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C. BAILEY.

ROTARY ENGINE.

No. 395,647. Patented Jan. 1, 1889.

Fig. 2.

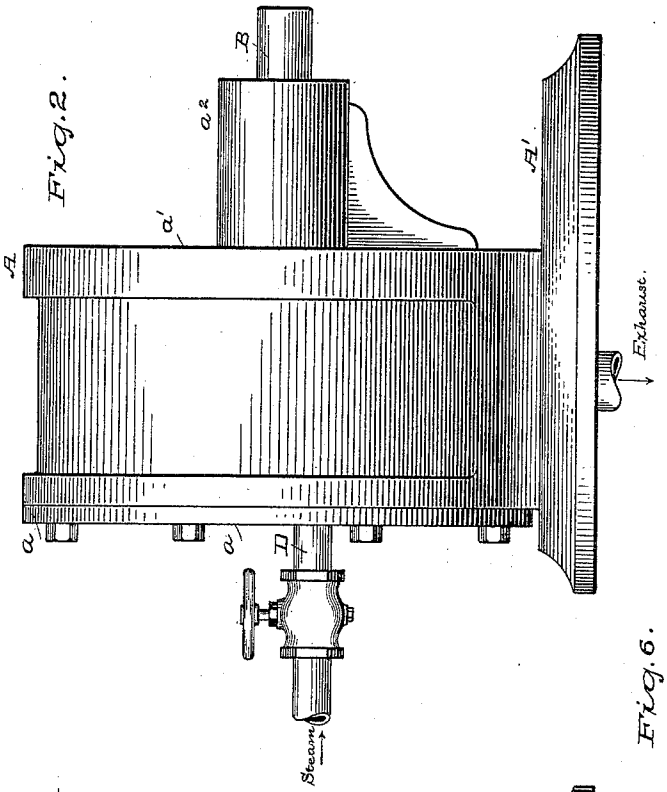

Fig. 10.

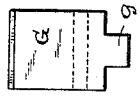

Fig. 9.

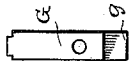

Fig. 6.

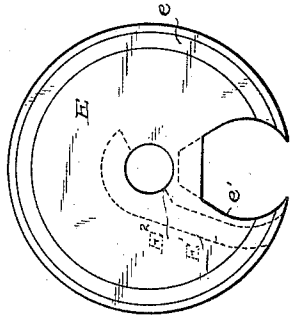

Fig 1

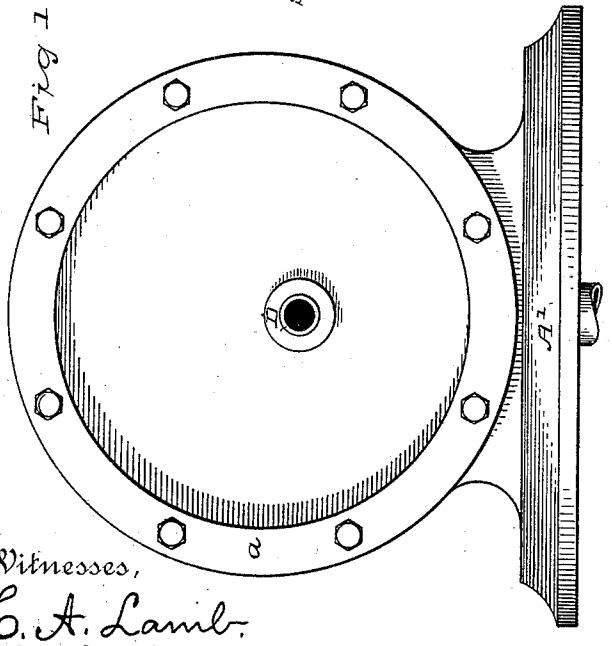

Fig. 8.

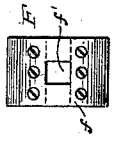

Fig. 7.

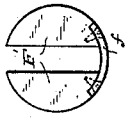

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Fig. 3.

