F. H. ROSENCRANTS.

FLOW METER.

APPLICATION FILED NOV. 10, 1915.

1,205,787.

Patented Nov. 21, 1916.

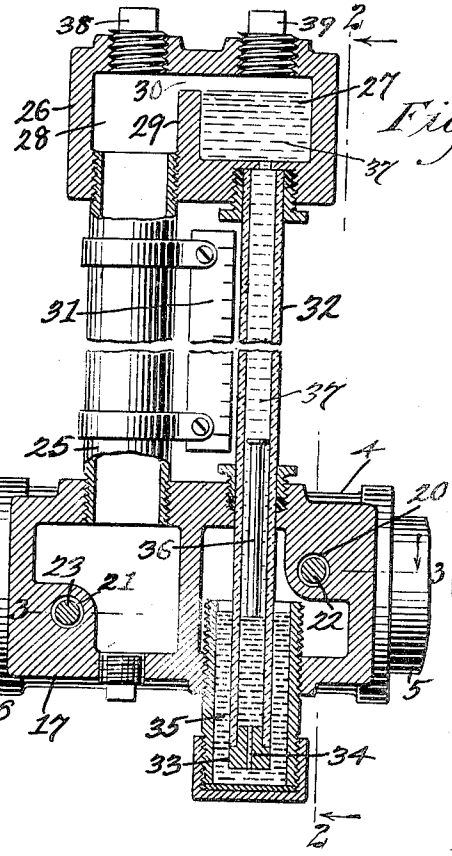


Fig. 1,

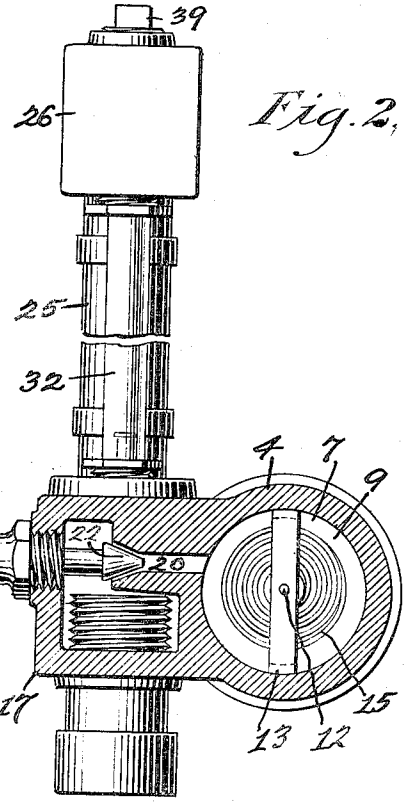
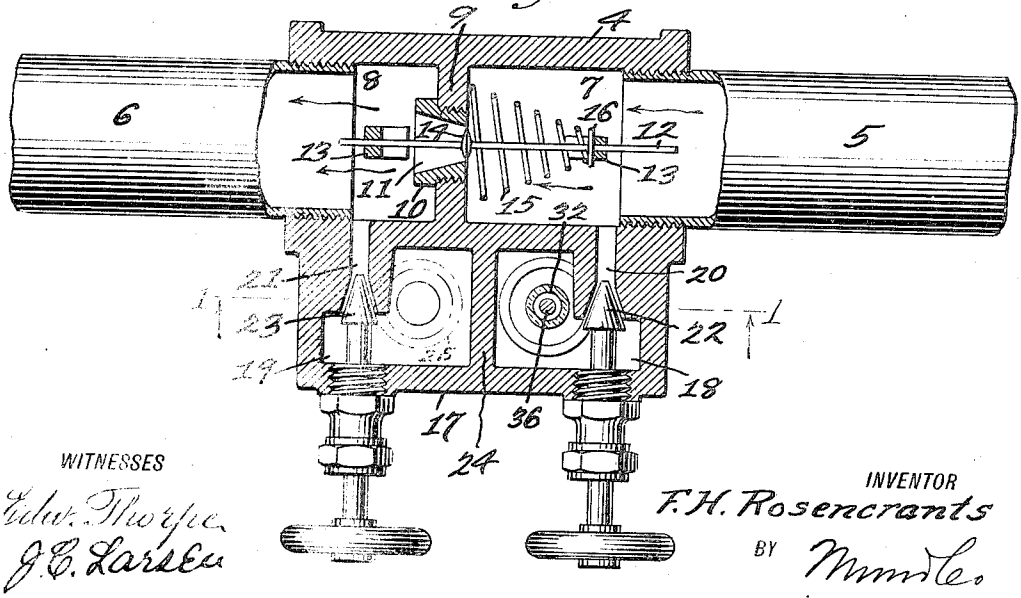


Fig. 2,

Fig. 3.



