

(No Model.)

J. HEMPHILL.  
Puppet Valve.

No. 238,685.

Patented March 8, 1881.

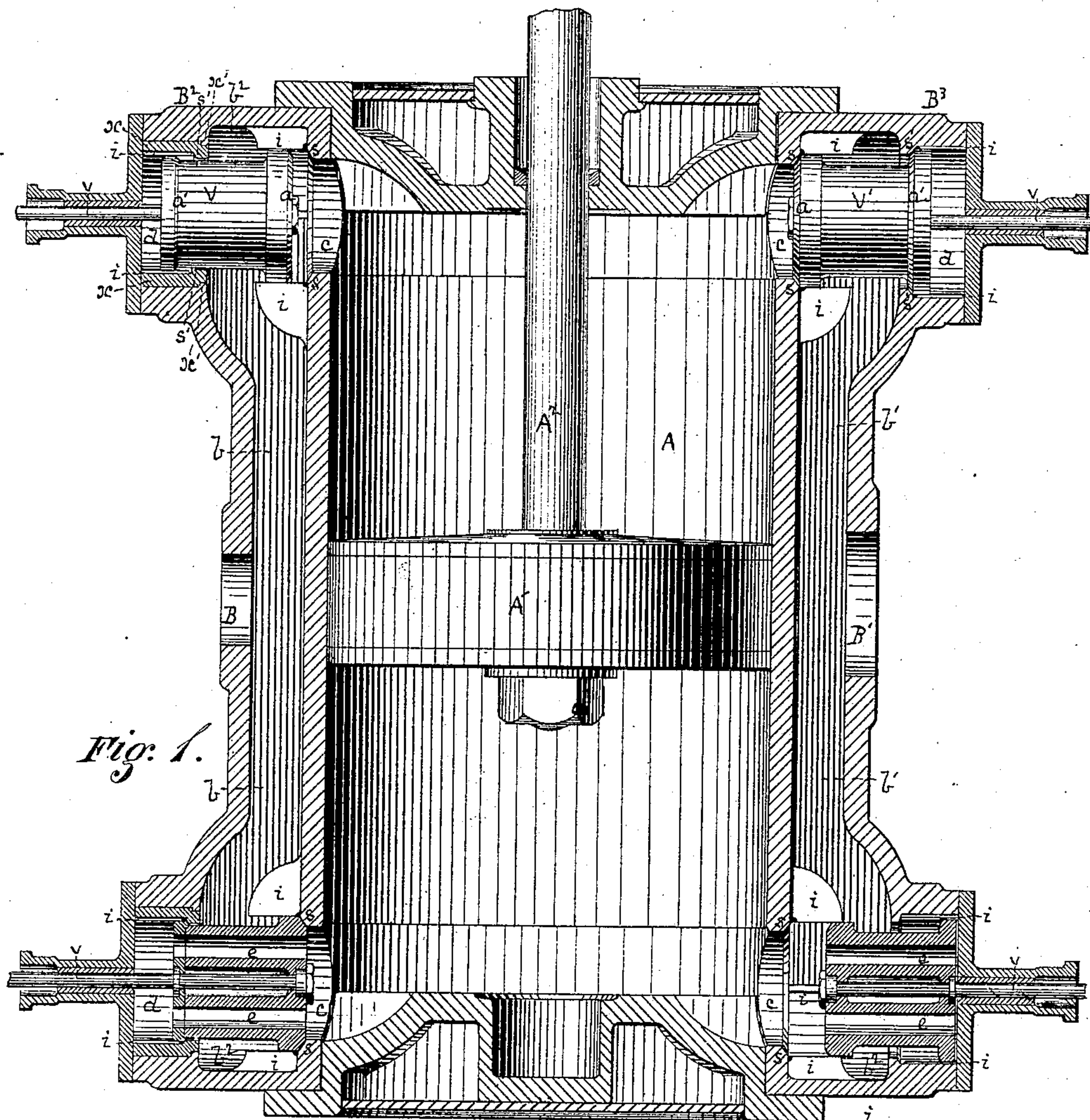


Fig. 1.

