(No Model.) 2 Sheets—Sheet 1.

P. H. ROSENKRANZ & F. PROPHET.

WATER METER.

No. 314,480. Patented Mar. 24, 1885.

Fig 17.

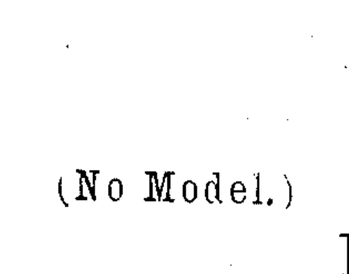


Fig 18.

Fig. 19.

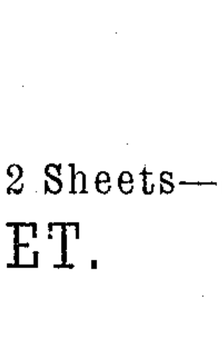


Fig 1.

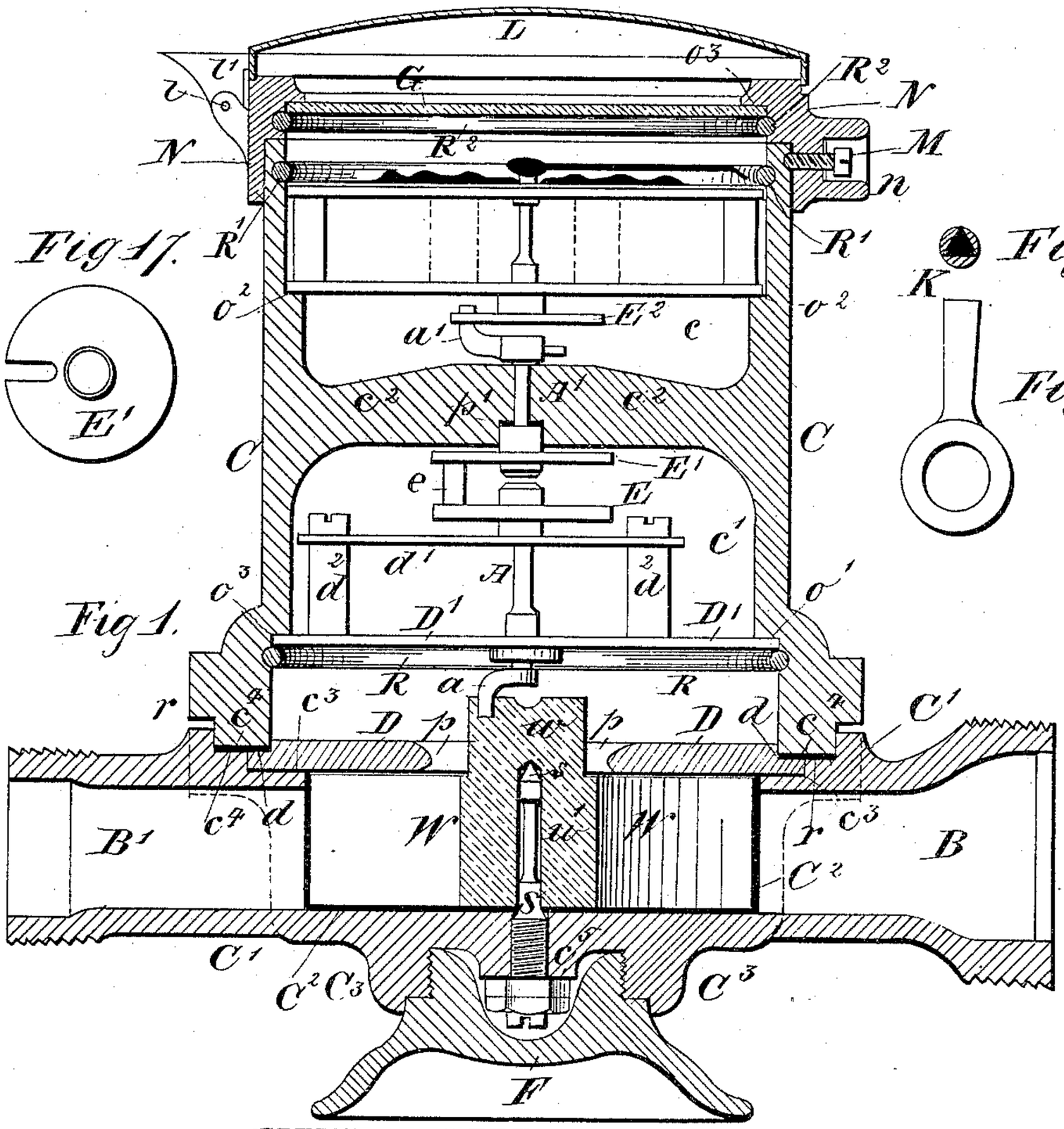
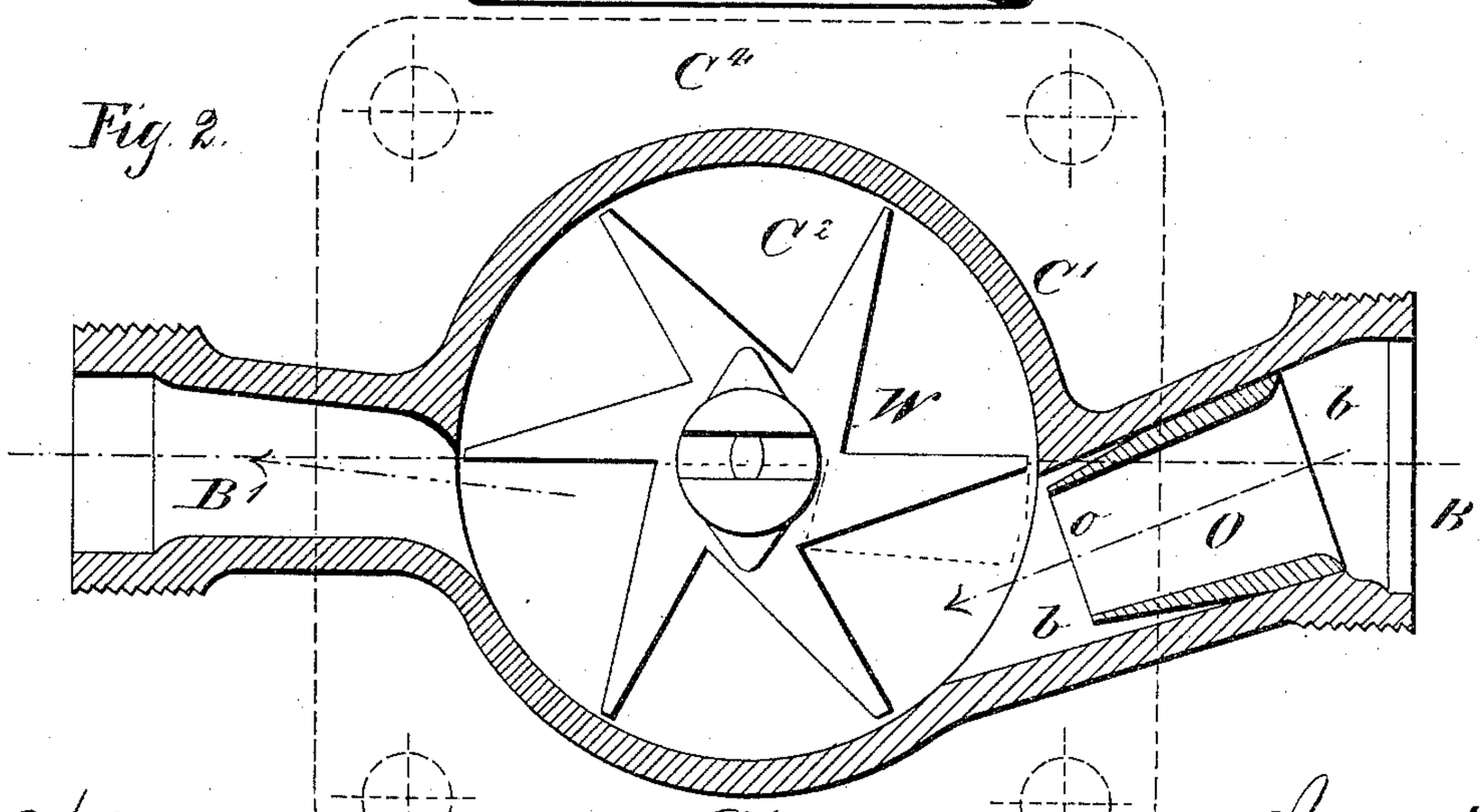


Fig. 2.



Witnesses:-
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by Henry Orth & Attorneys.

(No Model.) 2 Sheets—Sheet 2.

