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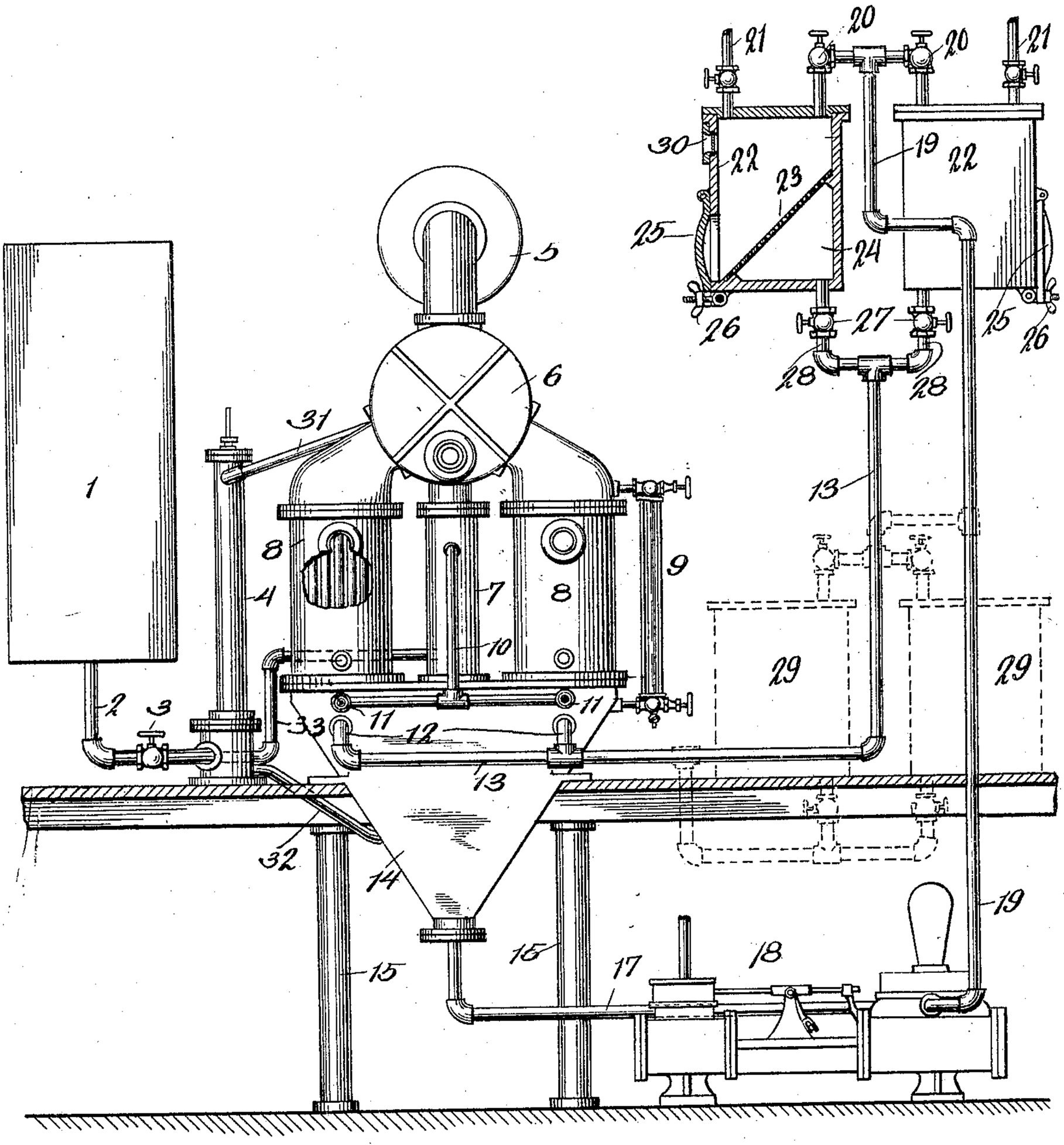
C. ORDWAY.

VACUUM EVAPORATING APPARATUS.

APPLICATION FILED MAR. 16, 1904.

NO MODEL.



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UNITED STATES PATENT OFFICE.

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VACUUM EVAPORATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 775,577, dated November 22, 1904.

Application filed March 16, 1904. Serial No. 198,330. (No model.)

To all whom it may concern:

Be it known that I, CHARLES ORDWAY, a citizen of the United States, and a resident of the borough of Brooklyn, city of New York, county of Kings, and State of New York, have invented certain new and useful Improvements in Vacuum Evaporating Apparatus, of which the following is a specification, taken in connection with the accompanying drawing, which forms a part of the same.

