No. 837,843. PATENTED DEC. 4, 1906.

C. A. KAISER.

ROTARY ENGINE.

APPLICATION FILED APR. 15, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

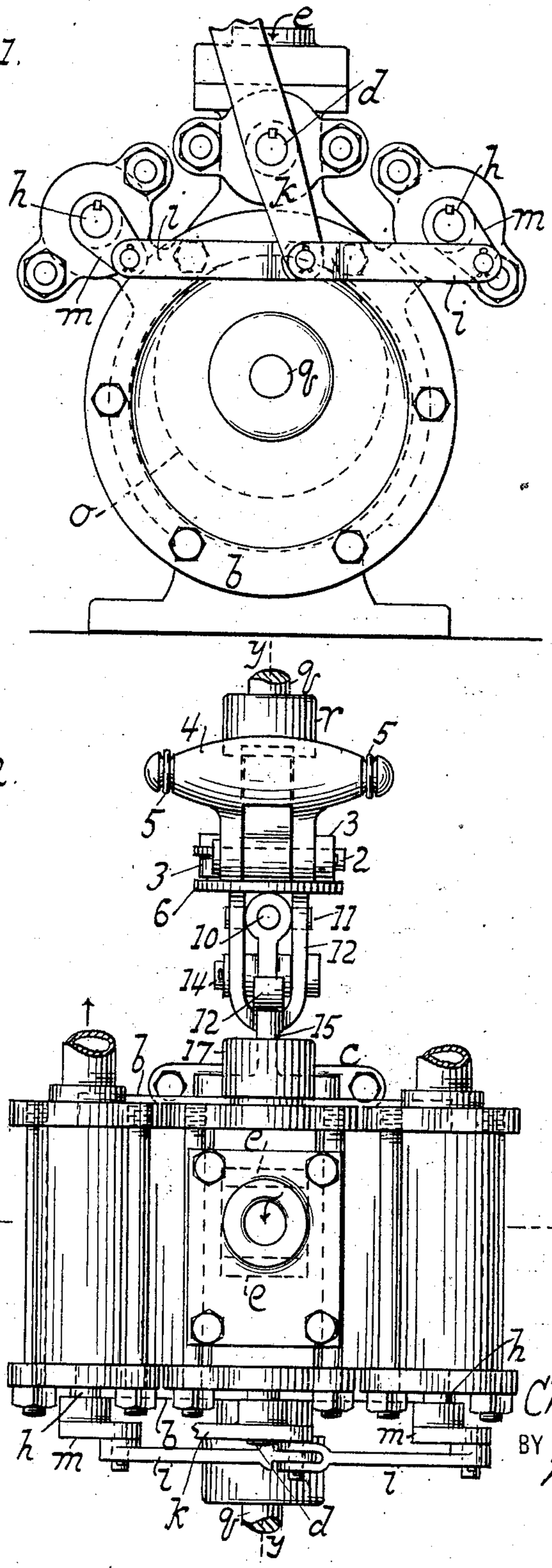

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

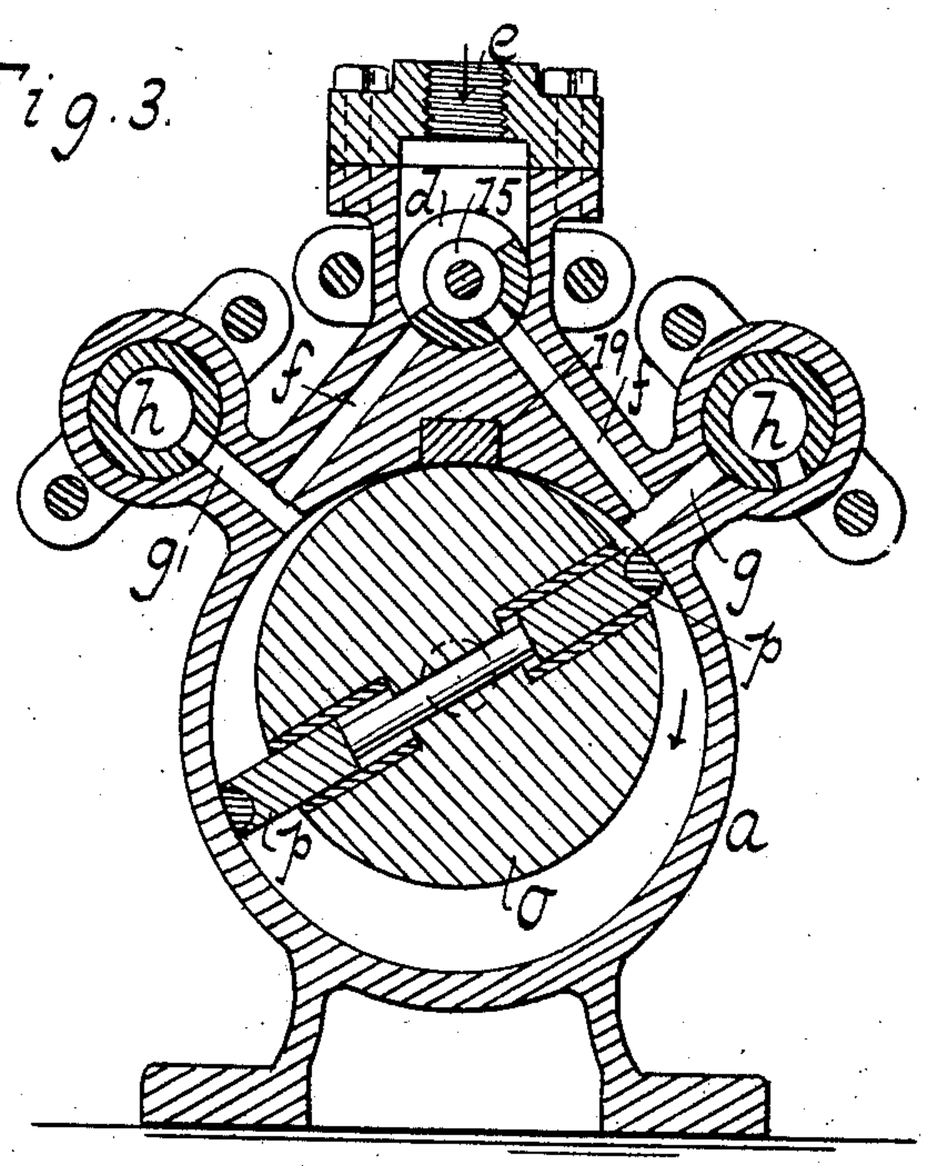


Fig. 4.

