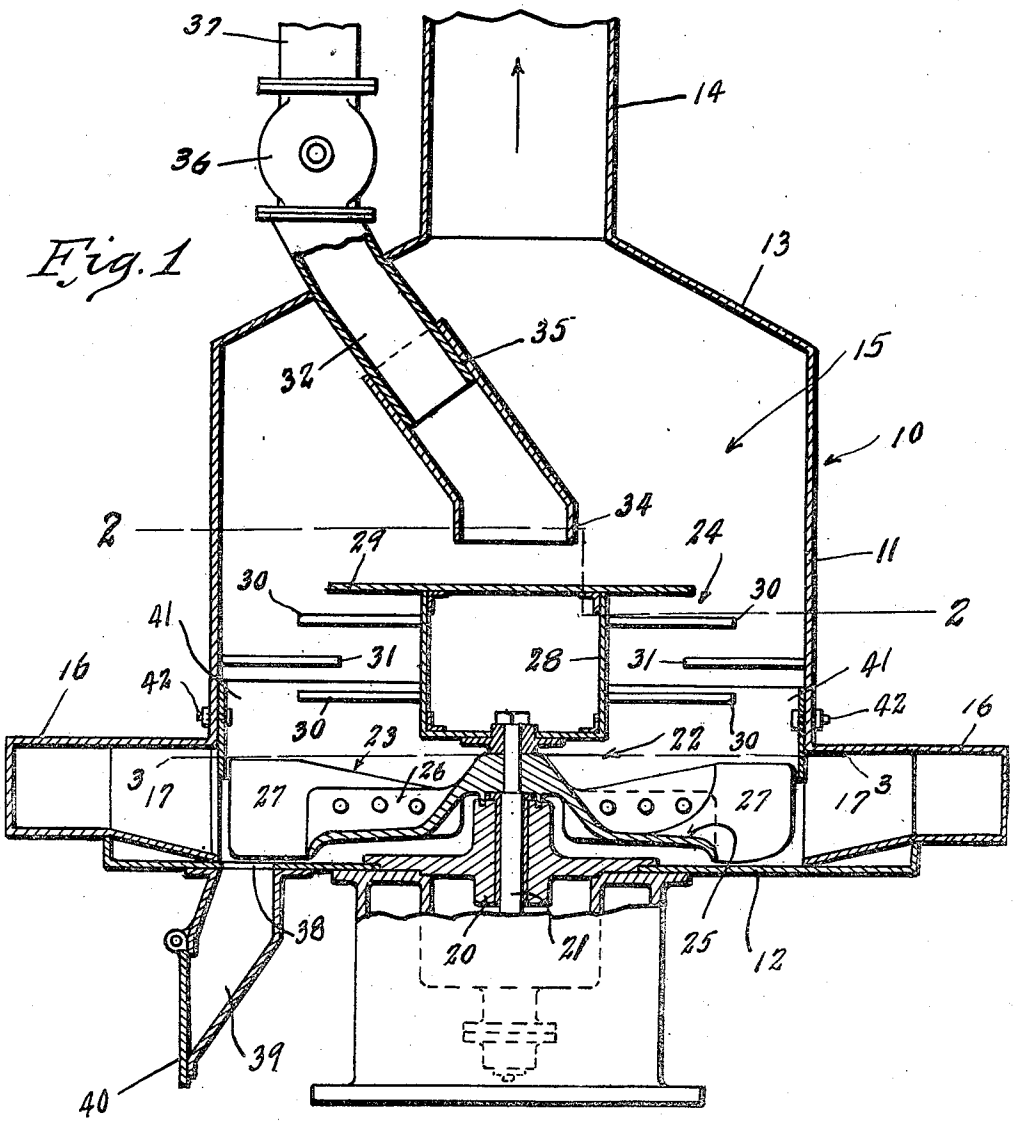
Sept. 21, 1943. C. E. HERMANN 2,329,900

AIR SEPARATOR

Filed Aug. 26, 1942 3 Sheets-Sheet 1

Fig. 1



