

T. ALLSOP AND W. W. SIBSON.

DRYING MACHINE.

APPLICATION FILED APR. 30, 1919. RENEWED OCT. 26, 1920.

1,383,053.

Patented June 28, 1921.

2 SHEETS—SHEET 1.

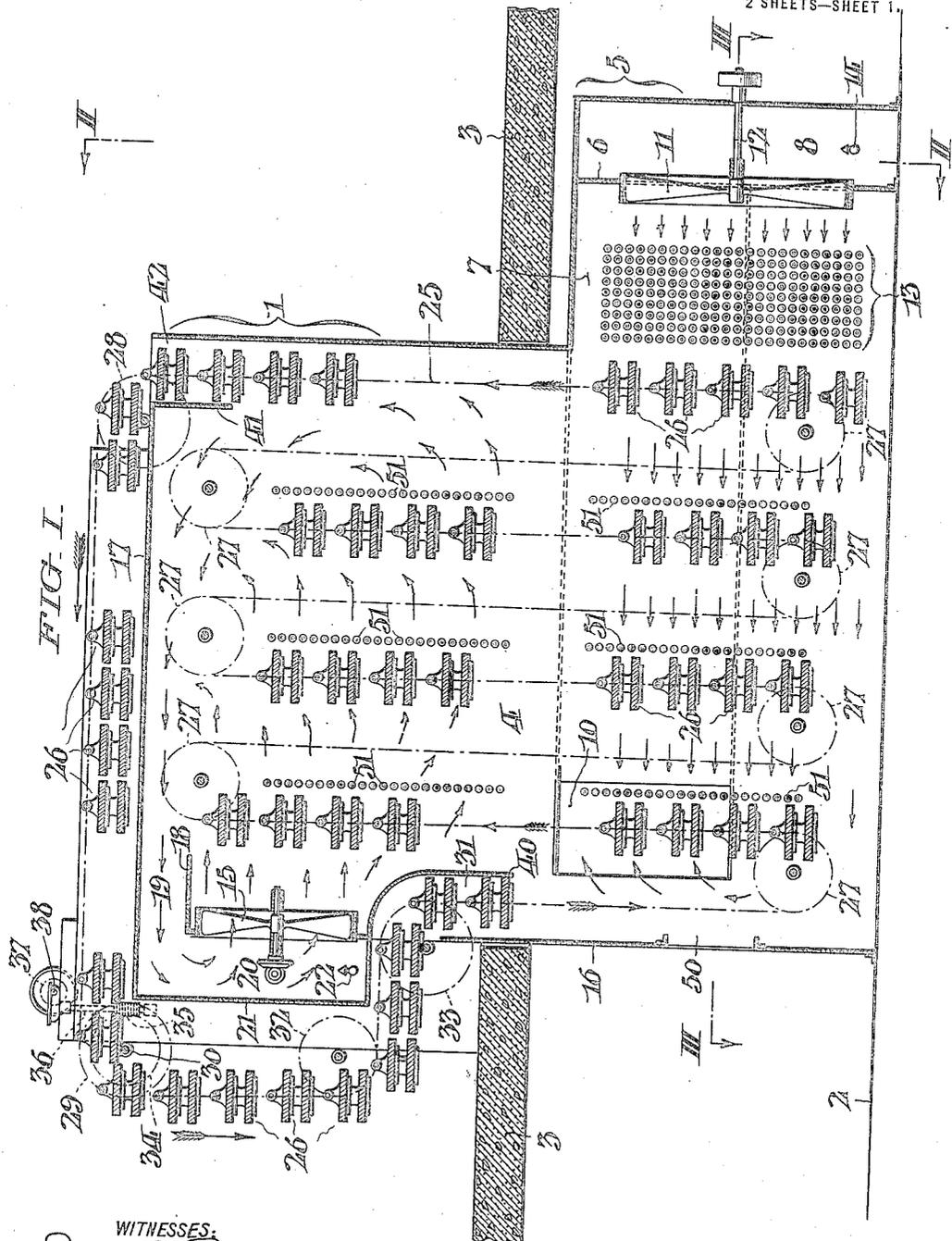


FIG. I.

