No. 705,730. Patented July 29, 1902.

J. T. WILSON.

BALANCED SLIDE VALVE.

(Application filed July 18, 1901.)

(No Model.)

Fig. 1.

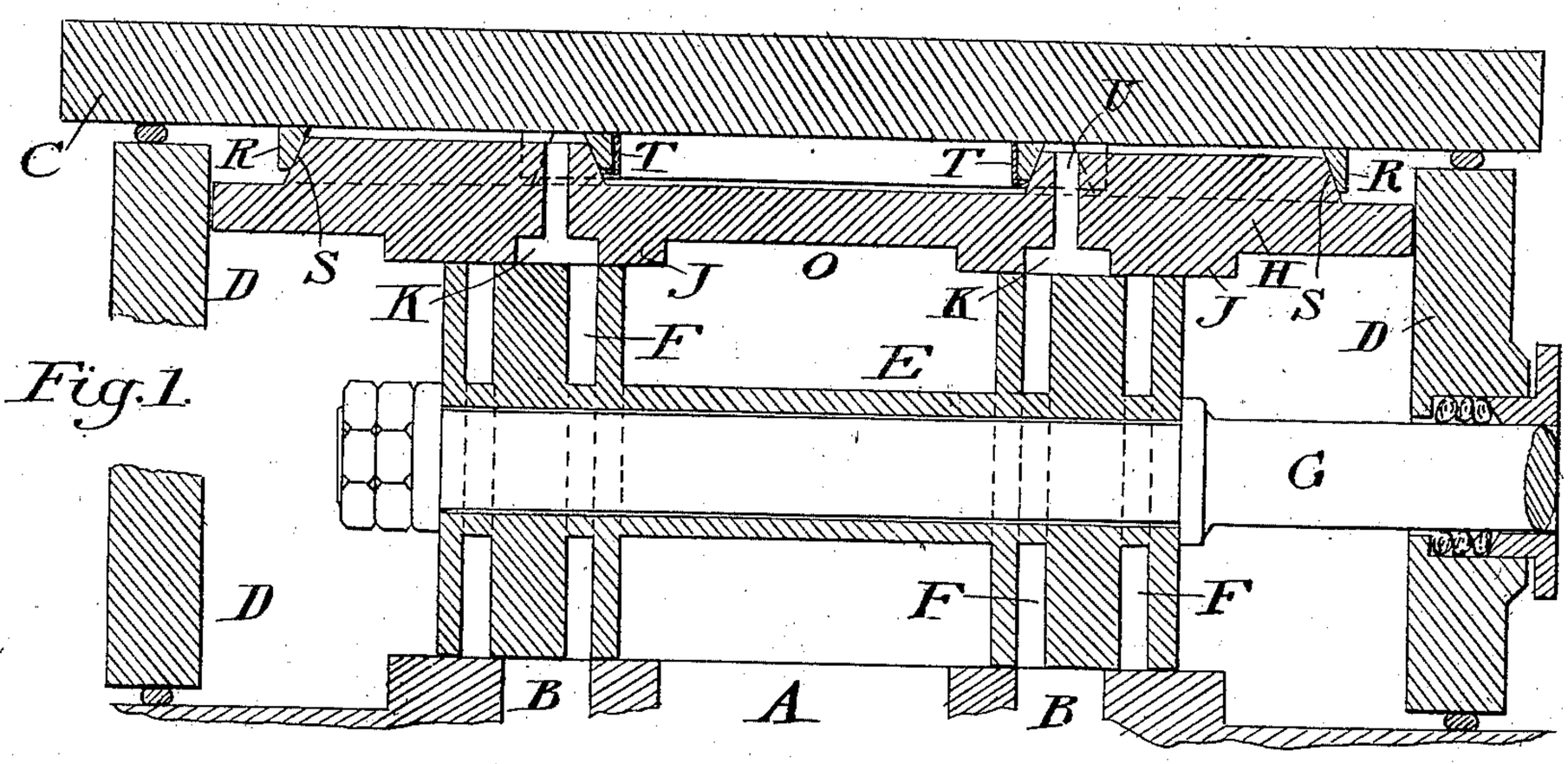


Fig. 2.

