(No Model.)

2 Sheets—Sheet 1.

O. E. MORSE.

ROTARY ENGINE.

No. 552,854. Patented Jan. 7, 1896.

Fig 1

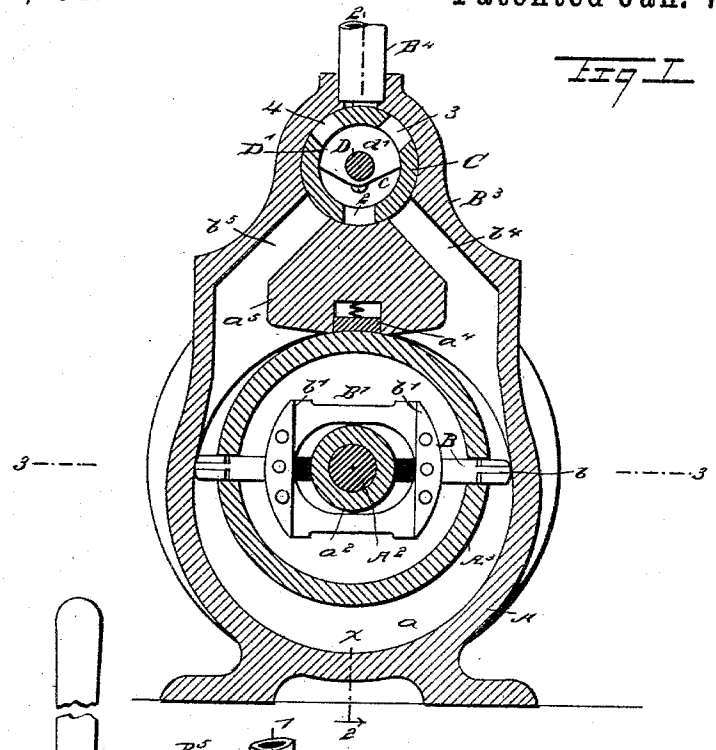
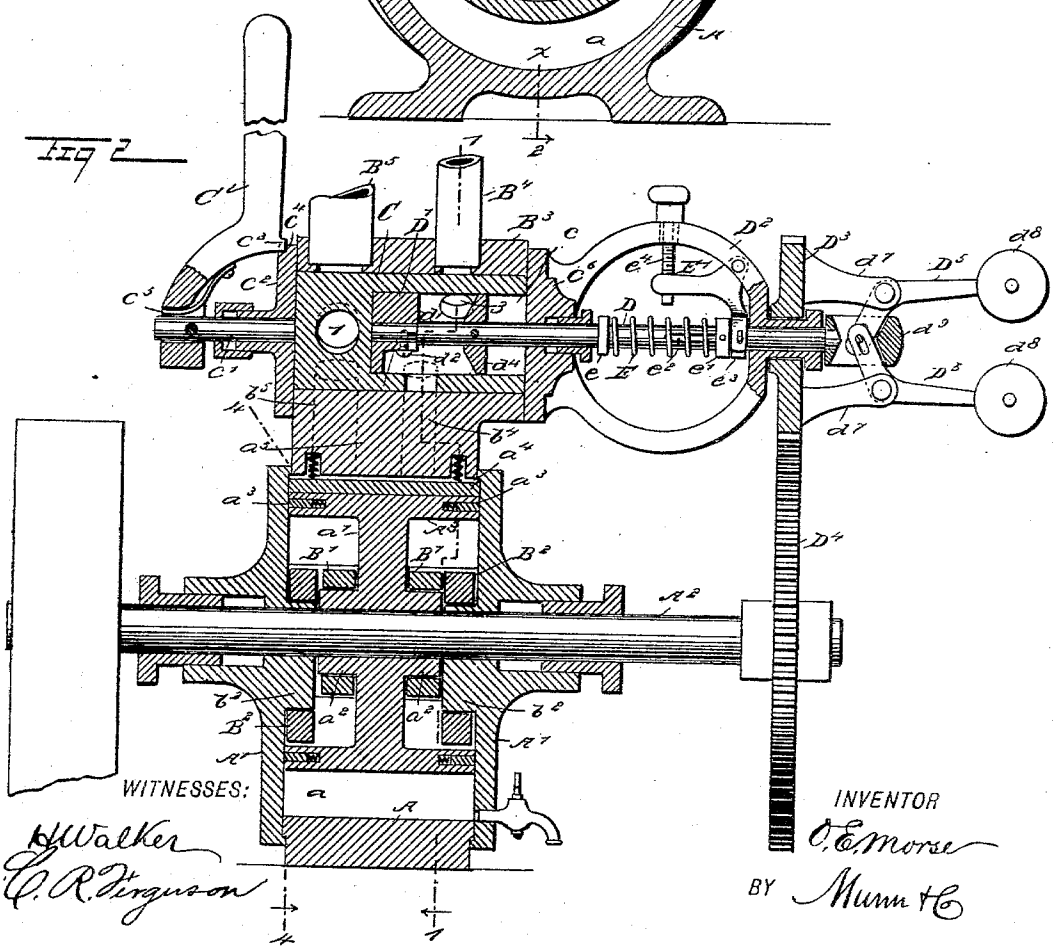


Fig 2



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(No Model.) 2 Sheets—Sheet 2.

