(No Model.) 2 Sheets—Sheet 1.

E. B. DE LA MATYR.

GAS METER.

No. 578,864. Patented Mar. 16, 1897.

Fig. 1

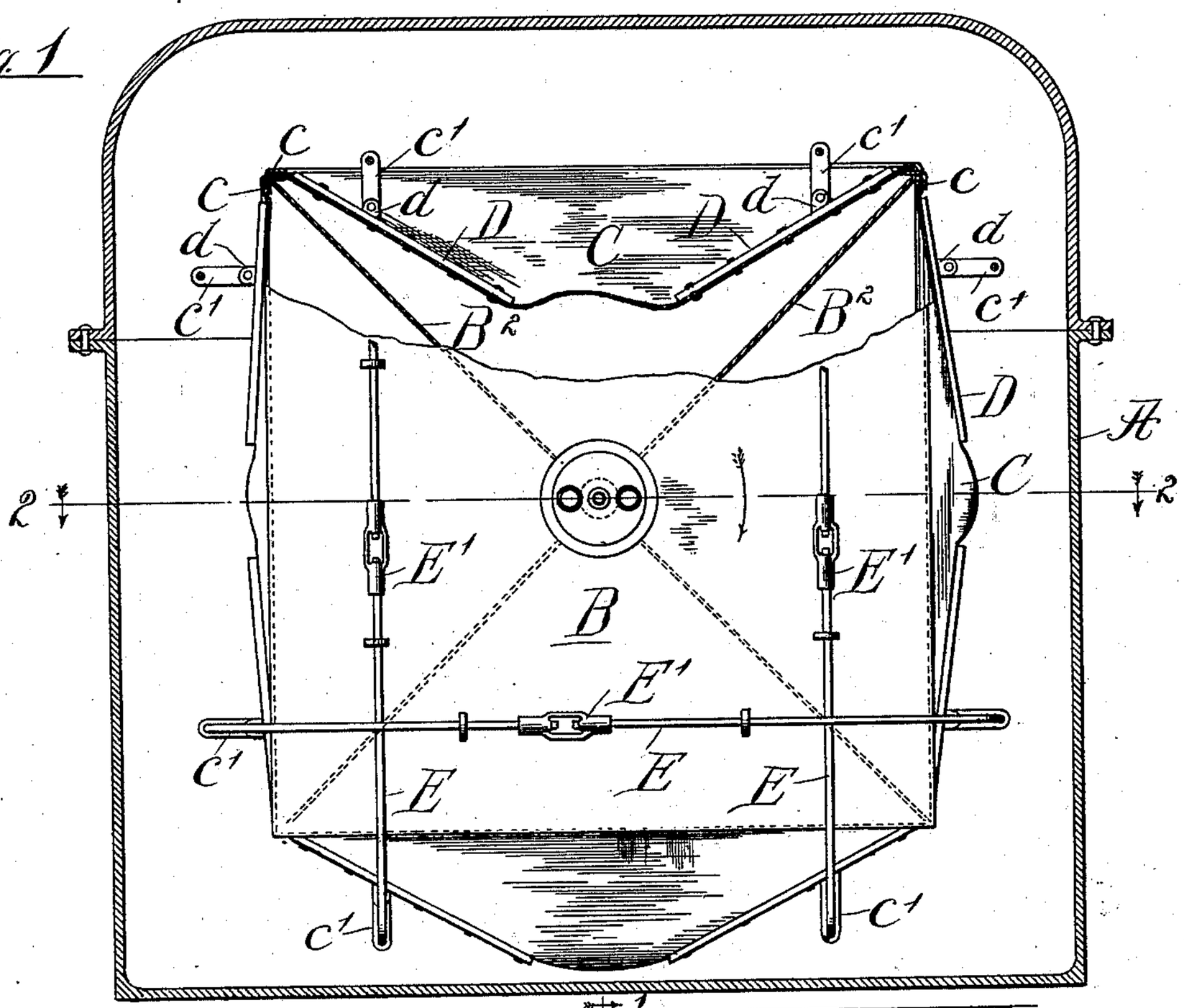
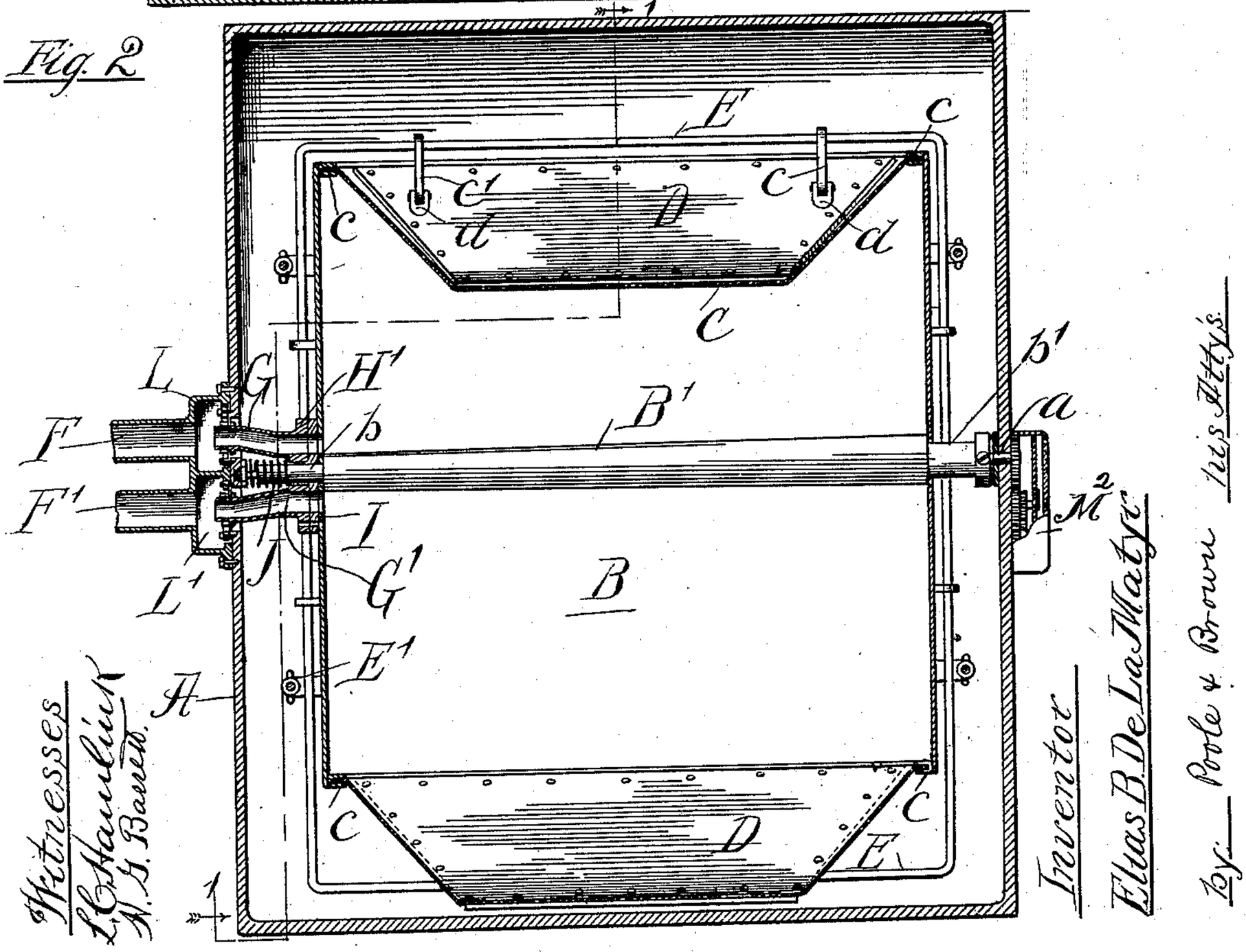


