No. 816,147.

PATENTED MAR. 27, 1906.

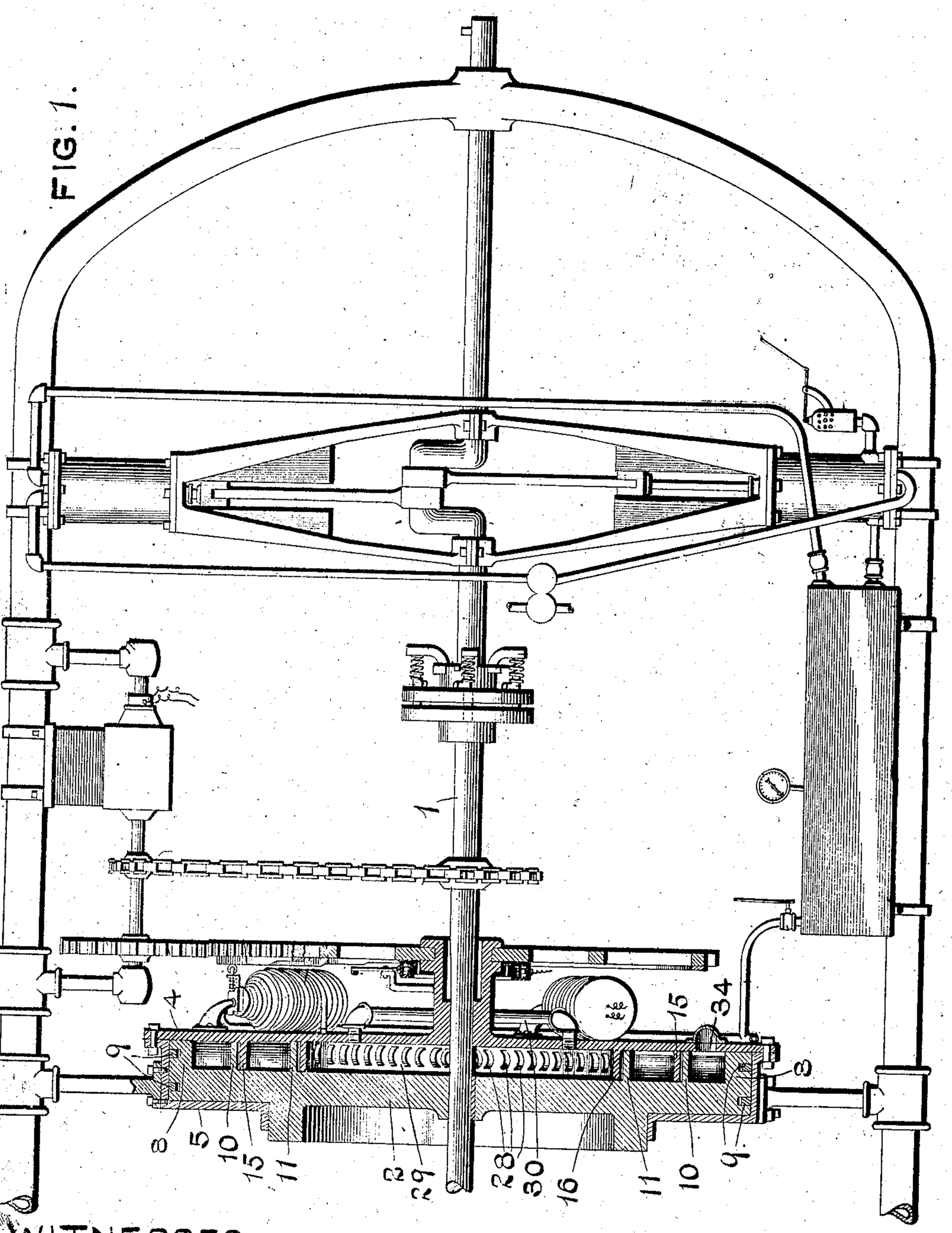
J. K. BRODERICK.

ROTARY MOTOR.

APPLICATION FILED OCT. 27, 1904.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES

a. J. McCauley.

R. F. Funk

INVENTOR:-

John K. Broderick.

