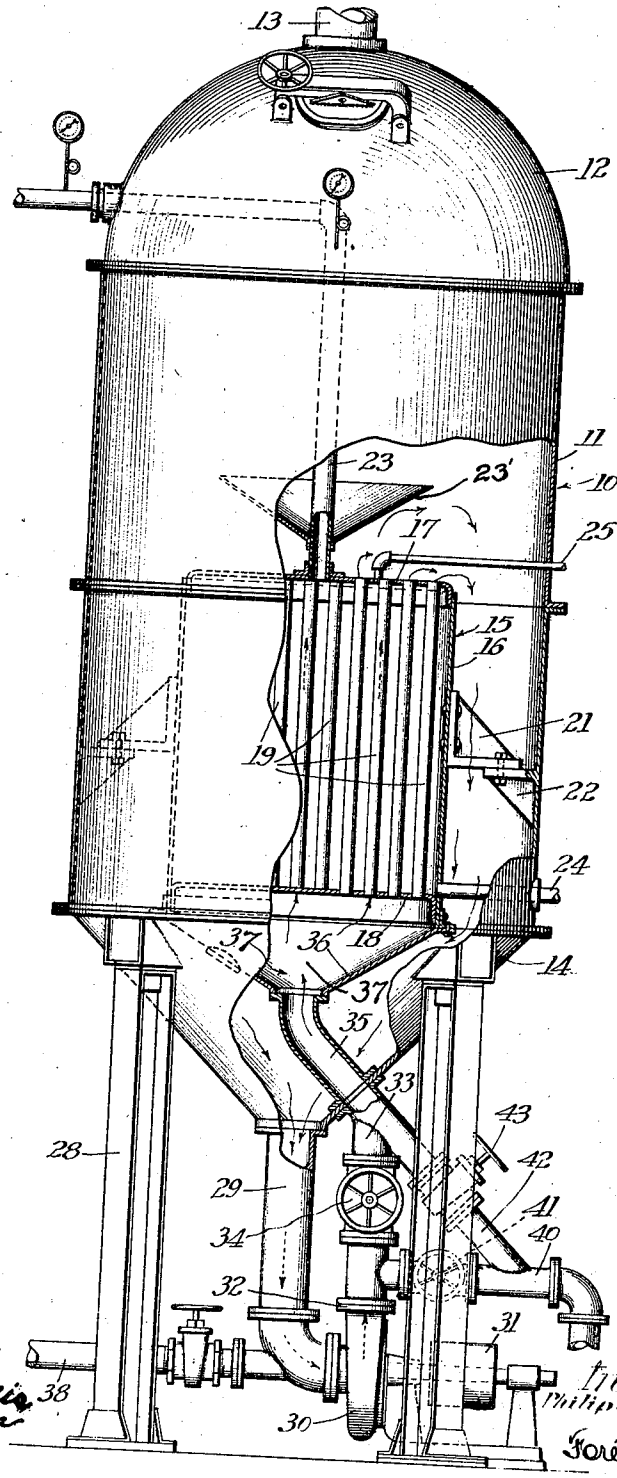
P. B. SADTLER.

EVAPORATOR.

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1,246,939.

Patented Nov. 20, 1917.



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UNITED STATES PATENT OFFICE.

PHILIP B. SADTLER, OF CHICAGO, ILLINOIS.

EVAPORATOR.

1,246,939. Specification of Letters Patent. Patented Nov. 20, 1917.

Application filed November 19, 1914. Serial No. 872,950.

To all whom it may concern:

Be it known that I, PHILIP B. SADTLER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Evaporators, of which the following is a specification.

My invention relates to improvements in evaporators, and has for its particular object to provide an evaporator that will satisfactorily and economically concentrate high density liquors.

In the treatment of high density liquors, such as calcium chlorid, caustic soda, and the like, it is very difficult to secure a heat-engendered circulation of the liquor with respect to the heated surfaces of the evaporator, because its density and viscosity make it so sluggish in movement that it tends to cake and adhere to the heated surfaces, thereby making an irregular product, rather than to maintain that smooth, even circulation that will most efficiently concentrate the entire liquor body to the desired degree.

Furthermore, also it is difficult to evacuate the evaporator of its high-density contents after full concentration, on account of the character of the material aforesaid.

The improvement wrought by my invention provides among other advantages, for effectively creating and maintaining circulation and insuring discharge of the finished product.

In the drawing wherein I have illustrated a practical embodiment of my invention, the single view represents the side elevation of a circular evaporator with parts broken away sufficiently to illustrate interior construction. It will be understood that in its broader aspects my invention is not limited to the form of evaporator that is herein shown, but the single form of construction herein illustrated is selected for purposes of disclosure of a commercially advantageous structure.

One suitable construction of evaporator for embodying my invention comprises in its body 10 a cylindrical portion 11, a vapor dome 12 (usually maintained under partial vacuum), opening to the vapor outlet 13, and a base cone 14, this casing structure inclosing and supporting a heating structure, shown as a steam chest 15 in the form of a drum having a peripheral wall 16 and top and bottom heads 17 and 18, through which heads the liquor tubes 19 open vertically. In this form of construction, natural liquor circulation would be up through the tubes 19, and down around the periphery of the chest.

