(No Model.) 2 Sheets—Sheet 1.

H. C. NICHOLS.

BALANCED SLIDE VALVE.

No. 457,211. Patented Aug. 4, 1891.

Fig. 2.

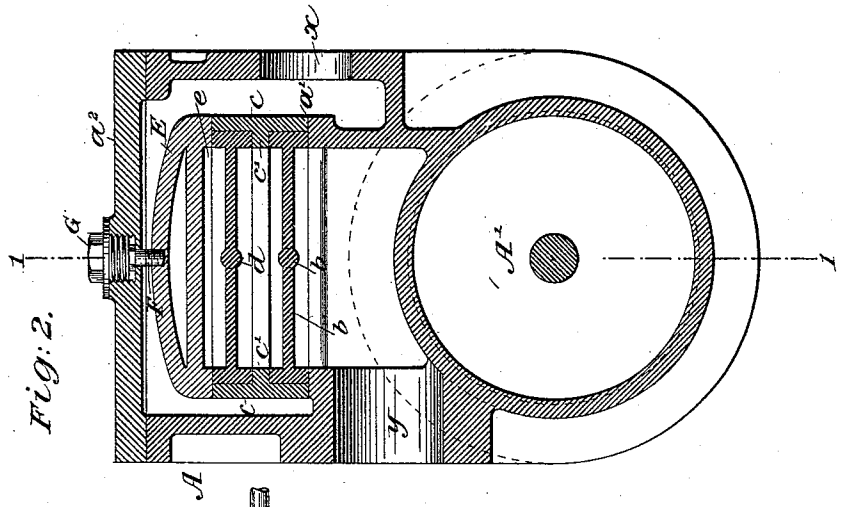
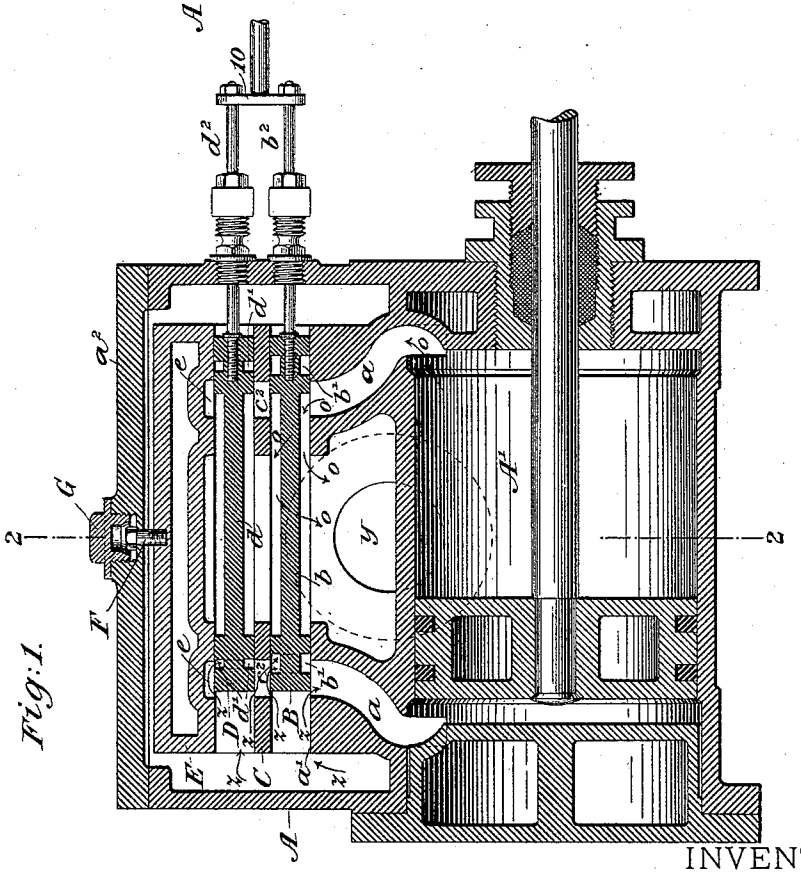


Fig. 1.



INVENTOR:

Henry C. Nichols

WITNESSES:

John A. Rennie.

A. W. Harrison

By Wm. F. Arbuckle

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

H. C. NICHOLS.

BALANCED SLIDE VALVE.