P. H. ROSENKRANZ & F. PROPHET.

WATER METER.

No. 314,480. Patented Mar. 24, 1885.

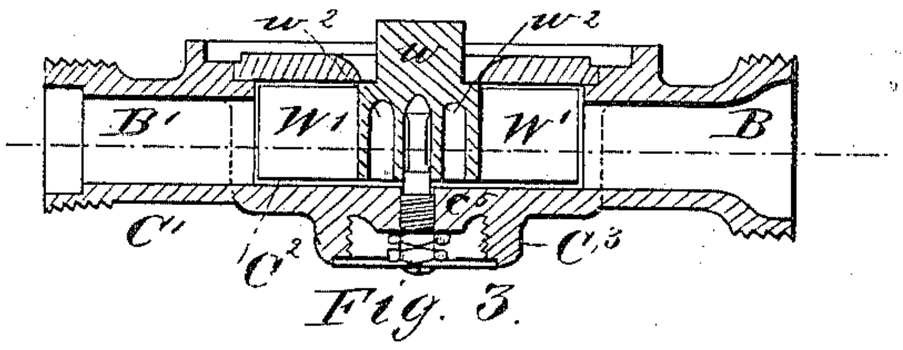


Fig. 3.

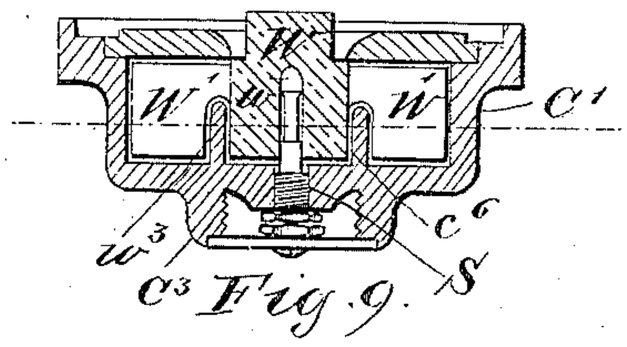


Fig. 9.

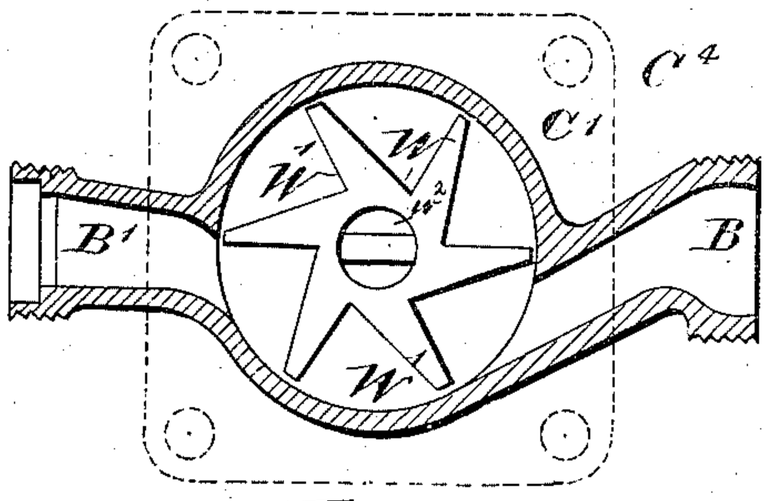


Fig. 4.

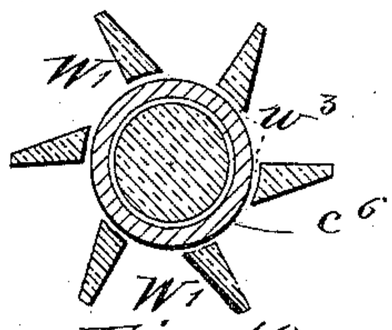


Fig. 10.

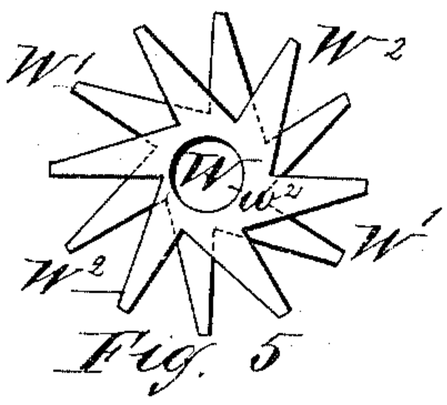


Fig. 5

Fig. 15

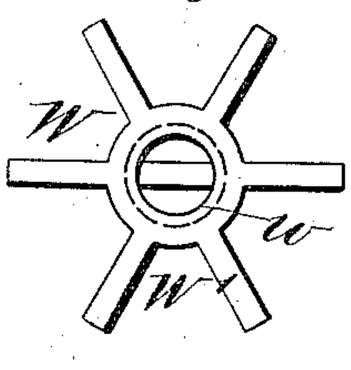


Fig. 16.