Inventor

Charles Edward Hermann

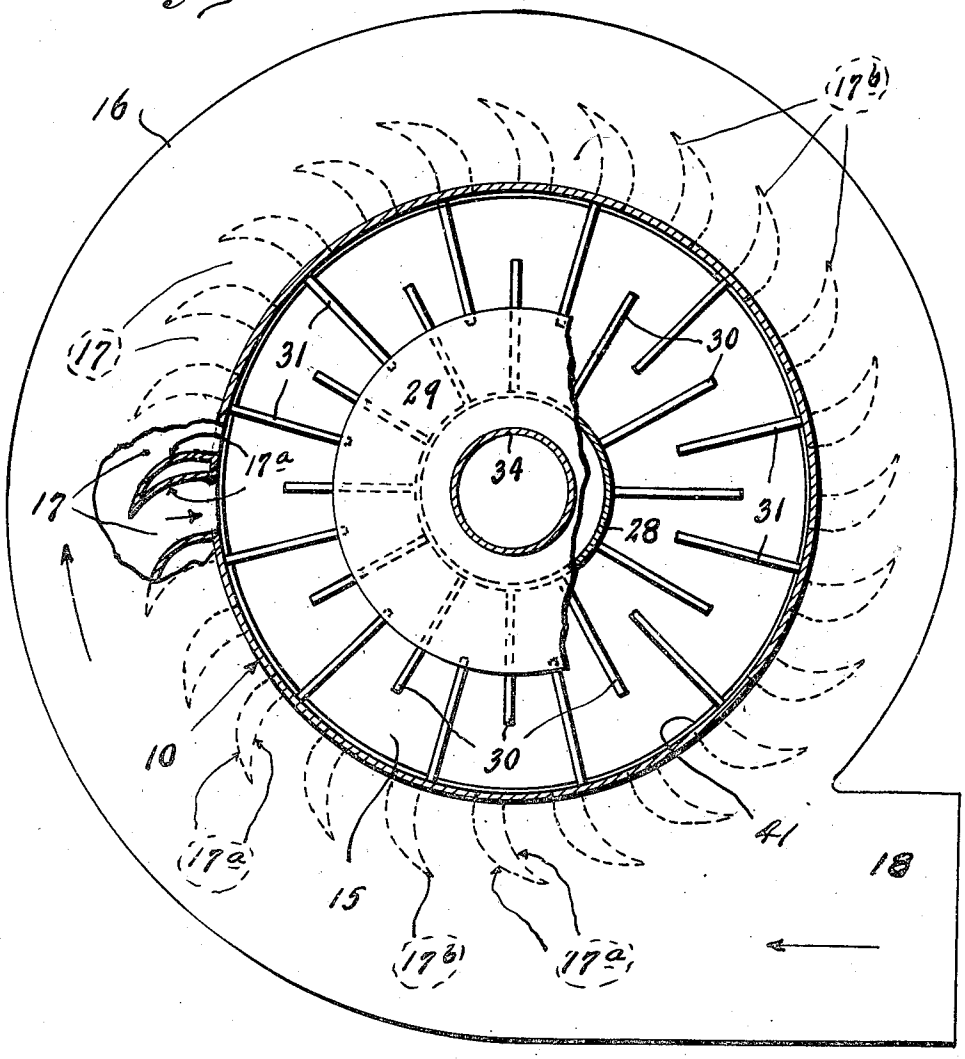
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AIR SEPARATOR

