No. 681,914. Patented Sept. 3, 1901.

J. W. HICKS.

ROTARY ENGINE.

(Application filed Mar. 30, 1900. Renewed Feb. 7, 1901.)

(No Model.) 4 Sheets—Sheet 1.

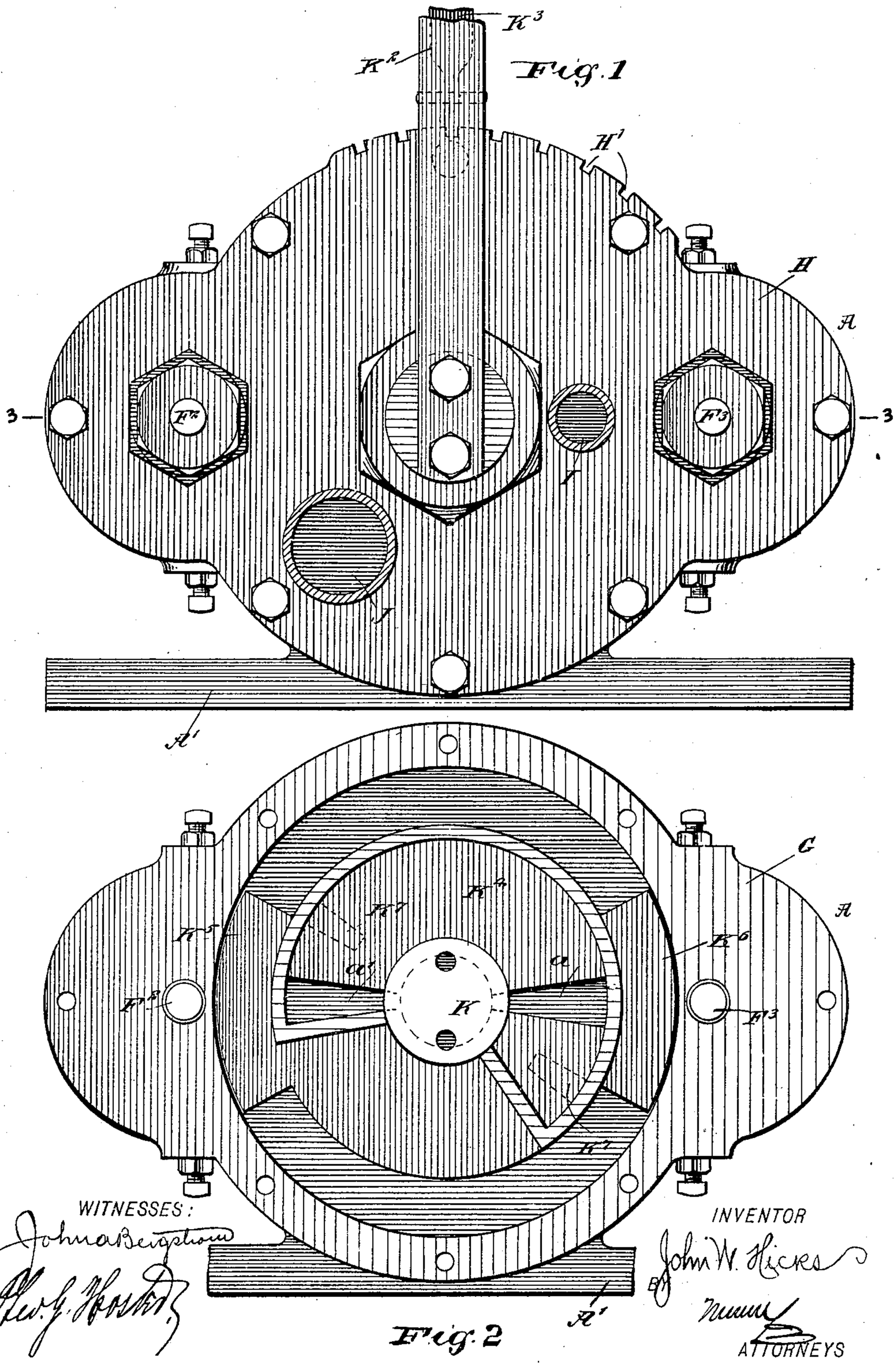

Fig. 2

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(No Model.) 4 Sheets—Sheet 2.

