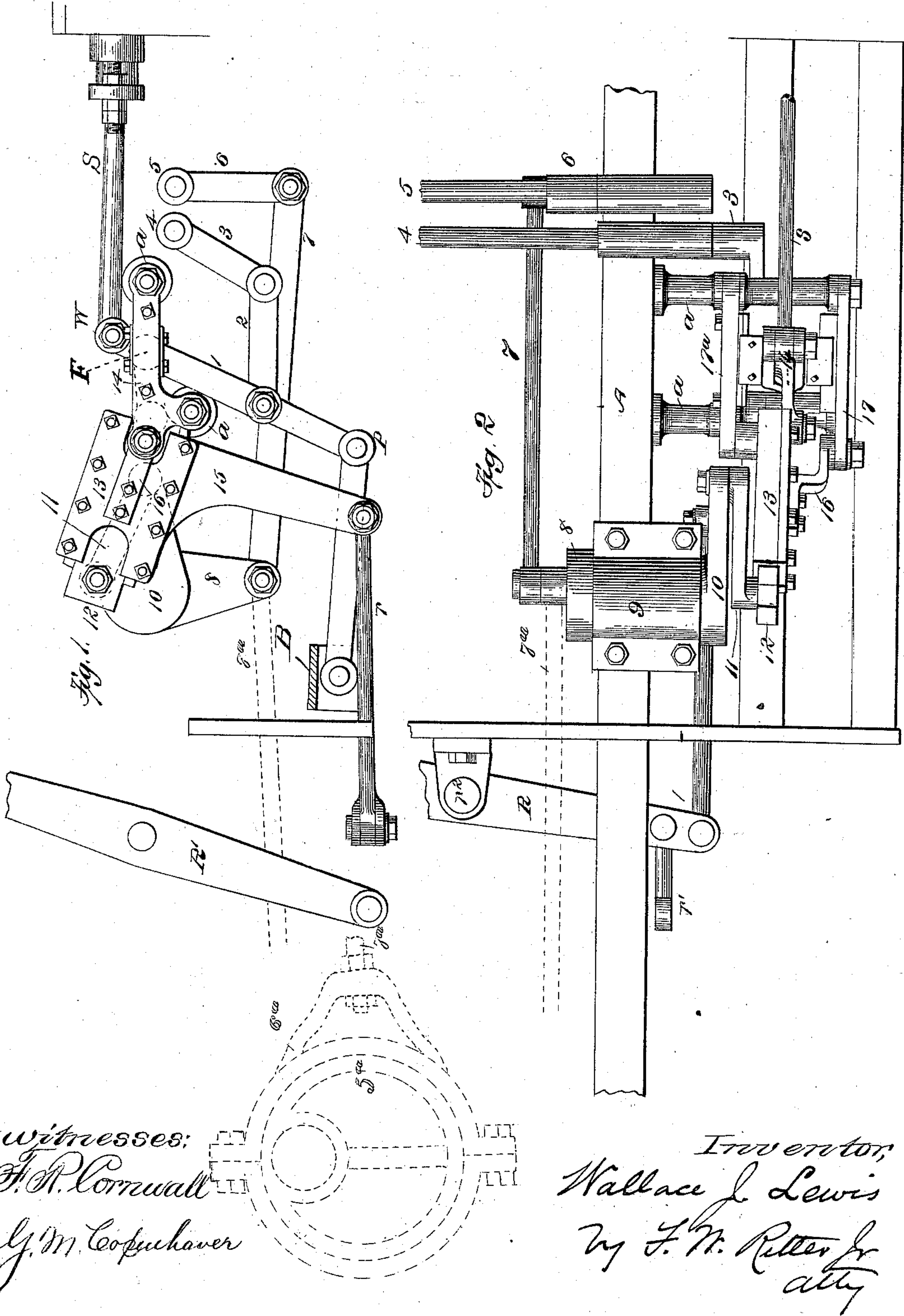


(No Model.)

W. J. LEWIS.  
VALVE GEAR.

No. 535,545.

Patented Mar. 12, 1895.



Witnesses:  
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att'y



# UNITED STATES PATENT OFFICE.

WALLACE J. LEWIS, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE LEWIS VALVE GEAR COMPANY, OF EAST ST. LOUIS, ILLINOIS.

## VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 535,545, dated March 12, 1895.

Application filed March 8, 1892. Serial No. 424,158. (No model.)

