P. H. Niles,

Piston Meter.

No. 17,654. Patented June 23, 1857.

Fig. 1.

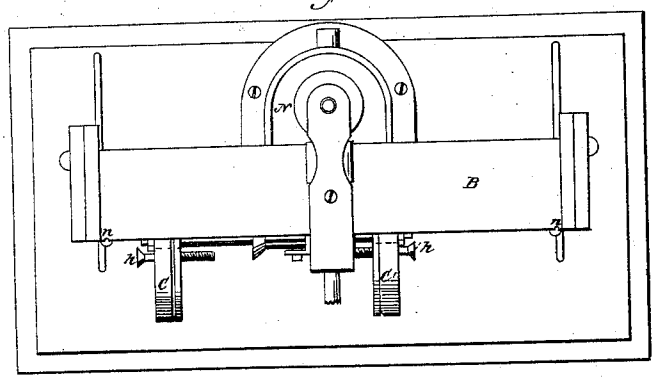


Fig. 2.

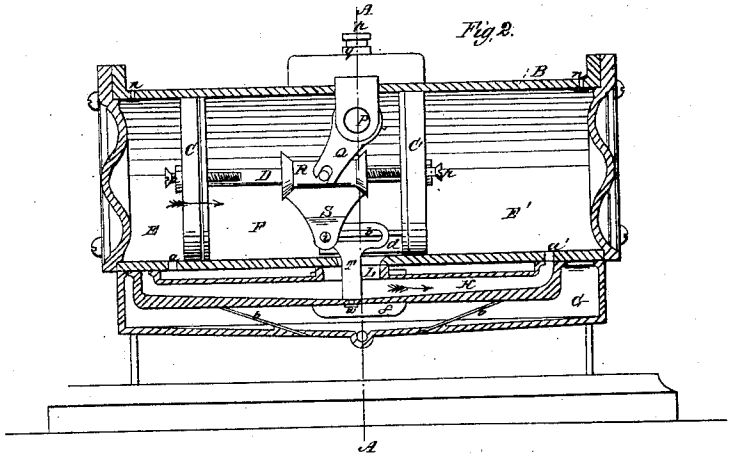


Fig. 3.

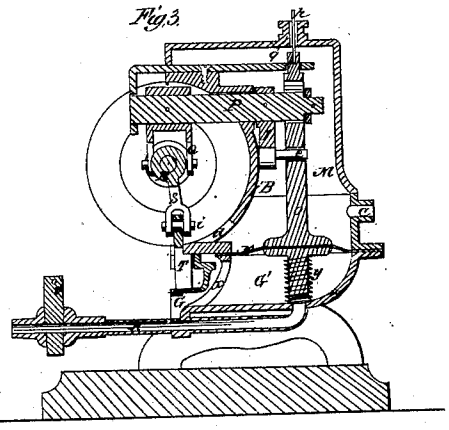
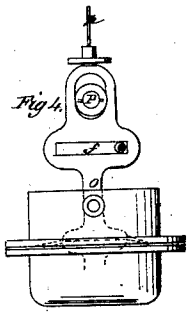


Fig. 4.



N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PETER H. NILES, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO HIMSELF AND ALFRED DOUGLASS, JR., OF BOSTON, MASSACHUSETTS.

WATER-METER.

Specification of Letters Patent No. 17,654, dated June 23, 1857.

To all whom it may concern:

Be it known that I, PETER H. NILES, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Water-Meters, of which the following is a full, clear, and exact description, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a plan, one-half of the meter cylinder and the water chamber G being removed to show the parts within; Fig. 2, a front view of the same; Fig. 3, a transverse section upon the line A, A of Fig. 2; Fig. 4, detail which will be referred to hereafter.

To enable others skilled in the art to understand my invention I will proceed to describe the manner in which I have carried it out.

In the said drawings B is the cylinder, to which is adapted two pistons C C′ which are connected by a shaft D, so as to divide the cylinder into three chambers or divisions, E E′ being the measuring chambers, and F a central or air chamber, between which and a reservoir or exhaust chamber M there is a constant communication through the open passage *d*. The water after it has passed through the measuring chambers E E′ is thrown into the air chamber F, and is drawn off from the reservoir M by the pipe *c*. Beneath the cylinder is the full chamber G, which extends back at G′ beneath the exhaust chamber M, the two compartments G G′ communicating with each other through the opening *x*.

The valve K operates in the chamber G, and is held up to the cylinder by the pressure of the water, the springs *b* performing this office when the water is drawn from the meter.

The measuring cylinders E E′ are made to communicate with the chamber G and the valve K through the openings *a a′*, the former being shown in Fig. 2 in communication with the chamber G and the latter with the valve K. The central passage of this valve communicates through the port L with the air chamber F between the pistons, from which the water passes through the opening *d* to the reservoir M behind the cylinder. For the purpose of moving the valve suddenly at the termination of the stroke of the pistons and of insuring its operation however slow may be the motion of the water through the meter the following device is employed: N is a disk of india rubber which forms a water-tight partition between the full chamber G′ and the reservoir M, and has attached to its center a shaft O, having a horizontal slot *f* in which plays a pin *e*, projecting from a crank I. This crank is attached to a rock shaft P, which passes through into the chamber F and carries at its inner end an arm Q, the forked extremity of which embraces a sleeve or spool R that slides freely upon the shaft D. From the valve K rises a standard T having a slot *g*, in which plays the pin *i* in the lower extremity of the arm S. This arm is attached to the sleeve R and vibrates back and forth with it.

