

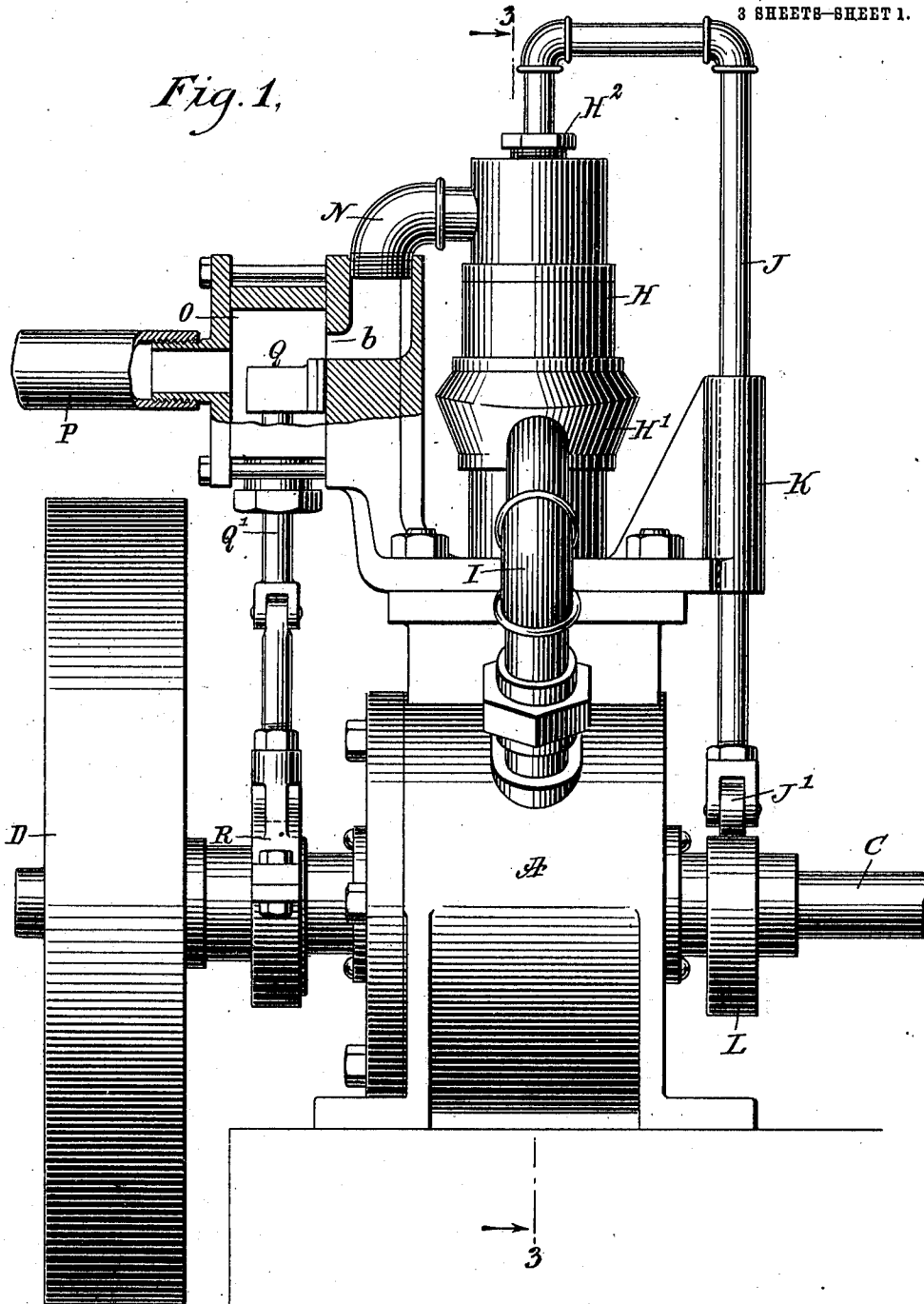
W. H. RICHMOND.
 ROTARY ENGINE.
 APPLICATION FILED MAR. 15, 1909.

988,949.

