April 16, 1940. P. S. RUSSEL 2,197,262

CONTROL DEVICE

Filed April 2, 1937

FIG. 3

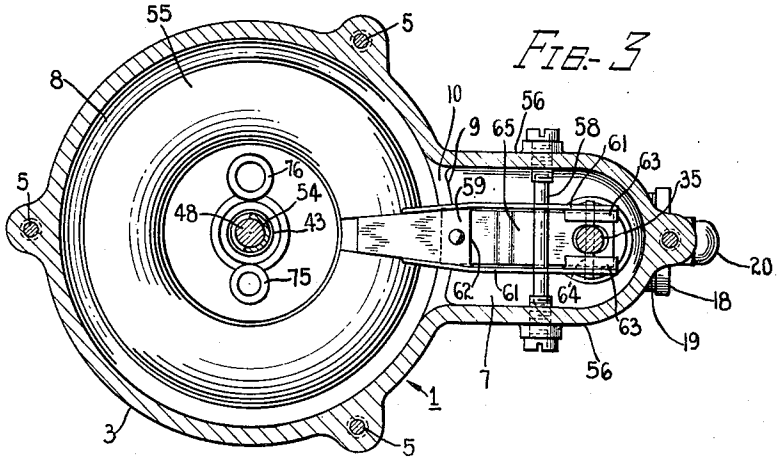


FIG. 1

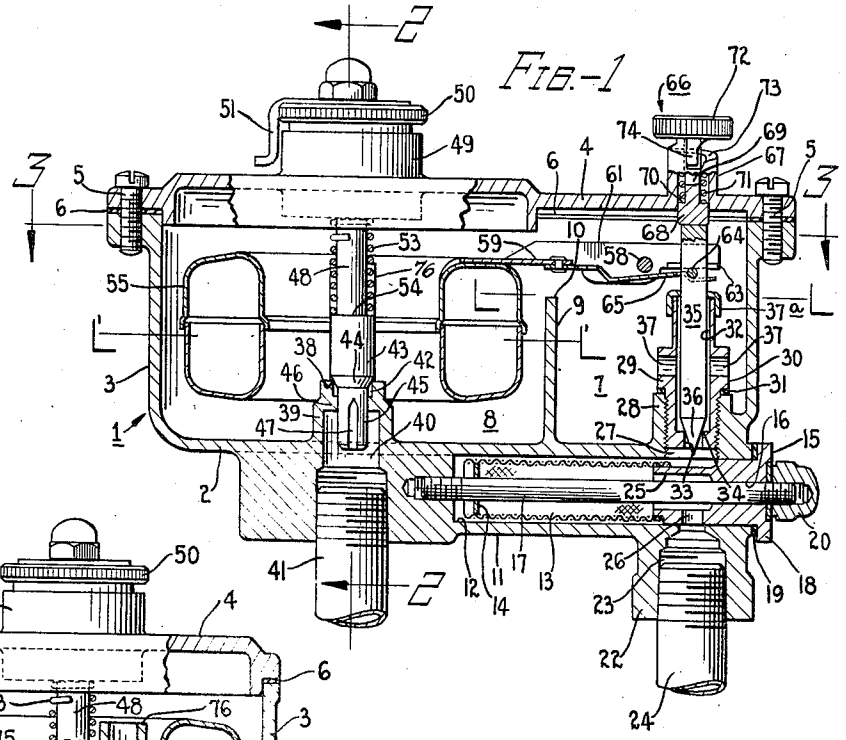
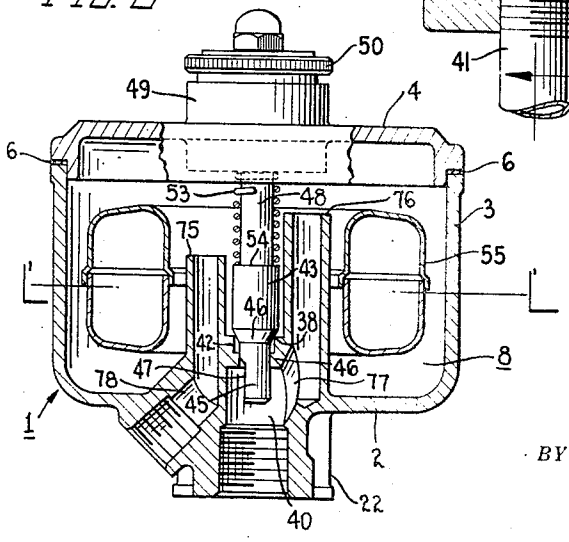


FIG. 2



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2,197,262

CONTROL DEVICE

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8 Claims. (Cl. 137—68)

This invention relates generally to fluid flow control devices and more particularly to gravity feed, constant level control devices for controlling flow of liquid fuel to a burner.

