

J. F. ALLEN.  
VALVES FOR STEAM-ENGINES.

No. 191,275.

Patented May 29, 1877.

Fig. III.

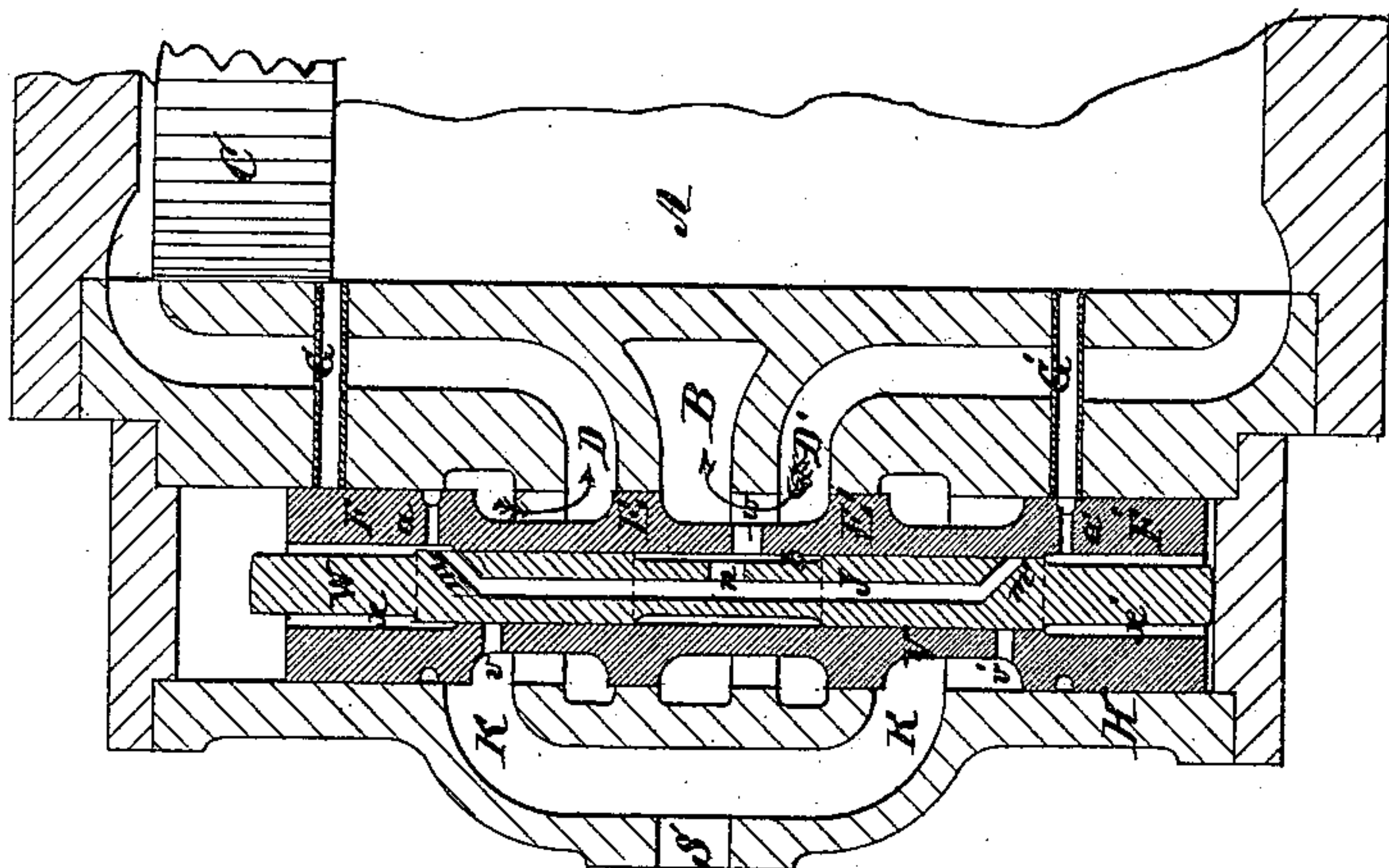


Fig. II.

