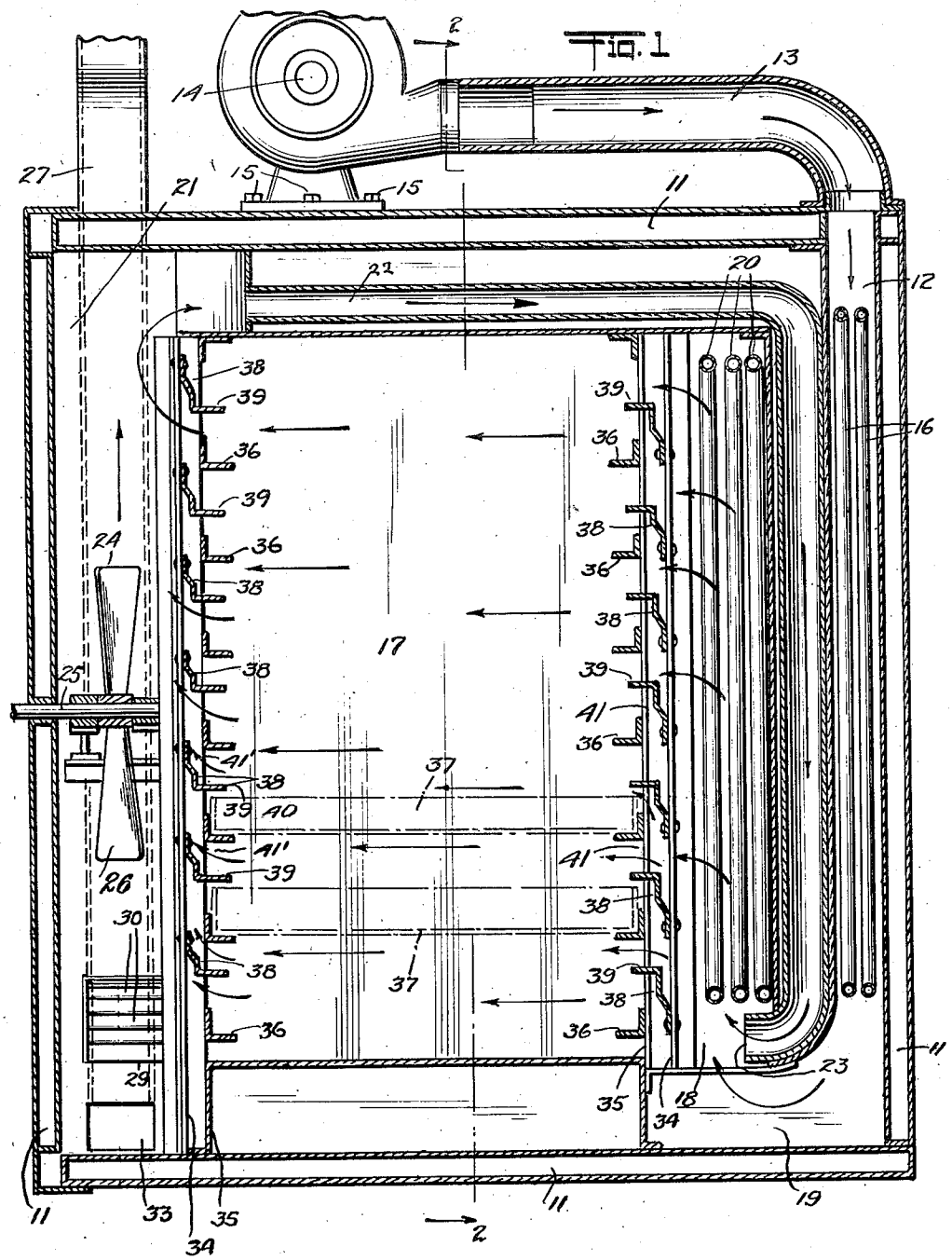
Feb. 24. 1925. 1,527,192

J. JUDELSON

DRIER

Filed Jan. 7, 1921 3 Sheets-Sheet 1

Fig. 1



