

(No Model.)

W. L. HOFFECKER.  
BALANCED PISTON VALVE.

No. 246,138.

Patented Aug. 23, 1881.

Fig. 1.

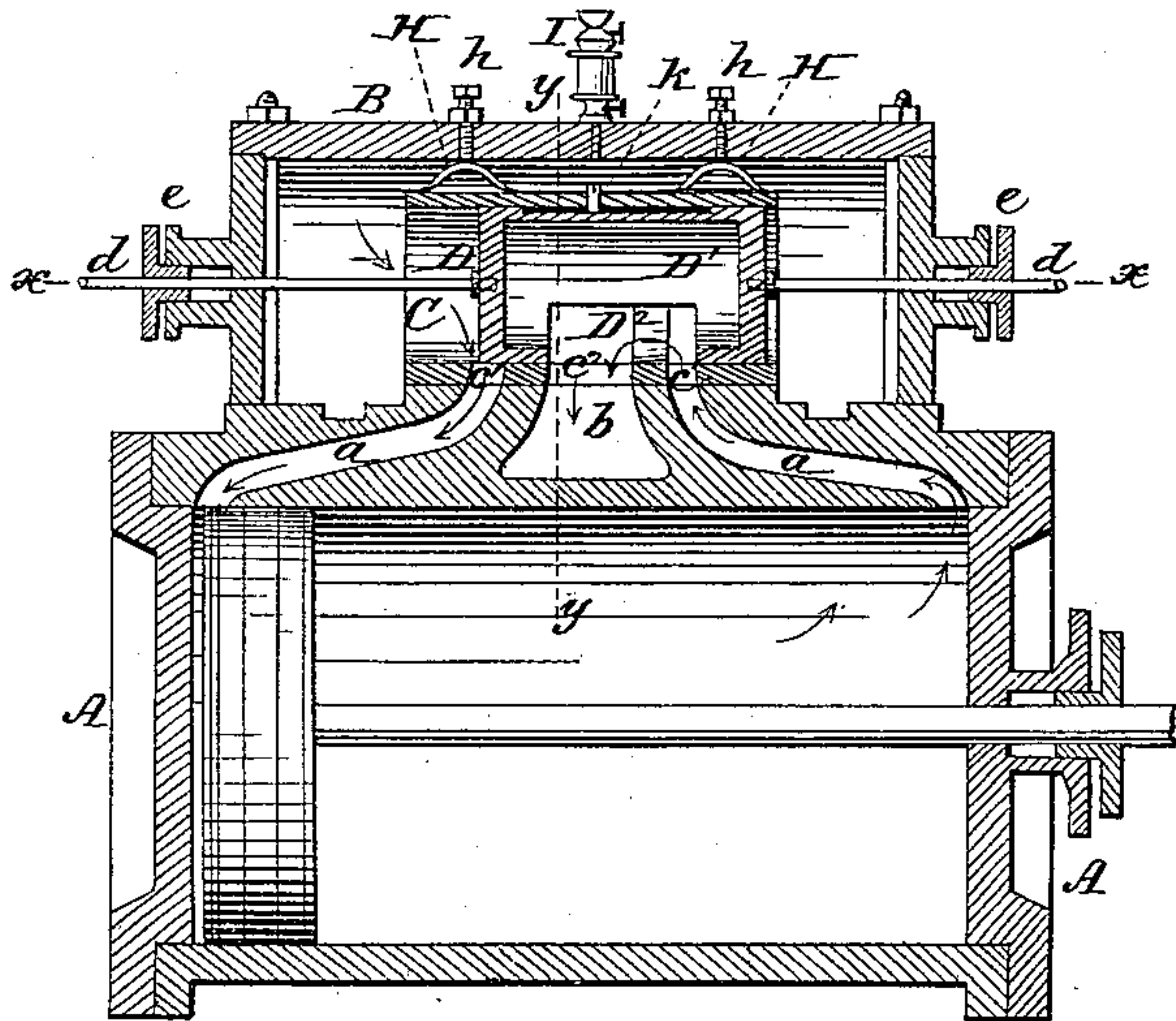


Fig. 2.

