

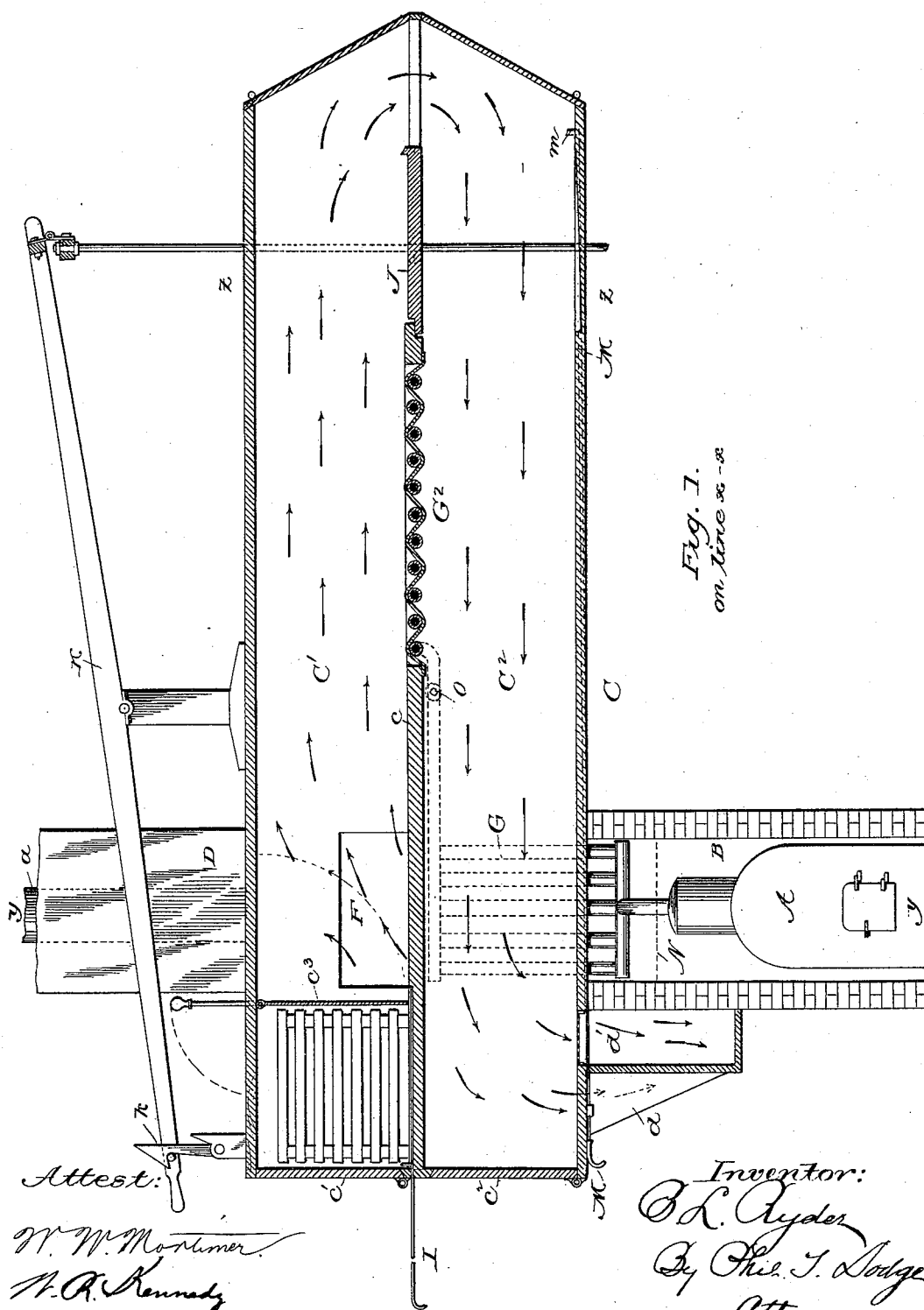
(No Model.)

2 Sheets—Sheet 1.

B. L. RYDER.
DRIER FOR TEAS AND FRUITS.

No. 478,134.

Patented July 5, 1892.



(No Model.)

