

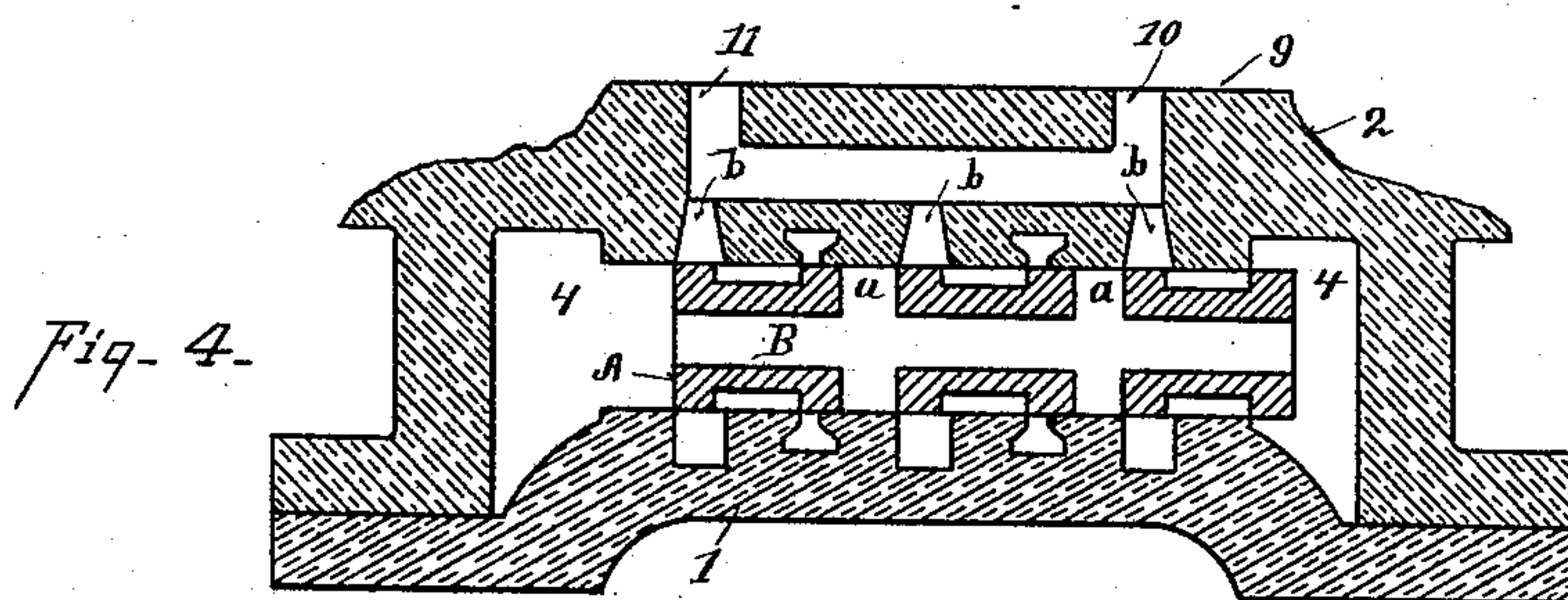
