No. 658,190. Patented Sept. 18, 1900.

C. F. MOSS & S. A. IMBODEN.

ROTARY ENGINE.

(Application filed Feb. 8, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

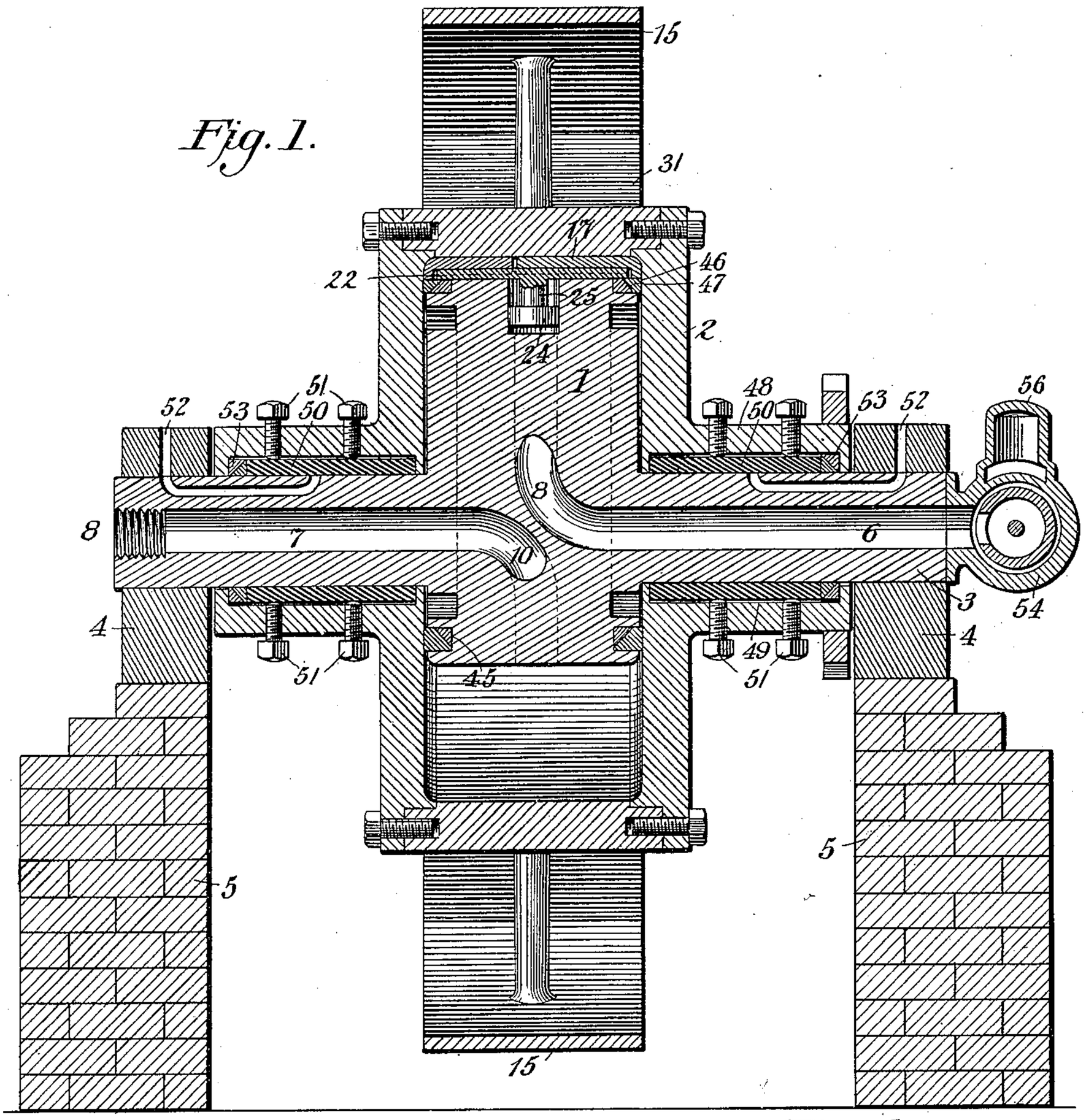


Fig. 4.