BY Bakewell & Cornwall

ATTY'S.

No. 816,147.

PATENTED MAR. 27, 1906.

J. K. BRODERICK.

ROTARY MOTOR.

APPLICATION FILED OCT. 27, 1904.

2 SHEETS—SHEET 2.

FIG. 4.

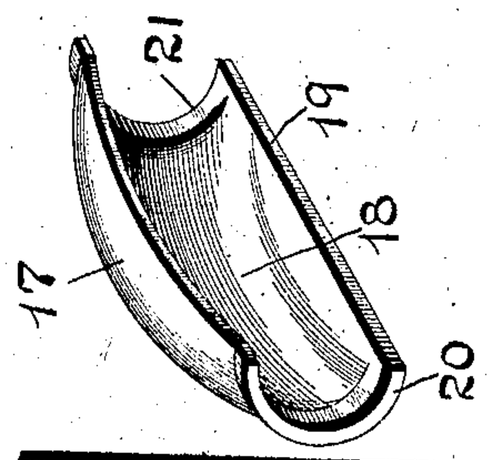


FIG. 3.

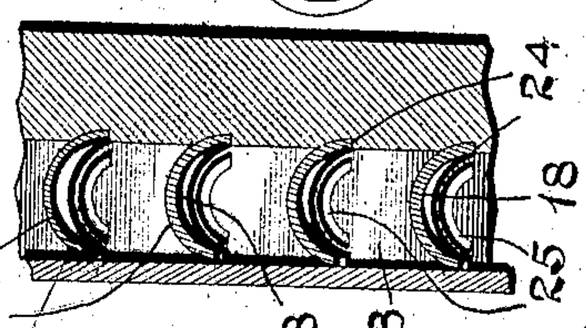


FIG. 5.

