S. H. GILMAN.

2 Sheets—Sheet 1.

Evaporator.

No. 27,219.

Patented Feb. 21, 1860.

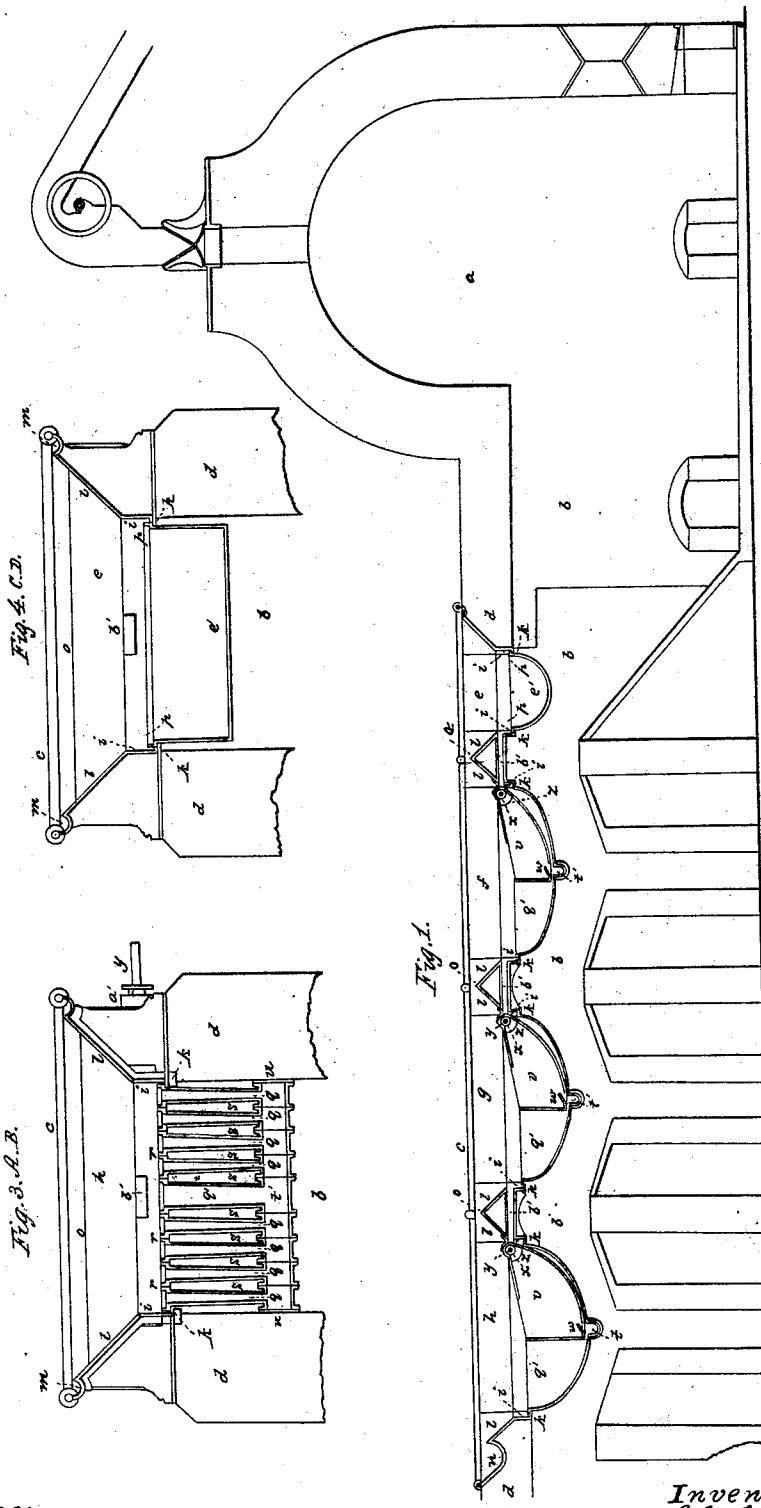


Fig. 1.



Fig. 4. C.D.



Fig. 3. A.B.

