

H. HERMANN'S.

ROTARY ENGINE.

APPLICATION FILED MAY 11, 1912.

1,044,782.

Patented Nov. 19, 1912.

5 SHEETS—SHEET 1.

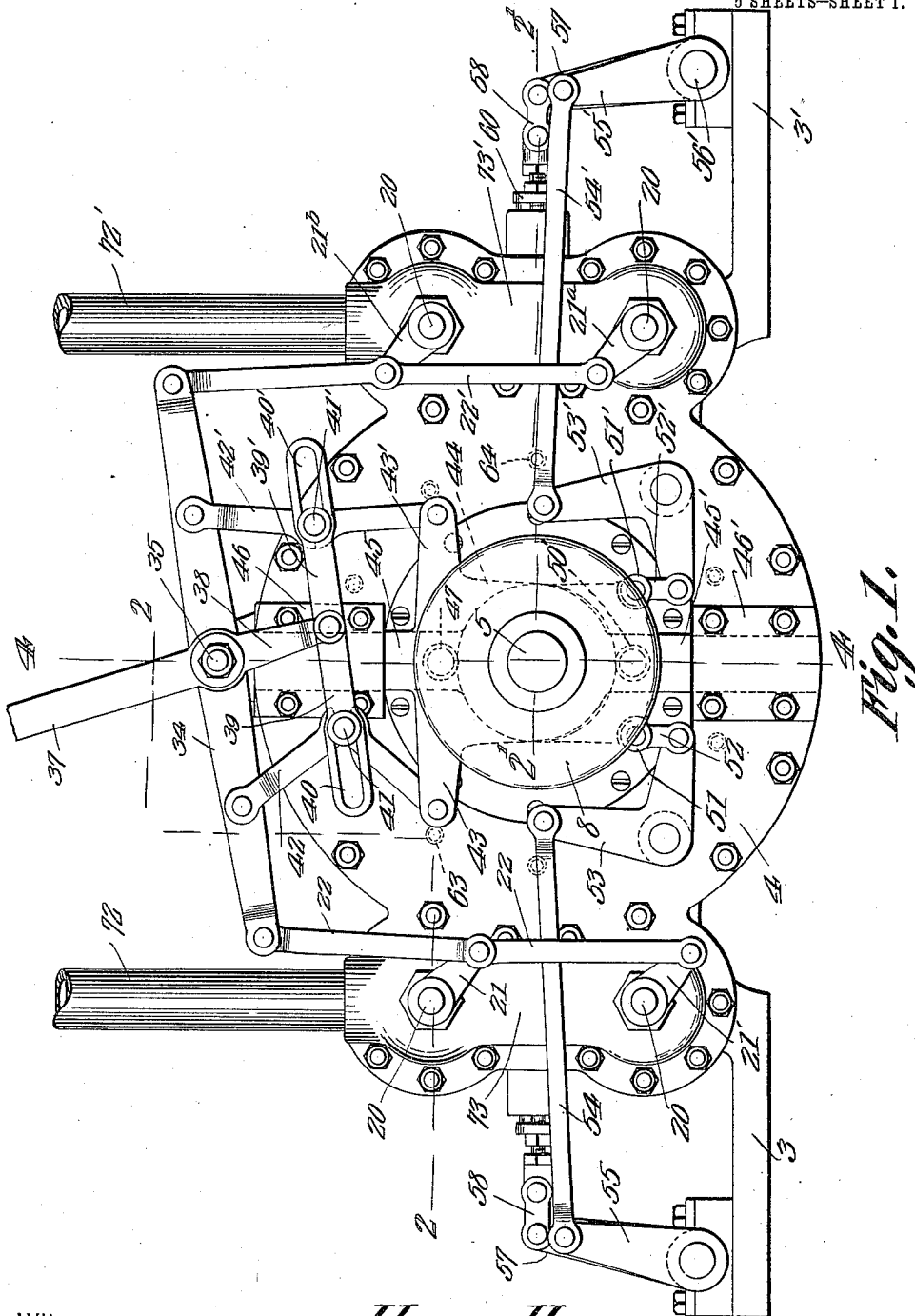


Fig. 1.

