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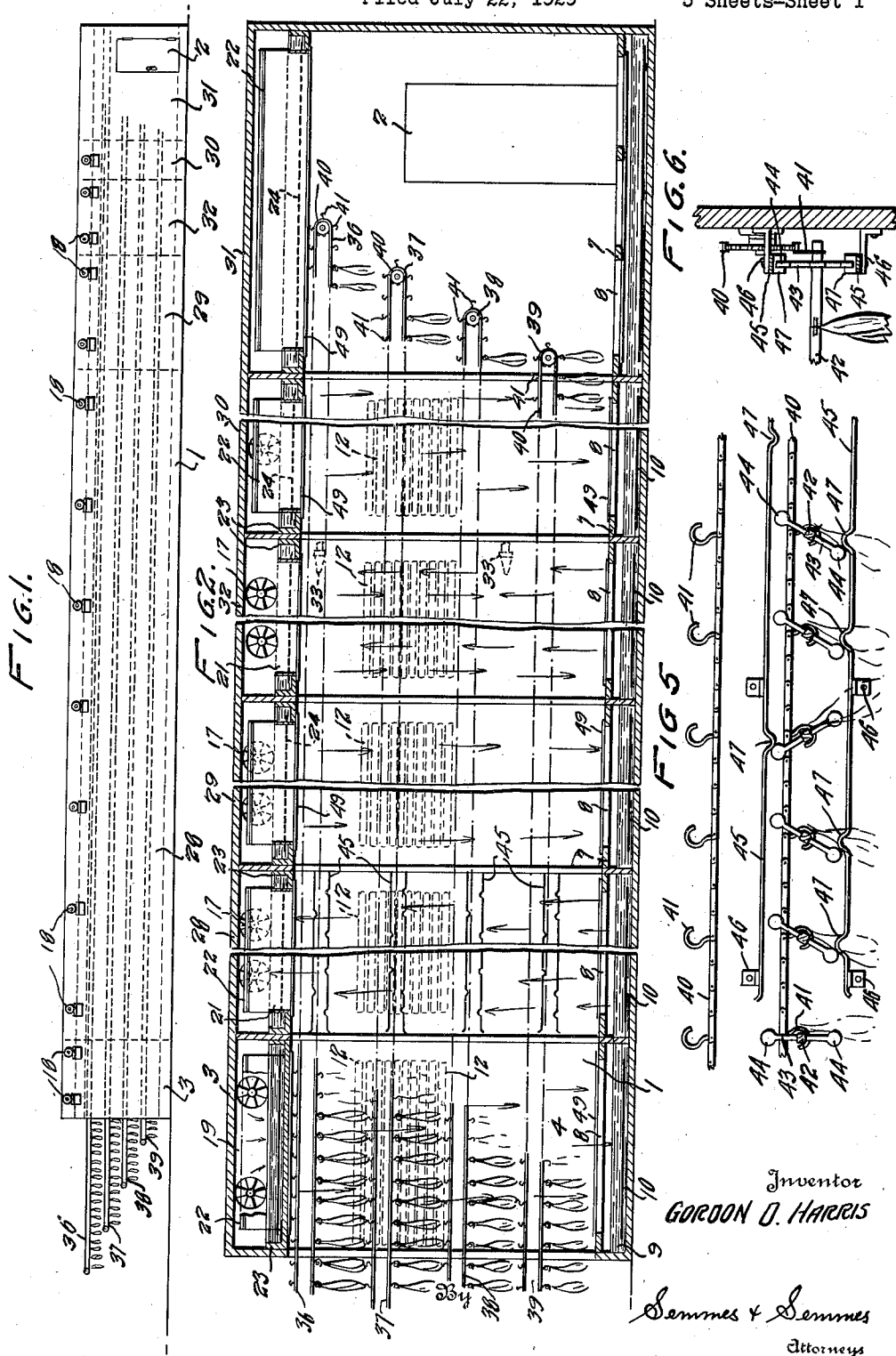
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2,104,036

CONTINUOUS TREATMENT OF MATERIALS

Filed July 22, 1929

5 Sheets-Sheet 1



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CONTINUOUS TREATMENT OF MATERIALS

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5 Sheets-Sheet 2

FIG. 4.

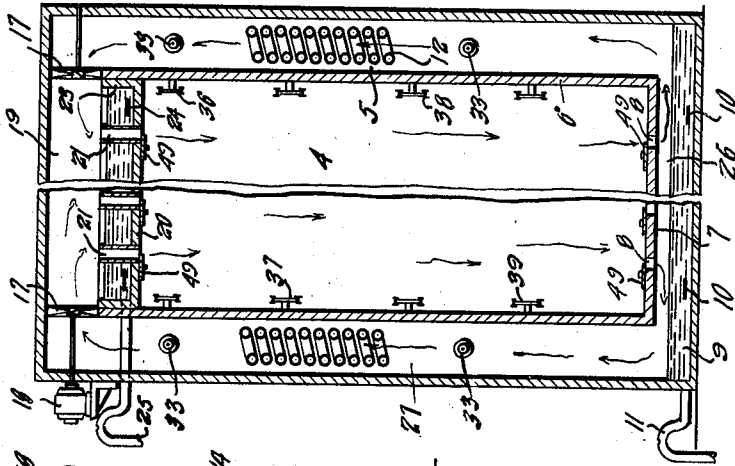
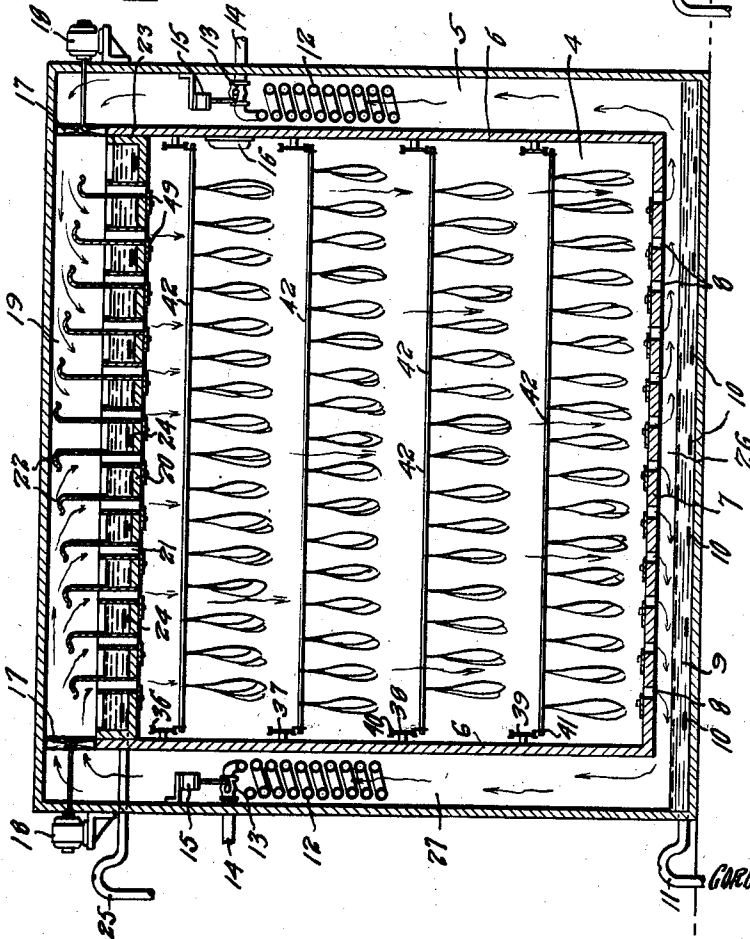


FIG. 3.



