

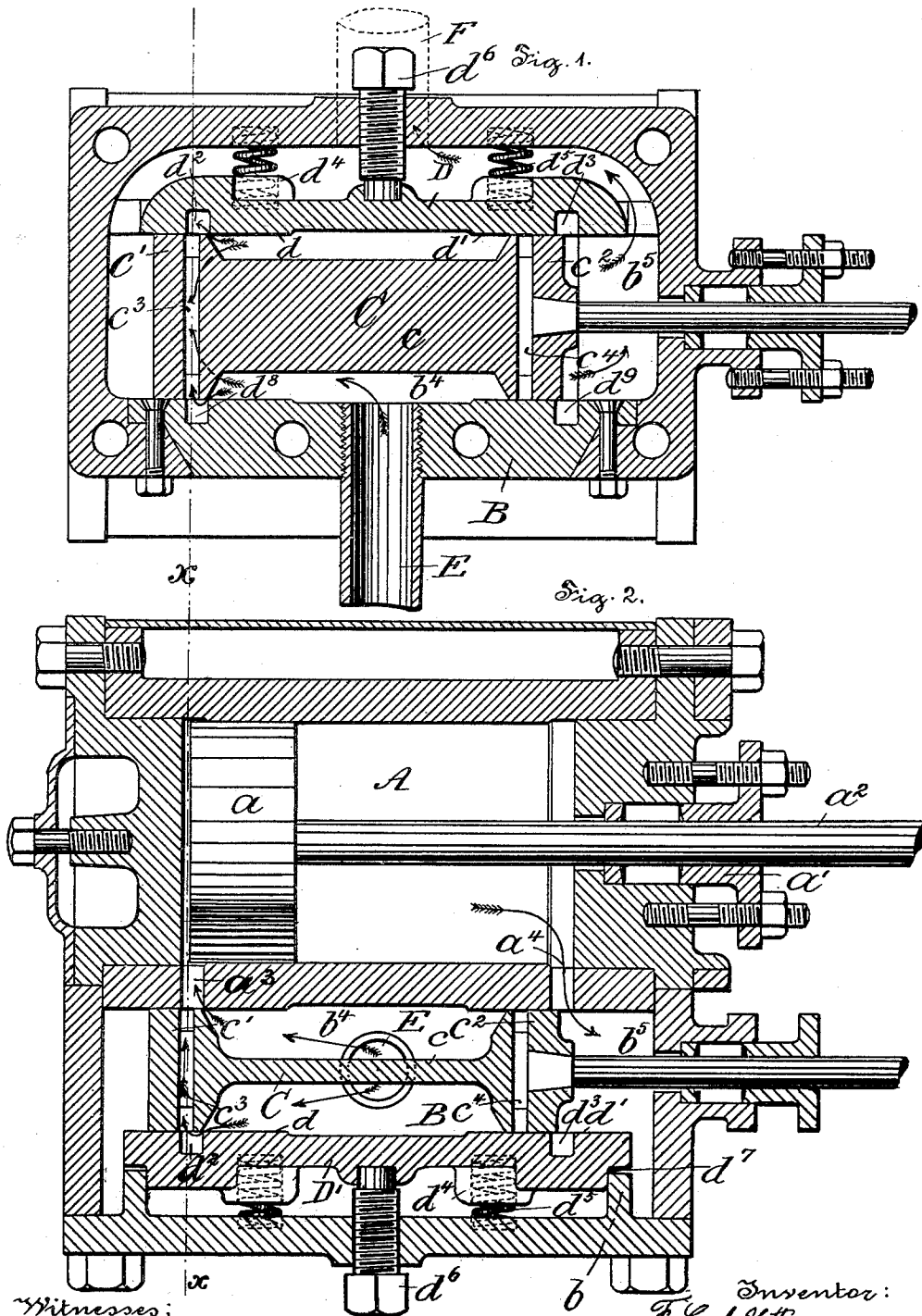
(No Model.)

2 Sheets—Sheet 1.

F. C. HETTINGER.
BALANCED SLIDE VALVE.

No. 462,816.

Patented Nov. 10, 1891.