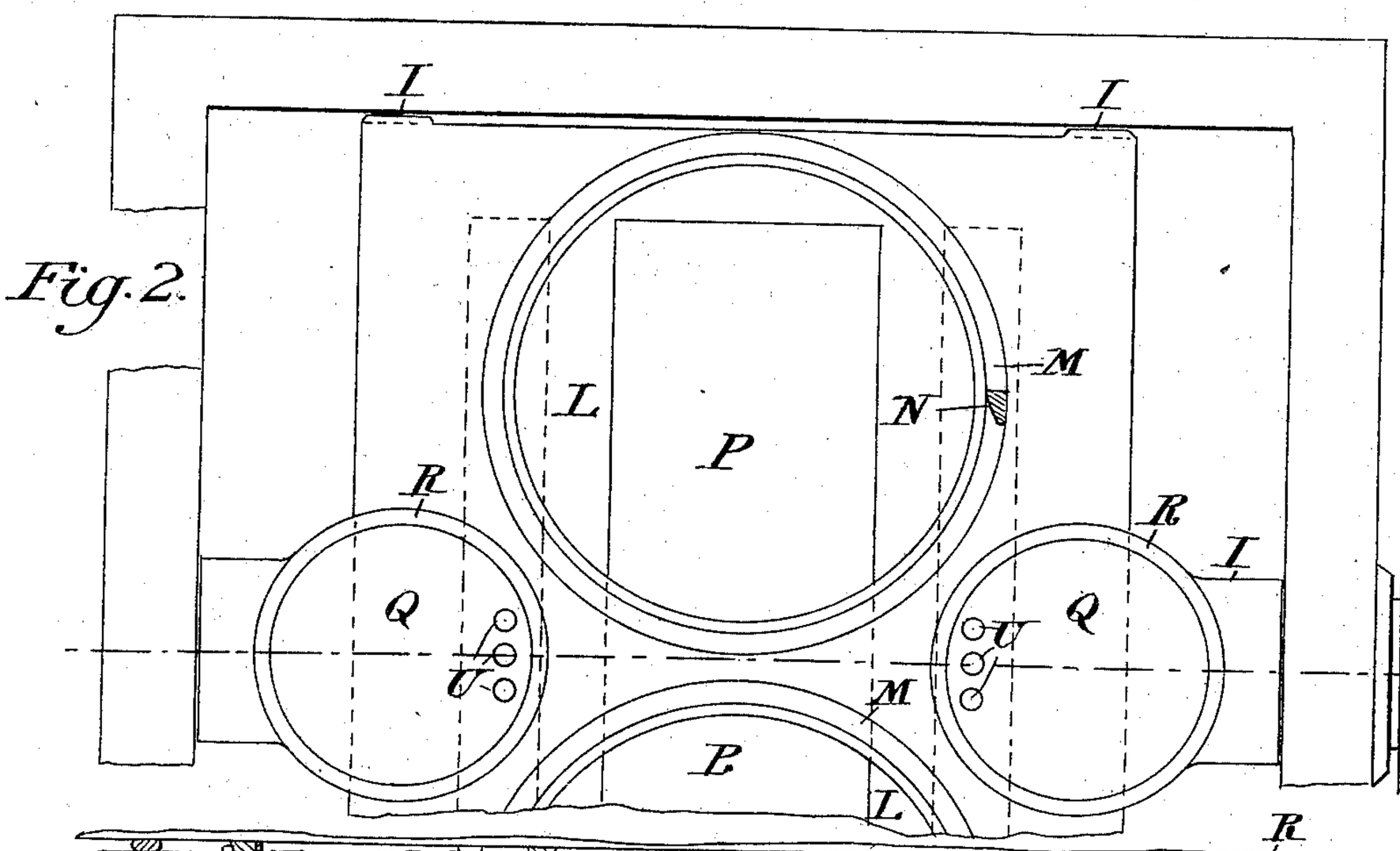
