April 17, 1928. 1,666,476

A. H. STEBBINS

AIR CLASSIFIER

Filed Oct. 14, 1926

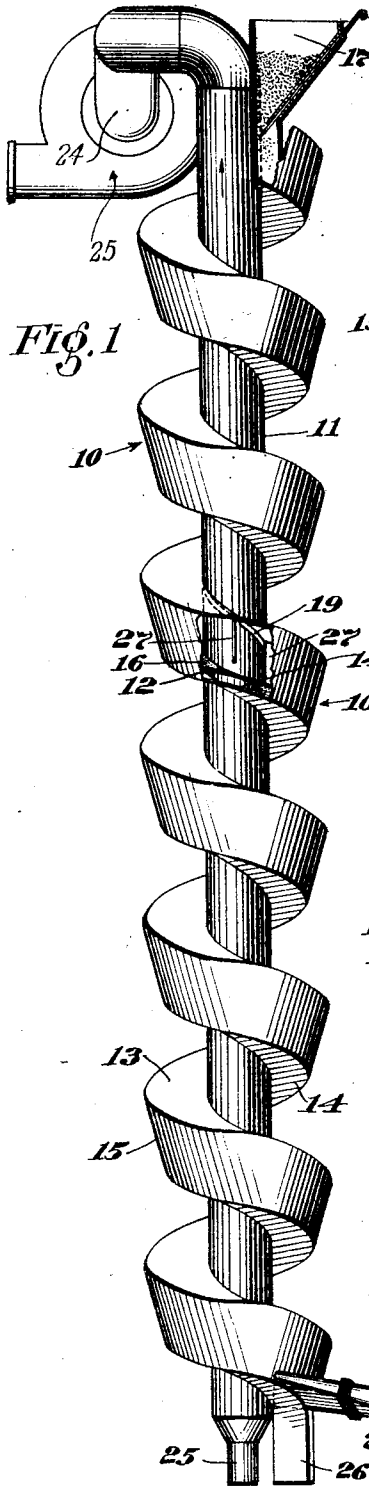


FIG. 1

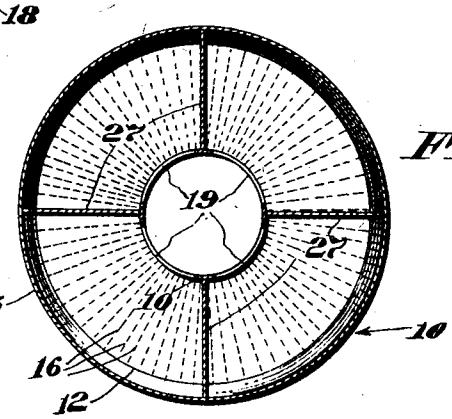


FIG. 2

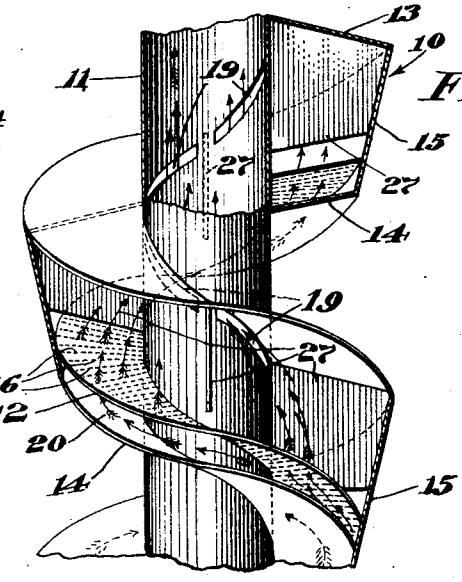


FIG. 3

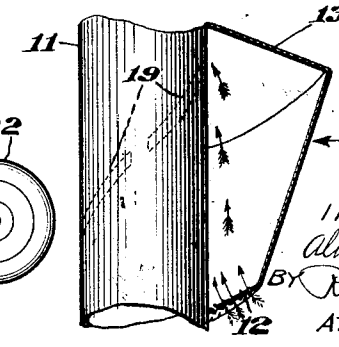


FIG. 4

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AIR CLASSIFIER.

Application filed October 14, 1926. Serial No. 141,547.

This invention relates to air classifiers of the type in which separation of the materials is effected by subjecting the materials to the action of air currents that carry off the lighter particles.

It has been proposed heretofore to classify materials by passing air upwardly through the materials traveling along a screen or other apertured surface so that the air will pick up the finer particles without carrying off the coarser particles.

These proposed air classifiers work very well when employed to remove fine dust-like particles from relatively large coarse particles, but when the materials being treated are very fine and differ only slightly in size, it is necessary to subject them time and time again to the separating action of gentle air currents in order to effect the desired classification.

