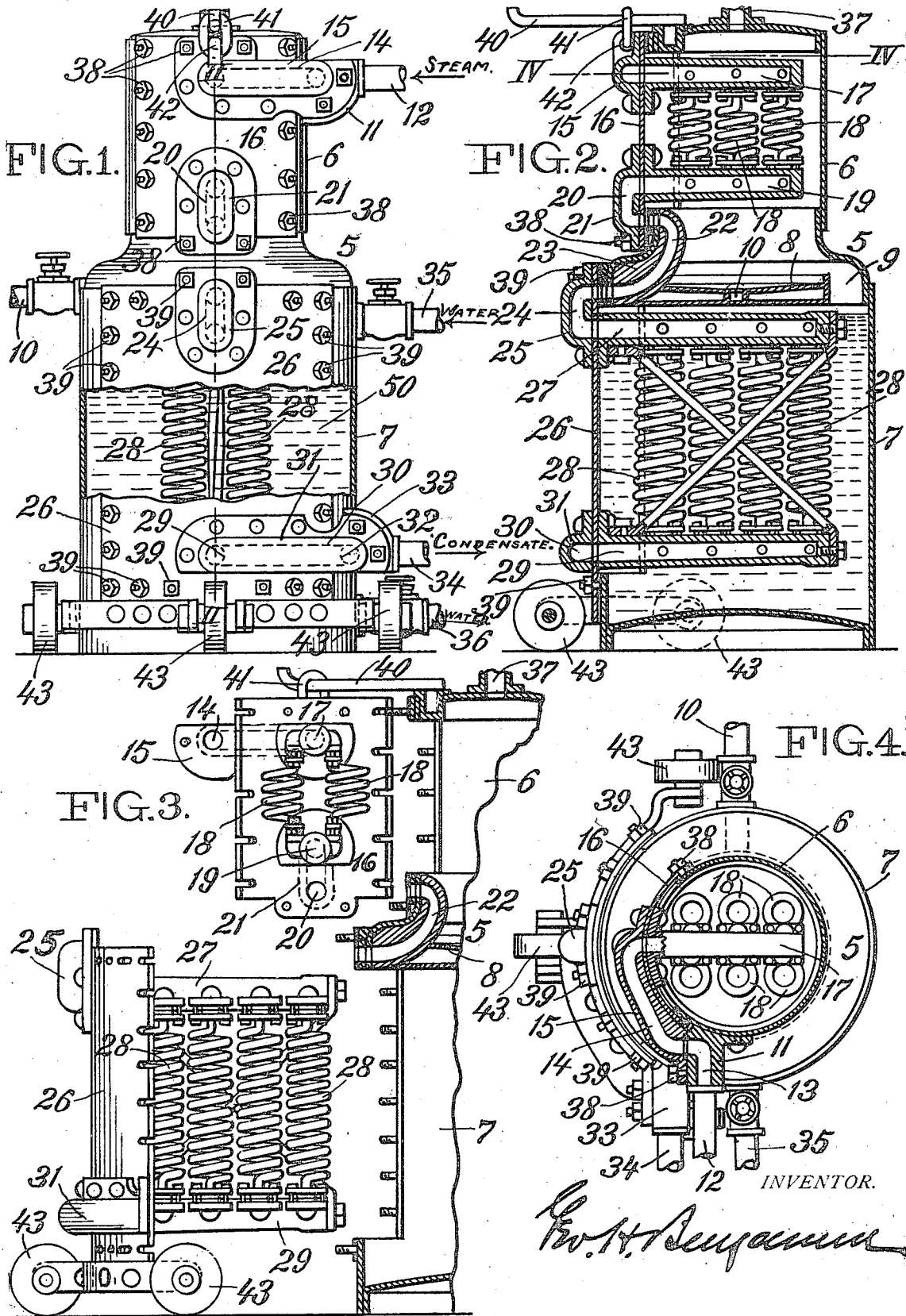


G. H. BENJAMIN.  
EVAPORATOR.  
APPLICATION FILED DEC. 29, 1917.

1,288,480.

Patented Dec. 24, 1918.



# UNITED STATES PATENT OFFICE.

GEORGE HILLARD BENJAMIN, OF NEW YORK, N. Y.

## EVAPORATOR.

1,288,480.

Specification of Letters Patent. Patented Dec. 24, 1918.

Application filed December 29, 1917. Serial No. 209,411.

