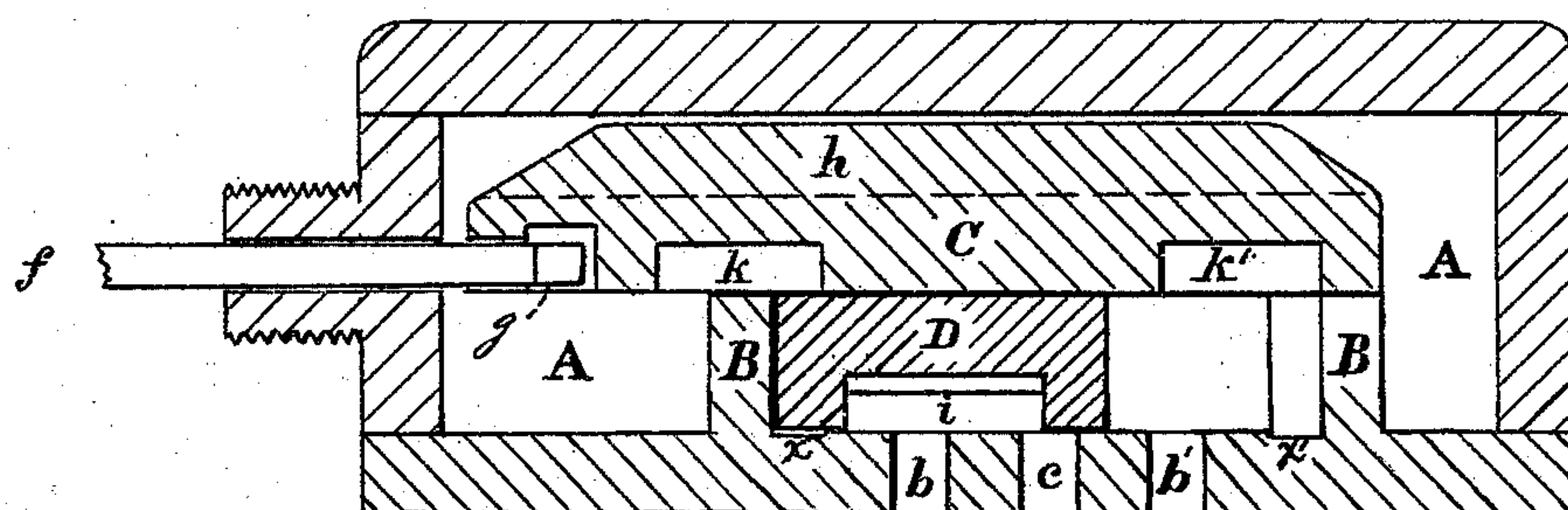
