No. 721,026. PATENTED FEB. 17, 1903.

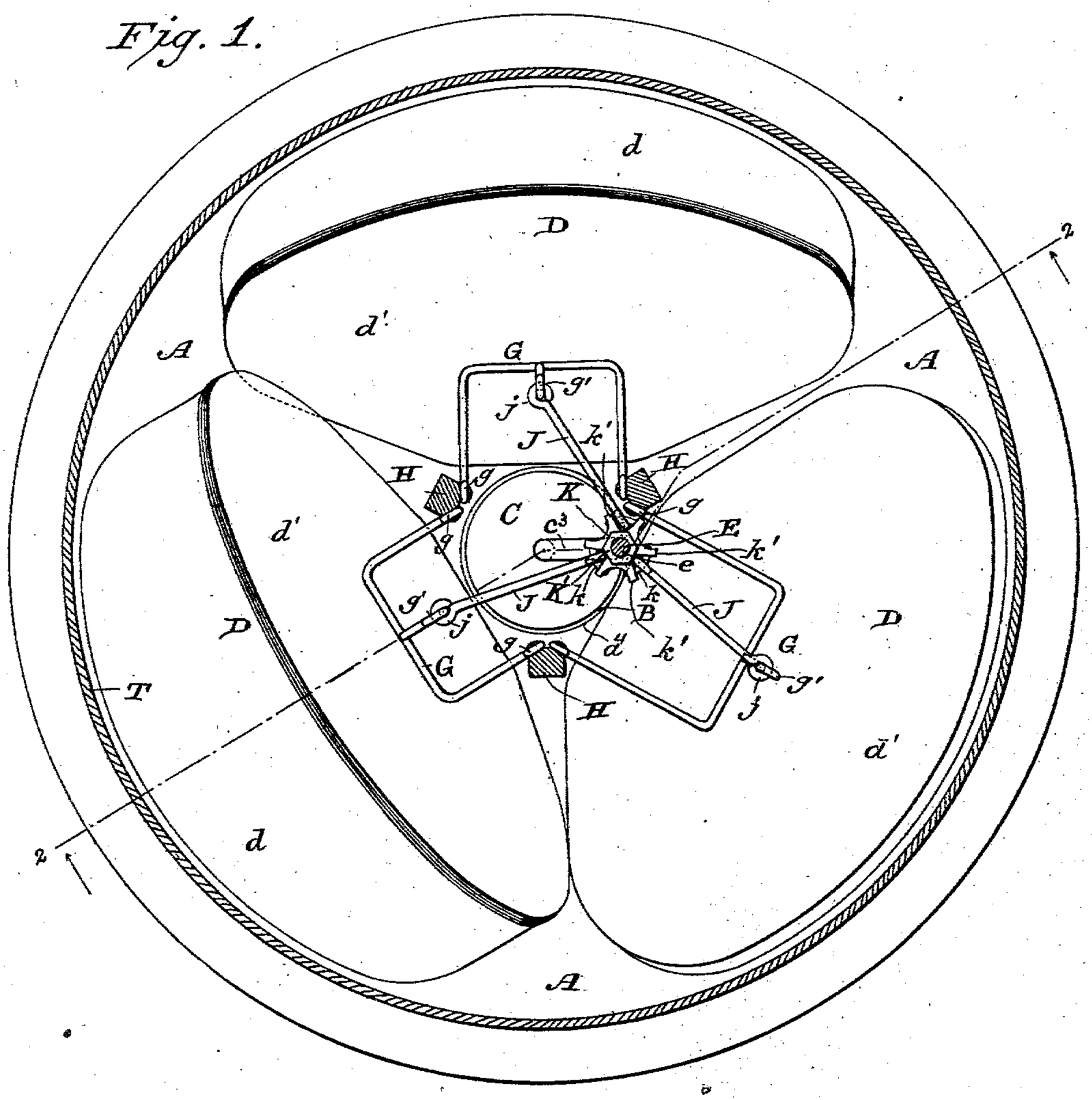
J. W. CULMER.

