

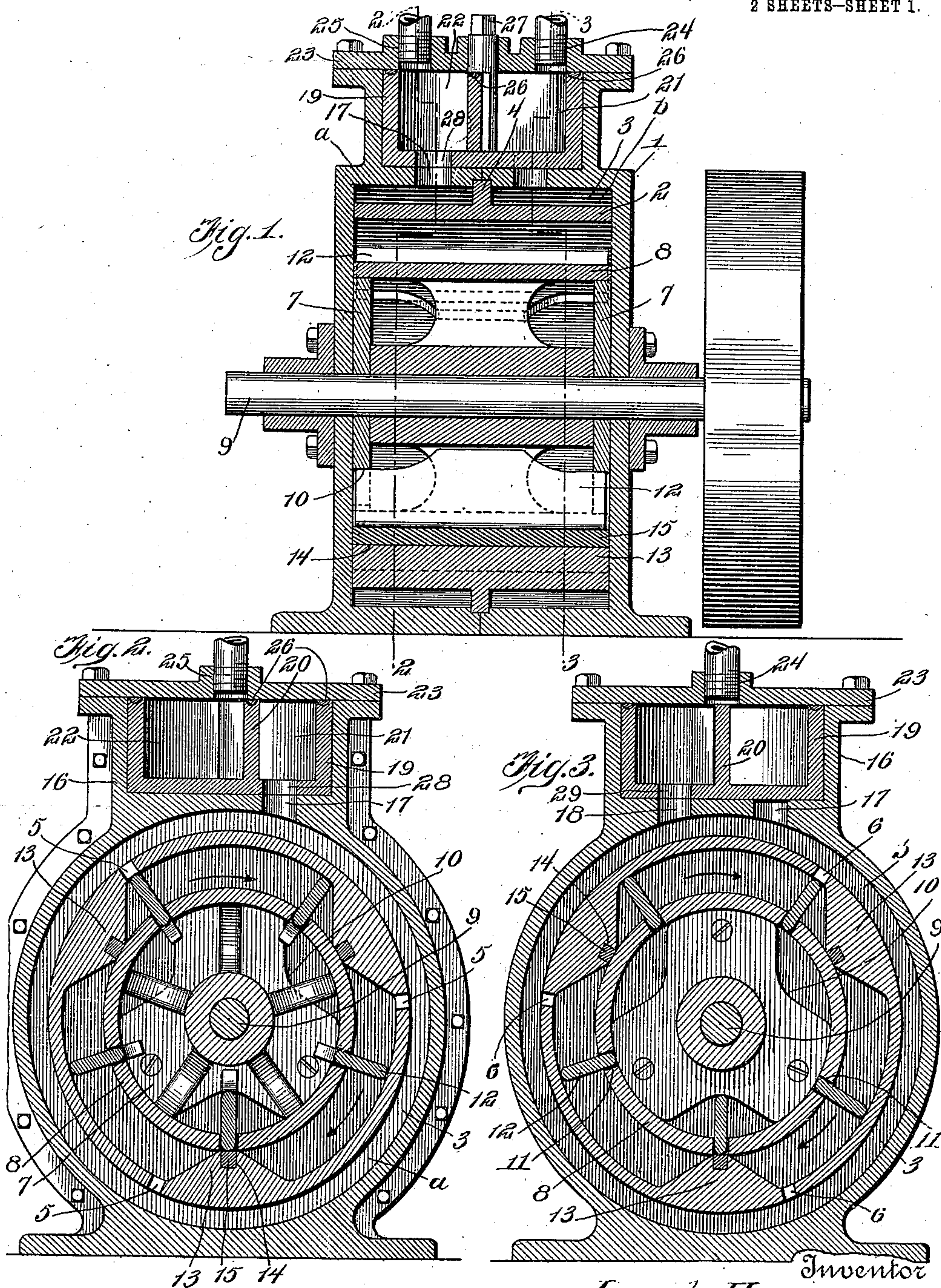
J. HARMAN.
ROTARY MOTOR.

APPLICATION FILED OCT. 10, 1910.

989,600.

Patented Apr. 18, 1911.

2 SHEETS—SHEET 1.



Witnesses

Louis R. Heinrich,
C. H. Giesbauer.

