F. H. SCHUBERT.

EVAPORATOR AND CONDENSER.

APPLICATION FILED MAR. 28, 1919.

1,361,910.

Patented Dec. 14, 1920.

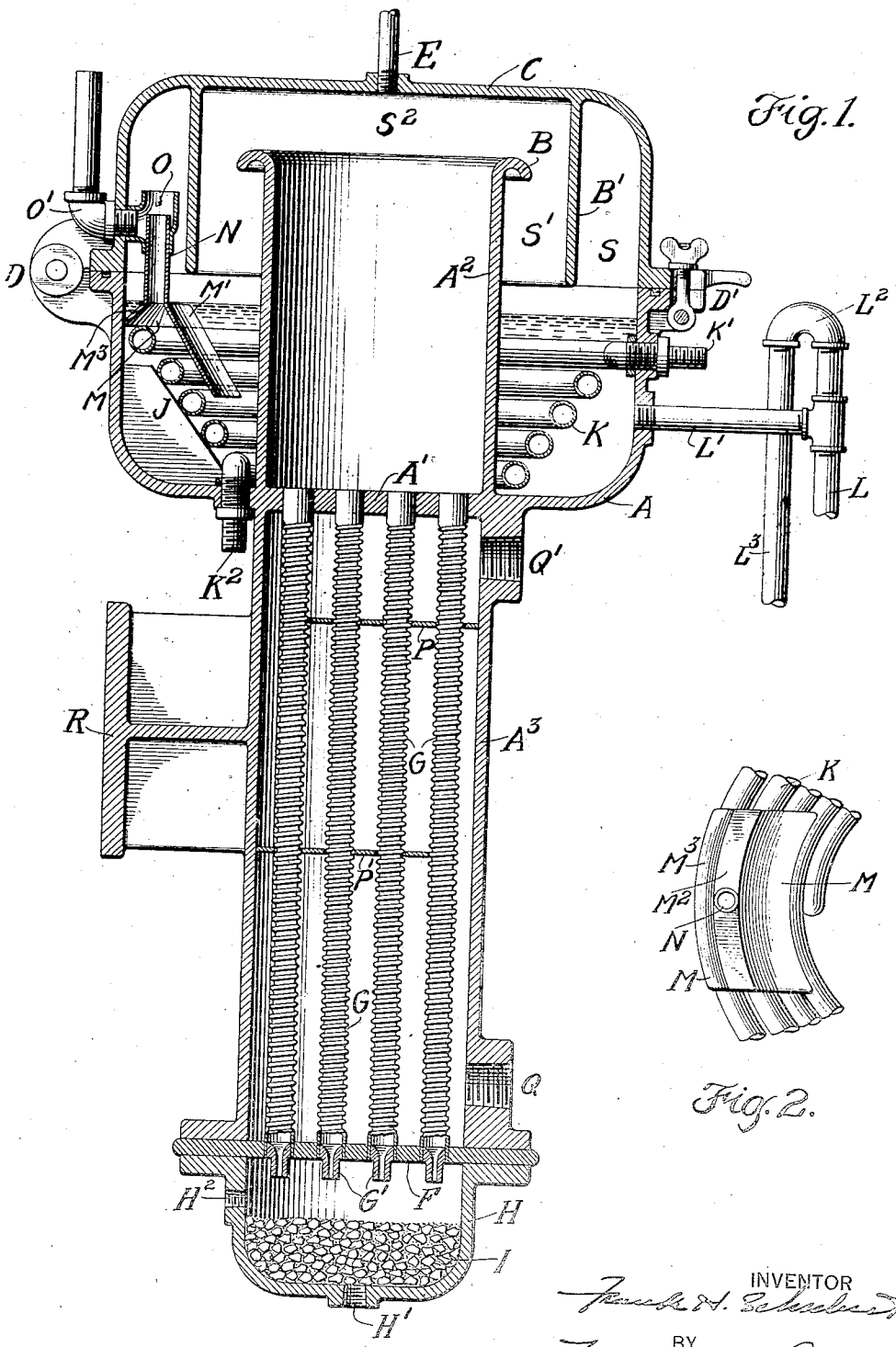

Fig. 1.

Fig. 2.

INVENTOR

Frank H. Schubert

BY

Francis J. Clarke

his ATTORNEY

UNITED STATES PATENT OFFICE.

FRANK H. SCHUBERT, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO BROWN-FERRIER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

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Application filed March 28, 1919. Serial No. 285,739.

To all whom it may concern:

Be it known that I, FRANK H. SCHUBERT, a citizen of the United States of America, and resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Evaporators and Condensers, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to combined evaporators and condensers of the kind, for instance, that are used to produce potable water on ship board, and it has for its object to provide a simple, strong, compact and efficient apparatus for this purpose; particular features which I have in view being a construction in which a large part of the main structure is made of a single casting, with consequent avoidance of joints, and a baffling arrangement which will tend to prevent water reaching the condensing part of the apparatus either by being carried with the steam or by splashing incident to movement of the apparatus when it is used on ship board. A further improved feature of my apparatus has to do with the provision for mixing air with the steam in such a way that it will be carried into the condensed water: I have also in view the special construction of the condenser in which the steam conducting tubes are at the same time given a large area in contact with a cooling fluid and are prevented from exerting disruptive strains on the tube sheets to which they are secured.

The nature of my improvements will be best understood as described in connection with the drawings in which they are illustrated and in which—

Figure 1 is a central vertical section through my improved evaporator and condenser, and

Fig. 2 is a plan view on an enlarged scale of the aerator, consisting of steam collecting hood, steam nozzle and aerator body shown in vertical section in Fig. 1.

