H. E. CURTIS.

EVAPORATOR.

APPLICATION FILED JULY 6, 1920.

1,399,692.

Patented Dec. 6, 1921.

2 SHEETS—SHEET 1.

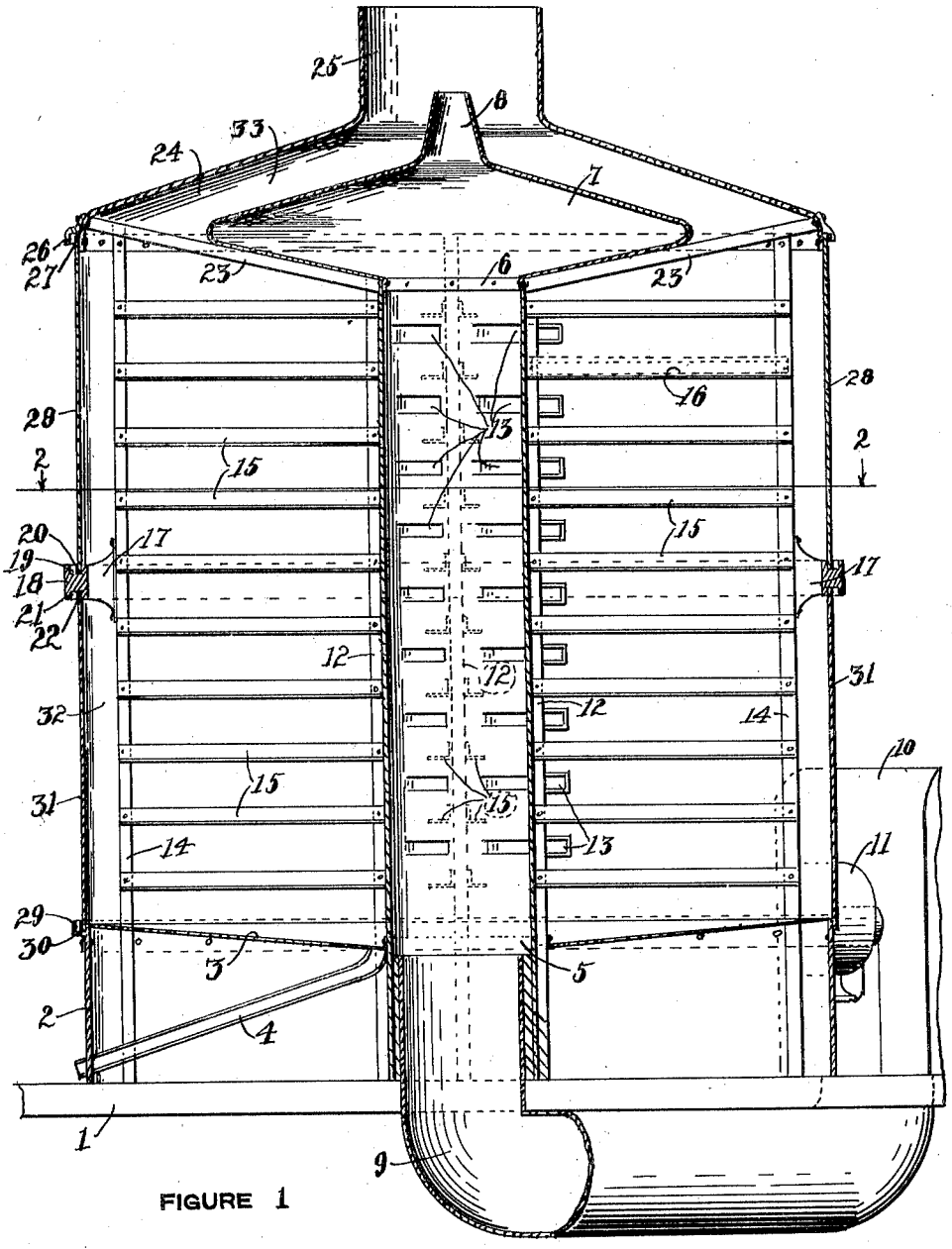


FIGURE 1

INVENTOR

Henry E. Curtis

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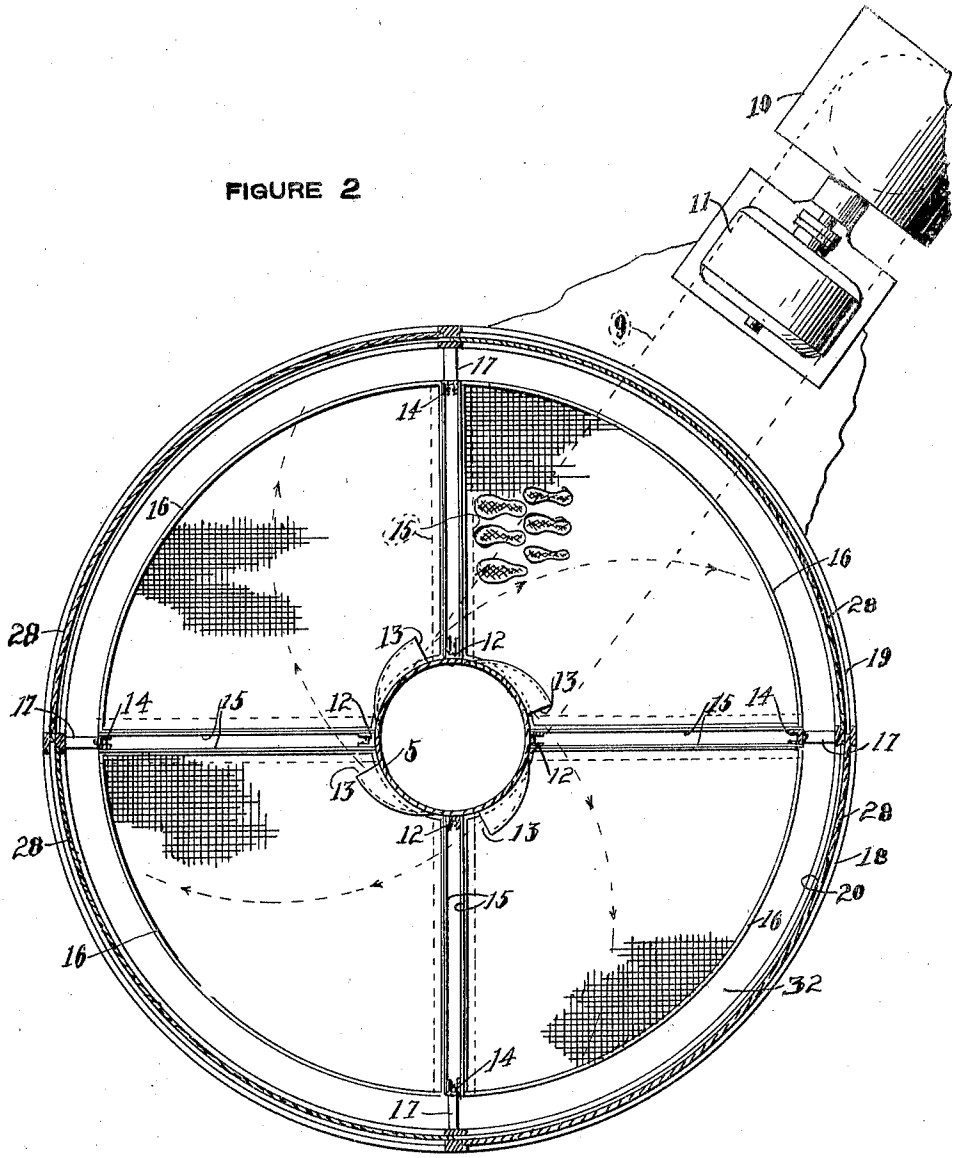
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2 SHEETS—SHEET 2.

FIGURE 2



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UNITED STATES PATENT OFFICE.

HENRY E. CURTIS, OF SAN JOSE, CALIFORNIA.

EVAPORATOR.

1,399,692. Specification of Letters Patent. Patented Dec. 6, 1921.

Application filed July 6, 1920. Serial No. 394,323.

To all whom it may concern:

Be it known that I, HENRY E. CURTIS, a citizen of the United States, and resident of San Jose, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Evaporators, of which the following is a specification.

My invention relates to evaporators for fruits, vegetables and the like. It is the object of my invention to provide an evaporator for drying fruits, vegetables and the like that will be simple in operation, compact in form, of low manufacturing cost, of high practical efficiency, and that will be capable of thoroughly drying a large quantity of material in a short space of time.

