Dec. 8, 1931. A. H. STEBBINS 1,834,981

AIR CLASSIFIER

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Fig. 1

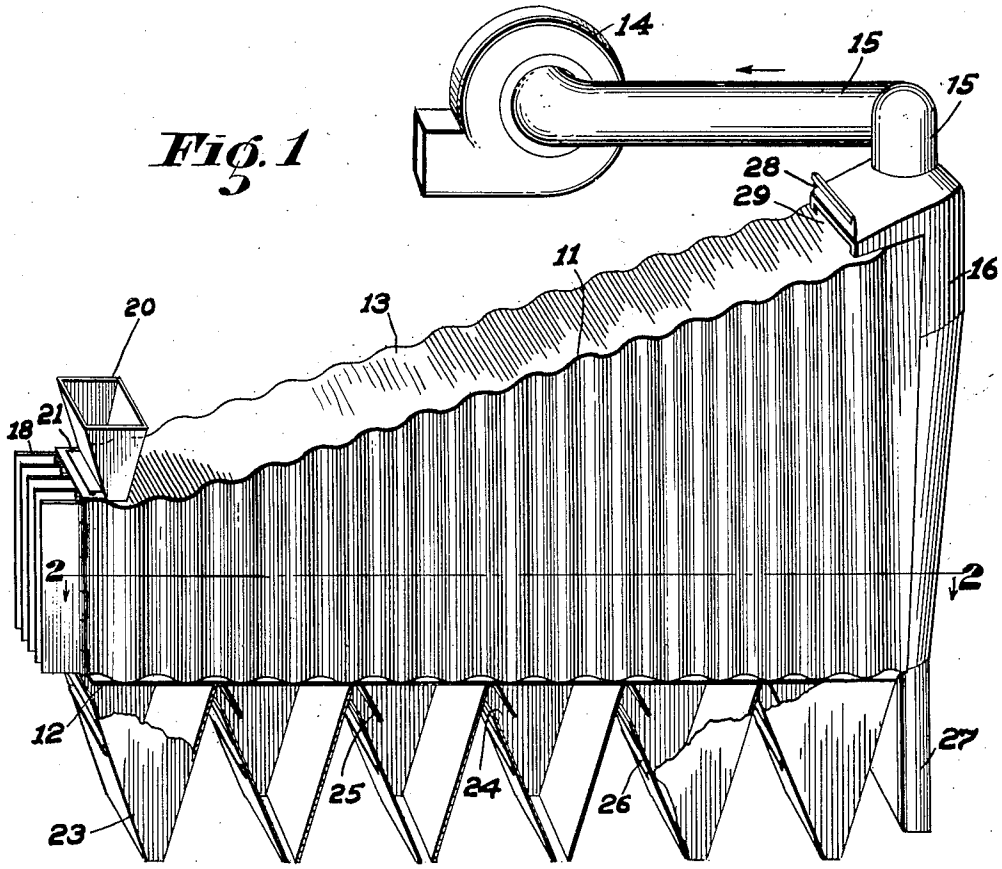
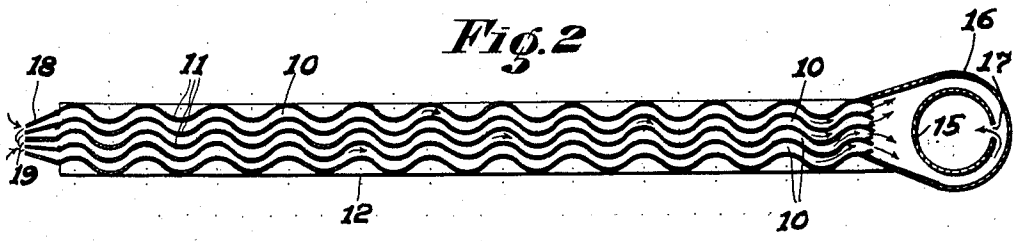


