

P. SAMAIN.
LIQUID METER.

(Application filed May 31, 1902.)

(No Model.)

5 Sheets—Sheet 1.

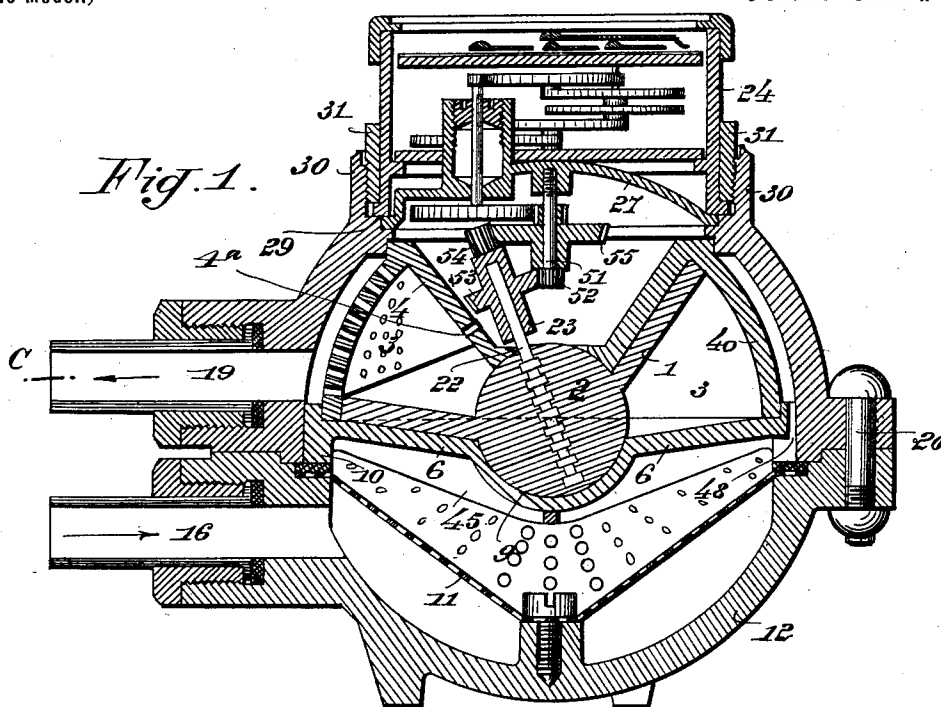
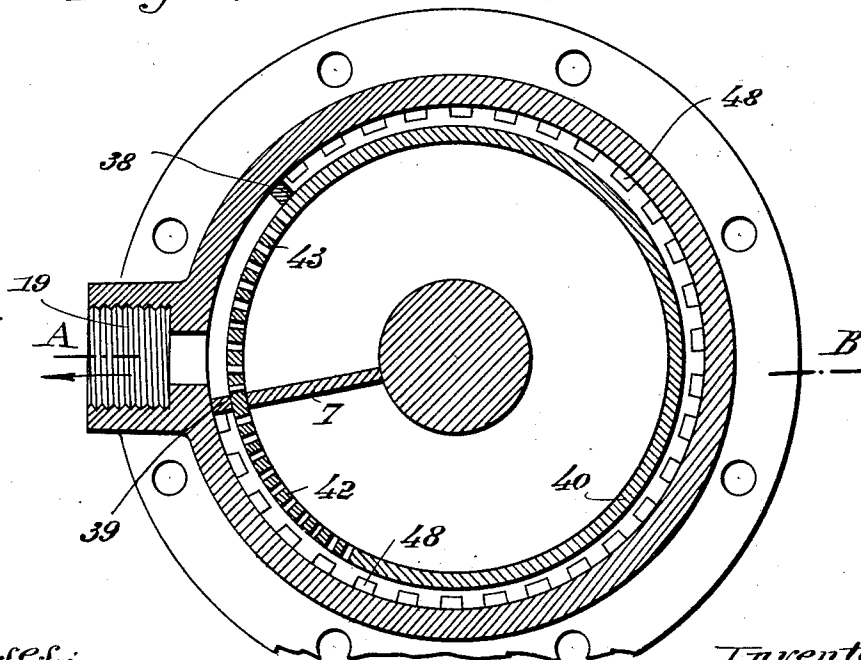


Fig. 2.



