

D. KILEY.
BALANCED VALVE.

No. 466,690.

Patented Jan. 5, 1892.

Fig: 1.

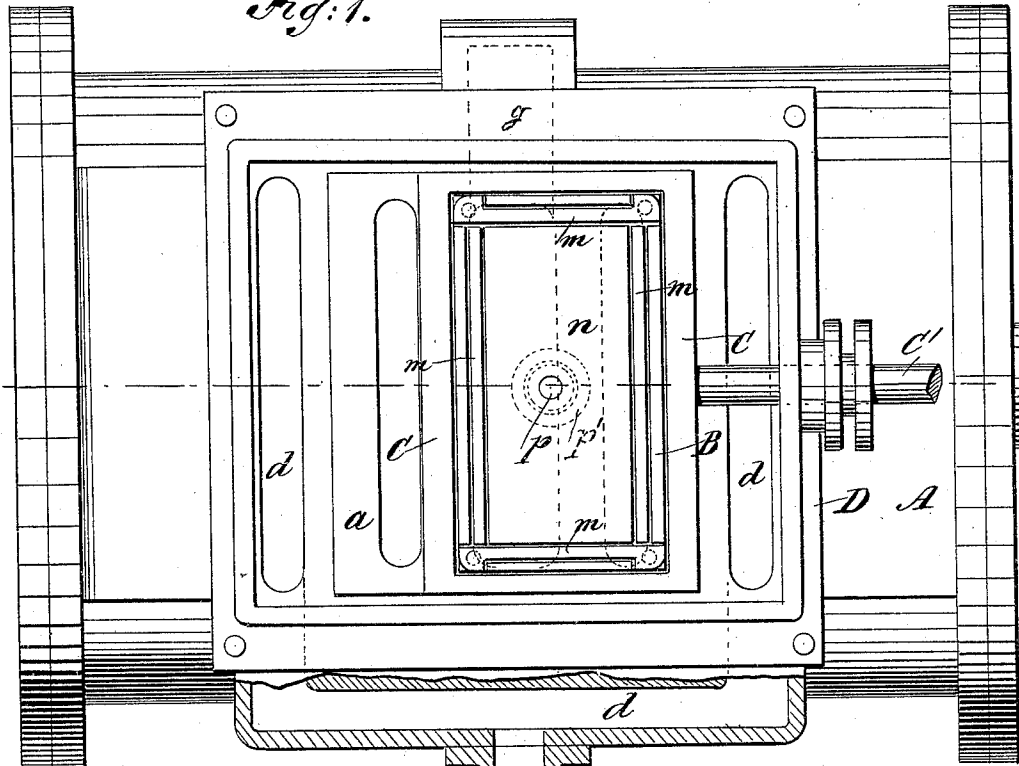
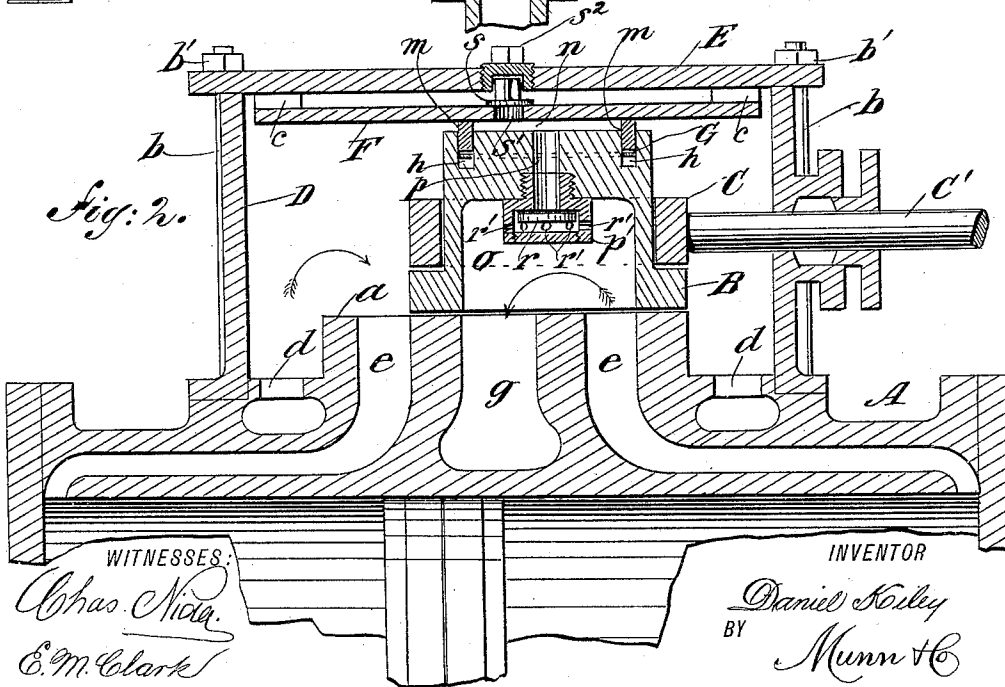


