G. L. YAGER.

SEPARATOR.

APPLICATION FILED MAR. 11, 1920.

1,389,085. Patented Aug. 30, 1921.

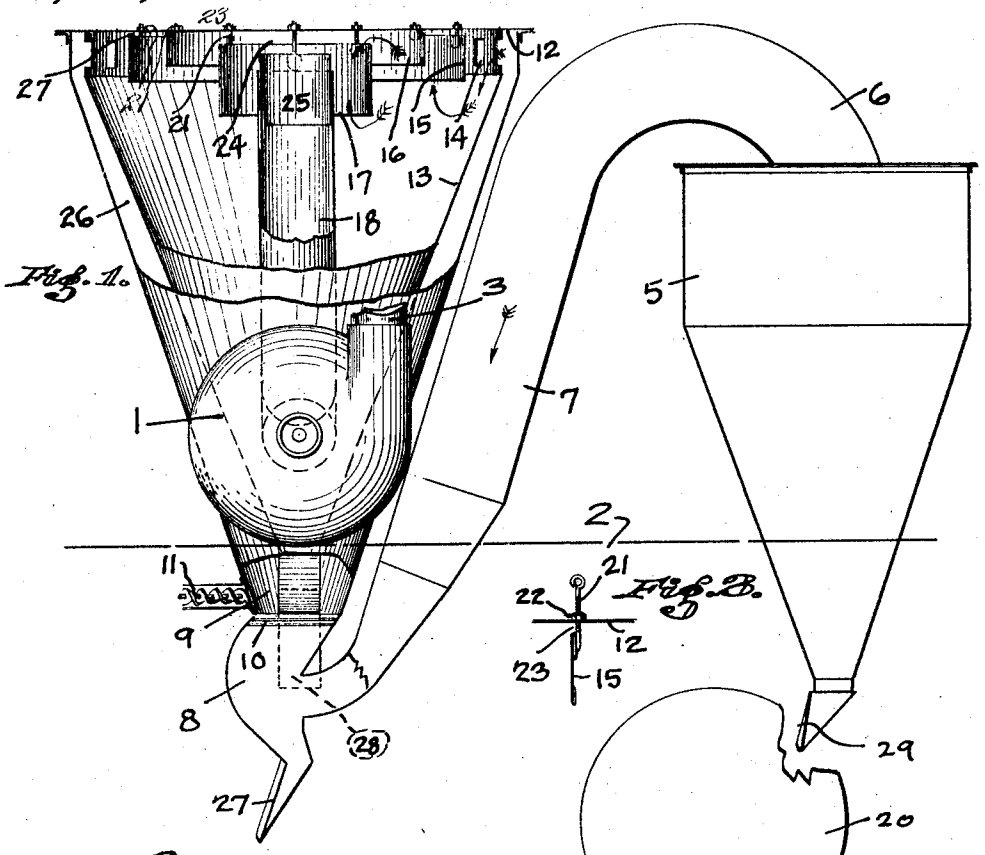


Fig. 1.

Fig. 2.

Fig. 3.

WITNESS

Lincoln Thurston

INVENTOR

George L. Yager

BY

Baldwin Vale

ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE L. YAGER, OF OAKLAND, CALIFORNIA.

SEPARATOR.

1,389,085. Specification of Letters Patent. Patented Aug. 30, 1921.

Application filed March 11, 1920. Serial No. 365,114.

To all whom it may concern:

Be it known that I, GEORGE L. YAGER, a citizen of the United States, and a resident of the city of Oakland, county of Alameda, State of California, have made a new and useful invention—to wit, Improvements in Separators; and I do hereby declare the following to be a full, clear, concise, and exact description of the same.

This invention relates more particularly to pneumatic separators for the dry separation of the finer from the coarser particles of pulverulent material such as paints and calcimine, pigments, pulverized ores and the like. Whereby the finer particles of material held suspended in an air current are permitted to precipitate by gravity, in the various stages of grade separation.

Among the objects of my invention are to increase the efficiency of the separation by causing the heavier particles in suspension to precipitate more quickly, leaving the impalpable powder or the ultimate separation desired in suspension, to be separated from the air current by any of the well known methods and means that may be combined in any conventional apparatus equipped with my invention. Other objects and advantages will appear as this description progresses.

In this specification and the annexed drawings, the invention is illustrated in the form considered to be the best, but it is to be understood that the invention is not limited to such form, because it may be embodied in other forms; and it is also to be understood that in and by the claims following the description, it is desired to cover the invention in whatsoever form it may be embodied.

In the accompanying one sheet of drawings:

Figure 1 is a diagrammatic illustration of a conventional separator, partially in cross section, disclosing the interior arrangement of the parts comprising my invention.

Fig. 2 is a plan view from above of the same, the cover of the first separator being removed.

Fig. 3 is a fragmentary detail illustrating the manner of adjusting the baffle plates.

