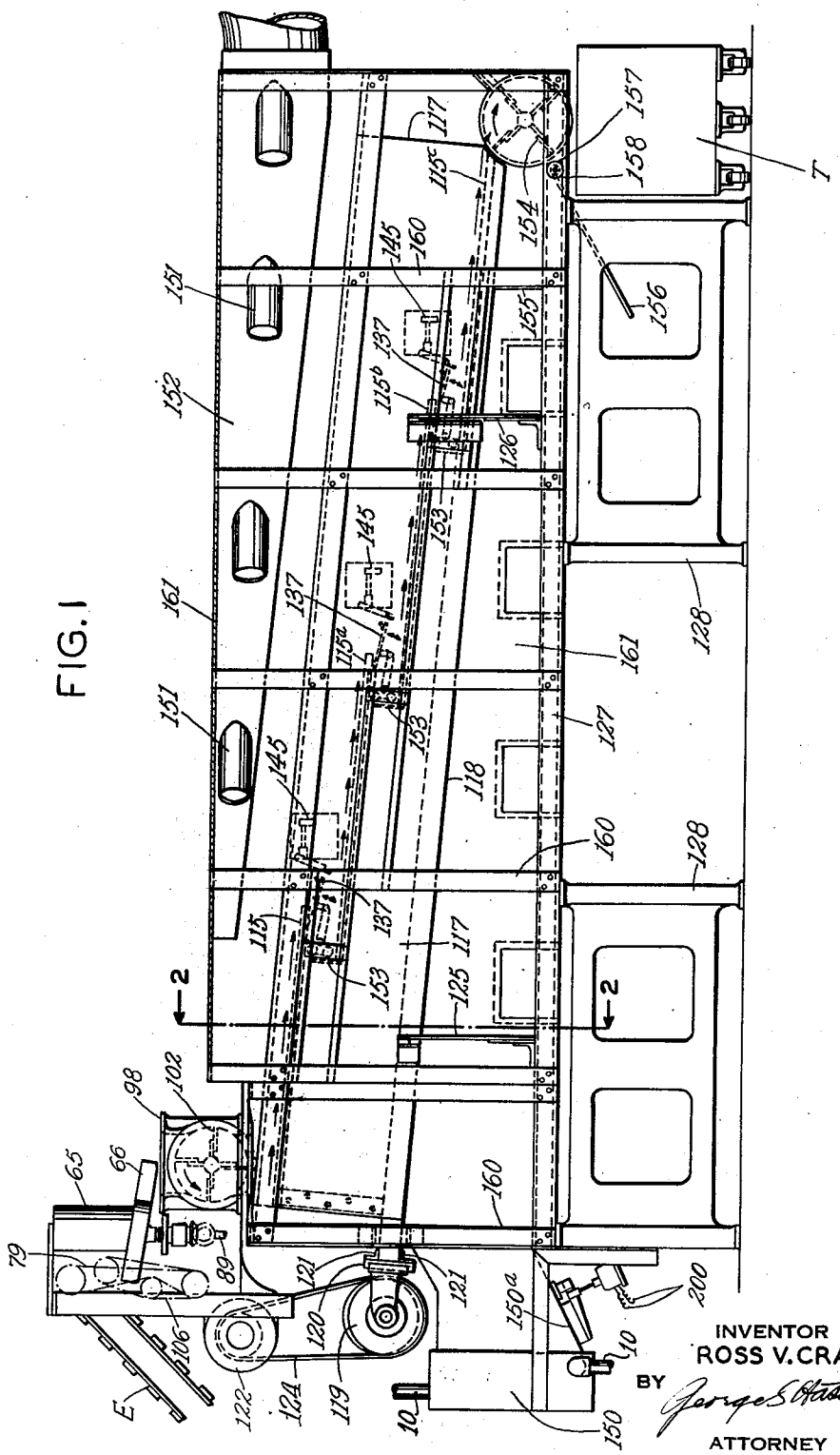
June 24, 1941. R. V. CRAGGS 2,246,914

METHOD AND APPARATUS FOR DRYING AND COOLING TOBACCO

Filed May 20, 1937 6 Sheets-Sheet 1

FIG. 1



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METHOD AND APPARATUS FOR DRYING AND COOLING TOBACCO

Filed May 20, 1937 6 Sheets-Sheet 2

FIG. 3

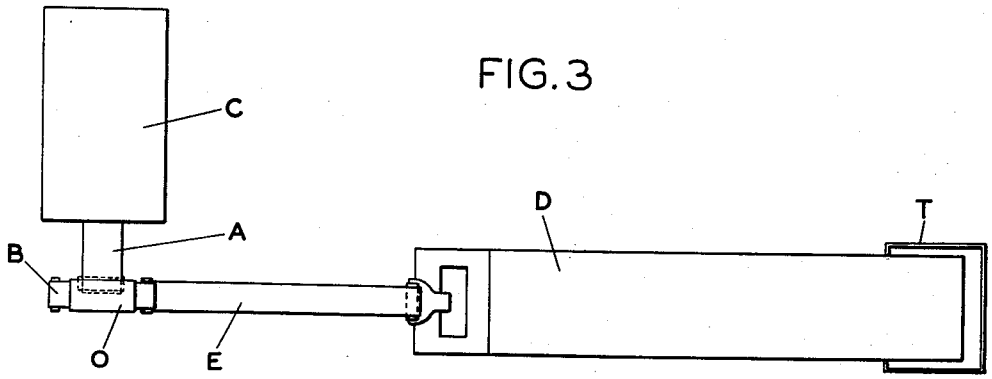
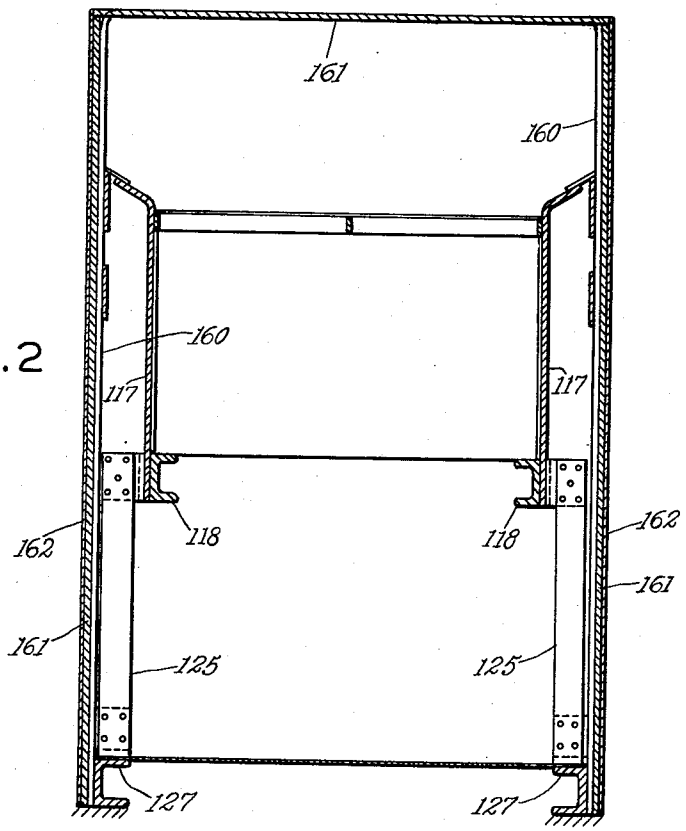


