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METHOD FOR TREATING TOBACCO

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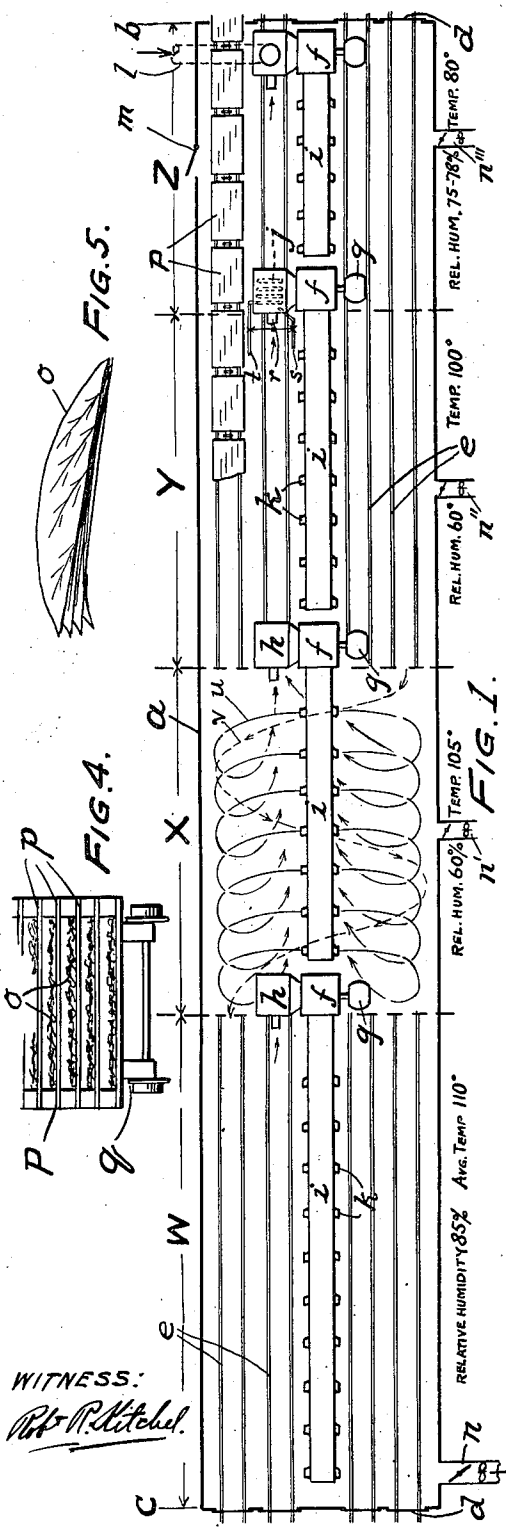


FIG. 5.

FIG. 4.

FIG. 1.

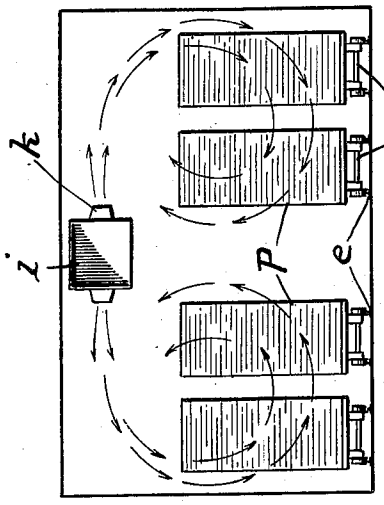


FIG. 3.

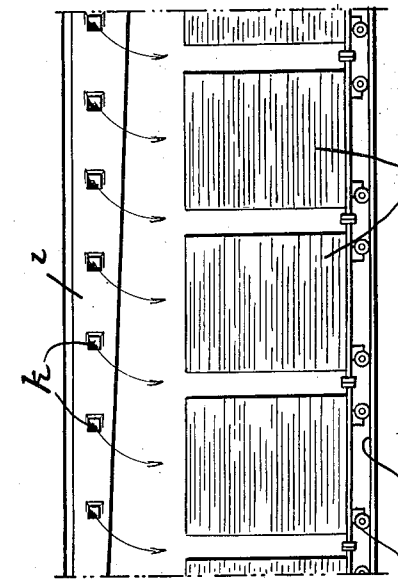


FIG. 2.

