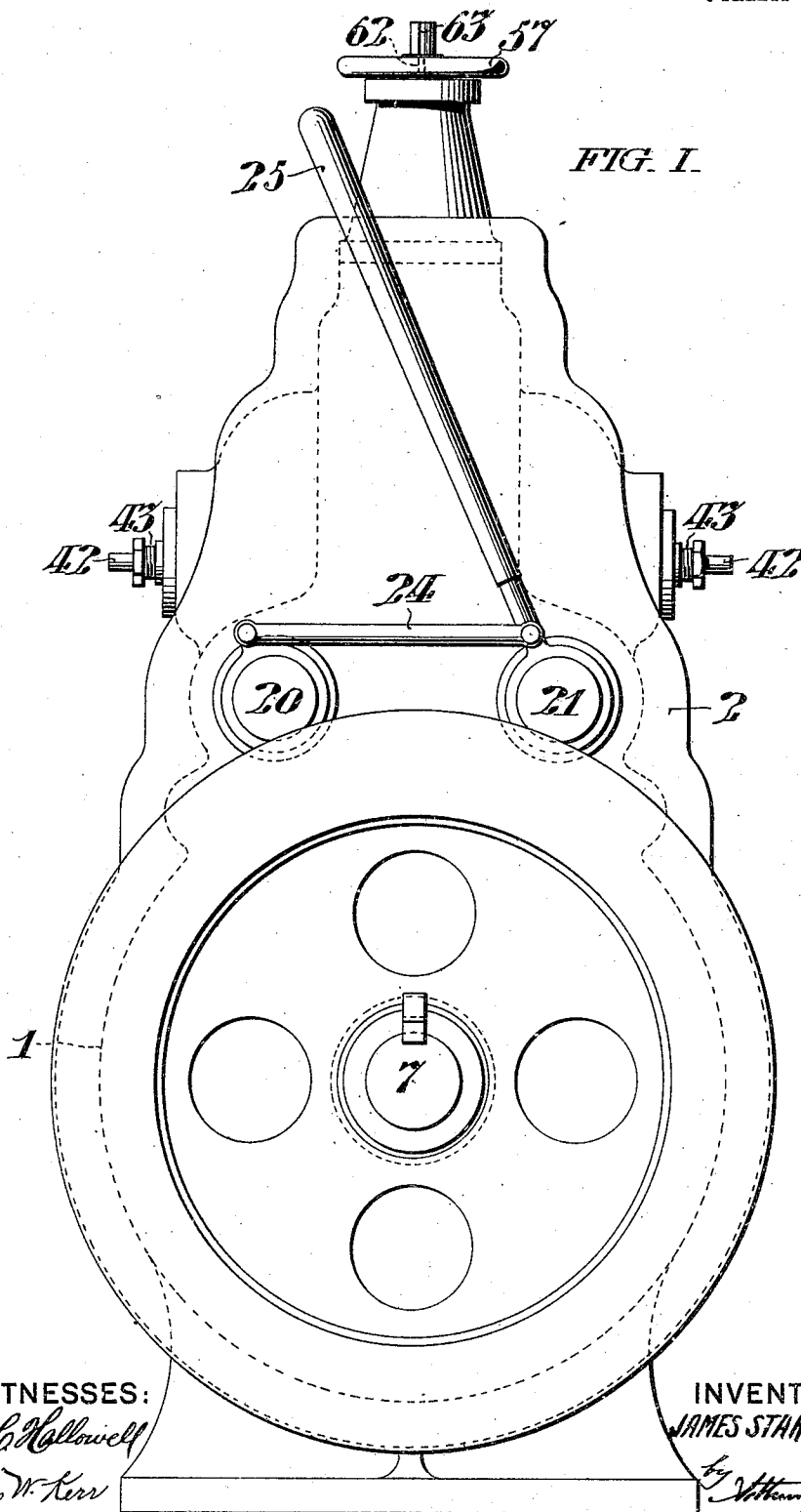


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 ROTARY ENGINE.
 APPLICATION FILED AUG. 6, 1908.

934,143.

Patented Sept. 14, 1909.

