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EVAPORATING APPARATUS.

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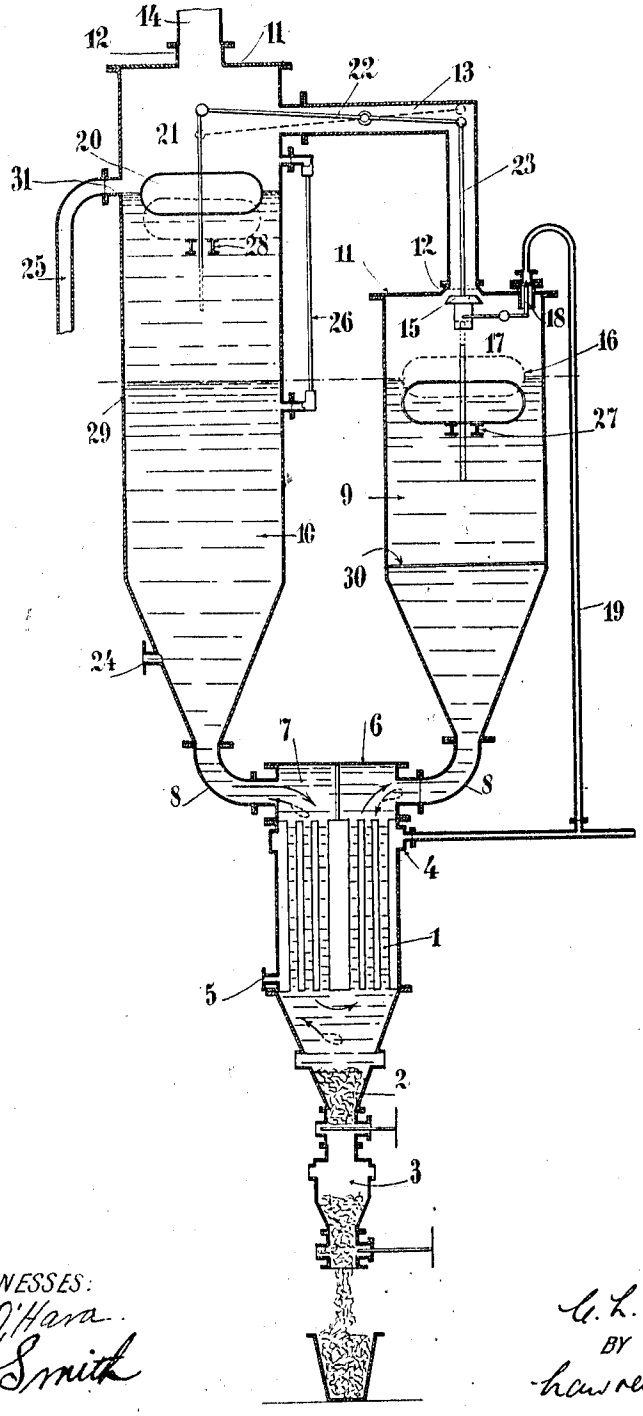

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EVAPORATING APPARATUS.

1,020,659. Specification of Letters Patent. Patented Mar. 19, 1912.

Application filed June 19, 1911. Serial No. 634,118.

To all whom it may concern:

Be it known that I, CHARLES LOUIS PRACHE, a citizen of the Republic of France, residing at Paris, Seine, France, post-office address 12 Rue de la Chaussée d'Antin, have invented new and useful Improvements in Evaporating Apparatus, which improvements are fully set forth in the following specification.

