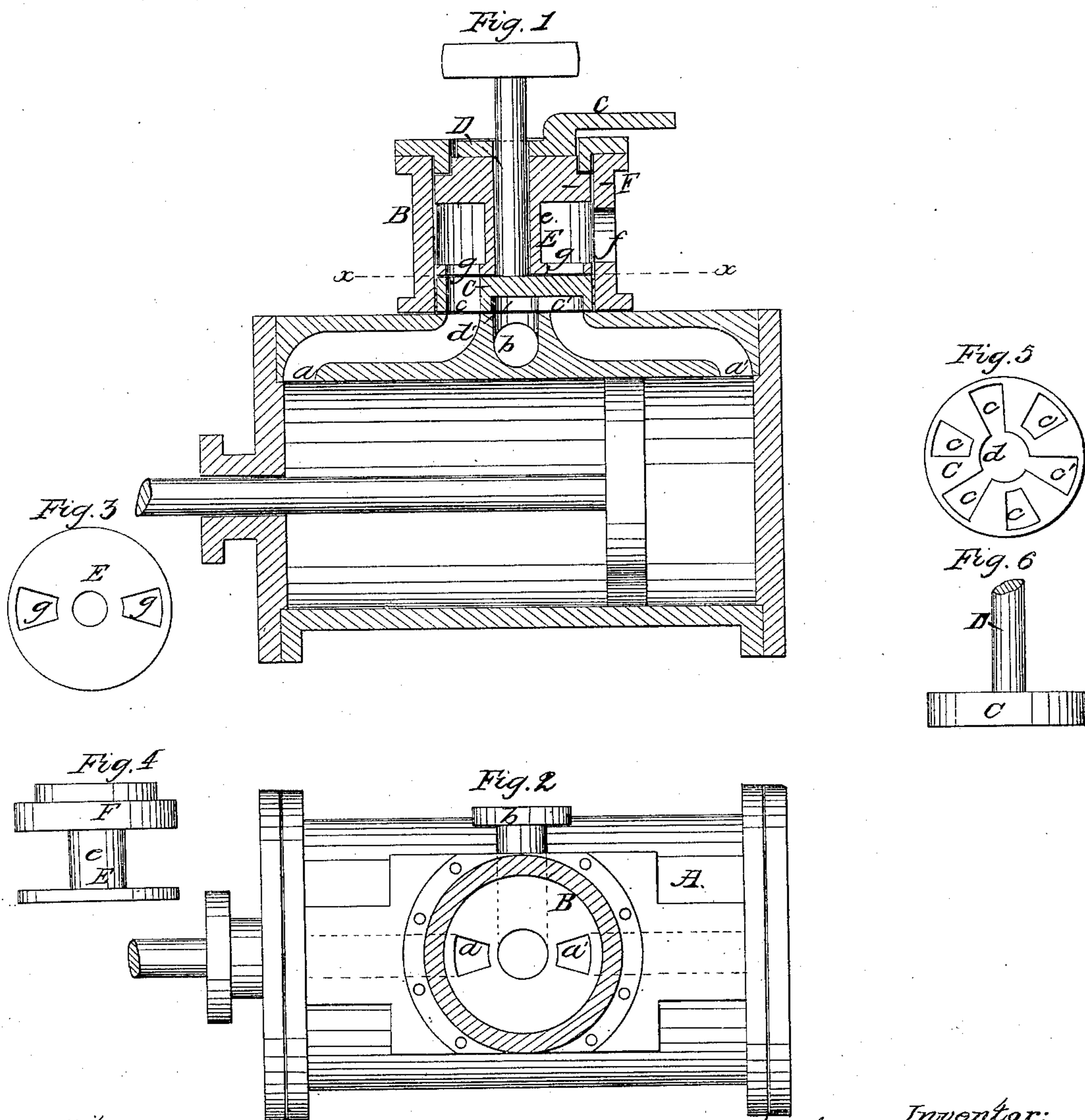


*B. F. McKinley,*  
*Rotary Steam Valve.*

*No 55,518.*

*Patented June 12, 1866.*



Witnesses:

*J. W. Langford*  
*As. A. Service*

Inventor:

*B. F. McKinley*  
*Per [Signature]*  
*Att'y*



# UNITED STATES PATENT OFFICE.

B. F. MCKINLEY, OF FALMOUTH, KENTUCKY.

## IMPROVEMENT IN BALANCED CUT-OFF VALVES.

Specification forming part of Letters Patent No. 55,518, dated June 12, 1866.

*To all whom it may concern:*

Be it known that I, B. F. MCKINLEY, of Falmouth, in the county of Pendleton and State of Kentucky, have invented a new and Improved Balanced Cut-Off Valve; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 represents a longitudinal central section of this invention. Fig. 2 is a transverse section of the same, the line *x x*, Fig. 1, indicating the plane of section. Fig. 3 is an inverted plan of the cut-off valve detached. Fig. 4 is a side elevation of the same. Fig. 5 is an inverted plan of the main valve detached. Fig. 6 is a side elevation of the same.