GAS METER.

APPLICATION FILED DEC. 26, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Wm. A. Skinkle

E. B. Gilchrist

INVENTOR:

John W. Culmer,

by his attorneys

Thurston & Bates

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

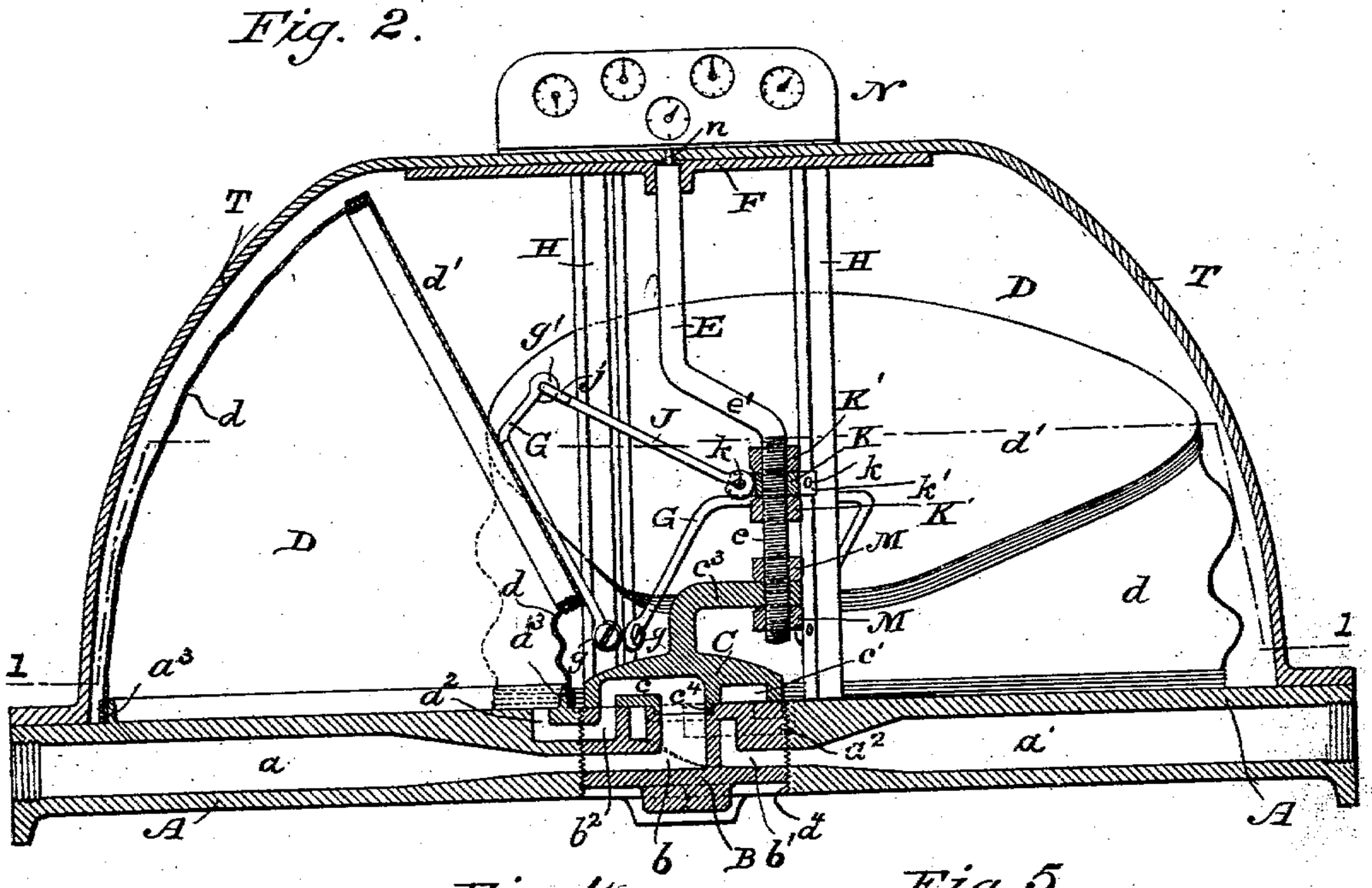


Fig. 4.

