Oct. 13, 1931. L. DE MARKUS 1,827,386

CARBONATOR

Filed Dec. 21, 1928 4 Sheets-Sheet 1

Fig. 1.

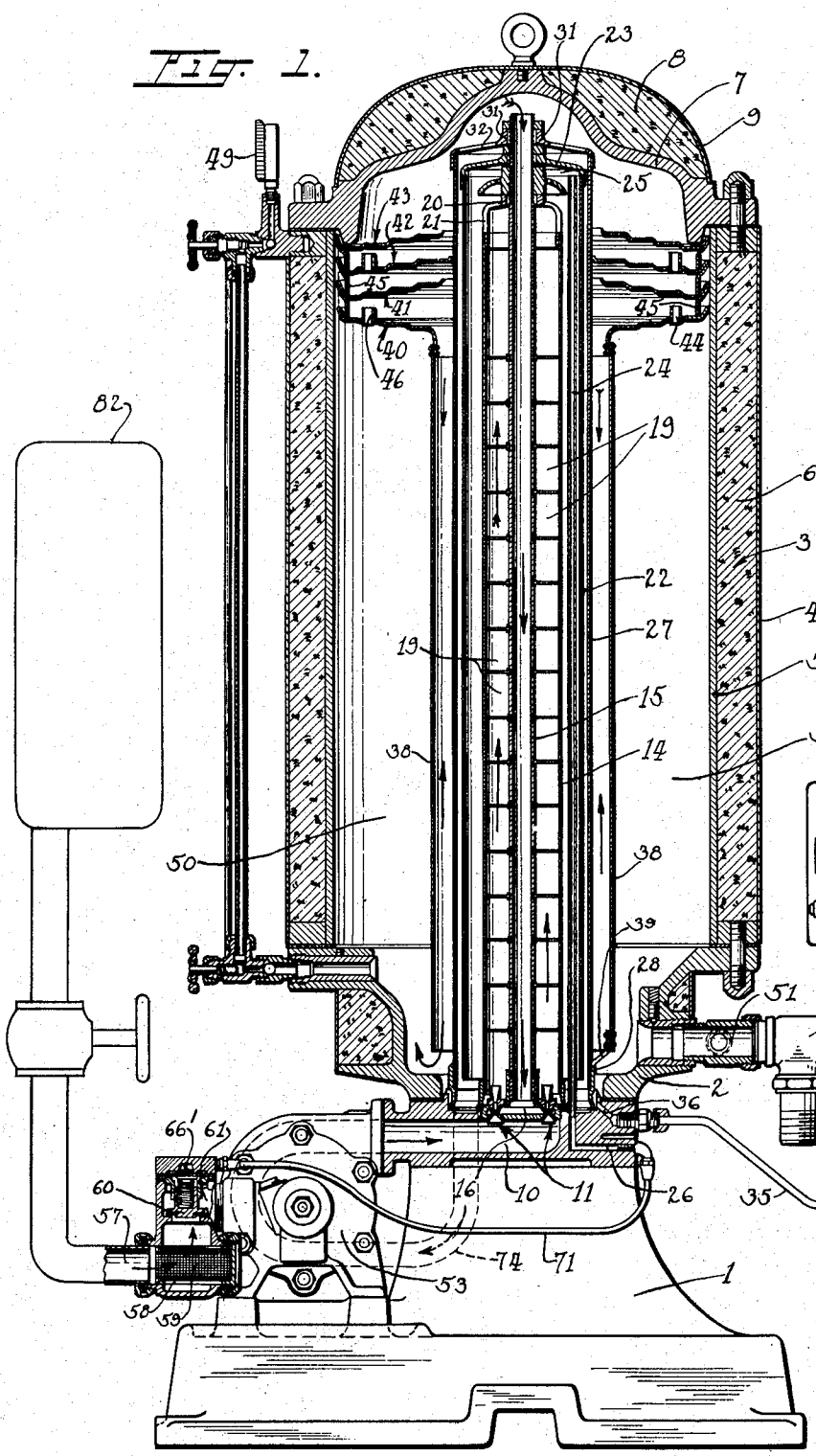
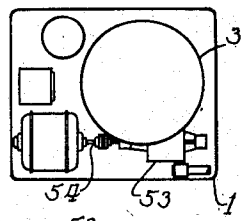


Fig. 2.



