Nov. 17, 1931. C. B. SCHNEIBLE 1,832,587

METHOD OF AND APPARATUS FOR DEALCOHOLIZING BEER AND THE LIKE

Filed July 30, 1926 2 Sheets-Sheet 1

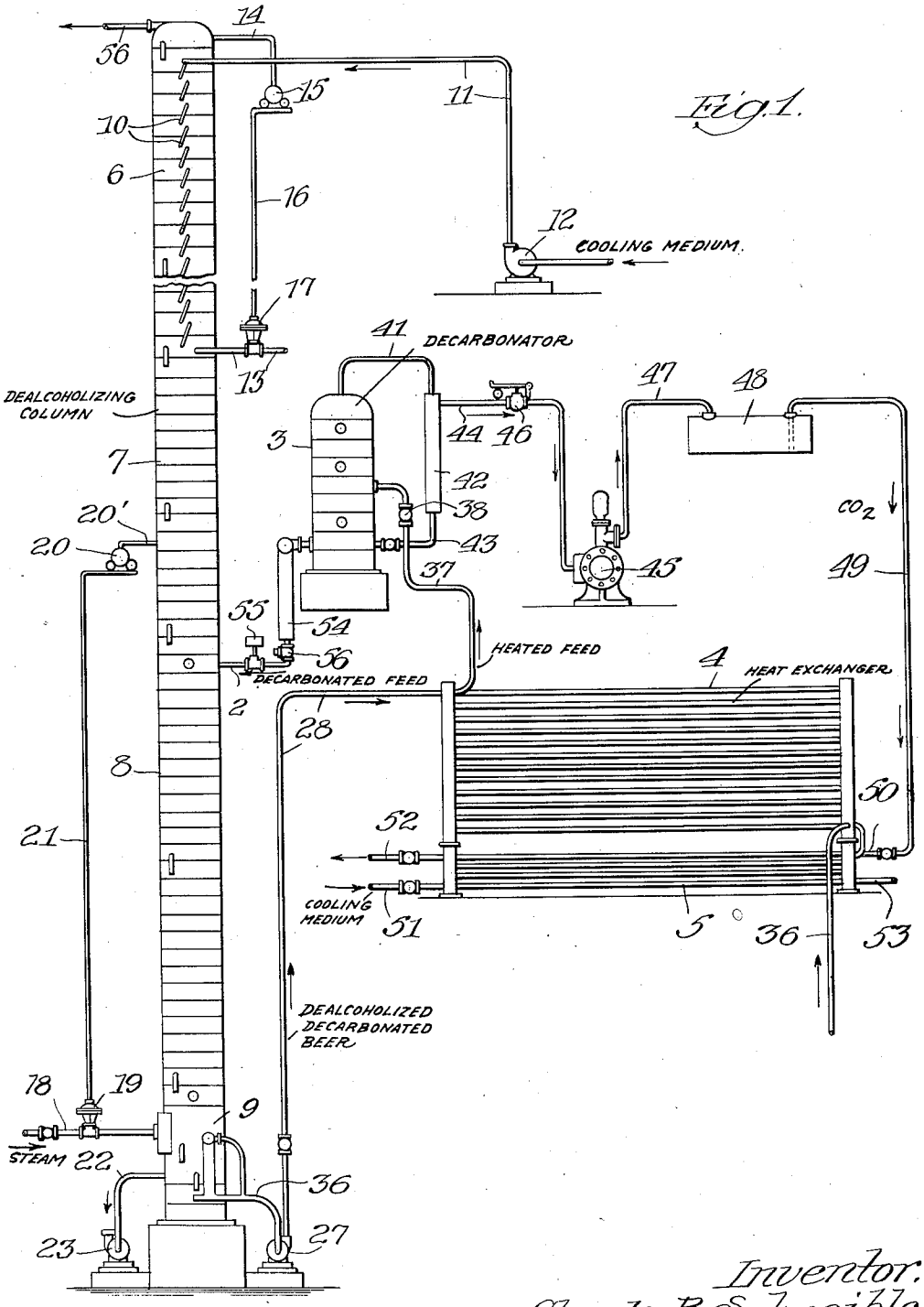


Fig. 1.

