

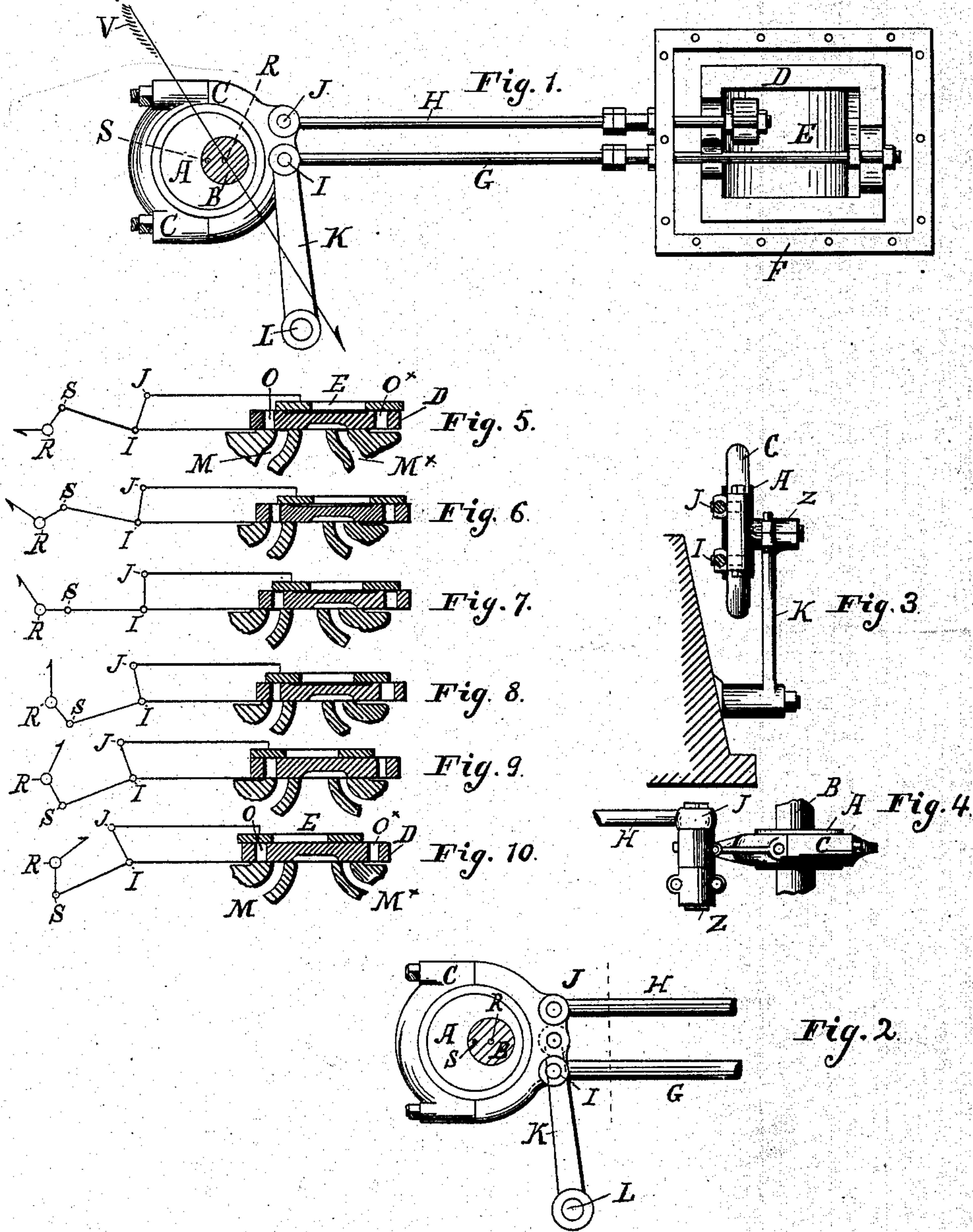
(No Model.)

W. G. CHAPIN.

VALVE MOTION FOR STEAM ENGINES.

No. 322,348.

Patented July 14, 1885.



Wm G. Chapin.

INVENTOR

By his Attorneys,  
H. C. Strawbridge,  
Benson Taylor.

WITNESSES:

A. H. Leubner  
John D. Lutz



# UNITED STATES PATENT OFFICE.

WILLIAM G. CHAPIN, OF BROOKLYN, NEW YORK, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO JAMES T. HALSEY, OF RICHMOND, VIRGINIA.

