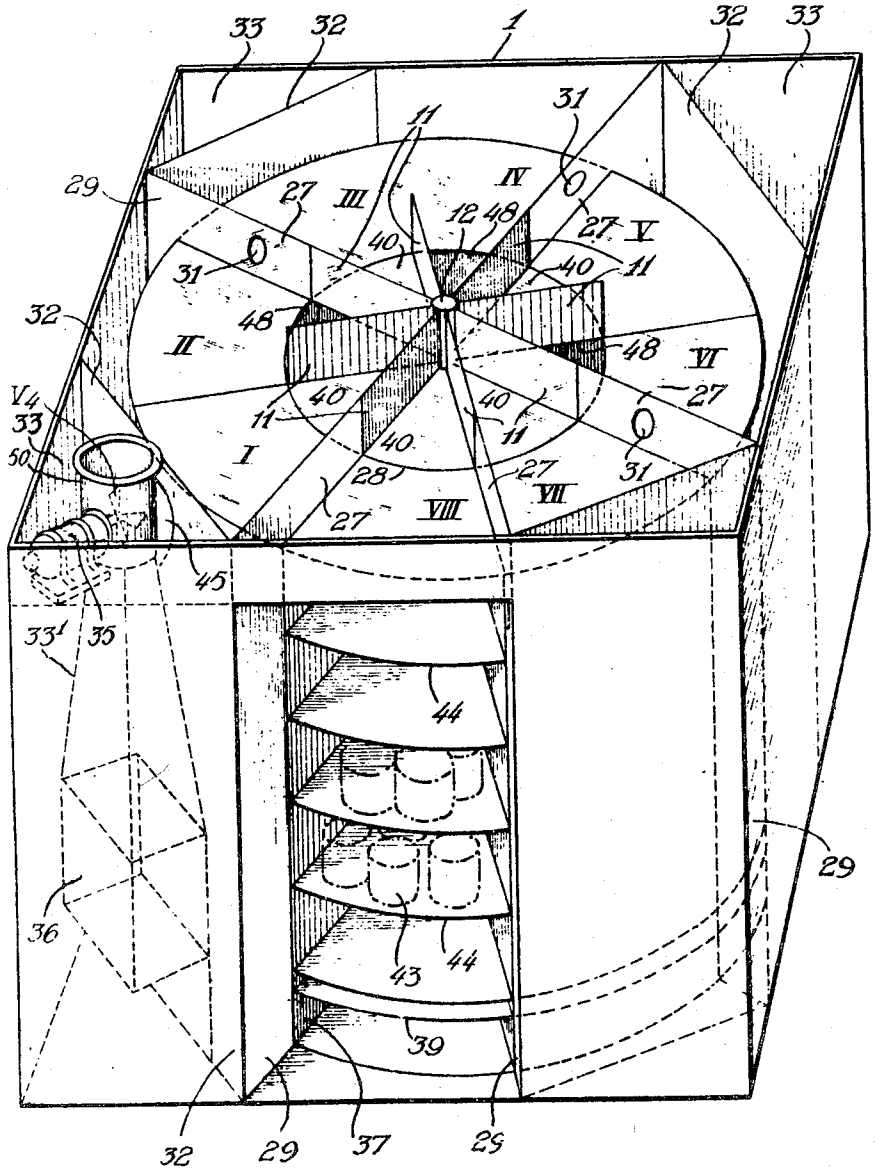
Aug. 16, 1949. J. V. E. M. PONCELET 2,479,049

DRIER OF THE CONTINUOUS TYPE FOR TEXTILE MATERIALS

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Fig. 1.



