

(No Model.)

2 Sheets—Sheet 1.

W. H. COLLINGS.  
VACUUM EVAPORATOR.

No. 421,163.

Patented Feb. 11, 1890.

FIG. 2

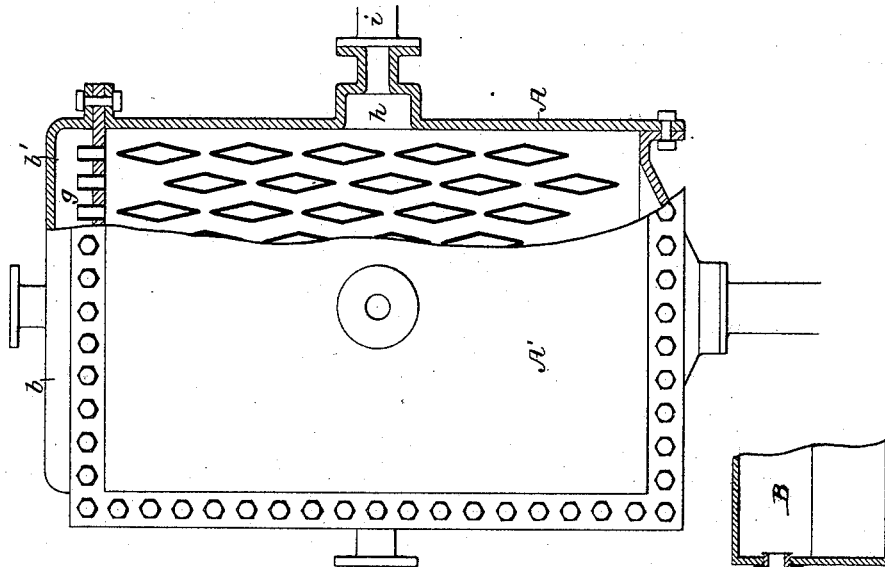


FIG. 1

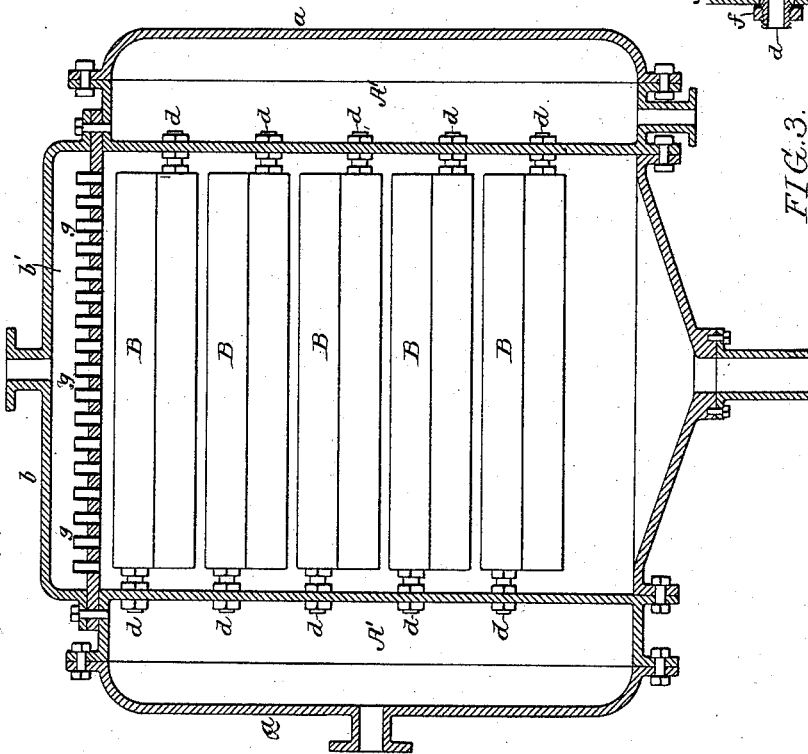
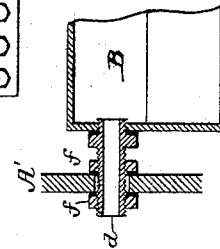


FIG. 3



Witnesses:  
Hamilton D. Turner.  
William D. Warner.

Inventor:  
William H. Collings  
by his Attorneys  
Howson & Howson

(No Model.)

