

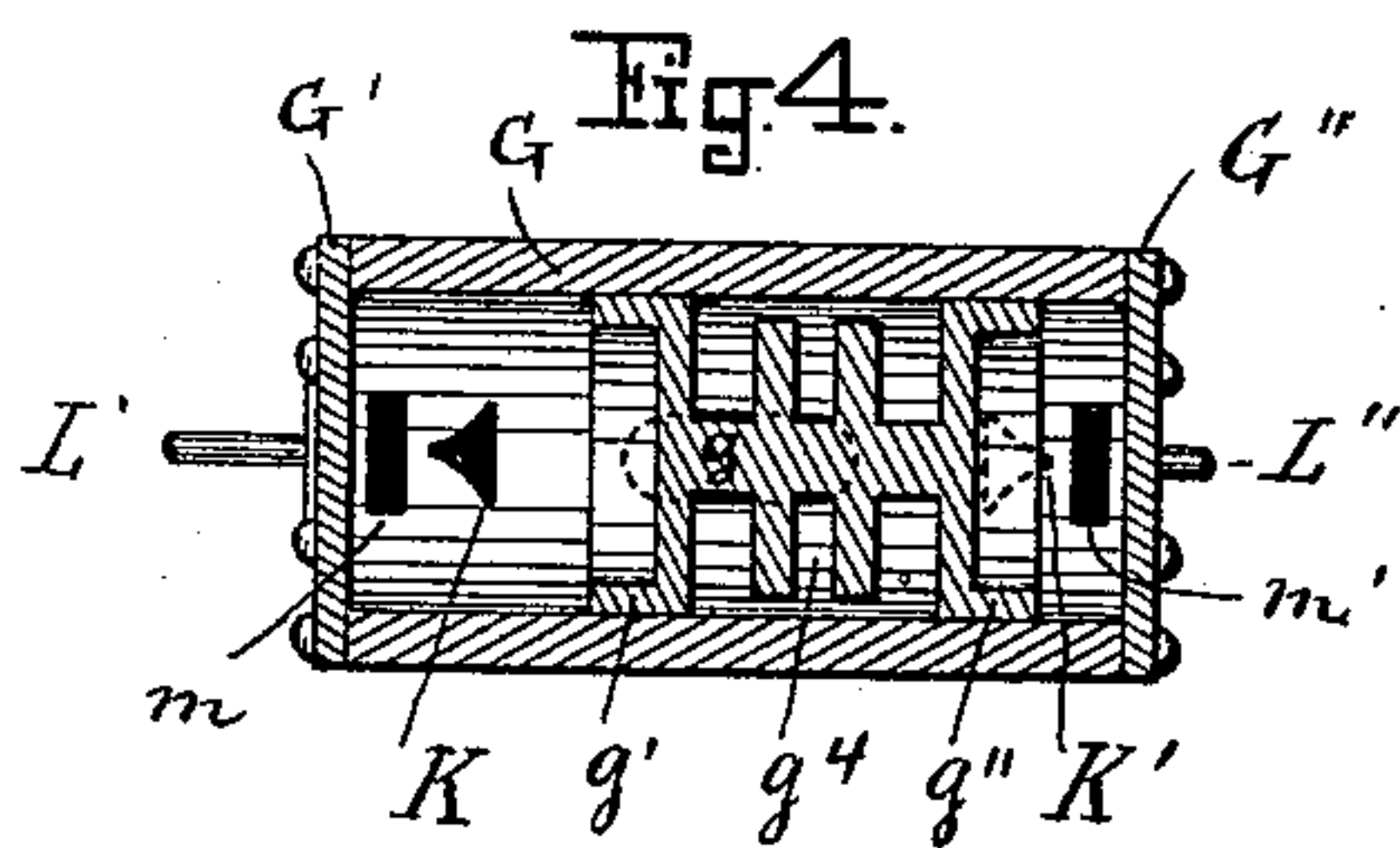
