

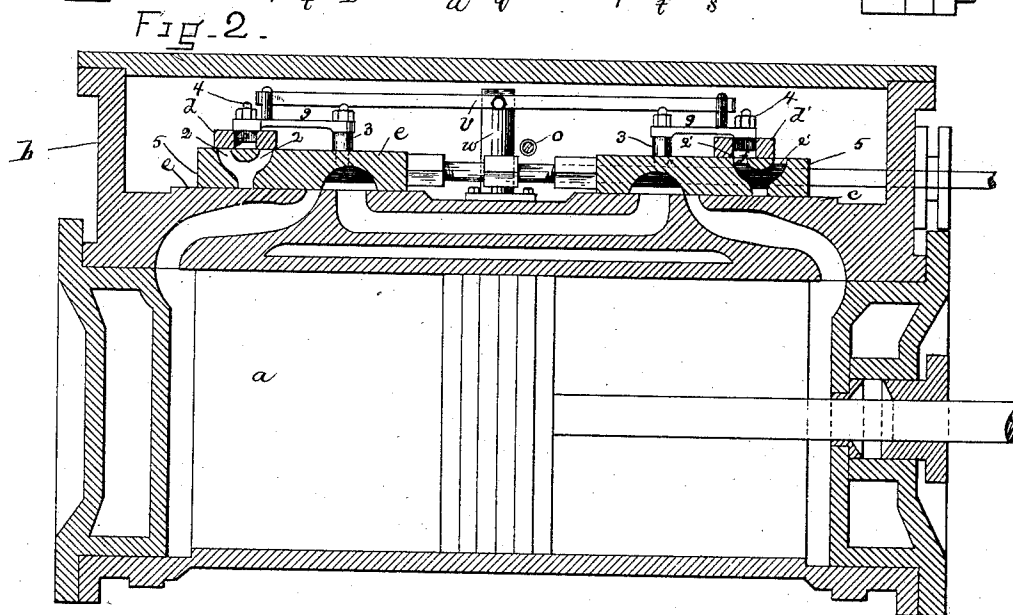
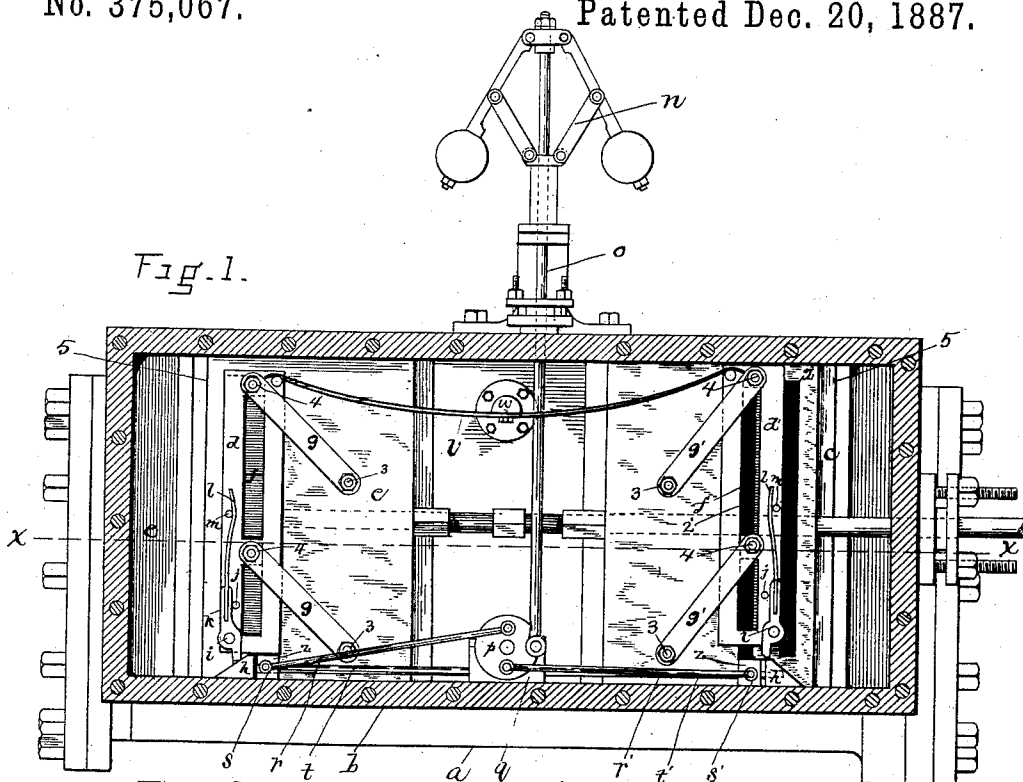
(No Model.)

J. A. HORTON.

CUT-OFF VALVE.

No. 375,067.

Patented Dec. 20, 1887.



WITNESSES:
H. Brown
W. Rogers

Fig. 3.

