G. B. DUNBAR.

ROTARY ENGINE.

APPLICATION FILED SEPT. 26, 1910.

994,825.

Patented June 13, 1911.

2 SHEETS—SHEET 1.

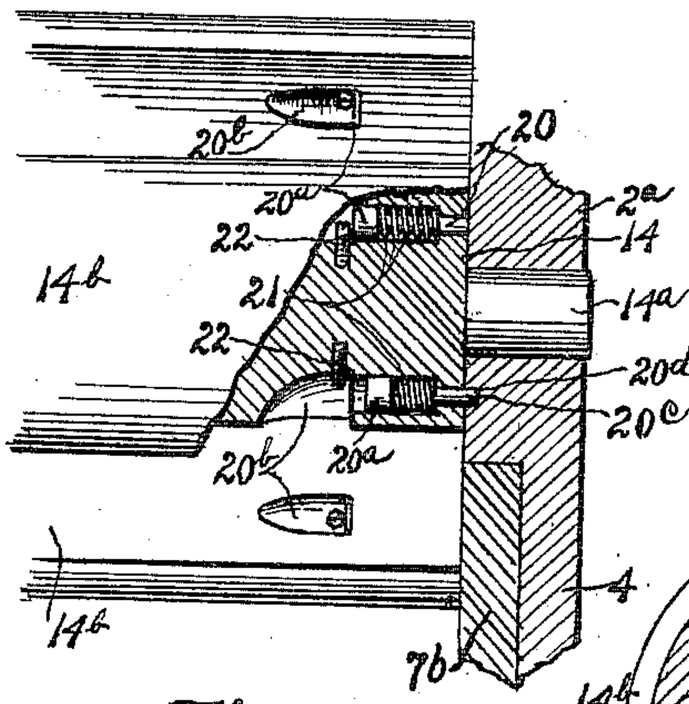

Fig. 6.

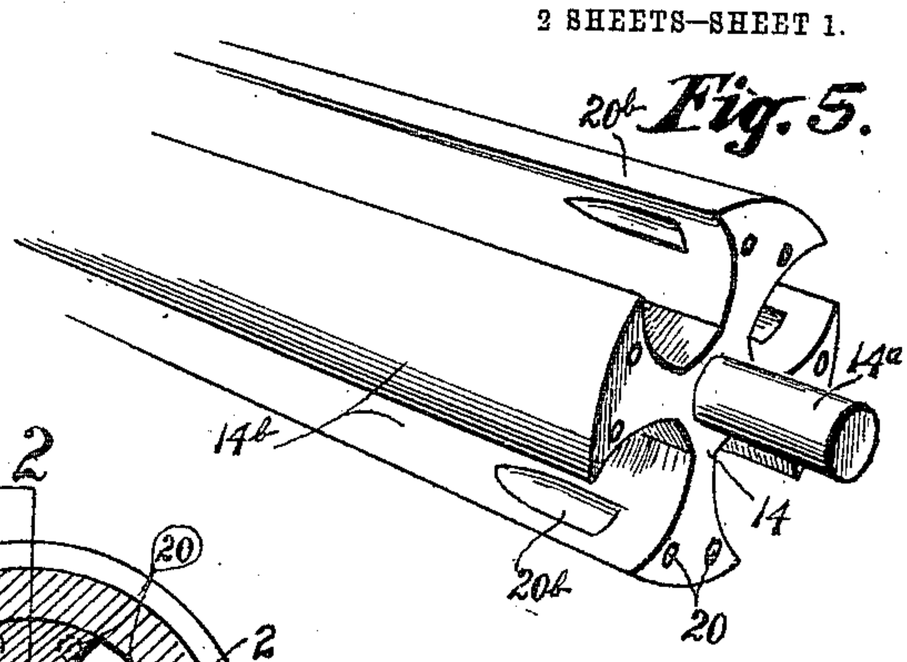

Fig. 5.

