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J. S. BLYMYER.

EVAPORATING PANS.

No. 182,549. Patented Sept. 26, 1876.

Fig. 1.

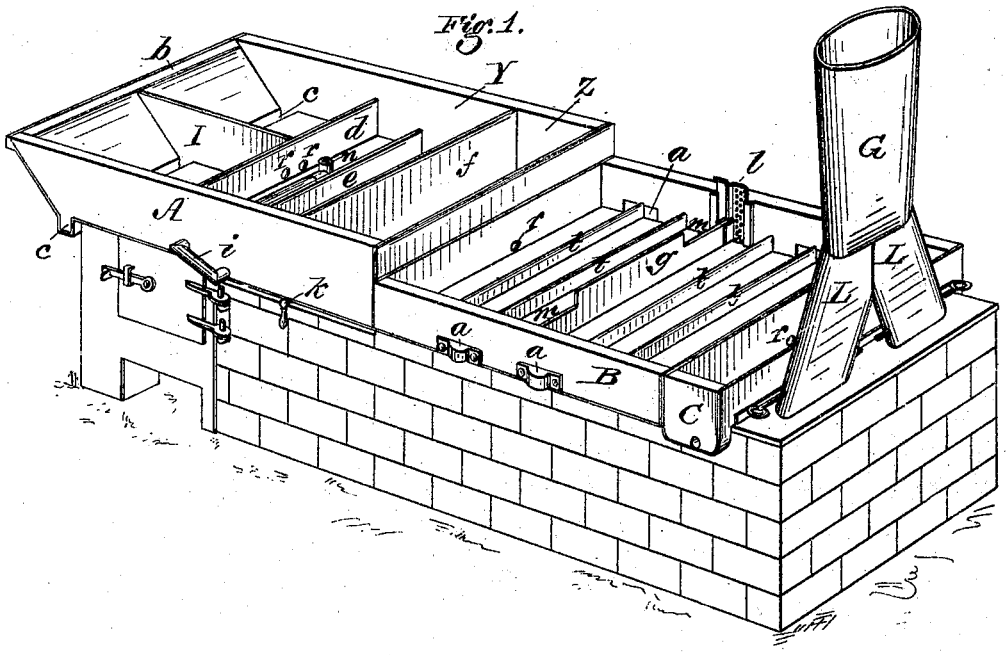
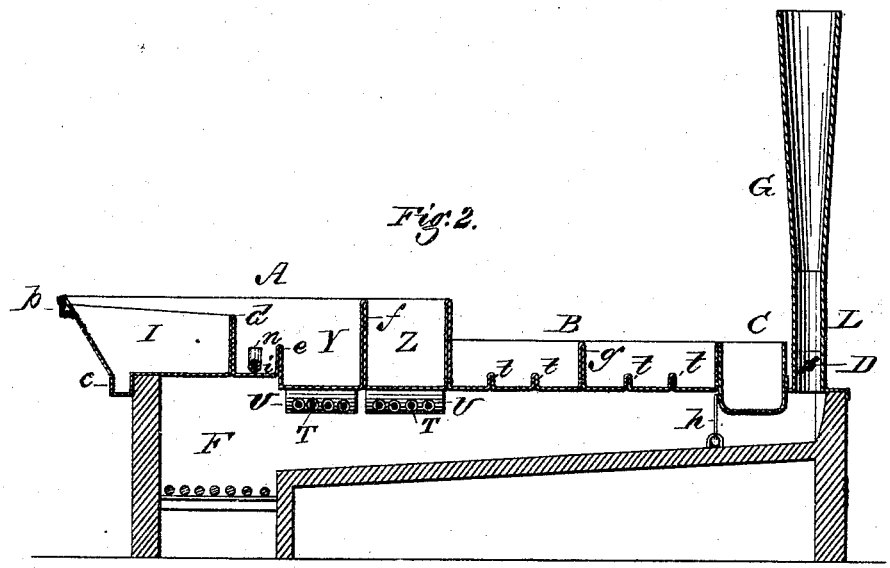


Fig. 2.



