(Model.) 4 Sheets—Sheet 1.

C. C. BARTON & J. THOMSON.

PISTON FLUID METER.

No. 285,209. Patented Sept. 18, 1883.

Fig. 1.

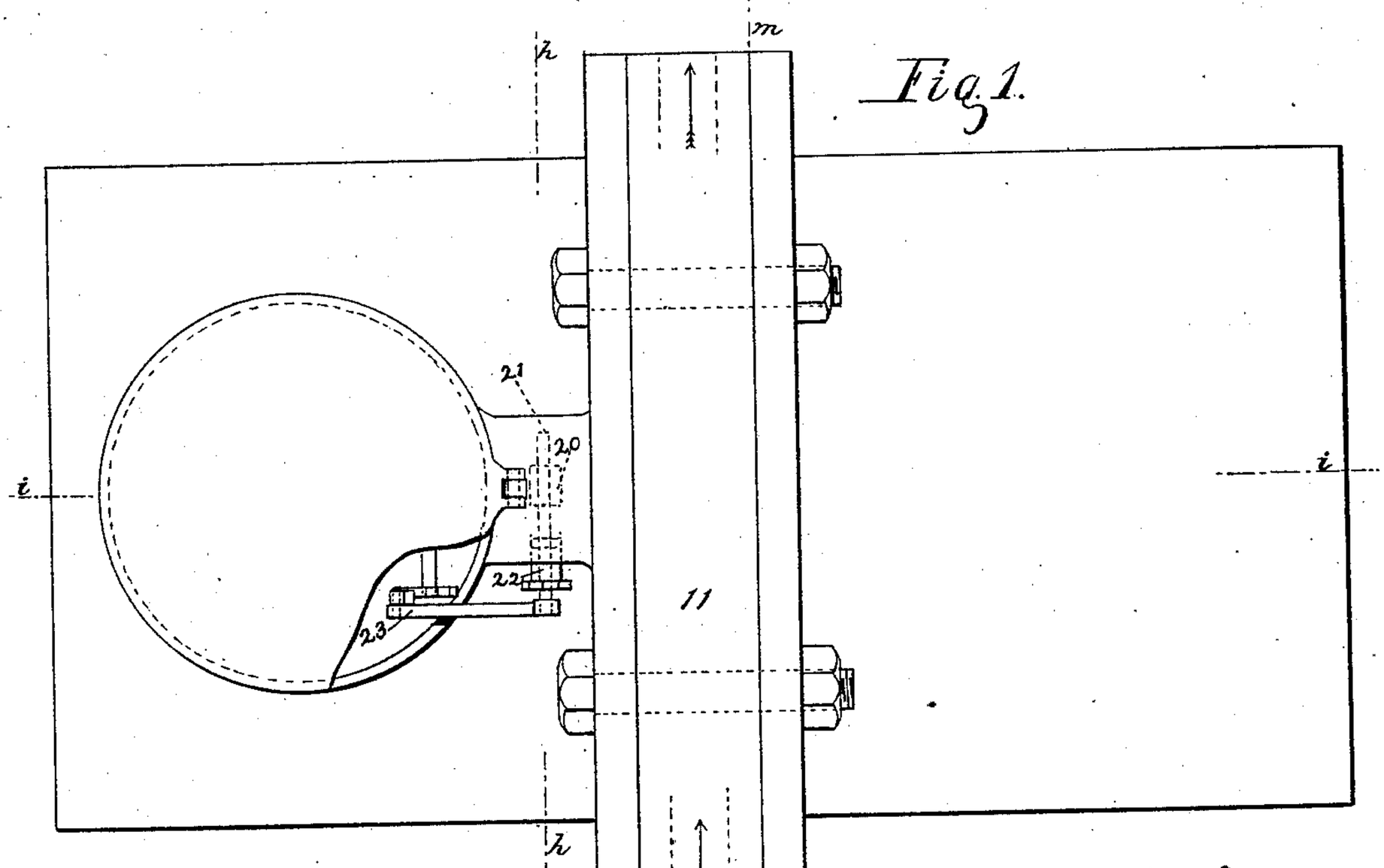
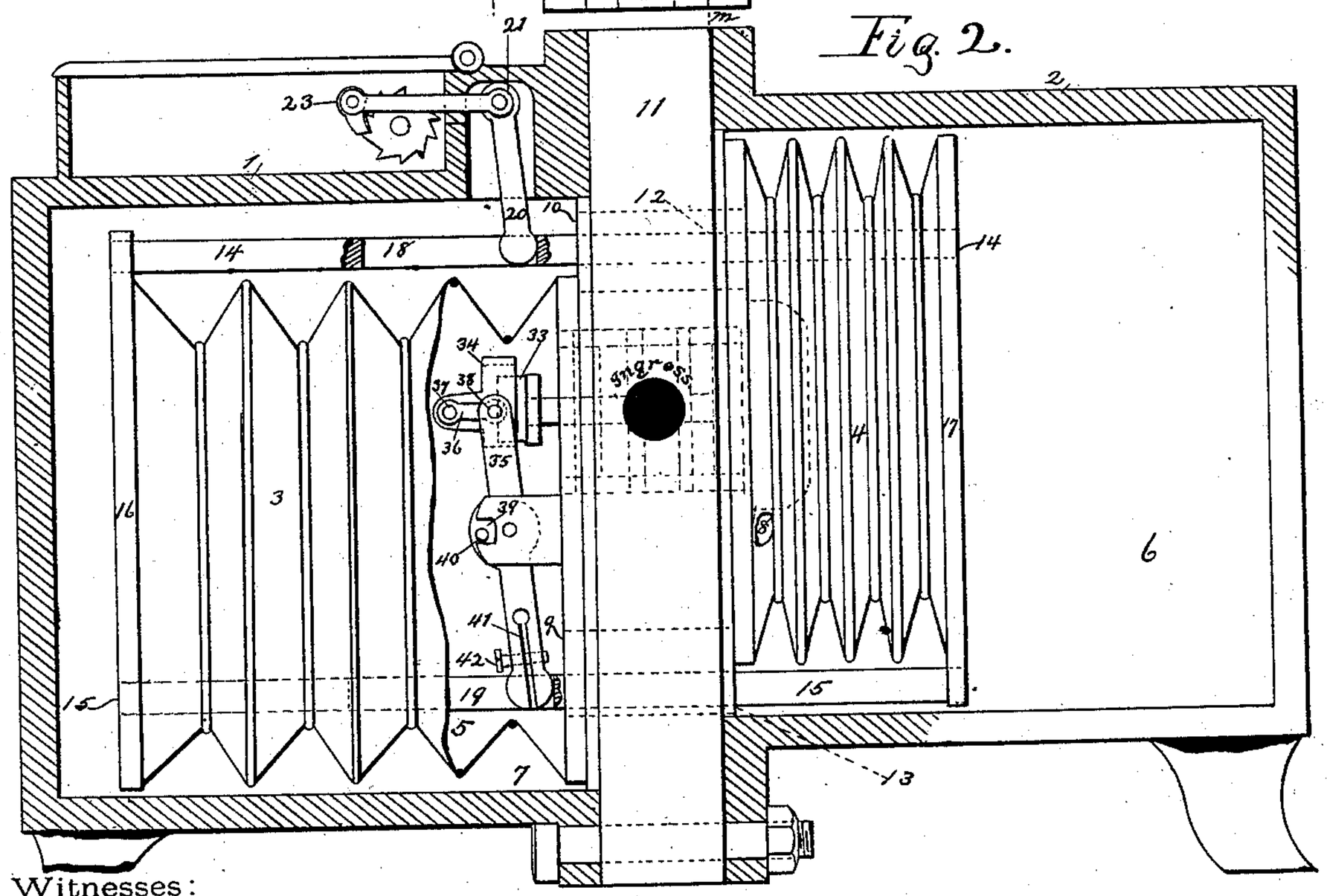