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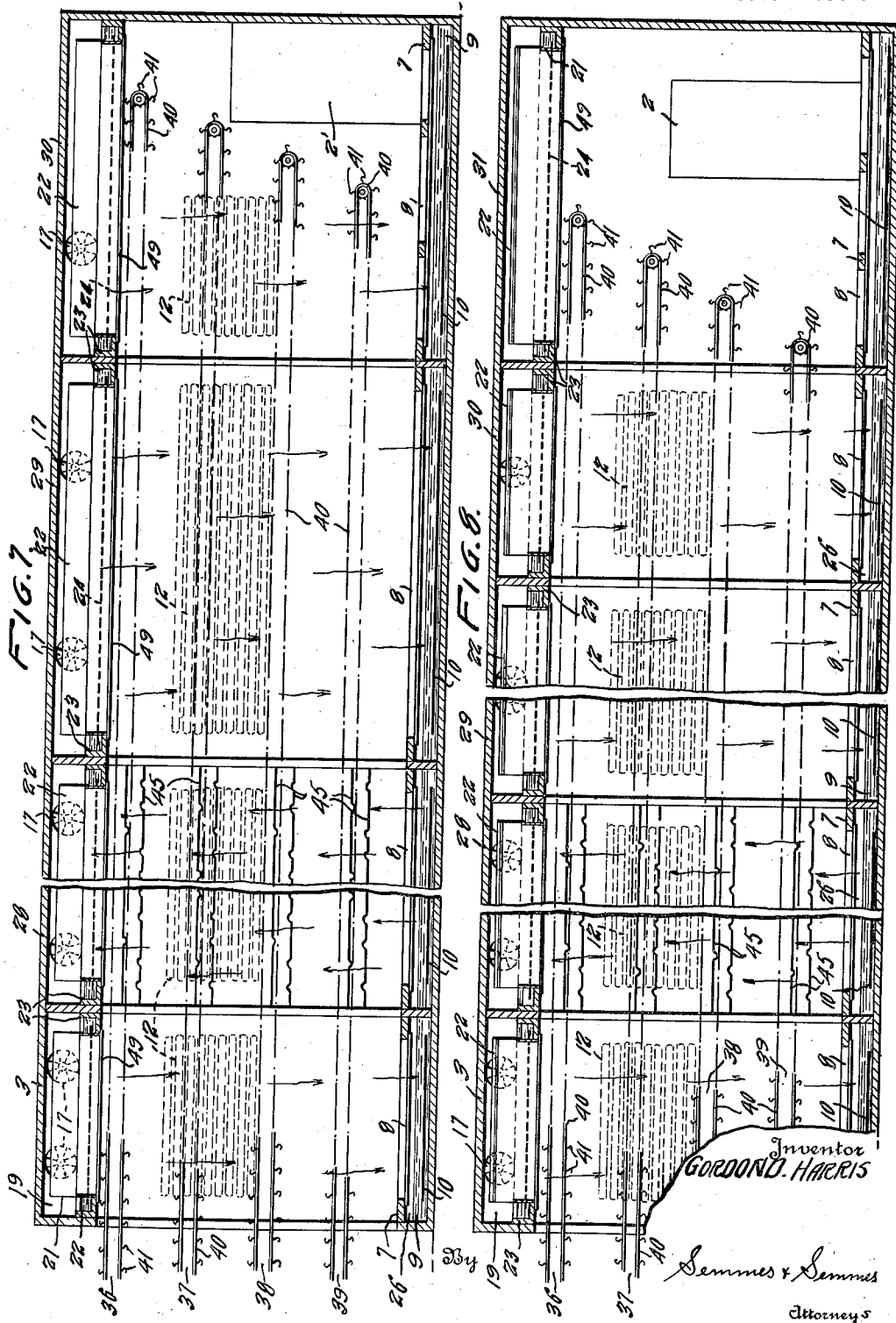
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CONTINUOUS TREATMENT OF MATERIALS

Filed July 22, 1929

5 Sheets-Sheet 3



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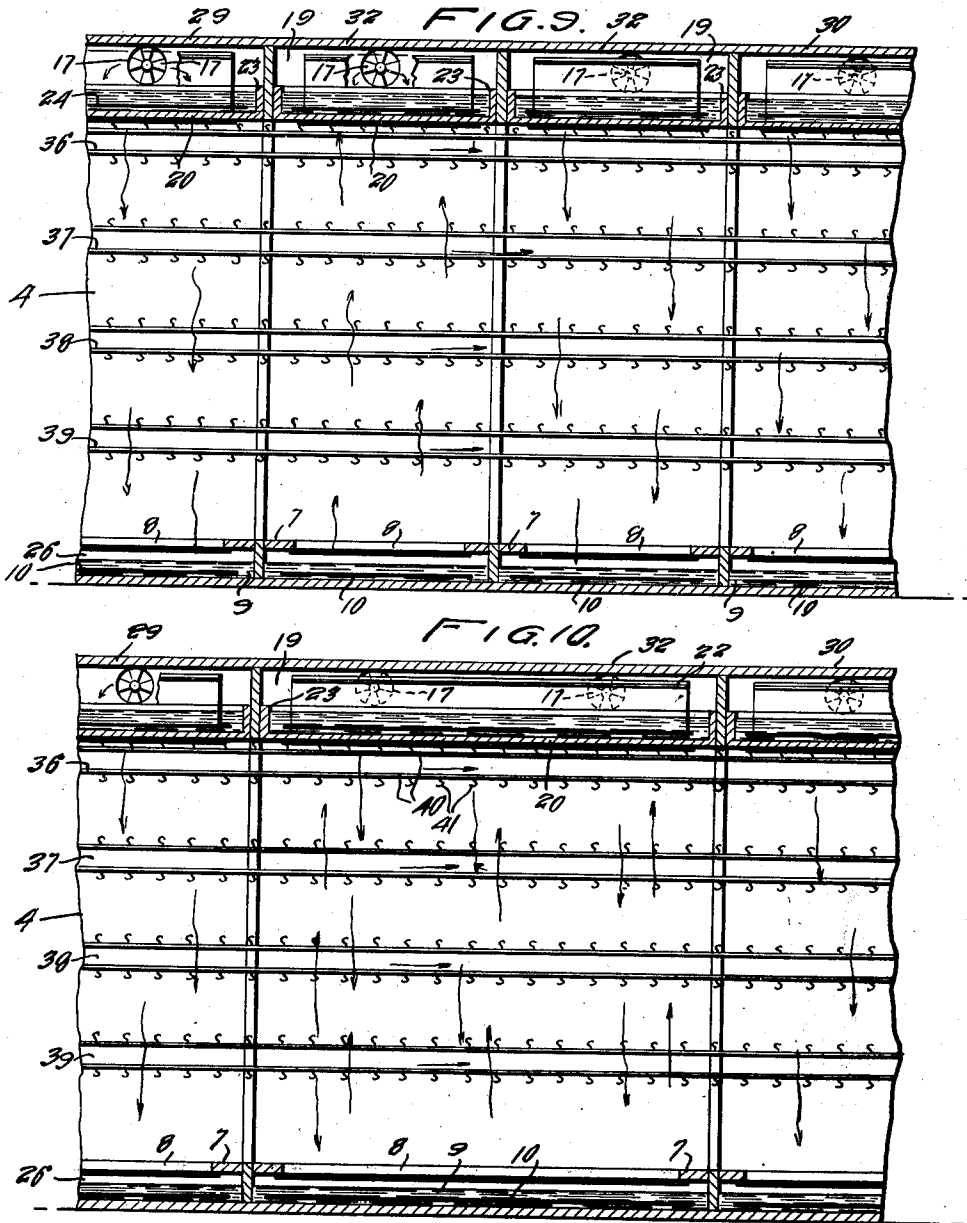
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CONTINUOUS TREATMENT OF MATERIALS

