(No Model.) 3 Sheets—Sheet 1.

A. FRAGER & B. L. MICHEL.

PISTON METER.

No. 391,956. Patented Oct. 30, 1888.

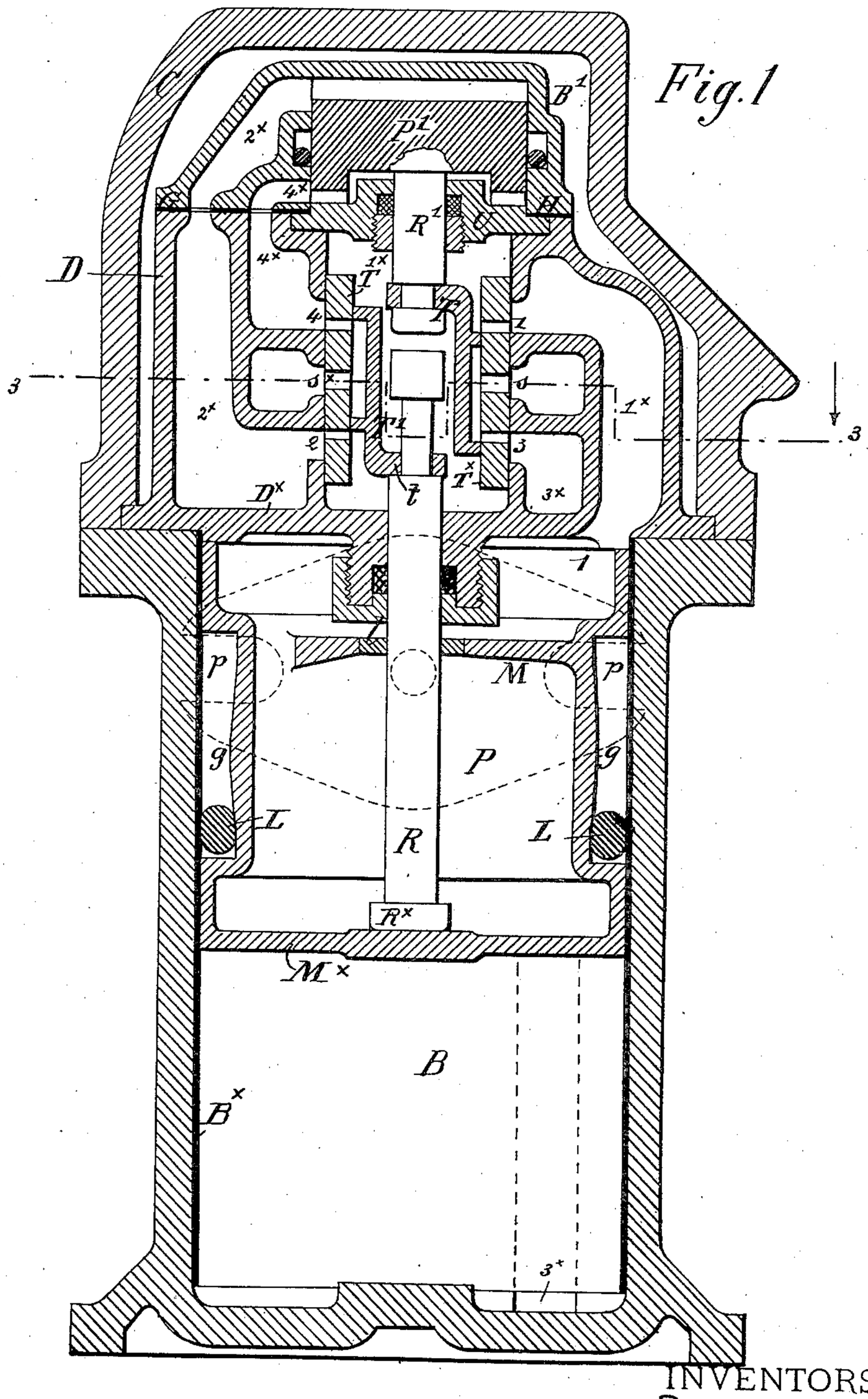

Fig. 1

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3 Sheets—Sheet 2.