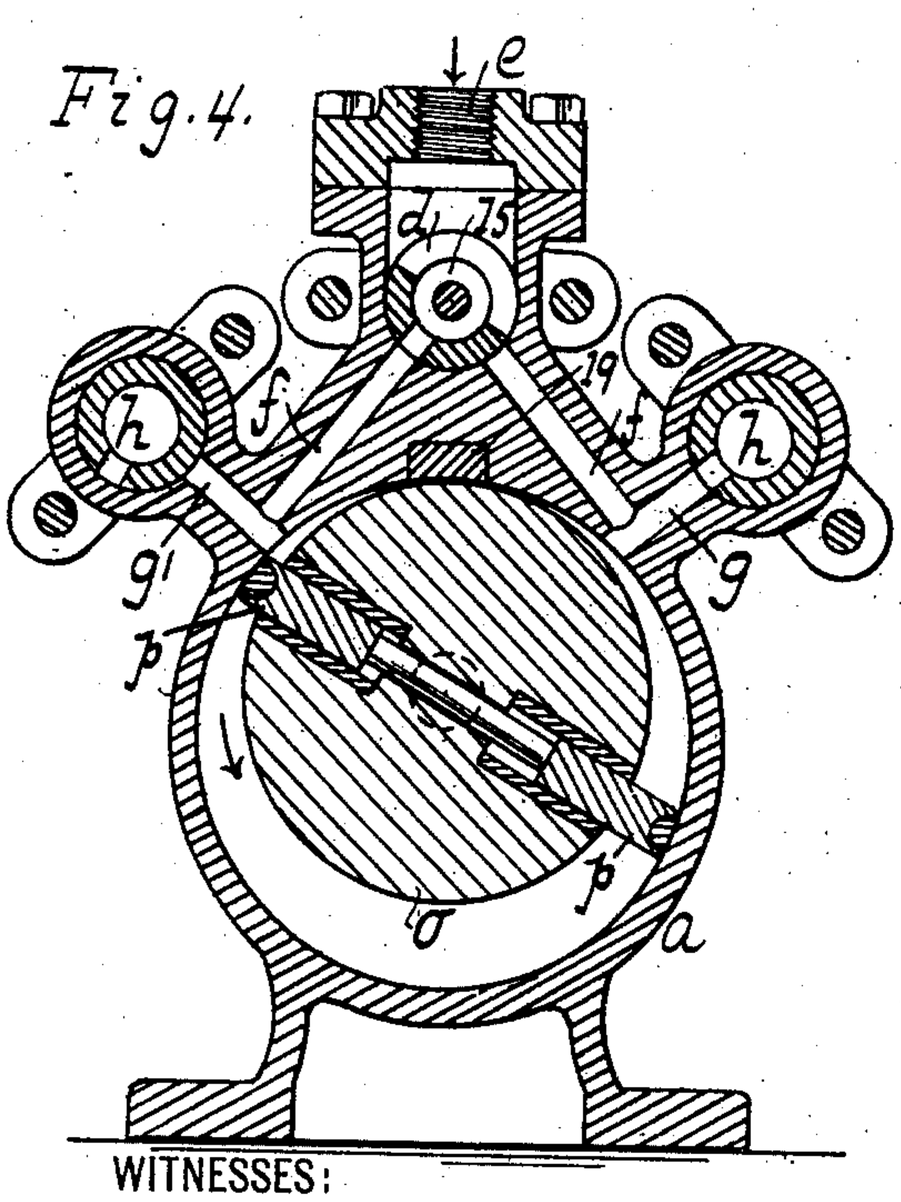
