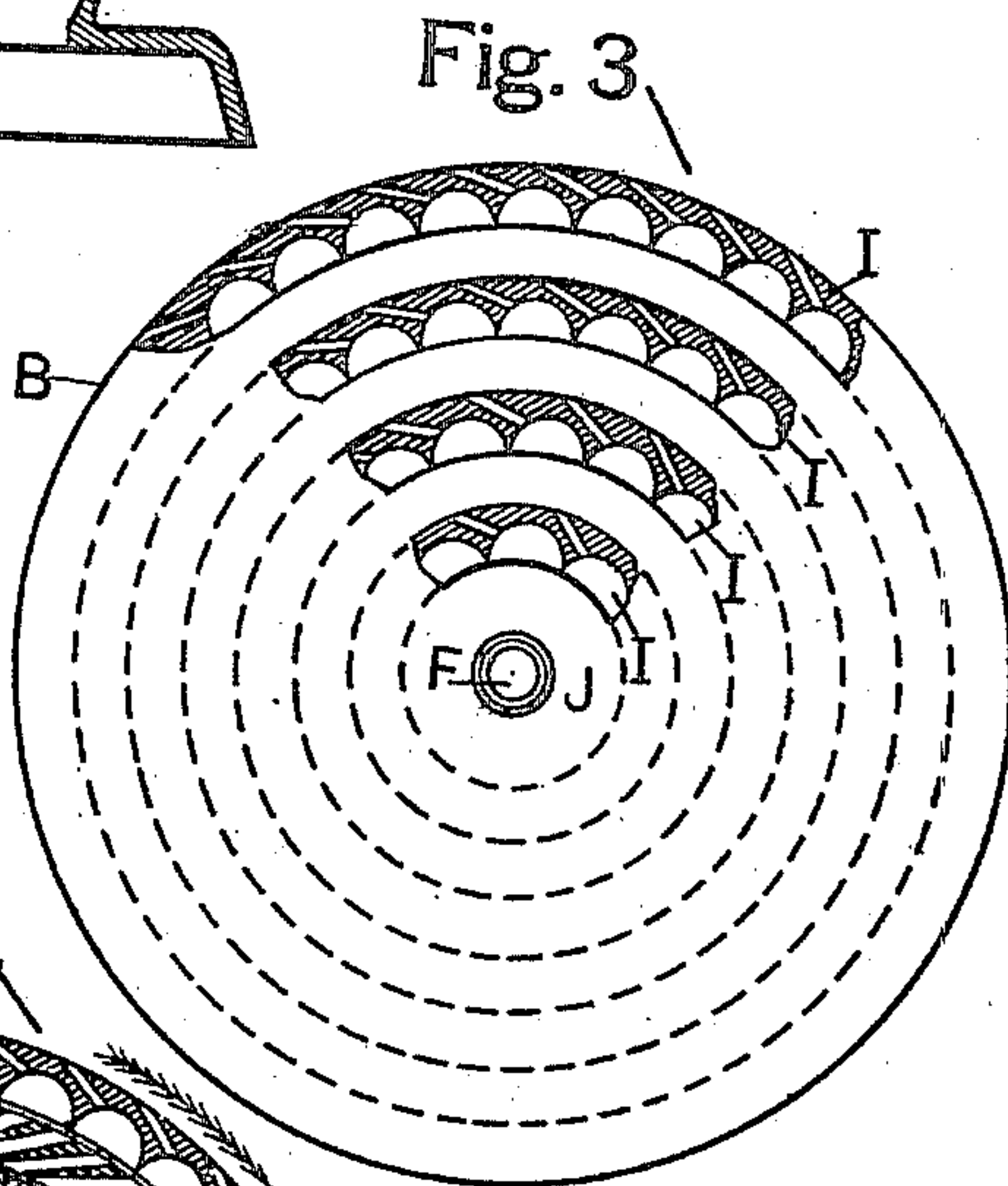


Fig. 3

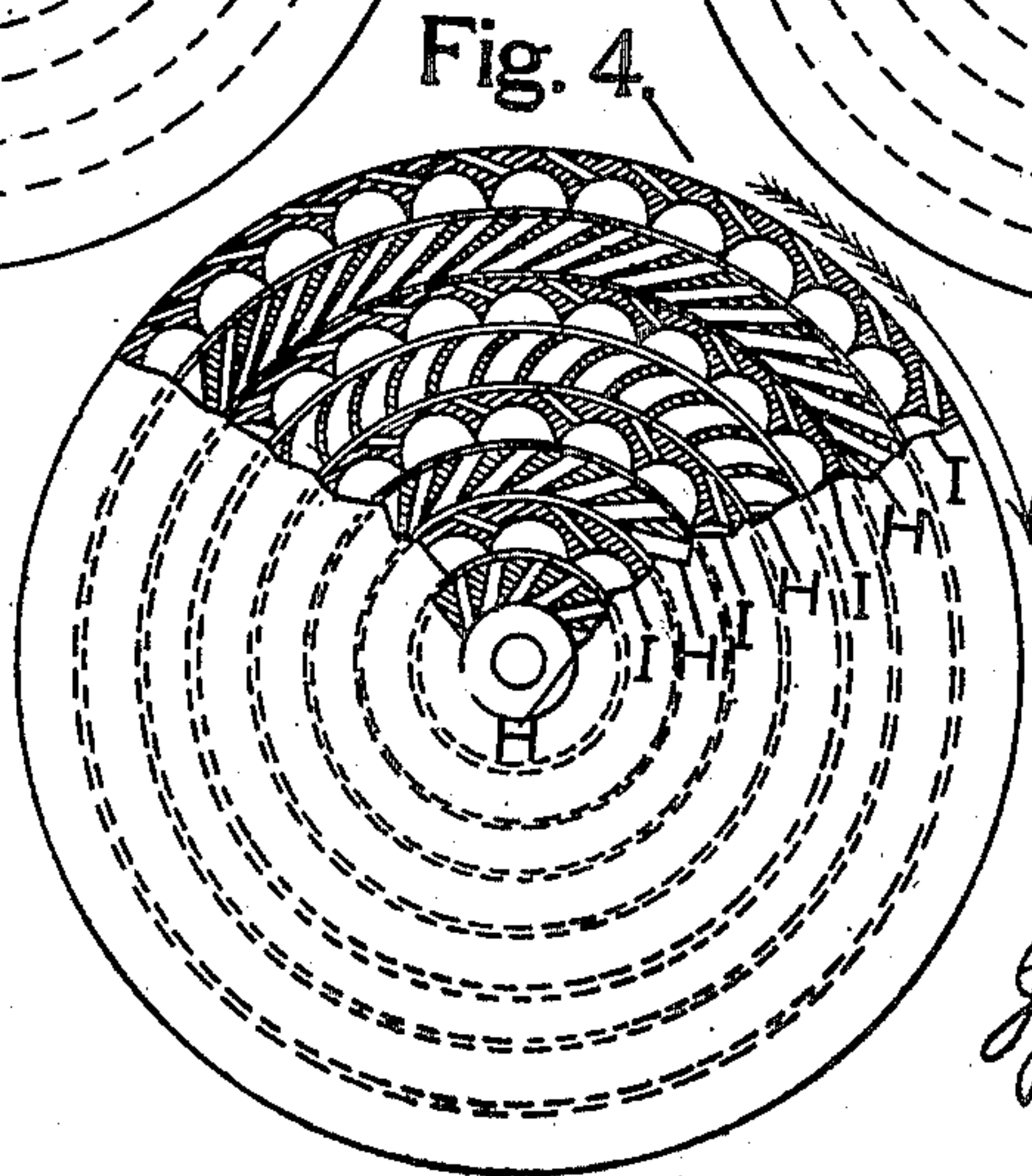


Fig. 4

WITNESSES:  
*W. L. Brown.*  
*C. Stone.*

INVENTOR:  
*John F. Brady.*  
By *Oscar Snell,*  
*att'y*



No. 679,358.

