

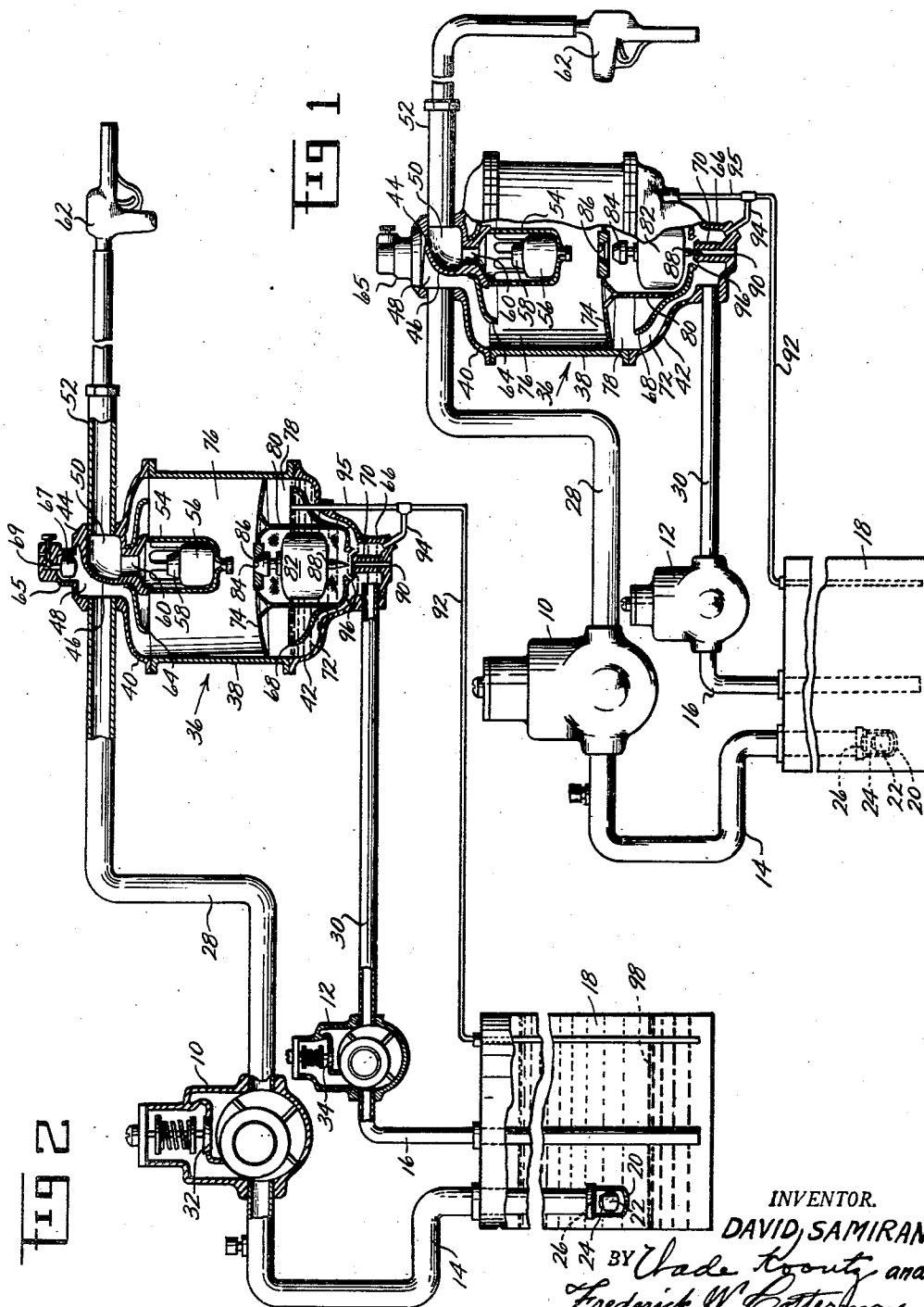
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SEGREGATOR SYSTEM

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SEGREGATOR SYSTEM

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without payment to me of any royalty thereon.

This invention relates to segregator systems, and is particularly effective in separating water from liquid hydrocarbon in a fuel dispensing system.

