

(No Model.)

D. A. WOODBURY.
BALANCED SLIDE VALVE.

No. 303,477.

Patented Aug. 12, 1884.

Fig. 1.

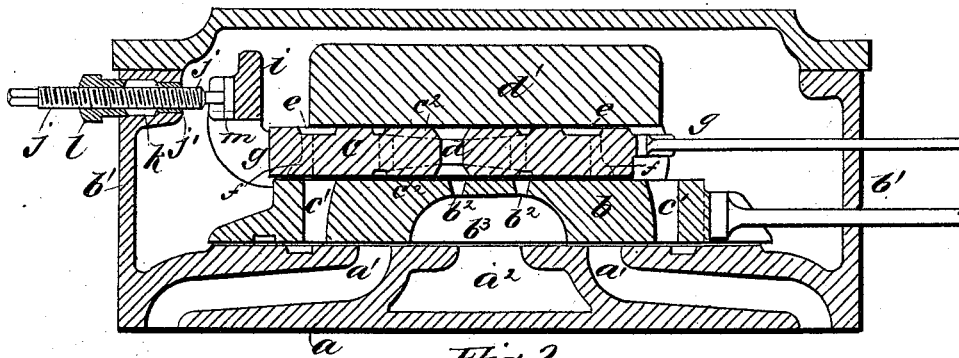


Fig. 2.

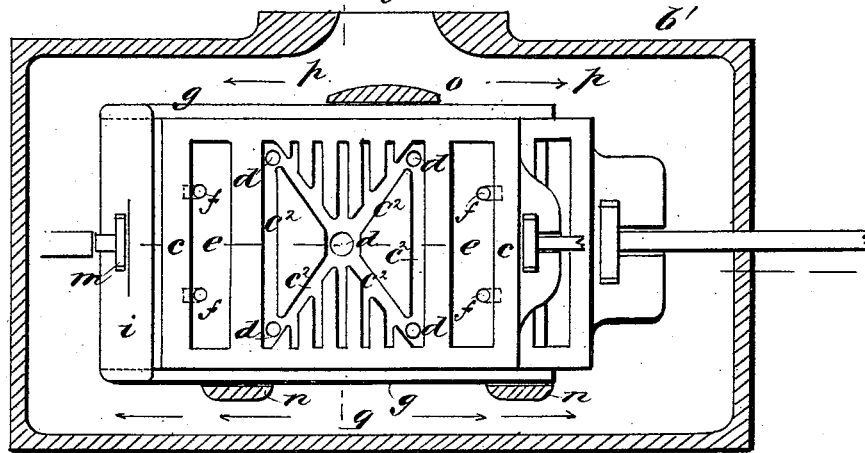


Fig. 3.

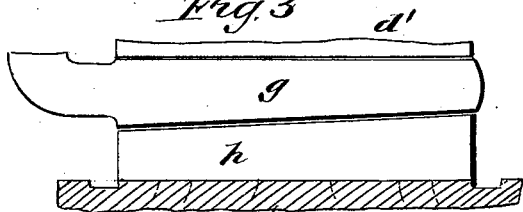
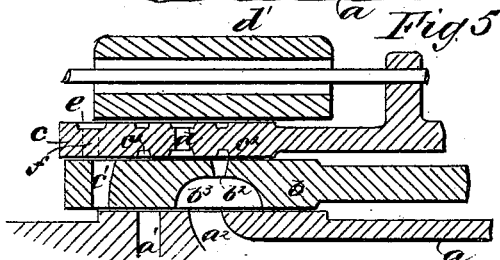
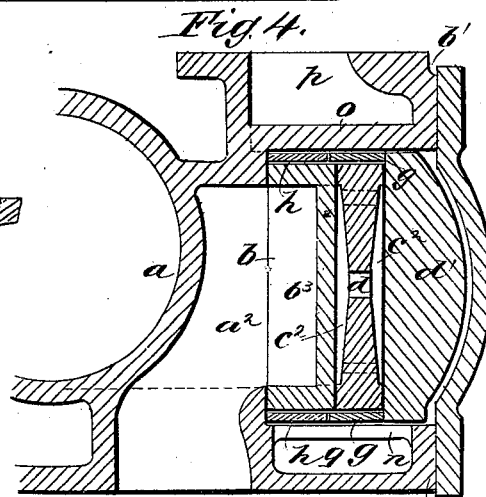


Fig. 4.



