2 Sheets--Sheet 1.

E. E. P. CLAUSOLLES.

Water-Meters.

No. 136,363. Patented March 4, 1873.

FIG. 1.

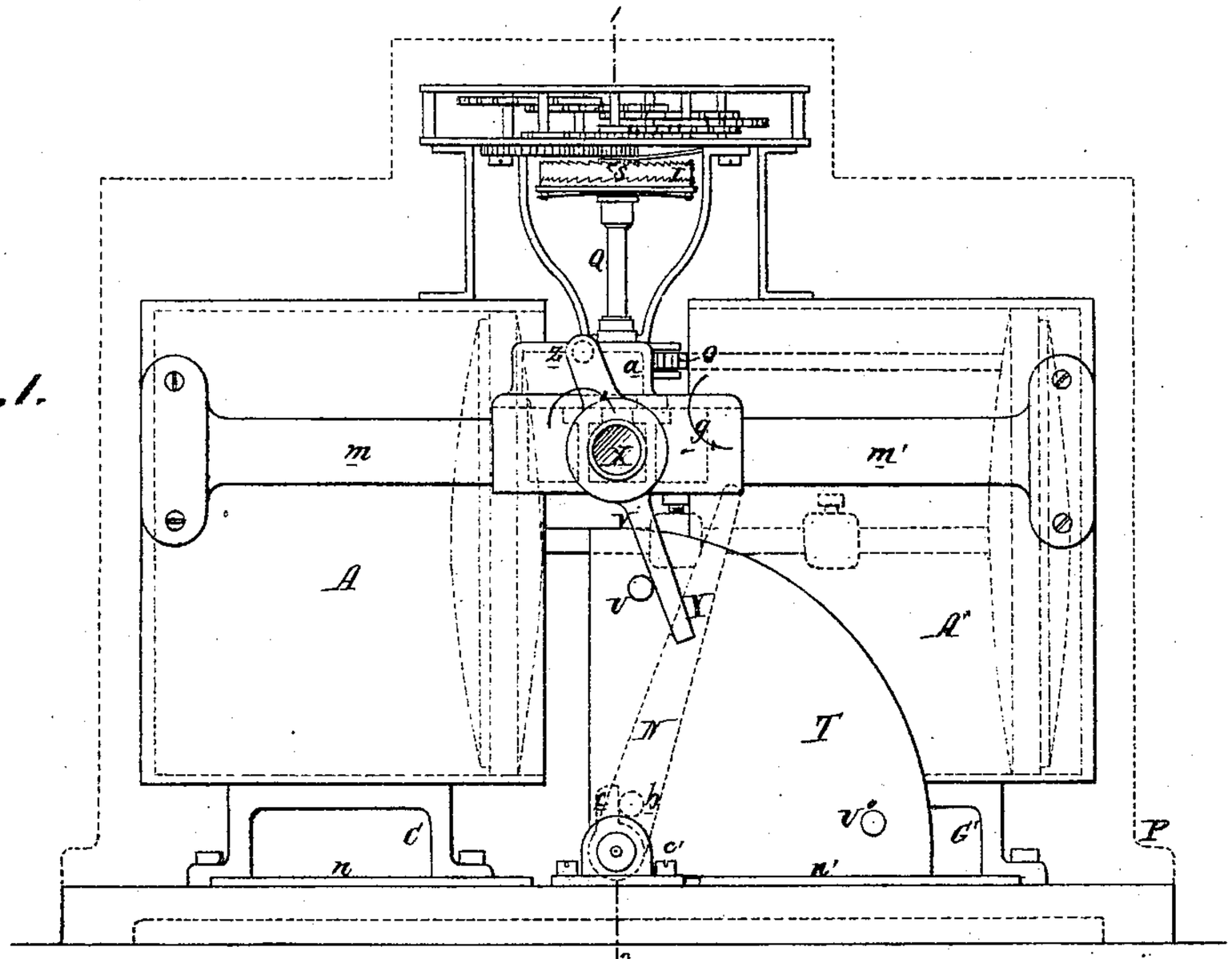


FIG. 2.

