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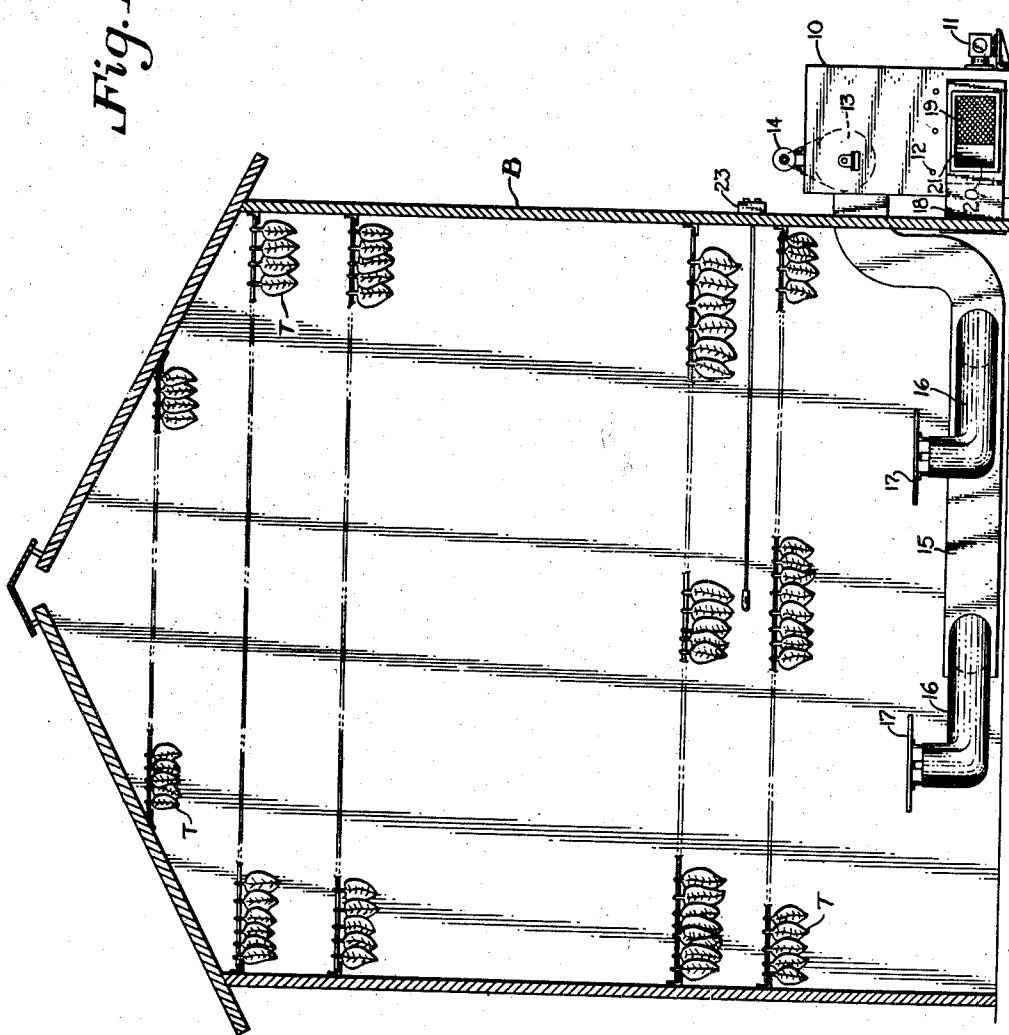
B. E. JONES
METHOD OF CURING TOBACCO

2,798,496

Filed May 5, 1953

2 Sheets-Sheet 1

Fig. 1



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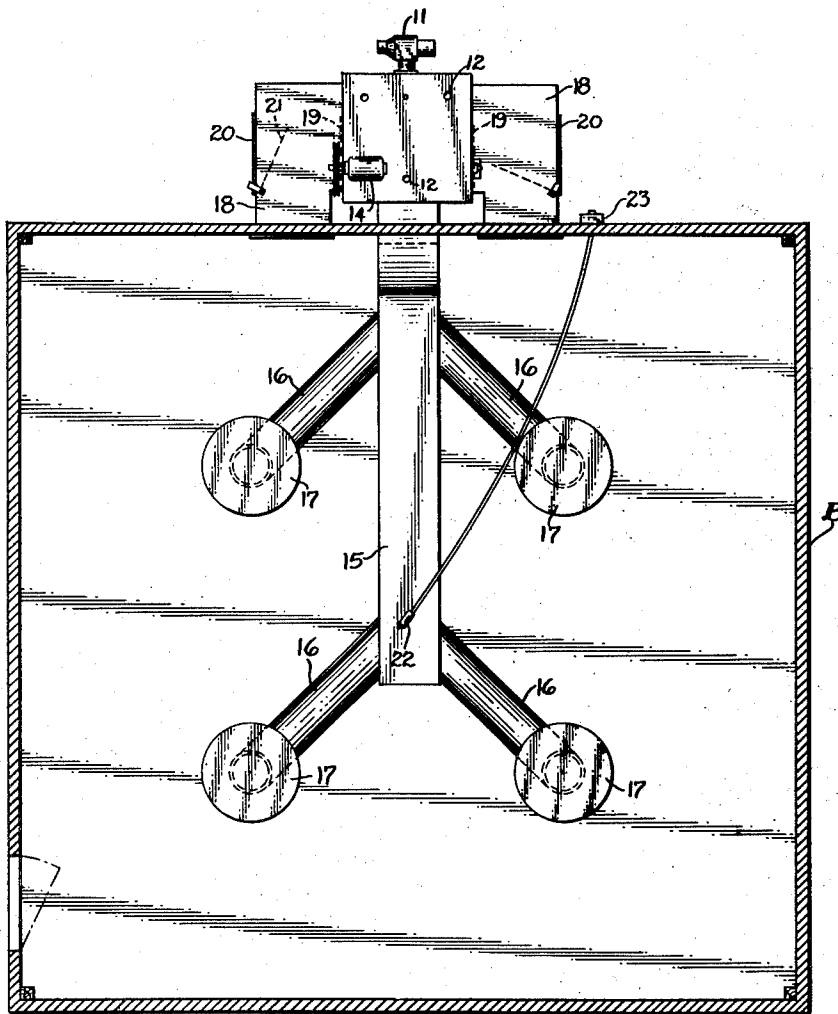
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2 Sheets-Sheet 2

