A. V. BUDD.

ROTARY ENGINE.

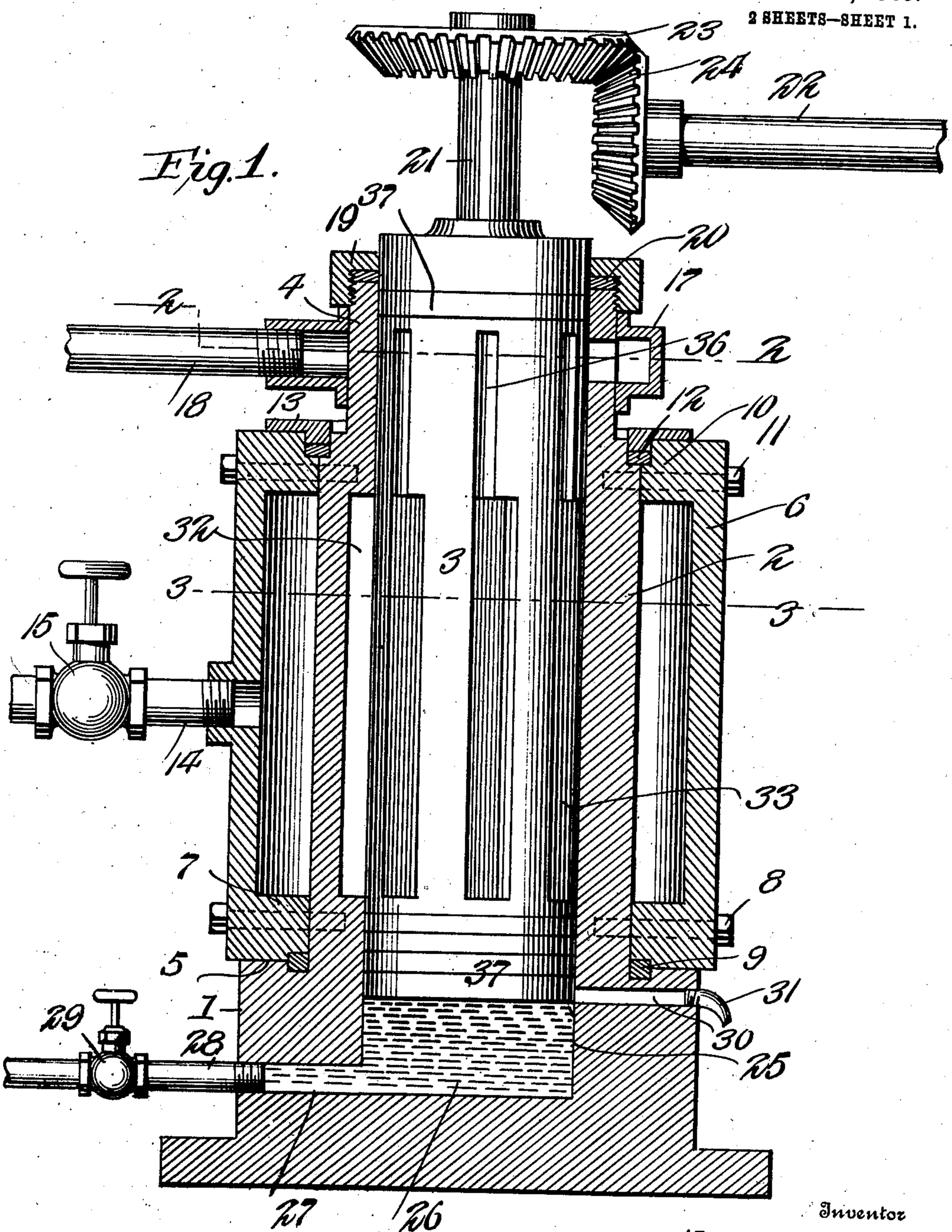
APPLICATION FILED JUNE 23, 1908.

915,549.