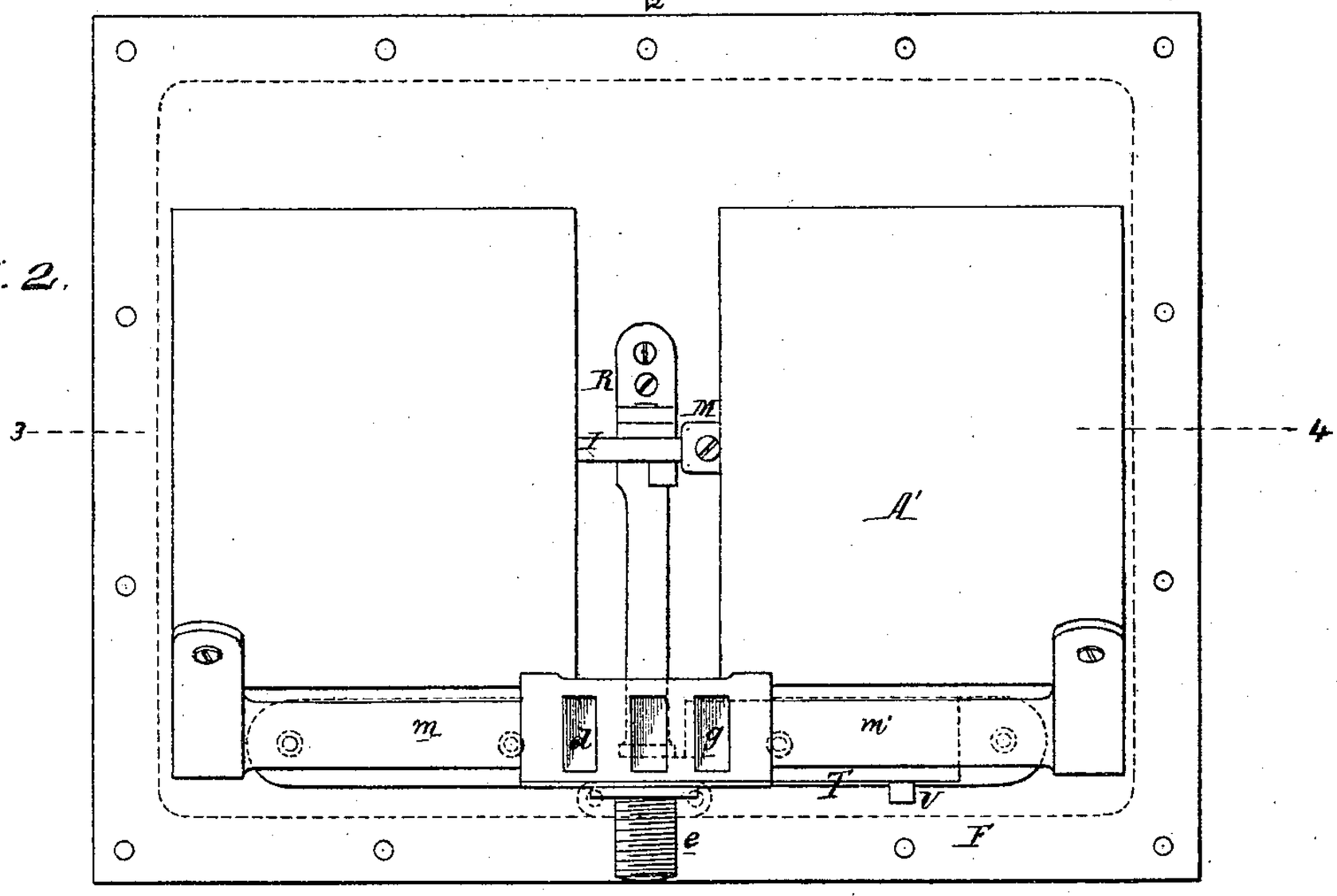


FIG. 5.