Filed July 22, 1929

5 Sheets-Sheet 4



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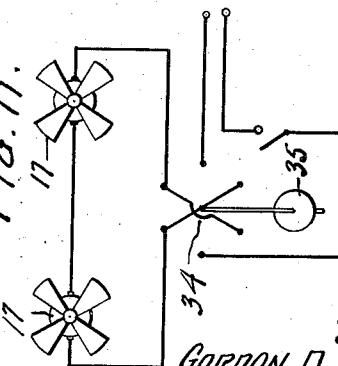
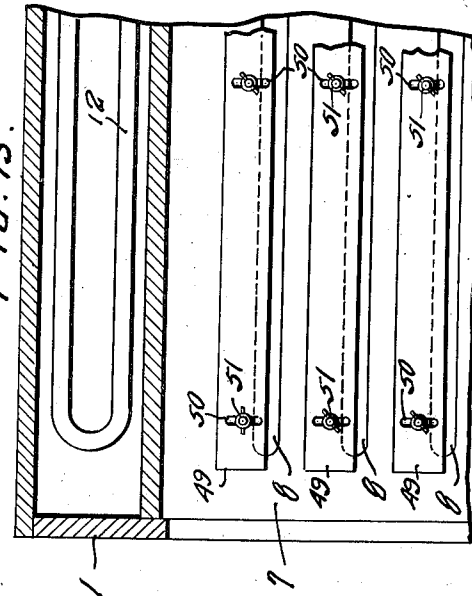
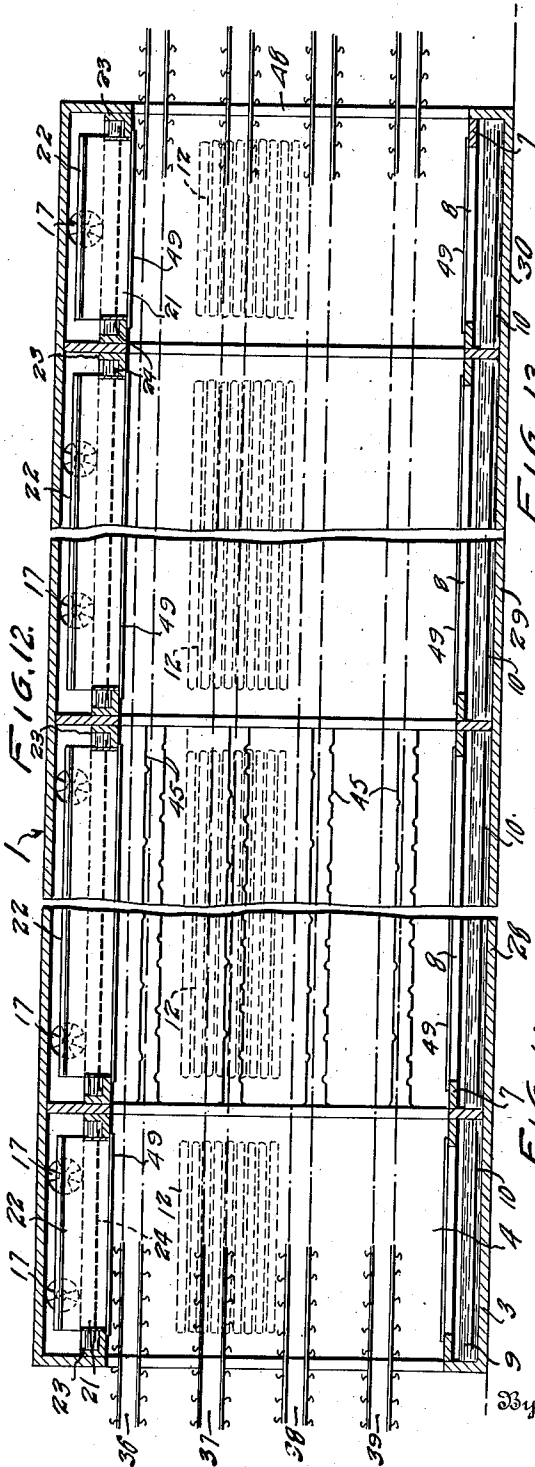
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2,104,036

CONTINUOUS TREATMENT OF MATERIALS

Filed July 22, 1923

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,104,036

CONTINUOUS TREATMENT OF MATERIALS

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sylvania

Application July 22, 1929, Serial No. 379,964

46 Claims. (Cl. 131—55)

This invention relates in general to the treat-
ment of materials and more particularly has ref-
erence to a process and apparatus for continu-
ously treating tobacco and materials requiring
5 similar treatment to incorporate moisture there-
in.

Tobacco, when dry, is crisp and brittle and,
consequently, cannot be worked without break-
ing the leaf. Tobacco leaves used as wrappers
10 for cigars must be manipulated many times prior
to being assembled on a cigar; yet must remain
unbroken. It is essential, therefore, that the
tobacco be treated so that the leaves will assim-
ilate enough moisture to render them sufficiently
15 pliable to be handled, stripped, etc., for use as
wrappers without fracture.

Many processes have been developed for treat-
ing the hands of dry tobacco to increase the
moisture content so that the tobacco may be
20 worked without damage to the same. Methods
of increasing the moisture content of tobacco in
which the tobacco is immersed directly in water,
or the application of surface moisture in any
form to the dry leaves, are disadvantageous, in
25 that the leaves become water stained and spotted;
the color is affected, and other desirable inher-
ent characteristics are lost. There is also the
danger of weakening the leaves by allowing the
same to become too wet, which causes the leaves
30 to become unworkable. Furthermore, if the
wrapper is too wet when applied to a cigar, it
will break or crack after the cigar becomes com-
mercially dry and is ready to be packed.

The most successful process for changing the
35 physical characteristics of tobacco from a dry
condition, wherein the leaves may be easily broken,
to a pliable and flexible condition, in which
it is susceptible of handling without fracture, is
that in which the hands of dry tobacco are sub-
40 jected to a properly conditioned air, the hands
of tobacco being taken directly from the bale and
placed in the machine ready for casing without
being damaged. The distribution and condition
of the air is modified during the treatment to
45 insure the permeation of moisture throughout
all parts of the leaves, including the stem, the
blade or lamina, and the petiole connecting the
blade with the stem. Tobacco treated in accord-
ance with this process is of high commercial
50 value.

The last described process is very effective for
conditioning tobacco, but, however, it is not
adapted for use with a continuous conveying
means.

55 A major object of the present invention is to

provide a process and apparatus for continuously
treating tobacco and other materials to cause the
same to assimilate moisture sufficient to render
them pliable and workable.

Another object of this invention is to devise 5
a method and apparatus for passing tobacco and
other materials through a plurality of stages of
variously conditioned air.

Yet another object of this invention is to pro-
vide a structure in which a plurality of stages of 10
air at varied conditions are maintained, and
which has means for conveying material to be
treated through the several stages.

Still another object of this invention is to de-
vise a method and apparatus for simultaneously 15
conditioning a plurality of tobaccos requiring dif-
ferent treatments.

A further object of this invention is to pro-
vide a method and apparatus for surface wetting
20 tobacco.

A still further object of this invention is to
provide an apparatus for conveying hands of 25
tobacco through the several stages of the process,
and for agitating the tobacco.

With these and other important objects in 25
view, which may be incident to my improvement,
the invention consists in the several method steps
and parts and combinations of apparatus to be
hereinafter set forth and claimed, with the un-
derstanding that the several necessary steps and 30
elements comprising my invention may be modi-
fied to meet varying operating conditions with-
out departing from the spirit and scope of the
appended claims.

In its broadest aspect the present invention 35
consists in the process and apparatus for expos-
ing materials such as dry tobacco in leaf form to
a plurality of bodies of air substantially saturat-
ed with moisture, each body of air being main-
40 tained at a desired temperature and being circu-
lated in a prescribed manner.

The apparatus for carrying out the process in
accordance with the present invention may be
arranged in the form of a tunnel divided into
a plurality of compartments, in each of which 45
there is an independent body of air independ-
ently conditioned and circulated. Each com-
partment consists of a products chamber, through
which the tobacco or other material to be treat-
ed is passed, and an air conditioning chamber. 50
The latter is provided with tanks containing wa-
ter, in which are submerged heating elements for
vaporizing the water, cooling coils for reducing
the temperature of the air and sprays, when de-
sired. Suitable fans are positioned in the con- 55

ditioning chamber for creating a circulation of the treated air from the conditioning chamber through the products chamber and back to the conditioning chamber for reconditioning.

5 Suitable thermostats and hygrometers, or humidostats, may be mounted in the products chamber for maintaining the temperature and moisture content of the air substantially constant.

10 Suitable conveyors for receiving the tobacco extend through the several compartments for conveying the tobacco through the several bodies of air. Each conveyor is preferably independently operated so that its velocity of travel may be regulated to secure various conditioning effects. 15 The length of treatment in any one compartment may be controlled by the length of the particular compartment. In passing through the several compartments it may be found necessary 20 to shake or agitate the tobacco. This is accomplished by rocking the sticks carried by the conveyor on which the hands of tobacco are mounted.

In order to make my invention more clearly 25 understood, I have shown, in the accompanying drawings, means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the purpose of 30 explanation, have been made the subject of illustration.

In the drawings:

Figure 1 is a diagrammatic elevation of a treating device constructed in accordance with the 35 present invention.

Figure 2 is a vertical sectional view of the treating apparatus shown in Figure 1.

Figure 3 is a cross-sectional view of the priming compartment, which is typical of the several 40 other compartments.