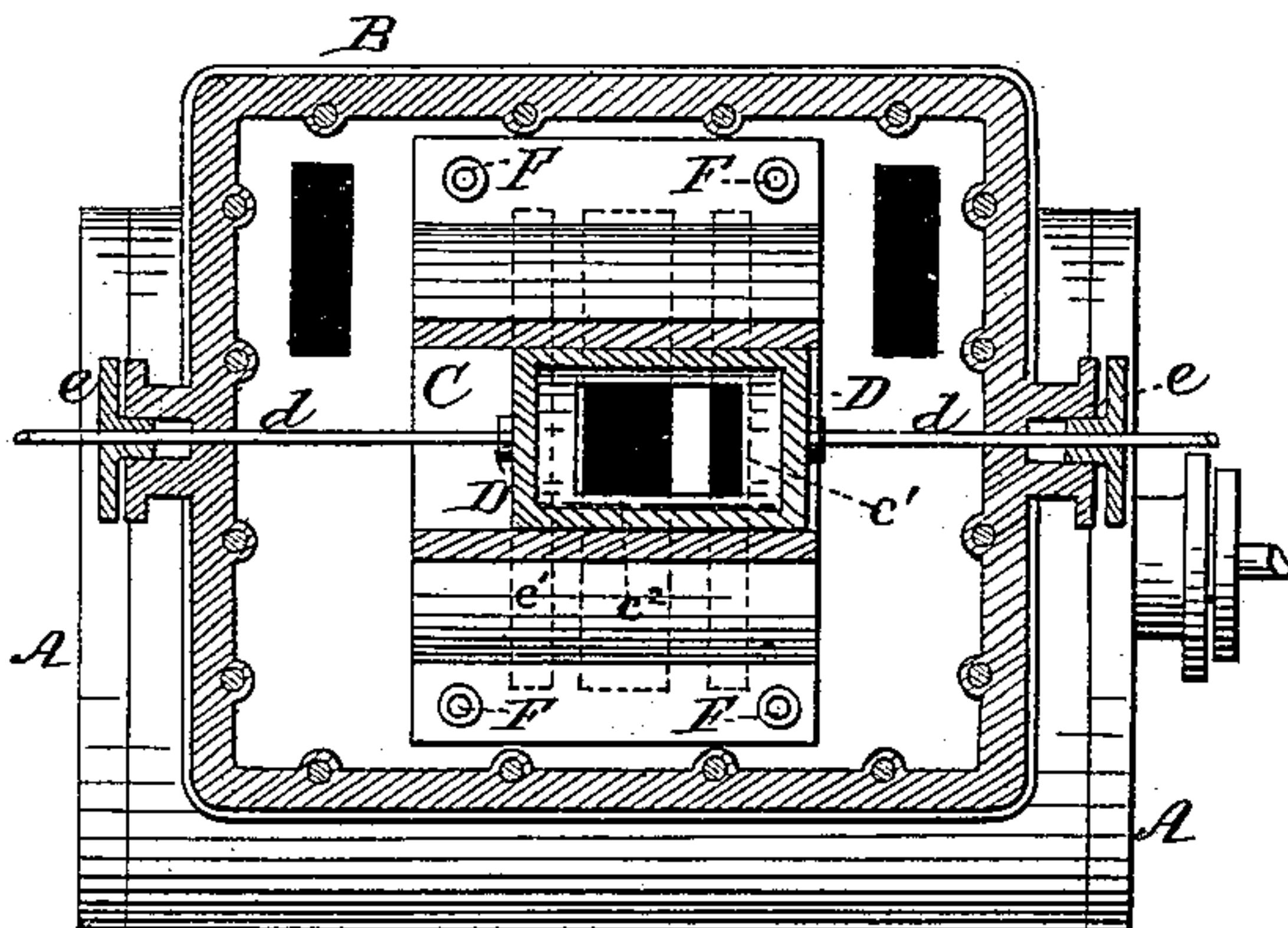


Fig. 3.

