Dec. 29, 1942. J. T. ROWELL 2,306,714

CARBONATING APPARATUS

Filed Aug. 3, 1940 4 Sheets-Sheet 1

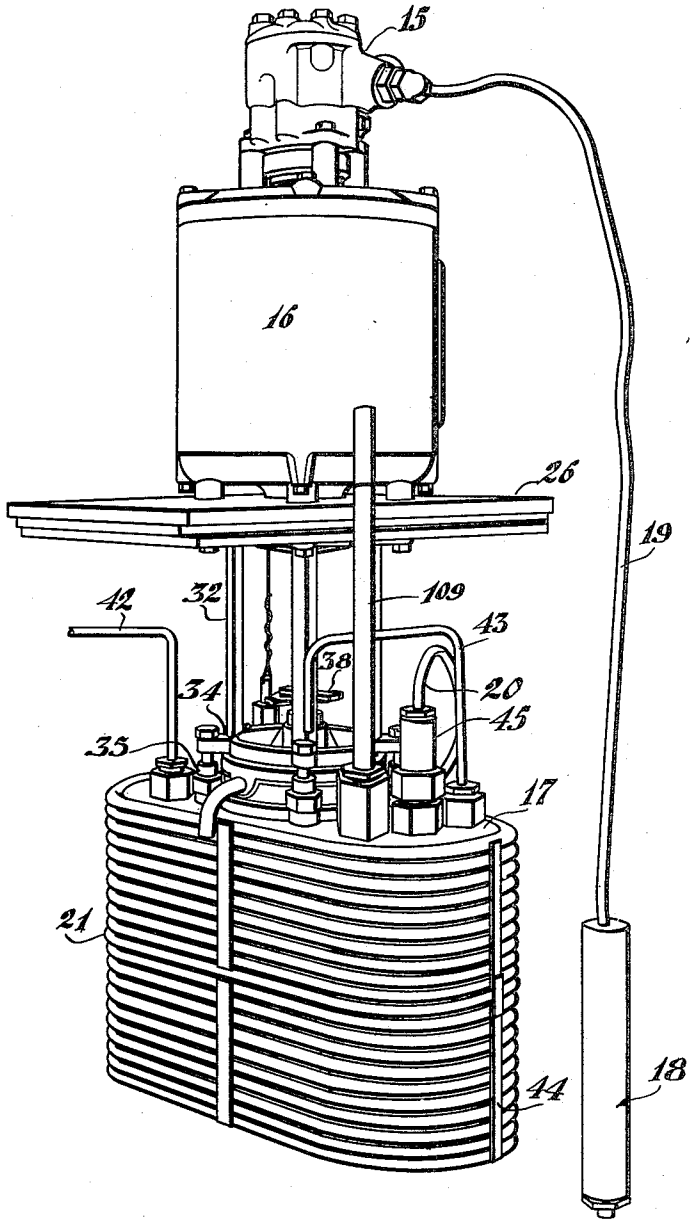

Fig. 1

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CARBONATING APPARATUS

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Fig. 2

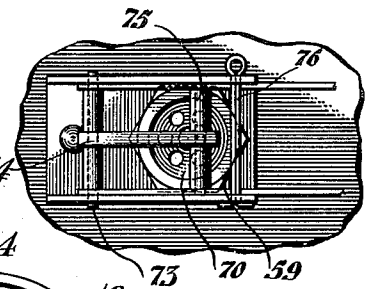

Fig. 3

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CARBONATING APPARATUS

Filed Aug. 3, 1940 4 Sheets-Sheet 3

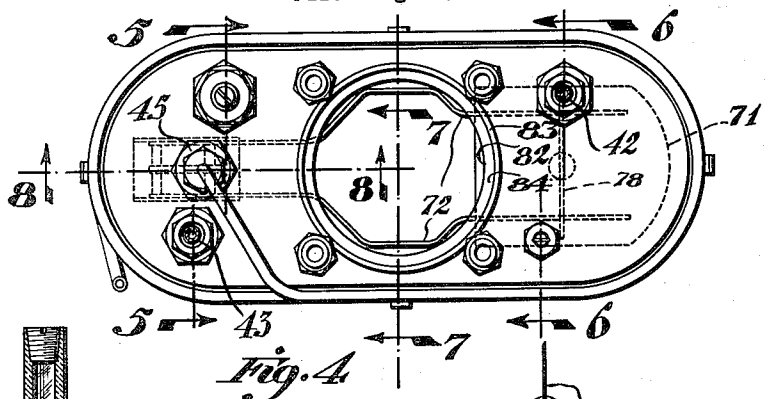

Fig. 4

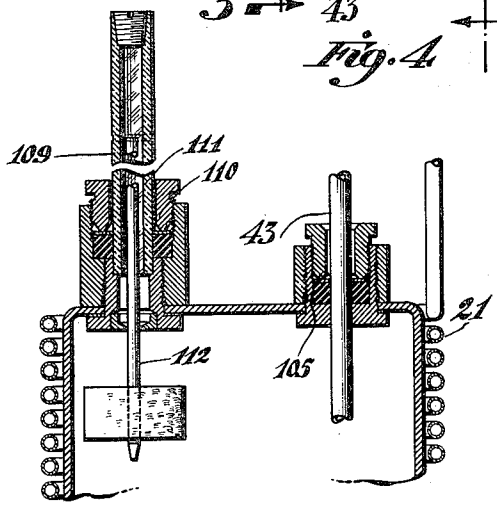

Fig. 5

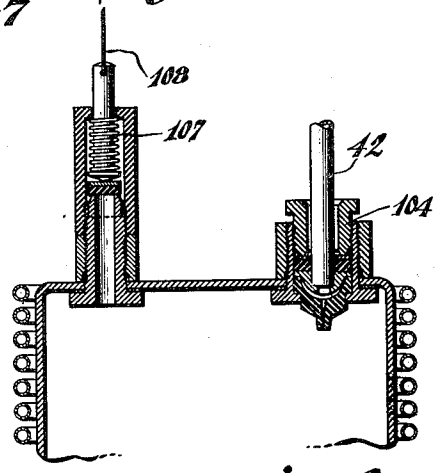

Fig. 6

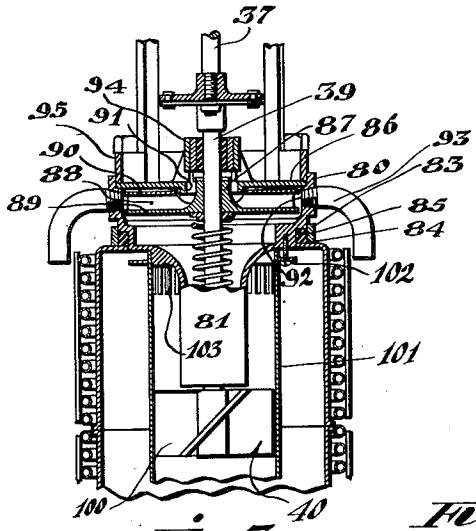

Fig. 7

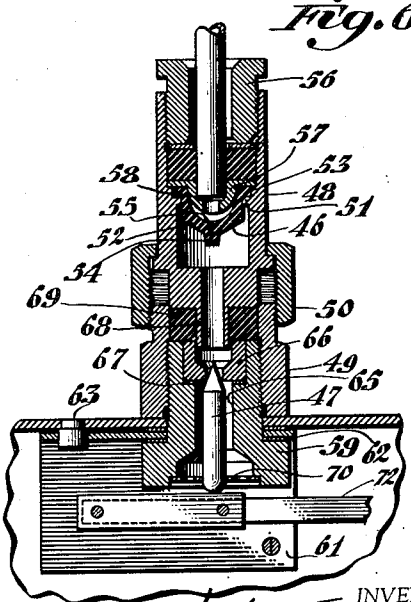

Fig. 8

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CARBONATING APPARATUS

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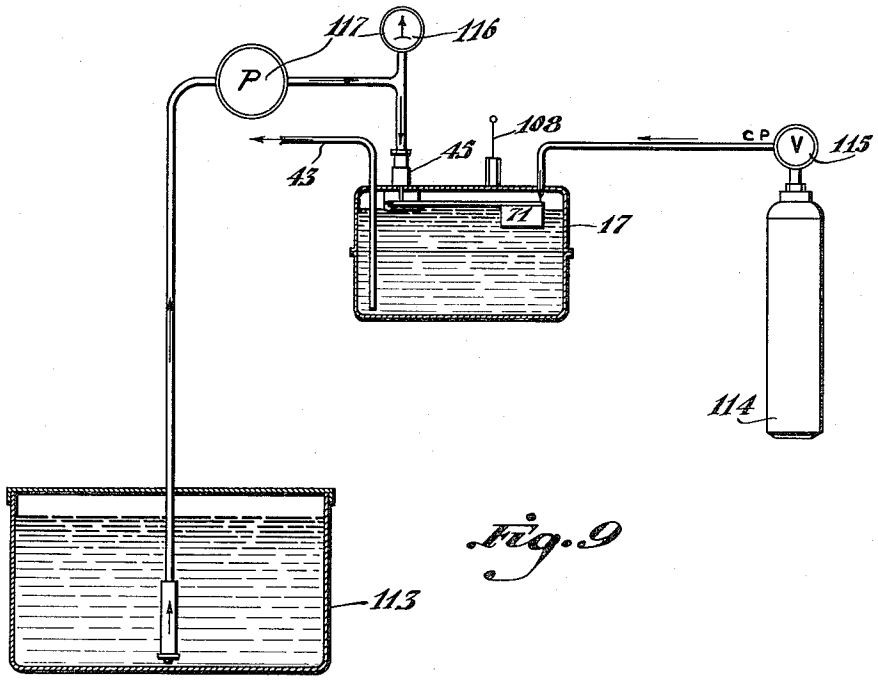

Fig. 9

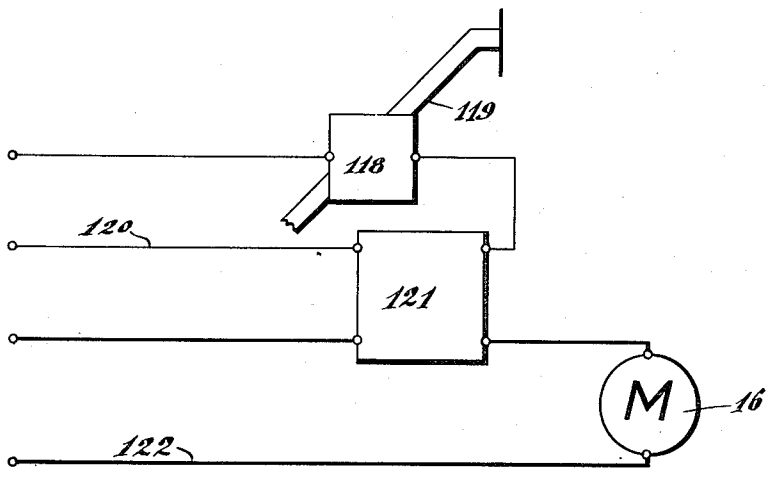

Fig. 10

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UNITED STATES PATENT OFFICE

2,306,714

CARBONATING APPARATUS

John T. Rowell, Cincinnati, Ohio, assignor to The Bock Machine Company, Cincinnati, Ohio, a partnership

