

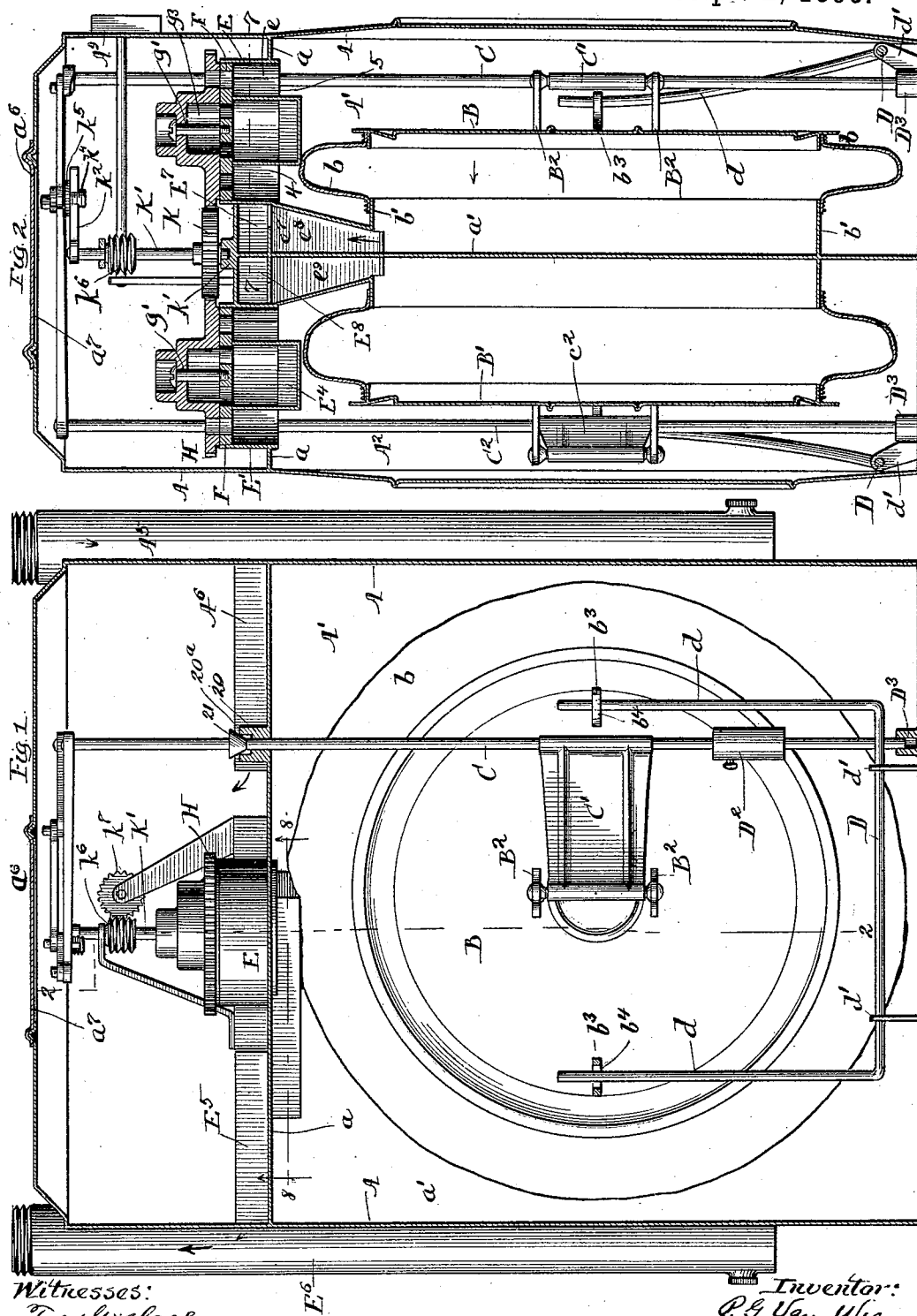
(No Model.)

2 Sheets—Sheet 1.

P. G. VAN WIE.
FLUID METER.

No. 536,823.

Patented Apr. 2, 1895.



