H. BAETZ.

DRYING APPARATUS.

APPLICATION FILED OCT. 30, 1918.

1,312,607.

Patented Aug. 12, 1919.

3 SHEETS—SHEET 1.

FIG. 1.

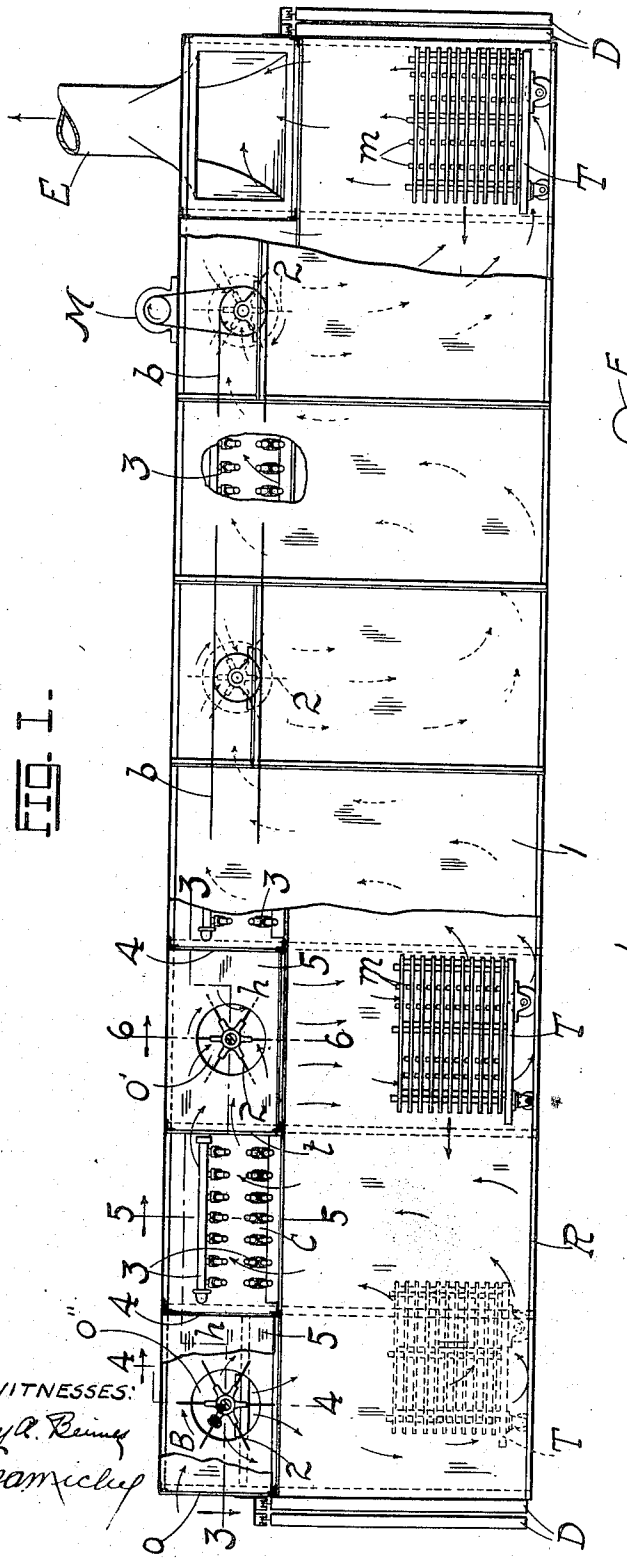
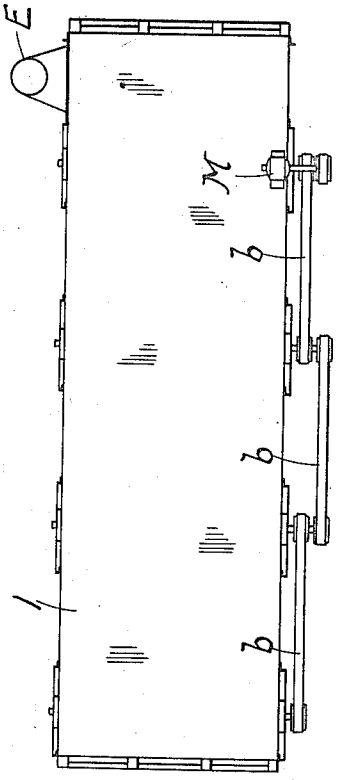


FIG. 2.



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3 SHEETS—SHEET 2.

