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SEPARATOR.

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1,165,866.

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Fig. 2.

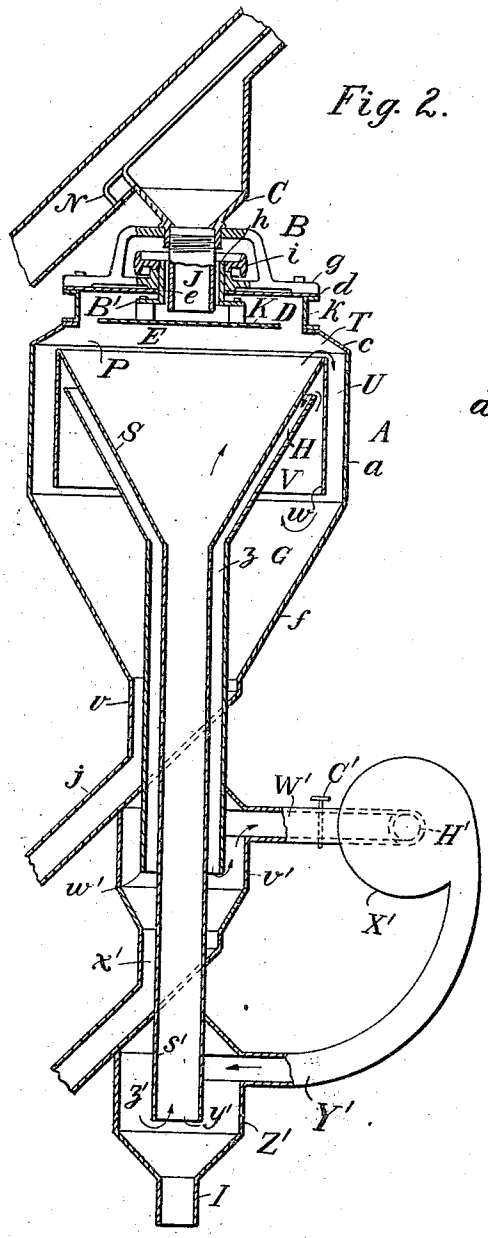
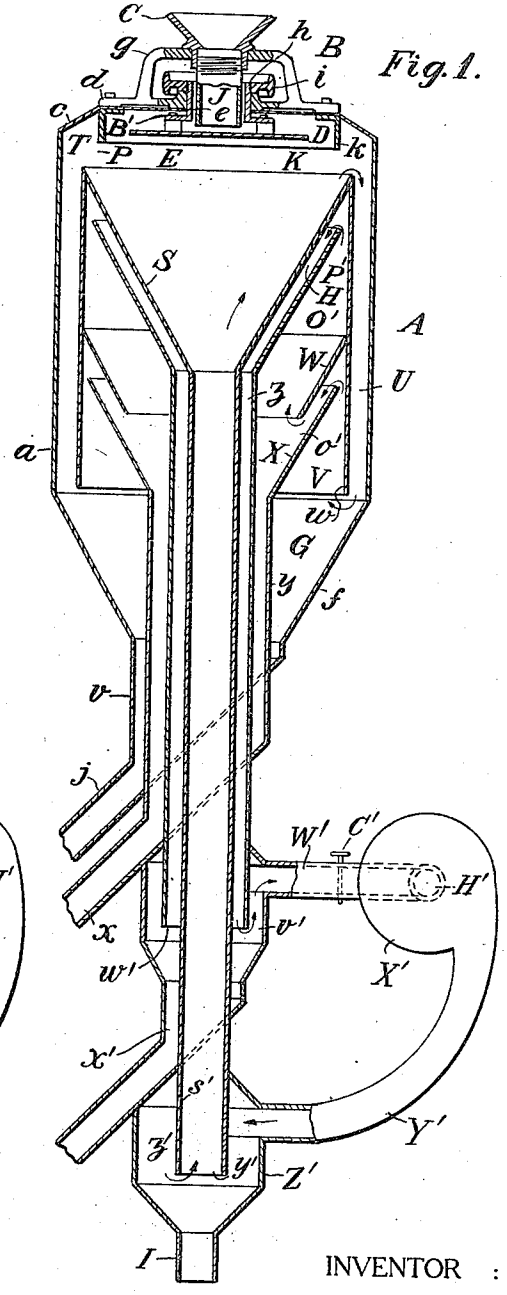


Fig. 1.



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To all whom it may concern:

Be it known that I, GEORGE HOLT FRASER, a citizen of the United States, residing in the borough of Brooklyn, in the county of Kings, in the city and State of New York, United States of America, have invented certain new and useful Improvements in Separators, of which the following is a specification, being a division of my application No. 599,913, filed December 29, 1910.

This invention relates to devices for separating, sizing, classifying, treating or collecting, materials by utilizing a fluid current, and aims to provide certain improvements therein.

