(No Model.)

4 Sheets—Sheet 1.

E. TATHAM.

OSCILLATING METER.

No. 322,500. Patented July 21, 1885.

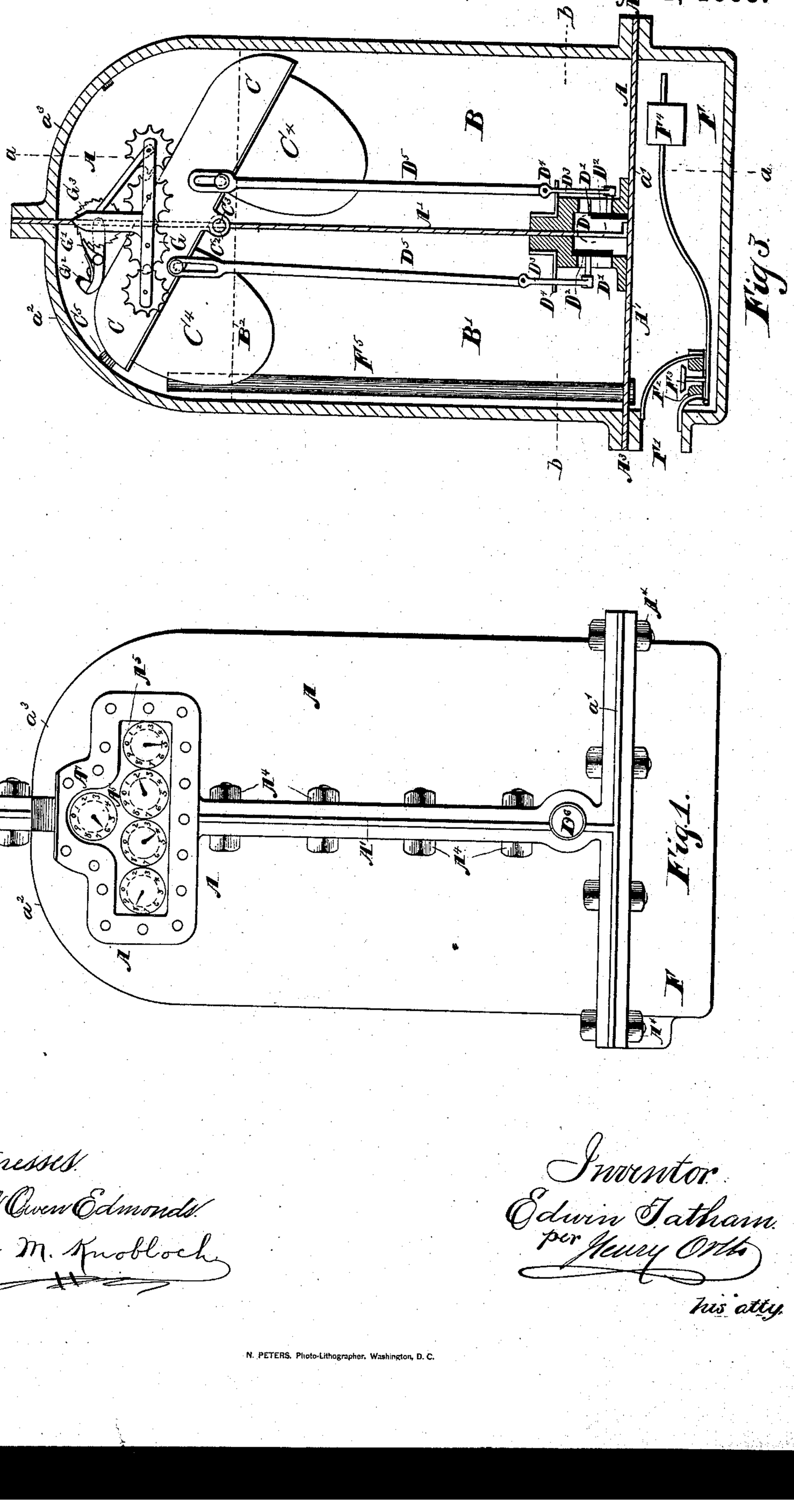

Fig. 3.

Fig. 1.

Witnesses.
Samuel Owen Edmonds.
Paul M. Knobloch

Inventor.
Edwin Tatham.
per Henry Orth
his atty.

(No Model.)

4 Sheets—Sheet 2.

E. TATHAM.

OSCILLATING METER.

No. 322,500. Patented July 21, 1885.