Heretofore control devices of this nature have been utilized with a rigid, stationary, fixed base or support so that when installed in a horizontal position in connection with a burner to be fed thereby, the liquid level to be maintained by the device when once adjusted has been invariable. However, it now occurs that gravity fed burners supplied by a constant level control device are mounted in automobile trailer cars and on or in other vehicles which do not provide a stable and stationary support, so that the control device is frequently tilted or tipped when the burner is in use as the car or vehicle encounters road grades or is stopped on uneven or inclined parking areas and the horizontal position of the control device is not maintained.

It is therefore one object of the invention to provide a constant level device which will maintain a substantially constant liquid head on the supply to the burner, whether the vehicle is on level road or ground or is tipped or tilted while travelling or when at rest or parked.

Another object of the invention is to provide for a burner a new and novel gravity feed control having mechanism for normally maintaining a substantially constant liquid fuel level or head, and of a character such that a substantially constant liquid fuel level may be maintained even in the event of failure of the mechanism that normally maintains a substantially constant liquid level.

Another object of the invention is to provide a liquid level gravity feed control having a new and improved arrangement of the operating and associated parts thereof.

Another object of the invention is to provide a control of the above mentioned character which is compact, inexpensive to manufacture and yet one which will be efficient in operation on a vehicle.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, I have fully and clearly illustrated the invention, in which drawing—

Figure 1 is a view shown in longitudinal central section of a gravity feed control device embodying features of the invention;

Fig. 2 is a view shown in cross section of the control device and taken along the line 2—2 of Fig. 1, and

Fig. 3 is a top plan view shown partly in section and partly in elevation taken along the line 3—3 of Fig. 1.

Referring to the drawing, the control device shown is particularly adapted among other uses for use on a vehicle, for example, a house car, trailer or other vehicle having a burner to which liquid fuel is supplied by gravity. The control device includes an oblong or elongated hollow casing 1 having a bottom wall 2, a continuous side wall 3 and a top wall 4. The top wall 4 is preferably formed by a cover that may be rigidly secured to outturned flanges of the casing side wall 3 by screws 5, or by other suitable means, and between the upper end of the casing 1 and the cover 4 there is preferably provided a gasket 6. The casing 1 preferably has an internal wall or partition 9 that divides the interior of the casing into a relatively small capacity inlet chamber 7 and a relatively large capacity outlet, or constant level chamber 8. Preferably the inlet chamber 7 is of elongated form extending longitudinally of the casing 1, and preferably the outlet chamber 8 is cylindrical in shape having a vertically extending axis of symmetry. The wall or partition 9 extends upwardly between the chambers 7, 8 and may be integral with and join the casing bottom and side walls. The vertical wall 9 terminates below, or has an upper end 10 spaced from the casing cover 4, the upper end or edge 10 of the wall 9 providing an overflow portion or dam over which the liquid fuel flows from the inlet chamber 7 into the cylindrical outlet chamber 8. The wall 9 and a cylindrically shaped inner wall surface portion of the continuous side wall 3 define the cylindrical outlet chamber 8, and preferably the inner surface of the partition 9 is concave and conforms in shape to the cylindrical internal wall surface of the wall 3, as shown in Fig. 3.

