

G. W. WEINMAN.
Balanced Valves.

No. 209,436.

Patented Oct. 29, 1878.

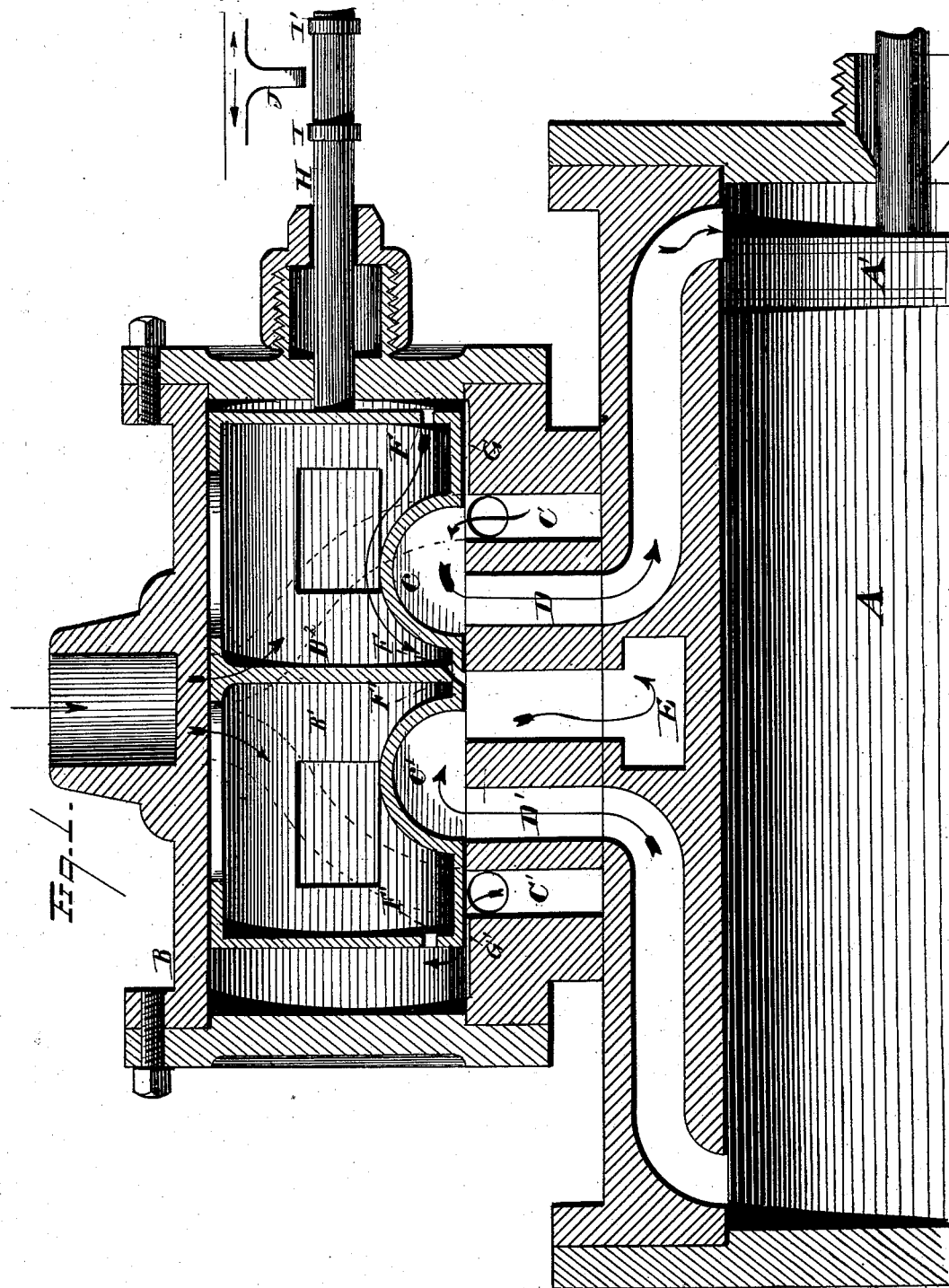


Fig. 1.

