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TREATING TOBACCO IN HOGSHEADS

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5 Claims. (Cl. 131—55)

This invention relates to a process of increasing the hydrophilic character of tobacco in hogsheads and is a continuation-in-part of my copending applications Serial No. 155,776 filed July 26, 1937, and Serial No. 167,858 filed October 7, 1937.

Tobacco is a very peculiar material and the problem of moistening it, particularly in large compressed bulk such as in hogsheads, is an involved and intricate one. With most substances it is sufficient to remove all air from the material, after which any steam introduced will penetrate at once throughout the product and moisten it. In the case of tobacco, particularly when so packed, even when all of the air has been removed from the tobacco, "cold spots" will sometimes occur in the tobacco upon the subsequent steaming. Sometimes these cold spots are quite extensive in size and they may be at the center of the hogshead, on the very edge, or at practically any point throughout it.

These cold spots appear to be due to the hydrophobic character of tobacco under certain conditions. When the spray process of the Bailey application, Serial 205,652, filed May 2, 1938, is employed, the cold spots show that the tobacco is hydrophobic also to liquid water. In many instances this hydrophobic character will prevail through several steaming and evacuation cycles.

In processes such as those described in my copending applications referred to above, it has been found that a thermometer in the center of a cold spot will frequently show no increase in temperature upon steaming but will show an increase in temperature upon a subsequent deep evacuation cycle.

For example, a hogshead of Kentucky burley tobacco having an initial temperature of 90.5° F. was subjected to a vacuum until the temperature had dropped to 82° F., whereupon steam was introduced to bring the bulk of the tobacco to 157° F. A bulb in the center of a cold spot, however, remained at approximately 82° F., in fact actually indicating 80.5° F. at the termination of the steaming operation. Thereupon the tobacco was subjected to an increased vacuum until its temperature had dropped to 117° F. in those portions which had shown the temperature increase upon steaming. During this evacuation operation the temperature in the cold spot rose to 91° F. Somewhere in this range the tobacco became hydrophilic so that upon a second steaming operation, the bulk of the tobacco was steamed to 160° F. and the temperature in the cold spot rose to 140° F. In the cycle just described, water was sprayed in with the first steaming operation. The operation was stopped at the point described and it was found that, as expected, the cold spot had not been completely eliminated.

In another operation Kentucky burley tobacco in a hogshead showed a temperature of 78.5° F. six inches from the outside, and of 82° F. at the center. The hogshead was evacuated until the center thermometer showed 70° F. and the outside 71.5° F. A first steaming and spraying operation was then carried out, the outer bulb going to 160° F. and the inner bulb to only 80° F. A relatively heavy evacuation was carried out during which the center bulb rose to 88° F., while the outer one fell to 102° F. During this cycle the tobacco in the cold spot became hydrophilic. Upon the next steaming operation both bulbs rose to approximately 156° F.

In another operation a hogshead of Kentucky burley tobacco showed a temperature near the outside of 82° F., and at the center of 78° F. A vacuum was pulled until the center temperature had dropped to 70° F. Thereupon, steam was introduced until the outer temperature had reached 160° F. At this time the center temperature was only 80° F. A vacuum was then pulled until the outer temperature had dropped to 91° F. during which time the center temperature rose to 95° F. Again the tobacco became hydrophilic so that upon a second steaming operation in which the outer temperature rose to 161° F., the inner temperature rose to 160° F.

In another operation upon Kentucky burley tobacco the center temperature remained at 68° F. upon steaming following evacuation, whereas the outer temperature went to 161° F. Upon evacuating again, the outer temperature was reduced to 75° while the inner temperature rose to 78°. Upon a second steaming the outside temperature was carried to 165°, whereas the inner temperature went only to 87° F. The tobacco was still hydrophobic and upon third evacuation the outer temperature was reduced to 124° while the inner temperature rose to 96°. This markedly increased the hydrophilic character of the tobacco in the cold spot and on a third steaming cycle the outer temperature was carried to 164° and the inner temperature went to 125° F. In the first two steaming operations water spray, in accordance with the Bailey application, was employed.

While the most hydrophobic tobacco generally appears near the center of the hogshead, this is not always the case. One reason why it appears more frequently is possible that when a ther-

mometer is inserted only six inches from the outside it tends to provide a pathway along which the steam can go. The thermometer then becomes heated and transfers warmth to the surrounding tobacco so that there is a general tendency in this manner to render adjacent tobacco hydrophilic. Thus, the frequency of observing exterior cold spots with a thermometer is far less than the actual occurrence of such phenomena. It may also be that the center of the hogshead becomes hotter during fermentation processes in storage and that in this way it becomes more hydrophobic.

The paradoxical rise in temperature during the evacuation cycle would appear to be due to the passage of steam boiled from the hotter portions of the tobacco through the colder portions. It would appear that when the tobacco has been heated to approximately 90–100° F., even the most hydrophobic material requires an increased ability to pick up moisture; but many hydrophobic tobaccos retain some of their hydrophobic characteristics above this range. It is somewhat difficult to give a specific hydrophobic limit because tobaccos differ so widely. At about 110° F. to 125° F., however, the temperature seems to change the tobacco to such an extent that it is markedly hydrophilic in substantially all cases.

The reasons for the development of hydrophilic characteristics are not at all understood. It is a fact that as tobacco is heated, even without an increase in moisture content, its pliability increases. This indicates, of course, that water in chemical combination has been driven out of the combined form and has become available as water. The same phenomenon is familiar in the case of other organic products such as bread, which become apparently much wetter upon heating.

