No. 669,461. Patented Mar. 5, 1901.

S. E. KOCHENDARFER & R. D. HUNTER

ROTARY ENGINE.

(Application filed May 15, 1900.)

(No Model.) 3 Sheets—Sheet 1.

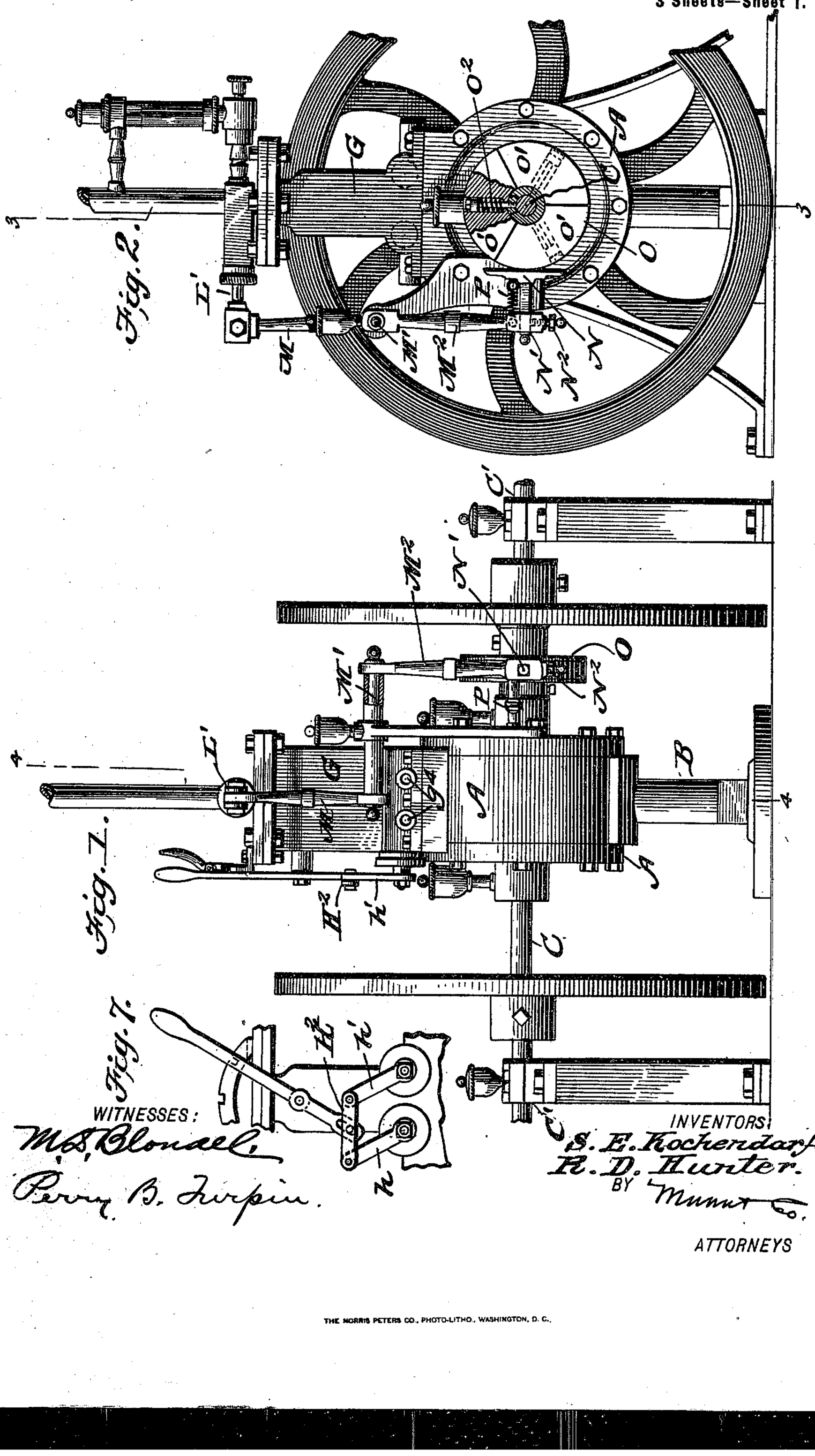

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Fig. 3.