2 Sheets—Sheet 2.

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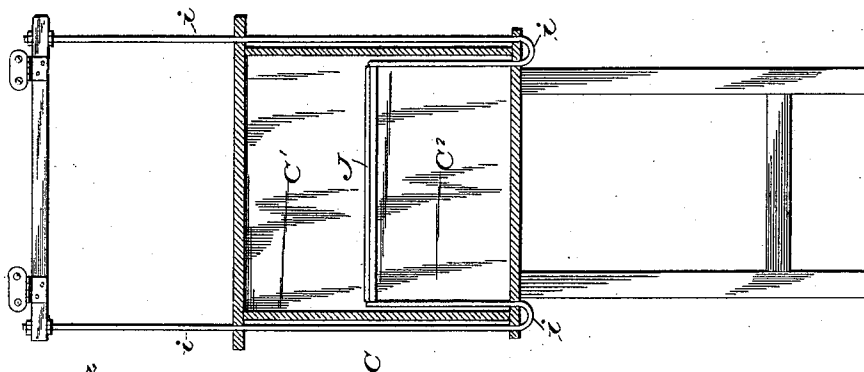


Fig. 3.
on line z-z

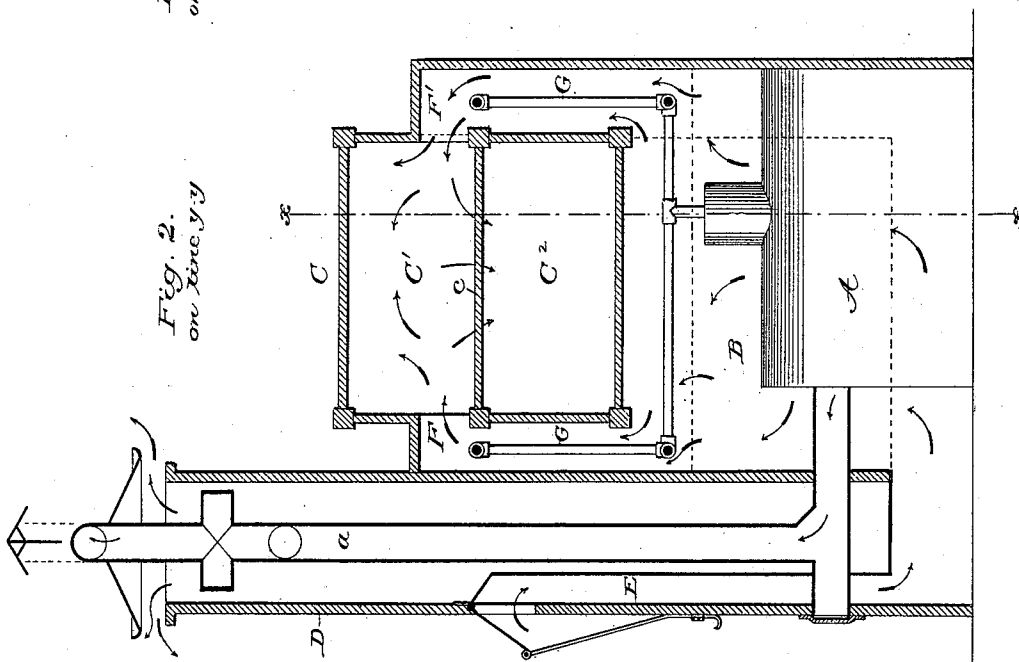


Fig. 2.
on line y-y

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UNITED STATES PATENT OFFICE.

BENJAMIN L. RYDER, OF CHAMBERSBURG, PENNSYLVANIA.

DRIER FOR TEAS AND FRUITS.

SPECIFICATION forming part of Letters Patent No. 478,134, dated July 5, 1892.

Application filed December 18, 1889. Serial No. 334,199. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN L. RYDER, of Chambersburg, in the county of Franklin and State of Pennsylvania, have invented certain
5 Improvements in Driers for Teas, Fruits, &c., of which the following is a specification.

My invention relates to an apparatus for drying teas, spices, and other vegetable and animal substances; and it consists in a peculiar
10 arrangement of drying-chambers, flues, and heating apparatus designed to secure a uniform diffusion and a slow but positive circulation of the heated air. Under my construction the heated air is delivered horizontally
15 through an upper drying-chamber and then compelled to descend and return horizontally through a lower drying-chamber, while the loaded trays are caused to move through said chambers in the course pursued by the air.
20 The air after being heated is delivered into the upper chamber in opposing currents from the two sides. The heating of the air is preferably effected by a steam-boiler and radiators, as herein shown and described; but any other
25 ordinary form of air-heater may be employed provided the air is delivered in the direction indicated herein.