Heretofore it has been common to distribute material within a feed chamber in which air currents act to draw the fine material into an outer casing, the fines settling in the outer casing and the air returning to the feed chamber, the coarse material falling through the air current in the feed chamber and discharging from the bottom of the latter.

My invention provides improvements especially applicable to devices of this general character, and in its preferred form it utilizes a non-rotary feed tube and an initial distributer, in conjunction with an annular exhaust chamber, a blower, a tangential discharge passage for the exhaust chamber, and a plurality of settling chambers successively receiving the return current and classifying the material in suspension therein, a reverse return passage for each settling chamber, means for separately withdrawing the different products, and a return or blast chamber, and means for tangentially returning the current thereto, and means for controlling the current.

My invention also includes means for independently driving the distributer and blower, means for adjusting the non-rotary feed spout, improved bearings and bearing dispositions, and various features of improvement in construction, arrangement and details, all of which will be hereinafter more fully set forth.

In the accompanying drawings, which show certain adaptations, of my invention, Figure 1 is a vertical axial section showing the preferred form of my invention; and Fig. 2 is a similar section showing a simpler form thereof.

Referring to the drawings, A indicates a casing, B the driving mechanism, C the feed hopper, D the distributer, E a chamber, X′ a blower, G the dust chamber, H the return passage, I the coarse outlet, and *j* the fine outlet. These may be of any usual or suitable construction and arrangement capable of distributing the feed, creating the necessary current, and collecting and discharging the products.

Referring to Fig. 1 I will now describe in detail the preferred form of my invention in the adaptation therein illustrated.

The casing A has a cylindrical body *a*, and tapering or conical top and bottom. The upper part of the casing consists of a head *c* which is tapered in the form of a truncated cone and has an annular top *d*, and a central opening *e*. The lower part of the casing consists of a conical bottom *f*, suspended from the top body *a*. The body *a* is suspended from the top *d*.

The driving mechanism shown consists of a driving shaft *h* carrying a pulley *i*. This shaft is mounted in bearings in the frame *g*, which frame is shown as crossing the machine and supported thereon.

The hopper C is preferably a stationary hopper, adapted to turn in any direction to connect with any source of feed, and preferably having a scalper and a tailing chute, and a screw threaded discharge outlet.

The feeder is preferably a non-rotary feed pipe J which is preferably vertically adjustable, as by screwing into the hopper outlet, and which leads into the casing and discharges onto a distributer K therein, the speed of feed being determined by vertical adjustment of the pipe, or of the distributer, or of both, as desired.

The distributer is preferably a rotary member, and preferably comprises a disk K. Opposite the disk K there is located a baffle ring *k* receiving the discharge therefrom and deflecting it downwardly toward the tailings cone S. Opposite the baffle ring is an annular exhaust passage P, surrounded by and discharging into an annular exhaust chamber T, which extends downwardly and directs their combined discharge into the annular return passage U, through which it passes to the dust chamber G. As the current descends in and escapes from the passage U the heavier dust may be close to the outer wall, from which it will slide into the chamber G, and the inner air will be correspondingly cleaned. The chamber G has a cylindrical annular

discharge pipe v. As the air discharges from the passage U into the settling chamber G the returning air is drawn from it by an annular intake V, of greater superficial area than that of the passage U and immediately adjacent thereto, so that the downward motion of the dust in the discharge from the passage U may have opportunity to throw out much dust centrifugally within the chamber G as the air current reverses to reach the return V. The air in the chamber G cleans itself by the process of settling, and by momentum and precipitation, before escaping through the return V, the area of which relatively to the passage U is sufficiently great to so diminish the speed of flow of the return current for the air to free itself of floating particles.

An annular suspended wall w constitutes the partition between the passages U and V and serves as the outer wall of the return passage V. The cone X constitutes the inner wall of this passage as well as one bottom wall of the succeeding settling chamber o', and has a cylindrical annular discharge pipe y traversing the chamber G, and an outlet x.

The air current flowing through the inlet of the return passage V, swings inwardly past the damper W and upwardly over the top edge of the cone X, and then flows eventually through the chamber O′ to the passage H which has a cylindrical or annular pipe z descending through the center of the chamber O′ and the pipes v and y and concentrically surrounding the tailing and blast pipe s', from whence it may continue to the suction chamber v', from which the air will be drawn through the tangential suction passage W′ by the blower X′. In flowing to the passage P the air must traverse the descending shower of material falling from the distributer, composed of coarse and fine material, from which, as the current passes through, particles fine enough to be floated by it will be carried outward and downward through the blast chamber T, while coarser material will fall to the tailings cone S.