Witnesses:
Hermann Bormann
Gideon Gropfen

Inventor:
F. C. Hettinger

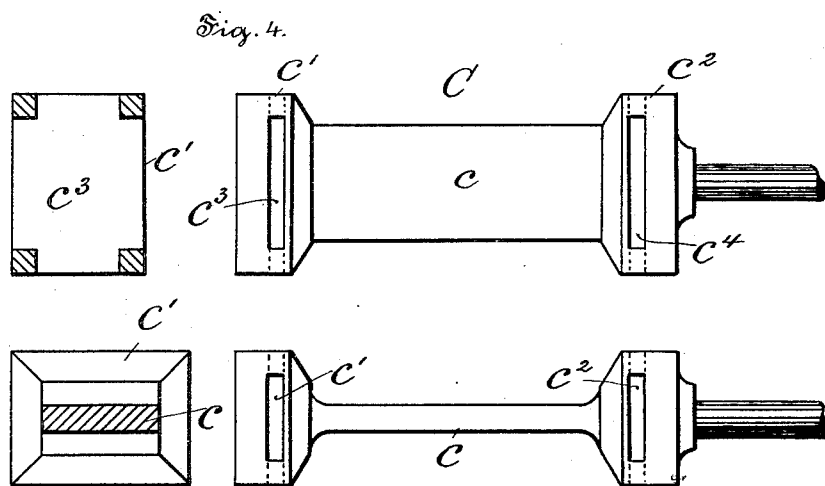
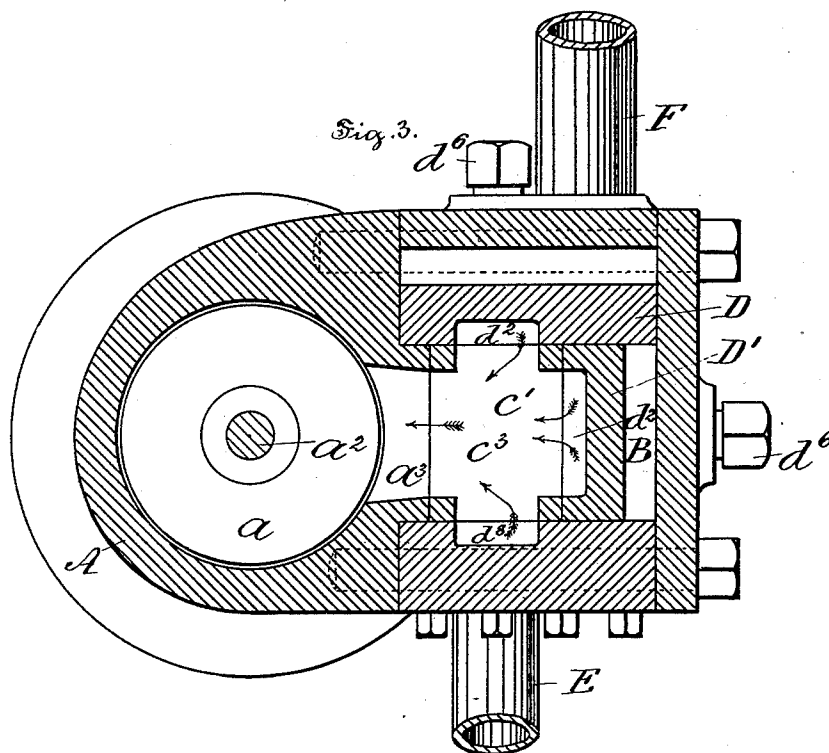
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Witnesses:
Hermann Bornemann
Edmund Groussin

Inventor
F. Carl Hettinger

UNITED STATES PATENT OFFICE.

FRIEDERICH CARL HETTINGER, OF PHILADELPHIA, PENNSYLVANIA.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 462,816, dated November 10, 1891.

Application filed July 24, 1891. Serial No. 400,646. (No model.)

To all whom it may concern:

Be it known that I, FRIEDERICH CARL HETTINGER, a subject of the Emperor of Germany, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Balanced Slide-Valves for Steam-Engines, of which the following is a specification.

My improvements have for their object to shorten the live-steam conduits between the slide-valve and steam-cylinder and to make a more compact, simple, and efficient and an entirely-balanced slide-valve, whereby a much higher speed of the engine is obtained.

My improvements consist of a slide-valve composed of the usual steam-chest adapted to be located close to the steam-cylinder, whereby the long live-steam conduits are omitted, and of a balanced valve operated in the usual manner from an eccentric of the crank-shaft, and which valve is at all times surrounded by steam, so that any undue pressure on one or more sides of the same is obviated.

The improvements further consist in the arrangement of the ports which admit of a greater quantity of steam to enter the steam-cylinder at a time, causing a quicker opening of and a longer maintenance of open ports during the admission of steam into the cylinder, which also allows of greater overlapping toward the steam-inlet of the slide-valve with its seat without interfering with the proper distribution of the steam. The steam entering the ports from four sides causes a shorter period in which the compression of the steam takes place, as the initial opening of the valve is greatly reduced. The overlapping of the valve toward the steam-inlet pipe being greatly increased, the filling of steam in the cylinder can be decreased to, say, fifty per cent., which was heretofore impossible on ordinary slide-valves without using the expansion slide-valve.

My invention further consists of devices for adjusting the relief-plates of the slide-valve, whereby steam-tightness of the valve is at all times insured and great labor is saved in the construction of the valve, as the exact fitting of the same to its seats may be dispensed with.

My invention will be more fully understood

taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is a central section through the steam-chest and slide-valve and showing the inlet and exhaust steam-pipes and also one of the adjustable relief-plates. Fig. 2 is a central section through steam cylinder and chest, showing the piston, the slide-valve, one of the adjustable relief-plates, and the arrangement of the steam-ports. Fig. 3 is a section on line *xx* of Fig. 2, and Fig. 4 is a detail view of the slide-valve.