Fig. 2.



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N. PETERS. Photo-Lithographer, Washington, D. C.

(Model.) 4 Sheets—Sheet 2.

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Fig. 3.

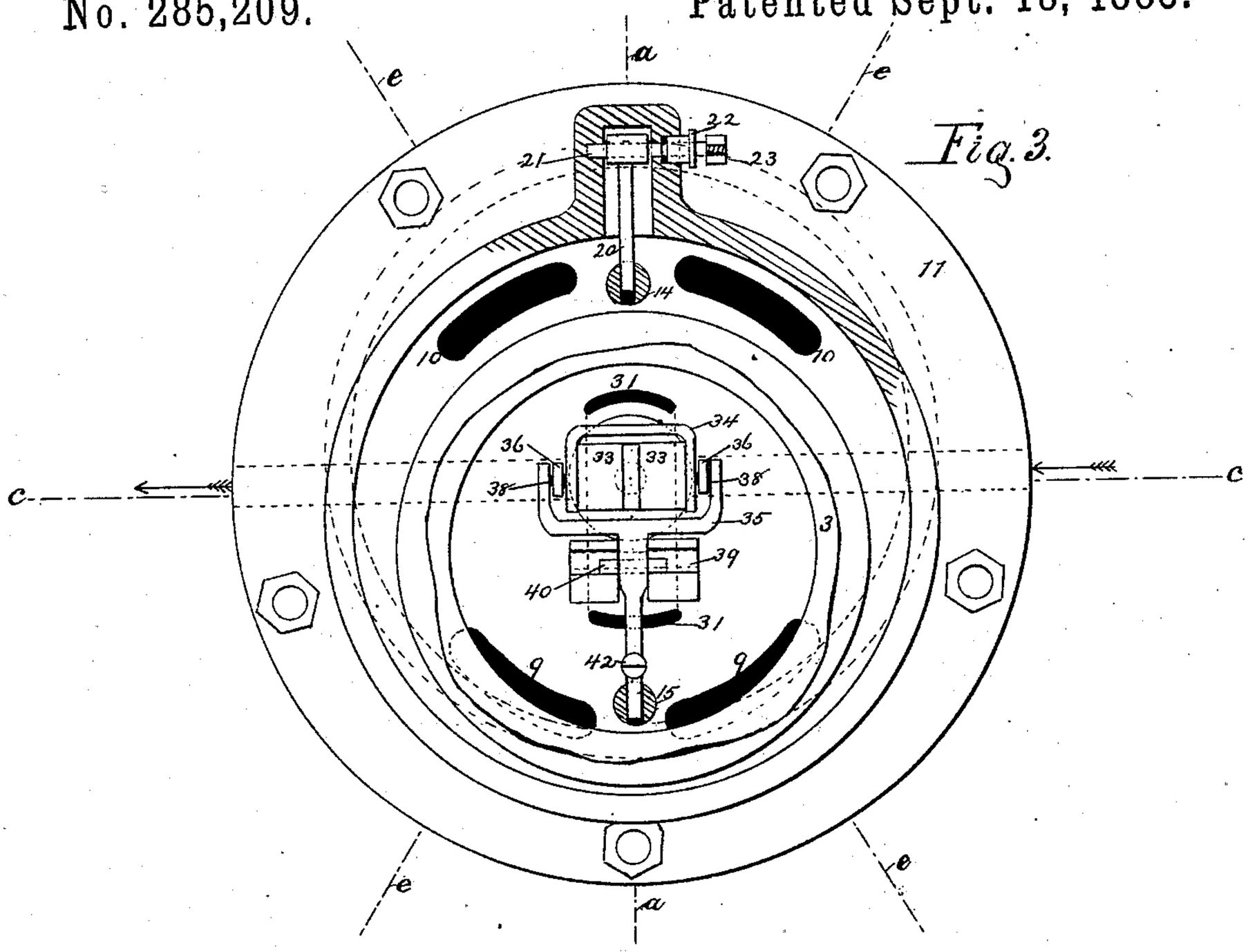

Fig. 4.