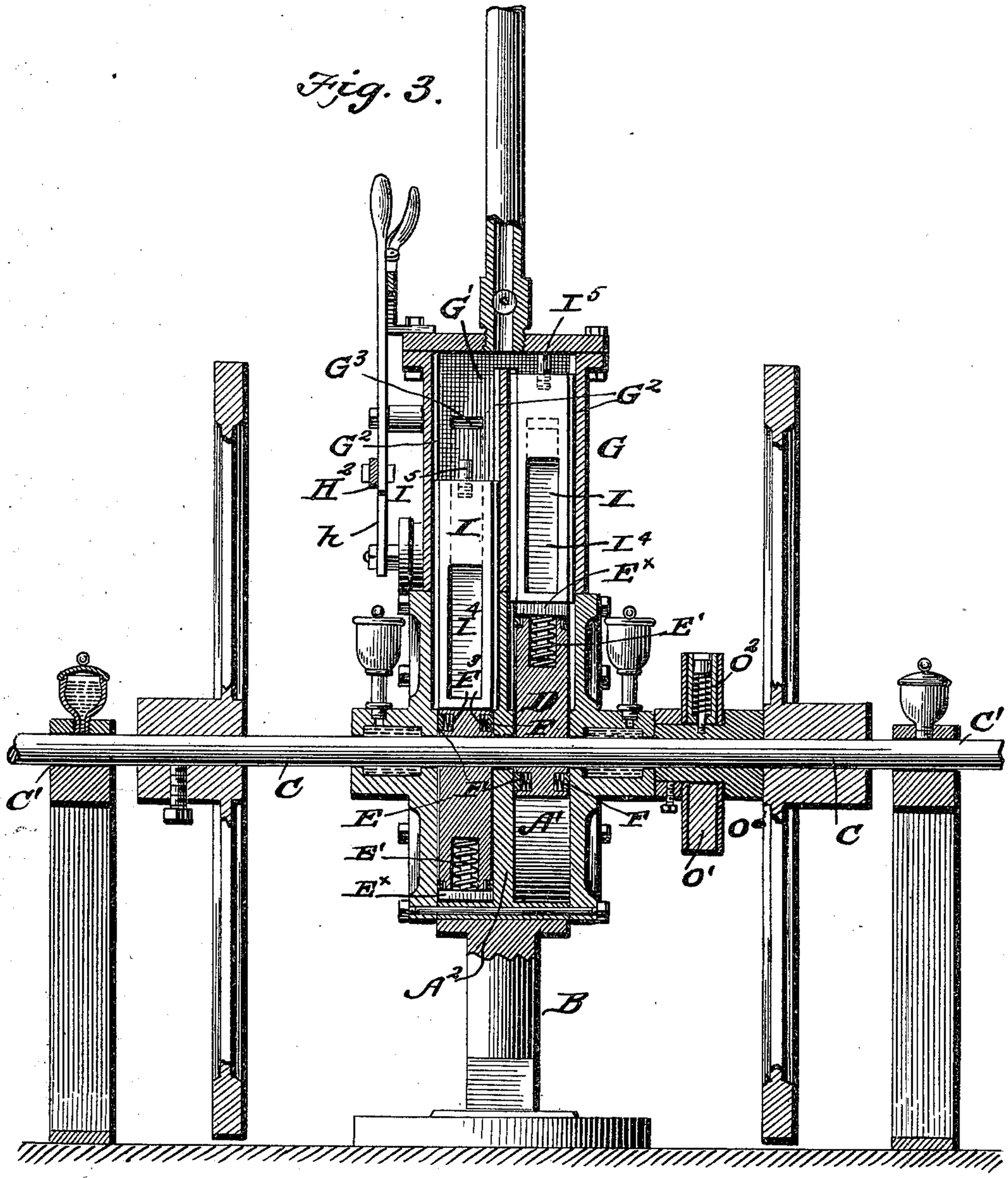

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Fig. 5

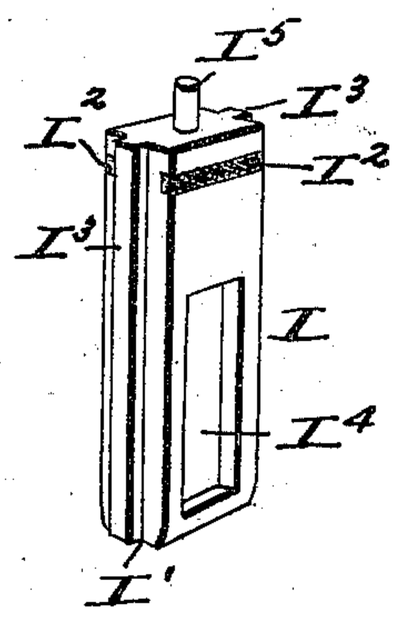


Fig. 4.

