Nov. 18, 1924. 1,515,925

F. L. BURRELL

DEHYDRATOR

Filed Aug. 21 1923 4 Sheets-Sheet 1

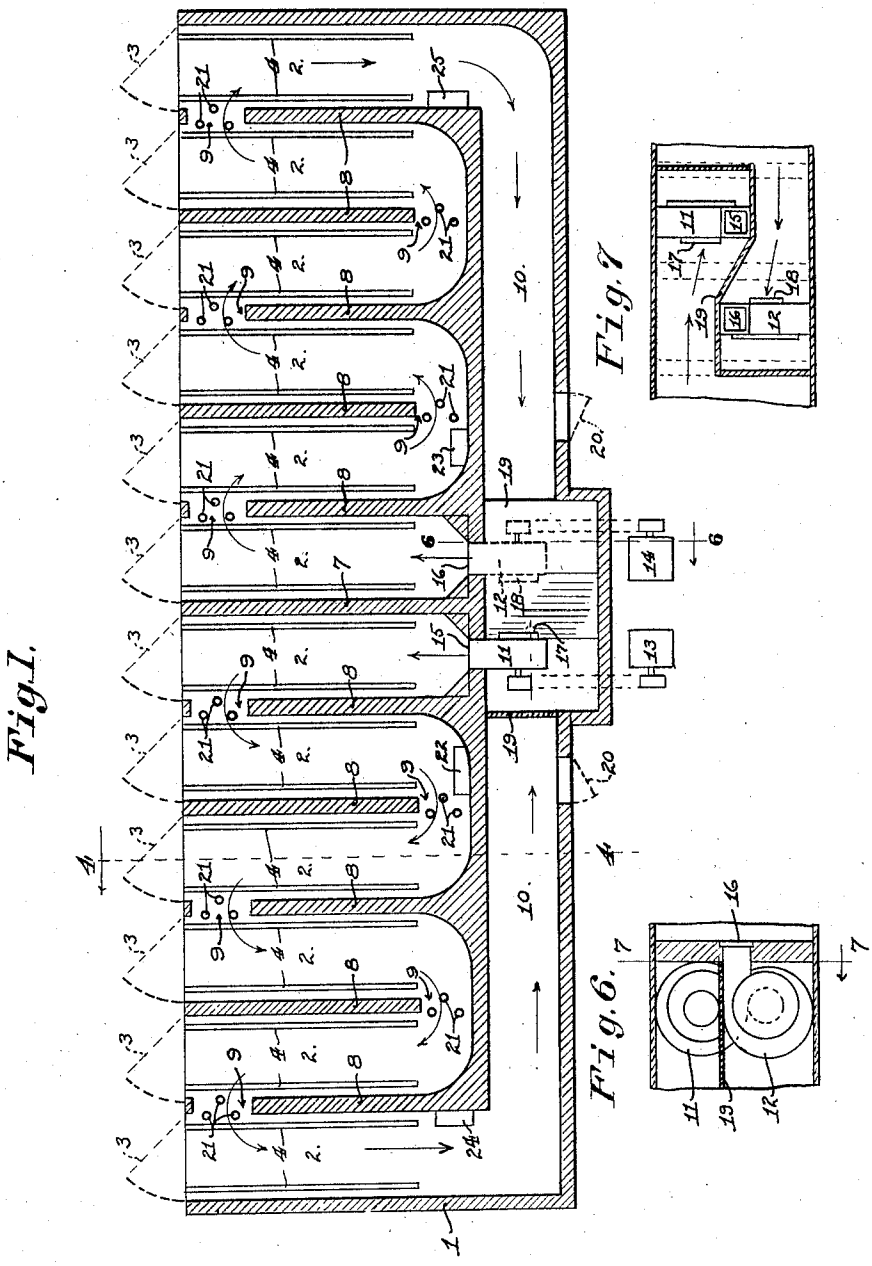

Fig. 1.

Fig. 7

Fig. 6.

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Fig. 2.