3 SHEETS—SHEET 1.



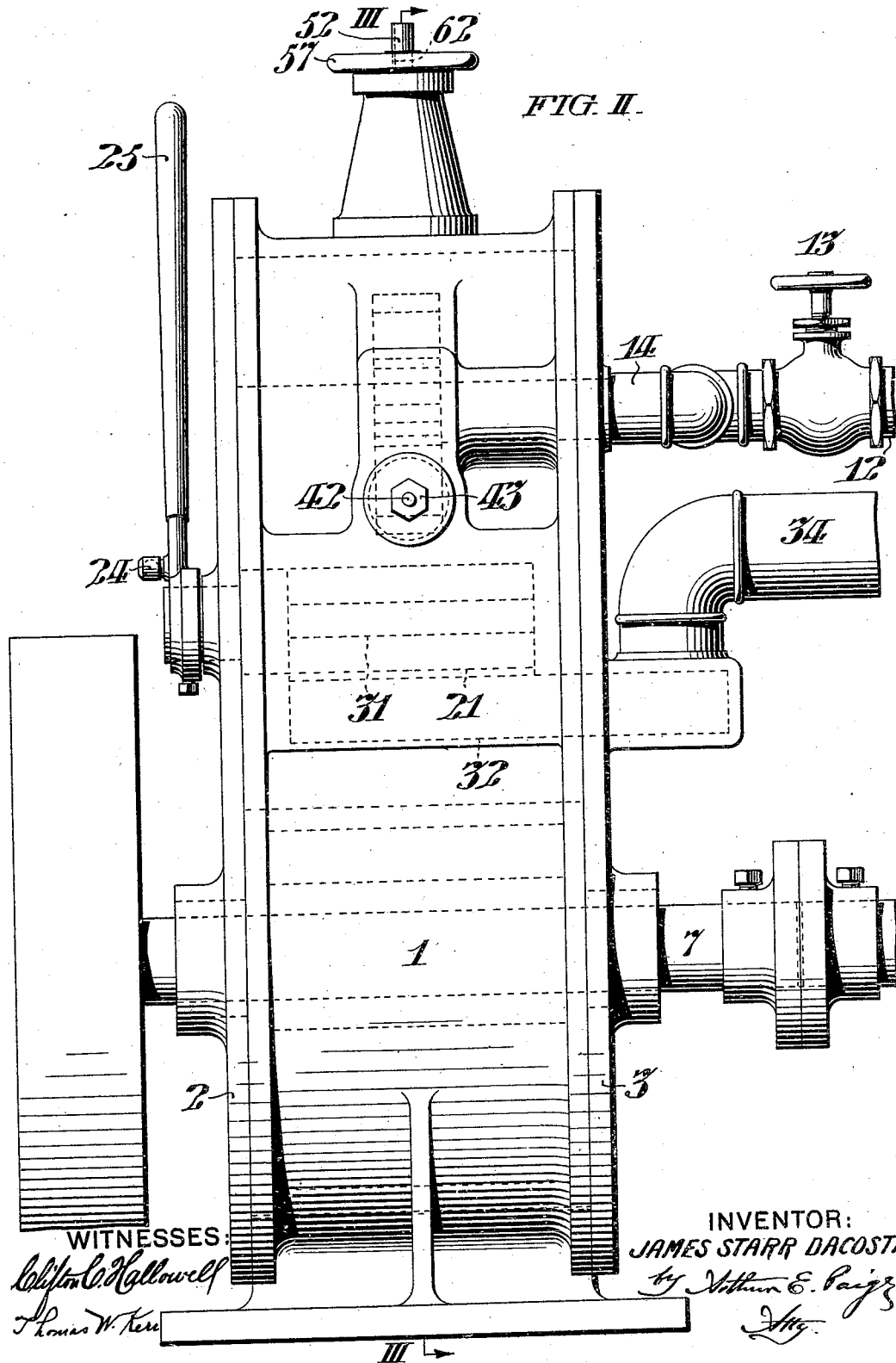