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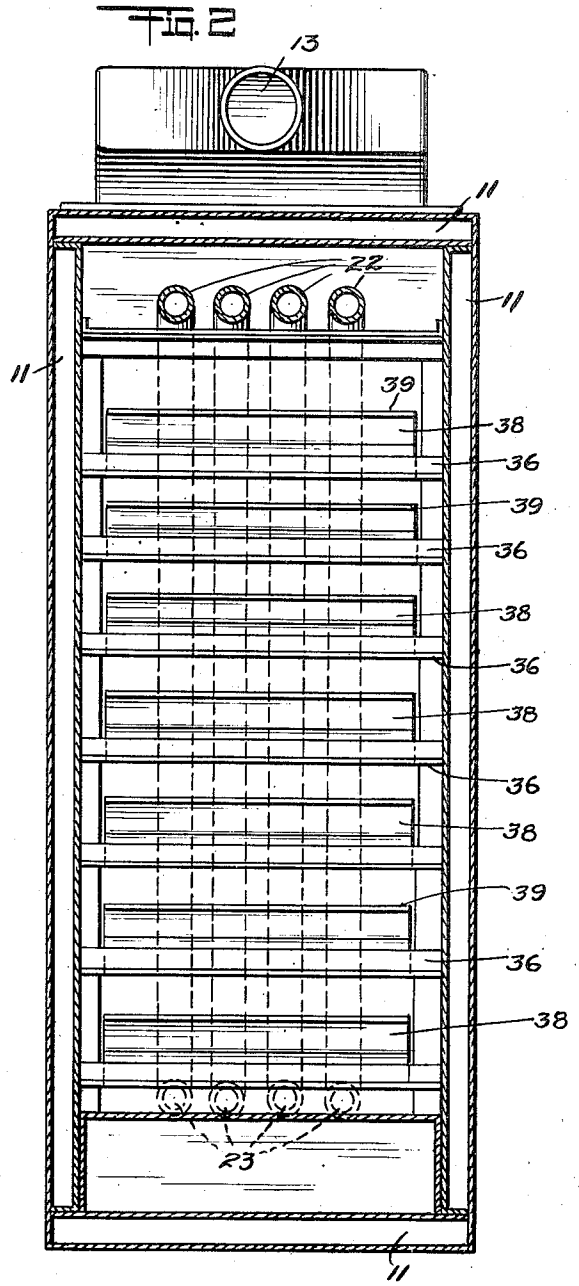
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DRIER