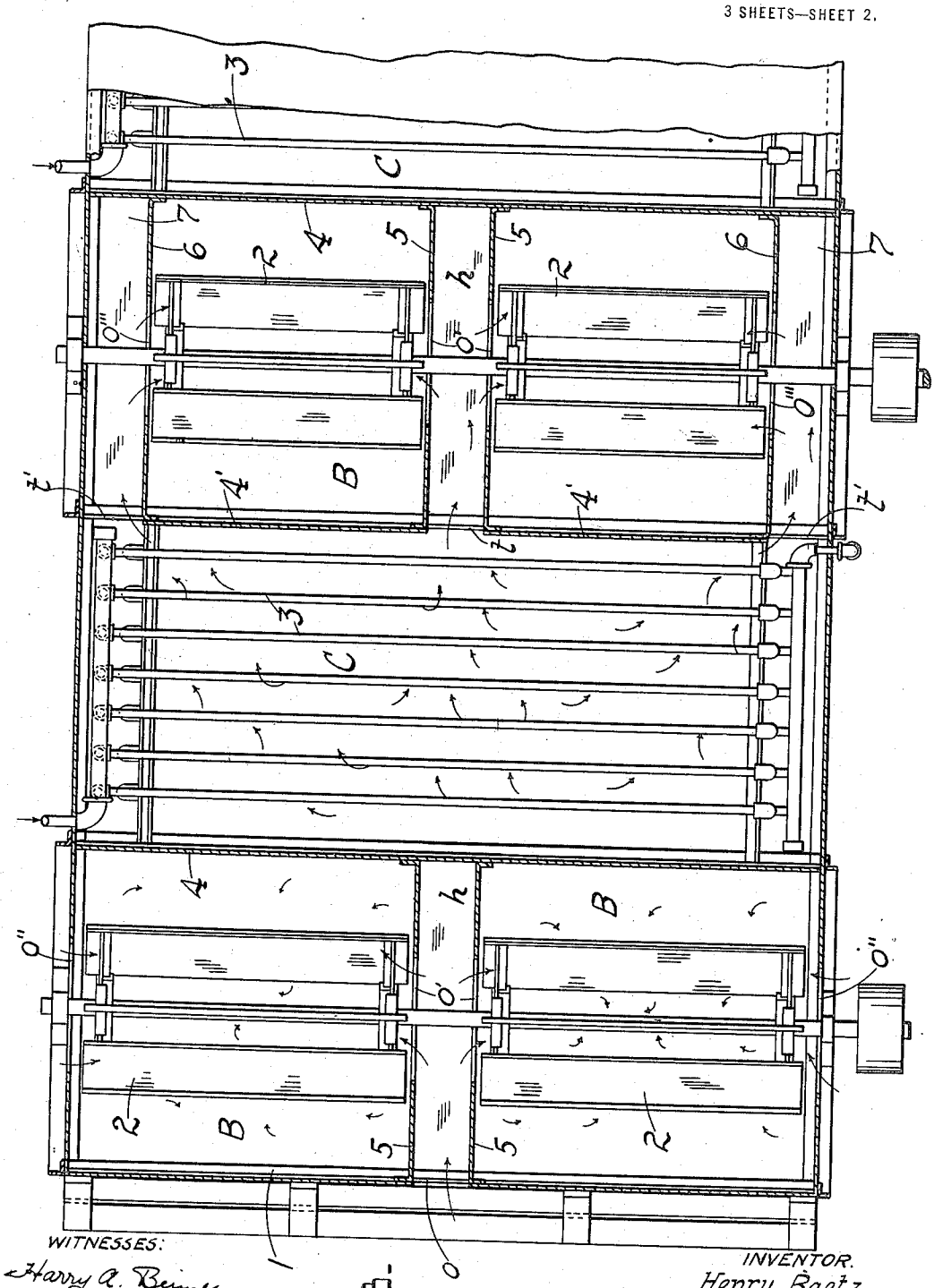


FIG. 3.

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3 SHEETS—SHEET 3.

