

No. 883,670.

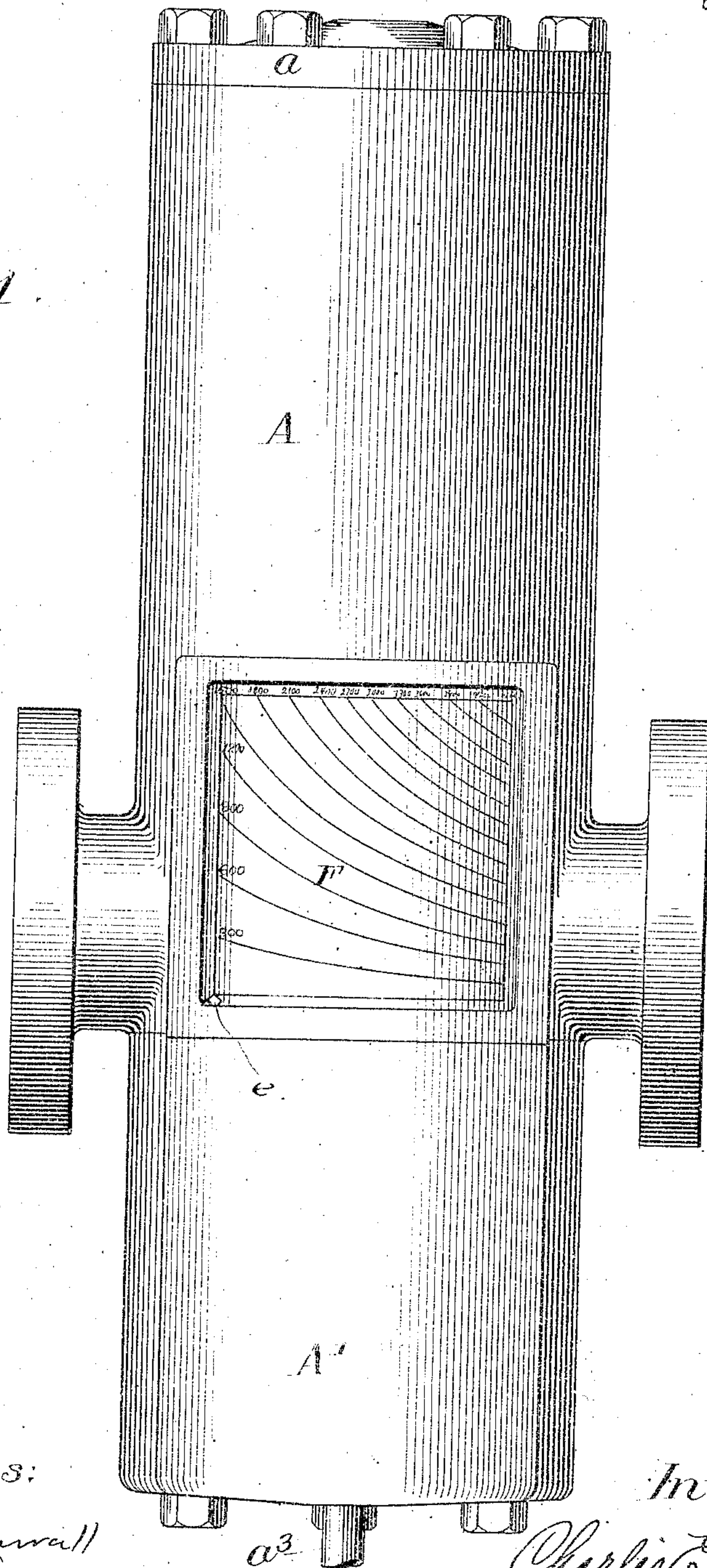
PATENTED MAR. 31, 1908.

C. E. SARGENT.
STEAM METER.

APPLICATION FILED MAY 6, 1905.

5 SHEETS SHEET 1.

Fig. 1.



Witnesses:

A. M. Cornwall
J. E. Sherry.

Inventor:

Charles E. Sargent,
by Bitner, Miles & Sherry
attys.

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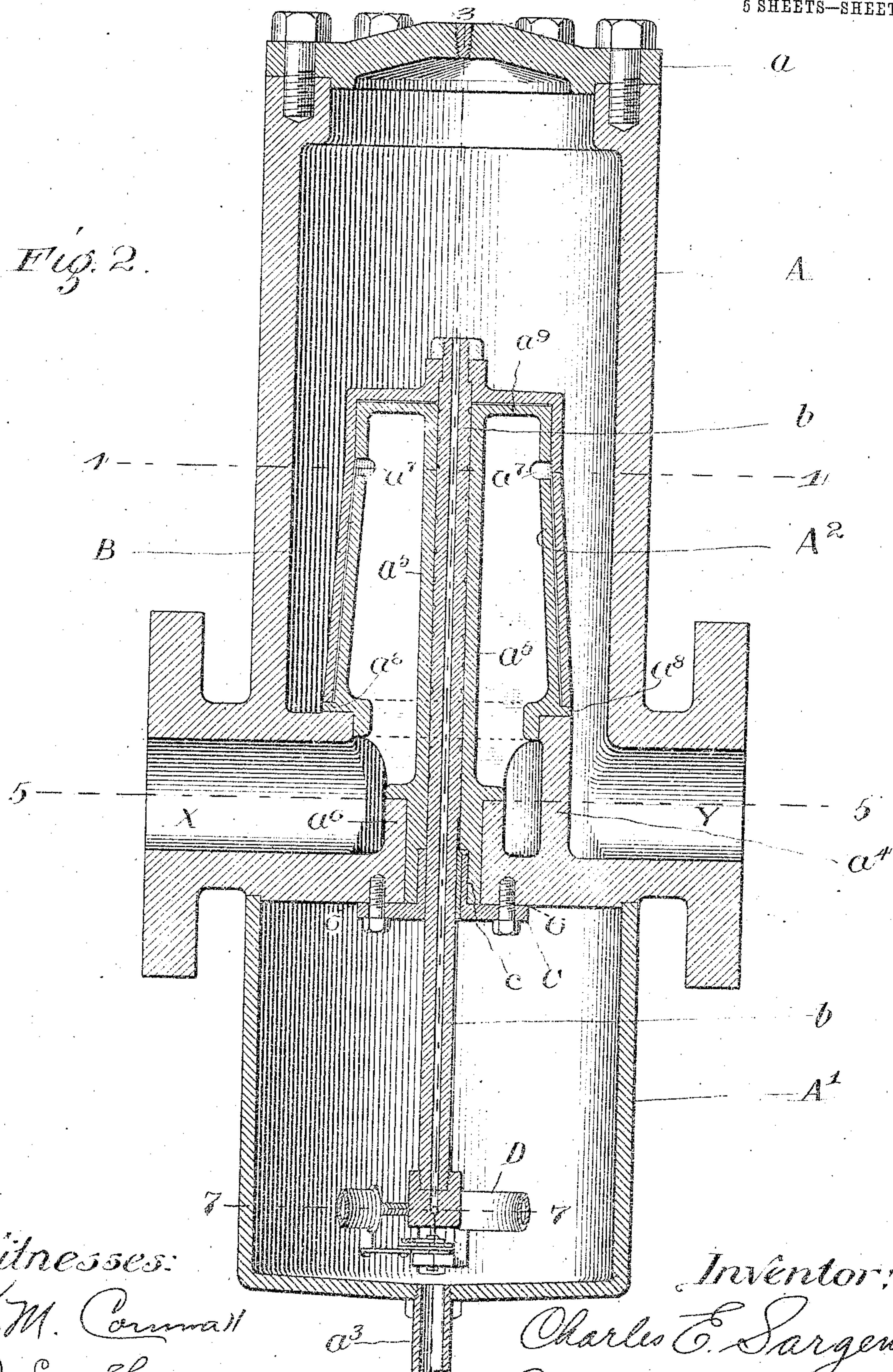
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5 SHEETS--SHEET 2.

