(No Model.)

2 Sheets—Sheet 1.

C. F. SLEIGH.

ROTARY ENGINE.

No. 389,328. Patented Sept. 11, 1888.

Fig. 1.

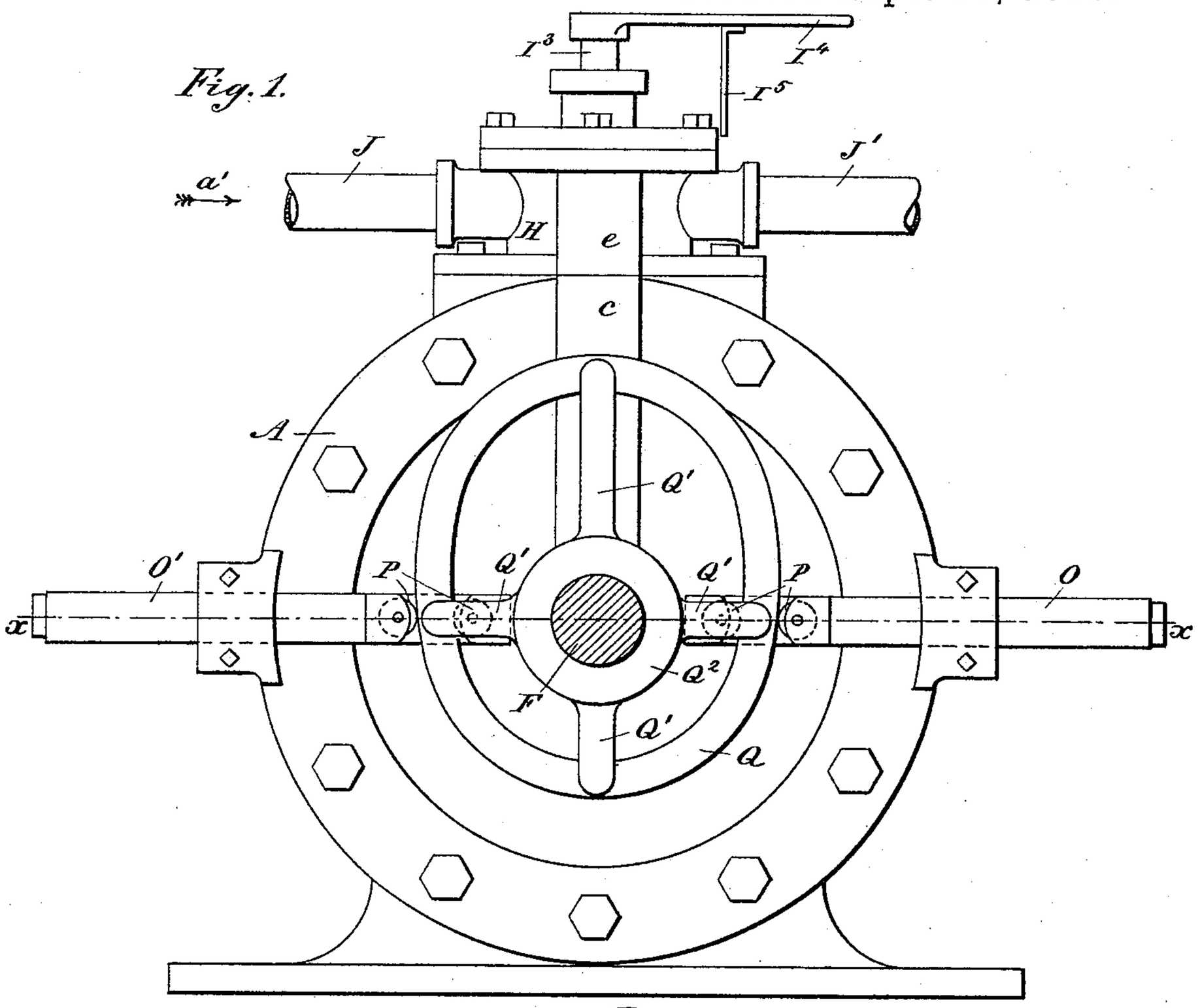
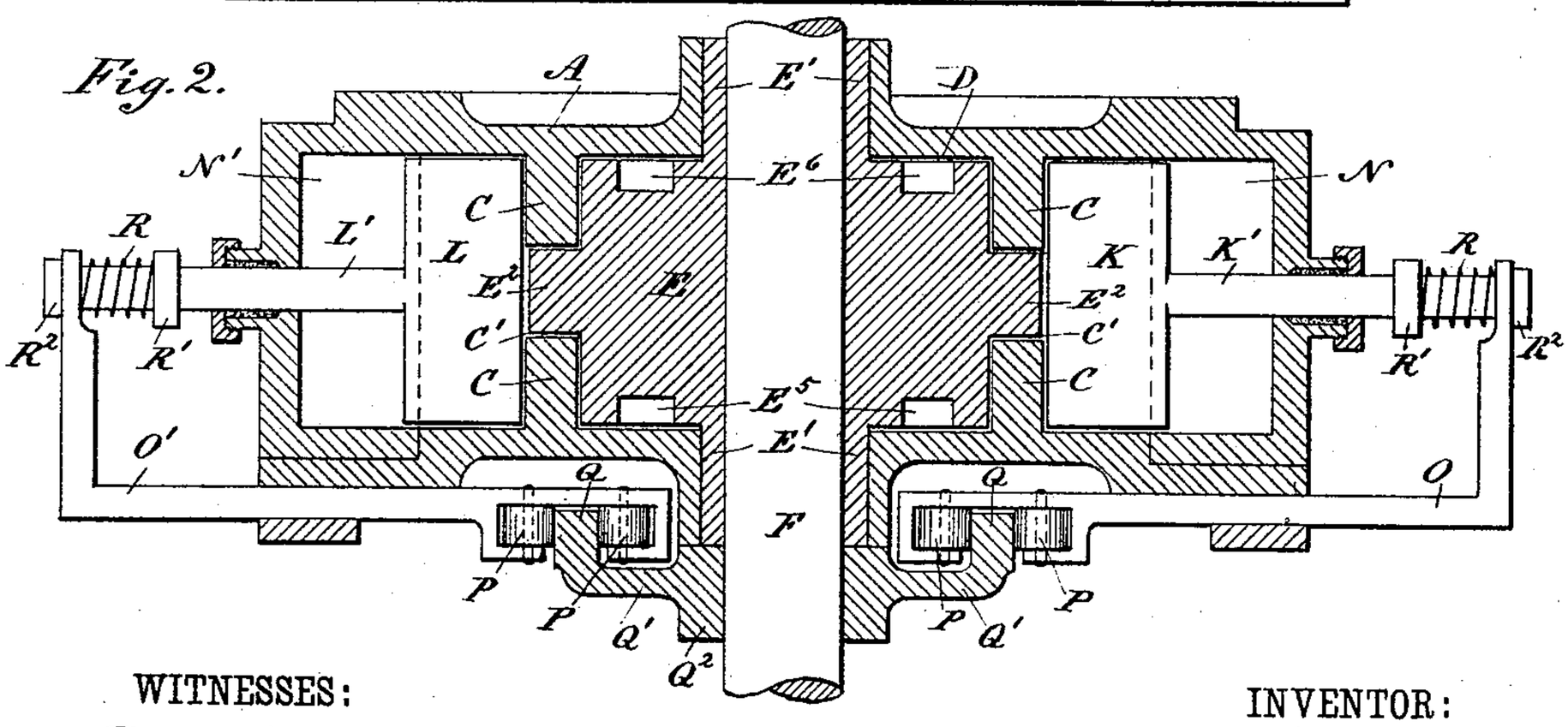


