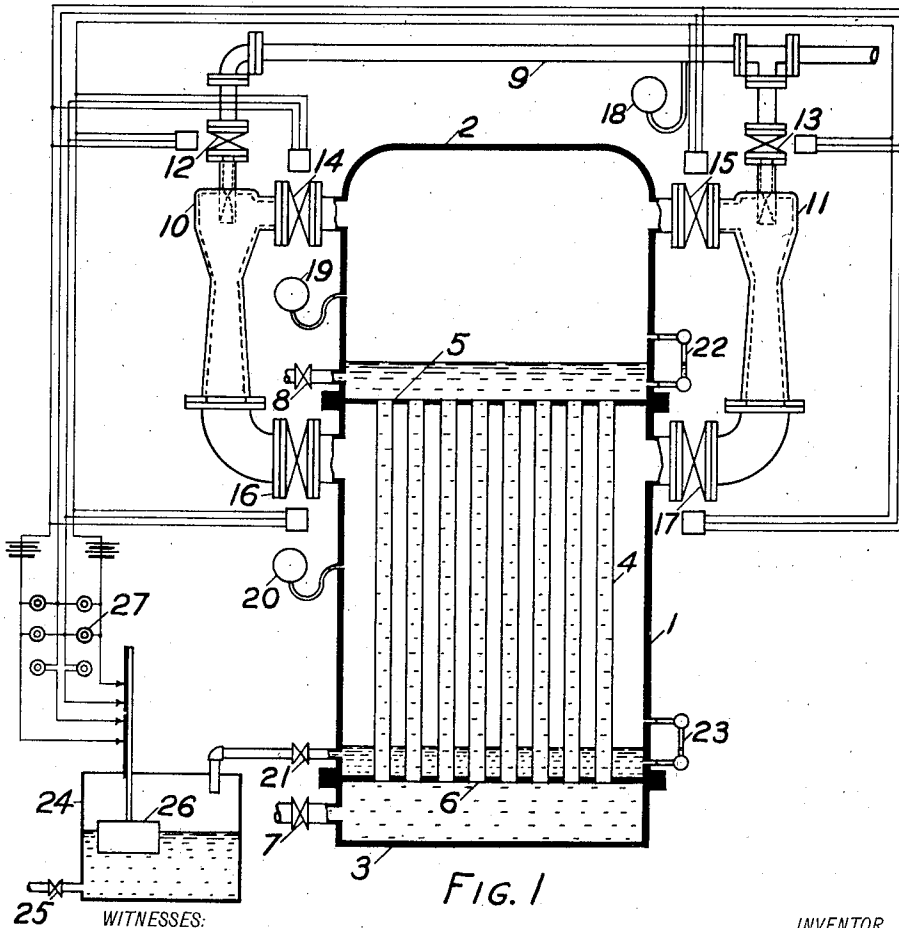
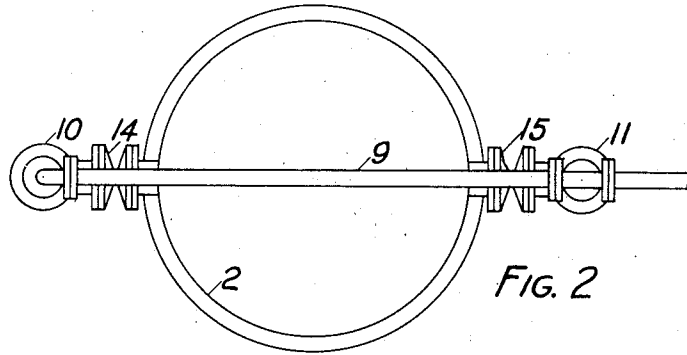


W. L. DE. BAUFRE,
SYSTEM OF EVAPORATION.
APPLICATION FILED SEPT. 16, 1916.

1,361,834.

Patented Dec. 14, 1920.



WITNESSES:

Frank C. Gause
R. E. Kaurde

INVENTOR

William L. De Baufre
BY

William W. Varney
ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM L. DE BAUFRE, OF ANNAPOLIS, MARYLAND.

SYSTEM OF EVAPORATION.

1,361,834.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM L. DE BAUFRE, a citizen of the United States, residing at Annapolis, in the county of Anne Arundel, in the State of Maryland, have invented a certain new and useful System of Evaporation, of which the following is a specification.

