Dec. 23, 1941. O. E. EISSMANN 2,267,326

AIR SEPARATOR FOR COMMINUTED TOBACCO

Filed March 31, 1938 2 Sheets-Sheet 1

Fig. 1.

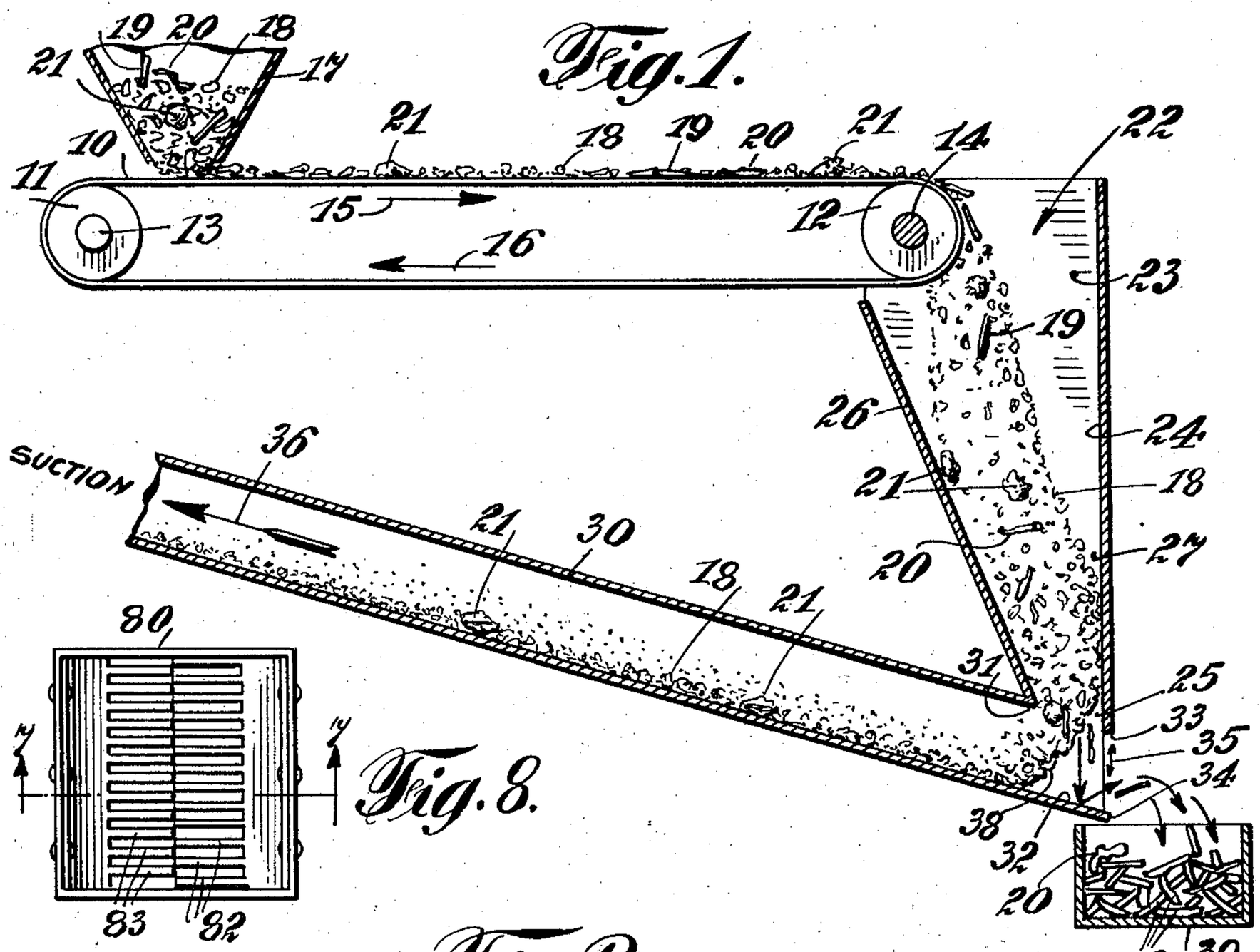

Fig. 8.

Fig. 2.

