

June 11, 1946.

C. V. DI PIETRO

2,401,915

DISPENSING APPARATUS

Filed Dec. 1, 1942

5 Sheets-Sheet 1

FIG. 1.

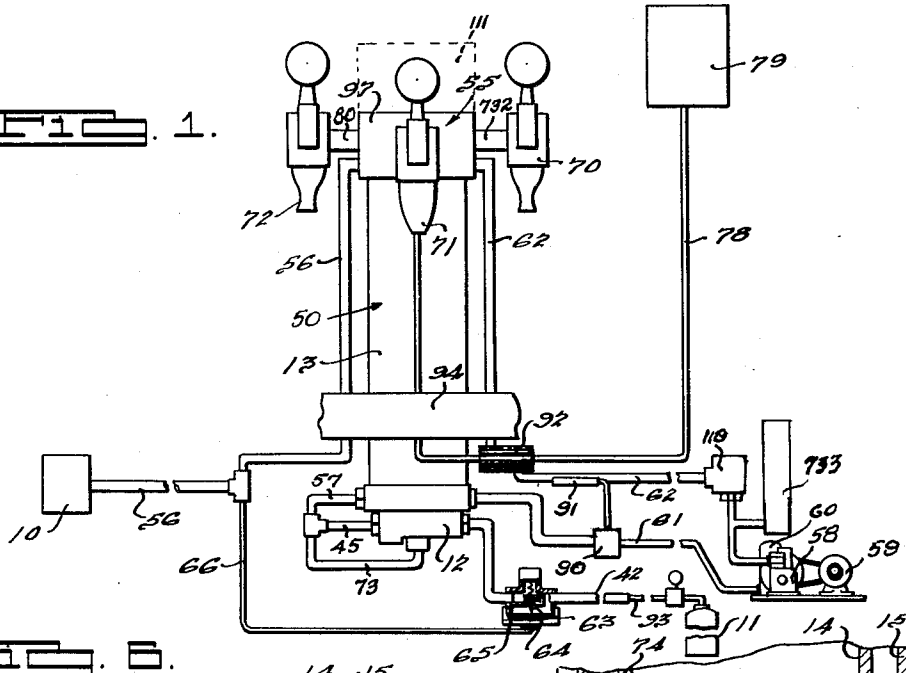


FIG. 6.

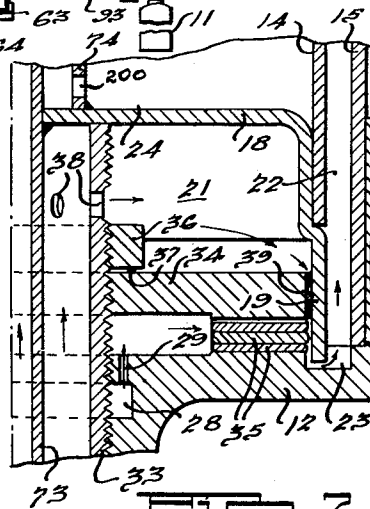
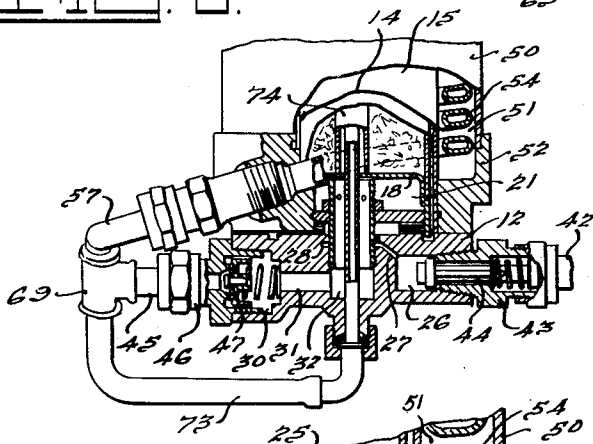


FIG. 7.

FIG. 10.

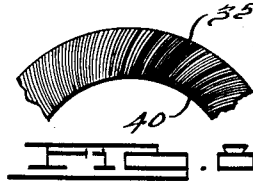
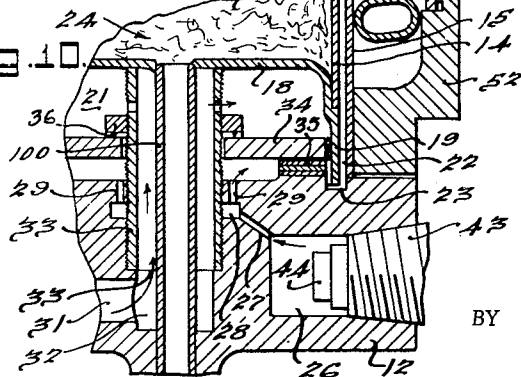


FIG. 8.

