(No Model.) 3 Sheets—Sheet 1.

R. CREUZBAUR.

ROTARY WATER METER.

No. 350,619. Patented Oct. 12, 1886.

Fig. 1.

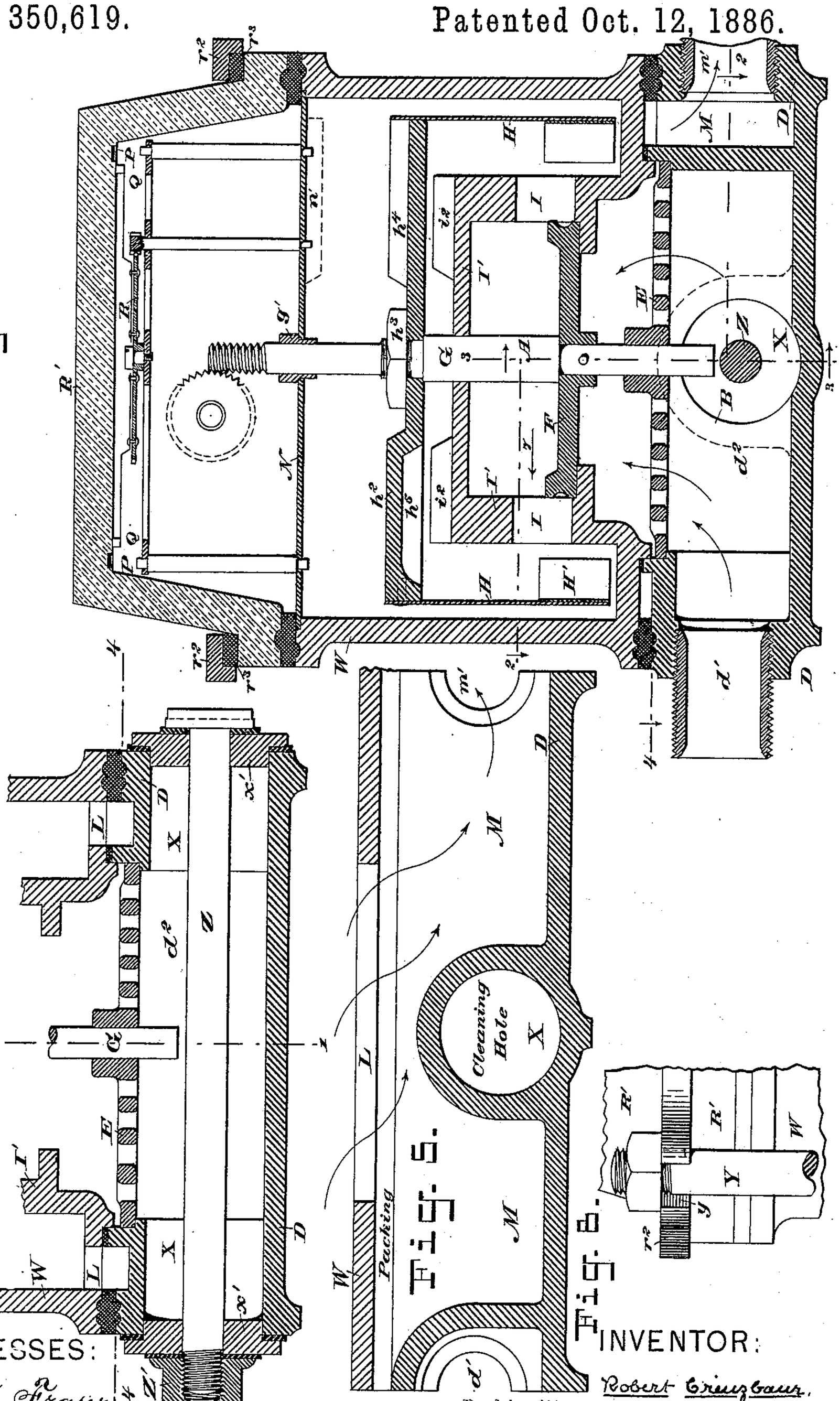

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

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(No Model.)