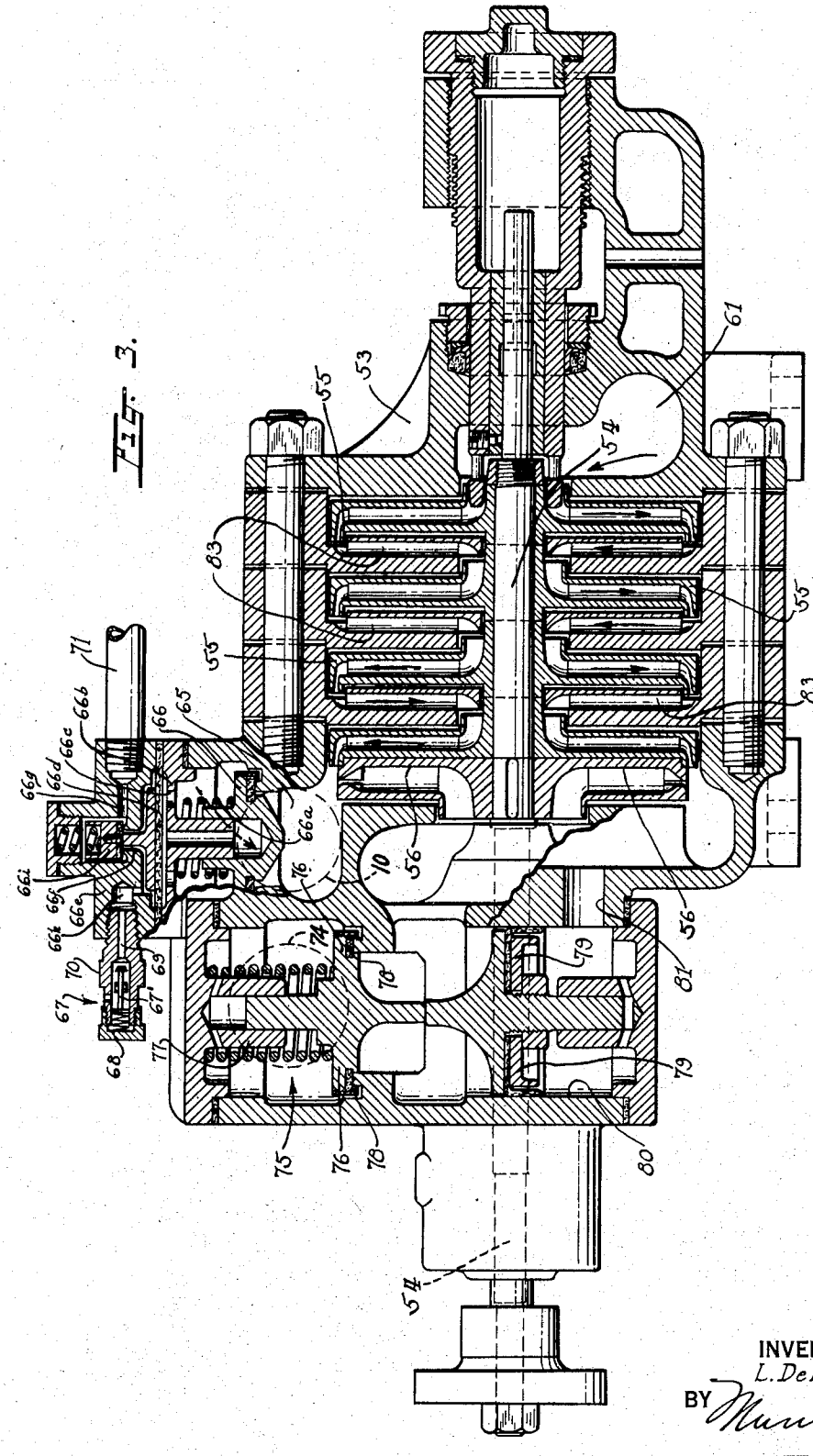
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CARBONATOR

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Fig. 3.



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CARBONATOR

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Fig. 4.