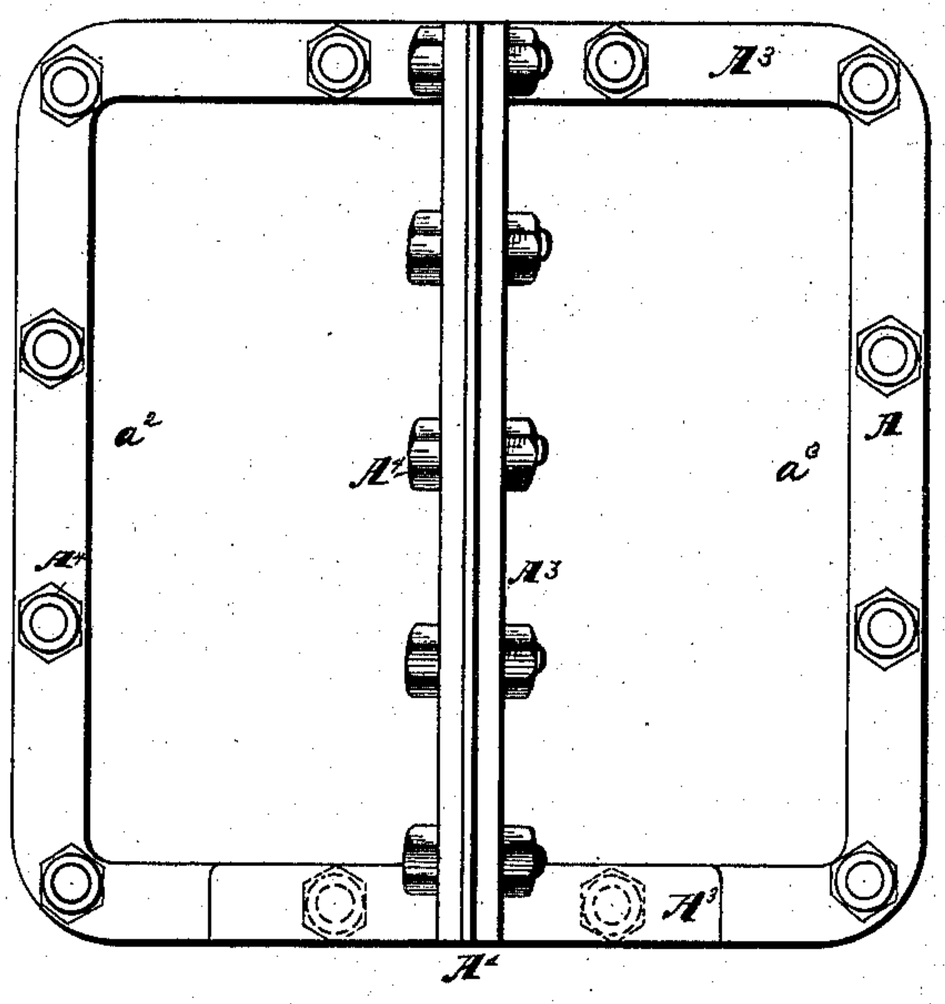

Fig. 2.

