(No Model.)

3 Sheets—Sheet 1.

C. S. BIRD.

ROTARY ENGINE.

No. 331,224. Patented Nov. 24, 1885.

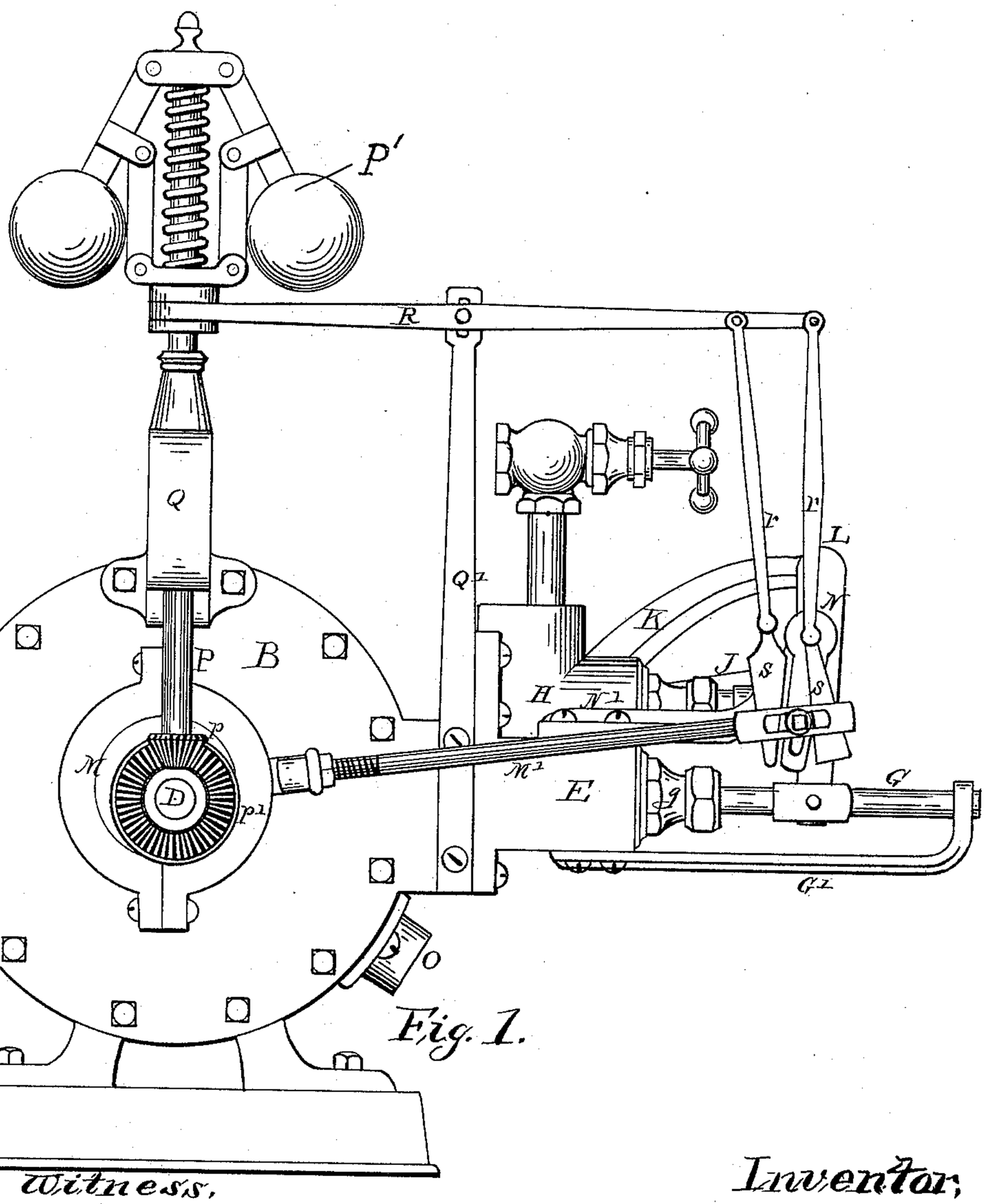

Fig. 1.

Witness,
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E. H. Laird.

Inventor;
Charles S. Bird.
By J. E. Pond & Atty.

(No Model.)

