Jan. 9, 1945. W. F. SCHULTZ 2,366,808

FLOAT CONTROLLED METER

Filed Sept. 2, 1941 3 Sheets-Sheet 1

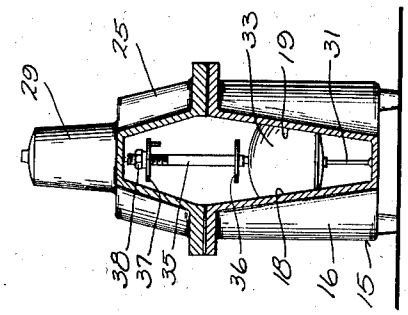


Fig. 4.

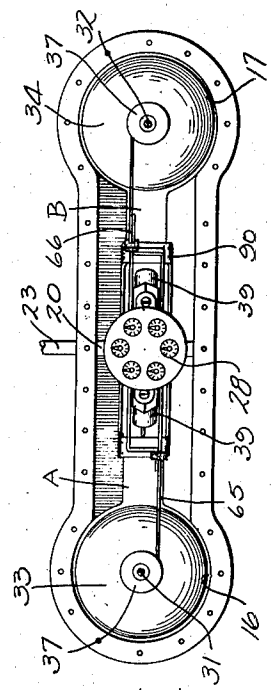


Fig. 3.

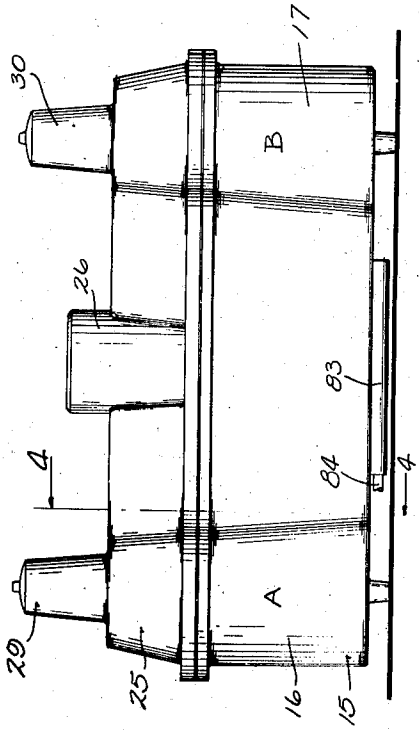


Fig. 1.

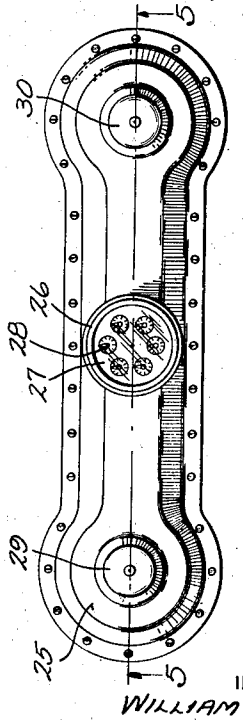


Fig. 2.