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INVENTORS:

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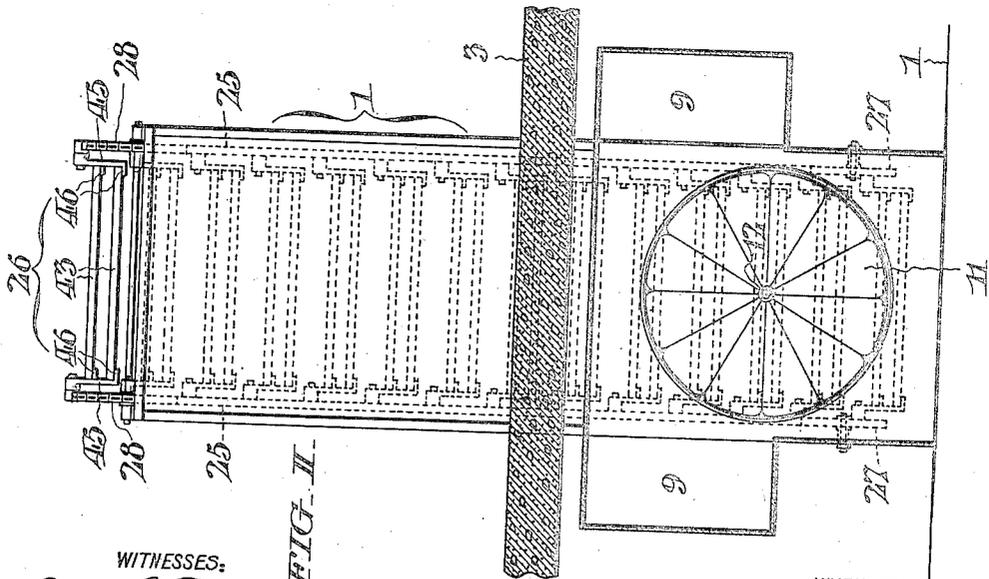
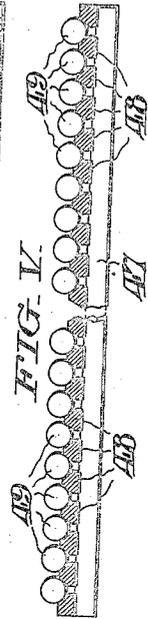
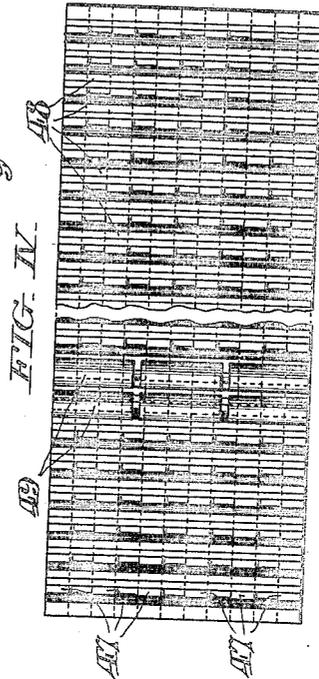
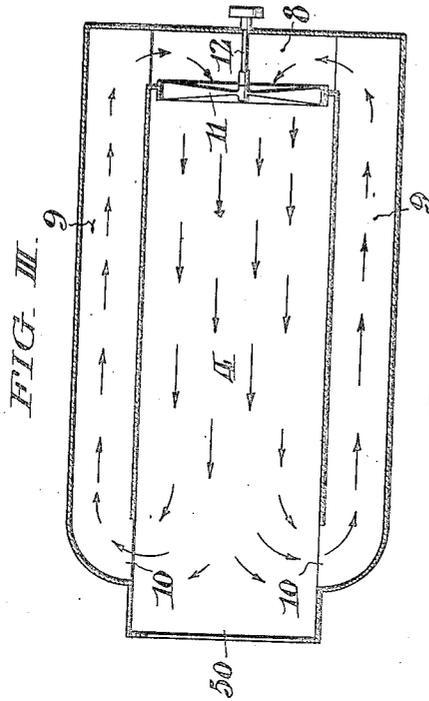
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2 SHEETS—SHEET 2.



WITNESSES:

*John C. Berger*  
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FIG. II.

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# UNITED STATES PATENT OFFICE.

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PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## DRYING-MACHINE.

1,383,053.

Specification of Letters Patent. Patented June 28, 1921.

Application filed April 30, 1919, Serial No. 293,877. Renewed October 26, 1920. Serial No. 419,734.

To all whom it may concern:

Be it known that we, THOMAS ALLSOP and WALTER W. SIBSON, citizens of the United States, residing in the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Drying-Machines, whereof the following is a specification, reference being had to the accompanying drawings.

The invention relates generally to drying machines of the type in which the material, or articles to be dried, are slowly progressed through a compartment wherein a constant circulation of heated air is mechanically maintained.