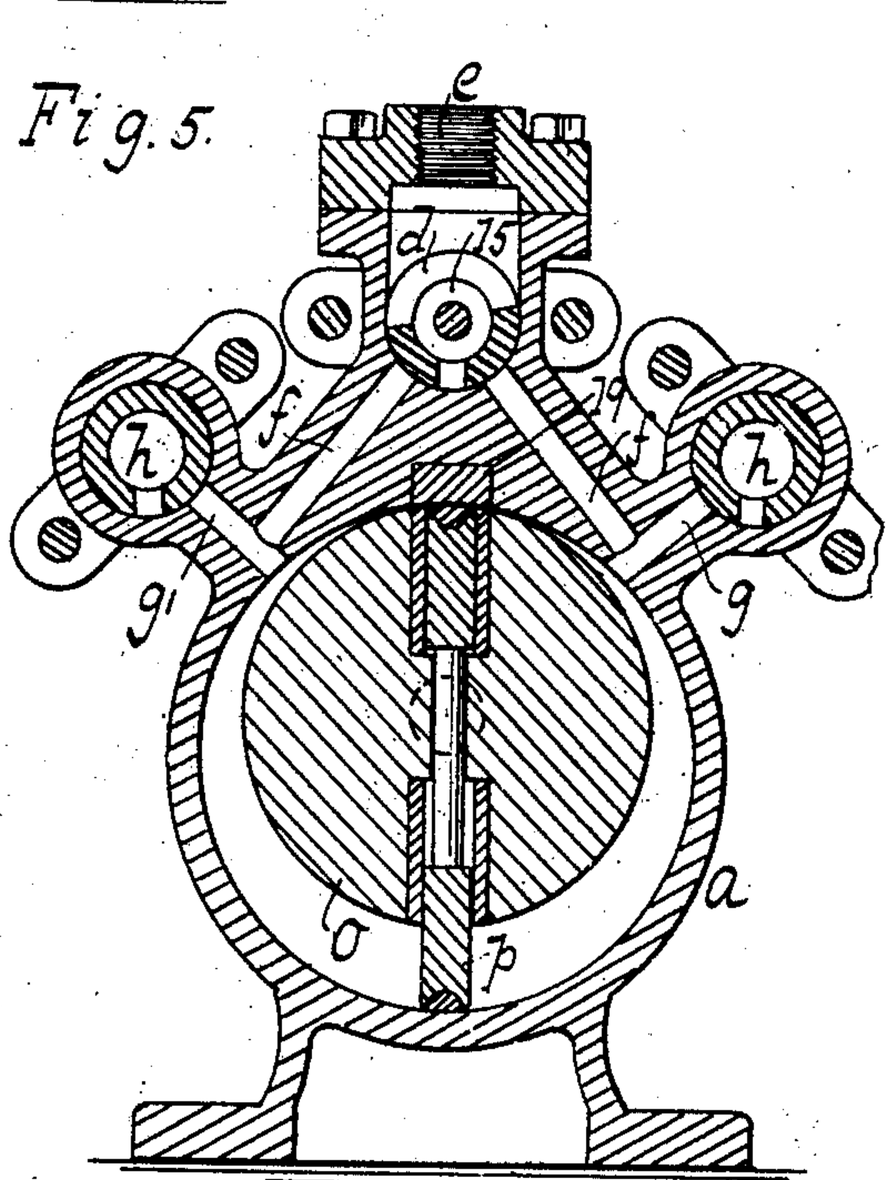


