F. P. NICHOLS.

ROTARY ENGINE.

APPLICATION FILED JUNE 16, 1910.

983,754.

Patented Feb. 7, 1911.

2 SHEETS—SHEET 1.

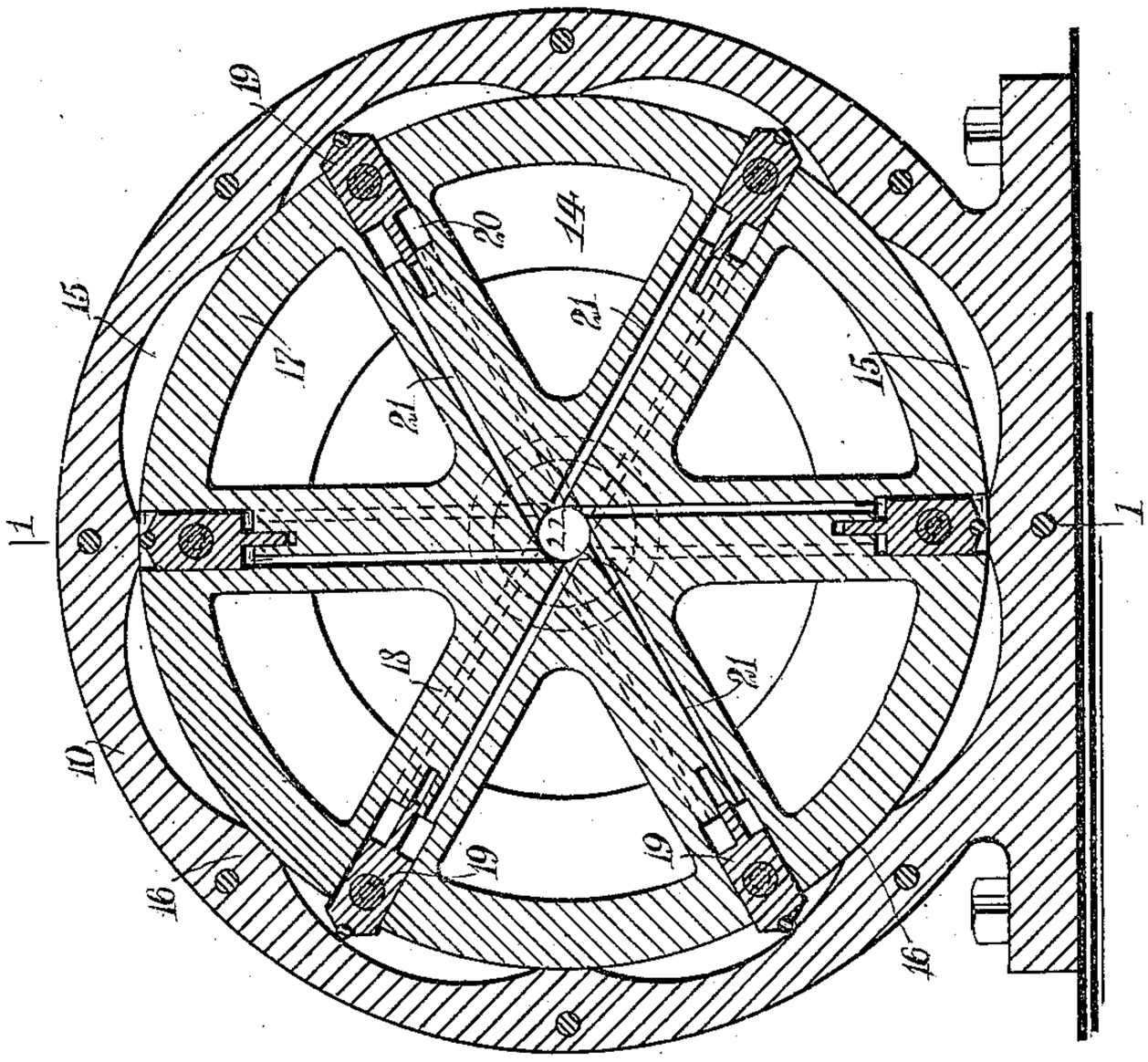

Fig. 2.