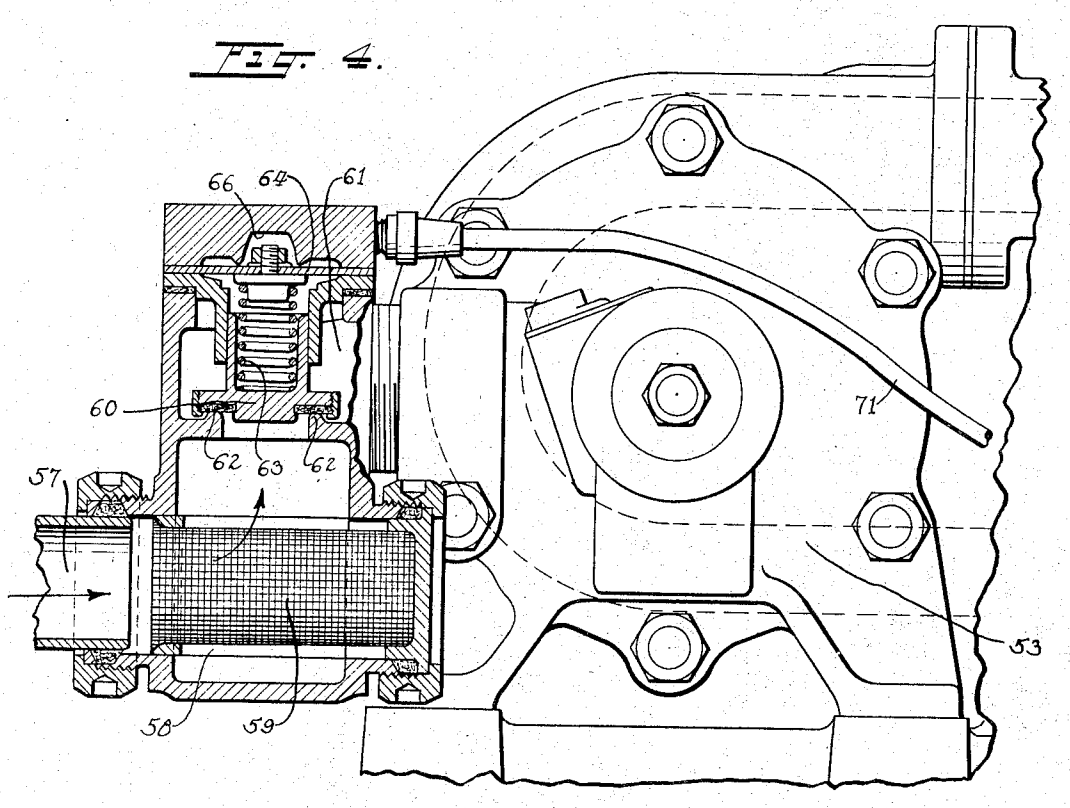
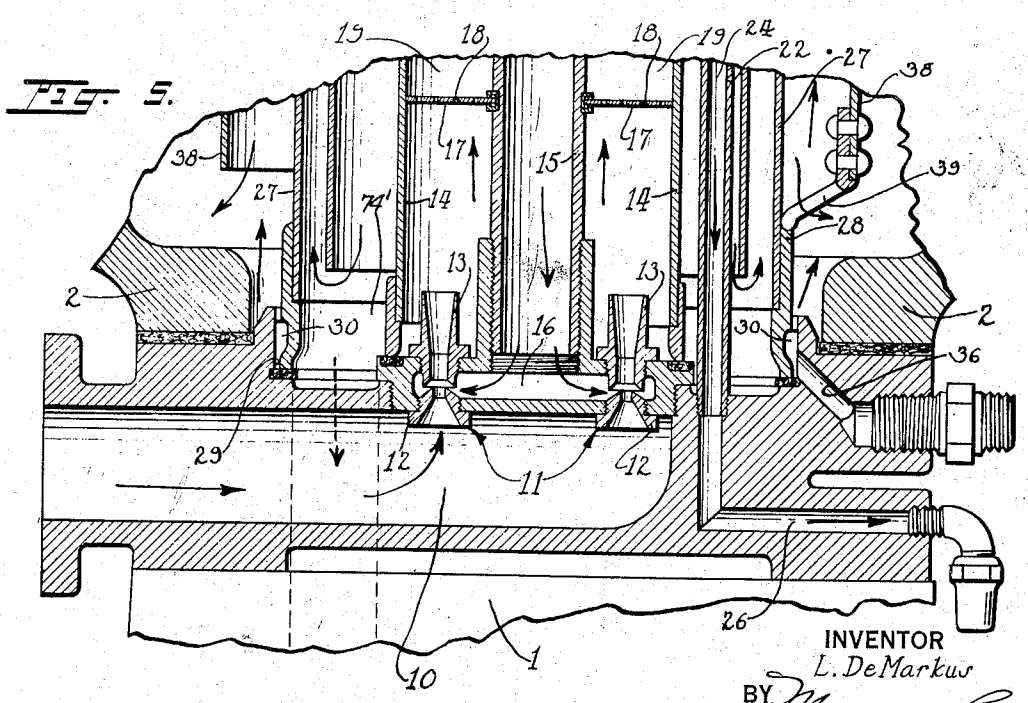


Fig. 5.



