(No Model.)

J. J. BLAIR.

REVOLVING CYLINDER ENGINE.

No. 294,304. Patented Feb. 26, 1884.

Fig. 1.

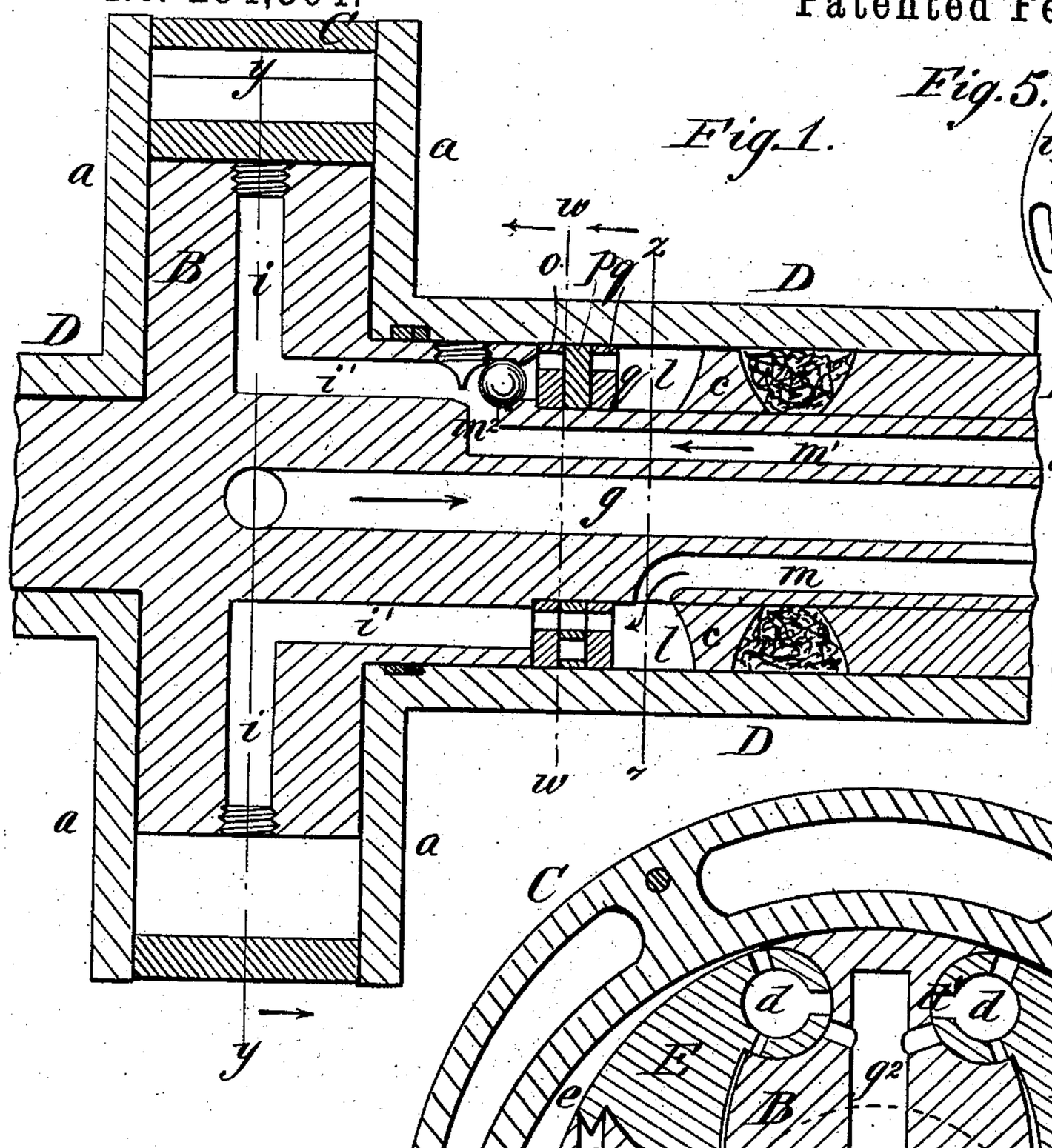


Fig. 5.

