A. Buchanan,

Steam Balanced Valve.

No. 33,981. Patented Dec. 24, 1861.

Fig. 1.

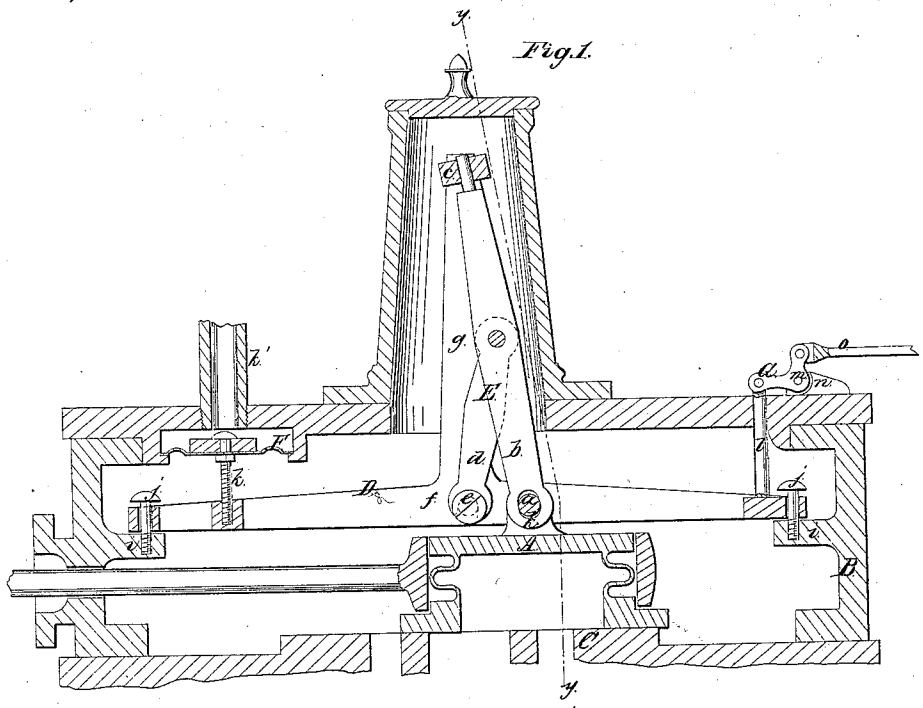
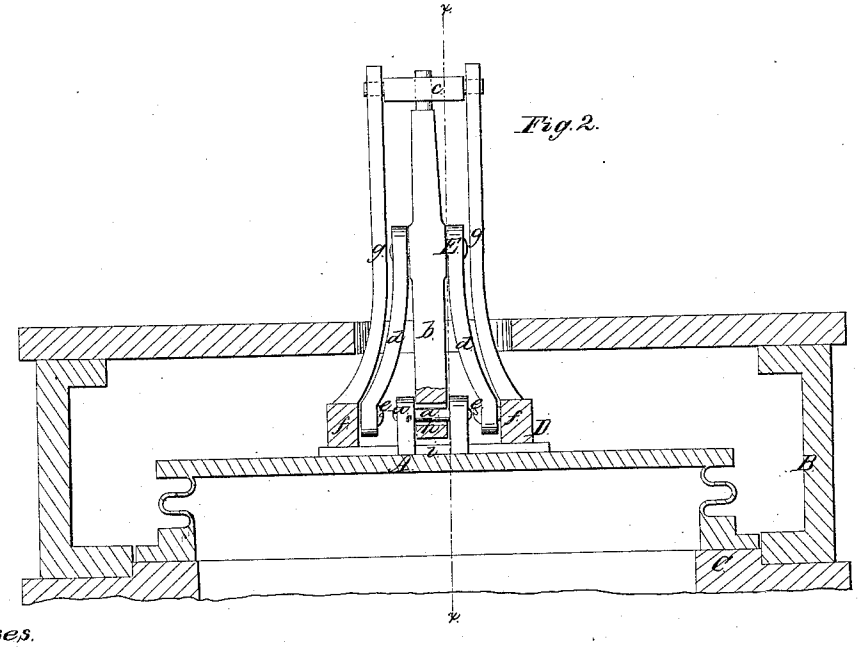


Fig. 2.



Witnesses.

Inventor.

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UNITED STATES PATENT OFFICE.

ANDREW BUCHANAN, OF JERSEY CITY, NEW JERSEY.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **33,981**, dated December 24, 1861.

To all whom it may concern:

Be it known that I, ANDREW BUCHANAN, of Jersey City, in the county of Hudson and State of New Jersey, have invented a new and Improved Device for Balancing Slide-Valves; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a vertical longitudinal section of a valve-chest with a slide-valve arranged according to my invention, the plane of section being indicated by the line *x x*, Fig. 2. Fig. 2 is a transverse vertical section of the same, taken in the plane indicated by the line *y y*, Fig. 1.

Similar letters of reference in both views indicate corresponding parts.

