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PREPARATION OF TOBACCO FOR PACKING

Filed Oct. 23, 1951

2 Sheets-Sheet 1

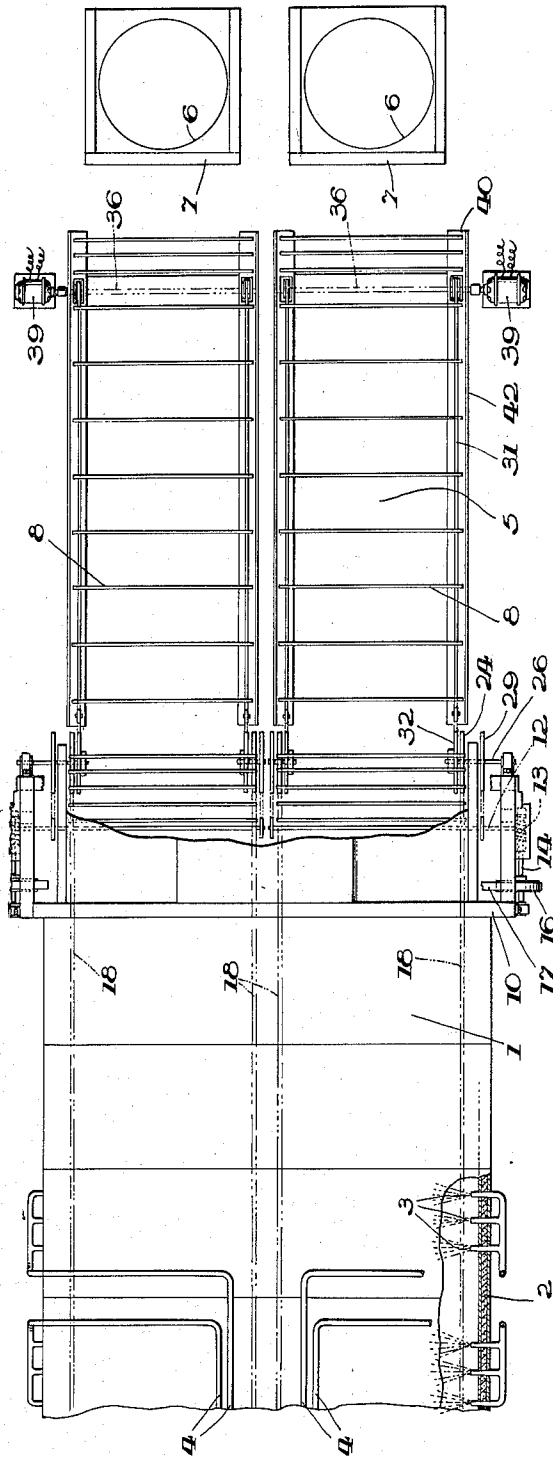
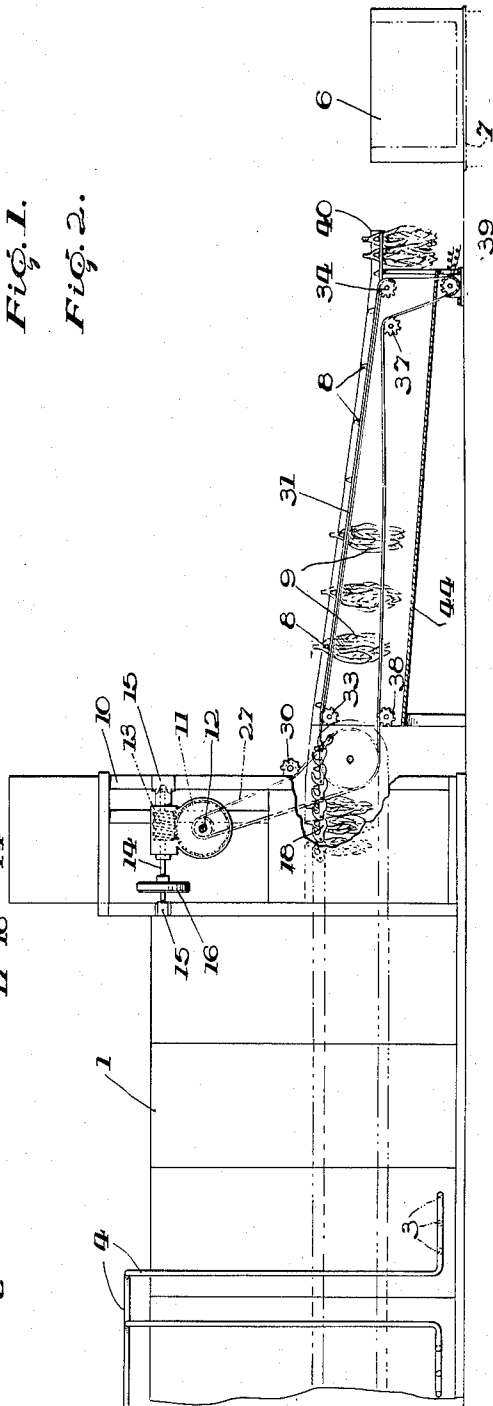


