March 28, 1939. R. D. TOUTON 2,151,947

METHOD FOR CONDITIONING TOBACCO

Filed June 18, 1935 3 Sheets-Sheet 1

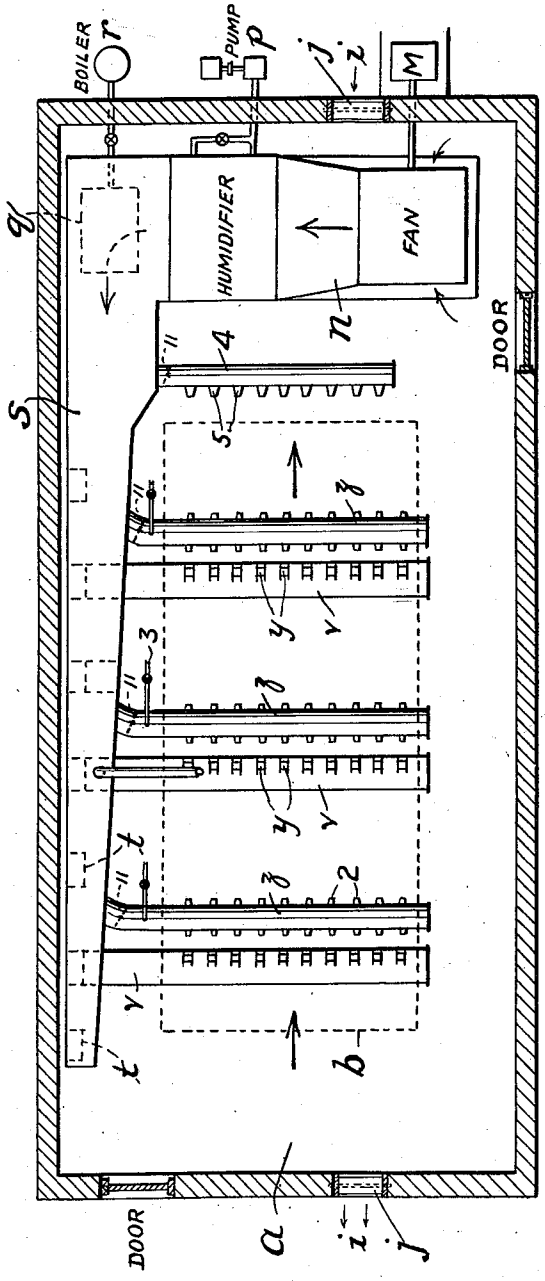


FIG. 1.

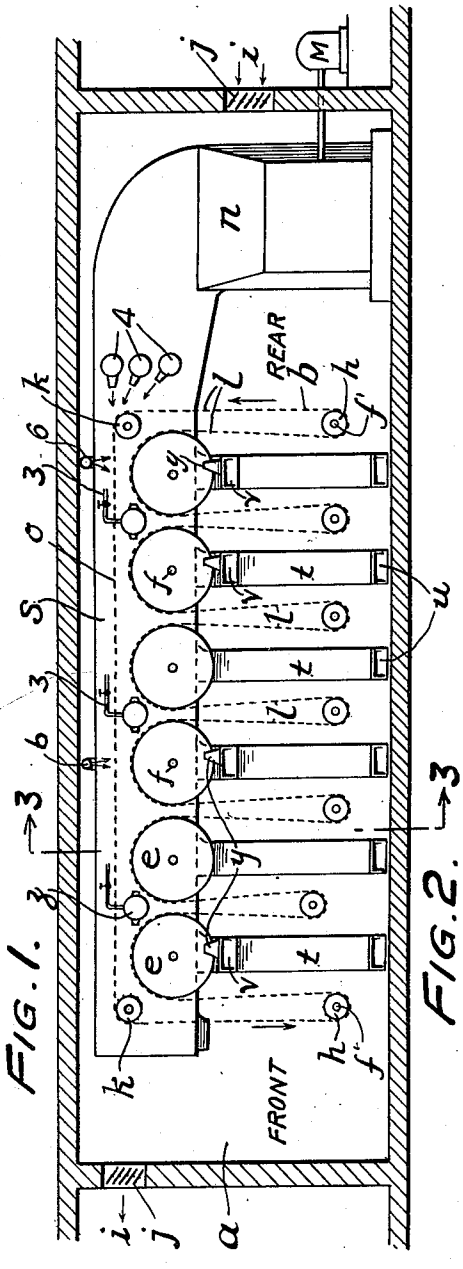


FIG. 2.

