June 22, 1954

D. W. VAN DOORN
APPARATUS FOR SEPARATING TRASH
FROM LINT COTTON AND THE LIKE

2,681,477

Filed Aug. 23, 1950

4 Sheets-Sheet 1

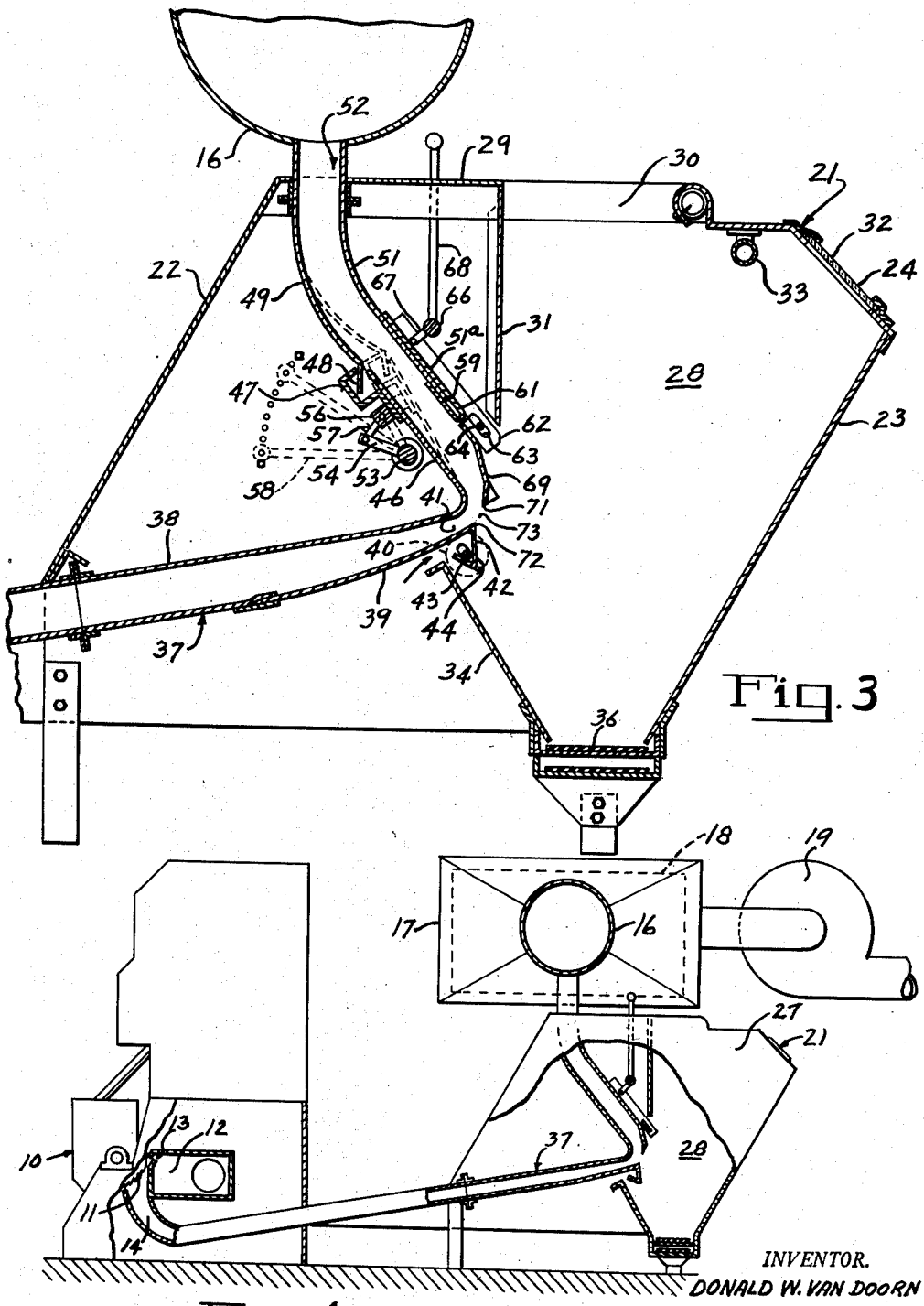


Fig. 3

Fig. 1

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4 Sheets-Sheet 2

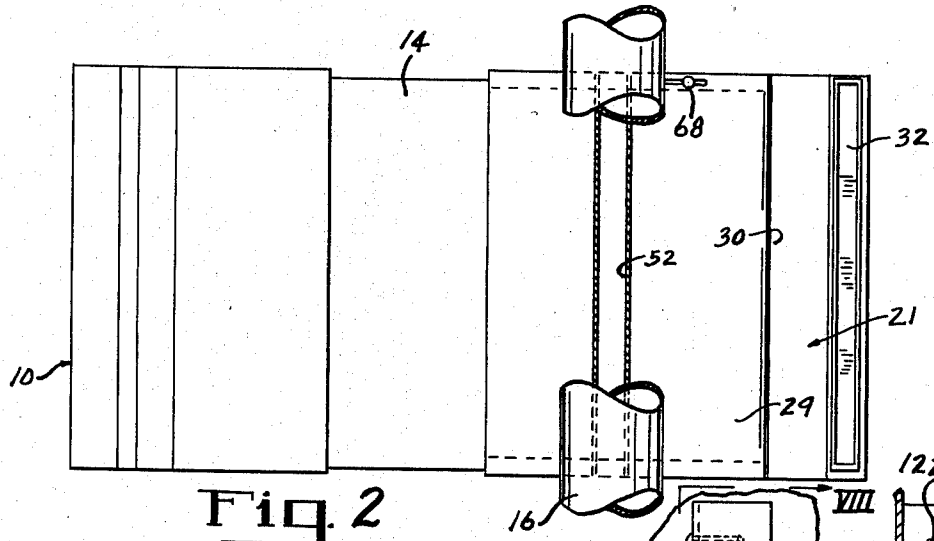


Fig. 2