Fig. 2.



Witnesses:

A. M. Cornwall

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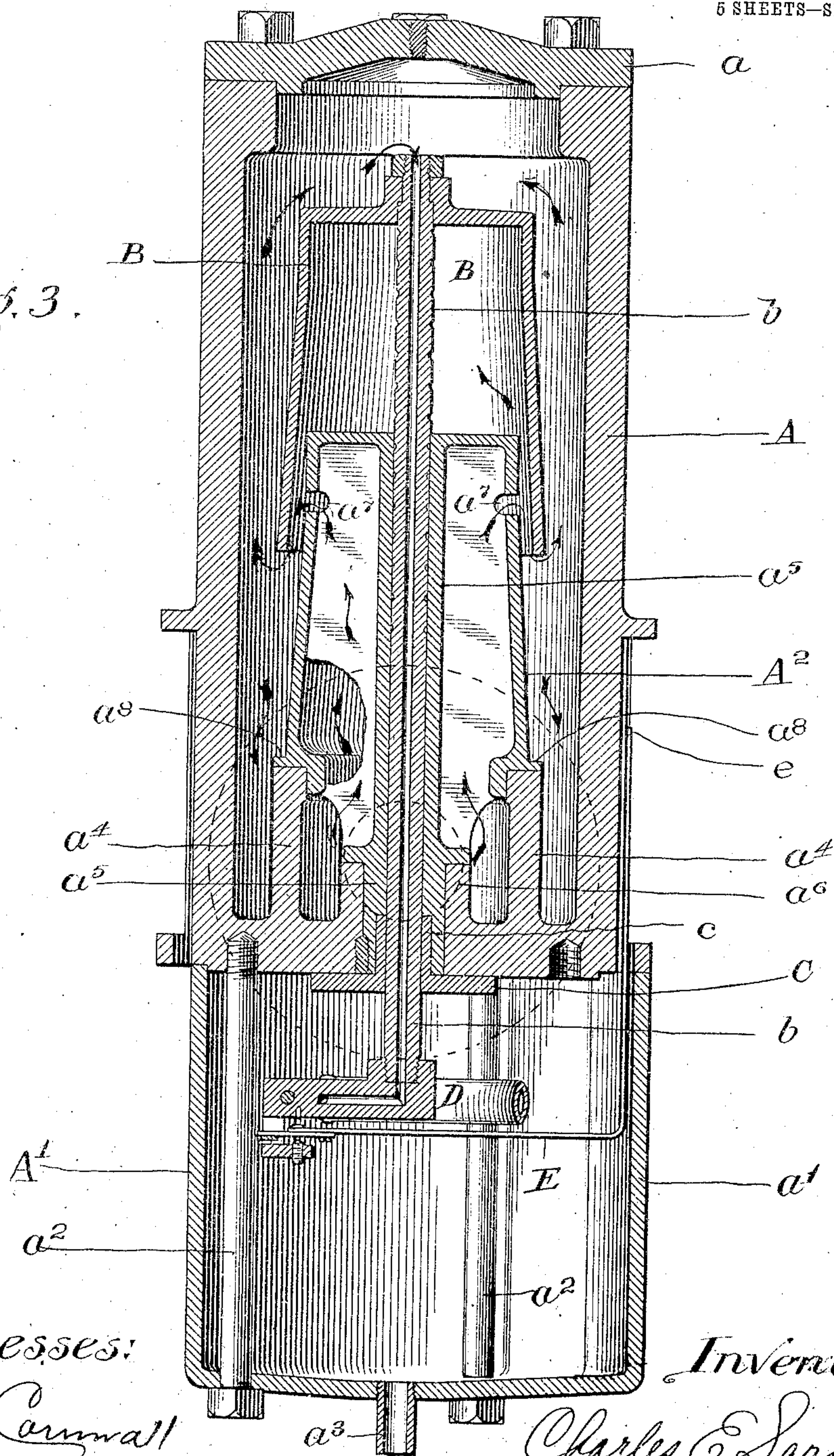
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5 SHEETS—SHEET 3.

Fig. 3.



