

No. 668,278.

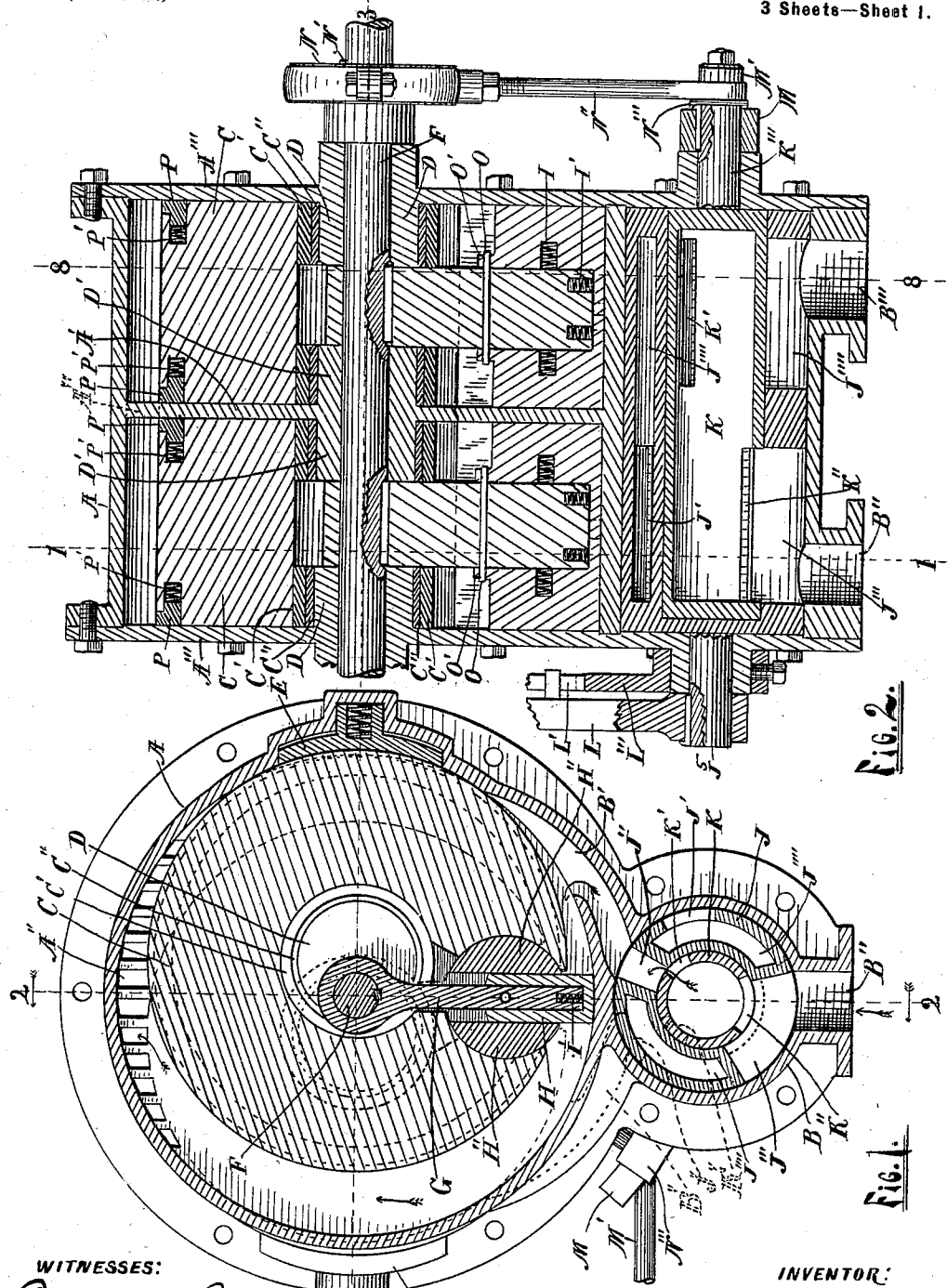
Patented Feb. 19, 1901.