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No. 714,823.

Patented Dec. 2, 1902.

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5 Sheets—Sheet 2.

(No Model.)

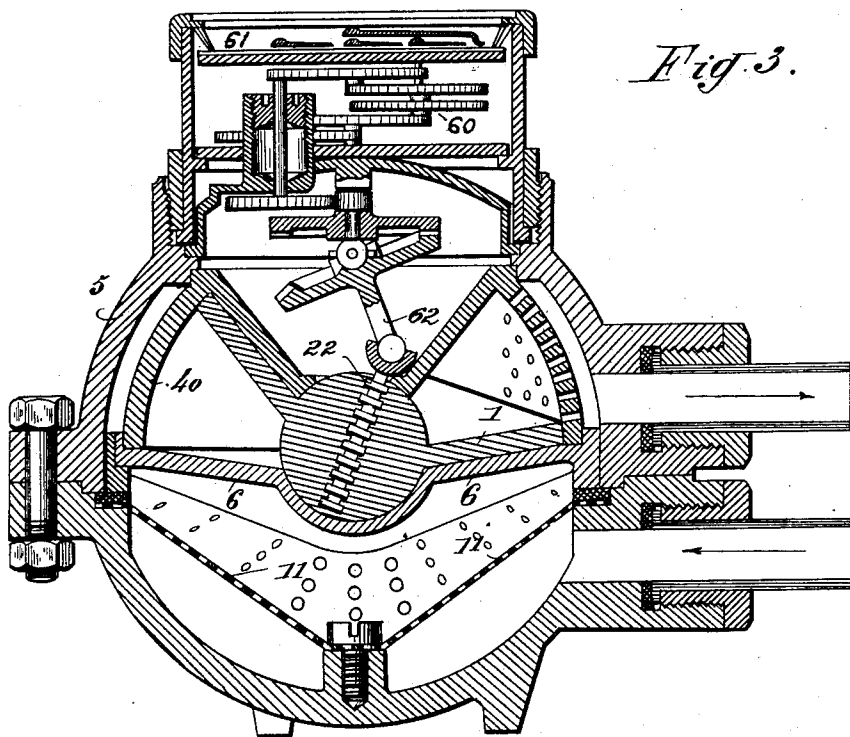


Fig. 3.

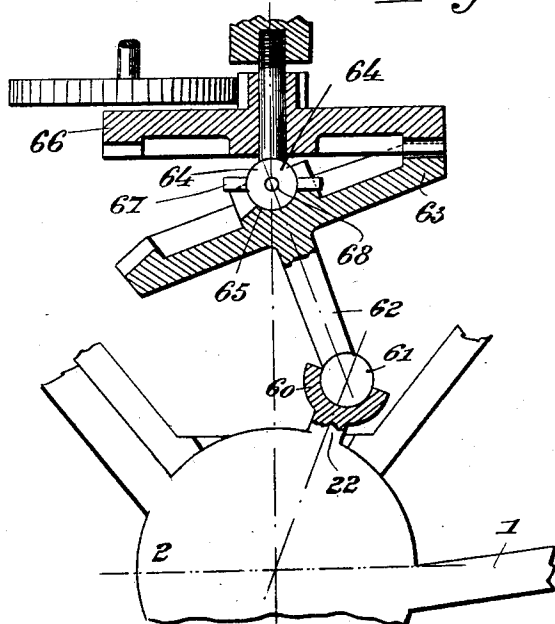


Fig. 4.

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5 Sheets—Sheet 3.

Fig. 5.

