No. 865,967. PATENTED SEPT. 10, 1907.

J. E. HARRIMAN, JR.

ROTARY ENGINE.

APPLICATION FILED FEB. 12, 1906.

2 SHEETS—SHEET 1.

Fig. 1

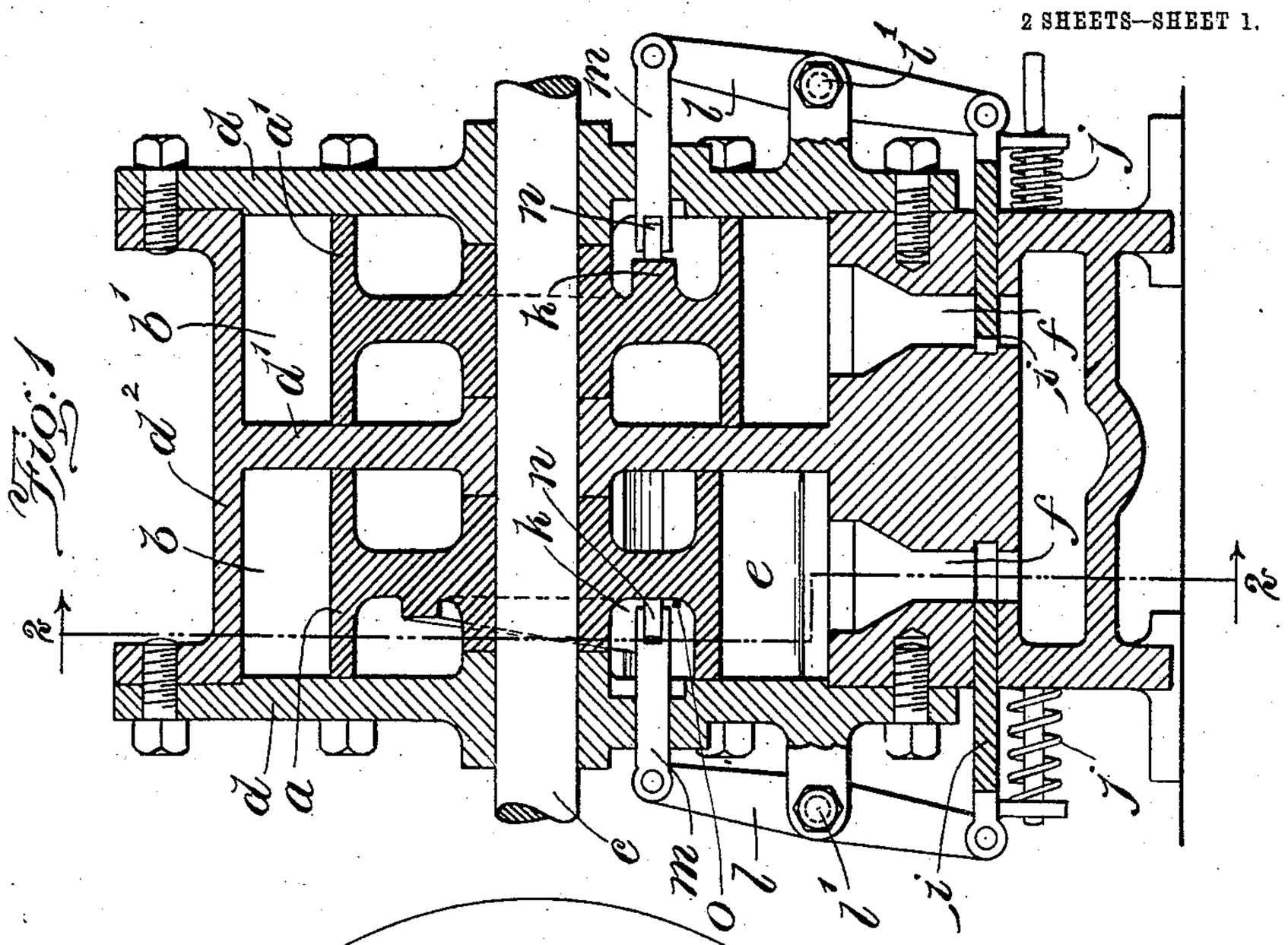
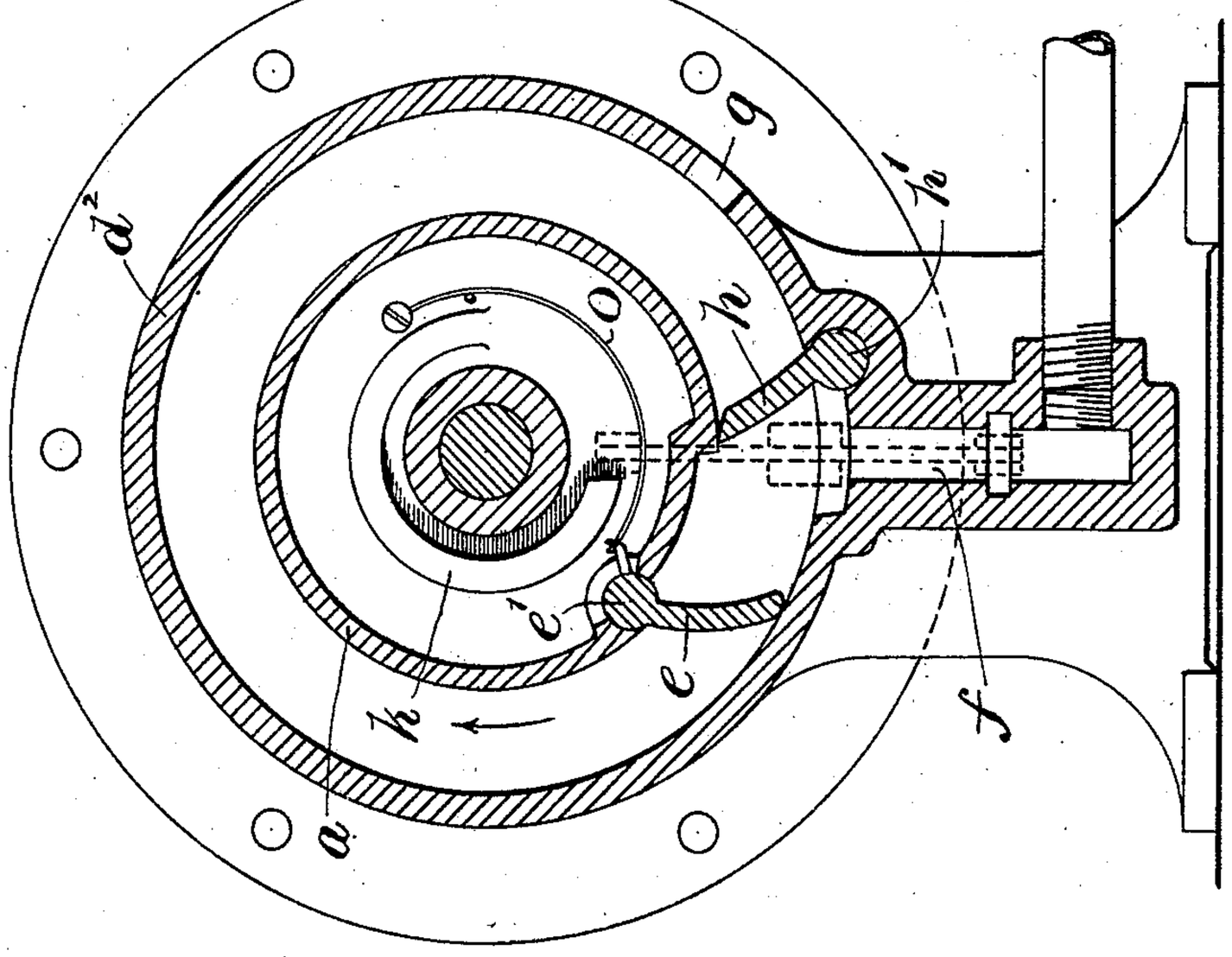


Fig. 2



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2 SHEETS—SHEET 2.

Fig. 5.

