(No Model.)

J. W. CULMER.

PLURAL PISTON GAS METER.

No. 398,708. Patented Feb. 26, 1889.

Fig. 1

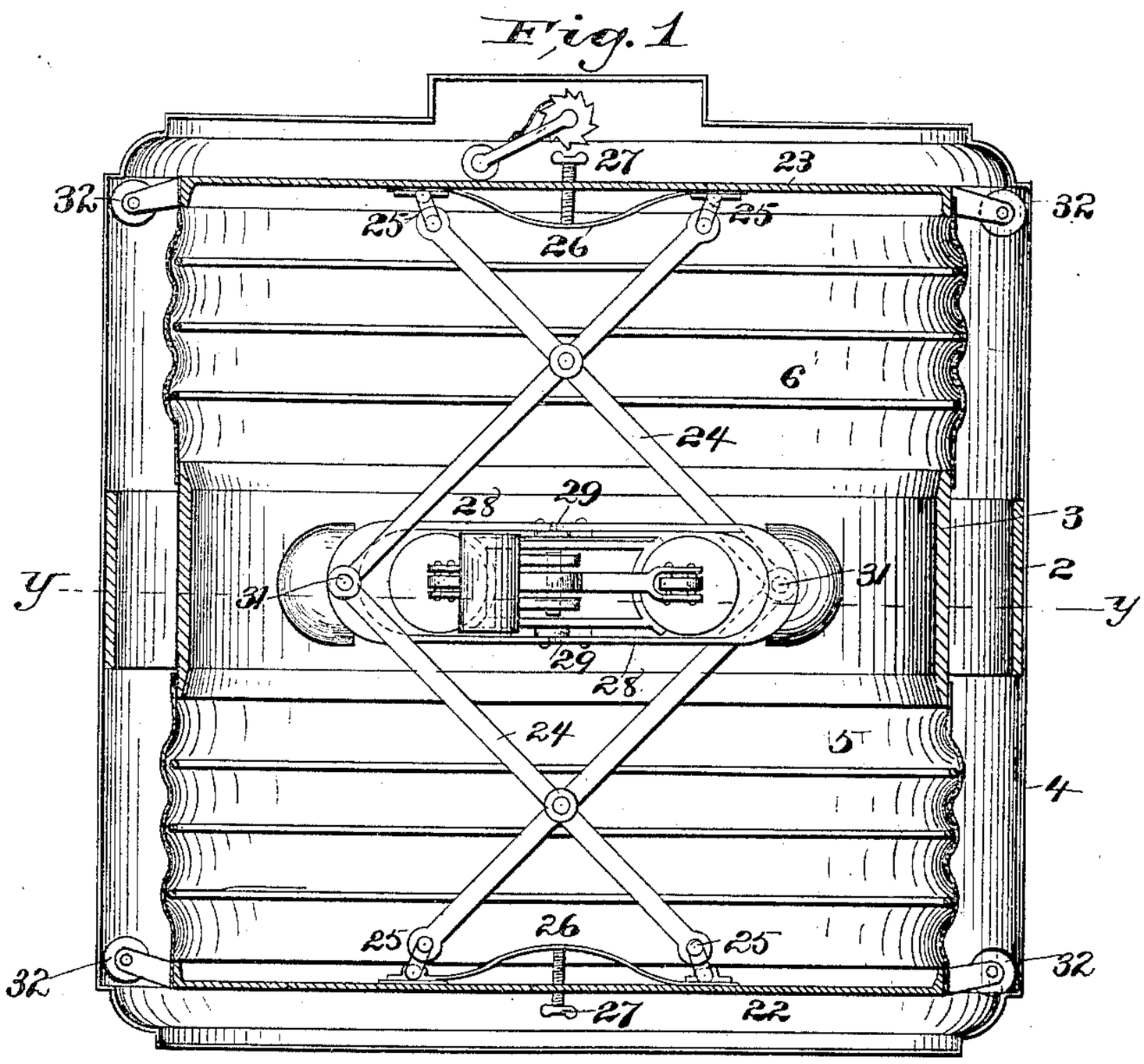
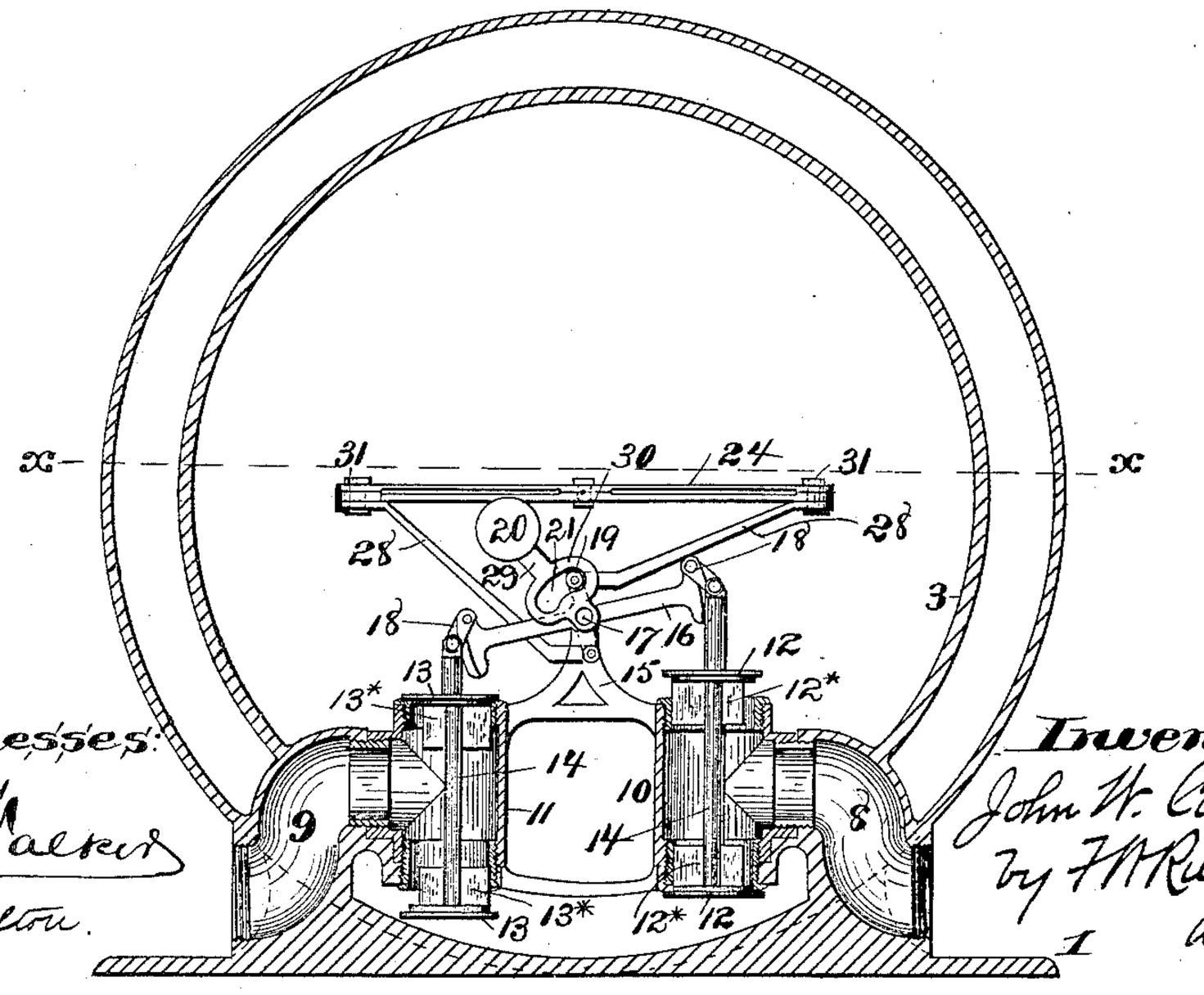