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FLOAT CONTROLLED METER

Filed Sept. 2, 1941 3 Sheets-Sheet 2

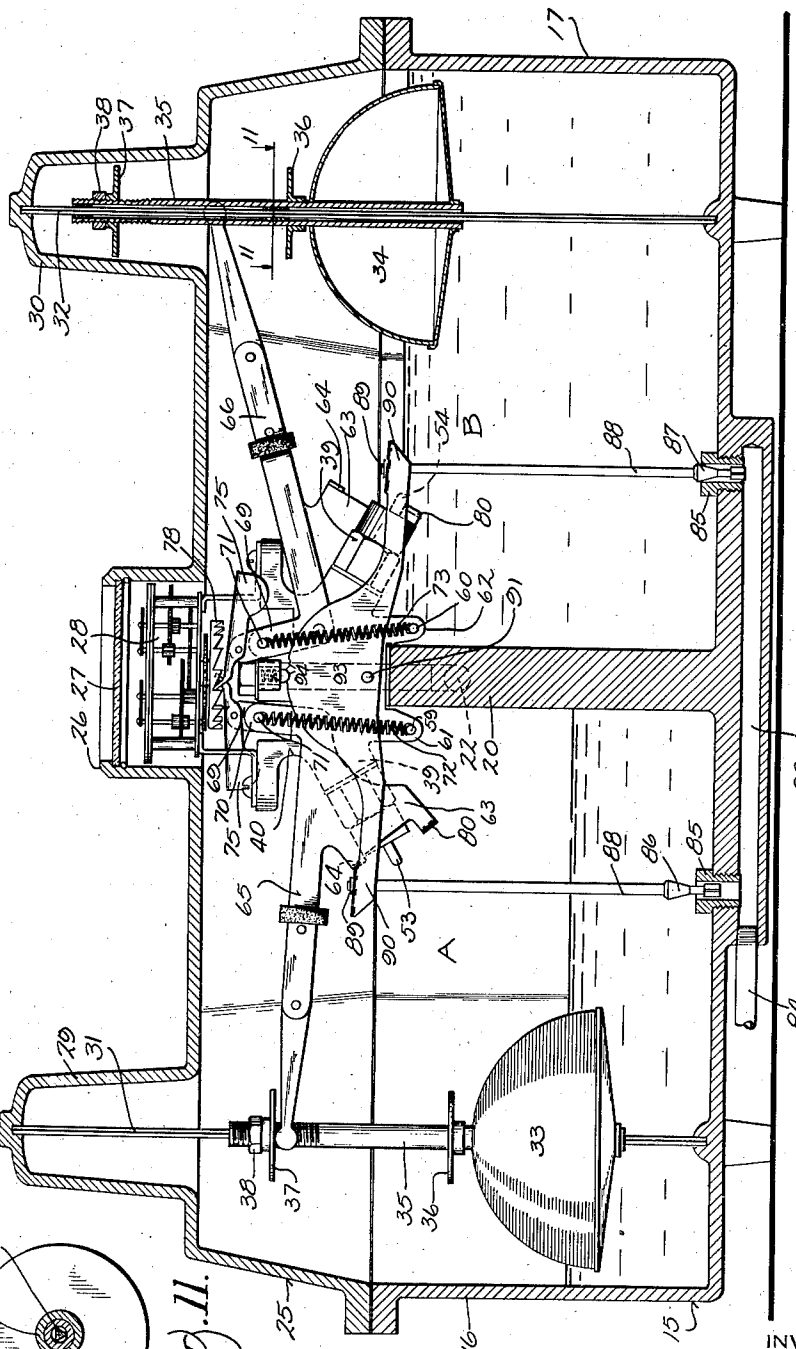


Fig. 5.

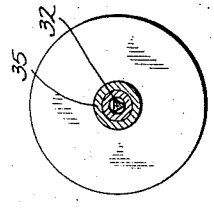


Fig. 11.

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FLOAT CONTROLLED METER

Filed Sept. 2, 1941 3 Sheets-Sheet 3

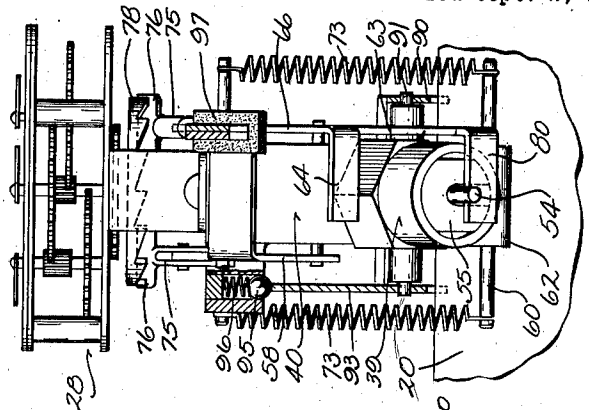


Fig. 8.

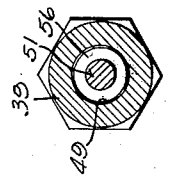


Fig. 10.

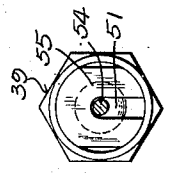


Fig. 9.

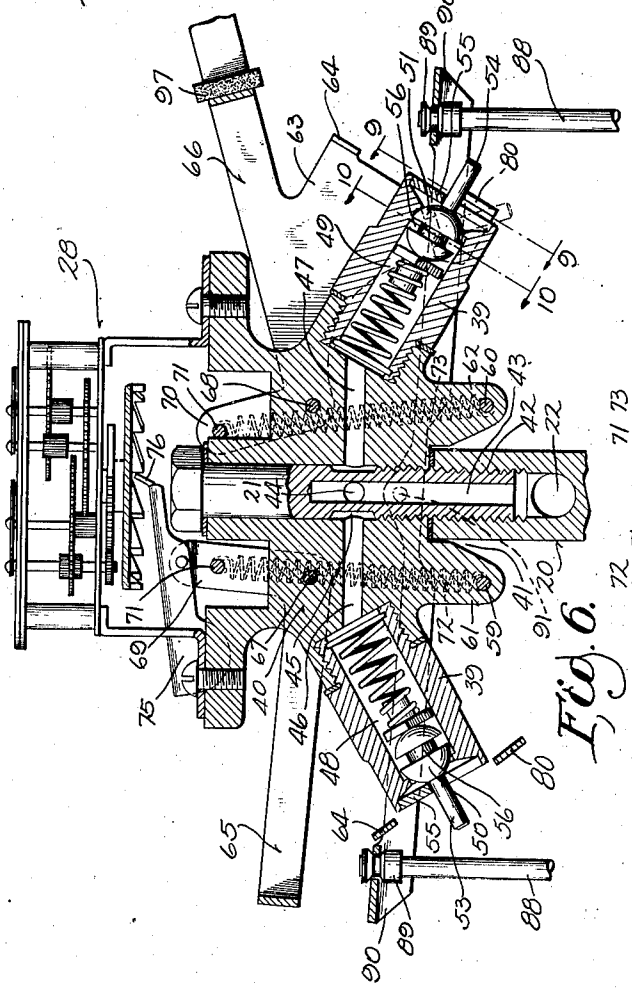


Fig. 6.