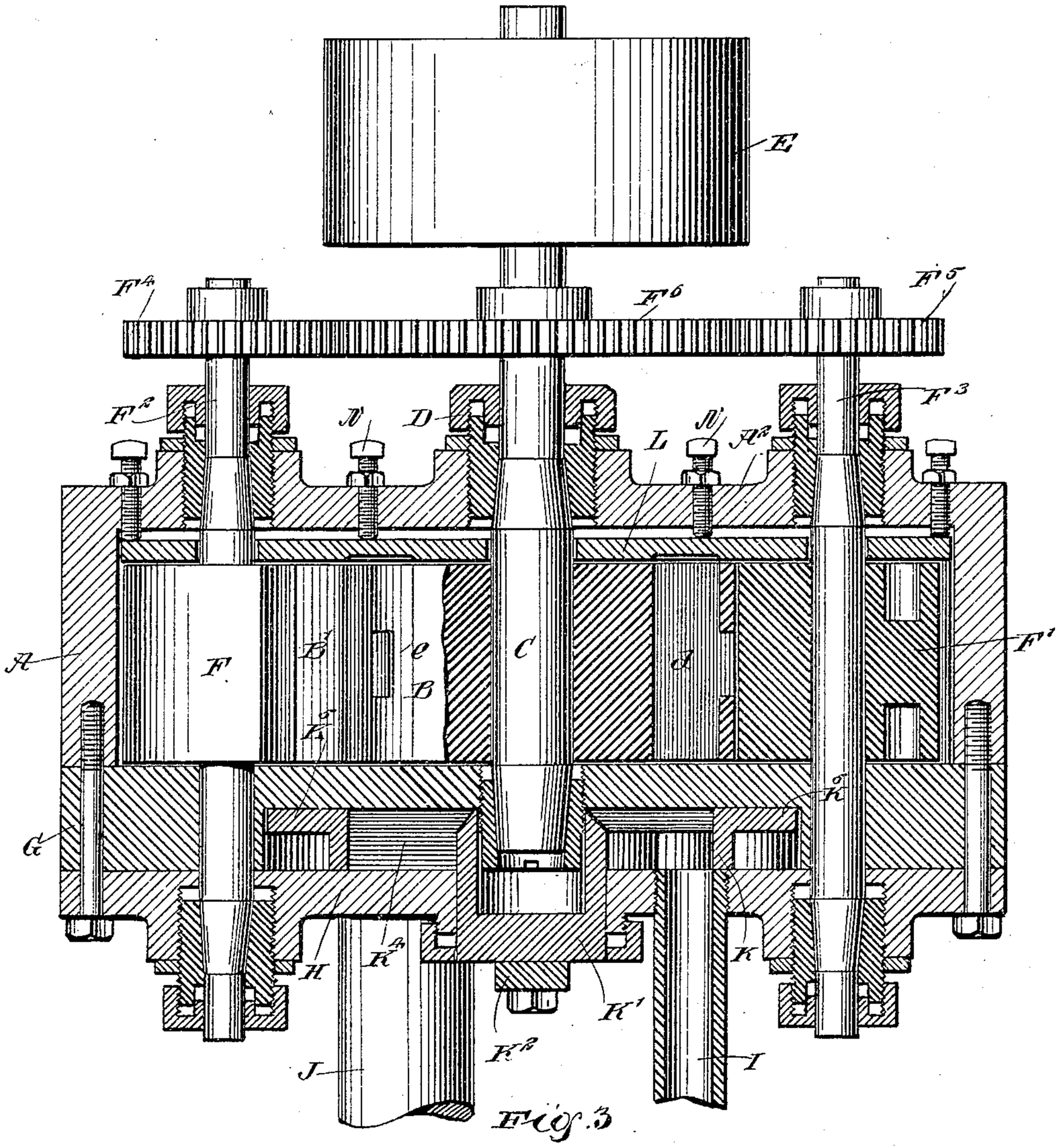

Fig. 3.

WITNESSES:

John A. Bergstrom

Geo. J. Hoster

INVENTOR

John W. Hicks

BY Munn & Co.

