# J. Y. Merrick,

## Steam Balance Valve.

No. 34,517. Patented Feb. 25, 1862.

Fig. 1.

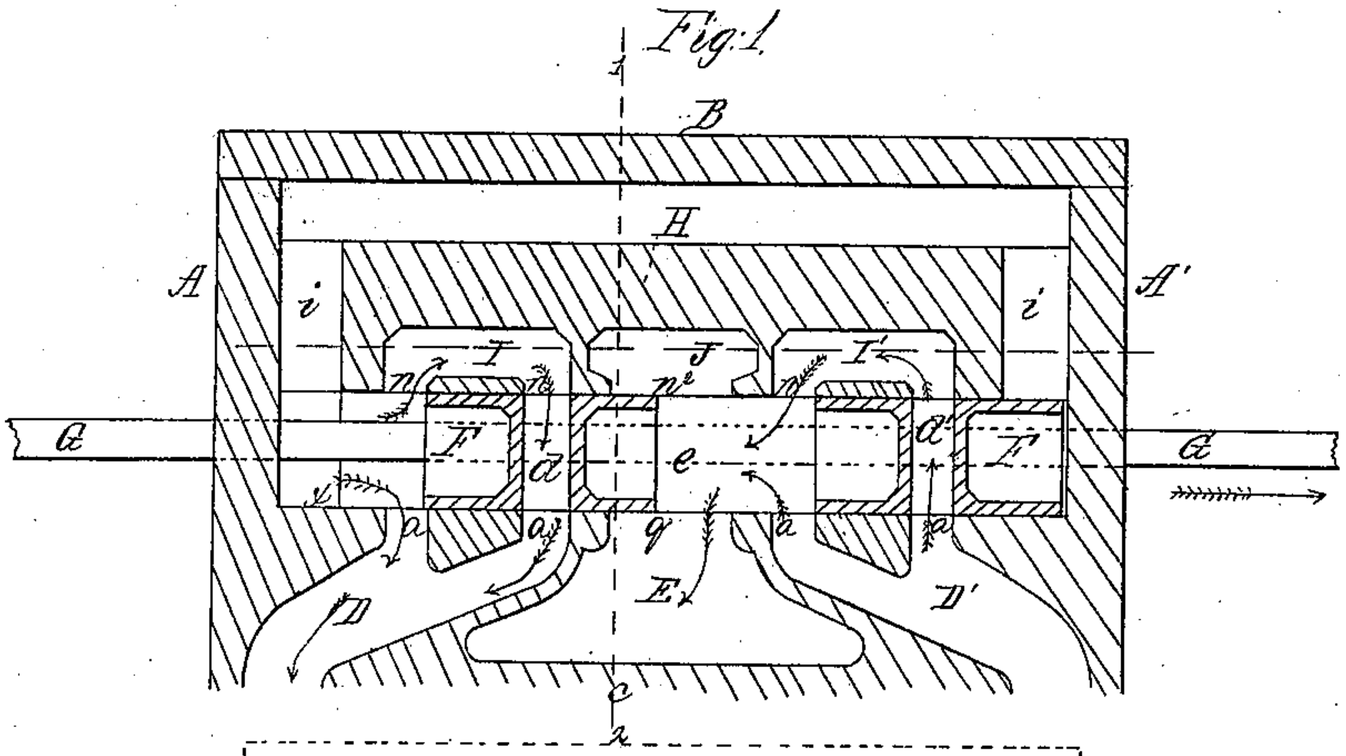



Fig. 2.