Figure 4 is a view similar to Figure 3 of a form of my invention employing sprays and eliminating the drip guard deflector construction in order to facilitate the deposition of surface moisture 45 on the tobacco.

Figure 5 is a detailed view showing a mechanism for rocking the tobacco-carrying sticks.

Figure 6 is another detail view of the mechanism shown in Figure 5.

50 Figure 7 is a diagrammatic view of a modified form of my invention, in which the surface-wetting and holding compartments are omitted.

Figure 8 is a diagrammatic view of another modified form of my invention, in which the surface-wetting compartment is omitted. 55

Figure 9 is a view of one form of surface-wetting compartment, in which the compartment is sub-divided, the air flow in one section being opposite to that in the other section.

60 Figure 10 is a view of another form of surface-wetting compartment, in which the direction of air flow is periodically reversed.

Figure 11 is a diagrammatic view of the time-controlled fan circuit for use with the surface 65 wetter shown in Figure 10.

Figure 12 is a diagrammatic view of a form of the treating apparatus in which the holding room is omitted, and in which both ends of the structure are open.

70 Figure 13 is a horizontal sectional view of one of the compartments showing the structure for regulating the port openings.

In the drawings, in which similar reference numerals indicate similar parts throughout the 75 several views thereof, there is shown a machine

for casing tobacco. As heretofore pointed out, the concept of the present invention involves the conveyance of tobacco or other materials through an enclosure divided into a plurality of compartments, in each of which there exists air or 5 some other treating gas under varying conditions. The casing or treating machine is in the form of an elongated enclosure 1, similar in form to a tunnel. One end of the tunnel or enclosure 1 is open to the atmosphere, and the other end may 10 be closed or opened as desired.

If one end is closed, it is preferably that end from which the finished product is obtained. This end may be provided with a door 2, through 15 which the treated material may be removed.

The tunnel 1 is divided into a plurality of compartments, the first of which is indicated by reference numeral 3, and will be referred to as the priming compartment. This compartment is divided into a treating chamber, indicated by 20 reference numeral 4, and air-conditioning chambers 5, 19, 26 and 27. As shown in Figure 3, the products chamber is located centrally of the compartment, and the air-conditioning chambers or ducts extend around the products chamber adjacent the exterior walls of the compartment. 25

The air-conditioning chambers 5 and 27, located on the sides of the products chamber, are separated from the products chamber by means of imperforate walls 6. The lower wall 7 of the 30 products compartment is provided with a plurality of openings 8, through which air from the products chamber may pass to the conditioning chamber 26.

Air flowing through the openings 8 is adapted 35 to flow over a body of water 9 located in the lower portion of the compartment, or in a tank positioned therein. A plurality of heating elements 10 are submerged in the body of water, so as to heat the same in order to produce a vapor. 40

The heating elements may be of any desired form, such as coils through which hot gases, steam or other fluid is circulated, or electrical resistance elements adapted to be heated upon the passage of an electric current through the 45 same.

Water may be supplied to the lower portion of the conditioning chamber by means of a conduit, not shown. It is desirable to maintain a 50 water level, and I may provide the water supply conduit with a suitable valve either manually operated or controlled by a float, or other automatic control device, such as a thermostat.

The lower portion of the conditioning chamber is provided with an overflow pipe 11, which is 55 adapted to operate when the water in the chamber reaches a predetermined level.

As the air passing through the openings 8 flows over the body of water 9, vapors arising from the body of water will diffuse into the air and substantially saturate the same. The substantially saturated air will then flow up in the side sections 5 and 27 of the conditioning chamber over the cooling coils 12, through which the flow of a cooling medium is controlled by means 65 of a valve 13. Valve 13 is located in a supply conduit 14, through which cold water or any other cooling medium may flow.

As the vapor-laden air flows over the cooling coils 12, there is a reduction in the temperature of the air, with a consequent condensation of moisture on the cooling coils. It is well known that saturated air at a high temperature contains more water vapor than saturated air at a lower temperature. Therefore, when the 75

air comes in contact with the cooling coils 12, there will be a quantity of water condensed from the gas mixture. The cooled air will be saturated as was the warmer air before contacting with the coils. The temperature of the cooling coils 12 may be controlled by a valve-actuating device 15, which is operated by means of a thermostat 16 positioned in the treating chamber.

After flowing over the cooling coils 12, the air is drawn upwardly by means of fans 17, driven by suitable motors 18, and is forced into an upper chamber 19, separated from the products chamber 4 by means of a slotted partition 20, which forms the bottom of a tank 23. Each of the slots 21 is fitted with a drip guard and deflector 22 extending above the tank a predetermined distance. Upstanding slot walls are provided to prevent the water from passing through the slots. The drip guards 22 prevent moisture which forms on the inside of the roof above the tank 23 from dripping through the slots 21 onto the tobacco in the products chamber 4. It is very desirable that the drip guards 22 be employed, since any drippings falling through the slots would tend to spot the tobacco in the products chamber and thereby reduce its commercial value.

The tank 23 is adapted to contain a body of water, in which are submerged the heating elements 24. These heating elements are similar to those positioned in the lower humidifying chamber and, as in the case of elements 10, may be of any desired form. The upper tank 23 is provided with a water inlet, not shown, in which may be associated a valve operated by an automatic control device similar to that described in connection with the lower tank, for regulating the flow of water to the tank 23. An overflow pipe 25 is associated with the upper tank 23 for maintaining a definite body of water within this tank.

It will readily be seen that with the construction just described, air conditioned by the addition of moisture in the lower and upper chambers and by cooling in the side chambers will be circulated downwardly by means of the fans 17 over the tobacco or other material maintained in the products chamber to give up a portion of its moisture content to the tobacco.

The other compartments in the treating device are constructed somewhat similarly to the structure described in connection with the priming compartment; therefore, it is thought that a detailed description of these compartments will not be necessary. Ordinarily, cooling coils will not be necessary in the casing section hereinafter to be referred to. It is to be noted that by merely reversing the direction of travel of the fans, the air may be made to flow in an upward direction in the conditioning chamber.

Adjacent the priming compartment 3 is a casing compartment 28, which is similar in construction to the priming compartment 3, with the exception that it is of greater length in order to insure a longer period of treatment to the tobacco passing through the same. The flow of conditioned air through the products chamber in the casing compartment 28 is preferably upwardly.

The upward flow of conditioned air moistens the body portion of the leaves of the tobacco to a greater extent than any other portion. One of the main reasons for the upward flow is to fan out the leaves and to expose them to the

conditioning air. However, due to the flow of the air in the upward direction and the fanning out of the leaves, the air friction causes a heating of the leaves on the edge, which tends to prevent a sufficient assimilation of moisture in this portion of the leaves. Also, because of the manner in which the hand is suspended in the products chamber, sufficient moisture is not assimilated in the stem portion or butts during this upward passage of the air. Consequently, in order to insure the proper assimilation of moisture in all portions of the tobacco, it has been found necessary to subject the tobacco leaves, as suspended, to what is termed a butt and edge casing process. This process is carried out in a compartment 29, located adjacent the casing compartment 28.

Compartment 29 is constructed similarly to compartment 3, as to the products chamber, the air-conditioning chamber and the means for circulating the air from one chamber into the other.

From the butt and edge casing compartment the tobacco may be transferred directly to a cooling compartment 30, or it may be passed through an intermediate surface-wetting compartment 32. (See Figures 9 and 10.) Cooling compartment 30 is constructed similarly to the other compartments 3, 28 and 29 hereinbefore described, and operates to reduce the temperature of the tobacco by passing cooled, moisture-saturated air over the tobacco. The cooling compartment serves to cool the tobacco down to approximately room temperature, so that any tendency for the moisture in the tobacco to be dissipated, owing to the fact that the temperature of the tobacco is higher than the room temperature, will be avoided.

From the cooling compartment 30, the tobacco is passed into a compartment 31, which is termed a holding room. This compartment may be of a relatively large size in order that a large quantity of tobacco may be stored therein. The condition of air within the holding room is maintained such that the tobacco will retain its moisture content as obtained in the preceding compartments. The air is here substantially saturated and at room temperature. By means of the holding room, the tobacco may be maintained in a condition suitable for use over a relatively long period of time.

If the holding rooms are employed at different points in the factory, to maintain the tobacco in prime condition between factory operations, it may not be desirable under certain operation conditions to pass the tobacco through the surface-wetting compartment. However, it is sometimes desirable that the tobacco be subjected to a surface-wetting process to supply an excess amount of moisture to compensate for moisture lost through evaporation during handling.

