

Nov. 5, 1935.

W. C. BUTTNER

2,019,479

CARBONATOR

Filed June 14, 1932

2 Sheets-Sheet 1

Fig.1

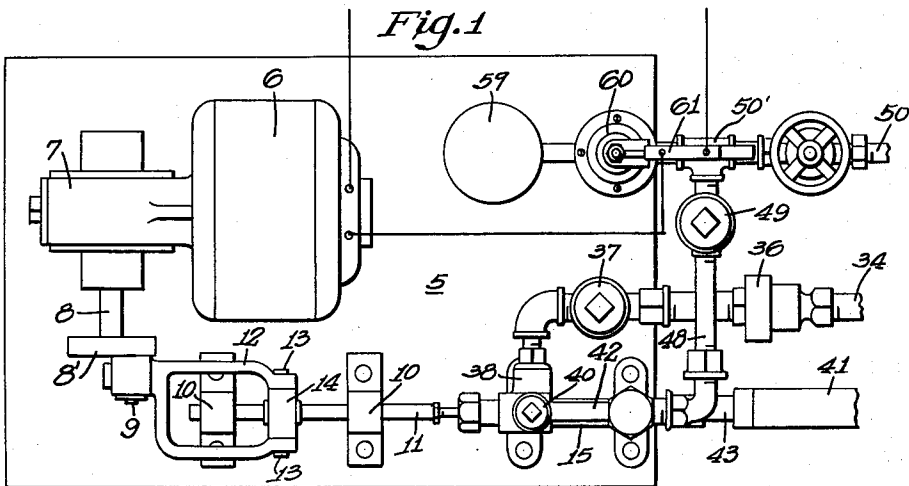


Fig. 2

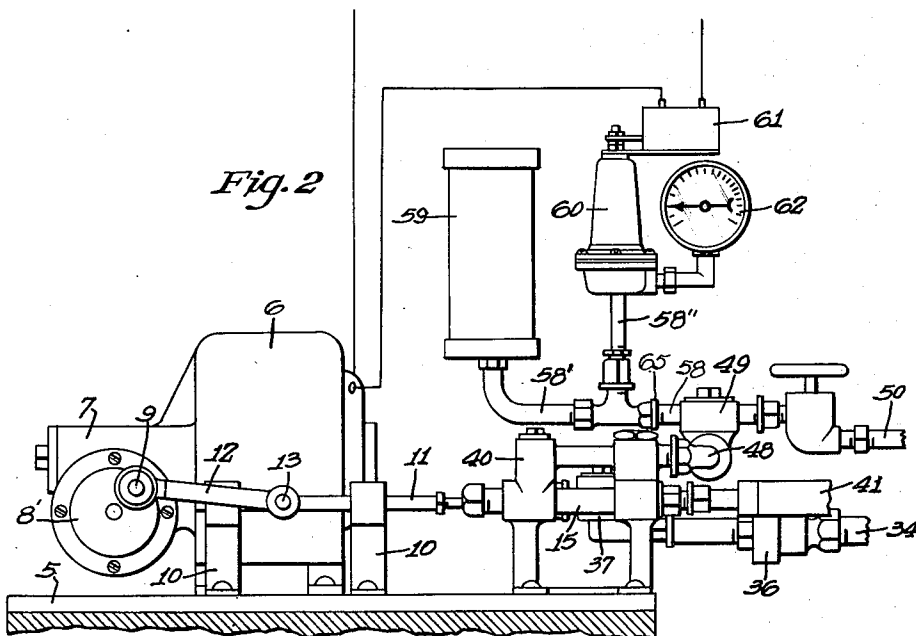
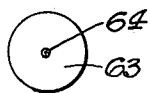


Fig. 5



Inventor:

William C. Buttner

By:

By: *N. O. Bell*
Atty.

Atty.