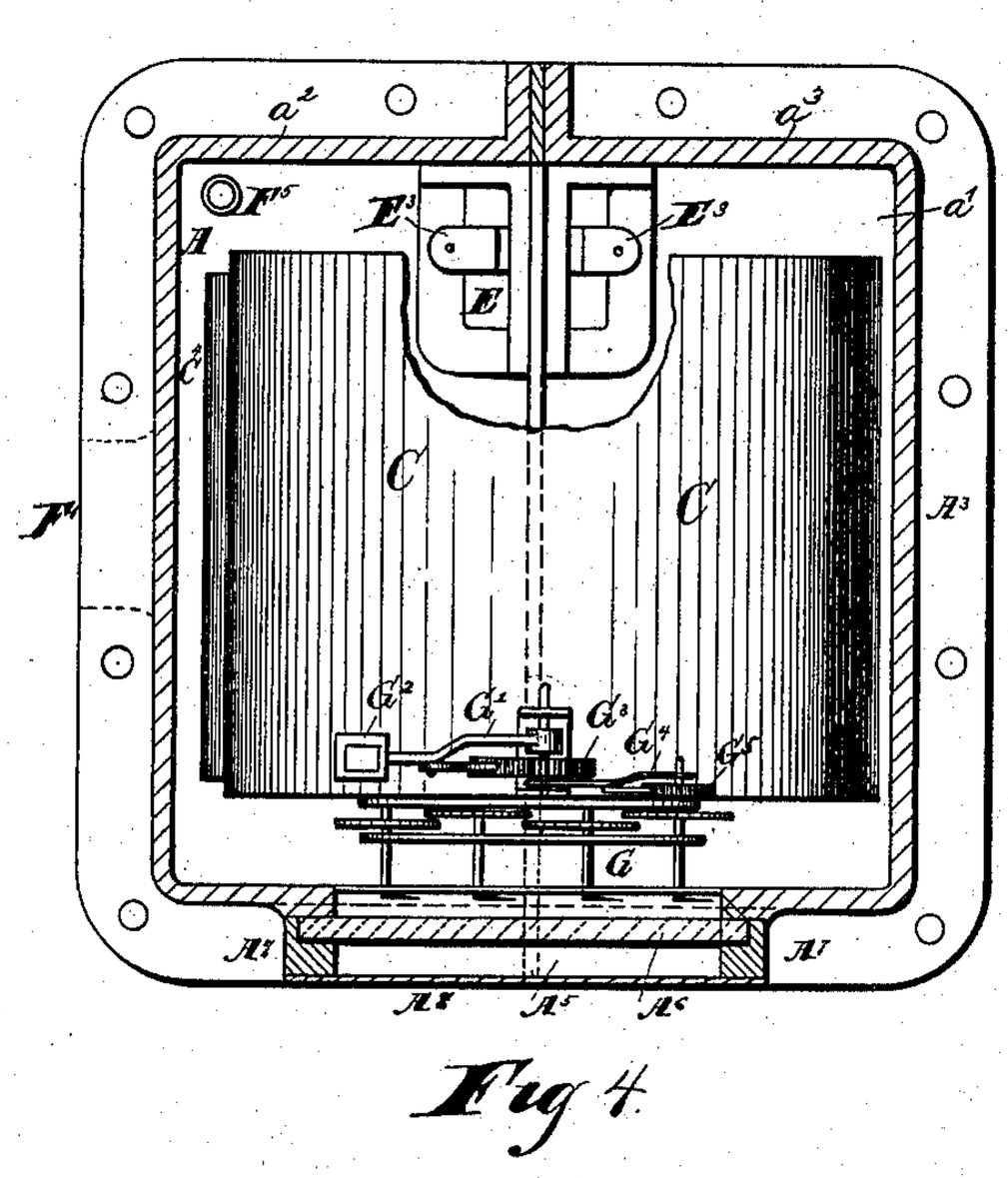

Fig 4.

Witnesses.
Samuel Owen Edmonds.
Paul M. Knobloch.

Inventor.
Edwin Tatham.
per Henry Orth
his atty.

(No Model.)

4 Sheets—Sheet 3.

E. TATHAM.

OSCILLATING METER.

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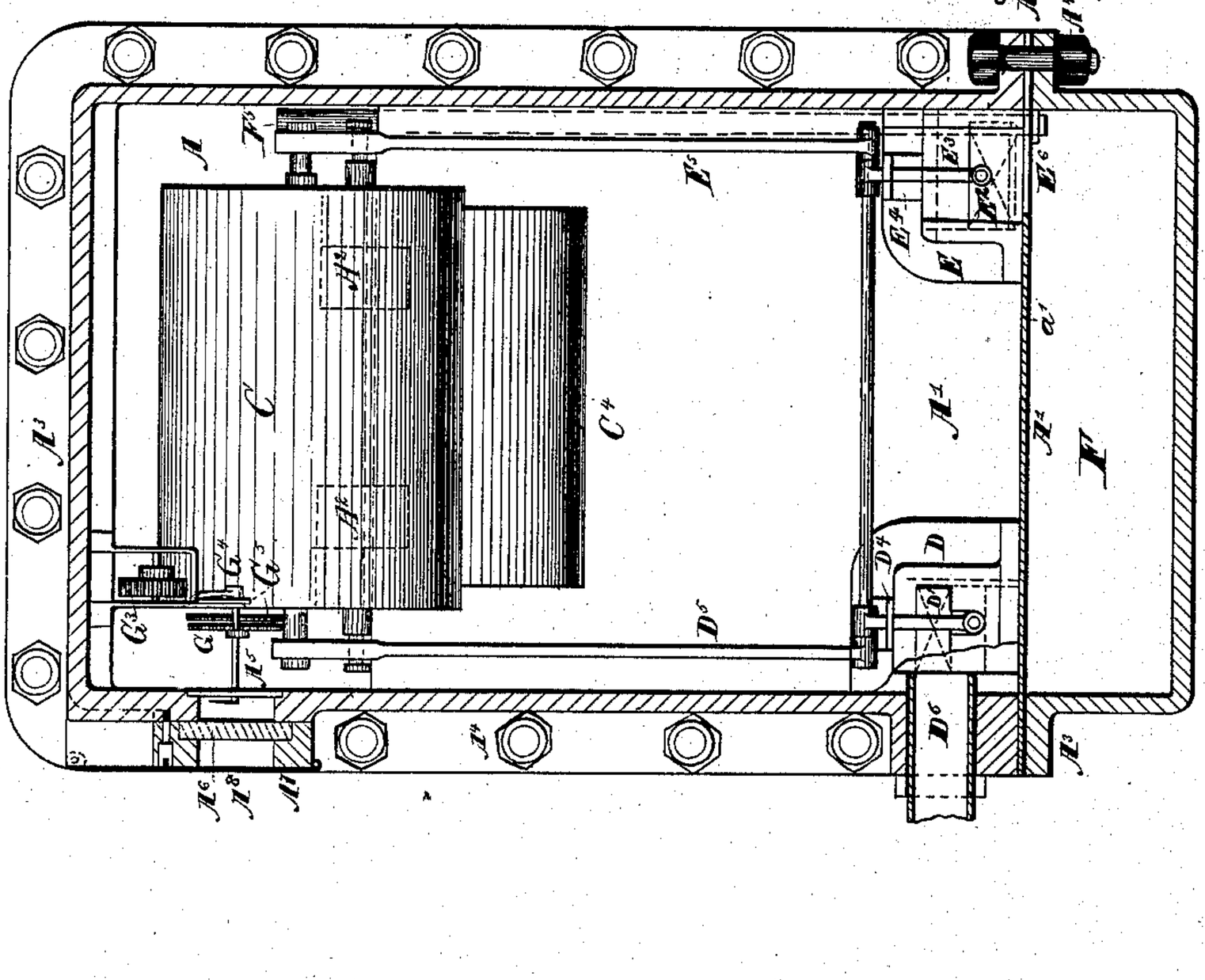

