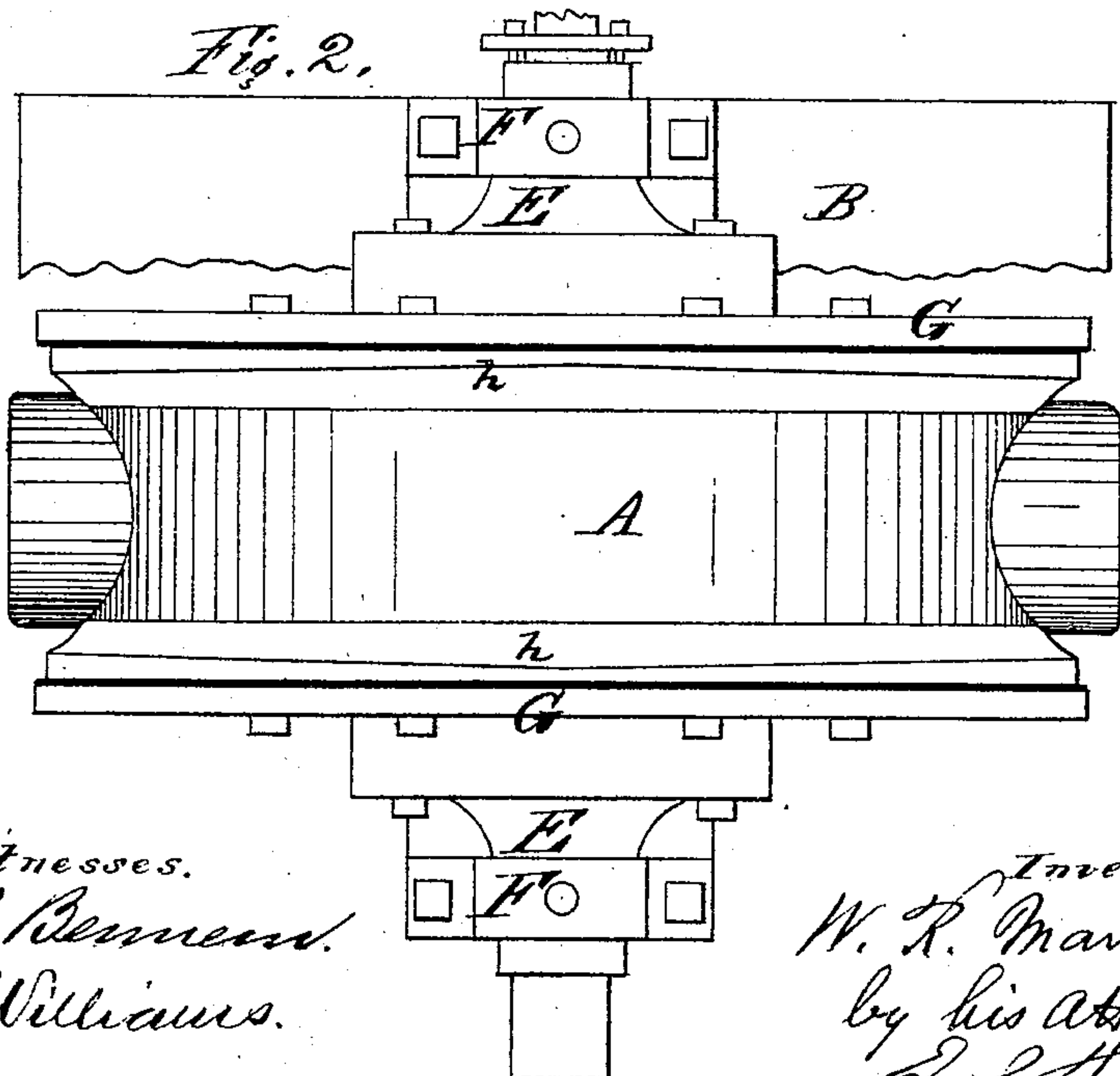
