C. GUYER.

ROTARY ENGINE.

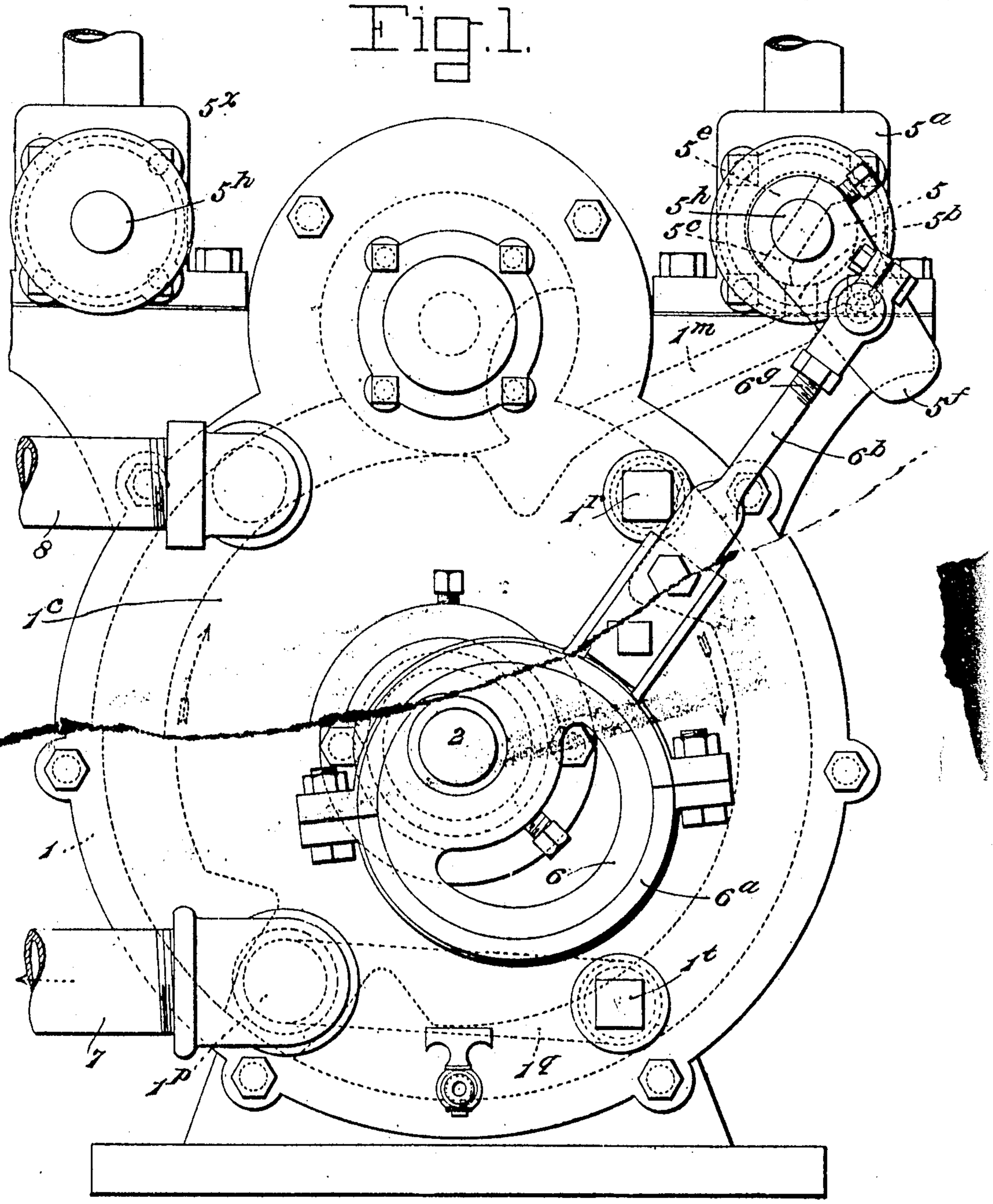
APPLICATION FILED JUNE 7, 1909.

944,361.

Patented Dec. 28, 1909.

4 SHEETS—SHEET 1.

Fig. 1.

