

No. 622,704.

Patented Apr. 11, 1899.

A. G. McPHERSON & E. M. LAING.
ROTARY ENGINE.

(No Model.)

(Application filed Aug. 21, 1897.)

2 Sheets—Sheet 1.

Fig. 2.

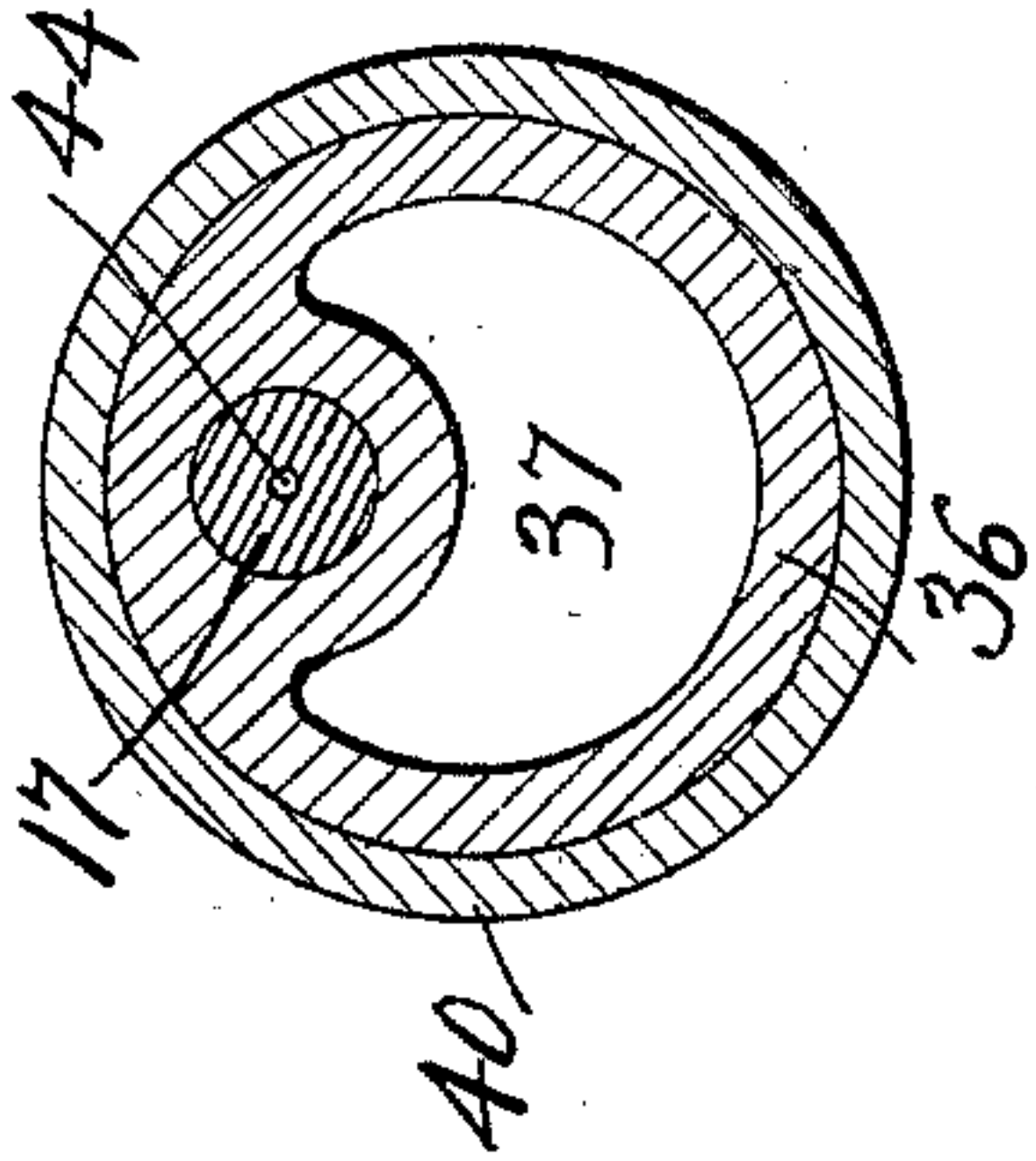


Fig. 3.