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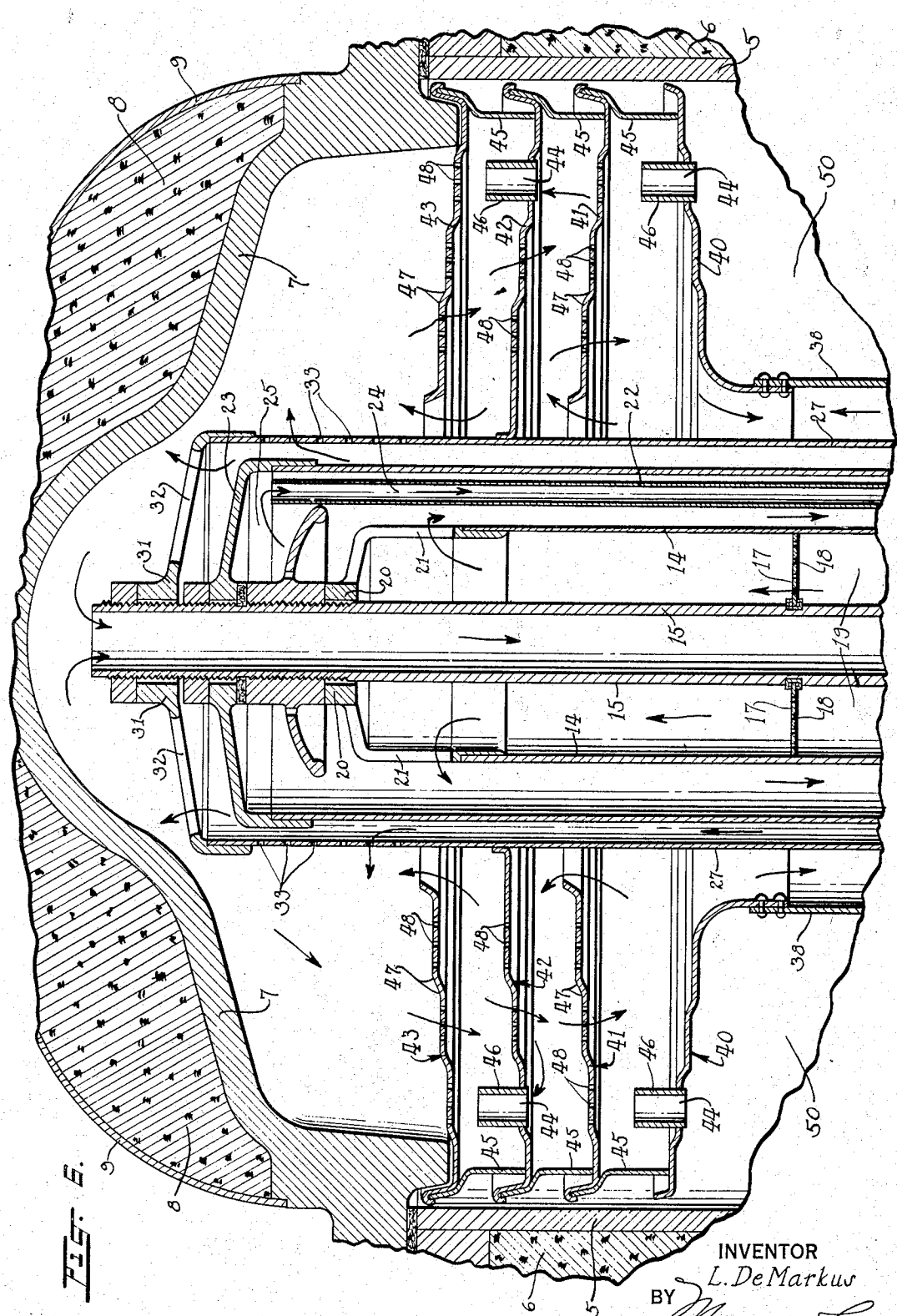


FIG. 5.

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Patented Oct. 13, 1931 1,827,386

UNITED STATES PATENT OFFICE

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CARBONATOR

Application filed December 21, 1928. Serial No. 327,609.

My invention relates to improvements in carbonators, and it consists in the combinations, constructions, and arrangements herein described and claimed.

An object of my invention is to provide a carbonator which has two stages of deaeration, to permit the water to be thoroughly penetrated by the carbon dioxide gas.

A further object of my invention is to provide a device of the type described which has novel means for recirculating the water so as to bring about the complete and efficient result.

A further object of my invention is to provide a device of the type described which has novel means for agitating the water for bringing about the deaeration.

A further object of my invention is to provide a device of the type described which has a novel automatic snifting or vent valve which automatically controls the deaeration in that the extent of deaeration depends, besides the thorough agitation of the water, upon the purity of the gas within the carbonator.

A further object of my invention is to provide a device of the type described which has two check valves in the circulating portion of the device which completely seal the circulating means from the carbonator when not in operation.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which

Figure 1 is a vertical sectional view of my device,

Figure 2 is a diagrammatic top plan view of my device,

Figure 3 is a longitudinal sectional view of the circulating and recirculating mechanism,

Figure 4 is an end elevation of the circulating and recirculating mechanism, a portion thereof being shown in section, and

Figures 5 and 6 are enlarged detail views of portions of my device.