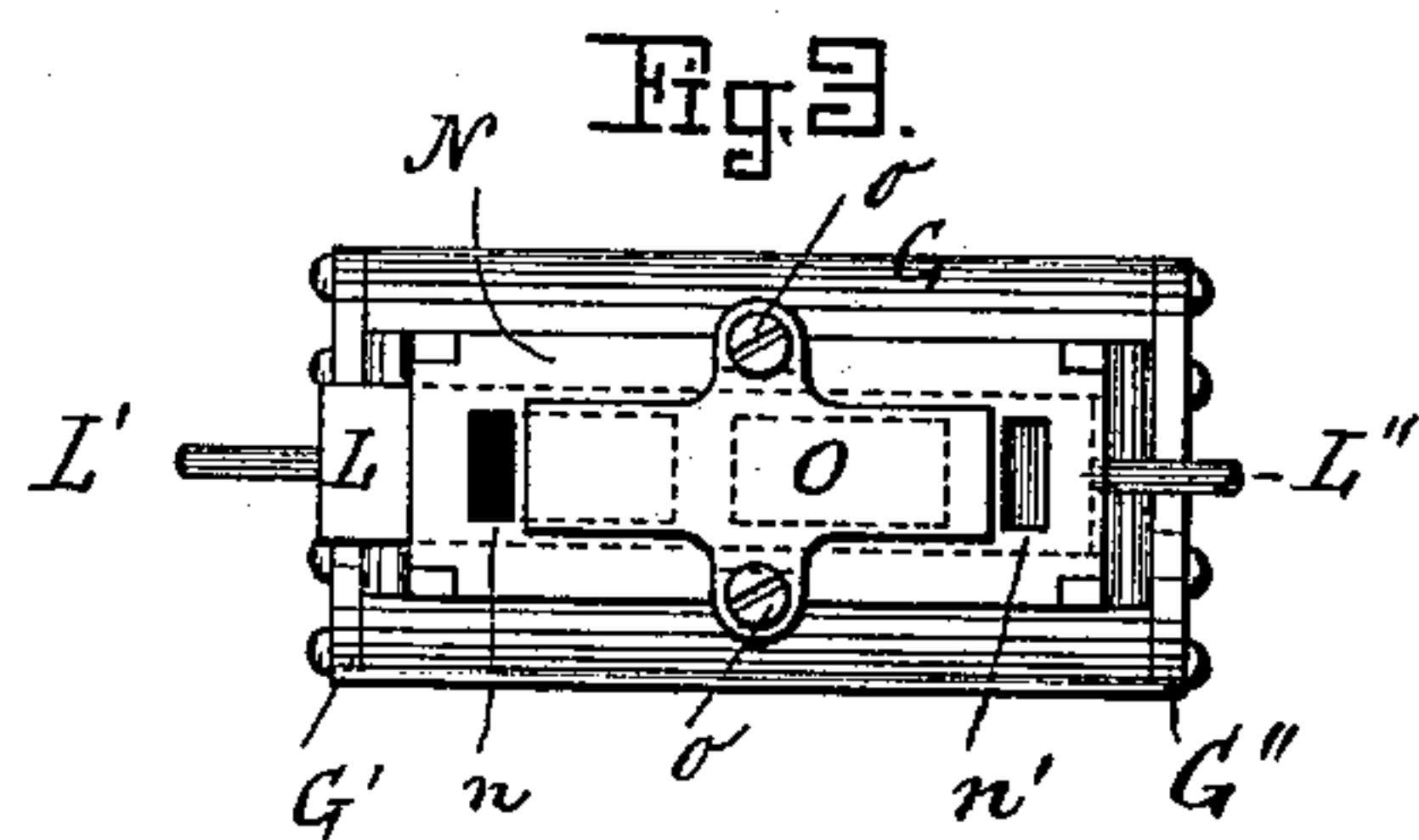