The invention is directed more particularly to an organization such as outlined above, wherein the circulation of the air in different portions of the drying compartment is localized, and the several independent circulating courses thus established caused to flow in relatively different directions, so that the articles under treatment progressed through the drying compartment, under the support of the conveyer, are subjected to the currents of the drying medium from various angles of impingement, with the result that uniform drying is accomplished.

The invention is further directed to a drying machine of the character outlined in which a portion of the conveyer circuit is disposed at the exterior of the drying compartment, so that the articles after being thoroughly dried during their traverse through the compartment, are permitted to cool before being removed.

The invention also comprehends a novel form of a conveyer suspension tray whereby articles of a cylindrical configuration are so supported and separated, as to permit free access of the drying medium to all portions of their surfaces.

The organization representative of our invention and embodying the characteristics above outlined will be best understood from the detailed description which follows:

In the drawings, Figure I, is a longitudinal sectional view through a drying machine, conveniently embodying our invention.

Fig. II, is an end cross sectional elevation of the same as viewed in the direction of the arrows II—II, in Fig. I.

Fig. III, is a diagrammatic plan section 55 along the plane indicated by the arrows III—III, in Fig. I.

Fig. IV, is a plan view of a tray especially adapted for supporting porcelain articles of cylindrical form, and 60

Fig. V, is a longitudinal sectional view of the tray. 60

The apparatus herein shown is designed for use in a building wherein the articles are loaded at one level or floor, and delivered at another floor preferably above. In its general aspect, the machine is in the form of an inclosure 1, supported upon the lower floor level indicated at 2, and extending vertically through the upper floor 3. The main portion of the inclosure serves as a drying chamber or compartment which is represented in the drawings by the numeral 4, and is supplemented at the lower floor level with an offset or extension 5. This extension affords a heating chamber which is subdivided by a vertical partition 6, into a heating compartment or chamber proper 7, shown as opening directly into and so communicating with the main drying chamber or compartment 4, and an auxiliary chamber 8, the latter communicating with the drying compartment 4, by way of ducts 9—9, disposed longitudinally along the sides of the inclosure. It will be observed from Fig. I, that the mouths or inlets 10—10, of the ducts 9—9, are located well forward of the lower part of the main or drying chamber, for a reason which will be presently set forth. Within an opening in the partition 6, is located a rotary fan 11, which is mounted upon a shaft 12, and driven by a pulley thereon. Under the action of the fan, the air is blown longitudinally through the lower part of the drying compartment, and after fully traversing said compartment is subdivided and returns to the auxiliary chamber 8, by way of the ducts 9—9. In this way, constant circulation of heated air is maintained over a general horizontal course in the lower part of the drying compartment. 85

Within the heating chamber 7, is located the main bank of heating coils comprehensively indicated by the numeral 13. 95

In the treatment of certain substances, it is essential that a specific degree of moisture be maintained, and to this end, we have pro- 105

vided a humidifying device conventionally represented at 14, in Fig. I. This device may be arranged for either automatic or hand operation, and located at any point along the course of the air circuit, but we have found that the best results are obtained by disposing the same behind the rotary fan 11, within the auxiliary chamber 8, as a result of which a thorough and even comingling with the air is effected.

The air in the upper part of the drying compartment is circulated by separate propelling means, in a direction substantially reverse to that of the previously described course. This circulation is effected by a fan 15, located in an opening in the front wall 16, of the inclosure. The top of this wall terminates short of the roof 17, and is extended laterally inward as at 18, with the resulting formation of a passage 19, which in connection with a channel 20, afforded by partition 21, serves as a return passage for the air. By this arrangement, the air is forced to circulate through the upper portion of the inclosure over the course represented by the arrows in Fig. I. If desired a humidifying device 22, may be located within the channel 20, for a purpose already understood.

The goods to be treated are carried through the machine by a conveyer consisting of spaced endless chains 25—25, (conventionally represented in the drawings by dot and dash lines) between which are pivotally hung a series of carriers 26. The conveyer travels through a circuitous route within the inclosure under the guidance of paired sprocket wheels 27—27. After tracing a series of vertical loops or up and down passes within the drying compartment, the conveyer emerges from the inclosure over a sprocket 28, and under the further support of a companion sprocket 29, travels across the top of the structure, thence downward, and is thereafter redirected, through an opening 31 behind the wall 16, into the interior over sprockets 32, 33.