Fig. 1.

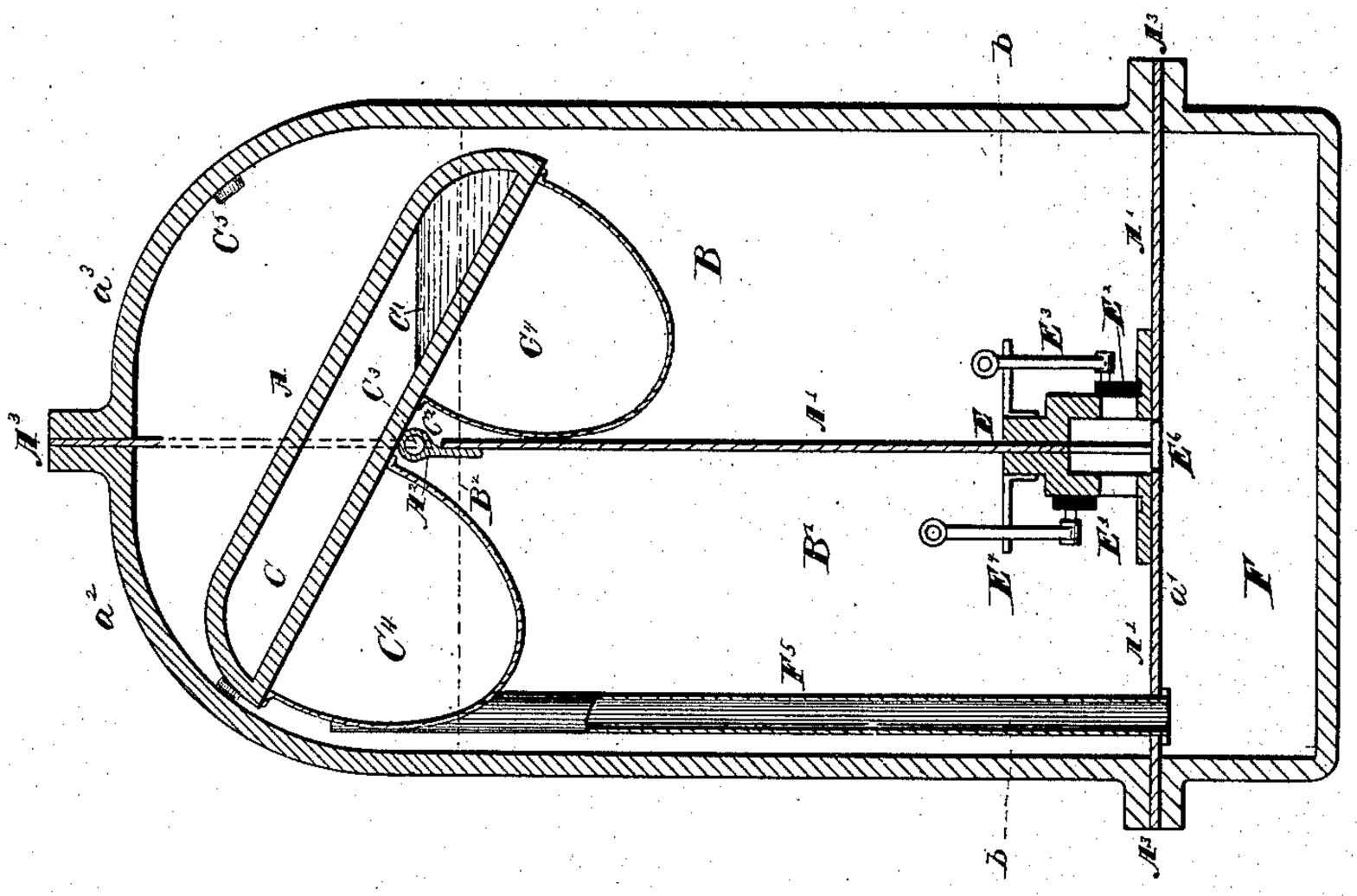

Fig. 5.

Witnesses
Samuel Owen Edmonds
Paul M. Knobloch

Inventor
Edwin Tatham
per Henry Orth
his atty.

(No Model.) 4 Sheets—Sheet 4.