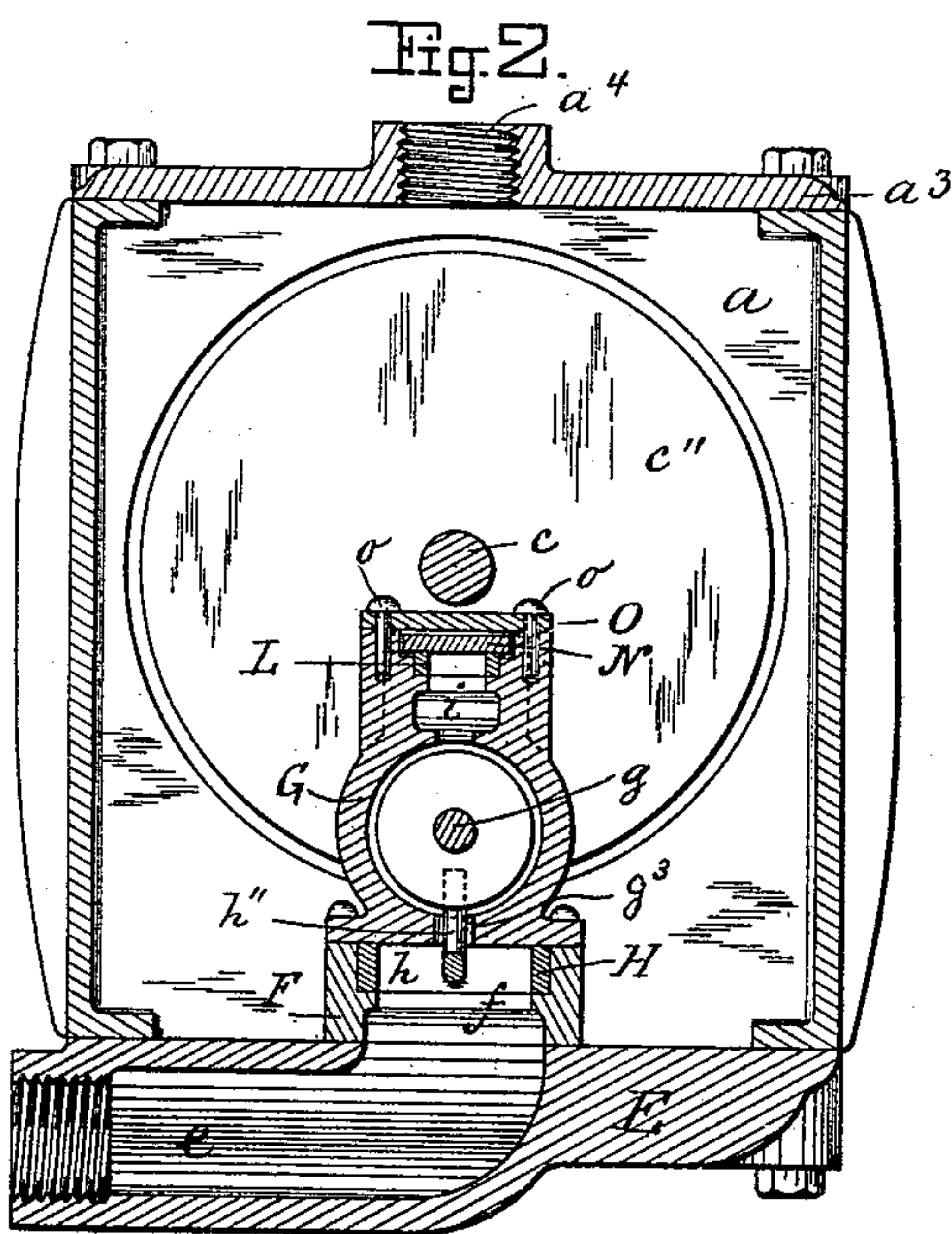