Fig. 2



Witnesses
L. C. Hamilton
N. S. Banes.

Inventor
Elias B. De La Matyr
By Poole & Brown his Attys.

(No Model.) 2 Sheets—Sheet 2.

E. B. DE LA MATYR.

GAS METER.

No. 578,864. Patented Mar. 16, 1897.

Fig. 3

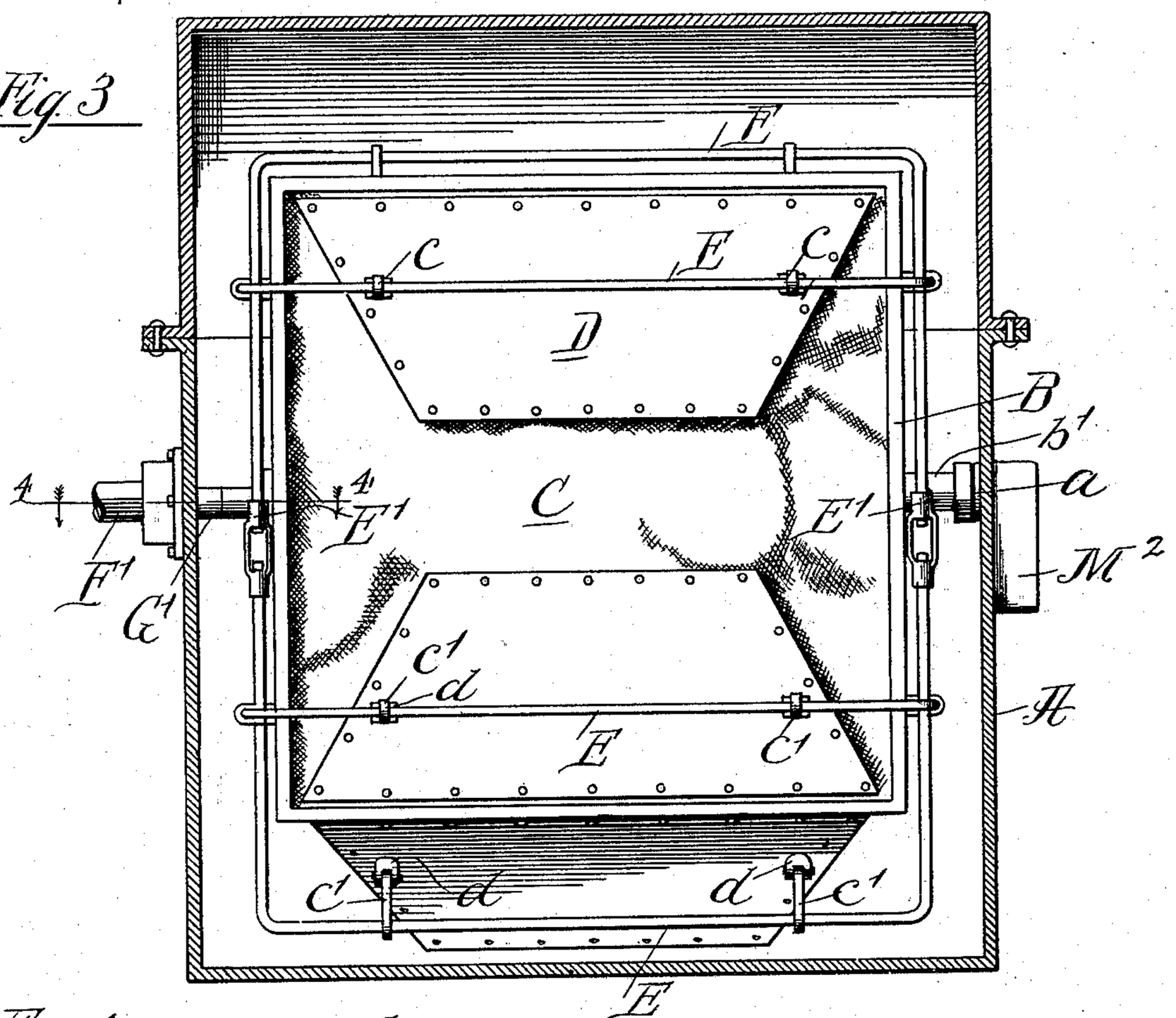


Fig. 4

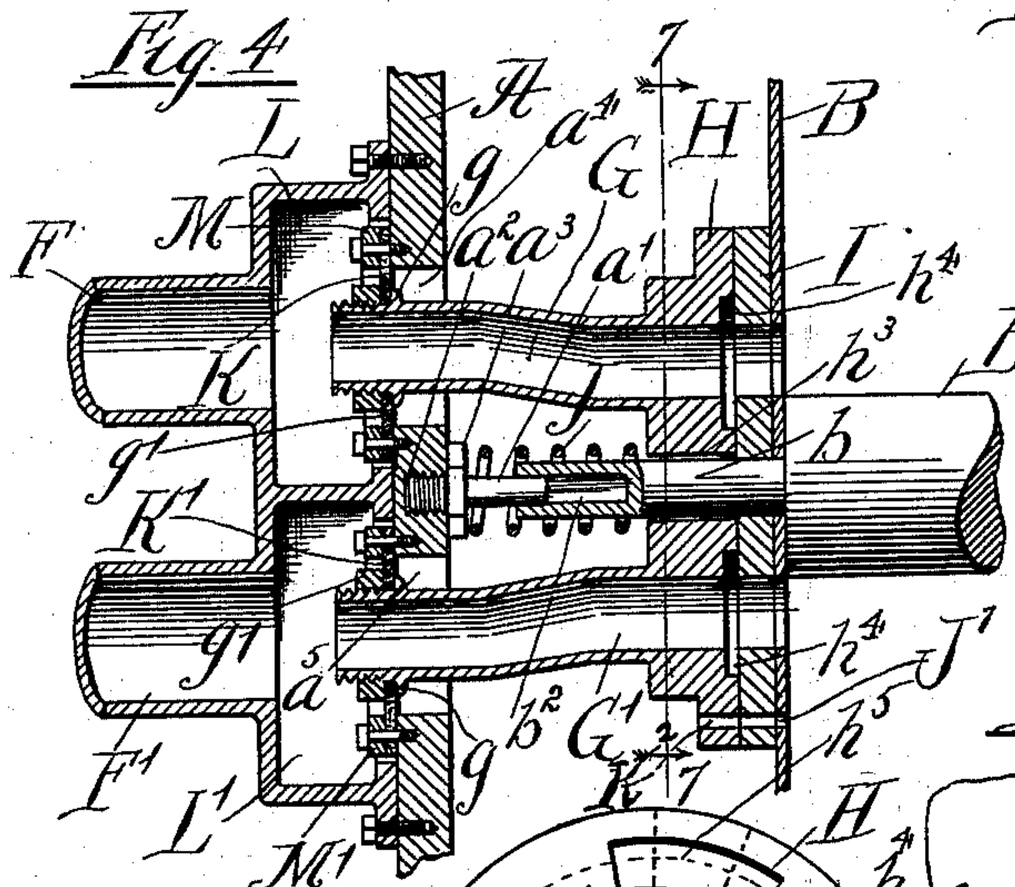


Fig. 5

Fig. 7

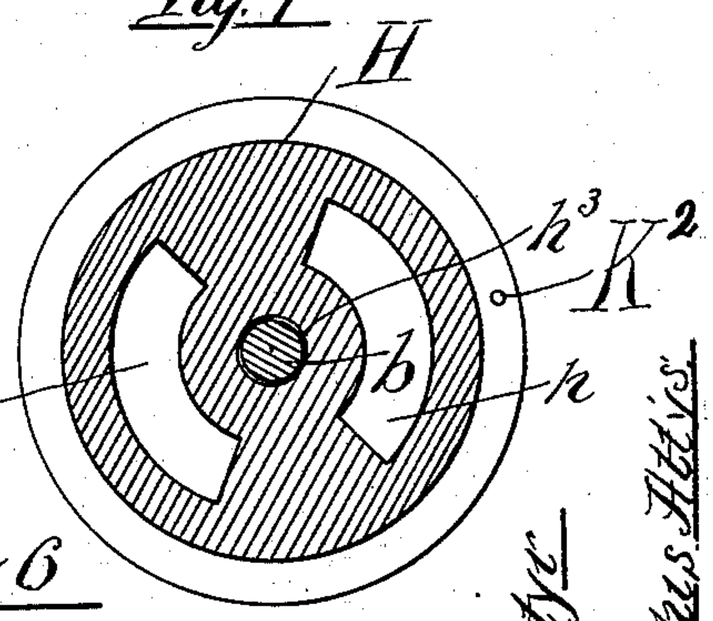
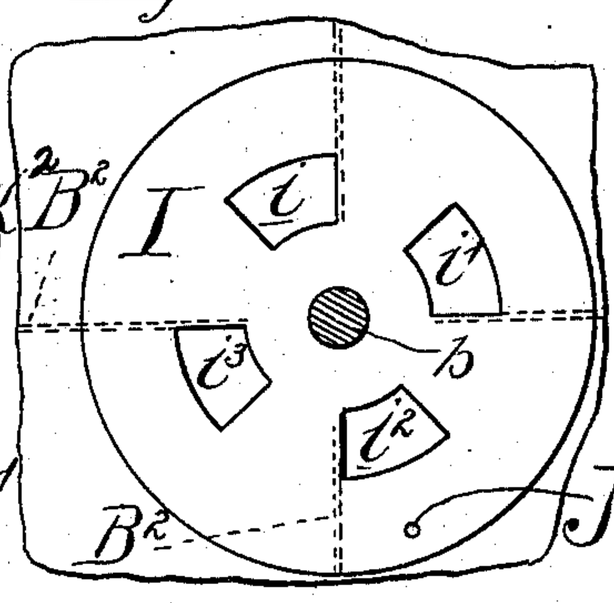