E. TATHAM.

OSCILLATING METER.

No. 322,500. Patented July 21, 1885.

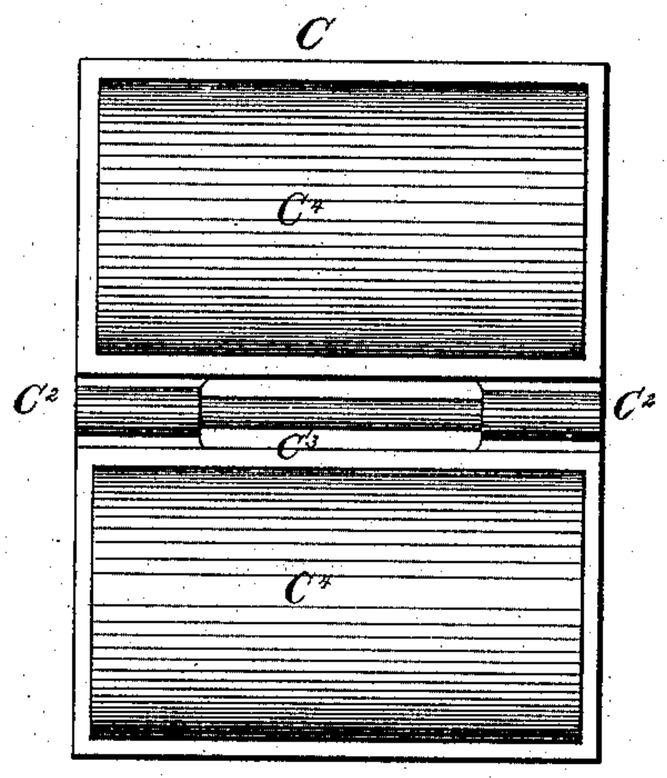

Fig. 8.

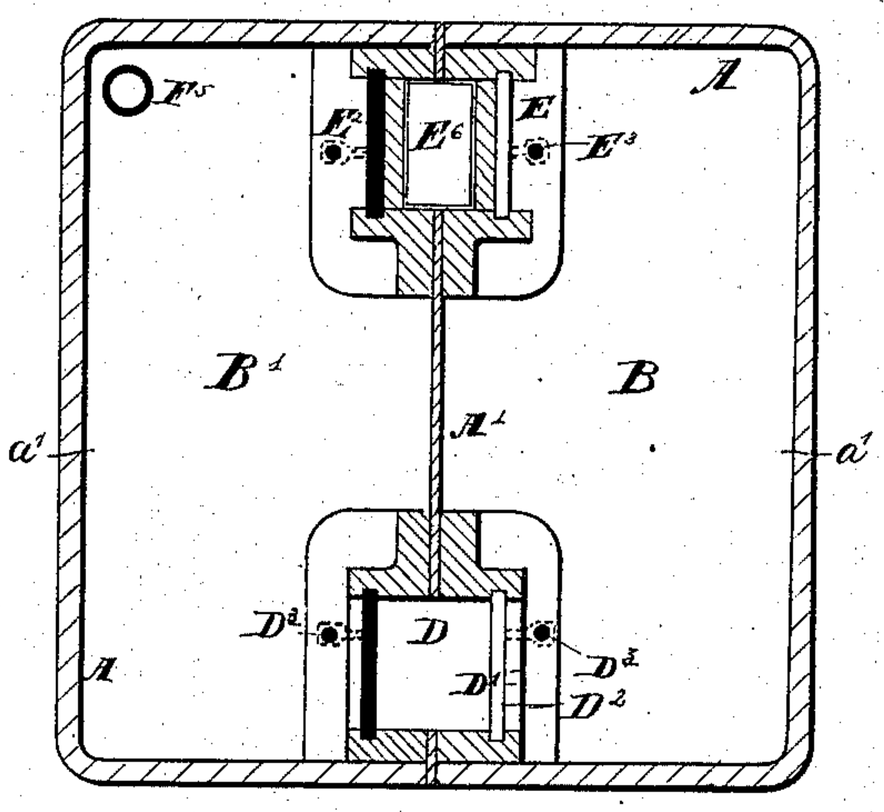

Fig. 6.

