No. 720,993. PATENTED FEB. 17, 1903.

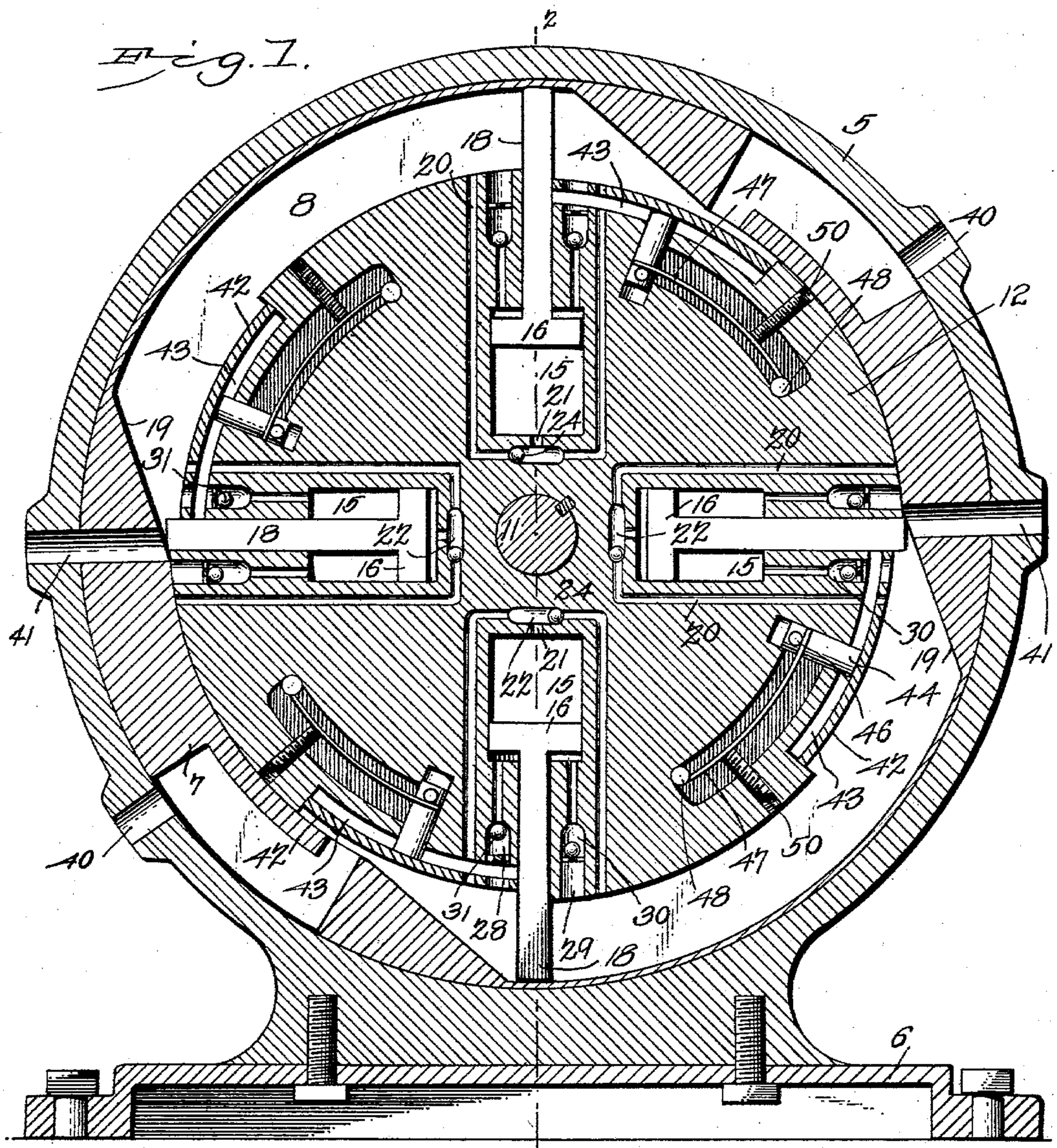
A. D. ALLEN.

ROTARY ENGINE.

