

(No Model.)

3 Sheets—Sheet 1.

L. H. NASH.

REGISTER CONNECTION FOR PISTON METERS.

No. 353,805.

Patented Dec. 7, 1886.

Fig. 1.

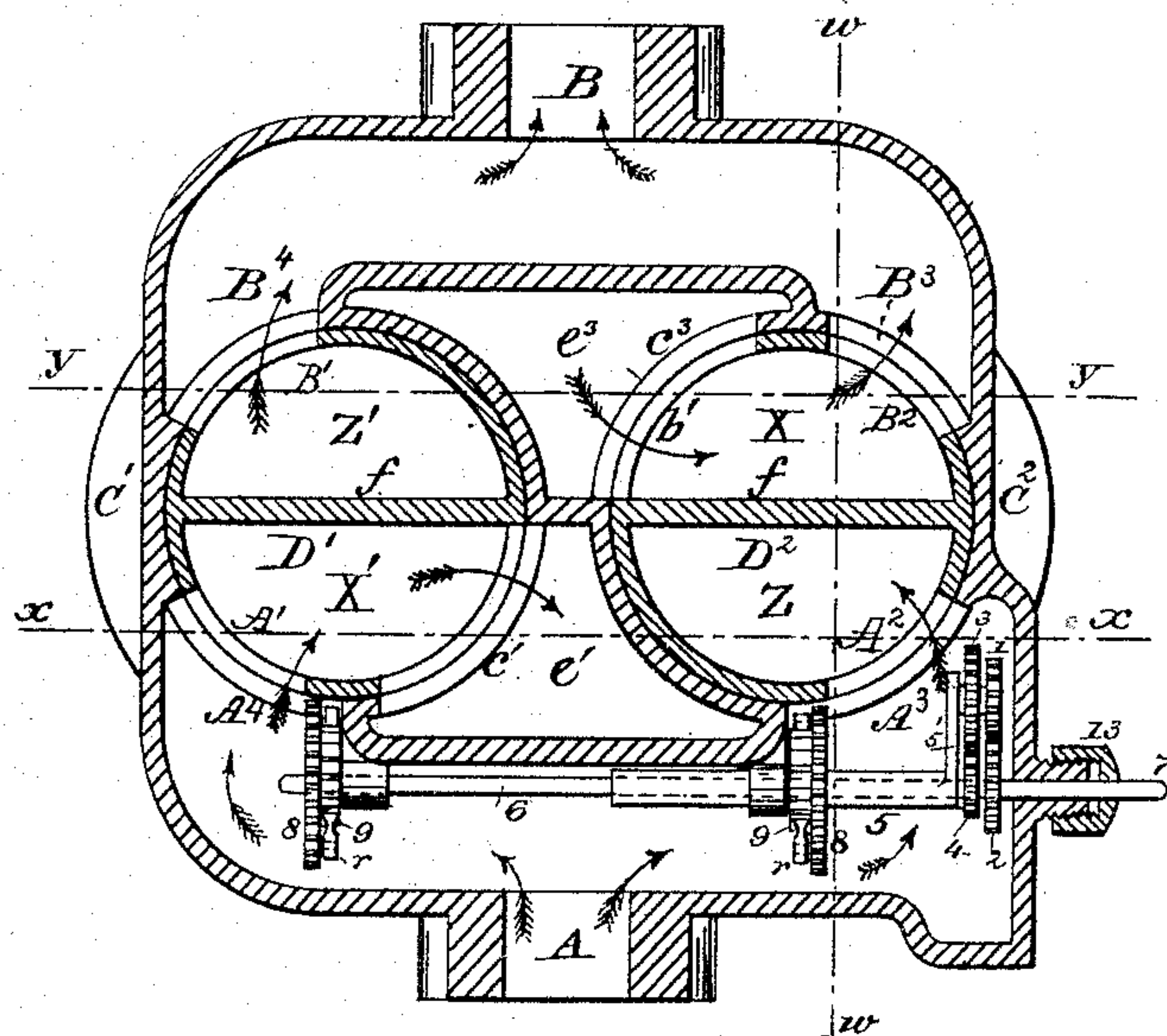


Fig. 2.

