No. 713,342. Patented Nov. 11, 1902.

W. I. PHIFER.

ROTARY ENGINE.

(Application filed June 14, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

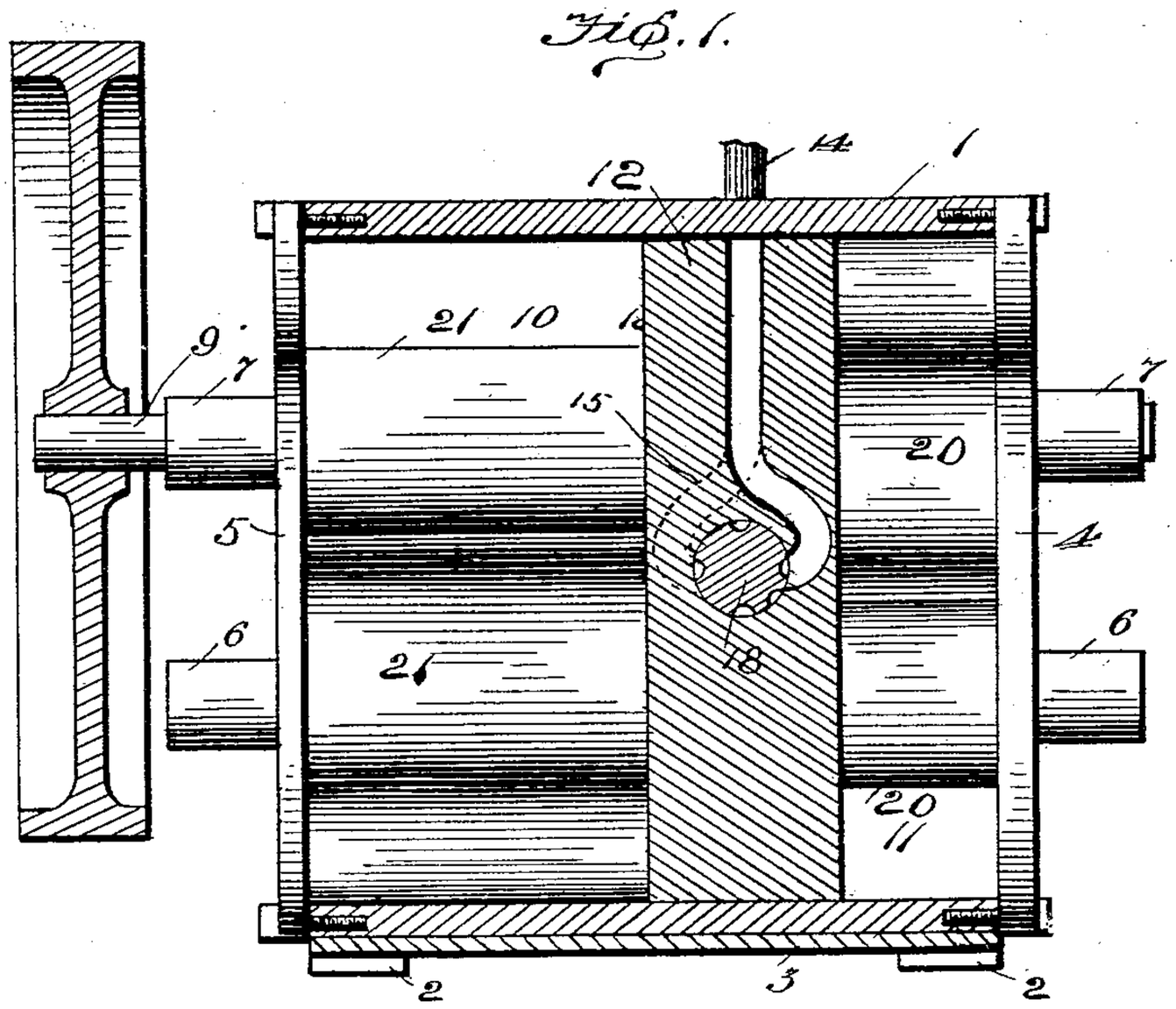

Fig. 2.