3 Sheets—Sheet 2.

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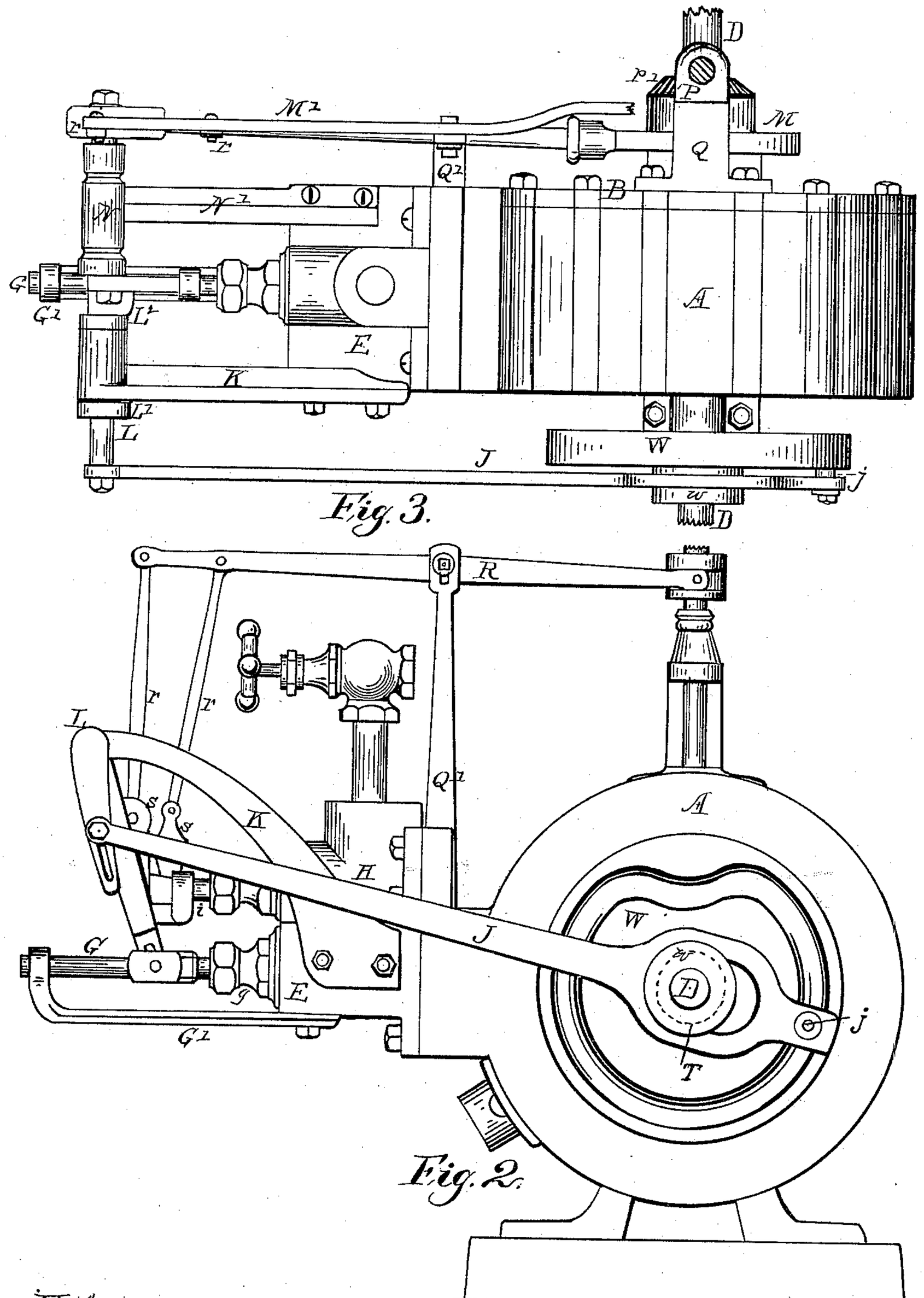

Fig. 3.

Fig. 2.

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By J. F. Pond. Atty

(No Model.)

3 Sheets—Sheet 3.

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ROTARY ENGINE.

