

No. 698,360.

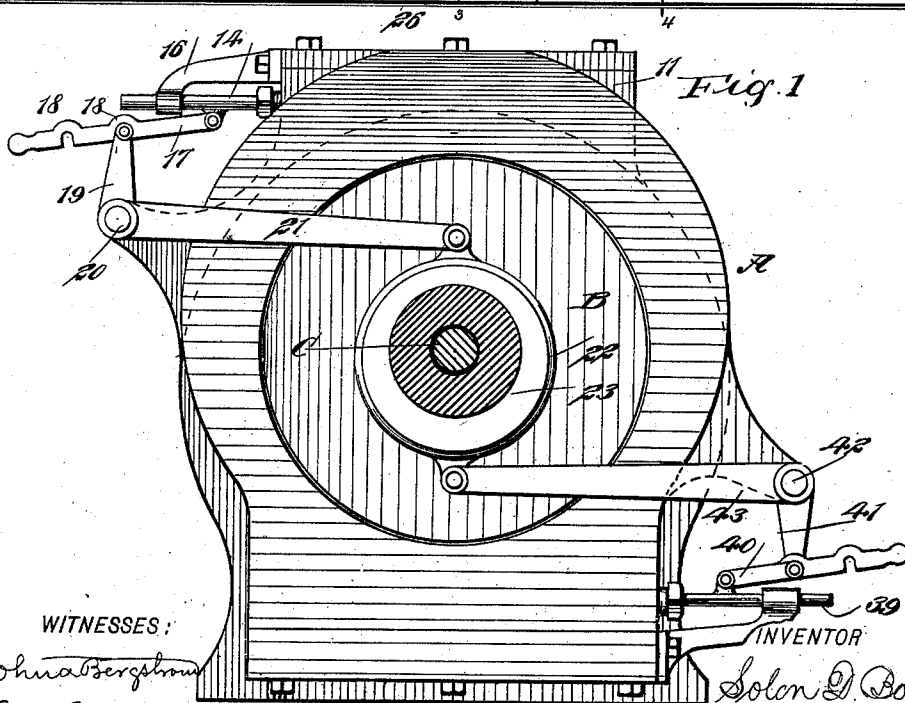
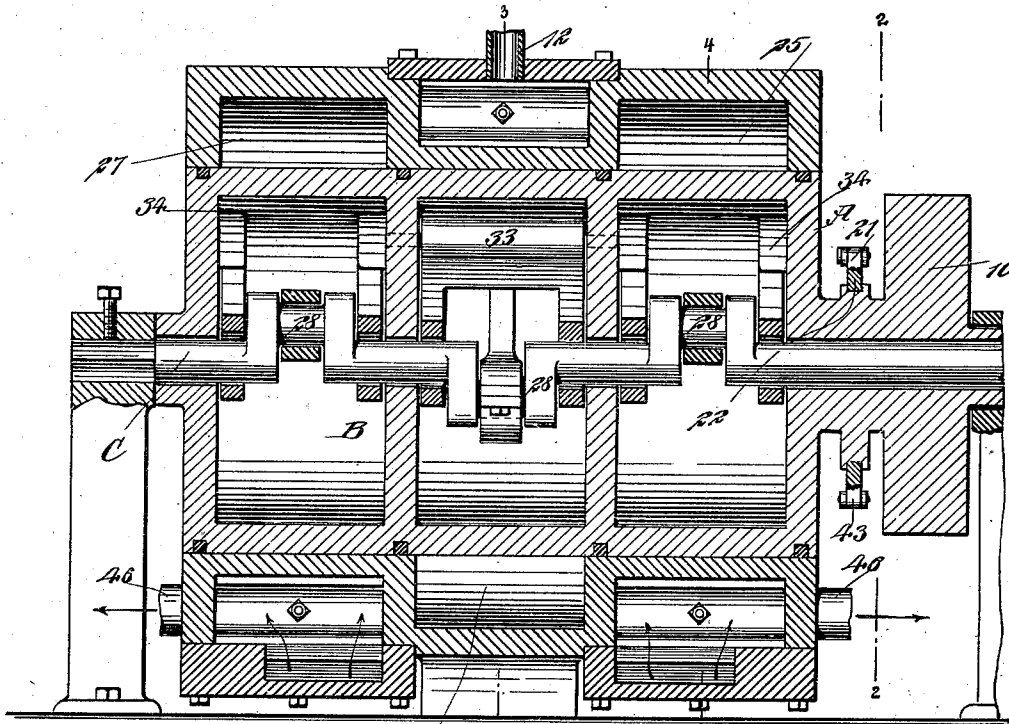
Patented Apr. 22, 1902.

