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TOBACCO MOISTENING PROCESS AND APPARATUS

Original Filed Feb. 6, 1961

3 Sheets-Sheet 1

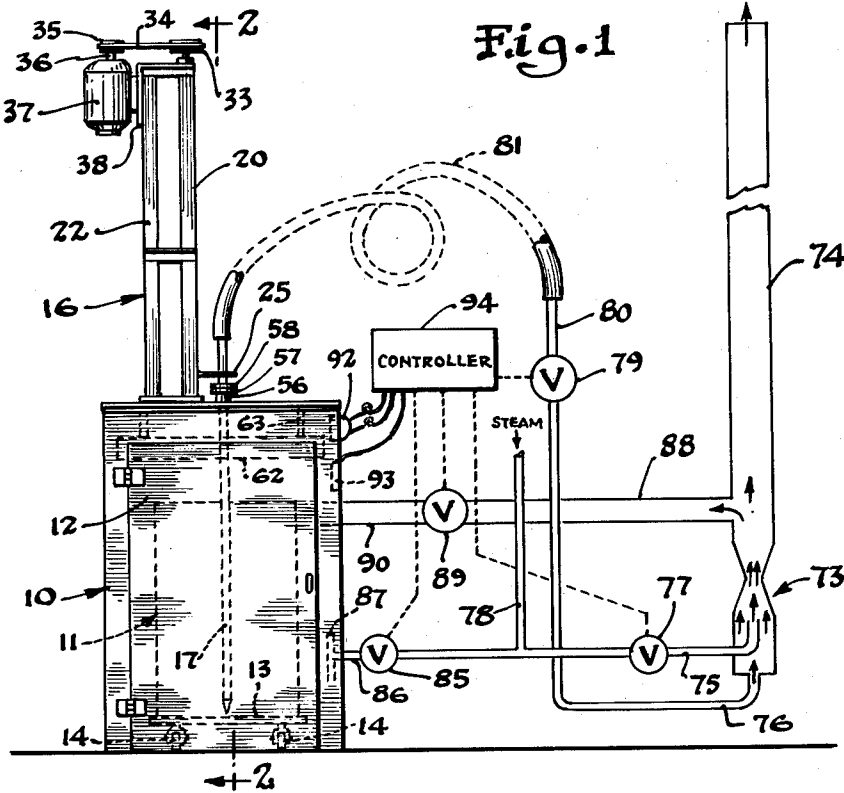
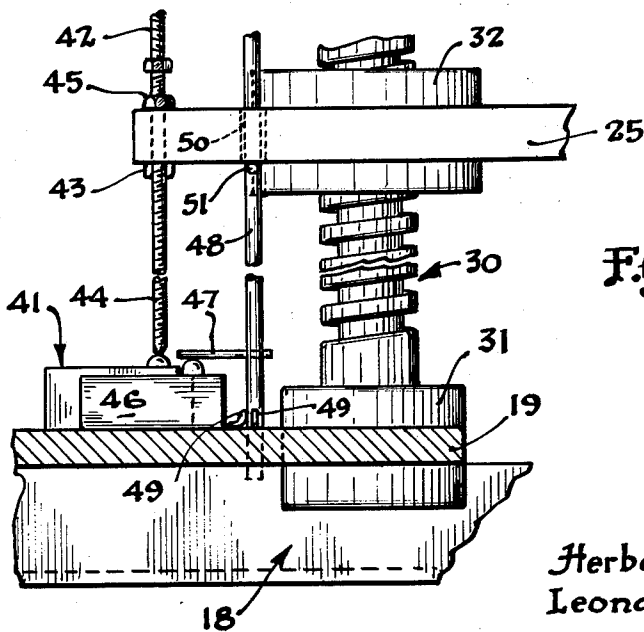


Fig. 4

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3 Sheets-Sheet 2

Fig. 3

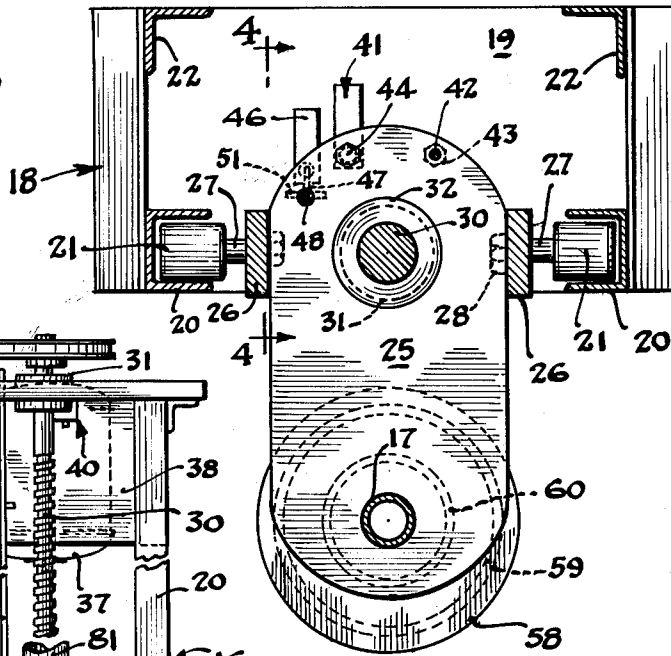
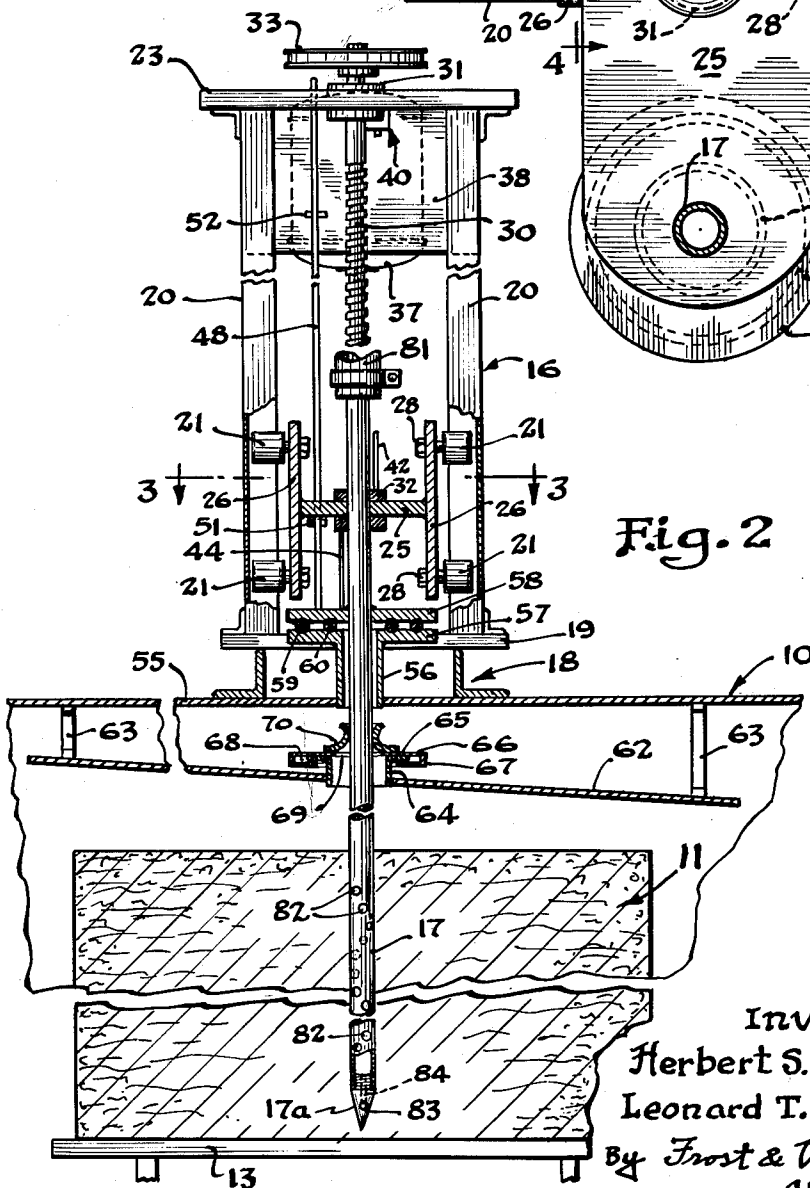


