3 Sheets—Sheet 1.

H. C. SERGEANT.

Liquid-Meter.

No. 103,509. Patented May 24, 1870.

Fig. 1.

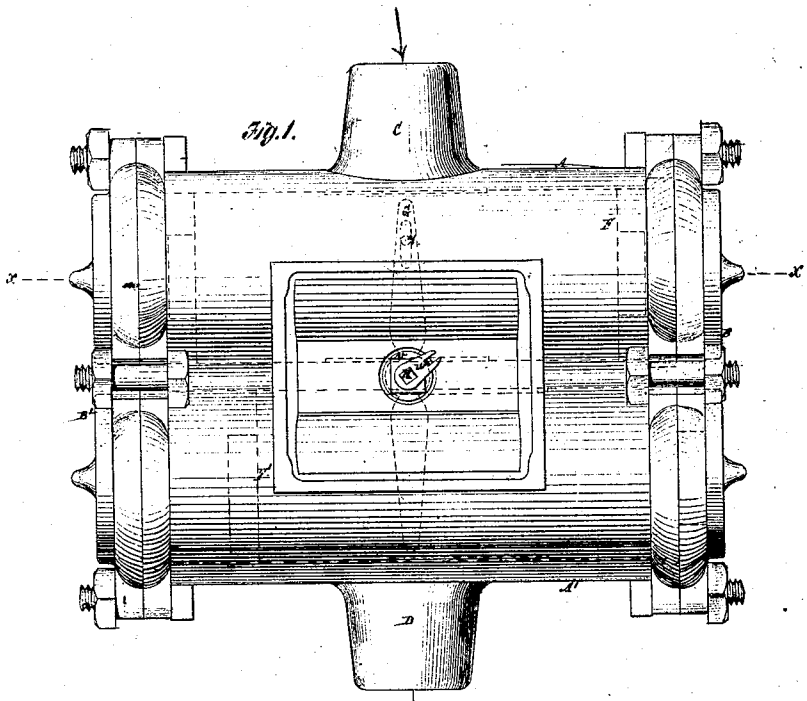


Fig. 2.

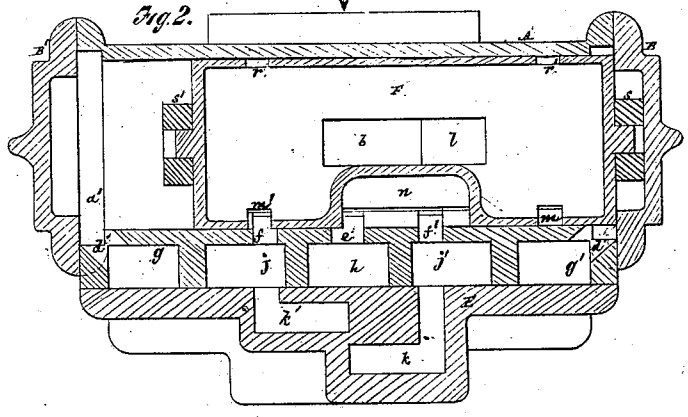
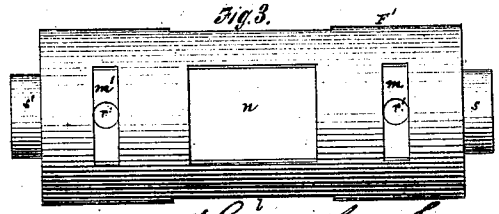


Fig. 3.



