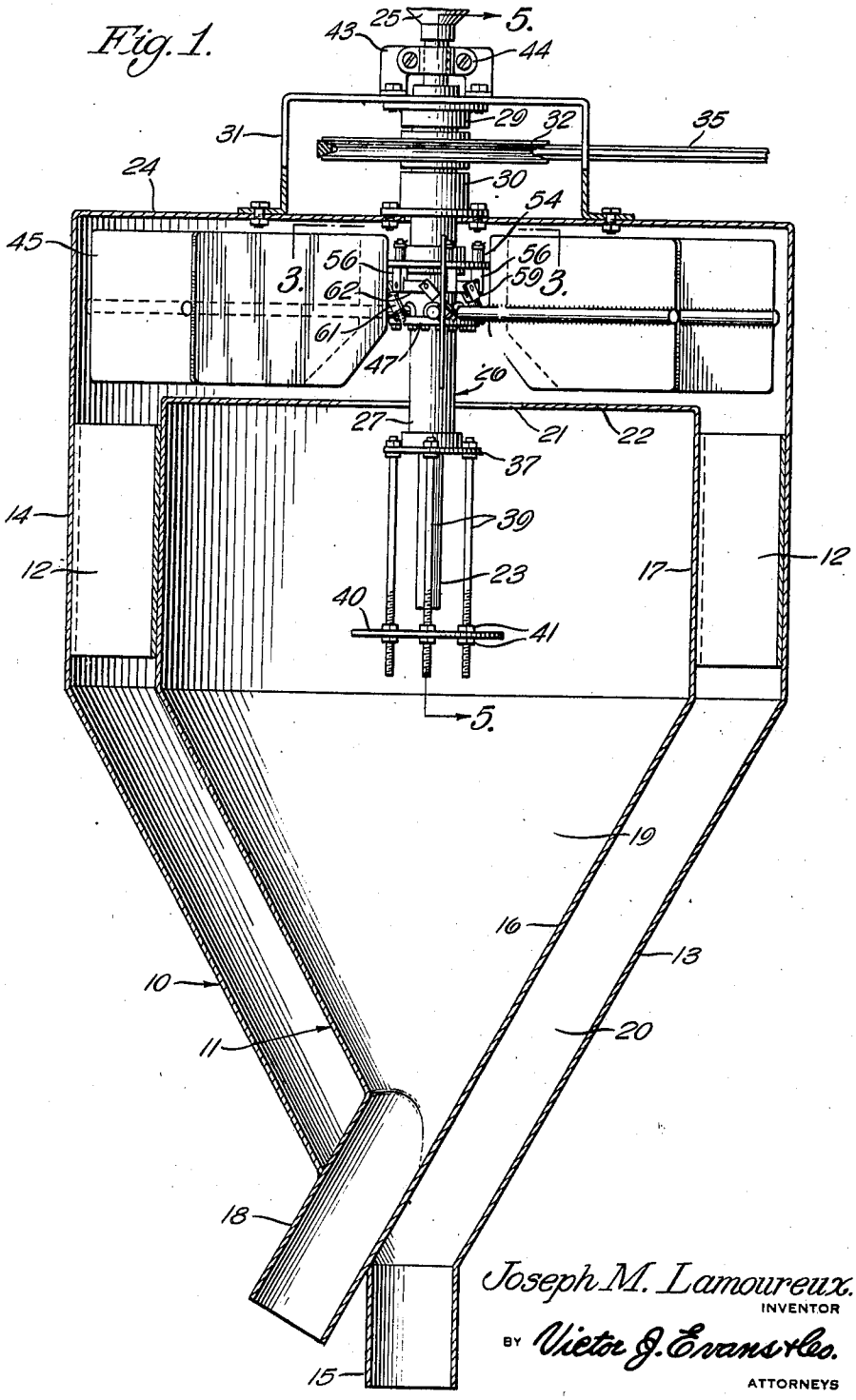
March 14, 1944. J. M. LAMOUREUX 2,343,985

AIR SEPARATOR

Filed July 7, 1941 3 Sheets-Sheet 1

Fig. 1.



