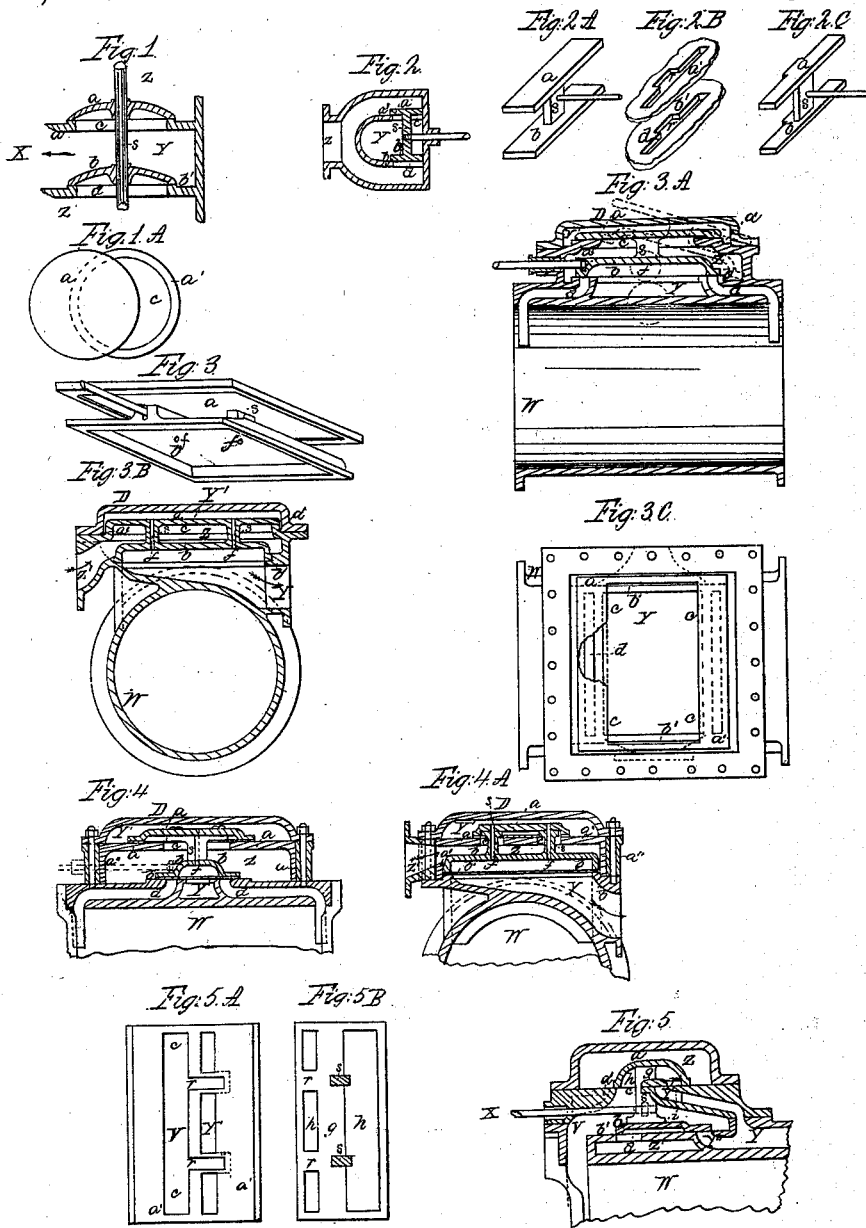


C. E. Emery

Steam Balanced Valve.

No. 47,284.

Patented Apr. 18, 1865.



Witnesses

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IMPROVEMENT IN BALANCED SLIDE-VALVES.

Specification forming part of Letters Patent No. 47,284, dated April 18, 1865.

To all whom it may concern:

Be it known that I, CHARLES E. EMERY, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Balanced Slide-Valves; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification.

This improvement is intended to be applied to that kind of balanced or partially-balanced slide-valves which are made in two connected parts sliding on parallel seats, and the general construction of which is similar to that of the "double puppet-valve."