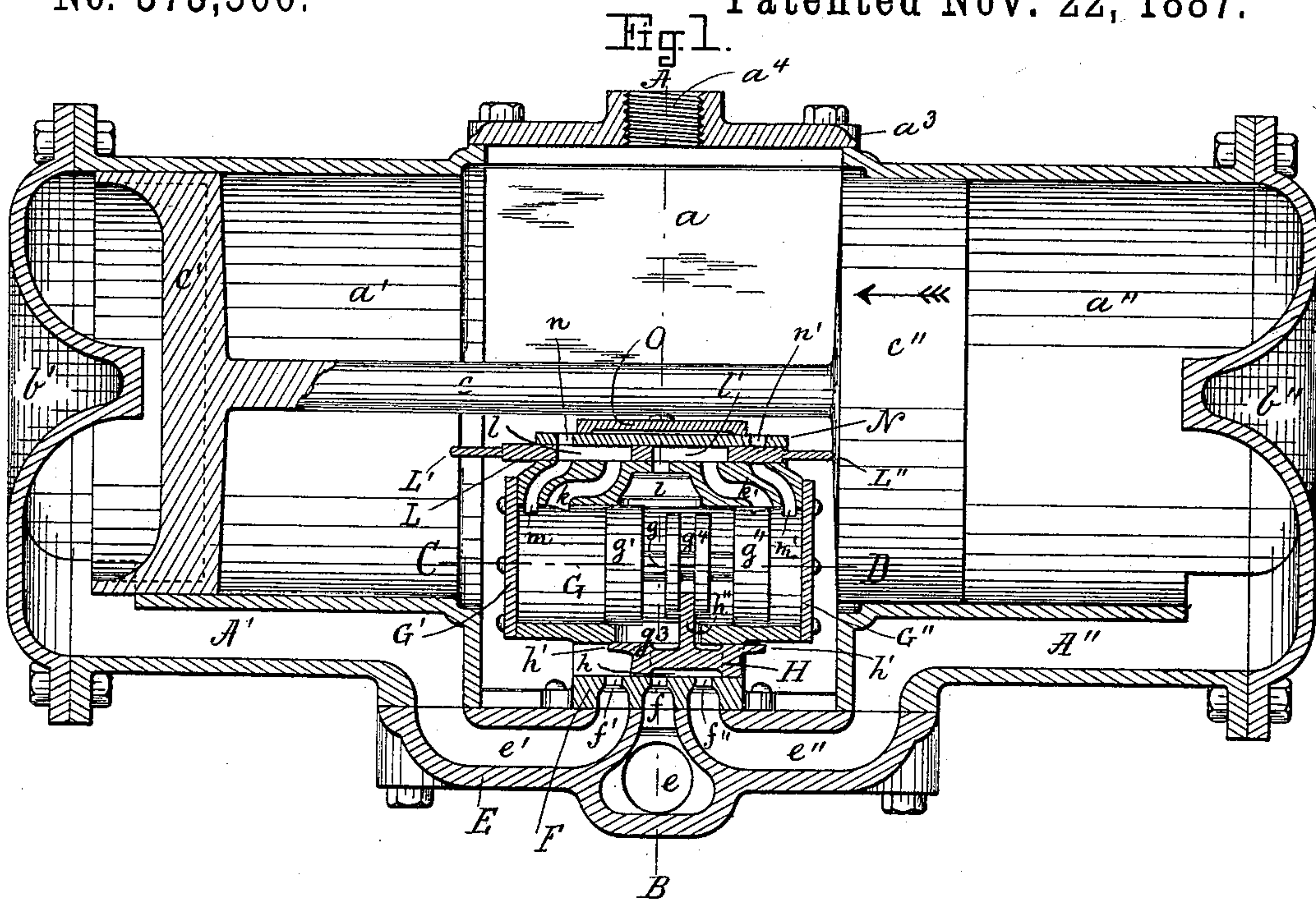
(No Model.)