S. D. BOOK.
ROTARY ENGINE.

(Application filed Jan. 4, 1900.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:
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J. B. Owens

INVENTOR
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Fig. 2

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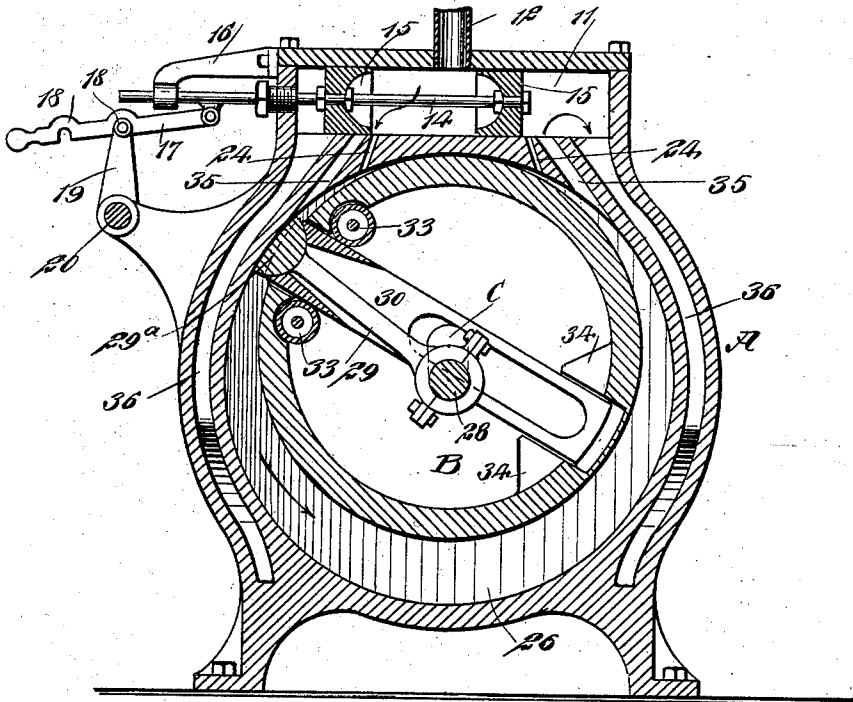