The invention consists, substantially, in such a construction of the valve and valve-chests that the parallel valve-faces and valve-seats are supported as rigidly as may be desired at the proper distance from each other to insure the contact of the valve faces and seats, the appliances being so designed that such distance will not be liable to change and cause leakage between the rubbing-surfaces of the valve and seats on account of precautions used to prevent other leakages or on account of the usual examinations which are found in practice to be necessary or expedient.

In the drawings those figures which represent different views or parts of the same thing have been given the same number, such different views or parts being distinguished from each other by an annexed capital letter.

The drawings will be described as they are referred to hereinafter.

In all the drawings the same letters of reference, other than those annexed to the numbers of the figures, refer to the same thing in figures of like number, and to corresponding things in the other figures.

Figure 1 represents, in section, a double puppet-valve and its seats of the usual construction, except that the faces on each of the disks *a* and *b* of the valve and their corresponding seats, *a'* and *b'*, instead of being conical, as usual, are flat and parallel to each other. If this valve be operated by moving it in a direction parallel with its seats—as, for instance, toward *X*—the arrangement shows the principle of the kind of valve to which my improvement is to be applied. In this case sliding the valve over its seats would expose

two crescent-shaped openings, like *c*, Fig. 1A, for the passage of the fluid controlled by the valve, or four such openings if the disks were sufficiently cup-shaped and the bearing parts of the seats elevated. Figs. 2 are intended to show the same principle better adapted for use as a slide-valve, the parts *a* and *b* of the valve being rectangular and uncovering openings of similar figure.

The figures numbered 3 represent the application of my improvement to a steam-engine slide valve, used to permit the ingress and egress of steam to the ends of the cylinder and balanced on the principle of the valve above mentioned. Fig. 3 is a perspective view of the valve; Fig. 3A, a longitudinal section through the valve-cylinder, steam-chests, &c.; Fig. 3B, a transverse section of the same; and Fig. 3C, a plan view of the same, the upper steam-chest, *D*, being removed, and the plate *a'* broken to show one of the ports *d*.

The figures numbered 4 represent a different mode of accomplishing the desired results, Fig. 4 being a longitudinal section, and Fig. 4A a transverse section, through the valve, steam-chest, and cylinder. In both these sets of figures, *W* represents the steam-cylinder; *d d*, the cylinder-ports; *Y*, the exhaust-port; *b*, the slide-valve proper, and *b'* its seat. These are constructed in the usual manner, and do not need further description. Connected with *b* by one or more standards, *s s*, is a plate, *a*, with bearing-faces on its lower side, which rest and slide on a seat, *a'*, at the same time that the valve-face on *b* rests and slides on *b'*, the standards *s s* passing through an opening or openings, *c c*, in *a'*, which opening or openings are of sufficient length to permit the movement of the valve. The upper seat, *a'*, being connected to *b'*, as represented, it is evident that if steam be admitted at *Z'* to the space *Z* it will tend to press the part *b* toward its seat *b'* and the part *a* away from its seat *a'*, the pressure tending to seat the valve being balanced in a greater or less degree in the proportion of the relative areas of *a* and *b* exposed to pressure. To maintain the same pressure at *Y'*, above *a*, that may be in the exhaust-port *Y*, *a* is covered by a chest, *D*, and openings *f f* are made through the standards *s s* to form a communication; or an exterior pipe is attached for that purpose. It is evident that steam may be admitted to *Y*

and Y and exhausted into the space Z without altering the principle of construction or method of balancing the valve.

In the construction of a slide-valve with two bearing-faces not in the same plane, on the principle above specified, several important requisites are to be considered.

First. In order that both the faces on the parts *a* and *b* of the valve may bear at the same time on their seats *a'* and *b'*, it is evident that the parts *a* and *b* must be firmly attached to each other in such a manner that the bearing-faces on them will not be liable to change their relative positions with or distance from each other. The same must be true of the seats *a'* and *b'*, for to have such a valve perform its duties properly both of the valve-faces must be in contact with their seats at the same time to prevent leakage.

Second. The details of construction should be so arranged that the valve may easily be removed for examination and the valve-seats exposed to view for similar purposes. It therefore follows that the act of taking apart and putting together such portions as may be necessary to make the usual examination and repairs should not be liable to injure the perfect action of the valve and cause leakage.