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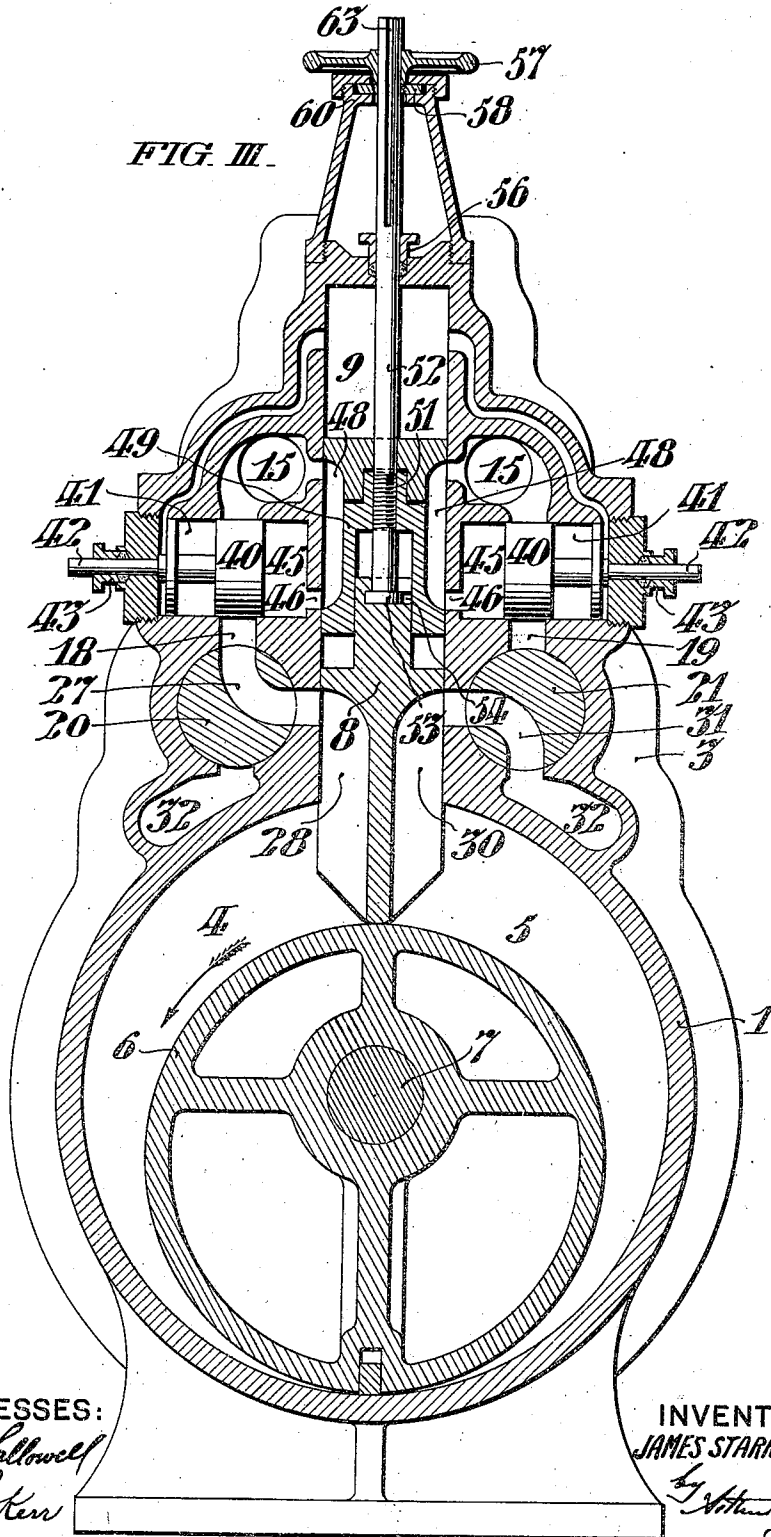