Inventor
Joseph Harman

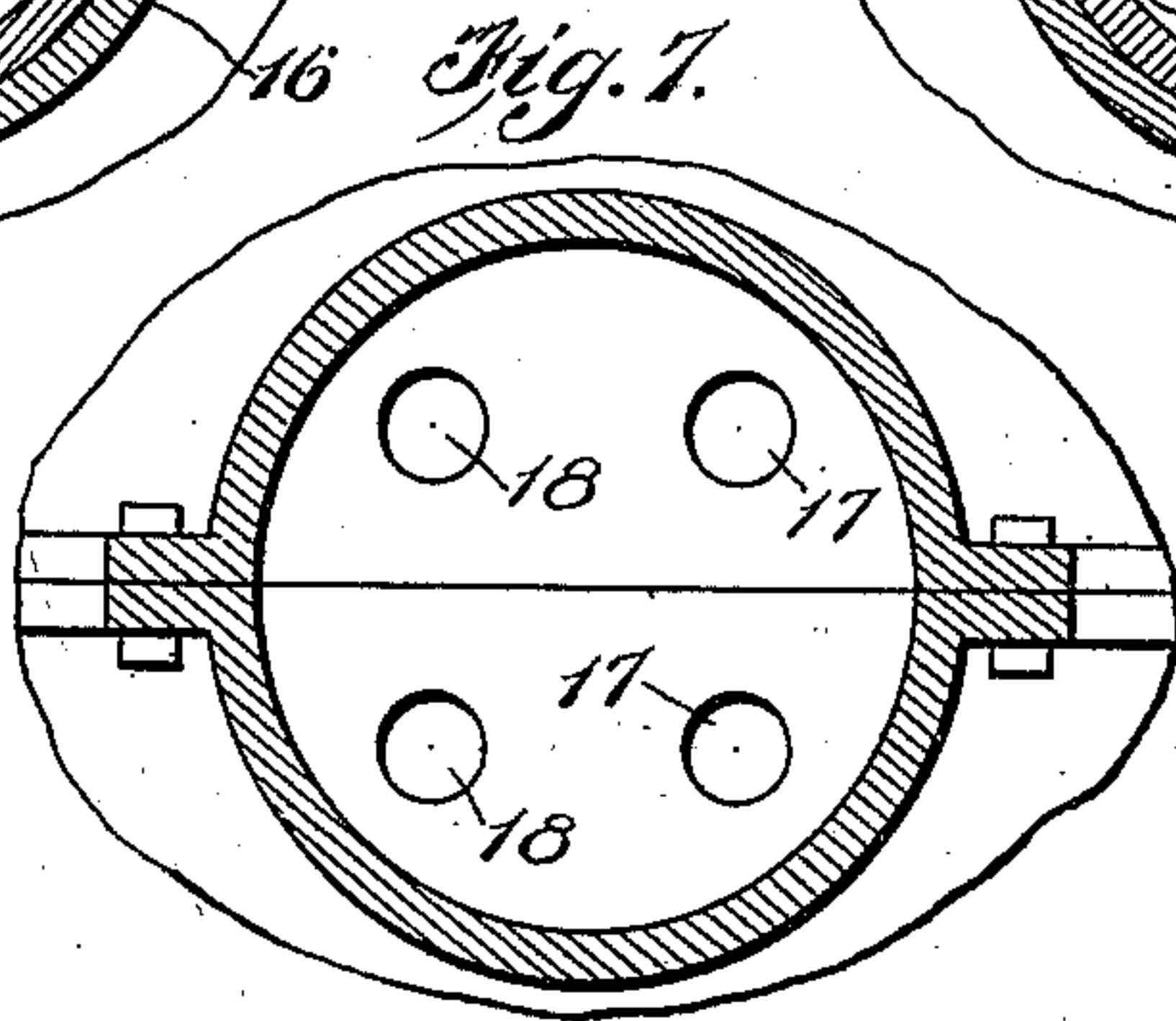
