(No Model.)

W. L. HORNE.

DISTILLING APPARATUS.

No. 388,278. Patented Aug. 21, 1888.

Fig. 1.

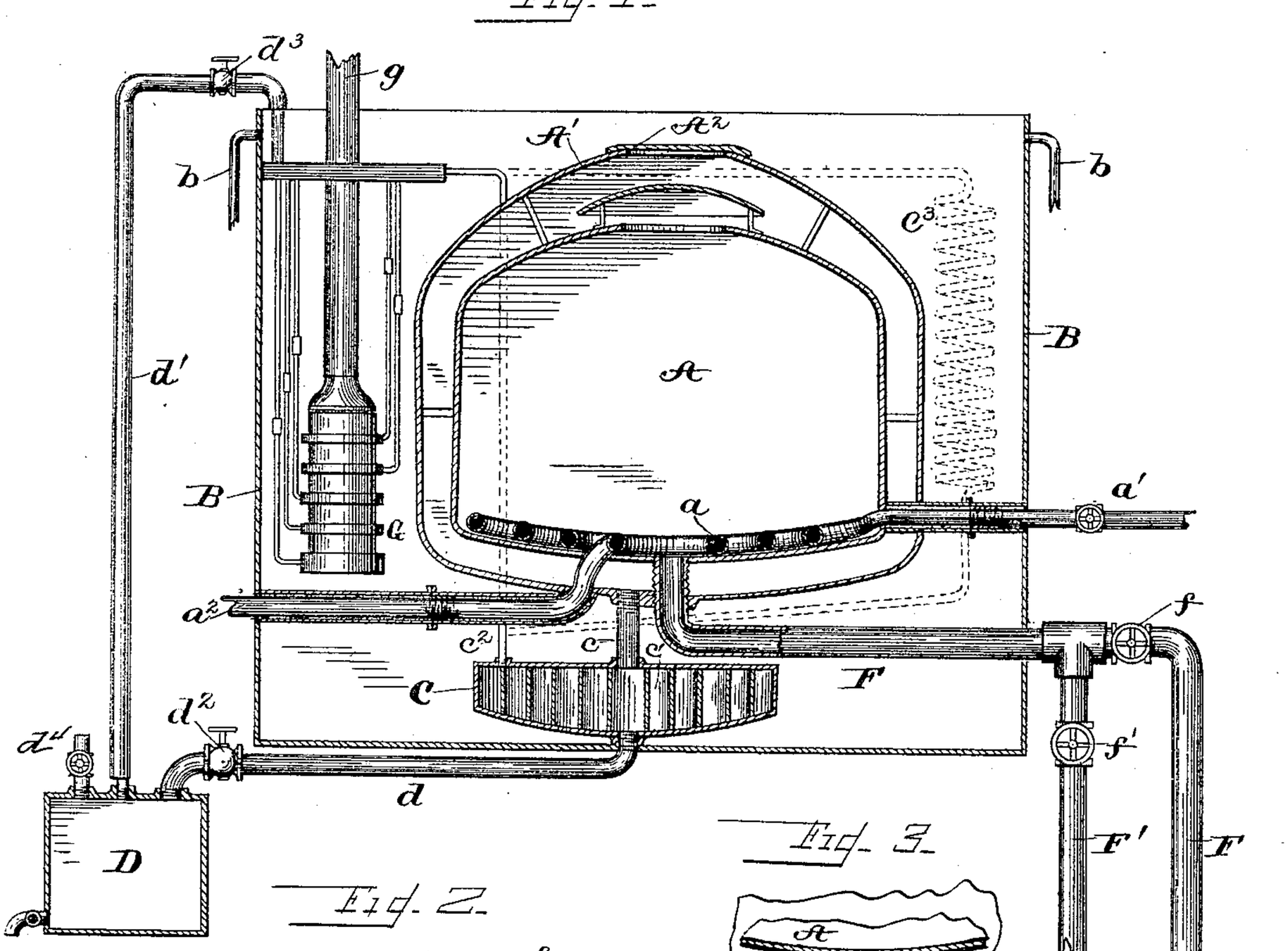


Fig. 2.

