March 2, 1937. M. M. WELKER ET AL 2,072,350

CARBONATING APPARATUS

Filed Nov. 16, 1934 2 Sheets-Sheet 1

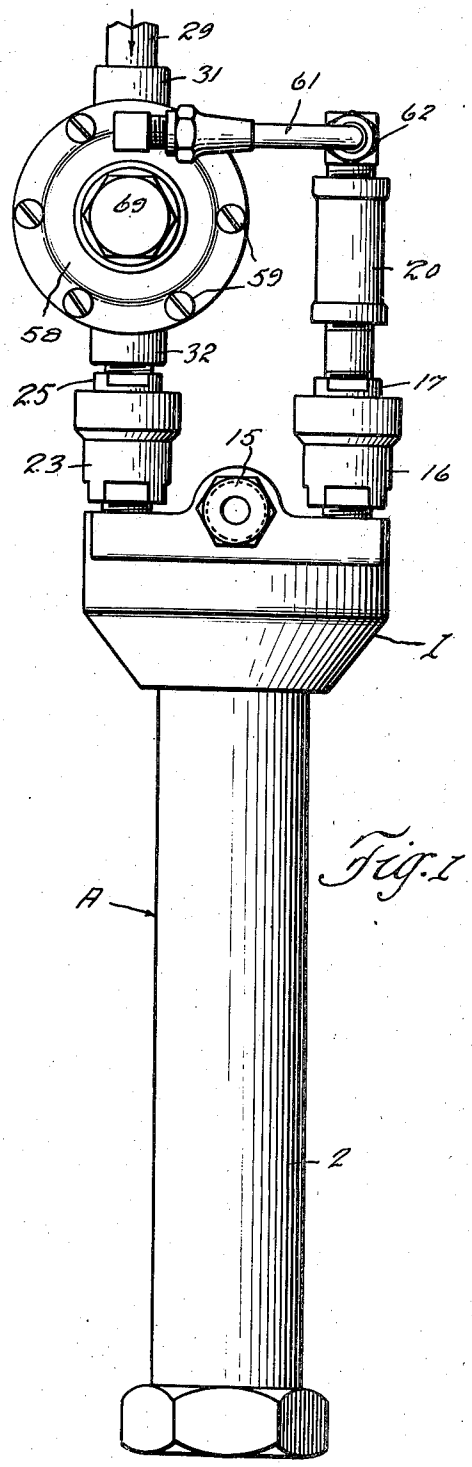


Fig. 1

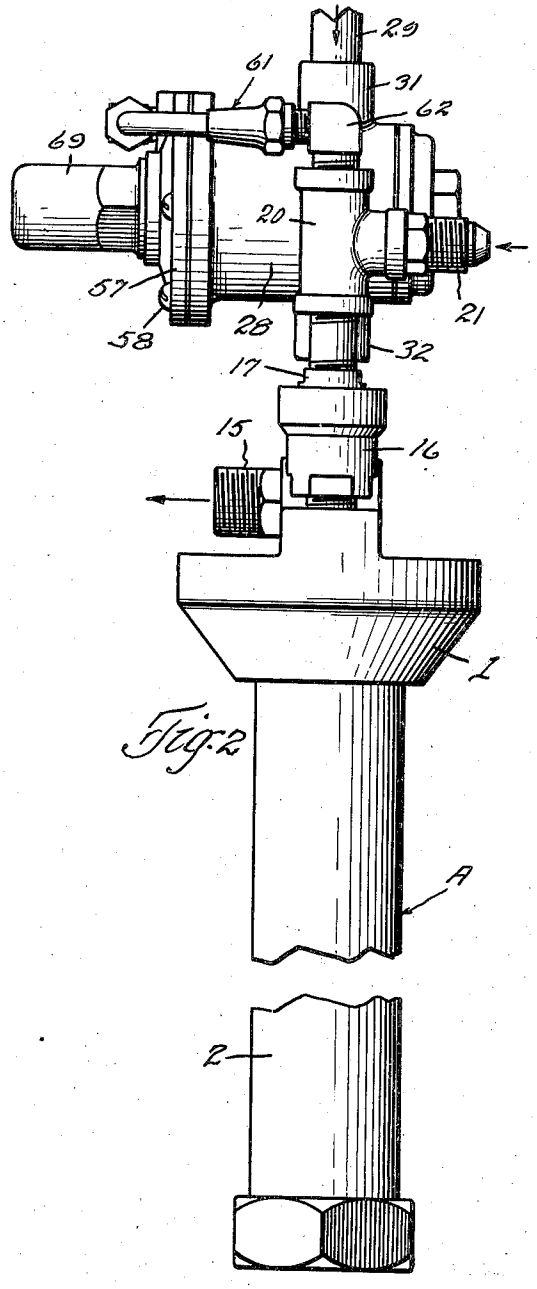


Fig. 2

INVENTOR.
M. M. Welker
C. R. Vaughan
BY
Kelly, Brock & West
ATTORNEY.