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WITNESS:

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METHOD FOR CONDITIONING TOBACCO

Filed June 18, 1935 3 Sheets-Sheet 2

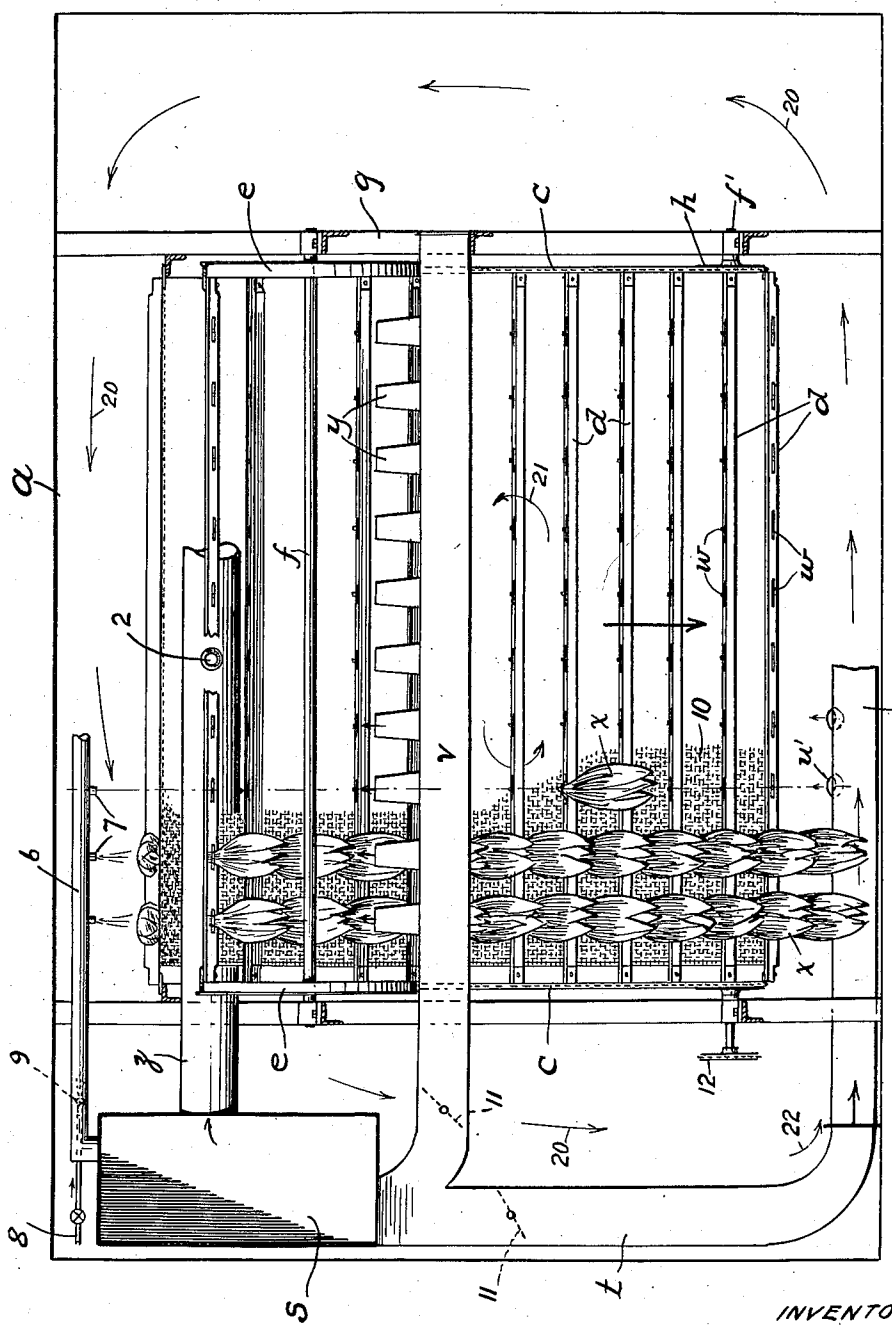


FIG. 3.