Fig. 2



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Fig. 3

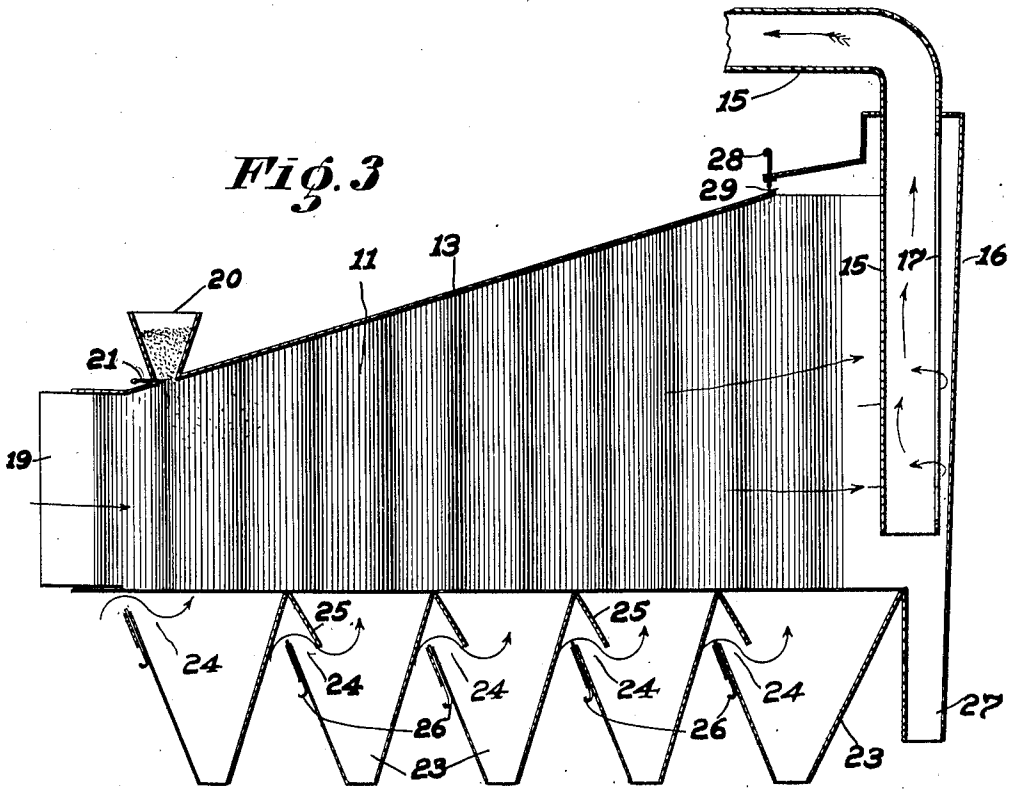


Fig. 4



Fig. 5

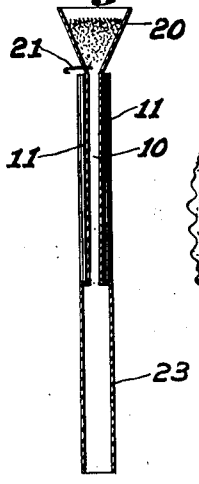
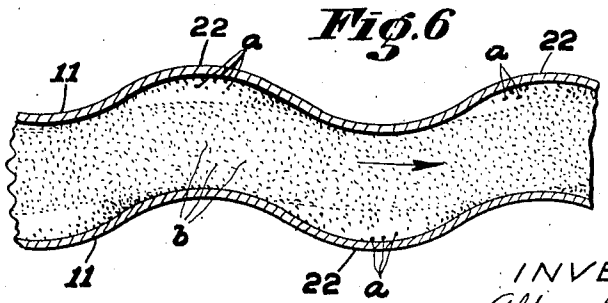


Fig. 6



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Patented Dec. 8, 1931

1,834,981

UNITED STATES PATENT OFFICE

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AIR CLASSIFIER

Application filed April 2, 1928. Serial No. 266,514.

This invention relates to air classifiers in which settling of the heavier particles out of the air is promoted by passing the material laden air through a narrow corrugated or tortuous passage.

