

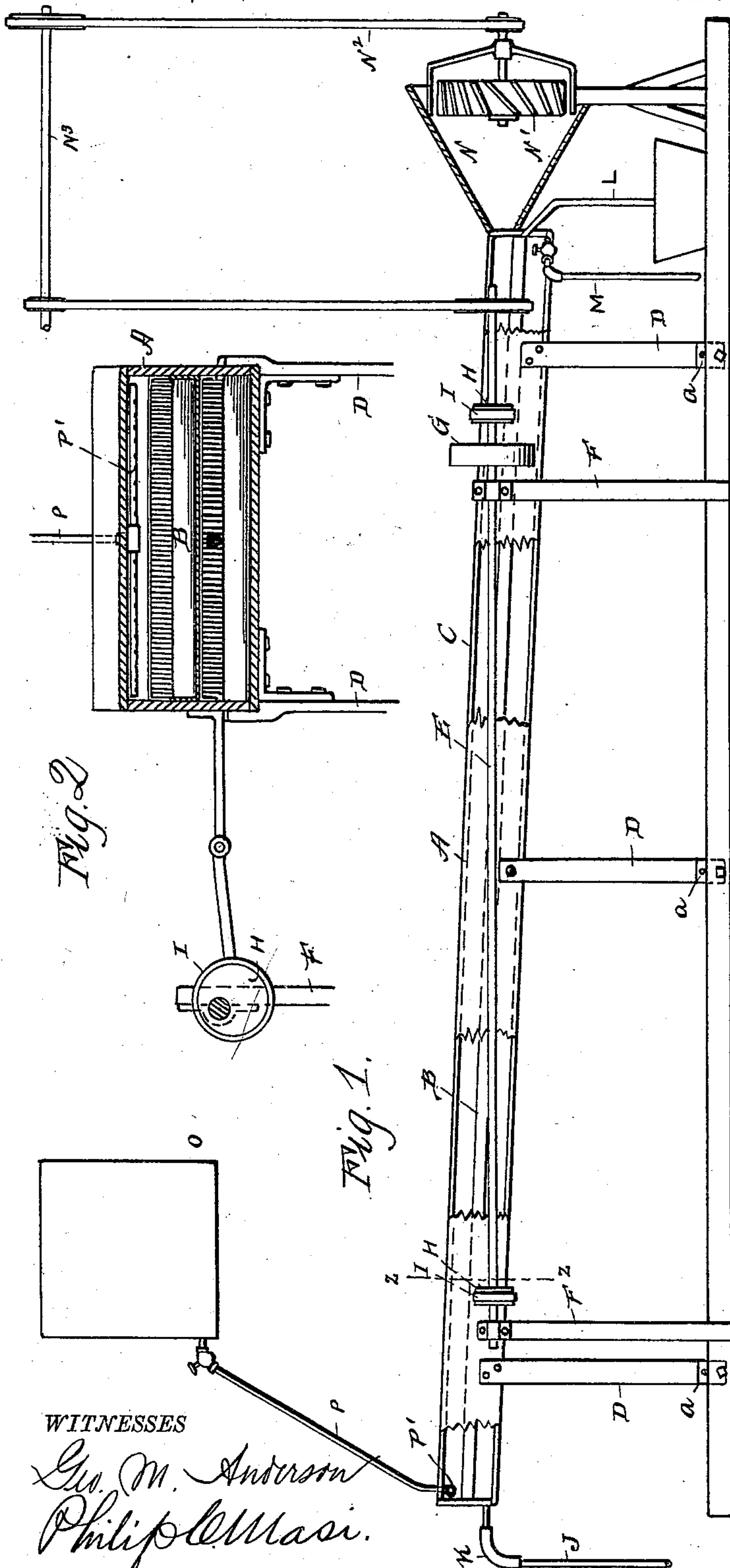
(No Model.)

3 Sheets—Sheet 1.

H. A. MERRIAM.
EVAPORATOR.

No. 551,732.

Patented Dec. 17, 1895.



WITNESSES

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INVENTOR

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(No Model.)