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DANIEL A. WOODBURY, OF ROCHESTER, NEW YORK.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 303,477, dated August 12, 1884.

Application filed November 30, 1883. (No model.)

To all whom it may concern:

Be it known that I, DANIEL A. WOODBURY, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Balanced Slide-Valves for Steam-Engines, of which the following is a full, clear, and exact description.

My invention relates to slide-valves of that class in which the cut-off valve is seated upon the main or distributing valve. The object is to provide for relieving the sliding faces of both the main and cut-off valves to any desired extent, by means under the control of the engineer, and so contrived as to accomplish the same by one movement of the adjusting device, all as hereinafter fully described.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal horizontal section through a short or single D-valve, located upon the side of the steam-cylinder. Fig. 2 is a longitudinal elevation through the valve-case, and side elevation of the valves with the relief-plate removed, and showing the back or plan of the cut-off valve. Fig. 3 is a detail illustrating the device for supporting and adjusting the relief-plate. Fig. 4 is a transverse section through the center of the valve-chest, valves, and cylinder. Fig. 5 is a longitudinal section through one end of a long or double D-valve, showing the manner of applying the invention to it.

The steam-cylinder *a* is provided with the usual steam-ports, *a'*, and exhaust-port *a''*, and in this example the steam-chest *b'* is represented as being cast together with the cylinder; but it may be made separately, if preferred.

I propose to provide the main or distributing valve *b* with one or more openings or passages, *b''*, extending from the exhaust-cavity *b''* through to the back of the valve, in addition to the usual cut-off steam-passages, *c'*, and I construct the cut-off valve with a number of channels or grooves, *c''*, on both of its faces, which grooves traverse an area equal or nearly so to the area of the exhaust-cavity *b''*, said cut-off valve *c* also having passages *d* extending through the said valve or from one side to the other for maintaining constant communication

through the passages *b''* with the exhaust-cavity *b''*, so that said grooves or channels *c''* will be filled with exhaust-steam at all times of the same pressure that prevails in said exhaust-cavity. The whole of the surfaces of the grooved areas might be removed, but the wear of the parts would be much less uniform, and as the exhaust-steam permeates the slight spaces between the surfaces left between the channels, the balance is as perfect as if the whole surface were removed.

In the back of the cut-off valve *c*, I form recesses *e* at suitable distances from the ends, which correspond in area with the area of the ports *c* at the back face of valve *b*, and I provide passages *f* through valve *c*, through which said recesses *e* are in constant communication with passages *c'* during those portions of the stroke when the steam is cut off by the action of the valve *c*, thereby balancing the partial exhaust of the steam from the passages by the expansion of the steam in the cylinder. The relief-plate *d'*, of the usual form with a plain working face, is arranged over the cut-off valve *c*, said plate being secured from longitudinal movement in any convenient manner, which it is not necessary to show. This plate *d'* is arranged upon wedges *g*, which sustain the pressure of the steam upon the plate, and said wedges may be so adjusted as to entirely relieve the cut-off valve, or leave so much pressure upon it as may be desired. The wedges *g* may be supported in any approved way; but I prefer the independent supports *h*, of like thickness and metal as the wedges, so that they may expand freely and uniformly with the wedges. The wedges may be restrained from longitudinal movement by any approved means, or one or both may be provided with means of independent adjustment to facilitate the attainment of a uniform bearing of the relief-plate along the edges of the valve. The wedges *g* are connected by a bar, *i*, at their wider ends, for being moved simultaneously by said bar, which has an adjusting-screw, *j*, connected with it, which screw extends out through a stuffing-box, *k*, and through a bush, *j'*, in the bottom of the box in which the screw works, to be screwed in or out by a wrench applied to the outer end of the screw. The gland *l* of the stuffing-box is threaded to fit