Witnesses.
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Fig. 4

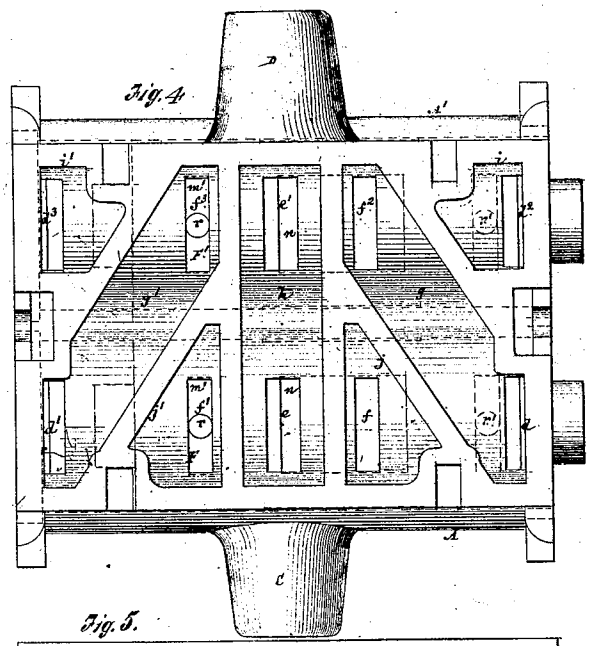
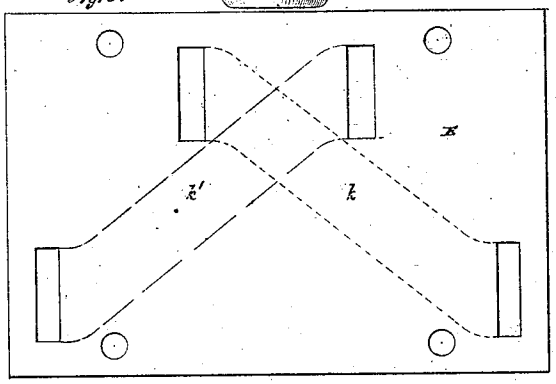


Fig. 5.



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3 Sheets—Sheet 3.

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Fig. 6.

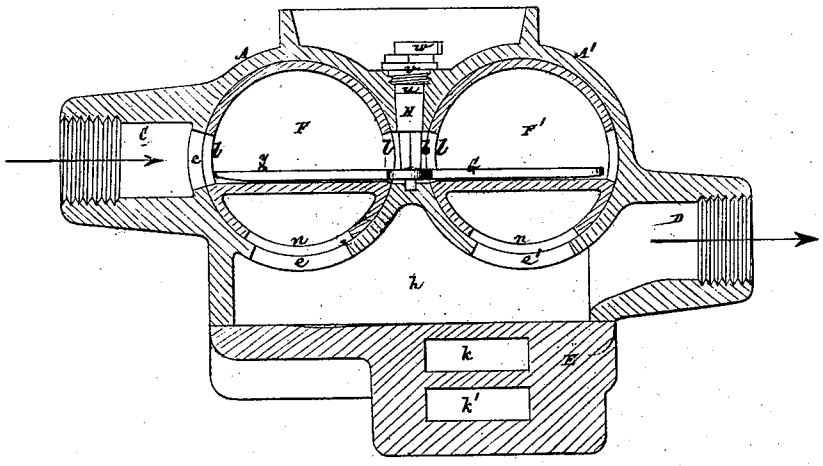

Fig. 7.

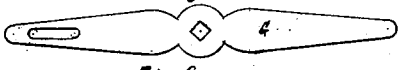

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

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UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF NEWARK, NEW JERSEY, ASSIGNOR TO JOSE FRANCISCO DE NAVARRO, OF NEW YORK CITY.

IMPROVEMENT IN FLUID-METERS.

Specification forming part of Letters Patent No. **103,509**, dated May 24, 1870.

To all whom it may concern:

Be it known that I, HENRY C. SERGEANT, of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Fluid-Meters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 represents a top view or plan of my improved meter; Fig. 2, a vertical longitudinal section taken as indicated by the line *x x* in Fig. 1; Fig. 3, an under view of one of the pistons that also operate as valves. Fig. 4 is an under view of the meter, with its bottom and end covers removed; Fig. 5, an inside face view of the bottom cover; Fig. 6, a central vertical section through the meter; Fig. 7, a longitudinal view of the bar by which motion is communicated to the indicator, and which serves to keep the pistons in position; and Figs. 8, 9, 10, and 11, views of details connected with said bar.

Similar letters of reference indicate corresponding parts.