The action of gravity is commonly employed to a more or less degree in air classifiers to effect the desired separation of the materials being treated, but when the particles being treated are quite small or differ only slightly in specific gravity they will not separate quickly under the action of gravity alone, and it is therefore customary to employ centrifugal force and in some cases friction and momentum to assist the action of gravity in effecting the desired separation.

The present invention relates to a novel construction in which all of the agencies above mentioned are employed to a more or less degree; that is, the present invention relates to a simple form of air classifier in which the desired separation of the material is secured through the combined action of gravity, centrifugal force, friction and momentum.

The utilization of these various agencies in securing the desired separation is effected in accordance with the present invention, by passing air or other fluid carrying the materials to be separated through a narrow passage the side walls of which are fluted or corrugated so that the air will travel along a serpentine path in passing through the passage. This serpentine movement will help to work the heavier particles out of the direct path of the air into contact with the side walls of the passage, and their engagement with the side walls of the classifier will reduce their speed and give them an opportunity to move downwardly under the action of gravity.

The finer particles being treated will remain in the path of the air better than the heavier particles as they will be effected by momentum and centrifugal force to a less degree than the heavier particles. The finer particles will therefore be carried by the air entirely through the tortuous classifier or further through the same than the heavier particles.

The various features of the invention and novel arrangement of parts will be best understood from the following description when read in connection with the accompanying drawings illustrating good practical forms of the invention.

In the drawings,—

Fig. 1 is a perspective view of a multiple air classifier constructed in accordance with the present invention;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view through a modified type of air classifier having a single tortuous air passage;

Fig. 4 is a horizontal sectional view of the classifier of Fig. 3;

Fig. 5 is a vertical sectional view taken through the feed hopper of Fig. 3; and

Fig. 6 on an enlarged scale is a horizontal sectional view through a portion of the tortuous air passage.

The air classifier forming the subject matter of the present invention may be variously constructed and may employ a single tortuous air passage as shown in Figs. 3 to 6 inclusive, or may be provided with a number of these air passages disposed side by side, as in the construction disclosed in Figs. 1 and 2. Air in most cases will be employed as the carrying medium for conveying the materials to be treated through the classifier, but it will be understood that water or other fluids might be employed as the carrying medium.

In the embodiments of the invention shown in the drawings the material laden air travels in substantially a horizontal direction through the narrow passage or passages and the flutes or corrugations extend in a vertical direction, but this is not essential in all embodiments of the invention since both the direction of the air through the narrow passage or passages and the arrangement of the corrugations or flutes may be varied as desired to promote the separation of the materials.

In the construction shown in Figs. 1 and 2 of the drawings an air classifier is shown as provided with a number of separate narrow air passages 10 which lie between the cor-

rugated or fluted walls 11. These fluted walls are secured at their lower ends to the base plate 12 and are provided at their upper ends with the cover plate 13.

Either blast or suction means may be employed to advance the material laden air through the narrow passages of the air classifier, and in the construction shown air from the atmosphere is introduced into the air passages at the left-hand end of the classifier and is exhausted from the right-hand end thereof by the exhaust fan 14 the suction side of which is connected to an exhaust pipe 15 which extends downwardly a substantial distance within the exhaust chamber 16, as best shown in Fig. 3 of the drawings. The exhaust pipe 15 is provided with an air inlet slot 17 through which air is drawn from the chamber 16 into the pipe 15 and this slot preferably faces away from the narrow passages 10 as shown in Fig. 2 to prevent the exhausted air from flowing directly from these passages into the slot 17. It may be desirable to vary the size of the inlet opening for each of the passages 10 and this is accomplished in the construction shown by providing the entrances of these passages with the swinging gages 18 which may be adjusted to vary the size of the inlet openings 19, as will be apparent from Fig. 2.