*To all whom it may concern:*

Be it known that I, GEORGE HILLARD BENJAMIN, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Evaporators, of which the following is a specification.

My invention relates to evaporators of the type used on ship board and designed to separate water from salt carried by the water.

My invention consists in an arrangement of parts, by reason of which the steam connections to the evaporator shell are permanently fixed, while at the same time the coil or coils within the evaporator shell are readily removable for scaling or repairing.

The accompanying drawings will serve to illustrate my invention, in which, Figure 1 is a front elevation with a portion of the shell broken away to show the coils in the lower part of the shell.

Fig. 2 is a vertical section on the line II—II of Fig. 1, looking from the right.

Fig. 3 is a vertical section of the shell, corresponding to Fig. 2, with the doors which close the upper and lower portions of the shell, and the coils thereon, shown in elevation.

Fig. 4 is a transverse section of the upper portion of the evaporator, taken on the line IV—IV of Fig. 2.

In the drawings, 5 represents the shell of the evaporator, shown as formed of plate metal, and divided into two parts, an upper part 6, and a lower part 7. The shell may be formed of cast iron, pressed steel, or otherwise, as desired. The part 6 is shown as smaller in vertical and transverse diameter than the part 7; the parts, however, may be of the same size. Located in the interior of the shell and between the parts 6 and 7, is a shield or diaphragm 8. The diaphragm 8 is smaller in diameter than the part 7, thereby providing a passage 9 for the vapor which is set free in the part 7. The diaphragm 8 is connected to a pipe 10, leading to the outside of the shell 7. If salt accumulates on the upper part of the diaphragm 8, it may be carried out of the apparatus through the pipe 10.

Permanently connected to the casting 11 attached to the outside of the part 6, is a steam pipe 12. The construction of this casting is best shown in Fig. 4. The interior of the casting is provided with a steam passage

13, which steam passage communicates with a steam passage 14 formed in the casting 15 attached to the front of the door 16 on part 6. The end of the steam passage 14, opposite to that connected to the steam passage 13, communicates with the upper manifold 17 in part 6. Communicating with this manifold, are the steam coils 18, the lower ends of which communicate with a manifold 19 in the part 6. The forward end of the manifold 19 communicates with a steam passage 20 in casting 21, which is secured to the front of the door 16. The lower end of the steam passage 20 communicates with the steam passage 22 in casting 23, situated within and secured to the parts 6 and 7. The lower end of the steam passage 22 communicates with a steam passage 24 in casting 25 mounted on the front of door 26 on part 7. The lower end of the steam passage 24 communicates with the outer end of the manifold 27 in the upper part of part 7. Connected to this manifold are the coils 28, the lower ends of which communicate with the manifold 29 in the lower part of the part 7. The forward end of the manifold 29 communicates with the steam passage 30 (shown in dotted lines, Fig. 1) in casting 31 connected to the lower end of door 26. The right hand end of this passage communicates with a steam passage 32 in casing 33, which is connected to the outside of the part 7 and connected to the right hand end of this steam passage is a steam exit pipe 34. represents a pipe by means of which fresh or salt water may be introduced into the part 7; 36 a pipe through which fresh or salt water may be withdrawn from the part 7. 37 represents a pipe through which the vapor set free in the evaporator may be carried out of the evaporator. The doors 16 and 26 are removable by removing the nuts 38—39. To support the door 16, manifolds 17 and 19, coils 18 and castings 15 and 21, a pivoted arm 40 is mounted on the front of the part 6, which arm supports a link 41 secured to the door 16 by means of an eye 42. When the door is in the closed position (see Fig. 2) the link 41 is near to the right hand end of the arm 40; when the door is in the open position (see Fig. 3) near to the left hand end of the arm 40. To support the door 26, three rollers 43 mounted on bearings and connected to the bottom of the door, outside of the part 7, are employed. When the door 26 is removed, it carries the

manifolds 27 and 29, coils 28, and castings 25 and 31.

