H. F. TOLHURST.

GAS METER.

APPLICATION FILED AUG. 18, 1916. RENEWED JUNE 30, 1919.

1,432,809.

Patented Oct. 24, 1922.

2 SHEETS—SHEET 1.

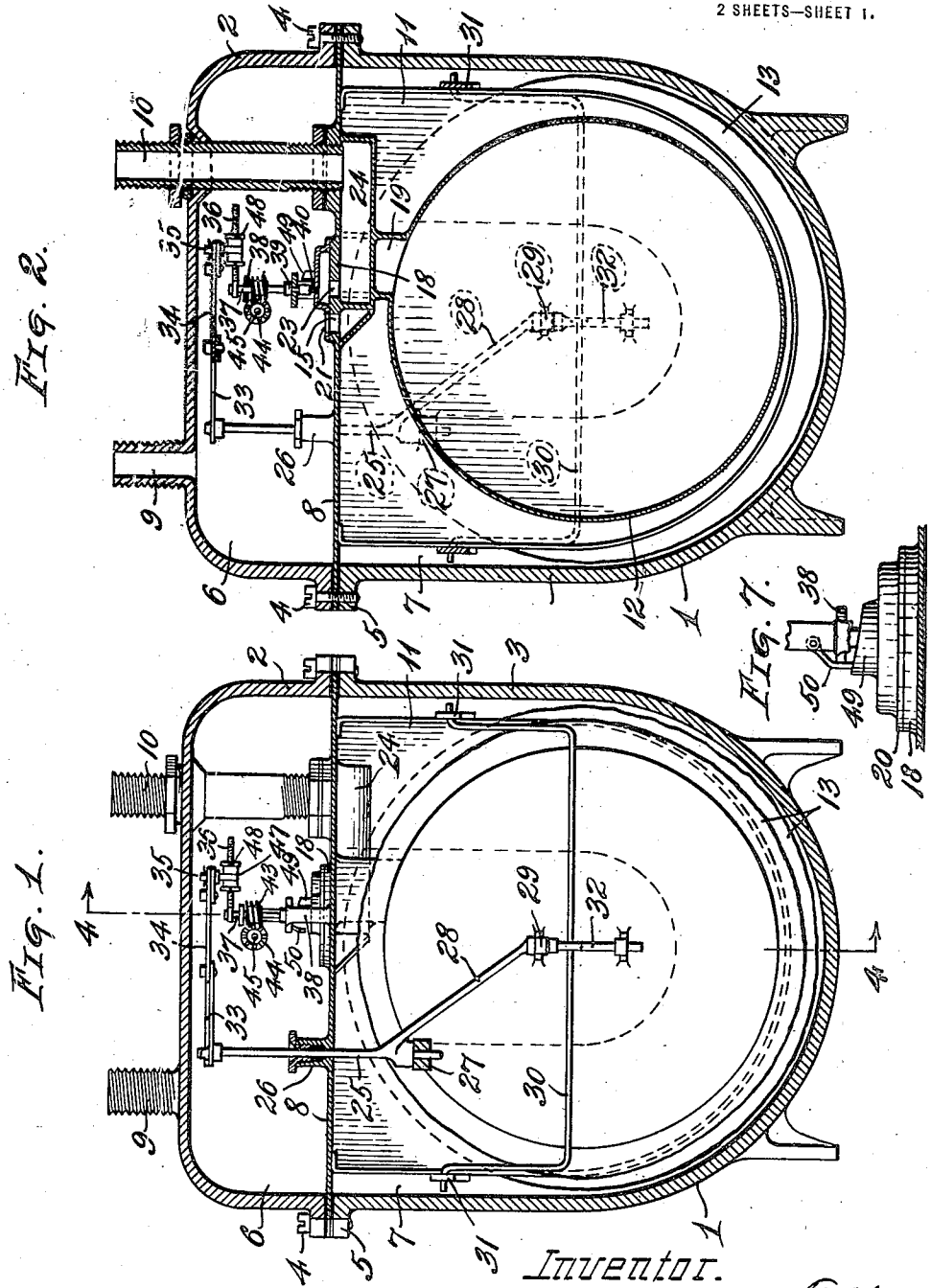


Fig. 2.