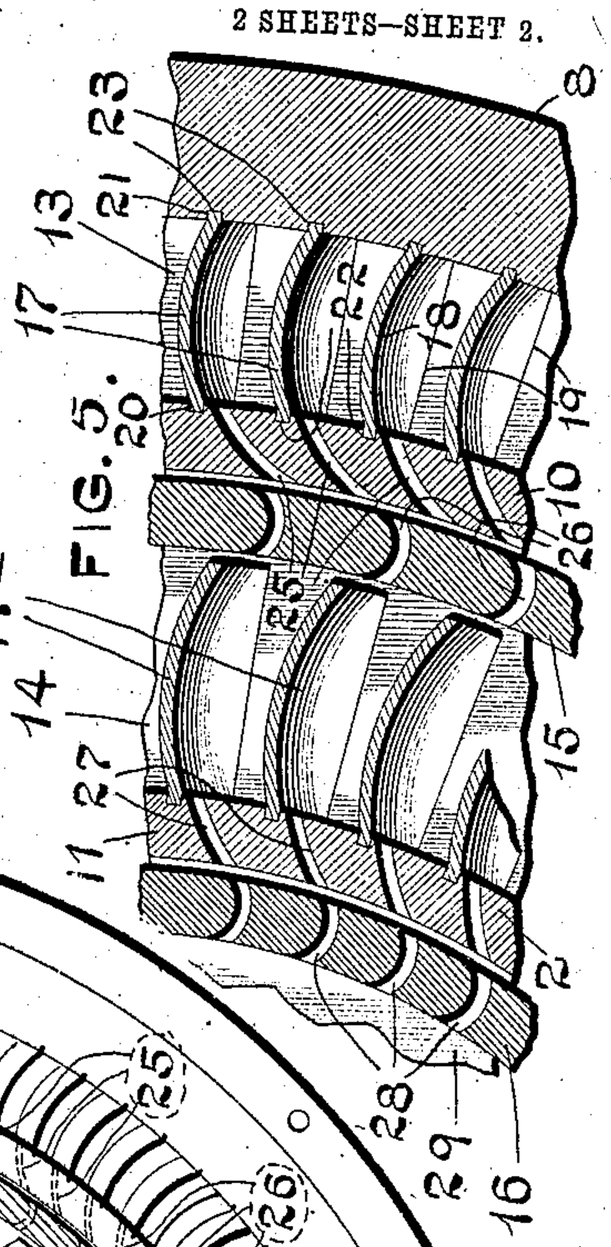
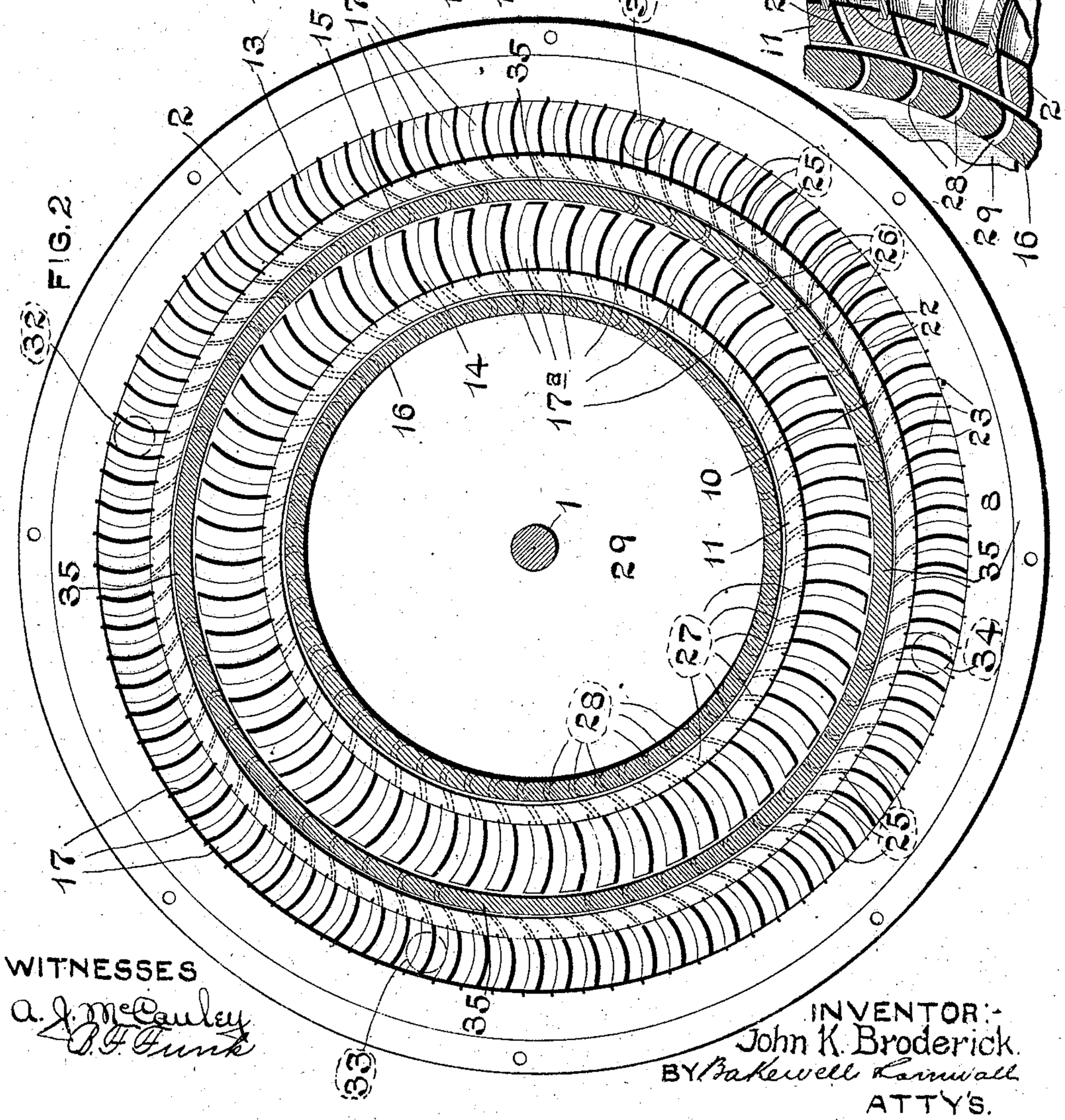


FIG. 2



WITNESSES

A. J. McCauley

B. F. Funk

INVENTOR:-

John K. Broderick.