In carrying out my invention, I provide a base 1 having a housing support 2 mounted thereupon. A casing 3 is mounted upon the housing support 2 and is rigidly secured in place. The casing 3 is provided with a relatively thin outer shell or insulation cover 4. An inner shell 5 is disposed within the outer shell 4, providing a cylindrical space therebetween. An insulation 6 of any suitable material, preferably a molded cork, is disposed between the inner shell 5 and the outer shell 4.

A cover 7 is rigidly and removably secured to the upper extremity of the casing 3. The cover 7 is also provided with an insulation as indicated at 8, which is covered with a dome-shaped shell 9.

The housing support 2 is provided with a liquid inlet opening 10. Gas-injecting nozzles 11 are provided with outer portions 12 and inner portions 13 which are carried by the housing support and positioned a slight distance apart. A cylindrical column 14 is centrally disposed in the casing 3 and has one end in engagement with the housing support 2 so as to receive the outer portions 13 of the nozzles 11. A center gas tube 15 is centrally disposed in the column 14 and has its lower end secured to the housing support 2 so that the tube will communicate with a passageway 16 which is in communication with the portions 12 and 13 of the nozzles 11. Perforated baffle plates 17 are disposed concentric with the tube 15 at spaced-apart positions within the column 14. The plates 17 contact with the inner wall of the column 14, thus allowing passage of gas or water through the column only by way of the openings 18 in the plates.

The spaced-apart plates 17 provide carbonating chambers 19 within the column 14. The upper end of the column 14 is secured to the gas tube 15 by means of a head portion 20 which is provided with a plurality of openings 21 in the side walls thereof.

An inner sleeve 22 is disposed concentric with the column 14 and has its upper end secured to the gas tube 15 by means of a head portion 23. The inner sleeve terminates a short distance from the housing support 2

for a purpose hereinafter described. An air exhaust tube 24 has its lower end secured to the housing support 2 and extends upwardly to a point substantially adjacent the head portion 23. The upper end of the tube 24 is in communication with an exhaust air chamber 25. The lower end of the tube 24 is in communication with an air outlet passageway 26.

An intermediate sleeve 27 is disposed concentric with the inner sleeve 22 and has its lower end secured to a collar 28. The collar 28 is receivable in an annular recess 29, is supported by the housing 2, and is provided with an annular recess which provides an annular passageway 30. The upper end of the intermediate sleeve 27 is secured to the gas tube 15 by means of a head portion 31 which has a plurality of openings 32 therein. A plurality of openings 33 is provided in the central sleeve 27 adjacent the upper end thereof.

A gas pressure regulator 34 is in communication with the annular recess 30 by means of a gas pipe or tube 35 and a passageway 36. A drum 37 is in communication with the gas pressure regulator 34 and is adapted to contain carbon dioxide gas.

An outer sleeve 38 is disposed concentric with the intermediate sleeve 27 and is supported by means of brackets 39 on the collar 28. A series of distributing plates or discs 40, 41, 42, and 43 is provided. The disc 40 is rigidly secured to the upper end of the outer sleeve 38 and is provided with a plurality of relatively short tubular portions 44 which extend upwardly therethrough. The discs 41 and 43 have annular flanges 45 which rest upon the discs 40 and 42, respectively. The discs 41 and 43 are also spaced away from the intermediate sleeve 27. The disc 42 is provided with inwardly extending tubular portions 46 and extends to and in engagement with the sleeve 27. The discs have step portions 47 which are positioned in different planes so as to cause a liquid placed thereupon to flow toward the outer edges thereof with the exception of the disc 40, in which the step portions are so positioned as to cause the liquid to flow toward the inner extremity thereof or in communication with the outer sleeve 38. A plurality of openings 48 is provided in the step portions 47 of the discs 41, 42, and 43.

A gauge 49 is carried by the cover 7 and is in communication with the carbonated water storage chamber 50. The carbonated water outlet 51 is also disposed in communication with the chamber 50 and has a regulating valve 52 in communication therewith.

A circulating and recirculating pump 53 is mounted upon the base 1. The pump 53 is provided with a rotating shaft 54 upon which a group of circulating impellers 55 is mounted and upon which a recirculating impeller 56 is mounted.

A water supply pipe 57 is in communication with a water supply at one end and has the other end in communication with a filtering chamber 58. A filtering strainer 59 is removably disposed in the chamber 58. A check valve 60 is disposed between the chamber 58 and an inlet opening 61 to the circulating unit of the pump 53. The check valve 60 is normally held in engagement with a valve seat 62 by means of a compression spring 63. One end of the compression spring 63 is disposed adjacent the diaphragm 64, the outer edges of which are firmly secured.