This invention consists, first, in arranging one or more parallel motions in combination with a slide-valve in such a manner that the pressure of the steam is counteracted by the parallel motion or motions and the valve sustained in the proper place, and that said valve moves equally free and easy when subjected to the pressure of the steam, as it does when the steam is shut off; second, in the employment of a valve with corrugated elastic sides and ends or with an elastic back in combination with an oblong bearing of the pivot, which secures the valve to the parallel motion in such a manner that said valve, when acted upon by the steam, is forced down upon its seat with a certain yielding pressure determined by the elasticity of its sides before the pressure of the steam is counteracted by the parallel motion, and that a jumping of the valve or leakage of steam is prevented; third, in arranging the frame which supports the parallel motion, in combination with an elastic diaphragm or piston, in such a manner that, by the action of the steam on the under side of the diaphragm or piston, the pressure of the steam on the back of the valve is partially counteracted and the pressure on the back of the valve is diminished, and, fourth, in the arrangement of a bell-crank lever or its equivalent, in combination with the frame supporting the parallel motion, in such a manner that said frame, together with the valve, can be raised clear off its seat and that when the motion of the valve continues after the steam has been shut off a cutting of the face of the valve or of the seat is prevented.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation, with reference to the drawings.

The valve A moves in the interior of the valve-chest B on the seat C in the ordinary manner. The back of the valve is connected by a pivot *a* to the vibrating lever *b*, the upper end of which is guided by a hole in the rocking bar *c*, while its center is connected to two links *d*, that oscillate on pivots *e*, inserted into the side pieces *f* of the frame D. From these side pieces rise the vertical standards *g*, which form the bearings for the ends of the rocking bar *c*. The vibrating lever *b* and the links *d* constitute the parallel motion E that is intended to relieve the slide-valve from the pressure of the steam. It is obvious that the parallel motion might be arranged in any other convenient manner, and two such motions might be attached—one to each side of the valve—if it should be found desirable.

The hole *h* in the vibrating lever *b*, through which the pivot *a* passes, which connects the parallel motion with the valve, is oblong, and the sides and ends of the valve (or its back) are made corrugated, so that when the pressure of the steam comes to act on the valve its back, or at least the central part of the back, is allowed to spring slightly and to close up to the seat until arrested by the pivot *a* coming in contact with the lower edge of the hole *h*. By these means the valve is held down upon its seat by a yielding pressure, which is determined by the elastic force of the sides or of the back of the valve and by the amount of play given to the pivot *a* in the hole *h*. The elastic force of the sides and ends or of the back of the valve is so arranged that the valve is kept down sufficiently tight to prevent it jumping, and the pressure on the underside of the valve and the power with which the valve bears down upon its seat are so balanced that it moves perfectly easy when subjected to the pressure of the steam.

The frame D, which supports the parallel motion, rests on lugs or ribs *i* on the inside of the steam-chest, and it is secured to the same by means of screw-bolts *j j* in such a

manner that it has a slight play in a vertical direction. One end of this frame is suspended by means of a screw *k* from an elastic diaphragm F, which is inserted into the cover of the valve-chest. The surface of this diaphragm is made of such dimensions that the upward pressure of the steam on the same by being transmitted through the action of the frame and parallel motion to the back of the valve relieves the latter from a certain portion of the pressure to which it would otherwise be subjected. If it is considered that the superficial area of the back of the valve of an ordinary locomotive-engine is about one hundred square inches and that the same, with a pressure of the steam of one hundred pounds to the square inch, is subjected to a pressure of ten thousand pounds, the action of the diaphragm will be fully appreciated. The diaphragm is so regulated that it leaves a pressure of about five hundred pounds on the back of the valve, just enough to keep the valve down, and if a valve with corrugated sides is used this pressure will be sufficient to cause the back of the valve to spring down and to bring the fulcrum-pin *a* in contact with the lower edge of the hole *h*.

Instead of the elastic diaphragm F, a piston, working in a suitable cylinder on the top of the steam-chest, might be employed.

When it is desired to suspend the action of the diaphragm steam is let on its upper surface through a pipe *k'*, which is intended to connect with the steam-boiler, and which, when not used, will be closed by a suitable stop-cock. The other end of the frame D is suspended by means of a rod *l* from a bell-crank lever G, which has its fulcrum on a pin *m*, passing through lugs *n* on the top of the steam-chest. From this bell-crank lever a rod *o* extends to the engineer's stand, so that the engineer by pulling said rod is enabled to raise the valve clear off its seat. It is desirable to do this when the locomotive runs down on a grade, or whenever the steam is shut off while the engine is in motion. When the valve is permitted to move on its seat, while the steam is shut off, it is liable to cut, and with ordinary valves it is necessary to introduce in such cases a large quantity of oil to preserve the faces of the valve and of the seat against injury.

It is obvious that instead of the bell-crank lever G, other devices—such as a cord running from the frame over a pulley to the engineer's stand—might be employed, and I do not therefore confine myself to the particular device represented in the drawings.

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

1. The arrangement of one or more parallel motions E, in combination with a slide-valve A, substantially as and for the purpose set forth.

2. The employment of a valve A, with corrugated sides and ends or with a corrugated back, in combination with the oblong bearing *h* of the pivot *a*, which connects the valve to the parallel motion E, substantially in the the manner, and for the purpose shown and described.

3. The rising and falling frame D, in combination with the valve A, and with an elastic diaphragm F or its equivalent, constructed and operating substantially as and for the purpose specified.

4. The combination of the bell-crank lever G or its equivalent with the rising and falling frame D and valve A, substantially in the manner and for the purpose set forth.

ANDREW BUCHANAN.

Witnesses:

M. M. LIVINGSTON,

C. W. COWLAN.