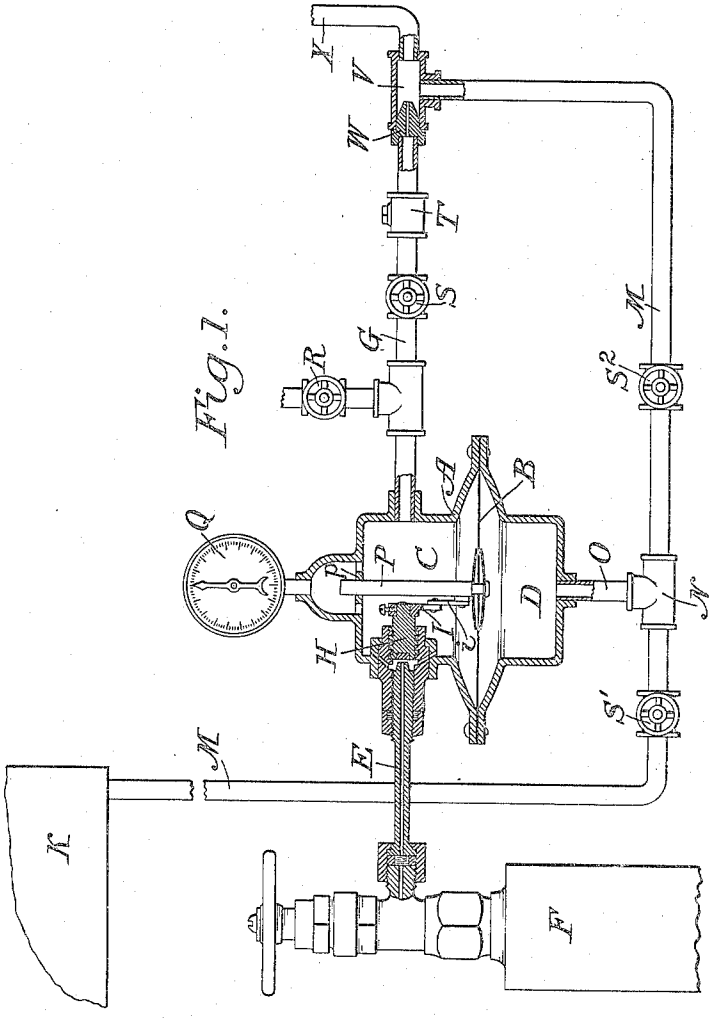
(No Model.) 2 Sheets—Sheet 1.

# C. A. & J. SCHNEIBLE.

## APPARATUS FOR AERATING LIQUIDS.

No. 474,414. Patented May 10, 1892.

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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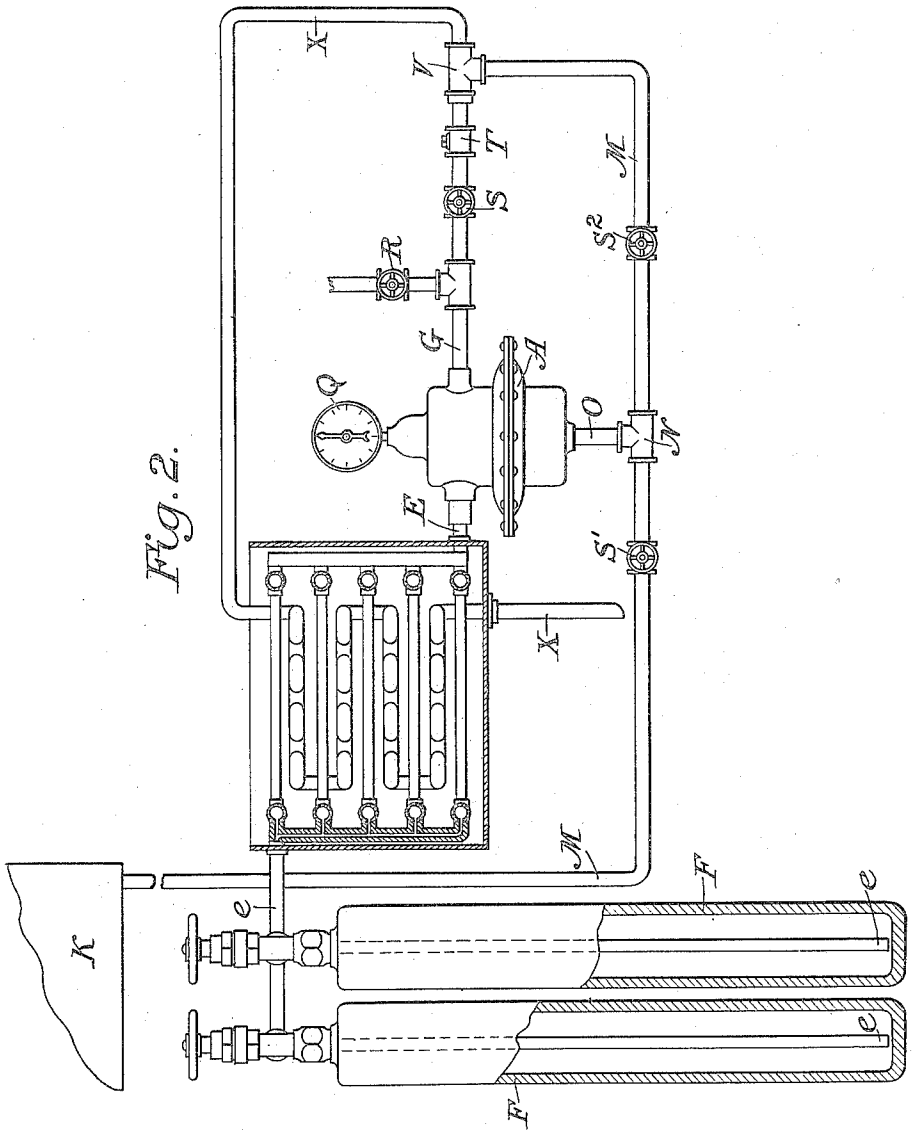
Fig. 2.