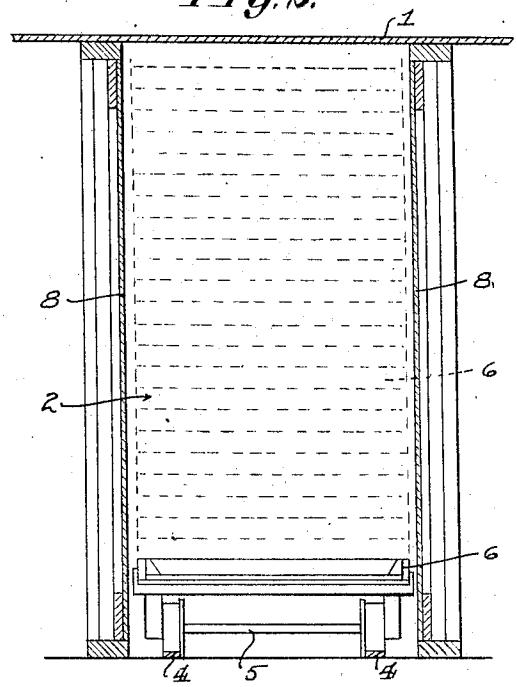
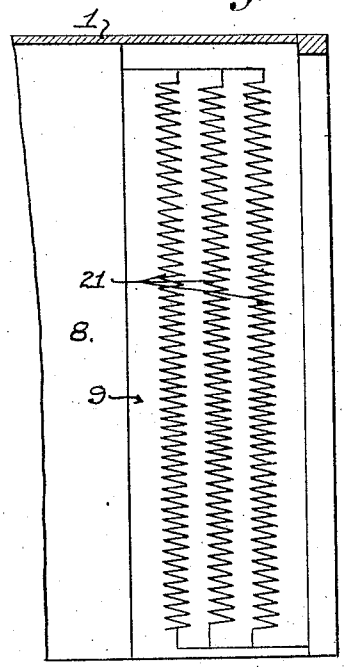


Fig. 3.



