

D. D. HARDY & A. C. WEST.

Rotary Steam-Engines.

No. 156,998.

Patented Nov. 17, 1874.

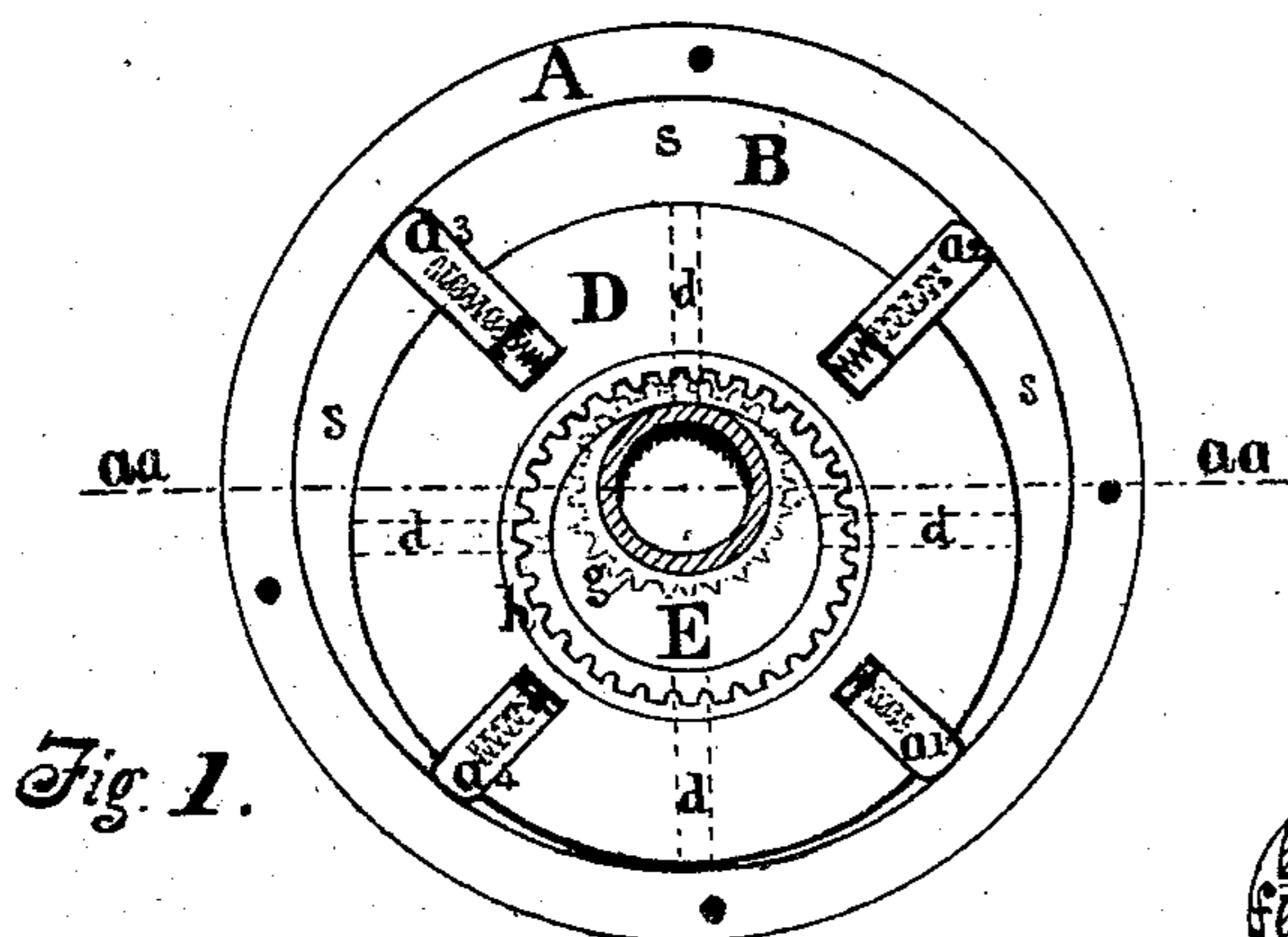


Fig. 1.