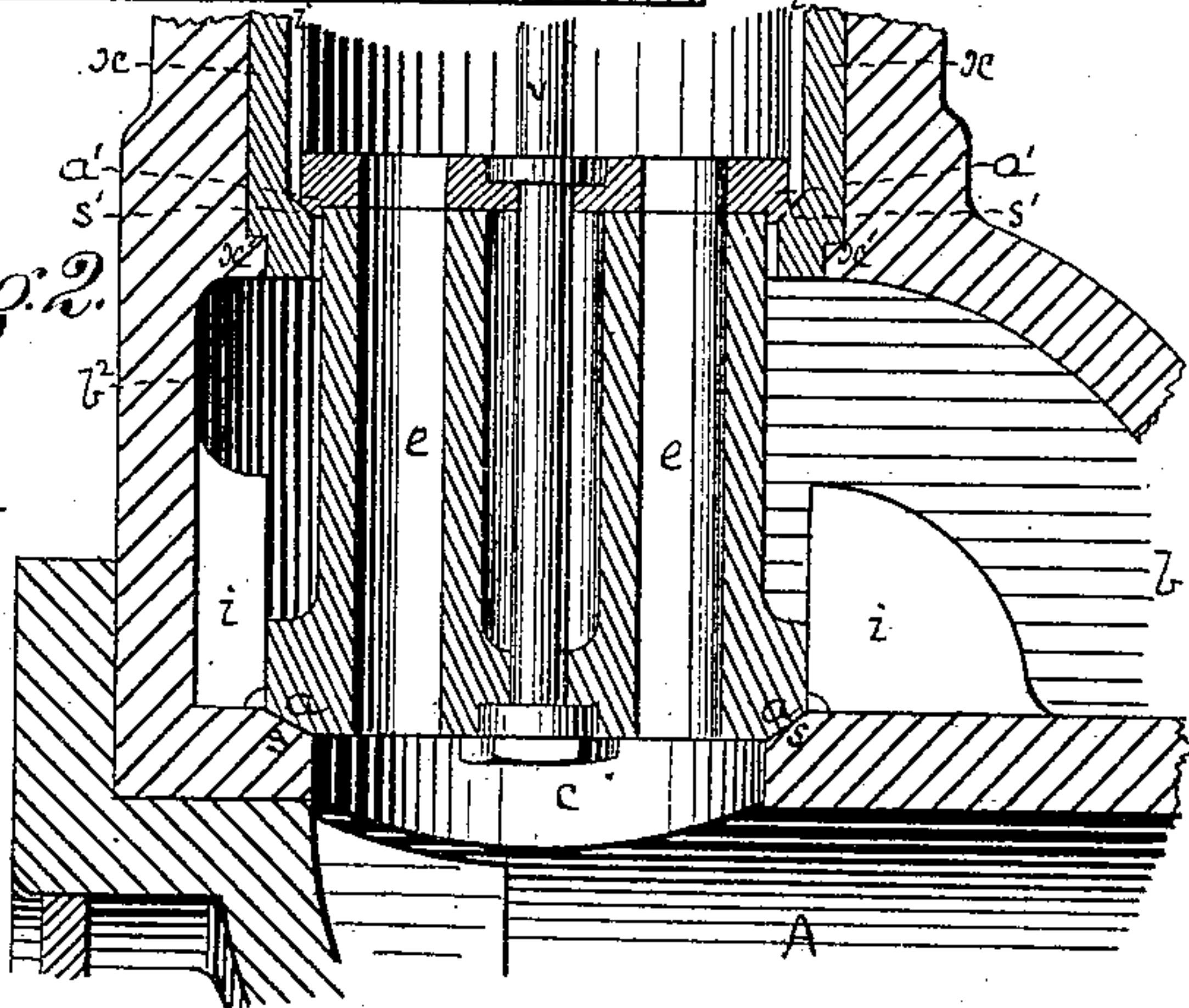


Fig. 2.