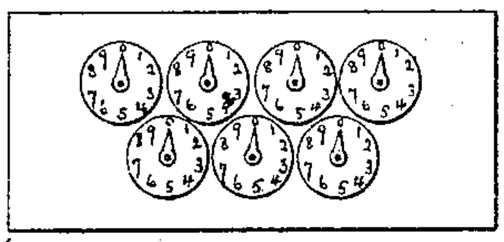
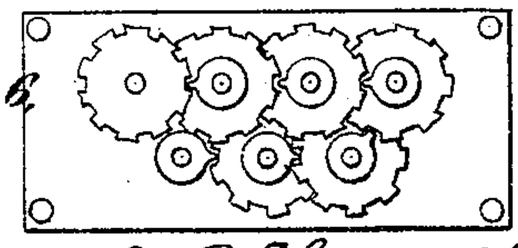


FIG. 6.



WITNESSES
John K. Rupertus
John Parker

Emile E. P. Clausolles
by his Attys. Strong and Son

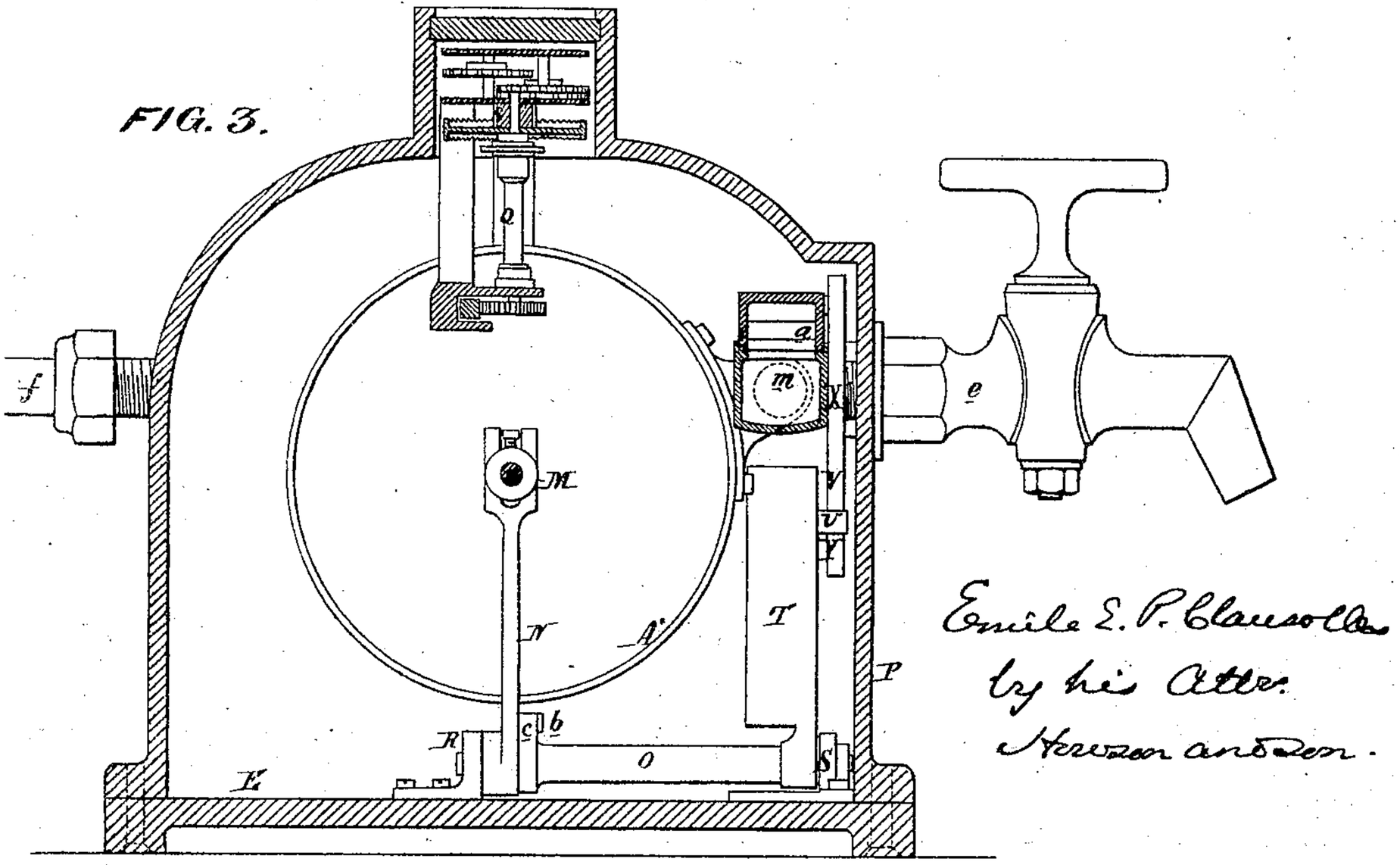
2 Sheets--Sheet 2.

