(No Model.) 2 Sheets—Sheet 1.

E. B. DE LA MATYR.

GAS METER.

No. 578,863. Patented Mar. 16, 1897.

Fig. 2.

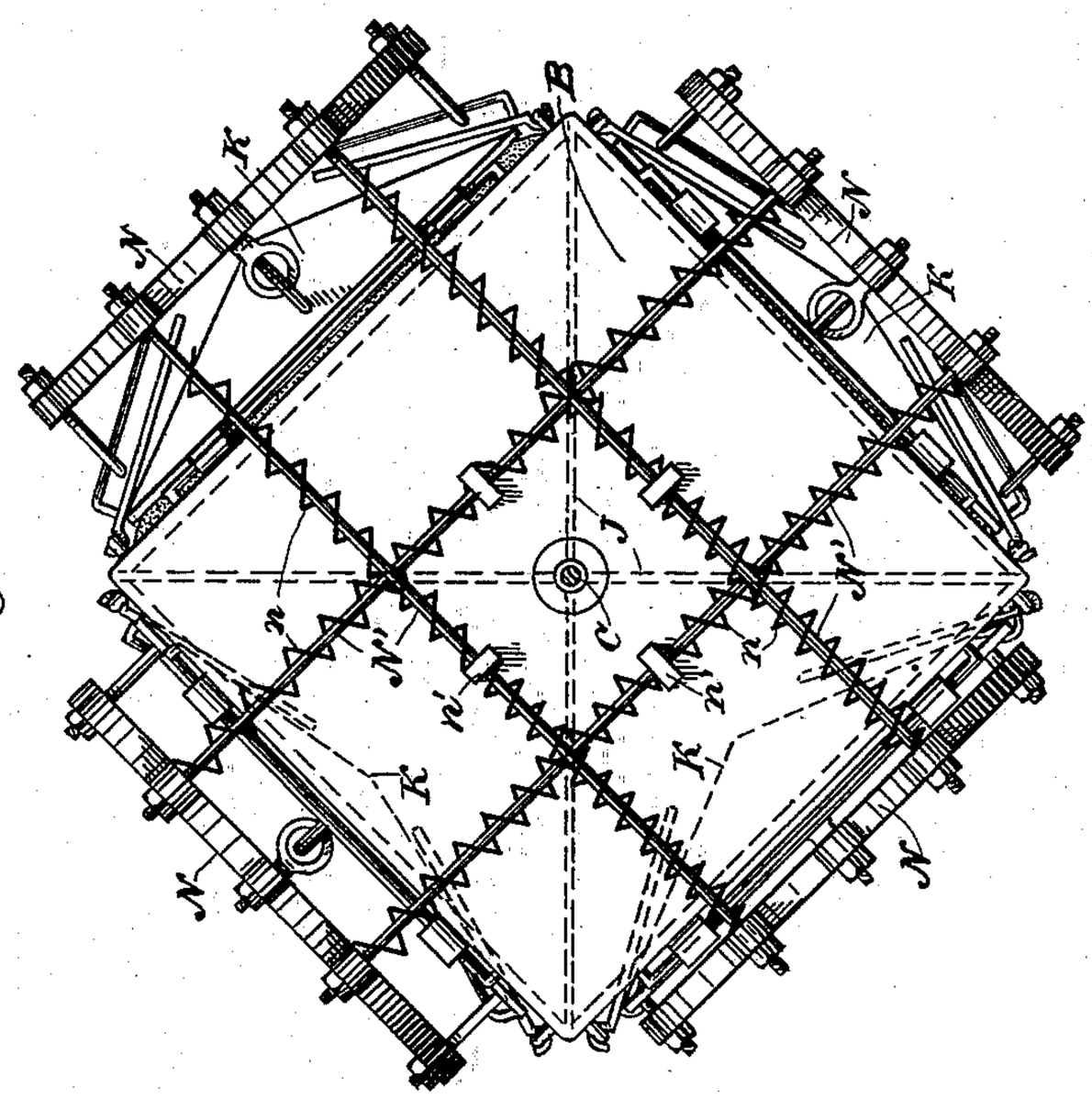
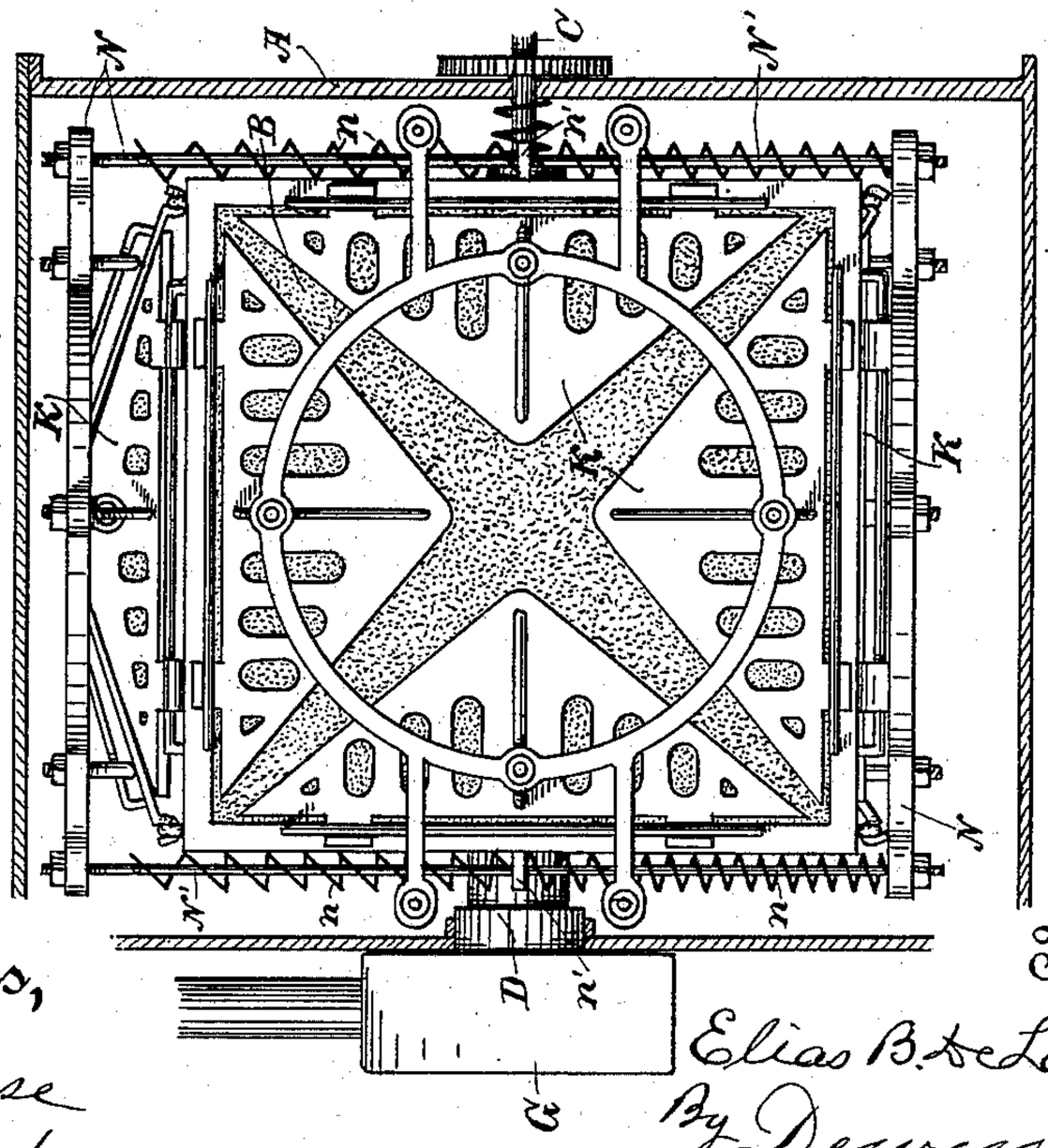