Inventor:
Claude B. Schneible,
By Dyrenforth, Lee, Chritton & Wiles.
Attys

Nov. 17, 1931. C. B. SCHNEIBLE 1,832,587

METHOD OF AND APPARATUS FOR DEALCOHOLIZING BEER AND THE LIKE

Filed July 30, 1926 2 Sheets-Sheet 2

Fig. 2.

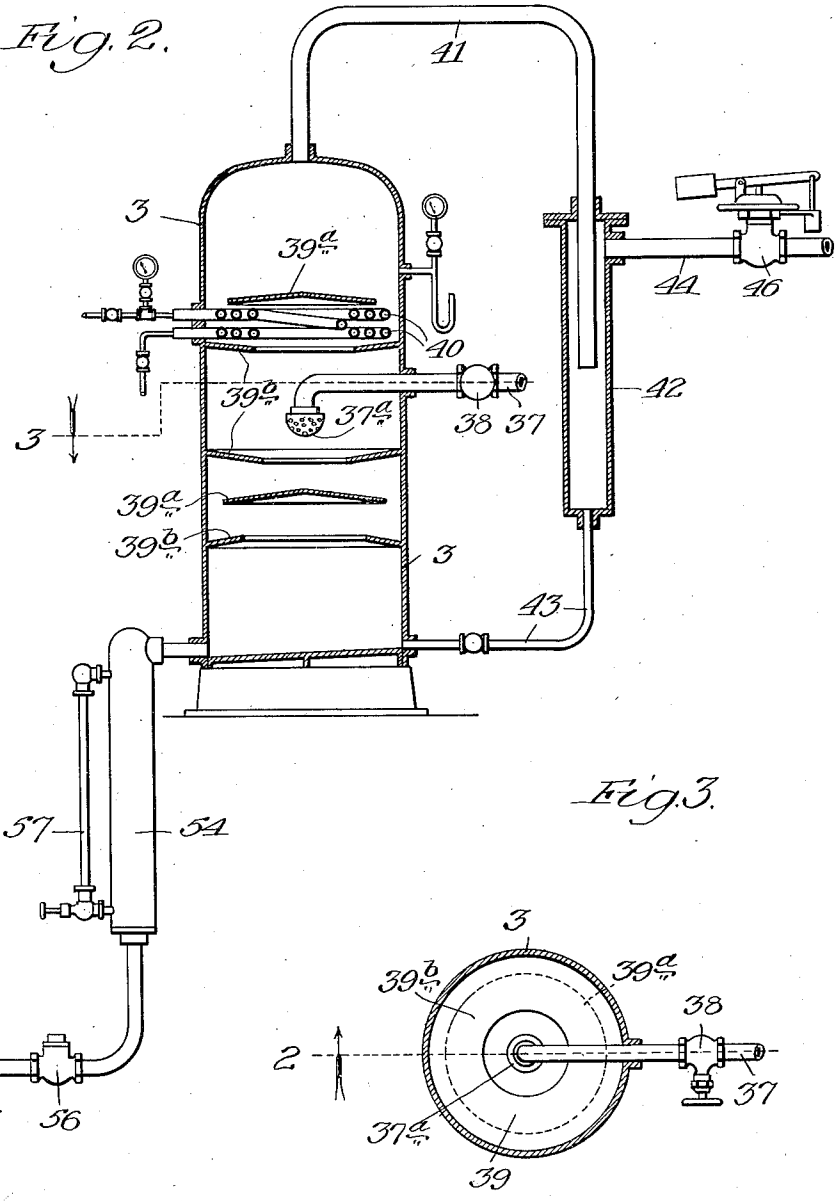


Fig. 3.

Inventor:
Claude B. Schneible,
By Dyrenforth, Lee, Chritton & Wills,
Attys.

Patented Nov. 17, 1931

1,832,587

UNITED STATES PATENT OFFICE

CLAUDE B. SCHNEIBLE, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO CLAUDE B. SCHNEIBLE, IRENE S. CLARK, AND BENJAMIN B. SCHNEIDER AS TRUSTEES UNDER NAME OF JOSEPH SCHNEIBLE TRUST

METHOD OF AND APPARATUS FOR DEALCOHOLIZING BEER AND THE LIKE

Application filed July 30, 1926. Serial No. 125,940.

