July 8, 1930. L. L. EDMUNDS 1,770,102

CONTINUOUS CUBE DRYING OVEN

Filed Aug. 20, 1928 3 Sheets-Sheet 1

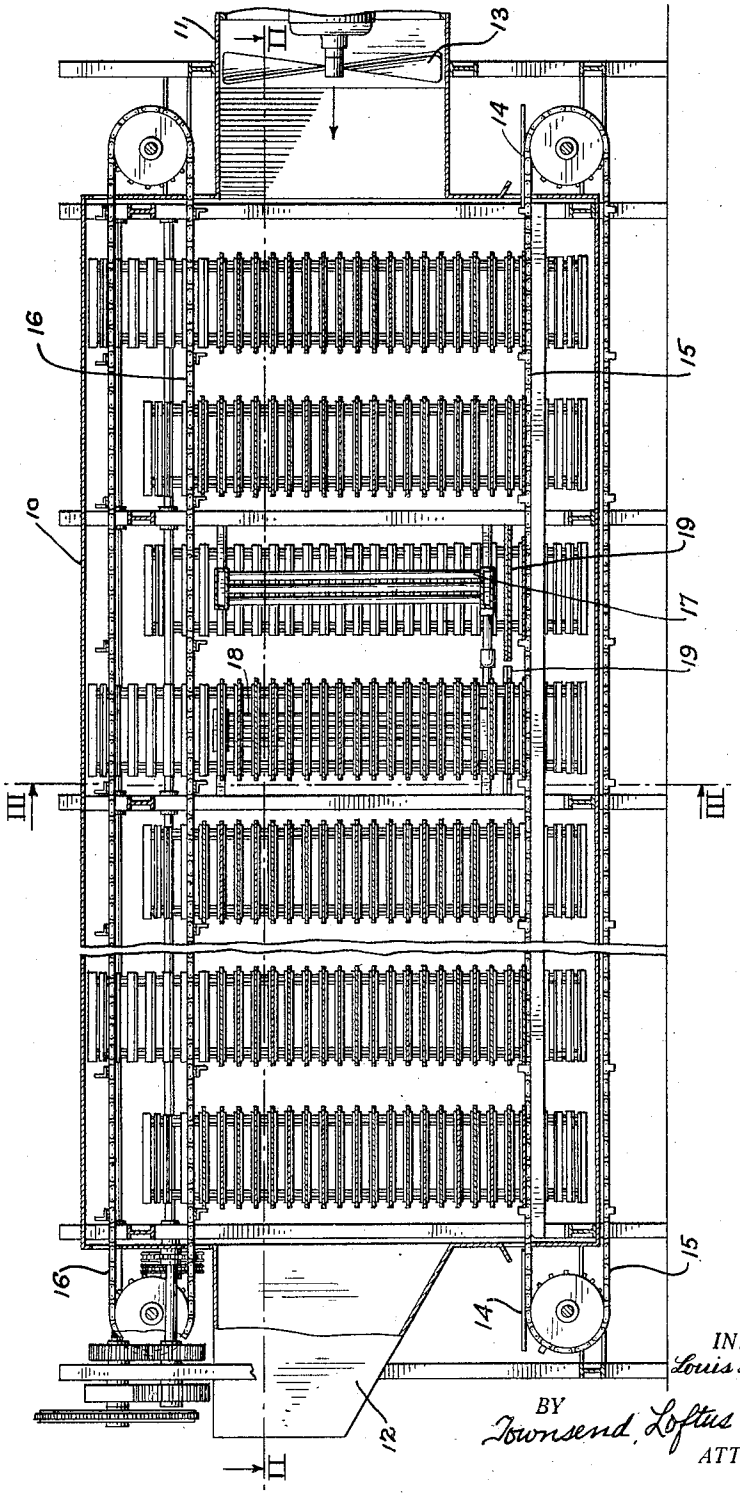

Fig. 1.