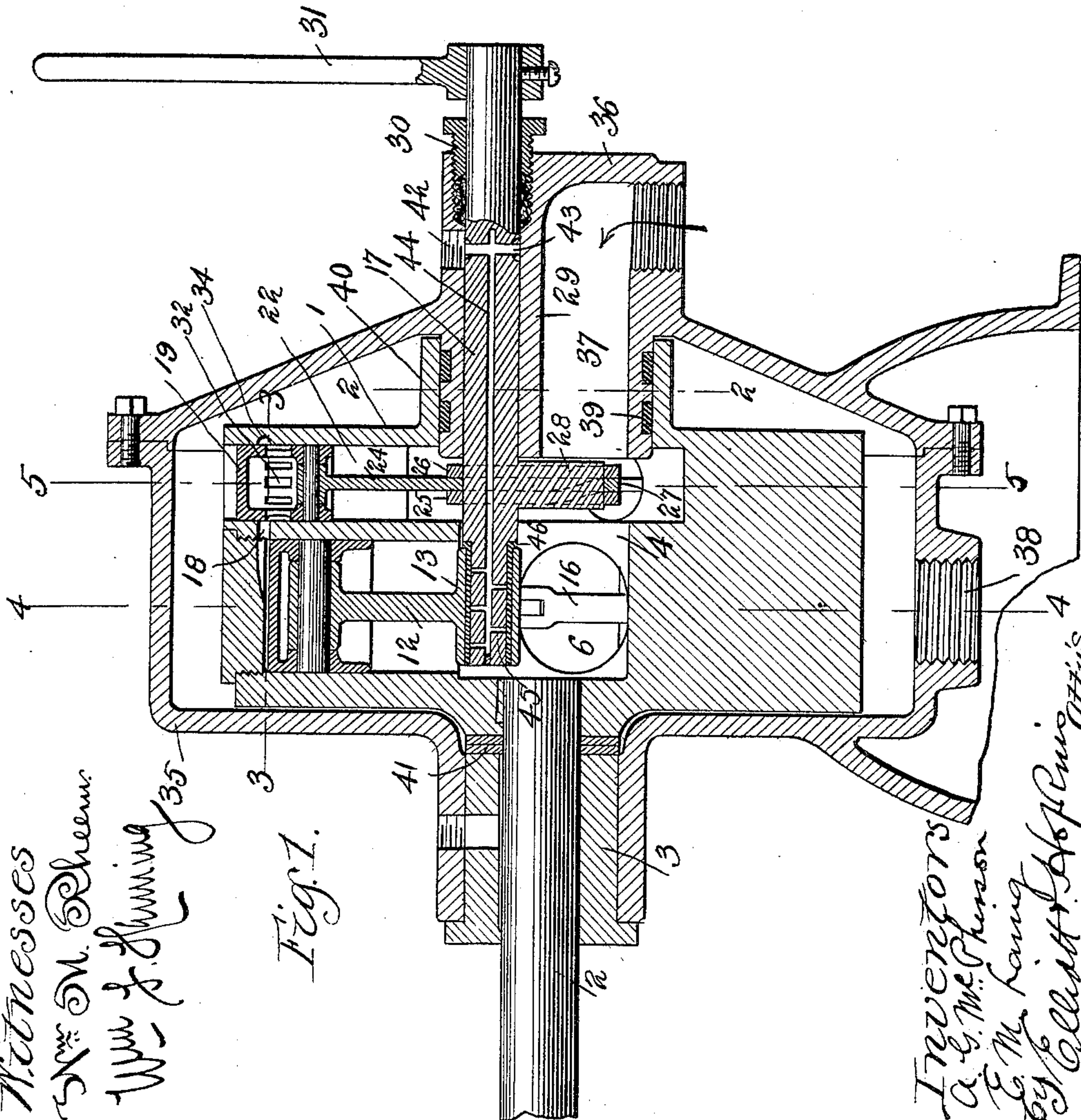
