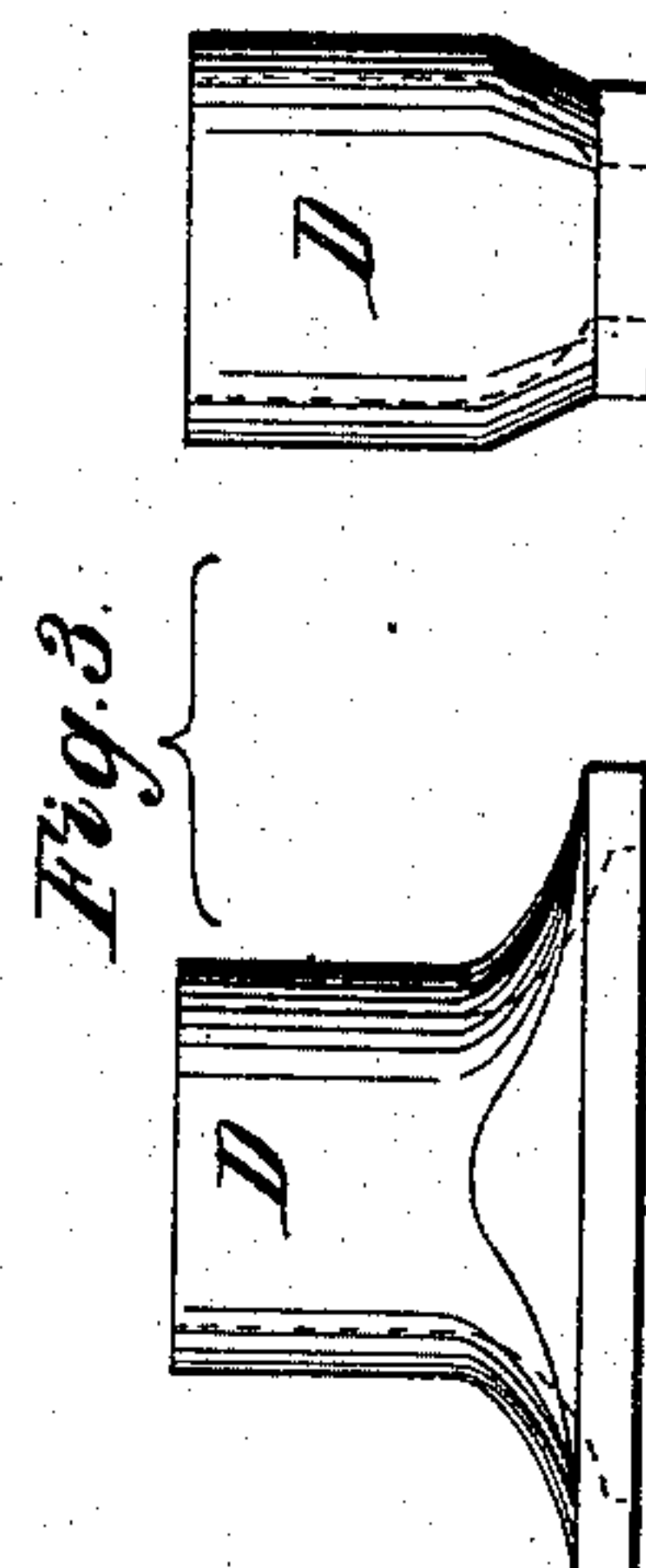
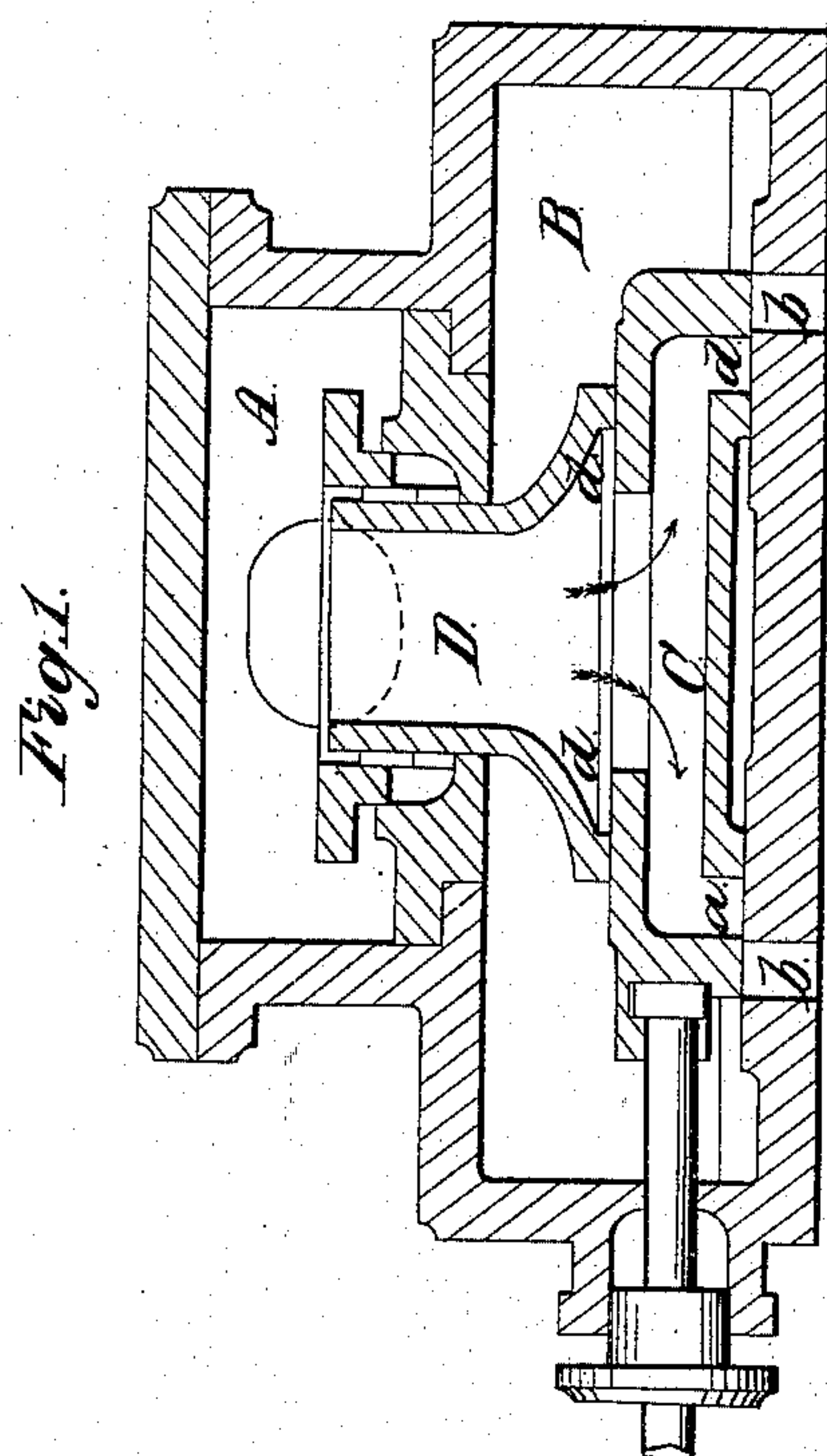
