M. WHITLATCH.

DRIER.

APPLICATION FILED MAY 4, 1909.

948,751. Patented Feb. 8, 1910.

6 SHEETS—SHEET 1.

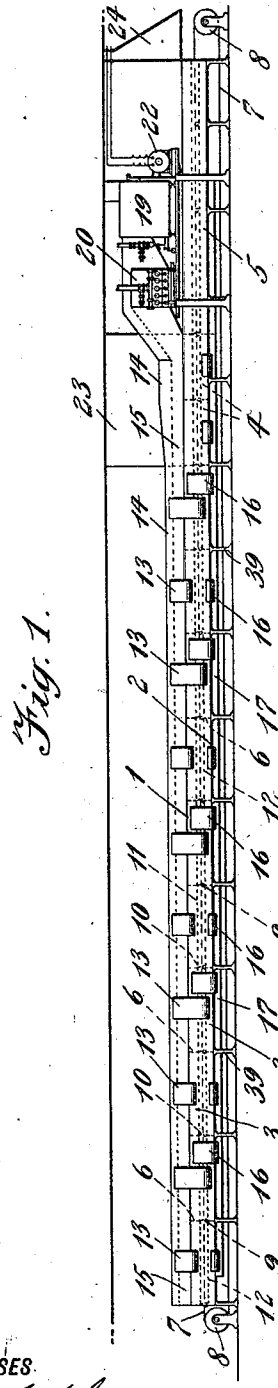

Fig. 1.

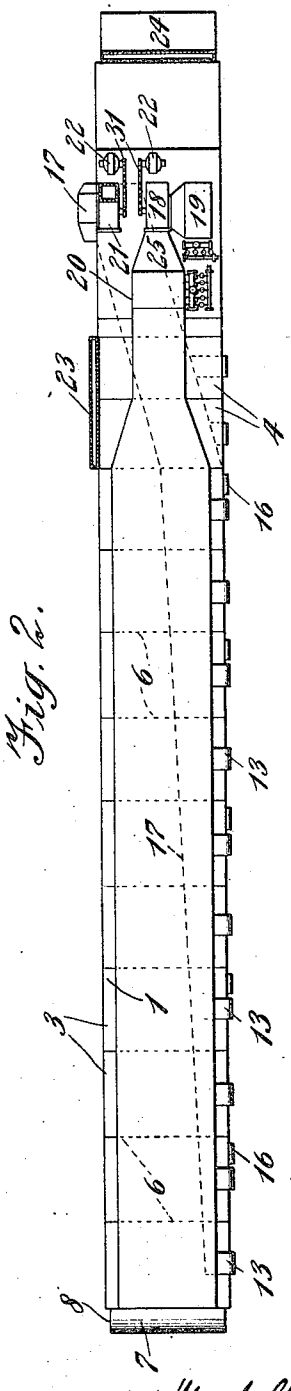

Fig. 2.

WITNESSES.

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6 SHEETS—SHEET 2.

