(No Model.) 2 Sheets—Sheet 1.

M. SWENSON.

VACUUM APPARATUS.

No. 504,374. Patented Sept. 5, 1893.

FIG. 1.

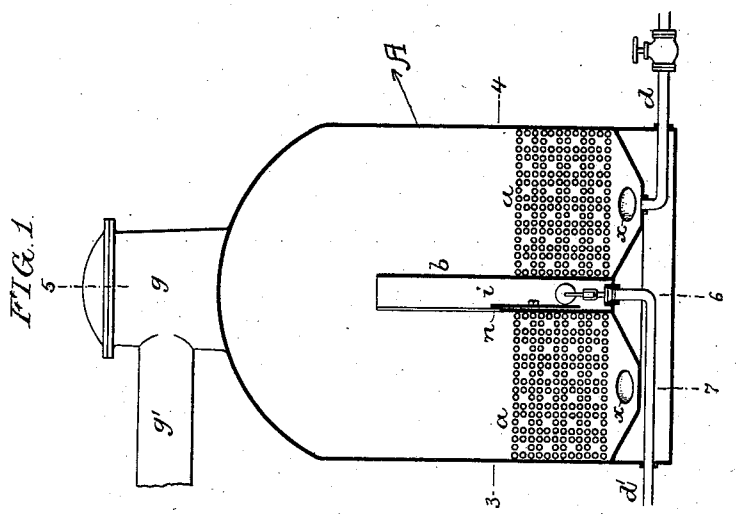


FIG. 2.

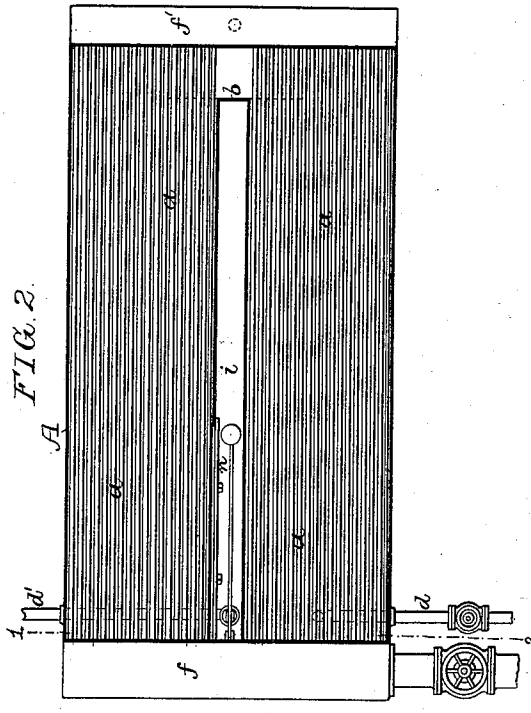
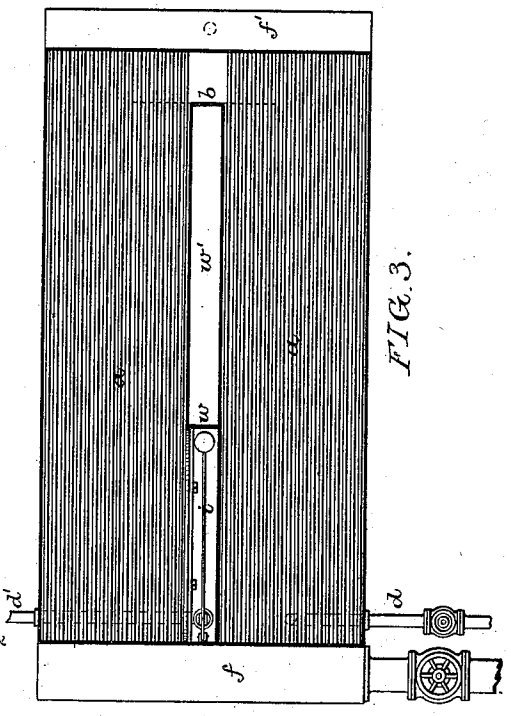


FIG. 3.



Witnesses:
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A. V. Groupe

Inventor:
Magnus Swenson
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(No Model.) 2 Sheets—Sheet 2.