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R. CREUZBAUR.

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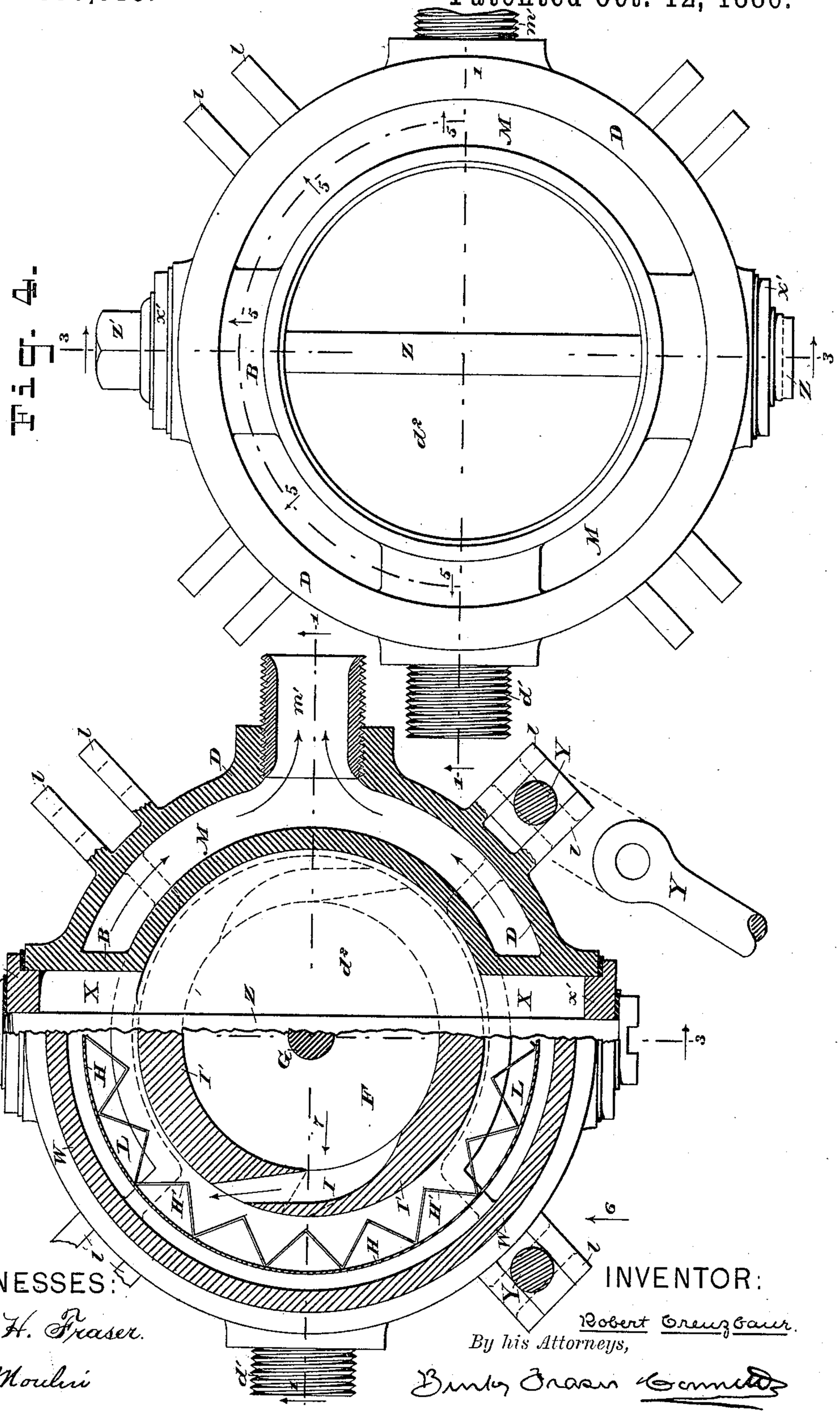

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3 Sheets—Sheet 3.