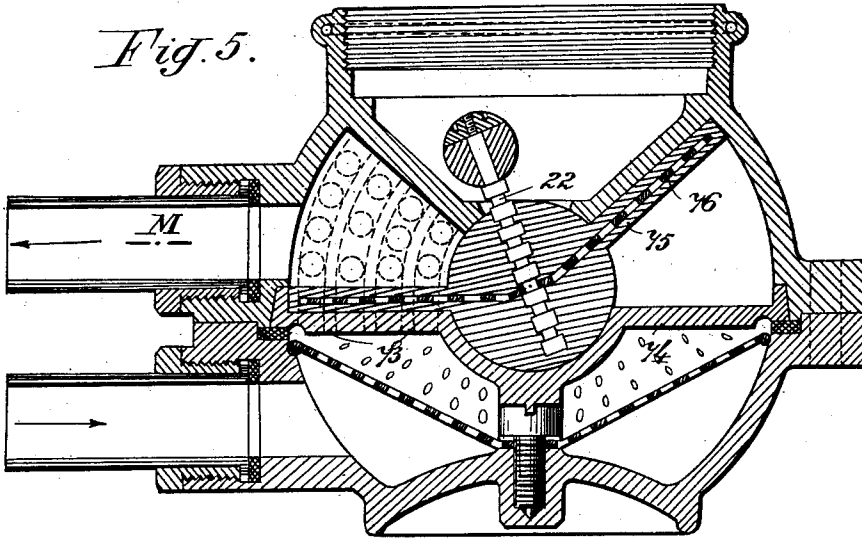


Fig. 6.

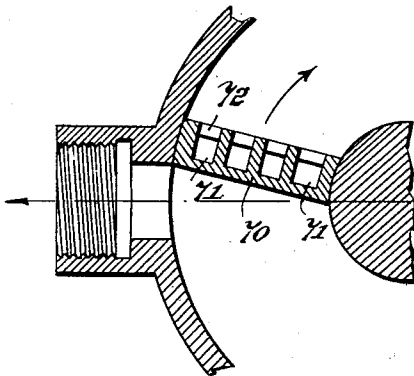
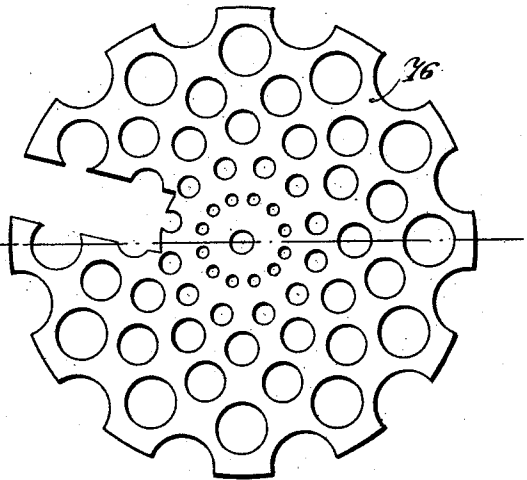


Fig. 7.