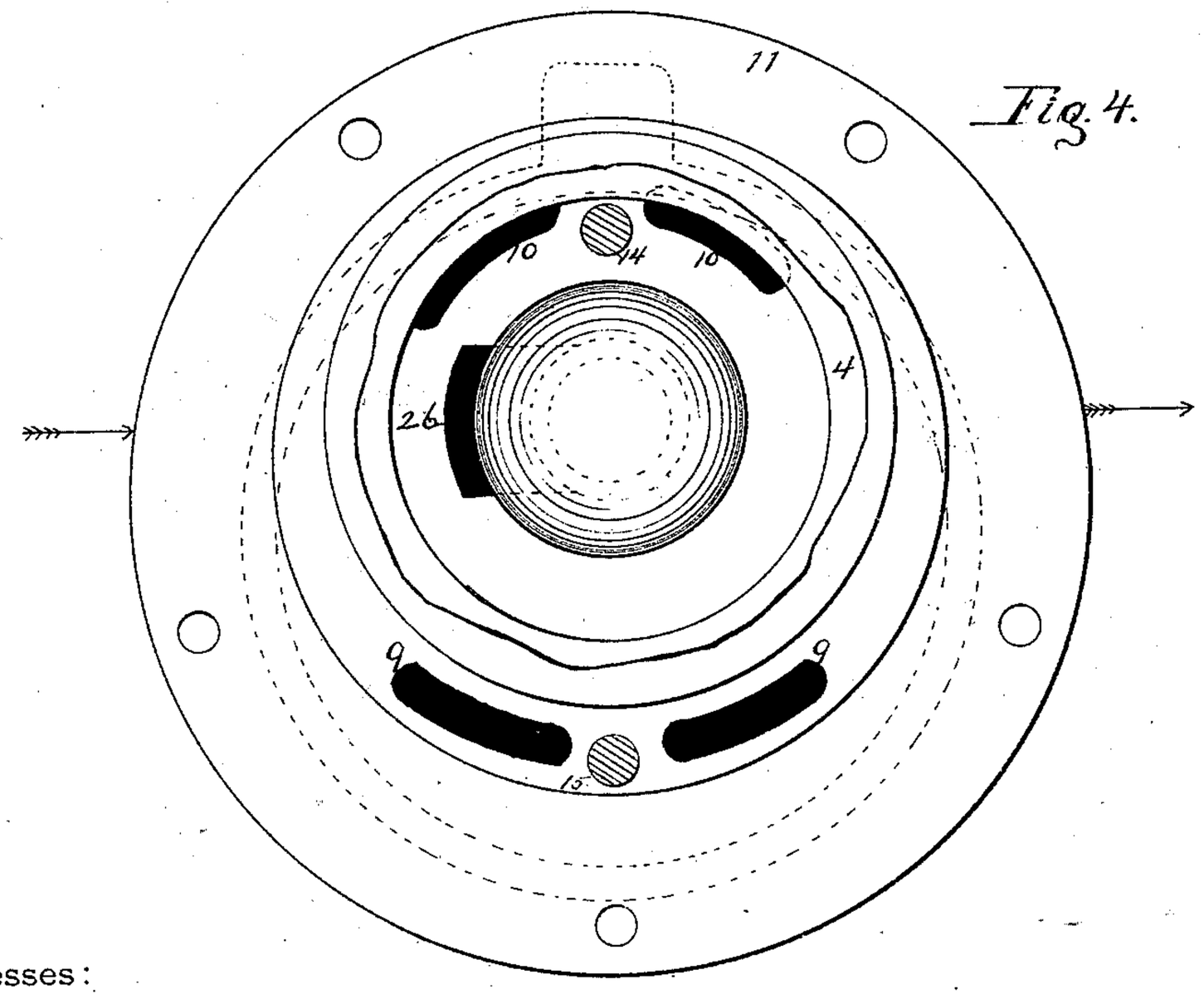

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Fig. 5.

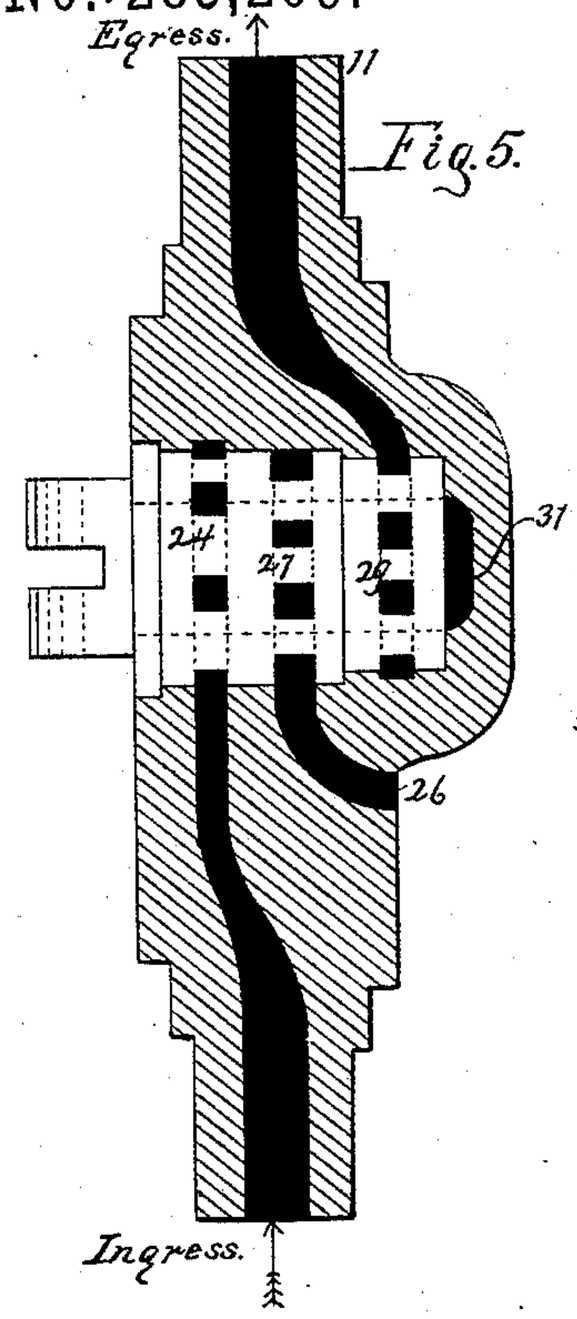


Fig. 6.