Filed Jan. 7, 1921 3 Sheets-Sheet 2

Fig. 2



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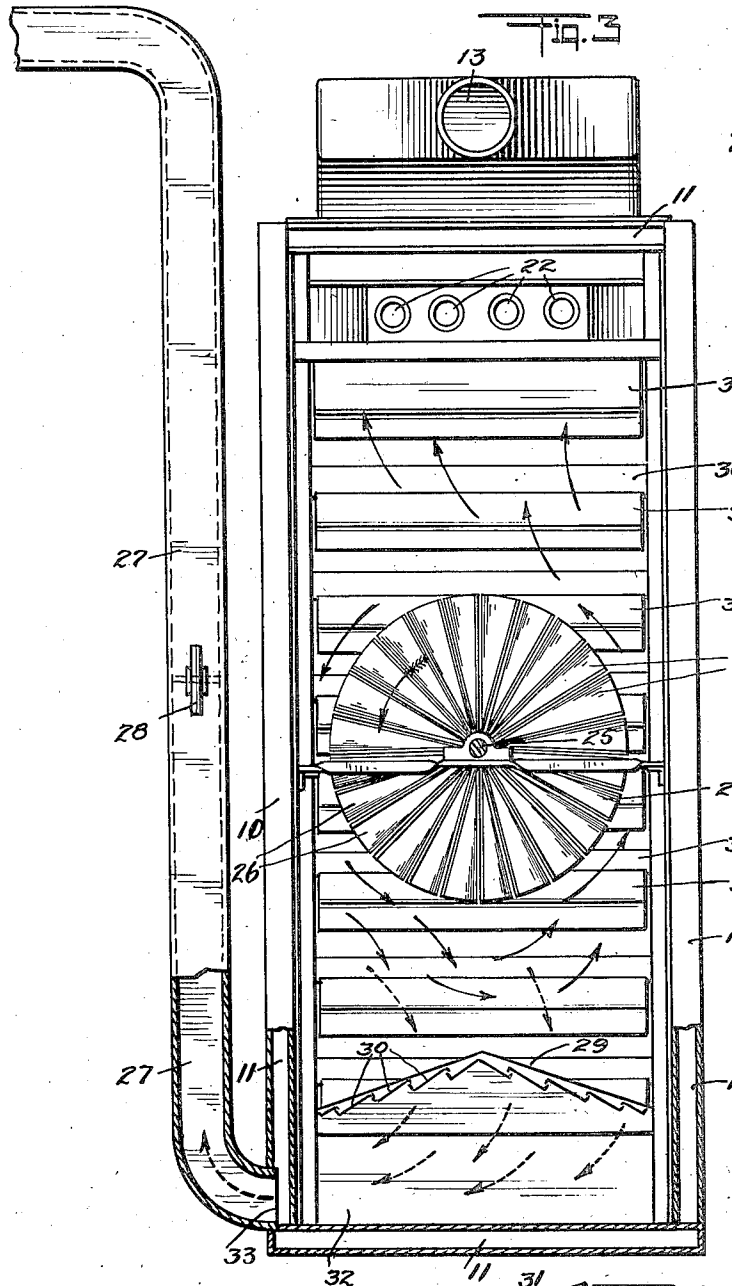
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J. JUDELSON

DRIER

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Fig. 3



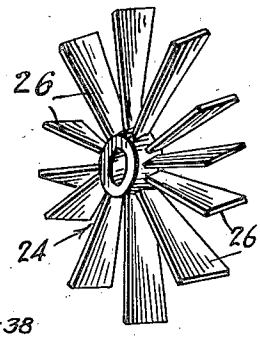
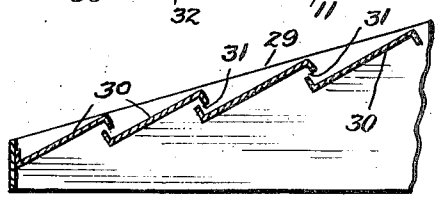


Fig. 5

Fig. 4



WITNESS
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Patented Feb. 24, 1925. 1,527,192

UNITED STATES PATENT OFFICE.

JULIUS JUDELSON, OF NEW YORK, N. Y., ASSIGNOR TO JUDELSON EVAPO-DRYER CORPORATION, A CORPORATION OF NEW YORK.

DRIER.

Application filed January 7, 1921. Serial No. 435,708.

To all whom it may concern:

Be it known that JULIUS JUDELSON, a citizen of the United States, and resident of the city of New York, in the county of Bronx and State of New York, has invented certain new and useful Improvements in Driers, of which the following is a specification.

This invention relates to drying apparatus for abstracting moisture from materials to be dried and in which the drying is accomplished by a heat vehicle such as heated air which is circulated into contact with the layers of the material.

In driers of this type, where the heated drying medium is brought into contact successively with the layers of the material to be dried, there is a reduction in temperature of the medium after some of the moisture has been absorbed by it which leaves the latter greatly reduced in its effectiveness for further drying purposes. The moisture containing medium must therefore either be discharged from the drier or if it is to be used further effectively, it must be reheated after each successive contact with each of the layers of the material. In either event, there is a considerable loss of efficiency resulting either from the total wastage of power due to discharge of the "dead" drying medium which of course still has quite some heat energy, or from the unwarranted extra amount of heat energy that must be supplied where the reheating must be repeated after successive contact with each layer of the material and is applied to a moisture containing used medium.

