

B. BRAZELLE.

BALANCED SLIDE VALVE.

No. 172,603.

Patented Jan. 25, 1876.

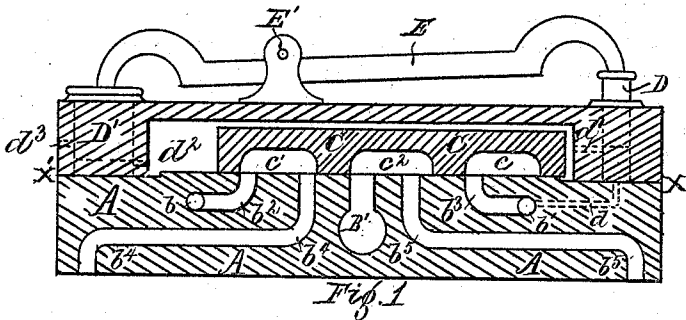


Fig. 1.

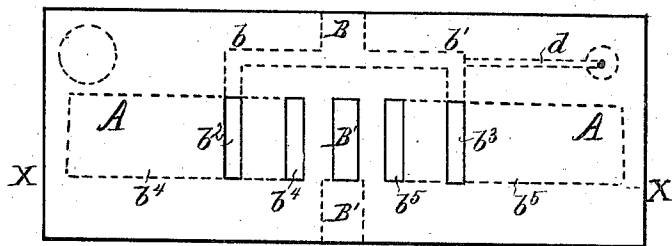


Fig. 2.

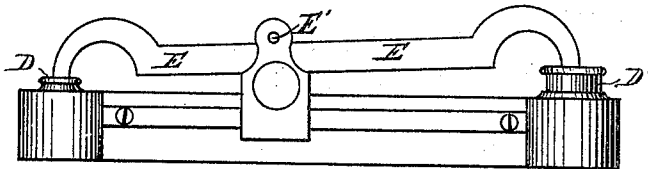


Fig. 3.

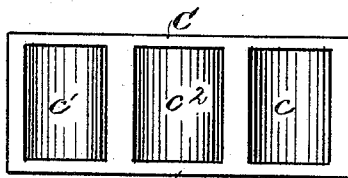


Fig. 4.

Witnesses:

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UNITED STATES PATENT OFFICE.

BENJAMIN BRAZELLE, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN BALANCED SLIDE-VALVES.

Specification forming part of Letters Patent No. 172,603, dated January 25, 1876; application filed July 26, 1875.

To all whom it may concern:

Be it known that I, BENJAMIN BRAZELLE, of St. Louis, Missouri, have invented an Improved Balanced Slide-Valve, of which the following is a specification:

This invention has for its object the relieving of slide-valves for steam-engines of friction, and achieves the advantageous results from the use of a balanced slide-valve.

The constructive principle of this invention is based upon the obtaining of a perfect balance or equilibrium by means of unequal pressures acting upon unequal areas, and as now will more fully appear.

Of the drawing, Figure 1 is a sectional elevation on line *x x* of Fig. 2. Fig. 2 is a top sectional plan on line *x' x'* of Fig. 1. Fig. 3 is a part side elevation, showing lever-connection with plunger-heads, Fig. 4 being a bottom plan of slide-valve.

A represents the cylinder. B, Fig. 2, is the induction-port. *b b'*, Figs. 1 and 2, are the steam-inlet ports, which communicate by transverse ports *b² b³* to the valve-seat. *b⁴ b⁵* are the main steam-ports, that serve alternately to admit steam to piston and exhaust from cylinder; B', Fig. 2, being the exhaust-port. In steam-chest is the usual slide-valve C, having the three D-chambers or cores *c c' c²*. The valve controls the ports *b² b³*, and main ports *b⁴ b⁵*. Thus, when valve is in the position as shown in Fig. 1, the core *c* covers the port *b³*, while the opposite core *c'* covers ports *b² b⁴*, establishing steam-connection to that end of cylinder, the center core *c²* establishing exhaust-connection by covering port *b⁵* and exhaust B', and vice versa when the reverse stroke of piston takes place.