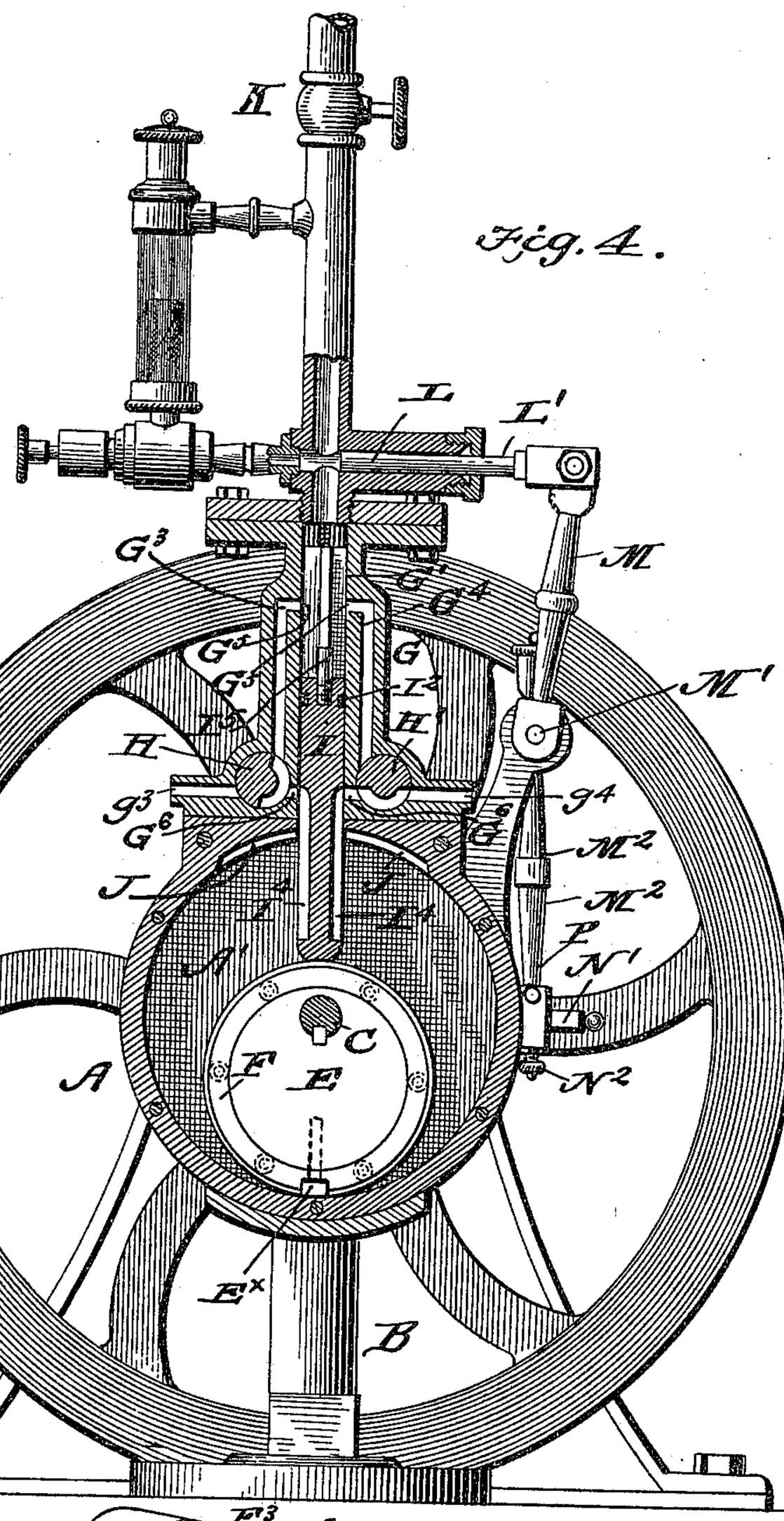
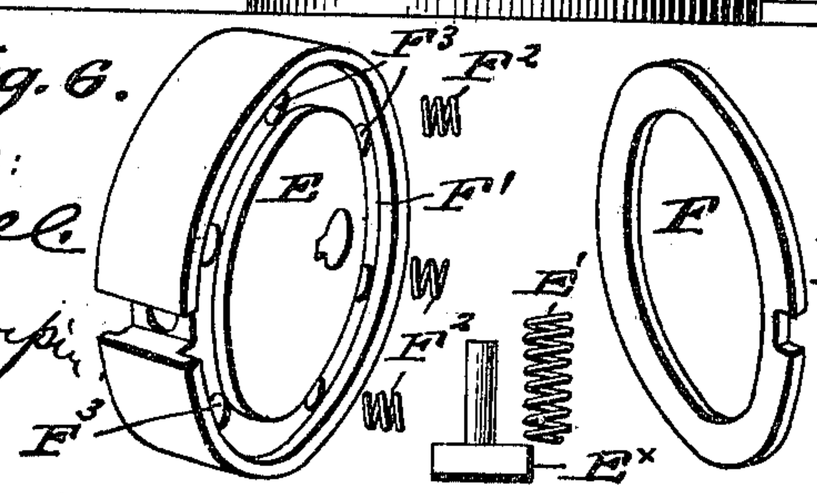


