(No Model.)

F. W. BRUCE.

ROTARY VALVE.

No. 492,267. Patented Feb. 21, 1893.

Fig. 1.

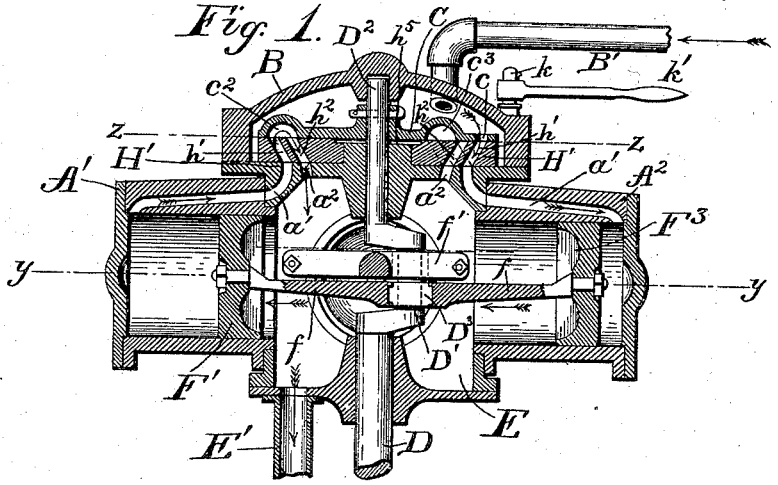


Fig. 2.

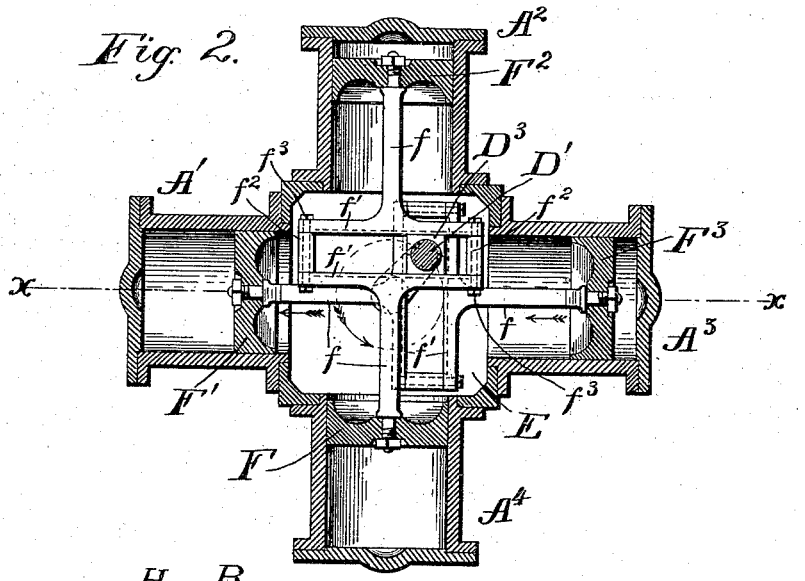


Fig. 3.

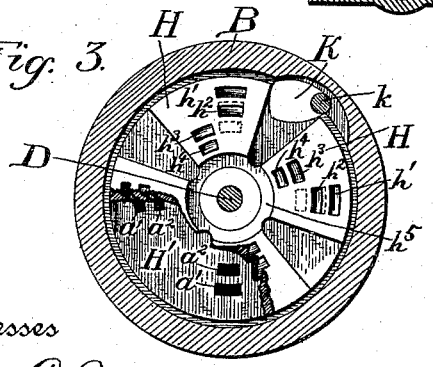
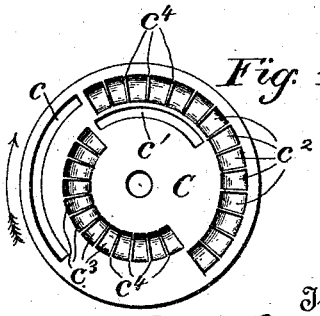


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

FRED W. BRUCE, OF MAYPORT, FLORIDA.

ROTARY VALVE.

SPECIFICATION forming part of Letters Patent No. 492,267, dated February 21, 1893.

Application filed September 13, 1892. Serial No. 445,732. (No model.)

To all whom it may concern:

Be it known that I, FRED W. BRUCE, a citizen of the United States, residing at Mayport, in the county of Duval and State of Florida, have invented certain new and useful Improvements in Rotary Valves for Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to rotary valves for engines adapted to be propelled by steam, compressed air, naphtha, or other gaseous material, and it is equally applicable to single or multiple cylinder engines or to engines running at a slow or a high speed and performing any kind of work; and it is specially intended to include certain improvements in the valves described in my patent No. 470,978, dated March 15, 1892.

Reference is had to the accompanying drawings, wherein the same parts are indicated by the same letters. Figure 1 represents a section of an engine having four cylinders closed at one end only and opening at the other into the exhaust. This section is made by the plane *x x*, in Fig. 2. Fig. 2 represents a section of the device shown in Fig. 1 made by the line *y y*, looking down. Fig. 3 represents a section of the device shown in Fig. 1, made by the plane *z z*, looking down. Fig. 4 represents a view of the lower side of a rotating valve adapted to cut off at half stroke.

The cylinders A′, A^2, A^3, and A^4 have their outer ends only closed and open at their inner ends to a common exhaust pipe E′. The four cylinders have a common steam chest B, connected to the boiler by the steam-pipe B′. Within the steam chest B the rotary valve C is keyed on a prolongation D^2 of the main shaft D.

Each piston F has rigidly connected thereto the piston-rod *f*, the inner end of which terminates in a flat guide *f′* which together with the opposite guide, the sleeves f^2, and bolts f^3 constitute a yoke in which the brasses D^3 of the crank pin D′ slide freely. The various piston rods *f* are bent, as shown in Fig. 1, so that each pair may have its own collar D^3 around the crank-pin D′.