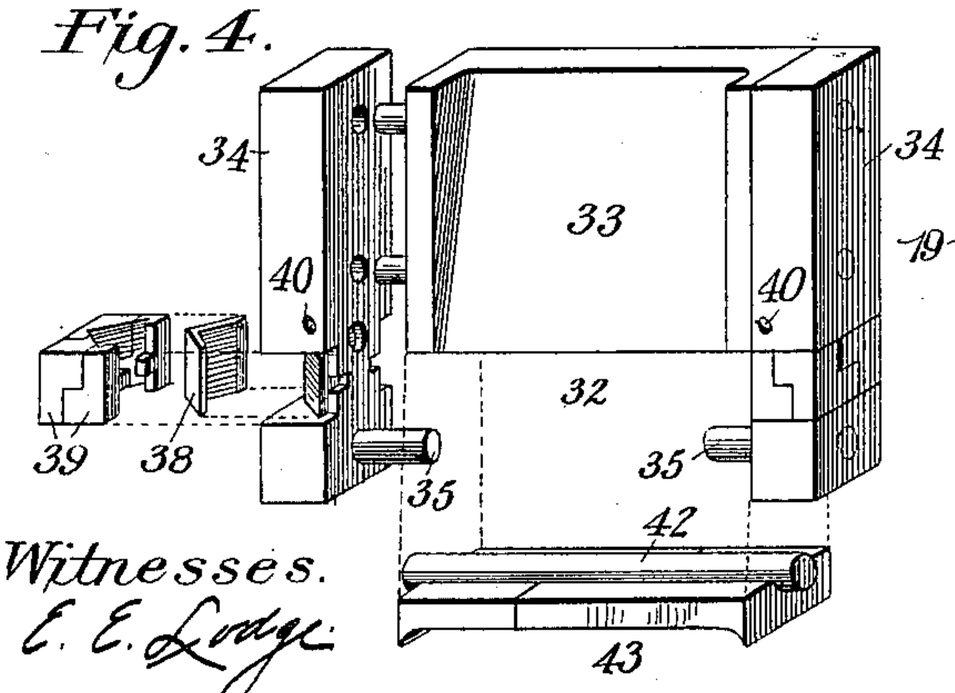
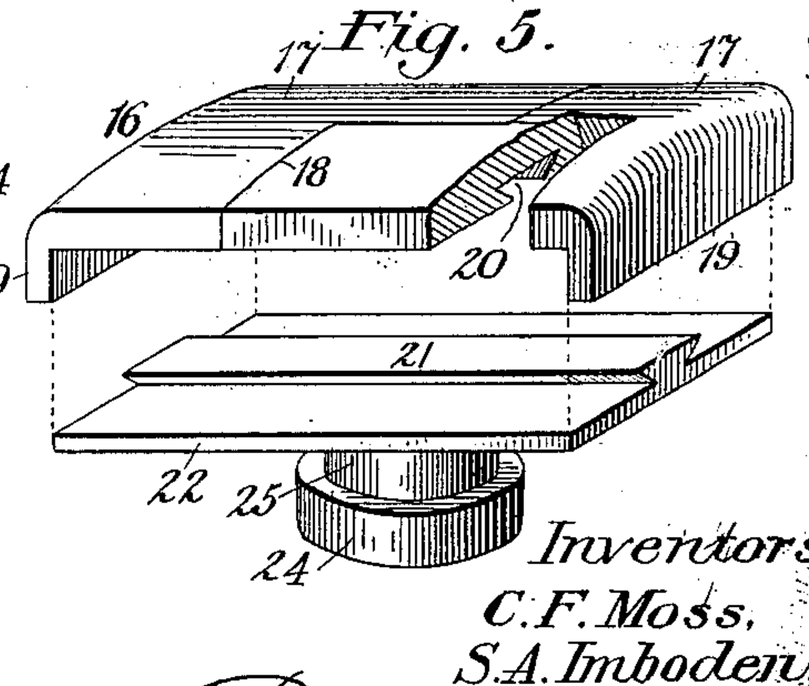


Fig. 5.



Witnesses.
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H. L. Amer.

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Fig. 2.