FIG. 1.

FIG. 2.



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FIG. 3.

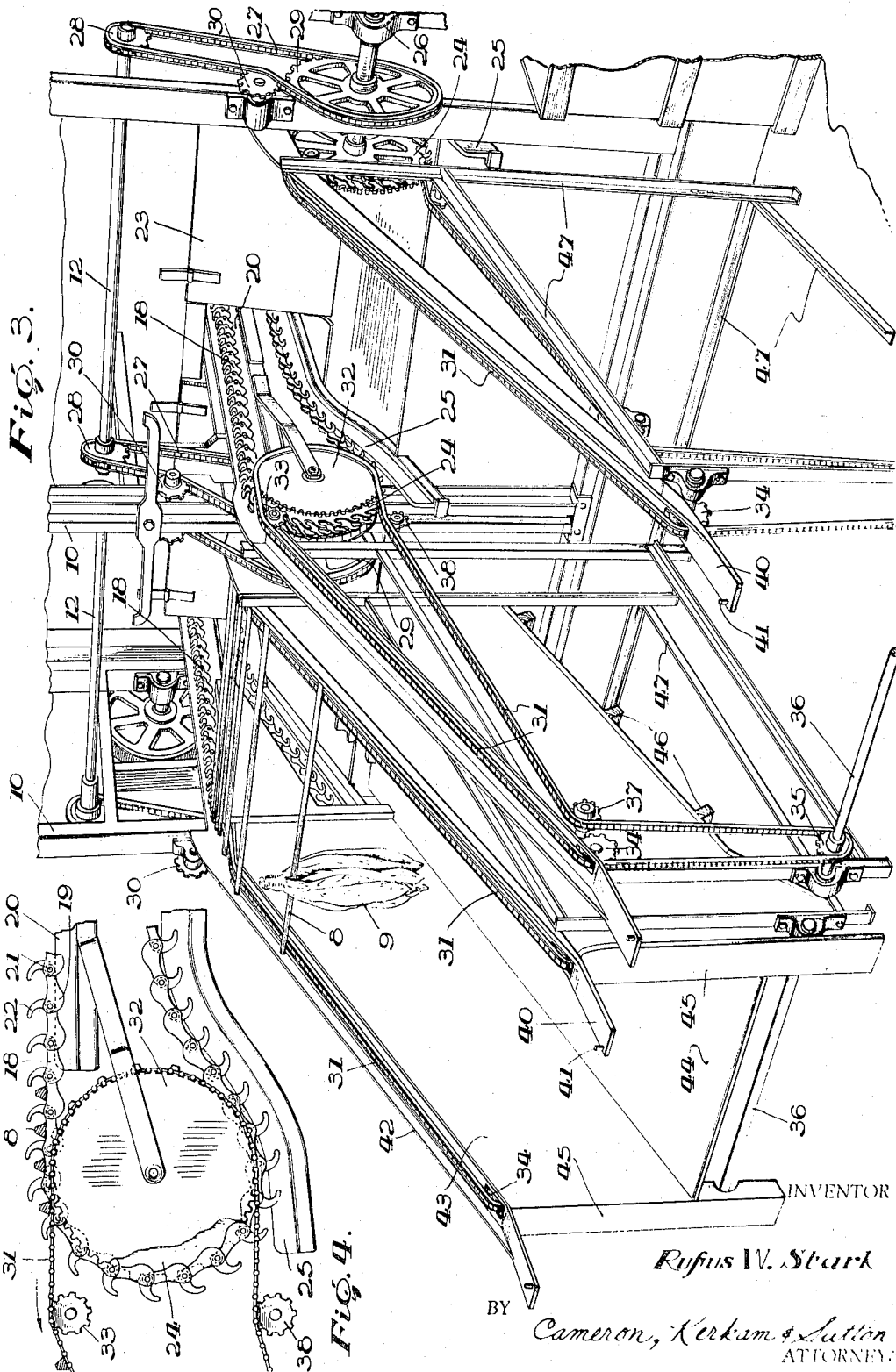
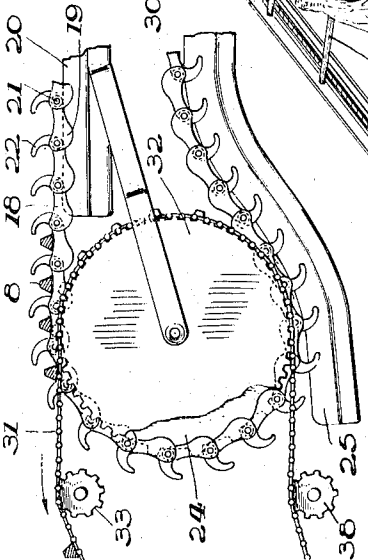