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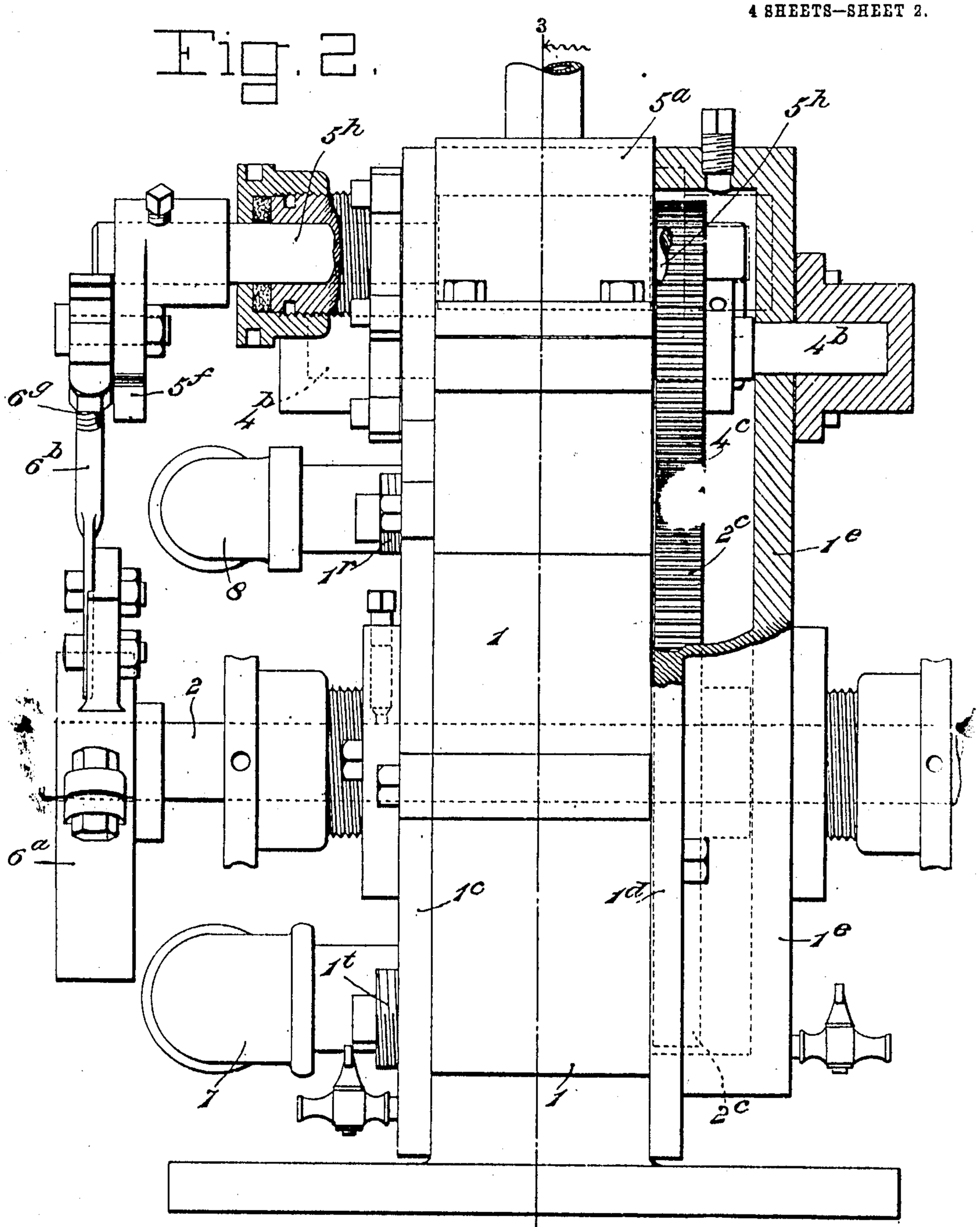
4 SHEETS—SHEET 2.

Fig. 2.

