No. 704,943.

Patented July 15, 1902.

D. F. SMITH.

ROTARY MOTOR.

(Application filed June 7, 1902.)

(No Model.)

3 Sheets—Sheet 1.

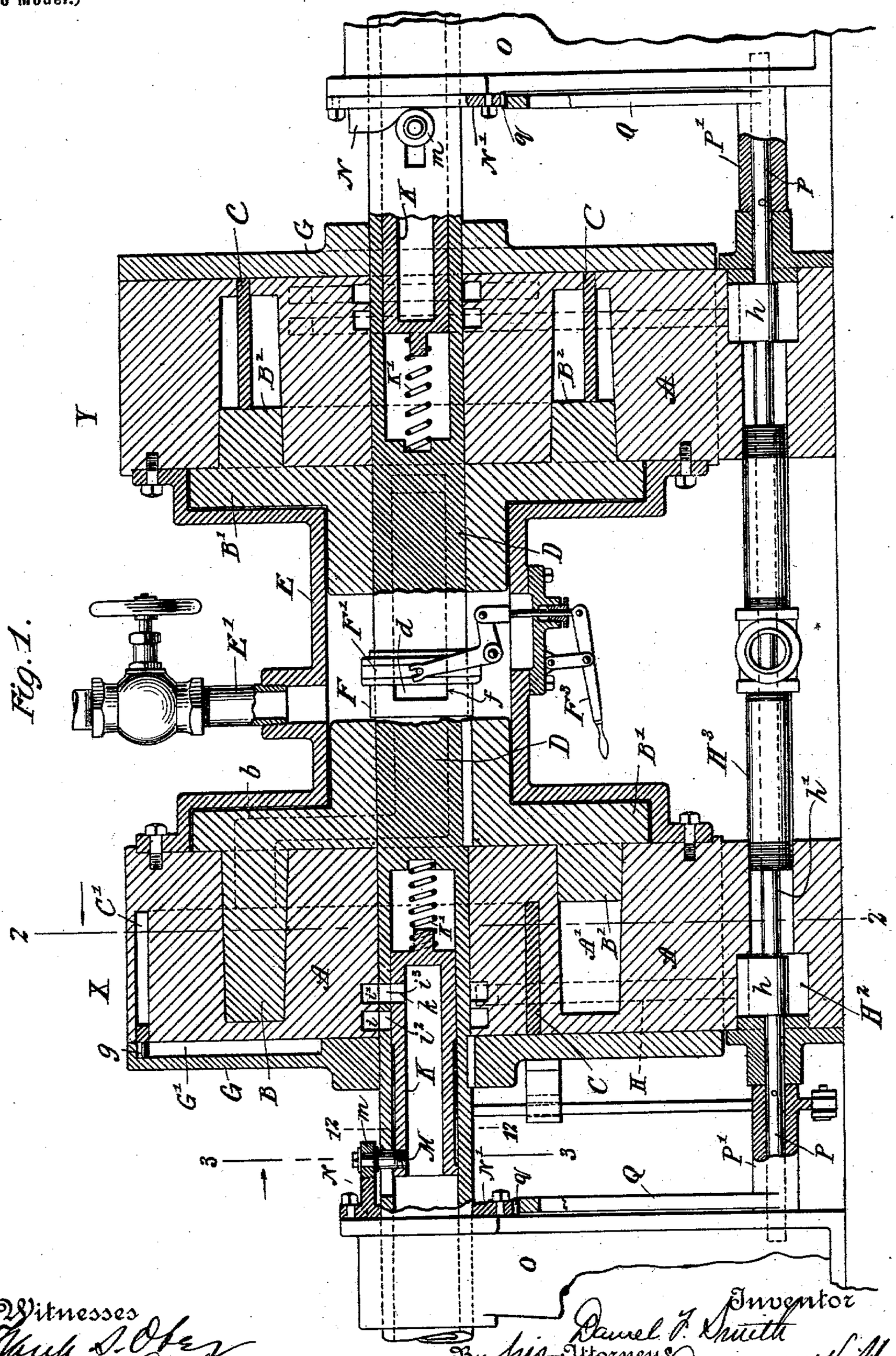

Fig. 1.