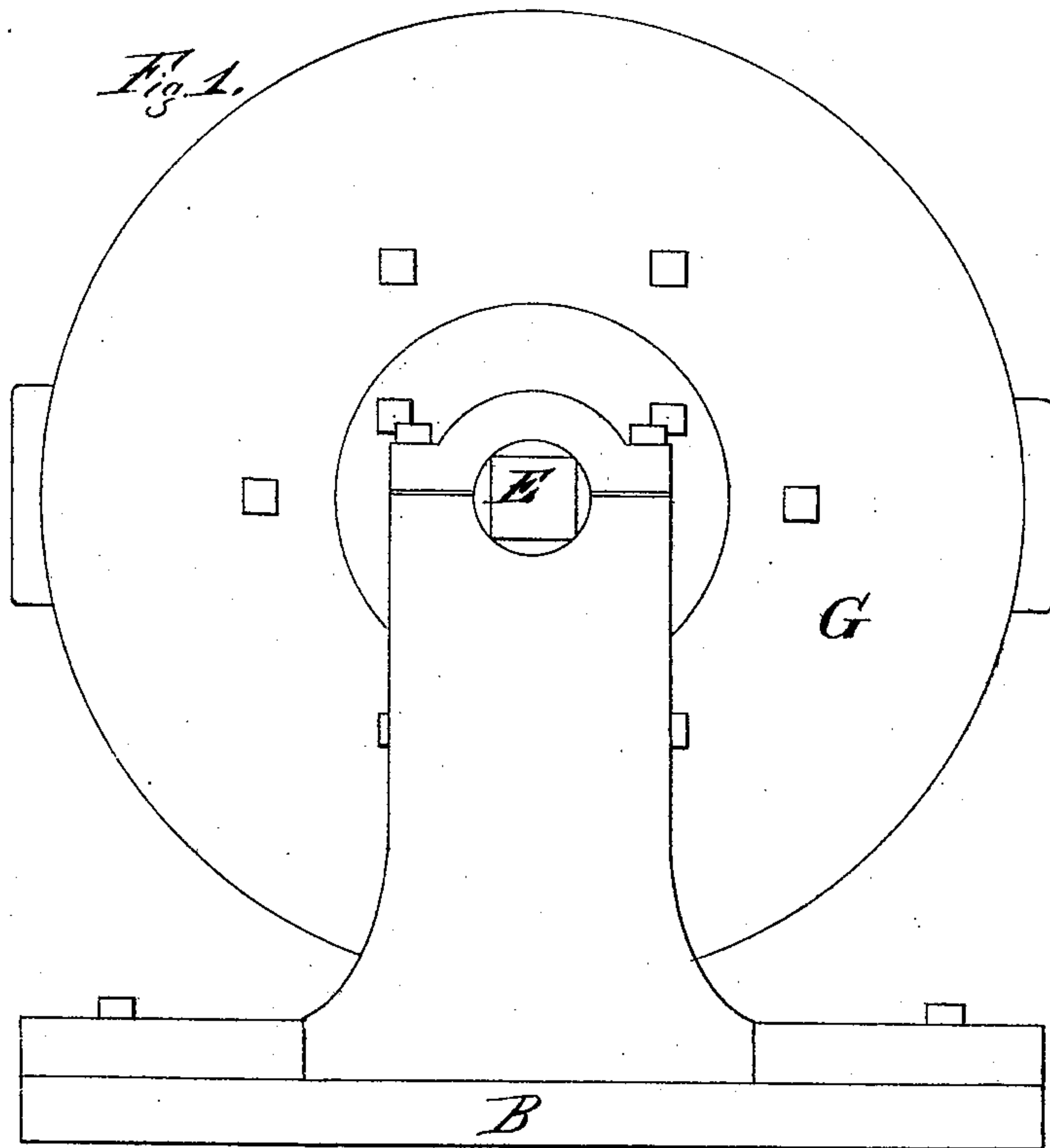