E. E. P. CLAUSOLLES.

Water-Meters.

No. 136,363. Patented March 4, 1873.

FIG. 3.



Emile E. P. Clausolles
by his Attys.
Howson and Sons.

FIG. 4.

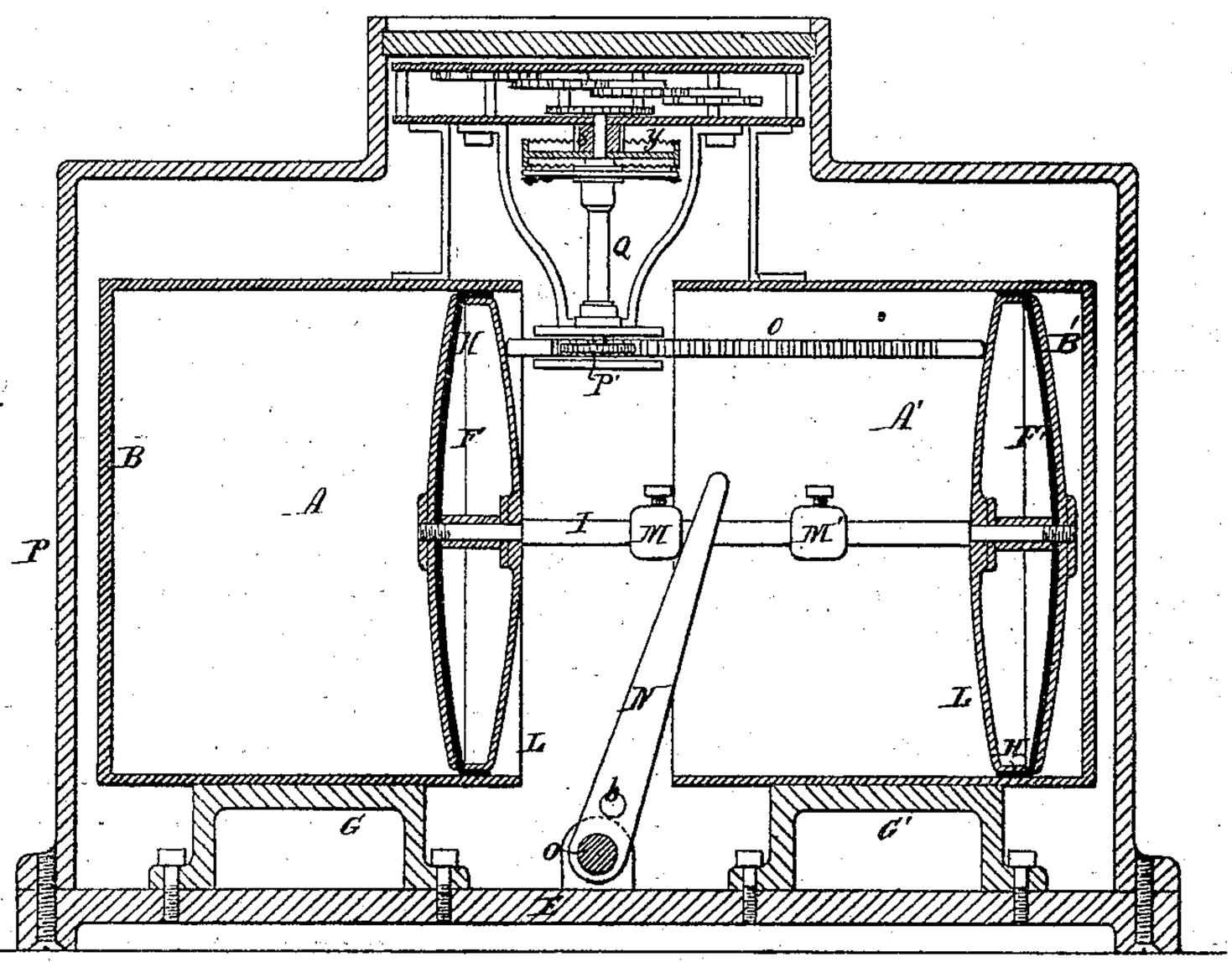
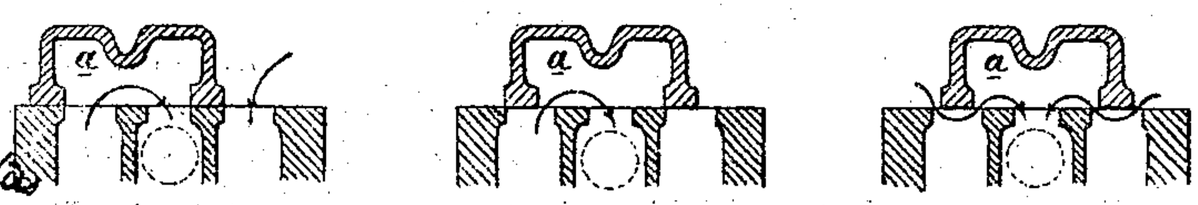


