(No Model.) 3 Sheets—Sheet 1.

P. E. MALMSTROM.

APPARATUS FOR CARBONATING AND DISPENSING LIQUIDS.

No. 603,404. Patented May 3, 1898.

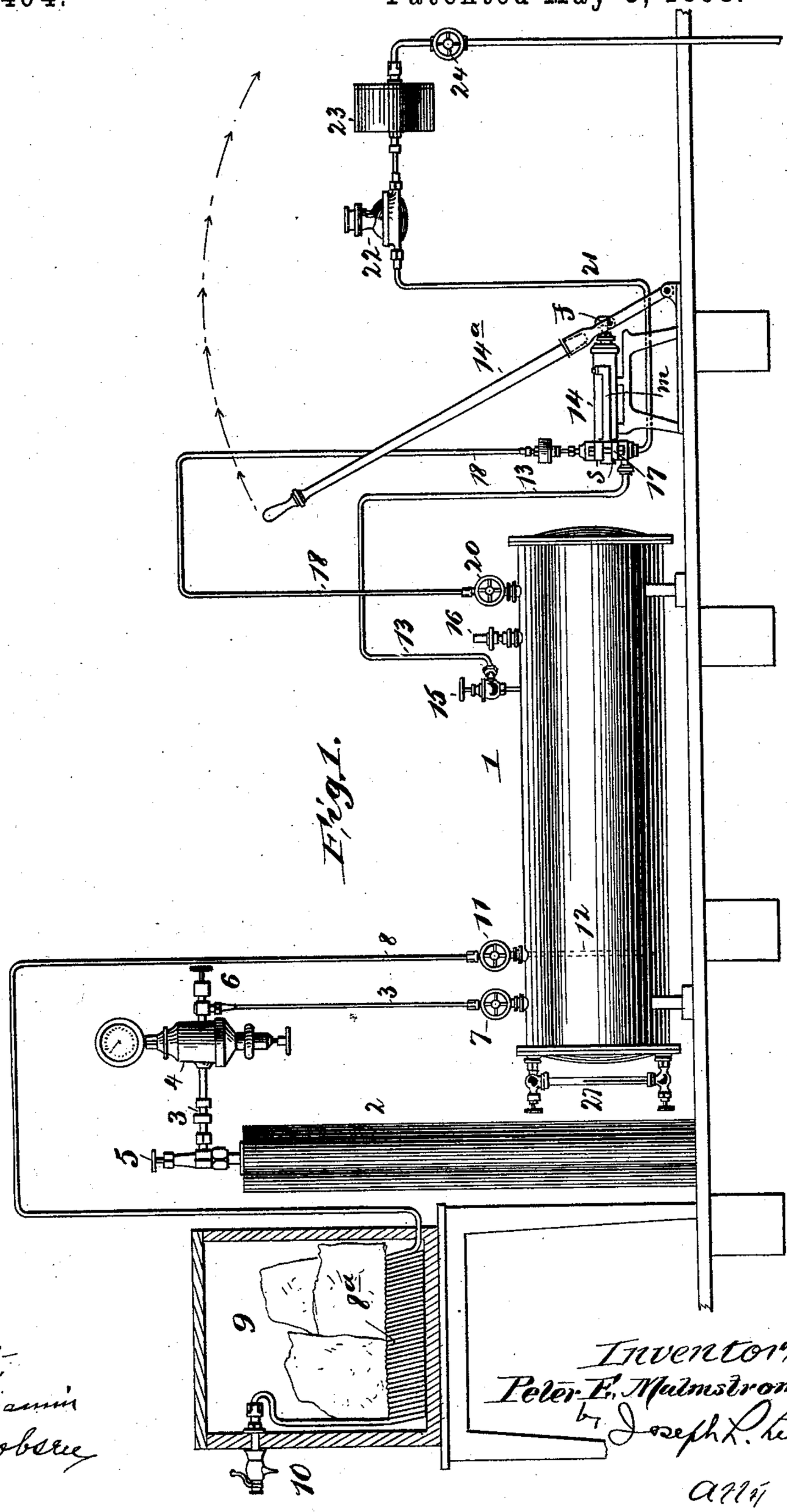

Fig. 1.

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Inventor:
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by Joseph L. Lucy
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(No Model.) 3 Sheets—Sheet 2.

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Fig. 7.

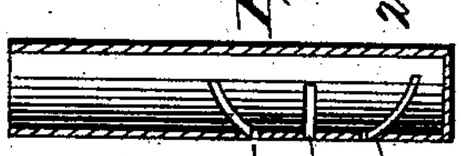

Fig. 6.