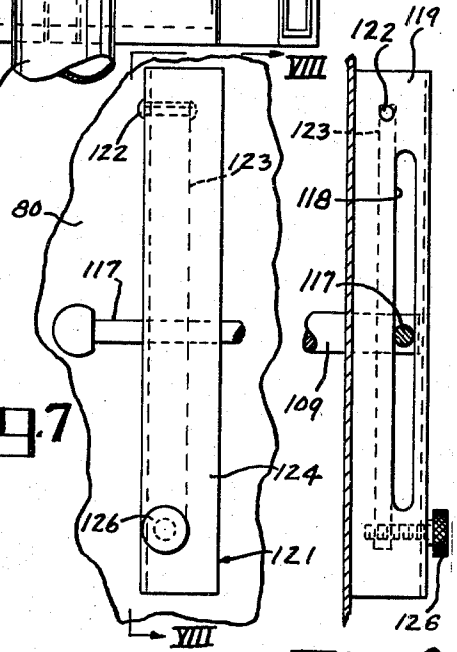


Fig. 7

Fig. 8

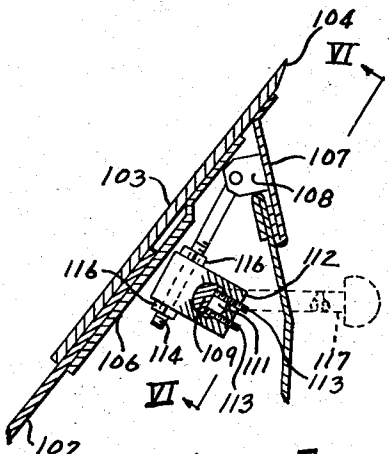


Fig. 5

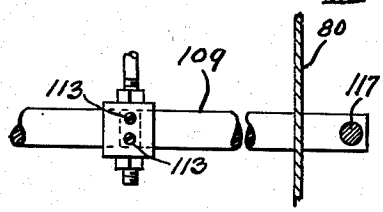


Fig. 6

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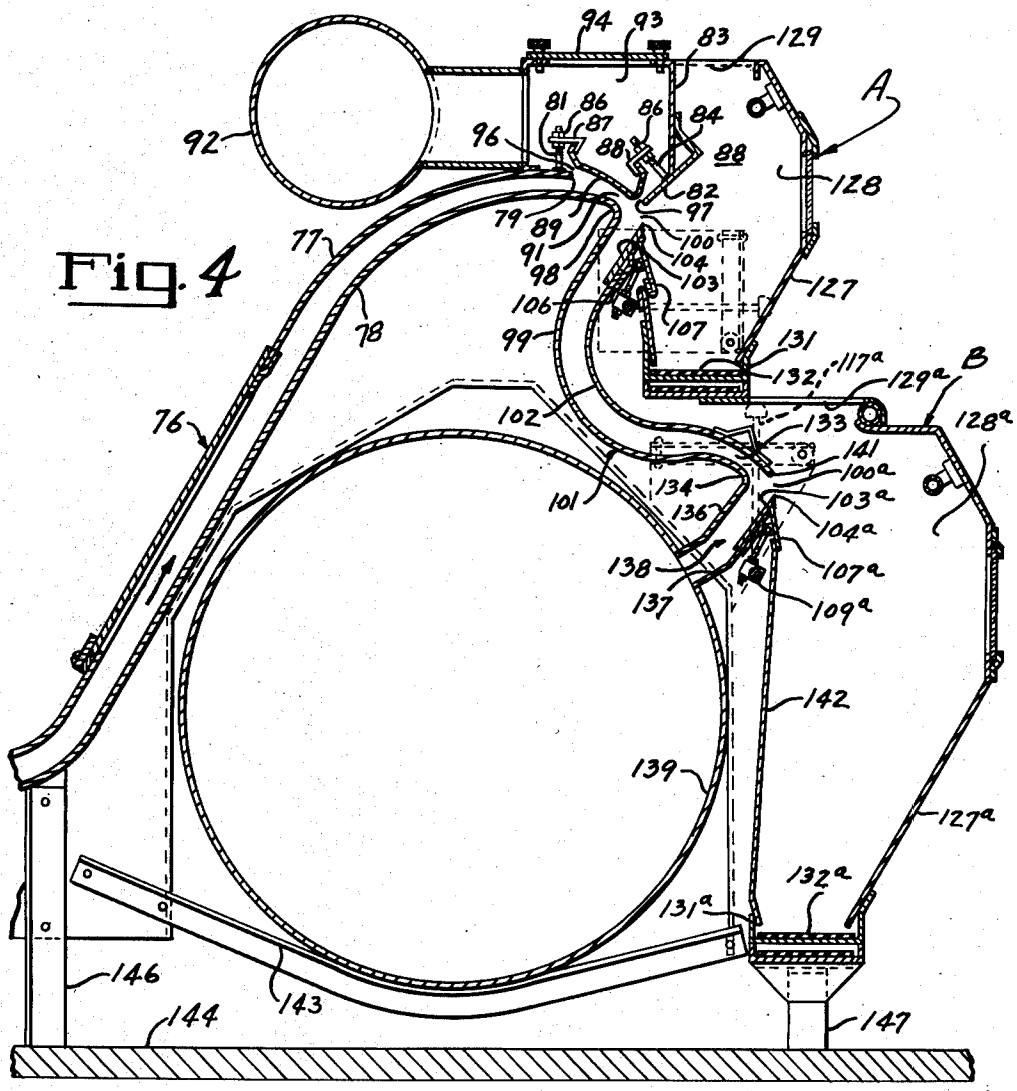
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Fig. 4