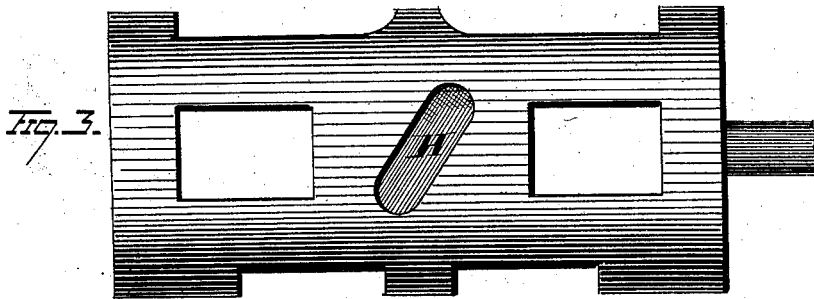
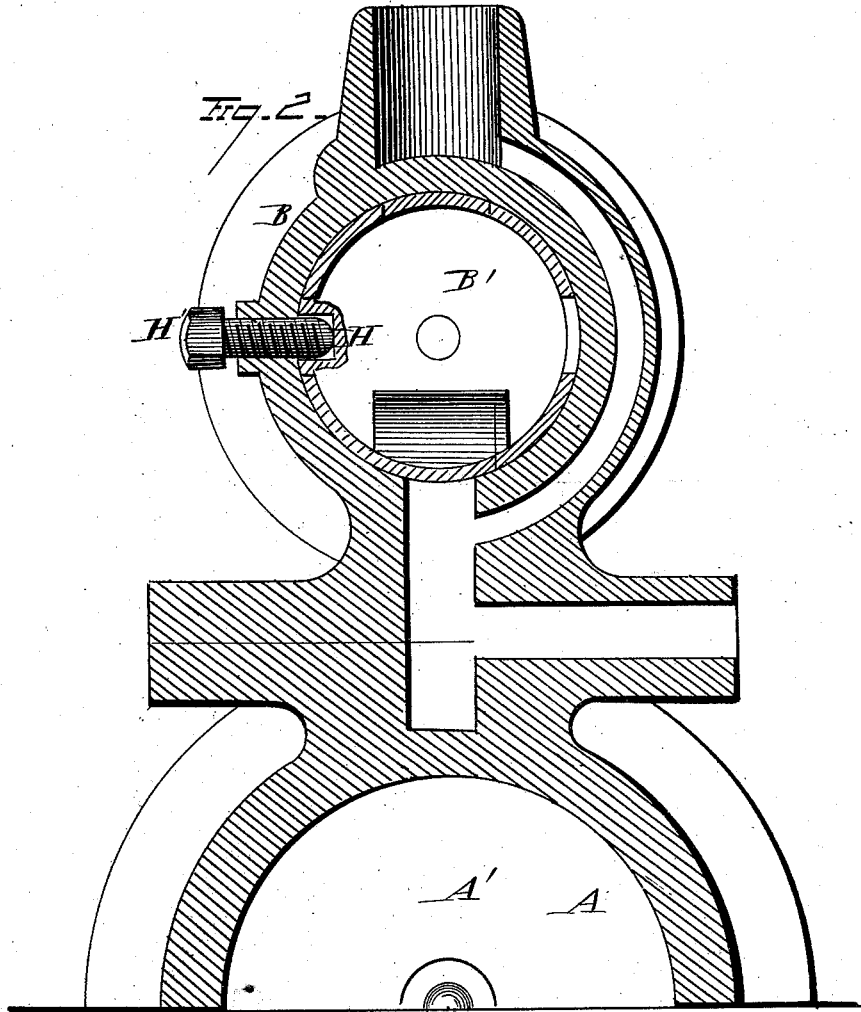
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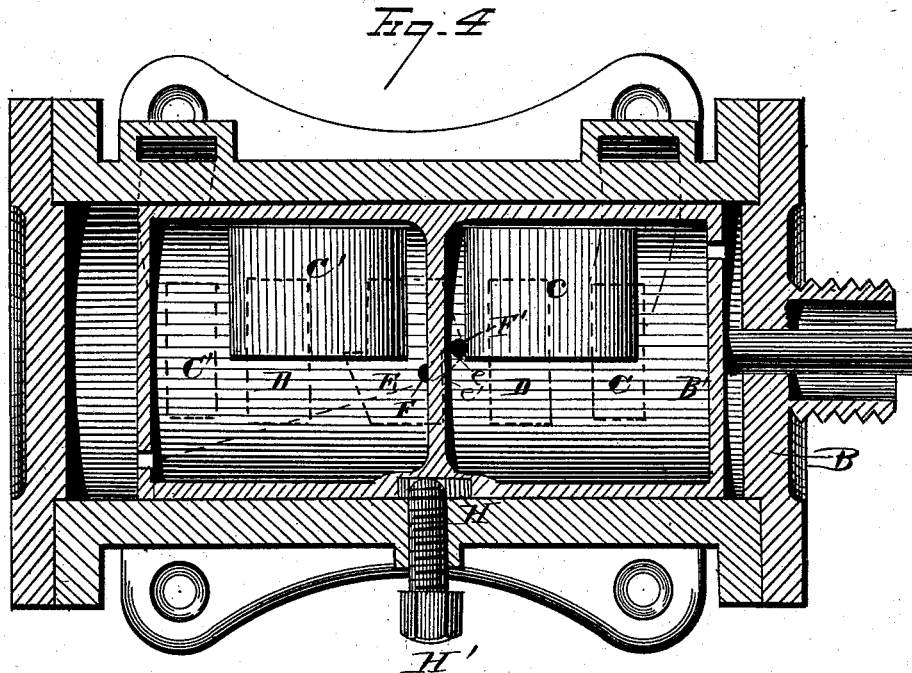
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UNITED STATES PATENT OFFICE.