Fig. 2



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METHOD OF CURING TOBACCO

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13 Claims. (Cl. 131—140)

The present invention relates to a method of curing tobacco, and more particularly to an improved method of curing "yellow leaf" type tobacco.

It is an object of the present invention to provide a method of curing yellow leaf tobacco which affords improved control of all stages of the cure and achieves better results as compared with present methods.

It is another object to provide a method of curing yellow leaf tobacco which reduces the time required for cure by present methods.

Another object is the provision of a method of curing yellow leaf tobacco which employs lower operating temperatures in providing the required heat, reducing the hazard of fire and lowering fuel costs.

Another object is the provision of a method of curing yellow leaf tobacco which requires only intermittent operation of the heating means to provide desired temperatures, so as to avoid unnecessary dissipation of moisture.

It is also an object to provide a method of curing yellow leaf tobacco in which the products of combustion of the heating means are utilized to furnish heat for effecting the cure.

A further object is the provision of a method of curing yellow leaf tobacco which employs forced circulation of air about the tobacco to control the humidity conditions in the curing space.

It is another object of the invention to provide a method of curing yellow leaf tobacco in which forced circulation of air about the tobacco affords a more thorough, uniform, and rapid cure.

Another object is the provision of an improved method of curing yellow leaf tobacco which provides better control of the cure, shortens the period required to complete the cure, accomplishes uniform treatment of all the tobacco, reduces the amount and cost of fuel required, achieves higher relative humidity when desired, and effects better results.

Other and further objects, advantages, and features of the invention will be apparent to those skilled in the art from the following description, taken in conjunction with the accompanying drawings, in which—

Fig. 1 is a vertical sectional view through a tobacco curing barn showing in elevation one type of heating means which may be employed with the barn for practicing the method of this invention; and

Fig. 2 is a horizontal sectional view through the barn showing the heating means in plan.

The type of tobacco grown in the southeastern United States, commonly known as "flue-cured" or "yellow leaf" tobacco, requires the application of heat under varying conditions of humidity for its curing. In general, the temperature is raised and the humidity reduced during the cure. The present method employs forced circulation of the air about the tobacco in a curing barn and recirculation of the air through the barn and intermittent heating means, with discharge of the products of combustion into the barn to utilize the heat thereof, to provide the required heat with only intermittent operation of the heat-

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ing means. It further provides for close control of the humidity from a maximum during the yellowing or color-setting stage to a minimum in the stem-killing stage, by exclusion or introduction of outside air in proper proportion to give the desired relative humidity within the barn under the temperature and moisture conditions prevailing therein. After curing, the tobacco is ordered by continuous forced circulation past it of outside air, greatly reducing the time required for this procedure.

The curing of yellow leaf tobacco is accomplished in the four successive stages of yellowing, yellowing and leaf drying, leaf drying, and stem killing, and is followed by an ordering period in which moisture is restored to the brittle tobacco to render it pliable. The yellowing stage is the most critical in the cure, since it largely determines the grade of the cured tobacco; the aim in this stage is to bring the tobacco to a "bright yellow" color and to set the color before drying of the tobacco begins. Accordingly, a relatively low temperature, in the approximate range of 90° to 115° F., is employed, and the humidity is kept as high as possible. In the yellowing and leaf-drying stage, the coloring is completed and drying is begun, the temperature being raised into a range above 110° F. and up to 140° F., and the humidity being lowered. During the leaf-drying stage, the temperature range is further raised to above the level obtaining in the preceding stage to about between 130° and 155° F., and the humidity reduced so that the moisture content of the tobacco is brought to a low level, completing the drying. In the next stage, in order to kill the stems of the tobacco leaves, the temperature is raised to a maximum, preferably not above 155° F., but in the range of about 140° to about 165° F., and practically all moisture is extracted from the tobacco so as to cause the stems to shrivel. While this completes the cure, the leaves are left in a very brittle condition so that they break very readily when handled, practically at a touch. The tobacco is therefore ordered or rendered pliable by exposing it to outside air, more humid than the atmosphere in the curing barn, to absorb moisture therefrom.