W. R. MANLEY.
Rotary Engines.

No. 146,010.

Patented Dec. 30, 1873.



Witnesses.
W. L. Bennett.
J. Williams.

Inventor.
W. R. Manley
by his attorney
C. L. Penwick

W. R. MANLEY.
Rotary Engines.

No. 146,010.

Patented Dec. 30, 1873.

Fig. 3.

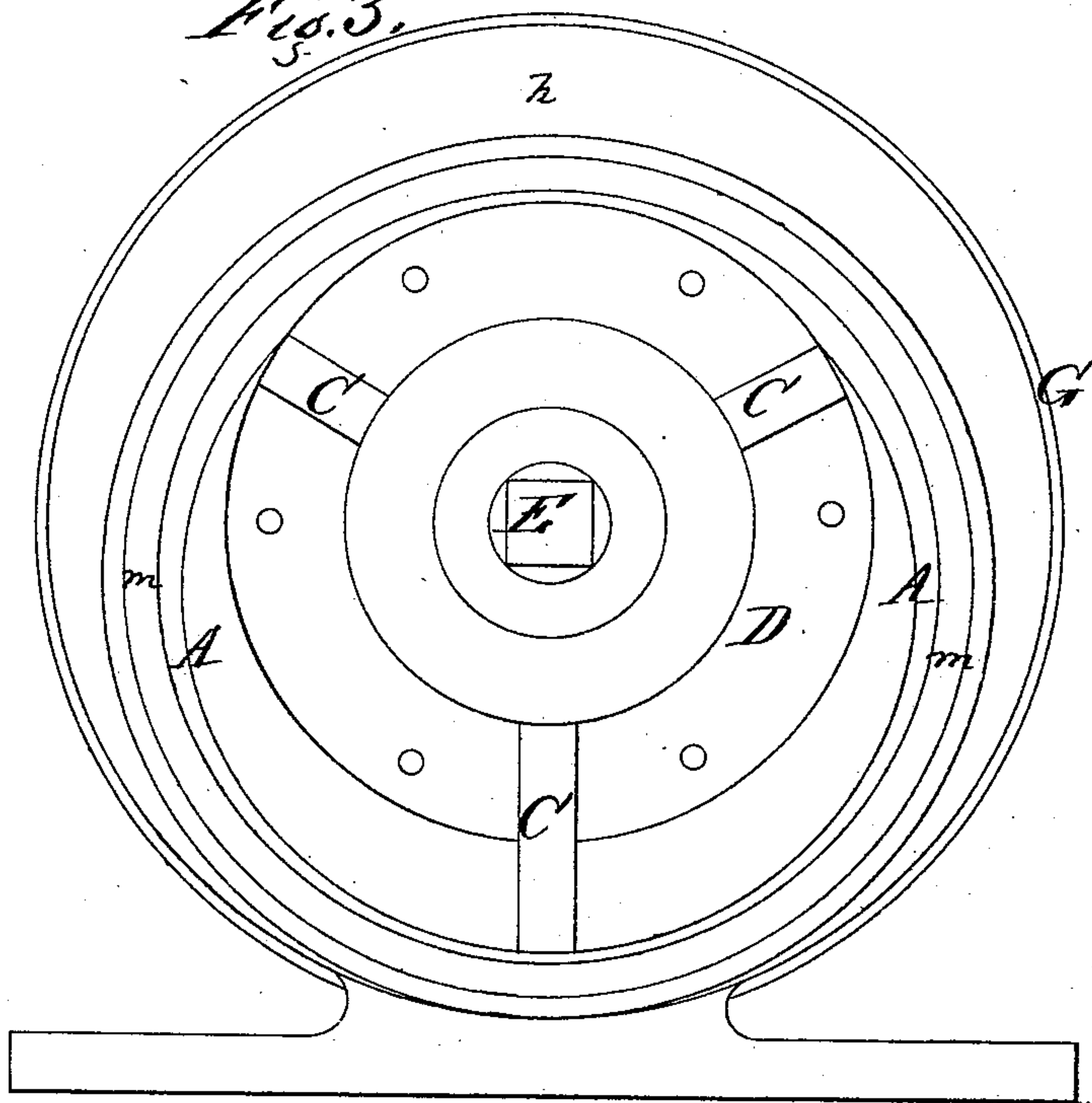
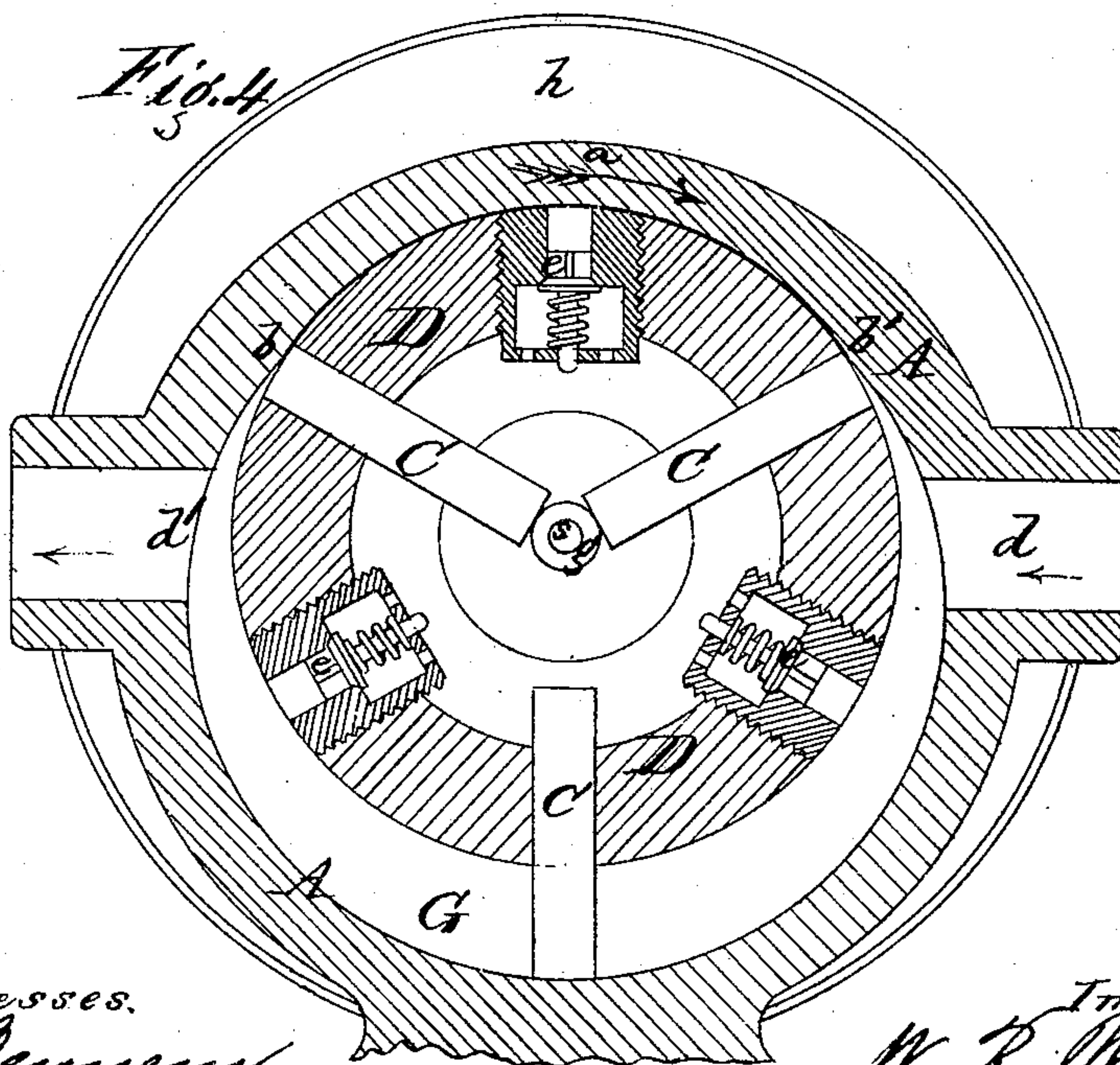