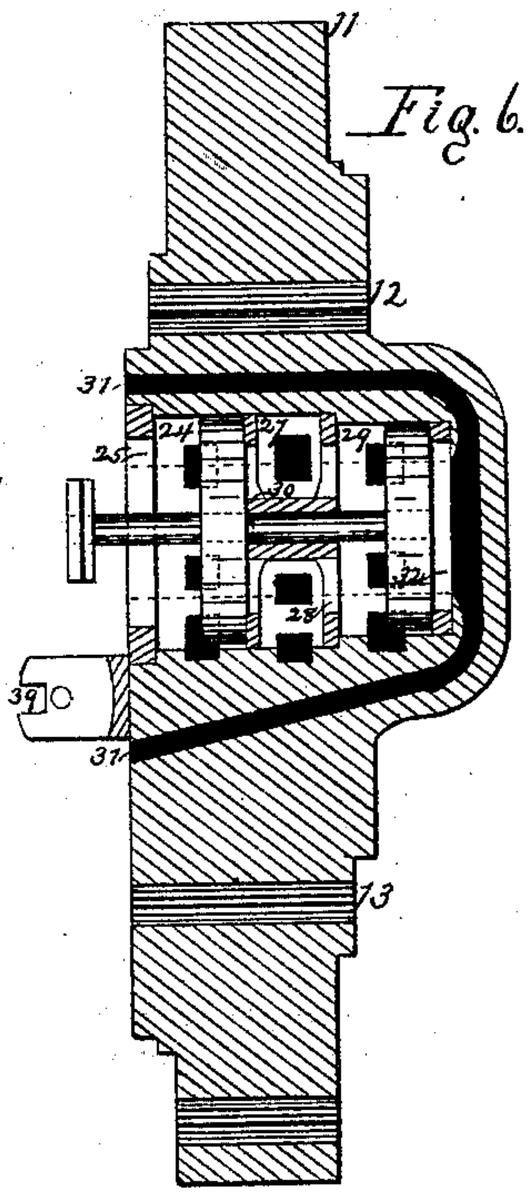


Fig. 7.

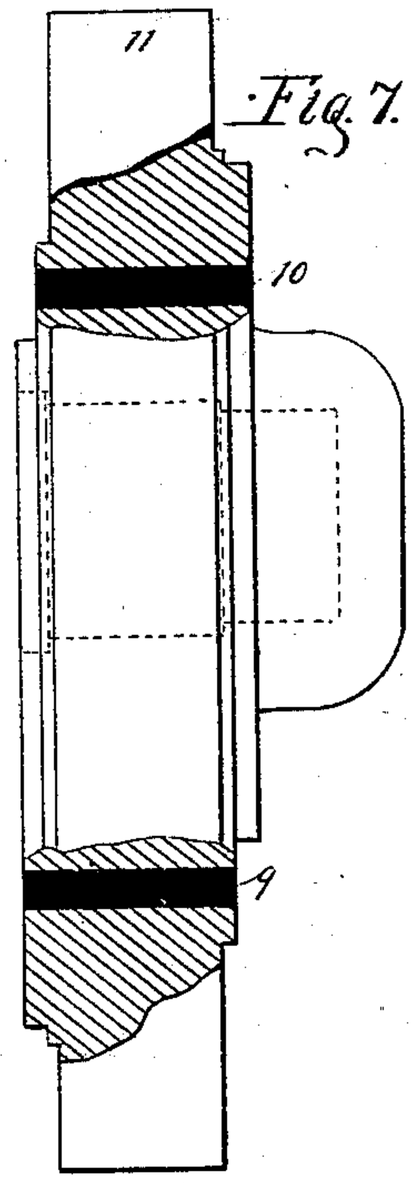


Fig. 8.

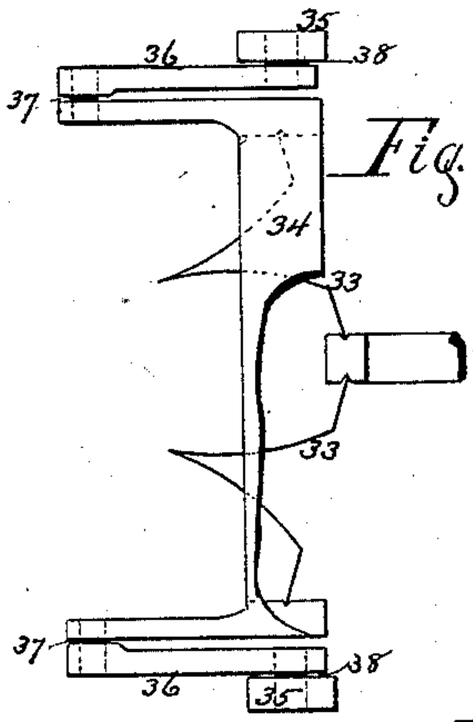


Fig. 10.

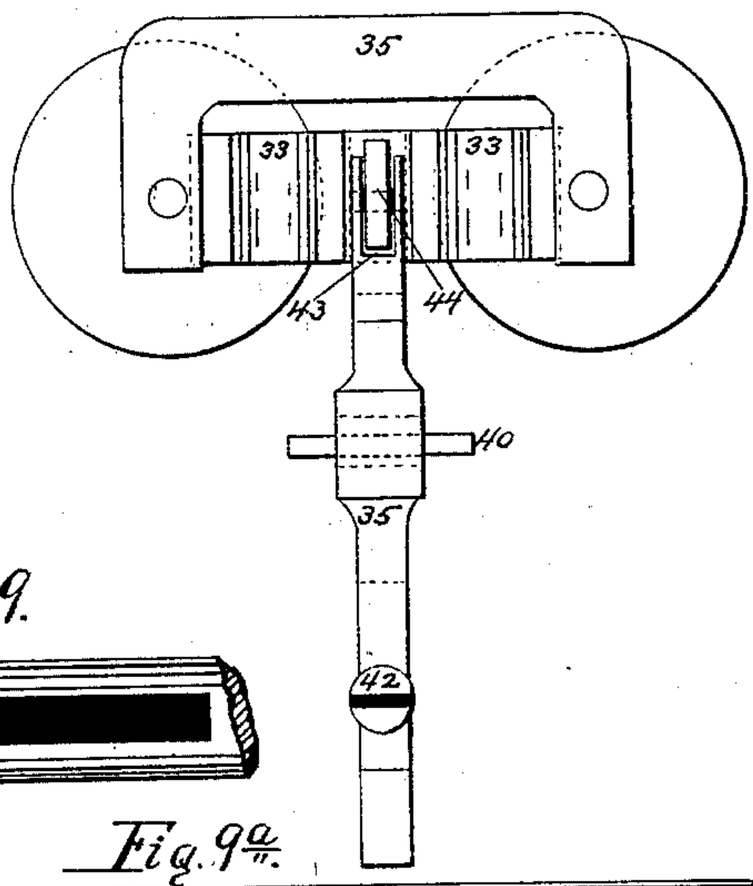


Fig. 11.