FIG. 4.



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PREPARATION OF TOBACCO FOR PACKING

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9 Claims. (Cl. 131—136)

This invention relates to the preparation and conditioning of tobacco for packing and more particularly to an improved method and apparatus for controlling and adjusting its temperature and moisture content.

Leaf tobacco is usually packed tightly in hogsheads, tierces or boxes or other suitable containers for storage and/or shipment. The moisture content of the tobacco at the time of packing must be held within rather narrow limits, since if it is too dry and brittle there will be excessive breakage of the leaves, while if it is too wet it may spoil in the hogshead. Depending on the use for which the tobacco is intended, the permissible range of moisture content varies from about 10% to about 15%, and for particular purposes it is often necessary to regulate the moisture content much more closely, for example, to maintain it between 10% and 11%. On the other hand, the tobacco must also be heated prior to packing to a temperature sufficient to destroy insect infestation, but then must be cooled to the proper temperature (about 110° F.) before being packed because, if packed too hot, the tobacco "cooks" in the hogshead and "hogshead burn" results, causing discoloration and deterioration in quality.

In practice the harvested tobacco leaves are formed into bundles which are dried by hanging in ventilated sheds or by artificial means. The dried bundles are collected and sent to the factory where they are subjected to a "redrying" or conditioning process preparatory to packing. In the usual redrying operation, the tobacco is first exposed to circulating hot air at temperatures which may be as high as about 220° F. to destroy infestation, this treatment also causing a reduction of its moisture content to approximately 6%. This excessively dry tobacco leaving the drying section is then cooled to around 90° F. and passed through an "ordering" section in which steam is circulated to remoisten it, the tobacco then leaving the redryer at a temperature of about 120° F. and a moisture content of around 11.5%.

Tobacco in the condition just described is too hot for immediate packing, and accordingly it has been the practice to spread the bundles leaving the redryer on a table and to allow the tobacco to cool before packing. In typical redrying machines, the bundles of tobacco leaves are supported by sticks which are carried by conveyor chains, and at the exit of the machine the sticks are lifted manually from the chains by a "stick puller" who places the sticks with bundles on a table, and after a brief cooling period, the bundles are handed to the packer, and the sticks removed. This procedure requires multiple handling of the tobacco. Furthermore, it is left to the experience and judgment of the stick puller to determine when the tobacco has cooled to the proper temperature for packing in the hogsheads, and in his effort to keep up with the output of the redrying machine, the stick puller cannot give individual care to each bundle or make sure that each bundle is cooled to the correct temperature before passing it on to the packer. During such cooling, moreover, there is some loss of moisture the

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amount of which varies according to the length of cooling time allowed, the temperature and relative humidity of the surrounding air, the extent of spreading of the bundles, etc. Thus the treatment of the tobacco is by no means uniform, and substantial variations occur in the temperature and moisture content of the product as packed, especially in case of changing climatic conditions such as air temperature and relative humidity.

One of the objects of the present invention is to provide an improved method and apparatus for handling the tobacco which, in cooperation with the redrying operation, insures the delivery to the packer of uniformly and properly conditioned tobacco.

