

Feb. 16, 1932.

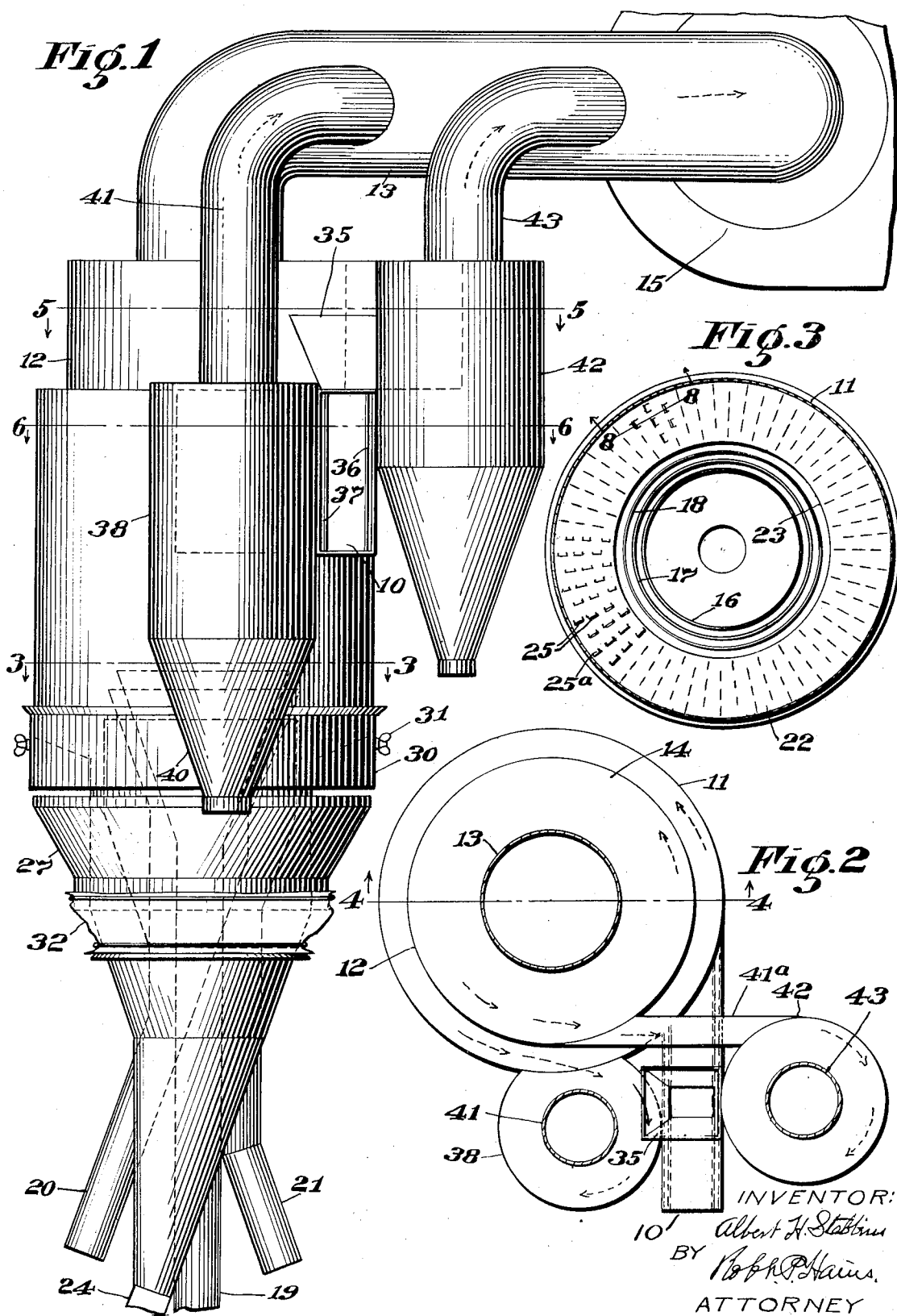
A. H. STEBBINS

1,845,567

AIR CLASSIFIER

Filed May 24, 1929

2 Sheets-Sheet 1



Feb. 16, 1932.