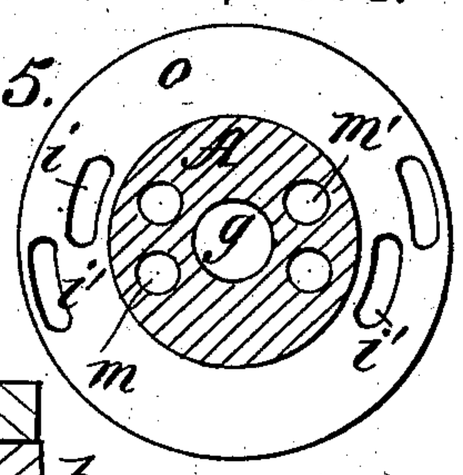


Fig. 6.

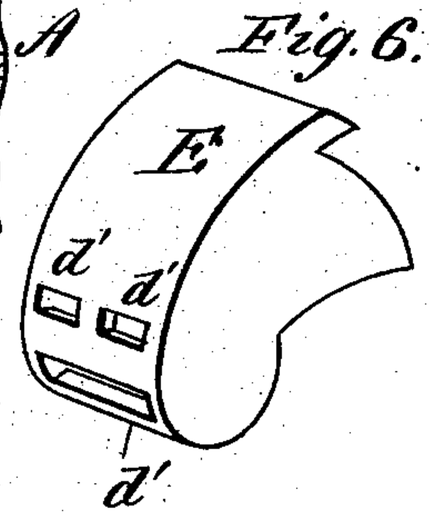


Fig. 2.

