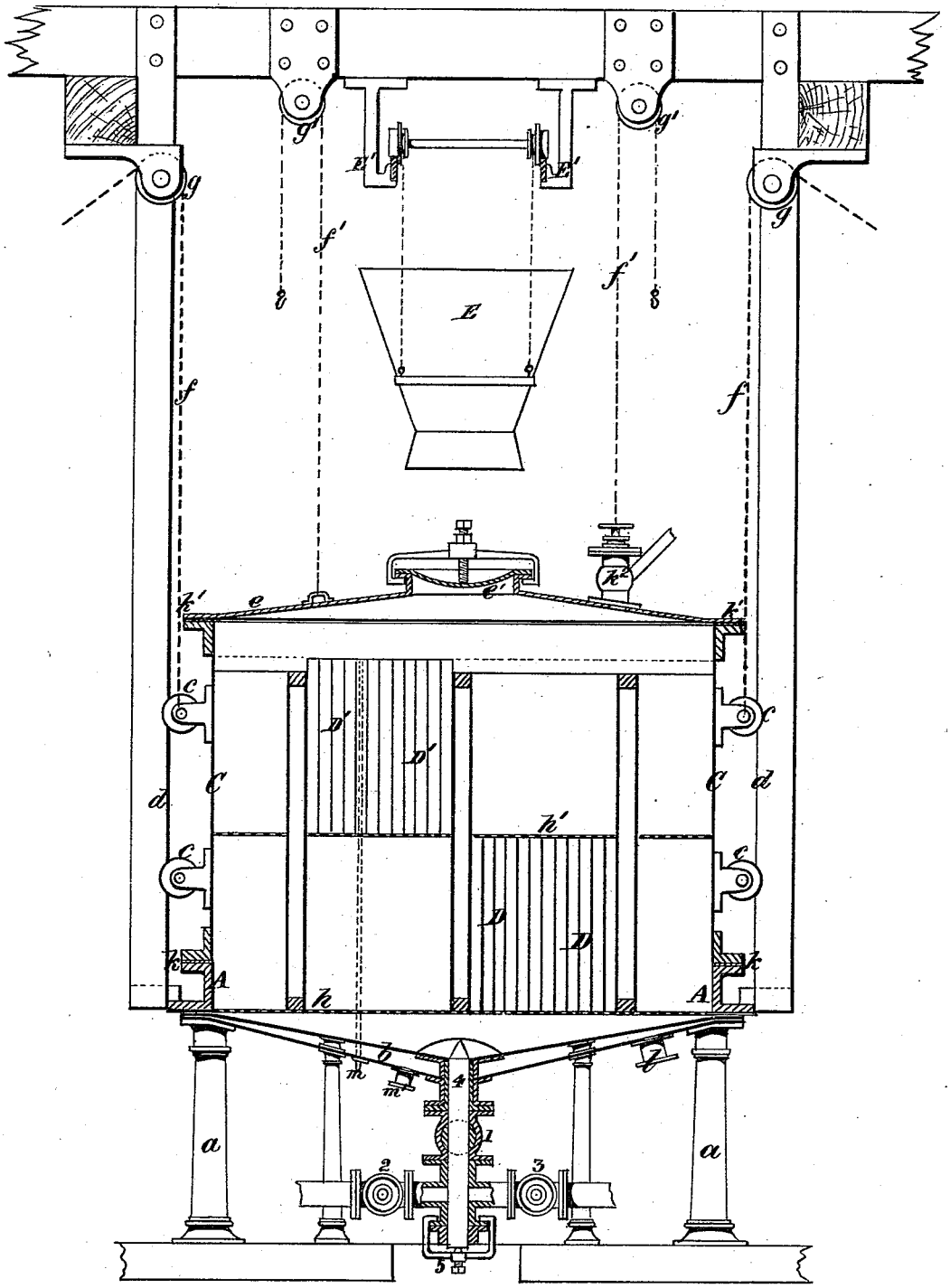
2 Sheets—Sheet 1.

A. H. SEYFERTH.

Process and Apparatus for Refining and Molding Sugar.

No. 211,797. Patented Jan. 28, 1879.



E. A. Dick
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Augustus H. Seyferth by
A. Pollok his attorney

2 Sheets—Sheet 2.

A. H. SEYFERTH.

Process and Apparatus for Refining and Molding Sugar

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Fig. 2.