Another object is to provide for more efficient and uniform cooling of the tobacco after redrying and before packing.

A further object is to reduce the labor heretofore involved in handling the tobacco between the redrying machine and the hogshead or other container in which it is packed.

A still further object is to provide an improved method and apparatus as characterized in the preceding objects wherein the treatment of the redried tobacco can be varied and adjusted according to variations in existing climatic conditions to produce a uniformly and properly conditioned product at all times.

In practicing the present invention, the tobacco, preferably in the form of bundles supported by the usual carrier sticks, passes through a redryer having consecutive drying, cooling and ordering sections, the tobacco being heated in the drying section to a temperature in the neighborhood of 220° F. to destroy infestation and at the same time dried to a low moisture content, then cooled in the cooling section, and then steamed and remoistened in the ordering section to the desired moisture level in the range of 10-15%. At the end of and beyond the usual redryer, however, the hot moist tobacco passes through a further cooling zone in which it is cooled to reduce its temperature to that desired for packing. In order to reduce the length of the redryer, the conveying system preferably moves therethrough at a relatively slow rate and the tobacco carriers or sticks are located close together, drying and cooling at least being promoted by forced circulation of conditioned atmospheres through the tobacco. For final cooling, however, an enclosed chamber is not necessary if the carrier sticks are separated to spread out the tobacco so that cooling can be accomplished effectively by natural circulation of atmospheric air through the bundles. These conditions are obtained by the provision of a conveying system having two sections and of automatic transfer of the sticks one by one from the first section to the second section, the first conveyor section moving slowly through the drying, cooling and ordering sections of the redryer as described above, and the second conveyor section moving through the final cooling zone at a substantially higher speed.

The foregoing arrangement also makes it possible to regulate the cooling effect by adjusting the speed of travel of the second conveyor section independently of the first section and therefore without affecting the redrying operations. The time required for the hot tobacco to cool to the desired temperature will depend on the temperature of the atmosphere which will vary from place to place and also from day to day and season to season. Thus the second conveying section may have any desired length, and preferably extends from the exit of the ordering section to a point where the cooled bundles can be handed directly to the packer at or in the hogshead. Whatever this distance may be, the proper extent of cooling of the tobacco can be obtained simply by regulating the speed of the second conveyor section and therefore the time required for the tobacco to travel

through the final cooling zone. Furthermore, changes in weather and particularly in the ambient temperature can be compensated by operating the conveyor system faster or slower as may be required.

Since the tobacco leaves the ordering section of the redryer with uniform relatively low temperature and moisture content, the regulated drop of temperature in the final cooling zone is accompanied by a small and approximately constant decrease in moisture content. For example, the tobacco may leave the redryer at 120° F. and 11.5% moisture content as stated above, and the final cooling may be regulated to produce a drop in temperature of about 10° F. and an accompanying decrease of moisture content of approximately 1%.

Thus the output of the cooling zone comprises a steady stream of uniformly conditioned tobacco ready for immediate packing in the hogshead. The separation of the carrier sticks in the final cooling zone makes it easy to inspect and check the condition of the tobacco before it is packed. The labor required in handling the tobacco is substantially reduced because the bundles can be taken from the carrier sticks at the end of the second conveyor section and placed directly in the hogsheads without spreading them out to cool, and the packing operation is facilitated because the packer receives a steady succession of carrier stick loads ready for immediate packing in the hogshead.

One embodiment of the invention has been illustrated in the accompanying drawings, but it is to be understood that said drawings are for purposes of illustration only and are not to be taken as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In the drawings,

Fig. 1 is a partial plan view of drying and conditioning apparatus embodying the invention;

Fig. 2 is a side view of Fig. 1, some of the parts having been removed for clarity of illustration;

Fig. 3 is a perspective view showing the discharge end of the redryer and the final cooling zone; and

Fig. 4 is a detailed view of part of the conveyor mechanism.

Figs. 1 and 2 show the discharge end of a redryer of known type, including an ordering section 1 enclosed in a suitably insulated housing 2 and provided with suitable steam jets 3 supplied by pipes 4. A final cooling section of the type described above is indicated generally at 5 and extends from the end of the redryer to a point closely adjacent one or more hogsheads 6 resting on scale platforms 7. It will be understood that the remainder of the redryer housing (not shown) is provided with suitable fans or the like for circulating conditioned air through the drying and cooling zones mentioned above which precede the ordering section. The details of these parts of the redryer have been omitted for simplicity of illustration.