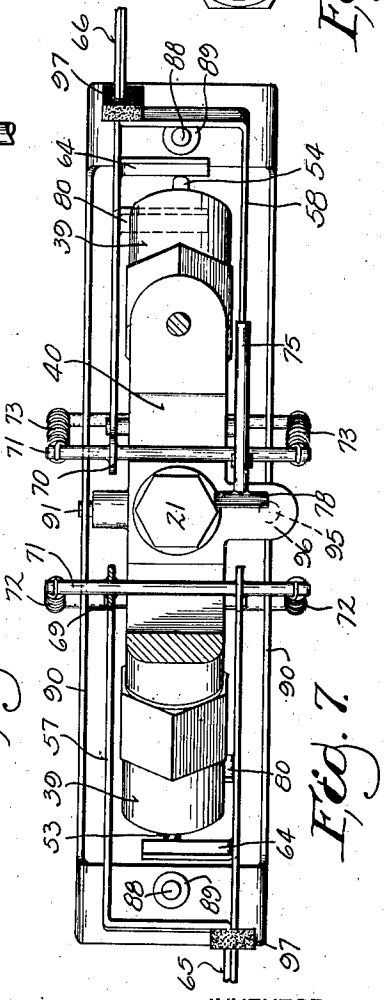


Fig. 7.

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UNITED STATES PATENT OFFICE

2,366,808

FLOAT CONTROLLED METER

William F. Schultz, Ripon, Wis.

Application September 2, 1941, Serial No. 409,160

14 Claims. (Cl. 73—221)

This invention relates to improvements in float controlled meters. This is a companion to my application filed May 28, 1941, Serial No. 395,601, now Patent 2,282,497, granted May 12, 1942, and is a further improvement over the invention disclosed in my Patent No. 2,202,606, granted May 28, 1940. Many of the objects of the present invention are those specified in the above identified companion application.

Broadly, it is an object of the present invention to simplify a device of this character, to reduce the cost of manufacture thereof, to increase its accuracy, and to eliminate many of its parts.

In accomplishing these objectives, it is my purpose to unify the valve and control structure in such manner that substantially the entire mechanism is mounted by a single bolt upon the partition between two metering chambers.

It is a further purpose of the invention to provide a novel and improved casing structure and control mechanism peculiarly designed and adapted to effectuate the aforesaid purposes of the invention, with particular reference to the elimination of friction as a source of inaccuracy.

It is a further purpose of the present invention to provide a mechanism which is even more truly a direct acting mechanism in the sense that the parts not only do not require to be latched and unlatched with respect to each other as was the case in my patented construction, but, additionally, the float operated levers act directly upon the valves in both directions of movement without requiring that motion be transmitted through any intervening part.

It is a further object of the invention to improve and simplify the valve head through the use of valve mechanism more particularly disclosed in another companion application entitled "Valves," Serial No. 409,161 filed September 2, 1941.

Other objects of the invention will appear in more detail from the following disclosure.

In the drawings:

Fig. 1 is a front elevation of a meter embodying the invention.

Fig. 2 is a plan view thereof.

Fig. 3 is a plan view of the meter with its cover removed.

Fig. 4 is a view taken in section on line 4—4 of Fig. 1.

Fig. 5 is an enlarged detail view taken in section on the line 5—5 of Fig. 2.

Fig. 6 is an enlarged detail view in vertical transverse section of the operating and control unit, the register mechanism mounted on the unit being shown in front elevation.

Fig. 7 is a plan view of the unit shown in Fig. 6 with the counter and pawls removed.

Fig. 8 is a view of the control unit in end elevation.

Fig. 9 is an end elevation of the valve as viewed on the line 9—9 of Fig. 6.

Fig. 10 is a view of the valve in cross section as viewed on the line 10—10 of Fig. 4.

Fig. 11 is a detail view in cross section through the float guide on the line 11—11 of Fig. 5.

Like parts are identified by the same reference characters throughout the several views.

The casing shown in Figs. 1 to 4 inclusive is of novel form specifically adapted to promote the proper functioning of a meter of the character hereinafter to be described. The casing proper or base 15 has the shape of a dumb-bell in plan, as clearly appears from Figs. 2 and 3. At its respective ends it is provided with generally cylindrical portions 16 and 17 between which the front and rear walls 18 and 19 are relatively close together and preferably disposed in downwardly converging planes as clearly appears from Fig. 3 and Fig. 4.

Substantially at the mid point a partition 20 connects walls 18 and 19, thus dividing the casing 15 into two like chambers marked A and B respectively in Figs. 1, 3 and 5. As best shown in Fig. 5, the control mechanism hereinafter to be described is mounted directly upon the partition 20 by means of tubular bolt 21, the interior of which communicates with an inlet conduit at 22 supplied from the rear by the feed line 23 (Fig. 3).