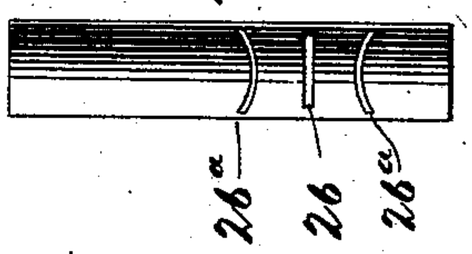

Fig 5

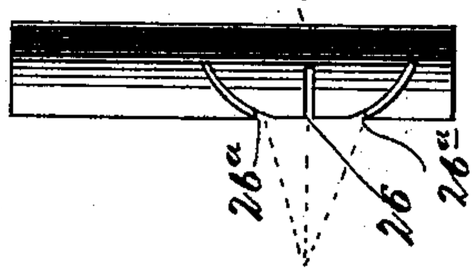

Fig. 2.

Fig. 3.

Fig. 8.

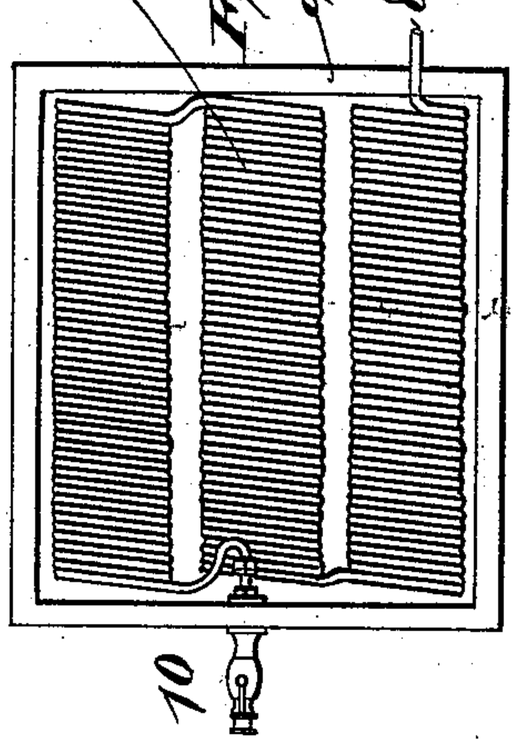

Fig. 4.

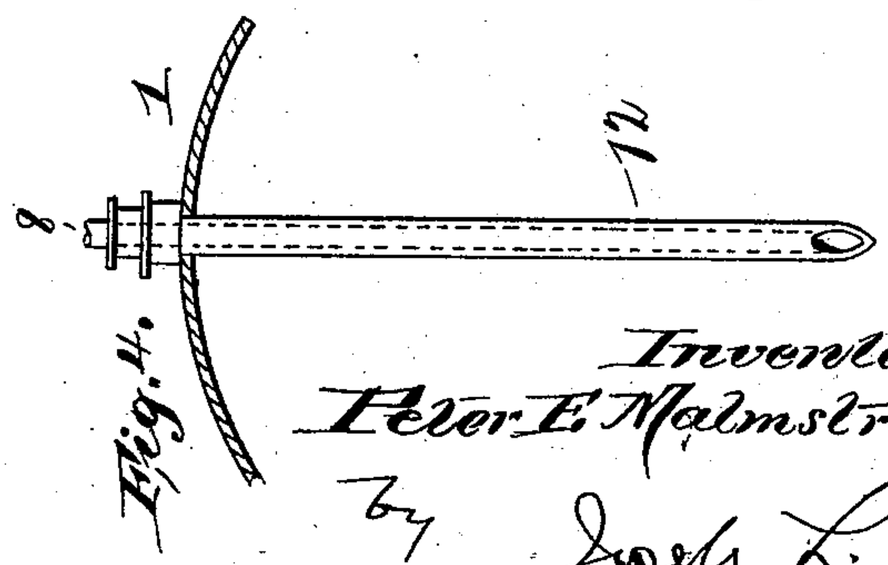

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Fig. 9.

