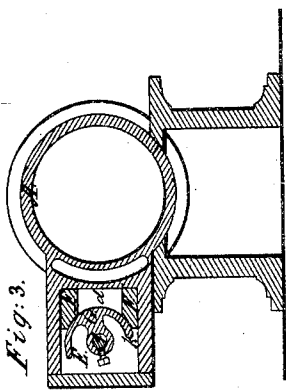


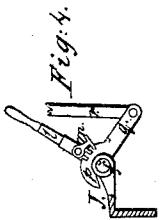
*A.K. Rider.*  
*Cut-off Valve.*

*N<sup>o</sup> 35170.*

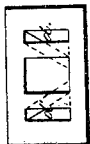
*Patented May 6. 1862*



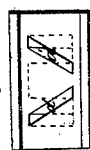
*Fig. 3.*



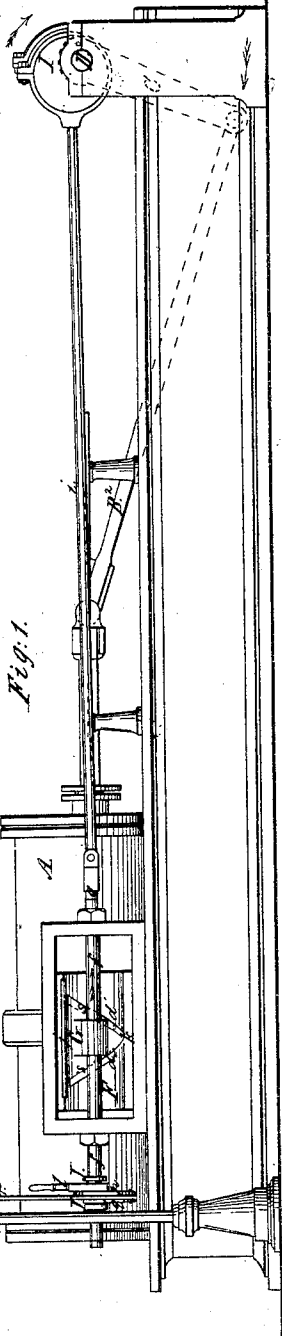
*Fig. 4.*



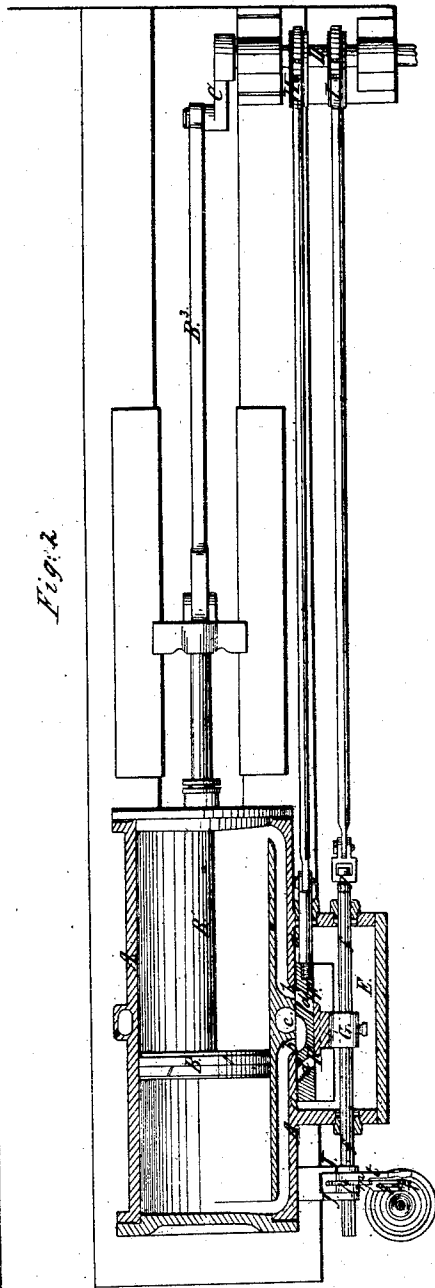
*Fig. 5.*



*Fig. 6.*



*Fig. 1.*



*Fig. 2.*

*Mitgesses.*  
*W. Womb.*  
*J. G. Reed.*

*Inventor.*  
*A. K. Rider*  
*per Messrs. & Co.*

# UNITED STATES PATENT OFFICE.

ALEXANDER K. RIDER, OF HYDEVILLE, VERMONT.