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FIG. 4

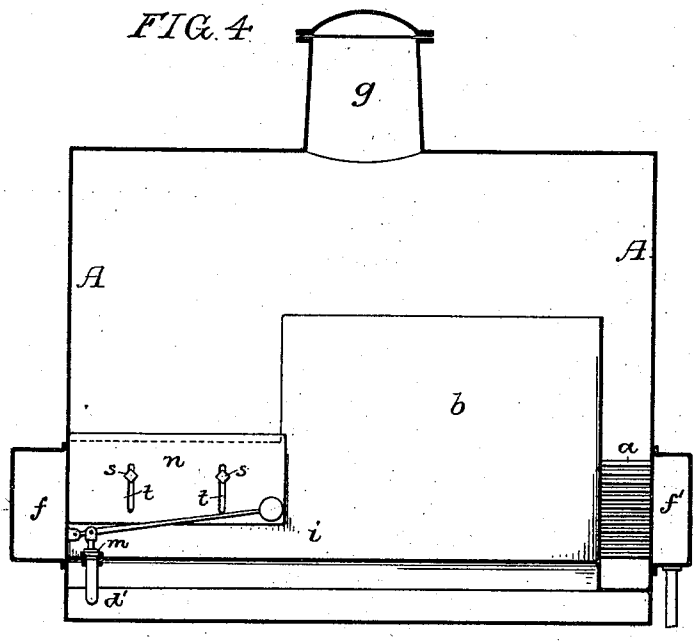
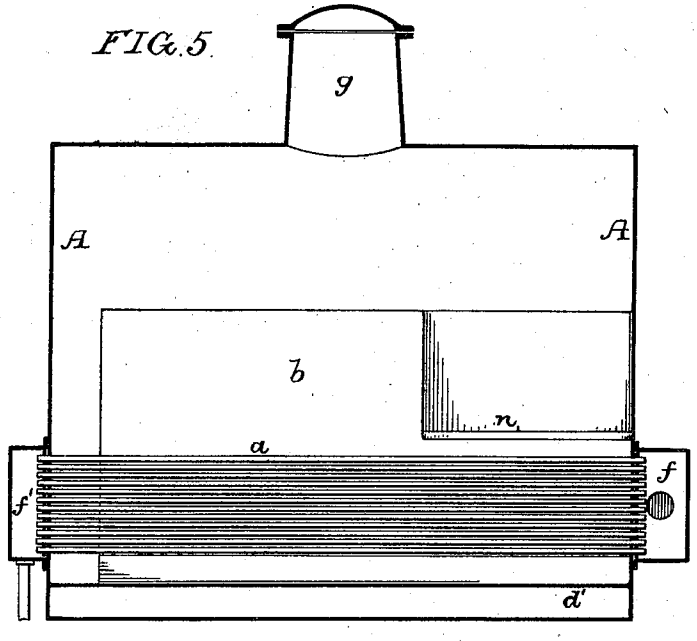


FIG. 5



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Magnus Swenson
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UNITED STATES PATENT OFFICE.

MAGNUS SWENSON, OF FORT SCOTT, KANSAS.

VACUUM APPARATUS.

SPECIFICATION forming part of Letters Patent No. 504,374, dated September 5, 1893.

Application filed December 3, 1891. Serial No. 413,869. (No model.)

To all whom it may concern:

Be it known that I, MAGNUS SWENSON, a citizen of the United States, and a resident of Fort Scott, Bourbon county, Kansas, have invented certain Improvements in Evaporators, of which the following is a specification.

My invention relates mainly to that class of evaporators in which the heating devices are located on opposite sides of a partition extending longitudinally from one end of the evaporating chamber to a point some distance from the opposite end of the same, so as to cause the liquid entering at one end of said evaporating chamber to flow first toward the opposite end of the same, thence around the end of the partition and thence on the opposite side of the latter, back toward the discharge point, the inlet and discharge being at the same end of the evaporator. Some of the features of the invention, however, are applicable to other forms of evaporators.

The object of my present invention is to provide convenient and effective means for permitting the discharge of the boiling liquid from the evaporating chamber and for maintaining said liquid in the chamber at a uniform or substantially uniform level, and this object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1, is a transverse section on the line 1—2, Fig. 2, of an evaporating vessel constructed in accordance with my present invention. Fig. 2, is a sectional plan view of the same on the line 3—4, Fig. 1. Fig. 3, is a similar view illustrating another feature of the invention. Fig. 4, is a longitudinal section on the line 5—6, Fig. 1; and Fig. 5, is a longitudinal section on the line 5—7, Fig. 1.

A represents the outer casing of the evaporator, which may be a single effect evaporator or may form one of a series constituting a double or triple effect apparatus, said casing having, in the lower portions, two sets of steam heated pipes *a a* or equivalent heating devices located on opposite sides of a partition *b* which extends from that end of the evaporating chamber where the liquid enters, almost to the opposite end of said chamber, the liquid being introduced through a valved pipe *d* and discharged through a pipe *d'* to a suitable receptacle or to the next vessel of the series. The pipes *a* receive steam or heated vapor from a chest *f* at one end of the casing and discharge into a chest *f'* at the opposite end, and the vapor arising from the liquid enters a dome *g* and is discharged therefrom through a pipe *g'* to a condenser or to the supply chest for the heating pipes of the next vessel of the series, as the case may be.

