(No Model.) 3 Sheets—Sheet 1.

S. J. HOLT & D. KINNEY.

ROTARY ENGINE.

No. 436,663. Patented Sept. 16, 1890.

Fig. 1.

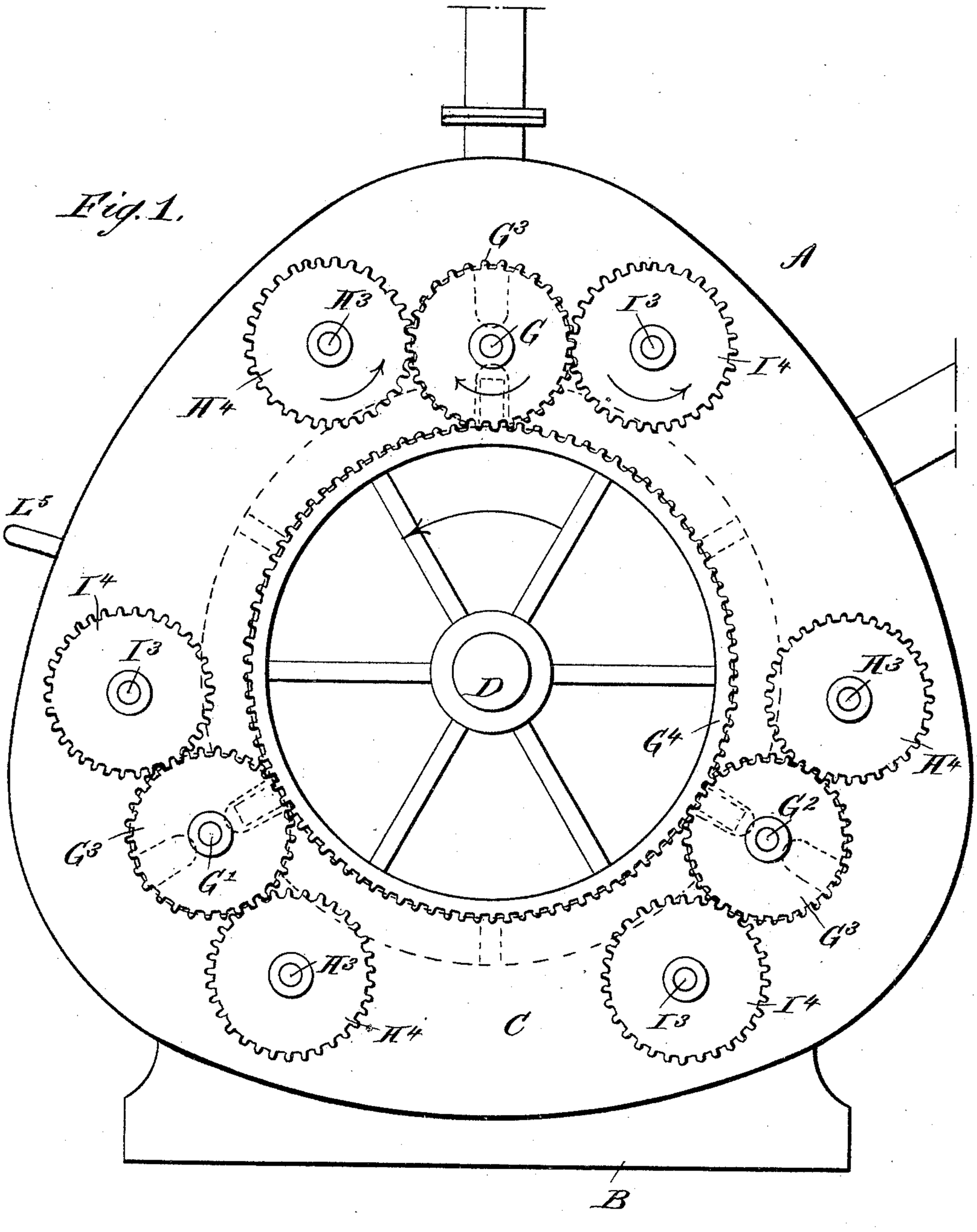

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Fig. 2.

