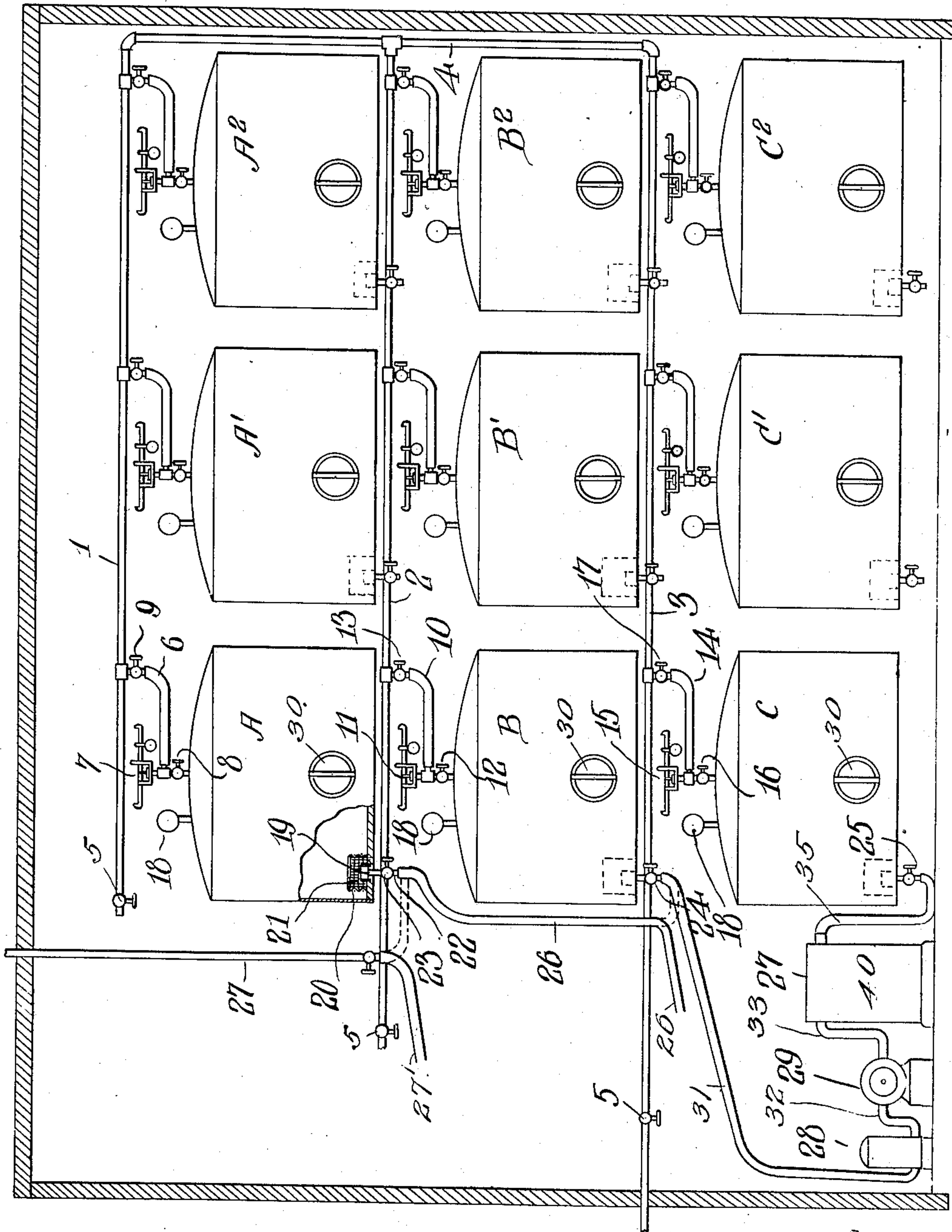


W. P. F. MOELLER.
ART OF BREWING.
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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM PETER FREDERIC MOELLER, a citizen of the United States, residing at Newport News, in the county of Warwick and State of Virginia, have invented certain new and useful Improvements in the Art of Brewing, of which the following is a specification.