March 2, 1937. M. M. WELKER ET AL 2,072,350

CARBONATING APPARATUS

Filed Nov. 16, 1934 2 Sheets-Sheet 2

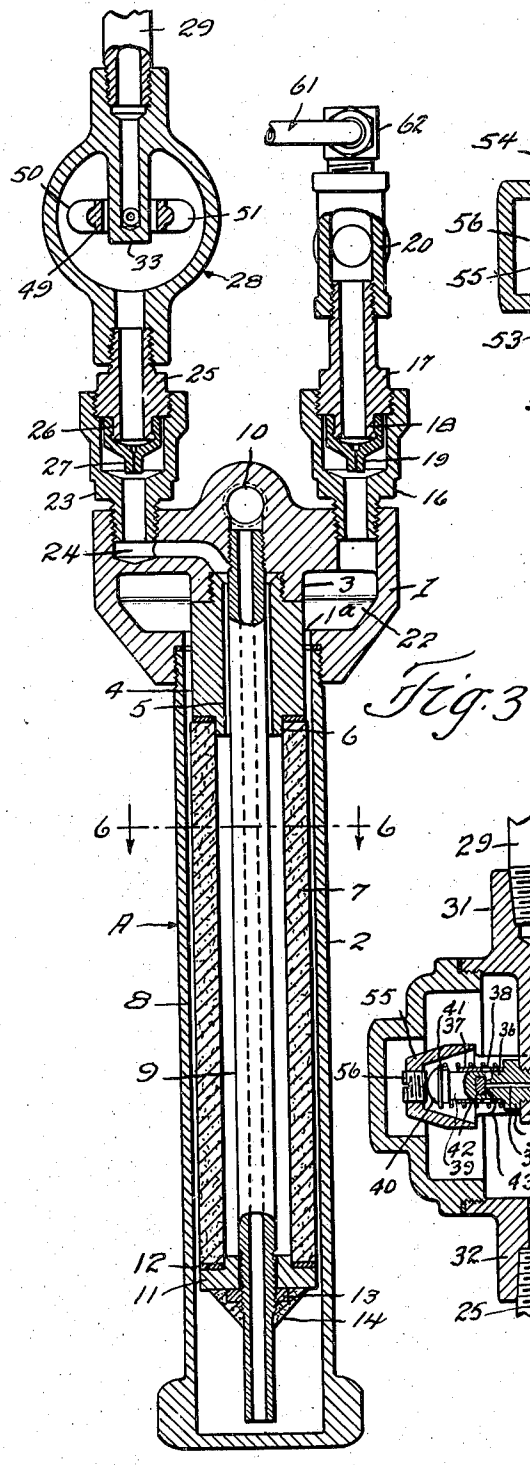


Fig. 3

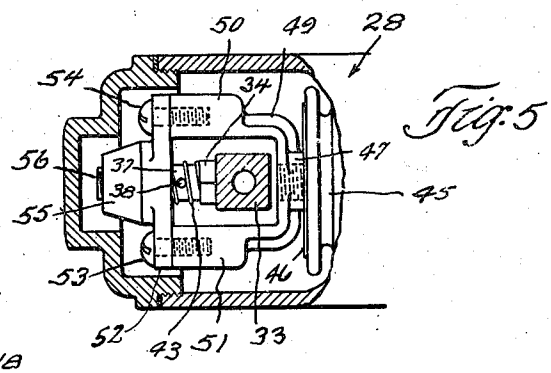


Fig. 5

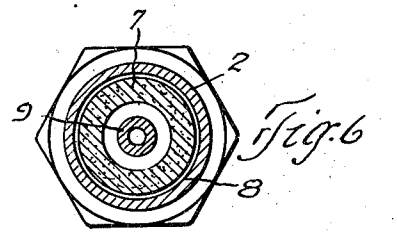


Fig. 6

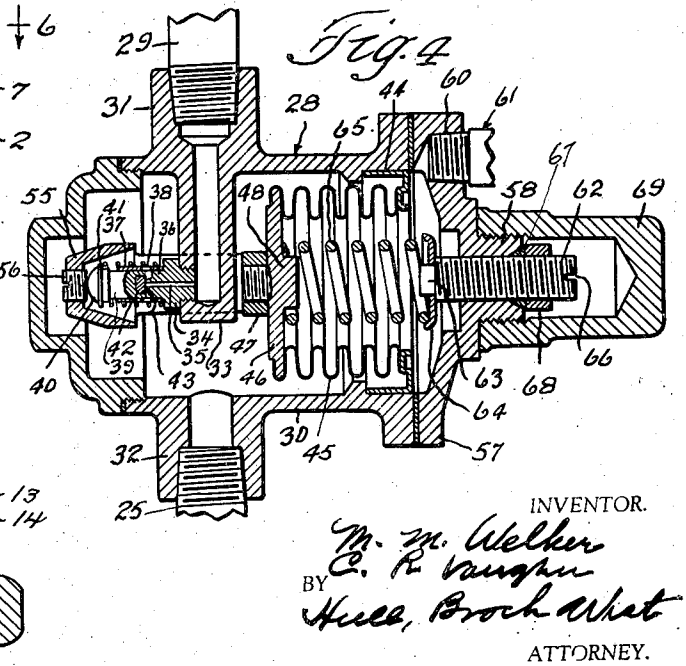


Fig. 4

INVENTOR.

M. M. Welker
E. R. Vaughn

BY Hull, Brock & Hull

ATTORNEY.

Patented Mar. 2, 1937 2,072,350

UNITED STATES PATENT OFFICE

2,072,350

CARBONATING APPARATUS

Mordecai M. Welker, Canfield, and Cory R. Vaughn, Youngstown, Ohio, assignors to General Dry Batteries, Inc., Cleveland, Ohio, a corporation of Ohio

Application November 16, 1934, Serial No. 753,350

7 Claims. (Cl. 261—96)

This invention relates to a carbonating apparatus which is particularly adapted for the preparation of carbonated water for use at soda fountains, bars and the like.

One of the main objects of the invention is to provide a carbonating device which is simple in construction, efficient in operation and which occupies very little space and which will effectively mix carbon dioxide and water in the proper proportions and which also does not require any moving parts which are likely to wear or get out of order.

Another object of the invention is to provide a carbonating apparatus of the character described by means of which water and carbon dioxide may be properly mixed without any specially designed agitating means.

Another object of the invention is to provide a carbonator of the character described in which water and carbon dioxide are mixed in proper proportion and which is provided with means for delivering the water and the gas to a carbonating chamber simultaneously and means for automatically maintaining the gas pressure and the water pressure substantially the same whereby efficient carbonation will be obtained even though there be a wide variation in water pressure.

A further object of the invention is to provide a method of making carbonated water in which the carbon dioxide gas is mixed with the water in the same proportions regardless of variations in the water pressure.