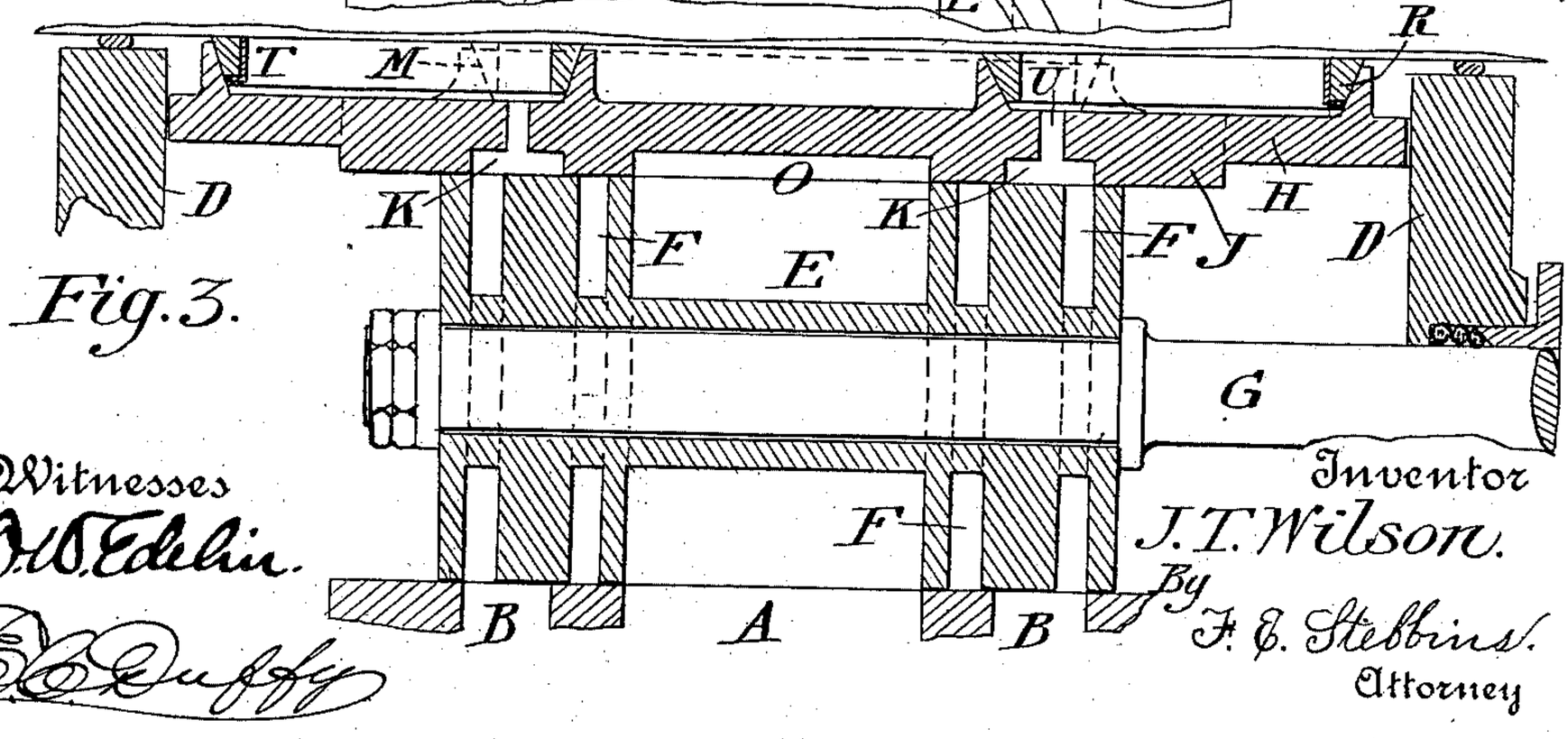