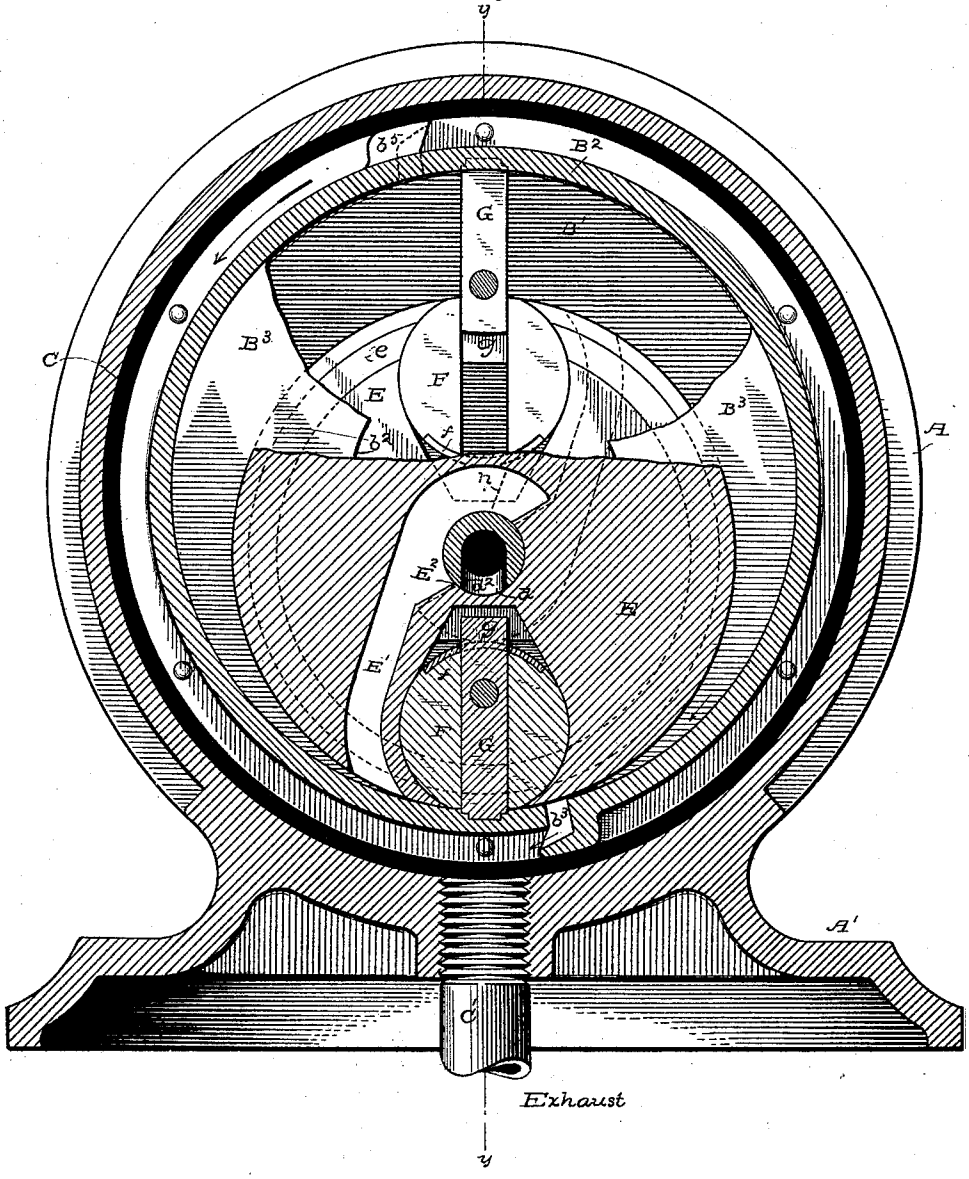

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