

UNITED STATES PATENT OFFICE.

D. BRAINERD SPOONER, OF SYRACUSE, NEW YORK.

IMPROVEMENT IN LIQUID AND GAS METERS.

Specification forming part of Letters Patent No. **113,591**, dated April 11, 1871.

To all whom it may concern:

Be it known that I, D. BRAINERD 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; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing, forming part of this specification, in which the view is a central vertical section of the cap of the meter and of the improved valve-operating devices contained therein.

This invention relates more particularly to that class of meters known as "diaphragm-meters," but is also applicable to all other meters that have valves that require a sudden impulse or movement to change the flow from one compartment or conduit to another; and the invention consists in an air-chamber having two elastic or flexible diaphragms placed in its walls opposite to each other, and connected in their action by a rod running through the chamber, one of its diaphragms having a larger working area than the other, so that any pressure on the outside of liquid or gas causes the larger diaphragm to outbalance the smaller one, and thereby give an elastic bearing or movement that is substituted with advantage in place of the actuating springs or weights commonly used in meters for obtaining a sudden change or movement of the valves, as hereinafter more fully explained.

In the accompanying drawing only the cap of the meter is shown, of which A is the shell or case. B is the ordinary slide-valve, having a changing apex, *b*. L L are anti-friction rollers for the spindle, and E is the apex roller, that is pressed down by the spindle C *c*.

Heretofore the spindle C *c* has usually received the required downward pressure from a coiled metallic spring; but I mount on the top of the yoke D an air-chamber, F, that is formed by a cylinder or vessel, *f f*, that is made open at both ends; but said ends are closed by flexible diaphragms G *g*, so that the air-chamber F is perfectly tight, and any air that is imprisoned therein after the parts are once together remains there permanently, the upper diaphragm, G, being screwed down upon

the case *f f* by a cap or screw-ring, H, and the lower diaphragm being clamped upon the lower end of the case *f* by a similar screw-cap, *h*.

The spindle C passes through the center of the lower diaphragm; but a tight joint is made by a nut, I, that clamps the center of said diaphragm *g* down upon a shoulder of the spindle C.

A disk of metal, J, is mounted on the upper end of the spindle *c* as a bearing for the upper diaphragm to push upon said spindle *c*. The upper part of the spindle is supported or steadied by a collar, K, that is held up within the air-chamber by arms or braces *k k*.

Its operation is as follows: The diaphragm or the piston of the meter, as it moves forward with a uniform speed, gives motion to the yoke D, which, in turn, draws the roller E to the apex of the valve B. As the roller mounts the apex the spindle C *c* is forced upward, and as it rises must lift the large diaphragm G against the outside pressure of the liquid or gas, and as soon as the roller E has balanced over the apex of the valve, the said outside pressure on the greater area of diaphragm G forces the roll down the incline of the apex, changing the valve.

The lower diaphragm, *g*, is used merely to make the air-chamber tight without the aid of a stuffing-box, and the diaphragm G is made large enough to balance *g* and give a surplus of pressure equal to changing the valve.

If the larger diaphragm has only one square inch more of working-surface than the smaller one, and if the pressure of fluid in the meter is thirty-five pounds, then the working force of the device is about equal to that of a spring that would sustain thirty-five pounds.

The air-chamber is ordinarily closed with the air in it at atmospheric pressure; but it may be necessary to exhaust a portion of it for light pressures.

Anti-friction rolls may be provided for the upper part of the spindle to prevent cramping, and a light spring may be used, placing it around the spindle between the collar K and shoulder or nut I, for getting a quick motion under low pressures. This, however, has not been found necessary with any pressure at which it has been used.

By these means I dispense with the metallic springs ordinarily used for operating the valves of meters and obtain a device of greater endurance; and the further important advantage is gained of having an operating device the power of which increases or diminishes with the pressure of liquid in the meter, and consequently with the working resistance of the parts.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

An air or vacuum chamber, F, formed by a cylinder or vessel, *ff*, and by two flexible diaphragms, G *g*, acting with each other in their movement, and being of unequal working areas, for supplying the power to actuate or throw the valves of liquid or gas meters.

The above specification of my invention signed by me this 9th day of March, 1871.

D. B. SPOONER.

Witnesses:

C. M. CROW,

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