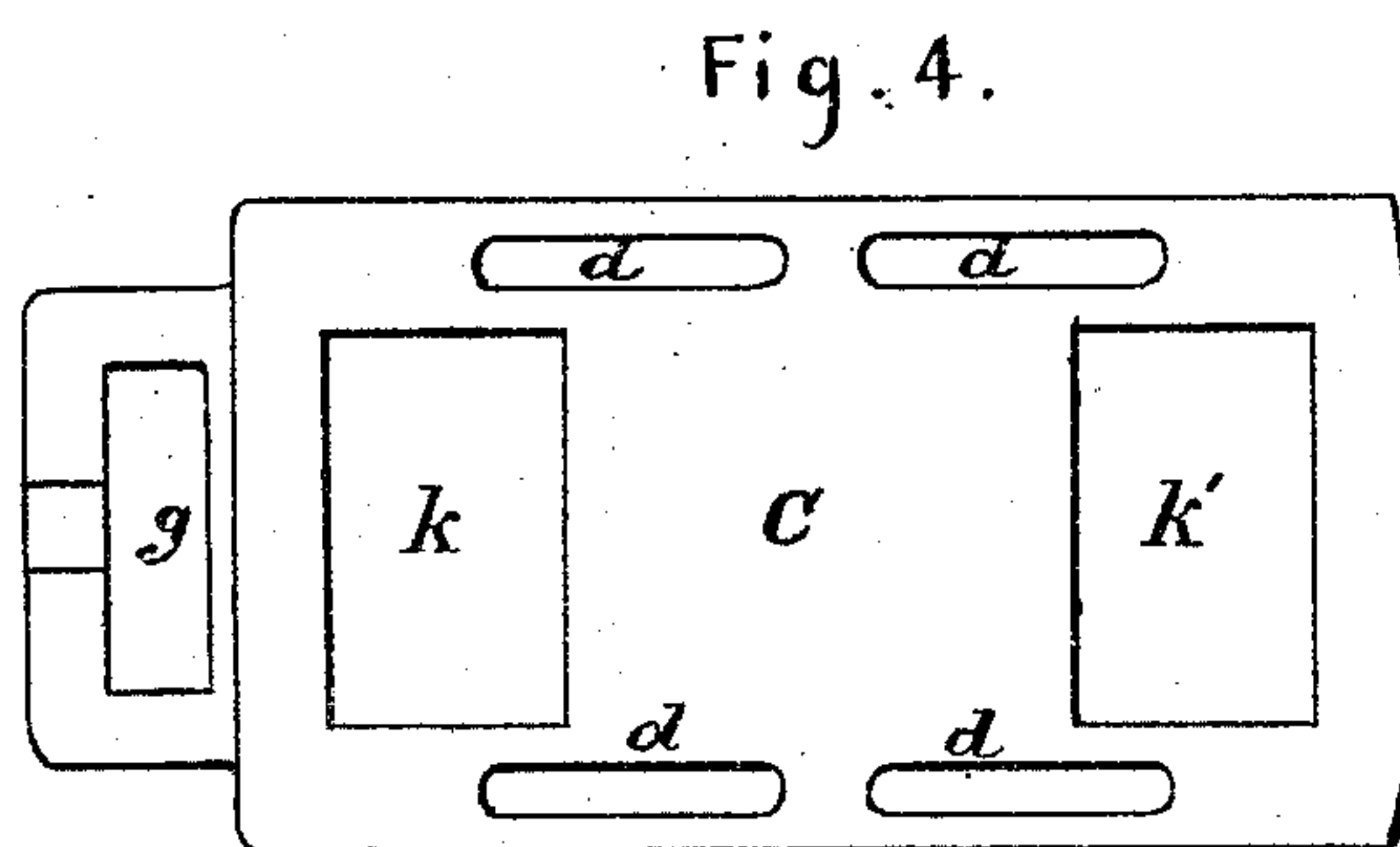
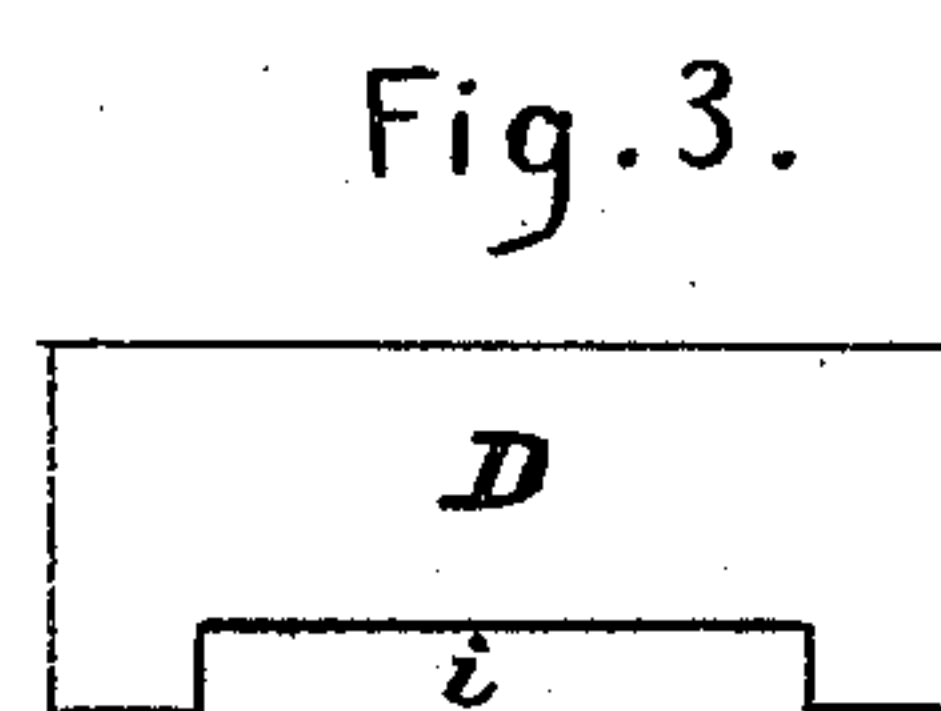
