

W. A. LIGHTHALL.
Combined Steam Condensers, Aerators and Filters.
No. 155,737. Patented Oct. 6, 1874.

Fig 1.

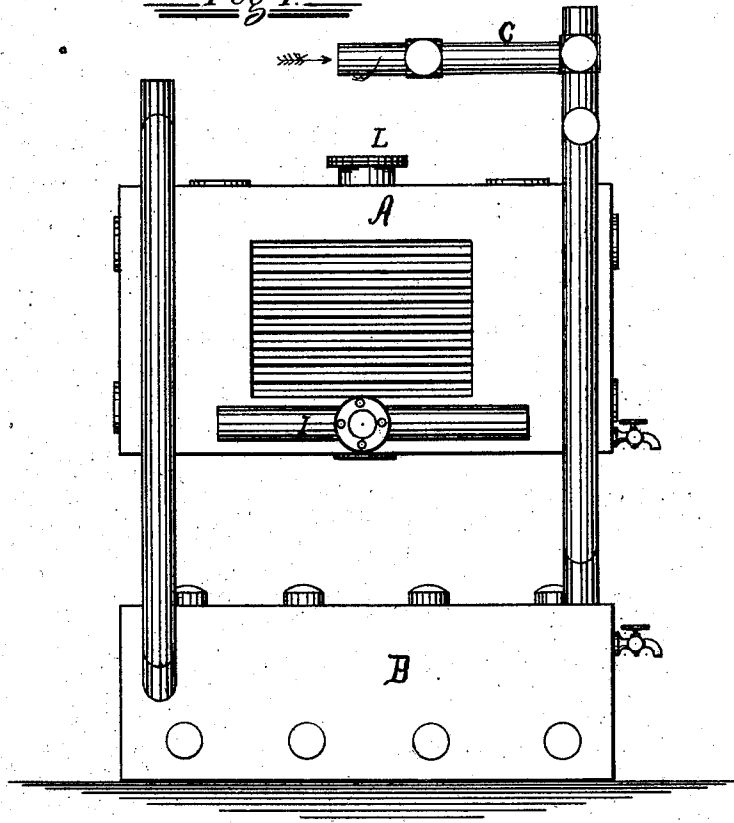
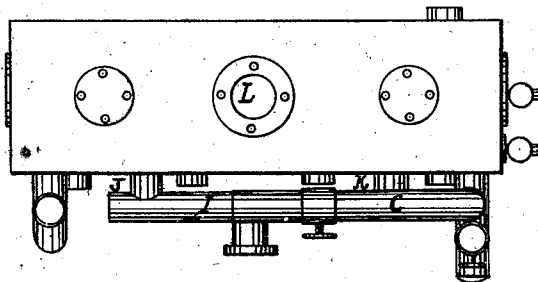


Fig 2.



Witnesses.