Fig 6



Witnesses
H. C. Hamblin
J. B. Barrett

Inventor
Elias B. De La Matyr
By: Poole & Brown
Atts.

UNITED STATES PATENT OFFICE.

ELIAS B. DE LA MATYR, OF SAN FRANCISCO, CALIFORNIA.

GAS-METER.

SPECIFICATION forming part of Letters Patent No. 578,864, dated March 16, 1897.

Application filed July 1, 1896. Serial No. 597,708. (No model.)

To all whom it may concern:

Be it known that I, ELIAS B. DE LA MATYR, of San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Gas-Meters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in meter or gas-measuring apparatus of the kind set forth in prior applications for Letters Patent filed by me in the United States Patent Office November 15, 1895, (renewal,) Serial No. 597,786, and March 27, 1896, Serial No. 585,048.

The apparatus illustrated in said applications embraces a revolving measuring-drum having a plurality of compartments each provided with a flexible diaphragm which forms a movable side wall to the compartment, a valve which is actuated by the turning of the drum and which operates to bring the compartments at the descending side of the revolving drum successively into communication with the supply-pipe and the compartments at the rising side of the drum successively into communication with the delivery-pipe, together with means acting on the movable side walls of the compartments at the rising side of the drum operating to throw said walls inwardly, so as to expel the gas from said compartments, the drum being rotated by the preponderance of weight at its descending side due to the diaphragms at that side being at a greater distance from the axis of the drum than those at the ascending side.

In the construction illustrated in said prior application of November 15, 1895, (renewal,) Serial No. 597,786, filed July 1, 1896, the drum is surrounded by an inclosure or case and the space between the case and the drum is in communication with the delivery-pipe, so that a pressure of gas is maintained therein equal to that in the delivery-pipe, with the advantages which are fully set forth in said application. In the construction illustrated in said application, however, all of the gas expelled from the compartments of the drum is discharged therefrom into the said exterior case and passes from the latter to the delivery-pipe. A disadvantage of this construction is that if any escape of gas occurs by leakage of one of the diaphragms or the rupture thereof, the escaping gas passes to the delivery-pipe and is not measured, so that a loss to the owners of the gas-plant is involved to the extent that such escaping gas is not registered or paid for. I propose, in order to avoid possibility of loss of gas in the manner stated, to extend both the supply and delivery-pipes through the exterior case and connect them directly with the inlet and outlet passages of the valve, so that none of the gas being measured will pass through the space between the drum and the outer case, and loss of gas in the manner described is thereby avoided. In connection with supply and delivery pipes thus arranged, I propose as a further improvement to provide a branch passage or orifice leading into said outer case from a compartment or passage which is subject to the pressure of the gas at the exit side of the drum. Such branch passage or orifice will, moreover, be made of very small size or will be opened at relatively infrequent intervals, for the reason that inasmuch as there is no means of escape of the gas from the outer case a very small escape or leakage of gas into the case will serve to keep up the required pressure in the external case outside of the drum, while at the same time by making the passage of small capacity, in case of leakage or rupture of one of the diaphragms allowing the escape of gas at high pressure into the exterior case, the quantity of gas which would escape through the said passage from the case to the delivery-pipe would be so slight as to be inappreciable in value. Moreover, in case of such leakage or rupture of one of the compartments of the drum the pressure in the exterior case, by reason of the small capacity of the leaking orifice or passage referred to, would become practically equal to that within the drum, and this would lead to the stoppage of the latter, the turning of which obviously depends on the existence of a substantial difference between the pressure within the supply-pipe and that in the interior of the case. By the construction described, therefore, I not only prevent the escape of gas unregistered but insure the stop-

page of the apparatus in case of leakage or rupture of one of the diaphragms.

The results above referred to are more satisfactorily obtained by the use of a construction in which the orifice or passage referred to is opened intermittingly and not constantly, and an important part of my invention is embraced in a construction which includes a valve mechanism operated by the revolving drum and acting to bring the outer case periodically into communication with the discharge side of the drum or the delivery-passage leading therefrom. Such valve mechanism will most conveniently be formed by means of suitable ports formed in the parts constituting the main valve, and a construction of this kind is therefore herein shown and constitutes a part of the present invention.

