(No Model.) 2 Sheets—Sheet 1.

A. J. HATCH.

DRIER.

No. 396,562. Patented Jan. 22, 1889.

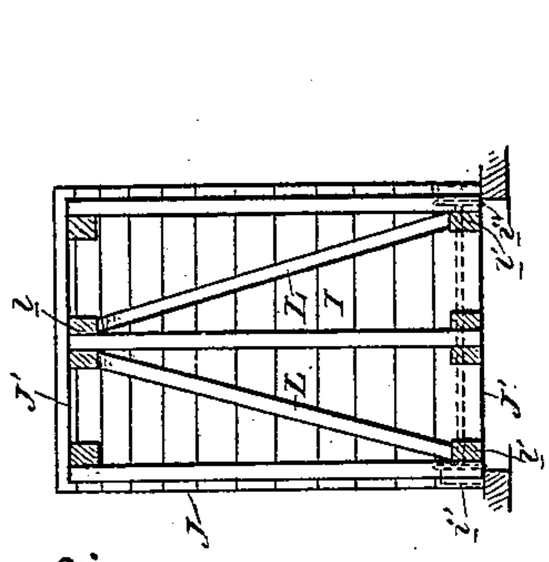

Fig. 8.

Fig. 1.

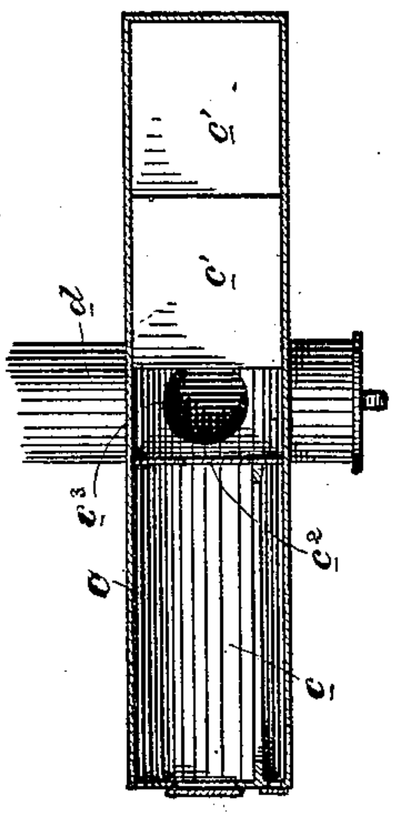

Fig. 4.

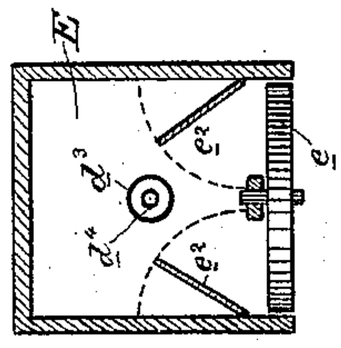

Fig. 2.

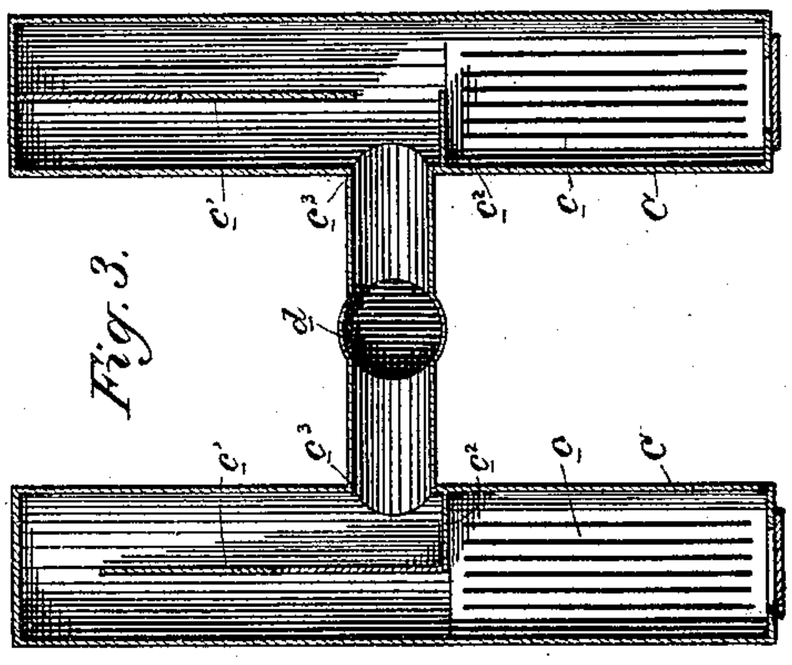

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

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DRIER.