Because of the forced circulation of the air in the present method, the curing process is more rapid, while the recirculation of the heated air requires only intermittent operation of the heating means to maintain or raise the temperature, reducing fuel consumption. Consumption of fuel is further lowered by the discharge of the products of combustion into the barn so that the heat thereof is utilized instead of being wasted by discharge to outside atmosphere, as is the practice with prior methods. This also allows the operation of the heating means at a much lower temperature than is necessary with the prior methods and means, greatly minimizing the fire hazard. The intermittent operation and lower operating temperature of the heating means is also advantageous in avoiding "burning up" of the moisture content of the air so that a higher relative humidity may be attained, which is especially desirable in the initial yellowing or color-setting stage of the cure. The forced recirculation of air in the barn contributes both to the high degree of humidity desired in the initial curing stage and to the lowering of humidity in the later stages, or in other words largely controls the humidity. Better control of the curing process, as well as the shortening of the period required and a reduction in the costs involved, are obtained by the present method.

Prior methods of curing tobacco almost universally use burners of the pot or wick type located in the barn and having flues or stacks to carry off the products of combustion—together with a large proportion of the heat produced. The burners lack positive control of the heat and are costly to operate because they burn continuously. This continuous burning dissipates much of the moisture

in the air, which is particularly undesirable in the yellowing stage. The burners operate at high temperatures around 500° F. and often rising to 600° F. to provide the required tobacco-curing heat. These high operating temperatures rapidly burn out the flues, which consequently must be replaced every one or two years, and also cause frequent fires. Because of the high incidence of fire loss on tobacco curing barns, insurance rates are high and only partial coverage can be obtained. Gravity, or convectional, flow of the air in the barn is depended upon for distribution of the heat, there being no positive circulation of the air, so that much of the heated air escapes through vents in the roof in rising from the heaters, carrying with it much of the moisture extracted from the tobacco and thus lowering the humidity level obtainable in the barn and making difficult the proper control of humidity. An average of over one hundred hours or about four and one-half days is required for a cure. The prior curing method therefore is only loosely controllable, gives variable results, is expensive and wasteful, relatively slow, and generally unsatisfactory, yet no improved method has heretofore been provided.

The method of this invention remedies the defects of the now commonly used method, being efficient, positive and uniform in results, economical, and considerably more rapid. The manner of practicing the new method will be explained by reference to the curing barn and heating means as shown in the drawings. The barn, generally designated B, has a peaked roof with vent means of ordinary construction, and a door in one wall. Leaves of tobacco T are suspended on sticks supported in the barn, all in the usual way. The leaves are picked usually just when the color begins to turn from green to yellow, and some 80% to 90% of their weight is represented by water. The weight of tobacco placed in the barn at one time for curing, averaging about 10,000 pounds, and the moisture content varies over the curing season due to the different times at which the leaves are picked and the size of the leaves, the larger bottom leaves being picked first. Adjacent and outside one wall of the barn B is a heater casing 10 enclosing the refractory or combustion chamber (not shown) of an injection type oil burner 11 to which fuel is supplied in any desired manner. The upper portion of the casing 10 has a double wall extending downwardly somewhat below the top of the combustion chamber to provide a cooling jacket through which air may circulate by means of apertures 12 to maintain the casing at a relatively low temperature during operation of the burner. Mounted in the upper part of the casing is a blower 13 driven by a suitable electric motor 14 for drawing heated air and gaseous products of combustion from the combustion chamber and blowing them under pressure into the interior of the barn through a distributing duct 15 extending from the blower through the wall of the barn and along the barn floor. The duct is preferably located centrally of the barn and has a plurality of branch ducts 16 extending from the sides thereof to distribute the hot air and gases. The branch ducts are arranged with their discharge ends uniformly spaced about the barn and bent upwardly, with spreader plates 17 supported thereover to provide for uniform distribution of the air and gases from the ducts.

On each side of the heater casing 10 is a return duct 18 leading from the interior of the barn to the lower part of the casing to conduct cooler air from the barn to and about the combustion chamber, whence it may pass through the distribution duct 15. Each duct 18 communicates with the casing through a screened aperture 19, and outside of the wall has an intake opening 20 for outside air, closed by a hinged damper 21 which may be opened more or less to admit a desired quantity or proportion of outside air to the heater casing. Each damper is preferably so arranged that when fully opened to admit the maximum of outside air into its duct 18 and the casing 10, it closes the duct against passage of barn air therethrough,

so that the duct functions as an intake duct only and not as a return duct. In this way, any desired proportion of outside air may be brought into the barn for mixture with or replacement of the interior air. Thermostatic means 22, suitably located in the barn, which may be set from control means 23 outside the barn, are provided to control the operation of the burner 11 automatically, and suitable humidity-indicating means may also be used in the barn. The means 22 and 23 are shown only somewhat diagrammatically, and the humidity indicating means are not shown, since they may be of any desired type and their application and use is well known. The burner is operated only intermittently, while the blower 13 operates substantially continuously during the cure. The blower motor 14 is driven by electricity supplied from any suitable source, under control of appropriate switch means so arranged that the blower must be in operation before the burner 11 can be operated.