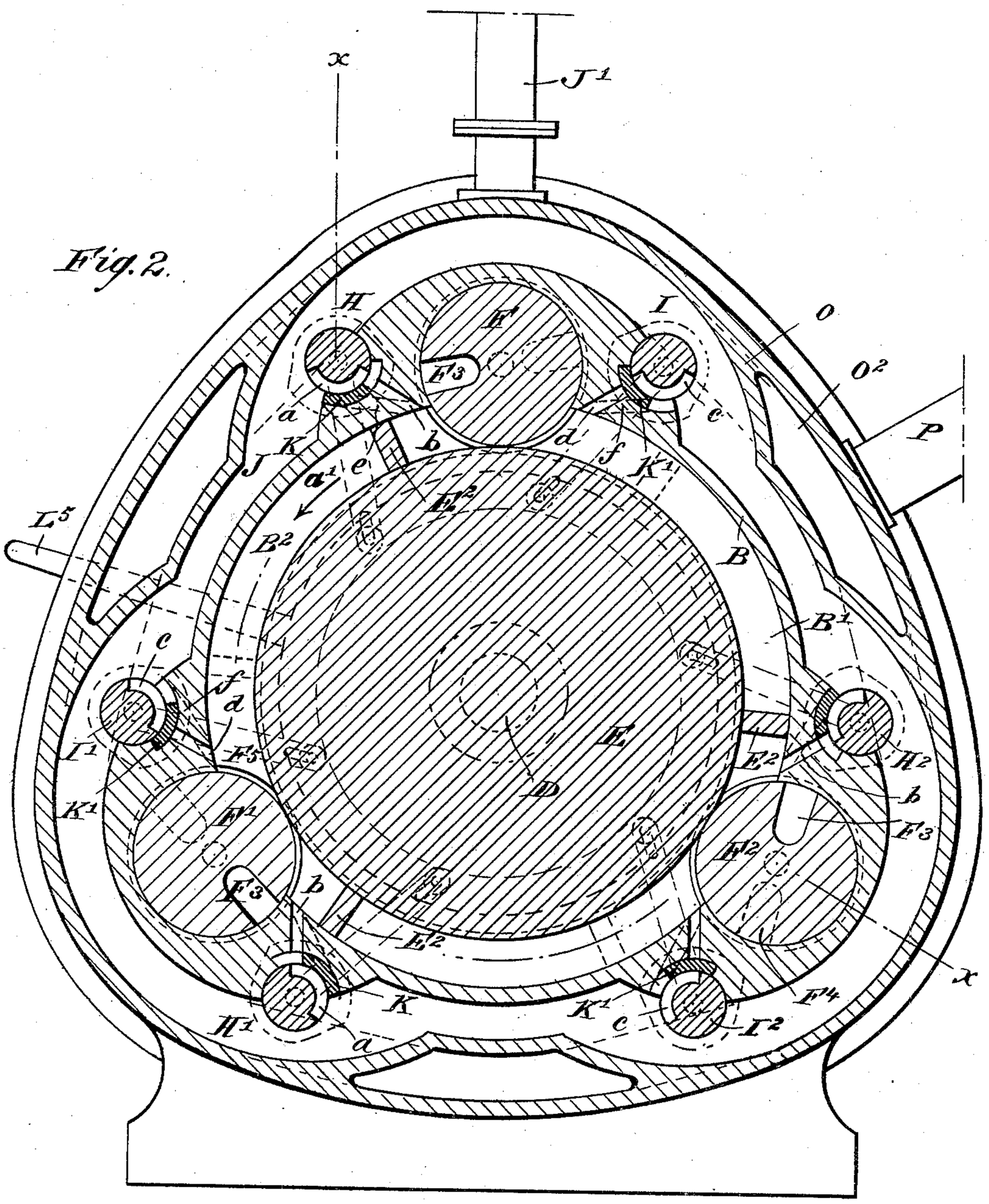

Fig. 4.