No. 396,562. Patented Jan. 22, 1889.

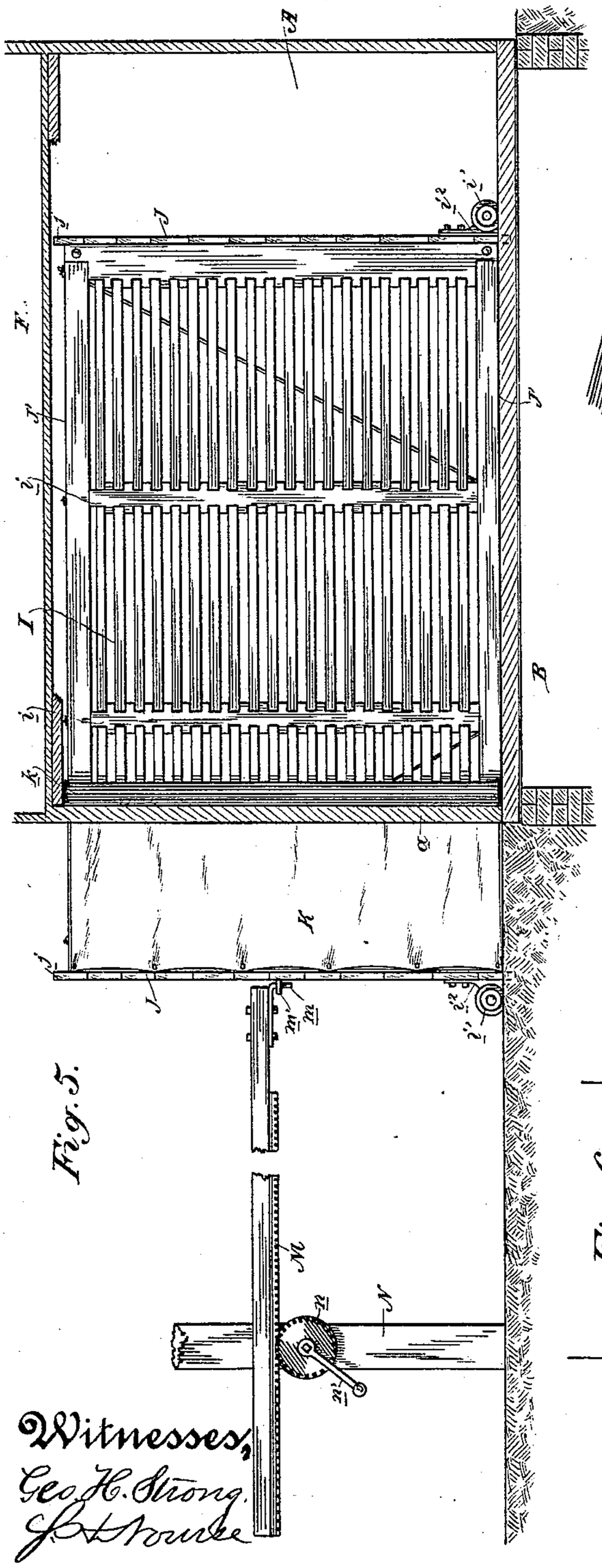

Fig. 5.

