Sheet 1, 2 Sheets.

R. Creuzbaur.

Piston Meter.

No. 98,353. Patented Dec. 28, 1869.

Fig. 1.

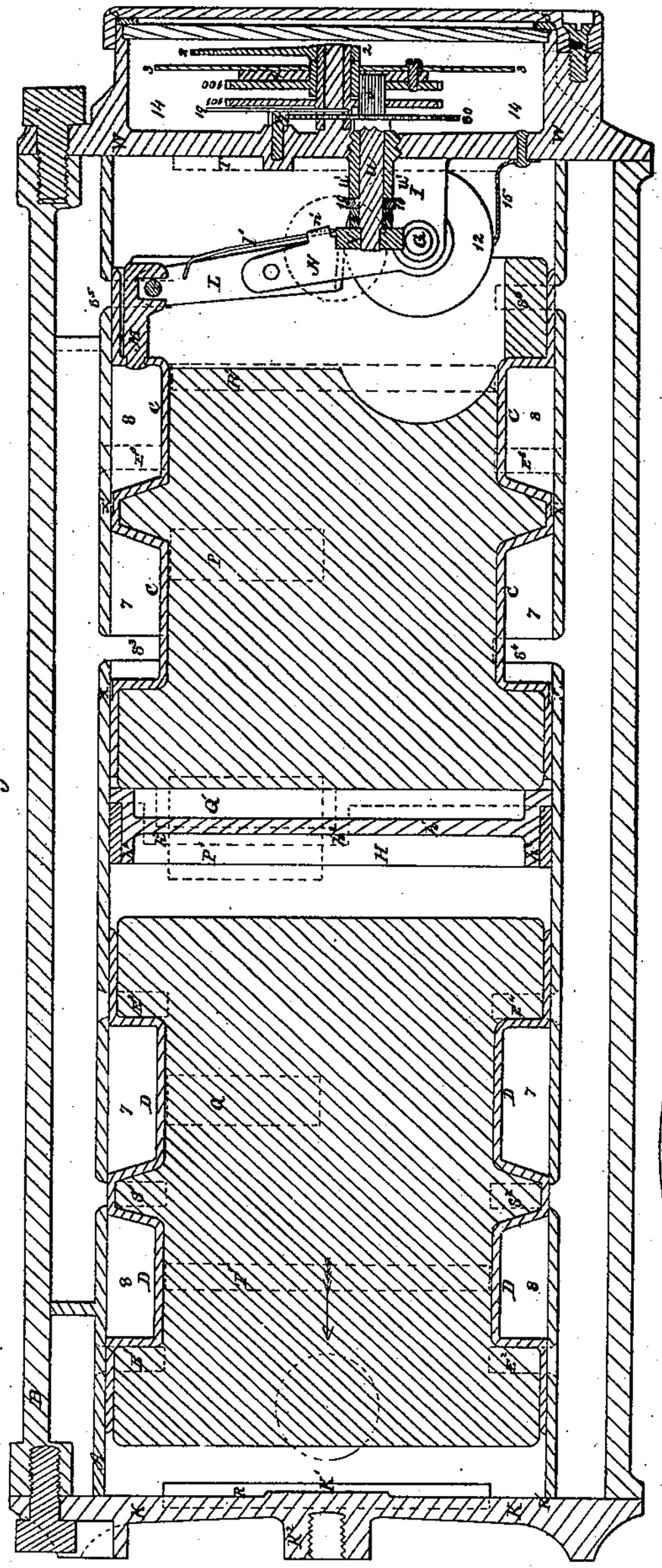


Fig. 3.