The lower or base portion 15 which comprises the meter casing proper, is hermetically sealed by a top closure 25 of corresponding shape in plan, as best appears upon comparison of Figs. 2 and 3. Centrally the top closure 25 is provided with an integral upstanding sleeve at 26 provided at its upper end with a glass window 27 through which the dials of the register mechanism 28 are visible. As best shown in Fig. 6, the register is mounted on brackets carried by the main valve casting hereinafter to be described. Centrally over each of the generally cylindrical portions 16 and 17 of the chambers A and B the top closure 25 is provided with bell-shaped upward extensions at 29 and 30, centrally socketed to receive the guide rods 31 and 32 respectively, upon which the floats 33 and 34 are guided for vertical reciprocation in their respective chambers A and B.

As disclosed in the present application, the guide rods 31 and 32 differ somewhat from the

cylindrical rods shown in my companion application 395,601. The present guide rods are polygonal in cross section, preferably being triangular, as best shown in Fig. 11. Thus, they bear upon the cylindrically tubular sleeves **35**, hereinafter mentioned, only at the rectilinearly bearing surfaces provided by the corners of the polygonally sectioned rods. I have found that this results in proportionately great increases in accuracy, either due to the fact that the relatively sharp bearing corners eliminate accumulations of foreign matter from the bearing surfaces of the sleeves, or, as may be more likely, the capillary resistance due to the viscosity of the liquid being metered is minimized by the fact that the bearing surfaces contact each other only rectilinearly at a few points peripherally of the rods. It is broadly immaterial what form is taken by the teeth which provide the bearing surfaces longitudinally of the rods, which need not necessarily be rectilinear, or their intervening spaces, which need not necessarily be flat as shown in Fig. 11.

Except for bottom surfaces which are slightly frusto-conical, the floats **33** and **34** are preferably semi-spherical in form. To assure positive response to any change of liquid level, the floats are relatively large in diameter. The cylindrical form of portions **16** and **17** of the chambers A and B accommodates these relatively large sized floats, while the more constricted passage between the front and rear walls **18** and **19** of the casing prevents the capacity of the respective chambers from being too large (as would be the case if each chamber were, throughout its length, of the same width as the cylindrical portion in which the respective float is located). At their lower ends the guids rods **31** and **32** are seated in socketed bosses formed integrally in the bottoms of the respective chambers.

The floats **33** and **34** are not directly reciprocable upon the guide rods but, instead, are preferably mounted upon sleeves **35** which are not only vertically reciprocable but also rotatable upon the respective guide rods. The rotation is important as a means of avoiding friction, as will hereinafter be explained. Each of the sleeves **35** has, adjacent its float, a relatively fixed collar at **36**. At a point remote from the float it is provided with screw threads upon which another collar **37** is adjustable, being held in adjustment by lock nut **38**.

The main control unit comprises a casting **40**. It serves as a mount or support for the inlet valve mechanism and the several control levers, as well as the register **28**. The casting **40** is notched at **41** to seat on the upper margin of the partition **20** where, as previously stated, it is retained by a single bolt **21** screw-threaded into an opening **42** which communicates with the liquid inlet conduit **22**. The bolt is tubular for a considerable part of its length, having an axial bore at **43** leading to a cross bore **44** which opens into an annular groove at **45** through which liquid admitted through the supply pipe **23** may reach the distributing ducts **46** and **47** which lead to the respective valve chambers **48** and **49**. These chambers are formed in the ends of the valve casings **39**, each of which is provided with an annular valve seat near its discharge end.

The respective inlet valves **50** and **51** have convex portions oscillatably engaged with the respective seats. The valves are preferably, though not necessarily, spheroidal. Each has an opening **56** from one side to the other, preferably taking the form of an annular groove, which, when the valve is oscillated between the full line position and the dotted line position shown at the right in Fig. 6, passes the plane of the seat, so that the opening or groove **56** provides communication through the seat, whereby discharge occurs into the corresponding liquid chamber A or B. The valves are preferably spring-biased to their seats by compression springs and pressure blocks, as shown in Fig. 6.

As disclosed in the above mentioned companion application filed herewith, the valves may be universally movable, but for the purposes of the present application, the valve stems **53** and **54** are constrained to move rectilinearly by means of slotted plates **55** pressed into the ends of the valve casings **39**, the slot being radial with respect to the center position of the stem as best shown in Fig. 9, so that all oscillation must occur in a plane common to each valve, and in which the valve actuating lever means oscillates as hereinafter described.

When the stem is centered with the axis of the valve casing as shown in full lines in Fig. 6, the annular groove or opening **56** lies parallel to and wholly above the plane of the valve seat, but when the valve is oscillated downwardly to the position shown in dotted lines at the right of Fig. 6, the opening or groove **56** extends through the plane of the seat from the interior to the exterior of the valve, thus providing a passage through which discharge occurs.

