2 Sheets—Sheet 1.

J. HOUPT.

CONDENSER FOR MARINE ENGINES.

No. 105,457. Patented July 19, 1870.

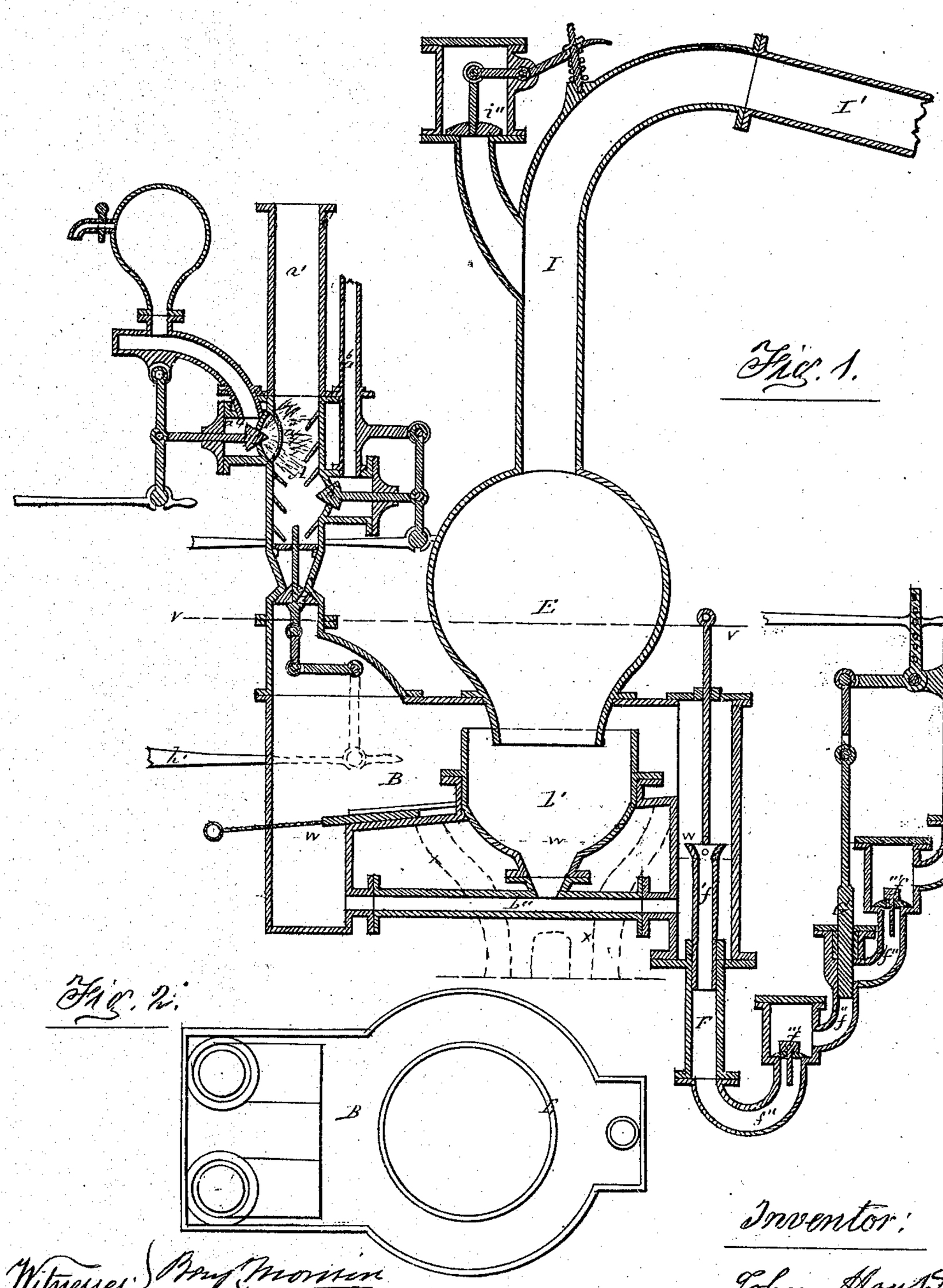
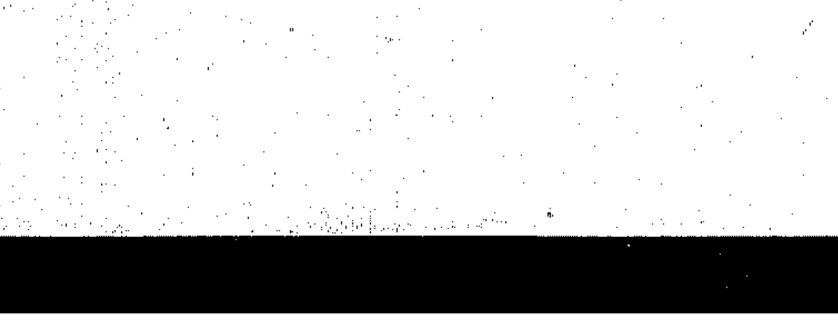