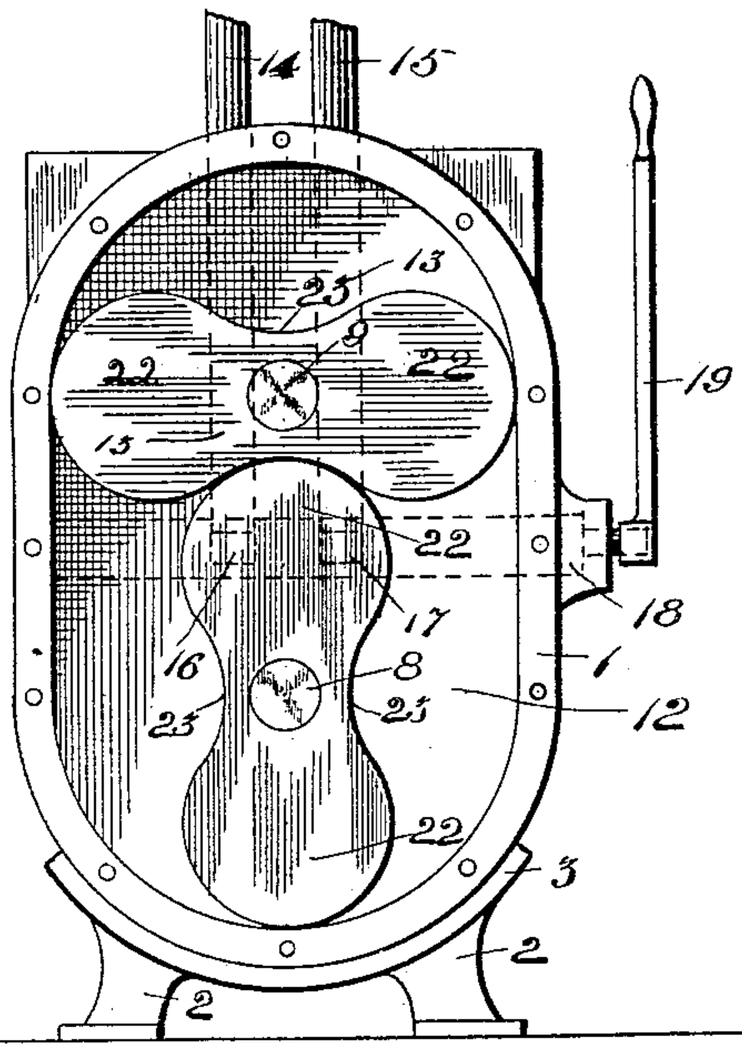

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Fig. 3.

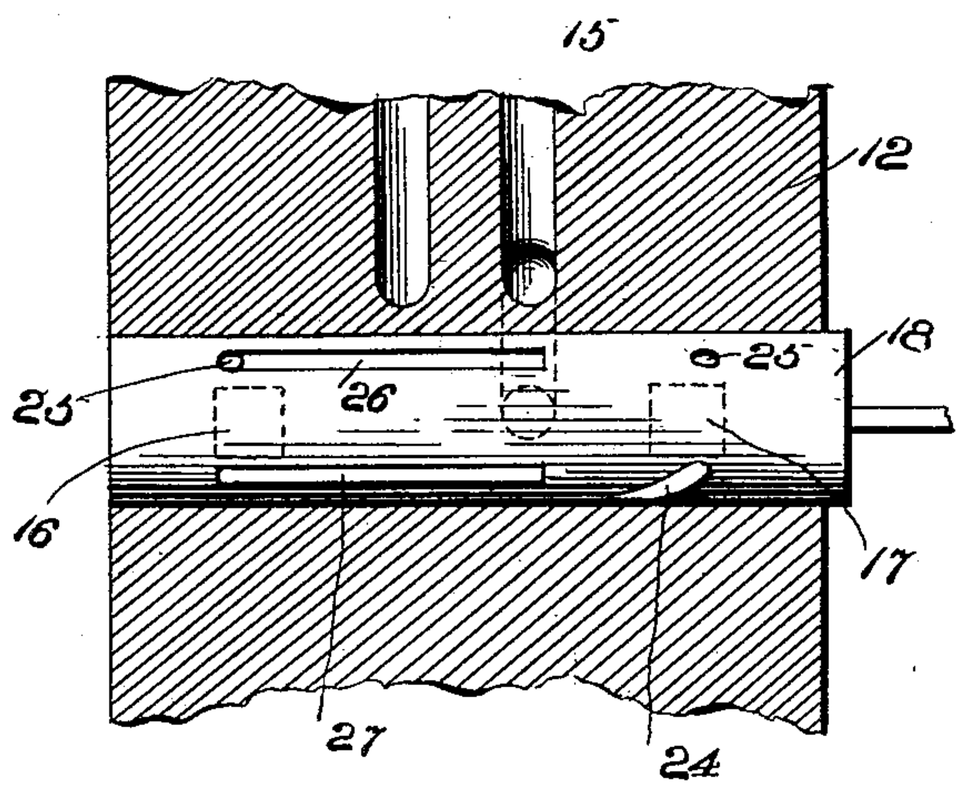


Fig. 4.

