Sheet 1- 2 Sheets.

J. E. Fisk,

Gas Meter.

No. 34,678. Patented Mar. 18, 1862.

Fig. 2

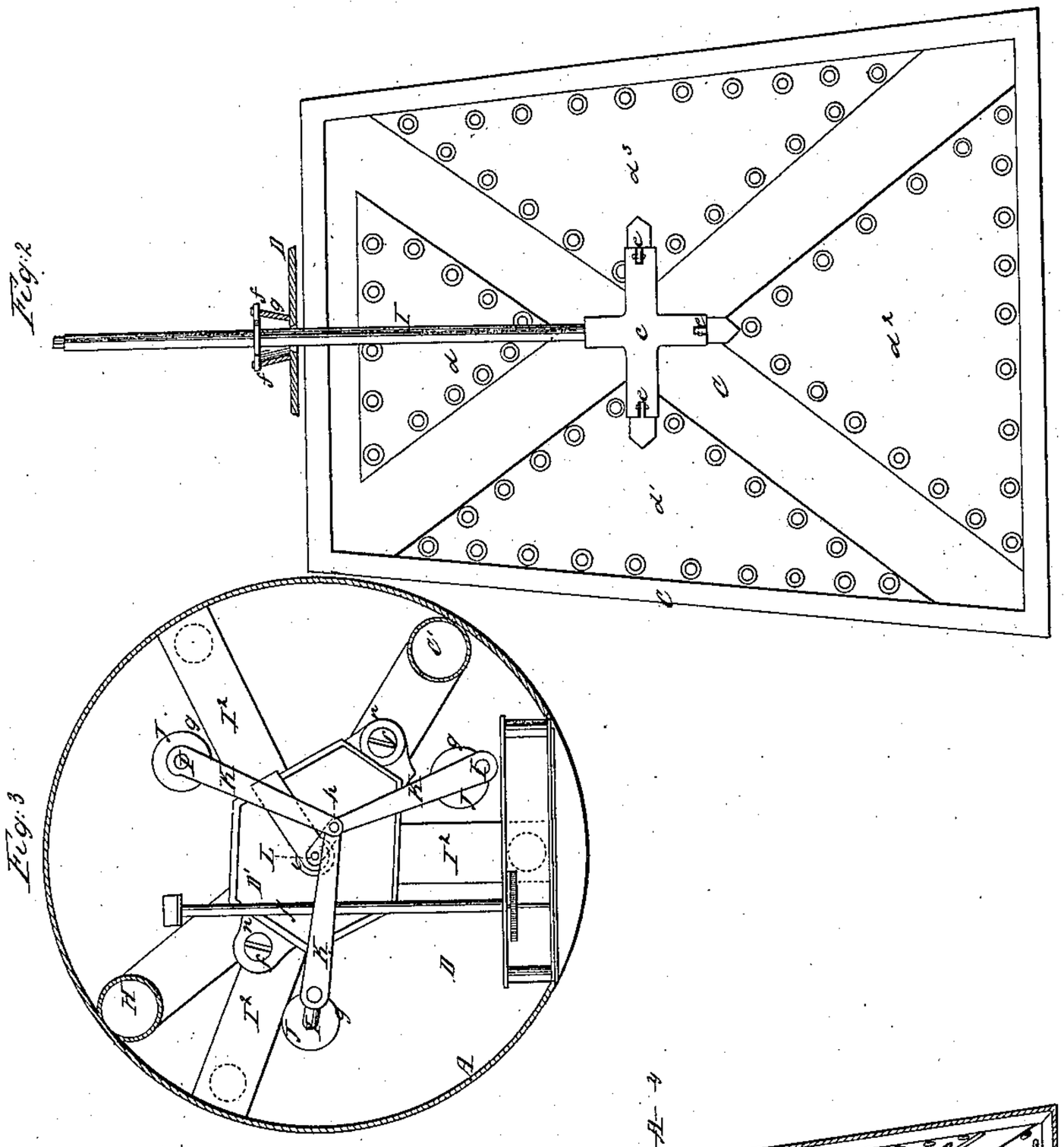

Fig. 3

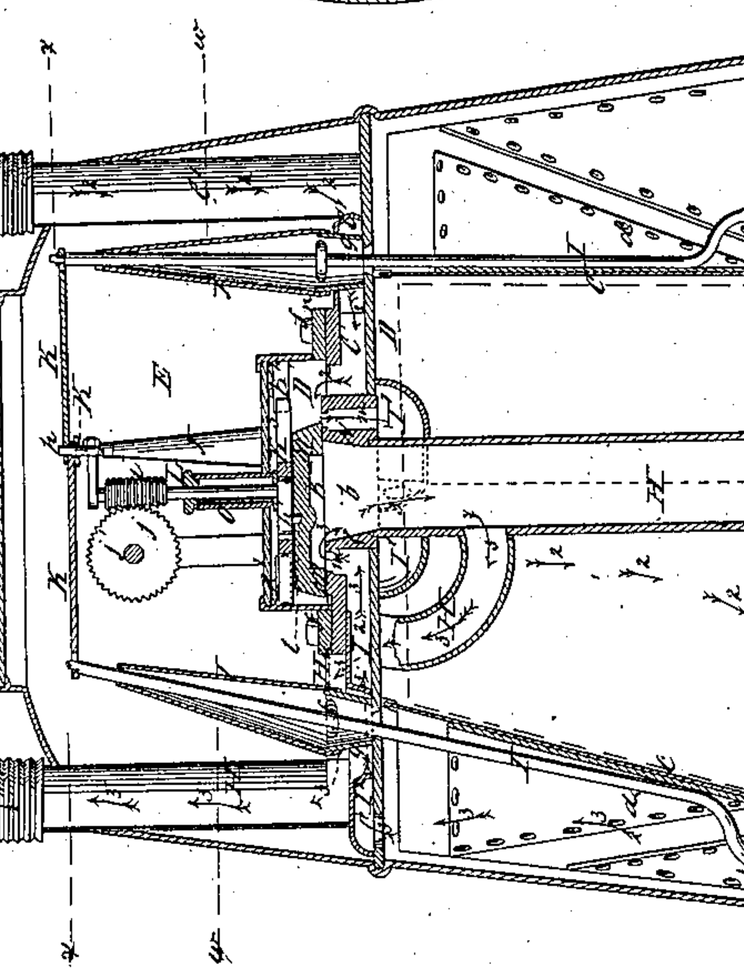

Fig. 1

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Sheet 2-2 Sheets.