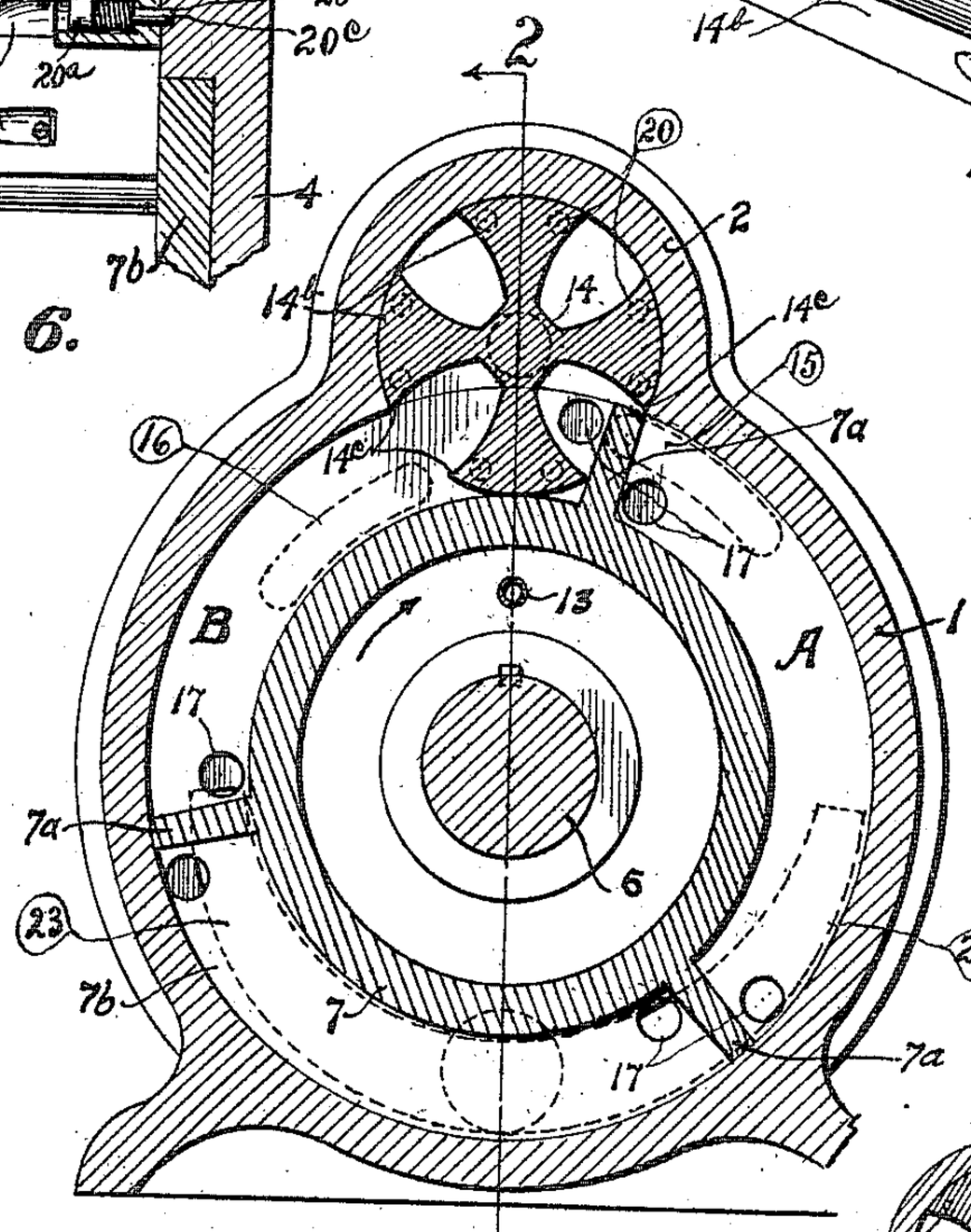

Fig. 1.