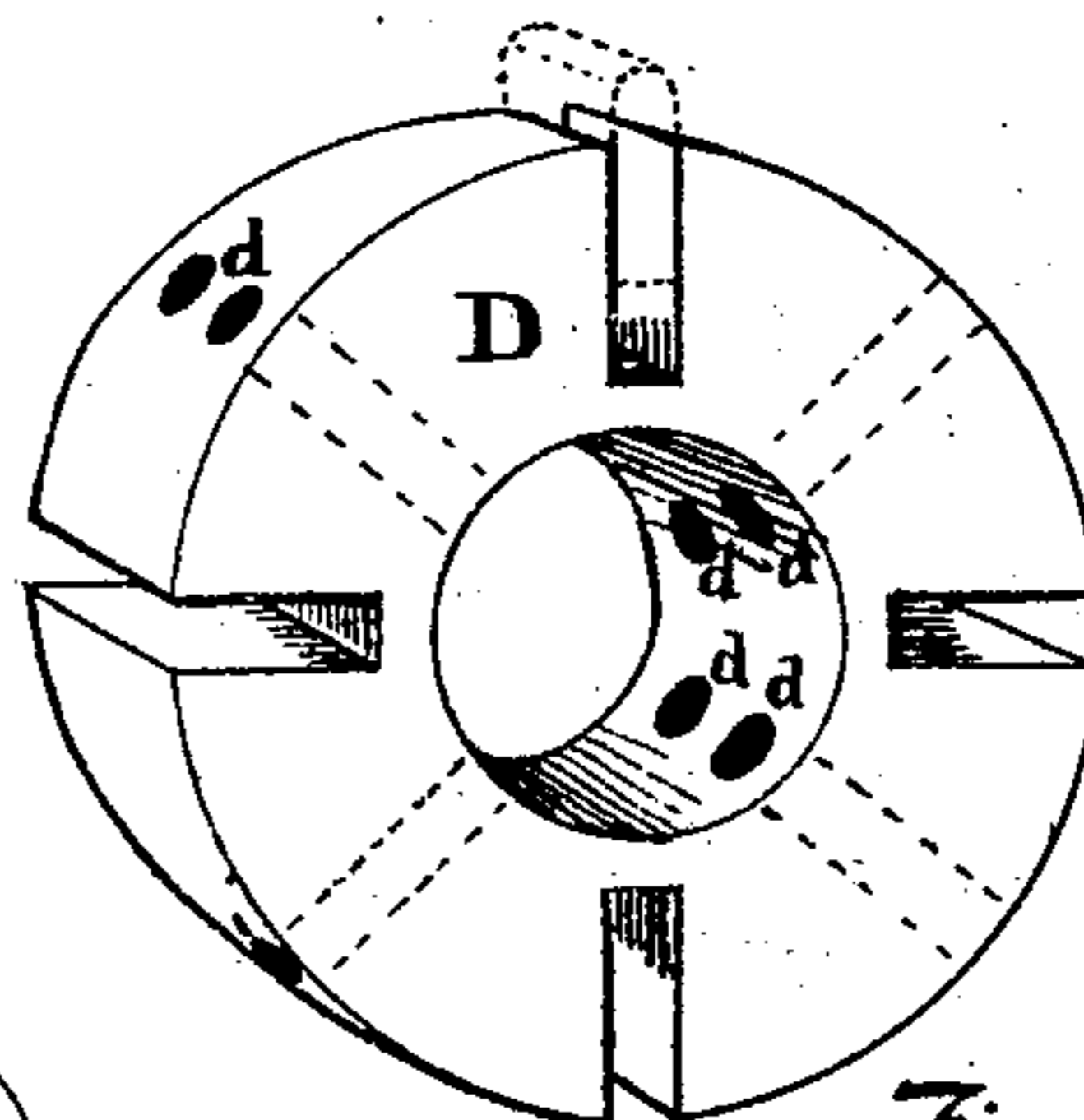


Fig. 2.