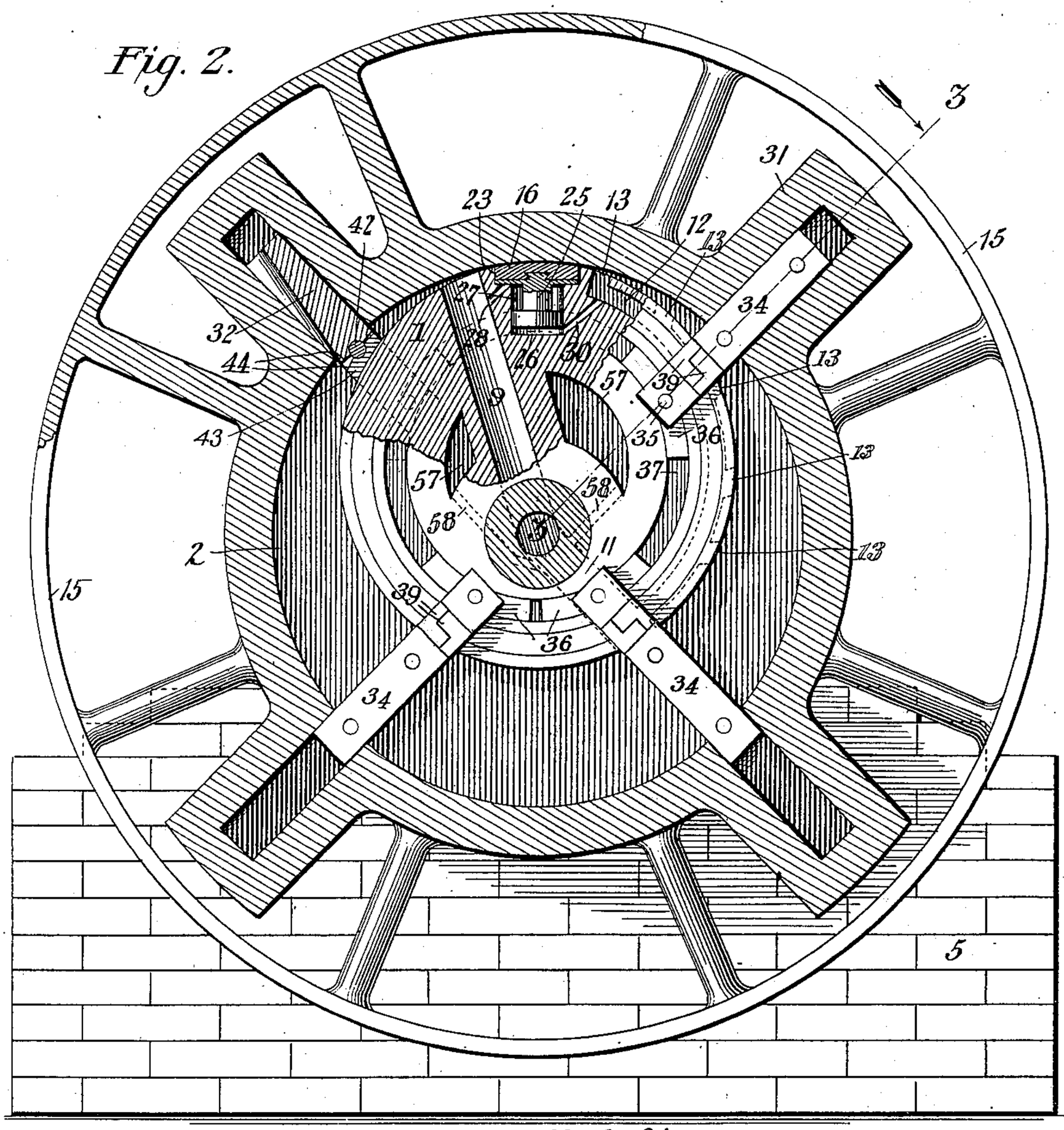
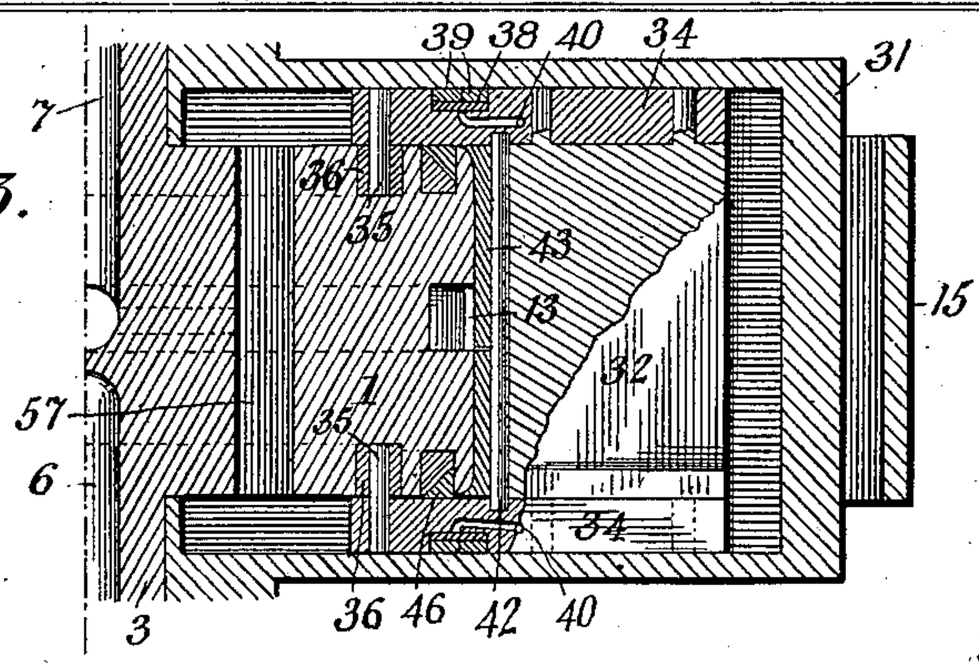