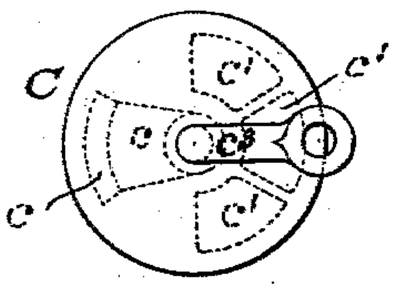


Fig. 5.

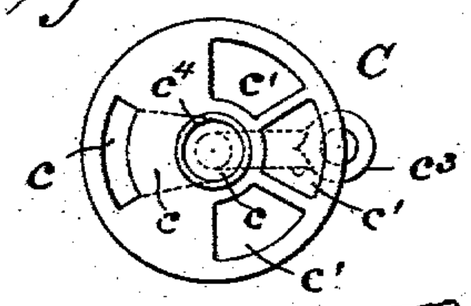
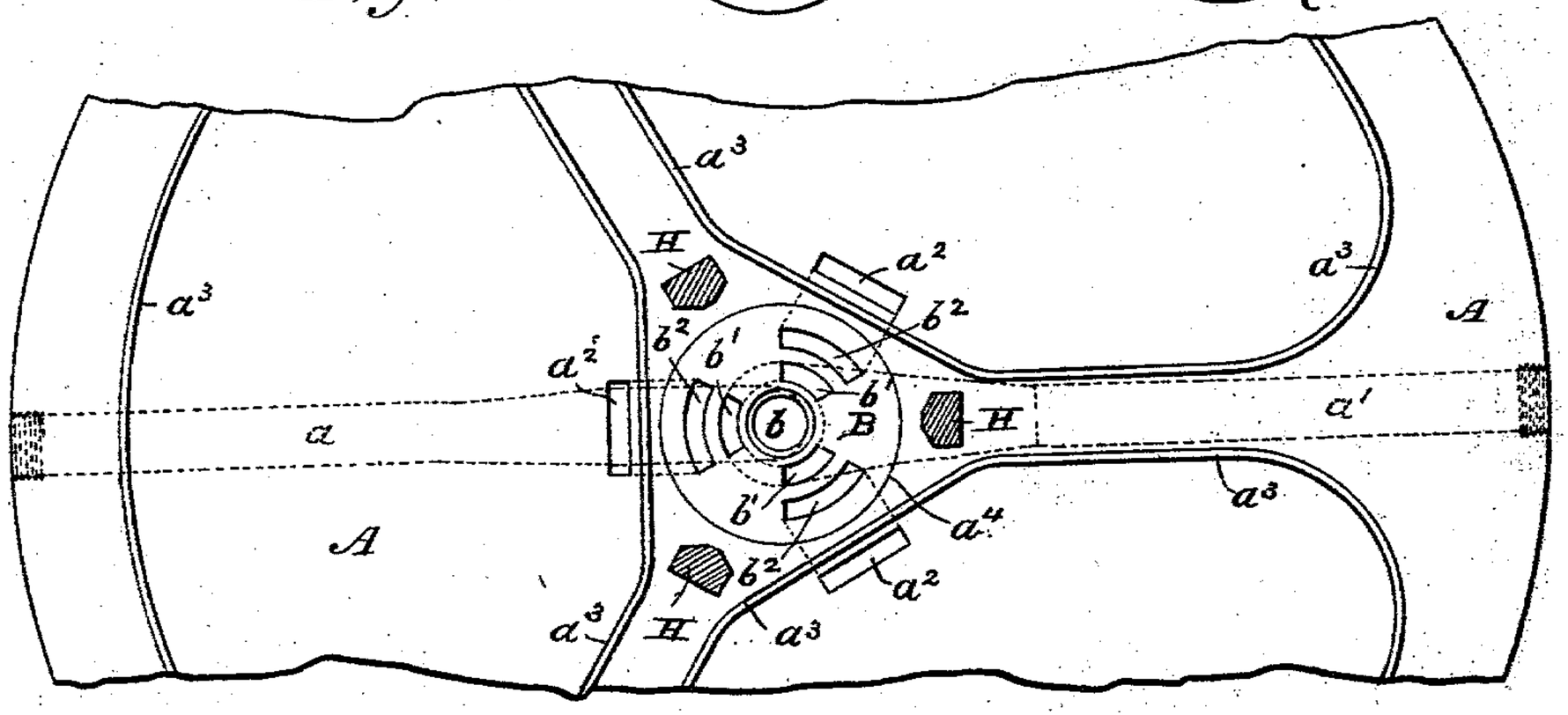


