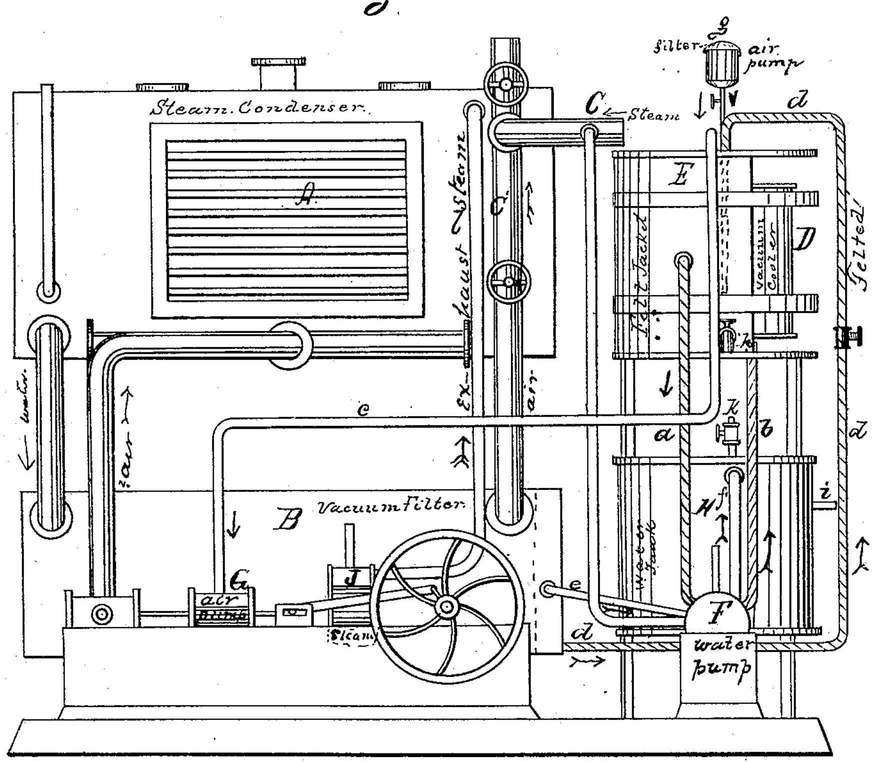
W. A. LIGHTHALL.

Apparatus for Cooling and Aerating Water.

No. 162,668. Patented April 27, 1875.

Fig 1.



Witnesses

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THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

2 Sheets--Sheet 2.

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Fig 2.

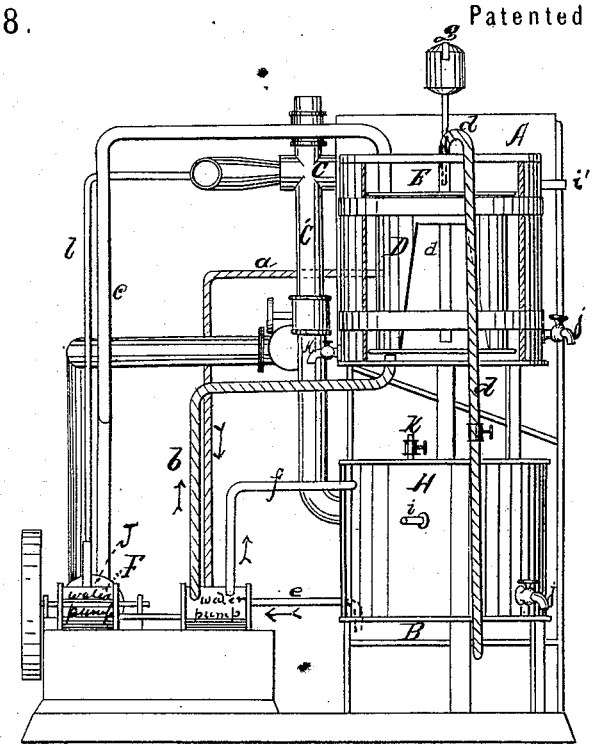
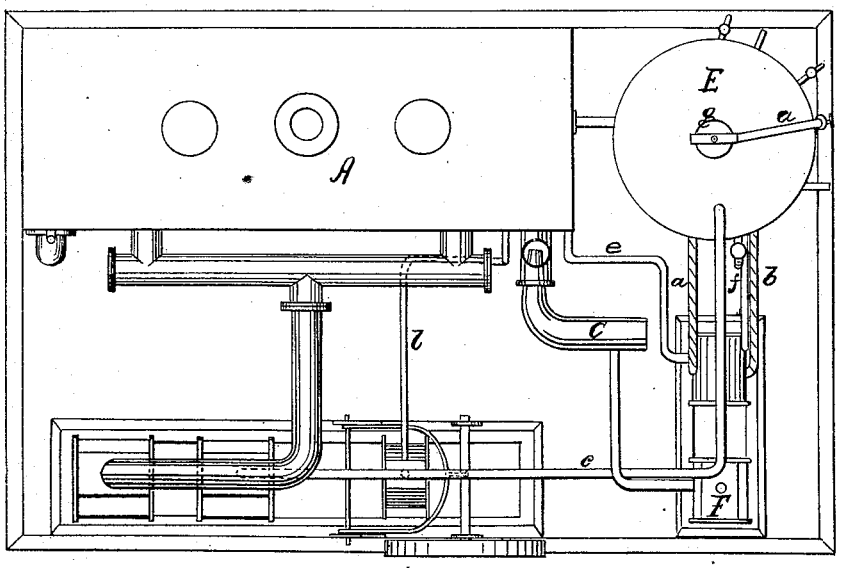


