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F. E. YOUNGS.

AIR OR GAS METER.

No. 485,075. Patented Oct. 25, 1892.

Fig. 1.

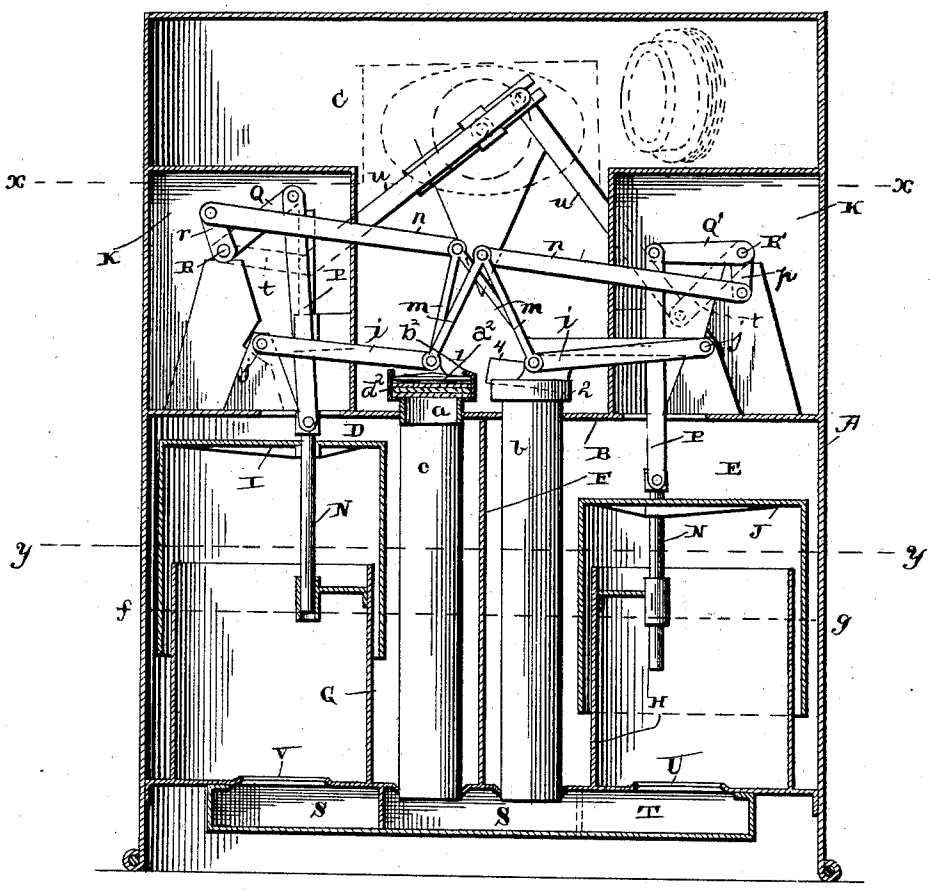

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Fig. 2.