Fig. 4.



Witnesses.
W. L. Bennett.
J. H. Williams.

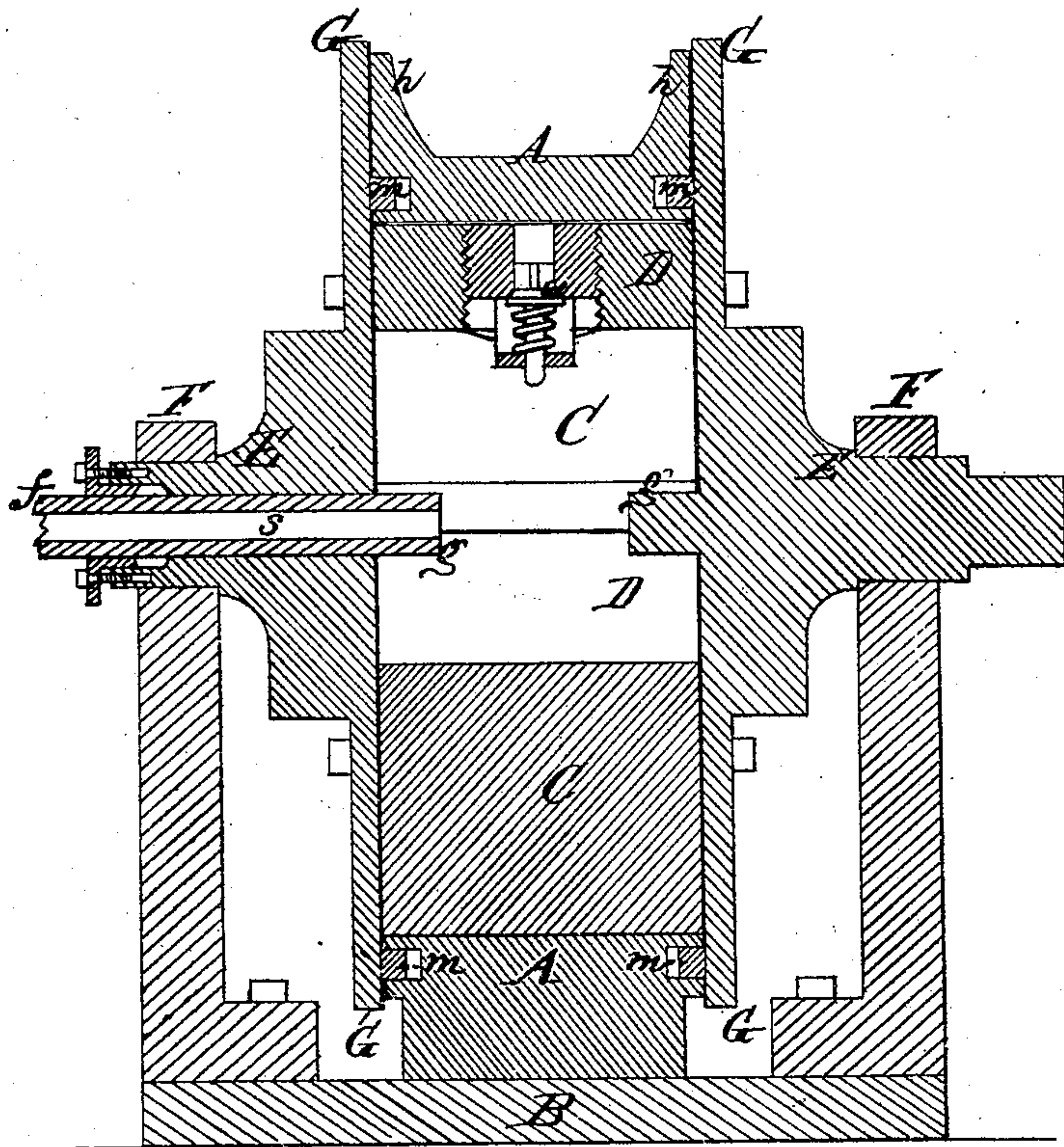
Inventor.
W. R. Manley
by his attorney
C. L. Remick

W. R. MANLEY.
Rotary Engines.

No. 146,010.

Patented Dec. 30, 1873.

Fig. 5.



Witnesses.