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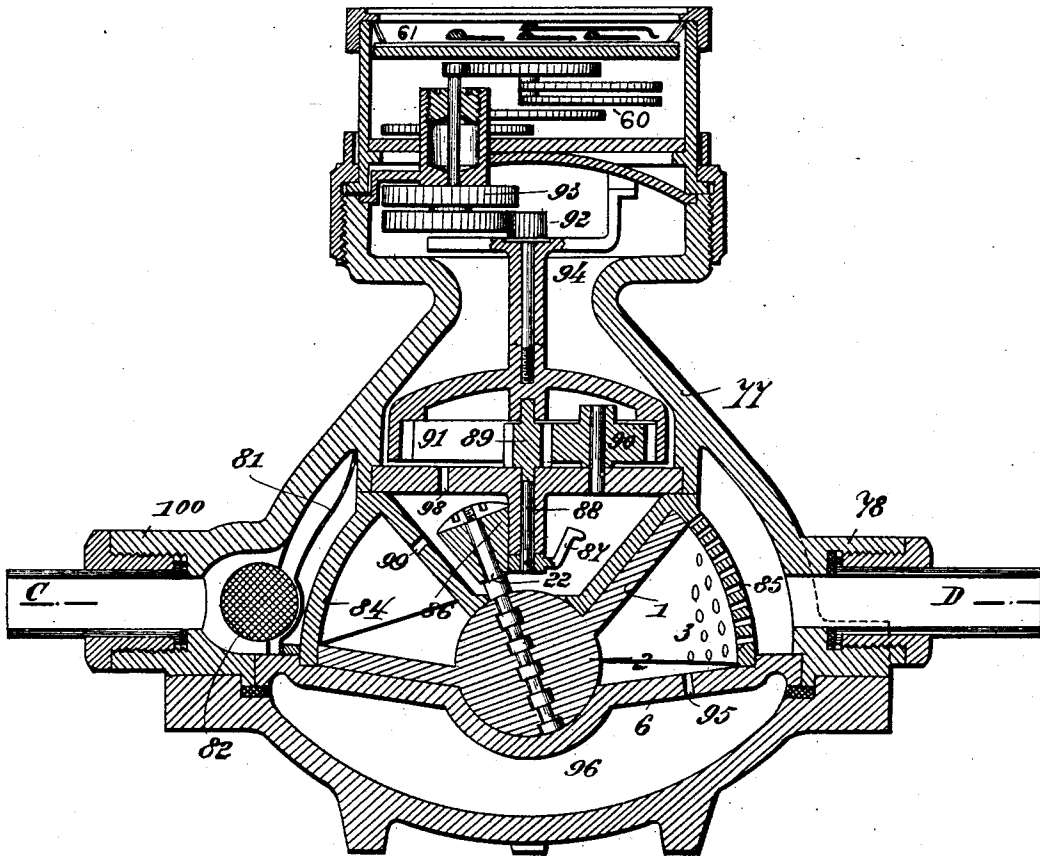
P. SAMAIN.
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(No Model.)

5 Sheets—Sheet 4.

Fig. 8



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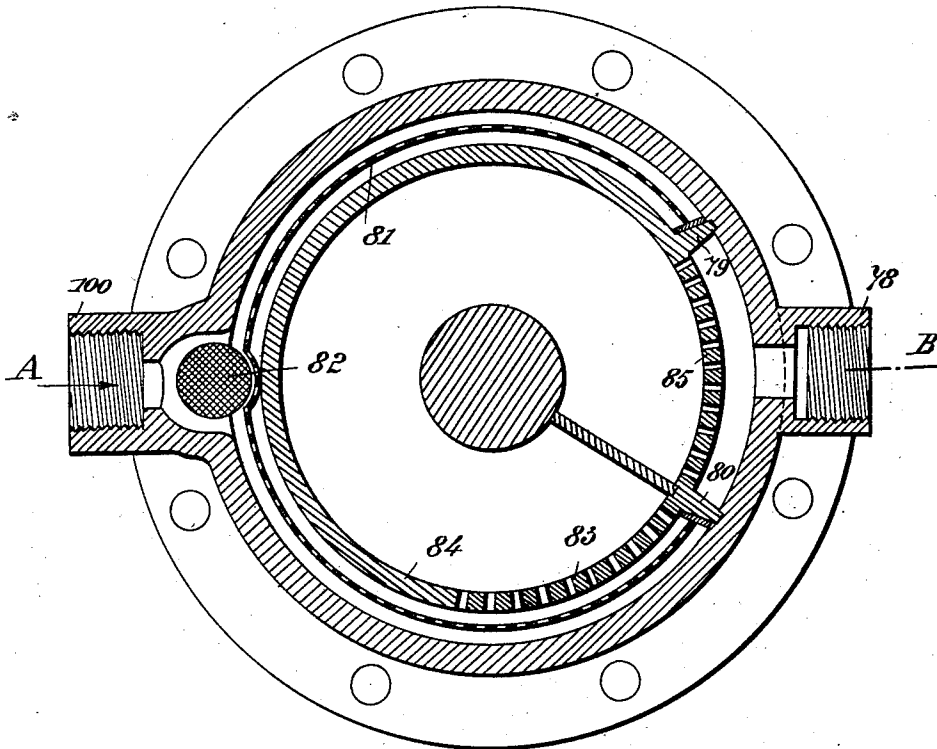
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(Application filed May 31, 1902.)