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Fig. 3.

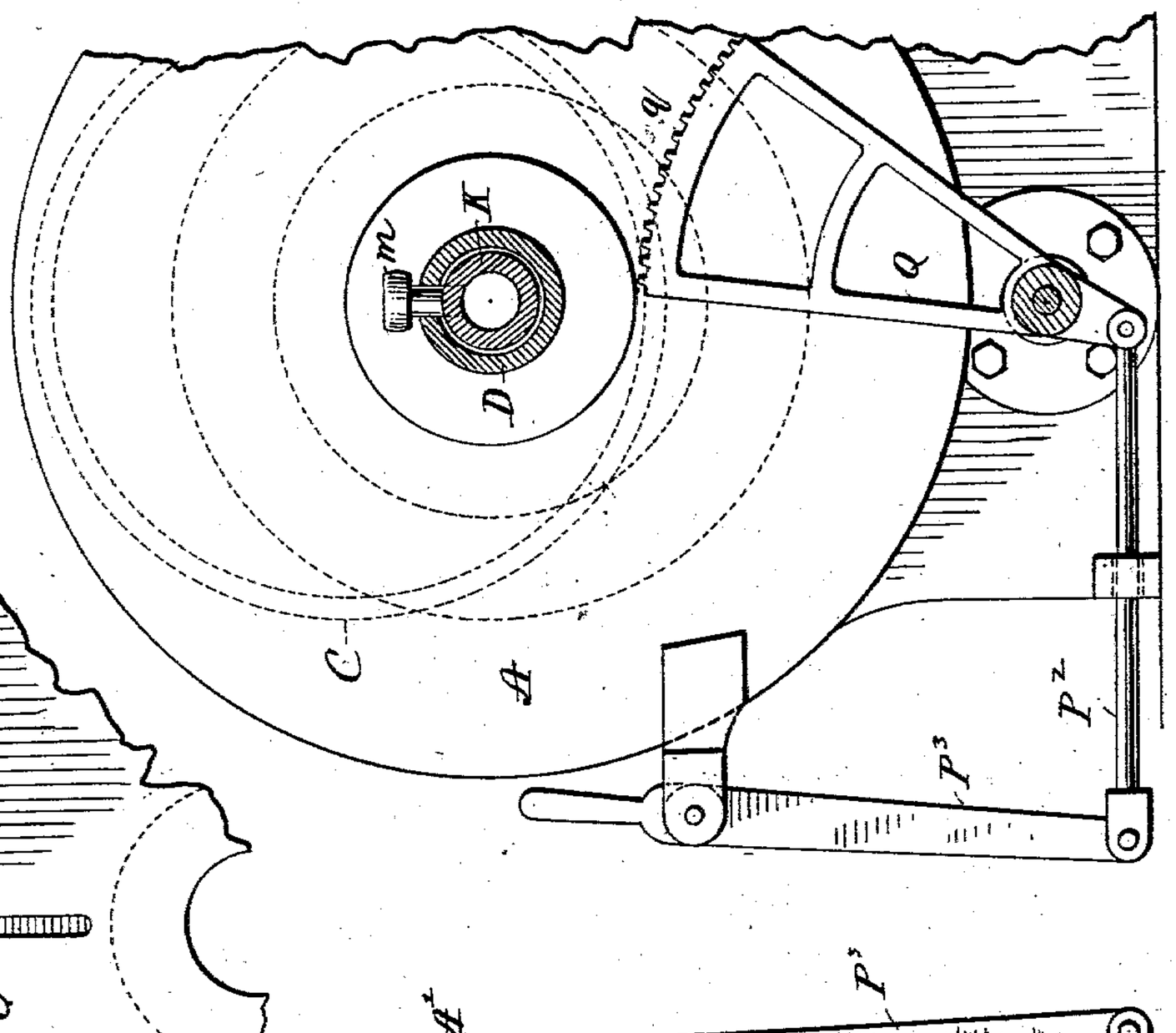


Fig. 4.