Witnesses:
Fredrick
Albina Adamick

Inventor:
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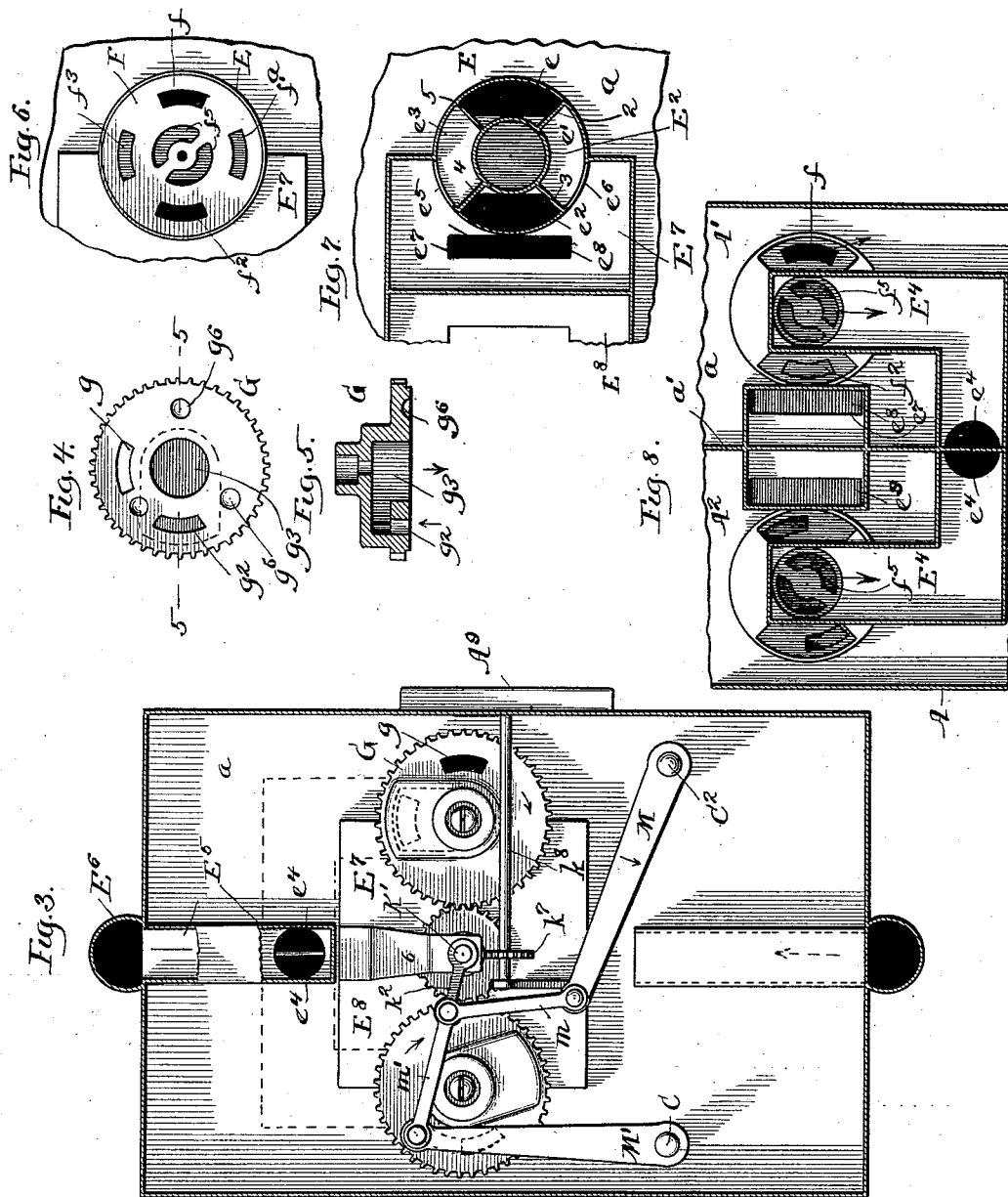
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2 Sheets—Sheet 2.

P. G. VAN WIE.
FLUID METER.

No. 536,823.

Patented Apr. 2, 1895.



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UNITED STATES PATENT OFFICE.

PETER G. VAN WIE, OF CHICAGO, ILLINOIS.

FLUID-METER.

SPECIFICATION forming part of Letters Patent No. 536,823, dated April 2, 1895.