Fig. 1.

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Fig. 3.

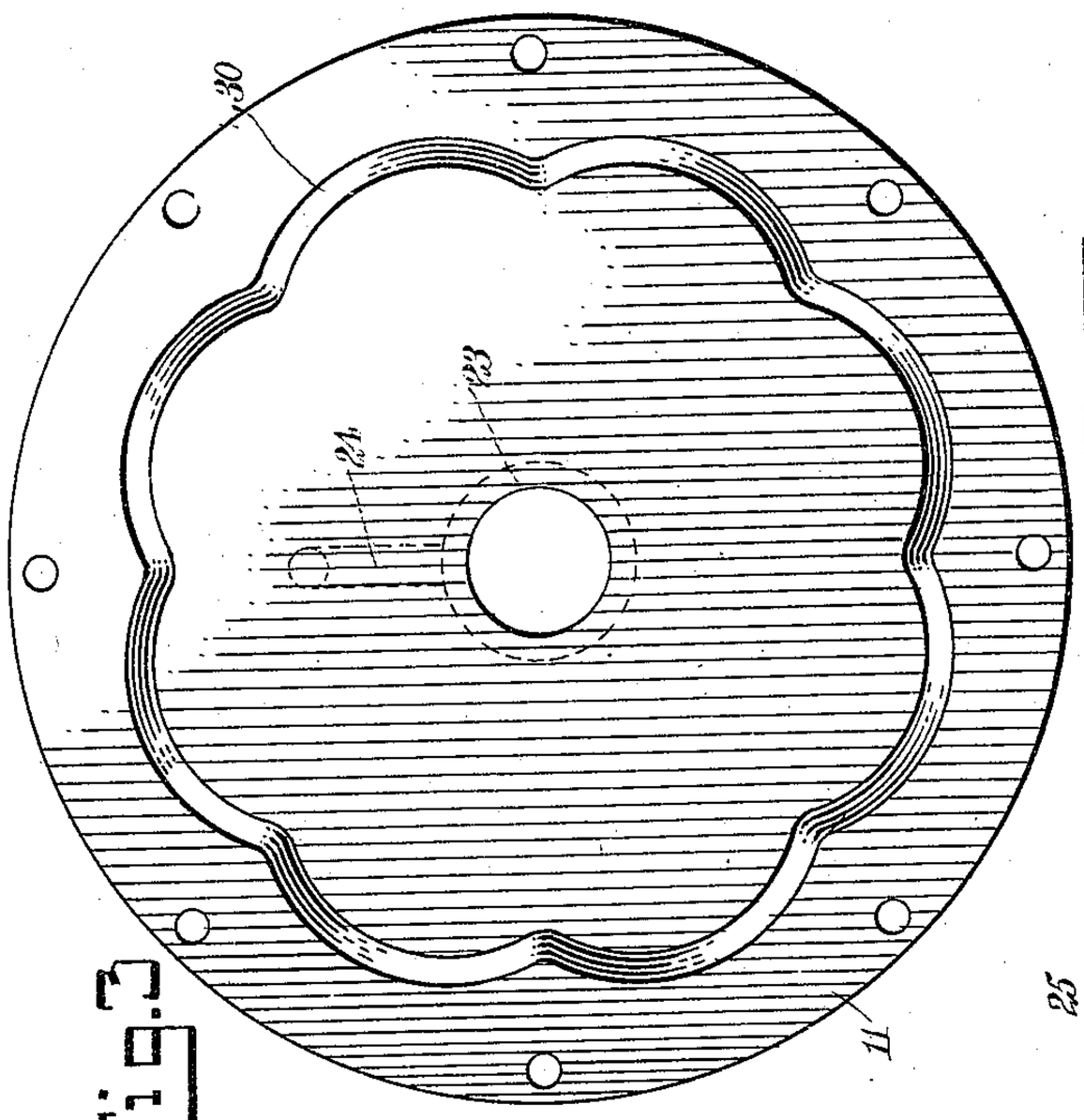

Fig. 5.