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METHOD FOR CONDITIONING TOBACCO

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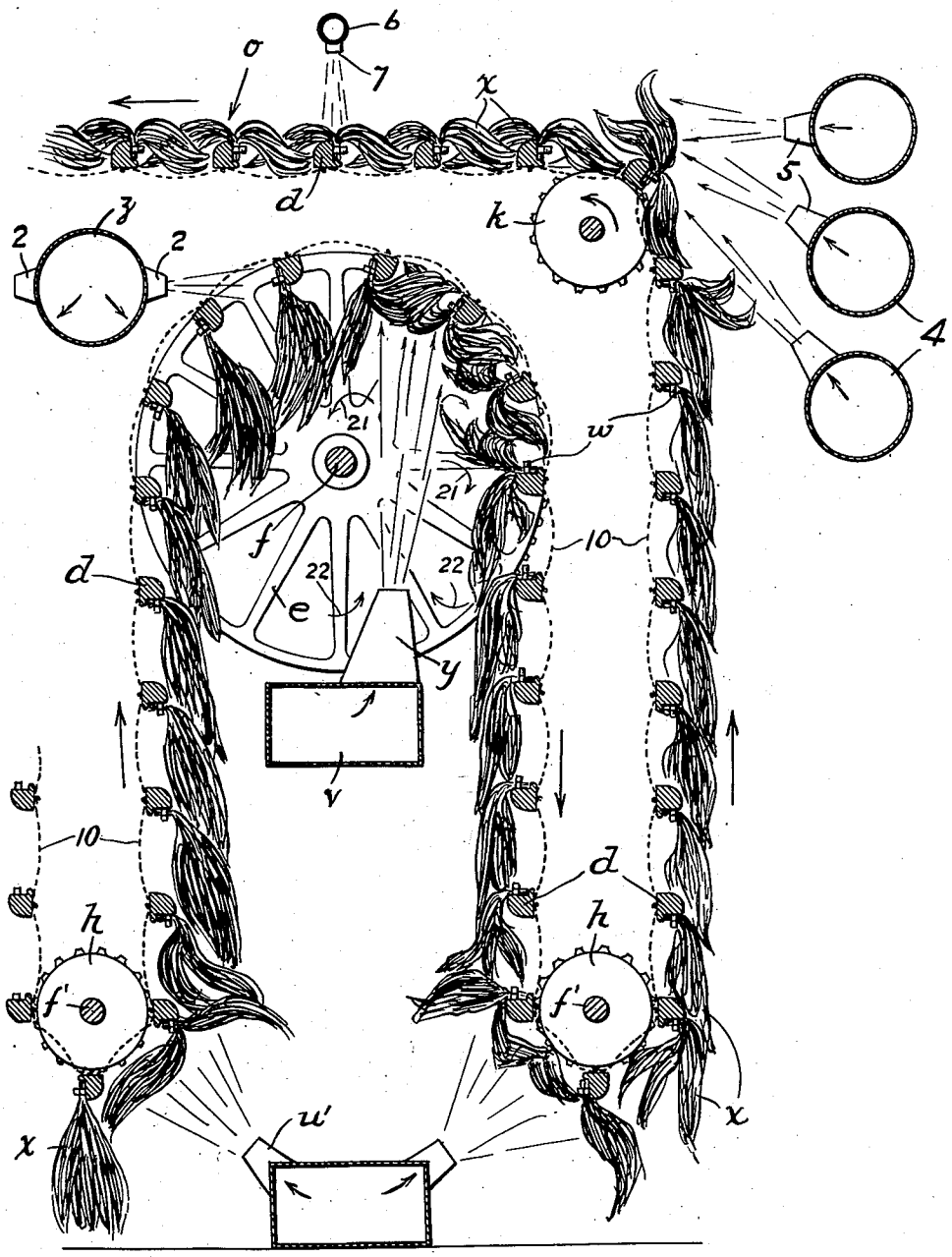


FIG. 4.

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UNITED STATES PATENT OFFICE

2,151,947

METHOD FOR CONDITIONING TOBACCO

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Application June 18, 1935, Serial No. 27,174

13 Claims. (Cl. 131—55)

This invention relates to a method for conditioning tobacco.