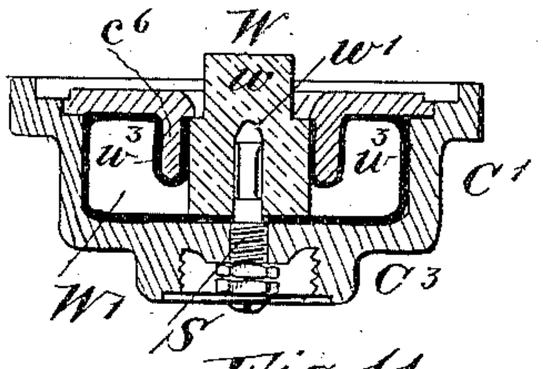


Fig. 11.

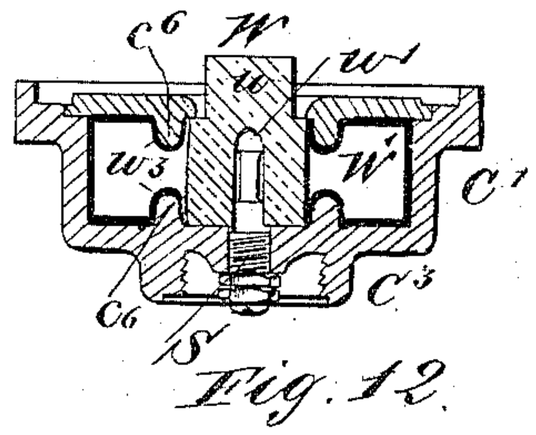


Fig. 12.

Fig. 6

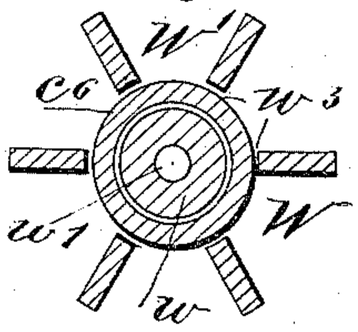


Fig. 8.

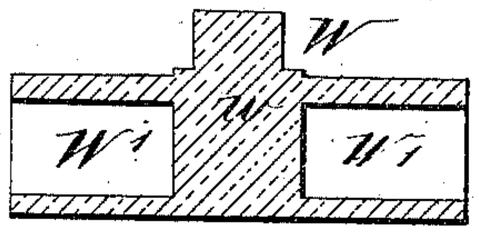


Fig 13.

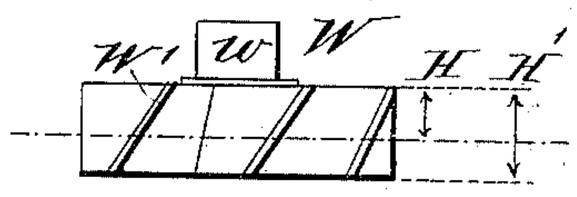


Fig. 7.

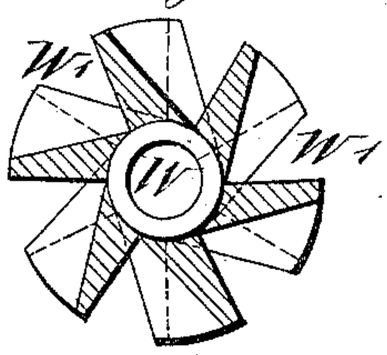
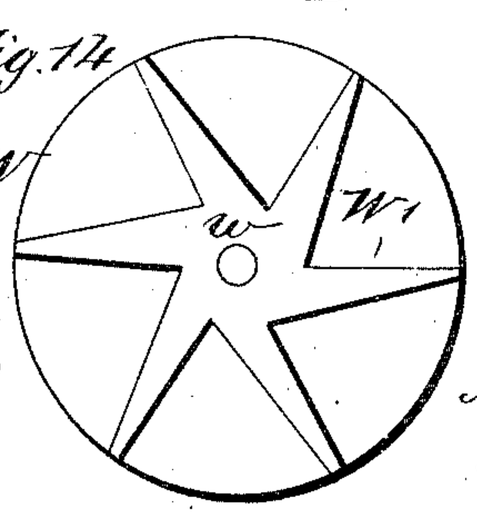


Fig. 14



Witnesses.