Fig. 3.



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UNITED STATES PATENT OFFICE.

CALVIN F. MOSS AND SAMUEL A. IMBODEN, OF LEEPER, MISSOURI.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 658,190, dated September 18, 1900.

Application filed February 8, 1900. Serial No. 4,529. (No model.)

To all whom it may concern:

Be it known that we, CALVIN F. MOSS and SAMUEL A. IMBODEN, citizens of the United States, residing at Leeper, in the county of Wayne and State of Missouri, have invented a certain new and useful Rotary Engine, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to steam-engines of the class known as "rotary," and is designed to be operated by expansion.

The object of the present invention is to provide a revolving cylinder which surrounds a stationary piston and to mount the piston upon a stationary shaft having its end portions hollow, one end of the shaft forming the steam-supply and the opposite end the exhaust. The cylinder carries a plurality of wings, which slide in and out in radial paths with relation to the stationary axle and which are controlled by their engagement with the stationary piston. The cylinder is provided with a rim and spokes rigidly connected thereto, which rim is adapted to receive a driving-belt, by means of which the power may be transmitted to any desired point.

Other detailed objects and advantages of the invention will be fully set forth in the course of the ensuing description.

The invention consists in a rotary steam-engine embodying certain novel features and details of construction and arrangement of parts, as hereinafter fully described, illustrated in the drawings, and incorporated in the claims.

In the accompanying drawings, Figure 1 is a vertical section through the improved engine, taken centrally of and in line with the stationary shaft. Fig. 2 is a central vertical section taken transversely of the stationary axle. Fig. 3 is a detail section on the line 3 3 of Fig. 2. Fig. 4 is a detail perspective view of one of the piston-wings with one of the side bars and its packing-segments removed, showing also one of the self-adjusting saddles which rest on the periphery of the piston. Fig. 5 is a detail perspective view of the self-adjusting abutment, showing also the follower-plate therefor.

Similar numerals of reference designate corresponding parts in the several figures of the drawings.