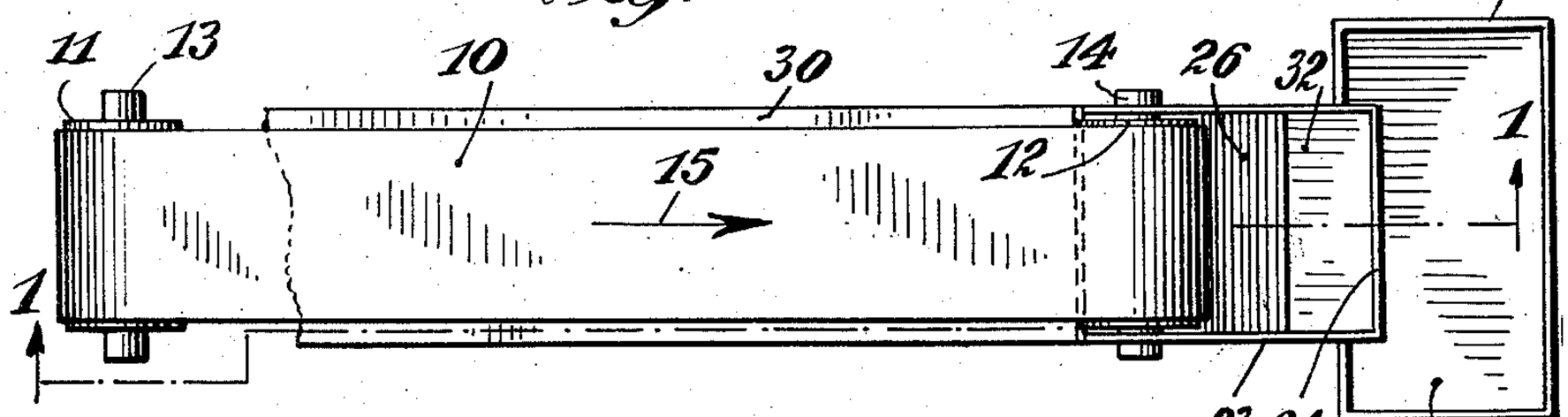

Fig. 7.

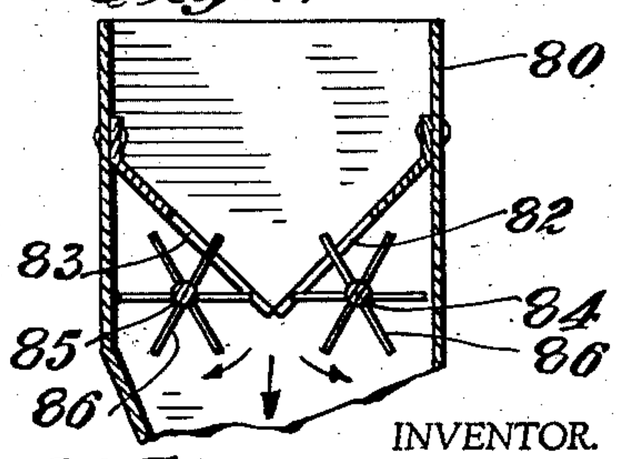

Fig. 3.

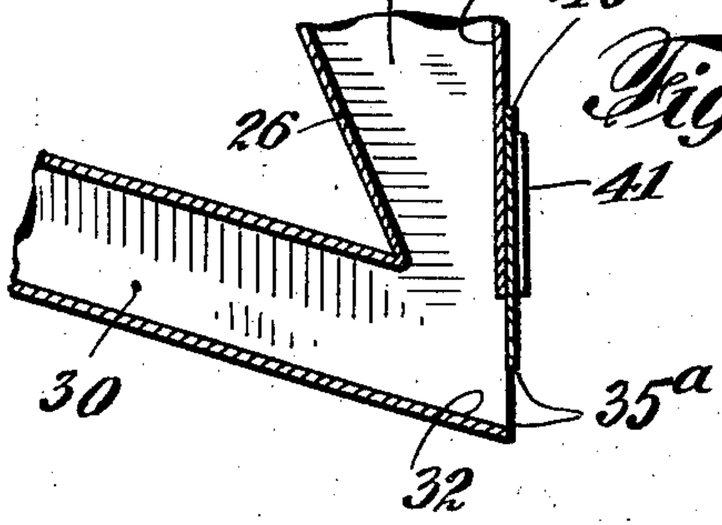

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Fig. 4.