Fig. 6.



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UNITED STATES PATENT OFFICE.

SIRUS E. KOCHENDARFER AND RALPH D. HUNTER, OF HOLLIDAYSBURG, PENNSYLVANIA, ASSIGNORS OF ONE-THIRD TO EDWIN W. DRURY, OF LANCASTER, PENNSYLVANIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 669,461, dated March 5, 1901.

Application filed May 15, 1900. Serial No. 16,763. (No model.)

To all whom it may concern:

Be it known that we, SIRUS E. KOCHENDARFER and RALH D. HUNTER, residing at Hollidaysburg, in the county of Blair and State of Pennsylvania, have made certain new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention is an improvement in rotary engines, and includes a casing having a cylinder, an eccentric piston operating therein, and means for controlling the admission and operation of the steam upon the said eccentric piston; and the invention consists in certain novel constructions and combinations of parts, as will be hereinafter described and claimed.

In the drawings, Figure 1 is a front view, and Fig. 2 a side view, of an engine embodying our invention. Fig. 3 is a sectional view on about line 3 3 of Fig. 2. Fig. 4 is a cross-sectional view on about line 4 4 of Fig. 1. Fig. 5 is a detail perspective view of one of the abutment-blades. Fig. 6 illustrates one of the pistons in detail, and Fig. 7 is a detail view of the reversing-gear.

In the construction shown the cylinder A is mounted upon a suitable support B and the shaft C is journaled at C′ in suitable bearings. This shaft extends through the cylinder A and has fixed upon it within the said cylinder the pistons D and E, which are constructed alike, are secured eccentrically upon the shaft C, and project in diametrically opposite directions from the said shaft. The pistons are constructed alike, and each operates within its chamber A′, formed in the cylinder A by the central partition A^2, as best shown in Fig. 3. In constructing the pistons we provide them at their extreme outermost point with a packing-strip $E^\times$, actuated by a spring E′ and pressed thereby firmly out against the inner side of the cylinder to form a steam-tight joint with the bearing between the rim of the piston and the interior of the cylinder. The ends of the pistons are packed by the rings F, which fit in the annular grooves F′, formed in the ends of the pistons near their outer edges, and these rings are pressed outwardly by springs F^2, seated in sockets F^3, extended from the base-walls of the grooves F′, as will be understood from Figs. 3 and 6. By the described construction the pistons are packed tightly in the cylinder.

Upon the cylinder A we mount the steam-chamber G, which is provided centrally with a way G′, which leads to the interior of the cylinder and is of a practically uniform size throughout. Grooves G^2 are formed longitudinally in the side walls of the way G′, and alongside said way the chamber G is provided with steam-passages G^3 and G^4, which are alike and open into the way G′ at points G^5 and G^6, near the upper and lower ends of the way G′, as shown. The passages G^3 and G^4 also communicate with exhaust-ports g^3 and g^4, and valves H H′ control the passage of steam and direct it either to the cylinder or from the cylinder to discharge at the exhaust, as desired. The valves H H′ and their connecting and operating devices, including the crank-arms h h', connecting-link H^2, and hand-lever and rack, constitute a reversing-gear, as will be readily understood from the drawings.

