2 Sheets—Sheet 1.

J. BUTCHER.
Rotary-Engine.

No. 208,565. Patented Oct. 1, 1878.

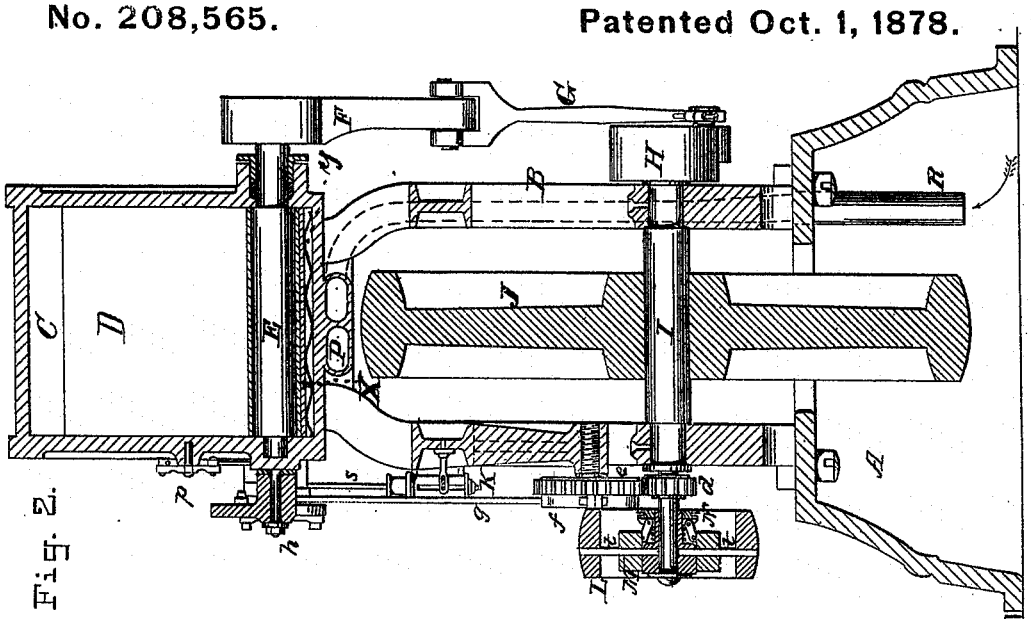

Fig. 2.