A still further object of the invention is to provide a carbonator of the character described which is of such a size that it may be located in the cooling tank usually found at a soda fountain or bar.

Further and more limited objects of the invention will appear as the description proceeds and by reference to the accompanying drawings in which Fig. 1 is a front elevation of our improved carbonator; Fig. 2 is a view similar to Fig. 1 taken at right angles thereto; Fig. 3 is a vertical sectional view of the carbonator shown in Fig. 1; Fig. 4 is an enlarged vertical sectional view of the gas regulating valve; Fig. 5 is a fragmentary horizontal sectional view of the gas regulating valve shown in Fig. 4; and Fig. 6 is a horizontal sectional view on the line 6—6 of Fig. 3.

One of the prerequisites of a satisfactory carbonator is that it functions the same under varying conditions of water pressure. Soda water should be dispensed with the highest possible gas content and at a temperautre of about 34° F. The carbonator should also be kept cool as the amount of carbon dioxide that the water will absorb is almost directly proportional to its temperature. The carbonator should also be located as near as possible to the cooling unit in the fountain and adequate storage capacity should be provided in the fountain cooling unit to insure the carbonated water remaining in the cooler long enough to become thoroughly chilled. This is especially true where there is a heavy demand for carbonated water.

In our improved carbonator gas is admitted to the carbonating chamber through a porous stone as the water is delivered over the stone in a thin stream. The gas is blown through the water under such pressure as to break up the water into a fine mist or spray which enables the water to absorb the maximum amount of gas. Our unit also embodies means for maintaining a gas pressure equal to the pressure at which the water is delivered to the carbonator. The water pressure in different localities may vary from 25 to 80 pounds depending upon conditions and our device will operate efficiently at any of the intervening pressures regardless of the water pressure fluctuations. Should the water pressure exceed 80 pounds, it is recommended that a water regulator be provided which will prevent a pressure in excess of 80 pounds. In our unit we recommend that a gas regulator valve be used which will deliver gas to the gas supply line at a pressure of approximately 100 pounds, which is considerably in excess of the water pressure usually found. This does not mean that a 100-pound gas pressure is entering the carbonator but merely insures a gas supply at a pressure at all times considerably above the water pressure. An additional gas regulating valve on the carbonator automatically controls the gas pressure entering the carbonator to the exact amount of prevailing water pressure regardless of the fluctuation.

Referring now to the drawings, our carbonator consists essentially of a carbonating chamber which is designated generally by the reference character A and which consists essentially of a hollow casting 1 to which is threadedly secured a hollow tubular casing 2. The casting 1 is provided with a centrally disposed bottom opening 1a above which is provided an annular depending shoulder 3 which is interiorly threaded. Threadedly secured in this threaded opening is a fitting 4 having a centrally disposed opening 5 therein. The lower end of the fitting 4 is provided with an annular shoulder 6 which receives thereover a hollow tubular member 7 which is preferably made of a porous ceramic material

through which the carbon dioxide is delivered and from which it is taken up and absorbed by the water passing over the surface thereof. The member 7 and the casing 2 are preferably circular but may be of different shape, if desired. The porous member 7 is slightly smaller in diameter than the tubular casing 2 so as to leave a very small circular space 8 between it and the inner wall of the casing 2. Extending through the tubular member 7 is a tube 9 the upper end of which is threadedly secured to the top of the casting 1 and is in communication with an outlet bore or passageway 10. The lower end of the tube 9 extends beyond the lower end of the porous member 7 and secured thereon is a circular block 11 which engages the lower end of the tubular member 7 and holds the same in place, a gasket 12 being provided to prevent leakage at this point. Also secured over the threaded lower end of the tube 9 is a nut 13 which engages the circular block 11 and serves to clamp the tube 7 in place. The nut 13 is preferably covered with a mass 14 of cement or plaster of Paris or other suitable material. The extreme lower end of the tube 9 terminates a short distance above the lower end of the outer casing 2. The tube 9 serves as a means for withdrawing the carbonated water from the carbonating chamber although the carbonated water may be withdrawn through the bottom of the chamber if desired. The capacity of the delivery tube with respect to the water inlet is such that the casing 2 is always filled and the porous stone is always covered with water. A fitting 15 is secured in the outer end of the passageway 10 and is adapted to be connected to a pipe leading to the draft arm at the fountain or bar.