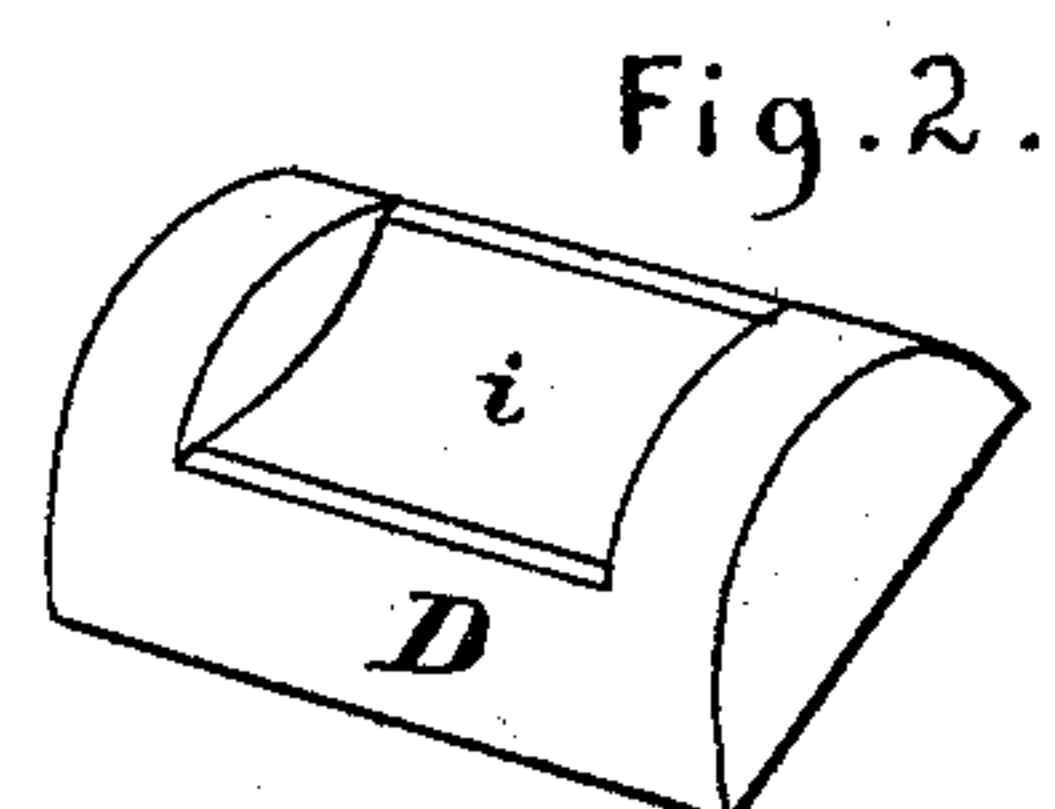