The usual carrier sticks on which the tobacco bundles are supported are shown at 8 in Figs. 1 and 2. Since in the form shown there are two parallel conveyors, there are also two series of carrier sticks 8 conveyed thereby. Fig. 2 shows the tobacco bundles 9 supported on the sticks 8 in the usual manner. The common practice is to form these bundles by wrapping and tying together the butt ends of a group of leaves, and the bundles are placed on the carrier sticks by dividing the free ends of the leaves and allowing them to hang down on either side of each stick.

Since the two side-by-side conveyors are preferably identical in construction and operation, description of only one of them is necessary. The first section of the conveyor, which moves slowly throughout the length of the redryer housing 2 as described above, can be driven in any suitable manner. For example, suitable framing 10 at the exit or delivery end of the redryer housing provides means for mounting a worm wheel 11 on the end of a shaft 12 which extends transversely above the conveyor (see

Fig. 3) and rotates in suitable bearings mounted on the framing 10. The worm wheel is driven by a worm 13 on a shaft 14 that rotates in suitable bearings 15 also carried by the framing 10. A pulley 16 on the shaft 14 is driven by a belt 17 from any suitable source of motive power.

Referring to Figs. 3 and 4, the ends of the sticks 8 are supported and moved through the redryer housing by means of spaced parallel conveyor chains 18. A suitable type of chain 18 is shown in greater detail in Fig. 4. The chain links are provided with flanges 19 which straddle and slide on guiding and supporting rails 20 preferably extending throughout the length of the redryer housing. The links are pivotally connected with one another at 21 and are provided with upright hook-like members 22, the ends of the sticks 8 resting on the chain links between the members 22.

The chains 18 emerge from the end of the redryer housing through suitable openings that are preferably closed by pivoted flap doors 23 when the conveyors are not in use. The framing 10 at the end of the redryer housing provides suitable mountings for drive sprockets 24, one for each of the chains 18 which pass around the sprocket wheels and back into the redryer housing on guide rails 25 similar to the rails 21. The drive sprocket shafts 26 are driven from the cross shafts 12 mentioned above by any suitable means such as drive chains 27 passing around sprockets 28 on the shafts 12 and sprockets 29 on the shafts 26. Suitable idler sprockets 30 may be employed to adjust the chains 27.

The final cooling section which extends beyond the end of the redryer housing likewise comprises two side-by-side conveyors, each having a pair of conveyor chains 31 which constitute extensions of the chains 18 and travel at a higher but adjustable rate of speed as described above. The chains 31 are suitably arranged to take the sticks 8 and their loads of tobacco bundles from the chains 18 and to convey the sticks through the final cooling zone. In the form shown, each chain 31 passes around an idler sprocket 32 of approximately the same diameter as the drive sprockets 24 and mounted on the framing 10 substantially concentrically and side by side with one of the sprockets 24. As shown in Fig. 4, each chain 31 passes from the top of its sprocket 32 to an idler sprocket 33 in an approximately horizontal direction and at substantially the level of the ends of the sticks 8 riding on the links of the chains 18. Thus as the chains 18 pass around the sprockets 24, the ends of the sticks come to rest on the horizontal reaches of the chains 31, and because the chains 31 are moving at greater speed than the chains 18, the sticks 8 are carried beyond the path of travel of the hooks 22 as they pass downwardly around their sprockets 24. Thus the sticks 8 with their loads of bundles 9 are automatically transferred one by one from the chains 18 to the chains 31 and moved off through the final cooling zone at increased speed. As shown in Fig. 2, the close spacing of the sticks and bundles carried by the chains 18 through the redryer is therefore increased when the sticks are transferred to the chains 31, the bundles being thus separated and spread out in the final cooling zone for more effective cooling and also for inspection of the quality and condition of the tobacco.

