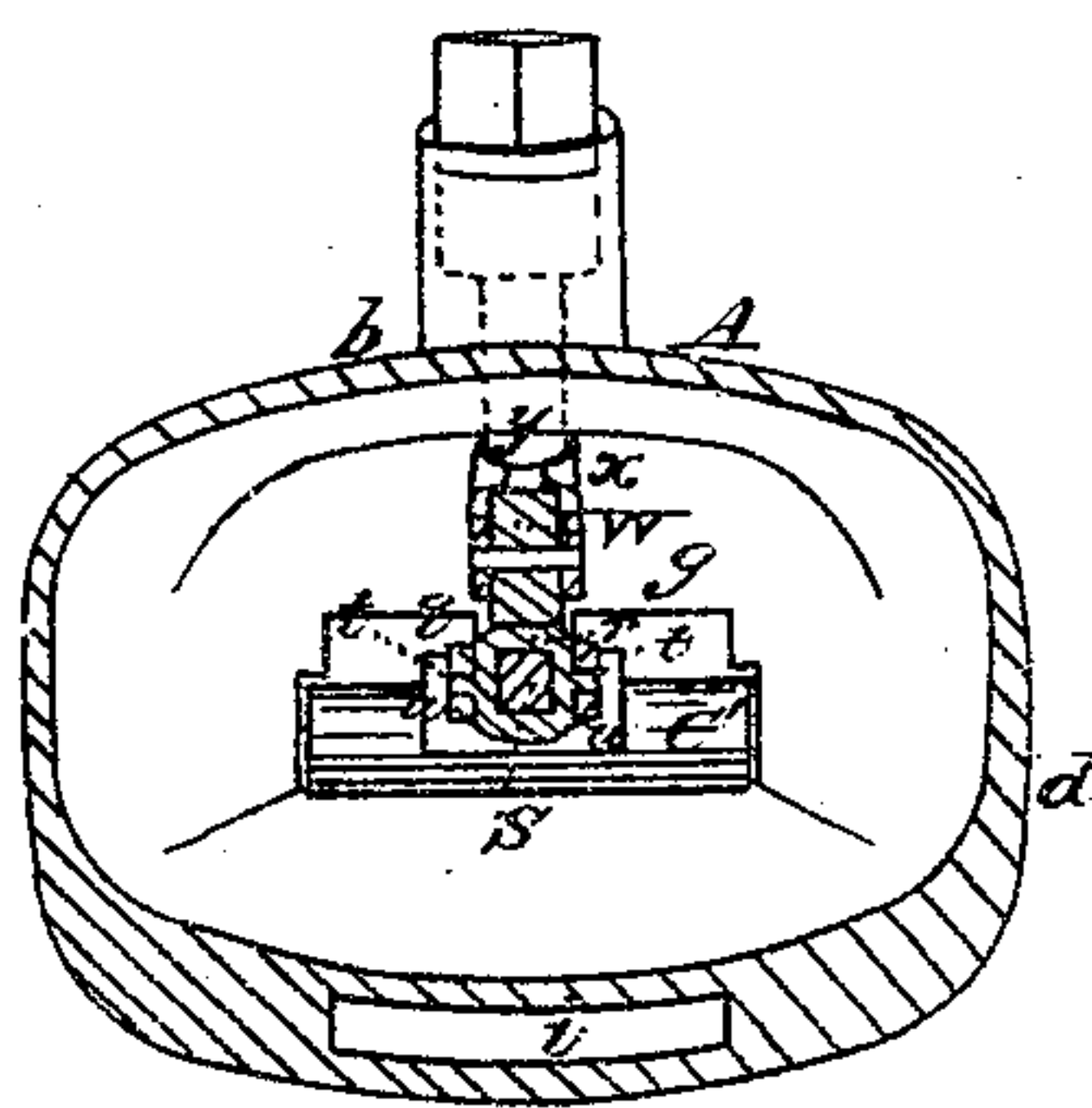