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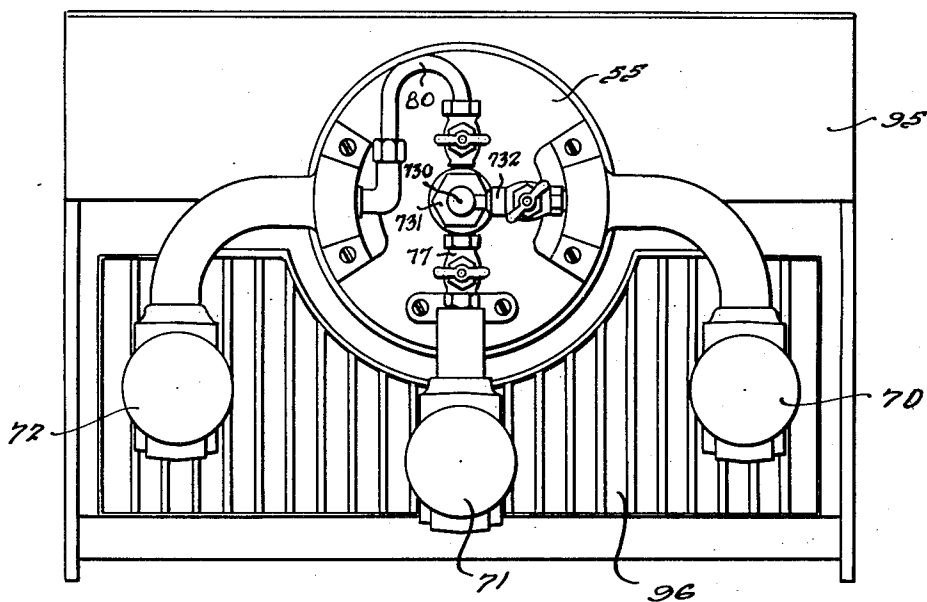


FIG. 2.

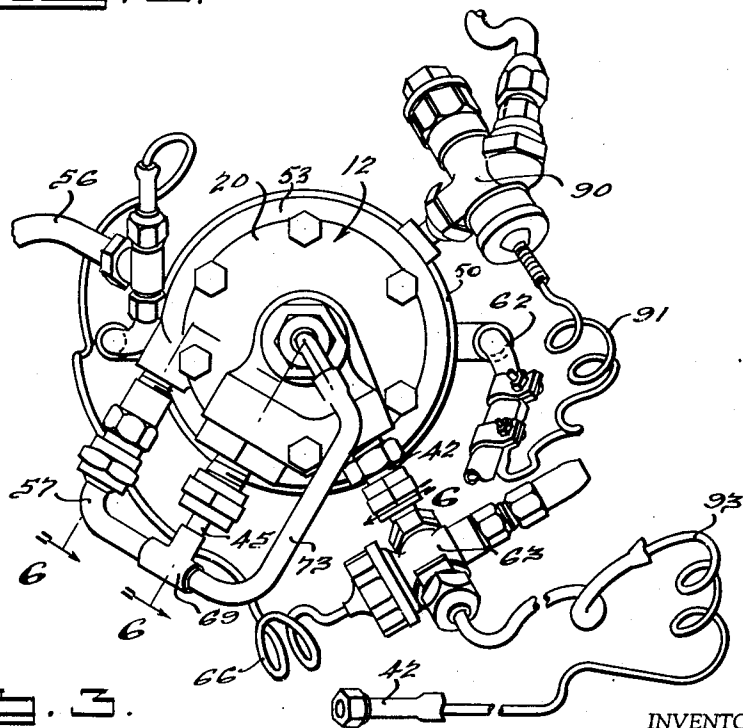


FIG. 3.