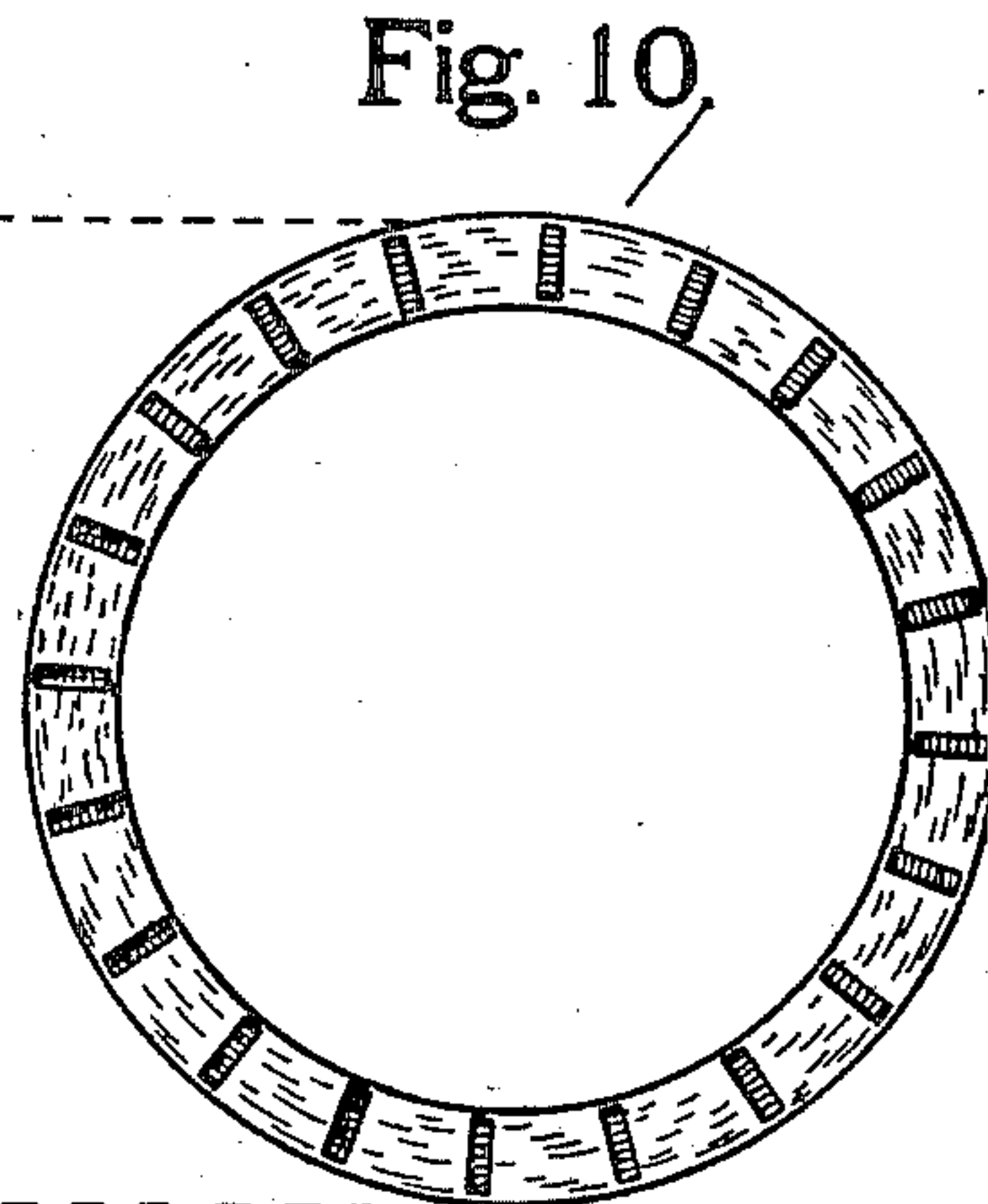