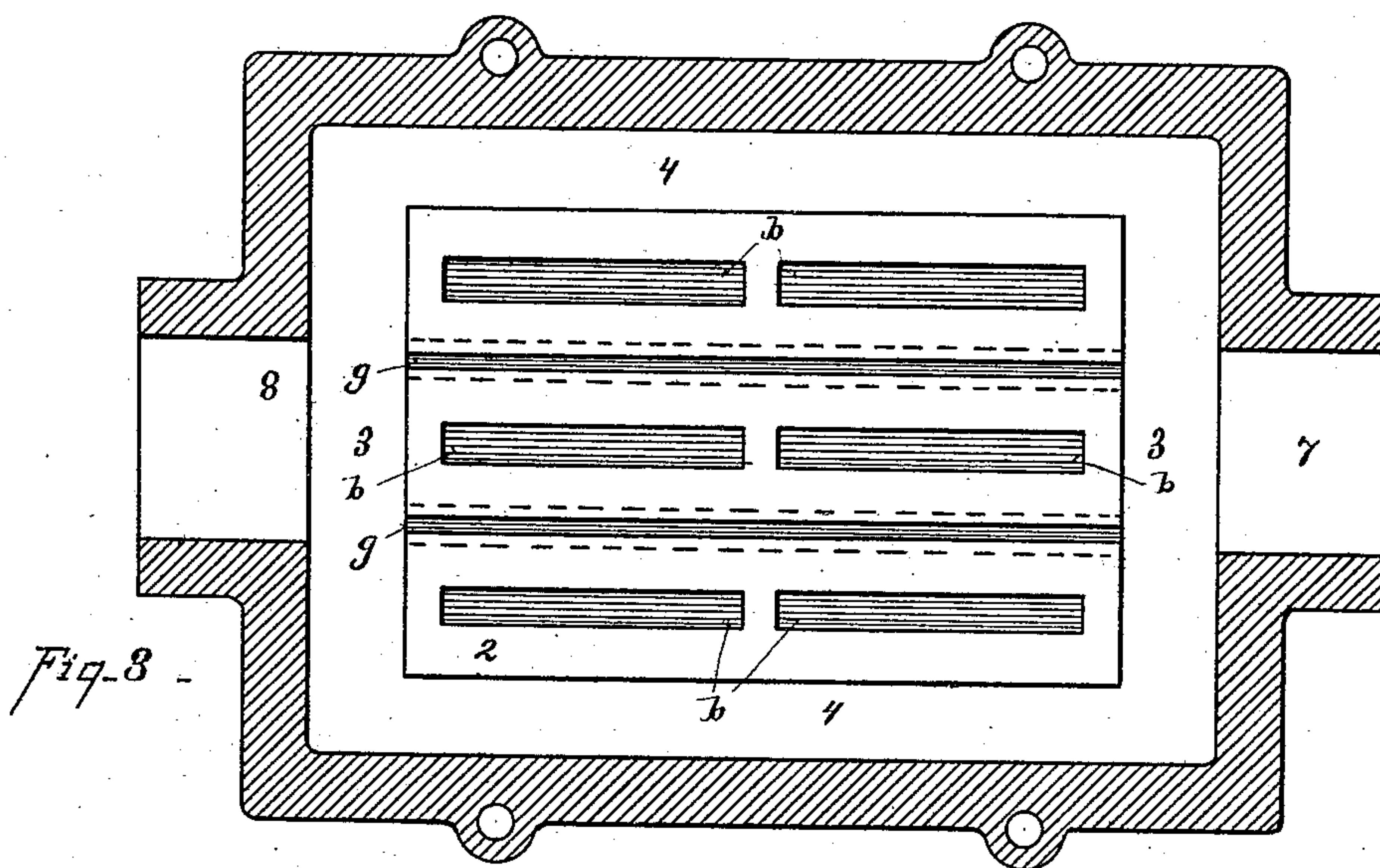