FIG. 3

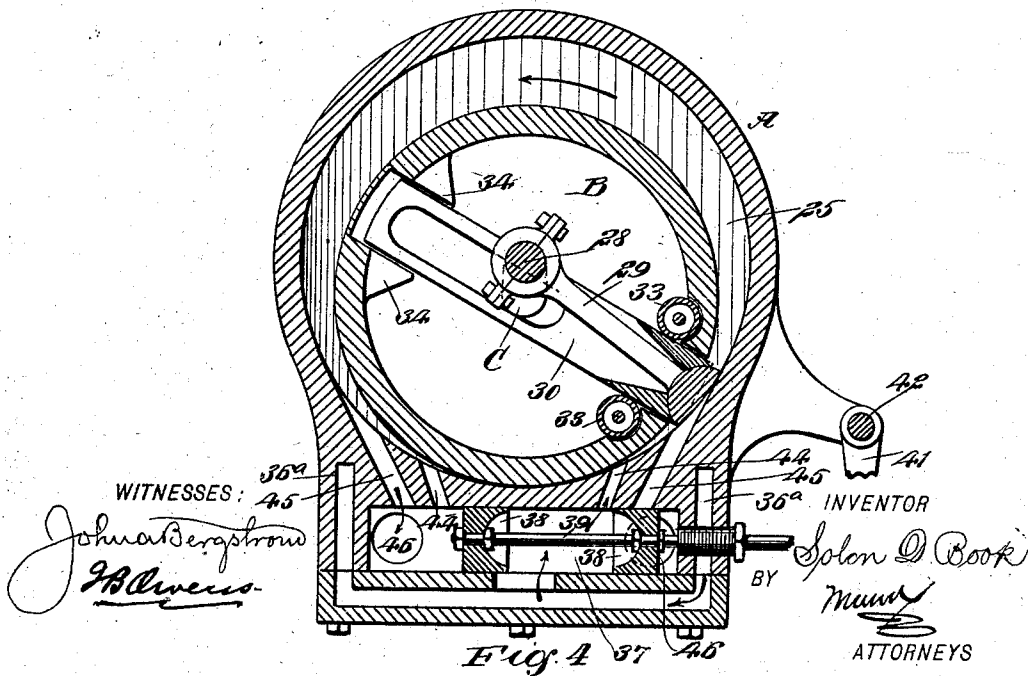


FIG. 4

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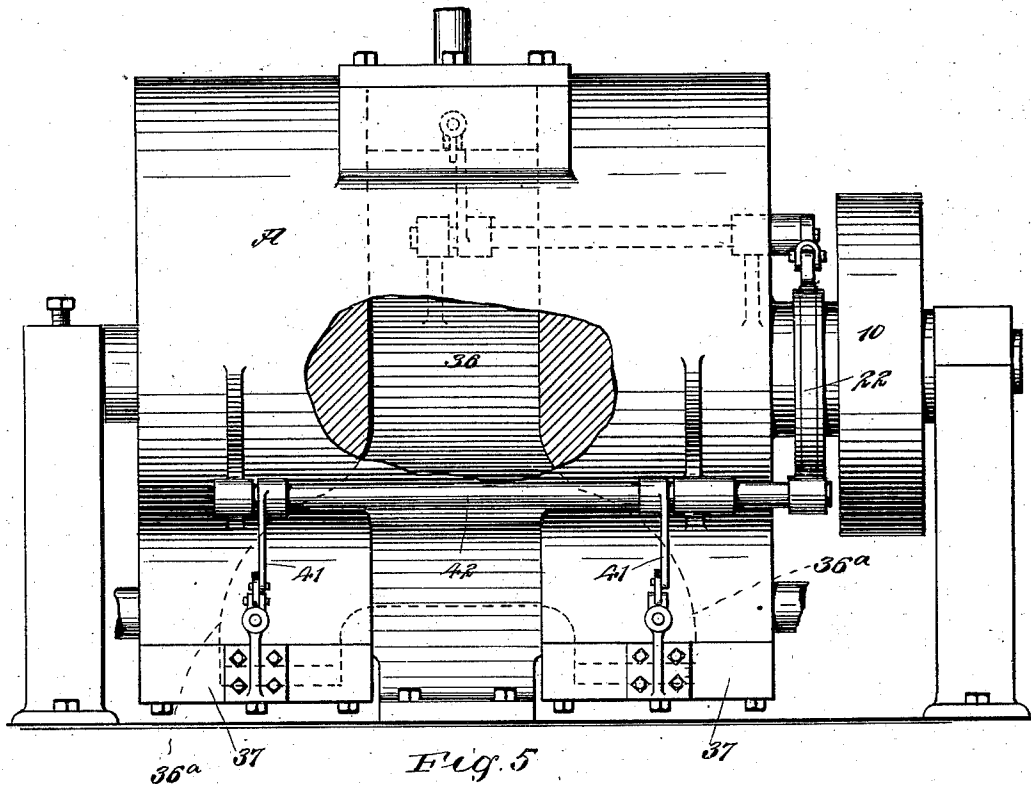


