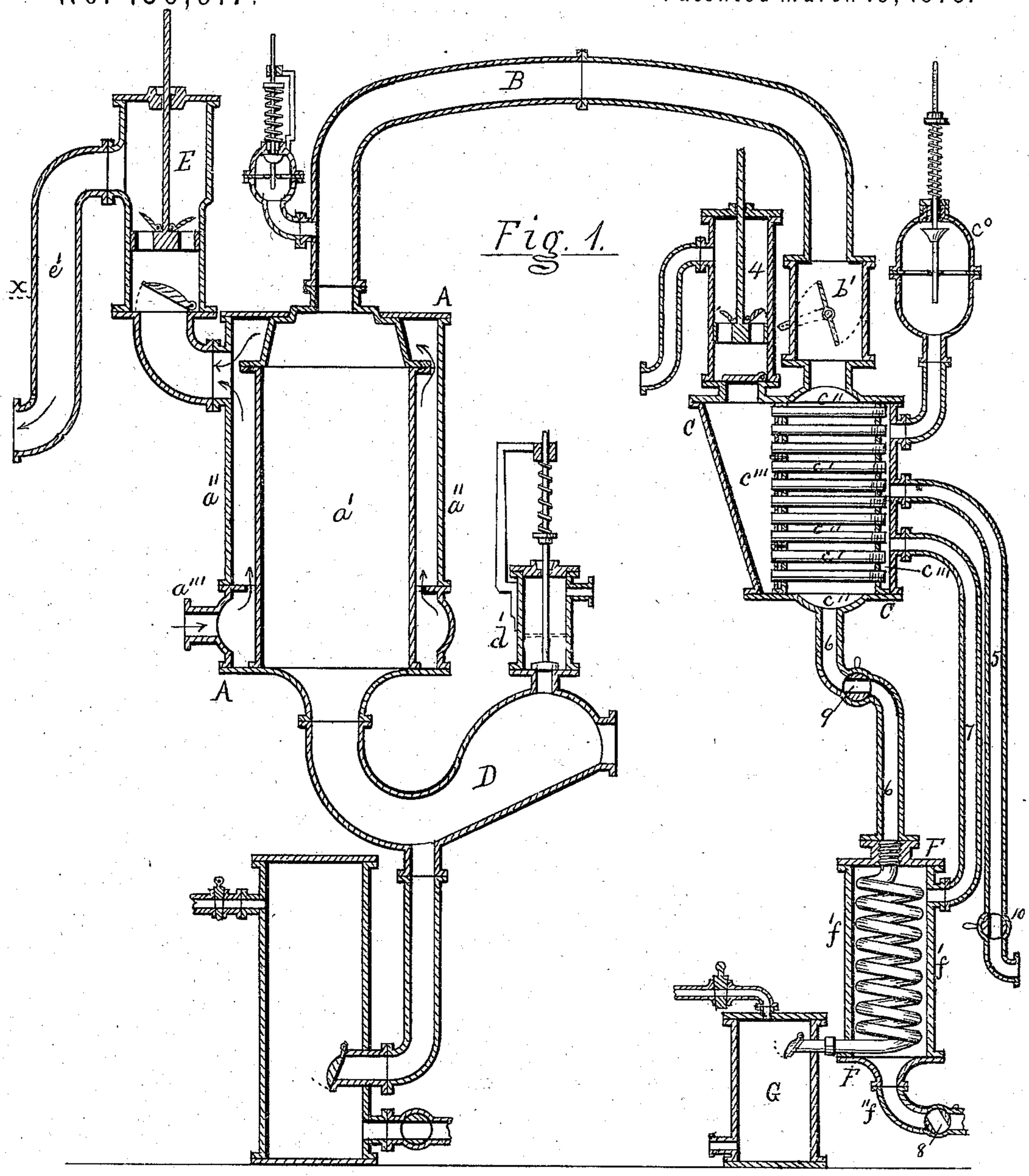
2 Sheets--Sheet 1.