An object of the invention is to provide a segregating system of this character having a fuel storage tank and two pumps, one pump being preferably, but not necessarily, smaller than the other and so arranged that when there is no water present in the storage tank both pumps will be pumping fuel, but when water is for any reason present, the smaller pump will automatically assume the duty of pumping out the water leaving the larger pump to temporarily assume the burden of maintaining the fuel supply.

Another object is to provide a dual segregator unit having a larger compartment into which the larger pump discharges and a smaller compartment into which the smaller pump discharges, the larger compartment discharging the fuel content after the water has been separated therefrom directly to the service nozzle, and the smaller compartment discharging the fuel content after the water has been separated therefrom into the larger compartment.

Float operated valves are provided for controlling the discharge openings, the floats being operative to rise in water but sink in fuel, whereby, when the water rises to a predetermined level, the discharge passages are closed, and when the water falls to a lower predetermined level the discharge passages are opened.

Another object is to so construct and arrange the device that when the smaller pump is pumping a fluid which is largely or entirely water, the float in the smaller compartment of the segregator will not only rise to close the discharge opening which connects the top of the smaller compartment to the bottom of the larger compartment, but will open the bottom of the smaller compartment to the atmosphere, with additional automatically operative drainage means whereby, if any water is left in the segregator when the system is not in use, it will be returned to the storage tank so that no damage due to freezing of the water in the segregator will occur.

Other objects and advantages will become evident as the invention is further described with reference to the drawings, wherein:

Fig. 1 is a schematic view of the assembled system as it appears when substantially no water is

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being pumped by either pump or as it appears when the system is at rest.

Fig. 2 is a schematic view of the assembled system as it appears when the output of the smaller pump is largely or entirely water.

Like reference characters refer to like parts throughout the drawings.

In the drawing, the main pump 10 and an auxiliary pump 12 have their respective suction pipes 14 and 16 connected to a tank 18. The end of the suction pipe 16 extends to a point relatively close to the bottom of the tank, while the end of the suction pipe 14 is somewhat farther up from the bottom.

A float cage 20 is attached to the lower end of the suction pipe 14 and contains a float 22 which is so balanced that it will remain in the bottom of the cage when suspended in hydrocarbon fuel but will rise to the top of the cage when suspended in water. The upper end of the float carries a valve part 24 which is adapted to be raised into engagement with the valve seat 26 to shut off the suction line 14 if an unusually large amount of water should inadvertently get into the tank.

Main pump 10 discharges into the main discharge line 28, while auxiliary pump 12 discharges into the auxiliary discharge line 30. Main pump 10 is provided with a relief valve 32 and auxiliary pump 12 with a relief valve 34 whereby excess pressure at the discharge sides of the pumps may return to the intake side as in common practice.

A dual segregator, which may be broadly designated by the numeral 36, consists of a body portion 38 closed at the upper end by the upper head 40 and at the lower end by the lower head 42, the heads being held to the body portion by screws or similar means. The upper head 40 has a hollow hub 44 with a lateral opening into which the main discharge pipe 28 empties. A partitioning member 46 within and integral with the hub 44 divides the interior of the hub 44 into a fluid receiving passageway 48 and a delivery passageway 50 from which the delivery pipe 52 emanates. The partitioning member 46 at its lower end supports a float cage 54. A float 56 is contained in and guided by the cage 54 and carries a valve part 58 on its top surface, the float 56 being balanced to rise in water but sink in hydrocarbon fuel, whereby the float 56 normally remains in the position shown in the drawing but may, if the water rises sufficiently, rise and close the passageway 60 which connects the interior of the float cage with the delivery passageway 50, whereby fuel delivery to the nozzle

62 will be, for the time being, interrupted. A deflector or baffle 64 shields the float 56 so that it will not be influenced by movement of fuel entering the passageway 48. As a means of eliminating accumulated air or vapor, a small hollow hub 65 on the upper side of the hub 44 contains a small float 67 which is so balanced as to maintain an air valve 69 closed as long as the fuel level is at a predetermined high level but will drop and open the air valve whenever an accumulation of air or vapor in and around the air valve 69 forces the level of the fuel downward to a predetermined low level.