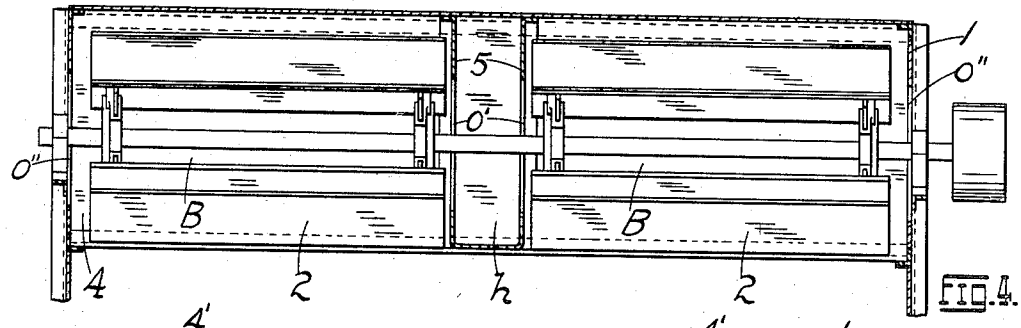


FIG. 4.

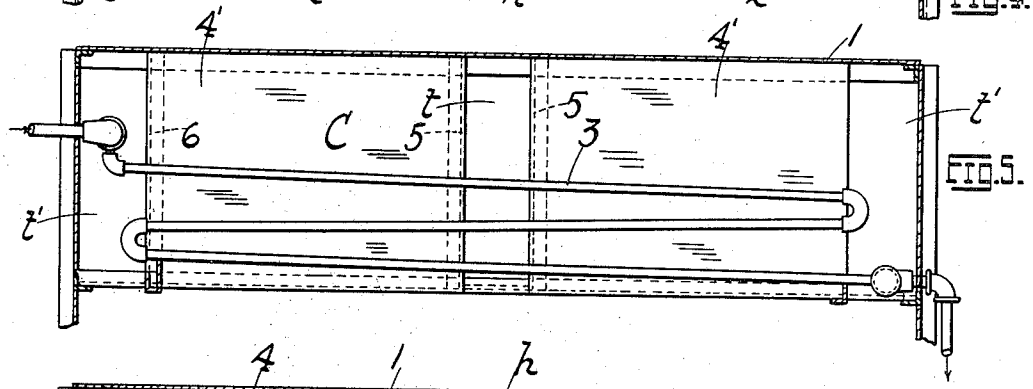


FIG. 5.

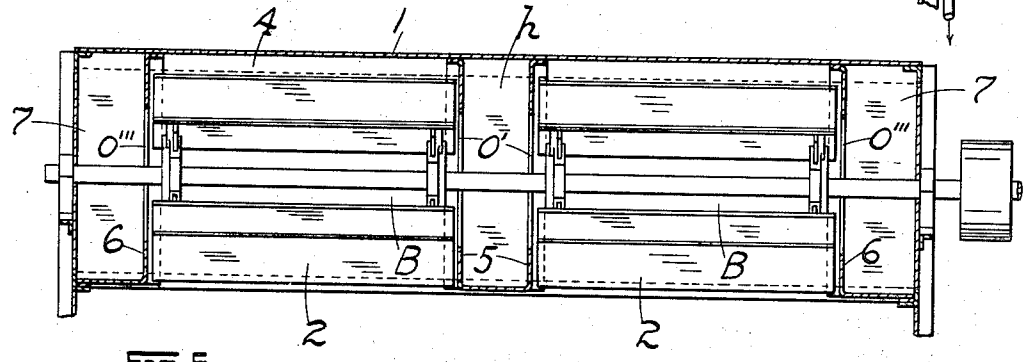


FIG. 6.

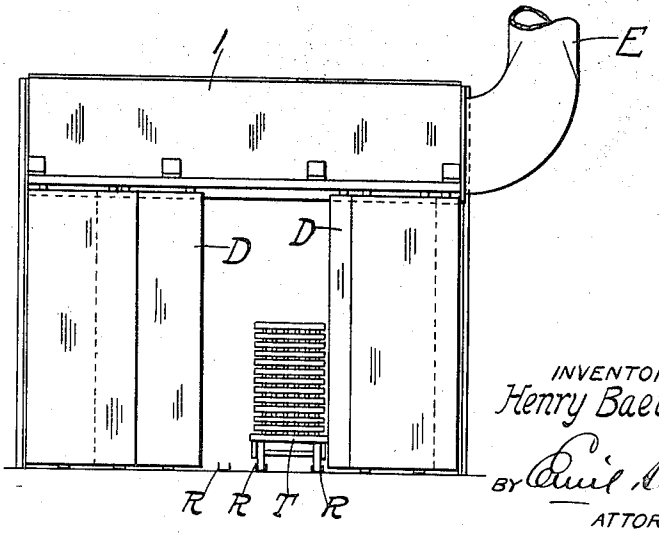


FIG. 7.

