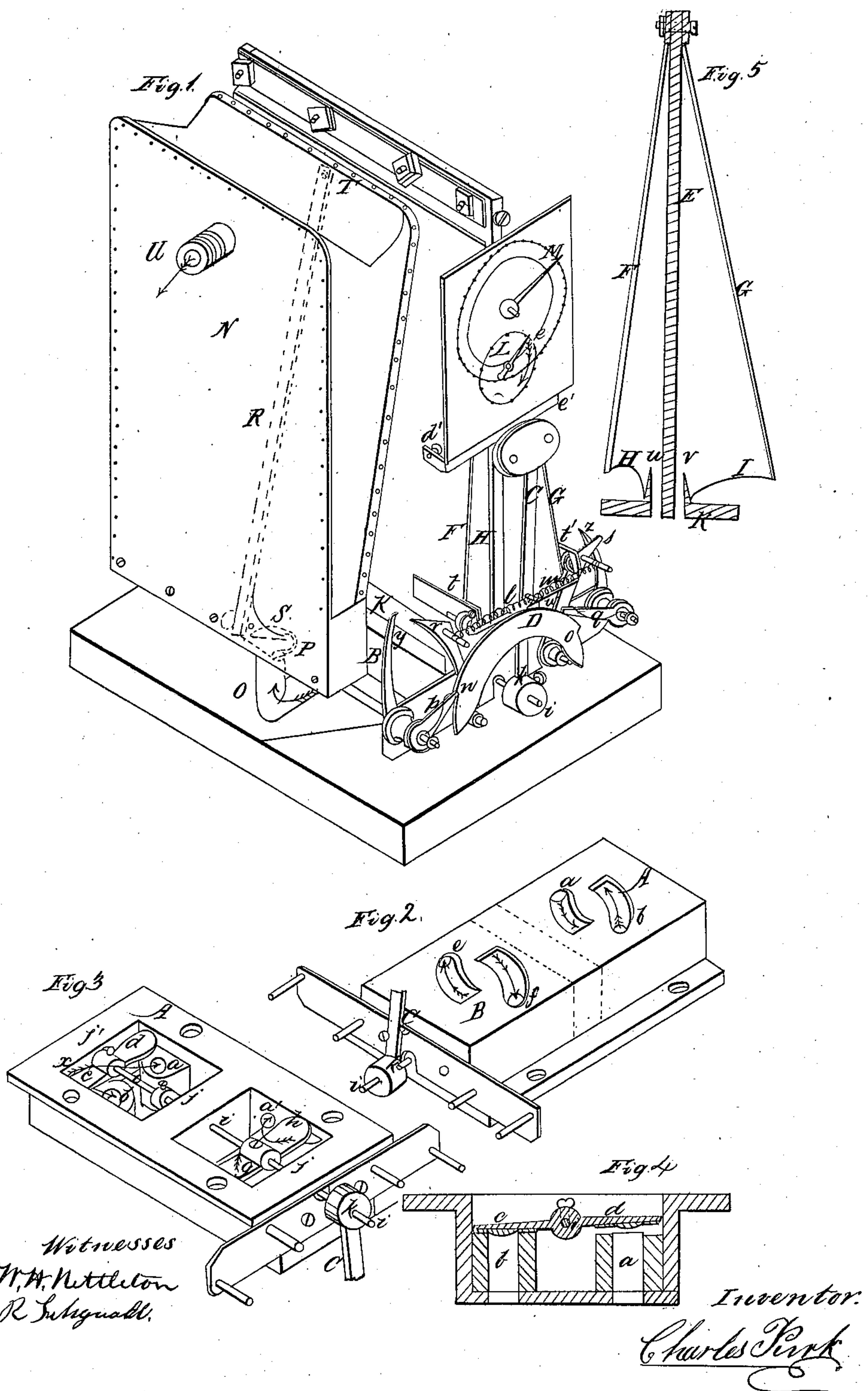


C. KIRK.
 DRY GAS METER.

No. 34,465.

Patented Feb. 18, 1862.



Witnesses
 W. H. Nettleton
 R. Schuabli.

Inventor.
 Charles Kirk.

UNITED STATES PATENT OFFICE.

CHARLES KIRK, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO CHARLES MONSON AND STILLMAN MOORE, OF SAME PLACE.

IMPROVEMENT IN DRY GAS-METERS.

Specification forming part of Letters Patent No. 34,465, dated February 18, 1862.