Fig. 1.

Fig. 2.



Witnesses: Benj Morrison, Wm H. Morrison

Inventor: John Houpt

2 Sheets—Sheet 2.

J. HOUPT.

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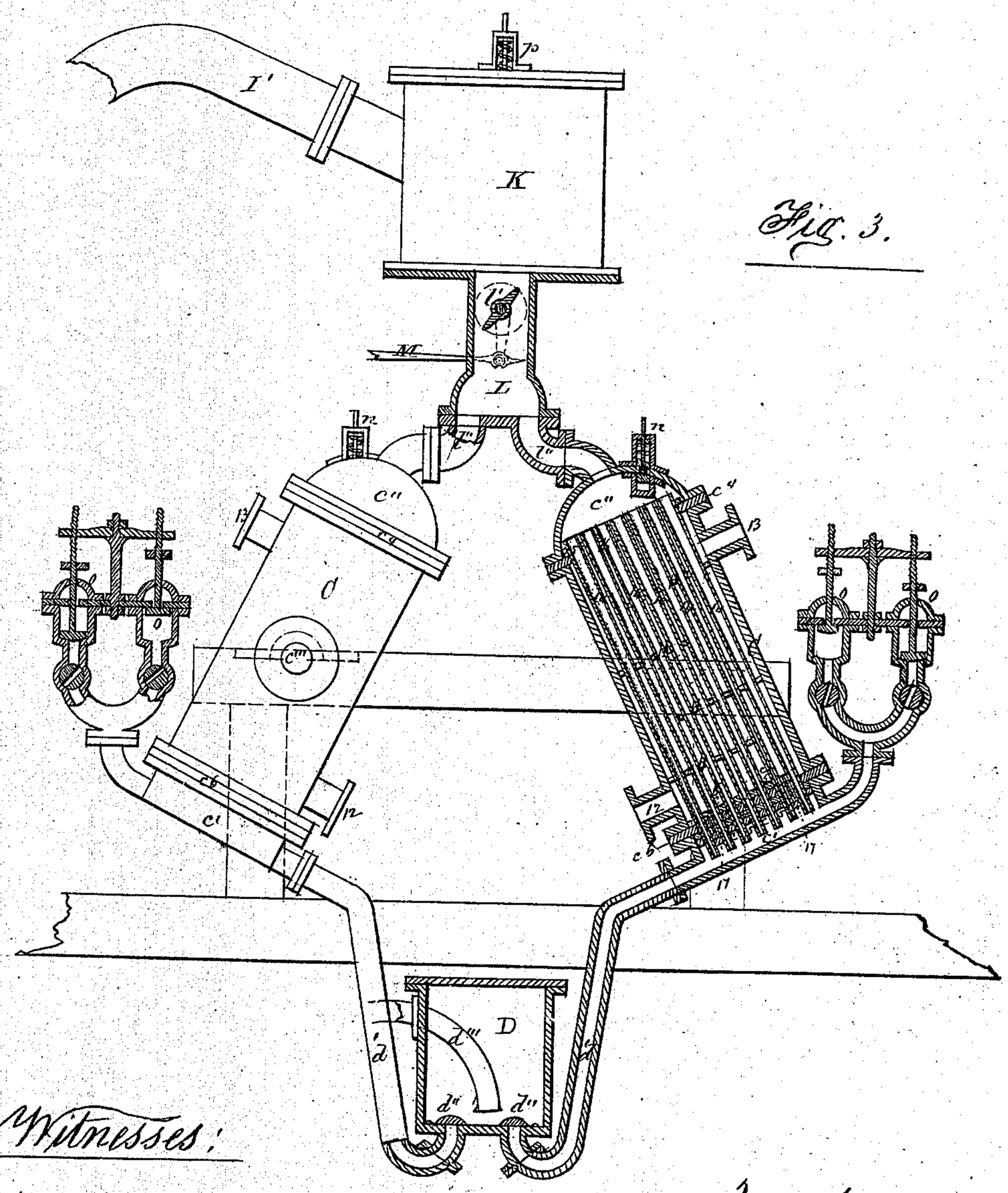

