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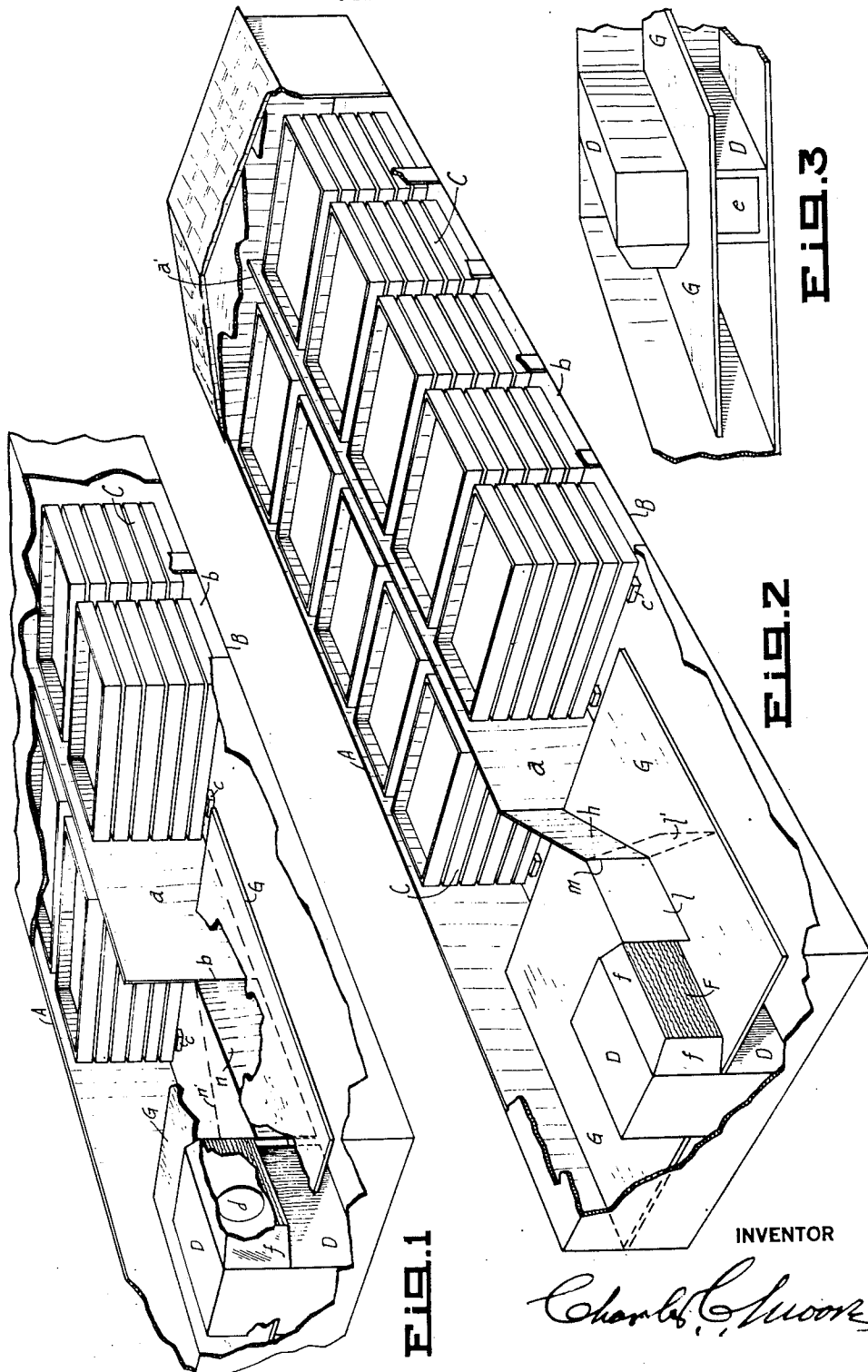
1,574,994

C. C. MOORE

APPARATUS FOR THE DEHYDRATION OF VEGETABLE MATERIALS

Filed Feb. 14, 1925

2 Sheets-Sheet 1



INVENTOR

Charles C. Moore

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2 Sheets-Sheet 2

Fig. 4.