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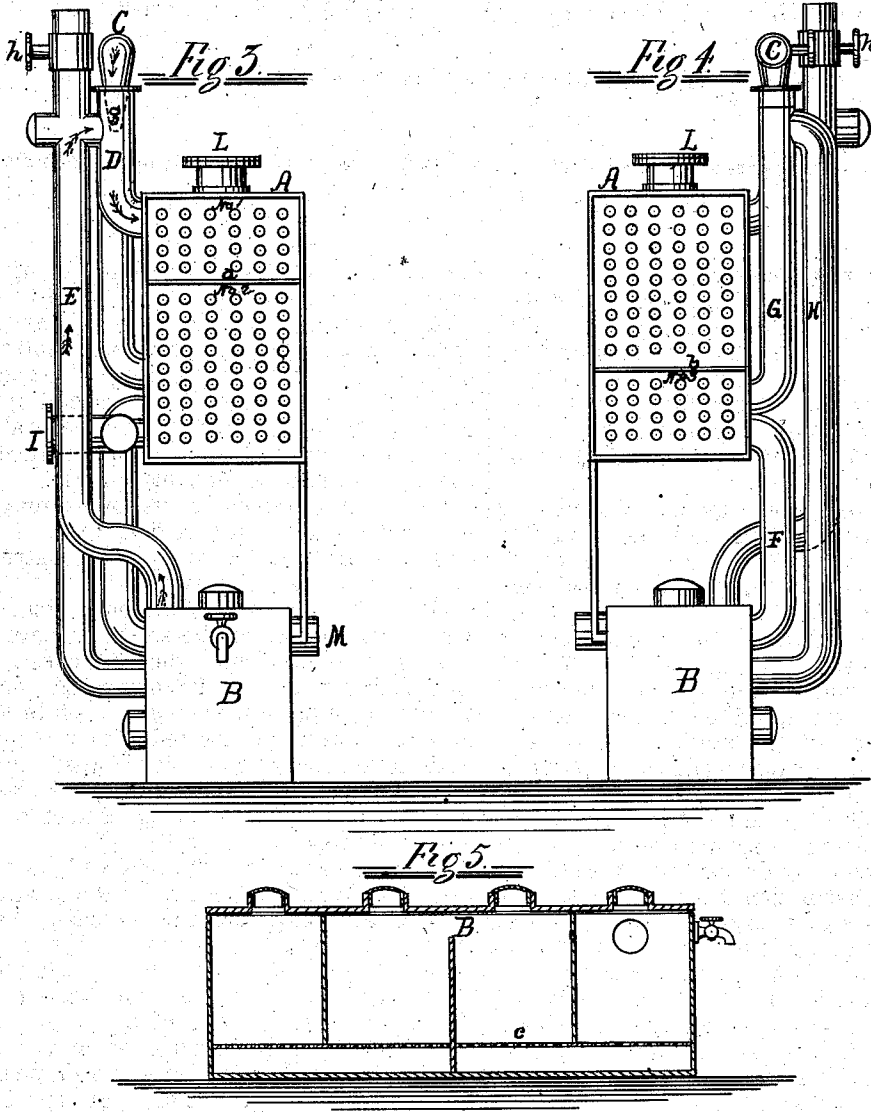
Wm A Lighthall

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UNITED STATES PATENT OFFICE.

WILLIAM A. LIGTHALL, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN COMBINED STEAM-CONDENSERS, AERATORS, AND FILTERS.

Specification forming part of Letters Patent No. **155,737**, dated October 6, 1874; application filed July 7, 1874.

To all whom it may concern:

Be it known that I, WILLIAM A. LIGHT-HALL, of the city of Brooklyn, Kings county, in the State of New York, have invented an Improvement in a Combined Steam-Condenser, Aerator, and Filter, for the manufacture of distilled water, reference being had to the accompanying drawings, forming part of this specification.

Figure 1 is a side elevation of my combined steam-condenser, aerator, and filter. Fig. 2 is a plan or top view, and Figs. 3 and 4 end views of the same. Fig. 5 is a central vertical section of the filter.

My invention relates to the combination of a steam-condenser, aerator, and filter, for the production of distilled water; and consists of the apparatus hereinafter described, wherein the introduction of the steam into the condenser is made to cause a partial vacuum in the filter, thereby facilitating the passage through the filter of the water, and at the same time reducing its temperature.

A is the steam-condenser, not essentially differing in construction from condensers in use. It consists of a large number of tubes, into which the steam is introduced to be condensed, inclosed in a water-tight case or tank, through which cold water is caused to circulate, in contact with the said pipes. These pipes all open into steam-tight chambers at the ends of the case, and these chambers are divided into compartments by the division-plates *a* and *b*, whereby the tubes are divided into three series, the steam passing through the upper series, No. 1, into the steam-chamber at the opposite end of the case, then back through the series No. 2, that lie between the plates *a* and *b*, and then back again and out of the condenser through the series No. 3, lying below plate *b*, thus protracting the condensing and cooling action taking place in the tubes. B is a filter, formed of a water-tight case or tank, divided, preferably, into several compartments, so arranged that water passing from one end to the other of the case shall circulate alternately downward through one compartment, and upward through another. To this end the case is supplied with a false perforated bottom, *c*, and the partitions *d* and *f* rest with the lower edges against the per-

forated bottom, the upper edges being fastened to the top or cover of the case B with water-tight screws. The middle partition *e*, extending through the perforated bottom, is fastened with a water-tight seam to the bottom of the case, but does not extend upward quite to the top of the case. The several compartments are filled with animal charcoal or some other suitable filtering-material.

I would recommend the use of a filter of the peculiar construction here described. A filter of any other suitable form and construction may be employed, however.

