

A. BREAR.
Evaporating-Pan.

No. 216,649.

Patented June 17, 1879.

Fig. 1.

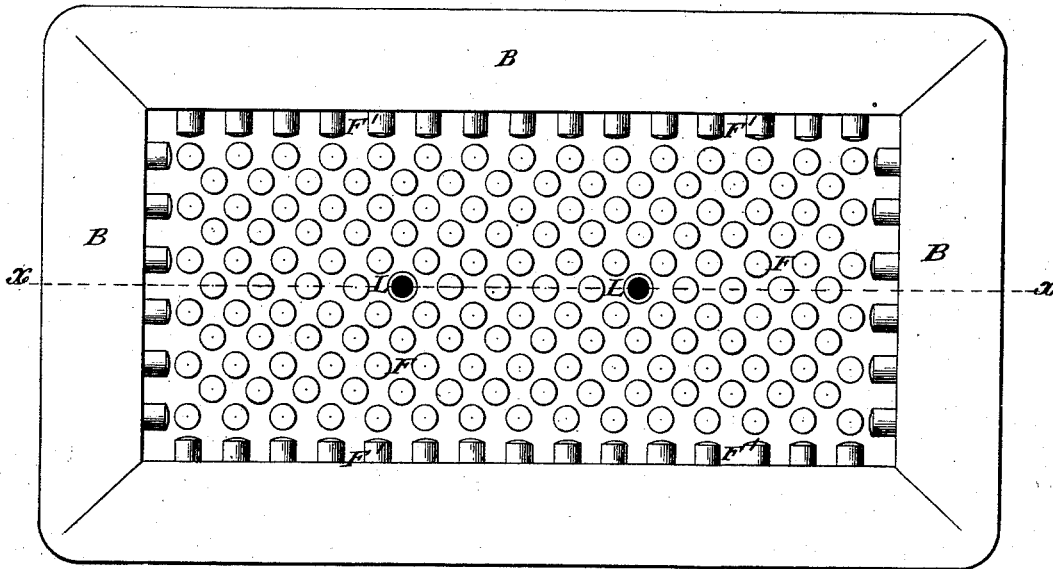
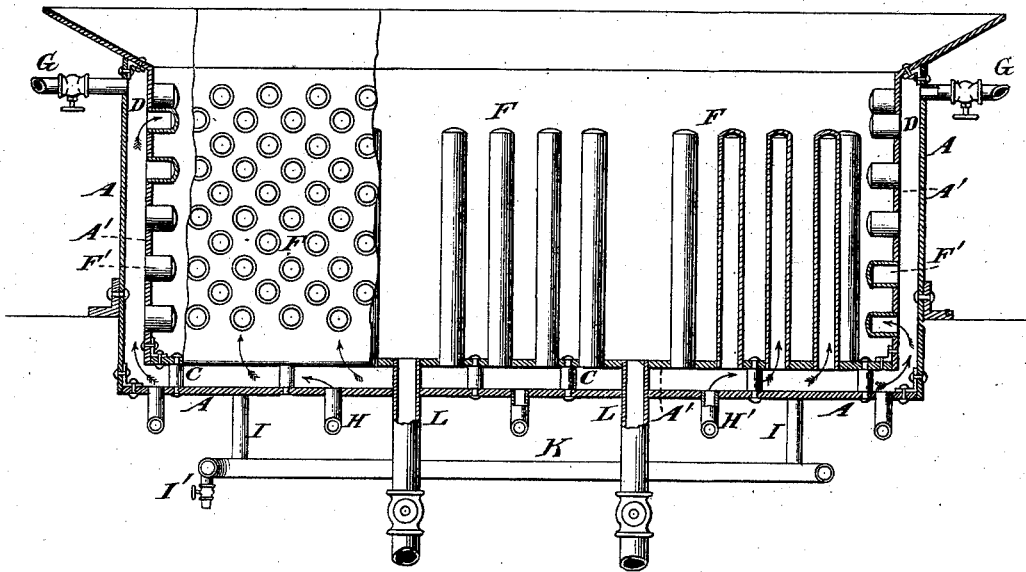


Fig. 2.



Witnesses.