Fig. 2



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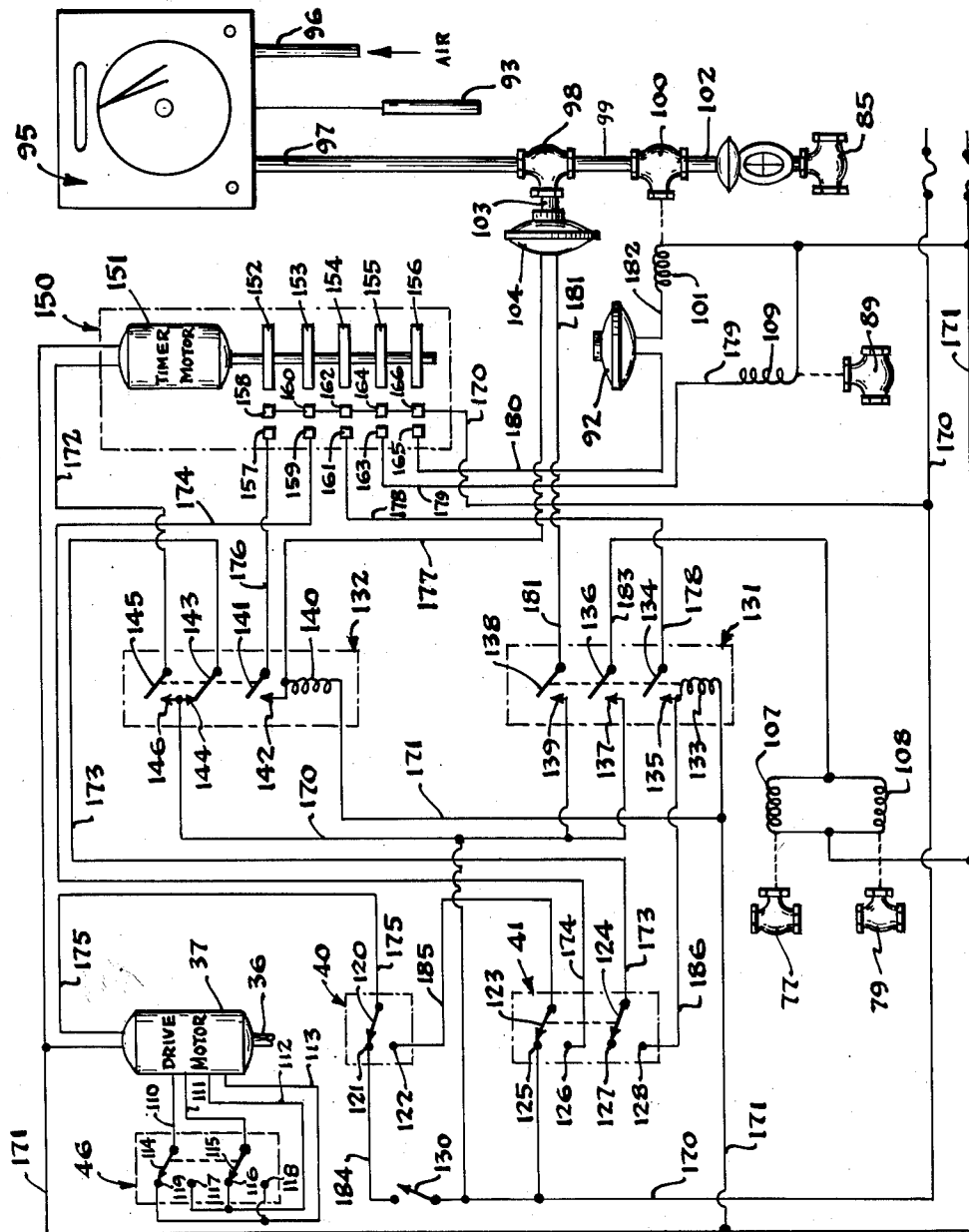


Fig. 5

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## TOBACCO MOISTENING PROCESS AND APPARATUS

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Continuation of application Ser. No. 87,348, Feb. 6, 1961.  
This application Sept. 5, 1961, Ser. No. 139,031  
13 Claims. (Cl. 131—135)

The present invention relates to a process and apparatus for use in the moistening of tobacco.

In the processing of tobacco for use in cigarettes, etc., one of the first steps is to store the tobacco for some period of time in large hogsheads. During this storage period the tobacco becomes very dry, and necessarily the first step after separation of the hogshead from about the body of tobacco that was stored therein is to remoisten the tobacco. The dry tobacco is very fragile, and should one endeavor to separate the individual leaves from the body of tobacco extracted from the hogshead, a very substantial amount of breakage would occur which would unnecessarily result in an economic loss.

Various methods and apparatus have been devised for use in the remoistening of the body of tobacco extracted from the hogsheads. Most of these involve alternate steps of vacuumizing and steaming. Usually the vacuumizing is carried out through the use of a steam ejector. With the commercial practices generally in use today, the steam consumption, both for steaming the tobacco and for obtaining the vacuum, is very substantial. Furthermore, the time periods involved are rather lengthy in order to obtain a uniform remoistening of the body of tobacco. The principal object of the present invention is to provide a novel process and apparatus to facilitate the remoistening operation, to reduce the time necessary to obtain uniform remoistening, and to reduce the amount of steam utilized.