W. S. AUSTIN.
ROTARY ENGINE.

(Application filed Mar. 19, 1900.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:
Palmer A. Jones.
Miles V. Eastaby

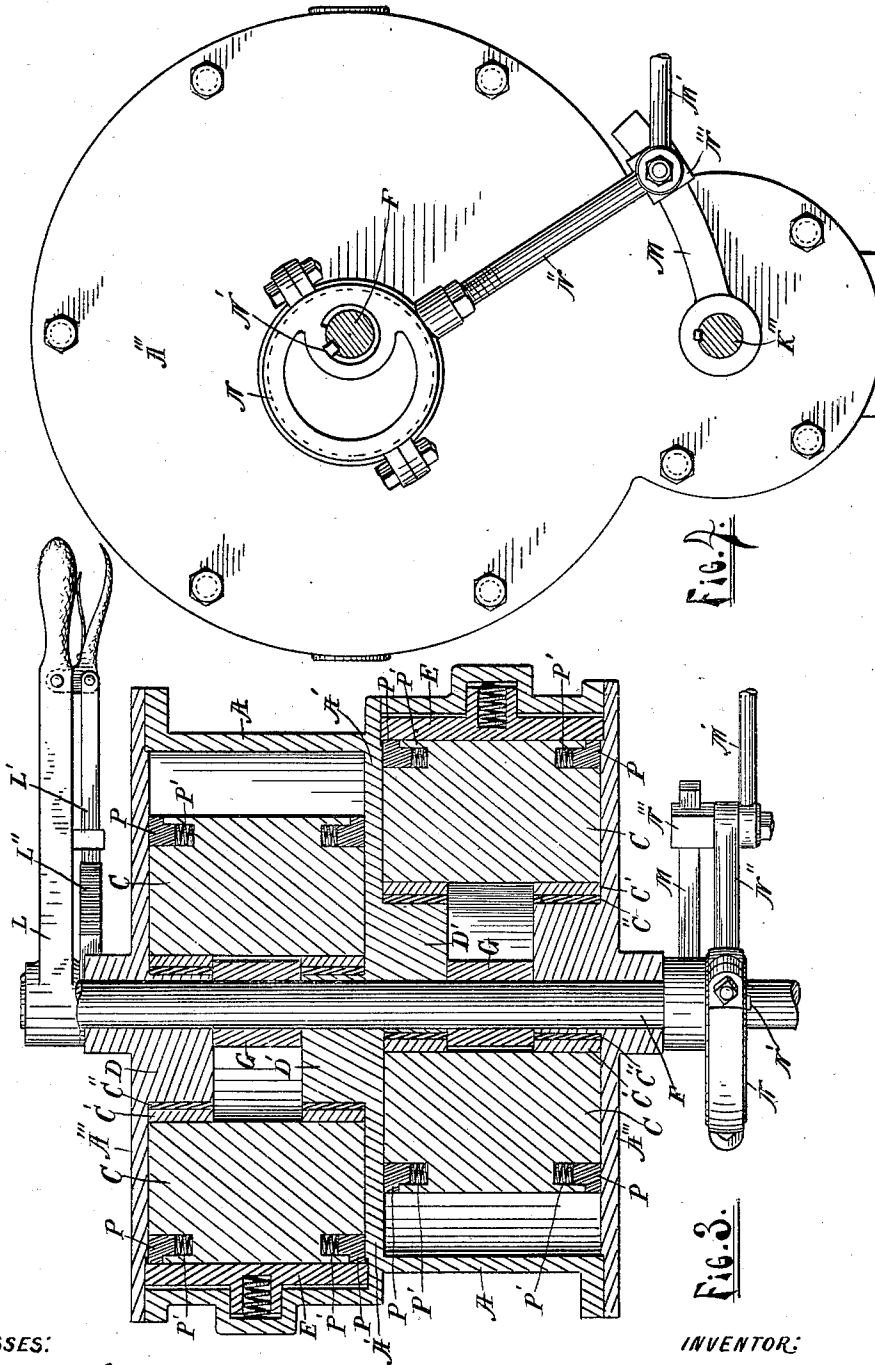
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3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