The lower head 42 has a hollow hub 66 with a lateral opening into which the pipe 30 discharges. A baffle in the form of a bowl 68 is carried by the upper end of a small hub 70 which extends upwardly from the bottom within the larger hub 66, thereby leaving a space 72 completely around the bowl 68 between the bowl and the head 42. A horizontally disposed partition 74 divides the space within the segregator unit 36 into a main compartment 76 and an auxiliary compartment 78.

A float cage 80, preferably made of fine mesh screening, at its lower end rests on the bowl 68 and is held at its upper end by the horizontal partition 74. A float 82 balanced to sink in hydrocarbon fuel but rise in water is guided for vertical movement in the cage 80. Float 82 on its upper surface carries a valve part 84 adapted upon upward movement of the float to close the passageway 86 between the compartments 76 and 78 and on its lower surface it carries a valve part 88 adapted upon downward movement of the float to close the passageway 90 which connects the inside of the bowl 68 at the bottom to the atmosphere.

A small fluid return pipe 92 extends from the segregator 36 to the bottom of the supply tank 18, a branch pipe 94 extending to the inside of the hub 66 and a branch pipe 95 to the upper portion of the chamber 78. One or more small leakage openings 96 connect the inside of the bowl 68 at the bottom to the space within the hub 66.

The operation of the improved segregator system is as follows:

Assuming that the tank 18 is full of fuel and that no water content is present, the apparatus will then be in the condition shown in Fig. 1. If both pumps are put into operation, the main pump 10 will draw fuel from the tank 18 through the intake pipe 14 and deliver it through the discharge pipe 28 and passageway 48 into the main segregator chamber 76, any air which may be contained in the fuel, passing out through the air eliminator valve 69 in the usual manner. Since there is now no water content, the float 56 remains in the lower position shown, the baffle 64 being operative to so spread the inflow that there will be no appreciable upward current to disturb the float 56. The fuel therefore flows through the openings in the cage 54 through the passageways 60 and 50 and through the discharge line 52 to the nozzle 62.

Still assuming that no water has accumulated in the tank 18, the auxiliary pump 12 draws fuel from the tank through the suction line 16 and delivers it through the discharge line 30 into the hub 66 from which it passes through the space 72 between the hub and the bowl 68, then through the screen 80 and through the passageway 86 into the main chamber 76, where it mixes with the fuel being pumped by the main pump 10 and passes to the nozzle 62 in the same manner.

Assume next that a small amount of water has in some manner gotten into the tank 18, and has risen to a level just slightly above the lower end of the auxiliary suction pipe 16. The auxiliary pump 12 may now pump a mixture, since it may alternately get hold of water then fuel. As long as the amount of water is relatively small, the float 82 may rise just far enough to slightly open the drain valve 88 but not far enough to close the shutoff valve 84, the small water content thereby passing out the drain 90. A small quantity of water may at this time pass through the branch pipe 94 and a small quantity of fuel or water through the branch pipe 95, then through the small return pipe 92 back to the tank 18. Should the water content in the tank 18 become greater, as, for instance, great enough to rise to the level 98, Fig. 2, the auxiliary pump 12 would pump water only and thereby soon raise the float 82 sufficiently to close the passageway 86 and open the drain opening 90 wide, as seen in Fig. 2.

For the time being then the main pump 10 would alone supply the nozzle 62. The float 22 provided at the lower end of the suction pipe 14 is substantially never called upon to perform its function since it is only in extreme and unexpected circumstances that the water level will rise high enough to close this float. When it does, however, no fuel can be delivered by either pump since the float 22 closes the suction line of the main pump and the float 82 closes the passageway 86, thereby shutting off discharge from the auxiliary pump. A condition may, however, arise where the water content rises gradually in the tank 18 so that a limited quantity of water may be drawn up through the suction pipe 14 by the main pump 10 before the float 22 rises far enough to shut off the suction inlet 14. When the water level in the tank is at such a height, necessarily the float 82 will have the passageway 86 closed, because the auxiliary pump 12 will also have been pumping water. If the water, which succeeded in entering the suction line 14 is sufficient to build high enough in the chamber 76 to raise the float 56, the valve part 58 will close the passageway 60 and thereby shut off the discharge to the nozzle 62. It is only under abnormal circumstances, however, that the water level will ever reach the float 22. When the system is not in operation, the contents of the chamber 78 will drain back to the tank 18, through the branch pipes 95 and 94, that within the bowl 68 passing gradually through the leakage opening or openings 96, whereby the danger of freezing within the segregator is substantially eliminated.