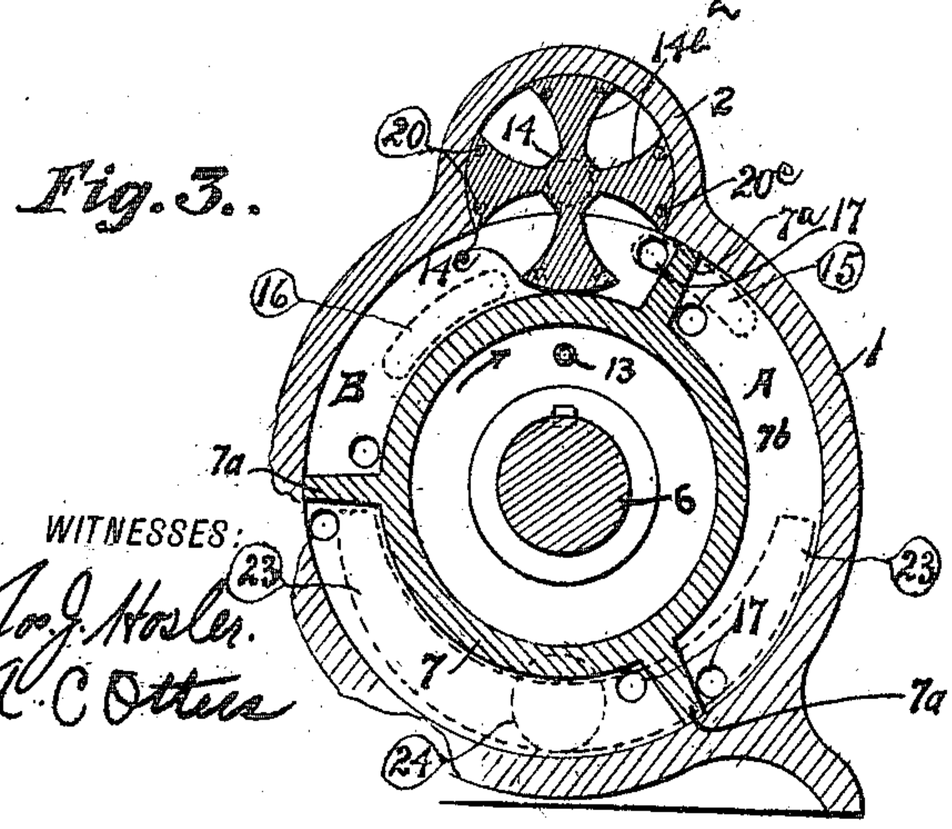

Fig. 3.

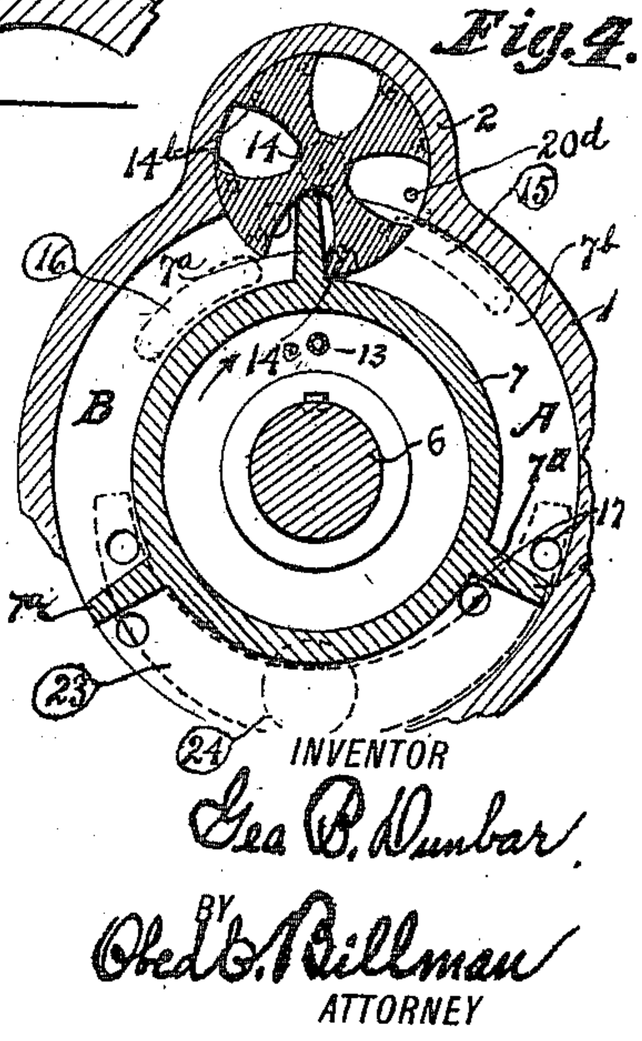

Fig. 4.