Samuel Owen Edmonds

Paul M Knobloch

Inventors.

Philipp H. Rosenkranz

Friedrich Prophet

by Henry Orth & Harvath

UNITED STATES PATENT OFFICE.

PHILIPP HERMANN ROSENKRANZ AND FRIEDRICH PROPHET, OF HANOVER, PRUSSIA, GERMANY, ASSIGNORS TO DREYER, ROSENKRANZ & DROOP, OF SAME PLACE.

WATER-METER.

SPECIFICATION forming part of Letters Patent No. 314,480, dated March 24, 1885.

Application filed October 3, 1884. (No model.) Patented in Germany May 2?, 1880, No. 12,358, and July 15, 1881, No. 1?,975; in England December 8, 1880, No. 5,116, and in Austria-Hungary January 7, 1881, No. 36,252 and No. 40,703.

To all whom it may concern:

Be it known that we, PHILIPP HERMANN ROSENKRANZ, a subject of the King of Prussia, residing at Hanover, Prussia, German Empire, and FRIEDRICH PROPHET, a subject of the King of Prussia, residing at Hanover, Prussia, German Empire, have invented certain new and useful Improvements in the Construction of Water-Meters; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to that class of meters in which a liquid is measured by a wheel rotating in a measuring-chamber.

The invention consists, essentially, in the construction and arrangement of the meter, substantially as hereinafter fully described, and as specifically set forth in the claims hereto annexed.

In the accompanying drawings, Figure 1 is a vertical transverse section of a meter constructed according to our invention. Fig. 2 is a horizontal section of the meter-casing, the measuring-wheel being shown in plan. Fig. 3 is a vertical transverse section of the measuring-chamber, showing a modified form of measuring-wheel. Fig. 4 is a horizontal section thereof. Figs. 5 and 6 are plan views of modifications in the construction of the measuring-wheel. Figs. 7 and 8 show by an elevation and a transverse sectional view, respectively, still further modifications in the construction of the wheel and the inclosing-casing thereof. Figs. 9, 11, and 12 are vertical sections of the wheel-casing and wheel; Figs. 10, 13, and 16, horizontal sections, and Figs. 14 and 15 plan views, of further modifications of the measuring-wheel and casing. Fig. 17 is a plan view of one of the transmitting-disks of the registering mechanism. Figs. 18 and 19 are a section and an elevation of the key for locking and unlocking the meter-case.

Like letters of reference indicate like parts wherever such may occur in the above figures of drawings.

The meter, Figs. 1 and 2, is practically composed of two cylindrical casings, C and C′, each provided with flanges or a plate, C^4, (shown in dotted lines, Fig. 2,) by means of which said casings are bolted or screwed together. The casing C is divided into two chambers, *c c′*, by a strong partition, c^2. The chamber *c* contains the registering mechanism, which may be of any well-known construction and arrangement, and need not here be particularly described. The chamber *c′* contains the transmitting mechanism, hereinafter referred to, for transmitting the movements of the measuring-wheel to the registering mechanism. The wheel-casing C′ is provided with an inlet branch, B, which may be on a plane coinciding with or inclined to the plane of rotation of the measuring-wheel, and an outlet branch, B′, diametrically opposite thereto on a plane coinciding with that of the rotation of the wheel.

We have found that in all fluid-meters the corroding or oxidizing action upon the inlet-passage as well as upon the measuring-wheel, after a comparatively limited time, changes the superficial area thereof to such an extent as to give rise to a very inaccurate measurement. This may be avoided in different ways—for instance, by so arranging the wheel as to adapt it to be readily removed and another one substituted, or by constructing the wheel of a substance indifferent to the corrosive or oxidizing action of the liquid, and by combining with the inlet-passage *b* a nozzle, O, adapted to be readily removed and another substituted, or by constructing said nozzle of a material indifferent to the corrosive or oxidizing action of the liquid to be measured.

