2 Sheets—Sheet 1.

B. FITTS.

Rotary Water-Meter.

No. 207,862. Patented Sept. 10, 1878.

Fig. 1.

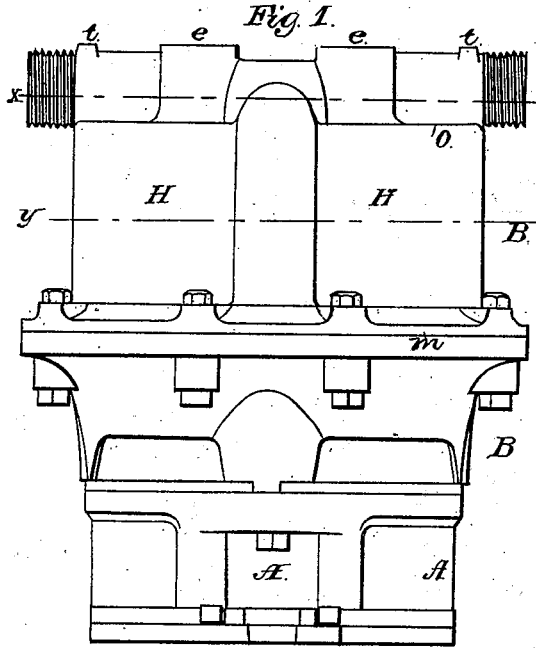


Fig. 2.

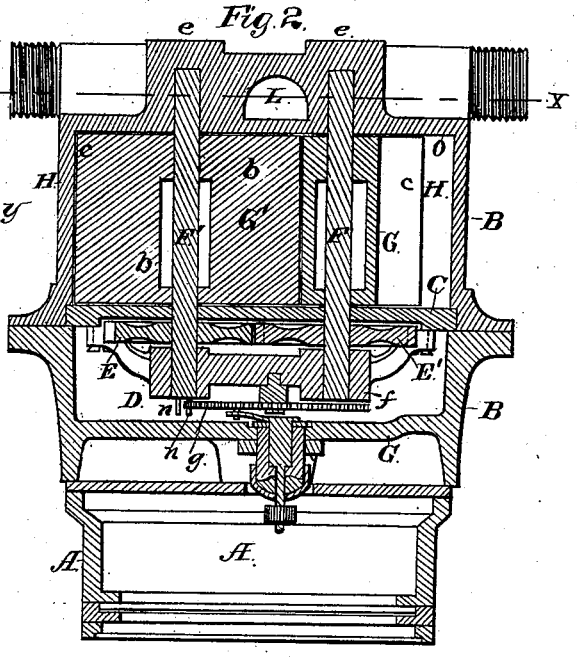


Fig. 3.

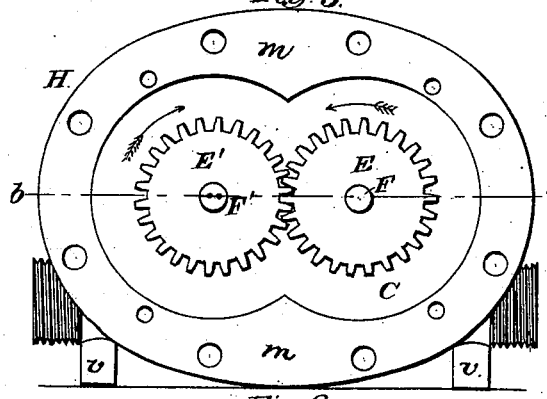


Fig. 4

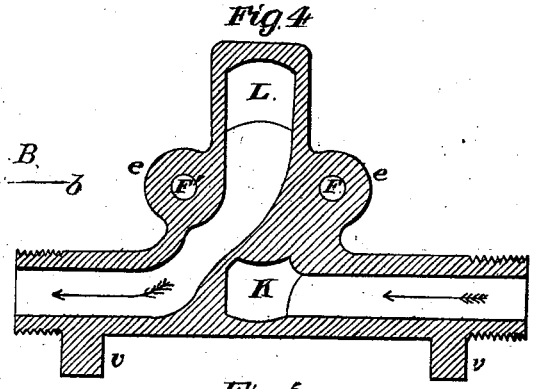


Fig. 6.