One object, therefore, of this invention is to provide a drier of the type described characterized by efficiency of operation and economy of power to a high degree.

Another object is to provide a drier of the type described with means for removing a large percentage of the moisture with a portion of the medium exhausted after its contact with the material and propelling the remaining portion of said medium back to the supply end of the drier for reheating and then into repeated contact with the material.

A still further object is to provide a drier in the form of a self-contained unit having propelling means for circulating the drying medium through the drying chamber continuously and for reconditioning the moist drying medium.

Another object is to provide a drier of the type described in which a substantially constant temperature is maintained throughout the entire drying chamber, and the drying medium simultaneously circulated into contact with all the layers of the material to be dried.

Other objects of this invention will be in part obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter described and of which the scope of application will be indicated in the following claims.

In the accompanying drawing, in which is shown one of various possible illustrative embodiments of this invention,

Fig. 1 is a longitudinal cross-sectional view of an evaporator embodying this invention;

Fig. 2 is a transverse cross-sectional view thereof cut along line 2—2 of Fig. 1;

Fig. 3 is a view of the drier with the end wall of the casing removed and parts broken away to expose the means for exhausting and for recirculating the drying medium;

Fig. 4 is an enlarged fragmentary detail view showing the louvers through which the moisture laden drying medium is drawn; and

Fig. 5 is a perspective view of the fan employed for drawing the drying medium through the drying chamber and for propelling it back into circulation and exhausting same.

Referring to the drawing, 10 indicates a casing preferably of double-walled construction so as to include heat insulating air spaces 11 for preventing loss of heat from the interior of the drier. The casing 10 is provided at one end with a passage 12 into which is supplied air or any other suitable vehicle through a conduit 13 which is suitably connected to a blower 14 of suitable type and which is secured preferably to the top of the casing as shown, by means such as bolts 15. Located preferably in the passage

12 is a heating device such as the steam pipes 16 (shown diagrammatically) for preheating the air supplied to the passage to any desired temperature. On the interior of the casing and occupying substantially a greater portion of the volume thereof is the drying chamber 17, at the end of which adjacent the supply passage 12 is the passage 18 communicating at the bottom with the supply passage 12 at co-terminus 19. Located in this passage 18 is another heating device such as the steam pipes 20 shown diagrammatically. Disposed at the opposite end of the chamber 17 is a passage 21 communicating at the top with a series of return flues 22 extending above the drying chamber 17 and down into the supply end of the evaporator and terminating at and communicating with the chamber 18 as shown at 23.

Located in the return passage 21 is a fan 24 suitably mounted on a shaft 25 adapted to be driven by a motor (not shown). The planes of the vanes 26 of the fan do not pass through the axis of the fan shaft but are turned at various angles thereto as shown by the shading in Figs. 1 and 3. Opening from the bottom of the passage 21 is an exhaust flue 27 provided with a damper device 28. Beneath the fan 24 is provided a triangular venting device or louvers 29 comprising metal strips 30, angularly disposed adjacent each other as shown in Fig. 4 and forming the sides of the triangle and providing between their bent ends openings 31 through which the passage 21 communicates through the space 32 at the bottom of the passage with the opening 33 of the flue.

The drying chamber 17 is open at each end and is provided at each end with spaced supporting pieces 34, 35. To the inner support 35 are secured angle irons 36 which serve to support trays 37 on which are placed the layers of material to be dried. Secured to the outer supports 34 are bent pieces 38 having horizontal portions 39 substantially parallel to the supporting flange 40 of the angle irons and extending therebetween these members 39 and 40 to form passageways 41, 41′ oppositely disposed in each end of the drying chamber and through which a draft is created across the top and bottom of the trays 37.

