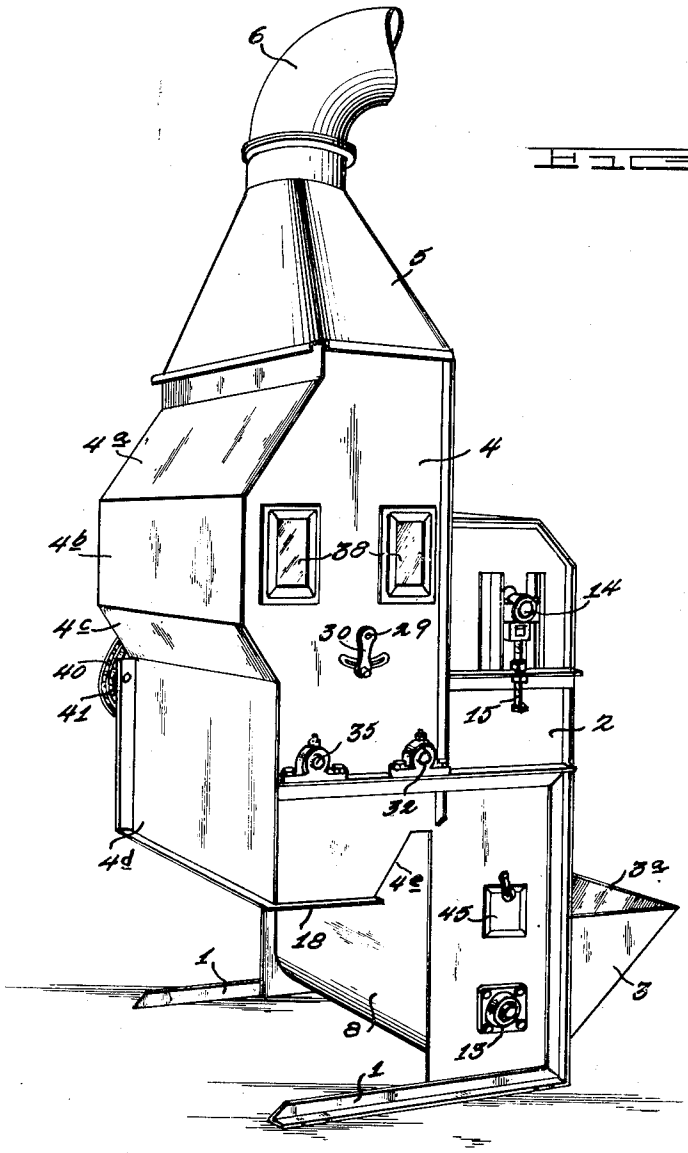
June 17, 1952 K. J. BRANDAU ET AL 2,600,965

PNEUMATIC SEPARATOR

Filed Nov. 17, 1948 4 Sheets-Sheet 1

FIG. 1.