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2 Sheets—Sheet 2.

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Fig. 3.

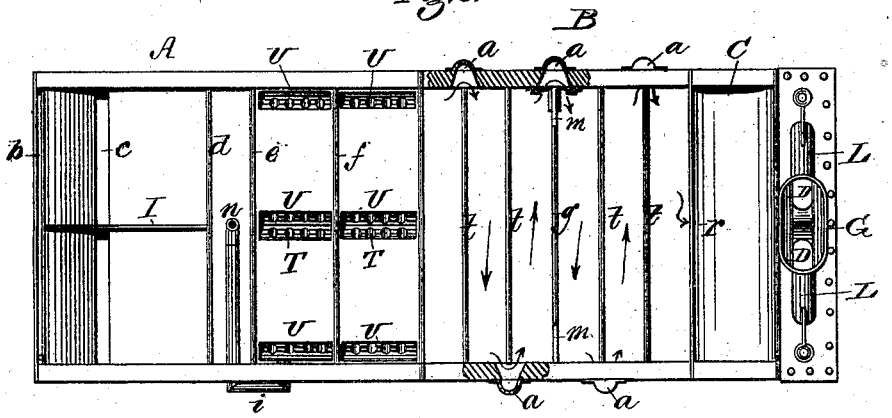
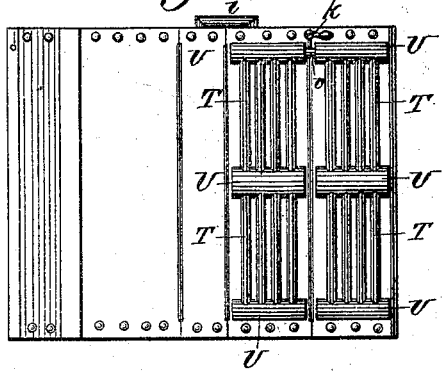


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN S. BLYMYER, OF CINCINNATI, OHIO.

IMPROVEMENT IN EVAPORATING-PANS.

Specification forming part of Letters Patent No. **182,549**, dated September 26, 1876; application filed May 1, 1876.

To all whom it may concern:

Be it known that I, JOHN S. BLYMYER, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain Improvements in Evaporators, of which the following is a specification:

My invention consists of a pan, or series of pans, of peculiar construction, for the evaporation of saccharine juices for the manufacture of sugar, as hereinafter more fully described.

Figure 1 is a perspective view of my improved apparatus. Fig. 2 is a longitudinal section. Fig. 3 is a top plan view, and Fig. 4 is a bottom plan view, of a portion.

The object of my present invention is to produce an apparatus for performing all the operations usually performed in a series of kettles or pans in preparing cane or similar juices for the manufacture of sugar.

In the evaporation of cane-juice, three conditions or steps are required, viz: First, the juice must be cleansed of all extraneous matter, as far as possible, which can only be done at a comparatively low heat; second, the evaporation proper, which requires a higher degree of heat, and which it is desirable to hasten as much as possible, and at the same time so conduct as to enable the operator to remove the remaining impurities; and, third, to finish or condense the juice to a point ready for crystallization. These operations are frequently, if not generally, carried on by means of a series of kettles or pans, used separately, requiring much time and labor, while my invention is designed to produce a pan or apparatus by which all these operations can be carried on simultaneously and continuously, with rapidity and economy. To enable this to be done, I construct my improved apparatus as shown in the several figures of the drawings. It consists, essentially, of a pan or evaporator, divided into three parts, A, B, and C, the first to cleanse the juice, the second to rapidly evaporate it, and the third to finish it, these three parts being all made together as parts of one pan, if desired, though I prefer to make them separate, for convenience in shipping them.