Projecting across the respective chambers A and B are the arms **65** and **66** of float actuated bell crank levers pivoted at **67** and **68** to the casting **40**, which serves as a frame for the control mechanism. Each of the bell crank levers **65** and **66** is preferably bifurcated to pass on both sides of the frame casting **40** in the manner clearly shown in Figs. 3, 6 and 7 to minimize distortion, equalize stresses, and avoid friction. This is preferably accomplished by locating the lever **65** at one side of the frame casting **40** and lever **66** at the other, each lever being provided with an offset leg. Reference to Fig. 7 will disclose the fact that the offset leg **57** of lever **65** is located at the back side of the casting, while the offset leg **58** of lever **66** is located at the front side of the frame casting **40**. At each side of the frame casting **40** each of the levers **65** and **66** and its associated leg has arms projecting upwardly from its pivot pin. The relatively long arm **69** on each of the legs **57** and **58** is connected with the relatively shorter arm **70** on each of the levers **65** and **66** by a cross rod at **71**, such cross rods serving as anchorages for the tension springs **72** and **73**, respectively. The lower ends of the respective springs are anchored to cross rods **59** and **60**, fixed in the ears **61** and **62** of the frame casting **40**, as best shown in Fig. 6 and in Fig. 8. In each instance the longer arms **69**, respectively located at opposite sides of the frame casting **40**, carry pawls **75** which are pivoted to the respective arms and provided with chisel-shaped terminal teeth **76** (Fig. 6) for engagement with the ratchet crown gear **78** (Fig. 6 and Fig. 8). The pawls are so formed as to be self-biasing toward operative engagement of their respective teeth **76** with successive ratchet teeth of the ratchet gear **78**, the latter being connected to the gear train of any suitable register such as that indicated generically at **28**.

As either one of the bell crank levers **65** or **66** is moved upwardly or downwardly its anchorage rod **71** is caused to move across the center line represented by its pivot **67** or **68**, whereby the

energy stored in the tension springs 72 or 73 completes with snap action movement the oscillation of the lever, whereby the lever overruns to some degree the float by which it has been actuated, and at the same time tends to snap the associated inlet valve either open or closed, as the case may be, by the following mechanism.

Each of the levers 65 and 66 has an arm 63 projecting obliquely downwardly beside the associated valve casing. Extending laterally from each of the arms 63 are the spaced fingers 64 and 80, the fingers 64 being in each instance above the valve stems 53 and 54 and the fingers 80 being in each instance below the valve stem 53. In the position in which the parts are illustrated throughout the drawings, with particular reference to Figs. 5 and 6, the lever 66 is in its uppermost position, having moved with a snap action to such position, overrunning its float and causing its lower finger 80 to engage the valve stem 54, thereby to oscillate the valve stem into alignment with the valve casing axis to shut off flow.

In the meantime, liquid is flowing from the left hand chamber A of the meter, and float 33 therein is moving lever 65 downwardly toward the position where its tension spring 72 is about to cross the center line represented by pivot 67. In this intermediate position of the parts neither of the fingers 64 or 80 is engaged with the valve stem 53. Finger 80 has moved away from the stem, and finger 64 will engage the stem to open the valve with a snap action as soon as the movement of the float progresses far enough to move the spring across center.

An outlet chamber is provided at 83 (Fig. 5) in the bottom of the casting which forms the metering chambers A and B respectively. From the outlet chamber a pipe 84 leads to the point at which the liquid metered is to be used. Screw threaded into the bottoms of the respective metering chambers A and B, preferably in the restricted portions thereof near the partition, are the valve seat fittings 85 through which liquid is drained from the metering chambers to the outlet chamber when the respective control valves are open.

The outlet valves 86 and 87 respectively are identical, each being provided with a stem 88 extending to a point above the chamber casting 15 and there provided with a control spool at 89. The respective control spools are loosely engaged by the outlet valve actuating lever 90 which is pivoted at 91 to the frame casting 40 (Figs. 6, 7 and 8), the lever 90 being provided with a center opening sufficiently large to clear the casting 40 entirely and to pass along opposite sides thereof, as best indicated in Fig. 7 and Fig. 8.

At the front side of frame casting 40, lever 90, which interconnects the stems of the outlet valves 86 and 87, is provided with an upstanding arm 93 on the top of which there are grooves 94 alternatively engaged by a spring-pressed ball 95 socketed in a forwardly projecting arm 96 of the frame casting 40, and arranged to offer a certain amount of resistance to the pivotal movement of lever 90 until sufficient energy has been stored to force the ball aside, whereupon it permits the snap action movement of the lever to open one of the discharge valves, simultaneously closing the other, the lever coming to rest with the ball engaged in the other groove 94. In practice this happens virtually instantaneously, since the discharge valves are not directly float actuated but are actuated by the impact of one of the bell crank levers 65 or 66. Reference has already been made to the fact that these bell crank levers are, themselves, movable with snap action when the respective springs 72 or 73 cross center, thereby causing the associated lever to overrun the control disk 37 of the float, by which it is being downwardly moved. When such overrun occurs, the pad 97 carried by lever 65 or 66 strikes the end of the lever 90, the resulting impact producing an immediate oscillation of lever 90 to shift or reverse the positions of the discharge valves.

The operation of the device is as follows:

Throughout the drawings the parts are illustrated in the same relative positions in which they appear in Fig. 5, chamber A being in process of being drained and chamber B having already been filled.

