S. H. GILMAN.

Making Sugar.

No. 14,717. Patented April 22, 1856.

Fig. 1.

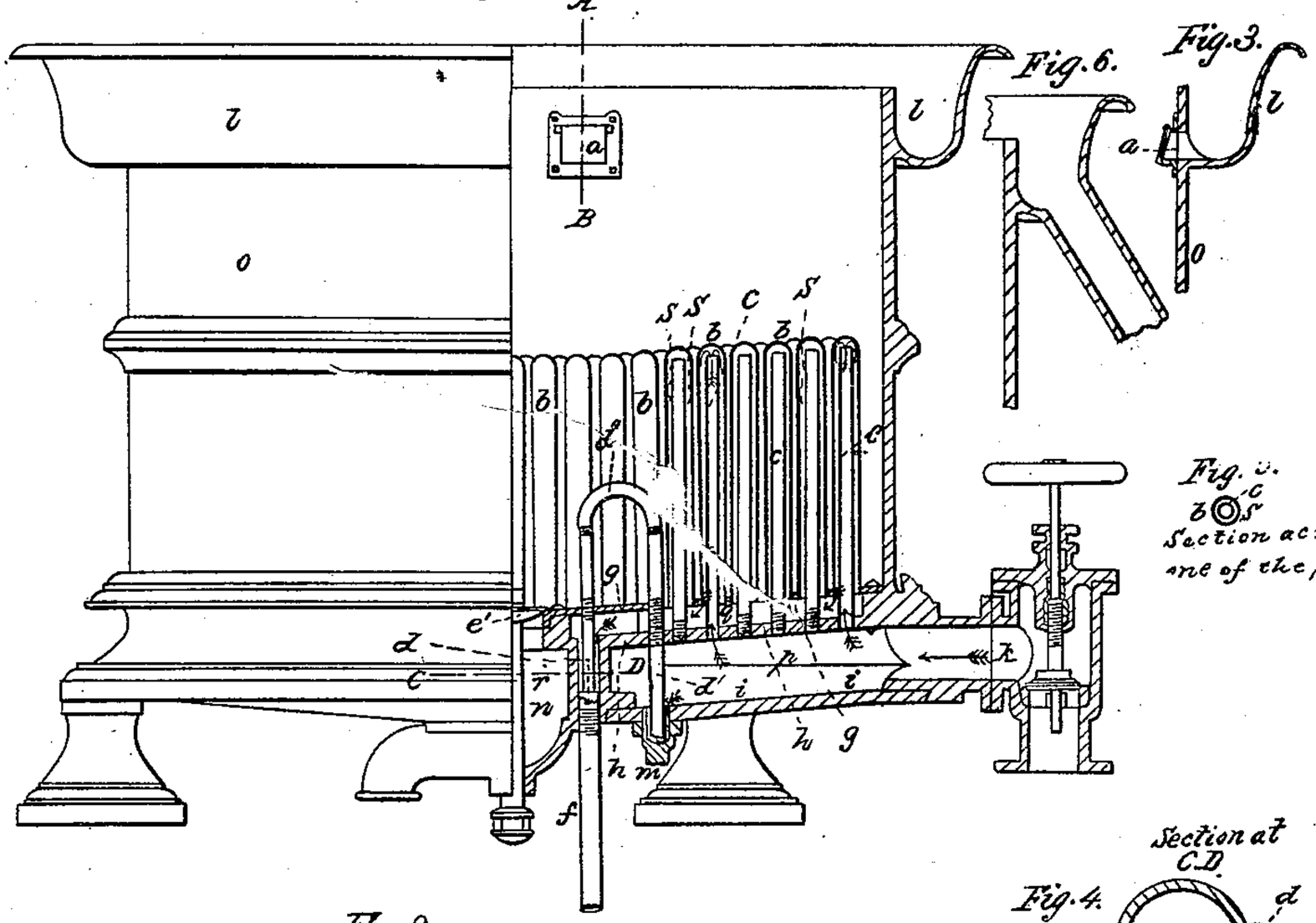


Fig. 6.

Fig. 3.

Fig. 5.

Section across one of the pipes.

Section at C D.

Fig. 4.