FIG. 2



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METHOD AND APPARATUS FOR DRYING AND COOLING TOBACCO

Filed May 20, 1937 6 Sheets-Sheet 3

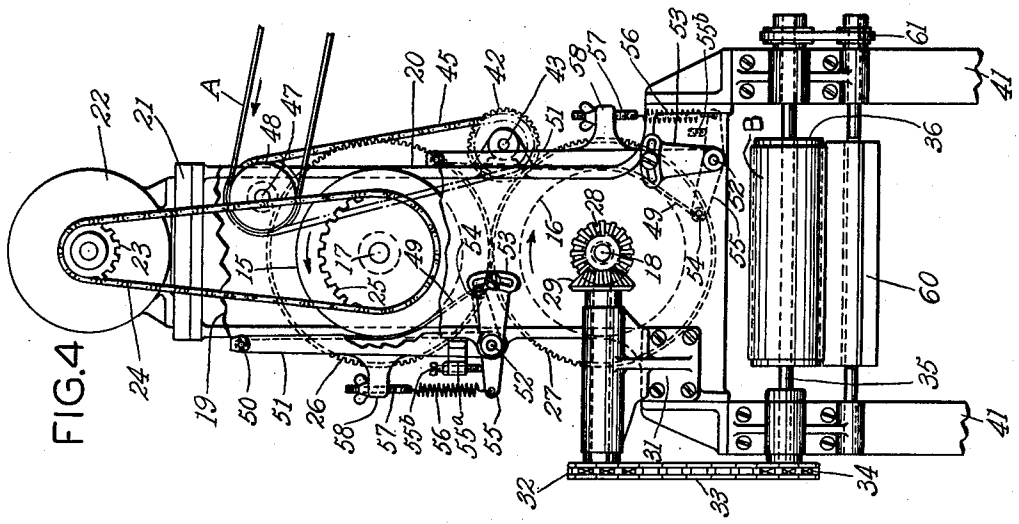


FIG.4

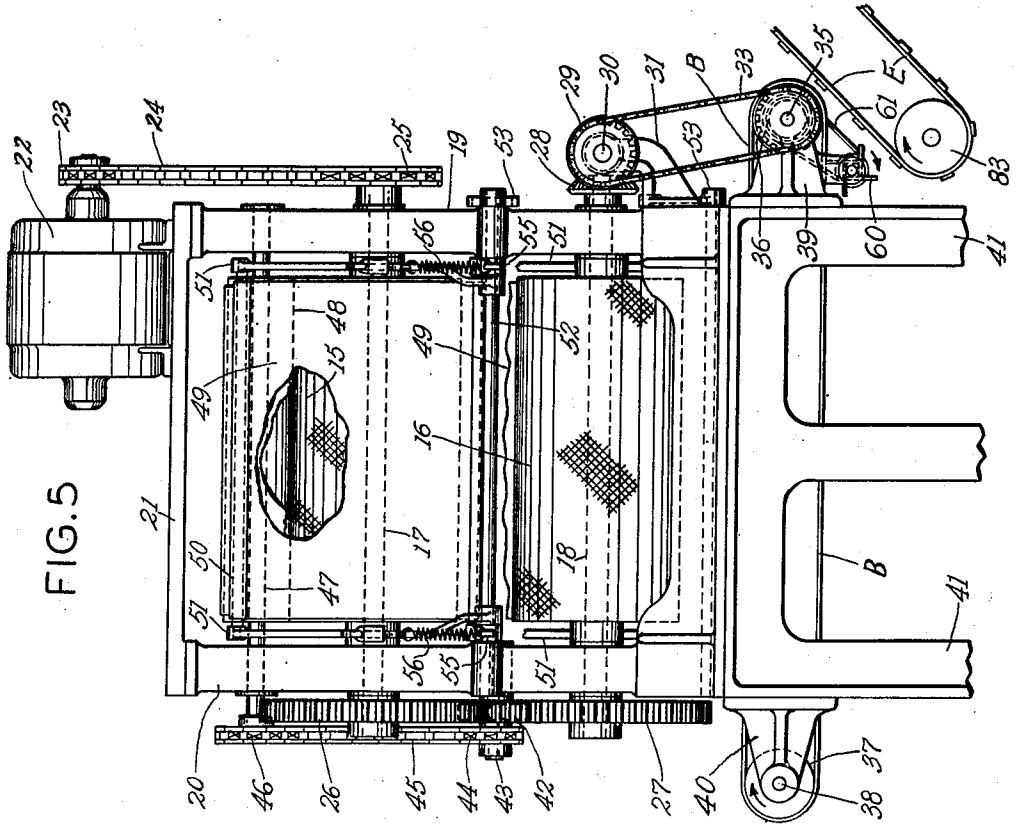


FIG.5

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June 24, 1941. R. V. CRAGGS 2,246,914