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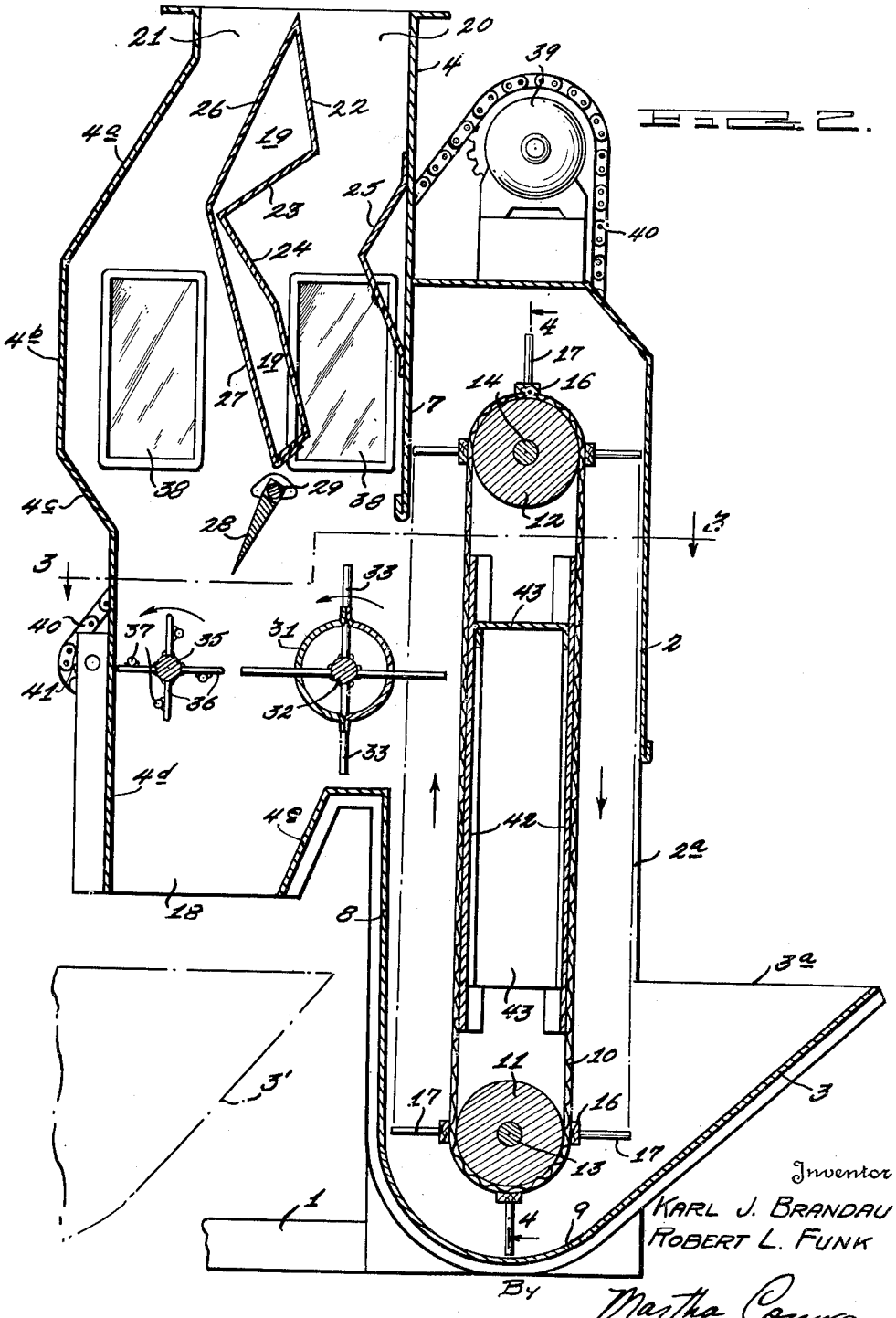
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PNEUMATIC SEPARATOR

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FIG. 2.