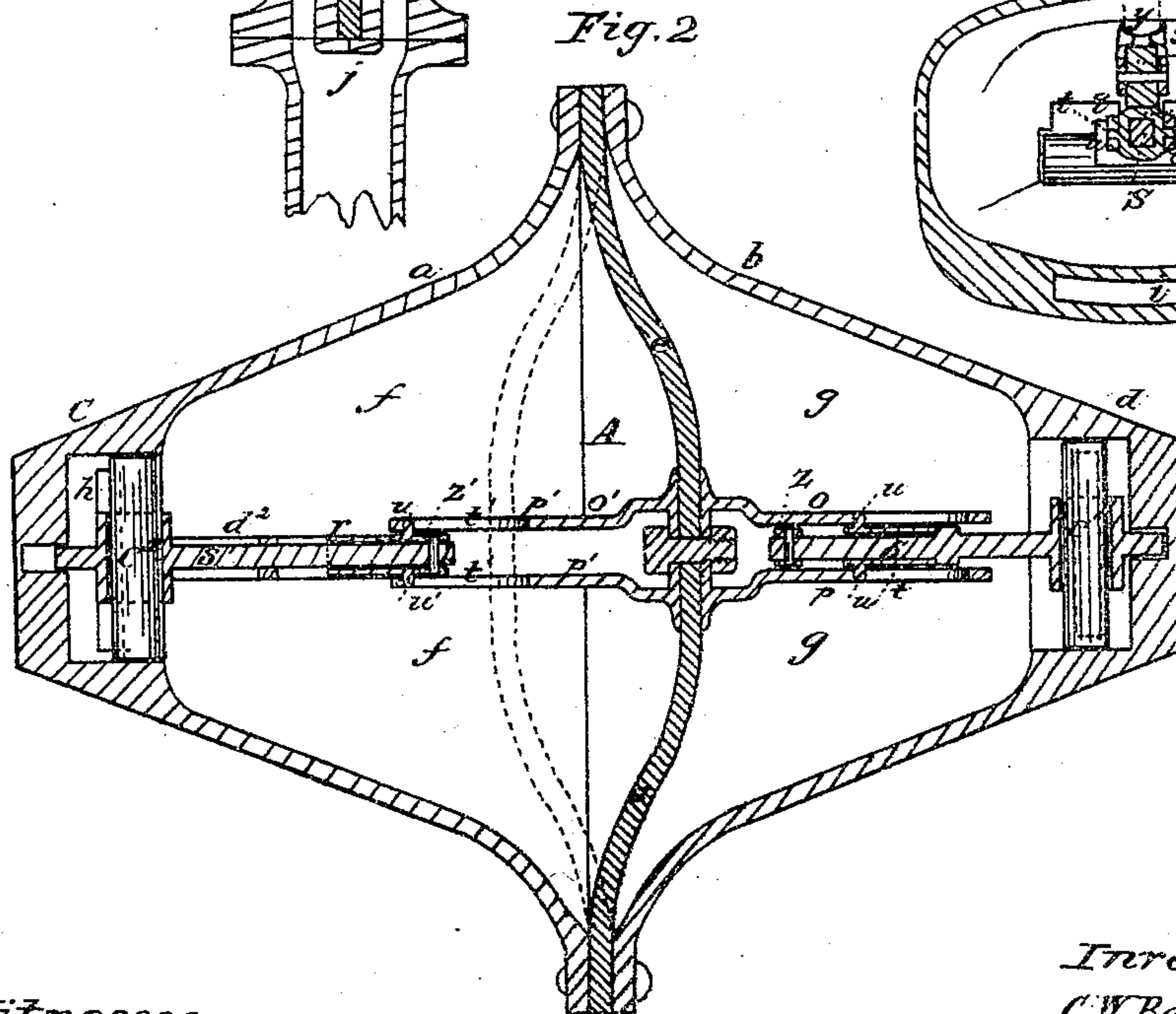
