No. 714,583. Patented Nov. 25, 1902.

# S. J. JOHNSON.

## ROTARY ENGINE.

(Application filed Mar. 28, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

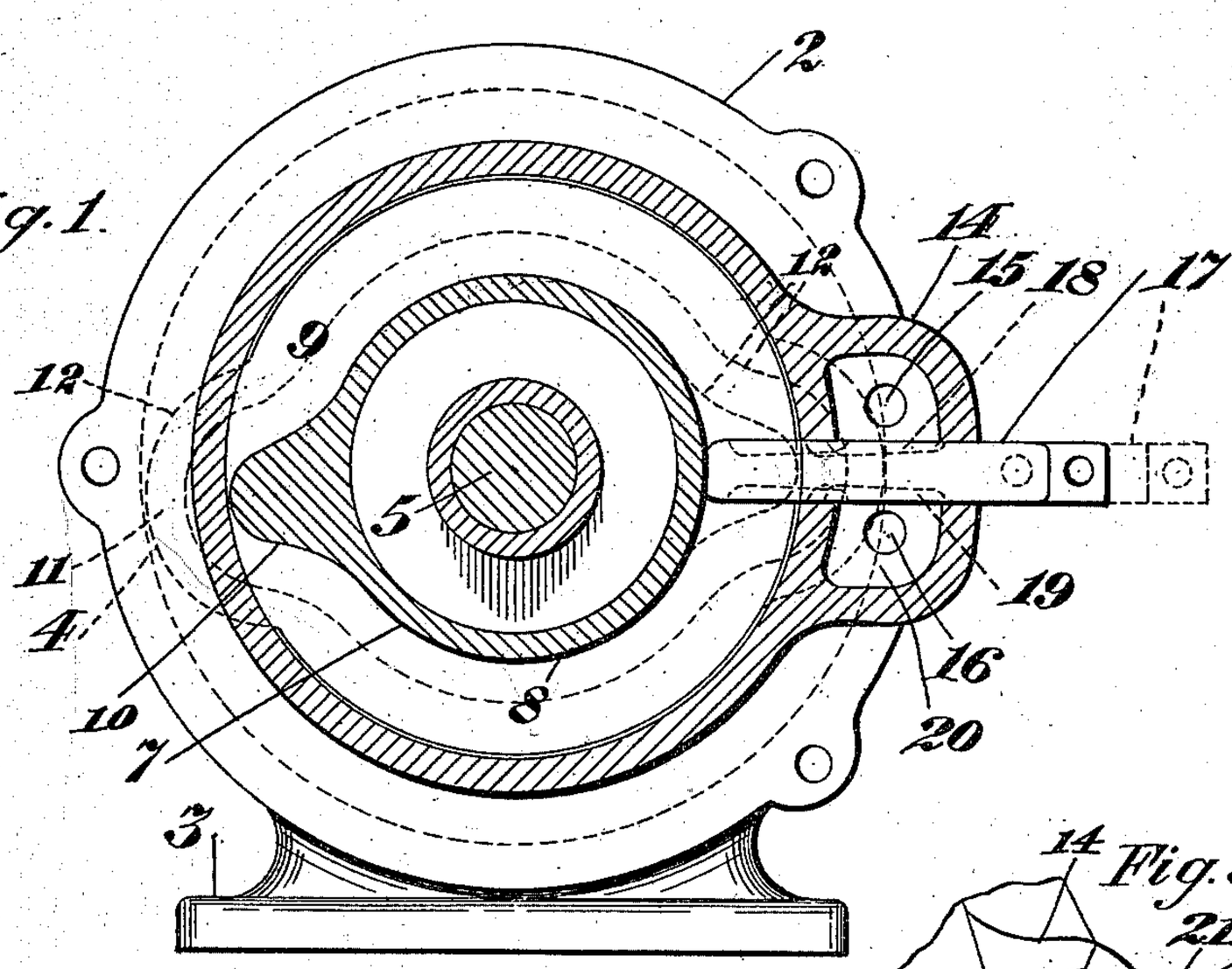



Fig. 3.

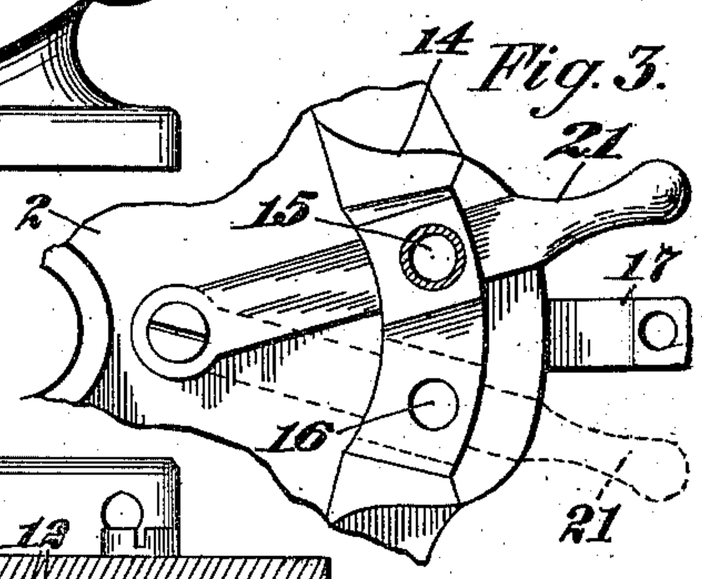



Fig. 2.

