

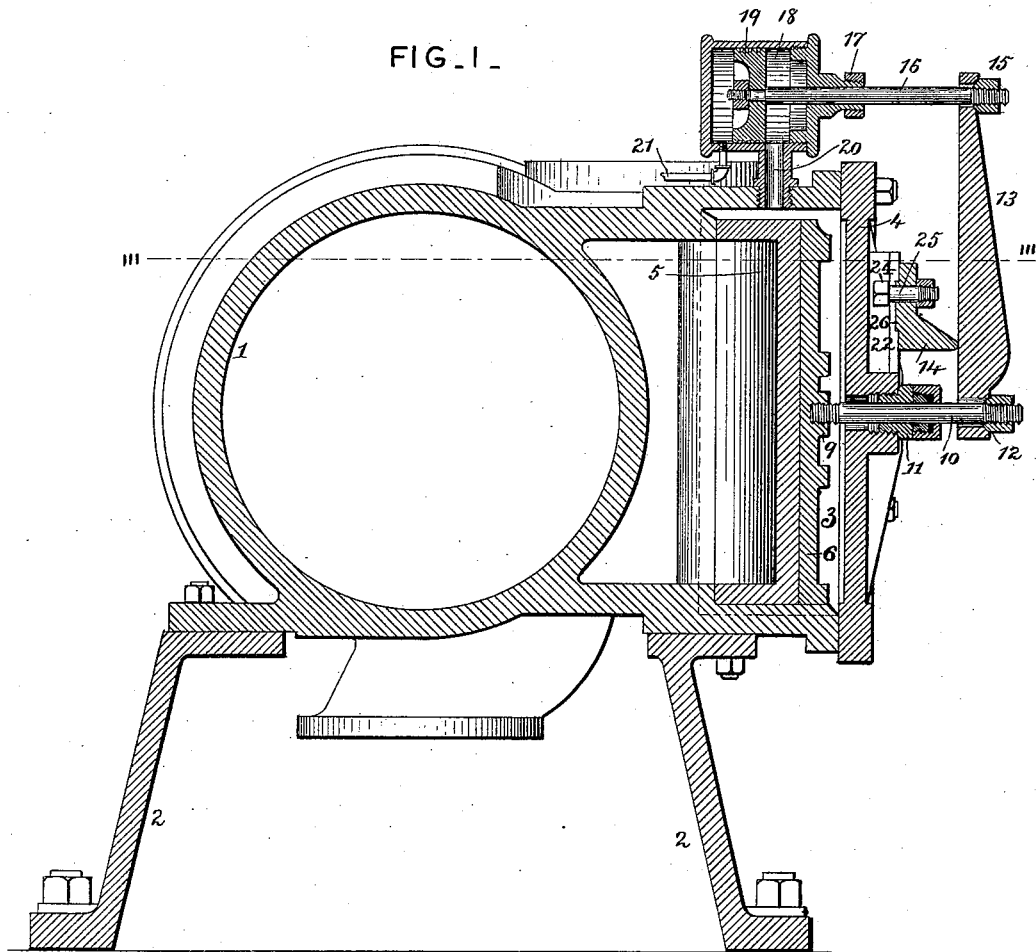
(No Model.)

3 Sheets—Sheet 1.

P. McDERMOTT.
BALANCED SLIDE VALVE.

No. 304,338.

Patented Sept. 2, 1884.



ATTEST—
Geo. T. Smallwood,
J. Henry Kaiser.

INVENTOR—
Patrick M. McDermott
By Knight Bros
attys.