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Fig. 2



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AIR SEPARATOR

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Fig. 3

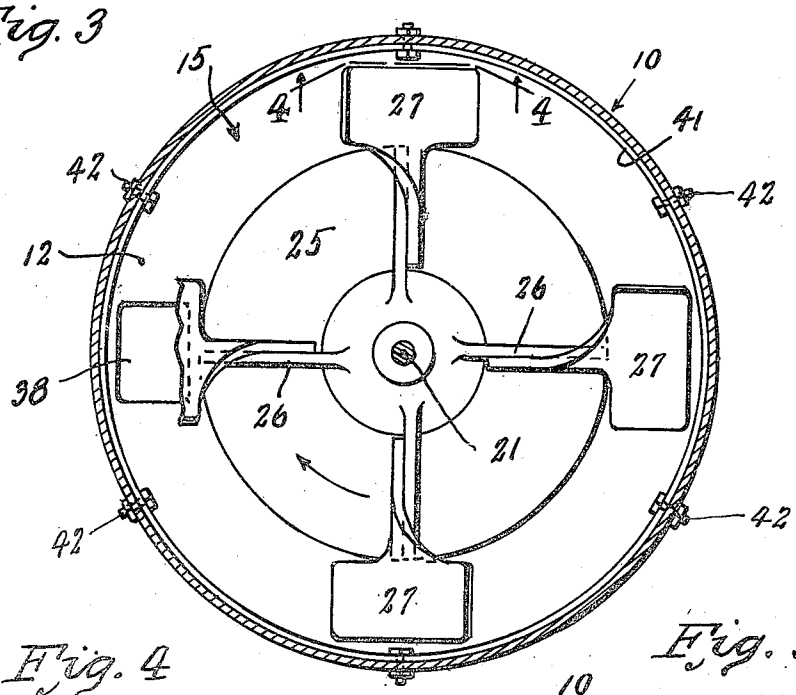


Fig. 4

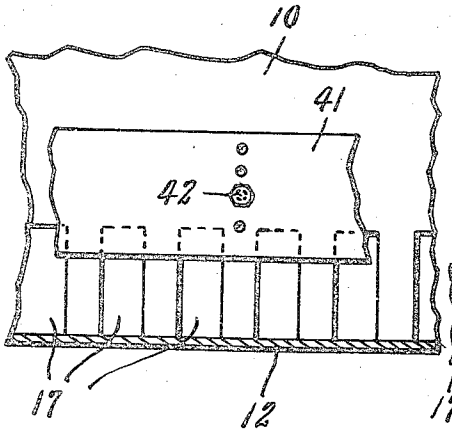
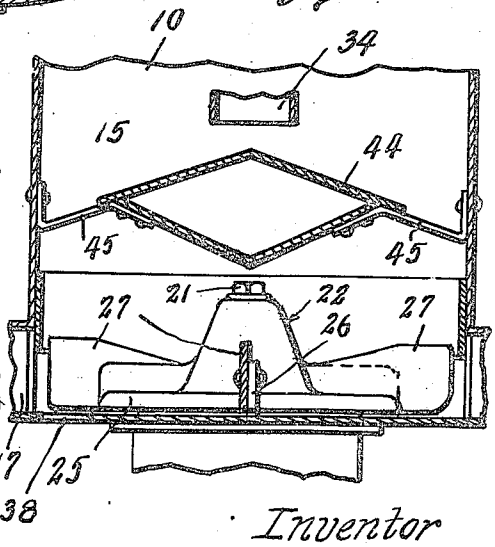


Fig. 5



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By William Fanna Atty.

Patented Sept. 21, 1943

2,329,900

UNITED STATES PATENT OFFICE

2,329,900

AIR SEPARATOR

Charles Edward Hermann, St. Louis, Mo.

Application August 26, 1942, Serial No. 456,452

15 Claims. (Cl. 209—139)

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

Among the main objects of the invention are the provision of an air separator having peripheral air inlets adjacent to the bottom of the classification chambers, and an air and fine material outlet in the upper end of said chamber, the material to be classified being fed into said chamber onto a rotating spreader plate disposed in said chamber intermediate said inlet and said outlet, there being a coarse material discharge opening formed in the bottom of said chamber and a plurality of agitators operating over said bottom to bring the material into the path of air currents issuing from said inlets and moving the coarse material toward said discharge opening.

Another object of the invention is the provision of an air separator of the class described having a rotating horizontally disposed spreader disk for receiving the material to be classified, a series of rotating arms disposed below said disk and extending radially outward from the axis of rotation, and another series of stationary arms disposed in a spaced relation with the horizontal plane or planes of said rotating arms and in overlapping relation therewith, whereby the material discharged from said disk is subjected to the action of said rotating and stationary arms.

Other objects of the invention are to provide an air separator having peripherally disposed air inlets adjacent to the bottom of the classification chamber, an axial air and fine material outlet in the upper end thereof, and a material agitating assembly revolubly mounted in said chamber coaxially therewith, said assembly comprising a horizontal spreader disk adapted to receive the material to be classified, and a plurality of arms extending radially outward, and one or more scoops or plows operating over the bottom of said chamber and in the horizontal plane of said air inlets, there being a discharge opening formed in said bottom through which the reject material is discharged by said plows as they operate over said bottom.

Another object of the invention is to provide an air separator having a plurality of air inlets disposed peripherally near the lower end thereof and having an air and fine material outlet at the upper end and a sleeve arranged in sliding engagement with the peripheral casing of said separator adjacent to said inlets and adjustable on said peripheral wall to regulate the size of said inlets.

With these and other objects in view, my invention consists in certain novel features of construction and arrangement of parts hereinafter more fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a vertical cross section through my improved air separator.

Figure 2 is a horizontal cross section taken on line 2—2 of Figure 1.

Figure 3 is a horizontal cross section taken on line 3—3 of Figure 1.

Figure 4 is a detail cross section taken on line 4—4 of Figure 1.

Figure 5 shows a modified form of separator having a stationary spreader member.

