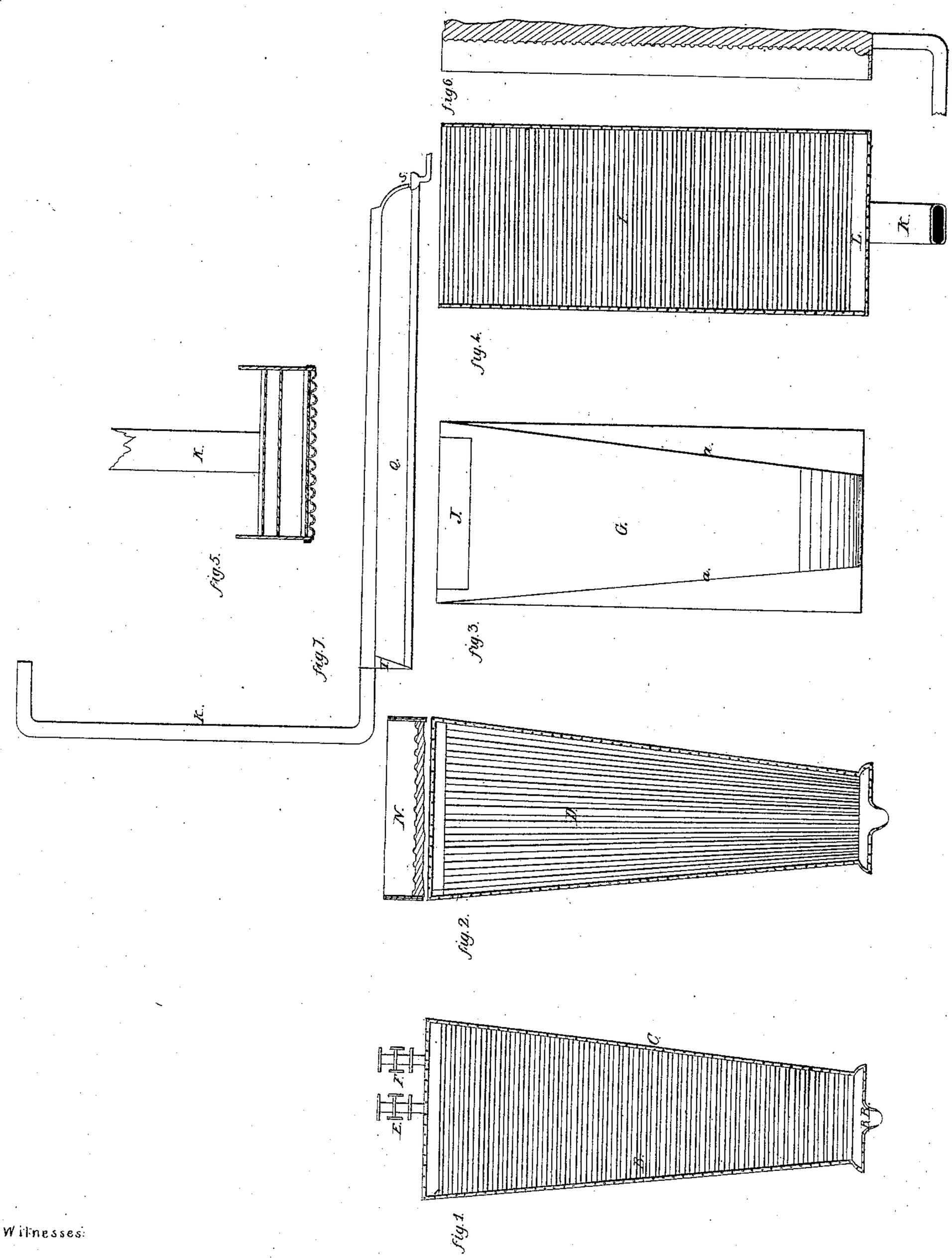
Sheet 1 - 2 Sheets.

S. T. Harrison,

Evaporating Pan,

No. 1,056. Patented Dec. 31, 1838.



Witnesses:

David Brent

Inventor:

Sam'l T. Harrison

Sheet 2-2 Sheets

S. T. Harrison,

Evaporating Pan,

No. 1056. Patented Dec. 31, 1838.