*To all whom it may concern:*

Be it known that I, WALLACE J. LEWIS, residing at the city of St. Louis, State of Missouri, have invented certain new and useful  
5 Improvements in Valve-Gear; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of a valve gear embodying my invention, the side frame which supports the gear being omitted, the full lines indicating the connections preferred when the throw of the valve is effected by the piston of the opposite side, and the dotted lines  
15 to the left of the drawing indicating the preferred connections when the throw of the valves is effected by an eccentric on the driving axle, and Fig. 2, is a plan view of the parts shown in full line Fig. 1, a portion of the supporting frame being shown.  
20

Like symbols refer to like parts wherever they occur.

My invention relates to the construction of that class of valve gear wherein the move-  
25 ments to overcome the lap and lead of the valve, and the throw of the valve are effected by different forces,—as for instance, the two opposite pistons, or cross-heads, where two engines are employed as in the case of locomotives, marine engines, &c. For purposes  
30 of illustration I have shown the novel combinations connected so as to obtain the movement to overcome the lap and lead from one side and the throw from the opposite side, and  
35 through the medium of rock-shafts (as in the patent of Matton, No. 285,286, and my own patents, Nos. 331,799 and 355,770); but do not intend the same as a matter of limitation, for said movements may also be obtained from ec-  
40 centrics on a driving axle or its equivalent;—and further, the novel combination which embraces the unit of construction may be used with a single engine. I have therefore added  
45 to Fig. 1, dotted lines which taken in connection with the description will clearly indicate to any one skilled in the art, how my invention may be applied to single engines as well as double engines, and how the power to move the valves may be applied by eccentrics as  
50 well as cross-heads or rock-shafts.

The function of the valve being to regulate

the alternate admission and discharge of steam at each end of the cylinder, the valve is accordingly set so as to be at a point beyond the middle of its travel—the required  
55 lap and lead—when the piston is at the beginning of its stroke, and in coming to said position the valve overcomes the lap and lead so that the admission of steam may fill the clearance space at the beginning of the stroke  
60 of the piston.

The travel of a slide-valve operated by the ordinary link motion is slightly greater during its passage over the middle portion of its stroke than it is at the outer portions thereof.  
65

In order to work effectively and economically either with full boiler pressure or expansively, it is desirable that the middle portion of the valve travel should be accelerated and the remainder of its travel correspond-  
70 ingly retarded, and the longer the retarded movement can be maintained consistent with the next following rapid movement, the better will be the results.

To accelerate the middle portion of the  
75 travel of the valve and retard the remainder of its travel, I interpose between the valve and its two sources of movement a floating lever with which said powers are connected, and in order to reverse the engines I provide  
80 a movable slide-box and a slide in said box connecting the slide-box with the reversing lever, and interposing the slide between the floating lever and one of said sources of movement, whereby engines having valve-gear of  
85 the general character specified may be readily reversed with the exercise of much less power than is now required—and the slide valves may be held at any desired point of  
90 cut-off.

There are other, minor, features of invention, all as will hereinafter more fully appear.

I will now proceed to describe my invention more fully so that others skilled in the art to which it appertains may apply the  
95 same.

In the drawings, which show the unit of organization or the combination as applicable to a single engine, and which is to be doubled for a locomotive or double engine—A indi-  
100 cates a portion of one side of the frame, and B the cross-head of the piston. Connecting



said cross-head B, or its equivalent with the stem S of the slide valve of said side, is a floating lever 1, which imparts to said valve its movement to overcome the lap and lead; and connecting said floating lever with the arm 3, of a long rock-shaft 4, is a link 2, whereby the "throw" of the valve on the opposite side is effected.

5, indicates a second long rock-shaft which extends transversely of the locomotive frame and at its distant end is connected with the floating lever (1) of the opposite engine. Said long rock-shaft 5, is provided with a crank arm 6, through which it is connected by a link 7, with one arm 8 of a short rock-shaft 9, journaled in the frame A, the other arm 10, of said short rock-shaft being connected by a link 11, with a slide 12, adapted to move in a pivoted guide-box 13, the opposite end of said slide 12, being connected to the floating lever 1, by a terminal link 14, as indicated in dotted lines, Fig. 1. As the shaft 5, has its distant end connected with the floating lever and cross-head of the opposite side, it will be apparent that through the medium of the devices 5 to 14, just described, the "throw" of valve stem S will be effected from the piston of the opposite side. In case however, it is desired to apply the power to the floating lever by means of eccentrics instead of rock-shafts, or to use the devices in conjunction with a single engine, the links 2 and 7, and the long rock-shafts 4 and 5, may be omitted, and an eccentric (5<sup>a</sup>) and link (7<sup>a</sup>) as indicated in dotted lines on the left of Fig. 1, may be employed to impart the throw to the valve gear mechanism, the floating lever 1, receiving its movement to overcome the lap and lead either from the cross-head B, as shown, or from a second eccentric and link connection similar to that shown in dotted lines.

