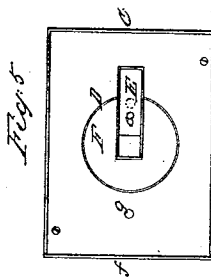
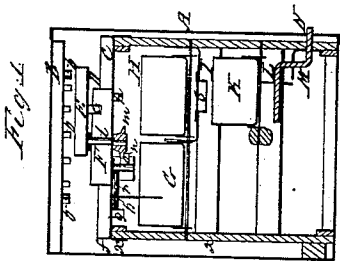
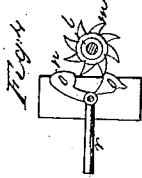
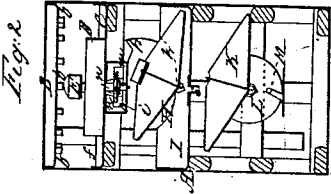
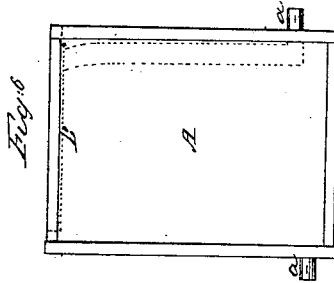
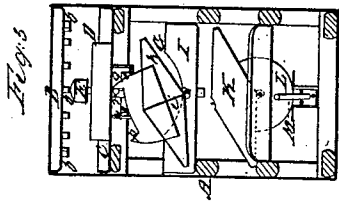


W. B. Durant,
Oscillating Meter.

N^o 79,559.

Patented July 7, 1868.



Witnesses
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J. R. Snow

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United States Patent Office.

WILLIAM B. DURANT, OF CAMBRIDGE, MASSACHUSETTS.

Letters Patent No. 79,559, dated July 7, 1868.

IMPROVEMENT IN WATER-METERS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL PERSONS TO WHOM THESE PRESENTS MAY COME:

Be it known that I, WILLIAM B. DURANT, of Cambridge, in the county of Middlesex, and State of Massachusetts, have invented a new and useful Water Meter; and I do hereby declare the same to be fully described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a longitudinal section, and

Figures 2 and 3 transverse sections of it.

Figure 4 is a top view of the escapement used in it, and to be hereinafter described.

Figure 5 is a top view of the receiving-pan, its divisional annulus, and movable trough.

Figure 6 is a side view of the meter-case.

The principle on which my invention is based consists, first, in dividing the water, so as to obtain a certain aliquot part of the whole, and next measuring that part. The part taken for measurement we will consider to be one-sixteenth of the whole which may pass through the meter.

The case, A, of the meter is a strong air and water-tight box. The water enters through an induction-pipe, *a*, which passes through the side of the meter, and then rises vertically upward until it enters a flat horizontal compartment, B, arranged at the upper part of the meter-case. On the under side of this compartment, and opening out of it, are sixteen small vertical tubes, *b*, &c., (the diameter of each being about one-fourth of that of the induction-pipe,) which are to be distributed around the circumference, whose centre is vertically above the centre of a flat, square pan, C, arranged immediately below the pipes. The radius of the circle of pipes is such that the water, as it descends from the sixteen pipes, will fall upon the pan outside of a divisional hoop or annulus, D, which surrounds the centre of the pan. Some one of the sixteen tubes, however, will be always over a narrow receiver or troughed arm, E, which, when in operation, rotates about the centre of the pan C, and reaches beyond the hoop. The water from that tube which may be over the trough E will be discharged into the trough, (whose width is the distance between the tubes,) and be discharged by a pipe, *e*, leading from the trough. Such water will fall inside of the hoop, or into the space F enclosed thereby. The rear side, *f*, of the square pan C of the meter is made lower than the other three sides of such pan, and does not fit tightly to the next adjacent side of the meter-case, but a space is left between the pan and the said side of the meter-case.