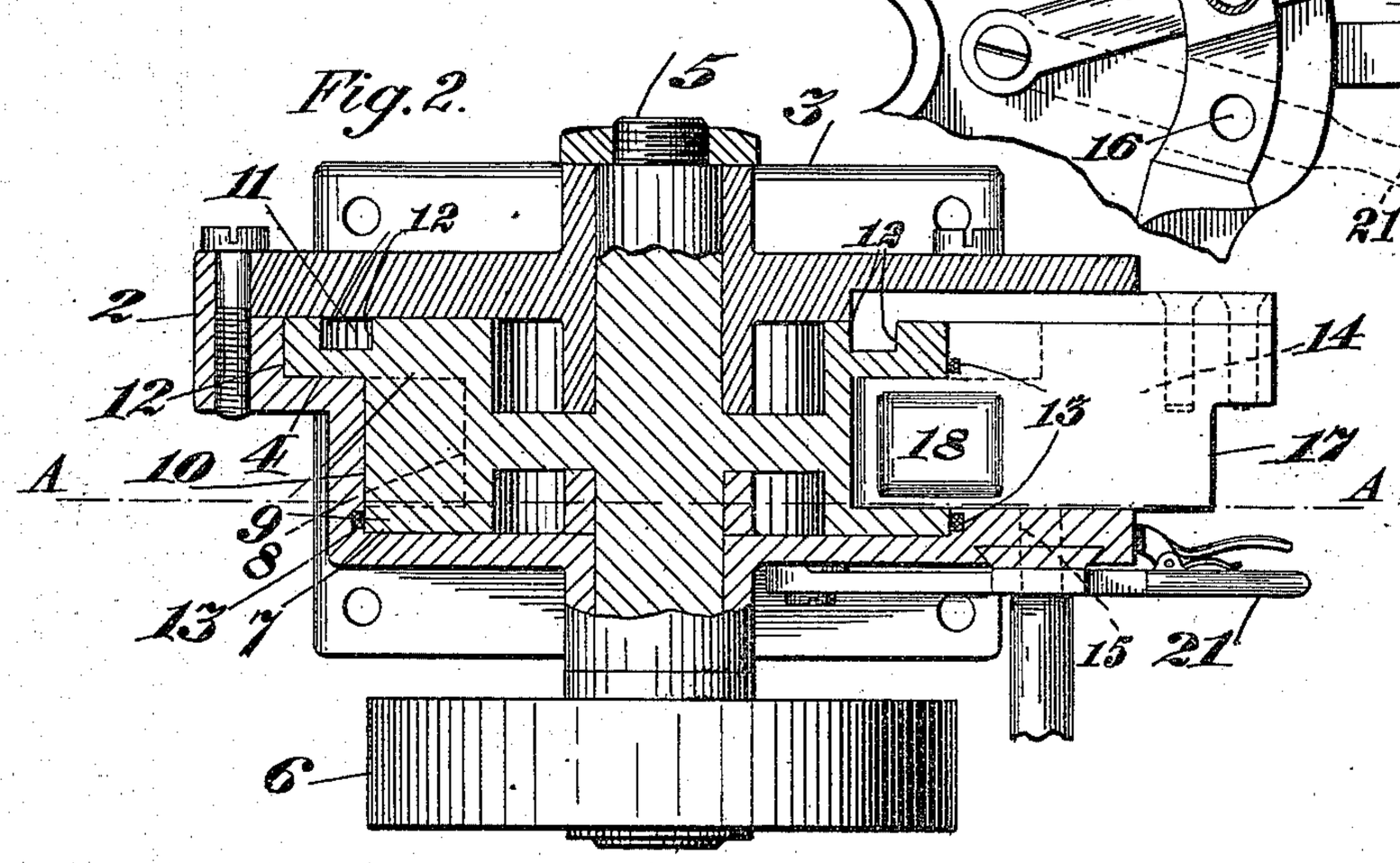
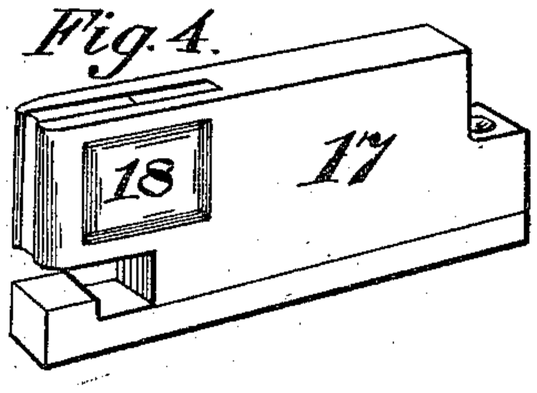



Fig. 4.

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(No Model.) 4 Sheets—Sheet 2.

Fig. 5.

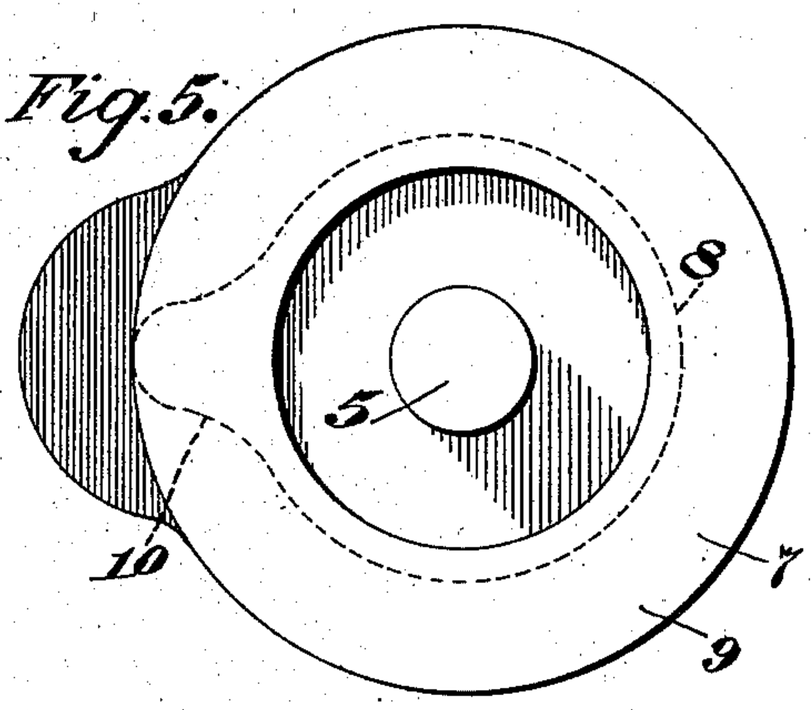
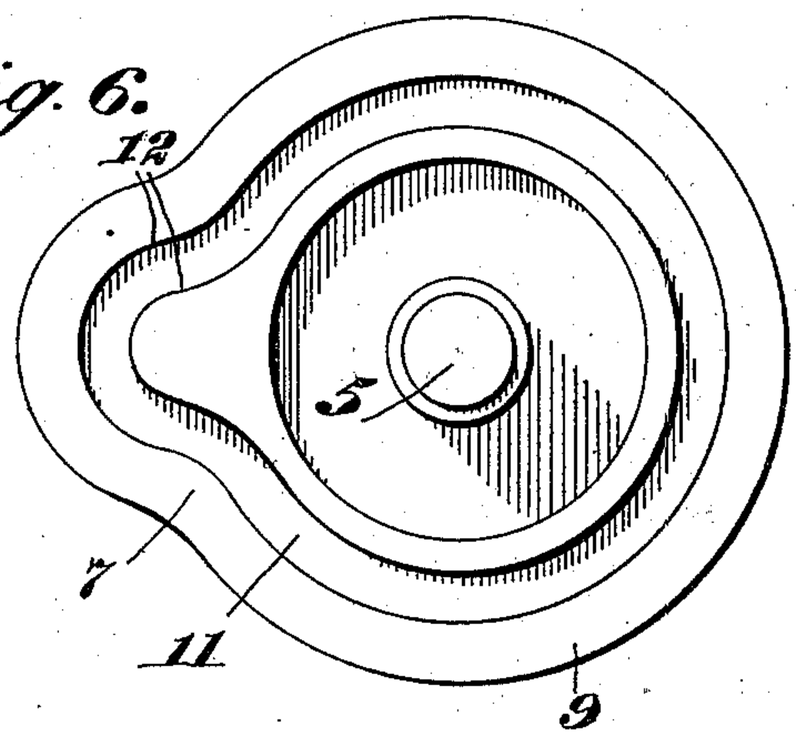



Fig. 6.