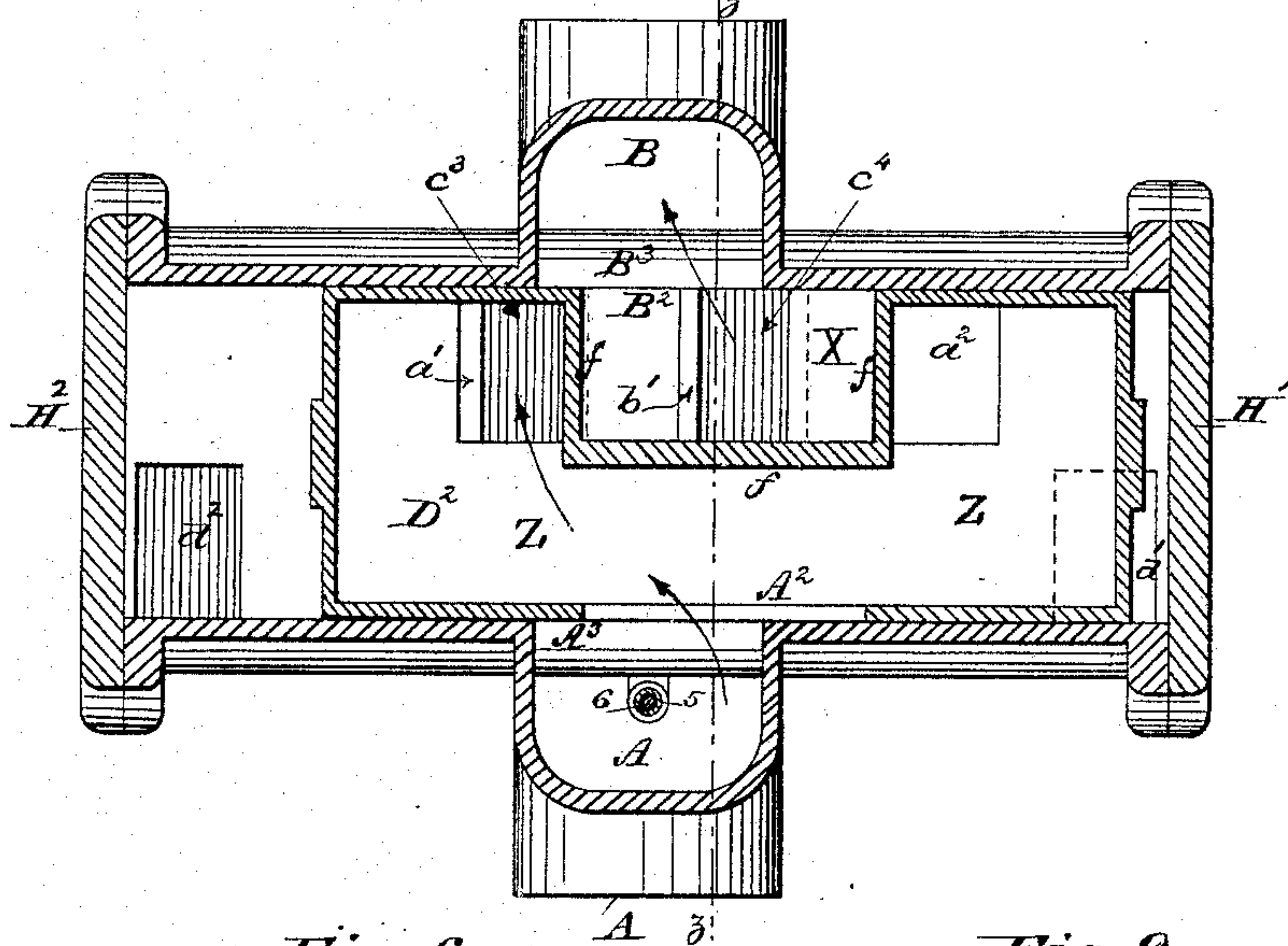


Fig. 6.

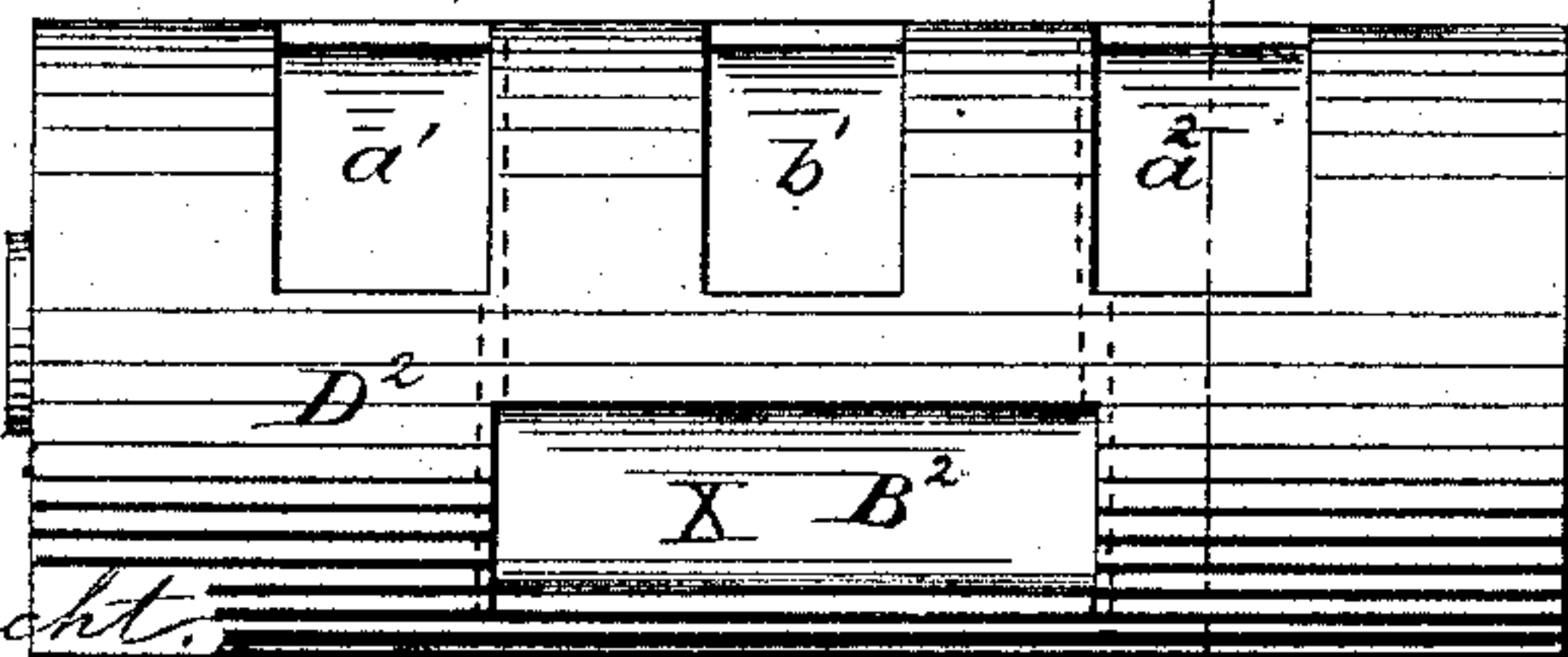
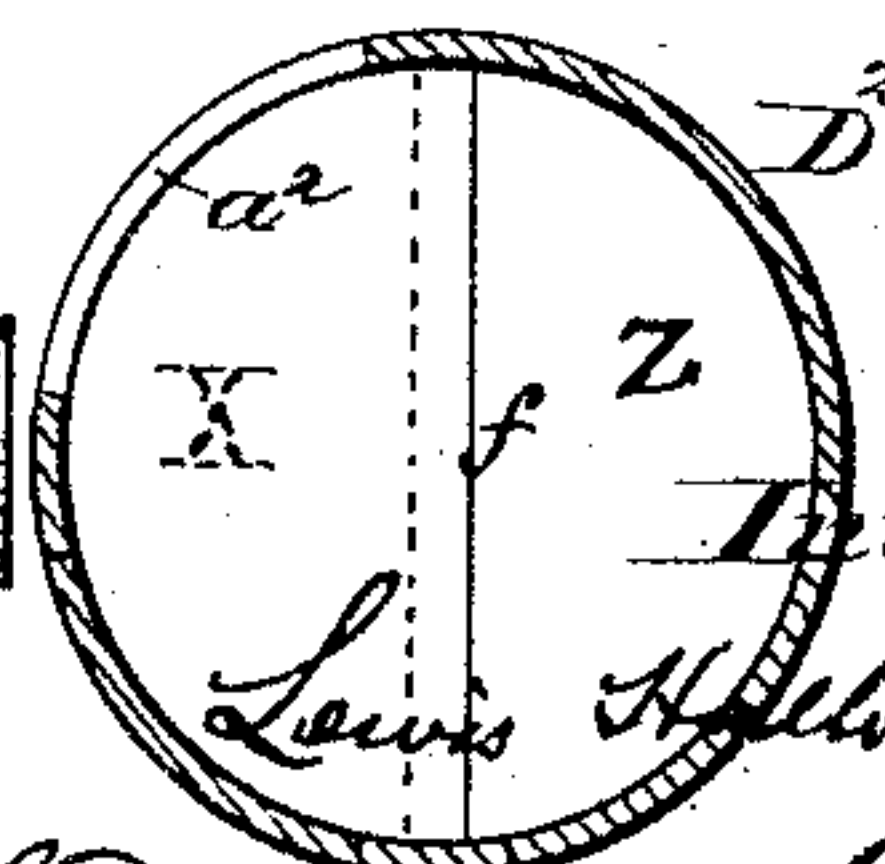


Fig. 9.