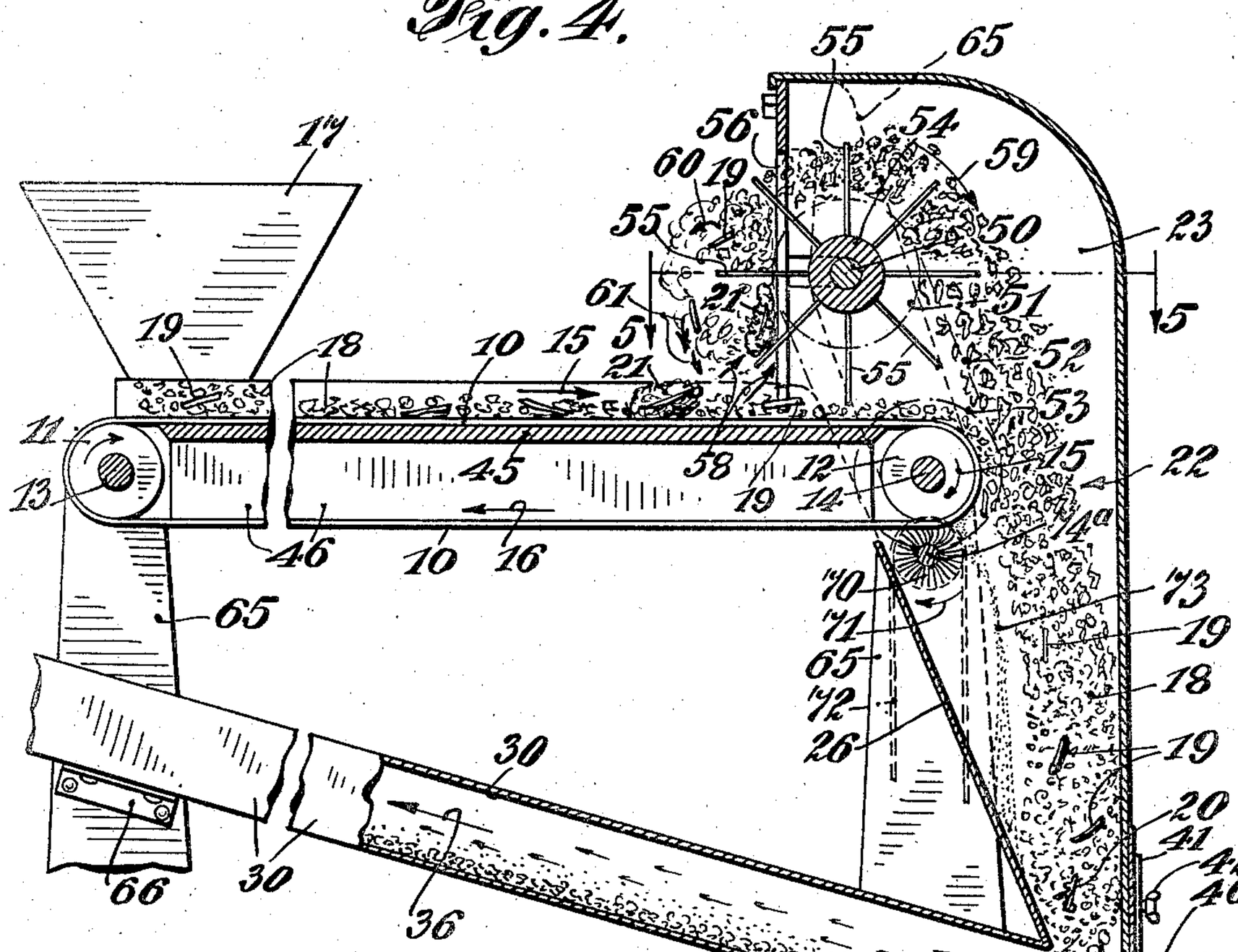


Fig. 5.