In the accompanying drawings, Figure 1 is a longitudinal vertical section of my drier on
30 the line *x x* of Fig. 2. Figs. 2 and 3 are cross-sections on the lines *y y* and *z z*, respectively, of Fig. 1.

Referring to the drawings, A represents a steam boiler or heater located in a chamber
35 B beneath one end of a long horizontal trunk C, which is closed at its ends and divided by a horizontal partition *c* into an upper drying-chamber C' and a lower chamber C², which communicate only at the rear end. The
40 smoke-pipe *a* of the boiler is carried upward past one side of the trunk through an open stack or flue D, which latter communicates at its base through flues *d d'* with the front end of the lower drying-chamber C², so that the
45 heat radiated by the smoke-pipe induces a flow of the moisture-laden air from the drying-chambers outward through the stack. A flue E, located within the stack, receives the cold air through a regulating-valve *e* at its
50 upper end and delivers the same into the base of the boiler-chamber, where it comes in contact with the outside of the boiler.

From the top of the boiler-chamber hot-air flues F F' lead into the forward end of the upper drying-chamber C' from opposite sides
55 and opposite each other. A grating, screen, or like retarding device, as N, is located in the top of the boiler-chamber to cause an equal delivery into the two sides of the drying-chamber.

In the flues F F', I locate steam-radiators G G', connected with the boiler to further heat the warm air before delivery to the drying-chamber. It will be perceived that the hot air thus delivered into the upper chamber
60 is compelled to travel rearward therethrough and then descend into the lower chamber and pass through its entire length to the front, where it finally escapes in the manner already described.

When the nature of the material to be dried demands, I make use of a third radiator G², composed of pipes and connected with the boiler. This radiator is located near the end of the trunk between its upper and lower
75 chambers, and the partition between the chambers is at this point made of sheet metal and carried in a serpentine course over and under the alternate pipes, so that although communication between the chambers is cut off
80 the pipes are exposed, part of them in the upper and the rest in the lower chamber. It is to be understood that this radiator is not a necessary part of my heater and that it may be omitted or the steam shut off therefrom by
85 valves O, provided for the purpose, as shown.

At the forward end the upper chamber C' is provided with a door *c'* for the admission of trays containing the material to be treated and the lower chamber provided with a door
90 *c²* for their delivery. The upper chamber is provided between the air-inlet flues F F' and the door *c'* with a gravitating valve *c³* at suitable distance from the door to admit trays between them. This valve closes the cham-
95 ber and prevents loss of heat when the door is opened to admit the trays.

The trays H are of any ordinary suitable construction, adapted to be stacked with air-spaces between them, so that they will prac-
100 tically fill the chambers from top to bottom. They are introduced into the front of the upper chamber and forced backward step by step as each new tray advances those ahead

of it until they reach the rear end, when they are lowered into the bottom chamber and advanced in like manner therethrough to the delivery-door at the front. The backward movement is effected by means of a pushing-rod I or equivalent device used against the forward stack as soon as it has been introduced and the door closed. The lowering of the trays is effected by a vertically-moving platform J, mounted in the trunk and forming part of the floor between the upper and lower chambers. This platform is operated by rods *i*, extending downward through the bottom of the trunk and then upward past its sides to a connection with the rear end of a lever K, mounted on top of the trunk and adapted to be locked at the front by a catch *k*. The platform stands normally in its elevated position to receive the trays. When the trays are to be lowered, the operator has only to unlatch the lever and permit its forward end to rise.

For the purpose of advancing the trays from the lowering-platform through the lower chamber a sliding rod M, provided at the front with a suitable handle, is extended lengthwise of the lower chamber and provided at the rear end with a catch *m* to engage the trays. Of course the device for lowering the trays and for moving the same forward may be changed in construction at will without departing from the scope of my invention. The only essential requirement in this regard is that the mechanism shall permit the trays to descend from the upper to the lower chamber and secure their advance through the latter.

In order to permit the free circulation of air, the chambers are extended rearward beyond the point at which the trays stop and the floor or partition omitted from this extended portion.