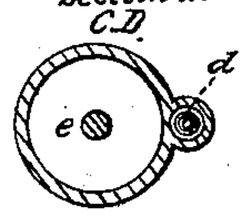
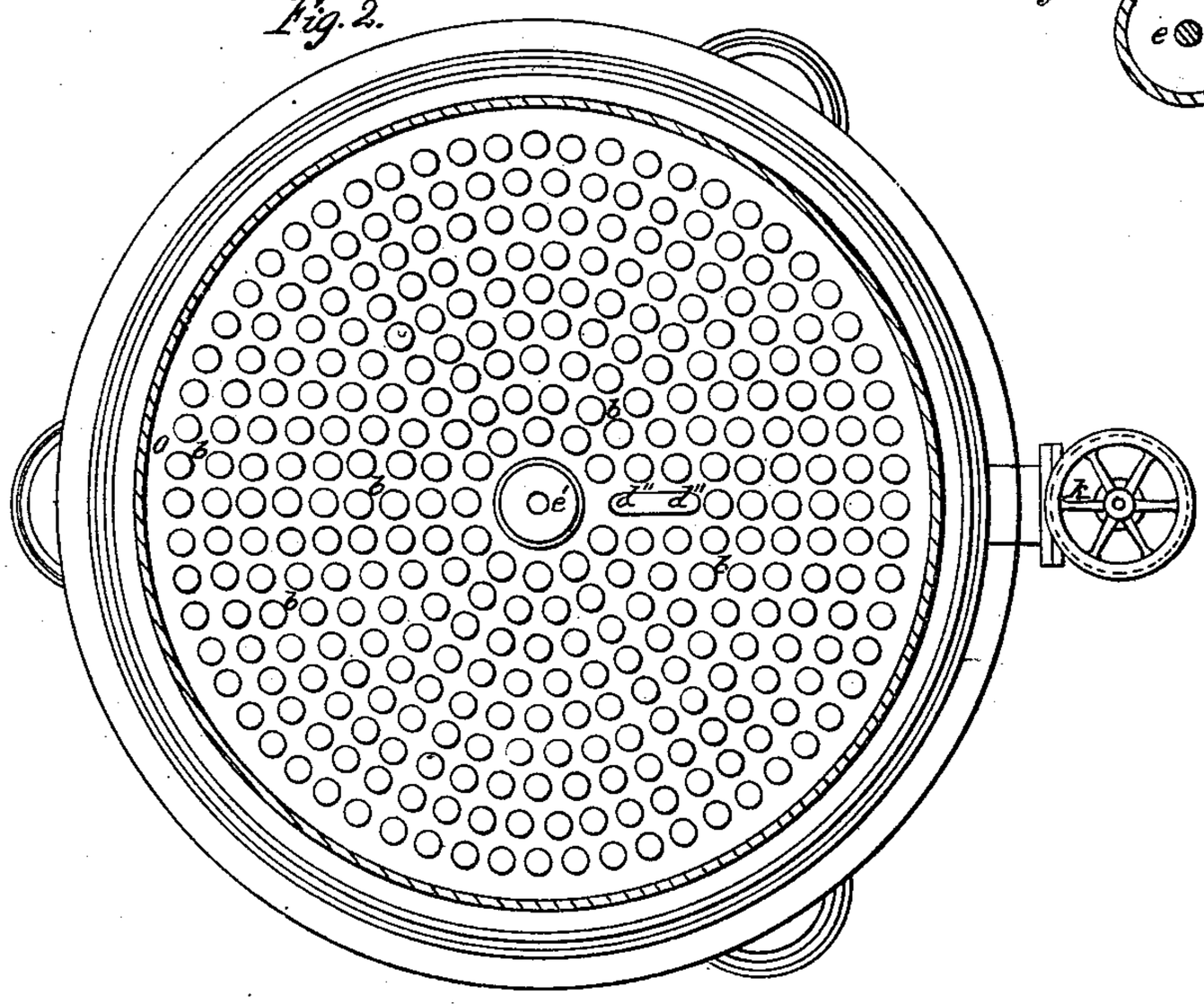


Fig. 2.



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

UNITED STATES PATENT OFFICE.

SAML. H. GILMAN, OF NEW ORLEANS, LOUISIANA.

IMPROVEMENT IN SUGAR-EVAPORATORS.