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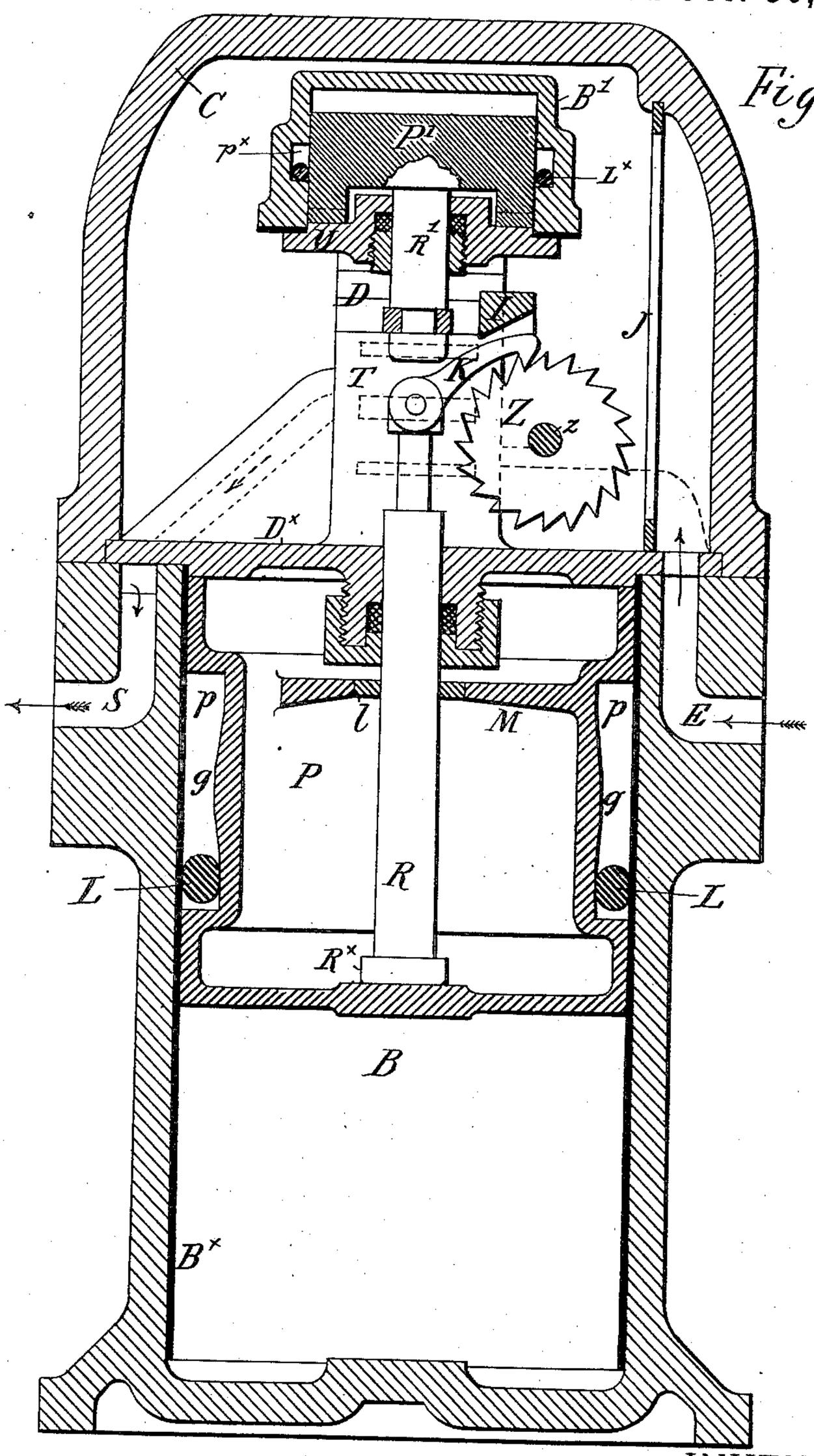

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 3.

