2 Sheets--Sheet 1.

D. B. SPOONER.

Improvement in Liquid and Gas-Meters.

No. 132,497. Patented Oct. 22, 1872.

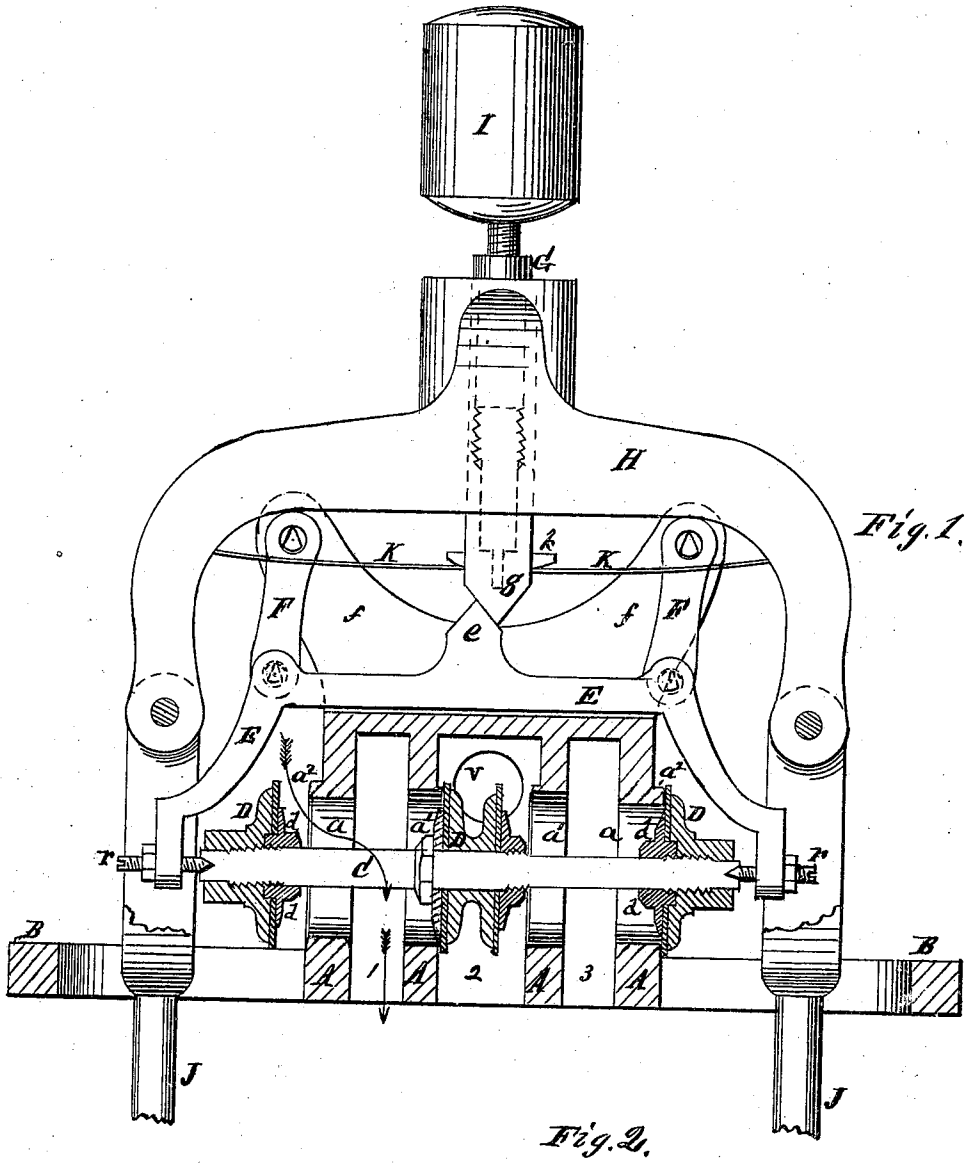
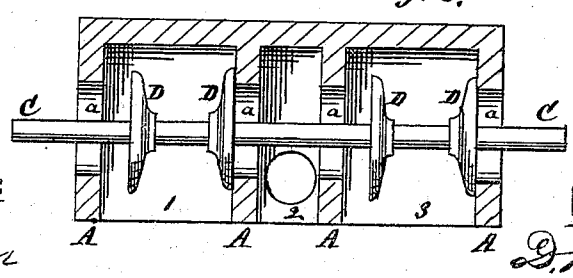


Fig. 1.

