

(No Model.)

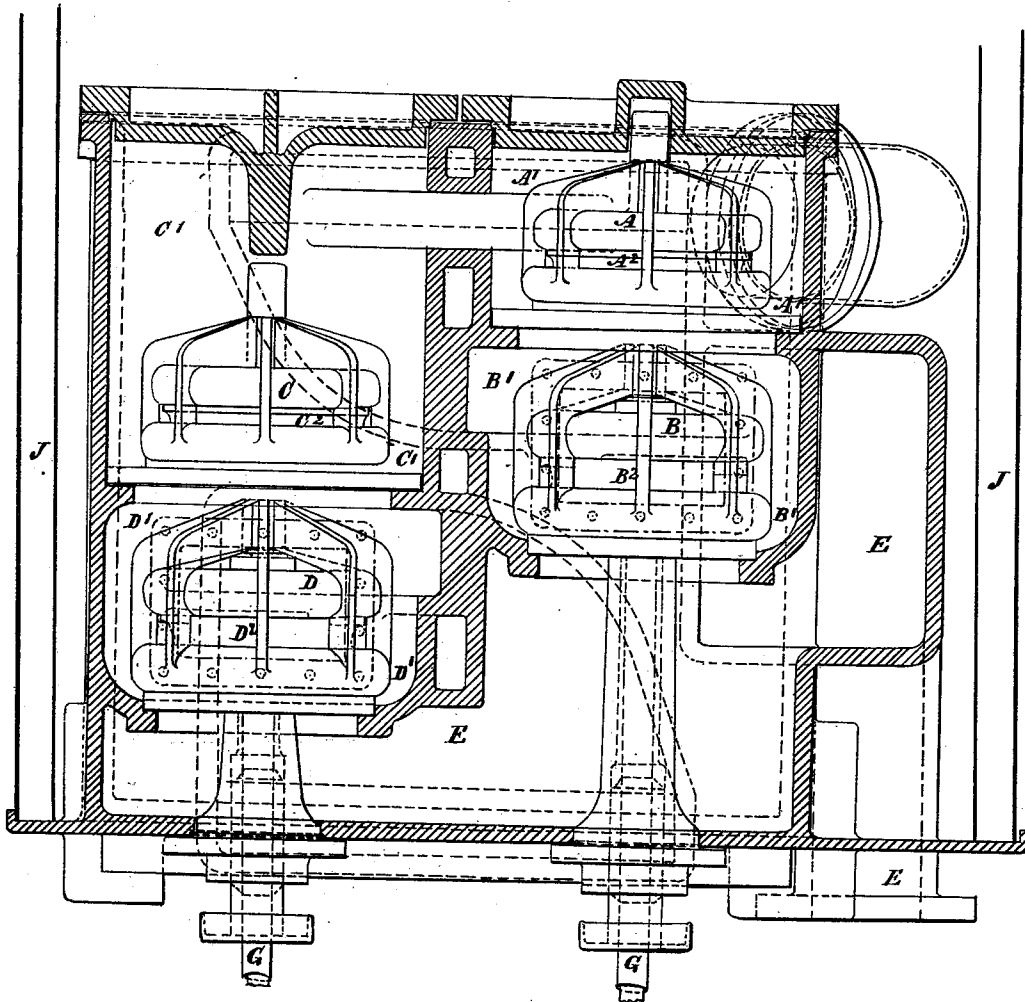
3 Sheets—Sheet 1.

L. PERKINS & W. W. HARRIS.
Valve Gear for Engines.

No. 235,287.

Patented Dec. 7, 1880.

Fig:1.



Witnesses

Wm. A. Shinkle
C. H. Baker

By their Attorneys

Galdwin, Hopkins & Peyton

Inventors:

Leftus Perkins.
William W. Harris.