Fig. 2.



WITNESSES:

D. C. Reusch.

C. Sedgwick.

INVENTOR:

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BY Munn & Co

ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

C. F. SLEIGH.

ROTARY ENGINE.

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Fig. 5.

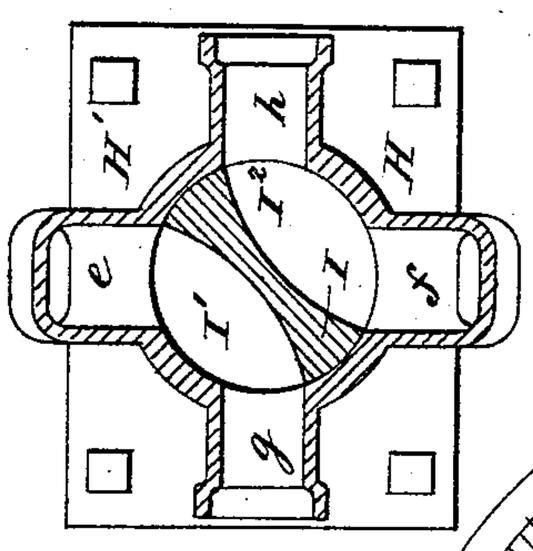


Fig. 4.

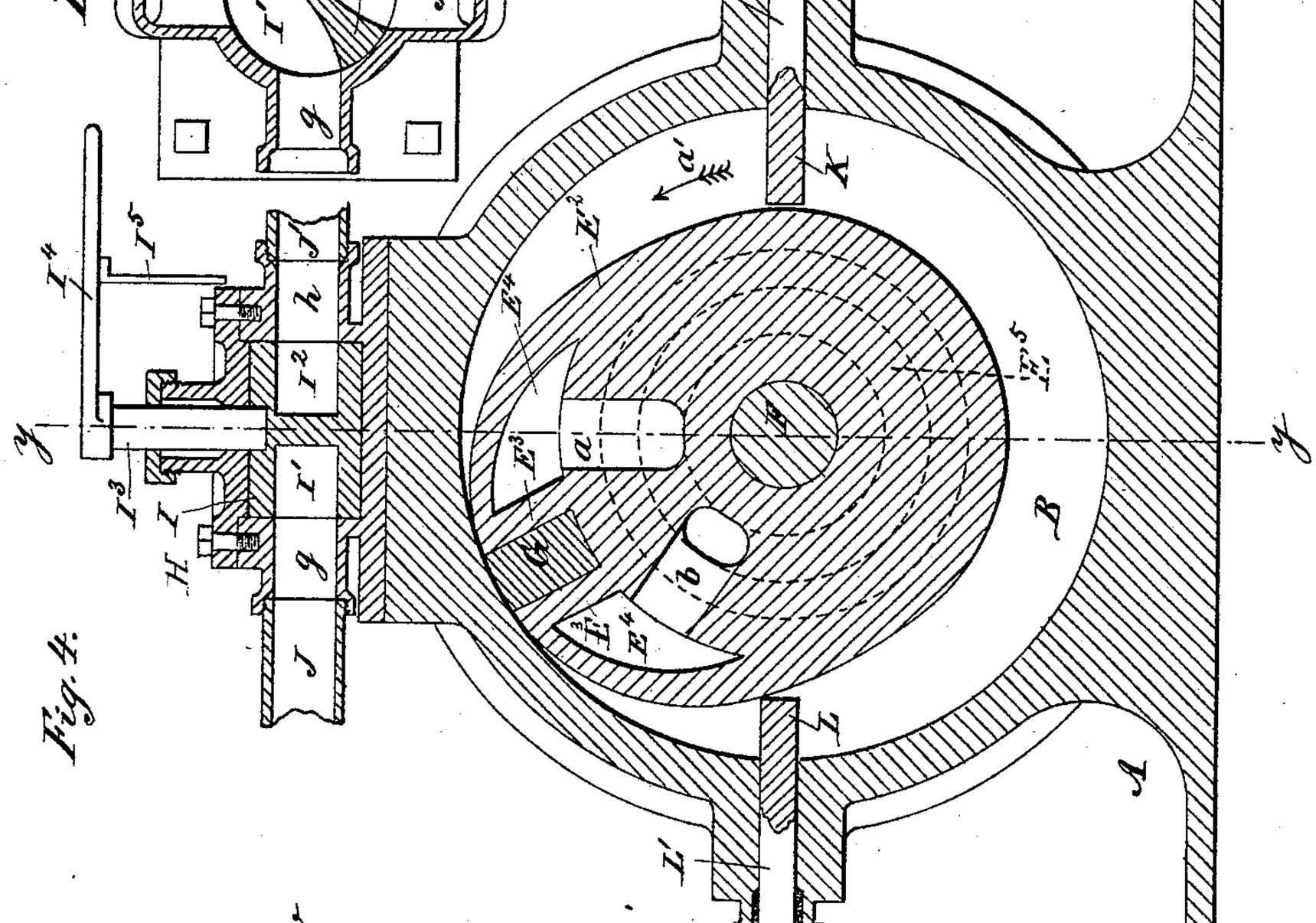
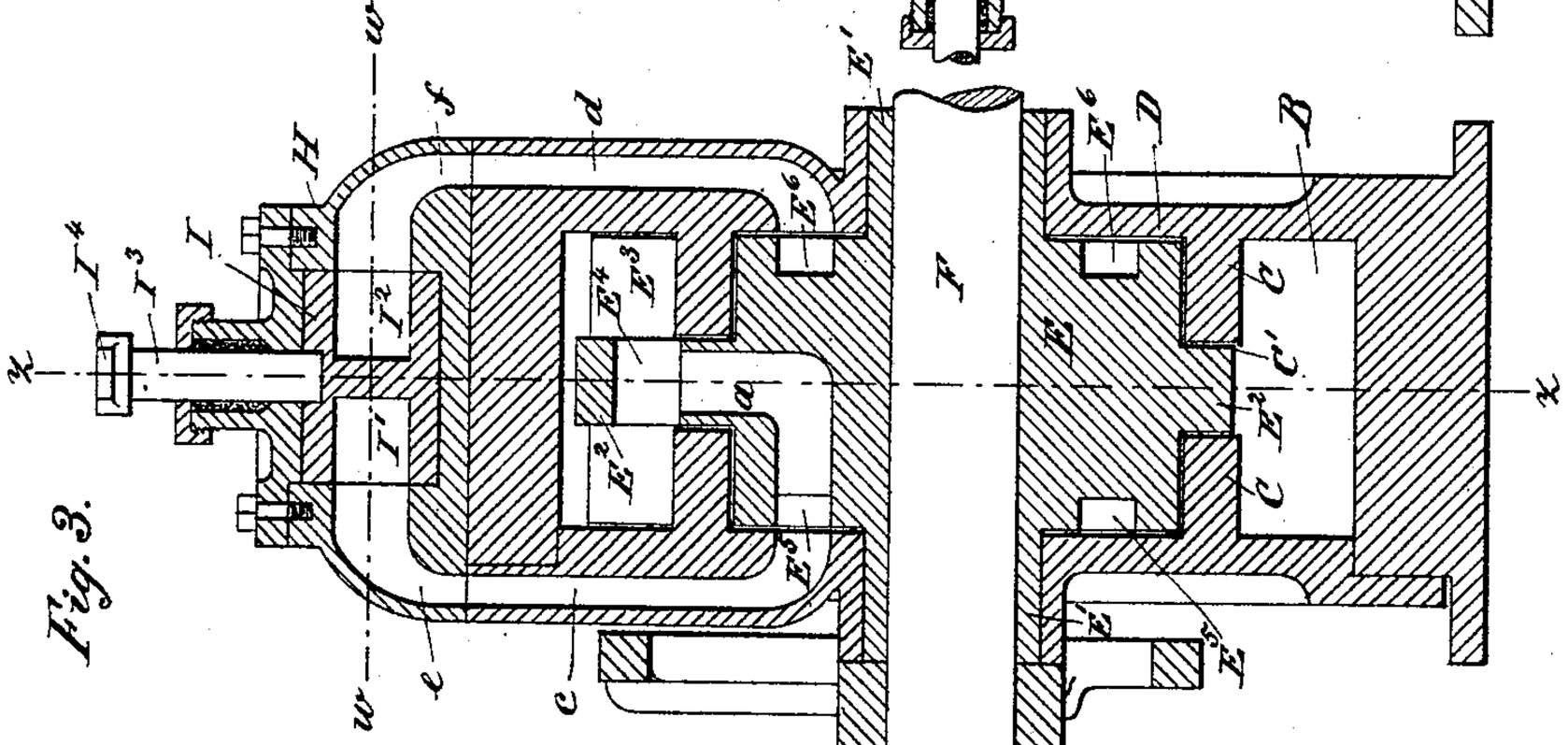