Fig. 5

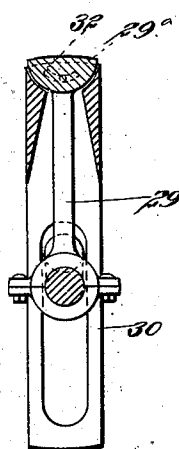


Fig. 6

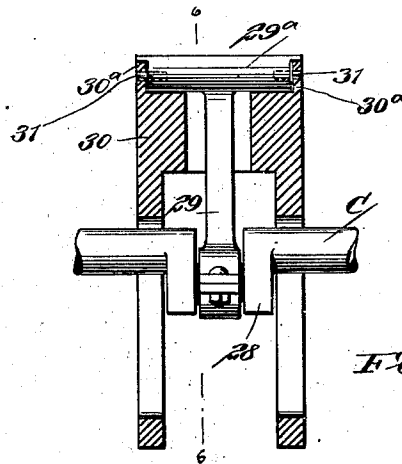


Fig. 7

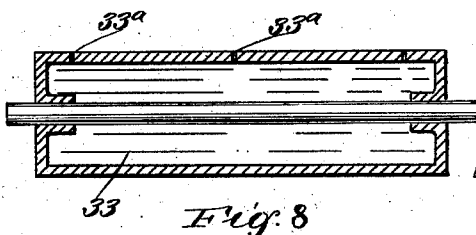


Fig. 8

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UNITED STATES PATENT OFFICE.

SOLON DENIS BOOK, OF BAGLEY, MINNESOTA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 698,360, dated April 22, 1902.

Application filed January 4, 1900. Serial No. 351. (No model.)

To all whom it may concern:

Be it known that I, SOLON DENIS BOOK, a subject of the Queen of Great Britain, and a resident of Bagley, in the county of Beltrami and State of Minnesota, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

This invention relates to a rotary engine provided with a piston divided into a plurality of chambers, in each of which works a piston-head, the steam acting on the piston-heads to act expansively therein.

This specification is the disclosure of one form of my invention, while the claims define the actual scope thereof.

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 longitudinal section of the invention. Fig. 2 is a sectional elevation on the line 2 2 of Fig. 1. Fig. 3 is a cross-section on the line 3 3 of Fig. 1. Fig. 4 is a cross-section on the line 4 4 of Fig. 1. Fig. 5 is a side elevation of the engine with a part of the casing or cylinder broken out. Fig. 6 is a detail section on the line 6 6 in Fig. 7, showing one of the piston-heads. Fig. 7 is a section of the same part at a right angle to the section shown in Fig. 6, and Fig. 8 is a detail view showing one of the self-lubricating rollers employed to guide the piston-heads.

According to the construction which I have here shown the engine is provided with a rigidly-mounted casing or cylinder A, wherein is mounted to turn a piston B, the piston revolving freely on a stationary shaft C and having one end formed with a hub, on which is carried a pulley 10, from which the power of the engine is transmitted. The cylinder A is formed at the middle of its upper portion, as best shown in Fig. 3, with a valve-chest 11, fed from a steam-pipe 12. In this valve-chest works a slide-valve composed of a stem 14, with heads 15 fastened thereto, the heads being arranged one on each side of the pipe 12 to form an inclosure, to which the live steam is conducted. This slide-valve has its stem projected outside of the valve-chest 11 and mounted to reciprocate in a bracket 16. A bar 17 is pivoted to the stem and provided with two hooks 18, which are each capable of

engaging with a pin on a crank-arm 19, the crank-arm being attached to a rock-shaft 20, mounted on the cylinder and actuated (see Fig. 2) by an arm 21, attached to the shaft 20 and to the strap 22 of an eccentric 23, which is mounted on the hub of the piston adjacent to the pulley 10. The revolution of the piston causes the valve in the chest 11 to be driven continuously during the operation of the engine.