GEORGE W. WEINMAN, OF COLUMBUS, OHIO.

IMPROVEMENT IN BALANCED VALVES.

Specification forming part of Letters Patent No. **209,436**, dated October 29, 1878; application filed September 23, 1878.

To all whom it may concern:

Be it known that I, GEORGE W. WEINMAN, of Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Valves for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to a new and improved valve for steam-engines; and consists in a cylindrical hollow piston fitted snugly within a cylindrical valve-chamber of sufficient length to permit of the proper longitudinal movement of the valve. The hollow piston is provided on its under side with bridges, through which steam is alternately fed and exhausted, the valve being shifted partially by the positive action of adjacent moving parts, and partially by the pressure of steam in the valve-chamber, as the pressure at either end is relieved by exhaustion caused by a partial rotation of the valve.

In the drawings, Figure 1 is a longitudinal section, illustrating my invention. Fig. 2 is a cross-section of same. Fig. 3 is a side view of the valve. Fig. 4 is a horizontal section through the middle of the valve, showing the steam and exhaust passages in dotted lines.

A is a steam-cylinder; B, the steam-chest; A¹, the main piston of the engine; and B' the valve, which constitutes my invention. The valve B' is in the form of a hollow cylinder, closed at its ends, but open above and at its sides, in order that the steam exhausting from the ends of the valve through it may assist in balancing the valve within its chamber; and a partition-wall, B², located centrally within the valve, prevents exhaust from either end until the exhaust-port corresponding with that end is opened.

C and C' are the steam-ports through which steam is fed to the valve. c and c' are bridges. D and D' are the ports through which steam passes from the valve to the steam-cylinder, and which become alternately supply and exhaust passages. E is the exhaust-passage. F and F' are small exhaust-passages leading

from the ends of the valve through the hollow interior of the valve to the main exhaust. G and G' are small steam-passages through which live steam is admitted to the ends of the valve to assist in shifting the same at the proper intervals. H is an inclined or cam slot in the side of the valve, and H' a pin in the cylinder, engaging with said slot, whereby as the valve is shifted from end to end of its chamber it is given a partial rotation about its axis, in order to bring the proper exhaust-passage F or F' over the main exhaust-passage E. I and I' are collars upon the valve-stem, between which a portion, J, of the moving parts of the engine operate to start the valve on its travel toward either end of its chamber. The said arm or projection J just moves the valve a slight distance, sufficient only to just open the exhaust-passage F or F', and the pin H' has sufficient play in the slot H that the valve in starting back will move in a straight line sufficiently to open the other passage, F or F', as will be hereinafter explained, the object being to allow the valve to be moved with the least possible resistance due to friction until either the port F or F' connects with the main exhaust-passage E. When the valve has been shifted sufficiently to bring the port F in communication with the main exhaust, all pressure will be relieved from one end of the valve as the steam on one end is allowed to exhaust directly into the main exhaust-passage, and the pressure of steam on the opposite end of the valve will operate to move the valve both longitudinally and axially, and thus bringing the other port, F, in communication with the main exhaust, and reverse the movement of the valve.

