

(No Model.)

W. D. HOOKER.
BALANCED VALVE.

No. 253,166.

Patented Jan. 31, 1882.

Fig. 1.

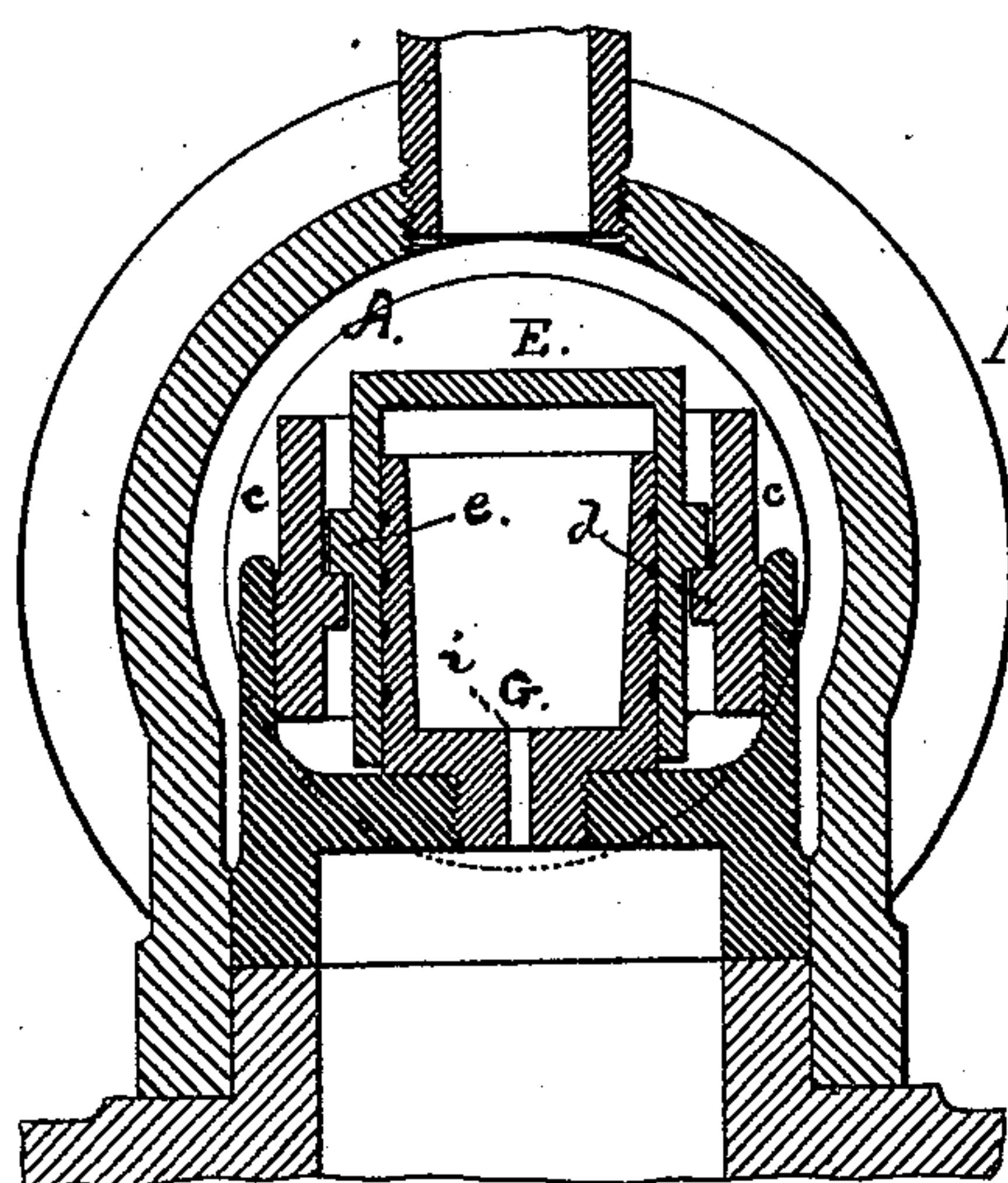
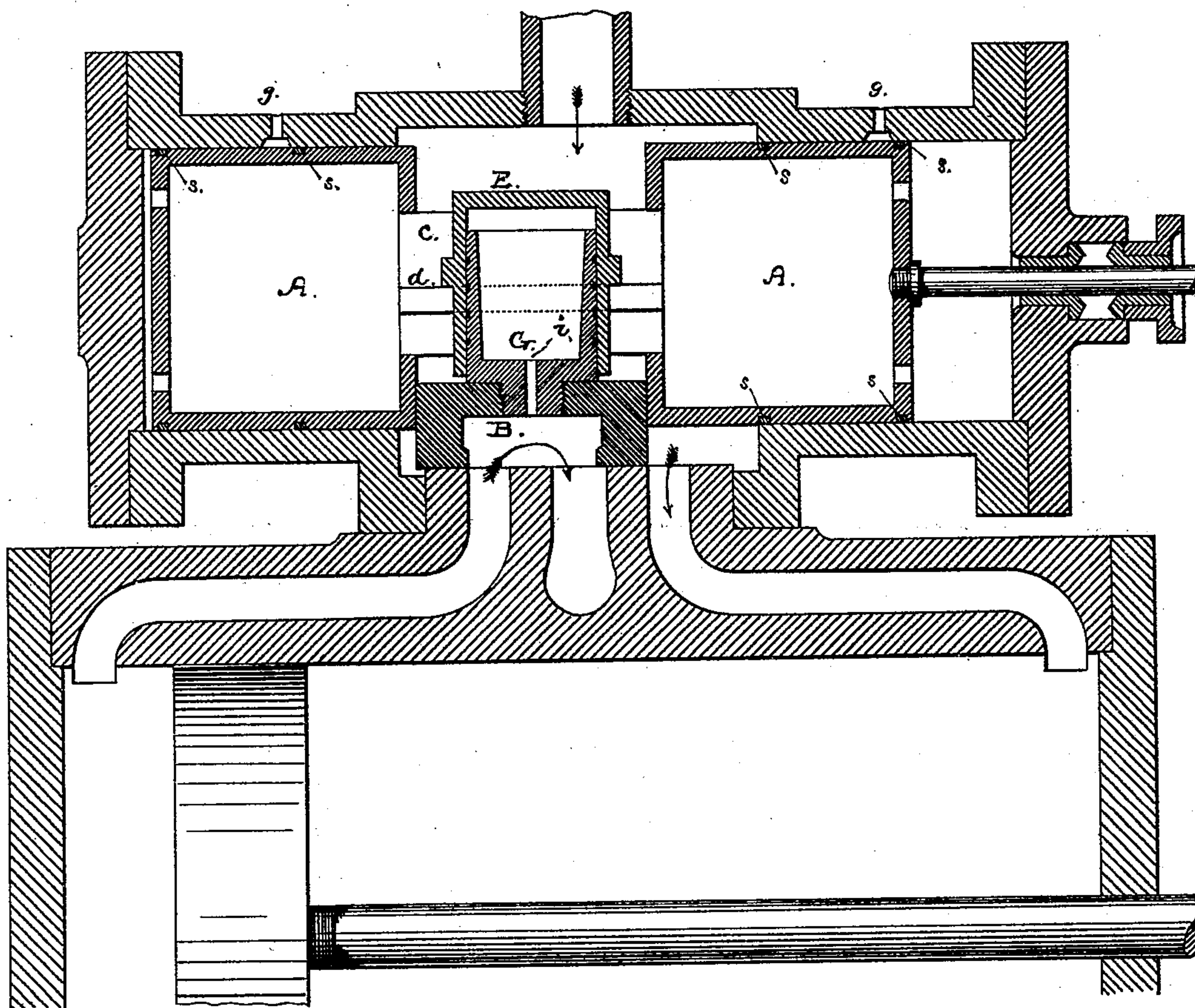