FIG. 7.



WITNESSES
John K Ruperto
John Parker

UNITED STATES PATENT OFFICE.

EMILE EUGENE PIERRE CLAUSOLLES, OF BARCELONA, SPAIN.

IMPROVEMENT IN WATER-METERS.

Specification forming part of Letters Patent No. **136,363**, dated March 4, 1873.

To all whom it may concern:

Be it known that I, EMILE EUGENE PIERRE CLAUSOLLES, of Barcelona, Spain, have invented certain Improvements in Water-Meters, of which the following is a specification:

My invention consists of certain improvements in water-meters, fully described hereafter; the principal advantages of my invention being as follows:

In the accompanying drawing, Figure 1 is a front elevation of the apparatus with one of the sides removed; Fig. 2, a top plan; Fig. 3, a transverse section on the line 1 2, Fig. 1; Fig. 4, a longitudinal section on the line 3 4, Fig. 2; Figs. 5 and 6, front views, respectively, of the dials and wheels of the register; Fig. 7, diagrams of a valve forming part of the apparatus.

The apparatus is composed of two cylinders of brass, tin, or composite metal, A A′, inclosed only at their ends B B′, and placed horizontally upon the same axis, so that their open ends shall be opposite each other. Their lower sides rest on supports C C′, which serve to fix them on the iron plate E, which constitutes the bed of the entire apparatus. Upon this same bed is fixed the case P, which hermetically incloses the whole mechanism. In the interior of each of the cylinders slides the hollow pistons F F′, well adjusted by means of thin and pliable leather packing H. These pistons are united by a rod, I, so that they are moved simultaneously from one end to the other of their cylinders uniformly, but in opposite directions—that is to say, while one of the pistons advances toward the open end of its cylinder the other is traveling toward the closed end of its cylinder. The pistons are hollow to prevent their weight bearing upon the bottom of their cylinders so as to wear one side rather than the other; being hollow and working in the water, they are, so to say, suspended in and lubricated by the water, which renders their movement very smooth. The rod which unites the two pistons has two adjustable collars, M M′, between which bears a forked lever, N, which oscillates at its lower part upon the horizontal shaft O. The movement to and fro of the pistons imparts to this lever an alternate vibratory movement. The shaft O, the ends of which turn freely in supports R S on the bed-plate, has at its other end a counter-weight or pendulum, T, fixed upon it. This counter-weight has two lugs, U U′, between which oscillates a lever, V, the center of which is at X upon the exit-tube. The lower extremity Y of this lever receives a circular alternate movement from the lugs U U′, and at its other extremity Z it communicates a rectilinear alternate movement to the slide-valve *a*. The oscillating movement of the counter-weight T is communicated to it by the arm N, which to this end has a lug, *b*, which pushes, alternately, the lugs *c c′*, so as to produce the fall of the counter-weight, thereby changing its position and that, consequently, of the slide-valve. The valve *a*, which is similar to those used in steam-engines, slides upon a plate having three ports, (see Figs. 1 and 2,) and every time it changes position the water already measured by one of the cylinders—that on the left, for instance—passes to the exterior, as indicated by the arrow *d*, Fig. 1, while the water which enters the hydrometer by the tube *f* is measured in the cylinder on the right by passing through the port *g* and tube *m′* and into the said cylinder, as indicated by the other arrow in Fig. 1.