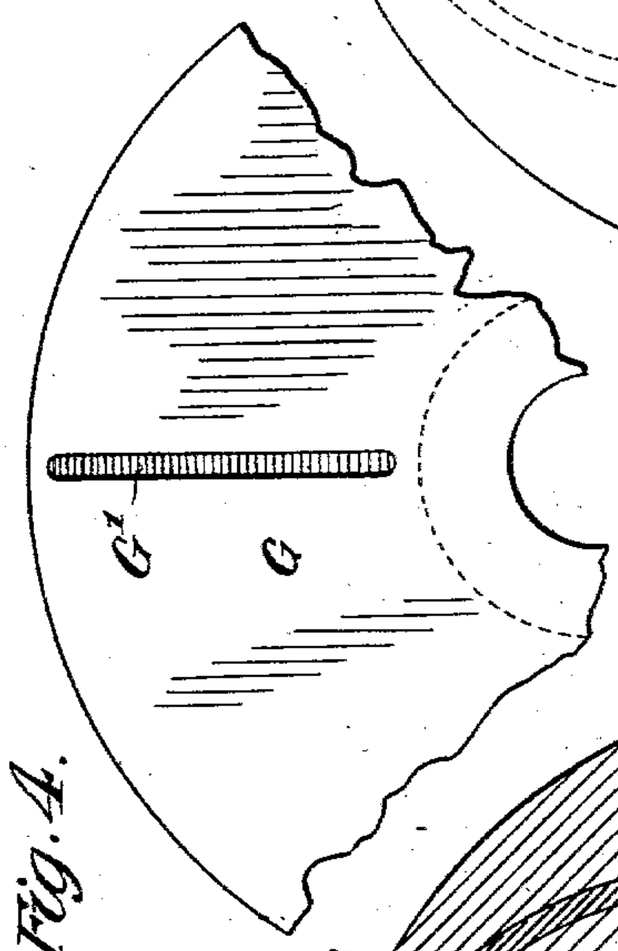
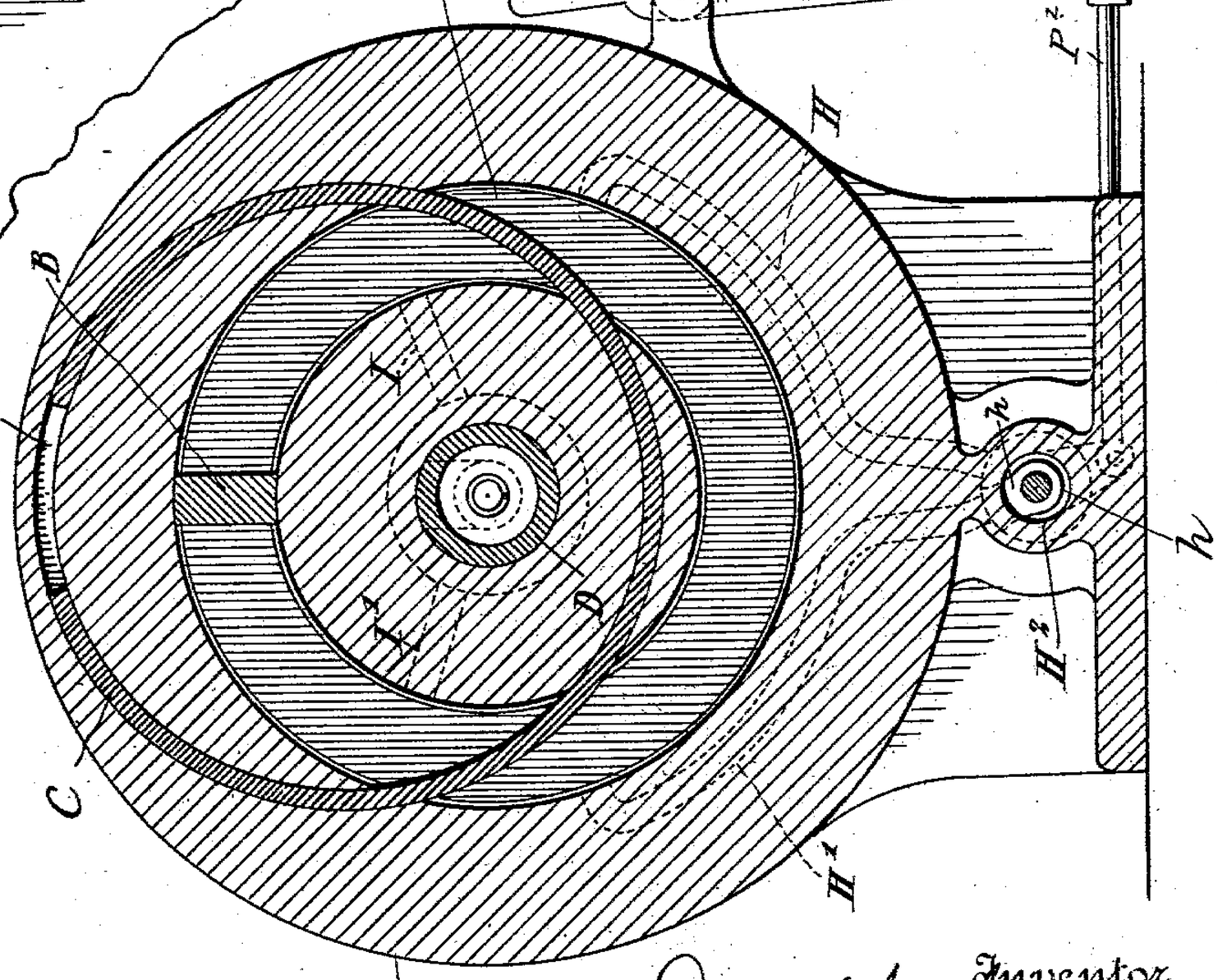