The apparatus for effecting the surface wetting may be modified somewhat from that described in connection with the other compartments. As shown in Figure 4, a structure is provided, in which there is a products chamber 4, surrounded by air-conditioning chambers 5, 19, 26 and 27. This compartment is constructed similarly to that shown in Figure 3, with the exception that spray nozzles 33 are provided above and below the cooling coils 12 mounted in the compartments 5 and 27. Any spraying or atomizing device, with or without accompanying cooling coil structures, may be employed. In the operation of this compartment, the air is conditioned so as to be saturated with water vapor and then

is passed up through the chambers 5 and 27 over cooling coils 12. Just prior to and after flowing over the coils 12, the air is subjected to water spraying from the nozzles 33. Water introduced into the air by the nozzles 33 is present therein in the form of entrained particles of moisture.

The air, together with the entrained moisture, is drawn upwardly by the fans 17 and is passed through the ducts or slots 21 down into the products chamber 4. A suitable tank structure 23, as previously described, is provided in the upper compartment 19, in order to further supply the air with water vapor.

When the saturated air with entrained moisture contacts with the tobacco leaves in the products chamber, there is a certain deposition of water on the exterior surface of the tobacco leaves. As hereinbefore pointed out, this, in some instances, is desirable.

In Figure 9 I have shown a fragmentary view of the tobacco treating device, in which the surface-wetting compartment is shown divided in two sub-compartments. The conditioned air in one of the sub-compartments flows upwardly; whereas the air in the other compartment flows downwardly. By having the saturated air-carrying entrained moisture flowing in two directions, the tobacco being subjected to the treatment will be thoroughly wetted both on the outside of the hand and on the leaves in the inner portion thereof.

In some cases it may be desirable to construct the compartment 32 so that the air will be circulated upwardly over a definite period of time and then downwardly over a similar period of time.

There is shown in Figure 11 a diagrammatic circuit for operating the fans for reversing the flow of air in the compartment 32, shown in Figure 10, so that the tobacco leaves can be thoroughly wetted. In Figure 11 the fans 17 are shown connected in series with a reversing switch 34, which is controlled by a suitable clock mechanism or timing device 35. With this construction the timing device can be set so that the switch 34 will be operated at definite time intervals so as to reverse the direction of rotation of fans 17, thereby causing the direction of airflow to be reversed.

In certain treatments it may be found unnecessary to subject the tobacco to all of the stages of the process. For instance, a treating structure such as shown in Figure 7 may be employed. This structure comprises a priming compartment 3, a casing compartment 28, a butt and edge casing compartment 29 and a cooling compartment 30. In this instance the cooling compartment is provided with a door 2' to permit the removal of the treated tobacco. For other treatments it may be found desirable to employ a holding room 31 together with the compartments 3, 28, 29 and 30. Such a structure is clearly shown in Figure 8.

In certain installations it is unnecessary to have the last compartment through which the tobacco passes closed. Figure 12 shows a structure similar to that shown in Figure 7, in which the cooling compartment 30 is open to the atmosphere. It, of course, is obvious that other combinations of the several compartments may be employed, in which the last compartment is open to the atmosphere.

It has been found that if all the slots 8 and 21 are of the same size, there is a tendency for the airflow through the products chamber to be uneven, resulting in improper treatment of material

positioned in certain portions of the products chamber. This difficulty may be overcome by regulating the size of the slots.

As shown in the several figures and in detail in Figure 13, the slotted partition 7 has a plurality of slot closures 49 adjustably secured thereto. Each closure member 49 is provided with a plurality of slots 50, through which extend studs carried by the partition 7. Suitable wing-nuts 51 are enthreaded on the studs and serve to fix the closures in adjusted positions. Similar closure members are provided on the under side of the upper partition 20. By adjusting the position of the closures any desired slot opening can be obtained for effecting the proper airflow.

In order to pass the tobacco through the several compartments or stages of treatment, I have provided a plurality of chain conveyors 36, 37, 38 and 39. Each of the conveyors consists of a pair of chains 40 provided with a plurality of hooks or similar attaching means 41. The hooks 41, carried by each of the chains 40, are spaced so that each one of those carried by the chain on one side of the treating structure will be directly opposite those carried by the other chain. In order to support the tobacco on the conveyor, a plurality of tobacco-carrying sticks 42 are mounted on the hooks 41. These sticks 42 are provided on each end with arms 43 having enlarged end portions 44 adapted to engage with projections adjacent the path of travel of the conveyor chains for rocking the tobacco-carrying sticks 42. One of the enlarged ends of the arm 43 is weighted so that it will hold the sticks 42 in a definite position. A plurality of rails 45 are mounted on the walls of the conditioning apparatus by means of suitable brackets 46. There is a rail 45 provided both above and below the lower portion of each of the conveyor chains. Each of the rails 45 is provided with a plurality of protuberances 47 adapted to be engaged by the enlarged end portions of the arms 43 for rocking the tobacco-carrying sticks 42.

In operation a plurality of hands of tobacco are positioned on the tobacco-carrying sticks 42. The loaded sticks are then mounted in the hooks 41 and assume a position wherein the arms 43 are vertical. The vertical position of the arms 43 is effected by means of the weighted end portion, as previously described. The conveyors with the loaded tobacco-carrying sticks 42 pass through the treating apparatus at a definite predetermined speed. When the tobacco on the conveyor reaches a point where it is desired that the tobacco be agitated, suitable rails, similar to those shown in Figures 5 and 6, are provided for engaging with the enlarged end portions of the arms 43, for rocking the sticks and agitating the tobacco supported thereon.

A structure for agitating the hands of tobacco will be found most desirable in compartment 28, where the tobacco is subjected to treatments over a relatively long period of time. The agitation loosens locked leaves.

I wish it to be clearly understood that the conveyors may be operated at any desired speed, either continuously or intermittently. If the conveyors are of the intermittent type, they may be either manually or automatically controlled.

When tobacco is to be treated in accordance with the present invention, it comes from the bale in the form of hands, and the hands are affixed to the tobacco-carrying sticks 42. The sticks 42 are then placed in the hooks 41 carried by the conveyor chains 40. For most types of

tobaccos, the speed of the conveyor and the length of the compartments may be adjusted so that the tobacco will be subjected to a priming treatment for a sufficient length of time. The priming treatment is employed to introduce a sufficient amount of moisture into the tobacco leaves so that they will not be fractured when subjected to later treatments. Priming may be so conducted as not only to moisten but also to cool the tobacco. The cooling makes it possible to carry out the subsequent operations in a shorter length of time than would otherwise be possible. Moisture absorbed during the priming prevents fracture of the leaves during subsequent treatment where the conditioning air is directed upwardly against the leaves. The temperature in the priming compartment is generally lower than that in the casing compartment. The humidity of the air, of course, is maintained as close to the saturation point as is possible, i. e., at a true humidity, in order that a large quantity of moisture will be assimilated by the tobacco leaf.

By reason of the fact that the same volume of air is continually circulated, the air in the priming compartment, at a short distance from the open end, will be substantially saturated. In other words, the circulation of air is so balanced that there is practically no interchange between the unsaturated air in the room and the saturated air in the compartment.

The tobacco, after passing from the priming compartment, is moved into the casing compartment 28, which is of such a length that the tobacco will be exposed to the air for a substantial period of time. The greater part of the moisture to be assimilated in the leaf is taken into the leaf during the casing operation carried out in compartment 28. The air-flow in this compartment is upwardly, so as to completely disperse the moisture-laden air through the hands of tobacco leaves suspended from the conveyor. In the priming compartment the air was circulated downwardly, so that there would be no tendency for the leaves to be spread apart until a sufficient amount of moisture was assimilated by them to prevent breakage. However, after the priming treatment, the leaves are sufficiently pliable, so that there is no danger of breaking them due to the upward flow of air in the casing compartment. It is desirable in all the compartments to have the submerged heaters under thermostatic control since the temperature of the air will depend upon the amount of heat supplied to the water. The temperature may be maintained as desired, for instance, from about 70° to 90° F.