Fig. 3.

United States Patent Office.

JOHN HOUPT, OF SPRINGTOWN, PENNSYLVANIA.

Letters Patent No. 105,457, *dated July* 19, 1870.

CONDENSER FOR MARINE ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

I, JOHN HOUPT, of Springtown, in the county of Bucks and State of Pennsylvania, have invented certain Improvements in Condensers for Marine Engines, of which the following is a specification.

Nature and Objects of the Invention.

My improvements relate to the general construction of a plurality of condensers, as well as to their application to a steam-engine, but more especially to such as are described in my application "allowed" on the 20th day of October, 1869, and those described briefly in the caveats filed by me on the 15th and 22d days of September, 1869, and on the 15th day of January, 1870.

The first part of my invention relates to the construction and combined arrangement of two primary condensers with the respective ends of the steam-cylinder of a marine engine, and with a single secondary condenser, in such a manner that the exhaust-steam of the cylinder will be more effectually and easily divided into two portions in passing through the two said condensers, the one portion passing onward toward a tertiary condenser, to be eventually reduced to fresh water for supplying the steam-generators of the said engine, and the other portion being condensed by a jet-spray of cold sea-water, and the saline fluid discharged overboard; the object of this part of my invention being to produce thereby a more perfect vacuum in front of the piston, and also to afford a sufficient supply of fresh water for a marine engine without a special distillatory apparatus for the purpose.

The second part of my invention relates to the construction of the secondary condenser and the pipe leading from it to the tertiary condenser, and to the connection therewith of a force-pump, in such a manner that, while any required height of water may be maintained in the condenser, and the surplus be discharged overboard, all the vapor discharged into and arising from the water in the said condenser will be conveyed to the tertiary condenser; the object of this part of my invention being to separate more effectually the saline water and the vapor, and rendering the latter available for condensation in the tertiary condenser, for the purpose of affording a supply of fresh water for the steam-generators of the engine.

The third part of my invention relates to the construction of a tertiary condenser, and to its arrangement and combination with the secondary and primary condensers and the respective ends of the steam cylinder, in such a manner that the portion of steam or vapor which passes upward from the secondary condenser will be perfectly and rapidly condensed, and finally discharged by the said tertiary condenser into a reservoir, for the purpose of supplying the steam-generators of the engine with a sufficiency of fresh water.

Description of the Accompanying Drawings.

Figure 1 is a vertical longitudinal section through the middle of one of the primary condensers and the middle of the secondary condenser and their immediate connections, detached from the tertiary condenser.

Figure 2 is a horizontal section of the secondary condenser, below the dotted line V of fig. 1.

Figure 3 is a vertical section of the tertiary condenser and fresh-water reservoir, detached from the primary and secondary condensers.

General Description.

A is one of the two like primary condensers, communicating by a pipe, a', with its respective end of the steam-cylinders (not shown) of a steam-engine.

B, the secondary condenser.

E, a capacious inverted vapor-receiver, supported upon the condenser B, and opening through the top of the same downward into the mouth of another vapor-receiver, b', within the said condenser B, while its upper end communicates with a capacious steam or vapor-pipe, I, leading into the drum K of the tertiary condenser or condensing cases C C.

b'' is a horizontal pipe, which forms a communication between the bottom of the condenser B and the bottom of the vessel b', so that any water in the bottoms of B and b' will preserve the same level, as indicated by the dotted line W on fig. 1.