Application August 3, 1940, Serial No. 350,389

11 Claims. (Cl. 261—93)

This invention relates generally to apparatus for carbonating water. More particularly, it is directed to carbonating apparatus utilized in coin operated machines dispensing flavored carbonated drinks.

These machines are customarily set up in factories, theaters, schools, garages and other public places. Generally speaking, each machine comprises a "sweet" water supply, a tank of compressed CO_2, means for mixing the two to form carbonated water, a supply of flavored syrup, a refrigerating unit, means for mixing the carbonated water and syrup and dispensing the mixture into a paper cup or other receptacle. Each dispensing unit is housed in an attractive cabinet and works entirely automatically, being serviced, generally, once every day by an attendant who refills the water and syrup tanks and paper cup magazines, and checks the operation of the machine.

It is desirable that these machines be compact, so as to take up as little floor space as possible, and easily serviceable with the mechanism readily accessible to the attendant for his daily check-up. It is of the utmost importance that the carbonating mechanism be capable of dispensing ice cold drinks of the maximum CO_2 content every operation.

In the past, the machines have not been compact nor the parts truly accessible because of the bulkiness and complexity of the carbonating mechanism. Accordingly, it has been an object of the present inventor to provide a carbonating mechanism for these dispensing machines which is simple, compact and has all of its parts readily accessible for servicing, and also dispenses drinks of correct temperature and exact consistency under all operating conditions.

Even with the complicated carbonators of the past, the problem of providing a large number of consistently charged drinks at one time was a major one. The machines in the past have been provided with large carbonating tanks which were recharged only after a number of drinks had been withdrawn. Therefore, in rush times, say during the noon hour, after a number of drinks had been withdrawn, the CO_2 content of the water would fall off during the recharging periods. Consequently, the latter drinks were flat and lacked the much desired tang.