It is known that for the evaporation of the products which during their concentration deposit crystals it is advantageous in order to avoid deposits upon the heating surfaces and for obtaining an efficient transmission of heat to cause the solution to be concentrated to circulate as rapidly as possible in contact with the heating surface. While this solution is in contact with the heating surface it is always subjected to a sufficient pressure to prevent ebullition occurring in contact with such surface but only in a special portion of the boiler apart from this heating surface and in which the superheated liquid subjected to a smaller pressure will vaporize of itself under the influence of the heat units in excess that it has taken up in the heater. In order to realize these conditions recourse is generally had to centrifugal or other circulation pumps serving to produce the circulation of the liquid in the heater and in the vaporizer. Apart from complications in operation and in cleaning that these pumps add to the apparatus they present the defect of operating under defective conditions owing to deposits of crystals produced in their parts and in the suction and delivery pipes.

The present invention has for its object a device which permits of obtaining in every part of the evaporating apparatus an automatic circulation of any desired intensity, the crystals produced being of course directed toward the lower part of the apparatus from which they are extracted by means of a lock chamber or by any other convenient means.

The apparatus is represented by way of example in the accompanying drawing in which the single figure is a section on a vertical plane.

This apparatus consists of a tubular heater 1 heated by steam and provided at its lower part with a depositing chamber 2 at the bottom of which a lock chamber 3 with two cocks is located; the heating steam is admitted at 4 while the water of condensation from this steam is discharged at 5.

The upper part of the heater comprises a liquid chamber 6 divided into two parts by a diametral partition 7. The two parts are in communication by means of bent pipes 8 with two evaporating reservoirs 9 and 10 arranged at the upper level. Each of these reservoirs is closed at the upper part by a cover 11 at the center of which a discharge orifice 12 is provided for the discharge of the steam produced in each of the reservoirs. The steam liberated from the vaporizer 9 proceeds through the bent pipe 13 to the upper part of the vaporizer 10 and thence to the exterior through the pipe 14. The discharge orifice 12 of the reservoir 9 is provided with a valve 15 which closes in the upward direction and which is lifted by the float 16 when the latter is at the top of its stroke. The valve 15 is rigidly connected by the lever 17 with the valve 18 controlling an admission of steam from the exterior for example from the heating chamber of the heater through the pipe 19 in such a manner that when the exhaust valve 15 is open the admission valve 18 is closed and vice versa. A float 20 is also arranged in the vessel 10 and in its highest position acts through the levers 21, 22 and 23 upon the valve 15 in the downward direction so as to open it.

The liquid to be concentrated is introduced into the apparatus through the aperture 24; the concentrated liquid is discharged through the pipe 25 forming the overflow. A gage 26 enables the level of the liquid in the apparatus to be ascertained. The stroke of the floats is limited by the tappets 27, 28 upon which they rest when the liquid falls.

The apparatus operates in the following manner with ebullition at atmospheric pressure. When the apparatus has been filled with liquid to the level 29 equilibrium exists in the two reservoirs 9 and 10, the float 16 is at the top of its stroke, closes the valve 15 and opens the steam inlet through the valve 18; this steam having been regulated to a sufficient pressure above atmospheric pressure presses upon the surface of the liquid contained in the reservoir. Under this

influence the level falls in the reservoir 9 and rises in the reservoir 10 in passing through the tubular heater. It will be understood that instead of employing steam entering through the valve 18 for expelling the liquid a fluid of any kind under pressure either inert or active might be utilized for increasing the rapidity of the crystallization. When the liquid has fallen to the level 30 in the reservoir 9 it occupies the level 31 in the reservoir 10. At this level the float 20 is lifted and by the action of the levers 21, 22 and 23 opens the valve 15 and simultaneously closes the valve 18 for the admission of steam. As a result of this the upper part of the two reservoirs 9 and 10 are placed in communication with atmospheric pressure, the liquid that had risen in the reservoir 10 again falls under the influence of gravity and reëstablishes the level 29 in the two reservoirs. When this level is reëstablished the float 16 rises closing the valve 15 and opening the valve 18 and the same series of operations is reproduced. In this manner an oscillatory movement of the liquid is obtained in the apparatus a portion of the liquid flowing alternately from one reservoir to the other passing each time through the heater in which it becomes heated.