3 Sheets—Sheet 2.

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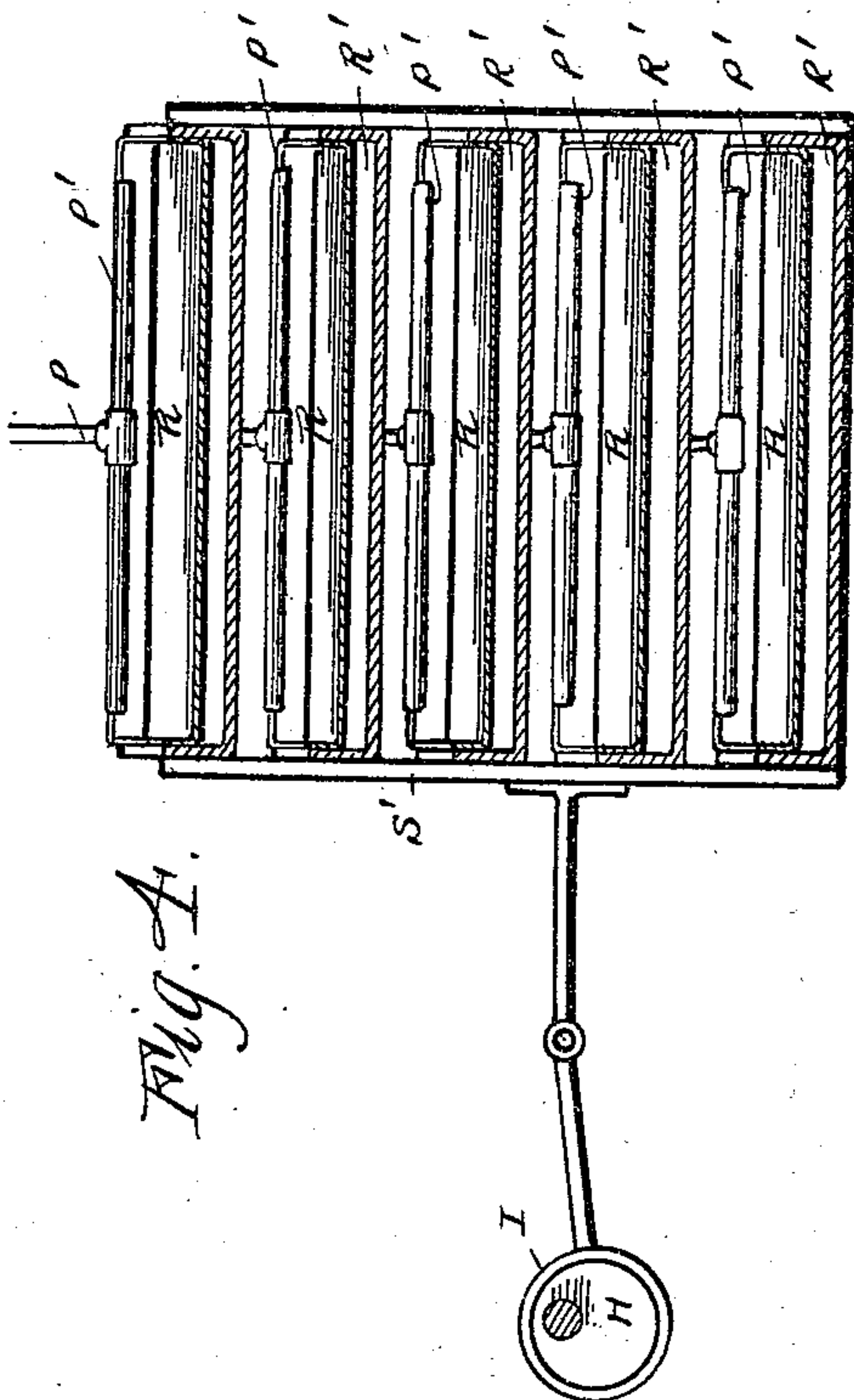


Fig. 4.

