

(No Model.)

3 Sheets—Sheet 1.

W. ROYCE.

PUMP FOR REMOVING LIQUIDS FROM LOW PRESSURE.

No. 421,974.

Patented Feb. 25, 1890.

Fig. 1.

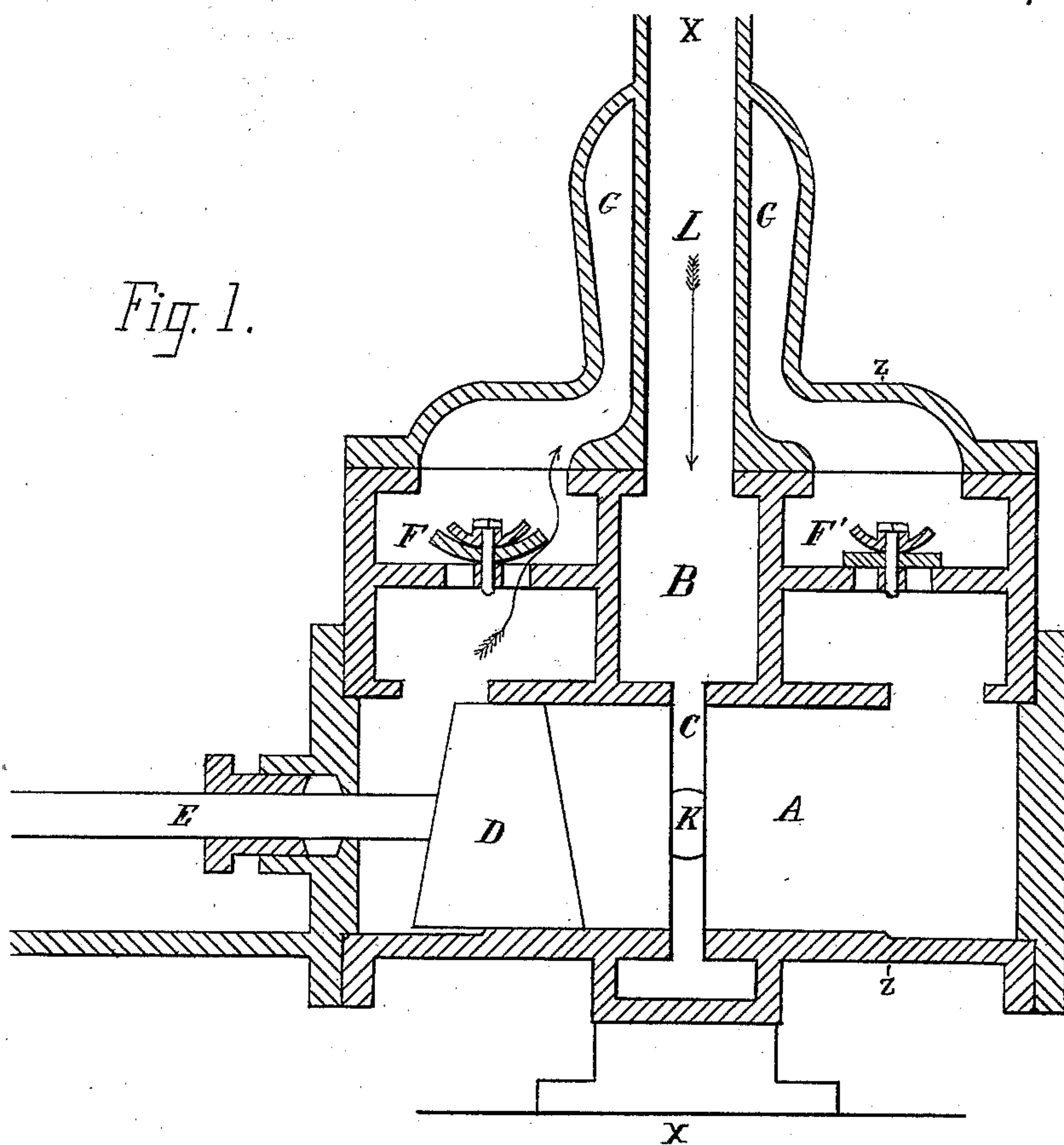


Fig. 2.