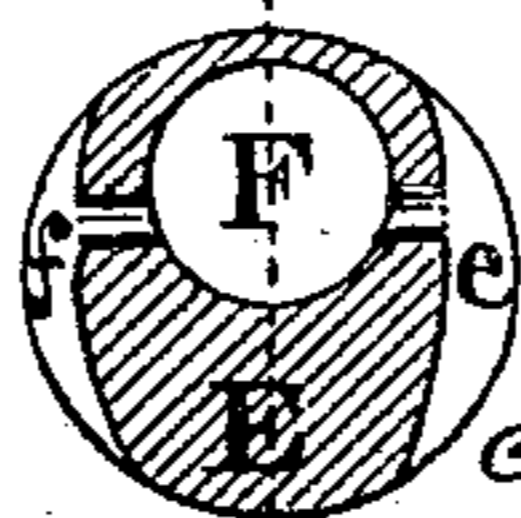


Fig. 4.

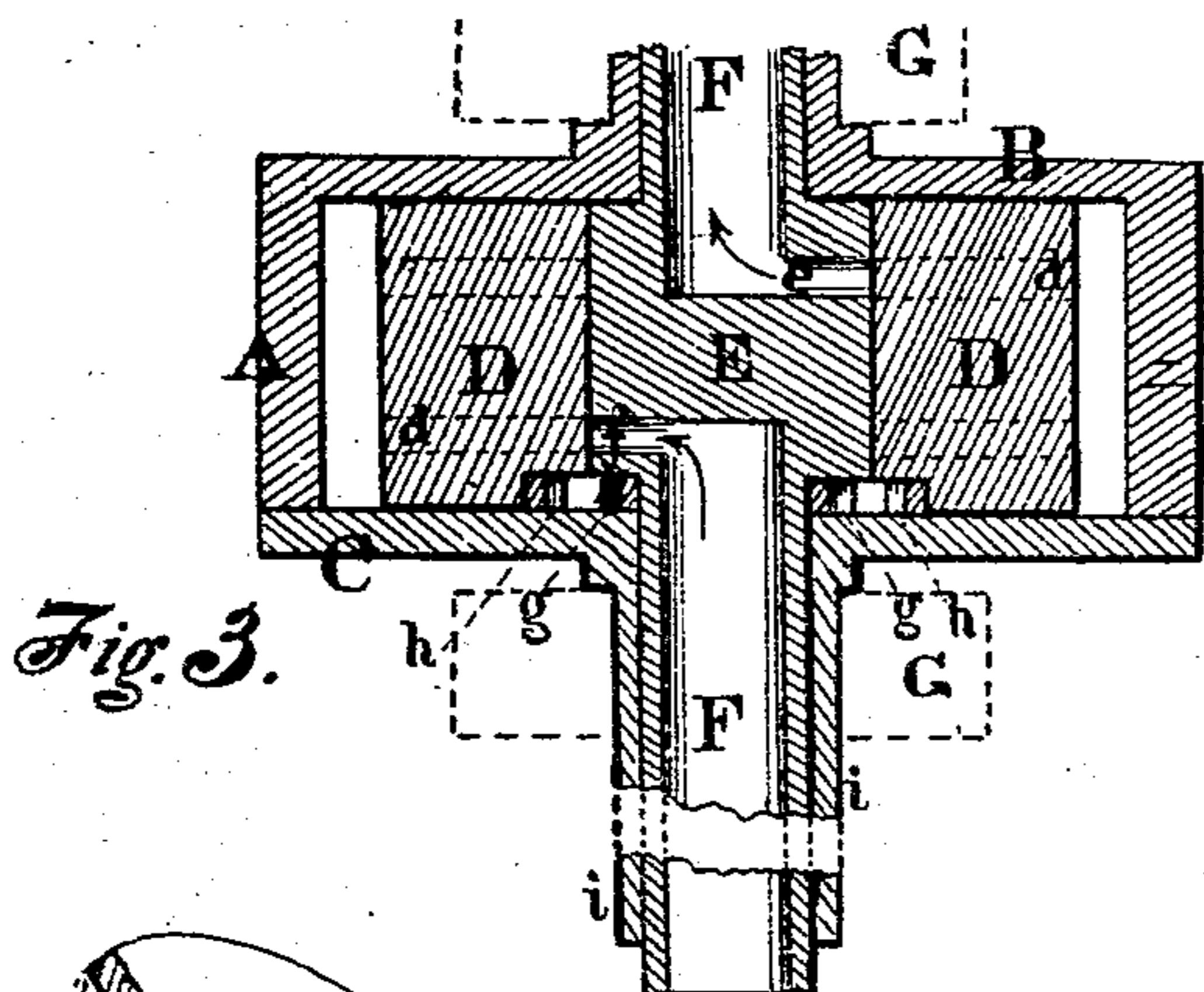


Fig. 3.