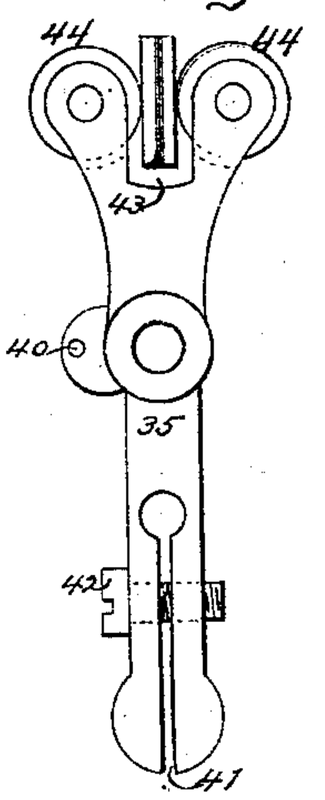


Fig. 9.

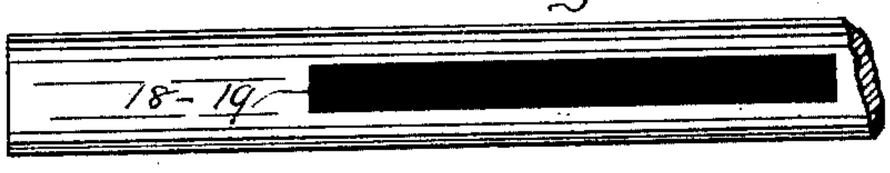
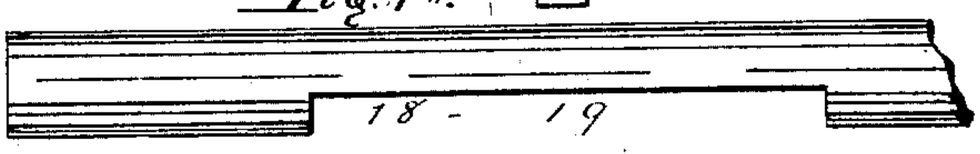


Fig. 9a.



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C. C. BARTON & J. THOMSON.

PISTON FLUID METER.

No. 285,209. Patented Sept. 18, 1883.

Fig. 12.

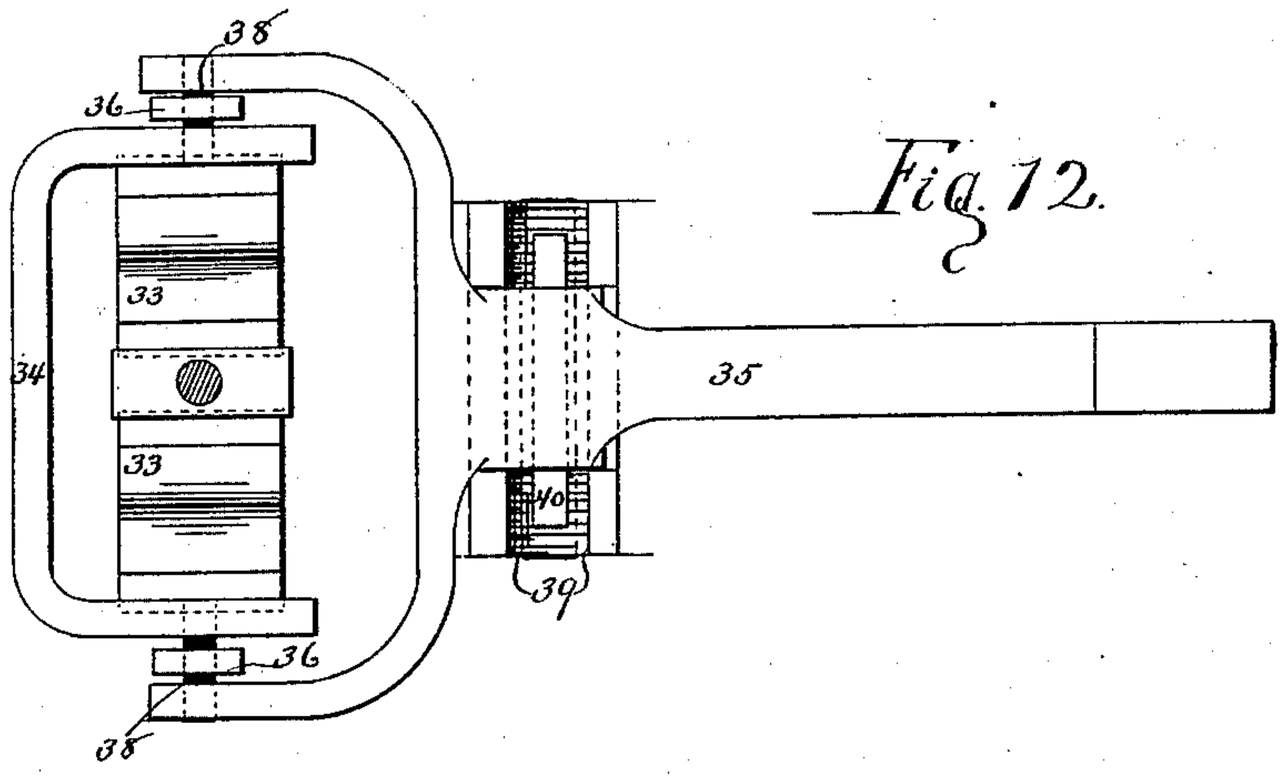


Fig. 13.