Application filed January 22, 1894. Serial No. 497,639. (No model.)

To all whom it may concern:

Be it known that I, PETER G. VAN WIE, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Fluid-Meters, of which I do declare the following to be a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My present invention has relation more particularly to that class of meters, commonly termed diaphragm meters, in which there is employed a main casing that is divided into separate compartments each containing a diaphragm, the admission and discharge of the fluid, such for example as illuminating gas, into and from the diaphragm chambers being controlled by valves that are operated by the diaphragms, the movements of the valves being transmitted to a register that serves to indicate the amount of fluid that has been passed through the meter. One great difficulty experienced with this class of meters has been that the individual valves which control the passage of fluid into the diaphragm chambers were of such construction that a continuous and steady passage of fluid through the meter did not occur since at certain points in the movements of the valves the passage of fluid was interrupted, thereby producing unsteadiness of flow, which, when the meter was working to approximately its full capacity, was discovered in the outlets such for example as at the burners for illuminating gas.

By my present invention I have provided valve mechanism whereby the effective capacity of a meter having diaphragm chambers of the usual size is very greatly increased and whereby a steadiness of passage of the fluid through the meter is obtained and whereby also many of the defects incident to this type of meters as heretofore constructed are entirely overcome.

My invention consists in certain novel features hereinafter described and particularly defined in the claims at the end of this specification.

Figure 1 is a side elevation, the outer casing being shown in section. Fig. 2 is a view in vertical section on line 2—2 of Fig. 1. Fig. 3 is a view in horizontal section on line 3—3

of Fig. 2. Fig. 4 is an inverted plan view of my improved valve. Fig. 5 is a view in vertical section on line 5—5 of Fig. 4. Fig. 6 is a plan view of the valve seat and part of the subjacent structure. Fig. 7 is a view in section on line 7—7 of Fig. 2. Fig. 8 is a view in horizontal section on line 8—8 of Fig. 1 looking up.

The casing A is divided by the transverse partition plate *a* into upper and lower chambers in the usual manner, and the lower chamber is divided longitudinally by the central plate *a'* so as to form the compartments A' and A². Within compartment A' is mounted the diaphragm B, the front part of which consists preferably of a metal plate united by the flexible side portion *b* to the annular rim *b'* that projects from the face of the division plate *a'*, and in like manner compartment A² is provided with a diaphragm B' of similar construction.

In front of the diaphragm B is mounted a vertical rock shaft C that passes upward through the horizontal division plate *a*, and to this rock shaft C is connected a vibrating arm C', the opposite end of which is connected to a pin extending between the lugs B² that project outward from the face of the diaphragm B. From the face of the diaphragm B project also the studs *b*³ having long slots *b*⁴ formed therein and through these slots extend the upper arms *d* of the guide bar D that is pivotally supported by the uprights *d'* that rise from the base of the main casing A. The purpose of the bar D is to insure the straight outward movement of the front plate of the diaphragm B. In front of the diaphragm B' is in like manner mounted the rock shaft C², extending upward through the horizontal division plate *a*, and this shaft is provided with the vibrating arm *c*² that is connected with the outer face of the diaphragm B' in the same manner as the vibrating arm C' is connected to the diaphragm B. In like manner also the guide bar D journaled in front of the diaphragm B' will have its upper arms passing through lugs projecting from the face of the diaphragm in order to insure the straight forward movement of the outer plate of the diaphragm. It will thus be seen that as the diaphragm plates B and B' are moved inward and outward by the pressure

of the fluid, motion will be transmitted to the vertical rock shafts C and C² and this motion will be communicated to the meter in manner to be presently described. In order to guard
 5 against the danger of leakage of fluid from the upper to the lower chamber of the casing at the points at which the vertical rock shafts C and C² pass through the horizontal division plate α , I prefer to provide a bearing block
 10 20 for each of these shafts, these bearing blocks being mounted upon the division plate α , and each of the bearing block D will have an annular seat 20^a formed in its upper surface presenting an edge on which will rest the cone-bearing 21 that is fixed to the shaft C or C².
 15 The weight of the shaft C will cause the cone 21 to firmly bear against the annular seat formed in the block 20 and will insure a tight joint at such point so as to prevent the leakage of fluid from the upper compartment of the main casing into the lower one. This manner of effecting a tight joint for the vertical rock shafts is a feature of importance as it has heretofore been found difficult to guard
 25 against the leakage through the division plate α at the points where the shafts pass through this plate.