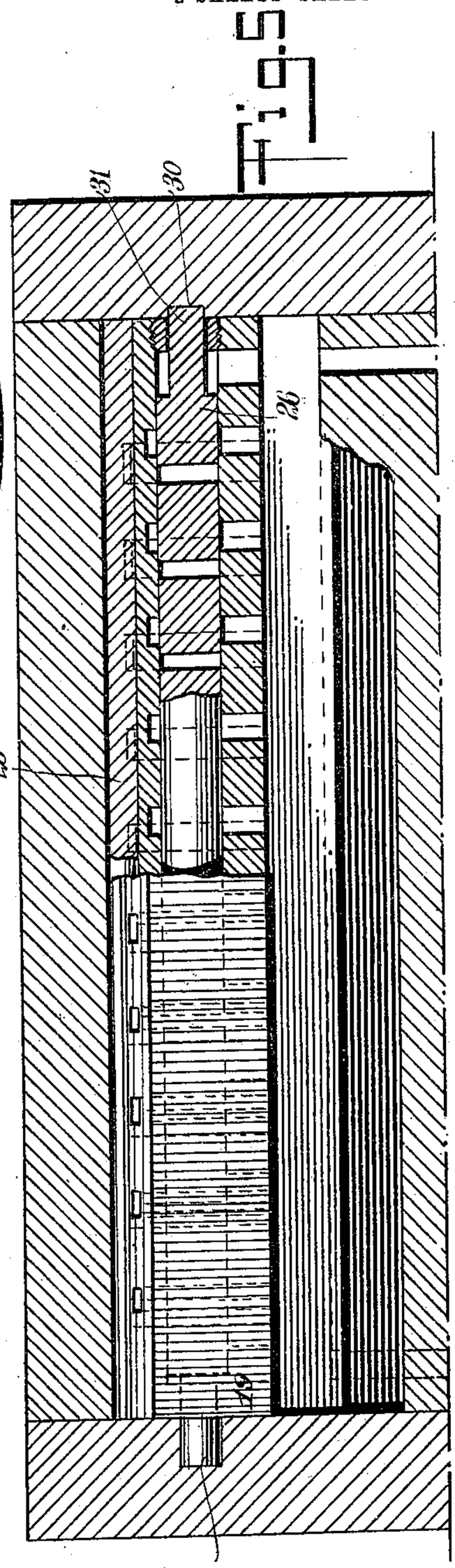

Fig. 4.