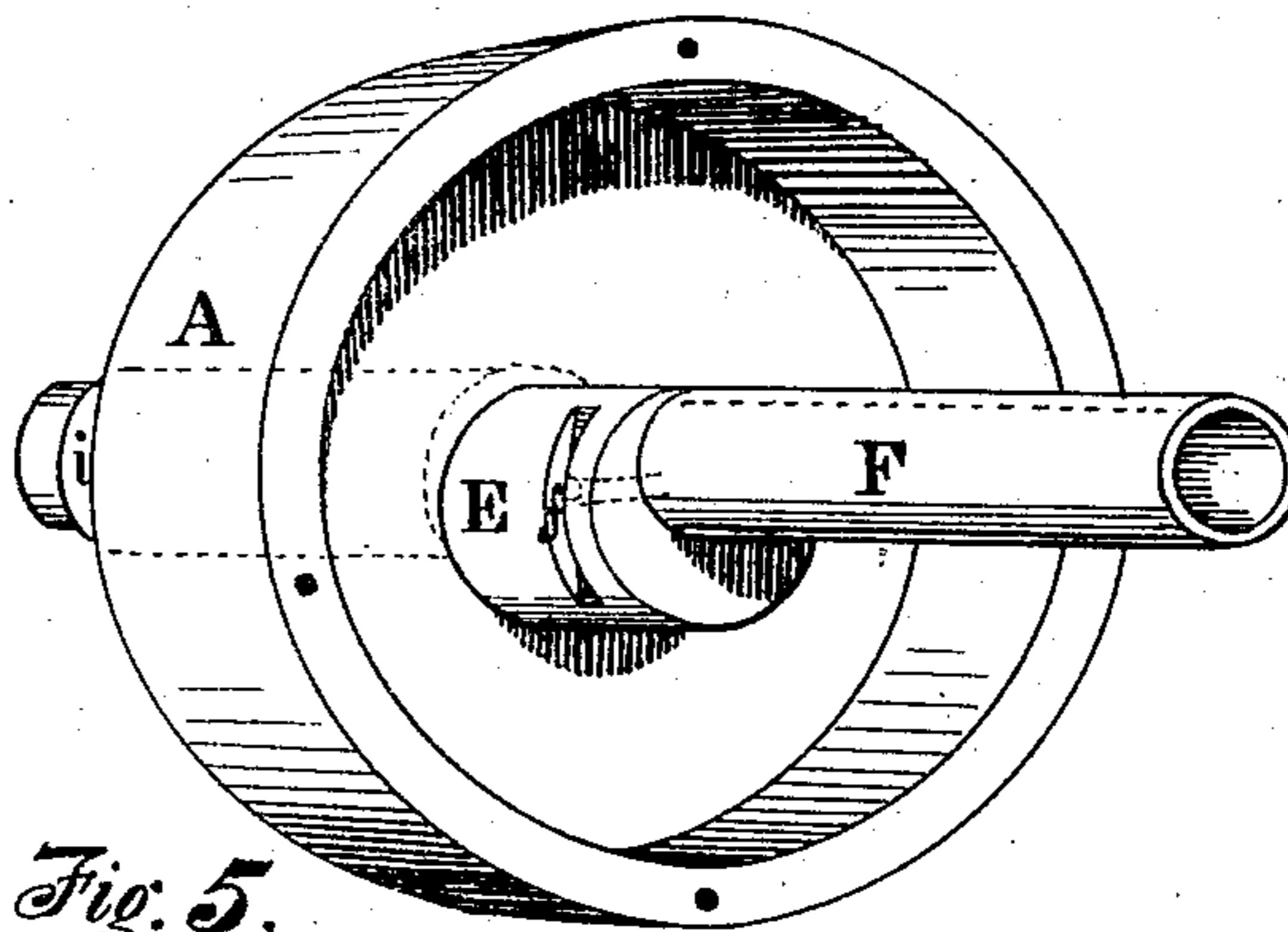


Fig. 5.