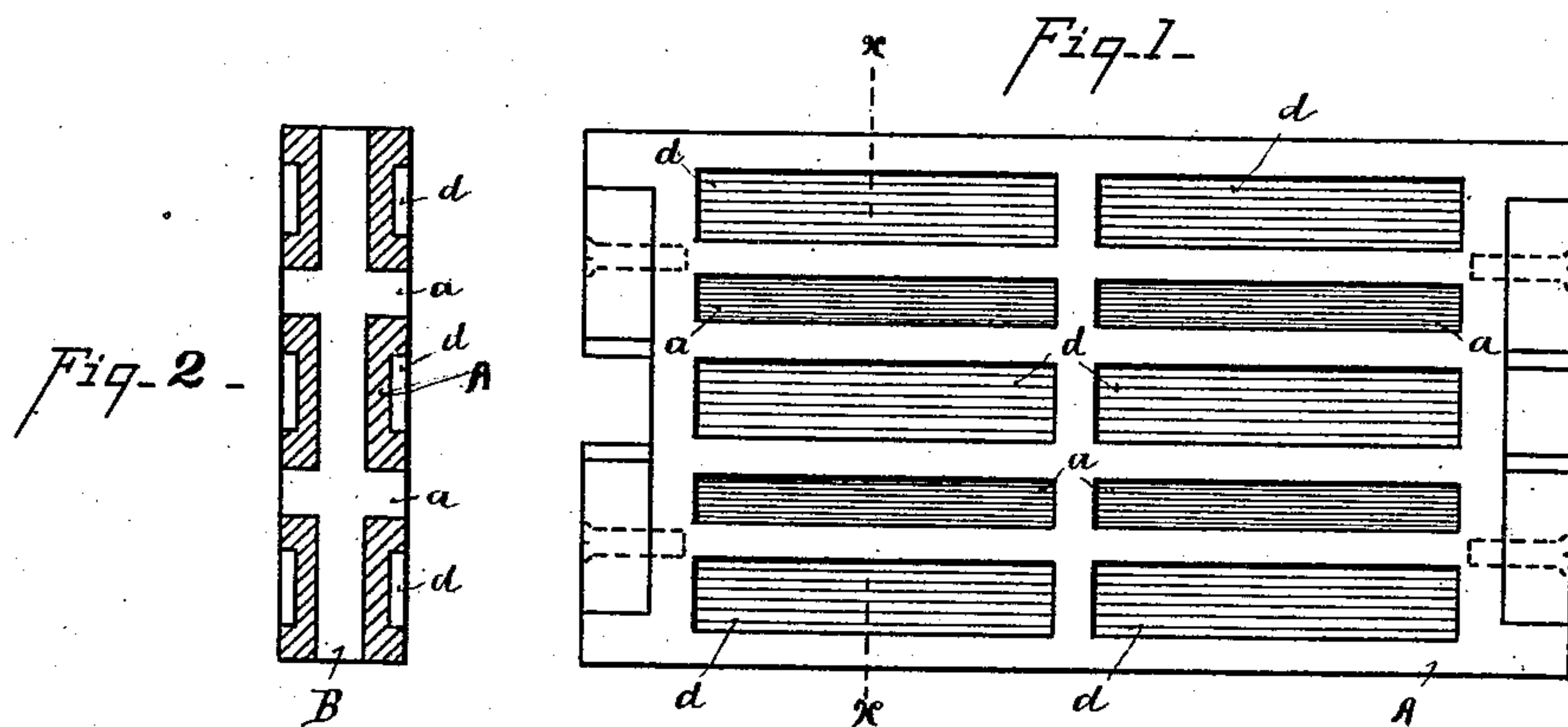
(No Model.)