More particularly, in accordance with this invention a method is provided whereby tobacco will be conditioned for any desired purpose. Thus, for example, tobacco may be conditioned by moistening or drying to adjust its moisture for fermentation, by moistening to prepare it for sorting, packing, for use in the manufacture of cigars, etc. In particular, the method in accordance with this invention will be found highly economical and efficient for the preparation of tobacco for fermentation.

The method in accordance with this invention will, from the broad standpoint, involve subjecting tobacco in bunches or hands to a gas, as air, conditioned with respect to the nature of the treatment of the tobacco, as moistening or drying. The gas, as air, will be generally circulated with respect to the tobacco and/or forcefully directed into the hands or bunches for the purpose of opening or spreading the leaves, and, at the same time, the hands or bunches will be subjected to movement through a circuitous path.

From the broad standpoint the apparatus for carrying out the method in accordance with this invention but not herein claimed will comprise a chamber in which travels a conveyor arranged with substantially vertical reaches and adapted to support bunches or hands of tobacco. Within the chamber will be arranged a system of ducts provided with outlets arranged with respect to the conveyor for the delivery to the chamber of conditioned gas in a manner to promote general circulation with respect to the tobacco and for the direction of conditioned gas into the bunches or hands. Means for the conditioning of gas, as air, with respect to temperature and humidity or moisture content will be provided and will be so arranged as to effect recirculation of air from the chamber through the system of ducts.

The more specific details of the method according to this invention will become apparent from the following detailed description of apparatus and its mode of operation in carrying out the method with reference to the accompanying drawings in which:

Figure 1 is a plan view, partly in section, of a form of apparatus for carrying out the method of this invention.

Figure 2 is a side view, partly in section, of the apparatus shown in Figure 1.

Figure 3 is a cross-sectional view on line 3—3 of Figure 2.

Figure 4 is a detached, descriptive, cross-sectional view of the apparatus shown in Figure 1.

Referring to the several figures *a* indicates a chamber, which may be of any suitable dimensions, depending upon the amount of tobacco to be treated, and which is desirably insulated. The chamber is provided with suitably placed doors for the introduction and removal of tobacco. The chamber is also provided with openings *i*, controlled by dampers *j*, for the admission and discharge of air from the chamber.

Within the chamber *a* is positioned an endless conveyor *b* of any desired type and which may comprise a pair of endless chains *c*, *c* from which are supported at spaced intervals cross-members or bars *d*, *d*. Means *w*, *w* adapted to secure hands of tobacco *x*, *x* are secured at spaced intervals to the cross bars *d*, *d*. The means may, for example, comprise bands of rubber secured at their ends to the cross bars. A netting 10 may, if desired, be carried by the cross bars *d*, *d*.

The chains *c*, *c* pass over a series of relatively large sprockets *e*, *e* secured to shafts *f*, *f* journaled in a frame *g* and positioned in line in the upper portion of the chamber; and also over a series of relatively small sprockets *h*, *h* secured to shafts *f'*, *f'* journaled in the frame *g* and positioned in line in the lower portion of the chamber and in staggered relation with the sprockets *e*, *e*; and finally over sprockets *k*, *k* secured to shafts journaled in the frame *g* and positioned above and beyond the ends of the series of sprockets *e*, *e*.

The conveyor will be driven through a sprocket 12 on one of the shafts *f'* by any suitable connection with any suitable prime mover, as through a chain or belt from an electric motor, the prime mover being desirably positioned without the chamber.

By virtue of the arrangement of the several sprockets *e*, *h* and *k*, the conveyor will have a number of pairs of substantially vertical reaches *l* in its travel from one end to the other of the series of sprockets *e* and *h*, which in pairs will be relatively close together, the pairs being relatively widely separated; and a horizontal overhead return reach *o*. The conveyor may be reversed over the arrangement shown in the drawings, i. e. the horizontal reach may run below the vertical reaches instead of above, with reversal of the relative positions of the large and small sprockets, the tobacco passing over the small sprockets instead of beneath them.

Within the chamber *a* adjacent one end thereof is positioned a gas or air conditionnig apparatus comprising a casing *n* provided with inlet openings and containing a fan positioned adjacent the

inlet openings and driven by a motor M positioned outside of the chamber. The fan will be arranged to deliver gas or air, drawn from the chamber, through a humidifier, which may comprise a water spray or sprays supplied by a pump *p* positioned outside the chamber, and over a heating element *q*, which may be an electrical unit or a steam coil supplied with steam from a boiler *r* positioned outside of the chamber. The gas or air from the conditioning apparatus is delivered under the influence of the fan into a main duct *s*, which extends longitudinally in the upper part of the chamber along one side thereof.