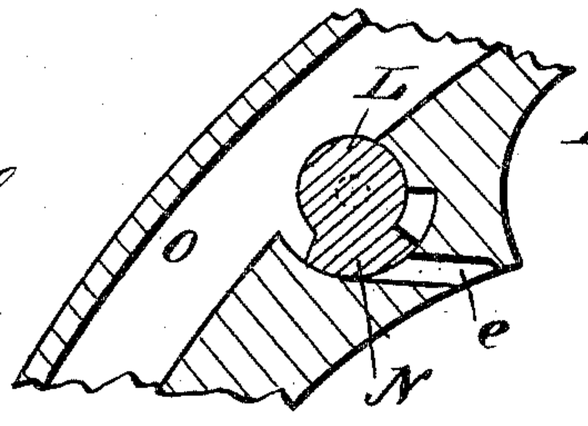

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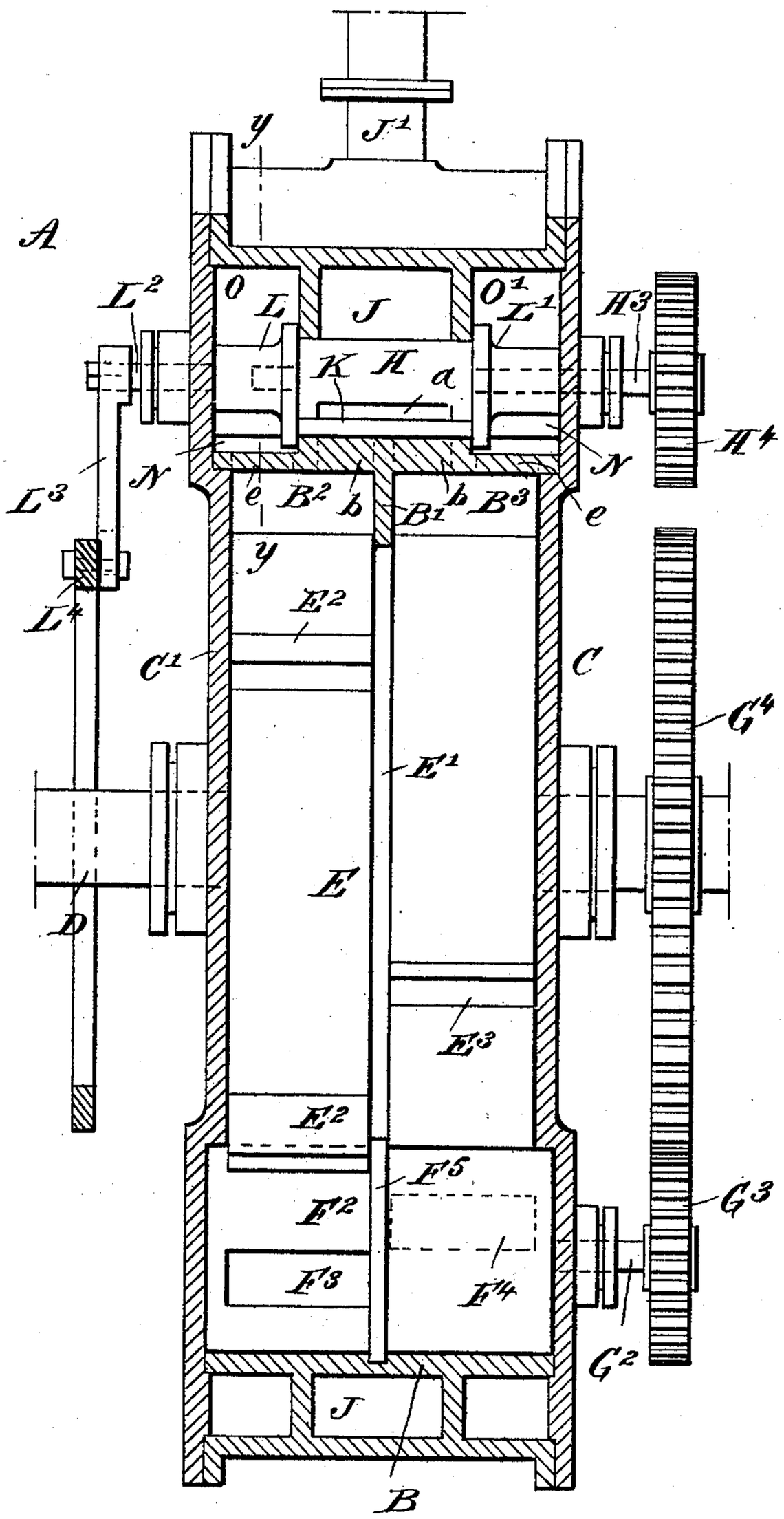
Fig. 3



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UNITED STATES PATENT OFFICE

SAMUEL J. HOLT AND DANIEL KINNEY, OF WEST PLAINS, MISSOURI.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 436,663, dated September 16, 1890.

Application filed May 10, 1890. Serial No. 351,232. (No model.)

To all whom it may concern:

Be it known that we, SAMUEL J. HOLT and DANIEL KINNEY, of West Plains, in the county of Howell and State of Missouri, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and Improved rotary engine which is simple and durable in construction, can be easily reversed, is very effective in operation, and utilizes the motive agent to the greatest advantage.