3 Sheets—Sheet 1.

E. W. HARDEN & M. R. CONWAY.
VALVE.

No. 486,403.

Patented Nov. 15, 1892.



Attest

J. A. Kneaford
Robert Smith,

Inventors

Edward W. Harden ^{and} Michael R. Conway
By Wood & Bond
Attorneys

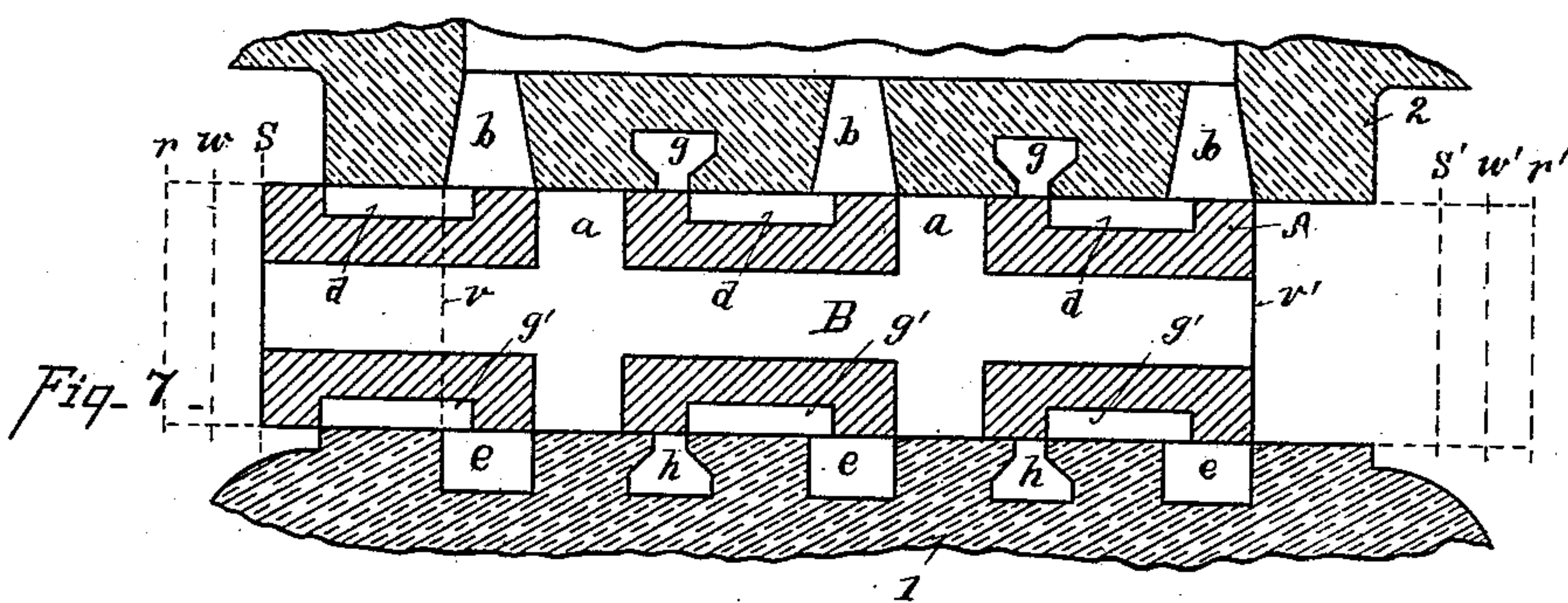
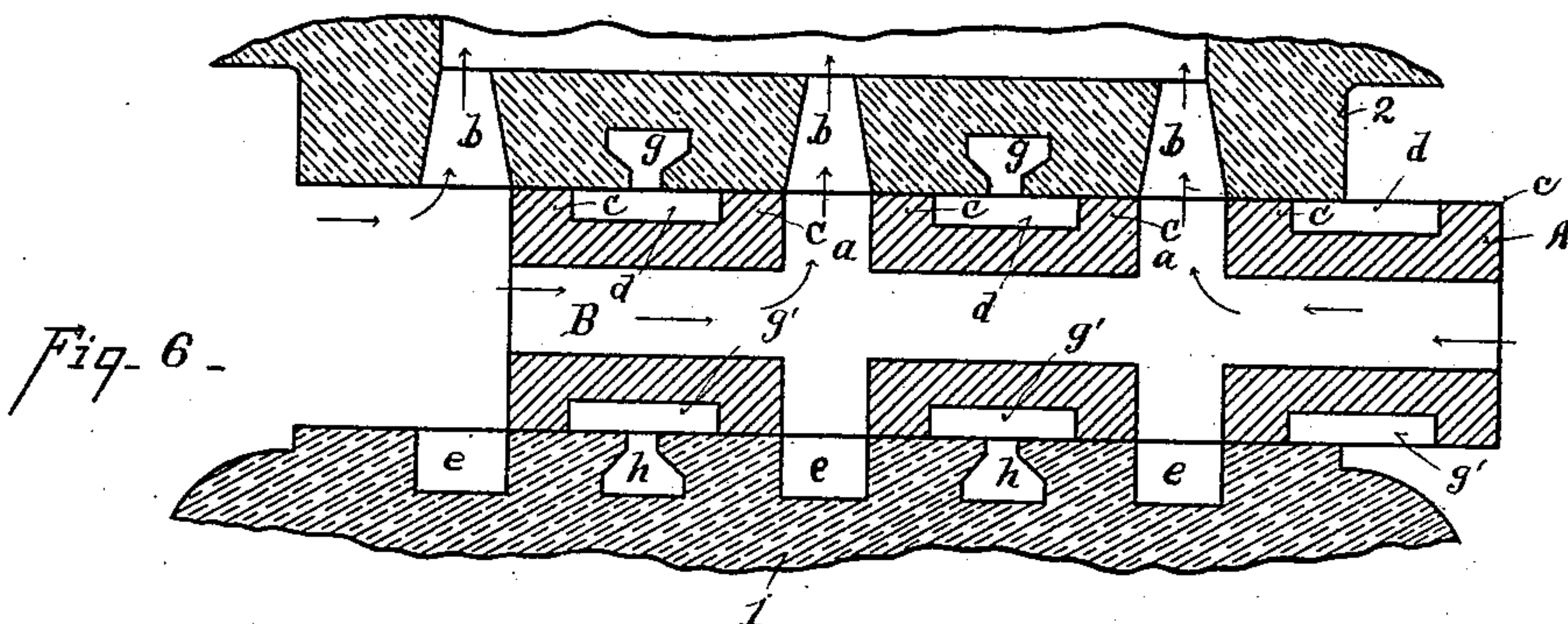
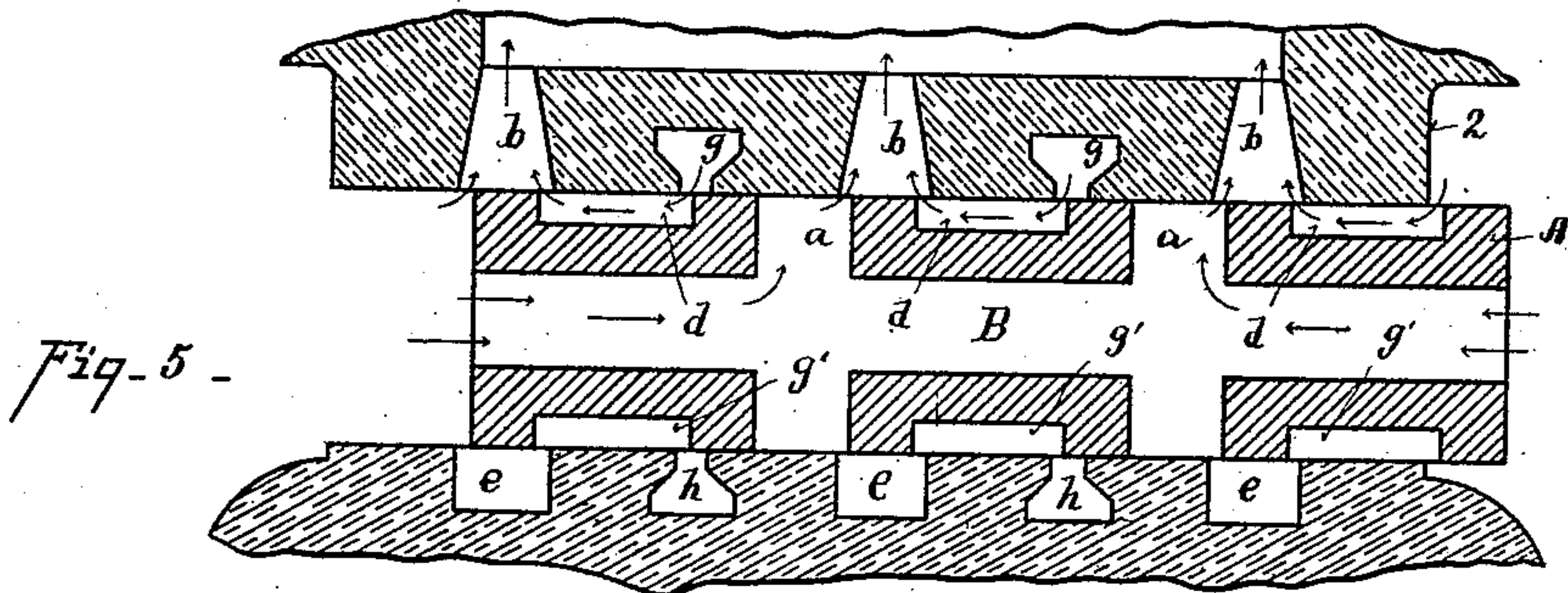
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3 Sheets—Sheet 2.