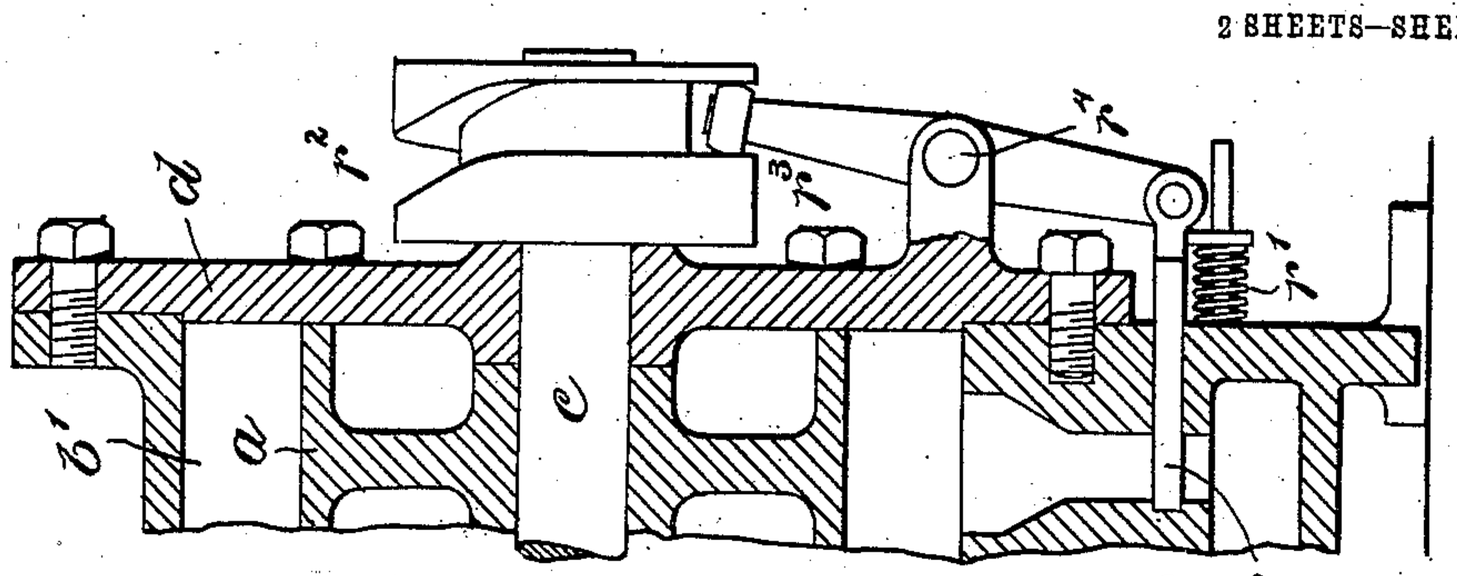


Fig. 4.