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Filed July 7, 1941 3 Sheets-Sheet 2

Fig. 2.

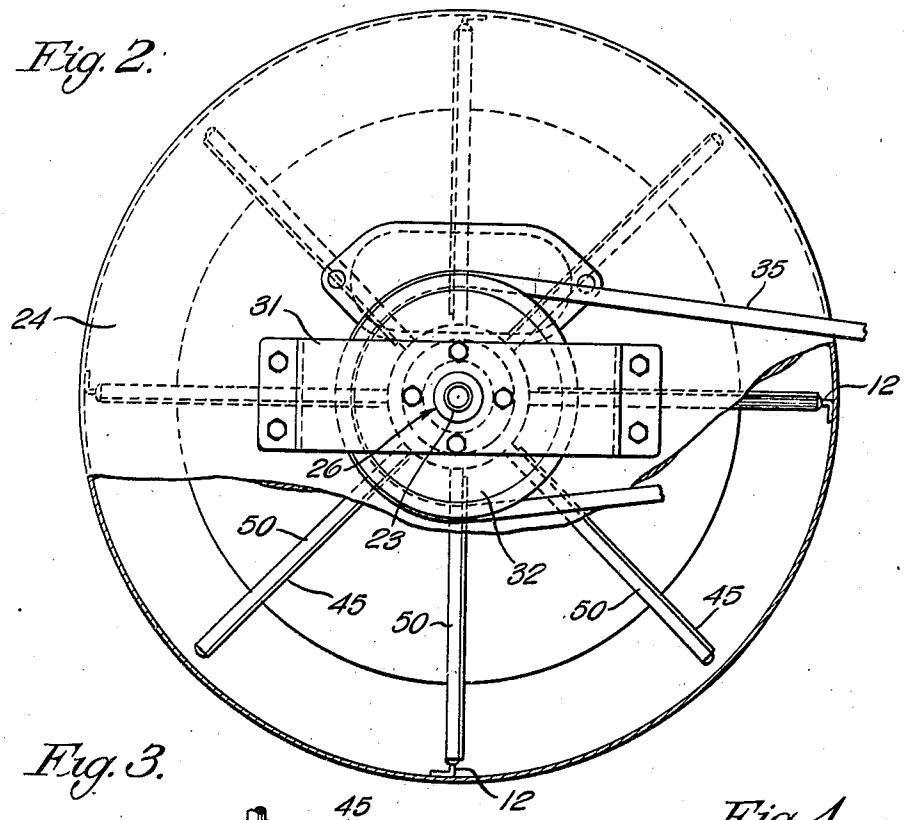


Fig. 3.

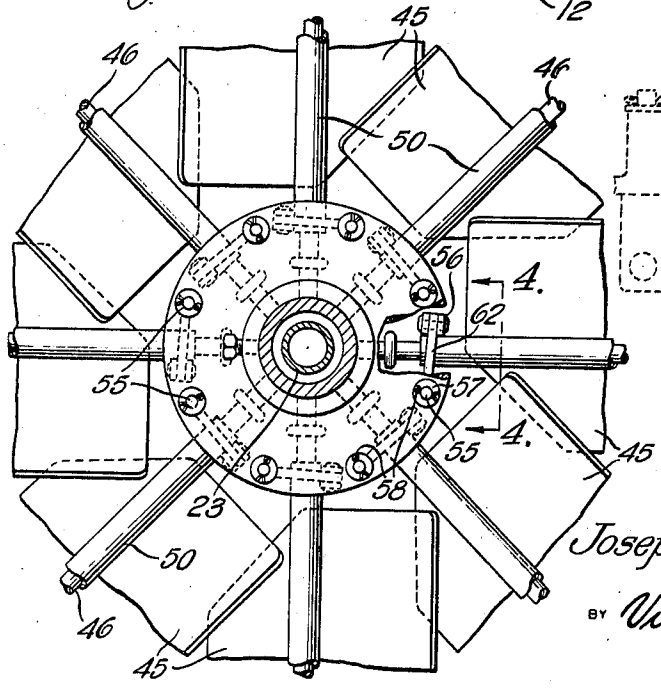
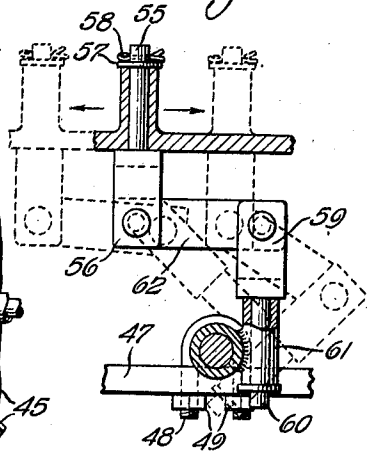