During the treatment of the tobacco leaves in the casing compartment 28 it may be desirable to utilize the apparatus hereinbefore described for agitating the leaves. It will be appreciated that a slight rocking motion of the tobacco-carrying sticks 42 will impart sufficient agitation to the leaves to insure a thorough assimilation of moisture therein; yet the agitation will not be so great as to damage the tobacco leaves. The agitation can be started as soon as the leaves are in the casing compartment 28, since sufficient moisture is absorbed by the leaves in the priming process to prevent them from breaking. The rocking action tends to separate any leaves which may have become interlocked when the tobacco was baled for shipment.

By the use of my process the injury which may occur by reason of handling and opening the

dry hands before they have become pliable through absorbed moisture is eliminated.

After the tobacco has been subjected to the treatment in the casing compartment, the body portions of the leaves have assimilated sufficient moisture to make them relatively pliable. However, since the stems of the tobacco leaves were placed upwardly in supporting the hands of tobacco on the tobacco-carrying sticks, the stem portion will not absorb sufficient moisture from the air flowing upwardly in the casing compartment. Also, as before explained, the air flowing upwardly over the thin edges of the tobacco leaves generates heat and prevents a sufficient assimilation of moisture into the thin edges. Since it is desirable that all of the leaf be pliable, the tobacco is conveyed through a compartment 32, in which it is subjected to a butt and edge casing process.

The condition of the air is maintained practically the same as that of the air in compartment 28. However, the air is delivered from the top of the compartment downwardly, in order to give the butts of the leaves a better opportunity to absorb additional moisture, and in order to bring the edges of the leaves into a prime condition.

After emerging from the butt and edge casing compartment 29 the tobacco may be subjected to a surface-wetting process in compartment 32. As hereinbefore described, this compartment may be divided into two sub-compartments, in one of which the air flows downwardly, and in the other of which the air flows upwardly. Water is here sprayed into the air from nozzles 33, as hereinbefore described. The saturated air, carrying the entrained moisture, is then directed down over the tobacco in one sub-compartment and up over the tobacco in the other sub-compartment, in order to thoroughly disperse the water over the surface of the leaves. When used, this treatment is carried on for a length of time which depends upon the initial condition of the tobacco and the condition to be obtained.

If found desirable, the divided surface-wetting compartment may be substituted by a single compartment, in which the direction of air-flow is changed at definite intervals of time. As hereinbefore described, this apparatus has a time-control reversing switch associated with the electrical circuit for operating the air-forcing fans, so that the direction of movement of the fans will be reversed at definite time intervals, to accomplish the same result effected by the subdivided compartment, in which air flows in one direction in one sub-compartment and in another direction in the other sub-compartment. When this last form of surface-wetting compartment is employed, the tobacco may be subjected to the treatment for a time corresponding to that employed in the other form.

From the surface-wetting process compartment the tobacco is passed through a cooling compartment in which the air is maintained at a temperature approximating that at which the tobacco is to be worked. The air in this compartment, as in each of the others, is, of course, maintained at approximately 100% moisture saturation.

The tobacco which has been cooled may be taken directly from the cooling compartment and carried to the machines for stripping and working the tobacco. If, however, the tobacco is to be held for a time before it is used, it is prefer-

able to discharge the same into a holding room 31, shown in the drawings. Tobacco may be held in proper condition in the holding room for several days without damage to the quality of the tobacco.

While the process has been described employing each of the treating steps diagrammatically shown in Figure 1, it is, of course, obvious that certain of the treatments may be eliminated. For instance, as shown in Figure 7, there is an apparatus for effecting a treating process in which the compartment for surface-wetting and the holding room are eliminated.

If desirable, the surface-wetting and cooling stages of the process can be combined as one.

In Figure 8 there is shown an apparatus in which the surface-wetting compartment is eliminated. The apparatus shown in Figure 8 is generally sufficient for processing tobaccos where subsequent holding machines are used between the various factory operations.

While the foregoing process has been described with relation to a conveyor moving at one speed, I wish it to be clearly understood that all four conveyors may be moved at different speeds, either continuously or intermittently. For instance, conveyor 36 could be loaded with one type of tobacco and moved through the apparatus at a speed so that the tobacco could be subjected to each of the process steps for certain periods of time, and the other conveyors could be loaded with different tobaccos and operated at different speeds to effect treatments of different periods of time. Thus it will be appreciated that the foregoing described process and apparatus is particularly desirable for use in cigar-making factories, where a plurality of kinds of tobacco are treated.

In the foregoing description sprays have been shown employed only in the compartment for the surface wetting of the tobacco. I wish it to be clearly understood, however, that sprays may be employed in any of the compartments, in order to introduce surface moisture on the tobacco leaves. It has been found, however, that unless the air is substantially saturated with water vapor, entrained moisture alone carried by the air will have little effect on the assimilation of moisture by the tobacco leaves.

In the foregoing description the process and apparatus have been described as applicable to the treatment of tobacco, but it should be understood that the same may be employed for the treatment of other materials which are to be changed from a hard, unpliant state to one in which the material may be easily worked. For instance, the process and apparatus here described are particularly applicable to the treatment of hides, shoe uppers and other leather goods, to render the leather pliable, so that it may be in a condition favorable for the subsequent manipulations required to produce an article of manufacture.

It has been found that the process and equipment herein described is ideal for "sammying" leather in the tanning industry. This operation consists in putting moisture into the skins after they have been dried. Tests have indicated that a better quality of skin is obtained from the raw material when the herein described method and apparatus are employed. Of course the size of the apparatus and handling equipment may be varied to best advantage, and the time of treatment can be regulated as found desirable. It is also to be understood that certain of the stages

of the process, such as surface wetting, may be omitted, if desired.

When treating tobacco I may, if I desire, support the hands in a position with the butts down, the leaves extending upwardly, and control the direction of air-travel in the various sections or compartments to give the advantages previously set forth when the hands are supported with the butts uppermost.

Throughout this specification and claims where I use the term "air" I mean to include any gas or mixture of gases which can be used in the place of air in similar treating processes.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction set forth herein, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention or exceeding the scope of the appended claims.

I claim:

1. A tobacco-treating process comprising subjecting dry tobacco to a priming treatment with moisture-saturated air, conveying the tobacco to a casing stage in which the tobacco is subjected to moisture-saturated air at approximately 70° to 90° F., and subjecting the tobacco to a surface-wetting stage.

2. A tobacco-treating process comprising subjecting dry tobacco to a priming treatment with moisture-saturated air, conveying the tobacco to a casing stage in which the tobacco is subjected to moisture-saturated air at approximately 70° to 90° F., subjecting the tobacco to a surface-wetting stage and cooling the tobacco to room temperature.

3. In combination with a tobacco-conditioning machine, a conveyor comprising a pair of flexible members, a plurality of rods carried by said flexible members, a plurality of members adjacent the flexible members and means on each of said rods adapted to engage with members adjacent the flexible members for rocking said rods.

4. A device for surface-wetting tobacco comprising a products chamber, an air-conditioning chamber, means in the latter for diffusing water vapor in air, means for dispersing water in the air, and means for circulating air through said chambers, and time-controlled means for reversing the flow of air through said chambers.

5. A device for surface wetting tobacco comprising a products chamber, an air-conditioning chamber, means in the latter for diffusing water vapor in the air, means for circulating air through said chambers, time-controlled means for reversing the flow of air through said chambers and means for passing tobacco through said device.

6. A device for surface wetting tobacco comprising a plurality of adjoining compartments, means for suspending hands of tobacco therein with the butt upward, means in each compartment for saturating air, means for entraining moisture in air, means in one compartment for forcing air upwardly to spread apart the tobacco leaves, means in the other compartment for forcing air downwardly and means for passing tobacco through both of said compartments.

7. A device for surface wetting tobacco comprising a products chamber, an air-conditioning chamber, means in the latter for diffusing water vapor in air, means for dispersing water in the air, and means for circulating air through said

chambers, said products chambers being in communication with said conditioning chambers by means of slotted partitions and means associated with said slots for varying the size thereof.

8. A device for moistening material comprising a products chamber, an air-conditioning chamber, means in the latter for diffusing water vapor in air, means for dispersing water in the air and means for circulating air through said chambers, said products chamber being in communication with said conditioning chamber by means of slotted partitions, and means associated with said slots for varying the size thereof.

9. A device for moistening material comprising a products chamber, an air-conditioning chamber, means in the latter for diffusing water vapor in the air, means for circulating air through said chambers, time-controlled means for reversing the flow of air through the said chambers and means for passing material through said device.