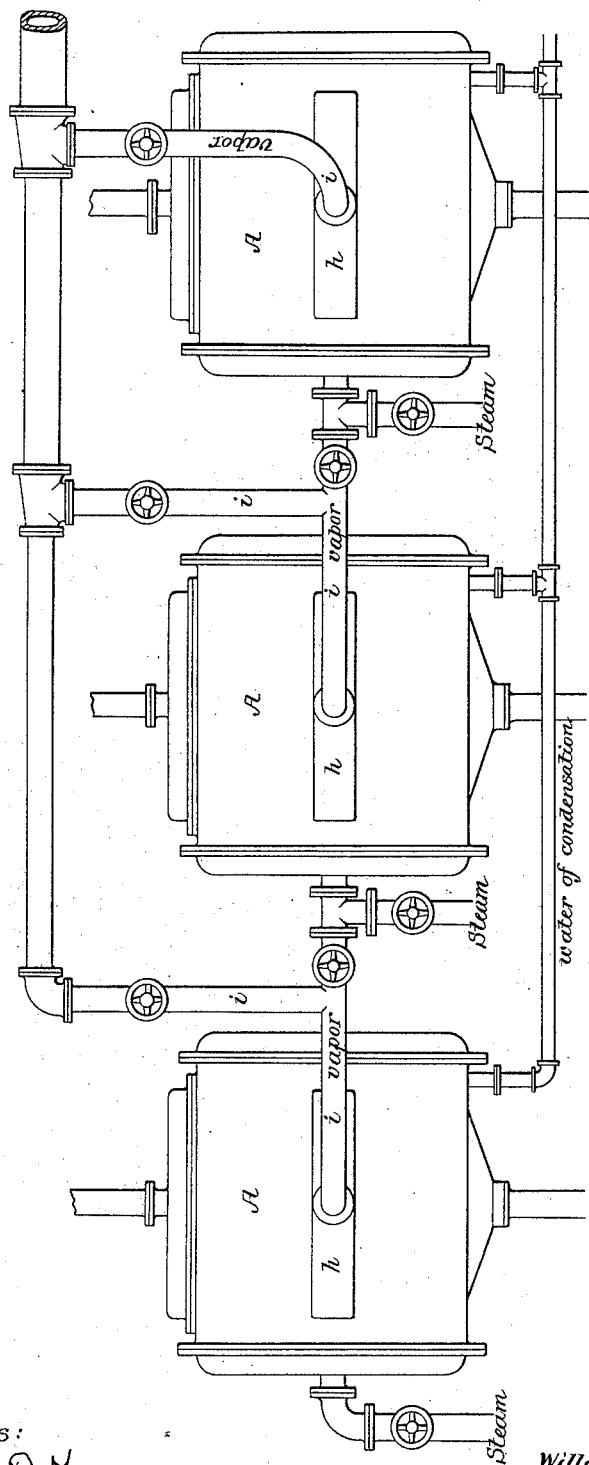
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FIG. 4



Witnesses:  
Hamilton A. Turner.  
William D. Warner.

Inventor:  
William H. Collings  
by his Attorneys  
Howson & Howson

# UNITED STATES PATENT OFFICE.

WILLIAM H. COLLINGS, OF COLLINGSWOOD, NEW JERSEY.

## VACUUM-EVAPORATOR.

SPECIFICATION forming part of Letters Patent No. 421,163, dated February 11, 1890.

Application filed January 24, 1889. Serial No. 297,402. (No model.)

### *To all whom it may concern:*

Be it known that I, WILLIAM H. COLLINGS, a citizen of the United States, and a resident of Collingswood, Camden county, New Jersey, have invented certain Improvements in Vacuum-Evaporators, of which the following is a specification.

The object of my invention is to so construct a vacuum-evaporator as to present an extremely large heating-surface to the liquid to be evaporated, to insure a uniform and steady flow of the liquid in thin films over the evaporating-surfaces, and to provide for the ready insertion or removal of any one of the elements of the evaporating-surface when required.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a vacuum-evaporator constructed in accordance with my invention. Fig. 2 is a side view of the same, partly in section. Fig. 3 is an enlarged sectional view of part of the apparatus, and Fig. 4 is a diagram showing a series of my improved evaporators arranged for working in accordance with what is known as the "triple-effect system."