After the sticks of tobacco are racked in the barn, the door is closed, the dampers 21 are disposed to block the openings 20, and operation of the burner and blower is begun. The air in the barn is drawn through the ducts 18, about and past the combustion chamber in the casing 10 to be heated, and forced through the duct 15 for distribution by the branch ducts 16 through discharge outlets covered by plates 17 for circulation about the tobacco. At the same time, the products of combustion are drawn from the combustion chamber and blown through the ducts 15 and 16. The entire volume of air is circulated through the barn and heating means several times a minute, and since no appreciable volume escapes to be replaced by outside air, is quickly heated to the desired temperature, particularly since the hot products of combustion are admixed with it. In circulating about the tobacco, the heated barn air extracts moisture therefrom and loses some of its heat so as to become heavier than the warmer air flowing from the distribution duct, and moves both by gravity and the suction effect of the blower toward the barn floor and is drawn through the heater casing. This circulation and recirculation of the barn air continues even though the burner is not operating, the temperature then dropping slowly until the thermostatic control means automatically bring the burner into operation to again provide heat and raise the temperature. The thermostatic means are adjusted from time to time to effect a gradual temperature rise within the desired range, approximately between 90° and 115° F., during the yellowing or color-setting stage of the cure. It has been found that on the average the burner may operate for about one minute and then may be off for about twenty minutes, then again operates for a minute and remains inoperative for a twenty-minute period, and so on during this stage. By reason of the continuous recirculation of the air in the barn without any substantial replacement by outside air, the barn air quickly comes to a warm, moisture-laden condition approaching the saturation point, its relative humidity rising to and beyond 90%. This high humidity results largely from the extraction of moisture from the tobacco, but because of the large volume of tobacco in the barn and its high moisture content, the tobacco is not appreciably dried. The moisture content of the air and tobacco soon come into balance as the air is circulated, so that very little further extraction of moisture from the tobacco by the air occurs in this stage after the air humidity has once been brought up to a maximal point. The tobacco is thus maintained in a substantially moist, undried state while being subjected to relatively low heat, so that it slowly comes to the desired bright golden yellow color instead of turning a dark color as would be the case if it should become dried or begin to dry too soon. The yellow color becomes "set" by the heat, and even though it is not necessarily altogether uniform throughout the leaf, drying of the leaf may safely begin without risk of turning to a dark color. This setting of the bright yellow color

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requires about 40 hours. During this period, the humidity within the barn is maintained substantially higher than that normally obtaining outside, and the temperature ranges considerably above the outside temperature. Because of the forced circulation of the air and the utilization of the gaseous products of combustion, the operating temperature of the heater is relatively low, the temperature at the discharge opening of the casing into the distributing duct not exceeding about 300° F., and the temperature of the heated air and gases on leaving the distributing duct being about 200° F., so that fuel consumption is reduced and the hazard of fire is largely eliminated. The intermittent operation of the heating means also lowers the fuel requirements, and in addition is important particularly in the yellowing stage of the cure because it avoids the partial dehumidification of the air which occurs with substantially continuous heating.

In the next stage, the yellowing of the tobacco continues to completion and drying begins. During the latter part of the yellowing stage, the relative humidity of the air and the moisture of the tobacco gradually decrease, due to the rise of temperature toward the upper limit of the desired range. This action continues in the yellowing and leaf-drying stage, the temperature of the barn air being gradually raised to a range which might vary between about 110° F. and 140° F. so as to increase the moisture-absorbing capacity of the air, lowering the relative humidity and effecting greater extraction of moisture from the tobacco. The circulation of the air is substantially continuous, as before, and the heater operation is intermittent, but because the rate of temperature rise desired is more rapid than in the yellowing stage, due to the fact that the yellowing and leaf-drying stage is considerably shorter than the yellowing stage, and also because the greater temperature differential between the interior and exterior of the barn results in greater heat loss through the enclosing surfaces, the burner operates more frequently, which may roughly average about one minute of heating time to about two and a half minutes of off time. The operating time of the burner is also increased by the fact that during this stage of the cure the dampers 21 are opened to allow replacement of up to about 75% of the barn air by the cooler outside air, which is also drier than the barn air, so that moisture may be extracted more rapidly and to a greater degree than could be accomplished by the relatively moist barn air. The exact proportion of outside air which is drawn into the barn and circulated with the remaining barn air and combustion gases depends upon the difference in humidity between the interior and outside air and the degree of dryness of the tobacco at any particular time. In general, the proportion of outside air admitted increases as the yellowing and leaf-drying stage progresses and as the temperature rises. The higher proportion of heater operating time also contributes to providing a drier atmosphere in the barn, since it tends to dehumidify the air. During this stage the speed of the blower 13 is preferably raised to increase the rate of movement of the recirculating air and thus further enhance the drying effect. This increased blower speed is continued in the later stages of the cure. The relative humidity in the barn is brought down from its peak during the yellowing stage to a fairly low level, of the order of 50%, and the moisture content of the tobacco falls to a corresponding low level. Not more than about twelve to twenty hours or about ten to twenty-one hours are required to complete the coloring of the tobacco and reduce the water content to this level.