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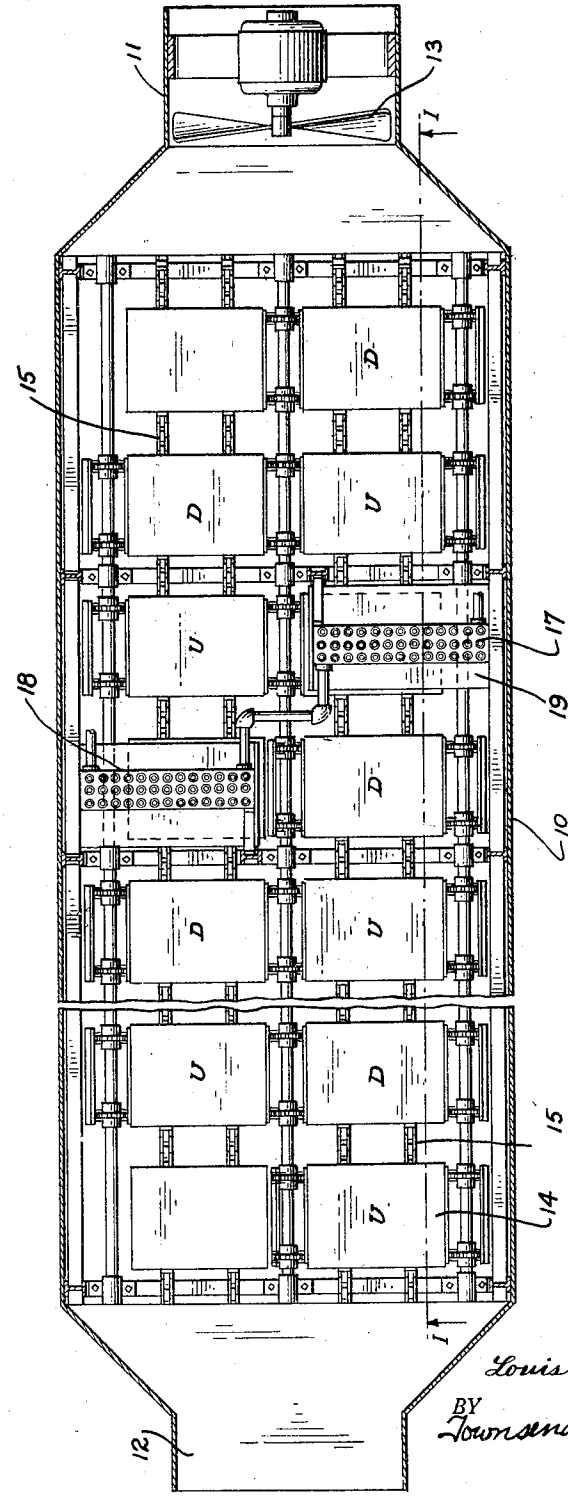

Fig. 2.

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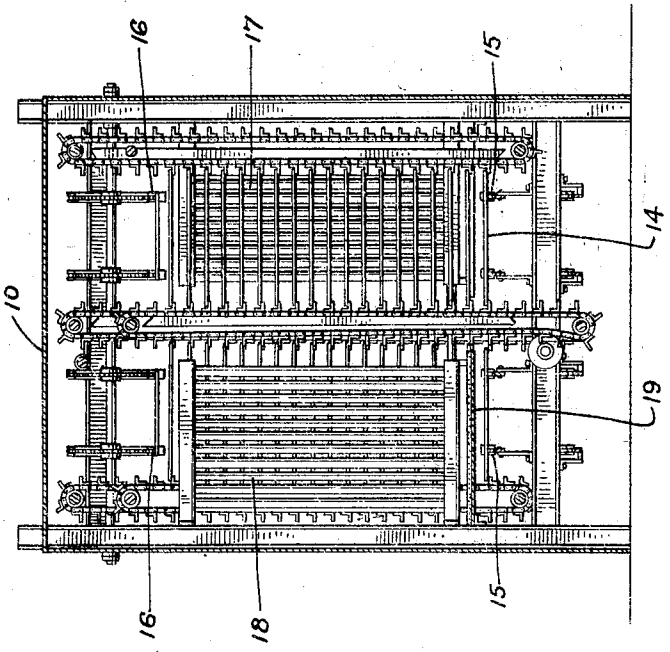
Fig. 3.



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UNITED STATES PATENT OFFICE

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CONTINUOUS CUBE-DRYING OVEN

Application filed August 20, 1928. Serial No. 300,715.

My present invention relates to a conveyor type of drier and more particularly to a cube drying oven for use in the manufacture of cube sugar and the like.

In a prior patent, issued to me June 26, 1928, Number 1,675,260, I have disclosed a continuous cube drying machine wherein there is provided a plurality of vertically moving conveyors which are adapted to carry trays of sugar alternately up and down in a vertical path. This patent also discloses suitable means for transferring the trays from one conveyor to the other so that the material upon the trays will progress in a sinuous path through the drier.