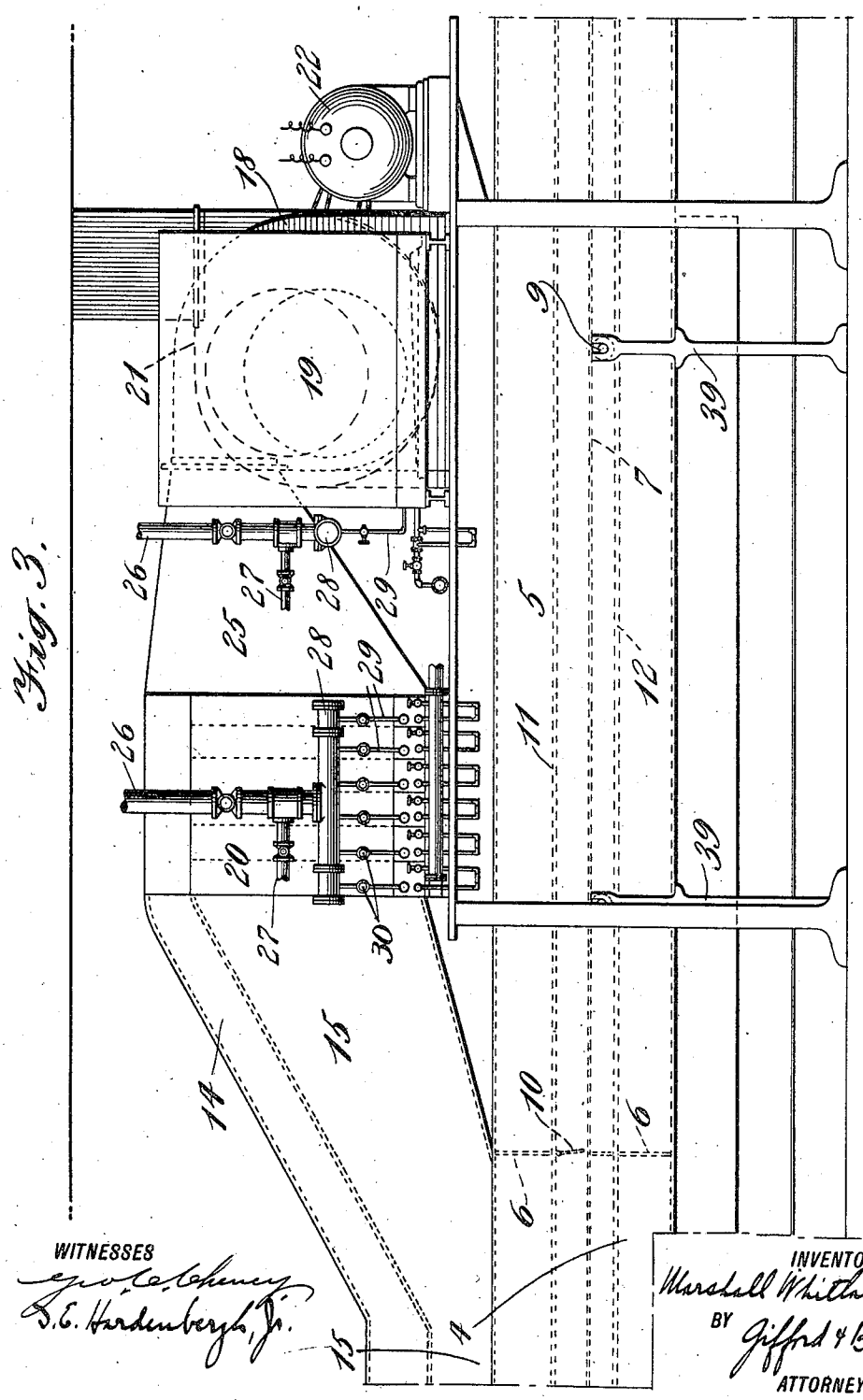

Fig. 3.

WITNESSES

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6 SHEETS—SHEET 3.

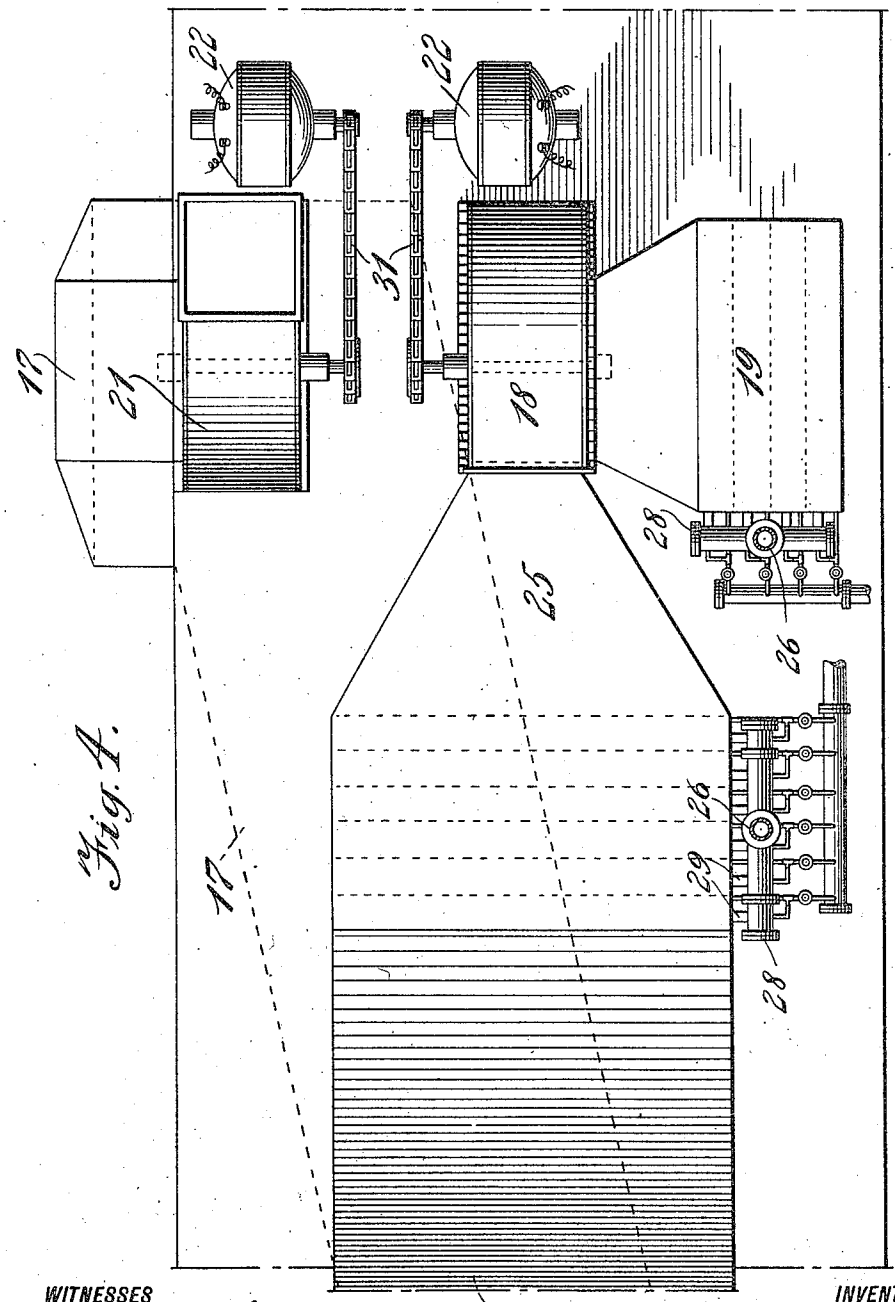

Fig. 4.