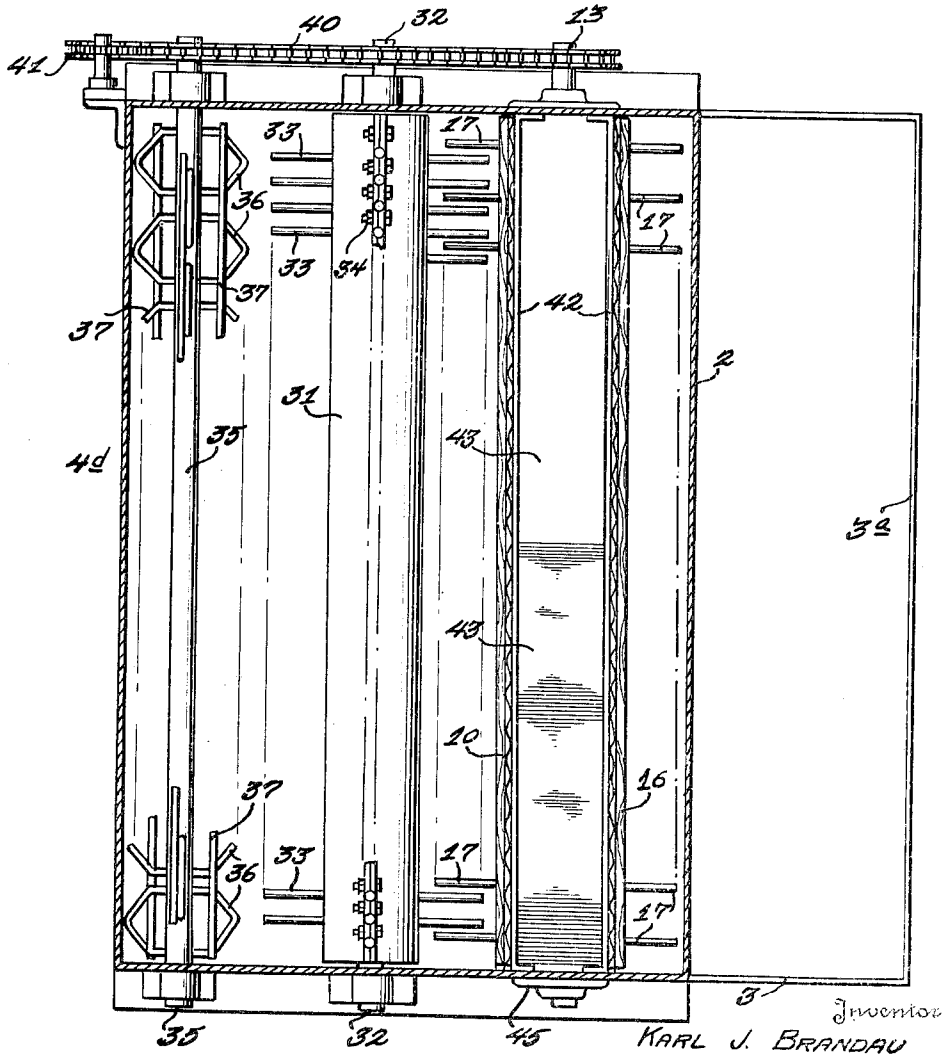
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FIG. 3.



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PNEUMATIC SEPARATOR

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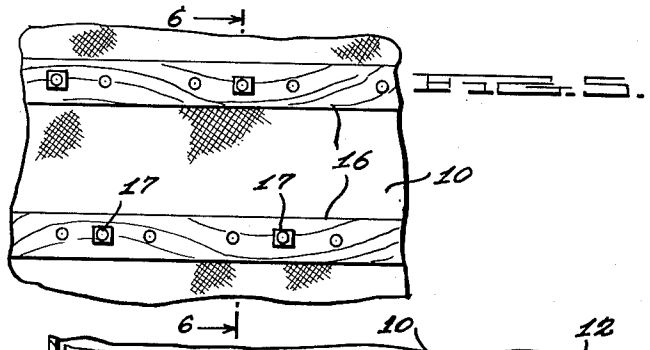


FIG. 5.

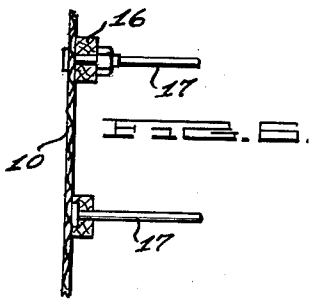


FIG. 6.

