J. W. VERMILLION.

Slide-Valve.

No. 167,140. Patented Aug. 24, 1875.

FIG. I

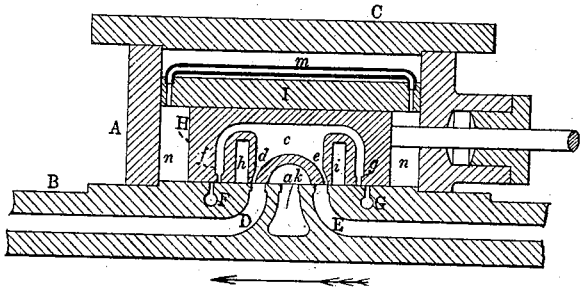


FIG. II

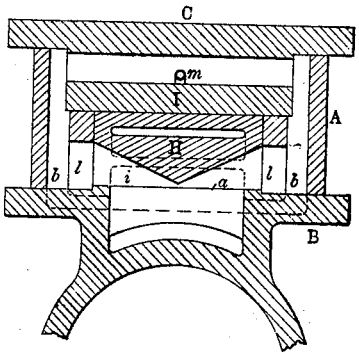


FIG. III

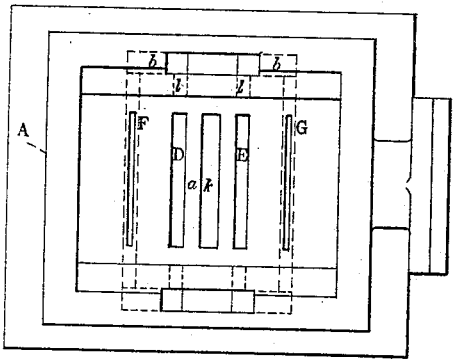


FIG. IV

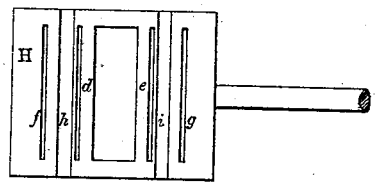
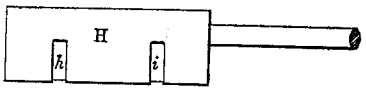


FIG. V



WITNESSES.

Wm. H. Dawson

W. W. Wharton

INVENTOR.

John W. Vermillion

by G. H. & W. J. Dawson

Attys

UNITED STATES PATENT OFFICE.

JOHN W. VERMILLION, OF ELKRIDGE LANDING, ASSIGNOR TO CHARLES E. BROWN, OF BALTIMORE, MARYLAND.

IMPROVEMENT IN SLIDE-VALVES.

Specification forming part of Letters Patent No. **167,140**, dated August 24, 1875; application filed July 12, 1875.

To all whom it may concern:

Be it known that I, JOHN W. VERMILLION, of Elkridge Landing, in the county of Howard and State of Maryland, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification; and I do hereby declare that in the same is contained a full, clear, and exact description of my said invention, reference being had to the accompanying drawing, and to the letters of reference marked thereon.

My invention relates, first, to certain passages in the face of the steam slide-valve, communicating with an inner chamber in the same, whereby steam is transferred from one side of the piston to the other, and to the end of the cylinder to which the piston is approaching, in order to place upon the piston, when near the end of its stroke, a limited counter or back pressure, for the purpose of partially overcoming the momentum of the said piston, as hereinafter described.

My invention relates, secondly, to openings in the face of the said steam-valve, communicating with the passages and inner chamber aforesaid, arranged to connect, in certain positions of the said valve, with channels in the cylinder valve-face, and in communication with the steam-chamber of the steam-chest, for the purpose of introducing to the cylinder an auxiliary supply of steam, as hereinafter fully set forth.