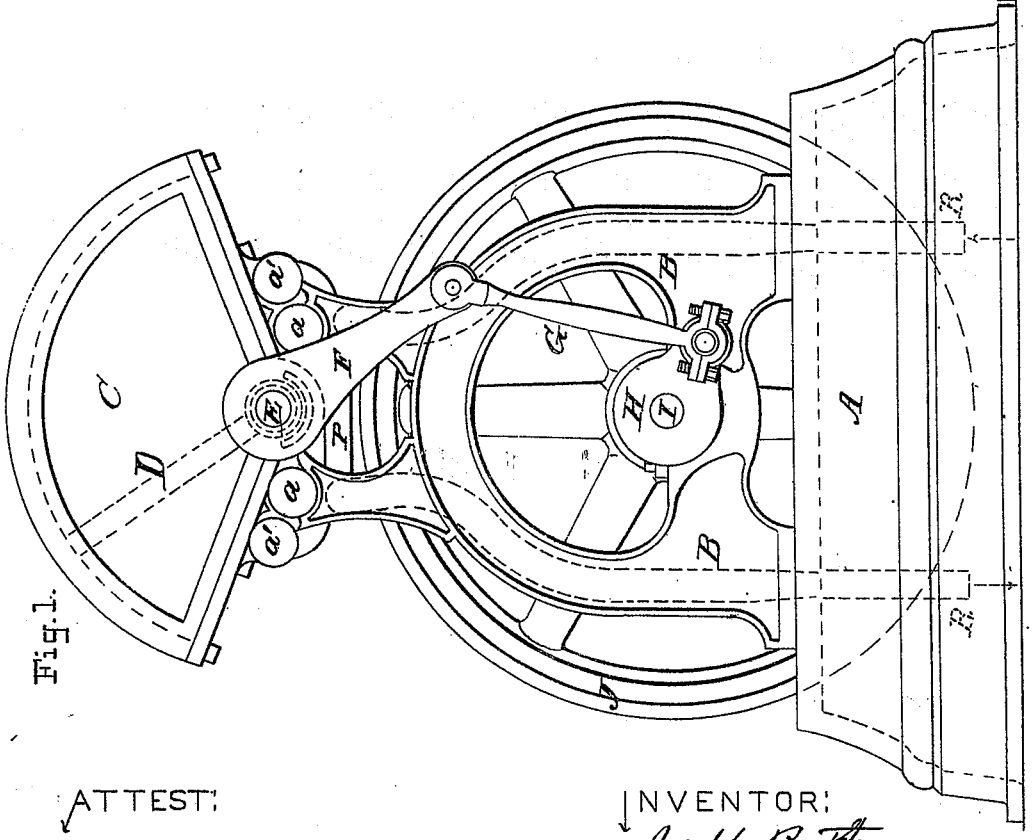

Fig. 1.

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2 Sheets—Sheet 2.

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Fig. 4.

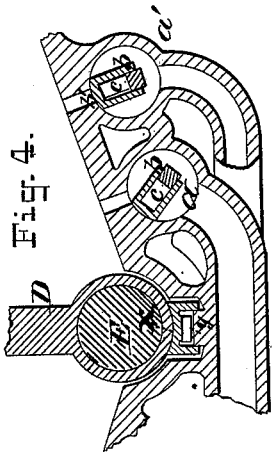
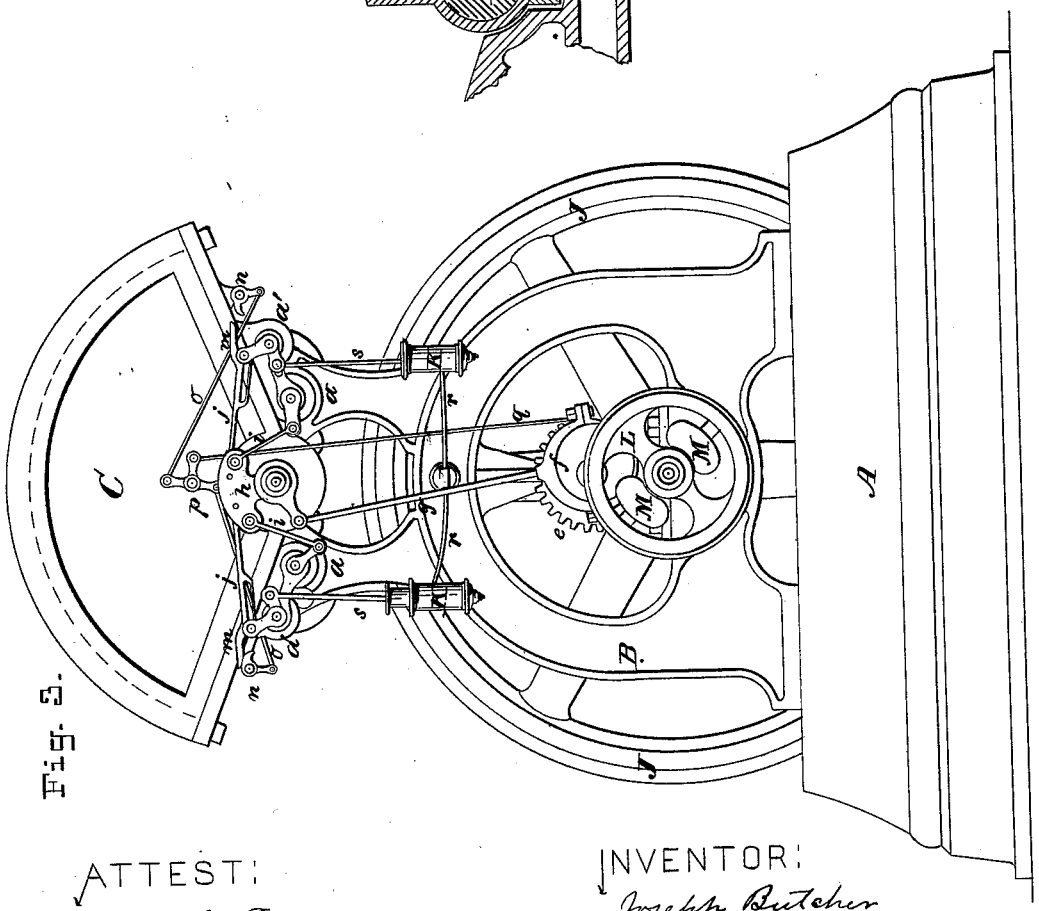


Fig. 5.



