No. 881,523. PATENTED MAR. 10, 1908.

H. WINTER.

APPARATUS FOR CONTINUOUS EVAPORATION.

APPLICATION FILED OCT. 31, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

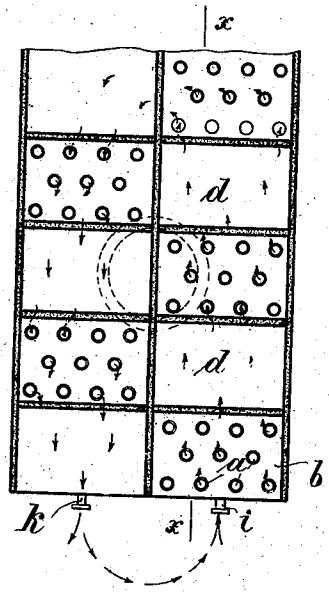


Fig. 2.

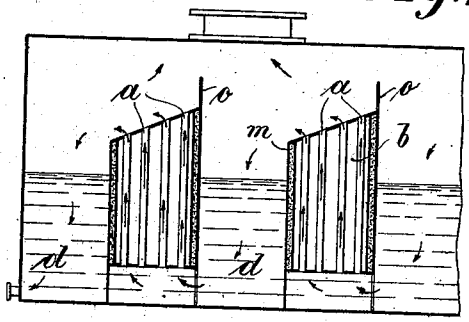


Fig. 3.

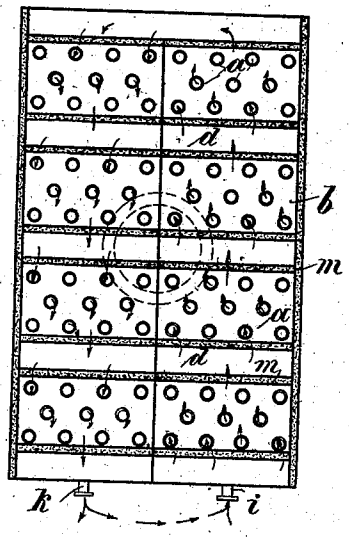
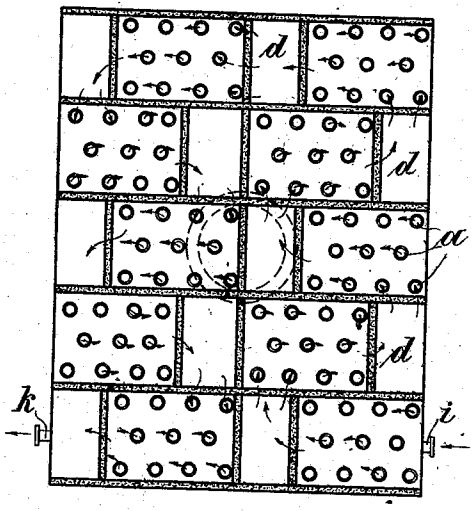


Fig. 4.



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No. 881,523. PATENTED MAR. 10, 1908.

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2 SHEETS—SHEET 2.

Fig. 5.

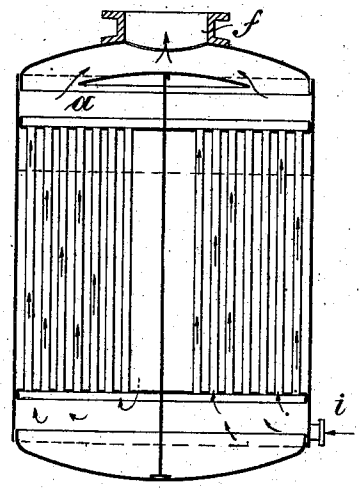


Fig. 7.

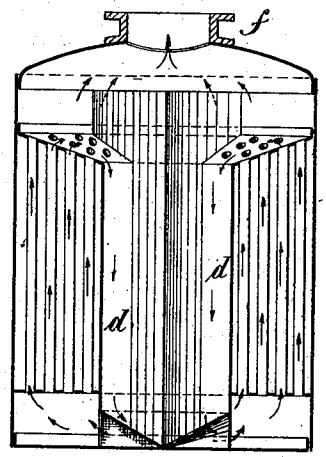


Fig. 6.