Fig: 2.



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Fig: 3.

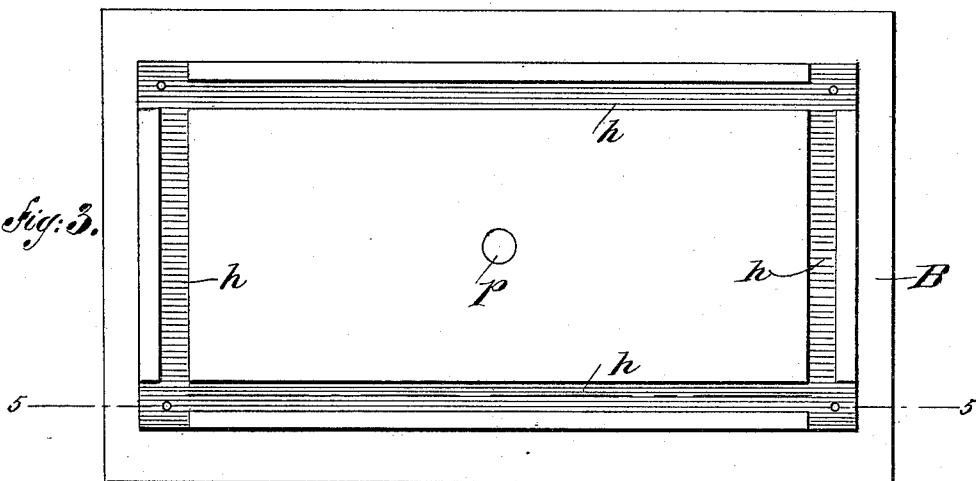


Fig: 4.

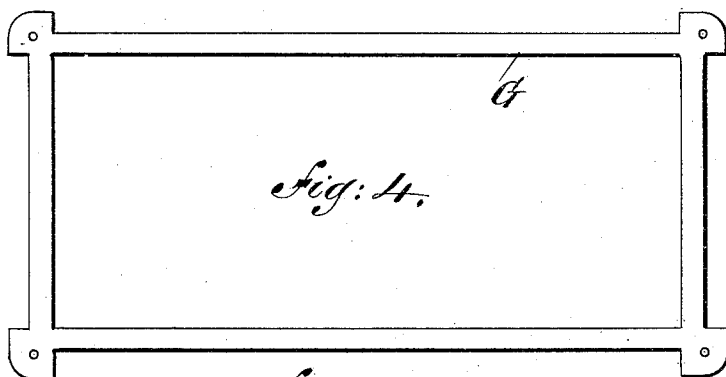


Fig: 5.

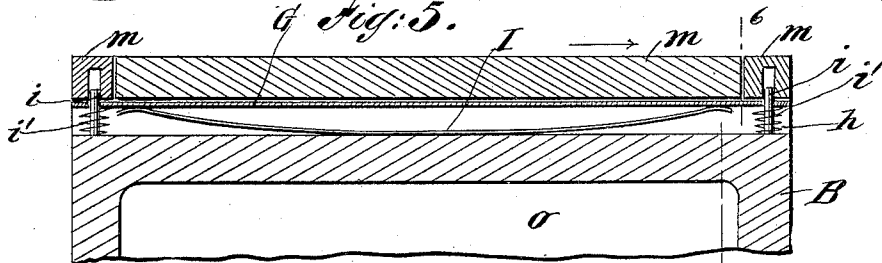
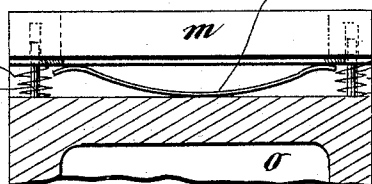


Fig: 6.