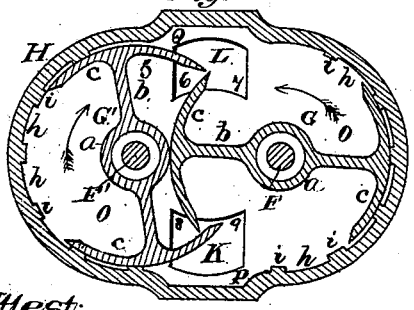
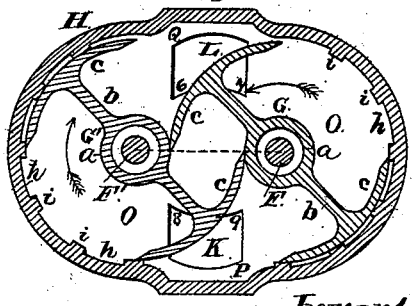


Fig 5



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Rotary Water-Meter.

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Fig. 8.

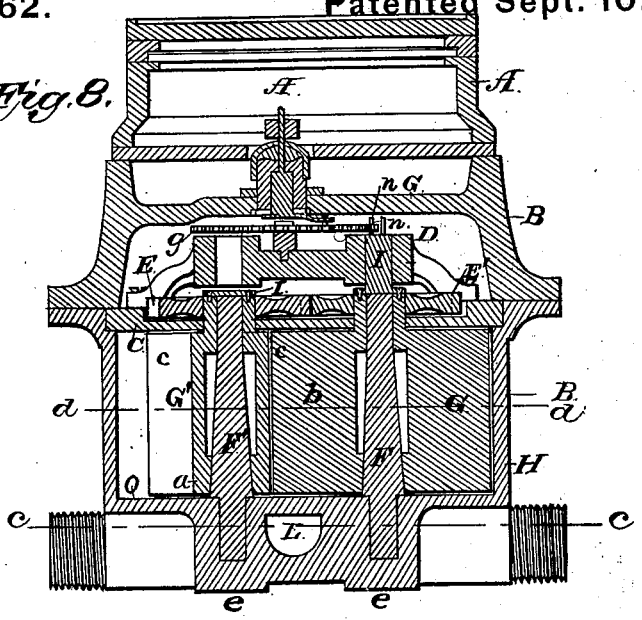


Fig. 9.

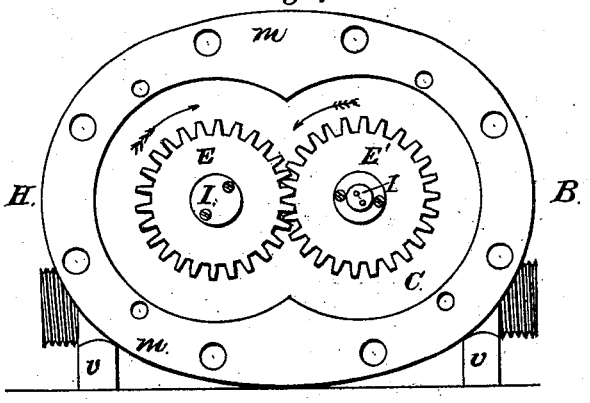
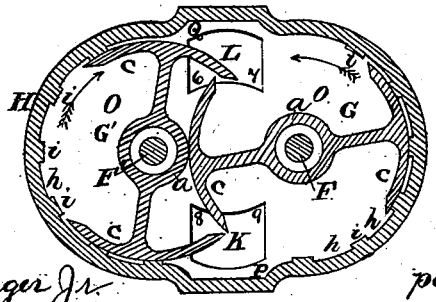


Fig. 7.



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UNITED STATES PATENT OFFICE.

BENAIAH FITTS, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN ROTARY WATER-METERS.

Specification forming part of Letters Patent No. **207,862**, dated September 10, 1878; application filed August 3, 1878.

