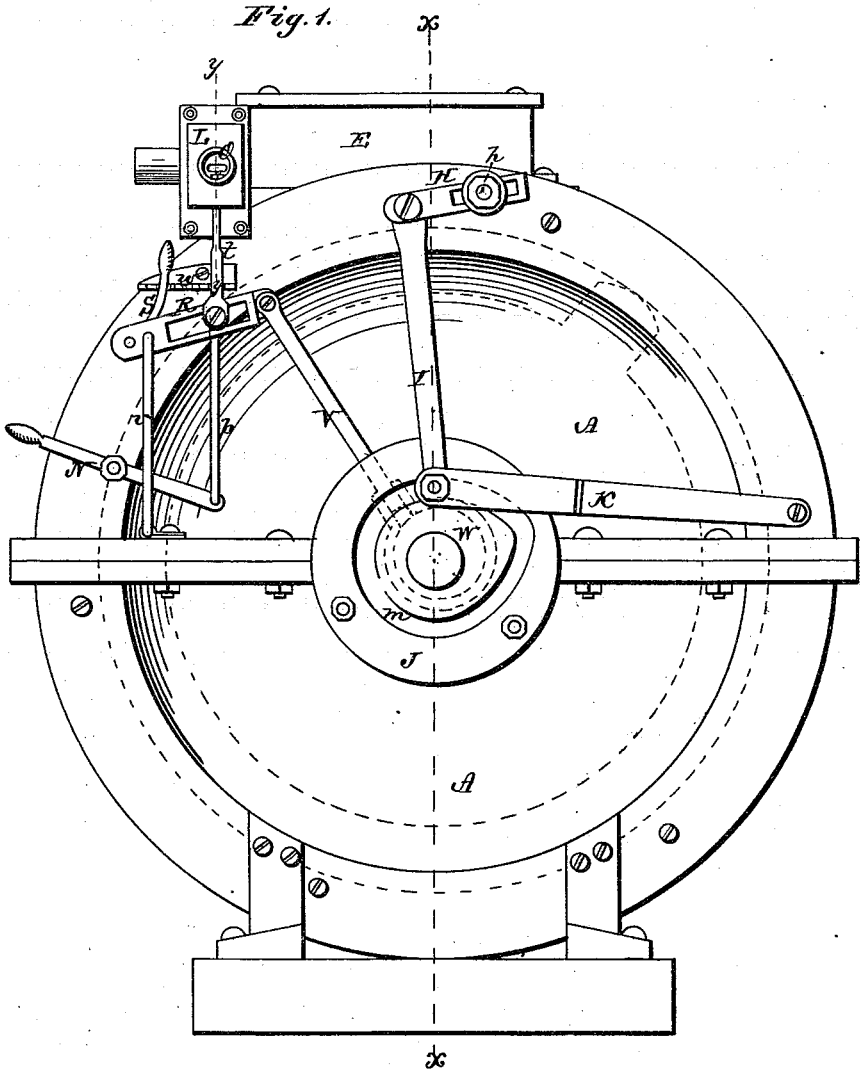
4 Sheets--Sheet 1.

T. E. STUART & J. A. EMERY.

Rotary-Engine.

No. 164,337. Patented June 8, 1875.

Fig. 1.