ATTEST:
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UNITED STATES PATENT OFFICE.

JOSEPH BUTCHER, OF NEW YORK, N. Y.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **208,565**, dated October 1, 1878; application filed October 3, 1877.

To all whom it may concern:

Be it known that I, JOSEPH BUTCHER, of the city, county, and State of New York, have invented certain Improvements in Steam-Engines, of which the following is a specification:

This invention relates to that class of engines in which the piston is fixed to a rock-shaft at one edge and oscillates within a chamber having a profile of sectoral form.

The invention consists partly in the arrangement and combination of parts, whereby the piston, in oscillating through less than one-half of a revolution, causes a complete revolution of a crank, to which it is connected.

It also consists in the combination of the vibrating piston and its chamber with exhaust-valve chambers, so arranged as to prevent the accumulation of water of condensation in the chamber, all as will be hereinafter more fully described.

In the drawings, Figure 1 is a front elevation of my improved engine. Fig. 2 is a vertical mid-section of the same, taken in a plane at right angles to Fig. 1. Fig. 3 is a rear elevation of the engine. Fig. 4 is an enlarged sectional detail, showing the valve-chambers and adjacent parts.

A represents a hollow base or bed-plate, upon which is mounted the frame B, which supplies passages for the steam, bearings for the main shaft, and support for the sectoral chamber C of the engine. D is an oscillating or vibrating piston, fixed to a rock-shaft, E, to the projecting end of which is keyed a long crank, F. This crank communicates, through a connecting-rod, G, with a short crank, H, on the main shaft I, which also bears a fly-wheel, J.

The piston D oscillates through less than one-half of a revolution; but it will be seen that when it passes from one end of the chamber C to the other it produces an entire revolution of the crank H. The return to its first position produces another revolution of the said crank, and thus two strokes of the piston D will produce two revolutions of the short crank H.

The chambers *a a* of the exhaust-valves are situated near the axis of oscillation of the piston D, so that any water of condensation which collects in the chamber C may escape before it can accumulate in any quantity that would be injurious. Moreover, it will be seen that the chamber C circumscribes the sweep of the piston to less than half a circle, and in consequence the "heads" of the chamber incline toward the center of oscillation of the piston, which is the lowest point, thus causing all the water of condensation to collect there. The chambers *a' a'* of the receiving-valves are situated near the exhaust-valve chambers, but farther out. *b b* are the valves, which are arranged to oscillate, and *c c* are springs, which hold them up to their seats. These valves are driven by any suitable gear, that shown forming no part of my present invention.

To prevent the steam from escaping around the axis of oscillation of the piston, a packing-strip, *x*, is kept closely pressed against the cylindrical collar of the piston (which surrounds the rock-shaft E) by means of the spring *y*, as shown in Figs. 2 and 4.

The governor (shown at L in the figures) may be of any good form. That shown in the drawings forms no part of my present invention.

The steam is admitted and exhausted through tubular cavities in the legs of the frame B, (indicated by dotted lines in Fig. 1,) connecting with ordinary passages P, which lead to the valve-chambers, as shown in Figs. 2 and 4. R R represent the pipes connected with the extremities of these cavities, and adapted to lead off to the boiler or the open air.

Having thus described my invention, I claim—

1. The combination of the sectoral chamber C, mounted on the base A and frame B, the oscillating or vibrating piston D, arranged to travel through less than one-half of a revolution or circle, the swinging crank F, connecting-rod G, and short crank H, when all are arranged in such relative proportions that the crank H makes a complete revolution while the crank F vibrates through less than one-half of a revolution, as set forth.

2. The combination of the sectoral chamber C and its vibrating piston D with the exhaust-valve chambers *a a*, arranged on opposite

sides of the shaft E, and at the lowest available point, substantially as and for the purposes set forth.

3. The sectoral chamber C, containing less than a semicircle, and so mounted upon the frame B that its apex may be lowest and the two heads of the chamber may incline at equal angles, as shown.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOSEPH BUTCHER.

Witnesses:
SAM TRO. SMITH,
BENJ. A. WHITEMAN.