METHOD AND APPARATUS FOR DRYING AND COOLING TOBACCO

Filed May 20, 1937 6 Sheets-Sheet 4

FIG. 11

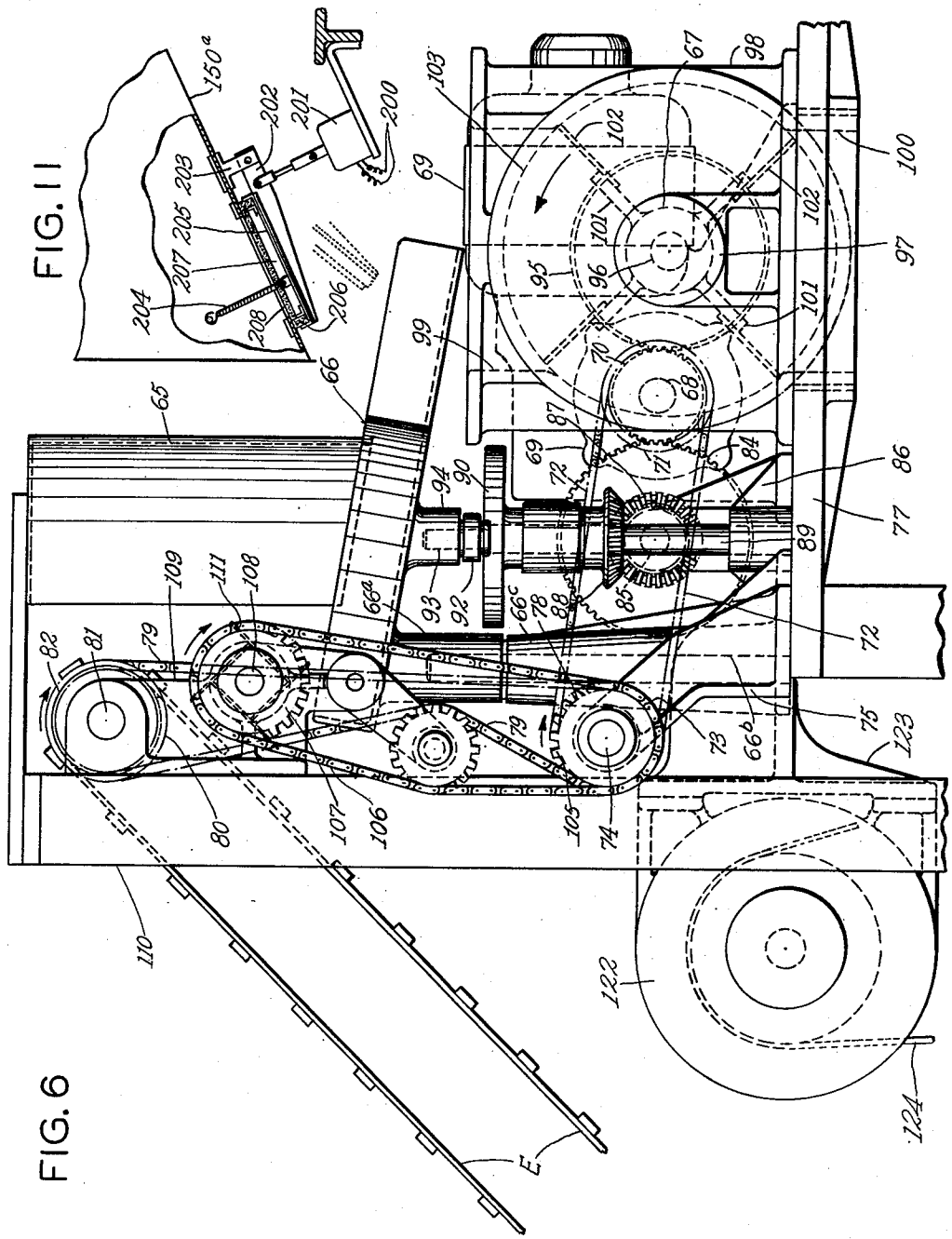


FIG. 6

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June 24, 1941. R. V. CRAGGS 2,246,914