A is the body of my evaporator chamber which may conveniently be of the bowl shape shown, and which is provided with a central bottom portion A′, formed with holes to serve as a tube sheet. Surrounding this tube sheet portion A′, and formed as a part of the same casting as the bowl A, is the upwardly extending cylinder A^2, which extends up into the steam space of the evaporator, as shown; also surrounding the tube sheet portion A′, and extending downward therefrom is the cylindrical body portion A^3 of the condenser also formed of the same casting with the bowl A and upwardly extending cylinder A^2. B is an outwardly extending annular baffle surrounding the cylinder A^2 and conveniently formed, as shown, by flanging out the upper edge of this cylinder. C is the top or cover of the evaporator, which may be secured to the bowl portion A, as shown, by a hinge as indicated at D, and a clamping device, as indicated at D′. This cover portion is formed with a downwardly extending cylinder B′ approximately bisecting the annular space between the cylinder A^2 and the outer wall of the evaporator and extending down toward, but not to, the water level in the evaporator. E is an open escape pipe or orifice leading from the top of the cover C. F is a tube sheet secured to the bottom of the condenser body A^3 and held, as shown, between a bottom flange on the condenser body and a water receiving chamber H, having a water escape passage H′ and an excess air escape passage H^2. I indicating filtering material which may conveniently be used in the water chamber. G, G, etc., are the tubes of the condenser which I prefer to form with peripheral corrugations which may extend as a helix throughout the length of the tubes, and which have the advantage of increasing the contact surface with the steam on the inside and the cooling water on the outside, and also of relieving the tube sheets A′ and F from destructive thrusts due to expansion of the tubes. I prefer to provide these condensing tubes with restricted outlet passages as indicated at G′. Q and Q′ indicate openings for water leading to and from the condenser body, and P and P′ baffles located in the condenser body, while R indicates a bracket conveniently formed in the same casting with the cylinder A^3 by which the apparatus can be secured to the wall of a ship or other supporting means. K is a steam heating coil located in the evaporator chamber and conveniently supported by a series of ribs such as are indicated at J; K′ indicates the steam entrance and K^2 the

steam exit from the coil. Water is supplied to the evaporator by gravity, a pump, or equivalent device, not shown, delivering the water through the pipe L and a branch leading from this pipe indicated at L'. The pipe L is continued above its union with the pipe L', draining first through a head L^2, and continuing downward by the pipe L^3 to the reservoir, not shown, through which the water is supplied. This device will hold the water level in the evaporator at approximately the level indicated by the bottom of the bend L^2. M is a steam collecting hood located in the evaporator and conveniently formed, as shown, of a flange M' extending down over the inner portion of the steam coil K, a top M^2, and a downwardly and outwardly extending flange M^3. From this hood extends a steam pipe N, opening into the steam space of the evaporator into the air nozzle O, laterally connecting with the open air as indicated at O'.

In operation the evaporator is maintained with an approximately constant water level, as indicated, and the water is heated by the steam coil K, the bulk of the steam coming off near the outer periphery of the evaporator below and passing upward into the space S on the outside of the baffle wall B', thence it passes down below the edge of the baffle wall and upward through the annular passage S' into the space S^2 above the steam cooling cylinder A^2, and thence it passes down through the tubes of the condenser, the water escaping into the chamber F. The annular baffle B' obviously will prevent water being carried into the space S^2 by the energetically issuing steam, and will also serve to prevent water from being splashed into the space S^2 by movements of the ship, and this danger of water being splashed into the space S^2 is also further counteracted by the baffle B.

Sufficient steam will be collected under the hood M to result in a steam jet of some energy issuing through the nozzle N, the effect of which as the steam passes into the air nozzle O is to draw air from the atmosphere through the connection O' and mix a considerable quantity of air with the steam, and a considerable portion of this air will remain in admixture and solution in the condensed water.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. An evaporator and condenser having a body member made up of a single casting comprising an evaporator body having a central portion of its bottom pierced to form a tube sheet, a cylindrical upwardly extending member surrounding said tube sheet portion and lying within the evaporator body, and a cylindrical downwardly extending member also surrounding said tube sheet portion and forming the body of the condenser.

2. An evaporator and condenser having an evaporator chamber formed with a cylindrical upwardly extending member extending into the steam space of the evaporator, and a cylindrical downwardly extending member of greater diameter than the upwardly extending member dividing the steam space of the condenser into inner and outer chambers.

3. An evaporator and condenser having an evaporator chamber formed with a cylindrical upwardly extending member extending into the steam space of the evaporator, and having an outwardly extending annular baffle, and a cylindrical downwardly extending member of greater diameter than the upwardly extending member dividing the steam space of the condenser into inner and outer chambers.

4. An evaporator and condenser having an evaporator body a portion of the bottom of which forms a tube sheet, and which is formed with a cylindrical upwardly extending member surrounding said tube sheet portion, in combination with a cover member provided with a downwardly extending cylindrical member of greater diameter than the upwardly extending cylindrical member and extending below the top edge thereof, a steam coil for heating the evaporator and a tubular condenser extending below the evaporator body.

5. In an evaporator and condenser, a steam collecting hood located in and extending below the water level of a portion of the evaporator, said hood being formed with an upwardly extending steam delivery nozzle, in combination with an air nozzle surrounding the steam nozzle and in communication with the atmosphere.

6. In an evaporator and condenser having a steam coil for heating the water, a steam collecting hood located in the evaporator and extending over a portion of the coil formed with an upwardly extending steam delivery nozzle, in combination with an air nozzle surrounding the steam nozzle and in communication with the atmosphere.

FRANK H. SCHUBERT.