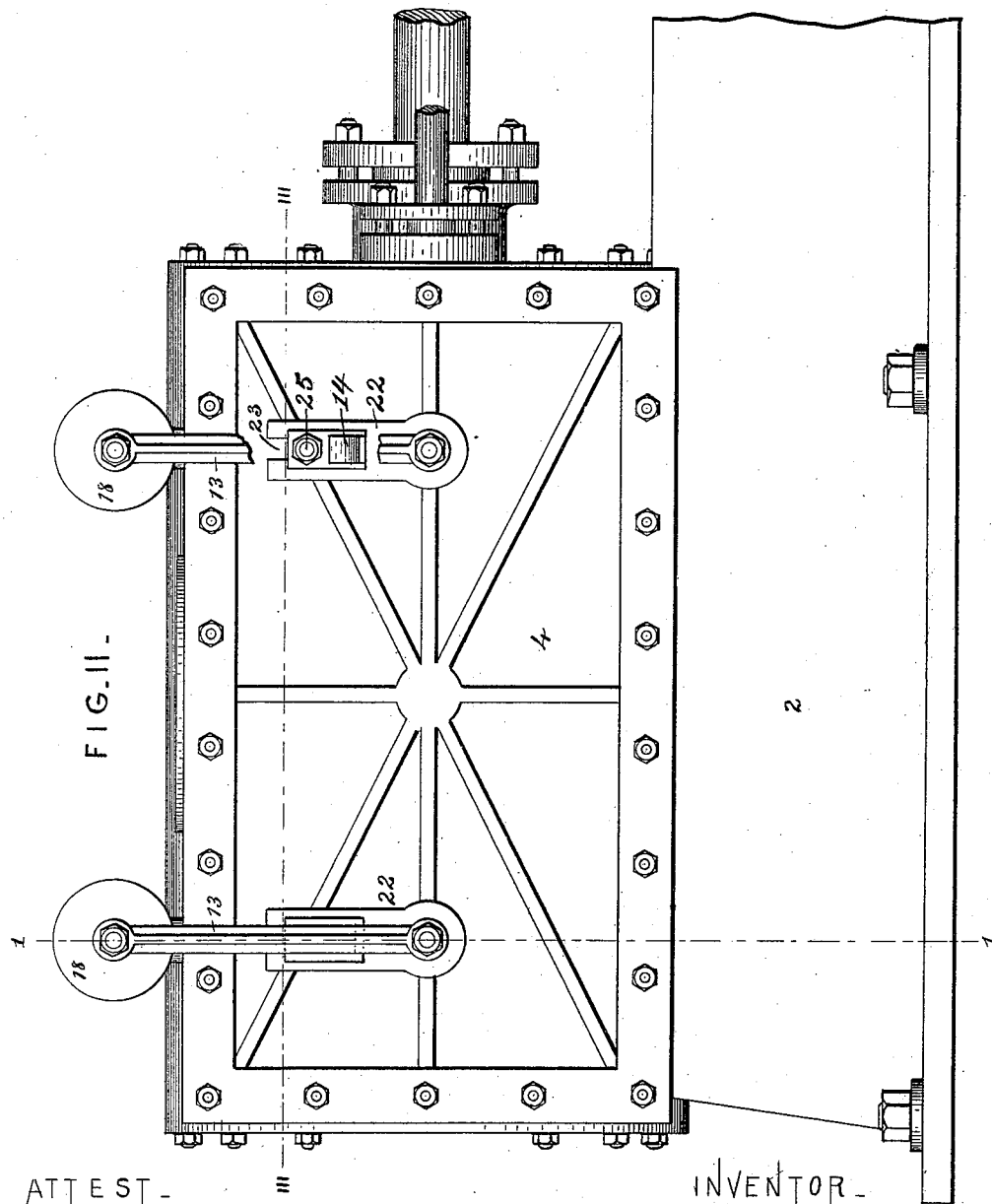
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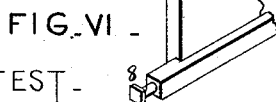
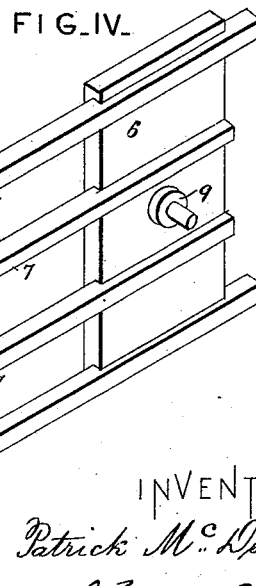