Third. The means employed to prevent leakage at whatever joints may be necessary in the steam chest or valve should not be liable to cause leakage of the valve itself under either of its faces.

In the figures numbered 3 the two parts *a* and *b* of the valve are represented as joined in one piece or casting by the standards *s s*. To enable the valve thus formed to be removed or put in place, the opening *c* in the plate *a'* is made wider than the part *b* of the valve, the part *a* being sufficiently wide to cover *c* when the valve is in its place, as shown in Fig. 3B. The length of the opening *c* is made to slightly exceed the distance from one end of the part *b* of the valve to the other side of standards or connections *s s*, so that by moving the valve to its limit one end can be lifted, putting the valve into the position shown in red lines in Fig. 3A, and the part *b* taken out through the opening *c*. The seat *a'* in Fig. 3 is represented as being made or cast in one piece with the steam chest or cylinder. This requires that the bearing-faces of *b'* shall be made smooth through the opening *c*, or such other side openings as may be provided. It will be observed that by this method of constructing the valve and its seats the requisites above mentioned are all fulfilled, for, first, the distances between the valve faces or seats will not be liable to change, for, each pair being in one piece, the question of preventing this is simply one of the disposition and strength of materials; second, the valve is easily removed and the seats exposed to view; and, third, there are no joints. This method not only furnishes an efficient but simple means of putting the kind of valve to which it is applied in practical operation.

But it is not always convenient to so proportion the valve that it may be put in place and removed through the opening *c*, and there are often cases where it would not be best in practice to make the steam chest, cylinder, and seats *a'* and *b'* in one piece.

The requisites above specified are then fulfilled by the following means: Wherever two pieces of metal which form any part of the connection of the parts *a* and *b* of the valve or of the connection between the two seats *a'* and *b'* come together, they are put in actual contact without the interposition of any soft substance to "make the joint," and especial provision is made to prevent leakage where it would be liable to occur.

In the figures numbered 4 the valve is represented as formed in two portions, the standards *s s* being cast on *b* and bolted to *a*. The seat *a'* is supported by the attached sides *a'' a''*, which rest on *b'* throughout the whole or a portion of their extent. The points where *a'' a''* touch *b'* are fitted to bear fairly, and no soft substance is introduced to make the joint. The steam-chest proper surrounds the sides or legs *a'' a''*, and is made in the usual manner, either cast on or with a joint on the cylinder at *b'*, kept tight by rubber, lead, or other packing, as usual. In the case represented the joint between the steam-chest and its cover *D* is made to extend over or onto the top of the plate *a'*, so as to prevent leakage, either outside the steam-chest or from the space *Z* to *Y*. This joint is made in the usual manner, there being no objection to the use of a soft substance, like rubber or lead. The plan adopted of using separate means to support the seat *a'* insures its being kept exactly at the proper distance from *b'*, as has been shown requisite; and since the metals come in contact where *a'' a''* touches *b'* the whole structure can be taken apart for examination and replaced without altering the distance between the faces in the least. Had *a'* been supported by the steam chest itself, and had joints been made in the latter in the usual way, the distance between the seats would be liable to vary every time they were examined, for, were rubber used for the joint, the distance between the seats would vary according as the steam-chest bolts were tight or loose, and were a soft substance, which afterward hardens—like red lead, putty, or cement—used, it would be difficult to make the joint of exactly the same thickness at different times.

It will be observed that the plan I adopt provides means to support the seat *a'*, whereby no yielding material is used to form any joint which will vary the distance between the seats, actual metallic contact being provided for in such cases, and also means to prevent leakage. The same principle may be applied to the construction of the valve in two portions when leakage at the joint would do injury. Another application of this plan would be to cast the seat *a'* to the steam-chest, and make a joint to secure the steam-chest to the cylinder.

