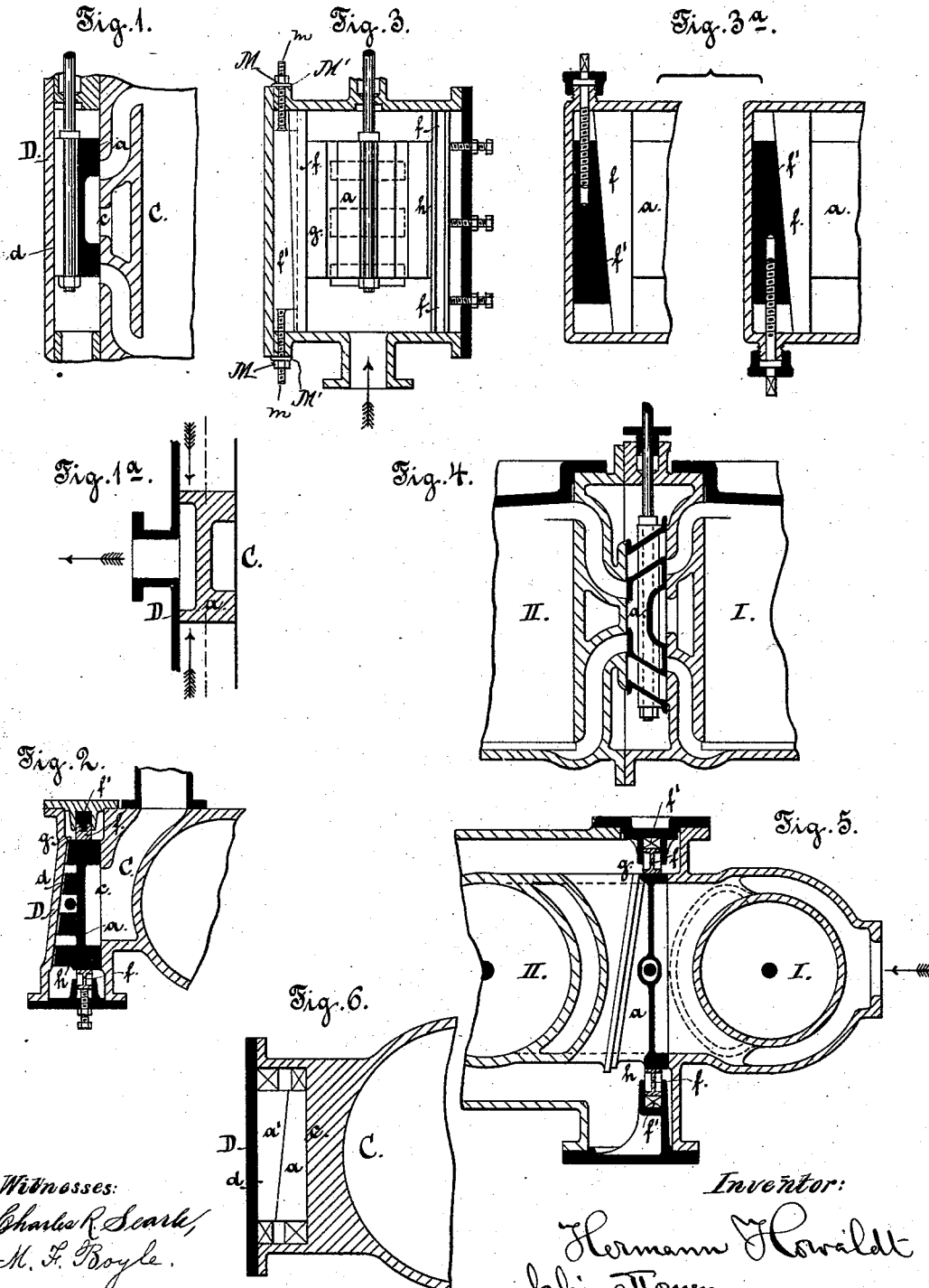


(No Model.)

H. HOWALDT.
BALANCED SLIDE VALVE.

No. 301,990.

Patented July 15, 1884.



Witnesses:
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HERMANN HOWALDT, OF DIETRICHSDORF, NEAR KIEL, PRUSSIA, GERMANY.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 301,990, dated July 15, 1884.

Application filed February 6, 1884. (No model.)

To all whom it may concern:

Be it known that I, HERMANN HOWALDT, of Dietrichsdorf, near Kiel, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Balanced Slide-Valves for Steam-Engines; and I do hereby declare that the following is a full description thereof.

The object of the invention is to reduce by the peculiar construction of the slide-valve for steam-engines the friction between the working-faces of the slide-valve and the slide-faces of the cylinder and of the chest-lid, and to provide means for balancing it against one-sided steam-pressure.