Fig. 1.

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Inventor.

Herbert F. Tolhurst

Brockett and Hyde

Atty's.

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2 SHEETS—SHEET 2.

FIG. 3.

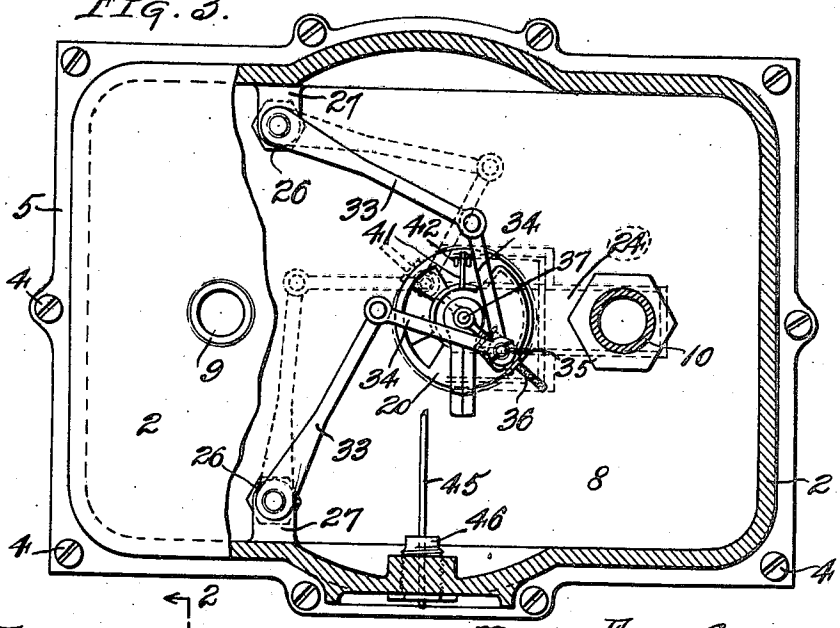


FIG. 4.

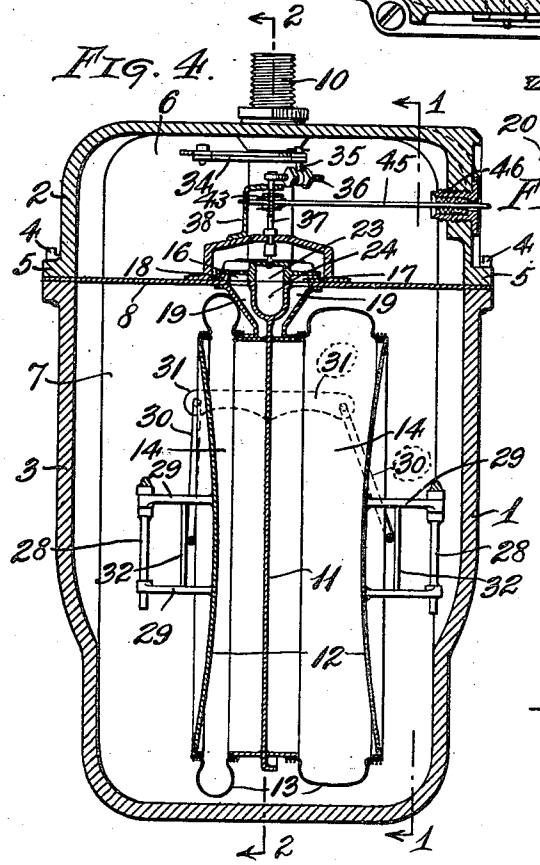


FIG. 6.

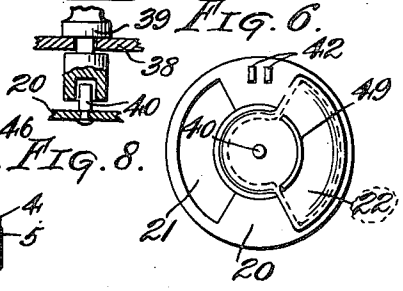
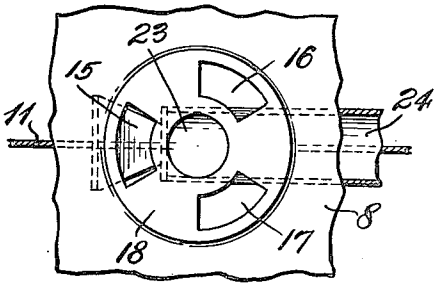


FIG. 8.