Patented Mar. 16, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

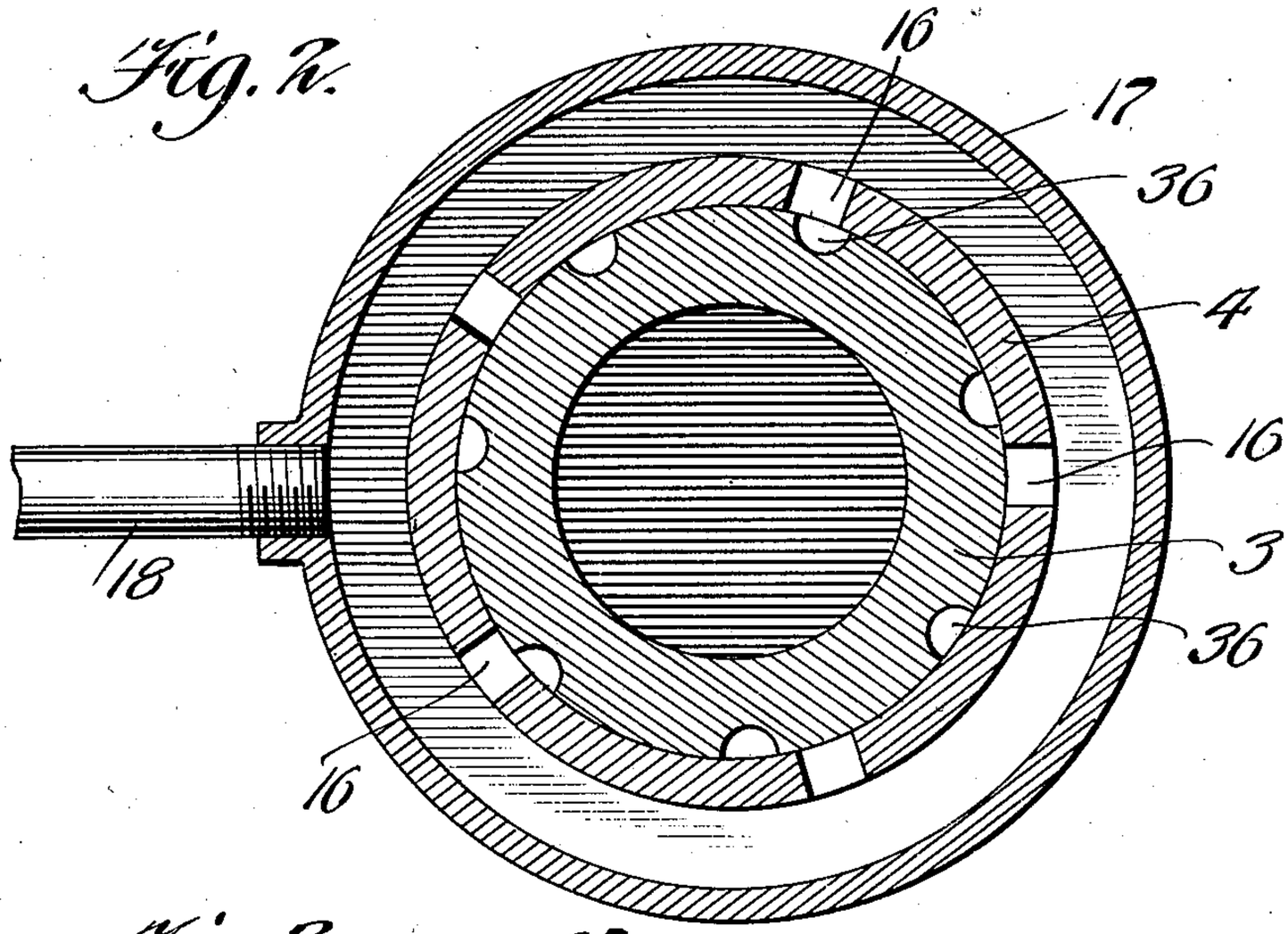
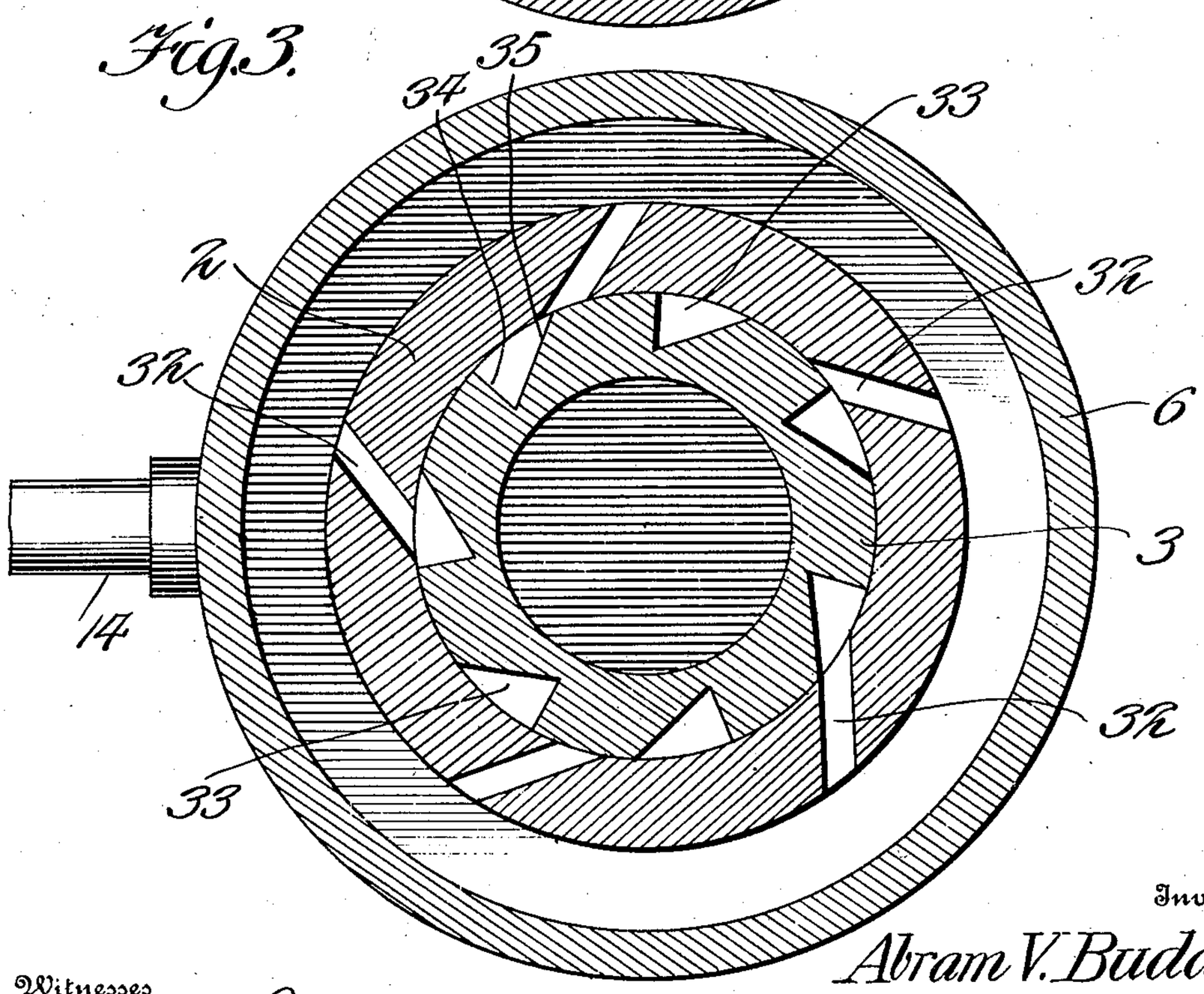