The operation of my improved device is as follows: Steam is introduced through the pipe 12, and passes through the steam passage 14 to manifold 17, coils 18 to manifold 19; thence through steam passage 20 to steam passage 22, steam passage 24, manifold 27, coils 28, manifold 29, steam passage 30, steam passage 32, and out in the form of condensed water through pipe 34. Steam passing through the coils 28, vaporizes the salt water 50 in the part 7, the vapor passing upward through the passage 9 into the part 6, where the vapor is superheated, which causes it to deposit its salt upon the diaphragm 8, the fresh vapor passing out of the apparatus through the pipe 37. By reason of the diaphragm 8, the vapor in part 6 is practically separated from the body of water in part 7, which permits of the vapor being superheated, which would not be possible in the absence of the diaphragm, as vapor cannot be superheated in the presence of water.

The means described and shown for supporting the doors 16 and 26, are those which I consider best for the purpose. I wish it understood, however, that I may use any means for supporting the doors which will be found desirable.

I have described my invention as provided with a shell divided into two parts 6 and 7, with two sets of heating coils. Manifestly the upper shell 6 may be omitted and the vaporization effected by the coils in the lower part 7, in which case the diaphragm 8, as well as the other parts which communicate between the parts 6 and 7, may be omitted, and the pipe 37 connected to the top of the part 6, in a manner well understood in evaporator construction.

It will be seen from the drawings, that the communicating passage for the steam between the coils 18 and the coils 28, is located within the shell of the structure. This is an advantage as it maintains the temperature of the steam in the passage.

Having thus described my invention, what I claim is:

1. In an evaporator, the combination of an inclosing shell, a steam pipe connected permanently to the upper part of the shell, a steam pipe connected permanently to the lower part of the shell, a plurality of removable doors for said shell, coils mounted on said doors, and means carried by the doors which will serve as a means of steam communication between the steam supply pipe and the upper end of the coils and the lower end of the coils and the steam or condensed water exit pipe.

2. In an evaporator, the combination of an inclosing shell, a casting connected to the upper part of the shell, a steam pipe con-

nected to the casting, a casting connected to the lower part of the shell, a steam or condensed water exit pipe connected to said casting, a plurality of removable doors, coils mounted on said doors, a casting having a steam passage therein mounted on the upper end of the upper door and adapted to cooperate with the casting connected to the upper part of the shell, a casting having a steam passage therein adapted to be interposed between the lower end of the upper coils and the upper end of the lower coils, and a casting connected to the lower portion of the lower door having a steam passage therein and adapted to cooperate with the casting connected to the lower part of the shell.

3. In an evaporator, the combination of an inclosing shell, a plurality of removable doors, manifolds mounted on the doors, steam coils interposed between the manifolds, a steam inlet pipe connected to the upper portion of the shell, a steam outlet pipe connected to the lower portion of the shell, and means mounted on the exterior of the doors for establishing steam connection between the upper door and the steam inlet pipe, the upper door and the lower door, and the lower door and the steam outlet pipe.

4. In an evaporator, the combination of an inclosing shell, a steam pipe connected permanently to the upper part of the shell, a plurality of removable doors, steam coils connected to said doors, means for connecting the steam coils together, an exit pipe connected permanently to the lower part of the shell, together with means for connecting the steam pipes to the inlet and outlet ends of the coils.

5. In an evaporator the combination of an inclosing shell divided into two parts, the upper part smaller in diameter than the lower part, a removable door connected to the upper part, a removable door connected to the lower part, steam coils mounted on said doors, a steam pipe connected to the exterior of the upper and smaller portion of the shell, a steam exit pipe connected to the lower and larger portion of the shell, means for connecting the upper portion of the coils in the smaller portion of the shell to the steam inlet pipe, means for connecting the coils in the upper portion of the shell and coils in the lower portion of the shell together, and means for connecting the lower portion of the coils in the larger portion of the shell to the steam exit pipe.

6. An evaporator, in which the steam inlet and exit pipes are connected permanently to the shell, and the evaporating coils wholly removable from the shell, together with means whereby the steam inlet and exit pipes will be connected respectively to the inlet and exit ends of the evaporating coils

when such coils are in position in the interior of the evaporator shell.

7. In an evaporator, the combination of an inclosing shell, a steam pipe connected permanently to the upper part of the shell, a steam pipe connected permanently to the lower part of the shell, a removable door for said shell, manifolds mounted on said door and projecting inwardly, coils introduced between said manifolds, and means carried by the door which serve as a means

of steam communication between the steam supply pipe and the upper manifolds, the introduced coils and the lower manifolds, and the steam or condensed water exit pipe. 10

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE HILLARD BENJAMIN.

Witnesses:

LESTER BEARDSLEY,  
HELEN E. KOELSCH.