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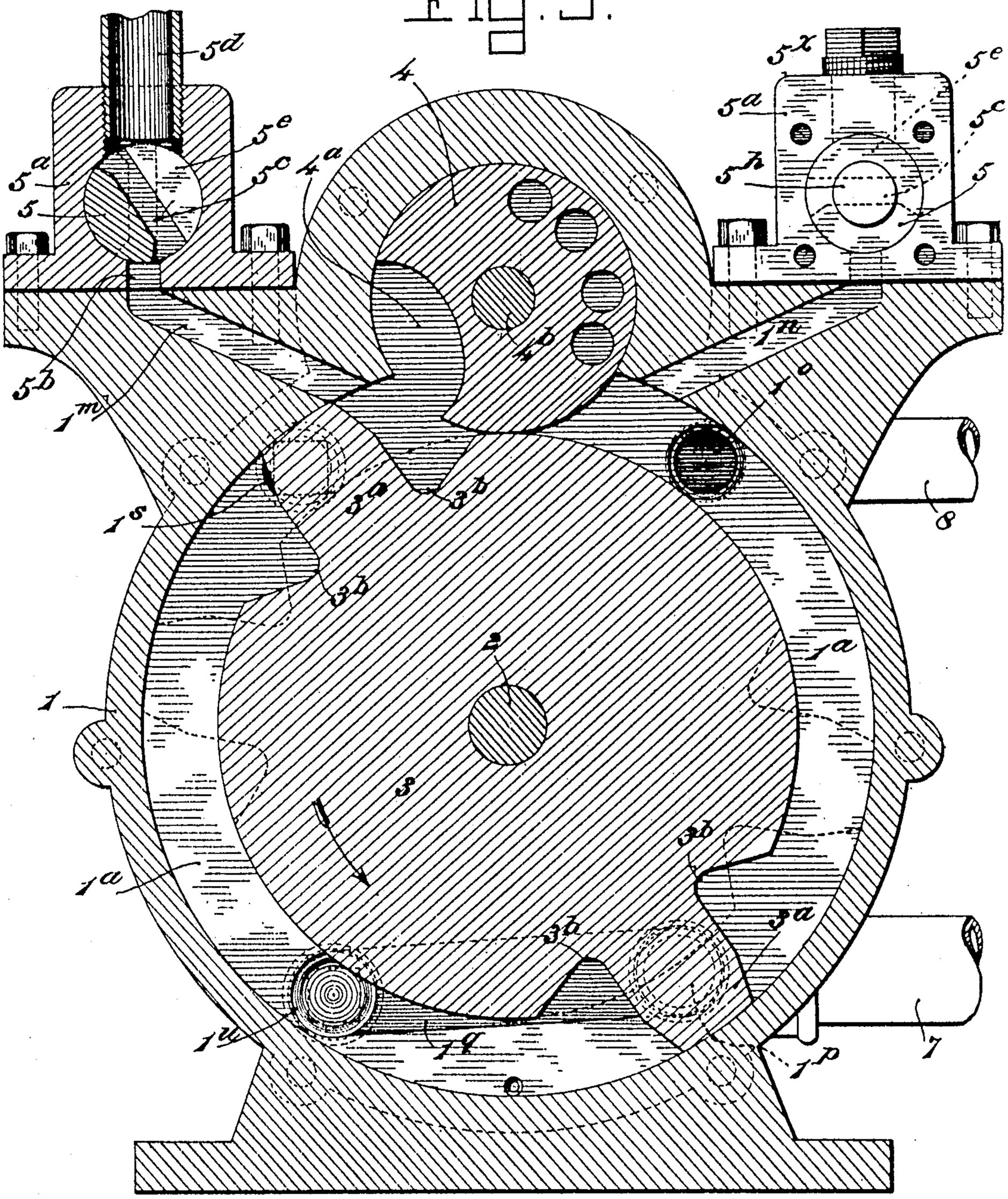
4 SHEETS—SHEET 3.

Fig. 3.