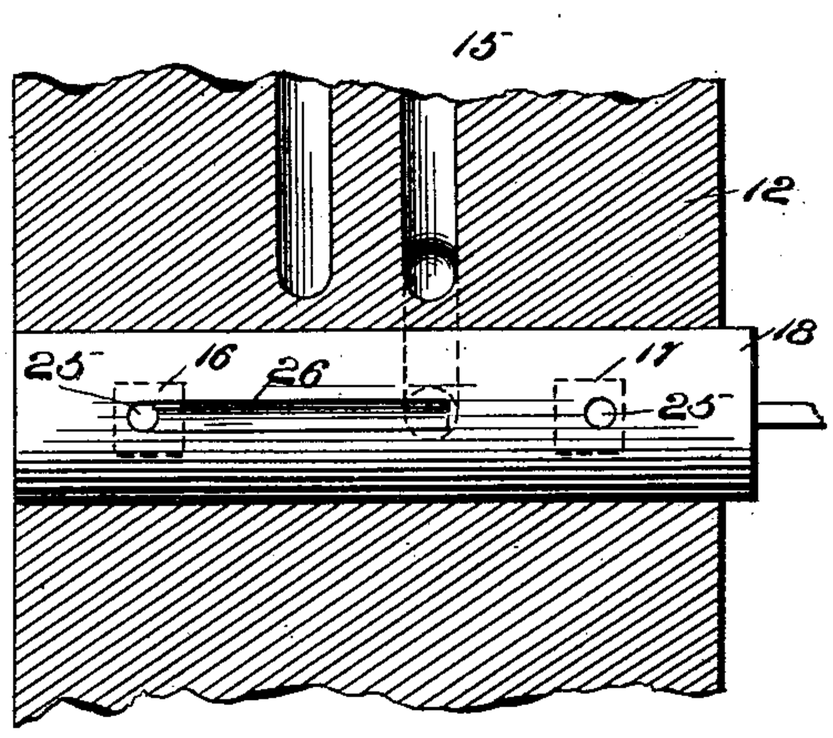


Fig. 5.

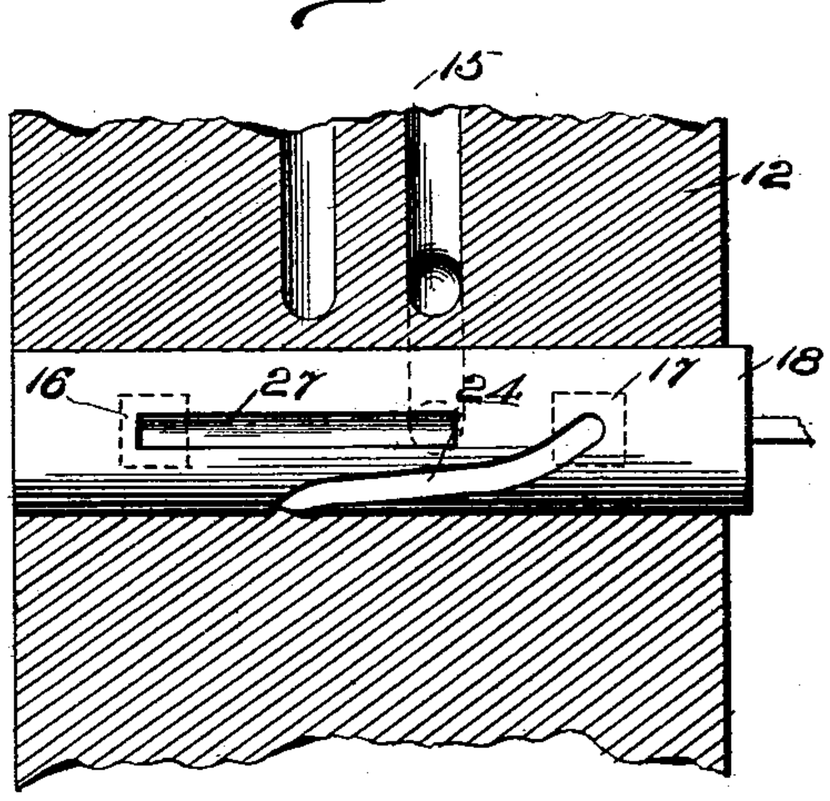


Fig. 6.