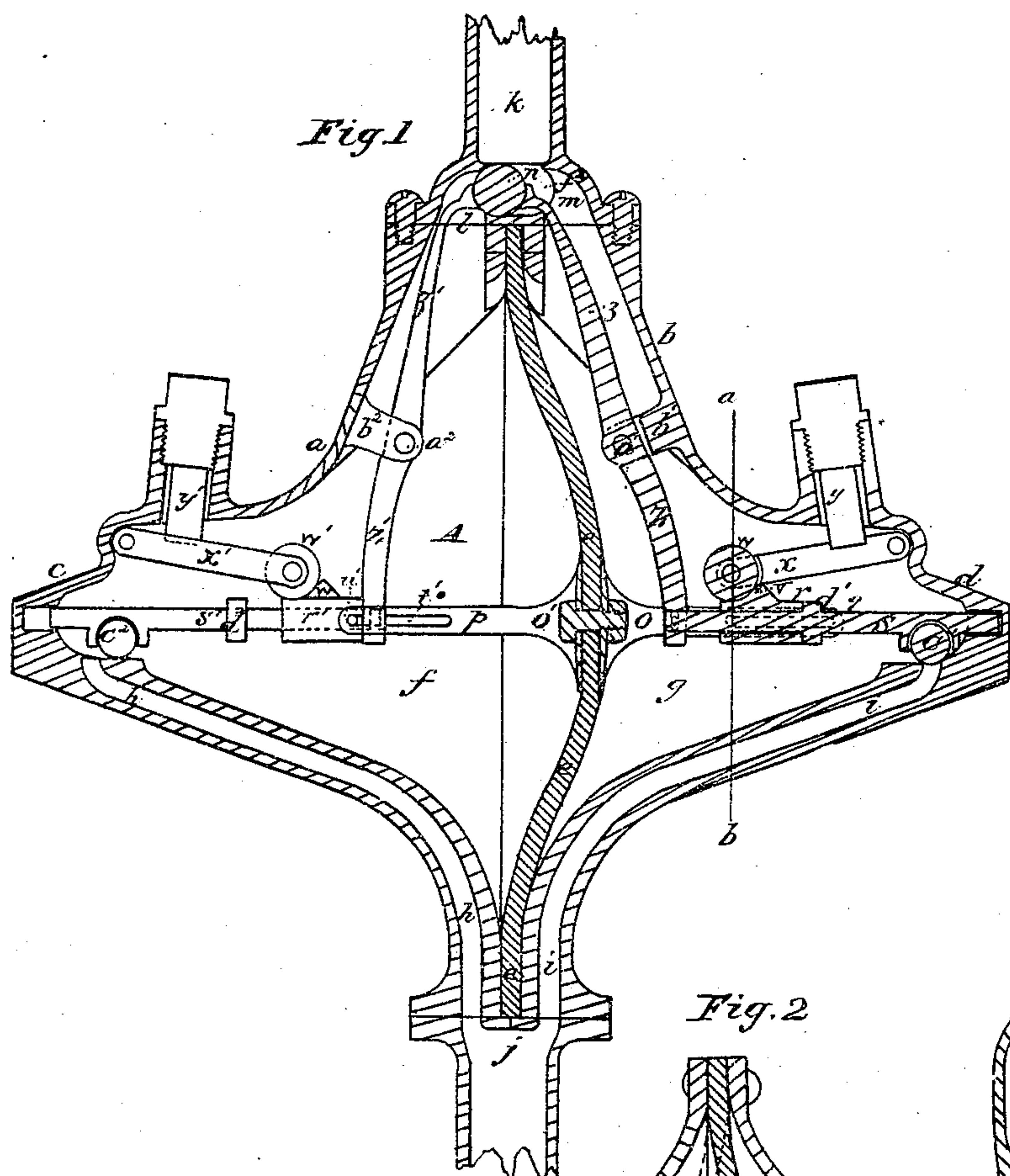