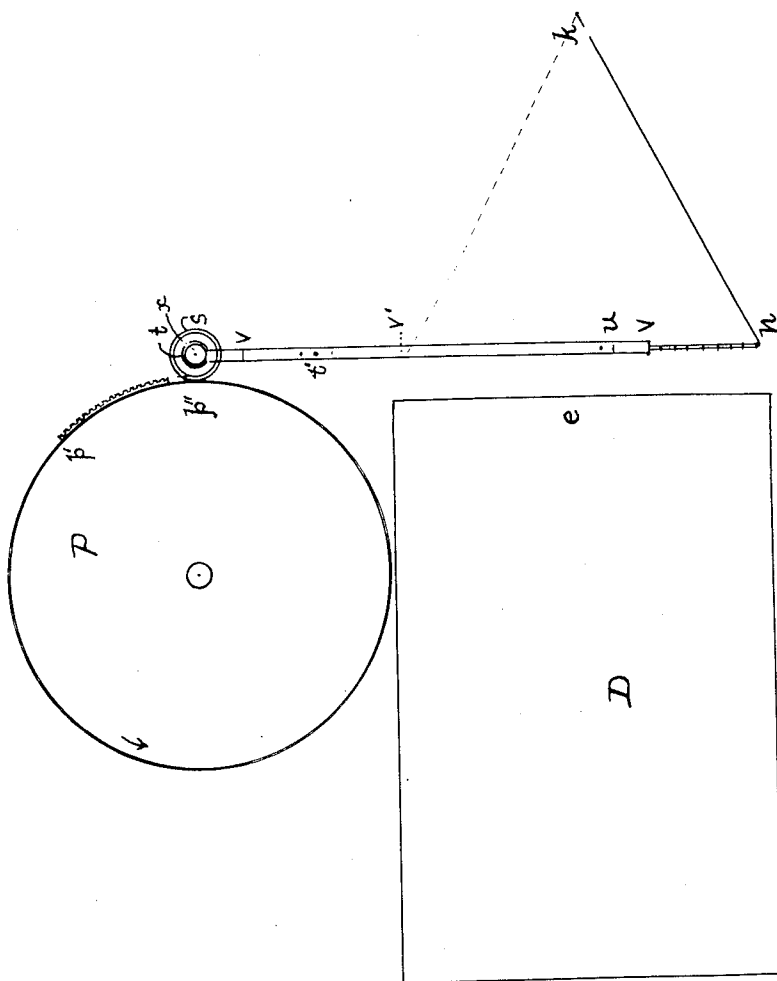
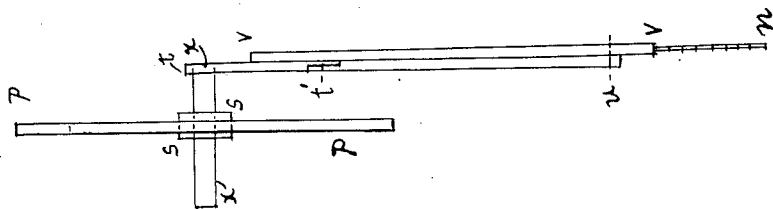


Fig. 5.



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CHARLES C. MOORE, OF SAN FRANCISCO, CALIFORNIA.

APPARATUS FOR THE DEHYDRATION OF VEGETABLE MATERIALS.

Application filed February 14, 1925. Serial No. 9,281.

To all whom it may concern:

Be it known that I, CHARLES C. MOORE, of the city and county of San Francisco and State of California, have invented certain new and useful Apparatus for the Dehydration of Vegetable Materials, of which the following is the specification.

