(No Model.)

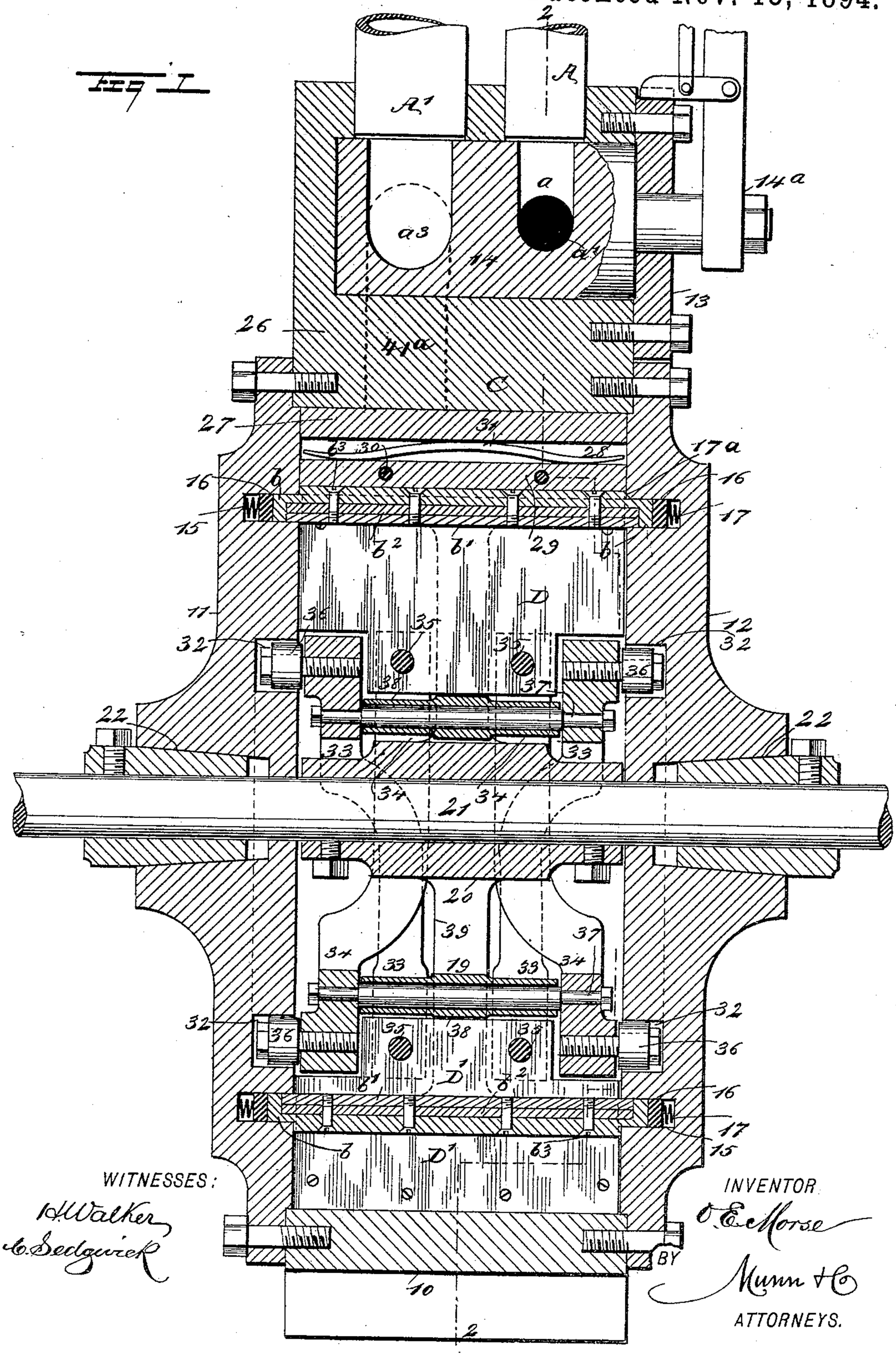
2 Sheets—Sheet 1.

O. E. MORSE.

ROTARY ENGINE.

No. 529,289. Patented Nov. 13, 1894.