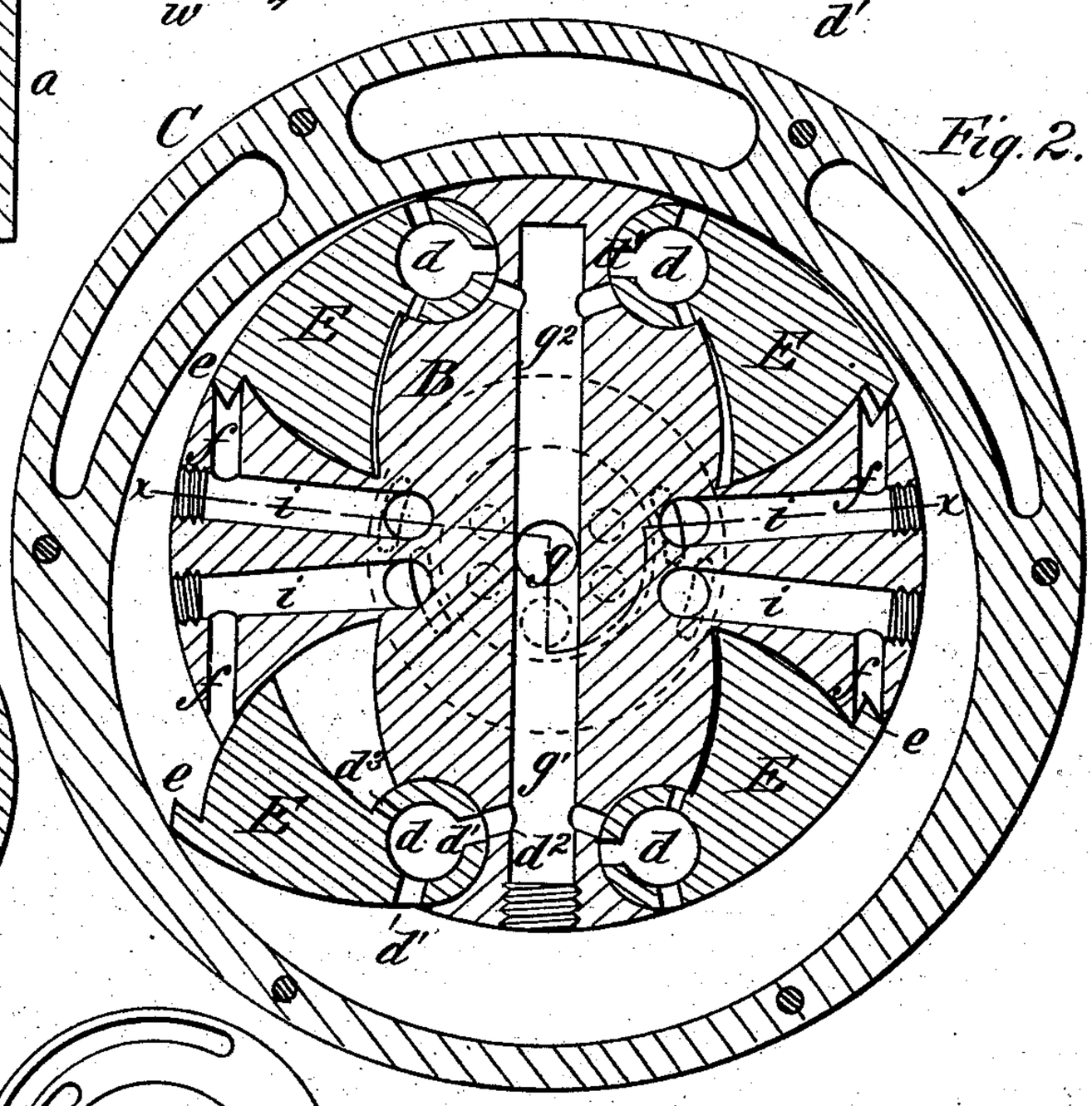


Fig. 3.

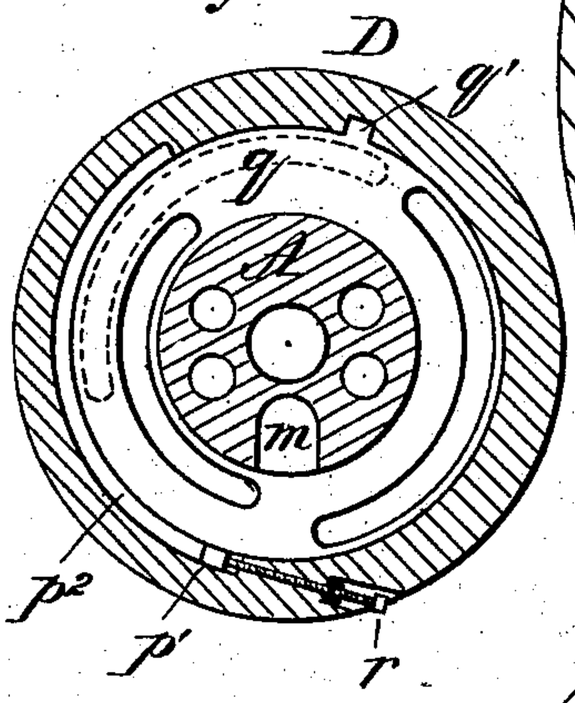
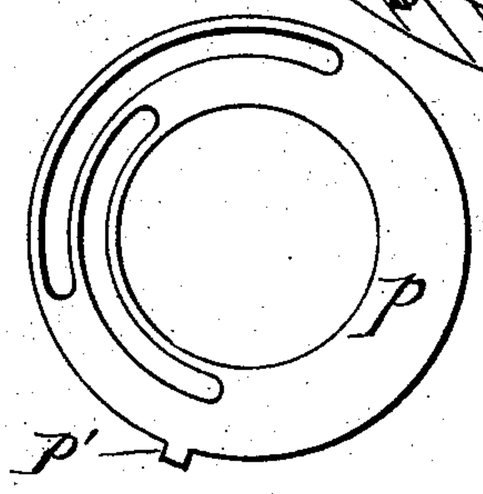


Fig. 4.



WITNESSES:

Donn Twitchell.

C. Sedgwick

INVENTOR:

J. J. Blair

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN J. BLAIR, OF TACOMA, WASHINGTON TERRITORY, ASSIGNOR TO HIMSELF, AND ROBERT R. BLAIR, OF AURORA, INDIANA.

REVOLVING-CYLINDER ENGINE.