Witnesses

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Fig. 3.

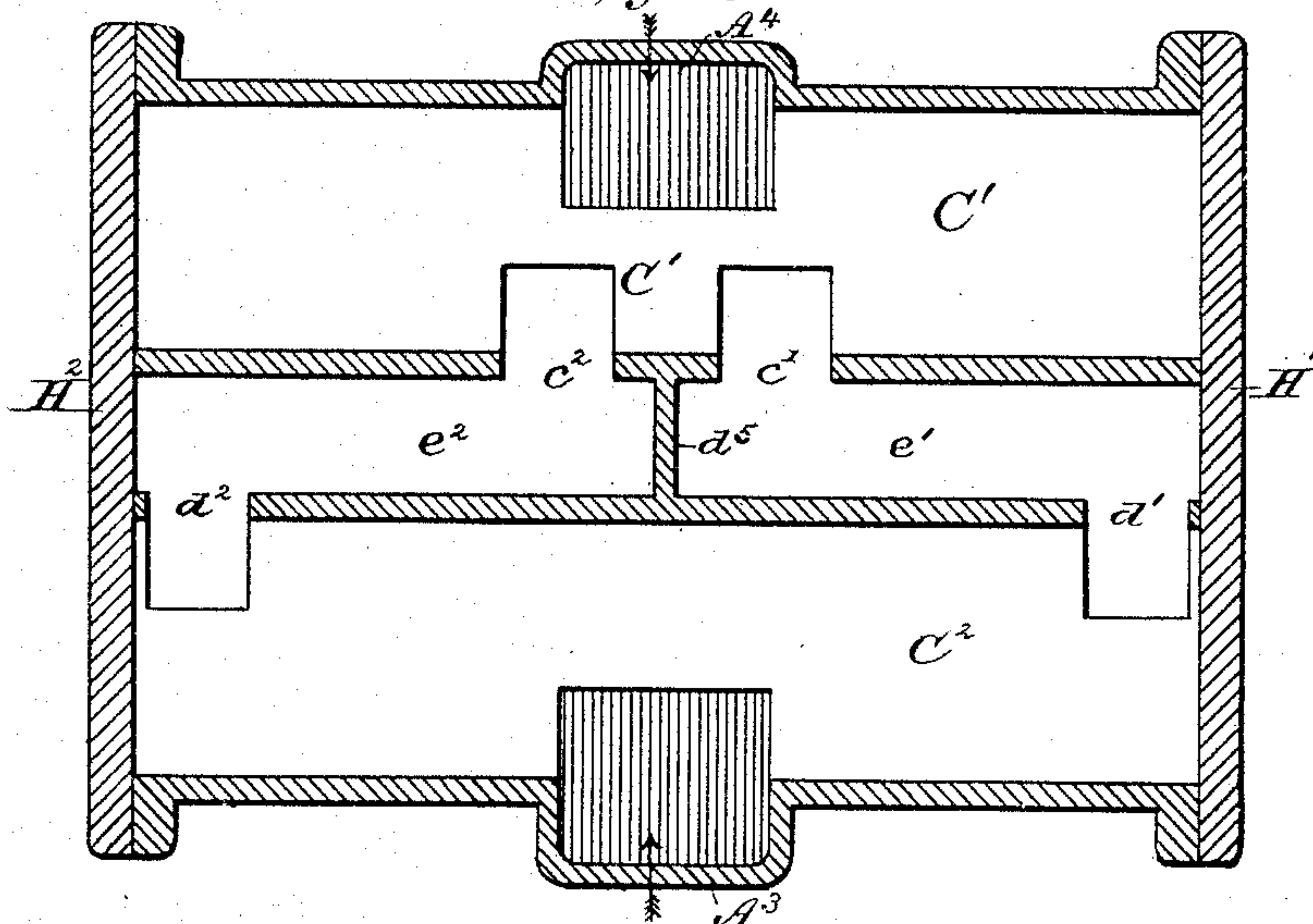


Fig. 4.