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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

934,143.

Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed August 6, 1908. Serial No. 447,207.

To all whom it may concern:

Be it known that I, JAMES STARR DA COSTA, of Easton, in the county of Northampton and State of Pennsylvania, have invented a certain new and useful Improvement in Rotary Engines, whereof the following is a specification, reference being had to the accompanying drawings.

My improvement relates to engines of the class comprising a circular piston mounted to rotate on an eccentric axis, in a circular chamber divided into two compartments by an abutment arranged to reciprocate toward and away from the center of rotation of said piston, in correspondence with the movement of the latter.

In the form of my invention hereinafter described, a reversible engine is provided with a pair of admission valves which are alternately operative to control the admission of the motor fluid, in accordance with the direction of rotation of said piston, and said valves are arranged to be operated by fluid pressure controlled by, and in accordance with the movement of, said abutment. Said abutment conveniently carries a valve which is adjustable with respect thereto, to vary the point of cut-off of the admission valves.

My invention comprises the various novel features of construction and arrangement hereinafter more definitely specified.

In said drawings; Figure I is a front elevation of an engine conveniently embodying my improvement. Fig. II is a side elevation of said engine. Fig. III is a vertical sectional view taken on the line III, III in Fig. II.

In said figures, 1 is the engine casing, having opposite removable heads 2, 3, inclosing the circular chamber, comprising separate compartments 4 and 5, in which the circular piston 6 is mounted to rotate on the axis concentric with its shaft 7, which axis is eccentric with respect to the piston, but concentric with respect to said circular chamber. The abutment 8, is mounted for vertical reciprocation in the chamber 9, toward and away from the center of rotation of said piston 6, in correspondence with the movement of the latter, and the reciprocatory movement of said abutment 8, and rotary movement of said piston 6, are effected by the motor fluid, supplied through the pipe 12 under control of the valve 13; said pipe

12 having branches 14, respectively in communication with the inlet ports 15, shown in Fig. III. Said motor fluid is admitted alternately upon opposite sides of said abutment, through the respective admission ports 18 and 19, in accordance with the direction it is desired to rotate the piston 6, said ports 18 and 19 being alternately opened and closed by the reversing gear, comprising the rotary plug two-way valves 20 and 21, which are coupled by the link 24 for contemporaneous operation, by the single lever 25, whereby they may be manually shifted.

The position of the reversing gear shown in the drawings, is such as to cause the rotation of the piston 6 in the direction of the arrow shown in Fig. III, in which position the valve 20 admits the motor fluid through its port 27, and the port 28, in the abutment 8, to the compartment 4. Contemporaneously, said valve 21 is turned to emit the exhaust from the compartment 5, through the port 30 in said abutment 8, and the port 31, in said valve 21, to the local exhaust port 32, with which the exhaust outlet pipe 34, shown in Fig. II, is connected. Said admission ports 18 and 19 are automatically controlled by the balanced admission valves 40, which are counterpart plungers having ports 41 arranged to register with said ports 18 and 19, and, having stems 42, extending through stuffing boxes 43 in the removable screw threaded caps at the outer ends of the valve chambers 45. It may be observed that the inner ends of said valves 40, are of greater area than their outer ends, so that they are shifted outwardly to close the ports 18 and 19, when the ports 46 leading to the respective valve chambers 45, are in communication with the inlet ports 15, through the ports 48 in the valve 49, which is carried by said abutment 8. As shown in Fig. III, said valve 49, which is conveniently formed in two pieces, is in screw threaded engagement at 51, with the rotary valve stem 52, having the head 53, engaged with the socket 54, in said abutment 8; the arrangement being such that said stem 52 cannot be displaced longitudinally when the parts are assembled in the position shown in Fig. III, but may be removed laterally from said socket when the valve 49 is withdrawn above the top of the abutment 8. Said stem 52 is thus arranged to carry the valve 49 in normally stationary relation with the abutment 8, dur-

ing the reciprocation of the latter. Said stem 52 being provided with the stuffing box 56 at the top of the casing 1, is free to reciprocate through the hand-wheel 57, which is free to rotate, but is prevented from reciprocating with the stem 52, by the flange 58, which engages the bearing 60; the latter being secured in stationary position upon said frame 1. Said wheel 57 is provided with the key 62, engaging the key-way 63, in said stem 52, so that the latter may be rotated by turning said hand-wheel 57 to raise or lower said valve 49 upon said abutment 8, so as to vary the time of operation of said admission valves 40. In the position shown, said valve 49 is so set as to cause the valves 40 to cut off when the piston 6 is midway in its circular stroke, as shown in Fig. III; but, it may be observed that the cut-off may be effected earlier or later with respect to the stroke of said piston in accordance with the position of adjustment of said valve 49, determined by rotation of said hand-wheel 57.

It may be observed that the motor fluid is admitted against the outer smaller ends of the valves 40 continuously, and serves to open said valves by thrusting them inwardly whenever the admission of fluid to the inner larger ends of said valves is prevented by the reciprocatory movement of the valve carried by said abutment 8, so that the engine above described operates as follows:—It is to be understood that the lever 25 may be used not only to determine the direction of rotation of the piston 6, to the left or to the right in accordance as to whether said lever is correspondingly deflected, to contemporaneously turn the valves 20 and 21, to admit the motor fluid and emit the exhaust from the respective compartments 4 and 5, but, the speed of rotation of the engine may be determined and controlled in accordance with the position of said lever, from the position of greatest deflection of said lever, corresponding with the greatest speed, to the vertical position of said lever in which the fluid is entirely shut off from the piston. With the lever deflected to the greatest extent toward the left, as shown in Fig. I, said valves 20 and 21, afford the full opening for pressure and exhaust respectively, to turn the piston in the direction indicated by the arrow in Fig. III, and when the piston is at the initial end of its stroke, *i. e.*, in such position that the compartment 4 is of the smallest dimensions, with the port leading thereto beginning to be uncovered by said piston, the abutment 8 presents the valve 49 in such position that the motor fluid is shut off from the larger inner ends of the admission valves 40, so that the pressure upon their outer smaller ends maintains said valves open, and said valves remain open until by the continued rotation of said piston 6, and downward move-

