No. 682,921. Patented Sept. 17, 1901.

H. D. & C. L. DUNBAR.

BALANCED SLIDE VALVE.

(Application filed May 1, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

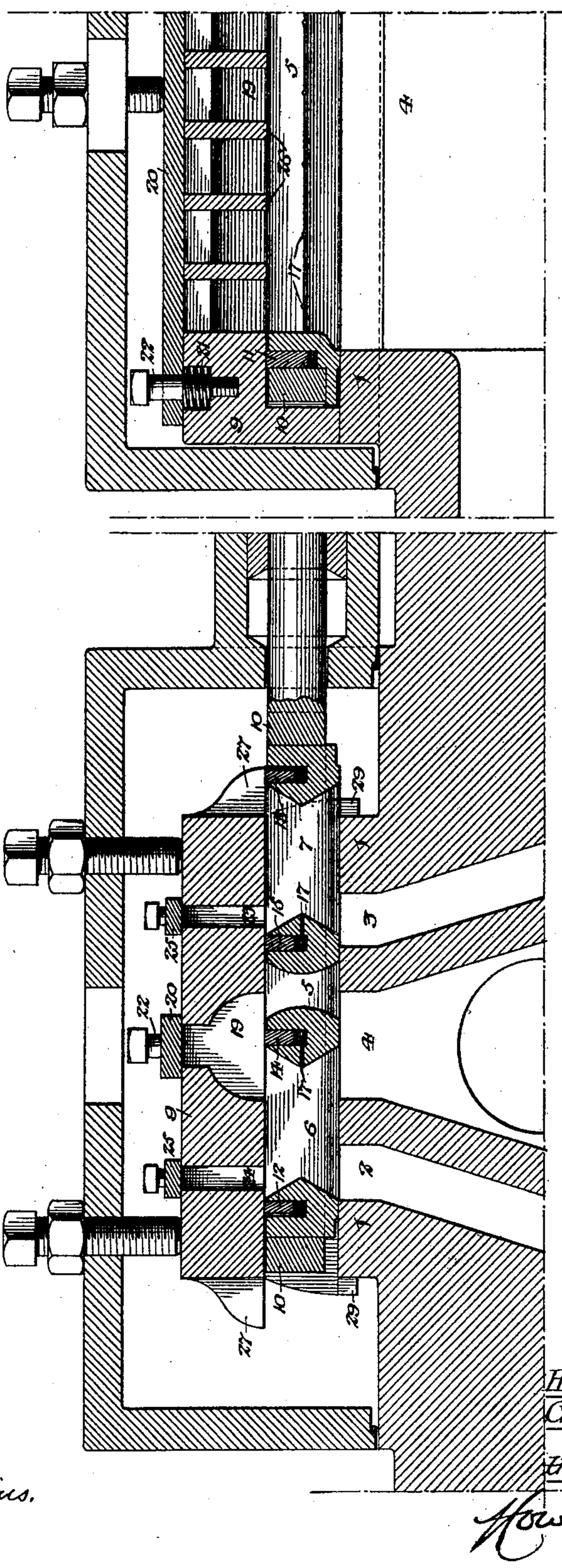


Fig. 1.

Witnesses:-
Louis W. Whitehead.
Herman E. Metius.

Inventors:-
Henry H. Dunbar
Charles L. Dunbar
-by-
their Attorneys:-
Howson & Howson

No. 682,921. Patented Sept. 17, 1901.

H. D. & C. L. DUNBAR.

BALANCED SLIDE VALVE.

(Application filed May 1, 1901.)

(No Model.) 2 Sheets—Sheet 2.

FIG. 4.