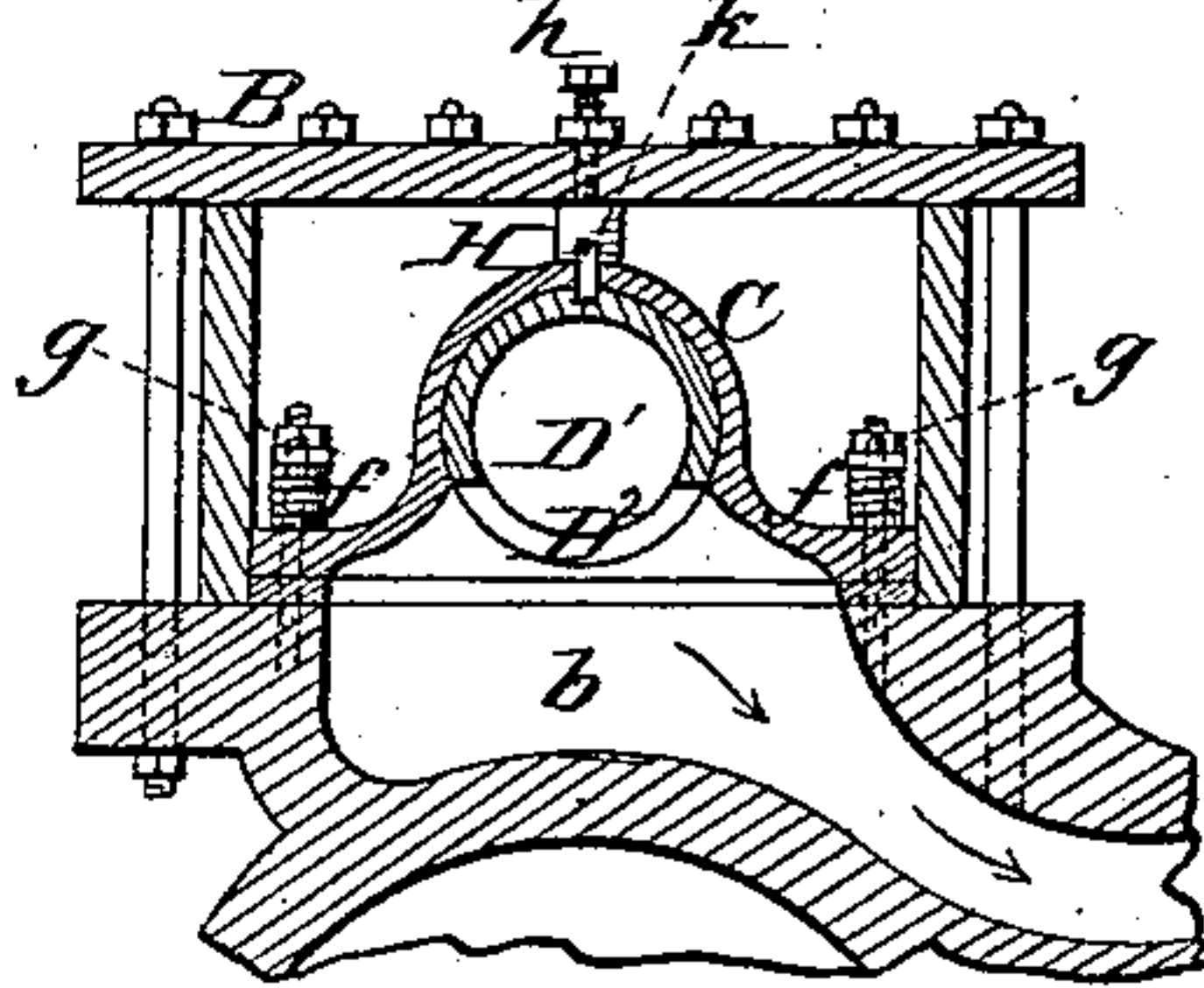


Fig. 4.