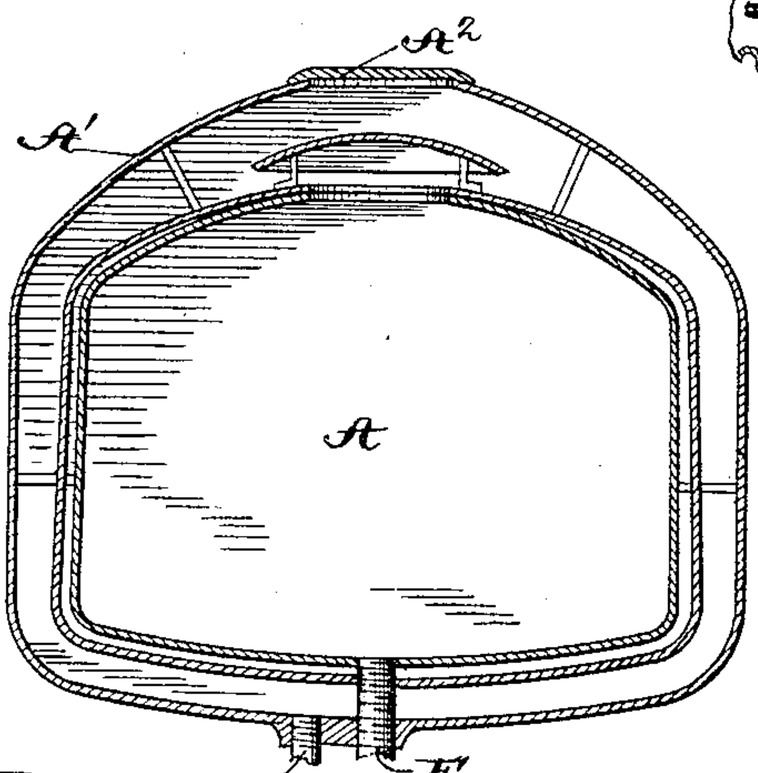
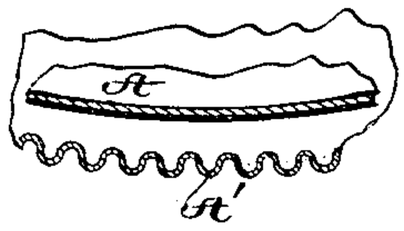


Fig. 3.



Witnesses.

G. A. Frauberschmidt.

L. B. Whitaker.

Inventor.

William L. Horne.

By his attys.

Whitaker & Prindle.

UNITED STATES PATENT OFFICE.

WILLIAM L. HORNE, OF MERIDEN, ASSIGNOR TO THE HORNE VACUUM COMPANY, OF HARTFORD, CONNECTICUT.

DISTILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 388,278, dated August 21, 1888.

Application filed February 20, 1888. Serial No. 264,672. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. HORNE, a citizen of the United States, residing at Meriden, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Distilling Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains make and use the same.

My invention relates to distilling apparatus, and is an improvement in vacuum-stills or stills distilling in a more or less perfect vacuum at low temperatures; and it consists in certain features of combination and construction which are fully disclosed in the following description and claims.

In the drawings, Figure 1 is a vertical section of my improved distilling apparatus. Fig. 2 is a vertical sectional view of a modified construction of still and condenser, and Fig. 3 is a partial horizontal section of another modified construction.

In the drawings, A is the distilling vessel or still, and A′ is the condenser, which is of like form and surrounds the still, a narrow space being left between them. The still opens within the condenser, and the space between the two receptacles is preferably greater at the top and gradually diminishes from this point toward the center beneath the still; but this is not an essential feature of construction. These two receptacles are suspended in a tank, B, by any preferred means, and below them is placed the receptacle or tank C, which is connected by the pipe *c* with the condenser to receive the distillate. The bottom of the tank C is inclined toward the center and the tank has within it the helical partition *c′*, or a partition composed of concentric rings with openings therein, forming a tortuous passage from the center to the circumference. A pipe, *d*, connects this tank with the final distillate-tank D. The still is supplied with the liquor to be distilled from the supply-tank E through pipe F, which connects with the interior of the still at or near the lowest point of the same. To this pipe F is connected a pipe, F′, which extends downward thirty or more feet to a tank, E′. This tank E′ receives the residual liquor left in the still after distillation. The connection of the pipes F F′ with the still is controlled by cocks *f* and *f′*.

G is a hydraulic vacuum-pump, which is in this instance located in the tank B with the condenser. This pump is supplied with liquid, usually water, through the pipe *g*, and the discharge from the pump supplies the requisite cooling medium for the condenser, the tank B being provided with one or more overflow-pipes, *b*. A pipe, c^2, connects the tank C with the pump, and the pump is also connected with the tank D by a pipe, *d′*.