der, one or both the parts of which joint should have metal protuberances or ridges attached to come in contact with the metal of the other part or parts, or metal slips be inserted for similar purposes, while the joint between the depressed portions could be made with rubber or other substances which would yield until the protuberances or slips touched metal to metal, so as to secure the two parts at a fixed distance from each other. This plan is particularly adapted to the case of the valve above mentioned. Or, where any joint occurs, the parts may be secured together so that they bear fairly at some few points sufficient to keep them at the proper distance, and then packing of any suitable kind can be driven or inserted into a space prepared for the purpose in a manner similar to that of making a rust-joint. It is evident that if this kind of joints be used in forming all necessary connections between the parallel seats *a'* and *b'*, or between the parallel valve-faces *a* and *b*, or for every joint liable to vary the distance between such parallel seats or faces—that is, if all joints are made in metallic or equivalent contact—their application will be equivalent to that of forming the valve-seats in one piece of metal, or the valve in that manner, as represented in Fig. 3, (so far as regards the object specified,) contact of metals to insure invariability being secured in each case—in Figs. 3 by atomical, and in Figs. 4 by mechanical, contact.

By using a "scraped" or "ground" joint in all places where a variable thickness of any substance making the joint would injure the perfect working of this kind of valve, a tight joint can be obtained, which will of itself furnish the contact of metal surfaces shown to be desirable. To apply this method to the steam-chest in the figures numbered 3, a ground or scraped joint would be made where such chest joins the cylinder at or near the height of the surface of the seat *b'*. (A joint of some kind would be desirable at that point in most cases, for convenience in finishing and examining the seat.) To apply such joint to the figures numbered 4, the seat *a'* could be cast directly to the steam-chest, and the joint between the latter and cylinder could be scraped or ground, or both. In many cases it will be convenient to construct the steam-chest and plate *a* separate, as well from each other as from the cylinder, in which case the precaution must be observed that all joints influencing the distance between the two seats must have sufficient metallic contact, or its equivalent, to be unvarying, and either or all such joints may be ground or scraped, or both.

The figures numbered 5 represent a modification of the kind of valve to which these improvements are applied, in which both of the parts *a* and *b* of the valve act as valves, and serve as a steam-engine slide of the "double-ported" variety. The construction may be understood by the letters of reference, which

indicate parts corresponding to those having the same letters in the other figures—V, however, in these figures referring to the cylinder-port. The steam-chest forming part of the upper seat, *a'*, is represented as meeting the cylinder with a ground or scraped joint.

The improvements mentioned herein are intended to be applied only to a slide-valve constructed in two connected parts, *a* and *b*, with a bearing-face on each, such faces facing in the same direction, and the connection or connections *s s* between the parts *a* and *b* of which valve pass through an opening or openings, *c c*, in one of the valve-seats *a'*—in other words, to that kind or style of valve the general appearance, form of construction, and method of balancing of which are similar to the double puppet-valve, but which is operated by a sliding motion, and the details of construction of which are adapted to such method of operation.

What I claim as new, and wish to secure by Letters Patent, is—

1. The combination of a valve of the kind or style above specified, with its seats, in such a manner that when the parts *a* and *b* of the valve are secured together or cast or formed in a single piece the whole valve may be inserted in and removed from its place by putting one part, *b*, through an opening, *c*, in one of its seats, *a'*, substantially as described, and as shown in the figures numbered 3.

2. The use of the supports *a'' a''*, Figs. 4, or their equivalents, between the valve-seats *a'* and *b'*, and of the standards or supports *s s* between the parts *a* and *b* of the valve, with actual or metallic contact at such of their joints as can vary the distance between the valve seats or faces, combined in manner described, to secure the purposes herein specified, with a common joint of any reliable kind to prevent leakage, substantially as shown and applied in Figs. 4, between the steam-chest, seat *a'*, and cover D.

3. The combination, to accomplish the purposes intended and specified, of a double-faced slide-valve of the kind or style to which these improvements are applied, as above expressed, with a steam-chest, or its equivalent, supporting one or both the parallel valve-seats, and so constructed that all joints between the parts of such steam-chest, or equivalent, or between such steam-chest and either or both of said valve-seats *a'* and *b'*, which can vary the distance between said seats, are made in sufficient actual or metallic contact, by scraping, grinding, or other means, to be tight without other appliances, and sustain said seats at a proper and certain distance from each other, substantially as described.

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