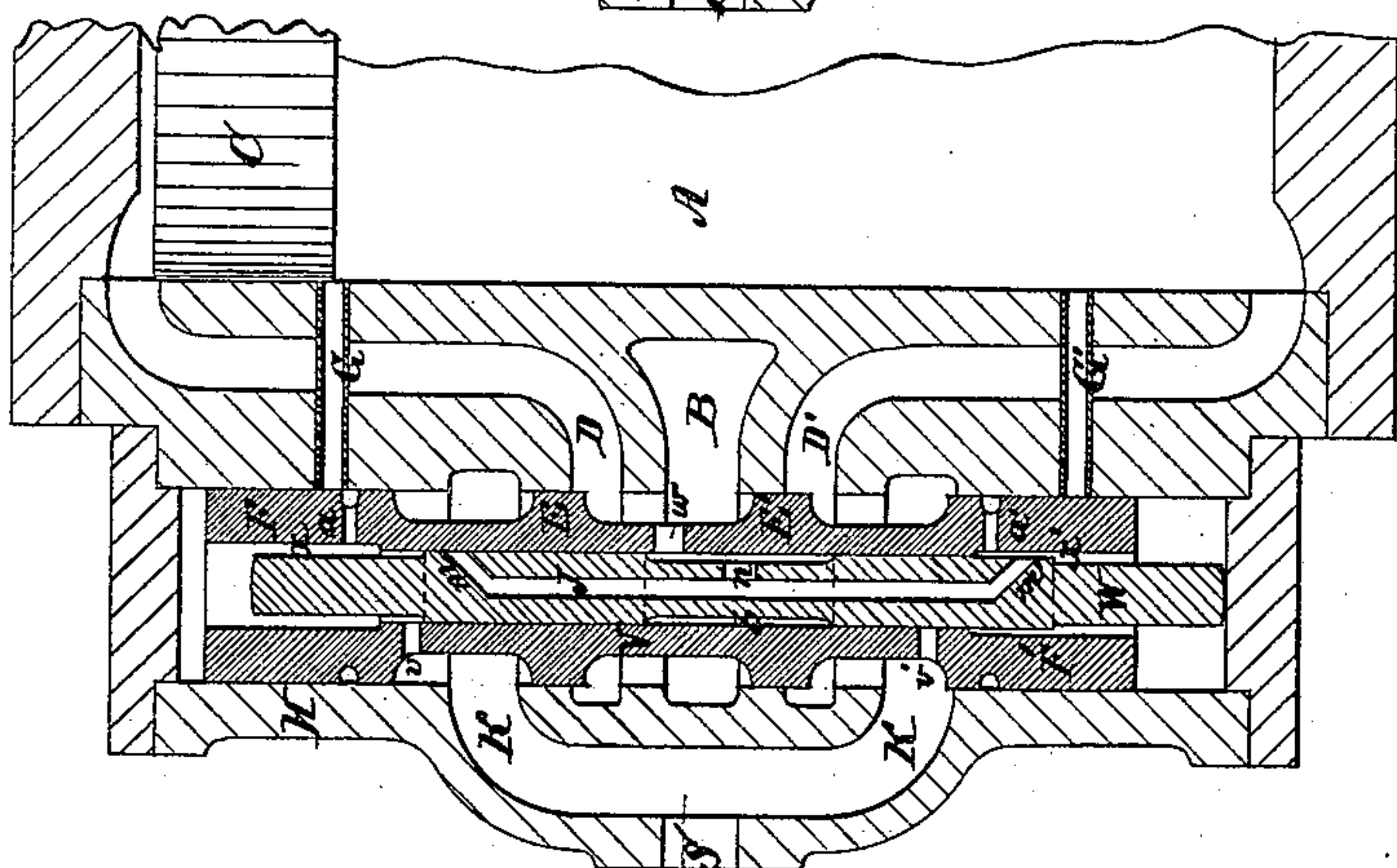