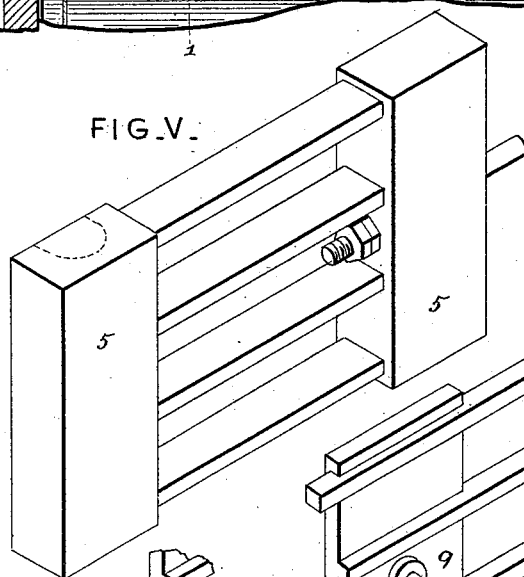
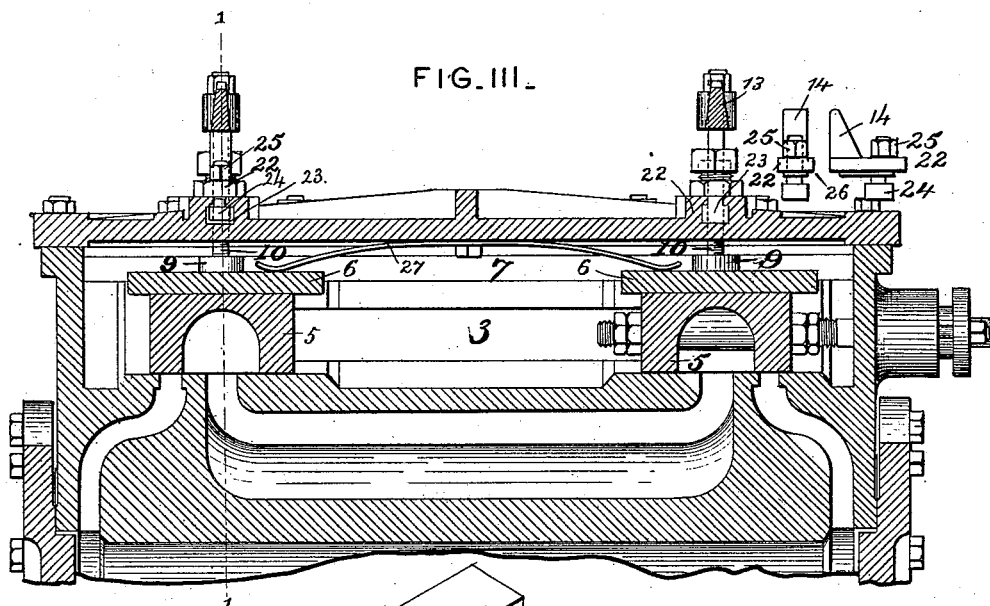
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UNITED STATES PATENT OFFICE.