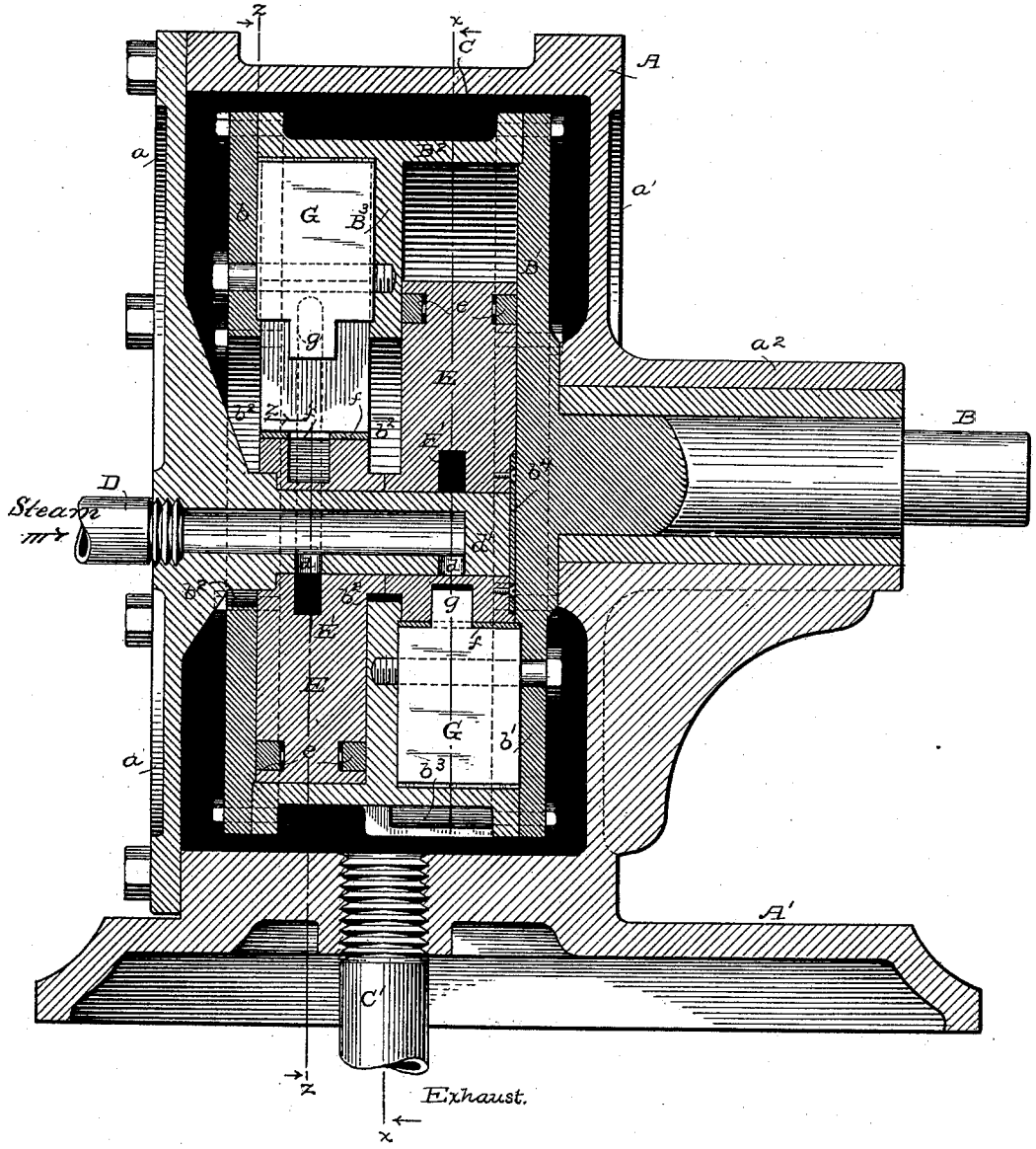
Fig. 4.



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ROTARY ENGINE.