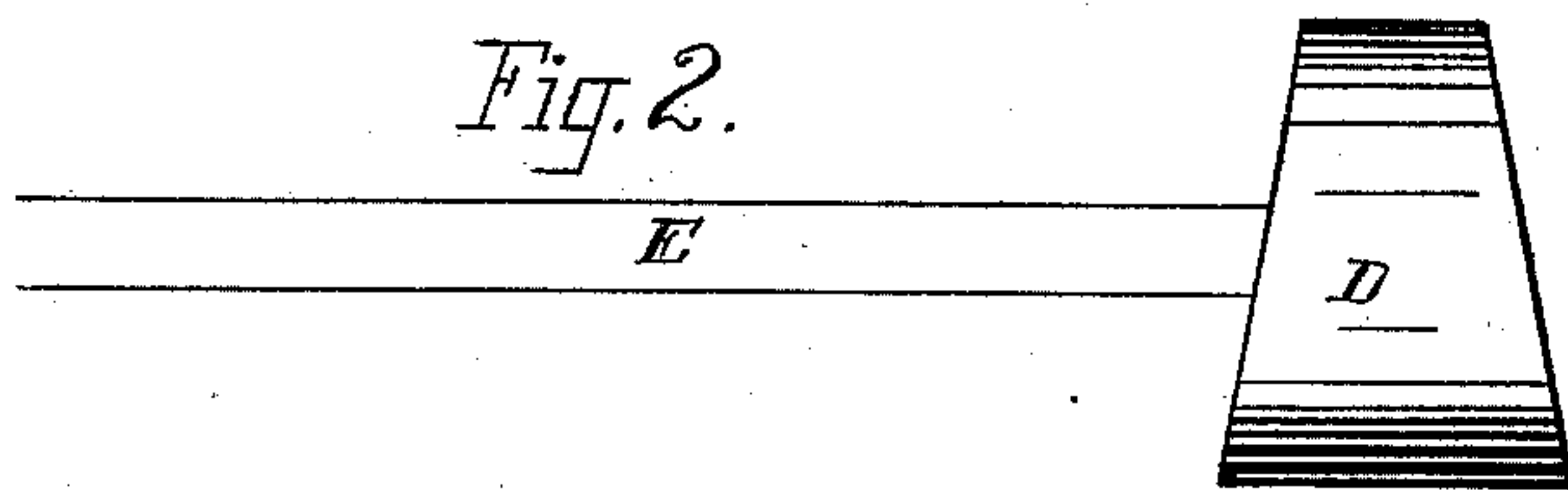
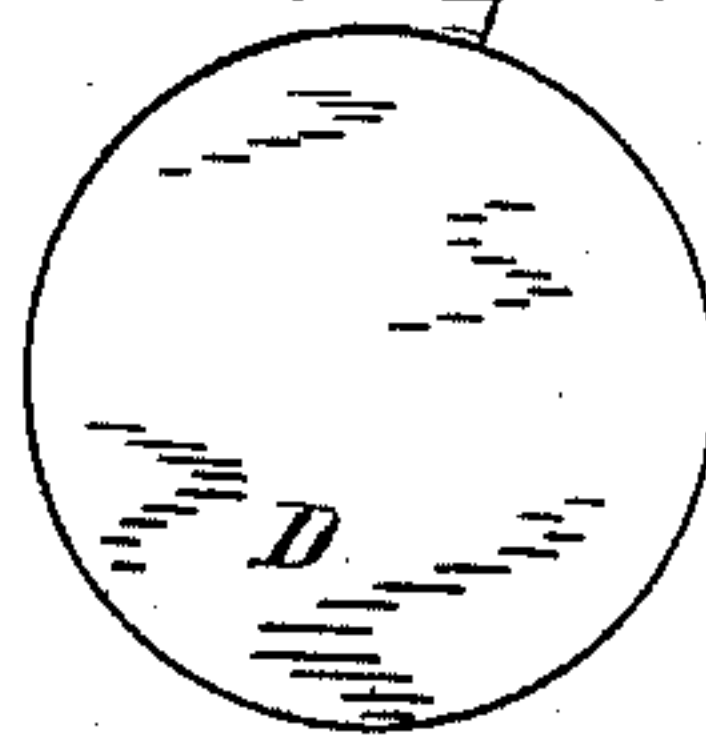


Fig. 3.



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Fig. 4.