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES F. SLEIGH, OF FORT WAYNE, INDIANA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 389,328, dated September 11, 1888.

Application filed March 7, 1888. Serial No. 266,449. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. SLEIGH, of Fort Wayne, in the county of Allen and State of Indiana, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The object of my invention is to provide a new and improved rotary engine, which is simple and durable in construction and very effective in operation, utilizing the steam to full advantage.

The invention consists in the construction and arrangement of certain parts and details and combinations of the same, as will be fully 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 my improvement. Fig. 2 is a sectional plan view of the same on the line *x x* of Fig. 1. Fig. 3 is a vertical cross-section of my improvement on the line *y y* of Fig. 4. Fig. 4 is a longitudinal sectional elevation of the same on the line *z z* of Fig. 3, and Fig. 5 is a sectional plan view of the valve and valve-chest on the line *w w* of Fig. 3.

My improved rotary engine is provided with a cylinder, A, having an outer steam-chamber, B, separated by annular inwardly-extending flanges C from the middle or inner chamber, D, in which is held to rotate a piston, E, provided at each end with a hub, E′, turning in suitable bearings formed on the steam-cylinder A. The piston E is secured to the main shaft F, passing through the center of said piston E and connected in any suitable manner with the machinery to be driven. On the edge of the piston E in its middle is formed an eccentric rim, E^2, part of which is semicircular and extends into the space C′, formed between the annular flanges C. The eccentric-rim E^2 is provided on its highest part with sidewise-extending lugs E^3, between which is held a block, G, filling the entire width of the steam-space B, as shown in Figs. 3 and 4. On the outer side of each lug E^3 is formed a transverse opening, E^4, in the eccentric-rim E^2, and into these openings E^4 lead the ports *a* and *b*, respectively, of which the port *a* connects with an annular groove, E^5, formed in one face of the piston E, and the other port, *b*, connects with an annular groove, E^6, formed in the other face of the piston E.

Into the annular grooves E^5 and E^6 lead the channels *c* and *d*, respectively, formed in the sides of the cylinder A and continuing, respectively, into the channels *e* and *f*, formed in the valve-chest H, secured in any suitable manner to the top of the cylinder A. The channels *e* and *f* in the valve-chest H are adapted to be connected alternately with the grooves I′ and I^2, formed in the rim of the valve I, held in a vertical position and adapted to be turned in a suitable seat formed in the valve-chest H. The grooves I′ and I^2 are adapted to be connected with the ports *g* and *h*, connected, respectively, with the steam-inlet pipe J and the exhaust-pipe J′.

The valve I is provided with a valve-rod, I^3, extending upward through the cover of the valve-chest H and carrying on its outer end a lever, I^4, by which the said valve can be turned. A connecting-arm, I^5, is secured to the said lever I^4, so as to indicate the respective position of the valve I in relation to the inlet and exhaust pipes J and J′.

It will be seen that in the position shown in Fig. 5 the valve I connects by its groove I′ the steam-inlet pipe J with the channels *e c*, leading to the port *a*, and the groove I^2 connects the exhaust-pipe J′ with the channels *f* and *d*, of which the latter leads to the port *a*. When the valve I is turned forty-five degrees, its groove I′ connects the channel *e* with the port *h*, while the groove I^2 connects the steam-inlet port *g* with the channel *f*. In this case the engine is reversed.

In the steam-space B are held diametrically opposite each other the gates K and L, secured, respectively, to the rods K′ and L′, adapted to slide in suitable bearings formed in the steam-cylinder A. The gates K and L can slide out of the steam space B into the spaces N and N′, respectively, formed in the cylinder A, so as to permit a free passage of the block G in the eccentric-rim E^2 of the piston E.

On the outer ends of the rods K′ and L′, respectively, are secured the angular rods O, extending in front of the cylinder A and held in

suitable bearings on the same. Near the inner end of each rod O or O′ are secured the rollers P P, between which passes an eccentric, Q, similar in shape to the eccentric-rim E^2 and placed in the same relative position. The eccentric Q is supported by arms Q′, fastened on a hub, Q^2, secured to the main shaft F. On the rods K′ and L′ are coiled springs R, one end of each of which springs presses against a collar, R′, secured on the rod L′ or K′, while its other end presses against the end of the arm O or O′, respectively. The arms O and O′ are prevented from slipping off of the rods L′ and K′ by a collar, R^2, secured to the outer end of each of said rods and against which one end of the respective rod O or O′ presses.