C is the steam-conductor from a steam-generator, through which the steam for condensation is introduced into the condenser. The end of this conductor is contracted, forming a small opening or nozzle, *g*, as seen in Fig. 3, and this nozzle is inserted into the pipe D with steam-tight connection. Just opposite the nozzle *g* a branch of the pipe E, leading from one end of the filtering case or tank B, enters the pipe D.

This arrangement of parts will be recognized as an injector, whereby the passage of a current of steam into the condenser through the nozzle *g* will rapidly exhaust and carry with it the air from the pipe E, thereby exhausting the air from the compartment in the filter, from which the said pipe leads. The pipe E is represented as open at the upper ends. It has, however, a valve, *h*, near the top, whereby it may be closed, or more or less air may be admitted, thereby regulating at pleasure, the draft of the air from the filter.

F is a water-conductor, for discharging the water of condensation from the condenser into the filter. G is an air-pipe, opening out of the lower compartment, No. 3, of the steam-chamber, whereby the air that has been introduced with the steam, and which has passed through the condenser, may be permitted to escape, or, at pleasure, be drawn down into the filter through the branch pipe H, which, connecting with the said pipe G, near the top, leads to and opens into the end of the filter at which the water is introduced. I is the induction-pipe, through which the cold water is introduced into the condenser, preferably by two or more branches, J K, for the better distribution of the water over the

pipes in the condenser. L is the eduction-pipe, through which the water is discharged from the condenser.

As will be observed, the water is introduced at the bottom of the condenser, and discharged at the top, while the steam to be condensed is introduced into the condensing-pipes at the top of the condenser, passes back and forth downward through the several series of tubes, and the water of condensation is in the lower series of pipes, and just before its discharge subjected to the cooling action of the water when it is entering the condenser, or when it is coolest. The water in this filter, after passing through the filtering medium in the several compartments, is discharged for use through the pipe M, the water being thereby kept drawn down in the filter so as to leave a clear air-space above it, from which the air may be drawn out through the pipe E, thereby forming the partial vacuum in the filter hereinbefore referred to.

Suitable valves and stop-cocks are provided at the points where they may be required, and openings or hand-holes, with proper air-tight or water-tight covers, are made in various parts of the apparatus for convenience in clearing and inspecting the interior of its several parts. The drawings show several of these openings, not lettered as not being important.

The operation of this apparatus is as follows: By a suitable force-pump cold water is driven into and made to circulate through the condenser-case A, entering at the bottom by the pipe I, and discharged at the top by the pipe L, the condenser-tube being thereby surrounded by cold water circulating among them, the lower series of pipes being subjected to the action of the coolest water as it enters the condenser. The steam to be condensed is then introduced through the pipe C, nozzle g, and pipe D. The water, resulting from the condensation of the steam, leaves the lower series of condensing-tubes through the steam-chamber at the end of the condenser, and flows into the filter through the pipe F. Meantime

a partial vacuum will be formed in the filter by the action of the steam passing through the nozzle g, drawing air from the pipe E. Such air mingles with the steam in its condensation, and very completely aerates the water formed by such condensation. Under the pressure upon the water caused by the partial vacuum it (the water) is urged through the filter more rapidly than it would be without the vacuum. At the same time the temperature of the water is somewhat reduced in consequence of the increased evaporation which takes place in the filter because of the vacuum. The surplus air, at the end of the condenser at which the distilled water is discharged, is, by the action of the ejector, drawn off through the pipes C and H and returned into the condenser at the opposite end with the steam, thus facilitating the introduction and circulation of air within the condenser for the aeration of the distilled water.

I do not claim here the novel construction of the filter herein described and shown. The same being a distinct invention I intend to make a separate application for an independent patent therefor.

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

1. The combination of a steam-condenser A, a filter, B, and an aerator formed in the pipe D by the nozzle g, the air-pipe E supplying air to the aerator leading from the filter, so that air supplied to aerate the steam entering the condenser is drawn from the filter, thus creating a partial vacuum therein, as and for the purpose specified.

2. The steam-condenser A and the filter B with the pipes G H E D C and injector-nozzle g, combined and operating as and for the purpose described.

Witness my hand this 3d day of July, 1874.

WM. A. LIDTHALL.

Witnesses:

B. S. CLARK,

JOS. S. MACKENZIE.

15 to Mackenzie