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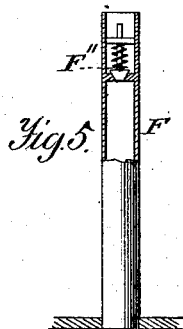
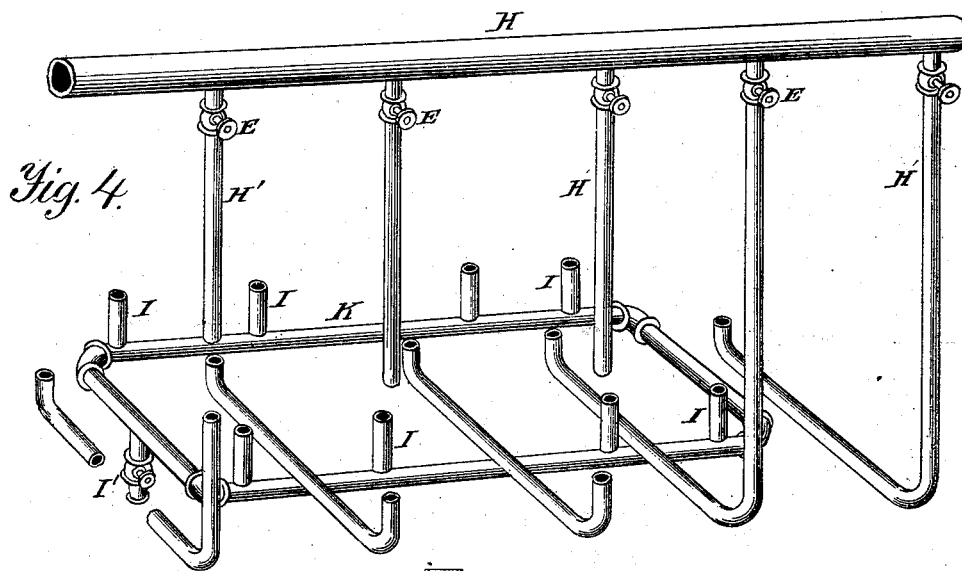
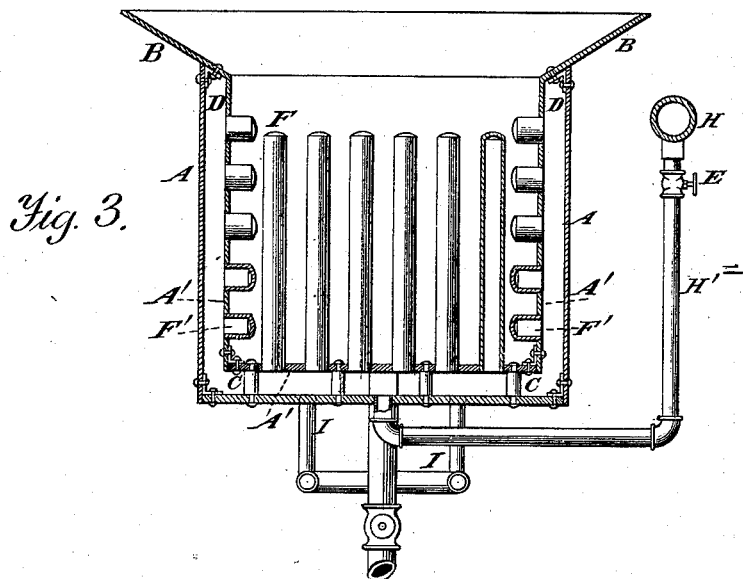
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UNITED STATES PATENT OFFICE.

ABEL BREAR, OF SAUGATUCK, CONNECTICUT.

IMPROVEMENT IN EVAPORATING-PANS.

Specification forming part of Letters Patent No. **216,649**, dated June 17, 1879; application filed October 23, 1878.

To all whom it may concern:

Be it known that I, ABEL BREAR, of Saugatuck, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Evaporating-Pans; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification—

Figure 1 being a plan view, showing the horizontal and vertical heating-tubes, the egress-pipes for the saccharine matter, and the beveled flange upon the outer surface of the pan. Fig. 2 is a sectional elevation on line *x x* of Fig. 1, showing the steam-space between the two portions of the pan, the beveled projecting flange upon its upper edge, a portion of the vertical and horizontal heating-tubes, egress-pipes for the drawing off of the material that has been treated, with the regulating-valves, pipes for the induction of steam to the space between the two portions of the pan, and also pipes for conducting away the water of condensation, and others for the escape of air or steam from the pan. Fig. 3 is a transverse vertical section, showing the parts above enumerated and their connection with a main steam-pipe for conducting steam to the various induction-pipes. Fig. 4 is a perspective view, showing the main steam-pipe and a portion of the induction-pipes, and of the pipes for taking off the water of condensation; and Fig. 5 is a detached sectional elevation of one of the vertical heating-tubes, showing how they may be supplied with escape or safety valves.