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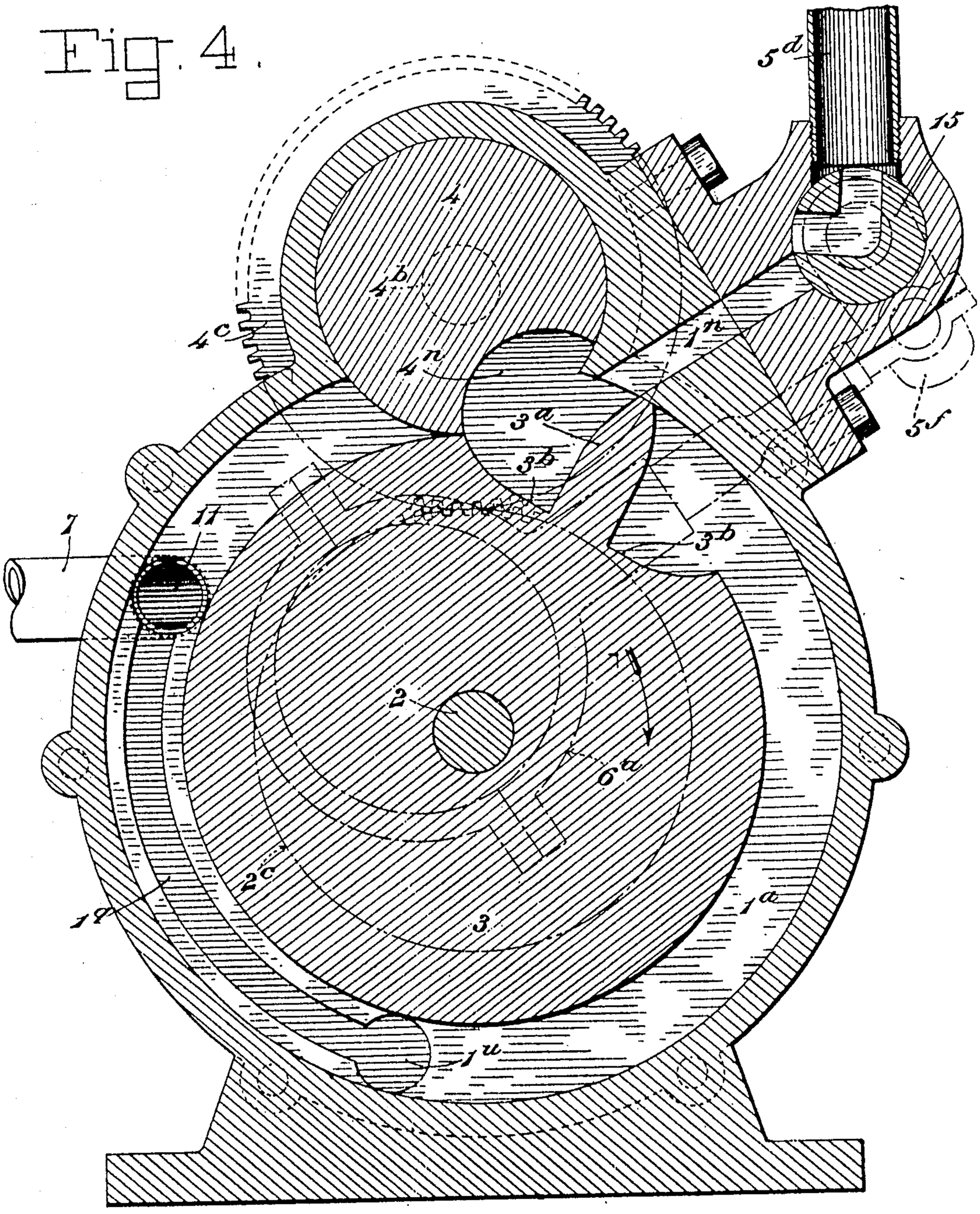
4 SHEETS—SHEET 4.

Fig. 4.

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# UNITED STATES PATENT OFFICE.

CLINTON GUYER, OF MUNCY, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO WILLIAM C. CRAWFORD, OF MUNCY, PENNSYLVANIA.

## ROTARY ENGINE.

944,361. Specification of Letters Patent. Patented Dec. 28, 1909.

Application filed June 7, 1909. Serial No. 500,752.

*To all whom it may concern:*

Be it known that I, CLINTON GUYER, a citizen of the United States, residing at Muncy, in the county of Lycoming and State of Pennsylvania, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention is an improvement in rotary engines, of that class in which the piston-abutment moves in a circular orbit within an annular working chamber, and the motive fluid is admitted, at one side of a rotary abutment, into the working chamber behind the piston-abutment, and is exhausted in front of the latter at the opposite side of said rotary abutment.