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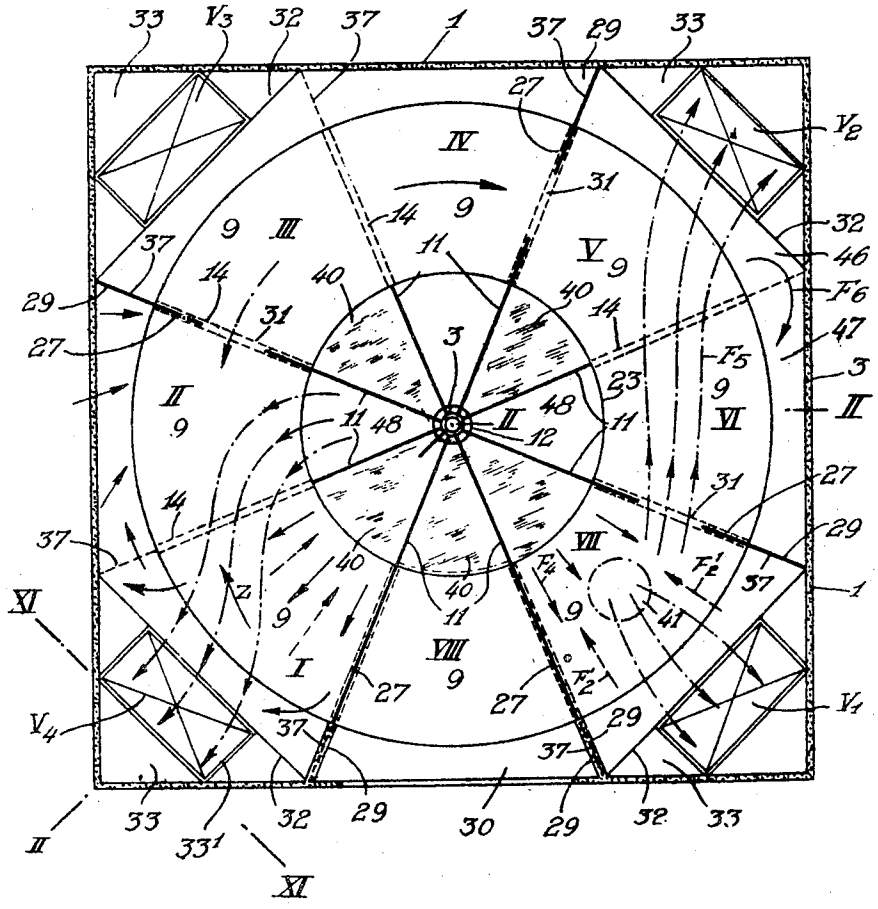
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DRIER OF THE CONTINUOUS TYPE FOR TEXTILE MATERIALS

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Fig. 1H.



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DRIER OF THE CONTINUOUS TYPE FOR TEXTILE MATERIALS

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Fig.2.