The operation of my device will now be clear. Air is drawn in from the outside by means of the blower 14 and is supplied through the conduit 13 to the supply chamber 12. This air in passing over the steam coils 16 is heated to any desired temperature and then passes from the bottom of the passage 12 into the chamber 18 and vents into the drying chamber 17 through the opening 41 as indicated by the arrows in full lines. It will be noted that in passing into the air chamber 17 the drying medium circulates both above and below the trays 37, thus imparting its heat both to the top and lower surface of the layers of moist material. Furthermore, all of the trays are simultaneously subjected to the action of the drying medium by reason of the fact that from the point of distribution at 19 the drying medium rises into the passage 18 and simultaneously distributes itself through the openings 41 throughout the whole drying chamber 17. Simultaneously with the operation of the blower 14 for the supply of air, the fan 24 is operated and revolved in the direction shown by the feathered arrow in Fig. 3. The operation of the fan creates a suction or draft across the chamber 17 and draws the drying medium out through the passageway 41′ as shown by the arrows in full lines in Fig. 1. This heating medium is passed under and above the trays and absorbs part of the moisture from the material to be dried and is drawn into the passage 21. The fan 24 in the passage 21 aids in drawing the drying medium at a comparatively rapid rate through the compartment 17 and simultaneously forces the moisture laden drying medium drawn into the passage 21 downwardly through the vent 29 into the exhaust flue 27, and upwardly to be recirculated through the return flues 22. It has been found in the actual operation of driers embodying this invention that the drying medium being exhausted beneath the fan 24 has a higher percentage of moisture than that returned for recirculation above the fan; the co-action of the various elements of the apparatus and their arrangement being to effectively remove a large portion of the moisture with the exhauster drying medium. The relative speeds of the fan 24 and of the blower 14 should be such that the pressure imparted to the return drying medium will be sufficient to recirculate the latter against the pressure with which the fresh air is supplied by the blower 14. The returned drying medium is propelled through the flues 22 and past the reheating steam coils 20 whereby sufficient heat is supplied to said medium to compensate it for the reduction in temperature resulting from its passage through the chamber 17 and contacting with the moist materials. At the co-terminus 19 the return drying medium which has now been reheated mixes with the fresh supply and is again uniformly and simultaneously circulated over and below all of the trays 37. It will be noted that the fresh supply of air and the return drying medium in part again pass by the reheater 20 in rising in the passage 18. This insures a heated drying medium of a definite temperature to be supplied in the drying chamber 17 and has the farther advantage that these trays that are farther

removed from the bottom of the drying chamber and from the supply or delivery terminus 19 will be acted upon by a drying medium of substantially the same temperature as those near the bottom of the chamber and closer to the terminus 19; for it will of course be understood that the trays in the lower portion of the chamber being close to the delivery or supply end of the heating medium receive the drying medium directly while a little time elapses before the medium has risen to the upper trays. Whatever the temperature loss in the interval may be, the loss is compensated for by the fact that the medium in rising up into the chamber 18 at the same time passes over the reheater 20. In this way, this reheater aids in maintaining a substantially constant temperature throughout the whole drying chamber.

It will thus be seen that there is provided apparatus in which the several objects of this invention are achieved and which is well adapted to meet the needs of practical use.

Of course, any heating device may be employed, such for example as electric heating coils, gas burners and any heat vehicle. In place of air any other heat vehicle such as other gases may be used.

As various possible embodiments might be made of the above invention and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

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

1. In an evaporator, the combination of a compartment, a plurality of supporting members in said compartment for supporting materials to be dried and spaced vertically adjacent each other, means for heating a drying medium to a desired temperature, means for circulating said drying medium across said compartment, and means positioned adjacent the ends of the supporting members for deflecting said drying medium to circulate in one direction above and below each of said supporting members.

2. In an evaporator, the combination of a compartment, a plurality of supporting members in said compartment for supporting materials to be dried and spaced vertically adjacent each other, means for heating a drying medium to a desired temperature, means for circulating said drying medium across said compartment, and means for deflecting said drying medium to circulate in one direction above and below said supporting members, said last mentioned means comprising vertically spaced baffles positioned adjacent the ends of the supporting members.