Referring by numerals to the accompanying drawings, 10 indicates a separator having a cylindrical wall 11, a bottom wall 12, and a top wall 13. The latter is preferably cone-shaped and terminates in an upward axial extension or conduit 14 which forms an outlet for air and fine material from the classification or separation chamber 15.

An enlargement 16 on the lower end of separator 10 forms an air or mud box which communicates with chamber 15 through a plurality of inlets 17 which are arranged peripherally around the lower end of said casing 10.

A tangential extension 18 is formed on air box 16 and is adapted to be connected to a suitable air return pipe 19 of the classification system.

A vertically disposed bearing 20 is fixed to the bottom wall 12 and journaled in said bearing is a vertically disposed shaft 21. The lower end of this shaft is actuated in any suitable manner. The upper end has fixed thereon a rotating assembly 22. This assembly consists of a lower rotating member 23 and an upper rotating member 24.

The lower member 23 encloses the upper end of shaft 21 and has a horizontally disposed annular disk or flange 25 arranged adjacent to bottom wall 12. One or more vertically and radially disposed flanges 26 are formed integral with member 23 and flange 26 and fixed to each flange 26 is a plow or agitator 27.

The upper member 24 is in the form of a vertically disposed drum 28 having the lower end fixed to shaft 21 and having the upper end provided with a horizontally disposed spreader disk 29 which extends a suitable distance past said drum.

Fixed to the drum 28 and extending radially outward therefrom are arms 30 arranged in one or more peripheral rows.

Stationary arms 31 are fixed to the casing and extend radially inward toward the drum. These arms 31 are also arranged in one or more peripheral rows in spaced relation with rows of rotating arms 30. Thus the material traversing the zones of the rotating arms 30 is deflected thereby outwardly and has to pass through the zones of stationary arms 31, thereby ensuring a more perfect separation of fine particles of material from the coarser particles.

The material to be classified is fed onto the spreader disk 29 through a conduit 32 extending into the separator 10 through top wall and having its lower end 33 disposed coaxially with said separator and terminating a suitable distance above said disk 29. A telescopic joint 34 in conduit 32 permits adjustment of said end 33 relatively to disk 29. The outer end of conduit 32 is connected to the discharge end of a mechanical feeder 36, the inlet end of which has connected thereto a material delivery pipe 37.

The reject or coarse material is deposited on bottom 12 and is removed therefrom through a discharge opening 38 formed in said bottom near the inlets 17. A collection chamber or conduit 39 is attached to bottom 12 and receives the reject material discharged through opening 38. A flap gate 40 closes the lower end of member 39.

Adjustably mounted in the lower end of separator casing 11 is a sleeve 41 which is movable vertically to reduce the openings connecting the inlet 17 with chamber 15. The sleeve is held in adjusted position by a plurality of horizontally disposed bolts 42 seated in casing 11 and each engaging one of several holes 43 arranged in a vertical row in sleeve 41.

By adjusting sleeve 41, the size of the openings of inlets 17 can be varied and the flow of air from box 16 to chamber 15 regulated. The inlets 17 are curved in the direction of the incoming air and preferably open radially into said chamber 18 (see Fig. 2). The walls 17*a* of the adjacent inlets converge and form a sharp point 17*b* to reduce air resistance to a minimum.

In the modified form shown in Figure 5, a spreader member 44 is held stationary in chamber 15 by rods 45 fixed to casing 10. This spreader member is of an inverted cone-shape and the material discharged thereon is spread downwardly in said casing.

The air separator of my improved construction has a closed casing provided with a suction outlet at the upper end and air inlets at the lower end. The air inlets are streamlined and are contained in a wind or air box which has a tangentially disposed air inlet port.

The material is fed into the separator by a feed pipe which is located above a material spreader member. The latter discharges the material into the space between the casing well and the rim of the spreader disk. The rising air stream picks up the fine material, while the coarser material drops and is agitated by the plows 27. Coarse or reject material collects on the bottom 12 and is discharged therefrom through the throw-out opening 38.

My improved air separator is simple in operation and provides accurate and efficient classification of material.

While I have shown and described herein the preferred form of my invention, various changes in the construction and arrangement thereof can be made without departing from the spirit of my invention.