ment of said abutment 8, said valve 49 is presented in such position as to admit the motor fluid to the larger inner ends of the valves 40, and thrust them outwardly, as shown in Fig. III, and thus effect the cut-off. Of course, from the time of cut-off during the remainder of the stroke of said piston 6, the fluid in the compartment 4 operates expansively to turn said piston 6, while the spent fluid in the compartment 5 escapes through the exhaust port. Of course, as the abutment 8 moves upwardly in correspondence with the continued rotary movement of said piston 6, the valve 49 is shifted to such position as to shut off the pressure from the inner larger ends of the valves 40, so that they are again opened by the fluid pressure upon their outer smaller ends, and the operation is repeated as above described.

I do not desire to limit myself to the precise details of construction and arrangement above described, as it is obvious that various modifications may be made therein, without departing from the essential features of my invention, as defined in the appended claims.

I claim:—

1. In a rotary engine, the combination with a casing containing a circular chamber; of a piston mounted to rotate in said chamber; an abutment arranged to reciprocate toward and away from the axis of said piston in correspondence with the movement of the latter and separating said chamber into two compartments; admission and exhaust ports for each compartment; reversing gear comprising rotary plug two-way valves respectively controlling the ports for said compartments and means coupling said reversing valves for contemporaneous rotation, whereby the admission port of one compartment is opened and its exhaust port closed, when the admission port of the other compartment is closed and its exhaust port opened, and vice versa; means interposed between said reversing valves and the source of motor fluid, controlling the admission and comprising balanced reciprocatory plunger valves of greater area at one end than at the other; means arranged to contemporaneously operate said admission valves by fluid pressure, comprising uncontrolled passageways admitting said fluid against the smaller ends of said valves, and passageways arranged to admit said fluid against the larger ends of said valves but controlled by a valve carried by said abutment; means whereby said abutment valve may be adjusted to vary the time of operation of said admission valves with respect to the time of operation of said abutment, comprising a valve stem carried by said abutment in screw threaded engagement with said abutment valve and extending exterior to said casing, and a wheel exterior to said casing having a bearing arranged to prevent its reciprocation.

with said stem, and having a key engaging a key-way in said stem.

2. In a rotary engine, the combination with a casing containing a circular chamber; of a piston mounted to rotate in said chamber; an abutment arranged to reciprocate toward and away from the axis of said piston in correspondence with the movement of the latter and separating said chamber into two compartments; admission and exhaust ports for said compartments; means controlling the admission, comprising reciprocatory plunger valves which are larger at one end than at the other; means arranged to contemporaneously operate said admission valves by fluid pressure, comprising passageways admitting said fluid against the smaller ends of said valves and passageways arranged to admit said fluid to the larger ends of said valves but controlled by a valve carried by said abutment; and means whereby said abutment valve may be adjusted to vary the time of operation of said admission valves with respect to the time of operation of said abutment, comprising means arranged to shift said valve on said abutment.

3. In a rotary engine, the combination with a casing containing a circular chamber; of a piston mounted to rotate in said chamber; an abutment arranged to reciprocate toward and away from the axis of said piston in correspondence with the movement of the latter and separating said chamber into two compartments; admission and exhaust ports for said compartments; means controlling the admission, comprising reciprocatory plunger valves which are larger at one end than at the other; and, means arranged

to contemporaneously operate said admission valves by fluid pressure, comprising passageways admitting said fluid against the smaller ends of said valves and passageways arranged to admit said fluid to the larger ends of said valves but controlled by a valve carried by said abutment.

4. In a rotary engine, the combination with a casing containing a circular chamber; of a piston mounted to rotate in said chamber; an abutment arranged to reciprocate toward and away from the axis of said piston in correspondence with the movement of the latter and separating said chamber into two compartments; admission and exhaust ports for said compartments; means controlling the admission, comprising reciprocatory plunger valves; and, means arranged to operate said admission valves by fluid pressure, comprising passageways arranged to admit said fluid against the opposite ends of said valves; and, means operatively connected with said abutment to control the passageways at one end of said valves.

5. In a rotary engine, the combination with a rotary piston; of a reciprocatory abutment; a valve carried by said abutment arranged to control the admission of the motor fluid to said piston; and, means arranged to adjustably vary the position of said valve on said abutment.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this twenty-fourth day of July 1908.

JAMES STARR DA COSTA.

Witnesses:

ARTHUR E. PAIGE,
ROBERT WILLIAM CANNING.