The sliding abutment-blade I fits and operates in the way G′ of the steam-chamber and extends within the cylinder and bears at its inner end against the piston. This blade I is of a special construction and has its lower end I′, where it rests upon the piston, made practically flat, as shown in Fig. 4, so the piston during a part of its upward stroke will rest beneath one corner of said lower end I′, so the steam can bear beneath such end of the blade I and operate to balance the said blade, or nearly balance it, so it will not exert any undue pressure against the piston and operate to hinder the movements of the engine. The opposite faces of the blade I are packed at I^2, and at the opposite edges of the blade we provide the longitudinal ribs I^3, which operate in the grooves G^2 of the chamber G, as will be understood from Figs. 3, 4, and 5. In the opposite faces of the blade I are formed recesses I^4, through which the steam passes to and from the cylinder. To

prevent any choking of the exhaust, as well as to permit a free inflow of the live steam, we provide the interior of the cylinder A, adjacent to the way G′ for the blade I, with grooves J, which extend for a short distance from the way G′ for the blade in opposite directions around the interior of the cylinder, as best shown in Fig. 4. Each blade I is provided at its upper end with a projecting pin I^5, which by engaging the upper end wall of the chamber G′ limits the upward movement of the blade I and prevents the lower end of said blade from moving upwardly out of the path of the packing-strip E of the piston.

A suitable throttle-valve K may be provided, as shown in Fig. 4, and in addition to this we employ a controlling-valve L, which may be adjusted to shut off the supply of steam to any desired extent. This valve L is operated automatically by connecting its stem L′ with one end of a lever M, which is pivoted at M′, and has its other arm M^2 provided with a shoe N, whose stem N′ is preferably adjustably connected with the arm M^2 and may be secured in any desired adjustment by the screw N^2, as will be understood from the drawings. The shoe N bears against the governor-pulley O, which is fixed upon the shaft C and is formed with a number of independently-movable sections O′, which may be thrown outward by centrifugal action and are normally pressed inward by springs O^2, supported and operated as will be understood from Fig. 2 of the drawings. A spring P tends to hold the shoe N tightly against the governor-pulley O. In the operation of this construction if the engine is running at or below the desired speed the governor-sections will not be forced outwardly to such an extent as to operate the lever M M^2 to limit the supply of steam. However, on any considerable increase of speed the governor-sections O′ will move outwardly and rock the lever in such manner as to shut off the supply of steam in proportion to the outward throw of the governor-sections. When the steam is thus shut off or reduced, the engine will slow down and the governor devices readjust themselves in such manner as to control the operation of the engine and secure the operation thereof at the desired speed. By adjusting the shoe N in or out on the arm M^2 the speed of the engine can be regulated.

In the operation when the reversing-valves are properly adjusted the steam will enter the cylinder on one side of the abutment-blade and acting between said blade and the piston will drive the latter positively around until it reaches the exhausting-point, at which time such piston will have driven its abutment-blade up to close the port G^5, leading to the steam-passage. Before one piston reaches its exhausting-point the other piston is being acted on by the live steam, so there is a constant steam action upon the engine and a constant positive operation of the shaft. The steam operating upon one side of the abutment-blade will press the ribs I^3 thereof firmly against the walls of the groove G^2, and thus aid in packing the engine, as will be readily understood.

In operation it will be seen the abutment-blade is operated in one direction or downward by the steam-pressure above and in the opposite or upward direction by the piston.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine the combination of the cylinder, the piston, the steam-chamber having a central passage for the abutment-blade and provided in the walls of said passage with longitudinal grooves and having passages for the steam, valves controlling the steam-passages, and the abutment-blade provided at its edges with ribs operating in the grooves of the steam-chamber and having upon its opposite faces packing-strips and provided in said faces with recesses substantially as set forth.

2. A rotary engine comprising the cylinder, the eccentric piston operating therein, the steam-chamber having a way for the abutment-valve and steam-passages on opposite sides of and communicating with said way at their opposite ends and also communicating with exhaust-ports, valves controlling such steam-passages and the abutment-blade provided in its opposite faces with recesses for the passage of the steam and arranged at its inner end to bear against the eccentric piston substantially as set forth.

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