

T. ALLSOP AND W. W. SIBSON.
 DRYING MACHINE.
 APPLICATION FILED MAR. 18, 1919.

1,322,279.

Patented Nov. 18, 1919.

2 SHEETS—SHEET 1.

FIG. II.

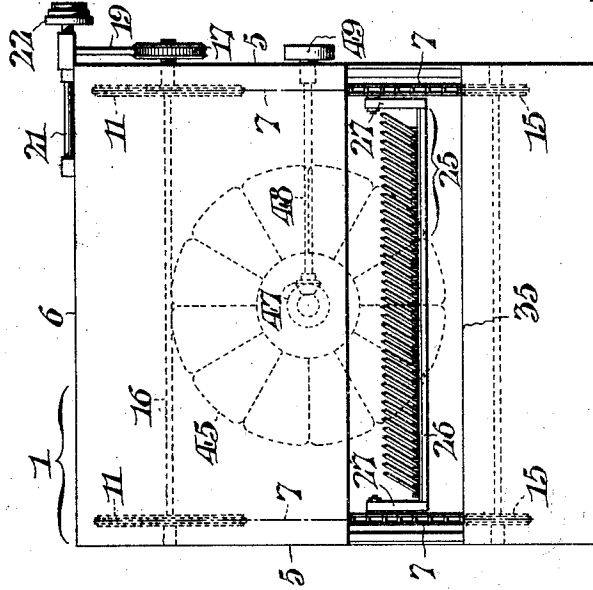
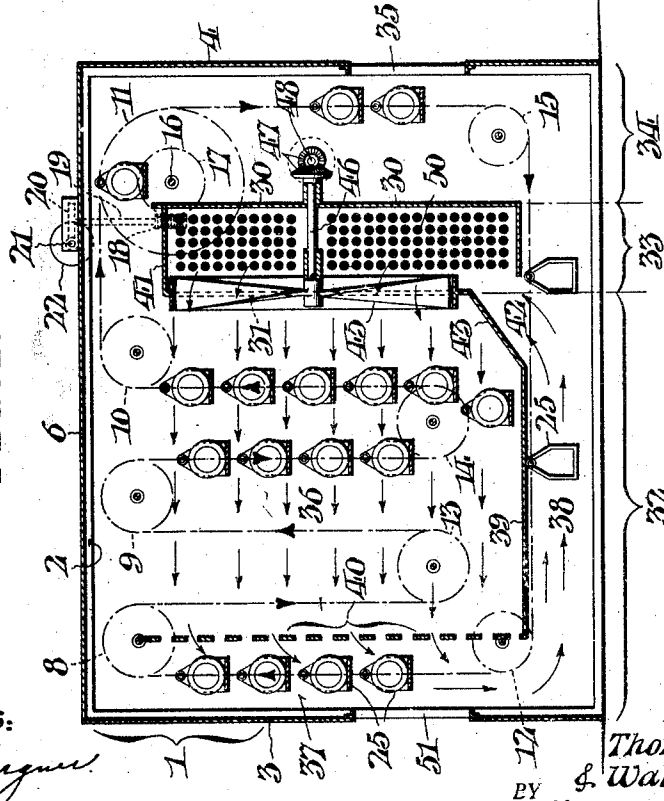


FIG. I.



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 2 SHEETS—SHEET 2.

FIG. III.