Witnesses

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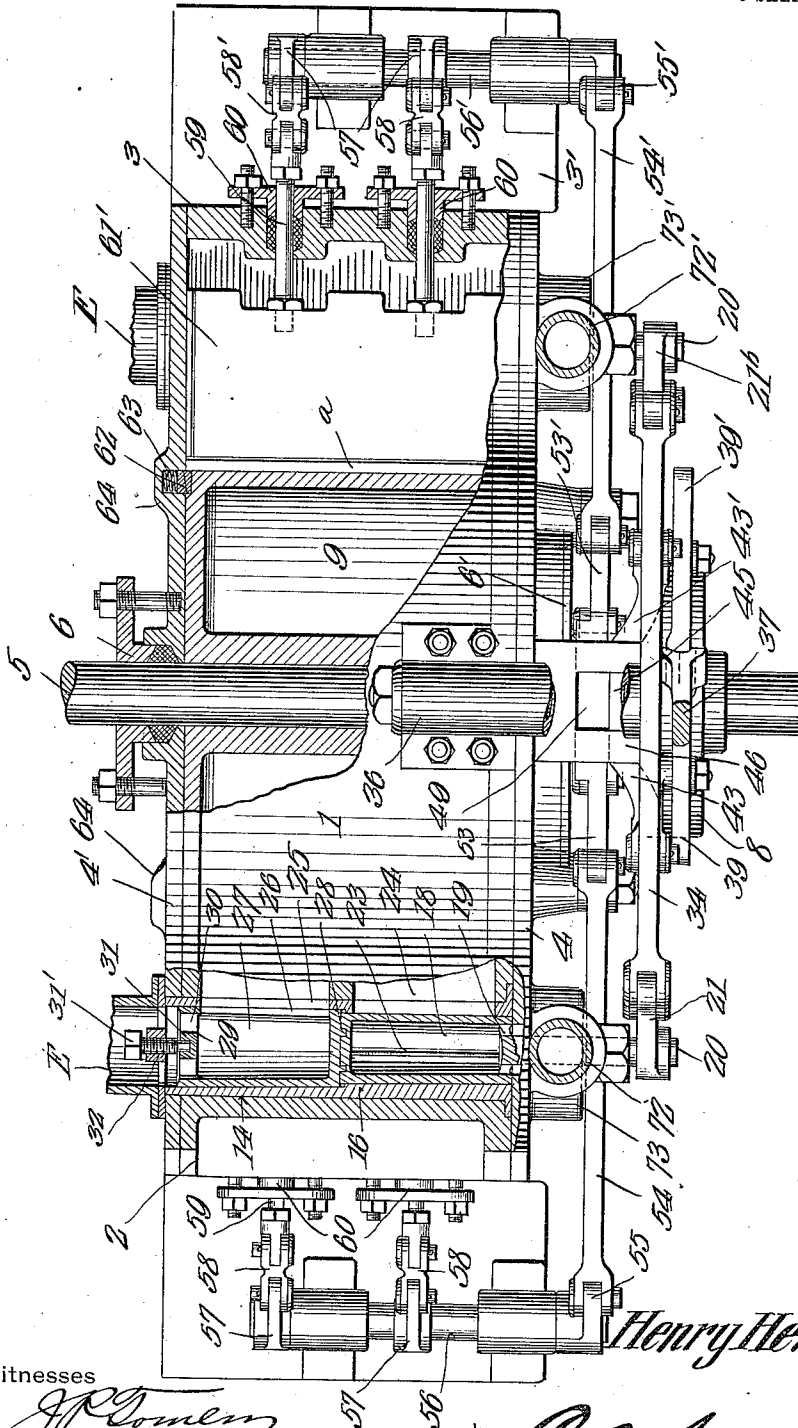


Fig. 2.

Witnesses

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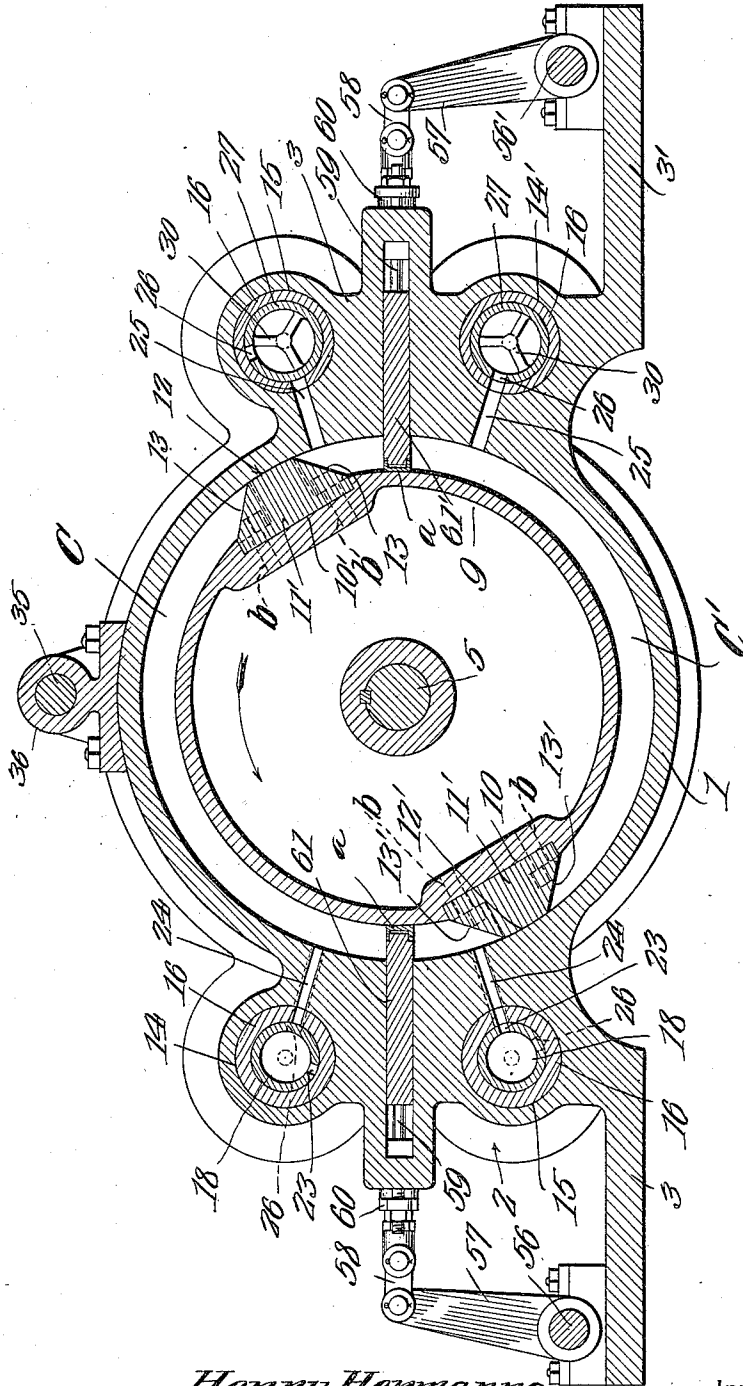
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5 SHEETS-SHEET 3.