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Fig. 9

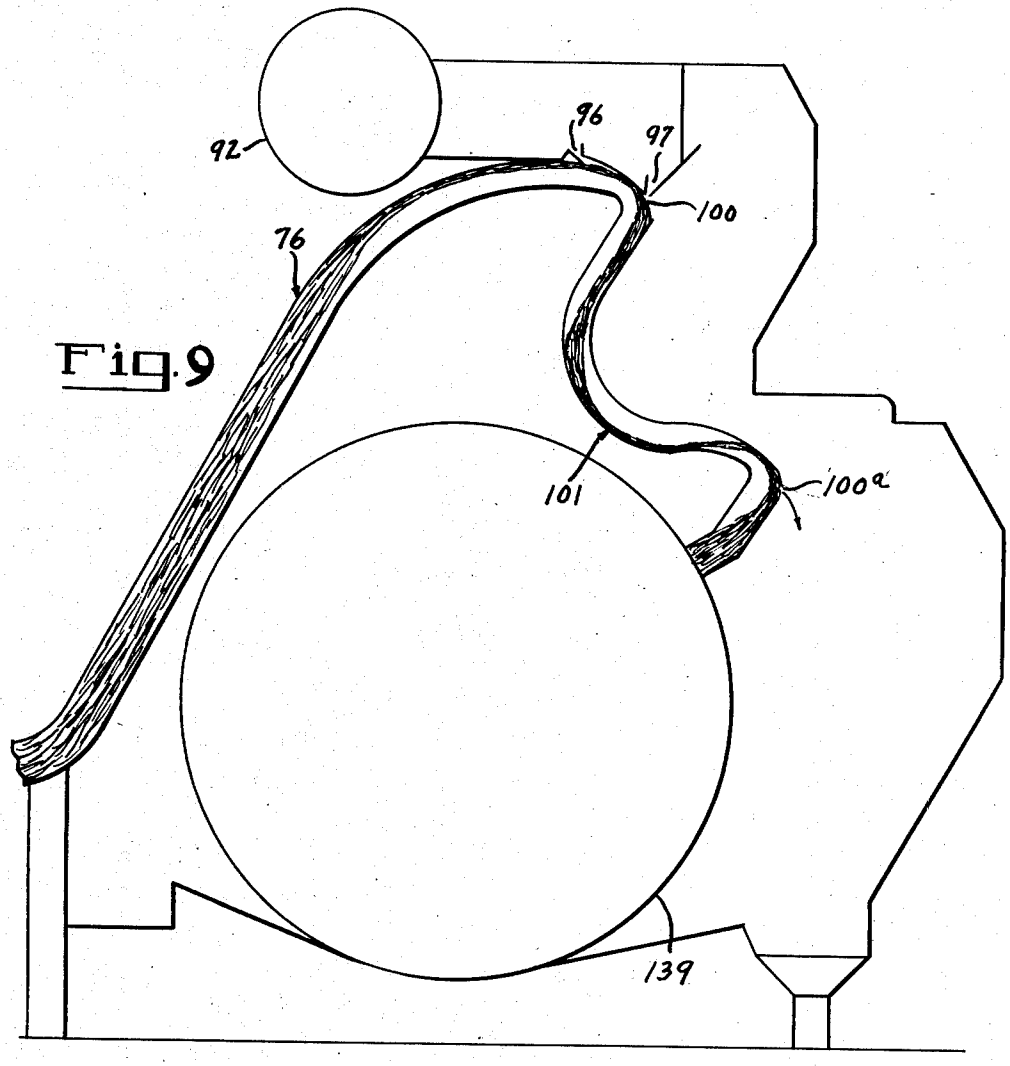
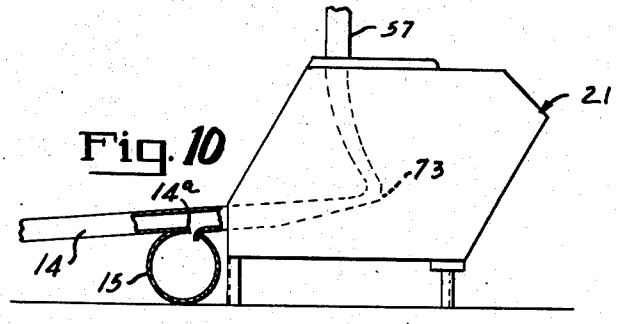


Fig. 10



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UNITED STATES PATENT OFFICE

2,681,477

APPARATUS FOR SEPARATING TRASH FROM LINT COTTON AND THE LIKE

Donald W. Van Doorn, Columbus, Ga., assignor to Lummus Cotton Gin Company, a corporation of Georgia

Application August 23, 1950, Serial No. 180,996

4 Claims. (Cl. 19—76)

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The present invention is an improvement over that disclosed in my co-pending application, Serial No. 115,204, filed September 12, 1949, subject "Method and Apparatus for Separating Trash from Lint Cotton and the Like."

Heretofore in the art to which this invention relates, it has been proposed to utilize the combined effects of centrifugal force and gravity to separate trash from lint cotton and the like while the commingled trash and cotton were air-borne, as for instance while borne along by an air stream in the lint flue. Such methods of separation have not proved to be entirely satisfactory. One reason for this appears to be that the specific gravities of the lint and a large part of the trash mixed therewith are approximately the same. Thus, a centrifugal separator capable of discharging such trash also discharges therewith an excessive quantity of lint. Another reason for the lack of success of centrifugal-gravity separators for these materials is that in those types embodying slotted side walls the lint chokes the slots, making the device inoperative after a short period of use unless the slots are frequently cleaned. In the mechanical type of cleaners embodying saws and cleaning bars, the saws appear to engage the cotton in such manner as to form snarled or tightly bunched groups of fibers which adversely affect the making of yarn from such lint. Also, considerable mechanical difficulty is encountered in properly sealing the condensers which are supposed to supply the cotton in a bat form to the saws of the prior art mechanical cleaners. Further, mechanical cleaners are expensive of manufacture and operation.