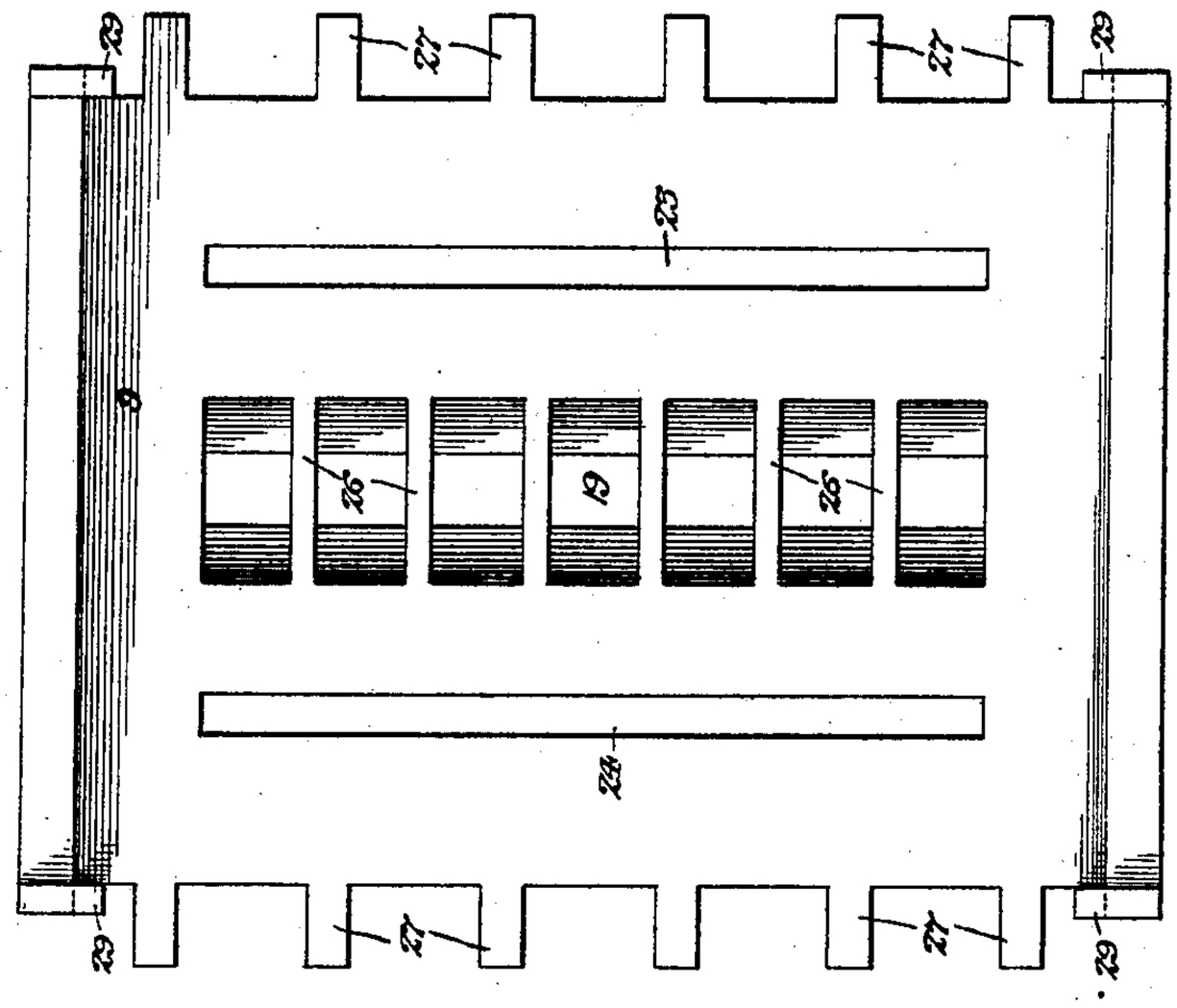