I prefer that, in such a type of evaporator the steam chest be positioned centrally in the casing and supported by lugs 21 secured to the peripheral wall 16 of the chest to bear on and be bolted to lugs 22 that may conveniently be cast integrally with the wall 11 of the casing. Steam may be led into the interior of the steam chest through the inlet pipe 23; carrying an exterior deflector or hood 23′, the water of condensation is drained out through drain 24, and an air relief pipe 25 may be provided, opening from the top of the steam chest. It will be understood, of course, that suitable gages and other instruments, piping valves, and the like, are provided in connection with these instrumentalities in usual fashion, but with these my present invention has no especial concern.

For effecting proper circulation of the liquor through the path of its heat-circulation tendency and insuring its adequate removal upon completion of the concentration, I provide, in coöperative relation, positive liquor circulating means and drainage structure. The casing 10 is preferably supported at a suitable elevation on pillars 28. and from the bottom of the liquor body—in this case the bottom of the cone 14—a downtaking pipe 29 leads to the eye of a pump 30, illustrated conventionally as a centrifugal pump placed below the casing and driven from the pulley 31. The pump outlet 32 has an uptake connection 33, valved as at 34, leading to the commencement point, so to speak, where the heat-effected circulation tendency takes effect, a lateral connection 35 extending diagonally through the wall of cone 14 and into a conical distributing head 36 that is bolted to the steam chest 15 so as to provide a peripherally closed chamber 37 below the vertical tubes 19. Obviously the liquor handled by the pump 30 will be forced up through the piping, 33—35 for distribution in the chamber 37 to the tubes 19, and after traversing said tubes will return around the steam chest to the pipe 29 and back to the eye of the pump, as indicated by arrows. The hood 23′, of course, tends to prevent liquor from splashing up into dome 12. A suitably valved supply pipe 38 may lead to the eye of the pump to supply fresh liquor as required.

At a suitable point in the uptake 33, preferably below the valve 34, an outlet pipe 40 for the finished product, controlled by a valve 41, is provided. This is preferably supplemented by a by-pass pipe 42 effecting connection between pipes 33 and 40 beyond the respective valves 34 and 41, and itself controlled by a valve 43.

It will be apparent that in an evaporator of the character illustrated the natural circulation tendency will be in the same direction as the arrows, and the action of the pump enhances and makes positive this circulation tendency with minimum expenditure of power in pumping, so that very dense liquors may be handled in the machine with assurance of that continuous and positive liquor flow that most effectively secures uniform concentration. When the treatment has been carried forward to the desired extent, valve 41 may be opened to permit evacuation of the evaporator contents at the desired rate, and the finished product, pumped against the opposition of the head of liquor in the evaporator, will flow steadily from the eduction pipe 40 while circulation is being maintained. In practice I find it to be feasible to pump out all save a very small quantity of material that tends to remain in the distributing chamber 37, and, when the evaporator has been emptied as far as may be by pumping, valve 34 may be closed and valve 43 opened for direct drainage of this small residual liquor body into the eduction pipe.

I have found that by my invention I am able to concentrate in a liquor tube evaporator, liquors that it has been considered, heretofore, practical to concentrate only in drying pans, and it will be apparent that the large capacity and the facility of operation of an evaporator as herein described enables such concentration to be made with minimum expense and high efficiency.

While I have herein described in some detail a particular embodiment of my invention, it will be understood that many changes might be made in the embodiment without departure f om the spirit of my invention, within the scope of the appended claims.

Having described my invention, what I claim is:—

1. In an evaporator the combination of a casing, a steam chest therein having liquor circulation tubes, a chamber into which lead the lower ends of the tubes, a pump, piping connections between one side of said pump and the casing and between the other side of said pump and the chamber and a valved outlet intermediate the pressure side of said pump and the chamber.

2. In an evaporator the combination of a casing, a steam chest therein having liquor circulation tubes, a pump, piping connections between one side of said pump and the casing and between the other side of said pump and the liquor tubes, a valved outlet on the pressure side of said pump, and a by-pass from the liquor tubes to the outlet around the outlet valve.

3. In an evaporator the combination of the shell, having a tapering bottom, a vertical steam drum therein having vertical liquor tubes, a distributing head coöperating with the lower end of said drum to form the distributing chamber 37, a pump, and piping connections between the tapering bottom of the casing and the pump and between the pump and the chamber 37.

4. In an evaporator the combination of the shell, having a tapering bottom, a vertical steam drum therein having vertical liquor tubes, a distributing head coöperating with the lower end of said drum to form the distributing chamber 37, a pump, piping connections between the tapering bottom of the casing and the pump and between the pump and the chamber 37 and a valved outlet between the pressure side of the pump and said chamber 37.

5. In an evaporator the combination of the shell, having a tapering bottom, a vertical steam drum therein having vertical liquor tubes, a distributing head coöperating with the lower end of said drum to form the distributing chamber 37, a pump, piping connections between the tapering bottom of the casing and the pump and between the pump and the chamber 37, a valved outlet between the pressure side of the pump and said chamber 37 and a valved by-pass from said chamber 37 around the valve for said outlet pipe.

6. In an evaporator the combination of a steam chest having liquor circulating passages therein, a chamber into which lead the lower ends of the liquor circulating passages, an inlet leading into the bottom of the chamber, a casing inclosing the steam chest and chamber, an outlet for the casing at the bottom thereof below the inlet to the chamber, a duct connecting the outlet of the casing with the inlet to the chamber, and means in said duct to stimulate liquor circulation.

In testimony whereof I hereunto set my hand in the presence of two subscribing witnesses.

PHILIP B. SADTLER.

In the presence of—
GEO. T. MAY, JR.,
MARY F. ALLEN.