In operating the apparatus the stack of trays is inserted through the door into the receiving end of the upper chamber. The door is then closed, and by means of a rod or other suitable means the trays are pushed forward past the yielding valve, which immediately falls behind them, so that the next stack may be inserted behind them without loss of heat. On entering the chamber the trays and their contents are subjected at once to the action of the air entering through the opposing flues at the sides. The result of arranging the inflowing currents in opposition to each other is to cause the air to pass effectively over and between the trays and to check its velocity, so that it moves at a comparatively slow speed. In due time a second stack of trays is inserted in the same manner as the first, which is pushed forward before it, this operation being continued until the upper chamber is full. As the successive stacks reach the rear end of the chamber, they are lowered by the vertically-moving platform, one after another, into the lower chamber, in which they are moved forward step by step

until they reach the front, where they are finally withdrawn. The air-current continues rearward in the upper chamber, and, descending at the back end, returns to the front through the lower chamber. It will be observed that as the trays are lowered from one chamber to the other without being turned the air-current is applied first from the front and afterward from the rear side of the trays, the effect being practically the same as a reversal in the direction of the current.

By driving the heated air downward in its course to the lower chamber in opposition to its natural tendency to rise I secure a retarded movement and cause the air to fill every portion of the chamber and act effectively upon every part of the material under treatment.

Having thus described my invention, what I claim is—

1. In a drier, the combination of two horizontal drying-chambers, one overlying the other and communicating at the rear end, an air-heater delivering into the forward end of the upper chamber, and a discharge-flue leading from the forward end of the lower chamber, said upper chamber constructed to admit of the introduction of trays at its forward end and their transfer at its opposite end to the lower chamber, and the latter constructed to admit of their passage through and discharge at its forward end.

2. In a drier, two drying-chambers communicating at their rear ends, lying one over the other, and provided at the front ends with doors for inserting and removing trays, in combination with a heater and air-inlet at the forward end of the upper chamber, mechanism for transferring the trays from the upper to the lower chamber at the rear end, and an outlet for the moisture-laden air at the forward end of the lower flue.

3. In combination with the chambers C C', communicating constantly at their rear end, the heater communicating with the front of the chamber C, the vertically-movable platform arranged to transfer the trays from one chamber to the other without affecting the communication between them, and devices, substantially as shown, for operating said platform, whereby a constant current of heated air may be maintained within the chambers regardless of the action of the platform.

4. In a drying apparatus in which the trays are successively introduced into an upper chamber, transferred to a lower chamber, and finally discharged, the combination of two drying-chambers, one overlying the other, doors at the forward ends of said chambers, a yielding valve at the forward end of the upper chamber, a vertically-movable platform at the rear ends of the chambers, its operating-lever, a rod for advancing the trays in the lower chamber, and a heater communicating with the upper chamber beyond the yielding valve, substantially as described.

5. In combination, the boiler, the inclosing chamber, the flues leading therefrom, the radiators in said flues, the upper drying-chamber into which the flues open, the lower drying-chamber communicating with the upper at one end, the outlet-stack communicating with the lower chamber, and the smoke-pipe located within the stack, whereby the heat radiated by the smoke-pipe will induce a flow of the moisture-laden air from the drying-chamber.

6. The combination, with the upper and lower drying-chambers and the horizontal separating-floor adapted to sustain the trays in their passage through the upper chamber, of the series of radiating-pipes lying horizontally side by side in the same plane with the floor and forming a continuation of the latter, and the separating-sheet applied alternately to opposite sides of the pipes in such manner as to form, in conjunction with the pipes, a support for the moving trays and to expose a portion of the pipes in one chamber and the re-

mainder in the other chamber without establishing communication between the chambers.

7. In combination with the upper and lower drying-chambers, the heater and its surrounding-chamber, the flue leading from the top thereof to the upper drying-chamber, the smoke-pipe leading from the heater, the stack surrounding the same and communicating with the lower drying-chamber, and the cold-air flue extending through the stack to the bottom of the heater, whereby the heat radiated from the smoke-pipe is applied to induce the discharge of moisture-laden air from the lower chamber and to heat the air entering through the flue in the stack.

In testimony whereof I hereunto set my hand, this 29th day of October, 1889, in the presence of two attesting witnesses.

BENJAMIN L. RYDER.

Witnesses:

B. Y. HAMSHER,
SAML. M. NOSBY.