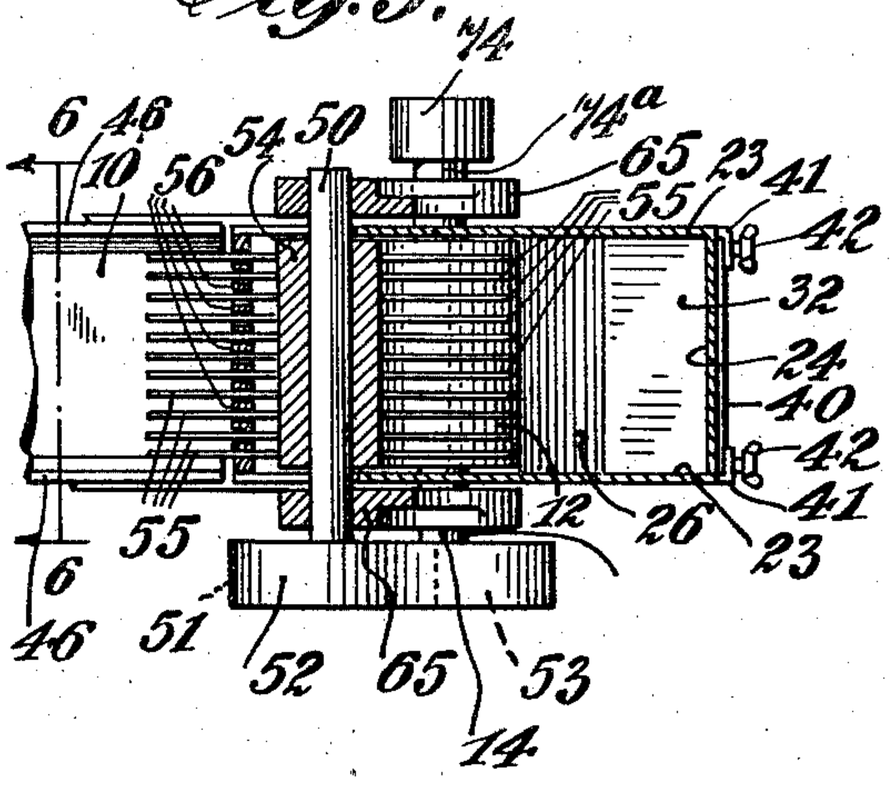
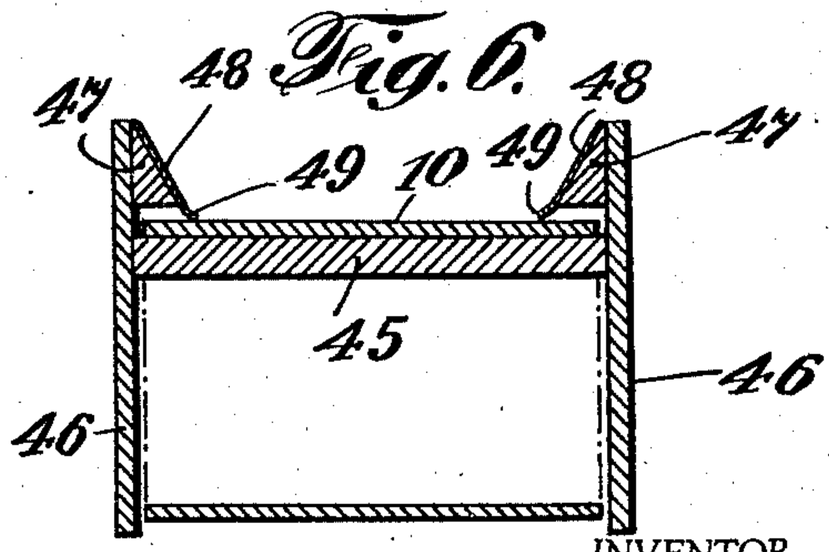


Fig. 6.



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Patented Dec. 23, 1941 2,267,326

UNITED STATES PATENT OFFICE

2,267,326

AIR SEPARATOR FOR COMMINUTED TOBACCO

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Application March 31, 1938, Serial No. 199,126

3 Claims. (Cl. 209—136)

This invention relates to an automatic tobacco feeder with a separator, more particularly to a device for removing foreign matters and tobacco stems from material used in tobacco products, and has for its object to clean the tobacco of foreign bodies and of any accumulated knots of tobacco, while the tobacco is being fed from a receiving hopper to the cigarette making machine. The tobacco here involved is such as is used for the making of cigarettes.

The object of the invention is to treat tobacco during its passage from the receiving hopper to the cigarette machine, and to provide means for the separation of hard or foreign bodies, such as stems of tobacco leaves and slivers of wood which sometimes are found in cut tobacco, and at the same time to remove any knots of tobacco which are likely to accumulate when the fine threads of cigarette cut tobacco intermingle and become more or less knotted with one another.