Witnesses:
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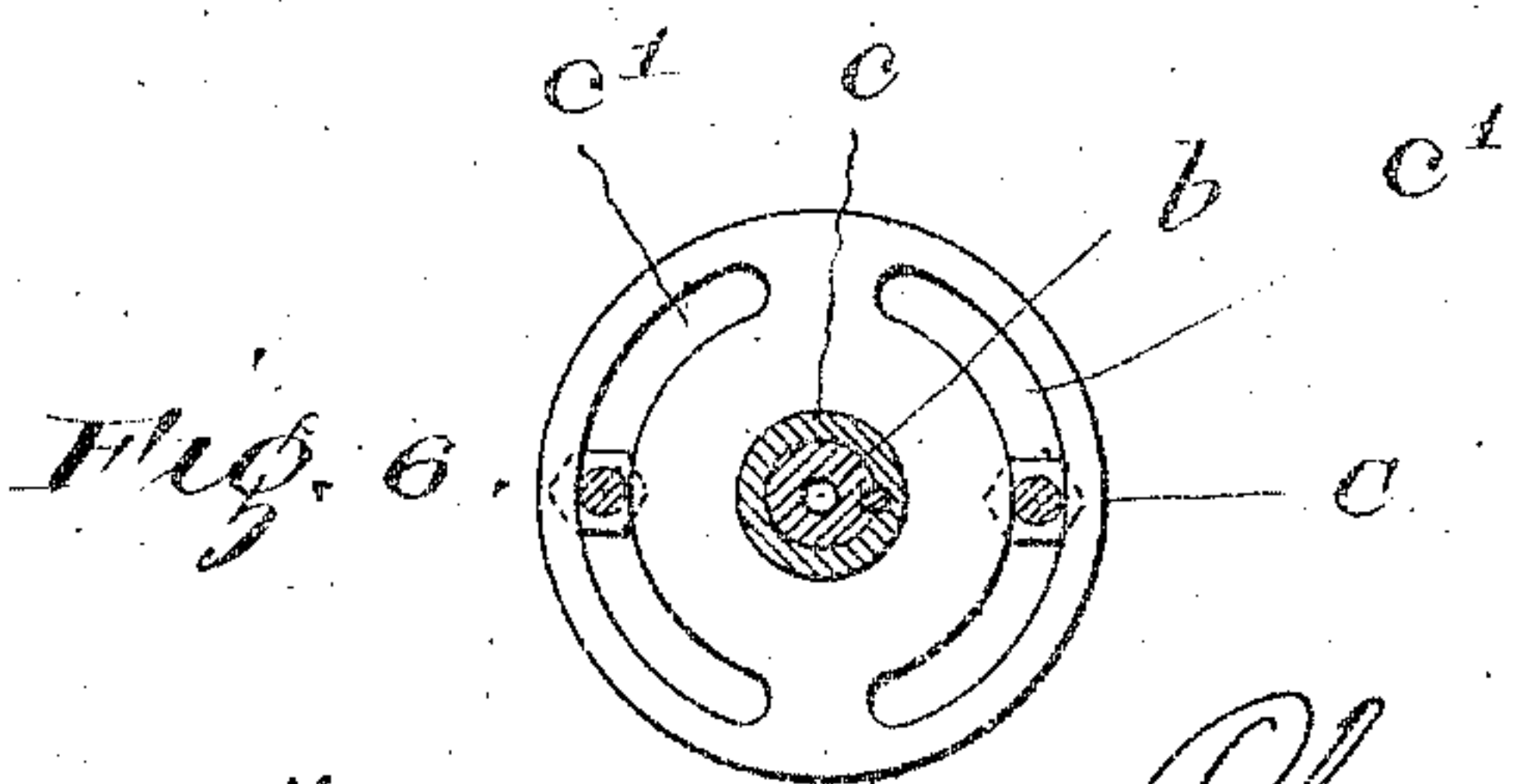
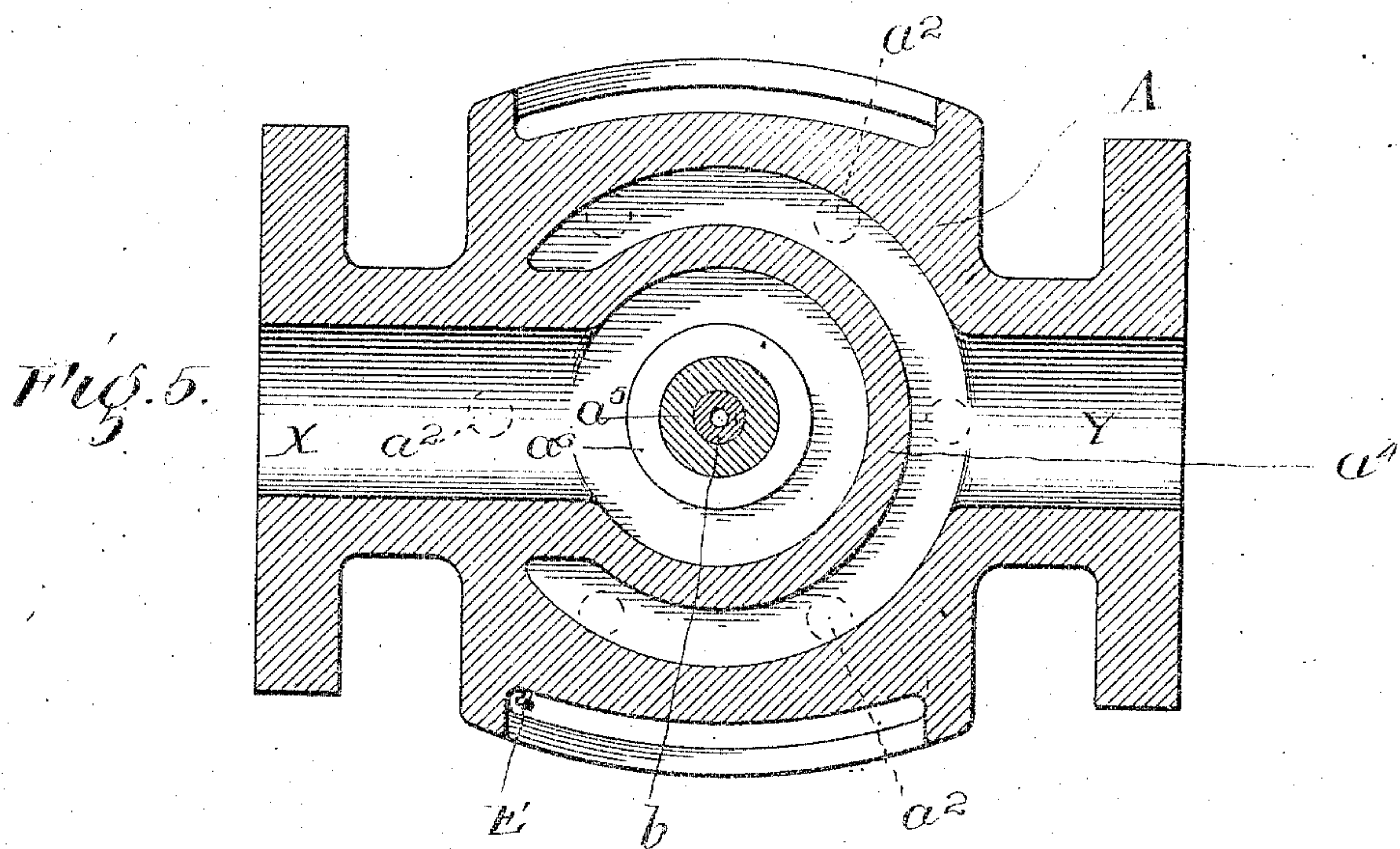