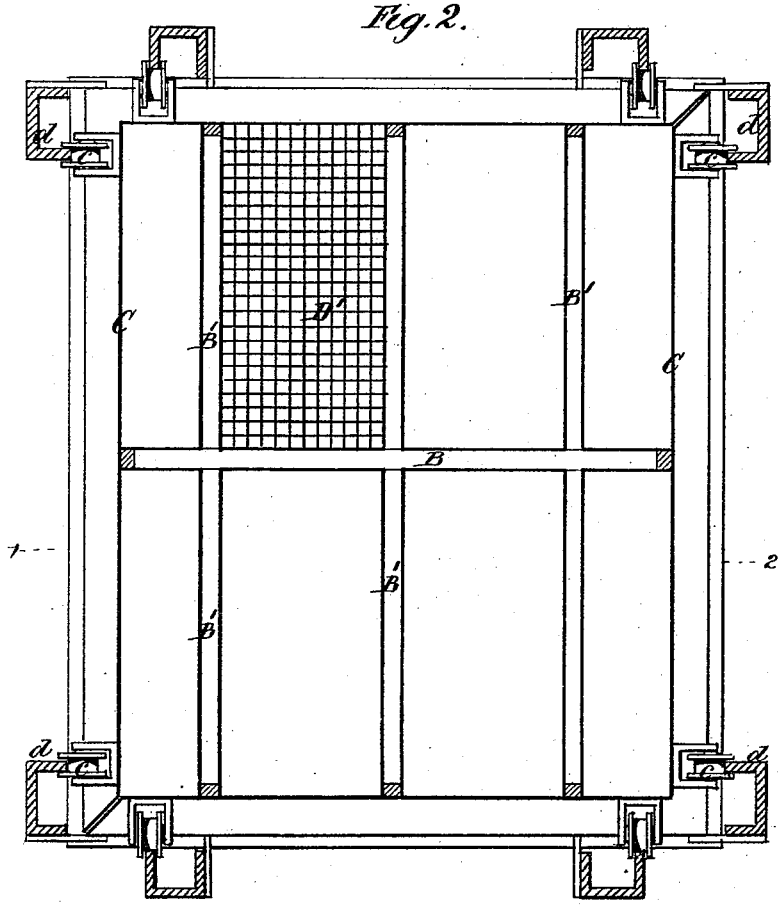


Fig. 3.

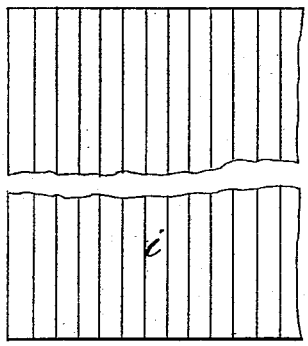


Fig. 4.

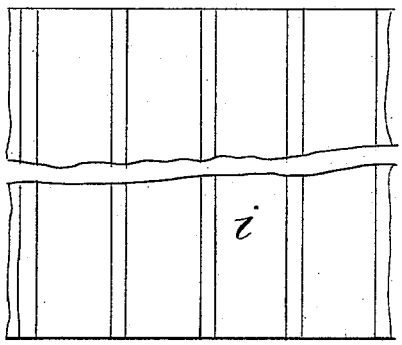
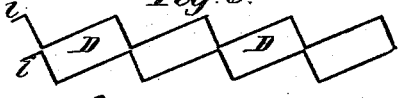


Fig. 5.

Fig. 6.



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UNITED STATES PATENT OFFICE.

AUGUSTUS H. SEYFERTH, OF BRUNSWICK, PRUSSIA.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR REFINING AND MOLDING SUGAR.

Specification forming part of Letters Patent No. **211,797**, dated January 28, 1879; application filed June 3, 1878.

To all whom it may concern:

Be it known that I, AUGUSTUS HERMANN SEYFERTH, of Brunswick, Prussia, have invented Improvements in Processes and Apparatus for Refining and Molding Sugar, of which the following is a specification:

My invention relates to the conversion of raw sugar into refined sugar, and has reference more particularly to that stage of the process at which the separation of the sirup from the newly-formed crystals is effected after the impurities have been removed from the raw sugar and the partially-refined sugar has been recrystallized; but the invention is also applicable to the removal of the impurities from the raw sugar, either for converting it direct into marketable sugar, or preparatorily to its subsequent treatment in the manner hereinafter referred to.

The removal of the sirup from the sugar, previous to its being brought into the market in the shape of loaves, has heretofore been effected either by washing the sugar when contained in the condition of what is known as "*masse cuite*" in centrifugal machines with saccharine solutions, or by blowing steam into such *masse cuite* when contained in the said machines. In the latter case the result is practically the same as in the former, a portion of the sugar contained in the machine being dissolved by the steam and forming a white saccharine solution.

Weak saccharine solutions are, however, unsuitable for washing the sugar crystals in order to free them from impurities, as, not being thoroughly charged with sugar, they have a tendency to dissolve the sugar crystals. Concentrated saccharine solutions are therefore necessarily employed, and, as their specific gravity approximates to that of the green sirup to be washed out, a mixture of the white liquor and green sirup takes place.