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

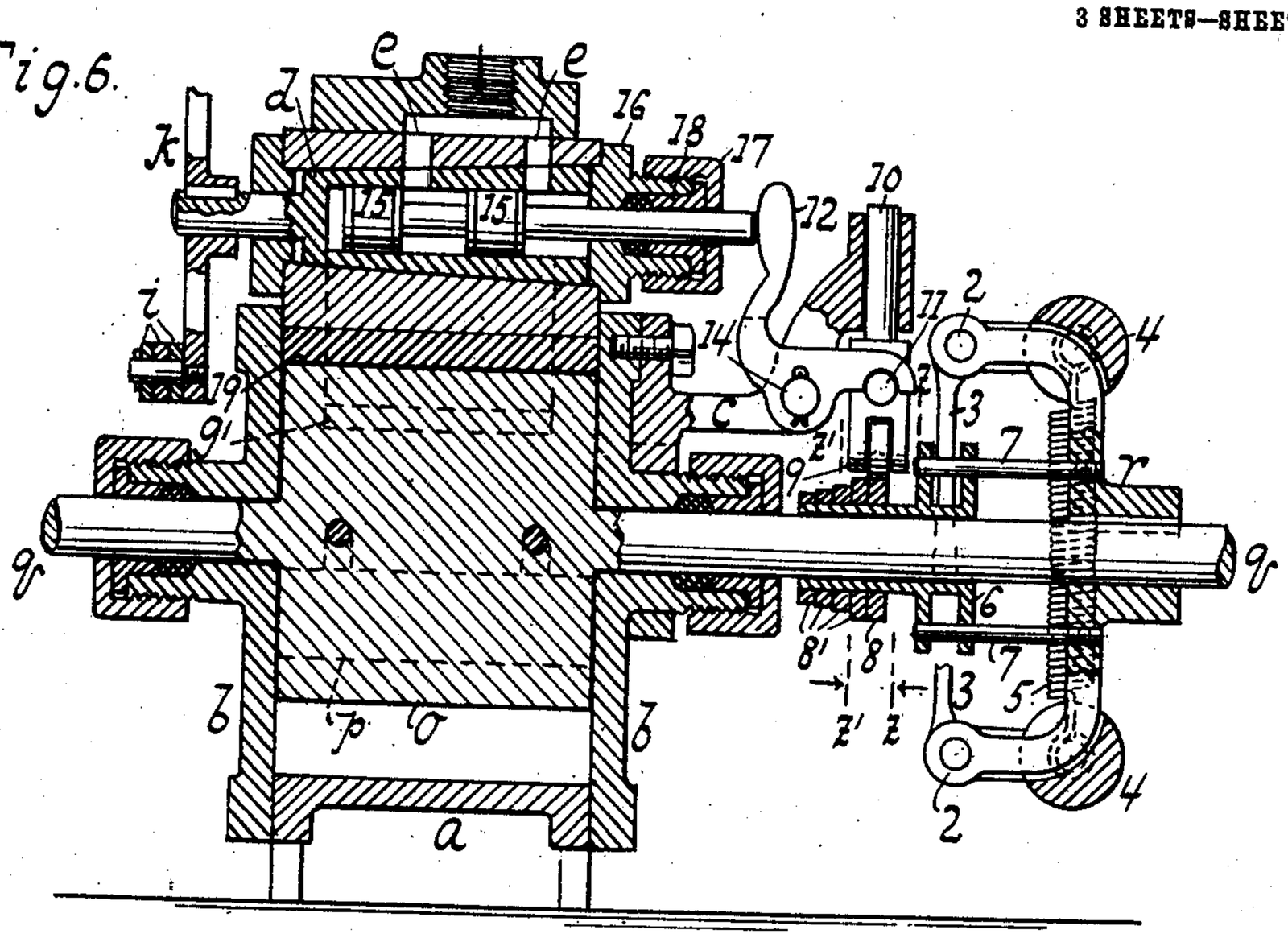


Fig. 7.