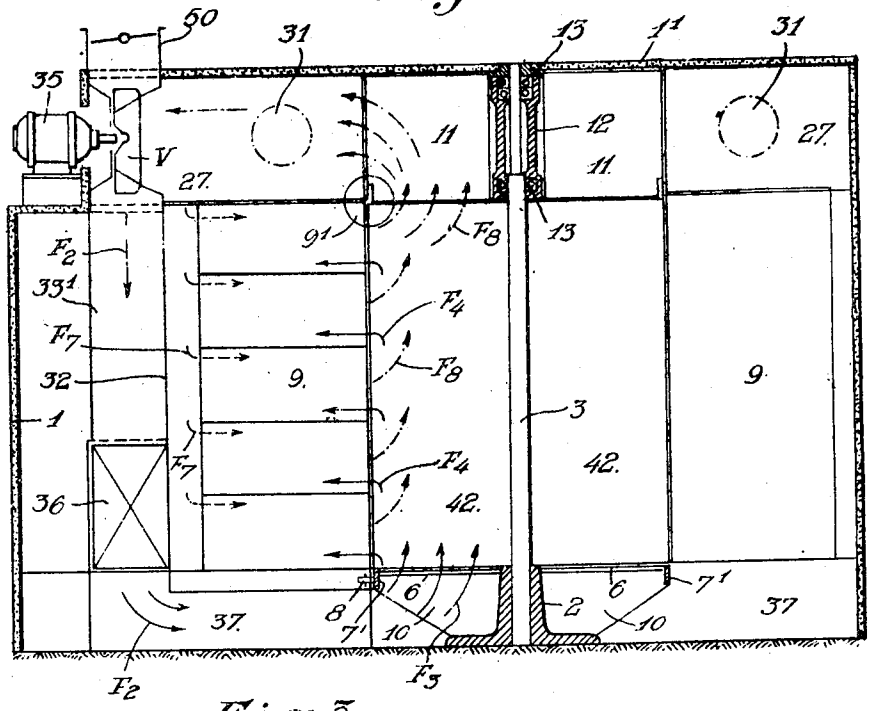


Fig.3.

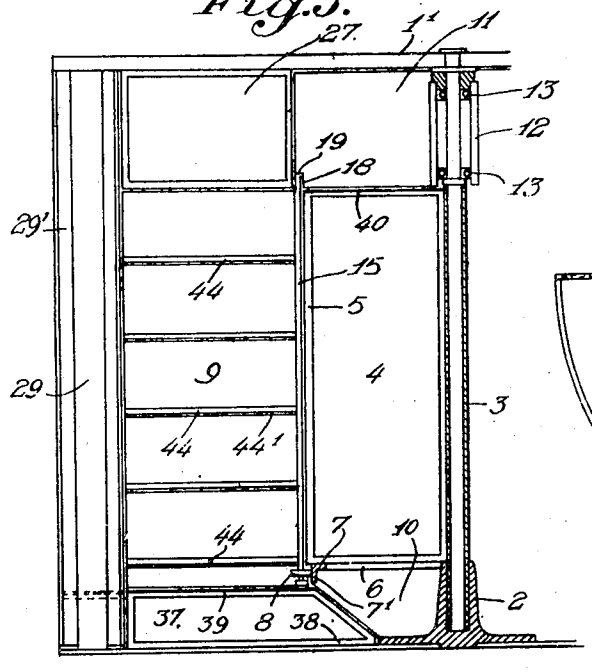
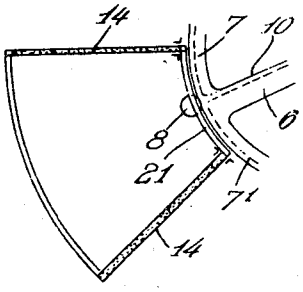


Fig.4.



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DRIER OF THE CONTINUOUS TYPE FOR TEXTILE MATERIALS

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Fig.5.

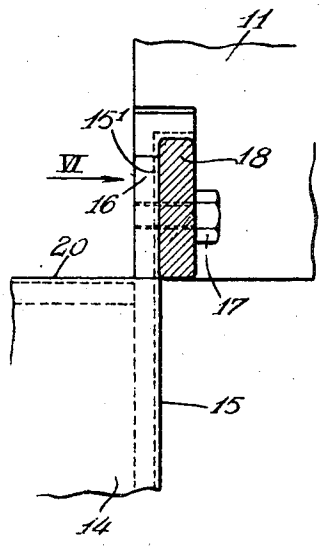


Fig.6.

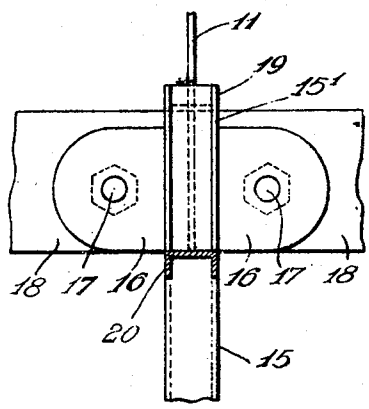


Fig.7.

