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H. B. Leach,

Fluid Meter.

No. 97,097. Patented Nov. 23, 1869.

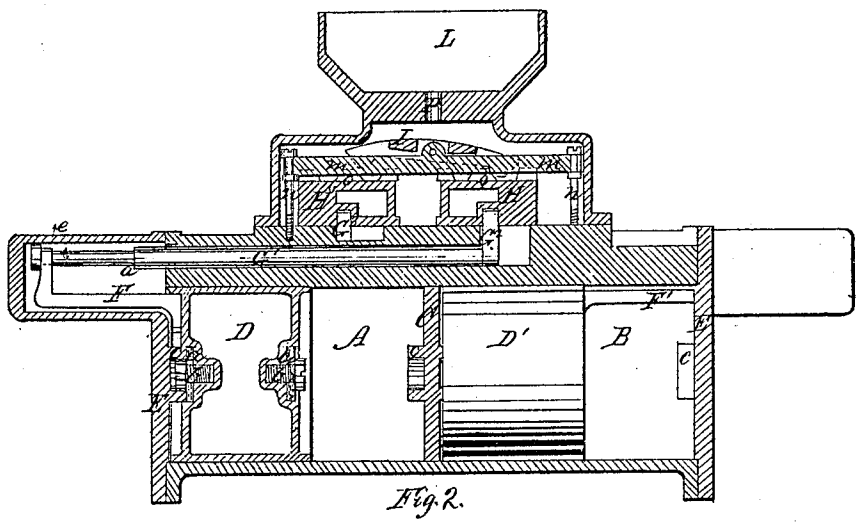

Fig. 2.

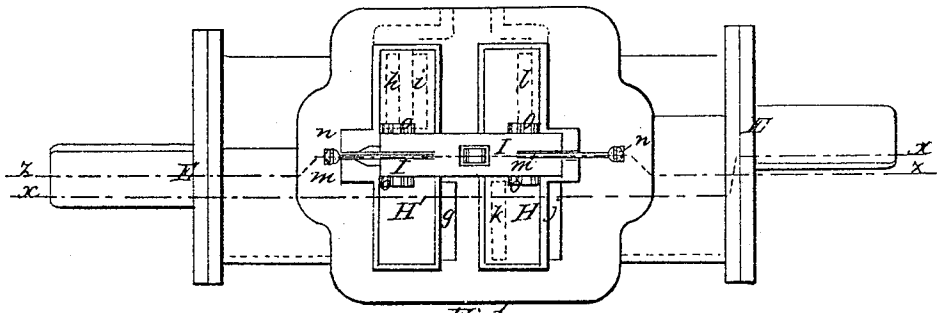

Fig. 1.

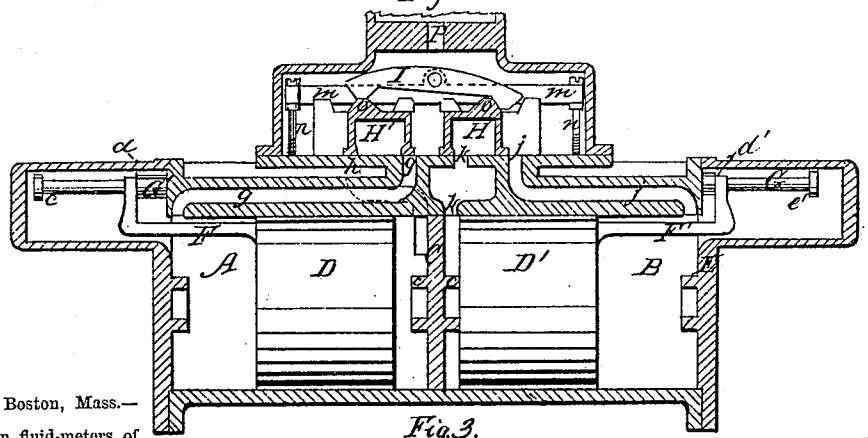

Fig. 3.

Inventor.
Henry B. Leach

97,097.—HENRY B. LEACH, Boston, Mass.—*Fluid-Meter.*—November 23, 1869.

Claim.—1. The arrangement, in fluid-meters, of two measuring-cylinders, placed end to end, with their axes in the same line, and each provided with a piston, and suitable water-passages communicating with a valve-chamber common to both, so that the fluid may be admitted to either end of either cylinder, and move either piston, while the other is stationary, whether said cylinders be cast in one piece or separately, substantially as described.