BY Bakewell Kanwall

ATTY'S.

UNITED STATES PATENT OFFICE.

JOHN K. BRODERICK, OF ST. LOUIS, MISSOURI.

ROTARY MOTOR.

No. 816,147. Specification of Letters Patent. Patented March 27, 1906.

Application filed October 27, 1904. Serial No. 230,196.

To all whom it may concern:

Be it known that I, JOHN K. BRODERICK, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Rotary Explosive-Motors, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a cross-sectional view through an engine constructed in accordance with my invention, the appurtenances thereto being shown in elevation. Fig. 2 is an enlarged plan view of the rotary piston. Fig. 3 is a cross-sectional view through the piston-cups. Fig. 4 is a detail perspective view of one of the cups, and Fig. 5 is an enlarged fragmentary sectional view through a portion of the rotary piston and the intermediate abutments.

This invention relates to explosive-motors, and particularly to a novel construction of piston therefor.

One of the objects of the invention is to provide means whereby the expanded gases entering the explosion-cylinder and which have acted upon one series of working faces carried by the piston may be permitted to exert pressure against one or more secondary series of working faces before being finally exhausted.

Another object is to provide means whereby a minimum resistance will be offered to the exhaustion of the utilized gases, so that a maximum pressure may be exerted against the working faces of the piston.

Other objects and advantages, as well as the novel details of construction of this invention, will be specifically described hereinafter, it being understood that changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages thereof.

The preferred embodiment of my invention is illustrated in the accompanying drawings, in which—

1 designates a driving-shaft. This shaft carries the piston 2. The piston 2 is inclosed in a casing, which casing is illustrated as comprising a plate 4, closing one side of the piston and forming a cover for the housing 5. The piston used in connection with this motor is of peculiar construction and is best illustrated in Figs. 2 to 5. This piston 2 is illustrated as comprising a disk having a peripheral flange 8, in which are packing-rings 9. Spaced from and concentric with the flange 8 is a plurality of flanges (designated by the numerals 10 and 11) forming fluid spaces or chambers 13 and 14. The chamber 13 is of less area than the chamber 14, it being obvious that inasmuch as the fluid enters the space 13 before entering the space 14 the expanded gas being of greater volume after having passed from the chamber 13 will require a greater area against which to exert its force. The flanges 10 and 11 alternate with similar flanges 15 and 16, carried by the disk 4, comprising part of the housing for the piston. The cups 17 in the chamber 13 are smaller than those in the chamber 14, and each cup comprises a concavo-convex body, the concave working surface 18 of which is in the form of a cycloidal curve, the lower edge 19 being straight. The ends of each cup 17 are provided with flanges 20 and 21, which are adapted to be inserted in the grooves 22 and 23, formed in the flanges 8 and 10 of the piston, the floor 24 of the chamber 13 being provided with grooves to receive the lower edges 19 of the respective cups. This construction will permit the cups to lie close together, so as to present a maximum surface to a given volume of expanded gas. The cups 17^a in the secondary chamber 14 are similar in construction to those in the primary chamber 13, except that the cups designated by the numerals 17^a are secured only at one of each of their ends, said cups being larger than those designated by the numeral 17.

25 designates the outlet ports or exhausts, there being an outlet or exhaust for each cup 17. One wall of each outlet-port is curved on the same arc as the curvature of the inner wall of said cup, so that the gas will readily pass from the space formed between two adjacent cups through the ports 25 and through oppositely-curved ports 26, formed in the stationary abutment on the disk 4. Ports 27, similar to those designated by the numeral 22, are formed in the flange 11 of the

piston 2, the walls of these ports also being curved on the same arc as the curvature of the inner walls of the cup 17ª, and these ports 27 direct the utilized gases through the final exhaust-ports 28 in the flange 16, so that they pass into the chamber 29, whence they may be exhausted into atmosphere through the exhaust-pipe 30.