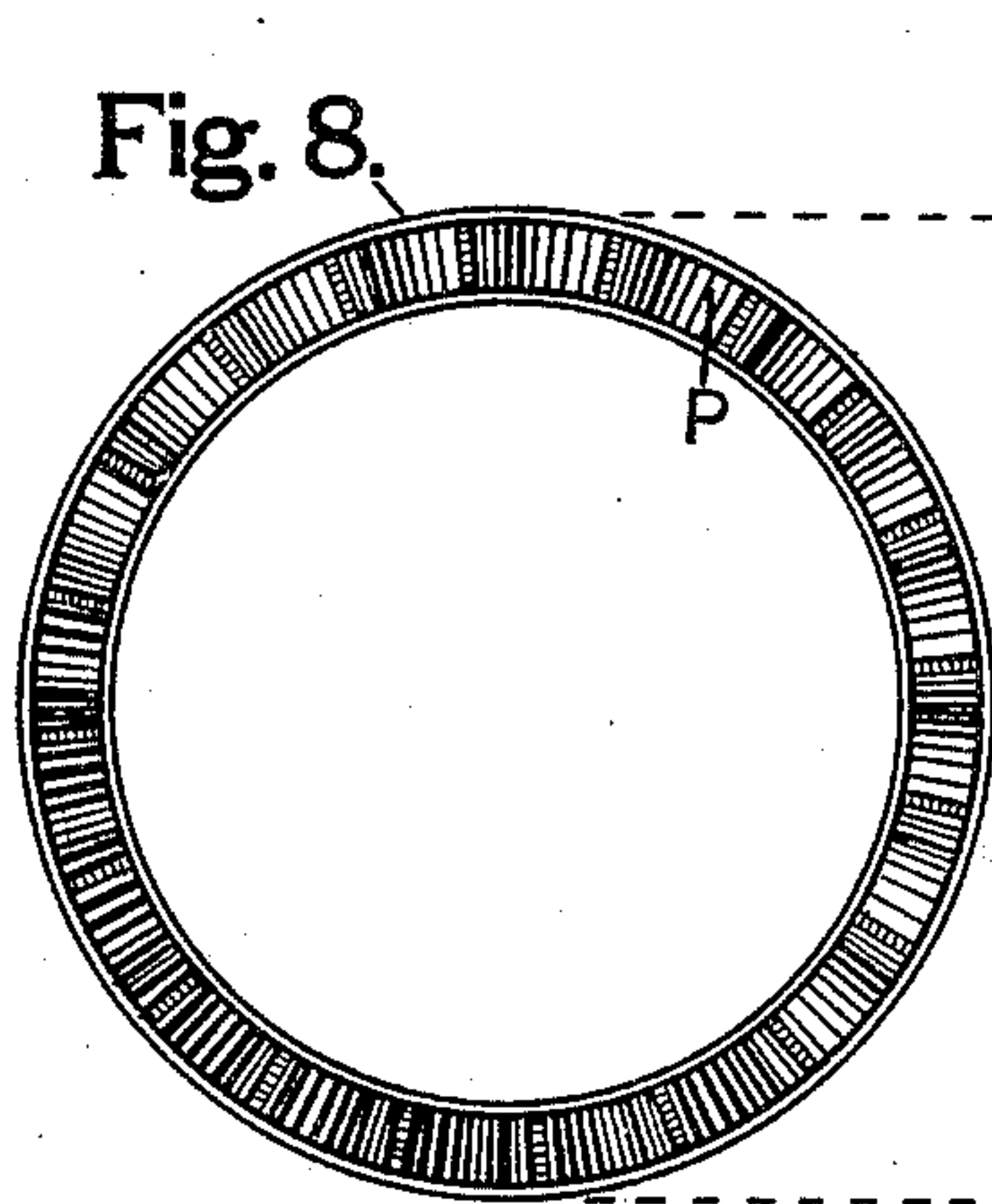
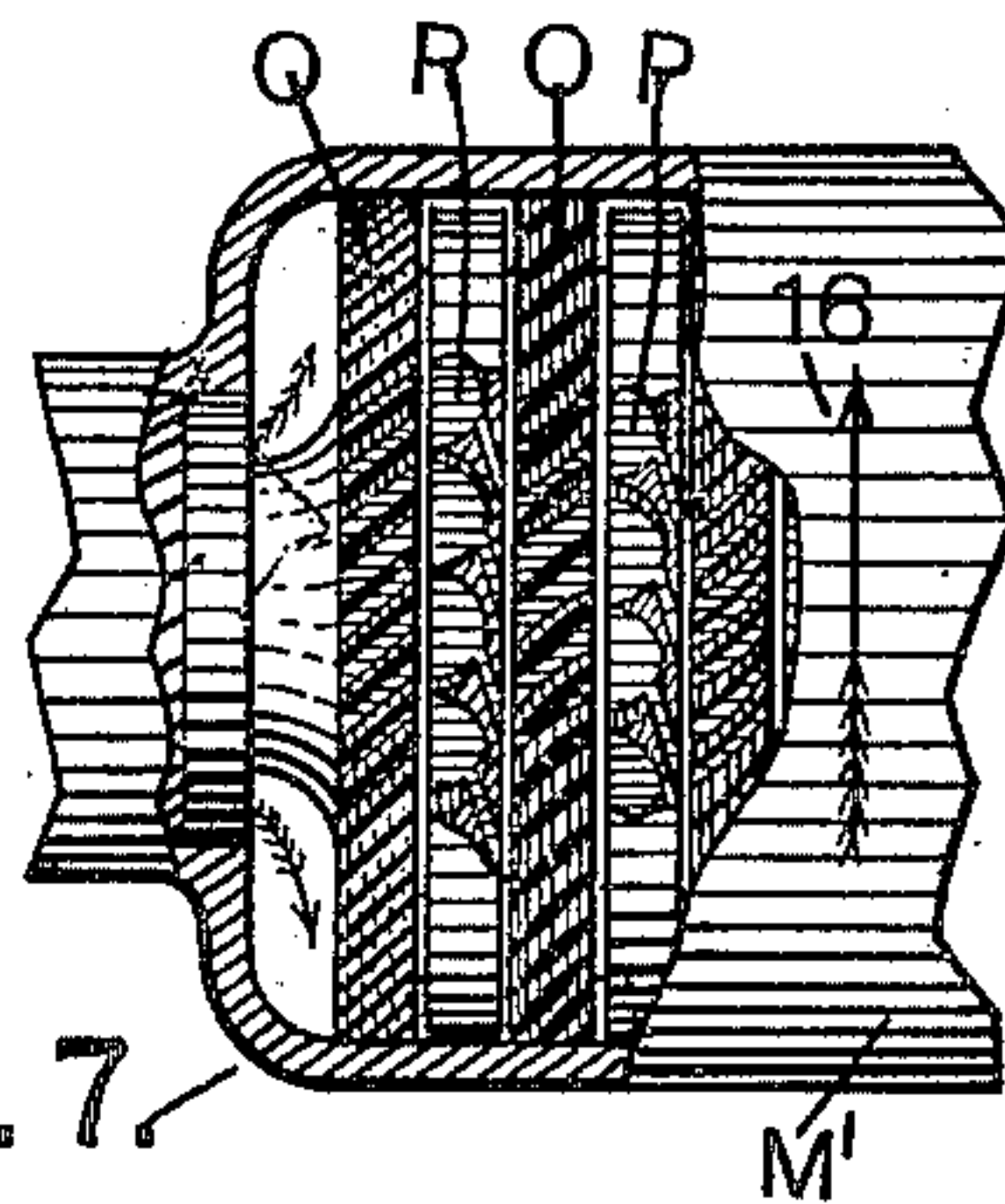