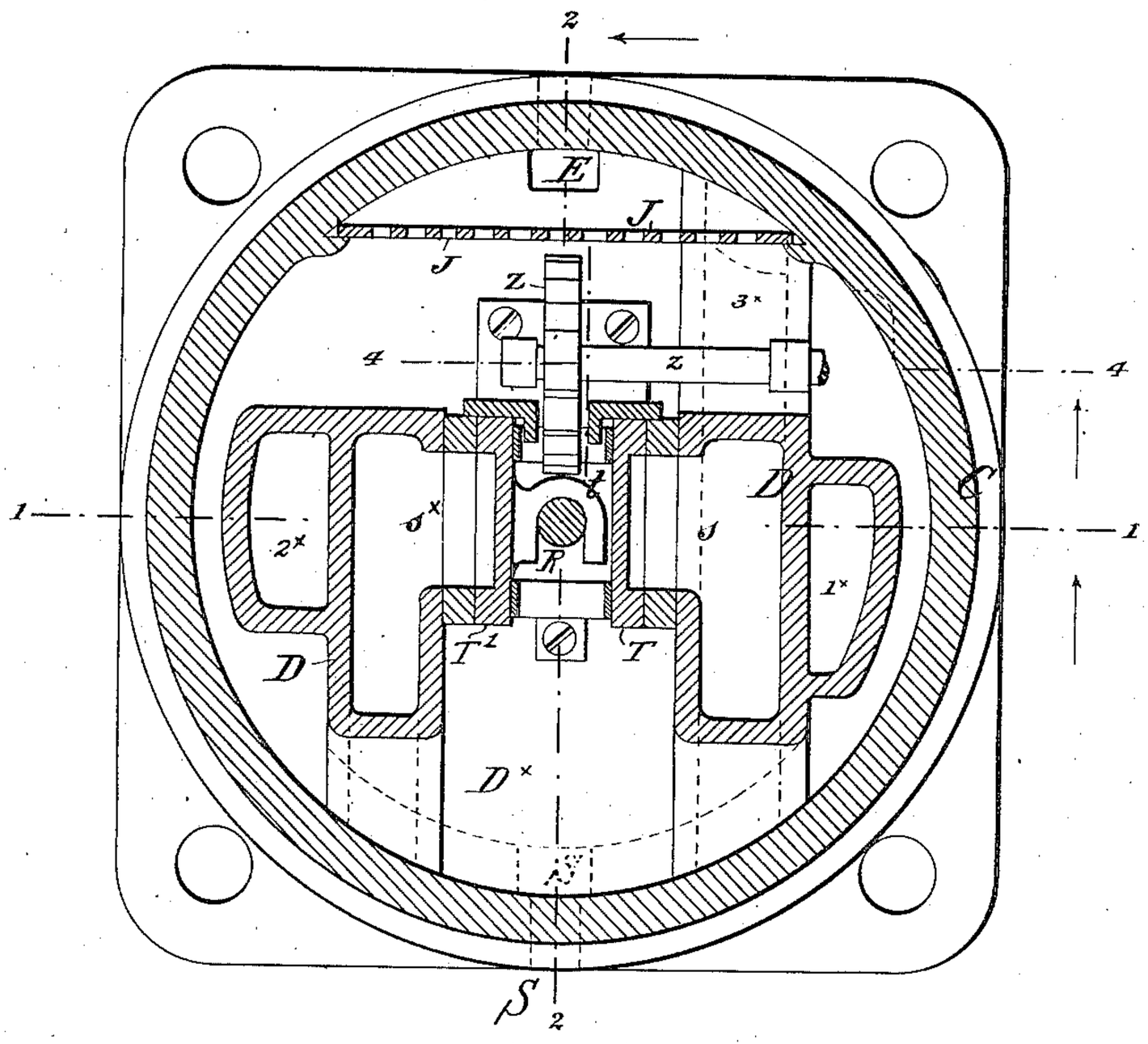
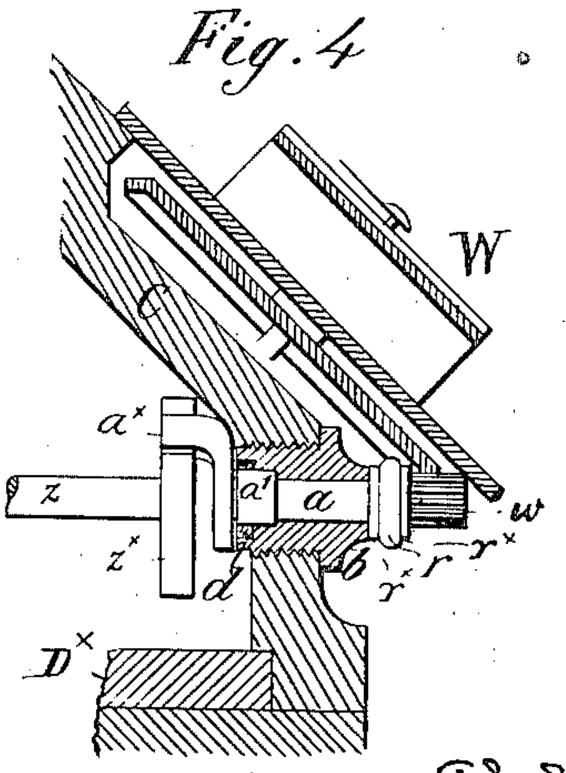


