

No. 669,435.

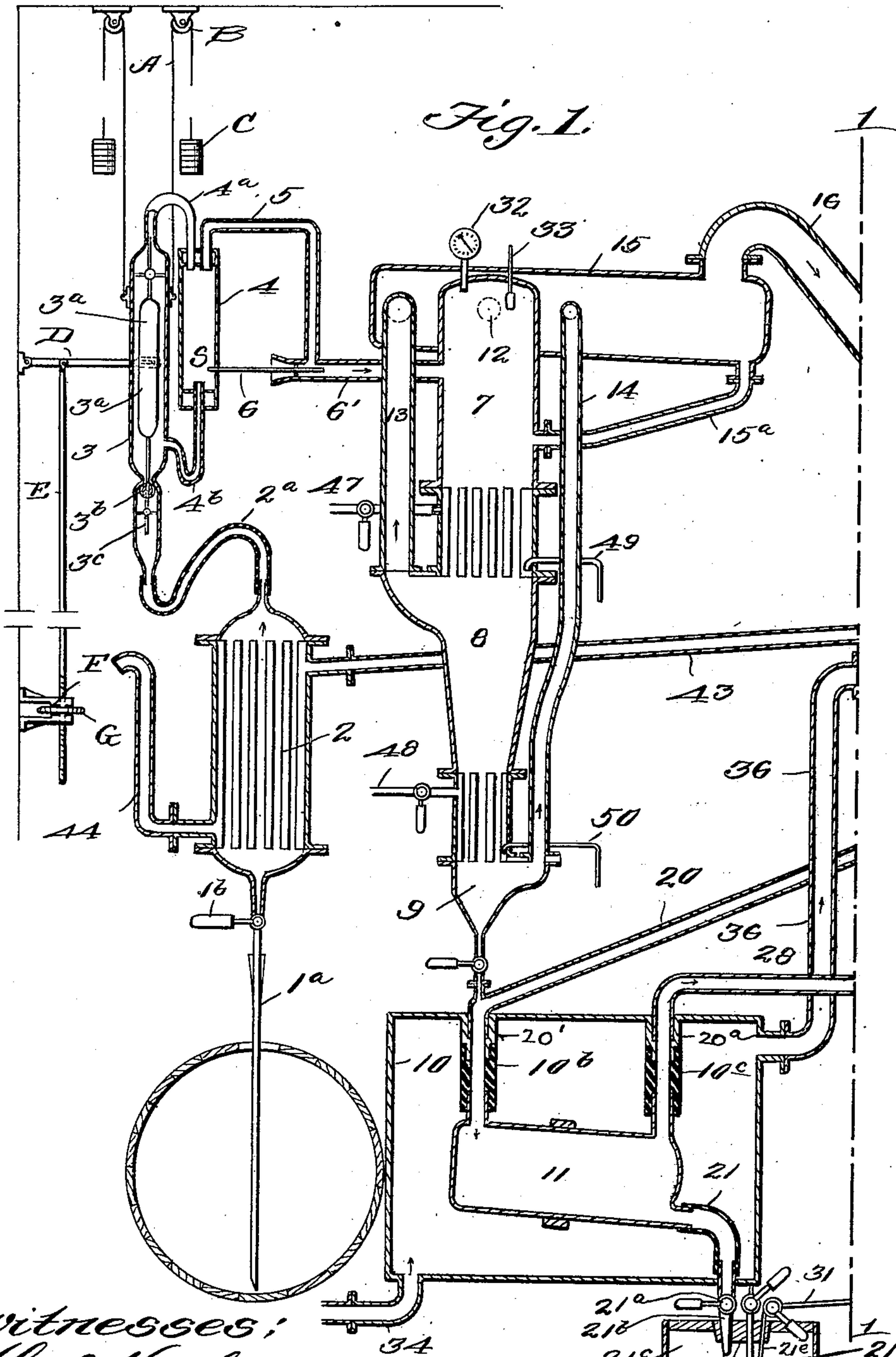
Patented Mar. 5, 1901.

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APPARATUS FOR DISTILLING AND CONCENTRATING LIQUIDS.

(No Model.)

(Application filed Oct. 24, 1896.)