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DEHYDRATOR

Filed Aug. 21, 1923 4 Sheets-Sheet 3

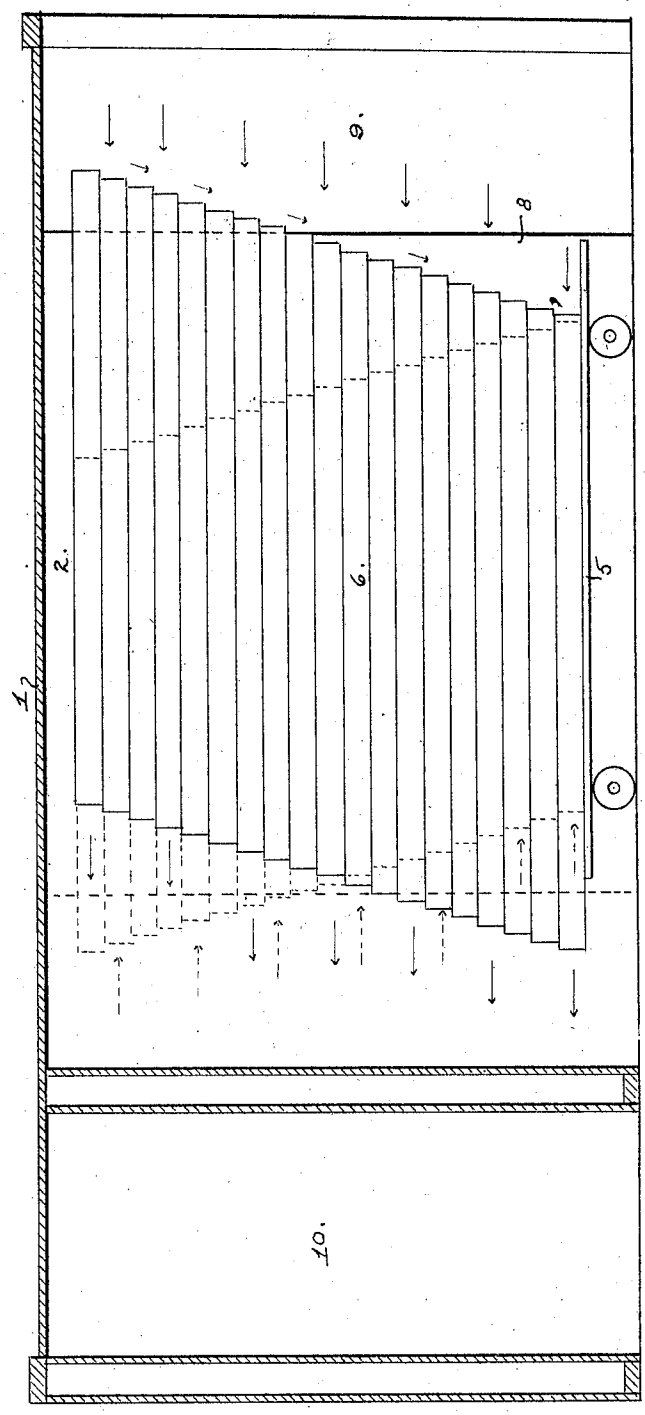

Fig. 4.

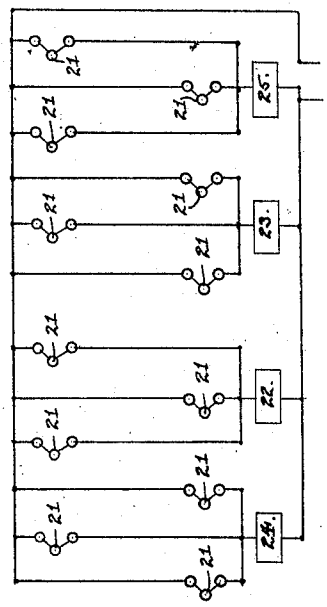

Fig. 5.

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Fig. 9.

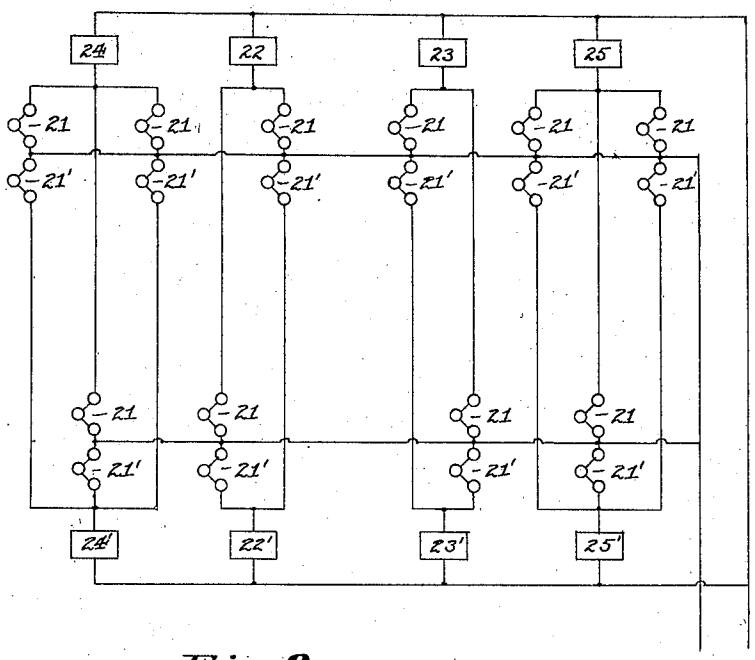
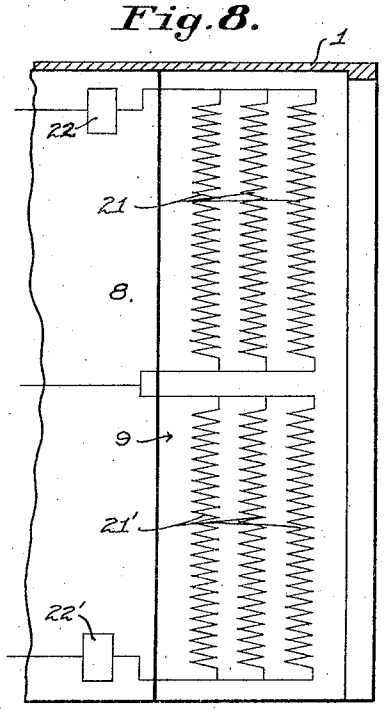


Fig. 8.