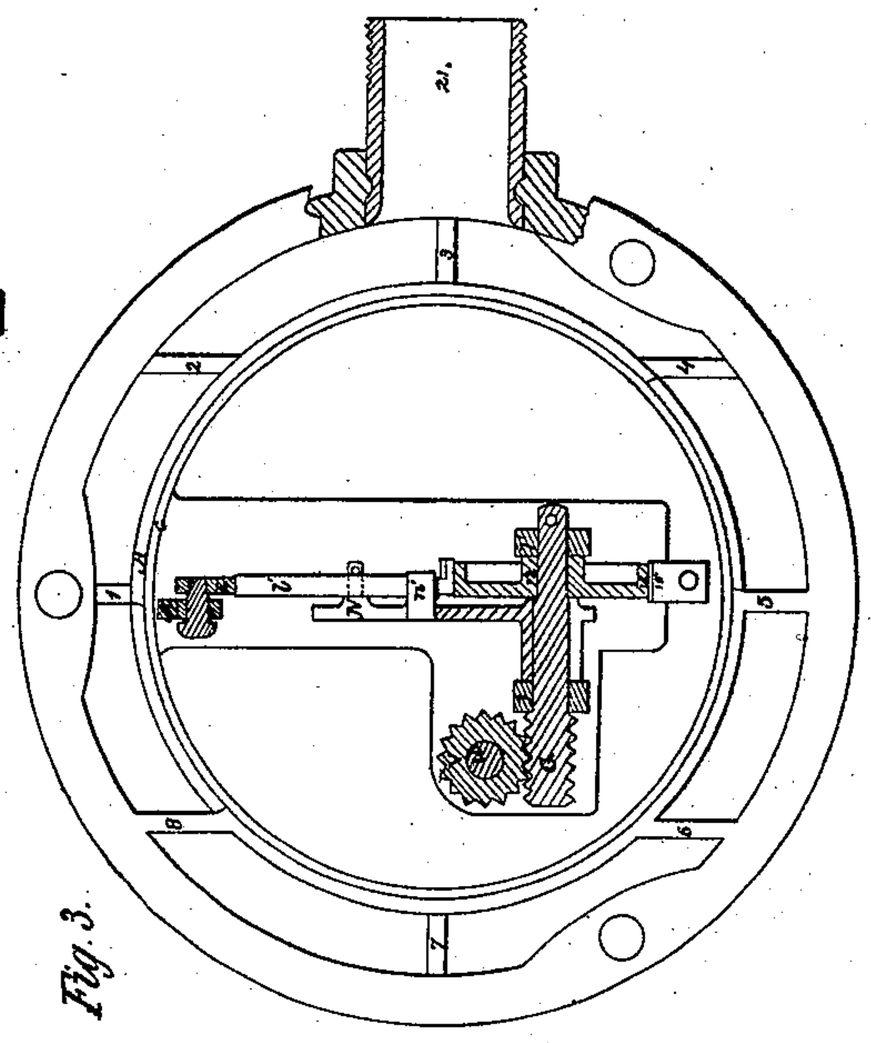