Fig. 4.



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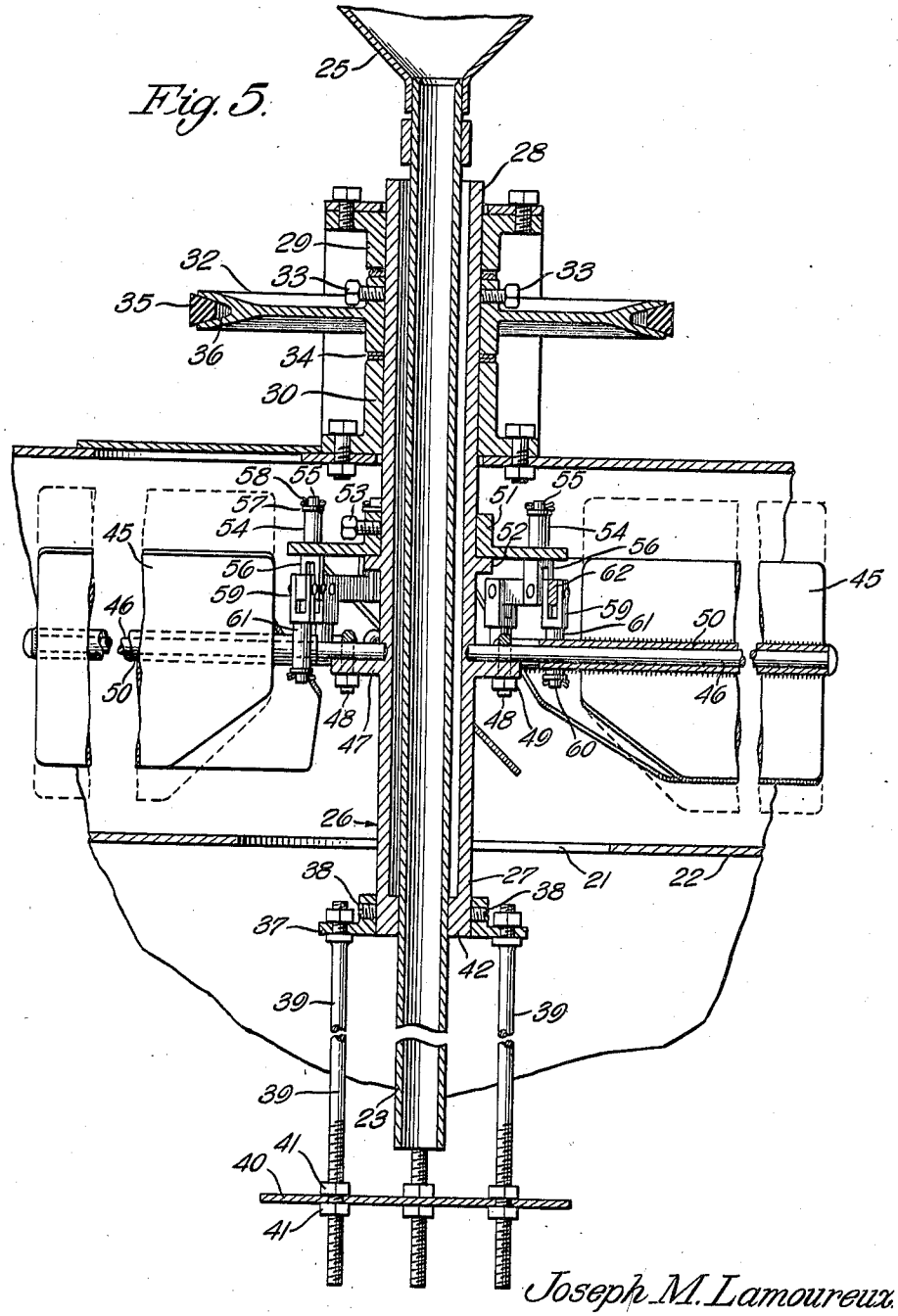
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March 14, 1944. J. M. LAMOUREUX 2,343,985