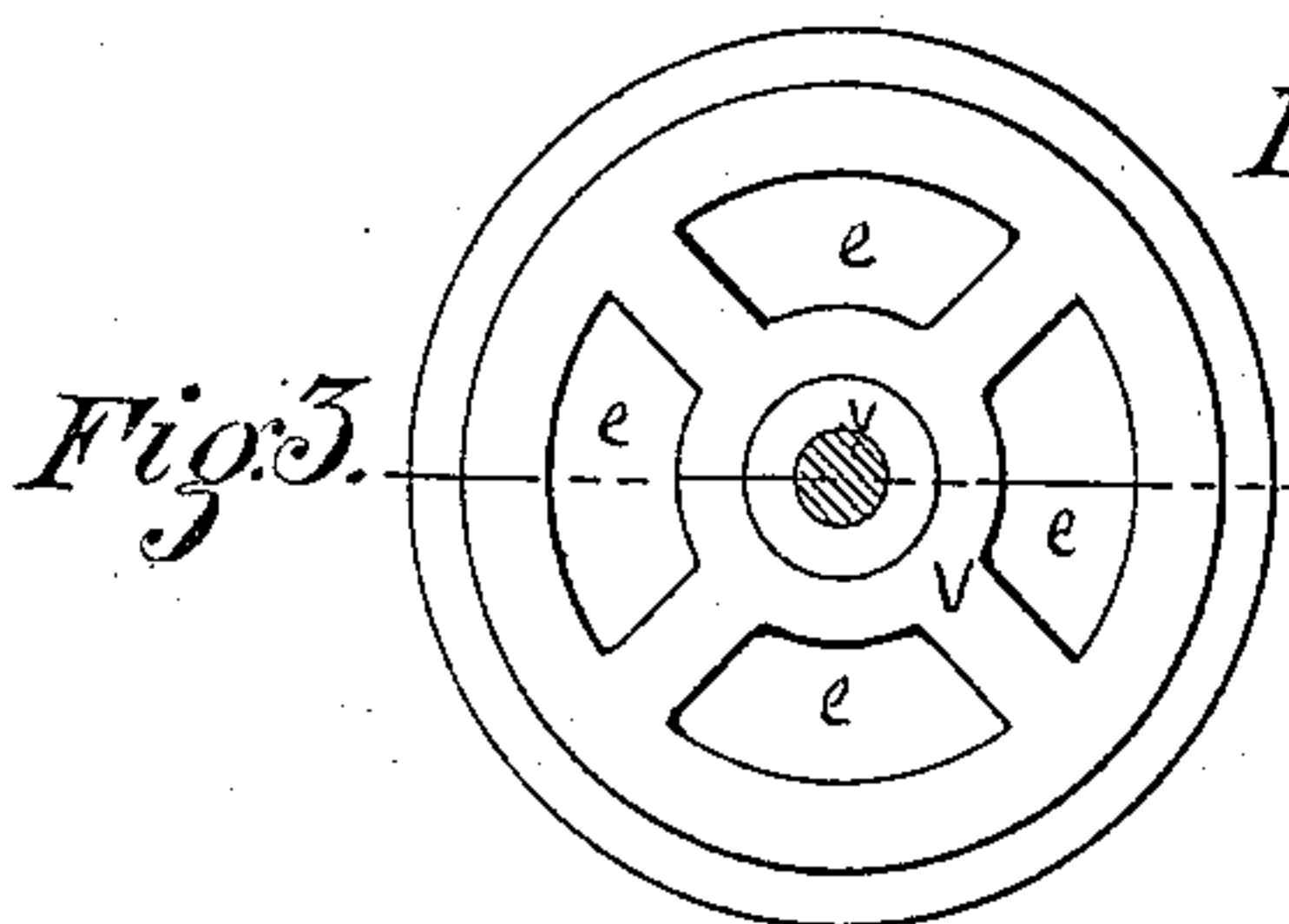


Fig. 3.