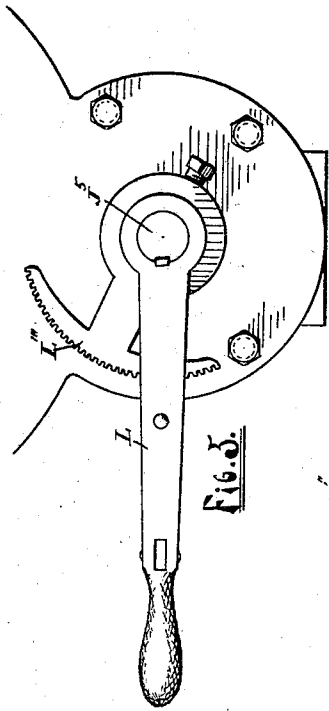


Fig. 5.

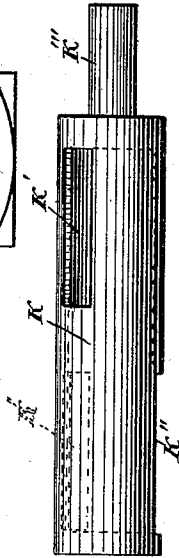


Fig. 6.

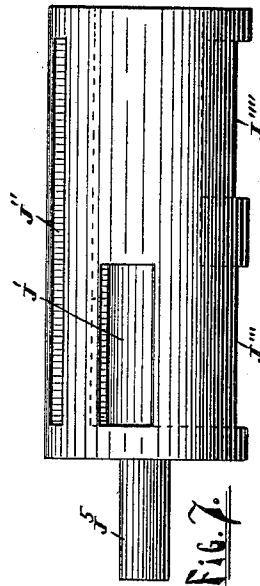


Fig. 7.

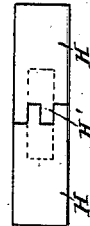


Fig. 11.

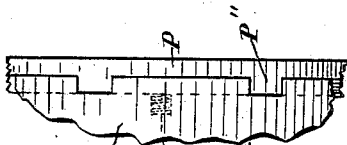


Fig. 10.

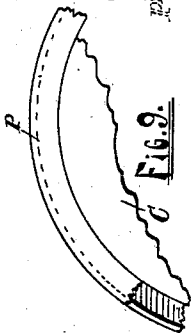


Fig. 9.

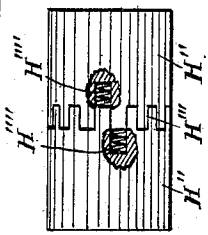


Fig. 12.

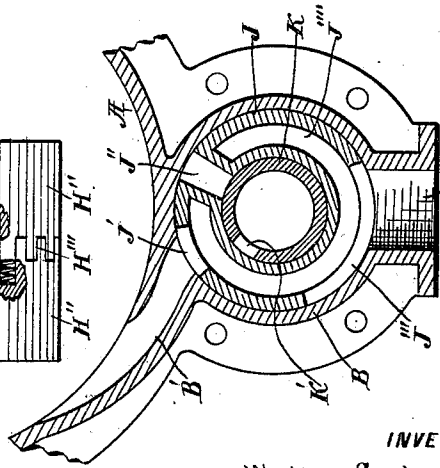


Fig. 8.

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UNITED STATES PATENT OFFICE.

WALTER S. AUSTIN, OF STANDISH, MICHIGAN:

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 668,278, dated February 19, 1901.

Application filed March 19, 1900. Serial No. 9,154. (No model.)

To all whom it may concern:

Be it known that I, WALTER S. AUSTIN, a citizen of the United States, residing at Standish, in the county of Arenac and State of Michigan, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in rotary engines; and its objects are to provide the same with improved means for working the steam expansively, to vary the cut-off at pleasure, to readily reverse the motion of the engine, and to provide the same with certain new and useful features hereinafter more fully described, and particularly pointed out in the claims.