The valve illustrated in the prior application referred to is formed by means of two valve-seats, one attached to and turning with the drum and the other attached to the case, said valve-seats being provided with ports, which in the turning of the drum serve to bring each compartment alternately into communication with the supply and delivery passages and being held in contact with each other by a spring acting on the drum to press it toward the stationary seat. As an improvement upon such valve I propose to construct the same with two valve-seats, one of which is attached to and turns with the drum and the other of which is non-rotative, but which is movably connected with the case by flexible connections, so that it may be moved toward or from the valve-seat on the drum in the direction of the axis of the latter, while at the same time it is free to adjust itself into perfect parallelism with said seat. In connection with the valve-seats thus arranged a spring is employed, which acts on the non-rotative and flexibly-connected valve-seat to press or hold the same in contact with the one on the drum. This construction has the advantage of always maintaining the contact-surfaces of the valve-seats in close and perfect contact with each other, notwithstanding inaccuracies of construction or wear of the parts.

The present invention also embraces other features of construction in gas-meters of the character referred to, as will hereinafter fully appear.

In the accompanying drawings, illustrating my invention, Figure 1 is a view in vertical section through one end of the casing of a meter embodying my invention, taken on line 1 1 of Fig. 2 and showing the drum partly in end elevation and partly in central section. Fig. 2 is a plan section through the case and drum, taken on line 2 2 of Fig. 1. Fig. 3 is a central vertical section through the case, showing the drum in side elevation. Fig. 4 is an enlarged sectional view of the valve and inlet and outlet pipes connected therewith, taken on line 4 4 of Fig. 3. Fig. 5 is a face view of the non-rotative valve-seat. Fig. 6 is a face view of the rotary valve-seat, which is attached to the drum. Fig. 7 is a section taken through the non-rotative valve-seat, taken on line 7 7 of Fig. 4.

In said drawings, A indicates an outer inclosure, case, or housing, and B a revolving measuring-drum, which is mounted to turn on a horizontal axis within the casing A. The case A may be made of any suitable shape, and is made of proper size to allow the drum to turn freely therein. As herein shown, said case A is made in two parts, the upper one forming a cap, which is detachably secured to the lower part in any suitable manner and which is removable for the purpose of obtaining access to the interior mechanism for the purpose of inspection, adjustment, or repairs. The said drum B is provided with a plurality of compartments, each having a movable wall or diaphragm C, adapted to be expanded or thrust outwardly by the pressure of gas within the compartment and to be forced inwardly by mechanical means to expel the gas from the compartment. The drum may have any desired number of compartments and a corresponding number of movable walls or diaphragms.

The drum is revolubly supported within the casing by means of a central shaft B′, which passes through the drum and projects beyond the ends of the same to form trunnions *b b′*. The trunnion *b′* engages a bearing *a* in one end wall of the case, while the trunnion *b* is provided with a bearing-recess b^2, which recess is engaged by the inner end of an axially-arranged bearing-stud *a′*, the outer end of which is screw-threaded and inserted in a socket a^2 in the opposite end wall of the case. Said stud *a′* is shown as having a collar or flange a^3, having flat faces for the application of a wrench, by which it may be turned. The bearing receiving the shaft is made so deep that the stud *a′* may be slipped into the same to permit the insertion of the opposite trunnion *b* into its bearing by an endwise movement of the drum, the stud being then slid outwardly and screwed into the socket a^2 in an obvious manner.

Referring now to the particular features of construction in the drum B, as herein shown, said drum has the form of a regular polygon and is provided with two square end walls arranged perpendicular to the axis of the drum, and between which extend radially-arranged partition-walls B^2, Fig. 1, which terminate at their outer ends at the angles of the drum, said walls forming the four compartments thereof. The four sides or faces of the drum are formed by the flexible walls or diaphragms C of the compartments. Said movable walls or diaphragms are formed of leather or other suitable flexible material which is impervious to gas and not liable to be injuriously acted upon by it, together with metal plates D, so arranged in connection with the flexible material that they may be

moved freely inward and outward to afford suitable expansion and contraction of the compartments. As herein shown, two of such metal plates D are used in connection with each diaphragm, and the outer edges of said plates are arranged parallel with the outer margins of the partition-walls B^2, so that the inner margins of the plates are free to move outwardly and inwardly. The flexible parts of the diaphragms C are secured at their margins to rectangular frames *c*, attached to the end walls of the drum and to the partitions B^2, and are made sufficiently full to enable them to be thrust inwardly until adjacent to the said radial partitions, so that approximately all of the gas may be forced from the compartment, and to be correspondingly forced outward to give a large capacity in the compartments when the latter are filled with gas.

The plates D may be secured by rivets or otherwise to the flexible parts of the diaphragms, as heretofore common, or they may be unattached thereto or independent thereof and rest against the outer surfaces of said flexible parts, as set forth in said application of March 27, 1896. The flexible connections thus made permit the plates D to move or swing outwardly under the pressure of gas entering the compartments and to be pressed or forced inwardly for the purpose of expelling the contained gas from the said compartments.

In connection with the diaphragms and plates, arranged as described, yokes or frames E are arranged to connect the plates at one side of the drum with those on the opposite side thereof. Said frames E extend around the ends and sides of the drum and are made sufficiently larger than the drum to stand at a short distance away from its outer surface. Two of said frames E are shown as used in connection with each pair of opposite diaphragms, each frame being connected with two opposite plates D. The said frames E are each made in two pieces, which are joined at their parts, which extend across the heads of the drum by means of adjustable connecting-pieces E′, herein shown as having the form of oppositely-screw-threaded nuts or turnbuckles. The frames E may be connected with the plates D in any suitable manner, the same being herein shown as connected by links *c′ c′* with lugs *d d* on the outer faces of the plates.