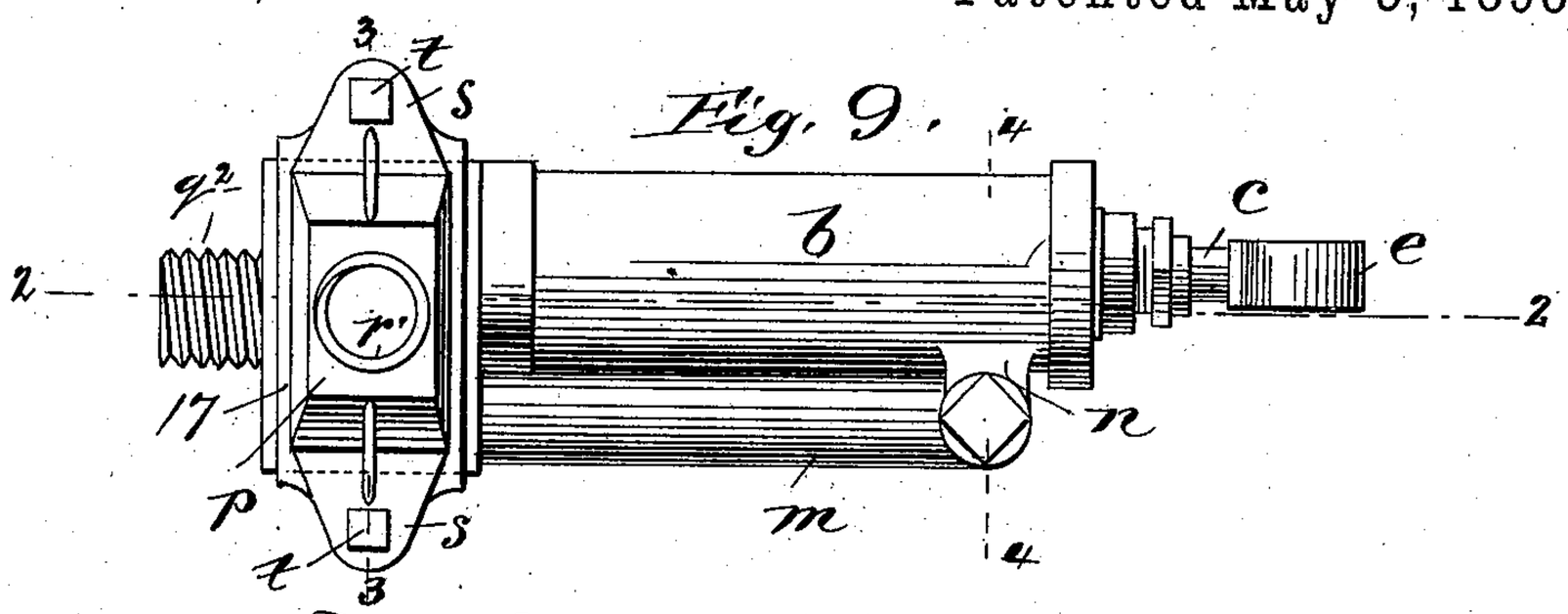


Fig. 10.