Fig. 2.



WITNESSES:

E. E. Blinn

F. A. Morley

INVENTOR:

D. B. Spooner

2 Sheets--Sheet 2.

D. B. SPOONER.

Improvement in Liquid and Gas-Meters.

No. 132,497. Patented Oct. 22, 1872.

Fig 3

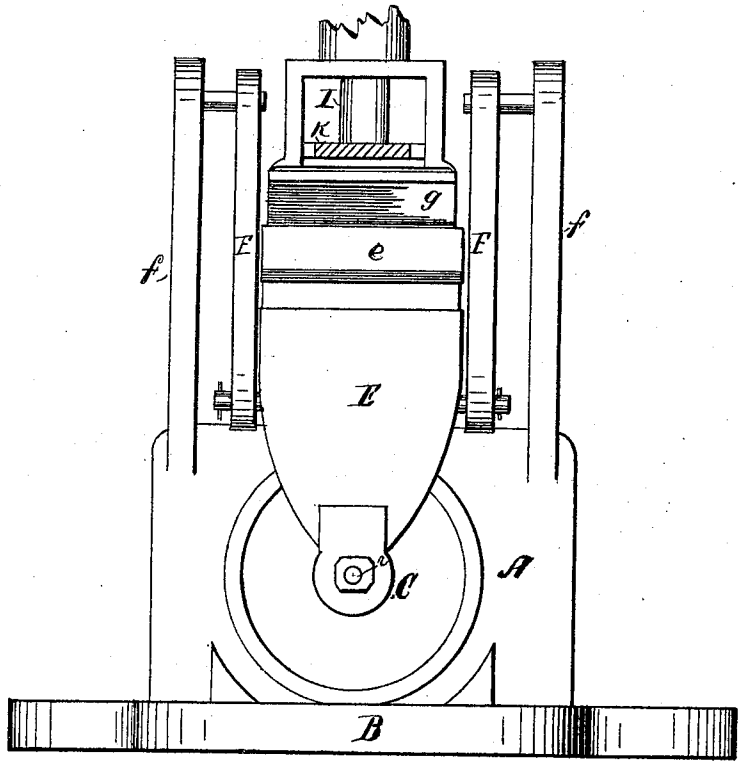
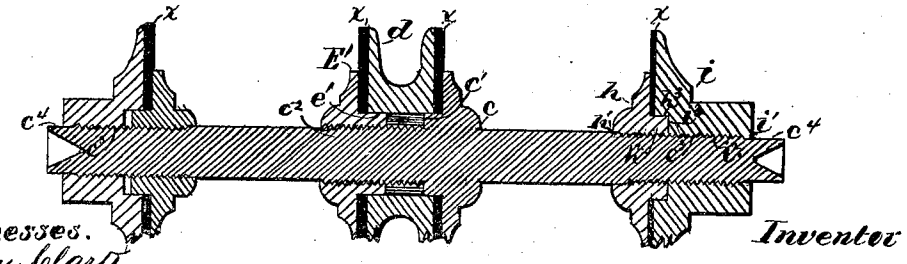


Fig 4



Witnesses.
Harry Clark
Columbus Choate

Inventor
D. B. Spooner
by Dyer, Beadle & Co.
Atty.

UNITED STATES PATENT OFFICE.

D. BRAINARD SPOONER, OF SYRACUSE, NEW YORK.

IMPROVEMENT IN LIQUID AND GAS METERS.

Specification forming part of Letters Patent No. **132,497**, dated October 22, 1872.

To all whom it may concern:

Be it known that I, D. BRAINARD SPOONER, of Syracuse, in the county of Onondaga and State of New York, have invented a new and useful Improvement in Liquid and Gas Meters.

This invention relates to that class of meters known as diaphragm-meters; and consists mainly, first, in the employment of a projection of prismatic form attached to the yoke operated by the disk-arms in connection with corresponding apex of the carrier-frame which operates the valves. Second, in the employment of a pendent carrier-frame for supporting the valve-rod and valves, and in the employment of valves of peculiar construction, and their combination with other operating parts. It further consists, also, in certain details of construction, which, in connection with the foregoing, will be fully described hereinafter.

In the drawing, Figure 1 represents the upper part of my improved meter, the casing being removed and the valve-plate and valve-chest being shown in section; Fig. 2 represents a sectional elevation of the valve-ports, the arrangement of the ports being the opposite of that shown in Fig. 1; and Fig. 3 represents an end elevation of the upper part of the meter; and Fig. 4, a longitudinal elevation, partially in section, of the valve-rod and valves.