The engine contemplated in this invention comprises a stationary piston 1 and a revolving cylinder 2. The piston 1 is mounted upon a stationary axle 3, which is supported at its opposite ends in pillow blocks or bearings 4, set into or mounted upon suitable walls or brickwork 5. This axle is hollow as to both of its end portions, being provided with a longitudinal bore 6 in one end, constituting the steam-supply passage, and having at its opposite end a longitudinal bore 7, forming the exhaust-passage, the bore 7 being internally threaded at its extremity, as shown at 8, to enable a pipe to be coupled thereto, which pipe may lead to a suitable condenser. The supply-passage 6 bends about centrally of the piston at the point 8 and is then extended to the periphery of the piston to form a radial passage 9. This passage 9 opens out at the periphery of the cylinder on one side of the abutment, hereinafter described, the said abutment dividing the interior of the cylinder into expansion and exhaust portions, as will hereinafter appear.

The exhaust-passage 7 after reaching the central portion of the piston 1 bends at the point 10 and then extends radially, as shown at 11 in dotted lines in Fig. 2, where it communicates with a curved or segmental passage 12, located near the periphery of the piston and extending parallel to the outer surface thereof. Leading outward from the passage 12 are several ports 13, which are intended to relieve back pressure by allowing the steam within the cylinder to pass into the passage 12 and thence into the exhaust-passage in a manner that will be readily understood by referring to Fig. 2.

The cylinder 2 completely incloses the piston and is arranged eccentrically thereto, as clearly shown in Figs. 1 and 2. The cylinder is provided with spokes 14, upon the outer ends of which is mounted a rim 15, which is carried around by the cylinder and which is adapted to receive a driving-belt by means of which the power derived from the engine may be belted off to any desired point. The inner surface of the cylinder 2 and the pe-

riphery of the piston 1 approach each other nearest at the top of the engine, and at this point there is placed a self-adjusting abutment 16, the said abutment being attached to the piston and bearing against the same, forming a steam-tight joint with the inner surface of the cylinder. The abutment 16 comprises a pair of sections 17, which are transversely divided on a zigzag line 18, by means of which they may slide together or away from each other, so as to accurately adjust themselves to the inner surface and side walls of the cylinder, each of the sections being provided with a right-angular flange 19, extending a short distance along and against one of the side walls of the cylinder. The sections 17 are also provided in their inner surfaces with dovetailed grooves 20, which are adapted to receive a correspondingly-shaped guide-rib 21 on a follower-plate 22, both the follower-plate and the abutment-sections being seated in a recess 23 in the periphery of the piston, as shown in Fig. 2. While the abutment-sections are thus locked to the follower-plate and displacement thereof prevented, they are free to slide longitudinally upon the rib 21 for adjusting themselves to the cylinder.

The follower-plate 21 is provided on its inner side with a round or disk-shaped head 24, connected with the follower-plate by a reduced shank or neck 25. This head 24 fits within a cylindrical recess 26 in the piston immediately under the abutment and is adapted to slide up and down therein. By providing the reduced neck or shank 25 an annular steam-space 27 is obtained and steam is admitted thereto beneath the follower-plate by a small passage 28, leading from the steam-passage 9, as shown in Fig. 2. The pressure of the steam is thus brought to bear behind the follower-plate with the effect that the latter, together with the abutment, is urged outward toward the inner surface of the cylinder, thus maintaining a tight joint and preventing the steam on the expansion side from getting to the opposite or exhaust side. A small ventilating-passage 30 leads from the base of the recess 26 to the exhaust-passage 12, so as to allow any steam or water of condensation which gets beneath the head 24 to escape.

The cylinder 2 is provided at intervals with outward radially-extending chambered offsets 31, in which slide a corresponding series or piston-wings 32. Each of said wings is constructed as shown in detail in Fig. 4, and comprises a body portion 33, against which the steam acts by expansion, and side bars 34. The side bars are of greater length than the wing and are provided at their inner ends with inwardly-extending pins or studs 35, which are received in openings in a pair of oppositely-located segmental shoes 36, adapted to traverse annular guide grooves or ways 37 in the opposite sides of the piston. As the grooves or ways 37 are eccentric to the inner surface of the cylinder as the cylinder rotates around the piston, said shoes act to move the wings 32 in and out without permitting the steam to pass by said wings.

