

Dec. 2, 1947.

J. L. HUDSON

2,431,936

LIQUID CARBONATOR

Filed Feb. 26, 1945

2 Sheets-Sheet 1

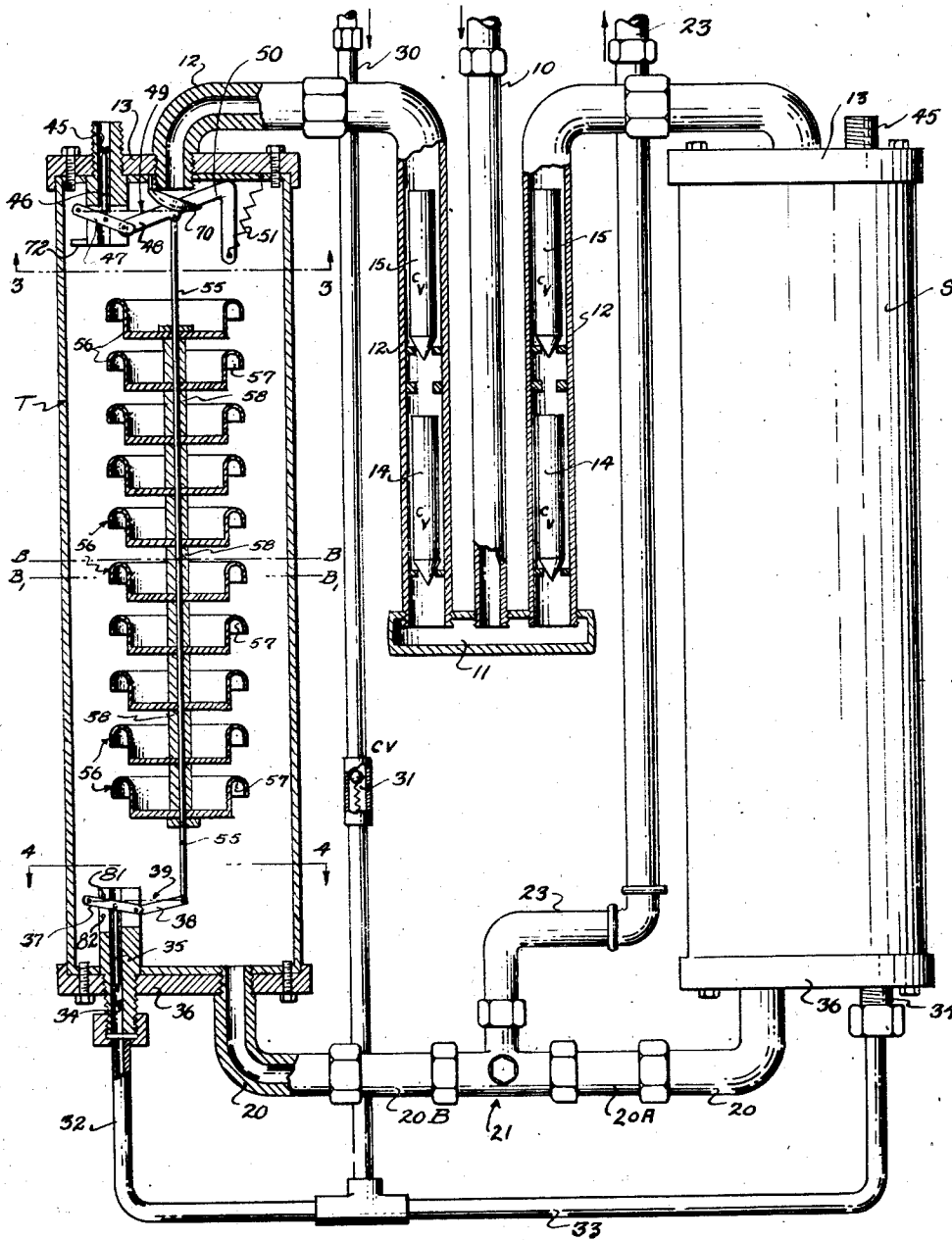


Fig. 1

INVENTOR.