2 Sheets—Sheet 1.



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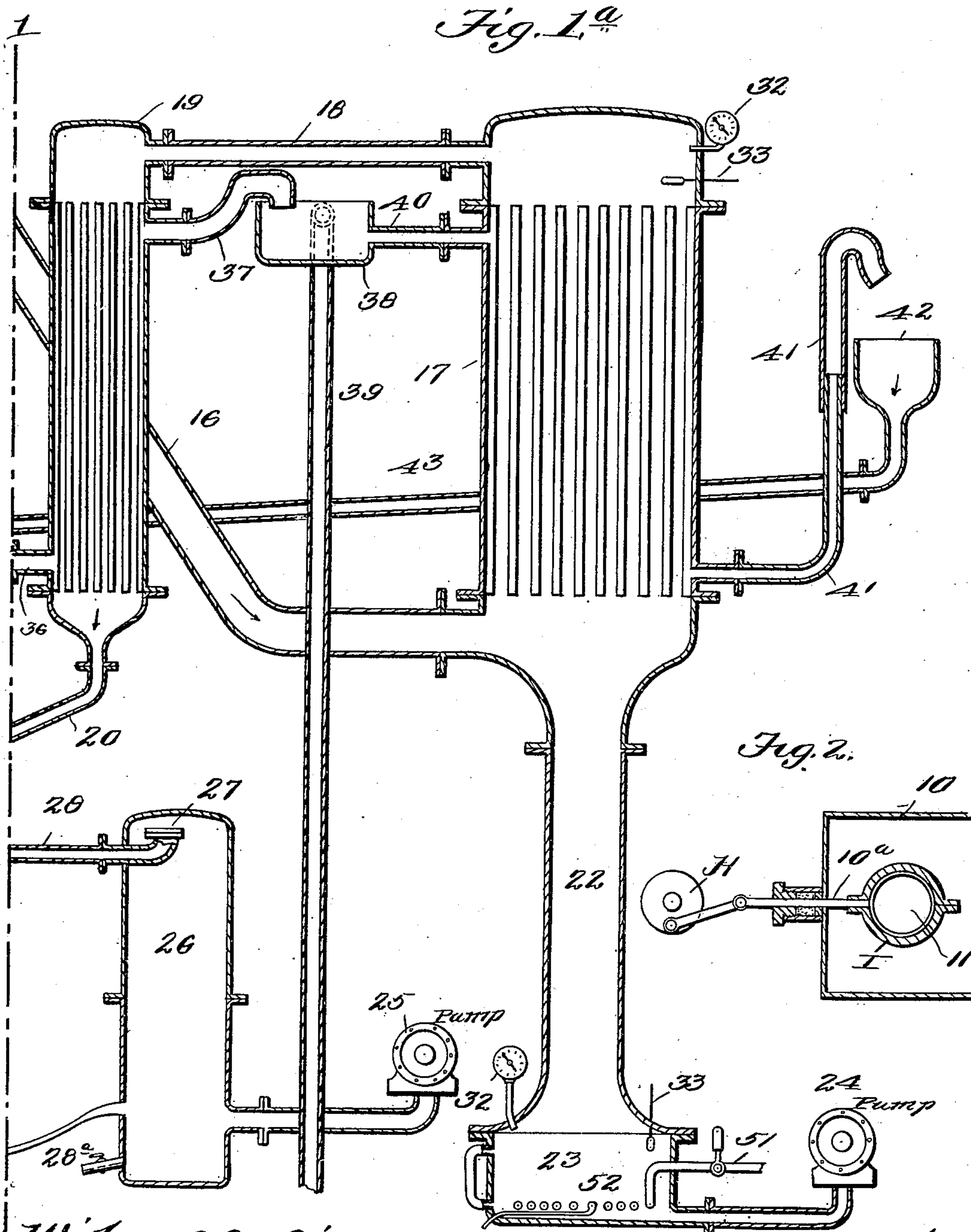
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# UNITED STATES PATENT OFFICE.

LOUIS MARIE BAUDOUIN AND PIERRE EMILE SCHRIBAUX, OF PARIS,  
FRANCE.

## APPARATUS FOR DISTILLING AND CONCENTRATING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 669,435, dated March 5, 1901.

Application filed October 24, 1896. Serial No. 609,950. (No model.)

*To all whom it may concern:*

Be it known that we, LOUIS MARIE BAUDOUIN and PIERRE EMILE SCHRIBAUX, citizens of France, and residents of Paris, France, have invented a new and Improved Apparatus for Distilling and Concentrating Liquids, of which the following is a specification.

Our invention consists in an apparatus for the concentration by evaporation of liquids—such as wine, cider, or beer—the useful constituents of which are partly fixed and partly volatile or fluid compounds containing volatile dissolvents—such, for example, as alcohol, ether, carbonic sulfid, &c.—which it may be desirable to recover, or alimentary fluids—such as milk, beef juices, and the like—from which the fixed constituents are to be extracted.

An apparatus constructed in accordance with our invention is illustrated in the accompanying drawings, in which—

Figures 1 and 1<sup>a</sup> when taken together illustrate a sectional elevation of the apparatus; and Fig. 2 is a cross-sectional view of the cooler and mixer, showing the agitating means for the latter.