10. A method of treating tobacco comprising suspending hands of tobacco, conveying the suspended hands of tobacco to a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas flowing vertically downwardly, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to vertical flowing gas substantially completely saturated with moisture and moving in a direction opposite to the direction of flow of the gas in the priming stage, to spread apart the suspended partially moistened leaves to permit access of the gas in the casing stage to all portions of the leaves.

11. A method of treating tobacco comprising suspending hands of tobacco, conveying the suspended hands of tobacco to a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas flowing vertically downwardly, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to vertical flowing gas substantially completely saturated with moisture and moving in a direction opposite to the direction of flow of the gas in the priming stage to spread apart the suspended partially moistened leaves to permit access of the gas in the casing stage to all portions of the leaves, and then passing the suspended hands of tobacco into a stage wherein substantially completely moisture saturated gas flows vertically downwardly.

12. A method of treating tobacco comprising conveying suspended hands of tobacco through a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas which has been cooled to a temperature below that of the tobacco to be treated and which is caused to flow vertically downwardly through the priming stage, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to a substantially completely moisture saturated gas at a higher temperature flowing vertically upwardly through the casing stage to spread apart the suspended partially moistened leaves to permit access of the gas in the casing stage to all portions of the leaves.

13. A method of treating tobacco comprising conveying suspended hands of tobacco through a priming stage, subjecting the tobacco in the

priming stage to the action of humidified gas which has been cooled to a temperature below that of the tobacco to be treated and which is caused to flow vertically downwardly through the priming stage, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to a substantially completely moisture saturated gas at a higher temperature flowing vertically upwardly through the casing stage to spread apart the suspended partially moistened leaves to permit access of the gas in the casing stage to all portions of the leaves, and then passing the suspended hands of tobacco into a stage wherein substantially completely moisture saturated gas flows vertically downwardly.

14. A method of treating tobacco to effect the assimilation of moisture therein comprising conveying suspended hands of tobacco through a priming stage, subjecting the tobacco in the priming stage to a vertical flowing body of highly humidified gas directed so as to contact the butt of the hands of tobacco prior to the leaves and so as to avoid disturbance of the leaves, conveying the suspended hands of tobacco from the priming stage into a casing stage where the suspended hands are subjected to vertical flowing streams of substantially completely moisture saturated gas passing in a direction opposite to the direction of flow of the gas in the priming stage to spread apart the suspended partially moistened leaves to permit access of the gas in the casing stage to all portions of the leaves.

15. A method of treating tobacco to effect the assimilation of moisture therein comprising conveying suspended hands of tobacco through a priming stage, subjecting the tobacco in the priming stage to a vertical flowing body of highly humidified gas directed so as to contact the butt of the hands of tobacco prior to the leaves and so as to avoid disturbance of the leaves, conveying the suspended hands of tobacco from the priming stage into a casing stage where the suspended hands are subjected to vertical flowing streams of substantially completely moisture saturated gas passing in a direction opposite to the direction of flow of the gas in the priming stage to spread apart the suspended partially moistened leaves to permit access of the gas in the casing stage to all portions of the leaves, and then passing the suspended hands of tobacco into a stage wherein substantially completely moisture saturated gas flows vertically downwardly.

16. A method of casing tobacco comprising conveying suspended hands of tobacco through a priming stage wherein the tobacco is subjected to the action of a body of gas substantially completely saturated with moisture and cooled to a temperature below that of the tobacco to be treated, conveying the suspended hands of tobacco from the priming stage into a casing stage wherein the hands of tobacco are subjected to a body of substantially completely moisture saturated gas maintained at a temperature above that of the gas in the priming stage, causing the gas in the casing stage to flow vertically upwardly in a manner so as to spread apart the leaves of the hands of tobacco and effect the assimilation of moisture throughout the entire body of leaves, subsequently conveying the suspended hands of tobacco into a third stage wherein the tobacco is subjected to the action of a body of gas which is substantially completely saturated with moisture and which is caused to flow vertically downwardly in a manner to effect the assimilation

of moisture in the butts and edge portions of the leaves of the suspended hands of tobacco.

17. A method of casing tobacco comprising conveying suspended hands of tobacco through a priming stage wherein the tobacco is subjected to the action of a body of gas substantially completely saturated with moisture and cooled to a temperature below that of the tobacco to be treated, passing said gas through the priming stage in a direction so as to cause a minimum of disturbance of the leaves of the hands of tobacco, conveying the suspended hands of tobacco from the priming stage when they have assimilated enough moisture to avoid breakage of the leaves upon movement thereof, and passing the suspended hands of tobacco into a casing stage wherein the tobacco is subjected to a body of substantially completely moisture saturated gas maintained at a temperature higher than that of the gas in the priming stage and which is caused to flow in a direction opposite to that of the gas flow through the priming stage so as to cause the maximum disturbance of the leaves of the hands of tobacco and effect the assimilation of moisture throughout the interior of the hands of tobacco.

18. A method of casing tobacco comprising conveying suspended hands of tobacco through a priming stage wherein the tobacco is subjected to the action of a body of gas substantially completely saturated with moisture and cooled to a temperature below that of the tobacco to be treated, passing said gas through the priming stage in a direction so as to cause a minimum of disturbance of the leaves of the hands of tobacco, conveying the suspended hands of tobacco from the priming stage when they have assimilated enough moisture to avoid breakage of the leaves upon movement thereof, and passing the suspended hands of tobacco into a casing stage wherein the tobacco is subjected to a body of substantially completely moisture saturated gas maintained at a temperature higher than that of the gas in the priming stage and which is caused to flow in a direction opposite to that of the gas flow through the priming stage so as to cause the maximum disturbance of the leaves of the hands of tobacco and effect the assimilation of moisture throughout the interior of the hands of tobacco, conveying the tobacco from the casing stage to a third stage wherein the hands of tobacco are subjected to the action of a body of substantially completely moisture saturated gas passing in a direction opposite to that of the gas flow through the casing stage so as to effect the assimilation of moisture in the butts of the hands of tobacco.

19. An apparatus for treating tobacco comprising a chamber for the tobacco to be treated, a gas conditioning chamber, means for circulating gas from the conditioning chamber through the chamber for the tobacco to be treated and back to the conditioning chamber, and time controlled means associated with the circulating means for periodically reversing the flow of the gas.

20. An apparatus for effecting the assimilation of moisture in materials comprising a chamber for the material to be treated, a gas humidifying chamber associated therewith, means in said humidifying chamber for saturating the gas therein with moisture, means for circulating gas from the humidifying chamber through the chamber for the material to be treated and back to the humidifying chamber, and time con-

trolled means associated with the circulating means for reversing the flow of the gas after the lapse of a predetermined time.

21. A method of treating tobacco to effect the assimilation of moisture therein comprising conveying hands of tobacco first through a priming stage and then into and through a casing stage, passing a body of moisture saturated air in contact with the tobacco in the priming stage and causing the gas to flow over the hands of tobacco in such a manner as to cause a minimum disturbance of the leaves of the hands of tobacco, subjecting the tobacco to the action of the saturated gas in the priming stage for a time sufficient to assimilate enough moisture in the tobacco to prevent fracture of the leaves upon movement of the leaves, subjecting the tobacco in the casing stage to the action of a moisture saturated gas which is caused to flow over the tobacco in a direction opposite to that of the flow of the gas through the priming stage and in such a manner as to produce a maximum disturbance of the leaves of the hand of tobacco and thereby insure a maximum assimilation of moisture in the leaves, both interiorly and exteriorly thereof, and mechanically agitating the hands of tobacco while passing through the casing stage in order to more completely effect the assimilation of moisture in the leaves.

22. An apparatus for casing tobacco comprising a series of communicating chambers, means for conveying the tobacco serially through the chambers, means in the first chamber into which the tobacco is conveyed for humidifying a gas and passing the same through the chamber in a direction relative to the position of the tobacco to effect the minimum degree of disturbance of the leaves, means in the next adjacent chamber for substantially completely saturating a gas with moisture, means for causing the gas to flow over the tobacco in a direction opposite to the direction of flow of the gas in the first chamber so as to effect the maximum degree of disturbance of the leaves of the tobacco, means in the next adjacent chamber for saturating a gas with water vapor, and means for causing the water vapor saturated gas to flow over the tobacco in the same direction of flow as takes place in the first chamber.