Preferably the casing bottom wall 2 has an integral boss 11 extending longitudinally thereof, externally of the casing, and this boss is provided with a chamber, preferably a bore 12 that extends longitudinally of the boss 11 and opens through one end thereof. Positioned in the bore 12 there is preferably a cylindrically shaped wire mesh strainer 13 for straining liquid enroute to the inlet chamber 7. The inner end of the strainer 13 is preferably closed by a closure member 14, and the outer end of the cylindrical strainer is open and fits tightly over an inner end portion of

a cylindrical closure member or plug 15 that closes bore 12. The closure plug 15 extends partway into the bore 12 and preferably has a centrally disposed, longitudinally extending aperture or bore 16 therethrough for receiving a rod 17 that extends longitudinally through the strainer 13 and through an aperture in the inner closure member 14 and tightly screw threads, against movement, into the inner end wall of the bore 12. Preferably the closure plug 15 has a head 18 on its outer end for seating against the outer end of the boss 11, and between the head 18 and the outer end of the boss 11 there may be provided a gasket 19 to insure a fluid tight connection. An outer end portion of the rod 17 projects from the outer end of closure plug 15 and may be externally threaded for receiving a nut 20 for abutment with the closure member 14 to urge the same inwardly and hold the gasket 19 under compression.

Integral with the boss 11 there is preferably a depending hollow boss 22 defining an inlet passage 23 that opens into the bore 12, the inlet 23 preferably being threaded for connection to one end of a supply conduit 24 that may lead from a supply or reservoir tank (not shown). The longitudinally extending bore 16, through the closure plug 15, preferably has a portion 25 of enlarged diameter that opens through the inner end of the plug into the interior of the strainer 13. The enlarged bore portion 25 provides an annular chamber that is in open communication with the inlet passage 23 via a laterally extending connecting bore 26 provided through the side of the closure plug 15 and disposed to align or register with the inlet 23.

Through the casing bottom wall 2 there is a passage 27, preferably a bore that communicates with the strainer chamber 12, and integral with the bottom wall 2 and registering with the bore there is preferably a tubular boss 28 projecting upwardly within the inlet chamber 7. The upstanding tubular boss 28 is preferably internally threaded to receive an open ended, removable fitting or valve seat member 29 that extends vertically and projects above the upper end of the tubular boss 28. Preferably the fitting 29 is provided with an external annular flange or downwardly facing shoulder 30 intermediate its ends for seating on the upper end of the tubular boss 28, and preferably a gasket 31 is disposed between the shoulder 30 and the upper end of the tubular boss 28 to insure a fluid tight connection therebetween. The fitting 29 has a vertically extending bore 32 opening through the upper end thereof, and adjacent the lower end of the fitting the bore 32 opens into an axially aligned bore 33 of relatively small diameter that provides an upwardly facing inlet port and valve seat 34. Positioned for reciprocal movement within the bore 32 of the fitting 29 there is a valve member 35, the lower end of which preferably has a conical face 36 for cooperating with the inlet port 34 to control flow therethrough. Through the side wall of the fitting 29, above the upper end of the tubular boss 28, there may be provided one or more laterally extending passages 37 for the passage of liquid fuel from the fitting inlet bore 32 into the casing inlet chamber 7. The valve member 35 projects upwardly above the upper end of the fitting 29, and fitted over the upper end of the member 29 there is preferably a cap 37a that has a centrally disposed aperture therethrough for slidably receiving and guiding the valve member 35.

An upwardly facing outlet port 38 is provided for the cylindrical outlet or constant level chamber 8, and this outlet port is located centrally of the cylindrical wall of chamber 8, or in axial alignment with the vertical axis of symmetry of chamber 8, so that the liquid pressure head on the outlet port 38 will remain substantially constant and will not increase, irrespective of tilting of the casing 1. In the present instance the outlet port 38 is formed or defined by the upper open end of a tubular wall member or hollow boss 39 that is integral with the casing bottom wall 2 and extends partway upward within the chamber 8. The hollow boss 39 defines an outlet passage 40 that opens through the casing bottom wall 2 and may be communicatively connected to a burner (not shown) by a conduit 41. The passage, preferably a bore 42, that opens through the upper end of the hollow boss 39 and defines the outlet port 38, also provides a seat for a manually operable valve member 43 that is preferably provided to regulate or control rate of flow of fuel from the outlet chamber 8. The valve member 43 may have a beveled or conical shaped face 44 for cooperating with the outlet port 38 to regulate rate of flow therethrough and for engaging its seat to stop flow of fuel through port 38. Below the conical valve face 44 the valve member 43 preferably has a lower end portion of reduced diameter, as at 45, that is slidably received and guided in a centrally disposed aperture or bore provided through an internal, transversely extending wall 46 of the tubular boss 39, the wall 46 preferably being located adjacent the upper end of the tubular boss. A metering slot 47 is provided in the side wall of the reduced valve portion 45 and extends longitudinally thereof, the slot 47 extending upwardly to a point such that the entire slot will be below the upper surface of the transverse wall 46 when the valve is seated, as shown. When the valve is raised from its seat such that a small portion of the metering slot 47 is above the upper surface of the transverse wall 46, fuel will flow from the chamber 8 through port 38, bore 42, metering slot 47, outlet passage 40 and conduit 41 to the burner, and the rate of flow of fluid will be governed or will depend upon how much of the metering slot 47 is above the transverse wall 46.