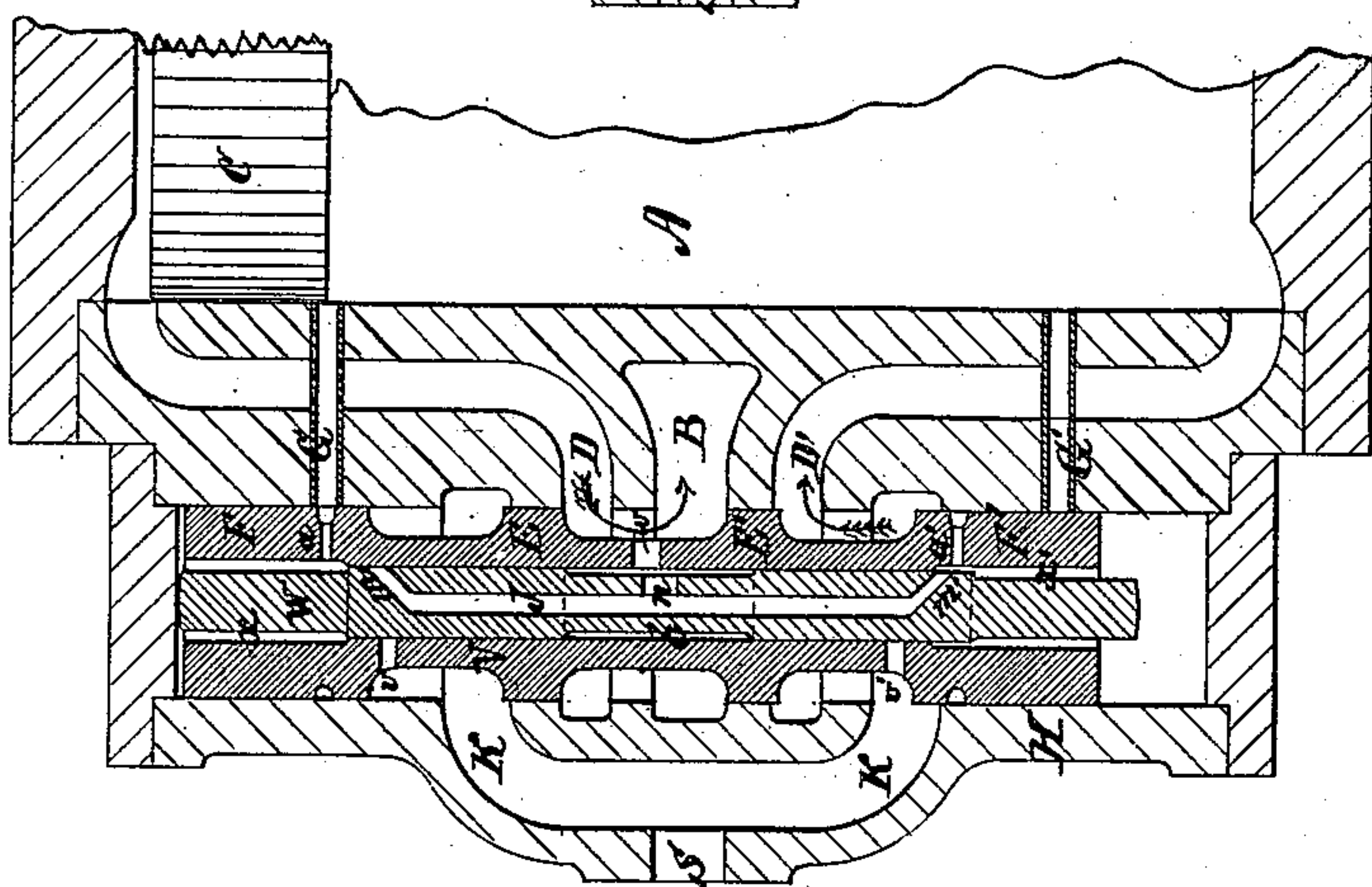