The humidifier may, for various uses of the apparatus, as in the moistening of tobacco, operate in effect as a cooler, dehumidifier and humidifier and for such operation will be supplied with cold water at a temperature such as to effect desired cooling, dehumidification and humidification for the provision of gas or air having desired wet and dry bulb temperatures for delivery to the duct *s*. Cooling may be effected by admission of cold air to the humidifier, or by the provision of a cool surface within the chamber *a*.

From the duct *s*, a series of vertical ducts *t*, *t* lead downwardly at one side of the chamber to the bottom thereof on lines between the pairs of vertical reaches *l* of the conveyor and terminate in lateral outlet openings *u*, *u*, Figure 2, from which conditioned gas is discharged transversely of the chamber between the pairs of vertical reaches *l* of the conveyor for the provision of general circulation of air in the chamber. The air issuing from outlet openings *u*, *u* will rotate in the chamber or travel in a circulatory path so that the tobacco will be surrounded by a sheath of conditioned gas. If desired, the ducts *t*, *t* may extend transversely along the bottom of the chamber between the pairs of vertical reaches *l* and discharge air through orifices *u'* spaced in line with the tobacco hand holding means *w*, *w* on bars *d*, *d* of the conveyor.

From the series of ducts *t*, *t* a series of horizontal ducts *v*, *v* extend transversely of the chamber beneath the sprockets *e*, *e* on lines between the pairs of vertical reaches *l*. Upwardly extending nozzles *y*, *y*, spaced in alignment with the tobacco hand holding means *w*, *w* on cross bars *d*, *d* of the conveyor lead from the top of the ducts and are adapted to direct forceful jets of conditioned gas into hands of tobacco carried by the conveyor as the conveyor passes over the sprockets *e*, *e*.

A second series of horizontal ducts *z*, *z* leading from the main ducts extend transversely of the chamber between pairs of the sprockets *e*, *e* and adjacent the top thereof. The ducts *z*, *z* are provided with later nozzles **2**, **2** spaced in alignment with the tobacco hand holding means *w*, *w* on cross bars *d*, *d* of the conveyor and adapted to direct conditioned gas at an angle with respect to the butts of hands of tobacco carried by the carrier and to promote local circulation in the upper portion of the chamber. Suitably valved pipes **3**, **3**, terminating in spray nozzles and connected to a suitable source of water are let into the ducts *z*, *z* for the supply of additional moisture to air passing therethrough.

A series of horizontal ducts **4**, **4** arranged in vertical alignment and leading from the main duct *s*, extend transversely of the chamber and adjacent to the sprockets *k* at the rear of the chamber over which the conveyor passes into the horizontal return reach *o*. The ducts **4**, **4** are provided with nozzles **5**, **5** spaced in alignment with the tobacco hand holding means *w*, *w* on the cross bars *d*, *d* of the conveyor and at angles to the vertical such as to direct forceful jets of air into hands of tobacco carried by the conveyor as it passes over the sprockets *k*.

A horizontal duct **6** leading from the main duct *s* extends transversely over the return reach *o* of the conveyor. The duct **6** is provided with downwardly extending nozzles **7**, **7** spaced in alignment with the holding means *w*, *w* on the cross bars *d*, *d* of the conveyor and are adapted for the direction of forceful jets of air into hands of tobacco carried by the conveyor. A suitably valved pipe **8** provided with a spray nozzle **9** at its end and connected with a supply of water is let into the duct **6** for the supply of moisture to the conditioned gas passing therethrough.

The various ducts may be provided with dampers **11**, whereby the amount of air passing into the various ducts may be controlled or entirely shut off.