PATRICK McDERMOTT, OF MEMPHIS, TENNESSEE.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 304,338, dated September 2, 1884.

Application filed March 7, 1884. (No model.)

To all whom it may concern:

Be it known that I, PATRICK McDERMOTT, a citizen of the United States, residing at Memphis, in the county of Shelby and State of Tennessee, have invented certain new and useful Improvements in Balanced Slide-Valves of Steam-Engines, of which the following is a specification.

Among other forms of balancing devices for slide-valves attempted to be used before my invention is that in which circular packing-rings are attached to the back of the valve to form a so-called "steam-tight joint" with the steam-chest cover, or with a plate fastened to the steam-chest cover. This form is objectionable in actual use by reason of the necessity which exists of frequent adjustment, the impossibility of proper adjustment with steam in the steam-chest, and the great difficulty in maintaining the joints steam-tight for any reasonable length of time. It has also been attempted to balance or relieve the pressure on slide-valves by the employment of a relief or pressure plate, between which and the valve-seat the valve works, the relief-plate being fixed rigidly to projections cast in the steam-chest. This method of balancing has been found very objectionable on account of the necessity of having to set the relief-plate very frequently, and the extremely difficult task of making a sufficiently tight joint, while at the same time allowing the valve sufficient room to work in without binding. With this form, also, the fact that the valve cannot leave its seat when working with water in the cylinder causes disastrous results. In my improvement a relief or pressure plate is employed, between which and the valve-seat the slide-valve works, this relief-plate being supported by suitable connecting devices from a second or balancing cylinder, the pressure in which varies directly with that in the steam-chest or supply-pipe, thus rendering the pressure of the plate upon the valve always constant. The relief-plate is supported from a lever having a movable fulcrum to enable adjustment, according to the relative pressure-areas of the relief-plate and the balancing-cylinder, the resultant being always allowed to be slightly in favor of downward pressure on the relief-plate, in order to secure a steam-tight joint, while allowing such freedom of movement as to prevent great friction and consequent wear. Novel means are provided for connecting the relief-

plate and the piston of the balancing-cylinder and for maintaining the relief-plate against the slide-valve independently of the force of the steam. The result of the improvements is the production of a system, among the advantages of which are simplicity, durability, economy, effectiveness, and easy adaptability to engines of various constructions.

In order that my invention may be more fully understood, I will proceed to describe it with reference to the accompanying drawings, which represent the invention applied to an engine in which is employed a **D** slide-valve of ordinary double form. Corresponding to this form of valve employed, all the parts of the balancing device are made in duplicate. Should a single valve be employed, such duplication would, in general, be unnecessary.

In the following description, when describing any of the parts of the balancing device, it will be understood without further explanation that the part will be duplicated or not, according to the necessities of the case.

Figure I is a transverse sectional view of a stationary engine with my improvement applied, the section being taken on the line I I, Figs. II and III. Fig. II is a side elevation of the same. Fig. III is a horizontal sectional view on the line III, Figs. I and II. Fig. IV is a perspective view of the relief-plate, and Fig. V is a similar view showing the form of slide-valve here employed. Fig. VI is a detail of a modification of the relief-plate guides.

1 is the cylinder, 2 the bed or base, 3 the steam-chest, and 4 the steam-chest cover, of an engine, all of which parts may be of the represented or any preferred construction.

The slide-valve 5 (see Fig. V) is of the ordinary **D** form, with a flat back, which may be, as here shown, formed in one piece with the valve; or the same result can be obtained by bolting with countersunk bolts a flat plate to the back of any oval-backed valve. The back of the valve should be of the same area as the seat-face of the valve, and both faces should be planed true and parallel.

The relief or pressure plate 6 is so constructed, when used for the double valve, as to have two surfaces or plates equal in area to and the same distance apart as the valve-seat faces. The two parts of the plate are connected by bars 7, formed integrally therewith or rigidly fixed thereto, and extending along the back of the plate and longitudinally of the valve. Said

bars 7 (or as many thereof as may be necessary) extend beyond the ends of the plate, as seen in Fig. IV, to the ends of the steam-chest, and are there dressed off, so as to nicely fit without binding, thus holding the plate from longitudinal while permitting its vertical movement. If desired, the extended bars 7 may be made shorter than the steam-chest, in which case their ends would be tapped, as shown in Fig. VI, for regulating-screws 8. By turning out the screws 8 lost motion of the plate longitudinally can be taken up and the position of the plate readily adjusted. The bottom, or that face of the plate which lies next the valve, should be planed true and straight. In the center of the back of the relief-plate 6 are cast bosses 9, for the reception of stems or rods 10, which are fastened to said bosses by screw, ball and socket, or otherwise. The rods 10 pass through stuffing-boxes 11, attached to steam-chest cover 4 by steam-tight screws, bolted flanges, or otherwise, and the other end of said rod is connected by ball-and-socket or other pivotal joint, 12, to one end of a lever, 13, fulcrumed on block 14, and connected by similar joint, 15, to a piston-rod, 16. The piston-rod 16 passes through stuffing-box 17 in the balancing-cylinder 18, where it is fixed to piston-head 19, which is packed within said cylinder.