Specification forming part of Letters Patent No. 14,717, dated April 22, 1856.

To all whom it may concern:

Be it known that I, SAMUEL H. GILMAN, of the city of New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and useful Improvement in the Construction of Steam-Pans, with especial reference to their use in the manufacture of sugar direct from cane-juice.

Among the objections to all the arrangements of heating-surface in steam-pans heretofore in use are, first, the length and position of the pipes, which necessarily produce an unequal temperature in different parts of the same body of liquid under evaporation, and consequently in concentrating or granulating sirup into sugar in pans of the usual size and construction one portion of the sugar is "cooked" so much more than another portion that on mixing the different parts during the process of "curing" the sugar is thus necessarily rendered unduly deliquescent, and to such an extent is this property imparted to open steam-pan sugar that it is only sold for immediate consumption; second, the arrangements of pipes horizontally necessarily renders about one-third of their lower sides useless, by having such portions of their outer surface turned downward and their inner surface covered with condensed-water; third, their liability to foam and boil over without any self-operating remedy; fourth, the difficulty of taking any one of the pipes for repairs, as cleaning, under any of the heretofore known arrangements.

The principal object and nature of my improvement comprises a remedy for the above four objections, with a method heretofore unknown for taking away the condensed-water as fast as it is made, and utilizing every portion of the heating-surface presented to the liquid under evaporation, and the nature of my invention is particularly distinguished from all other steam-pans by, first, its treble bottom forming two separate chambers; second, its double vertical pipes, forming an annular steam-space, in which the current of steam exposed to the heating-surface is from the top downward, and of the same temperature in every part of the pan; third, its self-returning overflow, by which it is impossible for it to bail over; fourth, its compensating condensed-water pipes, by which either chamber, in discharging its waters, draws from and tends to discharge the condensed-water from the other chamber; fifth, the accessibility to every part of its heating-surface to clean it without taking out or moving a pipe, and the facility with which one or more pipes may be taken out without disturbing the others; and I do hereby declare that the following is a full, clear, and exact description of the construction by which the objects of my invention above mentioned are obtained.

In the annexed drawings, which form a part of this specification, Figure 1 is an elevation, one-half in section. Fig. 2 is a plan without the skimming-trough. Fig. 3 is a vertical section at the line A B through the skimming-trough and returning-valve. Fig. 4 is a horizontal section at the line C D through the pipes for discharging the contents of the pan, and the condensed-water pipe. Fig. 5 is a cross-section through a steam and evaporating pipe, showing the annular steam-space.

The form of the pan may be of any of the usual styles—round or square, with sides parallel to each other in their height, or larger at the top—but the form which I prefer is round, six feet in diameter, and four feet high on the inside or above the "tube-plate." The treble bottom is formed of three plates, *g h i*, lying in different horizontal planes, with their centers in the same vertical plane. The top plate, *g*, I call the "tube-plate;" the middle one, *h*, the "division-plate," and the lower one, *i*, the "bottom plate." The space between the tube and division plates should be about two inches, and forms the condensed-water chamber *q*, and the space between the division and bottom plates should be about six inches, and forms the steam-chamber *p*. The three plates forming this treble bottom are fastened together on their outer edges, as the whole is cast in one piece with a discharging-opening in and through their common centers, the three plates being slightly and equally dishing, to facilitate the rapid discharge of the contents of the pan. The tube-plate *g* is perforated with holes two and a quarter inches in diameter, and in the same vertical planes with their centers the division-plate is also perforated with holes one and five-eighths inch in diameter, into which are screwed pipes *c c*, having an outside diameter of one and five-eighths inch, and in length standing twenty-three inches above the tube-plate. Into the holes in the tube-plates are screwed the evaporating-pipes *b*, having their upper ends

closed and their lower ends opened, and of sufficient length to leave a space of about one inch above the upper ends of the steam-pipes *c c*, which are opened at both ends, and the combination of the two pipes *c* and *b*, thus forming an annular steam-passage, *s*, through which the steam rushes in a current from the top of the passage downward, being condensed on its way by the colder temperature of the liquid in the pan, and falling in the form of condensed-water into the condensed-water chamber *q*.