In the carrying out of the method in accordance with this invention with use of the apparatus described above, the fan in the humidifying apparatus will be started and air conditioned as required will be delivered into the main duct and discharged into the chamber through the various ducts described. The conveyor will be put in motion, in the direction of the arrows, and charged with bundles or hands of tobacco *x* by inserting the butt ends thereof beneath the rubber bands comprising the holding means *w*, *w* on bars *d*, *d*. The conveyor will be charged at the front end, the hands or bunches being secured to the bars *d*, *d* as they progressively pass down the front or first vertical reach of the conveyor. The hands will be initially secured to the bars *d*, *d* with leaves pendant, as in the position shown in Figure 3.

If the tobacco to be treated is in the dry state in which it is received by the fabricator of, for example, cigars and is to be conditioned for fabrication, the hands or bunches will remain on the conveyor, which will be driven slowly, for such considerable period as is necessary for the addition to the tobacco of sufficient moisture to bring it to the proper condition and consequently will make a number of complete circuits on the conveyor, including passage over the horizontal return reach thereof, or the conveyor being fully loaded with tobacco may remain still for a period and set into motion. On the other hand, if the tobacco is to be treated to condition it for fermentation, as for sorting or packing, by adjustment of its moisture content, either by moistening or drying, the amount of moisture necessary to be added or taken from the tobacco will be relatively small and conditioning can be effected in one passage of the tobacco at a slow conveyor speed through the vertical reaches of the conveyor. In such case the hands or bunches may be secured to the front or first vertical reach of the conveyor and removed from an intermediate reach or from the rear or last vertical reach of the conveyor.

In the travel of the conveyor through the pairs of vertical reaches *l* the leaves of the bunches or hands of tobacco will be, as it were, shingled with inversion of the hands by swinging through an arc of 180° in the passage of the conveyor about the sprockets *h* and *e*.

As the hands move downwardly and upwardly in the vertical reaches, the tobacco in a quiescent state will be subjected to conditioned air in general rotary circulation in the chamber by virtue

of the air delivered into the chambers from the ducts *t, t,* through outlets *u*. Conditioned air is delivered through outlets *u, u* with force so that it travels across the chamber, upwardly, back and down, as shown by the arrows **20**, Figure 3, and surrounds the tobacco on the conveyor with a sheath of air. As the conveyor passes around the sprockets *e* and *h* and the hands are passed through an arc of 180°, and thus inverted, they will be in effect manipulated and opened up with separation of the leaves. Such opening up will occur immediately where, as charged on the conveyor, the tobacco is substantialy moist and the leaves free. Where the tobacco as charged on the conveyor is dry and the leaves of the hands are adhered, the opening of the hands will occur beginning generally with the outer leaves as the leaves absorb more or less moisture.

In the movement of the hands through a conditioned atmosphere in a shingled relationship, that is to say, one hand resting in part upon another and having another resting in part upon it, humid air which has entered the hands when they are separated, is, as it were, entrapped and an opportunity is given for the leaves to absorb the moisture therefrom substantially uniformly. Even where the hands are not subjected to periodic separation between shingled relationship benefit is obtained from shingled relationship, inasmuch as the leaves of the hands are kept in contact as they become moistened with the result that the moisture tends to become more rapidly and more uniformly transmitted from the inner to the outer leaves of the hands.

The periodic flexing of the bunches or hands by the passage of the conveyor about the sprockets *e* and *h* and resulting in opening up of the hands enables the circulation of humidified air within the hands to the end that the conditioning of all the leaves of the hands is uniform.

In the passage of the conveyor around the sprockets *e*, conditioned air in forceful jets from the nozzles *y, y* on ducts *v, v* passes directly into the hands as they are inverted by swinging. The discharge ends of the nozzles will be adjacent to the tips of the leaves of the hands as the hands pass the nozzles. Desirably the nozzles will discharge within, for example, 2 to 18 inches, preferably about 9 inches, from the tips of the leaves. The jets of air from nozzles *y, y* not only penetrate into the hands as they are opened in their swinging movement, but as to manipulate the leaves as the hands pass to and from the vertical, thus insuring full opening of the hands, penetration of the air and uniform conditioning. The movement of the tobacco on the conveyor and the jets from nozzles *y, y*, with reference to the generally circulated air cause the formation of eddying currents, as shown by the arrows **21**, Figure 4, which penetrate into the hands and between the leaves thereof. Induced circulation is set adjacent the discharges of the various nozzles and outlet *u* as shown by arrows **22**.