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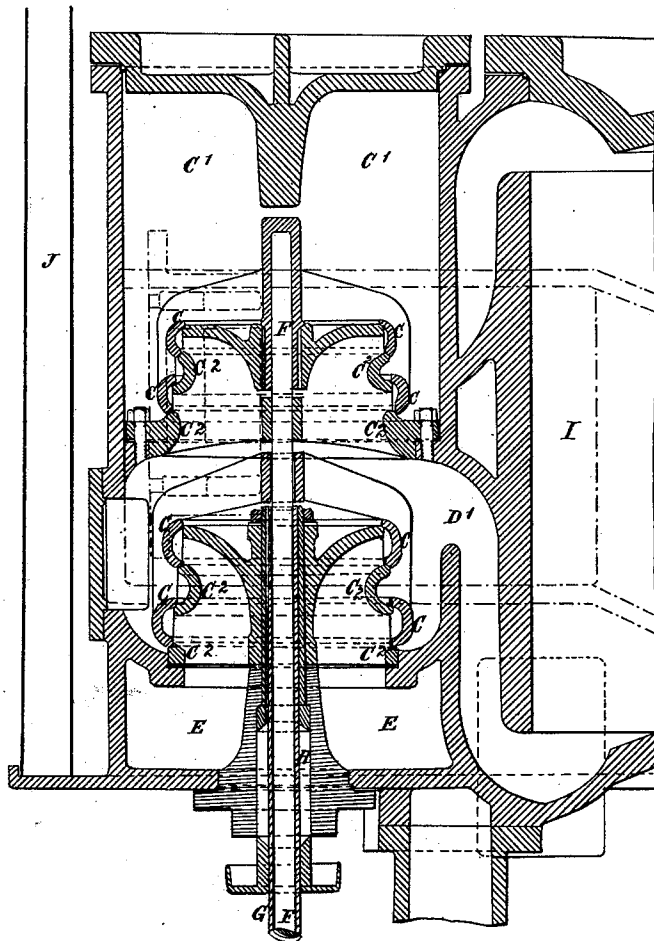
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Fig: 2.



Witnesses

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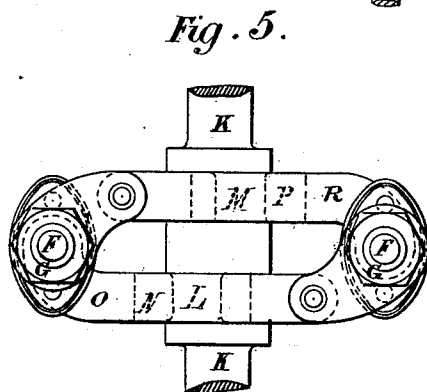
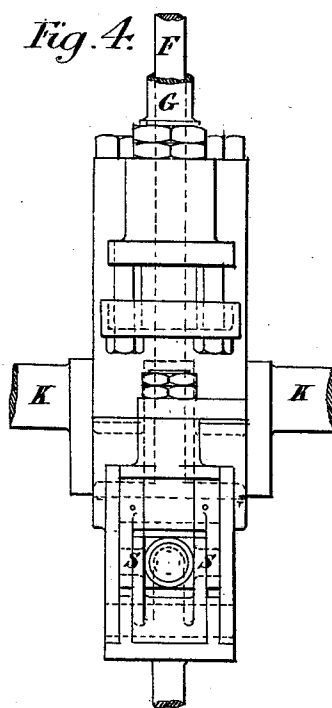
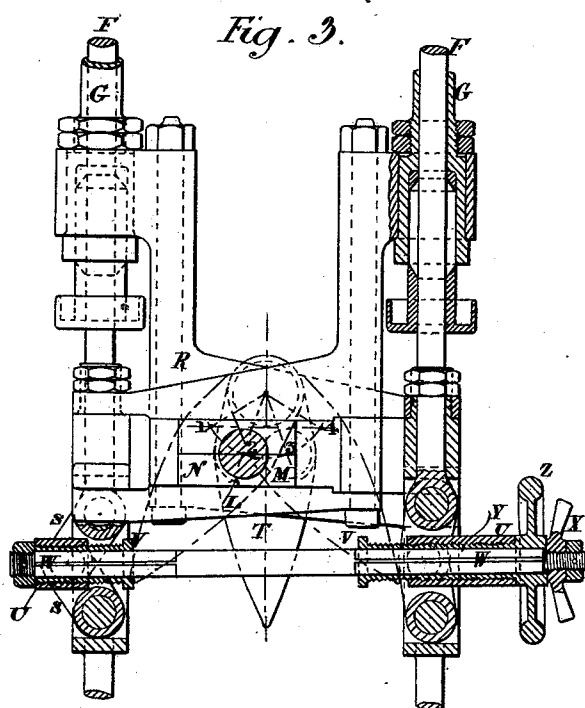
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UNITED STATES PATENT OFFICE.

LOFTUS PERKINS AND WILLIAM W. HARRIS, OF SEAFORD STREET, COUNTY OF MIDDLESEX, ENGLAND.

VALVE-GEAR FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 235,287, dated December 7, 1880.

Application filed October 12, 1880. (No model.) Patented in England January 14, 1880.

To all whom it may concern :

Be it known that we, LOFTUS PERKINS and WILLIAM WALLINGTON HARRIS, subjects of the Queen of Great Britain, residing at Seaford Street, in the county of Middlesex, England, have invented certain new and useful Improvements in Valve-Gear for Engines, (for which we have received Letters Patent in England, No. 168, dated 14th January, 1880,) of which the following is a specification.

