

No. 639,642.

Patented Dec. 19, 1899.

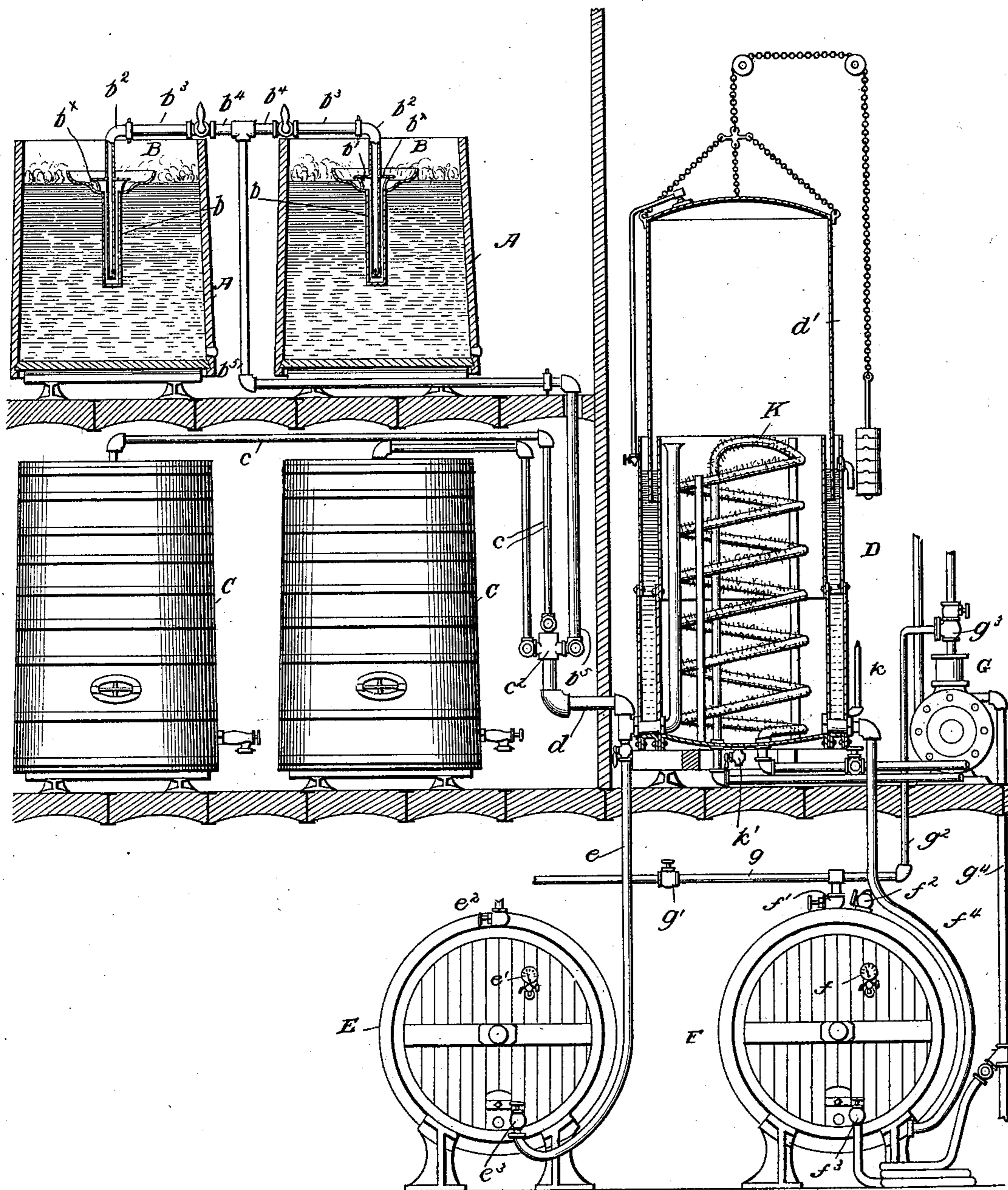
J. F. WITTEMAN.
APPARATUS FOR COLLECTING CARBONIC ACID GAS.

