Jan. 6, 1925. 1,522,151

A. H. STEBBINS

PNEUMATIC CLASSIFIER

Filed June 15, 1923

Fig.1

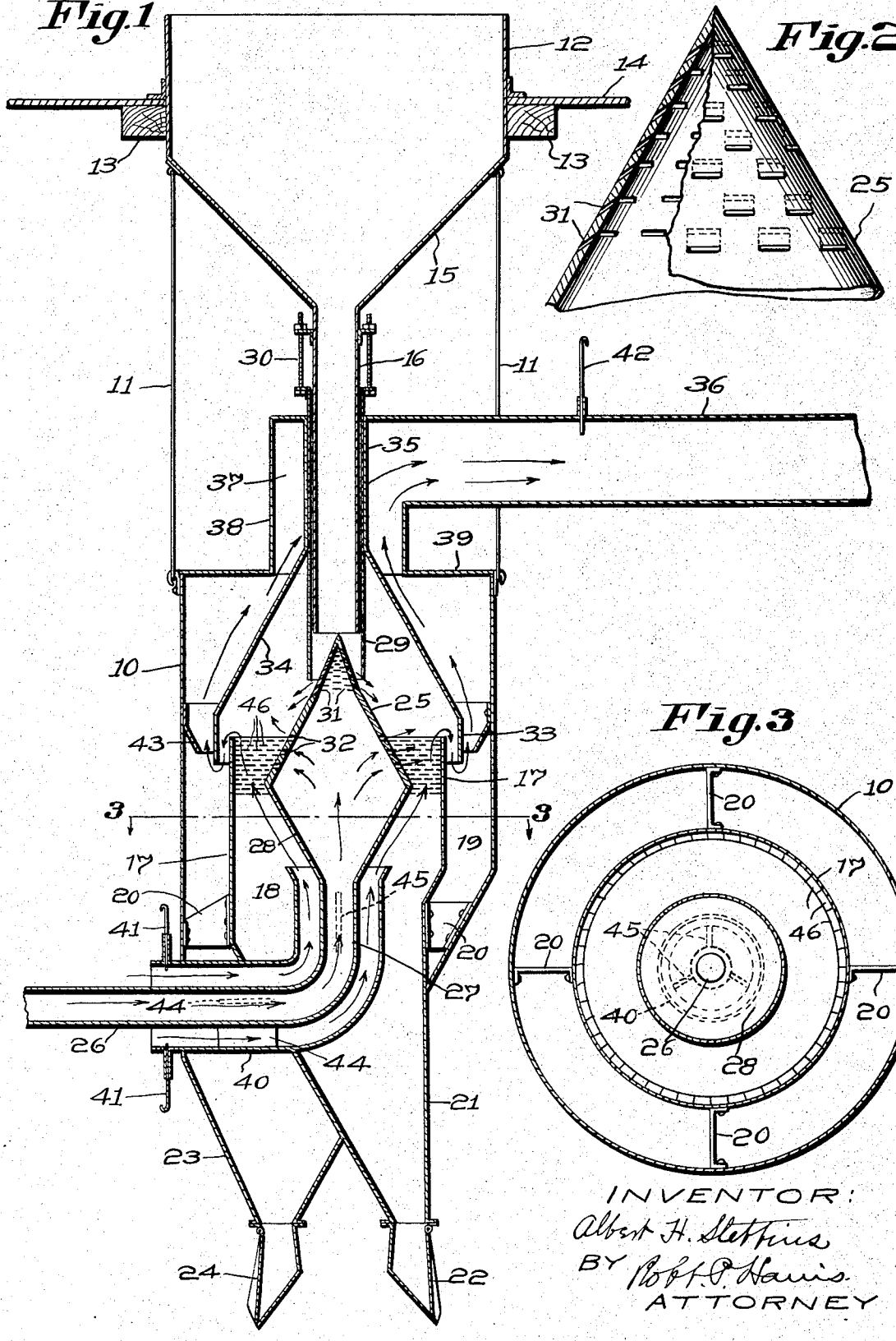

Fig.2

Fig.3

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Patented Jan. 6, 1925. 1,522,151

UNITED STATES PATENT OFFICE.

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PNEUMATIC CLASSIFIER.

Application filed June 15, 1923. Serial No. 645,534.

To all whom it may concern:

Be it known that I, ALBERT H. STEBBINS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented an Improvement in Pneumatic Classifiers, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to pneumatic classifiers of a type in which the materials to be treated are spread out substantially radially from a central position into the path of rising air currents.