WITNESSES

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6 SHEETS—SHEET 4.

Fig. 10.

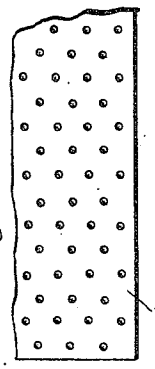


Fig. 9.

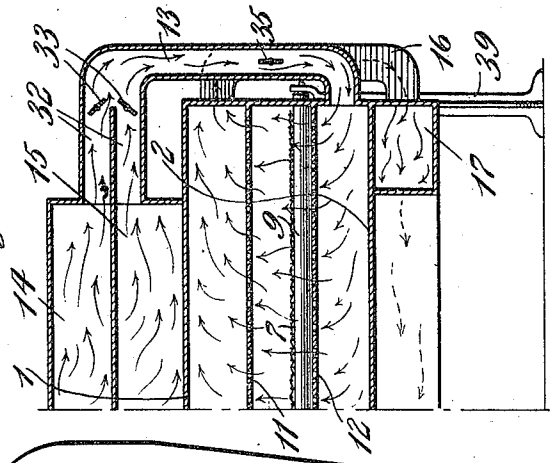
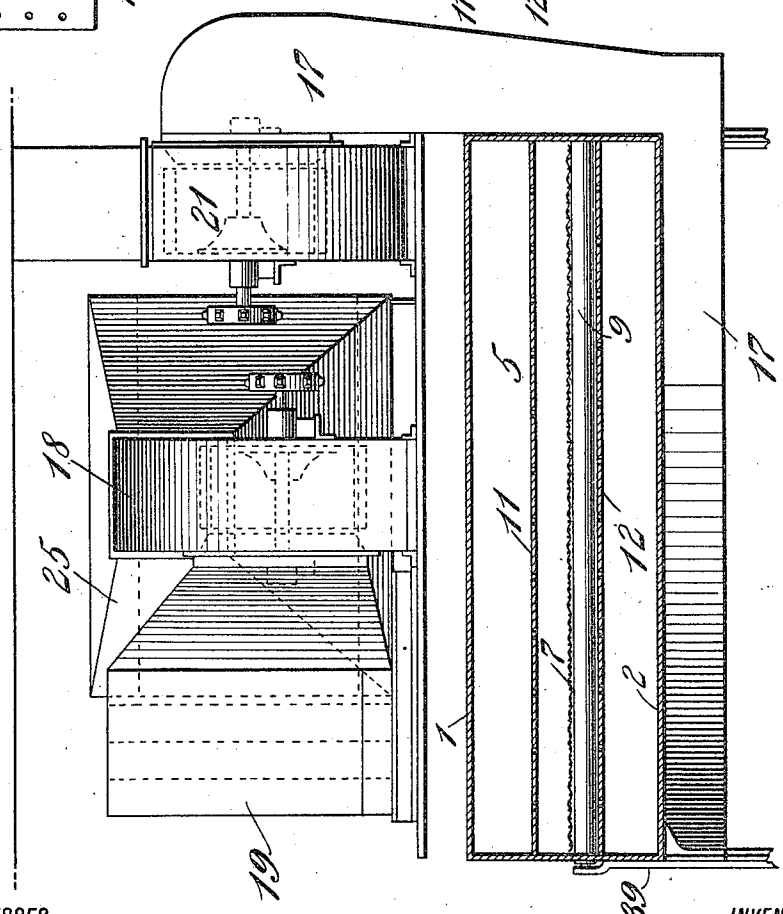


Fig. 5.



WITNESSES

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APPLICATION FILED MAY 4, 1909.

948,751.

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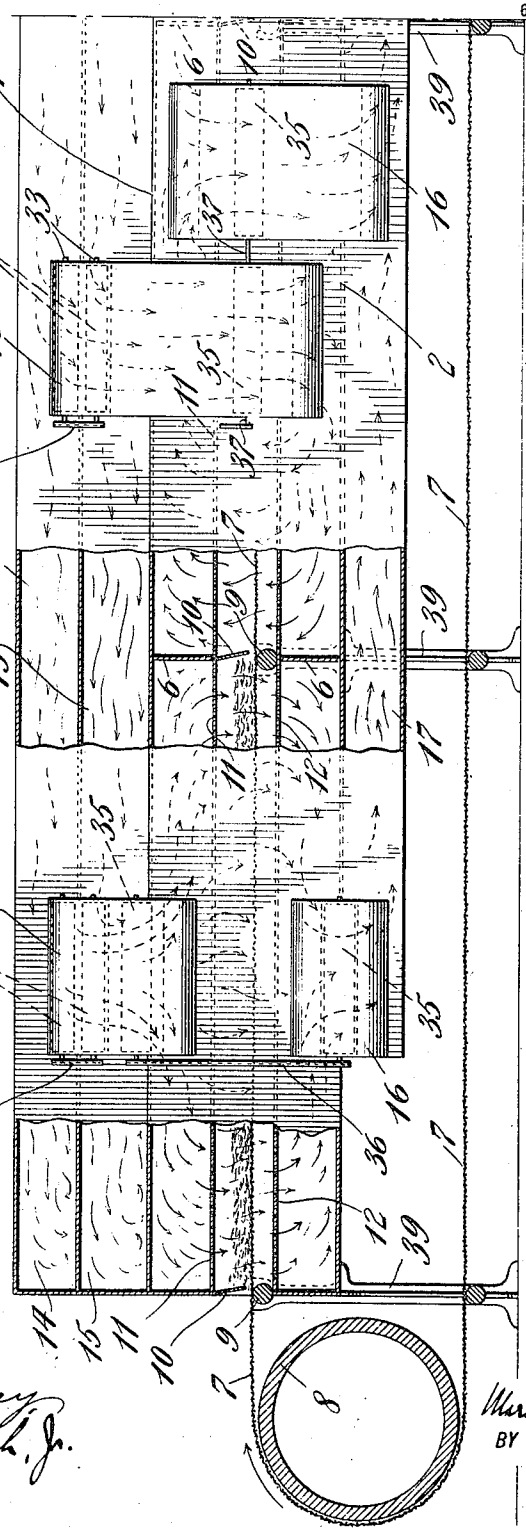
6 SHEETS—SHEET 5.