To all whom it may concern:

Be it known that I, CHARLES KIRK, of the city and county of New Haven, in the State of Connecticut, have invented a new and useful Improvement in Dry Gas-Meters; and I do hereby declare that the following is a full, clear, and exact description of the construction, character, and operation of the same, reference being had to the accompanying drawings, which make part of this specification, in which—

Figure 1 is a perspective view of the meter ready for use. Fig. 2 is a perspective view of the gas-chest, or the portion which contains the valves, showing the ingress and egress gas ports or passages into and out of the double or two chambered bellows. Fig. 3 is a perspective view of the same inverted, showing the valve-rod, valves, and ports. Fig. 4 is a cross-section of Fig. 3 cut vertically through the center of one pair of the valves, gas-ports, &c. Fig. 5 is a section of the double or measuring bellows cut vertically through the diaphragm and wings, showing one of the gas-ports for each apartment.

My improvement consists in so constructing and arranging the double or measuring bellows in connection with the valves that the outer or external surfaces of the two wings of the bellows when alternately filled will work the valves of the gas-ports, so that the induction-valve for one apartment of the bellows and the eduction-valve of the other will be simultaneously opened, while the other valves will be closed, so that when the required quantity of gas shall have passed into one apartment of the bellows it will be so far expanded that the outer surface, working on the extremity of one arm of a bell-crank, will close the two valves which have been opened and open the opposite two, and the two wings of the bellows being firmly and inflexibly connected together by an inflexible cross-bar, one apartment must discharge as the other fills; and, so that the same expansion of the bellows will work the index to register the quantity of gas which has been measured, and as a regulator to counteract the unequal pressure in the main I use a secondary bellows, which receives the gas after it has been measured in the double bellows and passes it out for use.

I make the gas-chest, or apartments which contain the valves, of cast-iron or any other

suitable material, substantially in the form shown in Figs. 2 and 3, in two apartments, A and B. One of these apartments, A, receives the gas through the aperture *x* before it enters the bellows or measuring-apartments, and the other, B, receives it from the bellows after it has been measured and passes it out through the aperture *a'* for use.

In the apartment A, I have two gas-ports or passages, as shown at *a* and *b*, Figs. 2 and 3, which I close alternately with the pair of valves *c* and *d*, (which are moved out of place to show the ports *a* and *b*, but when in use are situated over the ports, as *g* and *h*, in apartment B,) Fig. 3; and in the apartment B, I also have two gas-ports, as shown at *e* and *f*, Fig. 2, and are concealed by the pair of valves *g* and *h*, Fig. 3. One pair of these gas-ports and valves is shown in section in its relative positions and of double size in Fig. 4.

I make the valves of brass or any other suitable material, substantially in the form shown in Fig. 3 and in section in Fig. 4, (the same for each apartment,) and cover them with soft leather, as shown in Fig. 4, or any other suitable substance.

I make the valve-rod *i* of steel or any other suitable material, and fit it gas-tight by grinding it into its bearings *j j j*, as indicated in Fig. 3, or by any other suitable means; and I fit the valves to this rod and secure them in their proper positions by binding screws, as shown in Figs. 3 and 4.

The valve-rod *i* is rocked to alternately open and close the valves by means of a vertical weighted bar, C, which is secured to the valve-rod *i* by a collar and binding-screw, *k*, and is worked by two helical springs, *l* and *m*, all as shown in Fig. 1. To the lower part of this vertical weighted bar C, I secure a semicircular piece, D, with a recess near each end, as *n* and *o*, into which the ends of the short arms *p* and *q* of the two bell-cranks alternately fall, (or are pressed by springs,) to hold the valves in their proper position, (two open and two shut alternately.)

The two helical springs *l* and *m* are attached to two unconfined tumblers, *r* and *s*, and to the weighted bar C, so that when one side of the double or measuring bellows is expanding (by being filled with gas) its external surface acts on one of the tumblers, and in forcing it

back stretches out the helical spring, while the other helical spring will be relaxed, so that when the end of the short arm, as *q*, of the bell-crank is raised out of the recess, as *o*, in the semicircular piece *D* the spring, as *m*, will throw the weighted bar *C* to the position shown in Fig. 1, which will close the recently-open valves and open those which were recently closed.

I make the double or measuring bellows with a cast-iron or other inflexible diaphragm, *E*, attached to a bed-plate, *K*, as indicated in section in Fig. 5, and the two wings or vibrating parts *F* and *G* of thin plate-iron or any other suitable inflexible material, and complete each apartment with properly-prepared leather or other material which is sufficiently flexible and impervious to gas, as shown at *H* and *I*, Figs. 1 and 5. Through this bed-plate *K* and the base of the diaphragm *E*, I make gas-ports, as *u* and *v*, Fig. 5, to correspond with the gas-ports *a b e f* in the gas-chest, Fig. 2, so that the gas may alternately pass into and out of the measuring-apartments as the operation of the valves will allow. I secure this bed-plate *K*, Fig. 5, to the top of the gas-chest, Fig. 2, as shown in Fig. 1, in such a manner that the gas-ports will properly correspond.

