C. Nida.

Water Meter

No. 94,235. Patented Aug. 31, 1869.

Fig. 3.

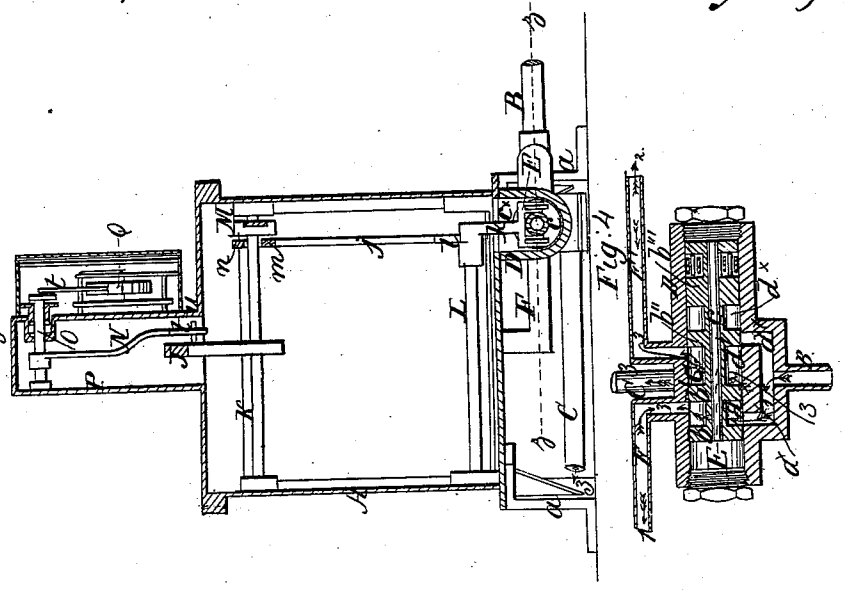


Fig. 4.

Fig. 1.

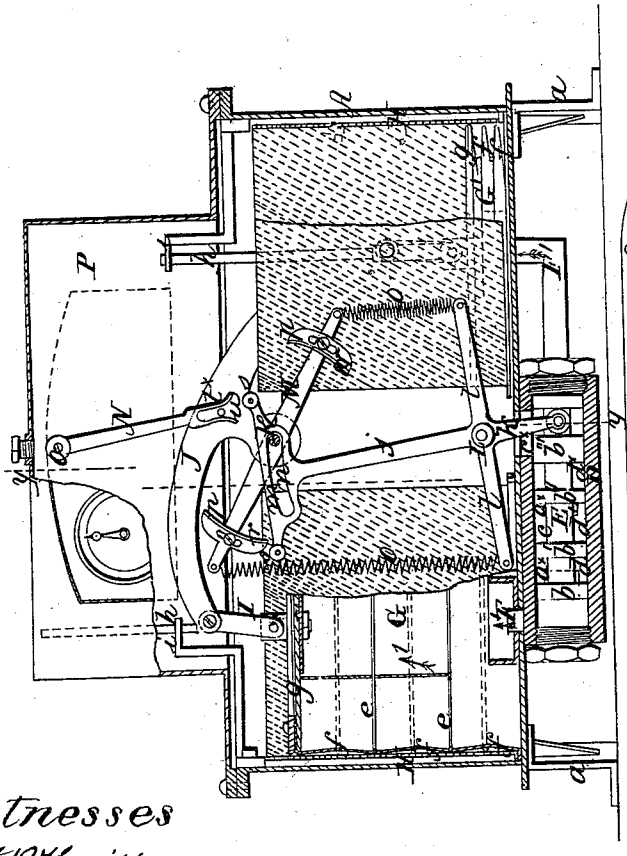
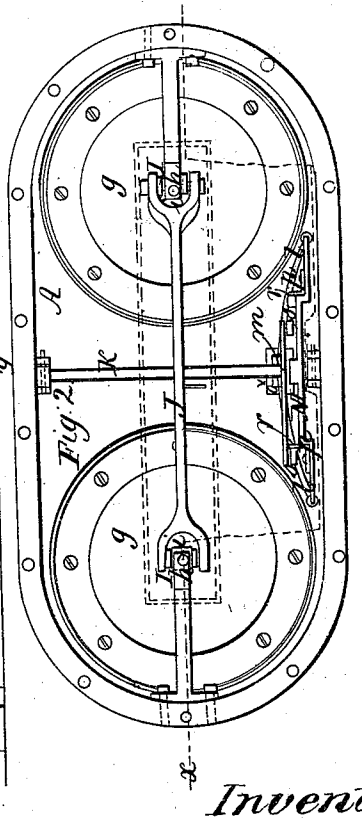