In the drawing:—

Figure 1 is a vertical section through my improved evaporator.

Fig. 2 is a sectional view on line 2—2 of Fig. 1.

Referring more particularly to the drawing, 1 indicates the foundation upon which is erected a circular base 2 with an inwardly sloping upper portion 3 to form a bottom for the evaporator, and which is provided with a drain pipe 4. Concentrically positioned in base 2 is a pipe 5 extending from the base 1 through bottom 3 to a point 6 where it is fitted with an enlarged circular drum 7 having a comparatively small discharge outlet 8 in the top thereof. The lower end of pipe 5 communicates with a conduit 9 connected to a fan 10, operated by a motor 11, the said fan being supplied with dry hot air from any suitable source of supply not shown.

At 12—12—12—12 are shown U bars secured to pipe 5. In each quarter section of pipe 5 between bars 12 and vertically spaced therein are formed discharge openings 13, each opening being formed to discharge air in a horizontal plane and at an angle to the radii of the pipe 3, the four discharge openings in each set being directed uniformly in one direction.

At 14—14—14—14 are four more U bars arranged parallel with bars 12, spaced a distance therefrom and equally spaced around a circle with the pair on one side in alinement with the pair on the other side, each pair of bars 12 and 14 having a plurality of horizontal and equally spaced angle irons 15 mounted on each side thereof. These parts are so arranged that each set of four pairs of angle irons 15 alternate with each set of four discharge openings 13. Trays 16—16—16—16 are formed to engage angle irons 15 and fit closely against pipe 5.

Mounted on each bar 14 and midway the length thereof is a bracket 17, the four brackets 17 supporting a circular member 18 having tracks 19—20 formed in the upper surface thereof and 21—22 in its lower surface. Supported on radiating bars 23 on bars 12—14 is a circular cap member 24 spaced a distance from drum 7 and having a discharge opening at 25. The outer edge of member 24 is provided with tracks 26—27 in vertical alinement with tracks 19—20 in the upper surface of member 18, and doors 28—28—28—28 are mounted to slide in tracks 19—26 and 20—27 respectively.

The upper edge of base 2 is also provided with circular tracks as 29—30 in vertical alinement with tracks 21—22 in the lower surface of member 18, and doors 31—31—31—31 are mounted to slide in tracks 29—21 and 30—32 respectively. The brackets 17 are so proportioned as to provide an open space 32 the full length of the evaporator between the trays therein and the doors thereof.

In operation hot dry air is forced upwardly into pipe 5 through conduit 9 by fan 10. This air is supplied in sufficient quantity and under sufficient pressure to cause it to issue from each opening 13 with such force as to carry it outwardly between the trays positioned above and below it to the vertical annular passage 32. But since these openings are angularly directed the four air currents from the four openings 13 create a spiral like movement of the air between the two layers of trays so that the said air travels over a considerable portion of the material in the trays before reaching the passage 32. Since it is the function of the dry warm air to extract the moisture content from the material placed in the trays, this circular or spiral motion is of considerable value. First, because it carries the air over a large amount of fruit and is consequently well impregnated with moisture before reaching passage 32, and, secondly, because it creates a turbulence that effectually moves the air around each individual element of material placed in the trays thereby hastening the drying period

by constantly and rapidly changing the air in contact with each of said individual elements.

The lower portion of the evaporator and doors 28 and 31 being closed the moisture laden air entering passage 32 must pass upwardly and is discharged at 25, any condensation of moisture on the walls of the device passing downwardly to bottom 3 and out through pipe 4.

By carrying drum 7 outwardly as shown a passage 33 is formed whereby the upwardly moving air is carried along to discharge opening 25 without passing into a pocket where condensation would occur. Also since the drum is filled with hot air it keeps up the temperature in passage 33 and thereby effectually prevents condensation until the moist air has been discharged from the evaporator.

It is clear that an efficient evaporator must remove the moisture content from a large quantity of material in a short space of time, and all of the material must be uniformly dried with a minimum use of hot air. In most evaporators the air is moved over or through a large number of trays with the result that the first trays treated by the air are thoroughly dried while the trays to be treated last are not thoroughly dried because the air is so laden with moisture by the time it reaches them that it can take up but little additional moisture.