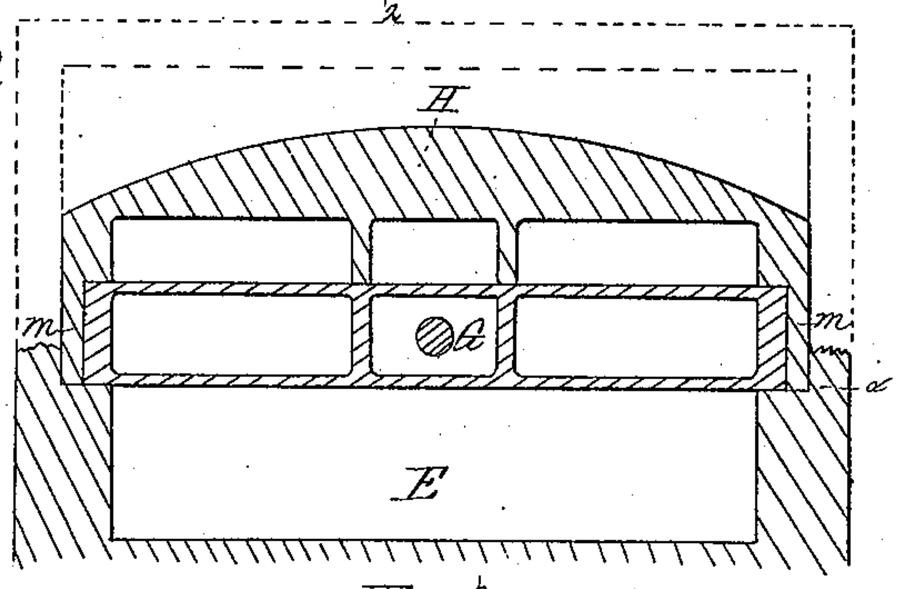
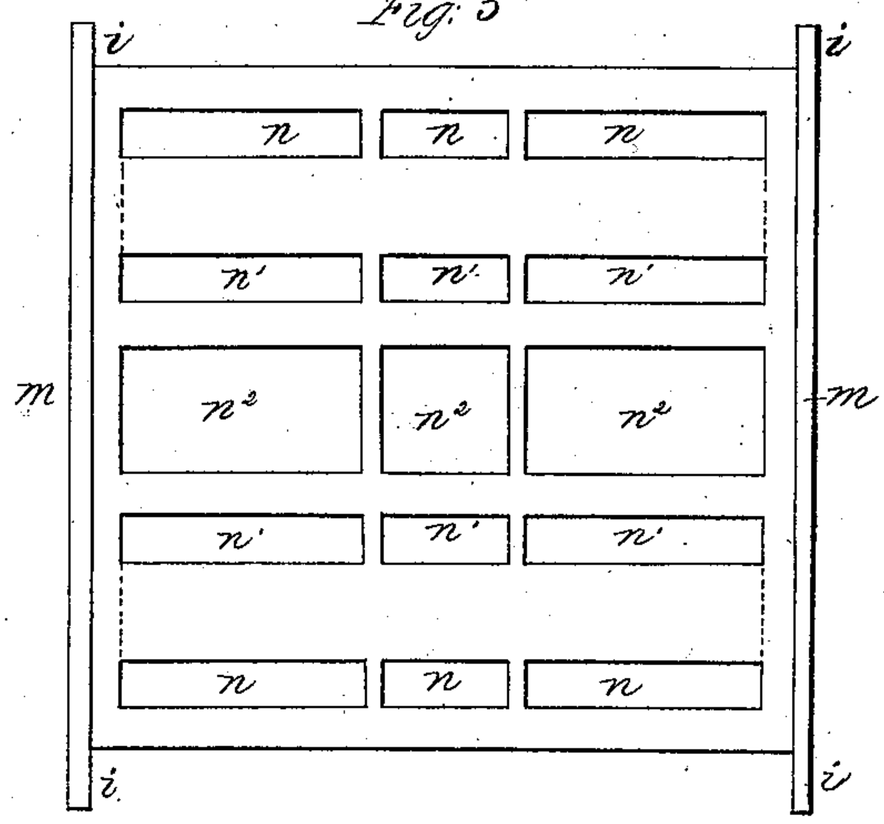



Fig. 3.




Witnesses:

Charles E. Foster

C. Howson.

Inventor.

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# UNITED STATES PATENT OFFICE.

J. VAUGHAN MERRICK, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVED SLIDE-VALVE FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **34,517**, dated February 25, 1862.

*To all whom it may concern:*

Be it known that I, J. VAUGHAN MERRICK, of Philadelphia, Pennsylvania, have invented an Improvement in Slide-Valves for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon.

My invention consists of a slide-valve and balancing-plate in combination with a double-ported cylinder-face, the valve being provided with such openings and the balancing-plate with such chambers and ports as to permit the steam to pass to and from the cylinder in the manner described hereinafter. The object of this combination has been to obtain all the important advantages alluded to hereinafter as being derived from a properly-balanced slide-valve and from one having a short stroke.

In order to enable others familiar with the construction of steam-engines to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the accompanying drawings, which form a part of this specification, Figure 1 is a vertical section of the steam-chest and part of the cylinder of a steam-engine with my improved slide-valve and balancing-plate; Fig. 2, a transverse section on the line 1 2, Fig. 1; and Fig. 3, an inverted plan view of the equilibrium or balancing plate.

Similar letters refer to similar parts throughout the several views.

A and A′ represent the opposite ends, and B the detachable cover, of the steam-chest, which is secured to or forms a part of the cylinder *c*.

D and D′ are the opposite steam-passages, and E the exhaust-passage, each steam-passage being divided into two ports *a* and *a′* at the face *x*, against which bears the valve F. Directly through this valve pass the two openings *d* and *d′*, each of which is of the same length and of the same or nearly the same width as one of the steam-ports. A central opening *e*, situated midway between the two openings *d* and *d′*, also passes directly through the valve, the latter being provided with spindles G G′, which, as usual, pass through stuffing-boxes formed on the steam-chest.