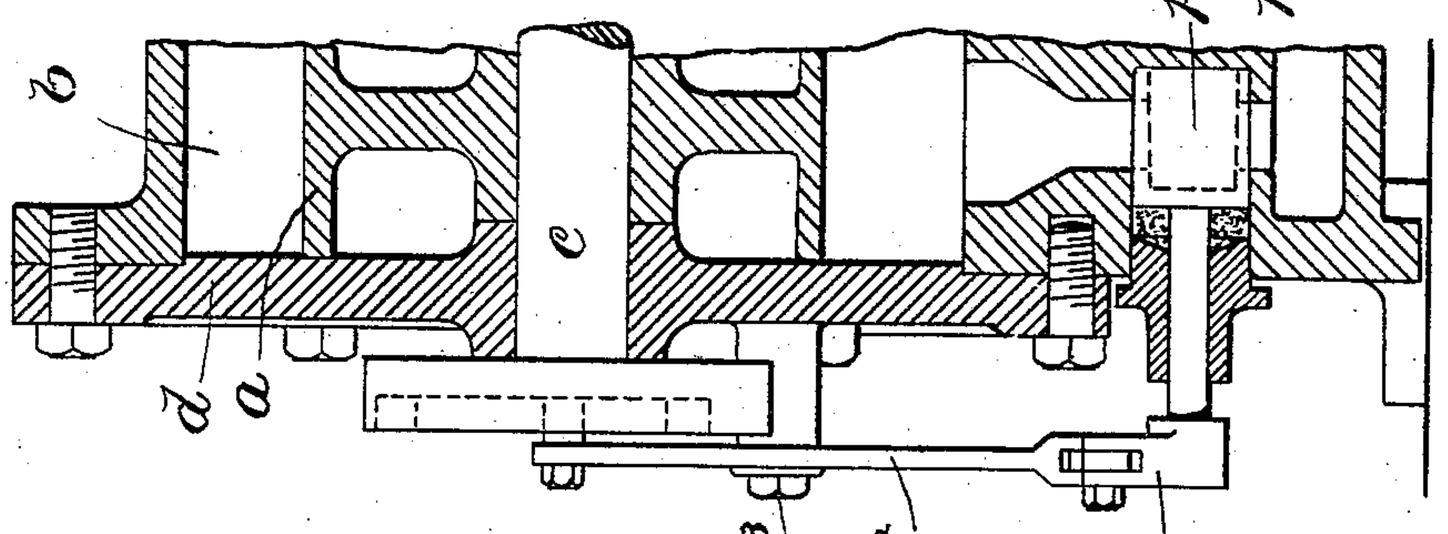
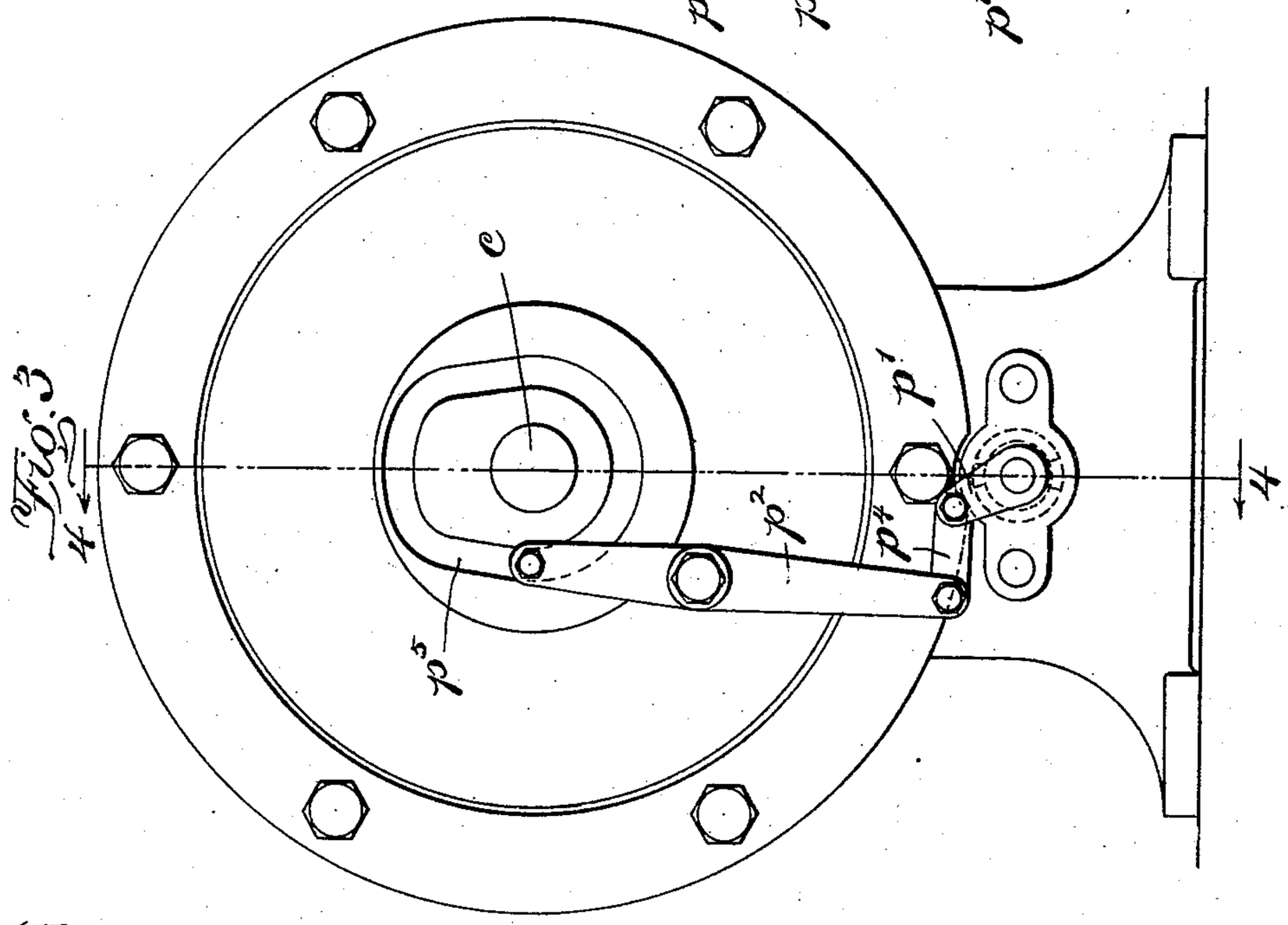