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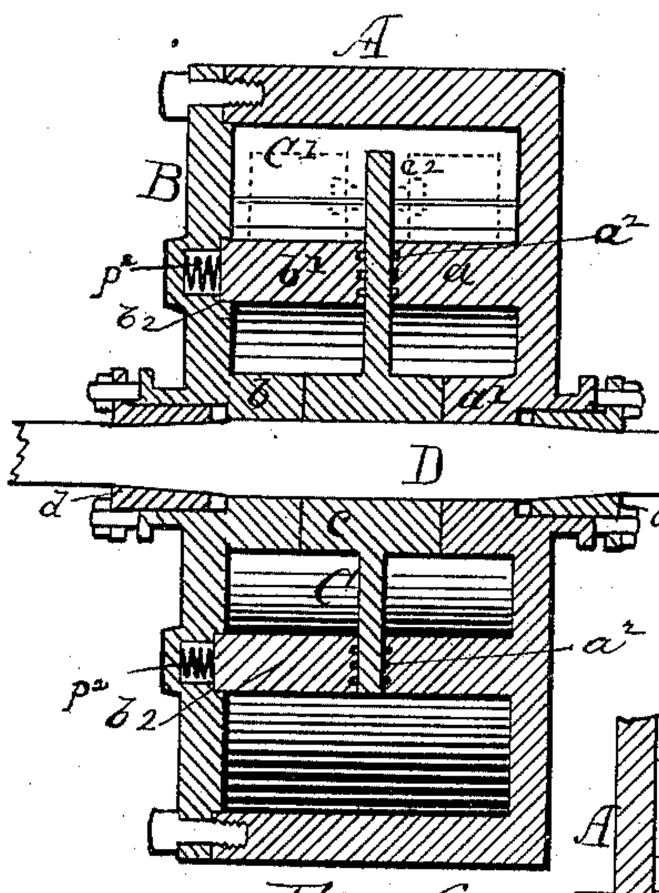

Fig. 6.