Fig. 1.



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H. F. Oscheck

Inventor
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By Dewey & Co. Attys

(No Model.) 2 Sheets—Sheet 2

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Fig. 3.

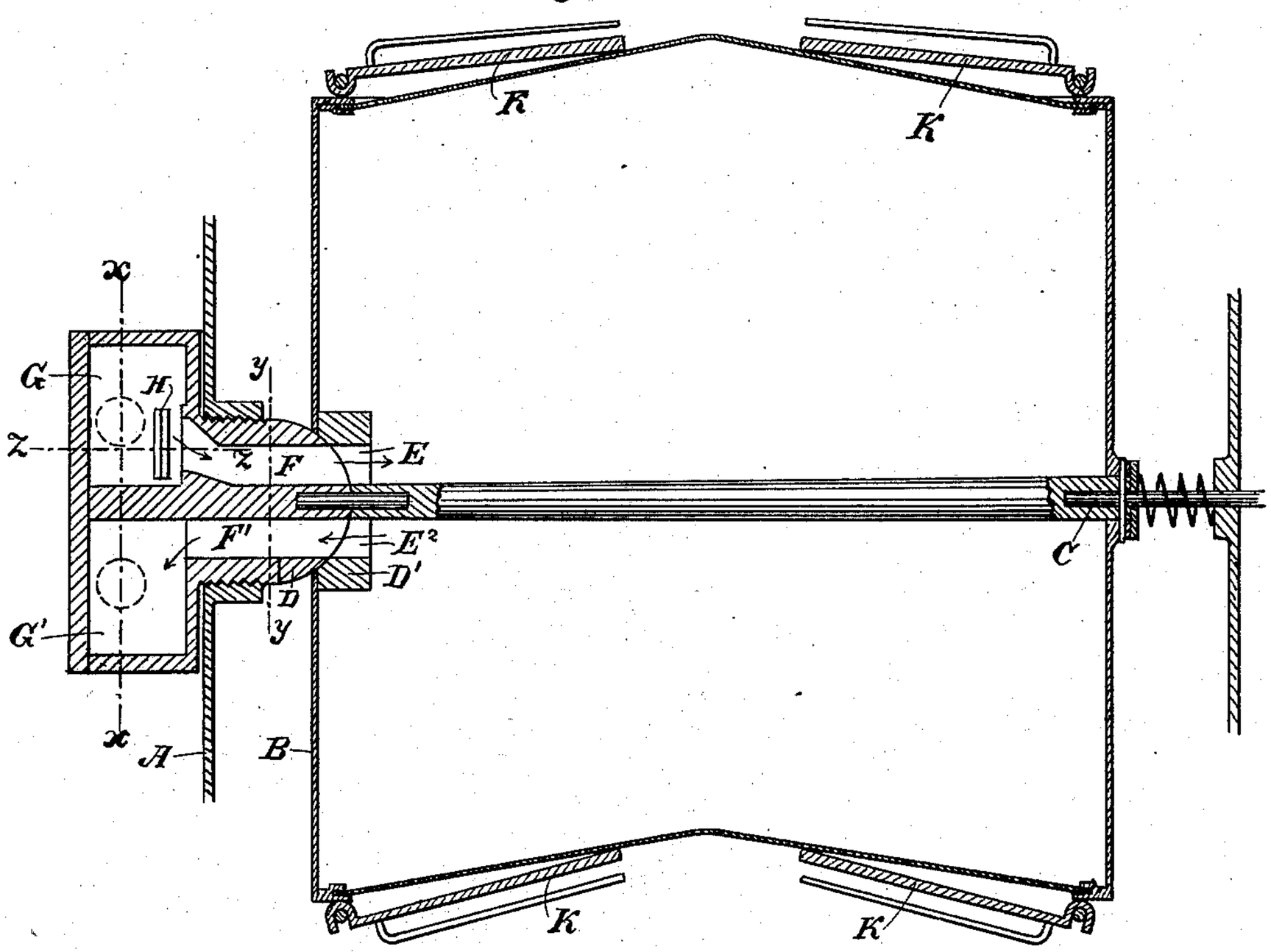


Fig. 4.