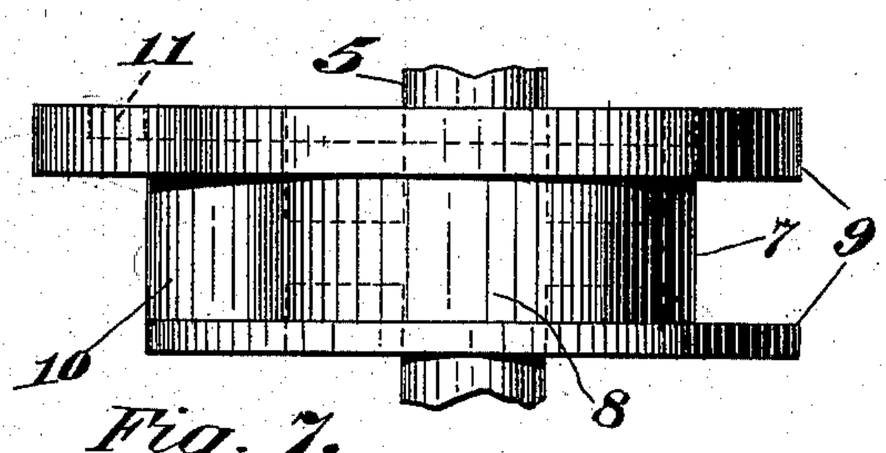
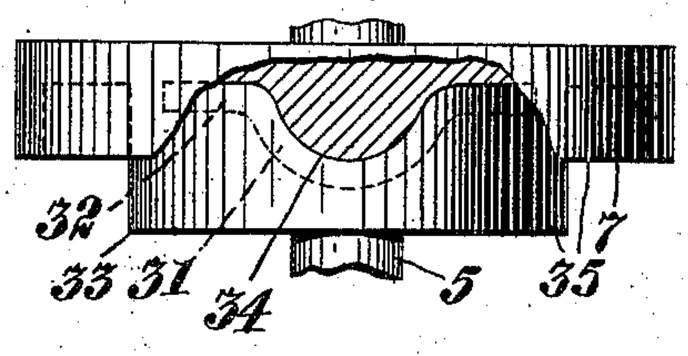




Fig. 7.

Fig. 10.



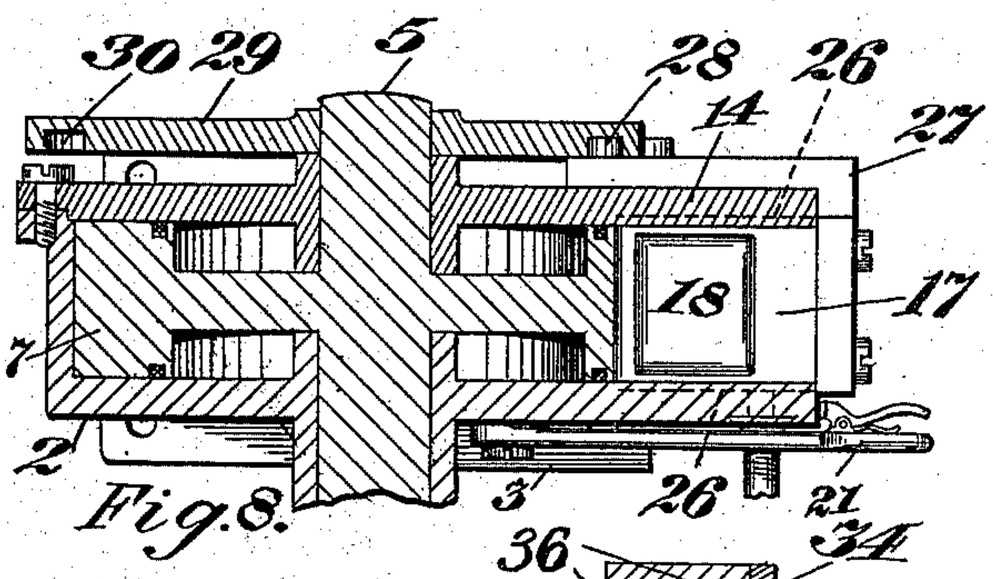




Fig. 8.

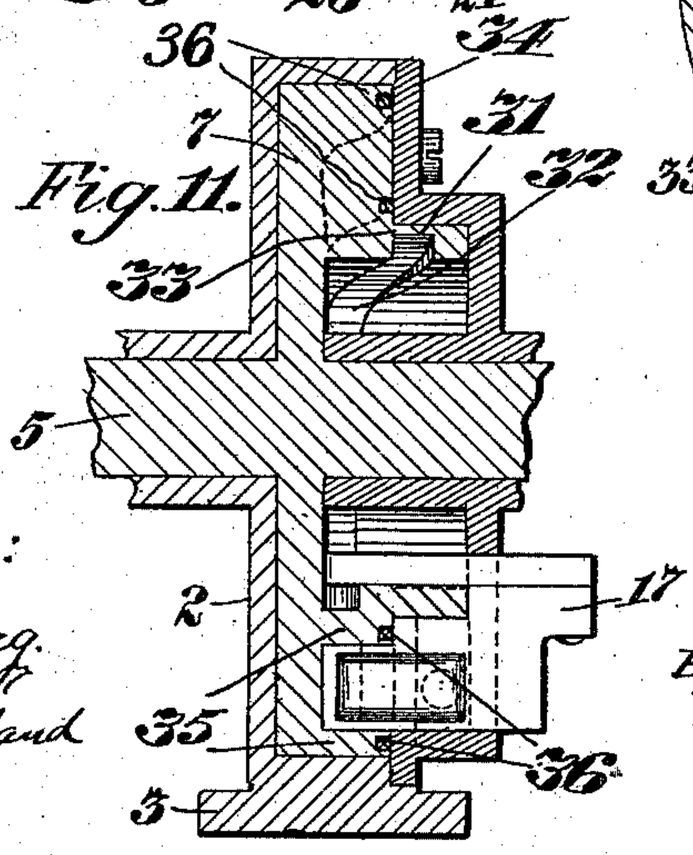



Fig. 11.