I claim:

1. In an air separator, the combination of a separator casing, an air outlet extending axially from the upper end thereof, a peripheral air box surrounding the lower end of said casing, a plurality of inlets connecting said air box with the interior of said casing, a vertically disposed shaft revolubly mounted in the bottom of said casing, and extending thereinto, a drum fixed to the upper end of said shaft, a horizontally disposed spreader disk fixed to the upper end of said drum, a material delivery pipe extending downwardly into said casing and terminating above said disk, whereby the material to be classified is discharged onto said disk, a plurality of rotating arms fixed to said drum and extending radially outward, a plurality of stationary arms fixed to said casing and extending radially inward in spaced relation with said rotating arms, whereby said rotating and stationary arms cooperate to separate coarse particles from fine material, an outlet for coarse particles arranged in the bottom of said casing, and a plurality of plows fixed to said shaft below said drum and operating over said bottom for moving said coarse particles to said outlet.

2. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end thereof, a peripheral air inlet box surrounding the lower end of said casing, a plurality of inlets connecting said air box with the interior of said casing, a vertically disposed shaft revolubly mounted in the lower end of said casing, a drum fixed to the upper end of said shaft, a horizontally disposed spreader disk fixed to the upper end of said drum, a material delivery pipe extending obliquely downward into said casing and terminating above said spreader disk for delivering material thereonto, a plurality of rotating radial arms fixed to said drum, a plurality of stationary arms fixed to said casing and extending inward in spaced relation with said rotating arms, whereby coarse particles of material are deflected downwardly by said stationary and rotating arms, a discharge for said coarse particles formed in the bottom of said casing near the outer periphery thereof, a receiver for said reject material connected to said discharge, and a plurality of vanes secured to said shaft below said drum for agitating the material adjacent to said air inlets and moving the reject material toward said discharge opening.

3. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end thereof, an air inlet box peripherally enclosing the lower end of said casing, a plurality of inlets connecting said air box with the interior of said casing, a vertically disposed bearing fixed to the bottom of said casing, a revoluble shaft journaled in said bearing and extending into said casing, a rotating assembly fixed on said shaft in said casing and comprising an upper member and lower member, a horizontally disposed spreader disk fixed to said upper rotating member, a material delivery pipe extending downward into said casing and terminating above said disk for discharging material thereinto, a reject material discharge disposed in the bottom of said casing adjacent to said inlets, and a plurality of vanes fixed to said lower rotating member and agitating the material past said inlets and sweeping the reject material on said bottom toward said discharge.

4. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end of said casing, a reject material discharge formed in the bottom of said casing near the outer periphery thereof, an air inlet box enclosing the lower end of said casing, a plurality of inlets connecting said air box with the lower end of said casing, a vertically disposed rotating assembly journaled in the lower end of said casing and comprising a lower rotating member and an upper rotating member, a horizontally disposed spreader disk on said upper rotating member, a material feed conduit extending downward into said casing and terminating above said disk for discharging material thereonto, and a plurality of agitator vanes carried by the lower rotating member and operating across said inlets to agitate the material over the bottom of said casing for moving the reject material to said discharge.

5. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end of said casing, a reject material discharge formed in the bottom of said casing near the outer periphery thereof, an air inlet box enclosing the lower end of said casing, a plurality of inlets connecting said air box with the lower end of said casing, a vertically disposed rotating assembly journaled in the lower end of said casing and comprising a lower rotating member and an upper rotating member, a horizontally disposed spreader disk on said upper rotating member, a material feed conduit extending downward into said casing and terminating above said disk for discharging material thereonto, a plurality of agitator vanes carried by the lower rotating member and operating across said inlets to agitate the material over the bottom of said casing for moving the reject material to said discharge, and a receptacle below said discharge for receiving said reject material.

6. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end of said casing, a reject material discharge formed in the bottom of said casing near the outer periphery thereof, an air inlet box enclosing the lower end of said casing, a plurality of inlets connecting said air box with the lower end of said casing, a vertically disposed rotating assembly journaled in the lower end of said casing and comprising a lower rotating member and an upper rotating member, a horizontally disposed spreader disk on said upper rotating member, a material feed conduit extending downward into said casing and terminating above said disk for discharging material thereonto, a plurality of vertically and radially disposed flanges fixed on said lower rotating member, and a vane fixed to each flange for agitating the material in said casing and moving the reject material on the bottom thereof to said discharge.

7. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end of said casing, a reject material discharge formed in the bottom of said casing near the outer periphery thereof, an air inlet box enclosing the lower end of said casing, a plurality of inlets connecting said air box with the lower end of said casing, a vertically disposed rotating assembly journaled in the lower end of said casing and comprising a lower rotating member and an upper rotating member, a horizontally disposed spreader disk on said upper rotating member, a material feed conduit extending downward into said casing and terminating above said disk for discharging material thereonto, a plurality of vertically and radially disposed flanges fixed on said lower rotating member, a vane fixed to each flange for agitating the material in said casing and moving the reject material on the bottom thereof to said discharge, a receptacle fixed to said casing bottom below said discharge for receiving the reject material, and a closure member for said receptacle for permitting removal of said reject material from said receptacle.

8. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end of said casing, an air inlet box enclosing the lower end of said casing, a plurality of air inlets arranged in said air box peripherally of said casing and opening thereinto, a sleeve slidably mounted in said casing above said inlets and adjustable downwardly to reduce the size of said inlet openings, a reject material discharge formed in the bottom of said casing, a vertically disposed revoluble member in said casing, a material delivery conduit extending into said casing, and means fixed to said revoluble member and operating over said casing bottom for moving the reject material to said discharge.

9. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end of said casing, an air inlet box enclosing the lower end of said casing, a plurality of air inlets arranged in said box peripherally of said casing and opening thereinto, a sleeve slidably mounted in said casing above said inlets and adjustable partially to close said inlets, means for securing said sleeve in adjusted position, a reject material discharge formed in the bottom of said casing, and means rotatably mounted in said casing and operable over the bottom thereof for moving the reject material toward said discharge opening.

10. In an air separator, the combination of a separator casing, an air and fine material outlet extending axially from the upper end of said casing, an air inlet box enclosing the lower end of said casing, a plurality of air inlets arranged in said box peripherally of said casing and opening thereinto, a sleeve slidably mounted in said casing above said inlets and adjustable partially to close said inlets, means for securing said sleeve in adjusted position, a reject material discharge formed in the bottom of said casing, means rotatably mounted in said casing and operable over the bottom thereof for moving the reject material toward said discharge opening, and a normally closed receptacle secured to the bottom of said casing below said discharge for receiving the reject material.

11. In an air separator, the combination of a separator casing, a suction air outlet extending axially from the upper end thereof, an air box surrounding the lower end of said casing, a plurality of inlets connecting said air box with said casing, a spreader member disposed in said casing above said inlets, means for discharging material to be classified onto said spreader member, a plurality of rotating plows operating over the bottom of said casing for agitating the material and moving the reject material collected in said bottom, said bottom being formed with a throw-out opening, and a receptacle connected in said

throw-out opening for receiving said reject material.

12. In an air separator, the combination of a separator casing, a suction air outlet extending axially from the upper end thereof, an air box surrounding the lower end of said casing, a plurality of inlets connecting said air box with said casing, a spreader member disposed in said casing above said inlets, means for discharging material to be classified onto said spreading member, a plurality of rotating plows operating over the bottom of said casing for agitating the material and moving the reject material collected in said bottom, said bottom being formed with a throw-out opening, a receptacle connected to said throw-out opening for receiving said reject material, and a flat gate for closing said receptacle for automatically discharging said reject material from said receptacle.

13. In an air separator, the combination of a casing, a suction air and fine material outlet in the upper end thereof, an air box surrounding the lower end of said casing, a plurality of inlets in said air box opening radially inward into said casing, a spreader member disposed in said casing above said inlets, means for discharging the material onto said spreader member, agitating means operating in the lower end of said casing for mixing the material discharged from the spreader member with the air currents from said inlets, a throw opening in the bottom of said casing, and a receptacle connected to said opening for receiving the reject material thrown out through said opening.

14. In an air separator, the combination of a casing, a suction air and fine material outlet in the upper end thereof, an air box surrounding the lower end of said casing, a plurality of inlets in said air box opening radially inward into said casing, a spreader member disposed in said casing above said inlets, means for discharging the material onto said spreader member, agitating means operating in the lower end of said casing for mixing the material discharged from the spreader member with the air currents from said inlets, a throw-out opening in the bottom of said casing, a receptacle connected to said opening for receiving the reject material thrown out through said opening, and a closure member in said receptacle for automatically discharging the reject material therefrom.

15. In an air separator, the combination of a casing, a suction air and fine material outlet in the upper end thereof, an air box surrounding the lower end of said casing, a plurality of inlets in said air box connecting said box with said casing, a spreader member disposed in said casing above said inlets, means for discharging the material onto said spreader member, agitating means in the lower end of said casing for mixing the material discharged from said spreader member with the air currents issuing from said air inlets, and a throw-out opening in the bottom of said casing for discharging therefrom the reject material.

CHARLES EDWARD HERMANN.