Fig. I.



Witnesses.

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## IMPROVEMENT IN VALVES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **191,275**, dated May 29, 1877; application filed May 5, 1876.

*To all whom it may concern:*

Be it known that I, JOHN F. ALLEN, of New York, in the State of New York, have invented a new and useful Improvement in Valves for Steam or Air Engines, of which the following is a specification:

This invention relates to that class of valves for steam or air engines in which the steam or air from the cylinder is caused to move the main valve to reverse the action of the cylinder-piston, and in which auxiliary valves, in connection with the main valve, are used for said purpose.

It consists in a novel arrangement of the several parts, in combination with the main and auxiliary valves of the engine.

In the accompanying drawing, Figures I, II, and III represent longitudinal sections through the valve-chest and cylinder, with the main and auxiliary valves in different positions.

A represents part of a cylinder, and C its reciprocating piston. H is the valve-chest, (which is here shown of cylindrical construction internally.) V is the main valve, which has a free sliding action within the chest H, and is constructed with suitable surfaces E E', to control the passages D D', which conduct the steam to and from opposite ends of the cylinder. The valve is likewise provided with surfaces F F' at each end. All the surfaces are made to work steam-tight in the valve-chest. Steam is admitted to the valve-chest through the passages K, between the surfaces E F and E' F', by the inlet S. The steam is exhausted from said chest, after the performance of its duty, through the passage B, in the usual manner. G G' are passages leading from the valve-chest toward opposite ends of the engine-cylinder, so arranged that they are uncovered by the cylinder-piston C toward the completion of its stroke, as will be hereafter described.

In the body of the valve V an auxiliary valve, W, is arranged, working steam-tight, and having a free sliding action within the valve V. The ends of the valve V are recessed at  $x x'$ , to allow a free passage around the auxiliary valve W, and passages  $a a'$  are arranged through the surfaces F F', to connect with those recesses  $x x'$ .

The central part of the auxiliary valve W is notched or formed with reduction  $b$ , to form a space around this part of the auxiliary valve, and a passage,  $w$ , through the main valve V forms a connection with this space  $b$  and the main exhaust-passage B at all times.

Between the surfaces E F and E' F' of the main valve passages  $v v'$  are arranged, communicating at all times with the steam-passage K, the inner ends of said passages  $v v'$  being covered or uncovered through the auxiliary valve W, as will be hereafter described.

Through the body of the auxiliary valve W a passage, J, is made, passing at  $m$  and  $m'$  to the surface of said valve W, and having a central passage,  $n$ , communicating at all times with the central space  $b$ , and consequently through the passage  $w$  with the exhaust B.

Dash-pots may be provided at the ends of the valve-chest to cushion the main valve at the completion of its throw in either direction.

The operation is as follows: Supposing the valves to be in the position represented in Fig. I, then steam has passed through the port D', and moved the piston C to the top of the cylinder, and the steam above the piston has been exhausted through the port D and the exhaust-passage B. The passage G' is closed through the valve-surface F', and the motion of the piston C has just opened the passage G, to allow the steam below the piston in the cylinder to pass through said passage G and the passage  $a$  in the surface F, which, in this position, is now opposite the passage G, into the recess  $x$ , and above the valve V and the auxiliary valve W, so as to force said valve downward. At the same time the space below the main valve V and auxiliary valve W connects, through the recess  $x'$ , port  $m'$ , passages J,  $n$ , and  $w$ , with the exhaust-passage B, producing thereby a vacuum below said valves, and allowing thereby the full effect of the pressure of the steam above the same, for the purpose of moving said valves downward. The auxiliary valve W, having less frictional surfaces, will be easily and quicker moved by the pressure until stopped by the bottom of the valve-chest. When the valve V has been moved so far that the passage  $a$  has passed the passage G, no more



steam can enter above the main valve, and the same might stop, on account of its great frictional surfaces, in a position represented in Fig. II.

By the complete motion of the auxiliary valve W the passage *v* has now been opened, so as to form a free communication between the steam-passage K, through *v*, recess *x*, and the top of the valve V, and thus completing the motion of said valve V—that is, to the position shown in Fig. III, in which position the passage *a'* comes in communication with the passage G', to allow the steam to enter below the valves as soon as the piston C comes near the bottom of its stroke, and thus change again the position of the valves. At the same time, in the position of the valves shown in Fig. III, the steam, which, as before described, has moved the valves downward, can escape, through the recess *x*, port *m*, passages J, *n*, and *w*, into the exhaust-passage B, producing thereby a vacuum above said valves, while the surface F of the main valve closes the port G, to again allow the upward movement of the valves in due course, in the manner described.

The main valve V, as here represented, is

a balanced one; but a D main valve may be arranged, provided with corresponding surfaces F F' and a similar auxiliary valve, W, and arranged with the required ports and passages to admit and exhaust the steam, substantially as above described.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The valve V, provided with ports or passages *a a'*, *v v'*, and *w*, in combination with an auxiliary valve, W, adapted to move independently and in advance of the main valve V, when arranged to operate in combination with auxiliary passages G G', passing from the cylinder into the steam-chest and the steam-passage K, substantially in the manner described, and for the purpose set forth.

2. The combination of the valve V, auxiliary valve W, central passage J, ports *m m'*, central port *n*, recesses *x x'*, port *w*, and exhaust-passage B, in the manner substantially as set forth, and for the purpose described.

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Witnesses:

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