Where the ducts *t, t* are extended transversely of the chambers and provided with nozzles *u', u'* extending toward the conveyor, the leaves of the hands are manipulated by the jets of air issuing from nozzles *u', u'* and the jets penetrate the hands as they swing as in the treatment of the hands as they swing in the passage of the conveyor around the sprockets *e*.

Again, as the conveyor passes around the sprockets *e* the butt ends of the hands or bunches are subjected to the local circulation of conditioned air created by the discharge of air from the ducts *z* through the nozzles **2**, which air may, from the addition of water into the ducts through pipes *z* carry water in a finely divided form, which will be deposited on and absorbed by the butts or stems, which normally will have a greater capacity for moisture than the leaves.

As has been indicated, if the tobacco to be conditioned either by drying or moistening requires the addition or removal of only a relatively small amount of moisture and the bunches are loose and open when applied to the conveyor, the conveyor can be operated at a speed with respect to the combined length of the vertical reaches such that the desire conditioning can be effected in one passage of the vertical reaches, since due to the manipulation of the leaves by the forceful air jets and the penetration thereof into the hands, the conditioning will proceed relatively rapidly and with uniformity.

Where the conditioning of the tobacco requires that it remain on the conveyor for a plurality of circuits, the bunches or hands will be subjected to forceful jets of conditioned air delivered from ducts **4**, through nozzles **5** as the conveyor traveling upwardly in the rear or last vertical reach approaches and passes around sprockets *k* by which it is led into the horizontal return reach *o*.

The jets of conditioned air issuing from nozzles **5** will manipulate the leaves and when they are sufficiently moist to be pliable will open up or divide the leaves of the hands and cause them to lie in opened position as the conveyor enters the horizontal return reach *o*, as shown, for example, in Figure 4.

As the conveyor travels through the horizontal reach *o*, conditioned air from duct **6**, which may contain water in finely divided state, admitted to the duct from pipe **8**, is directed into the open hands through nozzles **7**, and the butts of the hands are subjected to the local circulation set up by the discharge of conditioned air, which may contain more moisture due to the admission of water into ducts *z* through nozzles **2**.

As will be appreciated, the conditioned air discharged through the duct system for general circulation and manipulation and penetration of the bunches or hands is recirculated with adjustment of its condition by passage through the humidifying apparatus, which, dependent upon the nature of the treatment to be given to the tobacco, will act to cool or heat, humidify or dehumidify the air to the temperature and relative humidity suitable to the particular treatment. If desired, the discharge of air and admission of fresh air into chamber *a*, by manipulation of dampers *j* controlling openings *i*, may be utilized in connection with the control of conditions in the chamber *a*. Likewise, any other arrangement for the control of temperature and relative humidity in chamber *a* may be utilized.

In the conditioning of tobacco by the method described above, in various cases such, for example, as where tobacco is to be moistened, the air introduced to the tobacco, through jets *y*, **5** and **2** will desirably be colder than the air introduced into the chamber for general circulation, to the end that the heat of absorption of moisture by the tobacco and which will tend to heat the air in general circulation may be reduced by the direct application of cool air to the tobacco. The air introduced through jets *y*, **5** and **2** may be rendered cool in comparison with

the air in the duct system generally by the admission to the ducts from which the jets discharge off cool air, as by sprays, as shown in connection with the ducts *z*, or by the use of a cooling device in the ducts variously. Again, when drying tobacco, air discharged from the jets may be warmer than the air in general circulation in the chamber. Warmer air may be provided by the admission of warm water into the ducts, as through sprays, or by the use of a heating device, or of steam in the ducts variously. Likewise, as has been indicated, gas introduced through the jets may have a higher or lower moisture content than that in general circulation, the moisture content being controlled through the use of water jets or suitable heating or cooling devices or steam. Thus, it will be observed that the tobacco at various points may be subjected to gas conditioned differently, as to temperature and/or humidity from that in general circulation.

Where dry tobacco is to be moistened, it will in many cases be desirable to subject the tobacco on the conveyor to the conditioned gas in general circulation before starting the conveyor, so that it will be partially moistened prior to its manipulation resultant from movement of the conveyor; and again dry tobacco may desirably be preliminarily treated with the conveyor in motion, but with all or more or fewer of the jets, as, for example, those adjacent the front end of the conveyor, shut off.

As will be appreciated, numerous and various modifications in detail may be made in the apparatus and in the modus operandi above described without departing from the scope of this invention.