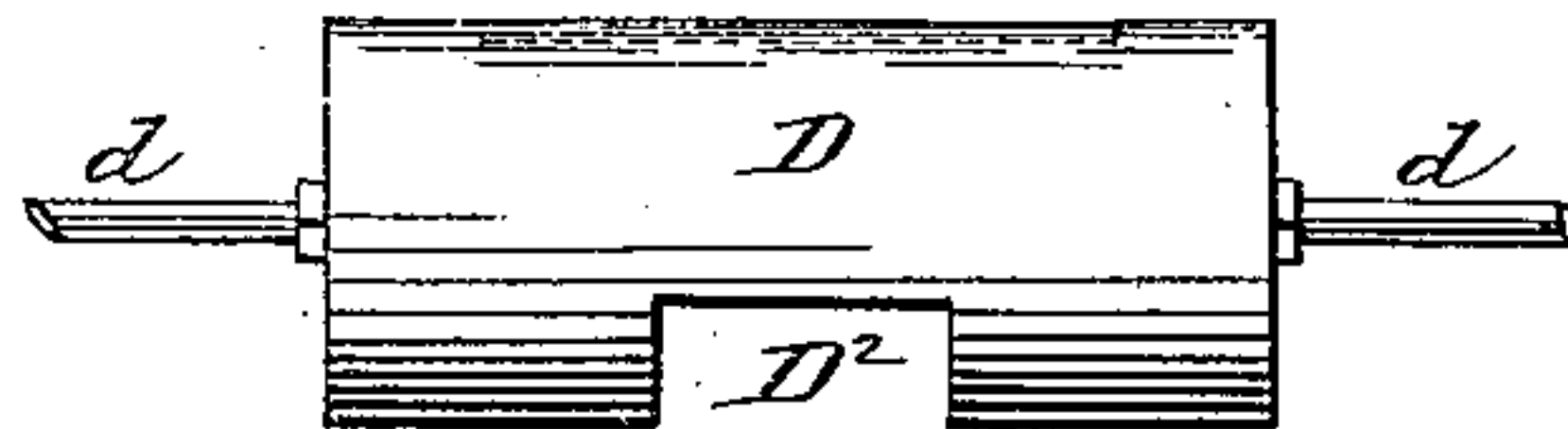


Fig. 5.