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2,105,848

METHOD FOR TREATING TOBACCO

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5 Claims. (Cl. 34—24)

This invention relates to a method and apparatus for treating tobacco and more particularly to a method for finally preparing tobacco for use in the manufacture of cigars.

As is well known, tobacco after harvesting is cured and packed in the form of bunches or hands in bales for shipment. When received by the fabricator the tobacco is dry and must be moistened to enable separation of the leaves forming the bunches or hands and to enable stripping or removal of the stems without injury to the leaves. Separation and stripping having been accomplished, it is necessary, as is well known, to reduce the moisture content of the tobacco prior to its fabrication, in order that the finished product, as a cigar, will have a proper and desired moisture content for use.

Heretofore, it has been customary to moisten tobacco in various ways in order to enable separation of the leaves and stripping, and then, after stripping, to effect reduction of the moisture content to a desired point for fabrication by subjecting the tobacco in pads comprising a plurality of leaves, to a dry, heated atmosphere for a requisite time.

The procedure for reducing the moisture content of tobacco prior to fabrication as heretofore known has been found unsatisfactory from the standpoint of the ultimate product in that the leaves are non-uniformly dried and the quality of the leaf is deleteriously affected. More particularly, the edges and exposed portions of the leaves are overdried and the tobacco as a whole rendered of a non-uniform moisture content, which renders it unsatisfactory for fabrication and productive of a non-uniform and unsatisfactory product from the standpoint of quality.

The disadvantages arising from the procedures heretofore followed in reducing the moisture content of tobacco prior to fabrication are, more particularly, disadvantageous in connection with the manufacture of cigars, which are required, for maximum quality, to have a uniform moisture content within relatively narrow limits.

Now in accordance with this invention a method for treating tobacco, and more particularly for reducing the moisture content thereof prior to fabrication, by which a uniform removal of moisture, or drying, to any desired degree is effected and, at the same time, by which the smoking quality of the tobacco is improved through the removal of constituents tending to give the tobacco a bitter taste on smoking and which may not have been removed to a desired degree in the original curing of the tobacco.

The method in accordance with this invention involves from the broad standpoint reduction in the moisture content of tobacco by subjecting the tobacco to a humid, heated atmosphere, and, more particularly, by passing the tobacco through a plurality of zones in which respectively the humidity and temperature varies.

More particularly, according to the method of this invention, the tobacco is passed first through a zone of relatively high temperature and high humidity, in which only a restricted evaporation of moisture occurs and in which the vapor pressure of the moisture in the tobacco is raised, and then through a plurality of zones at lowered humidity and temperature and in which the vapor pressure of the air is low, to uniformly bring the moisture content of the tobacco down to the desired point.

Still more particularly, the tobacco will be passed in counterflow with air, the air being recirculated in the several zones. In other words, the air used for treatment of the tobacco in the final zone will pass progressively from zone to zone, with recirculation in each zone until finally it will be used for treatment of the tobacco in the initial zone.

The apparatus embodying this invention will comprise a chamber or tunnel, of relatively great length in comparison to its width, having an inlet for air at one end and a discharge at its other end and provided with means whereby air introduced at an end of the chamber will be recirculated in zones and, at the same time, have a longitudinal flow. The chamber will be adapted for the reception and passage of means carrying tobacco to be treated. More specific features of the method and apparatus will appear from the following more detailed description thereof.

Having now indicated in a general way the nature and purpose of this invention, I will proceed to a more detailed description of a preferred form of apparatus for carrying out of the method, with reference to the following drawing, in which:

Figure 1 is a diagrammatic plan view of the apparatus in accordance with this invention.

Figure 2 is a longitudinal detail view of the subject of Figure 1.

Figure 3 is a transverse detail view of the subject of Figure 1.

Figure 4 is a detail view of support for tobacco.

Figure 5 is a perspective view of a pad of stripped tobacco.

In the drawing *a* indicates an elongated chamber or tunnel, the ends of which are respectively designated *b* and *c*.