Communication with the steam-chest for the admission of steam to act against piston-head 19 is had by a neck, 20, fixed to the cylinder 18 and to the steam-chest by screwing, bolting, or other manner to produce a steam-tight joint. Any waste steam or water that may escape past the piston-head 19 is allowed to run off by pipe 21.

Attached to and forming part of the steam-chest cover 4, either by being cast in one therewith or by bolting, are seats 22, having a slot, 23, undercut to receive the head 24 of a bolt, 25, by means of which the fulcrum-block 14 may be clamped firmly to place and adjusted in position vertically, as required, a tongue, 26, on the bottom of the block occupying the slot 23, to permit vertical while denying lateral movement. It will be seen that a wide range of adjustment transversely across the steam-chest cover is allowed the fulcrum-block 14. By shifting the fulcrum the balance-cylinder may be made to more or less completely balance the pressure in the relief-plate, the force of bearing of the same on the valve being thus under the control of the engineer. In Fig. III one of these fulcrums 14 is removed from its seat and shown in side and end elevation.

Attached to the inside face of the steam-chest cover by bolt or otherwise is an elliptic steel spring, 27, to hold the plate and valve to proper position.

From the foregoing it will now be apparent that the pressure of the steam in the steam-chest would, if unrestrained, exert a great force in pressing the relief-plate against the valve—freedom of vertical motion being

allowed said plate—causing a corresponding friction on the valve, and consequent wear and loss of force. This pressure is, however, counterbalanced to a greater or less extent at will by the cylinder 18 and the connecting mechanism above described, the conditions remaining the same, no matter what may be the varying pressure of the steam. This system, after being once regulated to the needs of a particular engine, needs no more attention in that respect, the mechanism being self-adjusting to all changes of pressure.

I do not limit myself to the precise construction shown or described; but I desire it to be understood that I claim any construction which shall embody and contain the spirit and substance of my invention.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. The combination of a valve-chest containing a sliding D-valve and a relief-plate over the same, a balancing-cylinder communicating at one end only with the valve-chest, a piston working in said balancing-cylinder, and mechanism for connecting the said piston with the relief-plate, substantially as and for the purpose set forth.

2. In combination with the slide-valve and a relief-plate over the same having liberty of vertical movement, a balancing-cylinder connected with the steam-chest by a suitable duct, a piston working in said balancing-cylinder, a rocking lever connecting the stem of said piston with the stem of the relief-plate, and a fulcrum on which said rocking lever rests, substantially as and for the purposes set forth.

3. In combination with the slide-valve and a relief-plate over the same having liberty of vertical movement, a balancing-cylinder connected to the steam-chest by a suitable duct, a piston working in said balancing-cylinder, a rocking lever connecting the stem of said piston with the stem of the relief-plate, and an adjustable fulcrum on which said rocking lever rests, whereby the pressure of the relief-plate on the valve is automatically balanced or relieved, as explained.

4. The combination of a relief-plate, a balancing-cylinder, a lever, and suitable connections with an adjustable fulcrum-block, for the purpose set forth.

5. In combination with slide-valve-balancing mechanism, substantially as described, a slotted fulcrum-seat on the steam-chest, a removable fulcrum having a fin entering said slotted way, and a clamping bolt and nut, substantially as and for the purpose set forth.

6. In slide-valve-balancing mechanism, the relief-plate fitted at its ends with adjusting-screws for taking up wear, as and for the purpose set forth.

PATRICK McDERMOTT.

Witnesses:

FRANK BLOMBERG,
H. G. FOX.