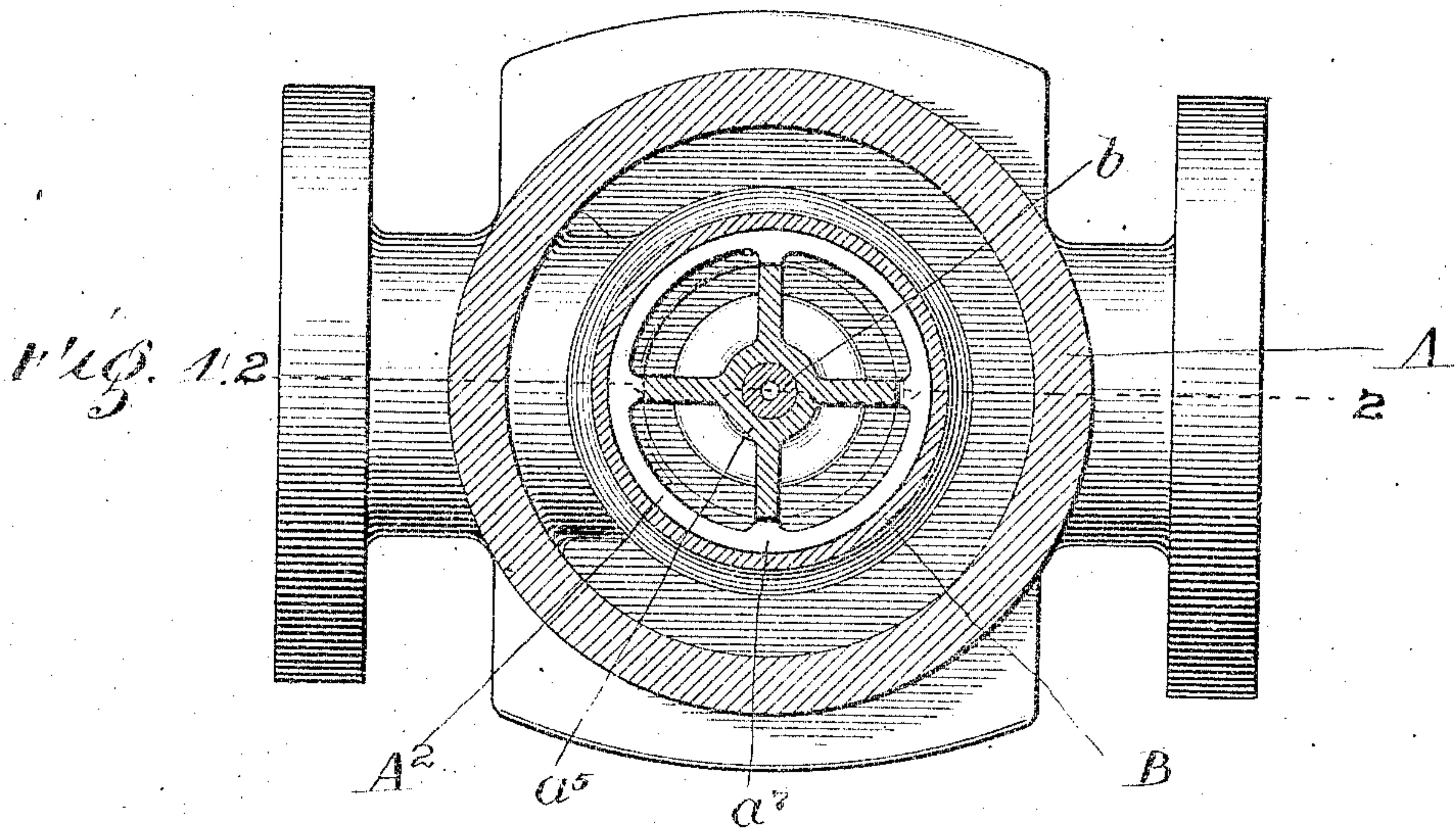
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STEAM METER.