JAMES L. HUDSON

BY

Barnes, Kisselle, Laughlin & Ruick
ATTORNEYS

Dec. 2, 1947.

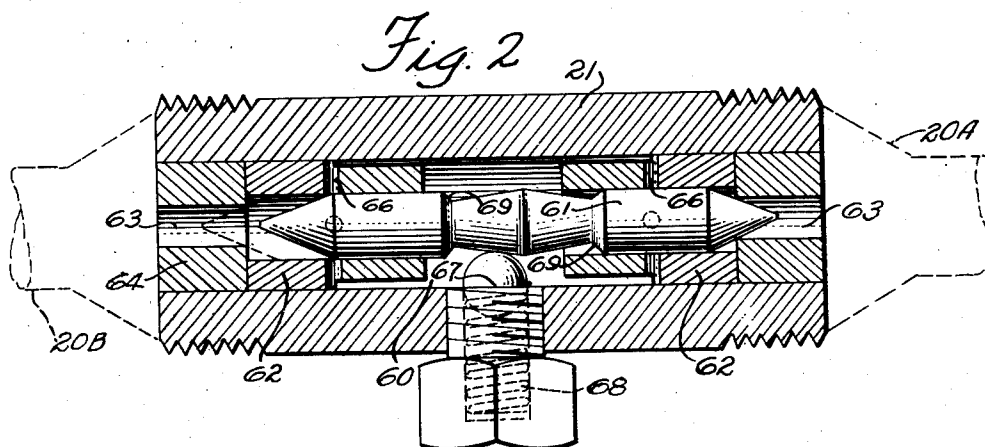
J. L. HUDSON

2,431,936

LIQUID CARBONATOR

Filed Feb. 26, 1945

2 Sheets-Sheet 2



INVENTOR.
JAMES L. HUDSON

BY

Barnes, Kiselle, Laughlin & Haisch
ATTORNEYS

UNITED STATES PATENT OFFICE

2,431,936

LIQUID CARBONATOR

James L. Hudson, Detroit, Mich.

Application February 26, 1945, Serial No. 579,762

8 Claims. (Cl. 261—23)

1

This invention relates to a carbonating device. It is an object of the present invention to provide a carbonating device which affords a supply of carbonated water at constant pressure and in continuous supply.

This application is a continuation-in-part of application, Serial No. 506,359, filed October 15, 1943.

One of the objections of previous carbonators has been that if water at the tap is constantly withdrawn it will start running through the carbonator without sufficient time for exposure to gas and consequent carbonation. Another objection has been that in some cases, when the water became low due to withdrawals from the carbonating tank, gas from the carbonator continued to flow through the vent valve causing a loss of the compressed gas. Also if the carbonator tank did not refill promptly because of frozen pipes or water supply cut-off, the vent valve would remain open and cause loss of carbonating gas.

The present invention contemplates a double tank carbonator each having a water responsive means which controls the gas inlet and gas outlet valves and an alternator valve between said tanks whereby carbonated water is always drawn from the tank having the highest pressure, thus affording time for the other tank to fill and carbonate before it is tapped. Other objects and features of the invention having to do with the specific construction will be brought out in the following description and claims:

In the drawings:

Fig. 1 is a circuit diagram illustrating the various elements of the carbonator and section.

Fig. 2 is a sectional view of the common alternator valve located between the tanks.

Referring to the drawings two tanks S and T are shown each identical in construction. The water inlet pipe 10 leads to a manifold 11 connected to upwardly extending pipes 12, which are connected into a head 13 on each of the tanks. Check valves 14 and 15 are arranged in the pipes 12 to prevent backflow.

At the bottom of each tank is a water outlet 20 which leads into a housing 21. An outlet pipe 23 for carbonated water leads from the housing 21.

A gas supply pipe 30 having a check valve 31 branches into two pipes 32 and 33 each leading to a valve housing 34. A needle valve 35 is positioned in housing 34 to control flow of gas into tank T. Valve housing 34 is mounted in a base plate 36. Valve 35 is operated by a snap action device consisting of levers 37 and 38 each pivoted

2

on a common pin on the right of housing 34 and operated by spring 39. Spring 39 is shown above the centerline in Fig. 1.