Fig 1



WITNESSES:

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ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

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Fig 3

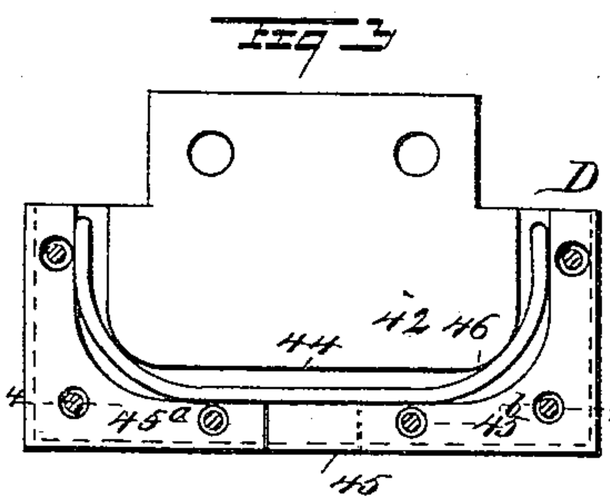

Fig 2

Fig 4

WITNESSES:

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UNITED STATES PATENT OFFICE.

OSCAR E. MORSE, OF DILLON, MONTANA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 529,289, dated November 13, 1894.

Application filed January 5, 1894. Serial No. 495,813. (No model.)

To all whom it may concern:

Be it known that I, OSCAR E. MORSE, of Dillon, in the county of Beaver Head and State of Montana, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

My invention relates to an improvement in rotary engines, and it has for its object to provide a means for utilizing steam for producing a rotary motion, and to obtain a maximum of power with a minimum expenditure of steam, and furthermore to so construct the engine of rotary type that it will be exceedingly simple and economic, comprising but few wearing parts, and capable of being worked in either direction, forward or backward, with equally good results.

Another feature of the invention is to provide a rotary engine in which a dead center will be avoided and wherein the steam will work at all times at the same distance from the driving shaft, thereby obtaining the full power of the machine and an even and uniform motion.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

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

Figure 1 is a vertical section through the engine, taken about centrally, and practically upon the line 1—1 of Fig. 2. Fig. 2 is a vertical section taken essentially on the line 2—2 of Fig. 1, the section in Fig. 2 being at right angles to that shown in Fig. 1. Fig. 3 is an elevation of one of the pistons detached from the engine, one of the plates of the piston being removed; and Fig. 4 is a longitudinal section through the piston complete, taken practically on the line 4—4 of Fig. 3.

In carrying out the invention the casing may be said to consist of a base 10 and two heads 11 and 12 preferably of circular pattern, the heads being provided with inwardly extending marginal flanges, the flanges of the two heads being adapted to abut and be fastened together in such manner as to form an inner chamber; but at the top of the casing an extension 13, is made, and within this extension a valve 14, is located, operated through the medium of an attached lever 14^a, provided with any suitable form of lock, as illustrated in Fig. 1. The valve is provided with a three-way steam inlet port, the members of which are designated respectively as a, a' and a^2, one of the said ports being in communication with a steam inlet pipe A. The valve is further provided with practically three-way exhaust ports, one of which is shown in the drawings in positive lines in Fig. 1 and in dotted lines in Fig. 2, and is designated as a^3, the said port being adapted to communicate with an offtake or exhaust pipe A′.

In the inner faces of the heads of the casing an annular groove 15, is produced, as illustrated in Fig. 1, and the said groove contains a packing ring 16, which is given an inward impulse through the medium of springs 17, any number of which may be located at the back of each ring.

A hollow cylinder 18, is held to turn within the chamber of the casing, being concentric with the inner wall of said chamber, as shown in Fig. 2, and the cylinder has guided movement in the grooves 15 in the heads of the casing by causing annular flanges b on the cylinder to enter said grooves and engage with the packing ring 16. Thus a steam chamber B, is produced between the walls of the chamber in the casing and the outer face of the cylinder, as illustrated in Fig. 2. The cylinder is connected by a web 19, located at its center and of disk-like construction, with a hub 20, the said hub being secured firmly upon a drive shaft 21, the said drive shaft being held to turn in suitable openings produced in the heads of the casing, and in tapering boxes 22, located in correspondingly formed seats made in the outer surface of the said casing heads, as is clearly shown in Fig. 1.