Fig. 4.



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UNITED STATES PATENT OFFICE.

ALPHONSE FRAGER AND BERNARD LOUIS MICHEL, OF PARIS, FRANCE, ASSIGNORS TO SAID ALPHONSE FRAGER AND SOCIÉTÉ MICHEL ET COMPAGNIE, OF SAME PLACE.

PISTON METER.

SPECIFICATION forming part of Letters Patent No. 391,956, dated October 30, 1888.

Application filed June 27, 1887. Serial No. 242,605. (No model.) Patented in France March 31, 1886, No. 175,171, and in England May 20, 1887, No. 7,391.

To all whom it may concern:

Be it known that we, ALPHONSE FRAGER and BERNARD LOUIS MICHEL, both citizens of the French Republic, and residents of Paris, France, have invented certain new and useful Improvements in Liquid Meters and the like, (for which patents have been granted in France March 31, 1886, No. 175,171, and in Great Britain May 20, 1887, No. 7,391,) of which the following is a specification.

Our improvements relate to that class of machines which are actuated by liquids, and notably to liquid or water meters.

Our invention will be hereinafter fully described, and its novel features carefully defined in the claims.

In the drawings our invention is illustrated as applied to a meter for measuring water or other liquids.

Figure 1 is a vertical axial longitudinal section of the meter, and Fig. 2 is a substantially similar section taken in a plane at right angles to that of Fig. 1. The planes of these sections are indicated, respectively, by the lines 1 1 and 2 2 in Fig. 3. Fig. 3 is a horizontal section taken substantially on line 3 3 in Fig. 1, and Fig. 4 is a fragmentary section taken on line 4 4 in Fig. 3.

The body of the meter is composed of three principal parts—namely, the barrel or base portion B, forming the measuring-cylinder, the distributing-chest D, mounted on cylinder B, and the cap C, covering all and supporting the registering mechanism, which is arranged exterior thereto. The cylinder B has usually a lining, $B^{\times}$. The base $D^{\times}$ of the chest D is rabbeted where it rests on the cylinder B, and the cap C is rabbeted where it rests on the base $D^{\times}$. In the chest D are formed the several water-passages leading from the inlet-ports to the cylinder and from the outlet-ports to the main outlet. In a central space formed in the chest D are arranged the two slide-valves T and T′, which stand back to back and play over parallel-faced seats $T^{\times}$ and $T'^{\times}$, respectively. In the seat $T^{\times}$ are formed two inlet-ports, 1 and 3, and an outlet-port, *s*, which leads to the main outlet S. (Seen in Figs. 2 and 3.) The valve T controls these ports. In the seat $T'^{\times}$ are formed two inlet-ports, 2 and 4, and an outlet-port, $s^{\times}$, which also leads to the main outlet S.