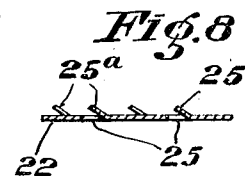
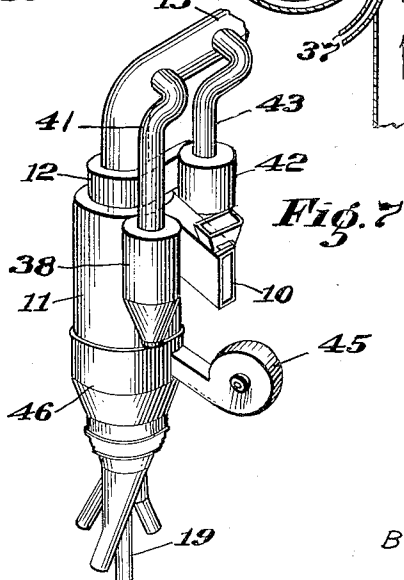
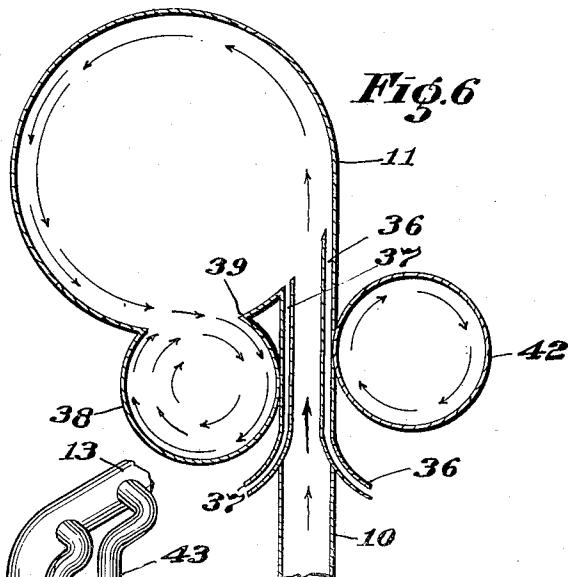
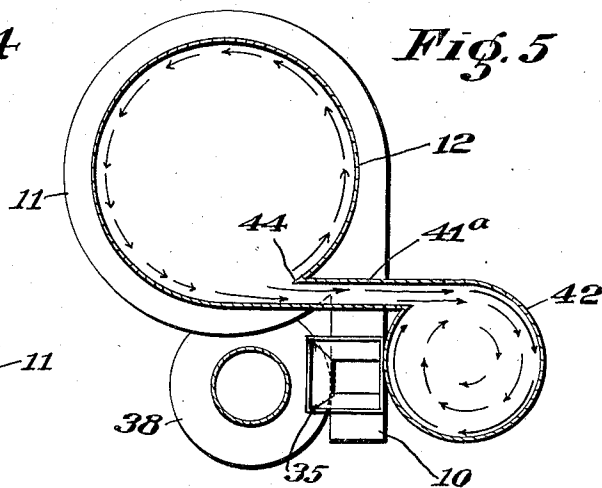
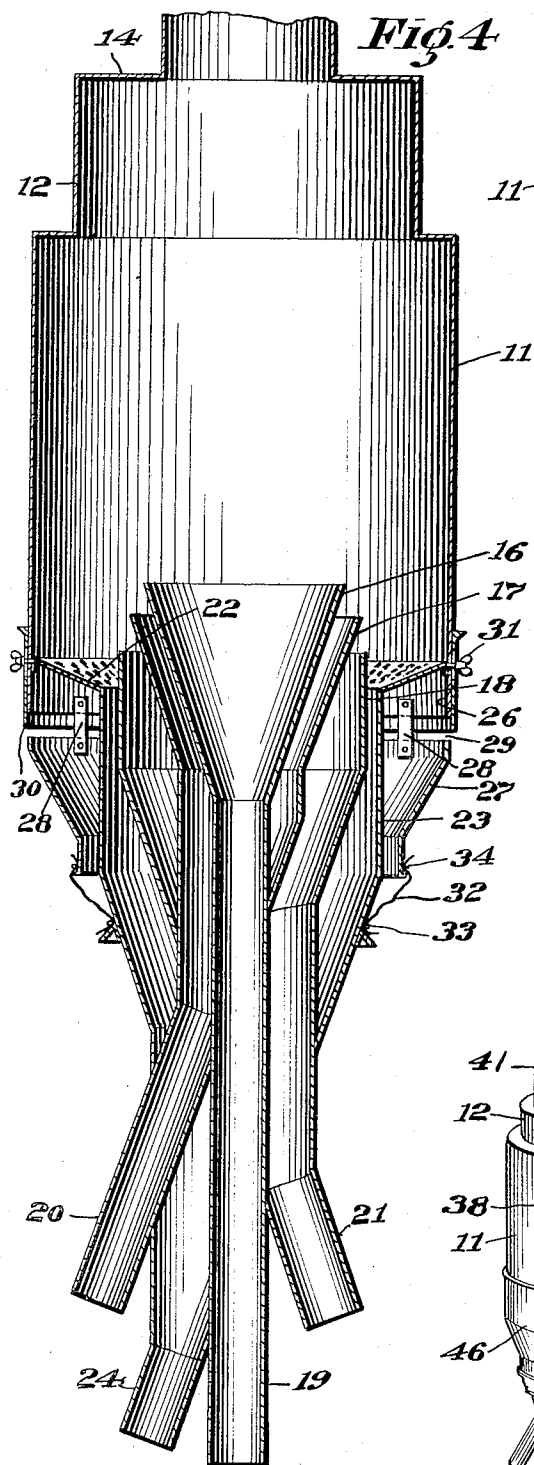
A. H. STEBBINS