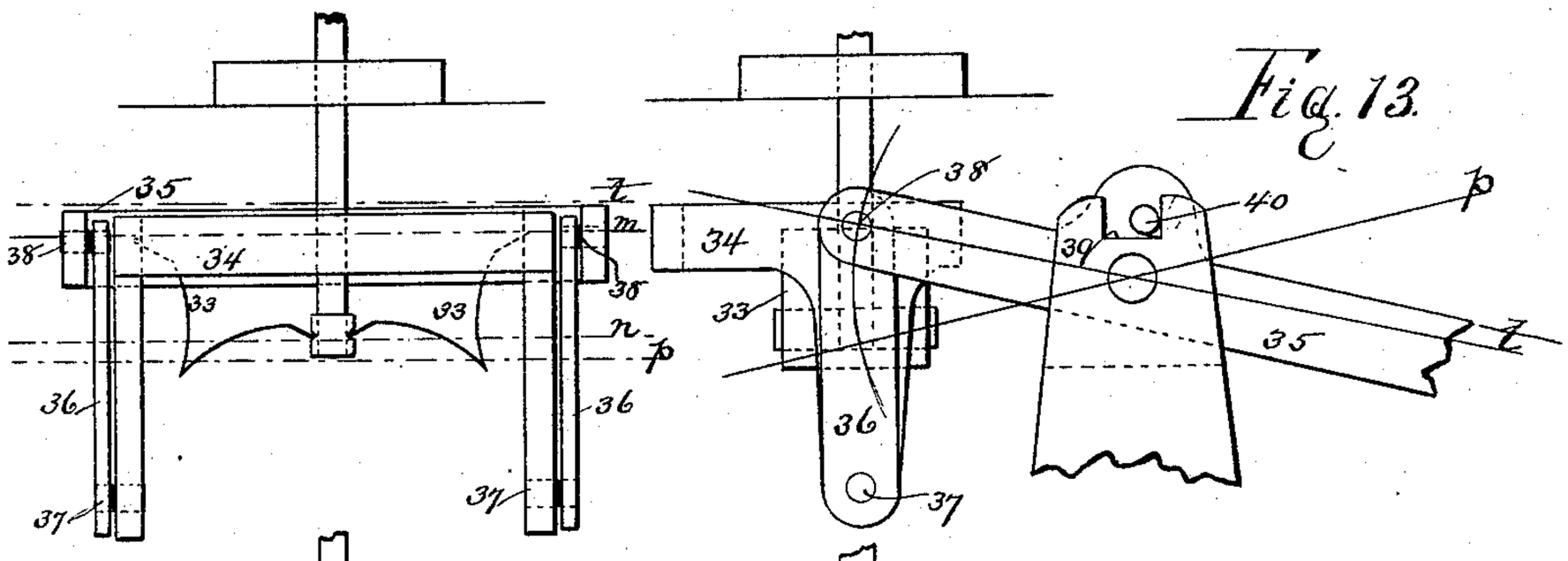
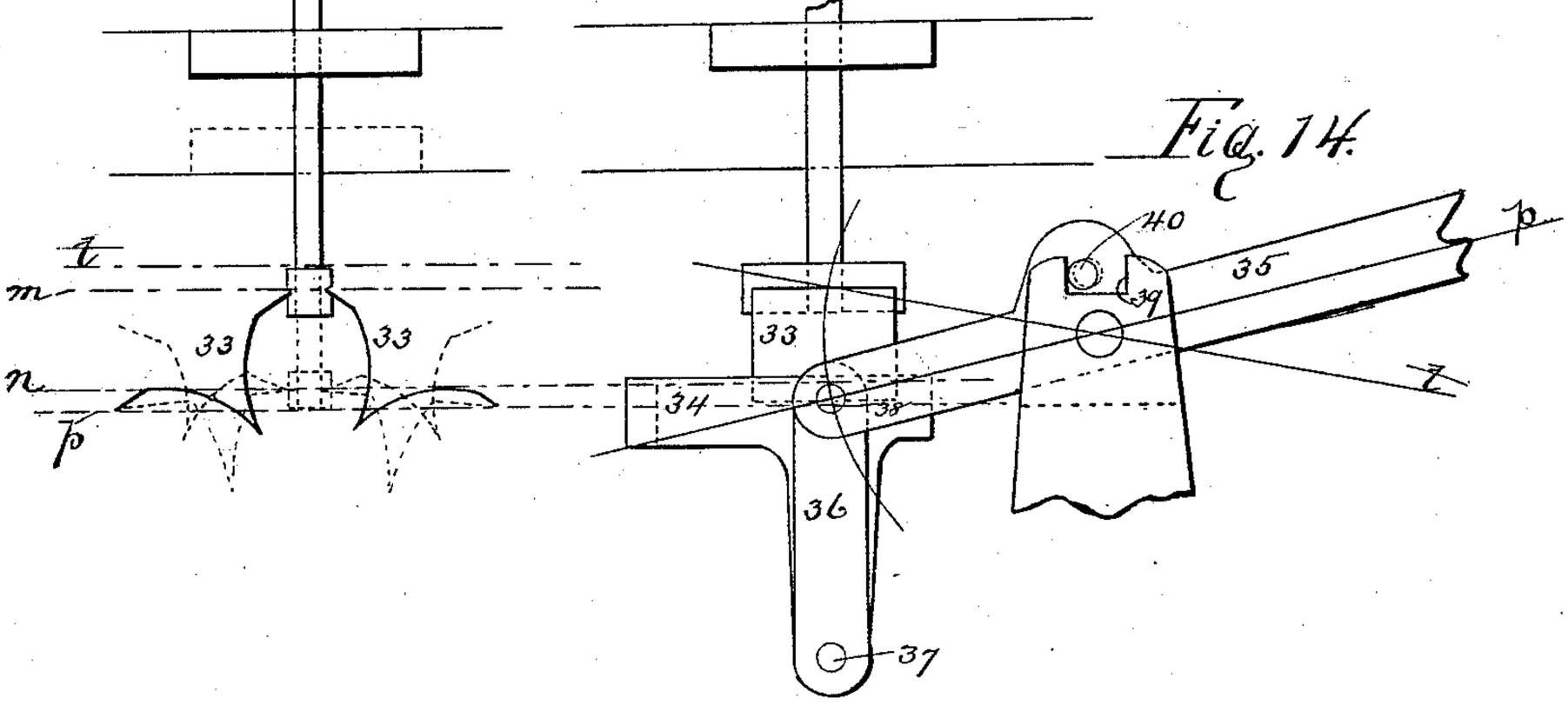


Fig. 14.



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UNITED STATES PATENT OFFICE.

CHARLES C. BARTON, OF NEW YORK, AND JOHN THOMSON, OF BROOKLYN, ASSIGNORS TO MARIA T. BARTON, OF NEW YORK, N. Y.

PISTON FLUID-METER.

SPECIFICATION forming part of Letters Patent No. 285,209, dated September 18, 1883.

Application filed January 6, 1883. (Model.)

To all whom it may concern:

Be it known that we, CHARLES C. BARTON, a citizen of the United States, residing at New York, New York, and JOHN THOMSON, 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 Fluid-Meters, of which the following is a specification.

This invention relates to compound coacting piston fluid-meters having inflating and collapsing linings.