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN W. CULMER, OF CLEVELAND, OHIO, ASSIGNOR TO EDGAR M. MOORE, OF ALLEGHENY, PENNSYLVANIA.

GAS-METER.

SPECIFICATION forming part of Letters Patent No. 721,026, dated February 17, 1903.

Application filed December 26, 1901. Serial No. 87,168. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. CULMER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Gas-Meters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The invention relates to mechanism for measuring the volume of gas passing through it, the object being to provide a cheap, simple, and efficient mechanism adapted for the purpose stated.

The invention consists of a rotatable crank-shaft, a plurality of radially-positioned collapsible chambers adapted to be successively connected with a common inlet and a common outlet, a valve operatively connected with said crank-shaft for effecting said connections, and mechanism intermediate of said crank-shaft and collapsible chambers whereby the filling of any chamber or chambers connected with the inlet causes the rotation of the crank-shaft, and the rotation of said crank-shaft causes the collapsing of the chamber or chambers which are connected with the outlet.

It also consists in the more specific combinations of parts, including specific mechanisms and features of construction, which increase the practical efficiency of the device, as shown, described, and definitely set forth in the claims.

In the drawings, Figure 1 is a plan view of my improved meter with the cover, crank, and standards sectioned horizontally in about the plane indicated by the line 1 1 of Fig. 2. Fig. 2 is a sectional elevation in the plane indicated by line 2 2 of Fig. 1. Fig. 3 is a plan view of the base of the device. Fig. 4 is a top plan view of the rotating valve, and Fig. 5 is a bottom view thereof.

Referring to the parts by letters, A represents the base of the device. It has a threaded vertical recess a^4, into which the cored valve-seat B is fitted, and it has also an inlet-port a and an outlet-port a', the inner ends of which two ports open into the valve-seat recess referred to. On the top surface of this plate are the endless raised flanges a^3, each of which is provided for the attachment of the lower end of a collapsible bellows d. In this plate are also a plurality of curved ports a^2, extending from the top of the plate to the valve-seat recess. There must be as many of these ports a^2 as there are collapsible chambers, and their upper ends are respectively within the space bounded by one of said flanges a^3. In the example of the invention shown there are three of these flanges a^3 and associated collapsible chambers, and therefore three of said ports a^2.

B represents a valve-seat fitted in the valve-seat recess in the base. It contains one port b, extending centrally down from the top of the valve-seat and then laterally into communication with the inlet-port a. It contains also a plurality of ports b', extending down from the top of said valve-seat, all joined at their lower ends and communicating with the outlet-port a'. It also contains a plurality of curved ports b^2, extending down from the top of the valve-seat and laterally, so as to communicate with the lower ends of ports a^2.