At one end of the bottom of B an opening and pipe, F, are provided, for the reception of an adjustable over-flow pipe, f', whereby any required height of the water-surface may be obtained in the condenser B and vessel b'.

The lower end of the pipe F is connected with a series of bent pipes, f'' f''' f'''' f''''', containing suitable valves, and a plunger, G, operated by the power of the engine, so that the surplus or overflow water of the condenser B will be forced overboard.

Communication between the primary condenser A and the secondary condenser B is closed and opened by means of a valve, H, operated by a rod, h', connected with the engine, substantially as described in my said "allowed" application.

In one side of the primary condenser A there is a recess, covered on the inner side by a perforated plate, a'', and in the middle of the recessed portion there is an opening fitted with a conical plug-valve, a''', in a water-chamber, a^4, which communicates with an elevated fountain-head, (not shown,) so that, whenever the valve is opened, a jet-spray of cold water will be forced into the condenser A.

At the opposite side of the condenser A, and a little below the jet-spray recess, is a small opening fitted with a conical plug-valve, a^5, covered by a case, which, by means of a pipe, a^6, receives hot-air from any suitable air-heating and forcing-chamber, so that, whenever the said valve is opened, a stream of said hot air will be forced into the condenser A.

This valve a^5, and also the valve a''', are operated by the engine substantially in the same manner as the valve H.

Side by side of each other the two primary condensers, of which A is a representation of either, having each an open communication with its respective ends of the steam-cylinder of the engine, and the valves of each of said primary condensers operating alternately as the exhaust steam is received from their respective ends of the said steam-cylinder, and both communicating with one and the same secondary condenser B, as described, the result will be as follows, viz:

During the entrance of the first puff of steam into either of the primary condensers, the valve H in the bottom of the same being still open, and the valves a^4 and a^5 closed, the said puff of steam and the air in the said primary condenser A will be driven down into the secondary condenser B, and the valve H immediately afterward closed, so that a moiety or portion of the exhaust steam coming from the cylinder will be retained in the condenser A, the valve a^4 now opens and a spray of cold water therefrom condenses the confined steam, and thus produces the vacuum required in front of the advancing piston, and the piston having advanced nearly to the end of its stroke, the valve a^4 closes, and the valve a^5 opens and lets hot air into the condensers A, to overcome the vacuum, or equalize the pressure in the primary and secondary condensers, and immediately afterward the valve a^5 closes, and the valve H opens, and lets the water in the primary condenser fall by gravitation into the secondary condenser.

The puff of high steam now coming through the open valve H of the other primary condenser, drives the vapor and warm air therein into the secondary condenser B, which vapor and air, together with whatever vapor may arise from the saline water therein, and in the capacious chamber b', will be driven upward into the capacious chamber E, and the said vapor of fresh water then driven upward through the vertical pipe I and the inclined pipe I' into the drum of the tertiary condenser, the saline water deposited in the secondary condenser B being at the same time kept at any required height or depth therein by the adjustable overflow pipe f' and the action of the pump-plunger G, operated by the engine so as to discharge overboard, through the pipe f^4, the overflow water.

The tertiary condenser consists of the drum K and two like cases, C C, of prismatic form, each fitted with a removable sunken bottom, c', and a removable cap, c'', and supported on a substantial frame by means of trunnions c''', in such a manner that, when detached from the outside pipes which connect it with its fellow case and other parts of the engine, it can be tilted to any suitable position required for cleansing or repairs.

The caps c'' c'' are secured upon the upper ends respectively of the cases C C, with a perforated plate, c^4, between, and form chambers which respectively communicate with the drum K above, through a valve-chamber; L, and pipes l'' l'', (see fig. 3.)

The sunken bottoms c' c' are each secured to the respective ends of C C, with two like perforated plates, c^5 c^5, and a correspondingly perforated compressible packing, c^6, between the said cases and bottoms.