W. L. Bennett.
John Williams.

Inventor,

W. R. Mauley
by his attorney
E. S. Kendrick

UNITED STATES PATENT OFFICE.

WILLIAM R. MANLEY, OF NEW YORK, N. Y.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **146,010**, dated December 30, 1873; application filed April 23, 1873.

To all whom it may concern:

Be it known that I, WILLIAM ROBINSON MANLEY, of the city, county, and State of New York, have made an invention of certain new and useful Improvements in Rotary Engines; and that the following is a full, clear, and exact description and specification of the same.

The invention has reference to that class of rotary engines in which one or more pistons are caused to revolve or rotate in a cylinder or case; and it is applicable to steam-engines, pumps, and blowing or other engines in which it may be useful. The object of the invention is to obviate the defects incident to the circular movement of a piston or pistons in contact with heads fixed to the cylinder or case confining the fluid. To this end the invention consists, primarily, of the combination of one or more revolving pistons with a fixed cylinder or case, and with heads which revolve with the piston or pistons, and embrace the cylinder between their adjacent faces, so that the circular movement of the piston or pistons in contact with fixed heads is avoided, and the necessity of constructing the cylinder in two pieces, so as to permit the heads to be introduced into grooves of the cylinder, is also avoided. The second part of the invention consists of the combination of one or more revolving pistons with a fixed cylinder or case, with heads which revolve with the piston or pistons, and with packing-rings which are arranged eccentrically to the centers of the revolving heads, so that the latter in their movement move transversely as well as circularly upon the packing-rings, the practical effect of which arrangement is to prevent the faces of the heads from wearing in grooves, and to keep the wearing surfaces more thoroughly lubricated. The invention consists, further, of certain other combinations, which are specified at the close of this schedule.

In order that my invention may be fully understood, I have represented in the accompanying drawings, and will proceed to describe, a rotary engine embodying it.

Figure 1 of the said drawings represents a side view of the engine. Fig. 2 represents a plan of the same. Fig. 3 represents a side view of the engine with one of the heads of the cylinder removed. Fig. 4 represents a vertical section of the engine. Fig. 5 represents a cross-section of the engine.

The engine represented in the drawings has a cylinder or case, A, which, in this example, is made fast to the bed-plate B. This cylinder is open at both sides, and constitutes a cylindrical cavity, in which the pistons rotate. The pistons C in this example, are three in number, and are connected with a hub, D, which is arranged to revolve within the cylinder and eccentrically with the cavity thereof. The hub D is supported by the gudgeons E E, which are arranged to revolve in pillow-blocks F, secured to the bed-plate B. The form of the cavity of the cylinder A, in this example, is that of two intersecting segments of true cylinders of different radii. One of these segments extends from *b* to *b'*, in the direction of the arrow *a* in Fig. 4, and is concentric with the piston-hub D, but is of slightly greater radius, so that the hub does not touch it in revolving. The other segment is of much larger radius than the radius of the piston-hub, is eccentric therewith, and extends from *b'* to *b*, Fig. 4, so as to form the working cavity, in which the fluid is contained, when acting upon or being acted upon by the pistons. The ports *d d'*, by which the fluid enters and escapes from the working cavity, are formed in the periphery of the cylinder, and have external nozzles, with which pipes may be connected. The sides of the cylinder A are closed by heads G G, which are rigidly connected with the piston-hub D, so that the hub, heads, and pistons all revolve together. The rims of these heads cover the flanges *h* of the cylinder A, and the joints between the two are, by preference, packed with metallic rings *m*, which are contained in ring-grooves in the cylinder, and are pressed toward the inner faces of the heads by springs. These packing-rings *m* are concentric, or thereabout, with the exterior periphery of the working cavity, and are thus eccentric with the centers or axes of revolution of the heads G. The pistons C, in the present example, are three in number. Each is constructed to slide radially in a slot in the revolving piston-hub D. The edges of each piston slide radially in contact with the inner faces of the heads G, and the outer end of each piston revolves in contact with the inner cylindrical surface of the cylinder A. In order that the outer ends of the pistons may be held in contact with the surface of the cylinder, so as to pre-