This invention consists essentially of a feeder discharging into a chute, and of a suction channel or conduit communicating with the lower part of the chute to draw from the chute the separated and loose tobacco. By such drawing of tobacco from the chute, the heavier particles descend by gravity and separate from the tobacco drawn by induced air into the conduit. The heavier particles bounce off the conduit wall, and the separated and cleaned tobacco is drawn by induced air through the conduit to the feedhoppers of the cigarette making machine.

This invention consists further of providing means whereby accumulated threads of tobacco which form into balls or knots are disintegrated into normal unballed threads of tobacco, and the invention also consists of means for moving the same to the cigarette making machine.

This invention consists further of modifications, as shown in the various embodiments of the drawings, and the invention will be more fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings,

Figure 1 is a vertical longitudinal section taken on line 1—1 of Figure 2, seen in the direction of the arrows of one embodiment of the invention.

Figure 2 is a plan view of Figure 1.

Figure 3 is a longitudinal section of a part of Figure 1, having an adjustable slide to regulate the speed or force of suction air.

Figure 4 is a vertical longitudinal section of a structure like that shown in Figure 1, but having a tobacco separating means attached thereto to break up the knots or bunches of tobacco, the embodiment shown in Figure 4 corresponding more closely to the commercial form, while Figure 1 is drawn more or less diagrammatically for the purpose of clarifying the operation of the invention.

Figure 5 shows a horizontal section of part of the structure shown in Figure 4, taken on line 5—5 of Figure 4, seen in the direction of the arrows.

Figure 6 is a vertical transverse section of the feed belt, taken on line 6—6 of Figure 5.

Figure 7 is a vertical section, taken on line 7—7 of Figure 8, of a combined feed chute or hopper and disintegrator, adapted to form part of the structure of Figure 3 if desired, thereby omitting the hopper, feed apron and disintegrator shown in Figure 4, and

Figure 8 shows a plan view of the staggered grids of Figure 7.

Similar characters of reference indicate corresponding parts throughout the various views.

Referring to the drawings, and more particularly to Figures 1 and 2, the feed belt 10 is supported and operated by means of pulleys 11 and 12 upon the shafts 13 and 14, respectively, the belt 10 moving in the direction of the arrow 15, and in a return direction as indicated by the arrow 16. At one end of the belt 10, a hopper 17 is provided which is supplied with the cut cigarette tobacco 18, and which, due to the nature of the tobacco, sometimes has stem portions 19, wood slivers 20, and knotted threads of tobacco 21. The hopper 17 is shown to show a feed device of known construction, and can be replaced by any other type of device such as to discharge its tobacco upon the apron 10. A workman could feed by hand directly upon the apron.

The chute 22 has parallel walls 23 forming with the end wall 24 a rectangular open end at the lowermost portion 25 of said chute. It is important to note that the side walls 23 are parallel with each other and form a rectangle with the end wall 24. The fourth wall of the chute is made up by the inclined wall 26, so that the tobacco dropped by the apron 10 falls upon the inclined wall 26 and is guided by said inclined wall along the side walls 23 and the end wall 24, without any danger of having the tobacco threads form accumulated balls or knots on account of the shape of the chute, as clearly seen also in Figure 2. After the tobacco has been discharged from the apron 10 into the chute 22, it falls down freely and openly, and even at and below

the point 27 the tobacco remains loose, so that when it enters the channel 30 it is still free and open.

At the lower part of the chute 22 there is disposed at an angle to the vertical a closed channel 30 which has its end 31 terminating at the inclined wall 26, and its other end portion 32 extending beyond the lower end of the inclined wall 26 to a position below the vertical wall 24. An orifice is formed between the lowermost edge 33 of the vertical wall 24 and the edge 34 of the extending lip portion 32 of the channel 30. The height and width of this orifice, generally indicated by 35, that is, the area, determines the character of the air sucked in by the suction of the channel 30, since it is known that air under suction always follows the shortest line of travel. A suction action may be provided in the channel 30 by a suitable suction fan known and not shown. This suction action is indicated by the arrow 36, as also by the word "suction" printed in connection therewith. When the suction has been applied to the channel 30 the induced air entering the orifice 35 will cause the tobacco to flow from the chute 22 through the lower orifice 25 of that chute and on the lower wall 32 of the channel 30, thus taking a more or less exterior curved direction as indicated generally by the character 38.