At one side of the casting 1 there is provided a water inlet connection 16 which is threadedly secured therein. Threadedly secured in the connection 16 is a fitting 17 having a shoulder 18 at the lower end thereof over which is secured a downwardly opened opening check valve 19 which is known to the trade as a Thomas rubber check valve. Threadedly secured to the fitting 17 is a T 20 from which leads a connection 21 which connects with the water supply or main. The casting 1 is also provided with a circular bore or passageway 22 which is in open communication with the space between the porous member 7 and the inner wall of the casing 2 so as to deliver a thin sheet of water over and about the porous member.

Disposed at the opposite side of the casting 1 is a fitting 23 which is threadedly secured therein and communicates with a bore or passageway 24 which communicates at its opposite end with the opening 5 in the fitting 4. Threadedly secured in the fitting 23 is a fitting 25 the lower end of which is provided with a shoulder 26 over which is secured a downwardly opening rubber check valve 27 like the check valve 19. Threadedly secured to the outer end of the fitting 25 is a gas regulator valve 28 which is shown in detail in Figs. 4 and 5, and to which is connected the gas supply line 29. A suitable regulator valve may be provided in the line 29 so that carbon dioxide gas will be delivered to the gas regulator valve 28 at a pressure of approximately 100 pounds.

The gas regulator valve 28 consists essentially of a casting 30 which is shaped in section as shown most clearly in Fig. 4. The gas supply pipe 29 connects with an interiorly threaded boss 31 and the fitting 25 connects with an interiorly threaded boss 32 disposed opposite the boss 31. Extending inwardly from the boss 31 is a hollow extension 33 which is rectangular in section as shown in Fig. 5 and which is provided with a threaded opening in which is secured a fitting 34 having a bore or passageway 35 therein. The fitting 34 is provided at its outer end with a circular shoulder 36 over which is secured a cylindrical sleeve 37 having a plurality of ports 38 therein. Fitting within the cylindrical sleeve 37 and slidable therein is a cylindrical plug 39 having an enlarged head 40. Surrounding the sleeve 37 is a coil spring 41 one end of which bears against the fitting 34 and the other end of which bears against the head 40 of plug 39 and urges the same outwardly or toward the left as seen in Fig. 4. The end of the plug 39 opposite the head 40 is provided with a recess in which is received a valve member 42 which engages a valve seat 43 provided on the outer end of the fitting 34. Disposed within the casting 30 is a cup shaped member 44 to which is secured a sylphon bellows 45 to the outer end of which is attached a plate 46. The plate 46 is provided with an interiorly threaded boss 47 at one side thereof and a boss 48 at the opposite side thereof. Secured to the boss 47 is a yoke 49 having a pair of oppositely disposed legs 50 and 51 which extend around the tubular extension 33. Secured to the legs 50 and 51 is a plate 52 which is held in place by suitable bolts 53 and 54. Carried by the plate 52 is a cap 55 in which is threadedly secured a plug 56 which is disposed immediately opposite and adjacent the head 41 of the plug 39. The casting 30 is open at one side and is closed by means of a cap plate 57 which has an interiorly and exteriorly threaded boss 58 thereon. This cap plate is held in place by suitable screws 59 and is provided with a threaded opening 60 which receives therein one end of a pipe 61 the opposite end of which connects with a fitting 62 threadedly secured in the T 20. The threaded opening 60 is in open communication with the interior of the bellows 45 and the connection 61 provides a connection between the water supply pipe and the opposite side of the plate 46 of the regulator valve.