Patented Apr. 4, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 2,

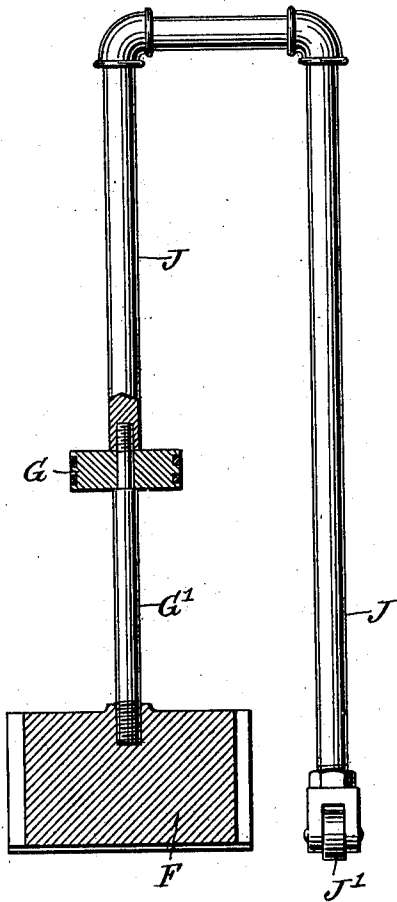
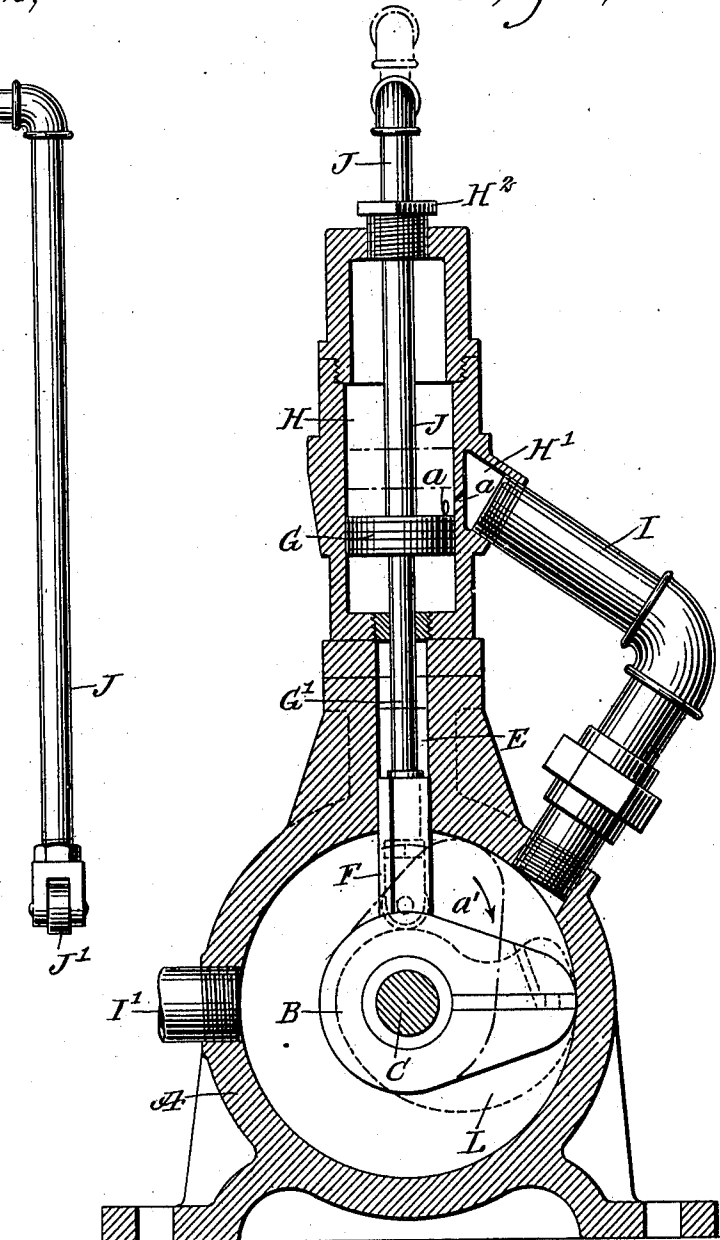