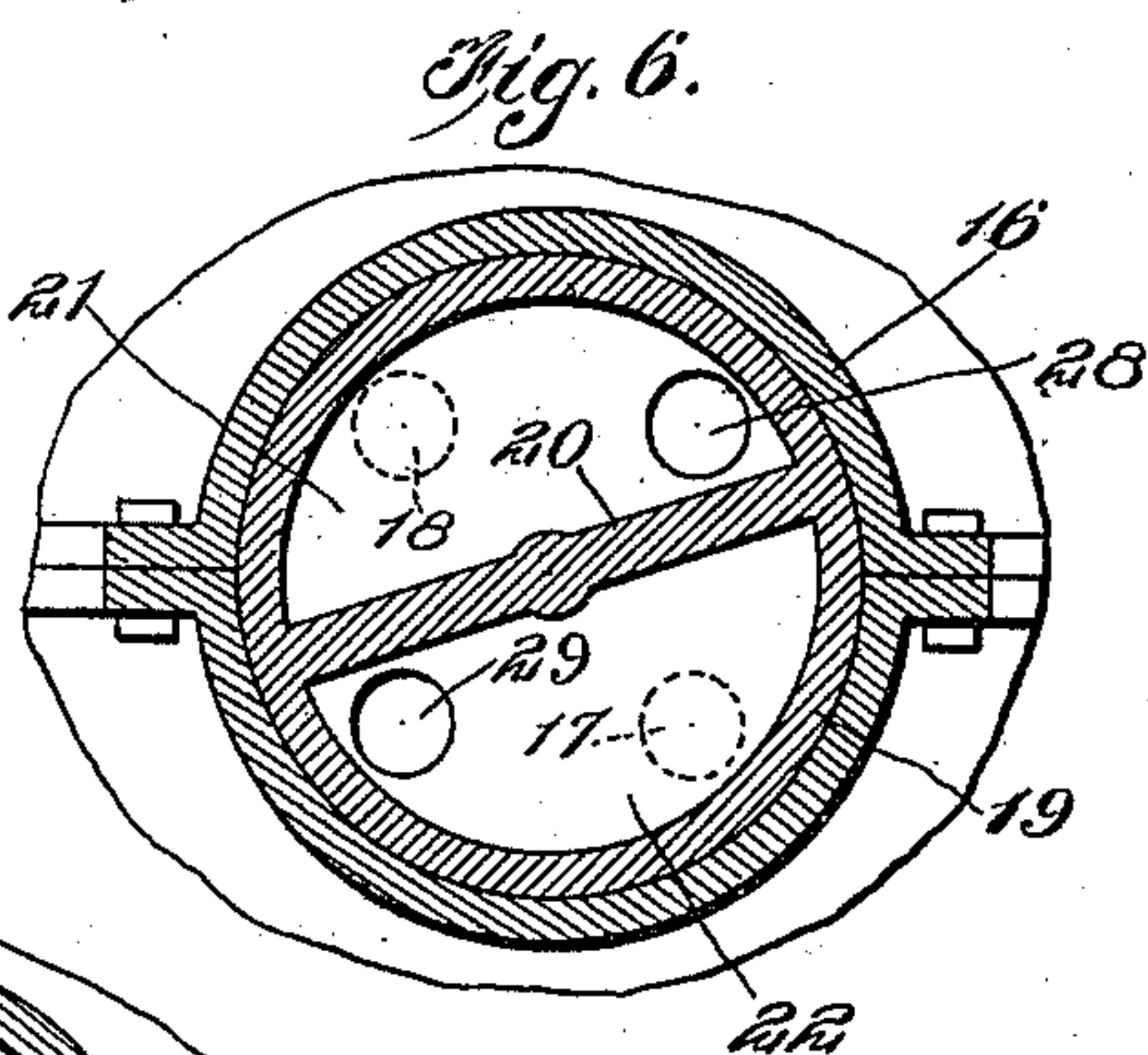
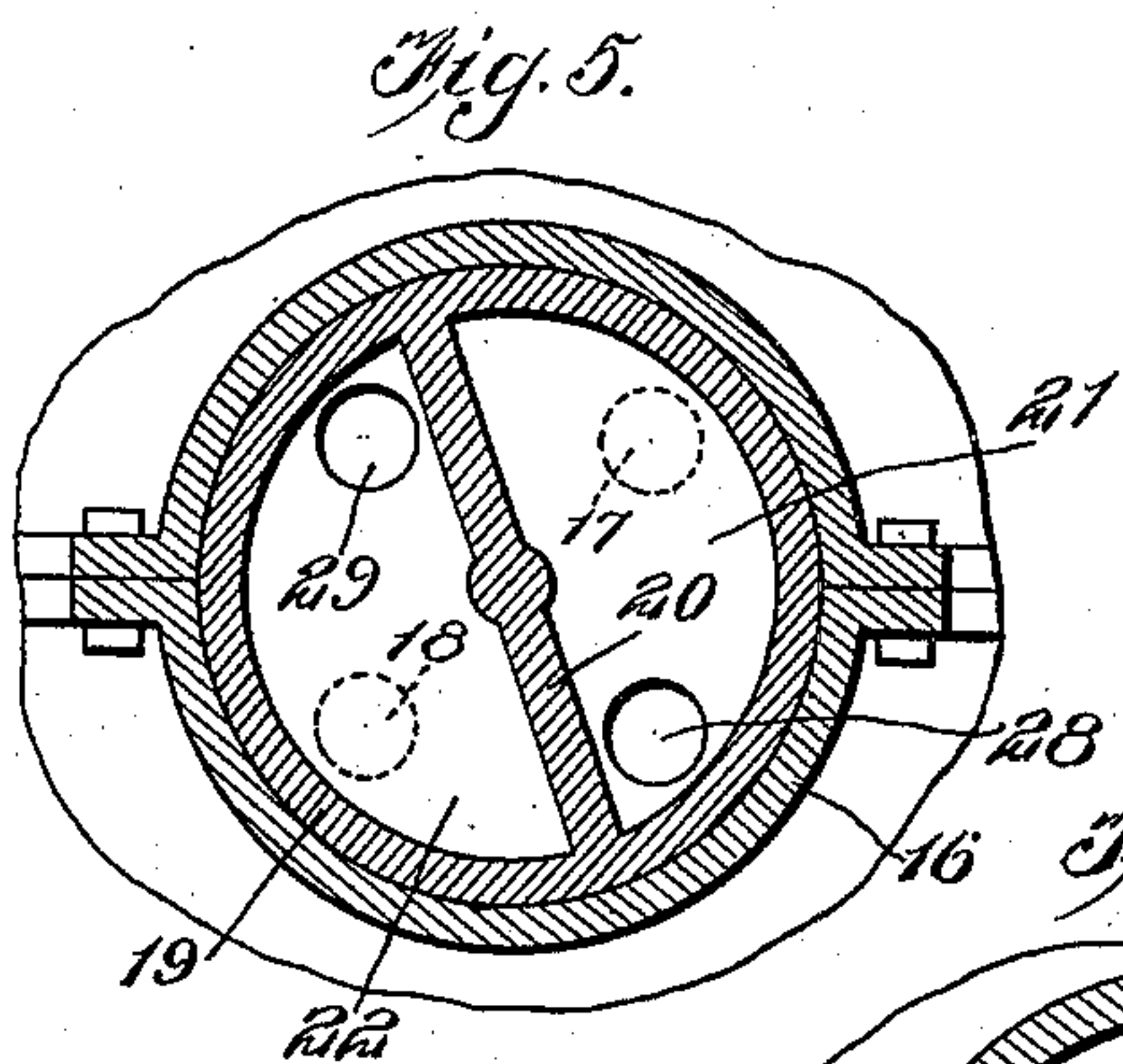