Cost always is an important factor in a manufacturing operation. By reducing the time necessary to steam a body of tobacco, with a given piece of apparatus more hogsheads of tobacco can be steamed during a given working period. The result is that the equipment is more effectively utilized and the processing cost thereby reduced. Reducing the steam consumption required to remoisten a body of tobacco also reduces the processing costs. Facilitating the use of the equipment by employees lessens the time that they must spend preparing a body of tobacco for steaming and removing it after the steaming is completed, with the result that the direct labor cost involved in processing each body of tobacco from a hogshead is reduced.

With some of the equipment presently in use, a probe first is inserted into the body of tobacco removed from the hogshead. The body of tobacco with the probe therein then is moved into the steaming chamber, and the probe connected to a processing line. Since the processing chamber is likely to be hot as a result of an immediately preceding steaming operation, the operations carried out in the steaming chamber to couple the probe to a processing line are likely to be unpleasant. Furthermore, in many instances the working space about the body of tobacco, once it has been moved into the steaming chamber, is restricted, making it difficult to carry out the coupling operation. These problems are eliminated through the use of the present invention, since with the use of our invention the probe always is coupled to the processing line. All that is necessary is to position the body of tobacco within the processing chamber and thereafter the probe, already connected to the processing line, automatically may be inserted into the body of tobacco.

Additional objects and advantages of our invention in-

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clude: a unique structure provides a tight seal between the movable probe and the processing chamber, eliminating leaks, and avoiding the problems attendant the usual packing glands and the like; the probe structure is such that limited lateral movement of the probe is permissible, thus avoiding the stresses that might otherwise be occasioned during the inserting of the probe into the body of tobacco; and the process we have devised is ideally suited for manual, semi-automatic and automatic operation.

Further objects and advantages will be apparent from the following description, taken in conjunction with the drawings in which:

FIGURE 1 is an elevation view of an embodiment of our invention, illustrating schematically its connection to the vacuumizing, steaming and control apparatus;

FIGURE 2 is a partial section as viewed at line 2—2 of FIGURE 1;

FIGURE 3 is a partial section as viewed at line 3—3 of FIGURE 2;

FIGURE 4 is a partial section as viewed at line 4—4 of FIGURE 3; and

FIGURE 5 is a schematic diagram of the control apparatus.

In the process we have devised, the body of tobacco removed from the hogshead is transferred directly to the processing chamber without the necessity of first carrying out any operations with respect thereto. After the body of tobacco is in the chamber, a hollow, apertured, probe already connected to the low pressure side of a steam ejector, is driven from adjacent one side of the chamber into the center of the body of tobacco, in such a position that the apertures on the probe are fully within the body of tobacco. Thereafter, steam is admitted to the steam ejector so as to obtain a vacuum. This vacuum which is connected to the hollow interior of the probe, draws the air from the chamber through the body of tobacco. The pressure in the chamber is reduced below about 10 inches of mercury, absolute, and preferably within the range of about 4—5 in., Hg, abs.

After the pressure has been so reduced, steam is admitted to the evacuated chamber. Because of the vacuum still being applied to the probe, the steam will be drawn through the body of tobacco with some of the steam passing entirely through the body and drawn out through the probe by the steam ejector. After the temperature in the chamber has been raised to an effective processing level, some of the waste steam from the steam ejector may be salvaged and used for the processing operation. The temperature within the chamber should be at least 100° F. before any effort is made to return steam from the steam ejector to the chamber. The best results are obtained if the temperature within the chamber is allowed to rise to about 120° F. before attempting to return steam from the ejector to the chamber. Above this point some steam is drawn off from the discharge side of the steam ejector and returned to the chamber. Thereafter the supply of fresh steam to the chamber may be reduced commensurate with the amount of exhaust steam that is returned from the ejector to the chamber. The fresh steam should be supplied at a rate sufficient to maintain the temperature in the chamber within the range of about 125° F. to about 135° F.

The steaming is continued for a period of time, sufficient to uniformly remoisten all portions of the body of tobacco to the desired degree. In the usual case this will take a period of about ten minutes after steam initially is admitted to the chamber. After the steaming has been completed air is readmitted to the chamber. In the process we have devised this is carried out by shutting off communication between the steam ejector and the hollow interior of the probe, and at the same time discontinuing the supply of steam to the steam ejection.

tor. Thereupon air will pour back into the discharge side of the steam ejector, and through the communication that had been established between the discharge side of the steam ejector and the chamber for the purpose of supplying exhaust steam from that discharge side to the chamber. This is important so as to prevent any deleterious effect on the tobacco by the admission of air into the hollow interior of the probe. It also has proven to be an extremely simple method of readmitting air to the chamber.

We have devised a novel apparatus to carry out this unique method. A description of this novel apparatus follows. Additional features of our method will be apparent from the description of the use of this apparatus.

FIGURE 1 illustrates a chamber, generally 10, within which the body of tobacco, generally 11, removed from a hogshead is placed for processing. In the illustrated embodiment the chamber 10 is sufficiently large to hold only one body 11 of tobacco. It will be apparent to those skilled in the art that our invention may be employed with larger chambers holding a number of bodies 11 of tobacco. A door 12 is employed on chamber 10 to permit the insertion and removal of the body 11 of tobacco. The body of tobacco is supported on a dolly 13 having a plurality of casters 14 to facilitate the moving of the body of tobacco into and out of the chamber 10. Door 12 is so constructed as to be hermetically sealed when the door is closed.

A probe inserting device, generally 16, is mounted on the top of chamber 10, and is operatively attached to probe 17. The body 11 of tobacco is generally cylindrical in shape, having taken that configuration from the hogshead in which the body of tobacco was formed. The body of tobacco is aligned in chamber 10 with the cylindrical axis coincident with the axis of probe 17, so that when the probe is extended into the body of tobacco it extends along the cylindrical axis of the body of tobacco.

The structure of the probe inserting device 16 is best illustrated in FIGURES 2 and 3. It comprises a frame, generally 18, having a bottom support plate 19. Extending upwardly from plate 19 are a pair of channels 20 which form ways for rollers 21, and a pair of vertical angle iron supports 22. A top plate 23 is affixed to channels 20 and angles 22.

A pressure member 25 has a pair of roller supports 26 secured thereto. Supports 26 may be formed integrally with pressure member 25 or may be separate pieces suitably secured as by means of welding. Rollers 21 are rotatably mounted on stub axles 27. The other end of axles 27 are threaded to provide a means for attaching axles 27 to roller supports 26. Nuts 28 are threaded on to the ends of stub axles 27 to hold them in place. Probe 17 extends through pressure member 25, and is suitably secured thereto by means of welding.

A threaded shaft 30 is journaled at top and bottom in bearings 31, secured to plates 19 and 23 respectively. Shaft 30 extends through and is threaded into a nut 32 secured to pressure member 25. A pulley 33 is secured to the upper end of shaft 30, and is driven by a belt 34 from a pulley 35 on the shaft 36 of motor 37. Motor 37 is mounted on a plate 38 secured to supports 22. Obviously, as shaft 30 is rotated pressure member 25 will be moved upwardly or downwardly, depending upon the direction of rotation of the shaft. Pressure member 25 will result in a corresponding upwardly or downwardly movement of probe 17.