My invention relates to a method for brewing malt liquors such as beer and the like, and my object is to effect a great saving of time, labor and material, and at the same time produce a purer fermentation and consequently a better product, and also to provide means by which the apparatus may be more perfectly kept free from mold, germs, bacteria, and poisonous matter.

To this end my invention consists in the peculiar method more fully described hereinafter and pointed out in the claims.

The preferred form of the apparatus for carrying out my invention is shown in elevation in the accompanying drawings, some of the parts being cut away to better disclose the interior.

In carrying out my process I employ three closed vessels A, B and C, respectively, which may be supported by any suitable means not deemed necessary to show. These three vessels are arranged one above the other in vertical series so that their liquid contents will flow by gravity from one to another. Although three vessels are shown in order to carry out my method or process, the number may be duplicated to include two more sets as denoted by the letters A', B' and C', respectively, and A², B² and C², respectively. As each set of vessels is identical in construction and operation, I will only describe the first mentioned set. All of the vessels are connected with common transfer pipes 1, 2, 3 and 4 adapted to convey excess of carbonic acid gas from one vessel into any one or all of the other vessels as will be more fully described hereinafter. Each of the vessels A, B and C is connected with the horizontal transfer pipes 1, 2 and 3 through the medium of short branch pipes 6, 10 and 14 having shut-off valves 8, 9, 12, 13, 16 and 17 so that any or all of the vessels may be shut off from the branch pipes, or the branch

pipes shut off from the transfer pipes. All three vessels are equipped at the top with safety valves 7, 11 and 15 of the adjustable weight and lever type, whereby the valve may be set to open at any predetermined pressure, or may be held wide open by shifting the weight from the right side of the lever to the left side. Valves 5 control the extremities of the transfer pipes 1, 2 and 3. Wort is supplied to the first vessel A through a vertical valve pipe 27 connected to a short flexible and removable pipe length 27' adapted to be connected to and disconnected from a nipple 22 on a short pipe 19 having a valve 23. This vertical pipe 19 is held in the bottom of the vessel A, and is surrounded by a tube 21 which projects above the bottom of the vessel so as to prevent the outflow of the precipitated solid matter which settles during fermentation. A strainer 20, considerably larger in diameter than the tube 21, surrounds the latter and retains the coarser settlings.

A removable draining pipe 26 is adapted to be connected with the nipple 22 on the bottom of the valve 23 in the operation of draining the fermented liquor of the vessel A into the vessel B. Vessels B and C are also provided with nipped valves 24 and 25 and strainer devices precisely like those of the first vessel above so that as the liquor passes from one of the upper vessels to the vessel below it is likewise strained. Each vessel is provided with a covered manhole 30 through which the yeast is inserted. This manhole is located a short distance above the bottom of the vessel, and after the yeast has been inserted is adapted to be hermetically closed. After the main fermentation has progressed to a certain degree and the wort in the first vessel A is drawn off into the vessel B and has been allowed to settle in the latter, it is in turn drained by gravity into the lowest vessel C through a removable pipe 31, which conducts it to a fining adding apparatus 28 whence it passes through pipe 32 to pump 29 which forces it through a pipe 33, cooler 40, pipe 35, and valve 25 into said vessel C.

The preferred form of apparatus having been thus described, I will now proceed to

set forth the method of carrying out my invention. In order to procure a pure taste in the finished beer and to obtain a pure yeast crop, it is necessary to separate the impurities such as hopresin, albuminoids, etc., from the liquid during certain stages of the fermentation. If this is not done some of the impurities, like hopresin, will dissolve later in the liquid and give the beer a bitter taste. To separate the solids or precipitates from the liquid, it is either necessary to transfer the liquid to another vessel, or to have a specially constructed apparatus of the Selg-Guntrum type. My object is to save the great expense involved in installing such an apparatus, and this is done by simply using air-tight vessels, tanks or tubs, of any convenient size or capacity, and piping them together in the simple and inexpensive manner previously described. The use of a series of vessels and the transferring of the liquid from one vessel to another results in a better clarification and purer article. The cooled wort is first run into the uppermost vessel A through pipe 27 and valve 23 until the latter is filled to about the height of the manhole. The temperature at which it is preferred to have the wort is from 6 to 8° R., according to the temperature of the cellar. The flexible pipe 27' is used to connect the pipe 27 with the valve 23 during this filling process, and then detached from the nipple 22 of said valve after the vessel A has been supplied and the valve closed. After the lower part of the vessel A has thus been covered with wort, the yeast is added through the manhole which is afterward closed, as already stated, and then the vessel is still further filled with the wort to within about a foot and a half of the top. Valves 8 and 9 should now be opened and the weight on the safety valve 7 so placed that the valve will open at a given pressure, six pounds being an approximate amount.