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN EMERY HARRIMAN, JR., OF BROOKLINE, MASSACHUSETTS.

ROTARY ENGINE.

No. 865,967. Specification of Letters Patent. Patented Sept. 10, 1907.

Application filed February 12, 1906. Serial No. 300,552.

To all whom it may concern:

Be it known that I, JOHN EMERY HARRIMAN, JR., of Brookline, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Rotary Engines or Motors, of which the following is a specification.

This invention relates to rotary engines and motors adapted to be driven by steam, compressed air or any other suitable fluid under pressure.

The invention has for its object to provide an engine of this character, combining simplicity of construction and efficiency of operation.

The invention is embodied in a rotary engine or motor, comprising one or a plurality of rotary members forming the inner walls of annular working chambers, a shaft affixed to said members and driven thereby, a fixed inclosing structure, which completes the said annular working chambers, and has suitable inlet and outlet ports therefor, automatic means for opening and closing the said inlet ports to intermittently admit a working agent to the said chambers, and means carried by the rotary members and the inclosing structure to act with the working-agent in imparting movement to the rotary members, the organization being such that the working agent is admitted to the chambers successively, so that one of the rotary members will always be under pressure when the working agent is being exhausted from the chamber of another rotary member to the end that a constant pressure will be exerted on the shaft, which is common to all the rotary members.

Of the accompanying drawings forming a part of this specification,—Figure 1 represents a longitudinal central section of a rotary engine embodying my invention. Fig. 2 represents a section on line 2—2 of Fig. 1. Fig. 3 represents an end elevation showing a different form of inlet port controlling mechanism from that shown in the preceding figures. Fig. 4 represents a section on line 4—4 of Fig. 3, showing a portion of the structure. Fig. 5 represents a view similar to Fig. 4, showing another organization of inlet port controlling mechanism.

The same letters of reference indicate the same parts in all the figures.

In the drawings *a a'* represent two rotary members, which have substantial cylindrical perimeters, forming the inner walls of annular working chambers *b b'*. The rotary members *a a'* are affixed rigidly to a shaft *c* which is driven by said members, the rotary members being connected by the shaft so that they necessarily rotate in unison.

In the embodiment of my invention, here shown, the rotary members *a a'* have the general form of wide rimmed pulleys, the hubs of which are affixed to the shaft *c*. The shaft is journaled in bearings in a fixed inclosing structure, which is of such form as to complete the annular working chambers *b b'*, the said structure comprising end portions *d d*, any intermediate portion *d'* and an annular portion d^2. As before stated, the perimeters of the rotary members *a a'* constitute the inner walls of the working chambers. The end portions *d d* and intermediate portion *d'* constitute the side walls of the chambers, and the outer portion d^2 provides the outer walls of the chambers. The width of the working members *a a'* is such that their edges have a close sliding fit against the end walls of the annular chambers. Each of the rotary members is provided with a piston *e* which projects outwardly from the perimeter across the working chamber, the outer edge of the piston being in sliding contact with the outer annular wall of the working chamber and its ends in sliding contact with the side walls of the chamber, hence the pressure of steam or other working agent applied to one side of the piston will cause the latter to move through the working chamber and thus impart a rotary motion to the rotary member with which the piston is connected. Each working chamber is provided with an inlet port *f* and an outlet port *g*, said ports being relatively near each other and included in a short segment of the annular outer wall of the working chamber, as shown in Fig. 2. Between the ports *f* and *g* is located an abutment *h*, which is engaged with the fixed outer wall of the working chamber and projects across the same into contact with the perimeter of the rotary member therein, the said abutment forming a wall or partition occupying the entire cross section of the working chamber at the point where the abutment is located, so that the working agent admitted through the port *f* tends to open and hold the abutment against the perimeter of the rotary member, and is prevented thereby from passing to the outlet port *g*. The pressure of the working agent is, therefore, exerted wholly upon the piston *e* while the latter is moving in the direction indicated by the arrow in Fig. 2, from the inlet port to the outlet port.