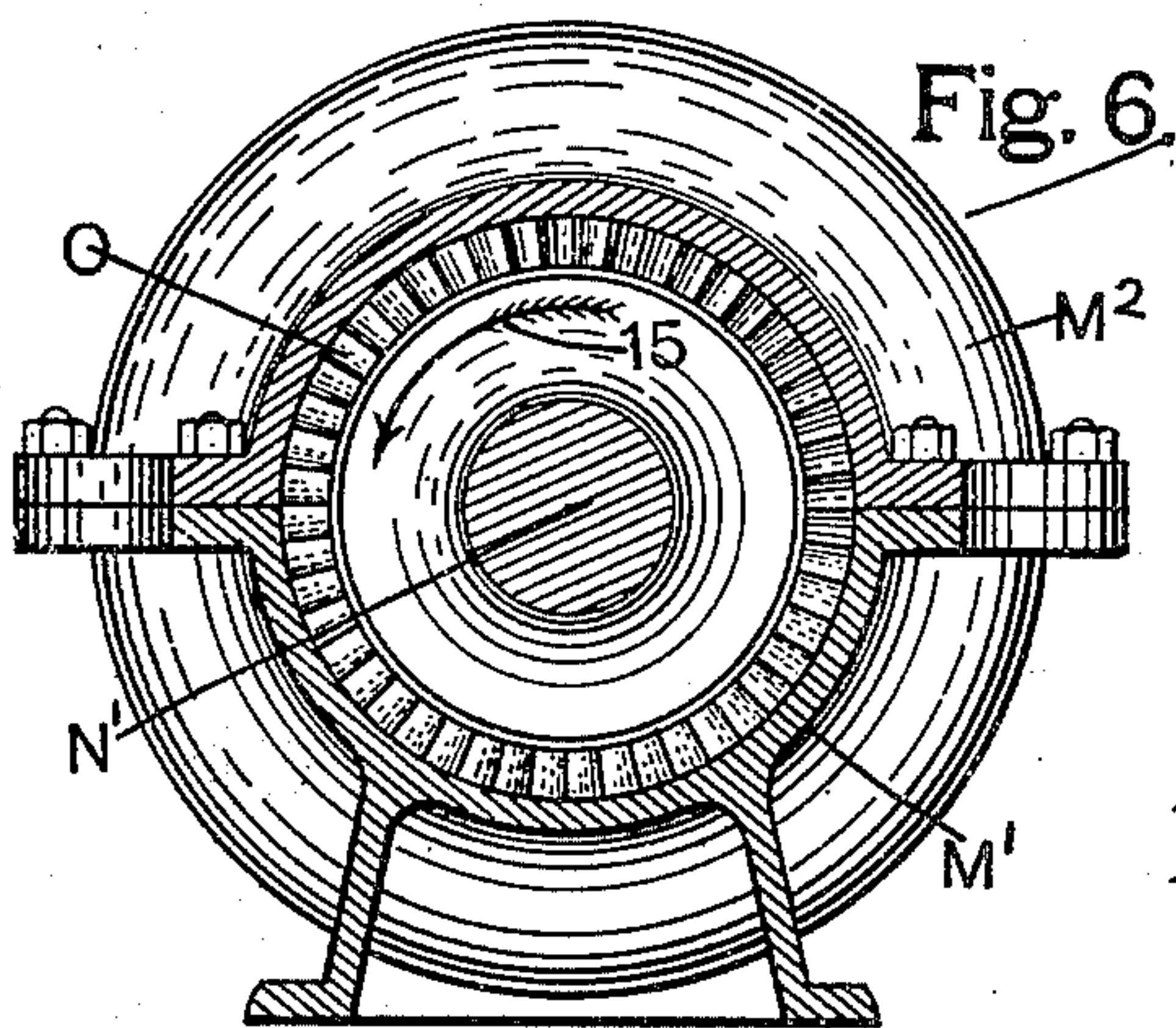