The valve member 43 preferably has a stem portion 48 that extends substantially vertically, and an upper end portion thereof preferably projects externally of the casing through the top wall or cover 4. Any suitable mechanism, such as for example a cam and cam follower (not shown), may be provided to obtain gradual rectilinear movement of the valve 43 to change the rate of flow of fluid, and this mechanism may be enclosed in a housing 49 formed by a hollow boss that may surround the valve stem and be integral of the casing cover 4. An upper end section of the valve stem projects above the housing 49, and secured thereto there is preferably provided a thumb screw or knob 50 for conveniently rotating the valve 43. Carried by the knob 50 there may be provided a pointer 51 for cooperation with indicia that may be provided on the casing cover to aid in positioning the valve to obtain a desired rate of flow of liquid fuel to the burner. Surrounding the valve 43 within the chamber 8 there is preferably provided a helical coil spring 53 having one end abutting an upwardly facing shoulder 54 formed on the valve member 43. The spring 53 is under compression acting to move the

valve member 43 downwardly or toward closed position.

Disposed within the cylindrical constant level chamber 8 there is a float 55 responsive to changes in liquid level in chamber 8 to actuate the inlet valve 35 to maintain a desired or predetermined, substantially constant liquid level or pressure head in the chamber 8 with respect to outlet port 38. In order that substantially the same predetermined, constant liquid level will be maintained by the float 55 in chamber 8, with respect to outlet port 38, when the casing 1 is tilted in any direction, as when the casing is on an even keel or horizontally positioned as in Fig. 1, the float is arranged in chamber 8 so that the center of liquid displacement by the float, when the valve is seated, will remain at a point of substantially constant height above the outlet port 38 irrespective of tilting of the casing. To this end there is preferably employed a float of symmetrical form, preferably cylindrical in shape and of uniform mass, and the float is arranged with its cylindrical side wall disposed toward the side wall of the cylindrical chamber 8, with the vertical axis of symmetry of the float substantially in coaxial alignment with the vertical axis of symmetry of the chamber 8 and outlet 38. The float 55 need not necessarily be symmetrical or cylindrical, or of uniform mass, but if a float is employed which is not symmetrical and uniform throughout in mass the float should, in order to obtain the best results, be arranged so that its center of liquid displacement will remain at a point of substantially constant height above the metering or outlet orifice 38 whether the casing is on an even keel or whether it is tilted in any direction. Or in other words the float should be arranged in the chamber 8 so that a substantially vertical line through the volumetric center of liquid in chamber 8 will pass through the center of mass of the float. In order to provide a compact device or unit, the float 55 is preferably a hollow, annular, ring-like member so that it may surround the outlet valve in chamber 8.

