

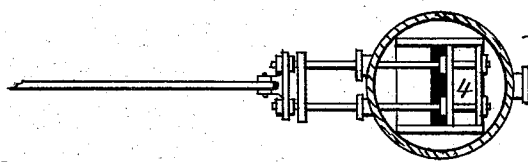
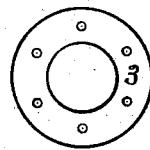
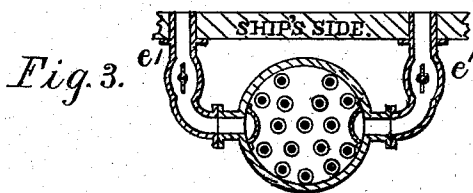
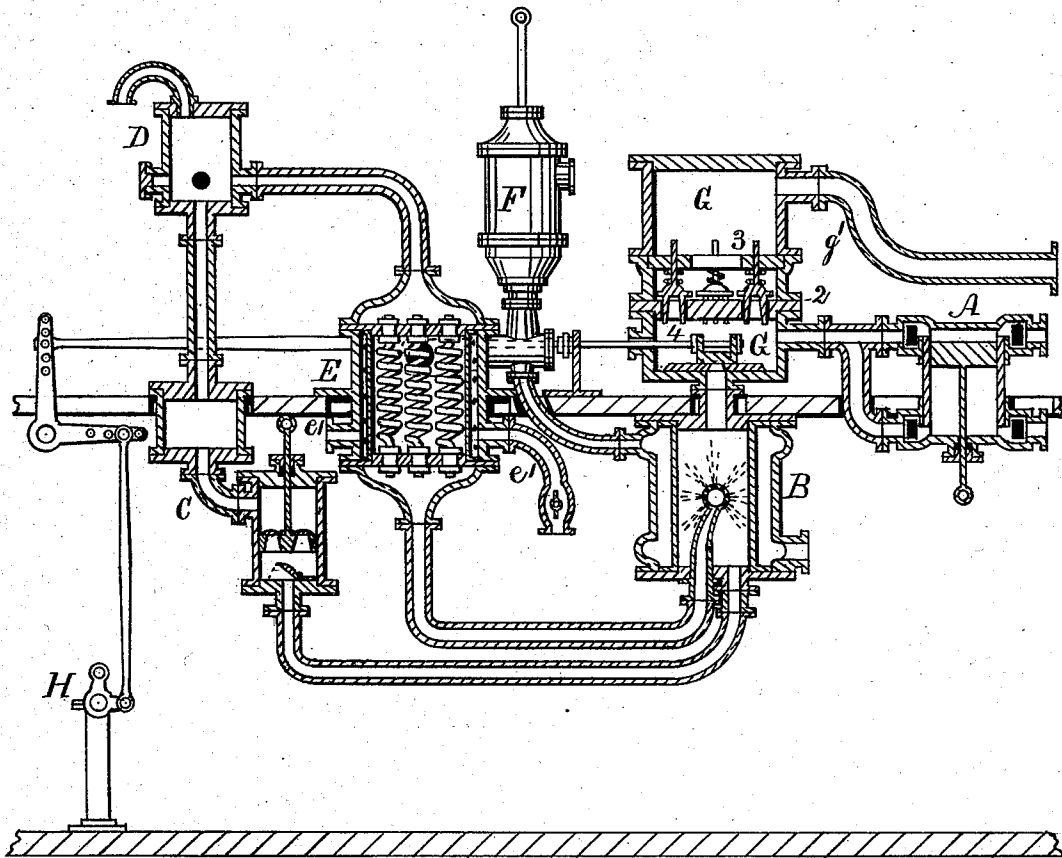
J. HOUPPT.

Compound Condensing Apparatus for Marine
Steam-Engines.

No. 154,951.

Patented Sept. 15, 1874.

Fig. 1.



Witnesses:

Sam. Morison.
Wm. F. Morison.

Inventor:

John Houpt

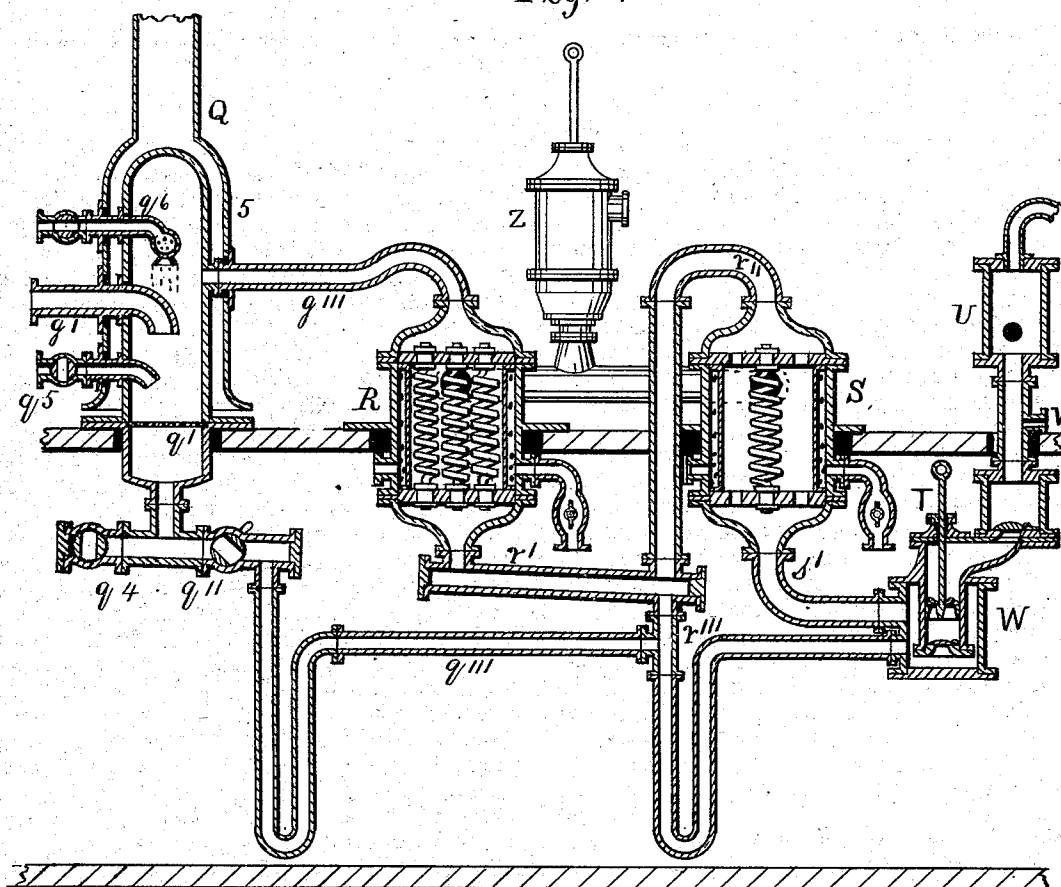
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Compound Condensing Apparatus for Marine
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No.154,951.

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Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN HOUPPT, OF SPRINGTOWN, PENNSYLVANIA.

IMPROVEMENT IN COMPOUND CONDENSING APPARATUS FOR MARINE STEAM-ENGINES.

Specification forming part of Letters Patent No. **154,951**, dated September 15, 1874; application filed July 25, 1874.

To all whom it may concern:

Be it known that I, JOHN HOUPPT, of Springtown, in the county of Bucks and State of Pennsylvania, have invented certain Improvements in Compound Condensing Apparatus for Marine Steam-Engines, of which the following is a specification:

My present improvements relate more especially to the improved condensing apparatus for which Letters Patent of the United States were granted to me bearing date November 4, 1873, and numbered 144,203; and the objects of my present invention are to provide an expander and evaporator, in combination with a compound condensing apparatus for marine steam-engines, whereby the larger portion of the exhaust steam coming from the steam-cylinder will be greatly expanded, and the saline matter of the sea-water, introduced therein to produce an increase of vapor, when desired, will be precipitated before the vapor reaches the surface-condenser; and, also, to provide for drawing off, at any time, from said condenser, a large portion of hot water for the boilers or steam-generators, as will be fully described with reference to the accompanying drawings.

The drawings accompanying my Letters Patent No. 144,203, before referred to, herein, are somewhat chaotic or confused, in consequence of the limited space allowed; and, therefore, in the present case, the different connecting devices are spread out in nearly the same vertical plane, and therefore more readily and distinctly seen.

Referring to these drawings, Figure 1 is a vertical section, in the same vertical plane, of the improved compound condensing apparatus No. 144,203, before referred to, with my present improvement embodied therein. Fig. 2 is a continuation of the same compound condensing apparatus shown in Fig. 1, in the same sectional vertical plane. Fig. 3 is a horizontal section of the refrigerator shown in Fig. 1. Fig. 4 is a horizontal section of the upper plate of the dividing-valves, and Fig. 5 is a plan view of the slide and opening of the said dividing-valves.

Fig. 1 represents a primary jet-condenser and a separating-valve, in combination with a powerful refrigerator, for the purpose of cooling down the fresh water of condensation from

the hot-well of the said jet-condenser, to be used over and over again as fresh sprinkling-water in the condenser, and for supplying the steam generator or boiler with fresh water, especially in moderately small-sized marine steamers, as described in my Letters Patent before referred to; and also represents, in connection with the aforesaid invention, my present improved dividing-valves arranged between the said primary jet-condenser and the surface-condensing apparatus in Fig. 2, with which latter apparatus the said dividing-valves are intended to communicate, for the purpose of supplying hot fresh water of condensation for the larger-sized marine steamers.

Referring to Fig. 2, Q is the expander and evaporator; R, the secondary surface-condenser, having my present improvement in the same embodied therein; S, the tertiary condenser; T, the air-pump; U, the hot-water reservoir; V, the hot-water-supply pipe leading to the boilers, (not shown;) W, the hot-well below it; and Z, the circulating-pump.