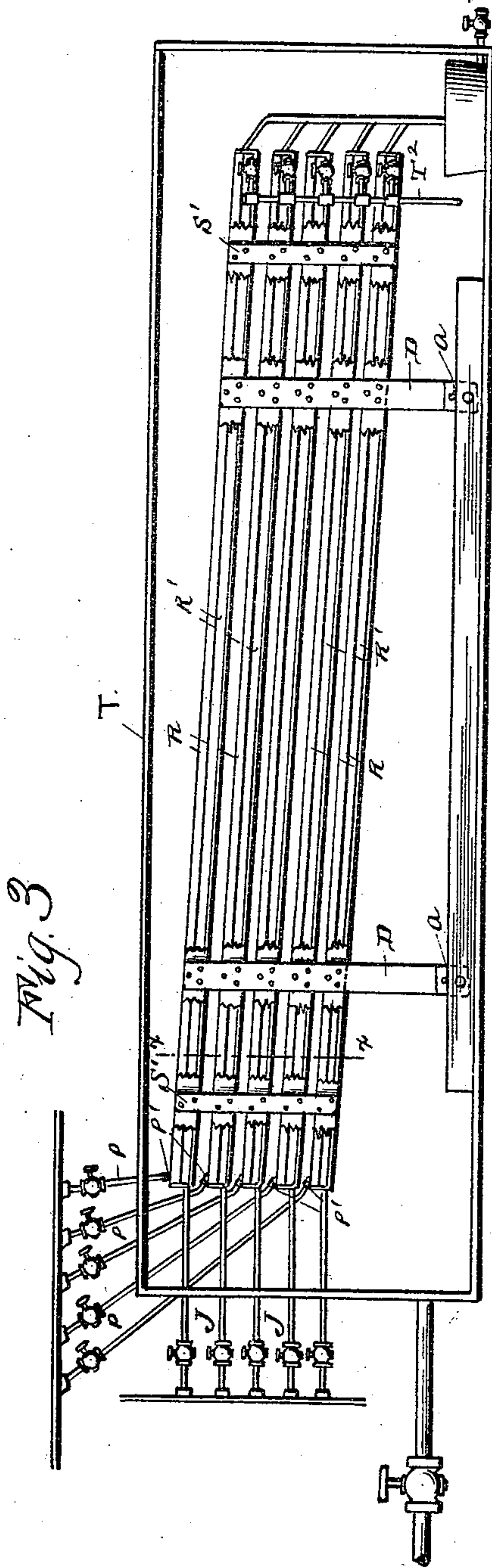


Fig. 3.

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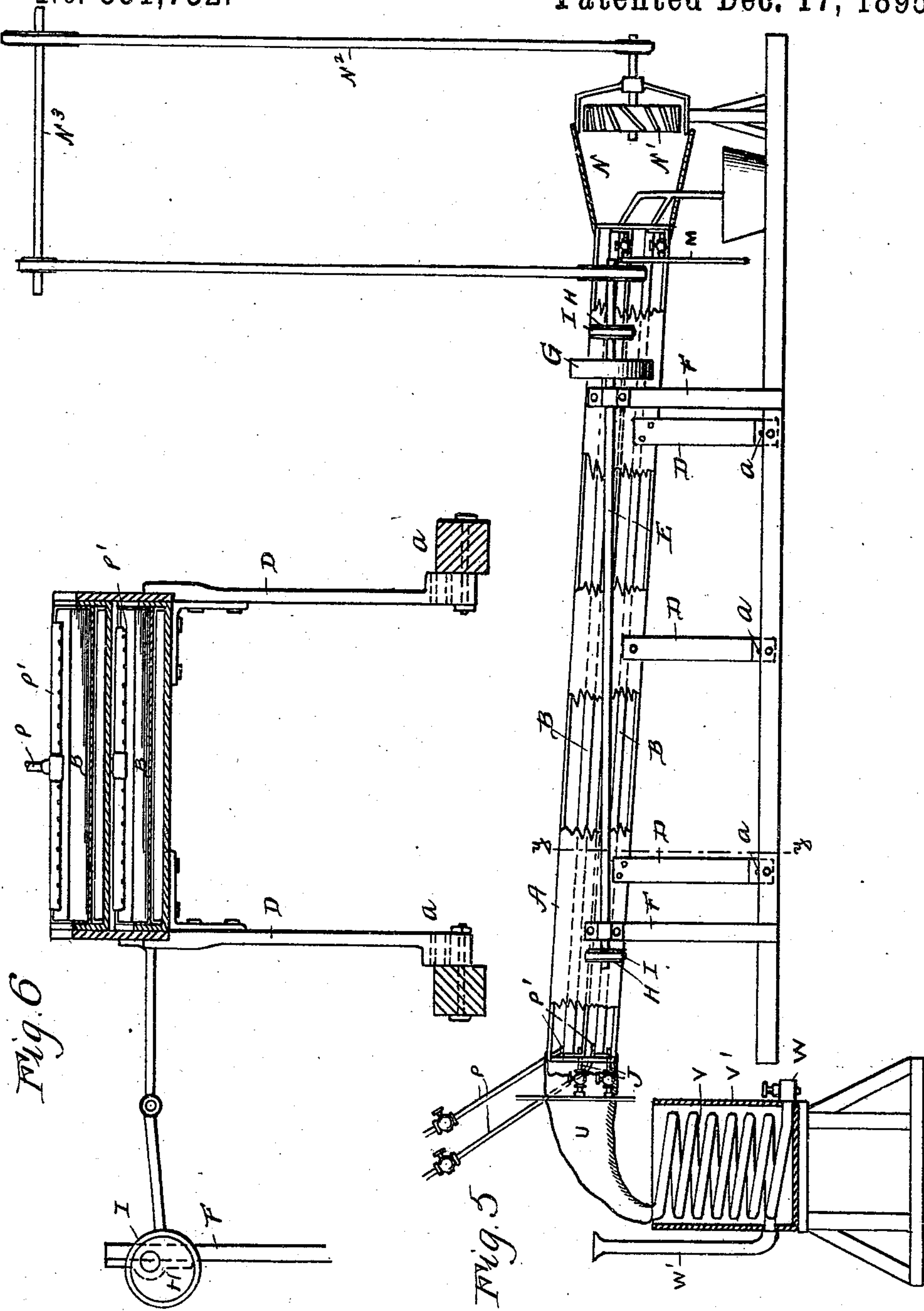
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UNITED STATES PATENT OFFICE.