Fig. 6.



WITNESSES

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6 SHEETS—SHEET 6.

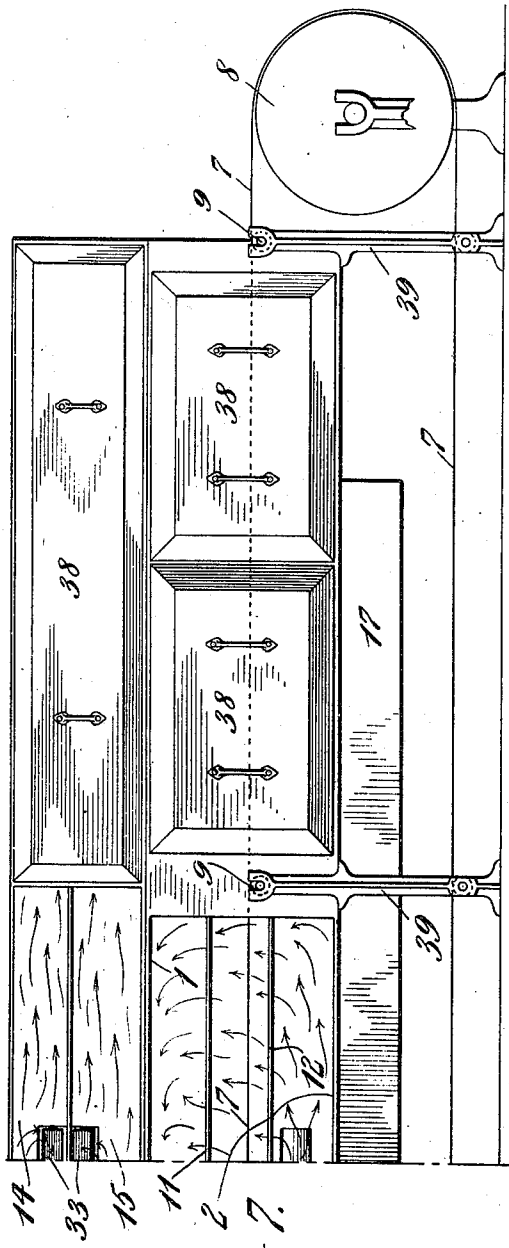

Fig. 7.

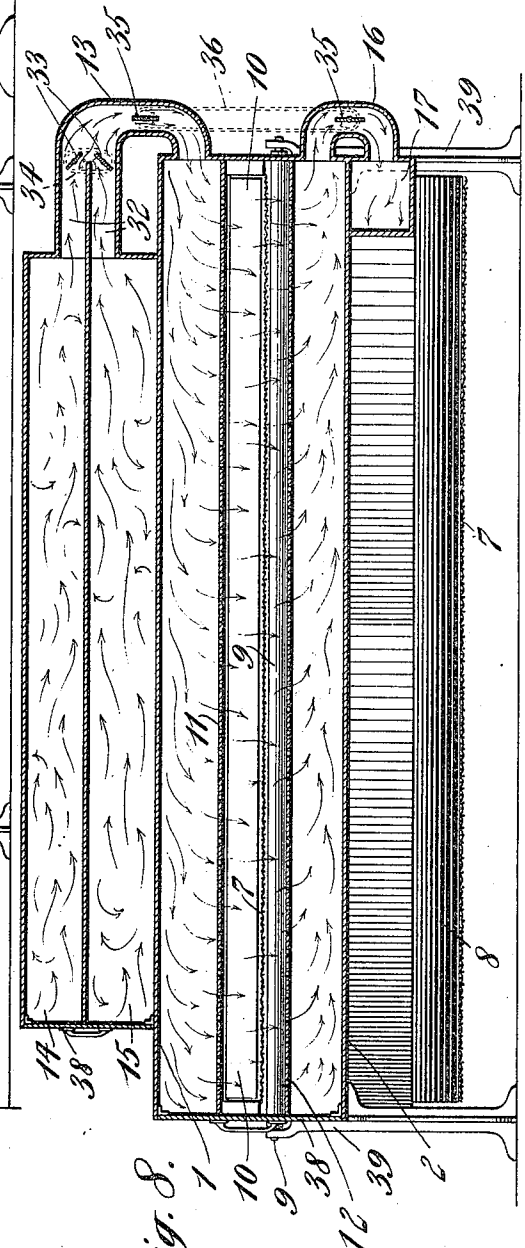

Fig. 8.