METHOD AND APPARATUS FOR DRYING AND COOLING TOBACCO

Filed May 20, 1937 6 Sheets-Sheet 5

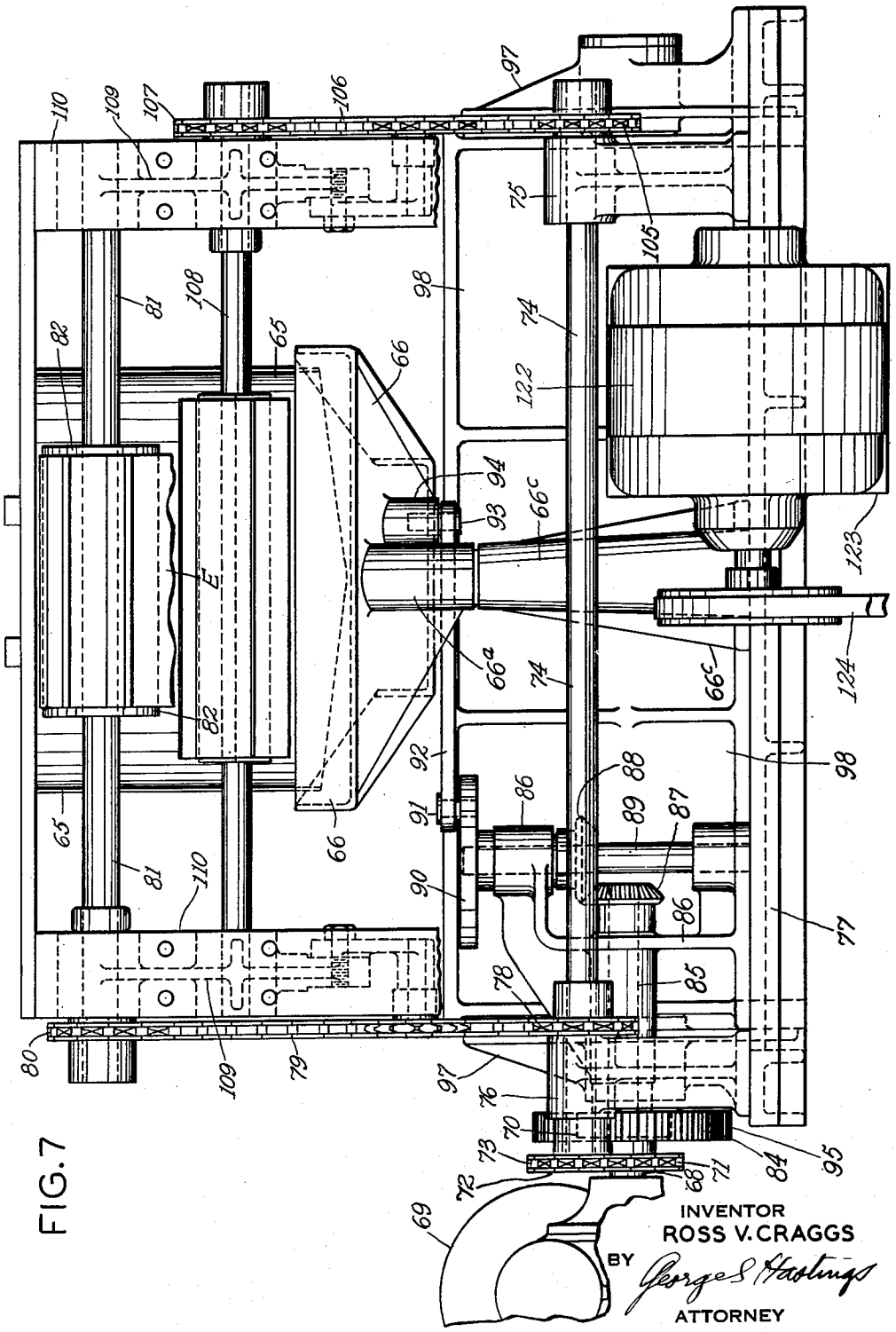


FIG. 7

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June 24, 1941. R. V. CRAGGS 2,246,914

METHOD AND APPARATUS FOR DRYING AND COOLING TOBACCO

Filed May 20, 1937 6 Sheets-Sheet 6

FIG. 8

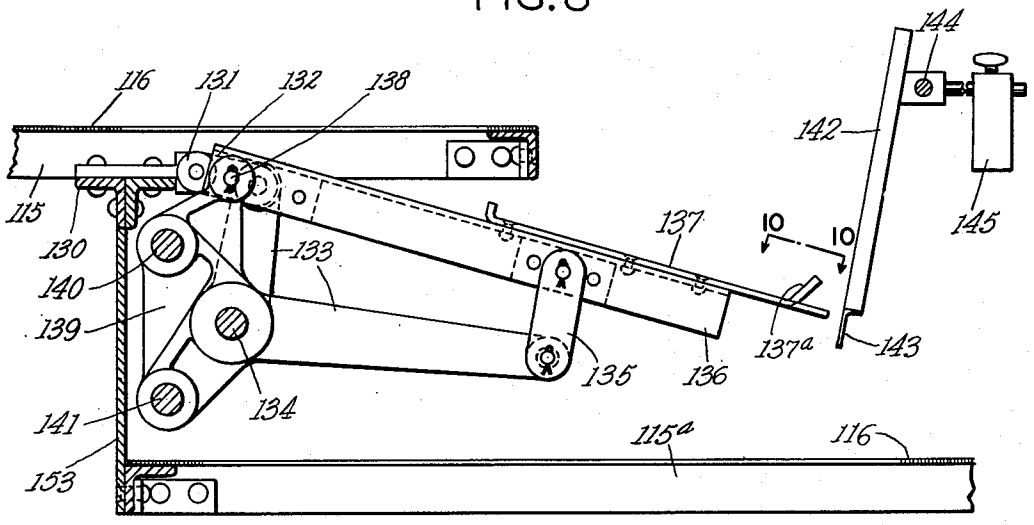


FIG. 9

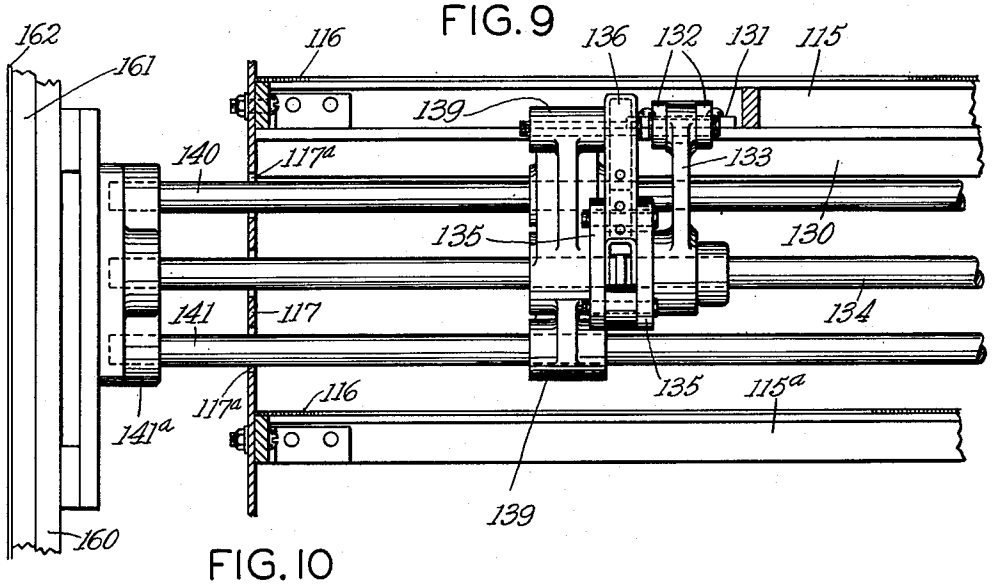
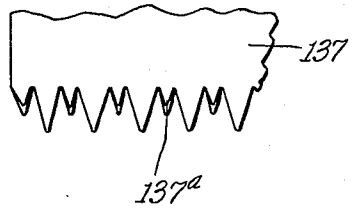