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Fig. 5.



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UNITED STATES PATENT OFFICE

2,343,985

AIR SEPARATOR

Joseph M. Lamoureux, Mabton, Wash., assignor to Yakima Chief Ranches, Inc., a corporation of Washington

Application July 7, 1941, Serial No. 401,385

2 Claims. (Cl. 209—154)

My invention relates to new and useful improvements in air separators.

An important object of my invention is the provision of a device that is partly, though not exclusively, adapted to separate lupulin from hop sweepings. The device includes an inner separating chamber in which the materials to be graded are thrown outwardly by a rotary distributor into the path of a rising current of air. A fan disposed above the separating chamber and in an outer distributing chamber generates the updraft of air in the separating chamber and a downdraft in the distributing chamber, whereby to draw the relatively fine lupulin particles upwardly into the distributing chamber and into the downdraft so that they may be discharged through a discharge chute provided in the bottom of the chamber while the coarser tailings or sweepings gravitate downwardly through the rising current of air to a separate discharge chute provided in the bottom of the separating chamber, which last-mentioned discharge chute also constitutes the sole air inlet for the separating chamber so that the tailings will be thoroughly agitated and swept by the current of air entering the chamber to effect complete separation of the lupulin therefrom.

Another object of my invention is to provide a fan system that is uniquely constructed to permit all of the fan blades to be simultaneously adjusted to regulate the velocity of the current of air flowing through the separating and distributing chambers.

Still another object of my invention is the provision of an apparatus of the above-mentioned character that is simple in its construction, inexpensive to manufacture and efficient and efficacious in the performance of its duties.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the drawings, forming a part of this specification, and wherein like numerals are employed to designate like parts throughout the same,

Figure 1 is a vertical sectional view of an air separator embodying my invention,

Figure 2 is a top plan view thereof showing parts broken away for clearness of illustration,

Figure 3 is a fragmentary transverse sectional view taken on the line 3—3 of Figure 1,

Figure 4 is a fragmentary vertical sectional view taken on the line 4—4 of Figure 3, and

Figure 5 is an enlarged fragmentary vertical sectional view taken on the line 5—5 of Figure 1.

In the accompanying drawings, wherein for the purpose of illustration, is shown a preferred embodiment of my invention, the numerals 10 and 11 designate respective outer and inner shells or casings arranged in nested relation and normally held in fixed spaced relation with each other by means of a plurality of radially extending, circumferentially spaced webs or ribs 12. As best illustrated in Figure 1, the outer shell 10 is formed with a lower cone-shaped portion 13 and an upper cylindrical portion 15, both of said portions being imperforate with the exception of the discharge chute 15 provided at the lower end of the cone-shaped portion. The inner shell 11 is similarly formed with a lower cone-shaped portion 16 and an upper cylindrical shaped portion 17 and the lower end of the cone-shaped portion 16 is formed with a downwardly and laterally extending discharge chute 18 which extends through a registering opening in the outer shell adjacent to the discharge chute 15. The shells may be secured in the above relation by any suitable means; however, I prefer that the webs 12 be welded to the shells and that weld material be placed in the mentioned opening of the outer shell around the discharge chute 18 whereby to provide an essentially integral construction.