HORACE ARNOLD MERRIAM, OF LOS GATOS, CALIFORNIA.

EVAPORATOR.

SPECIFICATION forming part of Letters Patent No. 551,732, dated December 17, 1895.

Application filed March 30, 1895. Serial No. 543,868. (No model.)

To all whom it may concern:

Be it known that I, HORACE ARNOLD MERRIAM, a citizen of the United States, and a resident of Los Gatos, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Evaporators; and I do 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 to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 is a side elevation, partly diagrammatic, of the invention, the blower-case being in section and the side walls of the box broken away in parts. Fig. 2 is a sectional view on line Z Z, Fig. 1. Fig. 3 is a side elevation of modification with side of jacket and driving-shaft and eccentrics removed, side walls of boxes being broken away in parts. Fig. 4 is a section on line X X, Fig. 3. Fig. 5 is a side elevation, partly diagrammatic, of second modification, blower-case and cold-water tank in section and side walls of box broken away in parts. Fig. 6 is a section on line Y Y of Fig. 5.

The object of this invention is to provide an evaporator of simple and inexpensive construction which will be more effective in its operation than those ordinarily in use, owing to the fact that the liquid therein to be evaporated is kept in constant motion to continuously expose new surfaces thereof to the evaporative agents, which act thereon both from above and below.

With this object in view the invention consists in the novel construction and combination of parts, all as hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings, the letter A designates a box of either wood or metal, which in a convenient size of the evaporator is twenty feet long, thirty inches wide and twelve inches high. These dimensions are, however, subject to such change as may be desired. Running the length of this box, midway the height thereof, and fastened securely at each side is a pan B, made of copper or brass plate, and stiffened if necessary by suitable angle-irons or stiffening-strips soldered or riveted to its under side. The

portion of the box A below this pan is closed at the bottom and at both ends, and constitutes the steam or hot-air chamber of the evaporator. The upper portion of the box, above the pan, is closed on top with a snug fitting but movable cover C, but is left open at both ends. This portion of the box constitutes the air-chamber of the evaporator.

The box A is inclined in the direction of its length, suitable means being provided, as indicated at *a*, for effecting an adjustment of the inclination.

It is essential to the invention that the box shall be supported in such a manner that it will be capable of a swinging side-to-side motion, and that means be employed for imparting such motion. There are various ways in which this may be accomplished; but I will describe but one way which I have found to be very successful, reserving the right, however, to employ such other means in lieu thereof as may be found more convenient or desirable.

In the drawings I have shown the supports as consisting of a series of flat wooden springs D, which are attached at their upper end portions to the sides of the box and at their lower portions to the floor or to a suitable bed or base, such springs being sufficiently flexible to permit the box the necessary movement. To impart this motion I have shown a shaft E extending longitudinally of and below the box, being rotatably journaled in suitable supports F and having a driving-pulley G. On this shaft are eccentrics H, fitted with straps I, connected to the box.

J designates a pipe which carries steam into the steam-chamber of the evaporator, being connected to the box by means of a flexible hose or other yielding coupling K. M designates a pipe for carrying off the water of condensation.

L is the discharge at the lower end of the pan.

N is a blower case or chamber leading into the lower end of the air-chamber, and N' indicates a fan or blower, the shaft of which may be conveniently driven by a belt N² from a counter-shaft N³ driven from the shaft E, the several pulleys being of the proper diameter respectively to multiply the speed to the necessary extent.

O designates the feed-tank, which is supported above the upper portion of the pan at the most convenient point. P is a feed-pipe which delivers the liquid to the pan and which has a perforated arm P' extending transversely across the upper portion of the pan.