To all whom it may concern:

Be it known that I, BENAIAH FITTS, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Rotary Meters; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 represents a plan of my improved rotary meter as constructed for the pistons to operate on horizontal shafts—*i. e.*, to turn in a vertical plane. Fig. 2 represents a horizontal section of the same as taken through the center of the shafts and pistons on the line *b b* of Fig. 3, with the front half of the case in position. In this view the registering mechanism proper is omitted, as it forms no part of the present invention. Fig. 3 represents an elevation of the meter with the front half of the case and the registering mechanism removed. Fig. 4 represents a vertical section of the meter, looking toward the rear, as taken through the lines *x x* of Figs. 1 and 2, and illustrates the arrangement and construction of the induction and eduction openings. Figs. 5, 6, and 7 represent vertical sections taken through the line *y y* of Fig. 1, and illustrate the relation and special construction of the induction and eduction openings with respect to the pistons and their related progressive movements. Fig. 8 represents a vertical section of a modified form of the meter to which the improvement is applied, in which the pistons are arranged to operate in a horizontal plane, their hubs being mounted and turning upon stationary standard axes; and Fig. 9 is a plan of the lower half of the meter, the upper half of the case and the registering mechanism being removed.

In the modification illustrated in Figs. 8 and 9, Fig. 4 would represent a horizontal section taken through the line *c c* of Fig. 8; and Figs. 5, 6, and 7, a horizontal section through the line *d d* of said Fig. 8.

In the use of rotary piston water-meters having two coacting pistons, each provided with blades that carry at their ends segmental bearing-surfaces, it is desirable, for various reasons, to use round instead of eccentric gears wherewith to connect the two, that their motion may be related and uniform. Heretofore such meters, from defects in the mode of constructing them, have been a practical failure, the principal reason for which lies in the fact that the blades and segmental bearing-surfaces of the two pistons as they revolve become water-locked, and hence render the meter practically inoperative.

Another defect arises from the present defective mode of arranging and constructing the induction-opening of the meter, which is so arranged that at certain times there is, in the passing of the segmental bearings of the two pistons, a point at which the pressure of the water is exerted equally on both blades of one piston, (and therefore counteracting all tendency of motion in that piston,) while it can exert but a trifling force on the other, it not having free access to the then acting radial blade of the latter, and hence, with a small stream and low pressure, bringing the meter to a dead-stop, this being more particularly true where the flow from the meter is cut off while the segmental bearing-surfaces of the pistons are in that position.

Another defect arises from the clogging of the meter by mud, sand, and other impurities in the water, and from the great amount of friction between the contacting surfaces of the meter.

To remedy these defects is the object of my present improvement.

My invention relates more especially to a novel construction and arrangement of the induction and eduction openings with respect to the pistons; and it consists, first, in arranging the eduction-opening at right angles to the plane of motion of the coacting pistons, and so constructing it that one side of said opening shall extend or project for some distance on the inside of the path of the segmental bearing-surfaces of the blades of both pistons, so that there shall always be a free discharge through said opening from both pistons, as will hereinafter be more fully described; secondly, in

a similar arrangement and construction of the induction-opening with respect to the pistons, so that there shall always be full pressure against at least one acting or forcing blade of some one of the pistons, as will be hereinafter more fully described; thirdly, in the combination of a cylinder provided with openings, arranged and constructed as above referred to, with two coacting pistons provided with blades and segmental bearing-surfaces, and with two round gears; fourthly, in the combination of a cylinder constructed with openings, arranged as above referred to, and with ribs on its internal or bearing surface, with two coacting pistons constructed with blades and segmental bearing-surfaces, and provided with two round gears, which mesh with each other, whereby a much more effective and sensitive meter can be made than has been heretofore provided.

To enable others skilled in the art to make, construct, and use my invention, I will describe it in detail, omitting a particular description of such parts of the meter as are unnecessary to a full understanding of the present improvement.

The mechanism of my improved meter and register is mounted in independent cases A and B, which are firmly bolted, the one to the other, case A forming the register-case, and case B the meter-case.