Fig. 3.



Witnesses

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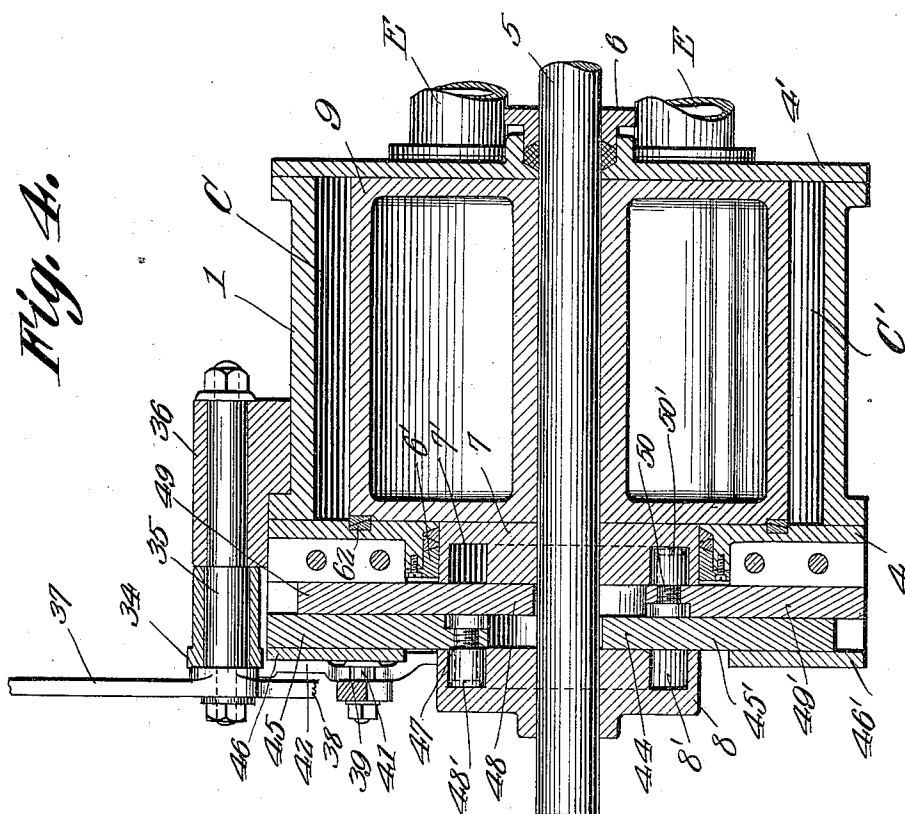
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Witnesses

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5 SHEETS—SHEET 5.

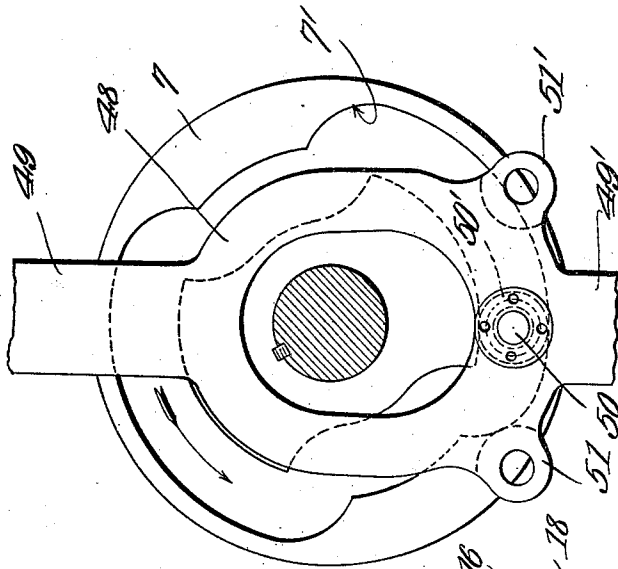


Fig. 6.