WITNESSES

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FLOW-METER.

1,205,787. Specification of Letters Patent. Patented Nov. 21, 1916.

Application filed November 10, 1915. Serial No. 60,703.

To all whom it may concern:

Be it known that I, FAY H. ROSENCRANTS, a citizen of the United States, and a resident of Corvallis, in the county of Benton and State of Oregon, have invented certain new and useful Improvements in Flow-Meters, of which the following is a specification.

My invention relates to meters for indicating the rate of flow of either opaque or transparent liquids through a pipe line, and is primarily intended for use in indicating the rate of flow of oil to the burners of oil burning boilers, although it may be used in a variety of places, such as in the feed-water lines of individual boilers, in the cooling water lines to transformers, gas engines, and almost any place where a small rate of flow is to be indicated.

My invention is fully described in the following specification, of which the accompanying drawings form a part, in which like characters refer to like parts in each of the views, and in which:—

Figure 1 is a central vertical sectional view through a meter constructed in accordance with my invention; Fig. 2 is a section taken on the line 2—2 of Fig. 1; and Fig. 3 is a section taken on the line 3—3 of Fig. 1.

In the drawings forming a part of this application I have shown a casing 4 screw threaded internally at each end to receive inlet and outlet pipes 5 and 6 and divided into two compartments 7 and 8 by means of a partition 9, which partition is drilled and threaded to receive a nipple 10 having a diverging orifice 11 therethrough.

Coinciding with the axis of the casing is a spindle 12 supported in suitable guides 13 and carrying a brass button 14 rigidly secured thereto of slightly less diameter than the smallest diameter of the orifice 11. The normal zero flow position of the button 14 is in the smallest section of the orifice 11 and it is held there by means of a conical spring 15 the large end of which bears on the partition 9 and the small end of which bears on a disk 16 mounted rigidly on the spindle 12. As flow takes place, the orifice button 14 is forced in the direction of flow against the force of the spring 15, the flow being from the small end of the orifice 11 toward the large end thereof. As the button 14 is moved by the flow the annular space around the button increases, and there is a definite difference of pressure between the two sides of the orifice 11 for each rate of flow.

The indicating device consists of a casing 17 on the side of the casing 4, said casing 17 being divided into two compartments 18 and 19 connected with the compartments 7 and 8 by means of ports 20 and 21 controlled by valves 22 and 23, respectively, the compartments 18 and 19 being formed by a partition 24.

Threaded into the casing 17 to enter the compartment 19 is a pipe 25 on the upper end of which is threaded a casing 26 having two compartments 27 and 28 formed by a partition 29 provided with a port 30 at the top thereof, the pipe 25 connecting with the compartment 28, and said pipe carries a plate 31 provided with the graduations of a scale.

Through suitable stuffing-boxes, the compartment 27 is connected with the compartment 18 by means of a glass tube 32 which extends nearly to the bottom of the compartment 18 and is provided with a hard wood plug 33 having a small bore 34 therethrough, the lower end of the tube 32 being submerged in mercury shown at 35. I provide a float 36 within the glass tube of a suitable length whereby the upper end thereof registers with the zero graduation on the scale plate 31 when the normal flow is at zero.

When flow occurs the several compartments, the pipe 25, and the tube 32 are filled with water or oil, or whatever the liquid passing through my meter, with the exception of the space occupied by the mercury and by the float, the latter being preferably made of hard rubber and designed to always rest upon the surface of the mercury within the tube 32. I prefer, however, to fill the glass tube 32 and the compartment 27 with water even though oil is the liquid being measured, in order that the tube 32 will be transparent at all times. The oil, being lighter than the water, floats on top and, as the mercury rises or falls in the glass tube 32, the compartment 27 accommodates the increase or decrease of water by a slight change in its surface. In order to illustrate this feature of the meter I have indicated the mercury and the water 37, but not the liquid passing through the meter, as it is understood that this liquid fills all the space shown empty. All spaces which would entrap air are filled through the openings closed by the plugs 38 and 39 before the meter is put into operation.