R. CREUZBAUR.

ROTARY WATER METER.

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Fig. 7.

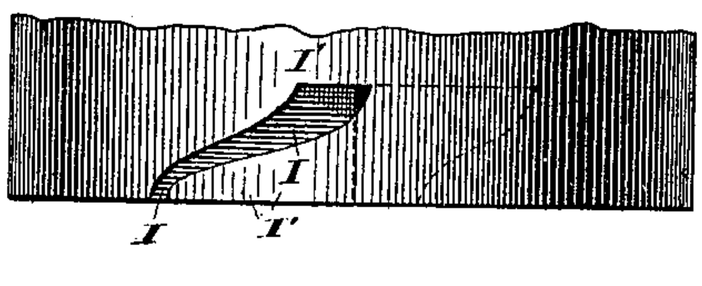


Fig. 8.

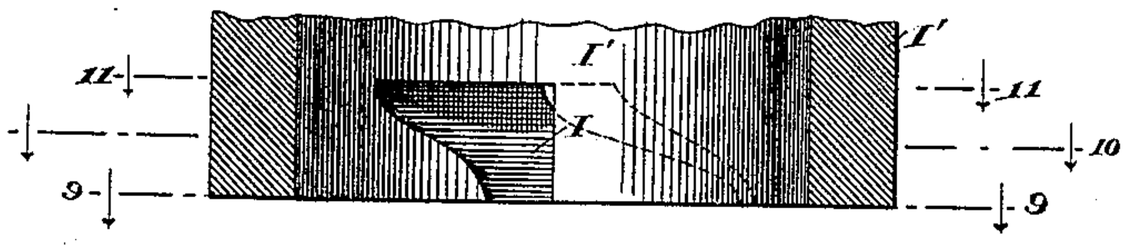


Fig. 9.

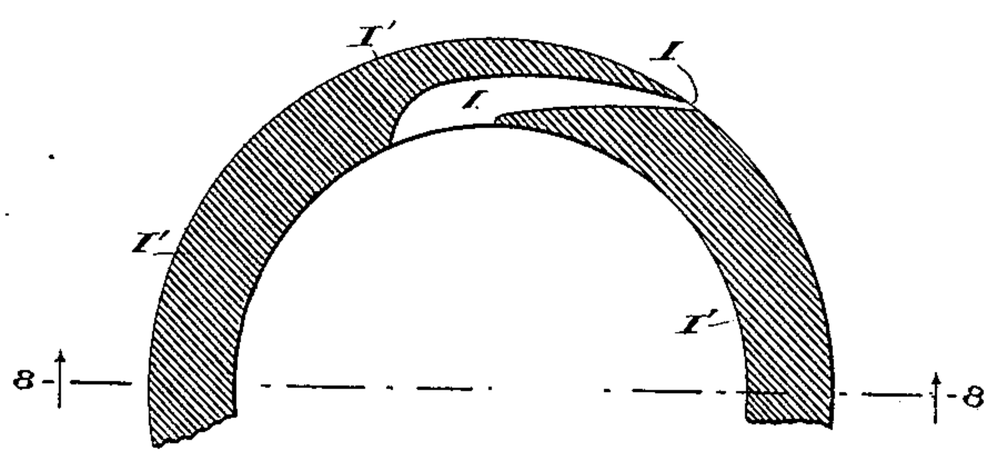
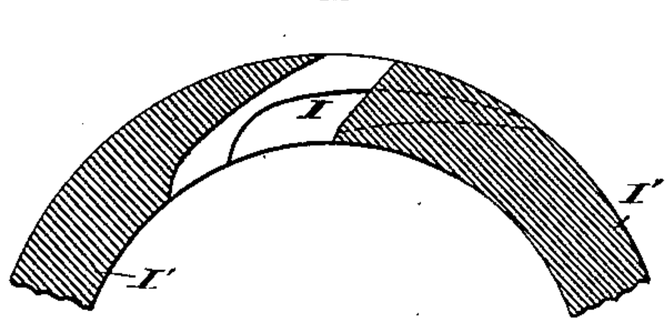


Fig. 10.