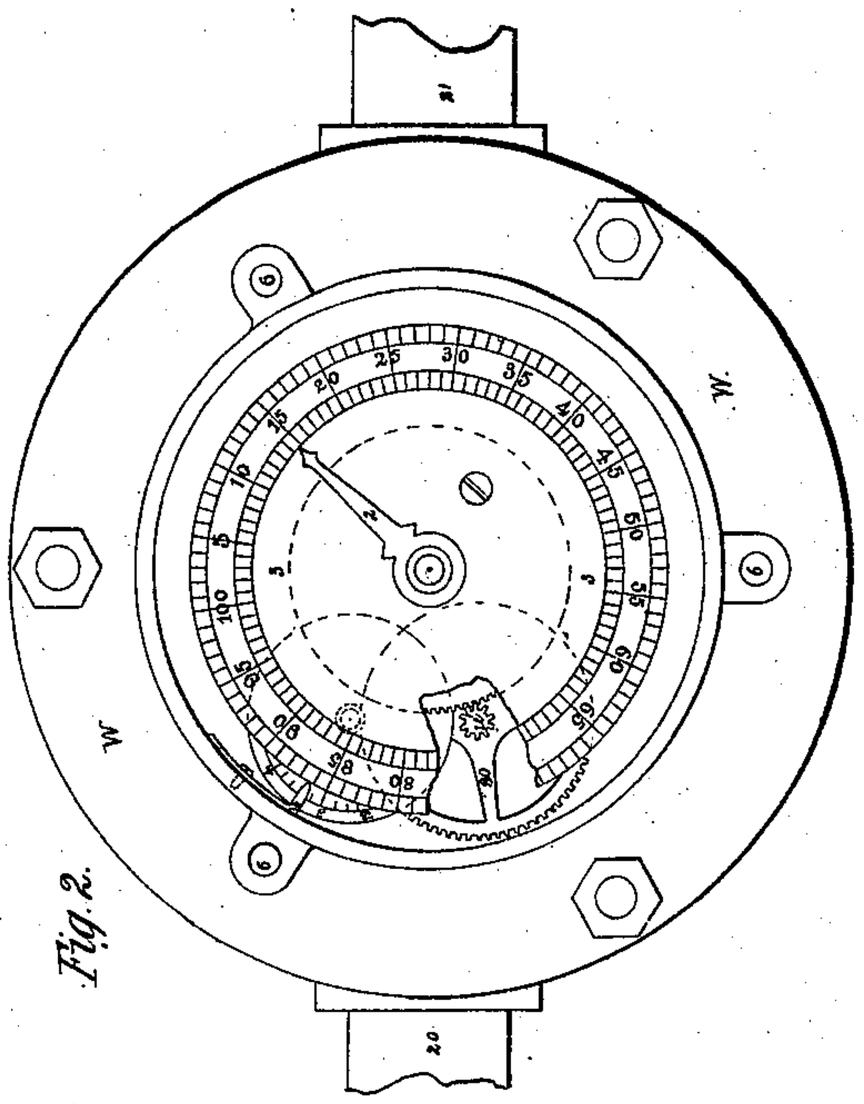