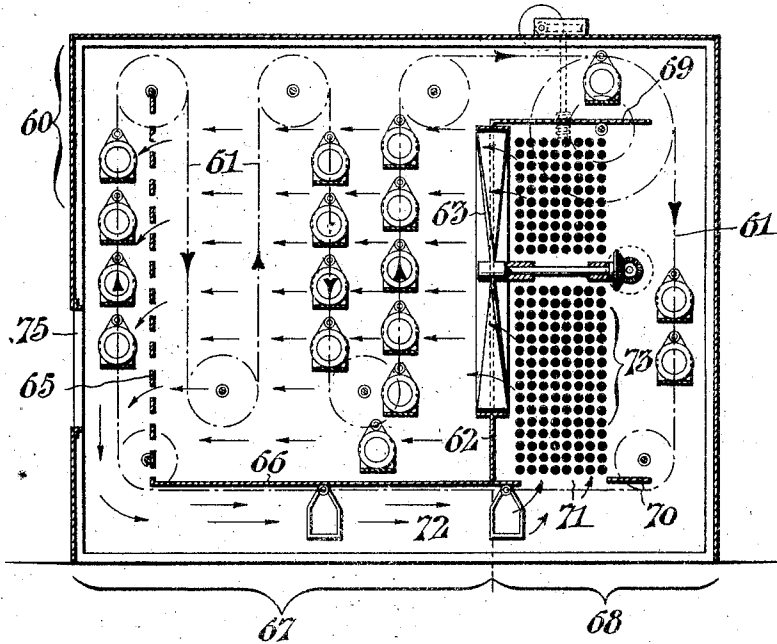
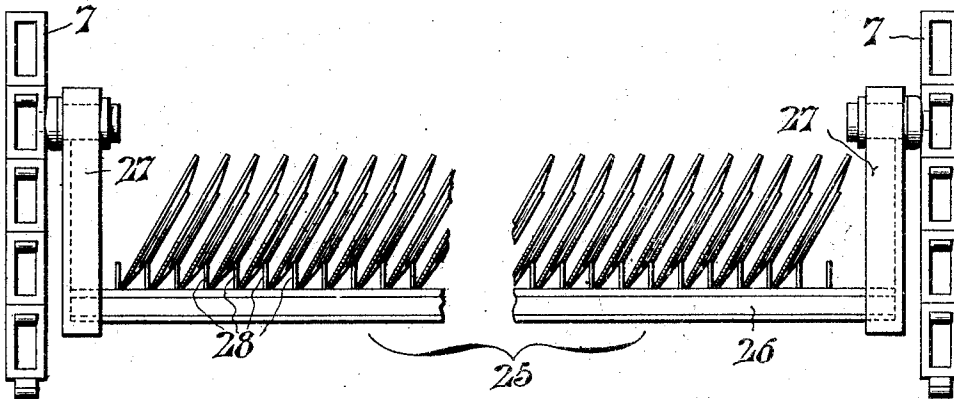


FIG. IV.



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UNITED STATES PATENT OFFICE.

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DRYING-MACHINE.

1,322,279.

Specification of Letters Patent.

Patented Nov. 18, 1919.

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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 to that type of drying machines in which the goods to be dried are subjected to the action of a mechanically agitated drying medium within a suitable inclosure, while supported upon a suitable traversing conveyer.

In previous structures of the type of such machines as above outlined, the drying medium has been circulated at right angles to the travel of the conveyer. While such an arrangement lends itself admirably to the treatment of certain classes of goods, we have found it deficient in other cases and especially in the treatment of articles of china pottery, etc., which, on account of their susceptibility to shrinking and warping must be very evenly dried in order to produce satisfactory results. Furthermore, certain kinds of such goods by virtue of their peculiar composition and configuration, do not generally allow of an economic disposal upon the supporting conveyer when considered in connection with a machine wherein the flow of the drying medium is in a direction transverse to the movement of the conveyer.

In order to overcome these difficulties, we have invented a drying machine in which the drying medium is circulated in the same general direction as that of the travel of the conveyer, and in which the articles under treatment, are so disposed or grouped as to attain maximum efficiency not only as to capacity, but also to insure intimate contact in conjunction with maximum surface exposure to the drying medium.

The organization by which we attain these ends will be more readily understood from the description which follows.

Figure I, is a longitudinal sectional elevation through a drying machine conveniently illustrating our invention.

Fig. II, is an end elevation of the same as viewed from the right of Fig. I.