Beneath the valve-chest 11 two feed-ports 24 are formed in the cylinder A, these ports communicating with the interior bore of the cylinder, which bore is divided into three compartments 25, 26, and 27. The ports 24 communicate with the intermediate compartment 26, which compartment, as shown in Fig. 3, is disposed eccentrically to the piston B, which is mounted eccentrically on the shaft C. The compartments 25 and 27 are disposed opposite to the compartment 26, as indicated in Fig. 4 and as also shown in Fig. 1. It will be seen, therefore, that the piston B is mounted eccentrically in all of the compartments of the cylinder and also that the two compartments 25 and 27 are arranged in the same position, which is opposite to the position of the compartment 26.

The cylinder A, as shown in Fig. 1, is divided into three chambers, through the walls of which the shaft C passes, and within each chamber of the piston the shaft C is formed with a crank 28. To these cranks are respectively connected the arms 29 of the piston-heads 30, which heads are mounted to slide across the axis of the piston and which are driven by the piston turning around the stationary shaft, which causes the arms 29 to transmit reciprocal movement to the piston-heads. The arms 29 are provided with enlarged outer portions 29^a, which bear against the interior walls of the middle compartment 26 of the cylinder A, and these enlargements 29^a are connected, as shown in Figs. 6 and 7, with the piston-heads 30 by means of pins 31, sliding in arc-shaped slots 32, formed in the enlargements 29^a of the arms 29, the pins 31 being carried on extensions or lugs 30^a of the piston-heads 30. By this arrangement the two parts 29 and 30 are connected so that movement will be transmitted from one part to the other and at the same time so that the

independent movement of the parts which is necessary to their operation will be allowed. The middle crank 28 of the shaft C is disposed oppositely to the end cranks 28, it being understood that the piston-heads of the end cranks work in the end compartments 25 and 27 of the cylinder, while the piston-head of the middle crank works in the middle compartment 26 of the cylinder.

The working ends of the piston-heads are guided by means of self-lubricating rollers 33, which are two for each piston-head, the rollers being mounted in the respective chambers of the piston and bearing against opposite sides of the adjacent piston-heads. (See Figs. 3 and 4.) These rollers 33, as shown in Fig. 8, are constructed hollow and provided with minute perforations 33^a, through which oil contained in the rollers may be fed to the piston-head to lubricate the same. The cylinders 33 may be supplied with oil by any desired means. The opposite ends of the piston-heads work loosely in orifices in the piston opposite the corresponding rollers 33, and the piston at these points is provided with a number of guide-lugs 34, as shown.

The steam entering the compartment 26 of the cylinder through the left-hand feed-port 24 (see Fig. 3) acts on the piston-head which is connected with the middle crank 28 of the shaft C, causing the piston to turn in the direction of the arrow in the figure referred to. The valve in the chest 11 being worked by the movement of the piston, the steam will be cut off at said left-hand feed-port 24 a short time after the starting of the operation referred to, whereupon the steam in the cylinder will be permitted to work expansively on the piston-head, as will be understood.

The cylinder A is constructed adjacent to each feed-port 24 with an exhaust-port 35, the exhaust-ports 35 leading from each side of the middle compartment 26 of the cylinder into the valve-chest 11. The adjustment of the valve in this chest, however, is such that the live steam between the heads 15 is never permitted to reach the exhaust-ports. The steam in being exhausted from the compartment 28 of the cylinder passes (see Fig. 3) through the right-hand exhaust-port 35 and into the right-hand end of the valve-chest 11 outside of the valve of the adjacent valve-head 15. The cylinder A is formed at each side with a passage 36, such passages respectively communicating with the exhaust-passages 35 through the medium of the ends of the valve-chest 11. These passages 36 are located adjacent to the middle compartment 26 of the cylinder, and, as indicated in Fig. 5, the passages 36 pass downward along the sides of the cylinder and are formed at their lower ends with branches 36^a, the branches of each passage 36 leading into valve-chests 37, similar to the valve-chest 11, except that the valve-chests 37 are located at the under side of the cylinder. These valve-chests 37 carry valves each composed of heads 38 and a stem 39,

similar to the parts 14 and 15, before described. The valves in the chests 37 have their stems 39 connected with arms 40, similar to the arms 17, and working with cranks 41 on a rock-shaft 42, also provided with an arm 43, such parts being respectively similar to the parts 19, 20, and 21, before described. The arm 43 is connected with the strap 22 of the eccentric 23, before described, so that the shaft 42 is rocked in unison with the valve in the chest 11, and the valves in the chests 37 are driven in the same manner.