The slide-valve must be a little shorter than the exterior length of the port-plate, as indicated in the diagram, Fig. 7, in order to prevent its stopping in the middle of its course without the counter-weight being able to carry it on. In fact, if the total length of the valve were equal to the extreme distance of the ports, it might happen that a change of position—and when it was at the middle of its course—would exactly close the two extreme orifices; and if the pressure in the hydrometer was considerable, it would be stopped in this position by the pressure of the liquid upon its whole external surface; but the moment that the valve is shorter, as the different positions of the details, Fig. 7, indicate, the pressure of the water has no longer any influence upon it, and it is perfectly operated by the counter-weight without any appreciable loss of water in its passage, which lasts only a fraction of a second.

The transmission of movement to the counting mechanism of the hydrometer, the needles of which must be moved in proportion to the number of cylinders and the course of the pistons, may be very simple.

A rack, O, is secured to and between the two pistons, and follows them in their rectilinear alternate movement. The length of the toothed portion of the rack (about seventy-eight millimeters) represents in the cylinders A A′ the capacity of a liter, plus an excess, which the counter indicates also, however small the quantity the pistons surpass the limits of the liter. This rack gears with a wheel, P′, fixed to a vertical shaft, Q, which carries at its other end a wheel with a double ratchet, I, presenting a very fine gear, and mounted loosely upon a shaft with a double pawl, which carries it. The pawls are so arranged that when one is at the bottom of a tooth the other acts upon the one behind so as to mark, with the greatest possible exactitude, the volume of the cylindered water. To the ratchet-wheel I is attached a pinion, *s*, which gears with the wheel of the first registering-cylinder. When one of the cylinders is filled with water—that on the right, for instance—the pistons, being moved from left to right, carry in their movement the rack, which causes the wheel P′ to turn, and thus cause the two pawls to operate backward without marking the first water cylindered. As soon as the slide-valve changes position the water which enters the cylinder from the right pushes the pistons toward the left, and this time they carry in their movement the rack, and turn the pinion, and consequently the ratchet-wheel, so that the counter during this return marks the two volumes of water cylindered, both of which are thus debited. The communication between the distributing-box and the cylinders is effected by the two tubes *m m′*. To deaden the shock of the counter-weight, although it will not be considerable, since it operates in the water, pieces of leather *n* and *n′* are fixed upon the plate E. The counting mechanism is constructed so that the needles shall always be in proper relation to the numbers of their respective dials, and so that the passages from one to the other shall be made intermittently and not in a continuous way. To do this the pinions have only a single tooth, which gears with one of the ten teeth of the adjoining wheel; and it is only after having made a complete turn that they take a new tooth. At each change of a tooth the needles leap from one to another number by an intermittent motion. The counting mechanism is lodged in a recess in the upper part of the case P, which incloses the whole apparatus. The size of this chamber is almost one-tenth of that which exists between the inlet for the water and the top of the case —that is to say, the part occupied by the compressed air—so that even where the apparatus should work at eight or ten atmospheres the water would not enter in the chamber containing the clock movement of the counter.