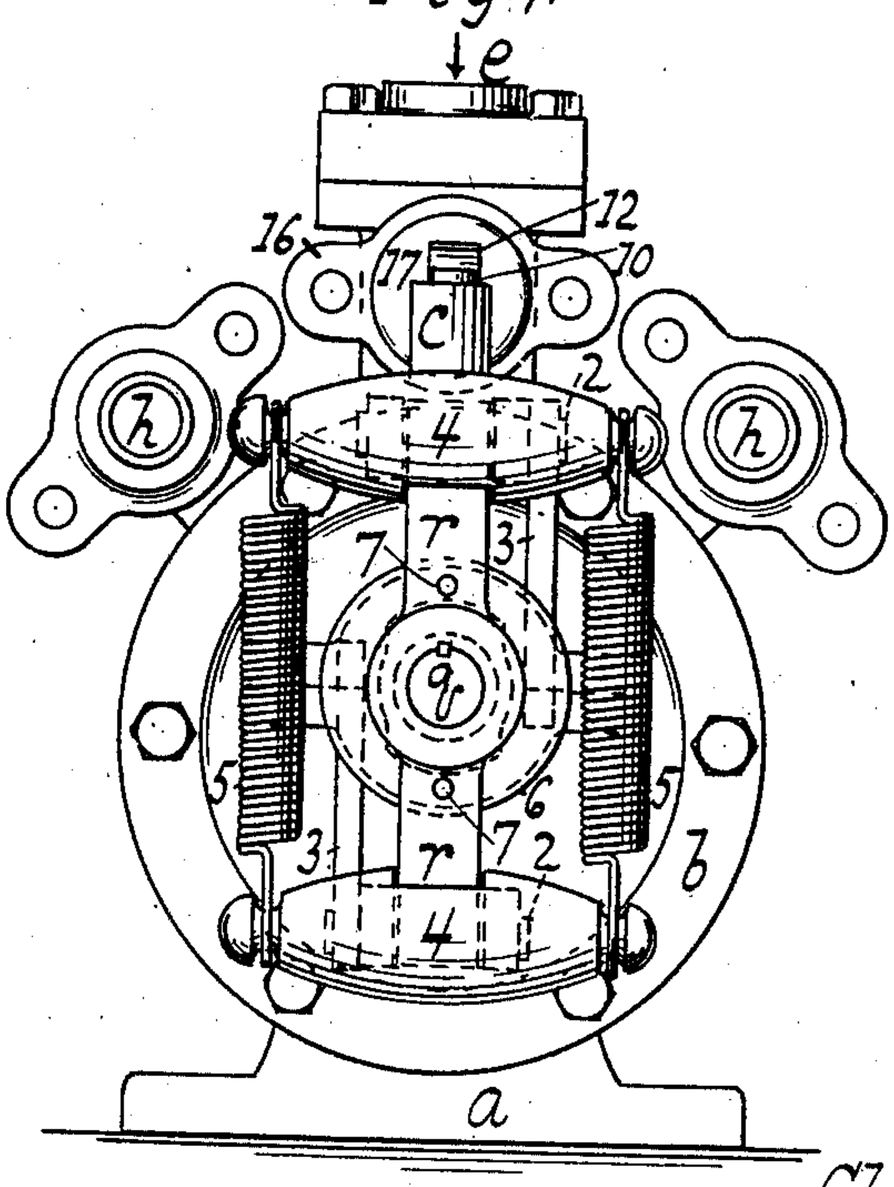


Fig. 8.

