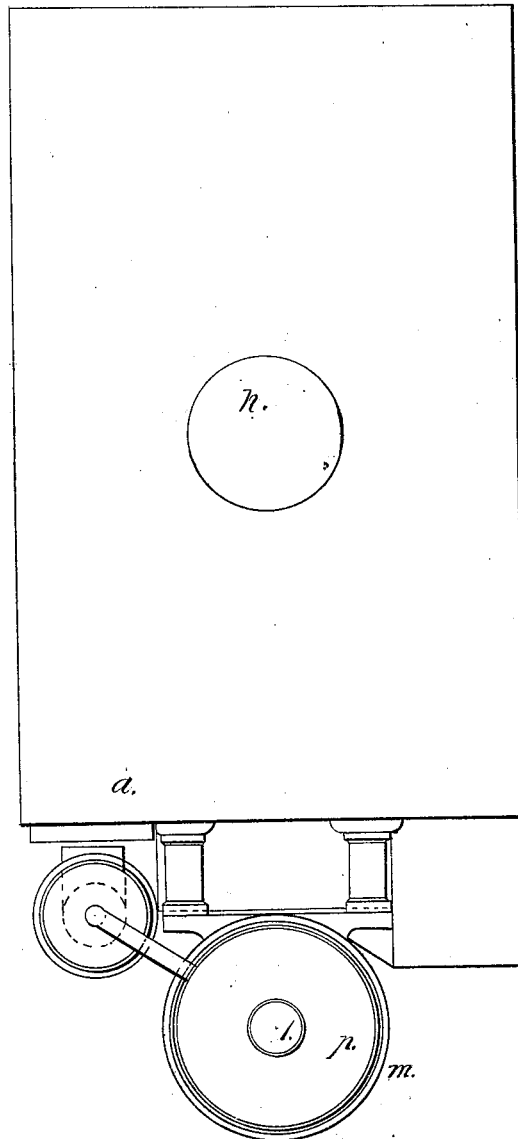


Sheet 1, 3 Sheets.

Ericsson & Forbes.
Feed-Water App's for Boilers.
N^o 6,815. Patented Oct. 23, 1849.

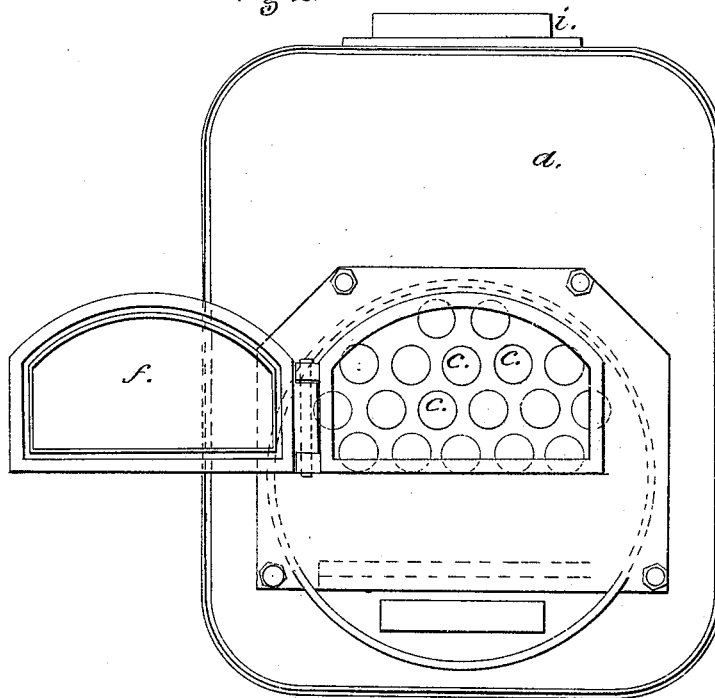
Fig. 1.



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Fig. 2.



UNITED STATES PATENT OFFICE.

JOHN ERICSSON, OF NEW YORK, N. Y., AND ROBERT B. FORBES, OF BOSTON,
MASSACHUSETTS.

APPARATUS FOR DISTILLING SEA-WATER.

Specification of Letters Patent No. 6,815, dated October 23, 1849.

To all whom it may concern:

Be it known that we, JOHN ERICSSON, of the city, county, and State of New York, and ROBERT B. FORBES, of Boston, Massachusetts, have invented new and useful Improvements in the Fresh-Water Maker for Distilling Sea-Water, and that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a horizontal section taken the line (A B) of Figs. 3 and 4; Fig. 2 a front elevation; and Fig. 3, a longitudinal vertical section of the apparatus; and Fig. 4, a vertical section of a modification of the condenser.

