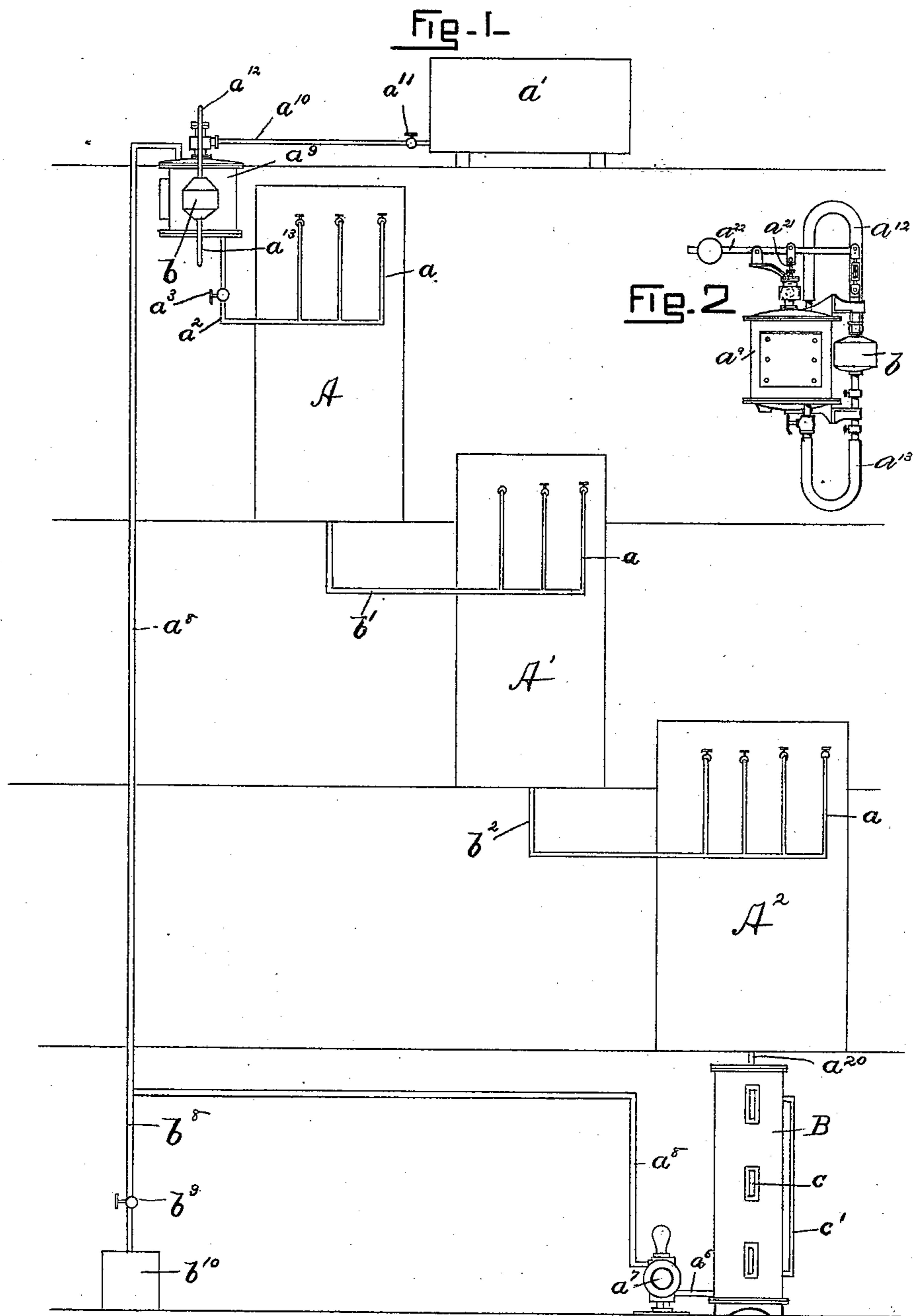


(No Model.)

T. GAUNT.
MULTIPLE EFFECT EVAPORATING APPARATUS.
No. 430,183. Patented June 17, 1890.



WITNESSES

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UNITED STATES PATENT OFFICE.

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MULTIPLE-EFFECT EVAPORATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 430,183, dated June 17, 1890.

Application filed March 7, 1890. Serial No. 342,945. (No model.)

To all whom it may concern:

Be it known that I, THOMAS GAUNT, of Brooklyn, county of Kings, State of New York, have invented an Improvement in Multiple-Effect Evaporating Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

10 This invention relates to multiple-effect evaporating apparatus of that class in which the liquor or substance being treated is evaporated while in transit over an evaporating-surface.