Corresponding letters denote like parts in all of the figures.

This invention relates to evaporating-pans for the evaporation of cane-juice and other saccharine substances, and for salt-water and other liquids; and it consists, first, in the combination of the outer and inner portions of the pan with a series of horizontal and vertical tubes; and, secondly, in an evaporating-pan having upon its interior surface a series of vertical and of horizontal tubes, closed at

their outer ends, as will be more fully explained hereinafter.

In the manufacture of sugar from the sugarcane or other sugar-producing plants, it is important that the juice should be converted into sugar in the least possible period of time after it has been expressed from the stalks, as the acidulation thereof commences in a short time thereafter, and goes forward with such rapidity as to decrease to a large extent the yield of sugar to a given quantity of juice when the same is allowed to remain exposed to the atmosphere for any great length of time previous to its being evaporated, in which case the products of the evaporating-pan would, to a greater or less extent, be molasses, which should have been converted into sugar, and would have been but for the acidulation of the juice.

The object of my present invention is the production of an evaporating-pan which shall present to the juice or matter to be evaporated the greatest possible amount of heating-surface in a given area. In doing this it is important that they be so constructed and arranged that when placed in the building where they are to be used the juice from the mill may be directed into them, and thus the pan or pans be made to evaporate as fast as it is expressed; and in order that this may be accomplished and a sufficient amount of room left in the building for the other operations of a sugar-manufactory, it is important that the work of evaporation be done in as small a space as possible.

In constructing my improved evaporating-pan there is provided a section, *A*, of any desired form, either rectangular, oblong, or circular, and of any size, according to the work it has to perform, it being made by preference of sheet metal and riveted or bolted together at its joints, so as to form a steam and water tight vessel when united with a section, *A'*, which is also made of wrought-iron, steel, or other suitable metal, and of such dimensions as to allow it to pass down into section *A*, and leave a space of two inches (more or less) between the exterior thereof and the interior surface of the section or portion *A*, as shown in Figs. 2 and 3 of the drawings. To the up-

per edge of the interior section, A', there is riveted a sheet of metal, or it may be several sheets, which form an outwardly and upwardly projecting or a beveled flange, B, which extends entirely around the pan and serves the double purpose of preventing the overflow of the material while being boiled and of a resting or lodging place for the dirt or other foreign substance which rises to the top of the material during the operation.

Between the upper edges of the two sections of the pan there is placed an angle or other iron band, to which both are riveted, and to which the beveled flange is also secured, or any other practicable method of uniting the parts may be adopted.

In order that this pan may be enabled to endure a pressure of steam varying, according to circumstances, from twenty pounds above the atmosphere to one hundred or more pounds, stay-bolts C C are used, which pass through thimbles or ferrules placed between the sheets composing the sections of the pan. These bolts and ferrules should be placed in rows or squares and from three to four inches apart, according to the thickness of the sheets and the pressure of steam it is designed to use.

It will be seen that with the sections or portions of the pan constructed and united as described there will be formed upon the bottom and sides thereof a steam-space, D, and that as a consequence the matter to be evaporated, which is within the inner portion, A', will be surrounded upon all of its sides except the top with steam at or nearly at the temperature at which it is taken from the generator, or it may be regulated as to pressure, and consequently as to temperature, by cocks or valves placed in the induction-pipes, as at E E.

In order that additional heating-surface may be attained, and that the aggregate may be as great as can be obtained in a given space, the bottom and side sheets of the inner portion of the pan are perforated with holes, which are to be as near each other as is found practicable, leaving a sufficient amount of metal between each to form the requisite support for tubes F, one of which is inserted into each of the holes in the lower sheet, while shorter ones, F', are inserted into each of the holes formed in the side and end sheets, as shown in Figs. 2 and 3. These tubes may be closed at their outer ends, while their inner ones are open and communicate with the steam-space between the two sections or portions of the pan, from which the steam passes into the tubes.