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Fig. 5

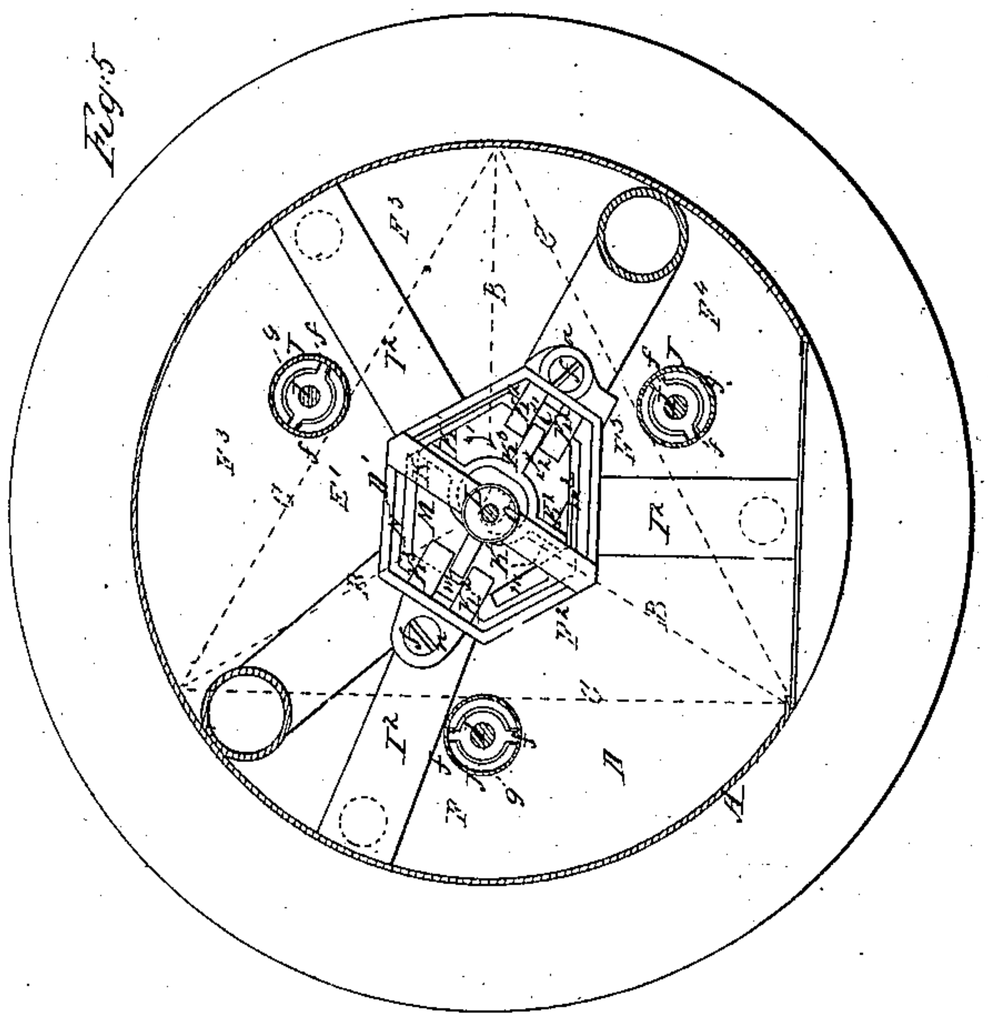


Fig. 9

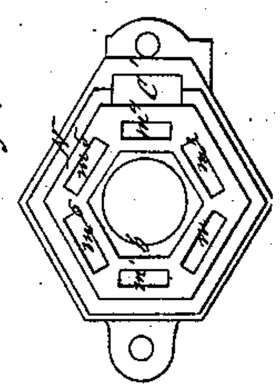


Fig. 10.