My invention relates to improvements in recirculating the column of drying air that is being used for dehydrating a material, such as the California walnut, in which the drying temperature is comparatively moderate, such as 90-100 F.; the drying period is comparatively long, such as one day or more; and the percentage of moisture evaporated is comparatively low, such as 8-12 per cent. As seen, these conditions are quite different from those where such a material as prunes is being dehydrated. In dehydrating a material, such as walnuts, where the moisture is vaporized very slowly, it is efficient to recirculate the drying air by a method that is quite different from the usual method of recirculating the drying air in the dehydration of fruits, such as prunes; the objects of my improvements being to obtain efficiency in the drying or curing of the nut, and in fuel consumption.

As generally known, walnuts must be dehydrated in a temperature that is below the melting point of certain constituents of the kernel; and must not be dried too rapidly, else there will be a splitting of the shells; nor must one part of a walnut be dried faster than other parts of the same nut, through having the drying air impinge on the nut continually from the same direction. Furthermore, a crop of walnuts are variable in the moisture content of the green nuts, due to season conditions at time of harvest; yet it is desired to have the finished nuts of a uniform moisture content. In other words, the walnut crop, though variable in the moisture content of the green nuts, must be brought to a finished condition in which the moisture content is quite uniform; and, during the period of dehydration, each tray of nuts must be subjected to a uniform rate of evaporation.

My apparatus can be described as two parallel and adjacent tunnels, under suitable roof, the partition wall between the tunnels terminating a few feet short of the outer walls at the closed end of the tunnels; a blast of warm air entering one tunnel, passing throughout its length, and into the other

tunnel through which it returns, and is then drawn through a heat radiator to the blower to be recirculated. In the outside walls of the tunnels are doors through which ricks of trays, containing nuts, are entered, endwise. The ricks can be entered, or removed, by means of any suitable form of truck that can be run under a load that is sufficiently elevated to admit the truck under it, the usual form of hoist-truck being suitable. When the tunnels are thus filled with ricks of trays, to the end of the partition wall, the ricks will be adjacent, sidewise, with scant space between their ends and the walls, and between the top tray and ceiling, so that a passing column of warm air must, necessarily, pass through the horizontal spaces between trays on each rick. After the column of air passes the length of one tunnel, it passes around the free space at the end of the partition wall, and into the other tunnel, through it and on to the radiator, and to the blower intake, thus causing it to be reheated as it recirculates.

It is quite evident that should the air move in the same direction at all times, there will be variations of temperature in the tunnels, and in different ends of the same tunnel, due to the fact that the air gives up its heat as it passes the trays of nuts; but, if the direction of the air be periodically changed so that for one minute it discharges into tunnel (A) and returns through tunnel (B), then, for the next minute, discharges into tunnel (B) and returns through tunnel (A), and so alternating, the result would be that each rick of trays, at any place in either tunnel, is subjected to the same average-minute of temperature and other drying conditions throughout the time that a rick remains in either one of the tunnels. When the drying of any rick of trays is completed, as judged by inspection, the rick is replaced by one of green-nut trays; it being suitable to have a rick of green-nut trays along side of a rick of trays containing nuts that are nearly dry, and have the same ricks subjected to the same average-minute of drying conditions.

For a detail description of my apparatus, I refer to the attached sheets of drawing in which Figs. 1, 2, 3, are perspective views of my dehydration apparatus with the roof, the ceiling, a side-wall and end-wall broken away; Fig. 4 is a plan view, and Fig. 5 is

an end view of the mechanism for changing the direction of the column of air that passes through the tunnels.

