Dec. 13, 1932. H. E. CHRISTIE ET AL 1,890,901

COMPENSATING HYDROMETER FLOAT

Filed June 7, 1927

Fig. 1.

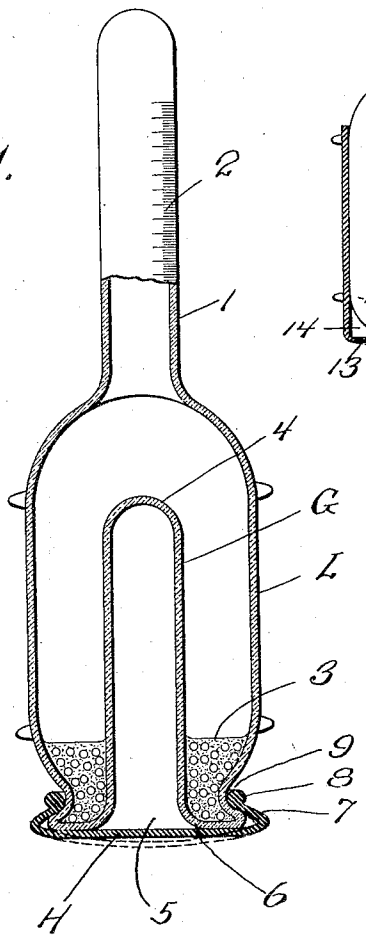
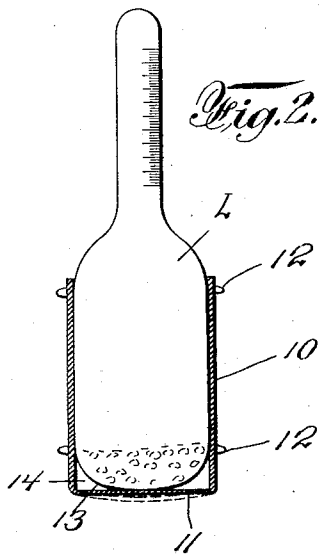


Fig. 2.



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UNITED STATES PATENT OFFICE

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COMPENSATING HYDROMETER FLOAT

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This invention relates to a compensating hydrometer float, an object of the invention being to provide a hydrometer float which will include means causing it to automatically compensate for changes in temperature and thus maintain a constant floating position upon its supporting medium in the presence of temperature changes.

A more detailed object is to provide a hydrometer float comprising means automatically operable by an increase in temperature of the medium within which the float may be floating to increase the submerged bulk of the float without increasing the weight of the float, thereby restraining the float from sinking to any appreciable degree within its supporting medium when the temperature increase occurs.

A further detailed object is to so arrange the parts of the structure that the tendency of the float to rise within its supporting medium will increase in accordance with the increase of temperature of the supporting medium so that increase in the loss of supporting quality of the supporting medium, which ordinarily would result in sinking of the float, will be counteracted by the proportionate increase in buoyancy of the float to thus maintain the float at a substantially constant level.

A further and more specific object is to provide a hydrometer float constructed to include an air pocket at its lower end adapted to retain a quantity of air in a position where it will be subject to temperature change, and consequent expansion and contraction, with any change of temperature of the supporting medium or fluid within which the float may be floating.

A further specific object is to provide means constituting a flexible confining wall for the mentioned air pocket adapted to always exclude liquid from said pocket and yet afford easy expansion of the air within said pocket.

A further object is to provide simple and efficient means adapted to protect the hydrometer float against injury at all times.

A further object is to provide protector means including a plurality of lateral projections adapted to serve as guide means for engaging against the side walls of the container within which the float normally operates.

Other objects and aims of the invention, more or less specific than those referred to above, will be in part obvious and in part pointed out in the course of the following description of the elements, combinations, arrangements of parts and applications of principles constituting the invention; and the scope of protection contemplated will be indicated in the appended claims.

In the accompanying drawing which is to be taken as a part of this specification, and in which we have shown merely a preferred form of embodiment of the invention:—

Fig. 1 is a vertical sectional view through a hydrometer float constructed in accordance with this invention, and

Fig. 2 is a similar view illustrating a modified arrangement of parts.

Referring to the drawing for describing in detail the structure illustrated therein, and referring first to the structure Fig. 1, the reference character L indicates the base or bulbular portion such as is found ordinarily in hydrometer floats, the usual reduced stem portion as 1 projecting centrally thereabove for carrying the graduations or other indicating marks as 2 thereon, the latter being intended to be read at the level of the supporting medium or liquid in the usual manner.

Within the bottom of the bulbular portion L is arranged the usual weighty material as 3 which may consist for instance of small lead shot or the like embedded in wax, or otherwise.

Centrally of the bulbular portion L is a small hollow tube as G projecting upwardly thereinto, closed at its upper end as at 4 and open at its lower end as at 5.

This entire structure is formed of glass, the tube G being merged into the bottom walls of the bulbular portion as at 6.

When the float as thus far described is placed within a quantity of fluid or like supporting medium the float will stand in a substantially vertical position and the air con-

tained within the tube G will have no outlet. This air will be therefore confined within said tube and will be under a slight pressure owing to the effort of the supporting fluid to move upwardly into the tube.