Limit switches, generally 40 and 41, are secured to plates 23 and 19 respectively. Limit switch 40 is operated by a threaded rod 42, threaded into and projecting upwardly from pressure member 25. It is fixed in place by a stop nut 43. Similarly, limit switch 41 is operated by a downwardly projecting rod 44 threaded into pressure member 25 and held in place by a stop nut 45. A reversing switch, generally 46, is operated

by an arm 47 affixed to and extending outwardly from a vertical rod 48. Rod 48 is slidably mounted in plates 19 and 23. Means such as springs 49 bear against rod 48 so as to prevent the accidental or vibrational displacement thereof. Rod 48 extends through an opening 50 in pressure member 25. A bottom operating pin 51 extends through and is secured to rod 48 below pressure member 25. A corresponding top operating pin 52 extends through and is secured to rod 48 above pressure member 25. Pin 51 is positioned so that as pressure member 25 reaches the downward extent of its travel pressure member 25 will push down on pin 51 moving rod 48 downwardly so that arm 47 actuates reversing switch 46. Similarly as pressure member 25 reaches the upward extent of its travel, it contacts pin 52, raising rod 48 and changing the position of the contacts of switch 46. Means (not shown) are provided for the mounting of pins 51 and 52 at various points longitudinally of rod 48 to permit them to be positioned so that rod 48 is moved simultaneously with the actuation of limit switches 40 and 41 respectively.

Projecting upwardly from the top of chamber 10 is a sleeve 56 which is suitably secured to the top of the chamber. An annular plate 57 is secured to the top of sleeve 56. An annular plate 58 having a corresponding external diameter is welded to probe 17. The weld forms a gas tight seal between the probe and plate 58. Positioned in circular grooves in plate 57 are a pair of O-rings 59 and 60 formed of a resilient natural rubber, synthetic rubber, etc. When the probe 17 is fully extended within the body 11 of tobacco, as illustrated in FIGURE 2, plate 58 presses against the top of the O-rings, with the O-rings forming a fluid tight seal between plates 57 and 58.

Extending across all portions of the top of the body of tobacco within the chamber is a slanting roof 62. Roof 62 is spaced downwardly from the top 55 of the chamber and is supported by a plurality of brackets 63, secured both to the top 55 and to roof 62. Concentric with probe 17 is a sleeve 64, secured to roof 62 and having an annular flange 65 about the top thereof. A cover plate 66 extends across the top of flange 65 and has a re-entrant rim 67 which fits above and below flange 65 and defines an annular space 68 between the inner periphery of rim 67 and the outer periphery of flange 65. This structure permits cover plate 67 to shift laterally with respect to flange 65, while at the same time trapping flange 65 between the top and bottom of rim 67.

Cover plate 66 has an opening 69 centrally thereof. Secured to the top of cover plate 66 is a seal 70 in the general form of an eyelet. Seal 70 is made of rubber, synthetic rubber, or the like, and fits sufficiently tight about probe 17 so as to prevent any moisture from flowing down around the probe from above the top of seal 70. The upper portion of seal 70 is somewhat funnel shaped so that it will center itself about probe 17 as the probe is lowered through the seal. Cover plate 66 allows some shifting of the probe from side to side so as to prevent undue stress on the probe when it is being inserted into the body 11 of tobacco. Sleeves 56 and 64 are sufficiently large to permit this limited shifting of probe 17. Despite the shifting of the probe, O-rings 59 and 60 will maintain a fluid tight seal between plates 57 and 58.

Referring to FIGURE 1, a steam ejector, generally 73, is used as a vacuum source. Ejector 73 has an exhaust side to which stack 74 is connected. At its upper end stack 74 communicates with atmosphere. Ejector 73 also has a steam connection and a low pressure connection to which pipes 75 and 76 respectively are secured. Pipe 75 is connected to a valve 77 which in turn connects to a steam supply pipe 78. Pipe 76 connects to a valve 79, having a pipe 80 on the opposite side thereof. A flexible hose 81 connects pipe 80 and the hollow probe 17.

Probe 17 has a plurality of perforations or openings 82

(FIGURE 2) therein. In the embodiment we have devised, openings 82 extend for a distance such that the upper opening will be just shortly below the top of the body of tobacco 11, with the lower openings being immediately above the point 17a of the probe at the lower end thereof. The point 17a of the probe has opposed openings 83 therein, with the openings 83 communicating with the hollow interior of the probe through passage-way 84. Openings 82 and 83 are  $\frac{3}{16}$  of an inch in diameter. The outer diameter of probe 17 is 1.625 inches and the inner diameter is about 1.25 inches. Since probe 17 is hollow a fluid communication exists from openings 82 and 83 through probe 17, hose 81, pipe 80, valve 79 and pipe 76 to the low pressure side of ejector 73.

The steam supply pipe 78 also connects to valve 85. The opposite side of valve 85 communicates with a pipe 86 which terminates in a T 87 within chamber 10. The two sides of T 87 are open so that steam entering the T from pipe 86 will be directed upwardly and downwardly within chamber 10. A pipe 88 connects to stack 74 immediately adjacent to the exhaust side of ejector 73. Pipe 88 connects to a valve 89 which in turn communicates with a pipe 90 opening into the interior of chamber 10.

A pressure responsive electrical switch 92 communicates with the interior of chamber 10 as does a temperature responsive bulb 93. As is diagrammatically illustrated in FIGURE 1, each of the valves 77, 79, 85 and 89, as well as pressure responsive switch 92 and temperature bulb 93, all are operatively connected to a controller, generally 94. Controller 94 operates valves 77, 79, 85 and 89 in a sequence to carry out our method as previously described. The details of controller 94 and its connection to the valves, etc., is illustrated in detail in FIGURE 5.

Temperature bulb 93 is a part of a recording thermometer with a pneumatic control, generally 95. Air is supplied to control 95 through a pipe 96. Air is delivered to a pipe 97 at a pressure that is a function of the temperature indicated by bulb 93. Pipe 97 connects to a T 98, and thence to a pipe 99 leading to valve 100. Valve 100 is a normally closed valve and is opened by a solenoid or coil 101. A pipe 102 leads from valve 100 to valve 85 which is a diaphragm motor valve. A pipe 103 connects T 98 with a pressure responsive electrical switch 104.

Valves 77, 79 and 89 all are normally closed valves, each being opened by its respective solenoid. The solenoids for valves 77, 79 and 89 are indicated at 107, 108 and 109 respectively.