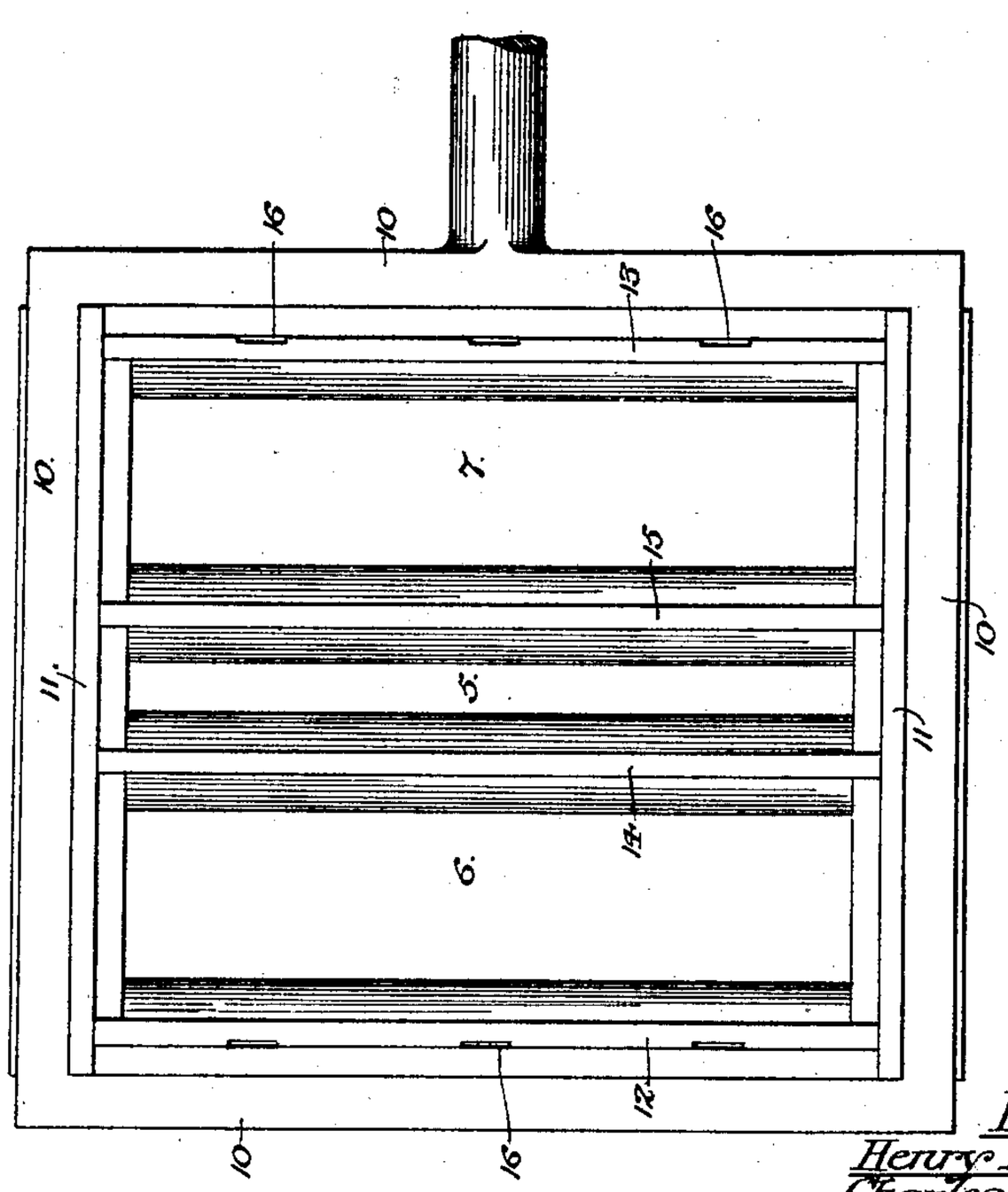