For the purpose of emptying the meter and the pipes in connection therewith whenever there is danger of frost or for other purposes the supply pipe H is furnished with a two-way cock U, so arranged that whenever the supply is cut off from the meter the water which it contains, as well as that within all its passages and chambers, shall pass off through the cock.

w is a float valve in the bottom of the valve K which is retained closed when the meter is in operation. When the meter is emptied as above, this valve falls and the water within the valve and the passages in connection therewith escapes. It is evident that when the meter is thus emptied the water which is drawn off will be replaced by air, and that this air must be allowed to escape as the water is again admitted, otherwise a correct measurement could not be had. This I accomplish by means of float valves which cover small apertures *n* in the top of the cylinder and rise whenever the water reaches them as the chambers fill. Before this occurs the air passes out through the openings.

Operation: The water being admitted to the meter by the pipe H, fills the chambers G and G′. Thence (the parts being in the position represented in Fig. 2) it flows through the opening *a* into the chamber E, the air passing out through the openings *n*. When the water reaches the top of the cylinder, the valves rise and close these openings. The pressure of the water now exerted upon the piston C forces it and the piston C′ in the direction of the arrow until the adjusting screw *h* bears against the sleeve R and carries it with the pistons, the pin *i* moving freely along the slot *g* in the standard T. As the sleeve R moves, it vibrates the shaft

P and the pin *e* traverses its slot *f* (Fig. 4), thereby depressing the shaft O and disk N. It is evident that whenever water is being drawn from the air chamber F or reservoir M, there will be a greater pressure upon the lower than upon the upper side of the diaphragm N, and that the shaft O will be pressed up with a force which results from the difference of these two pressures. I have therefore styled this diaphragm a differential piston, the object and operation of which will now be explained. As before stated, the pin *e* in its motion through the slot *f*, depresses the differential piston and as soon as this pin has passed the center of the slot, the pressure upon the bottom of the diaphragm forces the pin to the end of the slot and vibrates the crank I and shaft P, by which means the pin *i* is thrown against the end of the slot *g* and the valve K is moved in the direction of its arrow, the opening *a* being brought into communication with the interior of the valve K and the opening *a'* with the full chamber G. The water now commences to flow into the chamber E' and out of the chamber E, through the valve K and port L into the air chamber F and reservoir M, and thence to the service pipes. It will be seen that the shaft O is depressed and raised each time the motion of the pistons is reversed, whether this be at longer or shorter intervals, and this motion of the shaft O is made to act upon the registering mechanism by means of the small rod *p*, which passes through the stuffing box *q* and is connected with the register in any suitable manner. The opening *a'* must be closed before the opening *a* is open. The valve K may therefore at times be left in a position where both the openings *a a'* are closed. This may happen at the instant after the service cock is shut off. There will then be an equilibrium of pressure upon the opposite sides of the differential piston and the valve K will remain motionless. If now the two-way cock be turned to let off the water from the meter, it is evident, the openings *a a'* being shut, that the water will be retained within the meter and the latter will not empty itself. To remedy this a light spring *q* is used to complete the throw of the valve should it be left in the position above referred to, and this it will easily accomplish as the pressure is all taken from the valve by the closing of the service cock. This spring, however, could by no means be depended upon to move the valve when the meter is in operation, but only after the service cock, as before stated, is closed.

The distinguishing feature of the differential piston, when employed as above explained, is this—that the force which it exerts increases in proportion as the work to be done increases. For instance, when there is a light pressure within the supply pipe, the valve K will require but a small force to move it and this will be furnished by the pressure upon the underside of the diaphragm, but should the pressure within the main and consequently upon the valve be very great, a corresponding pressure will be exerted upon the diaphragm, which will still be able to move the valve. The meter is thus adapted to any head of water under which it may be desirable to work it.

It will be perceived that by the above described arrangement and construction I obtain, 1st, an air chamber within the cylinder itself, whereby an entire uniformity of flow from the service pipes is obtained; 2d, but a single stuffing box is required and this for the passage of a rod having no duty but the actuation of the register to perform, so that it can be made very small and the friction and leakage from this cause almost entirely done away with, the connections between the pistons and the valve being entirely within the water space; 3d, the differential piston for throwing the valve being entirely surrounded by water, is noiseless in its action and removed from the danger of being tampered with by design or put out of order by ignorance or carelessness; 4th the meter and the service pipes may at any time be emptied by the act of shutting off the supply whenever danger of freezing is apprehended or repairs become necessary; 5th, any air that may accumulate in the cylinder is at once drawn off by the action of admitting the water to the meter, whereby accurate register of the water passing through the meter is obtained.

The screws *h*, which actuate the sleeve R and throw the valve K, are made adjustable that the quantity of water delivered by the measuring chambers may be made to correspond with that indicated by the registering apparatus.

What I claim as my invention, and desire to secure by Letters-Patent, is—

1. The two pistons operating in a single cylinder in the manner substantially as herein set forth, in combination with the differential piston, as described.

2. I claim the air-chamber F, between the pistons C, C', operating in the manner substantially as set forth.

3. I claim the float valve *w*, in combination with the two way cock U, whereby when the water is shut off all the chambers of the meter are emptied, as set forth.

PETER H. NILES.

Witnesses:
THOS. R. ROACH,
P. E. TESCHEMACHER.