Fig. III, is a view corresponding to Fig. I, of a modified form of our invention, and

Fig. IV, is an elevation, on an enlarged scale, of the carriers by which the articles are supported during traverse through the drying machine.

Referring first to the form of our invention illustrated in Figs. I and II, the machine will be observed to consist of a quadrangular inclosure comprehensively indicated at 1, and formed as a metallic fire proof structure constituted by a skeleton framework 2, and a covering comprising the end walls 3 and 4, side walls 5—5, and a roof 6. These cover elements, in actual practice, are usually in the form of thermo-insulated panels and of standard construction and a detailed showing has therefore been omitted in the drawings.

The articles to be dried are progressed through the inclosure by an endless conveyer traveling at a slow rate of speed in order to afford the requisite time period for the proper treatment. This conveyer comprises a pair of endless chains 7—7, which follow a circuitous path longitudinally through the inclosure under the guidance of a series of paired sprockets 8 to 15 inclusive, graphically represented in dot and dash lines in Fig. I. Each pair of sprockets is in general mounted upon a common shaft and the system is driven from the shaft 16, upon which the sprockets 11, are mounted. To this protruding end of shaft 16, (Fig. II) is fixed a worm wheel 17, which is actuated by a worm 18, on a vertical shaft 19, the latter being in turn driven through a second worm gear couple 20, from a pulley shaft 21. Power from any convenient source may be transmitted through a belt connection with the pulley 22, on shaft 21.

Referring again to Fig. II, it will be noted that the conveyer chains are disposed in close proximity to the side walls 5—5, within the inclosure, thereby affording an extensive interspace which is transversely spanned by a series of supporting carriers 25. As best shown in Fig. IV, each of these carriers consists of a shelf or tray 26, pivotally suspended from the sprocket chains 7—7, under the support of a pair of end brackets 24—24. Provision is, of course, made for enabling the trays to pass the sprocket

shafts, as by suitable proportioning of sprocket and trays,—the drawing being somewhat diagrammatic in this respect. We have herein shown the tray as supplemented
 5 with a series of rack members 28, which lend themselves readily to bracing flat articles such as plates or saucers thereby holding them in a substantially vertical position. This disposal of the articles upon the trays
 10 has an important bearing in serving to assist in directing the drying medium in its circulation, as will be more specifically explained later herein.

For the purpose of confining the circuit
 15 of the drying medium to a definite path, the inclosure has been divided by partitioning into a series of compartments and channels. Of these partitions, the vertical ones represented by the numerals 30—31, extend
 20 substantially the full height of the inclosure with provision at the top and bottom for the passage of the conveyer carriers, and subdivide said inclosure into a drying compartment 32, a heating compartment 33, and
 25 a third subdivision 34, which may be conveniently termed an auxiliary compartment through which the vertical portion of the return run of the conveyer passes. This compartment, (as will be better understood
 30 from further description) is neutral in so far as the circulation of the drying medium is concerned so that access may be had to the conveyer for unloading through an opening 35, provided in the end wall 4,
 35 without entailing any loss of the heated air.

The drying compartment is in turn subdivided into a main or diffusing chamber 36, and a duct constituted by a vertical branch 37, and horizontal branch 38, which is functional as a by-pass between the diffusing chamber and the heating compartment. This subdivision is co-jointly effected by partitioning consisting of the vertical member 31, already described, a horizontal member 39, spaced from the floor of the inclosure with only a sufficient margin for the passage of the conveyer carriers, and a third vertical grated partition 40, likewise spaced from the left hand end wall 3, of the inclosure. The heating compartment 33, is closed at the top by a horizontal section 41, and at its bottom, communicates with the horizontal duct branch 38, through an opening 42. Interposed between the vertical partition 31,
 55 and the horizontal partition 39, is an inclined section 43, which facilitates the passage of the air between the duct and the heating compartment under the propulsion of the rotary fan 45, centrally located in an appropriate opening in partition 31. This fan, is mounted upon a shaft 46, driven by a bevel gear couple 47, from a shaft 48, whose terminal end protrudes beyond the inclosure to afford attachment for a pulley 49.
 65 The latter may be coördinated by a belt

connection with the conveyer drive system, or actuated from an individual source of power.