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UNITED STATES PATENT OFFICE.

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DRYING APPARATUS.

1,312,607. Specification of Letters Patent. Patented Aug. 12, 1919.

Application filed October 30, 1918. Serial No. 260,359.

To all whom it may concern:

Be it known that I, HENRY BAETZ, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Drying Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

The present invention is directed to improvements in drying apparatus, being specially designed for the drying of soap in bar or cake form, though obviously not restricted thereto, as the same may with like advantage be used for the drying of veneer, leather, vegetable, animal, and mineral matter and in fact in any art or industry in which the expulsion of moisture is desired. The object of the invention is to bring about a circulation of the drying medium (heated air) in such a way as to cause the air currents to reach every portion of the material to be dried, the stock entering the drying chamber at a point where the air is hottest and emerging from the chamber thoroughly dried at a point where the air is coolest. In the present embodiment of my invention the circulation of the heated air is brought about by a series of fans or blowers operating in conjunction with a corresponding series of steam heating coils, although other forms of heating devices such as electric, air or gas heaters may be substituted for the steam coils. The advantages of the construction forming the basis of the present invention will be fully apparent from the following detailed description in connection with the accompanying drawings in which—

Figure 1 represents a combined side elevation and middle vertical longitudinal section of the casing or drying chamber; Fig. 2 is a top plan on a smaller scale; Fig. 3 is an enlarged horizontal section of a portion of the drying chamber on the zig-zag line 3—3 of Fig. 1; Figs. 4, 5 and 6, are vertical cross-sections of the upper portion of the drying chamber on the section lines 4—4, 5—5, and 6—6 respectively, on Fig. 1; and Fig. 7 is a front or feed-end elevation of the drying chamber.

Referring to the drawings, 1 represents a casing or drying chamber of any desired length, the opposite ends thereof being open for the reception and discharge of the trucks T on which the stock to be dried is deposited, the stock in the present instance representing bars of soap *m*. The open ends of the casing are adapted to be closed by doors D which are preferably of the conventional barn-door type, the portions of the end walls above the doors being closed with the exception of the central air intake opening *o* in the rear end wall. One of the side walls of the casing adjacent the intake end for the stock is provided with an exit flue E, from which the heated moisture-laden air may be conducted to any desired point of consumption or allowed to escape into the atmosphere (as shown). Disposed beneath, and adjacent the roof of the casing or drying chamber are a series of pairs of fans or blowers 2 extending transversely across the casing, said fans alternating with a corresponding series of steam heating coils 3 (or their equivalent) likewise extending across the casing, the bottoms of the coils and the bottom sweep of the fan blades being in a horizontal plane substantially even with the bottom of the air intake opening *o* aforesaid, or with the upper edges of the sliding doors D. The fans are separated from the adjacent coils by transverse partitions 4, 4′, the lower edges of the several partitions being disposed in a horizontal plane substantially even with the bottom of the opening *o*, or with the upper edges of the doors D, or in the plane with the bottoms of the coils and bottom sweep of the fan blades. Connecting the rear end wall of the casing and the first partition 4 of the series, and disposed on each side of the central air intake opening *o* in said wall, are longitudinally disposed partitions 5, 5, of the same depth as the partitions 4, 4′, said partitions forming a central longitudinal duct or intake flue *h* for the delivery of the air currents to the adjacent ends of the first pair of fans, said partitions being provided with openings *o′* for the purpose, the outer ends of the fans of the first pair drawing in air through openings *o″* formed in the side walls of the casing. It is to be understood that the partitions 4 extend entirely across the casing 1, whereas the partitions 4′ are in two sections whose inner vertical edges terminate along longitudinal vertical planes coincident with the planes of disposition of the partitions 5, 5, aforesaid, like longitudinal partitions 5, 5, connecting the inner ends of said sections 4′, 4′, with the next succeeding transverse partition 4, and likewise forming a central longitudinal conduit *h* which is in free communication with