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN T. WILSON, OF JERSEY SHORE, PENNSYLVANIA.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 705,730, dated July 29, 1902.

Application filed July 13, 1901. Serial No. 68,195. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. WILSON, a citizen of the United States, residing at Jersey Shore, in the county of Lycoming and State of Pennsylvania, have invented new and useful Improvements in Balanced Slide-Valves, of which the following is a specification.

The invention relates to balanced slide-valves, the object being the production of a valve which shall be balanced at all points of its travel upon the seat, which shall wear evenly and prevent the formation of concavities or irregular surfaces upon the seat or balancing-plate that would allow the passage of motive fluid between the frictional surfaces to the exhaust-space of the chest, which can be easily moved, which shall be adapted for application to engines now in use and for taking the place of inferior types of valves, which shall be comparatively cheap to manufacture and apply, which shall not easily become deranged in service, and which, withal, shall constitute a superior means for performing the requisite functions of a perfect valve.

With these ends in view my invention consists, objectively, in the combination, within a chest, of a valve-seat, a movable valve, a balancing-plate having an inclosed space or spaces to which motive fluid is admitted at certain portions of the valve's travel and from which it is exhausted at other portions of its travel, and means for holding the valve to its seat, the said valve only having reciprocating motion and between the seat and balancing-plate.

It further consists in certain novelties of construction and combinations and arrangements of parts herein disclosed, and specified in the claims.

The accompanying drawings illustrate two examples of the physical embodiment of my invention, one in connection with an engine having external admission of motive fluid and the other having internal admission and both constructed according to the best modes I have so far devised for the practical application of the principle.

Figure 1 is a cross-section in elevation of Fig. 2, taken on the line *x x*. Fig. 2 is a top plan view of a part of the steam-chest of an external-admission valve, the cover being removed, so as to disclose the top of the balancing-plate and the inclosed areas. Fig. 3 is a cross-section in elevation of an internal-admission valve, taken on line *x x* of the chest and with a balancing-plate substantially identical with that shown in Fig. 2, one of the rings inclosing the permanent balancing areas being shown in dotted lines at the top.

Referring to the several figures, the letter A designates the valve-seats, which in both examples are raised some distance above the bottom of the chest.

B designates the ports to the cylinders.

C is the steam-chest cover.

D designates the walls of the chests; E, the reciprocating valves, having parallel top and bottom faces; F, slots through the valves from top to bottom except where the valve-stems pass and at the ends, said slots being of substantially the same length as the ports to the cylinder; G, the valve-stems; H, the balancing-plates; I, lugs which hold the balancing-plate central within the steam-chest, said lugs being in slight frictional contact with the walls D, so as to prevent horizontal movements of the plate, but to permit vertical and rocking movements.

J is a raised or projecting seat upon the under surface of each plate which corresponds in outline with the valve-seat; K, shallow pockets in the surface of the projecting portion which correspond in length and width with the ports B in the valve-seat; L, permanent balance areas; M, beveled snap-rings inclosing the said areas; N, (see Fig. 2,) beveled surfaces against which rings M bear; O, pockets which correspond with central openings in the valve-seats; P, openings through the balance-plate and located within the areas bounded by the snap-rings M, as shown; Q, inclosed spaces or areas on top of the balancing-plate; R, beveled and jointed snap-rings; S, beveled surfaces against which the snap-rings R bear; T, the lap-joints of the rings, and U are openings from the pockets K to the inclosed spaces Q, one or more being present, as occasion may demand.

In the first example, Figs. 1 and 2, the permanent balance areas L are open to the exhaust only, the balance snap-rings M bearing against the beveled surfaces N and the bottom of the steam-chest cover, thus excluding

live motive fluid or steam from the said areas, but allowing the balancing-plate to move vertically and to rock slightly without breaking the joints. The area of the top of the plate which is to be excluded from the steam-pressure is determined in any given case by experiment and should be such as will result in a downward pressure of the plate upon the valve great enough to hold the valve in frictional contact with the valve-seat and the under surface of the said plate and not allow the passage of motive fluid to the exhaust.