Fig. 11.



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UNITED STATES PATENT OFFICE.

ROBERT CREUZBAUR, OF BROOKLYN, NEW YORK.

ROTARY WATER-METER.

SPECIFICATION forming part of Letters Patent No. 350,619, dated October 12, 1886.

Application filed September 7, 1885. Serial No. 176,361. (No model.)

To all whom it may concern:

Be it known that I, ROBERT CREUZBAUR, a citizen of the United States, residing in the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Rotary Water Meters, of which the following is a specification.

My invention relates to that class of rotary meters in which a drum or wheel is rotated by the impact of the water upon it, and embraces the following characteristics:

First. The incoming water, by being made to raise a valve on its way to the rotating wheel, is caused to support the wheel and its spindle, which are attached to such valve and move in unison with it. A supporting pivot or socket is thus avoided, the wheel-spindle being guided laterally so as to control the wheel's motions transversely to its spindle.

Second. The incoming water, having at all times the weight of the valve and of the wheel and its spindle upon it, enters the ports under constant pressure and velocity, whether at minimum, maximum, or intermediate flow, and is thus enabled to register a very small stream, aided by the other conditions named.

Third. The correct registry of the water during all stages of its flow from the minimum to the maximum is attained by giving to the ports the necessary direction to attain that end, to wit: If the meter overregister with a small stream, the parts of the ports which correspond to such stream—that is, the lower parts thereof—are given a less pitch, which reduces its circumferential velocity and impact, both being thus wasted in a radial direction. To remedy overregistration at a maximum flow, the reverse measures are taken—that is, the upper parts of the ports are given a less pitch, which diminishes the effective velocity and impact, and the lower parts are given an increased pitch, which increases the effective velocity and impact.

Fourth. Correct registry is also aided and obtained by means of current-obstructing wings, so arranged that with an excess of registry such wings are closest together, thus giving the maximum resistance to the wheel's rotation, and with an under-registry they are farthest apart, an arrangement which becomes practicable through the falling and rising of the rotating wheel, according to the quantity of water passing under and elevating the valve with the wheel.

Fifth. The rotating wheel in lieu of buckets or wings is provided with corrugations upon its inner side, upon which the impact of the water issuing from the ports is directed. This is a convenient and effective method for providing suitable abutments for the water to impinge upon, and to provide the greatest number of them, so that a bucket is at all times in effective reach of the ports.

Sixth. To avoid a stuffing-box between the wheel and registering mechanism, the register-casing is made entirely of glass, admitting the light freely to the inside, and dial-marks are sunk into the glass on the inside and filled with a colored substance, clearly visible from the outside. To obviate the masking of the dial-pointers by sediment lodging upon the glass, a small prominently-colored knob slightly pressed against the glass takes the place of the usual pointer.

Seventh. A well-hole is provided in which floating matter can collect, and which is separated from the ports and wheel-chamber by a strainer. This well-hole is arranged to be quickly laid open and emptied of its contents by the removal of only one bolt and nut, which secure two opposite end caps.

I obtain these objects by the mechanism illustrated in the accompanying drawings, in which Figure 1 is a vertical central section of the meter through the inlet and outlet nozzles. Fig. 2 is a horizontal cross section cut in the plane of the lines 2 2 in Fig. 1. Fig. 3 is a vertical section of the lower part of the meter cut at right angles to Fig. 1 on the line 3 3 in Fig. 2. Fig. 4 is a plan view of the base-piece, and Fig. 5 is a vertical "stretch-out" section thereof cut on the line 5 5 in Fig. 4. Fig. 6 is a fragmentary side elevation, looking in the same direction as Fig. 1, and showing one of the clamping-bolts. Fig. 7 is a fragmentary side elevation of the valve-chamber, showing the exterior of one of the ports. Fig. 8 is a fragmentary vertical mid-section of this chamber, showing the inner side of the same port, and Figs. 9, 10, and 11 are transverse sections through this port in the planes denoted, respectively, by the lines 9 9, 10 10, and 11 11, in Fig. 8.