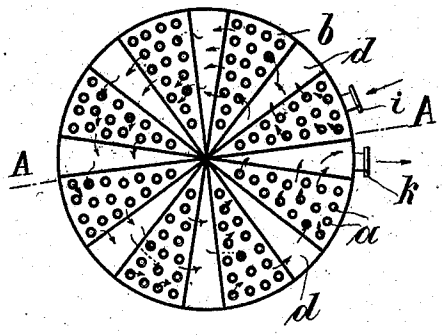
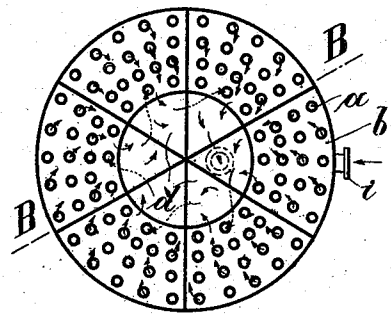


Fig. 8.



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APPARATUS FOR CONTINUOUS EVAPORATION.

No. 881,523. Specification of Letters Patent. Patented March 10, 1908.

Application filed October 31, 1904. Serial No. 230,846.

To all whom it may concern:

Be it known that I, HEINRICH WINTER, doctor of philosophy, citizen of the German Empire, and a resident of 150ª Kantstrasse, Charlottenburg, near Berlin, Germany, have invented new and useful Improvements in Apparatus for Continuous Evaporation, of which the following is a specification.

The present invention relates to an improved apparatus for continuous evaporation. The principle of the evaporation is based on the well known fact, that, not as heretofore, already evaporated liquid particles are mixed with non-concentrated liquid and conducted over the same heating-surfaces, but that all liquid particles are continuously concentrated and continuously placed in contact with new heating-surfaces. From this it results that the time of heating is shortened as much as possible and the evaporation rendered as quick as possible, so that chemical decompositions are avoided. The advantages of this system are in practical use and are used among others in the Yorgau-apparatus. In this apparatus long horizontal tubes are employed in which scale is easily formed, while in the present invention short vertical heating-tubes are used in which scale formation is avoided and in which a number of other essential differences are shown.

The invention consists in the combination of a plurality of individual evaporators placed in a common shell or casing, each evaporator being provided with a chamber having heating-surfaces for the ascending and a non-heating chamber for the descending liquid (return-current). The pairs of chambers are so connected with each other that a non-heating chamber of the first pair is connected with the lower end of the heating-chamber of the second pair and so on, so that the liquid passes successively through all the chambers and is more and more concentrated in the heating-chambers. The dividing-partitions between the individual evaporators do not extend entirely to the upper part of the casing, so that the vapors can be drawn off through the cover of the same. The heating of the heating-chambers can be accomplished in any suitable manner, either by steam of different pressures or by coils or other heating-bodies, preferably, however, by means of vertical tubes and a heated plate which is inclined towards the return-chamber. The return-chambers are insulated from the heating-chambers to such an extent that in the former no steam can be generated.

In the accompanying drawing, in which different forms of apparatus constructed in accordance with the invention are illustrated diagrammatically, Figure 1 is a plan-view of one form of the apparatus, Fig. 2 is a section of a horizontal evaporating apparatus with short straight tubes, in which the return-chambers are of the same size as the heating-chambers, Figs. 3 and 4 are plan-views of an evaporator in which the return-chambers are smaller than the heating-chambers, Figs. 5 and 6 are respectively a section and a plan-view of an upright evaporator of modified form, and Figs. 7 and 8 also show an upright evaporator of still further modified construction.

In the drawing *a* represents the heating-tubes, *b* the steam-space of the heating-chambers and *c* the space for the vapors.

d indicates the unheated return-chambers and *f* the discharge-tube for the vapors.

The liquid to be evaporated passes through an inlet *i* into the apparatus and out through an outlet *k*. Each heating-chamber is separated from the adjacent return-chamber by a partition *m*, and between the individual evaporators and the pairs of chambers are partitions *o*.

In the evaporator shown in Figs. 5 and 6 the chambers are arranged in the shape of sectors in a cylindrical shell or casing. The liquid enters at *i* from below into the heating-tubes, runs over the upper inclined heating-plate in downward direction into the non-heated adjacent chamber *d*, enters then into the next following heating-chamber and so on until it is discharged at the lower end of the last return-chamber.

Figs. 7 and 8 represent also an upright evaporator in which the heating-chambers form an exterior ring, while the return-chambers are formed in the shape of sectors in the inside spaces. The upper heating-plates are inclined in inward direction so that the liquid is conducted into the return-chamber and from the same at the lower end into the next heating-chamber.

What I claim is:

In an apparatus for continuous evaporation, the combination of a casing and pairs of chambers within said casing spaced from the top thereof, each pair comprising a heating-chamber and a collecting- or return-chamber,

the heating-chamber being provided with heating-tubes and an upper heating-plate obliquely situated, the collecting-chamber communicating at its lower portion with the adjacent heating-chamber of the next pair of chambers.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

HEINRICH WINTER.

Witnesses:

HENRY HASPER,

AD. FRIEDMANN.