Any convenient means may be employed for maintaining an even drying temperature in the heating chamber, but for the present purposes, we have diagrammatically represented a series of steam or water heating coils 50, which serve advantageously in practice from an economical standpoint.
 70 These coils are grouped so as to expose the maximum heating surface to the air flow, and extend laterally across the full width of the inclosure within the confines of the heating compartment. This feature, when
 80 taken in connection with the central location of the fan 45, between the conveyer chains, assures both an even heating of the air and a uniform distribution of the same over the cross sectional area of the diffusing chamber.
 85

The conveyer may be both loaded and unloaded through the opening 35, in the end wall 4, of the inclosure or if preferred, the loading operation may be performed through
 90 a separate opening 51, in the left hand end wall 3.

In operation, the carriers are charged through the opening 51, and the conveyer slowly progressed through the inclosure
 95 along its circuitous course in the direction indicated by the arrow heads in Fig. 1. The heated air is at the same time circulated back and forth between the diffusing chamber 36, and heating compartment
 100 through the interposed by-pass constituted by the duct branches 37 and 38. By this construction, the air circulation is confined entirely to that portion of the inclosure at the left of the partition 30, so that the auxiliary compartment is rendered neutral, thereby preventing escape of the drying medium beyond the inclosure notwithstanding accessibility through the opening 35. The heated air under the propulsion of the fan 45, is blown longitudinally across the
 110 diffusing chamber 36, i. e., in the direction in which the conveyer progresses through the chamber or in the opposite direction, and uniformly distributed therein, through
 115 the coöperation of the grated partition 40, and thereafter broken up or dispersed through the interstices of the grated partition and first encounters the newly loaded carriers in the vertical duct branch 37. The
 120 air thus dispersed in various directions within the duct, impinges upon the articles upon the carriers from many different angles of approach, thereby effecting an even initial heating before they are advanced to the inner chamber 36. When once within this chamber, the supported articles, by virtue of their vertical disposal upon the carriers, are not only exposed at both sides to the
 125 horizontal air flow, but become functional
 130

themselves in serving as baffles to channel the air between them and thereby render the distribution of all the more even, notwithstanding the several reversals of motion of the conveyer in following its circuitous path within the chamber. After the treatment in the said chamber, the conveyer finally passes about the sprocket wheels 11, and into the auxiliary compartment 34, and are finally relieved of the goods through the opening 35, as already noted.

The above described distribution of the goods upon the conveyer carriers is further advantageous in permitting the draining of the excess of the glazing solution with which articles of china or pottery are coated, and which, after drying lends the desired gloss finish.

The modification disclosed in Fig. III, comprehends the same general features described in connection with the first embodiment, except that the equivalent of the partition 30, has been omitted with the consequent elimination of the auxiliary compartment.

This modification may be briefly described as follows:

The inclosure is here represented by the numeral 60, and since the conveyer 61, and its driving appurtenances are already well understood from the detailing of the previous embodiment, repetition is deemed unnecessary in this connection. The inclosure 60, is interrupted longitudinally by the transverse vertical partition 62, in which the circulating fan 63, is mounted while the partitions 65 and 66, are functional in a general manner as before. By this construction, the machine is first of all divided into a main drying compartment 67, and a heating compartment 68. Said heating compartment is completed preferably by supplementing the upper edge of the fan partition 62, with a lateral extension 69, and prolonging the horizontal partition 66, to the right of the fan partition as at 70, to the extent clearly shown in the drawing. Prolongation 70, is provided with an opening 71, communicative with horizontal portion 72, of the return air duct. The heating coils 73, are located directly to the right of the fan partition 62, and within the confines determined by the said partition and the elements 69 and 70. By this arrangement, the course of the air is short circuited through the opening 71, and drawn between the pipe coils in reëntering the diffusing chamber. In the present instance, the inclosure is provided with a single opening 75, which serves both for loading and unloading the conveyer.