In my improved meter, which, while applicable to measuring various fluids, it will suffice here to describe as a water-meter, two independent pistons are used, and the same arranged to reciprocate in horizontal cylinders or measuring-chambers, preferably placed side by side. These pistons, in addition to their function as moving diaphragms to make their cylinders measuring-chambers, also operate as valves, the one to the other, respectively, and so that they serve to control, without the aid of additional valves or gear to make them operate in unison, the ingress and egress of water to or from each other at opposite ends alternately. Said pistons are of elongated form and made hollow with closed ends, and the water, at its full pressure, is passed into the meter through said pistons, so as to fill them and keep them constantly supplied or filled with water. Thus the interiors of the pistons are made receivers, instead of the measuring-chambers, as where the supply is admitted direct to the latter, for any sand or sediment which may be in the water. These pistons are provided at their bottoms with opposite end passages and with a central or intermediate exhaust-cavity for operation in connection with fixed passages and ports made in the bottom of the meter and in a cover to said bottom; also, with upper inlet and lower outlet branches or pipes, whereby not only is the necessary reciprocating and automatic action secured to the pistons, but all the water is received above and passes out from below, and all lodgment of grit or sediment within the cylinders to cut them and the pistons is prevented; likewise an upward pressure thrown upon the pistons to assist in balancing them, and which may be perfectly secured or more closely reached by apertures made in the top portions of the peripheries of the pistons and working under cover of the cylinders. The motion of the indicator or registering mechanisms as derived from the pistons, or one of them, is obtained by a bar or lever arranged to pass through side passages in the pistons, by which the water is supplied to their interior, whereby not only is said lever made to operate a spindle or arbor by which motion is communicated to the registering mechanism, but it also serves to keep the pistons in position or from turning out of line with the fixed ports or passages.

In the accompanying drawings, A A′ represent two horizontal cylinders arranged side side and provided with end covers, B B′. The extreme ends of these cylinders are enlarged, as at *a a′*, to establish clearance from the cylinders of any sand or sediment that may temporarily find its way thereto. Said cylinders are made to communicate at or near their centers by an opening, *b*, and are supplied with water through the pistons, as hereinafter described, by an upper inlet pipe or branch, C, and the discharge established through a bottom or lower branch, D. The cylinder A has an elongated side passage, *c*, in communication with the inlet branch C, and both cylinders A A′ are provided at their bottoms with opposite end passages, *d d′ d² d³*, and intermediate ports or passages, *e f f′ e′ f² f³*. The end passages *d d′* of the one cylinder, A, connect by oblique passages *g g′*, made in the bottom of the meter, with the intermediate ports, *f² f³* of the cylinder A′. The central intermediate ports, *e e′*, of the two cylinders are in communication with a general passage, *h*, in

said bottom, which passage is in direct connection with the exhaust branch D. The end passages d^2 d^3 of the cylinder A′ connect, respectively, with cavities or passages i i', and the ports f f' of the cylinder A with cavities or passages j j' in the bottom of the meter. These cavities or passages i i' and j j' are connected by cross-passages k k', made in a cover, E, to said meter-bottom, the one cross-passage, k, connecting the cavity i with the cavity j', and the other cross-passage, k', the cavities i' and j.