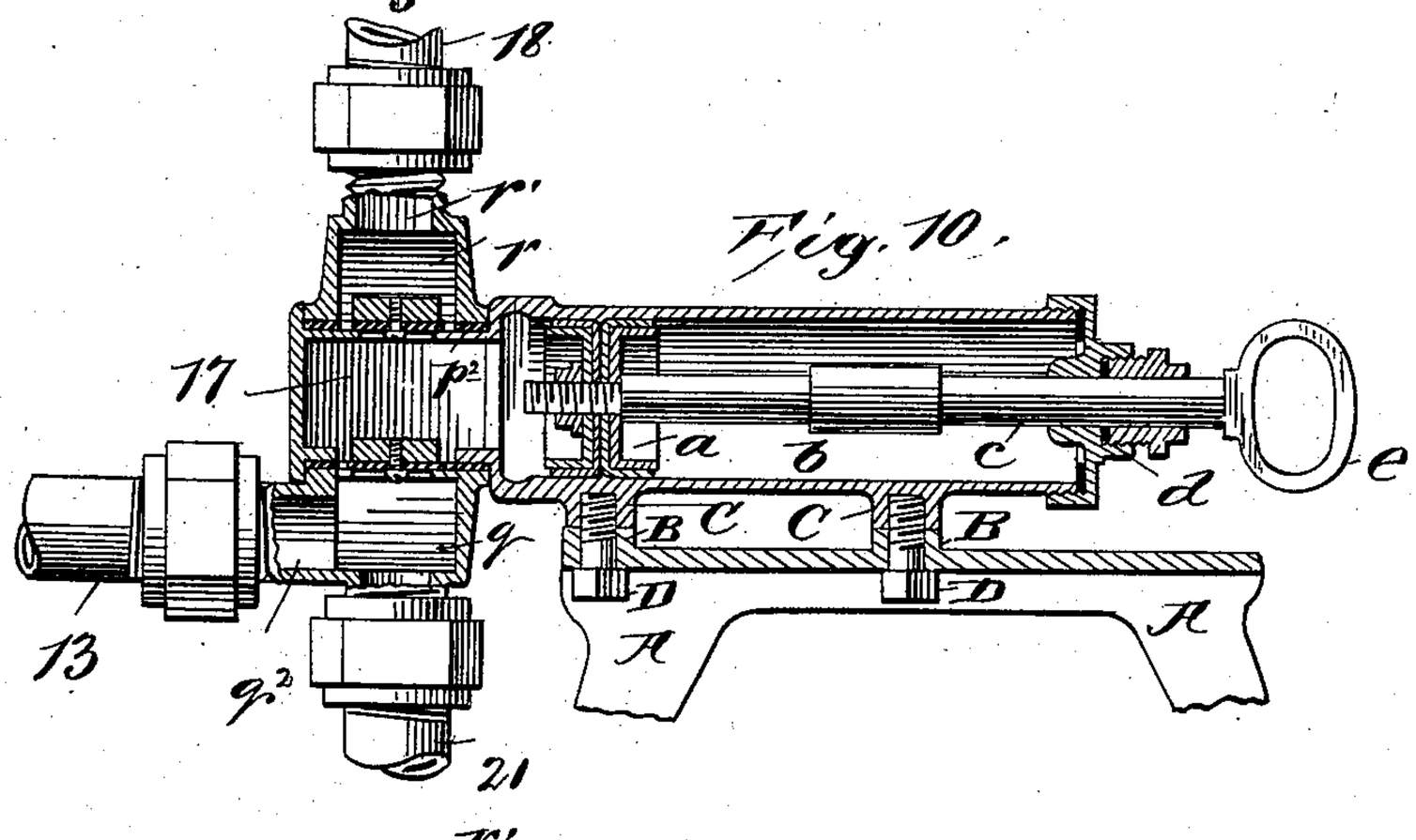


Fig. 11.

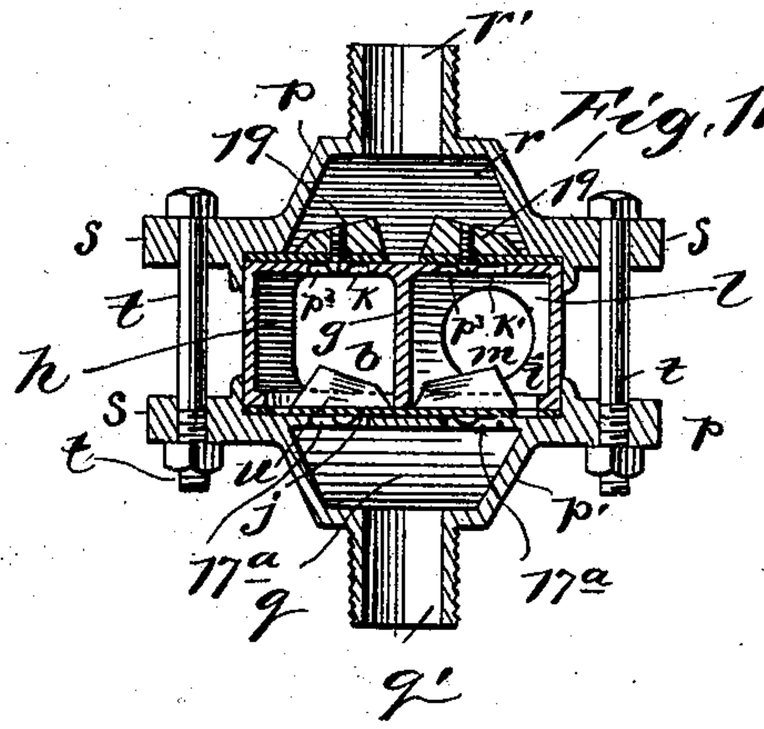
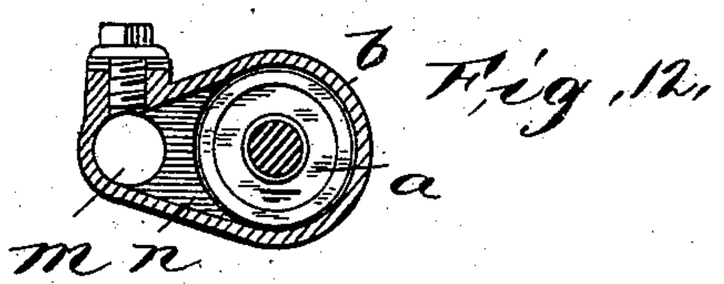


Fig. 12.