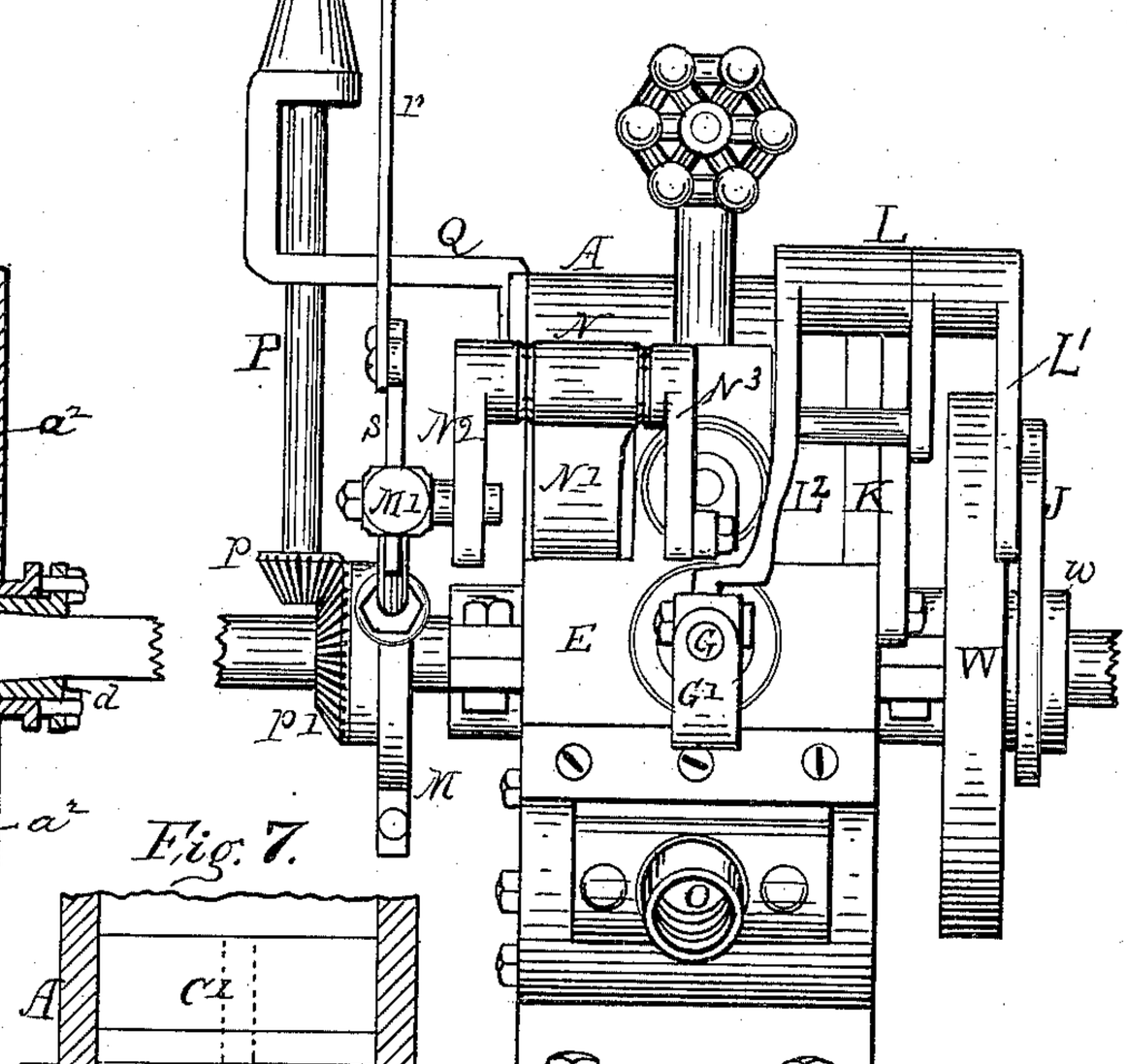

Fig. 7.

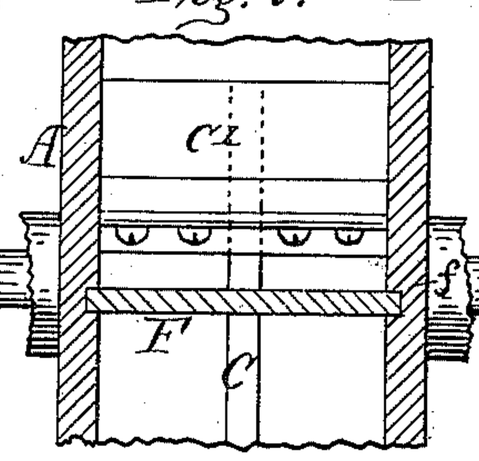

Fig. 4.