In operation steam is admitted into the lower chamber, and air, hot or cold, to the upper chamber, and the shaft E rotated to impart a more or less rapid shaking side-to-side motion to the box and pan, which motion is however even and regular. The faucet of the feed-pipe is opened and the liquid flows by gravity into the pan, where by reason of the inclination of the latter and the rapid motion imparted it is kept in constant action, flowing toward the lower end and continuously exposing new surfaces to the evaporative agents—heat from the steam-heated pan and dry air forced through the air-box, which sweeps across the surface of the liquid, carrying with it the condensed vapors perfectly and swiftly.

The object of the side-to-side motion is, as partially indicated above, to keep the liquid in motion transversely across the pan, whereby its flow over the pan is not only retarded somewhat, but it is kept in constant agitation to continuously expose new surfaces to the action of the evaporative agents.

Inasmuch as evaporation takes place only at the surface of a liquid, it is obvious that the present invention exposes a maximum surface to be acted upon by the evaporative agents in a given time. Practical tests have proven this evaporator to be a perfect film-evaporator, evaporation and concentration being quickly effected in the open air and without boiling or discoloring.

In Figs. 3 and 4 I have shown the invention as adapted for use as a vacuum-evaporator for large sugar-houses. In this form a set or series of pans R are employed, one above another, and having each a shallow steam or hot-air box R' thereunder. These pans are all moved in unison by an eccentric S at each end and attached to a rod or bar S', fastened to all the boxes and evaporator plates or pans. The whole is inclosed in a jacket or box T, and fed as in the form first described, being discharged by vacuum-pumps. The heat and vapor is conveyed from the jacket or box through a vacuum-pipe having a valve *t*. T² designates a discharge-pipe and draw-off cocks for removing the water of condensation from the steam boxes or chambers.

In Figs. 5 and 6 I have shown the invention as adapted for use in distilleries for the evaporation of fermented liquids. For this purpose two or more of the pans are used, one above another, with steam-pipe connections, blower, and means for imparting movement to the pans and boxes, all substantially as before described, with such changes in the arrangement as may be desirable to suit the particu-

lar case. The upper ends of the air-compartments are closed by a box or hood U, with canvas or other flexible connection with a worm V. V' is a condensing-tank for the worm, which is filled with cold running water. The pan or blower is run gently, just sufficient to carry the vapor from the pans into the worm, where it is quickly condensed and discharged from the outlet W, the air escaping from the pipe W'.

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

1. An evaporator pan, a box in which said pan is supported and having therein a steam or hot air chamber underneath said pan, and means for imparting a side-to-side movement to said box, substantially as specified.

2. An evaporator pan, a box in which said pan is supported, and having therein a closed steam or hot air chamber underneath said pan, and an air chamber above the pan, laterally movable supports for said box, and means for imparting a side-to-side movement to said box, substantially as specified.

3. An evaporator, having an evaporating pan, a box inclined with the pan in the direction of its length and having a closed steam or hot air chamber underneath the pan and an open-ended air chamber above the pan, laterally movable supports for said box, means for imparting a side-to-side motion thereto, a steam pipe flexibly connected thereto, a blower arranged to force air into said air chamber, and a feed pipe, substantially as specified.

4. In an evaporator, the combination with the elongated box having the pan fastened therein, and having a chamber above and below said pan, of the series of laterally flexible supports for said box, a longitudinal rotatable shaft, eccentrics thereon, and straps fitted to said eccentrics and attached to said box, substantially as specified.

5. In an evaporator, the combination of two or more inclined pans, one above another, a heating chamber underneath each pan, means for supplying heat thereto, and means for effecting a sidewise motion to said pans, substantially as specified.

6. In an evaporator, the combination of two or more inclined pans, one above another, a heating chamber underneath each pan, an air and vapor chamber or chambers above the pans, a fan or blower communicating with one end of said air and vapor chamber or chambers, a closed hood communicating with the upper ends thereof, and having a flexible connection with a worm, and means for imparting sidewise motion to said pans, substantially as specified.

7. In an evaporator, an elongated evaporator pan, and a box or casing within which said pan is supported longitudinally, said box or casing having a closed heating chamber below the pan and an air chamber above the

same, and means whereby a side to side movement may be imparted to said pan, substantially as specified.

5 8. In an evaporator, an elongated, inclined pan, and a box or casing within which said pan is supported longitudinally, said box or casing being supported to oscillate or swing in a direction transverse to its length, and having below the pan a heating chamber and

above the pan an air chamber, and means for imparting motion to said box or casing, substantially as specified.

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

HORACE ARNOLD MERRIAM.

Witnesses:

A. L. WILLIAMS,

F. L. ALEXANDER.