J. HOUPT.

Condensing Apparatus for Steam-Engines.

No. 136,917. Patented March 18, 1873.

Fig. 1.



WITNESSES:

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Wm H. Morison.

INVENTOR:

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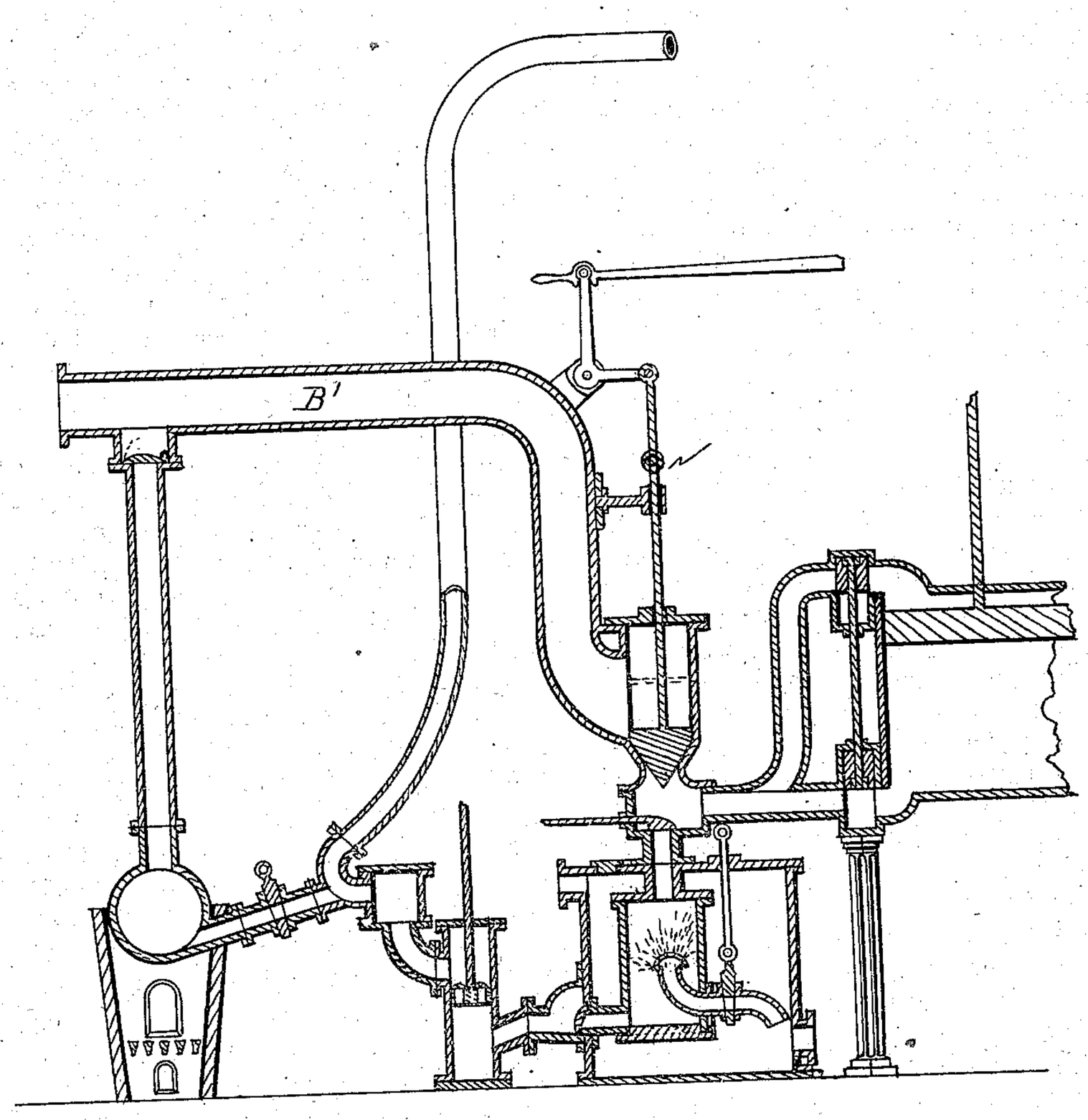
2 Sheets--Sheet 2.