The invention consists in certain parts and details and combinations of the same, as will be described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a front elevation of the improvement. Fig. 2 is a sectional front view of the same. Fig. 3 is a transverse section of the same on the line *x x* of Fig. 2, and Fig. 4 is a sectional front view of part of the improvement on the line *y y* of Fig. 3.

The improved rotary engine A is provided with a cylinder B, having the heads C and C′, in which is mounted to turn the main shaft D, carrying a piston E, provided with an annular groove E′, arranged in the middle of its periphery, and into which fits an annular flange B′, extending in the cylinder B so as to form two steam-compartments B^2 and B^3 between the inner wall of the cylinder B and the periphery of the piston E. The latter is provided on its periphery with a series of alternately-arranged arms E^2 E^3, extending across the spaces B^2 and B^3, and against which the pressure of the motive agent is exerted, as hereinafter more fully described.

Into the spaces B^2 and B^3 project cylindrical abutments F, F′, and F^2, placed equal distances apart and their peripheries fitting onto the periphery of the piston E, each abutment being provided with oppositely-arranged recesses F^3 and F^4, adapted to be engaged by the arms or projections E^2 or E^3 of the piston E. Each of the abutments F, F′, and F^2 is also provided in its middle with an annular flange F^5, fitting into the annular recess E′, formed on the piston E.

The stems G, G′, and G^2 of the abutments F, F′, and F^2 project at one end to the outside of the head C, and each of them carries at its outer end a gear-wheel G^3 in mesh with a large gear-wheel G^4, secured on the main driving-shaft D, so that when the latter is rotated by the steam pressing against the arms E^2 the abutments F, F′, and F^2 rotate in unison with the piston E, at the same time forming a backing for the motive agent pressing on the arms E^2.

In valve-seats formed at the sides of each abutment F, F′, and F^2 are arranged valves H I, H′ I′, and H^2 I^2, respectively, as is plainly shown in Fig. 2. All the sets of valves are the same in construction and operation in relation to the piston E, so that it suffices to describe one set. Each valve H, H′, or H^2 is provided with a valve-stem H^3, extending through the head C to the outside and carrying on its outer end a gear-wheel H^4, in mesh with the gear-wheel G^3, secured on the valve-stem G, G′, or G^2, respectively. The valve-stems I^3 of the valves I, I′, and I^2 are similarly provided with a gear-wheel I^4, meshing into the respective gear-wheel G^3 on the valve-stems G, G′, and G^2, respectively, the said gear-wheels being arranged opposite the gear-wheel H^4, previously mentioned. (See Fig. 1.) Thus when the main driving-shaft D is rotated, the gear-wheel G^4 imparts a simultaneous rotary motion to the abutments F, F′, and F^2 and the valves H I, H′ I′ and H^2 I^2.

The valves H I, H′ I′, and H^2 I^2 extend into a steam-chest J, formed around the cylinder B, and into which opens the steam-inlet pipe J′. Each of the valves H, H′, and H^2 is provided in its periphery with a port *a*, adapted to connect the interior of the steam-chest J with ports *b*, leading to the spaces B^2 and B^3, formed in the cylinder B between the latter and the piston E. In a similar manner the valves I, I′, and I^2 are each provided with a port *c*, adapted to connect the interior of the steam-chest J with ports *d*, leading to the spaces B^2 and B^3.

A cut-off plate K is arranged on each valve H, H′, and H^2, so as to disconnect, whenever desired, the ports *a* and *b*, the said plate K

being held on collars L and L′, mounted to turn loosely on each of the valves H, H′, and H^2. A similar plate K′ is arranged on each of the valves I, I′, and I^2, and serves to close or disconnect the ports *c* and *d*, the plates K and K′ being arranged in such a manner that when one closes its respective ports the other is opened, so as to permit communication of the respective ports.

In order to shift the plates K and K′ on the several valves, the collars L are provided with a stem L^2, extending to the outside, and on each outer end of the stem is arranged an arm L^3, preferably connected with a ring L^4, having a handle L^5. When the latter is moved, the ring L^4 is shifted, so that the several arms L^3, acting on the stems L^2, change the positions of the collars and the plates K and K′ simultaneously in the manner above described.