D D is the base-piece embodying the inlet-

nozzle d', delivering the water into mud-well d^2, from whence it rises through strainer E into the cylindrical valve-chamber A. This chamber has two or more ports, I I, formed through its side wall, through which ports the water passes into the outer chamber, B. A valve, F, is arranged in the chamber A, being capable of rising and falling therein and thereby uncovering more or less of the ports I I. The valve is attached to a rotary spindle, G, to which is fixed the rotary measuring-wheel H. This wheel extends down around the chamber A, and has buckets or vanes H′ in such position as to receive the impact of the water issuing from the ports I I. When the water is flowing, it lifts the valve F, and with it also the spindle G and wheel H. The valve F, with its attachments, will rise to a height corresponding to the amount of water drawn through the meter and corresponding to the pressure and velocity given the water through the ports I I by the overweight of the valve and its attachments. The impact of the water thus received through the weight of the valve F acts in a tangential direction given it by the ports I upon the buckets H′ of the wheel H, causing the latter to revolve, the number of revolutions being recorded by the register in the usual way. After the impact of the water has thus been spent upon the wheel H, the water escapes downward through openings L, Figs. 2, 3, and 5, into circular channel M, Figs. 1, 2, 4, and 5, and exhausts through nozzle m'.

The wheel H consists of a sleeve or drum closed on the top by a head, h^2, which may or may not be perforated. This head or cap is shouldered upon spindle G and confined to the latter by nut h^3. The buckets H′ may be of various shapes and varying in number. I prefer to use corrugations, as shown, which multiply the number of abutments and thereby insure a better action of the wheel. The whole wheel may be made of hard rubber, or the drum and buckets may be made of thin sheet-brass, and the cap h^2 and valve F of hard rubber, the material used depending somewhat upon the weight desired to act upon the water through valve F. Spindle G is guided below in a hub formed upon the strainer E, or when no strainer is used, by an eye, to be provided for it in the well d^2. At the top the spindle is guided in sleeve g', attached to counter-plate N. The spindle, being with all its attachments supported by the water pressing up the valve F, has no end support.

The wheel H and its buckets H′ are given ample clearance to prevent their clogging by obstructions passing the strainer.

The constant weight of valve, wheel, and spindle bearing upon the water gives to the latter an approximately constant velocity and impact; but the varying quantity so acting upon the wheel produces a varying velocity of the wheel. As an effective means for regulating the velocity of the wheel, so as to conform accurately to the amount of water passed through the meter, the ports are given an increasing pitch from the bottom upward, or vice versa—that is, if the meter overregisters with a minimum stream, the corresponding or lower parts of the ports are given a direction more nearly radial, which reduces its circumferential impact and velocity, the upper portion of the ports being given a maximum tangential direction, which utilizes the utmost attainable amount of velocity and impact. The ports thus formed are shown at the left in Fig. 2, the maximum pitch being shown in full lines and the minimum pitch in dotted lines; or, if the meter under-registers at a minimum flow, as is more apt to be the case, the ports are given a "decreasing pitch" from the bottom upward. The usual and preferred form of the ports for correcting this tendency, according to my invention, is illustrated in Figs. 7 to 11. At the bottom the port is of the maximum pitch, being in fact tangential, as shown in Fig. 9, so that when only this portion of the port is uncovered the small stream issuing therethrough is given the most effective direction of impact against the rotating wheel. As the port ascends, its pitch decreases. Fig. 10 is a section half-way up. At the top of the port its pitch is very slight, as is shown by Fig. 11, so that the increased quantity of water issuing through it is directed against the wheel more nearly in a radial direction, and much of its effect for the rotation of the wheel is lost. Furthermore, I make the ports of such form as will cause the valve F to rise more rapidly with an increase in a small flow than it does with a proportionate increase in a larger flow. This is in order to lift the valve rapidly when the flow commences, in order that the lifting movement of the valve will "limber-up" the registering mechanism, as will be presently explained. This variation in the lift of the valve is caused by contracting or narrowing the ports toward the bottom. Either the outside or outlet ends of the ports may be thus shaped, as shown in Fig. 7, or the inner ends thereof may be similarly narrowed or contracted toward the bottom, as shown in Fig. 8. I prefer to thus contract the lower portions of the ports at both the inner and outer ends, as shown. The meter may be regulated without using such varying pitch of the ports, or such regulation may be assisted by means of current-resisting wings. If the meter overregister with a maximum stream, the wings h^4, on the top of wheel-cap h^2, are used, and wings n', under counter-plate N, Fig. 1, are used. The wheel H being raised up in proportion to the amount of water passed through, these wings would be closest together and would most obstruct the velocity of the wheel at maximum flow, and vice versa with a minimum flow. On the other hand, if the wheel overregister with a minimum flow, wings i^2 are formed on the top of casing I′, and wings h^5 under the cap h^2, as shown on the left, Fig. 1, such wings being closest together and resisting the rotation of the wheel H most with a minimum stream