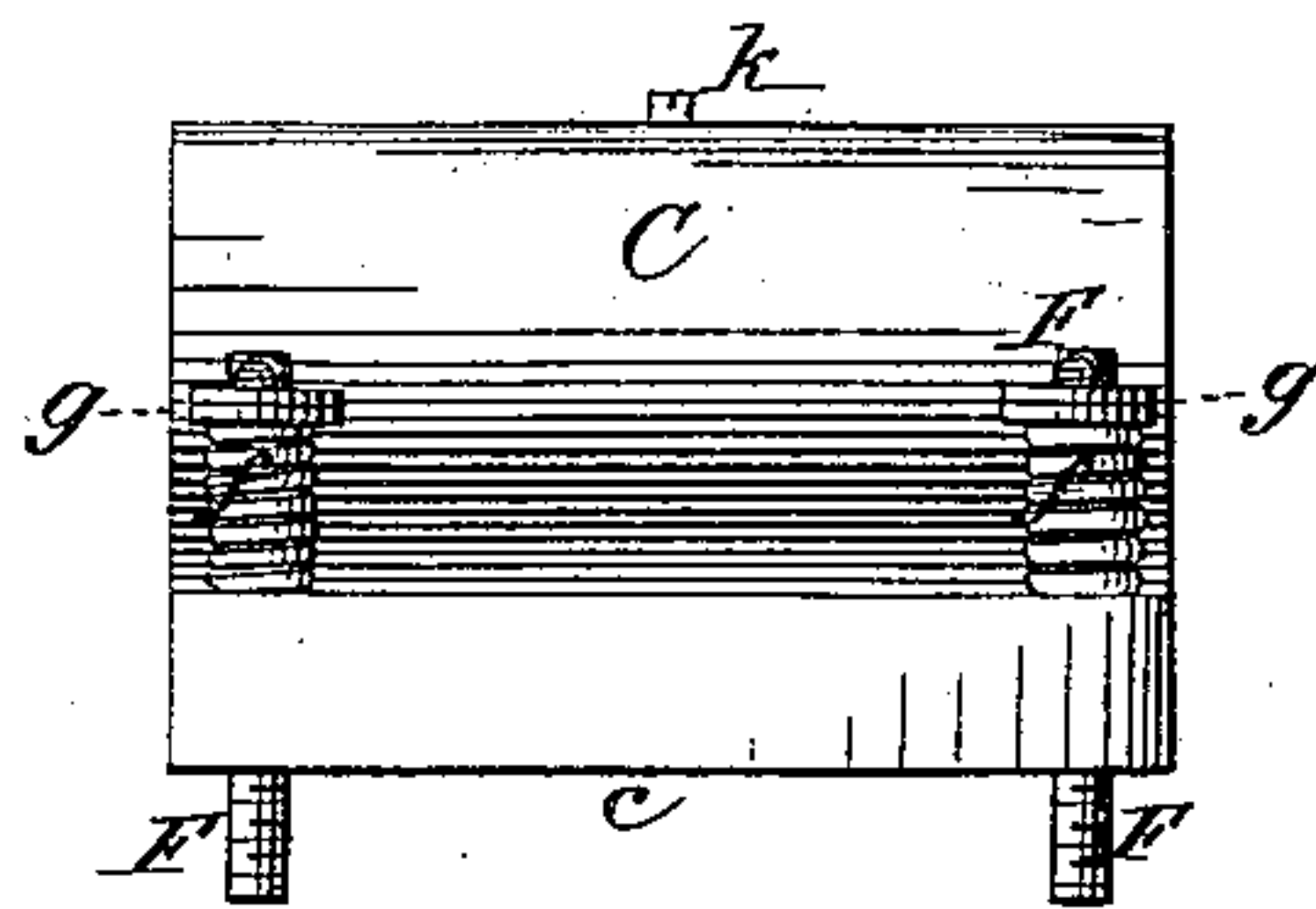


Fig. 6.