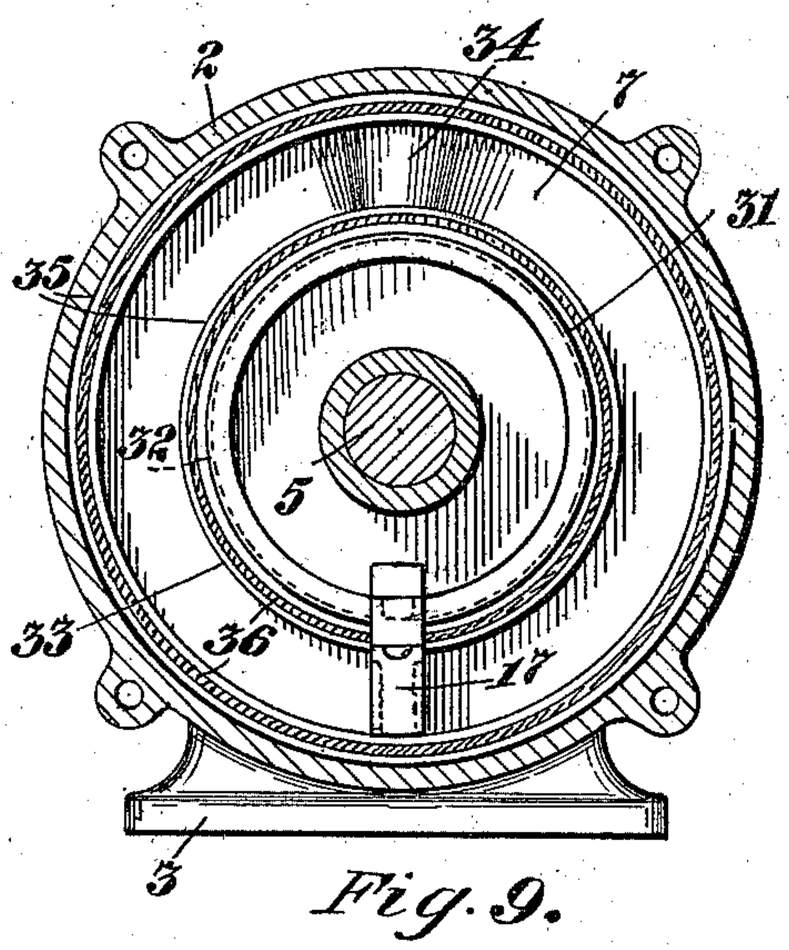



Fig. 9.

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## ROTARY ENGINE.

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Fig. 12.

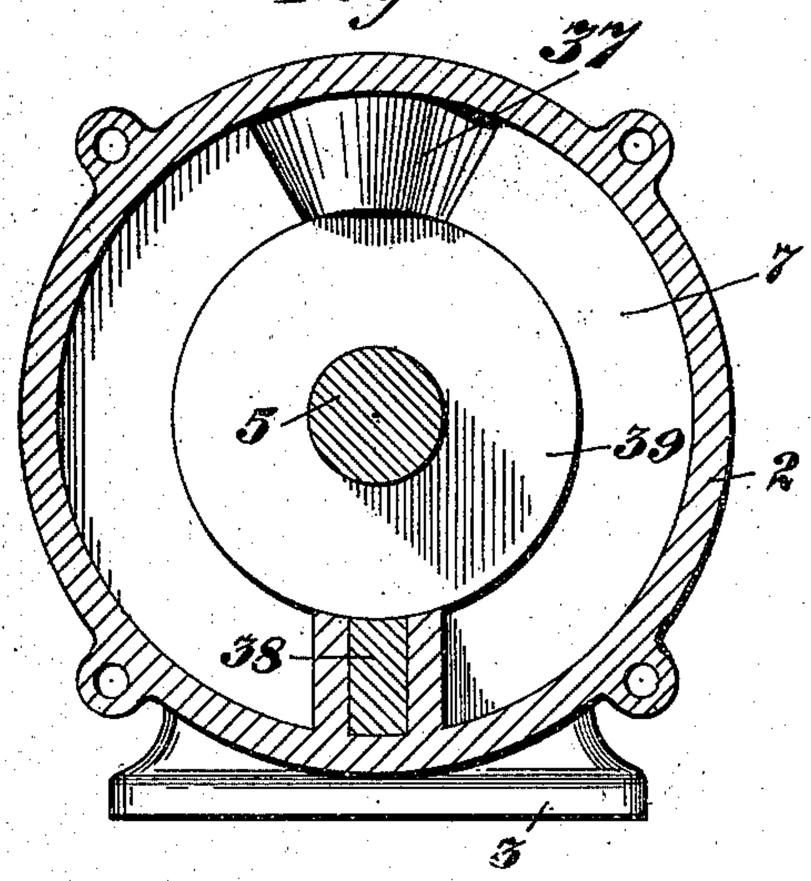



Fig. 13.

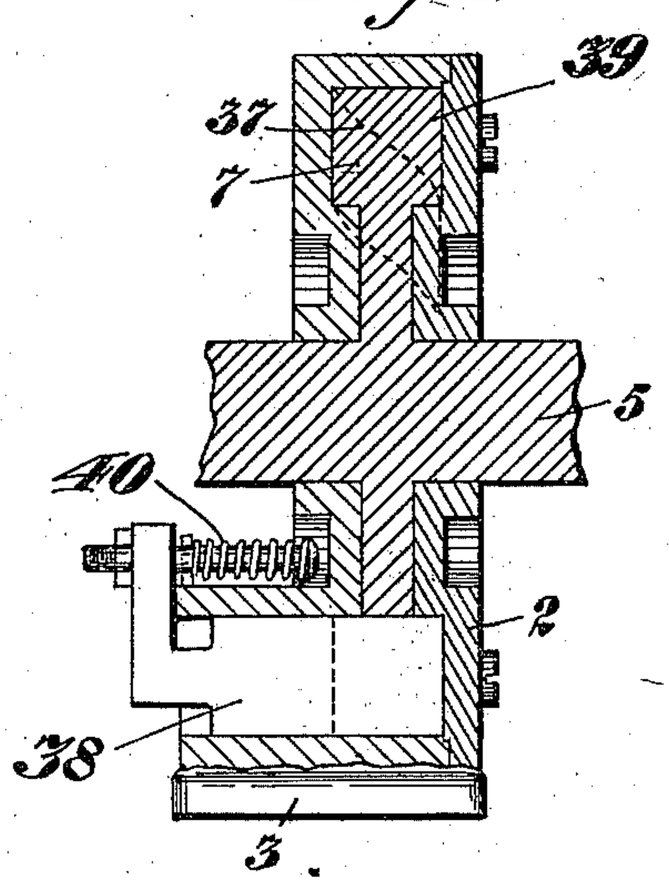



Fig. 14.