No. 457,211. Patented Aug. 4, 1891.

Fig: 3.

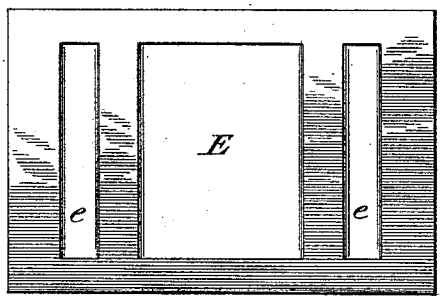


Fig: 4.

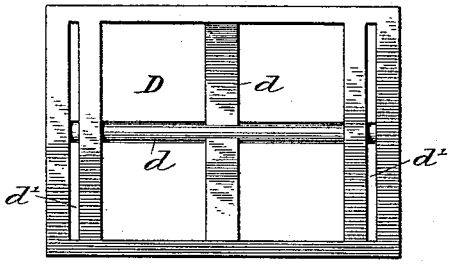
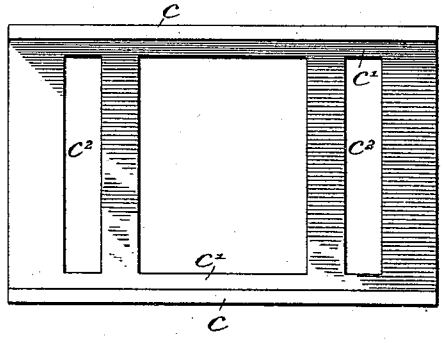


Fig: 5.



INVENTOR:

Henry C. Nichols,

Wm. H. Appleton,

Attorney.

WITNESSES:

John A. Rennie.

A. W. Harrison

By

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY C. NICHOLS, OF HOPKINTON, RHODE ISLAND.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 457,211, dated August 4, 1891.

Application filed August 25, 1890. Serial No. 362,987. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. NICHOLS, a citizen of the United States, and a resident of Hopkinton, county of Washington, and State of Rhode Island, have invented certain new and useful Improvements in Balanced Slide-Valves for Steam-Engines, of which the following is a specification.

My invention relates to slide-valves, and has particular reference to such valves for double-acting reciprocating-stroke steam and air engines intended for running with a high degree of rapidity of stroke. To produce the best results in such engines it is desirable to so construct the valve that the requisite amount of steam or air shall be admitted to the cylinder with the least possible extent of motion of the valve, and to produce a valve capable of allowing full pressure in the cylinder and yet having a minimum of throw or lead is the object of my invention. To attain this object I combine with a main balanced slide-valve an auxiliary valve of similar construction placed above it and separated therefrom by a division-plate having openings or ports corresponding with the ports of the cylinder; and in this my invention consists.

My invention also consists in the construction and combination of parts as hereinafter described and claimed.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a longitudinal central section of the cylinder, steam-chest, and valves, taken in the plane 1 1 of Fig. 2; Fig. 2, a central cross-section of the same, taken in the plane 2 2 of Fig. 1; Fig. 3, a detail showing an under plan view of the balance-plate; Fig. 4, a detail showing a plan view of the auxiliary valve, the main valve being of the same type, but with wider ports; and Fig. 5, a detail showing a plan view of the division-plate.

In all the figures like letters and numerals are employed to designate corresponding parts.

The steam-chest A, having ports a, which may be of any preferred form or length leading to each end of the cylinder A′, is provided with suitably-dressed ways a' for the main valve B, and resting on these ways, outside the valve B, are the side walls c of the division-plate C, which is formed with inwardly-projecting ways c', between which and the ways a' the valve B is fitted to travel. This valve, which is preferably of rectangular form and strengthened and braced by cross-strips b, is provided at each end with a port or opening b' of any desired width extending entirely through it. The division-plate C is likewise furnished with ports e^2, which are so disposed therein that when the plate is in position they shall be brought directly over the ports a.

