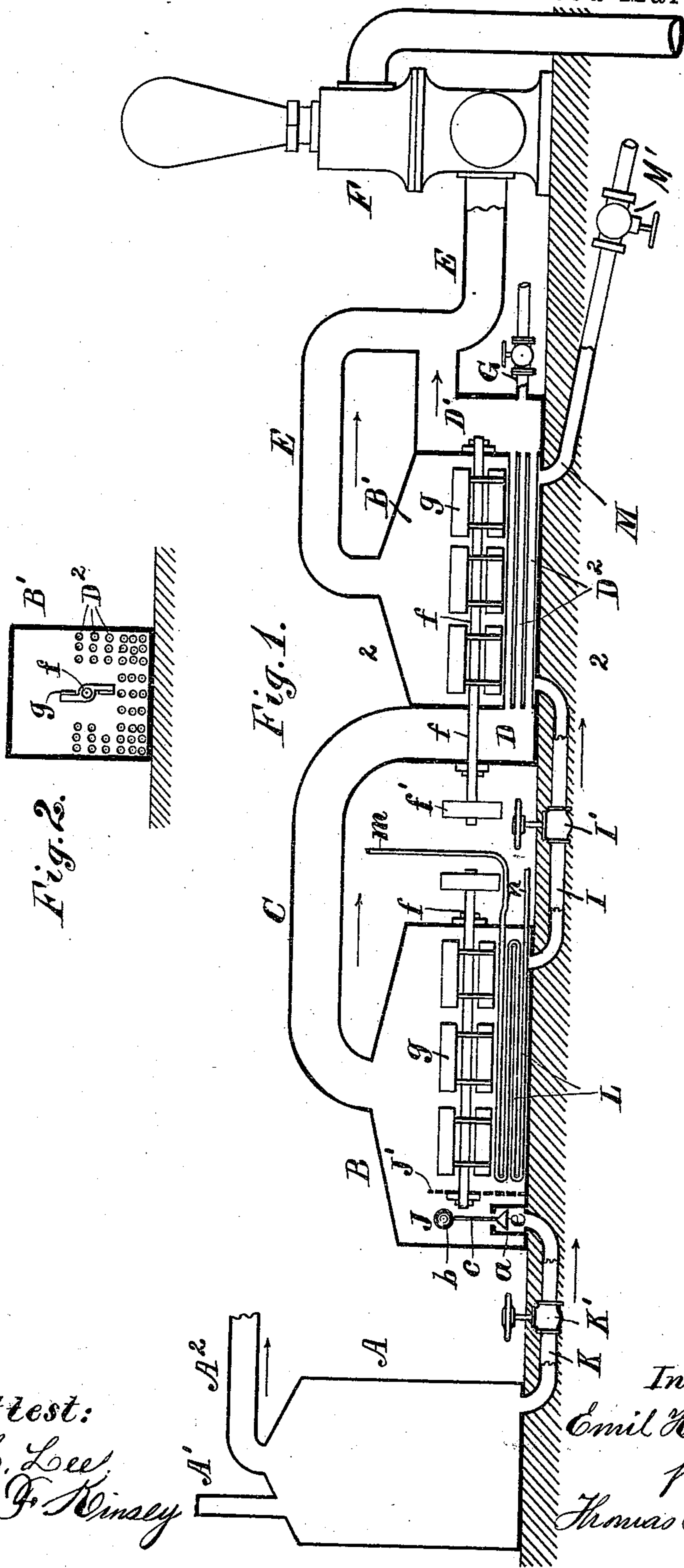


(No Model.)

E. HOLTHAUS.
EVAPORATOR FOR TANK WATERS, &c.

No. 556,147.

Patented Mar. 10, 1896.



Attest:
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UNITED STATES PATENT OFFICE.

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EVAPORATOR FOR TANK-WATERS, &c.

SPECIFICATION forming part of Letters Patent No. 556,147, dated March 10, 1896.

Application filed March 6, 1895. Serial No. 540,695. (No model.)

To all whom it may concern:

Be it known that I, EMIL HOLTHAUS, a citizen of the United States, residing at Canarsie, Kings county, New York, have invented certain new and useful Improvements in Evaporators for Tank-Water and the Like, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to furnish a cheap and effective apparatus for concentrating the tank-liquor from rendering establishments, the sweet water from sugar refineries, and similar liquids.

My construction belongs to that class in which double or triple effects are secured from the live steam by discharging the vapor which is generated in one evaporator through heating-pipes immersed in the liquor of the succeeding evaporator; but the vapor discharged from the heating-pipes is, in my invention, led to the condenser upon its discharge from the succeeding evaporator. I am thus, contrary to the usual practice, enabled to obtain a considerable vacuum in the first evaporator and thus greatly facilitate the rapidity of the evaporation, and am thus enabled to secure such evaporation at a lower temperature. In my construction the liquor is agitated by paddles affixed to a horizontal shaft, and the heating-pipes are extended through the liquor at opposite sides of the shaft as well as below the same, so that the liquor may be driven toward such heating-pipes in whatever direction it is propelled by the paddles. In my construction the evaporators are formed as tanks and arranged upon the same level, and are connected by a pipe below the bottom of the same, so that the liquor may stand at the same level in both, and an automatic supply of liquor to the first evaporator is secured in the usual manner by means of a ball-valve to maintain a uniform level during the evaporative process.

The invention will be understood by reference to the annexed drawings, which exhibit in diagrammatic form an embodiment of my invention.

Figure 1 is an elevation of the apparatus in longitudinal section where unshaded, and Fig. 2 is a cross-section of the evaporator on line 2 2 in Fig. 1.