2. In combination with two cylinders and their pistons, constructed and arranged as set forth, the arrangement of the valve-rods G and G^1, the brackets, arms F and F', and the arms G^2 and G^3, substantially as described.

3. In combination with two cylinders and their pistons, constructed and arranged as set forth, the arrangement of the water-passages and ports *g*, *h*, *i*, *j*, *k*, and *l*, substantially as described.

4. The pistons D and D', having their motions controlled so as to insure the completion of the stroke of each piston before it commences its return-stroke, by locking one valve by the motion of the other valve, substantially as described.

United States Patent Office.

HENRY B. LEACH, OF BOSTON, MASSACHUSETTS.

Letters Patent No. 97,097, *dated November* 23, 1869.

IMPROVEMENT IN FLUID-METERS.

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

To all whom it may concern:.

Be it known that I, HENRY B. LEACH, of Boston, in the county of Suffolk, and State of Massachusetts, have invented certain new and useful Improvements in Fluid-Meters; and I do hereby declare the following to be a full, clear, and exact description of the same, taken in connection with the accompanying drawings, making a part of this specification, and the letters of reference marked thereon, in which—

Figure 1 is a plan of my improved meter, with the valve-casing removed;

Figure 2 is a vertical longitudinal section on line *z z*, on fig. 1; and

Figure 3 is a vertical longitudinal section on line *x x*, on fig. 1.

My invention relates, in the first place, to the construction and arrangement of the cylinders, pistons, and valves, and the manner of working the valves, and consists, first, in constructing and arranging two cylinders, or measuring-chambers, and two reciprocating pistons, in such a manner that one centre line shall be common to both, said cylinders being placed end to end, either cast in one piece, and bored out as one cylinder, and divided into two, by inserting a solid partition in the middle of its length, or cast separately, with two heads to each, and placed together, end to end, and provided with passages from each, leading to one common valve-chamber, the passages and valves being so arranged that the valve covering the ports and passages communicating with one cylinder may be moved by the piston working in the opposite cylinder, in the same direction that the piston itself moves, without the use of levers.

In order to accomplish this result, the passages leading from the valve-chamber, to either end of one of the chambers, have to cross each other, as shown in fig. 3, and in order to simplify the cores, and make it comparatively easy to cast the cylinders and passages, the ports are arranged as shown in fig. 1.

It also consists in the use of an arm, attached to each piston, in combination with a valve-rod, fitted to slide in a bearing provided for the purpose, between the water-passages, and having an arm projecting up through a slot made in the valve-seat, and fitting into a recess made in the under side of the valve, said valve being made so as to cover the slot in which said arm works at all times.

The connection between the arm attached to the piston and the valve-rod is made by a fork on the end of said arm, partially surrounding said rod, and moving between two shoulders or collars on said rod, so that the piston may travel through the greater part of its movement before it begins to move the valve.

It also consists in making the connection between the piston and the valve-rod inside of a bonnet or casing, attached to the cylinder-head, and communicating with the cylinder, by which means the wearing-surface of the cylinder is kept intact, and no impediment is presented to packing the piston in the most thorough manner.

It has been found, in practice, that in meters, where reciprocating pistons and slide-valves, moved by said pistons, are used, if a leak occurs, or a small stream is allowed to run to waste, the piston does not make a full stroke, and if the register is worked by the last part of the stroke, no register of the leak or waste will take place; or, if the register be operated by the first part, or middle, of said stroke, then a full stroke will be registered, when only a partial stroke has been made.

To obviate this difficulty, and compel the piston to complete its stroke before commencing its return stroke, even when drops only are passing through the machine, and thereby make a perfect register, is the object of the second part of my invention; and

It consists in the use of a double-ended pawl or detent-lever, hung upon a pivot above the valves, in combination with suitable lugs or teeth, having inclined sides on the upper side of the valve, so arranged that when one valve is at the extreme of its motion, and the other commences to move, the first valve shall be effectually locked in position by said movement of the other valve, so that it cannot move until the second valve has completed its movement, and, as the valves are moved by the pistons, it follows that each piston must complete its full stroke before commencing its return stroke, as will be more fully described.