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# UNITED STATES PATENT OFFICE.

CARL A. SCHNEIBLE, OF NEW YORK, AND JOSEPH SCHNEIBLE, OF BROOKLYN, NEW YORK.

## APPARATUS FOR AERATING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 474,414, dated May 10, 1892.

Application filed January 22, 1892. Serial No. 418,889. (No model.)

*To all whom it may concern:*

Be it known that we, CARL A. SCHNEIBLE, of New York, in the county and State of New York, and JOSEPH SCHNEIBLE, of Brooklyn, Kings county, and State of New York, have invented certain new and useful Improvements in Apparatus for Aerating Liquids; and we do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

In another application for Letters Patent filed November 2, 1891, serially numbered 410,671, we have described a novel method of aerating or charging liquids, which depends largely for its successful operation upon the maintenance of substantially equal pressure upon the liquid to be charged and upon the gas with which it is to be charged. In practice the pressure on the gas is slightly in excess of that on the liquid, and it becomes important that the established relation between the pressures should be maintained.

In our experiments made with the purpose of perfecting the apparatus employed in the practice of the method we have found that the great difference in density between the liquid and the gas renders necessary, under the operation of well-known physical laws, certain modifications of apparatus which might be effective with two liquids or with two gases, and that in order to produce the best results when a gas and a liquid are to be mixed under a substantial equality of pressure the orifice of the pipe which conducts the gas from the pressure-regulator to the point where it is to be introduced into the liquid must be contracted, so that its area shall be considerably less than that of the orifice which discharges the uncharged liquid. We have also found in the application of our method to the carbonating of liquids when large quantities of gas are used and when the carbonic-acid gas is supplied from the usual cylinder in which it has been reduced to a liquid under great pressure that we are in practice obliged to provide an expansion-chamber intermediate the cylinder and the other portions of the apparatus, in order to prevent the stoppage of the operation by freezing, and that we can take advantage of the cold produced in this expansion-chamber to cool the newly-charged liquid for the purpose of mixing the gas or for increasing its capacity to absorb gas, and thereby dispense with the use of ice for the purpose.

Accordingly our present invention consists in the apparatus hereinafter described and claimed, and which we have thus far found best adapted for the successful operation of our method above referred to.

In the accompanying drawings, Figure 1 is a partly sectional elevation of so much of a complete apparatus as is necessary to illustrate our improved means for producing a proper mixture of the gas and liquid, and Fig. 2 is a similar view showing the further modification of the apparatus which we have referred to above as desirable in the charging of liquids from liquid-carbonate cylinders.

In general the gas and the liquid to be charged are led from their respective sources of supply by independent pipes or conductors to pressure-regulating devices adapted to maintain the proper pressure upon each, and thence to the point where the gas is to be introduced into the liquid. From this point a common delivery-pipe conducts the charged liquid to the receiver or to the delivery or dispensing cock.

When the apparatus is used for carbonating, as before referred to, or whenever a sufficient degree of expansion takes place in the gas, the delivery-tube is passed through the expansion-chamber before reaching the receiver or delivery-cock.

The pressure-regulator, which is employed to maintain the substantial balance or proper relation between the pressure on the gas and that on the liquid, comprises, essentially, a suitable casing A, which is divided by a suitable diaphragm B into two chambers C and D, communicating, respectively, with the gas-supply and the liquid-supply, and a valve operated by the diaphragm to control the flow of either the gas or the liquid. We have shown the upper chamber as connected on one side, through a pipe E, with a liquid-carbonate cylinder F and as connected on the other side with a gas-delivery pipe G, and we have shown the valve for controlling the de-

livery of the gas as consisting of a screw-plug H, suitably seated opposite the orifice of the pipe E and connected through an arm I and link *i* with the diaphragm to be turned by the movement of the diaphragm to open or close the orifice of the pipe; but the character of the gas-supply, of the connections, and of the valve is immaterial, it being essential, merely, that the gas shall be delivered to the regulator under a proper degree of pressure. Likewise the character of the liquid-supply and of its connections with the other chamber of the regulator is immaterial, provided a steady pressure is provided either by gravity or by a force-pump. We have indicated a tank K, connected by a pipe M with the lower chamber and extended to a point where the gas and liquid are mixed. We find, however, that the action of the diaphragm is much steadier if the liquid-supply pipe M, instead of being connected directly into the sides of the chamber D, so that the liquid should flow through the chamber, is provided with a T-joint N and single pipe O, which communicate with the chamber. The effect of this arrangement is to form an air-cushion or dead-water space, which prevents shocks upon the diaphragm.