Fig. 3.



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UNITED STATES PATENT OFFICE.

ABRAM V. BUDD, OF PHILADELPHIA, PENNSYLVANIA.

ROTARY ENGINE.

No. 915,549. Specification of Letters Patent. Patented March 16, 1909.

Application filed June 23, 1908. Serial No. 439,995.

To all whom it may concern:

Be it known that I, ABRAM V. BUDD, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to rotary engines and has for its object to provide a novel and simple construction of vertical or horizontal engine of this type in which provision is made for the effective supply, use and exhaust of the steam or other impelling medium, whereby a high degree of driving power may be secured with economy in the consumption of the impelling agent.

Another object of the invention is to provide a novel construction of vertical rotary engine in which a cushioned bearing for the piston is employed, whereby the piston is supported and balanced in an effective manner.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a central vertical section through a vertical rotary engine embodying my invention, the piston appearing in elevation. Figs. 2 and 3 are horizontal sections taken, respectively, on the lines 2—2 and 3—3 of Fig. 1.

In the exemplification of the invention as herein shown in the form of an upright engine, 1 designates a base, from which rises a cylinder 2, within which turns the rotary piston 3. The cylinder 2 is preferably integral at its lower end with the base and provided at its upper end with a reduced cylindrical extension 4, the body of the cylinder being of less diameter than the base so that the latter projects in the form of a surrounding supporting shoulder 5.