In order to obviate these objections it has been proposed to use alcohol, which dissolves but little if any of the sugar; but it has heretofore been found impracticable to recover the alcohol from the interior of the loaf, either by evaporation by the application of external heat on account of the large volume of sugar through which the heat has to penetrate, or by forcing air through the body of the loaf, the alcoholic vapors in the latter case becoming mixed with such air, and thereby rendered incapable of being condensed in the ordinary worm.

Sugar has also heretofore been drained to be formed into sticks in molds divided by partition-plates, no heat being employed in the process.

My invention consists in washing the sugar with concentrated alcohol charged with sugar, and subsequently separating the said concentrated alcohol by means of absolute alcohol or ether, or by washing the sugar with absolute alcohol or ether, and in either case then recovering the alcohol or ether from the mass by the application of heat to the exterior surfaces of the sugar through the intervention of the said division-plates which have served for the molding of the sugar.

My invention consists, also, in apparatus for treating the sugar in molds, constructed of plates of a corrugated stepped or zigzag shape, combined with heating appliances, whereby the *masse cuite* under treatment is divided into multiple prismatic sticks or segments of a section suitable for subdivision into lumps, and the maximum area of each of which is such as, with the aid of the said division-plates, which act as conductors, to admit of the heat in the subsequent process of evaporation, as hereinafter described, penetrating the sugar, in order to drive off the clarifying or washing agent, and thus recover the same for reutilization.

In order that my said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters of reference indicating corresponding parts in all the figures.

Figure 1 of my drawings represents a sectional elevation, taken along the line 1 2, Fig. 2, of an apparatus for the clarifying and molding of sugar constructed according to my invention, and Fig. 2 is a sectional plan of the same. Figs. 3 and 4 are elevations, and Figs. 5 and 6 corresponding horizontal sections, illustrating, respectively, two modifications of molds.

In carrying out my invention I employ a

rectangular vessel, A, supported on suitable columns *a*, and having a double conical bottom, forming a steam-space, *b*, which latter is in communication with a narrow vertical chamber, B, extending across the vessel A, and in its turn communicating with similar chambers B′, constructed at right angles to it.

Over the vessel A, with its vertical chambers B B′, is placed a hood, C, which is fitted with rollers *c*, adapted to guide-bars *d*, so as to admit of its being readily moved vertically, and is also furnished with a removable cover, *e*, having a man-hole, *e′*, chains *f f′*, and pulleys *g g′* being provided for the facility of raising and lowering the hood C bodily or its cover *e*, as required.

A cock, 1, is fitted to the lower part of the vessel A, and below it are provided two other cocks, 2 3, for the purposes hereinafter explained.

At a convenient distance above the double bottom *b* there is arranged a perforated false bottom, *h*, (the plates forming the sides of the vertical chamber B extending downward through the same,) upon which (the hood C being elevated) is placed in a vertical position a series of plates, *i*, of a corrugated step or zigzag shape—such, for example, as are shown in detail in Figs. 3 and 5 and Figs. 4 and 6, respectively—so constructed and arranged that the whole space is divided into a large number of prismatic cells or cavities, D, corresponding, for example, to the size of the sticks or segments of sugar intended to be made. The hood C is then let down upon the vessel A and securely bolted to it at *k*, at which part it is provided with an india-rubber ring for the facility of forming a tight junction. The cock 1 is then opened, and a plug, 4, having a conical end, is inserted through the cock and its connections, and held in position by a clamp, 5, the object of the plug 4 being to preserve the cock and its connections free from sugar when the apparatus is charged. The charging is then proceeded with in the following manner: The cover *e* of the hood C being elevated, and its manhole *e′* open, the sugar as it is taken from the vacuum-pan is conveyed by means of suspended chargers E, traversing an overhead track, E′, over the apparatus, and discharged into the same, the sugar being supplied to a level considerably above the top of the molds D, in order to compensate for the diminution of volume which takes place in cooling, and the apparatus is then allowed to stand for a sufficient time for subsidence to take place.

When the sugar contained in the molds D has partially set, there is placed upon the top of the said molds another perforated false bottom, *h′*, (similar to the perforated false bottom *h*,) and upon it another series of division-plates, so as to form a second series of prismatic cavities, D′, similar to the lower series, D. The charging is then resumed, and the sugar allowed to subside; or, when the perforations of the false bottom *h′* are of a sufficiently large mesh, both series of molds may be charged simultaneously, the sugar passing from the upper molds through the plate *h′* to the lower molds.

After the sugar has completely set the plug 4 is partially withdrawn from the cock 1, so as to admit of the escape of the green sirup which has collected beneath the perforated false bottom *h* through the cock 2, whence it is conducted to a suitable collecting-tank. The cover *e* is then lowered onto the top flange, k^1, of the hood C, (faced with india-rubber,) and is securely bolted to the same, and the cover of the man-hole *e′* is also closed, thereby rendering the whole apparatus perfectly tight.