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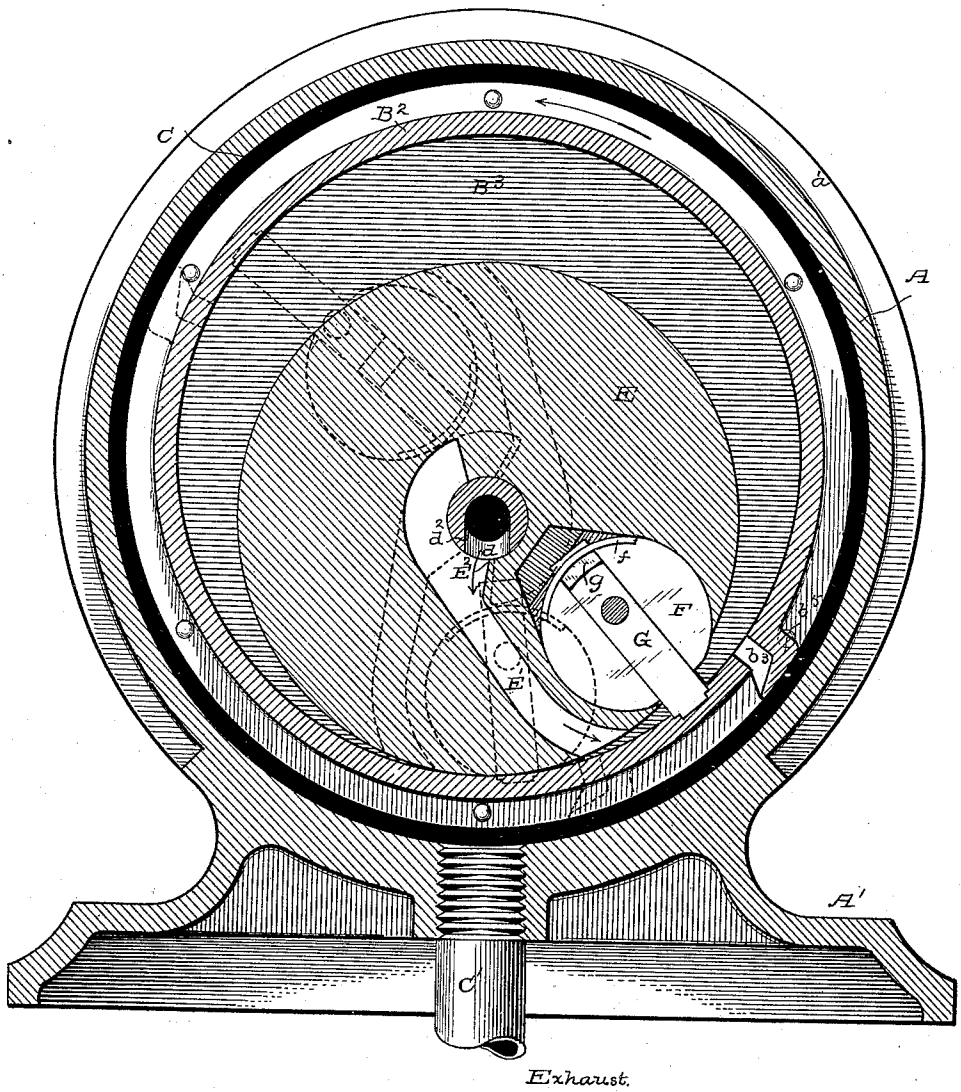
Fig. 5.



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UNITED STATES PATENT OFFICE.

CYRUS BAILEY, OF AKRON, OHIO.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 395,647, dated January 1, 1889.

Application filed September 27, 1886. Renewed April 28, 1888. Serial No. 272,126. (No model.)

To all whom it may concern:

Be it known that I, CYRUS BAILEY, of Akron, in the county of Summit and State of Ohio, 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 pertains to make and use the same.

My invention relates to improvements in rotary engines; and it consists in certain features of construction and in combination of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation or end view of my improved engine. Fig. 2 is a side elevation, the driving-pulley, fly-wheel, &c., being omitted. Figs. 3 and 5 are sectional elevations, respectively, on the lines *x x z z*, Fig. 4, looking in the direction of the arrows, the latter figure showing the parts in different working positions. Fig. 4 is an elevation in longitudinal section on the line *y y*, Fig. 3. Fig. 6 is an end elevation of the piston-wheel, showing in dotted lines the induction-ports thereof. Figs. 7 and 8 are respectively an end elevation and plan of an oscillating piston-bearing. Figs. 9 and 10 are respectively edge and side views of the piston.

Similar letters denote like parts throughout.

A represents the casing of the engine, the same being cylindrical in form and having a broad supporting-base, A′, and having also a removable head, *a*, and usually (but not necessarily) a solid head, *a′*, to which latter is attached, or made integral with, a journal-box, a^2, for supporting the engine-shaft B.

Mounted on the shaft B, and rigidly secured to and concentric therewith, is a double cylinder, B′—that is to say, a cylinder with two compartments—consisting of a rim, B^2, with an internal web or diaphragm, B^3, together with heads *b* and *b′*, arranged and secured substantially as shown in Fig. 4. The external dimensions of the double cylinder are considerably less than the internal dimension of the casing, (see Figs. 3 and 4,) leaving an ample space, C, between the two that serves as an exhaust-chamber, the latter being in open relation with the exhaust-pipe C′.