A vacuum is first obtained in the apparatus in a manner hereinafter described. The liquid—say wine—to be treated is placed in a vat or cask 1, from which it is raised by suction caused by the pump 25 through a connecting-pipe 1<sup>a</sup>, provided with a cut-off 1<sup>b</sup>, into a heater 2. From the heater it is carried by means of the flexible pipe 2<sup>a</sup> to the feed-governor, consisting of a vessel 3, having an inclosed float 3<sup>a</sup>, which controls the valve 3<sup>b</sup>, adjustably connected to the valve-stem 3<sup>c</sup>. The float 3<sup>a</sup> controls the valve 3<sup>b</sup> for opening and closing the pipe 2<sup>a</sup> to maintain a constant liquid-level in the receiver 4, communicating with the vessel 3 by means of the pipes 4<sup>a</sup> 4<sup>b</sup>. The feed-governor is suspended from a ceiling or overhead support by ropes A, passing over pulleys B and connected to weights C. A pivoted arm D, with a forked end, engages the sides of the vessel 3. To the arm D is connected a rod E, which extends through a fixed bracket F. A hand-wheel G is arranged in said bracket and upon the threaded end of the rod E. By turning the wheel G the vessel 3 will be lowered or raised, as the case may

require. The top of the receiver 4 is connected by a tube 5 with the first evaporator 7 by the closed pipe 6', into which the liquid flows through the discharge-pipe 6 from the receiver 4. The level in the latter is independent of variations of pressure which may occur in the apparatus, so that the feed after having once been regulated remains uniform. The wine passes through the first evaporator 7, presently to be described, thence into the second evaporator 8, and finally descends in the condition of hot extract to the bottom of the second receiver 9, whence it is conducted to a combined cooler and mixer 11, where it mixes with the volatile products which it is desired to preserve and the method of circulation of which will now be described.

The vapors, carrying with them water as well as alcohol, ether, and other volatile products, escape from the first evaporator 7 through the outlets 12 and from the evaporator 8 through the outlet 13, and from the second receiver 9 they rise through a tube 14 and meet in a cylindrical receiver 15. The upper closed end of the first evaporator 7 lies partly within the receiver 15, and the latter is slightly inclined from left to right and acts as a froth-breaker. Should any of the froth be brought along with the vapors, it would be returned to the first evaporator 7 through a return-pipe 15<sup>a</sup>, which connects the said evaporator 7 with the lower end of the inclined receiver 15. From the inclined cylindrical receiver 15 the vapors pass through a pipe into an analyzer 17, hereinafter to be described. This analyzer is cooled to such a degree that the vapors of alcohol, ether, and the like, which are here separated for the most part from the water when escaping therefrom, are at the proper degree of concentration. The vapors are then conducted by a tube 18 into the condenser 19, having a lower temperature than the analyzer 17, whence the condensed matters pass along a suitable pipe 20 to the cooler or mixer 11, where they are continuously agitated and mixed with the extract.

The mixer 11 is mounted in the cooler 10, the former being agitated by means of the shaft 10<sup>a</sup>, connected to a suitable operating mechanism H and to the mixer 11 by the



clamping-band I. The mixer 11 is suspended within the cooler 10 by the flexible pipes 10<sup>b</sup> and 10<sup>c</sup>, the pipe 10<sup>b</sup> communicating with the second receiver 9 and pipe 20 by means of the annular flange 20' and the pipe 10<sup>c</sup> communicating with the pipe 28 by means of the annular flange 20<sup>a</sup>. The mixture is then removed from the mixer 11 through a flexible tube or spout 21, having a tap 21<sup>a</sup> connected to a tube 21<sup>b</sup>, and collected in a receptacle 21<sup>c</sup>, wherein a vacuum has been previously obtained. The portion of the vapor condensed in the analyzer 17 passes into a rectifier or distilling-column 22, wherein it is freed from any residual alcohol which may have been carried along with it and whence it is discharged into a receiver 23. By maintaining it in a state of slight ebullition in such receiver the wine residue is entirely freed from alcohol. The residue, containing water, acetic acid, and other more or less objectionable matters, is removed by means of any suitable form of pump 24, the operation of which is so timed as to maintain the wine residue at a practically constant level in the said receiver 23.

The air is exhausted or a vacuum obtained in the apparatus by means of an air-pump 25, of any suitable construction, acting directly upon a receiver 26, which is connected by a pipe 28 with the mixer 11 and provided with an outlet 28<sup>a</sup>. The pipe 28 is fitted with a normally-closed flap-valve 27, by which the apparatus may be connected with the pump whenever the pressure falls below a predetermined degree, or, in other words, the valve 27 is arranged to close by gravity whenever the exhaust or suction current falls below a given point and to open again by the passage of said current whenever the latter shall have a suitable force.