(Application filed July 9, 1896.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



Witnesses

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2 Sheets—Sheet 2.

Fig. 2.

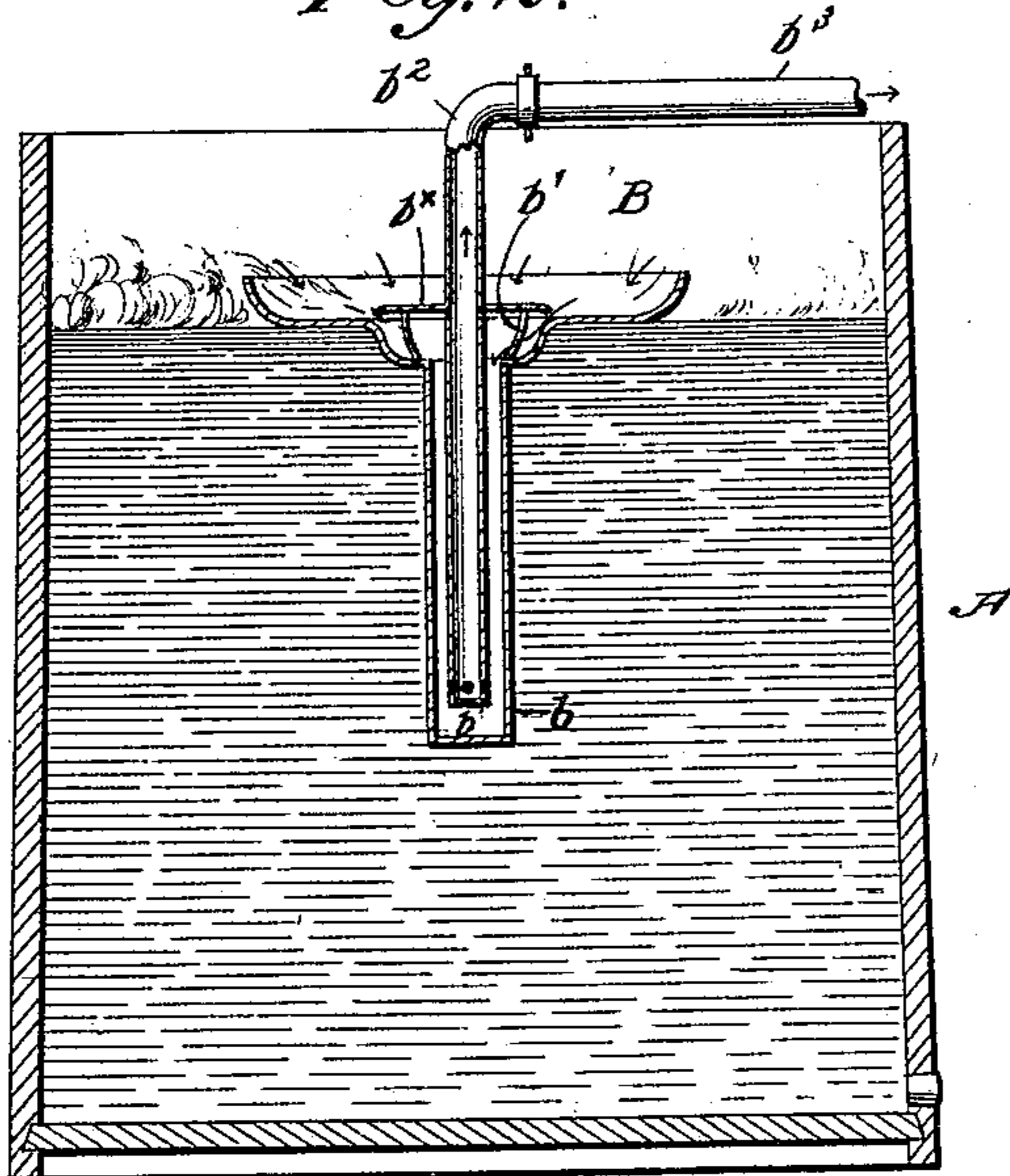
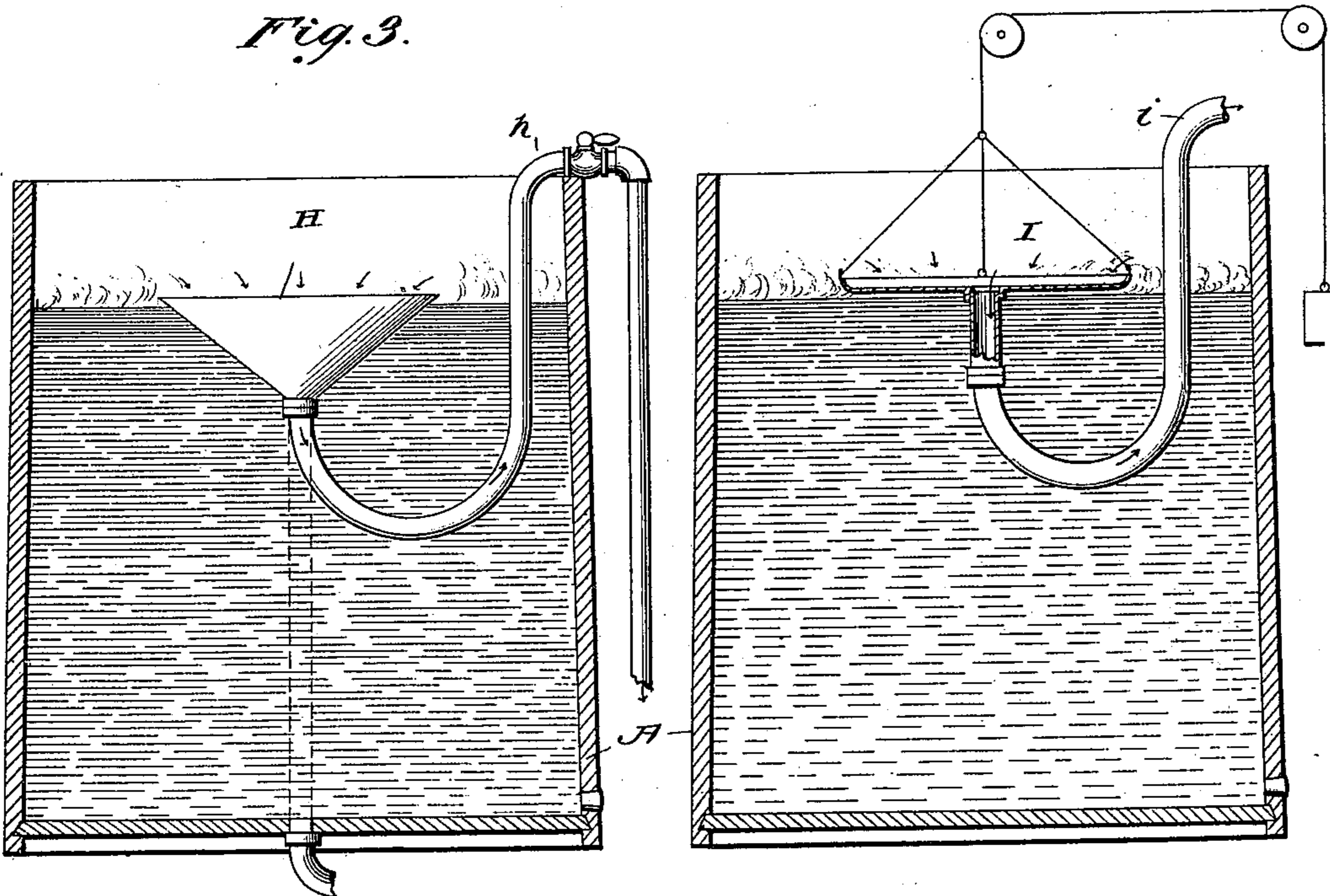


Fig. 4.