C represents a rotatable valve resting upon the valve-seat and prevented from moving otherwise than rotatably about a vertical axis by an axial cylindrical projection c^4, which enters a corresponding recess in the top of the valve-seat. The engaging surfaces of the seat and valve are ground so as to nicely fit each other. In this valve is a port c, one end of which communicates with the upper end of the port b, while the other end communicates with the upper end of one of the ports b^2, depending upon the position of said valve. In the face of this valve there are also three ports c', so placed that they will establish communication between the upper ends of certain of the ports b' b^2, depending upon the position of the valve. These three ports c', as shown, are all arranged upon one side of a diametric line, while the port c is placed centrally on the other side of said diametric line. These ports are placed as shown in order that two of the collapsible chambers D shall be in communication with the outlet-port a' so long as the other chamber D remains in communication with the inlet-port a. A crank-arm c^3 is connected centrally with this valve, being preferably an integral part

thereof. The horizontal part of this crank-arm is perforated to receive the threaded lower end *e* of a bent crank-shaft E, whose upper end is axial with respect to the valve C, and is rotatably mounted in a plate F, which plate is secured to the tops of the standards H, and said standards are secured to the plate A and are arranged symmetrically around the axis of the valve. The crank-arm c^3 is made fast to the shaft E by means of two nuts M, and thus the crank-shaft E and valve C become rigid parts of a rotating member, having a crank of which the arm c^3 and a laterally-bent part *e'* of the shaft E form the crank-arms, and the lower end *e* of the shaft is the crank-pin. The upper end of the shaft E is operatively connected by a stem *n* with the primary wheel of a register or clock N, which may be of any well-known form.

It will be seen from the above description that when the crank-arm c^3 and the end of the shaft E are made fast they will be capable of being rotated in unison, since both the shaft E and the valve C are in the same axial line.

Flexible bellows-tubes *d* have their lower ends fastened to the flanges a^3, while their upper ends are tightly attached to the disks of plates *d'*. The described construction results in the producing of a plurality (in the present case three) of collapsible gas-tight chambers D, each of which receives and discharges gas through one of the ports a^2. A hinge frame or member G is attached to each of the plates *d'*, and each of said hinge-frames is hinged to the vertical standards H. A connecting-rod J forms an operative connection between each plate *d'* to the crank-pin *e*. Specifically each hinge-frame G is a bent wire, the lower ends having eyes *g g*, which embrace pivots attached to standards H, and each of these bent-wire hinge-frames G has at its upper end an inwardly-projecting arm terminated by an eye *g'*. The connecting-rods J are wires, each having at one end an eye *j*, which engages with the eye *g'*, and having at the other end another eye which embraces a curved pin-rod *k*, forming a part of a collar K, which embraces the crank-pin *e*. These curved rods lie between shoulders *k'*, formed by radially-projecting arms on said collar. The vertical position of the collar on the crank-pin determines the movement of each plate *d'*, and consequently determines the amount of gas which each collapsible chamber D will take in and discharge at each pulsation, and this collar K may be adjusted up and down upon the crank-pin until it is placed in such position that each chamber at each pulsation will take in and discharge the desired known volume of gas. In adjusting the device after the parts are assembled the inlet-passage *a* is connected with a source of supply of air or gas under pressure. The operation of the device ensues, and a known volume of gas is passed through it. A comparison is made between this known volume and the indication on the register N, and if this indication is not correct the collar K is moved up or down upon the crank-pin *e* until the proper adjustment is made. When the collar is in this position, it is secured there by the nuts K'. A casing or cover T is then secured in place inclosing the mechanism and serving to protect it from dust and accidental injury, said cover having no function in connection with the operation of the device or the preservation of the operative relationship of the parts.

In the operating of the device, if the parts be in the position shown in Fig. 2, for example, gas has been admitted to the collapsible chamber at the left side of the figure through the ports *a*, *b*, *c*, b^2, and a^2, and as this chamber has been filled and its top plate *d'* caused to swing upward upon its hinges the crank-shaft E and valve C have been caused to turn upon the common axis. This turning of this crank has caused the other plates *d'* to be swung downward, thereby collapsing the other chambers D and causing the expulsion of the gas they contain through the ports a^2, b^2, *c'*, *b'*, and *a'*. When the one chamber is entirely filled, the ports in the valve C have been turned, so that no further passage of gas into that chamber is possible, and in the next instant it opens the communication between the inlet-port *a* and the port a^2, associated with the next collapsible chamber D, which has in the meantime been substantially emptied of its contents. At the same instant the filled chamber is placed in communication with the discharge-port *a'* through the described ports in the valve. The first chamber is now discharging its gas, the second chamber is being filled, and the third chamber is also discharging gas and will be entirely empty when the second chamber is filled. It will then by the movement of the valve C begin to fill, while the second chamber will begin to empty, and these operations will continue indefinitely, being accompanied by the proper movement of the gas-register N.