To carry out the principle of my invention as stated, constituting the nature thereof, I provide a further port or communication, *d*, in conjunction with one of the inlet-ports—say, *b¹*—(see dotted lines, Figs. 1 and 2,) the purpose of this port being to admit steam to operate a plunger, D, which is top of, or to one side of, the cylinder, as shown in Figs. 1, 2, 3, the plunger D being to control the further admission of steam to steam-chest; hence the farther port *d'*, (shown in Fig. 1,) and communicating from plunger-cylinder to steam-

chest. The steam in the chest has a further communication by a port, *d²*, to the cylinder that contains the plunger D'. (Shown clearly in Fig. 1.)

By this means direct steam-connection from boiler is had to operate the plungers D D', these being connected by the lever E, as shown in Figs. 1 and 3. The leverage can be established or regulated by means of a movable fulcrum, E', which, as here shown, slides on a horizontal bar, *e*, Fig. 3, although other ordinary ways of changing the fulcrum can be used. The areas of the plungers are dissimilar; thus, as shown, that of D is smaller than that of D', in order to obtain unequal pressures, and to effect the purpose of my improvement, as will hereinafter appear.

My improvement being thus constructed and arranged, the operation of the parts is as follows: Supposing the position of the valve to be as in Fig. 1, the steam is admitted through inlet-port *b* and port *b²* under the core *c'* of the valve; thence into main steam-port *b⁵* to drive the piston to complete a stroke, the exhaust taking place through the opposite main port *b⁴* under the center core *c²* of valve, from thence out of exhaust. At same time, be it noted, the direct pressure of steam from boiler has entered the inlet-port *b¹*, and, by means of the port *d*, raised the small plunger D, and in doing so passes through the port *d'* into the steam-chest top of the valve. The excess of steam-pressure top of valve, owing to its increased area, passes through the port *d²* and raises the large plunger D', and in so doing, by means of the lever-connection with plunger D, causes it to close further admission of steam to the chest. The fulcrum having been supposed at center, it is plain that thus the steam-pressure top of the valve becomes less to that degree that the steam-pressure under the valve is the greater—*i. e.*, the less pressure of steam top of valve with its increased area, being, therefore, counterbalanced by the greater steam-pressure under the valve acting upon less area, causes said valve to be automatically balanced, and relieved of its friction.

In case the steam-pressure in the steam-chest becomes reduced from condensation or

other causes, then the small plunger, on account of the greater pressure below the valve, will be forced up, and thus supply the chest through port d^1 with its loss of pressure. If the pressure under the valve C becomes reduced and a greater pressure is in the steam-chest, then the larger plunger will be forced up, to permit such excess of pressure to escape through the exhaust-port d^2 . (See Fig. 1.) This done, said plunger will also close. A greater pressure in the steam-chest can be achieved for the purpose of a pressure-valve, by sliding or changing the fulcrum in the direction of the large plunger. (See Figs. 1 and 3.) The excess of leverage will then be in favor of small plunger, and this raised admits the required greater pressure in steam-chest. My improvement, therefore, enables the valve to be balanced or to act as a pressure-valve, or be overbalanced, (by changing the fulcrum in the direction of the small plunger,) and all this while the engine is in motion, the engineer having the valve under perfect control.

By changing the position of the fulcrum all

wear that takes place can be compensated, or follow up whatever increase of area arises from use; also, the steam-chest can be freed from all dirt, grit, and impurities out of the exhaust d^3 , and otherwise my improvement possesses advantages readily apparent.

What I claim is—

1. A lever having a changeable fulcrum, and carrying plungers arranged in a steam-chest with relation to a slide-valve, in the manner herein shown and described, and by means whereof the lesser pressure top of valve is counterbalanced by the greater pressure below said valve, forming an improved balanced valve, as set forth.

2. The combination of the plungers D D', lever E, movable fulcrum E', ports d^2 d^1 d , with relation to a steam-chest and cylinder A, to operate as and for the purpose set forth.

In testimony of said invention I have hereunto set my hand.

BENJAMIN BRAZELLE.

Witnesses:

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