At the top of each tank located in the head 13 is a venting valve housing 45 in which is located a needle valve 46 to be operated by a snap action arrangement consisting of levers 47 and 48 each pivoted at the same point on valve housing 45 and operated by spring 49. Spring 49 is shown simply by a dotted line on Fig. 1. Lever 48 is an angle lever abutting against head 13. This lever is held in this position by a tension spring 51 when the load of the liquid-filled cups does not overcome its pull.

The lever 38 and the lever 48 are each connected to a rod 55 on which is mounted a plurality of dish-shaped members 56 each of which has an overhanging or reverse lip 57. These dish-shaped members or cups 56 are spaced by spacers 58 on the rod 55.

The snap action devices controlling needle valves 35 and 46 are so arranged as regard their stroke that upon downward movement of rod 55 valve 35 will shift to a closed position prior to the time that valve 46 is shifted to open position. Also valve 35 is arranged to remain closed until valve 46 is closed on the upward stroke of shaft 55. This is accomplished by arranging the stroke of levers 37 and 38 to a shorter distance than the stroke of levers 47 and 48 on the downward stroke; on the upward stroke, levers 47 and 48 reach the deadcenter position ahead of levers 37 and 38. This is due to the fact that in the downward movement of the rod 55, spring 49 of the top vent valve 46 is somewhat farther from the centerline over which it has to be thrown than is the spring 39 at the lower valve. Consequently, spring 39 will throw over center first and close the gas inlet valve 35 before spring 49 throws over center and opens the vent valve. This is clearly shown by comparing the position of the springs 39 and 49 with respect to the centers over which they throw in Fig. 1. On the upward movement of the rod 55 which opens the gas valve it is desirable, as already explained, to have the vent valve closed before the gas valve is opened. In order to accomplish this the stop 72 is placed at the bottom of the valve housing 45 to stop the downward movement of the top lever 47 short and, consequently, the top lever 47 is stopped in its downward movement short of the arc in which the lower lever 37 can swing. The result is that in the upward movement of rod 55 the lower spring 39 has to move through a greater distance before it throws lever 37 over the centerline than

is the case with spring 49 in pulling lever 47 upwardly over the centerline. Hence, the vent valve closes before the inlet valve 35 opens the stop pins 81 and 82 control the throw of lever 37.

Referring to Fig. 2, it will be seen that there are two pipes 20A and 20B leading from tanks S and T. A central bore 60 connects with the openings 20A and 20B, but a double ended needle valve 61 is arranged to close one or the other of the pipes 20A or 20B. This needle valve 61 is slidably mounted in sleeves 62 which press fit into bore 60 of housing 21. Each end of the valve seats in bore 63 of plugs 64 and 65. Sleeves 62 at their inner ends are reduced in diameter and provided with radial openings 66 which permit flow to bore 60 when valve 61 is shifted away from one end or the other.

A ball 67 backed by spring 68 cooperates with tapered sections 69 on the midpart of valve 61 whereby a predetermined pressure differential is required to shift valve 61. Spring 68 may be varied to the requirements.

In the operation of the device, when it is properly connected to a water supply and gas supply, the water is turned on first and the cylinders S and T are allowed to fill to approximately line 3—3 of Fig. 1. Then the gas is turned on. Meanwhile the water in the cylinders has exerted sufficient force on the accumulators or cups 56 that spring 51 will pull lever 48 up and close valve 46. Gas enters at the bottom of the cylinders and rises through the water to carbonate the same. A cup 70 is shown directly beneath the water inlet. This serves to break up the water as it enters the cylinder thus causing carbonation with gas already in the cylinder.

The degree of carbonation in a carbonator depends on these factors, namely: temperature, agitation, pressure and absorption. Of these the latter is most important and requires time. A low temperature is obtained by feeding a cold water supply into the carbonator and by keeping the entire apparatus under refrigeration. Agitation is obtained by the opening of a snap action inlet valve thus instantly releasing the full force of the CO₂ gas pressure, usually about 125 pounds per square inch, into the bottom of a chamber of water with a narrow space at the top which has a low pressure. This is due to venting down to the water supply pressure which is usually 49 to 50 pounds per square inch. In the present installation since the CO₂ inlet is located at the bottom of the tank it will provide violent agitation which is assisted by a series of inverted I-p cups 56. These cups serve as traps for gas and also serve to deflect the flow of gas in its upward travel causing complete mixing throughout.