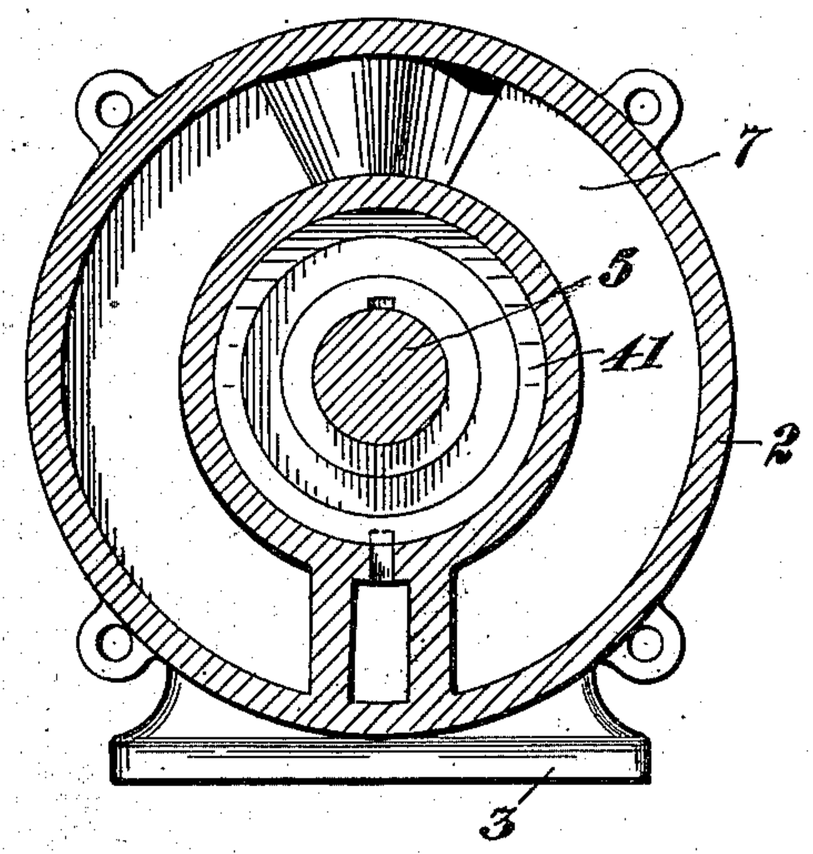
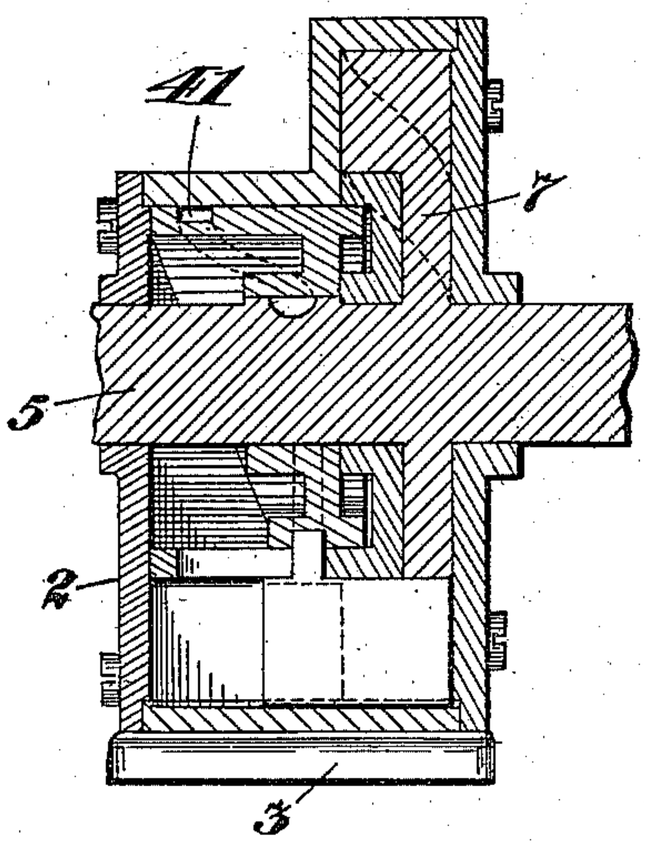



Fig. 15.

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## ROTARY ENGINE.

(Application filed Mar. 28, 1901.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 16.