INVENTOR:
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UNITED STATES PATENT OFFICE.

JAMES A. HORTON, OF READING, MASSACHUSETTS.

CUT-OFF VALVE.

SPECIFICATION forming part of Letters Patent No. 375,067, dated December 20, 1887.

Application filed March 3, 1887. Serial No. 229,636. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. HORTON, of Reading, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Cut-Off Valves, of which the following is a specification.

This invention relates to that class of steam-engines in which a variable "cut-off" valve is used, in connection with the main valve, to regulate the admission of steam to the cylinder of the same in such quantities as may be necessary, and to cut off the steam at different points of the stroke of the piston; and it has for its object to provide means for operating said cut-off valve during its initial movement of opening the ports of the main valve, so that when said main valve commences to travel in either direction the cut-off valve will be operated in such manner as to give a full opening of the ports in the main valve and close the same independently of the opposite movement of said main valve.

The invention consists in a cut off valve provided with devices connecting it with the main valve and mechanism co-operating therewith in such manner that when the initial or opening movement of the main valve takes place, said cut-off valve will be caused to travel in the arc of a circle during the distance required to secure a full opening of the ports of the main valve, and then be carried with said main valve until such time as it is necessary to close said ports or cut off the steam from the same.

The invention also consists in the combination of a governor and devices for operating the cut-off valve, by which the latter may be caused to close the openings or ports in the main valve at any point of the stroke of the piston.

The invention also consists in certain details, all of which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of my improved cut-off valve and its attached devices secured to a slide-valve of a stationary engine, said slide-valve resting on the valve-seat, being in position on its seat, the steam-chest being represented in section, the ports in one end of the main valve being represented as open and at the opposite

end as closed. Fig. 2 represents a longitudinal section of the same on the line *x x* of Fig. 1. Fig. 3 represents a detail view, herein after referred to.

The same letters of reference indicate the same parts in all the figures.

a represent the cylinder, *b* the steam-chest, and *c* the valve-seat, of a steam-engine of common and well-known construction, the steam-chest being shown in this instance as attached to the side of the cylinder, which is a common form of construction.

e represents the main valve resting on the valve-seat *c*, and provided with ports 2 2' 2' at each end. Said ports coincide with ports in the valve-seat *c* for the admission to and the escape from the cylinder of the steam in the usual manner. The main valve is operated by the usual devices—viz., an eccentric on the main shaft of the engine connected to the valve-stem, which devices being common and well known, it is not considered necessary to illustrate the same in the drawings.

d d' represent cut-off valves adapted to control the admission of steam to the cylinder through the main valve. Said valves are of the form and construction known as the "grid-iron-valve," each being provided with an opening, *f*, extending longitudinally of the same, so that when they are moved to open the ports 2 2 in the main valve such opening is accomplished by the valves moving only the width of said ports to secure a full opening of the same, as will be understood by reference to ports 2' 2', Figs. 1 and 2. The cut-off valves may have more than one opening, the main valve having a like number of ports.

g g g' represent links attached by pins or studs 3 3 to the valve *e*, and at 4 4 to the cut-off valves *d d'*. Said links stand at an angle to the valves *d d'* of about forty-five degrees when said valves are closed, so that when the main valve moves, in a manner hereinafter described, the valves *d d'* will be moved in the arc of a circle by devices which I will now proceed to explain.

h h', Fig. 1, represent blocks rigidly secured to the lower side of the steam-chest or cast integral therewith. Said blocks are inclined on their upper portions at an angle substantially corresponding to the inclinations of lugs 9 9 9' 9', so that when valve *e* has moved in the

direction of the arrow in Fig. 1 the same movement will carry valve d' in the same direction and cause it to be raised and describe the arc of a circle, said movement rapidly opening the ports $2' 2'$, as explained hereinafter.

$i i'$ represent lifters or dogs pivotally secured to the cut off valves $d d'$, and normally held by springs $l l'$ against pins $j j$ on said valves. The dogs $i i'$ bear, respectively, on the blocks $h h'$, and the pins $j j$ are so arranged that when the dog which each pin accompanies is moving up the incline of the corresponding block and onward in continuation of said movement said dog will be supported rigidly by its pin j , and thus caused to raise the cut-off valve to which it is connected; but when the dog is moving in the opposite direction it will yield to the block and pass over it without raising the valve.

n represents a governor secured to the side of the chest and adapted to be operated from the main shaft of the engine by any suitable means. Said governor is adapted to impart a reciprocating movement to a rod, o , extending downwardly into the steam-chest and connected at its lower end with a disk, p , suitably journaled in a bearing-block, q , secured to the side of the steam-chest. Said rod is provided with suitable packing at the point where it passes through the steam-chest, to prevent the escape of steam therefrom and at the same time allow the rod to move freely up and down.

