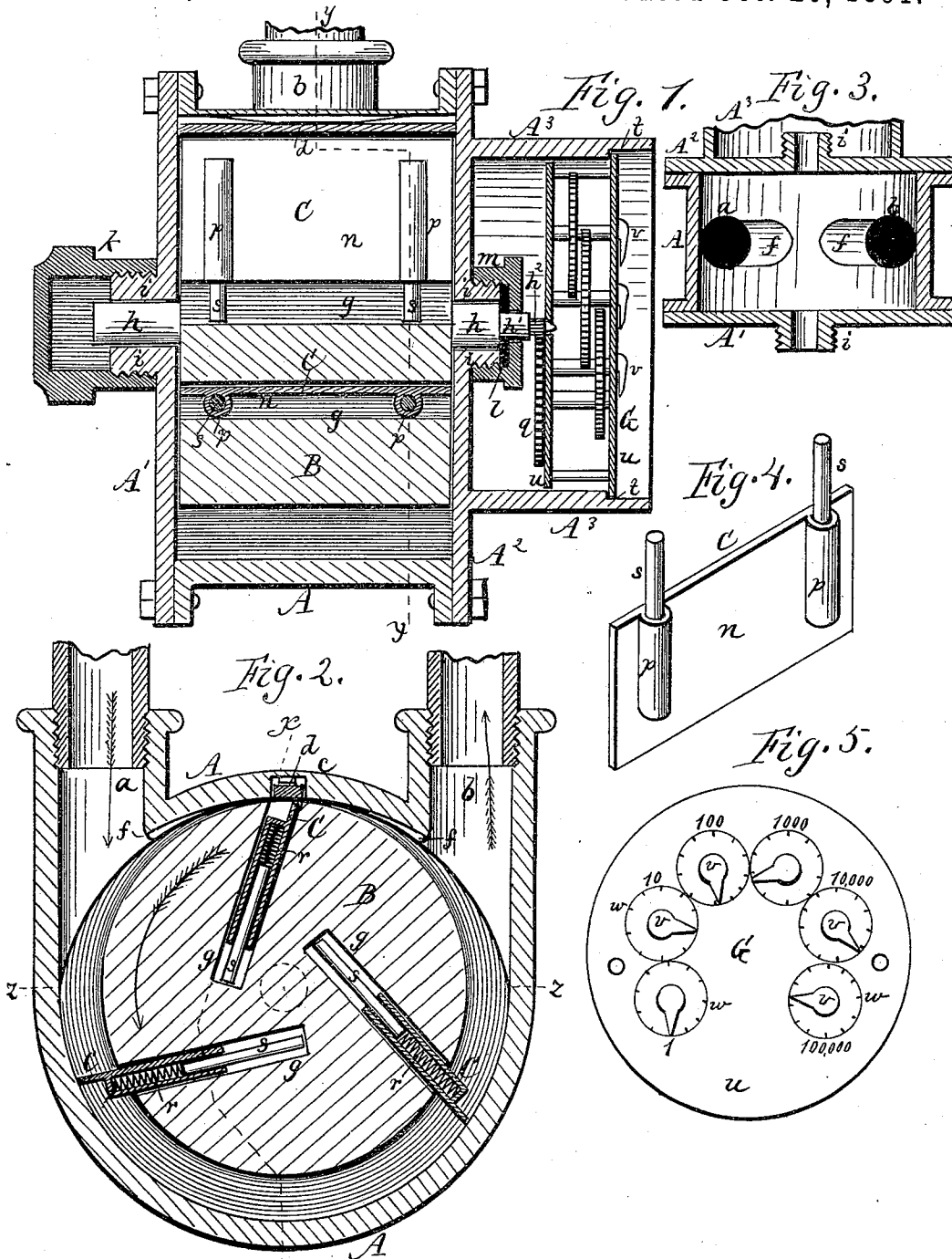


(No Model.)

P. AINSWORTH.
WATER METER.

No. 461,533.

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WATER-METER.

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To all whom it may concern:

Be it known that I, PERLEY AINSWORTH, of Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Improvement in Water-Meters; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the drawings accompanying this application.

My invention relates to improvements in water meters and motors, in the inclosing case of which I place a rotating cylinder located eccentrically to the upper half of the inclosing case and concentrically to the lower half, and which is provided with pistons that move out and in as the cylinder rotates, and which are driven by the pressure of water in the rear.

The invention consists in the construction and arrangement of parts, hereinafter described and definitely claimed.

In the drawings, Figure 1 is a longitudinal vertical section of the apparatus in line $x x$ of Fig. 2. Fig. 2 is a vertical cross-section in line $y y$ of Fig. 1. Fig. 3 is a reduced cross-section of the case in line $z z$ of Fig. 2 looking upward and designed to show more particularly the recesses at the top of the case. Fig. 4 is a perspective view of one of the pistons. Fig. 5 is a face view of the registering mechanism.