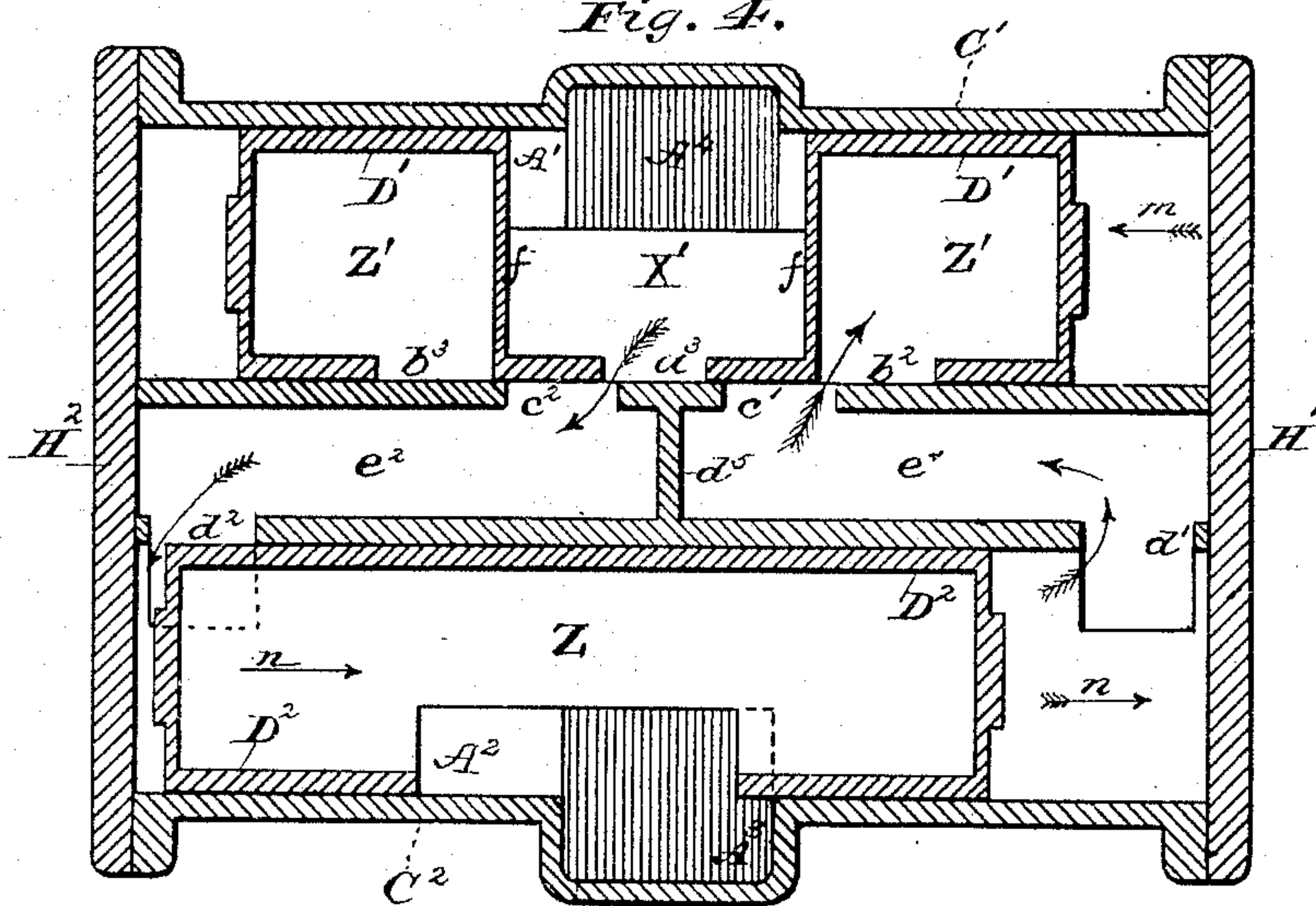


Fig. 8.

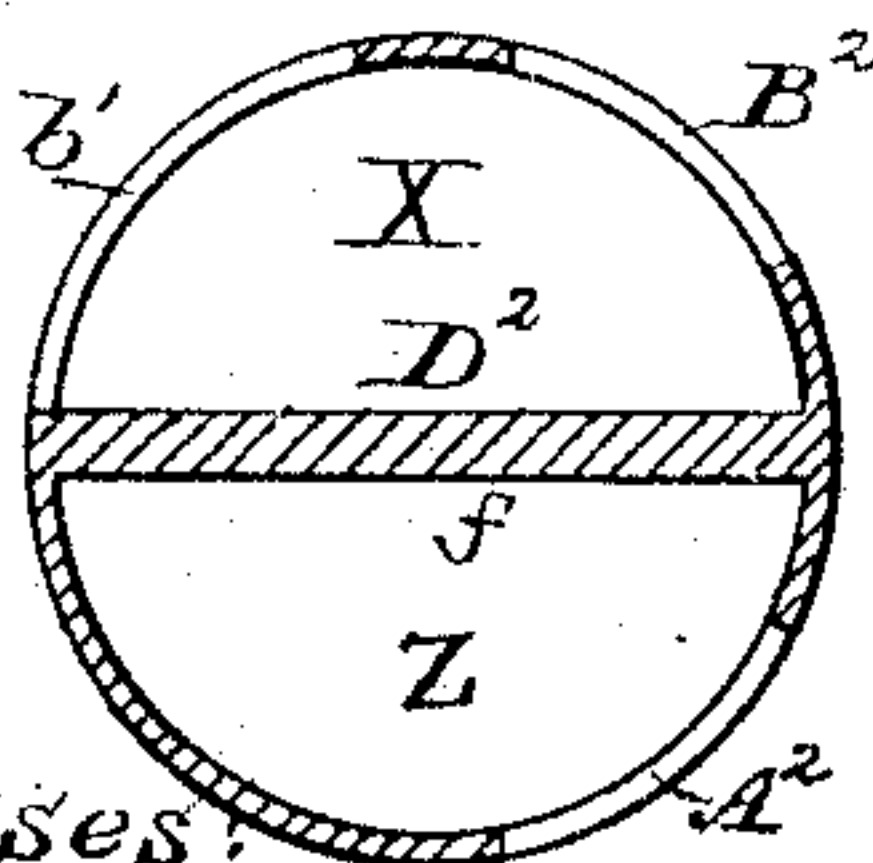
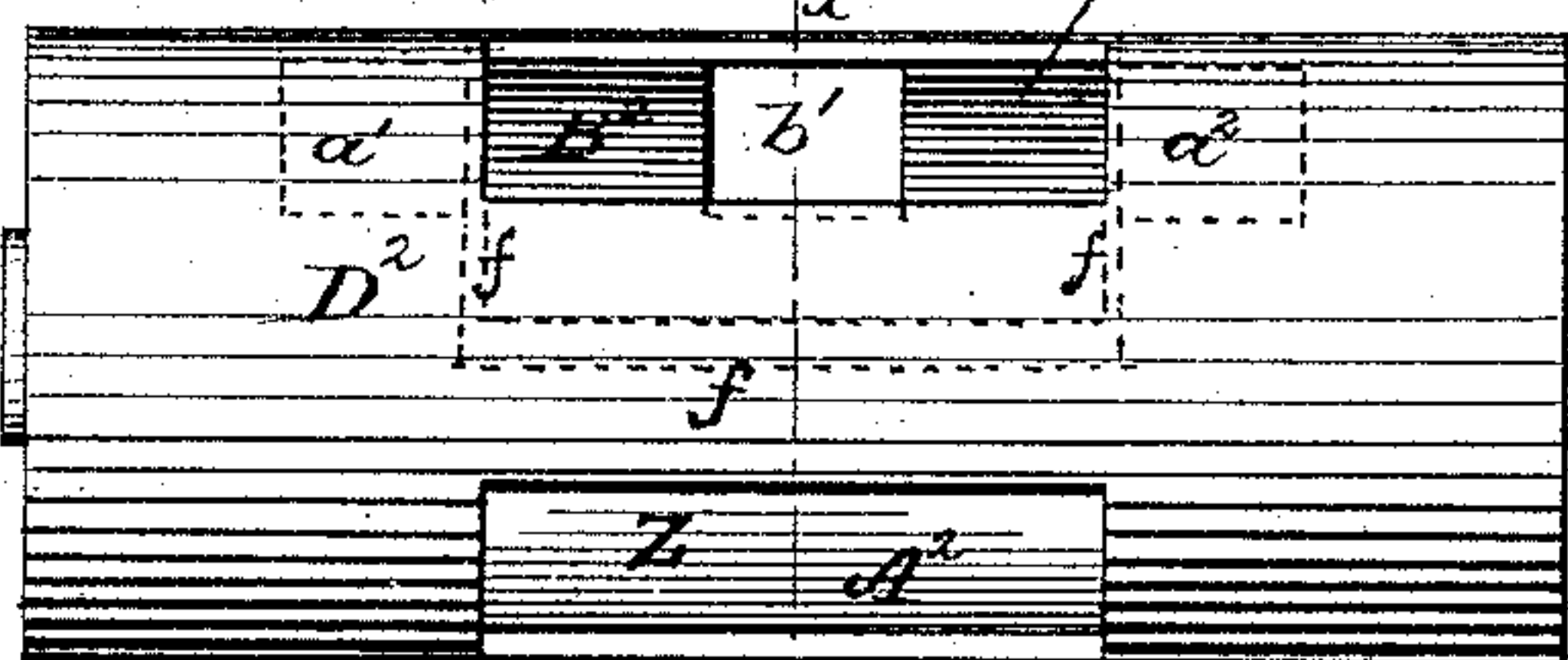


Fig. 7.