The casing side wall 3 preferably has substantially parallel, oppositely disposed wall portions 56 that form in part the small inlet chamber 7, and preferably secured in and to the wall portions 56 there is a shaft 58 that is disposed between the inlet valve 35 and float 55. A lever 59 is supported intermediate its ends on the shaft 58 and extending above the overflow dam 10 has one end preferably rigidly secured to the float 55 and its other end loosely connected to the inlet valve 35. The lever 59 preferably has upturned, substantially parallel side flanges 61 provided with aligned apertures to receive the shaft 58. The lever proper terminates, as at 62, between the float 55 and shaft 58, and the lever side flanges 61 extend beyond or past the lever proper and have inturned, opposed flange portions 63 between which the valve 35 extends. The valve 35 has an abutment member which may be a pin 64 extending transverse to the longitudinal axis of the valve and having opposite end portions projecting from the valve for abutment with the flange portions 63 of the lever side flanges 61. A leaf spring 65 is secured adjacent one end thereof to the lever proper, and extending longitudinally of and between the lever flanges 61 has an aperture adjacent its other or free end for receiving the valve 35 below pin 64. The leaf spring 65 is under tension urging and holding valve 35 in engagement with the lever so that there will not be any lost motion or slack therebetween.

A manually operable means, designated in general by the numeral 66, is preferably provided for closing the inlet valve 35. To this end the casing top wall or cover 4 is preferably provided with an integral, upstanding hollow boss 67 overlying or registering with the upper end of valve 35 for receiving and guiding a plunger 68 that is arranged to engage valve 35. The plunger 68 preferably has an upwardly extending stem 69 providing an upwardly facing annular shoulder 70, and surrounding the stem 69 there is preferably a helical coil spring 71 having one end abutting the plunger shoulder 70 and its other end abutting the inner top wall of the hollow boss 67. The spring 71 is under compression and acts to move the plunger 68 downward into engagement with the upper end of valve 35 to move and hold the valve on its seat. The plunger stem 69 projects upwardly above and externally of the hollow boss 67, and rigidly secured to the upper end of the stem there is preferably provided a thumb screw or knob 72 by means of which the plunger 68 may be conveniently rotated. Formed on the upper end of the hollow boss 67 there is preferably a helical cam surface 73, and carried by and depending from the knob 72 there is a cam follower member 74 cooperable with the cam surface to move plunger 68 rectilinearly upon rotation of the plunger. When the plunger 68 is in the position shown in Fig. 1, the spring 71 is holding the plunger down in engagement with the valve 35 to hold the valve against its seat. When the plunger 68 is rotated in the direction which will cause the cam follower 74 to climb the helical cam surface 73, the plunger will be moved upward out of engagement with valve 35, after which the valve is free to be actuated by float 55.

The inlet valve 35, actuated by the float 55, normally maintains a substantially constant liquid level in chamber 8, but to insure against undue liquid level rise, if for any reason the normal operating means fails to maintain the desired liquid level, an overflow or drain tube 75 is provided and extends upward within chamber 8 above the normally maintained liquid level designated L'—L', see Fig. 2, the level L'—L' being the mean float controlled level. Also, in chamber 8 there is preferably provided an upstanding vent tube 76 for venting air or other gases from the delivery side of the outlet port, and this tube extends upwardly to a sufficient height or distance above the upper end of drain tube 75 to prevent overflow of liquid thereinto, even when the casing 1 is tilted. In order that the control device may be a small and compact unit, as is desirable when employed in a house car or trailer, the vent tube 76 is arranged closely adjacent to the outlet valve 43 and the tube 75, preferably so that the valve 43 extends or is positioned between the tubes, as shown, and so that the tubes 75 and 76 may occupy the space, or be disposed within the centrally disposed aperture through the float 55. The tubes 75, 76 may be cast integral with casing 1 and may join with the casing bottom wall 2 and with the upstanding hollow boss 39 that forms the outlet port. The vent tube 76 communicates with the outlet passage 40 by a connecting bore 77. The drain tube 75 communicates with an outlet passage, preferably a bore 78, provided in the casing bottom wall 2, and overflow of fuel may flow out of the outlet

passage 78 as waste, or may be caught in a receptacle as desired.