WITNESSES

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APPARATUS FOR CARBONATING AND DISPENSING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 603,404, dated May 3, 1898.

Application filed November 30, 1896. Serial No. 613,912. (No model.)

To all whom it may concern:

Be it known that I, PETER E. MALMSTROM, a citizen of the United States, residing in the city, county, and State of New York, have invented a certain new and useful Apparatus for Carbonating and Dispensing Liquids, of which the following is a specification.

My invention relates primarily to improved means for carbonating water or other liquid, or, in other words, of mixing water with gas, such as carbonic-acid gas; and the invention also relates to improvements in an apparatus whereby the liquid and gas can be properly commingled and a supply kept constantly on hand with very little trouble.

My invention has for its object to do away with the employment of a number of gas-holders for supplying fountains where carbonized liquids are dispensed and to provide an apparatus for the carrying out of my process of carbonizing which will be an adjunct of the dispensing-fountain and with which the water or other liquid can be carbonized at will and as wanted.

Briefly, according to my invention, the gas in starting the carbonating operation is allowed to pass from the gas-tank under a regulated pressure into a suitable chamber, whence it is allowed to pass to a force-pump, where the gas and water from a suitable source of supply are allowed to commingle, the gas passing from the carbonating-chamber into the pump under a pressure preferably about equal to the pressure or the head of water. The gas and water are then forced by the pump back into the carbonating-chamber, where the water is sprayed or split up in fine particles, settling at the bottom of the chamber, the gas freeing itself from the water and settling at the top of the said chamber. This completes the first or initial step in the carbonizing process, at which time there may or may not be enough carbonized water in the chamber for use; but to more thoroughly charge the water and to provide a supply sufficiently large I proceed as follows: The force-pump is again operated, the free gas in the carbonating-chamber again passing or being drawn into the pump, there commingling with a fresh supply of water, and is again forced by the pump back into the said chamber, being again split up, and by repeating this operation the primary charge or residue of the charge of gas in the chamber may be repeatedly drawn off and commingled with a fresh supply of water, thoroughly carbonizing the water and avoiding the necessity of using a fresh supply of gas for a fresh supply of water. The practicing of this part of my invention has many other advantages in part hereinafter referred to.

The apparatus by means of which my invention may be practiced consists in a mixing or storage chamber or cylinder adapted to be connected with a gas-holder, a pump connected with said chamber or cylinder by two pipes, one of which is adapted to convey gas to a chamber in the pump, the other of which pipes is adapted to convey a mixture of gas and liquid to the main chamber or cylinder from said pump, and means for supplying the chamber of said pump with water, and suitable valves are provided for regulating the passage of gas and liquid to the pump and its passage therefrom to the main cylinder. Suitable valves and a gas-pressure indicator are arranged between the gas-holder and the main cylinder, whereby the supply and pressure of the gas to the latter can be regulated, and like devices are also provided whereby the pressure under which the gas passes to the pump-cylinder may be regulated.

The invention further consists in the novel details of improvement and the combination of parts that will be more fully hereinafter set forth, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part hereof, wherein—

Figure 1 is a side elevation of an apparatus embodying my invention and with which my process can be carried out. Fig. 2 is a vertical longitudinal section of the main storage or mixing chamber or reservoir, showing the inlet and outlet passages and valves. Fig. 3 is a sectional elevation on the line $x\ x$ in Fig. 2. Fig. 4 is an enlarged detail view, partly in section, showing the outlet for the carbonated liquid from the main cylinder. Fig. 5 is an enlarged side view of the inlet or nozzle that leads from the pump into the main cylinder. Fig. 6 is a front view of the same, and Fig. 7 is a central vertical section of the

inlet or nozzle as shown in Fig. 5. Fig. 8 is a plan view of a coil-chamber for cooling the carbonated liquid as it is drawn for use. Fig. 9 is a plan view, enlarged, of the force-pump and commingling-chamber. Fig. 10 is a sectional elevation of the same on the plane of line 2 2, Fig. 9. Fig. 11 is a transverse sectional elevation of the commingling-chamber on the plane of line 3 3, Fig. 9; and Fig. 12 is a transverse sectional elevation on the plane of the line 4 4, Fig. 9.