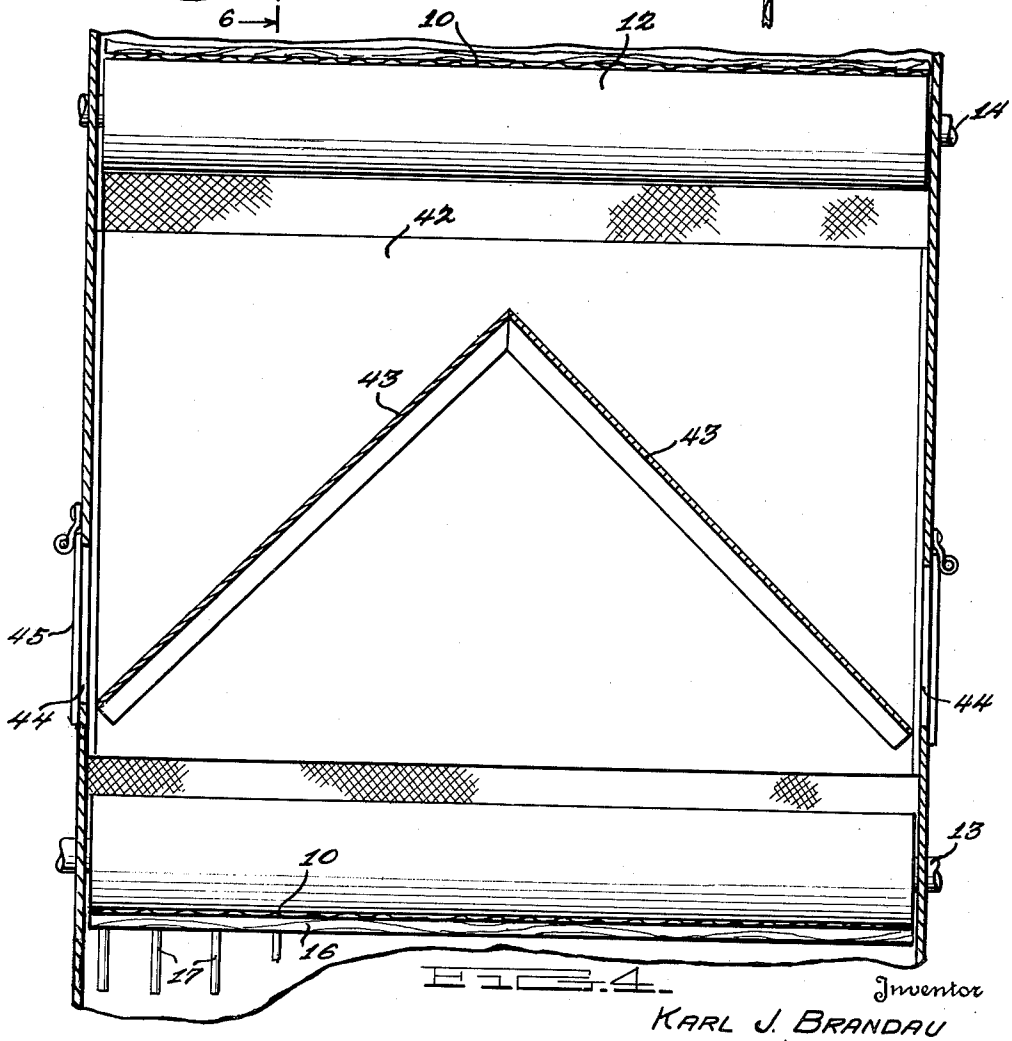


FIG. 4.

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UNITED STATES PATENT OFFICE

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PNEUMATIC SEPARATOR

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Application November 17, 1948, Serial No. 60,532

8 Claims. (Cl. 209—139)

1

This invention relates to pneumatic separators and more particularly to separators of the type comprising a generally vertical casing having an open top and bottom and through which an upwardly moving stream of air is caused to flow.

While applicable to the separation of other material, the apparatus of the invention is designed especially for use in separating and cleaning leaf tobacco, that is tobacco leaf material which has been stripped from the stems.

Specifically, the present invention may be considered as in the nature of an improvement over the stationary separator disclosed in Patent No. 2,257,552, issued September 30, 1941, to George W. Hammack.

The general object of the invention is to devise a separator of this character which will operate more efficiently, which will effect a substantial saving in floor space, and which will be capable of handling more tobacco per unit area of space occupied.