W. A. SYLVESTER.

PISTON METER.

No. 373,500.

Patented Nov. 22, 1887.



Witnesses

Henry Chadbourne.
Charles H. Fogg.

Inventor

W. Allen Sylvester.
by Alban Judrien,
his atty.

UNITED STATES PATENT OFFICE.

W. ALLEN SYLVESTER, OF CHELSEA, MASSACHUSETTS.

PISTON METER.

SPECIFICATION forming part of Letters Patent No. 373,500, dated November 22, 1887.

Application filed February 14, 1887. Serial No. 227,625. (No model.)

To all whom it may concern:

Be it known that I, W. ALLEN SYLVESTER, a citizen of the United States, and a resident of Chelsea, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Water-Meters, of which the following, taken in connection with the accompanying drawings, is a specification.

This my invention relates to improvements in reciprocatory-piston meters, and particularly to automatic valve mechanism for the same; and it is carried out as follows, reference being had to the accompanying drawings, where in—

Figure 1 represents a central longitudinal section of my improved water-meter. Fig. 2 represents a cross-section on the line A B, shown in Fig. 1. Fig. 3 represents a top view of the automatic valve mechanism; and Fig. 4 represents a horizontal section on the line C D, shown in Fig. 1.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

The water-meter shell has the central water-chamber, *a*, and bored-out cylinders *a'* and *a''*, as usual, covered at their ends by means of the heads *b'* and *b''*, as shown in Fig. 1.

c' and *c''* are the reciprocatory pistons, secured to or cast in one piece with the piston rod or connection *c*, as shown.

a³ is the top plate, as usual, with its supply-opening *a⁴*, to which the liquid is conducted by means of a supply-pipe in the ordinary manner.

To the under side of the shell of the meter is secured, in a suitable manner, the bottom plate, E, having the cored-out passages *e'* and *e''*, leading, respectively, to the ends of the cylinders *a'* and *a''*, as shown in Fig. 1, and said bottom plate has also the cored-out exhaust-passage *e*, the end of which is connected to a pipe in the usual manner.

F is the valve-base, secured to the bottom plate, E, within the central chamber, *a*, in a suitable manner, and said valve-base is provided with ports *f*, *f'*, and *f''*, leading, respectively, to the exhaust-passage *e* and cored-out passages *e'* and *e''* in the valve-base E.

A' and A'' are cored-out passages in the shell of the meter, leading, respectively, from

the ends of the respective cylinders *a'* and *a''* to the passages *e'* and *e''* in bottom plate, E, as shown in Fig. 1. To the stationary valve-base F is secured or cast in one piece the supplementary cylinder G, having covers G' and G'' in its ends, as shown. Within said cylinder is freely movable the valve-mover, consisting of pistons *g'* and *g''*, secured to or cast in one piece with the rod or connection *g*, as shown in Fig. 1. The supplementary cylinder G has in its lower part an opening or passage, *g³*, that is at all times in communication with the central port, *f*, in the valve-base F and exhaust-passage *e* in the bottom plate, E, as shown in Figs. 1 and 2. Between the planed under side of the supplementary cylinder G and upper side of the stationary valve-base F is located the reciprocatory balanced main valve H, having a vertical passage, *h*, by which a constant communication is established from the passage *g³* in the bottom of the cylinder G to the exhaust *e* and alternately between the ports *f' f* and *f'' f*, and from the central chamber, *a*, alternately to the ends of the cylinders *a'* and *a''*, according to the position of said balanced main valve H. The said main valve H has lips or extensions *h' h'* on its upper portion, as shown in Fig. 1, upon the under side of which the pressure of the liquid in central chamber, *a*, acts to counteract the downward pressure of the liquid from the middle portion of the cylinder G, so as to equalize the pressure on both sides of said main valve H, and thus keep it balanced, or very nearly so. The said main valve H has an upwardly-projecting rod or pin, *h''*, the upper end of which fits within an annular groove, *g⁴*, on the piston-spindle *g*, as shown in Figs. 1, 2, and 4, and thus it will be seen that a positive reciprocating motion is imparted to the main valve H from the pistons *g' g''* and their spindle *g*.

