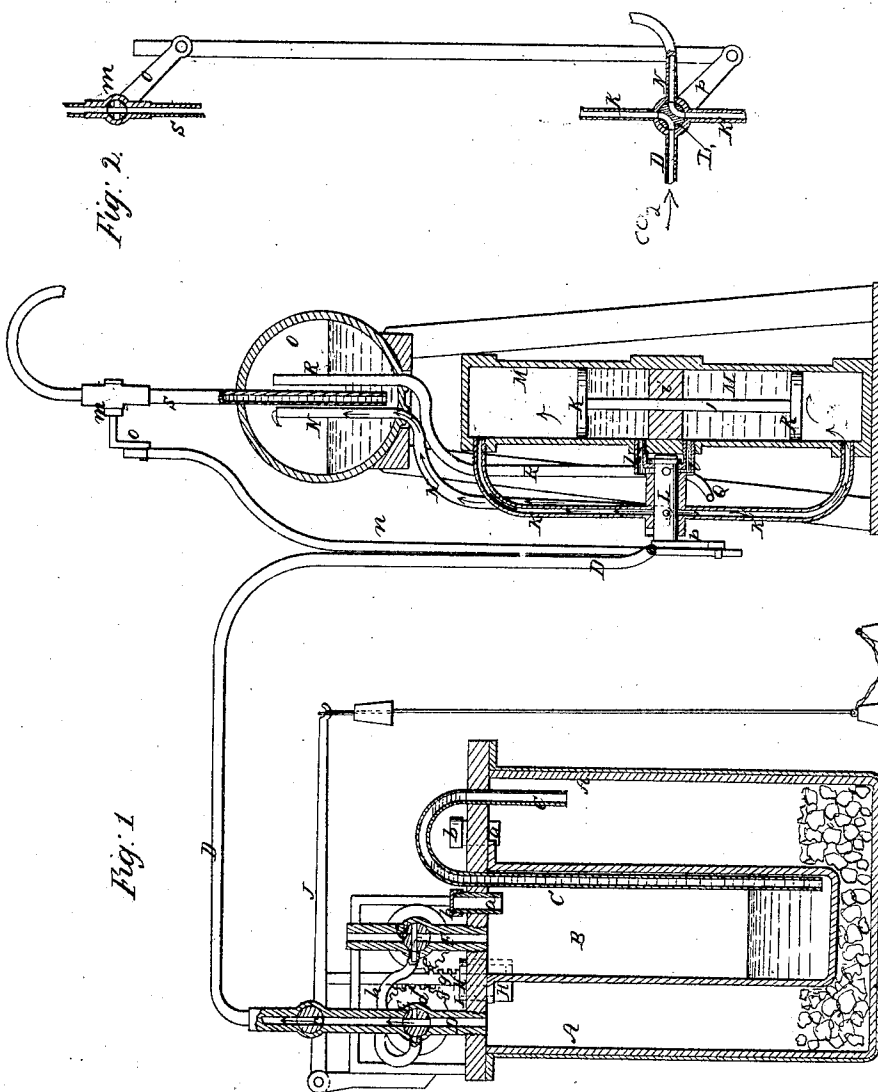


S. CHAMBERLAIN.

APPARATUS FOR GENERATING CARBONIC ACID GAS, &c.

No. 27,775.

Patented Apr. 10, 1860.



Witnesses;
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UNITED STATES PATENT OFFICE.

SAMUEL CHAMBERLAINE, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR GENERATING GASES.

Specification of Letters Patent No. 27,775, dated April 10, 1860.

To all whom it may concern:

Be it known that I, SAMUEL CHAMBERLAINE, M. D., of the city of Philadelphia and State of Pennsylvania, have invented a new and Improved Apparatus for the Generation of Carbonic-Acid Gas and the Application of the Same in the Manufacture of Mineral Waters; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1, represents a vertical section of the apparatus complete. Fig. 2, represents a vertical section of part of the apparatus taken at right angles to Fig. 1.

Similar letters of reference indicate corresponding parts in the several figures.

My invention consists in an apparatus for obtaining carbonic acid gas in any required quantity at such uniformly regulated pressure as may be desired, by the mixture of suitable chemical matters, and for employing the pressure of such gas to pump water into a receiver or cooler in which it is charged with the gas and from which it may be supplied to a fountain for use, or drawn off into bottles.