Case B is formed in two parts, and is provided with a partition-plate or diaphragm, C, which I prefer to make in two halves for convenience of removal. Diaphragm C divides the meter-case into two compartments, in the upper one, D, of which are arranged and secured the register-driving apparatus and the two gear-wheels E and E′, which connect the hubs or shafts F and F′ of the two pistons G and G′, and cause them to rotate with a related motion by meshing with each other. In this case the gear-wheels are round and of the same diameter, so that the pistons must move uniformly and with the same speed.

Each piston consists of a hollow hub, *a*, on which is formed or otherwise secured two solid radial blades, *b*, diametrically opposed to each other, and on the outer end of which is formed or secured a segmental bearing-surface, *c*, of a size slightly less than that of a quadrant of a circle, and just sufficient to give clearance to their ends in passing each other. The arrangement of the blades of each piston with respect to those of the other in organizing them for use in the meter is well illustrated in Fig. 5, where the extreme end of one segmental rim of each piston is set at a point in a line drawn centrally through both shafts, as shown by the dotted line in said figure.

When these pistons are intended to revolve in a vertical plane, as shown in Figs. 1 and 2, they are mounted upon and keyed fast to the horizontal shafts F and F′, which find their bearings at one end in bosses *e e*, formed on the rear side of the measuring-cylinder H, and at their other in the spider-frame *f*, which supports the driving-gear *g* of the register mechanism. The spider-frame *f* is bolted to the flange *m* of the lower half of the meter-case, recesses being formed in the flange of the upper half to make room for its feet. On the end of one of the shafts F are secured two stud-pins, *n n*, so arranged as to impart motion to driving-gear *g* as the piston-shaft F′ revolves.

The measuring-cylinder H, in which the pistons revolve on its internal periphery or bearing-surface, is provided with a series of ribs, *i*, which project sufficiently far to form recesses *h* of some depth, which act as places of deposit for mud, sand, and other foreign matter contained in the water. The contacting faces of the ribs *i* are made concave, to correspond with and fit the convex surface of the segmental rims of the pistons, as shown. The mode of arranging and constructing these recesses and ribs is clearly illustrated in Figs. 5, 6, and 7. Ordinarily I prefer to use in each end of the measuring-cylinder three or four of these ribs, and to have the same comparatively narrow, to lessen friction and the deposition of calcareous or other foreign matter held in solution in the water on their faces. I prefer to arrange one of these ribs on each side of the induction-opening and in its immediate vicinity. The next one is then arranged in such near proximity to it as that the advancing edge of the segmental rim of the piston shall, at least, come fairly in contact with it or over it before the other edge leaves the face of the first rib. The next rib is arranged in like manner, and so on for as many as it may be deemed advisable to use. The only point to be observed in arranging these ribs and their number is to employ enough of them to insure on the inlet side of the meter constant contact at each end of the chamber between the peripheral face of one of the segmental rims *c* of the piston and one of the ribs *i*, that no water may pass unmeasured.

On the inside of the rear side, O, of the measuring-chamber, and centrally between its ends, are arranged the induction-opening K and eduction-opening L, the induction-opening in this case being at the lower side of the chamber and the eduction-opening at the upper. If desired, however, the meter can be so constructed as that these openings may be reversed. The mode of constructing these openings is shown in Fig. 4, the arrows indicating the course of the water as it enters and leaves the meter.

The construction of these openings and their relation to the segmental rims *c* of the pistons are well illustrated in Figs. 5, 6, and 7, from which it will be seen free passage is always given to the water in front of the advancing blades *b* of the pistons, even when the points of the advancing segmental rims *c* of the two pistons are in the act of passing each other, and which in the old construction of cylinder

and arrangement of the eduction-opening could not be done, and hence became water-locked. This I avoid by the arrangement of the mouth of the discharge-opening in the side of the cylinder which supports the shafts of the pistons, and constructing it of such size and shape that the opening shall extend for some distance within the path of motion of the segmental rims *c* of both pistons. A suitable form and construction is shown in Figs. 5, 6, and 7; but various other forms may be used so long as a portion of the opening shall lie within the path of the segments of both pistons. This feature is of paramount importance, and is essential to the practical working of a meter having two coacting pistons, the motions of which are related through the action of round gears, and which I will now illustrate.

