

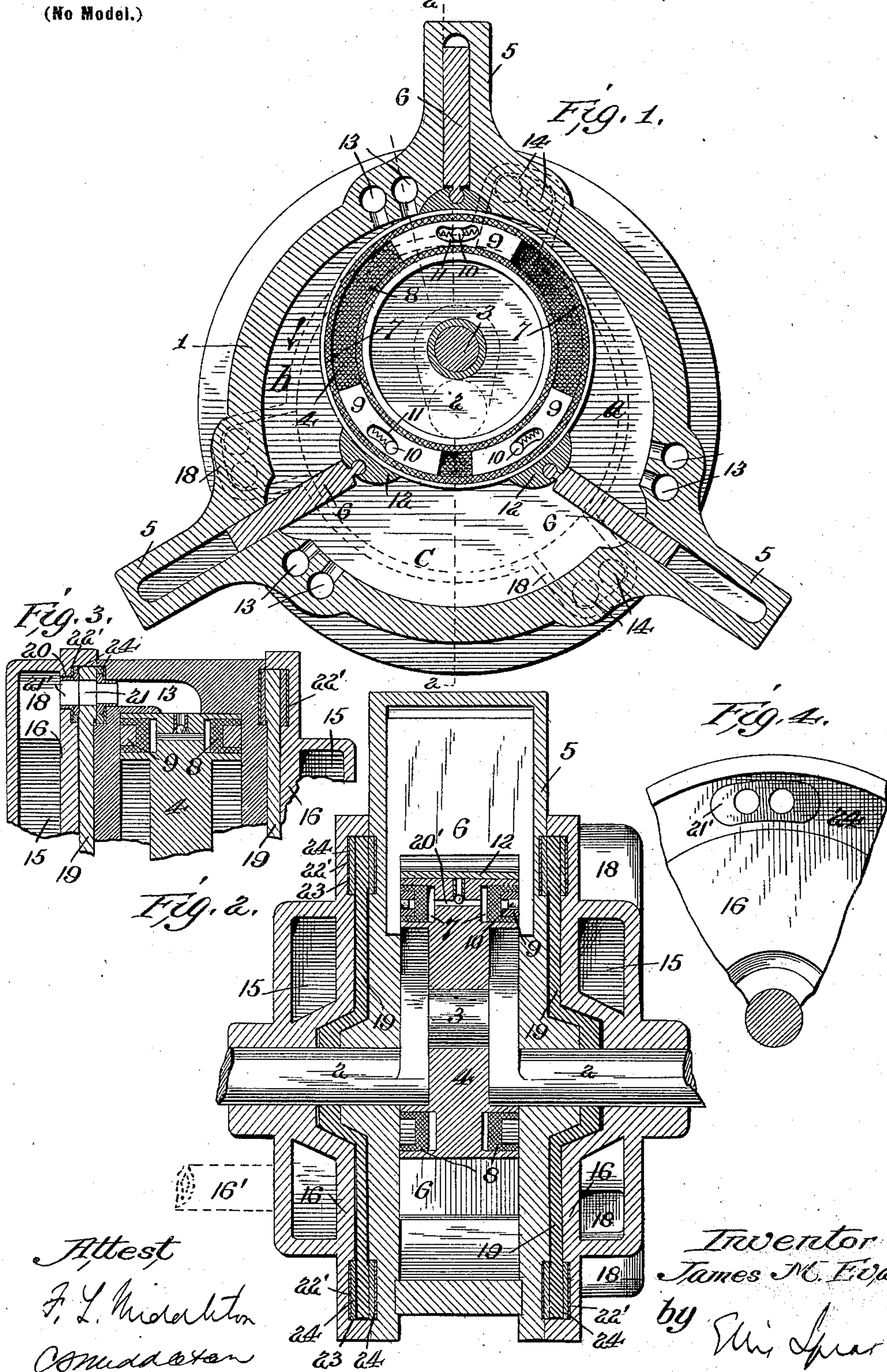
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Patented Aug. 28, 1900.

J. M. EVANS.
ROTARY ENGINE.

(Application filed Apr. 25, 1899. Renewed Jan. 31, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

JAMES M. EVANS, OF MARQUETTE, MICHIGAN.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 656,694, dated August 28, 1900.

Application filed April 25, 1899. Renewed January 31, 1900. Serial No. 3,519. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. EVANS, a citizen of the United States, residing at Marquette, in the county of Marquette and State of Michigan, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to rotary engines, the object of the invention being to avoid dead-points and to utilize to the highest possible degree the steam-pressure. It includes a rotary piston mounted upon a crank-pin and revolving eccentrically with its periphery in contact with the inner surface of the periphery of the cylinder with multiple sliding divisional walls and with inlet and exhaust ports between the walls of each steam-compartment.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a cross-sectional view of the engine. Fig. 2 is a sectional view on the line 2 2 of Fig. 1. Fig. 3 is a detail sectional view on line 3 3 of Fig. 1, and Fig. 4 is a detail face view of one of the front plates of the steam-chest at one of the inlet-openings.