Fig. 2.



Witnesses

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IMPROVEMENT IN LIQUID-METERS.

Specification forming part of Letters Patent No. **94,235**, dated August 31, 1869.

To all whom it may concern:

Be it known that I, CHARLES NIDA, of Greenville, in the county of Hudson and State of New Jersey, have invented a new and Improved Water-Meter; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The object of this invention is to obtain a simple, economical, and efficient device to measure water as it flows and is discharged from a pipe or outlet under any suitable pressure.

The invention is more especially designed for use in cities and other places which are supplied with water from a distance through artificial means or channels, and where, in case a good reliable water-meter can be obtained, each consumer need not be taxed for any more water than he uses, or any more than the meter shows is consumed on his premises.

The essential requisites necessary to constitute a good and reliable water-meter are, first, the avoidance of all leakage of water during the passage of the same through the meter. Every particle or molecule previous to its discharge should be made to operate and perform its part in actuating the register. Second, a perfect automatic mechanism for operating the valve, by the movement of which the passage of water into, through, and from the meter may be regulated or controlled, and the volume discharged noted or indicated by the register with the nicest accuracy. Third, simplicity in the construction and arrangement of the operating mechanism, so that it will not be liable to get out of order or become deranged by use. These conditions, it is believed, are fully obtained in my invention.

In the accompanying sheet of drawings, Figure 1 is a side sectional view of my invention, taken in the line *x x*, Fig. 2; Fig. 2, a plan or top view of the same with the cap or lid removed; Fig. 3, a vertical section of the same, taken in the line *y y*, Fig. 1; Fig. 4, a horizontal section of the valve and its chest or box, taken in the line *z z*, Fig. 3.

Similar letters of reference indicate corresponding parts in the several figures.

To enable those skilled in the art to fully understand and construct my invention, I will proceed to describe it.

A represents the case of the meter, which is oblong in form and has semi-cylindrical ends. This probably would be the most desirable shape, a correct idea of which may be obtained by referring to Fig. 2. The case may be of rolled or cast iron—the latter material will probably be used—and it is provided with feet *a*, to afford space underneath for the induction and eduction pipes B C and the valve-chest D. (See Figs. 1 and 3.)

The construction of the valve E within the chest D will be fully understood by referring to Fig. 4. It is composed of circular disks *b b′ b″ b‴*, placed on a stem, *c*, the disks being equal in diameter to the interior of the chest, which, internally, is cylindrical in form the greater portion of its length, a communication, $c^{\times}$, which is made between the valve-chest and the case A, being the only departure of the chest from a cylindrical shape. (See Figs. 1 and 3.) The disks *b b′ b″ b‴* are designed to work water-tight, or as nearly so as practicable, within the chest D. The induction-pipe B is so located that it may, by means of forked or branched passages $a^{\times}$ $a^{\times\times}$, alternately communicate with two spaces, *d* $d^{\times}$, the first, *d*, being between the disks *b b′* of the valve in the valve-chest, and the other space, $d^{\times}$, being between the disks *b″ b‴*. (See Fig. 4.) Two pipes, F F′, communicate with said spaces *d* $d^{\times}$—the pipe F with *d* and F′ with $d^{\times}$. These pipes F F′ also communicate at their opposite ends—one, F, with a chamber, G, and the other, F′, with a similar chamber, G′. (See Fig. 1.)