My invention consists, essentially, in a transversely-divided cylinder having an axial driving-shaft with radial pistons thereon and arranged substantially in line with each other, oppositely-adjusted eccentric drums surrounding the shaft and partially inclosing the pistons, a cut-off valve, a reverse-valve, means for operating the valves, and ports in the valves and cylinder, whereby the steam passes through each part of said cylinder in succession and in either direction at pleasure and also whereby the steam is cut off at any desirable interval, as hereinafter more fully described, and particularly pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a transverse vertical section on the line 1 1 of Fig. 2; Fig. 2, a longitudinal vertical section on the line 2 2 of Fig. 1; Fig. 3, a horizontal section on the line 3 3 of Figs. 1 and 2; Fig. 4, an end elevation showing the cut-off mechanism; Fig. 5, a detail of the reverse-lever mechanism; Fig. 6, a detail of the cut-off valve; Fig. 7, a detail of the reverse-valve; Fig. 8, a transverse section of the valves on the line 8 8 of Fig. 2. Figs. 9 and 10 represent a detail of the drum-packing, Fig. 11, a detail of the piston-packing, and Fig. 12 a detail of the packing member at each side of the piston.

Like letters refer to like parts in all of the figures.

A represents the cylinder, having a parti-

tion A', dividing the same into two parts, and provided with a series of narrow ports A'' to permit passage of steam from one portion to the other of the said cylinder and having bridge-bars between the ports to prevent blowing through between the pistons as the same pass the ports.

A''' represents suitable heads to close the respective ends of the cylinder and valve-chamber.

B is the valve-chamber.

B' represents ports connecting the valve-chamber with the respective ends of the cylinder and suitably located to alternately act as induction and eduction ports in accordance with the adjustment of the reverse-valve, as hereinafter described.

B'' is the induction-opening, and B''' the exhaust-opening, to the valve-chamber.

In each end of the cylinder is a cylindrical drum C, arranged eccentric to the axis of the cylinder and of less diameter than the same, whereby a lune-shaped space between the drum and cylinder, extending nearly around the drum, is provided. Said drums are mounted on suitable bosses D and D' on the partition A' and heads A''', the drums being arranged to contact opposite sides of the cylinder and with their axes at opposite sides of the cylinder-axis. The interior of the cylinder is bored concentric with the axis of the drum and provided with a suitable yielding stop E to prevent the passage of steam. Each drum also is provided with suitable packing-rings P, having springs P' to hold the same in contact with the heads and partition, and each ring is provided with projections P'', engaging recesses in the drum to cause the ring to rotate with the drum and to prevent blowing through between the drum and cylinder-head. To form a continuous bearing and to provide for taking up wear by inserting new parts, removable rings C' are inserted in the drums C, and rings C'' may also be placed on the bosses to provide a better bearing-surface.

F is the driving-shaft of the engine, arranged in the axis of the cylinder and passing through the bosses D and D'. Fixed upon this shaft are radial pistons G, arranged substantially in line with each other and provided with suitable packing-plates H, which

plates are suitably recessed to receive the end of the piston G and provided with intermeshing portions H' to permit of expansion by means of springs I to insure contact with the partition A' and heads A'''. These plates H are also pressed radially by springs I' and are held from undue radial movement by pins O, inserted in the pistons G, and the lugs O' on the plates H, which plates are adjusted for wear by filing the holes in the lugs O' to permit the plates to move outward until they fit closely against the interior of the cylinder. The piston G and plates H extend through radial openings in the drum C, in which openings are cylindrical packing members H'', engaging concave seats in the drums and having transverse openings through which the pistons and plates extend and slidably engage the same, whereby the pistons will oscillate within the openings in the drum and at the same time a tight joint be maintained to prevent passage of steam into the interior of the drums. These packing members H'' are transversely divided and provided with intermeshing portions H''' and springs H'''' to insure longitudinal expansion and close contact at the ends with the heads and partition of the cylinder.

