





# UNITED STATES PATENT OFFICE.

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## VALVE-MOTION.

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*To all whom it may concern:*

Be it known that I, CHARLES F. SLEIGH, a citizen of the United States of America, and a resident of Parkersburg, in the county of Wood and State of West Virginia, have invented certain new and useful Improvements in Valve-Motions, of which the following is a specification.

This invention relates to certain new and useful improvements in valve-motions, and while designed, primarily, for locomotive-engines it is to be understood that the invention is not restricted to such class of engines, but that it is applicable to stationary engines of different types, and in the following description, while for convenience sake the invention herein disclosed will be referred to particularly as applied to a locomotive-engine, it is to be understood that it is in no wise limited thereto.

The invention has for its objects, among others, to provide an improved valve-motion whereby the construction is simplified, the number of parts reduced, and a more perfect, reliable, and efficient motion obtained. I dispense with one eccentric and form a pivotal connection between the eccentric which is employed and the lower end of the rocker-arm, and I form a link on the outside of the rocker-arm which takes its center at the center of the rocker-arm, whereby the link has an oscillatory movement about a fixed point, but does not reciprocate vertically. Within this link is disposed a shifting die-block, upon which is pivotally mounted an arm the upper end of which has connection with the valve-stem of the slide-valve and the lower end has pivotally connected therewith a rod the opposite end of which has pivotal connection with the cross-head, which latter is connected in the usual manner with the piston-rod and also with the connecting-rod, which is connected in well-known manner with the crank-arm. The die-block is mounted so as to be adjusted vertically in the link by suitable means, so as to change the motion when desired. It is to be noted that the link is worked from one eccentric, and the valve takes its motion from the cross-head, while the die-block is in the center of the link,

which gives to the valve only the required motion needed for lead and lap. When the die-block is moved above the center, the valve takes motion from both the eccentric and the cross-head. When the die-block is moved to a point below the center, the valve likewise takes a motion from both the eccentric and the cross-head; but, as will be readily understood, the engine will be reversed. It will thus be seen that when the die-block is at a point below the center I obtain a direct motion to the valve, and when the die-block is in its uppermost position an indirect motion is obtained. It will further be noted that by the construction above outlined and more fully described I accomplish with one eccentric and particular form of connections what has heretofore required two eccentrics on each side with the necessary connections and a consequent reduction in the number of wearing-joints employed, thus providing a more substantial and efficient valve-motion, as will further appear as the description proceeds.

The invention in its preferable form is clearly illustrated in the accompanying drawings, which, with the figures of reference marked thereon, form a part of this specification, and in which—

Figure 1 is a side elevation with parts in section, showing the application of the invention to a locomotive-engine. Fig. 2 is an enlarged section on the line 2 2 of Fig. 1. Fig. 3 is a view, partly in section and partly in elevation, looking at the back of the link.

Like numerals of reference indicate like parts throughout the several views.

Referring now to the details of the drawings, 1 designates a cylinder, 2 the piston, and 3 the piston-rod thereof, all these parts being of common and well-known construction in this art, in this instance being shown as that of a locomotive-engine.

4 is the valve-chest, and 5 and 6 the ports or passages leading from opposite ends of the cylinder 1 to said valve-chest.

7 is the valve, in this instance shown as a slide-valve of known construction, and 8 is a valve-rod connected therewith in the usual manner. The valve-rod 8 passes through an



ordinary stuffing-box 9, and the piston-rod 3 passes through a similar stuffing-box 10 on the end of the cylinder. All of these parts, it will be understood, may be of any well-known or approved form of construction and do not form *per se* any part of the present invention.

11 designates a portion of the framework from which depends the guide-yoke 12 and the pedestal-jaw 13, these parts also being of any suitable form of construction.

14 represents the cross-head slide or guide, upon which the cross-head 15 is mounted for reciprocation. The piston-rod 3 is connected, as at 16, with this cross-head.

17 is the pitman or connecting rod, pivotally connected at one end with the cross-head 15 and is mounted to reciprocate through a suitable guide on the guide-yoke 12. Its other end is pivotally connected, as at 18, with the crank-arm 19 on the shaft or axle 20, in this instance being shown as the axle of the engine, the wheel 21 being indicated by dotted lines.