C. W. Baldwin.
Water-Meter.

Nº 72958

Patented Dec. 31, 1867.



Witnesses:
Edmund H. Hawkins.
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United States Patent Office.

CYRUS W. BALDWIN, OF BOSTON, MASSACHUSETTS.

Letters Patent No. 72,958, dated December 31, 1867.

IMPROVEMENT IN WATER-METERS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Be it known that I, CYRUS W. BALDWIN, of Boston, in the county of Suffolk, and State of Massachusetts, have invented a new and useful Device or Instrument for Determining and Registering the Amount of a Flowing Liquid; and do hereby declare the following to be a full, clear, and exact description thereof, due reference being had to the accompanying drawings, making part of this specification, and in which—

Figure 1 is a vertical and longitudinal section, and

Figure 2 a horizontal section of such invention;

Figure 3 being a vertical and transverse section of it.

Figures 4, 5, and 6 are respectively end, top, and side views of the sliding sleeve, to be hereinafter described.

One object of this invention is to produce an instrument or a device for measuring and indicating the contents of a flowing liquid, under any conditions of such flow of liquid, whether escaping in a large body, and under great or little pressure, or escaping drop by drop. Another object of the invention is to construct the apparatus in such manner as to require no nice fitting or grinding or high finishing of parts, and with no possibility of clandestine escape of liquid from it by leakage, the apparatus, under these conditions of things, being simple and cheap of construction.

The invention consists in a hollow circular case or box, of suitable construction, divided at its centre into two separate chambers, by an elastic diaphragm, each of such chambers being constructed with an inlet and outlet-aperture or passage, the two outlets joining in one general outlet, and the inlet, in like manner, communicating with one general inlet or supply-throat, and provided with valves connected with the diaphragm, for allowing the liquid to alternately escape from one chamber and closing the escape from the opposite chamber, in the manner and under conditions as hereinafter explained.

In the drawings above mentioned, A denotes a circular case, constructed in two halves or sections, *a b*, each of which is formed with a central elongation or extension, *c* or *d*, for accommodation of a portion of the mechanism, the joint between such sections, *a b*, being sealed by the edge of an elastic diaphragm, *e*, which is enclosed between the two, thus dividing the interior of the case A into two chambers, *f g*, of equal dimensions and capacities. The enlargements, *c* or *d*, of each section, *a* or *b*, are hollow, and are a part of the chambers *f* and *g*, respectively, each enlargement having an attenuated passage or outlet-port, *h* or *i*, formed in the metal composing it, and leading out of it just below its centre, each of such passages *h* or *i* joining at the bottom of the case in a general central outlet, *j*, below the diaphragm *e*. Each chamber, *f* or *g*, communicates at top, and above the diaphragm *e*, with a general central inlet or mouth, *k*, by a port or passage, *l* or *m*, made in or over the flange or metal supporting the diaphragm, such ports being alternately opened and closed by a spherical or cylindrical valve, *n*, which lies loosely in a valve-chest, *f*², formed within the supply-pipe leading to the case A, and over the diaphragm *e*, and which plays alternately between the passages *l* or *m*. The diaphragm *e* carries at each of its opposite sides, and centrally of the case A, and within the chambers *f* or *g*, a horizontal fork, *o* or *o'*, the arms *p q* of which straddle a sleeve, *r*, sliding upon a horizontal rod, *s*, and supports such sleeve by means of slots *t t*, made in them, in which are inserted pins *u u*, extending from opposite sides of the sleeve, thus allowing of free reciprocating rectilinear movements of such sleeve upon the rod *s* to the extent of the length of the slots *t t*, the remaining necessary movements of the sleeve *r* being effected by a triangular or other proper-shaped wiper, *v*, fixed to its upper surface, against which a friction-roller, *w*, bears and acts, such roller being supported by a vibrating-arm, *x*, pivoted to the upper wall or boundary of the extension *d*, the arm *x* being depressed by a spring, *y*, placed over it, as represented in the drawings. The inner end of each rod, *s s'*, is pivoted to the lower extremity of a vibrating-lever or tripper, *z* or *z'*, which is supported at about its middle upon a fulcrum, *a'*, upheld by a bracket, *b'*, projecting from the wall of each chamber, *f* or *g*, the upper end of such trippers acting, in conjunction with the spherical or cylindrical valve *n*, to throw it alternately from one to the other of the ports *l* or *m*. Furthermore, the outer end of each rod *s s'* carries a ball or cylindrical valve, *c'*, which, when such rod is at the extreme of its outward movement, lies over and closes the port *i*.