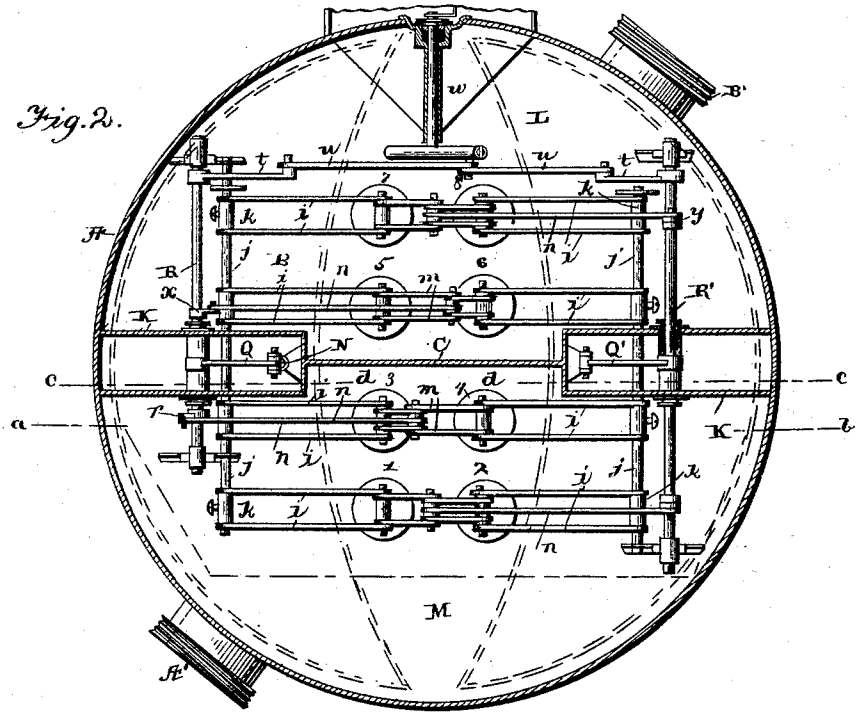

Fig. 3.

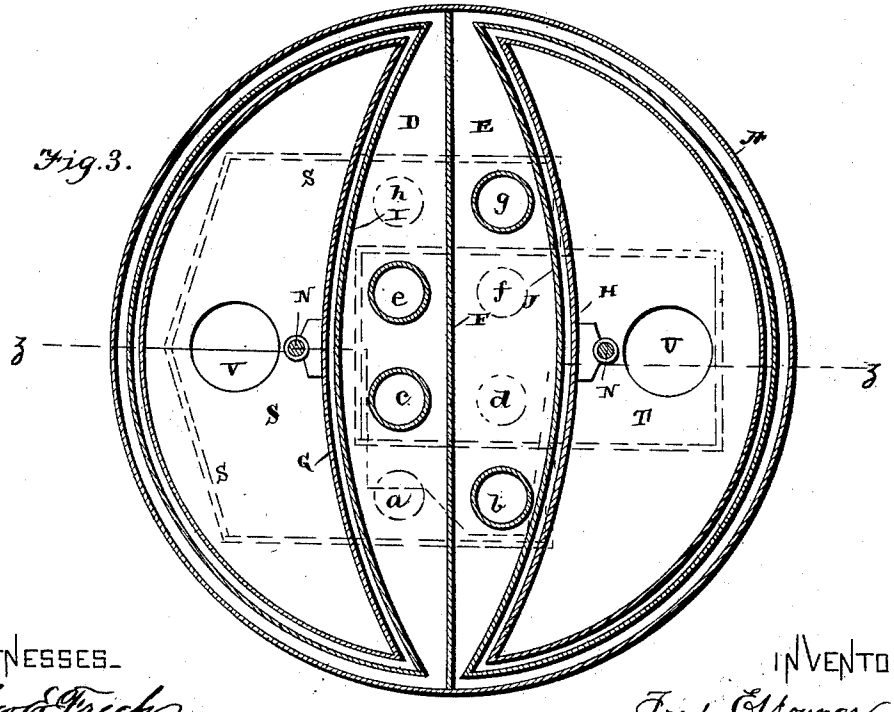

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Fig. 4.