In the specification of a former patent granted to one of us, dated 13th April, 1880, No. 226,416, was described means of opening and closing valves used for controlling the admission and escape of steam from the cylinders of steam-engines whenever lifting-valves were used for this purpose. Each valve was lifted from and lowered onto its seat by means of a rod passed up through a stuffing-box into the steam-passage below the valve. The rod had a positive upward and downward motion given to it, and moved away from the valve when the valve was resting on its seat. When such valves were used for controlling the admission and escape of steam to and from the low-pressure cylinder of the engine described in that specification, the space occupied by the four valves and valve-passages requisite for its control was considerable. To allow of lifting-valves being used for controlling the admission and escape of steam to and from the low-pressure cylinder of this engine, and to the cylinders of other engines, without the space occupied by the valves and valve-gear being too great, we now place the steam and exhaust valves used for controlling the passage of steam to and from each end of the cylinder in valve-chambers vertically one above the other. The exhaust-valve is arranged to be the lower one. It is raised and opened by a tube which passes up through the tubular center of the valve-seat. The upper valve, which is the steam-valve, is opened by a rod which passes up through the center of the tube that opens the exhaust-valve.

Each valve-seat we make of the form of a hollow truncated cone closed at the top, and with an opening or openings formed as rings all around it. The valve is formed of a solid ring or rings to cover these openings.

At the top of the valve is a central collar, from which pass radial arms, which serve to

hold the collar and rings together, and it is upon this collar that the lifting tube or rods acts to raise and open the valve.

The valve-rings are formed with inclined valve-faces at top and bottom, to fit on corresponding valve-faces at the top and bottom of the openings in the valve-seat. Each solid ring of the valve is also arched outward, so as when lifted, to give a free passage of steam to the openings in the valve-seat.

The valve-chambers containing the valves for controlling the passage of steam to and from one end of the cylinder we place side by side with the chambers containing the valves for the other end of the cylinder.

Figure 1 is a section showing two pairs of lifting-valves, arranged as above described for admitting steam to and allowing it to escape from both ends of the cylinder of a steam engine. Fig. 2 is a section, taken at right angles to the section Fig. 1, through the pair of valves for admitting steam to and allowing it to escape from the lower end of the cylinder. These figures show the valves applied to the low-pressure cylinder of a steam-engine constructed as described in the specification above mentioned; but, as before stated, similar valve apparatus may be used for admitting steam to and allowing it to escape from the cylinders of other engines.

A is the inlet-valve for admitting steam to the upper end of the cylinder, and B the exhaust-valve for this end. C is the inlet-valve for the lower end of the cylinder, and D the exhaust-valve. These valves are in separate chambers A' B' C' D'. The inlet-valves A C rest on valve-seats A² C², which stand on plates forming the division between the chambers A' B' and C' D'. The exhaust valves B D rest on valve-seats B² D², which form part of the division between the chambers B' D' and the exhaust-passage E, by which the exhaust-steam is conveyed away to the condenser.

F F are rods for lifting the inlet-valves A C, and G G tubes for lifting the exhaust-valves B D. Each tube G passes up through a stuffing-box, H, with a long neck, which stands up from the bottom of the exhaust-passage E and rises up above the solid top of the valve-seat B² D².

The valve-rings of which each valve is com

posed, as above explained, are connected by arms with a central boss or collar, up through which the rods F pass. When the tube is lifted it comes against the bottom of the collar and lifts the valve off its seat, and when the tube is lowered the valve comes down with it until it is left resting upon its seat. The rods F pass up through the tubes G, and their upper ends pass into the central boss of the inlet-valves, so that the boss forms a cap to cover over the top of the rod. On the exterior of the boss is a small valve to close down onto a corresponding valve-face formed around the top of the opening in the solid top of the valve-seat, up through which the rod passes, so that the escape of steam through this opening is prevented when the valve A or C is resting upon its seat. When the rod F is lifted or lowered the valve is raised or allowed to descend onto its seat, as explained.

I is a portion of the low-pressure cylinder of the engine, and J is a portion of a double casing by which the steam-cylinders, passages, and valve-chambers of the engine are all inclosed, as explained in the specification before mentioned.

Fig. 3 shows an elevation, partly in section; Fig. 4, an end view; and Fig. 5, a plan of mechanism for controlling the raising and lowering of the rods and tubes, so as to open and close the valves at the times required.