In order to allow the counting mechanism to be placed entirely outside of the case P, and to give motion to it without piercing the disk *y* to allow passage to any axis necessitating a stuffing box, I can arrange a magnet upon the axis Q, and above the ratchet-wheel, the said magnet to carry with it by attraction a needle placed outside the case P. The needle is connected with and operates the counting mechanism, and transmits very faithfully to the said counters all the movements of the ratchet-wheel and magnet.

The apparatus operates in the following manner: The water which enters the hydrometer by the tube or orifice *f* partly fills the case; and, if we suppose that the distribution-valve is in the position indicated by the plan, the water will enter by the opening *g*, and, passing through the tube *m′*, will fill the cylinder on the right, exercising a pressure on its piston. The interior of the cylinder on the left being in communication with the exit-cock, its interior pressure is less, twelve to fourteen centimeters of water, than that of the cylinder on the right, whence the destroying of the equilibrium which causes the pistons to operate. The pistons being pushed by the water, their rod, by means of the collar M′ on the right, pushes the forked lever N, and causes it to oscillate. This lever, by means of its lower lug *b*, carries simultaneously the lug *c* of the shaft O, and causes it to move, as well as the counter-weight or pendulum T, which forms part of it. A little before the pistons arrive at the end of their course, the counter-weight T, passing the vertical, falls to the left, and the lug U carries the lever Y, which produces instantaneously change of position of the valve, and consequently the water will fill the cylinder A at the left, while that already measured, which fills the cylinder A′ at the right, leaves by the cock *e*. The apparatus continues to operate in the same manner, providing there be sufficient centimeters of pressure, and its parts are lubricated by the water in which it operates, excepting, however, the counting clock-work, which is moved in the air, as we have said, above, and which consequently is completely protected from deterioration.

That the apparatus may operate with suitable precision, its speed must have a certain limit; and that it may not pass this limit or maximum of speed, the exit of the water is regulated by an obturator or hydrophragm, which is placed in the exit-cock *e*. This is simply a metallic washer pierced with a hole of greater or less size in proportion to the pressure of the water which is to pass into or out of the hydrometer.

One of the most important features of my improved hydrometer is that the whole of the operating parts are contained within a hermetically-sealed casing, and have no communication whatever with the external air. This enables me to dispense with the usual stuffing-boxes, and to therefore avoid friction; and it prevents loss of water, renders fraud impossible; and, besides, prevents deterioration of the registering devices by the water, as they operate in compressed air above the level of the said water.

I claim as my invention—

1. The two cylinders A A′, open at their inner ends, arranged on the same axis, and so situated within an outer casing as to be surrounded by water, in combination with the two connected pistons F F′, and with the devices described, or their equivalents.

2. The combination, with the cylinders and pistons, and with the inlet and outlet pipes and casing of the apparatus, of a distributing slide-valve, *a*, operating substantially as specified, and receiving its movement from the pistons through the medium of the devices described, or their equivalents.

3. The combination of the shaft O, carrying the counter-weight T for operating the valve, its lugs *c* and *c′*, the arm N with its lug *b*, and the collars M M′ on the piston-rod, all substantially as specified.

4. The combination of the rack O secured to and moving with the pistons, the shaft Q with its pinion and ratchet-wheel, and a train of registering-wheels, all substantially as and for the purpose specified.

5. A water-meter in which the operating and indicating devices are arranged entirely within a hermetically-sealed water-chamber, 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.

Barcelona, Spain, March 27, 1872.

EMILE EUGENE PIERRE CLAUSOLLES.

Witnesses:

G. ORMAUD,

AMADOR PFEIFFER.