If now the temperature of the supporting fluid, and consequently of the air contained within the tube G, is raised said air will expand to a degree in proportion to the increase in temperature and will press down the level of the fluid which has entered the lower end of the tube. This will increase the buoyancy of the float in proportion to the degree to which the level of the fluid within the tube is pressed down and, therefore also in proportion to the increase in temperature and consequent loss of supporting quality of the supporting fluid.

The float will thus be readily held automatically at a constant level within the supporting fluid notwithstanding changes in temperature of said fluid.

In order to prevent accidental entrance of fluid into the tube G at any time, as well as to insure cleanliness of the interior of said tube, it is proposed that the lower end of the tube may be closed by a closure member as H, said closure member being suitably flexible, as for instance if made of thin rubber or other suitable material, so that it will yield with the changes in bulk of the air contained within the tube G and will in consequence increase or diminish the total exterior bulk of the submerged portion of the float in response to temperature changes. This closure as illustrated preferably extends across the entire under-surface of the float and has an annular upturned flange as 7 thereon with a terminal rib as 8 adapted to engage within an annular groove 9 provided to receive it at the margin of the float. The portion of the closure which extends across the bottom of the float comprises preferably a disc of thin rubber or like material. It is normally not stretched or under tension, and it is of sufficient area so that the slight convexing and concaving thereof with temperature changes will require little or no stretching of the rubber. It is thus rendered extremely sensitive to act in response to the changing pressures within the tube G, which changes are of course only very slight in normal use.

The marginal flange portion 7 serves merely to support the main closure or bottom wall part and provide a tight seal against the groove 9 of the float.

It is important to note however that this closure at the lower end of the float, being of soft resilient material, and entirely covering said lower end, provides an excellent protecting cap or guard member at the lower end of the float for preventing possible injury to the float during any handling thereof.

In the modification Fig. 2 an arrangement is shown by which the construction of the glass portion or bulb L is the same as is at the present time ordinary common practice, that is the interior tube G, the annular exterior groove 9, etc. as illustrated in Fig. 1, are not employed. In their stead this modification proposes an external jacket substantially entirely enclosing the bulbular portion L of the float, said jacket including annular side walls 10 for hugging about the annular side walls of the float, and a bottom wall as 11 closing the bottom end of the jacket.

This entire jacket is preferably formed of soft resilient and flexible material such as rubber or the like, and it may if desired be provided with one or more sets of laterally projecting fingers as 12—12 thereon for engaging against the interior wall surfaces of a tube such as is usually employed to contain the supporting fluid within which the float is intended to operate. These fingers may be spaced apart in a row circumferentially of the jacket and there may be any desired number of them in each set or row. They are of the same resilient flexible material as the jacket and hence provide relatively soft cushion like projections upon the bulbular portion of the float for engaging the walls of the tubular container. They serve to provide only "point" contact between the float and the walls of the container so as to avoid strong capillary attraction as between the float and said walls as is common with ordinary glass hydrometers.

The bottom end surface as 13 of the bulbular portion L of the float is substantially semispherical. The side walls 10 of the jacket extend straight downwardly to the substantially flat bottom wall 11 and thus define an annular air pocket as 14 within the jacket between the semispherical bottom wall of the float and the flat bottom wall of the jacket, the bottom wall of the jacket being normally in contact, or nearly so, with the extreme bottom point of the float.

The air which is confined within the air pocket 14 constitutes an element of buoyancy for the float. Its degree of buoyancy is determined by its bulk, and its bulk is subject to increase and loss under temperature changes so that the bottom wall 11 will be convexed and concaved, and the bulk and consequent buoyancy of the completed float will be altered by temperature changes of the supporting fluid, the float being thus automatically maintained at a constant level in the presence of temperature changes in the same manner as described with respect to the structure Fig. 1.

It is noteworthy that the central tube G illustrated in Fig. 1 could readily be employed in association with the jacket 10—11 suggested in Fig. 2, or, inversely, that the jacket 10—11 of Fig. 2 could readily be employed in lieu of the closure H shown in Fig. 1.

As many changes could be made in this construction without departing from the scope of the invention, as defined in the following claims, it is intended that all matter contained in the above description, or shown in the accompanying drawing, shall be interpreted as illustrative only and not in a limiting sense.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. A hydrometer float comprising the usual bulbular portion and stem portion, a member within which the bulbular portion engages and providing an air pocket associated with the bulbular portion, and said member providing a flexible wall for said air pocket, the degree of flexibility of which permits it to flex and thus change the displacement of the float in response to expansion and contraction of the air in said pocket incident to temperature changes of said air in use.

2. A hydrometer float comprising the usual bulbular portion and stem portion, and a jacket formed of flexible material within which the bulbular portion engages and having parts co-operative with parts of the bulbular portion to define an air pocket associated with the bulbular portion, the parts of said jacket which co-operate to define said air pocket providing a flexible wall for said air pocket, the degree of flexibility of which permits it to flex and thus change the displacement of the float in response to expansion and contraction of the air in said pocket incident to temperature changes of said air in use.

3. A hydrometer float comprising the usual bulbular portion and stem portion, and a jacket within which the bulbular portion engages, said jacket being formed of rubber and having parts extending free of the bulbular portion to provide an air pocket associated with the bulbular portion, a part of said jacket providing a flexible wall for said air pocket, the degree of flexibility of which permits it to flex and thus change the displacement of the float in response to expansion and contraction of the air in said pocket incident to temperature changes of said air in use.

In testimony whereof we affix our signatures.

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