The valve-chests 37 are respectively related to the compartments 25 and 27 of the cylinder. The cylinder adjacent to each valve-chest 37 and compartment 25 and 26 is formed with feed-ports 44, similar to the ports 24, and exhaust-ports 45, similar to the ports 35, before described. These ports 45 and 44 communicate with the respective compartments 25 and 27, and the valves of the chests 37 work with the ports 44 and 45 in the same manner as that described with reference to the ports 24 and 35, it being understood that the steam after acting on the middle piston-head is transmitted to the compartments 25 and 26 of the cylinder and there acts expansively on the ends of the piston-heads.

The ports 24, 35, 44, and 45 are constructed in duplicate to permit the reversal of the engine, which is effected by "hooking up" the arms 17 and 40, so as to change the relative position of the valves in the chests 11 and 37, which operation will be understood by those skilled in the art. The exhausts from the compartments 25 and 27 are returned to the respective valve-chambers 37 and permitted to escape through exhaust-pipes 46, leading from the ends of the chambers, as shown. It should be understood that during the operation of the engine only one exhaust-port at each end of the cylinder is in operation. Two exhaust-ports are provided to facilitate the reversal of the engine. The parts of the engine which are to be fitted steam-tight may be packed in any desired manner. I do not confine myself to any particular kind of means for effecting this result.

From the foregoing description it may be easy to understand the operation of the engine. The steam enters by the pipe 12 and acts directly on the middle piston-head, causing the piston to turn, and then the steam passes by the appropriate passage 36 to the end piston-heads, or, in other words, to the compartments 25 and 27, where it acts expansively on the end piston-heads and is exhausted through the ports 46. The valves in the several valve-chests work continuously to introduce and then cut off the steam, permitting the steam to expand, and thus to derive from the steam the full force of its power. The exhaust-steam may be led either to a condenser or to the atmosphere, as desired.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A rotary engine having a cylinder, a piston working therein, a slide-valve controlling the supply of steam to the cylinder, an eccentric driven from the piston, a rock-shaft driven from the eccentric, and a notched arm connected with the valve and adapted adjustably to engage a part of the rock-shaft to be actuated therefrom.

2. A rotary engine, having a cylinder, a piston working therein, a piston-head mounted in the piston, and working through an opening therein, means connected with the piston-head to cause the movement thereof, and a hollow roller against which the piston-head bears, the roller having perforations permitting a lubricant to be expelled from the interior of the roller.

3. A rotary engine having a cylinder divided into a plurality of eccentrically-disposed compartments, a piston working in each compartment of the cylinder, the pistons being connected together, a piston-head for each piston, the piston-heads sliding radially in the pistons, a movement-transmitting means located outside of the engine and connected with the pistons, a stationary crank-shaft passed through the piston-heads, means connecting the piston-heads with said crank-shaft, and valve devices for controlling the

passage of steam from one compartment of the cylinder to the other, the cylinder being formed with a passage leading between the compartments, for the purpose specified.

4. The combination of a cylinder, a piston arranged eccentrically therein, a piston-head sliding radially in the piston, a stationary crank-shaft disposed centrally of the piston, an arm journaled on the crank of said shaft, the arm extending to the working end of the piston-head and having a transverse enlargement mounted to rock in said outer end of the piston-head, the enlargement of the arm bearing against the interior wall of the cylinder, and a positive connection between the outer end of the piston-head and the said enlargement and arranged to permit of the rocking movement of the latter, the piston being mounted to turn on the stationary shaft, thereby causing the arm journaled on the crank to move the piston-head, for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SOLON DENIS BOOK.

Witnesses:

B. F. BROWN,
JAMES M. ANDREWS.