In the central upper portion of the supplementary cylinder G is a port, *i*, and on either side of it are the ports *k m* and *k' m'*, as shown in the drawings, and above the planed upper portion of the supplementary cylinder G is located the reciprocating supplementary valve L, having ports *l l'* and end projections, L' L'', as shown in the drawings. The supplementary valve L is reciprocated between the top of the planed surface of the cylinder G and the under

side of the stationary cover N, that is held onto the top of the cylinder G in a suitable manner, and in case the meter should be arranged and secured in a vertical direction I arrange on top of the cover N a binder-plate, O, having ears through which pass loosely the screws *o o*, which latter are screwed into the upper portion of the supplementary cylinder G, as shown in Fig. 2, and which may be adjusted in such a manner as to produce a proper friction between the cover N, valve L, and top of cylinder G, so as to prevent the supplementary valve L from dropping after it has been raised to its highest position by one of the main pistons *c'* or *c''*. When the meter is arranged horizontally, said binder-plate may be dispensed with, if so desired.

n and *n'* are ports in the cover N, through which the liquid from the central chamber, *a*, is alternately conducted to opposite ends of the cylinder G as the supplementary valve L is actuated by the respective main pistons *c'* and *c''*. If so desired, the supplementary cylinder G and its pistons and the main valve H may be arranged at right angle to the axis of the piston-rod *c* without departing from the essence of my invention; also, if so desired, the pistons *g' g''* may be made flat, instead of cylindrical, and the cylinder G made to correspond to produce the same effect; but I prefer to make the said pistons of a cylindrical shape, to enable them to turn freely around their common axis, so as to wear all parts alike; also, instead of connecting the upper central port, *i*, in cylinder G with the exhaust-passage *e* directly through the middle portion of cylinder G, a cored-out passage or channel may be made outside of said cylinder G to the said exhaust-passage *e* without departing from the essence of my invention.

Where the ports *k* and *k'* enter the supplementary cylinder G, I make them in the form of a triangle, K K', (shown in Fig. 4,) or tapering toward the respective ends of said cylinder, by which arrangement the exhaust from the cylinder G, as the pistons *g' g''* reach or approach the end of their strokes, is gradually shut off, by which the annoying water hammer or pounding of the valve-mover is entirely prevented without the need of springs, bunters, or other objectionable devices now in use. To equal advantage, in case the valve-mover *g' g''* is made flat or non-rotating, I may make tapering recesses or notches in the top of such valve-mover, to gradually stop the latter when it approaches the ends of its stroke, and thus gradually close the exhaust-passages from the chamber G, and thereby prevent water hammering or pounding, as above described. Any suitable registering mechanism may be connected to any one of the reciprocating parts of the device in the usual way, such connection and registering mechanism being, however, not shown in the drawings.

The operation of this my improved water-meter is as follows: We will suppose the main pistons *c' c''* have been moving in the direc-