J. HOUPT.

Condensing Apparatus for Steam-Engines.

No. 136,917. Patented March 18, 1873.

Fig. 2.



WITNESSES

Benj Morison.
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INVENTOR.

John Houpt

UNITED STATES PATENT OFFICE.

JOHN HOUPT, OF SPRINGTOWN, PENNSYLVANIA.

IMPROVEMENT IN CONDENSING APPARATUS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **136,917**, dated March 18, 1873.

To all whom it may concern:

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

My invention relates to marine steam-engines generally, and especially to the marine steam-engine described in the Letters Patent No. 109,616, granted to me for "improvement in steam-generators," dated November 29, 1870. The first part of my invention consists in the peculiar construction and arrangement of a comparatively large surface-cooler, in combination with the exhaust-pipe of the steam-cylinder (or with the primary jet-condenser of the same) and the secondary surface-condenser of a marine steam-engine, as hereinafter set forth; the object of this part of my invention being to enable me to greatly reduce the size or capacity, and consequently the cost of construction, of the secondary and tertiary condensers when the latter are used in connection with said marine engines. Another part of my invention consists in the peculiar construction and arrangement of a tertiary condenser, as hereinafter set forth, in combination with the secondary surface-condenser of a marine steam-engine; the object of this part of my invention being the production of a perfect condensation of all the steam or vapor that may pass as such from the secondary condenser with which the said tertiary condenser communicates, and thus economize the fresh water required for keeping up the supply for the steam generators or boilers of the engine.

Figure 1 is a vertical section of the condensing portion of a marine steam-engine embodying my invention. Fig. 2 represents that portion of a marine steam-engine having the "conjoined steam-cylinder and primary condenser" patented to me November 29, 1870, before named herein. The object of presenting this figure is to show the point of connection between my present invention and the conjoined steam-cylinder and primary condenser of a marine steam-engine.

The surface-cooler is a large steam-chamber, A A, the upper end of which communicates, through a long and capacious pipe, B, with the upper end of the secondary surface-condenser C C, while the lower end of said cooler communicates, through a pipe, D, with the conjoined primary condenser and exhaust-pipe, or either of them, of a marine steam-engine. The said cooler A A consists of a steam-chamber proper, a', surrounded by a cold-water case, a'', through which, by the action of a circulating-pump, E, cold sea-water is drawn into the lower part of the said case a'', (by means of a pipe, a''', which is intended to be fixed water-tight through the side of the ship,) and forced out (as it is drawn from the upper part of the said cooler) through a pipe, e', leading from the pump E through the side of the ship, so as to discharge the water at a point below the surface of the sea, the dotted line x indicating the surface-line of the sea. By thus discharging the current of cooling-water below the surface of the sea the power required to lift the water and keep up a constant flow upward through the cooler A is but trifling. Attached to the pipe D there is a safety-valve, d', adapted to open from any extraordinary pressure of the exhaust steam entering the pipe D. At the end of the pipe B, near its point of connection with the secondary or surface condenser C C, there is a valve, b', connected by its crank-shaft to any suitable moving part of the engine, so that it will be nearly closed during the first part of each puff of the exhaust steam entering the cooler A, and gradually opened immediately afterward. The object of this valve b' and of the large extent and capacity of the pipe B is, first, to prevent the steam from being driven, by the force of said puffs, down through the secondary condenser C C, or further, and thus prevent its condensation; and, second, to allow the exhaust steam ample room to expand, and cause a steady and nearly uniform flow of steam from the cooler into the condenser C C. The secondary condenser C C is of the ordinary construction, excepting that it is smaller, and has, comparatively, a much less number of the cooling-pipes, set further apart from each other—an advantage derived from the presence of the surface-cooler A A—whereby the exhaust steam passing through the latter is reduced in temperature and pressure before it enters the condenser. The water or cooling pipes c' c', open at both ends, project through

