G. W. Richardson.

Balanced Slide Valve.

No. 111,382. Patented Jan. 31, 1871.

Fig. 1.

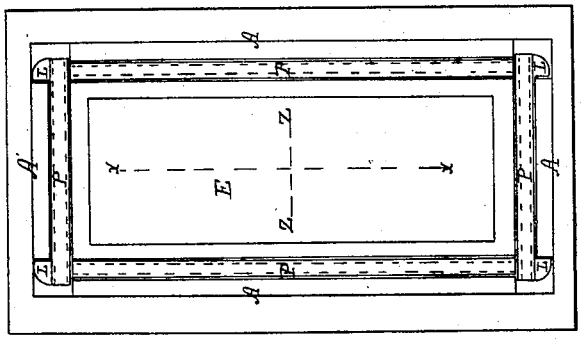


Fig. 3.

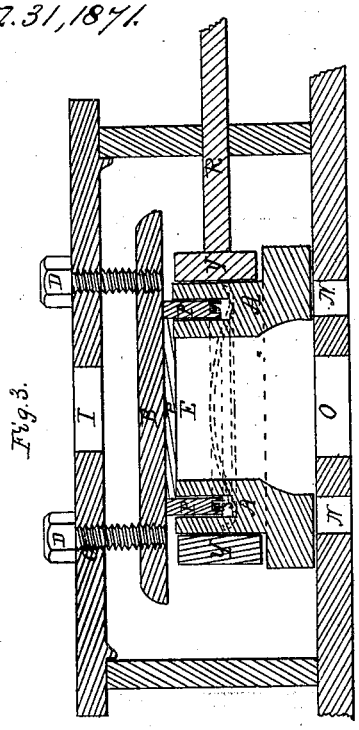


Fig. 2.

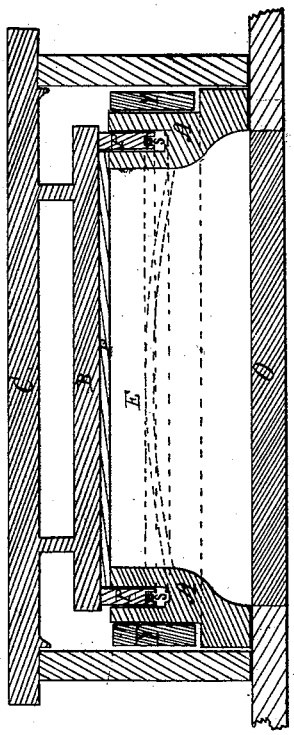


Fig. 4

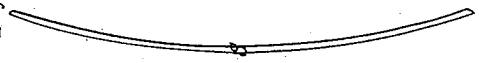


Fig. 5

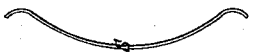


Fig. 6

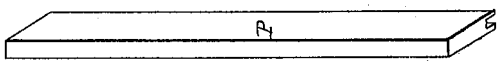
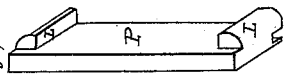


Fig. 7



Witnesses

W. H. Powers

A. D. Lyon

Inventor

Geo. W. Richardson

UNITED STATES PATENT OFFICE.

GEORGE W. RICHARDSON, OF TROY, NEW YORK.

IMPROVEMENT IN BALANCE SLIDE-VALVES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **111,382**, dated January 31, 1871.

I, GEORGE W. RICHARDSON, of the city of Troy, in the county of Rensselaer and State of New York, have invented a certain Improvement in Balance Slide-Valves for Steam and Air Engines, of which the following is a specification:

Nature and Objects of the Invention.

My invention relates to the construction and arrangement of a packing in combination with the slide-valve, by which all undesired pressure of steam upon the valve may be done away, while the packing always keeps itself in perfect order by its own wear.

Description of the Accompanying Drawing.

Figure 1 is a plan of the upper side of a slide-valve with the packing embodying my invention. Fig. 2 is a vertical section of the valve, packing, balancing-plate, valve-yoke, and steam-chest, fitted to a cylinder ready for use. The section is made in the line *x x*, Fig. 1. Fig. 3 is a transverse vertical section of the same. This section is made in the line *z z*, Fig. 1. Figs. 4 and 5 are springs which support the packing when in position. Fig. 6 is one of the packing-bars which pack the sides of the valve. Fig. 7 is one of the packing-bars which pack the ends of the valve.

General Description.

A is the valve. Its face is constructed just like the ordinary slide-valve; but, instead of the ordinary exhaust-cavity, an exhaust-opening, E, is cut through the valve. I prefer this opening to be nearly as large as the ordinary exhaust-cavity, as thereby the upward pressure of the exhaust-steam from the cylinder will not in any way affect the balance of the valve.