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

The general operation of my meter is similar to others of this class—that is, a central diaphragm is carried from side to side by the inflow of water alternately upon each side through proper ports—the movement of the diaphragm through intermediate connections operating the valves to regulate the supply and discharge.

H, Fig. 1, represents the yoke, which is pivoted between the forked ends of the disk-arms J. *g* represents a projection of prismatic form, which is suitably attached to the yoke H in such manner as to have free vertical movement, this result being accomplished in this case by means of a rod, G, sliding in a socket in the yoke. K represents a strap of any suitable material, which is centrally secured to the sliding rod G and at each end to the yoke H, as shown, by means of which the rod is securely held in its vertical movement and prevented from binding on either side. I represents a weight, which is attached to the upper end of the rod G for the purpose of causing it to fall quickly in its downward movement, and with sufficient force to operate the valves. E represents a carrier-frame, hung by means of links F from the standards *f f* rising from the valve-chest. The bearing-points of these links, it will be observed, hang upon knife-edges for the purpose of reducing the friction. This carrier-frame is connected at its lower end, by means of set-screws *r*, to the valve-rod C carrying the valves D, and is also provided with an apex or prismatic projection, *e*, corresponding in form with the projection *g*. The set-screws terminate in a point which rests in a corresponding central socket in the ends of shaft C, as shown. The construction of this shaft is peculiar. It is provided with a flange, *c*, cast solidly with the shaft, which is provided with a shoulder, c^1, as shown. It has, moreover, the central-threaded portion c^2, the threaded portions c^3 c^3 near the ends, and the plain bearings c^4 c^4 at the extreme ends, as shown. *d* represents the central portion, forming a double valve, which controls the discharge of the water from the meter. This portion when in place rests partially upon the shoulder c^1 of the flange *c*, and partially upon the shoulder e' of the flanged nut E′, which has its inner circumference threaded to fit the central threaded portion of the shaft. *h* represents a flanged nut, the inner circumference of which is provided with a plain portion, h^1, and a threaded portion, h^2, and which has also a shoulder, h^3. *i* represents the valve, the inner circumference of which, also, is provided with a plain portion, i^1, a threaded portion, i^2, and a recess, i^3, adapted to fit the shoulder. *x* represents a washer, which is placed upon the shaft to insure the perfect closing of the ports and to deaden the force of the blow and prevent shock as the valves move. a^2 represents the valve-seat, consisting of a projecting rib having an oval face, by means of which construction the surface upon which the valve is liable to stick is reduced to the minimum. The valve-chest is cast solid with the valve-plate B, and is provided with walls A A A A,

forming chambers 1 2 3, each of which is provided with ports or openings *a a* a^1 a^1, in line with each other and of nearly equal size, the discharge-ports a^1 a^1 being preferably, however, of slightly larger area than the supply-ports *a a*.

The operation of my improved meter is as follows: Water is admitted to the upper part of the meter in the usual manner. From thence it passes into the diaphragm-chamber through the valve-ports and actuates the diaphragm. When the valves are in the position shown in Fig. 1 the water passes, as indicated by the arrow, through the port *a* and chamber 1 to the left side of the diaphragm. The pressure of the water acting on the diaphragm carries it to one side against the right disk, which disk, being thus swung back upon its pivot, throws forward the upper end of the disk-arm J carrying the yoke H. The movement of the yoke H causes the projection *g* to move up the inclined face of the corresponding projection *e* of the carrier-frame until its point passes the point *e* of the carrier-frame, when the latter, being free to move, is thrown quickly to one side by the inclined surface of the descending projection *g*. The movement of the carrier-frame operates the valve-rod to change the valves, so that the inflow of water is changed from the left supply-port to the right supply-port, and through chamber 3 to the right side of the diaphragm; the water upon the left side now flowing out through chamber 2 and discharge-opening *v*. The described operation is of course repeated continuously as long as water is supplied to the meter.