Witnessed.  
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# UNITED STATES PATENT OFFICE.

JAMES HEMPHILL, OF PITTSBURG, PENNSYLVANIA.

## PUPPET-VALVE.

SPECIFICATION forming part of Letters Patent No. 238,685, dated March 8, 1881.

Application filed September 20, 1880. (No model.)

*To all whom it may concern :*

Be it known that I, JAMES HEMPHILL, of  
Pittsburg, county of Allegheny, State of Penn-  
sylvania, have invented or discovered a new  
5 and useful Improvement in Puppet-Valves;  
and I do hereby declare the following to be  
a full, clear, concise, and exact description  
thereof, reference being had to the accompa-  
nying drawings, making a part of this specifi-  
10 cation, in which—like letters indicating like  
parts—

Figure 1 is a sectional view of the steam-  
cylinder of a vertical engine illustrative of  
the arrangement of the valves with reference  
15 thereto, as also of the construction of the  
valves themselves, the two upper valves being  
shown in elevation and the two lower in sec-  
tion. Fig. 2 is a sectional view, to a somewhat  
larger scale, of one of the receiving or steam-  
20 supply valves, and illustrating its arrangement  
with reference to a horizontal cylinder; and  
Fig. 3 is a top view of the valve.

My present invention relates to certain im-  
provements in the old and well-known balanced  
25 puppet-valve, whereby I am enabled to secure  
a more perfect balancing, greater compactness  
of construction, and a more equable and uni-  
form motion, as well as greater facility in the  
inserting and removing of the valve in repairs,  
30 or for other purposes.

To this end I make the body of the valve,  
between its seats, large enough for the making  
therein of one, two, or more steam-ports, which  
extend from end to end of the valve, and I ex-  
35 tend the steam-supply chamber around, or al-  
most entirely around, the body of the valve,  
between its end seats, and also so construct  
the other parts of the valve-chamber that, the  
valve being seated at its lower end directly on  
40 the cylinder-wall, it shall, when unseated, admit  
steam through both seats or ports, as a result  
of which the valve is balanced by steam-press-  
ure, and the ports through the valve give ad-  
ditional room for the passage of steam.

45 The cylinder of a vertical engine is repre-  
sented at A, and A' is its piston, and A<sup>2</sup> the  
piston-stem. The steam-supply pipe may be  
connected at B and the exhaust-pipe at B'.  
The passages *b* lead to the valve-chambers B<sup>2</sup>,  
50 and on the opposite side like passages, *b'*, lead  
from the exhaust-valve chambers B<sup>3</sup>. In the

steam-supply valve-chambers B<sup>2</sup>, I arrange the  
valves V, and I will first describe the construc-  
tion and arrangement of these valves. Each  
valve is made with two seating-faces, *a a'*, 55  
which, when the valve is seated, rest and make  
close joints on the seats *s s'*. The upper seat  
(and by upper I mean the one most distant  
from the cylinder) has a slightly less diameter  
than the lower, and at least so much or such 60  
length of the body of the valve between its  
seating-faces as is intended in the motion of  
the valve to play through the upper seat is  
made slightly less in diameter than the seat  
itself, so that when the valve is unseated steam 65  
may not only pass under the valve through the  
port *c* and into the cylinder, but may also, and  
at the same instant of time, pass between the  
body of the valve and the upper valve-seat  
into that part, *d*, of the valve-chamber which is 70  
above the valve, and thereby apply steam-  
pressure to both ends of the valve simultane-  
ously, and so practically balance it; and also  
such steam, while thus acting in its progress  
as a balancing agent, may also pass along 75  
through the port or ports *e*, which I make  
lengthwise through the valve, and so, passing  
through the port *c*, enter the cylinder. In or-  
der to get a good steam-supply and keep the  
valve balanced laterally as well as longitudi- 80  
nally, I carry the passage *b* well around the  
valve at *b<sup>2</sup>*; and in order that the valve may  
be properly guided at both ends I add guid-  
ing-ribs *i*, or equivalent device performing a  
like function, and in any desired number, 85  
around both ends of the valve. It will now  
be seen that when the valve is seated there  
will be a slight preponderance of downward  
or seating pressure, and when unseated the  
preponderance will be slightly the other way. 90  
Hence the positive motions of unseating and  
seating, which are communicated through any  
suitable means to the valve-stems *v*, are always  
against the pressure, which is a desirable fea-  
ture in valves of this class. It is also an im- 95  
portant feature that on the opening of the  
valve the application of a balancing-pressure  
to the upper end is as instantaneous as the ap-  
plication of fluid-pressure below the valve, and  
also that the ports through the valve operate 100  
as steam-supply ports to the cylinder.  
I am aware that holes through puppet-valves