tion of the arrow shown in Fig. 1, during which motion the liquid in central chamber, *a*, has passed through the then open port *f''* and through the passages *e'' A''* to the rear end of cylinder *a''*, back of piston *c''*, while at the same time the liquid in cylinder *a'*, back of piston *c'*, has been forced out through passages *A' e'* and through ports *f'* and *f* to the exhaust *e*. During such motion of said pistons *c' c''* as they reach or approach the end of their stroke in this direction the piston *c''* comes in contact with the projection *L''* on the supplementary valve L, and gradually moves it to the position shown in Fig. 1, causing the liquid from central chamber, *a*, to pass through port *n* in cover N, through port *l* in the valve L, and through ports *k m* in top of cylinder G back of piston *g'*, by which the pistons *g' g''* and the main valve H are instantly moved to the positions shown in Fig. 1, causing the port *f* in the valve-base F to be in open communication with the central chamber, *a*, and forcing the liquid from the latter through the passages *e'* and *A'* into the outer end of cylinder *a'*, back of piston *c'*, and thus imparting a movement of pistons *c' c''* in an opposite direction to that shown by arrow in Fig. 1, while at the same time the liquid in cylinder *a''*, back of piston *c''*, is allowed freely to pass out through passages *A'' e''*, ports *f'' f*, and main valve F to the exhaust *e*, as shown in said Fig. 1, and during such motion of the pistons *g' g''* the liquid in the cylinder G, back of the piston *g''*, is exhausted through the port *k'*, supplementary valve opening or port *l'*, port *i* in top of cylinder G, and through the central portion of the latter and its bottom opening, *g''*, to the main valve opening or port *h*, exhaust-port *f* in the valve-base F, and exhaust-passage *e*, as shown. During such motion of the valve-mover *g' g''* the exhaust back of the piston *g''* is gradually cut off by the triangular or tapering orifice K' at the lower end of port *k'* being covered by the piston *g''*, as above described, thus causing the supplementary pistons to move noiselessly, and preventing the water hammering or pounding, so common in most meters of this kind. As the pistons *c'* approaches the end of its stroke in a direction opposite to that indicated by arrow in Fig. 1, it comes in contact with the projection *L'* on the supplementary valve L, by which an opposite motion of the respective parts takes place with corresponding supply and exhaust of the liquid under pressure, and so on.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent and claim—

1. In a fluid-meter, the combination, with the cylinders *a' a''*, reciprocating pistons *c' c''*, and chamber *a*, of the supplementary cylinder G, having inlet-ports *m m'* at its ends, tapering exhaust-passages *k K k' K'* near its ends, and valve-mover *g' g''*, arranged within said cylinder G, the supplementary valve L, actuated by the pistons *c' c''* to admit the liquid to the

cylinder G, and from it to the exhaust *e*, as herein set forth.

2. In a fluid-meter, the combination, with the cylinders *a' a''*, reciprocating pistons *c' c''*, and chamber *a*, of the cover N, supplementary valve L, actuated by the pistons *c' c''*, and having the two ports *l l'*, the supplementary cylinder G, having the ports *m m'* at its opposite ends and tapering exhaust-passages *k* K *k' K'* near its ends, the valve-mover *g' g''*, and exhaust-port *i* leading to main exhaust *e*, the passage *g³*, and the main valve H, positively operated by the said valve-mover and adapted to alternately direct the liquid from the chamber *a* to the ends of cylinders *a' a''* and from the latter to the exhaust *e*, as herein set forth and described.

3. In combination with the cylinders *a' a''*, reciprocating pistons *c' c''*, and chamber *a*, the valve-mover *g' g''*, supplementary chamber G, and its passages or ports *k m k' m'*, the supplementary valve L, cover N, and binder-plate O, above the cover N, as and for the purpose set forth.

4. In combination with the cylinders *a' a''*, reciprocating pistons *c' c''*, and chamber *a*, the passages *A' e' A'' e''*, leading from the cylinder ends to the chamber *a*, the valve-base F, with its ports *f f' f''*, and the exhaust *e* in bottom plate, E, the valve-mover *g' g''*, arranged within the cylinder G, and coupled to the main valve H, as described, said cylinder G having exhaust *i*, communicating with main exhaust *e*, and inlet-ports *m m'*, tapering exhaust-passages *k K k' K'*, and the reciprocating supplementary valve L, actuated by the pistons *c' c''*, and having the ports *l l'*, as and for the purpose set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 4th day of February, A. D. 1887.

W. ALLEN SYLVESTER.

Witnesses:

ALBAN ANDRÉN,
HENRY CHADBOURN.