The objects of the present invention are to produce a practical engine of great simplicity of construction and economical in operation; to eliminate the friction of moving parts as far as possible; to increase the working surface of the piston abutment for a given cross section of working chamber; to provide simple means whereby the engine may be caused to drive either right or left; to provide such engine with readily controllable valve mechanism operated by an eccentric and capable of being adjusted to cut off the steam at any desired point in the working stroke of the piston abutment so as to permit the engine to be operated in part by the expansive force of the motive fluid; and to so connect the parts that absolute certainty in operation is insured and the engine can be run at high speed with great efficiency.

I will now explain the invention in detail with reference to the accompanying drawings which form part of this specification; and the parts and combination of parts for which protection is desired will be summarized in the claims following such detailed description of the engine.

In said drawings: Figure 1 is a front end elevation of an engine embodying the invention, and showing the preferred arrangement of valves and eccentric devices for operating the same. Fig. 2 is a side elevation of such engine, partly broken away to show interior parts. Fig. 3 is a vertical sectional view of such engine on line 3—3, Fig. 2 looking from the gear side, and showing in full lines the position of parts when the main valve is beginning to open; and in dotted lines the positions when main valve is fully opened. Fig. 4 is a sectional view of a single acting engine of slightly modified construction.

In the preferred embodiment of the invention (Figs. 1 to 3), the engine has a main circular piston 3 fixedly secured upon a main shaft 2, within a cylindrical recess in the central part 1 of the casing, the recess being of larger diameter than said piston, so as to form an annular working chamber $1^a$ between the outer periphery of the piston 3 and the outer periphery of said recess. This working chamber $1^a$ is traversed by abutments $3^a$ projecting from the periphery of piston 3, said abutments $3^a$ corresponding in cross section to the cross sectional area of chamber $1^a$, and being adapted to move freely in said chamber $1^a$ as the piston rotates. The piston may have one or more abutments $3^a$; in the preferred form of engine two abutments $3^a$ are provided on piston 3, at diametrically opposite points. The piston 3 may be recessed at the sides of each abutment, as shown at $3^b$; the radially disposed sides of such recesses adjacent the abutments $3^a$ forming continuations of the working or pressure surfaces of such abutments.

The shaft 2 has bearings in the end-plates $1^c$ $1^d$, of the casing, which plates are suitably steam tightly secured to the central recessed portion 1 of the casing, and are fitted closely against the sides of piston 2, and form and close the sides of chamber $1^a$.

Coacting with the piston abutments $3^a$ is a rotary abutment 4 which is preferably arranged above piston 3 and fitted within a corresponding cylindrical recess in part 1 of the casing. The abutment 4 projects into and across the working chamber $1^a$ and normally contacts with the periphery of piston 3 and closes the chamber $1^a$ at a point between the inlet ports $1^m$, and the vent open-

ing $1^o$. The vent $1^o$ may be connected with a pipe 8 to carry away the vented fluid.

The rotary abutment 4 is provided with a peripheral pocket $4^a$ adapted to register with each piston abutment $3^a$, as it reaches the abutment 4, and allow the piston abutments $3^a$ to move past the rotary abutment 4. The abutment 4 is caused to turn with the same peripheral speed as the piston 3, by suitable means, such as a pinion $4^c$ on the shaft or trunnion $4^b$ of the abutment 4 (which trunnion is extended through a suitable bearing in the side plate $1^d$) and meshing with a pinion $2^c$ on shaft 2 as shown. The said pinions are preferably inclosed in a housing $1^e$ attached to the casing as shown; and a fly wheel or pulley (not shown) can be mounted on shaft 2 exterior to said housing. When the piston has two abutments $3^a$, the rotary abutment 4 should be geared to rotate twice for each rotation of the piston.

The admission of the motive fluid to port $1^m$ is controlled by a valve 5 contained in a casing $5^a$ secured to the engine casing, as shown in the drawings, the outlet port $5^b$ of said casing communicating with the engine inlet port $1^m$ as shown. Valve 5 is preferably provided with a transverse port $5^c$ the ends of which are alternately brought into register with port $5^b$ as the valve is rocked, and the said port $5^c$ is continually in communication by a slot $5^e$ with a motive fluid supply, such as a steam generator, by suitable pipe connections indicated at $5^d$.