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2 SHEETS—SHEET 2.

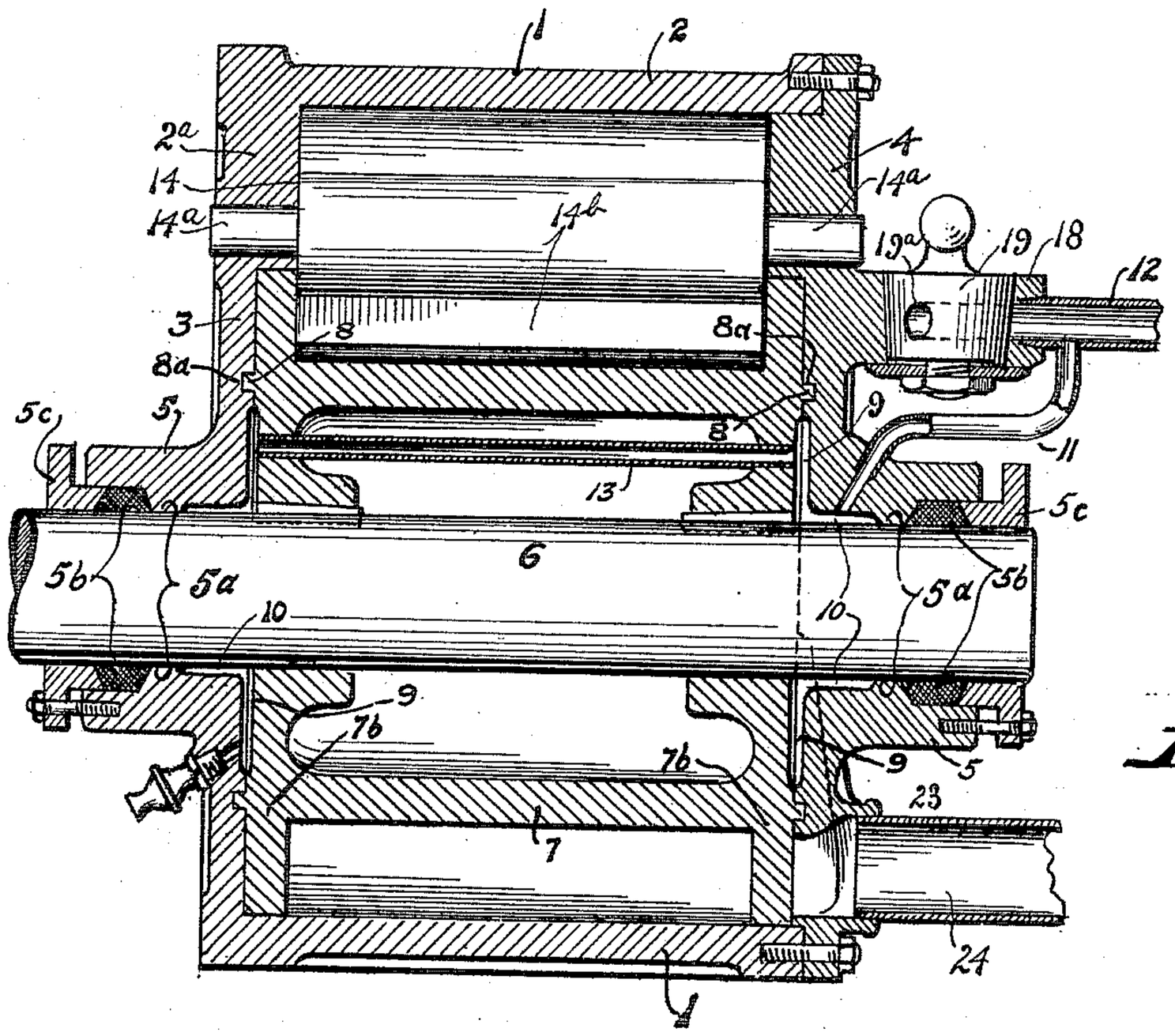

Fig. 2.