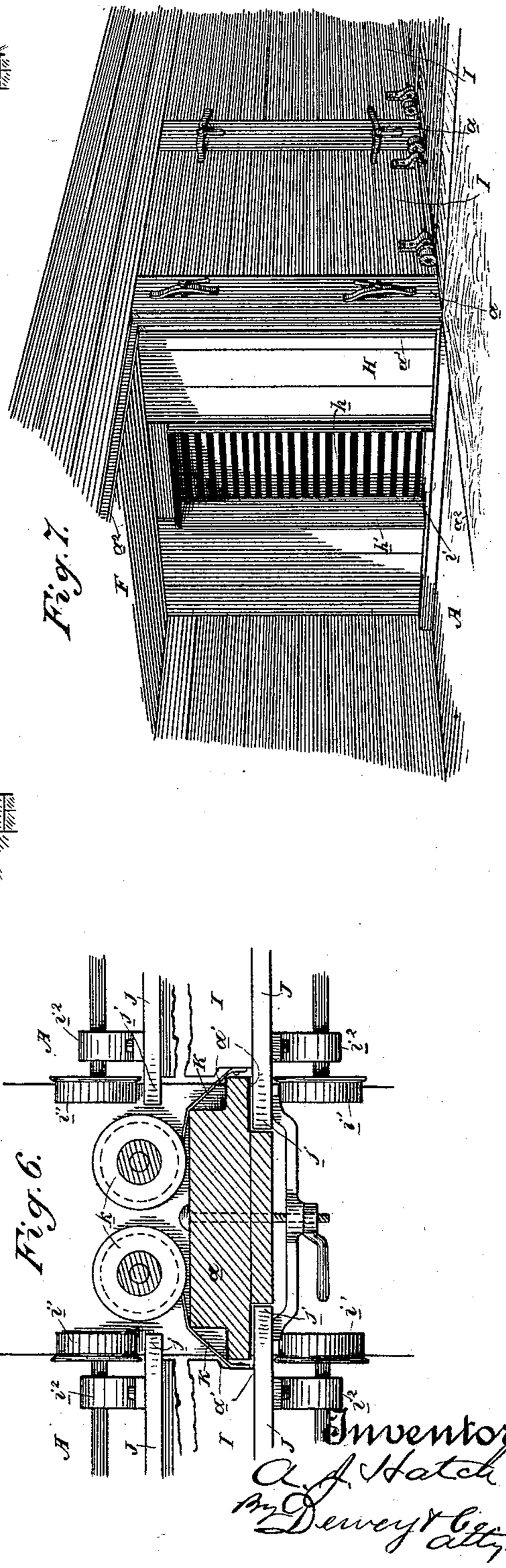

Fig. 7.

Fig. 6.

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UNITED STATES PATENT OFFICE.

ANDREW J. HATCH, OF SAN FRANCISCO, CALIFORNIA.

DRIER.

SPECIFICATION forming part of Letters Patent No. 396,562, dated January 22, 1889.

Application filed April 2, 1888. Serial No. 269,338. (No model.)

To all whom it may concern:

Be it known that I, ANDREW J. HATCH, of the city and county of San Francisco, State of California, have invented new and useful Improvements in Driers; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that class of driers for fruit, &c., in which means are provided for producing a horizontal draft through the drying-chamber, and in which the fruit is contained on trays carried by cars traveling on tracks into and out of the side or front of the chamber; and my invention consists in the constructions and combinations of devices which I shall hereinafter fully describe and claim.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a longitudinal vertical section. Fig. 2 is a horizontal section through the tower E in the line *x x* of Fig. 1. Fig. 3 is a central horizontal section of one of the furnaces. Fig. 4 is a vertical central section of same. Fig. 5 is a vertical cross-section of the drying-chamber, showing one of the cars and the handling mechanism. Fig. 6 is a horizontal section of the door-frame, showing the adjacent cars and the side curtains. Fig. 7 is a perspective showing the partition H within the drying-chamber. Fig. 8 is a vertical transverse section through one of the cars.

A is the drying-chamber of the apparatus, under which is located the heating-chamber B, which contains the furnaces or heaters C.

The heating-chamber is connected with the drying-chamber at each end by valve-controlled apertures *b* and with the exterior air by door-controlled inlet-opening *b'*. Within the chamber are the radiators D, which are constructed of intercommunicating pipes, substantially in the manner shown in my patent, No. 371,684, dated October 18, 1887, and therefore need not herein be specifically described. These radiators are connected by flues *d* with the furnaces or heaters, and these flues and the radiators throughout the whole drier are connected by flues *d'*, and in all of said connecting-flues are dampers, (shown at d^2,) whereby the heat of any one or more of the furnaces may be directed into any one or more of the radiators, according to the necessities of the operation, all of which I have heretofore fully described in my patent above mentioned, and these parts need not be herein more particularly referred to, except to state that the object of the radiators within the chamber is to augment the temperature of the draft passing through the chamber at points where, by radiation and other causes, it loses its primary heat in its long course of travel through the chamber.

Having now described generally the parts of the drier which have heretofore been patented by me, the several improvements in connection with the apparatus will be more readily understood.