Fig. 2.



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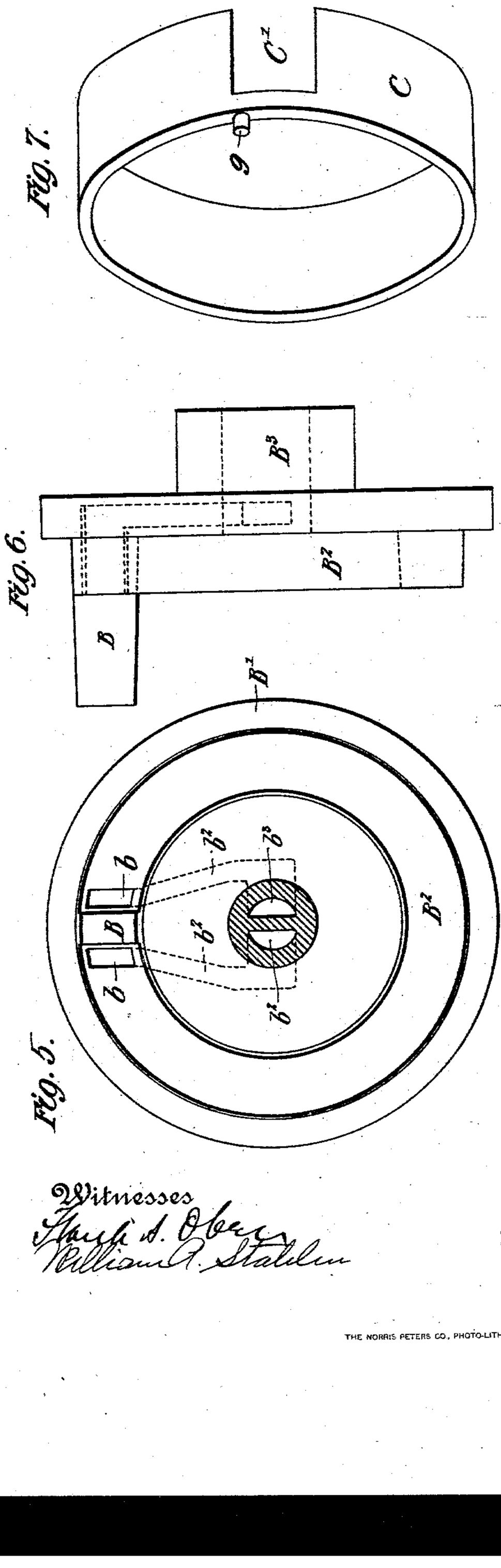