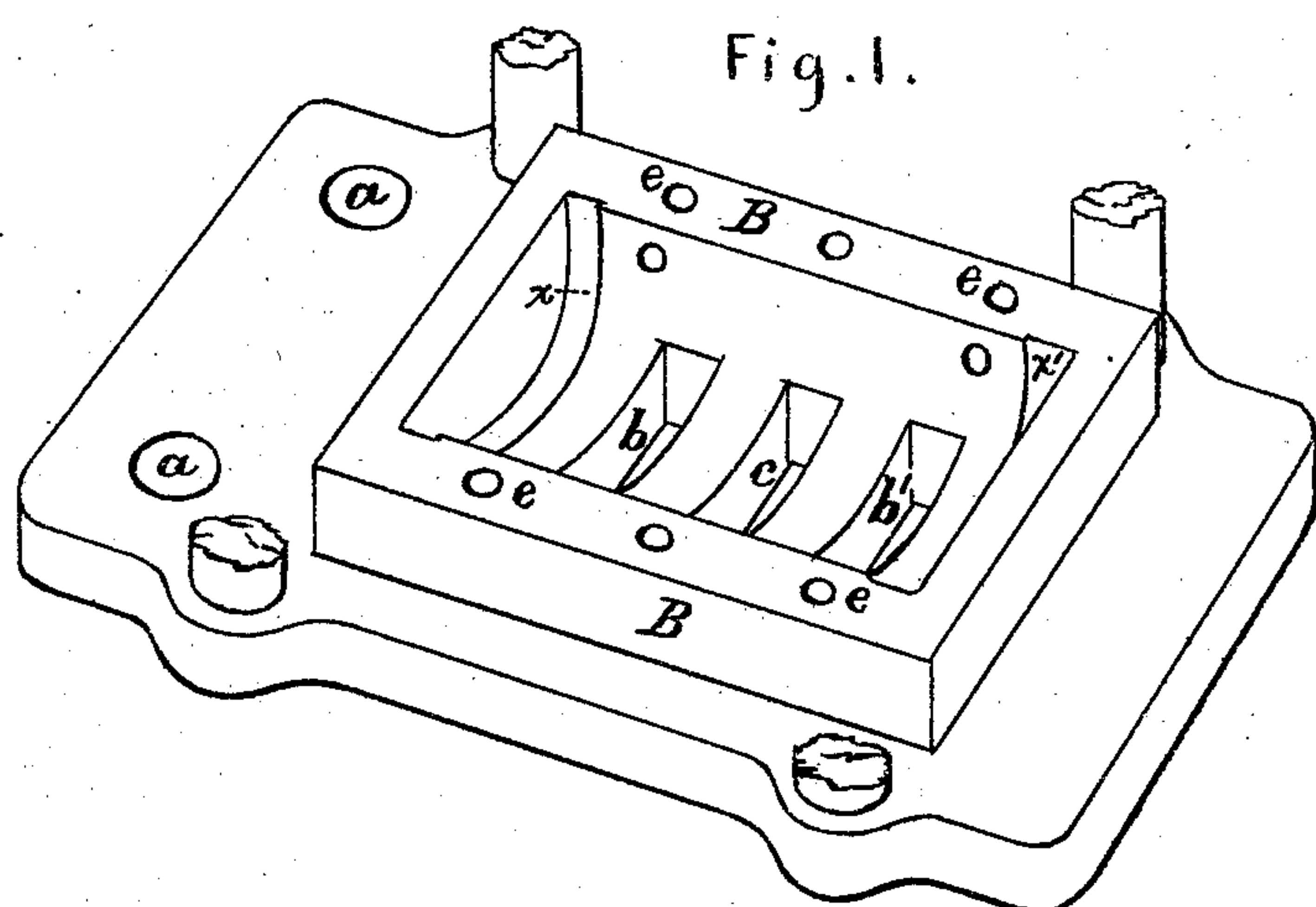