Automatic mechanism is provided for opening and closing the inlet ports *f f* and intermittently admitting the working agent to the annular working chambers. The said mechanism, as illustrated in Fig. 1, includes sliding valves *i i* adapted to close said ports; springs *j j* adapted to normally retract the valves and open the ports; cams *k k* formed on the hub portions of the rotary members *a a'*, and connections between the cams and the valves, comprising levers *l l* and pivoted at *l'* to the supporting frame and engaged at their lower ends with the valves *i* and rods *m m* engaged with the upper ends of the levers *l l* and passing through orifices in the fixed casing, said rods having rolls *n n* at their inner ends adapted to ride on the cams *k k*. The arrangement is such that each cam *k* is caused by the rotation of the rotary member on which it is formed to alternately project and release the accompanying rod

m. The projection of the rod m causes the projection or closing of the valve i connected therewith. When the cam k passes away from the rod m, the spring j acts to retract or open the valve and force the rod m inwardly.

The above described mechanisms are organized so that the inlet ports of the working chambers are opened successively, so that the working agent is admitted to the different chambers at different times in such manner that pressure will be exerted on the piston e of one rotary member, after the piston of the other rotary member has passed the exhaust port, and has been relieved from the pressure of the working agent. This arrangement insures the desired continuity in the application of power and prevents any appreciable loss of power while either piston is passing from the outlet port to the inlet port. The mechanism is so timed that the working agent is admitted to each working chamber just after the piston in that chamber has crossed the inlet port. I prefer to hinge each piston e and abutment h so that these parts are adapted to oscillate in such manner that when the piston is passing the abutment the piston may swing inwardly toward the perimeter of the working member by which it is carried, and the abutment may swing outwardly toward the outer wall of the working chamber in which it is located. I have here shown the piston provided with a circular hub portion e' and the abutment provided with a similar hub portion h', these parts being adapted to rock in sockets formed for their reception. The piston may be normally held in its operative position, shown in Fig. 2, by means of a suitable spring o. If desired, either the piston or the abutment may be rigidly affixed to the part on which it is supported, so that only one of these parts will be capable of swinging or oscillating.

In Figs. 3, 4 and 5 I show certain variations in the construction of the mechanism for controlling the inlet ports. The mechanism shown in Figs. 3 and 4 comprises a rocking valve p in the inlet port, an arm p' affixed to the stem of said valve, a lever p^2 pivoted at p^3 to the fixed casing and connected at one end by a link p^4, with the arm p', its other end having a trundle roll or stud engaging a cam groove p^5 in a disk affixed to the shaft c. The cam groove p^5 oscillates the lever p^2 and the latter through the link p^4 and arm p' oscillates the valve p. The mechanism shown in Fig. 5 includes a sliding valve r normally opened by a spring r', a cam r^2 affixed to the shaft c and a lever r^3 pivoted at r^4 to the fixed casing, one end of the lever being engaged with the valve r and its other end with the cam r^2. It will be understood that in each of the constructions represented in Figs. 3, 4 and 5, the organization is such that the inlet ports of the different working chambers will be opened successively as in the construction first described.

The series of working chambers and rotary members may be duplicated, the arrangement of pistons and abutments of one series of chambers being such that their coöperation with the working agent will rotate the shaft in the opposite direction from that caused by the arrangement in the other set of chambers.

