D. B. COBB.

HEATING APPARATUS FOR VACUUM-PAN.

No. 193,488. Patented July 24, 1877.

Fig. 1.

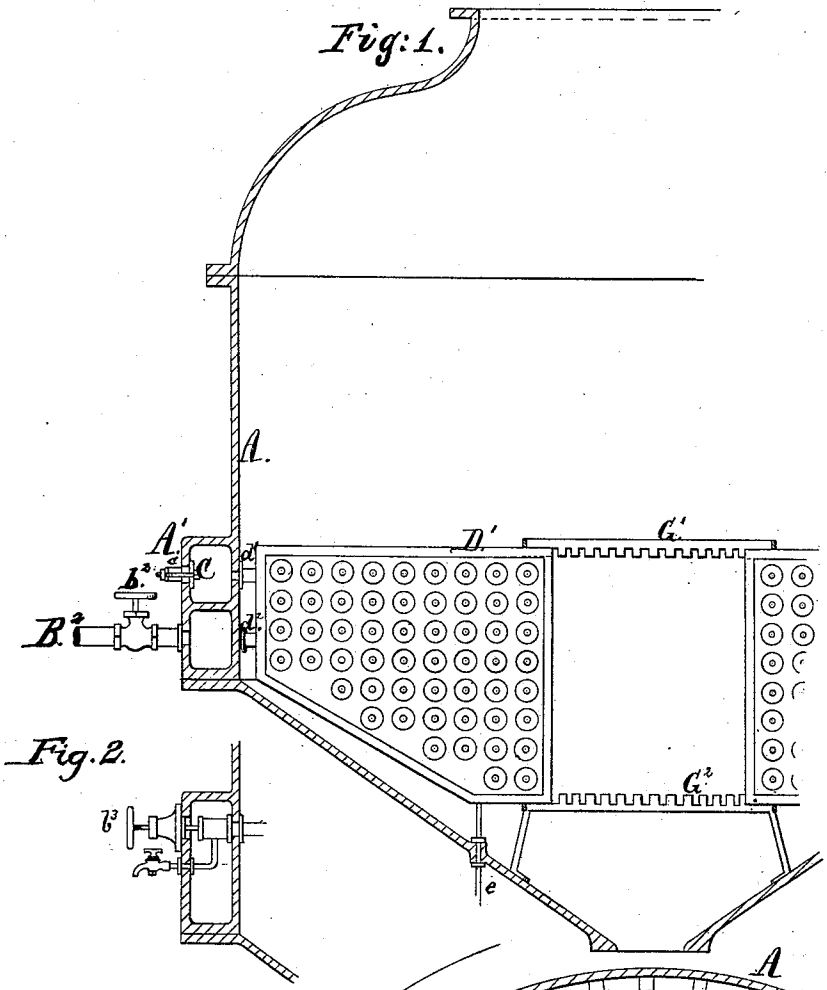
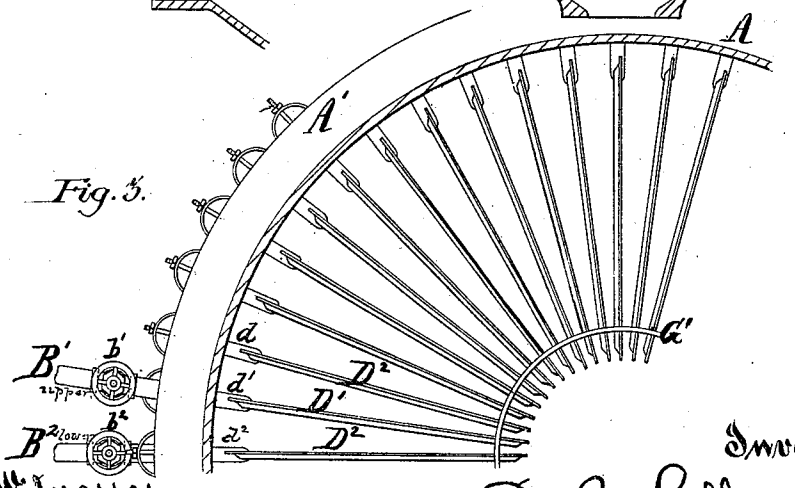


Fig. 2.

Fig. 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

DELPHIN B. COBB, OF JERSEY CITY, NEW JERSEY, ASSIGNOR OF ONE-HALF HIS RIGHT TO BABCOCK & WILCOX, OF NEW YORK, N. Y.

IMPROVEMENT IN HEATING APPARATUS FOR VACUUM-PANS.

Specification forming part of Letters Patent No. **193,488**, dated July 24, 1877; application filed July 23, 1875.

To all whom it may concern:

Be it known that I, DELPHIN B. COBB, of Jersey City, State of New Jersey, have invented certain new and useful Improvements relating to Heating Apparatus for Vacuum-Pans or other evaporating-pans, of which the following is a specification:

The efficiency of very narrow chambers of thin metal with steam inside of them as a means of providing a greater amount of heating-surface in proportion to the space occupied in apparatus for heating liquids has long been established. I have devised an improved arrangement of such chambers, whereby the circulation of the liquid through the apparatus is facilitated, and the cooler portions being constantly brought in contact with the heating-surface, the efficiency of the latter is increased.