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5 SHEETS—SHEET 4.



Witnesses:
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No. 883,670.

PATENTED MAR. 31, 1908.

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STEAM METER.

APPLICATION FILED MAY 6, 1905,

5 SHEETS—SHEET 5.

Fig. 7.

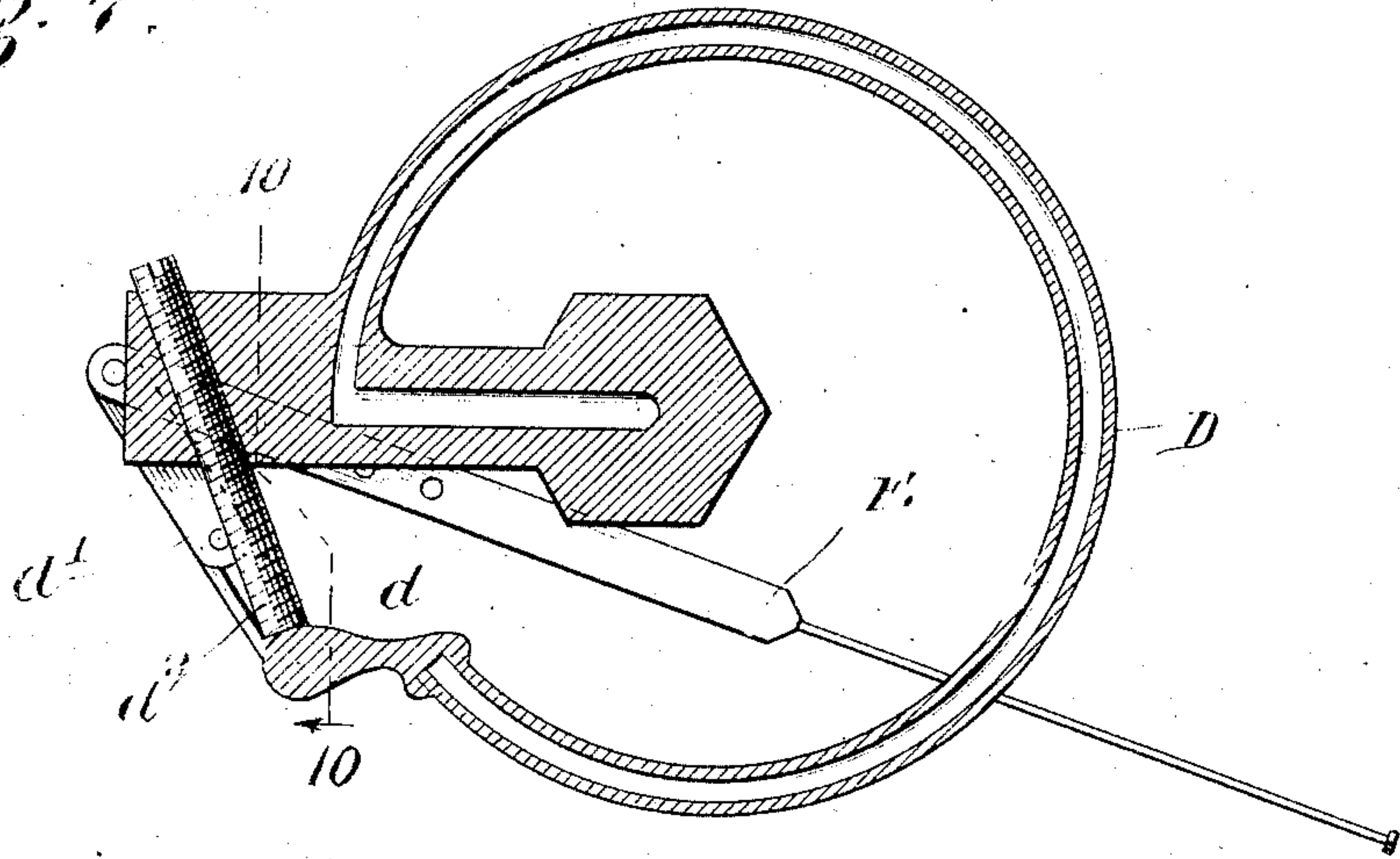


Fig. 8.