FIG. 10



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UNITED STATES PATENT OFFICE

2,246,914

METHOD AND APPARATUS FOR DRYING AND COOLING TOBACCO

Ross V. Craggs, Brooklyn, N. Y., assignor to American Machine & Foundry Company, a corporation of New Jersey

Application May 20, 1937, Serial No. 143,699

18 Claims. (Cl. 131—136)

This invention relates to an improved method and apparatus for cooling and drying tobacco in which the tobacco is dried, conditioned and cooled ready for use in cigarette making machines.

Heretofore, shredded tobacco was dried in revolving steam heated drums or cylinders wherein the tobacco was tumbled over and over to secure an intimate contact of all portions of the tobacco mass with the hot surface of the drum. In the operation of these drums, portions of the tobacco would at times adhere thereto and be burned or scorched. An important object of the invention, therefore, is to avoid the stated disadvantage of such driers, and with this end in view the shredded tobacco is dried in a current of warm air.

In the case of cigarette tobacco, a guillotine cutter is generally employed to separate slabs or slices from a compressed mass of tobacco, wherefore the shreds thereof should be loosened to assure effective drying. It is a further object of the invention, therefore, to open or loosen the slabs or slices prior to their delivery to the drier. With this end in view, a suitable form of opening mechanism is illustrated herein, but it will be understood that other suitable constructions may be employed.

In the illustrated embodiment of the invention the drier comprises an enclosed chamber having a series of vibrating sieves or tables, one delivering to the other, to pass the tobacco through the chamber. At one end tobacco is delivered through an inlet valve to the uppermost sieve. The vibrating motion of the sieve, which is lengthwise in direction, feeds the tobacco over the edge of the first sieve onto a shaker table which deposits upon the next sieve. Each sieve has perforations of about ½ mm. diameter for passing heated air without losing tobacco. As the tobacco is delivered from one sieve to the other, it is tumbled over more or less, which has been found important because it insures against the bottom of the layer being drier than the top. Air enters the bottom of the chamber after first passing through a steam heated radiator, and the warm air is drawn out of the top, which carries the air upwardly through the tobacco on the sieves. The delivery end of each shaker table is provided with a toothed edge and a yieldable element with toothed edges cooperates therewith to break up any lumps, and feed down onto the next table more uniformly. At the opposite end of the chamber from which the tobacco is delivered there is provided a partition, and into the compartment so formed cold air is admitted for the purpose of cooling the tobacco.

From what has been said, it will be seen that there is uniform drying without danger of contact with steampipes and without the rough tumbling employed in present machines of this type, which tends to break up the shreds and create "shorts." Moreover, a fluffy condition and uniform coloring are maintained due to the way the tobacco is fed and turned over. Control of the drying may be effected by controlling the flow of air through the agency of a variable humidostat within the drier connected to a shutter in the air intake. Drying, dressing and cooling in the same unit and with the same handling of the tobacco are attained, including breaking up of lumps so that no additional operation is needed for this purpose.

The present construction is believed to accomplish its duty in a better manner than the three machines necessary at the present time. Of these, the rotary drying machine circulates the tobacco in direct contact with the steam heated elements and tends to destroy the oil secretion responsible for the desired flavor and aroma. Then when tobacco is discharged into the cooling machine, the tobacco mass is not properly and sufficiently cooled and tends to agglomerate and form a sticky mass when stored, thereby necessitating an additional machine comprising a rotary drum provided with vanes, which redresses the tobacco before it is ready to be used in a cigarette making machine.

In the accompanying drawings, which form a part of this specification and in which like characters of reference indicate the same or like parts:

Fig. 1 is a side view of the drying and cooling machine;

Fig. 2 is a sectional end elevation taken on line 2—2 of Fig. 1, showing the manner of mounting the vibrating members;

Fig. 3 is a schematic plan view showing the drying and cooling machine used in connection with a tobacco shredder and tobacco slab opening machine;

Fig. 4 is an end view of the tobacco slab opening machine;

Fig. 5 is a side elevation of the same;

Fig. 6 is a side view showing the conveyor which delivers the tobacco from the slab opening machine to the distributor directing the same into an inlet valve of the drying and cooling machine;

Fig. 7 is an end elevation of the same;

Fig. 8 is a side elevation of the shaker tables which convey the tobacco from one sieve to the other through the drying chamber;

Fig. 9 is an end elevation of the same;

Fig. 10 is a plan view taken from line 10—10 of Fig. 8, showing a portion of the toothed edge provided on the shaker plates.

Fig. 11 is a detail view, partially in section, showing the automatic shutter and associated parts for admitting cool air to the air intake to regulate the air temperature.

Referring to the drawings, the tobacco leaves are placed in a tobacco shredding machine C of well known construction (Fig. 3) wherein the leaves are compressed to a more or less solid column from the forward end of which slabs or slices of the thickness requisite to produce the desired thickness of shreds are cut. The slabs fall on to a conveyor A and are carried to the slab opening mechanism O in which they are rolled, first in a counterclockwise direction, and then in a clockwise direction, thereby loosening the solid slab and producing a loose, more or less cylindrically shaped plug. This formed plug emerges from the slab opening device and falls on to a conveyor belt B which transports the same on to a conveyor E delivering to the drying and cooling machine D in which the tobacco is dried and cooled. The conditioned tobacco is finally discharged through an outlet valve into a truck T wherein the shredded tobacco is removed to the cigarette making machines or to storage bins as desired.