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Fig. 3

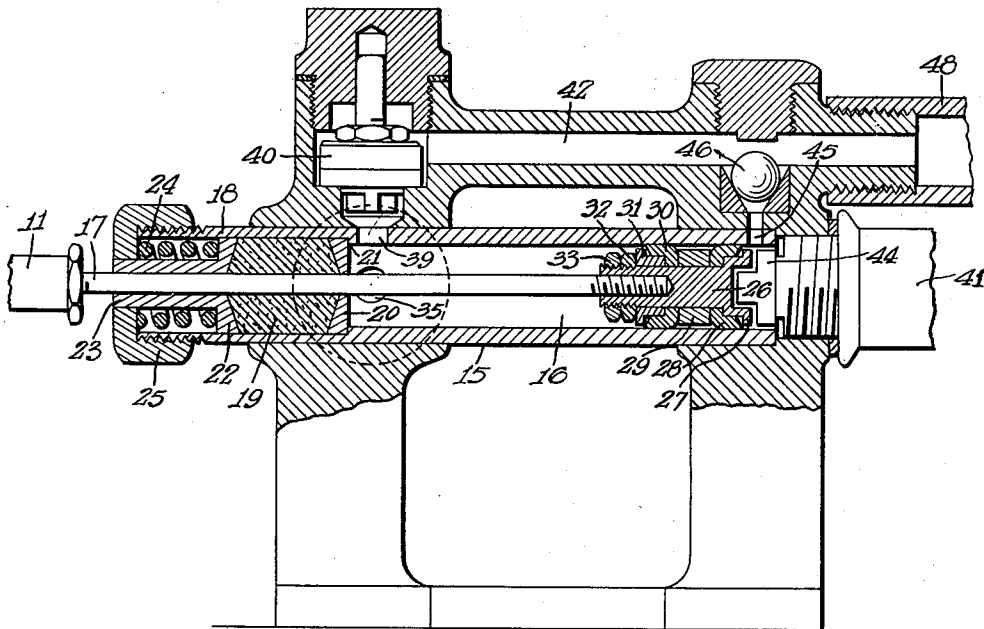
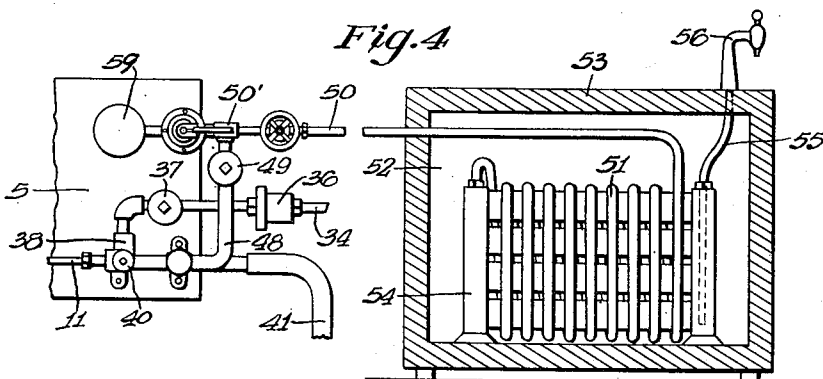


Fig.4



UNITED STATES PATENT OFFICE

2,019,479

CARBONATOR

William C. Buttner, Chicago, Ill., assignor to The Bastian-Blessing Company, Chicago, Ill., a corporation of Illinois

Application June 14, 1932, Serial No. 617,154

4 Claims. (Cl. 261—28)

This invention relates to carbonating apparatus in which carbon dioxide gas is mixed with water to produce carbonated water or, as it is sometimes called, soda water, for use in soda fountains or other places where mixed drinks are dispensed, and the general object is to provide a simple and novel automatic apparatus for manufacturing and supplying carbonated water to the fountain.

Heretofore it has been the practice to supply water and carbon dioxide gas to a tank located remotely from the fountain and to carbonate the water in the tank by the violent action of an agitator or by spraying or other means. The carbonated water is then piped from the carbonator to a cooling compartment in the fountain where it is stored until dispensed through the fountain faucets. The tank is of comparatively large size and is usually located in some room where the temperature is above ordinary room temperature, such as a basement where the average temperature generally runs around 80° F. The carbon dioxide gas is pumped into the tank under a pressure of approximately one hundred fifty pounds per square inch, which pressure is maintained throughout the system. At this pressure and temperature one volume of water will absorb about six volumes of carbon dioxide gas and when the carbonated water is cooled in the cooling compartment of the fountain the water is capable of absorbing about another six volumes of gas if the gas were available at this point and suitable agitating means could be inserted in the cooling chamber. When the carbonated water is dispensed in the glass under this high pressure the violent action causes a large proportion of the gas to escape so that the water in the glass has only about three volumes of gas absorbed therein. It is evident that if the pressure could be reduced and the same original absorption of the gas take place there would be less loss of gas when dispensing the carbonated water, and another object of my invention is to produce carbonated water by using a comparatively low pressure to absorb practically the same amount of gas as has heretofore been absorbed in the present style of carbonator.