WITNESSES

Henry N. Miller

C. L. Ewert

By

INVENTOR

T. E. Stuart & John A. Emery

Alexander Mason

Attorney

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

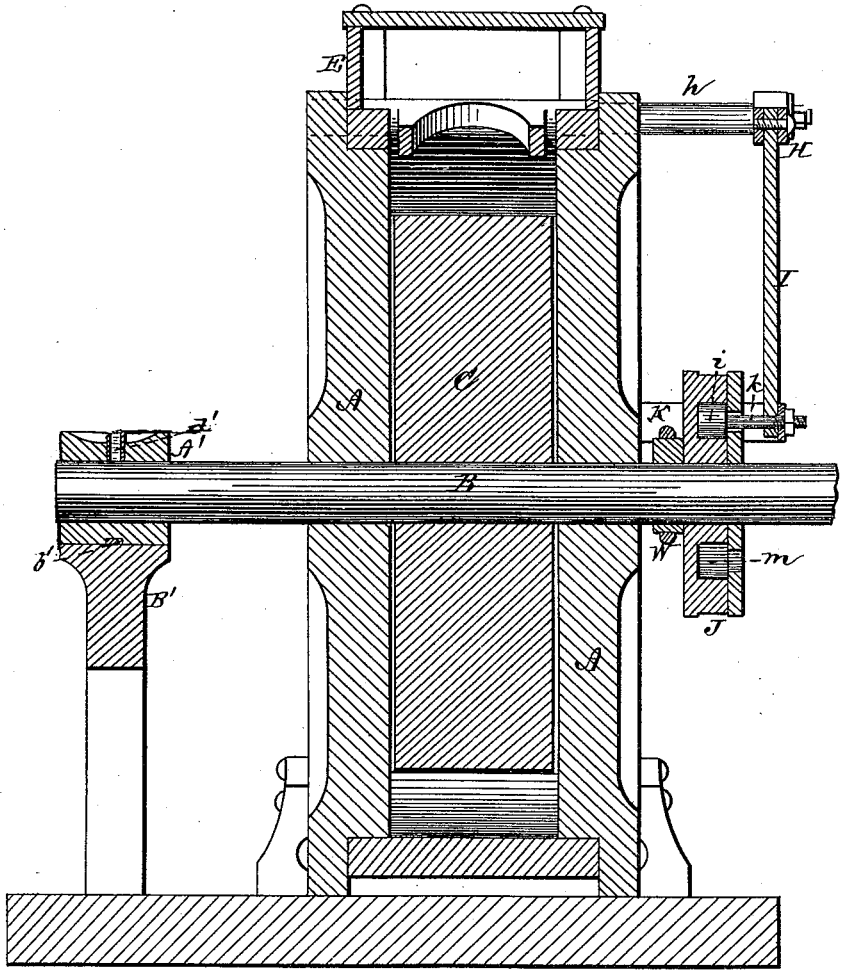
4 Sheets--Sheet 2.

T. E. STUART & J. A. EMERY.

Rotary-Engine.

No. 164,337. Patented June 8, 1875.

Fig. 2.



WITNESSES

Henry N. Miller

C. L. Ewert

INVENTOR

T. E. Stuart & John A. Emery

By Alexander Mason

Attorney

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

4 Sheets--Sheet 3.

T. E. STUART & J. A. EMERY.

Rotary-Engine.

No. 164,337. Patented June 8, 1875.

Fig. 3.