The operation of this device is very simple and certain. Suppose the steam-piston A' to be at the right-hand end of the cylinder and just starting to the left, the valve B' will also be at the right-hand end of its chamber. Steam will be entering the cylinder through C, c, and D. Live steam through the passage G' will be pressing against the left end of the valve B, while the right end of the valve will have been relieved by exhaustion through F as its opening passed across the main exhaust when the valve was last shifted, and steam will be exhausting freely from the front of the piston

or left end of the steam-cylinder through the passages D' and E. Now, when the steam-piston A' has arrived nearly at the end of its stroke, the arm J will strike the collar I and move the valve B' in a straight line sufficiently far to expose the exhaust-port F' over the main exhaust E. The steam-pressure at the left end of the valve then relieves itself through F' and E, and the pressure of live steam through G upon the right-hand end of the valve will cause it to complete its travel to the left, and in doing so the pin H', impinging against the side of the cam-slot H, will revolve its valve sufficiently to again close the passage F', and leave it in such position relative to the exhaust E that on the return-stroke it will not present over the exhaust, but, on the contrary, the other passage, F, will so present, when the operation is repeated.

It will be noticed that the valve, when starting in either direction, goes in a straight line until F or F' is opened, and when one said passage is open the further travel of the valve rotates the said valve, so that the other passage will open on the return-trip; moreover, that the straight motion is effected by the positive action of a moving part, J, while the stroke is completed by the action of steam alone.

By this construction of valve a very small quantity of steam is required to shift the valve, and all live steam is excluded from the interior of the valve except the quantity required to shift the valve. Moreover, the valve has all its wearing parts upon the under side, and at the same time is almost perfectly balanced; and, finally, the steam is not cooled and condensed by passing through the valve; but, inasmuch as it only passes through the bridge *c* or *c'*, its heat is not expended, but it passes in hot condition into the cylinder.

Of course I do not limit myself to any particular external means for starting the valve in either direction.

It will be noticed that the exhaust-port E has its sides inclined. The object of this is that both passages F and F' may be started from a closed position when the valve is started from either end. Otherwise it is apparent that one of said valves would be open and the other closed, and in this condition it would have to be started against a pressure of steam which would require considerable power to start it; but inasmuch as both passages are closed when the valve is at either end of its stroke, the live steam entering the ends of the valve-chamber through the small steam-passages G and G', it

presses against both ends of the valve simultaneously, and the valve is thereby so nicely balanced that the slightest pressure will start it.

It is apparent that the valve may be cushioned at its ends, or it may be effected by so adjusting the valve motion with respect to the main exhaust that the openings F F' shall be closed by completing their passage across the exhaust E before the valve shall have completed its full stroke, thus cutting off the exhaust through F or F', and causing the live steam, through G or G', as the case may be, to cushion the valve.

By notching the exhaust E at *e*, as shown, the end exhaust may be opened after traveling a very little distance from the starting-point, while the inclined portion of the opposite wall of the exhaust may cut off the exhaust at any desired distance before completing the stroke.

What I claim is—

1. The valve B¹, made hollow and provided with bridges *c c'*, partition B², and exhaust-passages F F', substantially as and for the purposes described.
2. The combination, with the valve and the exhaust-port E, of the end exhaust-passages F F', and mechanism for rotating the valve so as to present the said end exhaust-passages alternately over the port E, substantially as and for the purposes described.
3. The combination, with the exhaust E and valve, of the end exhaust-passages F F', the pin H', and cam-slot H, whereby the valve is caused to rotate by the direct pressure of the steam, substantially as described.
4. The combination, with the exhaust E and valve B¹, of passages F F' and loose pin and slot connection H' H, and in connection therewith the valve-stem and external means for starting the valve in either direction, the whole constituting a means whereby the valve is shifted and also caused to present the passages F and F' alternately over the exhaust E, substantially as and for the purposes described.
5. The combination, with valve B¹, provided with end exhaust-passages F and F', of the exhaust E, made inclined at its edges, whereby both passages F and F' are closed when the valve starts from either end of its chamber.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE WM. WEINMAN.

Witnesses:

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WILLARD FRACKER.