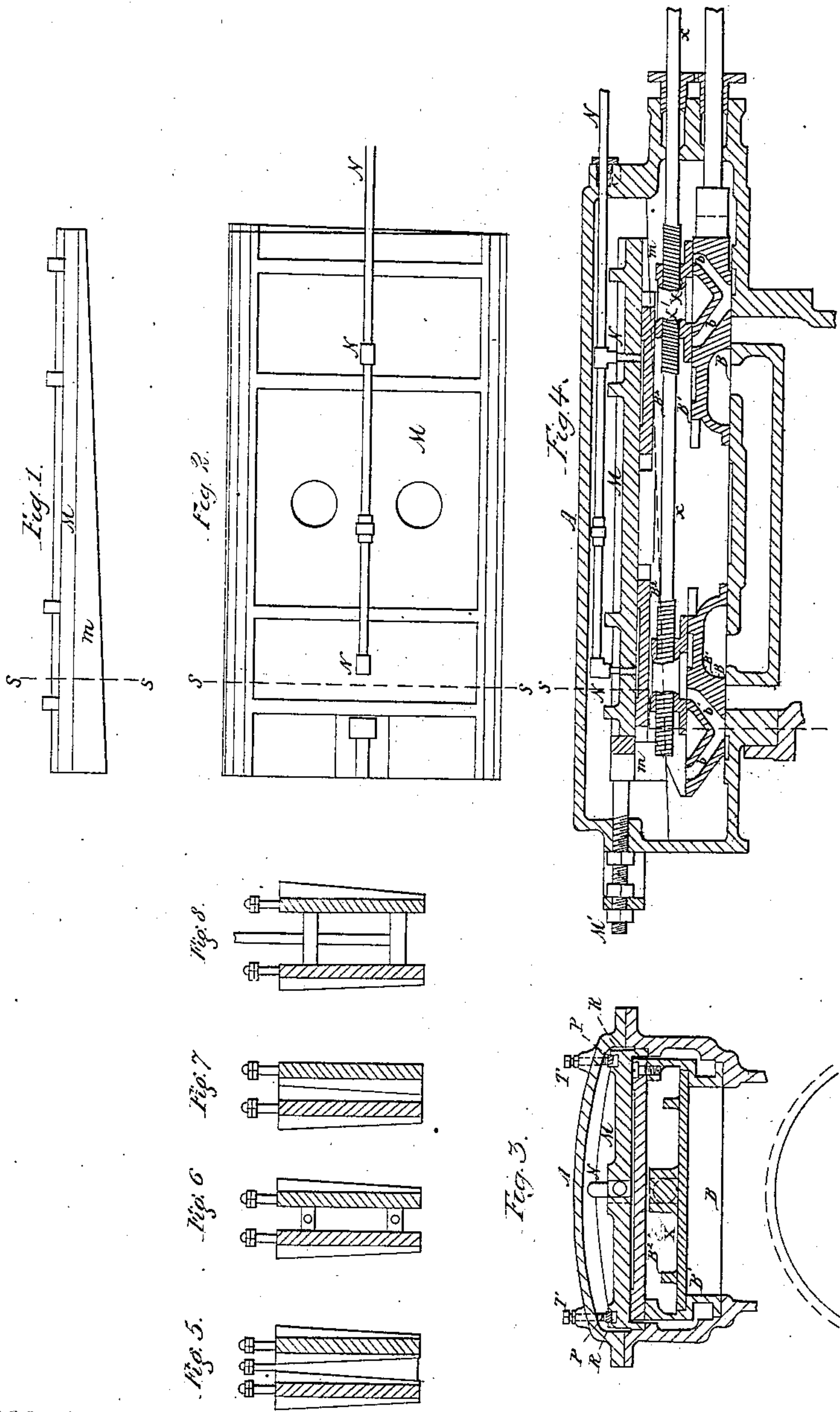


# Steam Balanced Valve.

*N<sup>o</sup> 39,064.*

*Patented June 30, 1863.*



*Witnesses.*

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN SLIDE-VALVES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 39,064, dated June 30, 1863.