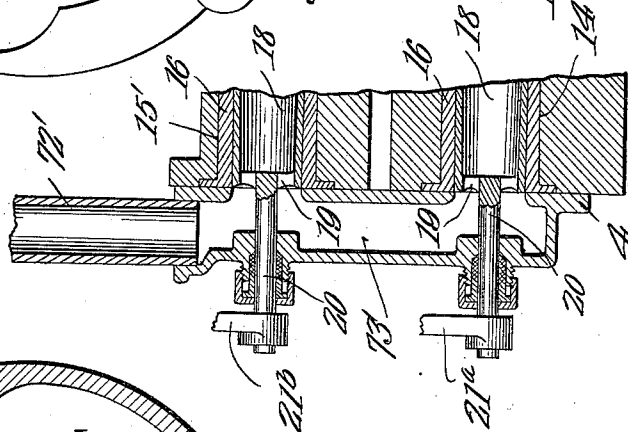


Fig. 7.

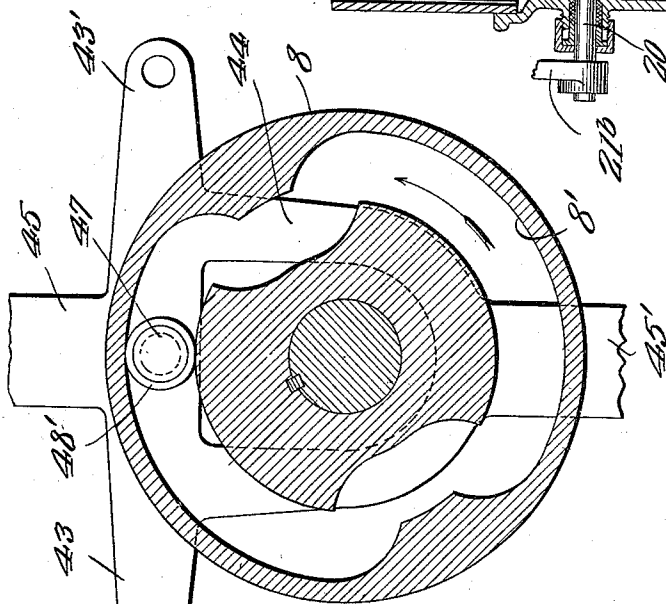


Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

HENRY HERMANNNS, OF CROSS ROADS, MARYLAND.

ROTARY ENGINE.

1,044,782.

Specification of Letters Patent.

Patented Nov. 19, 1912.

Application filed May 11, 1912. Serial No. 696,684.

To all whom it may concern:

Be it known that I, HENRY HERMANNNS, a citizen of the United States, residing at Cross Roads, in the county of Charles and State of Maryland, have invented a new and useful Rotary Engine, of which the following is a specification.

The present invention relates to improvements in rotary engines, the primary object of the invention being the provision of a balance reversible rotary engine, in which a plurality of intake and exhaust valves are oscillated in time through the medium of the rotor, a novel mechanism being provided for regulating the registration of the ports of the respective valves to conduct the pressure fluid to the rotor chamber to regulate the speed at which the rotor is operated and also the direction of rotation.

A further object of the present invention is the provision of a novel form of cam actuated mechanism for imparting simultaneous oscillation to all of the respective valves of the engine, so that the pressure fluid will be properly conducted at substantially diametrically opposite points within the rotor chamber, the rotor being provided further with rigid abutments, while the stator is provided with diametrically opposite slidable partitions disposed to be projected and retracted relatively to the rotor, a plurality of cams being carried by the rotor and operably connected to the valve operating and the partition operating mechanisms to actuate the valves and such partitions in consonance with the rotation of the rotor.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings—Figure 1 is an end elevation of the complete rotary engine taken from the valve and partition actuating side thereof. Fig. 2 is a top plan view of the complete rotary engine, sections being taken on lines 2—2 and 2'—2' of Fig. 1 to show the construction of valve and partition controlling means. Fig. 3 is a longitudinal sec-

tional view through the complete rotary engine. Fig. 4 is a section taken on line 4—4 of Fig. 1. Figs. 5 and 6 are detail views of the two cams and their reciprocatory frames. Fig. 7 is a vertical section through the two superposed valves at the outlets thereof and also a portion of the casing adjacent thereto.

Referring to the drawings, the numeral 1 designates the stator or main casing which is provided with the diametrically oppositely projecting portions 2 and 2' respectively, terminating in the feet or supporting portions 3 and 3', respectively. The rotor casing 1 is open at both ends and is therefore properly sealed by means of the plates or heads 4 and 4' respectively.

Disposed concentrically of the casing 1 is a shaft 5, one end of which is journaled in the stuffing box 6 carried by the head 4', while the other end carries the inner cam 7 internally of the head 4, and which is surrounded by the stuffing gland or ring 6'. Keyed upon and rotatable with the shaft 5 beyond the cam 7, is another cam 8, said cam 7 being provided with the cam recess 7', while the cam 8 is provided with the cam recess 8', the purposes of which will presently appear.