The same letters indicate like parts in all the figures.

The production of fresh water for use on ship board by distillation, to save the weight and room occupied by water casks or tanks, has long been desired as a matter of economy and humanity. That human life should be sacrificed for the want of water, while floating on that element, is a reproach to the present age which has made so much progress in science and the useful arts. Of the many attempts which have been made to produce an apparatus for the purpose of distilling sea water, none have so far been practically successful, for the following reasons. Such an apparatus must occupy but little space, must be economical of fuel, must not be liable to derangement and must be easily managed. All these conditions must be fulfilled in view of the purpose to which such a distillery is to be applied. It must occupy but little space and consume but a small quantity of fuel, or economy is not attained; it must be self feeding, or it cannot be worked by such persons as constitute the crew of a ship; and finally it must not be liable to derangement or it would expose the crew to the very danger it is intended to avoid.

The object of our invention is to meet in a simple and practical manner, all the above requirements, and to this end our invention consists of a boiler to be worked at very low pressure, with horizontal flue tubes so

situated, relatively to the door for supplying the fuel to the grate, that the opening of this door will expose the flue tubes to view and admit of cleaning out the soot that unavoidably collects in, and which would otherwise choke them. Also, in connecting the steam chamber of the said boiler with the upper end of a condenser by a flexible pipe attached to a bonnet or dome which rests on, and closes a large aperture at the top of the boiler in the manner of a safety valve that it may answer the manifold purposes of steam pipe connection, safety valve, steam dome or chamber, hand hole for giving access to the inside of the boiler and for ascertaining by inspection the height of water in the boiler. Also, in condensing the steam by causing it to pass between two vessels, the inner one kept cool by the flow of water through it and the other by the evaporating action of the atmosphere on moist cloth or other porous substance surrounding it that the required condensation may be effectively attained in very warm climates. Also, in employing in combination with the boiler and the condenser a water feed pipe having a double connection, one with the boiler and the other with the condenser, whereby the same feed pipe supplies the boiler and the condenser. And finally, in combining with the boiler and the feed pipe a feed cistern with a cork or other light float which when the water is at the required height in the boiler will be forced up to close the aperture of the feed pipe and thus cut off the supply.

In the accompanying drawings (a) represents the boiler which for convenience and economy of room is made quadrangular, but which may be of any other suitable form, with a furnace orifice chamber (b) of the usual construction at the forward end. Within the boiler there are horizontal flue tubes (c) which extend from the fire chamber to the smoke box (d) at the back leading to the chimney. The furnace door (f) lined with fire brick or soap stone is placed on a line with the flue tubes that when it is opened to feed the fire the condition of the flue tubes may be seen, and cleaned out when required without arresting the operation of the apparatus. At the bottom the boiler is provided with a blow off or discharge cock.

At the top the boiler is provided with a

hand hole (*h*) of sufficient capacity to give access to the inside of the boiler, and this is surrounded by a short cylindrical flanch (*i*) to which is fitted, by a ground joint, like the seat of a valve, a bonnet or steam dome (*j*), the upper end of which is in the form of an elbow pipe (*k*) so formed that one end of a flexible pipe of prepared india rubber or other flexible substance may be secured to it steam tight, the other end of the said flexible pipe being in like manner attached to a pipe (*l*) at the upper end of the condenser.

The flexible connection of the bonnet or steam dome with the condenser, and the manner in which it is connected with the boiler, renders this part of the apparatus of several uses. It answers the purpose of a steam dome or chamber; and a steam pipe connection. It may be lifted off to give access to the inside of the boiler for inspection and cleaning, and for charging the boiler at the commencement. And should the pressure of the steam become too great from any accidental cause it will answer the purpose of a safety valve. The condenser (*m*) is a vertical cylinder with which the steam pipe connects by a nozzle (*n*), and at the lower end it has a discharge pipe for the discharge of the water produced by the condensation. Within this there is another cylinder (*p*) resting on the bottom of the outer cylinder by a flanch (*q*) and provided near the top with a flanch (*r*) to fit accurately the upper end of the outer cylinder and the junction of the two is then rendered steam tight by india rubber packing (*s*), that the two may expand unequally without the danger of breaking. The space between these two cylinders is for the reception of the steam which in passing down is condensed by the surfaces of the metal which are kept cool in the following manner. The outer cylinder is wrapped around with cloth or other porous substance which will absorb moisture, that when kept in a moist state the evaporating action of the atmosphere may absorb heat from the metal and thus effect the condensation of steam. This part is specially to be employed in hot climates. And the inner cylinder is kept cool by the flow of water through it. The feed pipe (*t*), funnel shaped at the upper end, is fitted to the upper end of the inner cylinder and descends to within a short distance of the bottom; water is to be supplied to this feed pipe by a pump or other means, and from this it flows up to the top where it escapes through a spout (*u*).