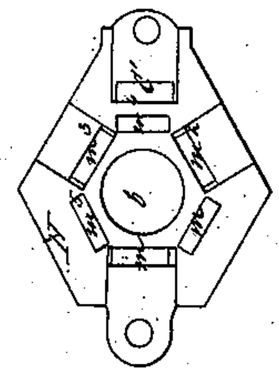


Fig. 7

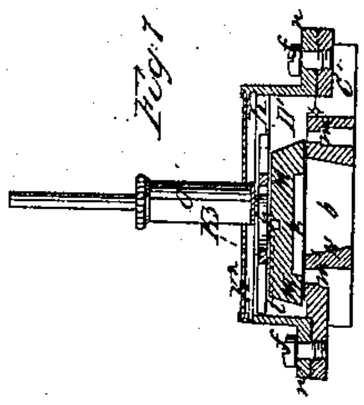


Fig. 8

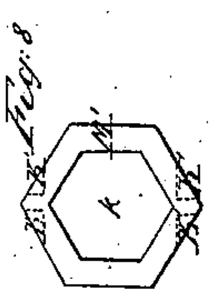


Fig. 6

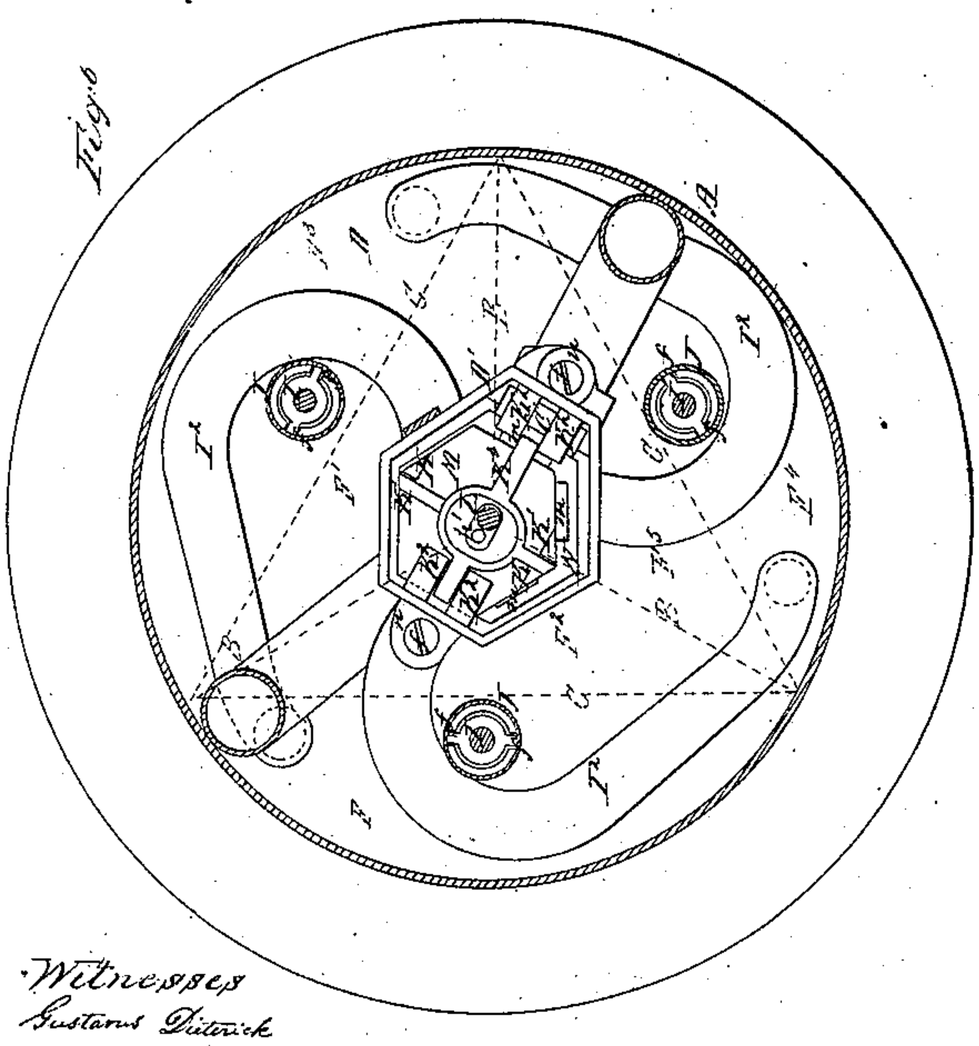
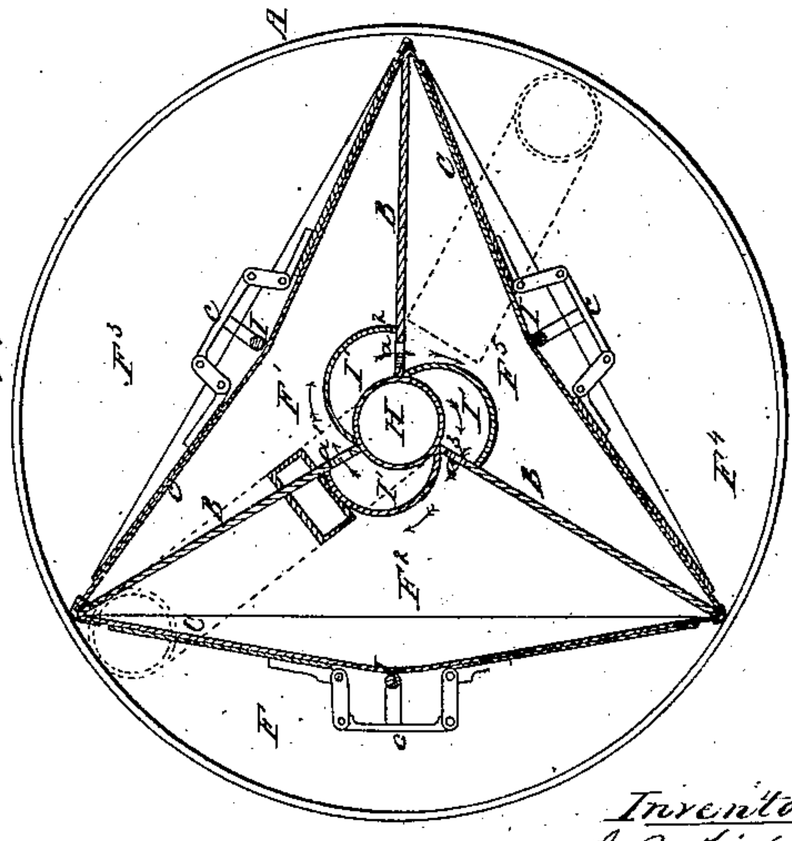


Fig. 4



Witnesses
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Inventor
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his Attorneys

UNITED STATES PATENT OFFICE.

JOSEPH E. FISK, OF SALEM, MASSACHUSETTS.

IMPROVEMENT IN DRY GAS-METERS.

Specification forming part of Letters Patent No. **34,678**, dated March 18, 1862.

To all whom it may concern:

Be it known that I, JOSEPH E. FISK, of Salem, in the county of Essex and State of Massachusetts, have invented a new and useful Improvement 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, forming part of this specification, in which—

Figure 1 is a vertical section of my improved gas-meter. Fig. 2 is a front view of one of the diaphragm-pistons detached from the meter. Fig. 3 is a horizontal section of the meter in the line *x x* of Fig. 1, looking downward. Fig. 4 is a horizontal section of the meter in the line *y y*, looking upward. Fig. 5 is a horizontal section in the line *w w* of Fig. 1, looking downward. Fig. 6 is another horizontal section in the line *w w* of Fig. 1, showing a modification of the arrangement of tubes for conveying the gas into the diaphragm-chambers of the meters. Figs. 7, 8, 9, and 10 are views of the valve and its seat detached from the meter.