(No Model.)

5 Sheets—Sheet 5.

Fig. 9.



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UNITED STATES PATENT OFFICE.

PIERRE SAMAIN, OF CLAMART, FRANCE.

LIQUID-METER.

SPECIFICATION forming part of Letters Patent No. 714,823, dated December 2, 1902.

Application filed May 31, 1902. Serial No. 109,685. (No model.)

To all whom it may concern:

Be it known that I, PIERRE SAMAIN, a citizen of the French Republic, and a resident of Clamart, Seine, France, have invented certain
5 new and useful Improvements in Liquid-Meters, of which the following is a specification.

My invention relates to liquid-meters, and contemplates the use of celluloid and other material of similar nature in the construction
10 of such meters, with a view to obviate certain disadvantages inherent in existing liquid-meters. From extensive observations I have found that celluloid or similar substances capable of being molded into shape either by a
15 hot or cold process could be usefully employed, so as to render meters of this class, more particularly water-meters, hygienic and at the same time cheaper and lighter than the meters ordinarily supplied. The hygienic nature
20 of the material is of great importance in connection with water-meters for domestic service, as it prevents contamination of the water by the rusting iron parts or the salts formed by the brass parts of the meter. For
25 other liquids, such as acids or alkalis, the material for use in the construction of the meter can readily be so selected as to be proof against any particular liquid, which, however, cannot be obtained with meters of ordinary
30 metal.

By judiciously selecting and combining the materials for the manufacture of the meters in accordance with their size, the work required, and the nature of the liquid being
35 measured the most advantageous results may be obtained. For example, the movable parts of a meter may be made of celluloid and the casing or stationary parts may be made of other materials—such as ivory, ebonite,
40 wired or armored cement, &c.

The object of this invention, therefore, is to utilize the aforementioned materials under the most advantageous conditions.

My improved system may be conveniently
45 adopted in connection with that type of water-meter commonly known as the "oscillating cone or disk meter." The movable member of this meter forms a cone mounted in a casing and adapted to oscillate simultaneously
50 in the plane of a partition, which cuts the said cone along one of its generatrices

and around the generatrix, which cuts it by the aforementioned partition.

The principle on which the function of these meters is based is well known and requires
55 no description, and I shall therefore restrict the following specification in reference to the annexed drawings to a mode of construction which I have found preferable for permitting the use of celluloid in the manufacture of the
60 said meter.

In the drawings, Figure 1 is a vertical section taken on the line A B of Fig. 2 of my improved meter. Fig. 2 is a horizontal section taken on the line C D, Fig. 1. Fig. 3 is
65 a vertical section of a meter with a slightly-modified transmission. Fig. 4 is a detail, drawn to a larger scale, of the transmission shown in Fig. 3. Fig. 5 is a vertical section of a modified form of construction. Fig. 6
70 is a horizontal section of a portion of the apparatus illustrated in Fig. 5. Fig. 7 represents a plan of the metallic insertion or armor for the oscillating cone. Fig. 8 is a vertical section on line A B of Fig. 9; and Fig.
75 9 is a section taken on the line C D of Fig. 8.

The numeral 1 denotes the cone, provided at its summit with a sphere 2, which serves as a pivot for the oscillation. The said cone oscillates within a chamber 3, limited by a
80 conical wall 4, an annular peripheral wall 40, and a conical base wall or floor 6. Said chamber 3 is divided into two parts by a partition 7, Fig. 2, and the cone 1 is generatrices for the passage of the partition 7. The floor 6 of
85 said chamber 3 is formed with a central spherical seat 9, and the edges of said floor coincide with the plane passed through the center of the sphere 2. At 45 are indicated
90 webs or ribs for strengthening the floor and rendering the same rigid. The external casing 5 terminates at its lower end in a cylindrical portion situated below the plane passed through the center of the sphere of which it
95 forms part and serves to facilitate the molding of said casing. As before stated, within the outer casing there is arranged another casing with spherical wall 40 and divided by the partition 7, on both sides of which latter
100 said spherical wall is perforated with a number of holes 42 and 43 to serve as inlets and outlets, respectively, for the liquid. (See Fig. 2.)