INVENTOR

Frank L. Burrell

BY

Booth & Booth

ATTORNEYS

Patented Nov. 18, 1924. 1,515,925

UNITED STATES PATENT OFFICE.

FRANK L. BURRELL, OF SAN JOSE, CALIFORNIA, ASSIGNOR TO ANDERSON-BARN-GROVER MFG. CO., OF SAN JOSE, CALIFORNIA, A CORPORATION OF CALIFORNIA.

DEHYDRATOR.

Application filed August 21, 1923. Serial No. 658,641.

To all whom it may concern:

Be it known that I, FRANK L. BURRELL, a citizen of the United States, residing at San Jose, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Dehydrators, of which the following is a specification.

My invention relates to dehydrators of the batch or discontinuous type.

The object of my invention is to provide a means for extracting moisture from food or other products, in which a larger amount of such product may be evenly and uniformly dried at each run or operation, and in which the temperature may be accurately controlled, to maintain the maximum efficiency without danger of overheating. A further object of the invention is to provide means for independently controlling the temperature of different portions of the product, to insure uniformity in the drying process. A still further object is to provide means for regulating the temperature which can, if desired, be controlled automatically by thermostatic action.

A preferred embodiment of my invention is herewith illustrated and hereinafter described, with the understanding that the construction shown and described may be varied, within the limits of the claims hereto appended, without departing from the essential principles of the said invention.

Referring to the accompanying drawings; Fig. 1 is a sectional plan of a preferred form of my dehydrator, certain portions being indicated diagrammatically.

Fig. 2 is an end elevation, enlarged, of one of the stalls, showing a stack of trays therein for holding the product.

Fig. 3 is a partly diagrammatic elevation of one form of heating member, showing its position in the air passage.

Fig. 4 is a transverse section taken in the direction of the arrow on the line 4—4 of Fig. 1 and enlarged, showing a side view of one of the stacks of trays.

Fig. 5 is a diagram of a suitable arrangement of the electrical heating circuits.

Fig. 6 is a sectional detail taken in the direction of the arrow on the line 6—6 of Fig. 1.

Fig. 7 is a sectional detail taken in the direction of the arrow on the line 7—7 of Fig. 6.

Fig. 8 is a partly diagrammatic elevation of one heating member of a slightly modified form.

Fig. 9 is a diagram of the arrangement of the electrical heating circuits employed when the heating members are as shown in Fig. 8.

In the drawings, the reference numeral 1 designates the shell of an elongated box-like structure having a plurality of transversely disposed adjacent stalls or chambers 2 adapted to be closed by doors indicated by dotted lines at 3. Each stall 2 is provided with tracks 4, upon which may be run a truck 5, as seen in Figs. 2 and 4. The product to be dried is placed in trays 6 of the usual form, which are stacked upon the trucks 5 and run into the stalls 2, the doors 3 being then tightly closed.

A vertical transverse partition 7, Fig. 1, divides the structure into two symmetrical end portions. The other vertical partitions 8 between the stalls 2 are provided with openings 9 arranged in staggered relation, as shown in Fig. 1, and preferably extending from the top to the bottom of the shell 1. These openings 9, with the stalls 2, form a continuous tortuous passage for the air or other drying medium, through each end portion of the structure, the paths of said medium being indicated by the arrows. It will be seen that, on account of the relative positions of the stacks of trays 6 (not shown in Fig. 1) and the openings 9, the air in following its tortuous paths from the center toward the ends of the shell 1, passes successively through said stacks of trays.