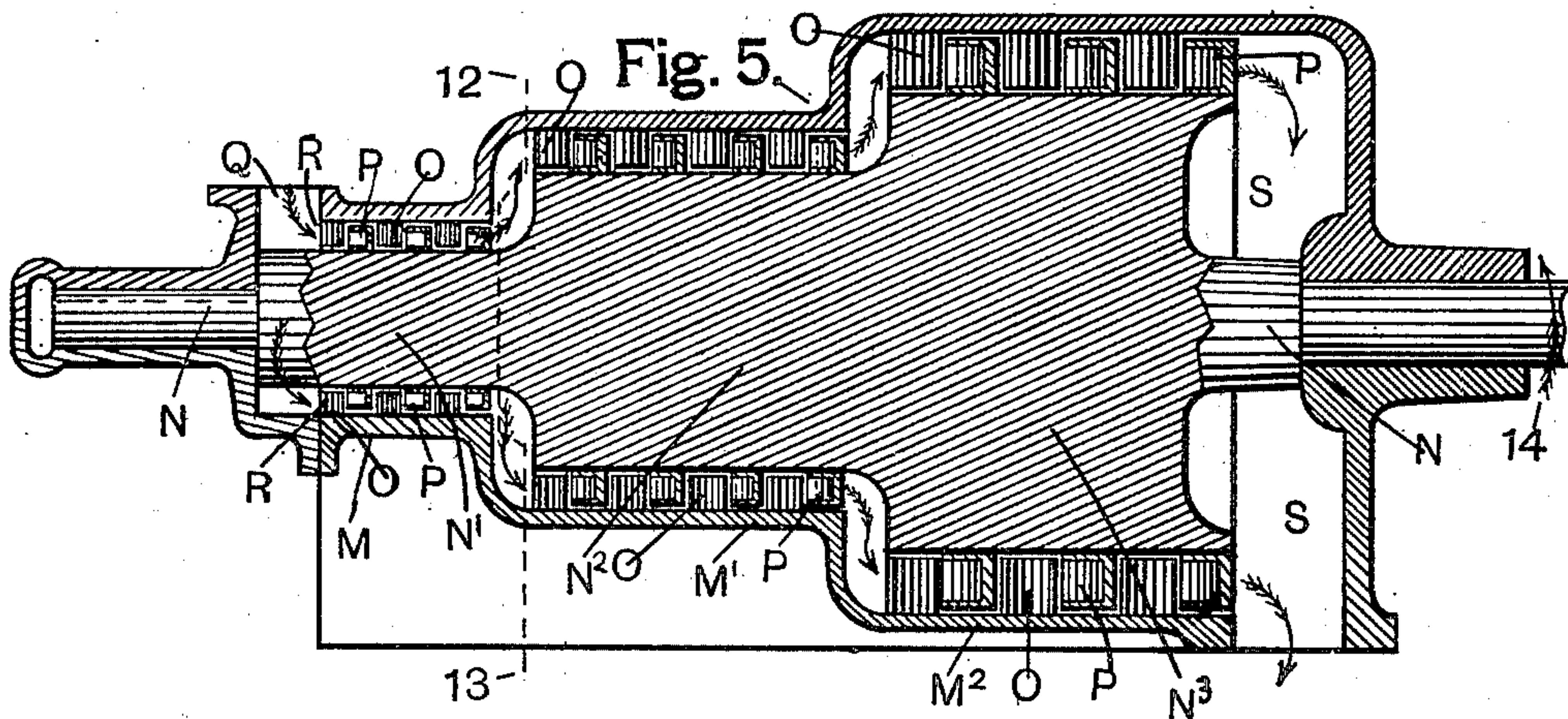
Patented July 30, 1901.