This arrangement of said internal casing insures the following advantages, viz: the liquid within and without said internal casing is in a perfect state of equilibrium and is consequently not subject to becoming deformed by reason of the pressure upon the surfaces. Moreover, as both sides are immersed in the water there can be produced no expansions due to uneven temperatures of the liquid.

11 is a perforated plate designed to serve as a strainer for grits or gravel and other impurities suspended in the liquid. Said strainer is fixed at its center by a screw secured in the base 12 of the casing, while its periphery is engaged under a projecting flange 10 of the base-plate 6 of the inner casing and the inner rim of the casing 5, which presses the same down upon a circular seat in the flange of the outer casing 12. The flanges of the parts 5 and 12 are secured together, with a packing-ring between them, by bolts 20.

The water-inlet is at 16, and after the water has passed through the strainer 11 and then through passages 48 and holes 42 it arrives in the chamber 3, and there produces the movement of the oscillating cone 1, and finally leaves through the holes 43 and outlet 19. Partitions 38 39 are so disposed as to prevent the outflowing and inflowing currents of the liquid to mix in the interior of the casing 40. By this arrangement the inlet of the liquid is effected at the farthest point from the center of oscillation of the cone 1, and thereby the starting of the latter facilitated.

In addition to providing the means for the adoption of a strainer the lower part 12 of the casing also permits of the displacement of the inlet-tubulure 16 relatively to the outlet-tubulure 19 by fractions of a turn of the screw-bolts 20, and it is thus possible to adjust these two tubulures to suit the existing local positions of the inlet and outlet tubes when mounting the meter in position.

The cover 27, which separates the chamber containing the transmitting mechanism from the chamber inclosing the wheel-train of the registering mechanism, is concave and is thus not affected by the internal pressure of the liquid, and therefore the moving parts are not liable to become wedged by the warping of said cover.

By adopting the spherical form for the lower portion 12, the top portion 5, and the cover 27 the meter is readily capable of resisting the internal pressures, while, moreover, all the surfaces of said parts are subjected to traction only, and thereby present a more favorable condition for the use of celluloid.

The number of oscillations of the cone are in proportion to the quantity of liquid drawn off, and these oscillations are transmitted to the registering mechanism.

In the arrangement shown in Fig. 1 the transmission of the movement at reduced speed is effected in the following manner: A sleeve 23 is mounted loose upon a spindle 22, the lower end of which latter is formed with

a number of collars and secured in the sphere 2 while molding the latter. The sleeve 23 carries a toothed wheel 53, meshing with a stationary pinion 52, so that when the toothed wheel 53 turns around said stationary pinion it has a reduced speed relatively to the proportion of the number of teeth in the wheel 53 and pinion 52. The extremity of said sleeve 23 forms a toothed pinion 54, turning integrally with the sleeve, and thereby imparting rotation to a toothed wheel 55 in gear with it and proportioned so as to further reduce the speed. The spindle 22, sleeve 23, and speed-reducing gears are inclosed in a chamber constituted by a truncated portion 4 and the cover 27. This chamber is filled with liquid and communicates with the chamber 3 through a small orifice 4^a, the liquid in said chamber remaining always the same and the introduction of gravel being almost entirely avoided.