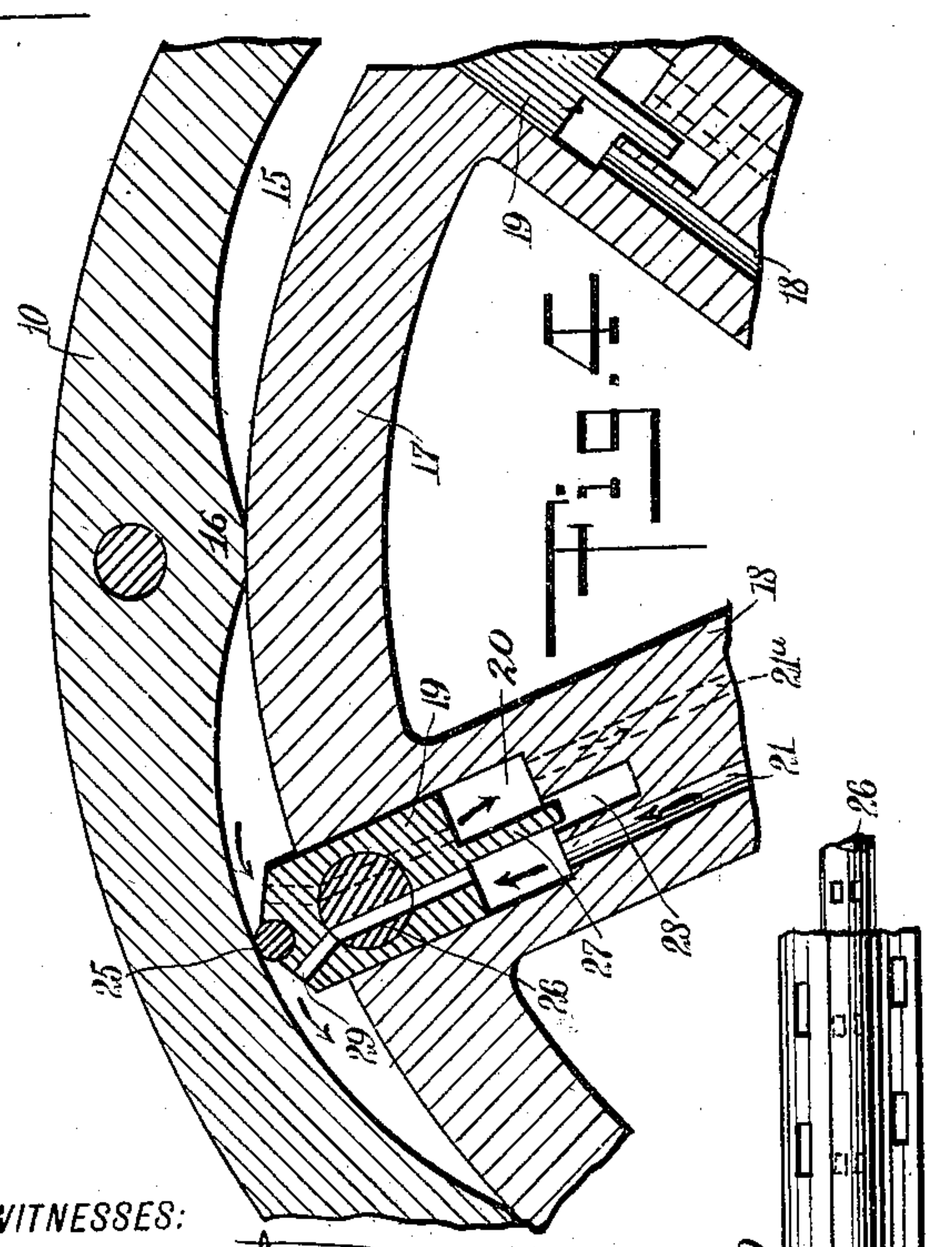

Fig. 1.

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FRANKLIN PRIESTLEY NICHOLS, OF HOUSTON, TEXAS.

ROTARY ENGINE.

983,754. Specification of Letters Patent. Patented Feb. 7, 1911.

Application filed June 16, 1910. Serial No. 567,134.

To all whom it may concern:

Be it known that I, FRANKLIN P. NICHOLS, a citizen of the United States, and a resident of Houston, in the county of Harris and State of Texas, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in rotary engines, and more particularly to that type of rotary engine, one example of which is illustrated in my previous Patent No. 928,147, issued July 13, 1909. In this engine, I employ an outer casing or shell, the inner surface of which is provided with a plurality of cam pockets, and within the casing is mounted a rotor having blades movable radially and adapted to follow the contour of the inner surface of the casing.

One object of my present invention is to more effectively control the delivery of motive fluid to the pockets in the outer casing, and in order to do this, I provide the sliding blades or pistons with valves, which are mechanically operated during the movement of the rotor.

Other objects and advantages of my invention will be set forth more fully hereinafter and the scope of the invention defined in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a longitudinal section through an engine constructed in accordance with my invention, said section being taken on the line 1—1 of Fig. 2; Fig. 2 is a transverse section through the engine and taken on the line 2—2 of Fig. 1; Fig. 3 is a view of the inner face of one of the end walls of the casing; Fig. 4 is a section similar to a portion of Fig. 2 but on an enlarged scale; Fig. 5 is a section similar to a portion of Fig. 1, but on an enlarged scale and showing portions of the sliding piston blade and controlling valve in section; and Fig. 6 is an edge view of a portion of one of the sliding piston blades.