WITNESSES

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UNITED STATES PATENT OFFICE.

MARSHALL WHITLATCH, OF NEW YORK, N. Y.

DRIER.

948,751. Specification of Letters Patent. Patented Feb. 8, 1910.

Application filed May 4, 1909. Serial No. 493,839.

To all whom it may concern:

Be it known that I, MARSHALL WHITLATCH, a citizen of the United States, residing at New York city, in the county of Kings and State of New York, have invented certain new and useful Improvements in Driers, of which the following is a specification.

In the designing of driers heretofore many difficulties have been encountered, chief among which has been that of subjecting the material to be treated to a constantly changing, fresh and unsaturated drying current of air or heated air without the formation of air pockets in the drier or permitting air which has once been in contact with the material to again come in contact therewith. The formation of air pockets occurs in spaces within the drier which are not directly in the line of flow of the current through the same, such pockets being composed of air in a more or less saturated condition, which tends to impair the drying conditions which it is desired to maintain within the drier, and also is liable to again be brought in contact with the material treated should a current empty all or a portion of a pocket. The difficulty of treating the material in the drier to a current of air which comes into contact with the material but once and then passes out of the drier, results also from the fact that any and all material inserted in the drier offers a resistance to the current of air passing through the same in a degree corresponding to the character of the material, the flow of the air being impeded, back currents formed, and the efficient operation of the drier otherwise interfered with.

It is the purpose of my invention to provide a drier which will be free both from the disadvantages and objections as above set forth, and other difficulties which have heretofore impaired the efficiency of driers of the class to which my invention relates.

In carrying out my invention I have provided a drier (1) in which the material treated is subjected to the drying action of a constant flow of substantially unsaturated air, the air being removed from the drier instantly upon having come in contact with the material; (2) in which the entire drying chamber throughout its whole extent receives an equal supply of constantly changing and substantially unsaturated air, every portion of the material within the chamber being thus treated alike.

A drier embodying my invention is of novel design, form and construction and comprises among its advantages novel supply and withdrawal of air, control of the temperature of the same, distribution of the air within the drying chamber, manner of treating the material, etc.

In the drawings herewith I have shown, and will hereafter describe, for the purpose of illustration a drier embodying my invention which is more especially adapted for use in the drying of tobacco although it will readily be seen that a drier embodying my invention may be constructed for use in any desired drying operation without departing from the spirit of my invention which consists in the design, arrangement, construction, combination and operation of parts as set forth in and falling within the scope of the claims hereto appended.

In the drawings herewith like characters of reference denote like parts in all the figures thereof.

Figure 1 represents a side view in elevation of a drier embodying my invention; Fig. 2 represents a plan view of a drier embodying my invention; Fig. 3 represents a detail view in side elevation of the heater and air supply end of a drier embodying my invention; Fig. 4 represents a detail plan view of the portion of the drier as shown in Fig. 3; Fig. 5 represents a detail view in end elevation of the supply and exhaust mechanism of a drier embodying my invention, the drier chamber being shown in section; Fig. 6 represents a detail view in side elevation of an end of a drier embodying my invention, portions of the side of the drier being broken away and the distribution of air currents shown; Fig. 7 represents a detail view in side elevation of the opposite side of the end of the drier shown in Fig. 6, portions of the side being removed; Fig. 8 represents a detail sectional view in end elevation taken centrally through the end compartment of the drier as shown in Fig. 6; Fig. 9 represents a detail sectional view in end elevation taken centrally through the supply and exhaust end of the second compartment of the drier as shown in Fig. 6. Fig. 10 represents a plan view of a portion of one of the perforated plates contained in a drier embodying my invention; the preferred arrangement of the perforations being shown therein.

A drier embodying my invention and

adapted especially for use in the drying of tobacco is shown in side elevation and in plan view in Figs. 1 and 2 respectively. As therein shown, the drier with top 1 and bottom 2 is divided into ten drying compartments 3, two cooling compartments 4, and reordering compartment 5. The dividing walls 6 between compartments are provided with horizontal openings through which passes the upper length of an endless conveyer apron 7, preferably of wire net, supported on drums 8 at the end of the drier and passing over rollers 9 intermediate its upper length, preferably at the points of its passage through walls 6, the bearings of rollers 9 being preferably outside of the drier. The lower length of the apron 7 passes underneath the drier, the direction of travel of the upper length of the apron being from left to right. At each opening in walls 6 a light swinging shutter 10 is provided adapted to rest on the apron and substantially close the opening between compartments except for the passage of the apron. Over the apron 7 and adjacent thereto is placed a perforated plate 11, a second perforated plate 12 being in a like manner placed underneath the apron. Each drying compartment 3 is connected by an inlet passage 13 with temperate air supply 14 and reheated air supply 15 above the drier, an exhaust passage 16 connecting each drying compartment with the exhaust pipe 17 underneath the drier. The inlet passages 13 enter alternate chambers above plate 11 and below plate 12, the exhaust passages 16 being arranged accordingly. A supply fan 18 draws the air supply through a tempering coil 19 and delivers it to supply pipes 14 and 15, a second heater or reheater 20 being placed at the entrance to reheated air supply pipe 15. An exhaust fan 21 withdraws the air through exhaust pipe 17. Motors 22 of equal capacity are preferably used to operate the fans. Cooling compartments 4 are connected with a cold air supply duct 23, the air being withdrawn through exhaust passages 16 connected with exhaust pipe 17. Over the apron conveyer 7 at the delivery end of the drier is located a vapor hood 24.