Pressure and absorption are related in that the amount of absorption is dependent upon the pressure applied. The pressure is maintained by the supply of CO₂ gas. Time is provided for absorption of gas by alternating from one tank to another.

When both tanks are completely filled with carbonated water the valve 46 is closed and the gas valve 35 is open. When water is to be withdrawn the pipe 23 is opened at the tap (not shown). Assuming that the alternator valve 21 is in the position shown in Fig. 2, water will be withdrawn from the tank T. Each of the members 56 will remain filled with water and the weight of this water on shaft 55 will cause a movement of lever 48 against the spring 51. It will also cause a movement of lever 38 and when the water level has reached the point indicated at approximately

line B valve 35 will close. Upon further withdrawing of water to a point indicated at line I valve 46 will be opened. This will decrease pressure in the tank and permit tap water to enter once more to bring the water level up. In the meantime when the pressure in the tank T has dropped a predetermined amount the pressure in pipe 20A will shift valve 61 thus closing connection 20B and opening the other tank S to the carbonated water outlet. When water again fills the left-hand tank T, the spring 51 the springs 3 and 49 will pull the accumulators 56 upwardly first closing valve 46 and then opening valve 35 to permit carbonation.

The cycles thus continue with one tank being used and then the other. Spring pressed detent 67 controlling double needle valve 61 of Fig. 2 is designed to permit a very slight drop in the pressure of one tank before the valve 61 shifts. Since both tanks are connected to the same source of gas supply, the pressure will remain the same until one tank is vented through valve 46. Upon venting of one, valve 61 will connect the carbonated water outlet to the other. Spring 51 may be controlled to regulate the lower water level in each tank. Spring 51 actually exerts an upward force on shaft 55 at all times. When the water level drops, the weight of the water in members 56 will counteract this spring the springs 39 and 49.

The overhanging lips 57 serve to trap gas and further the carbonation by interrupting the flow of gas upward through the water. After the cycles have started carbonation will be furthered by water being sprayed into the gaseous atmosphere of the tank by splash plate 70 previously described.

There is thus provided a device for effecting a continuous supply of carbonated water at constant pressure with no danger of loss of gas.

An important feature of the above described invention is the maintenance of a constant pressure at the faucet. Previous carbonation devices have been objectionable in that the pressure throughout the system has had to drop below water pressure in order to obtain a refilling of water supply. This is a serious defect especially when used in automatic drink dispensing apparatus. With the present device, as soon as pressure in one tank drops, due to venting, to permit refilling from the water supply, the other high pressure tank will be connected to the outlet, thus insuring substantially constant high pressure at the draft. The device has been referred to, for purposes of convenience, as a carbonating device throughout the description and claims but it should be understood that it may be used for the bringing about of absorption of any type of gas by a liquid. The claims are intended to cover any such use of the device or its components.

What I claim is:

1. In a carbonating apparatus, the combination of a plurality of tanks, each tank provided with a gas inlet port, a gas vent port and valves in each tank for controlling the same; and also provided with a liquid inlet and means for controlling the liquid inlet operated by the pressure in the tank, means contained within each tank for controlling the gas inlet and vent valves of that tank and operated by the liquid levels in said tanks, a carbonated liquid discharge pipe leading from each tank, a common outlet pipe connected with each tank discharge pipe, change-over valve means controlling the flow of liquid from the individual tank discharge pipes, said valve means subject to

5

and shifted by the pressures in said tanks, the said valve means automatically closing off a tank where the pressure has fallen below a given point and opening a fully-charged tank to the common liquid discharge pipe.

2. The combination claimed in claim 1, in which the means contained within each tank for controlling the gas inlet and vent valves comprises a member which rises and falls with the liquid levels in the tank and operating connections contained within the tank for transmitting the movements of said member to the valves.