The same letters of reference in each of the several figures indicate corresponding parts.

The nature of my invention consists, first, in the use of rods which swing or vibrate on axial joints in the path of a vertical circle for transmitting the motion of the diaphragm-pistons to the registering mechanism; second, the combination of a detachable gas-valve chest which has not a removable top with the diaphragm-chambers and the register gear-chamber in such manner that ready access to the valve is allowed, and that while the gas has every freedom to circulate under and above the valve and in and out of the diaphragm-chambers it is excluded from the gearing-chamber, and thus the deposit of clogging matter upon the gearing prevented; third, the combination, with the valve operating as hereinafter described, of the vibrating rods and connecting-arms of the crank-shaft and diaphragms; fourth, in inclosing the joint between the diaphragm-rods and the top of the diaphragm-chambers by means of flexible sleeves; fifth, in attaching the vibrating rod to the upper shield of the diaphragm and directly to the other three shields by means of a cross formed at the lower angular termination of the rod and by connecting-links; sixth, in the thimble-socket and rocking journals of the diaphragm-rod for supporting the diaphragms and allowing the rod to vibrate in the proper direction.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is a cylindrical case of a gas-meter divided vertically by three radial partitions, B B B, and three fixed diaphragm-pistons, C C C, into six gas-chambers, F F′ F² F³ F⁴ F⁵, and by a horizontal partition, D, into an upper and lower compartment.

The construction and relative disposition of the diaphragm-pistons, and also of the interior of the meter-case, are substantially the same as that of many dry meters in use—that is, so far as the central tube, H, the radial partitions, and the horizontal partition are concerned.

The lower end of each one of the rods I I I of the diaphragm-pistons is bent outward and terminates in a cross, *c*, and attaches above the cross directly to the upper shield, *d*, of the diaphragm, and indirectly, at the extremities of the cross, through horizontal links *e e e*, to the other three shields, *d′ d² d³*, as shown.

The rods I extend up from the center of the width and length of the diaphragm-pistons through the horizontal partition D and terminate near the top of the register-gear chamber E, and just above the partition D each rod is hung by means of horizontal journals *f f* in a thimble-socket, *g*, so as to be capable of vibrating in the path of a vertical circle. Each of the joints thus formed is inclosed or sealed by means of a flexible sleeve, J, which is of a taper tubular shape and made of leather or rubber, and extends down from near the top of the rod and encircles the thimble-socket. The rods thus attached and arranged are connected at their upper ends by means of horizontal arms K K K, which meet over the center of the meter and attach loosely to the crank-pin *h* of the vertical double-crank shaft L, that actuates the gas-valve M, and also transmits the motion of the flexible portion of the diaphragms to the registering-gear by means of a worm-thread, *i*, on its circumference, and a screw-wheel, *j*, on the shaft *j′*, leading to said registering-gear.

The gas-valve M is of hexagon shape, and

has a hexagon-shaped chamber, *k*, to allow the measured gas to escape, in its under side, said chamber being inclosed by a narrow hexagon-shaped rim, M′. It also has a central step or socket, *l*, in its back to receive the lower crank-pin, *h*′, of the crank-shaft L. It works in a peculiar manner, hereinafter described, on a hexagon seat, N, which is arranged in the center of the diaphragm. This seat is furnished in this instance with six gas-ports, *m* *m*′ *m*² *m*³ *m*⁴ *m*⁵, said ports being arranged round a central hexagon-shaped orifice, *b*, which terminates in a circle and connects with the central discharge-tube, H, of the meter. At one end of the seat and outside of the boundary line of the working-surface thereof a right-angle inlet-passage, C′, is formed, said passage leading horizontally and vertically through the seat into a detachable gas-chest, D′. The ports of the seat lead into the diapragm-chambers, three by means of curved passages I′ I′ I′, and three by means of pipes I² I² I², as shown.

The valve M in working over the seat incloses the whole of one port, about two-thirds of another, and about one-third of another, and leaves fully open one port, about two-thirds of another, and about one-third of another. Open guides K′ K′ at opposite corners of the valve, and other open guides, K² K², set at right angles to K′ K′, and on the inner sides of the gas-chest, in combination with a cross, K³, which consists of four arms branching out from a central ring, insure the proper relative position of the valve to the gas-ports of the seat when the valve is operating.