23. An apparatus for casing tobacco comprising a series of communicating chambers, means for conveying the tobacco serially through the chambers, means in the first chamber into which the tobacco is conveyed for humidifying a gas and passing the same through the chamber in a direction relative to the position of the tobacco to effect the minimum degree of disturbance of the leaves, means in the next adjacent chamber for substantially completely saturating a gas with moisture, means for causing the gas to flow over the tobacco in a direction opposite to the direction of flow of the gas in the first chamber so as to effect the maximum degree of disturbance of the leaves of the tobacco, means in the next adjacent chamber for saturating a gas with water vapor, and means for causing the water vapor saturated gas to flow over the tobacco in the same direction of flow as takes place in the first chamber, and means for agitating the tobacco as it is moved through said chambers.

24. An apparatus for casing tobacco comprising a series of communicating chambers, means for conveying the tobacco serially through the chambers, means in the first chamber into which the tobacco is conveyed for humidifying a gas and

passing the same through the chamber in a direction relative to the position of the tobacco to effect the minimum degree of disturbance of the leaves, means in the next adjacent chamber for substantially completely saturating a gas with moisture, means for causing the gas to flow over the tobacco in a direction opposite to the direction of flow of the gas in the first chamber so as to effect the maximum degree of disturbance of the leaves of the tobacco, and means for agitating the tobacco as it is moved through said chambers.

25. A method of treating tobacco comprising suspending hands of tobacco, conveying the suspended hands of tobacco to a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas flowing vertically downwardly, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to vertical flowing gas substantially completely saturated with moisture and moving in a direction opposite to the direction of flow of the gas in the priming stage, and mechanically agitating the leaves of the hand of tobacco as the same is moved through the casing stage.

26. A method of treating tobacco comprising suspending hands of tobacco, conveying the suspended hands of tobacco to a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas flowing vertically downwardly, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to vertical flowing gas substantially completely saturated with moisture and moving in a direction opposite to the direction of flow of the gas in the priming stage, and then passing the suspended hands of tobacco into a stage wherein substantially completely moisture saturated gas flows vertically downwardly, and mechanically agitating the leaves of the hands of tobacco as they are conveyed through the casing and subsequent stages.

27. A method of treating tobacco comprising suspending hands of tobacco, conveying the suspended hands of tobacco to a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas flowing vertically downwardly, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to vertical flowing gas substantially completely saturated with moisture and moving in a direction opposite to the direction of flow of the gas in the priming stage, and surface wetting the leaves of the hands of tobacco by passing the same through a stage in which a humidified gas containing entrained moisture is passed in contact with the tobacco leaves.

28. A method of treating tobacco comprising suspending hands of tobacco, conveying the suspended hands of tobacco to a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas flowing vertically downwardly, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to vertical flowing gas substantially completely saturated with moisture and moving in a direction opposite to the direction of flow of the gas in the priming stage, and surface wetting the leaves of the hands of tobacco by passing the same through a stage in which a humidified gas containing entrained moisture is passed in contact with the tobacco leaves, and periodically reversing the direction of flow of the humidified moisture entrained gas to

effect a complete wetting of the leaves of the hands of tobacco.

29. A method of treating tobacco comprising suspending hands of tobacco, conveying the suspended hands of tobacco to a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas flowing vertically downwardly, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to vertical flowing gas substantially completely saturated with moisture and moving in a direction opposite to the direction of flow of the gas in the priming stage, and subsequently passing the tobacco into a stage wherein moisture saturated gas at a temperature approximately that of the atmosphere into which the tobacco is to be discharged is circulated in contact with the tobacco in order to cool the same to a temperature at which the tobacco will retain its moisture upon being discharged from the stage.

30. A method of treating tobacco comprising suspending hands of tobacco, conveying the suspended hands of tobacco to a priming stage, subjecting the tobacco in the priming stage to the action of humidified gas flowing vertically downwardly, conveying the suspended hands of tobacco into a casing stage wherein the suspended hands of tobacco are subjected to vertical flowing gas substantially completely saturated with moisture and moving in a direction opposite to the direction of flow of the gas in the priming stage, and subsequently passing the tobacco into a stage wherein moisture saturated gas at a temperature approximately that of the atmosphere into which the tobacco is to be discharged is circulated in contact with the tobacco in order to cool the same to a temperature at which the tobacco will retain its moisture upon being discharged from the stage, and then transferring the tobacco into a holding stage wherein a body of moisture saturated gas is circulated in contact with the tobacco in order to maintain the moisture content of the tobacco until it is desired to fabricate the same.

31. An apparatus for treating tobacco comprising, a treating chamber where the tobacco hands are subjected to a gas conditioned both as to moisture content and as to temperature, support means for the hands, means to progressively move the support means for the hands in the chamber, and means to agitate the support means to agitate the hands to permit the conditioned gas to more readily obtain access to the tobacco leaves.

32. An apparatus for treating tobacco comprising, a treating chamber wherein the tobacco hands are subjected to a gas conditioned both as to temperature and moisture content, a conveyor in the chamber, support means for the hands on the conveyor, and means to agitate the support means to agitate the hands to permit the conditioned gas to more readily obtain access to the tobacco leaves.

33. An apparatus for treating tobacco comprising, a conveyor on which the hands are supported, a treating chamber conditioned as to temperature and humidity in which the conveyor travels to cause the tobacco hands to move within the chamber, and means cooperating with the conveyor to agitate the hands of tobacco.

34. The herein described method of conditioning tobacco leaf wrappers to render them soft and pliant, which consists in passing suspended hands of leaves through a chamber slowly and

in direct contact with a current of humid air moving through the chamber, the said air having a moisture content at least as great as 96 per cent and a temperature of approximately 80° F.

35. The herein described method of conditioning tobacco leaf wrappers to render them soft and pliant, which consists in continually passing suspended hands of leaves through an upwardly moving current of humid air having a moisture content at least as great as 96 per cent and a temperature of approximately 80° F., and in maintaining the leaves in such atmosphere for a period of time sufficient to render them soft and pliant.

36. The herein described method of conditioning tobacco leaf wrappers to render them soft and pliant, which consists in passing suspended hands of leaves through a chamber slowly and in direct contact with a current of humid air moving through the chamber, said air having a high moisture content and a temperature of approximately 80° F.

37. A process of treating tobacco comprising, continually passing the tobacco into and out of a conditioning zone, where in such continuous passage through the zone the tobacco is subjected to a temperature of from 70 to 85° F., and a relative humidity in excess of 94 per cent.

38. A process of treating tobacco comprising, continually passing the tobacco into and out of a conditioning zone, where in such continuous passage through the zone the tobacco is subjected to a temperature of from 70 to 85° F., and a high relative humidity.

39. A process of treating tobacco comprising, continually passing the tobacco into and out of a conditioning zone, where in such continuous passage through the zone the tobacco is subjected to a temperature of from 70 to 85° F., and a relative humidity at least as great as that which approximates complete saturation.

40. A process of treating tobacco comprising, continually passing the tobacco into and out of

a conditioning zone, where in such continuous passage through the zone the tobacco is subjected to a temperature approximating 70° F. and a high relative humidity.

41. A process of treating tobacco comprising, continually passing the tobacco into and out of a conditioning zone, where in such continuous passage through the zone the tobacco is subjected to a temperature approximating 85° F. and a high relative humidity.

42. A process of treating tobacco comprising, suspending the hands on a support, continually passing the tobacco on the support into and out of the zone where it is subjected to an air conditioned both as to temperature and humidity, while agitating the support to agitate the leaves of the tobacco hands.

43. The method for conditioning tobacco which includes moving tobacco in hands comprising a plurality of tobacco leaves compressed together, secured at their butts only without separation of their leaves, through a humid atmosphere and manipulating the leaves to effect separation thereof as they absorb moisture.

44. The herein-described method of conditioning cigar wrapper leaf tobacco to render the leaves soft and pliant, which consists in continuously passing suspended hands of leaves through a conditioning chamber, causing humid air to pass upward through the chamber and through the traveling leaves, and in imparting a swinging motion to the hands of leaves as they pass through the chamber.

45. The method for conditioning of tobacco which includes moving hands of tobacco through a humid atmosphere and periodically agitating the hands.

46. The herein-described method of conditioning cigar wrapper leaf tobacco to render the leaves soft and pliant, which consists in passing suspended hands of leaves through a humid atmosphere and in imparting a swinging motion to the hands during the conditioning operation.

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