## VALVE-MOTION FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 322,348, dated July 14, 1885.

Application filed April 16, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM G. CHAPIN, of the city of Brooklyn, county of Kings, and State of New York, have invented a new and useful Valve-Motion for Steam-Engines, of which the following is a specification.

My invention relates to that class of steam-engines in which steam is alternately admitted to opposite ends of the steam-cylinder through suitable ports by means of a main valve adapted to slide over these ports, and to that class of valves in which the supply of steam is admitted through suitable openings or passages in the main valve and cut off by means of a secondary or cut-off valve sliding upon the main valve and over the openings in it.

The object of my invention is to provide a simple and effective means for giving a proper motion to the secondary or cut-off valve.

A preferred form of a convenient embodiment of my invention is hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a view in side elevation of the steam-chest, main valve, cut-off valve, and my apparatus for giving motion to said cut-off valve. Fig. 2 is a partial detailed view in side elevation of a modified form of my apparatus, as hereinafter set forth; Fig. 3, an end elevational view of the modified apparatus represented in Fig. 2, and Fig. 4 a top plan detail of the same. Figs. 5, 6, 7, 8, 9, and 10 are respectively central sectional elevational details through the main valve and the cut-off valve, representing their positions with respect the one to the other during a half-revolution of the eccentric, and also representing the respective positions of said valves with regard to the ports in the steam-chest and the respective positions of the centers of the eccentric, the shaft, and of the pins or points of attachment of the two valve-stems to the eccentric-strap, as hereinafter more fully explained.

In the drawings, A is the eccentric, and B the eccentric-shaft, to which the eccentric is rigidly connected in the usual manner.

C is the eccentric-strap, which is applied to the eccentric so as to be actuated thereby, and

is designed, in connection therewith, to afford a means of connection and actuation for the valve-stems and valves.

D is the main valve, and E the cut-off valve.

F is the steam-chest.

G is the valve-stem which operates the main valve, and H the valve-stem which operates the cut-off valve. These stems are connected on the one hand in the usual manner with the valves, and on the other hand are connected with the eccentric-strap by means of the pins I and J, I connecting the valve-stem G of the main valve, and J the valve-stem H of the cut-off valve.

K is an arm pivoted to the eccentric-strap, and also to the bed of the engine or other fixed support exterior to the strap, by means of the pivot L. In the construction represented in Fig. 1, this arm is pivoted to the strap by means of the pivot I, which connects the valve-stem G of the main valve to said strap.

M M<sup>x</sup> are ports in the steam-chest F.

O O<sup>x</sup> are steam passages or openings in the main valve.

Such being a description of a convenient embodiment of my invention, its operation will be readily understood. The movement of the eccentric upon its shaft actuates the eccentric-strap, which in turn, subject to the control of the arm, actuates the valve-stems, which in turn operate the valves in the usual manner.

The object of the arm is simply to guide the motion of the pin I in the direction of the motion of the valve.

The main valve herein mentioned is the well-known plain slide-valve for admitting steam into the ports M M<sup>x</sup> through the passages O O<sup>x</sup>. The setting and the motion of this valve are not different from those adopted for the operation of plain slide valves of this character generally.

The cut-off or secondary valve, which slides upon the main valve, is connected by means of the valve-stem H and the pin J with the eccentric-strap C.

The position of the pin J with respect to the pin I is such that a line through the cen-



ter of the two would be perpendicular to a line through the pin I and the center S of the eccentric.

R represents the center of the shaft, and the arrow V the position of the crank-pin relatively to the position of the eccentric.

The length of the cut-off valve with respect to the distance between the outer edge of the passage O and that of the passage O<sup>x</sup>, may be varied at will, so as to effect an earlier or later closure of the cut-off valve.

In the detailed views, respectively numbered Figs. 5 to 10, I have represented the various positions of the two valves with respect to each other, to the ports in the steam-chest, and to the various positions of the pins I and J and the centers of the eccentric and of its shaft. The lettering in these figures corresponds to the lettering in Fig. 1, and while I have illustrated in full drawings the positions of the valves, I have simply indicated by graphic lines and the letters by which I have denominated them the pins and the centers referred to.