Starting at this point, the successive positions of the parts in the course of a complete cycle may conveniently be shown in the following table:

1.	A draining	B full
	Inlet closed	Inlet closed
	Outlet open	Outlet closed
2.	A empty	B full
	Inlet opens	Inlet closed
	Outlet closes	Outlet open
3.	A full	B draining
	Inlet closes	Inlet closed
	Outlet closed	Outlet open
4.	A full	B empty
	Inlet closed	Inlet opens
	Outlet opens	Outlet closes

As the liquid needed by the device is withdrawn through pipe 84, the level of liquid in chamber A will gradually fall, thus lowering float 33, the downward movement of the float being communicated by collar 37 to bell crank lever 65.

Reference has already been made to the fact that the specific construction of the device is calculated to improve its accuracy of performance by elimination of friction. It will be noted, by reference to Fig. 3, that the ends of the levers 65 and 66 are offset to engage collars 36 and 37 laterally adjacent the rods 31 and 32 on which the float assemblies are reciprocable. As the bell crank levers oscillate about their respective fulcrums, the relative movement between the ends of these levers and the respective collars is accommodated by a bodily rotation of the respective float assemblies upon their respective guide rods. It has been found that this results in greatly improved accuracy as compared with any organization in which the end of the lever would be obliged to scrape frictionally across the collar, as would be the case if the arrangement did not permit the free rotation of the float assembly to eliminate this source of frictional resistance.

In the positions in which the parts are illustrated in Figs. 5 and 6 the float assembly has already somewhat lowered the bell crank lever 65 from its initial position. In the continued draining of chamber A float 33 will reach its lowermost operative position in such chamber (at which position the chamber will be assumed to be empty, even though it may have some residuum of liquid therein). In the assumed lowermost position of the float the bell crank lever 65 will have oscillated to a position where its upper spring anchorage 69 will have moved the upper ends of springs 72 across the center line represented by pivot 67.

The result will be snap action movement of lever 65 counter-clockwise about its pivot 67 to

engage its pad or bumper 97 sharply with lever 90, the resulting impact producing an immediate oscillation of lever 90 to reverse the positions of the discharge valves, closing valve 86 and opening valve 87, this being the second position defined in the foregoing table. The downward movement of lever 65 has caused its finger portion 64 to open inlet valve 50, thus permitting immediate commencement of the operation of filling chamber A.

The filling of chamber A is entirely independent of the draining of chamber B. Assuming the device to be connected to an oil burner or the like, the draining of chamber B may take hours or days. In the meantime chamber A will be refilled in a few minutes to make its contents available whenever chamber B may be drained.

As chamber A becomes filled, the float 33 will rise therein and the collar 36 of the float assembly will ultimately engage the end of bell crank lever 65 to elevate the bell crank lever toward its extreme upper position (a position corresponding to that in which bell crank lever 66 is illustrated in the drawings). Shortly after the bell crank lever passes the position in which it is illustrated in Figs. 5 and 6, but moving, this time, in an upward or clockwise direction, the tension springs 72 will again be swung across center, with the result that the lever 65 will move sharply upwardly to its extreme position, leaving collar 36, in so doing. The movement of the bell crank lever in a clockwise direction to its extreme position actuates the register mechanism to show the amount of liquid just admitted to chamber A, motion being communicated to the register mechanism through the upwardly extending arm 69 of the bell crank lever and the pawl 75 which is pivoted to the upper end of the arm and so weighted by its own form that its chisel tooth 76 is held against the ratchet 78 to advance this ratchet one tooth each time the lever 65 moves upwardly in a clockwise direction.

Meantime the upward snap action motion of arm 65 has caused its lower finger 80 to engage the valve stem 53 to move the valve 50 to its centered and closed position. This is the third position of the foregoing table.

The closing of the valve results, with precision, when a specified quantity of liquid has been delivered into the chamber from the supply pipe 23 through the passage 22, the duct 43, the cross bore 44, the duct 46, the valve chamber 48, and the valve groove 56. In practice, calibration of the device might be achieved by the adjustment of collar 36 to regulate the top level of liquid in the chamber, but it has been found equally satisfactory to adjust the more readily accessible collar 37 to determine the bottom level of liquid in the chamber.

As above noted, the filling and the control of the filling of one chamber is entirely independent of the draining of the other.

The closing of discharge valve 86 of chamber A, and the opening of the corresponding discharge valve 87 of chamber B, place the contents of the latter chamber in communication with the discharge manifold at 83, which is never without a supply of liquid. Withdrawals through the pipe 84 will therefore come from chamber B from the moment that valve 86 closes and the filling of chamber A commences.

As the contents of chamber B become exhausted, the adjustable collar 37 on the float valve assembly engages lever 66 and begins to oscillate such lever clockwise as viewed in Figs. 5 and 6. As in chamber A, the float valve assembly rotates on the guide rod 32 to eliminate friction between the lever and the collar.