In detail the construction illustrated in the drawings includes the exhaust blower 1, preferably mounted upon the floor 2. The discharge 3 of the blower is connected through the conduit 4 with the side of the "cyclone" dust collector 5, that is closed against escape of air; from which the blast is discharged through the elbow 6 leading to the conduit 7; from whence it is discharged into the lower receiving end of the outer cone 9, forming the outer casing of the conical first separator. The grate bars 10 are interposed between the receiving box 8 and the lower end of the outer cone 9. The material to be separated is fed onto the grate bars 10 by the screw conveyer 11 from the grinding mill, not shown. This outer cone 9 is closed by the cover 12, that supports the inner cone 13, the walls of which are substantially parallel with the walls of the outer cone 9, with a slight convergency toward the top. These two cones have no communication except through the inlet openings 14 through the walls of the inner cone near the cover 12.

The annular baffle plates 15, 16 and 17 are adjustably suspended from the cover 12 and arranged in concentric circles between the top walls of the inner cone 13 and the vertical discharge pipe 18 located axially within the inner cone 13. This pipe 18 is carried through the walls of both cones and is connected axially with the casing of the blower, the suction of which, acting through the vertical pipe 18, creates a suction within the inner cone 13. The by-pass pipe 19 leads from the elbow 6 into the "stocking" separator 20. The construction of this apparatus as described is conventional with the exception of the features comprising my invention, installed within the inner cone 13 and involving baffle means between the inlet and the outlet through the vertical pipe 18.

The annular baffle plate 15 is suspended on the threaded rod 21 having a running nut 22 threaded thereon and bearing against the cover 12 to support the weight of the baffle plate 15. It is advisable to provide three or more of these support rods 21, to symmetrically support the baffle plate, and to provide means for raising and lowering it to vary the gap 23 between the upper edge of the plate and the underside of the cover 12. The baffle plate 16 may be similarly mounted or it may be fastened directly to the cover 12, as a passage 23 would not be desirable at this point. The annular baffle 17 is mounted similarly to the baffle plate 15 and provides a passage 24 between the top of the baffle plate and the underside of the cover 12. To vary the space between upper end

of the exhaust pipe 18 and the underside of the cover 12, a telescoping sleeve 25 is fitted over the end of the pipe 18 and supported similarly to the adjustable support for the baffle plate 15, namely the threaded rod 21 and nut 22 for the purpose of adjusting the space between the cover 12 and the top of the sleeve.

This invention operates substantially as follows: The functioning of the blower 1 causes a suction through the vertical pipe 18 downward, inducing a suction within the cone 9; the discharge 3 from the blower passes through 4 to the cyclone separator 5, out through the elbow 6, through the conduit 7 and upward through the grate bars 10 and continues upward through the space 26, between the cones 9 and 13, and enters the openings 14 through the inner cone, meeting the suction therein. The blower 1 therefor is in a continuous closed circuit, creating a continuous circulation of air through the various mechanisms enumerated. When the pulverized material, fed into the screw conveyer 11, drops down onto the grate bars 10, the coarser particles drop therethrough and are discharged through the gate 27 onto a conveyer that returns them to the grinding mill, not shown. The pulverulent material that is sufficiently finely divided and suspended in the air current, passes upward through the space 26 between the cones, giving up much of the heavier particles by gravity, which flow back through the grate bars and out of the trap door 27, that is held normally closed, except for the discharge of material, to prevent the escape of any of the air, continuing upward through the space 26, the air current carrying the lighter particles passes through the several passages 14 and strikes the first baffle plate 15 and is deflected downwardly thereby, except that portion carrying the lighter particles that may escape over the top of the baffle plate 15 through the space 27, see arrows in Fig. 1, this portion thus escaping through the passage 27 strikes the succeeding baffle plate 16 and is deflected downwardly thereby. Each time that the current of air is deflected downward by the baffle plates 15 and 16 it gives up its heavier particles of suspended matter that gravitate down the sides of the inner cone 13 and are discharged through the outlet 28, that passes through the wall of the cone 9 above the grate bars. Passing onward from the baffle plates 15 and 16 the air passes the last baffle plate 17, the lower edge of which is below the inlet 25 of the outlet pipe 18, some of the air current, conveying the lighter particles, passes above the baffle plate 17 through the space 24 and then directly into the outlet pipe 18, the remainder of the air current passes beneath the baffle 17 and is drawn upward toward the mouth 25 of the outlet pipe 18. The remaining heavy particles are released from the air current before it passes into the discharge pipe 18, the heavy particles descending through the outlet 28 as described. In this manner the air current carries into the outlet pipe 18 only those lighter products that are held in suspension within the air current passing through the blower 1 and are discharged into the "cycline" separator 5.