The pistons F F′, which work within the cylinders A A′, are of elongated form and made hollow, with elongated side openings, l, in them. These openings l are of such length and so arranged that during the entire reciprocating action of the pistons communication is kept open through said openings l and passages b and c between the interior of the pistons and the inlet c. Furthermore, said pistons are each provided at their bottoms with opposite end openings, m m', and a central, D, or valvular cavity n, also with upper apertures, r r', which work continually under cover of the cylinders. By this construction and arrangement of the parts, ports, passages, and cavities a continuous reciprocating action of the pistons is kept up on letting on water by the inlet C and opening the outlet D, or pipe connected therewith, the pistons acting as valves the one to the other. Thus, supposing both pistons to be at the end of their one or right-hand stroke, as represented in Figs. 2 and 4, then water from the interior of the pistons, as supplied by the inlet C through the openings c, b, and l, will pass through the end passage, m', of the piston F and port f' into the cavity j', and from thence by the cross-passage k to the cavity i, from whence it passes by the end port, d^2, to act upon the back of the piston F′ to move it to the left, the opposite end of its cylinder A′ being at the same time open by the end passage d^3, cavity i', cross-passage k', cavity j, and port f to the exhaust-cavity n of the other piston, F, from whence it passes by the one intermediate port, e, into the general exhaust-passage h, which is in communication with the outlet D. In this way the piston F′ will be driven by the pressure of the incoming water to the left or opposite end of its cylinder, and as it reaches or approaches the end of such stroke the piston F′ will open the port F^2 for inlet-water from it to enter the oblique passage g, and from thence by the passage d, cause it to act upon the back of the piston F to drive it also to the right, the passage d' at the same time being open through the oblique passage g', port f^3, and exhaust-cavity e' of the piston F′ to the exhaust-passage h to free the piston F of water in front of it. As the piston F completes the end of its stroke to the left, its end passage, m, establishes opening with the port f, and cavity j, and through the cross-passage k' with the port d^3, to admit inlet-water to the opposite end of the piston F′ to drive it to the right, the water exhausting from the other end of said piston F′ through the port d^2, cavity i, cross-passage k, cavity j', port f', and exhaust-cavity e to the exhaust-outlet h. In this way are the independent pistons made to act as valves to control each other, and a succession of reciprocating movements of the two pistons kept up in such manner that there is a continuous or uninterrupted discharge. The pistons act as receivers for the water under pressure before it passes to the cylinders. Consequently any grit or sediment will be received within said cylinders; and by the arrangement of the inlet C above and outlet D below, and various passages or ports in the bottoms of the pistons and lower portions of the meter, all the water is introduced above and discharged below, thus leaving no chance for sand or sediment to remain; and should any get into the cylinders, the opportunity for which is very limited, it will be promptly pushed out by the pistons into the enlarged spaces a a' at the ends of the cylinders, and from thence pass off to the exhaust with no possibility of returning; hence there is no danger of the pistons or cylinders cutting. The several passages in the bottoms of the hollow pistons, which are exposed to an internal pressure of water, as described, assist in balancing the piston as against their weight and the downward flow of the current, while the apertures r r' in the tops of the pistons act in a compensating manner to establish a more perfect balance or prevent too much lift of the pistons without crippling the size of the bottom piston-passages, m m'.

On the head of the pistons are rubber buffers s s', to soften concussion in case of the pistons, when working fast and under a heavy pressure, striking the end covers of the cylinders.

Motion to work the indicator is taken from the one piston, F, by a bar or lever, G, connected to a vertical spindle or arbor, H, that is provided with an upper packing, u, and, working through a nut, v, carries an arm, w, by which motion may be communicated to any suitable registering mechanism. This lever G is in slotted gear with a driving-pin, y, in the piston F, and is arranged to extend through certain of the side slots, l, in the pistons and intermediate passage, b, by which arrangement said lever not only serves to operate the indicator, but also to keep the pistons in straight position, or so that they will not turn to throw their passages out of line with those in the cylinder.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The induction-passages l l, arranged on opposite sides of the hollow pistons F, in combination with the ports m, m', and n, arranged on their under side, substantially as specified.

2. The passages m m, arranged in the bottoms of the hollow pistons, in combination

with balancing-apertures r in their upper sides, essentially as shown and described.

3. The arrangement of the exhaust-cavities n, and the end passages, m m', in the bottoms of the hollow pistons, essentially as herein set forth.

4. The arrangement of the ports d d' d^2 d^3 e e' and f f' f^2 f^3, with the fixed cavities and passages in the bottom of the meter, and its cover with which said ports communicate, exhaust-cavities n, and passages m m' in the bottoms of the hollow pistons, and inlet-openings to the latter in communication with the supply pipe or branch, substantially as specified.

5. The bar G, arranged to pass through the inlet-openings l, in the hollow pistons, for the double purpose of working the indicator and of keeping the pistons in position, substantially as specified.

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Witnesses:
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