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DANIEL KILEY, OF BROOKLYN, NEW YORK.

BALANCED VALVE.

SPECIFICATION forming part of Letters Patent No. 466,690, dated January 5, 1892.

Application filed September 8, 1891. Serial No. 405,130. (No model.)

To all whom it may concern:

Be it known that I, DANIEL KILEY, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Balanced Valve for Engines, of which the following is a full, clear, and exact description.

This invention relates to improvements in balanced valves for steam-engines, and particularly to such as are conjunctively used with steam-cylinders of locomotives having reciprocating pistons within, the object being to render such devices more efficient when steam is cut off from the steam-cylinders and the locomotive is propelled by the force of gravity on a descending grade.

To this end my invention consists in the construction and combination of parts, substantially as is hereinafter described and claimed.

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 plan view of a steam-cylinder, a steam-chest thereon, and a valve within exposed by the removal of the chest-lid, part of the improvement being shown on the valve in dotted lines. Fig. 2 is a side view in section of the valve-seat on a steam-cylinder broken away below, a lid on the steam-chest, that is shown secured to the cylinder on the valve-seat, and a valve within, the chest-lid and valve having the features of improvement thereon. Fig. 3 is a plan view of the valve detached and enlarged. Fig. 4 is a top view of an enlarged detached detail of construction that is part of the valve attachments. Fig. 5 is a longitudinal section of the valve broken away below, taken on the line 5 5 in Fig. 3; and Fig. 6 is a broken transverse section of the valve, taken on the line 6 6 in Fig. 5.

There are several methods of construction in use for balancing the ordinary locomotive slide-valve, the style in most general use being shown in the drawings, which will be described, together with features of improvement therewith combined that render the balancing more perfect in case the engine is progressively moved by its gravity without steam—as, for instance, when the locomotive descends a grade with steam shut off from the valve-chest.

In Figs. 1 and 2, A is the locomotive steam-

cylinder; B, the slide-valve; *a*, the valve-seat whereon the valve is reciprocated; C, the valve-yoke; C', the stem or rod extending from the valve through a stuffing-box, as usual, and D a rectangular steam-chest seated on the cylinder around the valve-seat.

The chest-lid E is held upon the steam-chest D by studs *b* and nuts *b'*, there being a pressure-plate F secured on the inner surface of the lid at each corner, where spacing-blocks *c* are introduced between the lid and plate, so as to allow a steam-space to intervene. Said blocks, having an equal thickness, retain the plate parallel with the lid.

The pressure-plate F is of less width and length than the interior of the chest it is located in when the chest-lid is in place, so that a free circulation of steam is permitted between the lid E and plate F when the chest D is filled with steam from the boiler, (not shown,) which steam enters the chest at each end through the ducts *d*.

There are the usual steam ports and passages *e* furnished, that extend from the valve-seat *a* to the cylinder ends, and an exhaust-port *g*, which extends from the center of the seat *a* to enter the smoke-box through pipes, (not shown,) the exhaust-steam being utilized to produce a forced draft, as is common to the locomotive type of steam-engines.

There are grooves *h* cut in the upper portion of the valve-body, one near each side wall and end wall, which grooves are parallel in pairs and together form a rectangular channel, as their ends intersect at the corners of the valve, (shown in Fig. 3,) the material being cut away at said corners to permit the free introduction of a rectangular annular washer-plate G, the form of which is indicated in Fig. 4. Within the grooves *h*, formed in the valve-body, as stated, a semi-elliptic spring I is located in each. These springs being of proper length to suit the length of the grooves have their convex sides engaged with the groove-bottoms and the return bent ends of said springs projected above said bottom walls of the grooves to receive and elastically sustain the washer-plate G.