Having thus described our invention, we claim:

1. A drying machine comprising an inclosure divided into a drying compartment and

a heating compartment; means for circulating the air longitudinally between said drying compartment and heating compartment; and an endless conveyer traveling over a longitudinal course through the inclosure.

2. A drying machine comprising an inclosure divided, by a transverse partition into a drying compartment and a heating compartment; a rotary fan centrally located in said partition and adapted to circulate the air longitudinally between said drying compartment and heating compartment; and an endless conveyer traveling a circuitous path longitudinally through the inclosure.

3. A drying machine comprising an inclosure divided into a drying compartment, a heating compartment, an auxiliary compartment accessible from the exterior of the inclosure; an endless conveyer traveling a circuitous path within the inclosure between the drying compartment and the auxiliary compartment; and means for circulating the air back and forth between the drying compartment and the heating compartment, longitudinally with reference to the conveyer, in a course confined to said drying and heating compartments.

4. A drying machine comprising an inclosure divided into a drying compartment; a heating compartment; and an auxiliary compartment accessible from the exterior through an opening in the inclosure; an endless conveyer traveling a circuitous path longitudinally within the inclosure between the drying compartment and the auxiliary compartment; means for circulating the air longitudinally between the drying compartment and the heating compartment; and means for confining the air circulation to a definite course to prevent escape into the auxiliary compartment.

5. A drying machine comprising an inclosure divided into a drying compartment and a heating compartment; means for circulating the air longitudinally between said drying compartment and heating compartment; means for subdividing said drying compartment into a diffusing chamber and a supplemental channel functional as a return passage for the air between the diffusing chamber and the heating compartment; and an endless conveyer traveling over a longitudinal course through the inclosure.

6. A drying machine comprising an inclosure divided into a drying compartment and a heating compartment, means for circulating the air back and forth between said drying compartment and heating compartment; a grated partition extending transversely across the drying compartment, and adapted to distribute the air flow within the said compartment; and an endless conveyer traveling over a longitudinal course through the inclosure.

7. A drying machine comprising a drying compartment; a conveyer traversing the compartment longitudinally, said conveyer consisting of a pair of endless chains; and a series of transverse carriers suspended between said chains; means for circulating heated air in a direction corresponding to the general longitudinal course of the conveyer whereby the air is blown laterally across the said carriers.
8. A drying machine comprising a drying compartment; a conveyer traversing said compartment and comprising a pair of endless chains; a series of carriers supported between said chains; in combination with air circulating means located in the said compartment in the interspace between the conveyer chains.
9. A drying machine comprising an inclosure divided into a drying compartment and a heating compartment, means for circulating the air longitudinally between said drying compartment and heating compartment; in combination with an endless conveyer traveling over a longitudinal course through the inclosure; and comprising a pair of spaced endless chains; a series of supporting trays extending transversely of the inclosure and pivotally suspended from said chains; and means associated with said trays for supporting flat articles, such as plates, in a substantially vertical position.
10. A drying machine comprising an inclosure divided into a drying compartment and a heating compartment; a group of heating coils located in the heating compartment and extending transversely of the inclosure; means for circulating the air longitudinally back and forth between said drying compartment and heating compartment; and an endless conveyer traveling over a longitudinal course through the inclosure.
- In testimony whereof we have hereunto signed our names at Philadelphia, Pennsylvania, this 11th day of March, 1919.
- THOMAS ALLSOP.
WALTER W. SIBSON.
- Witnesses:
JAMES H. BELL,
E. L. FULLERTON.