ATTORNEYS

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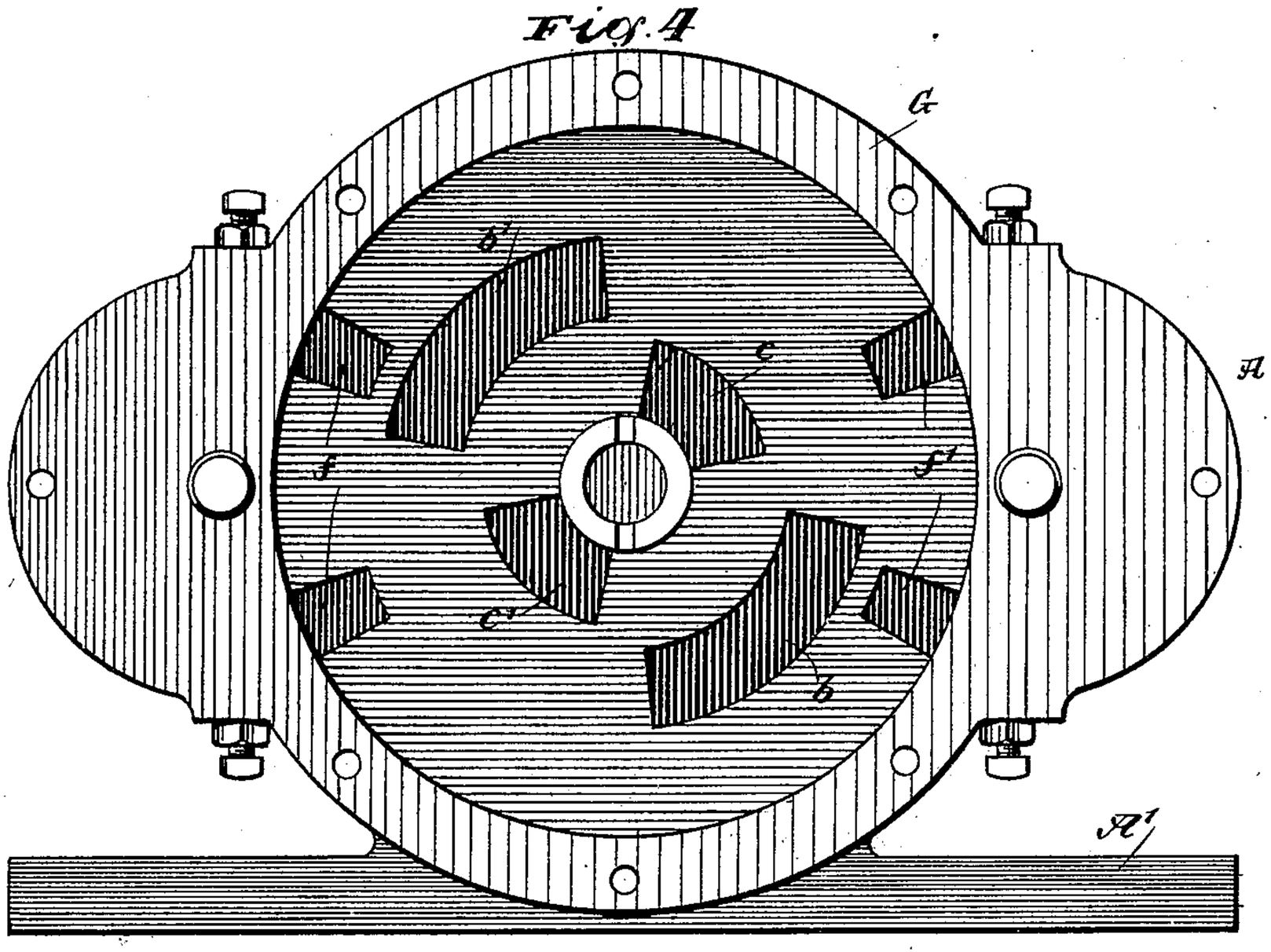
Fig. 4