O. J. BYRUD.

Slide-Valves for Steam-Engines.

No. 154,370.

Patented Aug. 25, 1874.



Witnesses :

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George H. Howard

Inventor :

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Fig. 6.

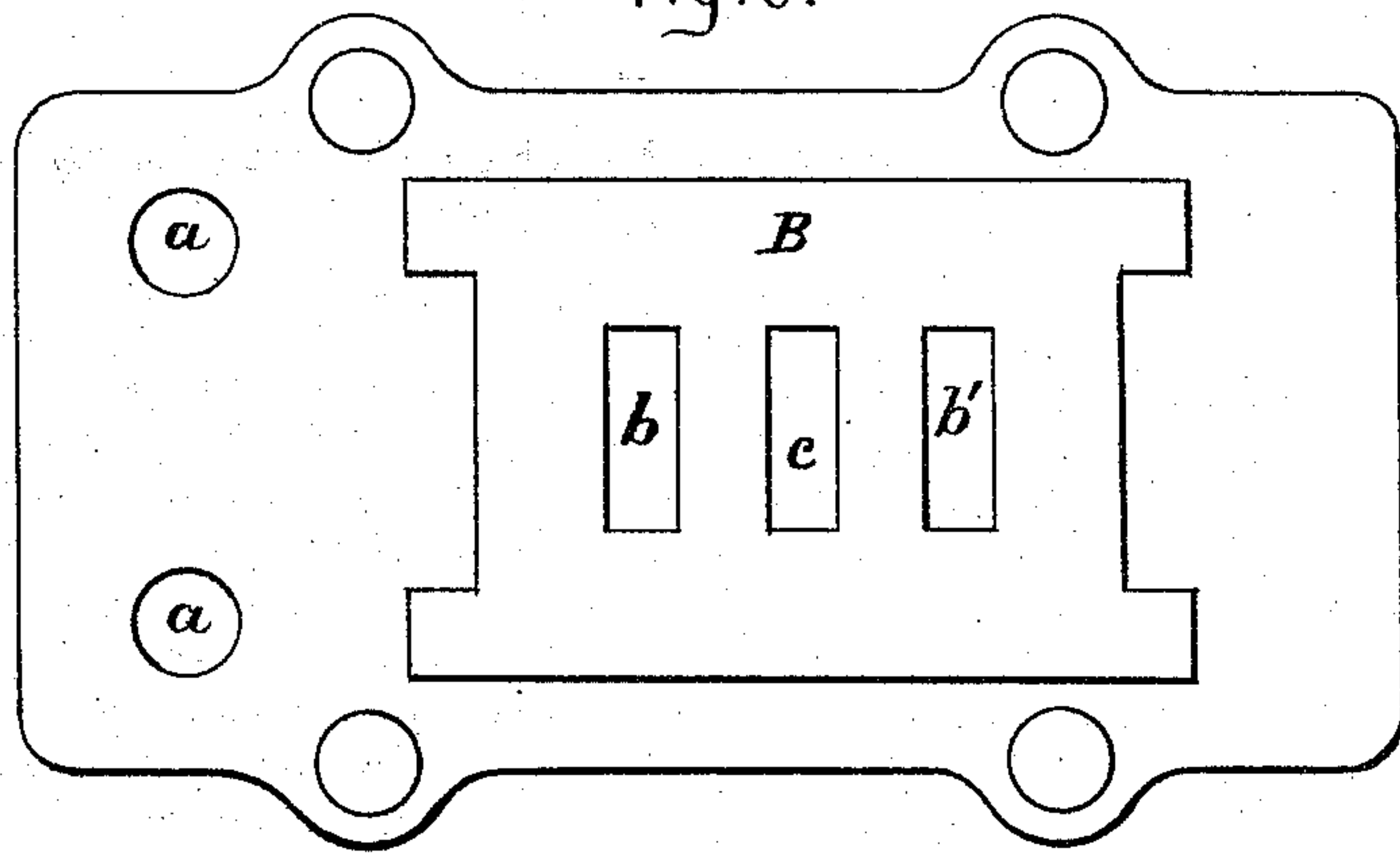


Fig. 7.

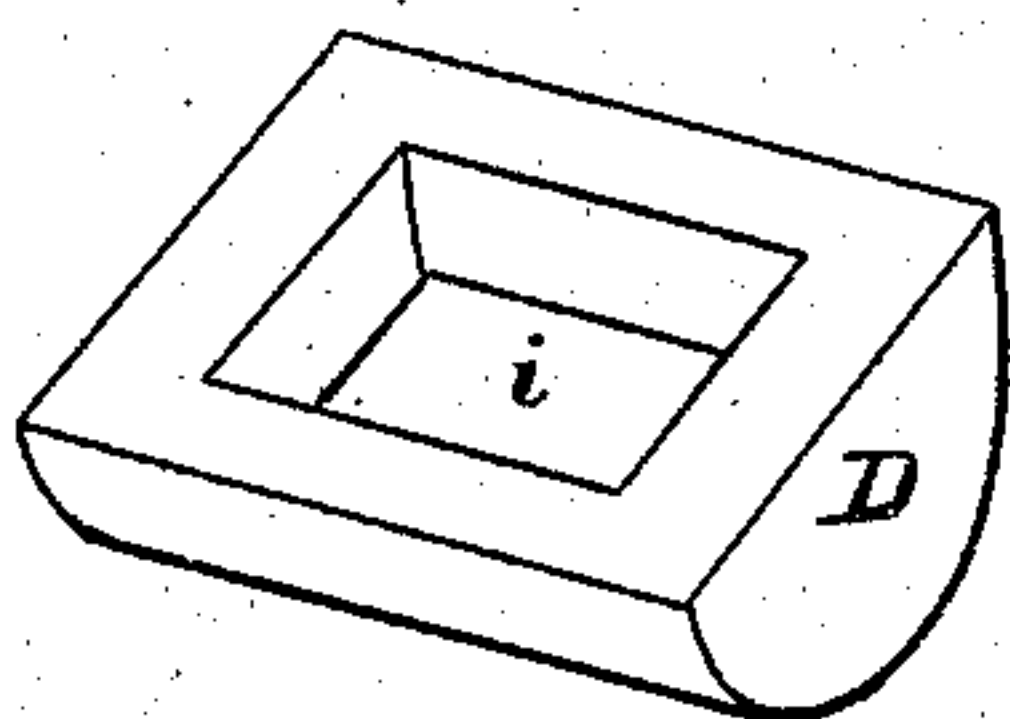


Fig. 8.