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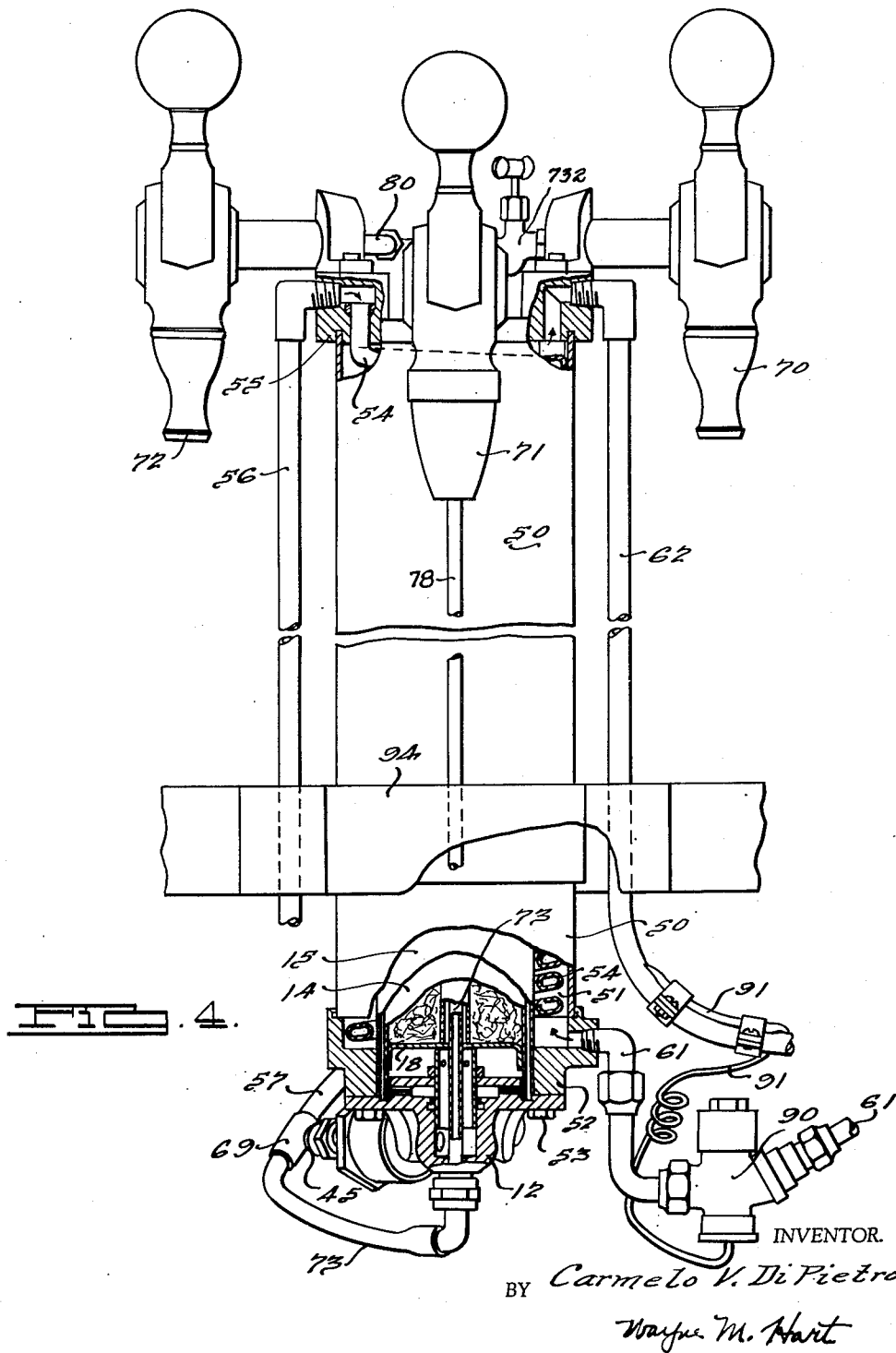
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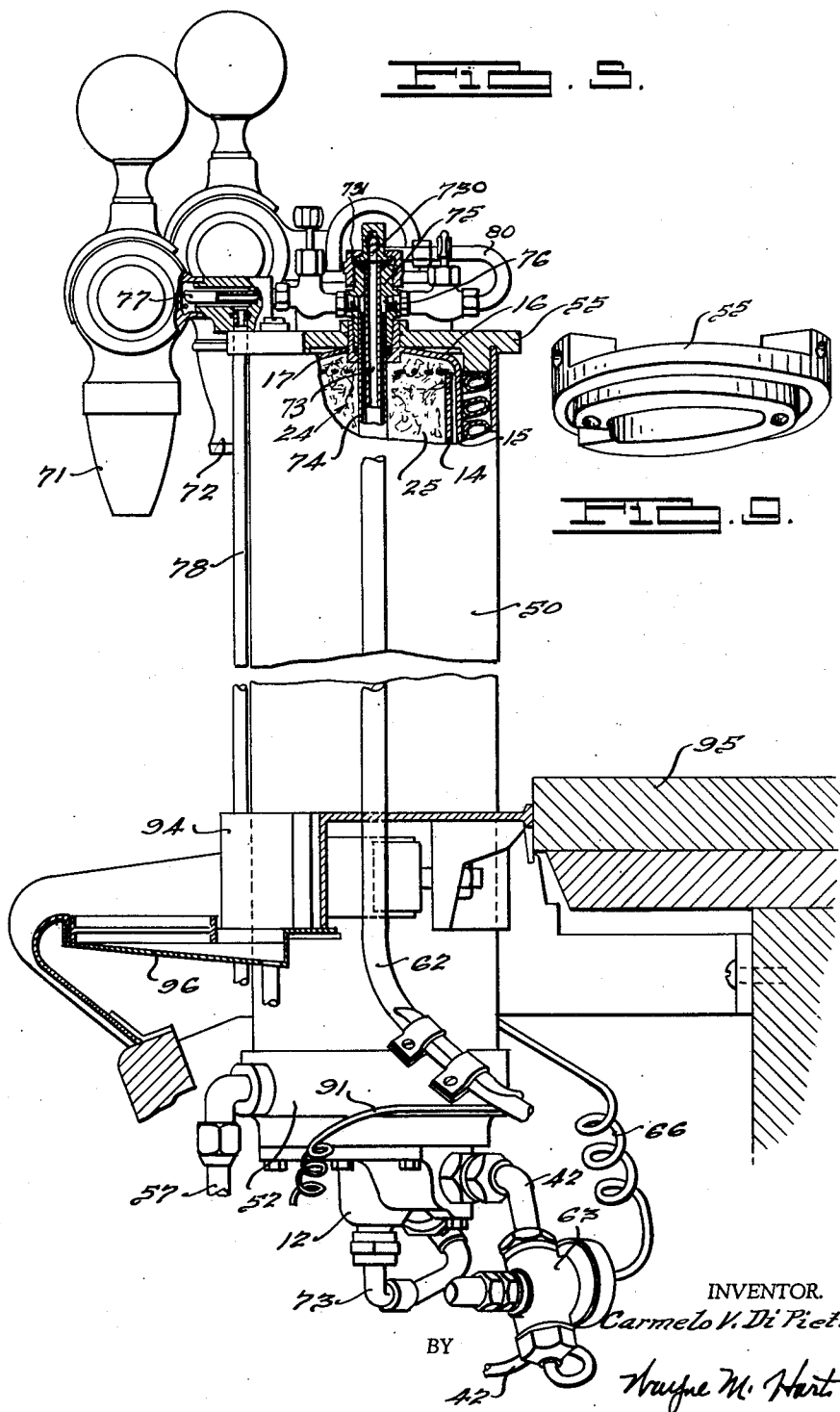