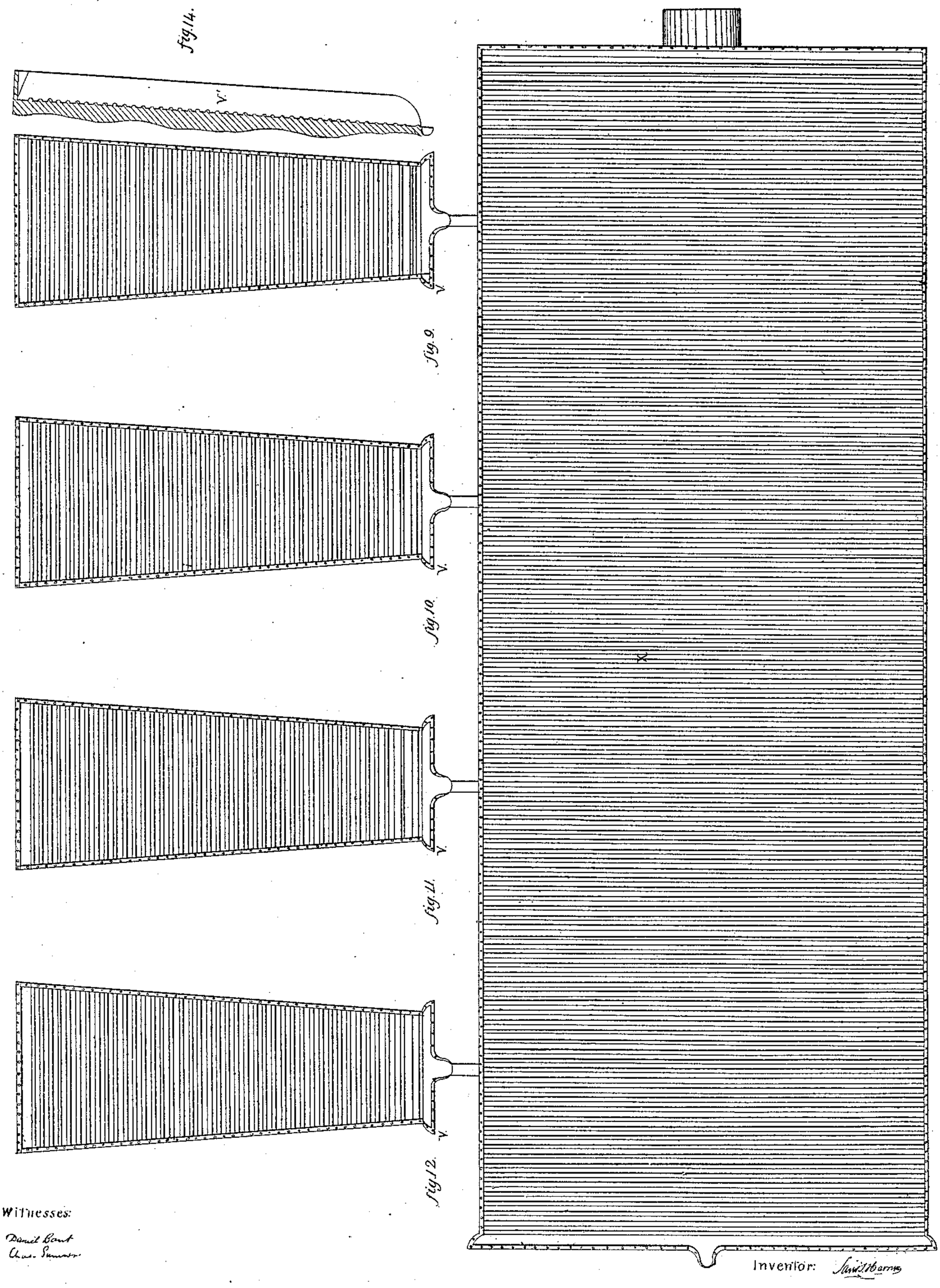


fig. 9. fig. 10. fig. 11. fig. 12. fig. 13. fig. 14.

Witnesses:

Daniel Bant
Chas. Sumner

Inventor: Saml. T. Harrison

UNITED STATES PATENT OFFICE.

SAMUEL T. HARRISON, OF BALTIMORE, MARYLAND.

IMPROVED EVAPORATOR.

Specification forming part of Letters Patent No. **1,056,** dated December 31, 1838.

To all whom it may concern:

Be it known that I, SAMUEL T. HARRISON, of the city of Baltimore, State of Maryland, have invented an Improvement in Evaporators, of which the following is a specification.