The opening mechanism (Figs. 4 and 5) consists of an upper rotating drum 15 turning in a counter-clockwise direction and a lower rotating drum 16 turning in the opposite direction, said drums being made of any suitable material, such as wood, metal or composition, plain or covered with fabric, as indicated by the hatching in Fig. 4, and mounted on shafts 17 and 18 respectively, supported in bearings of the upright frames 19 and 20. A tie plate 21 carried by frames 19 and 20 supports a motor 22 equipped with a sprocket 23 driving a chain 24 running over a sprocket 25 fixed on end of shaft 17. The other end of shaft 17 is provided with a gear 26 in mesh with a gear 27 fixed on shaft 18, the opposite end of shaft 18 carrying a bevel gear 28 driving a bevel gear 29 attached to shaft 30 supported in a bracket 31 fastened to the frame 19. Shaft 30 also carries a sprocket 32 driving a chain 33 running over a sprocket 34 fixed on shaft 35. The pulley 36 fastened on shaft 35 is thereby rotated in the proper direction to drive the conveyor belt B running over an idler pulley 37 loosely mounted on a shaft 38. Shafts 35 and 38 are supported in brackets 39 and 40 respectively, attached to the bed 41 of the mechanism. Gear 27 drives a pinion 42 mounted on a stud 43 supported in frame 20, said pinion having fastened thereto a sprocket 44 driving a chain 45 running over a sprocket 46 whereby motion is imparted to shaft 47 and pulley 48, thereby driving conveyor belt A.

Each cut tobacco slab is delivered by conveyor A on to the drum 15 and carried against an apron 49 which is yieldingly held in contact with said drum and nips the leading end of the slab of tobacco and thereupon rolls the same into a cylindrically shaped plug. This rolling action tends to open or loosen the compressed shreds of tobacco. On leaving drum 15 and apron 49, the rolled plug of tobacco drops on to the lower drum 16 which turns in the opposite direction and is also provided with a similar apron 49 which is arranged on the opposite side of drum 16 and coacts with its drum 16 to roll the plug in the opposite direction, whereby it is more considerably loosened. The plug, on leaving the lower drum 16, drops onto the conveyor B which transports the same to a conveyor E delivering to the inlet of the drying and cooling mechanism.

At its upper end, each apron 49 is looped around a cross rod 50 supported in arms 51 adjustably mounted on a shaft 52 supported by frames 19 and 20. An arm 53 attached to one end of each shaft 52 provides means for changing the position of arms 51 and aprons 49 relatively to the drums 15 and 16. The lower end of each apron 49 is looped around a cross rod 54 supported at its ends in arms 55 loosely mounted on shaft 52, the other end of arms 55 being fastened to the springs 56 connected to adjusting screws 57 carried by lugs 58 of arms 51. In the described manner, each of the aprons 49 may be adjusted for longer or shorter contact of tobacco between the drum and apron and for tight or loose tension to suit the condition of the tobacco in order to obtain best results. Holders 55a, attached to frames 19 and 20, are equipped with adjustable stop members or screws 55b resting against arms 55 and thereby controlling the movement of said arms in one direction and also limiting the pulling action of springs 56. With this arrangement either apron 49 can be adjusted to fulfill its duties of rolling the slab of tobacco, and it may be noted that if the apron is too tight about its drum it will have a tendency to break the slab of tobacco rather than roll it. A beater 60 driven from shaft 35 by a belt drive 61, is located below the lower loop of conveyor B and acts to vibrate and thereby remove dust or loose tobacco shreds from the same.

The loosely rolled plugs deposited upon conveyor E are transported upwardly, and on arriving at the peak of the conveyor, by the momentum of the same, are hurled against a deflector 65 (Figs. 6 and 7). The plugs are thus loosened into shreds and fall upon an oscillating platform 66 which further tends to spread the tobacco lumps, directing and distributing the same across the entire extent of the inlet valve 67 of the drying and cooling machine, in order to deliver an even mat of tobacco to the uppermost vibrating screen to be presently described.

A motor shaft 68 driven from motor 69 is equipped with a pinion 70 and a sprocket 71 (Fig. 7), the latter driving a chain 72 running over a sprocket 73 fastened on shaft 74 (Fig. 6). Shaft 74 is supported by pedestals 75 and 76 attached to bed-plate 77, a sprocket 78 also fastened on said shaft driving a chain 79 running over sprocket 80 fastened to shaft 81. A pulley 82 on shaft 81 drives a conveyor E running over an idler pulley 83 (Fig. 5). Pinion 70 drives a gear 84 loosely mounted on a stud 85 supported in a bearing of bracket 86 which is fastened to plate 77. To the gear 84 is fastened a bevel gear 87 meshing with a bevel gear 88 carried by an upright shaft 89 supported in bearings of bracket 86. The upper end of shaft 89 is provided with a crank-disk 90 carrying a crank-pin 91 connected to one end of a link 92 which is pivotally mounted at its other end in a stud 93 fastened in boss 94 of the platform 66. In this manner oscillating motion is imparted to the above mentioned platform.

Platform 66 is also provided with a hub 66a pivotally mounted on the upper end of an upright spindle 66b supported in a bracket 66c car-

ried by plate 77. Pinion 70 also drives a gear 95 mounted on shaft 96 turning in bearings of covers 97 which close the ends of inlet valve housing 98. This housing is provided with an intake 99 admitting the tobacco to the inlet valve 67 and an outlet 100 at its base permitting the tobacco to be delivered to the uppermost table of the drying and cooling device. The hub of the inlet valve is fastened on shaft 96, and has formed thereon spaced ribs 101 into which are fastened plates 102 closely fitting the surface of bore 103 of the valve housing. This arrangement of the valve construction tends to reduce to a minimum the possibility of warm air escaping from the drying chamber.

At its other end, shaft 74 is provided with a sprocket 105 driving a chain 106 running over a sprocket 107 mounted on shaft 108 carried by brackets 109 fastened on the standards 110 of the machine. A beater 111 fastened to shaft 108 tends to remove tobacco dust and particles of tobacco which may cling to the conveyor E.