O. E. MORSE.

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Fig 3

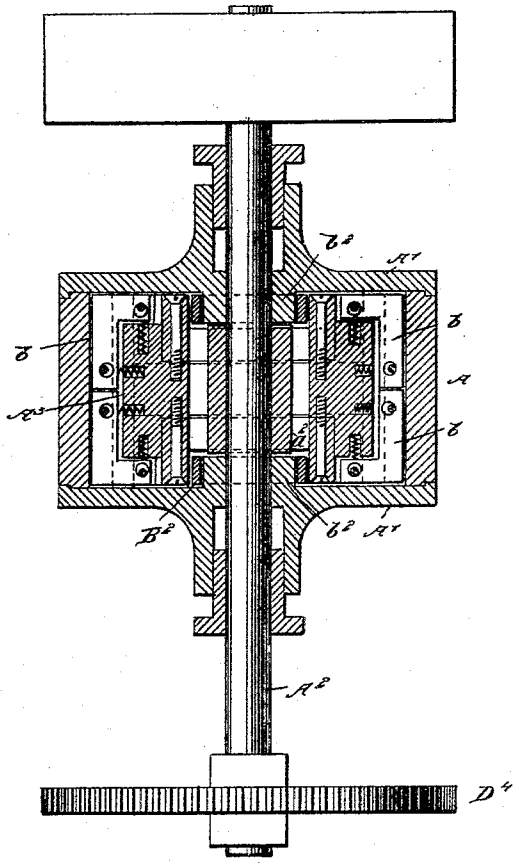
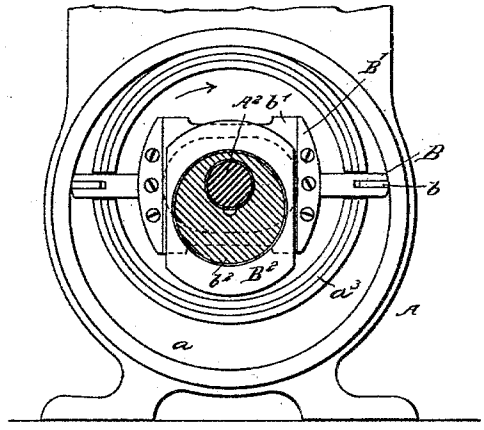


Fig 4



WITNESSES:

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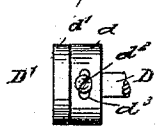
Fig 5



INVENTOR

O. E. Morse

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UNITED STATES PATENT OFFICE.

OSCAR ERNEST MORSE, OF DILLON, MONTANA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 552,854, dated January 7, 1896.

Application filed May 17, 1895. Serial No. 549,711. (No model.)

To all whom it may concern:

Be it known that I, OSCAR ERNEST MORSE, of Dillon, in the county of Beaver Head and State of Montana, have invented a certain new and useful Improvement in Rotary Engines, of which the following is a full, clear, and exact description.

This invention relates to that class of engines in which steam or other similar motive agent causes the rotation of a piston within a cylinder to transmit motion to a power-shaft.

The object of the invention is to provide an engine of the class mentioned wherein the motive agent will act on the pistons at all times at a certain distance from their axes, thereby maintaining an even leverage, and consequently producing a steady and even motion.

A further object is to so construct the parts that the engine-pistons may be rotated equally well in either direction.

The invention consists in means for producing a positive action of the pistons with relation to the steam-cylinder and in providing an automatic governor or cut-off, so that more or less steam may be admitted for expansion as the speed tends to increase or decrease.

It further consists in the construction and novel arrangement of parts, as will be hereinafter explained, and pointed out in the appended claims.

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

Figure 1 is a transverse section on the line 1 1 of Fig. 2 of a rotary engine embodying my invention. Fig. 2 is a vertical section on the line 2 2 of Fig. 1. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1. Fig. 4 is a partial elevation and partial section on the line 4 4 of Fig. 1, and Fig. 5 is an edge view of a regulating-valve employed.