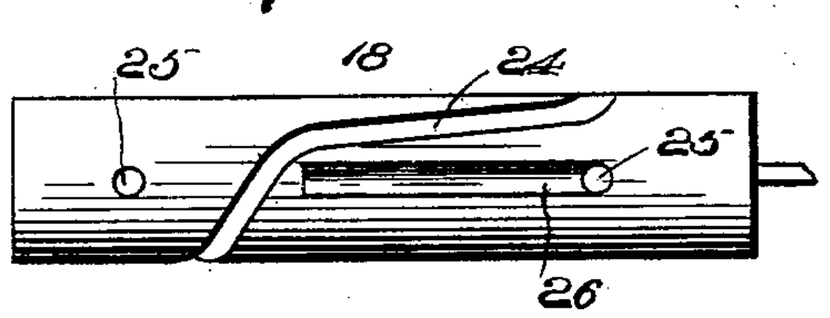
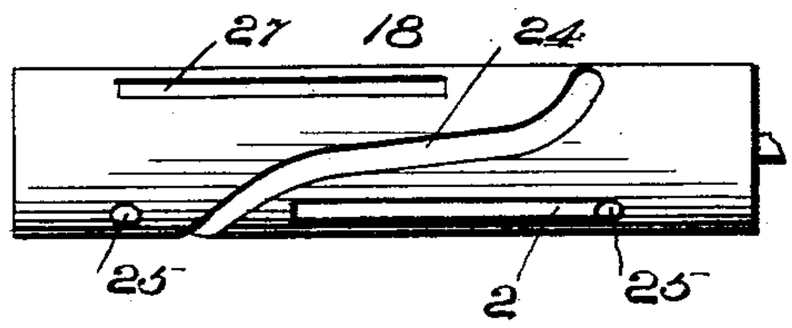


Fig. 7.



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ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 713,342, dated November 11, 1902.

Application filed June 14, 1901. Serial No. 64,581. (No model.)

To all whom it may concern:

Be it known that I, WASHINGTON IRVING PHIFER, a citizen of the United States, residing at California, in the county of Moniteau and State of Missouri, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to improvements in rotary engines; and the main object of my invention is the provision of a rotary engine which is provided with a dual system of rotary pistons, each shaft of which carries one pair, each piston of which is located in its chamber of the engine, and a simple valve for starting forward or reversing the pistons.

Another object of my invention is the provision of a rotary engine which is the embodiment of simplicity, durability, and inexpensiveness, thus producing a very useful and practical engine.

To attain the desired objects, the invention consists of a rotary engine embodying novel features of construction and combination of parts, substantially as disclosed herein.

In the drawings, Figure 1 is a side elevation of my engine with one side broken away to show clearly the interior mechanism. Fig. 2 is an end view thereof with the end of the casing removed. Fig. 3 is a transverse section of the partition or wall with the valve in position therein when being used as a throttle-valve. Fig. 4 is a similar view with the grooves 26 of the valve registering with the mouths of the ports 16 and 17. Fig. 5 is a similar view with the grooves 27 of the valve registering with the ports 16 and 17 of the partition. Figs. 6 and 7 are detail views of the valve removed.

Referring to the drawings, the numeral 1 designates the casing, which is substantially elliptical in cross-section and is provided with the standards 2 and the cradles 3. Secured to and removable from the ends of the casing are the caps or ends 4 and 5, which are provided with the incased alined bearings or boxes 6 and the hollow alined bearings 7, and journaled in the incased bearings is the lower shaft 8, while in the hollow bearings is the upper shaft 9. Dividing the casing of the engine into a large chamber 10 and a small chamber 11 is a partition or wall 12, which is provided with the channels or ducts 13, one to the rear of the other, which communicate with the steam-pipes 14 and 15, and provided in this partition midway of their length and upon opposite sides of the casing are the inlet or outlet ports 16 and 17, which are arranged in such a manner as to allow the proper distribution of steam and are adapted to be in the same plane as the valve-ports 25 of the valve 18. The ports 16 and 17 are placed in the position as shown in Fig. 3 and in dotted lines as in Fig. 1, and thus when one port is used as an inlet the other is used as an outlet or exhaust, and the lower ends of said ports are of a sufficient size to properly establish communication between one of the series of ports of the valve. As clearly shown, the lower ends of the ports open upon opposite sides of the valve-chamber, thus insuring a proper operation to the pistons of the engine. These ports are controlled by the valve 18, which is operated by the lever 19 to either admit steam through one port or the other to give the engine a forward or reverse movement, as may be desired. These ports 16 and 17 cause communication between the two chambers and are also in communication with the channels or ducts 13, so that by means of the valve, which intercepts the ports 16 and 17 and which is operated by the lever 19, steam is admitted through the proper pipe, duct, and outlet to give the proper motion to the engine.