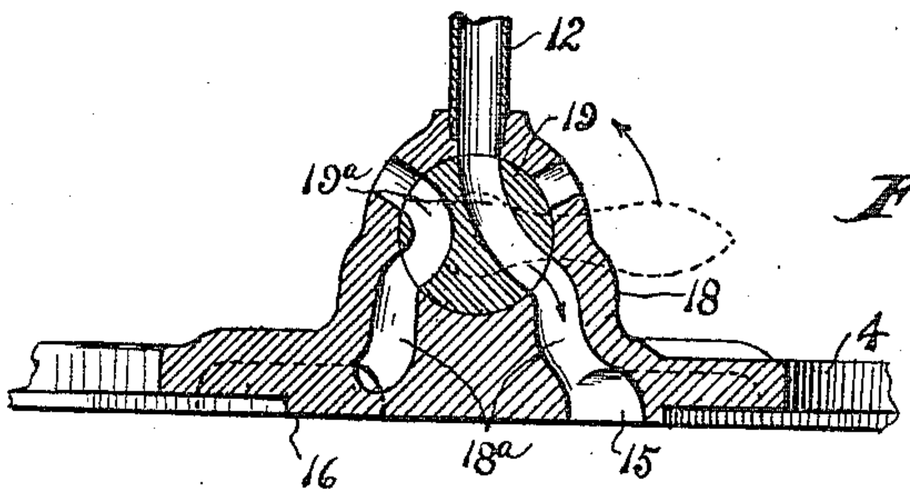

Fig. 8.