Witnesses.
Samuel Cuvn Edmonds
Paul M. Knobloch

Inventor.
Edwin Tatham.
per Munn & Co
Attys

UNITED STATES PATENT OFFICE.

EDWIN TATHAM, OF BALMAIN, NEW SOUTH WALES.

OSCILLATING METER.

SPECIFICATION forming part of Letters Patent No. 322,500, dated July 21, 1885.

Application filed January 17, 1885. (No model.) Patented in Victoria November 25, 1884, No. 3,896; in England January 12, 1885, No. 397; in New South Wales February 4, 1885, and in Canada February 28, 1885, No. 21,188.

To all whom it may concern:

Be it known that I, EDWIN TATHAM, a subject of the Queen of Great Britain, residing at Balmain, near Sydney, in the Colony of New South Wales, have invented certain new and useful Improvements in Liquid-Meters, (for which I have obtained Letters Patent in the Colony of Victoria, No. 3,896, dated November 25, 1884; in the Colony of New South Wales, dated February 4, 1885; in Great Britain, No. 397, dated January 12, 1885, and in Canada, No. 21,188, dated February 28, 1885; and have made applications for patents in India under date of February 11, 1885; in Germany, France, Belgium, and Italy, all under date of January 12, 1885, and in Austria under date of January 16, 1885,) of which the following is a full, clear, and exact description.

This invention relates to that class of apparatus designed for measuring and registering the volume of fluid passing through the same.

My improved liquid-meter is composed, essentially, of a casing divided into two chambers of like and predetermined capacities, and of suitable valves operated by an oscillating lever or balance combined with a float, and a moving or shifting body or substance acting on the lever to tilt the same when one of its ends is elevated by the liquid rising in one of the measuring-chambers to a given level. The lever or balance is so connected with the valves that when one of the chambers is full and the lever is tilted it will open the exhaust-valve of the filled chamber and close the inlet-valve thereof, and simultaneously therewith open the inlet-valve and close the exhaust-valve of the chamber previously emptied. In this manner one of the measuring-chambers is filling while the other is emptying. The meter is further composed of a delivery-chamber, to which the measured liquid is delivered and from which it passes to the delivery pipe or pipes, said delivery-chamber being provided with a suitable check-valve to prevent the return of the liquid delivered therefrom. It is further composed of any suitable registering mechanism, actuated by the oscillatory lever or balance to register the oscillations thereof, and consequently the number of times each measuring-chamber is filled and emptied.

The invention consists in the construction of the meter and of its parts and in their combination, substantially as hereinafter fully described, and as specifically pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a front elevation, and Fig. 2 a plan, respectively, of an improved liquid-meter. Fig. 3 is an internal elevation showing the casing or meter-casting, the induction-valves, and the discharge pipe or orifice in section; Fig. 4, an internal plan showing the casing in section; Fig. 5, a vertical section on line *a a* in Fig. 3; Fig. 6, a horizontal section on line *b b* in Figs. 3 and 5. Fig. 7 is an internal elevation in a plane at right angles to the planes of Figs. 1, 3, and 5, the casing and the induction pipe or orifice being shown in section; and Fig. 8 is a plan view of the under side of the oscillating lever or water-balance.

Like letters of reference indicate like parts whenever they occur in the drawings.

In the drawings, A indicates the meter-casing, which is preferably made in two parts, a^2 and a^3, bolted together and to a central partition, A′, that divides the casing into two measuring-chambers, B and B′, of equal capacity. The partition A′ is in the form of an inverted T, the horizontal portion a' of which forms the bottom or floor of the chambers B and B′, and to said horizontal portion and suitable flanges, *a*, on the two halves of the meter-casing is bolted the delivery-chamber F, which has corresponding flanges, *f*, as shown, the parts being bolted together by bolts A^4.

F^5 is a pipe extending from the chamber F into one of the chambers (that, B′, as shown) of the meter-casing to a point some distance above the highest level reached by the liquid therein, for a purpose presently explained.