Fig. 2.



Witnesses.
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Jno P. Kirk

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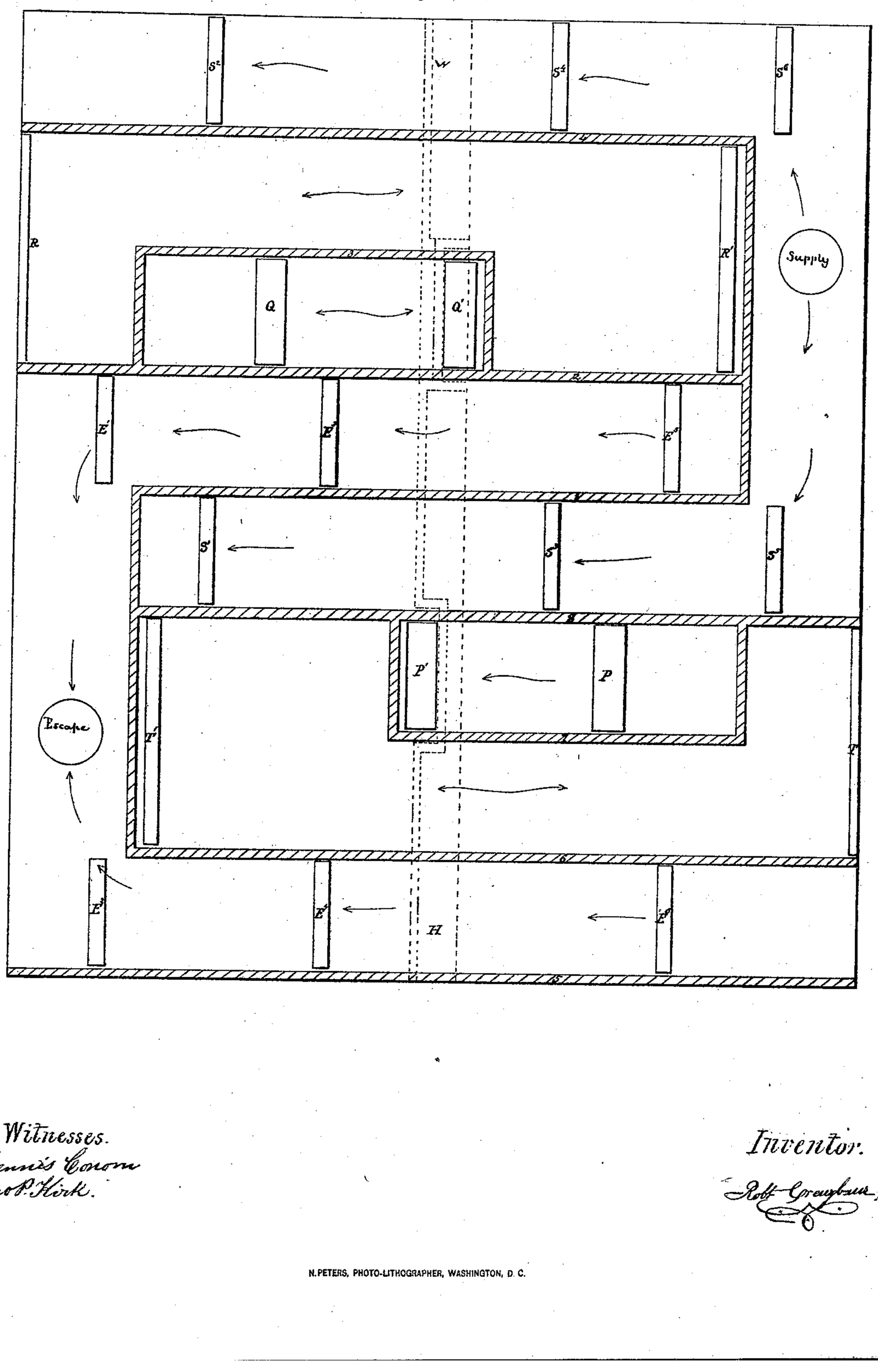
Sheet 2, 2 Sheets.

R. Creuzbaur.

Piston Meter.

No. 98,353. Patented Dec. 28, 1869.

Fig. 4.



Witnesses.
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ROBERT CREUZBAUR, OF BROOKLYN, NEW YORK.

Letters Patent No. 98,353, *dated December* 28, 1869.

IMPROVEMENT IN PISTON LIQUID-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, ROBERT CREUZBAUR, of the city of Brooklyn, in Kings county, State of New York, have invented an Improved Piston Fluid-Meter; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, and to the letters and figures of reference thereon, making a part of this specification, in which—

Figure 1 is a longitudinal section;

Figure 2, an end view, with parts removed;

Figure 3, a cross-section; and

Figure 4, a plan view of the water-channels and ports, representing them as though the inner casing A were unrolled and formed a plane.

The "escape" and "supply"-ports thereon are represented where they are located on the outer skin B.

The nature of my invention consists in making a piston fluid-meter, as follows:

First, of such form as to have great strength and durability, combined with cheap construction and little weight.

Second, I float the moving valve-pistons with cork, or its equivalent, and leave them disconnected and free to move independent of each other, so that they will obey the slightest impulse of the water, and thereby bring friction, resistance, and therefore the reduction of head, to a minimum.

Third, so as to avoid the carrying of dead water, which seriously obstructs free motion.

Fourth, to let the water in upon the valve-pistons in such a manner as to have them perfectly balanced under any pressure, to prevent reduction of head.

Fifth, so as to avoid the bursting of the meter through the action of the "water-hammer," and in case the water therein should freeze.

And of such other minor advantages and improvements as are herein minutely set forth.

The first step in the construction of the meter is the casting of the central brass piece A, which is in one piece with the ribs 1, 2, 3, 4, 5, and 6, figs. 3 and 4, and with the transverse end partitions connecting these, as shown in fig. 4.