The pressure in compartment 7 is commu-

nicated through the port 20 and to the surface of the mercury outside the glass tube 32 in 18. The pressure in compartment 8 is communicated through port 21 to compartment 19, up through pipe 25 to compartment 28, thence to 27, thence to the surface of mercury inside the glass tube 32. The flow being through orifice 11 from compartment 7 to compartment 8, the pressure in 7 is always greater than in 8 causing the mercury in the glass tube 32 to rise until the column of mercury measured from the mercury surface outside to the mercury surface inside the glass tube 32 is equivalent to the difference of pressure in 7 and 8. As the flow from 7 to 8 through orifice 11 increases this difference of pressure increases and causes the mercury to rise correspondingly higher in glass tube 32, thus indicating the flow on scale 31. The spring resisted button 14 performs the function of making it possible to use a much larger orifice (which as a consequence will not become easily stopped up), than the corresponding unobstructed orifice for equal scale readings would allow. It also performs the function of increasing the effective area of the orifice 11 with increasing flow resulting in a scale the graduations of which are much more desirable than can be obtained with a plain orifice meter inasmuch as a given increase of flow at low rates of flow gives nearly the same increase in the height of the mercury column as would the same increase of flow at high rates of flow.

The construction and arrangement of parts drawn adapts itself to flow from right to left in a horizontal pipe only, but it will be obvious that I do not desire to restrict myself to this construction, as the same principles may be incorporated in meters so constructed as to adapt them to existing conditions such as flow in vertical pipes either up or down or from left to right in a horizontal pipe. Neither do I desire to restrict myself to a fixed and unalterable arrangement of parts in a meter for any given conditions, as various modifications may suggest themselves or become desirable, and I reserve the right to all such changes as come within the spirit of my invention and within the scope of the appended claims.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. A flow meter, comprising a casing arranged in a pipe line, a partition dividing said casing into compartments and provided with a relatively small orifice diverging in the direction of flow, a movable button substantially closing the smallest portion of said orifice at zero rate of flow and the position of which is controlled by the difference of the pressures in the two compartments, means for yieldingly resisting the movement of said button, a vertical pipe connected with one of said compartments, a mercury tube connected with the other of said compartments, a scale arranged alongside of said mercury tube, and a supplemental casing joining the tops of said pipe and tube.

2. A flow meter, comprising a casing arranged in a pipe line, a partition dividing said casing into compartments and provided with a relatively small orifice diverging in the direction of flow, a movable button substantially closing the smallest portion of said orifice at zero rate of flow and the position of which is controlled by the difference of the pressures in the two compartments, means for yieldingly resisting the movement of said button, a tube connected with one of said compartments, a mercury well at the bottom of said tube, a water reservoir connected with the upper end of said tube, and means for leading the liquid being measured to said mercury well and to the surface of the water in said reservoir to raise or lower the mercury in said tube as the difference of pressures in said compartments varies.

3. A flow meter, comprising a casing arranged in a pipe line, a partition dividing said casing into compartments and provided with a relatively small orifice diverging in the direction of flow, a movable button substantially closing the smallest portion of said orifice at zero rate of flow and the position of which is controlled by the difference in the pressures in the two compartments, means for yieldingly resisting the movement of said button, a vertical pipe connected with one of said compartments, means for controlling the flow to said pipe, a mercury tube connected with the other of said compartments, and a supplemental casing joining the tops of said pipe and tube.

4. A flow meter, comprising a casing arranged in a pipe line, a partition dividing said casing into compartments and provided with a relatively small orifice diverging in the direction of flow, a movable button substantially closing the smallest portion of said orifice at zero rate of flow and the position of which is controlled by the difference in the pressures in the two compartments, means for yieldingly resisting the movement of said button, a vertical pipe connected with one of said compartments, a mercury tube connected with the other of said compartments, means for controlling the flow to said tube, and a supplemental casing joining the tops of said pipe and tube.

5. A flow meter, comprising a casing arranged in a pipe line, a partition dividing said casing into compartments and provided with a relatively small orifice diverging in the direction of flow, a slidably mounted rod projected through said orifice, a button car-

ried by said rod, means for normally maintaining said button at the smallest portion of said orifice in a yielding manner, a vertical pipe connected with one of said compartments, a mercury tube connected with the other of said compartments, and a supplemental casing joining the tops of said pipe and tube, the position of said button with respect to said orifice being controlled by the difference in pressures in the two compartments.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FAY HARRY ROSENCRANTS.

Witnesses:

T. A. H. TEETER,

M. C. PHILLIPS.