The part A, as shown in Figs. 1 and 2, is made with its sides much higher than the part B, so that the juice may stand of greater depth therein. The front end of the part A is made inclined, as shown, with a pocket, *b*, at its top, for receiving the lighter material, which will rise to the surface when the juice is heated; and at the bottom of the incline I make another pocket, *c*, for catching and retaining the heavier impurities. The pan or section A is divided by transverse partitions *d* and *f* into three compartments, the first of which is again divided by a longitudinal partition, I, thus making four separate compartments in all. In the central compartment there is placed a transverse partition, *e*, much lower than the others. Openings *r* are made through the partition *d* for the juice to pass from the first to the second compartment; and in this second is arranged an open-ended tube, *i*, which extends out through the side of the pan, and re-enters the pan after passing around the end of the partition *e*, as shown in Figs. 1 and 3. Upon the inner end of this tube I place loosely an elbow-joint or short tube, *n*, the mouth or open end of which can be turned up or down, thereby regulating the depth at which the juice will stand in these compartments.

The bottoms of the two compartments Y and Z are formed with three longitudinal recesses, U, one at the center and one near each side, as shown in Fig. 3; and the central recess is connected with each of the others by a series of tubes, T, located underneath the bottom of the pan, as shown in Figs. 2, 3, and 4, the latter representing the pan as being turned bottom up. It will be seen, by observing Fig. 2, that these tubes T are located some little distance below the bottom of the pan, thus leaving an open space all around them for the flame and heat to play through, as well as against the bottom, so as to produce a rapid boiling of the liquid at this point. As shown in Figs. 2 and 4, a small tube, V, connects the recesses U at one or both sides, and is provided with a cock, K, by which the juice is admitted from the compartment Y into the adjoining compartment Z. The object and operation of these parts will be more fully described hereafter.

The part B is made more shallow, and is divided by a series of transverse partitions, *t*,

of uniform height, or nearly so. About midway there is another partition, *g*, which is made higher than the others, but which is cut away at each end, as shown at *m*, Figs. 1 and 3. At the end of these several partitions, as shown in Fig. 3, a passage is made through the side of the pan around the end into the next apartment; and these passages being arranged alternately at opposite sides, so that the juice in passing from one to the other compartment will be compelled to flow back and forth across the pan, as indicated by the arrows in Fig. 3. As shown in Fig. 1, gates or slides *l* may be arranged at one or more of these side passages to regulate the flow of the juice; and, if desired, some of these may be of perforated metal, or similar material, to serve as strainers, so as to prevent the passage of any foreign matter that may happen to be in the juice. Instead of forming these side passages, as shown, tubes may be used to connect the several compartments outside of the pan, and be provided with cocks for regulating the supply of the juice to each compartment, though it is intended to have the juice in all of them of a uniform depth, or nearly so.

The last section, C, is intended for the final concentration of the juice, and is denominated the finishing or "strike" pan. This, as shown in Figs. 1 and 2, is quite narrow, and much deeper than the section B, it being a plain smooth pan or vessel, without any partitions. As shown, it is located at the rear end of the furnace, where the heat is less intense, whereby the danger of scorching or burning the concentrated juice or sirup is avoided. The apparatus thus constructed is set on a furnace, as shown in Figs. 1 and 2, the fire-chamber of which is at the front end, under the front part A of the evaporator.

The smoke-pipe is located at the rear end, and is divided at its lower portion into two separate pipes, L, one starting from near each side, and converging and uniting in a single pipe, G, as shown in Fig. 1. Each of the pipes L is provided with a separate damper, D, as shown in Fig. 2, so that the draft in either or both can be regulated at will. By this arrangement the heat can be drawn from the center toward the sides, thereby equalizing the heat under all parts of the strike-pan C, or it can be thrown more to one or the other side at will.

Within the furnace-flue, just at the front of pan C, I also place another damper, *h*, which extends from one side half-way or more across the flue, and which has a handle projecting outward through the wall, so that said damper can be turned up, as shown in Fig. 2, in which case the heat and smoke are made to pass to the opposite side, around the end of said damper, and from thence are made to travel lengthwise under the pan C, the damper D in the pipe L at the further side being closed, in which case more heat will be applied to the pan C. In case it be required to apply less heat to the pan C, the damper *h* will be turned up, and the damper D in the farther pipe L will be opened, while the other will be closed, in which case the heat will pass under one end only of the pan.