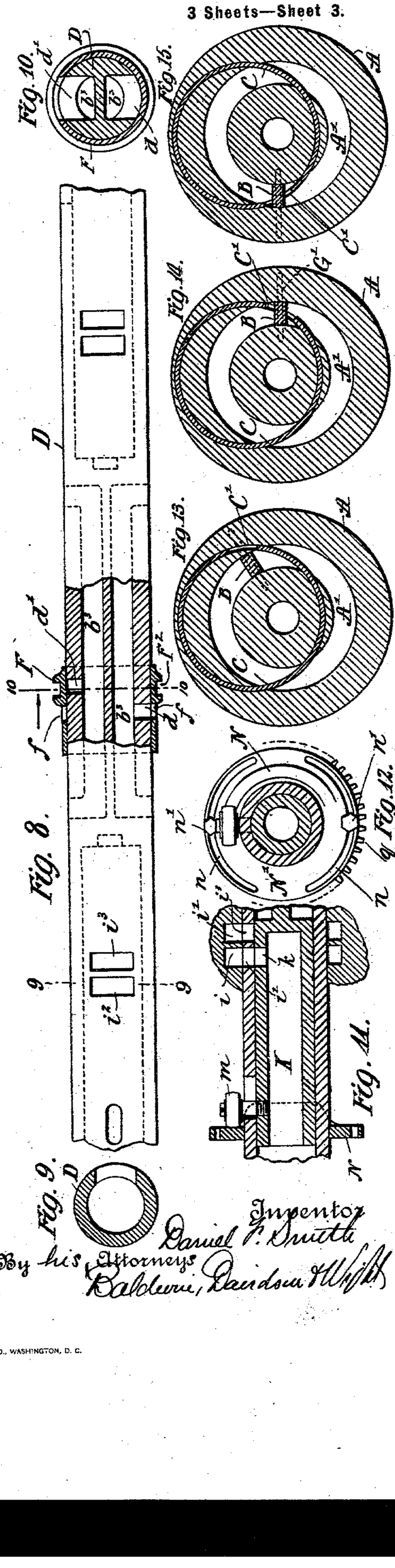

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UNITED STATES PATENT OFFICE.

DANIEL F. SMITH, OF NEW YORK, N. Y.

ROTARY MOTOR.

SPECIFICATION forming part of Letters Patent No. 704,943, dated July 15, 1902.

Application filed June 7, 1902. Serial No. 110,630. (No model.)

To all whom it may concern:

Be it known that I, DANIEL F. SMITH, a citizen of the United States, residing in the borough of Manhattan, city of New York, State of New York, have invented a certain new and Improved Rotary Motor, of which the following is a specification.

This invention comprises the employment of a piston traveling in a circular path in a proper chamber and an annular-ring abutment traveling in a circular path eccentric to that of the piston, the organization being such that at certain points in the movement the piston crosses the ring abutment, which at all times acts as an abutment for the continuous progressive rotation of the piston. So far as I am aware a movement of this character is novel.