This invention relates to a method of and apparatus for dealcoholizing beer and the like and will be readily understood from the following description in conjunction with the accompanying drawings, in which:

Figure 1 is an elevation of a preferred form of apparatus;

Fig. 2 is an enlarged sectional view of the decarbonating chamber and associated parts on the line 2—2 of Fig. 3; and

Fig. 3 is a horizontal section on the line 3—3 of Fig. 2.

Referring to the drawings, 1 is a suitable still column, to which the beer or the like is supplied at an intermediate point by pipe 2, and in which the beer is dealcoholized in the lower portion and the alcohol fractionated in the upper portion, reflux being returned to the beer residue. 3 is a decarbonating chamber in which the carbon dioxide is removed from the beer or the like before it is fed into the still column 1. 4 is a heat exchanger of the double tube type in which the incoming beer is preheated by the residue from the still column 1. 5 is a brine cooler of the double tube type in which the carbon dioxide from the carbonating chamber is redissolved in the residue from the column still 1 and the dealcoholized, carbonated beer cooled by brine.

The column still 1 may suitably be similar to that shown in U. S. patent application Serial No. 433,376, filed December 27, 1920 and comprises in superimposed relation a reflux condensing part 6, a dephlegmating part 7 above the pipe 2, a stripping part 8 below the pipe 2 and a heating part 9 at the base of the column. The sections of the reflux condensing part 6 of the tower are provided with cooling coils which are connected in series by pipes 10. Cold water or other cooling medium is supplied to the coils by pipe 11 and pump 12. The water passes from the coils by pipe 13 and the flow through the coils is regulated in accordance with the temperaure of vapors at the top of the column by a thermostat therein, connected by line 14 with a thermostat control 15 which is connected by line 16 with valve 17 controlling the flow of water through the coil at the outlet pipe 13. The heating part of the column 9 is provided with heating coils which are supplied with steam by the pipe 18, controlled by valve 19 which is controlled by thermostat 20 through line 21, the thermostat control being connected with a thermostat in the column at a suitable intermediate point 20′ above the pipe 2. Steam and condensed water are removed from the heating coils through line 22 by pump 23.

The top of the tower is provided with a pipe 56 for leading off the alcohol vapors. This pipe is connected to a suitable condensing apparatus and an exhausting pump (not shown) to maintain a high degree of vacuum in the still column.

The liquid residue is drawn off by the pipe 26 and pump 27 and fed through valved pipe 28 to the heat exchanger 4, in which it is cooled by the incoming beer, preheating the latter. The heat exchanger 4 is suitably of the double tube type, the outgoing residue and incoming beer travelling in countercurrent, the incoming beer being supplied to the inner tube from pipe 36 and the preheated beer passing into an intermediate point in the decarbonating chamber 3 by pipe 37 which may be provided with a valve 38. The decarbonating chamber is preferably of circular cross-section and is provided above and below the pipe 37 with baffles 39^a and 39^b of the ring and disk type, each of the baffles being downwardly pitched to prevent accumulation of liquid thereon. The pipe 37 extends into the chamber 3 and is provided with a rose or distributing nozzle 37^a which is adapted to distribute the incoming beer over the baffle-ring 39^b therebeneath and assists in the breaking up of the foam. A steam coil 40 may be provided in the upper part of the chamber 3, if necessary, for the purpose of breaking up the foam. The bottom of the decarbonating chamber 3 communicates with a trapped receptacle 54, at a lower level and provided with gauge glass 57. The pipe 2 leads from the bottom of the chamber 54 to the still, and is provided with a control valve 55 and a check valve 56. From the top of chamber 3, a carbon dioxide pipe 41 leads into a liquid trap 42 provided with a valved return pipe 43, which conducts any liquid

separated therein to the base of the chamber 3, and with a gas conduit 44 which is connected with the intake of pump 45. The pipe 44 is provided with a vacuum regulating valve 46 which is operated by the difference of pressure between the atmosphere and the pressure in the decarbonating chamber 3, to maintain the latter at a suitable pressure for the effective removal of the carbon dioxide together, if desired, with a certain quantity of alcohol therein. From the pump 45, the pipe 47 leads the gas, compressed, for example, to 35 to 40 pounds gauge, to a receiver 48, from which it is conducted by pipe 49 and injected into the dealcoholized residue in the brine cooler 5 at 50. The brine cooler 5 is also of the double tube countercurrent type. Refrigerated brine is admitted to the inner tube at 51 and passed out at 52. Residue, cooled in the heat exchanger 4, and carbon dioxide from pipe 49 pass through the outer tubes and out at 53, the gas being dissolved in the dealcoholized liquid during the cooling of the latter.