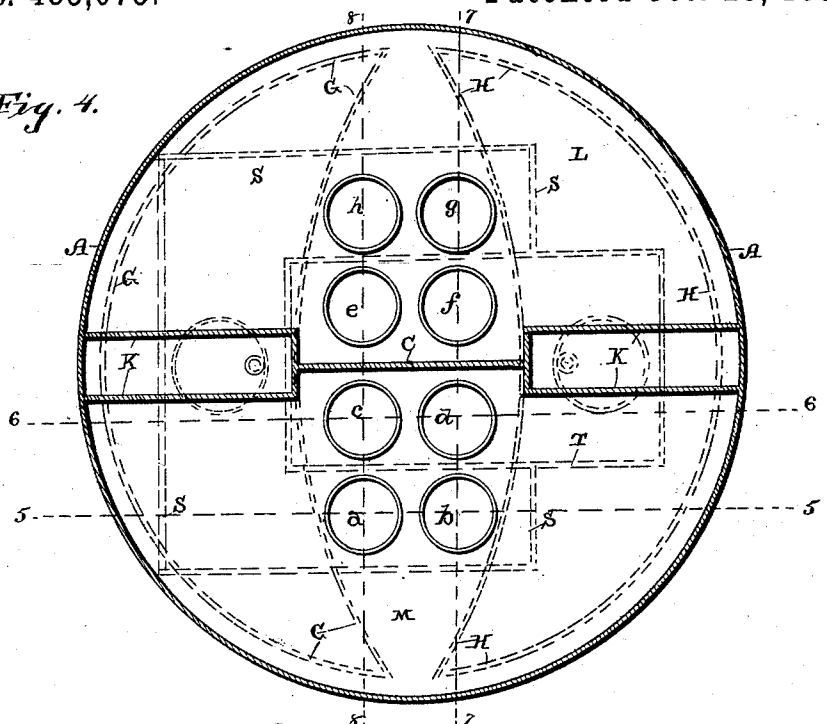

Fig 5.

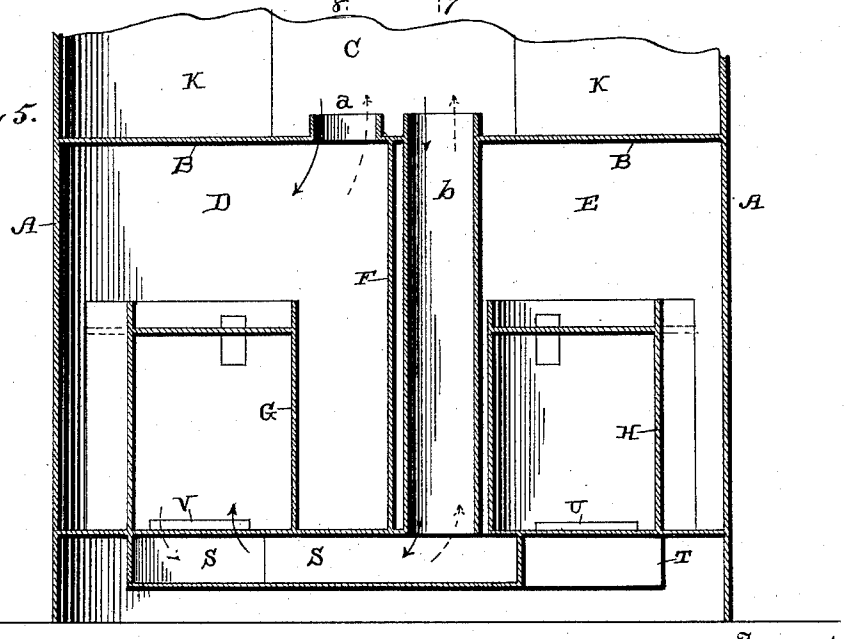

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Fig. 6.