The tobacco has now been deposited from the inlet valve on to the uppermost vibrating table 115 (Fig. 1) which carries a sieve 116 (Fig. 8); and the motion of the table thoroughly agitates the tobacco to permit the sand and grit to escape through the sieve, and being lengthwise in direction feeds the tobacco on to the next table 115a and thence on to the tables 115b and 115c successively. As the tobacco is delivered from one table to the other, it is tumbled over more or less, which has been found important because it assures uniform drying of the tobacco. Table 115 (Figs. 8 and 9) is rectangular in shape and supports the sieve 116, which may be a perforated sheet having stamped holes of about ½ mm. diameter, permitting the passage of heated air without loss of tobacco. The table 115 is fastened to side plates 117 (Figs. 1 and 2) attached to channels 118 which may be vibrated lengthwise from a "Eureka-Buhler" eccentricless drive 119, such as shown in the patent to Roth, 1,517,587. The driven gyratory member thereof is attached to a cross member 120 supported by angle-irons 121 provided on each of the channels 118. A motor 122 (Figs. 1, 6 and 7) mounted on a bracket 123 fastened to plate 77, drives a belt 124 running over the gyratory driving member of the eccentricless drive 119 whereby motion is imparted to channels 118 together with the tables and their sieves. Members 117 are suspended on sets of leaf springs 125 and 126, said springs at their bases being anchored to stationary channels 127 supported on beds 128. A pair of cross-bars 130 (Figs. 8 and 9) attached to the bottom of table 115 carry bearings 131 wherein are pivotally mounted the links 132 connected to one end of bell-crank levers 133 fulcrumed on shaft 134. The other ends of levers 133 are connected by links 135 to the U-shaped arms 136 which carry the shaker plate 137. Arms 136 are pivotally mounted on studs 138 provided in brackets 139 mounted on the shaft 134 and rods 140 and 141. The plates 117 are provided with slots 117a permitting movement of the same over the rods 134, 140 and 141. The latter are fixed at their ends in sockets 141a carried by the frame work of the machine. It will be seen that the to and fro motion of tables 115, 115a and 115b permits the bearings 131 to actuate links 132, whereby levers 133 are rocked to impart reciprocating motion to the shaker tables 137, thereby delivering to the succeeding sieve. The forward end of each of the shaker plates 137 is suitably notched to provide a toothed surface, and alternate teeth thereof are upturned to provide lips 137a (Fig. 10). A yieldable element 142 provided with a toothed edge 143 cooperates with the forward end of each shaker plate to break up any lumps and feed down onto the next sieve more uniformly. Member 142 is mounted on a pintle 144 and counter-balanced by a weight 145 which is adjustably mounted on member 142 to hold the same closer or farther away from the end of plate 137 in order to break up the lumps of tobacco most efficaciously.

From the foregoing, it will be clear that the invention consists in part of the combination with a shredder adapted to separate slices from a compressed mass of tobacco, and to forward said individual slices transversely of their length while so separated and loosening their shreds, of mechanism for advancing said loosened slices successively in the direction of their length and thereby spreading the slices, a drier, and mechanism for transferring the loosened shreds to said drier forming a mat of opened shreds substantially continuous and uniform in depth and breadth.

It is further apparent from the foregoing disclosure that the invention includes a drier-mechanism D comprising in a unitary structure means 150—160 for drying the shredded tobacco, mechanism 15—16 for advancing the individual slices transversely of their length while separated, means B to then advance them successively in the direction of their length, thereby spreading the slices of tobacco lengthwise, and mechanism E, 102 for transferring them to said drier-mechanism, forming thereon a mat of open shreds substantially continuous and uniform in depth and breadth.

The invention also includes, as above disclosed, mechanism 137 for disintegrating said mat continuously and uniformly to constitute a continuous stream of fluffy shreds, and a unitary mechanism 153 for spreading, drying and cooling said stream, and means 154 for delivering the supply of filler tobacco constituted thereby.

The air for drying the tobacco may be heated by a steam heated radiator 10 arranged in the air intake 150 of the machine (Fig. 1), and the warm air is drawn out at the top of the chamber through ducts 151 of a conduit 152 leading to a suitable source of suction such as a fan or the like. The tables are provided with baffle plates 153 which prevent the warm air from circulating out underneath the shaker plates 137. Therefore the current of warm air is directed underneath the vibrating tables and drawn upwardly through the perforations of the sieves and dries the tobacco thereon. A humidostat (not shown) may be arranged within the drier to control a shutter or valve in the air intake and govern the flow of air. The tables 115, 115a and 115b each deliver to the succeeding table, and the last table 115c, having no shaker plate, delivers the shredded tobacco directly into a discharge valve 154, which dumps the tobacco into a truck T. A baffle plate 155 prevents the warm air from flowing under the forward end of the table 115c and in a sense provides a cooling compartment or chamber. The latter chamber is equipped with a shutter 156 fixed on a shaft 157 with a handwheel 158 providing means for regulating the cool air inlet to best suit the requirements for proper cooling of the tobacco.

The channels 127 support a number of U-shaped frames 160 serving to carry the side, top

and end heat insulating boards 161, and also the outer shell 162 of the machine, as shown in Figs. 1 and 2.

The humidostat (not shown) is arranged within the drying chamber to close a circuit through a solenoid and thereby open a shutter and admit cool air to its air intake 150 whenever the humidity within the drying chamber falls below a predetermined degree. As shown more particularly in Fig. 11, the solenoid circuit includes the leads 200 of the winding of the solenoid 201 whose core is linked to the arm 202 pivoted on the bracket 203.

A tension spring 204 normally holds the shutter 205 carried by arm 202 in position to cut off the supply of cool air to the air intake 150. If desired, the shutter 205 may be provided with felt strips 206 at the margin of its inner face which engage the margins of the cool air inlet 207 provided in the bottom 150a of the air intake and interrupt the ingress of cool air therethrough, unless the solenoid is actuated by the humidostat and the shutter is thereby opened.