In connection with the apparatus described in the above patent there was provided suitable air heating apparatus which consisted of a steam heated compartment, an air scrubber, and a blower which would operate to draw air in through the scrubber and force it through the heater compartment and then into the cube drying compartment. It was found that this arrangement required considerable valuable floor space and could not be conveniently installed except in a relatively large room.

While this arrangement worked very satisfactorily, it was found shortly after the machine was put into operation that the sugar cubes, when discharged from the oven, were so hot that they could not be conveniently handled by the packers and, as a result, it was necessary to provide a means for cooling the cube sugar so that it could be handled and packed and, since the discharge from the drier was substantially continuous, the solution of this problem involved the provision of a relatively long conveyor which carried the sugar through the room a distance which would permit the sugar to cool sufficiently for handling. This additional feature also required considerable additional space and it is therefore an object of my present invention to provide a cube drying oven which will overcome the above objectionable features.

For a better understanding of my invention, reference should be had to the accompanying drawings, wherein I have shown by way of illustration, an embodiment of my invention in a cube drier of the type disclosed in my above referred to patent.

In these drawings—

Figure 1 is a side elevation in section taken along line I—I of Figure 2, showing the interior arrangement of my drier,

Figure 2 is a plan view in section taken along line II—II of Figure 1, and

Figure 3 is an end elevation in section of my invention taken along line III—III of Figure 1.

Referring now more particularly to the drawings, 10 designates an outer shell or housing adapted to enclose the mechanism with which the present invention is concerned. This housing 10 is adapted to permit a circulation of air therethrough from end to end. At one end there is shown an air inlet 11 and at the other end an outlet or exhaust 12. To these openings there may be attached suitable conduits for conducting the air to and from the heater. In connection with the air inlet 11 there is shown a suitable blower 13. It should be understood that this blower can be mounted anywhere within the conduit 11, its object being to create a forced circulation of air through the housing 10.

By referring to Figures 1 and 2, it will be seen that there is provided within the housing 10 a plurality of vertically moving conveyors which are adapted to carry suitable trays upon which the material to be dried is placed. These trays, one of which is designated by the numeral 14 on Figure 1, are fed into the housing 10 upon a suitable conveyor chain 15. The chain 15 carries suitable followers so that the trays 14 will be moved in spaced relation therealong. Similar followers are mounted upon a second and similar chain 16 along the top of the vertical conveyors so that when the device is in operation these chains will move the trays lengthwise through the housing, as will hereinafter appear. The chains 15 and 16 and the vertically moving conveyors are driven with an intermittent movement by suitable means, and the movement of these chains and the conveyors is so timed that the chains will

move when the conveyors are stationary and vice versa. As a result of this movement, the trays 14 will be first moved into engagement with the lower part of the first or upwardly moving set of vertical conveyors and the top tray therein will be moved horizontally into the next or downwardly moving conveyor. This operation will be carried out throughout the length of the drier, the trays moving in the direction indicated in Figure 2 by the letters U for up and D for down. It is thought that a further explanation of the specific construction of these conveyors is unnecessary inasmuch as a full disclosure thereof is made in the above identified patent.

At a suitable point within the housing 10 intermediate the ends of the conveyor system just described, there is located a suitable heating means. In the present instance two vertically extending steam radiators 17 and 18 are shown. These radiators, as previously stated, are arranged intermediate the ends of the conveyor system and immediately behind, with respect to the movement of the material being dried, a downwardly moving conveyor so that the trays of sugar being transferred past the heaters will pass thereunder and not above. This arrangement insures against overheating of the sugar due to exposure to excessive heat. In this connection there is provided below each of the radiators 17 and 18 a suitable baffle or partition 19. This partition 19 is so arranged that it will project between the heater and the tray of sugar passing to the next succeeding upwardly moving conveyor. After the trays 14 with their contents have passed under either of the heaters 17 or 18, they will move into engagement with the next upwardly moving conveyor and then, after passing through this conveyor to the next or downwardly moving conveyor and so on, they will finally be discharged from the bottom of the last downwardly moving conveyor and out of the housing 10, where they will then be transferred to a suitable point for the purpose of packing or further treatment.

The number of vertically moving conveyors arranged either ahead of, or behind, the heater units 17 or 18 with respect to the movement of the trays is immaterial, as any number of such conveyors may be provided, the only consideration being the nature of the product being treated and the amount of time required within the drier. It is presumed that a greater number of vertically moving conveyors will be necessary ahead of the heater elements than will be necessary therebehind; however, the particular conditions encountered will, as stated above, determine this factor.