It is the prime object of my invention, therefore, to effect a greatly improved separation of air-borne trash and lint cotton, and to accomplish this separation with simple apparatus especially adapted for insertion in the lint flue between the gin and condenser.

Another object is to provide apparatus of the character designated which is further characterized by the introduction into the confined space of an auxiliary or "booster" jet of high velocity air ahead of the point therein where the lint and trash are separated, thus increasing the velocity of the commingled stream and "blooming" or opening the lint, thus disentangling trash bound therein, and in this manner facilitating the separating of the lint and trash.

Another object is to provide apparatus of the character designated in which the lint and trash at the point of separation thereof are subjected to a transversely directed, high velocity, low

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volume stream of air under positive pressure operable to turn the lint and inoperable to turn the trash, such an air stream serving the purpose, among others, of driving the lint with a high velocity toward another abrupt turn in the confined space where the same may be subjected to another separating action. This transverse positive air stream eliminates the need of maintaining the lint discharge space of the first turn under vacuum and therefore makes it possible to have a second turn with both turns operating under optimum conditions of velocity and pressure.

Another object is to provide lint cleaning apparatus in which the commingled, air-borne lint and trash are introduced into a downwardly directed lint duct, there being a second lint duct adjacent the lower end of the first duct angularly disposed relative thereto, together with an opening at the adjacent ends of the lint ducts whereby, when commingled lint and trash are introduced into the first duct under the conditions hereinafter set forth the trash continues its downward movement, passing through the slot and out of the lint duct and the lint turns into the second duct, such construction eliminating drawing back into the lint duct of trash more or less suspended in the atmosphere immediately adjacent the outside of the lint duct, near the slot.

Another object is to provide apparatus of the character designated in which the commingled lint and trash stream, just prior to reaching and while substantially at the trash discharge opening is subjected to auxiliary jets of air under pressure, the first jet being directed into the lint-trash stream in a direction toward which the same is moving, the second jet being directed somewhat transversely of the moving stream, the velocity of the second jet being sufficient to aid in changing the direction of movement of the lint and insufficient to change materially the direction of movement of the trash.

Another object is to provide apparatus of the character described in which there is introduced into the inlet section of the lint duct ahead of the trash discharge opening, a jet of air operable to increase the velocity of the commingled lint-trash stream and also operable to drive toward the cleaning opening some of the heavy, low surface area trash which tends to settle on the bottom of the entering duct, thus making my improved apparatus suitable for use with brush type gins and in those gins embodying pneumatic doffing mechanism delivering doffing air at low velocities.

Other objects of my invention are to make provision for adjusting the size of the trash discharge opening, preferably by adjusting the position of the knife edged member previously mentioned; to provide a housing into which the trash is discharged and having trash removing means therein; to so design the apparatus that the lint flue may be placed within the confines thereof, eliminating the necessity of excavating the floor of the gin house or of installing the lint flue under the floor; and in general to provide apparatus which is particularly free of structural complications and which is simple of installation and operation.

Apparatus illustrating the features of my invention is illustrated in the accompanying drawings forming a part of this application in which:

Fig. 1 is a side elevational view partly in section of a gin, its associated feeder, and my improved apparatus between the gin and condenser;

Fig. 2 is a plan view, partly broken away and in section of the gin and feeder and my improved apparatus associated therewith;

Fig. 3 is an enlarged vertical sectional view through my improved separating apparatus with certain parts broken away for the sake of clarity;

Fig. 4 is a vertical sectional view through a modified form of my invention embodying the booster and transverse jets, the downwardly directed lint receiving duct, and in which the lint flue is disposed within the confines of the apparatus;

Fig. 5 is an enlarged detail sectional view of the adjustable wall having the sharpened edge adjacent the trash slot employed with the apparatus shown in Fig. 4;

Fig. 6 is a fragmental sectional view taken generally along line VI—VI of Fig. 5;

Fig. 7 is a fragmental end elevational view of the operating handle and locking member therefor for the adjustable sharpened wall of the apparatus shown in Fig. 4;

Fig. 8 is a detail sectional view taken along line VIII—VIII of Fig. 7;

Fig. 9 is a wholly diagrammatic view illustrating the functioning of the apparatus shown in Fig. 4; and

Fig. 10 is a fragmentary side elevational view of a duct leading from the gin and embodying means for introducing an additional jet of air into the same ahead of the cleaning apparatus.

Referring now to the drawings for a better understanding of my invention and more particularly to Figs. 1, 2 and 3, I show at 10 the usual gin stand embodying a rotating saw cylinder 11. Adjacent the saw cylinder is an air chamber 12 which supplies air through a doffing nozzle 13 for removing lint cotton from the saw cylinder 11. Beneath the saw cylinder is a lint duct 14. Lint from the saws is discharged into the lint duct 14 in the manner well understood in the art. While only one gin stand is shown in the drawing, it will later appear that my invention is adapted for association with each gin of a multiple number thereof. Thus, lint from the separate gins 10 is eventually delivered through a system of ducts from the duct 14 to a common lint flue 16. The lint duct 14 is of a width corresponding substantially to the length of the saw cylinder 11, as shown in Fig. 2. Also, the doffing nozzle 13 as is well understood, extends along the saw cylinder and discharges into the duct 14. From the lint duct 14 the lint heretofore has been discharged into a battery condenser if there is more than one gin, or to an individual condenser

if that is desirable, which would be the case in the event there was but a single gin. The condenser 17 is of the usual type and may embody a rotary foraminous drum 18. Connected to the condenser to exert suction on the drum 18 and thence on the lint flue 16 is a suction fan 19.