E. W. HARDEN & M. R. CONWAY.
VALVE.

No. 486,403.

Patented Nov. 15, 1892.



Attest—
J. A. Rutherford
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INVENTORS
Edward W. Harden and *Michael Conway*
By—*Wood & Bond*
S. W. Torrey

(No Model.)

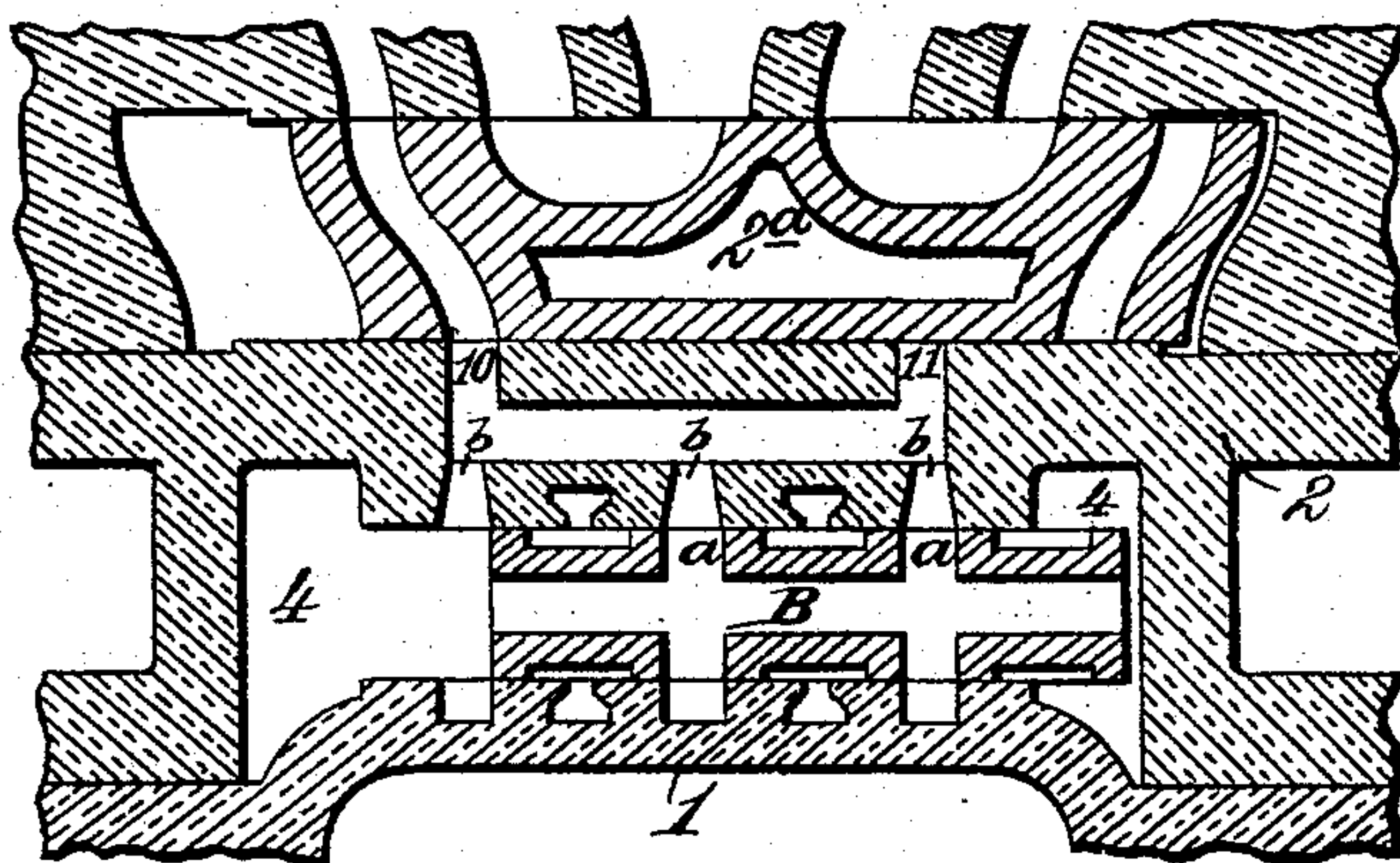
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VALVE.