When fermentation sets in, expansion and pressure are created in the contents of the vessel A and carbonic acid gas is generated until the pressure overcomes the safety valve 7 and allows the surplus carbonic acid gas to escape through valve 8, pipe 6 and valve 9 to transfer pipes 1, 4, 2 and 3, from whence it may be conducted to any or all empty and clean vessels by opening the safety valve and the two associated valves thereof. The gas thus introduced will protect the empty vessels against the growth of molds and other impure vegetation, and will serve also as a counter-pressure which is needed later. When the empty tubs show a pressure of from five to six pounds, the controlling valves thereof should be closed and the gas allowed to escape through valve 5 into the outside atmosphere. After the fermentation has progressed to a certain degree

(generally the fourth or fifth day after the adding of the yeast to the wort), the still fermenting wort is drawn off into the vessel B which has previously received a gas pressure of from five to six pounds from the excess gas from the tub A. Valve 5 is closed, the safety valves 7 and 11 are set in open adjustment by shifting the weights on the lever from the right hand side to the left hand side. Valves 8, 9, 12 and 13 are also open, thereby allowing free communication between the vessels A and B and equalizing the pressure while the liquid runs from the vessel A to the vessel B through valve 8, pipe 6 and valve 9 to transfer pipes 1, 4 and 2, thence through valve 13, pipe 10 and valve 12 into the second vessel B. It is understood that the safety valve 11 was previously set into open adjustment and the valves in the pipe line were left open to permit the gas to pass freely through them into the empty tubs. In a certain stage of the process the weight on the lever 7 of the vessel A should be shifted from the right-hand side to the left-hand side of the valve lever for the purpose of holding the safety valve open and allowing free communication between the two vessels A and B, whereby the pressure in them is perfectly equalized. Then, after fermentation has reached a certain point, the fermenting wort is run from tub A into tub B, by means of pipe 27'. This draining is accomplished by means of the pipe 26 which is attached to the nipple 22 of valve 23 after the flexible pipe 27' has been removed from said nipple. Before the operation of draining the liquid from the upper vessel into the lower vessel is attempted, it is understood that the valves 23 and 24 have been closed, but as soon as they are opened after the pipe 26 has been connected, the fermented wort will flow freely from the upper into the lower vessel because of the equal pressures existing in the two vessels.

After all the wort has been transferred from tub A to B, valves 23 and 24 are closed. There remains now a sediment in tub A, consisting of hopresin, albuminoids, exhausted or dead and weak yeast cells, etc., which can be washed out by removing the screen and short tubs from the outlet of pipe 19. The wort in tub B contains all the healthy and vigorous yeast cells, which now complete the fermentation. In order to stimulate this yeast, it is advisable to let the pressure escape for a short time after the wort is in tub B and then set the safety valve again to from five to six pounds. The liquid, by the action of the yeast, will soon have again the desired pressure and is then allowed to remain under this pressure until the fermentation is finished, the finishing being determined by the saccharimeter. If

the saccharimeter indicates no reduction, or less than one-tenth of 1% during twenty-four hours, the main fermentation is considered finished. The healthy yeast will then settle to the bottom of vessel B, forming a solid layer. The liquor has now the same amount of carbonic acid gas which the finished beer should contain. This gas should not be allowed to escape until the liquor is consumed. This is quite contrary to other processes, wherein the fermented liquor is treated with chips or the fermented wort is pumped into the ship-cask in a flat condition and then mixed with krausen for the purpose of creating an additional fermentation or "after-fermentation."