The agitation of the tobacco on the sieves, together with the tumbling thereof from one vibratory table to another assures a more efficient removal of the dust in the upward current of warm air through the sieves and thence out of the machine. Heretofore, for this purpose, the shredded tobacco was subjected to a current of cool air during the cooling operation, but the removal of dust in this manner was inefficient.

What is claimed is:

1. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of a drier, mechanism for rolling the slices and thereby loosening the shreds of tobacco in the slices separated by said shredder and transporting them to said drier.

2. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of a drier, mechanism for loosening the shreds of tobacco in the slices separated by said shredder and transporting them to said drier, said mechanism including a pair of members having relative movement and coacting to roll a slice therebetween, and a device for transferring the slices from said shredder to said members whereby the slices are rolled between said members and the shreds thereof are thereby loosened.

3. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of a drier, and mechanism for loosening the shreds of tobacco in the slices separated by said shredder and transporting them to said drier, said mechanism including sets of members having relative movement and coacting to roll the slices therebetween first in one direction and then the other, and a device for transferring slices from said shredder to said members, whereby the compressed shreds of the slices will be loosened by being so rolled in one direction and then rolled in the opposite direction.

4. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of a drier, and mechanism for rolling the slices and thereby loosening the shreds of tobacco in the slices separated by said shredder and transporting them to said drier, said drier including a series of vibratory sieves arranged in cascade relation and adapted to agitate the tobacco thereon to permit dust and grit to escape therefrom through the sieve, and feed the tobacco on to the next sieve, whereby the tobacco is tumbled while being delivered from one sieve to the next, means for circulating warm air through the sieves to dry the tobacco thereon, and means to cool the warm tobacco shreds.

5. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of a drier, and mechanism for loosening the shreds of tobacco in the slices separated by said shredder and transporting them to said drier, inclined vibrating shaker tables intermediate adjacent sieves and arranged to receive tobacco from one sieve and deposit it upon the next sieve, and members coacting with the delivery end of each shaker table to loosen any lumps of tobacco thereon.

6. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of mechanism for rolling and thereby loosening the shreds of tobacco in the slices separated by said shredder.

7. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of mechanism for loosening the shreds of tobacco in the slices separated by said shredder, said mechanism including members having relative movement and coacting to roll a slice of tobacco therebetween.

8. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of mechanism for loosening the shreds of tobacco in the slices separated by said shredder, said mechanism including a revolving member, a flexible element yieldingly held against said member, and a device for transferring the slices from said shredder on to said member whereby the slices are rolled between said element and member and the shreds thereof are thereby loosened.

9. The combination with a guillotine shredder adapted to separate slices from a compressed mass of tobacco, of mechanism for loosening the shreds of tobacco in the slices separated by said shredder, said mechanism including a pair of oppositely revolving members, a pair of oppositely arranged elements yieldingly held against opposite sides of said members respectively, and a device for transferring slices from said shredder on to one of said members, the other of said members being arranged to receive the slices from the first member, whereby the compressed shreds of the slices will be loosened by being rolled in one direction between the first member and its yielding element and then rolled in the opposite direction between the second member and its yielding element.

10. Mechanism for loosening the shreds of tobacco in slices separated from a compressed mass of tobacco, comprising opposed members spaced sufficiently to admit a slice of tobacco therebetween and having sufficient relative movement to effect rolling of the slice whereby the shreds thereof are thereby loosened.

11. Mechanism for loosening the shreds of slices of tobacco separated from a compressed mass, comprising sets of members having relative movement and coacting to roll a slice of tobacco first in one direction and then the other whereby the shreds thereof are loosened.

12. The process of preparing tobacco which comprises the steps of separating slices from a compressed mass of tobacco, rolling the slices individually to loosen the shreds of tobacco in the slices, and drying the shreds.

13. The process of preparing tobacco which

comprises the steps of cutting slices from a compressed mass of tobacco, and rolling the slices individually between endless travelling members one of which has differential movement of its slice-engaging surface relatively to that of the other.

14. The process of preparing tobacco as claimed in claim 13, and in which one of said members is constituted by an endless flexible band operating in a constantly forward direction.

15. The combination with a shredder adapted to separate slices from a compressed mass of tobacco, of a drier-mechanism, comprising in a unitary structure means for drying, fluffing and cooling the shredded tobacco, mechanism to advance the individual slices transversely of their length while separated, and then to advance them successively in the direction of their length, thereby spreading the slices of tobacco lengthwise, and mechanism for transferring them to said drier-mechanism, forming therein a mat of opened shreds substantially continuous and uniform in depth and breadth.

16. The combination with a shredder adapted to separate slices from a compressed mass of tobacco, and to forward said individual slices transversely of their length while so separated and to loosen their shreds, mechanism for advancing said loosened slices successively in the direction of their length and thereby spreading the slices, a drier, and mechanism for transferring the loosened shreds to said drier forming a mat of opened shreds substantially continuous and uniform in depth and breadth.

17. The combination with a shredder adapted to separate slices from a compressed mass of tobacco, of mechanism to advance the individual slices transversely of their length while separated, and then to advance them successively in the direction of the length, thereby spreading the slices lengthwise in a mat substantially continuous and uniform in depth and breadth while preserving substantially the original continuity of the shred lengths.

18. The combination with a shredder adapted to separate slices from a compressed mass of tobacco, of mechanism to advance the individual slices transversely of their length while separated, thereby spreading the slices lengthwise in approximate continuity of the shred lengths, loosening the shreds thereof, to free the included foreign substances, such as grit, and forming a mat of shredded tobacco substantially continuous and uniform in depth and breadth, mechanism for disintegrating said mat continuously and uniformly to constitute a continuous stream of fluffy shreds, and a unitary mechanism for spreading, drying and cooling said stream, and for delivering the supply of filler tobacco constituted thereby.

ROSS V. CRAGGS.