A indicates the case, B the interior rotating cylinder set in the case, and C C C the pistons sliding in and out of slots formed in the cylinder, all as hereinafter described.

The case A is preferably provided with separate heads $A^1 A^2$ bolted on, but, if desired, may be cast in one piece. It has an induction-port a and an eduction-port b , which stand on the upper side and open down vertically, as shown in Fig. 2, for a purpose presently to be described. Between these ports is the bridge forming the abutment c , having, preferably, a packing-piece d , that is pressed down by a spring and always remains in contact with the revolving cylinder B. The latter is set in the case with its upper surface resting in contact with the abutment, and its lower surface resting some distance from the bottom of the case, leaving thereby a way for the passage of the water. The interior of the case in cross-section has the form of connect-

ed arcs of intersecting circles, the lower part being concentric with the rotating cylinder B and the other eccentric thereto, as represented, whereby a space of uniform width is provided from the bottom of the inlet around under the cylinder B to the bottom of the outlet. This leaves the water-way below the revolving cylinder of the same width at all points to the extent of a half-circle, whereby the pistons, when thrown out, remain stationary relatively to the revolving cylinder, for a purpose which will be more fully described hereinafter. The curvature of the case between the parts on the other side is such that it is in close proximity to cylinder B along and adjacent to one line, so that said part of the case constitutes an abutment. The case is also provided in its upper side with recesses or channels $f f$, leading from near the abutment outward to the induction and eduction ports $a b$, said recesses being eccentric to the interior periphery of the case and serving on one side to allow the escape of such of the water as would otherwise be imprisoned by the pistons after passing the eduction-port, and before reaching the abutment, and on the other to allow the water from the induction-port to enter in above the top of the revolving cylinder and add its pressure to force the cylinder down on that side, thus aiding the revolving motion of the same.

The revolving cylinder B is provided with slots $g g g$, three in number, in which rest and move the pistons C C C. These slots are arranged angularly and longitudinally of the cylinder B, equidistant in cross-section, preferably upon the sides of an equilateral triangle, so that the pistons, when projected across the water-way, stand at an acute angle to the periphery of the cylinder B upon the side leaving the induction-port and at an obtuse angle to the periphery of the cylinder B upon the side approaching the eduction-port, as shown, whereby they tend to hold the power and pressure of the water behind them more effectively toward and upon that half of the cylinder B under the induction-port, and to throw off the power and pressure from the half of the cylinder B under the eduction-port. By this means, also, the slots are deeper than if made radially, and the pistons can be made wider and have a more secure bearing.

The cylinder B is provided at opposite ends with journals h h , which turn in the hubs or bearings i i , threaded on the outside to receive the screw-caps, and which are cast whole on the heads of the case. On one end screws a closed cap k , which packs against the head of the case and makes a water-tight joint. No other packing is required and the water passing around the journal lubricates the same and obviates the necessity of oiling. In case the apparatus is used as a motor instead of a meter the cap is provided with a hole at the outer end for the passage of the journal and the space between the cap and the end of the bearing is fitted with packing. The opposite journal has a reduced end h' and outside of this a small pinion h^2 , which gives motion to the registering mechanism. Around the reduced end h' rests a packing-ring l covering the joint between the enlarged part of the journal h and its bearing i , and outside of this rests a closed cap m , which screws on the bearing i and against the packing-ring and forces the latter up to place. By this means the joint is made perfectly water-tight without a stuffing-box.

The pistons C C C consist each of a thin plate n , which fits the side of the slot next to the induction-port, and two or more cross-guides p p on the back, which fill the slot transversely and slide freely therein, serving to hold the plate in close contact with its side of the slot. In these tubular guides are spiral springs r r , which rest against the ends of pins s s , fitting loosely in the tubes and resting against the bottom of the slots. These springs tend to keep the pistons out against the periphery of the case. If desired, any other form of spring may be used to keep the pistons out against the inner periphery of the case. One object of these springs is to keep the pistons in place when the meter is at rest, so that at the moment the power is applied the pistons will be ready in place to respond instantly. The advantage of this construction of the pistons is that the thin blades produce less friction and wear on the case and there is also less friction inside the slots. Therefore there is less impediment to the passage of the water. In addition to this the pistons leave the slots entirely open between the tubular guides, by which the water has free access into and from the slots to compensate for the movement of the pistons out and in.