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3 Sheets—Sheet 3.

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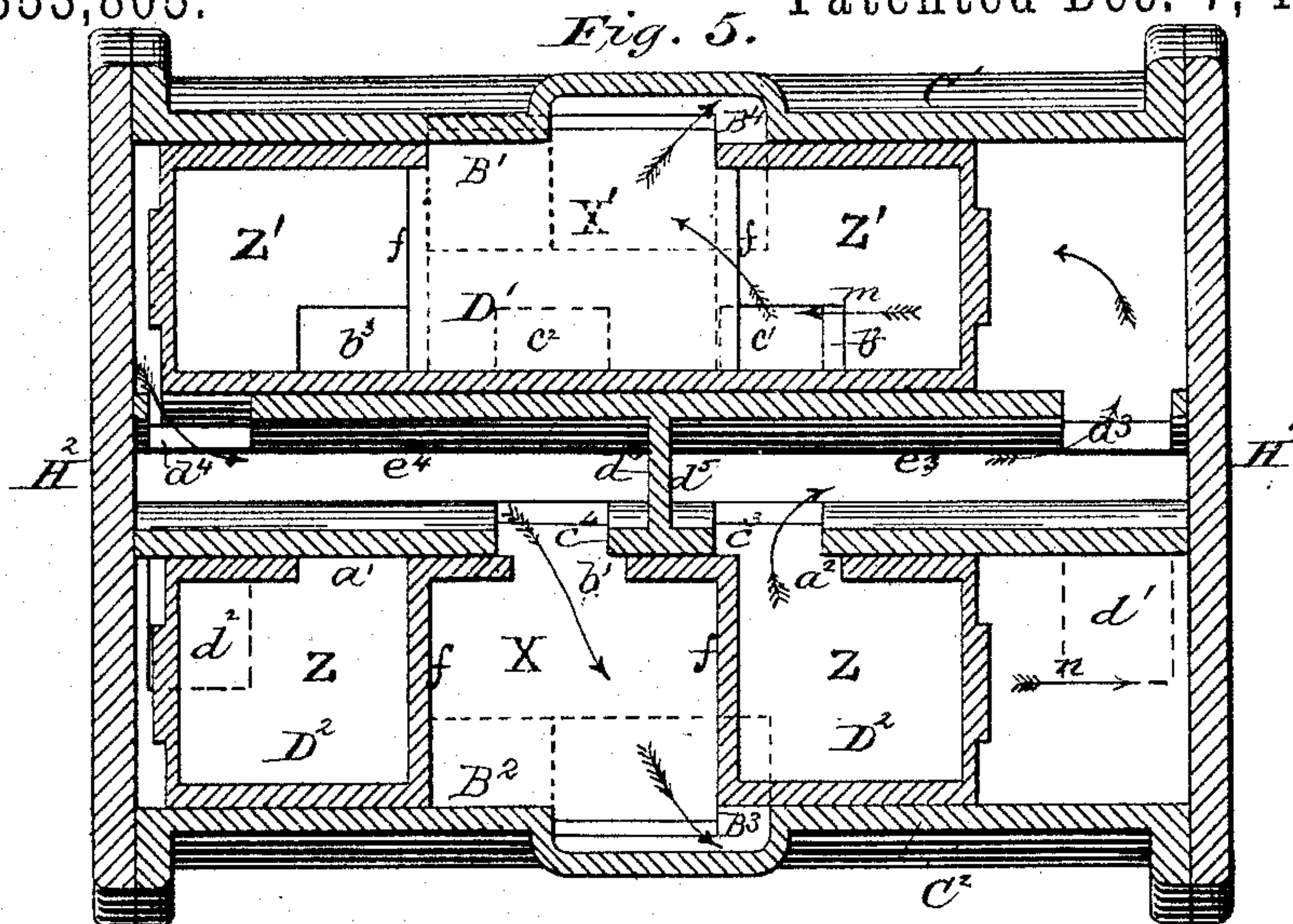
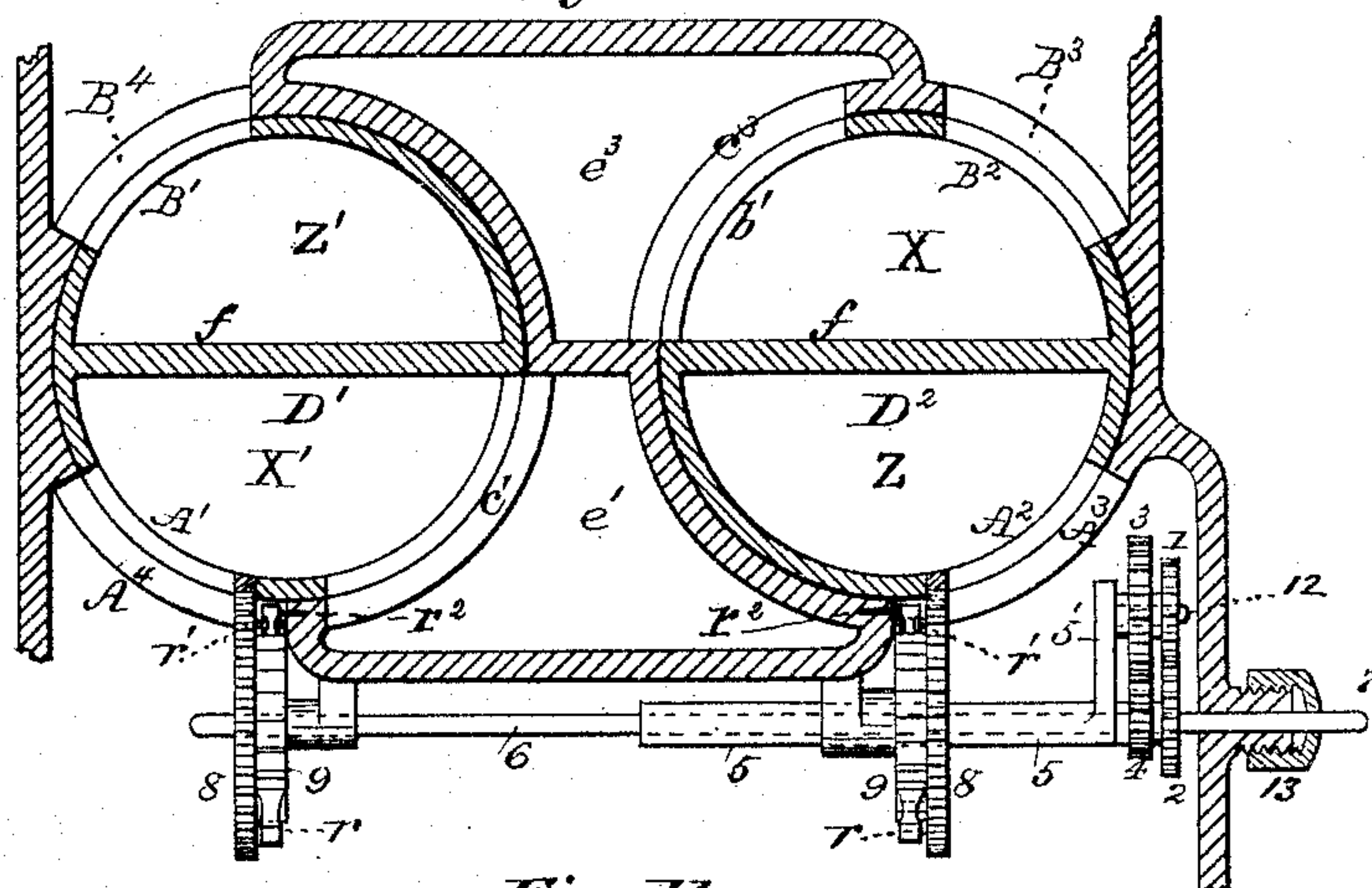