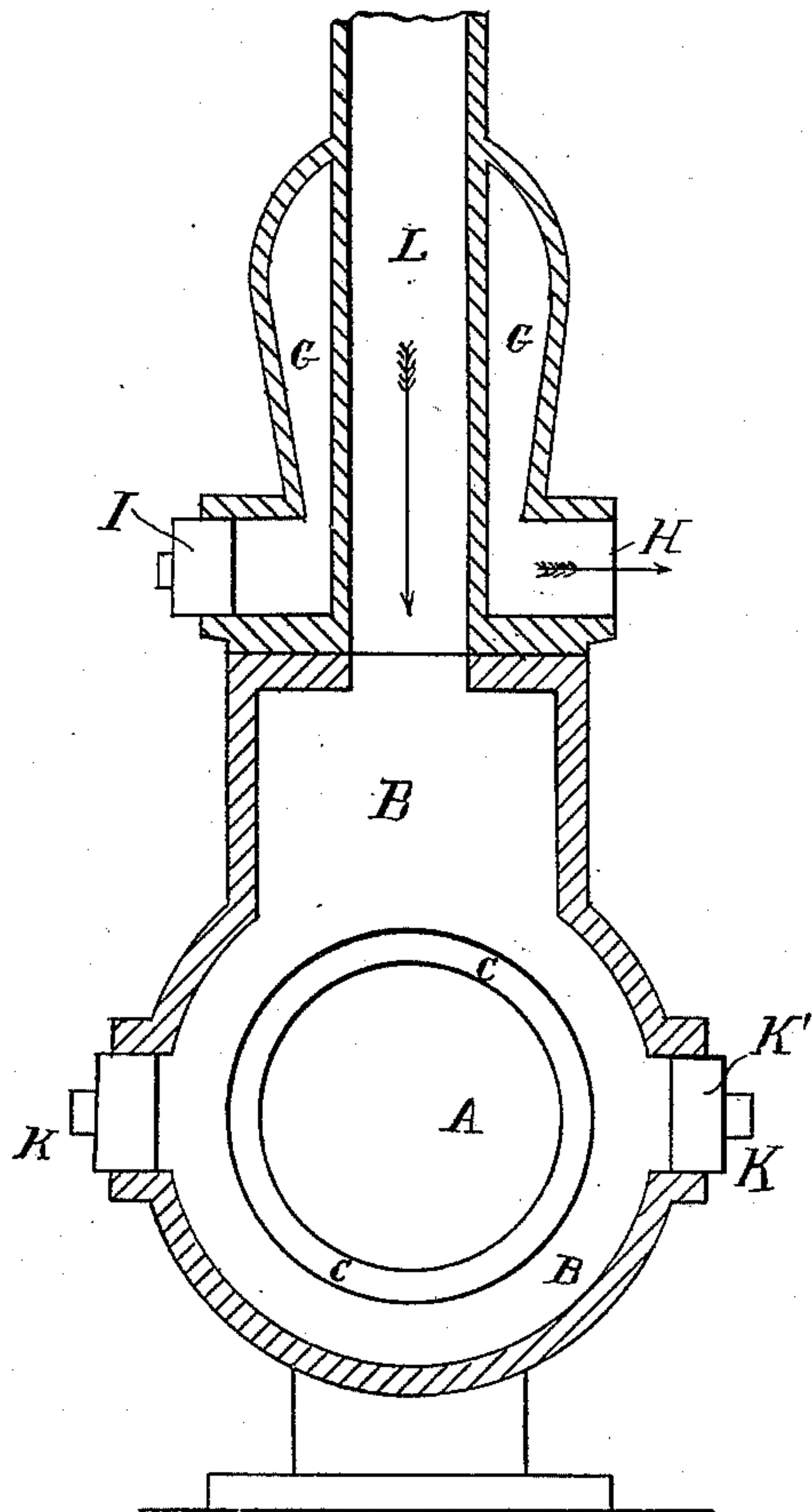