P is a piston which plays in the measuring-cylinder B. An axial valve-stem, R, passes through a stuffing-box in base $D^{\times}$, which covers cylinder B, and passes also through a partial diaphragm or partition, M, at the upper end of the long hollow piston P. On the lower end of stem R is a button, $R^{\times}$, and when piston P has reached a point near the end of its down (or out) stroke the partition M engages said button and draws down stem R. Valve T′ is coupled to stem R, and when piston P draws down said stem the valve will be shifted. On the upstroke of piston P its bottom $M^{\times}$ strikes the end of stem R, when the piston is near the end of said stroke, and thus moves and shifts the valve in the opposite direction.

Valve T is coupled to a valve-stem, R′, aligned with stem R. This stem R′ passes through a stuffing-box in a rabbeted plate, U, and is connected rigidly to a smaller piston, P′, which plays in a cylinder, B′, mounted on top of chest D. The line of junction between cylinder B′ and chest D is indicated by plane G H, the joint being packed.

The water enters the chamber in cap C by way of the main inlet E, formed in the wall of the cylinder B, first entering behind a screen or grid, J, which partitions off a part of said chamber. This screen keeps out floating particles. The outlet S is also formed in the wall of the cylinder B, and connects with the two outlet-ports *s* and $s^{\times}$ by passages indicated in dotted lines in Fig. 3. After entering the chamber of cap C the way is open for the water to reach the valve and the inlet-ports that may be open. Suppose the ports standing as indicated in Fig. 1. The water under pressure has free access by way of port 2 and passage $2^{\times}$ to the cylinder B′ above piston P′, which latter is thus depressed, and in turn holds valve T in position to open port 1 by way of passage $1^{\times}$ to the upper end of cylinder B above piston P. This latter piston descends,

and when button R× is engaged by partition M the further descent of the piston shifts valve T'. Port 4 will now be open and water enters and passes by way of passage 4× to the under side of piston P', driving it upward. The water above piston P' escapes by way of passage 2× and ports 2 and s× to the main outlet S. In the meantime, valve T having been shifted, port 3 will be opened, and the water then passes by way of passage 3× (mainly formed in the wall of cylinder B) to the lower end of cylinder B below piston P, the water above said piston escaping by way of passage 1× and ports 1 and *s* to main outlet S. This operation may be maintained indefinitely, piston P operating the valve controlling the passage of water to and from cylinder B' and piston P' operating the valve controlling the passage of water to and from cylinder B.

Figs. 2 and 4 illustrate the means employed for communicating the movements of piston P to the counter or registering device mounted on the cap C. Z is a ratchet-wheel mounted fixedly on a shaft, *z*, rotatively mounted in bearings on the base D×, and K is a hook-pawl pivoted to the upper end of valve-stem R. The pawl rests on wheel Z by gravity. The downward movement of stem R causes the pawl to rotate the wheel to the extent of one tooth. On the end of shaft *z* is a notched disk, *z*×, the notch in which is engaged rather loosely by a crank, *a*×, fixed on a pinion-shaft, *a*. This pinion-shaft fits snugly (see Fig. 4) in a bearing in a screw-bush, *b*, screwed tightly into a hole in cap C, and it has a boss, *a'*, that is drawn up, in the manner of a valve, against a face in a recess in the end of bush *b* by an elastic rubber washer, *r*, which is placed between two metallic washers, *r*× *r*×, and slipped on the outer end of shaft *a*. A pinion, *w*, is screwed onto the outer end of shaft *a* and up against washer *r*, so as to compress the latter more or less and hold the boss *a'* up to its place. The pinion *w* drives the registering device indicated as a whole by the letter W in Fig. 4. This device of itself forms no part of our present invention.

In Fig. 4, *d* represents a receptacle for some thick or viscid lubricant formed in the end of bush *b*, as represented.

We have shown the ratchet-wheel Z and its shaft in plan in Fig. 3 for purposes of illustration, although the plane of the section is taken below the same.