The separation of these fine, dust-like particles can be effected by advancing them over the surface of a long screen or apertured supporting surface having gentle currents of air passing upwardly through the apertures to carry off the lighter particles, but a screen or supporting surface having a sufficient length to effect a complete classification of the materials may occupy an excessive amount of floor space.

The present invention therefore contemplates a construction in which the classifying chamber is given the form of a spiral conduit and is provided with an apertured supporting surface that is constructed to form a spiral slide-way along which the materials to be treated travel. This spirally shaped classifier is supported in an upright position and therefore requires only a small amount of floor-space.

One of the features of the invention resides in the construction whereby air is exhausted from the spiral classifying chamber above the apertured surface at a number of points along the spiral chamber.

Another feature of the invention resides in the construction whereby air under pressure is forced upwardly through the apertures of the spiral supporting surface.

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 good practical forms of the invention.

In the drawings—

Fig. 1 is a side elevation, with parts broken away, of a spiral air classifier constructed in accordance with the present invention;

Fig. 2 on an enlarged scale is a transverse sectional view through the classifier of Fig. 1;

Fig. 3 on an enlarged scale is a vertical sectional view through a portion of the classifier of Fig. 1; and

Fig. 4 is a sectional view similar to Fig. 3, but shows a modified construction.

The air classifier forming the subject matter of the present invention is designed more particularly for use in treating fine dust-like particles, and as above pointed out, in order to effectively separate these fine particles it is necessary to subject them repeatedly to the separating action of gentle air currents. This is done in accordance with the present invention by causing the materials to be treated to travel along a spirally wound material supporting surface or slide-way which is provided with apertures, and air is caused to pass upwardly through the apertures and materials upon the slide-way to carry off the lighter particles.

The general construction of the classifier whereby the materials traveling along the spiral slide-way are subjected to the separating action of the rising air currents may be varied as desired, and in the construction shown the classifier comprises a casing or conduit 10 which is wound about a vertically disposed pipe 11. This construction is desirable because the pipe 11 constitutes a supporting structure for the spiral casing 10 and it also constitutes a satisfactory means for exhausting air from the casing, as will presently appear; it is apparent, however, that other means might be provided for supporting the spirally disposed coils of the casing and for producing the desired rising air currents within this casing.

The casing 10 is constructed to form a closure above or about the apertured material-supporting surface 12 and the portion of the casing which is disposed above the supporting surface or slide-way 12 constitutes a settling chamber. The casing is therefore preferably constructed so that it flares outwardly as it extends upwardly from the surface 12 to increase the size of the set-

tling chamber, as will be apparent from the vertical sectional view of Fig. 3, wherein the casing is shown as formed of the wide upper wall 13, the narrow lower wall 14 and the side wall 15.

The inclination or pitch of the spirally wound casing 10 is preferably such that when the casing is supported in a vertical position the materials will slide downwardly along the spiral slide-way 12 under the influence of gravity assisted by the action of the air passing upwardly through the apertures 16 of the surface 12. The materials to be treated may be delivered to the upper portion of the classifier by a hopper 17 having the sliding gate 18 that may be adjusted to vary the rate of feed, and the rate at which the materials are supplied to the classifier is preferably such that the materials will slide rapidly along the floor-plate 12 in a thin layer so that all particles are repeatedly subjected to the lifting action of the air.

The separation of the materials is effected by causing air to pass upwardly through the apertures 16 and materials traveling over the apertures to pick up the lighter particles. These rising air currents may be produced by exhausting air from the spiral casing 10 at a number of points along its length, and this is accomplished in the construction shown by providing the passages or elongated slots 19 in the walls of the pipe 11 so that when air is exhausted from the pipe 11 a suction will be produced within the casing 10 to draw air upwardly through the apertures 16. The slots 19 preferably are disposed near the upper wall 13 of the casing to exhaust air from the casing adjacent this upper wall.

The rising air currents within the casing 10 may be further produced by providing the air passage 20 formed between the apertured surface 12 and the lower wall 14, and air under pressure may be forced into this passage near the lower end of the classifier by the pipe 21 that is connected to a blast fan 22.

The discharge end of the pipe 21 is preferably flattened out as at 23 so that it will extend into the passage 20. Air is exhausted from the pipe 11 by connecting the upper portion 24 of this pipe to a suction fan 25.

The lighter particles which are picked up from the surface 12 by the air currents are carried through the openings 19 into the pipe 11, and such particles as may settle in this pipe are discharged through its reduced lower end 25, while the particles that remain suspended in the air are carried off by the suction means. The heavier particles that are not picked up by the air are directed by the slide-way 12 into the receptacle 26.