APPLICATION FILED SEPT. 11, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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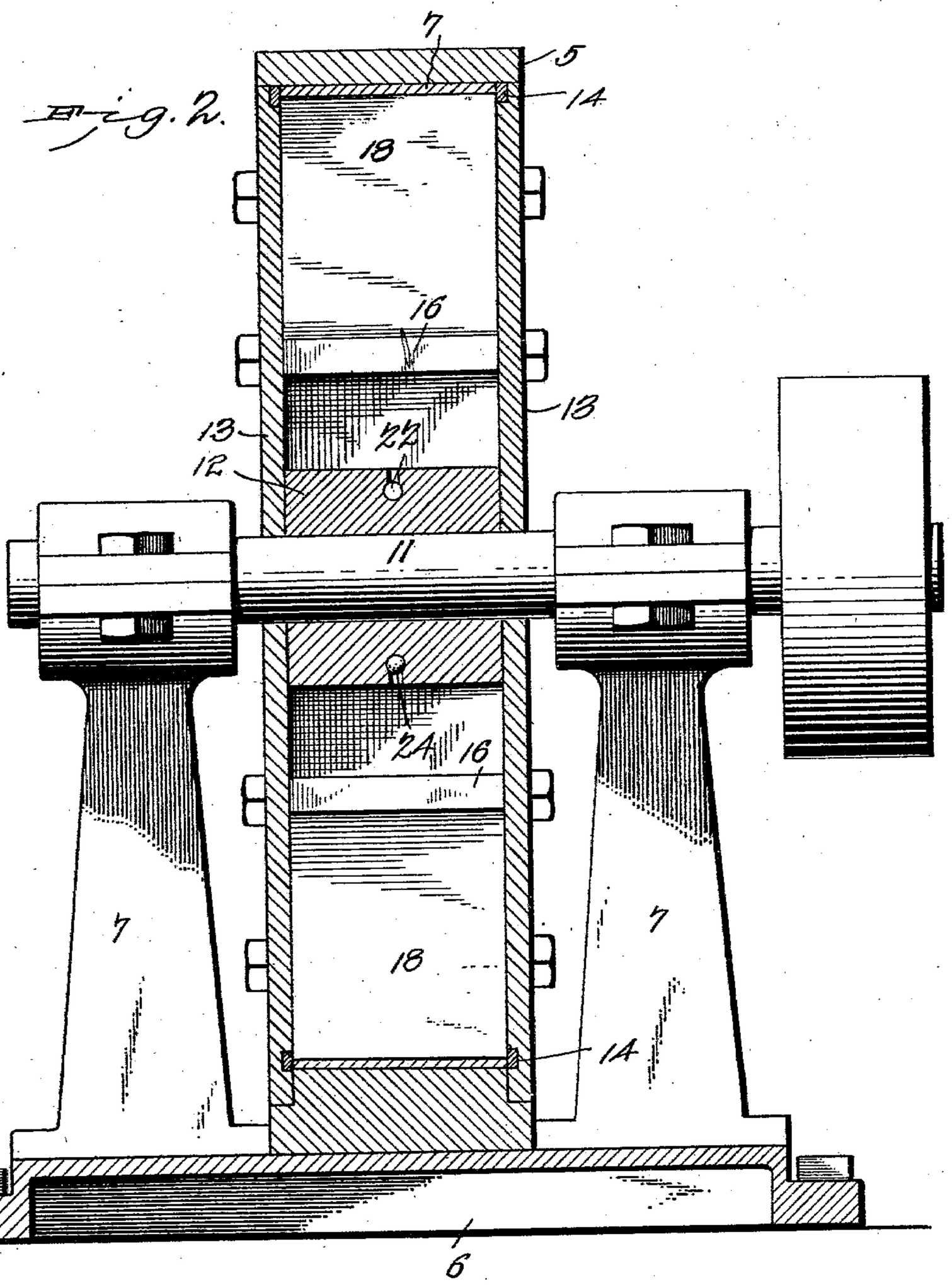
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

ANDERSON D. ALLEN, OF LITTLE COMPTON, RHODE ISLAND, ASSIGNOR OF ONE-HALF TO CORA BELL SEABURY, OF LITTLE COMPTON, RHODE ISLAND.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 720,993, dated February 17, 1903.

Application filed September 11, 1902. Serial No. 123,014. (No model.)

To all whom it may concern:

Be it known that I, ANDERSON D. ALLEN, a citizen of the United States, residing at Little Compton, in the county of Newport and State of Rhode Island, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to certain improvements in rotary engines, and has for its principal object to provide an engine having a piston so constructed as to regulate the quantity of steam admitted to the cylinder in accordance with the speed of the engine.

A further object is to provide an improved governing device carried by the engine-piston and adjustable to cut off the admittance of steam after the engine has attained the desired speed.

A still further object of the invention is to provide an improved form of piston and of the piston-blade mechanism whereby the radially-disposed piston-blades may be kept in close contact with the inner curved walls of the cylinder.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings, Figure 1 is a longitudinal sectional elevation of a rotary engine constructed in accordance with the invention. Fig. 2 is a transverse sectional elevation of the same on the line 2 2 of Fig. 1.

The outer casing 5 of the cylinder is ring-like in form and is secured to a suitable base 6. Within the outer casing is a cylinder 7, having two diametrically opposed steam-chambers 8, while the remaining portion of the inner wall of the cylinder fits snugly against the periphery of the piston. In some cases the outer casing 5 and the cylinder 7 may be formed integral, and the number of steam-chambers may be increased to any desired extent.