vent the escape of steam from one side of the piston to its other side while the piston is traversing the working cavity, the piston-hub D is made hollow, and the fluid is admitted into the cavity, so as to force the pistons outward. The fluid for this purpose is admitted by means of self-acting valves *e*, one of which is applied to the space between every two pistons. These valves open inward, so that, when the pressure of the steam (or other fluid) in the working cavity between any two pistons is greater than the pressure in the cavity of the piston-hub, the steam (or other fluid) may enter such cavity, and operate upon the inner ends of the pistons; but when the pressure of the fluid between two pistons is less than the pressure within the hub, the valve closes by the action of its spring, and prevents the reduction of the pressure in the cavity of the piston-hub.

In order that the pistons may be held in place at the time the engine is started, one of the gudgeons E is bored, so as to form a passage, *s*, and this passage is connected with a pipe, *f*, by means of a stuffing-box, so that steam (or other fluid under pressure) may be admitted to the piston-hub, to press upon the inner ends of the pistons.

In order to insure the holding of the pistons to the surface of the concentric segment *b b'*, a nipple, *g*, is secured within the cavity of the piston-hub to each head, in such position as to hold up the pistons by bearing against their inner ends.

If the engine thus described is used as a steam-engine, the steam is admitted by one port, *d*, and, after acting upon the piston in front of it, escapes at the other port, *d'*. The power is transmitted by means of one or more cog-wheels or belt-pulleys, secured to one or both of the gudgeons, E; or one or both of the gudgeons may be connected with revolving shafts.

When the engine is used as a pump or as a blowing-engine, it is driven by power applied to one or both of its gudgeons E; and the fluid, entering at one port, *d*, is expelled at the other, *d'*.

It will be noticed that, in an engine constructed as above described, the edges of the pistons slide radially in contact with the surfaces of the heads, but do not revolve against them. As in such radial sliding all the parts of the pistons in contact with the head move the same lineal distance, the wear is equalized, and unequal wear of the pistons is prevented; whereas, if the edges of the pistons turned in contact with fixed cylinder-heads, (as has heretofore been common,) the inner ends of the

pistons would describe smaller circles than their outer ends, and, consequently, the former would travel shorter lineal distances than the latter, the result of which would be unequal wear and constant leakage. Moreover, as the packing-rings between the cylinder-heads and the cylinder are eccentric to the centers or axes of the heads, the faces of the heads move transversely as well as circularly upon the adjacent faces of the packing-rings, and the wear upon the cylinder-heads is distributed over a broad annular space whose width is about twice as great as the eccentricity of the rings to the axes of the heads. This sidewise movement of the heads over the packing-rings also carries the lubricating material laterally between the adjacent wearing surfaces.

The form, construction, and proportions of the engine may be greatly varied, to suit the views of different constructors or users. Thus, for example, the piston, piston-hub, and cylinder-heads may be fixed to the bed plate, and the cylinder may be constructed to revolve round them.

What I claim as my invention is—

1. The combination, substantially as before set forth, of the revolving piston, the fixed cylinder, and the heads of the cylinder revolving with the piston, and arranged to embrace the cylinder between their adjacent faces.

2. The combination, substantially as before set forth, of the revolving piston, the fixed cylinder, the cylinder-heads revolving with the piston, and the packing-rings arranged eccentrically to the centers of the cylinder-heads.

3. The combination, substantially as before set forth, of the revolving piston, the hollow piston-hub, the revolving cylinder-heads, the fixed cylinder, and the valves for supplying the hollow piston-hub with fluid from the cylinder.

4. The combination, substantially as before set forth, of the revolving piston, the hollow piston-hub, the revolving cylinder-heads, the fixed cylinder, and the passage through the gudgeon of the piston-hub, for supplying fluid thereto from the exterior of the engine.

5. The combination, substantially as before set forth, of the revolving piston, the hollow piston-hub, the revolving cylinder-heads, the fixed cylinder, and the nipple for holding the piston to the surface of the cylinder.

Witness my hand this 18th day of April, 1873.

W. R. MANLEY.

Witnesses:

W. L. BENNEM,
E. S. RENWICK.