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Fig. 8.



Witnesses.
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Woodruff Boyd, Attys.

UNITED STATES PATENT OFFICE.

EDWARD W. HARDEN AND MICHAEL R. CONWAY, OF CINCINNATI, OHIO,
ASSIGNORS TO FREDERIC C. WEIR, OF SAME PLACE.

VALVE.

SPECIFICATION forming part of Letters Patent No. 486,403, dated November 15, 1892.

Application filed January 27, 1892. Serial No. 419,461. (No model.)

To all whom it may concern:

Be it known that we, EDWARD W. HARDEN and MICHAEL R. CONWAY, citizens of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Valves, of which the following is a specification.

Our invention relates to an auxiliary valve for a steam-engine. It is primarily adapted to be used in connection with the engine shown in the Letters Patent No. 469,563, issued to Harden and Conway February 23, 1892; but it may be used in connection with any other well-known form of valve.

One of the objects of our invention is to apply the steam in more effective manner by means of the auxiliary griddle cut-off valve.

Another object of our invention is to provide a cut-off valve with ports and passages, so that the full amount of steam can be admitted with the minimum amount of valve movement, and which amount remains constant until the proper time for cutting off and is then cut off with a minimum movement.

Another object of our invention is to provide a balanced slide and cut-off griddle-valve.

The various features of our invention are fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

Figure 1 is a top plan view of our improved valve. Fig. 2 is a section on line *x x*, Fig. 1. Fig. 3 is a bottom plan view of the upper main valve-seat. Fig. 4 is a cross-section of the auxiliary shell-valve and its seat, showing the position at the initial point of movement. Fig. 5 is a similar section showing the valve advanced to full opening. Fig. 6 is a similar section showing the valve at the extreme position. Fig. 7 is a similar section at the initial point of opening on its return movement; and Fig. 8 is a view similar to Fig. 4, showing the main valve in position.

1 represents the lower or auxiliary valve-seat; 2, the upper or main valve-seat.

3 represents the end steam-chambers, and 4 side steam-chambers in the valve-chest.

A represents the auxiliary valve. It is of

shell form and receives the steam from the chambers 3 and 4 in the central opening B.

a a represent ports through the valve.

b b b represent ports through the upper or main valve-seat 2, on which the main valve 2^a, Fig. 8, works. When three ports are thus employed, six cut-off points *c* of the valve are required to close these ports. In order to admit steam each side of these cut-off points *c*,

we provide a series of passages *d* in the upper or main valve-seat, so that steam is admitted each side of the cut-offs *c* from the steam-chambers 4 from the steam-passages *d*, which are supplied with steam by the passages *g* in the upper valve-seat, taking steam from the chambers 3. We likewise provide

ports *e* in the lower valve-seat, similar to the ports *b*, so as to receive steam on the underside of the valve, and also passages *h* for supplying steam to the passages *g* in the lower side of the valve. Thus the upper and lower faces

of the valve are subjected to the same steam-pressure, and a multiple series of openings or steam-passages are made through the valve, which balances the valves nearly under the pressure of the steam and allows it to move

freely and to open and close quickly, coming to a full opening at a slight throw and continuing this until just before the cut-off point. In Fig. 4 we have shown the position of the valve just on the point of opening. A slight movement

brings it into the position shown in Fig. 5, which is full opening. This full opening is maintained as the valve moves forward, the last portion of the movement being shown in Fig. 6. The valve moves backward, maintaining the full opening until it arrives in the position shown in Fig. 5, when it commences to reduce until it moves into position

shown in Fig. 4, which is entirely cut off, and then continues to move in the same direction with the steam cut off until position in Fig. 7 is reached, which is the reverse of position shown in Fig. 4. In Fig. 7 we have

shown a diagram representing the strokes of the valve from *r* to *s*, representing the working period of the valve stroke, and likewise from *s'* to *r'*.

w' and *w* represent the central line of the

working stroke, in which position the valve is shown in Fig. 5.

s to v and s' to v' represent the idle movement at either end of the stroke.