At the end of the required period, the leaf-drying stage begins, during which drying of the tobacco is completed. To complete the drying of the tobacco, the temperature is raised, during a period of about eight to fourteen hours, to a range above that employed in the yellowing and leaf-drying stage, and which may vary approximately between 130° and 155° F., by intermittent operation of

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the heating means averaging roughly about half the total time involved. The air in the barn is substantially continuously recirculated, but the dampers are opened so that from about 25% to about 75% of the air is replaced by outside air, the proportion generally decreasing from the beginning to the end of the drying period. While the outside air is normally more humid than the barn air in this stage, the dehumidifying effect of the burner and the rising temperature effect a reduction of the relative humidity, while the recirculation of the air through the tobacco and the relatively rapid replacement or change of air assist in further extraction of moisture from the tobacco while exhausting air which has become so laden with moisture that it cannot well absorb more water from the tobacco. As the tobacco becomes drier, the temperature increases and the proportion of outside air decreases so that the relative humidity is maintained sufficiently low for further extraction of moisture, the relatively high temperature perhaps being the most important single factor in accomplishing the final drying of the tobacco. When the tobacco is dried to the desired low moisture content, the drying stage is completed.

The stems must now be killed so that harsh, coarse particles will be eliminated from the tobacco when processed for smoking. This is accomplished by raising the temperature to a range above that in the drying stage, not above about 165° F. and preferably no higher than about 150° F., but which might vary approximately between the temperatures of 140° F. and 165° F. The heating means is automatically operated intermittently as already explained, the burner being on somewhat less than half the time, on the average. The recirculation of air in the barn is again substantially continuous throughout this stage, and a minor proportion of the circulating air is replaced by outside air, up to about 25%. The already dry atmosphere in the barn thus has its relative humidity lowered still further, approaching 0%, and extracts all or practically all of the remaining moisture in the tobacco so that its moisture content approaches zero. Since there is little moisture in the tobacco in the first place, the circulating air is not much humidified by the water it absorbs, and therefore remains effective to dehumidify the tobacco. A major proportion of the moisture remaining in the tobacco at the end of the leaf-drying stage is contained in the relatively thick stem portions, which afford for evaporating contact with the air only a relatively small surface area. The aim in this stem-killing stage is to dry out the stems to substantially the same extent as the remainder of the leaves, and this end is accomplished by the high temperature and the continued recirculation of very dry air. The stems are caused to dry up and shrivel, and are thus "killed." While the killing process is relatively rapid considering the difficulty occasioned by the relatively small differential in the moisture contents of the air and tobacco and the small evaporating surface presented by the stems, it still requires a matter of some hours to complete this stage. By the present method, not more than about ten to seventeen hours is necessary to kill the stems. The curing of the tobacco is then complete.

The dry tobacco resulting from the final curing stage is very brittle and therefore breaks and crumbles when handled. To prevent loss of the tobacco, it is ordered by exposure to the humidity of the outside air so as to absorb moisture therefrom and thus become sufficiently pliable to be handled without substantial breaking or crumbling. By the prior method, ordering is accomplished by opening the barn to allow the outside air to come into contact with the tobacco, about twenty-four hours being necessary for the tobacco to absorb an adequate amount of moisture. By the present method, the burner is shut off altogether and the dampers 21 are disposed to block any return of air from the barn to the heater casing 10 and allow a maximum of outside air to be taken in through the ducts 18. The blower is oper-

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ated continuously to pass the outside air in a constant stream about and past the tobacco, so that a much greater volume of air comes into contact with the tobacco in a given time than if no positive or forced circulation were provided, and the time required for absorption of adequate moisture by the tobacco is greatly reduced. Ordering of the tobacco is effected in not more than about ten hours by the present method. Ordering by the forced circulation of air is also advantageous in that the barn is cooled sufficiently to be entered for removal of the tobacco as soon as ordering has been completed, as against a long waiting period necessary with the prior method because of the heat still in the barn.

It will be apparent that the disclosed method presents great advantages over prior methods in shortening the time required for the cure, achieving more positive control of the cure with resultant improved tobacco grade quality, reducing fuel cost, maintenance cost and fire hazard, and generally providing a more satisfactory procedure and result.

It is to be appreciated that climatic and weather conditions, as well as the particular condition of each picking of tobacco, representing uncontrollable factors, require some variation in the specific practice of the method in particular cases, and that the several stages of the cure overlap each other to some extent rather than being sharply defined from each other. The present method reduces the time required for a cure to not more than about seventy to eighty hours, or at least 25% less than necessary with the prior method, and the time required for curing and ordering to not over eighty to ninety hours, about 33% less. The shortening of the curing time by the present method is important in permitting the use of fewer barns, thus reducing the capital investment required as well as operating and maintenance costs.