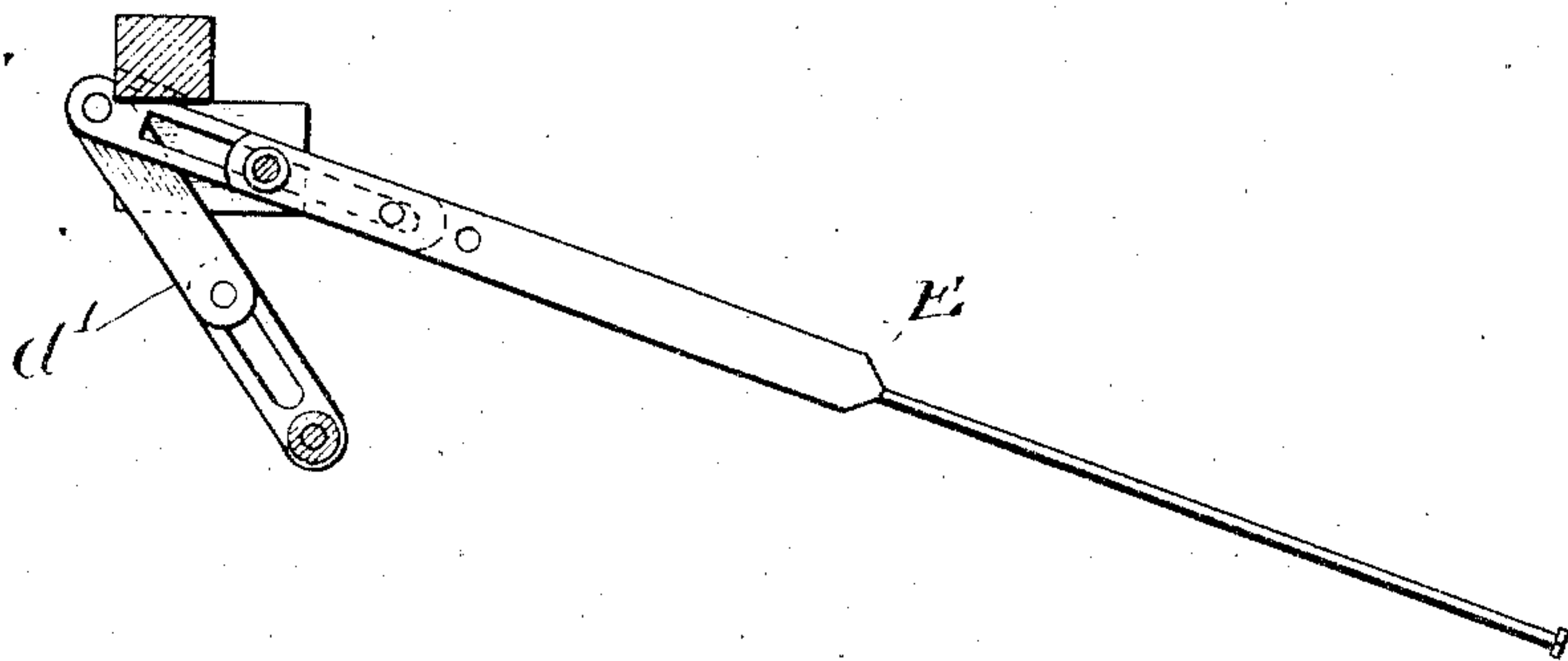


Fig. 9.

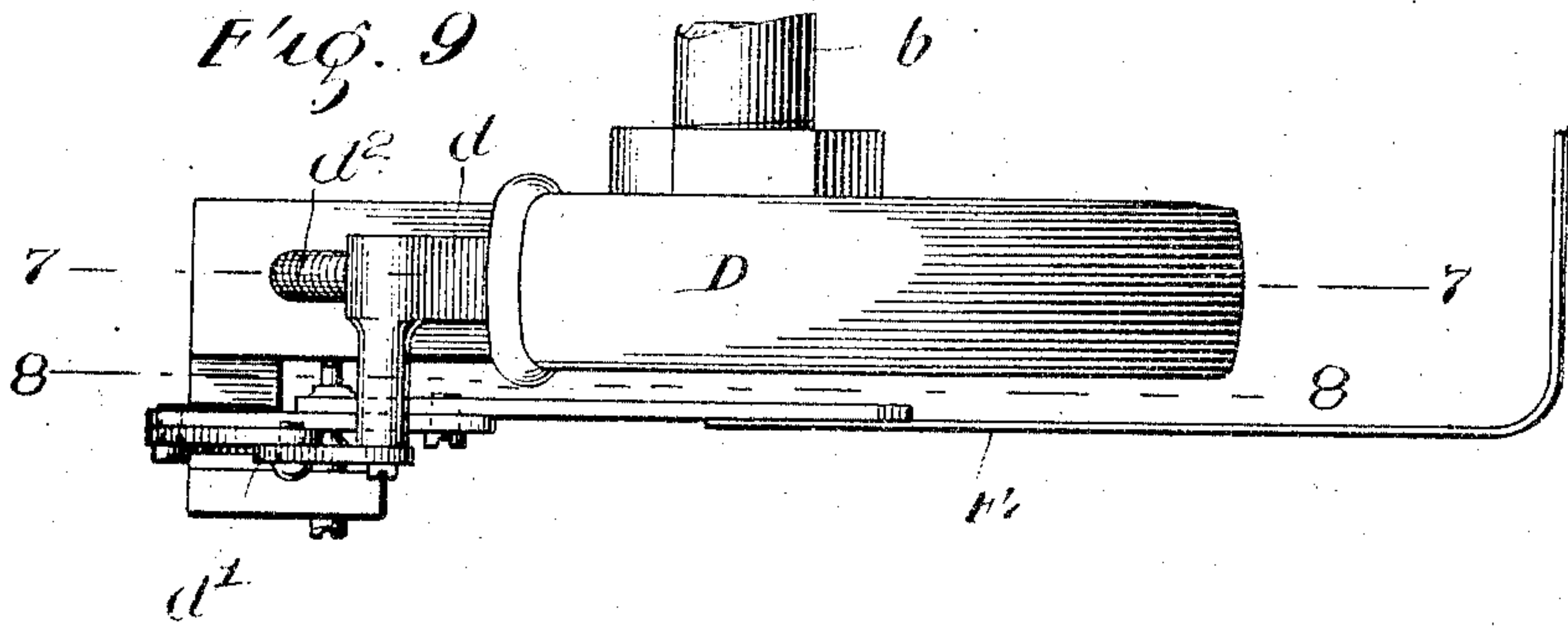
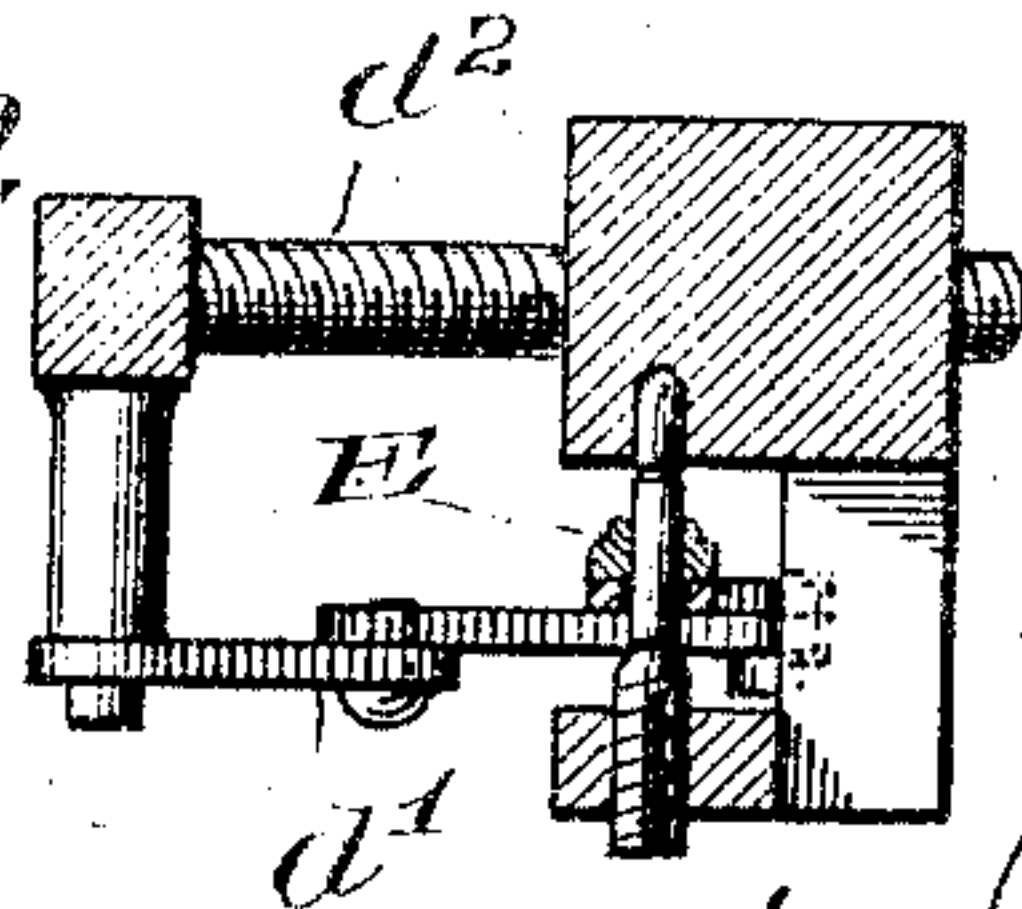