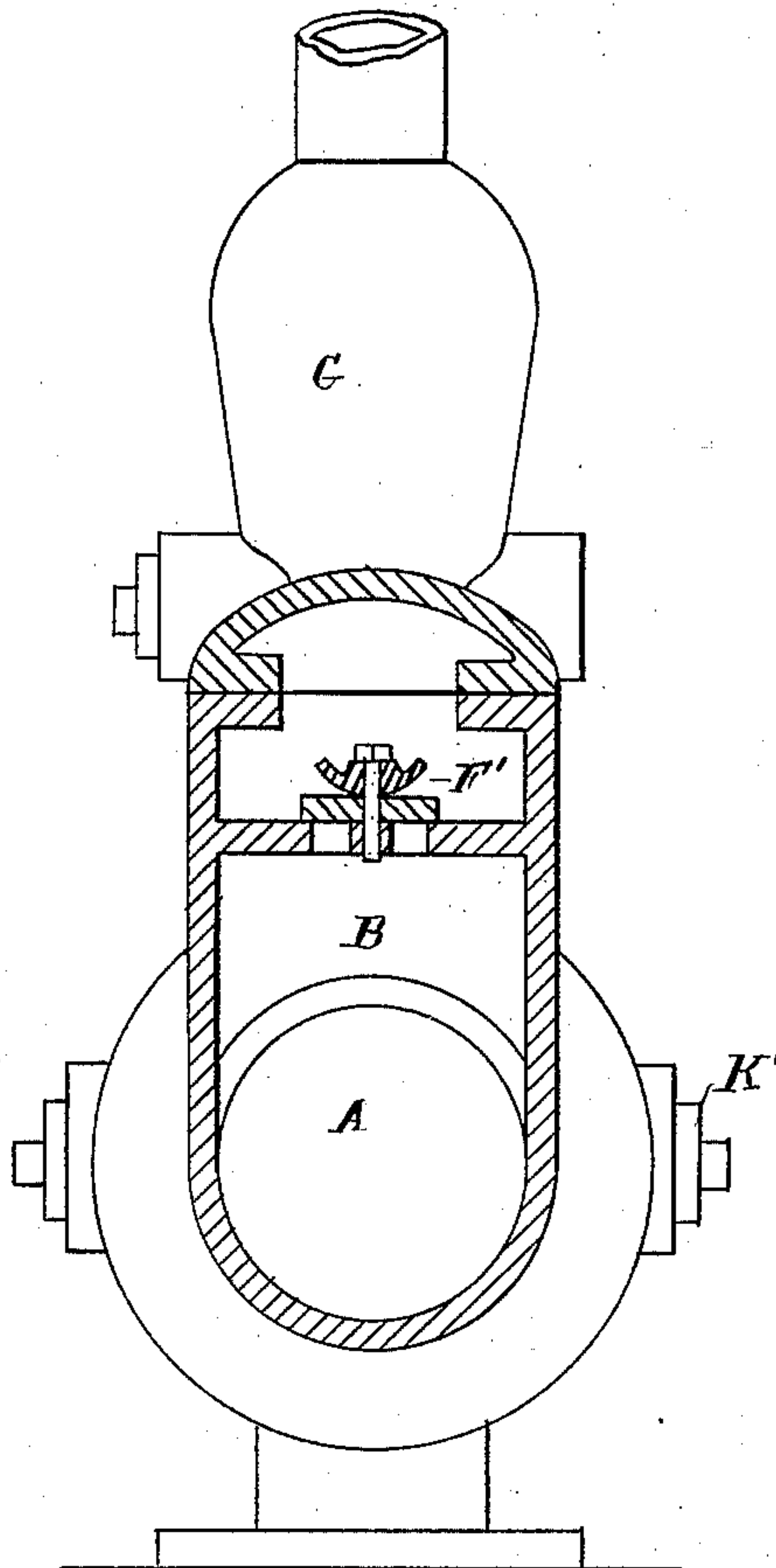