D is a steam-pipe that passes through a suitable opening in the head *a*, making a tight joint therewith. This pipe extends through openings b^2 respectively in the head *b* and diaphragm B^3. The pipe D has ports *d* opening into the respective compartments of the cylinder, and has a solid end, *d′*, that abuts the plate b^4, the latter being secured to the piston-wheel in position to receive any wear at this part. On the pipe D are journaled the piston-wheels E, located, respectively, in the different compartments of the cylinder. These wheels are fac-similes of each other and are fitted with great accuracy, as are also the compartments of the cylinder in which they respectively operate. Each piston-wheel has a steam-port, E′, packing-rings *e*, and a chamber, *e′*, extending longitudinally, in the circular part of which latter is fitted the oscillating piston-seat F. The pistons G are rigidly secured to the inner periphery of the respective cylinder-compartments and are set radially and on opposite sides of the axis of the cylinder.

The pistons are embraced by the segmental cylindrical blocks F, that are connected by the plate *f*, the latter having the central openings, *f′*, through which the tenons *g* of the piston may pass. The two blocks and plate forming the piston-seat are made to fit and oscillate in the circular portion of the chamber *e′* aforesaid. By this arrangement of parts the cylinder and piston-wheel revolve freely and in unison without cramping the piston, notwithstanding the eccentricity of these parts, whereby only the vertical radial lines of the piston-wheel and cylinder coincide.

The journals made on the pipe D hold the piston-wheels in actual contact with the bottom side of the bore of the cylinder, forming always a steam-tight joint at the bottom of the piston-wheels, which point, for brevity, I will hereinafter in this specification call the "contact-point." The ports *d* and E′ extend circumferentially far enough to admit steam the desired portion of a stroke or revolution of the engine. The points E^2 and d^2 of the respective ports must be arranged to admit steam just as the outer end of the port *d* has passed the contact-point. By shortening the port E′ at the inner end of course steam will be cut off sooner, and in this man-

ner the engine may be constructed to cut off at a third or half or at any other portion of a stroke or revolution. For instance, with the parts arranged substantially as shown in full and dotted lines, Figs. 3 and 5, the cut-off would occur at about three-quarters stroke; but suppose the inner end of the port E′ only extended as far as the line *n* marked on the port. (See Fig. 3.) In such case the cut-off would occur at about a third-stroke or little more. This will be readily understood by engineers and engine-builders without any further details.

It will be observed that a steam-port, *d*, opens into its compartment of the cylinder just at the rear of the piston, and that the exhaust-port b^3 for this same compartment is located just in advance of the piston, these respective exhaust-ports for the two compartments being always in open relation with the chamber C, except that they respectively close for a moment in passing the aforesaid contact-point.

In Fig. 3 the position of parts shown is where the engine has made almost a revolution since steam was admitted and the port b^3 has just reached the point where it commences to exhaust the steam that is at the rear of the piston, and this port, as aforesaid, remains open during almost an entire revolution.

The position of parts while taking, exhausting, and about to take steam is well illustrated in Fig. 5. Bosses b^5 are made on the outside of the shell of the cylinder where the exhaust-ports b^3 are located. These bosses are chambered, as shown in Figs. 3, 4, and 5, with a portion overhanging the port and curved to direct the steam rearward, by which arrangement whatever reactive force there may be in the exhaust-steam is utilized in propelling the engine on the principle of the well-known Barker mill. I have then a rotary engine that may be constructed to cut off steam at any desired point, and with a free exhaust that is open during almost the entire revolution of the cylinder. I make some of these engines single—that is, with but one compartment in the cylinder—and consequently with but one piston and one piston-wheel, and with such construction, of course, a fly-wheel is provided to carry the engine past the point where the steam is inoperative. The extra cost, however, of making the engine double is small as compared with the extra cost of making a double reciprocating engine, and I therefore consider it advisable to make the double variety, the same as illustrated.

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

1. In a rotary engine, the combination, with a main or driving shaft, of a rotating cylinder axially secured thereon, said shaft extending to one line only, a fixed piston extending into said cylinder, and a piston-wheel eccentrically supported within the cylinder and positively but flexibly connected with the piston, the wheel and piston together forming the abutment, substantially as described.

2. In a rotary engine, the combination, with an axially-mounted rotating cylinder, of an eccentrically-mounted rotating piston-wheel valve within the said cylinder arranged to control the ingress and egress of steam to and from the cylinder, substantially as described.