The operation is as follows: In the position shown in Figs. 2, 3, 4, and 5 the steam enters through the inlet-pipe J and passes from the same to the port *g* and through the groove I′ in the valve I to the channel *e*, connecting with the port *c*, from which the steam passes into the annular groove E^5 on one face of the piston E, and from the said annular groove E^5 the steam passes through the port *a* into the steam-space B between the plug G in the piston E and the gate K. The steam exerts its pressure against the lugs E^3 and the block G, whereby the piston E is turned in the direction of the arrow *a*′. The gates K and L move in and out with the movement of the eccentric-rim E^2 of the piston E on account of the eccentric Q being similar in shape and form to the rim E^2 and moving in the same relative position with the main shaft F. The exhaust-steam in front of the block G passes through the port *b* into the annular groove E^6, and from the latter into the channels *d* and *f*, from which latter the steam passes through the groove I^2 in the valve I to the port *h*, leading to the exhaust-port J′. It will be seen that the steam entering the inlet-pipe J passes continually to one side of the block G, thus imparting a continuous rotary motion to the piston E, while at the same time the steam is continually exhausted on the other side of the block G by passing through the port *b* into the groove E^6, and from the latter, as above described, to the exhaust-pipe J′.

When the operator turns the valve I about forty-five degrees, the steam entering through the pipe J passes through the groove I^2 into the channel *f*, and from the latter to the channel *d*, which connects by means of the annular groove E^6 with the port *b*, so that the steam enters now on the other side of the lugs E^3 and the block G of the piston E, whereby the latter is turned in the inverse direction of the arrow *a*′. The exhaust now takes place through the port *a*, leading to the annular groove E^6, connected with the channels *e c*, and from the latter the steam passes through the groove I′ into the port *h* and to the exhaust-pipe J′. Thus it will be seen that I utilize the steam to full advantage and impart a uniform, powerful, and regular motion to the piston E and its main shaft F. At the same time I am enabled to reverse the engine at any point of its stroke by turning the handle I^4 forty-five degrees.

The springs R on the rods K′ and L′, carrying the gates K and L, permit an easy sliding motion of the said gates, as the said springs R permit the rods O to yield according to the motion of the eccentric Q. The engine thus runs without any noise, and at the same time the motion of the gates K and L is accurate and easy in relation to the eccentric-rim E^2 of the piston E. It is understood that the gates K and L cannot move farther inward than to the annular flanges C.

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

1. In a rotary steam-engine, the combination, with the cylinder having a steam-space and provided with inlet and exhaust channels, and an eccentric piston held to rotate in said cylinder and provided on each face with an annular groove having connection with ports leading to the steam-chamber, of a valve-chest, as H, located on top of said cylinder, a vertical valve, as I, within said chest, having grooves I′ and I^2, and a handle, I^4, for moving the same, substantially as described.

2. In a rotary engine, the combination, with the cylinder A, provided with the steam-space B and the channels *c d*, and the steam-chest H on the cylinder, of the rotary piston E, provided with eccentric-rim E^2, lugs E^3 on the rim, having transverse openings E^4, the ports *a b*, and the annular grooves E^5 E^6, substantially as herein shown and described.

3. In a rotary engine, the combination, with a cylinder having a steam-space and provided with steam inlet and exhaust channels, of a piston held to rotate in the said cylinder and secured to a main shaft, and provided on each face with an annular groove connecting with the said inlet and exhaust channels, each annular groove being also connected with a port leading to the steam-chamber of the cylinder, an eccentric-rim held on said piston and extending into the steam-space, a block held in the said eccentric-rim and extending throughout the width of the said steam-space, gates held to slide in and out of said steam-space, an eccentric secured to the main shaft, having an inwardly-extending peripheral edge and connected with said gates for moving the latter in and out of said steam-chamber according to the motion of the eccentric-rim of the piston, and rollers mounted on the connections between the gates and eccentric and between which the eccentric works, substantially as shown and described.

4. In a rotary engine, the combination, with a cylinder having a steam-space and provided with steam inlet and exhaust channels, of a piston held to rotate in the said cylinder and secured to a main shaft, and provided on each face with an annular groove connecting with the said inlet and exhaust channels, each an-

nular groove being also connected with a port leading to the steam-chamber of the cylinder, an eccentric-rim held on said piston and extending into the steam-space, a block held on the said eccentric-rim and extending throughout the width of the said steam-space, gates held to slide in and out of said steam-space, and an eccentric secured to the main shaft and connected with said gates for moving the latter in and out of said steam-chamber according to the motion of the eccentric-rim of the piston, coiled springs arranged between the gates and eccentric, and a reversing-valve adapted to be connected alternately with the said channels on the cylinder and also connected with the steam inlet and exhaust pipes, substantially as shown and described.

CHARLES F. SLEIGH.

Witnesses:
JOHN P. PAYNTER,
DANIEL WEBSTERS.