What is claimed is:

1. A method of curing tobacco racked in an enclosed space which comprises for a period of not more than about 40 hours intermittently heating said space to obtain a temperature about between 90° and 115° F. and continuously effecting positive recirculation of the air uniformly throughout said space while substantially preventing replacement thereof by outside air to extract and retain moisture from the tobacco to provide maximum humidity conditions in the space and considerably greater than obtain outside for setting the color of the tobacco, after setting of color and for a period of from about 10 to 21 hours continuing intermittent heating while continuously replacing up to about 75% of said air by outside air and continuing recirculation of substantially all the air in said space uniformly therethrough to raise the temperature through the range of about between 110° and 140° F. to lower the humidity for completing coloring of and partially drying the tobacco, thereafter further continuing the heating and continuous recirculation of the air in said space for a period of from about 8 to 14 hours while continuously replacing from about 25% to about 75% of the air in the space by outside air to further reduce the humidity and raise the temperature through the range of about between 130° and 155° F. for drying the tobacco to desired moisture content, and after completion of drying to said moisture content further continuing the heating and continuous recirculation of the air in the space for a period of from about 10 to about 17 hours while replacing up to about 25% of the air in said space by outside air to reduce the humidity still further and raise the temperature through the range of about between 140° and 165° F. for killing the tobacco stems.

2. A method of preparing for market tobacco racked in an enclosed space having heating means in an enclosure exteriorly thereof and communicating therewith, which comprises intermittently operating the heating means and discharging the products of combustion into said space to raise the temperature in said space initial-

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ly to about 90° F. and thereafter substantially steadily to not more than about 165° F. and positively recirculating the air through said space and enclosure substantially continuously during said raising of the temperature, for a period of not more than about 40 hours substantially preventing replacement of the air in said space while the temperature is in the range of about between 90° and 115° F. to maintain the relative humidity in the space at a maximum and considerably above that obtaining outside by absorption of moisture from the tobacco by the recirculating air for setting the color of the tobacco without appreciable drying thereof, for a period of from about 10 to about 21 hours after setting of color and while the temperature is above that in the color-setting period and in the range of about between 110° and 140° F. continuously replacing not more than about 75% of the air in said space by outside air to gradually reduce the relative humidity of the air in said space for completing the coloring of and partially drying the tobacco, thereafter for a period of from about 8 to about 14 hours while the temperature is above that obtaining during the coloring completion and partial drying and in the range of about between 130° and 155° F. replacing from about 25% to about 75% of the air in said space by outside air to further reduce the humidity for drying the tobacco, after substantial drying of the tobacco and for a period of from about 10 to about 17 hours while the temperature is above that in the drying period and in the range of about 140° and 165° F. continuously replacing up to about 25% of the air in said space by outside air to still further reduce the humidity for killing the tobacco stems by substantially complete dehydration, and thereafter for a period of not more than about 10 hours discontinuing heating and recirculation of the air and continuously forcing outside air past the tobacco to restore moisture thereto for rendering the same pliable.

3. A method of curing tobacco racked in an enclosed space having heating means in an enclosure immediately adjacent thereto and communicating therewith, which comprises intermittently operating the heating means to raise the temperature of the air in said space initially to about 90° F. and thereafter substantially steadily to not more than about 165° F. while substantially continuously recirculating the air through said space and enclosure during said raising of the temperature, for a period of not more than about 40 hours substantially preventing replacement of the air in said space by outside air while the temperature is in the range of about between 90° and 115° F. to maintain maximum relative humidity in said space and considerably above that obtaining outside by absorption of moisture from the tobacco by the recirculating air in said space for setting the color of the tobacco before appreciable drying thereof, for a period of from about 10 to about 21 hours after setting of color and while the temperature is in the range of about between 110° and 140° F. replacing about up to 75% of the air in said space by outside air to gradually reduce the humidity of the air in said space for completing coloring of and partially drying the tobacco, after completion of coloring and partial drying of the tobacco and while the temperature is in the range of about between 130° and 155° F. replacing from about 25% to about 75% of the air in said space by outside air to further reduce the humidity for drying the tobacco, and after substantially complete drying of the tobacco and while the temperature is in the range of about between 140° and 165° F. replacing up to about 25% of the air in said space by outside air for substantially complete dehydration of the tobacco leaf stems to kill the same.

4. A method of curing tobacco racked in an enclosed space which comprises for a period of not more than about 40 hours heating the air in said space to a temperature about between 90° and 115° F. and continuously effecting positive recirculation of the air uniformly

throughout said space while substantially preventing replacement thereof by outside air to extract and retain moisture from the tobacco to provide maximum humidity conditions in the space and considerably greater than obtain outside for setting the color of the tobacco, after setting of color and for a period of from about 10 to about 21 hours continuing heating of the air while replacing up to about 75% of said air by outside air and continuously recirculating substantially all the air in said space uniformly therethrough to raise the temperature through the range of about between 110° and 140° F. to lower the humidity for completing coloring of and partially drying the tobacco, thereafter further continuing the heating and continuous recirculation of the air in said space for a period of from about 8 to about 14 hours while continuously replacing from about 25% to about 75% of the air in the space by outside air to further reduce the humidity and raise the temperature through the range of about between 130° and 155° F. for drying the tobacco to desired moisture content, and after completion of drying to said moisture content continuing the heating and continuous recirculation of the air in the space for a period of from about 10 to about 17 hours while replacing up to about 25% of the air in said space by outside air to reduce humidity still further and raise the temperature through the range of about between 140° and 165° F. for killing the tobacco stems.