The movement given to the descending tobacco from the chute 22 and the ascending tobacco in the channel 30 causes an empty space to be formed exterior to the contour line 38 and above the lip portion 32 of the channel 30. As the movement of the objects under suction action depends, on the one hand, upon the force of the suction and, on the other hand, upon the weight of the objects, as the tobacco leaves the chute 22 the heavier parts thereof, such as stems 19 and perhaps the heavier slivers of wood 20, are not carried along by the suction air but dropped from the tobacco stream upon the inclined lip 32 and bounce off therefrom, due to the angular position of the lip 32 in respect to the descending particles. Due to this angular incidence and its deflected angle, these particles 19 and 20 hop out of the channel 30 into a box placed to receive them. The other portions of the tobacco, consisting mainly of tobacco threads, and perhaps also including some knots, are not heavy enough to bounce off the angular lip 32, and are drawn along by suction upwardly through the channel 30.

In order to provide a variation of the area of the orifice 35, a valve 40 is guided by wall 41 as shown in Figure 3, the valve plate 40 being movable substantially parallel with the end wall 24. This plate 40 may be adjusted by suitable means such as thumb screws 42 (Figure 4) or the like, or by frictional hold in the guide wall 41, and the area of the orifice 35 as shown in Figure 1 can be regulated to a smaller size, as indicated by 35*a* in Figure 3.

The invention has been described in respect to the separation of heavier particles from the tobacco feed by an induction air flow, with the heavier particles bouncing off the inclined lip 32. The invention thus described finds its embodiment also in Figure 4. In order to remove the knots of tobacco or accumulations of threads from the tobacco stream flowing up the induction channel 30, separating or disintegrating means are provided above the discharge end of the apron 10 in the embodiment shown in Figure 4. The apron 10 in the embodiment shown in Figure 4 has a stationary member or board 45 supported by the frame of the machine immediately below the belt 10, so as to prevent any sagging of the belt 10 when loaded with tobacco. At the same time each of the lateral walls 46 has a triangular member 47 secured thereto, and these triangular members 47 are in turn covered by a layer 48 of flexible material, such as leather or canvas or the like, with downwardly extending lips 49, either in close proximity to the apron 10 or contacting therewith. The object of these triangular members 47, with their flexible material covers 48 and lips 49, is to keep the tobacco confined within the width of the feed apron 10. These parts are clearly shown in Figure 6.

Immediately above the discharge end of the feed apron 10, a tobacco loosening and separating device or disintegrator is shown. This device is rotated by the shaft 50, having at its end a pulley 51, which pulley has a belt 52 passing over the pulley 53 on the shaft 14 of the feed apron 10. The shaft 50 has a hub portion 54 into which a large number of rods 55 are secured. Circumferentially considered in the embodiment shown in Figure 4, eight rods are shown, and considered longitudinally of shaft 50, eleven rods are shown. These rods 55 are spaced longitudinally, as also circumferentially, as shown. At about one-half to one-third of the length of these rods 55, when the same are in a horizontal position, a vertical grid 56, extending at right angles to the rods 55 when the same are in a horizontal position, is provided. This grid consists of a plurality of spaced bars, the spaces being sufficient to allow for the passage of the rods 55 with a certain amount of tobacco, and the grid, extending from its uppermost portion, is placed to permit the rotary movements of the rods 55 therethrough and downwardly, so as to have its lower end come into the path of the tobacco stream on the feed apron 10. As the tobacco stream on the feed apron 10 meets this barrier, it is necessarily moved upwardly in the direction of the arrows 58, and as the rods 55 rotate clockwise in the direction of the arrow 59, the accumulated flow of tobacco in front of the grid 56 is engaged by the rods and broken up and forced through the spaces between the grid 56; as it is forced through, the tobacco is thrown rain-like into the upper space of the chute portion 23, the finer parts of the tobacco remaining on or falling upon the apron 10 and this is conveyed by the apron to its discharge end into the chute 22. Certain of the smaller stems of the tobacco may pass here and there through the spaces of the grids, others are thrown upwardly in the direction of the arrow 60 and descend as shown by the arrow 61, and again perhaps partake of the upward movement, or pass through the grids; similarly the wood slivers 20. The knots of tobacco 21, however, are disrupted by the action of the rods 55 through the grid 56, and this disrupted or loosened tobacco is thrown into the chute portion 23. In consequence, the material in the chute 22 consists of well separated tobacco threads, and, unfortunately, of stems 19 and slivers 20.