In the further description of my invention which follows, due reference must be had to the accompanying drawing forming a part of this specification, and in which—

Figures 1 and 2 are, respectively, longitudinal and cross sections of a steam-chest slide-valve, and portions of the steam-cylinder, embodying my improvements. Fig. 3 is a plan of the steam-chest and a portion of the steam-cylinder with the steam-chest top removed. Fig. 4 is an exterior view of the under side of the steam-valve, and Fig. 5 a similar view of the side of the same.

Similar letters of reference indicate similar parts in all the figures.

A is the steam-chest, secured to the cylinder B, and covered by the top C. D E are the steam-ports, leading from the cylinder valve-face *a* to opposite ends of the cylinder. F G are channels extending across the cylinder valve-face *a*, and in communication with the recesses *b* on the sides of the steam-chest.

H is the slide-valve, and *c* the inner chamber, from which extend the passages *d e* and openings *f g*. The main steam-ports in the valve are represented by *h i*, and the exhaust-port in the cylinder by *k*. The ports *h i* communicate at their ends with apertures *l* in the sides of the chest leading to the recesses *b*, which receive steam from the steam-pipe. I is a plate resting upon projections in the steam-chest, and *m* a pipe, the ends of which are secured to the said plate, and form the only means of communication between the spaces *n* in the chest. The valve is made to fit steam-tight between the sides of the chest, and between the cylinder-face and the under side of the plate I; consequently the spaces *n* are, except in case of leakage, free from steam. But as the maintaining of a vacuum in the spaces *n* would be practically impossible, the pipe *m* is used to prevent compression of vapor or air in either space, the said air being transferred from one space to the other as the valve is moved.

In the following description of the operation and functions of the different parts of the invention which follows, it must be understood that the steam enters the steam-chest at the upper part thereof, above the plate I, and that the crank has passed one of the dead-points, and is moving in the direction of the arrow. The valve-port *i* is brought into communication with the steam-port E, and steam admitted to the face of the piston in the cylinder. Simultaneously with the uncovering of the port E, and the admittance of steam thereto, the opening *f* is brought into communication with the channel F, which is charged with steam from the steam-chest, and an auxiliary current of steam conducted to the inner chamber *c*, and thence through the passage *e* to the steam-port E.

By this arrangement, two currents of steam are at once introduced to the cylinder, which is equivalent to doubling the speed of the valve for a short period of its stroke, or until the full opening of channel F. After the chan-

nel F is closed by the valve, and the auxiliary current of steam is cut off, the cylinder is supplied during the balance of the stroke of the piston from the port *i*. When the port E is closed, as the piston approaches the end of its stroke, the passage *d* is brought into communication with the port D, and steam from the chamber *c*, which is at this time charged from the port E, conducted to the opposite side of the piston to form an elastic cushion, the tendency of which is to force the approaching piston in an opposite direction.

It will be understood that as the steam used to cushion the piston or retard its velocity near the end of its stroke is abstracted from that propelling the same, a slight approach toward the establishment of an equilibrium at the two sides of the piston is secured; consequently the jar caused by the change of motion of the piston is materially lessened.

By referring to the drawing it will be seen that although steam from the boiler and that isolated from the boiler and used in propelling the piston are alternately admitted to and occupy the chamber *c*, and the openings and passages leading therefrom, no intermingling of the two kinds at any time occurs; consequently steam from the boiler is not used to cushion the piston, except when lead is given to the valve.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The valve H, having the passages *d e*, chamber *c*, openings *f g*, and main steam-ports *h i*, substantially as and for the purposes specified.

2. The valve H, having therein the passages *d e*, openings *f g*, and main steam-ports *h i*, in combination with the apertures *l* and recesses *b* in the chest, and the channels F G, arranged with reference to the cylinder steam-ports D E and recesses *b*, substantially as specified.

In testimony whereof I have hereunto subscribed my name this 14th day of June, in the year of our Lord 1875.

JNO. W. VERMILLION.

Witnesses:
CHAS. E. BROWN,
WM. T. HOWARD.