On the projecting stem $5^h$ of valve 5, is a valve lever $5^f$, which is connected by a link $6^b$, to an eccentric strap $6^a$ on an eccentric 6 fast to shaft 2, and preferably located at the side of the casing opposite the fly wheel. The connections between the valve lever $5^f$ and eccentric strap $6^a$ are preferably adjustable and may be a thread and socket connection as shown at $6^g$, so that the connections may be adjusted to cause the engine to operate under more or less expansive effect of the fluid. Obviously the connection may be rendered adjustable in other ways.

The working chamber $1^a$ is provided at a point between the inlet port $1^m$ and vent $1^o$, with an exhaust port $1^p$ to which may be connected a pipe 7 to convey the exhaust fluid to any desired point of discharge.

The inlet valve 5 should be so adjusted that the motive fluid will be admitted only after piston abutment $3^a$ has fully passed the rotary abutment 4, and the latter turned so that it closes direct communication between the port $1^m$ and vent $1^o$ (see Fig. 3), at opposite sides of said rotary abutment; and the motive fluid should be cut off before that abutment $3^a$ against which the fluid is acting reaches exhaust port $1^p$; the expansive force of the propelling fluid can thus be utilized for any desirable part of the working stroke of each abutment $3^a$. After an abutment $3^a$ passes exhaust port $1^p$ the working fluid is exhausted behind such abutment $3^a$, and any fluid that may be trapped in advance of such abutment, between it and the rotary abutment 4, is vented through outlet $1^o$. In order to relieve the pressure somewhat before the abutment $3^a$ reaches outlet $1^p$, I provide a short channel $1^q$ i nthe side of chamber $1^a$, through which the fluid begins to escape in advance of the piston abutment before the latter reaches the exhaust port $1^p$.

In order to drive the engine either right or left a second inlet valve, similar to that already described, may be located on the casing at the opposite side of abutment 4, as indicated at $5^x$, the outlet port of this valve communicating with an inlet port $1^n$ leading into working chamber $1^a$. A vent opening $1^s$ may also be formed at the side of rotary abutment 4 opposite vent $1^o$, and an exhaust opening $1^u$ at the end of channel $1^q$ opposite opening $1^p$. The vent $1^s$ can be normally closed, as by a plug $1^r$, and the exhaust port $1^u$ normally closed as by a plug $1^t$. The valve $5^x$ will also be normally closed when the valve 5 is in operation.

When it is desired to have the main piston turn in the opposite direction to that indicated in the drawing, the eccentric and strap are disconnected from the right-hand valve 5, as shown in Fig. 1, and similarly connected to the left-hand valve $5^x$. The vent $1^o$ can then be closed by plug $1^r$ and vent $1^s$ connected with pipe 8; and the exhaust port $1^p$ can be closed by plug $1^t$ and the outlet port $1^u$ opened and connected with pipe 7. Then the engine will operate as above described, but the main piston 3 will turn in the opposite direction from that indicated in the drawings.

While I have shown the piston 3 as provided with two abutments $3^a$ in Figs. 1 and 3, it is obvious that the number of piston abutments might be varied, and the rotary abutment 4 so proportioned and operated as to permit the passage of the piston abutments at the proper time; and the valve be adjusted to control the fluid in the proper manner. Where but one abutment is used both exhaust ports $1^p$ and $1^u$ might be closed and the steam exhausted through either vent $1^o$, or $1^s$, which will then serve as an exhaust pert and allow a longer working stroke of the piston abutment.

In the modification illustrated in Fig. 4 the similarly marked parts correspond with like parts in other figures. The piston 2 however has but one abutment $3^a$, and in order to give it a greater working stroke the exhaust port 11 is located about in the position of one of the vent ports $1^o$ in the double acting engine (Figs. 1–3), and port

11 serves both as an exhaust and vent. In place of the double acting valve 5 shown in Fig. 2, a single acting valve 15 is used, but operated by the eccentric as shown. Obviously by duplicating the inlet and exhaust ports, as described, for the double acting engine, (Figs. 1–3) the engine shown in Fig. 4 could be made reversible. In operating this single acting engine the eccentric is set to open valve 15 and admit steam to the working chamber when the piston abutment $3^a$ has passed port $1^a$, as indicated in Fig. 4, and continue to admit steam to the working chamber for any desired part of the stroke, until the abutment $3^a$ reaches the forward end $1^a$ of channel $1^a$, but preferably the steam is cut off before the abutment reaches this point, so that the piston will be operated by expansion until the exhaust port is uncovered. The inlet port is then closed until the abutment $3^a$ has repassed the rotary abutment 4, and again reached the position indicated in Fig. 4.