To this end the invention contemplates improved means for feeding the tobacco into the separator, such improved means comprising a hopper and a vertically disposed endless conveyer for elevating the material from the hopper to the separating chamber.

The invention further includes improved means for removing the material from this conveyer and delivering it into the airstream flowing through the separating chamber, and also additional mechanical means for agitating the material while still subjected to the air current.

Like Hammack, the present invention employs a pair of generally vertical co-extensive ducts communicating with or forming part of the separating chamber, and a further specific object is to provide improved means for controlling the relative size of the lower or inlet ends of these ducts, whereby the relative velocity of the air flowing through them may be adjusted.

A still further object of the invention is to devise an improved construction of duct so shaped as to cause the stream of material flowing therethrough to abruptly change its course, and thus be broken up and disintegrated. To this end the opposite walls of the duct have portions disposed at sharp angles to each other in such manner as to form a ziz-zag or tortuous path.

With the above and other objects in view, and to improve generally on the details of such apparatus, the invention consists in the construction, combination and arrangement of parts hereinafter described and claimed, and illustrated in the accompanying drawings, forming part of this specification, and in which:

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Fig. 1 is a perspective view of our improved separator unit.

Fig. 2 is a vertical central section therethrough.

Fig. 3 is a horizontal transverse section substantially on the line 3—3 of Fig. 2.

Fig. 4 is a vertical section substantially on the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary elevation showing a portion of our improved conveyer belt, and

Fig. 6 is a transverse section on the line 6—6 of Fig. 5.

Referring to the drawings in detail and more particularly first to Figs. 1 and 2 thereof, our improved separator unit comprises a housing preferably constructed of sheet metal and supported on a suitable base such as the angle members 1. The housing comprises a pair of closely adjacent vertically extending chambers, namely a conveyer chamber 2 and a separating chamber 4. At the lower end of the conveyer chamber 2 is located a material-receiving hopper 3 having an open top 3a. On the upper end of the separating chamber 4 is mounted a conical adapter 5 and connected with the upper end of this adapter is a conduit or pipe 6 which extends to a suitable suction-producing means such as an exhaust fan (not shown).

It will be observed that while the conveyer chamber and separating chamber extend alongside of each other, they are vertically off-set, the lower end of the conveyer chamber 2 projecting below the bottom of the separating chamber, and the upper end of the separating chamber projecting above the top of the conveyer chamber.

The wall of the separating chamber adjacent the conveying chamber is extended downwardly to consitute a partition between the two chambers as indicated at 7 in Fig. 2, while the rear wall 8 of the conveyer chamber extends upwardly from the hopper and preferably lies substantially in the plane of the partition 7. Between the lower edge of the partition 7 and the upper edge of the wall 8 is an opening providing communication between the two chambers. It will further be noted that the lower portion of the front wall 2 of the conveyer chamber is cut away to provide an opening 2a immediately above the hopper 3.

Mounted in the conveyer chamber is a vertically extending endless conveyer comprising a belt 10 of canvas or the like passing around lower and upper rollers 11 and 12, supported on the shafts

13 and 14 respectively. The bearings carrying the shaft 14 are preferably adjustable as by means of a screw 15, as shown in Fig. 1, so that proper tension on the belt may be maintained. Secured to the belt 10 are a series of transversely extending bars 16 in each of which is set a series of spaced pins or fingers 17 as clearly shown in Fig. 3. The bottom 9 of the hopper is arcuate around the shaft 13 as a center, the distance from this shaft and the radius of curvature being such as to permit the pins 17 to sweep closely over the curved surface of the bottom of the hopper.

The conveyer is driven in the direction indicated by the arrows in Fig. 2, and it will be seen that the upwardly moving run of the conveyer travels past and in close proximity to the opening between the two chambers.