J. F. BRADY.  
STEAM TURBINE.

(No Model.)

(Application filed Dec. 18, 1899.)

2 Sheets—Sheet 2.



WITNESSES:

*H. L. Brown*  
*E. Stone.*

INVENTOR:

*John F. Brady*  
*By Oscar Snell*  
*Atty*



# UNITED STATES PATENT OFFICE.

JOHN F. BRADY, OF CHICAGO, ILLINOIS.

## STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 679,358, dated July 30, 1901.

Application filed December 18, 1899. Serial No. 740,718. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN F. BRADY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have  
5 invented a new and useful Improvement in Steam-Turbines, of which the following is a specification.

My invention relates to steam-turbines; and my object is to provide a series of stationary  
10 guides in combination with a series of movable steam expansion-chambers and passage-ways leading therefrom, whereby very high results are attained in the economical use of steam under high pressure, the same being  
15 described hereinafter, and illustrated in the accompanying drawings, in which—

Figure 1 is a vertical axial section, with the pivotal shaft in elevation, of one form of disk steam-turbine in which is shown the applica-  
20 tion of my improvement. Fig. 2 is a partial cross-section of four series of stationary guides on broken lines 11, Fig. 1, to illustrate several different usual forms of guides adapted to direct the steam in the desired direction  
25 to the movable expansion-chambers. Fig. 3 is a partial cross-section on broken line 11, Fig. 1, of four series of movable expansion-chambers adapted to revolve in the same plane and all but one series between the sev-  
30 eral series of stationary guides shown in Fig. 2. Fig. 4 is a partial section on broken line 11, Fig. 1, showing the combination of the guides and expansion-chambers illustrated in Figs. 3 and 4. Fig. 5 is a vertical axial sec-  
35 tion, except a small portion of the ends of the pivotal shaft in elevation, of a cylindrical steam-turbine to illustrate method of applying my combination of stationary guides and steam expansion-chambers to turbines of this  
40 class. Fig. 6 is a transverse section on broken line 11 12 of Fig. 5. Fig. 7 is a plan of a portion of the turbine illustrated in Fig. 5, with the outer casing and portions of two expansion-chamber rings broken away to plainly  
45 show the combination of guides and expansion-chambers as applied to cylindrical turbines. Figs. 8, 9, and 10 show, respectively, front, side, and rear elevations of one of the expansion-chamber rings for the cylindrical  
50 turbine, with a portion shown broken away in Fig. 9 to illustrate the position and rela-

tive size of the expansion-chambers and the passage-ways for steam leading out of them.

Similar letters indicate like parts throughout the several views.

The two forms of steam-turbines illustrated in the drawings are not either shown or described in every detail, for the reason that in this instance they are introduced to more  
plainly show the adaptability of the combi- 60 nation of ordinary stationary vanes or guides with my system of buckets or steam expansion-chambers and the passage-ways leading out of them tangentially relative to their movement and opposite to the angle of the  
65 guides.