The base 6 supports a pair of standards 7, having bearings for the reception of a shaft 11, on which is mounted the piston 12, the latter being substantially circular in form and provided at each side with a disk 13, fitting closely within the ring-like casing 5 and against the sides of the cylinder member 7, annular packing-strips 14 being introduced between the two to prevent the escape of steam. The piston 12 is provided with a number of radially-disposed cylinders 15—four in the present instance—each cylinder receiving a rectangular piston 16, connected to a radially-guided piston-blade 18, the latter being moved from and toward the center of the piston by introducing steam or other fluid under pressure into the small cylinder. The inward movement of the piston-blades is made positive by contact with the inclined abutment-walls 19 of the cylinder, and the steam in the smaller cylinders is forced out into the arcuate steam-spaces and thence to the exhaust. Extending around each of the cylinders 15 is a U-shaped steam-passage 20, opening into the steam-space of the main cylinder on opposite sides of the respective piston-blades, and the small cylinders 15 are placed in communication with the respective steam-passages 20 by ports 21. Ordinarily this U-shaped passage would permit the direct flow of steam around the blades to the exhaust-port, and to prevent this a valve-chamber 22 is formed in each of the passages, said valve-chamber having a valve-seat at each end for the reception of a ball-valve 24, so that steam entering from either end of the passage 20 will force the ball against one of the valve-seats and prevent the direct flow of steam in said passage, while permitting the entrance of the steam to the port 21 to project the small piston 16 and the piston-blade to which it is secured. To permit the escape of steam or air from the space between the outer ends of the small cylinders and their respective pistons, I employ two escape-passages 28 and 29, disposed one on each side of the piston-blade and extending from the periphery of the main piston inwardly to the small cylinder. Each passage is provided with a valve-seat 30, against which may seat a ball-valve 31 under pressure of steam from

the curved steam-spaces of the main cylinder. The operation of this portion of the device will be readily understood. When one side of a piston-blade is under steam-pressure, steam enters through that portion of the steam-passage 20 in communication with the pressure-space and forces the ball 24 to the valve-seat at that end of the valve-chamber farthest from the steam-engines, preventing the passage of steam directly through the passage 20, while permitting steam to flow through the port 21 into the cylinder and force the piston and connected piston-blade outwardly into proper working position. At the same time the steam-pressure will be exerted on one or other of the ball-valves 31, that valve at the pressure side of the piston-blade being moved to closed position, while the opposite valve falls and permits free communication between the outer end of the small cylinder and the exhaust side of the piston-blade, so that no resistance is offered to the radial outward movement of the small piston and its blade. The mechanism will work equally well in either direction, and as the present engine is provided with four piston-blades and a corresponding number of small cylinders and pistons for maintaining said blades in operative position I employ two steam-ports 40 and two exhaust-ports 41, and the piping connections with these ports may be so arranged as to permit the use of either set of ports as steam-supply and the other as exhaust port.

One of the principal objects of the present invention is to automatically govern the quantity of steam admitted to the main cylinder in accordance with the speed of travel of the piston, and to this end I employ a radially-movable valve in the form of an arcute plate 42, disposed in a correspondingly-shaped recess 43 in the periphery of the main piston, there being one of such valves arranged adjacent to each of the piston-blades. The valve 42 is provided with a guiding-stem 44, fitting within a suitable guiding-opening in the piston, and the plate moves in a radial line when the speed of travel of the piston becomes abnormal. Each of the guiding-pins 44 is provided with a lug or projection 46, against which bears one end of a spring 47, having its opposite end secured to a fixed stud 48 in a recess in the body of the piston. The spring normally tends to force the pin 44 and the cut-off valve 42 inwardly, and the stress of each spring may be regulated to any desired extent by a screw 50, adapted to a suitable threaded opening in the periphery of the piston and bearing on the spring. These screws are so arranged that they may be brought opposite the exhaust-port 41 should it become necessary to change the adjustment without removing the piston from the cylinder. The position of the steam-supply ports with respect to the piston is such that steam can only be admitted to the cylinders while the recessed portions 43 of the piston are traveling past said steam-ports, and the radial position of the cut-off valve 42 governs the available area of said recess and regulates the quantity of steam admitted. When the speed of rotation is abnormal, the plates 42 are moved either inwardly or outwardly, the outward movement being under the influence of centrifugal force when the speed is increased and serving to lessen the steam area of the recess 43, and this valve-plate may move outwardly to such an extent as to completely cut off the supply of steam in the event of racing, where the engine is employed for driving a steamboat-propeller or where the speed of an automobile to which it is connected increases beyond a desired point, and the speed at which the steam is entirely cut off may be accurately adjusted by increasing or decreasing the stress of the springs 47 through the adjustable screws 50. While the engine may be reversed, as in slightly backing an automobile or boat, its construction is such that the automatic cut-off valves will operate in but one direction or that direction in which the piston normally travels, although this feature may be modified by placing a similar cut-off valve on the opposite side of each of the radial blades and providing means for locking one or other set of valves in inoperative position, while the other will be free to move to automatically cut off the steam-pressure. Each of the valves 42 is so arranged that the pressure of steam will be about equal on both sides of the valve, and for this purpose the small steam-passages 20 and 28 are continued through the valve-plate in order not to interfere with the proper operation of the small blade-moving pistons when the valves are at the extreme inward position, as well as to admit the steam between the inward face of the valve-plates and the bottom of the recesses as soon as the valve begins to move outwardly at the impulse of centrifugal force.