In the drawings—

A and B represent two measuring-chambers, constructed, in the case represented in the drawings, by making one long cylinder, and dividing it, transversely, in the middle by the solid partition C, so as to form two distinct chambers, placed end to end.

The partition C may be cast in one piece, with the cylinder, or the two cylinders may be cast separately, and placed end to end, in a perfectly obvious manner, without affecting the principle of operation.

D and D′ are the pistons, made of such length as to have sufficient bearing-surface to guide them in their movements without other guides.

The pistons are made hollow, as shown in fig. 2, to lighten them, and are provided with elastic cushions *a a*, fitted into recesses formed in their ends for the purpose, said cushions being held in place by the screw *b*, and serve the purpose of elastic stops, to check the movement of the piston at the end of its stroke, by coming in contact with the rings *c c*, projecting into the cylinder, from the center of the cylinder-heads E E, and the partition C.

By the use of the screws *b b*, the elastic cushions

a a may be slightly adjusted, by placing paper, or other suitable material, behind them, to vary the movements of the pistons, as will be readily understood by any good mechanic.

F and F′ are arms or brackets, attached to the outer ends of the pistons D and D′, and projecting outward into the bonnets or casings attached to the cylinder-head, where they are forked on to the valve-rods G and G¹, so as to move freely on said rods, until they come in contact with one of the shoulders *d* and *d′* or *e* and *e′*.

The valve-rods G and G¹ are fitted to slide in bearings formed in the solid metal between the water-passages, and are provided with arms G² and G³ on their inner ends, which project upward, through a slot in the valve-seat, and into a recess formed for the purpose in the under side of the slide-valve.

The valve-rod that is connected at one end to the piston D is connected at its other end to the valve that covers the passages leading to the cylinder in which the piston D′ works, and the rod that is connected at one end to the piston D′ is connected at its other end to the valve that covers the passages leading to the cylinder in which the piston D moves, so that the movement of the piston D moves the valve that communicates with the chamber B, and *vice versa*.

H H′ are the slide-valves, made of such a form as to cover the necessary ports or passages, and the slot through which the valve-rod communicates with the valve, so that the valves may be worked directly by the movement of the piston, without the use of stuffing-boxes in any form.

g and *h* are the supply-passages, communicating with the chamber A, and cross each other, as shown in fig. 3, the passage *h* being shown in dotted lines.

i is the discharge-port, or passage, covered by the same valve, and communicating with the same chamber, through the valve H′, and is shown in dotted lines in fig. 1.

j and *k* are the supply-passages, and *l*, the discharge-passage communicating with the chamber B, also shown in dotted lines in fig. 1.

The valves H and H′ are guided in their movements by the guide-bar *m*, fitting into a groove formed in the upper surface of the valves, said guide-bar being supported on adjustable standards *n n*, at either end of the same.

I is a double pawl, or detent-lever, pivoted to the guide-bar *m*, so as to be free to move as it is acted upon by either valve.

The pawl, or detent-lever I is provided with two inclined holding-faces at either end, to work in conjunction with the raised lugs, or lips *o*, on the upper side of the valves, also having two inclined holding-faces and a flat surface at the top, between the two inclines, as shown in fig. 3.

L is a case to receive the gearing of the registering-apparatus, not shown in the drawings.

The operation of my improved meter is as follows:

Supposing each piston to be at the outer end of its cylinder, and the valve H to be in the position in which it is shown in fig. 3, *i. e.*, with the port *j* wide open, the pressure of the water passing through the passage *j*, and acting upon the piston D′, causes it to move toward the other end of the cylinder, until the arm F′ comes in contact with the shoulder *d′*, on the valve-rod G, and moves the valve H′, covering the passages to the cylinder A, and, if a full stream is being drawn, the piston D′ will complete its stroke, and give the valve H′ its full movement, the water on the other side of the piston D′ being discharged through the passage *k*, the valve H, and the passage *l*.

When the piston D′ has completed its stroke, and the elastic cushion *a* has come in contact with the ring *c*, and the valve H′ is moved so as to uncover the port *g*, the pressure of the water is transmitted through the passage *g*, to the outer end of the piston D, and causes it to move toward the inner end of the cylinder, and the forked end of the bracket, or arm F, coming in contact with the shoulder *d*, on the valve-rod G′, the valve H is moved until the port *k* is uncovered, and the piston D is brought to a standstill by the elastic cushion *a* coming in contact with the ring *c*, on the partition C, when the pressure of the water will cause the piston D′ to move toward the outer end of the cylinder B, and, by its movement, move the valve H′, until the port *h* is uncovered, and the pressure of the head of water, being transmitted through the passage *h* to the inner end of the piston D, causes it to move toward the outer end of the cylinder A, which operation will be repeated indefinitely, the locking-device being inoperative, or not effective, because there is no occasion for its use as long as a full or nearly full stream is being drawn from the faucet.