$r r'$ represent connecting-rods, connected at one of their ends to disk p , and at their other ends to blocks $s s'$, constituting extensions of the blocks $h h'$. Said blocks $s s'$ are adapted to slide on guides $t t'$, passing through the same and rigidly secured at one of their ends to blocks $h h'$, and at their other ends to bearing-block q . Blocks $s s'$, Fig. 3, are provided with tongues $u u'$, which project into blocks $h h'$.

v represents a spring secured to a stud, w , secured to the main valve. Said spring at its outer ends engages with pins $4 4$ in cut-off valves $d d'$, and is adapted to exert a pressure on said valves when in a raised position, to insure their return to their port-covering position when said valves are released by the lifters $i i'$. Said springs are not essential, however, as gravitation may be relied on to hold the cut-off valves in their normal position.

In Fig. 2 I have shown the main valve in a central position on its seat, and the cut-off valve d' as uncovering the ports $2' 2'$ in said main valve. The relative position of valve e to cut-off valve d' when in operation would be that valve e would travel half the distance of the "outside lap"—that is, one-half of the distance that would be required to bring the outside face, 5 , of valve e to the edge of ports $3 3$ in the valve-seat, or vice versa.

The operation of my improved cut-off devices is as follows: It being supposed that the valve e stands in the position represented in Figs. 1 and 2—viz., "on the center"—it will be

necessary to move the engine by hand or "bar her over" until the valve e shall move in the direction indicated by the arrow in Fig. 1 a sufficient distance to bring lifter i into engagement with the inclined face of block h , when, as lifter i moves up said inclined face, the valve d' is raised and at the same time drawn back in the arc of a circle, thus causing valve d' to be drawn back about the same distance as it is raised, thus opening the ports in main valve to the full width and admitting steam to the cylinder with a wide-open port in valve e . The lifter i , after having raised the valve d' to its port-opening position, now travels along the top side of blocks h and s' and over the inner end, z , of the latter, when said lifter i drops over said end of said block, causing the valve to drop and resume the port-covering position of valve d . (The operation of valve d' is attended with that of valve d , each valve performing the same movements and opening and closing the ports in main valve alternately.) To regulate the cut-off movements of the valves $d d'$, the blocks $s s'$ are operated through their connections with the governor n , so that as disk p is rotated in either direction the movement imparted to blocks $s s'$ causes the lifters i to remain on the top side of said blocks for a longer or shorter distance, as required. Blocks $s s'$ being adapted to slide on guides t by the rotation of disk p , and the variations of speed of the engine being imparted to the governor cause a variation in the movement of blocks $s s'$, so that if a longer opening is required said blocks may be drawn out toward each other by the rotation of the disk p in the direction of the arrow on said disk; and if a shorter period of opening is required the blocks $s s'$ are propelled in the opposite direction, allowing lifters i to drop over the ends z of blocks $s s'$, and the valves will resume the port-closing position of valve d' . Lifters $i i'$, being pivotally connected to valves $d d'$, are adapted to yield and allow said valves to assume the position of valve d , and then be brought back to the position shown by springs l .

I claim—

1. The combination of the reciprocating main valve, the cut-off valves movable with and also independently of the main valve, and means, substantially as described, whereby each cut-off valve is caused by the movement of the main valve to move in the arc of a circle, and thereby first uncover and then cover the corresponding ports of the main valve, as set forth.

2. The combination, with the reciprocating main valve, of the cut-off valves, which normally cover the ports of the main valve and are connected to the main valve by swinging links, and devices, substantially as described, whereby each cut-off valve moving with the main valve is also moved independently in the arc of a circle and caused to uncover the corresponding port of the main valve during a part of the movement of the main valve, and is

then released and allowed to assume its normal or port-closing position.

3. The combination of the reciprocating main valve, the cut-off valves connected thereto by swinging links and normally held to close the ports of the main valve, a fixed block for each cut-off valve formed and arranged to first move the corresponding cut-off valve from its normal position, and then release said valve during a movement of the main valve in one direction, and a pivoted dog or raiser upon each cut-off valve arranged to bear upon the corresponding block and communicate the displacing motion therefrom to the valve during the movement of the main valve in one direction, and to yield to the block without moving the valve during the opposite movement of the main valve, as set forth.

4. The combination of the reciprocating main valve, the cut-off valves connected thereto by swinging links and normally held to close the ports of the main valve, the fixed valve-displacing blocks, movable extensions for said

blocks, whereby their length and the time of displacement of the cut-off valves may be varied, and a governor whereby said extensions are controlled, as set forth.

5. The combination of the reciprocating main valve, the cut-off valves connected thereto by swinging links and normally held to close the ports of the main valve, springs arranged to normally hold the cut-off valves in their port-closing position, and the valve-displacing blocks formed and arranged to first move the valves against the pressure of said springs, and then release the valves and permit the springs to close them, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 7th day of February, 1887.

JAMES A. HORTON.

Witnesses:

C. F. BROWN,
A. D. HARRISON.