FIG. 5.



Witnesses:-
Louis A. L. Whitehead
Herman E. Metius.

Inventors:-
Henry D. Dunbar
Charles L. Dunbar
by their Attorneys:-
Howson & Howson

UNITED STATES PATENT OFFICE.

HENRY D. DUNBAR, OF NORTH HARTLAND, VERMONT, AND CHARLES L. DUNBAR, OF LEBANON, NEW HAMPSHIRE.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 682,921, dated September 17, 1901.

Application filed May 1, 1901. Serial No. 58,273. (No model.)

To all whom it may concern:

Be it known that we, HENRY D. DUNBAR, of North Hartland, Windsor county, Vermont, and CHARLES L. DUNBAR, of Lebanon, Grafton county, New Hampshire, have invented certain Improvements in Balanced Slide-Valves, of which the following is a specification.

The object of our invention is to provide a balanced slide-valve of simple construction which will permit free inflow of steam to the cylinder and unobstructed exhaust therefrom, will be properly packed against leakage of steam, can be readily fitted to existing valve-chests, will permit free escape of water from the cylinder, and will provide for the relief of vacuum when the engine is running with the steam cut off.

In the accompanying drawings, Figure 1 is a longitudinal section of a balanced slide-valve constructed in accordance with our invention, illustrating the valve at one extreme of its movement. Fig. 2 is a transverse section on the line *a a*, Fig. 1. Fig. 3 is a top view of the valve, and Fig. 4 is an inverted view of the back plate or shield.

1 represents the ported face of the valve-chest; 2, the combined induction and eduction passage leading to one end of the cylinder; 3, the induction and eduction passage leading to the opposite end of the cylinder, and 4 the exhaust-passage. The valve is of the gridiron type and has extending through it from top to bottom three passages 5, 6, and 7, this valve working in the space between the ported valve-seat 1 and a back plate 9, which is rigidly seated upon the valve-seat and confined in position by suitable means—as, for instance, by screws passing through the valve-chest cap or cover, so that it is maintained at a predetermined distance from the valve-seat 1. The valve is embraced by the usual yoke 10, which is connected to the valve-operating rod, and leakage through the valve is prevented by longitudinal packing-strips located at the back of the valve and bearing against the back plate 9. These strips comprise the longitudinal strips 11 at the sides of the valve and transverse strips 12, 13, 14, and 15, the strips 12 and 13 being near the ends of the valve and the strips 14 and 15 being interposed between the passages 5 and 6 and 5 and 7, respectively. The side packing-strips 11 are deeper than the grooves which receive the transverse strips 14 and 15 and also by preference bear the same relation to the grooves which receive the strips 12 and 13, and thereby prevent any leakage of steam into said grooves at the ends, and the chamber in which each of the packing-strips is fitted is somewhat deeper than the strip itself, so that steam can gain access to the space behind the strip in order to press the same rearwardly against the back plate 9, the passages in the side and end strips for this purpose being preferably in the form of shallow grooves formed in the outer sides of the strips, as shown, for instance, at 16 in Fig. 3, and the passages for conveying steam to the chambers containing the inner strips 14 and 15 being in the form of openings 17 of contracted diameter communicating, respectively, with the spaces 6 and 7, as shown in Fig. 1. Each of the strips may also be acted upon by a spring or springs deposited in the base of the groove which contains said strip. The back plate 9 has a central transverse chamber 19, closed at the ends and which may also be closed at the top, although it is preferable to extend it through to the back of the plate 9 and there close it by a longitudinal bar 20, normally held down upon the top of the plate 9 by the pressure of steam in the chest, but when the engine is running without steam being lifted by means of springs 21 at the opposite ends to an extent limited by its contact with the heads of stud-bolts 22, whereby the opposite ends of the bar are guided, the bar thus acting as a vacuum-relief valve for the cylinder of the engine when running under these conditions. Other passages 23 and 24 are formed through the back plate 9, one in advance of the passage 19 and the other in the rear of the same, and these passages are normally closed by valve-bars 25, mounted and actuated in a manner similar to the bar 20, these valve-bars 25 serving to permit escape of water from the cylinder into the chest in order to prevent accident due to the starting of the engine when there is an undue accumulation of water in the cylinder. The passages 19, 23, and 24 being of large

area provide for quick relief, and the bars 20 and 25 constitute simple forms of valve which can be readily retained in place upon the plate 9 and which are not likely to get out of order in use, thereby overcoming the objection to the use of ordinary valves or other supplementary parts within the valve-chest of the engine, where they are inaccessible during the running of the engine. The passage 19 is crossed at suitable intervals by bridge-bars 26, which provide a bearing for the packing-strips 14 and 15 as the valve reciprocates, and the ends of the plate 9 have projecting fingers 27 in order to provide a like bearing for the end strips 12 and 13.

In the operation of the valve steam enters the chamber 6 or 7 of the valve as soon as the corresponding end bar of the valve has moved outwardly beyond the end of the valve-seat and back plate, steam entering the chamber both at top and bottom, so that a large area of opening is available for the inflow, thereby providing for a quick entry of steam into the cylinder. There is also a double flow into the exhaust-passage—namely, the direct flow from the passage 2 or 3 into the passage 4 and an indirect flow through the passage 19 of the back plate and through the central passage 5 of the valve—whereby free and unobstructed escape of the steam from the cylinder is also insured. The use of the back plate 9 insures the proper balancing of the valve, so that the latter can be operated with the minimum of frictional resistance, this quality, combined with the provision for effecting free flow of steam into and from the cylinder, rendering the valve especially available for engines in which high speed is desirable.