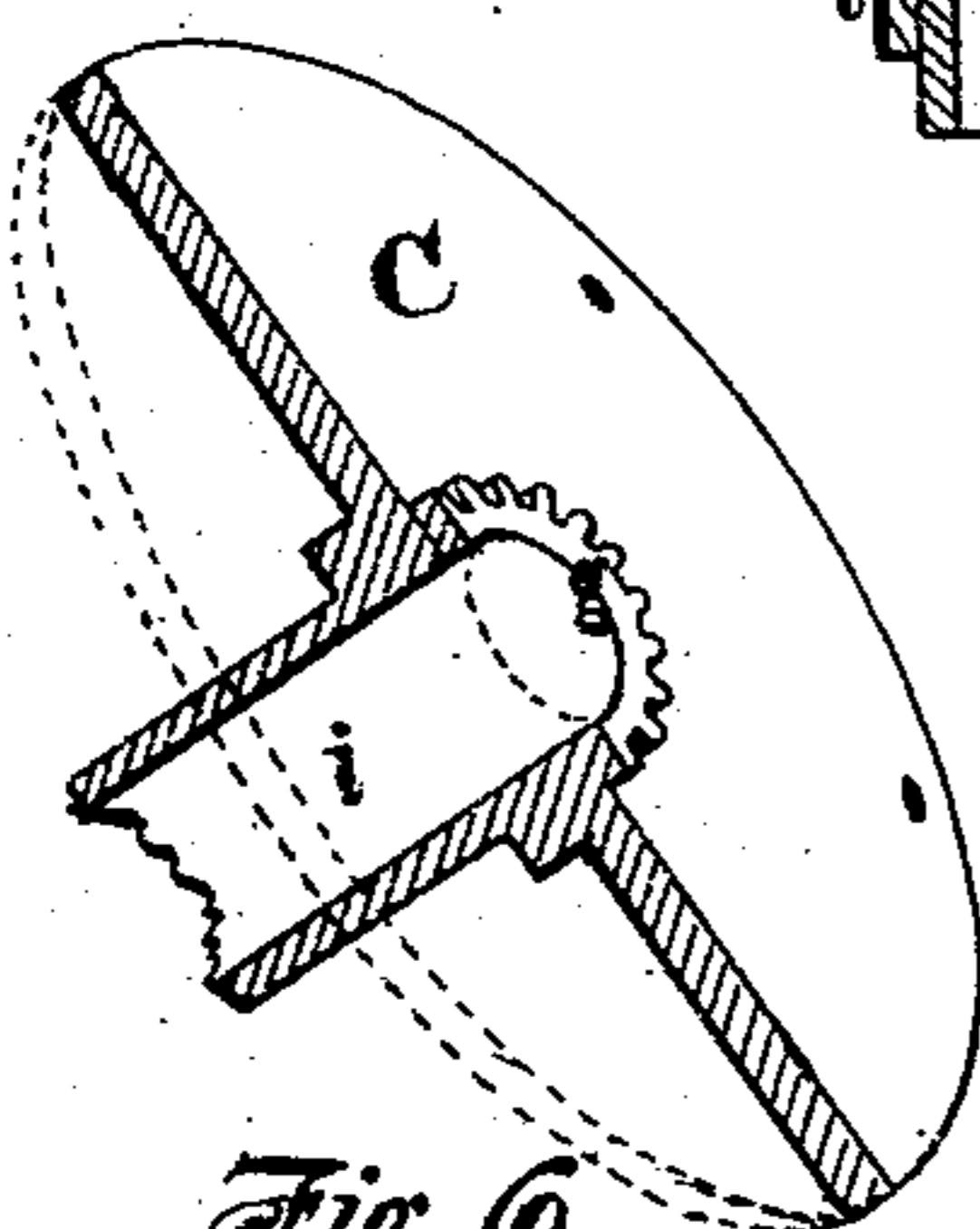


Fig. 6.

