

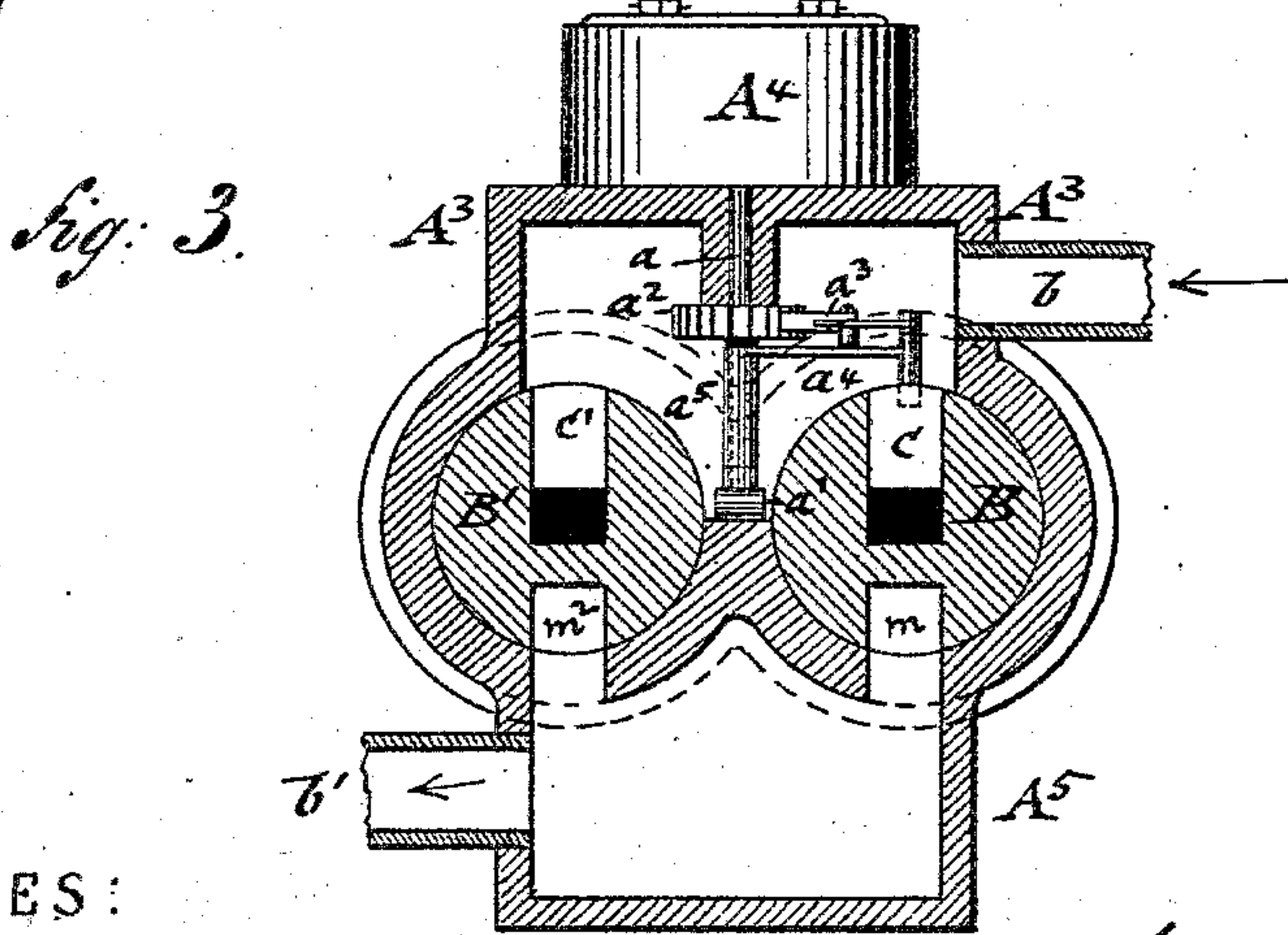
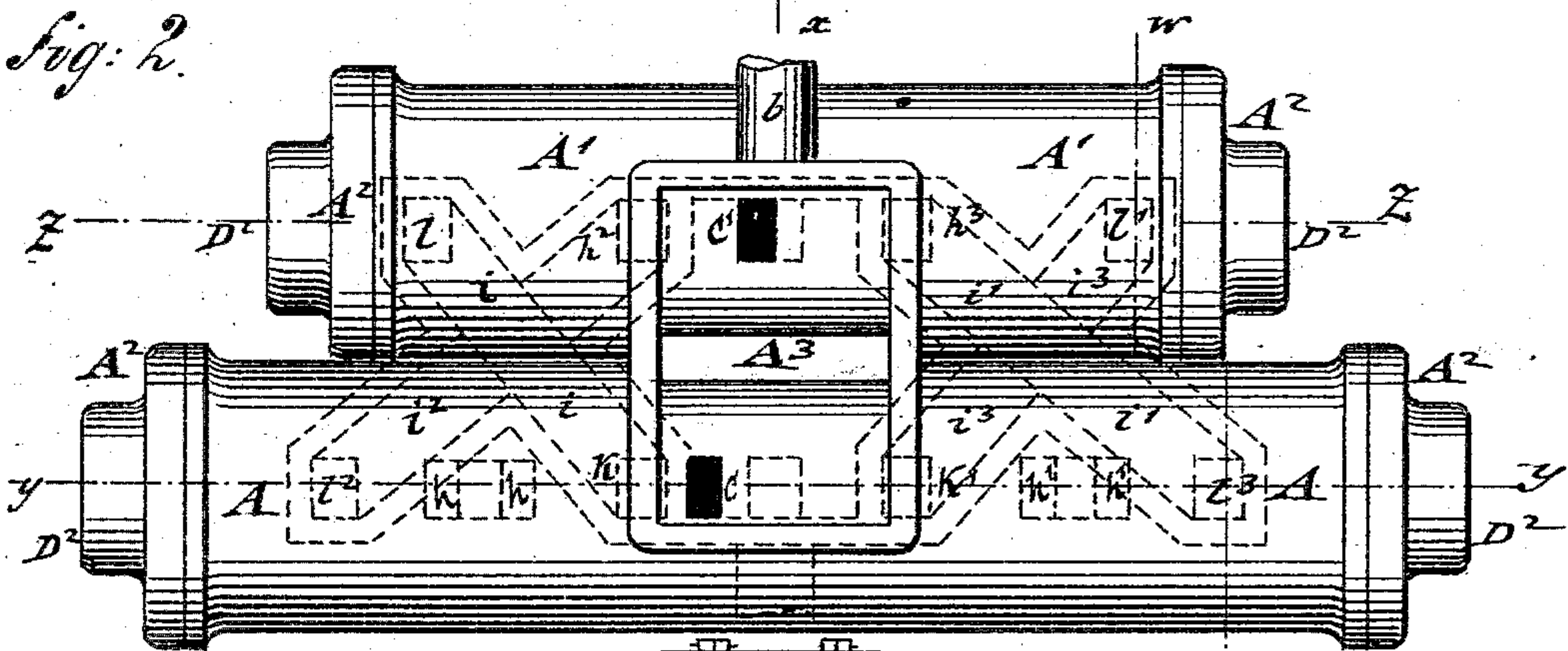