The objects of our invention are to entirely avoid the packing of all internal working parts; also, to secure a direct, positive, and ready means of operating the register; also, to provide such a construction of the fluid-ways in the septum-wall with respect to the valve-pistons and cylinder as to present the minimum of friction to the passage of the fluid; also, the adaptation of a single balanced compound puppet-valve to this class of meters; also, to provide an improved means of operating the valve; also, to provide means for adjusting the stroke of the pistons for accurate measurement of volume; and, further, to accomplish a more perfect operation of the meter as a whole.

The invention consists, essentially, in the combination of a compound cylinder and compound coacting pistons, each end of the cylinder and pistons being set eccentrically to each other at opposite sides of a septum-wall, with respect to which the cylinders are concentrical, and in said septum-wall, &c., are means for controlling the direction of the currents, the compound cylinder being divided into four sub-compartments by means of the pistons and flexible collapsing linings attached thereto, each one of the piston-rods passing from one sub-compartment to another in the order in which said compartments are connected by valveless sluices formed in the septum-wall; and the invention also consists in certain details of construction, as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a plan view of our improved meter, showing the position of the register. Fig. 2 is a vertical longitudinal section on the line *i* of Fig. 1. Fig. 3 is a vertical transverse section on the line *h* of Fig. 1. Fig. 4 is a vertical transverse section, showing the reverse side of the parts shown in Fig. 3, the cylinder being removed at the line *m* of Fig. 1. Fig. 5 is a horizontal section of the septum or partition wall on the line *c*, Fig. 3. Fig. 6 is a vertical section of the same on the line *a* of Fig. 3. Fig. 7 is a partial section of the septum on the line *e* of Fig. 3. Fig. 8 is an end view of the carriage and valve-springs. Fig. 9 is an enlarged view of a piston-rod, showing the slot for actuating the register and carriage-levers. Fig. 9ª shows a modification in the form of the piston-rod slot or recess. Fig. 10 is a plan illustrating the attachment of the carriage and valve-springs to a set of double valves; and Fig. 11 is a detached view of the carriage-lever, showing the manner of adjusting it for the stroke, and also a modification of the connection to the motor-springs. Fig. 12 is an enlarged detail plan view of the actuating-lever, spring-carriage, and toggle-springs, taken from the right-hand side of Fig. 2. Figs. 13 and 14 represent detached side and end views, respectively, of the same parts.

The compound cylinder 1 2 is divided into four sub-compartments by the bellows-linings 3 4 and pistons 16 17, Fig. 2, said compartments 5, 6, 7 and 8 being connected with each other in the order named by the open or valveless sluices 9 10, Figs. 3, 4, and 7, that are formed in the septum-wall 11. It will be seen that by means of these sluices each pair of sub-compartments are connected as one. The opposite ends of the compound cylinder, together with their respective pistons and linings, are eccentric to or off center from each other; but all are concentric to the septum-wall. In consequence of this arrangement of the two ends of the cylinder 1 2, and the linings 3 4, and pistons 16 17, we are enabled to employ two piston-rods, 14 15, in which neither of their bearings 12 13 have the slightest packing, instead of being compelled to use a single central piston-rod necessarily requiring a stuffing-box. In making the ends of the cylinder conform in eccentricity with the internal linings and pistons, it is with a view to economy of material and convenience more particularly, as it is evident that by using a cylinder sufficiently large the same result would follow so long as the internal conditions remained as shown. It will be seen that two piston-rods, 14 15, are placed diametrically opposite each other, and that each rod passes

alternately from the inner to the outer side of the flexible lining, exactly in the order that the sub-compartments are connected by the sluices 9 10; hence it is apparent that the bearings of the piston-rods may be as loosely fitted as consistent with their double function—namely, to properly guide the piston-heads 16 17 and to operate the valve and register apparatus. The piston-rods 14 15 are preferably slotted or recessed, as shown at 18 19, Figs. 2, 9, 9ª, the upper rod, 14, serving to actuate the arm 20, that is secured within the cylinder to the shaft 21, said shaft projecting out through a packed bearing, 22, and thereby connecting, as by the arm and pawl 23, to the register. This is the only packed bearing in the meter, and, as will be hereinafter shown, serves a useful purpose, even in consequence of the friction involved in its operation. The packing for this bearing is separate from the case or recess that contains the register, and hence, in the event of leakage, the drip would simply flow down upon and off from the cylinders.

The construction of the valve, valve-seats, and chambers inclosed in the septum-wall is shown in Figs. 5 and 6. The incoming fluid passes continuously to the left-hand valve-chamber, 24, when the valve being in the position assumed, the exit from said chamber is through the open port 25, thereby filling the sub-compartment 5, and also through the lower sluices, 9, and the sub-compartment 6, while the outgoing fluid passes from sub-compartment 7 through the upper sluices, 10, into sub-compartment 8, and thence through the sluice 26 to the central valve-chamber, 27, passing on through the now open right-hand valve-chamber, 29, and thence out as a known volume through the final sluice of egress. As chamber 5 is being filled, the piston-head 16 is carried away from the septum-wall, and by means of the solid terminus of slot 19 in the piston-rod 15 the lower end of the valve-actuating lever 35 is carried in a like direction, while the upper or forward end of the lever carrying the spring-carriage and springs (see Fig. 2) is moved in the opposite direction, or toward the septum-wall, the assumed position of the valve being shown in Fig. 6. The essential conditions of correct operations are that the valve shall move, when it does move, in the same direction as that of the piston.