Having described my invention, I claim—

1. The combination of a base containing an inlet-port and an outlet-port and having on its top side a plurality of upwardly-extending flanges, and containing a corresponding number of ports communicating with the space inclosed by said flanges, a rotatable valve containing ports by means of which the ports last referred to are severally placed in communication with said inlet and outlet ports, a rotatable crank-shaft rigidly connected with said valve, a plurality of collapsible bellows-tubes which are severally secured at their lower ends to the flanges on the base, plates respectively secured to and closing the upper ends of said bellows-tubes, hinged frames severally secured to said plates and hinged to fixed supports, and operative connections between said several hinged members and said crank-shaft, a register, and an operative connection between the same and the crank-shaft, substantially as specified.

2. In a gas-meter, the combination of a base-plate, containing an inlet, an outlet-port, and a valve-seat recess with which they communicate, and having on its top side symmetrically arranged about said recess, a plurality of upwardly-extended endless flanges, and containing also a plurality of ports which severally extend from the space inclosed by said flanges to the valve-seat recess, and a valve-seat secured in said recess and containing a central vertical port having a lateral connection with the inlet-port, a plurality of ports symmetrically arranged around this central port, which ports communicate with each other and with the outlet-port in the base, and a plurality of ports severally communicating with the other ports in the base-plate, with a valve rotatably mounted upon said valve-seat and containing ports *c* and *c'*, a rotatable crank-shaft rigidly connected with said valve, a register, an operative connection between the crank-shaft and register, a plurality of bellows-tubes whose lower ends are severally connected with said flanges on the base, plates hinged to fixed supports and connected to and serving to close the upper ends of said bellows-tubes, and links flexibly connected with said several plates and operatively connected with the crank-shaft, substantially as specified.

3. In a gas-meter, the combination of a base-plate containing an inlet-port, an outlet-port, and ports severally communicating with collapsible chambers, a rotatable valve containing ports through which the several ports last referred to are respectively placed in communication with the inlet and outlet ports in the base, a crank-shaft operatively connected with said valve, a plurality of collapsible chambers secured upon the base, each having for its top side a hinged plate, operative connections between said several hinged plates and the crank-shaft, and means whereby the connections between the several collapsible chambers and the crank-shaft may be adjusted lengthwise of said shaft, substantially as and for the purpose specified.

4. In a gas-meter, the combination of a base-plate containing an inlet-port, an outlet-port and ports severally communicating with collapsible chambers, a rotatable valve containing ports through which the several ports last referred to are respectively placed in communication with the inlet and outlet ports in the base, a crank-shaft operatively connected with said valve, a plurality of collapsible chambers secured upon the base, each having for its top side a hinged plate, a collar embracing said crank-shaft, nuts for adjustably fixing said collar to the crank-shaft, and links flexibly connected with said collar and with the several hinged tops of said collapsible chambers, substantially as and for the purpose specified.

5. In a gas-meter, the combination of a base containing an inlet-port, an outlet-port, and a plurality of ports severally communicating with a series of collapsible chambers, a rotatable valve adapted to place the last-named ports severally into communication with the said inlet and outlet ports, vertical standards secured upon said base-plate, a plate secured thereon, a crank-shaft rotatably mounted at its upper end in said plate and fast at its lower end to said valve, a plurality of collapsible chambers upon said base-plate, plates forming upper ends of said chambers which plates are severally hinged to said standards, and links connecting said plates with said crank-shaft, substantially as and for the purpose specified.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JOHN W. CULMER.

Witnesses:
E. B. GILCHRIST,
E. L. THURSTON.