It will also be seen from inspection of Fig. 2 the bottom of the separating chamber 4 is open as indicated at 18. It will thus be apparent that when suction is applied to the upper end of the separating chamber as described, air will be drawn into and up through the same, both from the open bottom 18 and through the opening 2^a, hopper 3, and the opening defined by the walls 7 and 8 and providing communication between the two chambers.

Mounted in and extending across the upper part of the separating chamber is a baffle designated in its entirety by the numeral 19, this baffle extending generally vertically and dividing the upper part of the separating chamber into two separate ducts 20 and 21. The baffle 19 is hollow as shown, and comprises spaced side walls. The wall adjacent the duct 20 is made up of portions 22, 23 and 24 disposed at sharp angles to each other, while on the opposite side of the duct is arranged an angular deflector 25. The relation of the parts 22, 23, 24 and 25 is such that the duct 20 includes a zig-zag passageway, the angular disposition of the several portions of the walls causing the upflowing current of air to abruptly change its direction at several points.

The wall of the baffle 19 adjacent the duct 21 comprises a pair of angularly disposed portions 26 and 27. The rear wall of the chamber 4 comprises portions 4^a, 4^b and 4^c angularly disposed with respect to each other and more or less parallel with the portions 26 and 27 respectively of the walls of the baffle. This has the effect of producing one or more sharp bends in the duct 21 also, thus causing upflowing currents of air to suddenly change their direction.

Disposed immediately adjacent the lower end of the baffle 19 is an angularly adjustable damper or deflector 28 mounted at its upper end on a rock shaft 29. This has on its outer end a crank and handle 30 by means of which it may be operated (see Fig. 1). It will be observed that the relative size of the lower ends of the two ducts 20 and 21 may be controlled by swinging this damper or deflector to one side or the other, as desired.

Disposed within the separating chamber adjacent the opening between the two chambers is a doffer, shown as comprising a cylinder 31 mounted on a horizontal shaft 32 and carrying a plurality of sets of radially extending pins 33. The cylinder 31 may be conveniently formed in two halves as shown, and one set of pins clamped between the two halves and held by means of bolts 34 as indicated in Fig. 3. This doffer is so located and the pins 33 are of such length that these pins pass between the pins 17 carried by the conveyer belt 10, so that when the doffer revolves in the direction of the arrow, the fingers 33 serve to strip the material from the pins 17 of the conveyer and throw or deliver it into the separating chamber.

A second doffer or agitating device is also preferably provided, this comprising a horizontal shaft 35 parallel and on the same level with the shaft 32 but spaced laterally therefrom and disposed adjacent the rear vertical wall 4^d of the separating chamber. The shaft 35 carries a plurality of sets of U-shaped beaters 36, preferably arranged 90° apart as shown in Fig. 2, and secured to each set is a longitudinally extending rod 37, as shown in Fig. 3. The material thrown from the doffer pins 33 is deposited upon the rotary agitator and this serves to further break up, disintegrate and separate this material. Windows 38 are preferably provided adjacent the lower ends of both ducts 20 and 21 so that the character of the material passing up through these ducts may be observed.

The agitator and doffer and conveyer are all three driven in the directions indicated by the arrows, as by means of an electric motor 39 mounted on top of the conveyer chamber, and having a sprocket wheel over which the sprocket chain 40 runs. This chain passes over an idler 41 at the rear of the separating chamber and then engages suitable sprockets on the shafts 35, 32 and 13.

Referring now more particularly to Figs. 3 and 4 as well as Fig. 2 it will be seen that a pair of flat plates 42 are provided and extend vertically just inside of the conveyer belt 10. These plates serve to reinforce and support the belt. Extending between and secured to this pair of plates is a V-shaped guide or chute 43 the legs of which extend diagonally downwardly from a point just beneath the roller 12 to discharge openings 44 formed in the wall of the housing. Suitable doors 45 normally close these openings. The belt 10 is necessarily somewhat foraminous so that dust sifts through it, and the purpose of the guides or chutes 43 is to collect and discharge the dust and other fine material which tends to accumulate inside of the conveyer between the plates 42.