The upper part of the apparatus is then filled with alcohol, of a strength of, say, about ninety-five per cent., the same being introduced through a valve, k^2, and flexible connections from a tank situated above. As soon as it is ascertained that the discharge through the cock 2 contains alcohol, that cock is closed, and the cock 3, which is in communication with distilling-vessels, is opened, the mixture of sirup and alcohol being allowed to flow into the said vessels until it is ascertained that the fluid passing the valve 3 is perfectly colorless.

The supply of ninety-five per cent. alcohol is then stopped for, say, two hours, until the level of the alcohol descends below that of the top of the sugar, and absolute alcohol is then supplied through the valve k^2, and by this means the ninety-five per cent. alcohol is washed off from the sugar crystals, and the sugar is also freed from all trace of water. When the whole of the ninety-five per cent. alcohol has been separated the supply of absolute alcohol is stopped, and the apparatus is then allowed to drain for, say, about six hours, (the period varying according to the density of the mass,) after which the remainder of the alcohol and moisture is removed by heat. For this purpose steam is introduced through a valve, *l*, into the space *b*, an air-cock provided at *m*, and a valve, *m′*, for the escape of water of condensation being left open, in order to obviate any liability of the overheating of the sugar, or of any excess of pressure taking place.

The alcohol is now evaporated and conducted partly direct by the valve k^2 to cooling-coils, and partly by the cock 3 to the distilling-vessels. When the controlling apparatus of the condensing apparatus indicates that the distillation is complete, the cover *e* of the washing and molding apparatus is first unfastened and lifted off, after which the hood C is also removed, the latter being made in two diagonal halves to facilitate the dismounting. The dry sugar is then taken out of the apparatus, together with the division-plates, the apparatus is washed out, and is ready for a fresh charge.

The sugar contained under the false bottom *h* may either remain for the next operation or it may be dissolved out. The porous sugar

at the upper part above the forms is taken off and placed in tanks, into which the alcohol from the cooling apparatus is conducted, so as to become charged with sugar, the alcohol thus saturated escaping through a perforated false bottom into a chamber below, whence it is drawn to be supplied through the valve k^2 for operating upon a fresh charge of sugar.

The mixture of green sirup and alcohol runs from the cock 3, leading to the distilling apparatus, is distilled by the temperature being elevated by means of steam, and the alcoholic vapors are condensed (according to requirements) into ninety-five per cent. or absolute alcohol. The last remainder of alcohol contained in the sirup is distilled off by steam and then condensed.

Vessels are provided which are filled with chloride of calcium, and serve the purpose of rectifying the alcohol.

The chloride-of-calcium solution obtained in this operation is raised to a tank, and by means of an evaporating apparatus evaporated down to dryness and then filled into a chloride-of-calcium column for reutilization.

If desired absolute alcohol or ether may be used for the first washing in substitution for concentrated alcohol, or a non-alcoholic white saccharine solution may be employed, in which case the residue of the solution after draining may be exhausted by placing the cock 1 in communication with a vacuum apparatus.

When the invention is applied to the treatment of raw sugar for washing out its impurities and separating the molasses which it contains, the alcoholic saccharine solution employed may be of a specific gravity of, say, about 1.05, it having been ascertained that the sirups contained in raw sugar are not readily soluble either in ninety-five per cent. or absolute alcohol, or a non-alcoholic white saccharine solution may be employed, as before mentioned.

The invention is also applicable to the production of what is known as "moist sugar" as well as sugar to be used in the condition of lumps.

If desired the molding apparatus may be formed with a number of conical depressions and apertures in its bottom in lieu of the entire bottom consisting of one extended depression, and the apparatus may be mounted on wheels in lieu of being made stationary.

I claim as my invention—

1. The mode or process of clarifying sugar and converting the same into a marketable product by washing it with concentrated alcohol charged with sugar, and subsequently removing the said concentrated alcohol by means of absolute alcohol or ether, or by washing the said sugar with absolute alcohol or ether, and in either case then recovering the alcohol or ether from the mass by the application of heat to the exterior surfaces of the sugar through the intervention of division-plates, which have served for the molding of the sugar into prismatic sticks or forms of a section suitable for subdivision into lumps or otherwise, substantially as hereinbefore described.

2. A containing vessel or chamber for clarifying and molding sugar, combined with suitable heating appliances, and divided by plates into multiple cells or cavities forming prismatic sticks or segments of sugar of a section suitable for subdivision into lumps or otherwise, the said plates also serving as conductors for heat when the same is employed in the subsequent process of expelling the clarifying agent or agents in order to recover such agent or agents for reutilization, substantially as hereinbefore described.

In witness whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUSTUS HERMANN SEYFERTH.

Witnesses:

WILLIAMS C. FOX,

JOHS. KRACKE.