In the cylinder 1 is journaled the crank-shaft 2, formed in two parts, connected by the interlocking portion of the crank-pin 3, upon which is mounted the piston 4, that rolls in contact with the inner periphery of the cylinder and drives the crank-shaft, as will appear hereinafter. Extending radially from the cylinder, at three points equidistant apart, are pockets 5, in which the outer ends of the sliding partitions 6 are guided, the inner ends of said partitions being secured to the piston, so that said ends may have a limited amount of movement and yet maintain a steam-tight contact with the piston at all times. The piston has an annular recess 7 in each face thereof near its periphery, in which is fitted an annular packing-ring 8, also recessed to receive the blocks 9, to which the partitions 6 are secured by pin-and-slot connections 10 11. The blocks maintain their relative radial positions in all movements of the piston, sliding in the recess in the packing-ring as the piston traverses the cylinder.

Each partition carries a shoe 12, that has its face bearing on the piston curved to conform thereto and is connected to said parti-

tion by means of a cylindrical head projecting from the partition and a corresponding socket formed in the shoe, so that said shoe may have pivotal movement. The socket 11 in the block 9 is curved on an arc struck from the center of said head, so that in the various positions assumed by the partition and block the shoe will at all times be held in close contact with the periphery of the piston by the pins 10, projecting inward from the legs of the partition which extend down into the guides in the cylinder-head on each side of the shoes. The shoes are preferably rounded on their upper faces and the inner periphery of the cylinder is correspondingly recessed to provide seats for said shoes when the partitions reach their extreme outward positions.

The three partitions heretofore referred to divide the cylinder into three independent steam-compartments *a*, *b*, and *c*, each of which is provided with separate steam inlet and exhaust ports. These ports lead through the wall of the cylinder, and to provide quick action—that is, quick opening and closing of the same—they are preferably formed of one long opening. The inlet-ports 13 are located on one side of the cylinder and the exhaust-ports 14 on the opposite side thereof. Disk or ring valves 19 are splined to the crank-shaft, these valves being located between the heads of the cylinder and the walls of the steam-chests which are secured to said heads. As each head of the cylinder is similarly constructed, so that the engine may drive forward or reverse with equal facility, depending only upon the side thereof which is used as the steam-inlet side, it will be only necessary to describe the structure of one side.

The steam-chest 15, before referred to, comprises a casting through the hub of which the crank-shaft passes, the front plate 16 thereof being secured to the cylinder-head and the steam-compartment, which is of annular form, extending from the back of said plate. A pipe 16' leads into this compartment, which is used, as the case may be, either as an inlet or as an exhaust pipe. The steam-compartment is within the line of the ports in the cylinder; but to put the same in connection therewith independent extensions 18 lead from said compartment to each set of ports

and inclose the same. The valves 19 are interposed, as before stated, between the said ports and the front plates of the steam-chests, which plates have openings 20, leading
 5 through the same, in line with the cylinder ports that open into said extensions, and said valves have corresponding openings 21 through the same arranged in predetermined positions, so that in the rotation thereof the
 10 ports will be opened by the openings 21 alining with the ports and the openings 20 in the front plates of the steam-chests and closed when said openings 21 pass out of alinement with said ports.

15 In the operation of the engine with the piston in the position shown in Fig. 1 the steam would be passed into the cylinder through the ports 13, communicating with the compartment *a*, and as the partition 6 closes the
 20 bottom of this compartment the piston would be forced in the direction of the arrow. The steam in the compartment *a* will continue to act alone until the piston reaches a position where the longitudinal axes of the cranks
 25 pass to the left of the inlet-ports of the compartment *b*, when said inlets will open and the inlet-ports in the compartment *a* will be closed, the steam in the compartment *a* acting expansively until the longitudinal axis
 30 of the crank is in line with the exhaust-ports of the compartment *b*, when the exhaust-ports of the compartment *a* will open for the discharge of the used steam therein. On the continued rotation of the piston the parts
 35 will reach the position where the inlet-ports on the compartment *c* will open. Then if an ordinary condenser is connected with the exhaust-ports with the ports in this position there will be a vacuum in the compart-
 40 ment *a* pulling on the piston, steam directly from the boiler acting in the compartment *c* and steam acting expansively in the compartment *b*. To keep the packing-rings 8 pressed at all times against the inner faces of the cyl-
 45 inder-heads, a series of ports 20 lead from the periphery of the piston to the recesses 7 in the rear of said rings. A ball-valve located in said ports prevents any exhaust therefrom while permitting free inlet thereto. To in-
 50 sure a steam-tight packing around the cylinder-ports, contacting plates 21 22 are located on each side of the valve at the cylinder-ports, with means for automatically taking up any wear thereon or on said valves. These con-
 55 tacting plates are located at each set of ports 13 14, and they are placed on both sides of the valves. The plates 21 are provided with nipples loosely fitting the openings in the front plates of the steam-chests, and the rear
 60 faces of the main portions thereof bear against a thin brass diaphragm or ring 22', which is seated in the bottom of an annular recess 23 in each front plate and which is maintained in place therein by a second ring 24, seated
 65 in said recess 22 above the diaphragm and bolted to said plate. The steam will pass between the nipples of said plates and the walls

of the openings in the front plates of the steam-chest and get behind the diaphragms and so force the plates against the valve and
 70 make a close contact. The heads of the cylinder are similarly recessed and carry corresponding diaphragms and contact-plates, the nipples of which extend into the cylinder-ports and have a corresponding action. 75