This unique construction provides an inner separating chamber 19 and an outer distributing chamber 20. The material to be separated is introduced into the inner separating chamber where it is acted upon by forces which carry the lighter particles thereof upwardly through a centrally located opening 21 in the top 22, which top substantially closes the upper cylindrical portion of the separating chamber. The lighter particles will thus enter the outer distributing chamber 20 and be discharged through the chute 15 while the heavy, coarse particles of the material will gravitate downwardly in the inner separating chamber and be separately ejected through the discharge chute 18.

I propose to introduce the material into the separating chamber 19 through a vertically disposed stationary tubular member 23 which extends through the top 24 of the outer shell, through the opening 21 in the top 22 of the inner shell and terminates slightly above the cone-shaped lower portion thereof. The end of the tubular member extending above the top 24 of the outer shell is formed with a funnel-shaped hopper 25 in which the material may be placed for introduction into the inner shell. The member 23 is telescopically received within a rotatable tubular shaft 26 which extends between the tops 22 and 24 of the inner and outer shells, the

lower end 27 thereof extending slightly below the top 22 and the upper end 28 thereof extending slightly above the top 24. The shaft is supported in this position by means of the flanged sleeves 29 and 30, which rotatably receive the upper end 28 thereof, the radial flange of the upper sleeve 29 being bolted or otherwise fixedly secured to a supporting bracket and the radial flange of the lower sleeve 30 being bolted or otherwise fixedly secured to the top 24 of the outer shell. The above arrangement is best illustrated in Figure 5, the respective sleeves being spaced apart to accommodate the pulley 32 therebetween, which pulley is fixedly associated with the shaft by means of the set screws 33. If desired, a plurality of shims 34 may be inserted between the pulley and the adjacent ends of the sleeves to assure a snug fitting relation between the parts and to prevent the pulley from shifting back and forth between the sleeves during the operation of the device. An endless belt 35 received within the peripheral groove 36 of the pulley extends around the driving wheel of an electric motor or other suitable drive means (not shown). The lower end 27 of the shaft is provided with a flanged collar 37 which is fixedly secured thereto by means of the set screws 38. The radially extending flange of the collar 37 carries a plurality of depending, circumferentially spaced rods 39 arranged concentrically about the extending lower end of the tubular member 23. The threaded lower ends of the rods support a distributing plate 40 slightly below the lower end of the tubular member and each of the rods is provided with nuts 41 above and below the plate which may be threaded along the rods to effect adjustment of the plate relative to the lower end of the tubular member. The inner wall of the tubular shaft is spaced slightly from the tubular member, which member is held concentrically in the shaft by means of an inwardly extending bearing portion 42 formed at the lower end of the shaft and by means of a suitable supporting bracket 43 bolted, or otherwise fixedly secured, to the bracket 31. The bearing portion 42 snugly but rotatable engages the stationary tubular member and the bracket 43 is provided with a clamping strip 44 which holds the upper end of the tubular member fixedly positioned at all times.