Reversing switch 46 is a double pole, double throw, switch connected to drive motor 37 in a manner such that the direction of rotation of the shaft of motor 37 will be different for each of the two positions of the switch. For example, wires 110 and 111 connect to the brushes of a series A.C. motor, while wires 112 and 113 connect to the current supply for the brushes. Wires 110 and 111 lead to the switch arms 114 and 115, respectively, of switch 46. Wire 112 leads to contact 116 of one pole of the switch, and to contact 117 of the opposite pole. Contacts 118 and 119 of the two poles are connected to wire 113. Thus with the switch arms 114 and 115 in the position illustrated, the armature of motor 37 is connected in one way with respect to the field coils of the motor, while when switch arms 114 and 115 are moved to contacts 117 and 118 respectively the armature is connected in the reverse manner with respect to the field coils of motor 37.

Upper limit switch 40 is a single pole, double throw, switch, having a switch arm 120 moveable alternatively between a pair of contacts 121 and 122. Lower limit switch 41 is a double pole, double throw, switch having switch arms 123 and 124, each having a pair of contacts 125-126 and 127-128 respectively. Switch 130 is a starting switch.

Included in the control means are a pair of relays, generally 131 and 132. Relay 131 includes an operating coil or solenoid 133, a first normally open switch arm

and contact 134 and 135, a second normally open switch arm and contact 136 and 137, and a third normally open switch arm and contact 138 and 139. Relay 132 has a coil or solenoid 140, a first normally open switch arm and contact 141 and 142, a second normally closed switch arm and contact 143 and 144, and a third normally open switch arm and contact 145 and 146.

An electrical switch actuating timer, generally 150, has a drive motor 151, which rotates a plurality of cams 152-156. Cam 152 actuates a switch formed of contacts 157 and 158. Cam 153 actuates a switch comprising contacts 159 and 160. Cam 154 actuates a switch comprising contacts 161 and 162. Cam 155 actuates a switch formed by contacts 163 and 164. Cam 156 actuates a switch comprising contacts 165 and 166.

Wires 170 and 171 lead to a suitable source of electric power. Wire 170 is connected to all of contacts 158, 160, 162, 164 and 166, to one side of starting switch 130, to contact 125 of switch 41, to contact 139 and 137 of relay 131, and to contacts 144 and 146 of relay 132. Wire 171 connects to one side of each of coils 101, 109, 107, 108, 133 and 140, as well as to one side of each of motors 37 and 151. A wire 172 connects the opposite side of motor 151 to switch arm 145. A wire 173 connects switch arm 143 with switch arm 124. A wire 174 connects contact 159 to contact 126. Wire 175 connects the other side of motor 37 with switch arm 120. A wire 176 connects contact 157 with switch arm 141. A wire 177 connects contact 142 and one side of coil 140 with pressure actuated switch 104. A wire 178 connects contact 161 with switch arm 134. A wire 179 connects contact 163 with solenoid 109. A wire 180 connects contact 165 with pressure operated switch 92. A wire 181 connects pressure operated switch 104 with switch arm 138. A wire 182 connects pressure operated switch 92 with solenoid 101. Wire 183 connects switch arm 136 with solenoids 107 and 108. A wire 184 connects contact 121 with starting switch 130. A wire 185 connects contact 122 with switch arm 123. A wire 186 connects contact 128 with contact 135 and coil 133 of relay 131.

At the start of the operation the probe 17 will be at the upward end of its stroke. At that time the various switch arms illustrated in FIGURE 5 will be positioned as illustrated in that figure. The various cams of the switch actuating timer 150 will position the contacts of that timer as follows: contacts 157 and 158 will be open; contacts 159 and 160 will be open; contacts 161 and 162 will be closed; contacts 163 and 164 will be open, and contacts 165 and 166 will be closed. All of the valves are closed.

The body 11 of tobacco removed from a hogshead is rolled into chamber 10 through door 12 on dolly 13. The body of tobacco is positioned within chamber 10 such that the axis of the body of tobacco is coincident with the axis of probe 17. Door 12 is closed, and the cycle is now started by momentarily closing switch 130. The closing of switch 130 sets up a circuit from wire 170 through switch 130, contact 121, switch arm 120, wire 175, motor 37 and wire 171. Motor 37 commences to rotate in a direction such that the pressure member 25 moves probe 17 downwardly. The initial downward movement of pressure member 25 repositions the upper limit switch 40 so that switch arm 120 now is on contact 122. This creates a circuit from wire 170, contact 125, switch arm 123, wire 185, switch arm 120 and wire 175 to motor 37. Thus the motor remains energized so as to continue to drive probe 17 downwardly with the pointed end 17a of the probe penetrating the body of tobacco 11.

When the probe reaches the proper position within the body 11 of tobacco, limit switch 41 is actuated by rod 44. The top switch arm 123 of limit switch 41 moves to contact 126 opening the circuit to motor 37 so that the motor stops and the downward movement of probe 17 is discontinued. The bottom switch arm 124 moves to contact 123 which energizes relay 131. The energizing circuit for relay coil 133 is as follows: wire 170, contact 144 of

relay 132, switch arm 143, wire 173, switch arm 124, contact 128, wire 186, coil 133 and wire 171. Energizing coil 133 closes all of switch arms 134, 136 and 138 against their respective contacts. The bottom contact arm is a locking contact arm to hold relay 131 closed. The circuit therefor is wire 170, contacts 162 and 161 of the timing apparatus 150, wire 178, switch arm 134, contact 135, coil 133 and wire 171.

Switch arm 136 energizes solenoids 107 and 108 of valves 77 and 79 respectively to open these valves. The circuit therefor is wire 170, contact 137 of relay 131, switch arm 136, wire 183, solenoids 107 and 108, and wire 171. Referring back to FIGURE 1, it will be seen that the opening of valve 77 supplies steam to ejector 73 so as to commence drawing a vacuum on the low pressure side thereof. Valve 79 opens to place the low pressure side of ejector 73, in communication with the hollow interior of probe 17. The closing of switch arm 138 does not establish a circuit at this time because the contacts of pressure operated switch 104 are open.

When the pressure within chamber 10 has dropped to the desired operating level, say, 5 in. Hg. abs., switch 92 will be actuated to close the contacts thereof. This creates a circuit to open valve 100 as follows: wire 170 contacts 166 and 165 of timing apparatus 150, wire 180, switch 92, wire 182, solenoid 101 and wire 171. The opening of valve 100 renders valve 85 subject to the control of the pneumatic control apparatus of recording thermometer 95. Since the temperature within chamber 10 is at substantially ambient temperature, valve 85 will be opened to admit steam from pipe 78 to T 87 in the interior of chamber 10. The steam commences raising the temperature within the interior of chamber 10, which is sensed by thermometer bulb 93. In addition, due to the continued vacuum being applied to the interior of probe 17, steam is drawn through the body of tobacco 11, commencing the moistening of the tobacco.

