J. M. SIMPSON.

ROTARY-ENGINE.

No. 184,919. Patented Nov. 28, 1876.

Fig. 1.

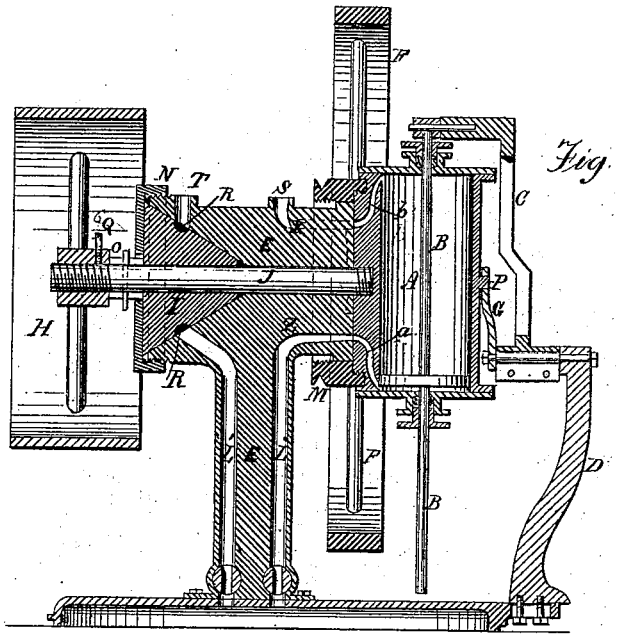


Fig. 2.

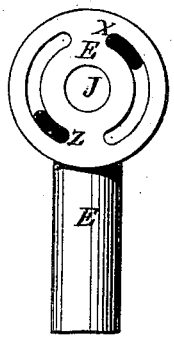
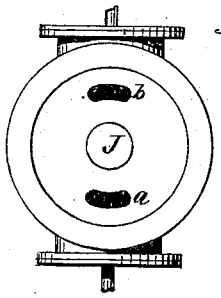


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOSIAH M. SIMPSON, OF OSHKOSH, WISCONSIN.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **184,919**, dated November 28, 1876; application filed June 22, 1876.

To all whom it may concern:

Be it known that I, JOSIAH M. SIMPSON, of Oshkosh, in the county of Winnebago and State of Wisconsin, have invented a new, useful, and Improved Revoluble Reciprocating Steam-Engine; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, making a part of this specification, in which—

Figure 1 is a vertical sectional view of a machine embodying the improvements of my invention. Fig. 2 shows the port end of the stand; and Fig. 3 represents the port face of the cylinder.

This invention relates to an improvement in steam-engines; and consists, first, of a cone secured to the main shaft, and provided with diametrical slots, in combination with a stand and the revolving cylinder; secondly, of a vertically-revolving cylinder secured to the main shaft of the machine, and provided with two ports, each of which becomes alternately a steam and an exhaust port, a reciprocating piston and rod, which revolves with the revolving cylinder, and a crank whose center is eccentric to the center of the revolving cylinder, in combination with a stand having inlet and exhaust pipes, and a cone secured to the main shaft, and provided with diametrical slots; thirdly, a vertically-revolving cylinder, having two steam-ports, each of which becomes alternately an inlet and an exhaust port, secured to a fly-wheel cast upon the main shaft, in combination with a stand having steam, water, and exhaust pipes, and a slotted cone secured to the main shaft; fourthly, a vertically-revolving cylinder, provided with two steam-ports, each of which becomes alternately an inlet and an exhaust port, secured to a fly-wheel cast upon the main shaft, in combination with a stand having steam, water, and exhaust pipes, a slotted cone secured near the opposite end of the main shaft, and a band-wheel screwed upon the end of the main shaft; the objects of the several parts of the invention being to dispense with the double slide-valves, eccentric-rod, and pump used in the ordinary reciprocating engine, and to supply their equivalents in a far more simple and decidedly cheaper manner than has heretofore been done.

In the accompanying drawing, similar letters of reference in the several figures indicate like parts of the invention.

The cylinder A is secured to, or cast upon, the fly-wheel F, which is cast upon the main shaft J, and is provided with a trunnion, P, which rests in the boxing-support G, secured to a shaft in the crank-support D. The piston-rod B has its piston at or near its center, and the rod B penetrates both cylinder-heads. A crank, C, secured to the crank-support D, is connected with one end of the piston-rod B in such a manner that the center of the crank C is set aside from the center P of the cylinder A a distance equal to one-half the length of the stroke of the piston-rod B. The cylinder A has two steam-ports, *a* and *b*, each of which becomes alternately an inlet and an exhaust port—that is to say, the port *a*, when the cylinder A is in the position shown in Fig. 1, is the inlet-port; but when the steam has forced the piston nearly to the other end of the cylinder the latter will have made one-half revolution, and will have carried the port *a* around to the position occupied by the port *b*, as shown in Fig. 1, at which time *a* becomes the exhaust and *b* the inlet-port. The stand E receives the main shaft J, upon one end of which the cylinder A and fly-wheel F are cast or otherwise attached, and is also constructed to receive the cone I, secured to the shaft J by the pin O. The band-wheel H is screwed upon the end of the shaft J, and may be turned against the cone I, and secured by the set-screw Q to hold the port faces of the cylinder A and stand E in their proper places. The cone I is provided with two diametrical slots, R R. Steam-pipes L L′ lead from the boiler, which, for convenience, should be placed beneath the engine—one to the cylinder A, and one to the cone I—for the purpose of equalizing the steam-pressure between the port face of the cylinder and the surface of cone, thus distributing the friction between these two points. Fig. 2 shows the port face of the stand E, in which X represents the exhaust-port, and Z the inlet-port.

