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PROCESS FOR ARTIFICIALLY CURING GREEN TOBACCO.

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To all whom it may concern:

Be it known that I, ALFRED CHARLES BUENSOD, a citizen of the United States, residing in the city of New York, county of New York, and State of New York, have invented a certain new and useful Process for Artificially Curing Green Tobacco, of which the following is a full, clear, and exact description.

My process refers particularly to the curing of tobacco leaves which are used for cigar wrappers, but may be advantageously applied to any type of tobacco requiring similar treatment, and in general it is carried out in some suitable chamber in which conditioned air is caused to be artificially circulated around and between the tobacco leaves in such a schedule of proper temperatures and humidities as to effect in the speediest manner, the desired results of cell starvation, etiolation of green color, control of the brown coloration and the incidental oxidation while at the same time preserving the cell structures thereby developing the elasticity of the tobacco.

The methods now used are to suspend the harvested green leaves in a shed or barn and the leaves are hung so that the sticks or laths holding the tobacco are spaced a relatively wide distance apart for the free access of air to the leaves, but usually no space is allowed between the tiers of the tobacco, so that the tips of the upper tier touch the tier immediately under or nearly so. There is also a large space left open under the lowest tier of tobacco and the ground.

The barns are equipped with openings at the sides and usually at the top for the purpose of ventilation, which openings can be shut off as desired.

The atmospheric conditions in the enclosure are not very different from the conditions prevailing out-doors, and are dependent on the weather conditions prevailing. The tobacco is therefore subject to a varying condition of temperature and relative humidity.

If the weather conditions are suitable good cures of tobacco are secured, but in adverse weather or in improper manipulation of the ventilators by the operator, poor cures are very often obtained and result in serious loss to the grower. In specially adverse weather, it becomes necessary to use small open fires directly in the shed and under the tobacco to prevent a total loss of the tobacco, but these fires are generally not used except in emergency as their improper use would greatly injure the quality of the tobacco. A few growers have been known to use such small fires at the beginning of the cure to obtain a quicker "wilt" of the tobacco.

When fires are used very irregular temperatures are obtained in the barn, usually too high at the bottom tier due to the proximity of the fire and much lower at the tier near the roof, the average temperatures maintained being about 90° F.

The air movement in the barn is hardly perceptible, except when all ventilators are open and considerable wind velocity prevails outdoors.

After the tobacco is cured, favorable moist weather conditions must be awaited by the grower in order to allow the tobacco to absorb a sufficient content of water necessary for the proper fermentation which is carried on later in other suitable buildings. It is also necessary to have the increased moisture in the tobacco to allow of removal without breakage. This moisture content is not subject to control and, as a consequence, either excessive or inefficient fermentation frequently results, producing an inferior quality and color.

It is generally known that green tobacco leaves have from 80% to 85% of water when harvested—varying somewhat with the season and the conditions prevailing at harvest time.

While it is therefore true that great quantities of water are evaporated in the curing process, the evaporation alone does not constitute proper curing as this could be effected in shorter periods of time by either hot or cold dry air, and in hours, compared to present methods occupying weeks. The loss of water is rather incidental and natural to the leaf, as in any other vegetation, by reason of the starvation of the cells and their consequent death due to being deprived of their sources of food supply, water supply and sunlight.

While the cells remain alive during the period of gradual starvation, the essential physical and chemical changes necessary in developing the desired properties of the leaf take place. These changes comprise the consumption of the stored up food, the etiolation of the green color, and the development of elasticity, texture and aroma.

The green leaf is harvested with more or less surplus food stored in the cells, the amount depending on seasonal conditions of growth, health and maturity at the time of the harvest. This surplus food of starch and protein is utilized, or partly so, by the cells in respiration in normal curing unless adverse conditions of temperature, moisture, dryness, or protoplasmic poisions cause premature death.

In the stage of starvation and while the cells are alive, the etiolation of the green color of the leaves takes place in the absence of bright daylight, but this ceases upon the death of the cells.

At the death of the cells, the cell sap and the soluble substances released by the protoplasm including enzymes such as the oxidases intimately mix and give rise to the brown color of the tobacco. If, at the death of the cells, a superfluous amount of water is still contained in them, the release of this water causes a quicker and greater spreading of the sap thus resulting in a deeper oxidation which gives rise to darker brown colors than are desired, and in extreme cases would result in black tobacco and possibly a deterioration in the cell structure.

