(No Model.)

D. KILEY.

BALANCED SLIDE VALVE.

No. 496,740. Patented May 2, 1893.

Fig: 1.

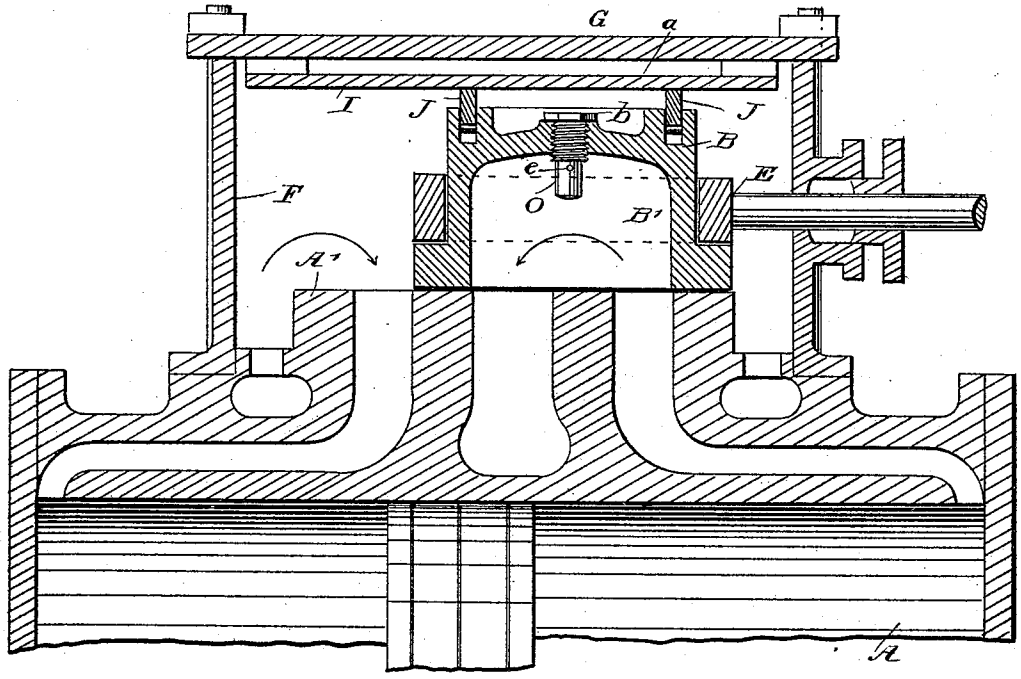
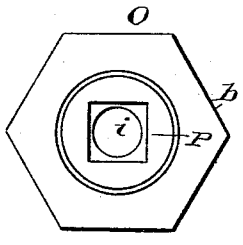


Fig: 2.

Fig: 3.



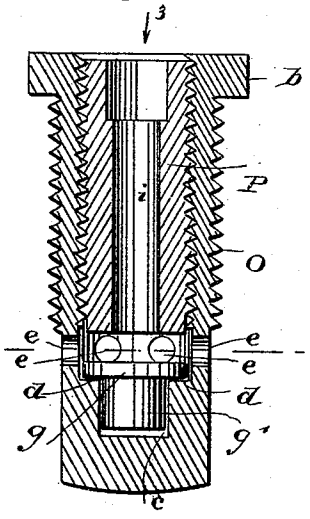
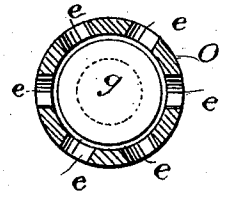


Fig: 4.



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DANIEL KILEY, OF BROOKLYN, NEW YORK.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 496,740, dated May 2, 1893.

Application filed February 7, 1893. Serial No. 461,334. (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 Improvement in Relief-Valves for Balanced Slide-Valves, of which the following is a full, clear, and exact description.

My invention relates to an improvement in valve attachments for balanced slide valves, and more particularly to such slide valves as have their top surfaces protected from direct contact with the live steam that enters the steam chest from the boiler; and has for its object to provide a simple relief valve attachment for such a balanced slide valve, and which is an improvement upon the construction of the balanced slide valve attachment for which a patent was issued to me January 5, 1892, and numbered 466,690.