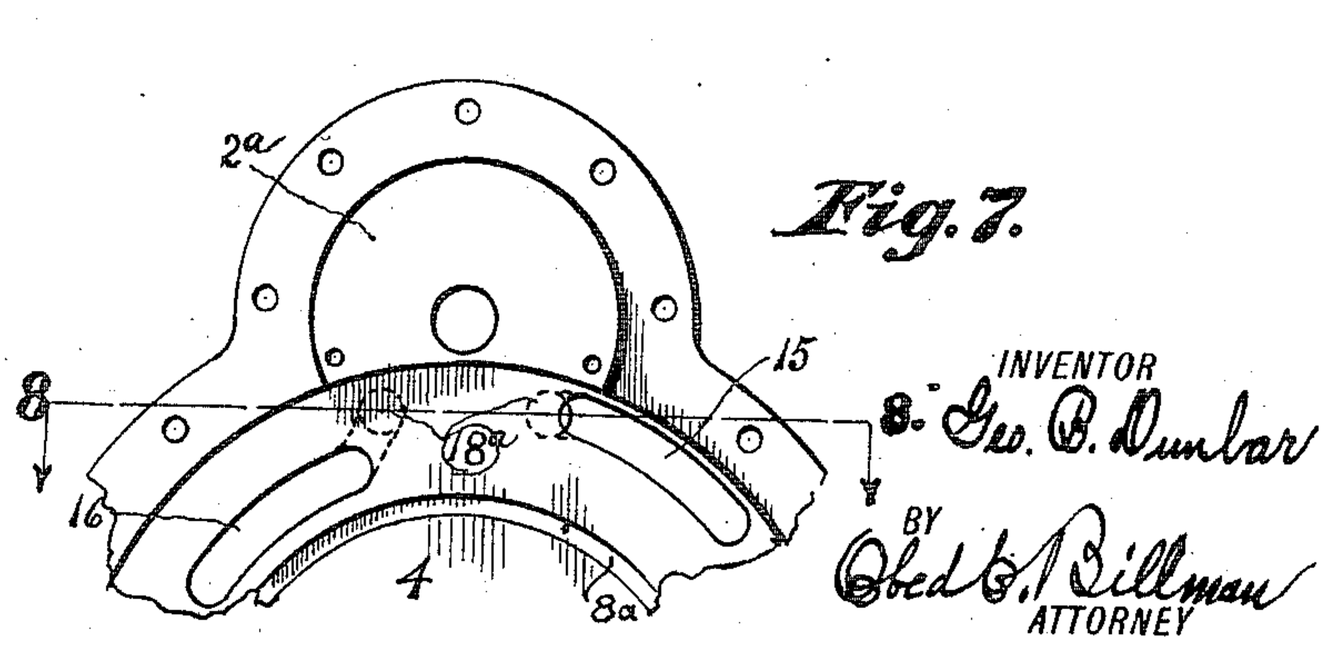

Fig. 7.

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ROTARY ENGINE.

994,825. Specification of Letters Patent. Patented June 13, 1911.

Application filed September 26, 1910. Serial No. 583,849.

To all whom it may concern:

Be it known that I, GEORGE B. DUNBAR, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to improvements in fluid-pressure motors, and more particularly to that class of motors known as "rotary engines."

As applied to motors or engines of the rotary type, the invention has for its object the provision of an engine of this type adapted to be driven by any suitable operating fluid such as steam, gas, or water, and which includes a revoluble element or winged rotor adapted to form an abutment for the operating fluid whereby to drive the piston rotor in the proper direction.

A further object is to provide a fluid pressure bearing for the piston rotor adapted to receive both the longitudinal and radial thrust between the fixed and rotatable members of said bearing.

A still further object is to provide an improved piston actuated abutment rotor adapted to be moved in an opposite direction to that of the piston rotor and to form expansion and exhaust chambers on opposite sides of the piston wings as the latter are operated.

A still further object of the invention is to provide fluid actuated mechanism for locking the abutment rotor or element against rotation, and for automatically releasing the same at certain periods during the revolution of the piston rotor.

A still further object of the invention is to provide improved valve mechanism for the steam or operating fluid to so control the passage of such fluid into the piston chamber that the piston rotor may be driven in either direction with equal efficiency, as well as providing improved induction and eduction ports for fully utilizing the expansive power of the operating fluid, and completely exhausting the latter at the proper time during the revolution of the piston rotor.

With the above mentioned and other ends in view, the invention consists in the novel construction, arrangement, and combination of parts, hereinafter described, illustrated in one of its embodiments in the accompanying drawings, and particularly pointed out in the appended claims.

Referring to the drawings, forming a part of this specification, Figure 1, is a cross sectional view of a rotary engine constructed in accordance with this invention, and showing the parts in the position occupied just prior to the opening of the inlet ports to the expansion chamber. Fig. 2, a vertical longitudinal sectional view taken on line 2—2 of Fig. 1. Fig. 3, a cross sectional view on a reduced scale showing the position of the parts at the initial opening of the induction or inlet ports into the expansion chamber. Fig. 4, a similar view showing the position of the parts just after the exhaust of the operating fluid from the expansion chamber and illustrating the manner in which the abutment rotor is moved to form the next abutment. Fig. 5, a detailed perspective view of one end of the abutment rotor showing the arrangement of the steam or fluid actuated piston bolts for intermittently locking the abutment rotor in its abutment forming position. Fig. 6, an enlarged side elevation, partly in section, of the locking end of the abutment rotor showing the relative arrangement of the parts. Fig. 7, a view of the inner side of the upper or port portion of the piston cylinder head, the side walls of the casing and abutment rotor being removed for the purpose of clearer illustration of the parts. Fig. 8, a sectional view taken on line 8—8 of Fig. 7.

Similar numerals of reference designate like parts throughout all the figures of the drawings.