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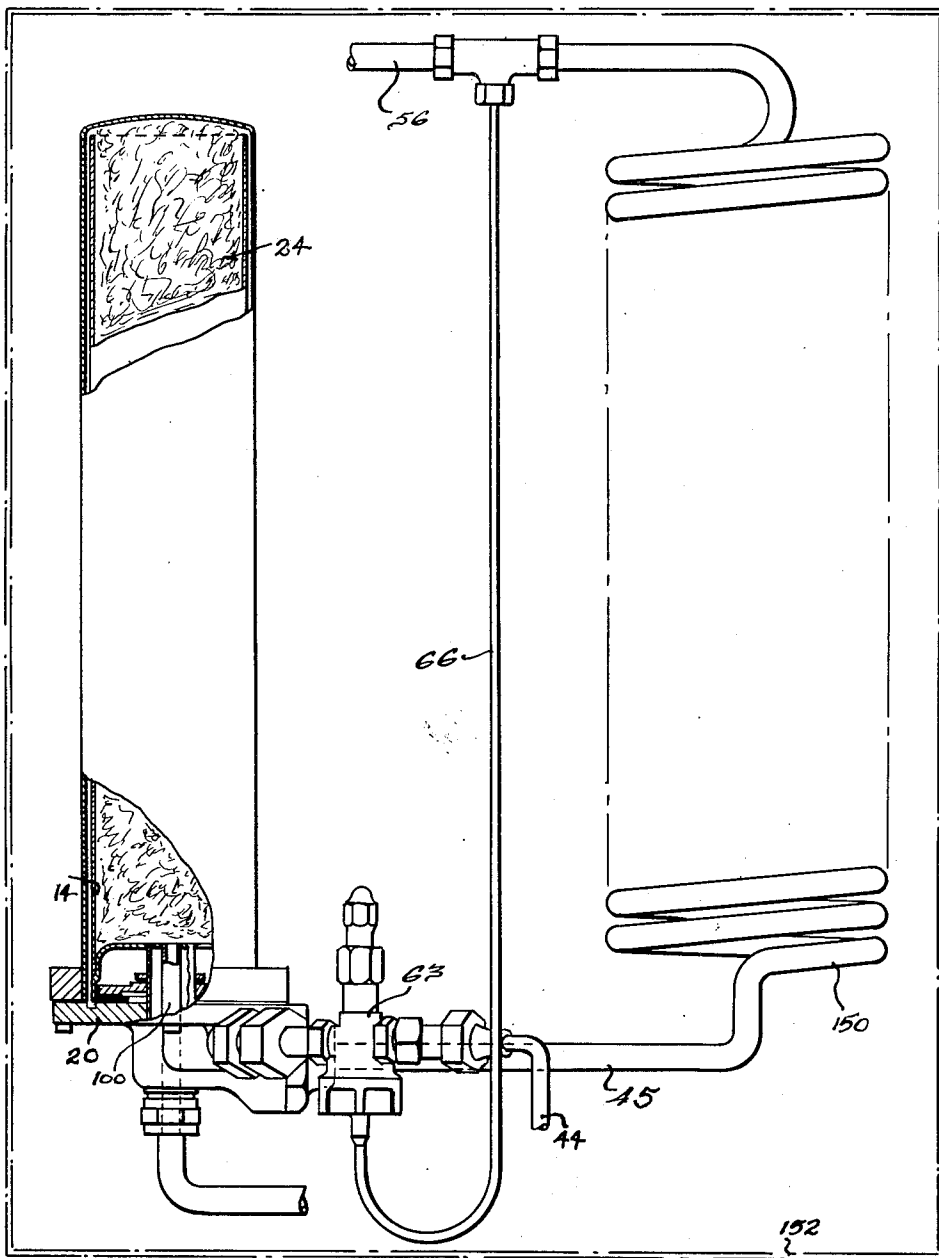
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DISPENSING APPARATUS