A steam chest or casing 6, of a height or length equivalent to that of the body of the cylinder, surrounds the same and is provided at its lower end with an inwardly extending flange 7 closely fitting about the lower end of the cylinder and secured by bolts or other suitable fastenings 8. The lower end of the chest or casing is sufficiently enlarged by the formation of the flange 7 to rest squarely upon the annular shoulder 5, the inner edges of the shoulder and flange being recessed to receive a suitable packing strip 9 to form a tight joint at the base of the chest. The upper end of the chest or casing 6 is similarly provided with an inwardly extending flange 10 and is fixed to the upper end of the cylinder below the extension 4 thereof by screws 11. The meeting edges of the flange and cylinder are also suitably recessed at this point for the reception of a packing strip 12 to form a straight joint, said strip being confined in position by a suitable annular compression plate 13, which may be secured to the upper end of the chest in any preferred manner.

The chest is provided at one side with a pipe 14 for the supply of the steam or other fluid impelling agent thereto, the feed of which through said pipe to the chest is controlled by a valve 15. The cylindrical extension 4 of the cylinder is provided with a plurality of radial exhaust ports 16, for the escape of the spent fluid medium into an annular exhaust chamber 17, with which is connected an exhaust pipe 18. The upper end of the extension 4 is externally threaded for the reception of a packing cap or ring 19, between which and the upper edge of said reduced extension is arranged suitable packing 20, to form a tight joint between the same and the upper end of the piston 3.

The piston 3 is of a proper form and diameter to snugly fit the interior of the cylinder 2, in which it is journaled for free rotation, the upper end of said piston having projecting therefrom a drive shaft 21 from which power may be communicated to a power shaft 22 in any preferred manner, as by the use of intermeshing gears 23 and 24. The piston extends at its lower end into a chamber 25 in the base, in which chamber is arranged a body 26 of some suitable bearing medium, such as a gas or liquid, oil of a proper kind being preferably employed. This body forms a cushioned support for the piston by which the latter is maintained in a determined position and permitted to have free rotation, vertical adjustment of the piston being also afforded by regulating the height or degree of elevation of the liquid. The base is provided at one side with an inlet 27 into which is tapped a pipe 28 having a controlling valve 29, through which pipe the supporting liquid may be supplied to the chamber 25. At the opposite side of the chamber 25 is formed a radial exhaust port

30, normally disposed above the highest level of the body of liquid 26 inclosed by the lower end of the piston, said port communicating at its lower end with a discharge nozzle 31. Through this exhaust port the liquid contained in the chamber 25 may be exhausted when occasion requires, as when it is desired to lower the piston in the cylinder or to replenish said chamber with a fresh supply of oil fed thereto through the pipe 28. This may be accomplished by forcing liquid through the pipe 28 into the chamber 25 so as to elevate the piston until its lower end passes above the base of the exhaust port 30, and continuing the flow of the liquid to hold the piston elevated and force out the old supply of liquid through said exhaust port, allowing a fresh charge of liquid to take its place. By decreasing the pressure on the liquid, which may be supplied by the action of a force pump through the pipe 28, the piston may be allowed to assume its normal position, as, upon the closing of the valve 29, it will force the excess amount of liquid out through the port 30 and then gravitate downward and close said port.

The cylinder 2 is formed with a plurality of longitudinal tangential feed slots or passages 32 extending entirely therethrough and affording communication between the interior of the chest and the interior of said cylinder. These slots are equidistantly arranged around the circumference of the cylinder and are of a height or length corresponding to the height or length of the portion thereof inclosed within the chest. The piston is formed for coöperation with said slots 32 with an annular series of longitudinal pockets or channels 33, each having a radial wall 34 and an inclined or tangential wall 35. These pockets are adapted to receive the steam introduced through the slots or passages 32 to effect the rotation of the piston within the cylinder, the walls 34 acting as abutments against which the steam impinges to impel the piston, as will be readily understood. In the upper end of the piston is also formed a series of grooves or channels 36 operating as discharge passages for the flow of the exhaust steam from the pockets 33 to the exhaust ports 16 communicating with the external exhaust chamber 17. As any certain pocket 33 in the piston comes into alinement and takes steam from a passage 32, the steam acts thereon to propel the piston in a determined direction according to the arrangement of the abutment walls 34, and upon the movement of the pocket past said passage and at a point intermediately between the same and the next adjoining passage in the course of revolution the coöperating exhaust groove 36 comes into an alinement with one of the exhaust ports 16, and the steam accordingly discharges through said groove and port into the exhaust chamber 17.