and least with a maximum stream. Either or both these means—that is, varying pitch of ports and current-resisting wings—may be used to regulate the registry of the meter.

As it is of the utmost importance in such a rotary meter to have a minimum of friction, so as to measure small streams, a water-tight stuffing-box is to be avoided between the registering-dial and the wheel-chamber. The attempts in this direction have been frustrated by the accumulation of sediment under the glass, obscuring the pointers and dial-marks.

To obviate this difficulty I sink the dial-marks into the under side of the glass, filling the indentations with a cement of prominent color, as at P P, Fig. 1, and cause the pointer ends Q Q slightly to bear against the smooth glass radially inside or outside of the marks, thus wiping away the film adhering to the glass. I use two pointers Q Q, so as to have an even bearing of the wheel R, to which they are attached. These pointers are of different color or shape, so as to distinguish the true pointer from the balancing false pointer. They are preferably made of thin German silver spring-plate riveted to wheel R. The elevating of the wheel, valve, and spindle G, also has the effect of limbering the registering-wheels, which is doubly important after the wheel has not been used for some time, this limbering and starting of the counters being thus accomplished by the water-pressure alone in the act of opening the valve. The vertical play of the wheel, valve, and spindle has the further effect of loosening and working out obstructions which may have lodged about these parts.

The two openings X X into the mud-well d^2 are arched over to separate them from exhaust-channel M, as shown in Figs. 4 and 5. These openings are closed by caps x' x', which are drawn to each other by bolt Z and capped nut Z'.

The base-piece D, middle piece, W, and cap-piece or register-case R′, are held together by bolts and nuts Y, the bolts having eyes on their lower ends and being pivoted between lugs l l on the bottom piece, D, so as to swing outwardly on the top in the usual way. The upper end of each bolt as it is turned up enters an open notch, y, in the flange or ear on the top piece, R′, as shown in Fig. 6. When the top piece, R′, is all glass, as shown, a special metal flange, r^2, with intervening rubber gasket r^3, is provided to receive and distribute the strain brought upon such flange by the said bolts and nuts.

The valve F need not revolve with the spindle G and wheel H; but I prefer to cause this valve to revolve with the wheel and spindle, as tending to reduce its leakage and to loosen obstructions.

I claim as my invention—

1. In a water-meter, the combination of a cylindrical valve chamber having ports in its cylindrical wall, a weighted valve arranged in said chamber to be lifted by the water on its way to said ports and acting to uncover the latter as it lifts, and a rotating measuring-wheel pivoted on an axis concentric with the axis of said valve-chamber and arranged with its vanes outside of said chamber in position to receive the impact of the water issuing from said ports, substantially as set forth.

2. In a water-meter, the combination of a valve-chamber having ports through its walls, a valve in said chamber arranged to be lifted by the water on its way to said ports and to uncover the latter as it lifts, and a rotating measuring-wheel receiving the impact of the water issuing from said ports and connected to said valve and rising and falling therewith, substantially as set forth.