It becomes necessary now to finish and clarify the wort thus fermented and self-charged with carbonic acid gas, and to separate the liquor from the yeast and sediment at the bottom of the vessel B. This third step in my process is accomplished by closing valve 24 and disconnecting drain pipe 26 therefrom, and connecting the lower drain-pipe 31 in its place. Gaseous communication should now be established between vessels B and C by opening the transfer pipe line 2, 4 and 3. This is done by setting wide open the two safety valves 11 and 15 and the controlling valves of the branch-pipes 10 and 14, as well as the valve 25 in the bottom of vessel C. An equilibrium of pressures will now become established between the second and third tanks. The second drain-pipe 31 should next be attached to the nipple at the bottom of vessel C, and the valves 24 and 25 opened, and pump 29 set in motion, whereby the liquor in tank B will pass through the fining adding apparatus, the pump 29, cooler 40, pipe 35, and into tank C. In describing the foregoing operation it is assumed that the branch pipes leading to all the other six vessels A', A², B', B², and C', C², were closed in order to cut them temporarily out of the circuit, but they are always available as reservoirs for the excess or surplus carbonic acid gases, or for larger or smaller brewings.

The cooler 40 should be gaged to cool the liquor down to approximately freezing point which will have the effect of precipitating albuminous matter and still further clarifying the beer. After the required amount of liquid has been run into vessel C, valves 16 and 25 should be closed. The beer now contains the necessary amount of carbonic acid gas, and as there is very little or no after fermentation on account of the low temperature and gas pressure, the beer will clarify in a very short time.

The advantages of my process are that a much purer fermentation is obtained by reason of the retention of the carbonic acid

gas in the liquid. The fermentation of the liquid under a carbonic acid gas pressure of from five to seven pounds suppresses the growth of foreign germs, causing them to settle at the bottom of the tub, thereby acting as a protector of the yeast. The charging of the empty tubs with gas pressure keeps them clean and free from mold. This charging is a substitute for sulfur vapors, but it has the advantage over the latter in that it has no effect on the taste of the liquid, when the gas is allowed to remain in the vessel; and further my process effects a great saving of much of the time usually required for storing the beer.

It is apparent that my invention might be varied in many ways that would suggest themselves to those skilled in the art. Therefore, I do not wish to limit myself to the exact process herein described and shown, but consider myself entitled to all such variations as come properly within the scope and spirit of my invention.

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

1. The process of fermenting wort, which consists in conducting the main fermentation in two communicable vessels under self-evolved gases by first precipitating and retaining in the first vessel the dead yeast cells and other impurities; secondly, establishing communication between the two vessels whereby the gaseous pressure is equalized between them; thirdly, transferring the purified wort from the first vessel to the second vessel, and fourthly, continuing the main fermentation in the second vessel.

2. The process of fermenting wort, which consists in effecting the main fermentation in two communicating vessels as follows: first, by allowing the exhausted yeast cells and other impurities to settle to the bottom of the first vessel while the liquid is fermenting in one closed vessel under pressure of its own evolved gases; second, establishing communication between the first vessel and a second closed vessel whereby the pressure is equalized between the two vessels; third, transferring the fermenting and purified liquid into said second vessel; and fourth, continuing the main fermentation in the second vessel under pressure of self-evolved gases.

3. The process of fermenting wort, which consists in precipitating and retaining the exhausted yeast cells and other impurities from the liquid, while the latter is fermenting under the predetermined pressure of its own gaseous products, in a closed vessel; secondly, drawing off the purified liquid portion from the first vessel into a second closed vessel under an equalized pressure established between the two vessels; third,

establishing gaseous communication between the second vessel and a third closed vessel; fourth, transferring the liquid from the second to the third vessel through a fin-
5 ing adding apparatus, whereby the residual good yeast is left in the second vessel and the finished liquor delivered to and stored in the third vessel.

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

WILLIAM PETER FREDERIC MOELLER.

Witnesses:

FRANCES STEWART,
GEO. J. ROWLAND,
GEORGE WISE.