In the accompanying drawings, Figure 1 is a general longitudinal vertical section, but with some of the parts in elevation; Fig. 2, a transverse section on the line 2 2 of Fig. 1; Fig. 3, a similar section on the line 3 3 of Fig. 1; Fig. 4, an elevation of a portion of one of the rotating end plates of the motor; Fig. 5, an elevation of the inner face of the circular member carrying the piston and showing a section of the shaft in which it is mounted; Fig. 6, a side elevation thereof; Fig. 7, a detached perspective view of the abutment-ring; Fig. 8, a view, partly in elevation and partly in section, of the main shaft; Fig. 9, a section on the line 9 9 of Fig. 8; Fig. 10, a section on the line 10 10 of Fig. 8; Fig. 11, a longitudinal section of the end of the main shaft and some related parts; Fig. 12, a section on the line 12 12 of Fig. 1; and Figs. 13, 14, and 15 are sectional views of a diagrammatic character, illustrating the mode of operation of the rotary piston and eccentrically-rotating abutment-ring.

The principle of operation of this motor may be understood in a general way by reference to Figs. 7, 13, 14, and 15.

A is the stationary body of the motor, having an annular chamber A′, around which the piston B is driven by steam or other fluid under pressure admitted in any appropriate way.

C is the eccentrically-rotating abutment-ring. If the piston B and abutment-ring be rotated in unison and steam be taken, for instance, on the upper side of the piston, as viewed in Fig. 13, it will be perceived that the ring, which crosses the path of the piston at the left-hand side of Fig. 13, will act as an abutment. At the point where the piston will intersect the abutment-ring the latter is cut away or notched at C′, and through this opening the piston passes, as seen in Fig. 14. The abutment-ring closes the annular chamber A′ behind the piston, which being still propelled by steam taken on the same side again crosses the abutment-ring, as seen at the left-hand side of Fig. 15. In this way continuous rotation is imparted to the piston by steam taken on one side thereof, and a substantially continuous and uniform abutment is preserved or afforded by the ring C. This is believed to be an entirely novel movement.

In order to counterbalance pressures, I prefer to mount such motors in pairs, and this may be done as indicated in Fig. 1, in which X represents one motor and Y another, both having a common shaft. The piston B, traveling in the annular chamber A′ in the stationary part or body A, is a projection from the face of the circular plate B′, which has also an annular flange B^2, including the base of the piston, which projects into the chamber A′. This flange as well as the piston and the walls of the chamber are preferably tapered, as indicated in Fig. 1. The part B′ is fast to the shaft D and has steam-ports *b b′* on each side of the piston, connected by passages b^2 with separate steam-passages b^3 in the shaft. The two motors X Y are coupled by an annular casing E, having radial flanges bolted to the respective body-pieces A. Around the central part of the shaft and between the ends of the hubs B^3 of the parts B′ B′ is an annular chamber into which steam-admission ports *d d′* in the shaft open, respectively, from the passages b^3 b^3 in the shaft. Around the shaft is applied a longitudinal sliding reversing-valve F, splined to the shaft and loosely embraced by a ring or sleeve F′, seated in an annular groove F^2, Fig. 8, in the valve and engaged by one end of a bell-crank lever, to the other end of which is connected a rod, passing through a suitable stuffing-box, having its outer end connected with a hand-lever F^3. In the valve F are openings *f f*, by means of

which either of the ports *d* or *d'* may be opened to the annular chamber, which is supplied with steam through a pipe E'. In this or any other appropriate way steam may be admitted continuously to either side of the piston B to effect its continuous rotation in either direction, suitable provision for exhaust being made.