As will be appreciated, the conditioning of the gas for delivery to chamber *a* will be automatically controlled by any suitable device responsive to the condition of the gas in the chamber and capable of manipulating the various heating, cooling and humidifying device.

What I claim and desire to protect by Letters Patent is:

1. The method of conditioning tobacco which includes subjecting hands of tobacco secured at their butt ends only to a conditioned atmosphere in a chamber, while moving the tobacco alternately in a path at an angle to the horizontal with the hands in a shingled relationship and in an arcuate path in which the hands are separated.

2. The method of conditioning tobacco which includes subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber, while moving the tobacco alternately in a substantially vertical path with the hands in a shingled relationship and in an arcuate path in which the hands are separated.

3. The method of conditioning tobacco which includes subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber, while moving the tobacco alternately in a substantially vertical path with the hands in a shingled relationship and in an arcuate path in which the hands are separated and causing other conditioned gas to penetrate into the hands at a point in the movement of the tobacco in an arcuate path when the hands are separated.

4. The method of conditioning tobacco which includes subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber, while moving the tobacco through a substantially vertical path with the hands in a shingled relationship, in an arcuate path in which the hands are separated, and a reverse substantially vertical path with the hands in a reversed shingled relationship.

5. The method of conditioning tobacco which includes subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber while moving the tobacco alternately in a path at an angle to the horizontal with the hands in a shingled relationship and in an arcuate path in which the hands are separated, causing conditioned gas to circulate generally about the moving tobacco and directing forceful jets of conditioned gas into the hand respectively when separated in the movement of the tobacco in an arcuate path.

6. The method of conditioning tobacco which includes subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber while moving the tobacco alternately in various paths at an angle to the horizontal with the hands in a shingled relationship and in an arcuate path in which the hands are separated, causing conditioned gas to circulate generally about the moving tobacco and directing forceful jets of conditioned gas into the hands from adjacent the tips of the leaves and at the butt ends thereof in the movement of the tobacco in an arcuate path when the hands are separated.

7. The method of conditioning tobacco which includes subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber while moving the tobacco alternately in a path at an angle to the horizontal with the hands in a shingled relationship and in an arcuate path in which the hands are separated, causing conditioned gas to circulate generally about the moving tobacco and directing conditioned gas carrying water in finely divided form at the butt ends thereof in the movement of the tobacco in an arcuate path when the hands are separated.

8. The method of conditioning tobacco which includes subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber while moving the hands of tobacco in a shingled relationship and periodically inverting the hands to reverse the shingled relationship.

9. The method of conditioning tobacco which involves subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber while moving the hands of tobacco in a shingled relationship, periodically inverting the hands to reverse the shingled relationship and directing forceful jets of conditioned gas into the hand and at the butts thereof in the course of their inversion.

10. The method of conditioning tobacco which involves subjecting hands of tobacco secured at their butt ends only to a conditioned gas in a chamber while moving the hands of tobacco in a shingled relationship, periodically inverting the hands to reverse the shingled relationship, directing forceful jets of conditioned gas into the hands in the course of their inversion and circulating conditioned gas about the hands in shingled relationship without disturbance of the hands.

11. The method of conditioning tobacco which includes subjecting partially dry hands of tobacco initially to a moist atmosphere without movement of the hands until the tobacco has absorbed a substantial amount of moisture, then moving the hands through a moist atmosphere and in their movement periodically passing them about a center whereby the are inverted.

12. The method of conditioning tobacco which includes subjecting partially dry hands of tobacco

initially to a moist atmosphere without movement of the hands until the tobacco has absorbed a substantial amount of moisture, then moving the hands through a moist atmosphere and periodically inverting them, and then while continuing the movement and periodic inversion of the hands periodically forcing moist jets of conditioned air into the hands.

13. The method of conditioning tobacco which includes moving hands of tobacco in a chamber alternately in a path at an angle to the horizontal with the hands in a shingled relationship and in an arcuate path in which the hands are separated, while maintaining a circulation of conditioned gas generally within the chamber and subjecting the tobacco to forceful jets of conditioned gas having a different condition from that initially possessed by the conditioned gas in general circulation while the hands are separated in traveling through the arcuate path.

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