a steam-chamber, c'', so as to communicate freely with the whole interior of an inclosing water chamber or case, c''', which is kept fully supplied with cold sea-water by means of a circulating-pump, 4, which draws the said cold water (through a pipe, 5, which communicates with the sea through the side of the ship) into the condenser and forces it overboard. A valve-chamber, c^0, provided with a spring-valve, communicates with the upper part of the interior of the water-case c''', and serves as an air-chamber and relief-valve in preventing any improper strain upon the joints of the said condenser by the action of the circulating-pump 4. The steam-conducting pipe B communicates with the interior of the steam-chamber c'' through the upper end of the latter, and the lower end of said steam-chamber c'', opens into a pipe, 6, which enters a cold-water case, f' f', of a tertiary condenser, F F, and coils spirally around in the latter like the worm of a still, and opens on the outer side of the lower end of said water-case into the hot well G, from which the boilers of the engine are to be supplied while the latter is in operation. The bottom end of the condenser F communicates with a pipe, f'', which extends through the side of the ship (not shown) into the sea, from whence the required cold water is drawn by the action of the circulating-pump 4, upward through the pipe 7, which forms the communication between the two cold-water cases f' and c''' of the respective condensers C and F. The pipe f'' has an adjustable cock, 8, whereby the current of water passing upward through the case f' is controlled or regulated as to quantity at the pleasure of the engineer. The pipe 6 has an adjustable cock, 9, whereby the engineer can, at pleasure, prevent an excess of steam from getting down into the tertiary condenser F and "blowing out," instead of being condensed therein as required. There is also an adjustable cock, 10, in the water-pipe 5, which mainly supplies the condenser C C, so that the current of water passing through the said pipe can be regulated as to quantity at the pleasure of the engineer, and the cold water for either or both condensers C and F be acquired through either or both said pipes 5 and f'', as the requirements of both or either may render proper.

It will be evident that the cooler A A will greatly reduce the temperature of the exhaust steam entering it, and that in connection with the long capacious pipe B the said steam will be allowed to expand, and by the action of the valve b' be prevented from entering the secondary condenser in puffs, and acting together that the cooled and expanded steam will enter the said condenser in a steady or uniform and continuous manner. Another advantage derived, which is of importance in marine steamers especially, is that the extended pipe B permits the condensers to be located at any distant point in the ship from the steam-cylinder. It will also be evident that, during the operation of a marine steam-engine having the tertiary condenser F arranged and attached as described in relation to the secondary or surface condenser C C, any steam which may as such pass down through the pipe 6 will be most certainly condensed in the spiral coils within the cold-water case f', and pass out as fresh water into the hot well G, from which the boilers of the engine are to be supplied during the operation of the latter; and that the great reduction in the size and in the number of the pipes of the secondary condenser (permitted by the intervention of cooler and expander A A between the said condenser and the steam-cylinder of the engine) will proportionately reduce the cost of the original construction of the surface-condensers for marine steam-engines; and also that the reduced size and more simple construction of the tertiary condenser F F will render it less costly and more durable than the tertiary condenser described in my said Letters Patent, and shown by Fig. 3 of the drawing therein.

I claim as my invention—

1. The surface-cooler A A, with its circulating-pump E, safety-valve d', and pipe B, the said parts being constructed, arranged, and combined to operate substantially as and for the purpose hereinbefore set forth and described.

2. The tertiary condenser F F, with the pipes 6, 7, and f'', in combination with the secondary surface-condenser C C, or its equivalent surface-condenser, the said condensers being constructed and arranged to operate together substantially as and for the purpose hereinbefore described and set forth.

JOHN HOUPT.

Witnesses:
BENJ. MORISON,
WM. H. MORISON.