In my previous driers I contemplated the use of a blower or exhaust-fan at each end of the drying-chamber, so that upon closing either end of the chamber and operating the opposite blower a reversible draft might be had. Instead of such an arrangement, my first improvement in the present case consists in the employment of but a single draft-discharge, which said discharge I prefer to locate at approximately the center of the drier, and which I have shown here in the form of a tower or casing, E, which communicates freely with an air conduit or passage, F, passing along the top of the drying-chamber and connecting with it at each end through gate-controlled apertures *f*. In this discharge-tower E, I locate the single suction-fan *e*. Now by closing down the gate of the aperture *f* at one end and opening up the gate at the other end it is obvious that by setting the fan in operation an artificial blast is produced, beginning at any of the air-inlets *b'* of the heating-chamber B, thence into the drying-chamber at one end through the connecting-aperture *b*, the valve of which is open, (the valve of the connecting-aperture *b* at the other end being closed,) and along through the entire length of the drying-chamber to the other end, thence up through the open aperture *f* into the flue F above and along to the discharge-tower E. To reverse the draft, I have but to close the communications which before were open and open those which before were closed, and it will thus be seen that I obtain by a single centrally-disposed discharge the reversible draft through the drying-chamber, which

I heretofore effected by means of two blowers or fans, one at each end. This central discharge tower or chamber, E, I utilize for another purpose—viz., the creation of a natural draft—and this I accomplish in the following manner: When the artificial draft is being used, I close the passage-way of the tower by means of gates e', so that the draft is drawn out toward the suction-fan; but when I wish to provide for the natural draft I shut off the fan from the tower or chamber by means of the gates e^2, Fig. 2, so that the tower shall be free vertically. This natural draft, which is employed usually when only a portion of the drying-chamber is in use, as I shall hereinafter explain, may be accelerated as follows: The discharge-flues d^2 of the radiators are passed through the upper air passage or conduit, F, and all are joined centrally in a common smoke-stack, d^3, which runs up the center of the tower and terminates just below its top. Into the stack, from preferably the neighborhood of the central furnace, I extend a pipe, d^4, terminating just short of the top of the smoke-stack, said pipe being for the purpose of passing through a jet of steam. It will now be seen that as the smoke-stack opens into the tower and the steam-jet pipe into the stack, each one being below the top of the other, the emission of the products of combustion and the steam tends to increase the draft in the tower. This placing of the discharge-flues d^2 in the upper air-conduit, F, also serves the purpose of utilizing whatever heat may be passing through them by tending to accelerate the natural draft. The natural draft so constituted is not sufficient, however, to carry away the vapors from the usually large quantity of fruit under process of desiccation in the drying-chamber. Therefore, when a large drier is used to its full capacity, the forced or artificial draft by means of the suction-fan must be used; but there are times when a drier of small capacity will answer the purpose, in which case I may use the natural draft; and in order to adapt this present apparatus for this purpose it is necessary to reduce the drying-chamber to dimensions less than the normal, for by so doing I can dispense with a portion of the heating apparatus and thereby effect a great economy in the use of fuel. To reduce the chamber to one-half its usual size, I place an air-tight partition, G, Fig. 1, across the drying-chamber, near the longitudinal center, and I make an opening controlled by a slide or gate, g, through the upper floor of the chamber communicating with the air-conduit F above or with the exhaust-tower E. I also reduce the width of the chamber by means of the portable upright partitions H, Fig. 7, which are located within the spaces between the fruit-laden cars I, and these partitions are open in the middle at h, said opening corresponding to one of the compartments of the car I. Around the edges of this opening h, I attach a casing, h', extending lengthwise of the chamber to the extent of the space between the cars, allowing only sufficient space for the cars to move in and out without rubbing the edges of casing. When these partitions are in place, the casings h' of the inner edges are in alignment with the upright transverse partitions i of the car-frame, to which said upright partitions cleats are fastened, on which the trays rest. These partitions i in the car-frame I make air-tight, Fig. 5, and when the cars with their air-tight partitions and the transverse partitions H between the cars are in place a smaller chamber is formed within the chamber proper having walls in nearly perfect alignment and as nearly air-tight as may be, and sufficiently so to cause the air-draft to flow readily through the space provided for it and only through that compartment of the car containing the fruit to be dried, for when the capacity of the chamber is thus reduced I place the fruit only in that compartment of the car which will correspond with the openings h of the transverse partitions H. When the full chamber is needed, the portable partitions H are taken down and carefully laid aside for future use.