Keyed upon and rotatable with the shaft 5 is the cylindrical and hollow rotor 9 provided with the diametrically opposed transverse slots 10 and 10' for the detachable reception of the pistons or stationary abutments 11 and 11', both of which are constructed similarly and are provided with the outer periphery engaging surfaces 12 and 12' and the two oppositely inclined surfaces 13 and 13' respectively. The bolts 6 are employed to retain the respective pistons or abutments 11—11' in the proper relation to the rotor 9 and when the rotor is assembled, the casing 1 is divided into the two fluid pressure receiving chambers C—C', respectively.

As clearly shown in Fig. 3, the abutments 2 and 2' are provided respectively with the transverse cylindrical bores 14—15 and 14' and 15' and in each of the respective bores is removably mounted a bushing 16 which is of substantially the full length of the bore, as clearly illustrated in Fig. 2. Mounted for oscillation in each of the respective bushings 16, is a hollow fluid-pressure induction valve 18 and an exhaust valve 27, both of

which are connected together for oscillation in unison through the medium of the pin-and-socket-connection 28, as clearly shown in Fig. 2.

5 In order to actuate both of the valves 18 and 27 simultaneously, the spider 19 carried in the inlet end of the fluid induction valve 18, is provided with the concentric boss 20, all of which as clearly shown in Fig. 1, project exteriorly of the head plate 4 of the engine and have connected thereto, the respective crank arms 21, 21', 21^a and 21^b, the crank arms 21—21' and 21^a—21^b being disposed in pairs for simultaneous and co-operative action. The two cranks 21—21' are coupled together by means of the rods 22, while the two crank arms 21^a—21^b are coupled together by means of the rod 22', the operation of which will be described later on.

Each fluid induction valve 18 is provided with the induction port 23 which at the proper time is disposed to be placed in registration with the induction port 24 of the casing 1, there being four of such ports, while the exhaust valves 27 are each provided with an exhaust port 26, which at the proper time is disposed to be placed in registration with the exhaust port 25 of the casing 1. The respective ports 23 and 25 are disposed in alinement, side-by-side, in proper relation to the respective valves 18 and 27, but as the respective ports 26 of the valves 18 and 27 are out of alinement with each other, it is impossible for the intake and exhaust ports of the two coupling valves to register with their respective casing's ports simultaneously.

Each of the exhaust valves 27 are provided at their outlet ends with the spiders 30, which permit of the proper exhaust of the pressure fluid therethrough and out of the head 4' of the engine, each spider being provided with the boss 31 concentrically thereof for the reception of the adjusting screw 31' mounted in the stationary spider 32 carried by the head 4', the said screw 31' being provided to properly adjust the valves 18 and 27 within the bushings 16 and thus properly retain the same and allow for any wear due to the friction between the valves and such bushings.

This particular engine is constructed to be used as a unit, or in a series, and when connected in series, an exhaust conduit E is connected to receive the exhaust from the respective valves 27 and convey them to the intake valves of the next succeeding engine.

In order to actuate the respective valves in consonance with the rotor 9, to control the introduction of the pressure fluid and the quantity thereof, a walking beam 34 has its journaling shaft 35 mounted in the pillow block 36 supported by the top of the casing 1, while the outer ends thereof are pivotally

connected to the upper ends of the respective rods 22 and 22'. By this means the arms 21—21' and 21^a and 21^b, have imparted thereto an equi-distant movement, but in order to regulate the throw of the respective valves, so that the respective intake and exhaust ports are moved into greater or less registration with the respective intake and exhaust ports of the casing 1, thus controlling the direction of flow of the pressure fluid and the quantity admitted to the chambers C and C' respectively, a manually controlled lever 37 is pivoted to the outer end of the shaft 35 and has its lower end 38 connected to the inner pivotal end of the oppositely extending arms 39—39'. Each of these respective arms 39—39' is provided with its respective slots 40—40', for the sliding reception of the respective pins 41—41' of the toggle joints 42 and 42' respectively. The upper ends of the respective toggle joints 42—42' are pivotally connected to the terminals of the walking beam 34 intermediate of the ends thereof, while the lower ends are pivotally connected to the ends of the respective lugs 43—43' carried by the reciprocatory frame 44. This frame 44 is mounted exteriorly of the head 4 and is provided with the oppositely extending guide arms 45—45', which are mounted for sliding movement within the removable guides 46—46' which are connected to the outer face of the head 4, as clearly shown in Figs. 1 and 4.

A pin 47 carrying a roller 48' is carried by the frame 44, such pin and roller being projected into the cam recess 8' of the cam 8, so that the rotation of the rotor 9 and shaft 5 will impart rotation to the cam 8 and through the recesses 8' and the pin 47 impart a reciprocatory movement to the frame 44 and thus through either toggle joint 42 or 42' will oscillate the walking beam 34 and consequently operate all of the valves of the engine.