The loss of water during the life of the cells should be such as to create a minimum spreading of sap at the death of the cells, but I have found that such loss of water must not be so rapid as to cause premature death of the cells, as then all further changes of the stored up food and the etiolation of the chloropyl would cease. The premature killing of the cells by other means would have the same effect.

I have found, that for the production of desirable shades of brown in the leaves, it is essential that the moisture content of the laminæ be reduced to a minimum percentage consistent with the continuation of the life processes of the cells up to the point where the cells die of starvation, and at that time to have attained a maximum etiolation of the green chlorophyl. I have found this percentage preferably to be substantially between 65% and 70%.

When the brown color has been attained and all the parts of the laminæ have lost their contained water to between 15% and 20%, it may be said to be "cured", as the word is commonly known. But generally the stems and ribs of the leaf remain alive for much longer periods than the laminæ and it is necessary to continue the cure until these parts are also cured and their water content reduced to the same amount.

Then the moisture content of the leaves must be increased to between 20% and 25% in order to have sufficient water content in the leaves for their further treatment in the commonly known process of fermentation and to allow of removal without breakage from the curing chamber.

In some tobacco growing sections the plant grows very rapidly due to atmospheric conditions and the leaves as harvested are physiologically weakened due to the rapid development, and usually contain, under these conditions, a large percentage of water by weight and correspondingly less reserve food. When these leaves are hung up to cure, the weakest of the cell structures readily collapse, especially in a moist atmosphere and local areas of the laminæ die. These areas dry out green and remain so throughout the curing process so that further curing in such dead areas is stopped entirely. These areas or "spots" are lifeless and do not have any of the characteristic qualities of a properly cured leaf.

I have found that if the cells are subjected to a temperature above atmospheric and between 95° F. to 110° F., that the rate of respiration is increased sufficiently to prevent the breaking down or clogging of the cells due to excess water. I have also found that, at these temperatures, a relatively high humidity should be used to prevent extraction, to the point of collapse, of the water of the cells before the stored food is consumed by respiration.

I have also found that high temperatures induce a higher rate of an etiolation of the green chlorophyl so that when the brown coloration is effected in the later stages the resultant colors, obtained by the etiolation of the green and the casting in of the brown through oxidation, are light in caste.

I have also found that this range of temperatures creates a quicker condition of "wilt" in the leaves which promotes rapid and thorough curing without injury to the quality of the tobacco.

I have also found that, at the death of the cells when all the food has been consumed, the percentage of water in the leaves should be reduced to substantially 65% or 70% so that the spreading of the water and sap of the cells would not be so prolific as to cause browning of a dark shade and yet sufficient to prevent death of the cells by dehydration, in other words, substantially 50% of the total water to be removed during the process must be absorbed by the air before browning commences.

On this account, I have further found that it is necessary to have a lower humidity at the start of the process and increase the

same slightly and just prior to the death of the cells to retard the rate of evaporation and insure the death of the cells by starvation and not by dehydration.

The green leaves, as harvested in the fields, are suspended in any of the methods now employed, but where the individual leaves are plucked from the stalk, I prefer to have the same suspended on a plurality of nails or points projecting on two sides of a lath or stick. The sticks or laths with the suspended leaves, or stalks with leaves attached, are then hung in a substantially air-tight and lightproof chamber in which conditioned air currents are artificially circulated and caused to pass around and between the tobacco.

Any method of hanging suspended tobacco may be employed that will allow proper mechanical circulation to be used effectively, but I prefer the laths or sticks of tobacco hung closely packed in a series of horizontal rows, the horizontal spaces between the rows to be clear of tobacco to the extent of substantially one-fourth to one-third of the total area, and of having the artificially produced currents of air pass between the horizontal rows of tobacco.

The sticks of tobacco could be hung so that no space is allowed between the rows of tobacco, but then the sticks of tobacco would have to be hung a relatively wide distance apart to allow circulation of the air currents. This would greatly reduce the holding capacity of the chamber. Thus, I prefer using a horizontal or transverse flow of the currents of air through the spaces between the rows of tobacco.