The cylindrical box 24, containing the registering mechanism 60 and indicator-dials 61, reposes with its lower end upon a flat annular flange 29, provided at the base of the crown portion 30. The box 24 is secured by a ring 31, having external screw-threads to screw into the crown 30. The ring 31 has an easy fit upon the exterior of the box 24 and presses the latter tightly upon the supporting-flange 29. This mode of fixing the box for the registering and indicating mechanism upon the chamber containing the transmitting mechanism is simple, easily separated, and yet furnishes a reliable tight joint which can be readily tightened. The chief advantage of this construction is that it permits the box, with the indicator, to be turned around into the most advantageous position for reading. This arrangement, together with the previously-described mode of adjusting the orifices for the ingress and egress of the water, is a very important feature in connection with water-meters, which often have to be mounted under various local conditions. This improved arrangement of meter allows the largest portion of the component parts thereof to be constructed of celluloid by molding the same—for example, the lower casing itself and the oscillating cone, and likewise the indicator-box.

The oscillating cone of celluloid is light and readily starts operating, even with a very small flow of liquid. Obviously this is a very important point for insuring a sensitive action of the meter, because when the cone is made of bronze it requires a certain velocity of the water to start the mass of such cone moving, and therefore an appreciable quantity of water is caused to pass unregistered through the interstices of the joints.

The metallic parts comprise the ring 31, the screw-bolts, and the gear-wheels of the indicator.

By employing transparent celluloid it will be easy to inspect the functions of the various parts of the meter and to ascertain any

irregularities without having to take the meter to pieces.

The meter can be made of celluloid or its derivative substances or of materials having a base of cellulose or casein.

Figs. 3 and 4 show a simplified construction of the transmitting mechanism for translating the motion of the oscillating cone at a reduced speed to the indicating mechanism.

The spindle 22, secured in the sphere 2, terminates at its outer end with a cup 60, forming the bearing for a ball 61 at the lower end of a stem 62 of a toothed bevel-wheel 63. In the center of said bevel-wheel a spherical cavity is formed to engage on a stationary sphere 64. The motion which said bevel-wheel receives from the oscillating cone is not such as to rotate it around its axis, but uses it to oscillate in a similar manner as the cone 1, and thereby bring its teeth successively into gear with the teeth of the wheel 66. In order to prevent the rotation of the wheel 63 and only permit it to oscillate, the spherical cavity 65 is formed with two grooves at right angles to each other, in which two pegs or keys disposed at right angles to one another engage. In this manner the toothed wheel 63 can only oscillate without rotating in two planes at right angles to each other, and the result of these displacements, due to the simultaneous oscillations in these two planes, causes all the circumferential points of the wheel 63 to come successively in contact with all the circumferential points of the wheel 66.

This contact, however, is not derived from the rotation of the two wheels, but is due only to the successive contact of all the circumferential points of the wheel 63 with those of the wheel 66. It follows, therefore, that with an equal number of teeth on both wheels the teeth of the wheel 63 will be caused to enter successively between those of the wheel 66, and this latter will remain stationary. Presuming, however, the wheel 63 to have fifty-one teeth and the wheel 66 to have fifty teeth, then for each complete revolution of the wheel 63, starting from the position shown in the figure, till it has returned to the same point, the fifty-one teeth of the wheel 63 will have been in engagement with fifty-one teeth of the wheel 66, and as the latter has only fifty teeth it has been advanced for one tooth. Taking into consideration the nature of the movement, it will be clear that the advancing motion of the tooth is not effected by a jerk. On the contrary, each engagement of a tooth of the wheel 63 with the wheel 66 causes the latter wheel to advance a distance corresponding to one-fiftieth of the tooth. This number fifty has been cited only as an example, so as to facilitate the description of how a considerable reduction in speed can be effected without adopting a gear-wheel greatly differing in diameter. A further advantage of this arrangement is that the oscillating cone 1 is constantly in contact by one of its generatrices with the walls of its casing, be-

cause the rigid stem 62 prevents the cone 1 to set itself in the axis of the apparatus.

Figs. 5, 6, and 7 show various improvements with a view to insure increased accuracy in registering and also to impart greater rigidity to the oscillating disk.