the screw to utilize the screw for tightening up the gland on the packing, and the gland at the same time serves as a jam or lock-nut to the screw. When the wedges are once properly
 5 adjusted, the screw *j* will seldom require changing, and may be inclosed to protect it from being tampered with. The screw *j* is connected to the cross-bar *i* by a collar, *m*, fitted in the slot of the bar, enabling the screw to draw the
 10 wedges back as well as to push them forward, and in practice a spring may be set in the end of the relief-plate, or any convenient place, to resist the forward movement of the wedges, and thus provide against any slackness of the
 15 joints concerned in the adjustment. The wedges might be made separate, and be adjusted by means of a wedge acting upon both at the same time; but I prefer the screw as the most convenient and simple device. The
 20 lower supporting-piece, *h*, and wedge *g* may be supported by the cross-bars *n*, and a central cross-bar, *o*, may be arranged over the upper supporting-piece and wedge for keeping them in place. Steam-passages *p* and *q* are formed
 25 along between the sides of the valve and the valve-chest, which passages are so proportioned that the steam will divide into two currents, one flowing toward each end of the chest. This will induce a flow through the
 30 passage *q*, first in one direction and then in the other, as the steam alternately draws from the ends of the chest. This keeps the whole valve system constantly surrounded by live steam, whereas otherwise the lower side might
 35 at times be immersed in water, and thus the expansion of the parts would be rendered unequal.

It will be seen that with the valves and adjusting devices constructed as shown, the
 40 relief-plate may be adjusted so as to bear the entire pressure of the steam, and the cut-off valve may be completely relieved of the pressure, which is a consideration of great importance when the cut-off valve is operated
 45 automatically. There will still be a little pressure upon the working-face of the main valve, incident to the steam-ports *a'* of the cylinder, which pressure may be counteracted in part by increasing the area of the balancing
 50 recesses *c''* in the cut-off valve or enlarging the outer ends of the passages *c* and the cavities *e*, or by both means. This pressure may be completely balanced by forming recesses of corresponding size to the ports *a'* in
 55 the backs of both the main and cut-off valves with passages so arranged as to keep up a constant communication therewith. This, however, increases the complication of the parts and the liability to leakage, besides it
 60 is found better in practice to have a little pressure upon the working-face of the distributing-valve.

The proportions and arrangements of the parts are capable of a great variety of modifications to adapt this improved valve system
 65 to different circumstances and requirements—as, for instance, the area of the channels or recesses *c''* might be elongated in the direction of movement of the valves, and narrowed in
 70 width, and the recesses *e* be divided and elongated in the same direction, and so as to extend along at the sides of the main recesses *c''*; and I may form the outer recesses or channels *c''* in the inner side or face of the relief-
 75 plate, or partly in the valve and partly in the plate, and the inner recesses *c''* may be formed either in the face of the cut-off valve or in the back of the main distributing-valve, or in both; but the arrangement of the recesses as shown is to be preferred in practice. 80

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of the relief-plate *d'* and cut-off valve *c* with the main distributing-valve *b*, and suitable communicating openings and passages, whereby the exhaust cavity or cavities of the distributing-valve will be counterbalanced by the distribution of the
 85 exhaust-steam over areas at the inside of the relief-plate, and at each side of the cut-off
 90 valve, corresponding in extent, or nearly so, with the area of the exhaust cavity or cavities in the main distributing-valve, substantially as shown and described. 95

2. The cut-off valve *c*, having recesses *e* and passages *f*, in combination with the relief-plate *d'*, and with the distributing-valve *b*, having passages *c'*, substantially as described. 100

3. The combination, with the valves *b* *c* and the relief-plate *d'*, of the wedges *g*, extending the whole length of the relief-plate and supporting the same, and means for adjusting the
 105 wedges, substantially as herein shown and described.

4. The combination, with the adjusting-wedges *g*, valves *b* *c*, and relief-plate *d'*, of the independent supports *h*, substantially as described. 110

5. In a balanced slide-valve, the combination, with the valve *c*, set upon edge and arranged on the side of the cylinder, and its relief-plate *d'*, of a steam space or passage, *g*, under the lower edge of said valve, substantially as herein shown and described, whereby
 115 a uniform expansion of the parts will be obtained, and a relief-plate caused to bear with a uniform pressure at its upper and lower edges upon the valve, as set forth.

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Witnesses:

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