3. In an evaporator, the combination of a compartment, supporting elements in said compartment spaced vertically from each other for supporting materials to be dried, means for heating a drying medium to a desired temperature, means for circulating said medium through said compartment, the walls of said compartment having aligned openings therein adjacent said supporting members wherethrough the drying medium may flow into and out of the compartment and vertically spaced baffles disposed at said openings for dividing the drying medium so as to circulate across said compartment above and below each of said supporting elements.

4. In an apparatus of the class described, a drying chamber, means for delivering a pre-heated drying medium at one end thereof, said means including a heater member in the path of a drying medium; another heater member spaced from said first-mentioned heater member, and a return flue at the other end of the chamber for returning said drying medium to the delivery end of the chamber and having a conduit extending between said heater members.

5. In an apparatus of the class described, a drying chamber, means for delivering a pre-heated drying medium at one end thereof, said means including a heater member in the path of a drying medium; another heater member spaced from said first-mentioned heater member and a return flue at the other end of the chamber for returning said drying medium to the delivery end of the chamber and having a conduit extending between said heater members, said conduit having a delivery orifice at the lower end thereof in communication with said means for delivering the pre-heated drying medium.

6. In an evaporator, a drying chamber, a delivery compartment adjacent one end of said drying chamber and communicating therewith, an exhaust compartment adjacent the opposite end of said drying chamber and communicating therewith, a plurality of spaced heaters in said delivery compartment, means for supplying a drying medium to said delivery compartment and adapted to bring said drying medium into contact with one of said heater members, means for circulating said drying medium across said drying chamber, including suction means in said exhaust compartment, and a return flue in communication with said exhaust compartment for returning the drying medium to the delivery compartment, said flue having a conduit member extending between said heater members and having an orifice at the lower end there-

of in communication with said drying compartment.

7. In an evaporator, a drying chamber, a delivery compartment adjacent one end of said drying chamber and communicating therewith, an exhaust compartment adjacent the opposite end of said drying chamber and communicating therewith, a plurality of spaced heaters in said delivery compartment, means for supplying a drying medium to said delivery compartment and adapted to bring said drying medium into contact with one of said heater members, means for circulating said drying medium across said drying chamber, including suction means in said exhaust compartment, a return flue in communication with said exhaust compartment for returning the drying medium to the delivery compartment, said flue having a conduit member extending between said heater members and having an orifice at the lower end thereof in communication with said drying compartment, and an exhaust flue communicating with the lower end of said exhaust compartment.

8. In an evaporator, a drying chamber, a plurality of vertically spaced supporting members in said chamber for supporting materials to be dried, two opposed walls of said chamber having vertically spaced openings therein adjacent said supporting members, the openings in said walls being in horizontal alignment with each other, a delivery compartment adjacent one of said walls and in communication with the drying chamber through the openings in said wall, an exhaust compartment adjacent the other wall and in communication with the drying chamber through the openings in said last mentioned wall, a heater member located in said drying compartment, means for supplying a drying medium to said delivery member, and means for circulating said drying medium through said drying chamber, and vertically spaced baffles disposed adjacent said aligned openings for dividing said drying medium so as to circulate above and below said supporting members.

9. In an evaporator, a drying chamber, a plurality of vertically spaced supporting members in said chamber for supporting materials to be dried, two opposed walls of said chamber having vertically spaced openings therein adjacent said supporting members, the openings in said walls being in horizontal alignment with each other, a delivery compartment adjacent one of said walls and in communication with the drying chamber through the openings in said wall, an exhaust compartment adjacent the other wall and in communication with the drying chamber through the openings in said last mentioned wall, a heater member located in said drying compartment, means for supplying a drying medium to said delivery member, means for circulating said drying medium through said drying chamber, and vertically spaced baffles disposed adjacent said aligned openings for dividing said drying medium so as to circulate above and below said supporting members, said means for circulating the drying medium including suction means in said exhaust compartment and a return flue in communication with said exhaust compartment at one end and with said delivery compartment at the other end.