Fig. 3,



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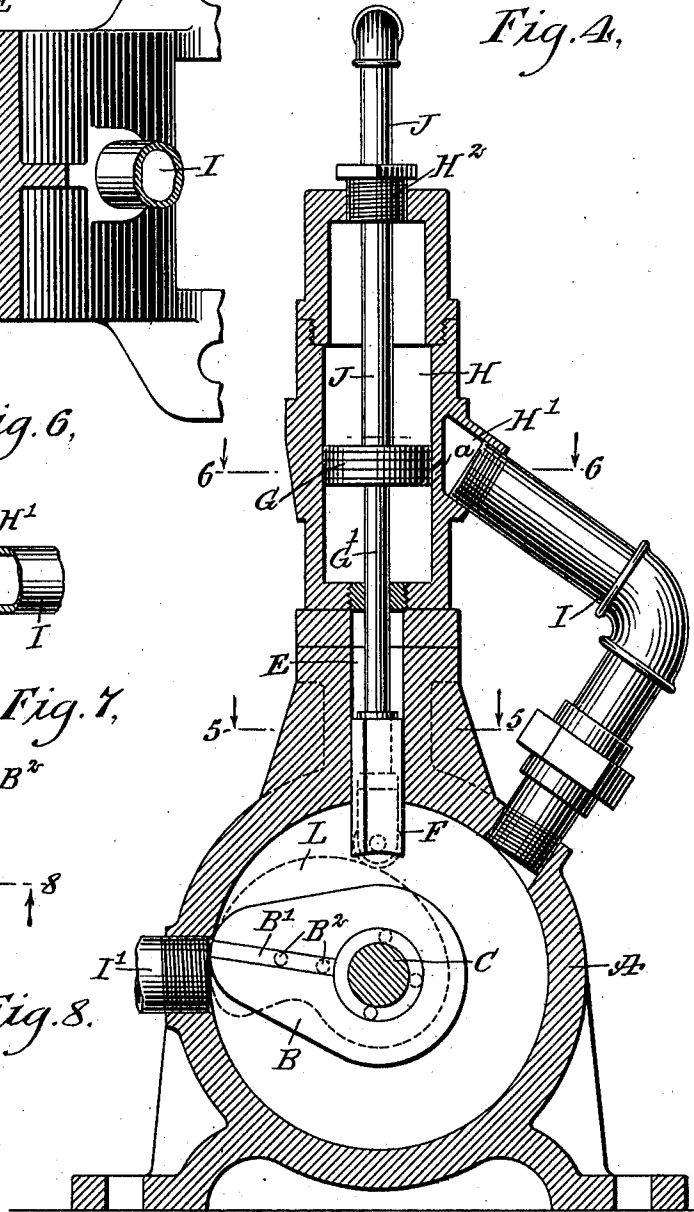
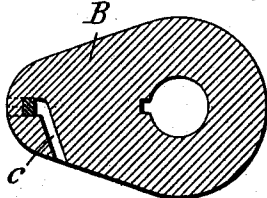
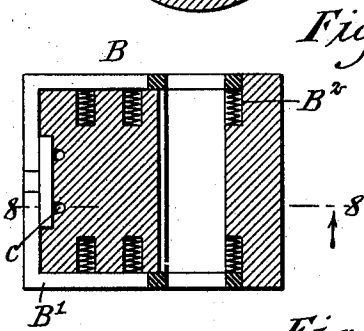
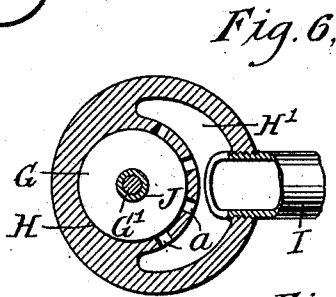
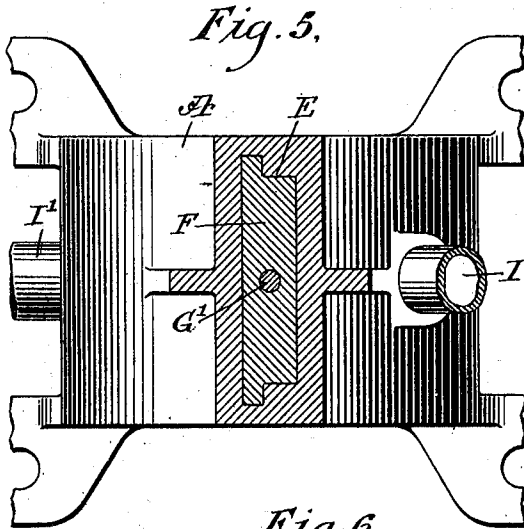
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

WESLEY HUFFMAN RICHMOND, OF MARQUETTE, MICHIGAN.

ROTARY ENGINE.

988,949.

Specification of Letters Patent.

Patented Apr. 4, 1911.

Application filed March 15, 1909. Serial No. 483,426.

To all whom it may concern:

Be it known that I, WESLEY H. RICHMOND, a citizen of the United States, and a resident of Marquette, in the county of Marquette and State of Michigan, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved rotary engine, arranged to utilize the motive agent to the fullest advantage, by giving the piston an initial impulse by the abutment and a second impulse by the direct pressure of the motive agent.