B is a balancing-plate, suspended from the steam-chest C in casting, or afterward by the stay-bolts D D. Its under surface should be a perfect plane, parallel with the upper surface of the valve. When the steam is admitted at each end of the chest the cover itself may serve as the balancing-plate. When it is suspended from the cover there should be ample room between it and the cover for the steam to pass from one end of the chest to the other. I is the opening through which the steam from the boiler passes into the chest. L L are lugs, attached to each end of the end-packing bars, to hold them in their places and carry them backward and forward with the valve in its travel. They should both be attached to the same side of the bar. N N are steam-ports, through which steam passes into and out of each end of the cylinder. O is the port through which the steam from the cylinder exhausts into the air. R is the driving-rod, connecting with the valve by means of the yoke Y.

P is the packing for the top of the valve. It consists of two long bars of equal length, for packing the sides of the valve, and two short ones of equal length for packing the ends of the valve. Their upper faces are rectangles, and wear against the lower face of the balancing-plate B. They should be, for an ordinary locomotive-valve, about three-eighths inch and one-sixteenth inch in thickness by one inch in width. These packing-bars rest in grooves planed into the top of the valve to receive them, and should have for side play about the thickness of a piece of writing-paper. The depth of the grooves should allow the upper surfaces of the bars to be just flush with the upper surface of the valve. The packing-bars, when in position, should form a rectangle, inclosing so much of the upper surface of the valve as it is desired to keep pressure from, to insure as little wear of the face of the valve as possible. The two bars which pack the sides of the valve should be plain and straight, having all their faces rectangles. In the faces which rest in the grooves small grooves should be planed from end to end to receive and protect small springs S, which support them when in position. The beds of the grooves planed in the valve have small grooves planed in them, similar to the ones in the packing-bars, and for the same purpose. The sum of the depths of both of these small grooves in the packing-bars and in the beds of the larger grooves should not exceed twice the thickness of the springs they are to contain.

The two bars which pack the ends of the valve should differ from the two just described only in length and in having a lug attached to each end on the side toward the end of the valve. The upper faces of these lugs should not be flush with the wearing-faces of the packing-bars, and should so fit to their places as to allow an end play of the bar of about

the thickness of a sheet of writing-paper. The lengths of these packing-bars depend upon the amount of the upper surface of the valve that it is desired to have pressure kept from.

When in position the ends of the side-packing bars abut so fairly against the inner sides of the end-packing bars as to form steam-tight joints. These joints are best made by first plowing the grooves for the side bars, then wedging the side bars into their grooves, and planing, at the same time, the end grooves and the ends of the side-packing bars. The small squares now formed in the corners of the valve by the grooves are to be chipped out to make places for the lugs of the end bars.

The spring which is to support the packing-bars when in position should be of sufficient strength to keep the bars up lightly against the balancing-plate when the steam is shut off. I prefer for this purpose a semi-elliptic spring, Figs. 4 and 5, of the full length and width that will easily play in the small grooves. For an ordinary locomotive-valve, the spring for the long bars should be about one-eighth inch square, and for the short bars about one-eighth inch by one-sixteenth inch. Such a spring would support a weight about three times as heavy as its bar.

The balancing-plate should be large enough so that the packing-bars may not pass from under it in their travel. It should be suspended to within about one-twelfth inch from the top of the valve, which will give sufficient inward pressure when the steam is on to insure tight joints between the packing-bars and the valve and at the abutting ends of the side packing-bars. The pressure of steam underneath them at the same time insures tight joints between the packing-bars and the balancing-plate.

The advantages of this valve arise from the construction and operation of the packing, and the peculiarity of the packing will be readily illustrated by supposing it to be made of one entire piece. It would then be seen, by careful observation after it began to wear, that some parts of it would be worn differently from other parts, and therefore it would leak. In any number of trials the same differences would be seen to occur in the same places. This packing is so constructed that those parts which wear alike are in sections by themselves, working entirely independent of each other in all their movements, and in their travel never crossing each other's lines of motion or the lines of their separation, so that their wear at all times produces perfect joints. At the same time they are so adjusted the one to the other that the joints between themselves are kept steam-tight. This result cannot be obtained by any other packing now used with the balance slide-valve, and the reason for it is fully developed in the use of a valve constructed as hereinbefore set forth, for it will be found that the wear of the end-packing bars forms curves having a radius nearly, if not quite, twice as long as the radius of the curves formed by the wear of the side-packing bars, so that, were the packing entire, either circular or rectangular, the different curves in which the different parts of it would wear would inevitably cause it to leak as soon as it should begin to wear, and to leak worse and worse as it should continue to wear.

Claims.

I claim as my invention—

1. The packing P P P P, constructed in separate parts, so that those portions which wear alike shall be in sections by themselves, working independently of each other, and in their travel never crossing each other's lines of motion or their lines of separation, substantially as and for the purpose hereinbefore set forth.

2. The manner of breaking the joints of the packing by abutting the ends of the side packing against the sides of the end packing, or otherwise abutting the different sections against each other, substantially as and for the purpose hereinbefore set forth.

GEO. W. RICHARDSON.

Witnesses:

W. H. POOR,

A. D. LYON.