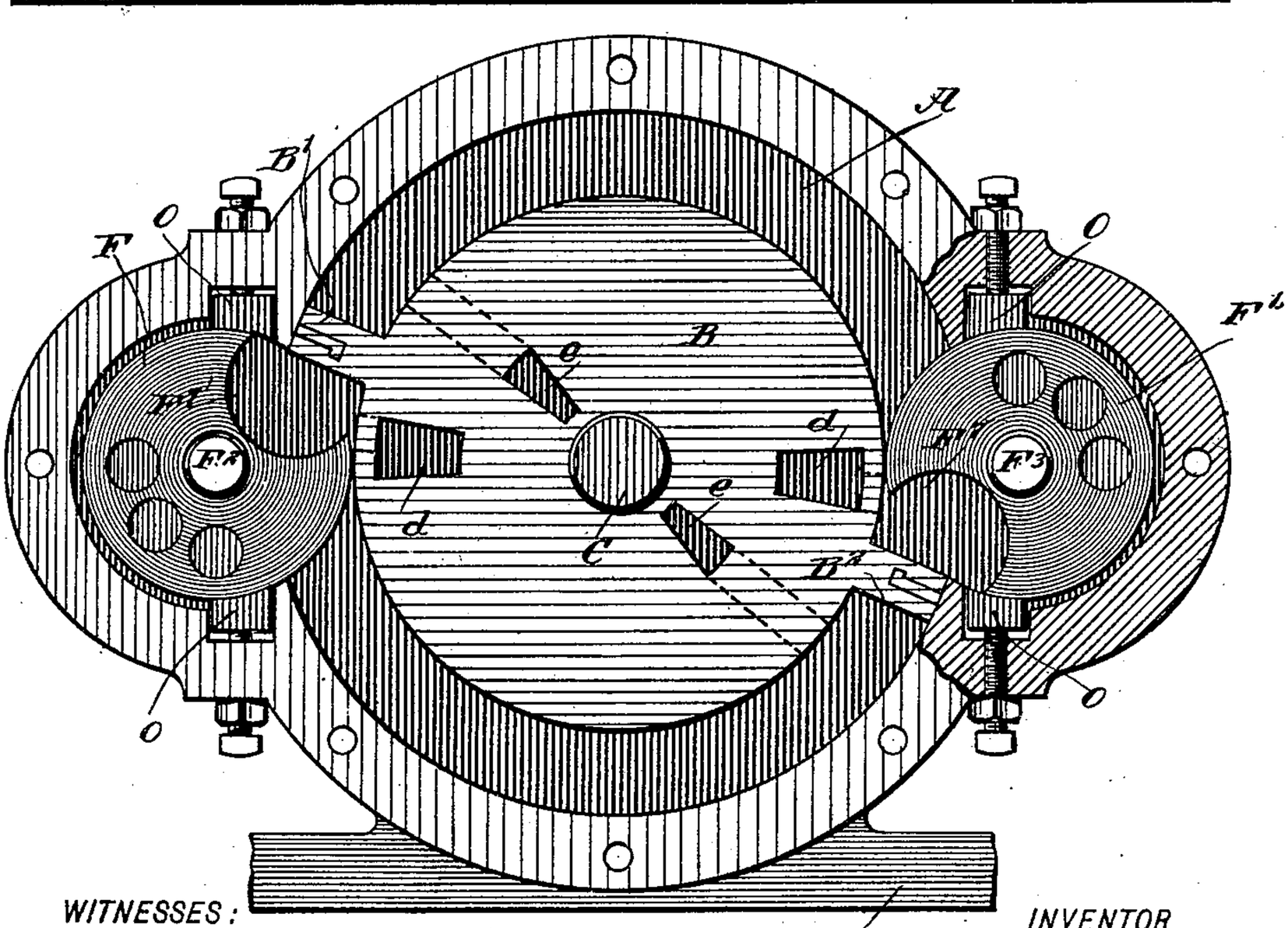


Fig. 5

WITNESSES:

John A. Berglund

Henry Hoster

INVENTOR

John W. Hicks

BY Munn & Co.

ATTORNEYS

No. 681,914. Patented Sept. 3, 1901.

J. W. HICKS.

ROTARY ENGINE.

(Application filed Mar. 30, 1900. Renewed Feb. 7, 1901.)

(No Model.) 4 Sheets—Sheet 4.