Each of the side bars 34 is hollowed out on three of its sides, as shown at the left hand of Fig. 4, and within said hollowed-out portion is placed a V-shaped follower-plate 38. Outside of the plate 38 are arranged packing-sections 39, the sections being divided in a manner similar to the abutment-sections 17, so that they may have a free relative movement, thereby enabling them to adjust themselves to the grooves in the cylinder in which the side bars slide. The sections 39 are forced outward by the plate 38, and the latter is impelled outward by the action of a small quantity of steam, which is admitted through a passage 40, communicating with the interior of the cylinder and opening into the cut-out portion of the side bar 34 behind the plate 38. In this manner the packing-sections 39 are forced outward to obtain a close steam-tight fit with the grooves in which the side bars 34 move, and this prevents the steam from escaping around the sides of the piston-wings. The inner edge of each wing is provided with a half-cylindrical seat 41 for the reception of the rock-pin 42 of a saddle 43, which fits closely against the periphery of the piston 1. The saddle 43 is divided into sections which have a relative sliding movement upon each other and the rock-pin 42, whereby they are enabled to adjust themselves to the surface of the piston. The opposing faces of the saddle and the inner edge of the piston-wing are reversely chamfered or beveled, as shown at 44 in Fig. 2, in order that the saddle may freely rock upon its fulcrum and maintain a close contact with the piston.

The piston is provided in its opposite sides with annular grooves 45, in which are placed packing-rings 46. Each of said wings is preferably split on an oblique line, as shown at 47, so that they will crowd upon each other and maintain a close contact between the side walls of the piston and the cylinder. The end or hub portions 48 of the cylinder are internally recessed, as shown at 49, to receive bearing-sleeves 50, which are preferably made in sections, and each section pressed inward by means of set-screws 51, so as to bear closely against the stationary axle 3 and form an efficient bearing for the cylinder. Oil-passages 52 lead through the pillow-blocks 4 and stationary axle 3 to the inner surfaces of the bearing-sleeves 50 for keeping the bearings properly lubricated. At the outer end of each bearing-sleeve 50 is arranged a divided packing-ring 53 similar to that, 46, hereinabove described, for preventing oil from escaping at the ends of the hub portions of the cylinder.

Connected with the supply end of the stationary hollow shaft is a valve-casing 54, in which is arranged a valve 55 for controlling the supply of steam to the engine, said valve-casing being equipped with a steam-chest 56. Any suitable valve mechanism may be em-

ployed for admitting steam to the cylinder and cutting off the supply at the proper intervals. The stationary piston may be chambered out at one or more places, as shown at 57, to receive water of condensation, and passages 58 may be provided leading therefrom to the exhaust-passages 11 for permitting the escape of such water of condensation.

In operation the steam enters the cylinder through the supply-passage 6 9 just at one side of the self-adjusting abutment 16, where it acts by expansion between the abutment and adjacent wing to impart rotary motion to the cylinder and the rim carried thereby. After traveling a certain distance the steam is cut off to allow the next wing to pass, after which steam is again admitted behind the following wing, and so on. After traversing about two-thirds of the cylinder the steam exhausts into the passage 11 and passes outward to the condenser. Any steam which may lie in advance of the piston-wings and which would exert a back pressure escapes through the ports 13 in the segmental passage 12, and is thus led to the main exhaust-passage 11 and outward in a manner that will be readily understood. It will be seen that care has been taken to provide suitable self-adjusting packing devices at the various points where the steam is apt to escape or interfere with the free movement of the cylinder, thereby adding greatly to the value of the improvements herein disclosed.

We do not desire to be limited to the exact details of construction and arrangement hereinabove set forth, but reserve the right to change, modify, or vary the construction within the scope of this invention.

Having thus described the invention, what is claimed as new is—

1. The combination with a piston and axle, of a cylinder surrounding the piston, sliding wings, and a self-adjusting saddle carried by each wing, substantially as described.

2. The combination with a stationary piston and axle, of a rotary cylinder surrounding the piston, wings carried by the cylinder and controlled in their movement by the piston, and a self-adjusting saddle carried by each wing and bearing against the piston, substantially as described.