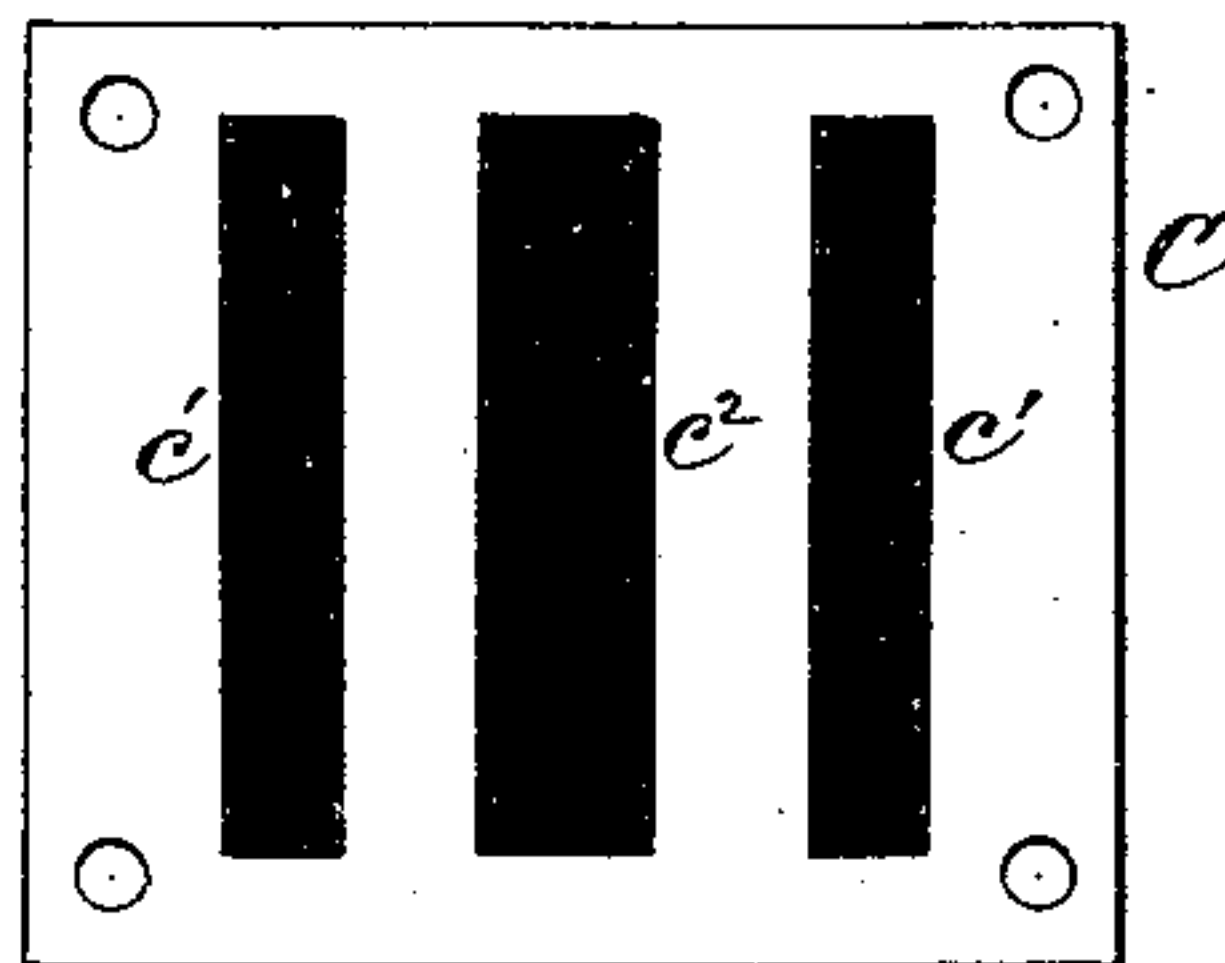
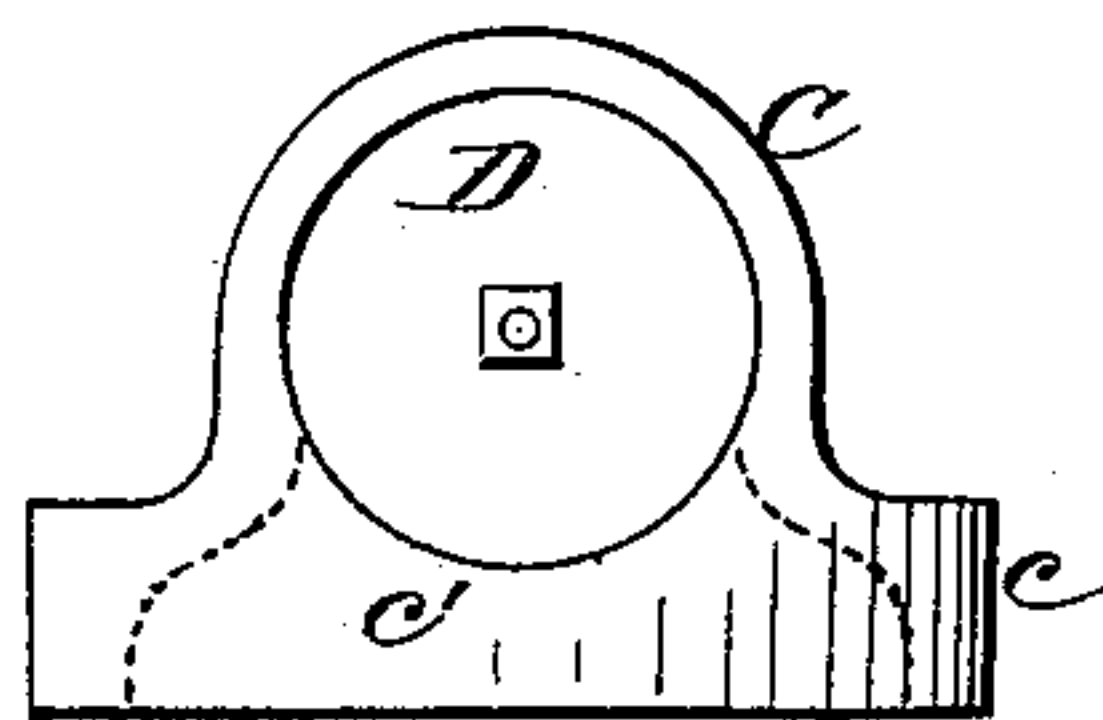


Fig. 7.



Witnesses:

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by Johnson and Johnson  
Attys.



# UNITED STATES PATENT OFFICE.

WILLIAM L. HOFFECKER, OF CONNELLSVILLE, PENNSYLVANIA.

## BALANCED PISTON-VALVE.

SPECIFICATION forming part of Letters Patent No. 246,138, dated August 23, 1881.