Therefore, it has been a further object of the present inventor to provide a carbonator which utilizes a relatively small carbonating tank, but recharges the contents after every drink is withdrawn, so that even though the machine be operated continuously, the charge of CO_2 in the water remains substantially constant.

The machines of the past also had trouble in maintaining consistently cold carbonated water in the tank because of the large volume of water and lack of adequate, rapid heat dispersion. Thus, another object of this inventor has been to provide a novel means for circulating a large volume of ice cold water to chill the carbonating tank properly. Another object has been to take advantage of the tendency of CO_2 to be absorbed more readily in cold water by providing an improved means for chilling the "sweet" water before it is introduced to the CO_2.

A further object has been to provide a simple means for breaking the water into a spray in an atmosphere of CO_2 to cause the carbonating operation to proceed more quickly.

A further object of the present inventor has been to provide a carbonator in which all operations are actuated from a single motor and to arrange the other parts of the carbonator on the same axis as the motor to provide a compact unitary structure.

It has been found that the carbonator disclosed here operates best with a 25-second recharging period. That is, the carbonating mechanism is actuated to run for 25 seconds after each coin is dropped. This time is possibly 5 or 10 seconds longer than is required for normal operation, but it is preferred over the shorter period to guarantee maximum carbonation under all operating conditions. The time required to dispense a drink is possibly 5 seconds. This leaves a 20-second running period for the carbonator after each drink is dispensed.

In the preferred embodiment, an accumulator switch is utilized. If, say, ten are withdrawn, one right after the other, the carbonator will be actuated by the accumulator switch to run 10 times the 25-second interval or a total of 250 seconds. Now, since approximately 5 seconds of each 25-second interval are taken up during each dispensing operation, after the tenth drink has been withdrawn, the carbonator will continue to run for 200 seconds or, roughly, three minutes. It has been found that an accumulator switch which is limited to ten, provides enough excess running time to take care of any demands over ten on the machine. In other words, the three-minute recharging period, after the last drink in a series of eleven or more has been withdrawn, is sufficient to bring the charge up to its maximum.

Machines located in places where the demand for drinks does not come in rushes, and where

the demand does not run over seven or eight continuously, may be provided with a straight time switch, running only 20 seconds after each drink has been withdrawn. I have found that in these instances, the single 20-second interval is sufficient to keep the carbonator charged.

Accordingly, it has been an object of my invention to provide a carbonating device having an accumulative time switch for use with machines upon which there is a heavy demand for drinks in rush periods and a straight time switch for use with machines upon which the demand is light.

Further objects of the present inventor and advantages of the invention will be more apparent from the following description of the drawings in which:

Figure 1 is a perspective view of the carbonating unit.

Figure 2 is a cross-sectional view of the carbonating unit in place, in the chilling bath tank.

Figure 3 is a fragmentary view looking up at the underside of the needle valve of the "sweet" water inlet.

Figure 4 is a top plan view of the carbonating tank with the mixing and agitating devices removed.

Figure 5 is a view taken on line 5—5, Figure 4, illustrating the indicator float and the carbonated water outlet in cross section.

Figure 6 is a sectional view taken on line 6—6, Figure 4, illustrating the snifter-safety valve and the CO_2 inlet in cross section.

Figure 7 is a sectional view taken on line 7—7, Figure 4, illustrating the chilling bath agitator and the carbonating agitator in detail.

Figure 8 is an enlarged detailed cross-sectional view of the "sweet" water inlet valve for the carbonating tank.

Figure 9 is a diagram illustrating the flow of the CO_2, "sweet" water, and carbonated water.

Figure 10 is a diagram of the wiring circuit for the accumulator switch control of the carbonating unit.

The general features of the improved carbonator can be seen in the perspective view in Figure 1 of the drawings. Generally speaking, the unit comprises three components: a pump 15, a motor 16, and a carbonating tank 17. The pump is coupled to the upper end of the drive shaft of the motor. It is adapted to inject water into the carbonating tank against the carbonating pressure. Preferably, the pump should be capable of supplying water at 100 pounds pressure. Other than this, the pump is an ordinary by-pass type, drawing water from a supply tank (not shown) through a strainer and check valve, indicated generally at 18, on one end of an intake line 19 and sending it through a line 20 and a chilling coil 21 into the carbonating tank 17. The by-pass (not shown) is adjusted to circulate the water in the pump when the water is at operating pressure. The flow of water into the carbonating tank is stopped by float-controlled means (see Figure 8).