A is a close vessel of cylindrical or other suitable form, which I prefer to be made of copper lined with lead, and which should be made of sufficient strength to be capable of sustaining a pressure of two hundred pounds per square inch; and B is a close leaden vessel arranged within the vessel A, and united therewith at the top, but having no communication therewith except through a siphon C, which dips nearly to the bottom B, but need not descend very far into A. The vessel A is intended to contain bicarbonate of soda, and the vessel B sulfuric acid, or the said vessels may be made to contain other substances by whose admixture, carbonic acid gas may be obtained. Each of said vessels is furnished with a charge pipe *a* fitted with a screwed cap *b*. The vessel A is furnished at the top with an outlet pipe D, which is fitted near the vessel with a three way cock E, and higher up with a stop cock *c*. The vessel B is furnished with an outlet pipe F which is fitted with a three way cock G. These cocks are furnished with toothed wheels *d* and *e* or segments to gear with toothed racks *f*, and *g*, formed on opposite sides of the rod H', of a piston H, which is

fitted into an upright cylinder I, whose bottom opens into the vessel A; said piston having a weighted lever J applied to counteract the pressure upon the under side of the piston, of the gas generated in the vessel A, and the said wheels or segments having each only a quarter circle of gearing on them, and the racks being of such length, that each cock will only receive a quarter revolution from its respective rack. The lever J to which the weights are applied to hold down the piston should have three weights applied, viz., a larger one hung on the lever itself, and two smaller ones attached by a cord or chain so that each will come into action only after the lever has risen a certain distance. The two three way cocks E, and G, are connected by a pipe *h*. The pipe F opens into the atmosphere, and the pipe D, leads to the pumping apparatus as will be presently described.

M, is a cylinder constituting both the cylinder of the pump, and of an engine operated by the pressure of the gas to drive the pump, said cylinder being closed at its ends, and having a transverse partition *i*, at the middle of its length which should be fitted with a stuffing box for the rod *j*, which connects the two pistons K, K'.

L, is an eight way cock, or more properly speaking, a double four-way cock, containing two distinct series of ways, each arranged as shown in the section of one series shown in Fig. 2, like the ways of the cock known to engineers as the four-way cock, which was used for the eduction and induction of steam to and from some of the earlier steam engines, the series of ways next the cylinder being for water, and the other series for gas.

Two of the ways of the latter series connect by pipes *k* and *k'*, with the cylinder close to the ends thereof, the third has connected with it the pipe D, which in its relation to the cylinder M, corresponds with the induction pipe of a steam engine, and the fourth has connected with it the pipe N, which corresponds with the exhaust pipe of a steam engine and which enters and opens into the upper part of the close receiver or cooler O, which should be capable of sustaining nearly the same internal pressure as the vessel A. Of the other series of ways, two connect by pipes or passages *l*, *l'*, with the cylinder M, close to and on

opposite sides of the partition *i*, the third has connected with it the suction pipe Q, the end of which is intended to dip into an open vessel containing water and the fourth having connected with it a pipe R, which enters the receiver or cooler O, in the upper part of which it should terminate in the form of a perforated rose to discharge the water thereinto in a shower among the gas which exhausts thereinto from the upper and lower parts of the cylinder M. The receiver or cooler O, is intended to be surrounded by ice. S, is the pipe leading to the fountain where the soda water is drawn, said pipe opening into the receiver or cooler near the bottom thereof, and being furnished with a draw cock *m*, which is so connected with the double four way cock L, by a rod *n*, and levers *o*, *p* that by the opening of the said stop cock the double four way cock may be moved to admit the gas to the upper or lower part of the cylinder M. The two series of passages in the plug of the cock L, are so arranged relatively to each other, that when the upper gas pipe *k*, is open to the induction pipe D, and the lower one *k'*, open to the eduction pipe N, the upper water passage *l*, is open to the eduction pipe R, and the lower one *l'*, is open to the suction pipe Q, and vice versa, by which arrangement the turning of the said cock to effect the induction and eduction of gas into and from the spaces above the piston K, and below the piston K', alternately causes the water to be alternately drawn into one and the other of the spaces between the pistons, and the partition *i* of the cylinder and forced therefore into the receiver or cooler O, where it meets the gas exhausted or forced from the cylinder M, through the pipe N. I will here mention that the drawing represents the cylinder M much larger in proportion to the receiver or cooler O, than it would be in practice.

The apparatus is set in motion in the following manner, a weighed quantity of bicarbonate of soda is put into the vessel A, and into B, one third of the same quantity, fluid ounce for ounce, of sulfuric acid, or other materials in suitable proportions, and water enough to cover the soda is then poured into the vessel A. The vessels being thus charged, the three way cock G is turned as shown in Fig. 1, to close the pipe G, to the vessel B, the three way cock E is turned as shown in the same Fig. 1, to open the communication from the vessel A, through the pipe D, and the stop cock *c*, and draw cock *m*, are closed. A small pipe attached to the vessel A, but not shown in the drawing, fitted with a stop cock, is then opened and the operator applying his mouth to this pipe blows into the vessel A, to produce a compression of the air in said vessel, and some air will pass from A, through the siphon C,