My improved engine in its construction embodies an outer casing having a substantially cylindrical peripheral wall 10 and end walls 11 and 12. The end walls present bearings for the shaft ends 13 of a rotor mounted within the casing and driven by the motive fluid. The inner surface of the peripheral wall 10 is scalloped or corrugated to present a series of pockets 15, each extending lengthwise of the peripheral wall parallel to the axis of rotation. These pockets are all of the same width and each is of its greatest depth intermediate its parallel side edges and gradually decreases in depth toward said side edges. The edge of one pocket is spaced a short distance from the adjacent edge of the next pocket, so as to present inwardly-extending flanges or ribs 16 separating the pockets. Within the casing the rotor 14 has a cylindrical peripheral wall 17 in engagement with the inner edge of each of said ridges or flanges, so as to completely separate each pocket from the adjacent ones. The wall 17 is connected to the center portion of the rotor by spoke sections 18, which also serve as conduits for delivering the motive fluid to the pockets, as will be set forth more fully hereinafter.

Spaced about the periphery of the wall 12 and preferably in alinement with each spoke, is a radially-movable plate or piston blade 19 of a length substantially equal to the length of the rotor and having its outer edge in engagement with the inner surface of the peripheral wall 10 of the casing. The several piston blades are pressed outwardly against this peripheral wall, so as to follow the contour of the several pockets and move inwardly and outwardly as the rotor moves. Each piston blade is preferably held outwardly by the pressure of the motive fluid itself, instead of by springs, cams or other mechanism. As shown, each piston blade is mounted to slide radially within a pocket or chamber 20, into the inner end of which the motor fluid may be delivered through a passage 21 extending radially in the corresponding spoke 18. The passages 21 are preferably located adjacent one end wall, as is shown in Fig. 1, and at the center they all communicate with a longitudinal passage 22 in the axle 13.

Within the adjacent end wall 11 of the casing, there is an annular chamber 23, which may receive motive fluid through a passage 24 and may deliver this motive fluid to the chamber 22 through radially-disposed passages in the axle. Thus, motive fluid entering through the passage 24 may at all times enter all of the chambers 20 and thus hold the piston blades outwardly against the wall

10. Each piston blade, at its outer end, is so constructed as to insure a close contact with the wall 10, and thus prevent the passage of motive fluid across the outer edge of the blade. As shown, each blade has a longitudinally-extending rod 25, fitting within a socket in the blade and presenting a curved wearing surface which slides or moves over the curved surfaces of the pockets.

For controlling the delivery of motive fluid to the pockets, each piston blade carries a valve 26 extending parallel to the axis of rotation of the rotor and movable lengthwise in its operation. Each piston blade 19, at its rear side, carries a depending flange or partition wall 27, adapted to fit into a socket 28 and to subdivide the chamber 20 into two separate and distinct compartments. Only one of these compartments receives motive fluid from the corresponding passage 21, while the other compartment communicates with a passage 21^a at the opposite end of the rotor, and shown in dotted lines in Figs. 1, 2 and 4. The passages 21^a are similar to the passages 21 and communicate with a central passage 22^a in the axle, an annular chamber 23^a extending around the axle, and an outlet passage 24^a in the end wall 12. These passages 21^a, 22^a, 23^a and 24^a correspond to the passages 21, 22, 23 and 24 at the opposite end, and either set of passages may operate for the delivery of motive fluid and the other set for the escape of the exhaust.

The valve 26 has two sets of passages 29 therethrough, one set of said passages leading from the chamber 20 at one side of the partition 27 to the pocket 15 at one side of the outer edge of the piston blade, and the other set of passages leading from the opposite side of the partition 27 to the pocket 15 on the opposite side of the outer edge of the piston blade from the outer ends of the first-mentioned set of passages. The piston blade has corresponding sets of passages, which may be brought into or out of registry with the passages in the valve by the reciprocation of the valve during the movement of the rotor.

If the engine is to be operated at full pressure of the motive fluid, it is not necessary that the valve 26 be employed, or if employed that it be movable, as the motive fluid may enter through one end wall of the casing and be delivered radially through the passages 21 to the chambers 20, to hold the piston blades out against the pocket walls, and the motive fluid will escape through one set of passages to the pockets and force the blades and the rotor in one direction. The engine as illustrated, is preferably constructed so as to cut off the supply of motive fluid before the piston has traveled the full length of its pocket, and thus utilize the expansion of the motive fluid if the latter be steam, compressed air or the like. The ports or passages through the valves are so arranged in respect to the passages through the piston blades, that when a valve is moved lengthwise to one position, for instance, that illustrated in Fig. 5, the ports will be out of registry and no motive fluid can escape out into the pocket. By moving the valve lengthwise toward the right-hand end to the position shown in Fig. 5, the ports will be brought into registry and the motive fluid may pass into the pockets and operate.