I secure two pieces, *t* and *t'*, on the outside of the wings *F* and *G* of the double bellows, which serve as supports for anti-friction rollers which work the tumblers *r* and *s* to stretch out or strain the helical springs *l* and *m*, and to the pieces *t* and *t'*, I secure a cross-bar, *w*, to brace and keep the two wings *F* and *G* constantly at the same distance, (which is equal to one apartment being full and the other empty;) or I use any other suitable means to keep the wings *F* and *G* at a constant distance.

Having constructed and arranged the several parts as described, I let the gas into the apartment *A* of the gas-chest through the aperture *x*, Fig. 3, when the double bellows is in the situation represented in Fig. 1, where the valves are open to allow the gas to pass out of the apartment *G I* to be burned, and to admit the gas into the apartment *F H* to be measured. The admitted gas will expand the apartment *F H*, so that the anti-friction rollers will force back the tumbler *r* and stretch out the helical spring *l* till it is sufficiently strained, and the piece *t* will come in contact with the point of the long arm *y* of the bell-crank and force it back until the point of the short arm *p* is raised out of the recess *n*, when the force of the strained spring *l* will carry the weighted bar *C* by the center to the left, and sufficiently rock the valve-rod *i* to close the two valves which had been open and open the two which had been closed, and the motion of the weighted bar *C* will also carry over the semicircular piece *D*, so that the point of the short arm *q* of the other bell-crank will fall into the recess *o* and firmly hold the valves in their positions. The movement will then be the re-

verse, so that the expansion of the apartment *G I* will stretch the spring *m* and force back the upper end of the long arm *z* of the other bell-crank, &c., and bring the whole apparatus again to the position represented in Fig. 1, as at first, thus continually measuring the gas and then discharging it at the aperture *a'*, Fig. 3, for use. To register the gas thus measured, I use a sliding bar, *e'*, so constructed and attached that it will be worked by the alternate expansion of the two parts of the measuring-bellows by means of adjusting-screws, as *d'*, one on each side, so that when the slide *e'* is moved in the direction indicated by the dart a spring hand or dog (not seen) will revolve a wheel (not seen) and carry the index or pointer *e'* one degree on the dial-plate *L* in the direction indicated by the dart, and that wheel will move others in the usual way, so as to carry an index, as *M*, and so on, to any desired extent.

To prevent the gas from blowing (at the burner) or any other bad effect from the increase of the pressure in the main, I use an additional bellows, as *N*, which receives the measured gas from the part *B* of the gas-chest (by means of the aperture *a'*, Fig. 3) through tube *O*. To cover the inner end of this tube *O*, I use a clapper-valve, which opens inward, as indicated by dots near *P*, to close which valve I use an elbow-shaped lever, as indicated by dots at *R*, which works on a fulcrum-pin near *S*, and its long arm is attached to the upper portion of the vibrating part of the bellows *N*, as at *T*, so that when the bellows is fully expanded the short arm will press upon and close the valve *P*, so that no change of pressure affects the passage of the gas through the tube *U*, except the pressure of the spring (not seen) which is used to close the bellows *N*.

I am aware that dry gas-meters have been made in which a swinging or vibrating diaphragm has operated to open and close the valves, and that flexible diaphragms have been used where their operation might have been connected with the valves. I therefore do not claim either of them or any apparatus in which a moving or yielding diaphragm is used or suitable for use as a dry gas-meter; but

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

1. So constructing and operating a dry gas-meter that the alternate expansion of the two apartments of the double bellows (while it measures the gas) will regulate the opening and closing of the valves which admit the gas alternately into the apartments, to be measured, and (after being measured) allow it to pass out for use, when the whole is constructed, arranged, and fitted for use substantially as herein described.

2. The method of opening and closing the two pairs of valves by means of the valve-rod *i* and the helical springs *l* and *m*, when they arranged, connected, and fitted to produce the result substantially as herein described.

3. The herein-described method of registering the quantity of gas thus measured by the alternate expansion of the two apartments of the double bellows by means of the slide and dog or hand, substantially as herein described.

4. The use of the additional bellows N to counteract the varying pressure in the main when fitted to close its induction-valve by its

own expansion and allow it to be opened by its contraction, substantially as herein described.

CHARLES KIRK.

Witnesses:

W. H. NETTLETON,
R. FITZGERALD.