In the accompanying drawings, in which similar letters and numerals of reference indicate corresponding parts in the several views, the number 1 indicates a cylinder or carbonating-chamber of suitable construction, which may be supported in any suitable manner.

2 is a gas holder or cylinder connected with the cylinder 1 by a pipe 3, that opens into the upper part of cylinder 1.

4 is a suitable gas-pressure indicator and regulator interposed in pipe 3, between the holder 2 and cylinder 1.

At 5 is a valve in pipe 3, between the holder 2 and the indicator 4, and 6 is a valve in pipe 3, between said indicator and the cylinder 1. With this arrangement when valve 5 is opened and valve 6 closed the indicator 4 will show the gas-pressure in holder 2, and when valve 5 is closed and valve 6 opened the indicator will show the gas-pressure in cylinder 1. When both of said valves are opened, gas may pass from holder 2 into cylinder 1.

At 7 is a valve connected with cylinder 1 and with pipe 3, whereby pipe 3 can be disconnected from cylinder 1, if desired, without permitting the escape of gas from cylinder 1.

At 8 is a pipe which leads from cylinder 1 to an ice-box or cooler 9, a coil of pipe 8^a being preferably located in said box and connecting the pipe 8 with a dispensing-faucet 10.

At 11 is a valve in pipe 8 to regulate the passage of the carbonated water from cylinder 1.

At 12 is a pipe or tube within cylinder 1 and which leads from pipe 8 to the lower part of cylinder 1 to conduct the carbonated liquid to pipe 8.

At 13 is a pipe which connects the upper area of cylinder 1 with a pump 14 of suitable construction, a valve 15 being placed in the pipe 13 to regulate the passage of gas from cylinder 1 to the pump 14, the valve 15 being preferably an automatic regulator-valve arranged to permit the passage of gas after the latter has reached a certain pressure.

At 16 is a suitable safety-valve in cylinder 1.

The pump 14, which is preferably constructed as shown, has a chamber 17, to which the pipe 13 leads, duplicate valves 17^a being arranged to permit gas to pass from the pipe 13 into said chamber, but to prevent it from passing back into said pipe.

At 18 is a pipe that leads from the cylinder 1 to the chamber 17 of pump 14, duplicate valves 19 being arranged in the chamber 17 to prevent gas from passing into chamber 17 through pipe 18, but arranged to permit liquid and gas to be forced through said pipe from chamber 17 to cylinder 1.

At 20 is a valve in pipe 18 to regulate the flow of gas and liquid into or from cylinder 1, and the chamber 17 of pump 14 is connected by a pipe 21 with a water-main or other source of supply, 22 being a water-meter, 23 a filter, and 24 a valve, all connected with pipe 21.

As before stated, the pump 14 may be of suitable construction; but I prefer that it be so arranged that when its piston a is operated by the lever 14^a or otherwise in either direction a charge of gas from cylinder 1 and a charge of water from pipe 21 will be drawn into chamber 17 and will be mixed therein and forced by the pump through pipe 18 into cylinder 1, as hereinafter described. To accomplish this result, the pump is constructed as follows: At b is the usual cylinder, in which works the piston a, the piston-rod c passing through the packing d in the usual way, the rod having the ring e, which engages with a stud f on the lever 14^a. The cylinder b opens into the chamber 17 at one end, which chamber is divided by a septum g into two compartments h i, the top of the chamber having an integral roof j, provided with apertures k', which open into the compartments h i, above which lie the duplicate valves formed from a sheet of rubber fabric l and weighted in the usual manner.

At m is a by-pass formed with the cylinder b, which connects at one end with the cylinder by means of the post n and at the other end with the compartment i in the chamber 17, so that by one stroke of the piston a in either direction the gas and water in either of the compartments b i will be forced through the respective valve 19 into the pipe 18, thence into cylinder 1.

In order to make a good construction and to properly connect each of the compartments h i with the source of supply and exit, I provide two clamps p p', clamp p' having an apertured roof p^2, the apertures p^3 of which lead into the compartments h i and over which the valves 17^a are seated, which apertures p^3 also lead into or from a commingling-chamber q, formed in the clamp, from which latter chamber leads a threaded nipple q', which connects with the water-supply pipe 21, and a further nipple q^2, which leads to the gas-supply pipe 13. The upper clamp p is also provided with a chamber r, from which extends a nipple r', which connects with the pipe 18 and in which the valves 19 lie, the compartments h i opening into the chamber.