The auxiliary valve D, which, as shown, is the counterpart of the valve B, and having similar cross-braces d, but with its ports d' preferably of less width than the ports b, is fitted to slide on the division-plate and its ways c' and between it and the plate E, which is provided with transverse grooves or recesses e on its under side, and which also rests on the top of the side walls c of the division-plate. Although these side walls serve in great measure to prevent undue pressure of the balance-plate upon the valves, yet I prefer in some cases to lessen the pressure which might exist by supporting said plate from the chest-cover a^2. I do this by means of a screw F, which passes through the cover and enters the top of the balance-plate, the head of said screw being supported in a countersunk hole in the cover, the sides of the countersunk portion of the hole being threaded to receive a cap-screw G for rendering the opening steam-tight. While thus supporting the balance-plate from the steam-chest cover against the pressure of steam upon its upper side, provision is made for an upward yielding movement of such plate when required without the steam escaping around the supporting screw or screws. In the drawings I have shown but a single supporting-screw. It is to be understood, however, that a greater number of such such screws may be employed, if found necessary or if preferred.

Valve-rods b^2 and d^2 for the the valves B and D, respectively, are shown in Fig. 1 as passing out from the steam-chest through any preferred form of stuffing-box, and in said figure the two rods are shown as connected by a tie-plate 10, to which is secured the end of an eccentric-rod or other equivalent valve-operating mechanism. The connections shown insure uniformity in operation of the two

valves, which is necessary to the successful operation of my invention; but it is obvious that the two valve-rods b^2 and d^2 might be operated from separate eccentrics or their equivalents so connected to the main shaft of the engine or other convenient part thereof as to insure their simultaneous and uniform movement.

The passages for connection of the entrance and exhaust-steam pipes are shown at x and y, respectively.

The operation is as follows: Live steam entering at x follows the direction of the arrows z, (shown in Fig. 1,) entering the spaces above and below the division-plate at the rear of the steam-chest, and, finding four outlets from said spaces, a portion passes directly into port a, a second portion passes up over the rear of valve B and through ports b' and a, a third portion passes under the rear end of valve D and through ports c^2, n', and a, and a fourth portion passes over the rear end of valve D, through recesses or grooves e in the balance-plate and down through ports d', c^2, b', and a, each of the several ports being preferably so proportioned as to size as to readily allow the passage of the quantity of steam seeking a way therethrough. At the other end of the cylinder the arrows o indicate the path for the exhaust-steam, and without a figure to illustrate it it will be readily understood that upon reversal of the valves the passage of the steam just described takes place at the other end of the valves and cylinder.

In the foregoing I have described the best means contemplated by me for carrying my invention into practice; but I wish it distinctly understood that I do not limit myself strictly thereto, as it is obvious that I may modify the same in various ways without departing from the spirit thereof. For instance, instead of forming the side walls c upon the edges of the division-plate C, I may make them separate therefrom and either cast them as separate pieces or as a part of the steam-chest. Furthermore, the relative distance between the ports of the valves may be altered in their relation to the distance between the ports a of the cylinder, so that the exhaust-steam or a portion of it will find outlet through the valve-ports, instead of as indicated by arrows o in Fig. 1. Again, the arrangement of valves here shown may be employed either with or without a cut-off, and, if desired, a second auxiliary valve arranged in relation to the first may also be employed.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, with a main slide-valve, of an auxiliary valve and a division-plate, the seat for the main valve and the division-plate having coinciding ports, and the two valves having coinciding openings or ports, whereby a simultaneous motion of the two valves will open four steam-passages, substantially as described.

2. The combination, with a main balanced slide-valve, of an auxiliary valve of similar construction placed above it and separated therefrom by a division-plate having openings or ports corresponding with the ports of the cylinder, substantially as described.

3. In a steam-engine, the combination, with the cylinder, of the main valve B, having ports b', the division-plate C, having ports c^2, the auxiliary valve D, having ports d', and the balance-plate E, having grooves or recesses e, the said valves being connected for simultaneous and uniform movement, substantially as described.

4. In a steam-engine, the combination, with the balance-plate, the steam-chest, and steam-chest cover, of a screw passing through the steam-chest cover into the balance-plate, and a cap-screw secured in said cover over the first-mentioned screw, whereby the balance-plate is supported from the steam-chest cover against the pressure of steam upon its upper side and provision made for such plate yielding upward, when required, without the steam escaping around the supporting-screws, substantially as described.

In testimony whereof I have hereunto set my hand this 21st day of August, 1890.

HENRY C. NICHOLS.

Witnesses:
WM. C. HAUFF,
WM. H. APPLETON.