The pump is connected to the upper end of the drive shaft of the motor through a loose couple 22 comprising a pair of pins 23 set in the end of a cap 24 which is pinned to the lower end of the drive shaft of the pump. The pins 23 extend down into two corresponding bores in the upper face of the motor drive shafts. The pins are smaller than the bores so that absolute axial alignment of the two shafts is not necessary. The pump is secured to the upper bell of the motor by bolts which pass through lugs on the pump housing and thread into corresponding bosses on the bell. A cap 25 is provided on the pump shaft just under the pump to cover the opening into the motor through which the pump shaft extends. This is to stop water, which might leak out of the pump, from entering the motor.

The whole carbonating unit is supported by a shelf 26 which rests in a step 27 in the upper edges of the sides of the chilling bath tank, indicated at 28. The lower bell of the motor is provided with bosses 29 which are secured to the shelf by bolts 30 passing upwardly through the shelf. The chilling bath tank may be provided with any conventional refrigerating coil.

The lower end of the drive shaft extends downwardly through a central opening 31 in the shelf toward the carbonating tank. The carbonating tank is spaced from the lower face of the shelf and secured thereto by legs 32. Lugs 33 at the upper ends of the legs are secured to the bottom of the shelf by the bolts 30 which also hold the motor in place. The lower ends of the legs 32 are provided with lugs 34 which are bolted to bosses 35 secured to the top of the carbonating tank. It will be noted that the carbonating tank is spaced from the bottom of the chilling bath tank so that a circulation (by means discussed later) of the chilling bath can touch all sides of the carbonating tank.

Referring to Figure 2, the lower end of the motor shaft is connected by a flexible coupling 36 to a shaft section 37 which is in turn connected to another flexible coupling 38 at the upper end of a drive shaft 39. The flexible couplings disclosed here are constituted by thin metal strips joining oppositely projected lateral arms on the two shafts. The drive shaft 39 is directly connected to a carbonating agitator 40 and a cooling bath agitator 41. Thus, the elements of the carbonator are aligned and driven by the single motor. Then, too, the various parts are fastened together so that by disconnecting the water intake line 19, the CO_2 inlet line, indicated at 42, and the carbonated water outlet line, indicated at 43, the whole assembly can be lifted out of the dispensing cabinet for a thorough cleaning, check-up, or repair whenever necessary. The flexible couplings 36 and 37 relieve any strains on the motor which might arise from such handling or which might be caused by inaccurate alignment of the parts in assemblage.

The carbonating tank is preferably fabricated in two sections; both sections being stamped out so that there are no difficult corner seams to seal. Lips are provided on the two sections so that they may be joined and sealed easily as at 18. The tank is generally oval shaped as viewed from the top, so that the chilling coil 21 in the sweet water line 20 leading from the outlet side of the pump to the carbonating tank may be fitted around it snugly. Straps may be soldered, or fastened by similar means, on the coil, as at 44, to maintain the coil's form. Here, the coil 21 is wrapped around the carbonating tank; although this is the preferred form for the coil, it is to be understood that it could just as well be positioned any other place in the chilling tank.

The sweet water line 20 enters the carbonating tank through a coupling assembly 45. The coupling element (Figure 8) houses two valves: one, a rubber check valve 46, utilized to provide a one-way passage for water into the carbonat-

ing tank; and the other, a needle valve 47, utilized to control the flow of water into the carbonating tank. The coupling assembly provides an upper sleeve 48 and a lower sleeve 49 joined by a coupler nut 50. The upper sleeve houses the rubber one-way valve 46 which is seated against an inturned lip 51 in the bore of the sleeve.

The one-way valve comprises a cup-shaped body portion 52 having an annular flange 53, which seats on the lip 51, and flat lip portions 54 depending from the bottom of the cup. The cup is open through the lips which provide a diametrical slit 55. Water can flow through the valve from the cup to the lips, but cannot flow through outwardly because pressure on the outside of the lips collapses the slit to close the opening. A packing gland 56 is engaged into the internal threads provided at the upper end of the sleeve 48 to press a washer 57 against the upper side of the one-way valve and hold it in place. The washer also seats the line 20 as at 58. When the packing in the gland 56 is compressed, it not only provides a seal around the valve at this point, but also holds the line 20 in place.