Both of the clamps p p' are provided with ears s, through which pass bolts t for securing the clamps down on the chamber 17, each of the clamps having recessed seats u, in which the rubber fabric j' of the valves is held.

A stand A, having nipples B, supports the

cylinder *b*, which is also provided with nipples C, through both of which nipples bolts D pass to hold the pump on the stand.

The double-acting force-pump thus formed enables the commingled gas and water to be forced back into the cylinder 1 very rapidly, and it is to secure this advantage, as well as to secure the employment of the commingling-chamber *q* distinct from the chamber 17, that I prefer this construction; but it is apparent that other forms of force-pumps can be employed without altering the nature of my process, the only essentials in this regard being a receiving or commingling chamber, suitable check-valves, and a force-pump.

In order to enable the liquid that passes into cylinder 1 through the pipe 18 to be distributed in one or more thin sheets and be more readily mingled with the gas in the upper area of the cylinder 1, I have provided an inlet nozzle or tube 25, which is located within the cylinder 1 and connected with pipe 18. (See Figs. 2 to 7.) The nozzle 25 is in the form of a tube having its lower end closed and one side wall provided with one or more narrow slits 26 26ª. The slit 26 is shown horizontally arranged, and the slits 26ª are segmental and respectively upwardly and downwardly inclined. This arrangement of the slits causes the liquid to issue from the tube 25 in one or more thin sheets, and when the slits 26 26ª are arranged as shown in Figs. 2 to 7, inclusive, the sheets of liquid issuing therefrom will be broken up and cause the liquid and gas in cylinder 1 to intimately commingle.

At 27 is a suitable water-gage connected with cylinder 1.

The operation of the apparatus may be described as follows: The parts being connected together, as shown in Fig. 1, valves 5, 6, and 7 are opened, so as to allow gas from holder 2 to pass into cylinder 1 under the desired pressure and to the desired volume, and when the desired volume of gas is in the cylinder 1 the valve 7 is closed and kept closed during the carbonating process. Valves 15 and 20 are then opened, whereby gas from cylinder 1 may pass to chamber 17 (or *q*) of pump 14, the valves 19 preventing the gas from passing to chamber 17 (or *h i*) through pipe 18. The valve 24 is also opened to allow water to pass to chamber 17 (or *q*) of pump 14, where the gas and water commingle in a measure. Pump 14 is now operated and when the piston is moving in one direction draws the gas and water into chamber 17, (or *h i*,) where they will mix, and when the piston moves in the opposite direction the gas and air in chamber 17 (or *h i*) are caused to commingle by the pressure applied by the piston and the mixture of gas and liquid is forced from the pump through pipe 18 into cylinder 1. The carbonated liquid passes from nozzle 25 in thin sheets, which by the inclination given the slits will be broken up into fine particles, and, passing through the upper area of the cylinder, absorbs more gas and finally falls to the bottom thereof. There should be an excess of gas in cylinder 1 over the liquid therein, so that the gas can continually be drawn from cylinder 1 into pump 14 during the operation. After a sufficient quantity of liquid has been commingled with gas and passed into cylinder 1 the pump can be stopped and valves 15, 20, and 24 closed to retain the carbonated liquid in cylinder 1. Valve 11 can then be opened and the carbonated liquid drawn off as desired, which valve may be kept open during the carbonating process to allow of a quantity of the carbonated liquid to be cooled in the coil. This operation by being repeated—that is, by continually using the same volume of gas in the cylinder 1 over and over to carbonate a fresh supply of water—thoroughly carbonates the water in the cylinder 1, the volume of which can be determined by the gage 27, and the valve 16 prevents too great a pressure being generated in the cylinder.

It is evident that if it is desired to produce the carbonated liquid in quantity for storage the valves 5, 6, 7, 15, 20, and 24 can be kept open as much as desired and the pump kept working, so that the carbonated liquid can be drawn off from the cylinder 1 as fast as it is produced.

Having now described my invention, what I claim is—

1. In an apparatus for carbonating liquids, a cylinder or vessel connected by a pipe with a gas-holder, a pump exterior to and connected with said cylinder by two pipes, both of said pipes being independent of the pipe from the gas-holder, means for supplying said pump with a liquid, and valves to control the passage of gas from said cylinder to said pump through one pipe, and to control the passage of the same gas and a liquid from said pump to said cylinder through the other pipe, substantially as described.