An example of the operation of the present invention is as follows: Beer to be dealcoholized is pumped into pipe 36 through heat exchanger 4, pipe 37, decarbonating chamber 3 and pipe 2 into the still column. The heating part of the column 9 is supplied through pipe 18, with steam at subatmospheric pressure, suitably at a temperature of about 65° C., and with a condensing temperature of about 56.5° C., vacuum being maintained by pump 23. Within the still column 1, a vacuum of 24 to 25 inches of mercury is maintained by an exhausting pump connected with the alcohol vapor line 56. The thermostat control 15 is adjusted so as to maintain a temperature of about 33½° C. at the top of the still and water is forced through the coils of the reflux condensing part 6 by the pump 12. The thermostat control 20 is adjusted so as to maintain a temperature of 46° C. at the point 20′ of the dephlegmating part of the column. Under these conditions the alcohol is substantially completely removed in concentrated form from the beer and its vapors pass off through pipe 56 to suitable condensers. The dealcoholized liquid passes from the tower through pipe 26 at a temperature of about 56.4° C. and is pumped by pump 27 through pipe 28, heat exchanger 4, brine cooler 5 and out through pipe 53 to suitable receptacles. In passing through the heat exchanger 4 the incoming material is heated by the outgoing dealcoholized liquid to a temperature of 50° C. at which temperature it is passed to the decarbonating chamber 3. Within the chamber 3, a vacuum of about 2 inches of mercury is maintained by pump 45, the valve 46 being adjusted for the desired degree of vacuum. Under these conditions the beer is substantially decarbonated before it enters the still column, the separated carbon dioxide being removed by the pump 45 and compressed to about 35 pounds per square inch, at which pressure it is retained in the receiver 48. The valve in the pipe 49 is adjusted so as to maintain a pressure of 35–40 pounds per square inch, which is suitable for the effective injection of the carbon dioxide into the dealcoholized liquid in the brine cooler 5. Refrigerated brine is fed to the latter by pipe 51 and led off by pipe 52. The valve 55 in the pipe is regulated to maintain a body of liquid in the chamber 54 as indicated by the gauge glass 57.

According to the foregoing example, the beer or the like is substantially completely deprived of alcohol. By slight modification, a partial removal of the alcohol may be effected. For example, the valve 46 may be adjusted so that an increased vacuum is applied to chamber 3 so that a certain part of the alcohol passes over with the carbon dioxide and is fed back into the beer at 50. Or the still 1 may be operated so that the residue therefrom retains a certain amount of alcohol therein as will readily be understood by those skilled in the art. Or a combination of these methods may be employed, that is, a certain amount of alcohol may be returned with the carbon dioxide at 50 and a further certain amount may be left in the residue of the still 1 so as to give the desired percentage in the recarbonated beer.

I claim:

1. The method of dealcoholizing beer and like beverages containing carbon dioxide and alcohol, which consists in heating the beer and thereafter subjecting it to subatmospheric pressure to remove carbon dioxide therefrom, subjecting the decarbonated beer to distillation to remove alcohol therefrom, cooling the dealcoholized beer and returning the carbon dioxide thereto while cooling.

2. The method of dealcoholizing beer and like beverages containing carbon dioxide and alcohol, which consists in heating beer, distributing the heated beer in finely divided form and thereafter subjecting it to reduced pressure to remove carbon dioxide therefrom, subjecting the decarbonated beer to distillation to remove alcohol therefrom, cooling the dealcoholized beer, compressing the carbon dioxide removed from the beer and returning same to the beer while cooling.