Fig. 10.



Witnesses:

K. M. Cornwall
J. E. Sherry.

Inventor:

Charles E. Sargent,
by Peter, Miles & Sherry
Attys.

UNITED STATES PATENT OFFICE.

CHARLES E. SARGENT, OF CHICAGO, ILLINOIS.

STEAM-METER.

No. 883,670.

Specification of Letters Patent.

Patented March 31, 1908.

Application filed May 6, 1905. Serial No. 259,083.

To all whom it may concern:

Be it known that I, CHARLES E. SARGENT, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Meters, of which the following is a specification.

My invention relates to improvements in steam meters and is fully described and explained in this specification, and shown in the accompanying drawings, in which

Figure 1 is an elevation of my improved device; Fig. 2 is a central longitudinal section on line 2—2 of Fig. 4 showing the device in the position it occupies when no steam is passing through it; Fig. 3 is a section in the line 3—3 of Fig. 2, showing the parts in the position which they occupy when steam is passing through the meter; Fig. 4 is a section in the line 4—4 of Fig. 2; Fig. 5 is a section in the line 5—5 of Fig. 2; Fig. 6 is a section in the line 6—6 of Fig. 2; Fig. 7 is a section in the line 7—7 of Fig. 2 on an enlarged scale; Fig. 8 is a horizontal section in the line 8—8 of Fig. 9; Fig. 9 is an elevation of the pressure-indicating-portion of the device looking in the same direction as in Fig. 3, and Fig. 10 is a section in the line 10—10 of Fig. 7.

My present device is intended as an improvement over a similar device shown in my Patent No. 729,511, dated May 26, 1903. In the device of said patent the construction is such that the poppet valve rises but a short distance in all, and as a result, it is necessary to use, instead of a simple direct connection between the puppet valve and the needle, a multiplying device which will give the needle a considerable amplitude of movement. Furthermore, the pressure-indicating device has but small total movement and it is, therefore, necessary to multiply its movement.

My present invention consists in substituting for the puppet valve of my prior patent a puppet valve so constructed as to move through a long space and to combine with it a sensitive pressure-indicating device so that all multiplying means are dispensed with.

Referring to the drawings, A, is a suitable valve casing provided with an upper removable head, a . Below the casing, A, and secured thereto is a cup, A^1 , which is cylindrical in form, but which has a forward projection, a^1 . The cup is secured to the casing, A, by bolts, a^2 , here shown as three in num-

ber and six corresponding holes are provided in the casing to receive the ends of the bolts so that the cup can be turned around for a purpose which will hereafter appear. The cup, A^1 , is provided with a small outlet pipe, a^3 , which communicates with a surge tank or sewer.

The casing, A, is provided with a partially cylindrical partition, a^4 , inclosing a chamber into which opens an induction port, X, and secured to the top of this partition, a^4 , is a frusto-conical, hollow, downwardly-open cup, A^2 , provided with a central hollow boss, a^5 , secured to a corresponding boss, a^6 , in the bottom of the valve-casing, A. The hollow frusto-conical cup, A^2 , communicates with the space inside the partition, a^4 , and this cup and partition divides the valve-casing into induction and eduction chambers, the induction chamber being that space within said cup and wall, and the eduction chamber being that space within the casing and outside the same. An eduction port, Y, communicates with the eduction chamber. The eduction and induction chambers are connected by a horizontal slot, a^7 , near the top of the frusto-conical cup, A^2 . A frusto-conical valve, B, fits over the frusto-conical cup, A^2 , and seats on a shoulder, a^8 , at the lower edge of said cup. A perforation, a^9 , at the top of the frusto-conical cup, A^2 , admits pressure to the end of the valve, B. A hollow valve stem, b , extends through the boss, a^5 , guiding the valve, and said stem is keyed against rotation in a boss, c , projecting upwards from a plate, C, secured to the bottom of the valve casing, A. This plate, C, is best seen in Fig. 6, and it will be noted that it is provided with slots, c^1 , through which the attaching screws extend, whereby it may be angularly adjusted.

Secured to the lower end of the hollow valve stem, b , is a Bourdon spring, D, the curve of which lies in a horizontal plane and the hollow of which communicates with the hollow of the valve stem, so that pressure from the top of the valve, B, will be transmitted to said spring. The free end, d , of the Bourdon spring is connected by an adjustable link, d^1 , to one end of a needle, E, pivoted between its ends. Movement of the spring is limited in one direction by an adjustable screw or stop, d^2 . It will be seen that an increase of pressure in the meter will straighten the Bourdon spring and will consequently move the point of the needle up-

wards as seen in Figs. 7 and 8, or to the right in the machine as set up. The needle, E, is carried upwards in the forward projection, a^1 , of the cup, A¹, the said needle terminating in an indicating point, e, which when the device is not subject to pressure, stands just above the lower edge of the casing and in front of a dial, F, on the front of the casing, A.