In balanced slide valves of the type mentioned, the ordinary D-valve used on locomotive engines is provided with four elastically supported strips of metal, which are embedded in a groove that is rectangular, marginally considered, and formed in the top of the valve body near its rectangular edges. Said strips form a nearly steam-tight joint with the grooves they are located in, projecting above the valve sufficiently to form a shallow chamber that is completed by the steam tight engagement of the upper edges of the strips with a horizontal pressure plate that is held depending from the steam chest cover. The formation of the shallow chamber above the valve which is maintained while the valve is in action, prevents in a large degree the pressure of live steam from the steam chest upon the valve from above. The portion of the slide valve that is not protected, is about equal in area with the area of the chamber in the valve which transmits steam from the cylinder to the exhaust pipe, so that theoretically the slide valve receives equal pressure on both sides, and is in a balanced condition.

Practice has shown that the shallow chamber formed by the border strips can not be kept perfectly steam tight, and the leakage of steam at the joints and corners of the rectangular chamber soon acquires a pressure in said chamber, that if not relieved would neutralize the benefit sought to be secured by the provision of the sealed chamber. A common means for overcoming the accumulation of steam pressure in the chamber above the slide valve, consists in the perforation of the top wall of the valve, which affords a passage from the exhaust cavity in the D-valve into the shallow and measurably sealed chamber above said valve, so that at each discharge of exhaust steam from the engine cylinder the outrush of steam will draw what steam has accumulated in the shallow chamber out of the latter, and so free the top of the slide valve from live steam pressure that would cause the valve to bear heavily upon its seat.

There is one defect pertaining to the perforation of the slide valve which vitiates its usefulness; this consists in a peculiar condition which obtains when a locomotive descends a grade. There is no steam used on the descent of a railroad grade by a locomotive, gravity alone affording the power needed for locomotion. The closure of the valve against the influx of steam from the boiler into the steam chests of the engines on the locomotive, and the reciprocation of the engine pistons and slide valves, has a tendency to form a vacuum in the steam chests and also in the shallow chamber above the valves, which valves are left to chatter and pound their faces upon the seats whereon they slide, resulting in injury to both the valves and valve seats.

The improvement shown in Letters Patent No. 466,690 before mentioned, consists mainly in the provision of a small disk valve that is located in a case which depends from an aperture in the top wall of the slide valve into the exhaust cavity of said valve, the small disk valve being lifted by the resulting vacuum when the steam is cut off from the steam chest, and thus seals the hole which is otherwise open from the exhaust cavity of the slide valve into the shallow "vacuum chamber," as this inclosed space is preferably termed, above the valve. When the valve is lifted, the exhaustion of the steam and air from the steam chest will also draw air and steam from the vacuum chamber above the slide valves, through the joints of the border strips, and lift said valve completely from its seat, which will break the vacuum, stop the pumping action of the pistons, and prevent the slide valves from chattering while the

engine is running down grade by force of gravity.

What has been explained has reference to the advantages secured by the improvement now patented to me, as before stated, and experience has shown that it is effective in service.

It has also been demonstrated that the manner of connecting the small disk valve with the top wall of the engine slide valve is not secure, it being screwed into the slide valve from within its exhaust cavity upwardly, so that the jarring motion of the locomotive is liable to unscrew the shell of the relief valve and permit it to drop upon the slide valve seat, which, if it occur, might cause serious damage to the slide valve and its seat, as well as to connected parts. The present improvement will obviate any contingency of an accident such as stated, and also adapts the small disk valve to operate more reliably, as will appear.

To these ends my invention consists in the construction and combinations of the parts, 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 sectional side view of the slide valve, its seat, and the steam chest on a steam engine cylinder broken away below, and the improved relief valve in place on said slide valve. Fig. 2 is an enlarged detached sectional view of the improved relief valve taken through its longitudinal center. Fig. 3 is a top view of the relief valve taken opposite the arrow 3 in Fig. 2; and Fig. 4 is a sectional plan view of the improvement on the line 4—4 in Fig. 2.