Filed Dec. 1, 1942

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UNITED STATES PATENT OFFICE

2,401,915

DISPENSING APPARATUS

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Application December 1, 1942, Serial No. 467,547

10 Claims. (Cl. 261-11)

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This invention relates to drink dispensing devices and more particularly to such devices including instantaneous carbonators and refrigerating apparatuses, and is in part a continuation in part of my application Serial No. 289,984, filed August 14, 1939, issued March 13, 1945, as Patent 2,371,431.

An object of the invention is to provide a carbonator in which pressure, time, temperature and mixing conditions are such that maximum absorption of carbon dioxide gas by water is obtained under varying dispensing conditions.

Another object of the invention is to provide an instantaneous carbonator from which fluid can be drawn at any rate desired fully charged with carbon dioxide gas and at a desired low temperature.

Another object of the invention is to provide an instantaneous carbonator in which water and carbon dioxide gas are mixed and flow to an outlet faucet so that the water is saturated with the gas.

Another object of the invention is to provide an instantaneous carbonator through which refrigerant in a mechanical refrigerating system flows without causing frosting back in the return line.

Another object of the invention is to provide a carbonator device in which shells and a water coil are arranged so that refrigerant flowing between the shells serves to cool charged water, plain water and dispensing faucets for the charged water and the plain water.

Another object of the invention is to provide a carbonator device that will thoroughly intermingle water and carbon dioxide gas in definite proportions.

Other objects of the invention will appear from the following description taken in connection with the drawings, which form a part of the specification, and in which:

Fig. 1 is an elevational view of a refrigerated beverage dispensing device incorporating the invention.

Fig. 2 is a top plan view of the dispensing device stationed on a fountain.

Fig. 3 is a bottom plan view of the carbonator.

Fig. 4 is an elevational view of the carbonator partly broken away and with the cover cap removed.

Fig. 5 is another elevational view of the carbonator, partly broken away and with the cover removed, and the station on which it is mounted.

Fig. 6 is a sectional view of the carbonator taken on line 6-6 of Fig. 3.

Fig. 7 is an enlarged sectional view of a portion of the structure shown in Fig. 6.

Fig. 8 is a fragmentary perspective view of one of the metering rings.

Fig. 9 is a perspective view of the header and displacement member removed from the carbonator.

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Fig. 10 is a fragmentary sectional view of a modified form of carbonator.

Fig. 11 is a side elevational view, partly broken away, showing a modified dispensing device in which ice refrigeration is utilized.

Referring now to the drawings by characters of reference, the carbonator system includes generally a source of water 10 under pressure, a source of carbon dioxide gas 11, a mixing and metering device 12 for the water and gas and a storage device 13 for the mixed water and gas.

The storage and mixing device form a unitary structure which will be referred to as a carbonator. Two shells 14 and 15 are arranged in telescoped spaced relation and are substantially coextensive. In the form of the invention shown in Figs. 1 to 9, the outer shell 15 has a top wall 16 from which a neck 17 extends and the inner shell 14 has an inverted cup shaped bottom wall 18 having a depending flange 19 forming a continuation of shell 14 and extending slightly below the bottom of the shell 15.

The mixing and metering device for the water and the gas has a body 20 that is suitably secured beneath the shells and closes the bottom of the space 22 between the shells. The bottom wall 18 and the body 20 form a chamber 21 that communicates with the chamber 22 through means of a groove 23 in the body. Flange 19 extends into this recess but is assembled short of the bottom thereof so that the mixture of water and gas can pass thereunder in flowing from chamber 21 to chamber 22. The upper end of shell 14 is spaced from the top wall 16 of shell 15 so that the mixture of water and gas can pass from chamber 22 into the top of chamber 24 interiorly of shell 14. Shell 14 is substantially filled with stainless steel wool 25, or some similar material, having the effect of attracting and holding the free gas in minute particles so that they will not rise to the top of the chamber.

The mixing body has a gas inlet recess 26 connected by passage 27 with an interior annular chamber 28 from which passages 29 lead to the mixing chamber 21. The body is also formed with an inlet recess 30 for the water that is connected by passage 31 with chamber 32 forming a reduced diameter continuation of chamber 28. A threaded tube 33 screws into the body chamber 32 and leads into the top of mixing chamber 21, such tube serving also to seal the gas chamber 28 from the water chamber 32. The shell 14 is free in the shell 15 and the bottom wall 18 thereof rests on the top of tube 33, thus the vertical adjustment of the tube in the body 20 will regulate the space between the bottom of shell flange 19 and the bottom of groove 23.

Means is provided in chamber 21 for creating violent turbulence or churning of the water and gas when intermingled for the purpose of speeding up the time required to saturate the water with gas to such an extent that the action takes