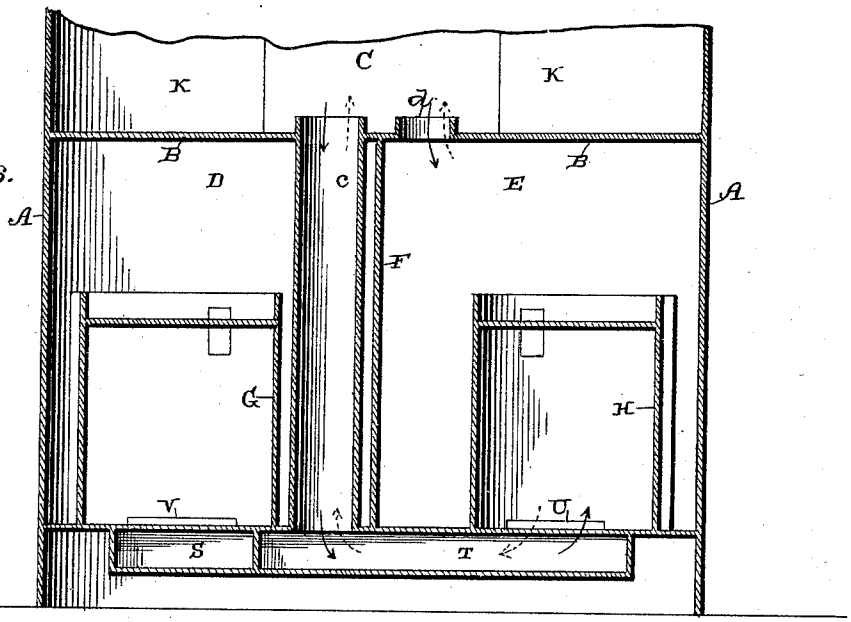

Fig. 7.

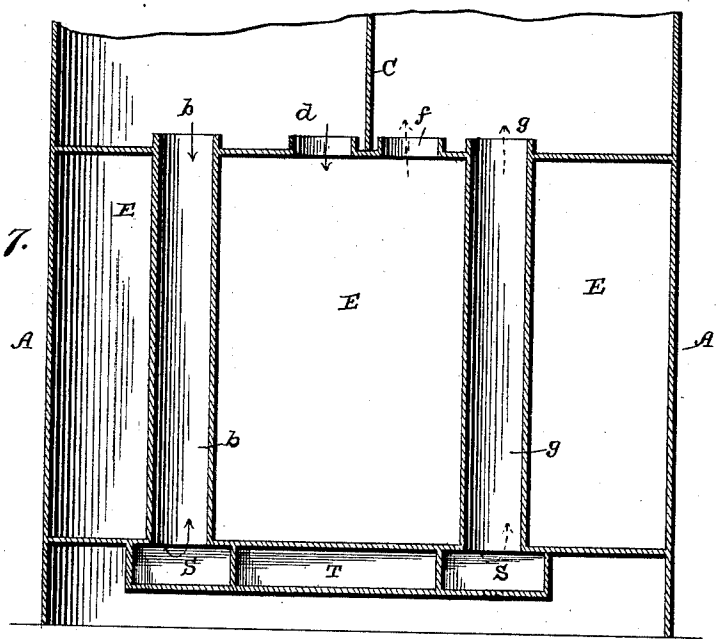

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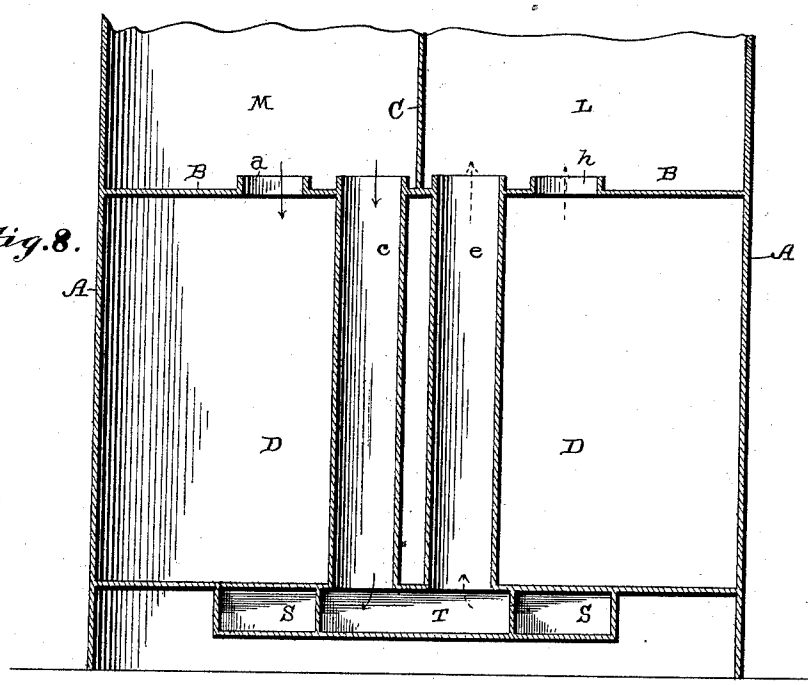
Fig. 8.