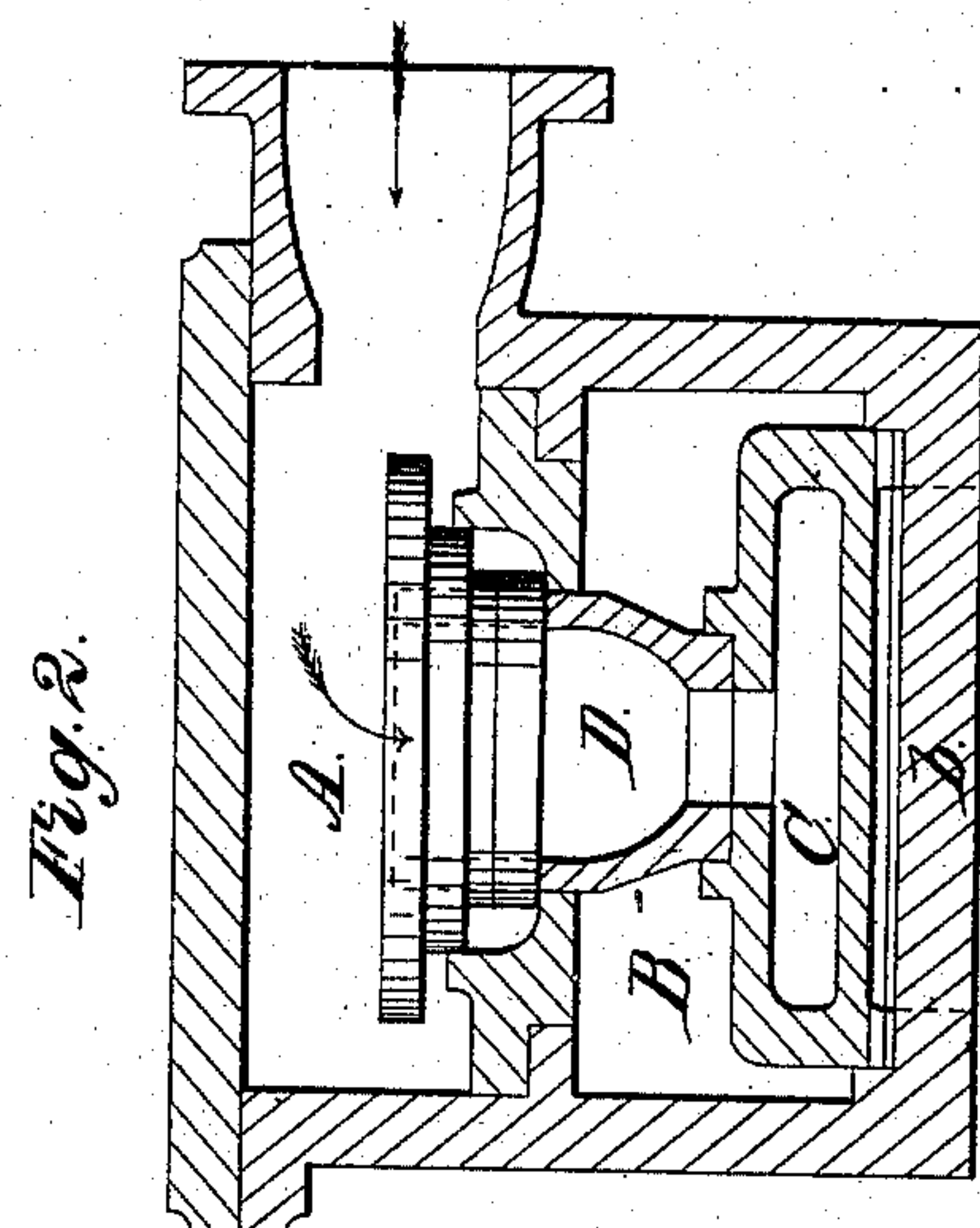