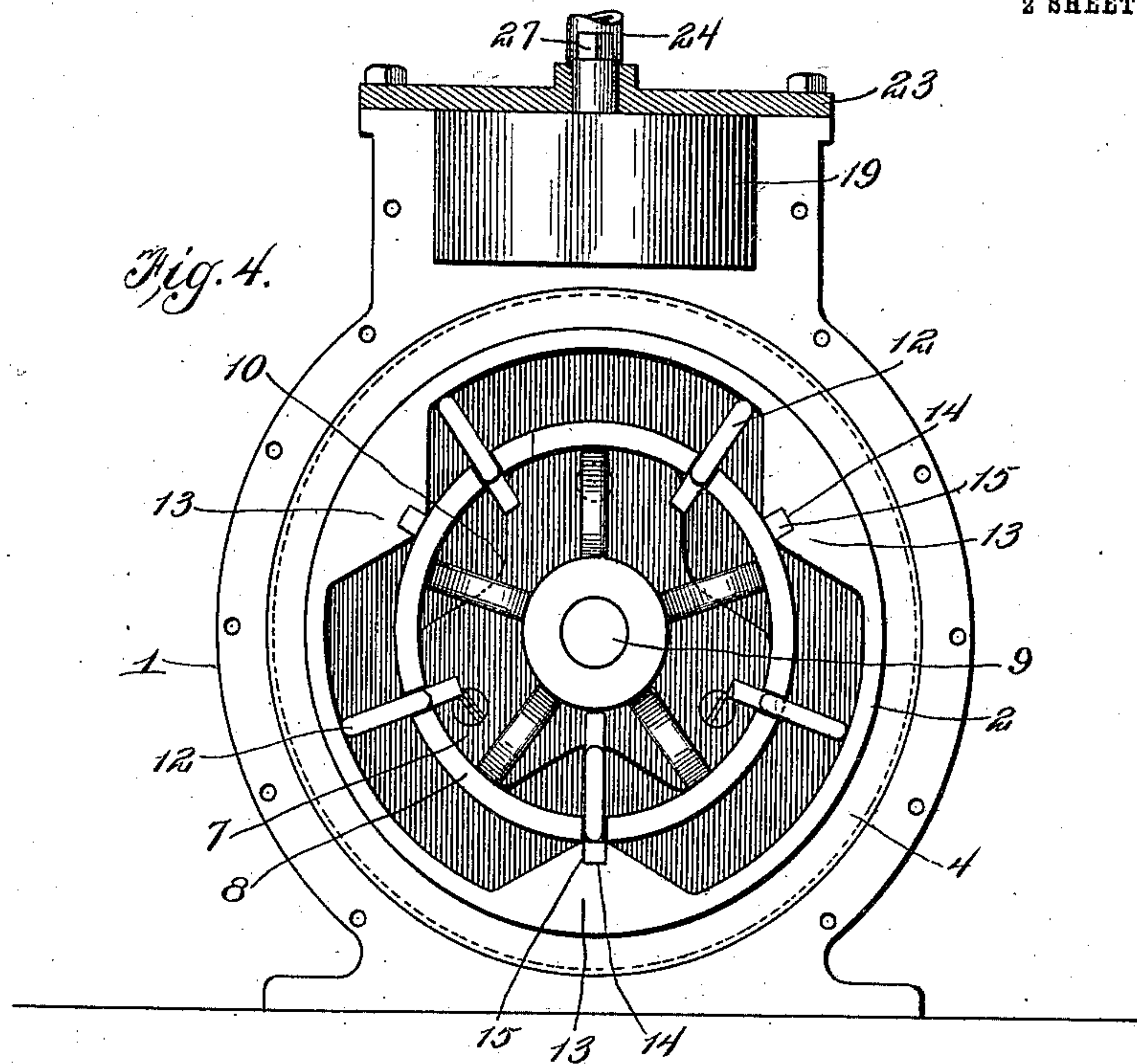
By *A. B. Wilson & Co.*
Attorneys