I claim:

1. A rotary engine or motor comprising a rotary member forming the inner walls of a working chamber, a shaft affixed to and driven by said member, a fixed inclosing structure which completes said chamber and has inlet and outlet ports therefor, automatic means for opening and closing the said inlet port to intermittently admit a working agent to the said chamber, and means carried by the rotary member and the inclosing structure, to co-act with the working agent in imparting movement to the rotary member, and controlled by the working agent so as to be put thereby into pressure-resisting relation.

2. A rotary engine or motor comprising a rotary shaft having a rotary member forming the inner walls of an annular working chamber, a shaft affixed to and driven by said member, a fixed inclosing structure which completes said annular chamber and has inlet and outlet ports therefor, a piston carried by the rotary member and extending across said chamber, an abutment engaged with the inclosing structure and located between the inlet and outlet ports and controlled by the inflow of steam, a valve controlling the said inlet ports, and means for automatically operating said valve.

3. A rotary engine or motor comprising a plurality of annular working chambers, each having independent inlet and outlet ports, the inner walls of said chambers being rotary members and connected to rotate in unison, while the other walls are fixed, pistons and abutments engaged respectively with the rotatable and the fixed walls of the chambers and coöperating with a working agent to cause the rotation of the said rotary members, the abutments arranged to clear the path of the pistons by their own weight and to be placed by the steam in pressure-resisting relation, and means operated by the rotation of the rotary members to open and close the inlet ports successively.

4. A rotary engine comprising a plurality of annular working chambers having rotary inner members which are connected to rotate in unison, and fixed outer members which are provided with inlet and outlet ports, pistons and abutments connected respectively with said inner and outer members and coöperating with a working agent to cause the rotation of the inner members, and caused to occupy operative positions by the pressure of the working agent, means operated by the rotation of the rotary members to open and close the inlet ports successively, and a shaft affixed to the rotary members and driven thereby.

5. A rotary engine or motor comprising a plurality of rotary members forming the inner walls of annular working chambers, a shaft affixed to and driven by said members, a fixed casing forming the complemental walls of the said annular chambers and having inlet and outlet ports for said chambers, pistons connected with the rotary members, and abutments connected with the casing, either the pistons or the abutments or both being yieldingly mounted so that the pistons may pass the abutments, and arranged so that the working fluid may make them operative and means operated by the rotation of the rotary members to open and close the inlet ports successively.

6. A rotary engine or motor comprising a plurality of rotary members forming the inner walls of annular working chambers, a shaft affixed to and driven by said members, a fixed casing forming the complemental walls of the said annular chambers and having inlet and outlet ports for said chambers, pistons hinged to the rotary members and yieldingly projected therefrom into the working chambers, abutments hinged to the casing and projecting into the paths of the pistons, arranged to fall away by gravity from such paths, and means operated by the rotation of the rotary members to open and close the inlet port successively.

7. A rotary engine or motor comprising a plurality of annular working chambers, each having independent inlet and outlet ports, the inner walls of said chambers being rotary members and connected to rotate in unison, while the other walls are fixed, pistons and abutments engaged respectively with the rotatable and the fixed walls of the chambers and coöperating with a working agent to cause the rotation of the said rotary members, the inlets arranged so as to project the abutments, valves controlling said inlet ports, cams or their equivalents connected with the rotary members, and connections between said cams and the valves for moving the latter.

8. A rotary engine or motor comprising a plurality of annular working chambers, each having independent inlet

and outlet ports, the inner walls of said chambers being rotary members and connected to rotate in unison, while the other walls are fixed, pistons and abutments engaged respectively with the rotatable and the fixed walls of the chambers and coöperating with a working agent to cause the rotation of the said rotary members and to be held in operative position, valves controlling said inlet ports, means for yieldingly holding the valves in their open position, and means operated by the rotation of the rotary members for intermittently moving the valves to their closed position.

In testimony whereof I have affixed my signature, in presence of two witnesses.

JOHN EMERY HARRIMAN, Jr.

Witnesses:
CHAS. S. HANKS,
H. GORDON JOHNSON.