When independent speeds of the distributer and the blower is desired these are differentially or separately driven. The distributer is carried on a tubular head B′, which is suitably spaced above it to permit the necessary passage for material between the disk K and the head, and which extends upwardly around the pipe J, and is adjustably suspended from the bearing D, and is driven by a pulley i. The blower is driven by a pulley H′.

For classifying or grading the fines my invention preferably provides one or more classifying chambers, between the dust chamber G and the return chamber H. One auxiliary settling chamber O′ is shown, which is preferably concentric of and partly inclosed in the chamber G, and surrounds and partly envelops the chamber E. The discharge from the chamber G slowly flows therefrom toward the inlet o' to the first classifying chamber, and is discharged downwardly in the latter through this contracted annular inlet, so that dust in the current may be precipitated by its velocity and by centrifugal action, as well as by gravity, as the discharge expands within the large part of the chamber O′ and the speed diminishes. The exhaust from the chamber O′ is slowly withdrawn through a large outlet P′ leading to the return passage H or to the succeeding classifying chamber if several are used, where the classifying is repeated as often as desired. From the last classifying chamber the discharge is taken through the return passage H and into the suction or exhaust chamber v' as before explained. Any desired number of these classifying chambers may be interposed between the discharge and the suction chambers and the fineness of product to be collected in each may be determined by properly proportioning the chambers, or the current speeds, or the superficial area of the inlet and outlet. A separate outlet spout may be provided for each chamber, or the various separations may be combined in one outlet, in which case the auxiliary chambers will simply be used as supplemental purifiers of the current returning to the separating chamber.

The return passage H constitutes a sinuous conduit between the fine chamber G and the distributing chamber E, and when one or more intermediate classifying chambers are interposed these are essentially a part of the return passage, and constitute enlargements or modifications thereof suited to effect the desired current modification best suited to the particular functions of each intermediate chamber. Making these intermediate chambers concentric and annular, and nesting them together between the tailings cone and the conical bottom of the separator attains great compactness, while permitting uniform annular current passages which facilitate uniformity of speed of flow at all sides of any part of any passage or chamber. This uniformity throughout the effective part of any compartment or passage is a feature of my invention which is accomplished by extending cylindrically the termination of any conical member into the cylindrical portion of the next succeeding member, as illustrated in Figs. 1 and 2. This is done where height limits permit and the uniformity is essential. But in the construction shown in Fig. 1 this feature is only partially utilized.

This invention provides an external exhaust and an external blast, which may be

used in conjunction with or in substitution for the internal blower. I prefer to provide a suction or external return passage W′ communicating with the chamber G through the passage H and extending horizontally and opening into the chamber v' as a tangential exhaust W′ which leads to an outside fan or outer blower X′. The pipe W′ draws tangentially from an annular centrifugal whirling or cyclone chamber surrounding the lower end of the pipe z which affords a dust apron w' in the drum v'. An annular outlet x' withdraws dust settling in this drum. The blower X′ exhausts through the pipes Y′ into a drum Z′ located below the chambers E and v' having a tubular central blast outlet y' therein and an internal equalizing annular centrifugal whirling or cyclone chamber z' surrounding the lower open end of the tailings pipe s' to insure uniform distribution of the current within the drum. The current may be increased or regulated by regulating the outside blower X′, or by a butterfly or other valve in either its blast or suction pipe C′ in Fig. 1 is such a regulator.

In operation the material entering the feed pipe will be controlled by its adjustment, the speeds and currents will be regulated to give the desired results and the various products will be separately withdrawn according to classification. One or all of the methods of classification will be used according to particular requirements.

When a single classification with an outside blower will suffice the modification shown in Fig. 2 may be used, in which the tailings pipe s' is extended into the pressure drum Z′ and constitutes a continuation of the blast pipe Y′ beyond which its outlet I discharges, and the passage H surrounds the cone S and its outlet and constitutes a part of the suction pipe W′, opening into the centrifugal drum v' which in this instance surrounds both pipes. In this view the improved scalper N is shown above the hopper C. This scalper consists of parallel wires alternately of greater longitudinal extension at their lower ends which are bent at right angles and extended a sufficient distance before meeting the adjacent part of the chute which supports them, thus leaving an overhanging part of sufficient depth to clear any nail or other large piece which hangs through the scalper and extra room at its extremity for its escape.

It will be understood that the invention is not limited to the particular details of construction, arrangement and combination set forth, as it can be employed in whole or in part according to any modifications.

What I claim is:

1. In separators and the like, a casing, means for distributing the material therein, means for causing a current to traverse material distributed therein, and a settling chamber, in combination with means outside of said casing for generating such current, means comprising suction and blast passages connecting said generating means with said casing, means providing an equalizing chamber in said suction passage having a tangential outlet, and an annular wall comprising a tubular portion of such suction passage and having an open end projecting within said equalizing chamber and affording a partition within the latter.