Disposed to the rear of the frame 44 and for reciprocatory movement individually thereof, is a frame 48 provided with the oppositely extending arms 49—49' and as before stated mounted to the rear of the arms 45—45' within the respective guides 46—46'. The frame 48 is provided with the stud or pin 50 which projects inwardly and has its roller 50' disposed within the cam recess 7' of the cam 7, so that the rotation of the shaft 5 and the cam 7 through the stud 50 will impart the necessary reciprocatory action to the frame 48.

The frame 48 is provided with the lugs 51—51' to which are pivotally connected the short links 52—52' respectively, and to these links are connected the inner terminals of the respective bell-crank levers 53—53' which are journaled to the head 4 of the engine and disposed in opposite actuating

position, as clearly shown in Fig. 1. The upper terminals of the respective bell-crank levers 53—53' are connected by means of the oppositely extending rods 54—54', to the crank arms 55—55' respectively, of the rock shafts 56—56' which are properly journaled upon the upper surface of the respective feet 3 and 3' of the casing.

Each shaft 56—56' has extending therefrom, a pair of arms 57 and through the medium of the short links 58 and the bolts or pins 59, which pass through the stuffing boxes 60 connected to the abutments 2 and 2' respectively of the casing 1 at diametrically opposite points, will properly actuate the slidable partition or abutting walls 61—61' mounted centrally of the respective abutments 2 and 2' to thus divide the space between the inner wall of the casing 1 and the outer peripheral surface of the rotor 9 into the respective chambers C—C'. Upon the inner ends of the respective partitions 61—61' are provided the stuffing strips *a* which provide a yielding contact between the respective partitions and the periphery of the rotor 9 and at the same time prevent any leakage of the pressure fluid at such point.

As clearly shown in Fig. 4, the circular packing ring 62 is mounted in the inner face of the head 4 and is held resiliently toward the end of the rotor 9 by means of a plurality of springs 63 which are disposed in cup-shaped abutments 64 formed integral with the head 4. By this means a tight joint is provided near the periphery of the rotor to prevent the escape of the pressure fluid to the space above and around the head at this point. By means of the packing gland 6', as also shown in Fig. 4, a tight joint at the periphery of the cam 7 between the surrounding portion of the head 4 and also the abutting end of the rotor 9 is provided, thus doubly insuring against the leakage of pressure fluid at this point.

From the foregoing description taken in connection with the drawings, the operation of the present invention is readily understood, but briefly stated it is as follows:—
The pressure fluid is admitted through both of the conduits or pipes 65—65' and into the respective inlet ends of the upper two intake valves 18 and through the conduits 66—66' respectively, to the lower two intake valves 18, thus providing a means for supplying the pressure fluid to the interior of all four of the valves 18. The lever 37 is now moved, as for instance to the position as shown in Fig. 1, so as to shorten the toggle 42 and make it idle, and permitting the toggle 42' to be extended practically its full length. The shortening of the toggle 42 thus decreases the distance between the arm 43 and terminals of the walking beam 34 connected to the valve actuating rod 22,

thus providing a means whereby as the cam 8 is rotated, and the frame 44 is consequently reciprocated, the walking beam 34 will be oscillated solely by the toggle 42, retaining the arms 21—21' and 21^a—21^b at the same respective angles to each other, the position of the respective arms 21—21' and 21^a—21^b controlling the position of their respective valves, so that the intake ports 23 and the exhaust ports 26 of the exhaust valves 27 are advanced in the valves controlled by the rod 22 so that the intake ports 23 of the diametrically opposed valves 18, will be placed simultaneously into registration with the intake ports 24 of the respective chambers C and C' and thus impart rotation to the rotor 9 in the direction of the arrow Fig. 3.

By means of the reciprocatory frame 48 and the cam 7, said frame 48 is reciprocated and through the bell crank levers 53—53', as the respective pistons 11 and 11' have passed the respective exhaust ports 25 disposed at diametrically opposite sides of the casing 1, one to each chamber C—C', the slidable partitions 61—61' will be actuated to be retracted within the respective abutments 2—2' and thus permit the pistons 11—11' to pass the said partitions, the cam 7 being so constructed that the instant the outer surface 12—12' of the respective pistons has passed beyond the inner ends of the partitions 61—61', the said partitions will be projected inwardly and into engagement with the periphery of the rotor 9 in time to provide the proper pockets for the pressure fluid between the partitions and the intake 24 of each chamber. By this means the pressure fluid is admitted at diametrically opposite points to the rotor chamber and the rotor has imparted thereto, the consequent desired rotation, and that the respective toggles 42—42' may be adjusted at various angles with relation to each other, thus regulating the position of the respective arms 21—21' and 21^a—21^b, and consequently the desired projection of the pressure fluid within the respective chambers and also the quantity, so that the speed and direction of rotation of the rotor 9 is controlled directly through the lever 37.