It will readily be apparent from the detail description of my invention hereafter that the above general design of a drier may be changed or modified as desired to accord with the purpose for which it is to be used, the capacity and drying effect desired, etc., without departing from the spirit of my invention; the general form of drier as above designed having been found in practice to be of especial value in the drying of tobacco on a large scale.

Turning now to the particular construction of my drier in detail, I will first describe the heaters and supply and exhaust fans as shown in Figs. 3, 4 and 5. The supply fan 18 draws air through a tempering coil 19 and delivers it through hood 25 to supply passages 14 and 15, the air passing directly into temperate air passage 14, and into reheated air passage 15 through a second heater 20, passage 15 being preferably below passage 14. Low pressure steam is supplied through pipes 26 and live steam through pipes 27 through headers 28 to heating pipes 29 passing into the tempering coil 19 and the heater 20. The heating pipes 29 passing into heater 20 are preferably arranged in independently valved sections each controlled by a hand valve 30. In this manner it will be seen that temperate air is supplied directly to the temperate air passage 14, while the air passing into reheated air passage 15 may be increased in temperature to any desired degree by the operation of heater 20. The fans 18 and 21 are preferably driven through chain driving connections 31 with motors 22 which are designed to operate the fans at equal capacities of supply and exhaust.

In order to gain the maximum efficiency of the drier the supply passages are uniform in size throughout their extension over the drying compartments, while the exhaust passage 16 is of uniformly increasing size, being at its point of connection to the drying compartment farthest removed from the exhaust fan, of a size necessary to receive the exhaust air from that compartment, being of double the initial capacity at its point of connection to the second compartment, of triple the capacity at the third compartment and so on as the volume of exhaust air which it must receive is increased by its connection with additional drying compartments.

The delivery of air to and exhaust of air from the drying compartments is shown in Figs. 6, 7, 8 and 9, the construction being such that a drier of the highest efficiency and uniformity of operation is produced. In Fig. 8, which illustrates, in the construction shown, the first drying compartment, the air is delivered through the inlet passage 13 over the perforated plate 11 and in a direction parallel with said plate between the same and the top of the drying compartment; in like manner the air is drawn out through the exhaust passage 16 from between perforated plate 12 and the bottom of the drying compartment. In the second chamber, as shown in Fig. 9, the air is delivered below the plate 12 and exhausted from above plate 11.

By means of the construction as above described each drying compartment is in effect divided into three chambers, one between the upper perforated plate and the top of the compartment, a second between the perforated plates through which the apron con-

veyer passes, a third between the lower perforated plate and the bottom of the compartment. The first or upper chamber constitutes an air distributing chamber, the third or lower a "distributing" exhaust chamber, or vice versa, and the middle a drying chamber. The upper plate 11 is necessarily farther removed from the conveyer belt than the lower plate 12 since the tobacco to be dried is piled upon the conveyer. The perforations in the plates 11 and 12 are preferably arranged in rows, the perforations of each row being offset or out of line with the perforations in adjacent rows (see Fig. 10). Each inlet passage 13 connects with both temperate air supply 14 and reheated air supply 15 through connecting pipes 32 in which are placed pivoted dampers 33 which are connected by chain 34 and may be regulated simultaneously to supply temperate air and reheated air in desired volumes. Each inlet passage thus forms a mixing passage for the temperate and reheated air. Pivoted dampers 35 are also placed in inlet passages 13 and exhaust passages 16, each pair being connected by chain 36 in such a manner that they may be simultaneously controlled to regulate the supply and exhaust equally. In the second chamber and in all chambers where the supply to the drying compartment is from below dampers 35 in inlet and exhaust passages 13 and 16 are simultaneously controlled through being mounted in the same horizontal plane on a shaft 37. The side of the drying compartments and supply passages opposite the supply inlet and exhaust outlet is formed in removable panels 38 which may be readily removed to expose the interior of the drier. The lower length of the conveyer apron being exposed underneath the drier, any damage thereto may be instantly noted and repaired. The drier is supported on standards 39, in which standards outside of the drier are also provided bearings for the ends of the rollers 9.