If, by accident or negligence, a leak occurs, or the faucet is left partially open, so that a very small stream is running through the faucet, the operation will be somewhat varied, from the fact, that without the use of the locking-device, the piston would only move so far in either direction as to open the valve far enough to allow of the passage of the very small quantity of water being passed through the machine, and then it would stop, and the other piston begin to move.

In case of a leak or a small stream being drawn, the operation will be as follows: The parts being in the position at first supposed, the piston D′ will be moved to the position in which it is shown in fig. 3, and the valve H′ into the position shown in the same figure, when it is open sufficiently to allow all the water to pass that is being passed through the faucet when the piston D′, having the valve and rod to move, while the piston D has no load upon it, the piston D′ stops, and the piston D moves until the forked end of the arm F comes in contact with the shoulder *d*, on the rod G′, and the piston D is in the position shown in fig. 3, when, as the valve H is firmly locked by one end of the pawl-lever I being depressed in such a position as to bear against the outer inclined surface on the lug *o*, and is held firmly in that position by the other end of said detent-lever resting on the top of the lug *o*, on the valve H′, the piston D must remain stationary until the piston D′ has completed its stroke, and moved the valve H′ from under the raised end of the pawl, or detent-lever I, when the piston D will commence to move again, and move the valve H until the port *k* is uncovered enough to allow the small quantity of water that is being drawn to pass through, when the piston D′ will begin to move toward the outer end of the cylinder, which movement will continue until the arm F′ comes in contact with the shoulder *e′*, on the valve-rod G, when, as the valve H′ is firmly locked by the detent, or pawl-lever I, it comes to a standstill, and remains in that position until the piston D has completed its stroke, and moved the valve H from under the raised end of the detent-lever I, when the piston D′ moves again, until the valve H′ commences to uncover the port *h*, when the piston D, being free to move, and having no load, is moved until the forked end of the arm F comes in contact with the shoulder *e*, on the rod G′.

This operation will be repeated as long as the leak or waste continues, that is, one piston will move through a portion of the stroke, and then stand still until the other piston has moved through a portion of its stroke, when it will remain stationary until the first piston has moved through another portion of its stroke, when it stops for the second one to complete its stroke, and so on to the end, both pistons finally moving the whole length of the stroke before commencing their return-stroke, and thereby insuring a perfect register.

The registering-apparatus is not shown, as there is nothing new in its construction, but is applied in the case L, with a spindle passing through the hole *p*, in the valve-casing, and is worked by the movement of the valve in any suitable manner.

I do not claim, broadly, the use of two measuring-chambers in one cylinder, the pistons of which work alternately, and each piston moving the valve that covers the ports, or passages communicating with the opposite chamber, for that is covered by the patent No. 87,104, granted to me February 23, 1869; but

What I claim as new, and desire to secure by Letters Patent, is—

1. The arrangement, in fluid-meters, of two measuring cylinders, placed end to end, with their axes in the same line, and each provided with a piston, and suitable water-passages communicating with a valve-chamber common to both, so that the fluid may be admitted to either end of either cylinder, and move either piston, while the other is stationary, whether said cylinders be cast in one piece or separately, substantially as described.

2. In combination with two cylinders and their pistons, constructed and arranged as set forth, the arrangement of the valve-rods G and G^1, the brackets, or arms F and F$'$, and the arms G^2 and G^3, substantially as described.

3. In combination with two cylinders and their pistons, constructed and arranged as set forth, the arrangement of the water-passages and ports *g*, *h*, *i*, *j*, *k*, and *l*, substantially as described.

4. The pistons D and D$'$, having their motions controlled so as to insure the completion of the stroke of each piston before it commences its return-stroke, by locking one valve by the motion of the other valve, substantially as described.

Executed at Boston, this 3d day of June, 1869.

Witnesses: HENRY B. LEACH.

THOS. HOLMES,

N. C. LOMBARD.