K is a shaft, to which a rocking motion is given from the crank-shaft of the engine. This is best effected by a crank-pin on a crank-arm of the shaft K, (not shown in the drawings,) being embraced by the link of an ordinary link-motion worked by a pair of eccentrics on the crank-shaft. On the shaft K are also two crank-pins, L M. One of these, L, is embraced by a bearing-block, N, which can slide to and fro in a horizontal slot or opening in a frame, O, while the other crank-pin, M, is embraced by a block, P, which can slide to and fro in a horizontal slot in a frame, R. The crank-pin L oscillates in an arc between the radial lines 1 and 3, while the crank-pin M oscillates between the lines 2 and 4. Thus one of the frames O R will be raised as the other is lowered. Each frame at its upper part is made fast to the lower end of one tube, G, while the lower part of the same frame has connected to it, by jointed or toggle links S, the lower end of the rod F, which passes up through the other tube, G. Thus, as each frame is in turn raised, the exhaust-valve will be opened to permit the escape of steam from one end of the cylinder of the engine, while at the same time the inlet-valve for admitting steam to the opposite end of the cylinder is also opened.

The exhaust-valve will be kept open throughout the full stroke of the piston of the engine, and if the toggle-links S were kept in a vertical position during the whole time the frame is being raised, steam would also be admitted throughout the stroke; but if, after the completion of one half or third, or other portion of the stroke, the toggle-links are allowed to move

into positions inclined to one another, the rod F will no longer be raised or held up by the links, and the valve at the top of this rod will at once close. To be thus able to effect the cut-off at any desired part of the stroke we employ an arm or tappet, T, on the rock-shaft K to strike against adjustable stops which are in connection with the central joints of the pairs of toggle-links. For this purpose the pins which form the central joint of each set of toggle-links are carried by a tube, U. Adjustable stops V screw the one into one tube and the other into the other tube, one with a right-handed, the other with a left-handed screw-thread. Through both stops V passes a square rod, W, by which they can be turned. This rod also serves as a link to couple together the tubes U of the two sets of toggle-links. One end of the rod has for this purpose upon it a nut that bears against the end of one tube, U, while the other end of the rod has upon it a nut, X, which bears against the end of a tube, Y, which fits over the rod W, and which screws into the other tube, U. On the tube Y is a handle, Z, by which it can be turned. When turned in one direction it brings the stops V nearer together, and at the same time moves the tubes U farther apart, and when turned in the other direction it moves the stops apart and brings the tubes nearer together. Thus, whenever the finger or tappet T comes against one stop V, and moves it outward, so that the links with which it is connected are made to incline to one another, the other pair of toggle-links are, as indicated by the drawings, always brought into and slightly beyond a vertical position, so that when the slide with which they are connected is in its turn made to rise, the rod F, with which the links are also connected, is raised also. The increase or decrease of the distance between the stops is caused by the tube Y screwing in or out of the tube U. In this manner the inlet-valves will always commence to open at the same time, but the closing of these valves can be effected at any desired part of the stroke simply by turning the handle Z.

If the adjustable stops are brought closer together, the finger or tappet T will the sooner act upon them and close the inlet-valves at an earlier period of the stroke; or, if the stops are moved apart from one another, they will close these valves at a later period of the stroke.

The time at which the opening of the inlet-valves commences can be adjusted by turning the nut X by the handles upon it. By turning this nut the rods F can be slightly raised or lowered with respect to the frames O R, as will be seen, and so the times at which these rods come against and lift the inlet-valves can be varied to a sufficient extent to allow of slight variations being made in the lead given to the opening of these valves.

We claim—

1. The combination of the steam-cylinder, the inlet-valve A, and the exhaust-valve B

beneath it at one end of the cylinder, the similarly-arranged inlet and exhaust valves C D at the opposite end thereof, the respective valve-chambers A' B' C' D', the tubes for lifting the exhaust-valves, the rods passing through said tubes and serving to lift the inlet-valves, and mechanism, essentially such as described, for controlling the raising and lowering of the rods and tubes to raise the exhaust-valves, first at one end of the cylinder and then at the other, while alternately opening the inlet-valves at the opposite ends of the cylinder, in the manner and for the purpose set forth.

15 2. The combination, with the lifting-rods F and tubes G, of frames O R, each frame attached to the lower end of one tube G and

also coupled to the rod which passes up through the other tube G, and one frame raised by a crank-pin on a rock-shaft, while the other is lowered by another crank-pin on the same shaft. 20

3. The combination, with the rods F, tubes G, frames O R, and toggle-links S, of adjustable stops V, carried by the central joints of these links for an arm or tappet on a rock-shaft to act against, for the purpose described. 25

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