Fig. 10.



B^2 *Fig. 11.*

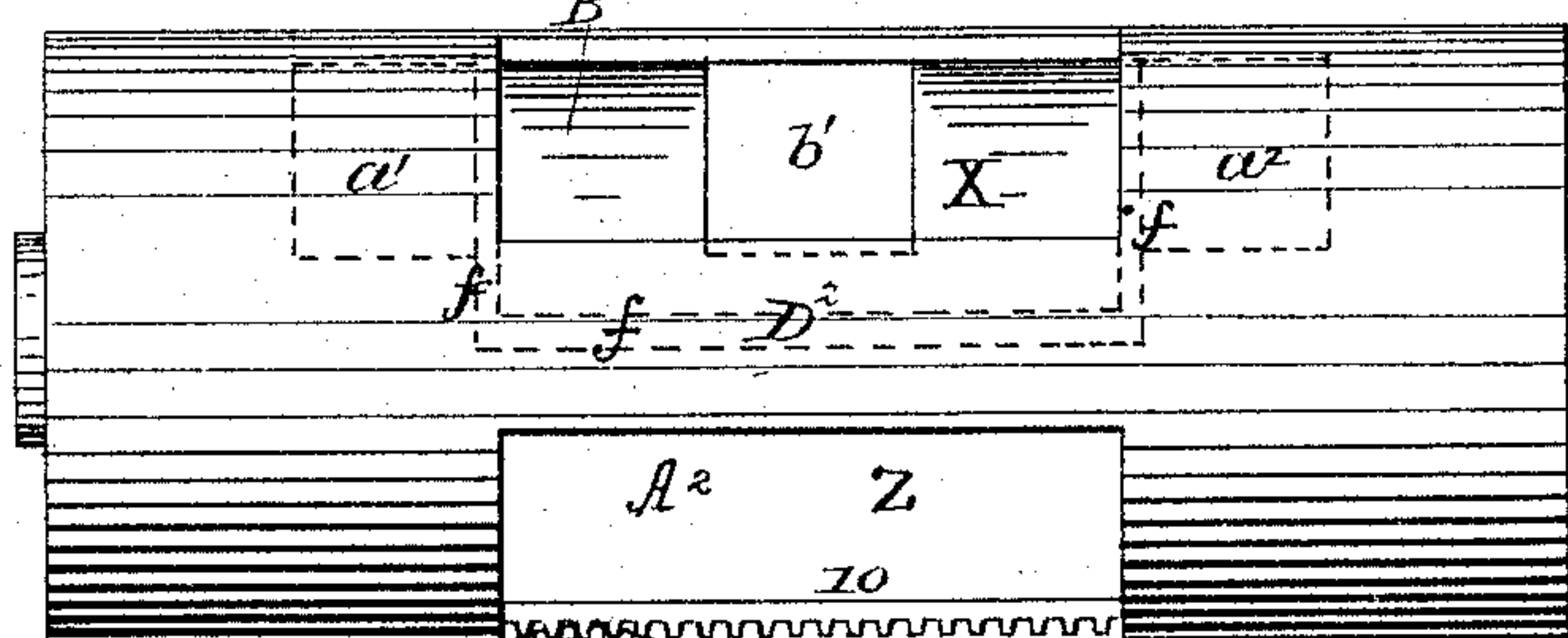
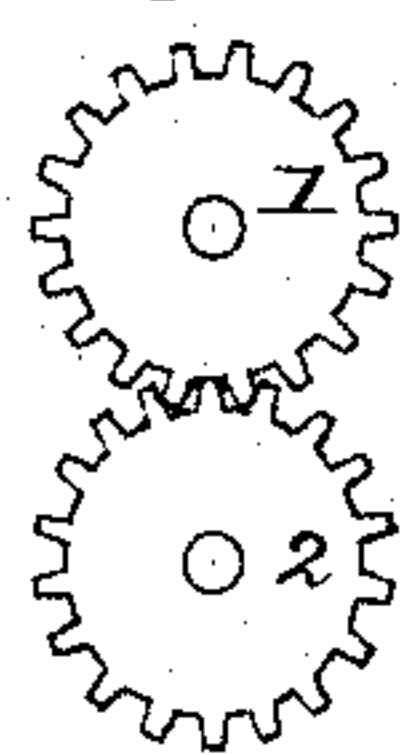
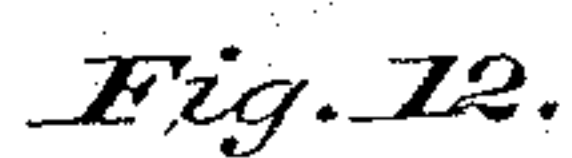
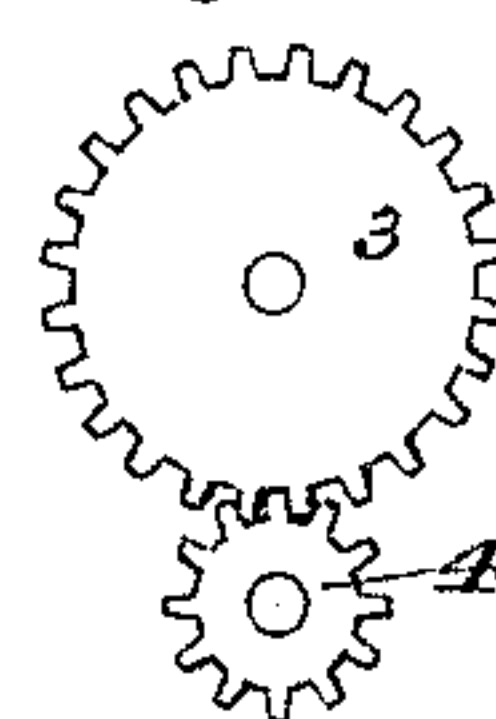