It may thus be seen that operation of the driving means will act through the medium of the endless belt 35 to impart rotation to the pulley 32. By reason of the fact that the pulley is fixedly associated with the shaft 26, the shaft and distributing plate 40 carried thereby will be rotated and the speed of rotation may be suitably regulated by proper control of the driving means. The material within the separating chamber is separated by means of an updraft created within the chamber and I propose to generate this draft by a plurality of blades 45 mounted on the portion of the rotary shaft extending between the respective tops of the inner and outer shells. The fan assembly includes a plurality of equi-spaced radially extending spindles 46 having the inner ends thereof fixedly secured to the radial flange 47 formed on the shank substantially medianly between the tops of the respective shells by any suitable means such as the U-bolts 48 and nuts 49. Each of the fan blades 45 has a tubular sleeve 50 welded, or otherwise fixedly secured, to one side thereof at substantially its middle, which sleeves rotatably receive a respective one of the spindles 46. The pitch of each of the fan blades may therefore be adjusted by rotating the sleeve portion about its supporting spindle.

I have provided means for uniformly and simultaneously adjusting all of the fan blades, which means includes a flanged collar 51 rotatably mounted on the shank above the fan blades. The collar is supported by an integral radial flange 52 formed on the shank and is normally held in fixed association with the shank by means of a set screw 53. A plurality of upstanding, circumferentially spaced sleeve bearings 54 are formed on the flange of the collar 51, one bearing being provided for each of the fan blades and each of the bearings rotatably receives the shank portion 55 of a clevis member 56. The bifurcations of the clevis members hang downwardly from the flange and a washer 57 is slipped over the portion of the shank 55 extending above the bearing, which washer seats against the adjacent end of the bearing and a cotter key 58, or the like, is slipped through an opening formed in the shank above the washer to hold the shank rotatably mounted within the bearing. Each of the clevis members is connected to a respective one of the fan blades by a suitable linkage which includes other clevis members 59, the shank portions 60 of which are received within transverse sleeves 61 welded, or otherwise fixedly secured, to the inner ends of the tubular members 50 of the fan blades. The bifurcations of the last-mentioned clevis members extend upwardly above the supporting spindles and a suitable link bar 62 has the opposite ends thereof pivotally journaled between the bifurcations of the respective clevis members 56 and 59.

It may thus be seen that upon retraction of the set screw 53, the flanged collar 51 may be rotated about the shank 26 and that such rotation will act through the medium of the linkage hereinabove described to simultaneously rotate each of the fan blades about its supporting spindle. All of the parts comprising the linkage assembly are identical and the movements of the fan blades will therefore be similar and uniform. Figure 4 best illustrates the operation of the fan actuating assembly. By moving the flanged collar 51 to the left, the fan blades will be rotated in an anti-clockwise direction and by rotating the flanged collar to the right, the fan blades may be rotated in a clockwise direction. The unique arrangement herein provided permits the fan blades to be moved to an arc of substantially 90° by relatively slight movement of the flanged collar. The limits of the movements through which it will be necessary to move the plate are illustrated by the dotted lines in Figure 4. By moving the flanged collar between these limits the fan blades may be shifted from a substantially horizontal to a substantially vertical position.

Obviously rotation of the shank will also effect rotation of the fan blades and, by regulating the pitch of the blades, an updraft may be created in the inner separating chamber 19 and a downdraft created in the outer distributing chamber 20. Also, by adjusting the pitch of the blades and by controlling the speed of rotation of the same, the velocity of the currents of air created thereby may be selectively varied. Attention is directed to the fact that the housing unit is impervious except for the discharge chutes 15 and 18 and it will therefore be necessary that the updraft of air within the inner separating cham-

ber enter through the chute 18 and that the downdraft of air in the outer distributing chamber 20 issue through the discharge chute 15.