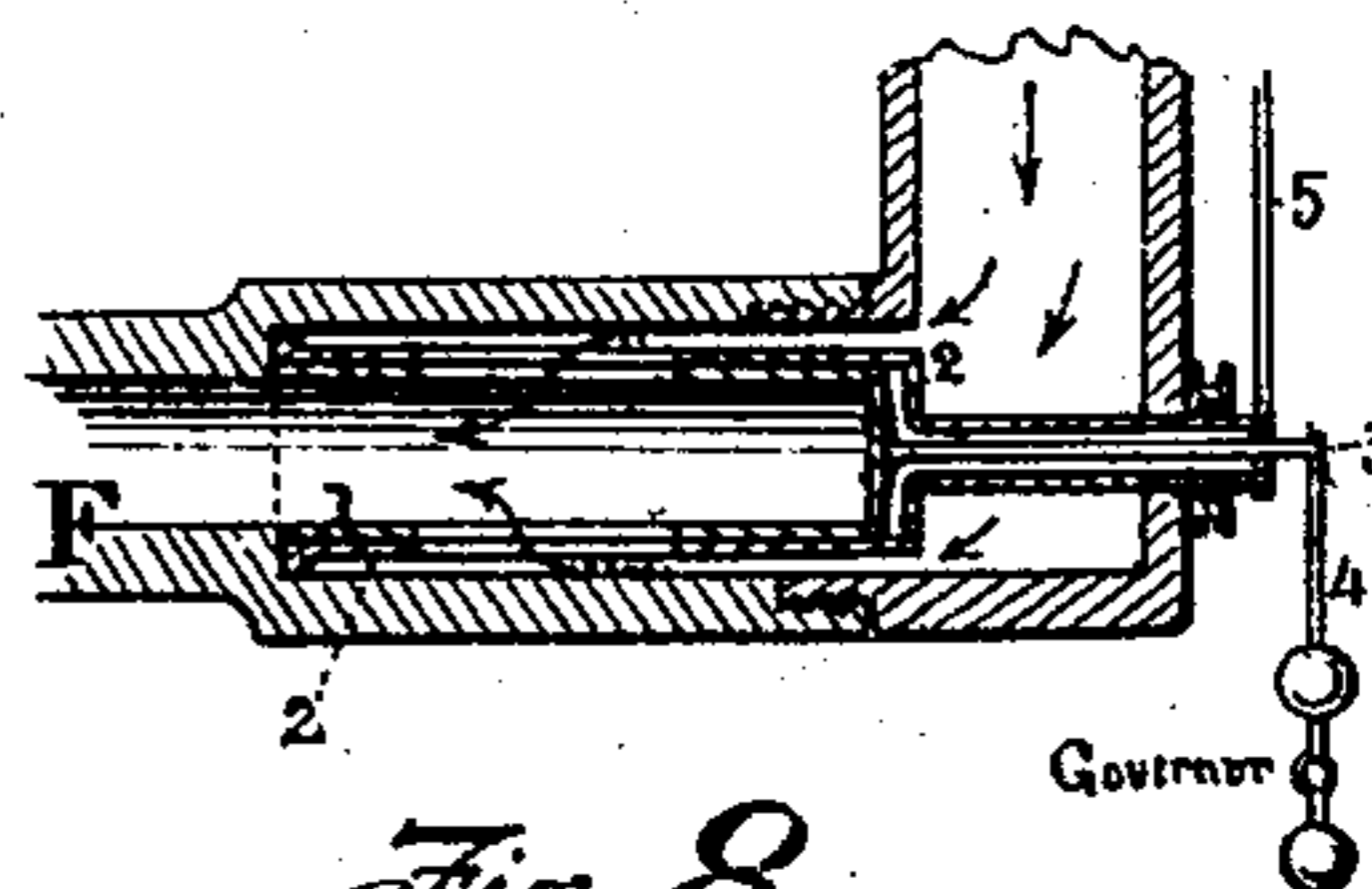


Fig. 8.