My invention relates to improvements in systems of evaporation and has for its object the providing of a flexible system of evaporation wherein an increased efficiency is obtained at a reduced capacity.

A further object of my invention is the providing of means of working an evaporator of predetermined capacity at a less capacity.

And a further object of my invention is the providing of automatic means of controlling the capacity of evaporators.

With the foregoing and other objects in view, my invention consists of the novel construction, combination and arrangement of parts as herein after specifically described and illustrated in the accompanying drawings, wherein is shown the preferred embodiment of my invention, but it is understood that changes, variations and modifications can be resorted to which come within the scope of the claims hereunto appended.

In the drawings of the herein described embodiment of my invention, Figure 1 shows a view in elevation, partly in section, of my improved evaporative system employing vapor ejectors, and Fig. 2 is a plan view of the arrangement shown in Fig. 1.

Similar numerals refer to similar parts throughout the several views.

The evaporator consists of shell 1, vapor head 2 and solution bottom 3, with tubes 4 extending between upper tube sheet 5 and lower tube sheet 6. The solution to be evaporated enters the evaporator at feed valve 7 into the solution bottom 3, and flows up through tubes 4 where it is partially evaporated, the concentrated solution being discharged at discharge valve 8.

Vapor for the operation of the evaporator (the primary vapor) is supplied through pipe 9 to ejectors 10 and 11 through stop valves 12 and 13. The vapor produced in the evaporator (the secondary vapor) is drawn through valves 14 and 15 to the ejectors, where it is combined with the primary

vapor, compressed, and then forced into the heating space of the evaporator through valves 16 and 17. Pressure gages 18, 19 and 20 are connected as shown to indicate the pressure of the primary vapor, the secondary vapor and the vapor within the heating space of the evaporator, respectively. The heating space is drained of condensed vapor through valve 21. Gage glass 22 on vapor head 2 shows the solution level therein. Gage glass 23 on shell 1 indicates the condensate level within.

The condensate drained from the evaporator through valve 21 is shown in the storage tank 24, having drain valve 25. A float 26 is arranged to automatically operate the valves 12, 14, 16 and 13, 15, 17 of ejectors 10 and 11 according to the liquid level in the storage tank. An electrical method is diagrammatically shown, each valve having two magnets or a reversible motor to open and close it, as indicated by the small squares placed at each valve. The magnets or motors may be arranged to open or close the valves controlling one ejector either instantaneously or in any desired sequence. The two contact strips 27 and 28 are insulated from each other and are in sliding electrical contact with the terminals 29, 30, 31 and 32. Push button switches 33, 34, 35 and 36 operate to make contact between the wires to which they are attached. Push button switches 37 and 38 operate to break the circuits in which they are connected. The batteries 39 and 40 furnish the electric energy. Mechanical means of operating the valves simultaneously or in sequence, by hand or by the float 26, may be substituted for the electrical method indicated.

For convenience in making the drawings, the evaporator has been shown with the solution undergoing evaporation, within the tubes and the vapor condensing outside of them, but any effective arrangement of vapor space and solution space may be employed having an effective heat transferring surface between them.

Two compressors only have been shown; a greater number may be provided for obtaining greater range of flexibility and efficiency. The ejectors may also be of different sizes in order that different capacities and efficiencies may be obtained even with the same number of ejectors in operation.

The operation of my invention is as follows:

Assume the evaporator working at its maximum capacity with all ejectors in operation. The effect of shutting off one ejector not only reduces the capacity but also increases the efficiency. This becomes evident when we consider that shutting off one ejector reduces the heat to be transferred by the fixed heating surface in the evaporator. Consequently, the temperature difference between the solution and the vapor in the heating space is reduced with a corresponding reduction in the range of compression required in the ejector. With reduced range of compression, more secondary vapor is compressed per pound of primary vapor than before the one ejector was shut off. That is, shutting off one ejector increases the efficiency of evaporation with the remaining ejectors in operation.

By providing several ejectors in parallel for a given capacity with a given evaporator, there is thus provided a flexibility of operation with an increase of efficiency at reduced capacities not available when a single ejector only is provided. By increase in efficiency is meant an increase in the ratio of the secondary vapor formed to the primary vapor supplied. With automatic control of the ejectors in operation, the evaporator will always work at its highest efficiency corresponding to the demand for condensed vapor.