Pneumatic classifiers are adapted to separate materials in accordance with their differences in specific gravity and to a less extent in accordance with their differences in size, and the province of the present device is to classify materials, and to remove the fine particles with a high degree of thoroughness.

One important feature of the present invention resides in novel means for delivering the materials to be treated into the path of the rising air currents and for spreading out the materials in substantially a radial direction.

Another important feature of the invention resides in a novel construction for directing air currents upwardly around the material distributing means through the material and then along a tortuous path to remove the coarser particles from the air.

Another important feature of the invention resides in the construction whereby the materials being treated are moved outwardly from a central point throughout the classifying operation so that the materials are progressively thinned out as they advance along the path of treatment.

Still another feature of the invention resides in novel means for regulating the flow of materials to the distributing means.

Other features of the invention and novel combination of parts in addition to the above will be hereinafter described in connection with the accompanying drawings which illustrate one good practical form thereof.

In the drawings:

Fig. 1 is a vertical central sectional view through a pneumatic classifier constructed in accordance with the present invention.

Fig. 2 is an enlarged view of the upper portion of the distributing cone, part being shown in section, and

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1.

In the embodiment of the invention illustrated the classifying operation takes place within the closed casing 10, and this casing is shown as suspended by rods 11 the upper ends of which are secured to a bin 12. The bin 12 may be supported by beams 13, and if desired may be mounted within an opening formed in the floor 14 of a building. The bin 12 preferably has a downwardly inclined bottom 15 at the lower end of which is provided the feed chute 16.

Within the casing 10 is provided an upwardly extending separating wall 17 disposed in spaced relation to the walls of the casing and forming an inner chamber 18 and an outer chamber 19. The wall 17 may be supported within the casing by the brackets 20, and these brackets preferably are positioned a substantial distance below the upper end of the wall 17 so that they will not interfere with the air currents adjacent the upper end of this wall. At the lower end of the wall 17 is provided a downwardly tapering bin 21 having a discharge door 22 at its lower end, and the lower end of the casing 10 may be provided with a downwardly tapering bin 23 having a discharge door 24.

The feed chute 16 extends into the upper portion of the casing 10, and within the annular wall 17 and adjacent the lower end of the feed chute is provided an upwardly extending cone 25, and this cone preferably is mounted in alignment with the axis of the chute 16 as shown. The cone 25 should be supported so that its supporting means will not interfere with the air currents which are caused to rise upwardly around the cone, and in the present case a pipe 26 is provided which extends laterally within the casing 10 near the lower end of the same and is then bent upwardly as at 27 and the upper end of this pipe is provided with an outwardly flaring end 28 to which the lower end of the cone 25 is secured.

The feed chute 16 delivers the materials to be treated upon the upper end of the cone 25, and the rate at which these materials are discharged at the lower end of the chute may be regulated by providing the chute with an adjustable extension 29 which extends downwardly over the upper end por-

tion of the cone as shown, and this extension may be raised or lowered relative to the cone by adjustable bolts 30 having supporting engagement with the upper end of the extension 29.

To prevent the materials within the feed chute from becoming packed or clogged at the lower end of the extension 29, the upper end portion of the cone 25 is provided with a number of downwardly inclined apertures 31, best shown in Fig. 2. The arrangement is such that air may be forced into the cone 25 through the pipe 26 from a blast fan or other suitable means, and this will cause jets of air to pass through the inclined apertures 31 and escape from the cone adjacent the lower end of the extension 29 to dislodge any particles that might tend to become stuck at this point.

As the materials to be treated escape from the lower end of the extension 29 they will slide down the inclined walls of the cone 25. It is desirable to throw the materials outwardly horizontally from the cone so that they may be thoroughly subjected to the action of the rising air currents, and to this end, in the construction shown, the cone 25 is provided with a second set of apertures 32 through which jets of air may escape from the cone in substantially a horizontal direction to blow the materials outwardly towards the annular wall 17. These apertures are preferably made relatively small so that a large volume of air will not escape from the interior of the cone 25, but the air should escape from the apertures 31 and 32 with a substantial degree of force so that a small amount of air will act with the desired effect upon the materials.

Within the casing 10 in the present construction is provided a downwardly extending wall 33 the lower end of which surrounds the upper end of the wall 17 in spaced relation thereto and extends into overlapping relation with the wall 17, as will be apparent from Fig. 1. The wall 33 may be supported by a conical portion 34 that extends upwardly to a sleeve 35 surrounding the extension 29.