A further object of my invention is to provide a compact automatic apparatus for producing carbonated water without a tank or agitator and which can be conveniently installed in any small space remote from or near to the cooling chamber of a fountain.

Referring to the drawings illustrating a selected embodiment of the invention

Fig. 1 is a plan view of the carbonating apparatus.

Fig. 2 is an elevation of the apparatus.

Fig. 3 is a sectional view of the double action pump.

Fig. 4 is a diagrammatic plan view of the carbonating apparatus and its relation to the cooling chamber of a soda fountain shown in section; and

Fig. 5 is an elevation of the gasket having an orifice therein.

Referring to the drawings, 5 is a base on which the parts of the carbonating apparatus are mounted. An electric motor 6 mounted on the base drives the moving parts of the apparatus through a speed reduction gear 7 having a shaft 8 extending therefrom. A crank pin 9 extends outwardly from a disk 8' on the end of the shaft 8. Two guide brackets 10 are mounted on the base and guide the movement of a slide rod 11 slidably mounted therein. A crank arm 12 is mounted on the crank pin 9 at one end thereof and is pivotally mounted at its other end on pins 13 on the short bar 14 fastened to the slide rod 11.

A pump housing 15, Fig. 3, having a displacement chamber 16 therein is mounted on the base. A piston rod 17 is threadedly fastened to the end of the slide rod 11 and extends into the displacement chamber 16 through a stuffing box 18 having packing 19 therein. The stuffing box has an end wall 20 in engagement with an offset 21 at the end of the displacement chamber. A gland 22 is provided in the stuffing box and it has a tubular extension 23 and a spring 24 thereon. A cap 25 is threadedly mounted on the end of the stuffing box and it has a circular opening therein to receive the gland extension. The spring is tensioned between the gland and the cap to cause the gland to compress the packing 19.

The piston rod 17 extends through the gland extension, the gland, the packing and the end wall into the displacement chamber 16 and is threadedly connected to a double action piston 26. The piston has a flange 27 at one end to hold a cup leather 28. A spacer 29 is mounted on the piston and separates the cup leather 28 from another cup leather 30 also mounted on the piston, the leathers being cupped in opposite directions. A retaining collar 31 is mounted on the piston and is held in place by a nut 32 and a lock nut 33 threaded on the piston.

A pipe 34, Fig. 1, connects any suitable source of water supply to the left end of the displacement chamber at 35, Fig. 3, and it is provided with a water strainer 36, a back pressure check

valve 37, and a water inlet check valve 38, the latter being located as close as possible to the displacement chamber to avoid any unnecessary cushioning space and to minimize the tendency of the pump to become air bound. Water is discharged from the displacement chamber through a port 39 into the absorption chamber 42 and the discharge is controlled by a check valve 40 which is located as close as possible to the port 39 to prevent return of water to the displacement chamber.

A supply drum (not shown) of carbon dioxide gas is connected by a tube 41, Fig. 3, to the right end of the displacement chamber and a check valve 44 is arranged in the displacement chamber to control the flow of gas therein, the water inlet and the gas inlet to the displacement chamber being located at opposite ends of the displacement chamber. When the drum is filled the gas is under about eight hundred pounds pressure per square inch and a reducing valve of any suitable type is provided to control the flow of gas to the displacement chamber. I have found it satisfactory to adjust the regulator to supply gas to the displacement chamber at about seventy-five pounds pressure. Gas is discharged from the displacement chamber through a port 45 which connects with the absorption chamber 42, and a ball check valve 46 controls the gas outlet.

A discharge pipe 48 is connected to the absorption chamber 42 at the end thereof adjacent the check valve 46 and a leader pipe 50' is connected with the pipe 48 through a T connection 50' and to a cooling coil 51 in the cooling chamber 52 of a fountain 53, Fig. 4. The coil 51 is connected to a supply tank 54 from which a dispensing pipe 55 leads to a dispensing faucet 56.

The pump discharges the gas into the water in the absorption chamber which constitutes a chamber in which the absorption of gas by the water commences and the absorption continues during the flow of the mixture through the discharge pipe 48 and leader pipe 50 and is completed during the tumbling action of the mixture while flowing through the coil. The cooling chamber 52 is filled with brine or other cooling medium for cooling the water and gas mixture flowing through the coil and supply tank.