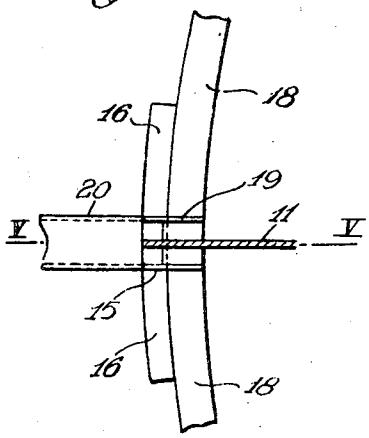


Fig.8.

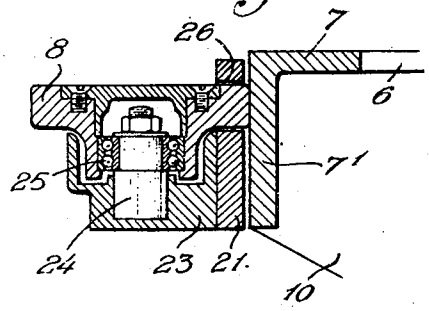
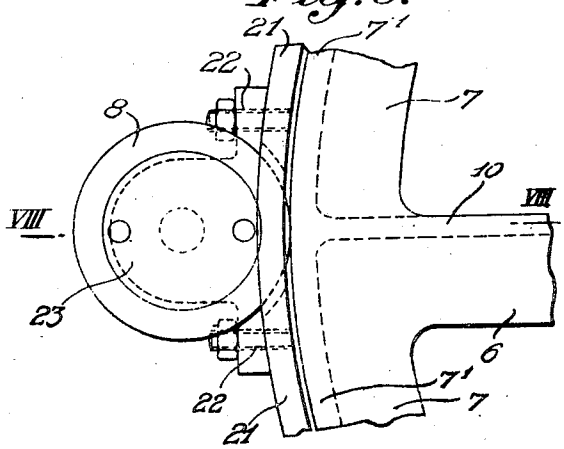


Fig.9.



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Fig. 10.

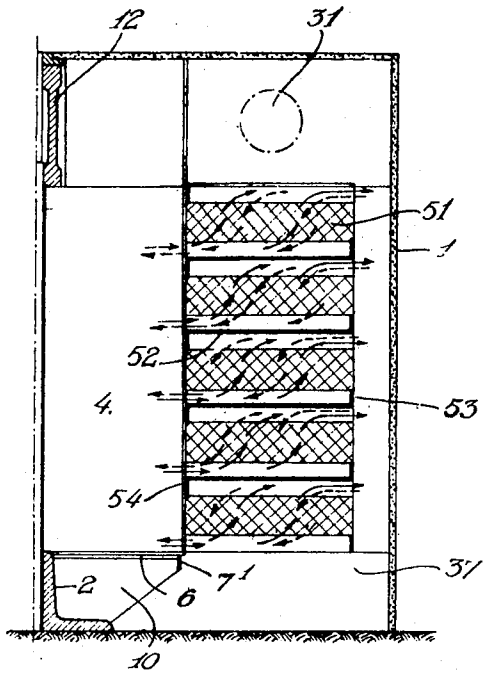
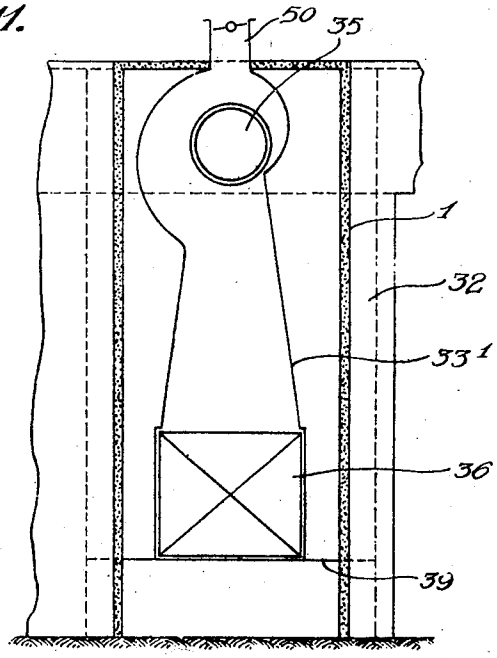


Fig. 11.