Application filed June 7, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM LONGSHORE HOFFECKER, a citizen of the United States, residing at Connellsville, in the county of Fayette and State of Pennsylvania, have invented new and useful Improvements in Balanced Piston-Valves for Steam-Engines, of which the following is a specification.

My invention relates to cylindrical piston-valves for steam-engines; and the objects of my improvements are to produce a well-balanced valve which will always be held to its seat; to provide a valve which will give a free exit to the exhaust-steam from the cylinder and permit its rapid and continuous exhaust from the valve itself, in order that it may not be retarded in its movements; and to relieve the steam-cylinder of air-pressure caused by suction through the exhaust-ports when the engine-valve motion is reversed. The cylindrical piston is fitted and operated within a housing having a flat bottom and adapted to yield vertically in its relation to the cylinder-ports when the valve-motion is reversed, while the piston itself forms an exhaust-chamber, and is adapted to operate with inlet and exhaust ports in the housing and in the cylinder, the steam being admitted to the cylinder at the outside of the ends of the cylindrical valve, similar to the ordinary slide-valve, the exhaust-chamber at each movement of the valve opening into the steam and exhaust ports and relieving the cylinder of steam almost at the moment the piston commences its return-stroke.

In the accompanying drawings, Figure 1 represents a vertical central section of a steam-cylinder and steam-chest provided with a valve constructed according to my invention, the valve being in the position, when receiving steam, at the front end of the cylinder; Fig. 2, a horizontal section through the steam-chest, the valve, and its housing, taken on the line  $x$  of Fig. 1; Fig. 3, a vertical section on the line  $yy$  of Fig. 1; Fig. 4, a side view of the cylindrical valve detached; Fig. 5, a side view of the valve-housing detached; Fig. 6, a bottom view of the same, and Fig. 7 an end view of the flat-bottomed housing and the valve within the same.

A represents an ordinary steam-cylinder, having the steam-ports  $a$  and exhaust-port  $b$ .

On the upper planed face or seat of the cylinder, and within the steam-chest B, is arranged a hollow cylindrical valve casing or housing, C, having a flat base,  $c$ , which is secured to the adjacent face of the cylinder, and is provided with passages,  $c'$ , coinciding with the steam-ports  $a$ , and an intermediate and wider passage,  $c''$ , coinciding with the exhaust-port  $b$ , the said passages  $c'$  connecting the interior of the housing with the interior of the cylinder, and the said passage  $c''$  opening into the exhaust-port  $b$ , or outward passage, arranged in the ordinary manner.

Within the housing C is arranged a hollow cylindrical valve, D, which works back and forth within said housing. The ends and top of this valve are closed so as to form a chamber,  $D'$ , and in its side is cut an opening,  $D''$ , extending from its lower surface to points near the level of its center line on both sides. This opening is the port through which exhaust-steam enters the valve-chamber  $D'$  from the cylinder, and the object in giving it so great a lateral extent is to form a steam-tight bearing at all times with the cylinder-valve, and thus prevent leakage by the wearing away of the valve and its corresponding settling lower in the housing, as the full diameter of the valve will always be preserved above its ports.

Stems  $d$  project from opposite ends of the valve through suitable stuffing-boxes,  $e$ , in the steam-chest. One of said stems is for connecting the valve with the ordinary valve-operating mechanism, and the object of providing the valve with two stems is to give equal area for steam-pressure on both ends of the valve.

The opening  $D''$  of the valve is of such a longitudinal extent, and the length of the valve such, that immediately the latter moves in either direction sufficiently to open either of the steam-ports  $a$  to the interior of the steam-chest the edge wall of the opening  $D''$  moves to effect a wider opening of the opposite steam-port, as shown in Fig. 1, and at the same time leave a very wide passage to the exhaust-port  $b$ , so that a very free and prompt exhaust of steam occurs from one end of the cylinder while it is entering at the other.

The housing C is secured by its flat bottom to the cylinder-seat by means of rods F, screwed into the cylinder-seat and projecting upward



through the base of the housing, said rods being surrounded by spiral springs *f*, above the base and resting upon the same, and held in place and adjusted by locking-nuts *g*, screwed  
5 on the upper ends of the rods to bear upon said springs.