The action of the air induction, as indicated by the arrow 36, in the channel 30 causes the tobacco to take its convex contour 38, allowing thereby a free space, where the weight of the particles 19 and 20 causes their descent by gravity, and being heavier than the force of the in-

duced air, leave the tobacco stream and bounce off the lip **32** into the collecting box **39**.

The tobacco which is now conveyed by the channel **30** under the action of induced air, is free from such stems, slivers, and knots or balls, and is in an efficient condition to be supplied to the cigarette making machines.

In the embodiment shown in Figure 4 the orifice **35***b* is smaller than the orifice **35** of Figure 1, having been regulated by the thumb screw **42** and the valve plate **40**. The speed of the suction flow of air is determined by the size of this orifice.

In the embodiment shown in Figure 4, the machine is provided with standards **65** which are provided with brackets **66** to support the chute **30**. There is also provided a brush **70** arranged at the upper part of the inclined wall **26** so as to act upon the lower surface of the apron **10** moving in the direction of the arrow **16**. The speed of this brush is higher than the speed of the shaft **14** and in consequence the belt shown in dotted lines in Figure 4 and indicated by **72**, and which passes over the pulley **74** on the shaft **74***a* of the pulley, is connected with some suitable portion of the drive shaft in order to accentuate this brush at a higher rate of rotation than shaft **14**. This brush **70** brushes off from the apron **10** the finer adhering tobacco particles, and such particles, moving in the direction of arrow **71**, provide the descending stream **73** which merges with the tobacco in the lower part of the chute **22** and is readily drawn along by the induction flow **36**, as shown in the finer particles exhibited in the interior of conduit **30**, the latter particles traveling above the heavier particles as shown. As the induced air has its greatest velocity along the shortest distance of its flow, the greatest velocity of induced air in the conduit **30** will be on a line defined by the size of the opening **35***b*.

From the foregoing it will have been seen that the feed apron **10** is provided by the feed hopper with tobacco containing various foreign bodies, and that by the action of the induction channel upon the lower end of the collecting chute, the heavier foreign bodies are permitted to separate from the tobacco stream and bounce off away from the stream, whereby only tobacco is forwarded to the cigarette making machine. It will also have been noted that in the forwarding of tobacco which contains accumulated particles of tobacco threads, means have been provided to disintegrate the same so as to cause the tobacco traveling in the induction channel to be not alone free from foreign bodies, but also free from knots or balls of tobacco. The action of the machine is automatic, in the sense that when the tobacco is once fed to the chute, the tobacco is subjected to the induced air flow so as to remove the foreign bodies.

In Figure 7 is shown a sectional view of a combined feed hopper or feeder and disintegrator. By removing the hopper **17** and feed apron **10**, with the shafts **13** and **14**, from the structure shown in Figure 1, this combined hopper and disintegrator can be placed directly upon the chute **24**, and thereby close the part indicated by **22**. This hopper **80** receives the tobacco at its open end. Within this hopper **80**, there are one or two grids. In the embodiment shown, there are two grids, **82** and **83**, each inclined downwardly towards the central part of the hopper. These grids have spaces between the bars thereof, as shown in Figures 5 and 8. Shafts **84** and **85** are suitably supported in bearings (not shown) in the walls of the hopper, and these shafts have rods **86** like the rods **55** in Figure 4 and Figure 5. The two inclined grids **82** and **83** are staggered in relation to each other, and almost meet at their ends. Thus, by the operation of the disintegrating rods **86** forcing the tobacco and its disentangled or loosened knots through the grids, the loosened tobacco is sprinkled like rain into the chute. Of course, the stem portions **19** and slivers **20** fall down into the chute, and are thereafter treated with the loosened tobacco in the manner hereinbefore described.

Tobacco for the particular use of cigarettes or cigarette making machines has been described, but it is clear that tobacco leaves may be treated in the same way, in that leaf tobacco stripped of the stems would be drawn along by the suction air, whereas heavier stems or other foreign matter would drop by gravity and bounce out of the suction conduit.