At each corner of the valve B where the grooves *h* join there is a short pin *i*, secured to project vertically. These studs passing through a perforation in each corner of the

washer-plate G serve to retain in place a spiral spring i' at each corner of the valve-body, whereon the corners of the washer-plate rest, so that the spiral springs supplement the springs I and afford support beyond the ends of the latter-named springs when the parts are assembled for service.

Upon the washer-plate G in each groove h a joint-bar m is inserted and made to fit measurably steam-tight, but free to slide vertically therein, the bars across the ends of the valve having gib-heads that hook outwardly, as represented in Fig. 1, so as to prevent a displacement of any of the bars. The upper sides of the joint-bars m have a steam-tight engagement with the lower surface of the pressure-plate F, and are also tight-jointed together at each corner, so that a shallow air-tight cavity n is produced on the top of the valve B, which is maintained when the valve is in motion.

The construction of parts just described prevents steam in the chest D from pressing upon the upper side of the valve B, except on the narrow edges that are outside of the bars m and the upper side of the yoke C or flange of the valve whereon the yoke is seated.

It is intended that the area exposed to steam-pressure on the upper and lower sides of the valve B shall be nearly equal, so that the weight of the valve and yoke will serve to hold the valve on the valve-seat a lightly, and thus avoid great frictional resistance to the reciprocation of the valve, that wears away the engaged parts and requires expenditure of considerable power to operate the valves of the duplicate engines.

To embody my improvement with the construction of parts hereinbefore described, an orifice p is formed in the top wall of the valve B, so as to join the top cavity n with the exhaust-cavity o in the valve, and in said hole a valve-box p' is screwed. The cage or valve-box p' is furnished with a disk valve r , that closes upwardly, but when free to do so will drop a short distance and open a passage from the orifice p into the valve-cavity o' through lateral holes r' in the valve-box.

In the chest-lid E a winged valve s is held to slide above a hole s' in the pressure-plate F by the loose engagement of the wings of the valve with a cupped recess made to receive them in a cylindrical plug s^2 , that is screwed into and about through the lid so that the radial flange formed on the valve-wings at their lower ends will provide an extended valve-face for each valve s , which will seal the hole s' when the valve is held upon the plate F by steam-pressure.

In service when the locomotive is using

steam the wing-valves s will be held over the apertures s' by steam-pressure on them and there will be only normal air-pressure in the upper cavities n .

While the operation of the balanced valves hereinbefore described is satisfactory when steam-pressure is maintained within the steam-chests D, it has been demonstrated by practice that if the locomotive descends a grade and steam is cut off from the chests and cylinders the pumping action of the pistons will produce more or less vacuum in the chests D, which will cause valves B to rise from valve-seats a and break the pumping action of the piston. Valve s is opened and valve r is closed by vacuum produced in chest D. When steam is admitted in chest D, it closes valve s and opens valve r .

The object of valves s and r is to allow the vacuum to get hold of the whole top surface of the valves B, the same as an ordinary valve without a balance, and lessen the friction between the joint-bars m and pressure-plate C.

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

1. A balanced slide-valve apertured in its top wall and provided with a depending valve-box, and disk valve below the aperture and within the exhaust-cavity of the slide-valve, substantially as described.

2. A balanced slide-valve provided with vertically-adjustable joint-strips on top, and a disk valve closing upwardly over an aperture in the top wall of the slide-valve, in combination with an inclosing steam-chest, a lid therefor, a pressure-plate on the lid and within the chest, having a perforation in it, and a valve held loosely in the lid over the hole in the pressure-plate, substantially as described.

3. The combination, with a steam-cylinder, a seat thereon having steam-ports, a steam-chest, and a lid thereon, of an apertured pressure-plate within held spaced from the lid, a drop-valve in the lid closing the aperture in the pressure-plate, a slide-valve having spring-pressed vertically-movable joint-bars on top that bear upon the pressure-plate, a valve-box pendent in the exhaust-cavity of the slide-valve, aligning with an orifice in the top wall of said valve, and a disk-valve in the valve-box, which will close the orifice in the slide-valve top wall when normal air-pressure is produced in the exhaust-cavity of the slide-valve, substantially as described.

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Witnesses:

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