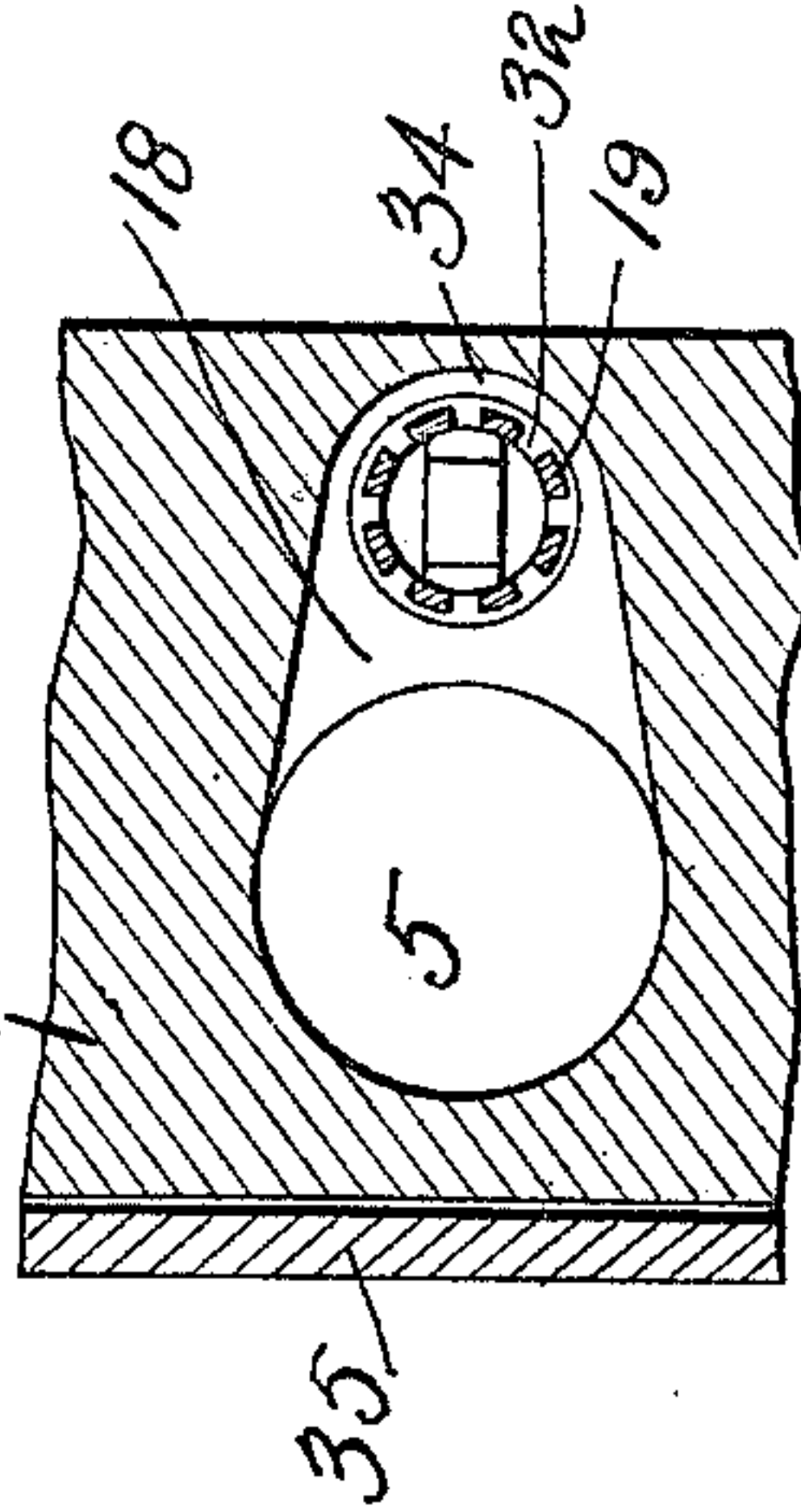