The chambers G G′ are constructed of india-rubber or other suitable elastic or yielding material which will admit of being folded or expanded and contracted, similar to bellows, and still be water tight. To insure the proper folding and unfolding (expanding and contracting) of these chambers, I place within them, at suitable distances apart, hoops or rings *e*, sufficiently rigid to keep the chambers at the points or places, where said hoops or rings are in contact with them, of the proper diameter. On the exterior of the chambers I place, midway between the hoops or rings, elastic bands *f*, which are of such a size that they have a tendency to compress the cham-

bers between the hoops or rings. (See Fig. 1.) The lower ends of the chambers are permanently attached to the bottom of the case A; but their tops are not attached to any fixture, being left free to work up and down, and have circular disks or heads *g*, secured to them. The chambers are encompassed by perforated cylinders H H, which have a fixed position, and the disks or heads *g g* of the chambers are connected, by pivoted shackles I I, with the ends of a lever, J, which is attached at its center permanently to a rock-shaft, K, within the case A of the meter. Each disk or head *g* has a vertical rod, *h*, attached centrally to it, and these rods pass and work freely through guides *i'*. (See Fig. 1.)

In the lower part of the case A, directly underneath and in a vertical plane with the rock-shaft K, there is a similar shaft, L, which has four arms, *j k l l*, projecting from it. (See Fig. 1.) The arm *j* extends upward, and has at its upper end a plate, *m*, with a curved slot, *n*, made in or through it, said slot being a portion of a circle of which the axis of shaft L is the center. The arms *l l* extend from the shaft L at opposite sides of the same and at right angles with *j*, while the arm *k* extends downward about in line with *j*, and is connected at its lower end with the valve-stem *c*, as shown clearly in Fig. 1, the arm *k* projecting through the passage or communication $c^{\times}$, which is made for that purpose solely.

On the shaft K there is secured an arm or bar, M, which extends at equal distances from opposite sides of K, and is connected at its ends with the outer ends of the arms *l l* by spiral springs *o o*. The arm or bar M has two segment-plates, *p p*, secured to it at opposite sides of the shaft K and at equal distances therefrom, the face sides *r* of said plates being parts of circles of which the shaft K is the center. The shaft K passes through the slot *n* in plate *m*, and said shaft serves as a stop for the arm *j*, limiting the length of its "throw" or vibrations. At each end of plate *m* there is a friction-roller, *s*, and these rollers work alternately over the face sides *r* of the segment-plates *p p*.

The mechanism above described operates the valve E, as will be presently explained.

N is a pendant attached to a shaft, O, in the upper part of the cap or lid P of the case A. This pendant is forked at its lower end, as shown at $t^{\times}$, and a pin, *u*, which projects horizontally from the lever J, above the shaft K, is fitted in this fork $t^{\times}$. The shaft O at one end extends through the side of the cap or lid, and said shaft is connected by any suitable gearing or mechanism which will note or register its vibrations.

The operation is as follows: By referring to Fig. 1 it will be seen that the chamber G is fully expanded, and the other chamber, G', in a folded or closed state. G therefore is filled with water, and G' empty, the chamber G expanded and filled under the advent of the water which passed through pipe F, (pipe F' at the time being cut off from the valve-chest,) the space *d* of the valve being in line with pipe F and the passage $a^{\times}$ of the induction-pipe B. The water therefore passed through B into *d*, and thence through F into G, expanding and raising the same. (See arrows 1.) During this expanding and upward movement of the chamber G the lever J was actuated so as to stretch the spring *o*, which is connected to the rising end of said lever, or, rather, which was the rising end when the chamber G was being filled, and as soon as the segment-plate *p*, at the end of the arm or bar M, which rose with the end of lever J, reached a point above the roller *s*, the most elevated one of plate *m*, (the position of the parts as now described is shown in Fig. 1,) the spring *o*, now stretched or fully extended in consequence of its attachment to the arm *t* below it, throws the arm *j* over to a reverse position, so that the opposite end of the slot *n* in plate *m* will be in contact with the shaft K. The springs *o o*, therefore, it will be seen, alternately operate or throw the valve E.