Above the valve F and bearing on the upper surface of the same is the equilibrium or balancing plate H, which is provided at the opposite ends with projections *i i*, the latter bearing against the ends of the steam-chest, and thus serving to maintain the plate in its proper longitudinal position, while the sides of the steam-chest prevent it from moving laterally. On each side of the balancing-plate is a longitudinal rib *m*, the lower edge of which coincides with the under face of the valve F, both resting on the face *x* of the cylinder, and the two ribs of the plate serving as guides to maintain the valve in its proper lateral position during its movement.

Within the balancing-plate are formed the two chambers I and I′, and midway between the latter a central chamber J, the two former chambers terminating at the under face of the plate in the two ports *n* and *n′*, and the chamber J, having an opening $n^2$ directly opposite to and of the same or nearly the same dimensions as the exhaust-port *q* in the face *x* of the cylinder, the ports *n* and *n′* of the plate being also directly opposite to and of the same or nearly the same dimensions as the ports *a* and *a′* of the cylinder.

Set-screws passing through the cover B of the steam-chest and springs may be used to maintain the under face of the balancing-plate in close contact with the valve, and the under face of the latter, as well as the ribs *m m* of the plate, in close contact with the face *x* of the cylinder, thereby preventing that jumping of the valve and plate to which during the movement of the engine they would be liable, but for these or other equivalent preventative appliances.

In Fig. 1 the valve F is illustrated as having reached the limit of its movement in the direction of the arrow, this position of the valve permitting the steam to pass from the steam-chest into the passage D in two currents, one directly through the port *a* and the other current through the port *n* of the balancing-plate into the chamber I and thence through the port *n′*, directly through the opening *d* of the valve, and through the port *a′*. In the meantime the exhaust-steam at

the opposite end of the cylinder is making its way in two currents from the passage D′ to the exhaust-passage E, one current taking a comparatively direct course through the port *a′* into the central opening *e* of the valve F, and thence through the port *q* into the exhaust-opening, while the other current takes a more circuitous course through the port *a*, through the opening *d′* of the valve, through the port *n*, chamber I′, and port *n′* of the balancing-plate, and thence through the central opening *e* of the valve, and through the port *q* to the exhaust-passage of the cylinder.

It will be evident that when the valve has reached the limit of its movement in the direction contrary to that pointed out by the arrow the direction of currents of steam to and from the cylinder will be reversed, and that the ports and chambers in the balance-plate serve alternately to direct the steam to and from the cylinder according to the position of the valve.

It will also be evident to those familiar with the construction of steam-engines that the plate H, situated as it is in close steam-tight contact with the valve and prevented by its ribs *m* and *m′* from bearing with more force than necessary on the valve, must serve to relieve the latter from that excessive and undue pressure of steam to which ordinary valves are subjected, while leakage is entirely prevented.

Double steam-ports have been heretofore used in steam-engines for the purpose of presenting an extended area of opening for the passage of steam to and from the cylinder by a very short movement of the valve, the eccentric and other appliances for operating the valve being consequently reduced in size, and a general diminution of friction and wear and tear of parts effected.

Different kinds of balanceing or equilibrium plates have also been used in connection with slide-valves for the purpose of relieving the latter from that excessive friction which detracts so seriously from the power of an engine furnished with ordinary unbalanced slide-valves, and for the purpose of rendering the appliances for operating the valve lighter, more simple, and inexpensive, and at the same time easily controlled by the attendant engineers.

All the advantages resulting from the use of a double-ported slide-valve with a short stroke and a balance-plate are so fully attained by my above-described improvements that the latter are especially applicable to large marine engines, those of the United States gunboat "Miami" affording a practical proof not only of the easy working of the valve itself, but of the simplicity and inexpensive character of the valve-gearing, and the facility with which the valve and consequently the engines can be controlled by the engineer, compared with the exertion demanded in the management of ordinary slide-valves of large engines, by the aid of much heavier and more costly appliances than those required for controlling my improved valves.

I wish it to be understood that I do not desire to claim, broadly, the double-ported slide-valve and the balancing or equilibrium plate viewed separately, nor do I claim the peculiar form of balancing-plate with its ribs *m*, as represented, such a plate having been heretofore used in England; nor in claiming the combination do I desire to restrict myself to the precise form or construction of the balancing-plate or slide-valve, as both may be modified without departing from the main feature of my invention; but

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

A slide-valve and balancing-plate, in combination with a double-ported cylinder-face, when the said valve is provided with such openings, and the said balancing-plate with such chambers and ports as to permit the steam to pass to and from the cylinder, substantially in the manner herein set forth.

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

J. VAUGHAN MERRICK.

Witnesses:

HENRY HOWSON,

JOHN WHITE.