In Fig. 5 the piston is at one end of its stroke, the main valve is about to open, and the cut-off valve is wide open. In Fig. 6 the crank is supposed to have turned one-twelfth of a revolution, the main valve is nearly open, and the cut-off also is nearly open. In Fig. 7, at one-sixth of a revolution the main valve is wide open and the cut-off valve has just closed. In Fig. 8, at one-quarter of a revolution or one-half stroke, the cut-off remains nearly at rest on the main valve. In Fig. 9, at three-quarters stroke, the main valve closes and the cut-off is beginning to move more rapidly upon it, and in Fig. 10 the cut-off valve has reached the full limit of its travel upon the main valve.

In all of the above figures the left-hand extremities of the valves are those considered.

These diagrams taken together are illustrative of the respective positions of the several members and parts at various stages of one half of a revolution of the eccentric. The positions during the remaining half of the revolution are correspondingly opposite, and may be considered as represented by the positions of the corresponding parts considered upon the opposite (right hand) ends of the valves from those considered in the description of the figures referred to.

By the above arrangement I am enabled to make the motion of the cut-off valve most rapid when the main valve is at the end of its travel, so that I am enabled also to open the valves wide enough to give the steam a ready entrance, and then to close them with a quick motion as early or as late in the stroke as I desire, and accomplish the same by means so simple and positive in its action as to insure entire reliability.

I have represented in Figs. 2, 3, and 4 the arm K, connected to the eccentric-strap at a point, Z, intermediate between the pins I and

J. This construction effectuates the same result as the construction first described, and, so far as said result goes, it would be practically the same, whether the connection is made above or below the pivot I, provided it be on a line through the pivots I and J.

In practice the construction represented in Figs. 2, 3, and 4 is, perhaps, the most available.

I have shown a flat sliding valve; but my invention is equally applicable to a round piston-valve.

While said invention as herein described is applied to a steam-engine, it is, of course, equally applicable to an air-engine employing a kindred construction of valves.

I do not claim as novel with me the use of a main valve provided with a cut-off valve sliding upon it; nor yet of an eccentric-strap to which two valve-stems are attached; but

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

1. The combination, in an air or steam engine, of a steam-chest, a main valve operating in connection therewith, a cut-off valve sliding upon said main valve, a valve-operating eccentric, an eccentric-strap surrounding and actuated by said eccentric, a valve rod or stem pivoted to said eccentric-strap and connected direct with the main valve, and a valve rod or stem likewise pivoted to said eccentric-strap and connected direct with the cut-off valve, the arrangement and operation being substantially such as are hereinbefore set forth.

2. The combination, in an air or steam engine, of a steam-chest, a main valve operating in connection therewith, a cut-off valve sliding upon said main valve, a valve-operating eccentric, an eccentric-strap surrounding and actuated by said eccentric, a valve rod or stem pivoted to said eccentric-strap and connected direct with the main valve, a valve rod or stem likewise pivoted to said eccentric-strap and connected direct with the cut-off valve, and a rocking arm pivoted to a fixed point exterior to the eccentric-strap and also pivoted to said eccentric-strap, substantially as and for the purposes specified.

3. The combination, in an air or steam engine, of a steam-chest, a main valve operating in connection therewith, a cut-off valve sliding upon said main valve, a valve-operating eccentric, an eccentric-strap surrounding and actuated by said eccentric, a valve rod or stem pivoted to said eccentric-strap and connected direct with the main valve, a valve rod or stem likewise pivoted to said eccentric-strap and connected direct with the cut-off valve, and a rocking arm pivoted to a fixed point exterior to the eccentric-strap and also pivoted to said eccentric-strap at a point coincident with the pivot of the main valve-stem, substantially as and for the purposes specified.

4. The combination, to form a valve-gearing



for an air or steam engine, of a steam-chest,  
a main valve operating in connection there-  
with, a cut-off valve sliding upon the main  
valve, a valve-operating eccentric, an eccen-  
5 tric-strap connected with and actuated by said  
eccentric, a valve-rod pivoted to the eccentric  
and connected direct with the main valve, a  
second valve-rod pivoted to the eccentric in  
line above the valve-rod last mentioned and  
10 connected direct with the cut-off valve, and a

strap-controlling arm pivoted to a fixed point  
exterior to said arm and also pivoted to said  
strap at a point on a line joining the pivots  
of the valve-stems, substantially as set forth.

In testimony whereof I have hereunto signed 15  
my name this 3d day of February, A. D. 1883.

W. G. CHAPIN.

In presence of—

CHARLES P. FLANIGAN,  
JOHN MCKICOL.