The last, or endmost of the stalls 2 communicate with a longitudinal passage 10 at the rear of the shell 1, which conducts the air back toward the center from both ends. A pair of blowers 11 and 12 are positioned in the central region of the return passage 10, said blowers being driven by any suitable means indicated in Fig. 1 at 13 and 14 respectively. The outlets 15 and 16 of the blowers 11 and 12, which discharge respectively into the stalls 2 immediately adjacent to the central partition 7 on each side are preferably in horizontal alignment, as shown in Figs. 6 and 7, to insure even distribution of the air, but the blowers themselves are reversed with respect to each other, so that the intake 17 of the blower 11 is elevated above the intake 18 of the blower 12. A partition 19 divides the passage 10 be-

tween said blowers in such a manner that the air coming from the right hand end of the shell, as viewed in Fig. 1, passes to the intake 17 of the blower 11, and is forced through the discharge 15 into the left hand end of the shell, returning through the left hand portion of the passage 10 to the intake 18 of the blower 12, by which it is forced through the right hand end of the shell. The path of the air is thus continuous, and in the form of a figure eight, passing first through one end portion of the shell 1, then back to the center and through the other end portion, and finally back to the center again. Doors 20, Fig. 1, are preferably provided in the rear wall of the passage 10 to permit changing the air when necessary.

Each opening 9 between adjacent stalls 2 is provided with a heat radiating member over which the air must pass in traversing said opening. Said heat radiating members may be of any suitable and well known construction, and may be heated by any suitable means, but for the sake of simplicity and ease of control I prefer to employ electric heating elements of suitable form. I have indicated such an electric heating element in Fig. 3 of the drawings as comprising coils 21 occupying nearly the full height and width of the opening 9.

The several heating members 21 may be arranged and controlled in any desired manner and combination and there may be any desired number of such members. For purposes of illustration I have shown in Fig. 5 a diagram illustrating a suitable arrangement of electrical circuits for controlling twelve heating members 21, although but ten such members are shown in Fig. 1. In each end of the shell 1, the heating coils nearest the outlet of each blower are connected in one circuit and those farthest from said blower outlet in the other circuit, thus making two circuits for each half or end of the shell, or four circuits in all, two controlling the heaters near the respective blower outlets, and the other two controlling the more remote heaters. Each circuit is preferably controlled by a thermostatic current regulator, of any well known form, said regulators being indicated diagrammatically in Figs. 1 and 5 by 22, 23, 24 and 25, the regulators 22 and 23 controlling the circuits of the heating coils nearest the blower outlets, and the regulators 24 and 25 controlling those farthest from said blower outlets. Said regulators are suitably placed within the air passages, as indicated in Fig. 1.

It will be seen from the foregoing that the air circulates through the shell 1 in a closed path, passing successively through the stacks of trays and the heating members, one of which is interposed between each two adjacent stacks. Therefore, as the air is cooled in passing over the product in the stacked trays, it is reheated to its proper temperature before being passed through the next stack, and is maintained at said proper temperature throughout its entire course. Moreover, by controlling the heating members near the ends of the shell independently of those near its center, I am able not only to maintain an even temperature throughout the length of the shell, but to maintain a slightly higher temperature at the ends, if such be necessary to compensate for the increased humidity in these regions, and thereby to insure even drying of the entire batch of product. The air is thus circulated through the shell until its humidity rises to such a point that it becomes inefficient as a drying medium, whereupon a fresh supply of air is admitted through the doors 20, and the humid air expelled through any of the doors 3.