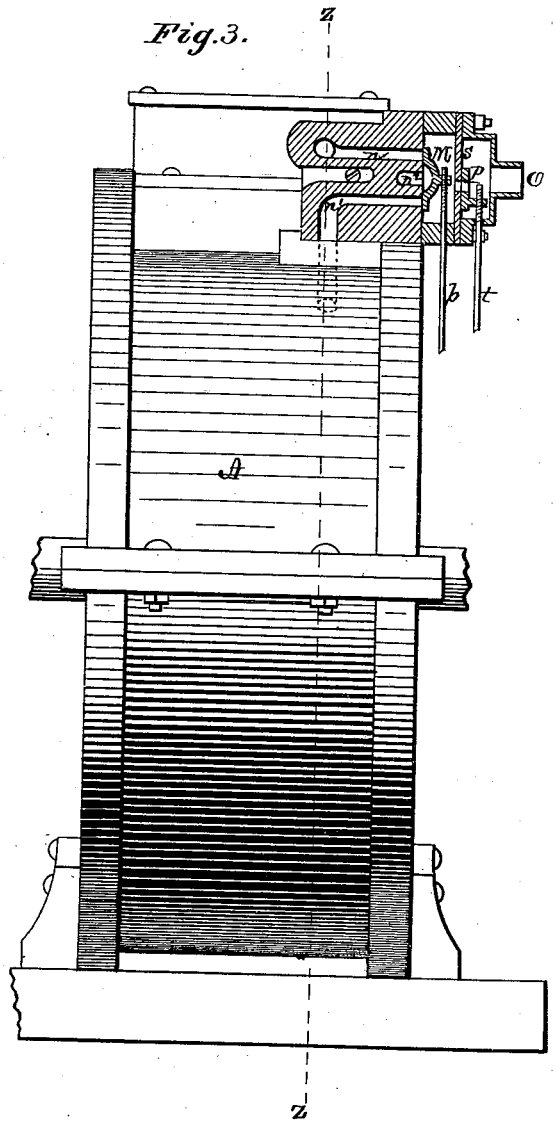
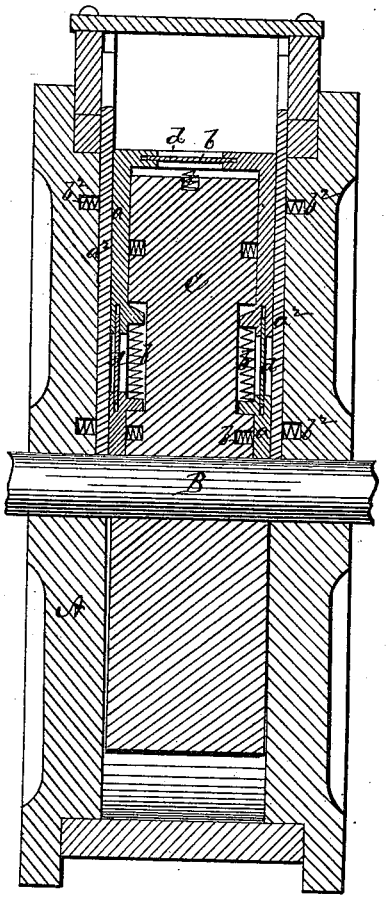


Fig. 4.



WITNESSES

Henry N. Miller

A. L. Ewerth

INVENTOR

By T. E. Stuart & John A. Emery,

Alexander Mason

Attorney