3. The method of dealcoholizing beer and like beverages containing carbon dioxide and alcohol, which consists in heating the beer and thereafter subjecting it to the action of an evacuating pump to abstract and remove carbon dioxide therefrom, subjecting the decarbonated beer to distillation to remove alcohol therefrom, passing the hot dealcoholized beer in heat exchange relationship with fresh beer whereby said beer is heated to a suitable decarbonating temperature and the

dealcoholized beer is cooled, and injecting the carbon dioxide from the decarbonating operation, under pressure into the cooled dealcoholized beer.

4. The method of dealcoholizing beer and like beverages containing carbon dioxide and alcohol, which consists in heating the beer to a temperature of about 50° C., thereafter subjecting the heated beer to vacuum to remove carbon dioxide therefrom, distilling the decarbonated beer to remove alcohol therefrom, abstracting the alcoholized beer at a temperature of about 56° C. from the distilling apparatus and forcing it in countercurrent to and in heat exchange relation with incoming fresh beer thereby heating said fresh beer to a temperature of about 50° C., compressing the carbon dioxide to about 30 pounds per square inch and injecting it into the cooled dealcoholized beer and subjecting the mixture of gas and beer to further cooling to effect solution and stabilization.

5. The method of dealcoholizing beer and like beverages containing carbon dioxide and alcohol, which consists in heating the beer and thereafter subjecting it to subatmospheric pressure to remove carbon dioxide and part of the alcohol therefrom, subjecting the decarbonated beer to distillation to remove alcohol therefrom, cooling the dealcoholized beer and returning the carbon dioxide and the accompanying alcohol thereto while cooling.

6. The method of dealcoholizing beer and like beverages containing carbon dioxide and alcohol, which consists in heating the beer and thereafter subjecting it to the action of an evacuating pump to abstract and remove carbon dioxide and a part of the alcohol therefrom, subjecting the decarbonated beer to distillation to remove alcohol therefrom, passing the hot dealcoholized beer in heat exchange relationship with fresh beer whereby said beer is heated to a suitable decarbonating temperature and the dealcoholized beer is cooled, injecting the carbon dioxide and alcohol from the decarbonating operation under pressure into the cooled dealcoholized beer.

7. An apparatus for dealcoholizing beer and like beverages containing carbon dioxide and alcohol, comprising means for heating the beer, a decarbonating chamber, means for conducting the heated beer to said chamber, a carbon dioxide line from said chamber, a pump for drawing off carbon dioxide and compressing same, a column still, a conduit from the base of said chamber to an intermediate part of said still, means for conducting liquid from said still to said heating means for the incoming liquid and means for injecting the carbon dioxide into the cooled liquid therefrom.

8. An apparatus for dealcoholizing beer and like beverages containing carbon dioxide and alcohol, comprising a heat exchanger, means for supplying beer thereto, a decarbonating chamber connected therewith, a gas line connected with said chamber, a pump in said gas line, liquid conduit means from said chamber to a still, a liquid conduit from said still to said heat exchanger, means for conducting cooled liquid from said heat exchanger to a further cooling means and an injector for injecting compressed carbon dioxide from said gas line into last said cooling means.

9. In an apparatus for dealcoholizing beer and like beverages containing carbon dioxide and alcohol, a decarbonating column, baffles therein adapted to effect a distribution of the beer while avoiding accumulation of liquid, means for supplying liquid thereto at an intermediate point in the column, means for supplying heat within the column above the point of liquid supply, a gas line from the top of said column, an exhausting pump connected with said line, and liquid conduit means from the bottom of said column.

10. In an apparatus for dealcoholizing beer and like beverages containing carbon dioxide and alcohol, a decarbonating column, ring and plate baffles therein pitched downwardly to avoid accumulation of liquid, liquid supply means above one of said ring baffles and adapted to sub-divide the incoming liquid, a coil within said column above the liquid supply means adapted for the passage of a heating fluid therethrough, a gas line connected with the top of said column and a liquid draw-off line at the base of the column.

11. In an apparatus for dealcoholizing beer and like beverages containing carbon dioxide and alcohol, a decarbonating column, baffles therein, means for supplying liquid thereto at an intermediate point in the column, a coil in the upper part of said column said coil being adapted for the passage of heating fluid therethrough, a gas line connected with the top of the column and a liquid line connected with the base of the column.

CLAUDE B. SCHNEIBLE.