When it is desired to reverse the rotation of the rotor 9 and cause the same to rotate in the opposite direction to the arrow in Fig. 3, the lever 37 is moved to the right as viewed in Fig. 1, to cause the lengthening of the toggle 42 and the folding of the toggle 42'.

When the rotor is rotating in the direction of the arrow in Fig. 3, the respective bores 15 and 15' are the steam induction portions of the engine, while the respective bores 14 and 14' are the exhaust portions of the engine, the reversal of the lever 37 reversing the respective valves in the bores of

the engine, so that when the lever 37 is thrown to the right and the toggle 42' is folded and the toggle 42 is straight, the bores 14—14' will be converted into the induction portion of the engine, while the bores 15—15' will be the exhaust portion.

What is claimed is:

1. A rotary engine, having a stator provided with a circular rotor chamber, a rotor disposed concentrically of the chamber, two diametrically opposed sliding partitions mounted in the stator and disposed to cooperate with the rotor to provide two pressure fluid chambers, each of said chambers being provided with two inlet and two exhaust ports, a plurality of tubular members constituting each an inlet and an exhaust valve, one member to each pair of intake and exhaust ports of the engine, an oscillatory connection for said valves, manually controlled means for regulating the timing of the valves with relation to their respective ports, means controlled by the rotor for operating the connecting means, and a separate means operably connecting the rotor and sliding partitions.

2. A rotary engine, having a stator provided with a circular rotor chamber, a rotor disposed concentrically of the chamber, two diametrically opposed sliding partitions mounted in the stator and disposed to cooperate with the rotor to provide two pressure fluid chambers, each of said chambers being provided with two inlet and two exhaust ports, a plurality of tubular members constituting each an inlet and an exhaust valve, one member to each pair of intake and exhaust ports of the engine, an oscillatory connection for said valves, manually controlled means for regulating the timing of the valves with relation to their respective ports, co-acting means carried by the rotor and stator and operably connected to the oscillating connecting means of the valves for oscillating the valves from the rotor, and separate means operably connecting the rotor with the sliding partitions.

3. A rotary engine, having a stator provided with a circular rotor chamber, a rotor disposed concentrically of the chamber, two diametrically opposed sliding partitions mounted in the stator and disposed to cooperate with the rotor to provide two pressure fluid chambers, each of said chambers being provided with two inlet and two exhaust ports, a plurality of tubular members constituting each an inlet and an exhaust valve, one member to each pair of intake and exhaust ports of the engine, an oscillatory connection for said valves, manually controlled means for regulating the timing of the valves with relation to their respective ports, co-acting means carried by the rotor and stator and operably connected to the oscillating connecting means of the valves

for oscillating the valves from the rotor, and co-acting means carried by the rotor and stator and operably connected to the sliding partitions, whereby the rotation of the rotor imparts sliding movement to the partition in timed relation to the rotor.

4. In a rotary engine, the combination with a stator, a rotor and a plurality of tubular oscillatory valves for controlling the admission and exhaust of the pressure fluid to the rotor, of means for operating the valves from the rotor and controlling the direction of rotation of the rotor, comprising a reciprocatory frame carried by the stator, co-acting means carried by the rotor and the reciprocatory frame, whereby the rotation of the rotor reciprocates the frame, an oscillatory connecting beam having its respective ends connected to the valves, and means connecting said frame with the oscillatory connecting beam for actuating the valves from the reciprocatory frame.

5. In a rotary engine, the combination with a stator, a rotor and a plurality of tubular oscillatory valves for controlling the admission and exhaust of the pressure fluid to the rotor, of means for operating the valves from the rotor and controlling the direction of rotation of the rotor, comprising a reciprocatory frame carried by the stator, co-acting means carried by the rotor and the reciprocatory frame, whereby the rotation of the rotor reciprocates the frame, an oscillatory connecting beam having its respective ends connected to the valves, a pair of toggles connecting the reciprocatory frame and the oscillatory connecting beam, and means for controlling the length of said toggles to regulate the relative position of the valves.

6. In a rotary engine, the combination with a stator, a rotor, said rotor being provided with diametrically opposed pistons, diametrically disposed slidably mounted partitions carried by the stator for co-action with the rotor to provide two pressure fluid chambers within the stator, each of said chambers being provided with two intake and two exhaust ports, an intake and an exhaust valve coupled for oscillation in unison, one for each pair of intake and exhaust ports of the stator, and a rod connecting two valves, one of each chamber for simultaneous movement, of means for actuating the valves and the partitions, comprising a walking beam having the terminals thereof pivotally connected to the valve connecting rods, a cam connected to the rotor, a reciprocatory frame mounted upon the stator and operably connected to the cam, two toggles connecting said frame to the walking beam upon each side of the pivotal point of the walking beam, means for controlling the position of the toggles and the consequent actuation of the valve connecting rods, and

means for operably connecting the partitions to the rotor.