In the construction of the engine it will be noticed that each shaft carries two pistons 20 and 21, but only one in each chamber—that is, one thin one, 20, for high pressure and one thick one, 21, for compounding—the two being separated by the partition in which the ports and valves are located. The pistons on each shaft are also set "quartering" or at right angles to each other, as shown in Fig. 2. By this arrangement they will act upon each other as eight large rolling cogs, thus producing a smooth motion without the use of cog-wheels to keep the parts in proper alinement. These pistons are each composed of the body which is composed of the two oppositely-arranged wings 22, the central curvature 23 having the same curve as the outer edge of each wing, so that they will snugly

fit and rotate properly in unison. The valve 18 is provided with S-shaped curved groove or spiral channel 24, whose inner end is upon the opposite side of the cylinder from the outer end, so that when one end registers with the proper duct the other end registers with the duct oppositely arranged and leading into the other chamber of the engine. This channel is employed to render the engine compound, and by turning the valve a one-half revolution the engine is reversed. This valve is further provided with the oppositely-arranged openings 25, having the horizontal channels 26 leading inward therefrom to the center of the valve, these channels being upon opposite sides, extending both toward the center of the valve from different directions. Parallel with these channels are the horizontal blind channels 27. When the blind channels and the spiral channel register with the ducts, the engine is compound with high pressure on both pistons, and when the short channels with the openings register with the ducts the engine is fed high pressure in both chambers on one side and will exhaust upon the other.

From this description, taken in connection with the drawings, the operation of my improved rotary engine will be readily understood and its numerous advantages fully appreciated; but, briefly stated, the operation is as follows: Steam is admitted through either one of the steam-pipes, the one not being employed as an entrance being converted into an exhaust by the valve, which is provided with proper channels to control the ducts 13 one at a time and at the proper time. When the engine is used as a compound engine, pressure is admitted first into the narrow chamber on the right-hand side, for instance, and exhausted through the partition into the wide chamber on the left. Of course either steam-pipe may be employed for feed and the other for exhaust. When the steam is admitted to the proper port, it enters the narrow chamber and then enters the larger chamber through the opposite port on the proper side of the pistons. By partly revolving the valve—that is, using the lever—the flow of the steam may be diverted to the opposite port, and a reverse movement will be imparted to the engine. When the valve is turned so that the channels 26 are respectively on top and bottom, the valve is a throttle-valve, as shown in Fig. 3. Assume now that the pipe 15 is the feed-pipe and pipe 14 the exhaust. Turn the valve toward the large chamber until the grooves 26 will register with the entrance of the inlet and outlet ports 16 and 17, as shown in Fig. 4. The engine will now be fed high pressure on both pistons on the left-hand side and exhaust from the right-hand side. If the valve be turned until the grooves 27, as shown in Fig. 5, register with the ports 16 and 17, high pressure is fed to the pistons from the right-hand side, and as the engine revolves the pressure fluid will pass to the left side and from there through the spiral groove 24 to the right-hand side of the thick piston, and as the engine continues to revolve the pressure fluid will pass over to the left side and exhaust through the channels 26. The engine is then working compound. To reverse its motion and maintain the compound working, the valve may be turned either way a half-revolution or until the grooves 26 change their relative positions to inlet and outlet. It will be seen that by means of this one valve and lever the engine will be under perfect control of the operator. Thus it will be seen that by this construction of valve and lever the ports may be so opened as to admit high pressure to both sets of pistons at the same time and allow the steam to exhaust through the opposite port, thus greatly increasing the engine's power when desirable—as, for instance, in starting a very heavy load. When the desired speed has been attained, the engine may be instantly changed to the compound working.