J is the reverse-valve, consisting of a cylindrical body having an interior tubular chamber to receive the cut-off valve K, each valve being independently rotative. The reverse-valve is provided with an intake-port J'', which at all times connects with the intake B''. The cut-off valve is provided with an intake-port K'', which at all times connects with the intake-port J'', so that steam is freely admitted to the interior of the cut-off valve in all positions of these valves. Through the upper part of the reverse-valve extends a live-steam port J', which is adapted to alternately connect with the respective ports B' B' when the reverse-valve is shifted from side to side.

J' represents exhaust-ports near the respective ends of the reverse-valve, which exhaust-ports are so located as to alternately connect with the ports B' B'. When the port J'' is connected with one of the ports B' B', one of the exhaust-ports connects with the other port B', and thus the current of steam is reversed in its direction through the engine by shifting the reverse-valve from side to side. The exhaust-ports J' open into a chamber J'''' in the reverse-valve, which chamber is open at the bottom opposite the exhaust-passage B''' in the valve-chamber and connects therewith at all times. The reverse-valve is provided with a stem J⁵, extending through the head A''', to which is attached a lever L, provided with a latch L', engaging a notched sector L'', whereby the reverse-valve may be turned and held as occasion may require. The cut-off valve K is provided with ports K' K', suitably located in its upper side to permit the passage of steam from its interior to the port J'', and these ports are so arranged that when the valve is oscillated by means of the eccentric N, connect-

ing-rod N', and the arm M, attached to the valve-stem K''', the flow of steam will be admitted as the piston passes the port B' and cut off at any point in the passage of the piston through the lune-shaped steam-space in the cylinder. The opening and closing of this cut-off is varied by varying the throw of the cut-off valve by means of a block N''', slidable on the arm M, to which block the connecting-rod N'' is attached and which block is adjusted on the arm by means of a rod M', connected to any suitable lever. (Not shown.) The cut-off may also be varied by a change of adjustment of the reverse-valve by shifting the latch L' in the notches of the sector L''. To provide for reversing the operation of the cut-off valve, the eccentric N is driven by a lug N', which is movable in a suitable recess in the eccentric, as shown in Fig. 4, whereby when the movement of the engine is reversed the eccentric will suitably shift its position on the shaft to properly operate the cut-off valve. The steam passing through the valves and port B' enters the lower end of the lune-shaped space between the drum and cylinder and engages the piston at its outer end, forcing the same around, thus applying the power directly to the driving-shaft F. As the piston passes the ports A'' the steam is permitted to escape through the same and engage the piston in the other portion of the cylinder, thus acting upon the same and forcing it forward while the first piston is out of action and passing the stop E, opposite which stop it is withdrawn within the circumference of the drum, as shown by dotted lines. These pistons may be somewhat out of line on the shaft, if desired, to permit of an earlier exhaust and less back pressure and also to provide against lateral pressure on the second piston. When the second abutment reaches the port B', the exhaust takes place, and the operation is again repeated. It will be observed that the exhaust does not take place until after the first piston has passed the live-steam port B'. Consequently there is no possible way in which the engine will stop on a dead-center. The end of the piston being narrower than the port B' it cannot stop opposite the port to close the same, and should it stop short of passing the port the steam will blow through in front of it and through the ports A'', and thus reach the other piston and drive it around to the exhaust, thus starting the engine. In the event that the engine should stop with the cut-off valve closed the reverse-lever can be shifted beyond the normal position far enough to open a passage to the cut-off port and start the engine. By shifting the reverse-valve so that the port J'' comes opposite the other port B' the steam enters, passes through, and escapes from the engine in the opposite direction, the eccentric automatically shifts its position on the shaft, and the operation of the parts is precisely the same as before, the engine running in the opposite direction. For

working the steam without expansion or to operate as a water-motor the cut-off valve may be dispensed with or permanently adjusted relative to the reverse-valve with one of the ports K' opposite the port J". It will thus be seen that the engine is well adapted to work any expansible vapor at any variation of cut-off, or to work water or other non-expansible liquid and may also be operated as a rotary pump, and is also readily reversible.