The alternating movement of the liquid in the apparatus produces in the tubes of the heater and in the piping connecting it with the evaporation reservoirs a series of expulsions of liquid, the intensity of which depends upon the difference of pressure created in the two reservoirs. These very intense and frequently repeated movements of liquid mechanically carry the crystals toward the lower part of the apparatus comprising the deposit chamber in which they are naturally deposited and from which they can be withdrawn through the lock chamber with two valves or in any other convenient manner. The walls of the evaporation reservoirs and the parts of the floats in contact with which the evaporation might produce the deposit of crystals being alternately in contact with the steam during the whole period for which the evaporator is partially empty cannot become charged with crystals which are always washed and dissolved by the steam which alternately comes into contact with them.

Evaporation in vacuo.—Instead of evaporation being effected at atmospheric pressure as in the foregoing description this evaporation can be effected at any pressure, *in vacuo* for example, by connecting the liberation pipe 14 with a condenser or even with the heating chamber of another similar apparatus for obtaining multiple evaporation effects. Similarly instead of admitting the motive steam intended to serve as the propulsion agent intermittently into one of the reservoirs it might be admitted alternately to the two reservoirs which would then both be provided with identical admission and discharge valves similar to those described above.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In combination a pair of stationary reservoirs, a connection between said reservoirs, a heater to heat said connection, and means to cause an alternating flow of liquid from one reservoir to the other.

2. In combination a pair of stationary reservoirs, a connection between said reservoirs, means to cause an alternating flow of liquid from one reservoir to the other and a heater adapted to heat said liquid during its flow from one reservoir to the other.

3. In combination a pair of stationary reservoirs, a connection between said reservoirs, a heater to heat said connection, means to cause an alternating flow of liquid from one reservoir to the other and means to remove deposits from said liquid.

4. In combination a pair of stationary reservoirs, a connection between said reservoirs, means to cause an alternating flow of liquid from one reservoir to the other, a heater adapted to heat said liquid during its flow from one reservoir to the other and means to remove deposits from said liquid.

5. In combination a pair of reservoirs, a connection between said reservoirs, a heater to heat said connection, and means to subject the liquid contents of said reservoirs to a fluid at a pressure higher than the normal exhaust pressure for intermittent alternating periods.

6. In combination a pair of reservoirs, a connection between said reservoirs, an exhaust space connecting the upper parts of said reservoirs, a heater to heat said connection, a means to admit pressure fluid intermittently into one of said reservoirs, and means to cut off communication between said reservoirs through said exhaust space during the admission of pressure fluid.

7. In combination a pair of reservoirs, a connection between said reservoirs, an exhaust space connecting the upper parts of said reservoirs, a heater to heat said connection, an automatically operated means to admit pressure fluid intermittently into one of said reservoirs, and means to cut off communication between said reservoirs through said exhaust space during the admission of pressure fluid.

8. In combination a pair of reservoirs, a connection between said reservoirs, an exhaust space connecting the upper parts of said reservoirs, a heater to heat said connection, a means controlled by the liquid level in one of said reservoirs to admit pressure fluid intermittently into one of said reservoirs, and means to cut off communica-

tion between said reservoirs through said exhaust space during the admission of pressure fluid.

9. In combination a pair of reservoirs, a connection between said reservoirs, a heater to heat said connection and fluid pressure means to cause an alternating flow of liquid from one reservoir to the other.

10. In combination a pair of reservoirs, a connection between said reservoirs, fluid pressure means to cause an alternating flow of liquid from one reservoir to the other and a heater adapted to heat said liquid during its flow from one reservoir to the other.

11. In combination, a pair of reservoirs, a connection between said reservoirs, means to cause an alternating flow of liquid from one reservoir to the other and means to heat said liquid only during its flow through said connection.

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

CHARLES LOUIS PRACHE.

Witnesses:
EMLIE LEDREY,
DEAN M. MASON.