By reference to Fig. 2 it will be observed that in the construction illustrated I prefer to have four inlet-ports communicating with the interior of the motor and in communication with the explosion-chamber, which supplies the necessary fluid to operate the piston. These inlet-ports are designated by the numerals 31, 32, 33, and 34, respectively. However, a different number may be utilized, if desired. In order that the velocity of the fluid entering the chamber 13 may be utilized to propel the piston irrespective of its explosive force against the cups 17, I provide the flange 10 for one-sixteenth of its circumference free from perforations. This portion in each instance I have designated by the reference-numeral 35. The time of the explosion in each explosion-chamber is arranged relative to the time of closing the particular circuit coöperating therewith, so that the gas in each particular chamber will explode during the time that both the inlet and outlet ports of the explosion-chamber are closed.

As the abutment 35 is provided on the flange 10 for one-sixteenth of its circumference, the gas will not be permitted to escape from the chamber 13 until the piston has made one-sixteenth of a revolution. After this one-sixteenth of a revolution has been made the gas will readily pass into a secondary chamber 14 to act upon the larger or secondary cups. The ports 26 in the abutment or flange 10 are curved in a reverse direction to the direction of curvature of the cups 17 and 17ª, as well as their exhaust-ports 25 and 27, and the object of this is that during the passage of the gas from the chamber 13 to the chamber 14 the pushing force of the gas will be exerted upon both sets of cups, so as to have a tendency to increase the power of the motor.

If desirable, a third set of cups may be arranged on the piston 2; but in this event said cups would be of larger area than the cups in the secondary chamber, and the reason for this is obvious.

It will be observed that by the construction of motor illustrated and described by me the gas during its time of explosion and during the time that it is adapted to exert its expansive force against the cups is held within the motor in a most efficient manner. After its work has been performed it will be permitted to speedily exhaust, so as to avoid any tendency toward back pressure, which would impair the efficiency of the motor.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a fluid-motor, a piston having primary cups 17, secondary cups 17ª, a flange at the bottom of the primary cups and provided with outlet-ports, a flange at the top of the secondary cups and having inlet-ports, and a flange at the bottom of the secondary cups having outlet-ports; substantially as described.

2. In a motor, a casing, a piston in the casing comprising a disk, circumferential flanges on said disk, curved cups attached to one of the flanges, which flange is provided with exhaust-ports curved on the same arc as the curvature of the working faces of the cups, and a second series of cups attached to one of the flanges, and adjacent exhaust-ports in the flange also curved on the same arc as the curvature of those particular cups; substantially as described.

3. In a motor, a casing, a piston in the casing comprising a disk, circumferential flanges on said disk, curved cups attached to one of the flanges, which flange is provided with exhaust-ports curved on the same arc as the curvature of the working faces of the cups, a second series of cups attached to one of the flanges, adjacent exhaust-ports in the flange also curved on the same arc as the curvature of those particular cups, and abutments in the casing for dividing the two series of cups, said abutments having ports for a portion of their circumference only; substantially as described.

4. In a motor, a casing, a piston in the casing comprising a disk, circumferential flanges on said disk, curved cups attached to one of the flanges, which flange is provided with exhaust-ports curved on the same arc as the curvature of the working faces of the cups, a second series of cups attached to one of the flanges, adjacent exhaust-ports in the flange also curved on the same arc as the curvature of those particular cups, and abutments in the casing for dividing the two series of cups, said abutments having ports for a portion of their circumference only, said ports in the abutments being curved in an opposite direction to the curvature of the ports in the piston; substantially as described.

5. In a motor, a rotary piston having cups to receive the actuating fluid, which cups are provided with working faces of cycloidal curvature, and exhaust-ports in the piston-wall of each cup alining with the working face of the cup; substantially as described.

6. In a rotary motor, a casing having ported interiorly-arranged circular flanges, a piston having ported flanges alternating with

the flanges of the casing, cups connected at their ends to one of the piston-flanges and to the outer edge of the piston, and cups connected at one of each of their ends to one of the piston-flanges and free at their opposite ends adjacent to one of the casing-flanges; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 21st day of October, 1904.

JOHN K. BRODERICK.

Witnesses:
B. F. FUNK,
GEORGE BAKEWELL.