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Patented Aug. 16, 1949 2,479,049

UNITED STATES PATENT OFFICE

2,479,049

DRIER OF THE CONTINUOUS TYPE FOR TEXTILE MATERIALS

Jules Victor Edouard Marie Poncelet, Brussels, Belgium, assignor to Anciens Ateliers Victor Charpentier et Compagnie, Société de Personnes a Responsabilite Limitee, Dolhain, Belgium, a Belgian company

Application December 10, 1946, Serial No. 715,251
In Belgium January 18, 1946

5 Claims. (Cl. 34—187)

1

My present invention relates to a dryer of the continuous type for all kinds of textile materials.

In dryers of this kind at present in use the material is contained in stationary compartments and generally remains immobile during the whole drying process; only the state of the air which blows onto the material is varied, for example, by the working valves operated by the doors of the compartments.

This arrangement contains the following disadvantages:

1. The heating batteries and the ventilators must be identical in all the compartments as all the phases of the drying process take place in each compartment;
2. Large volumes of air must be exhausted to prevent too great a rise in temperature when the material is nearly dry. This considerably harms the specific consumption of air especially for light materials containing little water;
3. When the compartment dryer serves as carboniser and dryer all batteries must be reinforced and thereby become overloaded for the drying period. The regulation of the temperature for passing from the carbonisation phase to the drying phase is very complicated;
4. The charging and discharging of the material is not made at the same place, which complicates the loading in the case where the dryer has several compartments.

My present invention aims at remedying the above disadvantages and of realising a dryer with particularly easy management and making for considerable economy in motive force as well as easy regulation of the different phases.

This dryer is characterised essentially by a material carrier in the form of a drum which is divided into compartments or cupboards containing the material to be dried and which is rotated around a fixed central portion and by an air circulation flowing in the reverse direction from that of the displacement of the material and which is produced by ventilators occupying fixed positions between the rotary material carrier and the cover of the dryer, each ventilator blowing air onto a heating battery.

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My invention will be described with reference to the accompanying drawings in which:

Fig. 1 is a perspective view of the assembled dryer;

Fig. 1A is a diagrammatic view showing, from above and with the top removed, the relative arrangement of the stationary and rotary parts;

Fig. 2 is a section on line II—II in Fig. 1A;

Fig. 3 is a view in elevation of a part of the dryer; taken along the arrow 3 on Fig. 1A;

Fig. 4 is a detail view showing the mounting of the rotary material carrier on the central stationary part of the apparatus;

Figs. 5, 6 and 7 show the connecting arrangement of the rotary material carrier to central guide valves provided at the upper part of the dryer; Fig. 5 being a vertical section on line V—V in Fig. 7; Fig. 6 being a view in elevation taken along the arrow VI of Fig. 5 and Fig. 7 a plan view;

Figs. 8 and 9 are detail views of the arrangement allowing for the rolling of the material carrier on a fixed circular rail. Fig. 8 is a section on line VIII—VIII of Fig. 9 and Fig. 9 is a plan view;

Fig. 10 shows a modification in the construction of the chambers;

Fig. 11 is a section on line XI—XI, Fig. 1A.

In the attached drawings 1 shows the cover of the dryer formed usually of panels of non-conducting material; on the interior of same is mounted a footstep bearing 2 to receive a vertical central shaft 3 likewise stationary and joined at its upper extremity of the top 1^1 of the apparatus. On this shaft 3 above the footstep 2 are mounted panels 4 forming vertical partitions, each mounted in a frame 5. The bearing 2 carries side arms 6 which branch out horizontally under the lower edge of the panels 4 and connected to a circular corner piece 7 of L shape the vertical branch 7^1 of which serves as a runway for rollers 8, ensuring the rotation of the rotatable part of the dryer which has the cupboards or compartments 9 containing the material to be dried.