The concentrated product is received in a tightly-closed receptacle 21<sup>c</sup>, having a tight plug 21<sup>d</sup>, through which three tubes 21<sup>b</sup> 21<sup>e</sup> 21<sup>f</sup> pass. The tube or pipe 21<sup>b</sup> connects the receptacle with the mixer 11, and through which the concentrated wine passes. Another of the said tubes, as 21<sup>e</sup>, connects the receptacle by means of the pipe 31 to the receiver 26, in which the vacuum or suction of the pump 25 is first established. This receiver is arranged between the pump 25 and the cooler 10. The remaining tube 21<sup>f</sup> communicates with the atmosphere. Each of the tubes is provided with a suitable cut-off or tap. When it is desired to extract the concentrated liquor, a vacuum more perfect than that which prevails in the main apparatus is first obtained in the receptacle 21<sup>c</sup> by closing the cut-offs of the tubes 21<sup>b</sup> and 21<sup>f</sup>. This result is attainable owing to the fact that the pump 25 acts through the pipe 31 and tube 21<sup>e</sup> directly upon the chamber of the receptacle 21<sup>c</sup> without being obliged to overcome the resistance of the valve 27, which cuts it off from the whole of the remaining portion of the apparatus, whereupon the tube 21<sup>a</sup>,

leading to the chamber in the receptacle 21<sup>c</sup>, is opened, and when said chamber is filled with liquor the cut-off of the tubes 21<sup>b</sup> is closed and the cut-off from the tube 21<sup>f</sup> opened. The admission of air to the chamber of the receptacle 21<sup>c</sup> by way of the tube 21<sup>f</sup> causes a pressure of one atmosphere, or nearly so, to be exerted upon the product which has been drawn into the receptacle, thereby driving it through the tube 31 into the receiver 26.

Pressure-gages 32 and thermometers 33 are arranged at the upper part of the evaporator 7 and of the analyzer 17 and also at the evaporator-outlet of the wine-residue receiver 23.

The cooling-water is supplied to the cooler 10 by the supply-pipe 34 and first passes around the mixer 11, wherein the mixture or extract and alcohol are cooled. Then it passes by way of the pipe 36 into the condenser 19 and is then discharged by the pipe 37 into the receiver 38, provided with an overflow 39, thence into the analyzer 17 by the pipe 40, where its speed of circulation is controlled by a predetermined difference of level between its inlet and outlet orifices, such differences being provided for by a telescopic outlet-tube 41. The water escapes through such tube while hot and descends into a receiver 42, and thence it flows by a tube 43 to the wine-heater 2 and is finally discharged through an outlet 44.

Concentration is obtained by heating the evaporators by means of steam-pipes 47 and 48, provision being made for the escape of condensation-water by exits 49 50.

The wine-residue receiver 23 is in its turn heated by a steam-coil 52, supplied from a steam-pipe 51.

We will now proceed fully to describe the duplex evaporator proper, 7 and 8. It consists of a series of tubes divided into two superposed sets and closed at the top and bottom by tube-plates. The heating-steam circulates outside such tubes within the tube-case. The liquor to be concentrated is first introduced by the pipe 6' above the upper tube-plate of the upper set of tubes 7 and enters such tubes. As it comes into contact with the heated tube-walls it gives off vapors finding their way out at the top through the opening 12 to the receiver 15. The vapors counteract too rapid a descent of the liquor and retain it in contact with the entire heating-surface, which is thus fully turned to account. On the other hand the bubbles of steam by thus retarding the descent of the liquor retain it for a time upon the tube-plate, which insures an even distribution among all the tubes. The liquor that has not yet been volatilized descends to the lower set of tubes 8, acting exactly in the same manner as the first set 7. The vapors generated in this lower set of tubes now flow toward the froth-breaker both through the pipe 13, rising from between the two sets of tubes, and



through a pipe 14, rising from below the lower set of tubes, and the liquor, having attained the desired degree of concentration, owing to its passage through the two sets of tubes, descends into the second receiver 9 below.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

An apparatus for concentrating fluids by evaporation, the combination with a heater, feed-governor and condensers, of an evaporating apparatus composed of two sets of vertical tubes superposed one above the other and discharging the vapors at the top and

bottom thereof, a receiver above said evaporator for receiving and uniting said vapors, a mixer adapted to receive the fluid extract and condensed matters for reuniting the same, and a pump to maintain an exhaust in said apparatus.

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

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PIERRE EMILE SCHRIBAU.

Witnesses:

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EDWARD P. MACLEAN.