When the temperature within chamber 10 has been raised to a predetermined minimum, say 120 degrees F., pressure operated switch 104 is closed by the air pressure supplied to pipe 97 from the recording thermometer apparatus 95. The closing of switch 104 establishes a circuit to pick up relay 132. This circuit is as follows: wire 170, contact 139 and switch arm 138 of relay 131, wire 181, switch 104, wire 177, coil 140 and wire 171. Switch arms 141 and 145 of relay 132 close against their contacts, while switch arm 143 moves away from its contact 144. The movement of switch arm 143 breaks the circuit that initially energized coil 133 of relay 131, but this relay remains picked up as a result of the previously described holding circuit through contacts 161 and 162 of the timing apparatus 150.

Switch arm 145 starts timer motor 151 by a circuit from wire 170, contact 146, switch arm 145, wire 172, motor 151, and wire 171. Motor 151 commences rotating to provide a timed operation of cams 152-156. The initial rotation of cam 152 closes contacts 157 and 158 to establish a holding circuit for relay 132. This circuit is from wire 170, contacts 153 and 157, wire 176, switch arm 141, contact 142, coil 140, and wire 171.

The rotation of cam 155 closes contacts 163 and 164 to operate valve 89. The circuit therefore is from wire 170, contacts 164 and 163, wire 179, solenoid 109 and wire 171. The opening of valve 89 permits some of the steam from the discharge side of steam ejector 73 to be returned to chamber 10 through pipes 88 and 90. While stack 74 is opened to the atmosphere at the end thereof, the length of the stack is sufficient to create some back pressure at the low pressure side of steam ejector 73, which results in the return of a portion of the steam from the steam ejector to chamber 10. It is important to remember that substantially all of the air was exhausted from chamber 10 and from the system much earlier in the cycle. Thus, all that is being returned from steam ejector 73 is a portion of the steam from pipes 75 and 76.

The steaming period now continues for a predetermined length of time. During this steaming period the return of steam from steam ejector 73 reduces the necessity for the addition of live steam from pipe 78 to chamber 10 through valve 85. Thus, as the temperature within chamber 10 approaches a predetermined maximum operating level, the increase in temperature sensed by bulb 93 causes the pneumatic control apparatus of the recording thermometer 95 to close valve 85 sufficiently to maintain the temperature within chamber 10 at this predetermined maximum operating level. Of course the partial closing of valve 85 reduces the amount of steam from pipe 78 that is delivered through pipe 86 into chamber 10. Thus there is a saving of steam by the return of steam from steam ejector 73 through pipe 88 and valve 89 to chamber 10, while at the same time valve 85 is automatically regulated to maintain a given operating temperature within chamber 10.

The length of the steaming cycle will be determined in advance, and is controlled by the continued rotation of cams 152-156 by motor 151. At the end of the steaming period contacts 165 and 166 of the timing apparatus 150 open to break the circuit through solenoid 101 and close valve 100. This shuts off the communication between controller 95 and valve 85, to permit valve 85 to close and discontinue the supply of steam to chamber 10. Contacts 161 and 162 of the timing apparatus 150 open to break the holding circuit for relay 131, and allow the relaxation of that relay. Switch arm 136 moving away from contact 137 of relay 131, breaks the circuit through solenoids 107 and 108 to close valves 77 and 79. Valve 77, upon closing, shuts off the supply of steam to ejector 73, whereupon air pours down stack 74 from the open end of the stack. The air returns from stack 74 through pipe 88, valve 89, and pipe 90 to chamber 10. The closing of valve 79 at the same time as valve 77 prevents any air from returning to chamber 10 through probe 17. This is important to prevent damage to the tobacco in body 11. Opening of switch arm 138 breaks the circuit that initially closed relay 132, and prevents the temperature within chamber 10 from having any effect upon the further operation of relay 132—as it otherwise might through the contacts of switch 104. However, relay 132 remains closed through the locking circuit of contacts 157 and 158 of timing apparatus 150.

The readmission of air to chamber 10 opens the contacts of switch 92. Thereafter, contacts 165 and 166 may be closed for the start of the subsequent cycle without affecting the further operation of the present cycle. Similarly, contacts 161 and 162 of the timing apparatus 150 may be closed for the subsequent cycle without affecting the present cycle, since relay 131 already is relaxed, and switch arm 134 is away from contact 135 thereof.

Contacts 159 and 160 are closed to again energize drive motor 37. Since switch 46 was repositioned early in the cycle, i.e., when pressure member 25 was lowered to the position illustrated in FIGURES 1 and 2, energizing drive motor 37 rotates shaft 36 in the opposite direction from which it was rotated during the lowering of probe 17. The circuit for energizing motor 37 is from wire 170, contacts 160 and 159 of timing apparatus 150, wire 174, contact 126 and switch arm 123 of lower limit switch 41, wire 185, contact 122 and switch arm 120 of upper limit switch 40, wire 175, motor 37, and wire 171. Again the initial upward movement of pressure member 25 results in a repositioning of lower limit switch 41. However, the circuit to drive motor 37 is continued from wire 170, contact 125, switch arm 123, wire 185, contact 122, switch arm 120, wire 175, motor 37 and wire 171. Thus the drive motor 37 continues to raise pressure member 25 and withdraw probe 17 from the body of tobacco 11.

Thereafter contacts 159 and 160 of the timing apparatus 150 may be opened to the proper position for the commencement of the following cycle. Contacts 163 and 164 now may be opened to allow valve 89 to close for

the start of the subsequent cycle. Also, at about this time contacts 157 and 158 are opened to end the cycle of timing apparatus 150. The opening of contacts 157 and 158 breaks the holding circuit through coil 140 of relay 132, allowing relay 132 to relax and open the circuit to timer motor 151 through switch arm 145 of relay 132.

In the meantime drive motor 37 will remain energized until pressure member 25 reaches the upper limit of its travel and actuates the upper limit switch 40. At the same time the reversing switch 46 will be actuated. The repositioning of switch arm 120 of the upper limit switch 40 breaks the circuit that was energizing motor 37 through contact 122 of switch 40. The cycle of the control apparatus 94 is now completed and merely awaits the momentary reclosing of starting switch 130 to set the apparatus in motion for a subsequent cycle. Upon the completion of the cycle, door 12 is opened, and the dolly 13 with the body 11 of tobacco thereon is removed from the chamber. A second body 11 of tobacco removed from a hogshead and positioned on a dolly 13 now is rolled into chamber 10, positioned in alignment under probe 17 and door 12 closed. Immediately upon the closing of door 12, switch 130 may be closed momentarily to initiate the next cycle, corresponding to the cycle previously described.

The foregoing detailed description is for the purpose of clarity and of providing a full understanding of our invention, and should not be construed as imposing any unnecessary limitations on the appended claims since modifications and variations of the detailed description of our invention will be apparent to those skilled in the art. For example, should it be desired not to include the probe inserting apparatus 16 as a part of the process cycle, switch arm 124 and contact 128 may be used as a starting switch for the steaming process cycle. A momentary closing of switch arm 124 against contact 128 will start the processing cycle as previously described, and the cycle will be completed upon the deenergizing of motor 151 by the relaxation of relay 132. In such a case, of course, the probe may be inserted by the probe inserting device 16 operated independently, or by other suitable apparatus.