Seated on the horizontal portion of the partition A′—that is to say, on the floor of the measuring-chambers and at opposite ends of the said partition—are two valve-casings, D and E. The interior of the valve-casing D is in communication with the inlet port or pipe, D^6, and has on its opposite sides a slide-valve, D^2, one for each chamber B and B′, said valves controlling the inlet-ports D′ in the valve-casing D. The valve-casing E, on the opposite end of the partition A′, is in communication

with the delivery-chamber F by a port, E^6, and a like valve-casing, D, has also on opposite sides a delivery or exhaust valve, E^2, one for each chamber B and B′, that control the delivery or exhaust ports E′ in the valve-casing E.

In its upper end the partition A′ has an opening, in which is arranged an oscillating lever or water-balance, C, composed, preferably, of an oblong air-tight box or casing nearly equal in area to the cross-sectional area of the meter-casing, but relatively very shallow, in which is hermetically sealed a small quantity of mercury, water, or other fluid, C′. On its under side the lever is provided centrally with lugs or hinge-knuckles or joints C^2, pivoted on a fulcrum-pin, C^3, so that the said lever or balance straddles the partition A′. On said under side of the lever or balance are also attached floats C^4, one for each chamber B B′, and at each end the lever or balance has on opposite sides, and in the vertical axial plane of the valves D^2 E^2, a stud or pin, to which is connected one end of a connecting-rod, which is slotted at that end, for purposes presently explained.

In the drawings, D^5 D^5 indicate the connecting-rods for the inlet-valves D^2 of the chambers, B B′, and E^5 E^5 indicate the like rods for the exhaust-valves E^2 of said chambers. The lower ends of the connecting-rods D^5 are pivoted to the valve-rods D^3 of the valves D^2, and the like ends of the rods E^5 are pivoted to the valve-rods E^3 of the valves E^2.

The registering mechanism, which may be of any usual or preferred construction, is located in the meter-case in front of the lever or balance C, and is controlled thereby through the medium of a weighted pawl, G′, that actuates the ratchet on the unit-wheel arbor, from which motion is transferred in any usual manner to other registering-arbors.

The weighted end G^2 of pawl-lever G rests on top of the balance or lever C, and as the latter oscillates on its fulcrum causes said pawl to move the ratchet a distance of one or more teeth at each complete oscillation; or the arrangement may be such as desired to register the oscillation of the lever in either direction, as will be readily understood.

A^5 is the opening; A^6, the glass face therein for reading the meter. A^7 is the frame in which the glass face is secured; A^8, the cover therefor.

The exhaust or discharge valve casing may be directly connected with the discharge-pipe, and such pipe provided with a proper check-valve to prevent the liquid from returning to the valve. When, however, the liquid discharged is to be delivered at an elevation above the meter or against a pressure, I prefer to employ a delivery-chamber, F, in which is formed the discharge-branch F′.

As above stated, the chamber F is in communication with the exhaust-valve casing E, and through the latter with both the chambers B B′, and it is provided with a suitable seat, F^2, for a check-valve, F^3, the stem of which is connected with a lever, the weighted float F^4 of which is adjustable thereon, so that the valve may be held to its seat with a pressure commensurate with that in the delivery-pipes.

The operation of the meter may be briefly described as follows: The water entering at D^6, and passing through valve-casing D and the inlet-port D′ of chamber B′, on rising to its highest level, as indicated by the dotted line B^2, lifts through the float C^4 the end of the lever or balance C, that extends into the chamber B′, and the fluid sealed in the lever-chamber flows from that end thereof to the opposite end that projects into the chamber B of the meter-casing and tilts the lever or balance on its fulcrum into the position shown in Figs. 3 and 5. In this movement of the lever the inlet-valve D^2 of chamber B′ is moved upward to close the inlet-port, and the exhaust or discharge valve E^2 of said chamber B′ is also moved upward to open the discharge-port in valve-casing E, corresponding with said valve. At the same time the corresponding valves, D^2 E^2, for chamber B are moved downward, the former to uncover the inlet, and the latter to cover the exhaust or outlet ports corresponding with said chamber B. The latter is now filling, while the former chamber, B′, is emptying, the water flowing from said chamber B′ into the delivery-chamber F. During the oscillation of the lever or balance C the weighted pawl G′ is also lifted, and rotates the ratchet-wheel on the unit-arbor the required distance, which is registered on the unit-dial. When the water in chamber B has risen to the highest or operative level, the movement of the parts are reversed, and chamber B empties, while chamber B′ again fills, the pawl G′ descending with the lever or balance, and, riding over the ratchet-wheel G^3 the required distance, engages therewith to rotate the same at the next oscillation of the lever or balance.