The feed pipe (*t*) is provided with a branch pipe (*u*) above the high water mark in the boiler and passing through the condenser, and this branch delivers the water vertically through an aperture of the requisite capacity into a fuel cistern (*v*) of greater capacity connected with the lower

part of the boiler, that the water delivered by the branch feed pipe into this cistern may flow into the boiler by gravity, the boiler being always worked at atmospheric pressure, or a little above. In the upper part of the cistern (*v*) there is a float (*w*) made of cork or any other buoyant substance fitting loosely so that when the water is at the required height in the boiler the said float shall be forced up against the discharge aperture of the branch feed pipe to check the supply, but so soon as the water sinks below the required height the float shall permit the water to flow from the feed pipe to give the required supply. In this way the apparatus is rendered self feeding for low pressures, as such an apparatus is not required to be worked above the pressure of the atmosphere.

It will be obvious from the foregoing that some parts of the above described apparatus may be varied in construction, as for instance, the connection of the steam bonnet or dome with the boiler, can be made by means of any ground joint which will admit of its using in the manner of a safety valve that it may rise by the pressure of the steam, and that it may be lifted off to give access to the inside of the boiler. The boiler may be of any other than a rectangular form. The feed cistern that conducts the feed water to the boiler may be of any desired capacity and form that will admit of the free working of a float of sufficient capacity to check the flow of water from the branch feed pipe when there is sufficient water in the boiler. And the float may be made of any substance other than cork, which will lose its buoyancy by the absorption of water. The feed pipes instead of being directly connected with the condenser and the feed cistern of the boiler may discharge the water in the condenser and the branch feed pipe receive the water for the supply of the boiler directly from the condenser.

Instead of using the condenser above described as constituting part of our present invention, any other condenser may be substituted such for instance as the one represented in section 4 of the accompanying drawings and which is constructed and connected as follows, viz: The condenser (*a'*) is a vertical cylindrical vessel in which are arranged a series of vertical tubes (*b'*) secured in the usual manner at top and bottom to a plate (*c'*). Below the lower plate there is properly secured a cap (*p'*) with a discharge pipe a space or chamber (*r'*) being formed in it below the lower ends of the tubes for the reception of the water produced by the condensation of the steam, which water runs out of the discharge pipe into any vessel that may be placed below. And the upper end of the said condenser is covered by a similar cap (*p'*) with a chamber, which

cap is connected with the steam pipe before described that the steam from the boiler may pass to, and through the tubes (*b'*) to be condensed.

- 5 The tubes (*b'*) for the condensation are kept cool by water surrounding them and flowing through the outer casing from the bottom and discharging at the top, thereby causing the current of water to pass in the
10 reversed direction of the current of steam. The water is supplied to and caused to flow through the condenser from a feed pipe (*d'*) connected with the lower end of the casing, the upper end being funnel shaped to receive
15 the water from a pump, or in any other manner, and at an elevation a little above the upper end of the casing of the condenser, which is provided with a delivery spout (*t'*), that the superior height of the column of
20 water in the feed pipe may insure the flow of water through the condenser.

What we claim as our invention and desire to secure by Letters Patent in the before described apparatus for the distillation or
25 production of fresh water on board of ships or other vessels, is—

1. Connecting the steam boiler with the condenser by means of a flexible pipe, substantially as described in combination with
30 the valve joint connection of the bonnet or steam dome covering the hand hole in the top of the boiler, substantially as described

whereby this connection is rendered of manifold uses, as described.

2. We also claim condensing the steam by 35 passing it in a space between two vessels, the inner one kept cool by a current of water, and the external one surrounded by woolen or other porous substance to be kept in a moist state to condense the steam by 40 the evaporating effect of the atmosphere on the moistened surface, surrounding the outer case, substantially as described, whereby the apparatus is especially adapted to very low latitudes, as described. 45

3. And finally, we claim the feed pipe for supplying water to the condenser and for feeding the boiler, substantially as described, in combination with the cistern that conducts the feed water to the boiler, and provided with a float for regulating the flow of water from the feed pipe, substantially as described, whereby the apparatus is rendered self feeding without liability of derangement, as described.

J. ERICSSON.
R. B. FORBES.

Witnesses to signature of J. Ericsson:

A. P. BROWNE,
O. E. PETERS.

Witnesses to signature of R. B. Forbes:

GEO. W. SAWIN,
F. E. GUILD.