The present application is a continuation of our prior application Serial No. 87,348, filed February 6, 1961, now abandoned.

We claim:

1. The process of moistening a body of tobacco characterized by the steps of: placing the body of tobacco in an enclosed chamber having a steam evacuator associated therewith; driving an apertured probe into the body of the tobacco from a wall of the chamber, said probe being connected at one end to the steam evacuator; passing steam into said evacuator and evacuating the chamber by exhaustion through the probe; introducing steam into the chamber while maintaining the evacuation through the probe; and thereafter introducing spent steam from the evacuator into the chamber and progressively reducing the fresh steam quantity as required to maintain a predetermined desired temperature and maintaining the same until the tobacco has received a predetermined desired quantity of moisture.

2. The process of moistening a body of tobacco in a closed chamber utilizing a perforate probe extending into said body with said probe communicating with the low pressure side of a steam ejector having a discharge side, said process comprising the steps of: supplying steam to said ejector to evacuate said chamber; after the pressure in said chamber has been reduced below about 10 inches of mercury, absolute, introducing fresh steam into said chamber; after the temperature in said chamber has reached substantially a predetermined value, establishing a fluid communication between said discharge side and said chamber to return a portion of the spent steam from said discharge side to said cham-

ber; controlling the supply of fresh steam to maintain substantially a given temperature in said chamber; and after a given period of time, stopping communication between said probe and said low pressure side and discontinuing the supply of steam to said chamber and to said ejector whereby said chamber will return to atmospheric pressure through said communication between said chamber and said discharge side.

3. In an apparatus for treating a body of tobacco in a closed chamber utilizing a perforate probe extending into said body with said probe being connected to the low pressure side of a steam ejector having a discharge side, the improvement comprising: means including a first valve to supply steam to said ejector; means including a second valve to supply steam to said chamber; means including a third valve connected to said discharge side and to said chamber to return a portion of the spent steam from said ejector to said chamber; and control means including a pressure responsive device and a temperature responsive device in said chamber, said control means being connected to said valves to initially open said first valve, to open said second valve after the pressure in said chamber has been reduced below about 10 inches of mercury, absolute, to open said third valve after the temperature in said chamber has reached substantially a predetermined value, and thereafter to position said second valve to maintain substantially a given temperature in said chamber.

4. Apparatus for treating a body of tobacco comprising: a closed chamber for receiving said body; a hollow perforate probe extending into said body; a steam ejector having a steam supply connection, a low pressure connection, a vent and a discharge side communicating with atmosphere through the vent; means including a first valve connecting the hollow interior of said probe with said low pressure connection; means including a second valve connected to said steam supply connection to supply steam to said ejector; means including a third valve communicating with the interior of said chamber to supply steam thereto; means including a fourth valve connecting said discharge side and said chamber to provide fluid communication therebetween; and control means including a pressure responsive device and a temperature responsive device in said chamber, said control means being connected to said valves to initially open said first and second valves, to open said third valve after the pressure in said chamber has reached substantially a predetermined degree of vacuum, to open said fourth valve after the temperature in said chamber has reached substantially a predetermined value, to control the position of said third valve to maintain substantially a given temperature in said chamber, and to close said first, second and third valves after a given period of time whereby said chamber will return to atmospheric pressure through said vent and said fourth valve.

5. In an apparatus for treating a body of tobacco in a closed chamber, the improvement including: a hollow perforate probe mounted in a first position at which said probe is spaced from said body and moveable to a second position at which said probe extends into said body of tobacco; power means connected to said probe to move said probe between said two positions; a steam ejector having a steam supply connection, a low pressure connection, a vent and a discharge side communicating with atmosphere through the vent; means including a first valve connecting the hollow interior of said probe with said low pressure connection; means including a second valve connected to said steam supply connection to supply steam to said ejector; means including a third valve communicating with the interior of said chamber to supply steam thereto; means including a fourth valve connecting said discharge side and said chamber to provide fluid communication therebetween;

and control means including a pressure responsive device and a temperature responsive device in said chamber, said control means being connected to said valves and to said power means to initially move said probe from said first to said second position, to open said first and second valves, to open said third valve after the pressure in said chamber has reached substantially a predetermined degree of vacuum, to open said fourth valve after the temperature in said chamber has reached substantially a predetermined value, to control the position of said third valve to maintain substantially a given temperature in said chamber, to close said first, second and third valves after a given period of time whereby said chamber will return to atmospheric pressure through said vent and said fourth valve, and thereafter to move said probe from said second to said first position.

6. In an apparatus for treating a body of tobacco in a closed chamber having a wall, the improvement including: a hollow perforate probe having a pointed end, said probe being positioned to extend through the wall of said chamber with the pointed end towards the interior of said chamber in line with the middle of one side of said body, said probe being moveably mounted with respect to said chamber for movement between a first position at which said end is spaced from said side to a second position at which said probe extends into said body with said pointed end adjacent the opposite side of said body; power means connected to a portion of said probe outside said chamber to move said probe between said two positions; a collar rigidly affixed to said probe in position thereon such that said collar will be in slightly spaced relation to the chamber when said probe is in said second position; a portion integral with and extending outwardly from said chamber, said portion having a central opening therethrough to define means to permit the probe to pass therethrough into the chamber, said portion further defining a radially outwardly extending flange at the uppermost terminal thereof; an O-ring interposed between said collar and said radially outwardly extending flange of said chamber and adapted to be compressed therebetween to form a fluid seal therebetween when said probe is in said second position; a steam ejector having a steam supply connection, a low pressure connection, a vent and a discharge side communicating with atmosphere through the vent; means including a first valve connecting the hollow interior of said probe with said low pressure connection; means including a second valve connected to said steam supply connection to supply steam to said ejector; means including a third valve communicating with the interior of said chamber to supply steam thereto; means including a fourth valve connecting said discharge side and said chamber to provide fluid communication therebetween; and control means including a pressure responsive device and a temperature responsive device in said chamber, said control means being connected to said valves and to said power means to initially move said probe from said first to said second position, to open said first and second valves, to open said third valve after the pressure in said chamber has reached substantially a predetermined degree of vacuum, to open said fourth valve after the temperature in said chamber has reached substantially a predetermined value, to control the position of said third valve to maintain substantially a given temperature on said chamber, to close said first, second and third valves after a given period of time whereby said chamber will return to atmospheric pressure through said vent and said fourth valve, and to move said probe from said second to said first position.