When the water is running through the meter with its full force, more than half of the whole amount, after falling upon the pan, passes down through this vacant space to the bottom of the meter without being employed at all; but when the water is running through with less than half its greatest force, or thereabouts, all the water received upon the pan, and which comes from fifteen of the tubes, passes down through a tube, *g*, leading from the pan near the side which is lower than the others. Another tube, *h*, is set in the pan, inside of the hoop, and these two tubes, *g* and *h*, are in the same straight line with each other and the centre of the pan. I have stated that the water from one of the sixteen tubes was conducted by the receiver to the space F inside of the hoop. My object is to make the portion which goes inside of the hoop exactly one-sixteenth of the whole amount which passes through the sixteen pipes. It is obvious that this can be done if the receiver can be made to stay an equal time under each of the sixteen tubes, for, when it has made one complete revolution, the errors will all balance each other, and the sum of the contributions to the hoop will be just one-sixteenth of the whole amount which has passed through the tubes during a complete revolution of the trough or receiver E. This object is effected in the following way: Under the pan are two tilting-vessels, G H, of similar construction and size, fastened together, each having two compartments, *i k*, and turning upon the same axis, which axis is directly under the line of the two tubes *g h* set in the pan. The diagram marked Figure 7 in the drawings may be supposed to exhibit a transverse section of one of these vessels, the other being similar.

A B C and B C D, in such fig. 7, are two compartments separated by the partition B C, and turning upon an axis, of which C is the centre. When the compartment A B C is so full that the weight of water causes the vessel to turn upon its axis, the vessel will turn and come in the position A' B' C', as shown in Figure 8, and the tube *h* will be over the other compartment B C D. When that is full, the vessel will be moved back to its first position.

It will be noticed that of these two vessels G H, (each having two compartments,) the one nearest the front end of the meter is under the tube *h*, which leads from the hoop, and the other has its axis under the tube *g* leading from the pan. The receiver, E, previously described, is fastened to an upright shaft, *l*, which passes through the centre of the pan. Below the pan an escape-wheel, *m*, is attached to the shaft *l*, such wheel having eight teeth to be operated by an escapement, *n*, of somewhat peculiar construction, having its arms *o o* so made that, when either of them is on the wheel, it will block it after moving it, so that it cannot be moved until the water acts upon the vessel again, for, upon one of the vessels G H, just described, (it matters not which, as they move together,) two projections, *p g*, are placed, which, as the vessel moves when filled with water, alter-ward half a tooth, or, as the wheel has eight teeth, just one-sixteenth of a revolution. Then it will be found that the receiver has departed from that tooth under which it was before, and has gone to the next one. With the next movement of the vessel the escapement moves back, and the receiver passes on and under the next nately strike an arm or lever, *r*, and thereby move the escapement, and cause the escape-wheel to move forward, and so on throughout the series of tubes *b*, &c. Now, as the water in these two vessels, G H, (attached together,) that is, as much as is necessary to make them move, is a certain definite quantity, it will take a certain definite time to supply that quantity from the tubes leading from the hoop and the pan. And whether the supply of water from the sixteen tubes be abundant, or merely comes drop by drop from only one of the sixteen, in all cases, as between the several tubes, the receiver will stay an equal time under each, whether that time be long or short, thus giving just one-sixteenth of all the water to the hoop, and thence to the vessel nearest the front end of the meter. The water from the other vessel falls directly upon the floor of the meter, but the sixteenth to be measured is discharged from the nearest vessel, H, into a box, I, directly under it. So far the process has been simply the division of the water.

The sixteenth quantity of fluid which we have thus divided off will be conducted from the box just mentioned by an orifice, *s*, in the middle thereof, into a measuring-vessel, K, below, of precisely similar construction to either of the vessels G H. Extending from the bottom of this vessel K are two arms, or a notched plate, L, working a crank, M, whose shaft, N, comes through the front to the outside of the meter, and so as to connect with a registering-machanism, (not seen in the drawings,) which should be so made as to register the number of times that the measuring-vessel may be filled and emptied.