My invention preferably is associated with a substantially closed housing indicated generally by the numeral 21. As shown in Figs. 1 and 3 the housing has a rear wall 22, a front wall embodying sloping sections 23 and 24 and end walls 27 and 28. There is also a top wall 29 extending partially across the top of the apparatus and the same terminates to provide an opening 30 therein. A partially extending vertical wall 31 depends from the edge of the opening 30. For the sake of observing the apparatus in operation I may provide glass observation windows or ports 32 in the sloping wall section 24, and may also light the interior of the housing by means of a fluorescent tube 33 or the like. At 34 is a partially extending wall which converges toward the wall 23 to form therewith a hopper bottom. A trash discharge belt 36 may be provided in the hopper bottom formed by the walls 34 and 23.

Within the housing 21 and passing beneath the lower end of the wall 22 and over the upper end of wall 34 is a relatively wide, shallow lint duct 37 into which lint from the gin 10 is delivered from the associated gin lint duct 14. The lint duct 37 comprises an upper wall 38 and a lower wall 39 spaced above the upper end of wall 34. The walls 38 and 39 converge toward each other adjacent the inner end of the duct 37, the wall 38 preferably being substantially straight and the wall 39 curving slightly upwards as shown. This construction provides a constricted throat or passage 41 adjacent the inner end of the duct 37. In practice I have found that the curved, converging end of the duct 37 causes the lint and trash moving in the duct 37 to move against the wall 39, concentrating the lint and trash into a relatively thin ribbon. As will later appear, the cross stream of air entering the duct acts uniformly on this thin ribbon, increasing the cleaning action of the apparatus.

The inner end of the wall 39 has a depending portion 42 which may be suitably secured to a cross rod 43 in turn projecting through slots 44 in the housing ends 27 and 28. The rod is adjustably secured at each end by means of nuts, not shown, whereby the inner end of the wall 39 may be adjusted toward and from the inner end of the wall 38. Cover plates 40 in the form of washers may be placed about the ends of the rod 43 to close the slots 44.

The wall 38 of duct 37 continues upwardly as at 46 at an angle to that portion thereof forming a part of duct 37. Preferably, the angle between the wall portions 38 and 46 is not greater than 90°. On the end of the wall 46 is a channel shaped extension 47 within which is placed the free end 48 of a wall 49 forming in effect a continuation of the wall 46. A second wall 51 co-acts with the wall 49 to form a laterally elongated lint discharge section 52.

Rotatably supported in the end walls of the housing is a cross shaft 53. At intervals along the cross shaft are secured arms 54. Secured to the lower side of the wall section 46 adjacent the channel shaped extension thereof is a cross member 56. Pivotally connected to the ends of the arms 54 and the cross member 56 are links 57.

The cross shaft 53 projects from one of the housing ends and secured to the projecting end thereof is an operating arm 58. It will thus be

apparent that by rotating the arm 58, shaft 53 may be rotated, thus moving the free upper edge of the wall portion 46 to the dotted line position indicated in the drawings, Fig. 3. The ends of wall section 49 fit closely against the end walls 27 and 28 of the housing making the duct 52 substantially airtight at those points. This serves to adjust the cross sectional area of the duct 52 at the point indicated.

The wall 51 has a straight lower section 51*a* terminating at 59. Fitting slidably about the lower end 51*a* of the wall 51 is a U-shaped plate 61. Secured to the top of the plate 61 at each end thereof to slide against the end walls 27 and 28 of the housing are upstanding brackets 62. The brackets 62 are provided with slots 63 in the ends thereof which slidably receive inwardly projecting pins 64 carried by the end walls 27 and 28.

Suitably journaled in the end walls of the housing is another cross shaft 66. Secured to the cross shaft 66 and pivotally secured to the brackets 62 are arms 67. Projecting upwardly from the shaft 66 is an operating rod 68 by means of which the shaft 66 may be rotated.

Secured to the lower ends of the brackets 62 is an adjustable section 69 forming in effect a continuation of the upper wall 51. The lower portion of the wall 69 is bent inwardly toward the wall sections 38 and 46 thus to define a somewhat constricted portion in the duct 52 at its lower end. The lower edge 71 of the wall 69 is sharpened. The edge 71 of the wall section 69 and the innermost edge 72 of the wall 39 define between them a trash discharge opening 73 through which trash is discharged in the manner later to appear. It will be understood that the opening 73 is substantially the width of the ducts 37 and 52, and that the latter are substantially as wide as the doffing mechanism of the gin.

From the foregoing the method of operation of my improved apparatus may now be described. With the gin 10 delivering commingled lint cotton and trash through the duct 14 and into the duct 37 it will be apparent that the velocity of the commingled stream is substantially increased at the constricted point 41 in the duct 37, just ahead of the trash discharge opening 73. With a certain type of 80 saw gin delivering approximately 3000 cubic feet of commingled lint trash and air per minute into the duct 37, I find that there is a pressure of approximately one inch on the water gauge at the inlet end of duct 37. Under these conditions I so regulate the suction fan 19 that there exists in the duct 52 a vacuum of approximately 2½ inches on the water gauge. I adjust the lower wall 39 relative to the upper wall 38 so that the commingled stream at the point 41 is moving at the rate of approximately 6000 feet per minute. Further, I so adjust the movable wall section 69 that the slot 73 is approximately 1⅜ inches in width. In actual practice, I have found that with an 80 saw gin supplying approximately 3000 cubic feet per minute of air and lint with its impurities to the duct 37 the throat at the point 41 should be approximately ¾ inch to 1 inch when using ducts 37 and 52 which are 3 inches in depth at their inlet and discharge ends, respectively. In this instance, the width of the ducts 37 and 52 was 63½ inches, being substantially the width of the doffing nozzle for a standard 80 saw gin.