7. In an apparatus for treating a body of tobacco in a closed chamber with the body having one side upwardly and the opposite side supporting said body, said body having an axis extending between said sides, the improvement including: a hollow perforate probe having a pointed end, said probe extending through the top of said chamber

in alignment with said axis and with the pointed end downwardly, said probe being moveably mounted with respect to said chamber for movement between a first position at which said end is spaced from said one side to a second position at which said probe extends into said body with said pointed end adjacent the opposite side of said body; power means connected to a portion of said probe outside said chamber to move said probe between said two positions; a collar rigidly affixed to said probe in vertical relation thereon such that said collar will be in spaced relation to the chamber when said probe is in said second position; a portion defined on said chamber, said portion having an opening extending therethrough adapted to telescopically receive the probe therein; an O-ring interposed between said collar and said portion of said chamber and adapted to be compressed therebetween to form a fluid seal therebetween when said probe is in said second position; a slanting roof within said chamber, spaced from the top thereof and extending over said body, said roof having an aperture through which said probe may extend; seal means between said probe and said roof when said probe is in the second position to prevent water from running down said probe from the space above said roof; a steam ejector defining a vent therein and having a steam supply connection, a low pressure connection and a discharge side communicating with atmosphere through said vent; means including a first valve connecting the hollow interior of said probe with said low pressure connection; means including a second valve connected to said steam supply connection to supply steam to said ejector; means including a third valve communicating with the interior of said chamber to supply steam thereto; means including a fourth valve connecting said discharge side and said chamber to provide fluid communication therebetween; and control means including a pressure responsive device and a temperature responsive device in said chamber, said control means being connected to said valves and to said power means to initially move said probe from said first to said second position, to open said first and second valves, to open said third valve after the pressure in said chamber has reached substantially a predetermined degree of vacuum, to open said fourth valve after the temperature in said chamber has reached substantially a predetermined value, to control the position of said third valve to maintain substantially a given temperature on said chamber, to close said first, second and third valves after a given period of time whereby said chamber will return to atmospheric pressure through said vent and said fourth valve, and to move said probe from said second to said first position.

8. In an apparatus for treating a body of tobacco in a closed chamber, having a wall, the improvement including: a hollow perforate probe having a pointed end, said probe being positioned to extend through the wall of said chamber in line with the middle of one side of said body, said probe being moveably mounted with respect to said chamber for movement between a first position at which said end is spaced from said side to a second position at which said probe extends into said body with said pointed end adjacent the opposite side of said body; power means connected to a portion of said probe outside said chamber to move said probe between said two positions; a collar rigidly affixed to said probe in position thereon such that said collar will be in spaced relation to the chamber wall when said probe is in said second position; a portion defined on said chamber wall, said portion having an opening extending therethrough adapted telescopically to receive the probe; an O-ring interposed between said collar and said portion of said chamber and adapted to be compressed therebetween to form a fluid seal therebetween when said probe is in said second position; means connected to said probe to draw a vacuum therethrough; and means communicating with said chamber to admit steam thereto.

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9. In an apparatus for treating a body of tobacco in a closed chamber with the body having one side upwardly and the opposite side supporting said body, said body having an axis extending between said sides, the improvement including: a hollow, tubular, perforate, probe having a pointed end, said probe extending through the top of said chamber in alignment with said axis and with the pointed end downwardly, said probe being moveably mounted with respect to said chamber for movement between a first position at which said end is spaced from said side to a second position at which said probe extends into said body with said pointed end adjacent the opposite side of said body; means on the top of said chamber defining an opening through which said probe may extend, said opening being substantially larger than the cross-sectional dimensions of said probe, said means defining a flange about said opening; power means connected to a portion of said probe outside said chamber to move said probe between said two positions; a collar on said probe outside said chamber and positioned to substantially abut said flange when said probe is in said second position; an O-ring interposed between said collar and said flange to form a fluid seal therebetween when said probe is in said second position spaced from the top thereof; a slanting roof within said chamber, and extending over said body, said roof having an aperture through which said probe may extend, said aperture being substantially larger than the cross-sectional dimensions of said probe; seal means between said probe and said roof when said probe is in the second position to prevent water from running down said probe from the space about said roof; means connected to said probe to draw a vacuum therethrough; and means communicating with said chamber to admit steam thereto.

10. An apparatus for treating a body of tobacco through movement of fluid in a path of travel through the body, comprising in combination: means defining a chamber adapted to receive the body of tobacco and having a wall in proximity to the body; an apertured probe adapted to penetrate the body of tobacco and thereby establish a path for fluid travel through the body; means reciprocally mounting the probe in relation to said wall, whereby in the retracted position the probe is withdrawn from the central portion of the chamber to permit insertion and removal of the body of tobacco and in the extended position the probe penetrates the body of tobacco, said means being further capable of driving the probe through the body of tobacco from retracted to extended position; a collar rigidly affixed to said probe, said collar being in spaced relation to the chamber wall when said probe is in said extended position; and an O-ring interposed between the collar and the chamber wall and adapted to be compressed therebetween when the probe is in said extended position to define a seal therebetween when the probe is in extended position.

11. The process of moistening a body of tobacco in a closed chamber having a steam ejector operatively associated therewith, said ejector defining a low pressure side and a discharge side, said process comprising the steps of: placing a perforated probe into the interior of said

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body of tobacco from a wall of the chamber, one end of said perforated probe being connected to the low pressure side of said steam ejector; supplying steam to said ejector to evacuate said chamber through said probe; supplying fresh steam to said chamber while maintaining evacuation through the probe; returning a portion of the steam from the discharge side of said ejector to said chamber; and controlling the supply of fresh steam to maintain substantially a given temperature in said chamber.

12. The process of moistening a body of tobacco in a closed chamber having a steam ejector operatively associated therewith, said ejector defining a low pressure side and a discharge side, said process comprising the steps of: placing a perforated probe into the interior of said body of tobacco from a wall of the chamber, one end of said perforated probe being connected to the low pressure side of said steam ejector; supplying steam to said ejector to evacuate said chamber through the probe; introducing fresh steam into said chamber while maintaining evacuation through the probe and after the pressure in said chamber has been reduced below about 10 inches of mercury, absolute; returning a portion of the spent steam from said discharge side to said chamber after the temperature in said chamber has reached substantially a predetermined value; and controlling the supply of fresh steam to maintain substantially a given temperature in said chamber.

13. The process of moistening a body of tobacco in a closed chamber having a steam ejector operatively associated therewith, said ejector defining a low pressure side and a discharge side, said process comprising the steps of: placing a perforated probe into the interior of said body of tobacco from a wall of the chamber, one end of said perforated probe being connected to the low pressure side of said steam ejector; supplying steam to said ejector to evacuate said chamber through said probe; introducing fresh steam into said chamber while maintaining evacuation through the probe and after the pressure in said chamber has been reduced below about 10 inches of mercury, absolute; returning a portion of the spent steam from said discharge side to said chamber after the temperature in said chamber has reached a temperature of about 100° F.; and controlling the supply of fresh steam to maintain a temperature of between about 125° F. and 135° F. in said chamber.

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