The construction described possesses very many marked advantages, as follows: The employment of the prismatic projection *g* in connection with the corresponding projection *e* of the carrier-frame insures certainty of action at the proper time and the instantaneous change of the valves. The cause of this certainty of action and instantaneous change will be understood when the operation of the projection *g* is carefully observed. When in operation this projection moves laterally and vertically upon one of the inclined sides of the projection *e* and necessarily presses at the same time the carrier-frame and consequently the valves strongly to place. This action continues throughout the entire movement of the yoke, which lasts until the meter fills, at which time the point of projection *g*, passing the apex of projection *e*, the carrier-frame is consequently released, and is easily thrown to one side by the descent of the weighted projection *g*. From this description it will be perceived that the carrier-frame is held by the projection *g* until the meter fills, when it is at once made free to move and quickly thrown to one side. The operation of projection *g* is much more perfect than that of the friction-roller formerly employed, for the reason that the bearing-point of the wheel, which in moving up the incline is on one side instead of at the center of the wheel, is compelled to pass the apex of the lower projection some distance—that is, to the center of the wheel—before the latter can descend. The employment of the pendent carrier-frame is especially advantageous, because the swinging movement to shift the valves is made without an appreciable amount of friction.

By means of the peculiar construction of the rod C and its valves it is rendered possible to attach the parts together accurately and securely. While difficulty is experienced in obtaining perfect accuracy in screw-threads, the plain surfaces are easily made true in a lathe, and the union of the two—that is, the plain surfaces and the screw-threads—insures an accurate and secure attachment between the valves and the rod.

By means of the enlarged area of the discharge-openings the outflow of the water is facilitated and the pressure lessened, this decrease of pressure upon one side of the diaphragm compensating in part for the increased pressure required upon the other side to force the projection *g* over the apex *e*.

The valves, it will be observed, are balanced in their action, and their use in connection with the pendent carrier-frame, by which they are supported, enables the valves to work under a very low pressure. The employment of the set-screws *r* in connection with the central shaft is especially advantageous, because it affords a ready means of adjusting the carrier-frame, and consequently the projection *e*, for the purpose of causing the valve to operate at the desired instant. It will be readily understood, by inspection of the drawing, that the adjustment of the carrier-frame to either side will cause the projection *g* to reach the apex of projection *e* sooner or later, in the movement of the yoke, as the case may be, by which means the operation of the valves occurs at an earlier or later time than it would otherwise have taken place.

The casting of the valve-plate, valve-chest, and the standards for holding the links of the carrier-frame in one piece is advantageous, not only because the expense of construction is reduced thereby, but also because the number of joints to be packed is reduced.

A weight is preferably employed in connection with the vertically-moving projection *g*, but, if desired, a spring or other equivalent may be used instead.

The movement of the yoke is communicated to the registering device in any proper manner.

If desired, the position of the valves may be reversed, as shown in Fig. 2, in which case the water is introduced through the central chamber.

If desired, some of the parts of the above-described invention may be used in connection with other well-known parts—for instance, the swinging carrier-frame and its connections may be operated by a friction-wheel instead of the projection *g*.

Having thus fully described my invention,

what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the prismatic projection *g* with the prismatic projection *e*, substantially as described.

2. The combination of the oscillating yoke, carrying the vertically-moving prismatic projection, with the carrier-frame having a corresponding projection, substantially as described.

3. In a water-meter a pendent carrier-frame adapted to support the valves, substantially as described.

4. In a water-meter the combination of the oscillating yoke carrying the vertically-moving prismatic projection, the pendent carrier-frame having the fixed prismatic projection, and the valve-rod carrying the valves and the valve-chest, substantially as and for the purpose described.

5. The valve-chest, provided with the chambers 1 2 3 having ports *a a* a^1 a^1, with the central swinging shaft C having the valves D, arranged as described.

6. The combination of the strap K with the vertically-moving rod and the yoke, substantially as described.

7. In a water-meter the combination of the shaft C having the series of valves adapted to close the ports, as described, with the set-screws *r* and the swinging carrier-frame, as and for the purpose set forth.

8. In a water-meter the valve-chest A, provided with the ports *a a* a^1 a^1, the discharge-ports a^1 a^1 having an enlarged area, as shown and described, for the purpose set forth.

9. In a water-meter, swinging-valves, adapted to regulate the supply and discharge of the water, substantially as described.

10. The shaft C, provided with the threaded and plain portions, as described, in combination with nuts and valves having threaded and plain portions, substantially as described.

11. In a water-meter the combination of a series of valves arranged upon a single shaft with mechanism for holding said valves until the movement of the diaphragm is completed or nearly so, and then shifting the same, substantially as described.

D. B. SPOONER.

Witnesses:
E. E. BLINN,
F. A. MORLEY.