The water enters the carbonating apparatus under normal city water pressure which is comparatively low, and the gas from the drum enters the apparatus at about seventy-five pounds per square inch and in a volume substantially equivalent to the volume of the water but at atmospheric pressure this volume of gas would be about six times the volume of water.

It is necessary for modern requirements that the apparatus be automatic in action to maintain a constant supply of carbonated water. As the carbonated water is dispensed at the faucet a drop in pressure is communicated back into the displacement chamber but it is not satisfactory merely to provide an automatic pressure switch in the line to control the action of the apparatus because this would result in frequent starting and stopping of the motor due to the rise and fall of pressure in the line between the faucet and the pump and also to the pulsations of the pump. To overcome this I provide the T 50' with a pipe 58, Fig. 2, which has a branch 58' connected to a cushion chamber 59 of any suitable type, and a branch 58'' connected to a control device 60 for the automatic pressure switch 61. A gauge 62 forms part of the control device for indicating the pressure at the control

device in the line. A disk or gasket 63 having a restricted opening 64, Fig. 5, is provided somewhere in the line between the cushion chamber, control device, automatic switch, and the rest of the apparatus, and is preferably located at 65, Fig. 2.

The operation of the apparatus is as follows:— On movement of the piston to the left, Fig. 3, water which has been admitted to the displacement chamber will be forced through the port 39 and past the check valve 40 into the absorption chamber 42 and at the same time gas from the drum unseats the check valve 44 and enters the displacement chamber on the right side of the piston. The piston then moves to the right closing the check valve 44 and forcing the gas from the displacement chamber through the port 45 and past the ball check valve 46 into the absorption chamber to aerate water therein. Gas forced through the port 45 flows around the ball check valve 46 to be dispersed thereby and this makes for more complete aeration. The ball check valve 46 is closed by the pressure in the absorption chamber on the movement of the piston to the left and the check valve 40 is closed by the pressure in the absorption chamber on the movement of the piston to the right. Thus the water and gas are forced into the absorption chamber alternately in substantially proportional volumes and a fresh charge of water is forced into the absorption chamber prior to each gas injection, and the incoming water forces the previously aerated water out of the displacement chamber and therefore each gas injection is made into a fresh charge of water which insures efficient aeration. The water begins to absorb the gas in the absorption chamber 42 and this absorption continues during the flow of water in the leader pipe and is completed in the coil and tank. The pipe 55 extends to the bottom of the tank 54 so that the water dispensed at the faucet will be drawn from the bottom of the tank and thus avoid drawing off any free gas which may accumulate at the top of the tank.

The pressure in the system will be reduced every time the faucet is opened to dispense carbonated water and if no provision were made to control the operation of the switch under this condition it would throw on and cause the pump to operate. This would result in throwing the pump into operation when the faucet opens and throwing it out of operation when the faucet closes thus making the apparatus unnecessarily sensitive and uneconomical in operation. I prefer that the pump should operate only after a number of glasses, six or eight for example, of carbonated water have been dispensed and I accomplish this by providing for the restricted flow of water through the opening 64, and I also eliminate the effect on the switch of pulsations in the line produced by the pump by providing the cushion chamber 59. The pressure in the control unit comprising the cushion chamber 59, the control device 60, and the connecting pipes to and including the disk 63, will not be affected by opening and closing the faucet as quickly as the pressure in the rest of the system because the flow of carbonated water from or to the control unit is reduced by the restricted opening 64. The pressure in the control unit will not reduce to the extent or as quickly as the pressure in the rest of the system when the faucet is opened to dispense a glass of carbonated water because the water in the control unit must flow through the restricted opening 64 at a slow rate of speed

compared with the flow from the faucet and the reduction in pressure in the control unit will not be sufficient to cause the switch to throw on until a predetermined quantity of carbonated water has been dispensed. When the pump has again built up the pressure to a predetermined amount the switch will be thrown off and the pump stopped. I have reduced the normal pressure of gas to be used in carbonating water about one-half and this low pressure is maintained throughout all parts of the apparatus so that at the dispensing faucet the pressure is approximately one-half of that formerly required. For this reason when carbonated water is dispensed from the faucet much less violent action of the water occurs and the quantity of gas that escapes is correspondingly reduced. My invention thus makes it possible to maintain the quality of the carbonated water dispensed at the fountain faucet according to present standards by using approximately one-half of the gas pressure heretofore required and this not only represents a considerable saving but it also tends to increase the uniformity of the product.