The loose connection of the crank *a*× with the driving-shaft *z* enables the cap C to be readily removed without disturbing shaft *z*. Any loose driving coupling or connection will serve in lieu of that described.

We arrange the valve-seats opposed and parallel, in order that they may be both dressed at one time.

As the pawl K is only held down by its own weight, it is liable to "stick" and not fall. To obviate this difficulty, we arrange above the pawl a fixed inclined abutment, I, which the pawl will strike when it is carried up. This will force the pawl down upon the ratchet-wheel.

Where the valve T' is coupled to the stem R the coupling-hook *t* on the valve engages an elongated neck on the stem. This allows a little play of the stem without moving the valve. The object of this is in part to give to the pawl K sufficient movement to insure its engagement each time with a tooth of the ratchet-wheel, and this play also lessens the liability of the arrest of the valve at the dead-point.

To facilitate the casting of the chest D and cylinder B' and the dressing of the valve seats, we make the cylinder and chest in two parts, joining them along the line G H, as before described, introducing the plate U in the manner shown in Fig. 1, and as explained. The upper face of this plate is set flush with the joint.

The packing of the larger piston, P, is provided as follows: An annular recess, *p*, is formed in the outer face of the piston, the body or neck of the piston at this recess being largest in diameter at the middle point, *g*, and tapering toward the ends. Thus the recess is most contracted at its middle. In this recess is arranged a rolling packing-ring, L, which is shown slightly compressed in Figs. 1 and 2. It will be obvious that at the ends of the stroke of the piston the ring L will be least tightly bound or compressed, and when the piston starts to move, if the ring should tend to slide instead of roll, it will soon reach the more contracted part of the annular recess, and the wedge-like action of the conical surface of the piston-neck will, by increased friction thereon, set said ring to rolling.

The packing of the lesser piston, P', is somewhat similar, except that the annular recess *p*× is in this case formed in the cylinder-wall and receives a packing-ring, L×. This ring rolls as the piston moves back and forth.

Our meter is especially suitable for measuring the feed-water supplied to a steam-generator by a pump, for the following reasons: The water which passes to cylinder B' and thence to the outlet S passes directly to the outside in such a manner that whatever may be the discharge the movement of the lesser piston is completed and the ports leading to the larger cylinder are opened in full. Thus the valve which controls the flow of water to the measuring-cylinder may be left to care for itself, and it can always be relied on to establish the proper alternate supply and discharge of water to and from the large cylinder, and thereby the continuity of the jet. Thus we avoid a difficulty which sometimes occurs—namely, that when the pump is started the ports of the meter are not fully open. To recapitulate, the lesser engine, controlling the valve of the larger engine, receives and discharges its water directly, and not indirectly, and it always makes a full stroke.

We arrange the inlet E and outlet S in the

cylinder B and make the connections thus below the seat upon which the cap C rests. This enables us to remove the cap and inspect the interior mechanism without the necessity of disconnecting or disturbing the pipes.

Having thus described our invention, we claim—

1. In a liquid-meter, the combination of the piston P, provided with an apertured partition, M, through which the valve-stem plays, the said stem R, provided with a button, $R^{\times}$, to catch under said partition, and the valve T', coupled loosely to said stem R, whereby stem R partakes of but a part of the movement of the piston and said valve partakes of but a part of the movement of said stem, as set forth.

2. The combination, with a piston provided with an elongated annular recess, as *p*, made deeper at its extremities than at its middle point, *g*, of a rubber packing-ring, as L, arranged in said recess, substantially as set forth.

3. In a liquid-meter, the combination, with the pinion-shaft *a*, provided with a boss, *a'*, of the bearing piece or part *b*, provided with a face to form a seat for the face of the said boss, the rubber washer *r* and flanking washer $r^{\times}$, and the pinion *w* on the outer end of shaft *a*, substantially as set forth.

In witness whereof we have hereunto signed our names in the presences of two subscribing witnesses.

ALPHONSE FRAGER.
B. LOUIS MICHEL.

Witnesses:
ROBT. M. HOOPER,
JULES ARMENGAUD, Jeune.