3. The combination with a stationary piston and axle, of a rotary cylinder surrounding the same, wings carried by the cylinder and controlled in their movement by the piston, and a saddle having a rocking engagement with each wing, substantially as and for the purpose specified.

4. The combination with a stationary piston and axle, of a rotary cylinder surrounding the same, a wing carried by the cylinder and controlled by the piston and provided in its inner edge with a semicylindrical seat, a saddle carried by the wing, and a rock-pin interposed between the saddle and wing, substantially as specified.

5. The combination with a stationary piston and axle, of a rotary cylinder surrounding the same, a wing carried by the cylinder and controlled by the piston, and a self-adjusting saddle carried by the wing and bearing against the piston and comprising relatively-movable sections, substantially as specified.

6. The combination with a stationary piston and axle, of a rotary cylinder surrounding the same, a wing carried by the cylinder and controlled by the piston, side bars on the wing moving in ways in the cylinder, and relatively-movable packing-sections connected with each of the side bars, substantially as described.

7. The combination with a stationary piston and axle, of a rotary cylinder surrounding the same, a wing carried by the cylinder and controlled by the piston, side bars on the wing movable in ways in the cylinder, and movable and self-adjusting packing-sections on each of the side bars, substantially as described.

8. The combination with a stationary piston and axle, of a rotary cylinder surrounding the same, a wing carried by the cylinder, side bars on the wing connected to the piston, relatively-movable packing-sections on each side bar, and a steam-actuated follower-plate for pressing the sections outward, substantially as described.

9. The combination with a stationary piston and axle, of a rotary cylinder surrounding the same, a wing carried by the cylinder, bars on the wing engaging the piston and each provided with a steam-passage, relatively-movable packing-sections on each side bar, and a steam-actuated follower-plate arranged behind the packing-sections and in front of the steam-passage, substantially as described.

10. The combination with a stationary piston and axle, of a rotary cylinder surrounding the same and carrying wings, an abutment seated in the piston and bearing against the cylinder and comprising relatively-movable sections, and a follower-plate arranged behind said sections, substantially as described.

11. The combination with a stationary piston and axle, of a cylinder surrounding the same and carrying wings, an abutment seated in a recess in the piston and bearing against the cylinder and comprising relatively-movable sections grooved on their inner faces, and a follower-plate provided with a guide-rib, substantially as and for the purpose specified.

12. The combination with a stationary piston, of a rotary cylinder surrounding the same, a movable abutment seated in the piston and comprising relatively-movable sections having dovetailed grooves in their inner surfaces, and a follower-plate provided with a dovetailed rib, substantially as and for the purpose specified.

13. The combination with a stationary piston and a rotary cylinder surrounding the

same, of a movable abutment seated in a recess in the piston, a follower-plate behind the abutment, a steam-chamber under the follower-plate and a steam-supply passage communicating with said chamber, substantially as described.

14. The combination with a stationary piston, of a rotary cylinder surrounding the same, a movable abutment connected with the piston, a follower-plate behind the abutment, a head connected by a reduced neck with the follower-plate and arranged in a recess forming a steam-chamber, and a steam-supply passage communicating with said steam-chamber, substantially as described.

15. The combination with a stationary piston, of a rotary cylinder surrounding the same, a movable abutment seated in a recess in the piston, a follower-plate behind the abutment, a head connected with said plate and arranged in a recess in the piston, a steam-inlet passage leading thereto, and an exhaust-passage leading therefrom, substantially as described.

16. The combination with a rotary cylinder, of a stationary piston provided with an inclosed segmental exhaust-passage extending parallel with the periphery of the piston at one side and having one or more ports leading therefrom to the chamber within the cylinder, substantially as described.

17. The combination with a stationary axle and piston, of a rotary cylinder surrounding the piston and having hub portions encircling the axle, sectional cylindrical bearing-sleeves interposed between the hub portions and the axle, adjusting-screws passing through the hub and pressing against the sectional bearing-sleeves, and oil-passages leading to the inner surfaces of said sleeves, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

CALVIN F. MOSS.
SAMUEL A. IMBODEN.

Witnesses:
HENRY N. NICHOLS,
E. H. FAIRCHILD.