The conveyer system is driven from the shaft 30, upon which the sprockets 29, are mounted, said shaft being provided with a worm wheel 34, which is in turn driven by a worm 35, upon a vertical shaft 36. A second worm couple 37, transmits the power from a pulley shaft 38. The opening 31, through which the conveyer enters the inclosure is protected by a curved guard 40, which prevents the escape of the circulated air from within. A guard 41, is provided for a similar purpose at the opening 42, through which the conveyer leaves the heating compartment.

The supporting carriers 26, may be of the type illustrated in Figs. I and II, consisting of one or more shelves 43, suspended from the conveyer chains 25, by end brack-

ets 45—45, which are provided with appropriate sustaining ledges or projections 46—46. For the purpose of supporting cylindrical objects such, for example, as porcelain insulators for spark plugs, we have devised a carrier tray or shelf of the special construction shown in Figs. IV and V. Said tray consists of a series of spaced longitudinal bars 47, preferably of wood, which are united by transverse separated cleats 48. The latter are beveled as shown in Fig. IV, so as to receive between them the cylindrical plugs indicated conventionally by the numeral 49. It will be noted that the cleats 48, are so formed and spaced that they contact with the plugs only at two points, so that the entire surfaces of said plugs are exposed to the drying medium. The latticed construction of the tray further facilitates the free circulation of the drying medium.

These trays may be used in pairs and incorporated to form the carriers as shown in Figs. I and II, either permanently attached to the end brackets 45, or so arranged as to be bodily removable to facilitate quick loading of the conveyer.

The conveyer is charged through an opening 50, in the front wall of the inclosure at the lower floor level, and the unloading is accomplished upon the upper level, while the conveyer is traveling outside the inclosure 1, as already noted.

If desired, additional or auxiliary heating coils 51—51, may be provided between adjacent vertical runs of the conveyer within the drying compartment.

The operation of the machine is as follows:

After being loaded through the opening 50, in the front wall of the inclosure, as already explained, the supporting carriers are progressed by the conveyer over its circuitous path within the drying compartment in the direction indicated by the arrows in Fig. I. In tracing the various circuit loops, the carriers pass alternately a number of times, from one air circulatory field established by the action of fan 11, to the other, under the propulsion of fan 15. Thus the drying medium is blown across the trays of the conveyer carriers in the general direction from left to right in the lower part of the compartment, and in the opposite direction in the upper portion of the compartment, with the result that contact with the articles under treatment is effected substantially from all angles, and the drying therefore rendered uniform. The openings 10 being in the sides of the heating chamber, the current of air in the chamber is so directed as to traverse the carriers of the conveyer substantially at right angles, without interference such as would result if the air had all to pass upward to openings in the roof of the chamber.

From Fig. I, it is to be noted that the dis-

posal of the several banks of heating coils is such that the articles are not initially subjected to the maximum temperature but that the transition is made gradual, the main bank of heating coils 13 having been, for this reason, purposely located adjacent the final vertical run of the conveyer circuit.

After emerging from the drying compartment through the opening 42, the carriers travel horizontally over the top of the inclosure so that their charges are permitted to cool before being removed at the front of the machine and at the upper floor level as already understood.

While we have herein illustrated but two separate blowing units, it is of course to be understood that this scheme may be multiplied indefinitely, so that as many independent local air circulatory fields may be established as required in accordance with the particular usage to which the machine is to be relegated in practice.

It is also to be noted, that either of the shown types of circulatory schemes may be duplicated without altering the principle of operation,—in other words, the arrangement shown in Fig. III, may be used as a unit and duplicated in reverse order at the top of the inclosure, or that shown at the top of Fig. I, duplicated in reverse order for the circulatory scheme at the bottom of the inclosure. In either event, the circulatory courses would be in opposed relation.

Furthermore, we do not wish to limit ourselves to the precise details and arrangements herein shown since various modifications may be made therein without departing from the spirit of the invention.

Having thus described our invention, we claim:

1. A drying machine consisting of a drying compartment; a conveyer traveling a circuitous path within the drying compartment; and means for establishing a number of separate localized air circulatory courses within the drying compartment, whereby the articles carried by the conveyer are subjected to the currents of the drying medium from various angles of impingement.

2. A drying machine consisting of a drying compartment; a conveyer traveling a circuitous path within the drying compartment; means for circulating the air in a portion of the drying compartment in one direction; and a separate means for circulating the air in another portion of the drying compartment in the opposite direction, whereby the articles carried by the conveyer are subjected to currents of the drying medium from various angles of impingement.