Fig. 5.



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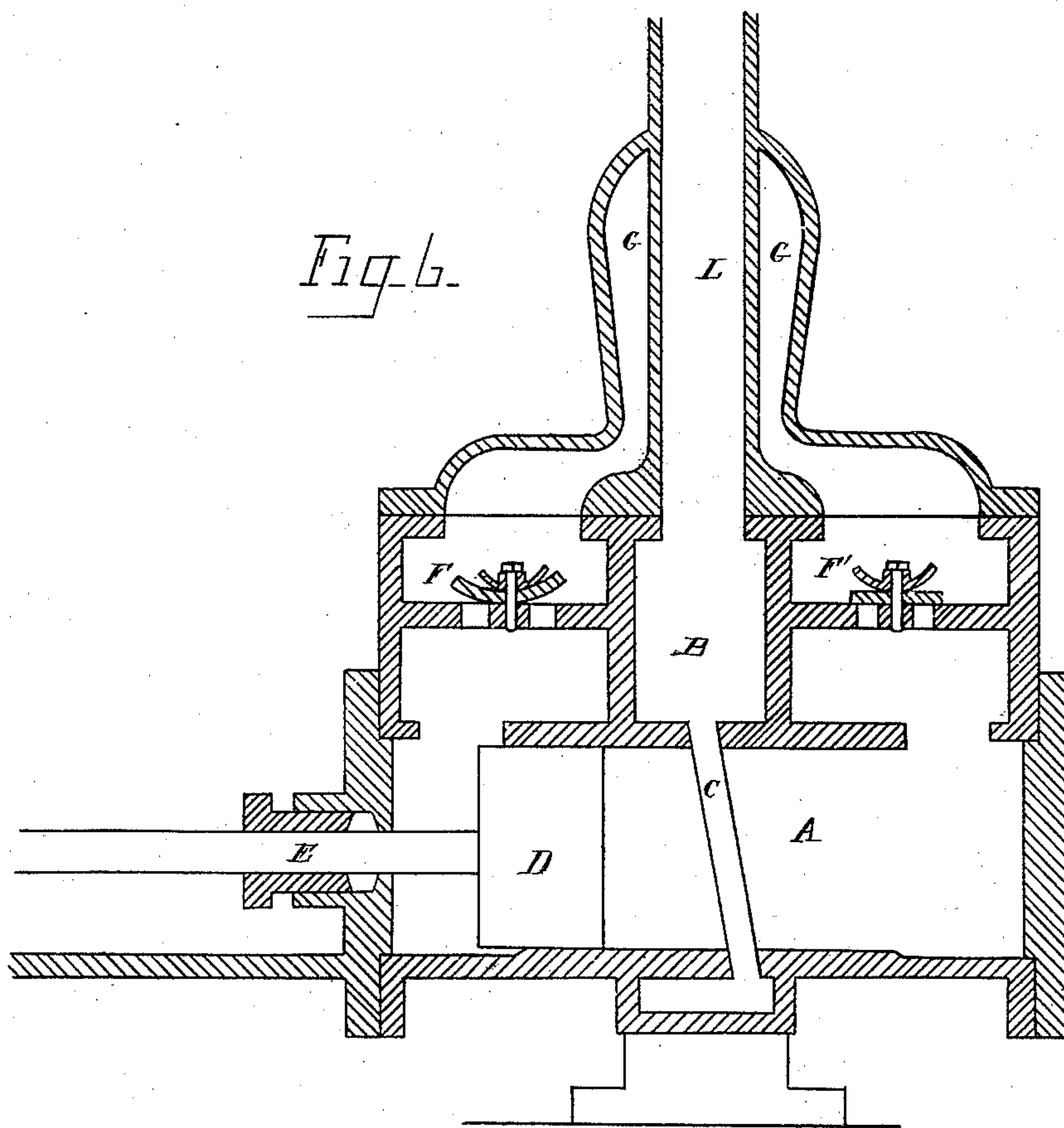
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UNITED STATES PATENT OFFICE.

WESLEY ROYCE, OF TOLEDO, OHIO.

PUMP FOR REMOVING LIQUIDS FROM LOW PRESSURE.

SPECIFICATION forming part of Letters Patent No. 421,974, dated February 25, 1890.

Application filed May 23, 1888. Serial No. 274,855. (No model.)

To all whom it may concern:

Be it known that I, WESLEY ROYCE, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in a Pump for Removing Fluids from Low Pressure; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

My invention relates to pumps for removing fluids from low pressure, or any fluid concentrated in vacuo, and to be removed from the receptacle without destroying the vacuum, being also adapted for forcing liquid or air delivered to a receptacle by gravity or suction.

The object of the invention is to provide an effective, cheap, and easily-constructed pump for the purpose of removing fluids held in vacuo without destroying the vacuum, and to dispense with suction-valves, by which means fluid in any condition may be led to the cylinder by gravity or otherwise and displaced by the piston, which in its reciprocation tends to assist by suction in drawing the fluid to the cylinder.

In the branch of the art to which my invention belongs it has been found impossible to remove liquids held in receptacles under high vacuum (or low pressure) or liquid in a state of ebullition, as in the case of devices where suction-valves are employed the boiling fluid will be checked in its outflow at the suction-valves and the piston or plunger will fail to lift the suction-valves against the vacuum.