place substantially instantaneously and without the aid of mechanical apparatus. Such means comprises a disk member 34 and rings 35 stacked between the disk member and the top face of the body 20. Turbulence of the water can be obtained by forming the disk member so that the water flowing therefrom is divided into minute streams that are directed to minute streams of gas so that upon contact the turbulence is increased. The disk member can have passages or grooves therein that can be formed by knurling the peripheral face 39 that has a close fit with the inner wall of flange 19. The water flowing through these grooves will criss-cross and flow from the disk member in many intersecting directions so that the streams are broken up with considerable force to provide violent agitation of the water flowing to the rings. The rings are of slightly less diameter than flange 19 to form a mixing space and at least one of the ring faces has minute grooves 40 thereacross, which can be etched therein, and gas will flow through such grooves into the churning water. The gas is directed to flow in a direction normal to the direction of water flow and this gas force further breaks up the water streams and increases the turbulence. To further increase the turbulence, the grooves 40 can be curved as shown in Fig. 8 so that the force of the gas contacting the churning water will cause rotation of the mixture. The mixture of churning water and gas will pass under flange 19 in groove 23 to chamber 22 and will continue churning until it passes into the storage chamber filled with steel wool. This wool is dense enough to prevent released gas bubbles therein from rising and consequently they will be picked up and be drawn from the chamber with the mixture without becoming collected in the top of the storage chamber. Thus, without the aid of mechanical apparatus, the water and gas are churned so that the water is substantially instantaneously saturated with gas and is so maintained until drawn off from the storage chamber. The tube 33 extends through the disk member and nut 36 is screwed on the tube to hold the disk member and the rings 35 clamped against the top wall of the body 20. This nut has a circular bottom flange 37 engaging the top face of the disk to provide a seal so that gas in the lower portion of the mixing chamber cannot pass into the upper portion of the mixing chamber. The disk and nut thus partition the mixing chamber into separated water and gas receiving portions or sections. The tube 33 can have outlet openings 38 so that water can flow through the tube into the upper section of the mixing chamber above the disk member.

The gas flows from container 11 through conduit 42 to fitting 43 that is screwed into recess 26 in the body 20, and a check valve 44 is arranged in the fitting. Water flows into recess 30 in the body from conduit 45 connected thereto by fitting 46 in which a check valve 47 is arranged. This conduit 45 is connected to communicate with the source of water supply 10.

It is desirable to introduce the water into the carbonator at a relatively low temperature and to keep the carbonator and the mixture therein at a constant low temperature. To this end, a shell 50 is telescoped on shell 15 to form an outer chamber 51. The lower ends of shells 15 and 50 fit into a base cover member 52 that closes the bottom of chamber 51 and serves as a support for body 20 that is secured thereto by bolts 53. A section 54 of the water conduit is spirally coiled

in chamber 51 and the inlet end extends into header member 55 that is secured over shells 14, 15 and 50, such header member forming the head wall between shells 15 and 50 and projecting into chamber 51 to contact the head end spiral coil of tube 54. This portion of the header member projecting into chamber 51 serves as a filler means for displacing refrigerant in the chamber beyond the head end of coil 54. The coiled conduit section 54 is connected with the source of water supply by conduit 56 fixed to the header member. The bottom outlet end of conduit 54 extends into a passage in base member 52 and it communicates with conduit 45 through conduit 57.

Chamber 51 is in series with a conventional mechanical refrigerating system. The refrigerating system has a compressor 58 driven by motor 59 and a condenser and liquid receiver 60. Liquid refrigerant flows from the receiver through outlet conduit 61 to the bottom of chamber 51 and refrigerant flows out of the top of chamber 51 to the compressor through conduit 62 in which is arranged a suction pressure control valve 110. The coiled tube 54 through which the water flows lies in chamber 51 in which a desired quantity of liquid refrigerant is maintained by the expansion valve 90 controlled by a thermostat 91 engaged against conduit 62. The refrigerant in the outer chamber will cool the chambers interiorly thereof, the mixing and metering device and the header member which are in thermal contact with the shells. Thus, the water and the mixture dispensed from the carbonator will be maintained at a desired low temperature, and due to the arrangement, this is so even when there is a high rate of flow from the carbonator provided the cooling surface and the compressor are of sufficient capacity.

A valve housing 63 containing a spring seated valve 64 can be interposed in the gas conduit 42 for controlling flow of gas through the conduit to the body. The valve has diaphragm 65 fixed in the housing and is connected to be influenced by pressure in the water supply conduit through the provision of a conduit 66 therebetween. When the water and gas mixture flows from the carbonator storage chamber, pressure is relieved, the valves 44 and 47 will open and pressure in the conduit between valve housing 63 and the mixing chamber is relieved so that the diaphragm 65 is moved by pressure of the water in conduit 66 to unseat valve 64. When the storage chamber in the carbonator is closed, pressure of the spring and carbon dioxide gas will close valve 64. This valve control by the water pressure will insure that the water and gas will flow into the mixing chamber in constant proportional relation. The relation of water and gas is maintained relatively constant by means of restriction in the water passage 45 and gas passages 27 and 29 and the knurled space between flange 19 and disk 34 and the grooves in disks 35. The check valves 44 and 47 will close when the faucets are closed.

The carbonator can be arranged to dispense the mixture of water and gas from the storage chamber, drinking water, or beverages consisting of carbonated water and syrup. Three faucets 70, 71 and 72 are secured on and in thermal contact with the header member 55. The conduits 45 and 57 can be connected with coupling 69 with which conduit 73 is connected and, as shown in the embodiment of the invention shown in Figs. 1 to 8, such conduit 73 can extend upwardly through the body 20, tube 33, the stor-

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age chamber 24 and through neck 17 to faucet 70. In this same embodiment of the invention, there is a tube 74 in the storage chamber 24 through which the water tube 73 extends. Tube 74 has an inlet end sealed to the bottom of the storage chamber 24 and the upper end extends through neck 17 into a chamber 76 in fitting 75 that screws on the neck. Openings 200 are provided in the bottom portion of tube 74 through which carbonated water flows from the storage chamber. A cap member 730 is secured in leak-proof relation on the upper end of tube 73 and is held in place by cap screw 731. Conduit 732 connects faucet 70 with the interior of cap member 730.