I claim—

1. In combination, the cylinder, the piston mounted therein, the sliding partitions, the blocks carried by said piston, said piston being movable independently thereof and the
 80 loose connection between said partition and said blocks to permit the inner ends thereof to move longitudinally of said blocks.

2. In combination, the cylinder, the piston mounted therein, the blocks carried by said
 85 piston, said piston moving independently of the same, the partition guided in the cylinder-wall, and the pin-and-slot connection between said partitions and said blocks.

3. In combination, the cylinder, the piston
 90 mounted therein, the block carried by said piston, said piston moving independently of the same, the partitions, the shoes having a pivotal connection to said partition and a bearing on said piston, said blocks having curved
 95 slots therein and pins extending from said partition into said slots.

4. In combination, the cylinder, the piston mounted therein, the block carried by said piston, the partitions guided in said cylinder hav-
 100 ing legs extending on each side of the piston, a bearing-shoe pivotally connected between said legs to said partitions and pins extending inwardly from said legs engaging said block.

5. In combination, the cylinder, the piston
 105 mounted therein, the plurality of blocks slidable in a recess in the piston, the partitions and the connection between the same and the blocks, said blocks moving independently of each other. 110

6. In combination, the cylinder, the piston mounted therein having an annular recess in each face thereof, a packing-ring fitted to each of said recesses having an annular recess in the same, blocks held in said recesses in the
 115 packing-ring, the partitions, shoes carried thereby bearing on said piston and pins also carried by said partitions having a loose engagement with said blocks.

7. In combination, the cylinder, the piston,
 120 the inlet and exhaust ports, the steam-chest secured to each cylinder-head and the extension therefrom projecting beyond the periphery of the same inclosing and communicating with said ports. 125

8. In combination, the cylinder, the piston, the plurality of inlet and exhaust ports in the cylinder-wall, the steam-chest secured to each head within the compass of said ports and the series of independent extensions leading from
 130 each chest and communicating with and inclosing the adjacent ports, substantially as described.

9. In combination, the cylinder, the crank-

shaft, the piston, the ports leading through the cylinder, the steam-chest communicating with the same and the valves carried by said shaft located outside of the steam-chests in between the front plates thereof and the cylinder-heads adapted to control the communication between the chests and said ports.

10. In combination, the cylinder, the piston, the ports leading through the cylinder-wall, the steam-chests communicating with the same and the rotary valve located outside of the steam-chest, said valve being interposed between said chest and the cylinder-head adapted to control said communication.

11. In combination, the cylinder, the piston, the ports leading through the cylinder-wall, steam-chests having openings in alignment with each of said ports, rotary disk valves controlling said openings and ports and contacting plates located contiguous to said openings and ports adapted to make a steam-tight fit around said ports and openings between the steam-chests and cylinder-heads and the valves with means for maintaining a constant pressure on said plates.

12. In combination, the cylinder, the piston journaled therein, the steam-chest secured to each head of said cylinder, ports in said cylinder and alining openings in said steam-chest, a rotary disk valve interposed between the cylinder-heads and the steam-chests, contacting plates carried by the chest and head, flexible diaphragm adapted to control said plates and means for maintaining pressure on said diaphragm.

13. In combination, the cylinder, the piston journaled therein, the steam-chest secured to each head of said cylinder, ports in the cylinder and openings in the steam-chests

alining therewith, a rotary disk valve interposed between the cylinder-heads and the steam-chests, a flexible diaphragm carried by the chest and cylinder-head, contacting plates controlled by said diaphragms and nipples carried by said plates extending through the diaphragms and forming steam-ducts between their peripheries and the wall of said steam-ports and openings, said ducts leading to the rear of said diaphragms.

14. In combination, the cylinder, the piston having an annular recess in each face thereof, a packing-ring seated in each recess, a steam-port leading from the periphery of the piston radially a short distance within the periphery thereof and branch ports leading from said radial port to each recess in the rear of the packing-ring therein and a valve controlling said radial port located at the junction of the branch port therewith.

15. In a rotary steam-engine and in combination, a cylinder having a central shaft, a circular revolving piston mounted upon the crank of the shaft within said cylinder, and arranged to bear upon the inner periphery of the cylinder in the revolution of the shaft, a plurality of sliding partitions subdividing the steam-space between the piston and the walls of the cylinder, inlet and exhaust ports for each subdivision formed by said partitions and valve mechanism, all substantially as set forth.

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

JAMES M. EVANS.

Witnesses:

G. W. BALLOCH,
WM. F. HALL.