The improved engine comprises a casing forming, in the present instance, a cylindrical piston cylinder 1, and an intersecting substantially semi-cylindrical abutment rotor casing 2. The piston cylinder or casing 1, and abutment rotor casing 2, are provided at one end with a head 3, and at the other with a removable valve or port head 4. The heads 3 and 4 are provided with collar bearings 5, the latter being preferably provided with annular friction portions 5^a, to receive and contain the power or driving shaft 6. If desired, the bearings 5, may be provided with an annular packing 5^b, secured by

means of removable packing or bearing collars 5[c]. The piston rotor 7, is keyed or otherwise secured upon the power or driving shaft 6, and is provided with a plurality of piston wings 7[a], adapted to revolve within the piston cylinder and to impinge upon the inner periphery or surface thereof. The piston rotor is provided with rotor heads 7[b], extending flush with the ends of the piston wings 7[a], and are adapted to form annular expansion and exhaust chambers on opposite sides of said piston wings as hereinafter described. The rotor heads 7[b], are preferably provided with annular flanges 8, adapted to extend into and to be revolved within similarly shaped grooves 8[a], of the heads 3 and 4.

As a means for providing steam or fluid pressure bearings at the ends of the piston rotor to receive the radial and lateral thrusts of the shaft and rotor, respectively, the bearing portions 5, of the heads 3 and 4, are provided with radially and circumferentially extending fluid pressure bearing chambers 9, and 10, respectively.

As a means for supplying the fluid chambers 9, and 10, with a live bed of steam or operating fluid under pressure, a branch inlet pipe 11, is connected to the fluid supply pipe 12, and leads into the chambers 9, and 10, through the bearing portion of the port head 4, as illustrated in Fig. 2 of the drawings. As a means for supplying the fluid chambers 9, and 10, of the opposite bearing head with the operating fluid, a supply pipe 13, is mounted longitudinally in the rotor, and intersects the fluid chambers 9, and 10, formed in the bearing portion of the opposite head 3.

The abutment rotor 14, is revolubly mounted in the rotor casing 2, by means of trunnions or bearing pins 14[a], in suitable bearings of the heads 2[a], of the rotor casing. The rotor 14, is provided with a plurality of wings 14[b], adapted to be successively engaged by the piston wings 7[a], of the piston rotor, each of said wings being adapted to form a fluid pressure abutment when moved to the position illustrated in Figs. 1, and 3, of the drawings. The wings 14[b], are of such form and disposition relative to the intersected portion of the inner periphery of the piston cylinder and the tips of the piston wings 7[a], that the wing tips 14[c], will register with said inner periphery of the piston cylinder or chamber when the abutment rotor 14, is in its abutment position as indicated in Figs. 1, and 3, of the drawings. The abutment rotor is provided with suitably shaped recesses between the wings 14[b], to receive and contain the piston wings 7[a], as the latter are in the act of passing and actuating the abutment rotor to form the next abutment as illustrated in Fig. 4 of the drawings.

The operating fluid is admitted into the piston chamber at a point between the wing of the abutment rotor in abutment forming position, and the adjacent piston wing through either of the ports 15, and 16, either of which is adapted to act as an inlet or exhaust port, depending on the direction in which the piston rotor is to be driven. The piston rotor is shown in the drawings as being driven from left to right, and consequently, the port 15, is acting as an inlet port and the port 16, as an outlet or exhaust port. The ports 15, and 16, are spaced from the shaft in different radially and circumferentially extending planes, and one of the rotor heads 7[b], is provided with ports 17, similarly spaced from the shaft or axis of the piston rotor and arranged on each side and in close proximity to the piston wing 7[a]. The ports 17, in the head 7[b], are adapted to register with the ports 15, and 16, in proper sequential order during the revolution of the piston rotor, and as a means for allowing the operating fluid to pass into the piston chamber for a proper time during the revolution of the piston rotor, said ports 15, and 16, are preferably elongated or extended in the form of slot openings as shown.

As a means for directing the operating fluid to the ports 15, and 16, (in accordance with the direction in which the piston rotor is to be moved), a valve body 18, is provided on the port head 4, near the ports 15, and 16, said valve body being provided with openings or ducts 18[a], and a two-way valve 19, provided with openings 19[a], adapted to be brought into registry with the ducts or ports 18[a], according to the direction in which it is desired to move the piston rotor as above referred to.