1,845,567

AIR CLASSIFIER

Filed May 24, 1929

2 Sheets-Sheet 2



INVENTOR:
Albert H. Stebbins
 BY *W. R. Hines*
 ATTORNEY

UNITED STATES PATENT OFFICE

ALBERT H. STEBBINS, OF LOS ANGELES, CALIFORNIA

AIR CLASSIFIER

Application filed May 24, 1929. Serial No. 365,748.

This invention relates to air classifiers of the type in which rotative movement is imparted to the material laden air to cause the heavier particles to be thrown outwardly by centrifugal force.

One of the features of the present invention resides in the construction whereby a thin layer of air and heavier material traveling adjacent the wall of the classifying receptacle are deflected out of the receptacle, whereupon the heavier particles may be readily removed from the small volume of air in which they are suspended.

Another feature of the invention resides in the construction whereby the materials that settle out of the air within the classifying receptacle are divided into several grades by supporting a plurality of collecting hoppers within the lower portion of the receptacle to catch the materials that settle in different portions thereof.

Still another feature of the invention resides in the construction whereby the materials that settle out of the air adjacent the walls of the receptacle are directed across an apertured surface to subject these materials to an air sweeping operation.

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 of an air classifier constructed in accordance with the present invention;

Fig. 2 is a top plan view of the air classifier of Fig. 1;

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

Fig. 4 is a vertical sectional view through the classifier taken on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 1;

Fig. 7 on a reduced scale is a perspective view of a modified type of air classifier; and

Fig. 8 on an enlarged scale is a sectional view taken on the line 8—8 of Fig. 3.

In the embodiment of the invention illustrated in the drawings the material laden air is delivered tangentially by a pipe 10 into a receptacle 11 to whirl in the receptacle about a vertical axis. The air that enters the receptacle 11 through the pipe 10 may be drawn in from the atmosphere by suction means to be described, or this pipe 10 may lead direct from a source of material laden air.

In the construction shown the receptacle 11 is provided at its upper end with a dome 12 of reduced diameter for the purpose of effecting further removal of the heavier particles from this portion of the air classifier in a manner to be described. It is not essential, however, that the dome 12 have a diameter less than that of the receptacle 11. Air is exhausted from the upper portion of the air classifier by a pipe 13 which communicates with an opening formed in the dome cover 14 and this pipe 13, in the construction shown, leads to the suction side of a fan 15.

The suction produced in the classifying receptacle by the exhaust pipe 13 will serve to impart a rotative movement to the air drawn tangentially into the receptacle through the inlet pipe 10 and this will serve to throw the heavier particles outward by centrifugal force against the side walls of the receptacle so that they will move downwardly adjacent the side walls into a collecting hopper, to be described. Since the air rotating near the central axis of the classifier will have less velocity than the air traveling near the side walls of the receptacle the materials settling out of the air near the central axis of the machine will be finer than those settling out of the air adjacent the side walls of the receptacle. It is desirable to prevent these finer particles from entering the collecting hopper provided for the heavier particles, and this is accomplished in accordance with the present invention by providing a plurality of nested hoppers in the lower portion of the receptacle 11 and which serves to grade or classify the materials settling out of the air in the lower portion of the receptacle. In the construction shown three of these collecting hoppers are provided and are indi-

cated by 16, 17 and 18 and the materials that enter these hoppers will pass downwardly into the discharge pipes 19, 20 and 21. The heaviest particles which move downwardly adjacent the side walls of the receptacle 11 in the construction shown will fall upon the inclined apertured surface 22 which serves to direct these materials into the outermost collecting hopper 23 which directs these heavier materials into the discharge pipe 24.