Upon the top of the housing, at each end, press the ends of two stout bow or other springs, *H*, adjusted and held down by screws *h* extending through the top plate of the steam-  
10 chest. By this mode of fastening the housing to the cylinder it is held upon the cylinder in proper relation to its ports and allowed to yield slightly upward when the valve is suddenly  
15 reversed, and thus relieve the cylinder of air-pressure caused by suction through the exhaust-ports.

It will be observed that by reason of the opening in the valve extending to near and below its center line a steam-tight bearing is always preserved between it and its seat, as the full diameter of the valve is preserved above the opening, and it gradually closes snugly to the inner surface of the housing as the bearing-faces are worn, and thus leakage of steam  
25 between said faces is prevented. The forcible entrance of the exhaust-steam into the interior of the valve counteracts any downward pressure which might be occasioned by the entrance  
30 of incoming steam between the upper surface of the valve and the inner upper surface of the housing when the valve is sunk somewhat by being worn.

In order to prevent any tendency of the valve to roll in its seat, I form in its top a longitudinal groove, into which projects the tip of a pin or screw, *k*, firmly fixed in the wall of the housing.

The operation of the valve as now explained, in connection with the description of its construction, will be readily understood by persons familiar with steam-engineering.

It is important to notice that the valve-chamber *D'* is to receive the exhaust-steam only  
45 from the cylinder and to give it free egress, and that the cylindrical ends only of the valve operate to uncover the steam-ports outside of the valve ends, upon which the pressure of the steam is always equal at both the open ends  
50 of the housing.

Referring to the capacity of the valve-housing to relieve the valve from air-pressure when its movement is reversed, the valve-housing will not be prevented from rising by reason of  
55 the double-end valve-rod connections, as there will be sufficient spring in the valve-rods to allow the housing to rise one-sixteenth of an inch, which will relieve the pressure against the action of the springs.

60 Steam is admitted into the steam-chest by the seat-ports, Fig. 2, in locomotive-engines,

and in the usual manner in stationary or marine engines. An oil-cup, *I*, supplies oil upon the top of the housing, so as to lubricate the moving parts.

I claim—

1. A hollow cylindrical slide or piston valve, *D*, housed in a cylindrical casing, *C*, and having an opening, *D*<sup>2</sup>, at the middle of its length, formed entirely below or to one side of its center line, substantially as and for the purpose set forth.

2. The combination, with the hollow cylindrical piston-valve *D* and its housing *C*, open at both ends, as described, of the rods *d*, extending from opposite ends of said valve through suitable stuffing-boxes arranged in the heads of the steam-chest, substantially as described, and for the purpose set forth.

3. The combination, with the housing *C*, the valve, and the cylinder, of yielding fastening devices, by which said housing is secured to said cylinder, substantially as described.

4. The combination, with the cylinder, the piston-valve, its housing, and the steam-chest, of the rods *F*, projecting from the cylinder through the flat base of the housing, and the springs *f*, surrounding said rods and held in place by adjusting lock-nuts *g*, substantially as described, for the purpose set forth.

5. The combination, with the housing and the steam-chest, of the bow-springs *H*, arranged between said housing and steam-chest, bearing upon the former and held in place by adjusting-screws passing through the top plate of said chest, substantially as described.

6. The combination, with the cylindrical balanced valve, constructed substantially as described, of the housing *C*, adapted for vertical movement upon its seat, and having base-ports corresponding with the ports of the cylinder, the piston-valve having the opening *D*<sup>2</sup>, and means whereby said opening is maintained in proper relation with the housing and its ports, substantially as described.

7. A balanced piston-valve consisting of the valve *D*, having an interior chamber, *D'*, open at its bottom at the middle of its length, the housing *C*, open at both ends, adapted for vertical movement upon its seat, and having the openings *c' c' c*<sup>2</sup> and the steam-chest *B*, the said valve-opening *D*<sup>2</sup> and the housing-openings being formed entirely below or to one side of the center line of said valve, substantially as described, for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

W. L. HOFFECKER.

Witnesses:

JOSIAH KURTZ,  
JOHN KURTZ.