The pans may be made wholly of metal, or the bottom may be of metal and the sides of wood, as preferred; and they may be all made together as one, or in sections, the latter being more convenient for shipment. As shown in Fig. 1, a tube or opening, *r*, serves to connect them, and permit the juice to flow from one into another.

The size of the apparatus and the number of partitions may be varied at will within certain limits; but it is the intention to make the apparatus of such a size that the entire operation of cleansing, evaporating, and finishing the juice or sirup shall all be performed by the time it has traversed the length of the apparatus, thereby performing the entire operation by means of one fire and one apparatus.

The operation is as follows: The juice is fed into either of the compartments at the front end of section A, where, as it is gradually heated, all the lighter material will rise to the surface and form a scum, which will either float or be brushed back into the upper pocket *b*. As the juice enters the next compartment Y it will be made to boil vigorously, whereby still more material will rise in the form of a scum, and as the heat will be much more intense at the center, the juice will flow from the center over toward the sides, carrying the floating matter with it, which will there be skimmed off by the attendants, and thrown back into one or the other of the compartments on opposite sides of the partition I, and as the heat tends to cause the fluid in said compartments to constantly rise and flow back toward the front end, the lighter matter will work or be brushed over into the pocket *b*, while the heavier particles will fall into the pocket *c*, where they will be retained.

The arrangement of the cavities U and the tubes T enables the juice to be boiled far more rapidly than in a smooth-bottomed pan, as there is far more heating-surface, and in addition thereto the juice will constantly enter the tubes at the sides of the pan, and discharge and rise at the center, flowing from thence over to the sides, thus greatly expediting the cleansing of the juice by the constant accumulation of the scum and foreign matter at the sides, where it can be readily removed.

By means of the tubes in the compartment Z, the juice is rapidly evaporated, so that by the time it enters the section B is much more thoroughly cleansed and reduced or concentrated than in the ordinary pans heretofore used.

By the peculiar construction of the section B the juice is not only made to travel forward and back across the same, but it is drawn

from the bottom of one into the next compartment, thereby retarding the passage of any floating material, which will be skimmed off by the attendant as it accumulates.

By having the fluid in the section B more shallow it can be more rapidly evaporated, and as it is always hottest at the center, the scum and floating matter will accumulate there, where it will be held back by the higher portion *g* of the partition, while any that rises farther along in the pan can be brushed back over the depressions *m* at the ends of the partition.

If desired, all the partitions in section B may be made like the partition *g;* but this is not deemed necessary, as the juice will be so thoroughly cleansed in section A.

By the time the juice has passed through the several compartments of section B it will be in proper condition to enter the strike-pan C, where it will be finished.

I am aware that tubes have been used in evaporators in various ways, in some cases being arranged to conduct the juice from the pan through the walls of the furnace and the fire, and in other cases being arranged vertically, so to connect an open pan above, with a closed pan below, and therefore I do not claim, broadly, the use of tubes, irrespective of their special arrangement in connection with other parts of the pan; but

Having thus described my invention, what I claim is—

1. The pocket *c* in the bottom, and located outside of the furnace, substantially as described.

2. An evaporating-pan, having the longitudinal depressions or trough-like cavities U in its bottom, in combination with the tubes T, all constructed and operating substantially as described.

3. An evaporating-pan, provided with one or more partitions, *g*, with recesses *m* at its ends, substantially as and for the purpose set forth.

4. In combination with the finishing-pan C, the converging flues or pipes L L, each provided with a damper, D, arranged to be operated independently, as described.

5. The combination, in an evaporator, of the converging flues L L, each provided with a damper, the pan C, and the damper *h* extending part way across the flue, all being arranged to operate substantially as described, for controlling the application of heat to the finishing pan, as set forth.

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GUSTAV BEROLD.