From the foregoing it will be understood that the stemmed tobacco to be separated and cleaned is delivered by a conveyer or other suitable means into the hopper 3. It is then picked up by the pins 17 of the conveyer 10 and carried upwardly past the opening between the walls 7 and 8. Here it is stripped from the pins 17 by the doffer pins 33 and thrown into the separating chamber, where it is further agitated and broken up by the beaters carried by the shaft 35. At the same time a stream of air is drawn upwardly through the open bottom 18 of the separating chamber and also through the open front 2^a and 3^a of the unit and thence through the opening between the conveyer chamber and separating chamber. These air streams serve to separate the lighter from the heavier material, and the lighter material is carried upwardly through the ducts 20 and 21, while the stems and other relatively heavy material fall down through and are discharged from the open lower end 18. As the lighter material is carried upwardly through the ducts 20 and 21 it is caused to impinge against the angularly disposed wall 23 of the duct 20 and heavier portions of it are thereby broken and detached, and fall back again into the separating chamber. The material pass-

ing up through both ducts is caused to abruptly change its course at one or more points and this tends to further agitate and disintegrate the material and to facilitate the separation of the lighter portions from the heavier by the upwardly moving air streams. By watching the operation through the windows 38 and by moving the deflector 23 the operator may adjust the relative velocity of the air streams and the relative amount of the material passing up through the two ducts in order to secure the best results.

The heavier material discharged from the lower end 18 of the separating chamber may be carried by a suitable conveyer to any desired point. In many cases however we find it advisable to use two units side by side in tandem so arranged that the material discharged from the first unit falls into the hopper of the second unit and is again subjected to a cleaning and separating operation. This is made possible by reason of the fact that the lower end 18 of the separating chamber is at a higher level than the top of the hopper 3 so that the hopper of the second unit readily fits under the lower end of the separating chamber of the first unit. In Fig. 2 we have indicated in broken lines at 3' the position of the hopper of the second unit. This idea of passing the material successively through two similar units, to effect a more perfect separation thereof is disclosed in the above identified patent to Hammack. It will be observed however that in the Hammack arrangement the two units are spaced relatively far apart and the material is carried from one to the other by a diagonally extending conveyer. In the present design however the two units may be placed close together since the conveyers are vertically disposed and built into the same housing which contains the separating chamber. Thus two units can be assembled in a very much more compact arrangement than in the Hammack patent and thus a great saving in floor space is achieved.

What we claim is:

1. A pneumatic separator comprising a vertically disposed casing containing a separating chamber and a conveyer chamber substantially parallel therewith, said separating chamber having an open unobstructed bottom and having suction means connected with the top thereof, said chambers having an opening between them at a point near the bottom of said separating chamber, said conveyer chamber also having a material-receiving opening, whereby air is drawn into and up through said separating chamber both through its open bottom and through said openings, an endless vertically disposed conveyer in said conveyer chamber having one run passing upwardly in close proximity to the opening between said chambers, and a rotary doffer mounted in said separating chamber adjacent said opening between the chambers and projecting therethrough into the path of said conveyer, whereby said doffer serves to strip the material from said run of the conveyer and deliver it into said separating chamber.

2. A pneumatic separator comprising a vertically disposed casing containing a separating chamber and a conveyer chamber, said separating chamber being open at the bottom and having suction means connected with the top thereof, said chambers having an opening between them at a point near the bottom of said separating chamber, said conveyer chamber also having a material-receiving opening, whereby air is drawn into and up through said separating chamber both through its open bottom and through said openings, an endless conveyer in said conveyer chamber having one run passing upwardly in close proximity to the opening between said chambers, said conveyer having outwardly projecting pins, and a rotary doffer mounted in said separating chamber adjacent said opening between the chambers and serving to strip the material from said run of the conveyer and deliver it into said separating chamber, said doffer having radial fingers constructed to project through said opening into the path of said conveyer and to work between the pins of said conveyer.