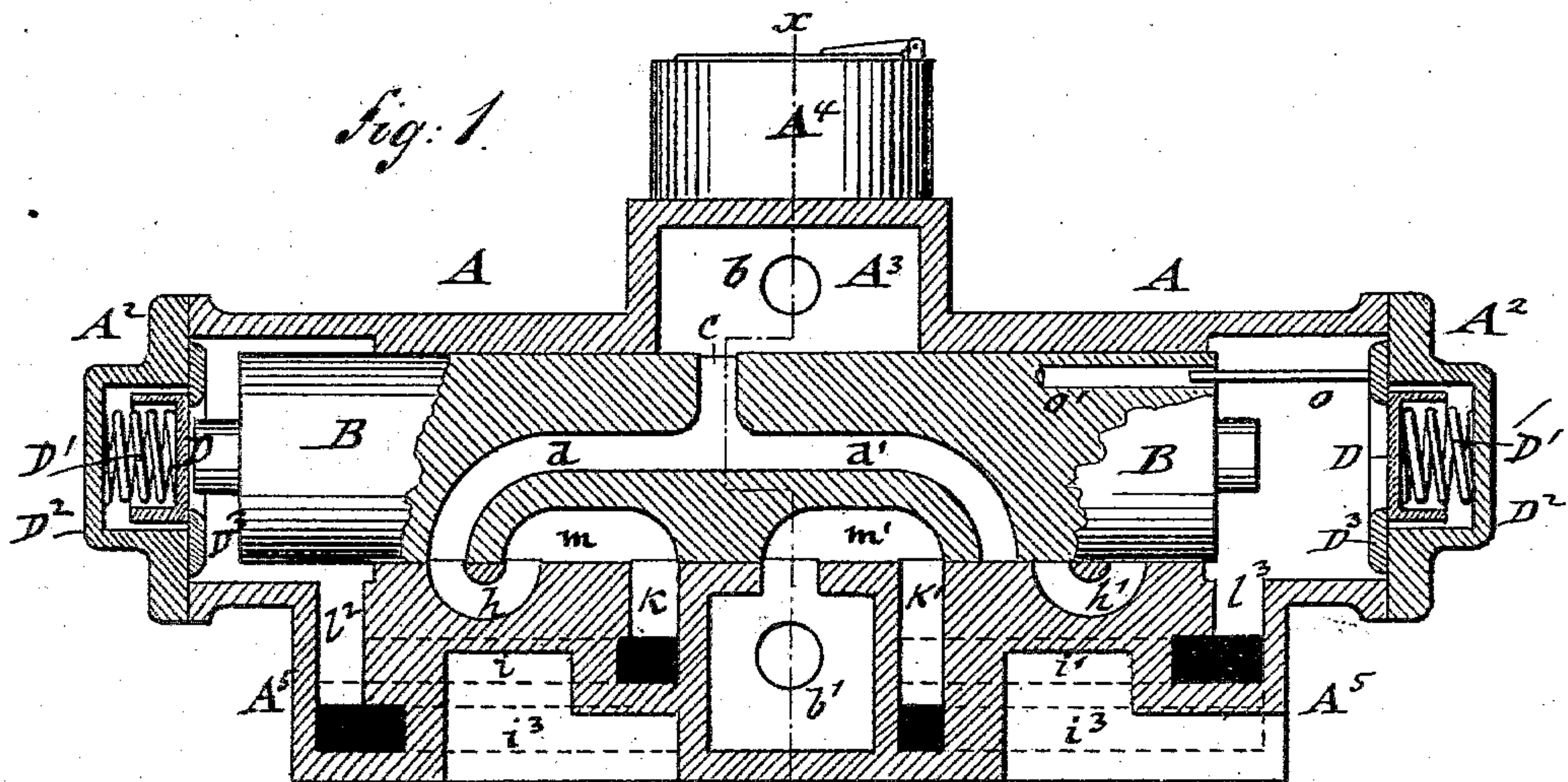
(No Model.)