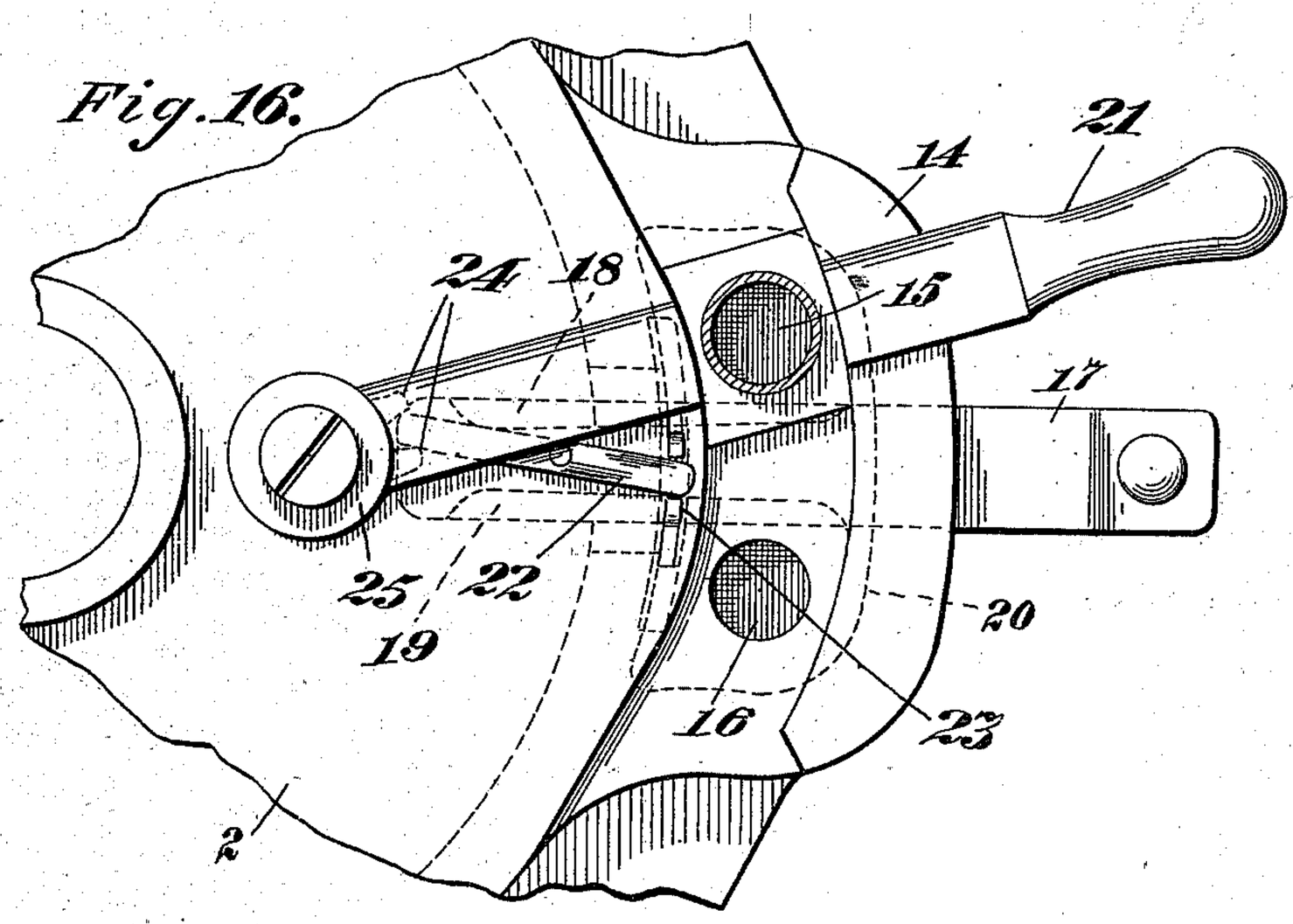



Fig. 17

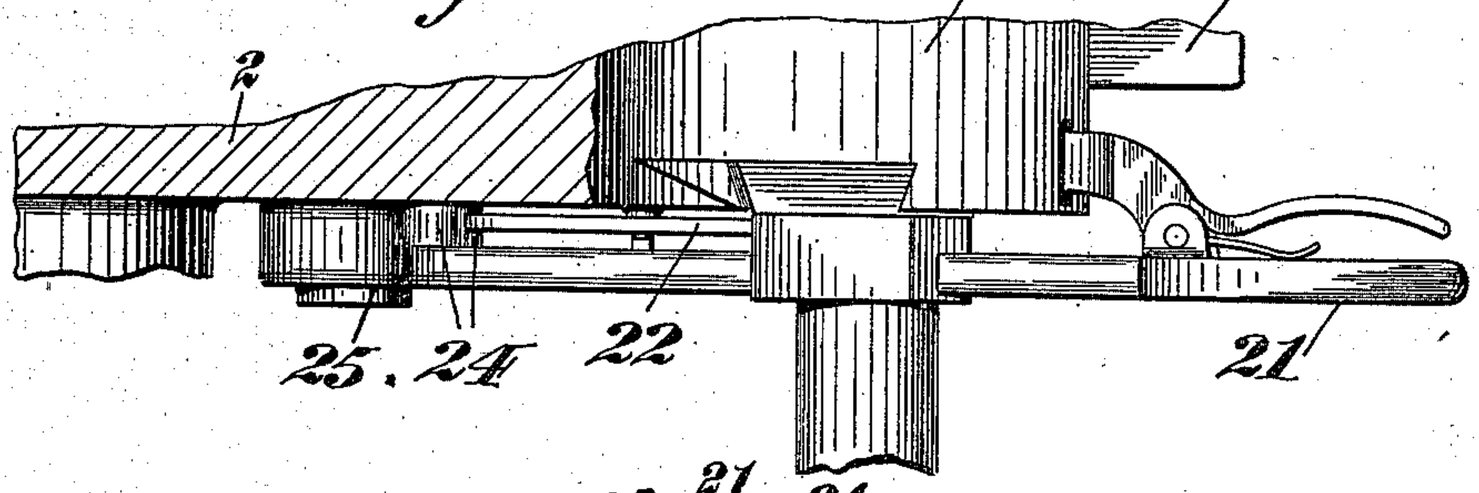
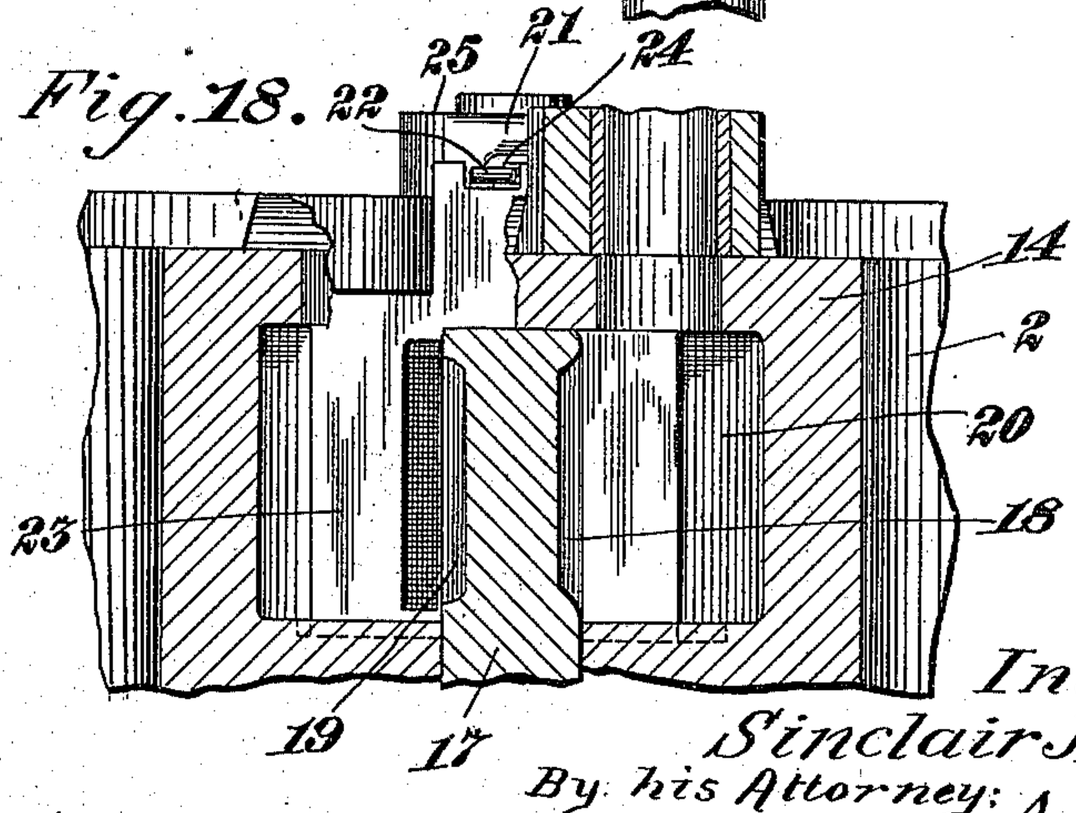



Fig. 18.

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# UNITED STATES PATENT OFFICE.

SINCLAIR J. JOHNSON, OF NUTLEY, NEW JERSEY.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 714,583, dated November 25, 1902.

Application filed March 28, 1901. Serial No. 53,169. (No model.)

*To all whom it may concern:*

Be it known that I, SINCLAIR J. JOHNSON, a citizen of the United States, residing in Nutley, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to improvements in rotary engines operated by fluid under pressure, and particularly those adapted to the use of steam, and has for one of its objects to provide an improved engine of that character simple and durable in construction and economical to manufacture and use, wherein the parts are simple and positively operating to insure steady and uniform action.