To place the cars within the chamber and to withdraw them without letting in a deluge of cold air was previously accomplished by the movable antechamber described in my patent, No. 335,351, dated February 2, 1886; but I find this result can be more readily accomplished and the sliding and swinging doors can be dispensed with by adopting the following mode: I board up each end of the car I, thus forming air-tight walls J for each end. These walls are extended on all sides beyond the ends of the car, so as to form projecting flanges or laps j, Fig. 6, and the door-frames a of the chamber A are packed at a', both on their outer and inner surfaces. Now when the car is pushed into its place in the chamber the projecting flange or lap j around the edges of its front wall coming up is seated against the packing a' of the door-frame a and makes a tight joint, and when the car is drawn out it will be limited by the projecting lap on the edges of its rear wall coming in contact with the inner packed surface of the door-frame, and again an air-tight joint will be made. Therefore when the car is both in the chamber and when it is out an air-tight joint is formed around all of its edges. Now to prevent the air from rushing in while the car is being moved in and out I make the top and bottom of the car air-tight by covering them with sheet-iron, J', and I put a weather-strip, a^2, Fig. 7, on the top and bottom of the door-frame a, which makes a tight joint both above and below while the car is moving. For the sides of the car it is obvious that as they are open for the purpose of introducing the fruit-trays a simple weather-strip would not be effective. For these, therefore, I have the following novel device: Curtains K are mounted on spring-rollers k, which are placed in an upright position within or back of the

door-frames, one end of the curtains being attached to the spring-roller and the other end hooked onto each side of the car at its front end. When the car is drawn out, the curtain being so attached is drawn out and over the side of the car covering the edges of the fruit-trays and the entire car-frame from top to bottom. The suction within the chamber A serves to keep the curtains down in place and the ingress of air is successfully prevented. When the car is withdrawn, so that the aperture is closed by the rear tight wall of the car, as heretofore described, the curtains may be detached from the front end and allowed to draw back to the door-frame, and when the car is to be replaced within the chamber the curtains are drawn out and can be attached as before. It is obvious that I might place similar curtains for the top and bottom of the car if I wished to leave them open; but the simpler plan is to close them up, as described, and use the weather-strips. Now as the car makes such a close fit with the drying-chamber, into and out of which it moves, I find it necessary to change the location of its wheels i'. Heretofore they have been placed directly under the car at suitable points; but in this position they would require openings or grooves in the sills of the door-frames to allow the car to be pushed fully in or drawn out to its extent, and these openings it would be difficult to render air-tight. I therefore change the location of the wheels, placing them on extensions i^2 of the car, so that they are beyond the end walls, J, as shown. This change in the location of the wheels leaves the longitudinal middle portion of the car unsupported, and as the car sustains a great weight I have adopted the construction which I have here shown, Fig. 8, in which I use diagonal braces L, running from the top center beam, l, of the car to the lower timbers, l', on each side, so that the sagging of the floor of the car is prevented by transferring the strain onto the side beams, which are better supported by the wheels.

I find in practice that it is often desirable to increase or diminish the amount of heat radiated from the furnaces or heaters C in the heating-chamber B and to supply a greater or less amount to the radiators D in the drying-chamber A. For this purpose I provide in each heater a partition, c', which divides the furnaces into two longitudinal compartments. This partition extends longitudinally from a point just back of the fire-box c to the rear end of the heater, and is so fitted in the shell of the heater that it may be slid to the end or up to a transverse partition, c^2, located in the heater forward of the outlet c^3. By moving this sliding partition fully up to the rear end of the heater I provide an opening between it and the transverse partition c^2, through which the flames and products of combustion from the fire-chamber pass directly and by the shortest route to the discharge-outlet. By moving it the other way—that is, forward—so as to bring it in contact with the transverse partition, I close the opening above formed, leaving an opening at the extreme end of the heater, so that the flames and products of combustion have to pass nearly twice the length of the heater to reach the outlet c^3. Now by making this longitudinal partition c' in sections or separate plates, as shown, each plate being independently movable, I can make the opening at different points in the length of the heater, and thus the flames and products of combustion travel a greater or less distance to reach the outlet, as I may desire. Now when I wish to cause the heater to radiate to its utmost capacity I place the sections of the partition c' in such a position that the open space or aperture is formed at the extreme rear end. The heat and gases then travel the length of the heater in one compartment and return around under or back of the partition, passing back to the point of exhaust c^3 at the side or top, as the case may be. Thus the heater itself radiates a greater part of the heat and a correspondingly less amount passes into the radiator D in the chamber above. When I wish to reverse the conditions, I slide the sections of the partition c' in such a way that the opening will be about opposite the exhaust-aperture c^3, thereby causing the heated gases to pass by the shortest and quickest route to the radiator. When the sections are arranged so that the aperture occurs at a point about midway of the partition, the radiation is equalized to a certain extent between the heater and the radiator.