The rotary valve C has two steam ports *c* and *c′*, the one radially exterior to the other. The position of the cut-off may be varied by increasing or decreasing the length of these ports. The rotary valve has two exhaust ports c^2 and c^3. These exhaust ports are preferably divided by ribs c^4 into a number of small chambers or pockets, as shown in Fig. 4. This arrangement prevents the necessity of the valve setting everywhere flat on its seat, and renders it possible to have a balancing pressure from beneath, as will be hereinafter described.

Beneath the rotating valve, and acting as a seat for the same, the reversing-valve H is provided. This valve preferably consists of a number of radial arms *h*, one over the steam and exhaust ports of each cylinder. This reversing valve has four pairs of similarly-disposed ports for admitting and exhausting steam while going ahead and four similar pairs of ports for backing. The go-ahead ports h' h^2 may be either radially exterior to the backing ports h^3 h^4, or vice versa. The cam K, moved by the handle *k′*, is adapted to shift the reversing valve from the go-ahead to the backing position, or vice versa. Immediately beneath the radial arms *h* of the reversing valve H are the steam-ports *a′* connected to the cylinder, and a^2 connected to the exhaust. The ports h' and h^2 are made slanting inward, and the ports h^3, h^4, slanting outward as shown in Fig. 3, so that but two ports *a′* and a^2 may suffice for each cylinder, thus differing from the device shown in my patent No. 470,978, wherein four ports are required.

The reversing valve and cylinder ports are so arranged that the one position of the cam K causes the go-ahead ports of the reversing valve to register with the ports *a′* and a^2, while the reverse position of the cam K will cause the backing ports of the reversing valve to register with the said ports *a′* and a^2. The reversing valve may be so constructed that a third or middle position of the cam K may cause all the ports to be closed, which would stop the engine. By cutting away the reversing valve between the ports, as shown at h^5, the bearing surface of the rotary valve on the valve seat is diminished, and steam entering the spaces between the radial arms *h* exerts

a balancing pressure on the lower side of the valve. The ribs c^4 in the exhaust portion of the valve prevent this steam between the said arms h from running through the exhaust passages of the valve into the exhaust; but as each pocket passes over the ports a' and a^2, as shown to the left in Fig. 1, it opens a free passage from the cylinder to the exhaust. Should these ribs c^4 be omitted, it will be necessary to have the valve C fit firmly in its seat, which will not only greatly increase the frictional surface, but do away with the balancing effect of the steam between the radial arms h.

The valve C may be either ribbed, as shown at c^4 in Fig. 4, or may have a plane face fitting closely on its seat with continuous exhaust passages. Moreover, the valve may be manufactured to cut off at any portion of the stroke.

From an inspection of Fig. 1 it will be seen that whenever one cylinder is admitting steam the opposite cylinder is exhausting and that two of the pistons are always at work driving the shaft D.

I have shown an engine having four single acting cylinders but it will be seen that my invention is equally applicable to an engine having any number of single-acting cylinders, or with slight modifications, to an engine having any number of double acting cylinders.

It will be obvious that while I have referred to the various parts as belonging to a steam-engine, that my device is equally applicable to engines driven by all sorts of gases under pressure.

It will be obvious that many modifications might be made by any one skilled in the art which could be used without departing from the spirit of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a valve mechanism for engines impelled by steam or other gas under pressure, the combination, with a cylinder and piston reciprocating therein, of a steam-chest, a rotary valve rotating in said steam-chest and having annular ports near the periphery thereof, the exhaust being divided by radial ribs into a plurality of pockets, a hand-operated reversing-valve pivoted beneath the rotary valve and constituting a valve seat therefor, the said reversing-valve having double sets of ports sloping as shown, and the said valve being cut away between the said ports, whereby the steam is admitted between the said ports beneath the rotary valve, tending to balance the same, and a valve-seat beneath the said reversing valve attached to or integral with the said cylinder, the said valve seat having one set of steam and exhaust ports therein opening into the cylinder, substantially as described.

2. In a valve mechanism for engines impelled by steam or other gas under pressure, the combination, with a cylinder and a piston reciprocating therein, of a steam chest, a rotary valve rotating in said steam chest and having annular ports near the periphery thereof, a reversing valve pivoted beneath the rotary valve and constituting a valve seat therefor, the said reversing valve having double sets of ports sloping as shown, and a valve seat beneath the said reversing valve, the said valve seat having one set of steam and exhaust ports therein opening into the cylinder, and registering with said sloping ports in the reversing valve, substantially as described.

3. In a steam-engine, the combination, with a steam-chest and a cylinder, a reversing valve having two sets of double ports sloping as shown, and a valve seat attached to or integral with the said cylinder and having two ports adapted to register with either set of said double ports in the reversing valve, substantially as described, of a rotary valve having two open annular ports therein, the one exterior to and concentric with the other, and two closed annular exhaust ports therein, the one interior to and concentric with the other, substantially as and for the purposes described.

4. In a steam engine, the combination with a shaft, of a plurality of piston rods connected to and driving the same, a plurality of single-acting cylinders whose pistons are connected to said piston rods, the said cylinders having one end open to the exhaust and the other open alternately to steam and the exhaust, a hand-operated reversing valve having ports sloping as shown and forming a valve seat for the rotary valve, a valve seat attached to or integral with each of said cylinders and having two ports to each cylinder adapted to register with the ports in the reversing valve, and a rotary valve having double sets of steam and exhaust ports corresponding to the number of said cylinders, and interior radially the one to the other, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRED W. BRUCE.

Witnesses:
F. J. BROCK,
J. G. MERRILL.