The shifting of the valve E, as above described, causes the space *d* between the disks *b* and *b'* to be thrown out of line with pipe F and the passage $a^{\times}$ of the induction-pipe B, and the space $d^{\times}$ between the disks *b''* and *b'''* is brought in line with the pipe F' and the other passage $a^{\times}$ $a^{\times}$ of the induction-pipe B, and the water therefore enters the chamber G', as indicated by the arrows 2, raising or expanding said chamber, while the water contained in G is, by the action of the lever J on the disk or head *g* of said chamber G, forced out of it through pipe F into the space *d'* of the valve-chamber D, and out from thence through pipe C, as indicated by the arrows 3. When the chamber G' is fully expanded, the valve E is thrown or moved by the other spring *o* to the position first described, and represented in Fig. 1, and the chamber G is again raised or expanded by the passage of water into it. Thus it will be seen that by the alternate filling and emptying of the chambers G G' (which are measures of capacity) the quantity of water which passes through the device may be correctly noted or registered by the connection of a suitable register with the lever J.

The segment-plates *p p* perform an important function, as they prevent the movement of the arm *j* under the action of the springs *o o* at an improper time, said springs being inoperative, or not being allowed to act until the plates *p* rise above the rollers *s*, which they alternately do.

The case A is always filled with water, said case being supplied with the same previous to the connection of the meter with the induction and eduction pipes, or before the water to be measured is allowed to pass through it. The cylinders H, in which the chambers G G' are placed, in consequence of being perforated, as

previously stated, will be subjected to an equal pressure all around. It will be seen, therefore, that when the chamber G or G′ is being compressed, and the water being expelled from it, the force by which the chamber is compressed or moved down is equal to the pressure of the water on its disk or head *g*, and the same pressure which is exerted upon the disk or head *g* is equal to the pressure which is exerted upon the under surface of the disk or head *g* of the other rising chamber; but in consequence of there being no resistance to the descent of the falling chamber, or the one being compressed, it descends or is compressed with a force due to the pressure of the water in A upon the exterior or upper surface of its disk or head *g*.

It will be understood, of course, that the water in the case A is stagnant—that is to say, is not in motion—and it merely serves as a medium to transmit force or power from the disk or head of one chamber to that of the other.

The register is connected with the pendant N, and may be constructed and arranged in any proper manner. A lever or pawl, *t*, for instance, may be attached to the end of the shaft O, which projects through the side of the cap or lid P, and said lever or pawl made to actuate a ratchet, Q. (See Fig. 3.)

I do not confine myself to any precise mechanism for operating a register, for many plans may be devised for that purpose, and all answer equally well.

I would state that the hoops or rings *e* within the elastic or expanding and contracting chambers G G′, in connection with the elastic bands *f*, insure the proper folding of said chambers as they are compressed. This will be understood by referring to Fig. 1, in which one chamber, G, is shown filled with water and fully expanded, and the other one, G′, shown empty and fully compressed or folded.

I am aware that water-meters have been provided with chambers containing an elastic diaphragm; but, so far as I am aware, none have been made having the entire chamber so constructed and arranged that it will expand and contract, or fold and unfold, like bellows. I do not claim broadly, therefore, an elastic or yielding material, irrespective of the construction and arrangement of the same, to operate as described.

I do not claim the valve E, nor any feature shown in the patent to J. Mason, dated September 17, 1867, and Joseph Thomas, dated October 1, 1861; but,

Having thus described my invention, what I do claim as new, and desire to secure by Letters Patent, is—

1. The perforated cylinders surrounding the chambers G G′, and the expanding chambers G G′, provided with hoops *e* and elastic bands *f*, all arranged substantially as and for the purpose specified.

2. The combination and arrangement of the chambers G G′, beam J, arm M, with plates *p p*, shaft K, four-armed lever *j k l l*, with slot *n*, and friction-rollers *s s* on shaft L, springs *o o*, all inclosed in a casing, A, and the valve E in chamber D, communicating with the chambers G G′, and provided with induction and eduction pipes, all constructed to operate substantially as described.

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Witnesses:
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WM. F. MCNAMARA.