the first steam coil compartment C through the passage t formed between the inner adjacent ends of the sections 4', 4'. The outer ends of the partition sections 4', 4', terminate a suitable distance from the side walls of the casing (Fig. 3), said ends being connected with the next succeeding partition 4 by longitudinal partitions 6, provided with central air intake openings o''' for delivering air to the outer ends of the fan members in the compartments B, it being understood that the several transverse partitions form suitable compartments B and C for the fans and steam coils respectively. The air reaches the intake openings o''' through the longitudinal side flues 7, 7, formed between the partitions 6 and the side walls of the casing, the heated air flowing into said flues from the steam-coil compartment C through the passages t' between the side walls of the casing and the outer ends of the partition sections 4', 4', the partitions 5, 5, being provided with air-intake openings o' for delivering air to the inner ends of the fan members. Beyond the first pair of fans 2, the arrangement of steam coils and circulating fans is the same as that described for the first steam coil and second set of fans, all subsequent steam coils and fans being duplications of such construction. In other words, with the exception of the first pair of fans 2 which draw in the cold air at their outer ends through openings o'' in the side walls of the casing, the outer ends of all subsequent fans draw in the casing air through openings o''' formed in the partitions 6, said air being of course heated since it had already passed over the steam coil 3 in the compartment C immediately preceding. There being no partitions 6 in the first fan compartments B, the blades of the fans in these compartments are preferably made longer than the blades of the fans in the succeeding fan compartments. Preferably, the several coils 3 derive their steam from a single source (not shown) the steam entering at one end and the water of condensation discharging at the opposite end as fully indicated by the arrows. The several fans are preferably driven from a common motor M, suitable belting b connecting the fan shafts as shown and clearly obvious from the drawings without further description. The trucks are preferably run into the drying chamber along channel rails R as shown.

The operation of the drier is substantially as follows: Assuming that the several fans have been set in motion and the steam turned on into the several coils, the trucks T with their stock of soap m (or other articles or material) to be dried are run into the chamber of the casing 1 at the end adjacent the exit flue E, the trucks being introduced one at a time and progressively advanced toward the cold air-intake end of the drying chamber or the end where the outside air enters the first fan compartments through the openings o, o', o'', (see Fig. 3). The fans in these compartments force or drive the air currents radially outward, and since none of these air currents can pass the imperforate partition 4 they must necessarily flow downward and circulate around the partition and over the articles deposited on the last truck of the series or that which is about to be wheeled out of the drying chamber or casing 1. In this downward circulation the air currents naturally tend to flow into the space under the first steam coil 3 by reason of the more or less rarefaction of the atmosphere in the region of a hot coil, the hot coil naturally causing the air to rise and thereby circulate around the pipes composing the coil, the upward flow of the rising air currents being in a large measure intensified by the inducing action of the second set of fans 2 to which air now heated by the first steam coil is admitted through the passages t, t', flues h and 7, and openings o', o''', as fully indicated by the arrows in Fig. 3. From the second set of fan compartments B the air is driven and forced downward toward and into the space below the second steam-coil compartment C, the currents rising up through the spaces around the coils in said compartment whence they are picked up by the next succeeding pair of fans and passed on to the next succeeding steam-coil compartment and so on through the entire series, until the air is discharged through the flue E. The air thus circulates vertically across the drying chamber and at the same time longitudinally through the chamber from the intake o to the discharge end or exit E.

It will be seen from the foregoing that as the air currents circulate toward the exit E they are constantly taking on fresh accessions of heat units from the steam coils they successively encounter so that the articles or stock first to enter the drying chamber comes in contact with highly heated air, the discharging truck or that leaving the chamber encountering the cold air which is first admitted to the chamber, the stock in its passage through the chamber traversing a succession of zones of constantly decreasing temperature, the incoming cold air meeting the stock which has been thoroughly dried, and the fresh stock meeting the air which has attained a maximum temperature. As shown by the arrows in Fig. 1, the course of the air circulation is a sinuous curve, the air being projected downward by the fans, then rising upward through the space around the coils, the upper and lower bends of said curve being substantially horizontal. The air flues are so disposed that the air moves practically in a body or solid mass through the spaces around the steam coils and through the interstices between the

stock, rather than in divided streams or streaks, thereby not only insuring a thorough heating of the air but a thorough drying of the stock. The details of the apparatus may be changed in many particulars without a departure from the spirit or nature of the invention. Features shown but not alluded to are well known in the art and require no description in the present connection.

Having described my invention what I claim is:

1. A drier comprising a suitable casing or chamber, a succession of air moving and air heating devices disposed in the upper portion of said chamber and operating to circulate heated air through the chamber in two distinct directions.

2. A drier comprising a suitable casing or chamber, a succession of air moving and air heating devices alternating with one another disposed in the upper portion of said chamber, and operating to circulate heated air through the chamber simultaneously in two distinct directions.