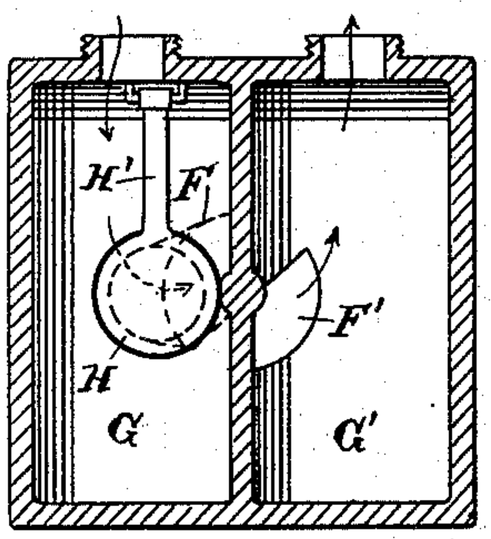


Fig. 5.

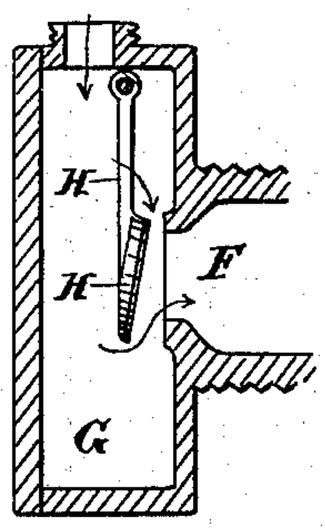


Fig. 6.

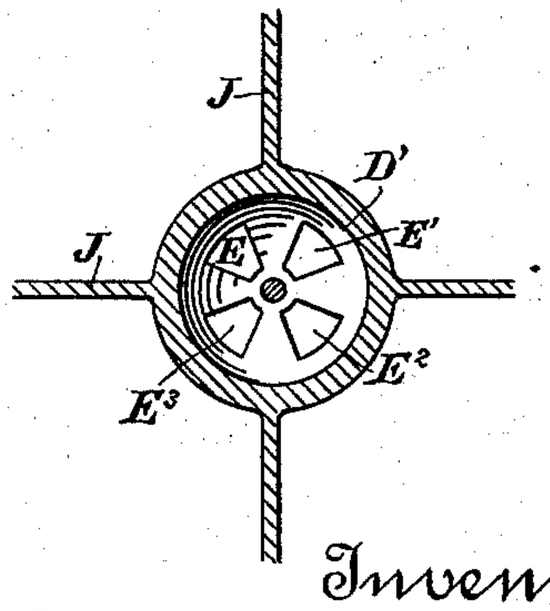
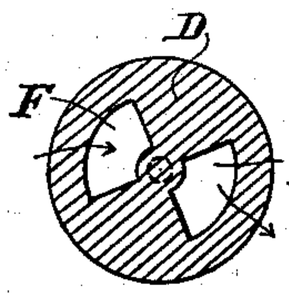


Fig. 7.



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Attys

UNITED STATES PATENT OFFICE.

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

GAS-METER.

SPECIFICATION forming part of Letters Patent No. 578,863, dated March 16, 1897.

Application filed March 27, 1896. Serial No. 585,048. (No model.)

To all whom it may concern:

Be it known that I, ELIAS B. DE LA MATYR, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Gas-Meters; and I hereby declare the following to be a full, clear, and exact description of the same.

My present invention relates to improvements in meters or gas-measuring apparatus of the kind set forth in a prior application for Letters Patent filed in the United States Patent Office November 15, 1895. The apparatus illustrated in that application 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 my said prior application the revolving drum is surrounded by a closed or air-tight inclosure or case, and the space between such case and the drum is in communication with the delivery or outlet passage of the drum, so that a pressure of gas is maintained in the space surrounding the drum practically equal to that in the delivery-pipe. The advantage of this construction is that the pressure of the gas within the compartments being filled is counterbalanced by the external pressure in the diaphragms of such compartments, thereby avoiding excessive pressure and strain on the diaphragms and working parts and insuring uniformity of action under varying pressures, as fully set forth in said prior application. In the apparatus illustrated in said prior application the necessary pressure is maintained in the case by arranging the exit-passage from the valve so that it discharges into the said case and by connecting the delivery-pipe with the case so that all of the gas passes through said case on its way to the delivery-pipe. A serious disadvantage attending the use of this particular construction is that if any escape of gas occurs by leakage of the diaphragms or rupture thereof the escaping gas passes to the delivery-pipe and is not measured. As a consequence in such case a loss results to the owners of the gas plant to the extent that the gas so escapes without being registered.