To explain the operation of the automatic control, first assume that the demand for condensed vapor just corresponds to the capacity with one ejector in operation. The float 26 will then come to rest in the position shown in Fig. 1, the contact strip 27 connecting terminals 31 and 32 and the contact strip 28 connecting terminals 29 and 30. That is valves 12, 14 and 16 will be operated by battery 39 which opens them, and valves 13, 15 and 17 will be operated by battery 40 which closes them.

If the demand for condensed vapor increases, the float 26 will fall, removing terminal 31 from contact with strip 27 and bringing it into contact with strip 28. So soon as this occurs, valves 13, 15 and 17 will be brought under the influence of battery 39 and consequently opened, thereby bringing ejector 11 into operation. However, should the demand for condensed vapor decrease the float 26 will rise, removing terminal 30 from contact with strip 28 to contact strip 27 and consequently closing valves 12, 14 and 16 controlling ejector 10.

By opening switches 37 or 38, ejector 10 or 11 will be removed from the influence of float 26. By closing switch 34, ejector 10 will then be put into operation, or by closing switch 36 it will be put out of operation. Similarly, ejector 11 may be put into and

out of operation by closing switches 33 and 35 respectively.

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

1. In a system of evaporation, an evaporating compartment and a condensing compartment, a plurality of ejectors connected to withdraw vapor from the said evaporating compartment and to discharge it compressed into the said condensing compartment, and means of varying the number of ejectors in operation.

2. In a system of evaporation, an evaporating compartment and a condensing compartment, a plurality of vapor compressors connected to withdraw vapor from the said evaporating compartment and to discharge it compressed into the said condensing compartment, and means of varying the number of vapor compressors in operation.

3. In a system of evaporation, an evaporating compartment and a condensing compartment, a plurality of vapor compressors connected to withdraw secondary vapor from the said evaporating compartment and to discharge it compressed into the said condensing compartment, and cut-off means between one of said vapor compressors and one of said compartments.

4. In a system of evaporation, an evaporating compartment and a condensing compartment, a plurality of vapor compressors connected to withdraw secondary vapor from the said evaporating compartment and to discharge it compressed into the said condensing compartment, cut-off means between one of said vapor compressors and one of said compartments and means of cutting off the supply of primary vapor to the same compressor.

5. In a system of evaporation, an evaporating compartment and a condensing compartment, a plurality of vapor compressors connected to withdraw vapor from the said evaporating compartment and to discharge it compressed into the said condensing compartment, cut-off means between the said compressors and one of said compartments, and means of operating the said cut-off means from a single station.

6. In a system of evaporation, an evaporating compartment and a condensing compartment, a plurality of vapor compressors connected to withdraw vapor from the said evaporating compartment and to discharge it compressed into the said condensing compartment, cut-off means between the said compressors and one of said compartments and automatic means of operating said cut-off means comprising an electrically operated control.

7. In a system of evaporation, an evaporating compartment and a condensing compartment, a plurality of means of supplying

the said condensing compartment with primary vapor and automatic electrical means of varying the number of supplying means in operation, the said automatic electrical means consisting of two contact strips sliding over terminals to change the said supplying means from an opening to a closing circuit, or the reverse.

8. In a system of evaporation, evaporating and condensing compartments with heat transferring surfaces between them, a vapor compressor of given capacity connected to withdraw secondary vapor from the said evaporating and to discharge it compressed into the said condensing compartments, and means of changing the relation of the heat transferring surface to the capacity of the said vapor compressor.

9. In a system of evaporation, evaporating and condensing compartments with heat transferring surfaces between them, an ejector of given capacity connected to withdraw secondary vapor from the said evaporating and to discharge it compressed into the said condensing compartments, and means of changing the relation of the heat transfer-

ring surface to the capacity of the said ejector.

10. In a system of evaporation, evaporating and condensing compartments with heat transferring surfaces between them, a plurality of vapor compressors connected to withdraw vapor from the said evaporating and to discharge it compressed into the said condensing compartments, and means of changing the relation of the heat transferring surface to the capacity of the said vapor compressors.

11. In a system of evaporation, evaporating and condensing compartments with heat transferring surfaces between them, a plurality of ejectors connected to withdraw vapor from the said evaporating and to discharge it compressed into the said condensing compartments, and means of changing the relation of the heat transferring surface to the capacity of the said ejectors.

WILLIAM L. DE BAUFRE.

Witnesses:

T. W. KIMKAD,
J. L. KAUFFMAN.