Fig. 1.

Witnesses
S. M. Deane
W. J. Fleming

Inventors
A. G. McPherson
E. M. Laing
by C. H. McPherson Attys.

No. 622,704.

Patented Apr. 11, 1899.

A. G. MCPHERSON & E. M. LAING.

ROTARY ENGINE.

(Application filed Aug. 21, 1897.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 5.

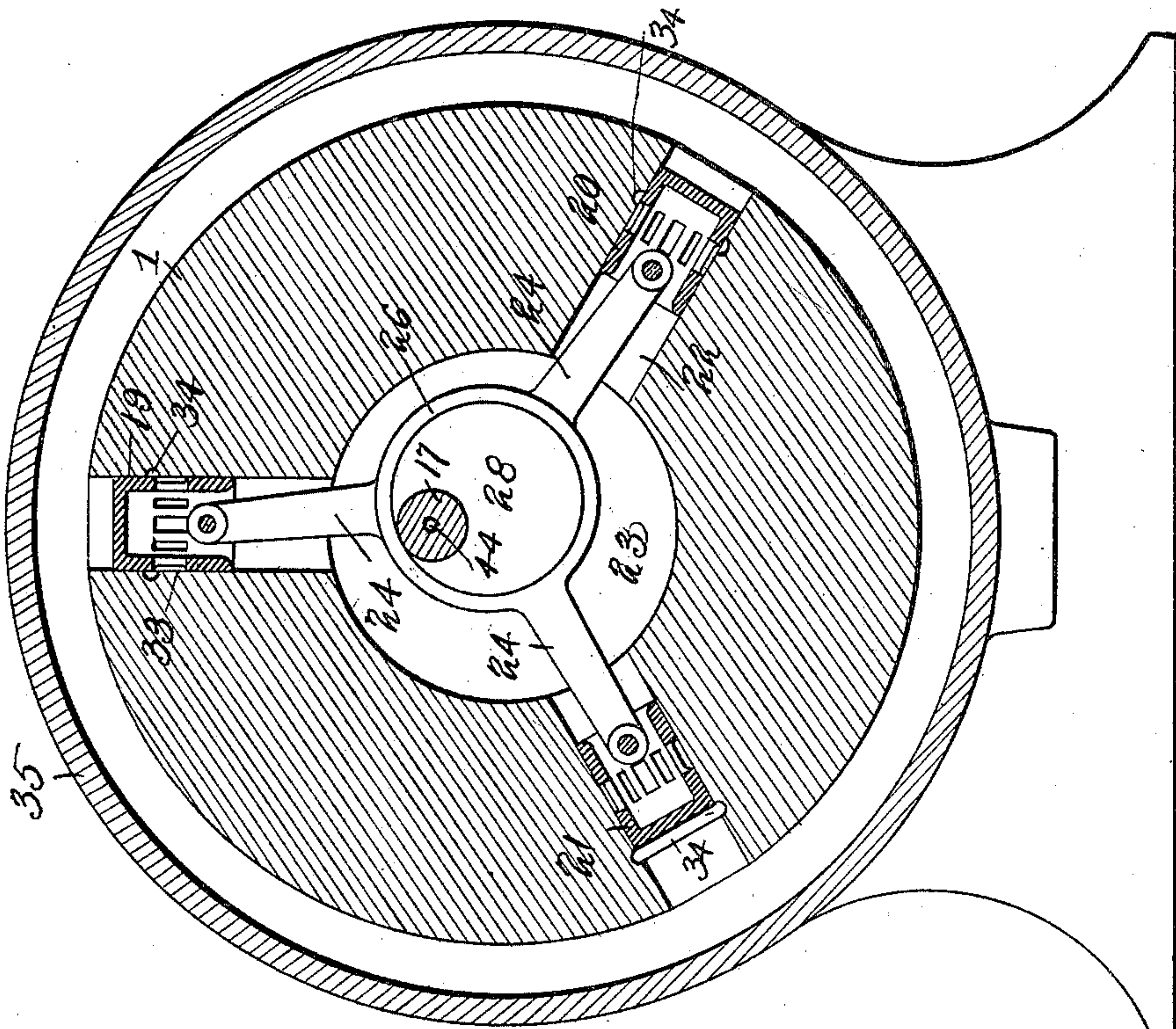
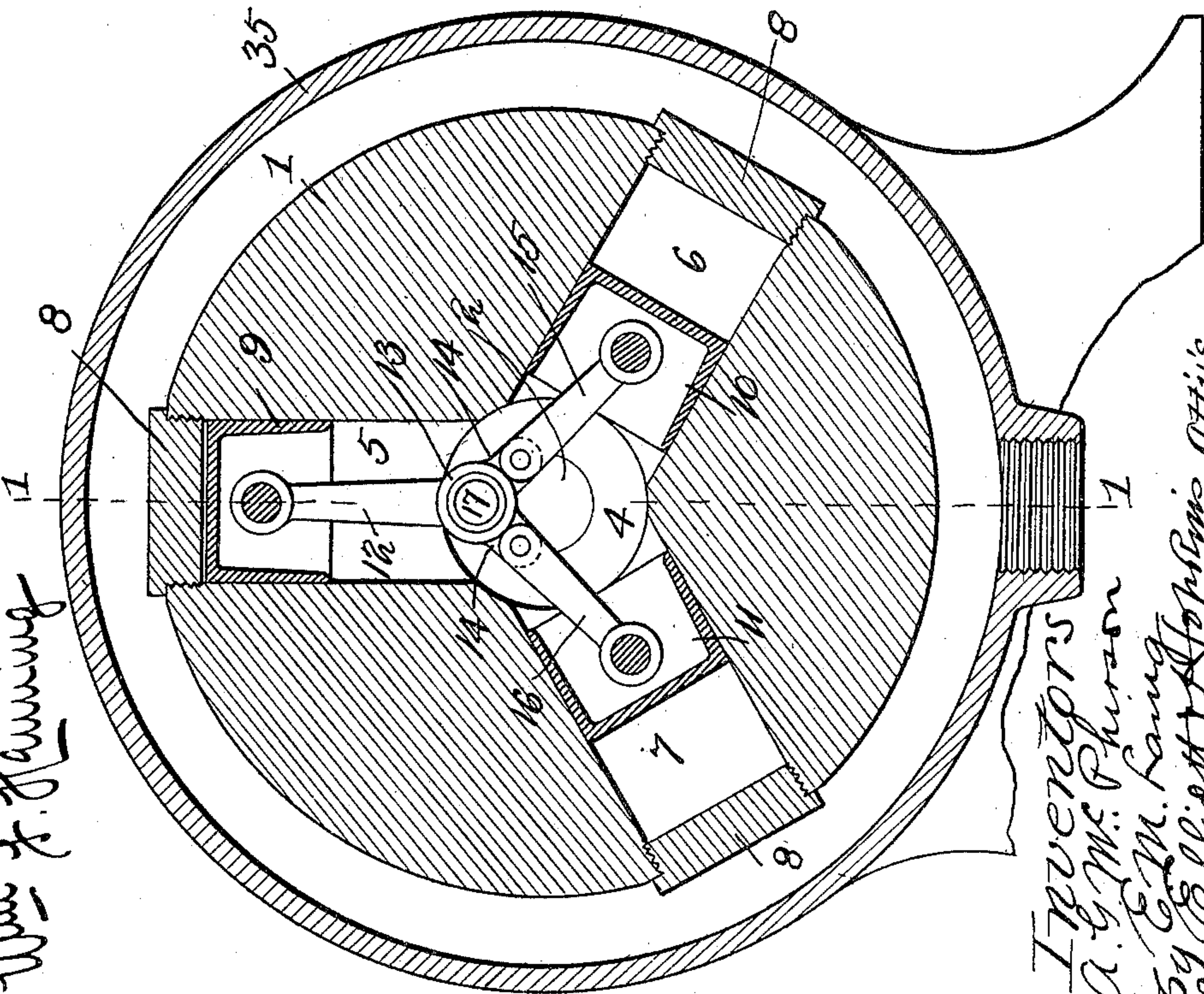