Between the cap c'' and the bottom c' of each case C. there are a series of transversely arranged partitions, 11 11 11 11, which extend alternately from opposite sides of the case to the extent of about two-thirds, more or less, of the distance between the said sides.

At a short distance below the lowest of the partitions 11 of each case C there are two flanged openings, 12 12, made for the purpose of the attachment to said case of two pipes (not shown) for the introduction of steady streams of cold sea-water from any sufficiently elevated reservoir, and at the opposite side of the case, near its upper end, there are made two correspondingly flanged openings, 13, to which pipes (not shown) are intended to be attached to carry off the water supplied to the case through the openings 12 12.

A numerous series of slightly tapering open tubes, 14 14, are secured longitudinally within each case C, by inserting each of said tubes downward through the respectively appropriate perforations in the plate 4, partitions 11 11, and plates c^5 c^6 c^5.

The upper end of each tube is screw-cut around its outer side, and fitted with two nuts, 15 and 16, the lower one serving as a jam-nut or adjustable shoulder, and the other one as a tightener, so that the upper or wider end of the tube 14 can be secured thereby in a water tight manner, in the said perforated plate c^4.

The perforations in the bottom-plates c^5 c^6 c^5 are made, respectively, to receive the lower part of the tubes in a closely fitting manner, so that, by means of small screw-bolts 17, the two plates c^5 c^5 can be caused to compress the elastic-packing-plate c^6 between them sufficiently to contract the perforations in the packing, or keep it always pressing in water-tight contact around the tubes, and at the same time, so as to allow the lower parts of the said tubes to slide up and down as their lengths may become varied by changes of temperature, without causing any leaking of the water around between them and the packing by such variation.

It will be seen, therefore, that the tubes 14 form a series of open communications between the two chambers formed at the respective ends of each of the prismatic cases C C by their respective caps c'' and bottoms c', and that water flowing under pressure into the said cases through the openings 12, will pass upward from side to side alternately, between the partitions 11 11, and thence out through the openings 13 without entering either the tubes 14, or the chambers c' c''

The said condensing-cases C C are supported upon their respective trunnions c''', with their upper ends inclined toward each other, (see fig. 3,) and are connected with the drum K by means of the chamber L, branch pipes l'' l'', and the pipes of the respective caps c'' c'', a governor-valve, l', being arranged in the chamber L so as to be periodically opened and closed partially, to equalize the pressure of the puffs of vapor in the cases, C C as may be required, by a positive motion derived from the engine through a connecting-rod, M, or its equivalent.

The shallow chambers formed at the lower ends of the cases C C, each communicate through a U-bent pipe, d', with a fresh-water receiver, D, through an intervening valve, d'', opening upward into the said receiver, which latter must be placed at a proper distance below the condenser, to receive and serve as a reservoir for the water of condensation which is to flow down through the tubes 14 of the condensing-cases C C. The fresh water thus supplied to the said reservoir D is intended to be drawn through a bent pipe, d''', to supply the usual steam-generators of the engine.

On the upper side of the pipe I there is a safety-valve, i'', opening outward, for the purpose of providing against any excessive pressure of the steam on its passage through pipes I I'.

On the drum K there is a valve, p, opening inward,

for the purpose of letting air into the drum to overcome, when necessary, such a vacuum as would cause a return motion in the condensed water of the tertiary when the valve *l'* is open. On the cap *c''* of each of the cases C C of the said tertiary condenser, there is a vacuum-valve, *n*, opening inward, for the purpose of providing against the possible occurrence of such a vacuum therein as would permit a return of the condensed water in the tubes 14 below, when the valve *l'* above is closed.

In connection with the sunken bottom *c'* of each of the cases C C, there are a pair of valves, *o o*, the one opening outward to allow the air to escape from the lower ends of the tubes 14, and the other opening inward to allow of the entrance of air into *c'*, if at any time necessary.

The valves *n*, *o o*, and *p*, are each made adjustable by a spring and screw-nut, to any degree of pressure that may be required, and are intended to be adjusted so as to act automatically, as the emergencies may require.

