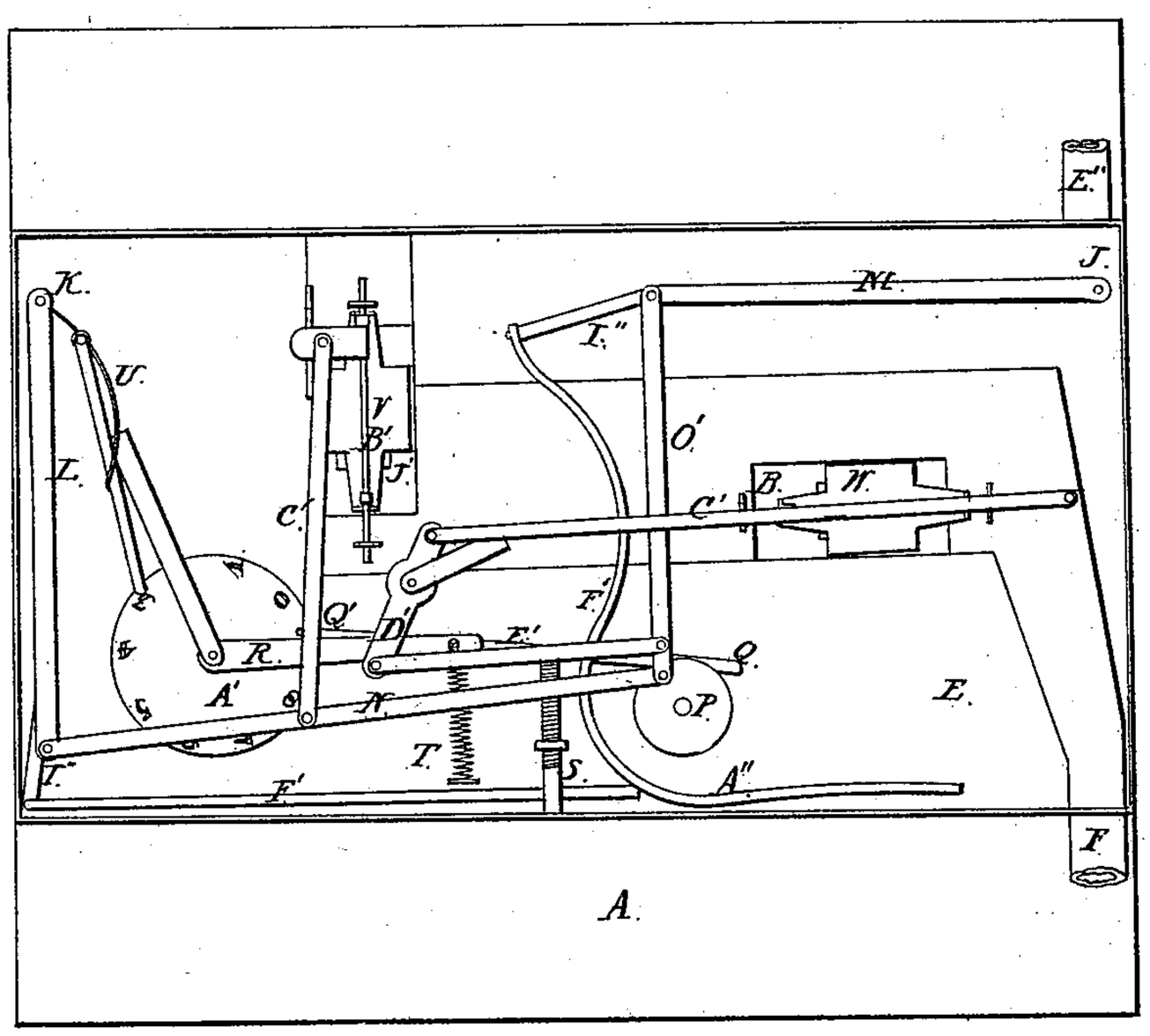
Lyon & Dickinson,

Gas Meter.

No. 14,770. Patented Apr. 29 1856.

Fig. 1.



A.

UNITED STATES PATENT OFFICE.

WILLIAM LYON AND CHARLES W. DICKINSON, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN THE CONSTRUCTION OF DRY GAS-METERS.

Specification forming part of Letters Patent No. **14,770**, dated April 29, 1856.

To all whom it may concern:

Be it known that we, WILLIAM LYON and CHARLES W. DICKINSON, of the city of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in the Construction of Gas-Meters, of which the following description, illustrated by the accompanying drawings and references, is sufficiently clear and distinct to enable others of competent skill to make and use our improvement.

The nature of our invention consists in the use of a metallic plate spring-bellows formed of a series of disks so constructed and arranged that their slight elasticity or the contraction and expansion of the metal, paper, or other suitable material of which they are composed shall produce a definite certain action upon the register, and also certain parts of the apparatus by which the action of the bellows is made to measure and also to indicate the amount of fluid which passes through it upon the register.

Figure 1 is a top view of the meter with the part of the case A above X X removed for the purpose of exhibiting a view of the mechanical arrangement of our meter. Fig. 2 is an end view, certain parts of the case being cut away, as shown. Fig. 3 is a vertical section through the case of the meter, representing its internal arrangement, and particularly the manner of constructing the bellows and its connections with the other parts of the working apparatus; and Fig. 4 is a top view of the small gas-channel *o*, Fig. 3, separated from other parts of the case and showing the valve openings and passages into and from the bellows and its surroundings, the top plate and slide-valves being removed.