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

4 Sheets--Sheet 4.

T. E. STUART & J. A. EMERY.

Rotary-Engine.

No. 164,337. Patented June 8, 1875.

Fig. 6.

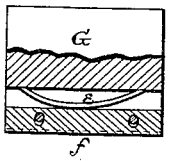
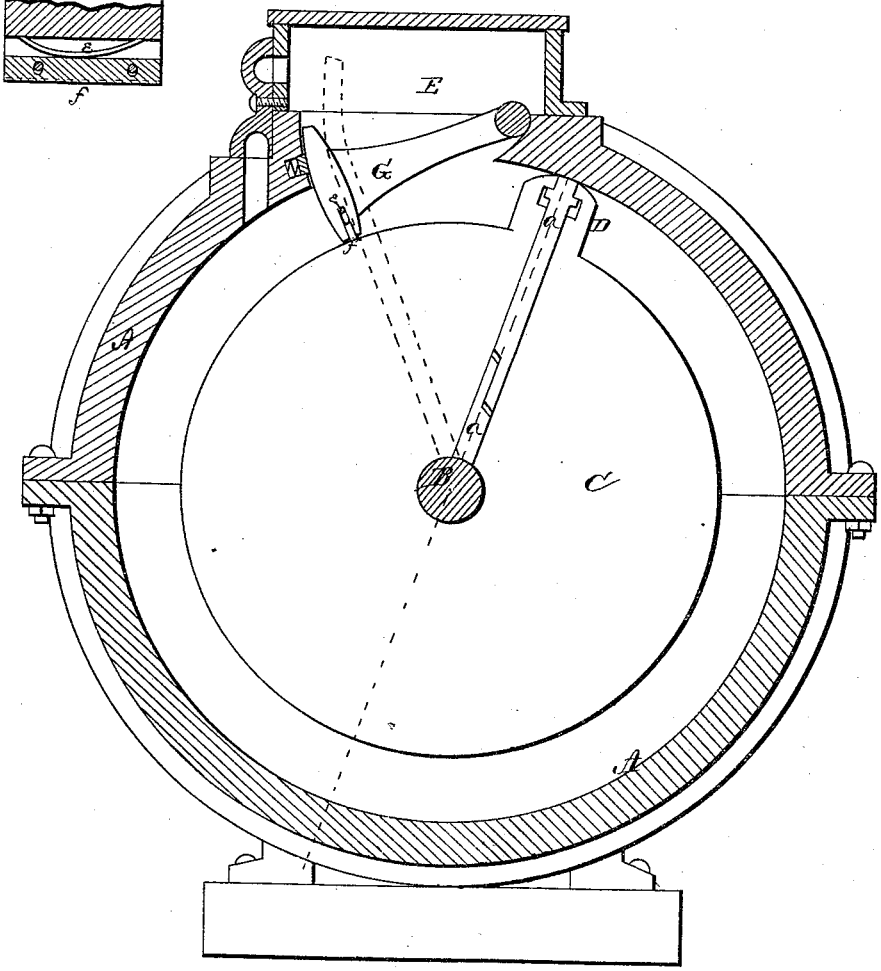