The supply and withdrawal of air is as follows: The fans being operated at equal capacities, the supply fan delivers a constant flow of temperate air to the temperate air passage and reheated air to the reheated air passage, such temperate air and reheated air being mixed in the inlet passage to each drying compartment before entering the compartment. The air being delivered in each compartment over or under a perforated plate and in a direction parallel therewith at a considerable velocity, flows at once to the opposite end of the air distributing chamber at the same time expanding and filling the chamber in its entire width after leaving the constricted mouth of the inlet passage. Upon striking the opposite end wall of the distributing chamber the air backs or piles up, the entire chamber over or under every portion of the perforated plate being thus supplied with air. Owing to the comparatively small size of the air distributing chamber and the manner of delivery of the air the above described supply occurs in a brief space of time and is substantially completed before the action of the exhaust fan from the opposite side of the plate through the drying chamber draws the air down or up through the plate. The action of the exhaust having become effective, the air is drawn through the plate over its entire extent in fine streams and immediately strikes the material to be dried; the material being piled on the conveyer apron and filling the greater part of the space between the apron and the upper plate, and the lower plate being adjacent to the apron. The air upon striking the material is not diffused, but, owing to the exhaust through the perforated plate on the opposite side of the apron conveyer, the streams of air are drawn through the material substantially unbroken, every portion of the material being subjected equally at all points in its course of travel through the drier to the drying effect of unsaturated, constantly flowing, heated air which is immediately removed after passing through the material. In a like manner the formation of a comparatively small air distributing exhaust chamber with the flow of the exhaust parallel to the perforated plate through which the air is drawn, provides for an equal withdrawal of air at all the perforations of said plate; the construction of the exhaust pipe with uniformly increasing capacity insuring an equal withdrawal of air from each drying compartment.

The drying operation above described has proved to be especially efficient for use in connection with tobacco which permits of the passage of the air through it in fine, spaced streams. Other material as desired may, however, be efficiently treated in the same manner.

It will be seen that a drier embodying my invention provides uniform and complete distribution of air supply in a distributing chamber, the passage of the air in spaced and positively directed streams through the entire extent of the drying chamber and a uniformly distributed withdrawal in the exhaust chamber. The tendency of the air to pass directly from inlet to outlet is overcome, the resistance offered by the material through which the air must pass is provided against, and the use of saturated air or its presence in the drying chamber is rendered impossible.

The temperature of the air in the supply passages or inlet passages may be governed by the use of necessary thermometers or indicating devices and the proper regulation of the mixing and throttling dampers for each drying compartment independent of the

others; in like manner the volume of air supplied any one compartment may be independently regulated.

The tobacco being placed on the apron conveyer (as indicated in Fig. 6) passes through successive drying compartments, is cooled in the cooling compartments, is treated in the reordering compartments, as is usual in the handling of tobacco, to prevent excessive dryness, and is delivered at the opposite end of the drier, the slight vapor or steam arising from the tobacco being drawn off through the vapor hood.

A drier embodying my invention is of maximum capacity, and of absolutely uniform operation with a minimum of time, labor and expense required for its care and regulation.

As has before been stated the supply of reheated air and of temperate air admitted to the inlet or mixing passage of each compartment may be controlled by simultaneous operation of dampers 33 by means of chain 34, and it will be noted as shown that the movement of chain 34 to close one damper 33 opens the second damper 33 to an equal degree; thus the exact volumes of reheated air and temperate air desired may be obtained and any desired temperature maintained in each of the drying compartments independent of the others.

Having thus described my invention, what I desire to claim by Letters Patent is:—

1. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber, and an air-withdrawal chamber arranged substantially in parallelism, an air supply passage, an inlet to said distributing chamber from said air supply passage, an air withdrawal passage, an outlet from said withdrawal chamber into said air withdrawal passage, and means for causing a flow of air through the drying compartment.

2. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber and an air-withdrawal chamber arranged substantially in parallelism, a plate provided with perforations forming a portion of the wall between said distributing chamber and said drying chamber, a second plate provided with perforations forming a portion of the wall between said drying chamber and said withdrawal chamber, an inlet to said distributing chamber, an outlet from said withdrawal chamber, and means for causing a flow of air through the compartment.

3. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber, and an air-withdrawal chamber arranged substantially in parallelism, an air supply passage, an inlet to said distributing chamber from said air supply passage, an outlet from said withdrawal chamber into said air withdrawal passage, means for supplying air to the distributing chamber through the inlet, and means for withdrawing air from the withdrawal chamber through the outlet.

4. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber and an air-withdrawal chamber arranged substantially in parallelism, a plate provided with perforations forming a portion of the wall between the distributing chamber and the drying chamber, a second plate provided with perforations forming a portion of the wall between the drying chamber and the withdrawal chamber, an inlet to the distributing chamber, an outlet from the withdrawal chamber, and means for causing a flow of air into said distributing chamber in a direction substantially parallel with the perforated plate between the distributing chamber and the drying chamber.

5. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber and an air-withdrawal chamber arranged substantially in parallelism, a plate provided with perforations forming a portion of the wall between the distributing chamber and the drying chamber, a second plate provided with perforations forming a portion of the wall between the drying chamber and the withdrawal chamber, an inlet to the distributing chamber, an outlet from the withdrawal chamber, and means for causing a flow of air from the withdrawal chamber in a direction substantially parallel with the perforated plate between the withdrawal chamber and the drying chamber.