G is the registering mechanism, consisting of a train of gears which are inclosed between two disks u u , the shafts of which are provided with pointers v v , which operate in connection with ordinary dials w w on the outside. The head A^2 of the case is provided with a cylindrical extension A^3 , in which the registering apparatus rests. This extension has on the inside a shoulder t , against which the outer disk of the registering mechanism strikes, the inner disk sliding free inside of the cylinder. In this condition the conical end of the pinion h^2 on the end of the jour-

nal of the revolving cylinder enters a hole in the inner disk, and said pinion engages with a spur-gear q on the inner side of the registering apparatus, said gear serving as the prime mover to the register-gearing, and receiving its motion from the pinion h^2 . It will be noticed that the registering mechanism is located in a central line with the axis of the revolving cylinder, and at the end of the same, and that the axes of the shafts of all the register-gears are parallel with the axis of the revolving cylinder. Therefore the action is more direct and certain than where the gearing is carried off on one side by worm or bevel gears. Furthermore, in inserting the registering mechanism it is self-centering in the cylinder A^3 , and in this condition the gear q is always sure to come into proper engagement with the pinion h^2 . This arrangement is also more compact and occupies less space than if carried off to one side, and the meter can be placed in more constrained positions when necessary.

It has been found in practice that the induction and eduction ports a b , placed in vertical positions in the upper side of the case, as shown in Fig. 2, have special advantages over those placed at the sides or at the bottom, as is ordinarily done, inasmuch as by so locating them all the pressure of the body of water on the induction side is made to bear down on the top of that half of the revolving cylinder B on that side, adding that power to the pressure on the projecting end of the piston, thus facilitating the revolution of the cylinder in the case. This pressure can reach back through the recess f and bears on the whole half-diameter of the cylinder. At the same time the pressure is relieved diametrically opposite at the eduction-port b .

It is also found that with the use of the induction and eduction ports so located it is advantageous to use three of the pistons, as shown, and not a greater or less number, for the reason that when one, as shown at the left in Fig. 2, has reached the point where it obtains the full force of the pressure the next above has not passed beyond the central line of the abutment. Therefore the water has free access through the recess f , whereby pressure is admitted to both sides of the piston and to the cylinder back of the piston.

Another advantage consists in making the lower part of the case (from z to z , Fig. 2), concentric with the revolving cylinder, as by so doing the pistons C C C make a half-revolution without sliding in their slots. Consequently there is less wear and friction than where the lower part of the case is eccentric to the axis of the cylinder. The pistons remain stationary relatively to the cylinder at all times, except when receiving or discharging their load. Where the case is made eccentric, there is a constant sliding of the pistons in the slots. Furthermore, when the case is so made eccentric, the superficial area

of water-way inclosed between any two of the pistons is constantly changing as the pistons move forward, being greater in some places than in others, and unless the body of water resting therein can be compressed or can escape the movement must cease, and such condition necessarily interferes with the proper action of the apparatus. In this invention the space inclosed between any two pistons is always the same from the moment the pistons leave the induction-port until they arrive at the eduction-port.

Another advantage of this construction is that the piston bearing the whole load is moved through the uniform channel at the same rate of speed until the piston following it assumes the whole load, so that one of the three pistons is always moving in the uniform channel, thus producing at all times a steady and regular motion of the machinery. A steady motion is greatly to be desired in water meters and motors, for it is produced with less loss of power by friction and with less noise and with less wear and tear and lighter machinery may be used with greater effect than if the motion is vibratory and intermittent. This uniform motion cannot be obtained if a less number of pistons is used, for at each revolution of the cylinder there will be an instant of time when no piston is in the uniform water-way, and hence the motion will be vibratory and intermittent. If a greater number of pistons is used, there will be a corresponding increase in friction which it is desirable to avoid. As the distance between the pistons is constant, it is obvious that any variation in the transverse dimension of the water-way must be accompanied by a tendency either to compress or expand the water contained between the pistons and by great variations of pressure and friction on the pistons. My invention is so constructed that the piston leaving the induction-port commences and continues to slide out until it enters the uniform water-way and receives the whole load, from which time it remains stationary until it leaves the uniform water-way and approaches the eduction-port, when the water

escapes, the load is lessened, and the piston commences and continues to slide in until it reaches the abutment.

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

1. The combination of the inclosing case provided with induction and eduction ports and an abutment and with circumferential recesses *f* between the abutment and the ports, said recesses disappearing in the inner surface of the case near said abutment, the revolving cylinder located in the case, and the pistons sliding in and out in slots of the cylinder, as and for the purpose specified.

2. The combination of the inclosing case provided with the ports and the intermediate abutment, the cylinder provided with ways, the pistons movable in said ways, the construction being such that the space between the case and cylinder increases in transverse dimension in each direction from the abutment to the ports and is constant in said dimension between the ports on the opposite side, whereby the content of the space between the pistons is constant except when it is in communication with a port, substantially as set forth.

3. The combination, with the revolving cylinder B, provided with slots *g g g*, of the pistons C C C, each consisting of a thin plate provided with guides on the back which fill the slots, as and for the purpose specified.

4. The combination, with the revolving cylinder B, provided with slots *g g g*, of the pistons C C C, provided with tubular guides *p p*, the springs *r r*, resting inside of said guides, and the pins *s s*, on which the guides slide, as shown and described, and for the purpose specified.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

PERLEY AINSWORTH.

Witnesses

R. F. OSGOOD,
WM. J. MCPHERSON.