My invention consists in providing a pump-cylinder with means for the fluid to flow or gravitate therein, (it having been found that fluid will gravitate out of vacuo and flow into a receptacle below the same,) with the point of ingress central of the stroke of the piston and points of egress upon either side thereof, whereby the fluid may as it flows within the cylinder be inclosed at either end of the same by the reciprocation of the plunger and forced

to the point of final discharge by being ejected from each end of the pump-cylinder.

In the drawings, Figure 1 is a longitudinal vertical sectional view of the pump. Fig. 2 is a side elevation of the piston. Fig. 3 is an end view of the same. Fig. 4 is a transverse section on lines $x x$, Fig. 1. Fig. 5 is a transverse section on lines $z z$, Fig. 1. Fig. 6 is a longitudinal vertical sectional view of the pump with a modified form of ingress-port and piston.

A designates the pump-cylinder.

B is the inlet-chamber to the pump-cylinder, into which the fluid is received and is led to the pump-cylinder through port C, which may be a vertical port, as shown in Fig. 1, with the piston D inclined on the front and rear faces; or the port may be inclined, as shown in Fig. 6, with the front and rear faces of the piston square.

E is the piston-rod, connected with any preferred motive-power.

F and F' are discharge-valves adapted to open at each reciprocation of the plunger as the liquid is forced therethrough, and closed as the piston makes a return-stroke, the liquid being forced into an annular chamber G and through exit-ports H, as indicated by the arrow, Fig. 4, wherein it will also be seen that there are ports at each side, by which means either or both may be opened for discharge of fluid, or one may be closed by plug I and the fluid discharged at but one port.

K are suction-pipes connected with the annular port C, by which means communication may be established with the fluid-receptacle and the fluid be admitted at either of these points, in which event the vertical passage L is closed, the fluid being admitted to the pump-cylinder through the annular port C, the same as when it is received through the vertical passage L. Each of the connections K is closed by plugs K' when the fluid is received through passage L.

In operation fluid is admitted to the inlet-chamber B, which extends entirely around the cylinder, as shown in Figs. 1 and 4, and flows into cylinder A through port C. The plunger upon being urged forward closes port C and incloses the fluid within the end of the cylinder, whereupon it finds its exit

through valve F'. During this interim the opposite end of the cylinder is filling, and as the plunger is retracted the fluid is forced through valve F, as indicated by the arrow, 5 Fig. 1, and the opposite end of the cylinder is filling. At each stroke the tendency of the plunger is to create a vacuum in the end of the cylinder from which the plunger is moving, which assists in filling the same with 10 fluid.

In the modified form illustrated in Fig. 6 the operation just described is the same, the only difference being in forming the annular port C at an incline to the axis of the cylinder and constructing the front and rear 15 faces of the piston at right angles to the sides.

It will be seen that there are no suction-valves employed, with their liability to be held inoperative by the vacuum; also that 20 the fluid is sealed within the discharge end of the cylinder when the piston or plunger is making a stroke, thereby making the operation positive.

While I have more particularly described 25 my pump as adapted to removing fluids held *in vacuo*, it is equally well adapted to all the purposes of an ordinary pump, it being immaterial whether the fluid is received by gravity, suction, or displacement. It will also 30 be seen that by the relative arrangement of the piston or plunger there is no possibility of "water ram," the plunger acting to close port C by a gradual or shearing process.

What I claim is—

35 1. In a pump, the combination, with a cylinder, of an entrance-chamber surrounding

the same and communicating with it by a port at its middle part, discharge-chambers at each end of the cylinder, an outlet-valve for each discharge-chamber, an annular chamber 40 G, arranged above the discharge-chambers and communicating with them by the outlet-valves, a vertical passage or tube L extending through the annular chamber and communicating with the entrance-chamber, 45 and a piston having inclined faces reciprocating past the inlet-port, all arranged and adapted to operate substantially as shown and described.

2. In a pump, the combination, with a cylinder, of an entrance-chamber surrounding the same and communicating with it by a port at its middle part, discharge-chambers at each end of the cylinder, an outlet-valve for each discharge-chamber, an annular chamber 55 arranged above the discharge-chambers and communicating with them by the outlet-valves, a vertical passage or tube extending through the annular chamber and communicating with the entrance-chamber, and a piston 60 reciprocating past the inlet-port, the faces of said piston and port being arranged at oblique angles to each other, substantially as and for the purpose described.

In testimony that I claim the foregoing as 65 my own I hereby affix my signature in presence of two witnesses.

WESLEY ROYCE.

Witnesses:

WILLIAM WEBSTER,
HAMILTON ROGERS.