When using my improved apparatus with a gin of the type shown, described and claimed in the patent application of Arvel L. Vandergriff,

Serial No. 36,935, filed July 3, 1948, subject "Pneumatic Doffing Mechanism for Cotton Gins and the Like," now Patent Number 2,588,593, I find that there is some variation in the delivery pressures and volumes which necessitates slight adjustments in my improved apparatus. The reason for this is that the type of gin disclosed in this application supplies considerably less doffing air and does not operate as successfully under pressure much in excess of .4 inch on the water gauge. Actually, with such a gin I find that the volume of commingled lint, trash and air supplied to the duct 37 is on the order of 1800 cubic feet per minute, and under a pressure of approximately $\frac{4}{16}$ inch on the water gauge. With this gin, therefore, I adjust the wall 39 so that the velocity of the commingled lint and trash at the point 41 is in the neighborhood of 4000 feet per minute. I further so regulate the fan 19 that there exists in the duct 52 a vacuum of approximately 1½ inches on the water gauge.

While in actual practice I have found it seldom necessary to constrict the duct 52 by means of the adjustable mechanism embodying the operating handle 58, this feature is desirable for certain types of cotton cleaning operations. At all events, and with the apparatus operating under the conditions just given for either type of gin with which it may be employed I have found that there is induced into the trash discharge opening 73 a volume of air moving at a velocity sufficient to cause the lint traveling in the duct 37 adjacent the point 41 thereof to assume an upward direction of movement, and yet which is insufficient to prevent the trash from continuing along substantially its initial direction of movement, thus to be discharged over the inner end 72 of the lower wall 39, out of the slot 73. This induced air is drawn downwardly through the opening 30 of the housing. Further, there is induced between the upper end of the wall 34 and the wall 39 a small volume of air indicated by the arrows which rinses the inner surface of the wall 34 of trash accumulating thereon, causing it to fall onto the belt 36. I estimate that the volume of air induced into the opening 73 is equal to approximately 2000 cubic feet per minute when employing the gin delivering the greater volume of air, lint and trash into the duct 37, and approximately 1600 cubic feet per minute when employing the gin delivering the smaller volume of air, lint and trash into the duct 37.

In lint cotton as it comes from the gin, there are usually bunches or wads of lint, and some lint which is wrapped about particles of trash. I have found that with the apparatus operating as just set forth the majority of these bunches of lint strike the knife sharp edge 71 of the wall section 69. The effect of this is to strip a large quantity of this lint from the trash or to untangle the same if it is bunched. Further, once the trash is disentangled or disengaged from the foreign matter about which it is wrapped the lint proceeds up the duct 52 and a large portion of the trash follows the trash stream out of the trash discharge opening 73. The sharpened edge 71 thus serves as a divider piece for the streams of lint and trash and likewise serves the purpose of disengaging or disentangling the bunched lint. Observing the apparatus in operation I note that the lint in fact impinges against the sharp edge 71 and appears, in high speed photographs, to momentarily drape over the sharpened edge 71 of wall 69. However, the amount of lint which

follows the trash stream is negligible and I have effectively separated a large part of both the heavy and fine trash such as is ordinarily mixed with cotton without any appreciable loss of lint. In actual practice I find that the average weight of lint thrown out by my apparatus is only about 5% of the weight of the trash removed, a figure which is far below the amount thrown out by other types of cleaners.

Referring now more particularly to Figs. 4 to 9, inclusive, I show a modified form of my improved apparatus. This form of apparatus embodies generally an upper separating section A and a lower separating section B. As will later appear, both sections A and B embody the principles of the apparatus already described.

The air-borne commingled lint cotton and trash from the gin is introduced into an upwardly directed, laterally elongated, curved duct 76 embodying an upper or outer wall 77 and an inner or lower wall 78. The duct 76 is preferably substantially the width of the air doffing nozzle of the gin. The upper wall 77 terminates at 79 and carries a plurality of upstanding studs 81 near the end thereof. Spaced from the end 79 of the wall 77 is an inclined plate 82 suitably supported from a vertically disposed wall 83 in turn carried by the end walls 80 of the apparatus. Projecting normally from the surface of the plate 82 are a plurality of studs 84. Adjustably mounted on the studs 81 and 84 by means of nuts 86 are brackets 87 and 88. The brackets are secured to the end of a vertically adjustable, slightly curved plate 89 forming in effect a continuation of the upper wall 77. The section 89 is thus vertically adjustable relative to the wall 78 by means of the nuts 86. The inner end of the plate 89, namely the end supported from the studs 84, is so adjusted that it lies closer to the lower wall 78 than the outer end thereof, thereby to define a constricted passage 91 in the duct 76.

Extending longitudinally of the apparatus is an air supply pipe 92. The pipe 92 communicates with a closed space 93 located above the adjustable wall section 89 which is defined between the walls 83, the end walls 80 of the apparatus and a removable cover plate 94. The space 93 is an air chamber to which air under pressure from any suitable source, not shown, is admitted from the air supply pipe 92. The edges of the movable wall section 89 define with the end 79 of wall 78 and lower end of the plate 82 a pair of air discharge openings or nozzles 96 and 97. Air from the nozzle 96 is directed into the duct 76 in a direction substantially parallel to the direction of movement of the commingled lint-trash stream therein. Air from the nozzle 97 is directed somewhat transversely of the moving stream as will later appear.