FIG. 5.



Inventor.

Herbert F. Tolhurst

Brocket and Hyde

Attys.

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UNITED STATES PATENT OFFICE.

HERBERT F. TOLHURST, OF CLEVELAND, OHIO.

GAS METER.

Application filed August 18, 1916, Serial No. 115,651. Renewed June 30, 1919. Serial No. 307,786.

To all whom it may concern:

Be it known that I, HERBERT F. TOLHURST, citizen of the United States, residing at Cleveland, in the county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Gas Meters, of which the following is a specification.

This invention relates to fluid meters, and more particularly to gas meters. The objects of the invention are to generally improve and simplify the construction of the meter; to provide a more durable meter; one whose inner working parts are removable bodily from the casing and may be replaced when out of order; one whose casing has a minimum number of sealed and finished joints; one whose valve is of simple form and is not liable to get out of order; one which avoids theft of gas by attempts to reverse the direction of operation of the meter; and finally a meter having a lesser number of measuring chambers or pockets than customarily employed in similar meters. Further objects of the invention are in part obvious and in part will appear more in detail hereinafter.

The invention comprises the fluid meter hereinafter described and claimed.

In the drawings, which represent one embodiment of the invention, Fig. 1 is a sectional elevation on the line 1—1, Fig. 4; Fig. 2 is a similar section on the line 2—2, Fig. 4; Fig. 3 is a plan view with a portion of the cover broken away to expose the mechanism; Fig. 4 is a transverse sectional elevation through the axis of rotation of the valve device; Fig. 5 is a plan view of the valve seat; Fig. 6 is a similar view of the valve; Fig. 7 is a detail elevation, illustrating a stop device; and Fig. 8 is a detail view of an operating shaft.

Referring to the drawings, 1 indicates the outer casing, which is of simple form and preferably comprises only two members, a cap member 2 and a body member 3, having plain finished meeting faces held together by clamping bolts 4 passing through ears on the flanges 5. The shape of said members is immaterial, so long as they conform to and receive the inner working parts and have sufficient capacity for the required operations. The casing is preferably made of cast metal, such as iron, as light as possible, but still heavy enough to prevent flaws or pin-holes which might permit leakage. Such a casing will not rust out as is the case with tin or other tin sheet metal casings, and also avoids soldered or brazed joints.

The space or cavity within the casing is divided into cap and body compartments or pockets 6, 7, by a suitable cross wall or diaphragm 8, whose edges are clamped between the meeting faces of the casing members. This cross wall also serves as a support for the bellows and other operating mechanism. The fluid or gas to be measured is all admitted or supplied to the fluid receiving chamber 6 from the supply pipe 9 and flows through the measuring devices to a delivery pipe 10 passing through the chamber 6 and leading to the delivery line.

Within the body chamber 7 is a double bellows formed by a central longitudinal wall 11 and two parallel metal walls or discs 12 connected thereto by flexible leathers 13. Wall 11 does not extend outwardly to the casing so that there are in effect three separate measuring chambers in the body, to wit, the outer body compartment 7 and the two like compartments 14 within the two bellows. These three chambers communicate independently with three ports 15, 16, 17 in a valve seat 18 carried by the cross wall 8. Port 15 is above and opens on both sides of a portion of the central wall 11, as shown in Fig. 5, while ports 16 and 17 communicate through closed passages 19 with their respective chambers 14, as shown in Fig. 4.

Upon the valve seat 18 is a rotary valve 20, which may be of any suitable form, but is shown as a sheet metal member held to its seat by the pressure of the fluid in the cap chamber 6 and provided with a through port 21 and pressed upwardly to form a hollow passage 22 on its bottom face. This passage overlaps a central port 23 in the valve seat and in all positions of said valve establishes communication from one or more of the ports 15, 16, 17 through the port 23 to a longitudinal passage 24 leading to the delivery pipe 10.