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UNITED STATES PATENT OFFICE.

JOSEPH HARMAN, OF BRAINERD, MINNESOTA, ASSIGNOR OF ONE-HALF TO PATRICK E. McCABE, OF BRAINERD, MINNESOTA.

ROTARY MOTOR.

989,600.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed October 10, 1910. Serial No. 586,347.

To all whom it may concern:

Be it known that I, JOSEPH HARMAN, a citizen of the United States, residing at Brainerd, in the county of Crow Wing and State of Minnesota, have invented certain new and useful Improvements in Rotary Motors; and I do 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.

This invention relates to improvements in rotary motors.

One object of the invention is to improve and simplify the construction of motors of this character whereby the efficiency and durability of the same will be increased.

Another object is to provide an improved construction and arrangement of combined steam and exhaust valve by means of which the motor may be quickly and easily reversed.

With these and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts as will be more fully described and particularly pointed out in the appended claim.

In the accompanying drawings: Figure 1 is a vertical longitudinal sectional view of a rotary motor constructed in accordance with the invention; Fig. 2 is a vertical cross section through the live steam side of the motor on the line 2—2 of Fig. 1. Fig. 3 is a similar view through the exhaust side of the motor on the line 3—3 of Fig. 1; Fig. 4 is a vertical longitudinal sectional view through the outer casing showing the inner casing in side elevation; Fig. 5 is a horizontal sectional view of the valve casing and valve showing the position of the latter when the motor is running in one direction; Fig. 6 is a similar view showing the position of the valve when the motor is reversed or running in the opposite direction; Fig. 7 is a similar view of the valve casing with the valve removed to more clearly illustrate the arrangement of the steam and exhaust ports in the casing.

My improved motor comprises an outer cylindrical casing 1 and an inner concentrically arranged casing 2 which is of less diameter than the outer casing thus forming between the two casings an annular steam space 3 which is divided midway between

the opposite ends or heads of the casing by an annular partition strip 4. The dividing strip 4 separates the space 3 into live steam and exhaust passages *a* and *b* respectively. In the inner casing 1 is formed a series of steam inlet ports 5 which communicate with the annular live steam passage *a* of the space 3 between the inner and outer casing. In the opposite side of the inner casing is formed a series of exhaust ports 6 which communicate with the annular exhaust passage *b* of the space 3 between the casings.