There is a proportion of a very fine product that is blown off through the by-pass 19, through the "stocking" separator 20, the air escaping through the meshes of the muslin stockings permitting the impalpable powder suspended therein to precipitate in the stocking separator. In this manner the first coarse separation escapes from the space 26 through the grate bars 10 and out of the trap 27; the second separation takes place within the cone 13 and escapes through the outlet 28; the third separation takes place within the cyclone separator 5 and escapes through the trap door 29, the fourth separation takes place in the stocking separator 20, these various separations represent commercial grades suitable for various purposes.

If the test shows that too much heavy material is escaping through the outlet pipe 18, the baffles 15 and 17 may be raised to limit the openings 24 and 27, thus limiting the volume of air current that can short circuit from the openings 14 to the exhaust pipe 28, causing a greater volume to pass through the tortuous way beneath the baffles 15, 16 and 17, in this manner causing it to spill out or release a greater quantity of the heavier quantity. For the same purpose the sleeve 25 may be adjusted to vary the extent of the opening adjacent the cover 2, perfect control is available for regulating the quality of separation before it reaches the mesh screen.

The particular advantage of the substantially vertical annular baffle plates 15, 16 and 17 is that they cause a tortuous passage between the openings 14 and the draft pipe 18, in a vertical plane. It is desirable to break up any tendency of the air current between 14 and 18 to set up a horizontal centrifugal or vertical motion, that in itself has power to overcome the power of gravity or precipitation, thus holding in suspension the heavier particles that it is desired to precipitate, and carrying undesirable grades upward to the mouth of the exhaust pipe 18. The vertical baffle plates work harmoniously at all times with the laws of gravitation for the purpose desired. The first separator designed and built in accordance with this invention has demonstrated separating efficiency of 98½% of the higher grades desired.

Having thus described this invention,

what I claim and desire to secure by Letters Patent is:—

1. In combination with a pneumatic separator, a series of substantially vertical baffle plates adjustably suspended from the upper end thereof and arranged at different levels between the inlet and the outlet from said separator.

2. In combination with a pneumatic separator, a series of substantially vertical baffle plates suspended from the upper end thereof and arranged at different levels between the inlet and outlet from said separator, some of said plates having passages thereover.

3. In combination with a pneumatic separator having a cover, a series of substantially vertical baffle plates arranged near and suspended from the cover of said separator between the inlet and outlet therefrom, some of said plates being set close to said cover, and some having passage between said plates and said cover.

4. In combination with a pneumatic separator, a casing with an inner body interspaced therefrom and having inlet air passages therethrough from said space; an exhaust pipe having its inlet spaced downward from the cover of said separator; concentrically arranged baffle plates adjustably suspended from said cover and interposed between said inlet passages and said exhaust pipe.

5. In combination with a pneumatic separator, a casing with an inner body interspaced therefrom and having inlet air passages therethrough from said space; an exhaust pipe having its inlet spaced downward from the cover of said separator; concentrically arranged substantially vertical baffle plates interposed between said inlet passages and said exhaust pipe, some of said plates adjustably suspended from said cover and having passages between said plates and said cover.

6. In combination with a pneumatic separator, a conical casing having a flat cover; an inner cone spaced from said casing and fixed to said cover and having air inlet passages near the top thereof; an exhaust pipe located substantially centrally within said inner cone and terminating near said cover; a series of substantially vertical baffle plates arranged at different levels between said air inlet passages and said exhaust pipe.

7. In combination with a pneumatic separator, a conical casing having a flat cover; an inner cone spaced from said casing and fixed to said cover and having air inlet passages near the top thereof; an exhaust pipe located substantially centrally within said inner cone and terminating near said cover; and having a telescoping sleeve thereon adjustably secured to said cover; a series of substantially vertical baffle plates arranged at different levels between said air inlet passages and said exhaust pipe.

8. In combination with a pneumatic separator, a conical casing having a flat cover; an inner cone spaced from said casing and fixed to said cover and having air inlet passages near the top thereof; an exhaust pipe located substantially centrally within said inner cone and terminating near said cover; a series of substantially vertical baffle plates adjustably suspended from said cover and arranged at different levels between said air inlet passages and said exhaust pipe.

9. In combination with a pneumatic separator, a conical casing having a flat cover; an inner cone spaced from said casing and fixed to said cover and having air inlet passages near the top thereof; an exhaust pipe located substantially centrally within said inner cone and terminating near said cover; a baffle plate surrounding said exhaust pipe from below the top thereof upward to near said cover; an intermediate baffle plate fixed to said cover and extending below the level of the top of the first mentioned baffle plate; and a baffle plate interposed between said intermediate plate and said air inlet passages, spaced downward from said cover and extending below the lower edge of said intermediate plate.

In testimony whereof I have hereunto set my hand at San Francisco, California, this 28th day of February, 1920.

GEORGE L. YAGER.

In presence of—

A. J. HENRY,

LINCOLN JOHNSON.