Threadedly secured in an opening provided in the boss 58 is a plug 62 the inner end of which is provided with a boss 63 and over which is secured a circular plate 64 which receives one end of a coil spring 65 the opposite end of which fits over and surrounds the boss 48 on the plate 46. The coil spring 65 is a compression spring and tends to urge the plate 46 toward the left, as seen in Fig. 4. The outer end of the plug 62 is provided with a tool receiving slot 66 by means of which the plug may be turned to adjust the tension on the spring 65. Surrounding the plug 62 is a suitable packing gland 67 and a packing nut 68. Threadedly secured over the boss 58 is a cap or cover plate 69 which is removable to permit adjustment of the plug 62.

It will be seen that by reason of the connection 61 the water pressure will be exerted upon the plate 46 which tends to move the same toward the left, as seen in Fig. 4. As this plate moves toward the left, the yoke 49 moves with it, which moves the plug 56 away from the head 40 of the plug 39. The coil spring 38 tends to move the valve plug 39 toward the left as seen in Fig. 4 and therefore to move the valve 42 from its seat to permit the carbon dioxide gas to flow into the gas regulator valve which exerts a pressure upon the opposite side of the plate 46. When the gas pressure exceeds the water pressure, the valve 42 will be moved to limit or cut off the delivery of gas

as the gas pressure in the gas supply line is in excess of the water pressure. It will therefore be seen that by adjusting the plugs **56** and **62**, a balanced condition may be obtained between the water pressure and the gas pressure delivered through the fitting **25** so as to always maintain a gas pressure equal to the water pressure. Should the water pressure decrease the pressure of the gas on the opposite side of the plate **46** it will tend to close the valve to decrease the flow of gas through the bore **35** thereby always maintaining a balanced condition of gas pressure and water pressure. The plug **56** and the plug **62** are adjusted to obtain a proper balanced condition when the device is installed. The carbonated water is drawn off through the bore **10** and connection **15** which is connected with the draft arm or carbonated water dispensing outlet at the fountain or bar. The entire unit is of such a size that it may be readily placed in the cooling unit immediately adjacent the fountain or bar, although the capacity of the carbonating chamber and the connections leading therefrom are such as to maintain a suitable amount of carbonated water which will be kept cool. Even though the draft arm may be left open a sufficient amount of carbon dioxide will be admixed with the water as it enters the carbonating chamber to supply carbonated water containing from 2½ to 4 volumes of carbon dioxide gas, which is in excess of the maximum required.

It will now be clear that we have provided a carbonator which will accomplish the objects of the invention as hereinbefore stated and which will function efficiently and automatically regardless of the variation in water pressure. It is to be understood that the embodiment of the invention herein disclosed is merely illustrative and is not to be considered in a limiting sense as various changes may be made in the details of construction without departing from the spirit of our invention as the invention is limited only in accordance with the scope of the appended claims.

Having thus described our invention, what we claim is:

1. A carbonating apparatus comprising a carbonating chamber made up of a head member having a water inlet and a gas inlet, an imperforate elongated tubular casing depending from said head member, a hollow porous member disposed within said tubular casing and substantially filling the same and depending from said head member, means connecting the interior of said porous member with the gas inlet, means connecting the space between said porous member and tubular casing with the water inlet, the space between said porous member and tubular casing being in the shape of a very thin annulus whereby water may be delivered downwardlly over said porous member in a very thin sheet while gas is being diffused through said porous member, means for regulating the gas pressure with respect to the water pressure and means for withdrawing carbonated water from said carbonating chamber.

2. A carbonating apparatus comprising a carbonating chamber made up of a head member having a water inlet and a gas inlet, an imperforate elongated tubular casing depending from said head member, a hollow porous member disposed within said tubular casing and substantially filling the same and depending from said head member, means connecting the interior of said porous member with the gas inlet, means connecting the space between said porous member and tubular casing with the water inlet, the space between said porous member and tubular casing being in the shape of a very thin annulus whereby water may be delivered downwardly over said porous member in a very thin sheet while gas is being diffused through said porous member, means for regulating the gas pressure with respect to the water pressure and means for withdrawing carbonated water from said carbonating chamber through said porous member.