and the acid in B, thus producing a compression of the air above the surface of the acid in B. The cock in the above mentioned pipe is then closed, and the cock *c*, opened when the condensed air will escape from A, through the pipe D, to the upper or lower part of the cylinder M, according to the position of the cock L; and the reduction of pressure thus affected in A, will permit the air in B, to expand and force over acid from the latter vessel through the siphon C into and among the charge in A, when the generation of gas will commence. The cock *c*, is then to be closed until the acid which flows over into A, is neutralized and an equilibrium between A and B, is restored, which may be known by the gas having ceased to bubble up through the acid in B. The cock *c*, is again opened to produce a similar operation and then closed again, and this alternate opening and closing of the said cock is repeated until the pressure in the vessels A and B is sufficient to just overcome the pressure of the larger weight on the piston I, and raise the said piston, which pressure is prevented being materially exceeded, in the following manner.

It may be observed on reference to Fig. 1, that the racks *f*, *g*, are so arranged one above the other that *f*, will turn the cock E, a quarter revolution before *g*, comes into action on the wheel or segment *e*. Now when a sufficient pressure of gas has been generated to overcome the effect of the larger weight on the piston I, the rise of the piston causes its rack *f*, by its action on the wheel or segment *d*, to turn the cock E, a quarter of the way round, and thus close the part of the pipe D, above the said cock, and open the part below it to the pipe *h*; and the gas now finds a vent from A, through the siphon C, and through the acid into B, from whence it passes into through the pipe F, cock G, pipe *h*, and cock E, into the upper part of the pipe D, and to the cylinder M, as before, but the further generation of gas almost immediately ceases, owing to the failure of any acid to pass over into the charge in A; but in case of too much acid having already flowed over, and a further increase of pressure taking place, the effect of the second weight attached to the lever J, is overcome by the piston I, and the latter rises higher, and brings the rack *g*, into action on the segment *e*, to turn the cock G far enough to open the pipe F, for the escape of gas to the atmosphere. The latter cock it will therefore be seen, constitutes a safety valve, and the cock E a saving valve to prevent as far as possible the generation of more gas than is necessary for use. The third weight applied to the lever J, merely serves to prevent the piston being raised further than is necessary to open the safety cock G.

When the requisite pressure of gas has

been obtained as above described, the cock L, (which for the present may be supposed to be disconnected from *m*,) is turned to admit the gas first at one end and then at the other of the cylinder, M, and the pistons K, K', are thus set in operation to pump water and admit gas into the receiver or cooler O, until the desired pressure is obtained therein, opening and closing the stop cock C, as before described, in the meantime, as often as may be necessary to produce the necessary supply of gas. When the receiver and cooler O is thus supplied with water charged with gas, the connection is made between the four way cock L, and draw cock *m*, in such a manner that when the draw cock is closed, the four way cock is made to close all its passages, and prevent induction or eduction of gas or water to or from the cylinder M, but that when the draw cock is opened, the four way cock L is also open to admit gas to one end or other of the cylinder. To permit the draw cock to be open, with either of the open positions of the four way cock, the former must have two passages as shown in Fig. 2. The stop cock C, is now always left open and the apparatus remains inoperative and no more gas is generated till the draw cock *m*, is opened to draw off the gas charged water at the fountain; when such opening of said cock produces the same effect in the generating apparatus as the opening of the stop cock C, as before described effecting a reduction of pressure in A, as compared with B, and causing more acid to flow over. The closing of the draw cock *m*, again at once stops the generation. The four way cock being opened along with the draw cock causes the pumping apparatus to be set in operation, and the supply of water and gas to the receiver and cooler O, to be kept up.

What I claim as my invention, and desire to secure by Letters Patent, is,

1. Combining the two vessels A and B, which contain the gas making ingredients by means of a siphon C, substantially as herein described so that when a reduction of pressure is produced in the generating vessel, by permitting the escape of gas or air therefrom, the acid or other liquid from the other vessel will be caused to flow over into the generating vessel by the difference of pressure.

2. The arrangement in combination, with the two vessels A and B and their connecting siphon C, of the two three way cocks or their equivalents E and G in the outlets of such vessels, the connecting pipe *h*, between the said cocks or equivalents, and the piston H geared with said cocks or equivalents, whereby when the pressure in the generating vessel, reaches a certain degree the gas is caused to flow back to the other vessel, and so prevent more acid or other liquid coming over from the latter vessel, and when a further increase of pressure takes place providing for the escape of gas to the atmosphere, substantially as herein described.

3. The pumping apparatus consisting of the cylinder M with its partition *i*, two connected pistons K, K', passages and double four way cock L, applied substantially as described in combination with the generating apparatus and the receiver or cooler O, to deliver gas and water simultaneously into the receiver and cooler at a uniform pressure.

January 31st 1860.

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Witnesses:

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JOS. BULLOCK.