In the second example, Fig. 3, which illustrates the internal admission, the valve is shortened in length and the snap-rings M and R are beveled on the outside instead of on the inside, as in the first example. The beveled surfaces are also reversed, as shown in section and dotted lines, Fig. 3. As the motive fluid is at the center of the chest, the requisite downward pressure of the plate upon the valve is dependent upon the areas L, which are open to live steam, and the size of these areas must be determined, as in the first example, experimentally.

In both the examples it is obvious that when the parts are assembled and live motive fluid admitted the downward pressure upon the plate must be ample to form steam-tight joints between the valve and the valve-seat and the lower surface of the top plate.

The mode of operation of the first example is as follows: Assuming the valve to occupy a central position, as shown in Fig. 1, and that it moves toward the left, the valve remains balanced during its movement to the position it occupies when about to open the port, for the area uncovered to steam-pressure at the right of the pocket K is equal to the area covered by the opposite end of the valve at the extreme left and adjacent the left-hand pocket. Upon the further travel of the valve the port B is opened and simultaneously the pocket K, and motive fluid passes to the inclosed area Q and also downwardly through the slot F, thus allowing a double admission to port B. The lower surface of the valve which overlaps the port is now subjected to an upward pressure in addition to the area uncovered at the right of pocket K, which is counterbalanced by the steam in the area Q, which area is substantially identical with the area of the steam-port. Steam remains in the area Q, preventing the upward movement of the edge of the balancing-plate until the valve in its return travel reaches the edge of the port and point of exhaust. When exhaust commences from the port B, there is a simultaneous exhaustion of steam from the area Q, and steam from the port can also pass upwardly through the left-hand slot F and by way of the pocket K find an outlet into the exhaust-cavity, the slot thus forming a secondary exhaust-outlet. The left-hand portion of the valve operates in the same manner as the right-hand portion simultaneously, but in inverse order—that is, when the right-hand portion of the valve admits steam to the right-hand port the left-hand portion opens the left-hand port to the exhaust-cavity, and vice versa. It is obvious from the foregoing that the valve is balanced at all points of its travel.

The mode of operation of the second example is substantially the same as that of the first, the only difference being that the valve is of the central-admission type, and consequently when the right-hand portion of the valve moves toward the right the port B and the inclosed area Q simultaneously receive the motive fluid, and when the valve moves toward the left this motive fluid is simultaneously exhausted from the port and the inclosed area at the back of the plate. It will be observed that the inclosed areas at the back of the balancing-plate in each example are always in communication with the ports in the seat, so that whatever pressure of motive fluid or absence of pressure is in the cylinder-ports is also within the inclosed or balancing areas Q. The permanent balancing of the valve can therefore be effected without regard to the ports.

In both examples there is a raised valve-seat with ports, a valve having parallel faces and slots, and a balancing-plate loosely engaging the walls of the chest and adapted to move vertically and also to rock slightly upon the valve.

The top plates each have a lower projecting surface of a form similar to the valve-seat, permanent balancing areas at the back inclosed by snap-rings, two inclosed areas Q inclosed by snap-rings, and openings from the shallow pockets K to the inclosed areas Q. The modes of operation are substantially the same, the admission of motive fluid to a port and to an inclosed area Q being simultaneous and the exhaust therefrom likewise being simultaneous.

From the foregoing it is clear that I have produced a valve which fulfils all the conditions set forth as the object of my invention, besides possessing additional and desirable features of construction and operation which will be recognized by persons familiar with the art. The valve can be applied to any existing steam-chest. It is practically balanced the same in every position of its travel. It will not be expensive to manufacture and apply, and the rings above the plate having no motion will not wear out.