Valve member 20 rotates constantly on its seat when the gas is flowing, its port 21 and passage 22 passing in turn over the three seat ports 15, 16 and 17 leading to the measuring compartments. While port 21 is passing over one of said seat ports gas flows under pressure into the corresponding measuring

chamber while when the passage 22 passes over said seat port gas flows from the corresponding measuring chamber out to the delivery pipe, each of said chambers being filled and emptied in turn, as is customary in this type of meter. If the casing is of the same size as the usual forms of meter having four measuring compartments, this three-compartment meter will give the same measuring capacity, although the mechanism is simpler and cheaper to manufacture and keep in order.

The valve movement is produced by the pumping action of the bellows whose discs 12 move out and in as the bellows dilate and contract. Said discs have a parallel motion toward and from each other, which motion is communicated to the registering apparatus by the flag wires 25. These flag wires are vertical rods journalled in packings or stuffing boxes 26 carried by the cross wall 8, their lower ends turning in bearings or openings in lugs or shelves 27 on the casing wall. These lower bearings are fairly close to the cross wall 8 and prevent any lateral play or movement of the flag wires and not only permit the use of shorter flag wires than usual but also serve as an additional rigid connection from the meter mechanism to the casing at a lower level than the wall 8. Each flag wire has an arm 28 whose free end turns in openings in posts 29 attached to a disc 12, said two posts preventing the disc from tilting about a horizontal axis. Tilting movement of each disc about a vertical axis is prevented by a U-shaped wire bail or member 30 whose ends are sprung into openings in brackets 31 carried by the wall 11 and whose central straight body portion lies between the disc and flag wire, and more specifically beneath a bridge 32 from post to post. As the disc moves in and out said wire bail swings about a horizontal axis through its ends and its body portion slides up and down under the bridge 32. Above the stuffing boxes 26 the flag wires are provided with arms 33 connected by links 34 to a pivot pin 35 on an arm 36 extending outwardly from the upper end of a vertical shaft 37 journalled in brackets 38 carried by the cross wall 8, and which shaft has a collar 39 resting on the lower bracket and a cavity in its lower end to receive a central pin 40 attached to the valve. This pin forms a pivot about which the valve turns but as the shaft is supported by the lower bracket 38 there is no weight upon the valve and it is held to its seat only by fluid pressure with minimum friction on its seat. Shaft 37 also has a radial arm 41 whose end lies between two ears 42 on the valve. The dilation and contraction of the two bellows oscillate the arms 33, which together produce a rotary movement of the shaft and turn the valve upon its seat. The rotation of the shaft is also communicated by a worm 43 and worm gear 44 to a cross shaft 45 passing through a stuffing box 46 to the outside of the frame and there attached to a suitable register, which counts up the number of revolutions of the shaft and thereby registers and indicates the volume of fluid measured in the usual manner.

Pivot pin 35 is carried by a member 47 held between two lock nuts 48 threaded on the arm 36. By adjusting said member along the arm the number of revolutions of the shaft 37 per unit of volume of gas measured may be increased or diminished, enabling the meter to be calibrated to the register.

The meter also is provided with a "thief catcher," designed to prevent unauthorized use of gas by re-arranging the connections to the meter so as the gas will flow backwardly therethrough. For this purpose the valve 20 is provided with a circumferentially extending vertical wall 49 whose upper edge is inclined and travels past a hinged stop or pawl 50 supported on the bracket 38. When the valve rotates in the proper direction, i. e., to the left in Fig. 7, the high part of the wall strikes the stop first and said stop lifts and drags over the inclined edge of the wall from its high to its low point. However, if the meter is run backwardly by reversing the supply and delivery connections to the pipes 9 and 10, the low part of the wall first engages the stop and serves as a wedge to jam said stop tightly against its bracket. The high part of the wall is above the lower end of the stop and cannot pass the same in the reversed direction of rotation. The meter, therefore, stops if attempts are made to reverse it. Moreover, the hinged stop 50 holds the valve tightly against its seat so that no gas can possibly flow through the meter by raising the valve from its seat, as is the case with prior devices of this kind.