It may be desirable to prevent the air within the casing 10 from traveling lengthwise of this spiral casing. This may be done by mounting in the casing the baffle plates 27 which are constructed to fit the upper portion of the casing. The baffle plates are shown as disposed at angles of 90° to each other and as having one slot 19 within the space formed between a pair of baffle plates. As a result of this construction the air rises more or less vertically within the upper portion of the casing forming the settling chambers.

In the modified construction of Fig. 4 the means for delivering air to the under side of the apertured surface under pressure is omitted, and the suction produced within the casing 10 serves to draw air from the atmosphere up through the apertures 16 of the material supporting surface 12.

Through the use of the spiral construction forming the subject matter of the present invention the materials being treated are caused to travel over an apertured surface 12 of any desired length. In this manner the particles are repeatedly subjected to the separating action of gentle air currents, and the classification of the materials is effected in a simple compact device that requires only a small amount of floor space.

What is claimed is:—

1. A spiral classifier, comprising in combination, a vertically disposed pipe having air inlet openings in its walls, a closed casing wound spirally around the pipe to communicate with said openings and constructed to form a spiral classifying chamber, an apertured floor-plate for the casing extending spirally around the central pipe and constructed so that the materials to be treated will slide down the floor-plate, means for delivering the materials to be treated to the upper end of the spiral casing, and means for exhausting air from said pipe to draw air into the spiral chamber through the apertures in the floor plate and from the chamber into the central pipe to cause the air to pick up and carry into the central pipe the lighter particles traveling along the floor-plate.

2. A classifier, comprising in combination, a spirally wound closed casing or conduit that is supported in an upright position and constructed to form a spiral classifying chamber, an apertured floor-plate for the casing and constructed to form a spiral slide-way for the materials, means for delivering the materials to be treated to the upper end of the casing to pass downwardly therein, and means for exhausting air from the casing at a multiplicity of points along its length to draw air upwardly through the apertures in the floor-plate to cause the air to pick up the lighter particles traveling along the floor-plate.

3. A classifier for classifying fine, dust-like materials, comprising in combination,

a spirally wound closed casing or conduit that is supported in an upright position and constructed to form a spiral classifying chamber, an apertured floor-plate for the casing and constructed to form a spiral slide-way for the materials, means for delivering the materials to be treated to the upper end of the casing to pass downwardly therein, means for forcing air upwardly through the apertures in the floor-plate to cause the air to pick up the lighter particles traveling along the floor-plate, and means for extracting from the conduit the air in which the lighter particles are suspended.

4. A classifier, comprising in combination, a vertically disposed pipe, a closed casing wound spirally around the pipe and constructed to form a spiral classifying chamber having air passages communicating with the interior of said pipe, an apertured floor-plate for the casing extending around said pipe and constructed to form a spiral slide-way for the materials, means for delivering the materials to be treated to the upper end of the casing, and means for producing air currents passing upwardly through said apertures and from the spiral casing into said pipe to pick up the lighter materials traveling along said slide-way.

5. A classifier, comprising in combination, a spirally wound closed casing or conduit that is supported in an upright position and constructed to form a spiral classifier, an apertured floor-plate supported in spaced relation to the under side wall of the casing or conduit and arranged to form a spiral slide-way for the materials and to provide an air passage below the floor-plate, means for delivering the materials to be treated to the upper end of the casing to pass downwardly therein, means for forcing air into the air passage below the floor-plate to produce air currents passing upwardly through the apertures of the floor-plate and which serve to pick up the lighter materials sliding along the floor-plate, and means for exhausting the air in which the lighter particles are suspended from the conduit at a series of points along its length.

6. A classifier, comprising in combination, a spirally wound closed casing or conduit that is supported in an upright position and constructed to form a spiral classifying chamber, an apertured floor-plate for the casing and constructed to form a spiral slide-way for the materials, means for exhausting air from the casing above the floor-plate at a multiplicity of points along the spiral casing to draw air upwardly through said apertures and cause the air to pick up and carry off the lighter particles traveling along the floor-plate, and baffle plates mounted in the spiral casing to prevent the air currents within the casing from traveling lengthwise of the spiral casing.

7. A classifier for classifying fine materials, comprising in combination, a spirally wound closed casing or conduit that is supported in an upright position and constructed to form a spiral classifying chamber in which the materials being treated are confined from the atmosphere, an apertured floor-plate for the casing and constructed to form a spiral slide-way for the materials and positioned to provide a settling space in the chamber above the floor-plate, means for delivering the materials to be treated to the upper end of the casing to pass downwardly therein, and means for producing air currents that pass upwardly through the apertures of the floor-plate into said chamber to pick up the lighter particles traveling along the floor-plate and operable also to exhaust air from said chamber to carry off the lighter particles.

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

ALBERT H. STEBBINS.