## IMPROVED CUT-OFF VALVE.

Specification forming part of Letters Patent No. 35,176, dated May 6, 1862.

*To all whom it may concern:*

Be it known that I, ALEXANDER K. RIDER, of Hydeville, in the county of Rutland and State of Vermont, have invented a new and useful Improvement in Variable Cut-Offs for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of a horizontal steam-engine with my improvement, representing it with the bonnet of the valve-chest removed to expose the cut-off to view. Fig. 2 is a plan of the same, with the cylinder and valve-chest in section. Fig. 3 is a transverse vertical section through the cylinder, valve-chest, main valve, and cut-off. Fig. 4 is a side view of the hand-gear for varying the point of stroke at which the steam is cut off. Fig. 5 is a front view of the main valve, and Fig. 6 is a back view of the same.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to that class of cut-offs in which the cut-off valve is fitted to the back of a main slide-valve, through which the induction and eduction of steam to and from the cylinder of the engine is effected.

It consists in the construction of the cut-off valve with its ends oblique to the direction of the movement of the main valve, and in so applying the said valve to the back of the main valve that it may work transversely thereto without interfering with the longitudinal movement of the latter valve, which has the outer orifices of its steam-ports arranged obliquely to correspond with the oblique ends of the cut-off valve. This construction of the valves, seat, and ports permits the point of cutting off to be varied throughout the whole length of the stroke of the piston by the transverse movement of the cut-off valve either by hand or by the governor.

To enable others skilled in the art to make and apply my invention, I will proceed to describe it with reference to the drawings.

A is the cylinder, B the piston, B' the piston-rod, B<sup>2</sup> the connecting-rod, C the crank, and D the crank-shaft, all constructed and arranged in the usual manner.

E is the valve-chest, and *a a* the valve-seat,

having the same system of ports, *b, b'*, and *c*, communicating with the cylinder and the exhaust-pipe, as is commonly provided when a single slide-valve is used to effect the induction and eduction of steam at both ends of the cylinder.

F is the slide-valve, having its face constructed in the manner common to the three-port valve, as shown in Fig. 5, but having its back parallel lengthwise with its face, but hollowed out transversely, in the manner best shown in Fig. 3, to form a seat for the cut-off valve G, which is represented of the form of a segment or sector of a cylinder. The induction-ports *d d'*, provided in the said valve F, have their inner mouths or orifices—that is to say, those next its seat *a a*—at right angles to the direction of the movement of the said valve, but their outer orifices—that is to say, those in the concave seat of the cut-off valve—arranged obliquely in opposite directions, as shown in Figs. 1 and 6. This valve F is operated by an eccentric, I, on the crank-shaft in the usual manner.

The segment or sector-shaped cut-off valve G, whose face constitutes a portion of the surface of a cylinder, is attached securely to a concentric stem, *f*, which is arranged parallel with the stem and face of the main valve, and which is fitted to work through stuffing-boxes in the ends of the valve-chest. The oblique ends *s s* of this valve G are parallel with the edges of the oblique orifices of the ports *d d'* of the main valve and meet in a point, *k*, and the length of the said valve may be such that it will just cover the outer edges of both ports *d d'* when its sides, *j*, which are parallel with its axis and its point *k*, lap equally over the ends of the said ports, and its width may be about double that of the length of the ports *d d'*, measured across the back of the valve F. The stem *f* is connected by a swivel, *g*, outside of the valve-chest, with the rod *i*, attached to an eccentric, I, on the crank-shaft. This swivel allows the valve-stem *f* and valve G to be turned about their axis, either by hand or by a governor connected with the stem, without interfering with the operation of the eccentric I and during the longitudinal movement of the said valve produced by the said eccentric. The eccentric I may have the same throw as that of H, which works the main

valve, and when it has such throw and the length of the valve is as before described the said eccentric I should be set about one-eighth of a revolution in advance of II. The stem *f* is represented as having firmly secured to it an arm, *l*, which serves as a handle by which to turn it and the valve G by hand to vary the point of cut off, and a dog, *m*, attached to the said lever, is made the means of connecting the governor-slide *n*, the said dog engaging with a notched sector-plate, *p*, (see Figs. 1, 2, and 4,) which is so fitted to the stem as to allow the latter to turn in it when necessary to alter the adjustment of the valve, and the said sector-plate having rigidly attached to it an arm, *q*, which is connected by a rod, *r*, with the governor-slide.