7. In a rotary engine, the combination with a stator, a rotor, said rotor being provided with diametrically opposed pistons, diametrically disposed slidably mounted partitions carried by the stator for co-action with the rotor to provide two pressure fluid chambers within the stator, each of said chambers being provided with two intake and two exhaust ports, an intake and an exhaust valve coupled for oscillation in unison for each pair of intake and exhaust ports of each chamber of the stator, and a rod connecting two valves, one of each chamber for simultaneous movement, of means for actuating the valves in the partitions, comprising a walking beam having the terminals thereof pivotally connected to the valve connecting rod, a cam connected to the rotor, a reciprocatory frame mounted upon the stator and operably connected to the cam, two toggles connecting said frame to the walking beam, one upon each side of the pivotal point of the walking beam, means for controlling the position of the toggles and the consequent actuation of the valve connecting rods, another cam operably connected to the rotor, a reciprocatory frame mounted upon the stator and operably connected to said last cam, and means for operably connecting the last reciprocatory frame with the sliding partitions.

8. A rotary engine, having a stator, a rotor, said rotor being provided with diametrically opposed pistons, two diametrically disposed sliding partitions mounted in the stator and in co-active relation with the rotor, said partitions dividing the rotor chamber into two compartments, each compartment being provided with an intake and an exhaust port, an oscillatory valve for each port, a rod connecting two of each valves for oscillation in unison, a walking beam pivoted to the stator and having its respective ends operably connected to the rods, a cam operably connected to the rotor, a reciprocatory frame mounted upon the stator and operably connected to the cam, means connecting said reciprocatory frame to the walking beam, whereby the rotor imparts oscillatory movement to the walking beam, and means for operably connecting the sliding partitions to the rotor.

9. A rotary engine, having a stator, a rotor, said rotor being provided with diametrically opposed pistons, two diametrically disposed sliding partitions mounted in the stator and in co-active relation with the rotor, said partitions dividing the rotor chamber into two compartments, each compartment being provided with an intake and an exhaust port, an oscillatory valve for each port, a rod connecting two of each of the valves for oscillation in unison, a walk-

ing beam pivoted to the stator and having its respective ends operably connected to the rods, a cam operably connected to the rotor, a reciprocatory frame mounted upon the stator and operably connected to the cam, means connecting said reciprocatory frame to the walking beam, whereby the rotor imparts oscillatory movement to the walking beam, another cam connected to the rotor, a reciprocatory frame mounted upon the stator and operably connected to the last cam, and means for operably connecting both of the partitions to said last reciprocatory frame whereby the partitions are actuated in time with the rotor.

10. A rotary engine, having a stator with oppositely disposed abutments, each of said abutments being provided with two superposed cylindrical bores, a rotor, two pistons connected rigidly to the periphery of the rotor, two slidably mounted partitions one to each abutment of the stator disposed for movement to and from the rotor, said partitions dividing the rotor chamber into two compartments, each of said compartments having an intake and an exhaust port, a hollow oscillatory valve mounted in each bore of the abutments, a rod connected to the two valves of each abutment, a walking beam connected to the stator and having its terminals operably connected to both of said rods, a cam connected to the rotor, a reciprocatory frame mounted upon the stator and operably connected to the cam, a toggle joint between the frame and the walking beam, means for regulating the length of the toggle joint and the consequent movement of the walking beam and valves, and means for operably connecting the partitions to the rotor.

11. A rotary engine, having a stator with oppositely disposed abutments, each of said abutments being provided with two superposed cylindrical bores, a rotor, two pistons connected rigidly to the periphery of the rotor, two slidably mounted partitions one to each abutment of the stator disposed for movement to and from the rotor, said partitions dividing the rotor chamber into two compartments, each of said compartments having an intake and an exhaust port, a hollow oscillatory valve mounted in each bore of the abutments, a rod connected to the two valves of each abutment, a walking beam connected to the stator and having its terminals operably connected to both of said rods, a cam connected to the rotor, a reciprocatory frame mounted upon the stator and operably connected to the cam, a toggle joint between the frame and the walking beam, means for regulating the length of the toggle joint and the consequent movement of the walking beam and valves, a second cam connected to the rotor, a second reciprocatory frame mounted upon the stator and operably con-

ected to the last cam, and means for oper-
ably connecting the last reciprocatory frame
to the sliding partitions.

12. A rotary engine, having a stator pro-
vided with a rotor chamber, a rotor dis-
posed in the chamber, two pairs of station-
ary and slidably mounted pressure fluid re-
sisting mediums carried co-actively by the
stator and rotor and dividing the chamber
into two compartments, and each compart-
ment having an inlet and an exhaust port,
two pairs of superposed rotary valves
mounted in the stator for controlling re-
spectively the intake of one compartment

and the exhaust of the other compartment, 15
a walking beam journaled upon the stator
and operably connected to all valves, a cam
operably connected to the rotor, a recipro-
catory frame, operably connected to the cam,
and means for operably connecting said 20
frame to the walking beam.

In testimony that I claim the foregoing
as my own, I have hereto affixed my signa-
ture in the presence of two witnesses.

HENRY HERMANN.

Witnesses:

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ERNEST F. RILEY.

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Washington, D. C."