Referring directly to Figs. 13 and 14, the exact operation of the valve mechanism will be readily apprehended. As shown in Fig. 13, the thrust of the toggle-springs 33 is sustained, first, by the valve upon its seat through the valve-stem, and, second, by the spring-carriage 34 to the links 36, and, finally, against the solid wall of the slot 39. The immediate effect of changing the center *t* toward *p* is to cause a slight compression of the toggle-springs, thereby accumulating power therein. This movement may continue without effecting the valve in the slightest, except to cause it to adhere more tightly to its seat in consequence of the additional pressure of the springs, as indicated by the dotted outline, until the springs are brought slightly beyond their straight line or dead-center *n*, when they will instantly reverse their thrust and snap the valve over to the position assumed in Fig. 14, the stop-pin 40 acting against the opposite side of the slot 39. As shown, the action of the lever is slightly in excess of the actual movement required to operate the valve, the movement of the spring-carriage being from *m* to *n*, while that of the valve-stem is from *t* to *p*. This is controlled entirely by the travel of the pin 40 in the slot 39, and the advantage of this is that the first action of the springs, after being carried over their dead-center is upon the carriage and lever, which, for the instant being without restraint and of much less inertia than the valve, are moved in advance of the valve; hence the springs are placed at a more favorable angle from which to act upon the valve, and will have acquired a certain movement before the movement of the lever is arrested by the slot. This also admits of the use of much lighter springs, and consequent greater durability of parts. Upon the reversal of the valve, the pivots 25 and 28 being thereby closed, the incoming fluid can only find outlet through the left-hand internal port, 30, to the central chamber, 27, passing from out the septum-wall through the sluice 26, filling sub-compartment 8, and through the upper sluices, 10, and the sub-compartment 7, when the outgoing fluid passes back from the sub-compartment 6 through the lower sluices, 9, into the sub-compartment 5, from which there is a free exit by the external valve-sluice, 31, through the right-hand valve-port, 32, to sub-valve-chamber 29, and thence out again as a known volume through the final egress-sluice. It will thus be seen that by simply connecting the central sub-valve-chamber, 27, by the sluice 26 directly with the sub-compartment 8, and said compartment with sub-compartment 7 by the upper sluice or sluices, 10, all of the other valve conditions and methods of construction remain unchanged, the single balanced compound valve acting to properly control the entire volume of the ingress and egress fluid to the quadruple set of sub-compartments within the cylinder. The valve is operated by means of the toggle-springs 33, mounted upon the carriage 34 and actuated by the carriage-lever 35, Figs. 2, 3, and 8. Heretofore the carriage has been guided by journal-bearings having shoulders that act as stops to the movement of the carriage, the actuating-lever being connected to the carriage by a simple forked connection. In the present instance all guiding-bearings are dispensed with, the carriage having no frictional contact but that of the toggle-springs and the connection to the actuating-lever. As a simple forked connection tends, in consequence of the arc described by the lever, to transmit a corresponding irregularity or thrust to the carriage, we connect the carriage end of the lever to the carriage by means of an intermediate link-connection, 36, pivoted as at

37 38. As this link can be of any desirable length, it will readily be seen that the angular effect of the lever in actuating the carriage and springs, tending to deflect them from a right line, is practically *nil*, while the friction of the bearing-points of the link is exceedingly slight in comparison with that of a forked connection. The locking of the carriage-lever against the thrust of the valve-springs when the springs have passed beyond their dead-points and the springs act to reverse the position of the valve is provided for by slotting the standard, as 39, upon which the carriage-lever is mounted, and inserting a pin, as 40, or leaving a suitable projection upon the lever to act within the said slot, as will readily be understood from the drawings.

To provide for accurate and ready adjustment of the meter for measurement of volume, the lower end of the carriage-lever, acted upon by the piston-rod, is slotted, as 41, and an adjusting-screw, 42, inserted, as shown. When first assembled, the screw is turned up until the divided ends of the lever are slightly drawn toward each other. Then by afterward turning the screw in or out, as the need may be, the proper adjustment may be readily secured. This has the effect of increasing or decreasing the breadth or spread of the end of said lever. It will be seen that the upper piston-rod, 14, makes contact with the arm 20 at the same time that the lower piston-rod, 15, makes contact with the carriage-lever. This is so designed in order that there may be no cramping tendency upon the piston-rods in their bearings through the septum-wall 11, the friction developed in the packed bearing 22 approximately balancing that developed in the valve action.

Figs. 9 and 9ª show detailed views of that portion of the piston-rods containing the slots or flattened portion, where the arm and lever are situated, and whereby they are operated.

In Figs. 10 and 11 is shown the adaptation of the carriage 34 to a set of puppet-valves mounted upon separate valve-stems. In this instance the carriage-lever 35 becomes the spring-lever, the centers of the springs themselves, instead of the carriage, being carried back or forth by the direct movement of said lever, the thrust of the springs in their action upon the valves being communicated first to the carriage, which sustains the direct pressure of the springs, as in the previous instance here shown, and in consequence of the indirect thrust of the springs from the carriage to the valve-stems. In order to develop the least amount of friction in the movement of the springs, the forked end 43 of the spring-lever is provided in the friction-rollers 44. It will be seen that in lieu of the friction-roller a double or single link-connection might be readily substituted in many respects similar to the instance hereinbefore described.

In placing the motor apparatus of the valve wholly upon one side of the septum-wall, the machine work and labor in assembling the parts are reduced to a minimum. This is also the case in situating the register upon the same side of the septum-wall as the valve apparatus, and also thereby the entire meter does not need to be taken apart in order to get at the valve, or the valve and register mechanism. By placing the valve entirely within the septum-wall, economy of space and material is secured, and the valve is brought into the most intimate relations with the different sluices.

Having thus described our invention, what we claim is—

1. In a fluid-meter, the combination of a compound cylinder and a compound coacting piston inclosed therein, each end of said cylinder and piston being set eccentric to the other at opposite sides of a septum-wall, substantially as described.

2. In a fluid-meter, the combination, with a compound cylinder, and a septum-wall having valveless sluices and means for controlling the direction of the currents, of the flexible inflating and collapsing linings and two pistons, said pistons and flexible linings being set eccentric to each other and adapted to coact by means of the piston-rods, each one of said rods passing from one sub-compartment of the cylinder to another in the order in which said sub-compartments are connected by the said valveless sluices, substantially as described.

3. In a fluid-meter, the combination, with a cylinder, a septum-wall in which are inclosed means for controlling the direction of the current, and a compound coacting piston, of two piston-rods, one of said rods being adapted to operate the valve mechanism, and the other of said rods being adapted to operate the register apparatus.

4. In a fluid-meter, the combination of the valve-spring 33, carriage 34, carriage-lever 35, and link-connection 36, substantially as described.

5. In a fluid-meter, the combination, with the valve-operating mechanism, of a slotted standard and a lever having a stop-piece adapted to act within said slot, substantially as described.

6. In a fluid-meter in which the valve or valves are operated by a lever, means for increasing or decreasing the spread of said lever, whereby the length of the piston-stroke is accurately adjusted for measurement of volume, substantially as described.

7. In a fluid-meter, the combination, with its valve or valves and motor apparatus, of a valve-operating lever having a slotted end, as 41, and adjusting-screw, as 42, for the purpose set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

CHARLES C. BARTON.
JOHN THOMSON.

Witnesses:
L. H. ESSEX,
J. A. RUTHERFORD.