The valve illustrated in the prior application referred to is formed by means of a central tube extending through the drum and a stationary hollow axle in the case, said tube and axle 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. As an improvement upon such valve I propose to construct the same with two valve-seats, one of which turns with the drum and the other of which is stationary. Said valve-seats are arranged concentrically with the axis of the drum, and one of them is movable toward and from the other in the direction of the said axis. In connection with the valve-seats thus arranged a spring is employed which acts to press or hold the valve-seats in contact with each other. This construction has the advantage of always maintaining the valve-seats in close contact with each other, notwithstanding wear of the parts, and it also avoids the objectionable feature in the prior construction of having the weight of the drum carried on the valve-seats, it being obviously practicable in the new construction referred to to support the drum by small axles or pivots instead of upon a hollow axle, as in the prior construction, whereby frictional resistance to the turning of the drum is greatly lessened.

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

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, illustrating my invention, Figure 1 is a view in central vertical section through the casing of a meter embodying my invention, showing the drum in side elevation. Fig. 2 is a sectional view of the case, showing the drum in end elevation. Fig. 3 is a longitudinal sectional view through the meter. Fig. 4 is a sectional view through the outside chamber, taken on line *x x* of Fig. 3. Fig. 5 is a similar section taken on line *z z* of Fig. 3. Fig. 6 is a face view of the rotary valve. Fig. 7 is a section through the stationary valve-seat, taken on line *y y* of Fig. 3.

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 suitable 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 removable cap, which is detachably secured to the lower part in any suitable manner and which may be removed 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 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.

Gas is supplied to the drum by means of an inlet-passage F and escapes therefrom through an exit-passage F′. Said passages are connected with two chambers G G′, which are formed on the end wall of the case A. The chamber G is connected with the gas-supply pipe and forms the inlet-chamber. The chamber G′ is connected with the outlet or delivery pipe and forms the outlet-chamber. Said delivery-pipe leads to the burner or place where the gas is consumed. In connection with the said drum B, revolubly mounted, as described, is employed a valve consisting of a stationary valve-seat D, which is secured to the inner surface of the end wall of the case, and a rotary valve-seat D′, which is affixed to and turns with the drum.

The inlet and outlet passages F F′ lead from the chambers G G′ through the stationary valve-seat and terminate in ports in the inner face of said seat. In the rotary seat D′ are formed ports E E′ E^2 E^3, which communicate with the several compartments of the drum B. I have shown the stationary valve-seat D as made of convex form and the rotary seat D′ as correspondingly concaved; but this shape in said seats is not essential. By the rotation of said drum the valve operates to admit the gas to and permit its exit from the several compartments of the drum in succession as the latter revolves, the pressure of the entering gas from the supply-pipe serving to expand the compartments as they are successively brought into communication with the said supply-pipe, and the gas being expelled from the several compartments to the delivery-pipe by suitable operative connections by which the movable walls of the compartments are forced inwardly when the said compartments are in communication with the delivery-pipe. The drum is constantly turned by the gravity of the movable walls of the expanded compartments, which, being at a greater distance from the axis of the drum than those of the contracted ones, operate to carry the side of the drum at which the filled compartments are located downwardly, the said valve being so arranged that the compartment at the descending side of the drum will be in communication with the supply-pipe and those at the rising side of the drum will be connected with the delivery-pipe of the meter, as set forth in said prior application for patent. The amount of gas passing through the meter is indicated by means of a suitable registering mechanism operated by the revolving drum.

The drum is revolubly supported within the casing by means of a socket in the end of the drum remote from the valve, which socket is engaged by a short shaft C, affixed to the wall of the case. A similar shaft or stud, inserted in the centers of the valve-seats D and D′, serves to support the end of the drum at which the valve is located. A spring applied between the case and the end of the drum serves to hold the valve-seats in contact with each other with a spring or yielding pressure, thereby insuring constant contact and a tight joint between the seats, notwithstanding wear which may take place in said seats.