2. In separators and the like, a casing, means for distributing material therein, means for causing a current to traverse material distributed therein, and a settling chamber, in combination with means outside of said casing for generating such current, means comprising suction and blast passages connecting said generating means with said casing, means providing an equalizing chamber in said blast passage having a tangential inlet, and means comprising a tubular member affording an outlet conduit for coarse material and a passage for returning current below said distributing means and having an annular open end projecting within said equalizing chamber and affording a partition within the latter.

3. In separators and the like, a casing, means for distributing material therein, means for causing a current to traverse material distributed therein, and a settling chamber, in combination with means comprising an exhaust passage having an inlet communicating with and concentric of said settling chamber, a tubular member affording a conduit for returning current and an outlet for coarse material inwardly of and surrounded by said inlet, current generating means outside of said casing, a suction pipe connecting said exhaust passage with said generating means, and a blast pipe connecting said generating means with said tubular member.

4. In separators and the like, a casing, means for distributing material therein, means for causing a current to traverse material distributed therein, and a settling chamber, in combination with means outside of said casing for generating a current, a suction pipe connecting the suction side of said generating means with said settling chamber, a tubular member affording a downward conduit for coarse material and an upward conduit for returning current, and a blast pipe connecting the blast side of said generating means with said tubular member.

5. In separators and the like, a casing, means for distributing material therein, means for causing a current to traverse material distributed therein, an annular and descending chamber surrounding said dis-

tributing means, and a settling chamber below said descending chamber, in combination with a suction pipe within and concentric of said settling chamber, current generating means outside of said casing, a connection between said suction pipe and the suction side of said generating means, and a blast pipe communicating between the blast side of said generating means and the interior of said casing inwardly of said distributer.

6. In separators and the like, a casing, means for distributing material therein, a tailings cone affording a feed chamber below said distributer, and an annular chamber surrounding said distributer, in combination with an annular suction pipe surrounding said cone and in communication with said chamber, current generating means outside of said casing, a drum in which the outlet end of said suction pipe projects and having an annular chamber surrounding such projecting end, and a tangential suction pipe communicating with said annular chamber and said drum and extending tangentially therefrom to the suction side of said generating means, and a blast pipe connecting the blast side of said generating means with said feed chamber.

7. In separators and the like, a casing, means for distributing material therein, and means for causing a currrent to traverse material distributed therein, in combination with a tailings cone having a lower opening and affording a downward passsage for coarse material and an upward passsage for returning current, a settling chamber surrounding said cone, current generating means outside of said casing, a suction pipe communicating with said settling chamber and connected to the suction side of said generating means, and a blast pipe connected to the blast side of said generating means and discharging into the lower opening of said cone for returning the current through the coarse material descending in the latter.

8. In separators and the like, a casing, means for distributing material therein, a tailings cone having a lower opening, and a settling chamber surrounding said cone, in combination with tubular means affording a passsage for material concentrically downwardly in said casing, an annular suction conduit surrounding said tubular means and communicating with said settling chamber, current generating means outside of said casing, a suction pipe connected to said suction passage and to the suction side to said generating means, and a blast pipe connected to the exhaust side of said generating means and discharging a return current through the lower opening of said cone.

9. In separators and the like, a casing, means for distributing material therein, and means for causing a current to traverse material distributed therein, in combination with a settling chamber having a cylindrical annular outlet, a second settling chamber having a cylindrical annular outlet traversing said first mentioned chamber, a suction pipe inwardly of said second chamber affording an annular passsage therethrough, a tailings pipe inwardly of said suction pipe and affording a conduit for returning current, a blower outside of said casing, a connection between the suction side of said blower and said suction pipe, and a blast pipe leading from said blower and communicating through said tailings pipe with said casing.

10. In separators and the like, a casing, means for distributing material therein, and tubular means affording a downward passage for material therethrough, in combination with concentric superposed annular suction and blast chambers surrounding said tubular means, current generating means outside of said casing, and means connecting said generating means with said chambers.

11. In separators and similar devices, a casing, and means for supplying material thereto, in combination with means for causing a current to flow within the casing, a tube affording an exhaust passage for such current comprising an annular wall having an open end affording an outlet passage at one extremity, means providing an annular centrifugal exhaust chamber surrounding said wall and communicating with said passage, and a tangential pipe affording a peripheral outlet from said chamber.

12. In separators and similar devices, a casing, a distributer for feeding material therein, in combination with means for delivering a current beneath said distributer and inwardly of the distributed material, consisting of a tubular member affording a conduit for descending material and a passage for ascending current having an annular opening intermediate of its extremities, a blast pipe having an outlet communicating with said opening, and current generating means outside of said casing supplying current to said blast pipe.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

GEORGE HOLT FRASER.

Witnesses:
GUSTAV SCHONHEIT,
ANTONIO BUONO.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."