A is the case of the meter, provided with an inferior chamber separated into two compartments by the partition B, each having no communication directly with the other, in each of which compartments C D are the bellows *f f*, similar one to the other. The portion of the case which contains the bellows may vary in form and the bellows be made to vary accordingly, a cylindrical form being the one represented at Fig. 2. The superior chamber E, which contains most of the working machinery of the meter, has a double communication with each compartment C D of the inferior chamber (but no direct communication with the generator or induction pipe F) and another, E″, with the gas-burner.

We will first describe our two pairs of bellows and how by their action the gas is made to register its own flow upon the dial A′.

In Fig. 3 the bellows are cut vertically through their centers. They are formed of a series of metallic parallel disks, usually of tin, (but may be made of thick hard paper or other suitable material coated or covered with enamel or varnish,) each alternate pair being soldered together by introducing a circular rim or belt. Within the outer edges, as represented at *y*, and within the inner edges, as shown at *e*, one end of each bellows is attached to the partition B, and the opposite end is attached to and operates the swing-levers H, which are stationary upon the vertical rods I I at each end of the meter. The action of the bellows turns these rods I I back and forward partially round within their bearings. These vertical rods pass through stuffing-boxes J K, and have the levers L M stationarily upon their upper ends. These horizontal levers L M give a reciprocating motion to the horizontal connections N O′, which, conjointly operating upon the wheel P at nearly right angles to each other, give to it a rotary motion whenever the bellows is in operation by the motion of the levers L M and connections N O′, above named. A pin or cam upon the under side of the wheel P raises the lever Q, which is hung in the arm R, which turns upon or fits loosely upon the shaft of the registering-wheel A′ at such a distance from such shaft that the end Q′ impinges upon the circumference or edge of the wheel and moves it in advance every time the lever Q is raised from the end of adjustable screw S by the pin or cam above named. The spring T serves to bring the lever Q and arm R back to their impinging-point immediately upon being liberated by the pin or cam upon the wheel P. The hand U, with its spring U′, serves only to prevent the registering-wheel from returning or moving at an improper time by its impingement upon its edge in the manner represented. V W are slide-valves operating like the ordinary slide-valve of the steam-engine, in which B′ B′ may be regarded as valve-rods, and which with the valves are worked by the levers C′ C′, the one

connected to and operated by the connection N and the other by the cross-head D′, which is worked by the connection O′ by means of E′.

The operation of the springs F′ F′ will be hereinafter described as an important feature of this invention.

It will be observed by reference to the two views, Figs. 2 and 3, that the plate-disks of which the bellows are formed are not plain metallic plates, each having received a very obtuse angular corrugated surface, which may be given them by a drop, pressure, or turning. The angles of corrugation are represented by circular lines *a a* upon the outer end disk of one bellows, Fig. 2, and by slightly-inclined lines in the vertical section, Fig. 3. The object of this form of disk is to prevent the bend or kink and the consequent snapping sound which would otherwise be caused by the unequal contraction and expansion of the bellows-plates.

We will now describe the action of the meter in relation to the flow and measurement of gas. Gas is admitted through the pipe F into the small gas-channel G′, Fig. 4. From thence it passes under the slide-valves through the center openings, *c c*, and alternately through the openings *i i* and *j j*, and alike alternately into the bellows and surrounding it upon the outside as the valves are operated, permitting it to pass through I′ I′ or J′ J′ to the openings above named, *i i* and *j j*, which, it will be observed, are the openings to the inside and outside of the bellows of each compartment C D. Upon the inside of the bellows being inflated the spring of the metallic plates or disks permits the bellows to expand and give operation to the machinery above described, which moves the valves. This motion of the valves opens the apertures by which the gas within the bellows is permitted to escape into the upper chamber and pass through E″ to the gas-burner. At the same instant the slide-valves open the apertures which permit the gas from the channel *o* to pass into the inferior chamber surrounding the bellows in each compartment. Its pressure thus operates in an opposite direction and causes a contraction of the bellows, and by such contraction carrying the lever H H in an opposite direction, thus by means of the levers and connections above described causing a revolution of the wheel P and a continued operation of the valves, the action of each valve and each bellows being the same. The flow of gas through the openings into and from the different chambers and compartments is not unlike the flow of steam into and from the cylinder of the steam-engine. One objection, however, exists to the use of the metallic (or other similar) spring-bellows operating in the manner of the one herein described. It is this: As the increased inflation or compression causes an increase in the tension of the metal of which it is composed, a greater pressure becomes necessary as the contraction and expansion increases and the force upon the levers lessened in the same ratio. This would destroy the uniformity of motion necessary to the correct operation of the machine. This objection is most effectually and beautifully overcome by the operation of the springs F′ F. These springs are attached to the side of the case at A″, and press upon the ends of the levers L M by means of the short connections I″ I″. It will be observed that the force of the springs is greatest when the levers L M are near the end of their vibrating circuit, which are the points at which the tension of the spring of the bellows is greatest also. In this manner the varying action of the springs is made to counterbalance the tension of the bellows with great accuracy at all times during the entire circuit of the wheel P. The registering-wheel A′ may be geared by the usual clock-work to indicate the number of feet (of gas measured) upon a dial-plate or otherwise in any convenient manner, the flow of the gas only being measured by this arrangement.

What we claim as our invention is—

1. So constructing the metallic bellows above described for the measurement of gas that the spring or bend of the metal may form chambers of varying dimensions and of definite capacities, as set forth, for receiving and measuring the gas, the whole arranged as specified, or in any equivalent manner.

2. Giving motion to the registering-wheel A′ by the impinging-lever Q, operated by the wheel P, and the levers and connections communicating with the bellows, substantially as described.

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