Fig. 13.



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UNITED STATES PATENT OFFICE.

LEWIS HALLOCK NASH, OF BROOKLYN, ASSIGNOR TO THE NATIONAL
METER COMPANY, OF NEW YORK, N. Y.

REGISTER-CONNECTION FOR PISTON METERS.

SPECIFICATION forming part of Letters Patent No. 353,805, dated December 7, 1886.

Application filed December 29, 1883. Serial No. 115,963. (No model.)

To all whom it may concern:

Be it known that I, LEWIS HALLOCK NASH, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Piston Water-Meters, of which the following is a specification.

My invention relates to improvements in that class of water-meters in which two reciprocating hollow pistons provided with suitable inlet and outlet ports and arranged in a shell or case serve to measure the water admitted and discharged therefrom; and the objects of my improvements are to dispense with the mechanism by which the pistons are usually operated, to provide for a free reciprocation of the pistons by the action of the flowing water, to control the speed and the extent of the stroke of one piston by the action of the other, and to effect an accurate measurement of the water without regard to the extent of the movement of either piston.

An important matter of my invention consists in decreasing the motion of the free pistons at the end of the stroke, and thereby prevent them from striking the cylinder-heads.

In connection with the free pistons a registering device is adapted to measure the extent of their movements; and my invention also consists in certain details of construction and of combinations, which will be more fully described hereinafter, and particularly pointed out in the claims.

Referring to the accompanying drawings, Figure 1 represents a cross-section of the meter upon the line $z z$ of Fig. 2, which is a vertical longitudinal section on the line $w w$ of Fig. 1. Fig. 3 represents a longitudinal horizontal section on the line $x x$ of Fig. 1, showing the meter shell or case with the pistons removed. Fig. 4 is a similar section on the same line, with the pistons in position; Fig. 5, a similar section on the line $y y$ of Fig. 1, with the piston in place. Figs. 6, 7, 8, and 9, Sheets 1 and 2, represent one of the pistons in elevations and cross-sections. Figs. 10, 11, 12, and 13 show the registering apparatus, on an enlarged scale, in its relation to the free operating pistons.

As the figures in the drawings are shown,

the meter is supposed to be in a horizontal position.

The case or shell has an inlet-opening, A, connected to a branch passage leading toward the outer lower side of the two cylinders $C' C^2$, with which it communicates by the inlet-ports A^3 and A^4 . These cylinders are placed side by side and have an intervening divided passage communicating with the outer opposite ends of the cylinders by ports d', d^2, d^3 , and d^4 , and in such manner that port c' , Figs. 1 and 3, of cylinder C' leads to port d' of cylinder C^2 through passage e' , port c^2 leads to port d^2 by passage e^2 at the opposite end of the cylinder, similarly port c^3 of cylinder C^2 , Figs. 1 and 5, communicates with port d^3 of cylinder C' by passage e^3 , and port c^4 with port d^4 of cylinder C' by passage e^4 .

The pistons $D' D^2$, which are entirely free—i. e., without any mechanical operating connections—reciprocate by the inflowing water in the cylinders $C' C^2$, and are so placed as to operate to admit and discharge the water at the proper time. These pistons are hollow, and are divided by a partition, f , at their center, similar to that in the ordinary D-valve. The piston D^2 has at its outer side a port, A^2 , communicating with the port A^3 in the cylinder, and at the side facing the intermediate passage a port, b' , and two side ports, $a' a^2$. The piston D^2 has a receiving-chamber, Z, which always has communication through the inlet-ports $A^2 A^3$ with the inlet-passage A, and a central outlet-chamber, X, Figs. 1, 2, and 5, which is formed by the partition f , and constantly communicates through the ports $B^2 B^3$ with the outlet-passage B, Fig. 1. The receiving-chamber Z communicates by the valve-ports $a' a^2$ with the cylinder-ports $c^3 c^4$, Fig. 5, and the outlet-chamber X has the port b' , which communicates with the cylinder-ports $c^3 c^4$ in the movement of said piston. The piston D' is identical in construction with piston D^2 , but is reversed in position in its cylinder, as seen in Fig. 1.

Referring to the position of piston D^2 , as shown in Figs. 1, 4, and 5, the water enters through the passage A, and is admitted by the ports $A^4 A'$ to the piston-inlet chamber X, from whence it is admitted by its port a^3 to the cylinder-ports $c' c^2$, Fig. 4, which commu-

5 nicate with the opposite ends of cylinder
 C² in the movement of the piston. In the op-
 eration of piston D' the water is discharged
 from the opposite ends of cylinder C², through
 the cylinder-ports c' c², into the chamber Z' of
 piston D' by its ports b² b³, from whence it es-
 10 capes into the outlet-passage B through the
 ports B' and B⁴, which are always in commu-
 nication with said passage. When the pistons
 are in the positions shown in Fig. 5, the water
 enters through port A², Fig. 1, into inlet-
 chamber Z of piston D², and through port a²,
 cylinder-port c³, to passage e³, port d³, and to
 15 the outside end of piston D', which it forces in
 the direction of the arrow m. The water in
 front of the piston D' is then forced out of
 cylinder C' by the port d⁴, passage e⁴, port c⁴,
 into outlet-chamber X of piston D², from
 whence it passes through ports B² B³ into and
 20 through the outlet-opening B.