In order to avoid the necessity of uncoupling the meter from the line-pipes, or of taking the casing apart, we prefer to construct both the wheel and the inlet-nozzle of a material indifferent to the corrosive or oxidizing action of the liquid to be measured, such substances depending largely upon the nature of said liq-

uid. It is further necessary to the good operation of a liquid-meter that its flow through the measuring-chamber should be retarded as little as possible, and this can be best effected by employing a measuring-wheel of or as near as possible of the same specific gravity as that of the liquid. This may be attained by various means or combination of means. For instance, the measuring-wheel may be constructed of a substance of approximately the same specific gravity as that of the liquid to be measured, such as hard rubber or vulcanite for water-meters, said hard rubber or vulcanite being nearly of the same specific gravity as that of water, and is indifferent to its oxidizing action. It may also be employed for other liquids that do not injuriously affect it, and if their relative specific gravities differ materially, or if the nature of the liquid does not admit of the use of it, and it is required to employ in the construction of the wheel a substance of greater or less specific gravity than that of said liquid, said wheel may be so constructed that the action of the liquid on its passage over the wheel will either load the same if the specific gravity is greater, or lighten or balance the wheel if its specific gravity is less, than that of the liquid. This action of the liquid may be increased or diminished by giving the inlet-passage a greater or less angle to the plane of rotation of the wheel. These constructions of the measuring-wheel will be more fully described hereinafter, and the various substances of which such wheels are to be constructed will readily suggest themselves to the manufacturer, according to the nature of the liquid to be measured by the meter, which we will describe as constructed for use as a water-meter having its inlet-passage on a plane inclined to the plane of rotation of the measuring-wheel.

O is the nozzle above referred to, made of vulcanite or hard rubber, and having a passage, *o*, of the required interior area. It is slightly tapering, and fits snugly into the tapering passage *b* of the inlet branch B. It may be cemented into the inlet branch, though we prefer to fit the same into the said branch, so as to form tight joints and yet admit of ready removal. We thus provide an inlet-passage that will remain unchanged in its superficial area and that will offer a minimum frictional resistance to the passage of the water.

The casing C′ has a central annular chamber, C^2, into which the branches B B′ open. The chamber C^2 is formed by said casing and a disk, D, that has a central opening, *p*, through which projects the hub or body *w* of the measuring-wheel W, located in said chamber C^2. The said casing C′ has in its upper face two annular offsets, c^3 c^4. On the former is seated the disk D, and on the latter the casing C, said disk D having itself an offset, *d*, the upper face of which is flush with that of the offset c^4, the wall of the casing C being partly seated upon the disk and partly on the offset c^4, as shown.

To prevent leakage at the point of connection of the casings C C′ and disk D, we interpose a packing-ring, *r*, of any suitable material. The hub or body *w* of the measuring-wheel W has a central annular recess, *w*′, terminating in a hollow cone, into which extends the conical end *s* of a spindle, S, on which the wheel W is mounted.

The arrangement of the wheel W within the chamber C^2 of the casing C is such that it will rotate in such close proximity to the vertical walls and bottom of the chamber as to allow none, or practically none, of the liquid to be measured to flow between the measuring-wheel or its wings and the said walls and bottom of the chamber. The casing C′ has a central boss, c^5, on its under side, provided with a screw-threaded axial aperture, into which the spindle is screwed and held against rotation by suitable check-nuts. Around the boss c^5 is formed an annular flange, C^3, into which is screwed a foot-piece, F, that supports the meter and at the same time protects the spindle-head. The rotation of the wheel W is communicated to the registering mechanism in any desired or usual manner—as, for instance, by means of a suitable transmitting mechanism located in the chamber *c*′ of casing C. This chamber *c*′ is formed by the partition c^2 and a disk, D′, secured to an offset, *o*′, in the wall of the casing by means of a ring, R, sprung into an annular groove formed below said offset.

A is the transmitting-shaft, that has its bearings in the disk D′ and in a plate, *d*′, secured by screws to posts d^2. The shaft A projects below the disk D′, and carries a crank-arm, *a*, that takes into an opening or a slot formed in the upper face of the hub or body *w* of the measuring-wheel W, by means of which the rotation of the wheel is transmitted to said shaft.