In practice the following is substantially the process which I employ in the curing of tobacco. After the chamber has been loaded with the green leaves, the air is caused to circulate through the spaces between the layers of tobacco and is heated to a temperature between 95° F. and 110° F. by means of injected warm air. Substantially no outside air is admitted to the chamber, until the relative humidity is increased by evaporation substantially between 70% and 80%. During this period, the cells of the tobacco are heated to a temperature above that of the wet bulb and below that of the dry bulb temperature of the air. This condition is quickly reached and then the relative humidity is regulated by the admission of a sufficient volume of fresh air of lower moisture content and simultaneously a similar volume of moisture laden air is exhausted from the chamber in any suitable way.

Well known types of automatic regulating instruments suitably placed in the chamber are employed for controlling the temperature and relative humidity, a thermostat being used to control the source of heat and a hygrostat or wet bulb temperature regulator being used to control the volume of fresh air admitted to, and a similar volume of moisture laden air exhausted from the chamber.

At the same temperature, the humidity is maintained between 70% and 75% for substantially 24 hours including the heating up period and during the total period the tobacco is thoroughly wilted, a rapid evaporation of moisture from the tobacco takes place and the processes of respiration and etiolation in the living cells are going on.

The humidity is then gradually increased during the next 24 hours and maintained between 75% and 80% at the same temperature or at a temperature gradually decreasing with the increase of humidity, the decrease of temperature preferably not exceeding 3° to 5° F. The process of etiolation is now completed and in a portion of the leaves respiration is completed and the cells of the same die as starvation takes place. The increase in humidity causes a lower rate of evaporation from the leaves than previously prevailed and such that at the death of the cells the percentage of moisture in the laminæ is reduced to between 65% and 70%. The humidity is then maintained between 77% and 80% and the temperature remaining constant as last decreased for a period of 3 to 6 days or until all parts of the web of the leaves are cured and browned. The remainder of the leaves complete their period of starvation during the first 24 to 48 hours at this condition. Then the temperature is decreased to from 70° to 80° F., and the humidity decreased to between 70% and 75% until all the stems of the leaves are cured, and until the moisture content is reduced to from 15% to 20%. The relative humidity is then increased to 80% to 85%, at substantially the same temperature, by the artificial evaporation of moisture, (by any well known means) into the air admitted to the chamber by the conditioning apparatus in order to increase the moisture content of the tobacco until it contains a sufficient water content to permit proper fermentation and to allow its removal from the treating chamber without breakage.

I have found it is essential that the water content of the tobacco as prepared for the fermentation process must be controlled uniformly and exactly at a percentage of between 23% and 25% to enable the well known process of fermentation to take place properly. The regain of the moisture in the tobacco to these percentages corresponds to from 80% to 85% relative humidity of the air in contact with the tobacco. If the tobacco contains a greater water content than desired, a much too rapid fermentation takes place attended with serious injury to the tobacco in color and quality, while if the water

content is insufficient, the fermentation is retarded and beneficial changes are not completed and are even prevented. By controlling the relative humidity of the air at this part of the process, the water content is fixed at a definite point. Well known automatic regulating instruments are employed to control the air conditions, a thermostat controlling the source of heat and a hygrostat, or wet bulb temperature regulator, or a dew point regulator controlling the source of moisture.

I have found that some types of tobacco improve in the appearance of the colors, if in the period after the temperature is decreased to from 70° to 80° F., the humidity is alternately increased and decreased once every 24 hours to a minimum of 65% and a maximum of 85% at the same temperature and until all parts of the stems are cured.

I have also found that the colors are further improved and evened, if after the stems are cured at low temperature, the temperature be increased to substantially 120° F. and the humidity to from 80% to 85% for a period of 12 to 48 hours, then reducing the temperature to from 70° F. to 80° F. and at the same humidity removing the tobacco from the chamber.