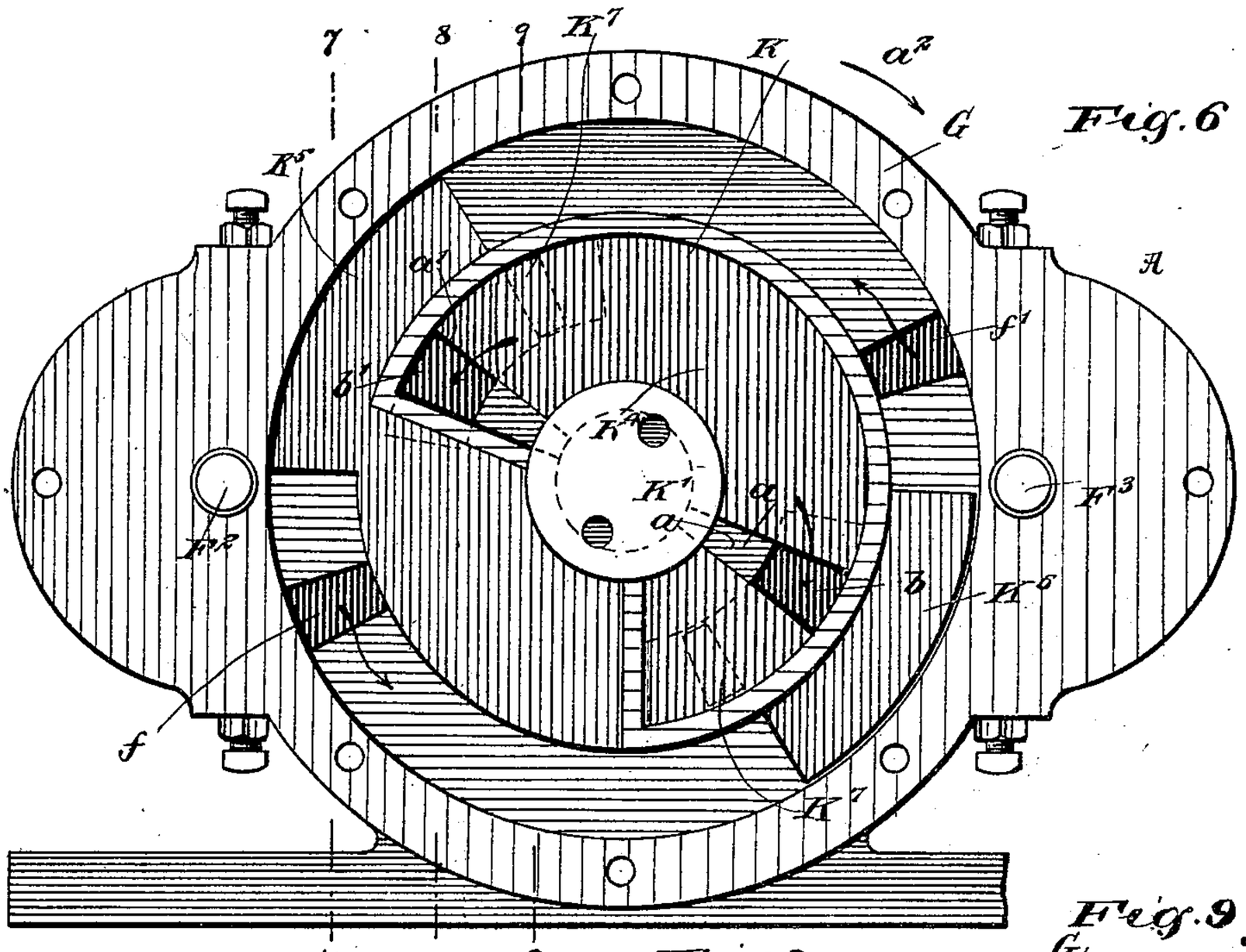


Fig. 6

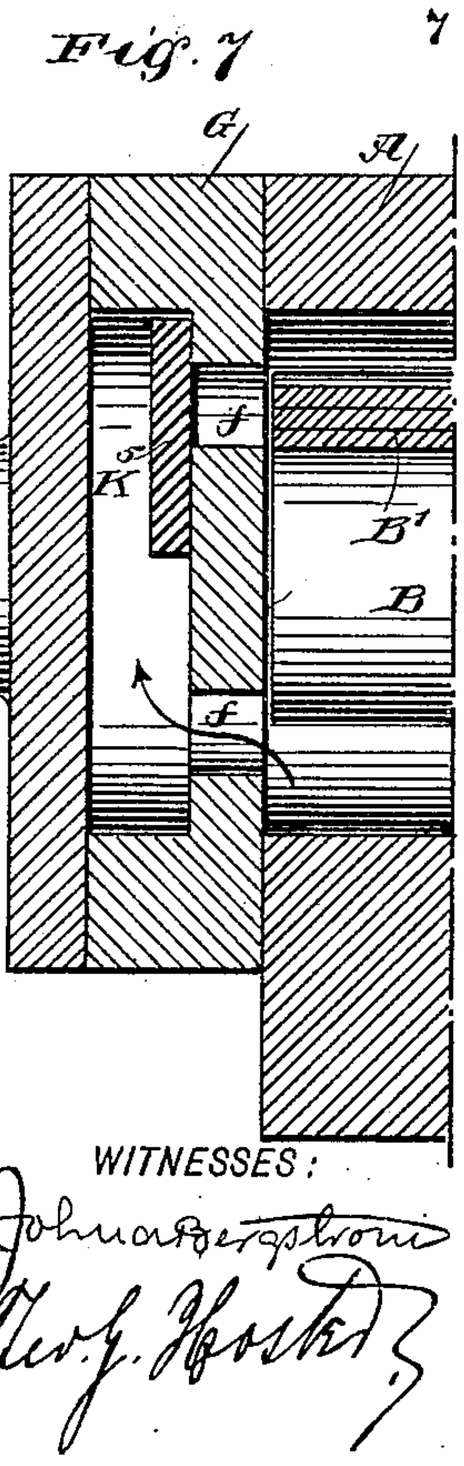


Fig. 7

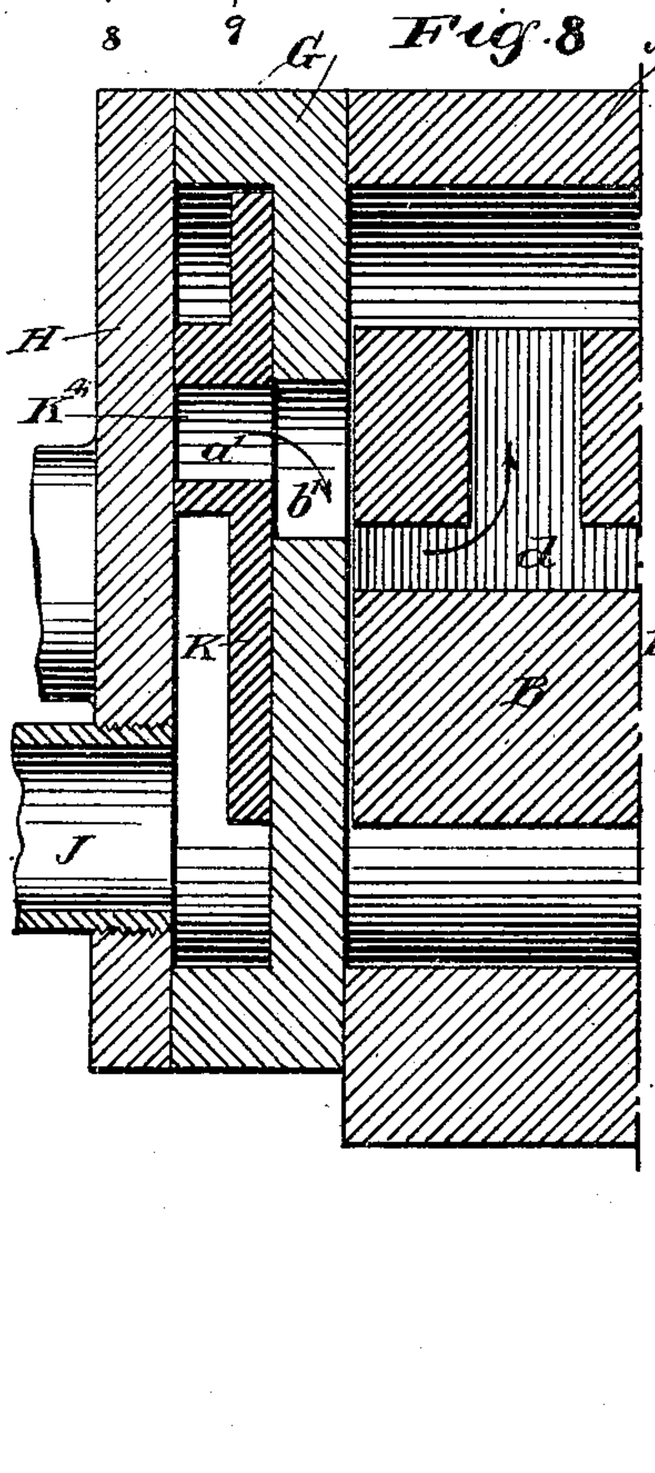


Fig. 8

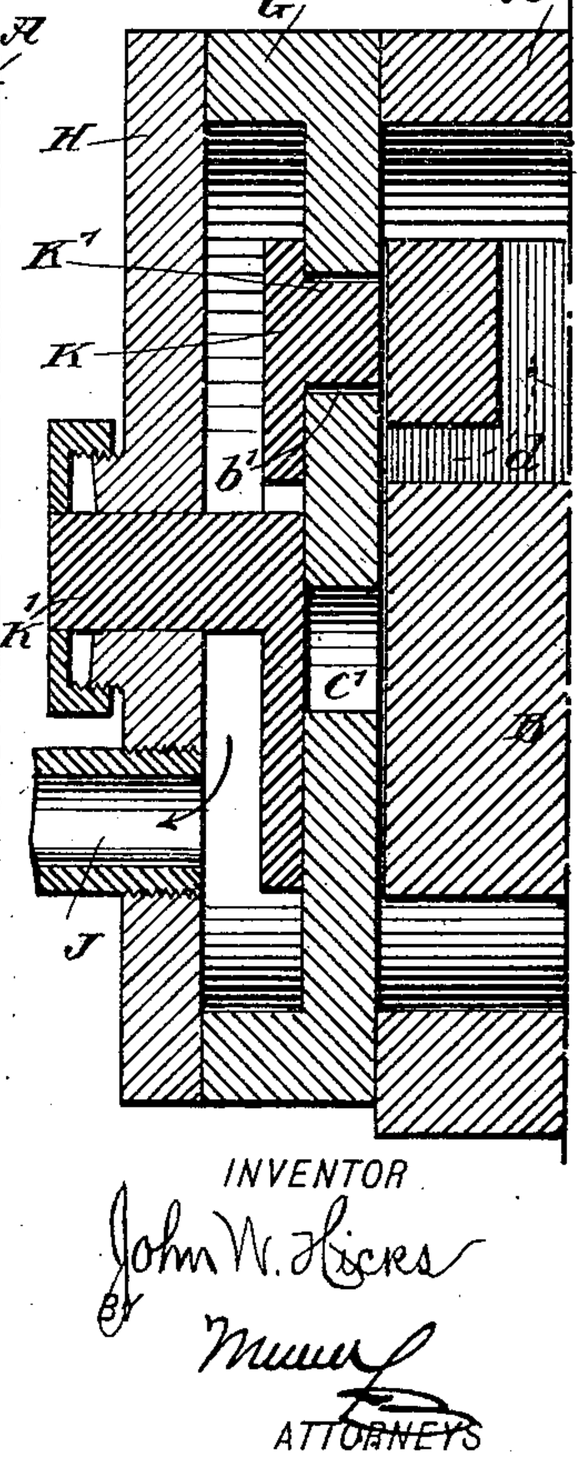


Fig. 9

WITNESSES:

John A. Bergstrom

Rud. J. Hoskey

INVENTOR

John W. Hicks

By Munn & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN W. HICKS, OF CHICAGO, ILLINOIS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 681,914, dated September 3, 1901.

Application filed March 30, 1900. Renewed February 7, 1901. Serial No. 46,372. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. HICKS, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, 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, very effective in operation, completely counterbalanced, and arranged to utilize the motive agent expansively and to the fullest advantage.

