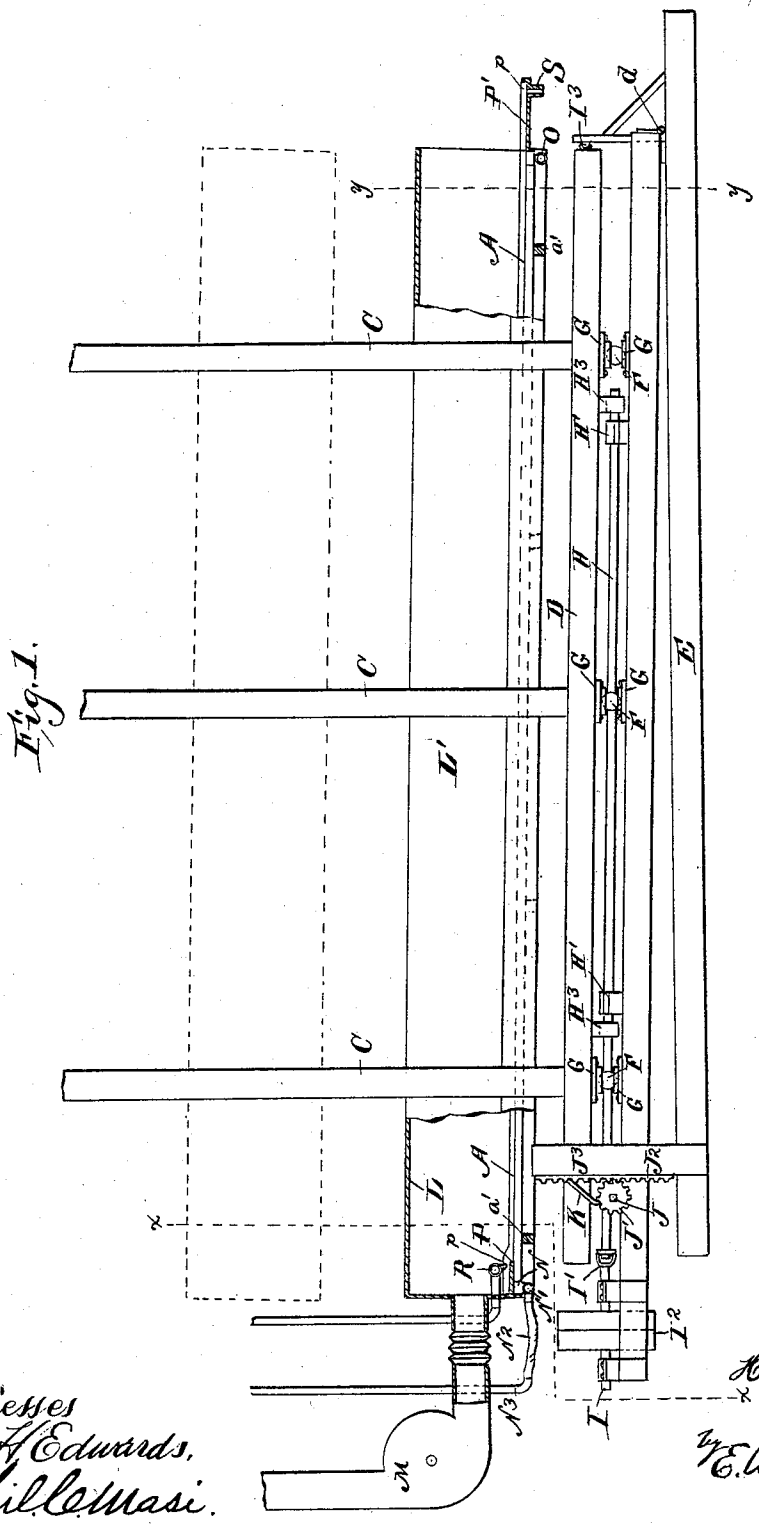
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H. A. MERRIAM.

EVAPORATOR.

No. 589,091. Patented Aug. 31, 1897.

Fig. 1.