In diametrically opposite portions of the cylinder longitudinal openings 23, are produced, and at each side of each opening diametrical recesses are made in the inner face of the cylinder to receive opposing packing sections 24 and 25. Each packing section comprises an inner plate b', and a packing b^2 of any approved character is located between

the plates and the cylinder 18, as is shown in cross section in Fig. 2, and in longitudinal section in Fig. 1.

In order to insure a positive steam-tight connection between the cylinder and the heads of the casing, shoulders 17^a, are formed upon the outer peripheral surface of the cylinder at the flanges b, as shown in Fig. 1, the shoulders bearing against the inner faces of the casing heads adjacent to their grooves 15. The packing b^2 is held between the cylinder and the plates b' by means of screws b^3, or their equivalents and the packing sections are made to engage with whatever object may pass through the openings 23.

An abutment C, is located centrally in the extension 13 of the casing, and the said abutment is preferably made in two sections, an upper section 26 contained entirely within the extension 13, and a lower section 27, which divides the steam chamber B at its upper section. These two sections may be connected in any approved manner, and the upper end of the upper section serves as a lower seat for the valve 14, and preferably the side walls of the upper section are inclined from the top downwardly and outwardly, the opposing walls of the casing section 13 being correspondingly inclined; and preferably the side walls of the lower section of the abutment are inclined in an opposite direction. A longitudinal opening 28, is made in the under surface of the lower section of the abutment, and in this opening a bearing block 29, is located, capable of limited vertical movement and held in place by screws 30, or their equivalents, passed through openings in the block of greater diameter than themselves; and the under surface of the bearing block 29, which usually extends beyond the under face of the lower section of the abutment, is of cylindrical formation, as shown in Fig. 2. The block is under constant downward pressure through the medium of a spring 31, shown best in Fig. 1, which has bearing upon said block and is contained in the opening 28.

The bearing block 29, is adapted to have constant and steam-tight bearing upon the cylinder, so that steam cannot escape past the abutment from one side of the steam chamber B to the other. An oval cam race 32, or eccentric groove, is produced in the inner face of each head of the casing around the opening through which the drive shaft 21 passes, the grooves being clearly shown in positive lines in Fig. 1 and in dotted lines in Fig. 2.

Two interlocking eccentric links 33 and 34, are located opposite the inner face of each head, which links are adapted to have movement around the axis of the cylinder; and in connection with these sets of links two pistons D and D′ are employed, the piston D being carried by the opposing links 34, while the piston D′ is carried by the opposing links 33, and the pistons are secured to the links carrying them by means of bolts 35, or equivalent fastening devices. At the ends of the links farthest removed from their point of attachment to the pistons, friction rollers 36, are located upon the outer faces of the links, and the said friction rollers enter and travel in the cam races or grooves 32, as shown in Fig. 1. The corresponding links of each set are connected at their roller ends by bolts 37, and each bolt is provided with a friction sleeve 38, the said sleeves being of greatest diameter at their central portions, and the central portions of the sleeves have rolling and guided movement in diametrical slots 39, produced in the web 19, said slots being located end to end, and they extend from a point near the center of the web a predetermined distance in direction of its periphery.

By locating the abutment C as above set forth, four ports 40, 41, 40^a and 41^a are obtained in the top or extension portion of the casing, the ports 40 and 41 being adapted to establish communication with the inlet pipe A, through the medium of the ways a and a' or a^2 of the valve 14, while the ports 40^a and 41^a are adapted to establish communication between the steam chamber B and the exhaust pipe A′, through the medium of the way a^3 of the valve 14. In the position of the valve illustrated by the drawings, steam is admitted through the ports a, a', and 40, and escapes through the ports 41^a and a^3.