The operation of my improved device is substantially as follows: Starting with the parts as shown in Fig. 2, if vapor under pressure is introduced at the induction port, X, it will pass up through the frusto-conical cup, A², and reach the lower surface of the valve, B, which it will raise. As the valve rises, pressure on the eduction side thereof will increase and the valve will finally cease to rise when the pressure on the two sides becomes equal. When this point is reached it will be found that the absolute pressure in the induction chamber is greater than that in the eduction chamber, because the area of the valve exposed to pressure in the induction chamber is less than the area of the valve exposed to pressure in the eduction chamber. In other words, a given pressure in the eduction chamber will balance a slightly greater pressure in the induction chamber. As the valve areas exposed in the two chambers bear a constant relation to each other, the absolute difference in pressure on the two sides of the valve will constantly vary for various absolute pressures, but the ratio between the pressures on the opposite sides will be constant. It is a well known law of gases, that the greater the difference in the pressure between the two sides of a given opening, the greater the weight of gas which will pass through, or to put the matter in another way, if the absolute pressure is kept constant on one side, the greater the difference in pressure between the two sides of the opening, the greater the volume which will pass through. This is substantially what is indicated by vertical rise of the valve of my improved device. If the absolute pressure on the eduction side of the device be kept constant and still the valve rises this means that a greater volume of gas or steam is passing through. Owing to the peculiar form of the valve of my improved device, the valve is not fully opened until a very considerable vertical movement has taken place, and as a result, a scale can properly be drawn which will show the volume passing through by direct reading from the valve without the interposition of any movement-multiplying device. It will be seen that as the valve rises, the needle moves upward at the same speed so that when the valve reaches the top limit of its movement the indicating point on the needle has reached the top of the dial.

To indicate weight of steam it is necessary not only to consider volume, but absolute

pressure, and this is taken care of by the Bourdon spring which is in direct connection through the hollow valve stem with the eduction chamber. It will be evident that if the valve remains stationary, i. e. if the volume remains constant and the absolute pressure increases, the weight will increase. The Bourdon spring is so sensitive that its movements can be read directly on the dial. As the pressure increases the indicating point on the needle swings to the right so that at any moment the position of the indicating point shows the speed with which steam is passing through by weight. The dial is made to read in the number of pounds per hour which is passing through.

Meters of this class are in practice set up in the steam supply pipes of engines or other steam using devices, and the eduction ports must be next the engine. In engine rooms and the like it is frequently the case that the steam pipes run close to the wall so that only one side of the device is visible when set up in this manner. To avoid the necessity of making right and left hand meters the casing, A, is provided with an extra dial at its rear side, so that the meter can be reversed. This is done by removing the cup, A¹, and releasing the plate, C, from engagement with the casing, A. The valve stem and plate, C, can then be turned around so as to bring the needle on the opposite side of the device, after which the plate, C, can be placed in position and the needle adjusted by turning said plate slightly upon its supporting screws. The cup, A¹, is then replaced in reversed position so that the projection, a^1 , is on the opposite side of the device.

I realize that considerable variation is possible in the details of the construction without departing from the spirit of the invention, and I therefore do not intend to limit myself to the specific form herein shown and described.

I claim as new and desire to secure by Letters Patent:—

1. The combination with a casing, of a frusto-conical partition within the same, a passage for the entrance of vapor beneath said frusto-conical partition, a frusto-conical valve seating over said partition and inclosing perforations therein, a device capable of being effected by pressure carried by said valve and having communication with the space within said casing, and an indicator operated by said device.

2. The combination with a casing having inlet and outlet openings, of a frusto-conical partition beneath which the inlet opening enters and between the same and the exhaust opening, a frusto-conical valve seating over said frusto-conical partition and inclosing perforations therein, a hollow valve stem carried by said valve and communicating with the vapor in said casing, and indi-

cating mechanism communicating with the hollow in said valve stem and carried by said valve stem, said indicating mechanism being constructed and arranged to perform an indicating movement with certain of its parts under the influence of pressure, whereby said indicating mechanism is moved bodily as the valve rises and performs a second movement independent of its bodily movement as the pressure varies.

3. The combination with a frame having inlet and outlet openings, of a frusto-conical partition beneath which the inlet opening enters and between the same and the exhaust opening, a frusto-conical valve seating over said frusto-conical partition and inclosing perforations therein, said frusto-conical partition having an opening in its top whereby vapor reaches the lower surface of said frusto-conical valve, a pressure-actuated indicating device, operative connections between said indicating device and said valve whereby said indicating device moves bodily with the valve, said pressure-indicating device having communication through a perforation in said operative connections with the vapor within said casing.

4. The combination with a casing having an opening therethrough, of a valve controlling said opening and constructed and arranged to maintain a constant ratio be-

tween the pressures upon its two sides, said valve being also constructed and arranged to rise more rapidly than it increases any single dimension of said opening, a Bourdon spring carried by the valve, connections between the Bourdon spring and the interior of the casing, and a needle carried by the valve and actuated by the Bourdon spring.

5. In a device of the class described, the combination with a frame having induction and eduction ports, a valve arranged to control a passage-way through said frame and a valve stem, of a pressure-indicating device carried by the valve stem, a needle carried by the valve stem and actuated by the pressure-indicating device, a cup secured to the bottom of the frame and having a forward projection to receive the needle, two dials on opposite sides of the frame and means for securing the cup in two diametrically opposite positions and guiding the valve stem in positions diametrically opposite.

In witness whereof I have signed the above application for Letters Patent at Chicago, in the county of Cook and State of Illinois, this 28th day of April, A. D. 1905.

CHARLES E. SARGENT.

Witnesses:

CHAS. O. SHERVEY,
J. E. SHERVEY.