Referring to the drawings, A is a steam-cylinder casing having the heads A provided with suitable stuffing-boxes, through which the driving-shaft A^2 extends. The shaft A^2 is eccentric to the axis of the cylinder A and has concentrically mounted on it a cylindrical piston-carrier A^3, which is thus eccentric to the steam-cylinder and provides between it and the lower portion of the steam-cylinder a steam-space *a*. The piston-carrier A^3 has a web portion a', and hubs or bosses a^2 extend from the web portion and surround the shaft A^2. The rim of the carrier extends across the steam-cylinder, and its edges are provided with packing-rings a^3, held in contact with the heads A' by means of springs. The upper side of the carrier revolves against a packing-plate a^4, seated in a channel in the partition-block a^5 and forced outward by means of springs.

B designates the pistons extended through diametrically-opposite openings in the rim of the carrier A^3 and adapted to bear against the wall of the cylinder A, and to provide a steam-tight connection the pistons carry at their outer ends spring-impelled packing-plates *b*. The inner ends of the pistons are rigidly secured to yoke-plates B' having openings elongated in the direction of the pistons and surrounding the hubs a^2. The plates B' have laterally-extended parallel end flanges b' against which the straight parallel edges of eccentric plates B^2 bear. The plates B^2 are mounted to rotate on bosses b^2 extended inward from the heads A' and eccentrically surrounding the shaft A^2. By this construction, as the piston-carrier rotates eccentrically to the inner wall of the cylinder A and rotates the plates B^2 on the fixed eccentrics b^2, the said plates will be moved transversely of the yoke-plates B', causing them to move transversely of the carrier A^3, thus changing the relative projections of the pistons B to cause each of them at all times to bear upon the wall of the cylinder A.

B^3 is a valve-chest mounted on the cylinder A and having steam-ports b^4 b^5 communicating with the steam-chamber *a*. Inlet and exhaust pipes B^4 B^5 communicate with the interior of the valve-chest.

C is the rotary cut-off valve in the valve-chest. At one end the valve C is provided with ports 1 adapted to form a connection between the exhaust-pipe B^5 and either one of the steam-ports b^4 b^5, and at the other end the valve has a longitudinal recess *c* forming a steam-chamber in the valve and from which steam-ports 2 3 4 lead outward. A stem c' extends from the end of the valve through the head c^2 of the valve-chest, and to the

outer end of the stem is secured a shifting-lever C′. This shifting-lever has a pivotal connection with the stem, so that it may be rocked outward on the stem. On its inner side the lever C′ is provided with a projection or lug c^3 adapted to be engaged in one of a series of notches c^4 in the periphery of the head c^2, with which it is held in locking engagement by means of a spring c^5, secured at one end to the lever and at the other end bearing upon the stem c'.

When the lever C′ is in its direct vertical position, as indicated in the drawings, the valve C will cut off the steam-ports, so that no motion will be imparted to the engine. By turning the lever laterally in one direction the valve will be rotated to connect the port 2 with the port b^4 and the port 3 with the steam-inlet B^4, and when in this position the exhaust will be out through the port b^5. By shifting the lever laterally in the opposite direction the port 2 will register with the port b^5 and the port 4 will register with the steam-inlet B^4, and the exhaust will be through the port b^4. It will be seen by this construction that the pistons may be caused to rotate in either direction.

I will now describe the automatic steam-regulating mechanism.

D is a rotary and longitudinally-movable valve-shaft extended through the head c^6 of the valve-chest B^3 and into the chamber c of the valve C, where it has secured to it a regulating-valve D′. This valve D′ has in its inner face a segmentally-cut-away portion d, forming a segmental projection d'. The valve D′ is designed to have a slight rotary movement on the shaft D, and with this end in view I loosely secure it to the shaft by means of a pin or screw d^2 passing through a slot d^3 in the valve and engaging with the shaft. With this connection the shaft is allowed a limited rotary motion relatively to the valve when the engine is reversed, causing the steam to be cut off at the proper time or place by the valve whichever way the engine runs. A disk d^4 is affixed to the shaft D within the chamber c at the side of the port b^4 opposite that of the valve D′. This disk by striking against the inner surface of the head c^6 will serve as a stop to limit the outward movement of the shaft.

The outer portion of the shaft D has a bearing through a yoke D^2, extended from the head c^6, and loosely mounted to rotate on this yoke is a pinion D^3, meshing with a gear-wheel D^4, rigidly mounted on the driving-shaft A^2. I find it desirable to make the pinion D^3 one-half the circumference of the gear D^4; but the relative sizes may be varied without departing from my invention, as the object is merely to impart a greater rotary speed to the shaft D than to the driving-shaft. Angle governor-arms D^5 are pivotally connected at their angle portion to brackets d^7 extended rigidly from the pinion D^3. The outer ends of the arms D^5 are provided with governor-weights d^8, and their inner ends are slotted, as shown, to engage with a pin extended across a transverse opening in a block d^9, rigidly secured to the end of the shaft D.