15 In accordance with my invention a series of evaporators are arranged in graduation—that is, on different levels and connected together to form a liquid seal between the separate evaporators—and the uppermost evaporator has its liquor-supply joined to an auxiliary chamber provided with a regulator, by which the amount of liquor supplied to the evaporator may be automatically controlled, and the lowermost evaporator of the series 20 communicates with an independent chamber, itself connected by a return-pipe to the said auxiliary chamber. The return-pipe referred to has a branch pipe provided with a valve by which the amount of liquid discharged 30 through the branch pipe may be regulated and the amount of liquor returned to the auxiliary chamber, and thereby the degree to which the liquor is concentrated may be controlled.

35 My invention in a multiple-effect transit evaporating apparatus, therefore, consists in the combination, with a series of evaporators arranged on different levels and connected together to form a liquid seal between the said 40 evaporators, of an auxiliary chamber connected to the first evaporator of the series and to the liquid-supply, a regulator to control the supply of liquid to the said auxiliary chamber, an independent chamber connected to a lower 45 evaporator of the series, a pump connected to the said independent chamber and having its outlet-pipe connected to the said auxiliary chamber, and a branch pipe provided with a cock or valve to regulate the degree 50 of concentration, substantially as will be described.

Other features of my invention will be here-

inafter pointed out in the claims at the end of this specification.

Figure 1 in elevation represents a multiple-effect evaporating apparatus constructed in accordance with my invention, and Fig. 2 a detail to be referred to.

My improved apparatus, as herein represented, consists of a triple effect composed of three evaporators $A A' A^2$, arranged in graduation—that is, on different levels—so that the liquor in small volume or quantity may flow continuously from one evaporator to the next lower evaporator of the series, and the said 65 evaporators are connected, as will be described, to form a liquid seal between the evaporators, whereby the difference of vacuum between the said evaporators is maintained.

Each evaporator is preferably composed of an evaporating-surface composed of tubes or pipes arranged in vertical line and each provided with a liquid feed or supply, substantially as shown and described in United States Patent No. 409,572, granted to me August 20, 1889. The liquid-supply for each row of tubes has connected to it a branch pipe a , and, as herein represented, the evaporators $A A'$ are provided with three rows of evaporating-tubes and the evaporator A^2 with four rows of evaporating-tubes. The branch pipes a of the evaporator A are connected to a liquid-supply pipe a^2 , provided, as herein shown, with a cock or valve a^3 , the said liquid-supply pipe being connected to and forming the outlet-pipe for an auxiliary vessel or chamber a^9 , located substantially above the level of the liquid-feeders of the evaporator A . The auxiliary chamber or vessel a^9 is provided with a liquid-inlet, to which is joined a pipe a^{10} , connected with a liquid-supply, herein shown as a tank a' , the pipe a^{10} being provided, as shown, with a cock or valve a^{11} . The liquid-inlet to the vessel a^9 is controlled by a suitable valve having its stem a^{21} connected to a counterbalanced lever a^{22} , pivotally supported upon the vessel a^9 , and having connected to it a float chamber or vessel b , the said float being connected by pipes $a^{12} a^{13}$ to the top and bottom, respectively, of the said chamber, substantially as shown and described in another application, Serial No. 296,907, filed by me January 100

19, 1889. The evaporator A is provided with a liquor-outlet pipe b' , which forms the liquor-supply pipe for the evaporator A' , the said pipe having connected to it the branch pipes a for the said evaporator, and the evaporator A' is provided with a liquor-outlet pipe b^3 , constituting the liquor-supply pipe for the evaporator A^2 , the said pipe having connected to it branch pipes a . The evaporator A^2 is provided with a liquor-outlet pipe a^{20} , which communicates with an independent chamber or vessel B, located below the evaporator A^2 , and preferably on a different floor from the said evaporator—as, for instance, in the basement of the building in which the evaporating apparatus is placed. The independent chamber B is provided with a liquor-outlet pipe a^6 , communicating with and forming the inlet-pipe for a pump a^7 , which may be of any usual or well-known construction. The pump a^7 is provided with a liquor outlet or discharge pipe a^8 , which is preferably connected with the top of the auxiliary chamber a^9 , the said pipe constituting a return-pipe for the liquor from the pump to the said auxiliary chamber. The return-pipe a^8 has connected to it a branch pipe b^8 , provided with a cock or valve b^9 , the said branch pipe communicating, as herein shown, with a receptacle b^{10} . The independent chamber B is provided, as herein shown, with sight-glasses c and a liquor-gage c' , by means of which the liquor within the said chamber may be seen.