It is immaterial what metal the steam-pipes *c c* are made of, as there is so sensible pressure upon them. The evaporating-pipes *b* may be of iron, copper, or brass, as the nature of the liquid to be operated upon may require, and the number of pipes in a pan should be according to the pressure of steam to be used and the work to be done. The condensed-water that may accumulate in the steam-chamber *p* falls into the reservoir *m* near the center, and the condensed-water from all of the evaporating-pipes falling into the chamber *q* runs out through the pipe or tube *n*, which is inserted into the division *h* and bottom plate, *i*, as near as possible to the center and lowest point.

To discharge the water-reservoir *m* of the steam-chamber *p* into the common condensed-water pipe, *n*, leading to the pump or float-box, I fix the siphon-pipe *d d' d''* into the tube and division-plates *g* and *h*, one leg of the siphon, *d'*, terminating in and near the bottom of the water-reservoir *m* in the steam-chamber *p*, the other leg, *d*, of the siphon terminating in and near the lower end of the condensed-water pipe *n*, leading from the condensed-water chamber, the center and highest point in the turn *d''* of the siphon-pipe being always about one-half as high above the tube-plate as the evaporating-pipes *b b*. The inside diameter of the main condensed-water pipe *n*, leading from the condensed-water chamber *q*, being two inches in diameter, and the diameter of the siphon-leg *d* outside being one and a quarter inch there remains an annular space three-eighths of one inch wide around the lower end of the siphon-leg, which terminates in the main condensed-water pipe *n*. By this arrangement whenever the greater pressure in the steam-chamber *p* forces the water in its reservoir *m* over or through the siphon-pipe *d d' d''*, the action of discharging said water into the main condensed-water-pipe *n* in the direction of its discharge produces a tendency to a vacuum in the annular space, and thus tends to draw from the condensed-water chamber *q* any water that it may contain, and in a like manner, if the discharge from the condensed-water chamber *q* through the annular space should be the most rapid, its effect in passing the end of the siphon-leg *d* would be to form a partial vacuum in the siphon-pipe, and thus draw the water from reservoir *m* in the steam-chamber. This arrangement is what I term a "compensating-condense-water pipe."

On the outside of the top of the sides of the pan *o*, I make a trough, *l*, running entirely around the top of the sides of the pan, and having a capacity of about fifty gallons, the outer rim of this trough *l* being several inches higher than the inner side, which is formed by the side of the pan. At any place on the inner side of the trough *l* (as shown by the section, Fig. 3) I place a common clack-valve, *a*, with the lower side of the hole, which it covers, on a level with the bottom of the inside of the trough, and with the valve being by its upper side and its seat slightly inclined upward, so that the weight of the valve will keep it shut against the pressure of a column of water six inches high. One of these valves will be sufficient for an ordinary-size pan, and when the pan is used as a clarifier the skimmings and brushings of one charge will not, under any circumstances, more than fill the trough, and if only partially full, after having settled until the next charge is nearly ready the valve *a* is raised and the clear juice runs back into the pan, while the rejected portion is to be run off through a large pipe fixed into the trough at any convenient place for that purpose, and opened at will by a plug or valve, as illustrated in Fig. 6. When this pan is used as an evaporator or battery and foams or runs over, the sirup falls into the trough *l*, where, meeting with no heating-surface, it remains tranquil until a sufficient quantity shall have run over to open by its pressure the valve *a*, through which it runs back into the pan, until the pressure diminishing the valve closes.

Having thus fully described the nature of my improvements, with the advantages to be derived from them, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The treble bottom *g h i*, forming the steam-chamber *p* below and the condense-water chamber *q* above, in connection with the steam-pipes *c*, open at both ends and fixed into the division-plate *h*, and with the evaporating-pipes *b*, closed at the top and open at the bottom, and fixed into the tube-plate *g*, all combined substantially as described, and for the purposes set forth.

2. The compensating condense-water siphon-pipe *d d' d''*, with one leg, *d'*, starting from the reservoir *m* in the steam-chamber, and passing up through the division *h* and tube-plate *g* into the pan, to about one-half the height of the evaporating-pipes *b*, then turning down through the tube-plate *g* and in the same vertical plane with and terminating in and near the lower end of the condense-water pipe *n* of the condense-water chamber *q*, substantially as described and set forth.

Witnesses: SAMUEL H. GILMAN.
R. HARRIS,
A. MOULTON.