The ends of the tunnel are provided with doorways, adapted to be closed by doors *d*, through which lines of track *e* extend longitudinally of the tunnel. As shown the tunnel contains four lines of track arranged in pairs on opposite sides of the central portion of the tunnel.

Air introduced at the end *b* of the tunnel is passed longitudinally through the tunnel and discharged at the end *c*, and, at the same time, recircuited in a plurality of zones formed longitudinally of the tunnel by means of a plurality of encased fans *f*, driven by any suitable means, as motors *g*, receiving air from inlet chambers *h*, equipped with heating means *j* connected with the fan casings and provided with inlets opening into the tunnel and discharging through conduits *i* extending longitudinally of the tunnel, centrally thereof, toward the end *c* and provided with lateral outlets *k*. The heating means *j* are adapted to be controlled by humidostat *r* positioned adjacent the inlets to chambers *h*, which responsive to the humidity in the several chambers, will operate to vary the supply of steam through conduits *t*, or to vary electric current supplied if the heating elements be electrical. Steam jets *s* for the admission of steam to the chambers *h* for increasing relative humidity in the chambers are also provided and adapted to be controlled by the humidostats *r*.

The fans *f*, inlet chambers *h* and conduits *i* are arranged progressively in the upper portion of the tunnel from the end *b* adjacent to which the first fan is positioned and are of similar construction except that the inlet chamber of the first fan adjacent to the end *b* of the tunnel is connected to a conduit *l* leading from an outside supply of conditioned air and through which conditioned air is supplied to the tunnel.

The discharge conduits *i* connected with the several encased fans *f*, while of the same structure, are of varying length, depending upon the extent of the respective zones to be formed in the chamber.

Adjacent to the end *b* of the tunnel a relief damper *m*, adapted to open automatically on the development of a predetermined pressure in the tunnel adjacent the end *b*, is provided; while a damper *n*, through which air is discharged from the tunnel, is provided adjacent to the end *c* of the tunnel. The operation of the damper *n* is arranged to be controlled automatically by mechanism (not shown) which is responsive to the relative humidity of the air in the tunnel adjacent to the end *c*.

Dampers *n'*, *n''* and *n'''*, adapted to be controlled automatically, are arranged for the discharge of air from the several chambers X, Y and Z for control of the condition of relative humidity in the several chambers.

Tobacco to be treated is introduced into the tunnel at the end *c* and discharged at the end *b*. The tobacco is thus passed through the tunnel in counterflow with respect to the flow of air, which, as has been indicated, enters the tunnel at the end *b*, through conduit *l*, and is discharged from the tunnel at end *c* through damper *n*.

The tobacco to be treated is passed through the tunnel in the form of shingled leaves or pads *o*, comprising a plurality of stripped leaves in superimposed relation, supported on trays *p*, in turn supported in stacks P on trucks *q*, which travel on the lines of track *e*. In practice the tunnel will be filled with lines of trucks arranged end to end, as shown in Figure 2, and the trucks and supported tobacco will be removed progressively from the end *b* of the tunnel by intermittent movement of the lines as a unit through the operation of any suitable mechanism. As trucks are removed from the tunnel at the end *b*, by a movement of the lines, respectively, as units corresponding space will be left for the entry of trucks into the tunnel at the end *c*.

The passage of air longitudinally of the tunnel and its recirculation in zones progressively will be accomplished by the operation of the several fans *f* and the longitudinal extent of the several zones of recirculation will be determined by the lengths of the several discharge conduits *i*.

Thus, the fan *f* adjacent the end *b* of the tunnel, will receive air through conduit *l* and will discharge it into the tunnel laterally through its conduit *i*, which has a limited extension longitudinally of the tunnel. At the same time air will be drawn from the tunnel into the inlet chamber *h* of the fan. Hence, a high pressure area will be built up in the zone of discharge from the conduit *i* and a low pressure area will be formed adjacent to the inlet from the tunnel to chamber *h*. The air discharged laterally from conduit *i* will have a rotary motion with respect to the tunnel and likewise a tendency to flow toward the low pressure area adjacent the inlet to chamber *h*, into which some of the air will flow and be recirculated by the fan.