A valve carrier 59 extending upwardly through an opening in the top of the carbonating tank is threaded into internal threads in the lower sleeve 49. A channel bracket 61 having a hole through its base corresponding to the opening in the top of the carbonating tank is held against the top of the carbonating tank by an annular flange 62 on the valve element. Thus, when the lower sleeve 49 of the assembly is tightened, the valve element is not only locked into place, but the bracket 61 is clamped against the roof of the tank. A rivet 63 through the tank and bracket also may be employed to hold the bracket in line.

The valve element houses the needle valve 47 in a central bore 65 therein. The bore 65 is larger than the needle to permit flow around it. A seat member 66 is provided for the needle in the upper end of the valve element. The seat is provided as a separate element fitting into an enlarged counterturned bore in the valve element against a shoulder 67. A washer may be provided between the shoulder 67 and the seat 66. Varying the thickness of the washer provides an adjustment for the needle valve.

When the couple is made between the two sleeves, 48 and 49, a teat 68 depending from the lower end of the upper sleeve 48 extends partially into the axial bore of the seat member 66. A packing ring 69 is installed around the teat, between the two sleeves and provides a seal for the union.

A spider 70, press-fitted into an enlarged counterturned opening in the bottom of the valve element 59, guides the needle axially in the opening. The needle is controlled by a float 71 which rises and falls with the level of water in the carbonating tank. The float is fastened on the end of a fork 72 (Figure 4) which is pivoted on a pin 73 extending between the walls of the channel bracket 61.

The float is situated in the opposite end of the tank from the needle valve which it controls, and the needle is positioned near the pivot point between the pivot and the float. Thus, sufficient leverage is obtained. Since the carbonating agitator extends down into the center of the carbonating tank, the arms of the fork are spread outwardly to clear it. Referring to Figure 3, a view looking up at the under side of the channel bracket 61, the needle rests on a bar 74 supported between the arms of the fork by the pivot pin 73 at one end and another pin 75 at its other end. Spacer sleeves around the two pins, 73 and 75, on both sides of the bar 74 maintain the bar in a centralized position for positive engagement with the end of the needle valve. A cotter pin 76 between the sides of the channel bracket, below the normal level of the arms, provides a rest for the float when the level of water in the tank falls low or when the tank is empty. This is provided so that the needle cannot slip completely out of the valve seat member 66 and jam open.

Preferably, the float is removably secured to the ends of the fork. This is accomplished in the present disclosure by a spring urged latch pin 77 (see Figure 2). The pin 77 extends through the float and carries a smaller cross pin 78 extending through the latch pin at right angles to it. The arms of the fork are set in grooves in the top of the float and are held therein by the cross pin 78. A spring 79 around the latch pin between the bottom of the float and a washer pinned at the lower end of the latch pin urges the cross pin 78 downwardly on the fork arms. By compressing the spring and turning the latch pin, the float may be removed.

As stated above, the drive shaft 37 is connected to a carbonating agitator 40 and a cooling bath agitator 41. The cooling bath agitator is housed in a circular casing 80. The body portion of the casing 80 is on the top of the carbonating tank while a neck portion 81 depends into the tank through a central opening 82. A reinforcing ring 83, larger than the opening 82, is welded, or fastened by other means, around the opening. A shoulder 84 is provided around the casing, where it enters the tank, for seating a rubber sealing ring 85. The casing above the shoulder fits snugly into the reinforcing ring 83. Thus, the rubber sealing ring, being confined by the reinforcing ring 83, provides an effective seal when the circular casing is drawn downwardly on it. A cover plate 86 for the casing seats on a shoulder running around the inside of the upper edge of the casing.

The agitator is constituted by a horizontal centrifugal pump pinned on the drive shaft 39. The pump comprises a hub 87, from which radial vanes 88 extend, a bottom plate 89, cast with the vanes, and a top plate 90. The intake for the centrifugal pump is through a central opening 91 in the cover plate 86 for the casing and a corresponding opening in the top plate 90 of the pump. The pump discharges through exhaust ports 92 in the sides of the casing. Elbows 93, threaded into the exhaust ports 92, are employed to direct the stream downwardly along the walls of the carbonating tank (see Figure 7). Thus, the chilling bath is circulated by the centrifugal pump to maintain an even temperature throughout the tank.