This invention relates to vacuum evaporating apparatus such as described in my United States Letters Patent No. 709,172, of September 16, 1902, and No. 755,529, of March 22, 1904, and relates especially to apparatus of this description which is to be operated continuously and in which the precipitated or crystallized material is continuously removed from the concentrated liquor in suitable collecting-tanks outside the effect itself.

The accompanying drawing, which represents an embodiment of this invention, is an elevation, parts being shown in section.

The illustrated embodiment of this invention shows an evaporating apparatus provided with vertically-arranged heating-tubes, although evaporating-pans or apparatus having heating-surfaces of any description may be employed. An effect is shown as provided with a number of uptakes 8, which contain the usual heating-tubes vertically arranged in this instance, these tubes being suitably heated in the ordinary way. The vapor-chamber 6 connects with the vapor-pipe 5, and the liquor-chamber 14 is indicated as having a gradually-tapering lower end. The jacketed downtake 7 is indicated as connecting the vapor-chamber and liquor-chamber and allows the circulation of liquor through the tubes in the uptakes, this liquor descending through the downtake 7 into the liquor-chamber, the gage-glass 9 being shown to indicate the amount of liquor in the effect.

The supply-tank 1 is connected by the supply-pipe 2 with the automatic level-gage 4, a suitable valve 3 being interposed for manual regulation when desired. This automatic gage governs the amount of liquor fed from the supply-tank into the effect through the supply-pipe 33, which, as indicated, enters the downtake-jacket, from which the liquor is conducted by the pipe 10 into the liquor-chamber through the valves 11. This automatic gage is provided with the vapor connection 31, leading into the vapor-chamber of the effect and with the similar liquor connection 32 and automatically maintains the correct amount of liquor in the effect.

A plurality of collecting-tanks are preferably arranged adjacent the effect and on a somewhat higher level, two of these tanks 22 being indicated in full lines in the drawing. Each of these tanks is preferably formed with an inclined screen 23 of suitable construction to prevent the passage of the precipitated or crystallized material in the concentrated liquor. A suitable eyeglass 30 may be formed in the tank, which is also preferably provided with a discharge-door 25, which is shown as hinged to the tank and secured in closed position by a suitable clamp 26, the joint being of course made tight by any desired form of packing. A suitable vacuum-break is connected to the cover of each tank when a closed form of tank is employed, this device being indicated as a valved pipe 21. If desired, also, a similar valved connection may be used to connect the closed tank with the vapor-space of the effect. The return-pipe 13, which, as indicated, leads into the liquor-chamber of the effect through the two connections 12, is connected with the collecting-tanks by the branches 28, each provided with a suitable valve 27 and leading into the space 24 of the collecting-tank below the screen. The discharge-pipe 17 connects with the constricted lower end of the liquor-chamber, which, as indicated, may be supported on suitable columns 15.

A suitable pump 18 may be used to force the concentrated liquor through the rest of the discharge-pipe 19 into the collecting-tanks, suitable valves 20 being employed to control the entrance of the concentrated liquor into the tanks. It is desirable for some reasons to employ closed collecting-tanks and to have them located on a comparatively high level, so that the return of the liquor to the effect

is caused in whole or in part by gravity. Yet this is not necessary in all cases, and, if desired, the open collecting-tanks 29 (indicated by dotted lines in the drawing) may be used, these tanks having a substantially similar construction and being connected with the discharge and return pipes in a similar way, as is indicated by the dotted connections.

In using this apparatus for the evaporation of salt or similar material the thin liquor is preferably continuously fed into the effect, the amount of liquor supplied being regulated by the automatic level-gage. At the same time a circulation of the concentrated liquor is constantly maintained through the effect and one of the collecting-tanks, this thick liquor, which may contain some crystallized material, passing from the lower end of the liquor-chamber through the discharge-pipe and through one of the valves 20 into the corresponding collecting-tank. The crystallized material remains above the screen in the tank, the liquor passing back into the effect through the return-pipe. In this way the liquor within the effect is kept comparatively free from suspended crystalline matter and the injurious deposit of crystalline material upon the heating-tubes is prevented. When one of the collecting-tanks is substantially filled with crystalline material, as can be observed through the eyeglass, the corresponding valve 20 is shut and the liquor is directed from the discharge-pipe 19 into another of the collecting-tanks. The vacuum in the filled collecting-tank is broken by operating a valve of the vacuum-break and the material in the tank is allowed to drain to the desired extent, any remaining liquor being sucked through the solid material by the vacuum below the screen. Thereafter the valve 27 may be closed and the discharge-door 25 opened so as to conveniently remove the crystallized material. By again closing the discharge-door and the valve of the vacuum-break the empty collecting-chamber is again ready for use and the vacuum may be again put upon it by opening the valve 27 or by operating another vacuum connection in the top of the tank.