Fig. 3.



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APPARATUS FOR COLLECTING CARBONIC-ACID GAS.

SPECIFICATION forming part of Letters Patent No. 639,642, dated December 19, 1899.

Application filed July 9, 1896. Serial No. 598,519. (No model.)

To all whom it may concern:

Be it known that I, JACOB F. WITTEMANN, a citizen of the United States, residing at New York, (Brooklyn,) in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for Collecting Carbonic-Acid Gas; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to apparatus for collecting carbonic-acid gas from fermenting tubs or casks.

In methods where fermenting tubs or vats have been hermetically closed or nearly closed by either a suspended or submerged bowl or bell-shaped collector and the gas allowed to pass off under a pressure generated within the closed vessels such pressure creates undesirable disturbances in the natural course of fermentation, while the employment of such closed or partially-closed vessels further prevents the desirable frequent skimming of the fermenting mass, owing to the inability of the skimmer to have free access thereto. These methods also prevent the natural separation of nitrogen and other organic gases from the carbonic-acid gas, which separation naturally takes place under atmospheric pressure, provided sufficient space is allowed within the vessels for the carbonic-acid gas to accumulate or provided the carbonic-acid gas is drawn off as fast as it is generated in the course of fermentation. Where open tanks have been employed and the gas drawn out by suction of pumps or similar mechanical means, it was either necessary to have too large a space within the fermenting tubs or vessels to prevent the drawing along of air or such suction of air could not be avoided and required subsequent separation and purification.

The primary object of my invention is to overcome these objectionable features and to provide apparatus whereby the gas as it collects may be removed from the surface of the liquid in such a manner as not to disturb the natural course of fermentation and to prevent the possibility of air passing along or

mixing with the carbonic-acid gas, so as to require subsequent purification.

Another object is to provide an apparatus whereby the carbonic-acid gas may be siphoned or drawn off from the surface of the liquid as it collects above the same and while the natural separation of the nitrogen and other gases from the carbonic-acid gas takes place and to provide means whereby the separated carbonic-acid gas, together with the aromatic and alcoholic ethers which it naturally carries, may be compressed, so as to be serviceable for brewery purposes, such as pressure for transferring beer from one vessel into another or as counter-pressure in filling shipping or other packages, as well as for recarbonating beer.

A further object is to provide simple, efficient, and convenient apparatus for collecting and utilizing the gas generated by fermentation in the storage or fermenting vats or casks.

The invention will first be hereinafter more particularly described with reference to the accompanying drawings, forming a part of this specification, and then pointed out in the claims at the end of the description.

In the drawings, Figure 1 is a general view, partly in elevation and partly in section, of one form of apparatus for carrying the invention into effect. Fig. 2 is an enlarged sectional view of one of the fermenting-vats, illustrating the normal position of the gas-collecting bowl; and Figs. 3 and 4 are enlarged sectional views of fermenting-vats each provided with a modified form of gas-collector.

I have discovered through extended practical experiments that a comparatively-small space left above the liquid in the fermenting vessel will be filled with practically air-free carbonic-acid gas saturated with alcoholic and aromatic ether, for which carbonic-acid gas, as is well known, has great affinity, and that such gas may be collected practically free of air and utilized for various purposes. To effect this, I preferably employ the apparatus shown in Figs. 1 and 2, though any suitable apparatus may be employed, if desired. In Figs. 1 and 2, A may designate ordinary fermenting vats or vessels having an open upper portion and in which the fermenting liquid is placed so as to leave a space above