2. The combination of a cylinder or vessel, a pump, a pipe connecting them for the passage of gas to the pump, a pipe connecting said cylinder with said pump for the passage of liquid from the latter to the former, valves to control the passage through said pipes, and a nozzle connected with the second-mentioned pipe within said cylinder, said nozzle having its end closed and slits in its side arranged to converge toward a point exterior thereto, substantially as described.

3. The combination with the gas-holder 2, a force-pump having a compression-chamber, the cylinder 1, pipes and controlling devices connecting the gas-holder with the pump-chamber through the gas-space of cylinder 1, a return-pipe connecting the pump and gas-space of cylinder 1 independently of the latter's connection with the gas-holder, and a source of liquid-supply connected with the pump-chamber, substantially as described.

4. The combination with the detachable gas-holder 2, a force-pump having a compres-

sion-chamber, the cylinder 1, pipes and devices controlling the passage of the gas from the holder through the gas-space of the cylinder to the pump-chamber, a return-pipe connecting the pump-chamber and gas-space of the cylinder, and a source of liquid-supply connected with the pump-chamber, a dispensing-faucet, the cooling-chamber, a coil in said chamber, and pipes connecting the liquid-space of the cylinder 1 with the coil and the latter with the faucet independently of the before-mentioned pipes, substantially as described.

5. The combination with the gas-holder 2, a force-pump, the cylinder 1, pipes and devices controlling the passage therethrough, said pipes connecting the gas-holder with the pump through the cylinder, a return-pipe connecting the pump and cylinder, and a source of liquid-supply connected with the pump, a dispensing-faucet, the cooling-chamber, a coil in said chamber, and pipes connecting the cylinder 1 with the coil and the latter with the faucet, substantially as described.

6. The combination with the gas-holder 2, the cylinder 1, a force-pump, a pipe connecting the inlet of the pump with the cylinder 1, a water-supply connected with said inlet, a pipe leading from the outlet of the pump to said cylinder 1, a pipe connecting the gas-holder and cylinder 1, and means for equalizing the water and gas pressure at the pump-inlet, substantially as described.

7. The combination with the gas-holder, the cylinder 1, the pipe 12 leading to the fluid-space in said cylinder and extending exteriorly of the cylinder by a pipe 8 to a suitable dispenser, a pipe 3 extending between the gas-holder 2 and the gas-space in cylinder 1, a pipe 13 leading from the gas-space in the cylinder to a force-pump, a pipe 21 leading to the pump from a fluid-supply, and a pipe 18 leading from the pump and terminating in the split nozzle 25 extending into the gas-space of the cylinder 1, substantially as described.

8. In a device for carbonating liquids the combination with the longitudinally-disposed cylinder 12, the gas-holder 2, the valve-regulated pipe 3 leading from the holder to the gas-space of said cylinder, a pump having a compression-chamber, a pipe 21 leading from a liquid-supply to the inlet of said chamber, a pipe 13 leading from the gas-space of said cylinder to said pump-chamber, and a pipe 18 leading from said pump-chamber to the gas-space in said cylinder and provided at its end with a slotted tube, substantially as described.

9. In a device for carbonating liquids, the combination with the horizontally-disposed cylinder 12, the gas-holder 2, the valve-regulated pipe 3 leading from the holder to the gas-space of said cylinder, a pump having a commingling and compression chamber comprising two separate and valve-controlled compression-compartments, a barrel having a plunger in communication with one of the compartments, and a by-pass in communication with the barrel and the other compartment, inlet and outlet compartments above and below the compression-compartments, a pipe 21 leading to the inlet-compartment, a pipe 13 leading from the gas-space of cylinder 12 to said inlet-compartment, a pipe 18 leading from the outlet-compartment to the gas-space of said cylinder, and means for operating said plunger, substantially as described.

10. In a device for carbonating and dispensing liquids, the combination with the horizontally-disposed cylinder 12, the gas-holder 2, the valve-regulated pipe 3 leading from the holder to the gas-space of said cylinder, a pump having a compression-chamber, a pipe 21, leading from a liquid-supply to the inlet of said chamber, a pipe 13 leading from the gas-space of said cylinder to said pump-chamber, a pipe 18 leading from said pump-chamber to the gas-space in said cylinder, a pipe 12 leading from the bottom of said cylinder, a cooling-box, a pipe-coil in said box, a pipe 8 leading from the pipe 12 to one end of said coil and having a valve 11, and a faucet 10 exterior to said box and in communication with the other end of said coil, substantially as described.

Signed at the city, county, and State of New York, this 28th day of November, 1896.

PETER E. MALMSTROM.

Witnesses:
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WILLIAM JACOBSEN.