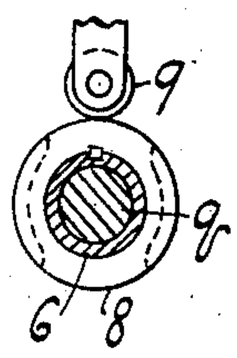
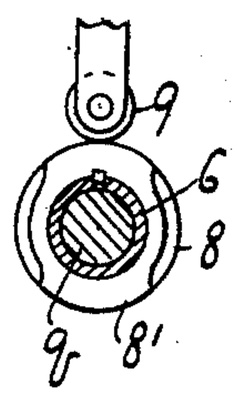


Fig. 9.



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

No. 837,843. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed April 15, 1905. Serial No. 255,768.

To all whom it may concern:

Be it known that I, CHARLES A. KAISER, a citizen of the United States, residing at Astoria, Long Island, in the county of Queens and State of New York, have invented new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to engines of the class usually known as "rotary" engines and which can be driven by steam, air, or other pressure.

This invention resides in certain features of construction set forth in the following specification and claims and illustrated in the annexed drawings, in which—

Figure 1 is an end elevation of an engine embodying this invention. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a section along the line *x x*, Fig. 2. Figs. 4 and 5 are views like Fig. 3, but with parts in different positions. Fig. 6 is a section along line *y y*, Fig. 2. Fig. 7 shows the end opposite to that one exposed in Fig. 1. Fig. 8 shows the disk for holding the slide-valve open. Fig. 9 shows an eccentric for actuating the slide-valve.

In the drawings is shown a cylinder *a*, with heads *b*, to one of which is secured a bracket *c* for a purpose presently explained. A rotary hollow valve is shown at *d*, into the interior or chamber of which steam or pressure medium enters from the inlet or slits *e*. Passing out from said valve *d* the pressure passes along one or two ports *f*, according as the inlet-valve *d* is turned or set to discharge into or communicate with one port or another. These ports *f* lead into branches *g* and *g'*. Each such branch port at one end leads into the interior of cylinder *a*. The other or outer end of each branch leads to a valve *h*. These valves might be called "exhaust-valves."

When the valves are set, as seen in Fig. 3, so that the outer or exhaust end of branch *g* is closed, while branch *g'* can exhaust or discharge into its valve *h* and the pressure from the inlet-valve *d* enters branch *g*, the machine rotates in one direction. If the outer end or exhaust through branch *g'* is closed and branch *g* can exhaust and the pressure from the inlet is led into *g'*, the machine reverses or moves in the other direction, as seen in Fig. 4.

The inlet and exhaust valves are connected by suitable connections or links *i*, pivoted to a handle or reversing-lever *k* on valve *d* and to arms *m* on valves *h*. As the valve *d* is turned to communicate or discharge into branch *g* the valves *h* are at the same time turned to close the outer or exhaust end of branch *g*, but to allow branch *g'* to discharge into or communicate with the interior of its exhaust-valve. On shifting the handle *k*, with valve *d*, to the reverse position the valves *h* are also shifted, so that the outer end of branch *g'* is closed; but branch *g* can exhaust into its valve *h*.

In the cylinder is a rotary drum *o*, whose plungers or pistons *p* can slide back and forth to always sit or close against the interior of cylinder *a* as the drum rotates.

When the pressure enters at port *g*, it acts successively on one of the faces of each plunger *p* and the drum is rotated one way. If port *g* exhausts and the pressure enters at *g'*, the drum rotates the other way.

It may also be noted from Fig. 5 that the valve may be set to closing position—that is, so that valve *d* is in intermediate position to communicate with neither of branches *g* nor *g'*, while valves *h* close the exhaust ends of both said branches. The machine will then stop.

The drum *o* is mounted eccentrically in the cylinder *a*, and the interior of the latter is not bored quite cylindrical, but so that the plunger *p* will keep in tight or closing contact about the inner wall of the cylinder, but without binding.