The invention is called the "Evaporator;" and its object is to produce an instantaneous and continued evaporation of saccharine, alkaline, alcoholic, or saline liquids by means of the application of vapor or steam, as described. One of the principal purposes to which it may be applied is the improvement of the manufacture of sugar.

By means of this invention the period for which a liquid to be evaporated is exposed to heat is very much lessened, and the known disadvantage of the continued contact between heat and the liquid is avoided.

In the manufacture of sugar by means of the present invention, the concentration requires but three minutes and a half at most, and the formation of molasses is diminished.

The general superiority of the machine will be seen in the promptitude and simplicity with which it works and in the economy of fuel.

The invention will be understood by reference to the drawings annexed, taken in connection with the following description.

The evaporators may be made of copper, cast or sheet iron. A single evaporator may be employed apart; but several may be employed to greater advantage, and the number which may be employed together is only limited by the house in which they are erected and by the wants of the proprietor. The principle admits of an indefinite application, and it is this principle which forms one of the main parts of the present invention. In the plans annexed nine evaporators are represented, which it is intended to employ together, the nine constituting one machine. By means of the employment of several together, an economy is effected in the employment of heat, which will be particularly explained hereinafter. Of the nine evaporators which constitute the machine to be described, there are four which we will call "first evaporators," and four which we will call "second evaporators," with a ninth which covers all the others, and which we will call a "third evaporator." The first eight evaporators are in pairs of two each, the four pairs being placed side by side, with the large evaporator, Plate II, Figure 13, X, extending over all of them. The manner of working the machine will be explained hereinafter. At present the machine will be viewed in connection with the drawings.

Plate 1, Fig. 1, A is a view of the upper portion of the first evaporator or surface upon which the liquid is introduced. It is represented in the figure as fluted crosswise, which is the most advantageous manner, as the liquid flows over it more slowly through flutes lengthwise, a plain or an uneven surface, will all answer the same purpose. The flutes may be made larger or smaller, and the evaporator will still perform its proper functions. If fluted lengthwise, they should not be made too high. Those in the figure are intended to be one inch in breadth, and one inch distant the one from the other. Fig. 1, B shows by means of the shadow the sides or walls of the evaporator, which are placed on the two sides lengthwise, and also at the top or upper end. The bottom or narrow end has no side. B′ B′ is a gutter to receive the sirup as it rolls off the evaporator, and there is no side or wall in this place; C, two bars of iron pierced at equal distances, which serve to unite the two bottoms A, Fig. 1, and D, Fig. 2, by means of screws or nuts outside of the evaporator, leaving the necessary steam-space between them; Fig. 2, D, under bottom of the evaporator, guttered or fluted lengthwise. The gutter, as shown in the annexed drawings, is intended to be about an inch and a half deep. It is at the rim of the outer gutter that the junction of the upper and lower bottom is made by means of the two bars marked and described in C, Fig. 1. Fig. 1, E, cock for the admission of vapor between the two bottoms; F, cock for drawing off the hot water. It is connected with a tube which communicates with the space between the two bottoms above described. Fig. 3, G, view of the under part of the second evaporator, which helps to form the first pair, as above described. This is placed on the first evaporator, to receive the steam or vapor disengaged from the liquid during evaporation upon the evaporator, which passes into it through J, an oblong opening in the under bottom of the second evapo-

rator, G, above mentioned, which, as above stated, affords a passage to this vapor, so as to let it pass down the channel between the two bottoms of the second evaporator, *a a*, in a groove or rabbet fitting on the evaporator below it. Fig. 4, I, view of the upper bottom of the second evaporator last described, on which, as on Fig. 1, A, the liquid to be received is evaporated. This upper bottom is in all respects the same as the upper bottom of first evaporator, Fig. 1, A; K, pipe conducting the steam produced upon evaporator A and upon the cover I between the double bottom of Fig. 13, Plate 2, to be hereinafter described; L, distributer consisting of a perforated trough, placed at the top of the above evaporator, which distributes the juice upon the whole breadth equally; M, scale of proportion. Fig. 2, N, front or end view of the under bottom of first evaporator, described above, D, Fig. 2. Fig. 7, Q, side view of an evaporator fluted and furnished with its second evaporator; S, gutter which receives the liquid after evaporation, as it leaves the evaporator; T, distributer, as at L in Fig. 4. Fig. 5, view of first evaporator, with its second evaporator bisected crosswise.