In Figure 2 of the drawing, it will be seen that the heater elements 17 and 18 are arranged across the housing 10 in a staggered relation. The reason for this is to reduce the total length of the housing 10 and to place the heater in the same relative position with respect to the preceding downwardly moving conveyor. The main consideration for this arrangement is principally because of the desire to pass the material being dried under the heater rather than over it, and it will therefore be readily seen that by staggering the radiators as shown, the length of the housing may be reduced to a degree equal to the width of one of the vertical conveyors.

By referring to Figure 3 of the drawing, it will be seen that the heater elements 17 and 18 are of such proportions that they provide a radiating surface substantially equal to the height and breadth of the vertical conveyor system so that the air circulated will pass in a direct line therethrough and between the trays being conveyed by the vertically moving conveyors.

The operation of my improved drier is as follows: It will be assumed that the trays 14 are being fed into the drier upon the chains 15 as illustrated in Figure 1 of the drawings and that the vertically moving conveyors are operating intermittently in synchronism with the movement of the chains 15 and 16, as previously described. Under these conditions the trays 14 will be moved into engagement with the first or upwardly moving flight of conveyors. The chains 15 and 16 will then come to a stop and the vertically moving conveyors will then move the distance of one tray flight either up or down, as the case may be; the chains 15 and 16 will then move again a distance equal to the spacing of the vertical conveyors and thus at the bottom of the vertical conveyors, trays will be moved into the next upwardly moving conveyor and the uppermost tray of these conveyors will be transferred to the top flight of the next succeeding downwardly moving conveyor. This will cause the sugar or other material being dried to be moved vertically up and down as it progresses through the drier. It is assumed that the blower 13 is in operation and that the heaters 17 and 18 are supplied with a suitable heating medium. Under these conditions the blower 13 will force a circulation of air, preferably cool, fresh air drawn from the outside of the building, through the housing 10 and between the trays carried by the last few vertically moving conveyors where it will cool the sugar or other material which has been previously heated in its travel through the forward part of the housing 10. The air, after passing through these conveyors with their heated material, will absorb the heat contained thereby and effect a cooling thereof. This air with its absorbed heat will then pass through the heater elements 17 and 18, where it will be heated to a higher and more suitable temperature for the drying operation. This hot air, after passing through the

heaters, will continue on through the housing 10 between the trays of material carried by the conveyors arranged thereahead and will then flow from the drier housing through the outlet 12 to a suitable exhaust.

From the above it will be seen that I have provided a new and novel drier for cube sugar and the like which is practical, efficient, and one which will require a minimum of space. It will also be seen that, because of the particular arrangement, each of the trays of material will be subjected to substantially the same drying and cooling action, irrespective of the tray upon which it happens to be, and that because of the freedom of movement of air therethrough, it will be possible to supply a greater quantity without resorting to a drier of excessive size, and while I have shown by way of illustration only one embodiment of my invention, I desire to have it understood that it may be carried out in a number of other ways without departing from the spirit and scope of the claims appended hereto.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. A drier for cube sugar and the like comprising an elongated housing, a system of conveyors adapted to receive trays of material and progressively carry the trays in a sinuous path through said housing, a blower at the discharge end of said housing adapted to maintain a circulation of air through said housing and between said trays in counter direction to the travel of the material, and a heater arranged vertically intermediate the ends of said housing and said conveyor system and forming an air heating zone extending completely across the housing, whereby the air from said blower will pass through said heater and between said trays to heat and dry the introduced material and before passing through said heater act to cool the previously heated material before it is discharged from the housing.

2. A drier for cube sugar and the like comprising an elongated housing, a system of vertically moving conveyors adapted to carry a plurality of trays in spaced horizontal positions, means to move said trays horizontally to place them upon and remove them from said vertically movable conveyors, a heater intermediate the ends of said housing extending vertically adjacent said moving trays and dividing the housing into a drying and a cooling compartment, and means for maintaining a circulation of air through said housing, whereby said air will pass directly through said heater and between said trays in a substantially horizontal direction counter to the direction of travel of the trays, the arrangement of said conveyors being such that the trays containing wet sugar cubes will approach closely to the heater at the upper and hottest part thereof and move downwardly therealong and thereafter pass under the heater to the cooling compartment and thus avoid scorching of the sugar.

LOUIS L. EDMUNDS.