Fig. 4.



Witnesses
S. M. Dehem.
Wm. F. Flanning

Inventors
A. G. McPherson
E. M. Laing
by Elliott & Hopkins Attys

UNITED STATES PATENT OFFICE.

ARTHUR G. McPHERSON AND EDWARD M. LAING, OF HIGHLAND PARK,
ILLINOIS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 622,704, dated April 11, 1899.

Application filed August 21, 1897. Serial No. 649,002. (No model.)

To all whom it may concern:

Be it known that we, ARTHUR G. McPHERSON and EDWARD M. LAING, citizens of the United States, residing at Highland Park, in the county of Lake and State of Illinois, have invented certain new and useful Improvements in Rotary Engines, of which the following is a full, clear, and exact specification.

Our invention relates to that class of rotary engines in which one or more reciprocating pistons are employed, and more especially to that species of such class in which the power is derived by the action of the steam or pressure exerted against one or more pistons swinging around a common center and each located in a cylinder formed radially in a revolving block whose center is eccentric to the center about which the pistons revolve.

Our invention has for its primary object to provide an improved construction of engine in which the revolving body having the cylinders formed therein shall be out of contact with any stationary parts and each cylinder thereof supplied with steam at the proper point, thus relieving the said revolving body of friction and avoiding the employment of packing between it and the casing heretofore employed.

Another object of our invention is to provide an improved engine of the described type in which each cylinder shall have its own admission and exhaust valve.

Another object of our invention is to envelop the cylinders and their valves with either the supply or exhaust steam, and thus prevent condensation.

A further object of our invention is to provide improved means whereby an engine of the described type may be readily reversed by altering the relative positions of the individual valves and the ratio of expansion while running in either direction regulated in the cylinders; and a still further object of our invention is to supply lubricant to the internal revolving parts by the centrifugal force of their movement.

With these ends in view our invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are at-

tained, all as fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a vertical longitudinal sectional view of our improved engine, taken on the line 1 1, Fig. 4. Fig. 2 is a detail transverse section taken on the line 2 2, Fig. 1. Fig. 3 is a detail plan section taken on the line 3 3, Fig. 1. Fig. 4 is a vertical transverse section taken on the line 4 4, Fig. 1; and Fig. 5 is a similar view taken on the line 5 5, Fig. 1.

1 represents a revolving block or body, which is preferably solid instead of skeleton form, and is mounted upon and secured to the main shaft 2 of the engine, which latter is journaled in suitable bearings 3. The center of this block is chambered out, as shown at 4, and extending outwardly or radially from this central chamber are one or more cylinders 5 6 7, which may be formed by boring directly through the periphery of the block into the chamber 4, the chamber 4 being formed only partially through the block, so as to leave material for the attachment of the shaft 2. The outer end of each of the cylinders is closed by a plug 8, or in any other suitable way, and arranged in these cylinders are pistons 9 10 11, respectively. The piston 9 is connected by an arm 12 to a hub 13, which is provided on its opposite sides with ears 14, to which latter are pivoted, respectively, links or pitmen 15 16, whose outer extremities are pivotally connected to the pistons 10 11, respectively. The hub 13 is journaled upon a pin 17, which constitutes the center about which the pistons swing and which pin is located eccentrically to the center of the block 1—that is, the shaft 2—so that as the block and pistons revolve around their respective non-coincident centers the pistons and cylinders will make relatively reciprocating movements.