A conduit 77 leads from chamber 76 to faucet 71 and syrup is supplied to such faucet by conduit 78 leading from a source of supply 79 under pressure, or the syrup can flow by gravity to the faucet from a container 111 as indicated by dotted lines in Fig. 1, such container being in thermal contact with the top of the carbonator. Water and gas mixture from the carbonator and syrup will flow through faucet 71 when it is opened. Chamber 76 is connected with faucet 72 by conduit 80 and, when open, water and gas mixture from the carbonator storage chamber will be dispensed. The plain drinking water will pass through refrigerated zones in passing through the carbonator, and as the dispensing faucet therefore is in thermal contact with the header member, the water drawn from the faucet will have a substantially constant low temperature. The carbonated water and beverage faucets are also in thermal contact with the header member so that the drinks dispensed therefrom will be maintained at a constant low temperature. The syrup conduit 78 is preferably in thermal contact with shell 50 along a portion of its length. The syrup can be further cooled by passing a coiled portion of conduit 78 through a chamber 92 forming an enlarged portion of the return refrigerant line 62. The suction control valve 110 will maintain any desired temperature and an equalizer tank 733 connected with the refrigerant return line 62 will prevent short cycling of the compressor.

The bottom wall 18 of shell 14 is sealed to tubes 73 and 74 and rests on the top of tube 33. The axial adjustment and securement of tube 33 will thus determine the vertical position of shell 14 and the space between the bottom of flange 19 and the bottom of groove 23. This adjustment has a part in regulating the rate of water flow into chamber 22. The size and number of the grooves in the rings 35 controls the metering of gas flowing into the water.

In the modified form of the invention shown in Fig. 10, the outlet tube 100 for the carbonated water extends downwardly from the bottom of chamber 24 and through the water tube 33 and the body 20 of the mixing and metering device. Such tube 100 can extend to a remote faucet (not shown). In this form of the invention, water can pass from the coupling 69 to a remote faucet (not shown) if desired.

In the form of the invention shown in Fig. 11, the carbonated water flows from the storage chamber through tube 100 as in Fig. 10. The water supply conduit 56 has a coiled portion 150 that connects directly with the inlet tube 45 leading into body 20. The gas inlet conduit 44 leads into the body 20 and the water and gas are metered and mixed and stored as previously described. Valve device 63 is arranged in the gas

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conduit and water in conduit 56 is connected therewith by pipe 66 to control gas flow as previously described. The carbonator, coiled water supply conduit 150 and the body 20 can be housed in a container or housing 152 filled with ice or with liquid cooled by a mechanical refrigerating system.

In each form of the invention, the shell 14 is substantially filled with stainless steel wool and the mixture of water and gas flows into the top of the shell and out from the bottom of the shell. The carbonated water will pass through chamber 22 from the bottom to the top and then down through the storage chamber so that the water will become fully saturated with gas and will remain so because of the length and time of travel together and through the steel wool. The refrigerated chambers also serve to maintain the water saturated with the gas.

The carbonator can be held by a bracket 94 fixed to a fountain 95, and the faucets can be arranged above the drain shelf 96. The faucets and the connections thereto above the header member can be enclosed by a cap 97. The faucets being in thermal contact with the refrigerated carbonator structure will cool the dispensed fluids passing therethrough so that the temperature of the dispensed fluids will be constant.

When the carbonated water faucets are closed, valves 44 and 47 will be closed and carbonated water will flow back thru disks 35 to the gas check valve. Upon opening such faucets causing a pressure drop in the container, the gas pressure will clear the gas passages of carbonated water that has backed up to the check valve. The amount of gas entering the device is influenced by this condition. However, when the rate of draft is rapid, there will not be sufficient time between the drawing of drinks to permit the soda water to back up to the check valve thru the very small grooves in rings 35 and other passages to the check valve. This condition will permit a greater volume of gas to enter the carbonator in relation to the amount of water that enters therein thereby making it impossible for the water to absorb all the excess gas under that temperature, pressure and time element which would result in leaving a gas pocket in the container that would have to be expelled through the faucet causing a "pop-off." In order to overcome this condition the capillary tube 93 will reduce the quantity of gas entering the carbonator in proportion to compensate for the difference between slow and rapid rate of draft. This capillary or restrictor is inserted far enough from the carbonator to permit the installation of a larger tube between that and the carbonator which will always have sufficient gas of the correct pressure to supply the proper proportion of gas when drawing intermittently at a slow rate.

The refrigeration of the carbonator structure provides and maintains the temperature of the fluids in the interior as desired regardless of the rate of draft. The water and gas are thoroughly and proportionately mixed and so maintained because of the mixing device and the travel through the wool. The rate ratio of water and gas is maintained by water pressure, check valves and restrictors to flow.