Ultimately the float reaches its lowermost position where, as in chamber A, the lever 66 has moved angularly to a point such that the springs 73 have snapped across center, thereby causing lever 66 to leave collar 37 and advance sharply in a clockwise direction, its pad 97 striking the underlying lever 90 clockwise, thereby closing exhaust valve 87 in chamber B to simultaneously open exhaust valve 86 in chamber A. In the same motion the upper finger 64 of bell crank lever 66 has engaged the valve stem 54 of valve 51 to oscillate valve 51 to its open position. This is the fourth position defined in the foregoing table.

All liquid supplied to the discharge line will now come from tank A. In the meantime a fresh supply of liquid will advance into chamber B from the supply pipe 23 through the passage 22 in the partition and through the bore 43 of the bolt 21. Thus, in chamber B, as in chamber A, the same operation which closes the discharge valve in either chamber effects the opening of the inlet valve to such chamber. However, in each case, the closing of the inlet valve is independent of any other operation except the actuation of the register. As the float 34 rises with the rising level of liquid admitted to chamber B, the collar 36 which moves with the float mechanism raises bell crank lever 66 counter-clockwise until it reaches a point where the springs 73 cause its continued movement with a snap action in a valve closing direction. The snap action with which lever 66 is advanced away from collar 36 to the position shown in Fig. 5 causes its pawl 75 (Fig. 6) to operate on the ratchet 78 of the register to show that another chamber full of liquid has been metered into the apparatus. The parts are now restored to the first position of the table.

The sequence of valve operations is similar in principle to that involved in the meter of my Patent 2,202,606 but the structure herein disclosed is greatly simplified and greatly improved in accuracy as compared with the structure disclosed in that patent.

The space within the meter casing 15 and its closure 25 may, if desired, be vented as shown at 99 in my companion application 395,601, as the liquid does not rise above the top of partition 20 in this type of meter. The maximum liquid level is preferably below the tops of valve stems 88.

Accuracy of the meter is enhanced not only by the relative simplicity and direct action of the control mechanism and by the elimination of friction, but also by the proportionately very large floats which substantially fill the enlarged terminal portions of the respective metering chambers and are located at a considerable distance from the unitary control set mounted above the partition. The construction of the chambers adjacent the partition further contributes to accuracy of response since a very large proportion of the liquid admitted to each chamber is directly operable upon the float despite the relatively distant location of the float from the control set. Thus, not only is the float large but, due to its distance from the control set, it has considerable moment in acting upon the elongated arms 65 and 66.

I claim:

1. In a device of the character described, the

combination with means providing a reservoir and a supply head having a discharge casing opening into said reservoir, of a valve pivotally mounted in said casing for operative oscillation between open and closed positions and having a projecting operator movable vertically, a lever pivoted for movement respecting said head in a vertical plane, a float operable in said chamber and with which said lever is engageable to receive motion from the float, snap action means connected with said lever and adapted to bias said lever toward both extreme positions, and means for transmitting motion directly from said lever to said valve operator, said last named means providing for lost motion, whereby said operator is actuated either toward open or its closed position by the final snap action movement of the lever.

2. In a device of the character described, the combination with a reservoir and a supply head provided with a discharge port leading to said reservoir and having a valve seat, of a valve of spheroidal form oscillatable upon said seat and provided with an opening adapted in the oscillation of said valve to provide passage through said seat, said valve having a projecting operator and means constraining said operator for movement in a vertical plane in the oscillation of said valve between open and closed positions, a float lever pivoted for movement in a vertical plane respecting said head, a spring extending to each side of the fulcrum of said lever and provided with an anchorage to said lever at one side of said fulcrum and with another anchorage at the other side of said fulcrum, said spring constituting snap action means biasing said lever toward extremes of its movement, fingers connected with the lever and spaced for engagement with the operator for the oscillation of said valve in the spring-biased movement of said lever toward its said extreme positions, and float means in said reservoir for the actuation of said lever.

3. The device of claim 2, in which said float means has lost motion connections for the actuation of said lever, whereby float induced initiation of lever movement will move said lever until said spring crosses said fulcrum, whereupon said lever is free to move in advance of float movement in the completion of lever movement to its extreme positions.

4. In a device of the character described, the combination with casing means providing separate metering chambers, of a supply head provided with separate discharge ports leading to the respective chambers and each provided with a valve seat, spheroidal valves oscillatable upon the respective seats between open and closed positions, each such valve having an opening adapted in the open position of the valve to provide passage through the seat, stems projecting from the respective valves and adapted for movement in vertical planes in the opening and closing movements of the valves, bell crank levers pivoted to the head and respectively disposed at opposite sides thereof, each such lever having a yoke leg laterally offset and coaxially pivoted to the opposite side of the head, each lever and its associated leg having an upwardly extending bell crank arm, a spring anchorage connected across said head between the bell crank arm of each lever and its associated leg, spring anchorages fixed to said head, tension springs respectively connected between the bell crank anchorages and the fixed anchorages aforesaid and movable across the fulcrums of the respective levers in the course of lever movement whereby to bias said levers toward their extreme positions of oscillation about their respective fulcrums, fingers connected with the respective levers and spaced above and below the stems of the respective valves, whereby to engage such stems and to actuate said valves during the spring-biased movement of the levers toward their respective extreme positions, and means for initiating the movement of the respective levers and thereby to store energy in the respective springs for the independent completion of lever movements.