An outlet opening 65 is provided for the pump 53 for receiving a liquid forced therethrough by the impellers 55 and the impeller 56. A discharge valve 66 is disposed between the impellers 55 and 56 and the outlet opening 65. A spring 66*a* is provided for normally holding the valve 66 closed. One end of the spring 66*a* engages with the valve 66 and the other end engages with a partition 66*b* which is provided with openings 66*c*. A diaphragm 66*d* is disposed upon the side of the plate opposite the spring 66*a*. A head plate 66*e* is disposed upon the diaphragm 66*d* and is provided with a passageway 66*f* which extends from an inlet 66*g*, in communication with the diaphragm, to an outlet 66*h*. A diaphragm-actuated valve 66*i* is disposed in the passageway 66*f*. The outlet opening 65 is in communication with the liquid inlet opening 10.

An adjustable deaerating control or snift valve 67 is secured to the head plate at the outlet 66*h* of the passageway 66*f* so as to provide an air outlet from the passageway 66*f* above the diaphragm 66*d*. The snift valve is provided with a needle portion 67′ which is carried by an adjusting head 68. The needle portion 67′ is adapted to be moved inwardly to vary the opening of a passageway 69 which extends into the outlet 66*h*. This is accomplished by rotating the adjusting head 68 which is connected to the valve body 70 by means of threads. An air escape tube 71 provides communication between the passageway 26 in the housing support 2 and the inlet 66*g*.

A return passage 74 has one end in communication with a carbonated water chamber 74′ and the other end in communication with the recirculating unit indicated at 75. A suction valve 76 is disposed in the unit 75 between the inlet of the return passage 74 and the impeller 56. A compression spring 77 is provided for normally holding the valve 76 closed or in engagement with its valve seat 78. A valve-actuating piston 79 is slidably disposed in a cylinder 80 of the unit 75 and is in engagement with the valve 76. A passageway 81 provides communication between the impeller 56 and the piston 79.

In order that the operation may be readily understood, I have indicated the course of the water by arrows having one pair of wings, the course of the gas by arrows having two pairs of wings, and the course of the air by arrows having three pairs of wings. Let us assume that the pump is set in motion and that water is supplied to the pipe 57 from any suitable source, such as a water supply tank 82. During the rotation of the impellers 55, the water will be drawn through the strainer 59 and into the compartment 58. The suction created by the rotation of the impellers 55 will open the valve 60 and allow the water to pass through the opening or passageway 61. The water is forced through the impellers 55 and through the passageway 83, as indicated by the arrows. This movement of the water is caused by centrifugal force due to the rapid rotation of the impellers 55. The force of the water in passing from the last impeller 55, that impeller substantially adjacent the valve 66, will cause the valve 66 to open, thus allowing the water to pass through the passageway 65 and the inlet opening 10.

The water in passing through the inlet opening 10 is forced through the conical-shaped openings in the portions 12 and then forced through the portions 13 of the nozzles 11. At this point carbon dioxide gas is admitted to the annular passageway 30 from the drum 37 through the valve 34, the tube 35, and the passageway 36. The gas passes from the annular passageway 30 around the collar 28, and upwardly between the outer sleeve 38 and the intermediate sleeve 27. The gas continues to pass upwardly until it has passed into the gas chamber, that chamber positioned above the discs 40 to 43, inclusive. It is obvious that the gas may readily pass around the disc 41 through the tubular portions 46 of the disc 42 and around the disc 43 into the gas compartment. Furthermore, the gas in passing from the annular passageway 30 may pass upwardly around the outer sleeve 38 and pass through the tubular portions 44 and then around and through the discs 41, 42, and 43, as indicated.

The gas in the compartment beneath the cover will be allowed to pass downwardly, through the gas tube 15, and into the passageway 16. At this point the water is first mixed with the gas and this takes place by the forcing of the gas through the portions 13 of the nozzles 11 and in so doing, the gas is mixed with the water.

The mixture of gas and water then passes upwardly through the column 14. In so doing, the water and gas are forced through the openings 18 in the agitating plates 17. This causes a breaking up of the water for allowing the air to pass therefrom. Owing to the fact that the gas is more soluble than the air, the water will absorb a certain amount of the gas. The greater the water is broken up, the greater will be the absorption of gas and hence the greater will be the deaeration thereof. Therefore, the almost continuous breaking up of the water during its passage through the column 14 causes substantially all the air within the water to pass therefrom and the substantially equal amount of gas to be absorbed thereby.