The fresh-water reservoir D being entirely below the tertiary condensers K C C, the water from the latter will gravitate into it, and the valves *d'' d''* will prevent any possibility of the return of any of said water, should a vacuum occur at any time in the said tertiary condensers.

It will be understood without further description, that, by applying a distinct and independent primary condenser for the reception of the exhaust steam from each end of the steam cylinder of an engine, so that both will open into one and the same secondary condenser, as described, the water of condensation in the bottom of either of the primary condensers will have time to fall down into the secondary condenser before the first puff of high steam from its end of the steam-cylinder reaches the said primary condenser, and consequently, when the puff of steam arrives, driving out the air in the primary, there will be less likelihood of an excess of steam being produced thereby, (before its valve closes,) greater than the tertiary condensers might be competent to receive and condense.

It will also be understood that, by increasing the capacity of the secondary condenser, and of the pipe which leads from it to the drum of the tertiary condenser, as shown, the sudden entrance of the puff of high steam and air from the primary condensers, and the expansive effect of the same upon the vapor in the secondary condenser, will be sufficiently provided for to prevent any saline water from entering the tertiary condenser, and at the same time allow all the fresh-water vaper to be driven onward into the tertiary condenser.

It is intended to apply a small furnace below the bottom of the vessel *b'* and pipe *b''* of the secondary condenser B, as indicated by the dotted line *x x*, for the purpose of heating the water and generating vapor in the condenser just before starting the engine, and to generate vapor at any time, should there be a deficiency in the regular production to keep up the supply of fresh water for the steam-generators of the engine.

Claims.

I claim as my invention—

1. The combination, with the primary condenser A, of the cold-water spray-valve *a'''*, and the hot-air valve *a⁵*, constructed and arranged to operate substantially as and for the purpose hereinbefore set forth.

2. The combination of two like primary condensers A, with the respective ends of the steam-cylinder of an engine, and with one and the same secondary condenser, B, so as to operate in relation to each other, substantially as and for the purpose hereinbefore set forth.

3. The combination, with the secondary condenser B, of the capacious vessel *b'*, the intercommunicating pipe *b''*, the capacious inverted vessel E and pipes I I', the said parts being constructed and arranged to operate substantially as and for the purpose hereinbefore set forth.

4. The combination, with the secondary condenser B, of the adjustable over-flow pipe *f''*, and its cylinder F, the plunger G and its cylinder *f'''*, and valves *f''' f'''*, and the overboard or waste-pipe *f⁴*, the said parts being constructed and arranged to operate substantially as and for the purpose hereinbefore set forth.

5. The tertiary condenser, consisting of the drum K and condensing-cases C C, connected together by the detachable pipes L and *l'' l'*, and arranged and supported upon trunnions *c'''*, substantially as and for the purpose hereinbefore set forth.

6. In combination with the pipe L, the governor-valve *l'*, arranged and operated substantially as and for the purpose hereinbefore set forth.

7. The open tubes 14 14, in the cases C C, in combination with the perforated plate *c⁴* and screw-nuts 15 and 16, at the upper ends of the said tubes, and the perforated plates *c⁵*, elastic packing-plate *c⁶*, and screw-bolts 17 17, at the lower ends of the said tubes, substantially as and for the purpose hereinbefore set forth.

8. In combination with the respective upper ends or caps *c'' c''* of the cases C C, the inlet-valves *n n*, constructed and operating substantially as and for the purpose hereinbefore set forth.

9. In combination with the respective lower ends or bottoms *c' c'* of the cases C C, the outlet and the inlet valves *o o*, constructed and operating substantially as and for the purposes hereinbefore set forth.

10. The combination, with the lower ends of the cases C C, of the detachable fresh-water reservoir D, substantially as and for the purpose hereinbefore set forth.

11. The combination, with the drum K, of the inlet-valve *p*, constructed and operating substantially as and for the purpose hereinbefore set forth.

12. The combination of the drum K with the secondary condenser B, by means of the pipes I' and I, and the capacious inverted vessel E, arranged in relation to each other substantially as and for the purpose hereinbefore set forth.

Witnesses: JOHN HOUPT.

BENJ. MORISON,
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