The meter described is of simple construction and can be manufactured at low cost. Its capacity is equal to that of the same sized meter with a larger number of measuring compartments. Its valve is simple and operates with minimum friction. The reduction in the number of parts and their simpler arrangement also reduces and practically eliminates noise so that the meter is silent in operation. The inner working parts are all supported by the cross wall or plate 8 so that by removing the cap all of the internal parts can be taken out as a unit. This enables the casing to be immediately replaced in service by substituting a new set of operating parts for the ones requiring repair. The cast iron case has only two finished surfaces requiring gaskets and the portable inner construction omits the usual gaskets around the edges of the central

longitudinal wall. The entire meter is therefore, less liable to leak than meters as usually constructed.

What I claim is:—

1. A fluid meter, comprising a casing having a cap and body provided with meeting faces, a supporting wall clamped between said faces, and fluid measuring devices carried by said cross wall and free on all sides from the walls of said body.

2. A fluid meter, comprising a casing having a cap and body provided with meeting faces, a supporting wall clamped between said faces, and fluid measuring devices carried by said cross wall and depending in the lower chamber in said body, said devices being free on all sides from the walls of said body and being removable bodily from said casing with said supporting wall.

3. A fluid meter, comprising a casing, a cross wall therein forming a receiving chamber on one side of said wall and an outer measuring compartment on the other side thereof, two bellows both exposed in said compartment, each having a measuring compartment therein, a valve seat on said wall provided with three ports, one communicating with each of said three measuring compartments, and a valve working on said seat controlling the flow of fluid from said receiving chamber to said three compartments.

4. A fluid meter, comprising a casing, a horizontal supporting member therein, measuring bellows carried by said member and pendant therefrom, flag wires extending above and below said member, bearings for said flag wires supported on the side walls of said casing, and arms extending from said flag wires to the bellows.

5. In a fluid meter, a supporting wall, a diaphragm attached thereto, bellows on opposite sides of said diaphragm and including reciprocating discs, flag wires, posts carried by said discs and pivotally engaging said flag wires, and hinged bails carried by said diaphragm and passing between said posts and beneath said flag wires for preventing tilting movement of said discs.

6. A fluid meter, comprising a casing, a horizontally extending supporting member therein, a diaphragm attached thereto, bellows on opposite sides of said diaphragm and including reciprocating discs, flag wires, posts carried by said discs and supporting said flag wires, and hinged bails carried by said diaphragm and passing between said posts and beneath said flag wires for preventing tilting movement of said bellows, the diaphragm, discs, and supporting member being together removable as a unit from the casing.

7. In a fluid meter, a supporting member, a valve seat thereon provided with ports, a valve rotating on said seat, bellows members carried by said member whose chambers communicate with said ports, a shaft above the center of said valve operated by said bellows, and a pin on said valve entering an opening in the lower end of said shaft and forming a pivot for said valve.

8. In a fluid meter, a supporting wall, a valve seat thereon provided with ports, a valve rotating on said seat, bellows members whose chambers communicate with said ports, a shaft above said valve and operated by said bellows, a circumferentially extending wall having an inclined upper edge carried by said valve, and a hinged pawl lying in the path of movement of said wall and arranged to co-operate with its inclined upper edge to prevent backward rotation of said valve.

9. In a fluid meter, comprising a casing, a supporting wall therein forming a fluid receiving chamber and a measuring compartment, a diaphragm carried by said wall and lying in said compartment and free at its edges from the walls thereof, and bellows members located on opposite sides of said diaphragm.

10. A fluid meter, comprising a casing having a cap and body provided with meeting faces, a supporting member extending across and removable from the cavity formed by said cap and body, and fluid measuring bellows carried by and removable with said member from the cap and body and free on all sides from the walls of said body.

11. A fluid meter, comprising a casing having a cap and body provided with meeting faces, a supporting member extending across and removable from the cavity formed by said cap and body, fluid measuring bellows carried by said member and depending in said cavity, and a wall separated by said bellows and carried by said member, said bellows and wall being free on all sides from the walls of said body and being removable bodily from said casing with said member.

In testimony whereof I affix my signature.

HERBERT F. TOLHURST.

Witnesses:

MARTHA B. MCCARTNEY,

HENRY GREENWALD.