In practice, I find that dry and wet bulb temperatures may be used for determining the condition of the air and also for controlling such condition. In the beginning of the process, the wet bulb temperature is rapidly increased to from 88° F. to 95° F. and at the same time the dry bulb temperature is increased to from 95° F. to 110° F., and such conditions are maintained for 24 hours. Then I gradually decrease the dry bulb temperature, maintaining the wet bulb temperature constant until starvation is completed and the moisture of the laminæ is reduced to from 65% to 70%, and at such time reducing the dry bulb temperature from 3° F. to 5° F. Then I maintain substantially the same dry and wet bulb temperatures until the laminæ of the leaves are browned and cured. It is to be noted that in this method and until the laminæ are cured, I maintain a constant wet bulb temperature and a decreasing dry bulb temperature. Then the dry and wet bulb temperatures are both reduced, the dry bulb to from 70° F. to 80° F. and the wet bulb from 6° F. to 8° F. lower, and such conditions are maintained until all the stems are cured, and the moisture content reduced to from 15% to 20%. Then the wet bulb temperature and the relative humidity are increased, at substantially the same dry bulb temperature, the increase in the wet bulb temperature being from 2° F. to 3° F. to increase the water content in the tobacco for proper fermentation and to allow removal of the tobacco from the chamber without breakage.

It will be noted that the wet bulb and dry bulb temperatures which I have above set forth are in excess of the natural dry and wet bulb temperatures which prevail in the localities where the curing of green tobacco takes place. It is impossible to attain the advantageous results secured by the practice of my process except when such conditions as I have described are artificially produced.

Having thus described my invention, what I claim is:

1. A process of the character described comprising the subjection of the tobacco cells to air curents forced through the rows of tobacco, such air having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% until substantially all of the food in the cells has been consumed.

2. A process of the character described comprising the subjection of the tobacco cells to forced air currents moving between the suspended leaves at substantially right angles to the rows of such leaves, such air having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% until substantially all of the food in the cells has been consumed.

3. A process of the character described comprising the subjection of the tobacco cells to moving recirculated air currents having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% until substantially all of the food in the cells has been consumed.

4. The herein described process comprising the subjection of the tobacco cells during a period of substantially twenty-four hours to air having a wet bulb temperature of from 88° F. to 95° F. and a dry bulb temperature of from 95° F. to 110° F., and then gradually decreasing the dry bulb temperature while maintaining the wet bulb temperature constant until starvation is completed and the moisture content of the laminæ is reduced to from 65% to 70%.

5. The herein described process comprising the subjection of the tobacco cells during a period of substantially twenty-four hours to air having a wet bulb temperature of from 88° F. to 95° F. and a dry bulb temperature of from 95° F. to 110° F., then gradually decreasing the dry bulb temperature while maintaining the wet bulb temperature constant until starvation is completed and the moisture content of the laminæ is reduced to from 65% to 70%, and then reducing the dry bulb temperature from 3° F. to 5° F. until the laminæ of the leaves are browned and cured.

6. The herein described process comprising the subjection of the tobacco cells during a period of substantially twenty-four hours to air having a wet bulb temperature of from 88° F. to 95° F. and a dry bulb tem-

perature of from 95° F. to 110° F., then gradually decreasing the dry bulb temperature for maintaining the wet bulb temperature constant until starvation is completed and the moisture content of the laminæ is reduced to from 65% to 70%, then reducing the dry bulb temperature from 3° F. to 5° F. until the laminæ of the leaves are browned and cured, and then reducing the dry bulb temperature to from 70° F. to 80° F. and the wet bulb temperature from 6° F. to 8° F. lower until all the stems are cured and the moisture content is reduced to from 15% to 20%.

7. The herein described process comprising the subjection of the tobacco cells during a period of substantially twenty-four hours to air having a wet bulb temperature of from 88° F. to 95° F. and a dry bulb temperature of from 95° F. to 110° F., then gradually decreasing the dry bulb temperature while maintaining the wet bulb temperature constant until starvation is completed and the moisture content of the laminæ is reduced to from 65% to 70%, then reducing the dry bulb temperature from 3° F. to 5° F. until the laminæ of the leaves are browned and cured, then reducing the dry bulb temperatures to from 70° F. to 80° F. and the wet bulb temperature from 6° F. to 8° F. lower until all the stems are cured and the moisture content is reduced to from 15% to 20%, and then increasing the wet bulb temperature from 2° F. to 3° F. while maintaining the dry bulb temperature so as to increase the water content in the tobacco for proper fermentation and to allow the removal of the tobacco without breakage.