In order to enable the stem and valve to move longitudinally independently of the handle *l* and sector-plate *p*, the stem is fitted to the said handle and sector-plate with a feather and groove, and the said plate and handle are prevented from moving in the direction of the length of the stem by means of a bracket, J, which is secured to the bed-plate or framing of the engine, and which encircles the stem on opposite sides of the said handle and sector-plate.

In the operation of the engine the cut-off valve G, deriving motion from the eccentric I, works back and forth on the back of the main valve F, and owing to the advanced position of its eccentric it opens the ports *d d'* of the main valve in turn before the said ports commence opening to their respective cylinder-ports *b b'* as the piston arrives at the end of its stroke. Before the piston has traveled far in the new stroke the movement of the valve G is reversed relatively to F, and it commences to close the port *d* or *d'*, as the case may be, and cut off the steam. This closing of the port *d* or *d'*, and consequent cutting off of the steam, is effected at an earlier or later point in the stroke of the piston, according as the cut-off valve is turned to a position in which a longer or shorter part of the said valve works over the ports *d d'*. By turning the valve-stem *f* to bring the pointed side of the valve nearer to the ports *d d'* the cutting off is caused to take place later in the stroke, and by turning the stem in the opposite direction an opposite effect is produced, and by turning the said valve far enough in either direction it may be made to cover so little of the main valve as never to close the ports entirely, and so permit the steam to enter the cylinder throughout the whole stroke of the piston, or cover so much as never to entirely uncover the ports *d d'*, and so to cut off the steam entirely from the cylinder. In Fig. 1 the valve G is represented as just cutting off the steam from the port *d'*, the piston being just beyond half-stroke and both valves moving in the direction of the arrow shown upon

the stem *f* and in the opposite direction to the piston, and G moving faster than F, owing to the eccentric H having only just "passed the center." The governor is so connected that by an increased speed of the engine it will be caused to turn the valve-stem *f* in a direction to bring the longer side, *j*, of the valve G toward the ports *d d'*, and vice versa. When it is desired to have the steam admitted to the cylinder through a greater or less portion of the stroke, the dog *m*, before mentioned, is shifted to a higher or lower notch in the sector-plate *p*. When it is not desired to apply the governor in connection with the cut-off, the sector-plate *p* is to be fixed, and the stem *f* can be turned by the lever *l* to bring the valve G to a position to cut off at any fixed point in the stroke, and secured by dropping the dog *m* into a suitable notch in the sector-plate.

Two cut-off valves of substantially similar construction may be used in combination with separate main valves at each end of the cylinder, both of said cut-off valves being attached to the same stem. The two cut-off valves, however, will only require to have each one oblique side, as each will only have to work in connection with one main-valve port.

The cut-off valve G may also be constructed flat, operating on a plane surface on the back of the main valve, being in such case so attached to the stem *f* as to allow of its rectilinear motion at right angles to the motion of said stem when the latter is partially rotated on its axis, the oblique ends of the valve and oblique ports producing substantially the same effect as the cylindrical arrangement above described. The angular-ended cut-off valves, whether cylindrical or flat, may also be used in separate valve-chests, in connection with oblique ports and oscillating reciprocating valve-stems, as before described.

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

1. The cut-off valve G, having its end or ends oblique to the direction of the movement of the main valve and applied to the latter valve, in combination with a stem, *f*, or its equivalent, by which it is moved transversely to the main valve, and operating substantially as described, in combination with an oblique arrangement of the outer orifices of the main-valve ports, for the purpose herein set forth.

2. Combining the stem *f* of the so constructed and applied cut-off valve with a governor by means of a handle or hand-lever, *l*, a dog, *m*, a sector-plate, *p*, and an arm, *q*, substantially as and for the purpose herein described.

ALEXR. K. RIDER.

Witnesses:

ROWLAND WALTER,  
MARSHALL JONES.