O. ZWIETUSCH.

CARBONIC ACID GAS-GENERATOR.

No. 191,912. Patented June 12, 1877.

Fig. 1.

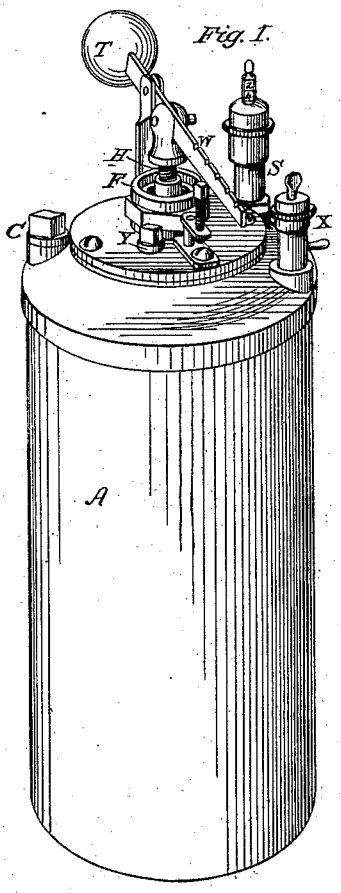


Fig. 2.

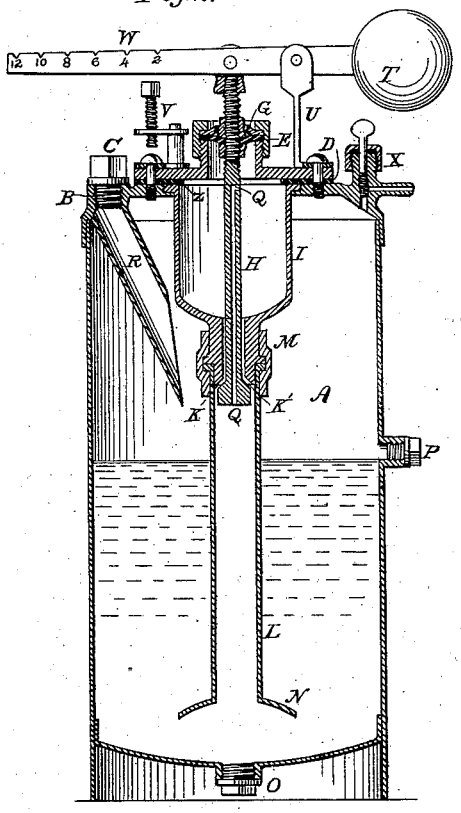
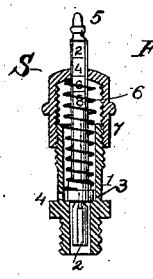


Fig. 3.



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OTTO ZWIETUSCH, OF MILWAUKEE, WISCONSIN.

IMPROVEMENT IN CARBONIC-ACID-GAS GENERATORS.

Specification forming part of Letters Patent No. **191,912**, dated June 12, 1877; application filed April 26, 1877.

To all whom it may concern:

Be it known that I, OTTO ZWIETUSCH, of Milwaukee, Wisconsin, have invented certain new and useful Improvements in Carbonic-Acid-Gas Generators, of which the following is a clear, full, and exact description, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of a carbonic-acid-gas generator with my improvements attached. Fig. 2 is a vertical section of same. Fig. 3 is a vertical section of the safety-valve detached from the machine.

My invention relates to carbonic-acid-gas generators constructed so as to operate automatically, and such as are especially used for preserving and forcing beer by means of the carbonic-acid gas; and it consists in the several combinations and arrangements of parts hereinafter described and claimed, whereby the gas is purified in the same chamber in which it is partly generated, thereby avoiding the aid and expense of all extra purifiers or washers.

To enable others skilled in the art to make and use my invention, I will proceed to describe the exact manner in which I have carried it out.