Similar letters of reference indicate like parts.

This invention relates to a rotary valve which revolves on a seat at the bottom of a cylindrical chamber, in combination with a cut-off valve fitted into the cylindrical chamber over the main valve and provided with a balance-piston in such a manner that by means of said piston both the cut-off and the main valve are relieved from the pressure of the steam or balanced, and by turning the cut-off valve in the direction against that in which the main valve revolves the steam can be cut off at any desired point of the stroke, or shut off entirely, without any effect on the exhaust, which goes on without interruption.

A represents a steam-cylinder, which is provided with steam-ports *a a'* and an exhaust-port, *b*, in the ordinary manner. From this cylinder rises a cylindrical valve-chamber, B, which contains the valve C. This valve is firmly secured to or cast solid with the spindle D, by means of which a revolving motion is imparted to the same, and it is ground down steam-tight on the seat which communicates through suitable openings and channels with the ports *a a' b*.

The valve C is provided with three segmental openings, *c*, which alternate with segmental cavities *c'*, as clearly shown in Fig. 5 of the drawings, and the cavities *c'* communicate with a central cavity, *d*. When the valve is placed on its seat and revolved the openings and cavities *c c'* are made to coincide suc-

cessively with the ports *a a'*, and the relative position of said openings and cavities is such that whenever one of the openings *c* coincides with the port *a* one of the cavities *c'* will coincide with the port *a'*, and vice versa, and if steam is admitted to the chamber B it passes in alternately through the port *a* and then through the port *a'*, and when the cylinder takes steam at one end exhausts at the other, as clearly shown in Fig. 1 of the drawings.

On the back of the valve C is fitted the cut-off valve E, which connects, by a tubular stem, *e*, with the balance-piston F. This piston and also the valve E are fitted nicely into the cylindrical chamber B, and the steam is admitted to said chamber through the aperture *f* between the piston F and valve E, so that the upward pressure of the steam on the piston will balance the downward pressure on the valve. Said valve is provided with two segmental openings, *g g*, and if these openings are brought in such a position that they are in line with the ports *a a'* in the seat of the main valve, steam is admitted to the cylinder during the whole stroke; but by turning the cut-off valve in a direction opposite to that in which the main valve rotates the steam can be cut off at any desirable point of the stroke, and if the cut-off valve is turned far enough the steam is cut off, without, however, interfering in the least with the exhaust of the main valve.

A suitable lever, G, serves to turn the cut-off valve E, and if this lever is connected to the governor an automatic cut-off is obtained.

The piston F is packed steam-tight by a stuffing-box and gland, and the main valve is revolved by gearing attached to the spindle D, or by any suitable mechanism. If desired, the amount of opening for the exhaust can be increased by additional ports in the seat.

This style of valve is susceptible of various modifications to suit the engine to which it is to be applied. For a large engine two valves are preferable, one for each end of the cylinder, since the combined area of the openings of two smaller valves will be equal to that of the openings of one much larger.

My valve may also be used as an independent cut-off, and in this form it can be made very cheaply and applied to almost any engine.



In the form in which I have shown my valve it is principally designed for locomotives and other engines of quick stroke and high speed, and to take the place of the common slide-valve operated with lap and varied by a suitable link-motion which heretofore has been considered the only practicable cut-off valve for such engines, and which, although it has many faults, has been extensively used for want of a better one. The principal difficulty with such valves is that in order to prevent the exhaust closing too soon it is necessary to give the exhaust-port of the valve considerably more lead than to the steam side, and if the steam is cut off at low points of the stroke, in consequence of the much lessened stroke of the valve, the opening for steam is very small and contracted, and also the exhaust-passage is opened a great deal too soon.

These and other difficulties are overcome by my valve, which is so constructed that the regulation of the cut-off does not affect the exhaust, which goes on without interruption, no matter how fast the engine may run or how

soon it may cut off. It will cut off as certainly and precisely if the engine makes one thousand revolutions per minute as if it make one hundred or only twenty per minute.

The steam can be cut off entirely from the engine, or it can be allowed on during any point of the stroke up to the full stroke by simply moving the lever G. The whole valve is very simple in its construction, and being perfectly balanced it works easily and almost free from friction.

I do not claim the device the subject-matter of Ethan Rogers in his patent of October 10, 1865; but

What I claim as new, and desire to secure by Letters Patent, is—

The adjustable cut-off valve E and balance piston F, in combination with the revolving valve C, constructed and operating substantially as and for the purpose described.

B. F. McKINLEY.

Witnesses:

H. N. NEWMAN,

H. F. MONROE.