From the vessel K, just described, the water falls upon the floor or bottom of the meter-case. As soon as the water upon the said bottom rises above the level of the eduction-pipe *u*, no air can pass out of such pipe, and, of course, no air can go back through the induction-pipe, for, in so doing, it would have to descend through water in the vertical pipe, which is impossible. The water will therefore continue rising upon the floor or bottom of the case until the pressure of the condensed air in the meter is equal to the pressure or "head" of the water, in which case the flow will cease until the eduction-pipe is opened, as it would be in drawing water, when the pressure of the confined air will drive out some of the water, and more water will come in to take its place. It will be noticed that the "head" of the water is not lost or impaired by the operation of the meter, as the elasticity of the compressed air will drive out the water with the same force as that with which it was itself compressed. The outside case of the meter must be made deep enough to allow space for the condensation of the air.

The reason why I employ the auxiliary vessel H under the tube *h*, fastened to the vessel G under the tube *g*, is the following:

When different and irregular quantities of water are falling from each of the sixteen tubes, it will sometimes happen that the receiving-trough is under a tube which discharges no water at all, or merely a drop or two at intervals. Then the vessel H comes into play, and, when filled, moves the escapement, and carries the trough on to the next pipe, whereas without it the trough might have remained a long time under the tube which discharged little or no water, thus introducing a great irregularity in the divisional process. Again, when only one of the tubes is flowing, and that one over the receiving-trough, all the water will pass into the vessel G through the tube *g*, but as G is fastened to the auxiliary vessel H, the two together turn in exactly the same time that they will turn in the next oscillation, when the vessel H will get all the water, and the vessel G will get none until the receiving-trough has made a complete revolution, (under the same hypothesis, that only one of the sixteen is discharging.) Thus, in this case, we get just one-sixteenth of the whole amount, whereas, without the combination of the vessels G and H, we should either get none at all or else get the whole amount into our measuring-apparatus, either event being equally unfortunate. The combination of the vessels G H therefore comes into use in correcting the irregularities of the several sixteen tubes, when the flow of water is small. But when the water is running through the meter with its greatest force, the sixteen tubes will discharge usually a nearly equal amount, and the vessel H is of little use, but even then, if the tube over the trough should discharge more or less than the others, the addition of a constant uniform flow from the tube *h* into the vessel H, to help in turning the combined vessels G and H, will be of great assistance in keeping the trough an equal time under each of the sixteen tubes.

I am aware of the invention described in Letters Patent No. 76,690, and make no claim to any portion thereof, meaning specially not to claim the combination of a pan, a tilting-vessel, a crank, a pawl, a ratchet, a conducting-shaft, and a hollow iron or spout, as such parts are constructed, arranged, and combined in manner and for the purpose or purposes indicated in such patent; but

In the hereinbefore-described meter, I claim as my invention the following, viz:

I claim the combination of the receiving-chamber B, provided with a series of discharging-tubes *b*, as described, the pan C, the chamber F, the discharging-tube *h*, the receiver E provided with a pipe to discharge into the chamber F, and one or more tilting-vessels, H, placed underneath or below the tube, and to operate as described.

I also claim the combination of the above, and mechanism, substantially as described, for effecting the intermittent rotary motion of the receiver E, as and for the purpose described, such mechanism being the projections *p q*, the shaft *l*, 'scape-wheel *m*, escapement *n*, and arm, *r*, the whole being substantially as specified.

I also claim the combination and arrangement of the box I, provided with an orifice, *s*, with tilting-vessels H and K, combined and to operate with the chamber B, its tube *b*, the pan C, the chamber F, and the receiver E, in manner substantially as described.

I also claim the combination and arrangement of the auxiliary tilting-vessel G and its induction-tube *g*, with the vessel H, the pan C, the space or chamber F, the receiver E, and the chamber B provided with the series of discharge-tubes *b*, to operate as described, the vessels G and H being fastened together, so as to move simultaneously and in the same manner, as and for the purpose explained.

WM. B. DURANT.

Witnesses:

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F. P. HALE, Jr.