The invention consists of novel features and parts and combinations of the same, which will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the improvement, parts being in section; Fig. 2 is a sectional side elevation of the abutment and the slide connected therewith; Fig. 3 is a cross section of the improvement on the line 3—3 of Fig. 1 and showing the parts in position for admitting the motive agent to the cylinder; Fig. 4 is a similar view of the same and showing the parts in position shortly after the beginning of the exhaust; Fig. 5 is a sectional plan view of the same on the line 5—5 of Fig. 4; Fig. 6 is a similar view of the same on the line 6—6 of Fig. 4; Fig. 7 is a sectional plan view of the revoluble piston; and Fig. 8 is a sectional elevation of the same on the line 8—8 of Fig. 7.

In the cylinder A is mounted to revolve a piston B in the form of an arm and secured on a shaft C extending centrally through the cylinder A, and into the cylinder A extends a bearing E in which is mounted to slide a radially disposed abutment F adapted to engage the peripheral face of the piston B.

The abutment F is secured to the lower end of the stem G' of a valve piston G, mounted to reciprocate in a cylinder H mounted on top of the cylinder A, and the cylinder H is connected by ports a with a chamber H' formed on the cylinder H and connected by a pipe I with the interior of the cylinder A, at one side of the bearing E and its abutment F, and an exhaust pipe

I' leads from the cylinder A to the other side of the abutment F. The upper end of the stem G' of the valve piston G is connected with one end of a U-shaped slide J, having one member extending through a stuffing box H² held on the closed top of the cylinder H, the other member of the slide J being mounted to slide in a bearing K attached to the cylinder A. The lower end of the outer member of the slide J is provided with a friction roller J', in contact with the peripheral face of a cam L, secured on the main shaft C, so that when the latter is rotated the slide J is caused to slide upward, thus moving the valve piston G and the abutment F in a like direction, so that the valve piston G closes the ports a to allow the motive agent subsequently to act initially on the valve piston G, for the abutment to press the piston B to give the latter an impulse during its travel from the top position until it has passed the pipe I (see dotted lines in Fig. 3).

The upper end of the cylinder H is connected by a pipe N with the port b of a steam chest O, connected by a pipe P with a suitable motive agent supply, and in the chest O reciprocates a slide valve Q, controlling the port b. The stem Q' of the slide valve Q is connected with an eccentric R mounted on the main shaft C, so that when the latter is rotated a reciprocating movement is given to the slide Q for the latter to open and close the port b for controlling the admission of the motive agent to the cylinder H. Now when the several parts are in the position shown in Figs. 1 and 3, then the motive agent passes from the chest O into the upper portion of the cylinder H and by way of the uncovered ports a into the chamber H', and from the latter by way of the pipe I into the cylinder A between the piston B and the abutment F, to give a fluid pressure impulse to the piston B in the direction of the arrow a'. After the piston B has traveled a desired distance, the valve Q closes and cuts off the motive agent from the cylinder A, thereby allowing the motive agent in the cylinder to act expansively on the piston B until the latter uncovers the exhaust pipe I' leading from one side of the cylinder A. When this takes place the motive agent contained in the cylinder A exhausts through the pipe I' and the cam L now acts on the slide J to lift the latter and with it

the valve piston G and the abutment F, and when the piston B reaches a vertical position then the slide valve Q moves downward into an open position by the action of the
 5 eccentric R, so as to uncover the port *b* and thereby allow the motive agent to pass from the chest O by way of the port *b* and the pipe N into the upper end of the auxiliary cylinder H. The motive agent
 10 now exerts a downward pressure upon the valve piston G, so that the abutment F presses against one side of the piston B to give an impulse to the latter, as before mentioned, and when the abutment F uncovers
 15 the pipe I then the valve piston G has moved sufficiently far downward to uncover the ports *a*, thus allowing the charge of motive agent in the auxiliary cylinder H to pass into the cylinder A with a view to give
 20 another impulse to the piston B, as above described.

During the downward movement of the valve piston G the slide valve Q moves upward to close the port *b*, thus shutting off
 25 the motive agent supply to the auxiliary cylinder H and the main cylinder A. The piston B is provided on its sides and ends with suitable packing strips B' pressed on by springs B², and the piston B is also provided with a port *c* to admit motive agent
 30 from the cylinder A to the inner faces of the packing bars at the outer end of the piston B, to press the said packing bars outward in firm contact with the inner surface
 35 of the cylinder A. By the arrangement described leakage of motive agent is prevented.