I have developed this arrangement primarily for the purpose of separating lupulin from hop sweepings. These sweepings usually comprise approximately 5% lupulin, which is intermixed with a mass of coarse heavy material consisting of hop blossoms, leaves, chaff and dirt. This combination of materials is introduced into the separating chamber through the stationary tubular member 23. The material will drop onto the distributing plate 40 which is being rotated at a relatively high rate of speed by means of the driven shaft 26. Obviously, the shaft is also rotating the fan blades to create an updraft current of air in the separating chamber and a downdraft current of air in the distributing chamber. As the material falls upon the distributing plate it will be thrown outwardly by centrifugal action. The effect of the above operation will be to spread the material in a horizontal sheet extending from the plate to the inner wall of the shell 11 in a manner to permit the fine particles of lupulin to be readily separated from the heavier coarser particles. The air rising within the separating chamber will gather the essentially light lupulin particles and carry the same through the opening 21 and outwardly into the distributing chamber 20. The velocity of the updraft current of air is regulated so that it will not be sufficiently strong to carry the heavier particles of the material into the distributing chamber. It is readily apparent that the particles of lupulin entering the distributing chamber will be carried downwardly by the draft of air therein and discharged through the chute 15. The heavier particles of the material remaining within the separating chamber will gravitate downwardly into the lower cone-shaped portion of the inner shell and against the updraft of air entering through the chute 18. Obviously, as the material moves into the chute it will be thoroughly agitated by reason of the constricted dimensions of the chute and lower end of the housing to effect an essentially complete separation of any particles therefrom of sufficient lightness to be carried upwardly by the draft of air. The particles too heavy to be carried by the draft of air will fall into the chute 18 and be discharged exteriorly of the housing. By providing a construction wherein a single opening or chute is used to admit air into the housing and to also discharge the relatively heavy sweepings therefrom, a construction has been developed which will assure substantially complete separation of the lighter particles from the heavier particles of the material and by providing separate chutes for the fine and coarse particles of the material, they may be directed into separate containers preparatory to distribution.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention, or scope of the appended claims.

Having described my invention, I claim:

1. In combination with an air separator casing, a vertical hollow shaft, a drive member fixed to the shaft, a bearing for rotatably supporting the said shaft and drive member, a feed tube extending through the shaft and spaced therefrom, the lower end of the shaft having an internal shoulder portion bearing against the feed tube, a plurality of spindles fixed to and extending radially from the shaft at circumferentially spaced intervals, a sleeve mounted to turn on each spindle, a fan blade fixed to the sleeve, a tubular bearing element fixed to one side of each sleeve and disposed vertically at its inner end, a stem pivotally mounted in the tubular bearing, a U-shaped element formed on the said stem and projecting above the tubular bearing, a link bar having its ends pivotally connected with the U-shaped elements of a pair of adjacent blade sleeves, an angularly adjustable collar mounted on the shaft above the spindles, a horizontal flange formed on the said collar, a plurality of circumferentially spaced vertical bosses formed on the collar flange in registration with openings therein, a stem mounted to turn in each boss, and an inverted U-shaped element depending from each last mentioned stem pivotally connected to the medial portion of each link bar whereby angular adjustment of the collar will effect simultaneous adjustment of the fan blade.

2. In blower mechanism of the character described, a rotary shaft, a circumferential flange formed on the shaft, a plurality of spindles detachably fastened to the said flange and extending radially of the shaft, a second flange formed on the shaft spaced axially from the first mentioned flange, a collar supported for angular adjustment on the said last mentioned flange, means for releasably locking the said collar in set position, a circumferential flange formed on and projecting from the collar, a plurality of bearing sleeves formed on the collar flange, in registration with openings therein and parallel with the axis of the shaft, a sleeve mounted to turn on each spindle, a blade fixed on the said sleeve, a tubular bearing element secured to the inner end of the sleeve and at right angles to the axis thereof, a stem mounted to turn in each tubular bearing element, a U-shaped pivot member formed on one end of the stem and projecting from the bearing element, a link bar having its ends pivotally connected to each adjacent pair of the U-shaped members, a stem rotatably mounted in each sleeve on the collar flange, and a U-shaped pivot element attached to the said stem and projecting axially of the collar flange pivotally connected to the intermediate portion of each link bar for simultaneous adjustment of the fan blade on angular adjustment of the collar.

JOSEPH M. LAMOUREUX.