5 Lines r to r' represent the extreme movement when the valve is doing full duty.

s to s' represent the minimum movement of the valve in working position. It will be observed, therefore, that the valve may be
10 moved a considerable distance without doing any work, always practically clearing the seat and avoiding wearing a shoulder, which is apt to occur when valves are arrested mid-way of their movement on the seat.

15 It will be observed that the steam is voided through the valve from the interior ports $a a$ and from the ports $d d$ on the exterior face of the valve simultaneously, and that the cut-off c uniformly reduces these main and auxiliary ports, simultaneously cutting off both
20 ports in its movement, so that by reason of this two-point admission twice the actual opening for steam is provided that could be provided from either exterior or interior ports
25 used singly, thus reducing the movement of the valve for any given area of steam-opening one half, and by using two ports $a a$ and three ports $b b b$ and three ports $d d d$ a very small movement makes a large area of actual
30 steam-opening of the valve, and so a further increase in a series of these ports would still lessen the necessary valve movement for any desired area of valve-opening. It is obvious that the number of ports leading through the
35 auxiliary valve and its upper and lower seats may be increased or decreased at pleasure. We have shown two openings 7 8 for admitting the steam into the valve-chamber. It is obvious that only one opening might be em-
40 ployed. It will be seen that the upper and lower faces of the valve are each the counterpart of the other and that the upper and lower seats are each the counterpart of the other.

45 It is designed in practice to have the upper side 9 (see Fig. 4) of the upper valve-seat 2 form the seat of the main valve to which the steam is communicated by the passages 10 11 alternately. It is obvious, however, that these
50 ports 10 11 might be used to cover and uncover the steam-ports of the steam-piston chamber instead of the ports of the main valve; but the preferred form of using this valve is as an auxiliary to a main valve. It
55 will be observed that the cut-off portions c are of less dimension than the ports b and that the said ports are closed by the overlapping of two of said cut-offs c , covering the ports b and g , respectively. We thus obtain
60 a perfectly-balanced valve which opens read-

ily on a slight movement, continues at full opening until just before the cut-off point is reached and quickly cuts off, so that we get a minimum amount of movement for the full opening of the cut-off. The valve may be op- 65
erated by any well-known mechanism adjustable so as to be cut off at any desired position.

Having described our invention, what we claim is—

1. A shell valve A, provided with one or 70
more passages d and one or more ports leading through the valve and one or more ports b above the valve and one or more steam-passages g in the top face of the valve-seat for admitting steam to the ports b , substantially 75
as specified.

2. An auxiliary shell valve having two or more ports b , passages g' , supplied from the opening B, one or more ports d in the top face of the valve-supplying ports b , and two or 80
more cut-offs c , substantially as specified.

3. The shell valve A, provided with the central opening B, ports a through the valve, ports b in the upper seat of the valve, similar ports i in the lower section of the valve, and 85
steam-ports $e h$ in the lower seat of the valve, substantially as specified.

4. A shell valve A, receiving steam into the interior opening B, a series of steam-passages a through the valve, a series of steam-ports b 90
in the valve-seat, the series of steam-passages $g d$, and the cut-offs c for closing the ports $b g$, substantially as specified.

5. In combination with the shell valve A, having the series of steam-ports $a d$ in the top 95
section of the valve and a similar series of ports through the lower section of the valve, and the duplex valve-seats provided with similar ports and passages, substantially as specified. 100

6. In combination with the shell valve A, having two or more exterior and two or more interior ports and four or more cut-offs c for reducing or closing simultaneously the ports 105
 b and g , whereby the steam is admitted alternately over the exterior and interior faces of the valve, substantially as specified.

7. In combination with the shell valve A, having a central opening B, having one or more exterior ports a , and two or more cut-offs 110
 c for reducing and closing simultaneously the main and auxiliary ports, substantially as specified.

In testimony whereof we have hereunto set our hands.

EDWARD W. HARDEN.
MICHAEL R. CONWAY.

Witnesses:

T. SIMMONS,
C. W. MILES.