3. A carbonating apparatus comprising a carbonating chamber made up of a head member having a water inlet and a gas inlet, an imperforate elongated tubular casing depending from said head member, a hollow porous member disposed within said tubular casing and substantially filling the same and depending from said head member, means connecting the interior of said porous member with the gas inlet, means connecting the space between said porous member and tubular casing with the water inlet, the space between said porous member and tubular casing being in the shape of a very thin annulus whereby water may be delivered downwardly over said porous member in a very thin sheet while gas is being diffused through said porous member, means for regulating the gas pressure with respect to the water pressure and means for withdrawing carbonated water from said carbonating chamber, said last mentioned means comprising a withdrawal tube extending through said porous member and having cooperating means thereon for securing said porous member in place.

4. A carbonating apparatus comprising a carbonating chamber including a head member having a centrally disposed opening therein, a fitting secured in said opening, a porous member secured to said fitting and extending downwardly therefrom, an imperforate tubular casing surrounding said porous member and spaced a very slight distance therefrom and providing a thin annular elongated passageway between said porous member and said casing, a bore leading through said head member and having one end connected with the interior of said porous member and its opposite end connected with a gas supply line, a second bore leading through said head and having one end connected with the space between said porous member and tubular casing and its opposite end connected with a water supply line, means for regulating the gas pressure in accordance with the water pressure and means for withdrawing carbonated water from the apparatus.

5. A carbonating apparatus comprising a carbonating chamber including a head member having a centrally disposed opening therein, a fitting secured in said opening, a porous member secured to said fitting and extending downwardly therefrom, an imperforate tubular casing surrounding said porous member and spaced a very slight distance therefrom and providing a thin elongated passageway between said porous member and said casing, a bore leading through said head member and having one end connected with the interior of said porous member and its opposite end connected with a gas supply line, a second bore leading through said head and having one end connected with the space between said porous member and tubular casing and its opposite end connected with a water supply line, means for regulating the gas pressure in accordance with the water pressure and means for withdrawing carbonated water from the apparatus, said last mentioned means including a withdrawal tube extending through said porous member and co-

operating means on said withdrawal tube and head for securing said porous member in place.

6. A carbonating apparatus of the character described comprising a carbonating chamber consisting of an imperforate downwardly depending tubular casing in which is arranged a hollow porous member which substantially fills and is spaced a very slight distance from the inner walls of said casing, means for delivering a thin annular sheet of water over the surface of said porous member and between the same and said imperforate casing, means for simultaneously delivering gas through said porous member, means for maintaining a gas pressure substantially equal to the water pressure including a gas regulator valve in the gas supply line and a connection to the water supply line and a pair of check valves in the water supply line and the gas supply line, respectively, and means for withdrawing the carbonated water from said chamber.

7. A carbonating apparatus comprising an elongated tubular imperforate carbonating chamber, a hollow porous member disposed within said chamber and substantially filling the same but leaving a thin annular space between the walls thereof and the walls of said chamber, a gas supply line leading into said porous member, a water supply line leading into said chamber and connected to deliver a thin annular sheet of water over said porous member and between it and said imperforate casing simultaneously with the delivery of gas through said porous member, a pair of check valves in said gas and water supply lines respectively, a gas regulator valve in said gas supply line in advance of the check valve therein, a connection between said gas regulator valve and said water supply line for maintaining a gas pressure equal to the water pressure, means for withdrawing carbonated water from the carbonating chamber, said gas pressure regulating valve consisting of a casing in which is arranged an expansible bellows, a valve connected with said bellows for controlling the flow of gas, one side of said bellows being subjected to the gas pressure and the opposite side thereof being subjected to the water pressure.

MORDECAI M. WELKER.
CORY R. VAUGHN.