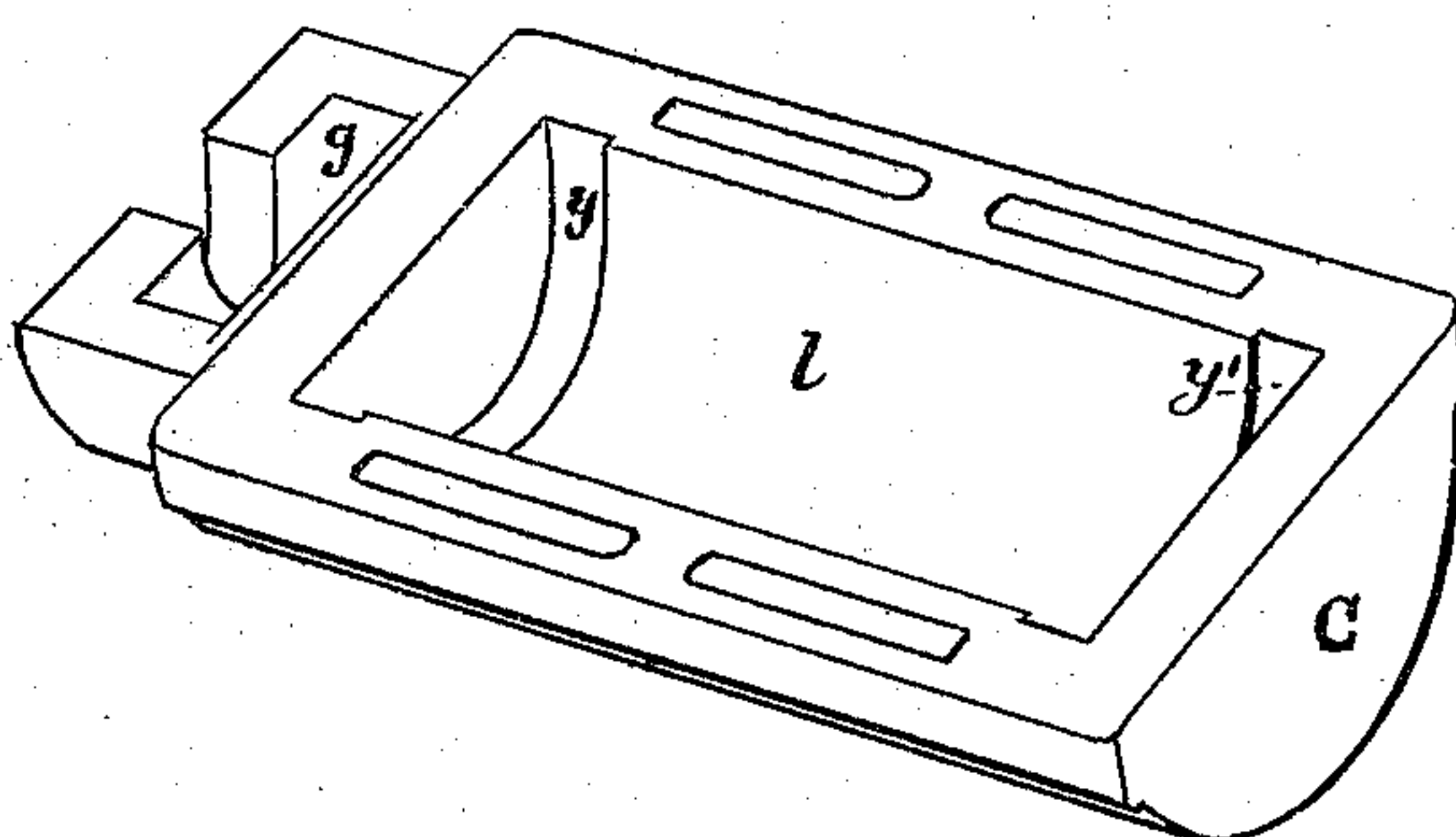
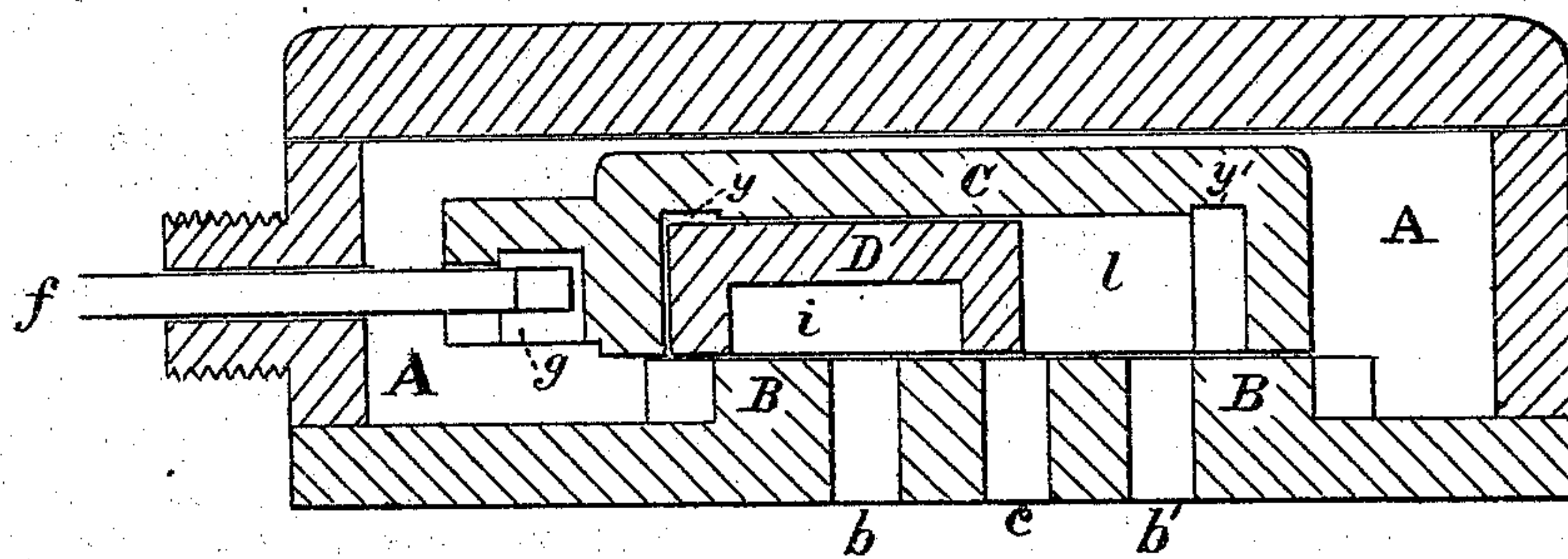