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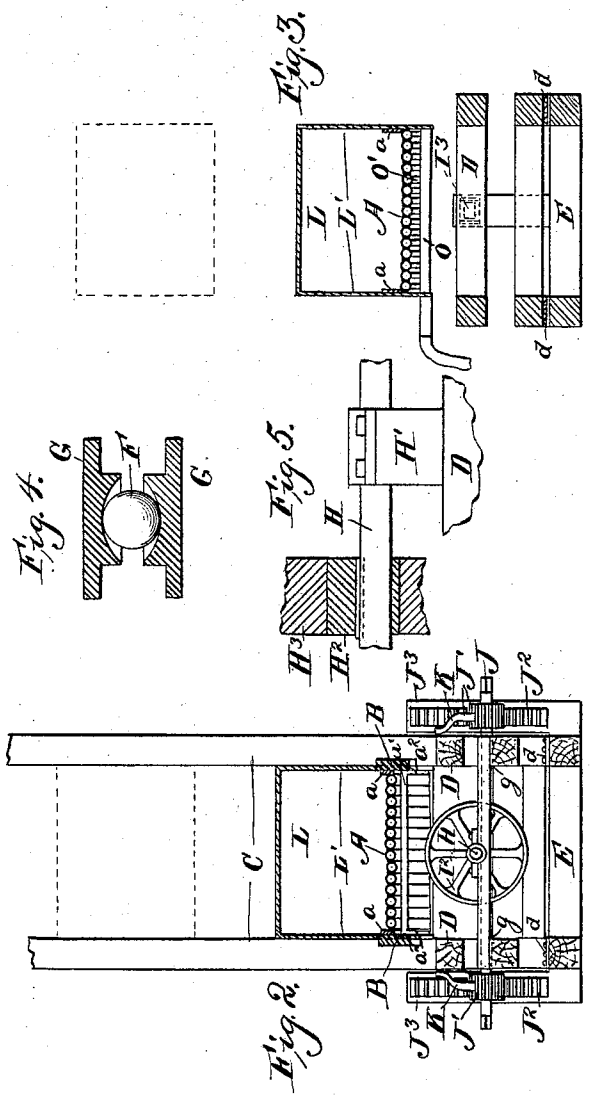
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UNITED STATES PATENT OFFICE.

HORACE ARNOLD MERRIAM, OF SAN FRANCISCO, CALIFORNIA.

EVAPORATOR.

SPECIFICATION forming part of Letters Patent No. 589,091, dated August 31, 1897.

Application filed August 14, 1896. Serial No. 602,813. (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 San Francisco, in the county of San Francisco 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 of the drawings is a side elevation, partly broken away, of an evaporator embodying the invention. Fig. 2 is a vertical section taken on line $x\,x$, Fig. 1. Fig. 3 is a vertical section taken on line $y\,y$, Fig. 1. Fig. 4 is a detail sectional view of one of the supports for the upper frame, and Fig. 5 is a similar view showing one of the eccentrics which actuate the pan.

This invention is designed to provide an evaporator of improved character possessing simplicity and economy of construction and a maximum area of heating evaporating-surface capable of being heated to any desired degree without the disadvantages found in an ordinary evaporating-pan due to the expansion and contraction thereof.

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

Referring to the accompanying drawings, the letter A designates the evaporating pan or surface, which is formed by a series of pipes or hollow tubes placed side by side in lengthwise arrangement and connected one with another in a liquid-tight manner by solder, brazing, or other suitable means.

a are lateral guard-strips which are secured to the outside pipes and which form the sides of the pan.

a' are cleats or battens which extend transversely underneath the pan at proper intervals, being rigidly secured to the pipes. The cleats or battens at their end portions project beyond the pan and are turned downwardly, as indicated at a^2, and securely bolted to a longitudinal frame-piece B. These pieces B extend the entire length of the evaporator and are in turn secured to uprights or posts C, which are secured to and rest upon the longitudinal parallel beams or upper sills D.

The beams or sills, with their cross connections, and the posts C and pieces B constitute what I term the "upper" frame of the evaporator. D is a lower frame composed of two parallel sills or beams, which at one end are hinged to a suitable bed E, as indicated at d.

The support for the upper frame upon the lower one consists of a series of metal balls F at each side, which are seated between flanged cups G, secured to the beams or sills above and below each ball. These balls, it will be observed, form movable bearings for the upper frame, whereby it with the pan may have imparted thereto an oscillatory or shaking motion or a compound lateral and vertical movement. The means for imparting such movement may be of any of the various kinds known to the mechanic. In the drawings I have shown such means as consisting of a shaft H, supported centrally and longitudinally underneath the upper frame in boxes or bearings H′, carried by the lower frame and carrying at suitable intervals eccentrics H^2, which rotate in bearings H^3 of said upper frame and thereby give it the desired movement. Such movement may be either regular or irregular, its purpose being to keep the liquid flowing over the pan in a state of agitation, in order that new portions thereof may constantly be exposed to the heating evaporating-surface of the pan and to the air above.