Contiguous to the outer face of the body A and fast upon the shaft is an end plate G, having in its inner face a radial slot or groove G', Figs. 1 and 4. Into this slot projects a pin *g*, extending from the edge of the abutment-ring C. The abutment-ring is therefore rotated in its annular seat formed in the body A, partly within the annular piston-chamber A' and partly in the portion lying outside of such annular chamber, as clearly seen in Figs. 2 and 13 to 15. It will be observed that the abutment-ring traveling in the annular seat formed in the body part is held at one edge by the end plate G and at the other by the face of the flange B^2 of the piston member. The two motors X Y are placed at an angle to each other of one hundred and eighty degrees, and the steam-pressure upon the rigidly-coupled piston members B' B' is neutralized. Steam may be exhausted at the proper time from the two parts or sections of the annular piston-chamber A', lying, respectively, within and outside of the eccentrically-disposed abutment-ring. Opposite ends of the portion of the chamber A' lying outside of the abutment-ring are connected by passages H H', which communicate with an exhaust-chamber H^2, opening to an exhaust-pipe H^3. Within this exhaust-chamber is a rocking valve *h*, actuated by a rod *h'*, attached to a pivoted hand-lever h^2, by means of which the valve *h* may be rocked to close either exhaust-passage H or H', according to the direction in which the engine is running. To provide a suitable exhaust from that part of the chamber A' lying within the eccentric abutment-ring, the following arrangement is shown: Opposite parts of this portion of said chamber are respectively connected by passages I I' with annular exhaust-chambers *i i'*, formed as annular grooves in the body A in the bearing-surface for the shaft D. At this point the shaft is hollow and is formed with apertures i^2 i^3, opening to the annular exhaust-chambers *i i'*. Within the hollow end of the shaft is splined a longitudinally-sliding hollow exhaust-valve K, having in it an exhaust-opening *k* and normally pressed outwardly by a spring K'. In the outer end of the valve K is fixed a radially-projecting bolt or stud-axle M, which passes through a slot in the hollow shaft and has applied to its outer end a roller *m*, that travels upon a cam-face N, Figs. 1 and 12, on a circular plate N', applied loosely around the hollow end of the shaft and having opposite segmental grooves *n*, through which bolts *n'* pass and are screwed into the standards O, in which the shaft has its bearings. On a shaft P, extending between the base part of the body and the standard O, is a rocking sleeve P', having a radial projection, to which is connected a rod P^2, to the end of which is applied a hand-lever P^3. From the rock-shaft extends a toothed segment Q, which engages corresponding teeth *q* on the cam-plate N'. Obviously by manipulation of the lever P the cam-plate N' may be partially rotated, so that the cam-surface thereon may be adjusted to properly coöperate with the spring-pressed exhaust-valve K to exhaust at proper times from that part of the piston-chamber A' lying within the eccentric abutment-ring.

I have shown my invention organized in what is deemed by me to be a suitable and practicable form. Obviously, however, the details of construction may be varied without departing from the principle of the invention or its general mode of operation.

I claim as my invention—

1. A rotary engine comprising a piston traveling in an annular steam or pressure chamber and a movable abutment-ring eccentrically disposed so as to divide the piston-chamber into two parts and within which the axis of the piston-chamber is located, the abutment-ring and piston being so constructed and operated that the piston may pass across the ring at the required point.

2. A rotary engine comprising an annular pressure piston-chamber, a piston traveling therein, and a rotating eccentrically-disposed abutment-ring intersecting said chamber at two points and formed with a notch through which the piston passes, and within which the axis of the piston-chamber is located.

3. A rotary engine comprising a stationary body portion having therein an annular piston-chamber with converging side walls, a piston-carrying member having a correspondingly-tapered piston extending to the bottom of said chamber and a correspondingly-tapered flange extending partly into the chamber, an eccentrically-disposed notched abutment-ring traveling in a seat or bearing in the body portion and intersecting said chamber at two points, and means for rotating the abutment-ring in proper unison with the piston.

4. A rotary engine comprising a body-piece having an annular piston-chamber, a piston-carrying member having a piston occupying said chamber and a flange part closing the chamber and a notched eccentrically-disposed abutment-ring traveling in a seat in the body part and held in position by the face of the flange on the piston member and within which the axis of the piston-chamber is located, and means for rotating the abutment-ring in unison with the movement of the piston for the purpose described.

In testimony whereof I have hereunto subscribed my name.

DANIEL F. SMITH.

Witnesses:
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KATHARINE MACMAHON.