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 J, which terminate at their outer ends at the angles of the drum, the four sides or faces of the drum being formed by the flexible walls or diaphragms of the compartments. Said flexible walls or diaphragms are formed of leather or other suitable flexible material which is impervious to gas and least liable to be injuriously acted upon by it, together with metal plates K, 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, the metal plates K are made of triangular form, and their outer edges are arranged parallel with the outer margins of the com-

partment-walls and have hinged connection with the same, so that the inner margins of the plates are free to move outwardly and inwardly. The flexible parts of the diaphragms are secured at their margins to the end walls of the drum and to the partitions J and are made sufficiently full to enable them to be thrust inwardly until close to the partitions J, so as to force approximately all of the gas from the compartments and to be correspondingly forced outward when the compartments are filled with gas.

The plates K, instead of being secured by rivets or otherwise to the flexible parts of the diaphragms, as heretofore common, are unattached thereto or independent thereof, merely resting against the outer surfaces of said flexible parts. By this construction the making of rivet-holes in the flexible material is rendered unnecessary and a fruitful source of leakage avoided. The diaphragms thus made are more durable than those which are attached to the plates, and are also much more easily made. The flexible connections thus made permit the plates K to move 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. Each of the compartments thus inclosed by the end walls of the drum, the partitions J, and the flexible walls provided with said plates K is adapted to contain a certain quantity of gas when the said walls are forced outwardly or distended, and the gas so contained in the compartments is expelled therefrom when the plates are forced inwardly. The adjacent edges of said plates are adjacent to each other, but out of contact, so that by thrusting the plates inwardly to the fullest extent practically all of the gas may be expelled from the compartments.

In connection with the diaphragms and movable plates K, I propose to connect the plates at one side of the drum with those on the opposite side thereof by rectangular yokes or frames N, which extend around the ends and sides of the drum B, and are made sufficiently larger than the drum to stand at a short distance away from its outer surface. Two of said frames are shown as used in connection with each pair of opposite diaphragms, and the opposite longitudinally-arranged parts of said frames, which extend over the sides of the drum, are connected by means of side rods N′, which slide in guides on the end walls of the drum. The frames N may be connected with the plates K, if desired, but they are herein shown as arranged to merely bear against the outer faces of the plates. All of the plates K on each side of the drum being engaged with the two frames N, 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 displacement of weight with relation to the center of motion caused by the forcing out of the plates forming the side which is being expanded and the drawing in of the plates forming the opposite one which is being contracted causes the drum to continuously rotate, as before stated.

By reason of the arrangement of the ports F F′ and E E′ E^2 E^3 described one or more of the ports of the rotating valve-seat on the drum will always be opposite the supply and exit ports F F′ of the stationary valve-seat, so that the gas will flow constantly from the inlet-chamber G to the compartments at the descending side of the drum and also from the compartments at the rising side of the drum into the chamber G′ and thence to the delivery-pipe. As before explained 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 plates K 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 F and being emptied when at the rising side of the drum when its port coincides with the exit-port F′. The said ports F F′ are made of a length circumferentially which is greater than the distance between the two adjacent ports of the rotating valve-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 a continuous, uninterrupted, and uniform flow of gas through the apparatus, regardless of variations of pressure or quantity used.

As another important feature of construction in the valve, the ports F and F′ are 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 each through somewhat more than a quarter of a circle at one side of the valve-seat, Fig. 4, so that the gas will continue to flow into each descending compartment until such compartment reaches a point nearly beneath the axle.

An important and valuable result secured by the arrangement of the ports last above referred to is that the full expansion of the

compartments necessary for completely filling the same 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.