If desired, a weight D² may be placed upon each shaft in order to more firmly seat the
 30 cone 21 upon the bearing block 20. It will be observed that the step block D³ wherein the lower end of each of the shafts C and C² is journaled is perforated to such depth as to permit the firm seating of the cone 21 upon
 35 the bearing block 20.

In order to control the admission and escape of fluid from the diaphragm chambers A' and A² I prefer to provide the construction and arrangement of valves, valve seats, and channels to be next described. Above the horizontal division plate α rise the two sets of annular plates E and E', but as these sets are of like construction, a description of one will answer for both. The annular space between
 40 the plates E and E' is divided by the partitions 2, 3, 4 and 5 so as to form the channels e , e' , e^2 and e^3 (see Fig. 7) and to the top of the plates E and E' is fixed the valve seat F. (See Fig. 6.) The valve seats for each set of plates
 45 E and E' will be of like construction. The valve seat F is provided with a series of induction and discharge ports f , f' , f^2 and f^3 , these ports being arranged respectively over the spaces e , e' , e^2 and e^3 beneath them. The
 50 valve seat F is provided also with the exhaust ports f^5 that lead directly into the space within the ring E' beneath the valve seat. The bottom of the space formed within the ring E' is closed by a plate E² and from the
 60 compartment thus formed leads a pipe or channel E⁴ (see Fig. 8) that communicates through the opening e^4 formed in the division plate α , with the discharge channel E⁵ that leads to the discharge pipe E⁶ outside the main
 65 casing A.

By reference more particularly to Fig. 7 of the drawings it will be seen that the periph-

ery of the ring E is provided with the ports e^5 , and e^6 , these ports serving to connect the spaces e' and e^3 respectively with a chamber
 70 E⁷ that rises above the division plate α about a portion of the ring E, and in the bottom of this chamber E⁷ is formed a port e^7 that communicates with the channel e^8 that leads through the ring b' of the diaphragm B within
 75 the chamber A' of the main casing. By reference more particularly to Figs. 2, 3, 7 and 8 of the drawings it will be seen that a like chamber E⁸ is formed upon the opposite side of the vertical division plate α' , which chamber E⁸ communicates by a channel e^9 with the interior of the diaphragm B'.

Upon the valve seat F is mounted a revolvable valve G (see Fig. 5), and through this valve is formed an admission port g whereby
 85 fluid is admitted from the upper chamber to the subjacent chamber or diaphragm of the main casing.

The valve G is pivotally held upon its seat by a pin g' passing into the valve seat, or in
 90 other convenient manner and is provided with the exhaust port g^2 and the exhaust cavity g^3 that is formed within a raised portion of the valve, the cavity g^3 communicating at all times with the exhaust port f^5 of the valve
 95 seat.

It is obvious that as the valve G is revolved, the admission and discharge ports g and g^2 will be brought successively opposite the various ports f , f' , &c., of the valve seat F, and the mechanism whereby the movement of the valve G is effected will be next described.

The rim of each of the valves G is provided with a series of cogs or teeth H which will mesh with the teeth of a gear wheel K that is
 105 fixed to the lower end of the vertical drive shaft K' and it will thus be seen that as the drive shaft K' is revolved by mechanism to be presently described like movement will be transmitted to each of the valves G. The
 110 drive shaft K' has its lower end journaled in the block k' that rests upon the top plate of the compartments E⁷ and E⁸ (see Fig. 2), and the upper portion of the drive shaft is held by the bracket 6, that rises from the upper surface
 115 of this plate. To the upper end of the drive shaft K' is connected the crank arm k^2 which passes through a slot formed through the pivot pin k^4 , this pin being retained in proper connection with the crank by means of a threaded
 120 washer k^5 . The upper portion of the pivot pin k^4 passes through the ends of the links m and m' that connect respectively to the crank arms M and M' that are fixed to the upper ends of the rock shafts C and C².