the same. A preferably floating bowl or pan B or other gas-collector is sufficiently submerged in the liquid of each vat to bring its upper rim within close proximity to the liquid-level, such bowl or pan being self-adjusting to compensate for the continually-lowering liquid-level. This bowl is preferably provided with an entirely open upper surface, so as to permit free ingress of the accumulated carbonic-acid gas, with which it is immediately filled, and preferably of sufficient size to crowd the "foam-cap" toward the outer rim of the fermenting vessel, where it can be conveniently reached by the skimmer. The floating bowl may be dished toward the center and provided with a preferably narrow or contracted extension b , secured to or formed integrally with the bowl, and may have a spreading-plate b^x , provided with depending legs or studs b' , adapted to rest upon the inner surface of the central depression of the bowl, so as to provide a preferably annular narrow opening between its outer edge and the wall of said bowl in order to form an extended overflow-surface and to distribute the slight suction when the gas is drawn off, as will be hereinafter explained. This spreading-plate may be loosely supported in the bottom of the bowl and sufficiently weighted to keep the bowl in its proper position and is preferably provided with a central aperture, to which a siphon connection or pipe b^2 is secured, said pipe being preferably of sufficient length to reach to or near the bottom of the extension b of the bowl and provided with an aperture or apertures at or near the lower end thereof, so as to provide a preferably deep column of gas, and to withdraw the gas a sufficient distance below the surface of the liquid to prevent the possibility of air commingling therewith. The upper end of the siphon pipe or connection of each vat is preferably connected to a flexible tube or hose b^3 , so as to permit self-adjustment of the bowl as the level of the liquid changes, said flexible hose being connected to valved branch pipes b^4 , which connect to the main gas leader or pipe b^5 , so as to regulate the flow of the gas from the vats to the main gas-pipe.

Stock-casks C, which are usually closed vessels, allowing of air-tight connections being made, may also be connected by branch pipes c to a multiple connection c' , the latter being connected to the main gas-pipe b^5 and provided with valves, so as to regulate or entirely shut off the flow of gas from either the vats A or the casks C. From either or both vats or casks the gas may be let or caused to flow into a gasometer D through the pipe d . This gasometer preferably has a tank comprising concentrically-arranged cylinders having closed bottoms and between which an open-ended floating dome d' is adapted to rise and fall. The floating dome may have a blow-off for air at its upper portion and is suitably counterbalanced, so as to maintain a pressure as near to the atmospheric pressure as possi-

ble, so as to neither create pressure nor suction in the gas-conveying pipes, the siphonic action in said pipes being most conveniently started by temporarily forming a suction in the same by putting additional weight or the equivalent on the balance-weight of the dome d' or otherwise raising said dome, so as to cause a partial vacuum to be created therein. I thus cause a continuous flow of air-free carbonic-acid gas without disturbing the natural course of fermentation and at the same time permitting frequent skimming of the fermenting mass.

For the purpose of utilizing the gas to expel the air and other gases from the storage or other casks a direct connection may be made between the pipe d and one or more casks, as at E, through a valved pipe e . This cask may be of sufficient strength to withstand a suitable internal pressure and may have a pressure-gage e' , an air-cock e^2 , and test-cocks (not shown) for determining the height of the carbonic-acid gas. The gas is preferably allowed to enter the cask through a valved inlet e^3 , located at or near the bottom of the cask, and owing to the heavier specific weight of the column of carbonic-acid gas within the gas-conveying pipes will readily displace the air contained within the cask, so as to expel the latter through the air-cock e^2 . Any air, nitrogen, or other lighter gas that may have been carried along with the carbonic-acid gas into the cask E will naturally separate from the carbonic-acid gas and be expelled, together with the air previously contained in the cask. In a like manner a series of similar casks or other suitable vessels may be filled with carbonic-acid gas and the air contained therein displaced by the same, and the gas contained in such vessels can be readily siphoned over into other vessels located at a lower elevation, the same as any other fluid.