3. In a rotary engine, the combination, with a rotating axially-mounted cylinder, of a non-rotating steam-pipe projecting into said cylinder and a rotating piston-wheel mounted upon the steam-pipe and formed with steam passages and ports corresponding to those in its support and acting to control the entrance to and egress of steam from the cylinder, substantially as described.

4. In a rotary engine, a cylinder rotating upon its central axis, a non-rotating steam-pipe projected into the cylinder upon a different axis, a piston-wheel mounted on the steam-pipe and provided with steam ports and passages corresponding with the ports, and passages upon the steam-pipe for admitting live steam to the cylinder, substantially as described.

5. In a rotary engine, the combination of a rotating cylinder mounted upon the main shaft, a fixed steam-pipe projected into the rotating cylinder, and a piston wheel or wheels mounted upon the fixed steam-pipe and arranged to be rotated within the cylinder by the motion thereof and to control the ingress and egress of steam therefrom, substantially as described.

6. The combination, with a casing and shaft, and a cylinder mounted on the shaft inside the casing, the parts being arranged substantially as described, of one or more piston-wheels operating inside of the cylinder and eccentric therewith, said piston wheel or wheels being journaled on a non-rotating steam-pipe and held thereby in contact at the bottom with the cylinder, substantially as set forth.

7. The combination, with a rotating cylinder, piston-wheels, and steam-pipe arranged substantially as indicated, of a piston for each piston-wheel, such piston or pistons being set radially with the cylinder and rigidly secured thereto, and oscillating piston-seats seated in the piston-wheels and made to embrace and slide on the respective pistons, substantially as set forth.

8. The combination, with a casing, cylinder, pistons, piston-wheels, and non-rotating steam-pipe arranged substantially as described, of corresponding ports in the steam-pipe and piston-wheels for admitting steam rearward of the piston, and open exhaust-ports made through the casing of the cylinder in advance of the respective pistons, substantially as set forth.

9. The combination, with a rotating cylinder operating inside of a stationary casing, the parts being arranged substantially as indicated, of open exhaust-ports corresponding in

number with the compartments of the cylinder, said ports being made in the periphery of the cylinder, the walls of said ports being shaped, substantially as described, to direct the exhaust-steam rearward or opposite the motion of the cylinder, substantially as set forth.

10. In a rotary engine, the combination, with the driving-shaft, of a revolving cylinder attached to and supported thereon, said shaft extending to one line only, a piston radially attached to the cylinder, and a piston-wheel operating inside the cylinder and arranged eccentric therewith, said piston-wheel having an oscillating seat made to embrace the piston and slide thereon, substantially as set forth.

11. In a rotary engine, the combination, with the driving-shaft, of a revolving cylinder attached to and supported thereon, a piston set radial with and rigidly secured to the cylinder, a piston-wheel operating in said cylinder and arranged eccentric therewith, said piston-wheel being journaled on a non-rotating steam-pipe, and induction-ports arranged in the piston-wheel and steam-pipe, the parts being arranged substantially as described.

12. In a rotary engine, a revolving cylinder having a central opening at one side, an eccentrically-mounted steam-pipe projecting thereinto, and at the other formed with a central projection adapted to carry the driving connection or pulley, substantially as described.

13. In a rotary engine, a revolving cylinder having a central opening at one side, an eccentrically-mounted steam-pipe projecting thereinto, and at the other formed with a central projection or extension integral therewith, said extension constituting a portion of the main or driving shaft and acting to support and carry the cylinder, substantially as described.

14. In a rotary engine, the combination, with a stationary casing and a revolving cylinder operating inside the casing and of smaller diameter to form an annular exhaust-space between their walls, of a piston rigidly attached to the cylinder, and a piston-wheel operating inside the cylinder and arranged eccentrically therewith, said piston-wheel having an oscillating seat made to embrace the piston and slide thereon, substantially as set forth.

15. In a rotary engine, the combination, with a stationary casing and a revolving cylinder operating inside the casing and of smaller diameter to form an exhaust-space between them, of a piston set radially with and rigidly secured to the cylinder, a piston-wheel operating inside the cylinder and arranged eccentrically therewith, said piston-wheel being journaled on a steam-pipe, and induction-ports arranged in the piston-wheel and steam-pipe, the parts being arranged substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 17th day of September, 1886.

CYRUS BAILEY.

Witnesses:
OSCAR KIRN,
W. J. EMERY.