The shaft *q* of the drum extends out through stuffing-boxes, as usual, and carries a hub or arms *r*, fixed thereto. On these arms at 2 are fulcrumed arms or bell-crank levers 3, having governors or weights 4. These weights are drawn toward one another by springs 5, as known in the construction of governors. The arms 3 engage a slide or sleeve 6, which is caused to rotate with the shaft by the engagement of the studs 7, extended from hub *r*, but which can slide or feather toward and from the hub or along the shaft. As the centrifugal force of the rotating shaft causes the governor-weights to assume a more or less eccentric position the arms 3 move the sleeve one way or another on the shaft. The sleeve is formed with or has secured thereto a disk 8 and a set of eccentrics or cams 8' of varying sizes. Each eccentric has two high and two low parts, and as an eccentric rotates and acts

against the foot or friction-roller 9 of a stem 10 the latter is vibrated or caused to move back and forth in a seat or tubular guide formed as part of the bracket *c*. Said oscillator-stem 10 by a pin 11 engages an arm of lever 12, whose fulcrum 14 is also carried by said bracket *c*. This lever 12 is conveniently formed as a bell-crank lever, and one of its arms engages or presses on the outer end of a slide-valve or cut-off 15. The inner end of this valve is acted on by the pressure or steam in the chamber in valve *d*, so that the said valve 15 has a tendency to move out or press against the lever 12. As the lever 12 oscillates the valve 15 is moved back and forth or in and out to open and close the inlet or entry of pressure from opening *e*. This valve 15 can extend out through a stuffing-box or packing formed by box 16, Fig. 6, with follower 18 and screw-cap 17, or any suitable known way.

When the machine is at rest, the stem 10 is held up by disk 8 and the valve 15 is permanently open, so that as soon as pressure enters at the inlet *e* said pressure can immediately act on the pistons *p* and start the engine in any desired direction as lever *k* and the valves may be set. When the engine has started to a certain speed, the governor actuates the slide-sleeve 6 to bring one or another of the cams 8′ into action, according to the action of the governor. As the speed varies or increases the governor brings one or another of the cams 8′ into action, a lower or smaller one of the cams allowing valve 15 to only partly open the inlet, and thus reduce excessive speed or compel the engine to work under greater expansion.

A packing 19, Fig. 3, can also be placed in the cylinder in form of a block, which can be adjusted or set to close or contact with the drum and pistons, and which packing is located between the ports *g* and *g′*.

The piston or slide valve 15 being placed in the rotary inlet-valve *d*, as seen, a compact structure is obtained. The inlet and exhaust valves, as stated, are so linked or connected that all three can be closed at once, but only two of said valves can be open at the same time, and as one exhaust or the other is open the engine rotates forward or reverses, each exhaust-valve channel or branch *g* or *g′* acting as an inlet when its respective exhaust-valve is closed.

The automatic slide or cut-off valve might be called a "twin piston-valve," since, as seen, it has a body or stem part with two closing or piston parts to cut off the inlet-slits. Being actuated or driven one way by the pressure or steam driving the engine and in the opposite direction by the lever 12, said valve is simple of construction. Said piston-valve could, if desired, be pivoted or connected to lever 12.

The valves *d* and *h* can all be ground snug into place or make tight fit in their seats without the aid of packing.

In regard to the operation of the machine it may be noted that if during the running of the engine all the valves, both inlet and exhaust, should be closed the steam which may be in advance of the piston or plunger *p* is compressed, while that on the opposite side is rarefied. What might be called a "double brake" is thus formed or quick stoppage effected.

The cut-off is arranged or turned to close or shut off pressure before a piston respectively reaches the port forming the exhaust. The result is that the steam which has entered the cylinder can expand and expend its life or pressure before escaping. At the same time before a piston has come to the exhaust-point the opposite piston has come to the port forming the inlet, so that it is acted on by the oncoming pressure before exhaust at the other piston has commenced. Dead-centers are thus avoided, the unexhausted pressure carrying the oncoming piston past the inlet before the expansion has died out or expended its energy.

The ports *g* and *g′*, as seen, are out of line with one another or both at one side of a diameter of the cylinder. These ports are in proximity to or not placed diametrically opposite one another. The drum is mounted eccentrically in the cylinder, or its center is at the same side of the cylinder as that on which the two ports are located. The pistons of the drum are in such position that one piston will be at the inlet-port *g* or *g′* before the opposite piston has reached that one of the ports which at the time serves as an exhaust. These pistons, as seen, are diametrically opposite or in line with one another and connected so as to move together or slide in and out of the drum to maintain contact with the cylinder-wall. Suitable packing can of course be applied to the pistons, and said pistons will maintain tight contact about the interior wall of the cylinder without requiring the use of any springs or gravity.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An engine having an inlet-valve and a port-valve contained in the inlet-valve, and means for continuously reciprocating the port-valve during the movement or working of the engine.