It will be observed that the passages 32 are less in number than the steam pockets 33, and that the arrangement of the passages and pockets is such that only a determined number of the pockets come into communication with a corresponding number of the passages at a time. In the present disclosure, the cylinder is shown as provided with five equidistantly arranged feed passages 32, while the piston is shown as provided with seven pockets, the construction and arrangement being such that three of the pockets at a time will come into communication with and take steam from three of the passages, while the supply of the steam will be cut off from the other pockets. Hence, in the rotation of the piston the pockets communicating with the steam supply passages are constantly changing, some of the pockets being filled with steam acting thereon to impel the piston, others being in exhaust position and still others arranged to take a fresh supply of steam from the supply passages, by which the piston is balanced in action by the steam pressures at different points thereon and a uniform rotation thereof under the action of the impelling agent secured. The exhaust grooves or channels 36 communicate with the upper ends of the pockets 33 in rear of the longitudinal center of the pockets in the direction of rotation of the piston, so that the pockets will be filled with steam which will act upon the abutting walls 34 to a determined extent before the steam passes into the exhaust channel, and, as before described, the exhaust ports 36 are so arranged relatively to the supply ports that a degree of revolution of the piston equivalent to one half or more of the distance between the adjacent supply ports is permitted before either discharge channel comes in communication with an exhaust port for the final exhaust of the steam from any particular pocket to the exhaust chamber 17, thus allowing the steam to have its full effect upon the abutment of the pocket before it is discharged. The upper and lower ends of the piston are cylindrical to snugly fit the lower end of the body of the cylinder and the upper end of its cylindrical extension 4, and are provided with suitable packing rings 37 to prevent leakage of the steam or impelling agent at these points.

In practice, it will, of course, be understood that the essential features of the invention may be embodied in a horizontal instead of a vertical engine, in which event the chest will rest upon a suitable supporting base and the piston may project at either end beyond the ends of the cylinder and provided with shaft extensions, from one or both of which power may be transmitted. In the vertical type of engine, a conical bearing may be emp[illegible]yed in the chamber 25, to support

the piston, and these changes are deemed to fall within the spirit and scope of my invention.

In the operation of the engine, it will, of course, be understood that upon the opening of the valve 13 the steam, compressed air or other motive agent employed will pass into and fill the chest 6, and thence flow through the slots or passages 32 of the pockets 33 of the piston, by which the latter will be rotated, and finally exhaust through the channels 36 into the exhaust chamber 17 and out from the latter through the pipe 18. It is believed that the simplicity of the construction and advantages thereof will be readily understood from the foregoing description.

Having thus fully described the invention, what is claimed as new is:—

1. A rotary engine embodying a base having a chamber therein, an upright cylinder rising therefrom, a rotary piston mounted in said cylinder with its lower end snugly fitting within the upper portion of said chamber, and a body of liquid in said chamber below said piston and forming a support for the piston.

2. A rotary engine embodying a base having a chamber provided with a valved inlet and an outlet disposed above the level thereof, a fluid supporting medium contained in said chamber, a cylinder rising from the base, a rotary piston mounted in said cylinder and resting at its lower end upon the body of liquid and closing said exhaust port, and means for supplying steam to said cylinder for driving the piston.

3. A rotary engine embodying a chest or casing, a cylinder inclosed therein and extending at one end therefrom, the body of said cylinder being provided with steam supply passages and the extension thereof with exhaust passages; and a piston mounted to rotate within the cylinder and provided with steam pockets for coöperation with said supply passages and with exhaust channels communicating therewith for coöperation with said exhaust passages.

4. A rotary engine embodying a chest or casing, means for supplying a fluid impelling medium thereto, a cylinder inclosed within the casing and extended at one end beyond the same, the body of said cylinder being provided with an annular series of feed passages and the end extension thereof with a series of exhaust passages, and a piston inclosed within the cylinder and its extension, said piston having its portion within the body of the cylinder formed with a series of longitudinal steam pockets and its portion inclosed within the end extension of the cylinder formed with a series of exhaust channels communicating with said pockets at one side of the longitudinal center of the latter and adapted to connect the pockets with the said exhaust passages.

5. A rotary engine comprising a chest provided with means for supplying a motive fluid thereto, a cylinder inclosed within the chest and extended at one end beyond the same, the body of said cylinder being formed with an annular series of tangential supply passages and the end extension thereof having an annular series of exhaust ports, a chamber inclosing said exhaust ports and provided with an outlet, and a piston mounted within the cylinder and its end extension, the body portion of said piston being provided with a longitudinal series of steam pockets of greater number than and adapted to coöperate with said supply passages and the portion of the piston disposed within the extension of the cylinder having exhaust channels communicating with the adjacent end of said pockets in rear of the axial line of the latter and adapted to connect the pockets in the rotation of the piston with the exhaust ports.

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

ABRAM V. BUDD.

Witnesses:
LEWIS THOMAS,
MARY C. THOMAS.