2 Sheets—Sheet 1.

A. C. CHRISTENSEN.  
WATER AND STEAM METER.

No. 305,893.

Patented Sept. 30, 1884.



WITNESSES:

*Sidney Inman*  
*Otto Risch*

INVENTOR:

*August C. Christensen*  
BY *Joseph R. Regener*  
ATTORNEYS.



(No Model.)

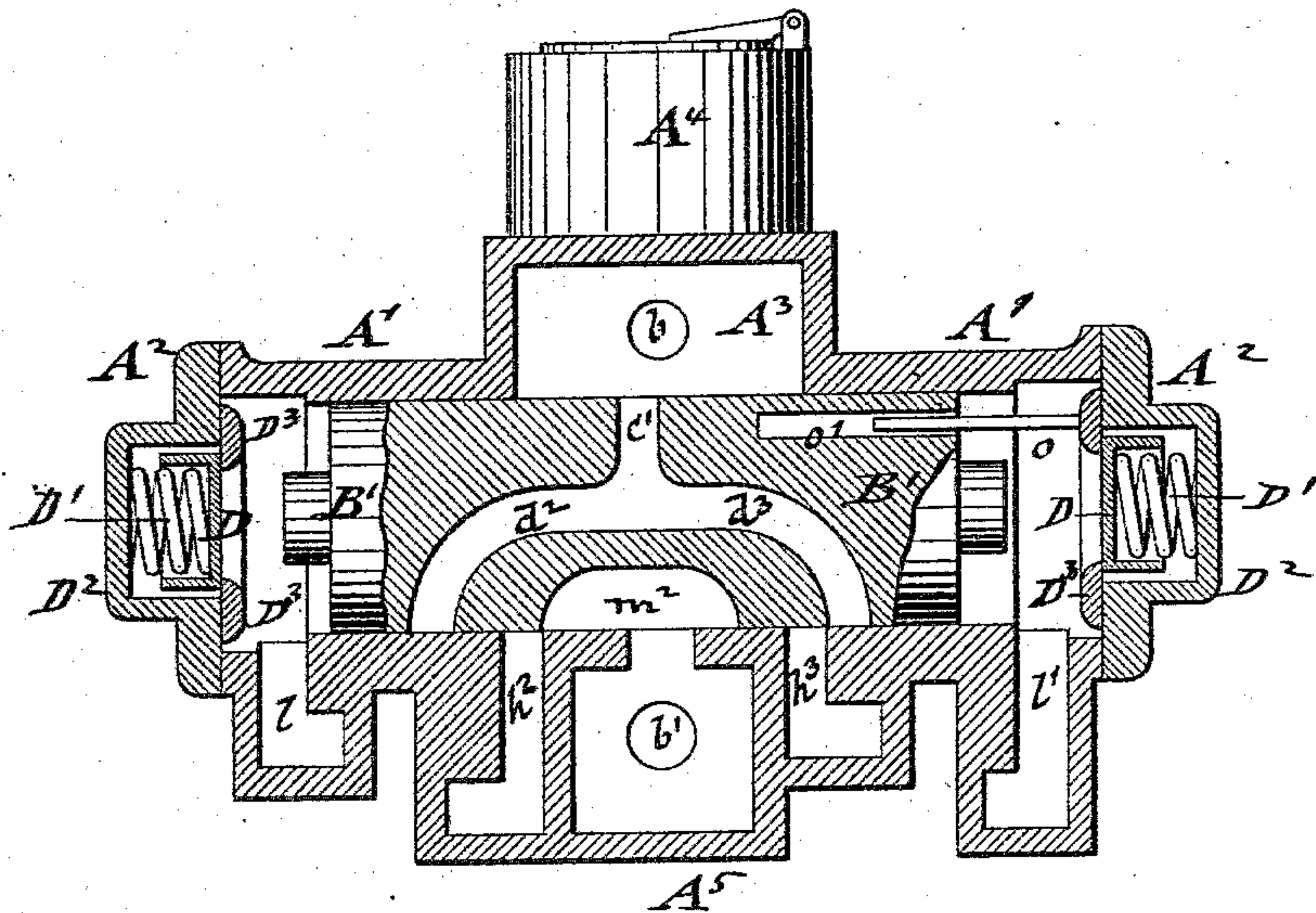
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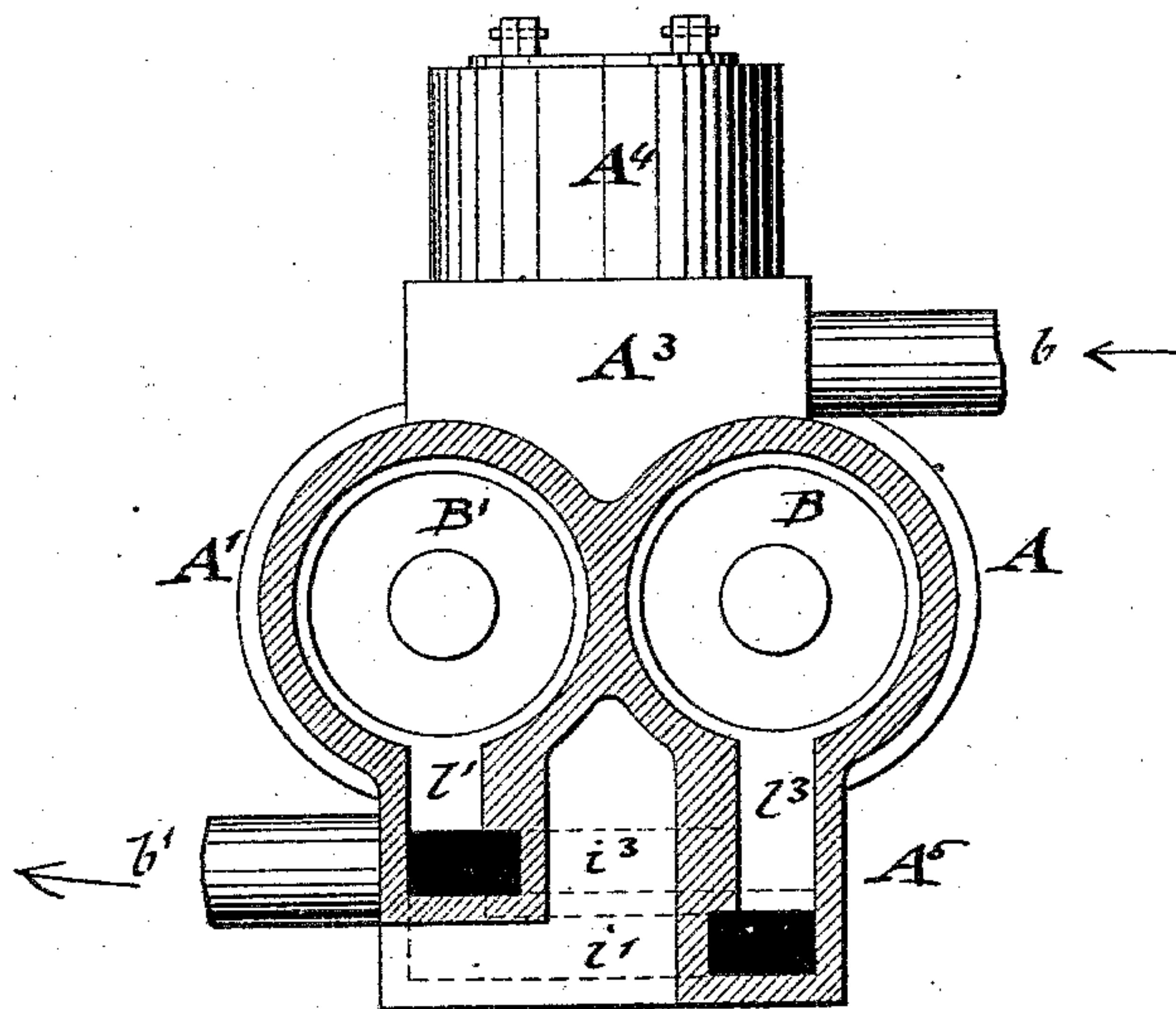
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*Fig. 4*