In the example represented the compartments are eight in number.

From the bearing 2 there radiate in addition under the arms 6 ribs 10, eight in number in the example shown which extend vertically beyond the panels 4, likewise eight in number.

The chambers 9 are joined at 9^1 (Fig. 2) by means which will be described hereinafter, to a guide vane having blades 11, eight in number in the example shown, fixed to a hub 12 rotating in roller bearings 13 around the upper part of the vertical shaft 3.

As shown by Figs. 5, 6 and 7, each panel 14, forming the intermediary partition between two chambers, is mounted in a U-iron 15 arranged vertically and extending upwards beyond the upper edge of the panel 14 by a member 15^1 on which is soldered or otherwise fixed on each side a tie piece 16, for example by bolts 17, to a mobile encircling piece 18 jointly with the blades 11. The upper end of the U-iron 15 is bent square towards the interior to be supported on the upper edge of the encircling piece 18. The upper edge of each panel 14 engages a U-iron 20 joined to the U-iron 15.

Towards the bottom, two successive panels 14 are joined to one another towards the interior of the dryer by a sector 21 (Fig. 4) concentric with the shaft 3 and on which is fixed, for example by screws 22 (Figs. 8 and 9) a casing 23 housing a shaft 24 arranged in a vertical position and around which may rotate in roller bearings 25, the roller 8 which comes into contact with the rim 7 passing through a slot 26 (Fig. 8) of the sector 21.

The stationary upper part of the dryer comprises in addition above the chambers 9 five partitions 27, rectangular in shape, which radiate from the exterior cover to a circular line 28 (Fig. 1) limited by the exterior edges of the blades 11. On the partitions 27 are mounted stationary panels 29 which may cooperate with these partitions and which extend vertically the whole height of the dryer between the exterior cover and the rotary part. These panels 29 may be fixed to corners 29^1 (Fig. 3) joined on the one hand to the top 1^1 and on the other hand to the bottom of the dryer. Two of the partitions 27 enclose the charging chamber 30 (Fig. 1A) whilst in the others openings 31 are provided for the passage of air. With this construction the upper part of the dryer above the compartments I and II is free of all partitioning and it is the same for the compartments III and IV, V and VI and for the compartment VII.

In each of the corners of the cover 1 are disposed partitions 32 which form with the two adjacent sides of the cover, spaces 33 of triangular section in which is placed a duct 33^1 serving as a housing in its upper part for a ventilator V^1, V^2, V^3, V^4, operated by an electric motor 35 enabling air to be blown onto a heating battery 36, arranged in the lower part of the duct 31^1 in such a manner that the air, after having been heated by the battery, may pass under the bottom 29 common to all the rotary chambers 9 through a hole provided in the partition 32.

In the lower part of the dryer there is provided in addition eight plates 37 fixed for example by angle pieces at the bottom 38 of the dryer and extending towards the top to a shelf 39. These plates 37 serve as a guide for the air coming from the corresponding battery 36.

Towards the top the central stationary part of the dryer there are five horizontal panels 40 fixed on the one hand to the stationary footstep 2, and on the other hand to the vertical partitions 4 between which they are disposed.

In the attached drawings we have represented by full line arrows the course of the air when it is directed from the battery towards the materials, and by broken arrows when the air returns towards the ventilator or is directed towards the following shelf.

The drawing in of fresh air takes place from the exterior through a duct 41 (Fig. 1A) by means of a ventilator V^1 at the upper part of the compartment VII containing the driest material about to be discharged (Fig. 1A).