The dividing-valves G G in Fig. 1 consist of a large chamber, which communicates, through a large opening in its bottom, with the jet-condenser B below, said opening being fitted with a slide-valve, 4, operated by a crank on main shaft H; and just above said slide there is a horizontal partition, 2, through which there are six openings, each fitted with a puppet-valve opening upward, and kept concentric in the opening by three downward-projecting stems, which slip up and down with the plate of the valve as the latter rises from the pressure of the steam entering from A, and closes by the action of a spring. The stem of each of said puppet-valves slides up and down through its respective steady-hole above in the partition 3.

The exhaust steam enters G from the steam-cylinder A at a point between the slide-valve 4 and the partition 2, and, forcing open the six puppet-valves, the main portion of the puff of steam passes up through the six puppet-valves, and is drawn off by the surface-condensing apparatus, Fig. 2, and is thereby condensed, so as to save the hot fresh water of condensation for supplying the steam-boilers.

Immediately after the first portion of the puff of steam has passed through the puppet-

valves in G, the slide-valve 4 opens and the remnant is condensed in the jet-condenser B, and is forced by the action of the pump C into reservoir D, thus producing the required vacuum before the piston of the steam-cylinder A, and the water in D—passing through the refrigerator E, and cooled by the cold sea-water passing through the case thereof—affords cold condensing fresh water for the jet-condenser B. The steam from G passes through pipe *g'* into the expanding reservoir and evaporator Q, which is a capacious vessel, having its upper two-thirds of length provided with a surrounding ventilating-jacket, 5, which leaves an air-space between for the purpose of carrying off the immediately surrounding air heated by Q, which, in operation, constantly radiates heat. A small pipe, *q^b*, regulated by a suitable cock, admits cold sea-water, (by dripping it therefrom through a sprinkler or rose,) which affords additional vapor, while the saline matter thereof falls down and drips through a perforated diaphragm, *qⁱ*, upon which is spread a blanket or other porous fabric that will allow the saline solution to pass down through it and escape through the bottom opening of Q into the pipe below, and out through cock *q^a*. The steam in Q passes off through pipe *g'''* into the condenser R, and from this latter the uncondensed portion of the vapor is drawn by the air-pump T into the tertiary condenser S, where it is reduced to water, which runs into hot-well W, and is afterward forced by the air-pump into reservoir U above. A pipe, *q^e*, which can be opened and closed at the will of the attendant, admits sea-water to wash out any saline matter that may in time accumulate in the bottom of Q or pipe below it, the cock *q^a* in said pipe being opened, and the cock *q'''* closed, to prevent the washings from entering fresh-water pipe *q^{'''}*. The steam Q is mostly condensed in the spiral tubes in R, the water of condensation running down through pipes *r'* and *r'''* into the hot-well W, and the vapor being drawn by the suction of the air-pump T through pipes *r''* into the spiral tubes in S, where it is all saved as fresh warm water, and finally forced up into the reservoir U, from which the boilers are to be supplied with the hot water through a pipe, V, leading thereto.

The condensers R and S are intended to be arranged below the surface-line of the sea, and the cold sea-water admitted near their respect-

ive lower ends, and, consequently, the circulating-pump Z, connected therewith, will require but little power to keep up a constant flow of the cold sea-water through the cases of said condensers. The regulating-valves *e' e'* of the condensers R and S are to be adjusted so as to regulate the temperature of R to a little below boiling water, and of S to a temperature low enough to save the water for use in the boilers. The spiral tubes in each of the three condensers E R S are each made of very thin sheet-copper, or other suitable metal, and their respective upper and lower ends left straight, to be inserted and soldered fast and water-tight in juxtaposition with corresponding holes in a metal casting provided with a flange around the end of same, which receives the end of the spiral tube, and provided also with a square or hexagonal stem, the outer end of which latter is cylindrical and screw-cut to receive a screw-nut, whereby the casting can be drawn so as to bring the flange thereof tightly against or upon an elastic packing between it and the end plate of the surface-condenser, thus making for each spiral tube a water-tight joint at both ends of the same, all of which and the utility thereof are more fully set forth in my Letters Patent No. 150,052, dated May 19, 1874.

I claim as my invention—

1. In combination with a compound condensing apparatus for marine steam-engines, substantially as described, the expander and evaporator Q, constructed and arranged between and in communication with the steam-chamber G and the surface-condenser R, as described, for the purpose of expanding the vapor therein.

2. The arrangement of the surface-condenser R at a position between and in communication with the expander Q and the tertiary condenser S, in combination with the pipes *r' r'''* and pump T, for the purpose of allowing a large portion of the fresh water therein to be drawn off at a temperature a little below boiling water, to supply the boilers or steam-generators with hotter water than can be supplied from the ordinary surface-condensers, as set forth.

JOHN HOUP. T.

Witnesses:

BENJ. MORISON,
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