6. In a drier, in combination, a drying compartment, comprising an air-distributing chamber, a drying chamber, and an air-withdrawal chamber arranged substantially in parallelism, a plate provided with perforations forming a portion of the wall between the distributing chamber and the drying chamber, a second plate provided with perforations forming a portion of the wall between the drying chamber and the withdrawal chamber, an inlet to the distributing chamber, an outlet from the withdrawal chamber, means for causing a flow of air into the distributing chamber in a direction substantially parallel with the perforated plate between the distributing chamber and the drying chamber, and means for causing a flow of air from the withdrawal chamber in a direction substantially parallel with the perforated plate between the withdrawal chamber and the drying chamber.

7. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber, and an air-withdrawal chamber arranged substantially

in parallelism, an air supply passage, an inlet for said distributing chamber, from said air supply passage, an air withdrawal passage, an outlet for said withdrawal chamber, into said air withdrawal passage and means for causing a flow of air from the distributing chamber into and through the drying chamber throughout the entire extent of the latter, the direction of flow of air into the distributing chamber from said inlet being substantially at right angles to the direction of flow of the air through the drying chamber.

8. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber, and an air-withdrawal chamber arranged substantially in parallelism, an air supply passage an inlet for said distributing chamber, from said air supply passage, an air withdrawal passage, an outlet for said withdrawal chamber into said air withdrawal passage and means for causing a flow of air through the drying chamber throughout its entire extent and into the withdrawal chamber, the direction of flow through the outlet from the withdrawal chamber being substantially at right angles to the direction of flow through the drying chamber.

9. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber, and an air-withdrawal chamber arranged substantially in parallelism, an inlet for said distributing chamber, an outlet for said withdrawal chamber and means for causing a flow of air through the chambers between said inlet and said outlet, the direction of flow of air into the distributing chamber from the inlet and through the outlet from the withdrawal chamber being substantially at right angles to the direction of flow of the air through the drying chamber.

10. In a drier, in combination, a drying compartment comprising an air-distributing chamber, a drying chamber, and an air-withdrawal chamber arranged substantially in parallelism, a plate forming a portion of the wall between the distributing chamber and the drying chamber provided with perforations, a second plate forming a portion of the wall between the drying chamber and the withdrawal chamber provided with perforations, an inlet to the distributing chamber, an outlet from the withdrawal chamber, and means for causing a flow of air into the distributing chamber and from the same through the drying chamber, the direction of flow of air into the distributing chamber being substantially at right angles to the direction of flow of air through the drying chamber.

11. In a drier, a drying compartment, a plurality of walls therein adapted to divide the compartment into an air-distributing chamber, a centrally disposed drying chamber, and an air-withdrawal chamber arranged substantially in parallelism, and means for causing a flow of air through the drying chamber throughout its entire extent, said means comprising perforations provided in the one of said walls between the drying chamber and the air-distributing chamber, an inlet into the air-distributing chamber, and means for supplying air to the air-distributing chamber through said inlet.

12. In a drier a drying compartment, a plurality of walls therein adapted to divide the compartment into an air-distributing chamber, a centrally disposed drying chamber, and an air-withdrawal chamber arranged substantially in parallelism, and means for causing a flow of air through the drying chamber throughout its entire extent, said means comprising perforations provided in the one of said walls between the drying chamber and the air-distributing chamber, an inlet into the air-distributing chamber, and means for supplying a flow of air into the air-distributing chamber through said inlet in a direction substantially at right angles to the direction of flow of air through said drying chamber.

13. In a drier, a drying compartment, a plurality of walls therein adapted to divide the compartment into an air-distributing chamber, a centrally disposed drying chamber and an air-withdrawal chamber arranged substantially in parallelism, and means for causing a flow of air through the drying chamber throughout its entire extent, said means comprising air-perforations provided in the one of said walls between the drying chamber and the air-withdrawal chamber, an outlet from the air-withdrawal chamber, and means for withdrawing the air from the withdrawal chamber through said outlet.

14. In a drier, a drying compartment, a plurality of walls therein adapted to divide the compartment into an air-distributing chamber, a centrally disposed drying chamber and an air-withdrawal chamber arranged substantially in parallelism, and means for causing a flow of air through the drying chamber throughout its entire extent, said means comprising perforations provided in the one of said walls between the drying chamber and the air-withdrawal chamber, an outlet from the air-withdrawal chamber, and means for causing a flow of air from the withdrawal chamber through said outlet in a direction substantially at right angles to the direction of flow of air through said drying chamber.

15. In a drier a drying compartment, a plurality of walls therein adapted to divide the compartment into an air-distributing chamber, a centrally disposed drying cham-

ber, and an air-withdrawal chamber arranged substantially in parallelism, and means for causing a flow of air through said compartment, said means comprising a plurality of perforations provided in the said walls between the drying chamber and the air-distributing chamber, and between the drying chamber and the air-withdrawal chamber, an inlet into the air-distributing chamber, an outlet from the air-withdrawal chamber, means for supplying a flow of air into the air-distributing chamber through said inlet, and for withdrawing the air from the air-withdrawal chamber through said outlet, said supply and withdrawal of air being in a direction substantially at right angles to the direction of flow of air through said drying chamber.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARSHALL WHITLATCH.

Witnesses:
T. E. HARDENBERGH, Jr.,
W. A. PAULING.