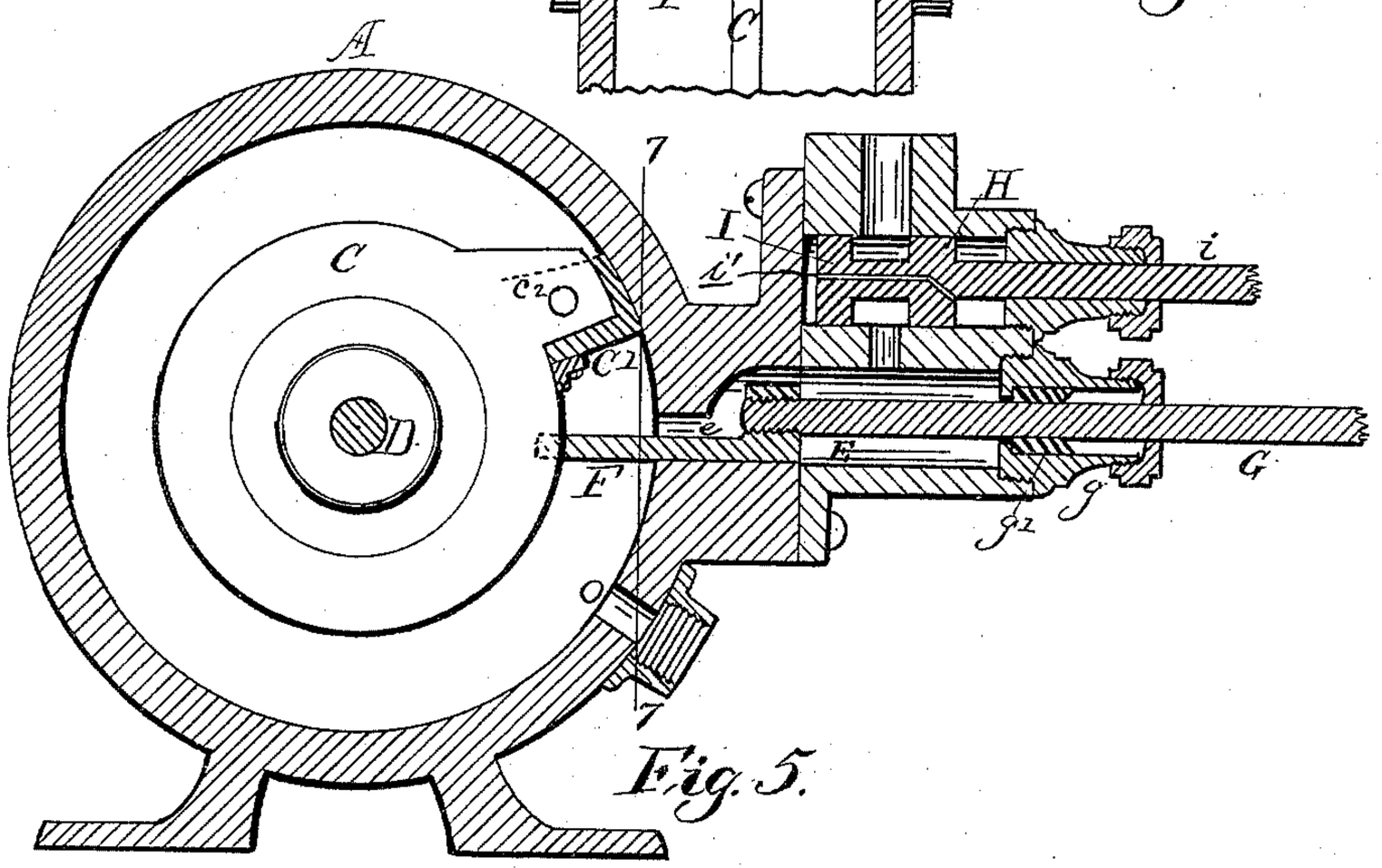

Fig. 5.

Witnesses,
Geo. H. Fibbitts
E. W. Laird.

Inventor,
Charles S. Bird
By J. E. Pond, Atty.

UNITED STATES PATENT OFFICE.

CHARLES S. BIRD, OF ELYRIA, OHIO.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 331,224, dated November 24, 1885.

Application filed March 17, 1883. Serial No. 88,627. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. BIRD, of Elyria, in the county of Lorain and State of Ohio, have invented new and useful Improvements in Rotary Engines, of which the following is a specification.

The nature and objects of these improvements will fully appear from the subjoined description, when considered in connection with the accompanying drawings, in which—

Figure 1 is a side elevation. Fig. 2 is a reverse side elevation. Fig. 3 is a top view. Fig. 4 is an end view. Fig. 5 is a longitudinal vertical section. Fig. 6 is a transverse section. Fig. 7 is a section in line 7 7 of Fig. 5.

Referring to the drawings, A is a cylinder having one head cast with it, and said head having an annular flange, *a*, and an internal hub, *a'*. Said flange *a* is nearly half the depth of the cylinder, while the hub is about one-third the depth.

B is a head having an internal hub, *b*, cast with it, which is also one-third the depth. A ring, *b'*, the size and diameter of the flange *a*, is attached to the head, fitting in an annular groove, b^2, in the inside face of said head, and is provided with a spring, a^2. This flange *a* and ring *b'* divide the interior of the cylinder into two chambers and relieve the shaft D from the load caused by the pressure of the steam as the steam presses against the outer shell or cylinder, A, and flange *a* and ring *b'*, the outer chamber being designed for the rotating piston.

C is a disk having a hub, *c*, keyed or fixed on a shaft, D, which fills the one-third space and revolves between the aforesaid hubs *a'* and *b*. The diameter of said disk C is equal to the outer diameter of said ring *b'* and flange *a*, and it revolves between them. Their edges, which are in contact with the disk, are provided with small grooves a^2, intended to fill with condensation, to prevent steam from passing and to lubricate between the surfaces of the disk and rings. The said disk C has an arm c^2, to which is attached a piston-plate, C', fitting in the outer chamber in the said cylinder A and in which it travels. At one side of said cylinder A is made a chamber, E, connected with the aforesaid outer chamber in cylinder A, in which is placed a sliding-plate, F. Attached to said plate F is a rod, G, working through a stuffing-box, *g*. Said plate is made to recede into the said chamber E by mechanism operating the rod G once in each and every revolution of the said disk C to let the piston pass, and immediately return again when it has passed. Said plate F plays in grooves *f* in the inside surface of the cylinder-heads and annular rings. Above the chamber E is located the valve-chamber H, in which is placed a round piston-valve, I, having a rod, *i*, operated by an outside mechanism, hereinafter described.

O is the exhaust-port.