Fig. 9.



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UNITED STATES PATENT OFFICE,

OLE JOHNSON BYRUD, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN SLIDE-VALVES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **154,370**, dated August 25, 1874; application filed May 21, 1874.

To all whom it may concern:

Be it known that I, OLE JOHNSON BYRUD, of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Slide-Valves for Steam-Engines; and I do hereby declare the following to be a clear and exact description of my invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the drawings, which form part of this specification.

The object of my invention is to provide a self-operating double slide-valve, or a valve in which the main valve, actuated by a valve-rod in the usual manner, does not operate direct in its relation to the steam-ports, but operates an auxiliary valve, which I prefer to call an "under valve," by the steam alone, (the said under valve being detached from the other parts of the apparatus,) in such a manner as to "balance" the pressure of steam within the valve-box and valve, thus forming what is commonly called a "balanced valve," but differing in construction and operation from any valves of this or any other kind heretofore made or used.

I have hereunto annexed two sheets of drawings, Sheet 2, however, showing simply a modified form of my invention as represented on Sheet 1. On this sheet, Figure 1 represents a perspective view of the bottom or valve-seat of a steam-chest having my improvement. Fig. 2 is a perspective view of the corresponding detached under valve. Fig. 3 is a side elevation of the same. Fig. 4 is a plan of the under side of the corresponding over valve; and Fig. 5 is a longitudinal vertical section of a steam-chest having my improvement, shown in detail in the foregoing figures.