10. In an apparatus of the class described, a compartment, a plurality of supports for materials to be dried therein, arranged vertically one above the other, means for supplying a preheated drying medium, including a supply conduit having a delivery opening, the wall of said compartment having passageways in communication with said delivery opening disposed adjacent said supports, and means for drawing said drying medium through said aligned passageways above and below each of said supports in one direction.

11. In an apparatus of the class described, a compartment, a plurality of supports for materials to be dried therein arranged vertically one above the other, means for supplying a preheated drying medium, including a supply conduit having a delivery opening the wall of said compartment having passageways in communication with said delivery opening disposed adjacent said supports, means for drawing said drying medium through said passageways above and below each of said supports in one direction, a return flue having a delivery orifice in communication with said conduit delivery opening, and means for propelling the drying medium issuing from the compartment into and through said flue to be recirculated through the compartment through said delivery openings.

12. In an apparatus of the class described, a compartment, a plurality of supports for materials to be dried therein arranged vertically one above the other, means for supplying a preheated drying medium to said compartment, an intake conduit having a delivery or supply opening adjacent the bottom of said compartment and a heating device disposed in the path of said drying medium as it issues from said delivery opening whereby the heating medium is further heated as it rises into said compartment.

13. In an apparatus of the character described, a compartment for drying material therein, and means for supplying an effectively conditioned drying medium of predetermined properties to said compartment and for passing the drying medium across the compartment in one direction above and

below the material to be dried, said means being arranged to recondition the drying medium to its initial predetermined effective state after each passage through said compartment and to reintroduce the reconditioned medium into effective circulation.

14. In an apparatus of the character described, a compartment for drying material therein, and means for supplying an effectively conditioned drying medium of predetermined properties to said compartment and for passing the drying medium across the compartment in one direction above and below the material to be dried, said means being arranged to recondition the drying medium to its initial predetermined effective state after each passage through said compartment and to reintroduce the reconditioned medium into effective circulation, said means including two complete circulating systems co-operatively interconnected.

15. In an apparatus of the character described, a compartment for drying material therein, and means for supplying a uniform and effectively conditioned drying medium of predetermined properties simultaneously to all parts of said compartment and for passing said medium across the compartment in one direction above and below the material to be dried, said means serving to recondition the drying medium after each passage through the compartment.

16. In an apparatus of the character described, a compartment for drying material therein, means for supplying an effectively conditioned drying medium of predetermined properties to said compartment and for passing the drying medium across the compartment in one direction above and below the material to be dried at a relatively high velocity, said means including a forced circulating system and an induced circulating system co-operatively interconnected.

17. In an apparatus of the character described, a compartment for drying material therein, means for drawing a drying medium at a relatively high velocity through the compartment and for simultaneously forcing a moisture laden portion of the drying medium drawn from said compartment to be exhausted and another portion thereof to be recirculated through said compartment.

18. In an apparatus of the character described, a compartment for drying material therein, means for drawing a drying medium at a relatively high velocity through the compartment and for simultaneously forcing a moisture laden portion of the drying medium drawn from said compartment downwardly to be exhausted, and another portion thereof upwardly to be recirculated through said compartment.

19. In an apparatus of the character described, a compartment for drying material therein, means for drawing a drying medium at a relatively high velocity through the compartment, said compartment having a passage into which the drying medium is drawn after passing through said compartment, and a fan in said passage for simultaneously forcing a moisture laden portion of the drying medium in the passage to be exhausted and another portion thereof to be recirculated through said compartment.

20. In an apparatus of the character described, a compartment for drying material therein, means for drawing a drying medium at a relatively high velocity through the compartment, said compartment having a passage into which the drying medium is drawn after passing through said compartment, a fan in the passage, an exhaust vent extending from the passage on one side of the fan, and a recirculating flue extending from the passage from the opposite side of the fan.

Signed at New York city, in the county of New York and State of New York this 30th day of December A. D. 1920.

JULIUS JUDELSON.