3. A pneumatic separator comprising a vertically disposed casing containing a separating chamber and a conveyer chamber, said separating chamber being open at the bottom and having suction means connected with the top thereof, said chambers having an opening between them at a point near the bottom of said separating chamber, said conveyer chamber also having a material-receiving opening, whereby air is drawn into and up through said separating chamber both through its open bottom and through said openings, an endless vertically disposed conveyer in said conveyer chamber wholly outside of said separating chamber and having one run passing upwardly in close proximity to the opening between said chambers, a rotary doffer mounted adjacent and projecting through said opening between the chambers and serving to strip the material from said run of the conveyer and deliver it into said separating chamber, and mechanical means adjacent said doffer for agitating the material so delivered.

4. A pneumatic separator comprising a vertically disposed separating chamber open at the bottom and having suction means connected with the top thereof, said chamber having a lateral opening at a point near the bottom thereof, an endless conveyer having one run passing upwardly in close proximity to said opening, a rotary doffer mounted adjacent and projecting through said opening and serving to strip the material from said run of the conveyer and deliver it into said separating chamber, and mechanical means located in the path of the airstream flowing upwardly through the open bottom of said separating chamber for agitating the material so delivered.

5. A pneumatic separator comprising a vertically disposed separating chamber open at the bottom and having suction means connected with the top thereof, said chamber having a lateral opening at a point near the bottom thereof, an endless conveyer having one run passing upwardly in close proximity to said opening, a rotary doffer mounted adjacent and projecting through said opening and serving to strip the material from said run of the conveyer and deliver it into said separating chamber, and a second rotary device mounted in said separating chamber and on to which at least a part of the material delivered by said doffer is deposited.

6. A pneumatic separator comprising a vertically disposed casing containing a separating chamber and a conveyer chamber, said separating chamber being open at the bottom and having suction means connected with the top thereof, said chambers lying side by side and having an opening between them at a point near the bottom of said separating chamber, a material-receiving hopper communicating with said conveyer chamber, a vertically disposed foraminous endless conveyer in said conveyer chamber ex-

tending from said hopper up beyond the opening between said chambers, an inclined chute located inside of said conveyer, said chute extending across the width of said conveyer and substantially filling the space between the runs thereof, and said casing having an opening adjacent the lower end of said chute through which material moving down said chute may be discharged.

7. A pneumatic separator comprising a vertical separating chamber and a vertical conveyer chamber in close proximity but vertically off-set, the separating chamber projecting above the top of the conveyer chamber, and the conveyer chamber projecting below the bottom of the separating chamber, said chambers having an opening between them, an open top, material-receiving hopper projecting from and delivering into the side of said conveyer chamber near the bottom thereof, said separating chamber having an open unobstructed bottom and having suction means connected with the top thereof, whereby air is drawn into and up through said separating chamber both through its own open bottom and said hopper and opening, and a vertically disposed endless conveyer in said conveyer chamber extending from said hopper up beyond the opening between said chambers, the open bottom of said separating chamber being at a higher level than the top of said hopper, whereby two such machines may be placed side by side, in such position that the bottom of the separating chamber of one machine overlies the hopper of the other machine.

8. A pneumatic separator comprising a vertically disposed casing containing a separating chamber open at its bottom, and having suction means connected with the upper end thereof, an open top hopper for receiving the material to be separated said hopper projecting laterally from the side of said casing, an endless conveyer extending vertically from said hopper alongside but wholly outside of said separating chamber, and means whereby the material carried up by said conveyer is delivered into said separating chamber at a point above the open bottom thereof, the lower edge of said open bottom being disposed at a higher level than the top edge of said hopper, whereby, two such separators may be placed side by side, with the open bottom of the separating chamber of one overlying the hopper of the other, so that material discharged from said open bottom of the first falls into the hopper of the second.

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