Since the travel of the four chains 31 is preferably the same, a description of only one chain is necessary. Referring to the right-hand side of Fig. 3, from which the chain shielding described hereinafter has been removed, each chain 31 after passing over its idler sprocket 33 preferably moves in a downwardly inclined direction to an idler sprocket 34 at the end of the final cooling section. The chain 31 then passes downwardly and around a bottom drive sprocket 35 mounted on a cross shaft 36, thence upwardly and around an idler sprocket 37, and thence back toward the redryer housing and over an idler sprocket 38 to the bottom of the sprocket 32 mentioned above. Each pair of chains 31 is driven by

one of the cross shafts 36, and the speed of rotation of the shafts 36 is preferably made adjustable so as to regulate the time of travel of the tobacco bundles through the final cooling zone as described above. In the form shown, these ends are accomplished by driving each of the shafts 36 by means of a variable speed electric motor 39 (Fig. 1).

The carrier sticks thus travel down the inclined upper reaches of the chains 31 as shown in Figs. 2 and 3. At the end of the final cooling zone, the sticks are delivered by the chains onto supporting arms 40 preferably provided with stops 41 so that the sticks are not crowded off their ends. At this point the bundles can be removed from the sticks and handed directly to the packer at or in the hogshead 6.

Preferably the chains 31 are suitably shielded to prevent entanglement of the tobacco leaves therewith and for safety reasons. In the form shown, the inclined upper reaches of the chains travel along the horizontal flanges of angle supports 42, the vertical flanges of these supports forming protecting shields along the outer sides of the chains. If desired, the angle supports 42 and the projecting arms 40 can be formed integrally. Extending downwardly from the inner edges of the chain supports 42 are the vertical sides 43 of a trough or chute having a bottom 44. The vertical reaches of the chains 31 at the end of the final cooling section are shielded by members 45. It will be understood that the supporting and shielding means described above may have any suitable form and construction and may be formed of any suitable material. For example, the sides 43 and bottom 44 of the trough may be made of wood, the bottom being strengthened by ribs 46 and the structure being mounted on suitable metal framing 47.

The operation of the apparatus described above will be understood from the foregoing description. By way of example, good results have been obtained under the following conditions: The travel of the chains 18 from the point where the sticks 8 were placed on the chain at the entrance to the redryer housing to the point where the sticks were transferred to the chains 31 was 127' 6". The chains 18 traveled at the rate of 2.125 feet per minute, 60 minutes being required for the sticks to travel the above distance. The tobacco placed on the conveyor contained from 12% to 20% moisture. In the first part of the redryer, it was subjected to heats up to approximately 220° F. to destroy infestation, and during its travel through the drying sections its moisture content dropped to about 6%. The tobacco then passed through a cooling section in which its temperature was reduced to around 90° F., and then through an ordering section into which live steam was injected and circulated through the tobacco, bringing its temperature up to about 120° F. and its moisture content up to about 11.5% as it emerged from the redryer housing.

The distance through which the tobacco had to be conveyed by the chains 31 from the redryer to the packing point was 16' 1". Under prevailing climatic conditions, it was found satisfactory to convey the tobacco over this distance in 1.5 minutes, the chains 31 being therefore regulated to travel at the rate of 10.733 feet per minute. Thus the chains 31 traveled approximately five times as fast as the chains 18 and the spacing between the sticks was increased correspondingly with the result that in the short period of 1.5 minutes, the temperature of the tobacco dropped to approximately 110° F. and its moisture content to about 10.5%. These conditions were correct for direct and immediate packing of the tobacco in the hogsheads and were uniformly maintained.

It will be understood, of course, that in colder drier weather the above-mentioned speed of the chains 31 would be increased, and in warmer damper weather it would be decreased, to maintain the same condition of the tobacco at the end of the final cooling zone. Moreover, in other installations where the length of the final

cooling zone might be either greater or less than in the above example, it might be desirable to increase or to decrease respectively the speed of the chains 31 relatively to the foregoing example, in order to obtain the same final conditions. The speed of the chains 31 can also be adjusted under any given conditions to produce a different final temperature and moisture content of the tobacco, when desired for any reason.

It is to be understood that the invention is not restricted to the details set forth in the foregoing description and illustrated in the drawings, and that reference should be had to the appended claims for a definition of its limits.