Upon the shaft D, at one side of the cylinder A, is placed a cam-grooved wheel, W, with groove in the side having a hub, *w*, having a groove, T, in its periphery for securing a connecting-rod, J. To the side of the chamber E is attached an arm, K, supporting a rock-shaft, L, having a crank, L', to which said connecting-rod J is attached. Said rock-shaft also has a crank, L^2, attached to the aforesaid rod G, said rod G being supported at its outer end by a bracket, G'. This comprises the mechanism for operating the before-mentioned plate F. Upon the shaft D, on the opposite side of the cylinder A, is placed an eccentric, M, having a connecting-rod, M', operating a second rock-shaft, N, supported by an arm, N', attached to the side of chamber E. The joint of said connecting-rod M' is made adjustable with the crank N^2 of the rock-shaft N. Said rock-shaft N also has a crank, N^3, connected with and operating the valve-rod *i* of valve I.

To the side of the cylinder A is attached a bracket, Q, supporting a vertical shaft, P, the upper end of which carries a governor, P'. The lower end of said shaft is provided with a bevel-pinion, *p*, meshing with and operated by a bevel-gear, *p'*, on the shaft D.

To the side of the chamber E is attached a post, Q', to the top of which is pivoted a lever, R, one end of which is connected with the governor, the other end having two depending-rods, *r r*, the lower ends of which have wedges, S S, that play in a slot in the end of the rod M'. These are for regulating the movement of the valve by the governor, as hereinafter shown. The portions of the shaft D which pass through the boxes in the cylinder A are made slightly tapering, and the boxes are made large enough

to contain a tapering sleeve, *d*, the purpose of which is to adjust the bearings in case of wear. Longitudinally through the valve I is made an opening, *i'*, for the purpose of allowing any steam which may get into the space at the ends of the valve to pass through, and thus avoid obstruction to the movements of the valve.

In the stuffing-box *g* is made a chamber with a shoulder at the inner end, but leaving a little space around the rod G, to allow steam to enter and bear against a packing-ring, *g'*, which forms a moving bottom in the stuffing-box which compresses the packing (by the pressure of the steam) around the rod G. This works automatically, as the steam operates upon the ring, and as the steam is alternately on and off—that is, when the steam is cut ff the pressure is off, and during this interval the plate F is moved back and forth, so the plate is easily moved.

The operation of this is as follows: Steam is admitted through the port into chamber E. It passes thence through space *e* into cylinder, the plate F forming a barrier to the steam it carries the piston C' around, and when it has passed by the exhaust-port the plate F is withdrawn by the described mechanism for that purpose and then the piston passes, and then the plate is pushed back in again. Before the piston has reached the exhaust-port, however, the steam has been cut off by the described mechanism for that purpose. This cut-off may be made to take place at a half or other proportionate part of a revolution, and the balance of the revolution made by the expansion of the steam. This is regulated by the adjustable joint on the end of rod M'. The governor regulates the speed through the medium of the wedges S S in the same joint, the movements of said wedges so changing the movements of the valve-crank as to cause the cut-off of the valves sooner or later, as the circumstances may require.

Each head of the cylinder A is provided with a groove, *f*, in which operates the slide F, and said grooves serve to make a steam-tight joint which will at all times serve to assist the impacting of the steam between the said slide and the piston-arm C^2, as seen in Fig. 7.

Having described my invention, I claim as follows:

1. In a rotary engine, substantially as described, the inner wall of the steam-chamber, formed of the rings *a* and *b'*, which, being supported by the casing A, relieve the main-shaft D of the heavy weight occasioned in ordinary rotary engines by the downward pressure of the steam against the piston-drum, as and for the purposes set forth.

2. In a rotary engine, the cylinder A, and rings *a* and *b'*, having annular grooves a^2, in combination with the disk C, piston C', and abutment F, for the purpose set forth.

3. In a rotary engine, the cylinder A and rings *a* and *b'*, in combination with the annular groove b^2, disk C, piston C', abutment F, and shaft D, for the purpose set forth.

4. In a rotary engine the cylinder A and rings *a* and *b'*, in combination with the spring p^2, annular groove b^2, disk C, piston C', and abutment F, for the purpose set forth.

5. In a rotary engine, the cylinder A, having grooves *f*, in combination with the abutment F, the rings *a* and *b'*, removable head B, annular groove b^2, disk C, and piston C', for the purpose herein set forth.

6. In a rotary engine, the piston-valve I, having aperture *i'*, in combination with the piston-rod *i*, and rock-shaft N, and crank N^3, for the purposes herein set forth.

CHAS. S. BIRD.

Witnesses:
E. W. LAIRD,
J. F. POND.