While I have illustrated and described only two examples of the physical embodiment of my invention, I do not thereby intend to limit the scope thereof to such examples, inasmuch as the invention can be embodied by different modes and in other shapes. Parts may be omitted, such as slots in the valve and one of the inclosed areas, and parts may be added and the number of inclosed areas at the back increased. Substitutions may be made—for example, other means introduced for holding

the balancing-plate in alinement, and other means, such as strips, used for forming the inclosed areas, and permanent balancing spaces at the back for holding the valve to its seat. All such and other modifications I intend to embrace within the scope of my claims.

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

1. The combination with a steam-chest having a ported seat, sides, and a cover; of a valve; and a balancing-plate; said valve adapted to reciprocate between the valve-seat and the lower surface of the balancing-plate; and said balancing-plate having an area or areas closed to the admission of motive fluid and adapted to move vertically and also to have a slight rocking motion so as to automatically take up the wear of the frictional surfaces.

2. The combination within a steam-chest, of a ported valve-seat; a reciprocating valve; and a balancing-plate; said balancing-plate being located between the valve and the steam-chest cover and provided with a permanent inclosed balancing area and with an inclosed area to which motive fluid is alternately admitted and exhausted by the valve at different portions of its travel.

3. The combination within a steam-chest, of a ported valve-seat; a reciprocating valve; and a balancing-plate located between the valve and the steam-chest cover, said balancing-plate being provided at its back with a permanent inclosed balancing space and also with two inclosed areas at opposite sides of the plate and to which motive fluid is admitted and exhausted.

4. The combination within a steam-chest, of a ported valve-seat; a reciprocating valve; and a balancing-plate; said balancing-plate being adapted to permanently hold the valve to its seat, and having two inclosed areas in line with the ports and to which areas motive fluid is alternately admitted and exhausted.

5. The combination within a steam-chest, of a ported valve-seat; a movable valve; a balancing-plate; and means for permanently balancing the valve; said balancing-plate having two inclosed areas, and the parts being so arranged that when motive fluid is admitted to a port it is simultaneously admitted to an inclosed area and when motive fluid is exhausted from the port it is simultaneously exhausted from the inclosed area.

6. The combination within a steam-chest, of a ported valve-seat; a movable valve; a balancing-plate; and means for permanently balancing the valve; said balancing-plate having inclosed areas at its back communicating with the live steam and exhaust, and said valve being slotted; whereby the valve is balanced at all points of its travel and a double admission and double exhaust is secured.

7. The combination within a steam-chest, of a ported seat; a movable valve; a balancing-plate; adapted to hold the valve between the balancing-plate and seat to form steam-tight joints; and inclosed areas or an inclosed area in communication with the ports or a port at all portions of the valve's travel.

8. The combination in a steam-chest, of a ported seat; a movable valve; a balancing-plate; adapted to hold the valve between the balancing-plate and seat to form a steam-tight joint; and a plurality of inclosed areas at the back of the plate; the said valve-seat being raised and the under surface of the balancing-plate being formed with a downwardly-extending portion corresponding to the valve-seat.

9. The combination within a steam-chest, of a ported valve-seat; a movable valve; a balancing-plate having inclosed areas; and means for effecting a permanent balance of the valve; the said plate being retained by lugs which prevent the lateral or longitudinal movement of the same.

10. The combination within a steam-chest of a seat; a valve; and a balancing-plate, constructed and operated substantially as set forth; the said balancing-plate having inclosed areas and pockets corresponding to the ports, and openings from the pockets to the inclosed areas.

11. The combination within a steam-chest, of a ported seat; a movable valve; and a balancing-plate located beneath the steam-chest cover; means for effecting a permanent balance of the valve; and means for counterbalancing the valve when subjected to upward pressure by the motive fluid within the ports.

12. The combination within a steam-chest, of a ported seat; a movable valve; a balancing-plate; adapted to effect a permanent pressure upon the valve; and means for balancing opposite edges of the plate when said edges become unbalanced.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN T. WILSON.

Witnesses:
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BRUCE HARLAN.