In describing the operation of the above-described apparatus, we will suppose the diaphragm *e* to be distended to its furthest extent in one direction, or to the right, as shown in the drawings, and with the passage *i*, of the chamber *g*, closed by its valve *c'*, the valve *n* being at this time against and closing the port *l* leading to

the opposite chamber *f*, and preventing entrance of liquid thereto, while the port *m* leading to the chamber is open for the admission of liquid, it being of course understood that both chambers, *f* and *g*, are filled and maintained full of liquid, and that the passage or outlet *h* of the chamber *f* is open, and with its valve and mechanism to the extreme right of their movement. Upon opening the outlet *j* of the apparatus, the liquid will begin to flow into the chamber *g*, and simultaneously therewith begin to discharge from the chamber *f*, thus forcing the diaphragm *e* in the direction of the red arrow thereon, it being borne in mind that the pins *u u* projecting from the sides of the sleeve *r*, (upon one side or half of the apparatus, or the right in the drawings,) are resting against the inner terminus of the slots *tt*. As the fork *o* is fixed to the diaphragm, it moves with it, without actuating the sleeve *r*, until the outer ends of the slots *tt* bring up against the pins *u u*, when the continued movement of the fork will carry the sleeve *r* with it, sliding upon the rod *s* until such sleeve arrives at the point of union of the rod *s* and the vibrating-lever *z*, when it strikes such lever, and forces the rod in the same direction, and starts the valve *c'* off its seat. At this point the triangular wiper *v* has moved under and forced upward the roller *w*, until such roller rests upon the apex of the wiper. The force of the spring *y*, acting through the arm *x* and roller *v*, as a medium, throws the rod *s* suddenly inward to the extreme of its movement. At the same time, by a like means, and with equal velocity, the ball of the opposite chamber *f* is forced outward to the extreme of its movement, closes the passage *h*, and cuts off the flow of liquid from such chamber *f*, the movement of the rod *s*, at its extreme inward movement, actuating the vibrating-lever *z*, and carrying it away from contact with the port *m*, at the same time that the lever *z*, in the opposite chamber *f*, strikes the valve *n*, and throws it suddenly in contact with and closes the port *m*, and consequently shuts off the flow of liquid to the chamber *g*, this act being simultaneous with the movement of the valves *c'* and *c''*. A collar or shoulder, *d'*, is fixed upon each rod *s*, in such manner as to bring up, when such rod is at its extreme inward position, in contact with the outer end of the sleeve *r*, for the purpose of allowing such sleeve, on its return movement, to complete the remaining movement of the rod *s*, and cause the valve *c'* to close the port *i*. The liquid now begins to flow into the chamber *f* and through the inlet *l*, and at the same time to discharge from the chamber *g*, through the passage *l*, and the diaphragm *e*, by the pressure or movement of the liquid, begins to contract and move in the direction of the blue arrow thereon, the pins *u u* of the sleeve *r* being at this time at the extreme inner end of the slots *tt* of the fork *o*. The fork, by the action of the diaphragm, is moved outwardly, without actuating any of the mechanism, until the inner end of its slots *tt* bring up against the pins *u u* of the sleeve *r*, when it moves the sleeve in the same direction. This movement of the sleeve *r*, by means of the collar *d'*, carries the rod *s* in the same direction with it, and until the rod *v* has mounted the inner incline of the wiper *w*, and rests upon its apex, when the pressure of the spring *y* upon the opposite incline of the wiper, completes the outward movement of the rod *s* with a sudden snap, and throws the valve *c'* upon and closes the passage *i*, at the same time forcing the upper end of the lever *z* inward, and throwing the valve *n* from the port *m*, so as to close the port *l*, the same movement also forcing the opposite rod *s'* inward, and opening the passage *h*.