In order to make the separated carbonic-acid gas, together with the aromatic and alcoholic ethers which it naturally carries, serviceable for brewery purposes, such as pressure for transferring beer from one vessel to another or as counter-pressure in filling shipping or other packages with effervescent beer, as well as for recarbonating beer, I have further devised a novel and simple method of compressing such gas within its containing vessels. For this purpose I provide one or more casks F of sufficient strength to withstand suitable internal pressure and provide the cask or casks with a pressure-gage f , stop-cock f' , air-cock f^2 , and bottom inlet-cock f^3 . A pipe f^4 may connect with the gas-supply in the gasometer, so as to convey the carbonic-acid gas collected therein from the fermenting-casks or otherwise to the inlet-cock f^3 when the lower end of the pipe f^4 is connected to the said inlet-cocks, so that the cask may be filled with the gas, so as to drive off the air and other gases contained therein through the air-cock f^2 . The stop-cock f' is connected

with pressure conduit or pipe g , which latter is provided with a valve g' and through the branch pipe g^2 is connected to the pressure regulator or governor g^3 , located upon the pump G, so as to control the propelling medium thereto. This pump is provided with a pipe g^4 , adapted to convey water under pressure to the cask F when its lower end is connected to the inlet-valve f^3 . After the cask is filled with gas and the air and other gases driven off through the air-cock f^3 the latter is closed and the stop-cock and valve g' opened. Water is now forced through the pipe g^4 into the cask F until the desired pressure is indicated by the pressure-gage f , when the governor g^3 is regulated so as to control or regulate the pump-impelling medium in order to maintain a uniform pressure during the discharge of the compressed gas through the pressure-conduit g from which the gas under pressure may be conveyed to be utilized as desired. The governor or regulator g^3 and the water-pump G may, if desired, be replaced by any similar mechanical means suitable to maintain a uniform pressure. By this method the collected gas may be employed for expelling the air from the casks or vessels and compressed to any desired pressure, so as to be utilized for various purposes.

The manner of using and constructing the invention will be readily understood from the foregoing description when taken in connection with the accompanying drawings. Assuming the parts to be in the position shown in Fig. 1 and fermentation to have taken place in the vats and storage-casks, it will be readily seen that if the dome d' of the gasometer be raised so as to create a partial vacuum therein sufficient suction will be created in the gas-conveying pipes to cause the carbonic-acid gas to flow therethrough. The spreading-plates b^x will distribute the slight suction at the entrance to the siphon connection b^2 , and when the gas has once started to flow it will continue to do so as long as the supply of carbonic-acid gas lasts owing to the gas-conveying pipes being arranged to perform the function of a siphon. The gas may be conveyed to the storage-cask E, so as to expel the air and other gases therefrom, or the gas may be compressed and utilized, as heretofore explained. I thus collect air-free carbonic-acid gas from the fermenting-vats while under atmospheric pressure and convey the same into a suitable receiving vessel without disturbing the natural course of fermentation and at the same time permit the fermenting mass to be frequently skimmed and the collected gas to be employed either as it flows from the vats or casks or in a compressed state, so as to be utilized for various purposes.

Instead of the form of bowls shown in Figs. 1 and 2 I may employ a funnel-shaped bowl or gas-collector H, arranged within the vat A, the lower portion of which is open and connected to a pipe h , which passes over the upper edge or through the side of the vat, or

may extend downward, so as to pass centrally therethrough, as shown in dotted lines in Fig. 3, while in Fig. 4 a counterbalanced pan or collector I is shown which has a siphon connection i secured thereto, so as to convey the carbonic-acid gas therefrom.

As a means of adapting the collected gas to be employed for the purpose of carbonating, I may arrange a refrigerating-coil K or similar means within the gasometer D, a thermometer k to determine the temperature of the gas, and a drain-cock k' therein for the purpose of removing any condensed liquid that may accumulate within the gasometer. The refrigeration of gas previous to its amalgamation with beverages in a carbonating process is not claimed, as such forms the subject-matter of a separate application.