As a means for locking the abutment rotor while in its abutment forming position, and while the operating fluid is under compression or is expanding between the abutment and the piston wing as illustrated in Fig. 3, of the drawings, as well as means for automatically releasing the lock just prior to the actuation of the abutment rotor by the piston rotor as indicated in Fig. 4, of the drawings, the ends of the wings 14[b], may be provided with a plurality of spring resisted piston bolts 20, (see Figs. 5 and 6,) mounted in suitable openings in the ends of the wings, said piston bolts being provided with piston heads 20[a], communicating with pockets 20[b], inset from the sides of the abutment wings 14[b]. The piston bolts 20, are normally confined against the resistance of the springs 21, by means of stop bolts 22, and when the rotor 14, is in abutment forming position, and the operating fluid is under compression between the abutment wing and the adjacent piston wing and is moving the latter as indicated in Fig. 3, of the drawings, the pressure of the operating fluid upon the piston head 20[a], of the piston bolt marked 20[c] in Figs. 3, and 6, of the drawings, will

hold said piston bolt seated in the opening 20^d, (see Figs. 4 and 6,) of the adjacent casing head 2^a.

The port head 4, is preferably provided with a crescent shaped exhaust portion 23, below or diagonally opposite the elongated ports 15, and 16, to receive the exhaust through the ports 17, in the heads 7^b, as the piston rotor is revolved, said exhaust portion 23, preferably communicating with an exhaust pipe 24.

When the piston rotor is moving in the direction indicated in the drawings, it will, of course, be apparent that any portion of the operating fluid remaining in the piston chamber will be positively exhausted in what may be termed the exhaust chamber portion B, and through the outlet port 16, as indicated on the drawings.

When the operating fluid has exhausted its force in what may be termed the expansion chamber portion A, the piston bolt 20^c, is retracted or drawn out of the opening 20^d, and the abutment rotor is free to be actuated by the adjacent piston wing as indicated in Fig. 4 of the drawings.

From the foregoing description, taken in connection with the accompanying drawings, the operation and advantages of my invention will be readily understood.

Having thus described an embodiment of my invention, what I claim and desire to secure by Letters Patent is,—

1. In a rotary engine, a casing provided with an abutment rotor and a piston rotor, a valved supply pipe provided with eduction and induction ports in said casing, and fluid actuated means for intermittently locking said abutment rotor in abutment forming position.

2. In a rotary engine, a casing provided with elongated ports spaced in different radially and circumferentially extending planes, a piston rotor provided with ports adapted to register and coöperate with said elongated ports, an abutment rotor provided with fluid actuated locking means and a fluid supply pipe provided with a valve adapted to divert the operating fluid to either of said elongated ports.

3. In a rotary engine, a casing provided with a power shaft and a head having elongated ports spaced from said shaft in different radially and circumferentially extending planes, a rotor on said shaft provided with a head having ports adapted to register with said elongated ports, a piston actuated abutment rotor intermediate said elongated ports, and an exhaust port in said head diametrically opposite said elongated ports and abutment rotor.

4. In a rotary engine, the combination with a casing provided with inlet and outlet ports, a piston rotor provided with a head having inlet and outlet ports adapted to be brought into coöperative relationship to said first mentioned ports, and a piston actuated abutment rotor provided with piston bolts adapted to lock said rotor while the operating fluid is under compression and to automatically release the same prior to being actuated by said piston rotor.

5. A rotary engine, comprising a casing formed with a piston chamber and a secondary chamber, a rotor provided with wings adapted to be successively moved into and to form abutments in said piston chamber, a rotor provided with piston wings adapted to engage said abutment wings and to form expansion and exhaust chambers on opposite sides thereof, elongated ports communicating with said expansion and exhaust chambers, a rotor-head provided with port openings on opposite sides of said piston wings, and a fluid supply pipe provided with a two-way valve adapted to supply the operating fluid to either of said elongated ports.

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

GEORGE B. DUNBAR.

Witnesses:
CHAS. H. SLOCUM,
ROSA A. SLOCUM.