Classification or separation of the materials is effected by producing air currents that pass upwardly within the chamber 18 about the distributing cone 25 and through the materials thrown outwardly from the cone by the jets of air escaping through the apertures 32. The rising air currents are caused to pass over the upper end of the annular wall 17 and then downwardly between this wall and the wall 33, as indicated by the arrows, and then pass around the lower end of the wall 33 and upwardly within the casing 10. This is accomplished by providing means for exhausting air within the upper portion of the casing 10 about the walls 33 and 34, and to this end a conduit 36 is provided which may be connected to a suction fan or other form of exhaust means. The conduit 36 may lead from an annular chamber 37 formed within the wall 38 which surrounds the feed chute, and this wall extends upwardly from a cover 39 secured to the upper end of the casing 10. The air which rises within the inner chamber 18 may be admitted to this chamber by a conduit 40 which is larger than the pipe 26 and surrounds the same, and the conduit extends inwardly through a lateral wall of the casing 10 and upwardly within the chamber 18, and air at atmospheric pressure may be drawn in through the outer open end of this conduit into the chamber 18 and upwardly along the path indicated by the arrows. The amount of air admitted through the conduit 40 is controlled by the adjustable gates 41, and the amount of air exhausted from the casing 10 may be controlled by adjusting the gate 42 within the conduit 36.

From the foregoing it will be understood that a relatively small amount of air is forced into the cone 25 through the pipe 26 and escapes through the apertures 31 and 32 with substantial force, and it will be understood that most of the air used within the present device enters the chamber 18 through the conduit 40 and is exhausted from the upper portion of the casing 10 through the conduit 36.

It should be noted that throughout the treatment of the materials they are moved outwardly from a central point, with the result that they are spread out more and more as they advance along the path of treatment; so that the air will act upon the materials with increasing thoroughness as the latter passes from one chamber to the other. The construction shown by which the air is caused to make a sharp turn at the upper end of the inner wall 17, and also about the lower end of the wall 33, is important because these sharp bends assist materially in releasing the heavier particles from the traveling air currents.

Some of the materials which remain suspended in the air as the latter travels around the lower end of the wall 33 may be thrown outwardly but not entirely released from the traveling air currents, and an annular deflecting plate 43 is therefore provided, extending inwardly and downwardly from the inner wall of the casing 10. The particles just mentioned which may be thrown outwardly but not entirely released from the air currents, will be arrested by this deflecting plate.

The strength of the air currents within the present pneumatic classifier, should be such that the heavier particles thrown outwardly from the cone 25 will not be lifted over the separating wall 17, so that these particles will settle downwardly in the chamber 18

and pass down into the bin 21. The particles which are sufficiently light to be lifted over the wall 17 will be carried downwardly by the air currents into the outer chamber 19, and all but the very light particles will be dislodged from the air currents by the sharp bend of the air about the lower end of the wall 33, it being understood that the deflecting plate 43 will assist in removing these particles from the air as it rises about the wall 33, and as a result of the present construction all but the very fine particles will be removed from the air before it escapes from the upper end of the casing 10.

The cone 25 and walls 17 and 33 are preferably mounted centrally within the casing 10, so that air currents of equal strength will be produced entirely around the parts just mentioned, and the materials will be similarly treated upon all sides of the distributing cone.

Narrow supporting blocks 44 and 45 may be interposed between the pipe 26 and conduit 40 to support the former centrally within the latter. Should it be found that the materials forced outwardly by the jets of air escaping through the apertures 32 tend to wear away the inner face of the separating wall 17, this may be prevented by providing slight inwardly extending shelves or flanges 46 upon which materials may lodge to protect the inner face of the wall.

The pneumatic classifier of the present invention is free from working parts, is inexpensive to install and operate, and in addition to classifying materials, will remove thoroughly the very fine particles from the materials being treated.

What is claimed is:

1. A pneumatic classifier comprising, in combination, a casing, an upwardly extending cone disposed centrally within the casing and having apertures in its inclined walls, a feed chute for delivering materials to be treated upon the cone to slide down the inclined cone walls, a wall surrounding the cone in spaced relation thereto, and means for producing a flow of air through said apertures and upwardly over the wall to lift the lighter particles over the wall without lifting the heavier particles over the same.