5. The device of claim 4, in which said motion initiating means constitutes in each chamber a float provided with spaced lever engaging collars, respectively engageable with the associated lever during the upward and downward movement of the float.

6. In a device of the character described, the combination with a valve chamber providing a seat, of a spheroidal valve body oscillatable upon the seat between open and closed positions and provided with a stem and an opening adapted in the open valve position to afford passage through said seat, an operating lever provided with a fulcrum adjacent said casing upon which said lever is movable between extreme positions, and a pair of fingers carried in mutually spaced positions by said lever and adapted in the movement of said lever to its respective positions to engage said stem and thereby to actuate said valve between its open and closed positions.

7. The device of claim 6, in which said lever is provided with snap action means biasing it for movement toward its said extreme positions, whereby the momentum of said lever is transmitted through the associated finger for snap action operation of the associated valve in each direction.

8. In a device of the character described, the combination with housing means having an intermediate partition and metering chambers at each side thereof, of a supply head provided with discharge passages leading to the respective chambers and each provided with a valve seat, valve means cooperative with the respective seats and each including an operator movable in a vertical plane, levers pivoted to the respective heads oscillatable in vertical planes over the respective chambers, spaced fingers on said levers engageable with the valve operators in the course of lever oscillation to move said operators in valve opening and closing directions, snap action springs connected with the respective levers and positioned to move across the fulcrums of said levers in intermediate lever positions, whereby said springs bias said levers in each direction toward their extreme positions, float means in said chambers provided with spaced lever actuating members in each chamber for the individual actuation of the respective levers movable over the respective chambers, and guides for the respective float means disposed in the respective chambers.

9. The device of claim 8, in which the respective guides are provided with peripherally spaced linear bearing surfaces upon which the respective float means are not only slidable but rotatable.

10. In a meter, the combination with a metering chamber provided with a valved inlet and a valve movable between open and closed positions, of a valve actuating lever provided with operative connections to the valve, a float hav-

ing spaced lever engaging means for the transmission of float movement with lost motion to the lever, said lever projecting beside said means in an off center position with respect to said float, and a guide upon which said float and lever operating means is mounted for sliding and for rotative movement, said guide having longitudinally extending and peripherally spaced teeth and intervening clearance, and said float and means having a generally cylindrical bearing contacting said guide only at the said teeth and rotatable as well as axially slidable upon the guide.

11. In a meter of the character described, the combination with casing means providing a meter chamber, of a supply conduit having a discharge port and seat for delivery into said chamber, a valve rockable upon said seat in a vertical plane of oscillation for control of delivery through said port, said valve having a stem projecting through said port, a lever pivoted behind said valve and projecting beyond said valve over said chamber, a float mounted for upright reciprocation in said chamber and provided with spaced means directly engageable with said lever for the oscillation thereof, means biasing said lever toward two extreme positions of movement, and spaced fingers connected with said lever and engageable with said valve stem in the course of lever oscillation between its extreme positions, said lever being pivoted to oscillate in approximately the same plane in which said valve and valve stem are rockably oscillatable, whereby oscillation of the lever will oscillate the valve stem in the same sense between valve open and valve closed positions with respect to said port.

12. In a meter of the character described, the combination with casing means providing a plurality of metering chambers and an intervening supply head having discharge ports directed to the respective chambers and seats contiguous to the respective ports, valves tiltably mounted upon the respective seats for oscillation in substantially vertical planes, said valves projecting in opposite directions from said head and having exposed valve operating stems, levers pivotally mounted upon said head and projecting in opposite directions over respective chambers, said levers being movable approximately vertically in approximately the plane in which said stems are movable, spaced fingers carried by each lever and engageable with the respective stems for the oscillation of said stems in the course of lever movement, and floats operable approximately vertically in the respective chambers and provided with spaced means engageable with the respective levers for individually actuating said levers for the direct oscillation of the respective stems.

13. The device of claim 12 in further combination with outlet valves for the respective chambers, said chambers having ports with which said valves are associated, a lever pivoted to said head and provided with stem connections to the respective outlet valves, portions of said last mentioned lever being engageable by the individual levers first mentioned in predetermined directions of movement of said first mentioned levers, whereby motion is transmitted from the float operated levers to the lever which controls the discharge valves.

14. A meter of the character described, comprising the combination with casing means providing chambers with an intervening partition, of a supply head including discharge ports opening to the respective chambers, individual valves controlling flow through the respective inlet ports, each valve being provided with a stem, separate pivotally mounted levers projecting in opposite directions from the head across the respective chambers, float means in the respective chambers and into the path of movement of which the respective levers extend for operation of the levers from the float means in both directions of float movement, and means on the respective levers directly engaging the stems of the respective valves controlling flow through the inlet ports to the chambers in which the respective floats are located, whereby each float directly operates a lever which directly operates a valve controlling the admission of liquid into the chamber in which such float is disposed.

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