5. A method of curing tobacco racked in an enclosed space which comprises for a period of not more than about 40 hours heating the air in said space to a temperature about between 90° and 115° F. and continuously effecting positive recirculation of the air uniformly throughout said space while substantially preventing replacement thereof by outside air to extract and retain moisture from the tobacco to provide maximum humidity conditions in the space and considerably greater than obtain outside for setting the color of the tobacco, after setting of color and for a period of from about 10 to about 21 hours continuing heating of the air while replacing up to about 75% of said air by outside air and continuously recirculating substantially all the air in said space uniformly therethrough to raise the temperature through the range of about between 110° and 140° F. to lower the humidity for completing coloring of and partially drying the tobacco, thereafter further continuing the heating and continuous recirculation of the air in said space for a period of from about 8 to about 14 hours while continuously replacing from about 25% to about 75% of the air in the space by outside air to further reduce the humidity and raise the temperature through the range of about between 130° and 155° F. for drying the tobacco to desired moisture content, after completion of drying to said moisture content continuing the heating and continuous recirculation of the air in the space for a period of from about 10 to about 17 hours while replacing up to about 25% of the air in said space by outside air to reduce humidity still further and raise the temperature through the range of about between 140° and 165° F. for killing the tobacco stems, and after killing the stems discontinuing heating and recirculation of air in said space and continuously replacing all air in the space by outside air for a period of not more than about 10 hours to order the tobacco.

6. A method of curing tobacco racked in an enclosed space having heating means in an enclosure immediately adjacent thereto and communicating therewith, which comprises intermittently operating the heating means and concurrently discharging the products of combustion thereof into said space to raise the temperature in the space initially to about 90° F. and thereafter substantially steadily to not more than about 165° F. while positively recirculating the air through said space and enclosure substantially continuously during said raising of the temperature, substantially preventing replacement of the air in said space by outside air while the temperature is in

the range of about between 90° and 115° F. to maintain the relative humidity in the space at a maximum and considerably about that obtaining outside by absorption of moisture from the tobacco by the recirculating air for setting the color of the tobacco before appreciable drying thereof, after setting of color and while the temperature is above that in the color-setting stage and in the range of about between 110° and 140° F. replacing not more than about 75% of the air in said space by outside air while continuing the recirculation to gradually reduce the humidity of the air in said space for completing coloring of and partially drying the tobacco, after completing the coloring and partially drying the tobacco and while the temperature is above that obtaining during coloring completion and partial drying and in the range of about between 130° and 155° F. replacing from about 25% to about 75% of the air in said space by outside air while continuing said recirculation to further reduce the humidity for drying the tobacco, and after substantial drying of the tobacco and while the temperature is above that in the drying stage and in the range of about between 140° and 165° F. replacing about 25% of the air in the space by outside air while continuing the recirculation to kill the tobacco stems by substantial dehydration thereof.

7. A method of curing tobacco racked in an enclosed space which comprises intermittently heating and continuously recirculating uniformly the air in said space to maintain the temperature about between 90° and 115° F. and to extract moisture from the tobacco while substantially preventing addition of outside air to the air in said space for obtaining maximum humidity condition therein to set the color in the tobacco, after setting of color continuing the intermittent heating of the air in said space to raise the temperature to between 110° F. and 140° F. while recirculating from about 25% to 100% of said air and adding up to about 75% of outside air to gradually reduce the humidity in said enclosed space for partially drying the tobacco, after completion of coloring and partial drying of the tobacco continuing heating of the air in said space to raise the temperature to about between 130° F. and 155° F. while recirculating from about 25% to about 75% of said air and adding about 75% to about 25% of outside air to further reduce the humidity for drying the tobacco, and after substantially complete drying of the tobacco further intermittently heating the air in said space to raise the temperature to about between 140° F. and 165° F. while recirculating from about 75% to 100% of the enclosed air and adding up to 25% of outside air by volume of enclosed air for killing the tobacco stems.

8. A method of curing tobacco racked in an enclosed space which comprises heating substantially all the air in said space to a temperature about between 90° and 115° F. for a period of not more than about 40 hours while discharging products of combustion into said space and continuously recirculating said air and admixed combustion products uniformly in said space while substantially preventing substitution of outside air therefor to extract and retain moisture from the tobacco to provide maximum humidity conditions in said space with relative humidity considerably higher than outside the space for setting the color in the tobacco, for a period of from about 10 to about 21 hours after setting of color continuing the heating of the air and discharge of combustion products in said space to raise the temperature to about between 110° and 140° F. while continuously replacing up to about 75% of said air and products in said space by outside air and continuously recirculating substantially all of the air and combustion products in said space to gradually reduce the humidity for completing coloring of and partially drying the tobacco, for a period of from about 8 to about 14 hours after completing the coloring of and partially drying the tobacco continuing the heating and discharge of combustion products in said space to raise the temperature to about between 130° and

155° F. while continuously replacing from about 25% to about 75% of said air and products by outside air and continuously recirculating substantially all the air and combustion products in said space to further reduce the humidity for drying the tobacco to a desired level, and for a period of from about 10 to about 17 hours after completion of drying to said level continuing the heating and discharge of combustion products to raise the temperature to about between 140° and 165° F. while replacing up to about 25% of said air and products by outside air and continuously recirculating substantially all air and combustion products in said space to kill the stems of the tobacco leaves.