The operation of the herein described control device is as follows: The device, when used on a vehicle, is preferably rigidly mounted thereon in a manner such that when the floor or support for the burner and device is horizontal, the vertical axis of the symmetrically shaped constant level chamber 8 is perpendicular to the liquid level line, or to the surface of the liquid in chamber 8. The float 55 is responsive to slight changes in the liquid level in chamber 8 and actuates the inlet valve 35 accordingly to maintain the liquid level in chamber 8, and therefore the pressure head, substantially constant or within close limits. After the relatively small inlet chamber 7 is filled to the level indicated L—L, any additional liquid fuel flows over the dam into the relatively large constant level chamber 8 wherein the level of the liquid is maintained at a level below the dam, as indicated by the line L'—L'. If the vehicle is on a hill or incline, the chamber 8 will be tilted with respect to the surface of the liquid therein which, in ordinary gravity feed control devices, changes the pressure head of the liquid on the outlet port. However, due to the provision of a symmetrical constant level chamber having a centrally disposed outlet together with a float positioned as above described, tilting of the casing in any direction will not cause an increase in the liquid head on the outlet port and the extent of decrease in liquid head will be negligible for all practical purposes and insufficient to affect the operation of the burner. When the casing 1 is tilted about its transverse axis in a counterclockwise direction, as seen in Fig. 1, more than the usual amount of liquid fuel will pour over the dam 18 from inlet chamber 7 into the outlet chamber 8, but by reason of the relatively small inlet chamber as compared to the outlet chamber, the additional liquid that will overflow into chamber 8 upon initial tilting of the device will be small and negligible. Whether the device is on an even keel or not, if for any reason the normal means for maintaining the constant liquid level fails to do so, the overflow or drain tube 75 will prevent any substantial increase in liquid level or pressure head in the chamber 8 with respect to outlet port 38. Upon failure of the normal means for maintaining a substantially constant level in chamber 8, the liquid level will rise and overflow into drain tube 75. The provision of the drain tube 75 provides a safety means in the event of failure of the normal level maintaining means, and prevents flooding of the burner. By reason of the overflow drain being located in close proximity to the central vertical axis of the liquid level chamber it will, should the float 55 fail to close the inlet valve 35, act to maintain a substantially constant liquid head on the outlet port irrespective of the direction or the angle of tilting which will be encountered.

From the foregoing description it will now be seen that a new and improved constant level control has been provided in which the pressure head will remain substantially constant with respect to the outlet port 38 when the casing is tilted or tipped. It will also be seen that a control device is provided having mechanism for normally maintaining a substantially constant liquid level, and having provision for maintaining a second substantially constant liquid level in the event of failure of the normal operating mechanism to maintain a substantially constant level.

What I claim and desire to secure by Letters Patent of the United States is:

1. In a gravity feed control device, a casing comprising an integral casting having a constant level chamber for liquid and an inlet therefor, a valve member controlling said inlet, said chamber having a fuel supplying outlet in the bottom wall thereof and disposed substantially centrally of said chamber so that the hydrostatic head will remain substantially constant with respect to said outlet irrespective of tilting of said casing, a float in said chamber and normally operable to actuate said valve member to maintain a substantially constant liquid level in said chamber with respect to said outlet, and an overflow outlet having a tubular portion cast integral with said casing and having its inlet opening leading from and below the top of said chamber and disposed above said substantially constant level, said overflow outlet discharging externally of said chamber and separately from said supplying outlet.

2. In a gravity feed control device, a casing having a constant level chamber and an inlet therefor, a valve member controlling said inlet, said chamber having a liquid supplying outlet and having an axis of symmetry substantially in alignment with said outlet so that the hydrostatic head on said outlet for a predetermined quantity of liquid will remain substantially constant irrespective of tilting of said casing, a float in said chamber for operating said valve member, said float having its center of mass in the axis of symmetry of said chamber so that the float will maintain said predetermined quantity of liquid in said outlet chamber irrespective of tilting of said casing, and an overflow outlet member in said chamber, said outlet member having its inlet from the chamber disposed above the normal liquid level and in close proximity to the axis of symmetry of said chamber so that it will on overflow thereinto maintain a substantially constant liquid head on the chamber outlet when the casing is tilted, and said overflow member having its outlet discharging separately from said supplying outlet.