Another object is to provide an improved engine of the character aforesaid which will be readily responsive to the actuating medium and convert the maximum amount of such medium into available energy, prevent appreciable loss of power by inertia, and be operated with a minimum number of exhausts per revolution, and be adapted to have the supply of the actuating medium cut off at any stage or relative position of the piston so as to be at all times under control for starting, stopping, reversing, or varying the cut-off, and to otherwise simplify and strengthen the parts of the mechanism to secure compactness of structure and in the arrangement of the parts and to secure the performance of the required work in an effective and satisfactory manner with the minimum resistance and wear in operation.

This improved rotary engine comprises in a general way a rotary piston and a sliding abutment normally pressed against said piston, said abutment being provided at one side with an induction-port communicating with the supply of the actuating medium and on the other side with an eduction-port communicating with an exhaust-chamber and also being adapted to be actuated by a working part, such as a cam on said piston, at each revolution to close both the induction and eduction ports and to reopen such ports after the working face of said piston has passed such abutment.

The improvement comprises a cylinder, a piston rotatably mounted in said cylinder, said piston having a cylindrical portion and terminal heads, one of said terminal heads fitting snugly against the walls of said cylinder, and a wing located between the planes of the terminal heads, one of said terminal heads having a cam-groove in its outer face and complementary opposite cam-surfaces on the periphery of said terminal head and on said wing, a casing located at one side of said cylinder and containing an inlet and an outlet port, an abutment adapted to work on said cam-surfaces and in said cam-groove and projecting into said cylinder through the opening between said cylinder and said casing, said abutment having a port on one side communicating with the inlet-port and a port on the other side communicating with the outlet-port, and said abutment being normally pressed against the cylindrical portion of said cylinder by the cam-groove and pressure of the motive medium on the forward wall of the port serving as the inlet.

This improvement is susceptible to various changes in form, proportion, and details of construction without departing from the principle or sacrificing any of the advantages thereof.

In the drawings accompanying and forming part of this specification, Figure 1 a vertical transverse sectional view taken in line A A, Fig. 2, of the improvement, the piston being shown in two positions, one in dotted lines. Fig. 2 is a plan view of the same, partly in section and with parts broken away. Figs. 3, 4, 5, 6, and 7 are detail views of parts of the improvement. Fig. 8 is a central longitudinal sectional view of one form of the improvement. Fig. 9 is an end elevation, partly in section, of another form of the improvement. Fig. 10 is a detail view, partly broken away and partly in section, of a part of the form shown in Fig. 9. Fig. 11 is a vertical sectional view of a part of the form shown in Fig. 9. Fig. 12 is an end elevation, partly in section, of another form of the improvement. Fig. 13 is a vertical sectional view of part of the form shown in Fig. 12. Fig. 14 is an end view, partly in section, of another form of the improvement. Fig. 15 is a vertical sectional view of part of the form shown in Fig. 14; and Figs. 16, 17, and 18 are enlarged detail views of the operating-lever and connections.

Similar characters of reference designate corresponding parts in the different figures of the drawings.

In the construction shown the improvement comprises a cylinder 2, which may be mounted upon a bed-plate 3, said cylinder having at one end a chamber 4 of greater diameter than the rest of the cylinder 2. A rotary shaft 5 is concentrically mounted in said cylinder 2, and in practice suitable stuffing-boxes (not shown) may be provided between the said shaft 5 and the walls of the openings in the ends of the cylinder through which said shaft 5 passes and suitable bearings. At one end of the shaft 5, if desired, a pulley 6 or other suitable means for the transmission of power may be provided. Secured to the shaft 5 in any suitable way or made integral therewith is a piston 7, having a cylindrical portion 8 and also having terminal heads 9, one of which fits properly against the walls of the cylinder 2 in that portion having a smaller diameter, and a wing 10, located between the planes of the terminal heads 9. The other terminal head 9 rotates in that portion of the cylinder 2 having an enlarged diameter, said latter head 9 having a cam-groove 11 in its outer face and complementary opposite cam-surfaces 12 on its periphery. The wing 10 also has similar complementary opposite cam-surfaces. The heads 9 and wing 10 may be provided with suitable packing, if desired, but in the present instance packing 13 is carried by the casing.

Located at one side of the cylinder is a casing 14, having an inlet-port 15 and an outlet-port 16 of any suitable construction. An abutment 17 has on one side a port 18, communicating with the inlet-port 15, and on the other side a port 19, communicating with the outlet-port 16. The abutment 17 is slidably mounted and projects through the opening 20, between the cylinder 2 and the casing 14 and is normally pressed against the cylindrical portion 8 of the piston 7. The end of the abutment 17 is adapted to ride on the wing 10, and one side of the end of the abutment is cut out complementary to the cam-groove 11 and cam-surfaces 12 of the head 9. The abutment 17 is thus adapted to ride up on the wing 10 as the piston 7 rotates, and when the end of the wing 10 is opposite the opening between the cylinder 2 and the casing 14 the abutment 17 is pressed back, so that the port on each side is closed. As soon as the end of the wing 10 passes this point the abutment 17 is pressed forward by the cam-groove 11 and by the motive medium bearing against the forward wall of the port 18, thereby opening the two ports 18 and 19 and permitting the actuating medium in the cylinder to pass into the exhaust and admitting to the cylinder a new supply of the actuating fluid, which presses against the working face of the wing 10 and causes the piston 7 to further rotate.

The supply of the actuating medium may be controlled by a swinging lever 21, and, if desired, this lever 21 may be spring-controlled, Fig. 17. The amount of the actuating medium admitted to the cylinder is shown regulated by the adjustment of a notched sliding plate 23, adjusted by a bar 22, pivotally mounted on a fixed point, one end of which rests in a notch of said plate 23, while the other end works between lugs 24, projecting from one side of hub 25 of lever 21.

The operation of this invention is as follows: The parts being in the position shown by the full lines in Fig. 1, the lever 21 is moved so as to open the supply-pipe and entering through the inlet-port 15 and the port 18 in the abutment 17 the motive medium presses against the working face of the wing 10 and rotates the piston 7. As the piston 7 rotates the abutment 17 rides up on the cam-surface 12 of the head 9 and on the wing 10, the cam-groove coacting with such cam-surface to steady it until the wing 10 occupies the position shown by the dotted lines in Fig. 1, when both the ports 18 and 19 in the abutment 17 are closed. When the ring 10 passes this point, the abutment 17 is returned to its normal position and the ports 18 and 19 opened, the motive medium remaining in the cylinder 2 escapes by the port 19, and a new supply thereof is admitted through the port 18. This process is repeated as long as there is a supply of the motive medium. To reverse, the lever 21 is moved to the opposite side, which opens communication between the port 16 and the port 19 in the abutment 17 and between the port 15 and the port 18 in said abutment 17, which port 16 will then constitute the inlet-port, while the port 15 will form the outlet-port. When the engine is running under certain conditions and where there is not enough force to carry the piston-wing 10 past the abutment 17, a fly-wheel may be used or two or more such engines properly placed on one shaft.