In apparatus of this character, the liquid, when it reaches the discharge end of the evaporating chamber, is in a state of violent ebullition and as the discharge is effected preferably at a point above the level of the heating tubes and at or near the surface of the liquid, the latter, at the point of discharge, is in a foamy or frothy condition. Hence, in order to provide such a free discharge of the liquid in this state as will equal the volume of supply (the liquid entering the evaporating chamber in a substantially solid stream) it is evident that the discharge outlet must be of much greater area than the inlet pipe, although, after the liquid is removed from contact with the heating pipes, the ebullition soon ceases and the liquid resumes its normal volume. In carrying out my present invention, therefore, I make the partition *a* hollow, so as to provide therein a discharge chamber *i* into which the foamy or frothy liquid can pass from the evaporating chamber through an opening or passage of as large an area as desired, opportunity being afforded for the liquid to settle or become reduced to its normal volume in this discharge chamber before it is permitted to escape therefrom, so that the discharge pipe need not be of excessive diameter.

The most convenient way of forming a communication between the discharge chamber *i* in the hollow partition and the discharge end of the evaporating chamber, is to cut away one wall of the partition at and near the discharge end of the chamber so as to reduce the height of said wall and permit the foamy or frothy liquid to overflow the same and thus pass directly into the discharge chamber, from which it may pass without obstruction into the discharge pipe *d'*, although it is preferable to provide the discharge chamber with

a float valve *m* so as to provide for the maintenance of liquid at a predetermined level in said discharge chamber.

It is advisable that provision be made for varying the overflow level at the discharge end of the evaporating chamber, as some liquids have more tendency to foam than others, and hence require a higher point of discharge. I therefore prefer to mount upon the reduced portion of the partition wall a vertically adjustable slide or gate *n*, which may be raised or lowered as desired, and secured in position after adjustment by any suitable means, for instance, by bolts *s* adapted to vertical slots *t* in the slide, as shown.

In applying my invention to an evaporator such as shown in my Patent No. 353,515, in which evaporating chambers are superposed, the hollow partition is provided with a transverse web *w*, as shown in Fig. 3, so as to form the desired flue *w'* for carrying the vapor from a lower evaporating chamber. When the evaporator is not of this character, however, it is not necessary that the partition should be hollow throughout, as the hollow portion of the partition need only be coincident in extent with the length of the reduced wall, the partition throughout the remaining portion of its extent being simply a flat web, but even in evaporators of this character it is preferable to make the partition hollow throughout its entire extent, so as to increase the capacity of the discharge chamber formed within said partition. When the evaporating vessel has no partition, the discharge chamber may be formed by means of a box or casing upon the inner or outer side of the main shell of the evaporator at the discharge end of the same.

The evaporating chambers on each side of the partition *b* are, by preference, formed with dished bottoms, as shown in Fig. 1, and openings *x* are formed in the ends of the casing A, close to said bottoms so as to provide for properly cleansing the same, and the bottom of that part of the evaporating chamber at the end of the partition is at the same level as the bottoms of the side chamber, so as to provide for the complete drainage of the evaporating chamber when desired.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. An evaporating vessel having heating devices in the lower portion, and inlet and discharge pipes so located that the liquid to be evaporated is caused to flow horizontally through the vessel from end to end, said vessel having at the discharge end a chamber separated from the evaporating chamber, but communicating laterally therewith through an opening in one of its walls, said opening being of larger area than the outlet pipe which communicates with said discharge chamber, substantially as specified.

2. An evaporating vessel having, in the lower portion, heating devices separated by a vertical partition extending part-way throughout the length of the evaporating chamber, said partition inclosing a discharge chamber and having, in one of its walls, an opening through which the liquid can overflow from the evaporating chamber into the discharge chamber within the partition, substantially as specified.

3. An evaporating vessel having, in the lower portion, heating devices separated by a vertical partition extending part-way throughout the length of the evaporating chamber, said partition being hollow throughout its entire extent and having, in one of its walls at the discharge end of the evaporating chamber, an opening through which the liquid can pass from the evaporating chamber, substantially as specified.

4. An evaporating vessel having heating devices in the lower portion, and having, at one end, a discharge chamber separated from the evaporating chamber, but having in one of its walls an opening or passage of larger area than the discharge pipe, in combination with a float valve contained in said discharge chamber, and governing the exit therefrom, substantially as specified.

5. An evaporating vessel having heating devices in the lower portion, and having, at one end, a discharge chamber separated from the evaporating chamber, but having in one of its walls an opening or passage of larger area than the discharge pipe, said wall also having an adjustable slide or gate whereby the level of overflow into the discharge chamber can be regulated, substantially as specified.

6. An evaporating vessel having, in the lower portion, heating devices on opposite sides of a hollow partition extending part way throughout the length of the evaporating chamber, one part of said hollow partition constituting a vapor flue, and the other part constituting a discharge chamber for the liquid, one of the walls of this latter portion of the hollow partition having an opening through which the liquid can pass from the evaporating chamber into the discharge chamber, substantially as specified.

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

MAGNUS SWENSON.

Witnesses:
A. W. WALBURN,
JAS. H. GIBSON.