9. A method of curing tobacco racked in an enclosed space having a heating means enclosure immediately adjacent thereto and communicating therewith, which comprises heating said space uniformly to a temperature about between 90° and 115° F. by operating the heating means and discharging the products of combustion into said space and continuously recirculating said air and admixed combustion products through said enclosure and throughout said space while substantially preventing substitution of outside air therefor to extract and retain moisture from the tobacco to provide maximum humidity conditions in said space with relative humidity considerably higher than outside for setting the color in the tobacco, after setting of color continuing the heating and combustion products discharge to raise the temperature to about between 110° and 140° F. while continuously replacing up to about 75% of said air and products in said space by outside air and continuously recirculating substantially all of the air and combustion products for gradually reducing the humidity to complete coloring of and partially dry the tobacco, after completing the coloring of and partially drying the tobacco further continuing the heating and combustion products discharge while continuously replacing from about 25% to about 75% of said air and products by outside air and continuously recirculating substantially all the air and combustion products in said space and enclosure to raise the temperature to about between 130° and 155° F. and further reduce the humidity for drying the tobacco to a desired level of moisture content, and after completion of drying to said level continuing the heating and discharge of combustion products while replacing up to about 25% of said air and products by outside air and continuously recirculating substantially all the air and combustion products in said space and enclosure to raise the temperature to about between 140° and 165° F. to reduce the humidity still further and kill the stems of the tobacco leaves.

10. A method of preparing for market tobacco racked in an enclosed space having heating means in an enclosure exteriorly thereof and communicating therewith, which comprises intermittently operating the heating means and discharging the products of combustion into said space to raise the temperature in the space initially to about 90° F. and thereafter substantially steadily to not more than about 165° F. and recirculating the air through said space and enclosure substantially continuously during said raising of the temperature, retaining substantially all of the air in said space while the temperature is in the range of about between 90° and 115° F. to maintain the relative humidity in the space at a maximum and considerably above that obtaining outside by absorption of moisture from the tobacco by the recirculating air for setting the color of the tobacco without appreciable drying thereof, after setting of color and while the temperature is above that in the color-setting stage and in the range of about between 110° and 140° F. replacing not more than about 75% of the air in said space by outside air to gradually lower the humidity of the air in said space for completing coloring of and partially drying the tobacco, thereafter and while the temperature is above that obtain-

ing during coloring completion and partial drying and in the range of about between 130° and 155° F. replacing from about 25% to about 75% of the air by outside air to further reduce the humidity for drying the tobacco, after substantial drying of the tobacco and while the temperature is above that in the drying stage and in the range of between about 140° and 165° F. continuously replacing up to about 25% of the air in the space by outside air to dehydrate substantially completely the stems of the tobacco, and thereafter discontinuing further heating and recirculation of the air and continuously forcing outside air past the tobacco to restore a degree of moisture thereto for rendering the same pliable.

11. In a method of curing tobacco racked in an enclosed space, which includes the stages of yellowing, yellowing and leaf drying, leaf drying, and stem killing, the improvement comprising in the yellowing and leaf-drying stage increasing the temperature of the air in said space substantially steadily in the range of about between 110° and 140° F. during a period of from about 10 hours to about 21 hours while substantially continuously recirculating from about 25% to 100% of said air uniformly throughout said space and about the heat source and replacing any remainder of said air by outside air to gradually reduce the humidity in said space for completing the yellowing of and for partially drying the tobacco.

12. In a method of curing tobacco racked in an enclosed space which includes the stages of yellowing, yellowing and leaf drying, leaf drying, and stem killing, the improvement comprising in the leaf-drying stage increasing the temperature of the air in said space substantially steadily through the range of about between 130° and 155° F. during a period of from about 8 to about 14 hours while substantially continuously recirculating from about 25% to about 75% of the air uniformly throughout said space and about the heat source and replacing the remainder of the air by outside air to reduce the humidity in said space to effect substantial drying of the tobacco.

13. In a method of curing tobacco racked in an enclosed space which includes the stages of yellowing, yellowing and leaf drying, leaf drying, and stem killing, the improvement comprising in the stem-killing stage increasing the temperature of the air in said space substantially steadily through the range of about between 140° and 165° F. during a period of from about 10 to about 17 hours while recirculating substantially continuously from about 75% to 100% of the air uniformly throughout said space and about the heat source and replacing any remainder of the air by outside air to kill the tobacco stems by substantially complete dehydration.

References Cited in the file of this patent

UNITED STATES PATENTS

125,277	Flippen	Apr. 2, 1872
448,595	Snow	Mar. 17, 1891
540,271	Proctor	June 4, 1895
1,194,351	Benjamin	Aug. 15, 1916
1,368,018	Brock	Feb. 8, 1921
1,543,245	Buensod	June 23, 1925
1,853,860	Harris	Apr. 12, 1932
2,086,194	Smith	July 6, 1937
2,090,633	Mayo	Aug. 24, 1937
2,229,546	Bogaty	Jan. 21, 1941
2,246,914	Craiggs	June 24, 1941
2,475,568	Moore	July 5, 1949

OTHER REFERENCES

- "The Story of Lucky Strike" by Roy C. Flannagan, New York World's Fair edition 1939, page 21.
 "The Story of Lucky Strike" by Roy C. Flannagan, New York World's Fair edition 1939, pages 13, 14 and 18.