A guiding-stem P may be affixed to the diaphragm and slide in a guide *p*, carried by the casing, but is not a necessary feature. The pressure-regulator may be fitted with a pressure-gage Q, and the gas-conducting pipe with a blow-off cock R, a stop-valve S, and a check-valve T; but these parts are not essential to the successful operation of our device.

Stop-cocks $S'$ and $S^2$ are preferably inserted in the liquid-conducting pipe M, one on each side of the connection with the pressure-regulator, whereby at any time the liquid-supply may be cut off, while preserving the same pressure on the other side of the regulator-diaphragm, and the flow of the gas remain unaffected. This arrangement is especially useful in establishing throughout the system of pipes the initial pressure under which the liquid is to be charged.

The liquid and gas conducting-pipes may be united by any convenient connection—as by an ordinary "T"—as shown at V, and it is essential that the area of the orifice through which the gas issues shall be considerably less than the area of that through which the liquid is discharged, in order that the gas may flow as a jet into the liquid. For this purpose we have shown a nozzle W, with a small aperture, inserted in one branch of the T.

As before stated, when liquefied carbonic acid is used as the source of the gas it is desirable to allow the expansion to take place between the cylinder in which it is stored and the pressure-regulator. Ordinarily the expansion is allowed to take place in the cylinder itself. The intense cold thus produced within the cylinder not infrequently causes a congelation of the carbonic acid and a consequent stoppage of the operation. We prefer to extend the conducting-tube to the bottom of the cylinder, as at *e*, so that the liquid itself is forced from the cylinder. The diameter of this tube is preserved for a convenient length, so that there shall be no expansion until it is brought to a point where an expansion-chamber may be placed. Here the capacity of the tube is increased either by enlarging the diameter or by providing a number of tubes to allow the liquid to expand into gas and is finally connected to the gas-conducting tube E. The delivery-tube X is brought from the point where the gas is injected into the liquid and its diameter still being preserved, so that there may be no expansion, it is led in close proximity to the expansion-tubes, so that the charged liquid therein contained may be subjected to the reduced temperature, and is then led to the receiver or delivery-cock. To facilitate the cooling, we prefer to inclose both the series of expansion-tubes and the coil of the tube X within a tank, which may be filled with salt-water or any other suitable material, which being itself cooled by contact with the expansion-tubes will the more rapidly absorb heat from the tube X.

For convenience in expression we have referred herein to an "expansion-chamber," through which the tube X is led; but the exact arrangement or construction of the same is immaterial, due regard being had to the result to be obtained.

The initial pressure put upon the gas and the liquid vary with the nature of the liquid to be charged and with the extent to which it is to be charged, while we have found that for the best results the ratio of the area of the orifice through which the gas is discharged to the area of the orifice through which the liquid is discharged should be slightly less than the ratio of the specific gravity of the gas to the specific gravity of the liquid, though we do not intend to limit ourselves to any particular size or relation or to the exact arrangement of the apparatus which we have shown herein.

We claim as our invention—

1. An apparatus for charging liquids with gas, consisting of a gas-supply and a liquid-supply, pipes for conducting the gas and liquid from the sources of supply and connected to mix the gas and liquid, the gas-conducting pipe having at the point of connection a nozzle with a contracted orifice, through which the gas may flow into the liquid, and a pressure-regulator having a diaphragm acted upon by both the gas and the liquid before mixture and having a valve operated by said diaphragm to control the flow of one of the fluids, substantially as shown and described.

2. An apparatus for charging liquids with gas, consisting of a gas-supply and a liquid-supply, pipes for conducting the gas and liquid from the sources of supply and connected to mix the gas and liquid, a pressure-regulator having a diaphragm acted upon by both the

gas and the liquid before mixture and having a valve operated by said diaphragm to control the flow of one of the fluids, and two stop-cocks inserted in the other conducting-pipe, one on each side of its connection with the pressure-regulator, substantially as shown and described.

3. An apparatus for charging liquids with gas, consisting of a liquid-supply and a gas-supply, in which the gas may be compressed, pipes for conducting the gas and the liquid from the sources of supply and connected to mix the gas and liquid, an expansion-chamber for the gas intermediate the supply and said point of mixture, and a conducting-tube for the charged liquid led from the point of mixture through the expansion-chamber, substantially as shown and described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

CARL A. SCHNEIBLE.
JOSEPH SCHNEIBLE.

Witnesses:
A. N. JESBERA,
A. WIDDER.