At the same time, with all the several fans in operation, alternate low and high pressure area will be formed progressively in the tunnel toward the end *c*, adjacent to the inlets of the respective chambers *h*, and by the discharge from the several conduits *i*. As a result some of the air will flow from the high pressure area formed by the discharge from the first conduit *i* into the low pressure area adjacent the inlet to the chamber *h* of the second fan, and into the chamber and second fan for discharge through the second conduit *i* and recirculation in a second zone as described. The several successive fans all operate in a similar manner with the formation of zones in which air is recirculated by the several fans with a rotary motion with, at the same time, formation of a spiral flow of air longitudinally of the chamber from the end *b* to the end *c*.

In the apparatus embodying this invention, as shown in the accompanying drawing, and for practical adaptation of the method in accordance with this invention for the preparation of, for example, fillers or binders for cigars, the elongated chamber or tunnel is divided into four zones designated, from the end *c* of the tunnel, as W, X, Y and Z.

The tobacco to be treated and containing, for example, as much as 35% of moisture, is entered at the end *c* of the tunnel into zone W, in which a relatively high temperature and high relative humidity is maintained. For example, the temperature in the zone W may be about 110° F., or within the range 100° F.–110° F. and the relative humidity may be, for example, about 85% or within about the range 70%–85%.

In the zone W very little moisture will be removed from the tobacco due to the high relative humidity of the air in that zone. The high temperature in the zone W will, however, effect a heating of the tobacco and cause the evolution of ammonia therein, which will dissolve and carry out of the tobacco any nicotine, oils and tars remaining therein, to a desired extent. In the zone W, while the evaporation of moisture from the tobacco will be restricted, a high vapor pressure within the tobacco leaves will be established.

The air circulated in zone W by the fan *f* controlling circulation in that zone, will be drawn, as described above, from the adjacent zone X. The air withdrawn from zone X for circulation in zone W, will have a high relative humidity due to the absorption of moisture from the tobacco in zone X and the desired temperature of the air circulated in zone W and consequently desired relative humidity will be obtained through a heating of the air drawn from zone X prior to circulation in zone W, to a suitable temperature as determined by the set of the humidostat *r*, by the heating means *j* in the inlet chamber *h* of the fan *f* controlling the circulation in zone W.

The tobacco having been subjected to treatment in zone W, the treatment involving essentially a heating up of the tobacco resulting in evolution of ammonia and generation of high vapor pressure in the leaf, will pass to the adjacent zone X, in which a lower temperature and lower relative humidity than prevails in zone W will be maintained. By way of example, the temperature in zone X may be about 105° F., or within about the range 95° F.–105° F. and the relative humidity will be say about 60%.

In the zone X the vapor pressure of the air will be relatively low and evaporation of moisture from tobacco will occur.

From the zone X the tobacco will pass to the adjacent zone Y, in which the temperature will be somewhat lower than in zone X, and in which the relative humidity may be substantially the same as in zone X. By way of example, the temperature of the air in zone Y may be about 100° F., or within about the range 80° F.–105° F. In the zone Y evaporation of moisture from the tobacco will occur. The rate of evaporation will be controlled automatically by the automatic control of the relative humidity in the zones through control of the heating means *j* or of the steam jets *t* by the humidostats *r*, and, indeed, evaporation may be stopped if the tobacco is permitted to remain overlong in the zones.

In the zones X and Y the moisture content of the tobacco will be reduced to and may be held at about the desired moisture content, which, by way of example, may be a moisture content of about 17%–18%, through control of the heating means by the humidostats *r*.

On leaving the zone Y the tobacco will pass into the zone Z, in which a relatively low temperature compared to that in the zones X and Y will be maintained and in which a relative humidity substantially higher than that in zones X and Y will be maintained. In the zone Z, as in the zone W, evaporation of moisture from the tobacco will be restricted. In the zone Z the tobacco will be cooled to a desired temperature and will be brought to a uniform moisture content.

In the zone Z the temperature will be within about the relatively narrow range 75° F.–85° F. and the relative humidity will be about 80%.