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UNITED STATES PATENT OFFICE.

FRED E. YOUNGS, OF ALLEGHENY, PENNSYLVANIA.

AIR OR GAS METER.

SPECIFICATION forming part of Letters Patent No. 485,075, dated October 25, 1892.

Application filed December 19, 1891. Serial No. 415,672. (No model.)

To all whom it may concern:

Be it known that I, FRED E. YOUNGS, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Valve Mechanisms; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to improvements in valve mechanisms which are especially intended and adapted to be used in connection with meters; and it consists in certain novel features of construction and arrangement of parts, which will be fully described hereinafter.

The object of my invention is to provide a valve mechanism for controlling direct-acting valves so constructed and arranged that under no conditions can the valves leading to or from both sides of the pistons be opened at the same time.

In the drawings, Figure 1 is a vertical section of a meter embodying my invention taken on the dotted line *z z*, Fig. 3, and on the dotted line *a b* of Fig. 2, above the line *y y*, and the boxes into which the piston-rods extend being sectioned on the dotted line *c d* of Fig. 2. Fig. 2 is a horizontal section taken on the dotted line *x x* of Fig. 1. Fig. 3 is a similar view taken on the dotted line *y y* of Fig. 1. Fig. 4 is a horizontal section taken on dotted line *x x* of Fig. 1 with the valve mechanism revolved. Fig. 5 is a vertical section taken on dotted line 5 5 of Fig. 4. Fig. 6 is a vertical section taken on dotted line 6 6 of Fig. 4. Fig. 7 is a vertical section taken on dotted line 7 7 of Fig. 4. Fig 8 is a vertical section taken on dotted line 8 8 of Fig. 4.

A indicates a cylindrical chamber, which is divided by a horizontal partition B into an upper valve-chamber and a lower cylinder-chamber, which latter is divided into two chambers D E by means of a vertical partition F. Placed within these cylinder-chambers are the vibrating pans or pistons I J, which are made of a crescent shape, as shown in Fig. 3, to allow room for ports between. The valve-chamber is divided into two chambers L M by the boxes K and the vertical partition C, which extends from the top of the case to the horizontal partition B. Passing through the pans are piston-rods N, which are guided by suitable bearings at their upper and lower ends, as shown. Connected at their lower ends to a cross-head placed on the piston-rods are the links P, which have their upper ends connected to the inner ends of arms Q Q′, which extend inward from the rock-shafts R R′. These rock-shafts are journaled upon suitable supports, which extend upward from the partition B, as shown.

The chambers D and E are filled with liquid, preferably oil, to the level indicated by dotted line *f g* in Fig. 1, so that gas passing into the said chambers D E forces the pans I J down, as will be understood. Secured to the under side of the bottom of the chambers D E is the passage S, serving to connect the lower ends of the ports *b g* with the opening V directly under the pan I. Also placed under these chambers D E is a passage T, which serves to connect the bottoms of the parts *c e* with the under side of the pan J through the opening U. The parts *a*, *d*, *f*, and *h* are connected directly into the upper ends of the cylinder D E.

The rock-shafts R R′ are operated by the pans I J, as will be seen, and these rock-shafts operate the valves. Connected with each of the valves are two arms *i*, which have their outer ends pivoted upon the shaft *j*, which are supported a suitable distance above the partition B by means of brackets, as shown. Secured to the rods or shafts *j* between the ends of the arms *i* are collars *k*, which hold the arms against lateral movement upon the rods and the valves in place upon or over their seats, as will be seen. The inner ends of these rods are connected with the valves by means of any suitable universal joint, so that the valves will seat themselves squarely and evenly upon the whole surface of their seats, thus making at all times a gas-tight joint. This joint consists of a circular cap d^2, having a suitable filling, upon which a disk a^2 rests, and upon this filling the disk rocks in any direction, being loosely held in place by lips b^2, extending inward over the said disk.