In order to facilitate the fitting of the back plate into its proper position, we provide the depending side portions of the plate with inwardly-projecting lugs 29 at the lower corners, these lugs overlapping the ends of the valve-seat, as shown in Fig. 1.

As the steam enters the chambers 6 and 7 of the valve on the inside of the end bars of the same, the yoke 10 offers no obstruction to the free flow of the steam as it does when the steam has to enter the port of the valve-seat around the outer edge of the valve. This feature aids in the quick flow of steam into the cylinder, and it may be employed in a valve taking steam at the top or bottom or at both points, as shown.

Having thus described our invention, we claim and desire to secure by Letters Patent—

1. The combination of the ported valve-seat, the back plate rigidly mounted in respect thereto and having a central passage therein, the valve having a central passage communicating with the exhaust-port and with said central passage of the back plate and near each end a passage communicating with the corresponding induction-port of the valve-seat, said latter passage as the valve is reciprocated being opened to the steam-chest at one end of the travel of the valve, and to the exhaust-port and back-plate passage at the other end of the travel of the valve, substantially as specified.

2. The combination of the ported valve-seat and the back plate rigidly mounted in respect thereto and having a central chamber therein with the valve having a central passage and a passage near each end, the central passage being always in communication with the exhaust-port and with the chamber in the back plate, and each end passage being in communication with the corresponding induction-port of the valve-seat and as the valve is reciprocated being opened alternately to the steam-chest at top and bottom and to the back-plate chamber and exhaust-port at top and bottom respectively, substantially as specified.

3. The combination of the ported valve-seat and the back plate rigidly mounted in respect thereto, with the valve having near each end a passage communicating with the corresponding induction-port of the valve-seat, said passage being opened alternately to the steam-chest and to the exhaust-port as the valve is reciprocated, and packing-strips located on the back of the valve and bearing against the back plate, said packing-strips being located respectively at the sides and ends of the valve, substantially as specified.

4. The combination of the ported valve-seat, the back plate rigidly mounted in respect thereto and having a central passage, the valve located between the valve-seat and back plate and having a central chamber, and a chamber between said central chamber and each end of the valve and packing-strips on the back of the valve for bearing against the back plate, said packing-strips comprising longitudinal side packing-strips, transverse end packing-strips, and intermediate transverse packing-strips between the end chambers and the central chamber of the valve, substantially as specified.

5. The combination of the ported valve-seat, the back plate rigidly mounted in respect thereto, the valve moving between the valve-seat and back plate and having a central passage, and opposite end passages extending through it from front to back, and packing-strips on the back of the valve and bearing against the back plate, said strips comprising longitudinal side strips and transverse strips located between the central passage and the end passages of the valve, substantially as specified.

6. The combination of the ported valve-seat, the back plate rigidly mounted in respect thereto, the valve moving between the valve-seat and back plate and having passages extending therethrough, and packing-strips on the back of the valve bearing against the back plate, said packing-strips comprising

both longitudinal and transverse strips, the longitudinal strips being deeper than the transverse strips, substantially as specified.

7. The combination of the ported valve-seat, the back plate rigidly mounted in respect thereto, and the valve moving between the valve-seat and back plate and having passages extending through the same, a relief-passage extending through the back plate, and a flat bar normally resting upon the back of the plate and guided at each end so as to serve as a relief-valve, substantially as specified.

8. The combination of the ported valve-seat, the back plate rigidly mounted in respect thereto and having projecting fingers at each end, and the valve moving between the valve-seat and back plate and having passages extending through it, and packing-strips mounted on the back of the valve and bearing against the back plate or its projecting fingers as the valve is reciprocated, substantially as specified.

9. The combination of the ported valve-seat, the valve and the back plate having depending side portions resting upon the valve-seat, and inwardly-projecting end lugs bearing against the ends of the valve-seat, substantially as specified.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY D. DUNBAR.
CHARLES L. DUNBAR.

Witnesses:
F. E. BECHTOLD,
JOS. H. KLEIN.