Having described an embodiment of my invention, I claim:

1. In a segregator system for separating a lighter from a heavier liquid, a supply tank, a main pump, an auxiliary pump, an auxiliary suction conduit for the auxiliary pump having its suction opening relatively close to the bottom of the tank, a main suction conduit for the main pump having its suction opening relatively farther from the bottom of the tank than the suction opening of the auxiliary suction conduit, a float cage associated with the suction opening of the main suction conduit, a suction conduit float in said cage balanced to sink to the bottom of the cage when suspended in the lighter liquid and to rise to the top of the cage when suspended in the heavier liquid, a valve operative by rise of said float to close the suction inlet of the main suction conduit, a dual segregator comprising a housing, a partition dividing the space

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within said housing into a main chamber and an auxiliary chamber, a main discharge conduit connecting the discharge side of the main pump to the main chamber, an auxiliary discharge conduit connecting the discharge side of the auxiliary pump to the auxiliary chamber, a service nozzle, a service conduit connecting the top of said main chamber to the service nozzle, said partition containing an auxiliary passageway connecting said auxiliary chamber to the main chamber, a main float and an auxiliary float in the main and auxiliary chambers respectively, both balanced to sink in the lighter liquid but to rise in the heavier liquid, a baffle in each chamber positioned to prevent the entering liquid from discharging directly against the floats in said chambers, a main and an auxiliary valve carried on the upper end of the main and the auxiliary floats respectively, adapted upon a rise of the main and the auxiliary floats to prevent flow through the service conduit and the auxiliary passageway, respectively, a drainage conduit in said auxiliary chamber, a valve member associated with said auxiliary float adapted upon downward movement of said auxiliary float to close said drainage conduit, and a restricted return pipe connecting the auxiliary chamber back to the tank.

2. In a segregator system for separating a lighter from a heavier liquid, a supply tank, a main pump, an auxiliary pump, an auxiliary suction conduit for the auxiliary pump having its suction opening relatively close to the bottom of the tank, a main suction conduit for the main pump having its suction opening relatively farther from the bottom of the tank than the suction opening of the auxiliary suction conduit, a dual segregator comprising a housing, a partition dividing the space within said housing into a main chamber and an auxiliary chamber, a main discharge conduit connecting the discharge side of the main pump to the main chamber, an auxiliary discharge conduit connecting the discharge side of the auxiliary pump to the auxiliary chamber, a service nozzle, said main chamber containing a main delivery passageway connecting the top of said main chamber to the service nozzle, and said partition containing a transfer passageway connecting said auxiliary chamber to the main chamber, a main float and an auxiliary float in the main and auxiliary chambers respectively, both balanced to sink in the lighter liquid but to rise in the heavier liquid, a baffle in each chamber positioned to prevent the entering liquid from discharging directly against the floats in said chambers, a main and an auxiliary valve carried on the upper end of the main and the auxiliary floats respectively, adapted upon a rise of the main and the auxiliary floats to close the main delivery and the transfer passageways respectively, a drainage conduit in said auxiliary chamber, a valve member associated with said auxiliary float adapted upon downward movement of said auxiliary float to close said drainage conduit, and a restricted return pipe connecting the auxiliary chamber back to the tank.