The construction of cut-off valve herein described represents the valve in the simplest form; but it will be understood that the invention consists, broadly, in the employment of a cut-off device carried by the piston of an engine and operable by centrifugal force.

Having thus described my invention, what I claim is—

1. In a rotary engine, a cylinder having steam inlet and exhaust ports, a revoluble piston seated within the cylinder, and an automatic cut-off arranged at the periphery of the piston and movable in one direction by centrifugal force, said cut-off forming one wall of the steam-inlet and serving to regulate the quantity of steam admitted to the engine.

2. In a rotary engine, a cylinder having inlet and exhaust ports, a revoluble piston within the cylinder, said piston having a recess which when brought into alinement with the steam-ports permits the passage of steam into the cylinder, and an automatic mechanism controllable by the speed of travel of the

piston for regulating the available steam area of said recess.

3. In a rotary engine, a cylinder having inlet and exhaust ports, a revoluble piston having a peripheral recess which when brought into alinement with the steam-ports permits the entrance of steam to the cylinder, and a plate disposed in said recess and movable in one direction by a spring and in the opposite direction by centrifugal force, said plate regulating the available steam area of the recess in accordance with the speed of travel of the engine.

4. In a rotary engine, a cylinder having steam inlet and exhaust ports, a revoluble piston having a peripheral recess for permitting the entrance of steam to said cylinder from the port, an arcuate plate disposed in said recess and movable outwardly under the influence of centrifugal force to reduce the steam area of the recess as the speed of the piston increases, and a spring effecting the inward movement of said plate when the speed of the piston decreases.

5. In a rotary engine, a cylinder having steam inlet and exhaust ports, a piston having a peripheral recess, a radially-movable plate fitting within said recess and having a guiding-stem adapted to a guiding-opening in the piston, a spring normally tending to force the plate inwardly toward the center of rotation of the piston, and means for adjusting the stress of said spring.

6. In a rotary engine, a cylinder having inlet and exhaust ports, a piston having a peripheral recess and provided with a guiding-opening, an arcuate plate disposed within the recess, a pin or stem carried by the plate and adapted to the guiding-opening of the piston, a spring carried by the piston and having one end bearing on said stem or pin, and an adjustable screw adapted to a threaded opening in the piston to regulate the stress of the spring.

7. In a rotary engine, a cylinder having steam inlet and exhaust ports, a revoluble piston disposed within the cylinder, a small radially-disposed cylinder in said piston, a radially-movable piston in said cylinder, a piston-blade connected to the radially-movable piston, a steam-passage extending around said small cylinder and in communication with the steam-space of the main cylinder on both sides of the blade, a steam-port leading from said passage into said smaller cylinder, a valve operable by steam-pressure from either direction for preventing the flow of steam from one side of the blade to the other, and valved passages located one on each side of the piston-blade for placing the outer end of said radial cylinder in communication with the steam-space of the main cylinder.

8. In a rotary engine, a cylinder, a revoluble piston therein, a radially-movable piston-blade, a blade-actuating piston, a radially-disposed cylinder formed in the main piston for the reception of said blade-actuating piston, a valved steam-passage communicating with the inner portion of the radial cylinder and with the steam-space of the main cylinder on both sides of the blade, and valved passages leading from the outer end of said small cylinder on each side of said blade.

9. In a rotary engine, a ring-like outer casing 5 having open sides or ends, a cylinder-section 7 fitted within said casing, a revoluble piston comprising a main revoluble drum and a plurality of radially-movable blades each of a width corresponding to that of the cylinder-section 7, a shaft carrying said piston, side plates bolted to the main cylinder and fitting within the casing 5 and bearing against both the sides of the cylinder-section 7, and bearings for the support of said shaft.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ANDERSON D. ALLEN.

Witnesses:
CORA M. BEALS,
SIMON R. ALLEN.