What is claimed is:

1. A method for redrying and conditioning tobacco for packing in hogsheads and like containers which comprises heating and drying the tobacco, then cooling and steaming the tobacco to increase its moisture content to a predetermined level, and then passing the hot moist tobacco through a cooling zone at room temperatures while regulating its speed of travel in relation to the length of travel in said zone to cool the tobacco to packing temperature of approximately 110° F. as it reaches the end of said zone.
2. A method for redrying and conditioning leaf tobacco for packing in hogsheads and like containers which comprises moving the tobacco in the form of successive rows of bundles continuously through drying, cooling, steaming and final cooling zones said final cooling zone being at room temperatures, increasing the speed of travel of the successive rows as they enter said final cooling zone, thereby increasing the spacing between the rows, and regulating the speed of travel of the tobacco through said final cooling zone in relation to its length of travel so that the tobacco is cooled to packing temperature of approximately 110° F. when it reaches the end of said final cooling zone.
3. In a method for redrying and conditioning tobacco for packing in hogsheads and like containers wherein the tobacco is first heated to destroy infestation and simultaneously dried and is then cooled and steamed to remoisten it to a desired moisture level, after which it is allowed to cool to packing temperature, the improvement which comprises conveying the hot moist tobacco through a cooling zone at room temperatures extending from the steaming zone to the packing point and regulating its speed and length of travel through said zone to cool it to packing temperature of approximately 110° F. as it reaches the end of said zone.
4. In a method for redrying and conditioning leaf tobacco for packing in hogsheads and like containers wherein successive rows of tobacco bundles are conveyed continuously through a heating and drying section, a cooling section, and an ordering section in which it is steamed to remoisten it to a desired moisture level and simultaneously reheated above packing temperature, the improvement which comprises conveying said rows of bundles from the ordering section through a final cooling zone at room temperatures extending to the packing point and at greater speed whereby the spacing between rows is increased, and regulating the speed and length of travel of the tobacco through said final cooling zone in relation to its length so that the tobacco is cooled to packing temperature of approximately 110° F. when it reaches the end of said final cooling zone.
5. A tobacco redryer of the type in which the tobacco is dried at an elevated temperature and then cooled and steamed to adjust its moisture content, comprising a redryer housing having successive drying, cooling and steaming sections and a stick conveyor for moving the tobacco through said sections in the form of bundles carried on sticks, in combination with final cooling means external to said housing and including a second stick conveyor receiving sticks from said first conveyor and variable speed driving means therefor, the speed of movement of said second conveyor being greater than that of said first con-

veyor to increase the stick spacing in said final cooling means and being timed to cool the tobacco to packing temperature as it reaches the end of said means.

6. The combination with a tobacco redryer of the type in which tobacco bundles are heated and dried and then cooled and steamed to remoisten the tobacco for packing while conveyed through said redryer, of cooling means external to said redryer and extending from the exit thereof to the point where the tobacco is to be packed, said cooling means comprising a conveyor adapted to receive the bundles of hot moist tobacco conveyed from the redryer, and variable speed conveyor driving means for regulating the speed of travel of the tobacco through said means so that it is cooled to packing temperature when it reaches said point.

7. Apparatus for redrying and conditioning tobacco for packing comprising a dryer housing, a tobacco conveying system movable through said housing and comprising a pair of spaced conveyors and tobacco carriers having their ends supported by said conveyors with the tobacco hanging therefrom between said conveyors, means for heating and drying the tobacco as it moves through said housing, means for cooling and steaming the tobacco to remoisten it to a desired moisture level as it leaves said housing, a second pair of spaced conveyors outside said housing, and means for automatically transferring said carriers from said first pair of conveyors to said second pair of conveyors, said second pair of conveyors moving at a higher speed than said first pair and separating said carriers for circulation of cooling air through the tobacco, whereby it is cooled to a desired temperature as it reaches the end of said second pair of conveyors.

8. Apparatus as defined in claim 7, including variable speed driving means for said second pair of conveyors whereby the cooling effect can be regulated.

9. Tobacco redrying and conditioning apparatus of the

type comprising a redryer having enclosed successive drying, cooling and ordering sections and a continuous stick conveyor extending through said sections for conveying the tobacco in the form of bundles supported on sticks, said ordering section having steam injection means whereby the tobacco leaves said redryer in hot, moist condition, in combination with a second stick conveyor extending from said ordering section approximately to a point at which the tobacco is to be packed and moving at a greater speed than said first conveyor, said second conveyor automatically receiving sticks one by one from said first conveyor and carrying them to said point with increased spacing between sticks, and means for regulating the speed of said second conveyor whereby the tobacco is cooled to packing temperature when it reaches said point.

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