The apparatus as described cooperates with the known cigarette making machines, and electrical or other means may be connected therewith, operating in conjunction with the cigarette making machine, so that upon any stoppage of the cigarette making machine, the feeder of this improved apparatus may be stopped.

I have shown embodiments of my invention, but I do not wish to be limited to the details thereof, as changes may be made therein without departing from the spirit of my invention as defined in the appended claims.

I claim as new:

1. In an automatic device for removing heavier particles such as tobacco stems and foreign bodies from finely cut tobacco, a chute having a rear vertical wall and an inclined front wall converging towards the lower end of the vertical wall to form an open discharge bottom, means for feeding tobacco in distributed form to the upper portion of said chute in a direction substantially at right angles to the vertical wall of said chute, said inclined wall directing the tobacco in the chute toward the lower end of said vertical wall, a suction conduit connected to the lower end of said chute and disposed at an acute angle with respect to the inclined and vertical walls of said chute, to receive the tobacco discharged from said chute, said suction conduit having an upper wall terminating at the inclined wall of the chute and a lower parallel wall extending across the discharge bottom of the chute in spaced relation thereto to form a lip portion, the free end of said lip portion terminating in line with said vertical wall of the chute and spaced below the lower end of said wall approximately the width of said suction conduit to form an air inlet opening, whereby the lighter tobacco is drawn into said suction conduit in a stream curving from the rear wall of said chute adjacent said discharge bottom to the lower wall of the conduit, and the heavier particles such as tobacco stems and foreign bodies separate from the stream of lighter tobacco particles and bounce off said lip portion of the conduit through said opening, and means for regulating the size of said opening to control the grading of the tobacco.

2. In an automatic device for removing heavier particles such as tobacco stems and foreign bodies from finely cut tobacco, a chute having a rear vertical wall and an inclined front wall converging towards the lower end of the vertical wall to form an open discharge bottom, means for feeding tobacco in distributed form to the

upper portion of said chute in a direction substantially at right angles to the vertical wall of said chute, said inclined wall directing the tobacco in the chute toward the lower end of said vertical wall, a suction conduit connected to the lower end of said chute and disposed at an acute angle with respect to the inclined and vertical walls of said chute, to receive the tobacco discharged from said chute, said suction conduit having an upper wall terminating at the inclined wall of the chute and a lower parallel wall extending across the discharge bottom of the chute in spaced relation thereto to form a lip portion, the free end of said lip portion terminating in line with said vertical wall of the chute and spaced below the lower end of said wall approximately the width of said suction conduit to form an inlet opening, whereby the lighter tobacco is drawn into said suction conduit in a stream curving from the rear wall of said chute adjacent said discharge bottom to the lower wall of the conduit, and the heavier particles such as tobacco stems and foreign bodies separate from the stream of lighter tobacco particles and bounce off said lip portion of the conduit through said opening, and a valve plate slidable on said rear vertical wall for regulating the size of said opening to control the grading of the tobacco.

3. In an automatic device for removing heavier particles such as tobacco stems and foreign bodies from finely cut tobacco, a chute having a rear substantially vertical wall and an inclined front wall converging towards the lower end of the vertical wall to form an open discharge bottom, means for feeding tobacco in distributed form to the upper portion of said chute in a direction substantially at right angles to the vertical wall of said chute, said inclined wall directing the tobacco in the chute toward the lower end of said vertical wall, a suction conduit connected to the lower end of said chute and disposed at an acute angle with respect to the inclined and vertical walls of said chute, to receive the tobacco discharged from said chute, said suction conduit having an upper wall terminating at the inclined wall of the chute and a lower substantially parallel wall extending across the discharge bottom of the chute in spaced relation thereto to form a lip portion, the free end of said lip portion terminating in line with said vertical wall of the chute and spaced below the lower end of said wall approximately the width of said suction conduit to form an air inlet opening, whereby the lighter tobacco is drawn into said suction conduit in a stream curving from the rear wall of said chute adjacent said discharge bottom to the lower wall of the conduit, and the heavier particles such as tobacco stems and foreign bodies separate from the stream of lighter tobacco particles and bounce off said lip portion of the conduit through said opening.

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