As seen in Fig. 2, the vertical partition, *a*, divides the dehydrater into two tunnels. this partition extending from the floor to the ceiling, and terminating at the far end, *a'*, so as to leave an open passage-way for the column of air to move from one tunnel into the other tunnel. Ricks of trays, *C*, are in the tunnels, resting on the supporting blocks, *c*. The walnuts that are to be dried are filled in these trays, there being a suitable clearance between trays for the passage of air. The trays are entered through the doorways, *b*, there being a door-way for each rick of trays. Any blower of the usual horizontal bottom-discharge type is positioned at, *D*, with an air intake at, *d*, (Fig. 1), and its discharge at, *e*, (Fig. 3). Any radiator of usual type of steam-pipe coils, or electric-wire coils, suitable for heating a current of passing air, is positioned at, *F*, there being a conduit, *f*, for the passage of the air that comes through the radiator to the blower's intake, *d*. (In Fig. 1, the radiator and conduit are broken away). A horizontal partition, *G*, terminates at the vertical partition, *a*, such that the discharge air leaves the blower, at the discharge-outlet, *e*, beneath the horizontal partition, as seen in Fig. 3, (this figure being a front view of the blower as when standing at the end of the vertical partition, *a*). Any suitable radiator positioned at, *F*; the conduit, *f*; and the intake, *d*, of a blower, are above the horizontal partition, *G*. The vertical partition, *h*, extends from the ceiling to the horizontal partition, *G*, and terminates at, *m*. The deflector, *l*, is pivoted on a vertical axis at, *m*, the terminus of the vertical partition, *h*, such that the deflector can move horizontally to the position of the dotted lines as shown at, *l'*; this deflector extends from the ceiling to the horizontal partition, *G*. Another deflector, *n*, (Fig. 1) is pivoted on a vertical axis at, *b*, the terminus of the vertical partition, *a*, such that the deflector can move horizontally to the position of the dotted line as shown at, *n'*; this deflector extends from the floor to the horizontal partition, *G*, which partition is broken away, in Fig. 1, for purpose of illustration.

Assuming the drying air is to enter tunnel, *A*, and be returned through tunnel, *B*; the deflector, *n*, is set in the position as shown in Fig. 1, and the deflector, *l*, is set in the position as shown in Fig. 2; causing the air discharged from the blower to pass through tunnel, *A*, and around the far end of the vertical partition at, *a'*; then back through tunnel, *B*, and through any suitable radiator located at, *F*, from which it goes through the conduit, *f*, to the intake of the blower.

Assuming the drying air is to enter tunnel, *B*, and be returned through tunnel, *A*; the deflector, *n*, is moved to the position of the dotted line as shown at, *n'*, in Fig. 1, and the deflector, *l*, is moved to the position of the dotted line as shown at, *l'*, in Fig. 2; causing the air discharged from the blower to enter tunnel, *B*, pass through that tunnel and around the far end of the vertical partition at, *a*; then back through tunnel, *A*, and through any suitable radiator located at, *F*, from which it goes through the conduit, *f*, to the intake of the blower.

A change in direction of the column of air can be made as often as desired. When the deflector, *n*, is changed in position to that of, *n'*, (Fig. 1), it causes the deflector, *l*, to change in position to that of, *l'*, (Fig. 2); for the reason that when the air is returning through tunnel, *B*, the air pressure forces the deflector, *l*, to the position as shown, and when the air is returning through tunnel, *A*, the air pressure forces the deflector, *l*, to the position of the dotted lines, *l'*. Therefore, it is only necessary to control the operation of the deflector, *n*, by any suitable means such as a power device that moves the deflector, periodically, in reverse directions.

The mechanism for controlling the movement of the deflector, *n*, is shown in Fig. 4, a plan view, and in Fig. 5, an end view; (in these two figures, the scale of drawing is four times that of the others). The position of the base of any suitable blower, of the horizontal bottom-discharge type, is shown as, *D*; the deflector, *n*, being in position to deflect the air into a tunnel such as, *A*, in Figs. 1, 2. The large wheel, *P*, has gear teeth only between, *p'-p''*; these gear teeth meshing with the gear wheel, *s*, which wheel is fixed on the shaft, *x*. The large wheel, *P*, is turned by any suitable means at a speed of one revolution per minute, for instance, and causes the small gear wheel to make one-half revolution during the time that the gear teeth, *p'-p''*, are in contact. As shown in the drawing, the contact with the gear teeth, *p'-p''*, has just terminated, and the small wheel will not revolve again until the large wheel has made a circuit.