My invention also involves means for excluding the steam from portions of the apparatus, leaving the action of the remainder evenly distributed through the mass, and allowing the separate use of certain portions of said apparatus.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

Similar letters of reference indicate corresponding parts in the figures.

The drawings represent the novel parts, with so much of the ordinary parts as is necessary to indicate their relations thereto.

Figure 1 represents a vertical section of my invention. Fig. 2 is a sectional view of a modification. Fig. 3 is a horizontal section in plan.

A is the exterior shell or main body of the vacuum-pan. A′ is a belt or annular chamber cast with or otherwise attached thereto, so as to form, practically, a part of the same. It is divided by a horizontal partition into two halves, the uppermost of which receives steam through a pipe, B^1, and the lowermost through a pipe, B^2, the flow of steam into the upper and lower halves of the belt, respectively, being controlled by the valves b^1 b^2.

D^1 D^2 are flat thin chambers of sheet copper or other metal, liberally studded or stayed, mounted, respectively, in upright positions, standing radially, or nearly so, in the vacuum-pan A. Suitable inlets for the steam and outlets for water of condensation and air are provided, respectively, at top and bottom.

The connections from the top of the chamber D^1 are marked d^1, and communicate with the upper half of the belt A′. The upper connections from the chambers D^2 are marked d^2, and communicate with the lower half of the belt A′. Pipes *e* communicate with the bottom of each of the flat chambers D^1 D^2.

The inner edges of the several flat chambers are held accurately in position by the notched hoops or frames G^1 G^2, in this manner allowing for free radial expansion. The lower of these frames is firmly supported.

It being understood that the vacuum-pan is provided with a liberal connection at the top, through which the thin vapor is constantly exhausted, and, after being condensed in a suitable condenser, pumped or drained out, as also with suitable injection cocks and pipes to supply the unconcentrated liquid, and valves and connections at the bottom to discharge it when concentrated.

The action of the apparatus is as follows: The pan being previously filled with thin liquid to a certain height above the heating-surface, steam is admitted into both parts of the belt A′, flows thence through the connections d^1 d^2 into the radial flat chambers D^1 D^2, where, after imparting its latent heat to the liquid outside, it is condensed into water, which is discharged through the pipes *e* at the bottom. The flat thin heating-chambers D^1 D^2 being placed radially, or nearly so, and of uniform width throughout, leave spaces between them which are radial, increasing in width from inward outward like sectors of a circle, and admit of thorough and very perfect circulation of the liquid.

As soon as heat is applied the portions of the liquid nearest to the heating-chambers and the belt A′ enter into ebullition, bubbles begin to rise, creating an upward current which is assisted by the liquid expanding and tending also to rise. This tends to create a void at the bottom and at the inner edges of the heating-chambers, which void is supplied from the column of cooler and denser liquid always moving down in the free space in the

center. Sometimes on the outer portions of the chambers, the space being greater between them, a column of cooler liquid may tend to go down in the center of that space to rise again in contact with the heating-chambers and the belt. Such would but very little interfere with the efficiency of the heating apparatus; but I prefer that such counter-currents shall not exist. The belt itself is a very effective heating-surface, and, in my opinion, adds materially to the good circulation of the liquid by preventing it from going down on the outside and keeping the main circulation central.

My apparatus will work with the steam-pressure below the pressure of the atmosphere; but for most cases it is preferable to have it a few pounds above.

It may be seen that, with my apparatus, according to the kind of liquid to be evaporated, I can use the whole or portion of the heating-surface by simply closing one or the other of the controlling-valves; as also, in case of accident to any one of the heating-chambers D^1 D^2, I can close the steam-connection to the part of the belt A′ to which such chamber is connected, and continue evaporating with half of the heating-surface. I also provide hand-holes C, closed by hand-hole plates *c*, opposite each one of the steam-inlets d^1 d^2, so that I can at any time open one of these hand-holes, plug up the steam-inlet opposite, and continue working with the remainder of the heating-surface.

I propose, instead of this, to employ, in addition to the main controlling-valves, further valves, one controlling the flow through each pipe at d^1 d^2. These should be used only in vacuum-pans or other evaporating-pans working under conditions where the expense will be warranted. I propose, also, to use air-escape pipes to facilitate the escape of air from the chambers D^1 D^2, should it be found necessary.

Instead of the divided belt shown in Fig. 1, I can realize a part of the advantages by using the single belt with a connection therefrom to each of the radial chambers D^1 D^2. Such case will require a separate valve for each radial chamber, as shown by b^3 in Fig. 2. That figure shows a pipe adapted to allow the discharge of air, there being one such discharge-pipe for each valve.

I claim as my invention—

1. The radial heating-chambers, in combination with a central well communicating with the spaces between the several heating-surfaces, as and for the purposes specified.

2. The steam-distributing belt A′, divided into two independent chambers, supplied with independent steam-inlets with means for controlling the admission of steam, and connected each with alternate chambers D^1 D^2 mounted within the evaporating-pan A, as and for the purposes specified.

3. The radial chambers, conformable to the shape of the bottom of the pan for operation and discharge of the vacuum-pan, and extending inwardly from near the interior circumference, and having a central well, all in combination with circumferential steam-belts with steam-connections to the radial chambers, as above described.

In testimony whereof I have hereunto set my hand this 22d day of July, 1875, in the presence of two subscribing witnesses.

DELPHIN B. COBB.

Witnesses:

HENRY GENTNER,
J. K. OULAHAN.