I do not limit myself to the exact construction shown. Various modifications of construction may be adopted without departing from the spirit of my invention.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of a cylinder having a transverse partition, a shaft in the axis of the cylinder, radial pistons attached to the shaft, and a drum in each end of the cylinder, said drums engaging opposite sides of the cylinder, and having their axes arranged at opposite sides of the shaft, substantially as described.

2. The combination of a cylinder having a fixed transverse partition provided with ports, a shaft in the axis of the cylinder, a radial piston in each part of the cylinder and attached to the shaft, eccentric drums in the respective parts of the cylinder and engaging opposite sides thereof, and means for admitting steam to one part of the cylinder, and means for exhausting the steam from the other part of the cylinder, substantially as described.

3. The combination of a cylinder having a transverse partition, a port connecting the respective parts of the cylinder, a shaft in the axis of the cylinder, pistons attached to the shaft and extending therefrom in the same direction and in substantially the same plane, eccentric drums in the respective parts of the cylinder and engaging opposite sides thereof and having their axes at opposite sides of the shaft, a valve-chamber, ports connecting the valve-chamber and the respective parts of the cylinder, and a reverse-valve in said chamber, substantially as described.

4. The combination of a cylinder having a transverse partition, a series of narrow ports in the partition, a shaft in the axis of the cylinder, radial pistons attached to the shaft at each side of the partition and substantially in line with each other, eccentric drums engaging opposite sides of the cylinder, a valve-chamber, ports extending from the valve-chamber to the respective parts of the cylinder, a cut-off valve, and a reversing-valve in the valve-chamber, and means for operating said valves, substantially as described.

5. In a rotary engine, a cylinder having a

transverse partition and a passage connecting the respective parts of the cylinder, a valve-chamber, ports connecting the chamber with the respective parts of the cylinder, a reverse-valve having a live-steam port and exhaust-ports, and a cut-off valve to open and close the live-steam port of the reverse-valve, and means for operating said valves, substantially as described.

6. In a rotary engine, a cylinder, a cylindrical valve-chamber, ports extending from the valve-chamber to the cylinder, a reverse-valve rotative in the valve-chamber, and having a live-steam port and exhaust-ports, a cut-off valve rotative in the reverse-valve, and means for oscillating the cut-off valve, substantially as described.

7. In a rotary engine, a cylinder having a transverse partition and a passage connecting the respective parts of the cylinder, a cylindrical valve-chamber having an intake and exhaust opening, ports extending from the valve-chamber to the respective parts of the cylinder, a reverse-valve rotative in the valve-chamber and having intake and exhaust openings, a live-steam port and exhaust-ports, and a tubular interior, a cut-off valve in the interior of the reverse-valve, and having an intake-port and live-steam ports, and means for operating said valves, substantially as described.

8. In a rotary engine, the combination of a rotary drum having a lateral opening, a shaft eccentric to the drum, a radial piston attached to the shaft, a cylindrical packing member in the lateral opening, and having a slot to receive the piston, said member also having transversely-divided and intermeshing parts, substantially as described.

9. In a rotary engine, the combination of a shaft, a radial piston attached to the shaft, an eccentric drum having a lateral opening, a cylindrical packing member in the opening and having a longitudinal slot, and transversely-divided and intermeshing parts, and packing-plates recessed to receive the piston, and having transversely-divided and intermeshing parts, substantially as described.

10. In a rotary engine, in combination with an eccentric drum having an axial opening and a lateral opening, both extending from end to end of the same, and bosses engaging the axial opening forming bearings for the drum, detachable rings forming continuous bearing-surfaces and inserted in the drum, substantially as described.

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

WALTER S. AUSTIN.

Witnesses:

PALMER A. JONES,
LUTHER V. MOULTON.