The pair of plates D on each side of the drums being engaged with the two frames E, it follows that when the plates on one wall are expanded by the interior pressure of the gas flowing into the compartment beneath it those on the opposite wall will be to an equal extent forced inward by the action of the said frames.

The adjustable connecting-pieces E′ enable the length of the side pieces of the frame to be changed, with the result of varying the extent to which the diaphragms of the compartments at the rising side of the drum are drawn inward and consequently varying the quantity of gas expelled from the compartments in the operation of the meter. By the use of such adjusting connections, therefore, the capacity of the drum may be accurately regulated to correspond with the quantity which the indicating apparatus is constructed to show as the quantity measured.

Gas is supplied to the meter by means of a supply-pipe F and is carried therefrom to the place where it is used by a delivery-pipe F′. Said pipes are attached to the end wall of the case A and communicate with the drum through the medium of two intermediate inlet and outlet pipes G G′, which lead to the valve by which the passage of the gas to and its exit from the compartments of the chamber is controlled. In connection with the said drum B, revolubly mounted as described, is employed a valve consisting of a non-rotative valve-seat H, which is mounted on the end wall of the case, and a rotary valve-seat I, which is affixed to and turns with the drum, said valve-seats being arranged concentrically with respect to the axis of rotation of the said drum. The non-rotating valve-seat H has a central orifice h^3, through which passes the end portion *b* of the shaft B′ of the drum, said valve-seat being free from contact with the said shaft, so that it may move freely with respect to the drum. Said seat H, moreover, is movably supported or connected with the case by connections permitting universal movement of the said seat, and the seat is held or pressed against the rotary seat I on the drum by a suitably-applied spring, herein shown as having the form of a coiled spring J, surrounding the end portion *b* of the shaft B′ between the outer face of the valve-seat and the wall of the case.

In connection with the movably-supported valve-seat H, I provide connections between the connecting-pipes G G′ and the supply and discharge pipes F F′, so arranged as to permit the seat to move freely without interfering with the passage of gas to and from the valve. Such connections may be made in several ways, but as a desirable way of constructing such connections I so construct said pipes G G′ that they constitute the support by which the seat H is supported from the wall of the case, and I form a movable or yielding connection between said pipes and the said wall by means of flexible diaphragms K K′, which are secured over openings a^4 a^5 in the wall and in which the outer ends of said pipes are secured. In connection with the diaphragms thus arranged the supply and delivery pipes F F′ are attached to the outer walls of two connected compartments, as L L′, which are attached to the wall of the case around or outside of said diaphragms, so as to avoid possibility of escape of gas should the diaphragm leak. Said boxes are shown as cast in one piece and separated by a dividing wall or partition.

As a simple and desirable way of constructing and attaching said diaphragms, the latter are shown as made of pieces of leather or the like, which are placed over the openings a^4 a^5 and secured to the wall of the case around said openings by means of rings M M′, secured to the wall over the said leather by bolts, screws, or rivets, so as to firmly hold or clamp the margins of the same. The pipes G G′ are shown as secured to the diaphragms K K′ by means of collars g g and nuts g' g' on said pipes, between which collars and nuts the edges of the diaphragms are firmly clamped.

In the face of the valve-seat H are formed two ports h h', which communicate with the pipes G G′, and in the rotary valve-seat I are formed four ports i i' i^2 i^3, which communicate severally with the compartments of the drum. Said valve-seats H and I are shown as having flat contact-faces.

The ports h h' are located at opposite sides of a vertical line passing through the center of the valve-seat H and are so arranged that the compartments at the descending side of the drum will always be in communication with the supply-pipe, while those at the ascending side will be in communication with the delivery-pipe. The said ports h h' of the non-rotating seat are made of a length circumferentially which is greater than the distance between the two adjacent ports of the rotating seat, and it follows from this construction that gas will begin to enter each of the compartments of the drum before it is cut off from the adjacent one in advance of it, and will similarly continue to flow from each of the compartments before it ceases to flow from the adjacent one in advance of it. This construction therefore insures uninterrupted and uniform flow of gas through the apparatus regardless of variations of pressure or quantity used.

The entering gas expands the compartments of the descending side by forcing the diaphragms outwardly into convex form, while the gas is expelled from the compartments at the rising side of the drum by the forcing inwardly of the diaphragm-plates at the rising side of the drum, as clearly seen in Fig. 3, the rotation of the drum being caused by the disturbance of the balance caused by such shifting of the plates, as before described. It follows from the above that each compartment will successively be filled and exhausted, the same being filled as it is descending at one side of the drum when its port coincides with the inlet-port h and being emptied when at the rising side of the drum when its port coincides with the exit-port h'.

By the arrangement of the pipes G and G′, connecting the valve with the inlet and outlet passages, the gas is carried through the outer casing from the supply-pipe to the drum, and thence to the delivery-pipe without communication with the space between the case and the drum. As a result of this construction, if one of the diaphragms leaks or is ruptured, the escaping gas will not be free to flow outwardly through the delivery-pipe, but will be confined in the case and reach a pressure outside of the drum practically equal to that of the entering gas inside the same, with the result of establishing an equilibrium of pressure and stopping the rotation of the drum. Loss of gas by the flow thereof from the ruptured compartment through the case and delivery-pipe to the burners will thus be prevented in case of such leakage or rupture of a diaphragm. The ports F and F′ are, moreover, so arranged that they will supply gas to and permit its exit from each compartment during the time the same is descending and until it reaches a point at which its diaphragm is so far below the level of the axis of the drum that it will tend to open or move outwardly by the action of gravity. For this purpose the said ports are extended through somewhat more than a quarter of a circle, Fig. 4, so that the gas will continue to flow into each descending compartment until such compartment reaches a point nearly beneath the axle.