The chamber *c*′, containing the transmitting mechanism, need not be fluid-tight, and to avoid too speedy wear of said mechanism we make the same of vulcanite or other analogous substance not readily corroded or oxidized by the liquid to be measured. The movement of the transmitting-gearing is transmitted to the registering mechanism by a disk, E, that has an eccentric stud, pin, or lug, *e*, that projects into a slot, *f*, Fig. 17, formed in a disk, E′, secured to the lower end of a second shaft, A′. The latter shaft carries at its upper end a crank-arm, *a*′, that projects into a slot in a disk, E^2, similar to disk E′, Fig. 17, secured to the lower end of the driving-shaft of the registering mechanism, located in chamber *c* of the casing C, and supported therein from an offset, o^2, and held in position by a ring, R′, sprung into a groove formed in the wall of casing C. The shaft A′ has its bearings in the partition c^2, the liquid being prevented from entering chamber *c* through the shaft-bearing by a suitable packing, *p*′.

Above the dial and pointers of the registering mechanism is arranged a glass face, G,

held against an annular shoulder or offset, o^3, in the walls of a ring, N, by means of a ring, R^2, sprung into a suitable groove formed in the inner periphery of said ring N below the offset. The ring N is detachably connected to the upper end of casing C, and is locked thereto in any suitable manner.

To prevent the ready and unauthorized removal of the ring N, it is provided with a hollow boss, *n*, that has a screw-threaded perforation for the passage of a screw, M, the point of which takes into a groove formed in the outer periphery of said ring to lock the same to casing C. The head of the screw M is prism-shaped, and is operated by a key, K, Figs. 18 and 19, the barrel of which is of such interior configuration as to fit the head of the screw M.

To avoid the accidental breakage of the glass face G, the ring N has hinged to it at *l* a lid or cap, L, of sheet metal, from which projects a thumb-piece, *l'*.

It will be observed that the meter-casing is so constructed that access may be had to any part thereof without disconnecting it from the line-pipes. For instance, if access is to be had to the registering mechanism, the removal of the ring N, the expansion-ring R', and the pointer or pointers from the main shaft of the registering mechanism will be sufficient, as such mechanism may then be lifted out of the casing C. If, on the other hand, access is to be had to the transmitting mechanism, the unscrewing of the bolts of the flanges C^1, that connect the casings C C', will be sufficient. The casing C can then be lifted off the casing C', the ring R removed, and the transmitting devices taken out; or the disk D can be removed and the measuring-wheel W lifted out of the chamber C^2. By unscrewing the foot F the spindle that supports the measuring-wheel may be removed. It will further be observed that the wheel W is suspended upon a conical spindle. The friction of said wheel on its support is therefore reduced to a minimum.

Since the described wheel is practically of the same specific gravity as that of the liquid, the inlet-passage may be in the same plane as that of the rotation of the wheel, and its wings or blades W' may be made to radiate from the body or hub *w* of said wheel, as in Figs. 15 and 16, instead of being formed on planes inclined to the plane of rotation thereof. A better flow is, however, obtained with less frictional resistance when said wings are inclined as shown. By giving an inclination to the inlet-passage the action of the liquid upon the wheel will tend to lift and balance the same in case the specific gravity thereof is greater than that of the liquid.

To increase the action of the liquid on the wheel, an annular recess, w^2, Figs. 4 and 5, may be formed in the hub or body *w* thereof, as shown in Figs. 3 and 4, or the wheel may be formed of two sets of wings, W' W^2, one set intersecting or projecting over the space between the wings of the other set, as in Fig. 5, the entering liquid exerting pressure on the under face of the intersecting wings W^2.

Instead of forming the wings on planes inclined to the plane of rotation of the wheel, said wings may be formed on curvilinear planes, as in Fig. 6, or the wings may be formed on planes inclined both to the plane of rotation and that of the axis of the wheel, as in Figs. 7 and 8. In the latter construction of the wings, and in the combination therewith of an inclined inlet-passage, it will be readily understood that when the vertical inclination of the wings is such that the liquid will act upon them from their upper edges downward said wheel will be forced down or loaded, and if this inclination is reversed the action of the liquid will tend to lift or balance the wheel, thus affording a convenient means for adjusting the specific gravity of the wheel relatively to that of the liquid to be measured.

To decrease the specific gravity of the wings W', or W' W^2, they may be provided with recesses w^3, into which fits an annular flange, c^6, formed on and projecting from the bottom of casing C or from the bottom of disk D, or from both, as shown in Figs. 9, 10, 11, and 12, respectively. The wings may also be formed in the shape of buckets, as in Figs. 13 and 14. Nor is it absolutely necessary that the wheel W and its wings W' or W' W^2 should occupy the full depth of chamber C^2, as said wheel and wings may be of any desired height relatively to the depth of chamber C^2, either the full height, as at H', or one-half, as at H, Fig. 7, or any other fraction of said height. It will also be understood that more than one inlet branch B may be employed upon the periphery of the wheel-casing C', and that instead of a wheel having six wings a wheel having more or less wings may be employed.