*To all whom it may concern:*

Be it known that I, WILLIAM PORTER, of Mystic River, in the town of Groton, in the county of New London, in the State of Connecticut, have invented a certain new and useful Improvement in Steam-Engines; and I do hereby declare that the following is a full and exact description thereof, which is prepared with a view to the obtaining of Letters Patent therefor.

The accompanying drawings form a part of this specification, and represent a steam-chest with a portion of the cylinder in section, and also a main slide-valve, a cut-off slide, and a back plate adapted to represent my invention in detail as it may be applied to use.

Figure 1 is an edge view of the back plate without the parts which are to be attached to it. Fig. 2 is a view of the back face of the back plate. Fig. 3 is a cross-section of the several parts on the line S S in the other figures. Fig. 4 is a longitudinal central section through the principal parts.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawings and of the letters of reference marked thereon.

A is a steam-chest, supplied with steam through a passage, (not represented,) and mounted upon a cylinder in the ordinary manner. It contains a main slide-valve of the form represented, operated through the aid of a stem, in the ordinary manner. This slide-valve has three distinct faces, all adapted to run steam-tight in contact with corresponding surfaces.

B is the lower face, moving in contact with the cylinder-face. B' is an intermediate face adapted to carry a cut-off slide; and B<sup>2</sup> is a back face moving in contact with a back plate, for the purpose of fully or partially relieving the valve from the pressure of the steam. The back faces are formed on parts, which are fixed by screws upon the main slide after the faces B' are properly finished.

M is the back plate. It is so mounted on wedge-faces *m m*, supported upon suitable inclined bearings at each side, that by moving it forward or backward within the steam-chest by the adjusting-stem M' and the nuts represented it is raised and lowered.

N N' are tubular connections, which form

open passages leading from the cavities within the back faces, B<sup>2</sup>, of the slide up through the back plate, M, and thence outward through a stuffing-box in the end of the steam-chest. This connection N, which may be an ordinary gas-pipe or other tube smoothly finished, communicates either directly with the external atmosphere or with the exhaust-pipe or with the condenser by a pipe or other connection. (Not represented.) It serves to insure an equality of pressure in the cavities in the balance back of the slide with that in the condenser or other place to which it leads. Suitable grooves in the back of the back plate, M, contain rubber or felt, R, and strips of metal, P, which are pressed upon by screws T, as represented. When the back plate is adjusted or moved backward or forward by changing the nuts on the stem M', the strips P move therewith under the screws T, and the elasticity of the springs R allows for the rising or sinking of M, and keeps the parts always in contact. This prevents the back plate from becoming displaced under any circumstances when there is no steam on.

X X' represent the cut off slides. They are two narrow faces, connected rigidly together, and adapted to cover and uncover the corresponding branches, *b b'*, of the steam-port through the main slide B.

My main slide B and cut-off slide X X' are formed with each end the converse of the other end in the manner familiar to every steam-engineer, and by turning the cut-off-valve stem *x*, which carries a right and left hand screw, the cut-off parts are caused to approach and recede, so as with the same motion from the engine to cut off earlier or later in the stroke, as may be desired.

The operation of my invention will now be readily understood. The main slide B is set and operated in the ordinary manner, except that all the steam admitted into the cylinder must pass through the passages *b b'*, the valve never moving so far as to allow steam to enter past the ends or outer edges. These passages are sufficiently large to allow all the steam required to enter freely without wire-drawing, but, being divided, neither passage need be as wide as the port in the cylinder. In practice I prefer to make them of the same length and a very little more than half as wide as the port in the cylinder. The cut-off slide