In the zone Z the tobacco will, as has been indicated, be brought to a uniform desired moisture content. Thus, the conditions in zone Z will be such that if the tobacco passing into zone Z from zone Y contains some excess moisture over that desired, excess will be evaporated in zone Z. Again, if the tobacco passing into zone Z have a moisture content somewhat below that desired, moisture will be added in zone Z. As will be appreciated, some parts of the tobacco entering zone Z may be deficient in moisture, while some parts may contain some excess moisture. In zone Z the tobacco will all be brought to a substantially uniform moisture content.

As will be appreciated, due to the flow of air longitudinally of the chamber or tunnel from the end *b* to the end *c*, the air, in its passage through the several zones to the zone W, will pick up moisture. The desired relative humidity in the several zones including the zone W, will be obtained by control of the temperature by the heating means *j* associated with the several fans *f* controlling the circulation in the several zones. The air introduced into the zone Z from conditioning means outside of the chamber or tunnel, will be initially at substantially the humidity and temperature desired for the zone Z and since comparatively little evaporation of moisture will take place in the zone Z, the conditions desired therein will readily be maintained through maintenance of the desired temperature and/or humidity by the heating means, which may include a moistening device, as steam jets *s*, associated with the fan controlling circulation in zone Z and under the control of humidostats *r*. It will be appreciated that such evaporation of moisture from tobacco as occurs in zone Z will tend to cool the air circulated therein and the temperature will be maintained by the heating means.

As the air passes through zone Z to zone Y and is circulated therein, its temperature will be raised by the heating means associated with the fan controlling the circulation in zone Y and consequently the relative humidity will be lowered, permitting evaporation of moisture from the tobacco.

As air passes from zone Y to zone X and is circulated in zone X, its relative humidity will remain substantially the same as that obtaining in zone Y by virtue of the fact that the temperature of the air in zone X is raised by the heating means associated with the fan, which controls circulation in zone X, to a temperature above that obtaining in zone Y.

The air circulated in zone X absorbs a further quantity of moisture over that absorbed in zone Y, due to even greater evaporation of moisture from the tobacco than occurs in zone Y. As a consequence, the air passing from zone X into zone W is of a relatively high humidity and the increase in temperature of the air in zone W is controlled so that the desired high relative humidity for restricted evaporation of moisture from the tobacco in zone W is obtained and, at the same time, so as to obtain the necessary desired heating of the tobacco.

From the above description, it will now be apparent that in accordance with the method embodying this invention tobacco is, as it were, counterflowed with air through a plurality of zones formed by local circulation of air traveling generally in a direction opposite to that in which the tobacco travels and that the conditions in the several zones are such that in the first zone the tobacco is heated with evolution of ammonia and solution and carrying off of nicotine oils, etc. and the vapor pressure in the leaves is raised and evaporation of moisture from the tobacco is restricted, while in the last zone the moisture content of the tobacco is brought to uniformity and in intermediate zones the evaporation of moisture from the tobacco to about a desired content is effected.

As will be apparent, conditioned air is supplied to the final zone and passes from zone to zone, respectively, to the zone into which the tobacco is initially entered so that the air used for ini-

tial treatment of the tobacco is the same air as has been used for subsequent treatment, including evaporation of moisture, and effecting uniformity of moisture content. Thus, the air used to initially treat the tobacco under conditions of restricted evaporation is charged with the moisture evaporated from the tobacco in subsequent treating zones. The relative humidity of the air in the several zones is regulated by regulation of the temperature of the air, it being noted that the temperature decreases in the zones progressively from the initial zone to the final zone, or conversely, increases from the final zone to the initial zone. The relative humidity is lower in the intermediate zones, in which evaporation takes place, than in the initial zone and rises again in the final zone, in which, as in the initial zone, evaporation is restricted. The high relative humidity condition obtaining in the initial zone is obtained in comparison with that obtaining in the final and intermediate zones by virtue of the absorption of moisture evaporated from the tobacco in the intermediate zones, in which, as has been indicated, the moisture content of the tobacco is reduced to about that desired.