Referring to Figs. 5 and 6, the ends of the segmental rims of the two pistons are in Fig. 5 represented as just about to pass each other on the discharge side of the meter, and in Fig. 6 as having just passed each other. Now, let us suppose that the discharge-opening was arranged in the top side of the cylinder, as is usual in vertically-rotating meters, then the moment the edges of the segments of the two pistons meet the water inclosed in the space 5 (see Fig. 5) would have no outlet, and the further advance of the pistons would be stopped, they, in effect, being water-locked; but by my improved construction and arrangement of the eduction-opening L the portion 6 of that opening gives free passage to the water, and allows the pistons to advance and pass each other, and so with the part 7 of the same opening, which allows the edges of the segments to pass each other when the positions of the two pistons are reversed.

In like manner the construction and arrangement of the induction-opening K with respect to the pistons are on the same plan as the eduction-opening, and will always insure a full pressure of water on the induction side against at least one acting blade of one of the pistons, and which cannot be done with the old construction and arrangement of induction-opening. This feature is illustrated in Fig. 7 by the part 8 of the induction-opening, the part 9 acting in the same manner when the positions of the pistons are reversed.

P and Q represent two recesses formed in the meter-case, the one, P, adjoining the induction-opening, and the other, Q, adjoining the eduction-opening. These recesses, respectively, greatly facilitate the inlet and discharge of the water.

t t represent short legs cast on the under side of the tubes which form the inlet and outlet passages of the meter, and are used for the support of the rear end of the meter.

In Figs. 8 and 9 the same improvements are illustrated in connection with pistons rotating in a horizontal plane. For this purpose I prefer to mount the hubs of the pistons on stationary standards or axes. They, for this purpose, are provided with adjustable caps I, firmly secured to their upper end by screws or screw-bolts, and which rest upon the upper ends of said standards, and thereby support the pistons. These standards form the axes around which the hubs of the pistons revolve.

In this modification the discharge and inlet openings are arranged in the bottom side of the casing, which supports the standards. In all other respects the cylinder and working parts are the same as those shown in the other figures. When constructed in this manner the meter is supported on the lower end of the bosses *e e*, in which the standards are mounted, and on legs *v v*, formed on the under side of the tubes which form the inlet and outlet passages of the meter.

Meters constructed with induction and eduction openings on this plan, and with a ribbed cylinder, can be run in connection with pistons connected by round gears with a much smaller stream of water and lower pressure than has heretofore been possible.

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

1. In a meter provided with two rotating coacting pistons connected by round gears, a cylinder or measuring-chamber provided with an eduction-opening, arranged at right angles to the plane of motion of the pistons, and so constructed as to project at one side for some distance on the inside of the path of their segmental rims, in the manner and for the purpose substantially as set forth.

2. In a meter provided with two rotating co-acting pistons connected by round gears, a cylinder or measuring chamber provided with an induction-opening, arranged at right angles to the plane of motion of the pistons, and so constructed as to project at one side for some distance on the inside of the path of their segmental rims, in the manner and for the purpose substantially as set forth.

3. In a meter provided with two rotating coacting pistons connected by round gears, a cylinder or measuring-chamber provided with an eduction and induction opening, arranged at right angles to the plane of motion of the pistons, and so constructed as to project at one side for some distance on the inside of the path of their segmental rims, in the manner and for the purposes substantially as set forth.

4. The combination, in a water-meter, with two coacting rotary pistons connected with round gears, of a cylinder or measuring-chamber provided with ribs *i* and recesses *h* at both ends, and with an induction and eduction opening arranged at right angles to the plane of motion of the pistons, said openings being so constructed as to extend at one side for some distance on the inside of the path of the

segmental rims of said pistons, in the manner and for the purposes set forth.

5. The combination of the recesses P and Q with induction and eduction openings arranged at right angles to the plane of motion of the pistons of a rotary water-meter, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

BENAIAH FITTS.

Witnesses:
D. G. STUART,
GEO. O. ALLEN.