In the construction shown the materials to be treated are directed into the air passages 10 near the inlet end thereof by the feed hopper 20 having the sliding gate 21 for controlling the flow of the materials from the feed hopper into the air classifier. The materials discharged into the passages 10 from the feed hopper 20 will be picked up by the air and carried lengthwise of the classifier in the direction indicated by the arrows, and as the material laden air travels along these tortuous passages the heavier particles will gradually work out of the direct path of the air and strike against the corrugated or fluted walls 11. The contact of these heavier particles with the walls will check their speed and this will give them an opportunity to settle in the channels formed by the flutes or corrugations under the action of gravity. The lighter particles will remain in the path of the air better than the heavier particles and will therefore contact with the side walls to a less degree, with the result that they will be carried entirely through the classifier, or at least lengthwise of the same a greater distance than the heavier particles. Both momentum and centrifugal force will tend to carry the heavier particles out of the direct path of the air since the centrifugal force will tend to throw the heavier particles out into the loops or bends of the tortuous passage, while centrifugal force will tend to cause the heavier particles to travel in a straight line into abutting engagement with a wall of the passage, rather than follow the tortuous path of the air. This will be best understood from the enlarged sectional view of Fig. 6 in which the heavier particles *a* are shown as lying within the channels 22 of the corrugated walls 11, while the lighter particles *b* are shown as remaining within the central path of the air.

The heavier particles within the air will obviously settle out of the air more quickly than the somewhat lighter particles and it is therefore possible to secure different grades of the materials by providing a series of collecting hoppers along the bottom plate 12 of the air classifier and into which the different materials will fall. The classifier shown gradually increases in height from its inlet towards its discharge end to permit expansion of the air as it travels lengthwise of the classifier. This expansion of the air will tend to decrease the speed of the air and thereby promote the settling of the materials out of the air as they approach the discharge end of the air classifier.

In some cases it may be desirable to introduce air at successive points lengthwise of the classifier in order to carry the lighter particles entirely through the classifier and out through the exhaust pipe 15, and to this end, in the construction shown, the collecting hoppers 23 are shown as provided near their upper ends with the air inlet openings 24 through which air may pass into the hoppers and then up through openings in the floor plate 12 into the passages 10, and the deflector plates 25 are preferably provided for directing this air downwardly somewhat within the hoppers to cause this air to pick up the lighter particles that might otherwise tend to be carried down with the heavier particles into the hoppers. The size of the air inlet openings 24 may be varied as desired by adjusting the sliding gates 26. The materials that settle in the lower portion of the exhaust chamber 16 will move downwardly into the collecting hopper 27. If desired air from the atmosphere may be introduced into the upper portion of the exhaust chamber 16 by adjusting the sliding gate 28 which controls the air inlet opening 29.

The modified form of air classifier shown in Figs. 3 to 6 inclusive is the same in construction and operation as that shown in Figs. 1 and 2, except that the classifier shown in Figs. 3, 5 and 6 employs a single air passage 10, whereas the classifier of Figs. 1 and 2 has a number of these air passages for the purpose of increasing the capacity of the air classifier.

What is claimed is:—

1. A horizontally extending air classifier, comprising an elongated container having corrugated upstanding side walls disposed in spaced relation to each other to form a serpentine air passage between them, means

for advancing material laden air through the serpentine passage, the passage being constructed to deflect the stream of material laden air laterally back and forth while traveling therethrough to cause the heavier particles to move out of the path of the air stream into the channels of the corrugated walls under the combined action of centrifugal force and momentum, a series of collecting hoppers arranged along the lower wall of the container and each provided with an air inlet opening for producing a stream of air passing upwardly within the hopper through the falling materials, and a deflecting plate adjacent each of said openings for directing the stream of air into the central portion of the hopper.

2. A horizontally extending air classifier, comprising an elongated container open to the atmosphere at one end and formed with corrugated upstanding side walls disposed in slightly spaced relation to each other to form serpentine air passages between them, means for introducing the materials to be classified into the passages near the air inlet, means for exhausting air from the opposite end of the passages, the passages being constructed to deflect the stream of material laden air laterally back and forth while traveling therethrough to cause the heavier particles to move out of the path of the air stream into the channels of the corrugated walls under the combined action of centrifugal force and momentum, and laterally movable gates at the inlet opening and adjustable to vary the size of the opening for each passage.

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

ALBERT H. STEBBINS.