Within the still is a coil of pipe, *a*, for supplying such heat as may be required by passing a heated circulating medium through the same. The inlet-pipe *a′* and the outlet-pipe a^2 are incased in larger pipes and surrounded with a non-conducting packing. This packing may be of any suitable or preferred material. The operation of my apparatus is as follows: On starting, the still, condenser, and their connections are full of air. The pump is set in operation, taking the air therefrom and filling the tank B with liquid. As soon as the air has been exhausted from these devices, the cock *f* in the air-pipe F is opened (the cock *f′* being closed) and the still supplied with the required amount of liquor to be operated upon. The cock *f* is then closed and the vaporization will begin. The vapor rising through opening in the top of the still and coming in contact with the walls of the condenser is more or less condensed, the condensed liquor flowing down into the bottom of the condenser and into the tank C. The pipe *c* communicating with the tank C near the inner end of the helical partition and the pipe c^2 communicating with said tank outside of the outer portion of said partition, or in like relation to the equivalent construction, any vapor remaining uncondensed will, after reaching the tank C, be drawn by the action of the pump G through the helical passage in the tank C and further condensed. If it is found that any vapors pass through the tank C uncondensed, the pipe c^2 may be provided with a coil, c^3, to secure the complete condensation of the same.

In practice it will be preferred to construct

a still with two pumps of different capacities, the larger one to effect the exhaustion of the air from the apparatus and the smaller, which will be of greatly-reduced capacity, to effect a slow draft on the vapors through the condenser and its connections. As soon as the evaporation of the liquid within the still has continued long enough to lower the temperature of said liquid and still, it is raised to a normal temperature by passing a heated medium through the coil *a* in a well-known manner.

The connections with the final distillate-tank with the pump G being open at the start, a vacuum will also be formed therein, and the distillate as it accumulates in the tank C will flow into the tank D, from which it is taken at any time by closing the cocks d^2 d^3 and opening the cock d^4 in the short pipe in the top of the tank.

The condenser is preferably provided with a man-hole, A^2, and a curved plate is placed beneath the same over the opening in the still to prevent any condensation within the man-hole from returning to the still.

In Fig. 2 I have shown the still having its outer wall composed of two thicknesses of metal with an air-space between. This construction is slightly more effective than the other; but good results are accomplished where but a single thickness is employed.

In order to give the condenser a greater amount of surface, the walls of the same may be corrugated either horizontally or vertically, as shown in Fig. 3.

The liquor introduced into the still contains more or less air and gas, and in the early part of the distillation such air and gas are withdrawn, causing an ebullition of the liquor. The agitation of the liquor caused thereby favors the vaporization of the lighter parts of the same and causes the distillation to proceed rapidly. After the air and gas have been removed from the liquor the ebullition subsides and the distillation proceeds more slowly. In order to secure the agitation of the liquor after the exhaustion of the occluded gas and air in the liquor in the still, I turn the cock *f*, so that a very small amount of fresh liquor is permitted to flow into the still. The occluded air and gas of the fresh liquor in the still thoroughly agitates the latter and accelerates the process of distillation. Instead of using the pipe F for this purpose a separate pipe and supply-tank may be employed.

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

1. The herein-described still and condenser, consisting of two receptacles, one within the other, the still being within the condenser and the two located within a third receptacle containing a cooling medium for the condenser.

2. The combination, with a condenser, and a liquid-cooling tank surrounding the same, of a liquid vacuum-pump connected with said condenser and discharging into the cooling-tank of the condenser, substantially as described.

3. The herein-described still and condenser, consisting of two receptacles, the former being located within the latter, the discharge from the condenser being at the lowest point of the same, the still opening into the condenser at the top, and the space between the two gradually decreasing toward the condenser-discharge, substantially as described.

4. The herein-described still and condenser, consisting of two receptacles, said still being located within the condenser and having its walls composed of two thicknesses of material with an air-space between them, substantially as described.

5. The combination, with a vacuum-still, condenser, and tank containing a cooling medium in which the condenser is located, of an air-pump and a tortuous passage within said tank between the condenser and air-pump, substantially as described.

6. The combination, with a still and condenser consisting of two receptacles, one within the other, the still being located within the condenser and opening into the same, of a tank containing a cooling-liquid for said condenser, a receptacle, also within said tank, containing a helical partition, the said condenser being connected with the said receptacle near the inner end of said partition, and an air-pump connected with said receptacle near the outer end of said partition, substantially as described.

7. The combination, with a still and condenser, of a receptacle containing a tortuous passage connected with said condenser, a tank in which said receptacle is located, and a liquid air-pump connected with said receptacle and discharging into said tank, substantially as described.

8. The combination, with a still and condenser, of a tank surrounding said condenser, and a liquid air-pump connected with said condenser and discharging into said tank, substantially as described.

9. The combination, with a still and condenser consisting of two receptacles, the still being located within the condenser and discharging into the condenser at the top, and the condenser discharging at the bottom, the space between the two receptacles gradually decreasing toward the condenser-disharge, of a liquid-cooling tank surrounding the condenser and a liquid air-pump connected with the condenser and discharging within the tank, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WM. L. HORNE.

Witnesses:
L. P. WHITAKER,
WM. R. MACK.