Having thus described my invention what I claim is:

1. In a rotary engine the combination of a casing, a rotary piston therein, an annular working chamber surrounding the piston, an abutment on the piston within the working chamber, a rotary abutment beside the piston, normally blocking the working chamber and provided with a pocket to permit the passage of the piston abutment, gearing for rotating the rotary abutment in unison with the piston, a main inlet port, an exhaust port, and a channel in the side of the working chamber leading from the exhaust port toward the inlet port.

2. In a rotary engine the combination of a casing, a rotary piston therein, an annular working chamber surrounding the piston, diametrically opposite abutments on the piston within the working chamber, a rotary abutment beside the piston, and normally blocking the working chamber, provided with a pocket to permit the passage of the piston abutments, gearing for rotating the abutment in unison with the piston, an inlet port at one side of the rotary abutment, a vent at the opposite side of such abutment, an exhaust port intermediate the inlet port and vent, and a venting channel leading from the exhaust port toward the inlet port.

3. In a rotary engine the combination of a casing, a rotary piston therein, an annular working chamber surrounding the piston, diametrically opposite abutments on the piston within the working chamber, a rotary abutment beside the piston provided with a pocket to permit the passage of the piston abutments, gearing for rotating the abutment in unison with the piston, a main inlet port and a vent at opposite sides of the rotary abutment, and an exhaust port intermediate the inlet and vent; with a main shaft connected with the piston, a main inlet valve, an eccentric on the main shaft, and adjustable connections between the eccentric and said valve for operating the latter.

4. In a rotary engine the combination of a casing, having an annular working chamber, a rotary piston in said chamber having an abutment, a rotary abutment beside the piston blocking the working chamber and having a pocket to permit the passage of the piston abutment, gearing for rotating the rotary abutment in unison with the piston, a main inlet port at one side of the rotary abutment, a vent at the opposite side of the rotary abutment, an exhaust port intermediate the vent and inlet, a main shaft connected with the piston, a main valve connected to the inlet port, a lever on the valve stem, an eccentric on the main shaft, an eccentric strap, and adjustable connections between the eccentric strap and said lever for operating the main valve.

5. In a rotary engine the combination of a casing, a rotary piston therein, an annular working chamber surrounding the piston, an abutment on the piston within the working chamber; a rotary abutment beside the piston provided with a pocket to permit the passage of the piston abutment, gearing for rotating the abutment in unison with the piston, an inlet port at each side of the rotary abutment, means for closing either one of these ports, an exhaust port intermediate the inlet ports, a main shaft connected with the piston, an eccentric on the main shaft, a valve for each inlet port, and means for connecting either inlet valve with the eccentric.

6. In a rotary engine the combination of a casing, a rotary piston therein, an annular working chamber surrounding the piston, diametrically opposite abutments on the piston within the working chamber, a rotary abutment beside the piston having a pocket to permit the passage of the piston abutments, and gearing for rotating the abutment in unison with the piston; an inlet port at each side of the rotary abutment, and a pair of exhaust ports intermediate the inlet ports; with a main shaft connected with the piston, an inlet valve for each inlet port, an eccentric on the main shaft, means for operating either valve from said eccentric, and means for closing one inlet and one exhaust port when the other inlet and exhaust port are opened.

7. In a rotary engine the combination of a casing having an annular working chamber, a rotary piston in said chamber having an abutment, a rotary abutment beside the piston blocking the working chamber and provided with a pocket to permit the passage of the piston abutment, gearing for rotating the rotary abutment in unison with the pis-

ton, a main inlet port at each side of the rotary abutment, two exhaust ports intermediate the inlet ports, means for closing one inlet port and one exhaust port when the other inlet and exhaust ports are in use, a main shaft connected with the piston, a valve for each inlet port, a lever on the valve stem, an eccentric on the main shaft, an eccentric strap and means for connecting the eccentric with either inlet valve.

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

CLINTON GUYER.

Witnesses:
THOMAS S. OPP,
HARRY P. ROGERS.