The invention is applicable to slide-valves of single-cylinder steam-engines, as well as of common twin engines, or of Woolf and compound engines, &c.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a section through one of the valves and the adjacent portions. Fig. 2 is a section at right angles to Fig. 1. Fig. 3 is a top view of the valve and the adjacent parts with the steam-chest cover removed. The two figures embraced in 3^a are horizontal sections showing two arrangements of devices for holding the valve in position laterally. Fig. 4 is a horizontal section through the valve and the adjacent parts which discharge the steam from a first cylinder into a second in a compound engine. Fig. 5 is a corresponding cross-section. Fig. 6 is a cross-section showing a modification.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

Figs. 1, 2, 3, and 3^a represent a slide-valve, *a*, of the D-slide type of a steam-engine with one cylinder. This slide-valve *a* forms a prismatic body of rectangular cross-section, provided with the passage necessary for the steam, and which is worked by valve-gear (not shown) to slide up and down or fore and aft, as the case may be, upon the valve-face of the cylinder C and the inner face of the lid D of the steam-chest.

Supposing the face *d* of the slide-valve *a* to

be uninterrupted and full, the fresh steam could not press at all upon the slide-valve *a*, while the under side *c* would endure only a small pressure, with the tendency to lift the slide-valve *a* from the face of the cylinder C. To counterbalance this pressure recesses extending lengthwise on the upper face, *d*, of the slide-valve *a* and of proportionate width are provided, as shown in Figs. 1 and 2, adapted to allow the fresh steam to act upon this portion of the upper face, *d*. The same effect is attained by providing a communication between the exhaust-pipe or the condenser of the engines and an excavation on the upper face, *d*, of the slide-valve *a*. (See Fig. 1^a.)

To prevent the slide-valve *a* from being forced by the steam-pressure upon the broader side *h* too tightly between the convergent faces of the lid D and the cylinder-face C, it is set by an adjustable plate or strip, *f*, extending along its narrow side *g* in such a manner that it works freely and with the minimum of friction, at the same time tightly enough to prevent the steam from entering between the working-faces. For greater security and for steadying the slide-valve *a* an adjustable strip or plate, *f*, similar to that above mentioned, is arranged working against the broader side *h*.

The adjustment of each set plate or strip *f* may be effected with some success by screws, as represented on the right-hand side of Fig. 3; but I have devised a preferable construction in which the end is better attained by wedges *f'*, manipulated by screws and nuts, as represented on the left-hand side of Fig. 3, on top of Fig. 2, and in Fig. 3^a. The wear of the working-faces *g h* of the slide-valve *a* and of the plates *f* is compensated by readjusting the wedges *f'*. A screw-stud, *m*, is fitted tightly and permanently in each end of the wedge *f'*, (see Fig. 3,) extending loosely through a hole in the end of the steam-chest, and serves thence forward as a part of *f'*. *M'* is a washer having its inner face accurately finished and fitted steam-tight against the corresponding surface of the steam-chest. *M* is a nut fitted tightly on the stud *m*. The same construction being at each end, and the nuts being screwed up tightly, hold the wedges *f'* firmly and make steam-tight joints. When it is desired to shift the wedge *f'*, the nut *M* at one end is slackened,

and the corresponding nut at the opposite end of the steam-chest is tightened.

In Figs. 4 and 5 are shown parts of the two cylinders of a compound engine with the new trapezoidal slide-valve *a* arranged between the slide-faces of the cylinders I and II, which faces are parallel in axial direction, but inclined or converging in the other, corresponding to the converging faces of the slide-valve *a*. (See Fig. 5.) The steam-chest belongs jointly to both cylinders I and II. The slide-valve *a* is set by an adjustable strip or plate, *f*, working against the narrower side *g* of the slide-valve *a*. A collateral strip, *f*, is provided against the broader side *h*. The cross-sections of the wedges, by means of which the set-plates *f* are adjusted, are indicated by *f'*. This form, which I will term the new "trapezoidal slide-valve," is important for twin-cylinders of common Woolf or compound or other engines, as it works steam-tight upon the slide-faces of each of the two cylinders, and at the same time with the minimum of friction and capacity for perfect adjustment. Where a second slide, *a'*, for the cut-off is used on top of the slide-valve *a* for the distribution and expansive working of the steam, one of them may be of rectangular cross-section

and the other of trapezoidal section, in which case the working-faces of the chest-lid and of the cylinder, or those of two cylinders, should be converging; or the cross-section of both slide-valves *a* and *a'* may be a trapezoid, in which case the steam-chest is of rectangular cross-section. The latter case is represented in Fig. 6. The dimensions and the construction in other respects of the slide-valve depend upon the construction and kind of the engine; but any skillful engineer will understand how to make this new trapezoidal slide-valve answer to any requirement by easy alterations without departing from the principle of the invention.

After having described my invention and suitable means to carry it into effect, I claim—

The adjusting-studs *m*, steam-tight washers *M'*, and nuts *M*, in combination with the adjusting-wedge *f'*, and guiding-strip *f*, arranged to serve relatively to each other and to the slide-valve *a* of a steam-engine.

This specification signed by me this 21st day of December, 1883.

HERMANN HOWALDT.

Witnesses:

CLARUS KÖHNHOLD,

ERNST BRÜCKELMANN.