It will be seen that the pipe L connects with the inlet-port Z at its lowest portion, and a depression in the face of the stand E continues nearly halfway around the face of the

stand E toward its top, to permit the steam to enter the port *a* or *b*, as the case may be, as long as it is opposite the depression. The exhaust-port S leads from the highest portion of the exhaust-port X to the top of the stand E, continuing nearly half-way around said face toward the bottom of the stand, to permit the exhaust of steam to continue as long as the port *a* or *b*, as the case may be, remains opposite the said depression. The pipe L′ leads, as before stated, from the boiler to the cone I, and a pipe, T, leads from the cone I to a water tank or reservoir above the engine. When the water is turned on, and the engine is in motion, the slots R R, as they come beneath the water-pipe T, will take water, and convey it, through the steam-pipe L′, to the boiler beneath, so that the cone I serves the double purpose of an equalizer and a pump. M is the pulley for the round belt that leads to the governor. N is the ordinary packing to make the cone end of the stand E steam-tight.

The operation of the invention is as follows, viz: Steam from the boiler enters the cylinder A through the pipe L, and the lowest port, *a* or *b*, as the case may be, drives the piston toward the other end of the cylinder A, and causes a rotary motion of the cylinder A, piston-rod B, and crank C, and also a rectilinear motion of the piston-rod B with relation to the cylinder A. The steam-port, when it has made one-half a revolution, becomes the exhaust-port; and when an entire revolution of the cylinder has been made it again becomes the steam-port, so that each port *a* and *b* takes and exhausts steam every revolution of the cylinder. Thus the double slide valves used where the cylinder is stationary are dispensed with.

The crank C has its center set aside from the cylinder A a distance equal to one-half the length of the stroke of the piston-rod in the cylinder, and thus the ordinary but expensive eccentric-rod is dispensed with.

The cone I is secured to the main shaft J, so that it may revolve with it, and slots in the collar U permit it to be driven on the shaft J by the band-wheel H, for the purpose of making the port faces of the cylinder and stand, as well as the face of the cone and stand, steam-tight. The diametrical slots R R act as cups, to carry water to the boiler, as before stated, thus converting the cone into a pump, while it, at the same time, performs the further office of an equalizer, to counteract the steam-pressure on the port face of the cylinder.

It will be seen that the axis of revolution of the cylinder A is concentric with the center of motion of the power-transmitting medium, which may be either the fly-wheel, prepared to receive a belt, or a combined fly and gear wheel, or the band-wheel H. In either case the axis of the cylinder will be in line with the axis of the main shaft, and the eccentric crank will produce the revoluble reciprocating motion of the piston-rod.

Having thus described my improvements, what I claim as new and useful, and desire to secure by Letters Patent, is—

1. The cone I, secured to the main shaft J, and provided with the diametrical slots R R, in combination with the stand E, provided with pipes L, L′, S, and T, and the revolving cylinder A, substantially as and for the purposes set forth.

2. The vertically-revolving cylinder A secured to the shaft J, and provided with the ports *a* and *b*, the piston-rod B, and eccentric crank C, in combination with the stand E, having pipes L, L′, S, and T, and the cone I, provided with diametrical slots R R, substantially as and for the purposes set forth.

3. The stand E, having steam, water, and exhaust pipes L, L′, S, and T, and the cone I, having the slots R R, in combination with the vertically-revolving cylinder A, having ports *a* and *b* secured to the fly-wheel F upon the shaft J, substantially as and for the purposes set forth.

4. The vertically-revolving cylinder A, having ports *a* and *b* secured to the fly-wheel F upon the main shaft J, in combination with the stand E, having steam, water, and exhaust pipes, a slotted cone, I, secured near the opposite end of the main shaft, and the band-wheel screwed upon the end of the main shaft, substantially as and for the purposes set forth.

In testimony that I claim the foregoing improvements as above described I have hereunto set my hand and seal this 19th day of June, 1876.

JOSIAH M. SIMPSON. [L. S.]

Witnesses:

O. H. HARRIS,

E. SANBORN.