SPECIFICATION forming part of Letters Patent No. 294,304, dated February 26, 1884.

Application filed June 20, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. BLAIR, of Tacoma, in the county of Pierce and Territory of Washington, have invented a new and Improved Revolving-Cylinder Engine, of which the following is a full, clear, and exact description.

In my improved engine the steam and exhaust passages are formed in the shaft, which is stationary and carries swinging gates, which are moved in and out of the steamway in the operation of the engine, the object being to have as little reciprocating motion as possible, so as to reduce the friction and obtain a perfect balance, by which the engine can be run at a high speed without any vibration, as hereinafter described and claimed.

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 longitudinal section of my improved engine on the line *x x*, Fig. 2. Fig. 2 is a transverse section on the line *y y*, Fig. 1. Fig. 3 is a transverse section on the line *z z*, Fig. 1. Fig. 4 is a face view of one valve-ring. Fig. 5 is a cross-section on line *w w* of Fig. 1, and Fig. 6 is a perspective view of one of the swinging gates.

A is the stationary shaft of the engine, which is to be fixed in place by any suitable means, and is formed between its ends with an annular flange or disk, B.

The case of the engine consists of a ring, C, to which are bolted the rings or plates *a a*, so that the parts *a* C inclose the disk B, and the rings or plates *a* are formed with boxes D, that inclose the shaft A.

b is a packing-gland fitted around the shaft A, and within one box D, so as to compress the packing between the gland and a solid portion, *c*, that is formed upon the shaft. The interior diameter of the ring C is somewhat larger than the diameter of the disk B, and the two are fitted eccentrically, so that the surface of the disk B impinges against the inner surface of the ring C at one point, and a crescent-shaped steamway is formed.

The disk B, as shown most clearly in Fig. 2, is fitted in its outer edge with swinging gates E, that slide in recesses formed in the face of the disk. These gates, of which there are four in the double-acting engine shown, are made with their journals or ends *d* hollow, and at the outer edges of their moving ends with lugs or projections *e*, which, in the inward position of the gates, enter recesses formed by the ends of the steam-ports *f*, and in the outward position of the gates these lugs *e* come in contact with the inner surface of the ring or case.

Through the center of the shaft A is the exhaust-steam passage *g*, connecting at the center of the disk B with transverse passages *g' g²*, that in turn connect by ports *d²* with the hollow journals *d* of the gates. In the disk B there are also radial steam-passages *i i*, that connect with longitudinal passages *i'* through the shaft to a steam-chest, *l*, that is formed by a reduction of the shaft A behind the solid projection *c*, and there are also steam-supply passages *m*, extending through the shaft from its outer end and connecting with the steam-chest *l*. There are four steam-passages, *i i'*, from the steam-chest to the steamway, one or the other pair being used, according to the direction in which the engine is to be rotated, and the steam-passages *f*, before mentioned, connect with the outer ends of the passages *i*, so as to admit steam behind the projections *e* of the gates E, for the purpose of moving the gates outward and admitting steam to the steamway. *m'* are steam-supply passages—four in number—through the shaft A, connecting with ports or passages *i'*, for the purpose of admitting steam to carry the engine over dead-centers, and between the pipes or passages *m'* and the passages *i* are fitted spherical valves *m²*, that serve to prevent steam from passing back and entering the steam-chest.

The valve mechanism is fitted in the steam-chest *l* as follows: *o* is a ring made fast to the stationary shaft A, and provided with posts or openings registering with the ends of passages *i'*. *p* is a valve-ring attached to the box D, so as to rotate therewith, by means of a lug, *p'*, fitting a groove, *p²*, that is formed in the box, as shown in Fig. 3. *q* is a valve-ring next to the ring *p*, and connected to the box D by a lug, *q'*, as shown in Fig. 3. The ring *p* is formed with two slots, as shown in Fig. 4, and the ring *q* with two similar posts or open-