This air is pressed (arrows F, Fig. 2) onto the battery 36, placed under the ventilator V^1, and is heated on contact with the tubes of this latter; it then passes (arrows F^2, Fig. 2, and F^{1_2}, Fig. 1A) guided by the plates 37 under the material in the chamber occupying at this moment the position VII and ascends (arrows F^3, Fig. 2) up an interior duct 42 formed by two successive panels 4, and then returns from the interior towards the exterior (arrows F^4, Figs. 1A and 2) sweeping the surface of the material, bobbins 43, cheeses or skeins resting for example on shelves 44 supported by corner pieces 44^1 fixed to the panels 14, or passing from bottom to top of the drawers when it relates to flock (Fig. 10). All the air passages at the interior of the chambers have the same length so that the air is distributed uniformly over the whole height of the compartment.

A part of this air is drawn in by the ventilator V^1 in passing by the opening 45 provided in each partition 32, and mixes with the fresh air introduced through the duct 41, whilst another portion of this air is drawn in by the ventilator V^2 passing through the communication opening 31 (arrows F^5, Fig. 1A).

The ventilator V^2 forces the air drawn in onto its heating battery 36; this air passes underneath the compartment V, returns from the interior towards the exterior crossing over the material as above described to the ventilator V^1 and traverses the compartment V^1 from the exterior towards the interior (arrows F^7, Fig. 2) after having passed, as indicated by the arrow F^6, Fig. 1A, from space 46 to space 47.

Owing to the absence of a horizontal panel 40 at the upper part of the space 48 (Fig. 1A) it divides at the upper part of the compartment V^1 (arrows F^6, Fig. 2) where it is partly drawn in by the ventilators V^3 and partly by the ventilator V^2.

In the case of Fig. 10 the drawers are then crossed in the compartments V^1 from top to bottom, then in the compartment V from bottom to top.

The ventilators V^3 and V^4 provide identical circuits for the air to those described for the ventilator V^2, the ventilator V^3 working on the compartments III and IV, and the ventilator V^4 on the compartments I and II where the material is more humid.

The ventilator V^4 exhaust to the exterior through a duct 50 (Fig. 1) a quantity of air equal to that drawn in by the ventilator V^1.

The compartment VIII is reserved for the charging and discharging of the material, operations which always take place at the same place. In the drawings, the compartment VIII has been left continually open as used for rapidly drying materials. With materials which require a rather longer drying period, several hours for example, this compartment is closed by a non-conducting door and it then forms part of the circuit of the ventilator V^1 of which the circuit, in this case, is identical to that of the other three ventilators.

In a dryer as described, each ventilator blows therefore onto the material in the two adjacent

compartments, but the air circuit is arranged in such a manner that the air blows onto the material in one compartment in one direction and in the following compartment in the reverse direction. This is of great importance for certain material such as bobbins or cheeses, where it is essential that the air should come in contact with all parts of the material.

The drying time being T minutes, the drum is advanced every T/8 and T/7 minutes (according as to whether the charging compartment forms part or not of the active compartments) ⅛ turn and the material passes successively before all the ventilators as in a continuous dryer. It can therefore be generally stated that, the number of compartments being n the drum is advanced every

$$\frac{'T}{8n} \text{ or } \frac{''T}{n-1} \text{ minutes}$$

The air which circulates as countercurrent is drawn in by the ventilator V^1 and is exhausted into the atmosphere in the humid state by the ventilator V^4 as in continuous countercurrent dryers.

The present dryer therefore has all the characteristics of a continuous one from which it only differs in the system of displacement of the material. Instead of a continuous movement one has a periodical movement which is more suited for materials the drying time of which is relatively great.

As a drying phase which is always the same corresponds to each position occupied by a compartment one can provide ventilators and different batteries from the position V^1 to V^4, and the temperature may easily be regulated in each zone. Carbonisation may thus be effected easily in that three ventilators and their batteries may be reserved for the drying and the fourth for carbonisation. The circulation of air onto the material has been rendered quite rational as in a continuous dryer.