3. A drier comprising a suitable casing or chamber, a succession of air moving and air heating devices disposed beneath and adjacent the roof of the casing and alternating with one another, the walls of the casing being provided with openings for the introduction and removal of the articles to be dried, said air moving and air heating devices operating to cause a circulation of the air vertically across the articles to be dried and longitudinally through the chamber.

4. A drier comprising a suitable casing or chamber having feed and discharge openings for the stock to be dried, a succession of fans and air heating devices alternating with one another disposed beneath and adjacent to the roof of the casing and above the stock to be dried in said chamber, and suitable partitions between the fans and heating devices for causing the air to circulate from the several fans downwardly and upwardly through the stock and upwardly and horizontally through the spaces around the heating devices, whereby the air progressively receives constant accessions of heat units in its passage through the chamber.

5. A drier comprising a suitable casing having intake and discharge openings at opposite ends for the stock to be treated, a succession of fans and air heating coils alternating with one another disposed beneath and adjacent the roof of the casing, suitable partitions between the fans and coils disposed to prevent direct communication between a fan and the space around an adjacent succeeding coil but to afford direct communication between the space around a coil and an adjacent succeeding fan, whereby the air is caused to circulate around a partition from a fan toward a coil, and is free to flow directly from a coil toward the next succeeding fan.

6. A drier comprising a suitable casing having inlet and outlet openings at opposite ends for the reception and discharge of the stock, the end wall at the discharge terminal of the casing being provided with a central air intake opening adjacent the roof of the casing, a series of transverse partitions disposed across the full width of the casing adjacent the roof and of a depth substantially equal to the depth of the air intake opening aforesaid, a second series of transverse partitions comprising each two sections spaced apart and having their outer ends spaced from the side walls of the casing, alternating with the first mentioned partitions, longitudinally disposed partitions on opposite sides of the central air intake opening aforesaid leading from the end wall of the casing to the first partition of the first mentioned series of transverse partitions, similar longitudinal partitions alined with the first mentioned longitudinal partitions leading from the inner terminals of the sections composing the second mentioned transverse partitions to the next adjacent partition of the first series of transverse partitions, whereby suitable pairs of compartments are formed between the side walls of the casing and each set of longitudinal partitions, and likewise compartments the full width of the casing alternating with the pairs of compartments aforesaid, a steam heating coil in each of the last mentioned compartments, a fan in each of the compartments formed between the side walls of the casing and longitudinal partitions, the side walls of the casing opposite the first set of fan compartments, and the several longitudinal partitions being provided with air intake openings, longitudinal partitions connecting the outer ends of the sections of the transverse sectional partitions with the next succeeding transverse partition thereby forming flues adjacent the inner faces of the side walls of the casing, said last named longitudinal partitions being provided with air intake openings, and a suitable air exit leading from the casing at the end opposite the first mentioned central air intake opening, the parts operating substantially as, and for the purpose set forth.

7. A drying apparatus comprising a suitable casing for the reception of the stock to be dried, a fan at one end of the casing adjacent the roof thereof, means in the casing walls for supplying atmospheric air to the fan, a series of heating coils and fans alternating with one another disposed in the casing adjacent the roof thereof and in free communication with one another and with the first mentioned fan, suitable compartments for the fans and heating coils open-

ing into the chamber of the casing, a steam coil compartment being in direct side communication with a fan compartment and the latter in direct bottom communication with the drying chamber of the casing, whereby upon the fans being set in motion the air is circulated vertically through the stock to be dried and is drawn horizontally from a heating coil compartment into the next fan compartment of the series.

8. A drying apparatus comprising a chamber traversed in one direction by the stock to be dried, means in the upper portions of the chamber for causing heated air to traverse the chamber in the opposite direction, and means adjacent the roof of the chamber for raising the temperature of the circulating air at intervals in its traverse through the chamber.

9. In a drying apparatus, a suitable casing, a series of fans and air heaters disposed in the upper regions of the chamber thereof, the lower portions of the chamber receiving the stock to be dried, and means for causing the air impelled by the fans to circulate vertically through the stock and simultaneously horizontally through the chamber to a suitable point of exit.

10. A drier comprising a suitable casing, a plurality of air moving devices disposed adjacent the upper portions of the casing, and means in the upper portions of the casing for causing an air circulation in combined vertical and horizontal paths through the casing to and from the aforesaid air moving devices.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY BAETZ.

Witnesses:
EMIL STAREK,
JOS. A. MICHEL.