From the foregoing description the operation of the construction as thus far defined will be seen to be as follows, it being assumed that fluid under pressure (such for example as illuminating gas) is admitted to the upper
 130 chamber of the casing A through the delivery pipe A⁵, that leads by the channel A⁶ into the upper part of the casing. By reference more particularly to Figs. 2, 3, 7 and 8 of the draw-

ings it will be seen that if the parts be in the position there shown, the fluid will pass through the delivery port g of the valve G, thence through the port f of the valve seat F into the space e between the rings E and E' beneath the valve seat and thence into the chamber A' of the main casing and around the diaphragm B. As fluid is thus admitted into the chamber A' it will force inward the diaphragm B causing the fluid within the diaphragm chamber to pass therefrom (see Fig. 2), by channels e^8 , port e^7 , the channel or compartment E', thence by port e^5 into the space e^3 (see Fig. 7), thence through port f^3 of the valve seat, through exhaust port g^2 of the valve G, through exhaust cavity g^3 , through exhaust port f^5 of the valve seat and into the exhaust chamber E' beneath the port f^5 , whence it will pass by the channel E' (see Fig. 8) to port e^4 and through this port to channel E' (see Fig. 1) and thence to the discharge pipe E' outside the main casing. As the diaphragm B is thus forced inward in the direction of the arrow Fig. 2, it will draw inward the arm C' causing this arm to rock the vertical shaft C and the movement of this shaft C will be transmitted by the crank M at its upper end to the link m and by this link to the crank arm k^2 upon the upper end of the shaft K'. The movement of the shaft K' will be transmitted by the gear wheel K to the valve G, causing this valve to revolve in the direction of the arrow Fig. 3. Fluid will thus continue to be delivered to the compartment A' of the main casing outside the diaphragm B until the valve G has so far moved in the direction of the arrow Fig. 3 as to bring the delivery port g of this valve over the blank portion of the valve seat intermediate the ports f and f' . (See Fig. 6.) As the movement of the valve G continues, the delivery port g will come above the port f' of the valve seat F and the exhaust port g^2 of the valve G will come opposite the port f of the valve seat, and at such time fluid will pass from the upper part of the main casing through port g , and through port f' into space e' (see Fig. 7), thence into the chamber E', thence downward through port e' and channels e^8 (see Fig. 2), into the interior of the diaphragm chamber B. At the same time that fluid is thus passing into the interior of the diaphragm chamber B, an escape of fluid will occur from compartment A' through the space e (see Fig. 7), through port f of valve seat F (see Fig. 2), through exhaust port g and exhaust cavity g^3 of valve G into the annular space beneath the cavity g^3 , thence by channel E' and through port e^4 (see Fig. 8), into exhaust channel E' and discharge pipe E'. As the valve G thus continues to revolve the delivery and exhaust ports of this valve will be brought successively adjacent ports of the valve seat F, thereby causing the fluid to be delivered and exhausted alternately to and from the interior and exterior of the diaphragm B within the compartment A' of the main casing; that

is to say, when the delivery port g of the valve G is opposite the port f^2 fluid will again pass through the space e^2 of the compartment A', outside the diaphragm B and will exhaust from the interior of the diaphragm chamber through channels e^8 , port e^7 , chamber or passage E', space e^8 , exhaust port g^2 and exhaust cavity g^3 of valve G, exhaust port f^5 of the valve seat and thence downward and outward in manner above defined. So also when the delivery port g comes opposite the port f^3 of the valve F, fluid will pass to the interior of the diaphragm chamber B and will exhaust from the exterior of this chamber through the space e^2 (see Fig. 7), exhaust port g^2 and exhaust cavity g^3 of the valve and thence downward and outward in manner above defined.

Inasmuch as the construction and mode of operation of the valve G' is the same as that of the valve G, and as the arrangement of the valve seat and parts beneath the same is identical with that of the parts beneath the valve G the mode of operation of the valve G' need not be particularly described. It will be observed however, that the valve G' will be set in such relation to the valve G as to insure an uninterrupted passage of fluid through the meter and to insure also a continuous and uniform movement of the valves.

While I have shown the valves G and G' as provided each with a single admission port, I have shown each of the valve seats as having an admission and discharge valve. It is manifest that the number of ports may be varied although these ports should be so arranged that there shall be no appreciable time when fluid is not entering through each of the valves into either the diaphragm or the chamber outside thereof, since by this means a uniform and steady passage of fluid through the meter is secured.