ings, and in the rotation of the box D, when the ports in the rings *o p q* are brought into register, steam is admitted to the steam-passages *i' i*. As shown in Figs. 2 and 5, the two pairs of passages *i'* and the corresponding parts in the fixed plate *o* vary in their distance from the center of the shaft. The long slots in rings *p q* are similarly arranged, and the location of the middle plate, *p*, regulated by the groove p^2 in box D, opens and closes either pair of ports in plate *o* to the slots in plate *q*, so that the motion of the engine in one direction or the other is determined. The hollow journals or pivots of the gates E are made with ports *d'*, which, when the gates are in their outward position, are open, one to the steamway and the other through a passage, d^2, with the exhaust-passage *g'* or g^2, so as to allow exhaust of steam from the steamway at that side of the gate; and there is also a passage, d^3, formed in the hollow journal, for the purpose of admitting steam behind the gates, so as to balance them or equalize the pressure. In position as shown in Fig. 1, steam, entering the steam pipe or passage *m* and pressing through the ports of the valve-rings, enters the steamway behind the gate E, that is moved outward in contact with the ring C. The steam may be cut off at any point in the movement by varying the length of the groove p^2, in which the lug *p'* of the valve-ring moves. I have shown a screw at *r* in Fig. 1, which may be turned in or out, so as to shift the ring from this position according to the extent of expansion, as it is desired. As soon as the gate directly opposite passes the point of contact between the disk B and the ring C the ports in the rings *p q* have been brought opposite the port in the ring *o*, so that steam is admitted through the steam-passage *f* to force the gate outward, also into the steamway, so that the ring C is forced around in the same direction as before. When this gate reaches nearly its extreme outward position, the steam previously confined exhausts through the hollow journals *d* and passages *d'* into the exhaust-passage *g'* or g^2, and the gate previously drawn out is forced inward by the shape of the steamway. When the engine is operated in the opposite direction, the other two gates E are in use. With a single-acting engine two gates with their steam-passages will be dispensed with. I prefer that the rings *o* and *p* be corrugated upon their sides next to the steam-chest, so as to reduce the friction. By this construction and arrangement but a small quantity of reciprocating motion is required in the operation of the gates, and there being no eccentrics, connecting-rods, cross-heads, slides, cranks, and other parts required in an ordinary engine, the friction is reduced to a minimum. Besides this, the engine is perfectly balanced, so that it may be run at a high speed without any vibration. The steamway increases gradually in size, thereby preventing unequal or sudden changes in the movement of the gates, and as the expansion can be regulated so as to obtain the best results, the engine will be most economical in its working.

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

1. In a revolving-cylinder engine, the combination, with the packing between the gland and solid part *c*, of the stationary shaft A, having between its ends the disk B, the ring C, and the plates *a*, provided with boxes D, whereby said shaft A and disk B may be inclosed, so as to press the packing, as described.

2. The combination, with the swinging gates E, having hollow journals *d*, and projections *e*, of disk B, formed with passages *i g' f*, and shaft A, having longitudinal passages *g m*, substantially as shown and described.

3. The combination of ring C, plates *a*, boxes, packing-glands *b*, shaft A, having steam-passages, and disk B, having longitudinal and radial passages, substantially as described.

4. The shaft A, having a reduced or shouldered portion, and formed with a solid projection, *c*, combined with box D, so as to form a steam and valve chest, *l*, substantially as shown and described.

5. The combination of the fixed ring *o* and valve-rings *p q*, provided with ports, and formed with lugs *p' q'*, combined with shaft A, having steam-passage *m*, and the box D, having grooves p^2, substantially as described.

6. The swinging gates E, having hollow journals *d* and ports *d'*, combined with disk B, having passages *g' g²*, substantially as described.

7. In a revolving-cylinder engine, the gates E, having their journals or ends *d* made hollow and with ports *d'*, in combination with shaft A, having passage *g*, and the disk B, having transverse passages *g' g²* and ports d^2, whereby steam may be exhausted from the steamway, as described.

8. The valves m^2, combined with the shaft and disk having passages *m' i*, and the valve-rings *o p q*, substantially as described.

JOHN J. BLAIR.

Witnesses:
W. H. HARRIS,
GEORGE B. MCCALLUM.