In order to obtain a simpler and efficient reversing mechanism, and one which will distribute the friction over a larger surface and reduce the power required to operate it, I arrange the slide 12 in a guide-box 13, movably supported as at 16, on a bracket 17—17<sup>a</sup>, secured to pillars *a, a*, projecting from the frame A. The pivot 16 should be at such a point on the line between the center of the short rock-shaft 9 and the point of attachment of terminal link 14 to floating lever 1, relative to the respective lengths of the slide bar and the terminal link, as will impart the required travel to the lever 1, equal distances from its central position. It is important that the point of attachment (F) of the terminal link to the floating lever should be confined by suitable guides to move in a straight line. In the present device, this action is secured by constructing a cross-head on the floating lever at the F point, the ends of the cross-head having recesses, which confine it to projecting bars on the brackets 17 and 17<sup>a</sup>.

Integral with or connected to the guide box 13, is a pendent arm 15, by which the rotation of the movable slide box 13 may be effected,

and said arm is connected by a link *r* with a rock-beam R, pivoted as at *r*<sup>2</sup>, and thence by an intermediate link *r'* to the reversing lever R'. 70

When through the medium of the reversing lever and arm 15, or their equivalents, the pivoted guide-box 13 is moved into its extreme position, either above or below, the valve will be caused to work at full cut-off, and at intermediate positions a graduated travel and cut-off will be obtained, while when the slide bar is in the plane passing through the point of attachment of link 14, to floating lever 1, and through the center of short rocker-shaft 9, the travel of the valve will be limited to its lap and lead. 80

If the rocker arm 10, is above the line and the slide bar is also raised the floating lever 1, will be caused to move backward, and if the arm 10, is below the line and the slide bar raised above the line, the floating lever 1, will be caused to move forward. 85

The operation of the valve gearing hereinbefore described will be as follows: From the cross-head B, or equivalent source, the power which controls the movement to overcome the lap and lead of the valve is applied to the floating lever 1, at P, the connection of the terminal link 14 with the floating lever as at F, acting for the time being as the fulcrum, so that the lever may be said to be for the time being a lever of the first order. Next the power which controls the throw of the valve is applied to the floating lever at the points F, and P in turn becomes the fulcrum, and the lever one of the third order; but as these two movements, whether the same be derived from eccentrics (5<sup>a</sup>, &c.) or from the cross-head B—of opposite sides—do not synchronize, their courses are at one moment in the same direction, and a moment later in opposite directions. When, therefore, the points P and F of the floating lever 1, are moving in the same direction, the slide-valve moves less rapidly or is retarded in its movement, and when the points P and F are moving in opposite directions, the movement of the slide valve is accelerated, with the results and advantages hereinbefore pointed out. 115

Having thus described the nature and operation of my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a valve gear the combination with a floating valve-lever, operated at two separate points by independent movements respectively from each engine of a double engine, whereby an accelerated or retarded motion can be given to the valve, of a reversing lever provided with a slide-box, and a slide in said box connected to said valve-lever by which one of said movements is communicated, whereby the double engine can be reversed and the slide valves thereof held at any point of cut-off desired, substantially as and for the purposes specified. 120 125 130

2. In a valve gear mechanism, the combination with the valve of a floating lever, connections for actuating the same, the whole ar-



5 ranged so that said lever is alternately a lever of the first and third order, a slide connected with the floating lever, and a movable slide box, substantially as and for the purposes specified.

10 3. In a valve gear, the combination with the valve of a floating lever 1, having one end connected with the cross-head or its equivalent, and the other with the valve stem, a slide 12 and link 14, which connects the slide and floating lever, a pivoted guide box for the

slide, and a rock-shaft which actuates the slide; substantially as and for the purposes specified.

In testimony whereof I affix my signature, 15 in presence of two witnesses, this 5th day of March, 1892.

WALLACE J. LEWIS.

Witnesses:

D. MCARTHUR,  
L. B. FISH.