A is the casing of the evaporator, which is preferably rectangular in cross-section, and has opposite chambered ends A', provided with suitable removable caps or covers *a*, and on the top of the casing is a cap or cover *b*, inclosing a chamber *b'*.

Contained in the evaporating-chamber within the casing A is a series of vertical rows of longitudinal tubes B, diamond-shaped in cross-section and having at each end threaded stems or pipes *d*, which terminate in the chambered ends of the casing, each stem being screwed into a threaded opening in the end of the tube and being confined to the end plate A' of the casing by means of lock-nuts *f*, one on each side of the end plate. One of the chambered heads of the casing is the inlet-head, and receives steam from any convenient generator, and the other is the discharge-head, and the stems *d*, which communicate with the inlet-head, are at the upper portions of the tubes B, while the stems *d*, which communicate with the discharge-head, are at the lower portions of the tubes, so that the water of condensation will be thoroughly drained from the latter.

By means of the detachable stems *d* the removal or application of a tube can be readily accomplished, all that is necessary being to withdraw the screw-stems from the ends of the tube, so that the latter is released and can be removed, a new tube being inserted in its place and secured in position by again screwing up the stems.

The tubes being arranged in a series of parallel vertical rows, it is advisable, in order to economize space and insure the presentation of the maximum evaporating-surface for the space occupied, that the horizontal centers of the tubes of one row should be arranged midway between the centers of the tubes in the adjoining rows, as shown in Fig. 2, so that the tubes may be placed very closely together.

The inner plate of the chambered top of the casing has above each vertical row of tubes a longitudinal row of nipples *g*, projecting some distance above said bottom plate, so that the liquid to be evaporated on being fed into the upper chamber will spread over the bottom of the same until it reaches the level of the mouths of the nipples, and will then flow down through the same and onto the vertical rows of tubes in the evaporating-chamber. The liquid consequently flows over the inclined surfaces of these tubes in a thin film, which is the form best calculated to insure a rapid evaporating effect, the diamond shape of each pipe insuring the presentation of an extremely large evaporating-surface, and the stream dropping from pipe to pipe of the row, so that in passing through the apparatus it will come in contact with every part of the heated surface exposed therein. The evaporated liquid passes from the bottom of the casing through a suitable stand-pipe, in which a column of liquid is maintained by reason of the vacuum maintained in the evaporating-chamber.

The vapor due to the evaporation of the liquid is collected in a transverse chamber *h* at one side or at each side of the casing A, this chamber communicating through a pipe *i* with any available vacuum-producing mechanism. Where the apparatus is to be used in a compound-effect system, however, steam is used only for heating the first evaporator of the set, and the last evaporator only of the

set is in communication with the exhauster, the vapor from the first evaporator taking the place of the steam as a means of heating the tubes B in the second evaporator, and the vapor from the latter serving to heat the tubes B in the third evaporator.

An instance of a construction adapted for use either as a single or multiple effect apparatus is illustrated in Fig. 4.

I do not claim as my invention the feeding device which I have shown, consisting of a horizontal distributing-chamber and feed-tubes for conveying the liquid to the evaporating-tubes and opening into the distributing-chamber at a short distance above the floor of the same and at approximately the same elevation, nor do I limit myself to this particular form of feeding device; but

I claim as my invention and desire to secure by Letters Patent—

1. The combination, in an evaporator, of the casing with its steam receiving and discharge heads, rows of heating-tubes diamond-shaped in cross-section and extending across the evaporating-chamber, and a feed-chamber having openings for discharging the liquid

onto the rows of tubes, substantially as specified.

2. The combination of the casing, the steam receiving and discharge heads, and the rows of tubes connecting the same, said tubes being diamond-shaped in cross-section and the horizontal centers of the tubes of one row being midway between the horizontal centers of the tubes of adjoining rows, substantially as specified.

3. The combination of the casing of the evaporator having opposite steam receiving and discharge heads, the heating-tubes, and tubular stems screwed into the ends of said tubes and projecting through openings in the inner walls of said steam receiving and discharge heads and having nuts on opposite sides of said walls, whereby they are secured thereto, substantially as specified.

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

WILLIAM H. COLLINGS.

Witnesses:

WILLIAM D. CONNER,  
HARRY SMITH.