From the spaces B^2 and B^3 also lead ports *e* and *f* to exhaust-chambers O and O′, arranged around the cylinder B at the sides of the steam-chest J, as is plainly shown in Fig. 3. The two exhaust chambers or compartments O and O′ are connected with each other by a transverse channel O^2, from which leads the exhaust-pipe P. The ports *e* and *f* are arranged near the valves H and I and are adapted to be opened and closed by plates N, secured to the collars L and L′, held on each of the valves H I H′ I′ H^2 I^2, as previously described, so that when the plates K and K′ are shifted the plates N are moved simultaneously to open and close the respective ports *e* and *f*. When the plate K, as shown in Fig. 2, opens the ports *b* to the port *a*, then the plates N close the ports *e*. (See Fig. 4.) At the same time the plate K′ closes the port *d*, while the plate N of the valve I opens the port *f*, so that the motive agent from the steam-chest J can pass through the ports *a* and *b* in one side of the abutment F, while an exhaust takes place on the other side of the said abutment through the ports *f* into the chambers O and O′, connected with the exhaust-pipe P. A similar arrangement is placed on the other sets of valves H′ I′ and H^2 I^2.

The operation is as follows: When the handle L^5 is in the position shown in Fig. 2, the valves H, H′, and H^2 control the inlet of the motive agent from the chamber J to the cylinder B, while the valves I, I′, and I^2 run empty, the plates K′ closing the ports *a*, as is plainly shown in the said figure. When the several parts are in the position illustrated in Fig. 2, the motive agent from the steam-chest J enters simultaneously through the ports *a* of the valves H, H′, and H^2 and passes through the ports *b* into the steam-spaces B^2 and B^3 to press against the arms E^2, so that the piston E is rotated in the direction of the arrow *a*′. The movement of the piston E causes the main shaft D to rotate, which by the gear-wheel G^4 imparts a rotary motion to the several abutmnets F F′ F^2 and the valves H H′ H^2. The ports *a* of the valves H, H′, and H^2 are cut off when the respective arm E^2 or E^3 has passed about two-thirds of the distance between two adjoining abutments, so that the steam can work expansively. The arm E^2 or E^3 finally passes through the respective recess F^3 or F^4 to the other side of the next following abutment to again receive steam from the next following inlet-valve, which now opens as soon as the arm has passed the respective inlet-port, as illustrated in Fig. 2. The steam in front of the respective arms E^2 or E^3 passes through the ports *f* into the exhaust-steam chambers O and O′, from which the exhaust-steam can pass through the exhaust-pipe P. When the operator desires to reverse the engine, he moves the arm L^5 upward, so that the positions of the several plates K, K′, and N change, whereby the valves I, I′, and I^2 now become inlet-valves, while the valves H, H′, and H^2 run empty. The operation is precisely the same as above described in reference to the valves H, H′, and H^2, the only difference being that the motive agent now enters the cylinder B on the opposite sides of the abutments F, F′, and F^2.

It will be seen that the two valves for each abutment are not necessary for single engines, as one valve will then be sufficient, and the plates K and K′ are not necessary.

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

1. The combination, with the cylinder having an internal annular flange to form two steam-spaces, the piston mounted in said cylinder and provided with a peripheral groove into which said flange projects, and alternating radial arms projecting from the cylinder at opposite sides of the groove, of rotary abutments mounted in the cylinder to rotate in unison with the piston and each having oppositely-arranged recesses to receive said alternating arms, an annular steam-chest, two ports connecting the two steam-spaces with the steam-chest at opposite sides of each of the rotary abutments, and rotary valves, each having a port adapted to control two of said ports, substantially as set forth.

2. The combination, with the cylinder having the two steam-spaces and the rotary piston having alternating arms working in said spaces, of the rotary abutments having oppositely-arranged recesses to receive said alternating arms, the two annular exhaust-chambers, the intermediate annular steam-chest, rotary valves at opposite sides of each abutment working in unison with the piston and each having a port controlling communication between the two steam-spaces and the single steam-chest, the segmental plates K in the steam-chest concentric with said rotary valves and operating over the steam-ports controlled thereby, plates N in the two exhaust-chambers controlling the exhaust from said steam-spaces and connected with the plates K, and

mechanism for operating said collars and the plates, substantially as set forth.

3. The rotary valve H, having a segment of its periphery cut away forming the port *a*, and the operating-shaft, of the collars L L′ on the shaft at the ends of the valve, curved plates N, carried by the collars, and the segmental plate K, connecting the said collars and concentric with the said valve, substantially as set forth.

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DANIEL KINNEY.

Witnesses:
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J. B. THORNTON.