A bearing 94, for the drive shaft 39, is situated just above the cover plate. The bearing is supported by legs which bridge the opening in the cover plate. Since this bearing is under water at all times, (see level indicated in dot-dash lines in Figure 2), a rubber bushing is provided.

The legs 32, by which the carbonating tank is attached to the shelf 26, and the lugs 34 at the lower end of the legs 32 are made integrally with, or may be welded to, a ring 95. The ring is the same size as the cover plate 86 and fits snugly in the shoulder around the upper inside edge of the

casing on top of the cover plate 86 to hold it in place. The ring has an annular flange 96 which is bolted to an annular flange 97 around the casing. Thus, when the bolts through the lugs 34 are tightened into the bosses 35, secured to the top of the carbonating tank, the agitator casing is fastened to the carbonating tank.

The lower end of the neck portion 81 of the casing comprises a packing gland 98. In the instance shown, the gland is provided with a carbon bearing which is held in place by a spring around the shaft 39 which presses downwardly on the gland. The drive shaft 39 extends through the packing gland and is pinned to the hub of a spiral propeller blade 100. The propeller is housed in a cylinder 101, the upper end of which is attached to the neck portion 81 of the casing, as at 102. The cylinder depends from the neck to a point near the bottom of the carbonating tank. Now, when the propeller is driven, water is forced up into the top of the cylinder and out through a plurality of narrow radial slots 103 provided near the top of the cylinder. This breaks the water into a fine spray above the water level in the carbonating tank in an atmosphere of CO_2 (see Figure 2). By injecting the water into an atmosphere of CO_2 in the form of a spray, the water reaches its saturation point quickly.

The CO_2 inlet line 42 enters the carbonating tank through a gland 104. Here, a rubber one-way valve, similar to the valve 46, is utilized to provide a check against the escape of CO_2 from the carbonating tank when line 42 is not subjected to pressure; for instance, when a new tank of CO_2 is being installed.

The carbonated water outlet line 43 also passes through a gland, as at 105 (Figure 5), where it enters the tank. In this instance, the outlet line extends down to a point near the bottom of the carbonating tank.

A safety valve 106 is provided for the tank. It is a standard pop-off type valve being controlled by a spring 107, (see Figure 6). A wire handle 108 is attached to the valve plunger, in this instance, so that the attendant periodically can "snift" the valve; i. e., open the valve by hand, to free the tank of air carried in solution by the incoming water and subsequently displaced by the more easily absorbed CO_2 inside of the tank.

A float gauge 109 is provided which comprises a gland 110, a glass sight tube 111, and a cork and quill 112. The cork floats on the carbonated water inside the tank and the quill extends up into the glass sight tube through the packing gland. A mark is made on the glass tube to indicate the correct water level inside of the carbonating tank, as shown by the height of the quill in the tube.

In Figure 9 the water and gas systems are shown diagrammatically. A storage tank 113 is provided for a source of water supply and a tank 114 of compressed CO_2 gas is provided as a source or carbonic gas. A conventional constant pressure valve 115 is provided on the CO_2 tank to regulate the flow of gas therefrom. A water pressure indicator 116 may also be utilized between the water pump, indicated at 117 in the diagram, and the carbonating tank 17.

In Figure 10 a wiring diagram is disclosed for accumulative control of the motor. A slug detector 118 having a coin chute 119 closes a secondary controlling circuit 120 to a conventional accumulator switch 121. A switch limited to ten accumulations is preferred as stated above. A primary circuit 122 to the motor 16 is controlled by the accumulative switch. When coins are dropped through the slug detector, the accumulator switch is set up to actuate the motor a number of operating intervals up to ten as determined by the number of coins dropped.

For the single operation, a straight time switch is substituted for the accumulative switch.

Having described my invention, I claim:

1. A carbonating unit, comprising, a motor, a water supply pump, an agitator, said motor, pump, and agitator mounted in axial alignment and the pump and agitator driven by the motor, a carbonating tank, said agitator projecting into said carbonating tank, a water supply pipe extending from the outlet of the pump to the interior of the carbonating tank and means for supplying carbonic gas to said tank.

2. A carbonating apparatus, comprising, a support, a motor mounted on said support, a carbonating tank suspended from said support, means for supplying carbonic gas to said carbonating tank, an agitator having a shaft extended from said motor into said tank, a tube in said tank, said agitator mounted in said tube, a bearing for said agitator extending downwardly into the tube, outlet apertures disposed around the upper end of the tube within the tank, a centrifugal pump fixed to the agitator shaft above and externally of the tank, whereby when said carbonating tank is submerged in water, said centrifugal pump is effective for agitating the water above the tank and causing it to cascade over the sides of the tank.