For controlling the movement of the valves, the end walls 11 and 12 are provided with grooves 30, corresponding in position and curvature to the inner surfaces of the corresponding pockets 13, and the groove in each scalloped portion is of varying depth and each valve has a terminal or end portion 31 disposed within the groove. The depth of the groove in one end wall bears such relationship to the depth of the groove in the opposite end wall, that the valves 26 will be reciprocated so as to open the valve for the admission of motive fluid to the pocket when the piston is at one end of the pocket, and to close the valve when the piston has passed across a portion of the width of the pocket, so as to shut off the motive fluid and permit the motive fluid within the pocket to act expansively upon the piston.

It will be noted that there are no parts operated by spring pressure or by any complicated mechanism, and the pressure of the pistons against the pocket walls is directly proportional to the pressure of the motive fluid, so that as the pressure of the motive fluid increases and the tendency of the fluid to flow past the outer edge of the piston increases, the pressure of the piston against the wall will correspondingly increase and permit this escape of the motive fluid. The pockets may be any depth or width desired, and a greater or lesser number of pistons may be employed. Preferably, the number of pistons is less than the number of pockets, so that it will be impossible for all of the pistons to the stop on dead center between adjacent pockets.

Various changes may be made in the construction and operation of my improved engine, without departing from the spirit of my invention.

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

1. A rotary engine having a casing, the inner surface of which presents a series of pockets extending parallel to the axis of rotation, a rotor within said casing and having a peripheral wall serving to separate each pocket from the adjacent ones, radially-movable blades carried by said peripheral wall, and a valve carried by each of said blades and extending along the blade ad-

jacent the outer edge of the latter, and movable lengthwise of said edge for controlling the supply of motive fluid to said pockets.

2. A rotary engine having a casing, a rotor disposed therein, a radially-movable piston blade carried by said rotor and adapted to engage with the inner surface of the casing, said rotor having a chamber in the rear of said piston blade, said piston blade having a partition subdividing said chamber into two separate compartments and having passages leading therethrough from each of said compartments, and said rotor having supply and exhaust passages communicating with said compartments, and a single valve carried by each piston blade and extending substantially parallel to the axis of rotation and serving to control the passages.

3. A rotary engine having a casing, a rotor disposed therein, a radially-movable piston blade carried by said rotor and adapted to engage with the inner surface of the casing, said rotor having a chamber in the rear of said piston blade, said piston blade having a partition subdividing said chamber into two separate compartments and having passages leading therethrough from each of said compartments, and said rotor having supply and exhaust passages communicating with said compartments, and a single valve carried by each piston blade and extending substantially parallel to the axis of rotation and movable lengthwise by its engagement with the casing.

4. A rotary engine having a casing provided with a peripheral wall and end walls, said peripheral wall having a series of pockets therein extending parallel to the axis of rotation of the engine and said end walls each having a cam groove therein, a rotor within said casing and having a series of radially-movable piston blades adapted to engage with the inner surface of the peripheral wall of the casing, and a valve carried by each piston blade and engaging with said cam grooves.

5. A rotary engine having a casing provided with a peripheral wall and end walls, said peripheral wall having a series of pockets therein extending parallel to the axis of rotation of the engine and said end walls each having a cam groove therein, a rotor within said casing and having a series of radially-movable piston blades adapted to engage with the inner surface of the peripheral wall of the casing, and a valve carried by each piston blade and extending substantially parallel to the axis of rotation of the rotor, each valve having portions extending beyond the opposite radial ends of its piston blade and engaging within said cam grooves, which latter serve to move the valve in a direction parallel to the axis of rotation.

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

FRANKLIN PRIESTLEY NICHOLS.

Witnesses:
J. J. NAUGHTON,
I. L. DUNN.