Witnesses:

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Inventor:

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N. PETERS. Photo-Lithographer, Washington, D. C.

2 Sheets—Sheet 2.

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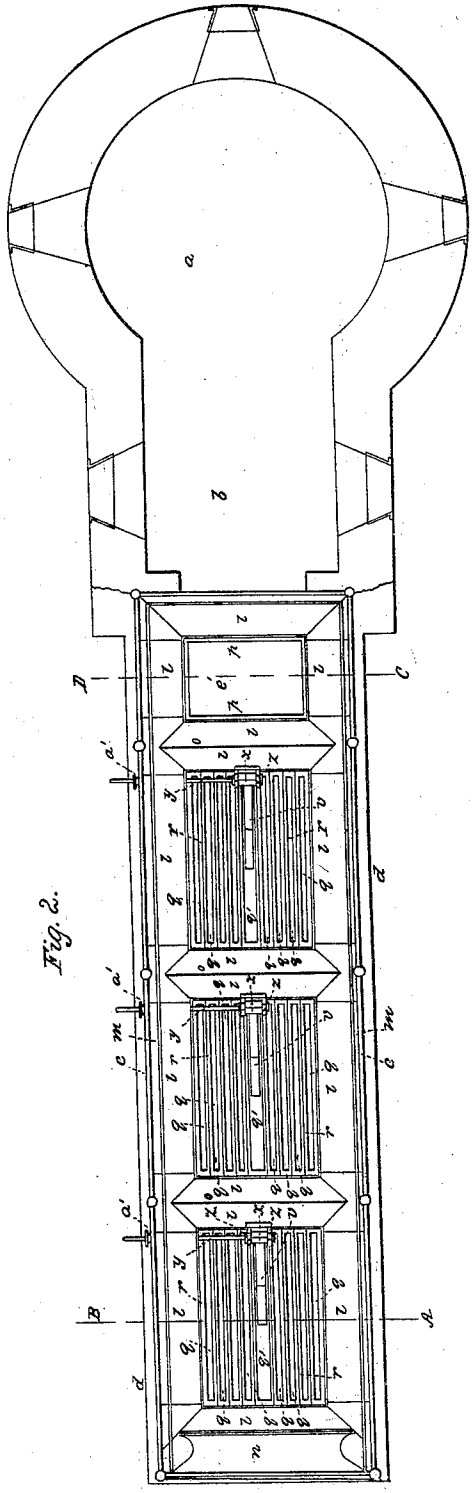


Fig. 2.

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# UNITED STATES PATENT OFFICE.

SAMUEL H. GILMAN, OF NEW ORLEANS, LOUISIANA.

## IMPROVEMENT IN APPARATUS FOR EVAPORATING SACCHARINE JUICES.

Specification forming part of Letters Patent No. **27,219**, dated February 21, 1860.

*To all whom it may concern:*

Be it known that I, SAMUEL H. GILMAN, of New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Evaporators for Evaporating Saccharine Juices and other Fluids; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a longitudinal vertical section of a train of evaporators for making sugar; Fig. 2, a plan; and Figs. 3 and 4, cross vertical sections taken at the lines A B and C D of Fig. 2, and represented on an enlarged scale.

The same letters indicate like parts in all the figures.

My invention is specially applicable to the making of sugar, and for that reason I shall describe it as applied to pans for evaporating saccharine juices; but as it is also applicable to evaporating other fluids I do not wish to be understood as limiting myself to the use thereof in the manufacture of sugar.

My said invention relates to the method of constructing evaporating pans or kettles with the view to economy of fuel by an efficient increase of the heating-surface, and at the same time obtain practical and efficient results with less wear and tear than by any other known plan, by so constructing the pans that they will readily yield, without breaking, to the unequal contraction and expansion unavoidable in apparatus for this purpose, and so that the members may be taken out separately for repairs and replaced without removing the rest; and my said invention also relates to the method of equalizing the evaporating capacity of a train of pans or kettles relatively to their cubical contents in the ratio of their distance from the furnace by increasing the projection of the parts constituting the bottoms thereof; and my said invention relates to the method of transferring the liquid from one pan to another in the train by means of a vibrating ladle and a connecting-pipe.