I have hereinbefore stated that the upper end of the connecting-rods D^5 and E^5 are slot ted, and that the pin by which said rods are connected with the lever or balance C passes through said slots. The object of this arrangement is to prevent the valves from operating until one end of the lever or balance has been lifted sufficiently to displace the liquid therein and tilt said lever—that is to say, until the liquid in the measuring-chamber has reached a predetermined level. These slots therefore control the level at which the liquid can rise in the measuring-chambers before the valves are brought into play, and said level may therefore be adjusted by the length of the slots within certain limits.

When the exhaust-valve casing is connected directly with the discharge-branch of the meter, the liquid entering at D^6 fills one of the measuring-chambers—say that, B. The air in the meter-casing is compressed and forms an air-cushion, and when the check-valve or trapped discharge is set or adjusted to that

pressure, the compressed air assists in forcing the liquid out of the measuring-chamber as soon as the exhaust-valve opens. The pressure within the meter-casing, as will be readily understood, is maintained practically uniform, as the chamber B′ commences to fill the moment chamber B commences to empty.

I have hereinabove stated that when the liquid is to be delivered at a higher level than that at which the meter is located, I prefer to employ in conjunction therewith a delivery-chamber, F; and in order to avail myself of the air-pressure above referred to the said chamber is connected by a pipe, F^5, with the interior of the meter, said pipe extending into the meter-case to a point above the maximum level to which the liquid rises therein to prevent said liquid passing through the pipe. In this case the air is compressed at the outset to the pressure at which the check-valve F^3 is set to discharge at, and the back-pressure of the column of liquid in the discharge-pipe further compresses the air within the meter when the valve is lifted off its seat by the float F^1, and such compressed air passes up through pipe F^5 to supplement the cushion formed by the air from the measuring-chambers, and the pressure thereof is felt by the liquid filling and discharging from measuring-chambers B and B′, respectively, and by the liquid which is being discharged through pipe F′, and which may be discharged at practically the same pressure at which it is supplied through pipe D^6 by adjusting the check-valve and weighted float F^4 at the proper distance from the fulcrum.

It is clearly to be seen that any cut-off and supply mechanism—such as taps, lift-valves, &c.—might be substituted for the slide-valves shown without departing from the nature of my invention; also, that it is not essential that the "water-balance" should be oblong or have parallel sides, nor that any particular sizes or materials are necessary to the success of the operations of my improved liquid-meter, although I prefer, when such meter is used, to measure water supplied in a pipe, say, one inch or less in diameter, to make each measuring-chamber of a capacity of two and a half gallons.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim, is—

1. In a liquid-meter, the combination, with the casing A, having inlet-port D^6, divided into two chambers by a central diaphragm, and the valve-casings D and E, having each an inlet and discharge valve D′ D^2 and E′ E^2, respectively, of the water-balance C, having floats C^4, the connecting-rods D^5 and E^5, for operating the valves connected with the water-balance, and a registering mechanism controlled by the said water-balance, said parts being arranged for co-operation, substantially as and for the purpose specified.

2. In a liquid-meter, the meter-casing A, formed in two parts, which, when bolted together, form the inlet-port D^6, a delivery-chamber, F, adapted to be secured to the casing A, in combination with the T-shaped partition or diaphragm A′, adapted to be clamped between the two parts of the casing and the delivery-chamber and divide the meter into three air-tight compartments, substantially as and for the purpose specified.

3. The combination, with the meter-case, valved measuring-chambers B B′, open at top, and the valved delivery-chamber, of the pipe F^5, whereby said measuring-chambers are placed in communication with the delivery-chamber independently of the valved communication between the two, substantially as described.

4. A liquid-meter divided into two air-tight measuring-chambers, inlet and discharge-valves for said chambers, a registering mechanism, an oscillating lever controlled by the liquid to be measured and controlling the inlet and discharge valves of the measuring-chambers, and the registering mechanism, in combination with an air-tight delivery-chamber in communication with the discharge-ports of the measuring-chambers, and with both said chambers at a point above the level to which the liquid rises therein, and a check-valve held to its seat by an adjustable pressure, substantially as and for the purpose specified.

5. A liquid-meter divided into two air-tight measuring-chambers, inlet and discharge-valves for said chambers, a registering mechanism, an oscillating lever controlled by the liquid to be measured, and controlling the inlet and discharge valves of the measuring-chambers, and the registering mechanism, in combination with an air-tight delivery-chamber in communication with the discharge-ports of the measuring-chambers, and with both said chambers at a point above the level to which the liquid rises therein, a check-valve, a lever for controlling the movements of the valve, and a float adapted for adjustment on and for controlling the lever through the liquid being discharged, substantially as and for the purpose specified.

EDWIN TATHAM.

Witnesses:
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EDGAR FUSSELL.