The lower wall 78 of the duct 76 is abruptly turned as indicated at 98 to provide a portion 99 forming one wall of a second duct 101. The wall 99 is curved as indicated and the upper edge of wall 102 terminates beneath the lower end of the plate 82. Adjustably secured to the upper edge of the wall 102 is a plate 103, having a sharpened upper edge 104. The plate 103 is secured to one side of a plate 106 and the lower ends of the plates 103 and 106 straddle the upper edge of the wall 102 and are slidable thereon. The sharpened edge 104 of plate 103 and the lower edge of bracket plate 82 define between them an elongated trash discharge opening 100. The opening 100 is in alignment with the path of movement of trash and lint moving along in the inner end of duct 76.

Secured to the outer side of the sharpened plate 103, near the upper end thereof is a depending and outwardly extending bracket plate 107. See Fig. 5. Projecting from the inner side of the plate 107 at intervals therealong are a plurality of lugs 108.

Rotatably mounted in the end plates 80 of the apparatus is a cross shaft 109. The shaft 109 is provided at intervals with flat bottomed cross slots 111 which extend approximately half way through the shaft. Mounted on the shaft 109 are a plurality of blocks 112 having threaded therethrough set screws 113 disposed to enter the slots 111 and engage the flat bottoms thereof. From this construction it will be seen that by adjusting the screws 113 the relative angularity of the blocks with respect to the shaft 109 may be determined.

Passing through each block 112 is a threaded rod 114 having its upper end pivotally connected to one of the lugs 108. The rods are adjustably supported in the blocks by means of nuts 116.

The shaft 109 projects from one end of the apparatus and is provided with an operating handle 117. The upper end of the operating handle passes through a slot 118 provided in one leg 119 of an angle 121 carried by the adjacent end plate 80. Pivotally mounted to the leg 119 of the angle as at 122 is a bar 123. Passing through the other leg 124 of the angle 121 and threaded into the free end of the bar 123 is a locking screw 126. By running in on the set screw 126 the operating handle 117 is clamped in adjusted position in the slot 118.

Referring again to Fig. 4 of the drawing, I provide an outer wall 127 spaced from the wall 83 and the lower duct 101. This wall defines with the parts just mentioned a space 128 for receiving trash thrown out of the trash opening 100 defined between the sharpened edge 104 and the lower end of the plate bracket 82. The top of the space 128 is open as indicated at 129 whereby air induced into the trash opening 100 is readily supplied for that purpose.

At the bottom of the space 128 is a trough 131 in which may be placed a suitable form of trash discharge apparatus, such for instance as a belt 132.

The walls 99 and 102 curve downwardly and thence outwardly and converge adjacent their inner ends to define another constricted space 133 in the duct 101. The wall 99 curves again downwardly at the point 134 to provide a short section 136. Another wall section 137 forms with the wall 136 a duct 138 leading to a lint flue 139. The upper end of the wall 107*a* is provided with a sharpened plate 103*a*, similar to plate 103, together with the adjusting mechanism previously described, including a cross shaft 109*a* and an operating handle 117*a*. The sharp edge 104*a* of the plate 103*a* defines with the lower end 141 of the wall 102 a trash discharge opening 100*a*, similar to the trash opening 100.

The section B has a vertical wall 142 extending from beneath the plate bracket 107*a* and terminating along the inner edge of a trough 131*a*. A front wall 127*a* terminates along the opposite or outer wall of the trough 131*a*, and a trash discharge belt 132*a* is placed in the trough. Similarly to the section A, the walls 142 and 127*a* define a trash receiving space 128*a* open at its top as at 129*a*.

It will be noted that in the construction just

described there is ample space for placing the lint flue 139 within the confines of the apparatus. This is accomplished by supporting the lint flue on a member 143 suitably secured to the framework of the apparatus. The entire apparatus may be supported clear of the floor 144 by means of legs 146 and 147.

From the foregoing the operation of the modification of my invention just described may now be explained. Depending upon the type of gin supplying the lint and trash with the doffing stream of air, the adjustments relative to the size of the constricted portions of the ducts 76 and 101 are made. The trash discharge openings 100 and 100a are regulated to approximately the size before mentioned. A supply of air under a pressure of approximately 10 to 15 inches on the water gauge is maintained in the air chamber 93 and the lint flue 139 is maintained under vacuum of from one to three inches, water gauge. I adjust the movable wall sections 89 so that the air discharge nozzle or jet 96 is approximately ⅛ inch wide and the air discharge nozzle 97 is approximately ¼ inch wide. Under these conditions the air entering through the opening 96 strikes the lint, and "puffs" or "blooms" the same, aiding in causing the trash therein to separate from the lint. This air enters at a velocity of approximately 10,000 feet per minute. As the commingled stream approaches the trash discharge opening 100 it is struck by the transversely directed stream of air having a velocity of about 10,000 feet per minute. Due to its velocity the effectiveness of this jet in turning the lint is very high. However, it induces very little air into the trash discharge opening 100 and thus adds practically no tendency to draw fine trash back into the duct. The jet from the opening 97 has the beneficial effect of driving the lint onto the second cleaning opening 100a without loss in velocity of the stream. Further, I have discovered that this stream of air does not materially change the direction of movement of the trash.

It is also to be noted that in the modification being described the induced air entering the slots 100 and 100a is moving downwardly in the spaces 128 and 128a, in the same direction that the trash falls after being discharged from the openings. This is of particular advantage and is an improvement over the first described modification in that fine trash more or less suspended in the spaces 128 and 128a has very little tendency to be drawn back into the lint ducts and is caused to settle onto the discharge belts in the troughs.

It will be noted that it is possible to use either of the sections A or B separately, thus obtaining the advantage just mentioned relative to having the induced air entering the opening 129 or 129a move in the same direction in which the trash is discharged from the slot, namely, downwardly. The "booster" jet of air entering the lint duct 76 through the opening 96 and the transversely directed jet entering the same through the opening 97 are particularly effective in cleaning excessively dirty cotton, for instance machine picked cotton.