What I claim is:

1. A carbonator comprising three telescoped shells spaced from each other and forming three chambers, the innermost and intermediate chambers being in open communication at their head ends, a mixing device for water and carbon di-

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oxide gas in communication with the base portion of the intermediate chamber, refrigerating means in the outer chamber, metal wool substantially filling the innermost chamber, a dispensing tube for the water and gas mixture in the innermost chamber and extending through the intermediate shell, the tube communicating with the base portion of the innermost chamber, a conduit for water coiled in the outer chamber, a water dispensing tube extending through the mixture dispensing tube, and means connecting the coiled conduit with the mixing device and with the water dispensing tube.

2. In a carbonator, a pair of telescoped shells forming a chamber, a spirally coiled water tube in the chamber having its ends extending exteriorly thereof, head and base cover means on the ends of the shells, a mechanical refrigerating system connected in circuit with the chamber to maintain the chamber substantially filled with liquid refrigerant, and means projecting from the head cover means into the chamber filling the space beyond the head end coil of the tube, and a reservoir chamber for the mixture of water and carbon dioxide gas surrounded by the refrigerated chamber, the refrigerant leaving the refrigerant chamber through the filler means and entering at the other end of the chamber and the water entering the tube through the filler means.

3. In a carbonator, an inner shell open at the top and having a bottom wall with a depending peripheral flange, an outer shell telescoping the inner shell, said outer shell having a top wall spaced above the open end of the inner shell and an open bottom end, said shells being spaced, a body fixed to the bottom of the outer shell and having a groove in its upper face into which the inner shell flange extends, a water tube adjustable vertically in and projecting above the top of the body, the bottom wall of the inner shell being supported on the top end of said tube and the adjustment of said tube in the body determining the space between the flange of the inner shell and the base of the body groove, a water passage in the body communicating with the lower end of the tube, passages for carbon dioxide gas in the body and opening below the bottom wall of the inner shell, a partition member on the tube portion above the body and substantially the same diameter as the interior of the flange of the inner shell, and gas metering rings between the body and the partition member, said rings being spaced slightly from the inner shell flange.

4. In a carbonator, a mixing device comprising chamber structure having a circular wall, a member in the chamber having a peripheral knurled face engaging the circular wall, a source of water under pressure leading to one face of the stacked ring members adjacent the outlet face of the knurled member, said rings being of slightly less diameter than the circular wall to form a mixing space and at least one of the abutting faces of the rings having grooves therein curving thereacross, and a source of carbon dioxide gas leading to the inner ends of the grooves in the ring member, criss-cross nature of the grooves in the peripheral face of the member causing the water passing therefrom to be violently agitated as it passes the outflowing streams of gas and the curved direction of the gas flow as it leaves the rings increasing the agitation of the water.

5. A carbonator comprising three spaced tele-

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scoped shells forming three coextensive chambers, the inner and intermediate chambers communicating at their top portions, means for refrigerating the outer chamber, means for introducing a mixture of carbon dioxide gas and water into the bottom portion of the intermediate chamber, and a carbonated water outlet open to the bottom portion of the inner chamber.

6. A carbonator comprising three spaced telescoped shells forming three coextensive chambers, the inner and intermediate chambers communicating at their top portions, means for refrigerating the outer chamber, a mixing device for water and carbon dioxide gas communicating with the lower portion of the intermediate chamber, and a water pipe connected with the mixing device and extending through the outer refrigerated chamber.

7. A carbonator comprising three spaced telescoped shells forming three coextensive chambers, the inner and intermediate chambers communicating at their top portions, means for refrigerating the outer chamber, a mixing device for water and carbon dioxide gas connected with the lower portion of the intermediate chamber, and a carbonated water outlet tube in the inner chamber having an open end adjacent the bottom of the chamber.

8. A carbonator comprising three spaced telescoped shells forming three chambers, a wall for the inner shell spaced from the bottom thereof to form a mixing chamber for carbon dioxide gas and water, said mixing chamber communicating with the bottom of the intermediate chamber and the inner and intermediate chambers communicating at their top portions, means refrigerating the outer chamber, a water supply tube connected with the mixing chamber and extending through the outer chamber, and a carbonated water outlet tube leading from the inner chamber.

9. In a carbonator, a pair of telescoped shells forming an inner carbonated water storage chamber and outer chamber, a water tube spirally coiled in the outer chamber and coextensive therewith, head and base cover members on the ends of the shells, a mechanical refrigerating system connected with the outer chamber, a carbon dioxide and water mixing device connected with the inner chamber and the outlet end of the coiled water tube, means entirely filling the space in the outer chamber between the head end spiral coil of the water tube and the head cover, and a restricted refrigerant outlet means formed by the filling means and the head.

10. In an instantaneous carbonator, a storage chamber for carbonated water, dispensing means leading from the chamber, a metering and mixing device for carbon dioxide gas and water communicating with the chamber, a source of carbon dioxide gas, a source of water under pressure, conduit means communicating with the source of water and the device, a one-way valve in the water conduit means opening in response to pressure drop in the chamber, conduit means connecting the source of gas with the device, said gas conduit means including a portion of smaller diameter adjacent the source of gas than the portion adjacent the device, and a one-way valve in the larger diameter portion of the gas conduit means, said smaller diameter portion of the gas conduit means restricting gas flow to reduce the quantity of gas supplied to the carbonator when the draft is intermittently at a slow rate.

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