3. In a water-meter, the combination of a cylindrical valve-chamber with tangential ports, a rotary valve in said chamber arranged to be lifted by the water on its way to said ports and to uncover the latter as it lifts, and a rotating measuring-wheel receiving the impact of the water issuing from said ports and connected rigidly to said valve, whereby the valve is caused to rotate with the wheel and the wheel is caused to rise and fall with the valve, substantially as set forth.

4. The combination of a cylindrical valve-chamber having outlet ports through its lateral wall, a weighted valve arranged in said chamber to be lifted by the water on its way to said ports and acting to uncover the latter as it lifts, and a rotating measuring-wheel arranged to receive the impact of the water issuing from said ports, the said ports being conformed with a varying pitch, as described, the portion first uncovered being of greater inclination than the portion thereof last uncovered by said valve.

5. The combination of a cylindrical valve-chamber having outlet-ports through its lateral wall, a weighted valve arranged in said chamber to be lifted by the water on its way to said ports and acting to uncover the latter as it lifts, and a rotating measuring-wheel arranged to receive the impact of the water issuing from said ports, the said ports being constructed with varying widths on their inner ends, the portions first uncovered being narrower than the portions last uncovered, substantially as described, whereby the valve is lifted proportionally higher at the commencement of the flow than with a subsequent increase in the flow.

6. The combination of a cylindrical valve-chamber having outlet-ports through its lateral wall, a weighted valve arranged in said chamber to be lifted by the water on its way to said ports and acting to uncover the latter as it lifts, and a rotating measuring-wheel arranged to receive the impact of the water issuing from said ports, the said ports being formed with varying transverse widths at their delivery ends, as shown.

7. In a rotary water-meter, the combination, with the ports and rotary wheel, of a valve arranged to resist the passage of water to the ports and sustaining the rotary wheel, whereby

the valve and wheel rise and fall in proportion to the volume of water passing through, and current-resisting wings attached to the rotating wheel and to a stationary part opposite thereto, substantially as described, whereby as the movement of the wheel up or down brings these wings into closer proximity their reciprocal resistance is increased and the wheel is retarded proportionately in order to correct its indication.

8. In a water-meter, the combination of cylindrical valve chamber A, having ports I I through its wall, a valve, F, in said chamber which is lifted by the water in its passage to said ports, a rotary spindle, G, connected to said valve and deriving motion therefrom, a rotary measuring-wheel, H, arranged to receive the impact of the water issuing from said ports connected to said spindle and imparting rotary motion thereto, a worm on said spindle, a worm-wheel in mesh therewith, and a counting or indicating mechanism arranged to be driven by said worm-wheel, substantially as set forth.

9. In a rotary water-meter, a glass register-cover having dial-marks, in combination with a pointer revolving beneath and in contact with the glass, substantially as set forth.

10. In a water-meter, the combination of a base-piece, D, embodying the water-inlet chamber and formed with cleansing-openings, a cylindrical valve-chamber, A, opening from said inlet-chamber, a strainer, E, between said chambers, and a valve, F, in the chamber A, with its spindle G having a bearing in said strainer, substantially as set forth.

11. The combination, with the inlet-chamber, the valve-chamber, the ports leading therefrom, the weighted valve adapted to move over said ports, and the rotating wheel, of the strainer E, interposed between the inlet-chamber and the valve-chamber, substantially as set forth.

12. In a water-meter, the combination, with the base or shell containing the measuring mechanism, of a cup-shaped glass cap-piece, R′, clamped thereto with a packed joint and forming a chamber exterior to said shell for inclosing the counting mechanism, substantially as set forth.

13. In a rotary water-meter, a base-piece, D, embodying the inlet and outlet nozzles, a middle piece, W, embodying a wheel-chamber, and a cap-piece, the whole held together by pivoted swinging bolts Y, arranged substantially as described.

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

ROBERT CREUZBAUR.

Witnesses:

ARTHUR C. FRASER,

GEORGE H. FRASER.