The air passing from the water will be received in the air chamber 25. The air in the chamber 25 will be under pressure caused by the force of the flow of the water and the gas through the column 14. Therefore, the air in the chamber 25 will pass downwardly through the air exhaust tube 24 through the passageway 26 and the tube 71 to the compartment 66′. As the air enters the passageway 66*f*, it is allowed to pass through the snift valve 67 and into the atmosphere. The speed at which the air may pass through the valve 67 may be varied by the adjustment of the adjusting head 68. The farther the valve 67 is allowed to open, the greater will be the passage of air therethrough. When the pump 53 is in motion, the force of the water will hold the valve 66 open, and, as the water pressure actuates the diaphragm 66*d*, the valve 66*i* will be held open. When the motion of the pump is stopped, the valves 66 and 66*i* are closed. Furthermore, the opening of the snift valve 67 determines how much air will be released from the carbonator, and hence the greater the opening, the more air will be released, and as a result the gas within the carbonator will be purer. The purer the gas in the carbonator, the more air it will replace in the water.

After the water has passed through the openings 18 in the agitating plates 17 and broken up so as to bring about a deaeration thereof, this water passes through the openings 21 and into the inner sleeve 22. The water passes downwardly through the inner sleeve around the lower end thereof and into the intermediate sleeve. The water passes upwardly through the intermediate sleeve to the upper extremity thereof where it may either pass through the openings 32 in the head portion 31 or through the openings 33. Upon passing from these openings, the water is again broken up and it comes in contact with the gas within the gas chamber.

A still further deaeration is brought about by causing the water to pass through the openings 48 in the discs 41, 42, and 43, breaking up the water and again permitting the gas to be received thereby when additional air has been passed therefrom. The water, after passing through the discs 41, 42, and 43, passes upon the disc 40 and from there it passes into the outer sleeve 38. The water then passes downwardly through the outer sleeve 38 and into the storage chamber 50. When the water reaches this position,

there is substantially a perfect deaeration of the water. To positively bring about a complete deaeration of the water, a recirculating means is provided. This recirculating means consists of the impeller 56 of the pump 53 which in its rotation causes water to pass from the chamber 74', through the return passage 74, and into the pump around the valve 76 after this valve has been opened. The valve 76 is opened by movement upwardly of the piston 79 which is actuated by the pressure of the water thereagainst as passing through the opening or passageway 81. In this manner the valve 76 is opened against the tension of the spring 77 and the water from the chamber 74' is allowed to enter the pump and be forced through the passageway 65 after passing through the valve 66 and then recirculating through the carbonator in the manner previously described.

I claim:

1. A device of the type described comprising a casing, a cylindrical column disposed vertically within the casing, a nozzle carried at the bottom of the column, a water inlet communicating with the nozzle, means for forcing the water in the inlet through the nozzle, means for introducing a carbonating gas into the interior of the casing under pressure, a gas tube disposed centrally within said column and having communication at its top with the interior of the casing, a series of perforated baffle plates between the gas tube and the walls of the column, an inner sleeve surrounding and being spaced from said column, a cover for said inner sleeve secured to said gas tube, said inner sleeve terminating short of the bottom of the casing, an intermediate sleeve surrounding said inner sleeve and secured to the bottom of the casing at one end and being open to the interior of the casing at the upper end, an outer sleeve surrounding said intermediate sleeve and spaced therefrom, said outer sleeve terminating short of the bottom of the casing, means connecting with the top of the outer sleeve for directing water into the space between the outer sleeve and the intermediate sleeve, and means for establishing communication with the bottom of the gas tube and said nozzle, whereby gas is mixed with the water entering said column.

2. A device of the type described comprising a casing, a cylindrical column disposed vertically within the casing, a nozzle carried at the bottom of the column, a water inlet communciating with the nozzle, means for forcing the water in the inlet through the nozzle, means for introducing a carbonating gas into the interior of the casing under pressure, a gas tube disposed centrally within said column and having communication at its top with the interior of the casing, a series of perforated baffle plates between the gas tube and the walls of the column, an inner sleeve surrounding and being spaced from said column, a cover for said inner sleeve secured to said gas tube, said inner sleeve terminating short of the bottom of the casing, an intermediate sleeve surrounding said inner sleeve and secured to the bottom of the casing at one end and being open to the interior of the casing at the upper end, an outer sleeve surrounding said intermediate sleeve and spaced therefrom, said outer sleeve terminating short of the bottom of the casing, means connecting with the top of the outer sleeve for directing water into the space between the outer sleeve and the intermediate sleeve, an air exhaust tube having its upper end disposed in the space between said inner sleeve and said column, an exhaust pipe, means for establishing communication between said air exhaust tube and said exhaust pipe for receiving air, and means for establishing communication with the bottom of the gas tube and said nozzle, whereby gas is mixed with the water entering said column

3. A device of the type described comprising a base portion, a casing carried by said base portion, a column disposed within the casing, a pump for introducing water under pressure at the bottom of the column, means for introducing gas under pressure at the bottom of the column, a series of concentric sleeves for causing a circuitous flow of water, a series of perforated discs for breaking up the water to permit the more ready absorption of the gas, said discs being disposed between the interior wall of the casing and the concentric sleeves, means for withdrawing air from the water during its passage from the inlet to the interior of the casing, and means for causing a portion of the gas-charged water to return to the pump for recirculation.