Various changes may be made in the form and construction of the improvement without departing from the principle or sacrificing the spirit of my invention, and hence I would have it understood that I do not limit myself to the form described, but consider myself at liberty to make such changes and alterations as fall within the spirit and scope of my invention.

In Figs. 8, 9, 10, 11, 12, 13, 14, and 15 are shown some of the possible modifications of the improvement. In that shown in Fig. 8 the abutment 17 slides in grooves 26 and is provided with an arm 27, extending inside the casing 14, said arm 27 provided with a stud 28, and there is a disk 29 mounted on the shaft 5 outside the cylinder 2, said disk having a cam-groove 30, in which the stud 28 moves. In that shown in Figs. 9, 10, and 11 the cam 31, formed by the cam-groove 32, is placed on a reduced portion of the piston 33, and the wing 34 and piston-heads 35 are placed axially to the piston 33 and have packing 36 suitably disposed. In this organization the

abutment 17 is shifted in a direction transverse to the direction of rotation of the piston. In Figs. 12 and 13 the piston is shown with simply a cam-surface 37, and the abutment 38 is returned and normally held against the piston 39 by a spring 40. In Figs. 14 and 15 the piston is similar to that shown in Figs. 12 and 13, except that a cam-groove 41 is used in place of the spring 40 to actuate the abutment.

Having fully described my invention, I claim—

1. In a rotary engine, the combination with a cylinder, of a rotary piston therein; and a sliding abutment controlling inlet and outlet ports and interlocked with said piston, whereby it is moved directly in and out by the piston.

2. In a rotary engine, the combination with a cylinder of a rotary piston therein; a sliding abutment having a port on each side, one communicating with the inlet-port and the other with the outlet-port said piston interlocked with the abutment whereby the abutment is moved in and out directly by the piston.

3. In a rotary engine, the combination with a cylinder, of a rotary piston therein, a sliding abutment having a port on each side, each of said ports being adapted to be connected with either the source of supply of the motive medium or an exhaust-chamber, said abutment and piston having coöperating interlocking cam-faces, whereby the abutment is moved in and out directly by the piston.

4. In a rotary engine, the combination with a cylinder, of a rotary piston therein having a terminal head and a wing; and a sliding abutment having inlet and outlet ports, said piston having cam-surfaces interlocked with said abutment whereby said abutment is moved in and out directly by the piston.

5. In a rotary engine, the combination with a cylinder of a rotary piston therein and a sliding abutment controlling inlet and outlet ports and interlocked with said piston and moved in and out directly by said piston in a direction transverse to the direction of rotation of the piston.

6. In a rotary engine, the combination, with a cylinder and a rotary piston therein, provided with terminal heads and a wing extending between said heads, one of said heads having a cam-surface, of a sliding abutment adapted to be operated directly by said cam-surface and having a port on each side, each of said ports adapted to be connected with either the source of supply of the motive medium or the exhaust.

7. In a rotary engine, the combination, with a cylinder and a rotary piston therein, provided with terminal heads and a wing extending between said heads, the periphery of one of said heads having similar, opposite cam-surfaces, a sliding abutment adapted to be operated directly by said cam-surfaces, and having a port on each side, each of such ports adapted to be connected with either the source of supply of the motive medium or the exhaust.

8. In a rotary engine, the combination, with a cylinder and a rotary piston therein, provided with terminal heads and a wing extending between said heads, the periphery of one of said heads having a cam-surface, of a sliding abutment adapted to be operated directly by said cam-surface and having a port on each side, each of such ports, adapted to be connected with either the source of supply of the motive medium or the exhaust; and means for reversing the piston.

9. In a rotary engine, the combination with a cylinder and a rotary piston therein, said piston having a cam-groove in the outer face of one head thereof and complementary opposite cam-surfaces, of a casing having an opening into said cylinder; an abutment sliding in said opening, said abutment having its end complementary to such cam-surfaces and said cam-groove and having an inlet-port on one side and an outlet-port on the other side.

10. In a rotary engine, a cylinder; a rotary piston therein provided with heads and a wing between such heads, one of said heads having a cam-groove in its outer face, its periphery and said wing forming complementary opposite cam-surfaces; a chamber opening into said cylinder; an abutment sliding in said opening and having a port on each side, one normally communicating with the supply and the other with the exhaust, said abutment adapted to ride on such cam-surfaces and having its end cut out to receive said cam-shaped periphery and to permit one part of such abutment to move in said cam-groove.

11. In a rotary engine, a cylinder; a rotary piston therein provided with heads and a wing between such heads, one of said heads having a cam-groove in its outer face, its periphery and said wing forming complementary opposite cam-surfaces; a chamber opening into said cylinder; an abutment sliding in said opening and having a port on each side, one normally communicating with the supply and the other with the exhaust, said abutment having its end complementary to such cam-surfaces and cam-groove; and a swinging lever controlling the inlet and outlet ports.

12. In a rotary engine, a cylinder; a rotary piston therein; a chamber opening into said cylinder; an abutment sliding in said opening, and adapted to disappear and reappear and having a port on each side, one communicating with the supply, and the other with the exhaust; a sliding plate controlling the inlet and outlet ports; a swinging lever; and means connecting said plate and lever for limiting the movement of said plate.

13. In a rotary engine, a cylinder; a rotary piston therein provided with heads and a wing between such heads, one of said heads having a cam-groove in its outer face, its pe-

riphery and said wing forming complementary opposite cam-surfaces; a chamber opening into said cylinder; an abutment sliding in said opening and having a port on each side, one normally communicating with the supply and the other with the exhaust, said abutment adapted to ride on such cam-surfaces and having its end cut out to receive said cam-shaped periphery and to permit one part of such abutment to move in said cam-groove; and a swinging spring-controlled lever controlling the inlet and outlet ports.

14. In a rotary engine, a cylinder, a rotary piston therein provided with heads and a wing between such heads, one of said heads having a cam-groove in its outer face, its periphery and said wing forming complementary opposite cam-surfaces; a chamber opening into said cylinder; an abutment sliding in said opening and having a port on each side, one normally communicating with the supply and the other with the exhaust, said abutment adapted to ride on such cam-surfaces and having its end cut out to receive said cam-shaped periphery and to permit one part of such abutment to move in said cam-groove; a swinging lever controlling the inlet and outlet ports; and a sliding plate adapted to be operated by said lever to regulate the opening of said inlet-port.

15. In a rotary engine having inlet and outlet ports, a sliding plate controlling said ports, a swinging lever for moving said sliding plate predetermined distances, and a pivoted member connecting said plate and lever.

16. In a rotary engine having inlet and outlet ports, a sliding plate controlling said ports; a swinging lever; and a shiftable connection between said plate and lever for limiting the movement of said plate.

17. In a rotary engine having inlet and outlet ports, a sliding plate controlling said ports and provided with a notch; a swinging lever having a hub provided with a pair of lugs; and a pivoted lever having one end in said notch and the other end between said lugs for limiting the movement of said plate.

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