In practice the different evaporators forming the multiple effect are preferably arranged on different floors of a building, and in operation the liquor from the supply-tank a' first flows into the auxiliary chamber a^9 , the weighted lever overcoming the float b and opening the inlet-valve of the said chamber to permit the liquor to flow therein, the valve a^3 in the pipe a^2 being at such time closed. After the liquor has attained a sufficient level in the auxiliary chamber a^9 to fill the float b , so as to overcome the weighted lever and move the inlet-valve to shut off the supply of liquor from the tank a' , the operator opens the cock or valve a^3 and permits the liquor in the auxiliary chamber a^9 to flow through the pipe a^2 , branch pipes a into the liquid feed or supply of the evaporator A, from which it flows over the evaporating-surface in the said evaporator. As soon as the liquid-level in the chamber a^9 has been lowered sufficiently to permit the weighted lever to overcome the weight of the float the inlet-valve of the said chamber is opened by the said lever and a fresh supply of liquor admitted to the chamber a^9 to maintain the supply of liquor to the evaporators. The liquor is concentrated on its passage through the evaporator A more or less, and the concentrated liquor from the said evaporator flows through the pipe b' and branch pipes a , connected thereto, into evaporator A' , where it is further concentrated, and the said liquor then flows through the pipe b^2 and branch pipes a into evaporator A^2 ,

from which it flows, still further concentrated, into the independent chamber B. By means of the sight-glasses in the independent chamber B the density or concentrated condition of the liquor may be ascertained. After the liquor has attained a certain level in the independent chamber B the operator starts the pump a^7 , and if it is desired to still further concentrate the liquor the valve b^9 in the branch pipe is maintained closed and the liquor is returned back through the pipe a^8 into the auxiliary chamber a^9 , where it mixes with the weak liquor supplied from the tank a' , so that the liquor, which is then caused to pass through the evaporators of the series, is of a greater density than the liquor in the tank a' . If the liquor in the independent chamber is of the desired or required density, the valve b^9 in the branch pipe is opened and the pump a^7 discharges the liquor through the pipe a^8 and branch pipe b^8 into the receptacle b^{10} . If it is desired that the liquor discharged into the receptacle b^{10} should be of a required density, which cannot be accomplished by once passing the liquor through the series of evaporators, the cock or valve b^9 may be partially opened, so that only a portion of the liquor may be discharged into the receptacle b^{10} , the remaining portion being forced back by the said pump into the auxiliary chamber a^9 , to be commingled with the weak liquor, so that the commingled liquor after passing through the series of evaporators will be of the desired density, and the liquor discharged into the receptacle b^{10} will be of the desired concentration. The difference of vacuum between the evaporators is maintained, as herein shown, by carrying the outlet-pipes for the higher evaporators of the series below the liquor-feed for the lower evaporators of the series, whereby a liquid seal is formed between the evaporators.

I claim—

1. In a multiple-effect transit evaporating apparatus, the combination, with a series of evaporators arranged on different levels and connected together to form a liquid seal between the said evaporators, of an auxiliary chamber connected to the first evaporator of the series and to the liquid-supply, a regulator to control the supply of liquid to the said auxiliary chamber, an independent chamber connected to a lower evaporator of the series, a pump connected to the said independent chamber and having its outlet-pipe connected to the said auxiliary chamber, and a branch pipe provided with a cock or valve to regulate the degree of concentration, substantially as described.

2. In a multiple-effect transit evaporating apparatus, the combination, with a series of evaporators arranged on different levels and connected together to form a liquid seal between the said evaporators, of an auxiliary chamber connected to the first evaporator of the series and to the liquid-supply, an outlet-pipe for said auxiliary chamber connected

to the liquid-feed pipes of the first evaporator of the series, a cock or valve in said outlet-pipe to control the amount of liquor supplied to the evaporators, a regulator to
5 control the supply of liquid to the said auxiliary chamber, an independent chamber connected to a lower evaporator of the series, a pump connected to the said independent chamber and having its outlet-pipe connected
10 to the said auxiliary chamber, and a branch

pipe provided with a cock or valve to regulate the degree of concentration, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of 15 two subscribing witnesses.

THOMAS GAUNT.

Witnesses:

JAS. H. CHURCHILL,
EMMA J. BURNETT.