In moving the cars I, heavily laden, in and out of the drying-chamber, it sometimes requires the combined exertion of three or four men. This condition applies to cars of the largest-sized driers, where frequently two or three tons of material are placed upon a single car. To make the moving of the car possible by one person, I provide the following mechanism:

M is a rack-bar, which is adapted to be connected with the front wall, J, of any of the cars by means of the hook m on its end, connecting with eyes or staples m' on the car-walls. A post, N, may be planted in suitable position opposite the car, said post carrying the pinion n, which meshes with the rack-bar M and is operated by the crank n'. By rotating this crank it will be found that there is sufficient power exerted to easily draw the car out of its place and shove it back again. The rack-bar is portable, so that it can be readily removed from one car to another, and the post can be taken down and moved from place to place, so that the apparatus presents a practical portable power mechanism for pulling the car out and pushing it in again, Fig. 5.

The bottom of the drying-chamber is preferably made of sheet-iron, the walls being supported on cross-pieces carried by the foundation.

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

1. In a drier, the combination of a drying-chamber having valve-controlled openings at each end for the passage of the air into either end of the chamber, a conduit or air-passage on the top of said chamber parallel therewith and extending its full length, valve-controlled apertures connecting the ends of the drying-chamber with the ends of the conduit or air-passage, and an exhaust passage or aperture in the conduit or air-passage, whereby the course of the air in the drying-chamber may be reversed in direction by manipulating the valves, substantially as herein described.

2. In a drier, a drying-chamber having valve-controlled openings at each end for the passage of the air, and an air passage or conduit above connected at each end with the ends of the drying-chamber by gate-controlled apertures, in combination with a tower or vertical passage communicating with the air passage or conduit, a suction-fan in the side of said passage for creating an artificial draft, the gates e', for closing the tower or passage above the fan, and the gates e^2, for shutting off the fan when the natural draft is desired, substantially as herein described.

3. In a drier, a drying-chamber having valve-controlled end openings for the passage of the air, the air passage or conduit on top of said chamber and communicating at each end by gate-controlled apertures with the ends of the drying-chamber, and the single exhaust-tower connected with the air-conduit above, in combination with a vertical partition dividing the drying-chamber into two parts, and the gate-controlled aperture in the top of the drying-chamber and communicating with the air-conduit above, whereby but half of the drying-chamber may be utilized, substantially as herein described.

4. In a drier having a drying-chamber, the cars I therein having compartments divided by air-tight partitions, in combination with removable transverse partitions H in the drying-chamber having openings communicating with one of the compartments of the cars, substantially as herein described.

5. In a drier having a drying-chamber, the cars I therein having compartments separated by air-tight partitions, in combination with the removable transverse partitions H in the drying-chamber having openings in alignment with one of the compartments of the car, and casings h', surrounding said openings and joining with the partitions of the car, whereby a practically air-tight continuous flue is formed in the main drying-chamber and of reduced capacity, substantially as herein described.

6. In a drier having a chamber and open-sided cars adapted to move in and out, the means for closing the open sides of the cars as they are moving in and out, consisting of curtains attached to the chamber-frame and to the front of the car and covering its sides as it is drawn out, substantially as herein described.

7. In a drier having a drying-chamber with openings, and open-sided cars moving in and out of said openings, the means for closing the open sides of the car as they are moving, consisting of rollers mounted within the drying-chamber, and curtains attached to said rollers and to the front end of the cars, whereby they cover their open sides as they are drawn out, substantially as herein described.

8. In a drier, the drying-chamber having door-frames and the open-sided cars passing through the door-frames into and out of the chamber, in combination with the spring-rollers mounted within the door-frames and on each side thereof, and the curtains attached to the rollers and to the front end of the cars, substantially as herein described.

9. In a drier, the furnaces or heaters having the transverse partition c^2 forward of the outlet, in combination with the sliding longitudinal partition c', made of independent and separately-movable sections, whereby a route is formed for the passage of the products of combustion, more or less direct, substantially as herein described.

10. In a drier, the drying-chamber, the heating-chamber below, the furnaces or heaters within the heating-chamber, and the radiators within the drying-chamber, in combination with the means for varying the radiation from the furnaces or radiators, respectively, consisting of the transverse partition c^2 in the furnaces forward of the outlet, and the sliding longitudinal partition or partitions movable to and from the transverse partition, whereby the course of the products of combustion is made more or less direct, substantially as herein described.

In witness whereof I have hereunto set my hand.

ANDREW J. HATCH.

Witnesses:
S. H. NOURSE,
H. C. LEE.