The more pliable tobacco becomes, the more hydrophilic it appears to become. Therefore, the repetition of the cycles is not only important in making the tobacco receptive to steam but is even more important in connection with the spray process described in the Bailey application. In connection with that process it has been found highly desirable to steam the tobacco before spraying it. This is true, surprisingly enough, even though the tobacco is then reduced almost to the temperature which it originally had, inasmuch as some of the hydrophilicness appears to be retained for a short while after cooling.

In accordance with this invention, therefore, tobacco in hogsheads is treated by a cycle of operations which are sufficient to insure that for the particular kind of tobacco all portions will not only have become hydrophilic, but that ample opportunity shall have been afforded for it to receive its due proportion of water either as steam or in liquid form, or from both sources. For the darker tobacco, such as Kentucky burley, with which a temperature of 140° to 160° F. may be employed with safety, an operating procedure consisting of five cycles is satisfactory to carry out the regular processing of a factory. Such a process may be carried out day after day without the occurrence of any substantial amount of cold and dry tobacco.

Where bright tobaccos are treated, a procedure consisting of five cycles is likewise satisfactory where temperature ranges to say about 140° F. top can be employed. Where, however, the maximum temperature permitted at any time is say 120° F. it is frequently found necessary to increase the number of cycles.

It has been discovered that by following a very simple formula, the steaming and evacuating steps may be regulated so that under all normal conditions tobacco of whatever usual type may be treated without the occurrence of any substantial number of cold spots.

These formulae are applicable regardless of the maximum temperature to which the tobacco is subjected.

These formulae are as follows:

$$A \times B = \text{at least } 20$$
$$C \times D = \text{at least } 50$$

In the above formulae "A" is always more than 1, and equals the number of evacuation steps following a steaming step in which the absolute pressure falls at least as low as 4 inches of mercury; "B" represents the total inches of mercury that the pressure drops during the evacuation steps; "C" is greater than 2, and represents the number of steaming steps following evacuations to at least 4 inches absolute; and "D" represents the total inches increase in pressure during such steaming steps.

Preferably the product of A and B should be at least 30, and the product of C and D at least 64.

For example, leaf tobacco was controlled by a pressure control; the absolute pressure being dropped initially to approximately 0.22 inch; steam and water spray being introduced to bring the pressure to 4.4 inches; a pressure of 1.30 then being produced by evacuation; steam being admitted to bring the pressure to 5.7 inches; the vacuum being again increased until the pressure had dropped to 1.60 inches; steam being admitted to bring the pressure to 5.90 inches; the pressure then being dropped to 2.40 inches; steam being admitted to bring it back up to 6 inches; pressure then being dropped to 2.40 inches again; and finally being brought back up by steam to 6 inches.

In this operation there were four evacuation cycles following steaming cycles with a total evacuation of 14.3 inches, so that the product of A and B was 57.2 or well above the minimum for proper treatment. At the same time the total steaming represented 20.1 inches and there were five steps, so that the product was 100.5, again leaving a considerable margin of safety. However, if the process had been stopped at the end of the third steaming, the products of A and B and of C and D would both have been too low.

In another operation in which higher temperatures and pressures were employed, an absolute pressure of 0.2 inch was produced followed by steaming to 4 inches. The pressure was then decreased to 0.4 inch, increased to 8 inches, decreased to 1.2 inches, increased to 8 inches, decreased to 1.4 inches and finally increased to 8.0 inches. Here again the product of A and B was well above 20, and the product of C and D was well above 50; but in both cases, if the final step had been omitted, the product would have been below that stated in the formula.

In an intermediate case, a vacuum of 0.25 inch of absolute pressure was produced; steam admitted to bring it to 3.6 inches; the pressure lowered to 1 inch, raised to 7 inches, lowered to 2.6 inches, raised to 6.8 inches, lowered to 2.6 inches, raised to 7 inches, lowered to 2.7 inches, and raised to 4.6 inches.

It is preferred that in the treatment there shall be at least two evacuations to an absolute pressure below 1.5 inches, and preferably to 1 inch or below. This is particularly true when employing a

water spray which is largely ineffective above 1 inch, even with hot water.

What I claim as new, and desire to secure by Letters Patent, is:

1. The method of treating tobacco in large compressed bulk such as hogsheads which comprises removing substantially all non-condensible gas from the tobacco to produce an atmosphere of steam at low pressure therein, admitting steam thereto under increased pressure to increase the temperature of the tobacco by condensation of water therein, decreasing the pressure to cause boiling of condensed water from the tobacco and lower its temperature, and repeating the successive steaming and evacuation cycles in accordance with the following formulae:

$$A \times B = \text{at least } 20$$
$$C \times D = \text{at least } 50$$

where A is greater than 1 and represents the number of evacuation steps following a steaming step in which the absolute pressure falls at least as low as 4 inches, B represents the total inches of evacuation during such evacuations, C is greater than 2 and represents the number of steaming steps following evacuations to at least 4 inches absolute, and D is the total inches increase in pressure during such steaming steps.

2. The method as set forth in claim 1, in which the product of A and B is at least 30 and the product of C and D is at least 64.

3. The method as set forth in claim 1, in which the absolute pressure is reduced as low as 1.5 inches of mercury at least twice.

4. The method as set forth in claim 1, in which the absolute pressure is reduced as low as 1 inch of mercury at least twice.

5. The method as set forth in claim 1, in which a micromist of water is introduced in an atmosphere of steam at increased pressure after completion of successive steaming and evacuation cycles in accordance with the formulae of claim 1.

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