2. An engine having a rotary inlet-valve with a piston-valve in the inlet-valve means for continuously reciprocating the piston-valve and a governor for regulating the position of said piston-valve.

3. An engine having a pressure-inlet and an inlet-valve, a piston-valve in the inlet-valve, and an actuating-lever at the outer end of the piston-valve, said inlet-valve having a permanent communication with the pres-

sure-inlet and also provided with a pressure-space at the inner extremity of the piston-valve to force or hold the latter outwardly against its actuating-lever.

4. An engine having an inlet-valve and a port-valve contained therein, means for continuously reciprocating the port-valve within the inlet-valve during the movement or working of the engine, exhaust-valves provided with crank-arms, links engaging the said crank-arms, and an operating-lever connected to the inlet-valve and to the said links.

5. An engine having ports each of which has an inlet and exhaust branch and valves for said port branches one of said port-valves having a continuously-acting cut-off valve to allow expansion of working pressure in the engine.

6. An engine having a valve-seat and a valve in said seat, a lever for moving said valve in one direction and mechanically-actuated means for vibrating the lever, the valve-seat being chambered to form a steam or pressure space to move the valve against the lever said pressure-space being made to communicate with the pressure-space of the engine to receive its pressure therefrom and have its pressure correspond to the working pressure of the engine.

7. An engine having a pressure-chamber with inlet-valve and lever, a cut-off valve in form of a piston fitted into the inlet-valve and reciprocated by the lever and by the pressure in the chamber, and a cam for actuating the lever.

8. An engine having steam-inlets, a cut-off valve with rims to close the inlets, a shaft carrying a cam or cams, a lever or actuator for the valve vibrated by the cam, and means for causing the pressure driving the engine to move the valve against the actuator.

9. An engine having ports, a rotary inlet-valve, a cut-off valve in the inlet-valve actuating-disks for the cut-off valve and a lever or handle for the inlet-valve to set the same to one port or another for movement in opposite directions.

10. An engine comprising a cylinder with an inlet and two outlet ports, a rotary inlet-valve in the inlet-port provided with a piston-valve, valves in the outlet-ports, connections between the inlet and outlet valves, means for continuously reciprocating the port-valve during the movement or working of the engine, and a drum with plungers or pistons rotatably disposed in the cylinder in eccentric relation to the latter, the connecting devices for the valves being operable to close all three ports simultaneously so that the steam or the like pressure medium in advance of one of the plungers or pistons is compressed, and that at the opposite side of the plunger or piston is rarefied to form a double safety brake or stop.

11. An engine having pressure-inlets, an inlet-valve, a cut-off valve for the inlets and placed in the inlet-valve, a shaft carrying a rotary cam for vibrating the cut-off valve and a disk for holding the valve open, a lever for the valve, and means for bringing the cam and disk to the lever.

12. An engine having an inlet-valve with a port-valve movable longitudinally therein, the inlet-valve having a pressure-space to receive the pressure medium and normally force the port-valve outwardly, and means for continuously actuating the port-valve in opposition to the pressure medium in the said pressure-space during the movement or working of the engine.

13. An engine having a valve-seat to receive the pressure medium, and a valve longitudinally movable in said seat, the seat being chambered to form a steam or pressure space to normally move the valve outwardly, said pressure-space being made to communicate with the pressure-space in the engine to receive its pressure therefrom and have the latter correspond to the working pressure of the engine, and means for automatically actuating the valve in opposition to the steam or pressure medium in the said pressure-space.

14. An engine having a pressure-chamber with an inlet-valve, provided with means for moving the same in opposite directions, a cut-off valve longitudinally reciprocable in the inlet-valve, the latter having a pressure-chamber to normally throw the cut-off valve outwardly, and means for moving the cut-off valve inwardly in opposition to the pressure in the said chamber.

15. An engine having inlets, a cut-off valve for controlling the open and closed condition of said inlets, the said cut-off valve being normally forced outwardly by the pressure driving the engine, an actuating device for moving the valve inwardly, and means coöperating with said actuating device for vibrating the latter in accordance with the speed of the engine.

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

CHARLES A. KAISER.

Witnesses:
EDWARD WIESNER,
GEORGE HULSBERG.