Fig. 2.



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UNITED STATES PATENT OFFICE.

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PLURAL-PISTON GAS-METER.

SPECIFICATION forming part of Letters Patent No. 398,708, dated February 26, 1889.

Application filed August 29, 1888. Serial No. 284,076. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. CULMER, a citizen of the United States, residing at the borough of New Brighton, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in Plural-Piston Gas-Meters; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, wherein—

Figure 1 is a horizontal section of a meter embodying my invention, taken on the line *x x*, Fig. 2; and Fig. 2 is a vertical transverse section of the same, taken on the line *y y*, Fig. 1.

Like figures refer to like parts wherever they occur.

My invention relates to that class of "dry meters" in which the measurement is effected by the reciprocating action of a piston or pistons inclosed in an outer case. The general form of such meters heretofore devised has consisted of a bellows or a plurality of the same attached gas-tight to pistons or suitable heads and to a base or bases, the space inclosed within the bellows between its points of greatest expansion and contraction being taken as the unit of measurement, and in such cases where two or more bellows and pistons were used the piston-heads and attachments were made complementary to each other, the action of one piston and bellows operating the valves and controlling the inflow and exhaust of the other or others; or the bellows have been complementary, in that they were attached by means of levers or bell-cranks to one and the same spindle, which they rotated, and which spindle operated the valves of each bellows at fixed relative strokes. As the motion of the valve-gear in such cases has been slow and continuous, the valves employed have necessarily been of the general character of slide-valves having a large contact-surface compared with the size of the ports, which occasioned much friction, constantly increasing as gummy or waxy precipitate from the gas was deposited on the sliding surfaces of the valves.

The object of the present invention is to construct a plural piston and bellows meter which shall operate by displacement—that is to say, by utilizing both the bellows and its case for measurement purposes as the bellows expands and contracts—and shall be provided with direct-seating valves, and reversing-gear which shall instantaneously reverse the valves at a fixed point within the range and near the ends of the strokes of the pistons.

To this end it consists in certain special combinations and particular features of construction, all as will hereinafter more fully appear.

I will now proceed to describe my invention more specifically, so that others skilled in the art to which it appertains may apply the same.

In the drawings, 1 indicates a base, upon which are arranged or formed two concentric vertical rings, 2 and 3, the outer ring, 2, for attachment of the outer shell or meter-case, 4, and the inner ring, 3, for attachment of the plural bellows 5 and 6. Extending from the outside of the outer ring, 2, to the inside of the inner ring, 3, are ports or passages 8 and 9, which terminate in tubular heads or T's 10 and 11, so that one port of each passage is within the inner ring, 3, and one port of each is without said ring 3 and between it and outer ring, 2. The tubular heads or T's 10 and 11 are preferably arranged vertically and parallel, and are each provided with a double puppet-valve or puppets, 12 and 13, connected in pairs by stems 14 14. These puppet-valves 12 and 13 may have the usual guide-wings, 12* 13*.

Between and preferably supported by the tubular heads or T's 10 and 11 is a bracket or stand, 15, on which is a rocking arm or lever, 16, which moves freely on a spindle, 17, journaled in the stand 15, the opposite ends of said rock-lever 16 being connected to the respective stems 14 of the double puppet-valves by means of links 18 18.

19 indicates a gravity or drop lever loosely journaled at one end on the spindle 17, provided at its opposite end with a weight, 20, and having an arc-shape or curved slot, 21, at some intermediate point, the function of said lever being to throw or suddenly rock the rock-lever 16, which controls the valves.

22 and 23 indicate the bellows heads or pistons, which are connected with the inner cen-

tral ring, 3, by the flexible bellows 5 and 6, and with each other by the lazy-tongs mechanism 24. The extremities of said lazy-tongs mechanism 24 are secured to the opposite pistons or heads, 22 and 23, by sliding pivot-blocks 25, and said extremities or their sliding pivot-blocks 25 of each side are connected by a bent plate, 26, or equivalent couplings, which may be operated by any suitable means—for instance, a screw, 27, passing through the piston-head—so that by drawing down the bent plates 26 by means of screws 27 the arc through which the levers of the lazy-tongs can move, and consequently the strokes of the pistons 22 and 23, are shortened, and can thus be readily adjusted at will to correct any errors of measurement.

At its mid-length, or at the central points or pivots, 31, which are in line with the valve mechanism, the lazy-tongs 24 are provided with connecting-rods 28, which connect the lazy-tongs with crank-arms 29 on spindle 17, and at said points of connection are crank-pins 30, one of which enters the slot 21 of the pivoted gravity-lever 19, by which means the lever 19, with its weight 20, is carried past its center point at the extremes of movement of the central points of lazy-tongs 24, and falling by gravity instantaneously throws or reverses the puppet-valves 12 and 13.

In the construction herein shown and described the plural pistons are arranged vertically and to reciprocate in a horizontal plane, which will relieve the gas from compression by the weight thereof and of the lazy-tongs and the meter from irregularity of action; but to preserve the relations of the case and bellows, as well as to obviate friction, it is desirable to provide the pistons with rollers, as indicated at 32, Fig. 1.