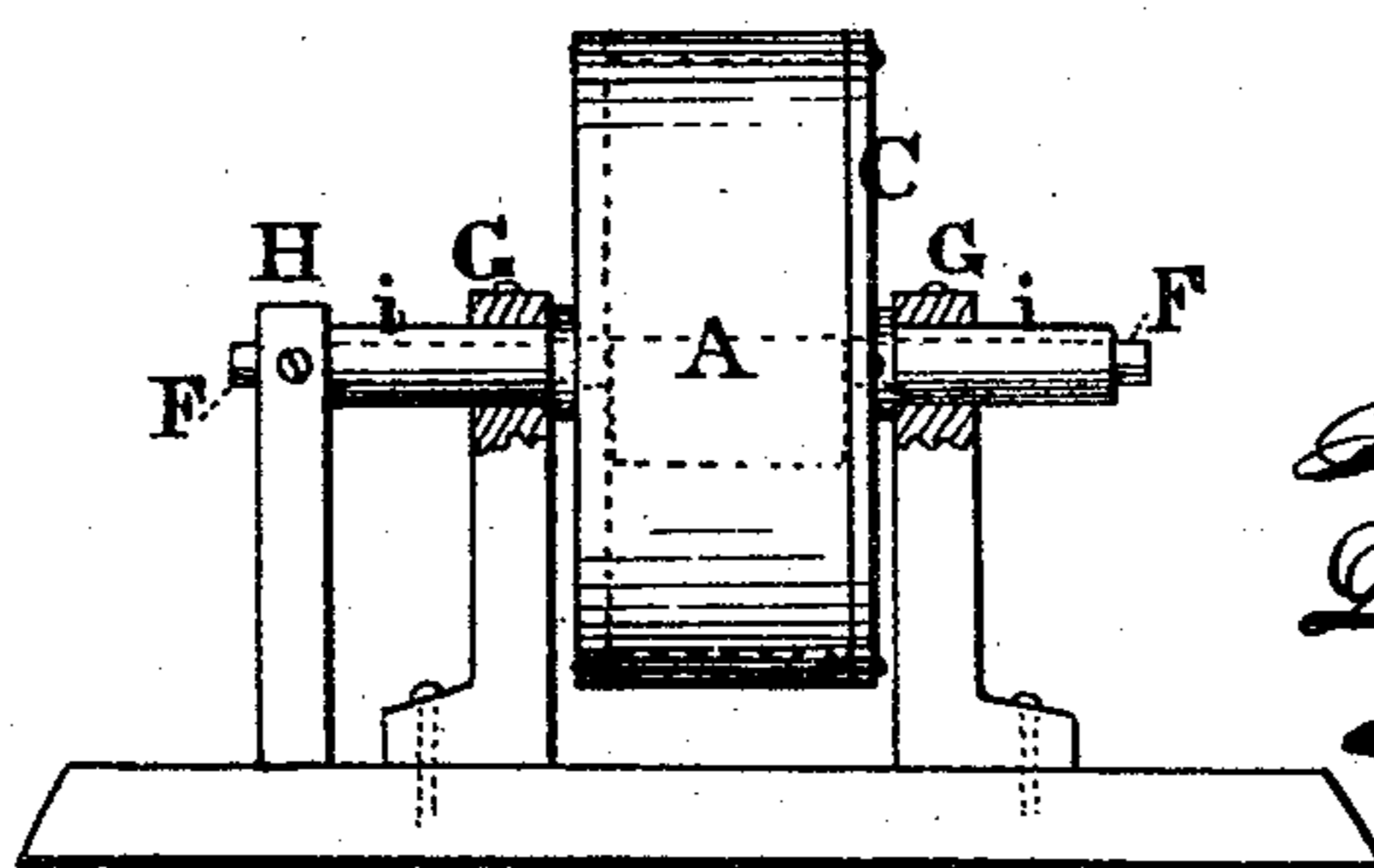


Fig. 7.

Witnesses
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UNITED STATES PATENT OFFICE.

DEXTER D. HARDY, OF PEKIN, AND AUGUSTINE C. WEST, OF PEORIA, ILL.

IMPROVEMENT IN ROTARY STEAM-ENGINES.

Specification forming part of Letters Patent No. **156,998**, dated November 17, 1874; application filed July 17, 1874.

To all whom it may concern:

Be it known that we, DEXTER D. HARDY, of the city of Pekin, Illinois, and AUGUSTINE C. WEST, of the city of Peoria, in the county of Peoria, in the State of Illinois, have invented an Improvement in Rotary Steam-Engines; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings, making a part of this specification, in which like letters of reference refer to like parts, and in which—

Figure 1 is a view, showing the cylinder-head removed. Fig. 2 is a perspective view of inner cylinder. Fig. 3 is a cross-section, as indicated by the dotted lines *a a a a* of Fig. 1. Fig. 4 is a vertical cross-section of eccentric. Fig. 5 is a perspective view of outer cylinder mounted upon the stationary shaft. Fig. 6 is a perspective view of one-half of removable head of outer cylinder, showing gear and sleeve. Fig. 7 is a view of the engine on a smaller scale; and Fig. 8 is a section of rotary cut-off applied to the axle of the engine.