*Fig. 5*



WITNESSES:

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# UNITED STATES PATENT OFFICE.

AUGUST C. CHRISTENSEN, OF BROOKLYN, NEW YORK.

## WATER AND STEAM METER.

SPECIFICATION forming part of Letters Patent No. 305,893, dated September 30, 1884.

Application filed May 1, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, AUGUST C. CHRISTENSEN, of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Water and Steam Meters, of which the following is a specification.

This invention relates to certain improvements in the water and steam meter for which Letters Patent have been granted to me heretofore, No. 269,260, dated December 19, 1882, the improved construction being more especially designed for use as a steam-meter. Practical tests have demonstrated that as steam moves much more rapidly than water, the pistons require only a small port-opening, and that consequently the use of the gridiron-valves which formed the essential feature of my former patent can be dispensed with.

The invention consists of an inclosing-casing having a chest at the upper part and a bottom chamber with diagonally-crossing channels at the lower part, reciprocatory plungers or pistons having channels forming slide-valves, said channels communicating with the chest and with the diagonal bottom channels of the casing.

The invention consists, secondly, of spring-buffers having cup-shaped faces arranged in sockets of the heads of the casing and retained by interior projecting collars.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section of my improved water and steam meter on line  $y y$ , Fig. 2. Fig. 2 is a plan; Fig. 3, a vertical transverse section on line  $x x$ , Fig. 1; Fig. 4, a vertical longitudinal section on line  $z z$ , Fig. 2, and Fig. 5 a vertical transverse section on line  $w w$ , Fig. 2.

Similar letters of reference indicate corresponding parts.

A A' represents the casing of my improved water and steam meter, which casing consists of two hollow cylinders that are arranged side-wise of each other and closed by heads A<sup>2</sup>. A chamber or chest, A<sup>3</sup>, is arranged at the top of the cylinders A A', and surmounted by a counter or register, A<sup>4</sup>. The spindle  $a$  of the registering mechanism A<sup>4</sup> is supported at its lower end by a spring,  $a'$ , which imparts the necessary friction to the spindle, while a ratchet-wheel,  $a^2$ , at its middle portion is engaged

by a spring-pawl,  $a^3$ , which is pivoted to a lever,  $a^4$ , the outer end of which works in a notch of one of the plungers, while the inner end is connected by a sleeve,  $a^5$ , with the spindle  $a$ , as shown in Fig. 3. The counter A<sup>4</sup> and its actuating mechanism are well known and used in all water-meters with reciprocating plungers. The casing A' is cast in one piece with the top chest, A<sup>3</sup>, and with an oblong chamber, A<sup>5</sup>, at the lower part of the casing, said top chest and bottom chamber being provided, respectively, with an inlet-port,  $b$ , and an outlet-port,  $b'$ .