A single lazy-tongs mechanism, as shown, will suffice for a combination of two piston-heads; but where the number of pistons and bellows inclosed in the case is increased the number of the lazy-tongs movements must be increased, and should be coupled at a common center, from which point they actuate the valve mechanism.

The meter, being constructed substantially as hereinbefore specified, will operate as follows: The devices being in the position shown in the drawings, the gas enters the meter through supply-pipe 8, and passes inner valve, 12, inflating the plural bellows 5 6 until the piston-heads 22 and 23 have reached the outer extremities of stroke permitted by the lazy-tongs mechanism, (as it has been adjusted by mechanism 26 27,) at which point the inward movement of the central pivots, 31, of the lazy-tongs, acting on weighted lever 19 by means of rods 28, has carried said lever over its center, whereupon it will suddenly fall by its own gravity, actuating rock-lever 16 so as to close the inner inlet-valve, 12, and the outer outlet-valve, 13, and open the outer inlet-valve, 12, and also open the inner outlet-valve, 13, or, in other words, will instantaneously reverse the square or direct-seating puppet-valve, whereupon the gas from the supply-pipe will enter the case instead of the bellows, and the gas from the interior of the bellows will escape through outlet-passage 9. As soon as the pistons 22 23 have approached each other (or the bellows contracted) to the extent permitted by the adjustment of the lazy-tongs mechanism, the extreme outward movement of the pivot-points 31 of the lazy-tongs will (through the medium of rods 28) carry weighted lever 19 back past its center, and it will fall in the reverse direction, causing the lever 16 to rock back into the position shown in the drawings, again reversing the valve so as to re-establish the communication between the supply and the interior bellows.

A specially-valuable feature of the invention consists in the combination of the bellows with the central ring and the coupling of the piston-heads and valves by the lazy-tongs, as thereby the surfaces upon which the gas (pressure) acts is multiplied, and its work in throwing the valves is proportionately reduced.

I do not herein claim, broadly, the combination, with the shell or outer case, bellows, and piston, of a bellows-ring having valved passages which connect with both the interior and exterior of said ring; neither do I broadly claim the combination, with a bellows and its piston, of lazy-tongs mechanism adjustably connected with said piston, as the same forms the subject-matter of a separate application, Serial No. 284,075, filed of even date herewith; but,

Having thus set forth the nature, operation, and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a plural-piston gas-meter, the combination, with a shell-ring, a shell or case attached thereto, and a series of bellows and pistons, of a bellows-ring arranged concentrically with the shell-ring and provided with valved passages which connect the interior and exterior of said bellows-ring, said bellows-ring forming a common attachment for the series of bellows, substantially as and for the purposes specified.

2. In a plural-piston meter, the combination of concentric case-ring and bellows-ring, an inlet-passage which extends through the annular chamber between said rings, said passages terminating in valve-boxes having ports on both sides of the inner ring, and double puppet-valves arranged to control the ports of said inlet and outlet passages, substantially as and for the purposes specified.

3. In a gas-meter, the combination of concentric shell-ring and bellows-ring, valve passages or boxes having ports on both sides of the inner ring, said boxes arranged parallel, double puppet-valves, a rock-lever for coupling said valves, and a gravity-lever for actuating the rock-lever from the bellows-pistons, substantially as and for the purposes specified.

4. In a gas-meter, the combination, with a central base, of a plurality of pistons, a single lazy-tongs mechanism which connects the several pistons, and inlet and outlet valves centrally arranged and actuated by the expansion and contraction of the lazy-tongs, substantially as and for the purposes specified.

5. In a gas-meter, the combination, with central concentrically-arranged shell-ring and bellows-ring, of plural piston-heads, a lazy-tongs mechanism which connects the piston-heads, and inlet and outlet valves arranged in the inner or bellows ring and actuated by the lazy-tongs, substantially as and for the purposes specified.

6. In a gas-meter, the combination, with a single case having centrally-arranged inlet and outlet valves, of a plurality of bellows, a lazy-tongs mechanism which connects the several pistons or bellows-heads, and adjustable connections for uniting the ends of the lazy-tongs mechanism with each of the several heads or pistons, substantially as and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 27th day of August, 1888.

JOHN W. CULMER.

Witnesses:
W. A. COVENTRY,
JOSEPH SWESEY.