The piston D' is precisely the same as piston
 D², its position being inverted, and it commu-
 nicates in a similar manner, by means of the
 ports and passages, as does piston D²—i. e.,
 25 the water enters, Fig. 1, through port A' of
 piston D', to the receiving-chamber X', and is
 admitted by port a³, Fig. 4, of piston D' to
 passage e², through port c², and to the outside
 end of piston D², which forces it in the direc-
 30 tion of the arrow n. The water in front of
 the piston D², Fig. 4, is forced out of cylinder
 C², by the port d', passage e', port c', to port b²,
 into the chamber Z' of piston D', through port
 B', Fig. 1, into the branch passage, and through
 35 the outlet-opening B. As the free piston D',
 Fig. 5, approaches the end of its stroke, it be-
 gins to close the port d⁴, thus retarding the es-
 cape of the water therefrom, and the speed of
 said free piston will gradually be decreased, as
 40 the port d⁴ is closed, until it comes to rest against
 the cylinder-cover H² without shock. The
 free piston D' should not entirely close the port
 d⁴, but close it sufficiently to prevent a sudden
 stoppage of said free piston, the amount of
 45 such opening being determined by use. It
 should also be opened sufficiently to allow the
 water to enter at d⁴, when the free piston shall
 have reversed the flow, so as to facilitate its
 starting readily on the return-stroke.

50 As shown in Fig. 4, the free piston D² is
 just beginning its return-stroke; the water, en-
 tering at d², moves the piston in the direction
 of the arrow n, the port d² will be opened
 wider and wider, and the free piston moves
 55 faster until its greatest speed is gained. When
 both ports d² and d' are uncovered, it will be-
 gin to close port d', gradually reducing its
 speed until it is gently brought to rest upon
 the case-head H'. It will be thus seen that
 60 by the operation of the ports d', d², d³, and d⁴
 the free pistons start from their rest with a
 gradually-accelerated motion, and are grad-
 ually retarded at the end of the stroke until
 brought to rest without any shock.

65 Both cylinders and pistons are constructed
 exactly alike, and the pistons reciprocate al-

ternately, thereby allowing a continuous and
 steady flow of water, and according to their
 size measure the quantity of water admitted
 and discharged through them.

70 The operation of the meter is as follows:
 The water enters the case through the inlet-
 opening A, Fig. 1, and passes through the
 branch passage alternately to each side of the
 case, and enters through the inlet-ports A⁴ A³
 75 into the pistons, chambers Z X', by the ports
 A' A², and passes thence, by the piston-ports
 a' a² of piston D² and a³ of piston D', into the
 corresponding cylinder-ports in the operation
 of the pistons. The arrows m and n indicate
 80 the direction of the motion of the free pistons,
 while the other arrows indicate the direction
 of the current of water. The free pistons be-
 ing in the position shown in Fig. 5, the water
 from the chamber Z of the free piston D²
 85 passes through the port c³, passage e³, and port
 d³, behind the free piston D', and forces it in
 the direction of the arrow m, the water escap-
 ing from the other end of the cylinder C' by
 the port d⁴ through the passage e⁴, port c⁴, to
 90 port b' of the piston D² and outlet-opening
 B³, which it reaches through the branch pas-
 sage B², leading thereto.

Each piston is provided with a rack, 10,
 placed below the circumference, and into said
 95 racks gear-wheels 8 8 mesh. The wheels 8 8
 are placed loosely on transverse shafts 5 6,
 which are journaled in lugs cast on the case
 in the inlet branch passage. One wheel 8
 is placed on the hollow shaft 5, while the other
 100 wheel 8 revolves on the solid shaft 6, which
 passes through said hollow shaft. The ratchet-
 wheels 9 9 are firmly secured to the shafts 5
 and 6. To each gear-wheel 8 8 are attached
 the double pawls r r, which drive the ratchet-
 105 wheels 9 9, said ratchet-wheels 9 9 being pre-
 vented from rotating in the opposite direction
 by the double spring-pawls r' r', secured to the
 case, and as the pistons reciprocate they re-
 volve the shafts 5 and 6 in the direction of the
 110 arrows. The pawls r' r' prevent the backward
 motion of the ratchet-wheels, and in Fig. 10
 these pawls are shown as being secured to the
 case-frame by pivot-pins r². The hollow shaft
 5 is provided with an arm, 5', having a pin,
 115 12, upon which the gear-wheels 1 and 3 are
 free to revolve, and said gears are secured to
 each other, so as to move together. A gear-
 wheel, 4, is secured to the shaft 6, and another
 wheel, 2, to the short solid shaft 7, and they
 120 mesh, respectively, with the wheels 1 and 3.
 The shaft 7 passes through a suitable stuffing-
 box, 13, which forms a bearing for the shaft, the
 outer end of which is connected with and
 drives the registering mechanism.

125 The operation of the registering apparatus
 is as follows: Supposing the shaft 5 to be sta-
 tionary and the shaft 6 to be moved, then the
 gear 4 will turn, moving the gears 3, to which
 the gear 1 is attached, from whence the move-
 130 ment will be communicated to gear 2, and to
 the extended shaft 7, and as the gears 1 and 2

are of equal diameter, and the gear 3 is double the size of gear 4, as shown, one revolution of the gear 4 will cause half a revolution of the gear 3 and of the extended shaft 7. Now let the shaft 6 be stationary and the shaft 5 revolve, carrying around with it the gears 1 and 3; then one revolution of the shaft 5 will cause half a revolution of the gear 2 and of the extended shaft 7.

10 It will be readily seen that an equal motion of the shafts 6 and 5 will cause an equal movement of the extended shaft 7, and if these two movements take place alternately their movements will each be communicated to the shaft 7, and thereby to the indicator of the meter.

15 While I have described and shown free pistons having valve ports and passages adapted to co-operate with each other and with cylinder ports, so that the valve-ports of one piston will control the admission and discharge of water into and from the other piston, yet the same operation may be effected by free pistons having a different arrangement of ports and passages.

25 I claim—

1. In a water-meter, the combination of the two free actuated pistons with an independent shaft and connecting-gearing for each piston and motion-transmitting gearing connecting each independent shaft with a regis-

tering connecting-shaft, whereby the motion of the two shafts is communicated to the registering mechanism, substantially as herein set forth.

2. The combination, in a water-meter, of two free water-actuated pistons, each having a cog-rack, 10, with an independent shaft, 5 and 6, for each piston, each shaft having a gear, 8, meshing with said piston-racks, a ratchet-wheel, 9, secured to each shaft, fixed pawls 7' for each ratchet-wheel, and motion-transmitting gearing adapted to transmit the motion of the shafts to the registering mechanism, substantially as described.

3. The combination, in a water-meter, of free actuated pistons, each having independent register-connecting mechanism, with an independent register-connecting shaft, and the gearing 1, 2, 3, and 4, whereby the registering mechanism is driven by the motion of the pistons, substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LEWIS HALLOCK NASH.

Witnesses:

A. E. H. JOHNSON,

J. W. HAMILTON JOHNSON.