are old; but so far as I am aware they have been only organized heretofore so as to convey the balancing steam-pressure from beneath the valve to the balancing chamber or pocket above, there being in such construction, as heretofore practiced, a packing around the valve, which prevented steam from the pocket above the valve from passing into the cylinder. In such construction the practical difficulty is met with that the first pressure of steam, when the valve is opened, is on the lower end of the valve, and this causes the valve to "jump," as it is called.

My improved construction differs from this, among other respects, in supplying steam both above and below the valve simultaneously, so as to balance it at once, and so prevent jumping; and also in dispensing with the packing, and so organizing the valve that the holes or ports through the valve operate as steam-supply ports on the receiving-slide and exhaust-ports on the other side without at all impairing or materially lessening the balancing effect desired. Also, as a result of supplying steam both above and below the valve from a steam-space,  $b^2$ , between the valve-seats, I am enabled to set the valve directly on the port  $c$ , made in the wall or shell of the cylinder. As the lower end of this valve is the larger, I make provision for inserting it in and removing it from its chamber without making the body of the valve-chamber in separate parts, and this I do by the use of a bushing,  $x$ , the exterior diameter of which is at least equal to the exterior diameter of the largest part of the valve. The interior wall of this bushing above the valve-seat is provided with ribs, as shown, so as to act as a guide to the upper end of the valve, and also leave a steam-space between the upper valve and the bushing for the free flow of steam past the valve-head when the valve is unseated; but such guiding-ribs may be made on the valve-head itself and play against the cylindrical cavity of the bushing. The upper valve-seat is made in this

bushing, and the latter is seated and held in place by a bevel-seat and shoulder, as at  $x'$ . Then the valve and bushing can be put in and removed together.

The exhaust-valves  $V'$  are of the same construction and operation, except that the upper end of the valve is slightly the larger, and the upper valve-seat has a little the greater diameter, so that no bushing is needed, and also so that when the valve is seated steam-pressure, acting through the ports  $e$ , shall, in the chamber or pocket  $d$ , balance the valve, with a slight preponderance of downward effect. Also, when the valve is unseated, steam passing through the holes or ports  $e$  will maintain a practical and substantial balance, and will also exhaust through said ports and through the partially-open port of the upper valve-seat, as well as through the fully-open port of the lower seat.

While I have described my improved valve as specially adapted to vertical engines, I do not limit myself to its use therewith, as it may be advantageously used with horizontal cylinders as well.

I claim herein as my invention—

1. In combination with a steam-port,  $c$ , made directly in the wall, body, or shell of a steam-cylinder, a double-balanced puppet-valve seated directly thereon, without any intervening pocket, and a steam-port opening directly from between the valve-seating faces simultaneously through both valve-seats on the unseating of the valve, substantially as set forth.

2. The double-balanced puppet-valve  $V$ , larger at the lower than at the upper end, in combination with a bush,  $x$ , adapted to furnish a seat for the valve and guide the same in its motion to and from its seat by suitable interposed guides, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JAMES HEMPHILL.

Witnesses:

R. H. WHITTLESEY,  
GEORGE H. CHRISTY.