In order to obviate inconveniences arising from the speed of the water in coming into contact with the cone, I have found that greater accuracy can be imparted to the meter by causing the inlet-water to flow through the partition 70. (See Fig. 6.) To this end said partition is made of sufficient thickness to enable a series of internal passages 71 to be made therein, which lead into the chamber of the oscillating cone 75 through orifices 72. The water passes from the interior of the partition 70 through a series of holes 73 in the lower end 74 of said partition and thence beneath the contact-surface of the partition.

The oscillating cone 75 is advantageously made of materials capable of being molded into shape—such as celluloid, ivory, and such like—providing the material has the necessary rigidity and resistance for this purpose. To provide this rigidity for said materials, I have embedded therein during the molding process an insertion of metal 76 in the cone 75, the said insertion being perforated, as shown in Fig. 7. In this manner I am enabled to preserve all the advantages of the selected materials and at the same time avoid the bending or breaking thereof.

Other metallic insertions or stiffenings may be embedded in the parts requiring great rigidity—for example, parts composed of cement. I am thus enabled to manufacture large meters either partly or entirely of armored cement, which constitutes an absolute novel application.

The form of construction shown in Figs. 8 and 9 combines to a high degree the advantages of perfect equilibrium of all the component parts, together with facility for molding the same. The outer casing 77 is provided with an inlet-tubulure 100 and an outlet-tubulure 78, and ribs 79 and 80 are provided to prevent the inlet-water and outlet-water from mixing together. At the inlet side there is furnished a strainer 81 for retaining gravel and other impurities, and a ball 82 forms a valve which prevents the liquid from circulating in the wrong direction through the meter. The holes 83 in the spherical wall of the inner casing 84 admit the liquid, which then traverses the chamber 3, and is thereby registered through the action of the disk 1, and finally leaves through holes 85 and through the outlet 78. The oscillating cone transmits its movements to the registering mechanism through the intervention of the spindle 22, fitted with a head 86, which rotates and moves with it the tap-pet 87, fast on the shaft 88. This shaft is fitted at its upper end with a toothed pinion 89, which transmits its rotary motion through

an intermediate gear-wheel 90 to an internally-toothed wheel 91, integral with an upwardly-projecting shaft which carries at its upper end a pinion 92. The gears marked 93 serve to reduce the speed. The chamber 94, in which the said speed-reducing gear is located, is formed by an extension of the walls of the casing 77. The floor 6 of the inner casing is effectually equilibrated by the provision of an orifice 95, through which the liquid from the chamber 3 passes into the space beneath said floor above the bottom 96 of the meter. The internal wall 84 is also in perfect equilibrium. Further, the chamber 97 communicates by orifices 98 99 with the chamber 3, and thereby places the oscillating cone and the transmitting and speed-reducing mechanism also in equilibrium.

The various forms of construction herein described have the advantage that they permit of the use of such materials that can be readily molded into shape either in a hot or cold condition and which have not heretofore been utilized for the same purpose. The following are some of the materials which I contemplate to employ for this purpose and which are cited by way of an example only, without limiting myself to them alone—viz., celluloid, xylonite, viscosite, cellulose, casein, ivory, ebonite, and others. I am thus enabled to pro-

duce under the best conditions of manufacture an absolutely novel industrial article.

Having now fully described my said invention, what I claim, and desire to secure by Letters Patent, is—

A water-meter of the type known as oscillating cone or disk, comprising first, a double casing in the interior of which the oscillating cone is mounted and which is provided with perforations for the ingress and egress of the water; secondly, the concave cover or partition for separating the registering mechanism from the interior of said casing and for providing the necessary resistance to withstand the internal pressure; thirdly, the lower portion of the casing furnished with a strainer to avoid the introduction of gravel into the meter, and adapted to be so adjusted, relatively to the upper portion, as to suit the local requirements of the pipes connected with the meter; and fourthly, means for joining the box, containing the registering mechanism to the internal casing.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

PIERRE SAMAIN.

Witnesses:

ADOLPH STURM,
EDWARD P. MACLEAN.