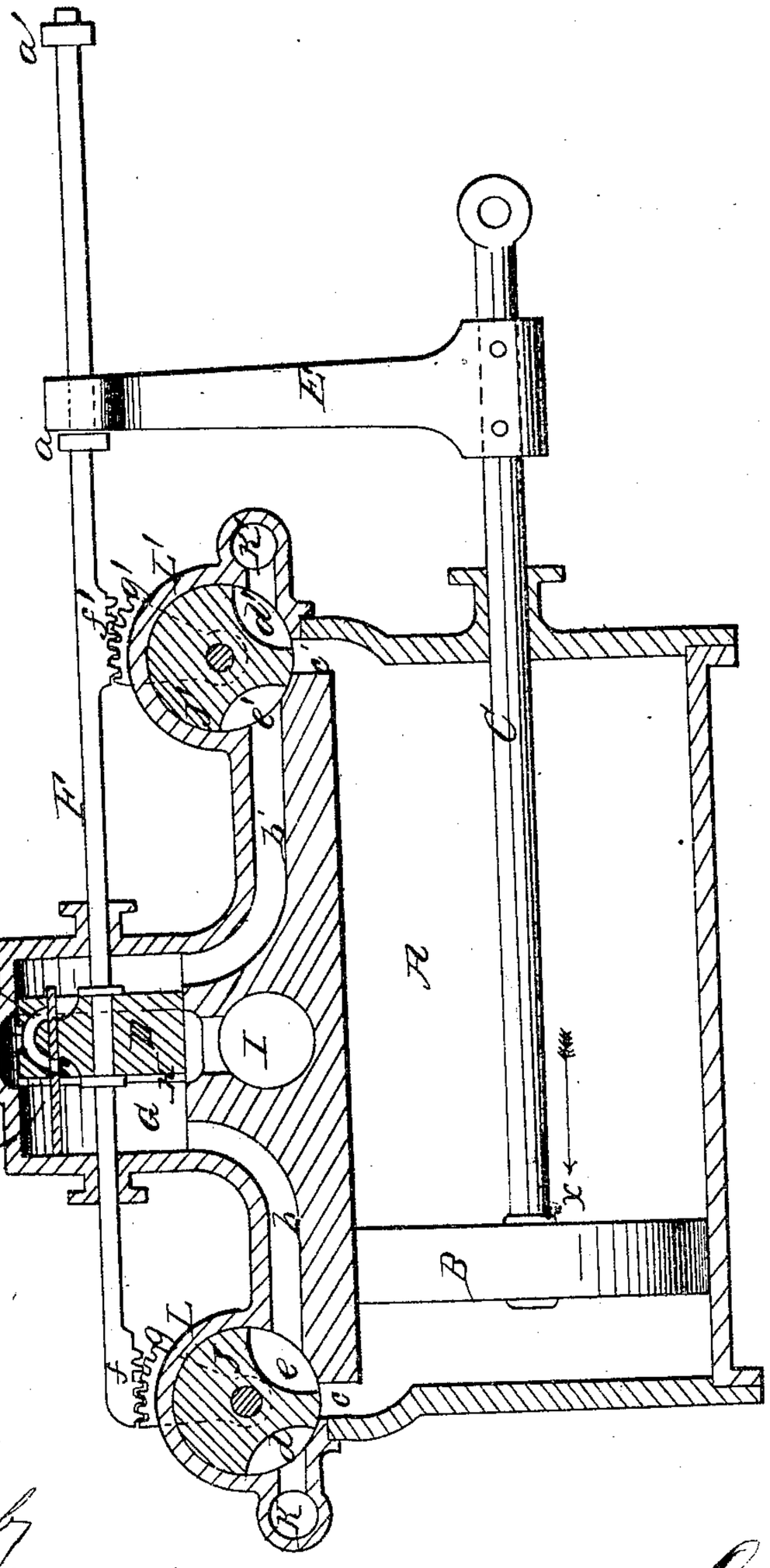
No. 78,518. PATENTED JUNE 2, 1868.

G. L. ENGGREN.

VALVE FOR STEAM ENGINES.



Witnesses.

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IMPROVEMENT IN VALVES FOR STEAM-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, GUSTAV L. ENGGREN, of Brooklyn in the county of Kings, and State of New York, have invented a new and useful Improvement in Operating Valves for Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification, and which represents an engine-cylinder and piston, as horizontally arranged, with my improved valve-gear or arrangement applied thereto.

This, my improvement, has reference to that description of valves or valve-gear which employs a subsidiary valve or piston for throwing the main valve by the spent steam of the main or engine-cylinder in its passage to the exhaust; and my invention consists, as controlled by the subsidiary valve or piston, in a novel arrangement of exhaust-passage around or connected with the cylinder of said piston, and in communication with the engine-ports at opposite ends of the main cylinder; also, in combination with the subsidiary valve or piston, of an independent valve or slide, carried by the same, for determining, in an automatic manner, by the movement of said piston, the cushioning effect at the close of the stroke or throw of the latter in both directions of its travel. Likewise, the invention consists in a combination, with the foregoing or their equivalents, of oscillating, cylindrical, or conical valves, controlling the engine-ports, and in constant or positive gear with the stem of the subsidiary valve.