is to admit and exclude steam by a slight movement analogous to what are often used for throttle-valves, and generally termed "grid-iron valves." A gentle motion of this slide communicated from the engine by ordinary means (not represented) suffices to cause its parts  $X X'$  to coincide with and cover at the proper period the upper ends of the branches  $b b'$  of the steam-ports in the main slide, from which period to the end of the stroke the parts  $X X'$  must continue to cover the passages  $b b'$ , but during the return-stroke they must of course move so as to uncover these passages. The motion of this cut-off relatively to the main slide may be less than usual, because the ports  $b b'$  are each narrower than usual; or, if the motion is as great as usual, the act of stopping the flow of steam is effected in less time than usual, and with the well-known advantage. Whenever, from wear of the surfaces or any other cause, the steam commences to escape between the back face,  $B^2$ , of the main slide and the back plate,  $M$ , it will be detected in its passage through the drain-pipe  $N$ . On such a condition becoming manifest, the engineer adjusts the nuts on  $M'$ , so as to draw the back plate,  $M$ , along on the incline  $m m$  till it is sufficiently lowered, the pipe  $N$  meanwhile moving freely through the stuffing-box, and the springs under the strips  $P$  extending to the same slight degree as the back plate,  $M$ , is lowered.

I do not confine myself to the precise forms of the parts which I have represented. I propose to change the form, as may be necessary, according to the size and proportion of the engine, the pressure of the steam to be understood and various other circumstances. If, for example, the engine be large enough to render it expedient, I may apply a ring or other suitable frame let in upon a rubber bed in the back face,  $B^2$ , instead of allowing the face itself to apply directly to the back plate,  $M$ , and the effect will be the same, as I have described, except that the elasticity of the rubber in the valve will contribute to compensate for slight wear or irregularity of the parts. I may also on large engines duplicate the ports  $b b'$  still further, so as to make three, or even more, branches of the steam-port all covered and uncovered at once by the movement of the cut-off valve. If the valve is very large, and the steam-pressure also high, I may make the face parts  $B^2$  of the main slide much thicker in proportion than is represented, in order to reduce the tendency to spring, or may even divide the cut off slide  $X X'$  into two or more distinct parts operated by separate rods  $x$ , and may connect the back-face part  $B^2$  with the main part  $B B'$  of the main slide by means of a web or the like along the center, so as to brace it in the manner which will be obvious to every mechanic. I may

also on small engines make the pipes  $N N'$  stronger and employ them alone as the means of moving and adjusting the position of the back plate, or, in other words, I can make the parts  $N'$  and the outer end of the pipe  $N$  one and the same part, performing the functions of both.

It is sometimes desirable in double engines to place the slide-valves and cut off valves for both cylinders in one steam-chest. My invention applies equally well in such cases as in single engines, and may be readily adapted to the various situations by an engineer with ordinary skill.

The sketches outlined in red, Figs. 5, 6, 7, and 8, and the accompanying explanations, indicate some of the modes available for holding down the two face-plates in such cases.

Some of the advantages due to several features of my invention may be separately enumerated as follows: First, by reason of my within-described means of constructing and arranging the surface  $M$ , the slide-valve faces  $B B' B^2$ , the ports  $b b'$ , and the cut-off slides  $X X'$ , I am able simply and effectively to combine all the advantages of a balanced main slide and of a convenient and efficient cut-off, which, with a gentle motion, acts rapidly and at a point very close to the cylinder; second, by reason of my within described manner of constructing and arranging the back plate,  $M$ , wedge-faces  $m m$ , inclosing steam-chest  $A$ , and single set of adjusting means  $M'$ , I am able to adjust its height very delicately and with perfect uniformity at a single operation without opening the steam-chest and while the steam is on; third, by my arrangement of the draining-passages  $N N'$  relatively to the adjustable back plate,  $M$ , and the other parts described, I insure a drainage or exhaustion of the balance portion of my valve in every position of the back plate.

Having now fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The arrangement of the surface  $M$ , main slide-faces  $B B' B^2$ , cut-off slides  $X X'$ , and ports  $b b'$ , all substantially in the manner and for the purpose herein set forth.

2. The construction and arrangement of the back plate,  $M$ , steam-chest  $A$ , wedge-faces  $m m$ , and single set of adjusting means  $M'$ , or their equivalents, substantially as and for the purpose herein set forth.

3. The arrangement of the draining-passages or pipes  $N N'$  relatively to the sliding adjustable back plate,  $M$ , and to the balance-face  $B^2$  of the main slide, substantially as and for the purpose herein set forth.

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Witnesses:

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