In carrying out the method in accordance with this invention using the apparatus in accordance therewith, as has been indicated, tobacco will be initially entered into the zone W in the form of packs *e* comprising a plurality of superimposed leaves positioned on racks *p*, carried by trucks *q*. The trucks carrying the tobacco will be entered into zone W on the tracks *e* through doors *d* in the end *c* of the elongated chamber or tunnel. The tobacco will be permitted to remain in the zone W for the desired length of time and will then be moved successively into the zones X, Y and Z, in each of which it will be permitted to remain for a sufficient length of time to accomplish the purpose of evaporation and regulation to a uniform moisture content. As will be obvious, the lines of track in the chamber or tunnel will ultimately be filled with trucks carrying tobacco.

As the tobacco carried on the trucks adjacent to the doors *d* at the end *b* of the tunnel is in proper condition, from the standpoint of uniform moisture content, the trucks adjacent the end *b* will be removed by hand, from one or all of the lines of track. Then, by the operation of any suitable mechanism, the line of trucks on the track or tracks from which a truck has been removed will be advanced and a truck or trucks will be entered by hand into the tunnel at the end *c* on the line or lines of tracks from which a truck or trucks has been removed at the end *b* of the tunnel.

Any given truckload of tobacco will be permitted to remain in the tunnel for such time as is necessary to bring it to a uniform desired moisture content. The exact time of treatment will depend upon various factors, as, for example, particular temperature and humidity, length of the tunnel as a whole, length of the several zones, respectively, and the like. It will be understood, however, that while for a given length of tunnel and given conditions of humidity and temperature in the several zones a minimum time of treatment will be required, depending upon the moisture content of the tobacco when introduced into the tunnel and desired moisture content to be obtained, it will be understood that tobacco may remain in the chamber or tunnel for any time longer than the minimum required for obtaining the desired uniform moisture content, since conditions in the final zone Z will be such as not only to bring the tobacco to a desired uniform moisture content, but to hold it at desired moisture content, it being noted that in the zone Z the conditions will be such that moisture may be evaporated from or absorbed by the tobacco, depending upon the moisture content of the tobacco when it enters the zone Z with respect to the desired moisture content.

By way of illustration of practical apparatus for the carrying out of the method in accordance with this invention, for example, the chamber or tunnel may have a total length of 168 feet. Zone W may have a length of 60 feet, the zones X and Y a length of 40 feet each and the zone Z a length of 28 feet. With an apparatus of such dimensions and assuming that tobacco is entered into the chamber or tunnel with a moisture content of about 35% and that it is desired to reduce the moisture content to about 17% or 18%, and assuming a temperature in zone W of 110° F. and a relative humidity of 85%, a temperature in zone X of 105° F. and a relative humidity of 60%, a temperature of 100° F. in zone Y and a relative humidity of 60% and a temperature of 75° F.–78° F. in zone Z and a relative humidity of 80%, the treating time in total will be about 24 hours. During the treating period of about 24 hours the tobacco will remain in zone W for about 8 hours, in zone X for about 6 hours, in zone Y for about 6 hours and may be removed from zone Z after about 4 hours therein.

As noted, it will be indicated that the tobacco may remain in the zones for a longer period than 24 hours, since the desired uniform minimum moisture content will be obtained and will be maintained in the zone X even though the tobacco be desired to remain therein longer than such time as may be necessary to maintain the desired uniform moisture content.

As will be appreciated, in the operation of the apparatus there will be a tendency for pressure to develop in the zone Z. The development of any material pressure will be prevented by virtue of the provision of damper *m* in the wall of the chamber or tunnel, which, as has been described, is arranged to open under pressure and will relieve any excess pressure which may develop. As has been indicated, discharge of air from the chamber or tunnel will be effected through the discharge *n* provided in the wall of the tunnel adjacent the end *c* thereof in the zone W. Discharge from the tunnel will be controlled by means of any suitable form of valve or damper controlling the discharge *n* and which will desirably be automatic in its operation and may, for example, be controlled by any suitable apparatus responsive to the relative humidity in the zone W.