22 is an eccentric on the shaft or axle 20, this eccentric being of the well-known or any approved form of construction.

23 is the eccentric-rod, carried by the eccentric 22 and pivotally connected, as at 24, with the lower end of the rocker-arm 25, the body portion of which is mounted in a suitable rocker-box 26, mounted on the frame 11. In Fig. 2 the body portion 25<sup>a</sup> of the rocker-arm is shown as mounted in the boxing 26, the cap of said boxing being removed for the purpose of better illustrating the parts. As seen best in Fig. 2, the body portion of the rocker-arm is formed with the flanges 27 or bridge, to which is secured the link 28, in this instance bolts 29 being shown as employed for this purpose, although it is evident that other means may be provided, or the link in some cases may be made integral with the body portion of the rocker-arm 6, being a mere matter of convenience in manufacture.

30 is a die-block fitted between the parallel side portions of the link, as seen clearly in Figs. 1 and 2. Mounted in this die-block is a pin or bolt 31, which in this instance is shown as separate from and held in the block; but it is evident that this may be integral therewith, if desired. This pin forms the pivot of the arm 32, to the upper end of which is pivotally connected, as at 33, the rod 34, that is connected with the valve-stem 8 by a suitable means, such as a knuckle-joint 35 of ordinary construction. The lower end of this arm 32 is pivotally connected, as at 36, with the rod 37, the other end of which is pivotally connected, as at 38, with a bracket or projection 39 on the cross-head 15. Any other convenient means may be employed for forming this connection between the rod 37 and the cross-head.

40 is a lifting-arm the lower end of which is mounted on the pin 31, as seen best in Fig.

2, and its upper end is pivotally connected, as at 41, with the horizontal arm of the bell-crank lever 42, carried on the shaft 43, the end of the other arm of the bell-crank lever being pivotally connected, as at 44, with a rod or bar 45, which may extend to any convenient position and operate by the ordinary reverse quadrant and lever or other means which it is not thought necessary to herein illustrate or describe. The shaft 43 is shown in this instance as mounted in suitable bearing or boxing 46 on the bracket or pedestal 47, rising from the frame 11.

With the parts constructed and arranged substantially as hereinbefore described the operation, which will be readily understood from the foregoing description when taken in connection with the annexed drawings, is, briefly stated, as follows: As shown in Fig. 1, the die-block is shown in its central position and the engine on its forward center, the valve being shown about to admit steam to the forward end of the piston. The piston being moved in the direction of the arrow in Fig. 1, the cross-head 15 will move in the same direction and with it the rod 37. This will move also portion of the arm 32 in the direction of the arrow thereon, and the upper end, consequently, in the opposite direction—that is, in the direction of the arrow projecting from said upper end. This moves the valve in the direction of the arrow attached thereto, it being understood that in the meantime the steam admitted to the forward end of the cylinder has advanced the piston to nearly the end of its stroke to the rear end of the cylinder. As the valve is moved in the direction of the arrow affixed thereto steam is shut off from the port 6 and admitted through the port 5 to the rear of the cylinder to force the piston in the opposite direction. It will be understood from the drawings that with the parts in this position the valve takes no motion from the eccentric, but merely is moved for what is known as “lead and lap.” If the shaft-arm 45 is moved in the direction of the arrow in Fig. 1, the bell-crank lever 42 will be operated so as to cause the arm 40 to throw the die-block downward below the center in a manner which will be readily understood and the engine will be operated to move the wheel 21 in the direction of the arrow thereon, the valve 7 now taking motion from both the eccentric and the cross-head. When the shift-rod 45 is moved so as to throw the die-block above the center, the valve takes motion from both the eccentric and the cross-head and the engine is reversed and the wheel 21 is revolved in the opposite direction.

By the construction hereinbefore described should the engine be on center, the die-block being also in its central position, the said die-block may be moved either up or down without affecting the valve. It will also be noted that the link, while having an oscillatory movement on the rocker-arm, does not move vertically. It will be further noted that the move-



ment of the arm 32 and its connections in no wise affects the arm 40 and its connections with the shift-rod.