Now it will be understood that if pressure be admitted successively to the cylinders at a point between the plug 8 and the piston the block 1 will be compelled to revolve in one direction or the other, accordingly as the arm 12 or the link 15 16 is inclined to the right or to the left of the axis of the cylinder receiving pressure. In order to thus supply each cylinder with pressure at a time when its pis-

ton is at or near the outer end of the cylinder, we provide the outer end of each cylinder with a port 18, each of which is controlled by an independent valve, whereby pressure will be admitted when the piston is at or near the outer extremity of its stroke and exhausted when it reaches the inner extremity of its stroke. This is accomplished by means of piston-valves 19 20 21, each arranged in a suitable barrel or housing 22, preferably formed in the block or body 1 by boring radial chambers through its periphery into a central cavity or chamber 23, arranged concentrically with and also communicating with but being slightly larger than the central chamber or cavity 4. Each of these valves is connected to one of three arms 24, each formed on or secured to one of three strips 25, 26, and 27 of an eccentric 28, formed on or secured to the eccentric-pin 17, the latter being journaled in a suitable bearing 29 and stuffing-box 30, having an operating lever or handle 31, whereby the pin 17 may be rotated and the position of the eccentric 28 altered for shifting the valves when it is desired to change the direction of rotation of or reverse the engine or to alter the ratio of expansion in the cylinders while running in either direction, it being understood that the position of the center of the eccentric 28 with reference to the center of the shaft 2 controls this action and any movement of the center of such eccentric toward the center of said shaft results in a shorter travel of the valves and also advances their lead.

We have not illustrated any automatic governor for regulating the speed of the engine in connection with our improvements; but it is obvious that any well-known governor operating in unison with the engine might be connected by well-known mechanism to the lever or handle 31 for rotating the pin 17 and controlling the positions of the valves.

Each of the valves is opened at its inner end and closed at its outer end, and around its sides are formed a number of ports 32, which communicate with a peripheral channel 33, formed in the outside of the valve, and through which ports and channel the steam or pressure is admitted to the port 18, the latter being also in communication with a channel 34, surrounding the inside of the housing 22. Steam is admitted to the cylinder through the valves via the ports 32 18 and is exhausted through the port 18 when the valve recedes inwardly and uncovers the port 18, thus permitting the pressure to escape through the outer end of the housing 22.

The mechanism thus described is preferably inclosed in a suitable casing 35, which also constitutes a support for the bearings 3 29 and which completely surrounds the block or body 1 containing the series of revolving cylinders and pistons as well as their valves; but there is preferably left between all sides of the block and the casing a space of more or less capacity, as clearly shown in the draw-

ings. One side of the casing 35 is provided with a neck 36, in which is formed the steam-supply passage 37, which is in direct communication with the central chambers 4 and 23, so that the pressure of the live steam is exerted alike against the inner sides of all the pistons and valves and is admitted to the outsides of the pistons only when the valves shift to the proper position for opening the ports 18. By this means it will be seen that the friction against the revolving block or body 1 heretofore entailed by the close contact of said block with the casing is avoided, and the pistons are prevented from rattling back and forth on their crank-pins in opposite directions as a result of being subjected alternately to the centrifugal force in one direction and the pressure of the steam on their outer faces in the other direction. The exhaust-steam is admitted from the ports 18 via the outer ends of the housings 22 directly into the space which surrounds the revolving block or body 1 and is carried off through the relief-port 38, and hence a further advantage of this construction is that all of the operating parts are completely enveloped in hot steam and condensation prevented without entailing an extra drain on the steam-supply.