8. A process of the character described, comprising the subjection of the tobacco cells to air having wet and dry bulb temperatures in excess of the natural dry and wet bulb temperatures for a period of substantially 24 hours, then gradually decreasing the dry bulb temperature, thus increasing the relative humidity of the air, for another period of substantially 24 hours, then maintaining constant such last mentioned dry and wet bulb temperatures until substantially all the food in the cells of the laminæ is consumed, and simultaneously subjecting the cells to a large volume of moving air currents having such dry and wet bulb temperatures, whereby the moisture content of the laminæ is reduced to a minimum without causing the death of the cells.

9. A process of the character described, comprising the subjection of the tobacco cells to air having a dry bulb temperature of from 95° F. to 110° F. and a wet bulb temerature of from 88° F. to 95° F. for a period of substantially 24 hours, then gradually decreasing the dry bulb temperature substantially 3° F. while maintaining the same wet bulb temperature, thus increasing the relative humidity of the air, for another period of substantially 24 hours, then maintaining constant such last mentioned dry and wet bulb temperatures until substantially all the food in the cells of the laminæ are consumed.

10. A process of the character described, comprising the subjection of the tobacco cells to air having wet and dry bulb temperatures in excess of the natural dry and wet bulb temperatures for a period of substantially 24 hours, then gradually decreasing the dry bulb temperature, thus increasing the relative humidity of the air, for another period of substantially 24 hours, then maintaining constant such last mentioned dry and wet bulb temperatures until substantially all the food in the cells of the laminæ is consumed, then, after the death of the cells, continuing such dry and wet bulb temperatures for a period of from 3 to 6 days until all the laminæ are browned.

11. A process of the character described, comprising the subjection of the tobacco cells to air having a dry bulb temperature of from 95° F. to 110° F., and a wet bulb temperature of from 88° F. to 95° F. for a period of substantially 24 hours, then gradually decreasing the dry bulb temperature substantially 3° F. while maintaining the same wet bulb temperature, thus increasing the relative humidity of the air, for another period of substantially 24 hours, then maintaining constant such last mentioned dry and wet bulb temperatures until substantially all the food in the cells of the laminæ is consumed, then, after the death of the cells, continuing such dry and wet bulb temperatures for a period of from 3 to 6 days until all the laminæ are browned.

12. A process of curing green tobacco, comprising the subjection of the tobacco cells to air having a dry bulb temperature of from 95° F. to 110° F. and a wet bulb temperature of from 88° F. to 95° F. for a period of substantially 24 hours, then gradually decreasing the dry bulb temperature substantially 3° F. while maintaining the same wet bulb temperature, thus increasing the relative humidity of the air, for another period of substantially 24 hours, then maintaining constant such last mentioned dry and wet bulb temperatures until substantially all the food in the cells of the laminæ is consumed, then reducing the dry bulb temperature to substantially the natural temperature, and simultaneously reducing the wet bulb temperature to from 6° F. to 8° F. lower than the dry bulb temperature until the tobacco stems are cured.

13. A process of curing green tobacco, comprising the subjection of the tobacco cells to air having a dry bulb temperature of from 95° F. to 110° F. and a wet bulb tem-

perature of from 88° F. to 95° F. for a period of substantially 24 hours, then gradually decreasing the dry bulb temperature substantially 3° F. while maintaining the same wet bulb temperature, thus increasing the relative humidity of the air, for another period of substantially 24 hours, then maintaining constant such last mentioned dry and wet bulb temperatures until substantially all the food in the cells of the laminæ is consumed, then reducing the dry bulb temperature to from 70° F. to 80° F. and simultaneously reducing the wet bulb temperature from 6° F. to 8° F. lower than the dry bulb temperature until the tobacco stems are cured.

14. A process of curing green tobacco, comprising the subjection of the tobacco cells to forced currents of air having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% for a period of substantially 24 hours, then, at the same temperature, or a temperature slightly lower, gradually increasing the relative humidity to from 75% to 80% during a further period of from 24 hours to 48 hours until the food in the cells of the laminæ is consumed, then maintaining the same temperature and relative humidity for from 3 to 6 days until all parts of the laminæ are browned, then reducing the temperature to from 70° F. to 80° F. and simultaneously reducing the humidity to from 70% to 75% until all parts of the stems are cured.