We have hereinabove described the apparatus as being in general of a cylindrical form. With the exception of the chamber C^2, this is, however, not necessary, as said apparatus may have any other interior or exterior form in cross-section, as will be readily understood.

Having now described our invention, what we claim as new is—

1. In a liquid-meter, the combination, substantially as described, of the meter-casing having a cylindrical measuring-chamber, an outlet-passage, and a tapering inlet-passage communicating with said chamber, with a measuring-wheel and an inlet-nozzle made of a taper corresponding with that of the inlet-passage in which said nozzle is loosely seated, for the purpose specified.

2. In a liquid-meter, the combination, substantially as described, of the meter-casing having a cylindrical measuring-chamber, an outlet-passage, and a tapering inlet-passage in communication with said chamber, with a measuring-wheel having peripheral wings or buckets, and an inlet-nozzle having a taper corresponding with that of the inlet-passage

in which the nozzle is loosely seated, said nozzle being arranged to direct the inflowing liquid in the line of a tangent to the wheel, for the purposes specified.

3. In a liquid-meter, the combination, substantially as described, with the meter-casing having a cylindrical measuring-chamber, an outlet-passage, and a tapering inlet-passage in the line of a tangent to the chamber and communicating therewith, with a measuring-wheel of or about of the same specific gravity as that of the liquid to be measured, and an inlet-nozzle of a taper corresponding to that of the inlet-passage in which the nozzle is loosely seated, said nozzle being made of a material indifferent to the chemical or corrosive action of the liquid to be measured, for the purpose specified.

4. In a liquid-meter, the combination, substantially as described, with the meter-casing having cylindrical measuring-chamber, an outlet-passage, and a tapering inlet-passage on the line of a tangent to the chamber, with a measuring-wheel of or practically of the same specific gravity as that of the liquid to be measured, and constructed of a material indifferent to the chemical action of said liquid, and an inlet-nozzle of a taper corresponding with that of the inlet-passage in which the nozzle is seated, said nozzle being constructed of a material indifferent to the chemical action of the liquid to be measured, for the purposes specified.

5. A measuring-wheel for liquid-meters, having two sets of superposed wings projecting from a common hub in like plane, one set intersecting the space between the wings of the other set, for the purposes specified.

6. A measuring-wheel for liquid-meters, having two sets of superposed wings projecting in like planes and on lines inclined or tangential to and from a common hub, one set of wings intersecting the space between the wings of the other set, for the purposes specified.

7. In a liquid-meter, the combination, substantially as described, of the meter-casing having a cylindrical measuring-chamber, an outlet-passage, and an inlet-passage on the line of a tangent to said chamber, with a measuring-wheel provided with two sets of superposed wings projecting on lines inclined or tangential to and from a common hub, one set of wings intersecting the space between those of the other set, for the purposes specified.

8. In a liquid-meter, the combination, substantially as herein described, of a measuring-wheel the wings whereof are provided with recesses w^3, with a measuring-chamber in which are formed annular flanges c^6, projecting into said recesses, for the purpose specified.

9. In a liquid-meter, the combination, substantially as herein described, of a measuring-wheel having a central annular recess for a spindle, and an annular recess, w^2, in its hub or body, with a measuring-chamber and an inlet-passage therefor, for the purpose specified.

10. The combination, substantially as herein described, of the casing C, having partition c^2 and offsets o' o^2, the disk D', and the supporting-plates for the registering-gearing of the expansion-rings R R', for the purpose specified.

11. The combination, substantially as herein described, with the casing C, of the ring N, the cap or lid L, pivoted thereto, and the glass G, of the expansion-ring R^2 and means, such as described, to lock the ring N to casing C, for the purpose set forth.

12. The combination, substantially as herein described, of the casing C', its annular flange C^3, and the disk D with the casing C and foot-piece F, for the purpose specified.

In testimony whereof we affix our signatures in presence of two witnesses.

PHILIPP HERMANN ROSENKRANZ.
FRIEDRICH PROPHET.

Witnesses:
WILLIAM C. FOX,
JOS. KRACKE.