Communication between the space existing between the exterior of the block 1 and the casing and the inlet or supply passage 37 is cut off by one or more packing-rings 39, surrounding the neck 36, and being in turn surrounded by a collar 40, formed on one side of the block 1. The other side of the block 1 rests against suitable abutment-washers 41, surrounding the shaft 2 and abutting against the bearing 3, such washers, if desired, being supported against balls or other antifriction devices, as will be understood.

Lubricant is admitted to the internal operating parts through a passage 42, to which any suitable oil-cup (not shown) may be connected, and which passage communicates with a transverse passage 43, having a peripheral channel, as shown in Fig. 1, formed in the pin 17 and communicating with a small duct 44, extending through said pin to its inner end, where it is provided with a number of tributary passages 45, leading outwardly to the bushing 46, upon which the hub 13 is journaled. Thus the oil finding its way onto the flying arms or pitmen of the pistons will be thrown outwardly along such arms by the centrifugal force and eventually find its way onto the pistons and their crank-pins.

It is of course very obvious that the passages 37 38 might be interchangeably used for the supply and exhaust, it being immaterial, excepting so far as loss by condensation is concerned, whether the live steam be admitted into the spaces surrounding the revolving block and into the cylinders through the outer ends of the housings 22 or through the course hereinbefore described. There is, however, an advantage in having the outer ends of the valve-housings 22 open and exhausting outwardly

therethrough, thus keeping the dying steam always traveling outwardly or away from the center from the time it begins to exhaust, because the waters of condensation are by this means forced outwardly through the open end of the valve-housing and the trapping of the water in the housing or other chambers is avoided.

Having thus described our invention, what we claim as new therein, and desire to secure by Letters Patent, is—

1. A rotary engine having in combination a cylinder revolving bodily about a given center; a piston located in said cylinder and being fixed with relation to and revolving about a different center; a valve for admitting and exhausting pressure to and from said cylinder, said valve revolving with said cylinder about a center eccentric to the center of rotation of said cylinder, and the center of rotation of said valve being adjustable to and from the center of rotation of said cylinder, whereby the adjustment of said center of rotation of the valve may be employed for both regulating the speed and reversing the engine, substantially as set forth.

2. A rotary engine having in combination a cylinder revolving about a given center, a piston located in said cylinder and being fixed with relation to and revolving about a different center, a valve for admitting pressure to said cylinder, said valve revolving with said cylinder, a normally-fixed eccentric connected to and actuating said valve, the axis of rotation of the eccentric being eccentric to the center of rotation of said cylinder, and means for rotating said eccentric for varying the cut-off and lead and thereby regulating the speed and reversing the engine, substantially as set forth.

3. A rotary engine having in combination

a cylinder revolving bodily about a given center, a piston located in said cylinder and being fixed with relation to and revolving about a different center, a valve for admitting pressure to said cylinder, and being fixed with relation to and revolving bodily about an adjustable center different from and independent of both of said other two centers, substantially as set forth.

4. A rotary engine having in combination a plurality of cylinders revolving about a given center, a plurality of pistons arranged in said cylinders respectively and revolving about a different center, a plurality of valves for controlling pressure to said cylinders revolving about a center located eccentric to and adjustable to and from the center of rotation of said cylinders, the neck for admitting pressure to said valves, the collar revolving with said cylinders and surrounding said neck, and a casing surrounding said cylinders and valves and being provided with an exhaust-port, substantially as set forth.

5. A rotary engine having in combination a cylinder revolving bodily about a given center, a piston located in said cylinder, the rotary pin located eccentric to said center and to which pin said piston is pivotally connected, a valve for controlling pressure to and from said cylinder, an eccentric-strap connected to said valve, an eccentric formed on said pin 17 and operating in said strap, means for rotating said pin and means for admitting pressure to said valve, substantially as set forth.

ARTHUR G. MCPHERSON.
EDWARD M. LAING.

Witnesses:

EDNA B. JOHNSON,
F. A. HOPKINS.