I am aware that a number of engines have been invented in which the overlapping piston in one form or another has been employed; but I lay no claim to these constructions, but I do to the special construction and arrangement of the pistons as herein set forth. By this construction and arrangement very many important advantages are attained. For instance, as the pistons are made to act as their own gears, holding or turning the shafts in unison, it is apparent that other gearing is dispensed with and also the cost, wear, and disagreeable humming noise due to rapidly-revolving gears; also, that the pressure will always hold the rolling points in close contact, preventing leakage therebetween, thus insuring the utilization of all the power. Again, by compounding in this way the tendency to leak is only half as great as when high pressure is in no way counterbalanced—that is, the high-pressure piston is subjected to a forward pressure practically twice as great as the back pressure against it. The back pressure will be equal to the forward pressure against the next piston, and in turn the back pressure against it will be equal to the atmosphere. In other words, all pressure ahead of the first or direct high pressure will act as packing to check its escape. In constructing these pistons they are made very symmetrical in shape and form, so as to enable them to roll together in continuous contact without any knocking or binding.

It is evident from the foregoing that I provide a rotary engine which is very simple, durable, and inexpensive in construction, thus producing a thoroughly efficient and practical engine.

What I claim as new, and desire to protect by Letters Patent, is—

1. In a rotary engine, the combination of a casing divided by a partition into a small and a large chamber, a series of rotary pistons, said pistons arranged in pairs one in

each chamber and adapted to always be in contact with each other, and means mounted in said partition for admitting a pressure fluid to the chambers to revolve said pistons.

2. In a rotary engine, the combination of a casing, a partition-wall dividing said casing in a large and a small chamber, shafts mounted in said casing, a large and a small piston carried by each shaft and located in their respective chambers, and means mounted in said partition for admitting pressure to revolve said pistons.

3. In a rotary engine, the combination of a casing having two chambers, shafts mounted in said casing, a pair of pistons carried by each shaft and mounted in their respective chamber, one piston of one shaft being in continuous contact with the opposite piston of the other shaft, and a valve mounted between the chambers for controlling the movement of the shafts.

4. In a rotary engine, the combination, of a casing, removable heads, a partition provided with inlet or outlet ports dividing the casing into two chambers and the ports causing communication therebetween, feed or exhaust pipes leading to said ports, a valve journaled in the partition for converting said ports into either entrance or exhaust ports, and shafts carrying rotary pistons mounted in said casing.

5. In a rotary engine, the combination, of a casing, a partition provided with inlet or outlet ports, and dividing the casing into a high and a low pressure chamber, said chambers being the same length and breadth but of different depths, said ports causing communication therebetween, a valve located in said partition to convert said ports into an entrance or exhaust port, shafts mounted in said casing, and a pair of pistons carried by each shaft, one of which is larger and adapted to revolve in the low-pressure chamber while the smaller revolves in the high-pressure chamber, the opposite pistons of each shaft being in continuous contact with each other.

6. In a rotary engine, the combination, of a casing provided with a high and a low pressure chamber, a partition incased by the casing and dividing the same into said chambers, said partition being provided with a central transverse bore and a series of ports, a series of dual pistons always in continuous contact located in their respective chamber, and a valve located in said bore for controlling the movements of said pistons.

7. In a rotary engine, the combination, of a casing, removable heads to said casing, a partition located therein providing a high and a low pressure chamber in said casing, ports located in said partition, a central transverse bore located in said partition, shafts mounted in the heads, pistons carried by the shafts and revoluble in the chambers, and a valve in the bore of the partition for controlling the ports.

8. In a rotary engine, the combination, of a casing, heads connected to said casing, and provided with a pair of hollow bearings, and a pair of incased bearings, a high-pressure and a low-pressure chamber in said casing, a partition provided with a central bore and a series of ports between said chambers, shafts mounted in said bearings, high and low pressure pistons carried by the shafts and mounted in their respective chambers, and a valve located in the bore of the partition for controlling the movement of the pistons.

9. In a rotary engine, the combination, of a casing, pressure feed and exhaust pipe connected therewith, a partition dividing the casing into a high and a low pressure chamber and ducts in said partition communicating with said pipes, ports in said partition causing communication between the chambers, a transverse bore extending from one edge of the partition to the other, rotary shafts carrying pistons mounted in said casing, and a valve mounted in the bore of the partition for controlling the feed and the proper port in the partition.

10. In a rotary engine, the combination, of a casing, a partition provided with a transverse central bore and a series of ports incased thereby, a high and a low pressure chamber provided therein and in communication with each other, shafts mounted in said casing, a large piston and a small piston carried by each shaft and revoluble in the low and the high pressure chamber respectively, the opposite pair of pistons always being in continuous contact with each other and the pistons of the same shaft being at substantially right angles to each other and in different chambers, and means revolubly mounted in the base of the partition for admitting pressure to revolve the pistons.

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

WASHINGTON I. PHIFER.

Witnesses:

G. D. INGERSOLL,

L. L. CARTER.