3. A carbonating apparatus, comprising, a support, a motor mounted on said support, a carbonating tank suspended from said support, means for supplying carbonic gas to said tank, an agitator extended from said motor into said tank, a water supply pump for delivering water to said tank, a supply pipe extending from said pump to said tank and including a water cooling coil encircling said carbonating tank, a centrifugal pump above and externally of said tank and driven from said motor, whereby when said carbonating tank is submerged in water, said centrifugal pump is effective for agitating the water above the tank and causing it to cascade over the coil.

4. A carbonating apparatus comprising a support, a motor mounted on said support, a carbonated tank, means for supplying carbonic gas to said tank, an agitator extending from said motor into said tank, a centrifugal pump mounted above the tank and driven by the motor, and a chilling bath tank, the carbonating tank and centrifugal pump being disposed beneath the surface of the chilling bath inside of the tank and said centrifugal pump adapted to circulate the chilling bath to maintain an even temperature throughout the bath.

5. A carbonating unit, comprising a motor, a water supply pump and an agitator driven from said motor, a support, said motor, water supply pump, and agitator mounted upon said support in axial alignment, a carbonating tank suspended from said support, means for supplying carbonic gas to said carbonating tank, said agitator mounted within said carbonating tank, a water supply pipe extended from the outlet of the pump to the interior of the carbonating tank and including a cooling coil surrounding said tank, a centrifugal water agitating pump mounted on the axis of the agitator and disposed above the carbonating tank, said water agitating pump driven by said motor, and a cooling tank surrounding said carbonating tank, said cooling tank adapted to con-

tain water, said centrifugal water agitating pump adapted to be disposed in the water in said cooling tank for agitating the same, said water agitating pump including outlets discharging the water in the direction of the cooling coil.

6. A carbonating unit, comprising a motor, a water supply pump mounted on top of the motor, a carbonating tank, means for supplying carbonic gas to said tank, a water supply pipe extending from said water supply pump into said carbonating tank, an agitator mounted within the tank and driven from said motor, and means for suspending said carbonating tank in the cooling tank.

7. A carbonating unit, comprising a motor, a water supply pump and an agitator driven from said motor, a support, said motor, water supply pump, and agitator mounted on said support in axial alignment, a carbonating tank suspended from said support, means for supplying carbonic gas to said tank, said agitator disposed within said carbonating tank, and a water supply pipe extended from the outlet of the pump to the interior of the carbonating tank and incorporating a cooling coil surrounding said tank.

8. A carbonating unit, comprising a motor, a water supply pump driven from said motor, a carbonating tank, means for supplying carbonic gas to said tank, an agitator driven from said motor and disposed in said carbonating tank, a water supply pipe extending from said pump to the interior of said tank and including a coil disposed around the tank, means for cooling said coil, and means for shutting off the water supply to the carbonating tank when the water reaches a predetermined level in said carbonating tank.

9. A carbonating unit, comprising a motor, a support means for said motor, a carbonating tank suspended from said support means, and an agitator supported and driven from said motor and disposed within the tank, and a cooling tank, said support means suspending said carbonating tank and contained agitator within said cooling tank.

10. A carbonating apparatus, comprising a support, a motor mounted on said support, a carbonating tank, means for supplying carbonic gas and water to said tank, an agitator disposed within the tank and driven from said motor, and a centrifugal pump disposed above said tank, said centrifugal pump being driven from said motor, said motor, agitator, and centrifugal pump being disposed coaxially, whereby when said carbonating tank is submerged in a cooling bath of water, said centrifugal pump is effective for pumping the water above the tank for causing streams of water to pass down over the sides of the tank.

11. A carbonating unit adapted to be suspended in a chilling bath, said unit comprising a carbonating tank adapted to receive carbonic gas and water for mixing, a water supply pump for delivering water into said carbonating tank, a carbonated water agitator disposed within the tank, a chilling bath agitating pump disposed above the carbonating tank, and a motor for driving said water supply pump, carbonated water agitator, and chilling bath agitator pump, said motor, water supply pump, carbonated water agitator, and chilling bath agitating pump being disposed on the same axis of rotation.

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