Within the yoke D^2 a spiral spring E surrounds the shaft D and abuts at one end against a collar e affixed to the shaft and at the other end against a collar e' movable longitudinally of the shaft, but intended to rotate therewith. As a means to allow the collar e' to move longitudinally of the shaft and cause it to rotate with the shaft, I here show the collar attached to the shaft by means of a pin carried by the collar and passing through a longitudinal slot e^2 in the shaft; but it is obvious that other connections may be made for this purpose, as the only object of moving the collar e' is to adjust the tension of the spring E as circumstances may require.

E′ is a tension-adjusting lever for the spring E. It is here shown in the form of an angle-lever pivoted at its angle to the yoke D^2. One arm of the lever is bifurcated and has a slotted pivotal connection with a ring e^3, mounted loosely on the shaft D and bearing against the outer surface of the collar e', and the other arm has a screw-thread engagement with an adjusting-screw e^4 passing upward through a slot opening in the yoke D^2. Obviously by manipulating the screw e^4 the lever E′ may be worked to move the ring e^3 and regulate the tension of the spring.

The operation of the engine is as follows: Steam is admitted to the steam-chamber a, where it exerts its force on the piston in line with the port b^4, causing it to move around until it has reached a point slightly above the position of the opposite piston shown in the drawings, when the steam will exhaust, and then of course the opposite piston will receive the force of live steam. When the engine is at rest, the governor and cut-off will be in the position shown in Fig. 2; but when set in motion the gear D^4 causes the pinion D^3 to rotate rapidly. As the speed increases, the weighted arms D^5 will be forced correspondingly outward to draw the shaft D outward and cause the projecting part d' of the valve D′ to more or less cover the port b^4. When a certain speed is attained, the valve D′ will be directly over the port b^4, and its cut-away portion will admit a full head of steam only while the piston is passing from the point shown to a point approximately at x, Fig. 1, when the projected portion of the valve will partially close the port b^4 and serve as an abutment, so that the steam will act expansively to the point of exhaust. If the load is taken off the engine so that a higher rate of speed is attained, the shaft D will be drawn more and more outward till all or nearly all of the steam will be cut off from the port b^4, thus reducing the speed, when the spring E will force the valve back toward its former position and admit steam enough to impart a regular speed to the engine.

Having thus described my invention, I

claim as new and desire to secure by Letters Patent—

1. In a rotary engine, the combination with a steam cylinder, of the piston carrier eccentrically mounted therein, the transversely reciprocating pistons in said carrier, and mechanism, comprising fixed eccentrics, and eccentric plates movable transversely of the pistons for causing said reciprocations during the rotary motion of the carrier, substantially as specified.

2. In a rotary engine, the combination with a steam cylinder, of the piston carrier therein and rigidly mounted on a driving shaft, the transversely movable pistons mounted in said carrier, a yoke plate to which the pistons are rigidly attached, the said plate having an elongated opening surrounding a hub on the carrier, an eccentric plate engaging with the yoke plate, and a fixed eccentric on which the eccentric plate rotates, substantially as specified.

3. In an engine, the rotary, chambered cut-off valve, the rotary regulating valve therein, and mechanism for moving the regulating valve longitudinally of the chambered valve for regulating the opening of a steam port, substantially as specified.

4. In a rotary engine, the combination with the rotary pistons and the driving shaft, of the chambered cut-off valve, a shaft extended therein and receiving rotary motion from the driving shaft, a regulating valve on the shaft within the chamber of the cut-off valve, and a governor operating by centrifugal action to draw the valve bearing shaft longitudinally outward, and the spring for moving said shaft in the opposite direction, substantially as specified.

5. The combination with the rotary cut-off valve having the steam chamber and the ports, of the regulating valve in said chamber having a segmental cut-away portion and a projecting portion, and mechanism for causing a rotary motion of the valve and also a movement longitudinally of the cut-off valve, substantially as specified.

6. The combination with the rotary cut-off valve having the steam chamber and the port, of the regulating valve, the shaft carrying the same and adapted to have a slight rotary movement relatively to the regulating valve, a centrifugal governor for moving the shaft in one direction, a spring for moving it in the other direction, and a tension device for the spring, substantially as specified.

OSCAR ERNEST MORSE.

Witnesses:
N. M. WHITE,
E. H. BRUNDAGE.