When that piece A is cast, the ports therein are trimmed to proper shape, for which there is free access all around.

The channels, formed by the ribs named, are then filled with core-sand, so that the piece A, thus filled and rounded off with core-sand, forms a core around which the outer shell B is cast.

The inlet and outlet-nozzles 20 and 21, I make by preparing short pieces of pipe with the desired thread, which are placed in the mould, so that when the outer shell B is cast, they will be firmly encircled by it, and form a part of it, as shown.

The meter is divided into two parts by the bulkhead H, which consists of the central disk h^1 and the recessed rim h^2. The space between the latter and the casing A is filled with red lead, or some other metallic cement. A couple of pins might be inserted to insure its stability.

The rim h^2 is recessed, as shown at h^3, to admit the port Q′, as shown, with the view of saving space endwise, and to allow the piston to abut against the bulkhead without covering the port.

The port P′ is admitted in like manner.

The edges of rim h^2 also serve for abutment to the cork filling in the pistons. Were the cork to abut on its whole face, suction might take place, which would interfere with the free working of the meter.

With a like view the projection K′, on the end cover K, is made, which prevents the whole surface or face of the cork from lying against the face of the cover.

The bulkhead being put in place, and the end covers bolted on, as shown, the body of the meter is ready for service.

By this mode of construction, the expensive mode of boring out an iron casting for the insertion of a brass lining, also requiring preparation, is totally avoided, and a superior result is produced.

The only moving parts in the meter, besides the registering-apparatus, are the two valve-pistons C and D, which, while doing service as pistons, act as valves for each other.

Each piston has two annular recesses, 7 and 8, which act in the following manner:

Taking the piston D as an example, the port T′, which connects through port T with the right-hand end of piston C, (see fig. 4,) is never covered, but always open to the annular recess 8, while port Q, which connects through port Q′ to the nearest end of piston C, is likewise always open to recess 7.

In the position shown, piston C is at the end of its stroke, and piston D midway of its path, and just in the act of changing the ports for piston C.

After moving a little to the left, the supply-port S′ will be in connection with port Q, and the escape-port E′ will be in connection with port T. In consequence, while piston D is continuing to the end of its stroke, the piston C is travelling in the right-hand direction, and midway of its stroke performs the same office for piston D.

The end ports R and T are partly recessed into the covers, as shown in faint lines at R′, for the purpose of saving space, as well as to prevent the covering of the ports when the pistons abut against the covers.

There is a possibility of both pistons covering the

ports at the same time, in which case the action of the meter would be checked. This is guarded against by the two pairs of relief-ports, X X′, each two forming a pair, which are placed opposite each other, so as to equalize the pressure upon the piston.

These relief-ports are very small, so as to admit a mere thread of water, which is sufficient to move the other piston off its centre. These relief-ports cause no leakage when the pistons are free to obey the impulse of the water, which they are by the mode here below given, because the water will not travel around corners, and through narrow channels, causing friction, while free vent is given to it by floating off the pistons. These relief-ports are placed in the right-hand piston, because, by its connection to the counters, it is prevented from turning.

All the ports which are alternately covered by the pistons, are made in pairs opposite to each other, so as to equalize the pressure upon the pistons. The manner in which this is accomplished, with the construction above given, is clearly shown in fig. 4, which also shows the course of the water to and from all the ports.

As it is impracticable to make the pistons light enough to float, they are made of such thickness that when filled with cork they will be of a specific gravity approximating that of the fluid in which they are to operate. This gravity is regulated by reducing the amount of cork in the centre of the piston. This cork serves a fivefold purpose:

First, it floats the pistons, as named.

Second, it forms the bulkhead in the piston, which prevents the passage of water through the same. If the pistons are cast with a bulkhead in them, they would be too heavy, and they could not be finished with so much ease.

Third, the cork displaces water, which would otherwise be moved forward and backward as dead weight, with four times the inertia to be overcome, cork having one-fourth the specific gravity of water.