The shaft H is driven by a shaft I, connected thereto by universal coupling I′ and carrying a driving-pulley I^2.

Endwise movement of the upper frame and the pan is prevented by an antifriction end bearing I^3.

In operation it is necessary that the pan shall be supported in an inclined plane, the degree of inclination depending upon the nature of the substance operated upon or of the product to be obtained, and it becomes necessary in making such adjustment to also

adjust both the upper and lower frames in order not to interfere with the support and bearing for the upper frame. To this end the sills of the lower frame are hingedly connected to the bed of the evaporator, as above described. To effect the adjustment, a shaft J may be journaled transversely underneath the upper portion of the upper frame in bearings *g* of lower frame, said shaft carrying pinions J', which are arranged to run in racks J^2, attached to fixed posts J^3 of the bed. K are holding-pawls for securing the adjustment. In lieu of this arrangement, however, ordinary lifting jacks or screws may be set under the upper end portion of the upper frame.

L designates the cover for the pan, supported some distance above the same and formed with depending lateral portions or curtains L', whereby a closed chamber is provided. Through this chamber a current of air is forced in operation by means of a suitable blower M, located at either end of the machine.

The series of pipes forming the bottom or heating surface of the pan are closed at their upper ends except for small pipes N, fitted into them and joined to a larger pipe or manifold N', which are connected by a flexible hose N^2 with the steam-supply pipe N^3.

An exhaust-pipe O, with suitable valve, is connected to the lower ends of the said pipes to carry off the water of condensation, the connection being by means of the small tubes O'.

Attached to the respective ends of the pans are extensions P P', having raised rims *p*. The extension P at the upper end forms the receptacle into which the branched feed-pipe R discharges and P' at the lower end the receptacle for the product of evaporation, from which it flows off through a suitable discharge S.

It will be seen that the steam-pipes forming the bottom of the pan provide what is in effect a corrugated surface therefor, which largely increases the area of such surface; also, that by means of this arrangement any amount of steam may be employed without the danger arising from undue expansion and contraction found with the ordinary flat pans.

The effect of the agitation is to constantly expose new surfaces of the liquid to the heated surface and also to the air-current above, which carries off the vapors.

The machine may be used for distilling fermented liquors by catching and condensing the vapors in the usual way. It may also be used *in vacuo* by inclosing it in a suitable air-tight jacket or closure.

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

1. In an evaporator, the combination of the lower frame hinged at one end, and means for raising and lowering said frame on its hinges, of the upper frame, the movable bearings between the two frames and upon which the said upper frame rests, the heating-coils supported in said upper frame and forming an evaporating-surface, and means for imparting motion to said upper frame, substantially as specified.

2. In an evaporator, the combination of an upper frame, a pan supported therein, a lower frame having rolling bearings upon which the upper frame rests, said lower frame being hinged at one end and means for imparting vibratory or oscillatory motion to said upper frame and pan, substantially as specified.

3. In an evaporator, the combination of the lower frame having the longitudinal sills or beams hingedly secured at one end to the bed of the evaporator, and means for raising and lowering the free ends of said sills, the ball-seating cups carried by said sills, the upper frame having similar but inverted cups, the balls seated in and interposed between the upper and lower cups, the pan secured in said upper frame, and means for imparting motion to said upper frame to agitate the liquid flowing over the said pan, substantially as specified.

4. In an evaporator, the combination of the lower frame having the longitudinal sills hingedly connected at one end to the bed of the evaporator, means for raising and lowering their opposite ends, the movable balls seated in bearings of said sills, the upper frame having bearings which rest on the said balls, means for imparting motion to the said upper frame, the series of contiguous steam-pipes supported in said upper frame and constituting the bottom of an evaporating-pan, the extensions at each end of said pan, into one of which the feed-pipe discharges, and from the other of which the evaporated product is discharged, means for supplying steam to said pipes and for removing the water of condensation therefrom, an air-chamber above said pan, and means for forcing a current of air through said chamber, substantially as specified.

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

HORACE ARNOLD MERRIAM.

Witnesses:
W. H. POLLARD,
LUIS KELLY.