15. A process of curing green tobacco, comprising the subjection of the tobacco cells to forced currents of air having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% for a period of substantially 24 hours, then, at substantially the same temperature, gradually increasing the relative humidity to from 75% to 80% during a further period of from 24 hours to 48 hours until the food in the cells of the laminæ is consumed, then maintaining the same temperature and relative humidity for from 3 to 6 days until all parts of the laminæ are browned, then reducing the temperature to from 70° F. to 80° F. and simultaneously reducing the humidity to from 70% to 75% until all parts of the stems are cured, then, while maintaining the same temperature, increasing the relative humidity of the air to from 80% to 85% until the tobacco has absorbed sufficient water content to allow subsequent proper fermentation and removal of the tobacco from the treating chamber.

16. A process of curing green tobacco, comprising the subjection of the tobacco cells to forced currents of air having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% for a period of 24 hours, then, at substantially the same temperature, gradually increasing the relative humidity to from 75% to 80% during a further period of from 24 hours to 48 hours until the food in the cells of the laminæ is consumed, then maintaining the same temperature and relative humidity for from 3 days to 6 days until all parts of the laminæ are browned, then reducing the temperature to from 70° F. to 80° F. then, while maintaining substantially the same temperature, decreasing the relative humidity to substantially 65% and thereafter, during each period of substantially 24 hours, alternately increasing to substantially 85% and decreasing to substantially 65% such relative humidity until all parts of the stems are cured.

17. A process of curing green tobacco, comprising the subjection of the tobacco cells to forced currents of air having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% for a period of 24 hours, then, at substantially the same temperature, gradually increasing the relative humidity to from 75% to 80% during a further period of from 24 hours to 48 hours until all the food in the cells of the laminæ is consumed, then maintaining the same temperature and relative humidity for from 3 days to 6 days until all parts of the laminæ are browned, then reducing the temperature to from 70° F. to 80° F. then, while maintaining substantially the same temperature, decreasing the relative humidity to substantially 65% and thereafter, during each period of substantially 24 hours alternately increasing to substantially 85% and decreasing to substantially 65% such relative humidity until all parts of the stems are cured, then while maintaining substantially the same temperature, increasing the relative humidity of the air to from 80% to 85% until the tobacco has absorbed a sufficient water content to allow subsequent proper fermentation and removal of the tobacco from the treating chamber.

18. A process of curing green tobacco, comprising the subjection of the tobacco cells to forced currents of air having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% for a period of substantially 24 hours, then, at substantially the same temperature, gradually increasing the relative humidity to from 75% to 80% during a further period of substantially 24 hours to 48 hours until all the food in the cells of the laminæ is consumed, then maintaining the same temperature and relative humidity for from 3 days to 6 days until all parts of the laminæ are browned, then reducing the temperature to from 70° F. to 80° F. and simultaneously reducing the humidity to from 70% to 75% until all parts of the stems are cured, then increasing the temperature to substantially

120° F. and increasing the relative humidity to from 80% to 85% for a period of from 12 hours to 48 hours, whereby the coloring of the tobacco is improved.

19. A process of curing green tobacco, comprising the subjection of the tobacco cells to forced currents of air having a temperature of from 95° F. to 110° F. and a relative humidity of from 70% to 75% for a period of substantially 24 hours, then, at substantially the same temperature, gradually increasing the relative humidity to from 75% to 80% during a further period of substantially 24 hours to 48 hours until all the food in the cells of the laminæ is consumed, then maintaining the same temperature and relative humidity for from 3 days to 6 days until all parts of the laminæ are browned, then reducing the temperature to from 70° F. to 80° F. and simultaneously reducing the humidity to from 70% to 75% until all parts of the stems are cured, then increasing the temperature to substantially 120° F. and increasing the relative humidity to from 80% to 85% for a period of from 12 hours to 48 hours, whereby the coloring of the tobacco is improved, then, reducing the temperature to from 70° F to 80° F. while maintaining substantially the same relative humidity until the tobacco has absorbed a sufficient water content to allow subsequent proper fermentation and removal of the tobacco from the treating chamber.

In testimony whereof, I have hereunto signed my name.

ALFRED CHARLES BUENSOD.