The amount of gas passing through the meter is indicated by means of a suitable registering mechanism M^2, operated by gearing connected with the shaft B′ of the drum in an obvious manner.

An important and valuable result secured by the arrangement of the ports last referred to is that the full expansion of the compartments necessary for completely filling the port occurs when the weight of the movable diaphragms at the descending side, as well as the opposite ones at the ascending side, together with that of the movable parts which are employed to connect the diaphragms with each other, is acting in a direction to force outwardly the diaphragms of the compartment being filled and to force inwardly that compartment from which the gas is being expelled, as fully set forth in said prior application hereinbefore referred to.

To relieve the diaphragm from the full force of pressure of the gas passing through the drum, I propose to maintain a body of gas in the space between the drum and casing, said body of gas being at a pressure less than that in the supply-pipe, and to conveniently attain this end I provide an orifice or passage leading from the delivery or exhaust side of the drum to the space within the outer case, which orifice is opened intermittingly instead of constantly. I have provided a port or passage J′, leading to the interior of one of the compartments, near the margin of the rotating valve-seat I, and in the stationary or non-rotating valve-seat H a corresponding small port K^2, said ports J′ and K^2 being arranged to coincide with each other once at each revolution of the drum, and thereby acting to bring the outer case periodically into communication with the discharge side of the drum. It will of course be understood that if the supply of gas afforded by such ports be

too small to maintain a pressure in the case equal to that in the discharge-passage, or practically so, the ports may be made larger than those shown, or a greater number of ports may be made in the drum.

The inlet and outlet pipes G G′, arranged as described, serve to conduct the gas from the supply-pipe to the valve and from the latter to the delivery-pipe, so that the gas supply and exit passages are kept separate from the interior space of the outer case A. At the same time the said space is periodically brought into communication with the compartment which is in connection with the outlet-passage or delivery-pipe by the ports J′ and K^2, as described, so that a pressure is maintained in the outer case equal to that in said delivery-pipe. As a result of this construction a pressure is maintained on the outer surfaces of the diaphragms equal to that in said delivery-pipe, so that the internal pressure thereon is counterbalanced to the extent of the external pressure, and excessive strain on the diaphragms and other working parts is avoided, as more fully pointed out in said prior application for patent, Serial No. 597,786, filed July 1, 1896, renewed November 15, 1896. By connecting the case with the delivery side of the drum through an intermittingly-opening part, which has small capacity for the passage of gas, the pressure in the closed outer case is kept uniform without affording a passage for the escape of gas from the case to the delivery-pipe in any considerable quantity in case of a rupture of or leakage in one of the diaphragms, it being obvious that the opening afforded for the passage of gas to the delivery-pipe by the parts arranged as described, or even by a minute hole which is always open, would not be sufficient to permit gas to escape in quantities large enough to supply even a single burner. It follows that no material loss of gas could result from the breakage of a diaphragm or extensive leakage thereof, because the amount of gas which would escape from the case to the delivery-pipe under such circumstances would be trifling. Moreover, by reason of the increase of pressure on the outside of the drum the internal pressure would be balanced and the diaphragm would no longer be moved outwardly by the incoming gas, so that the drum would cease to revolve, and it would be necessary to repair the meter before it would again permit the passage to the delivery-pipe of enough gas to be of any benefit to the user. In case of leakage or rupture of the drum, therefore, there would be no waste of gas, and the consumer would be obliged to see that the meter was repaired before he could procure a supply sufficient for any practical use.

There is liability that hard particles may sometimes reach the contact-faces of the rotary valves, such as herein shown, it having been found that particles thus lodging between the valve-faces are more likely to remain between such surfaces and interfere with the action of the valve in case of a rotating than in that of a reciprocating valve, because in the turning of the valve any such particle will tend to move continuously in a circular path.

As an improved construction in rotary valves for gas-meters intended to avoid the objection stated I propose to cut away the valve-faces in such manner as not to interfere with the operation of the ports, but at the same time in such manner that no single point on either valve-face shall remain constantly in contact with the other face during a complete rotation of the movable part. This construction is illustrated as applied to the central portion of the valve shown, or that inside of the outer parts which contain the ports J′ and K^2, by providing recesses h^4 h^5 in the non-rotating seat H, of which the recesses h^4 form radial inward and outward extensions of the ports h h', and the recesses h^5 are located in flat face of the stationary seat between the ends of said ports. Said recesses h^4 h^5 overlap each other radially, so that all of the parts of the opposing valve-seat embraced within the area covered by said recesses will at certain periods come opposite the said recesses. As a result of this construction any particles of dirt caught in the valve-faces will finally reach one of the recesses and will be caught and carried along by the edge of the moving valve at the rear of the recess, this construction giving the same result, as far as the automatic or self-cleaning action of the valve is concerned, as is obtained in the use of a reciprocating valve which acts to alternately cover and uncover one of the valve-faces. I have shown the recesses referred to as located in the stationary part H of the valve-seat, but they may of course be similarly arranged in the rotating part of the seat.