4. A device of the type described comprising a base, a housing support disposed upon said base and having a water inlet opening, a casing mounted upon said housing support, a cover removably secured to said casing, a column disposed in said casing and mounted upon said support, a nozzle carried by said support and having an outer portion in communication with said water inlet and an inner portion communicating with said column, a gas tube centrally disposed in said column and having the lower end thereof secured to said support adjacent said nozzle, a plurality of agitating plates having openings therein disposed in said column concentric with said gas tube, an inner sleeve concentric with said column and secured to said gas tube, an intermediate sleeve concentric with said inner sleeve and having the upper end thereof secured to said gas tube, a collar carried by said support, the lower end of said intermediate sleeve being received in said collar, an outer sleeve concentric with said intermediate sleeve and supported by said collar, a

disc concentric with said intermediate sleeve and secured to said outer sleeve, a plurality of perforated discs disposed upon said first-named disc, a circulating unit adapted to receive water and force the water through said inlet opening in said support through said nozzle and into said column, the water in said column being forced through said agitating plates and into said inner sleeve, the water in said inner sleeve being forced into said intermediate sleeve, means whereby water may be forced from said intermediate sleeve onto said discs, said discs being arranged whereby the water may pass therefrom into said outer sleeve, and a water chamber provided in said casing for receiving the water passing from said outer sleeve.

5. A device of the type described comprising a supporting base, a pump mounted on the base and in communication with a water supply, a housing mounted on said base, a sleeve member vertically disposed within the housing and mounted on the base, nozzles mounted in the base and disposed within the sleeve member, said nozzles providing communication between the pump and the sleeve member whereby the water may be forced upwardly through the sleeve member, a tubular core disposed within and concentric with the sleeve member, a plurality of spaced baffle plates disposed between the tubular core and the sleeve member and provided with openings for permitting the water to pass therethrough, an inner and an outer cylindrical member disposed concentric and in spaced-apart relation with respect to the sleeve member and each other, said inner cylindrical member having a closed top end, said outer cylindrical member and tubular core having an open top end for providing communication between the interior thereof and the chamber within the housing, said tubular core having an open lower end for providing communication with the interior of the nozzle, the lower ends of said inner and outer cylindrical members being open and in communication with said pump, and a cylindrical shell disposed in spaced-apart relation on the exterior of said outer cylindrical member and concentric therewith, the top end of said cylindrical shell being open and connected with a plurality of spaced-apart baffle plates disposed within the housing chamber and provided with openings therethrough whereby water may circulate within the housing, the lower end of said shell being open and in communication with the chamber and a gas supply, said gas and water circulating through the chamber.

6. A device of the type described comprising a supporting base, a pump mounted on the base and in communication with a water supply, a housing mounted on said base, a sleeve member vertically disposed within the housing and mounted on the base, nozzles mounted in the base and disposed within the sleeve member, said nozzles providing communication between the pump and the sleeve member whereby the water may be forced upwardly through the sleeve member, a tubular core disposed within and concentric with the sleeve member, a plurality of spaced baffle plates disposed between the tubular core and the sleeve member and provided with openings for permitting the water to pass therethrough, an inner and an outer cylindrical member disposed concentric and in spaced-apart relation with respect to the sleeve member and each other, said inner cylindrical member having a closed top end, said outer cylindrical member and tubular core having an open top end for providing communication between the interior thereof and the chamber within the housing, said tubular core having an open lower end for providing communication with the interior of the nozzle, the lower ends of said inner and outer cylindrical members being open and in communication with said pump, a cylindrical shell disposed in spaced-apart relation on the exterior of said outer cylindrical member and concentric therewith, the top end of said cylindrical shell being open and connected with a plurality of spaced-apart baffle plates disposed within the housing chamber and provided with openings therethrough whereby water may circulate within the housing, the lower end of said shell being open and in communication with the chamber and a gas supply, said gas and water circulating through the chamber, and means for drawing off the gas within the inner cylindrical member when the gas exceeds a desired pressure.

Signed at Pittsburgh, in the county of Allegheny, and State of Pennsylvania, this 11th day of December, A. D. 1928.

LOUIS DE MARKUS.