On the shaft, *x*, is fixed the crank, *t*; and a connecting rod, *u*, is pivoted to the crank at, *t*. The bar, *v*, moves lengthwise between suitable guides not shown in the drawing; to this bar, *v*, is pivoted the connecting rod, *u*. The length of the crank, *t*, causes the bar, *v*, to move until its end comes to a position as shown at, *v'*; and will reverse its direction of movement each time the large wheel, *P*, makes a revolution. To the end of the bar, *v*, is fixed a chain extending and attached to the deflector, *n*. When the bar, *v*, moves until the end on which the chain is fixed comes to *v'*, the wind pressure

from the blower will force the deflector until it would be stopped at the position shown by the dotted line, $k-v'$; and when the bar, v , is returning, its end, on which the chain is fixed, forces the deflector until it passes the center line of the wind pressure whereupon the wind pressure forces it to the position, $k-n$. There are, of course, suitable jam-stops for holding the deflector, when it has swung to its full and proper position in either direction.

It is obvious that when the direction of the air through the tunnels is changed each minute, for instance, the drying conditions are, practically, uniform throughout the length of the tunnels, and at any position in either tunnel; the minute-average temperature is constant.

I claim:

1. In a dehydration apparatus, the combination of a series of ricks of trays containing material to be dried by air that moves continuously through the spaces between the trays and in the same relative direction over all of the trays in the series of ricks, means for moving the said air under pressure through the said spaces and from one of said ricks to a next rick in line, and means for automatically reversing, at predetermined intervals of time, the direction of the said moving air through the said spaces and from one of said ricks to a next rick in line.

2. In a dehydration apparatus, the combination of a series of ricks of trays containing material to be dried by air that moves continuously through the spaces between the trays and in the same relative direction over all of the trays in the series of ricks, means for moving the said air under pressure through the said spaces and from one of said ricks to a next rick in line, means for automatically reversing, at predetermined intervals of time, the direction of the said moving air through the said spaces and from one of said ricks to a next rick in line, and means for heating the said air before it moves through the said series of ricks of trays.

3. In a dehydration apparatus, the combination of a series of ricks of trays containing material to be dried by air that moves continuously through the spaces between the trays and in the same relative direction over all of the trays in the series of ricks, means for moving the said air under pressure through the said spaces and from one of said ricks to a next rick in line, means for automatically reversing, at

predetermined intervals of time, the direction of the said moving air through the said spaces and from one of said ricks to a next rick in line, and means for heating the said air after it moves through the said series of ricks of trays.

4. In a dehydration apparatus, the combination of a series of ricks of trays containing material to be dried by air that moves continuously through the spaces between the trays and in the same relative direction over all of the trays in the series of ricks, means for moving the said air under pressure through the said spaces and from one of said ricks to a next rick in line, means for automatically reversing, at predetermined intervals of time, the direction of the said moving air through the said spaces and from one of said ricks to a next rick in line, and means for returning a part or all of the said air to the air-intake of the means for moving the air.

5. In a dehydration apparatus, the combination of series of ricks of trays containing material to be dried by air that moves continuously through the spaces between the trays and in the same relative direction over all of the trays in the series of ricks, means for moving the said air under pressure through the said spaces and from one of said ricks to a next rick in line, means for automatically reversing, at predetermined intervals of time, the direction of the said moving air through the said spaces and from one of said ricks to a next rick in line, means for heating the said air before it moves through the said series of ricks of trays, and means for returning a part or all of the said air to the air-intake of the means for moving the air.

6. In a dehydration apparatus, the combination of a series of ricks of trays containing material to be dried by air that moves continuously through the spaces between the trays and in the same relative direction over all of the trays in the series of ricks, means for moving the said air under pressure through the said spaces and from one of said ricks to a next rick in line, means for automatically reversing, at predetermined intervals of time, the direction of the said moving air through the said spaces and from one of said ricks to a next rick in line, means for heating the said air after it moves through the said series of ricks of trays, and means for returning a part or all of the said air to the air-intake of means for moving the air.

CHARLES C. MOORE.