The accompanying drawings represent a train of evaporators on my improved plan for making sugar in connection with a bagasse-furnace, described in Letters Patent heretofore granted to me, and bearing date the 4th day of December, 1855; and in the said drawings *a* represents the furnace, not necessary to be described, as it makes no part of my present invention, and any other suitable furnace may be substituted therefor. The products of combustion from the furnace pass through a flue-space, *b*, under the pans to any suitable chimney, the said flue-space being formed along the sides and bottom by suitable masonry, and along the top by the evaporators or pans.

The train *c* of pans rests on the side walls, *d d*, of the flue-space, and this train is composed of four pans or evaporators, *e f g h*, the one, *e*, or finishing-pan, nearest the furnace being represented as made with the usual semi-cylindrical bottom, *e'*, and with the usual appendages, and the others, *f g h*, are represented as made on my improved plan. These pans or evaporators, including the one *e*, may be so formed as to be continuous, in the manner represented. Each pan is quadrangular, and from the part termed the "bottom" vertical for a few inches, as at *i*, the lower edges being formed with a horizontal flange, *k*, extending inward to a sufficient extent to receive and sustain the bottom, to be presently described. Above the vertical part *i* the four sides flare outward, as at *l*, and are formed at the upper edge into a gutter, *m*, on each side of the train, which gutter extends the whole length and serves the purpose of catching the overflow from the several pans and conducting it back to the pan *e*. The pan *h* at the extreme end is formed with a large gutter, *n*, to receive the skimmings, which can be conducted by suitable means, not necessary to be described.

The flaring part *l* of the ends of the contiguous pans are united by their upper edges, as at *o o o*. The bottom *e'* of the finishing-pan *e* is formed with a flange, *p*, all around, resting on the flange *k*, and there secured by bolts or other equivalent means, so that it can be readily taken out for repairs and replaced, and this mode of connection with the upper part admits of the unequal expansion and contraction without serious strain or injury. The bottom of each of the other pans, although connected with the upper part in the same manner, are of a different construction, and being all alike, except as to dimensions, the description of one will suffice for all. Each bottom is composed of a series of compartments, *q*, sufficient in number to extend the

whole width, and each compartment extends the whole length between the end flanges, *k k*. In the side elevation they are in the form of a semi-ellipse, with the upper and horizontal edge open and the lower and elliptical edge closed. In their cross-section I prefer to make them inside a little wider at top than at bottom, as represented in Fig. 3. as that will favor the molding, if made of cast-iron, and, made of whatever material, will favor the process of evaporation. The upper edge is formed with a flange, *r*, all around the ends of all of them, resting on the end flanges, *k k*, and the outer flange of each of the two outer compartments resting their whole length on the flanges *k k* at the sides. The inner flanges are made with vertical faces, so as to form close joints along the whole length of the contiguous compartments. By suitable packing and bolts, or equivalent means, the several compartments are united with each other and with the flanges *k* of the upper part of the pan, so that the whole series or any one of the series of compartments can be readily taken out for repairs and replaced or others substituted. A series of narrow passages, *s*, are left between the several compartments, extending from end to end, and from the bottom to the flanges at the upper edge, which passages constitute a continuation of the flue-space *b* for the passage of the products of combustion from the furnace. At the lower part of the elliptical or curved edge each compartment is formed with a depression, *t*, the ends of which are suitably flanged, so that the whole series can be connected to form a connecting horizontal pipe, *t'*, (see Fig. 3,) the ends of which are closed by suitable cap-plates, *u*, which can be taken out for the purpose of cleaning the inside. By means of this connecting-pipe the liquid contents of the whole series will remain at the same level, for it will flow freely from one to another, and this connection will also favor circulation and vaporization whenever the compartments are unequally heated, for in that event the liquid will circulate upward in those which are most heated and downward in those which are less heated.