Fig. 2.

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WILLIAM D. HOOKER, OF OAKLAND, CALIFORNIA.

BALANCED VALVE.

SPECIFICATION forming part of Letters Patent No. 253,166, dated January 31, 1882.

Application filed June 8, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. HOOKER, of the city of Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Balanced Valves for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to an improved method and arrangement for balancing the steam-pressure on slide-valves that are moved by or with or in a fixed relation to a supplemental piston; and it consists in transferring the pressure from the slide-valve to the supplemental piston, and then counteracting the pressure on the piston by exposing a corresponding area of the piston to the steam-pressure in a counter direction, all as hereinafter described.

Referring to the accompanying drawings, Figure 1 is a vertical longitudinal section. Fig. 2 is a transverse section through the center of the valve-chamber and the supplemental piston.

Let A A represent a supplemental piston which is moved by steam or other pressure in the main-valve chamber of an engine, and with which the main valve B, which admits steam to and exhausts it from the engine-cylinder, is connected so as to be moved by or with it. Usually this supplemental piston consists of two heads and a connecting-stem of smaller diameter, as represented in the drawings, and the main valve B is carried in a recess in its under side. As herein represented, the heads of this supplemental piston are made hollow, and they are connected by two bars, *c c*. (Shown at Fig. 2.) In constructing these bars I cast or otherwise form a ledge, rib, or lug, *d*, on the inside of each, so that the two lugs will be opposite each other. I then take an inverted-cup-shaped cylinder, E, on the opposite sides of which a corresponding lug or rib, *e*, is formed, and drop it down between the bars *c c* until its lugs or ribs *e* rest upon the lugs or ribs *d*. This arrangement I have adopted because it is simple and answers every purpose; but the cylinder can be secured to or mounted upon the piston in the position represented in any other way. The slide-valve B fits in the recess between the heads A A of the supplemental pis-

ton and below the inverted-cup-shaped cylinder E.