In the drawings, A represents the generating apparatus, with the cover B preferably cast in one piece. C is an opening in cover B for the introduction of water and alkalies. D is an upper cover, screwed on cover B, and provided with a rubber packing, and having secured to it the elastic diaphragm E and the washer G by means of the screw-cap F. The washer G is for the protection of the elastic diaphragm, and prevents too much upward expansion. A vent-rod or valve-stem, H, made of brass, with a lead covering or lining, passes down through the acid-chamber I, and is provided at its lower end with a valve, K, fitting in the valve-seat K′. This vent-rod H is partly hollow, furnishing a channel for leading the gas from the generating-chamber A and pipe L into the acid-chamber, where it acts as an equalizer by its pressure on the diaphragm E. The upper end of the rod H passes through the center of the diaphragm, which is secured to the rod by means of two screw-nuts, or in any other convenient manner. The pipe L leads the acid toward the bottom of the chamber A, and is secured to the stone or glass acid-chamber I by means of a coupling, M, of rubber tubing, as shown in Fig. 1. At the lower end of the pipe L, I form a convex-flanged catch, N, to catch the generated gas and lead it through pipe L and hollow rod H into the acid-chamber I, to act on the diaphragm E. The position of the convex flange N is somewhat above the bottom of the generator A, which is provided with the discharge-opening O for removing refuse matter. On the side of the generating-chamber I place the opening P, at a point to which the chamber is to be filled with liquid. Q is the lower point of the channel through the vent-rod or valve-stem H. Leading from the opening C in the top B is the transfer-pipe R, to convey the alkalies toward the center of the generator. S, Fig. 3, represents the safety-valve. T is a weighted lever connected with the rod H, and resting in the bail U. This lever causes the valve K on the lower end of the rod to rest in its seat K′ when the apparatus is not in operation. V is a bail for supporting the set-screw, which stops the long arm of the lever T, thus securing an adjustment of the rod H and its valve, and guarding against too much stretching of the diaphragm E in its downward movements. On the long arm of the lever T is a scale to regulate the pressure of weight upon the rod H. Gas is allowed to escape from the generator through the stop-cock X. The inlet Y is for the introduction of the acid in the chamber I. Z is a rubber packing between cover B and D, which also tightens the acid-chamber I. In Fig. 3 the barrel 1 is provided with inlet 2, vent-seat 3, and outlet 4.

5 is a valve-rod, with indicating-marks at the upper end; 6, a spring around the valve-rod 5; 7, a regulating-cap, which presses on spring 6. As the regulating-cap is set to the indicating-rod, so will be the pressure, and all pressure greater than that will escape. If acid-chamber I is made of glass or stone, it is hung in cover B, as shown in Fig. 1, and tightened by a rubber packing, Z, and cover D, and at coupling M the acid-leading pipe L is fastened to the same. Glass chambers are

preferable, but by making them of lead they may be soldered directly to cover D and pipe L. The diameter of funnel N should be made nearly the diameter of the opening in cover B, so that the acid-chamber, its connections, and pipe L, with its funnel-shaped outlet, can be taken out easily and together for inspection or repair. Washer G, as well as set-screw on bail V, are mediums for the prevention of too great expansion of diaphragm E, as, by a high pressure, it presses against the washer, and the tension is checked. On the contrary, when the acid-valve is opened the whole strength of the weights would act upon the rubber diphragm if not prevented by the set-screw under the long arm of the lever.

My improved apparatus operates in the following manner:

Fill the apparatus, through openings C, with water to opening P. Then add a quantity of bicarbonate of soda, a little more in quantity than the acid in proportion would absorb through the same opening, and it will be carried to the center of the chamber by means of the pipe R. One part of the alkali is dissolved by the water, while the other settles in the generating-chamber A. The weighted lever T keeps the acid-valve constantly closed if the scale-end of the lever is not provided with weights. The necessary quantity of sulphuric acid is added through opening Y, and only so much in proportion to the alkalies that when all the acid is used a residue of alkali remains in the water.

After all openings are closed a suitable weight is hung to the lever on the scale-marks W, by which the valve K is opened. Acid flows then through pipe L directly on the soda lying below, and produces carbonic-acid gas. Part of the gas produced in this way passes first upward, by means of convex-flanged catch N, into pipe L, through channel Q into the acid-chamber I, and acts against the flexible diaphragm E, by which the valve K is closed and the flow of the acid stopped. The balance of the generated gas passes through the water saturated well with bicarbonate of soda, by which it is thoroughly purified, and then concentrates in the upper part of the apparatus. By opening the cock X the carbonic-acid gas is led to the beer. Now, when the pressure diminishes above the liquid in the generating-chamber, the gas contained in the acid-chamber, which has previously passed into it, passes downward through channel Q, and presses upon the liquid in pipe L, presses it downward, and then passes out beneath the convex-flanged catch N, through the soda solution, into the upper part of the generating-chamber. At the same time the pipe L is emptied of the liquid contained therein, and stays empty, because the pressure in acid-chamber I and pipe L is always so much greater than the corresponding weight of the water-column. If the pressure in the acid-chamber I is diminished, the flexible diaphragm E is pressed downward, which causes the acid-valve K to be opened. Acid is then again allowed to flow to the alkalies, and carbonic-acid gas is again produced. In this way the apparatus operates continually and automatically as long as there is a supply of acid.