Plate 2, V V V V, four figures representing four pairs of evaporators (similar to the pair already described in Plate 1) upon the same level. The steam disengaged from the liquid while the evaporator is in operation is conducted between the double bottom of third evaporator, marked X, which it is employed to heat. A section lengthwise is shown at V′, Fig. 14. Fig. 13, X, is an apparatus twenty-one feet long and eight broad, constructed in the same manner as the second evaporator, just described in Figs. 3 and 4, which receives between its double bottom (of which the upper bottom is only seen in the annexed drawings) all the steam or vapor disengaged from the liquid during evaporation upon the evaporators beneath. This third evaporator, instead of being placed upon the others, as above described, may be placed on a furnace, so that by heating the steam or vapor which is between the two bottoms, without increasing the tension, we may increase its caloric to a degree equivalent to the greatest degree of tension. The apparatus X can be made of copper, sheet or cast iron. It may be fluted or guttered lengthwise or crosswise—have a plain or an uneven surface. The two bottoms are united by means of nuts and screws at a foot or two distant from each other. The space between the two bottoms should be six or eight inches deep, to render the circulation of the vapor or steam free. It is furnished with sides, as in Fig. 1, A.

Any form may be given to the evaporators, and they may be made larger or smaller without impeding their operation. The form in Fig. 1, A, is adopted, because as the liquid evaporates it diminishes in volume, and by inclining the evaporator the evaporation is hastened.

The manner of working the apparatus above described is as follows: A certain quantity of liquid to be evaporated is contained in a reservoir above the evaporator, which has a cock to regulate its emission therefrom. The operation is commenced by admitting the steam between the double bottom of the first evaporator and opening the return-cock for the hot water. After the operation both should be shut. During the passage of the liquid over the surface of the evaporator, forming a shallow depth from the top to the bottom, before it runs off the evaporator, it acquires the density required. It is by opening or shutting the cock of the distributer more or less, and producing a greater or less emission of juice upon the evaporator, that a greater or less degree of concentration is produced. If the emission be greater, the concentration is less, and vice versa. The emission being once regulated and the cock left open and the steam kept at the same tension, the work will go on of itself; but attention must be paid to the tension of the steam, so that by means of the cock, in regulating the emission, we may diminish the quantity or increase it according as the steam may have a greater or less tension. As the evaporation of the liquid upon the evaporator is finished it flows off and fresh juice is received. There is no intermission in the operation. The dilatation of the liquid is so great as to produce a precipitate of all foreign insoluble matter, and all matter that is volatile is carried off by the vapor or steam—an effect peculiar to this system of evaporation. The liquid which runs upon the surface of the second evaporator is only heated by means of the vapor or steam produced by the evaporation of the liquid upon the first evaporators, the design being to utilize the caloric of the steam produced by the first evaporation, which, in point of fact, contains nearly as much caloric as was necessary in the first place to produce it. Its operation upon the range of second evaporators may be called "double effect," and that upon the third evaporator "triple effect." This system may be carried to any extent, and any number of evaporators may be added, especially if the manner which has just been specified be adopted—that of placing the third evaporator upon a furnace, by which one augments the heat of simple steam and increases its caloric to that of a steam of several atmospheres, the principle being to increase the degree of heat as high as we wish without increasing its tension—a principle which admits of the suppression of generators of compressed steam, and by heating the vapor or steam produced by pressure a little above atmospheric air to produce a great evaporation with less production of steam in the apparatus. The vapor or steam produced by evaporation upon the third evaporator may be conducted by pipes to heat the stoves, the purgeries, drying-room, or any purpose.

It is further apparent that in proportion to the quantity of liquid evaporated from the

construction of this apparatus a quantity of condensed vapor or distilled water will be collected, which may be employed to supply the boilers with water and other purposes.

There is great advantage in using distilled water in place of common water, as the boilers will not require cleansing often. An absence of heterogeneous matter in water is also advantageous in any process where it is required.

A patent is hereby claimed for the application of the above-described apparatus or evaporator, in order to produce instantaneous and continued evaporation of liquid from a less to a greater density by means of the multiplied application of steam or vapor through the use of several evaporators in one machine, as described in the above specification, whether the first evaporators be heated by means of the direct action of fire, by means of heated gas, or by means of the caloric of vapor; also, for the application of the principle that steam may be heated to any greater degree without increasing its tension, as above described.

SAML. T. HARRISON.

Witnesses:
DANIEL BRENT,
CHAS. SUMNER.