To the upper side of the slide-valve I attach a piston, G, which will extend up into the cylinder E when the main valve is in position between the heads A A. This piston can be cast as a part of the valve, if desired. In the drawings it is represented in the form of a cup; but it can be made like any other piston, its object being to fit in the cylinder E and make a comparatively tight joint which will prevent the steam from passing into the cylinder above it. A port or passage, *i*, leads from the space above the piston G down through the piston and main valve, so as to connect the space above the piston in the cylinder with the exhaust-passage; or it might be connected with the open air with equal advantage, its object being to prevent any steam-pressure in the space. Now, when steam is admitted into the valve-chamber it will press upon the top of the inverted cylinder E and upon the exposed portion of the valve that projects around the piston; but it will not enter the space in the cylinder above the piston. Consequently there will be no pressure in the space, and the valve will be relieved in proportion to the areas of the piston and valve, respectively. Should any portion of steam gain entrance to the space above the piston, it immediately passes through the port *i* to the exhaust or to the open air, so that it is impossible to obtain any pressure upon the piston.

In constructing the valve B, piston G, and cylinder E, I regulate their respective areas according to the amount of pressure I desire to take off the main valve. By this arrangement the valve is free to lift when the pressure underneath it exceeds the pressure above it, because the piston G can move upward in the cylinder. Should the valve-rod, therefore, or any of its connections with the engine become detached or broken, the momentum of the engine will continue to move the piston until the resistance and friction stops it, in which case the pressure in the cylinder will lift the slide-valve from its seat, and thus fill the cylinder with steam, thus preventing any damage. As stated, this relieves the pressure on the valve; but it is evident that the pressure thus taken

off the valve is only transferred to the supplemental piston, because the cylinder E rests upon the supplemental piston, and the pressure comes on top of the cylinder and presses the supplemental piston downward. This pressure on the supplemental piston can be relieved in various ways; but the simplest method is to make a port or opening, *g*, in the valve-chamber above each hollow head A A of the supplemental piston, so as to connect the interior of the chamber with the open air at such a point that each opening will be covered by the moving piston during its entire stroke, and thus prevent the escape of the steam. The combined area of these openings being equal to the area of the cylinder E, the upward pressure of the steam in the hollow piston will counteract the downward pressure upon the cylinder E, thus balancing the valve and piston both horizontally and vertically throughout the entire length of their stroke.

To insure an easy motion of the supplemental piston, and at the same time preserve a tight joint between the steam-space and the opening *g*, I place a packing-ring, *s*, around each piston-head, on each side of the opening.

When the ends of the supplemental piston are solid, and the piston is moved by steam, either through the medium of an auxiliary valve or otherwise, I provide a recess under each end of the supplemental piston, the combined areas of which are equal to the area of the cylinder E, so that the live steam will fill the recesses and exert an upward pressure corresponding to the downward pressure on the piston. A very suitable arrangement for this purpose is shown in my Letters Patent No. 81,168, which was issued to me on the 18th day of August, 1868, in which a puppet-valve is

arranged in each end of the supplemental piston, so as to retain steam for cushioning the stroke of the piston. This arrangement is especially adapted for relieving this downward pressure when the admission of steam to move the supplemental piston is controlled by an auxiliary valve. I do not, however, confine myself to any special arrangement for counteracting this downward pressure.

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

1. The improvement in balancing slide-valves, consisting in transferring the steam pressure from the valve to a supplemental cylindrical piston, and then counteracting the pressure upon the piston by exposing a corresponding area of the piston to the steam-pressure in a counter direction, substantially as described.

2. The inverted-cup-shaped cylinder E, attached to the horizontally-moving supplemental piston A A, in combination with the slide-valve B, with its piston G fitting in the cylinder E, and having the space above it connected with the exhaust or open air by a passage, *i*, substantially as described.

3. The hollow supplemental piston A A, arranged to move in a case or shell having a space, *g*, connected with the open air, in combination with the inverted-cup-shaped cylinder E and main valve B, with its piston G and the passage *i*, all combined and arranged to operate substantially as above described.

In witness whereof I have hereunto set my hand and seal.

WILLIAM DAVIS HOOKER. [L. s.]

Attest:

W. F. CLARK,
W. VOIT.