The object of our invention is to overcome the uneven wear, and, consequently, the great waste of steam, heretofore existing in this class of engines, producing an engine that is simple in construction, thereby very materially reducing the cost of manufacture, and having but a moiety of the friction which of necessity exists in steam-engines now in use.

To do this we employ two cylinders, A and D, one within the other, and revolving together on a stationary shaft, F, which is concentric to the outer cylinder A, but not with the inner cylinder, D, which revolves upon an eccentric, E, fixed to the said shaft, through which the steam is received and discharged from and into said hollow shaft F. The two cylinders are in contact at their heads or ends, and nearly touch at their peripheries, at a point opposite the throw of eccentric E. The two cylinders are coupled together, so as to move at nearly the same speed, by means of an internal inverted gear, *g h*, or by means of a pin fixed on the interior face of head of cylinder A, and working in a sliding block which moves in a radial slot in the end of the inner cylinder D. The inner cylinder D is provided with four radial pistons, *a¹ a² a³ a⁴*, and four

radial pockets to receive them, equidistant around its periphery, said pistons being held in contact with the inner periphery of the outside cylinder by means of elastic springs. The inner cylinder is also provided with induction and eduction ports *d d*, equidistant between the pistons, which are in communication with the receiving and exhaust ports *e f* in eccentric E, as it rotates upon the same. The ports in one plane of revolution are induction-ports, and vice versa in reversing the engine. The shaft has a partition between the receiving and exhaust ports, consequently no communication between the two ends of shaft except through the engine. The outside cylinder has projecting sleeves *i i*, by which it is hung in bearings G G, and through which passes the stationary hollow shaft F.

The operation of this engine is as follows:

Steam enters the shaft F, passing through one of the ports *e* in eccentric E, and through ports *d* in the inner cylinder D, into the steam-spaces *s* between the two cylinders, exerting its force on the piston-blades *a¹ a² a³ a⁴*, as they are presented in rotation. The ports may be so arranged that the steam may be cut off at any desired point, and, having exerted its force, may be exhausted through the ports in communication with the exhaust-port in eccentric E, and passed out the opposite end of shaft F, and vice versa, in reversing the engine. The two cylinders revolve together in nearly the same time, and are coupled by means of an internal inverted gear, *g h*, or sliding block and pin, thereby obviating differential end wear. The internal spur-wheel is fixed concentrically on the inner cylinder D, and the spur-wheel gearing with it is fixed concentrically on the inside of the outer cylinder-head.

We use a follower or blind-head for lateral adjustment. We use, also, a cut-off, adjusted in one end of shaft F, and so connected with the movement of engine and governor-balls that the steam-opening is graduated, and at a given point entirely closed, making an automatic steam cut-off. (See Fig. 8.)

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

1. The combination of the revolving cylin-

der A, having an inverted internal gear-wheel, *g*, with the revolving cylinder D, having an internal gear-wheel, *h*, substantially as and for the purpose set forth.

2. The revolving cylinder A, provided with an internal gear-wheel, *g*, in combination with the revolving cylinder D, provided with an internal gear-wheel *h*, steam-ducts *d*, and spring piston-blades *a*¹ *a*² *a*³ *a*⁴, and arranged to revolve on its axis upon the eccentric E, substantially as and for the purpose set forth.

3. The stationary shaft F, and eccentric E, provided with the receiving and exhaust ports *e f*, in combination with the eduction-ports *d* of the inner cylinder D, and cylinder A, con-

structed substantially as and for the purpose set forth.

4. The revolving cylinder A, with sleeves *i*, arranged to revolve on and independently of the fixed shaft F, substantially as set forth.

In testimony that we claim the foregoing improvement in rotary engines, we have hereunto set our hands this 15th day of May, A. D. 1874.

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AUGUSTINE C. WEST.

Witnesses:

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