In addition as the air traverses the material in two directions, the distribution of the air along the whole height of the compartment has been rendered uniform by the fact that all the trajectories of the different streams of air have the same length. Gradual and uniform drying of the material is thus obtained.

A variation consists in the rotation of the drum by means of an electric motor and reduction gearing and the charging and discharging in the case of flock by blowers. The dryer thus becomes continuous in the usual meaning of the word.

Another variation applicable to very heavy materials necessitating a very long drying period permits the use of a perfected drying-stove. In this conception all ventilators are provided with fresh air intake and exhaust of air which may be regulated. The general functioning of the dryer is then as follows:

The eight compartments are filled with material to be dried. At the beginning of the drying process much of the air is exhausted to the exterior the four exhausts being open. As the drying progresses the inlets of the ventilators V^2, V^3 and V^4 and the outlets of the ventilators V^1, V^2 and V^3 are closed successively, so that towards the end of the drying process the circulation of the air is established as in continuous drying. At the same time the batteries are regulated which makes it possible to bring about in the total time taken for the drying a great economy in consumption as compared with an ordinary drying stove. In the course of the drying ⅛ turn is given periodically to the drum which causes the air to traverse the material in the reverse direction to that of the preceding period. This is a considerable advantage as compared with an ordinary drying stove where the air always traverses the material in the same direction. The drying time is thus shortened.

Fig. 10 relates to a modification in which the flock material to be dried or carbonised is contained in drawers 51 with four lateral walls, for example of plain sheet metal, the bottom of which is latticed the drawers being slid into each compartment on corner pieces fixed to the insulated walls of the vertical partitions of the chambers.

In this modification in addition barriers or horizontal separating walls 52, usually of sheet metal, with the edge 53 bent square towards the top of the exterior side and the edge 54 bent square towards the bottom of the interior side in such a way as to compel the air of one ventilator working on two compartments, that is to say in the example represented on ⅜ of the periphery, to traverse the material:

1st from bottom to top when the air comes from the interior (arrows in full)
2nd from top to bottom when the air comes from the exterior (arrows dotted).

What I claim is:

1. In a drying apparatus for textile materials, in combination an outer casing, a carrier for the material rotatably mounted therein, the said carrier comprising an annular bottom and compartments formed by vertical partitions, a vertical fixed central shaft, panels mounted on said shaft whereby fixed vertical ducts are formed between two successive panels, fans occupying fixed positions in spaces formed by vertical partitions between the rotating material carrier and the outer casing, the said spaces containing also air heaters, guiding means whereby air having been circulated over the corresponding heater passes under the bottom of the rotating carrier and is caused to ascend up in an interior fixed duct, a horizontal baffle provided at the upper part of each of the fixed vertical ducts situated opposite a blowing fan whereby the air is caused to circulate from the interior to the exterior in sweeping the material contained in one compartment of the rotating carrier when situated in front of said vertical fixed duct and is caused to traverse the adjacent compartment containing more dry material from the exterior to the interior, stationary partitions radially and vertically arranged above the rotating material carrier in positions corresponding to the intersection between two vertical fixed interior ducts and on which the said ducts are mounted stationary panels which extend the whole height of the apparatus between the exterior casing and the rotating material carrier, and which are disposed so as to form external spaces corresponding to the circumferential amplitude of two compartments of the rotating carriers, the said stationary partitions being pierced by an opening whereby the air after having passed from the exterior to the interior in one compartment is drawn partly by the fan corresponding to one pair of fixed ducts and also by the following fan.

2. A drying apparatus according to claim 1,

including rollers, and a circular corner piece as a runway for said rollers.

3. A drying apparatus according to claim 1, including drawers horizontally arranged.

4. A drying apparatus according to claim 3, in which the drawers are crossed from top to bottom.

5. A drying apparatus according to claim 3, including horizontal walls in Z shape so that the air passes through the material once from the bottom to top and once from top to bottom.

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