Referring to Fig. 9 I have indicated diagrammatically the way the lint and trash stream move in the ducts 76 and 101, and the position thereof at the time it is engaged by the jets 96 and 97. Fig. 9 also indicates the position of the lint and trash adjacent the trash discharge openings 100 and 100a. Due in part to the curvature of the ducts it will be noted that the particles in the air-borne stream are more or less condensed against the duct wall at these points. This results in a more uniform action on the particles at the slot and therefore a more perfect separation. This is due not only to the curvatures of the ducts but also to the high velocity within the duct system and I have found this to be advantageous in effecting separation.

Referring to Fig. 10, I show an additional feature which may be used with the apparatus shown in Figs. 1 to 4. In practice the portion of the lint duct 14 immediately ahead of the cleaning apparatus is substantially horizontal. This may permit certain of the heavy trash to settle out onto the lower wall of the duct. If the cleaner is to be used with a gin having brush doffing means or with a pneumatic gin in which the doffing air is of low velocity, this settling out action becomes a more serious problem.

In order to overcome this settling out of trash and to move the entire commingled stream in duct 14 at a higher velocity, I slit the bottom wall of the duct 14 as at 14a, substantially across its width. Air under pressure of about 15 inches water gauge is supplied to the slit 14a by means of an air pipe 15. This jet of air is directed along the lower duct wall and moves therealong any trash settled out. In some instances I note a remarkable improvement in the amount of trash removed when using the jet 14a. This feature makes my improved cleaner entirely suitable for use with brush type gins.

From the foregoing it will be apparent that I have devised an improved apparatus for separating trash from lint cotton. In actual practice I have found that the apparatus herein described is extremely effective for its intended purposes. I have further found that very little additional overall power for a ginning system embodying the same is required and that no damage is done to the lint. With either form of the apparatus I have observed that the combination of super atmospheric pressure on the inlet end of the ducts and sub-atmospheric pressure on the outlet end thereof is essential for obtaining the best cleaning results with the apparatus shown in Figs. 1, 2 and 3. Referring to Fig. 4 it will be seen that duct 101 could be led directly into the lint flue 139. With respect to pressure in the inlet ducts, when the commingled stream is delivered by a present day gin, such pressure cannot be raised very much above 1 inch water gauge because the gin will back lash, namely, lint will not be removed from the saws and wedges between the gin ribs, choking the gin. In all forms of the invention shown and described herein it will be noted that the ducts are so arranged, especially adjacent the trash discharge slots, as to reduce turbulence to the minimum. Thus, immediately ahead of each slot the several ducts curve on easy radii, with the result that the thin ribbons of commingled lint and trash are effectively acted upon by the several positive and induced streams of separating air. The radius of the curve between the adjacent ducts defining between the slots should, in all cases, be such as to reduce turbulent flow therein to the minimum, and in practice I find that the radius between the ducts 76 and 101, for example, should be about 1 inch.

In order to further demonstrate the increase in efficiency due to moving the commingled lint-trash stream at relatively high velocities, I show below a table of separating efficiencies at different velocities. The table represents the

quantity of trash "X" removed at the velocity of 3000 feet per minute as 100%. The table shows that at 3500 feet per minute 30% more trash is removed than at 3000 feet per minute, etc.

Velocity at constricted passage in entering duct	Trash removd, percent
3,000 feet per min	100
3,500 feet per min	130
4,000 feet per min	180
4,500 feet per min	225

While I have shown my invention in but two forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and, I, desire therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In apparatus for separating lint cotton and trash from an air-borne stream of the same, a laterally elongated relatively shallow duct into which the air-borne stream is introduced, an elongated opening in one wall of the duct, means to supply air under super-atmospheric pneumatic pressure through the elongated opening into the duct substantially parallel to the direction of movement of the lint-trash stream therein, a second duct having its inlet end angularly disposed relative to the discharge end of the first duct, there being a laterally elongated opening in alignment with the discharge end of the first duct through which trash is discharged, means to maintain the second duct under sub-atmospheric pneumatic pressure, and means to direct a stream of air under pressure transversely of the lint-trash stream just ahead of the trash discharge opening.

2. Apparatus as defined in claim 1 in which the air under pressure supplied to said ducts through said elongated openings is supplied from a common air supply source.

3. In lint cotton cleaning apparatus, a lint duct of substantial width and whose depth is a minor fraction of its width and having inlet and outlet sections joined together and angularly disposed with respect to each other, there being a trash outlet opening to the atmosphere at the juncture of said sections substantially in line with the inlet section, means for introducing an air-borne stream of lint cotton and trash into the inlet section, suction means connected to the outlet section, and additional means to introduce a booster stream of air at super atmospheric pressure substantially entirely across the inlet section of the duct in the direction of travel of the airborne stream.

4. In lint cotton cleaning apparatus, a relatively wide shallow duct having an upwardly inclined inlet section and an outlet section at an abrupt angle thereto and having a narrow elongated trash discharge slot at the juncture of the inlet and outlet sections in the outer wall of the duct substantially in line with the inlet section, means to introduce air-borne lint and trash into the inlet section under super atmospheric pressure, means to maintain the outlet section of said duct under sub-atmospheric pressure, a restricted passage in the inlet section of said duct adjacent the trash discharge slot whereby to increase the velocity of said stream and reduce its pressure adjacent said slot, a housing for the duct including a chamber into which the discharge slot opens, said chamber being open at the top to admit air from the atmosphere for introduction into the slot and having a vertical side wall extending downwardly toward the open slot to direct the air downwardly toward the slot normal to the path of the trash being discharged, a lower upwardly diverging wall for the chamber terminating below the inlet section of the duct and in spaced relation thereto to admit air from the atmosphere over said wall, and a downturned lip on the inlet section of the duct at said slot overhanging said lower wall to direct the air downwardly.

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