3. A drying machine consisting of a drying compartment; a conveyer traveling a circuitous path within the drying compartment; means for circulating the air in a portion of the compartment over a course in one

direction; and a separate means for circulating the air in another portion of the compartment over a course in a direction differing from that of the first mentioned circulatory course, whereby the articles carried by the conveyer are subjected to currents of the drying medium from various angles of impingement.

4. A drying machine consisting of a drying compartment; a conveyer traveling a circuitous path within the drying compartment; means for blowing the air horizontally through the lower portion of the compartment in one direction; and means for blowing the air horizontally through the upper part of the compartment in the opposite direction, whereby the articles carried by the conveyer are subjected to the currents of the drying medium from various angles of impingement.

5. A drying machine consisting of an inclosure having in its length a main or drying chamber and an adjacent heating chamber opening directly thereinto; ducts running longitudinally along the sides of the inclosure and connecting said drying chamber and heating chamber; means for propelling the air through the circulatory system thus established; and a conveyer for articles to be dried traveling a circuitous path with a plurality of up and down passes in said drying chamber.

6. A drying machine consisting of an inclosure having in its length a number of intercommunicating serial chambers including a main or drying compartment, a heating compartment, and an auxiliary chamber; ducts running longitudinally along the sides of the inclosure and connecting said auxiliary chamber with the opposite end of the drying compartment; means for propelling the air through the circulatory system thus established and a conveyer for articles to be dried traveling a circuitous path with a plurality of up and down passes in said drying chamber.

7. A drying machine consisting of an inclosure having in its length a number of intercommunicating serial chambers including a main or drying compartment, a heating compartment, and an auxiliary chamber; ducts running longitudinally along the sides of the inclosure and connecting said auxiliary chamber with the opposite end of the drying compartment; a partition extending transversely of the inclosure between the heating compartment and the auxiliary chamber; a rotary fan located in an opening in said partition, whereby the air is circulated between the said intercommunicating serial chambers by way of said ducts, and a conveyer for articles to be dried traveling a circuitous path with a plurality of up and down passes in said drying chamber.

8. A drying machine consisting of an in-

closure having in its length a number of intercommunicating serial chambers including a main or drying compartment, a heating compartment, and an auxiliary chamber; ducts running longitudinally along the sides of the inclosure and connecting said auxiliary chamber with the opposite end of the drying compartment; a partition extending transversely of the inclosure between the heating compartment and the auxiliary chamber; a rotary fan located in an opening in said partition, whereby the air is circulated between the said intercommunicating serial chambers by way of said ducts; a bank of heating coils located in the heating compartment at the pressure side of said fan; and a humidifying means located in the auxiliary compartment on the suction side of said fan.

9. A drying machine consisting of an inclosure having a main or drying compartment, and a heating compartment; a main bank of heating coils located in said compartment; a number of separate heating coil groups distributed through the drying compartment; a conveyer traveling through a circuitous path within the drying compartment in a direction such that the articles carried thereby are gradually heated and not subjected to the maximum heat of the main heating coils until the conveyer traces its final run within the drying compartment.

10. A drying machine consisting of an inclosure having a main or drying compartment; and a heating compartment; a conveyer tracing a series of loops in traveling a circuitous path through the drying compartment; a main bank of heating coils located in the heating compartment; and a number of separate coil groups distributed

through the drying compartment and located between adjacent runs of the conveyer, said conveyer traveling in a direction such that the articles carried thereby are not subjected to the direct heat of the main heating coils until the conveyer traces its final run within the drying compartment.

11. A drying machine consisting of an inclosure; means for circulating heated air within the inclosure; an endless conveyer traveling through the inclosure, and having its final return run disposed at the exterior of the inclosure to permit the cooling of the articles carried by the conveyer previous to their removal.

12. A drying machine consisting of an inclosure; means for circulating heated air within the inclosure; a conveyer traveling through the inclosure, said conveyer including a pair of spaced endless sprocket chains; in combination with a series of carriers extending transversely between said chains and pivotally suspended therefrom, said carriers comprising latticed supporting trays formed of longitudinal bars and transverse cleats, the upper edges of said cleats being beveled to support between them, in separated relation, articles of cylindrical form in such a manner as to permit free air circulation about all portions of said articles.

In witness whereof, we have hereunto signed our names at Philadelphia, Pennsylvania, this 26th day of April, 1919.

THOMAS ALLSOP.  
WALTER W. SIBSON.

Witnesses:

JAMES H. BELL,  
E. L. FULLERTON.