3. In a gravity feed control device, a casing having a constant level chamber for liquid and an inlet therefor, a valve member controlling said inlet, said chamber having an outlet in the bottom wall thereof with said outlet disposed substantially centrally of said chamber so that changes in the hydrostatic head of the liquid due to tilting of said casing will be minimized, a valve controlling said outlet for regulating the rate of flow therefrom, said second-named valve having a stem extending upwardly within said casing, an upstanding overflow tube extending longitudinally of said valve stem in close proximity to said outlet, a vent tube for venting gases fom the outlet side of said second-named valve and extending upwardly in said chamber longitudinally of and in close proximity to said valve stem, said vent tube having an opening above the opening of said overflow tube, a float in said chamber and surrounding said valve stem, vent tube and overflow tube, and means operatively connecting said float to said first-named valve member so that said float will act to maintain a substantially constant liquid level in said chamber and below the opening of said overflow tube.

4. In a gravity feed control device, a casing

having a chamber for liquid and an inlet and an outlet therefor, a valve controlling said inlet, a float operable in response to changes in liquid level in said chamber for actuating said valve to maintain a substantially constant level in said chamber, and an overflow port in said chamber preventing upon tilting of said casing more than a fixed increase in liquid level above said first-named level, said overflow port being arranged substantially in alignment with a substantially vertical line passing through the volumetric center of said chamber and discharging externally of said casing and separate from said outlet.

5. In a liquid feeding device, a casing having a bottom wall and a surrounding side wall extending upwardly from said bottom wall and defining a liquid receiving chamber, a plurality of hollow outlet members cast integral with and projecting upwardly from said bottom wall, said bottom wall having an inlet port, a valve member controlling said port, one of said outlet members having an inlet port below the normal liquid level in said chamber, another of said outlet members having its hollow portion separate from the hollow portion of said one outlet member, said other outlet member having an inlet port to its hollow portion above the normal liquid level in said chamber, said other outlet member acting to maintain a substantially constant liquid level in said chamber upon failure of said valve member to close said inlet, a cover member on said casing having an aperture alined with the inlet port of said one outlet member, a liquid metering valve member carried by said cover member and positioned thereby relative to said one outlet member to control flow through the inlet port of said one outlet member, and a float member operatively connected to said first-named valve member and surrounding said metering valve member, said float member acting to maintain a substantially constant level of liquid intermediate the levels of the inlet ports to said outlet members.

6. In a liquid feeding device, a hollow casing having a chamber with an inlet for liquid, a valve controlling admission of liquid through said inlet, and an upwardly extending hollow member in said chamber, said member having a plurality of vertical outlet passageways therethrough establishing communication between the inside and the outside of said casing, one of said passageways being branched to provide two ports from said chamber to said one passageway, said two ports being at different levels, and another of said passageways having its inlet from said chamber at a level intermediate the levels of said two ports.

7. In a liquid feeding device, a hollow casing having a chamber with an inlet for liquid, a valve controlling admission of liquid through said inlet, an upwardly extending hollow member in said chamber, said member having a plurality of vertical outlet passageways therethrough establishing communication between the inside and the outside of said casing, one of said passageways being branched to provide two ports from said chamber to said one passageway, said two ports being at different levels, and another of said passageways having its inlet from said chamber at a level intermediate the levels of said two ports, a cover member on said casing and having an aperture therethrough alined with the lowermost of said ports, and a valve member extending through said aperture and cooperable with the said lowermost of said ports to control flow from said chamber.

8. A fuel supply controlling device for maintaining a substantially constant liquid level comprising a cast metal hollow casing having a liquid receiving chamber and having an inlet aperture through its bottom wall, a valve seat member removably secured in said aperture and extending upwardly into said casing, a valve member guided in said seat member, an annular float member positioned in said chamber, a lever arm having a fulcrum support and operatively connecting said float member to said valve member, an outlet sleeve member cast integral with said casing and extending upward from the bottom wall of said chamber concentric with said float member, a hollow portion external of said chamber and projecting from the bottom wall of said casing concentric with said sleeve member and having a fuel supply outlet passageway opening at its opposite ends through said sleeve member and said projecting portion, a plate member secured to said casing and overlying said float member, a metering valve member carried by said plate member and extending downward through said float member and into said passageway to control flow through and from said projecting portion, and a tubular overflow portion cast integral with said casing and having an inlet within said chamber above the constant liquid level and having an outlet leading through the bottom wall of said casing separate from said supply outlet so that the hydrostatic head on said supply outlet will be maintained at a substantially constant height above said constant level upon failure of said float member to maintain said constant level.

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