It is of course understood that the separate collecting-tanks and the circulating means connected therewith may be employed in connection with either a single-effect apparatus or may be connected with each effect of a multiple-effect evaporating apparatus, and, furthermore, may be employed in connection with effects or evaporating-pans having heating-surfaces in the form of vertical, horizontal, or inclined tubes or formed in other ways, Those familiar with this art may make many changes in the form, number, and proportions of parts of this apparatus. Parts of the same may be used in connection with other devices and parts may be used without employing all of the same without departing from the spirit of this invention or losing the advantages of the same. I do not, therefore, desire to be limited to the details of the disclosure which has been made in this case; but

What I claim as new, and what I desire to secure by Letters Patent, is set forth in the appended claims:

1. In vacuum evaporating apparatus, an effect comprising heating means, a vapor-chamber, a downwardly-tapering liquor-chamber and a jacketed downtake connecting said vapor-chamber and said liquor-chamber, a supply-tank an automatic level-gage and a valved supply-pipe connecting said supply-tank, said gage and said effect, a plurality of collecting-tanks, each of said collecting-tanks comprising a screen, a discharge-door, an eye-glass and a vacuum-break, a return-pipe connected to said effect and provided with valved connections with said collecting-tanks, a pump and a discharge-pipe connected with said liquor-chamber and with said pump and having valved connections to said collecting-tanks to operate them alternately.

2. In vacuum evaporating apparatus, an effect comprising a downwardly-tapering liquor-chamber, a supply-tank, an automatic level-gage and a supply-pipe connecting said supply-tank, said gage and said effect, a plurality of collecting-tanks, each of said tanks comprising a screen and a discharge-opening, a return-pipe connected to said effect and provided with valved connections with said collecting-tanks, a pump, and a discharge-pipe connected to said liquor-chamber and pump, and having valved connections leading to said collecting-tanks to operate them alternately.

3. In vacuum evaporating apparatus, an effect, a supply-pipe to feed liquor into said effect, a plurality of closed collecting-tanks, each of said tanks comprising a screen and a discharge-door, a return-pipe connected to said effect and said tanks, a pump, and a discharge-pipe connected to said effect and said pump and provided with valved connections leading to said collecting-tanks to operate them alternately.

4. In vacuum evaporating apparatus, an effect, a supply-pipe to supply liquor to said effect, a plurality of collecting-tanks, a return-pipe connected to said effect and said tanks and a discharge-pipe connected to said effect and having valved connections leading to said tanks to maintain a continuous circulation of concentrated liquor from said effect through one of said tanks.

5. In vacuum evaporating apparatus, an effect, a plurality of collecting-tanks formed with screens, a return-pipe connected to said effect and to said tanks, a discharge-pipe connected to said effect and said tanks and means to allow a continuous circulation of concentrated liquor from said effect through one of said tanks.

6. In vacuum evaporating apparatus, an effect, a collecting-tank adjacent said effect, a

return-pipe connected to said effect and said tank and a discharge-pipe connected to said effect and said tank to allow a circulation of concentrated liquor from said effect through said tank to remove the precipitated material from said liquor before returning the same to said effect.

7. In vacuum evaporating apparatus, an effect, a plurality of closed collecting-tanks, each of said tanks comprising a screen, a discharge-door, an eyeglass and a vacuum-break, a return-pipe connected to said effect and said tanks and a discharge-pipe connected to said effect and having valved connections with said tanks to operate them alternately.

8. In vacuum evaporating apparatus, an effect, a supply-pipe to supply liquor to said effect, a closed collecting-tank adjacent said effect, a return-pipe connected to said effect and said tank, a discharge-pipe connected to said effect and said tank and a pump to cause a circulation of concentrated liquor from said effect through said tank to continuously remove precipitated material from said liquor.

9. In vacuum evaporating apparatus, an effect, a supply-pipe to supply liquor to said effect, a collecting-tank adjacent said effect, a return-pipe connected to said effect and said tank, a discharge-pipe connected to said effect and said tank, and means to cause a circulation of concentrated liquor from said effect through said tank to continuously remove precipitated material from said liquor.

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