Fig. 5.



WITNESSES

Henry N. Miller

C. L. Emerson

By

INVENTOR

T. E. Stuart & John A. Emery

Alexander Mason

Attorney

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

UNITED STATES PATENT OFFICE.

TIMOTHY E. STUART, OF BOSTON, AND JOHN A. EMERY, OF CAMBRIDGE, MASSACHUSETTS.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **164,337**, dated June 8, 1875; application filed April 24, 1875.

To all whom it may concern:

Be it known that we, TIMOTHY E. STUART, of Boston, Suffolk county, Massachusetts, and JOHN A. EMERY, of Cambridge, in the county of Middlesex and in the State of Massachusetts, have invented certain new and useful Improvements in Rotary Engines; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of our invention consists in the construction and arrangement of a rotary engine, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which our invention appertains to make and use the same, we will now proceed to describe its construction and operation, referring to the annexed drawings, in which—

Figure 1 is a front elevation of our improved rotary engine. Fig. 2 is a transverse vertical section of the same. Fig. 3 is a side elevation of the engine with the steam-chest in section. Fig. 4 is another transverse vertical section of our engine. Fig. 5 is a longitudinal section of the same, and Fig. 6 is a section through the head of the valve.

A represents a cylindrical casing of any suitable dimensions, the body of which is made in two parts, having flanges at its ends united by screws or bolts, as shown, to be perfectly steam-tight. Through the center of the casing A passes a shaft, B, upon which is secured a circular wheel, C, of smaller diameter than the interior diameter of the casing. This wheel is shown as formed with one piston, D, but more than one may be used, if so desired, and the various devices of the engine are adapted for one piston only. This piston is of such size as to extend to the interior surface of the casing, and is formed with straight side walls and its outer surface curved. Extending from the center shaft B radially along one side of the wheel to the outer side of the piston D across said piston, and along the other side of the wheel to the shaft on that side, are a series of packing-bars, *a a*, arranged with overlapping joints, and with springs *b b*, so placed in the wheel and piston as to press the sectional packing bars or plates outward against the casing on all sides and prevent any escape of steam. At the overlapping joints of the packing-bars *a* are inserted steel plates *d*, as shown in Fig. 5, which allow of the contraction and expansion of the packing-bars, and prevent the ingress of steam behind said bars. It is, of course, understood that the packing-bars are placed in grooves made in the wheel and piston. In the heads of the casing are also inserted packing-bars a^2 extending from the shaft B radially upward and into the abutment-chamber E formed on top of the casing A, these packing-bars being also pressed outward by means of springs b^2. In one end of the abutment-chamber E is hung the abutment G, constructed substantially in the form shown in Fig. 6, and extending down through a slot into the casing, so that the head of the abutment will rest on the periphery of the wheel therein. In the head of the abutment is inserted a packing-bar, *f*, which is pressed outward by means of a spring, *e*. The rod *h*, forming the journal of the abutment G, and to which it is permanently secured, extends beyond the abutment-chamber for a suitable distance on one side, and on this end of the rod or shaft is fastened an adjustable arm or crank, H, to the outer end of which is pivoted an arm, I, having upon its lower end a stud, *k*, with friction-roller *i*. This stud and roller extends into and works in an eccentric groove, *m*, in a wheel, J, fastened on and revolving with the shaft B. On the stud *i* is pivoted an arm, K, the other end of which is pivoted to the casing A. It will be seen that as the eccentric J revolves the abutment is raised and lowered by the movement of the arm I and crank H. The eccentric is so arranged on the shaft B, with relation to the wheel C and its piston D, that the abutment will be raised just as the piston reaches the same, and be lowered again as soon as the piston has passed the abutment.

L represents the steam-chest, provided with two ports or steam-passages, *n* n^1, into the interior of the casing, and with exhaust-port n^2. When the steam enters through the port *n* it exhausts through the ports n^1 n^2, and when it

enters through the port n^1 it exhausts through the ports n n^2. Over the entrances to these ports is placed a valve, M, which is used for reversing the engine by being moved so as to open either of the ports n or n^1, and form communication between the other one of said ports and the exhaust-port. This valve is, by a rod, p, conuected with a lever, N, pivoted to the side of the casing, and by which said valve is operated.

O is the steam-inlet into the chest L, and within said chest, between this inlet and the valve M, is a partition, s, with a single port through the same. Over this port is placed a valve, P, with corresponding port, which valve is operated so as to cut off the steam just at the time when the piston D passes the abutment G, allowing the steam at this time to work by expansion, but as soon as the piston has passed the abutment G the valve P opens again, admitting live steam to the engine.

The valve P is, by a rod, t, connected to a longitudinally-slotted link, R, one end of which is, by a rod, v, flexibly connected to the outside of the casing A; and the upper end of this rod is extended, forming a lever or handle, S, which is held at any point desired in a rack, w, attached to the casing, the rod v thus forming the fulcrum on which the link can oscillate. The other end of the link R is provided with a pivoted arm, V, which extends toward the central shaft B, and its lower end operated by an eccentric, W, secured thereon. Thus, by the revolution of the shaft B, the link R is oscillated up and down, operating thereby the valve P, to shut off or let on steam at the desired time.

The amount of oscillation of the link, and consequent extent of the movement of the valve, is regulated by the position of the lever S in the rack w, such movement of the lever bringing the point at which the rod t is connected to the link closer to or farther from the fulcrum, which, as stated, is the rod v.

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

1. The packing-bars a a, made in sections, with overlapping joints, provided with steel plates d in the joints, and pressed outward by means of springs b b, substantially as and for the purposes herein set forth.

2. The combination, with the abutment G of the rod h, adjustable link H, arm I, bar K, stud k, with roller i, and the eccentric J, all substantially as and for the purposes herein set forth.

3. In a rotary engine, the combination, with the cut-off valve P and its rod t, of the slotted adjustable link R, the arm V, and eccentric W, for operating the valve, and the rod v, extending through the link R, and forming a handle, S, to catch into the rack w, for adjusting the valve, substantially as herein set forth.

In testimony that we claim the foregoing we have hereunto set our hands and seals this 22d day of March, 1875.

TIMOTHY E. STUART. [L. S.]
JOHN A. EMERY. [L. S.]

Witnesses:
FRANCIS L. HAYS,
F. A. S. STORER.