3. The combination claimed in claim 1 in which the means contained within each tank for controlling the gas inlet and vent valves comprises a member in the tank which rises and falls with the liquid levels in the tank and connections contained within the tank between said member and the gas inlet and vent valves, said connections containing snap-over-center means which does not communicate the movement of the liquid level control member to the valve until a center position is reached, whereupon the devices snap over center and instantly operate the valve by the accumulated energy.

4. The combination claimed in claim 1 in which the means contained within each tank for controlling the gas inlet and vent valves comprises a member contained within the tank and which rises and falls with the liquid level in the tank and connections between said member and each of the valves including snap-over-center levers and springs, the same being arranged to be non-operative on the valves until a centerline position is reached, whereupon the valve is moved instantly by the snap-over action and the throw of the levers.

5. The combination claimed in claim 1 in which the valve means controlling the flow of liquid from the individual tank discharge pipes and operated by the pressures in said tanks comprises a valve member which guards the openings of two or more tanks into the common discharge pipe and which is shiftable by a given differential in pressure between the two tanks from a position of closing one tank to a position of opening to the discharge pipe the other tank having the larger pressure.

6. The combination claimed in claim 1 in which the valve means controlling the flow of liquid from the individual tank discharge pipes and operated by the pressures in said tanks comprises a common alternator valve controlling the discharge openings from said tanks to the common discharge pipe, the said alternator valve shiftable by a quick action from a position of allowing the escape of the carbonated liquid from one tank to a position of cutting off said escape when the pressure in this tank falls below a given point, at the same time opening to the common discharge pipe a companion fully-charged tank.

7. In a carbonating apparatus, the combination of a pair of tanks with discharge pipes uniting to discharge through a common pipe, valve means associated with said discharge pipes to control which pipe discharges into the common discharge pipe, each tank provided with a gas inlet and

6

gas vent and valves in the tank for controlling the same, a water level-controlled member inside each tank having actuating connections with said valves and located in said tank and independent of the actuating connections in the other tank for closing the inlet valve and opening the gas vent valve of that particular tank only and conversely opening the gas inlet valve and closing the gas vent valve of that particular tank only, the said valve means for the discharge pipes including a part subjected to the discharge pressures of the tanks whereby the valve is shifted by the pressure differential in the two tanks to close the discharge flow from one tank and open the discharge from the other tank when the pressure in the one tank is vented as aforesaid by the connections with the water level-controlled member when the liquid level in the tank falls below a given level, and means for supplying water to the two tanks.

8. In a carbonating apparatus, the combination of a pair of tanks with discharge pipes uniting to discharge through a common pipe, valve means associated with said discharge pipes to control which pipe discharges into the common discharge pipe, each tank provided with a gas inlet and gas vent and valves in the tank for controlling the same, a water level-controlled member inside each tank having actuating connections with said valves and located in said tank and independent of the actuating connections in the other tank for closing the inlet valve and opening the gas vent valve of that particular tank only and conversely opening the gas inlet valve and closing the gas vent valve of that particular tank only, the said valve means for the discharge pipes including a part subjected to the discharge pressures of the tanks whereby the valve is shifted by the pressure differential in the two tanks to close the discharge flow from one tank and open the discharge from the other tank when the pressure in the one tank is vented as aforesaid by the connections with the water level-controlled member when the liquid level in the tank falls below a given level, and a water supply pipe with a check valve closed when the gas pressure of the tank exceeds the water pressure and opened automatically when the gas is vented from the tank by the operation of the actuating connections upon the drop of the liquid level-controlled member to a given level.

JAMES L. HUDSON.

REFERENCES CITED

55 The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
60 855,243	Green et al. -----	May 28, 1907
1,029,740	Beck -----	June 18, 1912
1,434,574	Walter et al. -----	Nov. 7, 1922
2,059,104	Harrah -----	Oct. 27, 1936
2,300,694	Overbeke -----	Nov. 3, 1942
65 2,314,984	Hudson -----	Mar. 30, 1942
2,391,043	St. Clair -----	Dec. 18, 1945
2,408,799	Melichar -----	Oct. 8, 1946