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

A practical embodiment of the invention is represented in 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 an end elevation of the improvement. Fig. 2 is a like view of the same with the steam-chest cover removed to show the inlet and reversing valve in the steam-chest. Fig. 3 is a sectional plan view of the improvement on the line 3 3 in Fig. 1. Fig. 4 is an end elevation of the same with the steam-chest cover and the inlet and reversing valve removed to show the inlet and exhaust ports in the steam-chest. Fig. 5 is a like view of the same with the steam-chest and inlet and reversing valve removed to show the piston and the rotary abutments. Fig. 6 is a like view of the improvement with the steam-chest cover removed and with the inlet and reversing valve in an active position. Fig. 7 is a longitudinal sectional elevation of the same on the line 7 7 in Fig. 6. Fig. 8 is a like view of the same on the line 8 8 in Fig. 6, and Fig. 9 is a similar view of the same on the line 9 9 in Fig. 6.

The cylinder A is provided with a suitable base A′ for supporting the engine on a foundation, and in said cylinder is mounted to rotate a piston B, preferably provided with two piston-heads B′ B^2, located diametrically opposite each other and extending to the inner peripheral surface of the cylinder, as is plainly indicated in Fig. 5. The piston B is secured on a shaft C, extending through a stuffing-box D in the cylinder-head A^2, (see Fig. 3,) and on the outer end of said shaft C is secured a pulley E for transmitting the rotary motion of the piston and shaft to other machinery. On opposite sides of the piston B are located the cylindrical rotary abutments F F′, arranged to operate in unison with the piston-heads B′ B^2, said abutments being for this purpose provided with recesses to allow said heads to pass when the piston B is rotated. The abutments F F′ are secured on shafts F^2 F^3, carrying at their outer ends gear-wheels F^4 F^5 in mesh with a gear-wheel F^6, secured on the shaft C, so that when the latter is rotated a rotary motion is given to the abutments F F′ to rotate the same in unison with the piston B.

The front end of the cylinder A is closed by a steam-chest G, having a cover H, carrying a steam-inlet pipe I and an exhaust-pipe J. In the steam-chest G is arranged an inlet and reversing valve K, having its valve-stem K′ mounted to turn centrally in the cover H, a lever K^2 being secured to the outer end of said stem K′ to be under the control of the operator. On the lever K^2 is arranged a locking-lever K^3, adapted to engage notches H′ on the upper edge of the cover H, so as to secure the lever K^2, and with it the valve K, in a desired position. For instance, when the said lever K^2 is in a vertical position, as shown in Fig. 1, then the valve K cuts off the motive agent from the piston and cylinder, and when the lever K^2 is moved to the right the motive agent is transmitted to the piston and cylinder to rotate the piston in the direction of the arrow a^2, as indicated in Fig. 6, and when said lever K^2 is moved to the left the engine is reversed—that is, the piston rotates in the inverse direction of said arrow a^2.

The valve K is formed in its face with a recess K^4, from which lead radially-extending ports *a a′*, adapted to register, when the lever K^2 is moved to the right, with ports *b b′*, formed in the steam-chest G, and adapted to register with ports *d d* in the face of the piston B and leading to the peripheral surface thereof at one side of the piston-heads B′ B^2. The ports *a a′* are also adapted to register with ports *c c′* in the steam-chest G

when the lever K^2 is moved to the left from the vertical position previously mentioned, and the ports *c c'* are adapted to register with ports *e e*, leading from the face of the piston B to the peripheral surface thereof at the sides of the heads B' and B^2, opposite to where the ports *d d* open into the cylinder. In the steam-chest G are also formed exhaust-ports *f f'*, registering with the working chambers of the cylinder A and adapted to be opened and closed by flanges K^5 K^6, formed on the valve K and located diametrically opposite each other, as is plainly indicated in Figs. 2 and 6. When the ports *f f'* are uncovered by the flanges K^5 K^6, the exhaust-steam can pass from the working chambers of the cylinder A into the steam-chest and from the latter through the exhaust-pipe J to the outside. Now when the valve K is shifted by the operator to the right to the position shown in Fig. 6, then the live motive agent entering the steam-chest G by way of the pipe I fills the recess K^4 in the valve K and passes from the said recess through the ports *a a'* into the ports *b b'* and through the ports *d d* into the cylinder A at one side of the piston-heads B' B^2 at the time the said heads have just passed the abutments, so that the motive agent passes between the abutments and piston-heads to rotate the piston B in the direction of the arrow a^2. As the piston rotates the ports *d* finally cut off from the ports *b b'*, and consequently steam is cut off from the cylinder, and the steam in the working chambers now works expansively on the heads of the piston until the working chambers register with the exhaust-ports *f f'*, so that the said steam can pass from the cylinder through said ports *f f'* into the steam-chest G and out through the pipe J. When the operator turns the lever K^2 to the left, then the ports *a a'* are moved out of register with the ports *b b'* and in register with the ports *c c'*. The motive agent now passes from the recess K^4 by way of the ports *a a'*, *c c'*, and ports *e e* to the cylinder A on opposite sides of the piston-heads B' B^2, so that the motive agent now causes the piston to rotate in the inverse direction of the arrow a^2. The rear face of the valve K is formed with lugs K^7, extending into the elongated ports *b b* and serving to vary the point of cut-off, and as the lever is moved more or less it increases or diminishes the live-steam period. It is understood that when the lever K^2 is moved to the right or to the left a desired distance more or less steam is admitted to the cylinder during one revolution of the piston, and consequently the cut-off of the motive agent is completely under the control of the engineer in charge and can be increased or diminished at pleasure.