The central compartment, *q'*, of the series in each pan is made wider than the rest to receive a dipper, *v*, which is a narrow vessel of about half the length of the compartment. It has an opening governed by a valve, *w*, at the bottom, near that end which extends to the bottom of the compartment, the valve opening inward, that the liquid contained in the compartment may flow in as it (the dipper) is let down, and closing to prevent the liquid from flowing out as the dipper is lifted up. The outer end of this dipper has a hub, *x*, the axle *y* of which is mounted in bracket-pieces *z z*. The axle *y* extends through and to the outside of the train, where a winch can be applied, by means of which the dipper can be operated, there being a suitable stuffing-box, *a'*, on each axle to prevent the escape of the liquid contained in the pans. There is a hole or passage through the periphery of the hub, which, when the dipper is lifted up, communicates with an inclined pipe, *b'*, leading into the next pan, and the end of this pipe is suitably fitted to the periphery of the hub, and extending so far over it that in any position the contained liquid shall only flow from the dipper through the pipe *b'* into the next pan. By this means the liquid contents of any one pan can be readily transferred to the next pan.

The series of compartments of the pans *f g h* are each in succession from the furnace made of greater depth by increasing the transverse axis of the semi-ellipse of their form, so that the pans farthest from the furnace shall present a greater extent of heating-surface relatively to the liquid contents in the ratio of the increased distance from the furnace, where the intensity of heat is reduced, thereby equalizing the evaporating capacity of the several pans of the train.

Although I have described the form of the lower edge of the compartments as being semi-elliptical, I wish it to be distinctly understood that I have only done so because I deem that the best form, and do not limit my claim of invention to such form, as it may be varied without changing the character of that part of my invention.

Although I have described the pan *e* as being made with a smooth bottom, I would remark that I have done this because a pan with the bottom formed of a series of compartments on my improved plan is not adapted to the finishing of the sugar; but when a steam-pan is to be used for this purpose, and the train is simply to be used for concentrating the saccharine juice, then I contemplate making the bottom of all the pans in the series with compartments.

I am aware that steam-boilers have been made with what are termed "water-legs," and that kettles have been made of various forms, for the purpose of increasing the amount of heating-surface, and therefore I do not wish to be understood as making claim, broadly, to the method of presenting liquids in narrow spaces, the metal composing which is on one side exposed to heat and on the other to the liquid; nor do I wish to be understood as now making claim, broadly, to the method of equalizing the evaporating capacity of each pan of a train relatively to the cubical contents by increasing the heating-surface in the ratio of the increased distance from the furnace, as this is secured to me by Letters Patent bearing date the 9th day of September, 1856.

What I do claim as my invention, and desire to secure by Letters Patent, in the construction of pans or kettles for evaporating saccharine juices or other liquids, is—

1. Making the bottoms thereof of a series of vertical compartments, open at the upper edge to receive the liquid from the upper part of the pan or kettle, and closed at the bottom, except for the purpose of connecting the inside of the series, and with open spaces between every two

of the series, forming continuous passages open to the flue-space, except where obstructed by the connecting-pipes, for the action of the products of combustion, substantially as and for the purpose specified.

2. Making each of the said compartments of the series constituting the bottom of a pan or kettle separate from the others and from the upper part of the pan or kettle, and provided with flanges to connect it with the series and with the lower edge of the upper part of the pan or kettle, substantially as and for the purposes specified.

3. Increasing the heating-surface of each pan or kettle of a train, relatively to its liquid cubical contents, in the ratio of its greater distance from the furnace, by making the series of compartments constituting the bottom thereof, substantially such as herein described, of greater depths, each in succession as they are more distant from the furnace, for the purpose hereinbefore described.

4. The manner, substantially as described, of connecting the series of pans or kettles constituting the train by means of the flaring sides, substantially as described, in combination with the manner of connecting the bottoms therewith, substantially as described, and for the purpose specified.

5. The vibrating dipper connected and combined with the pans or kettles, substantially as described, for the purpose of transferring the liquid from one pan to the next in the train, as set forth.

S. H. GILMAN.

Witnesses:
A. B. CARVER,
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