The object of providing the apertured surface 22 is to subject these heavy particles to a final air treatment before they enter the collecting hopper 23 and this is accomplished in the constructions shown in Figs. 1 to 6 inclusive by admitting air from the atmosphere to the under face of the apertured surface 22 so that it will be drawn upwardly through these apertures into the classifying receptacle 11 by the action of the exhaust pipe 13. The air which passes upwardly through the apertures 25 of the plate 22 preferably serves also to promote the whirling movement of the air within the receptacle 11. This is accomplished by providing these apertures with inclined lips 25^a adapted to direct the jets of air entering these apertures so that they will impart a whirling movement to the volume of air within the classifying receptacle. It will therefore be seen that these air jets perform the double function of air-sweeping or cleansing the heavier particles moving across the inclined plate 22 to the mouth of the hopper 23 and also of increasing the whirling movement of the air within the classifying receptacle.

It is desirable to control the volume of air admitted from the atmosphere to the under face of the apertured surface 22. This is accomplished in the construction shown by extending the annular casing 11 of the receptacle downwardly below the point at which the apertured surface is secured to the inner wall of the receptacle 11, as indicated by 26, and below this downwardly extending portion 26 is suspended an apron 27 which may be supported by the straps 28, in spaced relation to the lower end of the portion 26.

The size of the opening 29 formed between the portions 26 and 27 of the outer casing may be varied as desired by providing the adjustable sleeve 30 adapted to be supported in the desired position of adjustment by the wing nuts 31. A small portion of the materials passing over the inclined plate 22 may fall through the apertures 25 and these materials may be caught by providing a stocking or the like 32 conveniently formed of cloth and retained in the position in which it is shown in Fig. 4 by the strings 33 and 34, the arrangement being such that this stocking may be removed from time to time to discharge the materials collected therein.

As above stated the suction produced within the classifying receptacle by the exhaust

pipe 13 will serve to draw air from the atmosphere inward through the feed pipe 10 and if desired the materials to be treated may be fed into the pipe 10 by the feed hopper 35, mounted upon the pipe 10, or if desired the pipe 10 may lead direct from a dust producing machine or some other source of supply.

It may be desirable to direct blasts of air in the form of thin sheets into the receptacle 11 at each side of the stream of air entering the pipe 10, and this may be done by providing the auxiliary inlet pipes 36 and 37 disposed as best shown in Fig. 6, and air under pressure may be supplied to these auxiliary pipes in the manner more fully disclosed in my co-pending application, Ser. No. 365,746, filed May 24, 1929. These sheets of air as pointed out in the application just mentioned will serve to delay the flow of air towards the exhaust pipe 13 long enough to give the heavier particles an opportunity to settle out of the whirling air, as more fully pointed out in said application.

As above pointed out a feature of the present invention of primary importance resides in the construction whereby the thin layer of air traveling adjacent the side walls of the receptacle and the heavy materials carried by this layer of air are deflected out of the receptacle, whereupon these heavy particles may be readily removed from the small volume of air in which they are suspended. This is accomplished, in accordance with the present invention, by providing an opening in the side wall of the receptacle 11 through which this thin layer of air and materials suspended therein is directed into a collecting receptacle or drum 38, and this is accomplished by providing one side of the opening with a knife edge portion 39 which serves to direct the layer of air just mentioned into the receptacle 38 with a whirling movement, as indicated by the arrows in Fig. 6. The heavy materials which settle in the receptacle 38 will move downwardly into the collecting hopper 40 at the lower end thereof from which may be drawn off from time to time or otherwise disposed of. The air which enters the receptacle 38 may be removed therefrom by an exhaust pipe 41 which is shown as communicating with the exhaust pipe 13.

If desired the heavy materials traveling adjacent the side walls of the dome 12 may be removed therefrom in a manner similar to that just described by providing this dome with the discharge pipe 41^a which leads to a collecting hopper or drum 42 which may be similar to the receptacle 38, and air is exhausted from the upper portion of the receptacle 42 by a pipe 43 which leads to the exhaust pipe 13. The thin sheet of air and heavy particles traveling adjacent the inner wall of the dome 12 will be directed into the

discharge pipe 41^a by the knife edge portion 44.

In some constructions it may be desirable to supply air under pressure to the lower face of the apertured surface 22 instead of admitting air from the atmosphere to the under face of this surface and in the modified construction shown in Fig. 7 the housing corresponding to the portions 26 and 27 above described is closed to the atmosphere and air is forced into this housing by a fan 45, with the result that any desired pressure may be produced within the closed housing 46 of this modified construction to force air upwardly through the apertured surface 22.