Reference to the figures on Sheet 2 will be made hereafter in describing the modification of my invention therein shown.

a denotes the ports through which steam is admitted into the steam-chest or valve-box A. The bottom or valve-seat B of the latter has two live-steam ports, *b b'*, and the common exhaust-port *c*, as usual. The main valve C slides upon the valve-seat B, and is provided with channeled passages at the sides, (shown

at *d*,) through which, in combination with the perforations *e* in the valve-seat, opening out into the steam-ports, steam maintains an equilibrium of pressure on both sides of the valve. It is operated by the valve-rod *f*, which is secured within the steam-chest to the valve in the recess *g*, as shown in the drawing, and is provided on the top and sides with projecting flanges *h*, which serve to guide its motion within the steam-chest by sliding upon the under side of the top and against the sides of the latter. The auxiliary valve or under valve D (shown in Figs. 2 and 3) rests within the semi-cylindrical recess in the valve-seat B, and is of a corresponding semi-cylindrical configuration. It has a cavity or recess, *i*, in the rounded part, which, when this valve is in its place within the valve-seat, serves as a conduit from either of the ports *b b'* to the exhaust-port *c*, according to its position. The main valve C has two recesses or chambers, *k k'*, by means of which, in the different positions of this valve, steam is admitted alternately above or below the under valve D. To enable the steam to enter the cavity in the valve-seat B, the latter is somewhat enlarged at each end, as shown at *x* and *x'* on Fig. 1, so that when the sliding under valve D has reached one of the ends, there will be space left at the sides to admit of the entrance of the steam between the valve D and the walls of the valve-seat B.

From the foregoing description, the operation of my improved valve will be readily understood. Supposing the main valve C to be in the position shown in the sectional view, Fig. 5, steam enters the chamber *k* from the steam-chest A, then passes into the annular recess *x* of the valve-seat B, thereby forcing the valve D downward, and opening the port *b*, through which the steam enters the cylinder; meanwhile, the steam under the piston is exhausted through the port *b'* and through the recessed chamber *i* in the valve D, which forms, when the valve is in this position, the conduit between the port *b'* and common exhaust-port *c*. The next move of the valve-rod shuts off the steam from *k*, but opens the chamber *k'*. Steam now enters the valve-seat through the annular recess *x'*, and impels the under valve D back-

ward again, and the exhaust now passes through port *b*, recess *i*, and the common exhaust-port *c*.

Figs. 6, 7, 8, and 9 on Sheet 2 represent a modified form of my invention. Instead of recessing the valve-seat B, I have here recessed the main valve C, forming a semi-cylindrical chamber, *l*, provided with two interior annular recesses, *y y'*, one at each end, precisely as the semi-cylindrical valve-seat B, already described. To correspond to the reversed portion of the cavity, the under valve D is, in this form of my invention, recessed on the flat side, as shown in Fig. 7, which is the side that here faces the flat valve-seat, Fig. 6, and the ports *b*, *c*, and *b'*. The operation of this form of my invention is shown in Fig. 9. Steam enters the main valve C through annular recess *y*, forces the under valve D down to *y'*, and enters the cylinder through port *b*. When the motion of the valve-rod is reversed, steam enters the chamber *l* of the valve C at *y'*, forcing D up to *y*, and steam enters the cylinder through port *b'*, while the exhaust passes through *b*, *i*, and *c*.

I am aware that it is not new to combine an auxiliary valve with the main valve in a steam-chest, for the purpose of preventing the clapping noise which is likely to result from the reciprocation of the main valve, as constructed in certain cases, (with a view to cause it to automatically take up its wear by lowering itself upon the valve-seat, and for other purposes;) and I do not, therefore, claim this combination, broadly; but

What I do claim, and desire to secure by Letters Patent, is—

The automatically-operating under valve D, having the cavity *i*, in combination with the recessed valve-seat B, having the interior annular recesses *x x'*, and the valve C, provided with recesses *k k'*, substantially as and for the purpose specified.

In testimony that I claim the foregoing I have hereunto set my hand this 16th day of February, A. D. 1874.

OLE JOHNSON BYRUD.

Witnesses:

J. W. ARCTANDER,
JOHN HAZELAND.