It is understood that by the arrangement described, the motive agent (steam, compressed air or the like) is initially used to
 40 press the valve piston G downward, for the abutment F to press on the side of the piston B to give the latter a first impulse, and after the piston B has passed the pipe I, the motive agent enters the main cylinder A between the abutment and the piston B to give
 45 the latter a second impulse.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

50 1. A rotary engine, comprising a main cylinder, a piston mounted to turn in the said main cylinder, an abutment slidable in and out of the said cylinder and adapted to abut against the said piston, a piston valve
 55 moving with the said abutment, an auxiliary cylinder connected with a source of motive agent supply and having ports connected with the said main cylinder, the said ports being controlled by the said valve piston, a main shaft carrying the said piston, a
 60 cam on the said main shaft, and a slide engaging the said cam and connected with the said valve piston.

65 2. A rotary engine, comprising a main cylinder, a piston mounted to turn in the said

main cylinder, an abutment slidable in and out of the said cylinder and adapted to abut against the said piston, a valve piston moving with the said abutment, an auxiliary
 70 cylinder connected with a source of motive agent supply and having ports connected with the said main cylinder, the said ports being controlled by the said valve piston, a main shaft carrying the said piston, a slide
 75 valve for controlling the motive agent to the said valve cylinder, and an eccentric for operating the said slide valve.

3. A rotary engine, comprising a main cylinder, a piston mounted to turn in the said
 80 main cylinder, an abutment slidable in and out of the said cylinder and adapted to abut against the said piston, a valve piston moving with the said abutment, an auxiliary cylinder connected with a source of motive agent supply and having ports connected
 85 with the said main cylinder, the said ports being controlled by the said valve piston, a main shaft carrying the said piston, a slide valve for controlling the motive agent to the said valve cylinder, an eccentric for operating the said slide valve, a cam on the
 90 said main shaft, and a slide engaging the said cam and connected with the said piston.

4. A rotary engine, comprising a main cylinder, a main shaft extending through
 95 the said cylinder, a piston secured on the said main shaft and in contact at its free end with the inner surface of the said cylinder, an abutment for contact with the said piston and sliding in and out of the said main
 100 cylinder, an auxiliary cylinder having an inlet and ports leading to a chamber, a valve piston therein and having its stem connected with the said abutment, the said valve piston controlling the said ports, an admission passage connecting the said chamber with the
 105 interior of the said main cylinder to conduct the motive agent to the cylinder, a cam secured on the said shaft, and a slide connected with the stem of the said valve piston and having a friction roller in contact with the peripheral face of the said cam.
 110

5. A rotary engine, comprising a main cylinder, a main shaft extending through the
 115 said cylinder, a piston secured on the said main shaft and in contact at its free end with the inner surface of the said cylinder, an abutment for contact with the said piston and sliding in and out of the said main cylinder, an auxiliary cylinder having an inlet
 120 and ports leading to a chamber, a valve piston therein and having its stem connected with the said abutment, the said valve piston controlling the said ports, an admission passage connecting the said chamber with the
 125 interior of the said main cylinder to conduct the motive agent to the cylinder, a cam secured on the said shaft, a slide connected with the stem of the said valve piston and having a friction roller in contact with the
 130

peripheral face of the said cam, a chest connected with a source of motive agent supply and with the said auxiliary cylinder, a slide valve in the said chest and controlling the
5 connection to the said auxiliary cylinder, and an eccentric on the said main shaft and connected with the said slide valve.

6. In a rotary engine, a cylinder, a shaft rotatable therein, and having a blade moving in contact with the walls of the cylinder,
10 an abutment for closing the space between the shaft and the cylinder wall, a chamber radial to the cylinder and communicating therewith, a piston controlling the communication and to whose rod the abutment is connected,
15 said piston opening the port when moving toward the shaft, a valve controlling the admission of the motive fluid to the cylinder and operated by the shaft, said valve
20 being arranged to open immediately after the blade passes the abutment, whereby to

move said abutment forcibly against the blade for the purpose set forth.

7. In a rotary engine, a cylinder, a shaft rotatable therein, and having a blade moving in contact with the walls of the cylinder,
25 an abutment for closing the space between the shaft and the cylinder wall, means operated by the rotation of the shaft for admitting the motive fluid to the cylinder, and
30 means operated by the incoming fluid for moving the abutment to impart a preliminary impulse to the blade before the motive fluid impinges thereon.

In testimony whereof I have signed my
35 name to this specification in the presence of two subscribing witnesses.

WESLEY HUFFMAN RICHMOND.

Witnesses:

FRANK J. JENNISON,
H. R. Fox.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