2. A pneumatic classifier comprising, in combination, a casing, an upwardly extending cone mounted centrally within the casing, a feed chute for delivering materials to be treated upon the cone to slide down the inclined cone walls and extending downwardly over the upper end of the cone, means for forcing air through the sides of the cone adjacent its upper end to force materials through the space between the cone and end of the feed chute, a wall surrounding the cone in spaced relation thereto, and means for producing a flow of air upwardly between the cone and wall to lift the lighter particles over the wall without lifting the heavier particles over the same.

3. A pneumatic classifier, comprising, in combination, a closed casing, an annular separating wall disposed centrally within said casing and extending upwardly therein to form an inner and an outer chamber within the casing, a second annular wall within the casing extending downwardly in spaced overlapping relation about the upper end of the separating wall, an upwardly extending cone within said inner chamber, means for delivering materials to be treated to the cone to slide downwardly upon its sloping walls, a conduit for conducting air into the inner chamber and having its discharge end positioned below the cone so that the latter prevents the materials from entering the conduit and means for exhausting air from the upper portion of the casing about said second wall to produce air currents that rise within the inner chamber and pass upwardly over the end of the separating wall and downwardly about the end of the second wall with a sharp bend to remove the lighter particles from the heavier particles.

4. A pneumatic classifier comprising, in combination, a closed casing, an annular separating wall extending upwardly within the casing and forming an inner and an outer chamber, a second annular wall within the casing extending downwardly therein in spaced overlapping relation about the upper end of the separating wall, means for delivering the materials to be treated into said inner chamber with spreading effect, an annular material arresting flange surrounding and positioned near but in spaced relation to the lower end of said second wall, and means for exhausting air from the upper portion of the casing about said second wall to produce air currents that rise within the inner chamber and pass upwardly over the end of the separating wall and downwardly about the end of the second wall to remove the lighter particles from the heavier particles.

5. A pneumatic classifier comprising, in combination, a closed casing, a pair of annular walls within said casing extending toward each other so that the end of one surrounds the end of the other in spaced overlapping relation, means for delivering the materials to be treated into the chamber enclosed by said walls with spreading effect, an annular flange supported adjacent the end of one wall and positioned to arrest the heavier particles within the air which are thrown outwardly by the sharp turn of the air in passing around the end of one wall, and means for exhausting air from around one of said walls to cause air currents to rise within said chamber and pass upwardly over the end of one wall and downwardly

around the end of the other wall with a sharp bend around the end of each wall to remove the lighter materials without removing the heavier materials.

6. A pneumatic classifier comprising, in combination, a casing, an upwardly extending cone within said casing and having apertures in its inclined walls, means for delivering materials to be treated upon the cone, means for forcing air through said apertures to throw the materials out in a horizontal direction, a wall surrounding the cone in spaced relation thereto, and means for producing a flow of air upwardly between the cone and wall to lift the lighter particles over the wall without lifting the heavier particles.

7. A pneumatic classifier comprising, in combination, a casing, a cone distributor within said casing extending upwardly therein and having apertures in its upper end portion, a feed chute extending downwardly over the upper end of said cone for delivering materials thereto, means for forcing air outwardly through said apertures to force materials from the end of said chute, and means for passing currents of air through the materials as the latter leave the distributor.

8. A pneumatic classifier, comprising, in combination, a closed casing, an annular separating wall mounted within the casing and extending upwardly therein to form an inner and an outer chamber, an air conduit extending upwardly within the inner chamber, an upwardly extending cone within the inner chamber supported over said conduit and having air discharge openings, a tube mounted within said conduit to supply air to the cone, means for delivering the materials to be treated to said cone to slide down the inclined cone walls, and means for producing a flow of air upwardly between the separating wall and cone and over the wall to lift the lighter particles over the wall without lifting the heavier particles over the same.

9. A pneumatic classifier, comprising, in combination, a closed casing, an annular separating wall disposed centrally within said casing and extending upwardly therein to form an inner and an outer chamber within the casing, a second annular wall within the casing extending downwardly in spaced overlapping relation about the upper end of the separating wall, an air conduit extending upwardly within the inner chamber, an upwardly extending cone within the inner chamber supported over said conduit so that materials sliding down the walls of the cone will not enter the conduit, means for delivering materials to be treated to the cone, and means for exhausting air from the upper portion of the casing about said second wall to produce air currents that rise within the inner chamber and pass upwardly over the end of the separating wall and downwardly about the end of the second wall to remove the lighter particles from the heavier particles.

In testimony whereof, I have signed my name to this specification.

ALBERT H. STEBBINS.