In Fig. 1 is shown the usual form of a disk turbine, which consists of two stationary side walls A and B, which are held apart, so as to form an interspace, by means of a circular  
70 marginal case C, which receives the waste steam and discharges it downwardly into a hollow base and thence outwardly. Central bosses D and E are hollow and form the bearings for the pivotal shaft F. A disk G is  
75 firmly mounted upon shaft F, within the interspace between A and B and at the center of width thereof.

Projecting inwardly around the side walls A and B are four circular series of guides H, 80 each circular series being concentric with shaft F and each series separated by a circular space from the other, as shown in Fig. 2.

At each side of central revoluble disk G project four series of walls, so shaped that four  
85 series of expansion-chambers I are formed at each side of the disk, and each series is separated from the one adjacent by a space. Each of the expansion-chambers I is provided with a passage-way leading out of one end and  
90 tangentially to the circle of chambers and in an opposite direction to the tangential disposition of guides H, as seen in Fig. 4.

Steam under pressure is admitted to a central distributing-chamber J through holes K 95 and L and expands outwardly through the tangential passage-ways between the first circle of guides H, and thence against the front wall of each of the first series of expansion-chambers I. Thence the steam passes out- 100 wardly through the passage-ways of the chambers, and its course is reversed by passing



between the second series of guides, thence against the front wall of the second series of expansion-chambers I, and thence outwardly and tangentially through the passage-ways, 5 and so on, until the steam passes into and out of the peripheral series of expansion-chambers and into the waste-steam space, and causing the central disk G, together with all the expansion-chambers I and shaft F, to revolve 10 in the direction indicated by the arrows in Figs. 1 and 4.

The manner of applying this combination of guides and expansion-chambers to steam-turbines of the cylindrical class is illustrated 15 in Figs. 5 to 10, inclusive, in which a multiple-cylinder turbine is shown which comprises three succeeding cylindrical casings M, M', and M<sup>2</sup>, which are integral, and axially through them is mounted to revolve a shaft 20 N, having three succeeding diameters of cylinders mounted thereon and indicated by N', N<sup>2</sup>, and N<sup>3</sup>, and each is smaller in diameter than the internal diameter of the cylindrical portion of the casing in which it is mounted, 25 so that circular spaces are formed into which project from the casing guides O, as shown in Figs. 5, 6, and 7. Guides O are each disposed at an angle to the center line of shaft N, as shown, and each ring of guides forming a series is 30 separated from the one adjacent by a space in which is disposed the circular series of steam expansion-chambers P, (shown in Figs. 1, 7, 8, 9, and 10,) and which are attached to the shaft N and revolve with it. Steam is admitted at Q, and having a free passage-way 35 around the first or smallest cylinder N' of shaft N passes first between the end guides O at R, then into and out of the first series of expansion-chambers P, then between the 40 second circle of guides O, thence into and out of the second circle of expansion-cham-

bers P, and so on successively through the succeeding circles of guides and expansion-chambers and out into the waste-steam space S, the action of the steam serving to revolve 45 shaft N in the direction indicated by arrows 14, 15, and 16 in Figs. 5, 6, and 7.

The expansion-chambers I are substantially the same as are shown in my application for patent of the United States for steam-turbines, filed November 4, 1898, Serial No. 735,790; but I do not confine myself to any particular form, since any shaped pocket or cavity fully open or almost fully open at one 50 side for receiving steam at an angle to the movement of the pocket, cavity, or chamber and a passage-way leading outwardly therefrom at an angle to its movement, substantially as shown and described, would embody my invention, and more especially is this so 60 if the passage-way leading out of the pocket should be of such a small size in comparison to the pocket or steam expansion-chamber as is shown in the drawings hereinbefore.

I claim as my invention— 65

In a steam-turbine, a revolubly-mounted series of separated rings of expansion-chambers opening against the flow of steam, in combination with a series of separated rings of stationary separated vanes or blades with 70 passage-ways for steam between them subtending an angle to the movement of the expansion-chambers, and passage-ways for steam leading out of the expansion-chambers at an angle to their movement and contrary 75 to the angles subtended by the passage-ways between the vanes or blades, for the purpose stated.

JOHN F. BRADY.

Witnesses:

OSCAR SNELL,  
H. L. BROWN.