By reference more particularly to Figs. 4 and 5 of the drawings it will be seen that the face of each of the valves is provided with a series of pockets or depressions g^6 of any desired shape, the purpose of these pockets being to confine a small part of the fluid which will act as a lubricant between the valve and its seat and thus decrease the friction of these parts. By forming the valve seat with a series of admission and discharge ports so that during a single revolution of the valve the diaphragm may be moved back and forth more than once, it is obvious that the capacity of the meter is thereby so much increased and by employing a reducing gear the friction is materially diminished particularly in large meters and in such as work under full capacity since when such gear is employed a complete movement of the diaphragm will impart only a partial revolution to the valve.

The movement of the vertical shaft K' may be transmitted to a suitable register inclosed within a casing A' by any of the well known forms of mechanism commonly employed for such purpose, such for example as a worm-

wheel k^6 mounted upon the shaft K' and engaging with a gear-wheel k^7 mounted upon a shaft k^8 that connects with the register mechanism within the casing A^9 .

- 5 In order to enable the mechanism within the top of the main casing to be conveniently reached for the purpose of adjustment or repairs, I provide the top of the main casing with an opening a^6 that is closed by a plate
10 a^7 , the edges of the plate a^7 being soldered or otherwise hermetically sealed to the top plate of the casing about the opening a^6 . With this construction it is only necessary, when it is desired to gain access to the interior of the
15 main casing for the purpose of adjusting or repairing the mechanism within the upper part thereof, to remove the plate a^7 which can be readily accomplished by passing the hot soldering iron around the edges in order to
20 melt the solder that unites the plate to the casing.

It is manifest that the details of construction above set out may be varied within wide limits without departing from the spirit of my
25 invention and to such details therefore I do not wish the invention to be understood as restricted.

Having thus described the invention, what I claim as new, and desire to secure by Letters
30 Patent, is—

1. In a fluid meter the combination with a main casing and with suitable diaphragms contained therein, of individual revoluble valves for controlling the passage of fluid to
35 and from said diaphragms and said casing, said valves being provided with gear teeth, and an interposed driving gear wheel connecting said revoluble valves together, substantially as described.

- 40 2. In a fluid meter the combination with a main casing and with suitable diaphragms contained therein, of individual revoluble valves for controlling the passage of fluid to and from said diaphragms and said casing,
45 each of said valves being provided upon its periphery with gear teeth, and an interposed driving gear wheel or pinion connecting said valves together and means for communicating motion from each of said diaphragms to said
50 interposed driving gear wheel, substantially as described.

3. In a fluid meter the combination with a

main casing and with suitable diaphragms contained therein, of individual revoluble valves for controlling the passage of fluid to
5 and from said diaphragms and said casing, said valves being provided with gear teeth, and an interposed driving wheel connecting with the gear teeth of said valves, said driving wheel having a less number of teeth than
6 the gear teeth of the valves whereby a reduction of movement is effected, substantially as described.

4. In a fluid meter the combination with a main casing and with suitable diaphragms
6 contained therein, of individual valve seats, one for each of said diaphragms, each of said valve seats having plural ports communicating with the interior of its corresponding diaphragm, and plural ports communicating with
7 the exterior of said diaphragm, revoluble valves, one for each of said diaphragms for controlling the passage of fluid through said ports, each of said revoluble valves being
7 provided with gear teeth, an interposed reducing gear wheel connected to said valves, a driving shaft connected to said gear wheel and suitable operating mechanism connect-
8 ing said drive shaft with the diaphragms, substantially as described.

5. In a fluid meter the combination with a main casing and with suitable diaphragms contained therein, of individual revoluble
8 valves for controlling the passage of fluid, each of said valves having its periphery provided with gear teeth and an intermediate driving gear wheel of smaller diameter than
9 said valve gears and serving to connect said valves, substantially as described.

6. In a fluid meter the combination with a main casing having a horizontal division plate
9 dividing said casing into upper and lower compartments, of a vertical shaft extending through said division plate, and provided with a cone fixed thereto, a bearing block
20 having an annular seat 20^a whereon said cone rests, said seat being larger than the lower part of said cone to form a pocket around the cone, substantially as described.

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Witnesses:

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