I have shown as applied to the frames N springs *n*, arranged to act against said frames at each side of the drum in a manner to force or move the same outwardly. Said springs are herein shown as made of coiled form and arranged to surround the rods N′ of the frames N between the guide projections *n′* and the ends of said frames N. Said springs are so arranged that when the diaphragms are thrust inwardly by the movement of the frames toward the drum the springs will be slightly compressed after the diaphragms have been moved inwardly to a certain point, said springs being thereby placed under compression when the diaphragms are flexed inwardly, so that, as they are moved outwardly, the springs will act to assist the gas-pressure within the compartments in giving motion to the same. The springs are so arranged that when the diaphragms are approximately equidistant from the center of the drum the springs will be under no tension and will not act in either direction. The pressure of the springs applied as described tends to aid in starting the diaphragms and counterbalances to a certain extent the weight of the moving parts, which need to be lifted at the beginning of the filling operation by reason of the position of the diaphragms at that particular time. Said springs may be so adjusted as to aid in moving the diaphragms and plates as the compartment being filled descends until the diaphragm reaches a horizontal line and thereby passes the point where any lifting is required. It is of course understood that after the diaphragms reach a line passing horizontally through the axis of the drum their weight tends to aid in expanding them and no further lifting power is required. By this arrangement of the springs, therefore, the actuation of the diaphragms may be greatly aided, because the springs will operate to lift them at the time the action of the gas in expanding is opposed by gravity while their weight will aid the gas-pressure as soon as the diaphragms reach the position where their gravity will tend to move them outward. It will of course be understood that the compression of the springs will take place at the time when the full weight of the diaphragms and frames is exerted for this purpose, namely, when the compartments being filled are at the lowest point of the descending side of the drum.

In order to prevent any tampering with the apparatus by tilting it, so that the valve-faces will be separated from each other and allow the gas to flow through the meter without turning the drum and registering, I have shown a pendulum valve H, which is sustained by a rod or link H′, so that when the meter stands on its proper level this valve will lie a short distance away from the inlet-opening, and if the meter should be tilted for the purpose of separating the faces of the inlet-valve the pendulum will swing, so that the valve H will entirely close the inlet and prevent any flow of gas while the meter is in its tilted position.

As there is always a slight condensation of moisture from the gas and deposit of the same upon the walls of the compartments, I have made provision 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 compartment formed by said shaft and pass through the ports into one of the chambers G or G′, from which it may be drawn as often as necessary. This construction prevents objectionable accumulation of moisture within the compartments of the drum.

An important feature of my invention is embraced in the construction by which the valve-seats are arranged concentrically with the axis of rotation of the drum and one of which is movable toward and from the other in connection with a spring acting to hold the said parts of the valve in contact with each other. This construction has the important advantage that the weight of the drum itself is not carried by or upon the contact-faces of the valve-seat, but, on the contrary, is supported solely by the pivots or journals of the drum, so that wear of the valve-faces by reason of the weight of the drum coming thereon is avoided. Moreover, the employment of a spring arranged as described insures that the valve-seats shall always be held in contact, notwithstanding the wear of the same arising from long use, thereby preventing the possibility of leakage at the valves by reason of such wear.

I claim as my invention—

1. 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 operated by the turning of the drum and constructed to admit the flow of gas to and its exit from two of the adjacent compartments simultaneously, said valve comprising two valve-seats arranged concentrically with the axis of the drum, one of which valve-seats is attached to and turns with the drum and the other of which is non-rotative and a spring acting in the direction of the axis of the drum and operating to hold said valve-seats in contact with each other, where-

by said valve remains tight notwithstanding wear in the valve-seats, substantially as described.

2. 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 actuated by the turning of the drum and operating to admit the gas to and permit its exit from said compartments in succession and springs applied to act on the said diaphragms to aid in the expanding of the same, substantially as described.

3. 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 operating to admit gas to and permit its exit from the said compartments in succession, frames engaging the diaphragms at opposite sides of the drum and springs acting on said frames, in a direction to move the diaphragms outwardly, substantially as described.

4. In a meter, a revoluble expansible compartment-drum inlet and outlet ports to each compartment and main inlet and outlet passages so disposed that the revolution of the drum brings each compartment alternately into communication with the main inlet and outlet passages and a swinging pendulum valve suspended in front of the inlet-passage so as to close it if the apparatus be tilted to one side.

5. In a meter a revoluble expansible compartment-drum, inlet and outlet ports to each compartment, main inlet and outlet passages so disposed that the revolution of the drum brings each compartment alternately into communication with the main inlet and outlet passages, a valve consisting of a stationary face having ports communicating respectively with the main inlet and outlet passages and a movable face carried by the drum and having ports connecting with each of the compartments thereof, a shaft with inclined sides extending through the center of the drum and having connection with the exit-passage through the valve-faces whereby any water of condensation will follow the inclined surface of the shaft and be discharged through said opening.

In witness whereof I have hereunto set my hand.

ELIAS B. DE LA MATYR.

Witnesses:
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JESSIE C. BRODIE.