Secured to the opposite heads or ends of the motor are piston guide and blade operating plates 7 with which are revolvably engaged the outer ends of a cylindrical piston 8 which is fixedly mounted on a shaft 9 passing through the plates 7 and opposite ends or heads of the motor as shown. In each of the plates 7 are formed a plurality of blade operating notches 10 the edges of which are inclined as shown. Formed in the piston 8 is a series of longitudinally disposed slots 11 in each of which is slidably mounted a wing or blade 12 which is provided to receive the pressure from the expansion of the steam which enters the steam space between the piston and the inner casing through the steam inlet ports 5.

On the inner side of the inner casing 2 opposite to or in line with the notches 10 in the plates 7 are substantially triangular wing or blade operating abutments 13 in the apices of which are formed longitudinal grooves 14 and in which are arranged packing strips 15 which bear against and form a fluid tight engagement with the outer surface of the piston 8. Assuming the motor to be running in the direction of the arrows shown in Figs. 2 and 3 of the drawings the steam will enter through the live steam ports 5 and will expand between the abutments 13 and the adjacent sides of the blades 12 thereby turning the piston. As the piston is thus turned and the blades brought opposite to the notches 10 and into engagement with the abutments 13 the inclined wall of the abutments will force the blades back into the piston and into engagement with the notches 10 in the plates 7 and when the blades have been forced into the piston and into the deepest part of the notches 10 the outer edges of the blades will be flush with the outer surface of the piston thus permitting the blades to pass the abutments 13.

Immediately after the blades have passed the abutments the inner edges thereof will be brought into engagement with the opposite inclined walls of the notches 10 which
 5 will again force the blades outwardly through the slots in the piston and into engagement with the inner wall of the inner casing to form a new steam expansion space between itself and the abutment just passed
 10 to receive the steam entering the inlet port communicating with this space. As the piston moves around and has its blades moved inwardly and outwardly in the manner described the exhaust steam in the spaces
 15 ahead of each of the blades will be forced out of the exhaust ports which communicate with said spaces and the annular exhaust passage *b* of the space between the inner and outer casings of the motor so that the ex-
 20 haust steam does not form any resistance to the forward movement of the piston.

On the upper side of the outer casing is arranged a valve casing 16 having in its lower end a valve seat provided with two pairs
 25 of steam inlet and exhaust ports 17 and 18 which communicate respectively with the inlet and exhaust passages *a* and *b* formed in the space between the inner and outer casings of the motor. Operatively mounted in
 30 the valve casing 16 is a hollow valve 19 which is divided by a transverse partition 20 into a steam inlet side 21 and a steam exhaust side 22. The valve 19 is revolubly mounted in the casing 16 said casing being
 35 closed at its upper end by a cover plate 23 in which is formed a steam inlet passage 24 and a steam exhaust passage 25. In the upper edges of the valve 19 and the partition 20 are arranged packing strips 26 which
 40 form a fluid tight engagement with the under side of the cover plate as shown. The valve 19 is provided with a centrally disposed operating stem 27 which projects upwardly through a bearing opening in the
 45 top plate 23 of the valve casing and is squared on its upper end to receive a wrench or handle by means of which the valve may be turned in the casing. In the bottom of the valve and on one side of the partition 20
 50 is formed a steam inlet port 28 and in the

bottom of the valve on the opposite side of the partition is formed a steam exhaust port 29. By turning the valve in the proper direction to bring the inlet and exhaust ports in alinement with the ports in the outer casing of the motor the live steam may be let
 55 into one or the other of the passages *a* or *b* while the other passage will serve as the exhaust passage thus controlling the direction in which the piston is driven and providing
 60 for the quick reversal of the motor.

From the foregoing description taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without
 65 requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention as defined in the appended claim.
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Having thus described my invention what I claim is:

A rotary motor comprising an outer casing, an inner casing concentrically arranged therein to form an annular steam space, said inner casing having formed therein a series of steam inlet and exhaust passages communicating with said steam space, an
 75 annular dividing strip adapted to separate said space into live and exhaust steam passages, a piston revolubly mounted in said inner casing, a series of blades slidably mounted in said piston, piston supporting
 80 plates secured to the inner ends of the motor casing said plates having formed therein a series of notches adapted to receive said blades when pushed into the piston and to project the same and a series of abutments
 85 arranged on said inner casing and adapted to push said blades into the piston and into the notches in said piston supporting plates.
 90

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.
 95

JOSEPH HARMAN.

Witnesses:

OLIVE S. OLSON,
 IDA S. CAILSON.