Referring now to the drawings for a further description of my invention, A is the steam-cylinder, *a* is the piston, and *a'* is a stuffing-box for piston-rod *a*².

B is the steam-chest, cast integral with the steam-cylinder A, or it is made in parts bolted to the cylinder, as shown.

C is the slide-valve, surrounded at all times by live steam, and it consists of the web *c*, Figs. 1, 2, and 4, and the seats *c'* and *c*². In these seats are formed the ports *c*³ and *c*⁴, communicating with steam-chest B by the channels *d*², *d*³, *d*⁸, and *d*⁹, and by the ports *a*³ and *a*⁴ direct with the steam-cylinder A.

D and D' are adjustable relief-plates, which are provided with seats *d* and *d'*, having channels *d*² and *d*³, for a purpose hereinafter described.

*d*⁴ are cups cast with the relief-plates D and D' for the reception of the springs *d*⁵, which normally press the relief-plates D and D' toward the slide-valve C.

*d*⁶ are adjusting-screws for taking up the wear of the slide-valve and relief-plates and which keep the latter in a proper position. The relief-plates D and D' are prevented from playing endwise by the flanges *b* of the steam-chest B and the seats *d*⁷.

E is the live-steam pipe, and F is the exhaust-steam pipe.

The operation of the slide-valve is as follows: Steam enters the portion *b*⁴ of the steam-chest B by the live-steam pipe E and surrounds the valve C, entirely balancing the same. Assuming now the piston in position; as shown, and the valve C at a position which allowed the initial admission of steam from the space *b*⁴ directly through the port *a*³ and through the port *c*³ by the channels *d*² and *d*⁸

into the port a^3 to the steam-cylinder A, the valve C, now moving farther to the left, (in the drawings,) the port c^3 is closed and the steam enters the steam-cylinder A directly by the port a^3 only. As the steam enters the cylinder at four sides—*i. e.*, at a^3 , d^2 , d^3 , and d^4 —of the valve simultaneously, the initial opening can be made very small, which results in a reduced compression of the steam; and as the steam-inlet conduits and ports are of great cross-section and short length very little or no steam is stored in the same, and as a result the working diagram will come nearer to the theoretic diagram—*i. e.*, a better result of the working of the engine provided with my improved slide-valve and a greater economy of steam is obtained than was heretofore possible. The exhaust-steam passes from the cylinder A directly through the ports a^4 a^3 , respectively, into the chamber b^3 , and from there to the exhaust-steam pipe F, having no obstruction whatever in its passage to the exhaust-pipe.

It is obvious that as to minor details, such as the adjusting of the relief-plates, &c., modifications of the invention may be made without departing from the spirit thereof.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A slide-valve composed of a web and seats at either end thereof, said seats bearing against adjustable relief-plates and the walls of the steam chest and cylinder, substantially as and for the purposes set forth.

2. A balanced slide-valve composed of a web having seats at either end, said seats provided with ports communicating directly with the steam-cylinder and steam-chest, in combination with adjustable relief-plates, said steam-chest and relief-plates having channels corresponding, respectively, to said ports of said valve, substantially as and for the purposes set forth.

3. A balanced slide-valve composed of a web having seats at either end provided with a port, in combination with a steam-cylinder, and a steam-chest provided with two adjustable relief-plates adapted to normally bear against the slide-valve and prevent it from

leakage, the steam-chest walls and relief-plates having channels formed transversely to the direction of motion of valve and communicating, respectively, with the said ports of the valve, substantially as and for the purposes set forth.

4. A balanced slide-valve composed of a web having seats at either end provided with ports, in combination with a steam cylinder and chest, the latter provided with relief-plates adapted to normally press against the valve and insure steam-tightness of the same, an exhaust-chamber formed around said valve and relief-plates, substantially as and for the purposes set forth.

5. A balanced slide-valve composed of a web having seats at either end provided with ports, in combination with a steam cylinder and chest, the slide-valve located near the steam-cylinder, and the steam-chest provided with adjustable relief-plates, one of which serves to divide said chest for the formation of an exhaust-chamber, substantially as described, and for the purposes set forth.

6. A balanced slide-valve composed of a web having seats at either end provided with ports, in combination with adjustable relief-plates, said ports communicating directly with the steam-cylinder and the steam-chest by channels formed transversely to the motion of valve in the sides of steam-chest and relief-plates, substantially as and for the purposes set forth.

7. In combination with a steam-cylinder A, piston a , and steam-chest B, having adjustable relief-plates D and D', a balanced slide-valve C, composed of the web c and seats c' and c^2 , having ports c^3 and c^4 , said ports communicating with the steam-cylinder A and chest B by the channels d^2 , d^3 , d^4 , and d^5 and ports a^3 and a^4 , substantially as and for the purposes described.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

FRIEDERICH CARL HETTINGER.

Witnesses:

HERMANN BORMANN,
GEO. W. REED.