It will be apparent from the foregoing that the present classifier will separate the materials being treated into a number of different grades, and in most cases the coarsest particles will be collected in the pipe 24. The particles that collect in the lower end of the receptacle 38 will be nearly as coarse as those collected in the pipe 24, while the receptacle 42 will furnish a somewhat finer grade. The finest materials collected by this classifier will be delivered by the pipe 19 while the grades next in size will be supplied by the pipes 20, and 21.

What is claimed is:—

1. A classifier comprising in combination, an annular receptacle, means for delivering material laden air into the receptacle with a whirling movement adapted to effect a centrifugal separation of the heavier particles out of the whirling air, means for exhausting air from the upper portion of the receptacle, a discharge hopper at the lower end of the receptacle, an annular inclined apertured surface extending between the receptacle and hopper to direct the heavier particles that move downwardly adjacent the wall of the receptacle into the discharge hopper, and adjustable means for admitting air from the atmosphere to the apertured surface and adapted to regulate the volume of air that is drawn into the receptacle through the apertured surface and materials thereupon.

2. A classifier comprising in combination, a receptacle, means for delivering material laden air into the receptacle with a whirling movement adapted to effect a centrifugal separation of the heavier particles out of the whirling air, means for exhausting air from the upper portion of the receptacle, a discharge hopper at the lower end of the receptacle, an inclined apertured surface positioned to direct the heavier particles that move downwardly adjacent the wall of the receptacle into the discharge hopper and arranged so that air from the atmosphere will pass upwardly through the apertured surface and materials thereupon into the receptacle, and inclined lips adjacent the apertures and arranged to direct the air passing through the apertures so that it will promote the rota-

tive whirling movement of the volume of air in the receptacle.

3. A classifier comprising in combination, a receptacle, means for delivering material laden air into the receptacle with a whirling movement adapted to effect a centrifugal separation of the heavier particles out of the whirling air, means for exhausting air from the upper portion of the receptacle, a discharge hopper at the lower end of the receptacle, an inclined apertured surface comprising an annular sheet metal apron positioned to direct the heavier particles that move downwardly adjacent the wall of the receptacle into the discharge hopper and to direct the air jets upwardly through the particles, a housing arranged to form a closure below said apertured surface and provided with an opening for admitting air from the atmosphere to said surface, and adjustable means for regulating the size of said opening.

4. A classifier comprising in combination, an annular receptacle, means for delivering material laden air into the receptacle with a whirling movement adapted to effect a centrifugal separation of the heavier particles out of the air stream, means for removing air from the upper portion of the receptacle, a discharge hopper at the lower end of the receptacle, an annular apertured surface positioned between the receptacle and discharge hopper to direct the heavier materials from the former into the latter and constructed to direct air upwardly through the materials and to impart a rotative whirling movement to the air entering the receptacle through these apertures.

5. A classifier comprising in combination, a receptacle, means for delivering material laden air into the receptacle with a whirling movement adapted to effect a centrifugal separation of the heavier particles out of the whirling air, means for exhausting air from the upper portion of the receptacle, a discharge hopper at the lower end of the receptacle, an annular, inclined, apertured surface extending between the receptacle and hopper to direct the heavier particles that move downwardly adjacent the wall of the receptacle into the discharge hopper, an air chamber below the apertured surface, and means for regulating the air admitted to said chamber to thereby control the volume of air that passes into the receptacle through the apertured surface and materials thereupon.

6. An air classifier comprising in combination, a cylindrical classifying receptacle mounted in an upright position, means for conducting air from the upper portion of the receptacle, a conduit for delivering material laden air into the receptacle with a whirling movement adapted to throw the heavier particles outward by centrifugal force against the side walls of the receptacle, a cylindrical

collecting drum mounted in an upright position in contacting relation with a side wall of the receptacle so that the distance between the central axes of the drum and receptacle
5 is less than the sum of the two radii and provided with an opening between the drum and receptacle and a knife edge portion at one side of said opening arranged to direct a thin layer of air and the heavier materials
10 traveling adjacent the wall of the classifier through said opening tangentially into said drum to rotate therein with sufficient velocity to subject these materials to a second centrifugal separation by throwing the heavier particles outwardly against the side walls of the
15 drum to move downwardly therein, and means for discharging from the upper end of the drum the air from which the coarser particles have been removed by centrifugal force.
20

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

ALBERT H. STEBBINS.

25

30

35

40

45

50

55

60

65