No. 43,381.

PATENTED JULY 5, 1864.

E. R. ARNOLD.
VALVE FOR STEAM ENGINES.



Witnesses.

Wm. V. Supper

C. G. Patterson

Inventor
Edward R. Arnold

UNITED STATES PATENT OFFICE.

EDWARD R. ARNOLD, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN VALVES FOR STEAM-ENGINES

Specification forming part of Letters Patent No. 43,381, dated July 5, 1864.

To all whom it may concern:

Be it known that I, EDWARD R. ARNOLD, of the city of Providence, county of Providence, State of Rhode Island, have invented certain new and useful improvements whereby slide-valves of steam-engines may be relieved of steam-pressure, thereby requiring less power to work them, and preventing the cutting and abrasion of their seats; and I hereby declare that the following specification, reference being had to the accompanying drawings, is a full and exact description thereof.

In the common forms of slide-valves, when the steam is admitted on the top, a pressure, due to the area of the ports and the lap, is upon the valve, and great power and leverage are required to work the valves by hand when the engine is unhooked. The distribution of metal in these same valves and their seats is so unequal that in large engines, if they are tight when cold, the heat of the steam is apt to warp and spring them, causing a leakage of steam and reducing the surfaces in contact. This, combined with the pressure on their backs, causes them to cut, wear, and leak badly. To remedy these defects is the object of my invention.

The form of valve that I have chosen is of the box form, in which the metal can be nearly uniformly distributed. The distribution of metal in the seat on which it works is uniform.

Figure 1 is a longitudinal, and Fig. 2 is a transverse, section of a valve-chest arranged according to my improvement. Fig. 3 is a side and end view of the induction-way.

Similar letters refer to similar parts in all the figures.

A is the steam, and B the exhaust, chest.

C is a slide-valve operated in the usual way, receiving steam through an opening in its top, and furnished with the steam-ports *a a'* in its bottom face, which alternately cover the cylinder-ports *b b'*. These cylinder-ports are by the travel of the valve alternately uncovered, so as to open into the exhaust-chest B.

D is an induction channel-way connected with the steam-chest through a slip or expansion joint, being on the top of the valve and covering the opening on the top of the same.

My invention consists in connecting the

steam-chest with the valve by means of an induction way or ways so constructed that it is held nearly in equilibrium by the pressure of the steam, the area of said induction-way being such as to counterbalance the pressure in the ports of the valve and cylinder, and in arranging this balanced induction-way to be self-adjusting by means of a slip or expansion joint, to compensate for the wear on the faces, or the expansion of the valve and induction-way, so that there may be no leakage of steam from between them.

We will suppose that steam has just been admitted to the cylinder through the port *b*, there would now be an upward pressure on the valve *c*, due to the area of the port *b* and the areas of the valve-ports *a a'*. The areas of the opening and top *c* of the induction-way D must be proportioned to balance this pressure. This area must in turn be modified by whatever pressure there is in the ends of the induction-way *d d'*, which tends to press downward on the valve and upward on the induction-way.

It is evident that this induction-way and mode of balancing can be equally well applied to other forms of valves—as, for instance, a double-ported or gridiron valve can be substituted for the one shown, whereby the travel and speed of the valve can be greatly reduced. The form of the induction way can also be varied. The bottom can be decreased in length and increased in width, so that it would approximate to a cylindrical tube.

I do not limit myself to the construction of the several parts precisely as described, as it is evident that the form, position, and arrangements of the several parts may be greatly varied without changing the principle of my invention.

I claim—

A balanced or nearly-balanced self-adjusting induction-way to connect the steam-chest with the valve, the area of said induction-way being such as to counterbalance the pressure in the ports of the valve and cylinder, substantially as described.

EDWARD R. ARNOLD.

Witnesses:

WM. V. TUPPER,
C. G. PATTERSON.