Fourth, the cork serves as bumpers to check the motion of the pistons at the ends of their strokes, and returns to them, on their return strokes, most of the force with which it was compressed.

Fifth, the cork, by its compressive quality, serves as preventive against the bursting of the meter, through the action of the "water-ram," when a cock is suddenly closed after a rapid flow; and also, when the meter is exposed to a freezing temperature, the expansion of the freezing water will compress the cork, instead of finding space by bursting the meter.

The mode adopted for recording the amount of water which passes through the meter is such as to record the distance travelled over by the pistons, and not the number of their strokes. This is necessary, because, in delivering a small stream, the pistons do not make full stroke.

The driver L, which is carried by the piston C by means of piece M, is pivoted to the arm N, which turns loosely on shaft G, and the point of the driver L is kept in contact with the wheel 12, by spring *l′*, pressed upon by projection *n′* on arm N. The wheel 12 moves with the shaft and screw G, which turns in standards I I. Screw G turns wheel V, the shaft *u* of which passes through the sleeve *u′* into the registering-wheel chamber 14.

The water is excluded from chamber 14 by the washer 10, ground to a close joint with the sleeve *u′*, and by the rubber sleeve 9.

Now, when the piston C moves to the right, the driver L, the point of which is to the right of a central line, will lock with the wheel 12, and carry it along; when the piston returns to the left, the dog 15 will prevent wheel 12 from returning on its path, while the driver L slides loosely over its surface.

Instead of using dog 15, the wheel 12 and its appendages may be placed in the centre, and another arm N and driver L used on the opposite side in such manner that the one will drive while the other slides. These parts, the wheel 12 and its appendages, may be recessed into the end cover W, so that the piston C can be entirely filled out with cork, like piston D, so as to better equalize their action.

The pinion *u′* of ten teeth on shaft *u*, drives the two wheels, of one hundred, and one hundred and one teeth, the three forming the old plan of differential wheels.

The dial 3 is fastened to wheel 100, and the index-finger 2 is fast by a sleeve to wheel 101; thus, when the wheel 100 has made one revolution, the finger 2 has advanced one of the one hundred divisions on the dial-plate.

The finger 16, fig. 2, denotes units, the finger 2 counting hundreds, and up to ten thousand in one revolution.

To be able to measure fractional parts in testing meters, and especially when measuring valuable liquids to be subdivided into fractional parts, the wheel 80, of eighty teeth, fastened to pinion *u′*, drives the pinion 8, of eight teeth, fastened to dial-plate 19, by which the hundredth part of a unit is indicated.

For extreme accuracy, a registering-apparatus could be attached to the other piston and cover also.

The supply and escape-ports may be interchanged.

Having thus described the construction and use of my improved meter,

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

1. The arrangement, within one barrel A, of two pistons, C and D, acting as valves for each other, substantially as and for the purpose hereinbefore set forth.

2. The arrangement of the two pistons C and D, acting as valves for each other, when the piston D, acting as valve for piston C, changes the ports for the latter at or near half stroke of D, and *vice versa*, and when the two pistons are disconnected and move independent of each other, substantially as and for the purpose hereinbefore set forth.

3. The combination, with a meter-shell, A, and one or more pistons, C and D, of the cork bulkheads named, substantially as and for the purposes hereinbefore set forth.

4. The combination, with a meter-shell A and pistons C and D, of the outside water-channels, arranged as shown, substantially as and for the purpose hereinbefore set forth.

5. The combination, with a meter-shell A and two pistons C and D, with their recesses 7 and 8, of the duplicate ports E and the duplicate ports S, substantially as and for the purpose hereinbefore set forth.

6. The combination, with a meter-shell, A, and two pistons C and D, of a bulkhead, H, with its rim h^2 and recesses h^3, substantially as and for the purpose hereinbefore set forth.

7. The small relief-ports *x x′*, in combination with the piston-valves C and D, arranged as described and for the purpose named.

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Witnesses:

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