I prefer, however, to make the vertical tubes F as shown in Fig. 5 of the drawings, where it is represented as having an outwardly-opening valve, F'', placed in its outer end, said valve being controlled by a spring, the tension of which may be regulated by its length or in any other manner, so that when steam is admitted thereto it may be caused to carry out through said valves any air which may be contained in the tubes, and thus allow the steam to pass to the upper ends of the tubes, and so

increase the heating-surface. These valves, when arranged as herein described, also act as safety-valves for the steam-generator, as, while the valve in the steam-induction pipe is kept open the pressure therein and in the generator cannot be increased beyond what the valves in the tubes are set to carry; neither can a pressure be put upon the pan so great as to endanger its integrity.

It will be seen that in operating a pan with tubes and valves such as above described it will be possible to set said valves to resist a pressure slightly above what would be required for evaporating purposes, and to admit to the tubes in starting the operation, or at any time thereafter, by manipulating the throttle or induction valves, a pressure that would cause the valves to rise and allow the air to pass out, when, by partially closing said throttle or induction valves, the pressure in the tubes will be so far reduced as to allow the valves to close and maintain the requisite pressure in the tubes and other portions of the steam-space for evaporating the material.

Owing to the fact that the substance to be evaporated is so nearly surrounded by steam, and that it is provided with heating-tubes which penetrate to all parts thereof, the temperature of the whole mass of material is maintained at an even degree, and that the greatest that can be produced by any given pressure of steam. As the effectiveness of this pan depends largely upon the operation of the tubes F and F', I propose to make them of copper, and as thin as it is possible to have them, and leave them sufficiently strong to endure the pressure to which they are to be subjected.

For further facilitating the operation of the pan there is placed at each of its ends or sides, or at any convenient point, air-eduction pipes G, which are controlled by valves or cocks, which, when the pan is first put in operation, or at any subsequent time, may be opened, and the air that is in the chamber or space D allowed to pass out, and thus the steam be allowed to at once rise to the top of the pan. These pipes and valves may also be used to cause a circulation of steam through the space D, should it be found necessary at any time to increase the temperature upon the outer surface of the material under treatment.

As a means of introducing steam into the chamber or space D there is provided a main steam-pipe, H, one end of which is connected with the steam-generator or to a pipe leading therefrom. From this main pipe extend a series of branch pipes, H', which are united to the pan at or near its center, as shown in Fig. 3, they being controlled by cocks or valves E, in order that the amount of steam admitted at any one point, and consequently the temperature at such point, may be regulated. It is important that ample means be provided in a pan intended for as rapid action as this one for taking away the water resulting from condensation of the steam; and in order that this may be accomplished, one or more rows of

pipes, I I, are provided, which are made to communicate at their upper ends with the space D, between the two sections of the pan, while their lower ends are all united by a pipe, K, which leads the water discharged from the pan through all of the pipes I to a valve, I', where it may be discharged into any suitable reservoir, from which it may be taken by a pump and returned to the steam-generator while in its heated condition.

The material to be operated upon is introduced, through suitable pipes, from a reservoir, in which it is collected, so far elevated above the pan as to cause it to flow in of its own gravity.

The operation of this device will be as follows: The parts having been constructed and arranged as described, the material to be treated will be introduced through suitable pipes until it shall cover the bottom of the pan to the depth of, say, two inches or more, when steam will be turned on, and the boiling soon commence. The required amount of material will thereafter be regularly admitted, and the boiling will be continued, the denser portions of the material settling to the bottom of the pan, while the lighter portions will rise to the top and be carried off in vapor. When the pan is filled to the proper height with material of the proper density, the valves in the pipes L L will be opened and the material drawn off, and the operation may be repeated.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a pan for evaporating cane-juice and other substances, the combination of the outer portion, A, the inner portion, A', a series of horizontal tubes, F', and a series of vertical tubes, F, both of which series are closed at their outer ends, but communicate at their open ends with the steam-space between the sections A and A' of the pan, whereby heat is communicated to all parts of the substance which is being treated, as set forth.

2. An evaporating pan having upon its interior surface a series of vertical tubes, F, and a series of horizontal tubes, F', both of the series being closed at their outer ends and open at their inner ones, whereby they are made to receive steam from a space formed outside of the sheet to which they are secured, and thus to convey the heat of such steam to all parts of the substance being treated, as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ABEL BREAR.

Witnesses:

C. M. CONNELL,
H. A. HALL.