The gas may be caused to flow directly from the fermenting casks or vats into either or both of the casks E and F, so as to drive the air and other gases therefrom, and the carbonic-acid gas may be compressed in either or both of the casks by forming a connection with the pump G.

The general arrangement and construction of the apparatus may be changed in some instances, and the spreading-plate and some of the other parts may be dispensed with or others substituted therefor without departing from the spirit of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an apparatus for collecting fermentation-gas, the combination of an open fermenting-cask, a floating bowl therein resting upon the liquid and submerged in the layer of carbonic-acid gas formed above the same, a gas-receiver located below said bowl, a siphon whose shorter leg communicates with the deeper portion of the bowl and whose longer leg communicates with said receiver, a counterbalanced dome in communication with the longer leg of the siphon, and means for sealing the dome while permitting vertical movement thereof sufficient to initiate siphonic flow of the gas from the bowl to the receiver.

2. An apparatus for collecting gas from fermenting casks or vessels, comprising a receiving vessel or vessels, one or more open fermenting vats or casks, a floating bowl provided with a central depression arranged in each cask adapted to rest upon the liquid beneath the layer of carbonic-acid gas formed above the same, a spreading-plate loosely supported within the floating bowl so as to provide an annular space between its edge and the wall of said bowl, pipes connecting the spreading-plate to the receiving vessel or vessels, and means for creating a siphonic action in said pipes, whereby a column of air-free carbonic-acid gas may be caused to flow into the receiving vessel or vessels, without disturbing the natural fermentation of the liquid, substantially as described.

3. In an apparatus for collecting and com-

pressing the carbonic-acid gas generated in fermenting vessels, the combination with one or more receiving vessels, of one or more fermenting vats or casks, a floating bowl arranged in each cask adapted to rest upon the liquid beneath the layer of carbonic-acid gas formed above the same, pipes connecting each floating bowl to the receiving vessel, means for creating a moving column of carbonic-acid gas through said pipes into the receiving vessel or vessels, a pump for forcing water into said receiving vessels so as to compress the gas, together with means for regulating the pump so as to provide a uniform compression of the gas, substantially as described.

4. In an apparatus for collecting carbonic-acid gas, the combination of an open-top fermenting-cask, a floating bowl arranged therein to rest upon the surface of the fermenting liquid below the level of the layer of gas, said bowl having a deep central portion, a siphon whose short leg depends in the latter, and a receiver with which the long leg of the siphon communicates, substantially as and for the purpose described.

5. In an apparatus for collecting carbonic-acid gas, the combination of an open-top fermenting-cask, a floating bowl arranged therein to rest upon the surface of the fermenting liquid below the level of the layer of gas, said bowl having a deep central portion, a siphon

straddling the edge of the cask its shorter leg communicating with the deeper portion of the floating bowl, and a receiver with which the longer leg of said siphon communicates, substantially as described.

6. In an apparatus of the character described, the combination of an open fermenting-cask, a floating gas-holder therein, a siphon whose shorter leg communicates with said holder, a gasometer with which the longer leg of the siphon communicates, a gas-storage receiver, and a connection between the same and the gasometer, substantially as described.

7. In an apparatus of the character described, the combination of an open fermenting-cask, a floating gas-holder therein, a siphon whose shorter leg communicates with said holder, a gasometer with which the longer leg of the siphon communicates, a gas-storage receiver, a connection between the same and the gasometer, a pump for forcing water into said receiver, a governor controlling admission of motive fluid to the pump, and a pressure-conduit communicating with said governor and the receiver.

In testimony whereof I affix my signature in presence of two witnesses.

JACOB F. WITTEMANN.

Witnesses:

CHAS. SPINDLER,
HERMANN COLBERG.