Connected at their lower ends to the valves

1 and 2 are the links *m*, which have their upper ends inclined toward each other and pivotally connected to the inner ends of the links *n*. The outer and opposite ends of the links *n* are connected to the downward-extending arm *p* of the rock-shaft R′. In a similar manner the valves 3 and 4 are connected to the upwardly-extending arm *r* on the rock-shaft R, and on the other side of the partition the valves 5 and 6 are connected to downwardly-extending arm *x* on the rock-shaft R, and the valves 7 and 8 are connected to an upwardly-extending arm *y* on rock-shaft R′. Surrounding the openings U and V and extending upward from the bottom of the chambers D E are the walls G and H, which are of a shape corresponding to the shape of the pans and fit closely within them. This arrangement reduces to a large extent the amount of oil necessary to fill the chambers to the proper level, as shown by the dotted line *f g*. On the rock-shafts R and R′ arms *t* are connected by the links *u* with a crank on the shaft *w*, which operates any suitable registering mechanism and also serves to keep the pans in the same relative position with reference to their stroke, so that when one pan is at the end of its stroke and its connection to the crank on its dead-center the other pan will be about in the middle of its stroke, thus permitting a uniform rotation of the crank.

Owing to the fact that one valve of each pair forms the fulcrum upon which the other is raised, it is absolutely necessary for one valve of each pair to be properly seated before the other is opened, which prevents absolutely the opening of both valves at the same time, or the opening of one valve in each pair in advance of the closing of the other valve, even to the slightest degree. This is a serious and common defect of ordinary meters, which is positively avoided in my meter in the manner just set forth.

In operation the gas, air, or steam may be fed into either the chamber L or the chamber M, as desired, the only effect being to reverse the motion of the meter.

For the purpose of illustrating the operation the port A′ will be described as the "inlet" and the port B′ as the "outlet" port. As shown in Fig. 1, the pan I is at the upper limit of its stroke, the pan J moving down, and gas passing from the chamber M through the open valve 4 to the chamber E above the pan and forcing it down, while gas is passing from the under side of the pan J through the passage T and port *e*, controlled by valve 5, to chamber L. The continued downward movement of the pan J opens the valve 1, controlling port *a*, communicating with the chamber D, and on the other side of the partition C opens the valve 8, controlling the port *h*, which communicates with the under side of the pan I through the passage S at the instant the pan I has reached the upward limit of its stroke. When the pan J reaches the downward limit of its stroke, the valve 4, controlling the port *d*, which communicates with the upper side of the pan J, is closed by the downward movement of the pan I, and the valve 3, controlling the port *c*, which communicates with the under side of the pan J through the passage T, is opened, thus admitting gas below the pan J, and at the same time the valve 5 is closed and the valve 6 is opened, allowing the gas from the upper side of the pan J to escape through the port *f* into the chamber L and through the outlet-port B′. The valves 1, 2, 7, and 8, which control ports for admitting and exhausting gas to operate the pan I, are operated and controlled by rock-shaft R′, which is operated by the pan J, and the valves 3, 4, 5, and 6, which coact with the pan J, are operated and controlled by the rock-shaft R, which is connected with the pan I. From this it will be seen that the valves which coact with one pan are operated and controlled by the movement of the other pan. It will also be understood from this description that gas is fed to and exhausted from opposite sides of the pans in a manner similar to admitting and exhausting steam to and from opposite sides of the piston of a steam-engine.