A is a tank containing the unconcentrated liquid, which would be supplied through pipe A', and the gases, if foul tank-water be used, conducted off through pipe A² and disposed of by cremation or otherwise.

B and B' are the evaporators, the top of the first being connected by vapor-pipe C with heating-tubes D² in the bottom of the evaporator B'. The evaporators are formed of rectangular tanks set upon the same level, and are connected below the bottom by a pipe I, by which means the liquor is sustained in both tanks at the same level, and a pipe M is provided to draw the concentrated liquor at pleasure from the evaporator B'. The liquor pipes are provided, respectively, with cocks K', I', and M'. A chamber J is formed in one end of the evaporator B by a perforated partition J', and the pipe K connects such chamber with the tank A by means of a ball-valve *e*. The valve is arranged to close upon a seat in the top of a valve-chamber *a*, and the float or ball *b* is attached to the valve by rod *c* to close the same when the liquor attains the desired level. As a partial vacuum is maintained in the evaporator B, the combined weight of the ball and valve is made sufficient to open the valve when the liquor falls below the desired level, thus automatically feeding an additional supply from the reservoir-tank A.

A heating-coil L is arranged within the liquor in the evaporator B and provided with boiler connection *m* and drain-pipe *n*. Vapor-chambers D and D' are formed at opposite ends of the evaporator B', and the heating-tubes D² are extended (between the chambers) through the liquor therein. A horizontal shaft *f* is mounted to rotate in each of the evaporators and provided with paddles *g* to agitate the liquor and bring fresh portions constantly in contact with the heating coil and tubes.

The shaft *f* in the evaporator B is supported upon the perforated partition J' and upon the opposite end of the tank, projecting outside of the same to receive the driving power. In the evaporator B' the shaft extends across the body of the evaporator and across the chamber D, extending outside of the same to receive the driving power.

Fig. 2 shows the heating-tubes D² arranged

at both sides of the horizontal shaft F, as well as below the same, and certain of the tubes extending nearly to the top of the paddles, where the level of the liquor would be maintained. By such disposition of the tubes the liquor is thrown against the tubes in which-
 5 ever direction it is impelled by the paddles, thus bringing the liquor more rapidly into contact with the tubes and promoting the
 10 evaporation thereby.

The top of the second evaporator is connected by pipe E with a vacuum-pump F, and the outlet-chamber D' at the terminal of the heating-tubes D² is also connected with the
 15 pipe E. A pipe G with suitable cock is provided to draw from the chamber D' the water condensed in the tubes D².

The operation of the apparatus is as follows: The cock M' is closed and the cocks K' and I' are opened and the liquor is permitted to enter through the ball-valve until the evaporators are filled to the proper level, when the valve closes. The shafts *f* are rotated by suitable means, as by the pulleys *f'*, and the liquor
 20 is thus agitated by the paddles *g*. The perforated partition J' protects the ball-float *b* from the currents which are produced by the agitator, while the perforated partition J' permits the liquor to flow freely from the chamber J as it is supplied by the valve. Live
 25 steam is circulated through the coil L, and the vapor generated in the evaporator B passes from the pipe C and tubes D² to the vacuum-pipe E. The vapor generated in the evaporator B' is drawn off through the same pipe,
 30 and a partial vacuum is thus maintained in both the evaporators. The water of condensation is drawn from the chamber D' through the pipe G by a suitable pump. As the concentration proceeds in both the evaporators,
 35 the level is maintained by the automatic opening of the valve *e*, and a test is made from time to time until the desired strength of the liquor is attained, when the supply-cock K' is closed and the cock M' is opened and the
 40 liquor drained from both the evaporators, passing from the first into the second through the pipe I. The cock M' is then closed and the cock K' opened and the evaporators re-filled until the ball-valve closes automatically.
 45 The agitation of the liquor greatly facilitates the evaporative process, while the introduction of fresh liquor through the valve *e*, to maintain a uniform depth of the same,
 50 preserves the dilution of the liquor in the highest possible degree as the evaporation progresses, and thus facilitates the boiling of

the liquor and the disengagement of the steam.

It will be understood that stuffing-boxes 60 would be required around the shafts *f* where they extend from the evaporator into the open air to receive the rotary power; but such and other details of construction are omitted from the drawings, as they are well understood in 65 the art and form no part of the present invention.

I do not claim the ordinary double or triple effect produced by conducting the vapor which is generated in one evaporator through 70 the heating-tubes in the succeeding evaporator, but have so constructed my series of evaporators that a connection exists between the heating-tubes D² and the suction-pipe of the condenser or vacuum-pump. 75

I am aware that ball-valves are old, as well as agitators, in various forms of apparatus, and do not therefore claim the same except in the arrangements herein set forth.

Having thus set forth the nature of the invention, what I claim herein is— 80

1. The evaporator-tank having vapor-chambers D and D' at opposite ends, the rotary shaft *f* extended through the evaporator and provided with paddles *g*, the heating- 85 tubes D² connecting the chambers D and D' through the evaporator, and arranged below and at both sides of the shaft F, and suitable connections from the evaporating-chamber and the chamber D' to the vacuum-pipe, the 90 whole arranged and operated substantially as set forth.

2. The rectangular evaporator-tank B having perforated partition J' forming chamber J near one end, the rotary shaft *f* supported 95 upon such perforated partition and upon the opposite end of the tank, and provided with paddles *g*, heating-pipes L supplied with live steam, the vapor-pipe C extended from the upper part of the evaporator, a supply-tank 100 connecting with the chamber J by an inlet-pipe K, and a ball-valve applied to the inlet-pipe within the chamber J and protected from the movements of the liquor beyond the perforated partition, as and for the purpose set 105 forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

EMIL HOLTHAUS.

Witnesses:

THOMAS S. CRANE,
 L. LEE.