The inlet-ports *d e* in the piston B are extended to the rear face of the piston (see Fig. 3) to conduct live motive agent to recesses in a plate L, abutting against screws N, screwing in the cylinder-head A^2. By this arrangement the piston B is counterbalanced, as the steam pressure is equal on both faces. The steam that passes to the plate L by way of the ports mentioned can also pass to the recesses in which the abutments F F' are located, so that the recesses are filled with steam to hold the abutments always in contact with the piston. The peripheral surfaces of the abutments are engaged at points close to the cylinder-opening by packing-blocks O (see Fig. 5) to prevent leaking of the motive agent from the working chambers in the cylinder. The abutments F F' are formed with cut-out portions at points opposite the peripheral recesses F^7 (see Fig. 5) to counterbalance the abutments.

Although I have shown the piston B provided with two piston-heads operating in conjunction with two abutments, I do not limit myself to such number of heads and abutments, as the piston may be provided with a single piston-head operating in conjunction with a single abutment, or the piston may be provided with more than two piston-heads. In the latter case a corresponding number of rotary abutments are employed. The engine may also be constructed as a compound engine, the exhaust from the high-pressure cylinder passing into the low-pressure cylinder and being used therein as the motive agent.

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

1. A rotary engine, comprising a cylinder, a piston mounted to turn therein and having a piston-head, a rotary abutment for said piston and mounted to rotate in unison therewith, a steam-chest having ports for registering with ports in said piston, and a valve in said steam-chest and under the control of the operator, to open and close the ports in the steam-chest, said valve also controlling the exhaust of the motive agent from the working chamber of the cylinder, substantially as shown and described.

2. A rotary engine, comprising a cylinder, a piston mounted to turn therein and having a piston-head, inlet-ports extending through the piston to opposite sides of the piston-head, a rotary abutment for said piston and mounted to rotate in unison therewith, a steam-chest having sets of ports for registering with the ports in said piston, and a valve in said steam-chest and under the control of the operator and having ports adapted to register with either set of the ports in said steam-chest, said valve also controlling the exhaust of the motive agent from the working chamber of the cylinder, as set forth.

3. A rotary engine, comprising a cylinder, a piston mounted to turn therein and having a piston-head, and sets of ports extending through the piston to the peripheral surface thereof at opposite sides of said piston-head, a rotary abutment for said piston and mounted to rotate in unison therewith, a steam-chest for closing one end of said cylinder, and

having sets of inlet-ports and sets of exhaust-ports, of which the latter register with the working chambers of the cylinder, and a valve mounted to turn in said steam-chest and having a set of ports for registering with either set of inlet-ports in said steam-chest, said valve having a recess connected with the steam-supply and from which lead said set of valved ports, the valve also having flanges for opening and closing the exhaust-ports in said steam-chest, substantially as described.

4. A rotary engine, comprising a cylinder, a piston mounted to turn therein and having a piston-head and provided with inlet-ports, a rotary abutment for said piston and mounted to turn in unison therewith, and a pressure-plate in said cylinder having recesses to which the motive agent is conducted from the inlet-ports to counterbalance the piston, substantially as described.

5. A rotary engine, comprising a cylinder, a piston mounted to turn therein and having a piston-head, a rotary abutment for said piston and mounted to rotate in unison therewith, a steam-chest having ports for registering with ports in said piston, a valve in said steam-chest and under the control of the operator to open or close the ports in the steam-chest, and a pressure-plate in said cylinder and having recesses in register with extensions of the piston-ports, substantially as shown and described.

6. A rotary engine, comprising a cylinder, a piston mounted to turn therein and provided with piston-heads, inlet-ports extending through the piston to opposite sides of the piston-heads, rotary abutments for said piston and mounted to rotate in unison therewith, a steam-chest having sets of ports for registering with the ports in said piston, a valve in said steam-chest and under the control of the operator and having ports adapted to register with either set of the ports in said steam-chest, and a pressure-plate in said cylinder having recesses registering with the inlet-ports in the piston, susbtantially as described.

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

JOHN W. HICKS.

Witnesses:
CONRAD NELSON,
J. N. FORD.