The pistons D and D′, have sliding movement through the openings 23 in the cylinder, between and in contact with the packing sections 24 and 25 in said openings. The detail construction of the pistons is shown in Figs. 3 and 4, in which it will be observed that each piston consists of two outer body plates 42 and 43, one only of which is shown in Fig. 3, but both are shown in Fig. 4. Each body plate is provided with a race or groove 44 in its inner face, the said recesses being adapted to register, and the recesses are produced at the margins of the plates, extending from what may be termed their inner edges along the side and top edges, and in the space formed by these recesses a packing plate 45, is located, made in two sections 45^a and 45^b, the sections of the plate being recessed to overlap at their inner edges. These plates are free to be projected downward and outward, and the tendency of the said plates is to incline constantly in both of the above-named directions by reason of a spring 46 being located in the recess 44, and having bearing against the inner edges of both of the sections, the spring being a bow spring as shown in Fig. 3, whereby it acts vertically and laterally. The packing plates and outer or face plates 42 and 43 of each piston are connected by screws 47 or the equivalents thereof, passed through all of the plates, the packing plates having openings 48 made in them to receive the screws and of much greater diameter than the diameter of the screws. Thus the springs 46 serve to cause the packing sections of each piston to engage with the peripheral wall of the steam

valve, establishing communication between the steam cylinder B and likewise with the side walls thereof, and the contact is a steam-tight one.

In the operation of the engine, the parts being in the position shown in Fig. 2, the steam which has entered the steam chamber B through the feed pipe A and the receiving ports *a* and *a'* of the valve 14, will have exerted such pressure upon the right-hand side of the lower piston D', which is in working position, as to cause the cylinder to revolve, while the steam which had been contained in the steam chamber B at the left-hand side of the lower piston D', will escape through the exhaust ports 41 and a^3 of the offtake pipe A'. When the cylinder has revolved sufficiently to carry the upper piston D to a position somewhat short of a midway point between the top and the bottom of the steam chamber, the links 33 will have acted in such manner, guided by the cam races 32, as to force the upper piston outward across the steam chamber, and the incoming steam will then act upon that piston, causing the cylinder to revolve, while at a predetermined time the links 34 will have been acted upon in such manner as to draw the opposing piston D' within the cylinder, permitting the steam between the piston D and the exhaust ports to escape. The piston D' will then remain within the cylinder, and the piston D in position to be operated upon by the incoming steam until the piston D' shall have passed the abutment C the required distance.

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

1. In a rotary engine, the combination, with the casing having cam races, and the rotary cylinder arranged within the casing, of pistons having sliding movement in the said cylinder, links connected to the pistons and extending therefrom beyond the center of the cylinder, and projections carried by the links on the opposite side of the center of the cylinder from the respective pistons connected to the said links, said projections having guided movement in the cam races, substantially as described.

2. The combination, with the casing having a steam chamber and an inlet thereto, the casing being provided with oval cam races whose longitudinal axes extend essentially in the direction of the inlet, of a rotary cylinder arranged in the casing, pistons held to slide in the cylinder, friction rollers connected to the pistons and engaging the cam races on the opposite side of the center of the cylinder from the pistons to which they are connected, substantially as described.

3. The combination, with the casing, the rotary cylinder arranged therein, the shaft located in the axis of the cylinder and the web connecting the cylinder to the shaft, said web being provided with radial slots, of pistons having sliding movement in the cylinder, links connected to the pistons—one at each side thereof—said links encircling the shaft rollers connected to the links belonging to the same piston, said rollers extending through the slots of the said web, and means for imparting a reciprocating motion to the pistons during the rotation of the cylinder, substantially as described.

4. In a rotary engine, the combinetion, with a steam chamber, inlet and exhaust ports connected therewith, and an abutment extending within the said chamber, opposite walls of the steam chamber being each provided with a cam race, of a cylinder held to revolve in the said steam chamber in contact with the abutment, a drive shaft connected with the cylinder, interlocking links arranged in pairs within the cylinder, corresponding links of each pair being connected and held to turn with the said shaft, opposing pistons having sliding movement in the cylinder, each piston being connected with one end of a set of links, and the opposite ends of the links being provided with friction rollers traveling in the said cam races, as and for the purpose specified.

OSCAR E. MORSE.

Witnesses:
E. H. BRUNDAGE,
HERBERT E. CARPENTER.