It will also be appreciated that through control of the humidostats of the heating means *j* and/or of the steam jets *s* associated with the air circulating system in each of the zones, and/or through control of the dampers *n*, *n'*, *n''* and *n'''* in each of the zones the proper conditions of relative humidity for desired evaporation of moisture from the tobacco will be readily automatically maintained. At the same time, by virtue of the automatic control exercised by the humidostats *r*, if the tobacco is permitted to remain in any zone for a period such that it would tend to lose moisture beyond the amount desired to be lost, the relative humidity will be regulated to such as to negative evaporation.

It will be understood that it is not contemplated

that this invention, either from the standpoint of method or apparatus, shall be limited by the detailed description given herein for purposes of illustration and exemplification, it being understood that modification and variation in detail, such as temperatures, relative humidities, time of treatment, dimensions of the chamber, or tunnel, dimensions and number of zones, particular apparatus for effecting circulating of air, etc., may be made without departing from the invention.

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

1. The method of treating tobacco to prepare it for use in the manufacture of cigars which comprises subjecting tobacco in a moist state to an atmosphere at a temperature within about the range 100–110° F. and having a relative humidity within about the range 70–85% and then subjecting the tobacco to an atmosphere at a lower temperature within about the range 95–105° F. and having a relative humidity of about 60%.

2. The method of treating tobacco to prepare it for use in the manufacture of cigars which comprises subjecting tobacco in a moist state to an atmosphere at a temperature within about the range 100–110° F. and having a relative humidity within about the range 70–85%, then subjecting the tobacco to an atmosphere at a lower temperature within about the range 95–105° F. and having a relative humidity of about 60% and finally subjecting the tobacco to an atmosphere at a temperature within about the range 75–80° F. and having a relative humidity of about 80%.

3. The method of treating tobacco which comprises first subjecting tobacco while in a moist state and at room temperature to a preliminary treatment in an atmosphere at a temperature such as to heat the tobacco and cause evolution of ammonia therein and having a relative humidity below 100% and such as to prevent deposition of moisture on the tobacco and minimize the evaporation of moisture from the tobacco and then subjecting the tobacco to an atmosphere at a temperature and having a relative humidity such as to promote the evaporation of moisture from the tobacco and while the tobacco retains a substantial amount of moisture subjecting the tobacco to an atmosphere at a temperature and having a relative humidity such as to regulate the moisture content of the tobacco to a predetermined amount of moisture.

4. The method of treating tobacco which comprises first subjecting tobacco while in a moist state and at room temperature to a preliminary treatment in an atmosphere at a temperature such as to heat the tobacco and cause evolution of ammonia therein and having a relative humidity below 100% and such as to prevent deposition of moisture on the tobacco and minimize the evaporation of moisture from the tobacco and then subjecting the tobacco to an atmosphere at a temperature and having a relative humidity such as to promote the evaporation of moisture from the tobacco and finally subjecting the tobacco to an atmosphere at a temperature and having a relative humidity below 100% and such as to minimize the evaporation of moisture from the tobacco and such as to bring the tobacco to a substantially uniform moisture content.

5. The method of treating tobacco which comprises moving tobacco carrying moisture through a plurality of successive zones in an unrestricted pass and including a preliminary treating zone, a final zone and an intermediate zone or zones, while counterflowing air through the zones successively in a direction opposite to the direction of movement of the tobacco, the flow of air being spiral and the air being recirculated locally in the zones respectively, the tobacco being moist and at room temperature on entry into the preliminary treating zone and the temperature of the air in the preliminary treating zone first entered by the tobacco being such as to heat the tobacco and cause the evolution of ammonia therein and the relative humidity of the air in side zone being below 100% and such as to prevent deposition of moisture on the tobacco and minimize the evaporation of moisture from tobacco, the air in the final zone entered by the tobacco being at a temperature lower than the air in the preceding zones and the relative humidity of the air in said final zone being such as to regulate the moisture content of the tobacco to a predetermined amount of moisture and the air in the intermediate zone or zones being at a temperature and having a relative humidity such as to promote the evaporation of moisture from the tobacco, the air recirculated in the zones respectively being, on entry into the zones respectively, automatically conditioned to the specified temperature and relative humidity for the zones respectively with respect to its temperature and relative humidity on leaving the next preceding zone.

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