It is to be noted that the eccentric is always set on quarter with relation to the crank and is not advanced in lead, as in ordinary constructions of linked valve-motions, and that while the engine is on center the full throw of the eccentric is either up or down, as the case may be, and that when the parts are in this position the link stands vertically.

From the above it will be seen that I have devised a novel, compact, simple, and efficient form of valve-motion, and while the structural embodiment of the invention as hereinbefore described is what I at the present time consider preferable it is evident that the same is subject to changes, variations, and modifications without departing from the spirit of the invention or sacrificing any of its advantages, and I do not, therefore, intend to restrict myself to the details of construction herein disclosed, but reserve the right to make such changes, variations, and modifications as come properly within the scope of the protection prayed.

What I claim as new is—

1. In a valve-motion for engines, an oscillatory link, an eccentric, a rock-arm having one end connected with the eccentric, a die-block movable in the link and means connected with the cross-head and valve and pivotally connected with said die-block.

2. In a valve-motion for engines, an oscillatory link, an eccentric, a rock-arm having its lower end connected with said link mounted to prevent vertical reciprocation thereof, a valve, a die-block mounted in the link, a cross-head and connections pivotally mounted on the die-block, substantially as described.

3. In a valve-motion for engines, a rocker-arm, a link movable therewith, an eccentric connected with the rocker-arm, a die-block movable in the link independent of the rocker-arm and an arm pivoted on said die-block and connecting the same with the valve and cross-head.

4. In a valve-motion for engines, a rocker-arm, a link movable therewith and thereon as a center, a crank-arm on the main shaft, an eccentric connected with the rocker-arm, a valve, a cross-head, a connection between the die-block and the valve and cross-head, the same being pivotally mounted on the die-block, a die-block movable in the link, means for shifting the position of said die-block in the link.

5. In a valve-motion for engines, a rocker-arm, a link movable therewith and thereon as a center, a crank-arm on the main shaft, an eccentric connected with the rocker-arm, a valve, a cross-head, a connection between the cross-

head and said crank-arm, a die-block movable in the link, a rocking connection between said die-block and the valve and the cross-head pivotally mounted on the die-block, and means for shifting said die-block to either side of its central position.

6. In a valve-motion for engines, a rocker-arm, a link movable therewith and thereon as a center, a crank-arm on the main shaft, an eccentric connected with the rocker-arm, a valve, a cross-head, a connection between the cross-head and said crank-arm, a die-block movable in the link, a connection between said die-block and the valve and the cross-head, the same being pivotally mounted on the die-block, and means for shifting said die-block to either side of its central position, said means being unaffected by the movement of the link.

7. In a valve-motion for engines, a single link, a single eccentric and connections for actuating the same, a die-block movable on the link, and an arm pivotally mounted on the die-block coöperating with the movement of the link and operatively connected with the valve and cross-head.

8. In a valve-motion for engines a single link, a single eccentric and connections for actuating the same, a die-block movable on the link, an arm pivotally mounted on the die-block coöperating with the link and operatively connected with the valve and cross-head, and mechanism for adjusting said arm and unaffected by the movement of the link.

9. In a valve-motion for engines a single link, a die-block movable on the link, a single eccentric, an arm pivotally mounted between its ends on the die-block, a valve and connections with said arm whereby the valve is moved independent of said eccentric.

10. In a valve-motion for engines a single link, a die-block movable on the link, a single eccentric, an arm pivotally mounted on the die-block, a valve and connections with said arm whereby the valve is moved independent of said eccentric, and a cross-head connected with said arms, and means for shifting said die-block in the link for giving motion to the valve.

11. In a valve-motion for engines a rocker-arm, a link mounted to move therewith and thereon as a fixed center, a die-block movably mounted on the link, means for actuating said rocker-arm and link, a cross-head and an arm pivoted on the die-block and connections with said arm for actuating the valve independent of said link.

Signed by me at Washington, District of Columbia, this 1st day of November, 1902.

CHARLES F. SLEIGH.

Witnesses:

E. CATESBY ROWZEE,  
GEO. W. BANVILLE.