The gas-chest D′ has a permanently-fitted top, and at opposite ends and from the base of this chest ears *n* *n* project horizontally, said ears resting upon extensions of the valve seat, and are fastened thereto by means of screws *f* *f*. By this arrangement of the gas-chest it can be readily removed and access to both the valve and the seat thus secured. There also extends up from the center of the gas-chest a vertical stuffing-box, *o*, said stuffing-box leading out of the gas-chamber of the chest. Down through this stuffing-box and the ring-center of the cross K³ the double-crank shaft L extends, and by its crank-pin *h*′ connects to the valve M, said pin entering the step or socket *l*, as shown.

From the foregoing description it will be understood that if the valve M occupies the position shown in Fig. 5 the gas will when "let on" flow into the gas-chest through the passage C′, and therefrom, through the ports *m* *m*′ *m*², pass into three of the diaphragm-chambers—that is, to the full capacity of the port *m*, about two-thirds the capacity of the port *m*′, and about one-third the capacity of the port *m*²—and thus through the motion imparted to the diaphragms and the intermediate connections set the valve in motion. The valve, being set in motion in the direction of the arrow 1, is caused to work eccentrically by the crank or eccentric *h*′ on its seat, and while this is so its sides maintain a parallelism with the sides of the ports of the seat. The valve also in making said movement its working-surface describes small circles, the radii of which are equal to the radius of the crank or eccentric *h*′, which radius is about equal to the width of the ports, and thus every part of the working-surface of the valve and seat will wear uniformly and the sedimentary deposits be swept into the discharge-tube H of the meter.

In the movements of the valve the ports *m* *m*′ *m*² *m*³ *m*⁴ *m*⁵ are successively opened fully to the inflowing gas; but when the port *m* is full open to the inflowing gas and introducing the gas into the inner diaphragm-chamber, F, the port *m*³ is fully open to the outflowing gas of the outer diaphragm-chamber, F³, and when port *m*′ is open to the inflowing gas and introducing the same into the outer diaphragm-chamber, F′, port *m*⁴ is open to the outflowing gas of the inner diaphragm-chamber, F², and when port *m*² is open to the inflowing gas and introducing gas into the outer diaphragm-chamber, F⁴, port *m*⁵ is open to the outflowing gas of the inner diaphragm-chamber, F⁵, and vice versa, as respects the entrance and exit of the gas to and from the diaphragm-chambers when the ports *m*³ *m*⁴ *m*⁵ are fully open to the inflowing gas. The gas, of course, in discharging from the diaphragm-chambers circulates in the chamber *k* in the under side of the valve, and then descends through the central discharge-orifice, *b*, and passes off through the pipe H, as indicated by the arrows 2 and 3.

If the plan of pipes I² for introducing the gas into the diaphragm-chambers shown in Fig. 6 be adopted, the gas will descend directly from the ports *m*² *m*³ *m*⁵ into the inner diaphragm chambers and the curved directors be dispensed with.

It is very essential to have the rods vibrate as I have shown, as the meter is thereby greatly simplified, one vibrating rod answering the purpose of two rods arranged in the ordinary manner.

Although I prefer to use but one vibrating rod in the manner shown, two rods vibrating in the path of a vertical circle might be used.

I do not claim in this patent the combination of motions specified in the valve, as the same is claimed in another application for Letters Patent by myself, bearing even date with this application. For the same reason I do not claim in this patent the means shown for producing said combination of motions in the valve, nor the construction of the valve and its seat; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The vertically-vibrating rod or rods I, in combination with the diaphragm or diaphragms of a gas-meter, for the purpose set forth.

2. The detachable gas-valve chest D′, constructed as described, in combination with

the diaphragm-chambers and the gearing-chamber, for the purpose set forth.

3. The combination, with a valve, M, operated substantially as herein described, of the vibrating rods I of the diaphragms and the connecting-arms K of the crank-shaft L, for the purpose set forth.

4. The flexible sleeves J, substantially as and for the purpose set forth.

5. Attaching the diaphragm C to the vertically-vibrating rod I by means of the cross *c* on the end of the rod and the connecting-links *e e e e*, in the manner and for the purpose described.

6. The thimble-socket *g* and rocking journals *f* of the vibrating rod for supporting the diaphragms and allowing the rod to vibrate, substantially as described.

JOSEPH E. FISK.

Witnesses:

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