The plungers B B' are cylindrical in shape, and fit closely to the interior of the cylinders A A'. These plungers are provided with channels extending through them, so as to serve for the double purpose of measuring the water or steam and for acting as each other's slide-valve.

The channels  $d d'$  and  $m$  and  $m'$  of the cylinder A are preferably arranged in the form of a B-valve, while the channels  $d^2$ ,  $d^3$ , and  $m^2$  of the cylinder A' form, preferably, a D-valve. An inlet-opening,  $c$ , connects the channels  $d d'$  of the plunger-valve B with the chest A<sup>3</sup>, while the plunger B' is provided with an inlet-opening,  $c'$ , which communicates with its channels  $d^2 d^3$ . The channels  $d d'$  of the plunger B communicate, respectively, with the channels  $h h'$  of the bottom chamber of the cylinder A, as said plunger moves alternately from one end of the cylinder to the other, while the channels  $d^2 d^3$  of the plunger B' communicate, respectively, with the channels  $h^2 h^3$  of the cylinder A'. A diagonal channel,  $i$ , connects the channel  $h$  of the cylinder A with the left-hand end of the plunger B' by means of the curved channel  $m$  of the plunger B and the vertical channels  $k$  and  $l$  of the bottom chamber, A<sup>5</sup>. The diagonal channel  $i'$  connects the channel  $h^3$  of the cylinder A' with the right-hand end of the plunger B, by the vertical channel  $l^3$ . Correspondingly the diagonal channel  $i^2$  connects the channel  $h^2$  of the cylinder A' with the left-hand end of cylinder A by the vertical channel  $l^2$ , while the diagonal channel  $i^3$  connects the channel  $h'$  of cylinder A' with the right-hand end of cylinder A' by the curved channel  $m'$  of the plunger B and the vertical channels  $k' l'$ .

The reciprocatory plungers B B' are pre-



vented from rotating on their axis by means of longitudinal guide-pins *o o*, secured to one of the heads  $A^2$  of the cylinders  $A A'$ , said guide-pins extending into corresponding holes, *o' o'*, of the plungers  $B B'$ , as shown in Figs. 1 and 4.

Each head  $A^2$  of the cylinders  $A A'$  is provided with spring-buffers  $D D$ , which are formed of cup-shaped plates and cushioned by spiral springs  $D'$ . The spring-buffers  $D$  are arranged in socket-shaped extensions  $D^2$  of the heads  $A^2$ , as shown clearly in Fig. 1. The spring-buffers  $D$  serve to cushion the plungers, so that they produce only a gentle touch against the heads and make the meter work almost noiselessly. The spring-buffers  $D$  are retained in the sockets  $D^2$  by inwardly projecting ring-shaped collars  $D^3$ , which are attached to the inside of the heads  $A^2$ , as shown in Figs. 1 and 4.

The operation of my improved meter is the same as that given in detail in my prior patent heretofor referred to, with the exception that the narrow ports *c c'* of the plungers  $B B'$  serve as inlet-ports for the steam, and that the gridiron-valves are dispensed with. As the meter is mainly designed to be used with steam, and as steam moves much more rapidly, the ports *c c'* can be made comparatively small, while the plungers can perform the function of opening the ports without the aid of the gridiron-valves. The meter can, however,

also be used as a water-meter. The construction of my improved meter is still more simplified, as the gridiron-valves are dispensed with.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a steam-meter, the combination of the reciprocating plungers  $B B'$ , provided with holes *o' o'* and pins *o o*, secured to the heads  $A^2$  and projecting into said holes, substantially as described.

2. In a steam-meter, the combination of the heads  $A^2$  of the cylinders  $A A'$ , the spring-buffers  $D D$ , the cushioning-springs  $D'$ , and reciprocating plungers having  $B$ -shaped and  $D$ -shaped channels, substantially as and for the purpose set forth.

3. The combination of the inclosing-casing having heads with outwardly-projecting sockets and interior ring-shaped collars, reciprocating plungers or pistons, and spring-buffers formed of cup-shaped plates and cushioning-springs, the spring-buffers being retained in the sockets of the cylinder heads by said projecting collars, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

A. C. CHRISTENSEN.

Witnesses:

PAUL GOEPEL,  
SIDNEY MANN.