A slightly modified arrangement of the heating members and their controlling circuits is shown in Figs. 8 and 9, which permits separate control of the temperature in the upper and lower portions of the shell, to compensate for the natural tendency of the warmer air to rise toward the top. In this arrangement each heating member comprises an upper section 21 and a lower section 21′, the two sections together occupying substantially the entire area of the opening 9. The upper section 21 is controlled by a suitable thermostatic regulator indicated at 22, and positioned in the upper portion of the shell, as shown in Fig. 8, and the lower section 21′ is separately controlled by a similar regulator indicated at 22′ and positioned in the lower portion of the shell. The complete electrical circuits for such an arrangement of heating members is shown in diagram in Fig. 9, the several groups of upper heating members 21 being respectively controlled by the regulators 22, 23, 24 and 25, and the lower groups 21′ by the regulators 22′, 23′, 24′, and 25′. As in the previously described arrangement, the regulators 22, 23, 22′, and 23′ control the heating members in the central region of the shell, and the regulators 24, 25, 24′ and 25′ control those at the ends. Thus I am able not only to regulate independently the temperature of different longitudinal sections of the shell, but also the temperature of its upper and lower portions, so that an even and constant temperature may be maintained in all portions of said shell.

I have found material advantage in positioning the trays 6 upon the trucks 5 in an inclined or overhanging stack as shown in Fig. 4, each tray being slightly displaced longitudinally with respect to the one beneath. The stack is inclined against the air current; that is, if the direction of the air current be from right to left as indicated by

the full line arrows in Fig. 4, then the top of the stack must incline toward the right, as shown. The stack in the next adjoining stall will be oppositely inclined, as shown by the dotted lines, because the air passes through said stall in the opposite direction, as indicated by the dotted arrows. The effect of this inclined stacking of the trays 6 is not only to permit freer circulation of the air through the stacks by spacing the end members of the trays, but also to compensate for the natural tendency of the warmer portions of the air to rise to the top of the stalls. The inclined end of the stack against which the air current impinges has a tendency to set up a slight downward current as indicated by the short arrows in Fig. 4, there being more space for the air to circulate in near the bottom than near the top, thus insuring an even temperature throughout the height of the stack.

I claim:

1. A dehydrator comprising a closed shell having a longitudinal passage at its rear; spaced transverse partitions dividing said shell into a plurality of product containing chambers, each partition having an opening connecting the adjacent chambers, and the endmost chambers having openings communicating with said longitudinal passage; heating members positioned in the openings between said chambers; and means for circulating a current of air through said chambers and said longitudinal passage.

2. A dehydrator comprising an elongated closed shell; a central transverse partition dividing said shell into two substantially symmetrical portions, each portion having a plurality of successively communicating product containing chambers and a return passage leading from the endmost chamber back to the central region of the shell; heating members positioned in said chambers; and means for circulating a current of air successively through the two portions of said shell.

3. A dehydrator comprising a closed shell; spaced vertical partitions dividing said shell into a plurality of product containing chambers, each partition havng an opening extending for substantially its full height, and the openings of adjacent partitions being positioned at relatively opposite ends to form, with said chambers, a tortuous horizontal passage through the shell; means for passing a current of air through said passage; and means for heating said air during its travel.

4. A dehydrator comprising a closed shell having front and back walls; a series of spaced vertical partitions extending from the front wall and terminating short of the back wall; a second series of vertical partitions alternating with the first series, the partitions of said second series extending from the back wall and terminating short of the front wall, said two series of partitions forming a plurality of successively communicating product containing chambers; means for passing a current of air through said chambers; and means for heating said air during its passage.

5. A dehytrator comprising a closed shell; spaced vertical partitions dividing said shell into a plurality of product containing chambers, each partition having an opening extending for substantially its full height, and the openings of adjacent partitions being positioned at relatively opposite ends to form, with said chambers, a tortuous horizontal passage through the shell; means for passing a current of air through said passage; heating members positioned in said openings, said heating members being divided into upper and lower portions; and means for separately controlling the upper and lower portions of said heating members.

6. A dehydrator comprising a shell having a tortuous horizontal passage therethrough; a plurality of stacks of product containing members positioned within said passage; heating members positioned in said passage between the stacks of product containing members, said heating members being divided into upper and lower portions; means for separately controlling the upper and lower portions of said heating members; and means for passing a current of air through said passage.

In testimony whereof I have signed my name to this specification.

FRANK L. BURRELL.