While I here show and describe a pan which is operated upon by the gas, I do not limit myself to the use thereof, for it will be understood that a diaphragm-piston or other similar device may be substituted therefor without affecting the construction or operation of my valve mechanism in any manner whatsoever. Neither do I limit myself to the use of this valve mechanism in a meter, for it will be readily conceived that it may be used in connection with marine or other engines, pumps, and in many other similar machines which feed and exhaust steam, air, gas, water, or other fluid to opposite sides of the piston, pan, diaphragm, or other similar mechanical element.

I do not in this application make any claim to a valve mechanism comprising two or more valves connected and moving in pairs and each pair fulcrumed upon another pair, for this is made the subject-matter of my pending application, Serial No. 415,673.

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

1. A valve mechanism comprising two or more valves which are fulcrumed one upon the other and an operating mechanism connected therewith, as described.

2. A valve mechanism comprising two valves fulcrumed one upon the other, which respectively control ports communicating with opposite sides of a piston, and a mechanism for alternately opening and closing the said valves, substantially as described.

3. In a valve mechanism comprising four valves connected in pairs, the valves of each pair being fulcrumed upon each other, and an operating means for and connected with each

pair, which reciprocates in a line therewith, whereby the valves of each pair are alternately rocked upon the other valves of the same pair, substantially as specified.

4. A valve mechanism comprising four valves connected in pairs, the valves of each pair being fulcrumed upon each other, and an operating means for and connected with each pair for rocking them, which reciprocates in a line with each pair of valves, the two reciprocating means moving in opposite directions, substantially as described.

5. A valve mechanism for two cylinders, comprising two pairs of valves for each cylinder, the valves of each pair controlling ports which communicate, respectively, with opposite sides of a piston, and a reciprocating operating mechanism connected with the valves for alternately opening and closing the valves of each pair, respectively, substantially as set forth.

6. A valve mechanism for two cylinders, comprising valves for each cylinder, which are connected in pairs by links having one end connected with the valves and their other ends connected together, and an operating mechanism connected with the links of each pair, which reciprocates the links back and forth for rocking the valves of each pair alternately upon each other, substantially as set forth.

7. A meter comprising a casing divided into cylinder and valve chambers, the valve-chamber being divided into inlet and outlet chambers, a piston within the cylinder-chamber, ports communicating, respectively, with opposite sides of the piston and with the inlet and outlet chambers, valves connected in pairs for controlling the said ports, and an operating mechanism connected with the valves and the piston for alternately opening and closing the valves of each pair, respectively, substantially as specified.

8. A meter comprising a casing divided into cylinder and valve chambers, the valve-chamber being divided into inlet and outlet chambers, a piston within the cylinder-chamber, ports communicating, respectively, with opposite sides of the piston, valves connected in pairs and fulcrumed upon each other for controlling the said ports, and an operating mechanism connected with the valves and piston, which reciprocates with the pair of valves, whereby they are rocked one upon the other and alternately opened and closed, substantially as described.

9. A meter comprising an inlet and outlet chamber, a piston, ports communicating, respectively, with opposite sides of the piston, valves controlling the ports, connected in pairs and fulcrumed upon each other, and an operating means connected with the piston and the valves, which reciprocates with the pairs of valves for rocking the valves of each pair upon each other and alternately opening and closing them, substantially as specified.

10. A meter comprising a valve-chamber divided into an inlet and an outlet chamber, two cylinder-chambers, pistons therein, boxes in the valve-chamber, communicating with the cylinder-chambers, ports communicating with opposite sides of the pistons, valves for controlling the said ports, rock-shafts in the valve-chambers, passing through the said boxes, the pistons connected with the rock-shafts within the boxes, and connections between the shafts and the valves outside of the boxes for operating them, substantially as set forth.

11. A meter comprising a circular casing having inlet and outlet chambers, two cylinder-chambers, crescent-shaped pistons therein, passages below the cylinder-chambers, communicating, respectively, with the under sides of the pistons, ports between the crescent-shaped pistons, communicating with the passages, ports communicating with the cylinder-chambers, valves for controlling the said ports, and an operating mechanism for the said valves, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

FRED E. YOUNGS.

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J. M. NESBIT.