As the mechanisms upon both sides of the diaphragm *e* are counterparts of each other, the above description of their operation, although confined for the most part to one of them, will yet enable a good mechanic, with the aid of the accompanying drawings, to understand the invention perfectly; the drawings, in fact, in this respect, giving the most insight into the invention, and would alone enable him to understand and construct it. I would call attention to the fact, however, that the whole power of the pressure of water upon, as well as that of the contraction of, the diaphragm itself operates to start the valves *c' c''* from off their seats, which being accomplished, the movement of the liquid aids the spring *y* in completing the movements of these valves or their supporting rods. It will be evident that the purpose of the slots *tt* in the arms of the fork *o* is to allow of the comparatively long movements of the diaphragm, without actuating the valves *c' c''* until the proper time. It may be found in practice desirable to employ a cage or grid to confine the extreme outward movements of the elastic diaphragm, but experiments thus far made would show that this will not be necessary. The amount of liquid displaced by each extreme movement or alternation of the diaphragm being ascertained, and the number of such movements registered by a suitable indicating-mechanism attached to the apparatus, enable the quantity of liquid passing through it to be accurately noted.

A great obstacle to be surmounted heretofore, in experiments with liquid meters, have been the differences of pressure upon the liquid in different localities. My invention enables the liquid, under any condition of pressure, as before observed, to be measured accurately, and a drop cannot escape that is not measured or registered.

Another advantage of my invention, as before observed, consists in the fact that no nice fitting or adjustment of the parts or grinding of valve-seats is necessary, as the entire apparatus is or may be made of cast metal, with the exception of the elastic diaphragm *e*, and the ball-valves, which, preferably, are to be made of vulcanized India rubber. The only point at which leakage could occur is the joint between the two halves or sections of the case *A*, but as this joint is perfectly sealed by the enclosure of the elastic diaphragm, no escape of liquid at this point can possibly occur. Added to these is the important advantage that no wear which can come upon the mechanism will impair its efficiency. I have contemplated constructing the apparatus, with the exception of the elastic diaphragm and the ball-valves, of the material known as hard rubber, in order to enable such apparatus or meter to be used for measuring acids.

What I claim as my invention, and desire to secure by Letters Patent of the United States of America, is—

1. The combination, in a meter such as described, with the valve-rods and valves for regulating the flow of the liquid through the meter, of the flexible diaphragm, and spring-devices, or their equivalents, for operating the said valves, under such an arrangement that, while the valves and valve-rods are partially actuated by the said diaphragm, they shall be caused to complete their movement in either direction by the action of the said spring-devices, substantially in the manner set forth.

2. The combination, with the flexible diaphragm, slotted-forks *o o'*, and sleeves *r r'*, which carry the trian-

gular wipers, of the valves $c^1 c^2$, valve-rods $s s'$, and spring-devices for completing the movement of the said valves, in the manner and for the purposes shown and specified.

3. The combination, with the flexible diaphragm, valves for closing the outlet-ports, and mechanism for actuating said valves, of the vibratory arms $z z$, and valve n for closing the outlet-port, substantially as shown and for the purposes described.

4. The combination and arrangement, with the valves $c^1 c^2$ and n , and mechanism for actuating the same, of the ports for the admission and discharge of the liquid into and from the meter, substantially as herein shown and set forth.

C. W. BALDWIN.

Witnesses:

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