Referring to the accompanying drawing, A represents the engine-cylinder, B its piston, and C the rod of the latter, and which may be connected with a pump or other device or mechanism requiring to be driven, said rod also serving, after the engine has commenced to run, to automatically start, alternately in opposite directions, a subsidiary valve or piston, D, through, say, an arm, E, acting against stops *a a'*, formed by projections on the stem or rod F of the piston D. This piston D reciprocates, in an intermittent manner, within a cylinder, G, that is provided, intermediately, or midway of its length, with an annular passage, H, that connects with the general exhaust or outlet I, said cylinder G communicating, at or near its ends, through passages *b b'*, with the general exhaust or outlet I, said cylinder G communicating, at or near its ends, through passages *b b'*, with the engine-ports *c c'*, by or through the intervention of intermittently-oscillating, cylindrical, or conical valves J J', having cavities, *d e*, *d' e'*, the one of which sets of cavities, *d d'*, serves to open connection, alternately at opposite ends, with the steam-inlet pipes or openings K K', while the other set of cavities, *e e'*, establishes communication alternately with the exhaust. These valves J J' work in cylinders or chambers L L', and are geared or connected outside with the stem or rod F, through rack-formations *f f'* and toothed sectors *g g'*, attached to the shafts of the valves J J'. Here, however, it may be observed that other methods of gearing the valves J J' with the rod F may be adopted, as, also, other forms of valves J J' be substituted; but the form or arrangement shown and described is preferred.

The piston-valve D is shown as provided with a passage, *h*, through it, communicating, as, say, at *s*, with the annular or other suitably-shaped and arranged exhaust-passage H, and controlled by an independent valve, which may be formed of a free or loose slide, L, having an aperture, *n*, through it, and which is carried by the piston-valve D.

In the operation, supposing the engine-piston B to be moving in direction of the arrow *x*, the arm E acts upon the stop *a*, as said piston approaches the completion of its stroke, to start the piston-valve D, and, at the same time, the valves J J', till the position of the latter is changed, so as to slightly open the exhaust-cavity *e'* of the valve J' to the port *c'*, when the spent steam from the engine-cylinder, rushing along the passage *b'*, acts upon the piston D, to continue its motion to the left, and suddenly shoot it so as to uncover the passage H on the side *b'* of the cylinder G, and thus establish connection of the passage *b'* with the exhaust-outlet I, and, at the same time, throwing the valve J, to put its cavity *d* in communication with the port *c* and steam-inlet K, to reverse the action of the engine-piston, which, as it approaches the completion of its stroke to the right, operates, through the arm E and stop *a'*, in a similar manner, but in a reverse direction, on the several valves, to start them, and admit of their further action, but in a reverse direction, as described, to again change the motion of the engine, by opening the port *c* and passage *b* to the exhaust, and port *c'* to the steam-inlet K'.

In this action of the piston-valve D, alternately uncovering the passage H, to establish connection with the exhaust-outlet L, on opposite ends of the engine-cylinder, the valve or slide L, carried by the piston D, performs an important part. Thus, prior to the movement of the piston D in either direction, and in the early portion of such stroke, the slide L has its passage *n* open to the passage *h*, so as to establish communication between the cylinder G and exhaust-passage H, through the aperture *s* on the forward—according to its direction of travel—side of the piston D, and after the piston has closed the passage H on said side or end of the cylinder G. This gives a free action to the piston D in the early portion of its stroke, a ready escape being established through the valve L, for vapor or air, into the general exhaust, and thus any counteracting effect, by compression on the piston-valve D, is avoided; but, as said piston approaches the end of its stroke by the force of the spent steam on its back side, the slide L strikes the end of the cylinder G, so as to close the passage *h* on the forward side of the piston D, which establishes a cushion, by compression of air or vapor in the cylinder G, in front of said piston, to check and bring it, in an easy manner, to a state of rest, or produce a balance, as it were, at the close of the stroke, a balance also being established prior to its movement by the spent steam. Furthermore, as the slide L thus closes the passage *h* on the one side of the piston D, it, by the continued motion of the piston, is forced sufficiently through the latter to open, by its aperture *n*, the passage *h*, on the opposite side of the piston D, to perform the same duty or duties, and, in like manner, on the reverse side of said piston, when the action of it is changed by the motion of the engine, the slide L, by striking either end of the cylinder G alternately, through the motion of the piston D, operating, in an automatic manner, to secure a timely cushioning effect to or on the valve-piston D, as necessary, to prevent shock, and render smooth and easy the action of such valve-gear or arrangement.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The combination, with the valve or piston D, having a passage, *h*, through it, and aperture *s*, in communication with the exhaust-passage H, or its equivalent, of a valve or slide, L, constructed and operating, by the throw of said piston, to effect or regulate the cushioning of the piston at or towards the close of its stroke, but allowing of a free escape for vapor or air on the forward side of said piston, in the early portion of its action, in either direction, essentially as herein set forth.

2. The combination of the piston D with its independent valve or slide L, operating in connection with exhaust-passages, as described, and valves J J′, constructed and arranged for action together, substantially as shown and described.

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Witnesses:
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