3. In a segregator system for separating a lighter from a heavier liquid, a supply tank, a main pump, an auxiliary pump, there being an auxiliary suction passageway for the auxiliary pump having a suction opening relatively close to the bottom of the tank, and a main suction passageway for the main pump having a suction opening relatively farther from the bottom of the

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tank than the suction opening of the auxiliary suction passageway, segregating means comprising, a main chamber and an auxiliary chamber, there being a main discharge passageway connecting the discharge side of the main pump to the main chamber, and an auxiliary discharge passageway connecting the discharge side of the auxiliary pump to the auxiliary chamber, a delivery pipe, there being a main delivery passageway connecting the top of said main chamber to the delivery pipe, and a transfer passageway connecting said auxiliary chamber to the main chamber, float valves, one in the main chamber adapted for closing said main delivery passageway and another in the auxiliary chamber adapted for closing said transfer passageway, the floats being balanced to rise in the heavier liquid and the valves being constructed and arranged to close upon a predetermined rise of the floats, a baffle in each chamber positioned to prevent the entering liquid from discharging directly against the float valve, means containing a drainage opening in the wall of said auxiliary chamber, a valve member associated with said auxiliary float valve adapted upon the opening of said auxiliary float valve to close said drainage opening, and a restricted return pipe connecting the auxiliary chamber back to the tank.

4. A system for separating a lighter from a heavier liquid, which comprises a supply tank, a main pump and an auxiliary pump, there being a suction passageway for each pump extending from the pumps to the supply tank, the suction passageway of the auxiliary pump extending to a point closer to the bottom of the tank than the suction passageway of the main pump, segregating means comprising, a main chamber and an auxiliary chamber, there being a main discharge passageway connecting the discharge side of the main pump to the main chamber, and an auxiliary discharge passageway connecting the discharge side of the auxiliary pump to the auxiliary chamber, a delivery conduit, there being a main delivery passageway connecting the top of said main chamber to the delivery conduit, and a transfer passageway connecting said auxiliary chamber to the main chamber, float valves, one in the main chamber adapted for closing said main delivery passageway and another in the auxiliary chamber adapted for closing said transfer passageway the floats being balanced to rise in the heavier liquid and the valves being constructed and arranged to close upon a predetermined rise of the floats, means containing a drainage opening in said auxiliary chamber, a valve member associated with said auxiliary float valve, adapted upon the opening of said auxiliary float valve to close said drainage opening, and a restricted return pipe connecting the auxiliary chamber back to the tank.

5. In a segregator system for separating a lighter from a heavier liquid, a main pump, an auxiliary pump, there being a main suction passageway connecting the main pump to the supply tank, and an auxiliary suction passageway connecting the auxiliary pump to the supply tank, the auxiliary suction passageway having a suction opening at a lower level than the suction opening of the main suction passageway, segregating means comprising, a main chamber and an auxiliary chamber, there being a main discharge opening connecting the discharge side of the main pump to the main chamber, and an auxiliary discharge opening connecting the dis-

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charge side of the auxiliary pump to the auxiliary chamber, a delivery conduit, there being a main delivery passageway connecting the top of said main chamber to the delivery conduit, and a transfer passageway connecting said auxiliary chamber to the main chamber, float valves, one in the main chamber adapted for closing said main delivery passageway and another in the auxiliary chamber adapted for closing said transfer passageway, the floats being balanced to rise in the heavier liquid and the valves being constructed and arranged to close upon a predetermined rise of the floats, means containing a drainage opening in said auxiliary chamber, and a drainage valve member associated with said auxiliary float valve adapted upon the opening of said auxiliary float valve to move said drainage valve member to close said drainage opening.

6. In a segregator system for separating a lighter from a heavier liquid, a liquid container, a main pump, an auxiliary pump, there being a suction opening for each pump, the auxiliary pump having its suction opening at a lower level with respect to said container than the suction opening of the main pump, segregating means comprising, a main chamber for receiving the discharge from the main pump and an auxiliary chamber for receiving the discharge from the auxiliary pump, a delivery pipe, there being a main passageway connecting the top of said main

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chamber to the delivery pipe, and a transfer passageway connecting said auxiliary chamber to the main chamber, float valves, one in the main chamber adapted for closing said main passageway and another in the auxiliary chamber for closing said transfer passageway, the floats being balanced to rise in the heavier liquid and the valves being constructed and arranged to close upon a predetermined rise of the floats, means containing a drainage opening in the wall of said auxiliary chamber, and a drainage valve member associated with said auxiliary float valve adapted upon the opening of said auxiliary float valve to move said drainage valve member to close said drainage opening.

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