In my invention a supply of fresh dry air is moved over each layer of four trays therefore the bottom layer receives exactly the same treatment as the top and intermediate layers with the result that all of the material in the evaporator receives exactly the same treatment and is discharged in a uniform condition. In the structure disclosed the trays are quickly and easily placed in position or removed from the evaporator, the door for one quarter section sliding around over the door of an adjoining quarter section during the process of placing and removing the trays. The evaporator may be made almost entirely of sheet metal and is capable of handling a large quantity of material in a very small space.

Trays 16 are peferably made of sheet metal with wire mesh bottoms so that the air can circulate freely around the contents thereof.

It is to be understood that while I have herein shown and described one particular embodiment of my invention it is to be considered as illustrative only, and that changes in form, proportions, construction and method of operation may be made within the scope of the appended claims.

I claim:—

1. An evaporator including a chamber having a discharge opening therein, an air conduit concentrically arranged therein, means for supporting a plurality of vertically spaced trays in said chamber and about said conduit, said conduit having openings formed therein communicating with said chamber, and means for imparting a spiral motion to the air discharged through said openings.

2. An evaporator including a chamber having a discharge opening therein, an air conduit concentrically arranged therein, means for supporting a plurality of trays in spaced vertical relation to each other about said conduit and in spaced relation to the wall of said chamber, and means for discharging air from said conduit between said vertically spaced trays and thence to the space between the wall of the chamber and the trays.

3. An evaporator including a chamber having a discharge opening in the upper portion thereof, a centrally arranged air conduit therein, an enlarged chamber communicating with said conduit and spaced a distance from the top of said first mentioned chamber to form a passage therebetween, a plurality of trays arranged about said conduit below said enlarged chamber and in spaced vertical relation to each other, and means for discharging air from the conduit between the trays.

4. An evaporator including a chamber having a discharge opening in the upper portion thereof, a centrally arranged air conduit therein, an enlarged chamber communicating with said conduit and spaced a distance from the top of said first mentioned chamber and provided with an opening discharging into said first mentioned opening, a plurality of trays arranged about said conduit below said enlarged chamber and in spaced vertical relation to each other, and means for discharging air from said conduit between said spaced trays.

5. An evaporator including a chamber having a discharge opening in the upper portion thereof, a centrally arranged air conduit therein, an enlarged chamber communicating with said conduit and spaced a distance from the top of said first mentioned chamber and provided with a discharge opening smaller than said conduit, a plurality of trays arranged about said conduit below said enlarged chamber and in spaced vertical relation to each other and spaced a distance from the wall of said first mentioned chamber, and means for discharging air from said conduit between said spaced trays.

6. An evaporator including a circular base, a framework thereon, sliding doors supported by said base and framework to form an inclosed chamber, a top supported on said framework and having a discharge opening therein, an air conduit centrally arranged in said framework and having a discharge outlet at its upper end, a plurality

of vertically spaced trays arranged on said framework, and means for discharging air from said air conduit between said spaced trays.

7. An evaporator including a chamber having a discharge opening in the upper portion thereof, an air conduit concentrically arranged therein and having a discharge opening at the upper end thereof, a plurality of sets of vertically spaced and radially arranged tray supports extending from said conduit and terminating a distance from the wall of said chamber, a plurality of trays arranged in horizontal planes on said tray supports, and means for discharging air from said conduit between the trays on successive planes.

8. An evaporator including a chamber having a discharge opening in the upper portion thereof, an air conduit concentrically arranged therein and having a discharge opening at the upper end thereof, a plurality of sets of vertically spaced and radially arranged tray supports extending from said conduit and terminating a distance from the wall of said chamber, a plurality of trays arranged in horizontal planes on said tray supports, said conduit having a plurality of laterally directed openings formed therein between the trays on successive planes.

9. An evaporator including a chamber having a discharge opening in the upper portion thereof, an air conduit concentrically arranged therein and having a discharge opening at the upper end thereof, a plurality of sets of vertically spaced and radially arranged tray supports extending from said conduit, a plurality of trays arranged in horizontal planes on said tray supports, said conduit having a plurality of laterally directed openings formed therein between the trays on successive planes arranged and directed to impart a spiral motion to the air discharged therefrom.

HENRY E. CURTIS.