I prefer to introduce the water into the pump on the side of the piston on which the piston rod is located because the rod reduces the capacity of the displacement chamber to some extent and it is better to reduce the water volume than the gas volume and also because the water will absorb any leakage of gas past the piston.

I do not limit the invention to the specific form, construction and arrangement of parts of the selected embodiment herein shown and described but desire to avail myself of any changes, alterations and rearrangement of parts as may fairly fall within the scope of the following claims.

I claim:

1. A carbonating apparatus comprising a unit embodying an absorption chamber and a displacement chamber, a piston in said displacement chamber, means on opposite sides of said piston to establish communication between said displacement chamber and said absorption chamber, valves in said communicating means, means supplying water to said displacement chamber on one side of said piston and having a valve controlling flow therethrough, means supplying gas to said displacement chamber on the other side of said piston and having a valve controlling flow therethrough, power operated means reciprocating said piston in said displacement chamber whereby gas is drawn into said displacement chamber and water is discharged therefrom into said absorption chamber as said piston moves in one direction and water is drawn into said displacement chamber and gas is forced therefrom into said absorption chamber as said piston moves in the other direction, a coil, a pipe interconnecting said absorption chamber and said coil whereby water and gas from said absorption chamber may pass through said pipe to said coil so that the water will absorb the gas during flow thereof to and through said coil, discharge means for said coil, a connector communicating with said pipe and having pressure responsive means connected thereto for regulating the operation of said power operated means, cushioning means communicating with said connector and into which water and gas flowing through said pipe may pass, and means in said connector intermediate the pressure operated means and the cushioning means and the pipe and having a restricted orifice therein to prevent rapid reduction of pres-

sure in said pressure operated means and said cushioning means when said discharge means is open.

2. A carbonating apparatus comprising a unit embodying an elongated absorption chamber having an outlet to which a distributing pipe is connected, a water inlet for said absorption chamber and connected thereto at a point remote from the outlet, a valve for controlling flow through said inlet, a gas inlet for said absorption chamber and connected thereto in spaced relation with the water inlet and adjacent the outlet and leading into said absorption chamber in a direction substantially normal to the extent of a charge of water stored therein, a valve for controlling flow through said gas inlet, and power operated means for injecting gas and water into said absorption chamber through the respective gas and water inlets alternately whereby said valves are alternately opened and closed, said power operated means injecting a fresh charge of water into said absorption chamber to be aerated by the subsequent gas injection therein, each fresh charge of water forcing the previous aerated charge of water through said outlet and into said pipe, the valve in said gas inlet dispersing the gas as it is injected into the water.

3. A carbonating apparatus comprising a unit embodying an elongated absorption chamber having an outlet to which a distributing pipe is connected, a water inlet for said absorption chamber and connected thereto at a point remote from the outlet, a gas inlet for said absorption chamber and connected thereto in spaced relation with the water inlet and adjacent the outlet and leading into said absorption chamber in a direction substantially normal to the extent of a charge of water therein, means for injecting gas and water into said absorption chamber through the respective gas and water inlets alternately whereby a fresh charge of water is injected into said absorption chamber to be aerated by the subsequent gas injection therein, each fresh injection of water forcing the previously aerated charge of water through said outlet and into said pipe, and means in said gas inlet for dispersing the gas injected into said absorption chamber to insure efficient aeration of each fresh charge of water.

4. A carbonating apparatus comprising a unit embodying an elongated absorption chamber having an outlet to which a distributing pipe is connected, a water inlet for said absorption chamber and connected thereto at a point remote from the outlet, a valve for controlling flow through said inlet, a gas inlet for said absorption chamber and connected thereto in spaced relation with the water inlet and adjacent the outlet and leading into said absorption chamber in a direction substantially normal to the extent of a charge of water therein, a ball valve for controlling flow through said gas inlet, and power operated means for injecting gas and water into said absorption chamber through the respective gas and water inlets alternately whereby said valves are alternately opened and closed, said power means injecting a fresh charge of water into said absorption chamber to be aerated by the subsequent gas injection therein, each fresh charge of water forcing the previously aerated charge of water through said outlet and into said pipe, said ball valve being positioned to disperse the gas as it is injected into the water to insure efficient aeration of each fresh charge of water.

WILLIAM C. BUTTNER.