Fig 3.



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UNITED STATES PATENT OFFICE.

WILLIAM A. LIGHTHALL, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN APPARATUS FOR COOLING AND AERATING WATER.

Specification forming part of Letters Patent No. **162,668**, dated April 27, 1875; application filed February 27, 1875.

To all whom it may concern:

Be it known that I, WILLIAM A. LIGHTHALL, of the city of Brooklyn, county of Kings, State of New York, have invented an Improvement in Apparatus for Cooling and Aerating Water, of which the following is a specification, reference being had to the accompanying drawings, forming part of the same, in which—

Figure 1 is a side elevation of an apparatus embodying my invention. Fig. 2 is an end view, and Fig. 3 a plan, of the same.

My invention relates to a combined steam-condenser and water filter and cooler and aerator; and consists in the combination of a steam-condenser and water-filter, in which the water formed by condensation of steam while being filtered is somewhat cooled by evaporation in a partial vacuum, and a vacuum-cooler, into which the water from the filter is conducted, where the cooling process is continued, and the water aerated.

A is the steam-condenser, and B the filter. The steam for condensation is conducted into the condenser by the pipe C, which opens into the pipe C′ through a contracted nozzle, which forms an ejector, whereby the air is drawn from the filter through the said pipe C′, which leads from the filter to the condenser, causing a partial vacuum in the filter, thereby promoting evaporation therein, whereby the temperature of the water is somewhat reduced. I do not deem it necessary to give a detailed description of the several parts of the apparatus constituting the condenser and filter, as they are fully described in the Letters Patent, No. 155,737, issued to me on the 6th day of October, 1874, but only to refer to the said patent; and I here limit such description to the additional devices which constitute my present invention.

D is a vacuum-cooler, the same being an air-tight tank, preferably made of metal. E is a water-tank, within which is placed the cooler D, the tank being considerably larger than the cooler, so as to leave a clear space within it around the cooler. F is a pump, and *a* a pipe leading from the cooler, through the wall of the water-tank E, into the cooler, entering the cooler at a point above which it is intended that the water shall not be permitted to rise in the cooler. *b* is a pipe leading from the pump F, and opening into the water-tank E outside of the cooler D. The pump is constructed to draw the water from the cooler D through the pipe *a*, and throw it into the tank E through the pipe *b*. G is an air-pump, and *c* a pipe connected with said pump, and opening into the top of the cooler D, the pump acting to abstract the air from the cooler, and cause therein a vacuum more or less complete. *d* is a pipe leading from the filter B, through the top of the cooler D, terminating with an open end near the bottom of the cooler. This pipe is connected with the filter near the bottom, and leads out of an apartment at one end of the same, into which the water flows after passing through the filtering-apartments. *e* is a pipe leading from the same water-apartment in the filter, and through it the greater portion of the filtered water is drawn off by a force-pump, and thence discharged into the tank H through the pipe *f*, or otherwise disposed of for use. The pipe *e* is preferably connected with the filter at a point, as shown in the drawings, somewhat above the level of that at which the pipe *d* is connected with the filter, so that the pipe *e* will draw off only the surplus water that is not drawn off through the pipe *d*. I have represented in the drawings a pump, F, the cylinder of which is divided into two chambers, with a single piston-rod passing through both, one chamber with its piston constituting the pump to draw the water from the cooler D, and discharge it into the tank E, and the other constitutes the pump to draw the water from the filter and discharge it into the tank H. If preferred, however, a separate and independent pump may be employed for each of these operations.