The valve K is regulated to be opened more or less, according to the setting of the screw on bail V. The well-saturated water prevents any sulphuric-acid particles being carried away by the produced gas, and the gas which reaches the acid-chamber must return through channel Q and pipe L, and pass through the purifying-liquid. In this way the gas is made to be thoroughly and chemically pure without the aid of an extra purifier, which is not the case with other machines now in use, in which the acid-chamber has openings above for the purpose of equalizing gas, because it is more liable to pass through the short acid column above, or be forced to pass through it by a high pressure contained in a pipe like L, especially when there is but little acid left in the acid-chamber, than where it has to pass through a larger column of soda solution. By that method of equalizing, the gas passes more or less unpurified through the valve into the acid-chamber when the valve is opened, and at the same time prevents a steady flow of acid through the valve, as is the case with the machine patented August 22, 1876, No. 181,268, and other machines used for the same purpose. One object of my present invention is to overcome these difficulties.

I am aware it is not new to have a hollow plunger for an equalizer; but I arrange the hollow valve-rod and a flexible diaphragm on top of the acid-chamber, also the convex-flanged acid-leading pipe near to the bottom of the generating-chamber, whereby the carbonic-acid gas comes in a more convenient and effective manner to the diaphragm E, and by which arrangement the gas which has acted as the equalizing power in the acid-chamber is led back through the purifying-liquid before it is drawn off for use. Nor is it new to lead the acid to the bottom of a carbonic-acid-gas generator, as this is done in several chemical fire-extinguishers and generators; nor is it new to lead the gas through a solution of bicarbonate of soda, as this is done by mine and other patented machines.

I have not a diaphragm or a perforated bottom in my generator, nor on the acid-leading pipe, as shown in Kayser patent. Such a perforated bottom is very dangerous, as the residue (sulphate of soda) crystallizes easily by cold weather, or by having less water than is necessary, and frequently blocks up the holes in the perforated bottom, which renders an explosion possible, and the high pressure lies against the vent so as to stop the regular operation. This I prevent by having a funnel-shaped outlet, N, attached. Through this outlet the gas is caused to concentrate in the acid chambers and pipes L and N, and as it passes out moves the crystals out of its way,

as there is plenty of room, and all danger of explosion avoided.

Having thus explained my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a carbonic-acid-gas generator, the coupling M between the chamber I and acid-leading pipe L, as described.

2. In a carbonic-acid-gas generator, in combination with diaphragm E and screw-nut F, the curved or hollow washer G, for the purpose set forth.

3. In a carbonic-acid-gas generator, the acid-chamber I and pipe L, in combination with the automatic valve K and channel Q in rod H.

4. In a carbonic-acid-gas generator, in combination with diaphragm E, rod H, and lever T, the bail, and set-screw *v*.

5. In a carbonic-acid-gas generator, the generating-chamber A, provided with inlet C, and the incline transfer-pipe R, substantially as and for the purpose set forth.

6. The diaphragm E, in combination with the rod H, having the channel Q, and provided at its lower end with a valve fitting in the valve-seat K′.

7. In a carbonic-acid-gas generator, the diaphragm E, in combination with rod H, acid-chamber I, and acid-leading pipe L, provided with the coupling M, all constructed to operate substantially as and for the purpose set forth.

8. In a carbonic-acid-gas generator, a combination of the diaphragm E and the rod H, provided with the channel Q, substantially as and for the purpose set forth.

9. In a carbonic-acid-gas generator, the combination of a closed acid-chamber having a hollow valve-rod within, and a leading-pipe attached at the lower end extending near to the bottom of the generating-chamber, the whole adapted and arranged that all the gas used as equalizing pressure must pass through the purifying solution in the generating-chamber before it is drawn off.

10. In a carbonic-acid-gas generator, the diaphragm E and rod H, provided with the channel Q, in combination with the pipe L, valve K, and catch N, substantially as and for the purpose set forth.

OTTO ZWIETUSCH.

Witnesses:
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