In the drawings, A represents the engine cylinder in part, A′ the valve seat, B an ordinary D-valve, E the valve yoke and its stem, whereby the slide valve is reciprocated, F the steam chest, G the chest lid, I the depending pressure plate having its lower surface level and parallel with the valve seat A′, and J, J, are two of the four strips which are seated on springs in grooves formed for their reception in the top of the D-valve, and which by their steam-tight, enforced engagement with the lower side of the pressure plate, provide a nearly steam-tight shallow chamber *a*, above the slide valve B, all of said parts being shown in Fig. 1, to illustrate the application and co-action of the improvement therewith. The relief valve shown detached in Figs. 2, 3 and 4, consists of a cylindrical valve case O, of a proper length, which is furnished at its upper end with a preferably hexagonal formation *b*, for the accommodation of a wrench, the exterior of the body of said shell having a thread cut upon it which is designed to fit steam-tight in a threaded perforation formed for its reception at the center of the top wall of the D-valve B, the smooth or unthreaded lower portion of the valve case O, extending below said top wall into the exhaust cavity B′ of the slide valve, when it is screwed downwardly, until its hexagonal enlargement *b* impinges upon the top surface of the valve B, as shown in Fig. 1. The case O, has an axially-bored recess produced in its lower end, as at *c* in Fig. 2, and a concentric larger cylindric hole is formed from the top end downwardly to intersect this small chamber, thereby producing an annular shoulder at *d*. Above the shoulder *d*, a portion of the larger cylindric aperture is left smooth on its circular side wall, and from the upper end of the case an internal thread is formed on the side wall of the concentric hole, of such a proportionate depth as will permit a portion of the side wall to remain uncut, for the formation of a valve chamber within the case above the shoulder *d*. A cylindrical axially-perforated plug P, is provided which is threaded externally, and adapted by its dimensions to fit tightly within the threaded case O, when inserted therein, by screwing it from above, its length permitting a proper space to exist between the lower end of the plug and the shoulder *d* on the case.

A series of radial holes *e*, are formed in the case wall, which are spaced apart evenly, and open several passages between the space above the shoulder *d* and the exhaust cavity B′ when the valve case O, is screwed into the slide valve as before mentioned. A disk valve *g*, is furnished, of such a relative diameter and thickness as will permit it to reciprocate freely in the space between the lower end of the plug P and the shoulder *d*. On the lower side of the disk valve *g*, a cylindrical projection *g′* is axially formed, of such a length and diameter as will allow said projection to loosely slide in the chamber or recess *c* and not prevent the disk valve from resting on the shoulder *d*. The plug P, has a squared hole at its upper end to permit the insertion of a mating pin lever, or any proper tool that will afford means to screw the plug into the valve case O a proper depth, which will locate the upper end of the plug below the upper end of the case, as shown in Fig. 2, the hole in said plug being bored through it of a slightly smaller diameter than the squared top portion, thus providing a free passage *i* from the vacuum chamber *a* to the exhaust recess B′ of the slide valve B when the parts are assembled, as indicated in Fig. 1, and the disk valve *g* is seated on the shoulder *d* by its gravity.

It will be seen that the features of improvement herein presented consist in the peculiar construction of the relief valve case O, the plug P, which limits the elevation of the disk valve *g*, and upon which said valve forms a tight joint when drawn upwardly by the vacuum formed as before explained, whereby the passage is cut off from the exhaust recess B′ to the vacuum chamber *a*, at the proper instant of time, the manner of inserting the valve case O, preventing it from becoming de-

tached, as it can be jammed upon the top of the slide valve B if a proper wrench is applied to its hexagonal portion.

The formation of the disk valve g, its depending part g' and recess in the case for the reception of the latter, are also features of improvement pertaining to the present invention.

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

1. A relief valve for balanced slide valves, comprising a cylindrical case radially perforated at its lower end and adapted to screw into the slide valve from above, a disk valve within the cylindrical case, and a hollow plug adjustable within the case and forming a seat for the disk valve, substantially as described.

2. A relief valve for balanced slide valves, comprising an externally and internally threaded cylindrical case, a radial projection at the top of the case, having a plurality of sides, radial perforations in the case at the lower end, a disk valve within the case, and a screw plug longitudinally perforated and adapted to engage the internal thread of the valve case, substantially as described.

3. A relief valve for balanced slide valves, having its body externally and internally threaded, a polygonal radial formation at its upper end, radial spaced holes in the lower end of the case, a disk valve adapted to slide in the case at its lower end and having a depending projection fitting a diametrically reduced recess in said case below its radial holes, and an axially perforated screw plug fitting within the valve case and adjustable from its upper end, having its lower end located above and near the radial holes in the case, substantially as described.

4. The combination, with a slide valve having a threaded hole in its top wall, of a relief valve comprising a cylindrical case threaded externally and internally and furnished with a hexagonal formation on its upper end, a series of radial perforations in the lower end of the case above a recess in the case, a disk valve having a depending projection loosely fitting said recess, and an axially apertured screw plug externally threaded and true on its lower end, forming a seat for the disk valve, and a squared socket formation in the axial aperture of the plug, substantially as described.

DANIEL KILEY.

Witnesses:
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E. M. CLARK.