g is a small air-pump inserted into the water-pipe *d* just above its entrance into the cooler D. It is preferably placed at this point for convenience; but it may be introduced at any other point desired—preferably, however, somewhere not far distant from the open end of the pipe *d*—its office being to introduce a rapidly-moving current of air into and through the water within the cooler, thereby agitating the water, and promoting evaporation. This pipe is furnished with a stop-cock for regulating the amount of air introduced,

which, of course, must not be so great as that abstracted by the action of the air-pump G—in other words, not so great but what there will be produced a partial vacuum, or a rarefied condition of the air, within the cooler. In the open end of the pump *g*, which is enlarged for the purpose, as shown in the drawing, there may and should be inserted some substance (preferably a mass of cotton fiber or sponge) that shall act to filter the air and remove from it dust and other impurities before its introduction into the cooler. If preferred, a separate pump or other motor may be employed to transfer the water from the filter to the cooler. The tank E is preferably jacketed with felt or some other substance that is a non-conductor of heat, to the end that the water, after having been cooled in the cooler D, and then transferred to the said tank by the action of the pump F, as before described, shall be kept as cool as may be. So, also, the pipes *d*, *a*, and *b* should preferably be covered with felt or other non-heat-conducting substance. *h* is a water-faucet, inserted near the bottom of the tank E, through which water may be drawn for use at pleasure. *i* is an escape-pipe for the overflow of water from the tank H, and *k* is a pipe provided with a stop-cock for the admission, at pleasure, of air into the tank H. The tanks E and H may, if preferred, be open at the top. *l* is the steam-escape pipe for the engine, which operates the pumps F and G. When a sufficient vacuum is formed in the cooler D by the action of the pump G, it is obvious that water standing in the filter will be forced thence through the pipe *d* into the cooler, and that the water so introduced will rise in the cooler until it reaches the point where the pipe *a* enters the cooler, through which pipe it will then be drawn off, and transferred to the tank E as fast as it continues to flow in through the pipe *d*, the water in the cooler always standing at the level of the open end of the pipe *a*, but not rising above it, and the water in the tank E, surrounding as it does the cooler, and in contact with it, will keep at the temperature of the water in the cooler. An overflow-pipe, *i'*, is inserted in the tank E near the top, for the escape of surplus water, which may, of course, if desired, be thence conducted to any desired point. The rarefying of the air in the cooler will, by a well-known law, cause an active evaporation, and the consequent cooling of the water within the cooler D, and the current of air which will rush into and through the water in the cooler by the small pump *g*, will perform the double office of aerating the water, and, by agitating it, still further promote its evaporation, the air-pump G drawing off the vapor from the cooler as fast as formed.

It is evident, also, that the water, after being somewhat cooled by the partial vacuum in the filter, is immediately, and while at such reduced temperature, transferred from the filter to the cooler D, where the cooling operation is continued and finished.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The condenser A, filter B, cooler D, air-pump G, air-pipes C and C', water-pipe *d*, and air-pipe *g*, all constructed and combined to operate as described, whereby steam is condensed, and the resulting water, filtered under a partial vacuum, is thereby somewhat cooled, and immediately forced into a vacuum-cooler, where the cooling operation is continued and the water aerated, substantially as specified.

2. The filter B, vacuum-cooler D, tank H, water-pipes *d*, *e*, and *f*, air-pump G, and force-pump F, all combined to operate as specified, whereby a certain portion of the filtered water is forced into the said cooler D, and the surplus forced into the tank H, substantially as described.

3. The vacuum-cooler D, placed within and surrounded by the tank E, the force-pump F, and pipes *a* and *b*, whereby water, as it is cooled in the said cooler, is transferred to the said tank, and there kept cool, ready for use, by contact with the said cooler, substantially as described.

In witness I have hereunto set my hand this 23d day of February, 1875.

WM. A. LIGHTHALL.

Witnesses:
B. S. CLARK,
A. S. FITCH.