Where a small port K^2 is employed, it is of course necessary that the valve-seat should be made continuous to prevent the opening of the port J′, except when the port K^2 coincides therewith. It is practicable, however, to omit said port K^2 and extend the recesses h^5 outwardly to the margin of the valve-face, in which case said recesses will perform the function of said port K^2. In such case, however, it will usually be necessary to make the recesses h^5 narrower than shown in the drawings, in order to prevent the port J′ from remaining open for too great a length of time. The construction last suggested is indicated by dotted lines in Fig. 5.

Provision is made for the drainage of water of condensation from the compartments by making the shaft which supports the drum tapering where it passes through the same, so that any water within the compartments will, when the same are at the upper part of the drum, flow along the inclined bottom of the compartments formed by said shaft and pass through the ports into a suitable receptacle connected with the delivery-pipe, from

which it may be drawn as often as is necessary.

I claim as my invention—

1. A gas-meter comprising a revoluble drum provided with a plurality of compartments having flexible walls or diaphragms, a closed casing surrounding the drum, means acting on the diaphragms at the rising side of the drum to force said diaphragms inward, and a valve operated by the turning of the drum, said valve comprising two valve-seats arranged concentrically with the axis of the drum, one of said valve-seats being attached to one end of the drum to turn with the same and provided with a series of annularly-arranged parts each of which communicates with one compartment of the drum, the other valve-seat being supported upon the wall of the casing to bear against the valve-seat on the drum and provided with a series of annularly-arranged gas supply and discharge parts coöperating with those of the rotating seat, and of such length as to establish communication with two parts of the moving valve-seat at a time, substantially as described.

2. A gas-meter comprising a revolving drum provided with a plurality of compartments having flexible walls or diaphragms, means acting on the diaphragms at the rising side of the drum to force said diaphragms inward, a valve operated by the turning of the drum acting to admit the flow of gas to and its exit from the said compartments in succession, an exterior closed case or inclosure surrounding the drum, the interior of said casing or inclosure being connected with the delivery side of the drum by a minute passage or orifice, and means operated by the turning of the drum for alternately closing and opening said minute passage or orifice, substantially as described.

3. A gas-meter comprising a revolving drum provided with a plurality of compartments having flexible walls or diaphragms, means acting on the diaphragms at the rising side of the drum to force said diaphragms inward, a valve operated by the turning of the drum acting to admit the flow of gas to and its exit from the said compartments in succession, an exterior closed case or inclosure surrounding the drum, the interior of said casing or inclosure being connected with the delivery side of the drum by a minute passage or orifice, said passage or orifice being formed by means of ports in the stationary and movable parts of the main valve whereby the same is intermittingly opened in the turning of the drum, substantially as described.

4. A gas-meter comprising a revoluble drum provided with a plurality of compartments having flexible walls or diaphragms, a valve actuated by the turning of the drum and acting to bring the compartments successively into connection with inlet and outlet passages, and means connecting the diaphragm on opposite sides of the drum embracing adjusting devices by which the quantity of gas passing through the respective compartments may be accurately regulated, substantially as described.

5. A gas-meter comprising a revoluble drum having the form of a regular polygon and having a plurality of compartments, the outer walls of which are formed by flexible diaphragms, a valve actuated by the turning of the drum and acting to bring the compartments successively into connection with inlet and outlet passages, and means for connecting the diaphragms on opposite sides of the drum comprising rigid frames having transverse connected parts which extend across the ends of the drum and are provided with adjustable connections by which their length may be changed to regulate the quantity of gas expelled from each compartment, substantially as described.

6. A gas-meter comprising a revoluble drum provided with a plurality of compartments having flexible walls or diaphragms, means acting on the diaphragms at the rising side of the drum to force said diaphragms inward, a valve comprising two valve-seats arranged concentrically with the axis of the drum, one of said valve-seats being attached to and turning with the drum and the other being non-rotative, inlet and outlet passages attached to the non-rotative seat and connected with supply-passages by flexible connections affording freedom of movement in the said non-rotative seat, and a spring applied to the non-rotative seat to hold said valve-seats in contact with each other, substantially as described.

7. A gas-meter comprising a revoluble drum provided with a plurality of compartments having flexible walls or diaphragms, a casing surrounding the drum, means acting on the diaphragms at the rising side of the drum to force the same inward, a valve comprising two valve-seats arranged concentrically with the axis of the drum, one of said valve-seats being attached to and turning with the drum and the other being non-rotative, supply and delivery pipes attached to the wall of said casing, inlet and outlet passages attached to the non-rotative valve-seat having communication with the said supply and delivery pipes and connected with the wall of the case by means of flexible diaphragms, and a spring applied to the non-rotative valve-seat to hold such valve-seats in contact with each other, substantially as described.

8. The combination with the revolving drum and exterior case of a valve consisting of a seat turning with the drum and a non-rotative seat, inlet and outlet passages attached to the non-rotative seat and passing through holes in the wall of the case, flexible diaphragms attached to the wall of the case around said holes and to the said passages, so as to movably support the non-rotating valve-seat, supply and delivery pipes attached to the wall of the casing outside of the last-named diaphragms and a spring act-

ing on the non-rotative valve-seat to hold the seats in contact with each other, substantially as described.

9. The combination with the revoluble drum, of a valve embracing a rotary valve-seat actuated by the drum, and a non-rotative valve-seat, arranged concentrically with each other, one of said seats having segmental recesses formed in its contact-face and overlapping each other radially to insure the removal of foreign particles from between the contact-faces, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 27th day of June, A. D. 1896.

ELIAS B. DE LA MATYR.

Witnesses:

AGAR LUDLOW PERKINS,

R. C. TALBOT PERKINS.