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CENTRIFUGAL APPARATUS FOR SEPARATING SOLID MATTERS FROM AIR.

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928,673. Patented July 20, 1909.

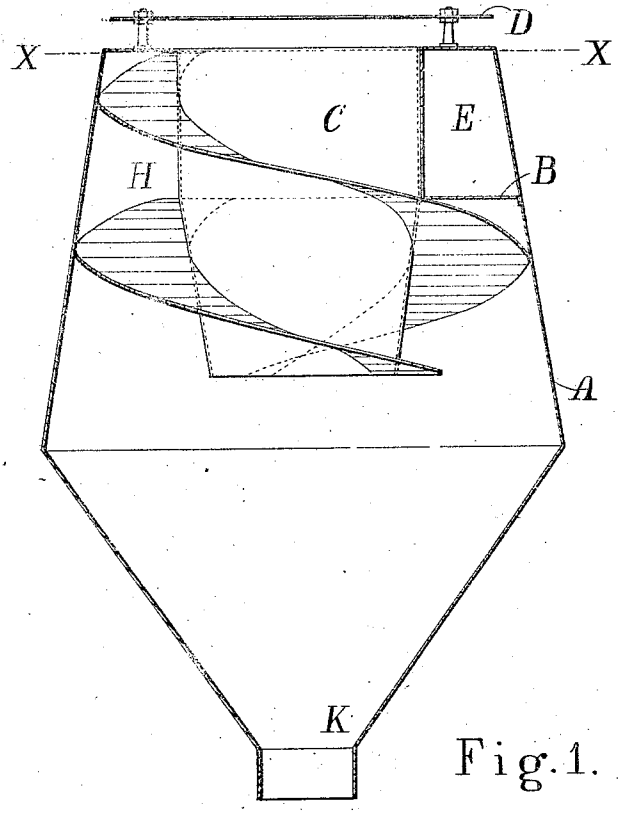
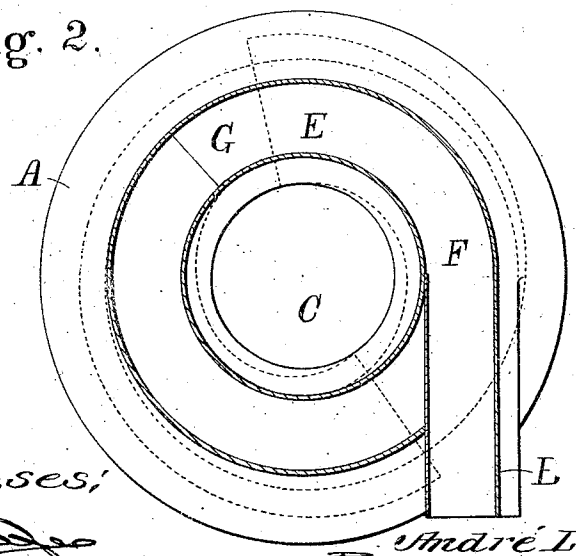


Fig. 1.

Fig. 2.



Witnesses:

Inventor:
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UNITED STATES PATENT OFFICE.

ANDRÉ LEBRASSEUR, OF PARIS, FRANCE, ASSIGNOR TO THE STURTEVANT ENGINEERING COMPANY, LIMITED, OF LONDON, ENGLAND, A CORPORATION OF GREAT BRITAIN.

CENTRIFUGAL APPARATUS FOR SEPARATING SOLID MATTERS FROM AIR.

No. 928,673. Specification of Letters Patent. Patented July 20, 1909.

Application filed July 20, 1908. Serial No. 444,388.

To all whom it may concern:

Be it known that I, ANDRÉ LEBRASSEUR, a citizen of the Republic of France, residing at Paris, France, have invented a certain new and useful Improved Centrifugal Apparatus for Separating Solid Matters from Air, of which the following is a specification.

This invention relates to an improved cyclone separator for separating solid matters, such as chips, sawdust, fibrous materials, cement and other fine dust, and the like from air and other gaseous fluids by centrifugal action. In apparatus of this kind the centrifugal force by which the separation is effected varies directly as the square of the speed, and inversely as the radius of curvature of the path described by the revolving matters. In order to be effective therefore it is advisable to keep the speed high and the radius of curvature small. It is a common practice in cyclone separators to admit the air at the periphery of the apparatus more or less tangentially and to allow it to escape in an axial direction from the center. Such constructions in the absence of special arrangements are objectionable in that interference takes place between the revolving air and the incoming air, and moreover a high counter pressure is produced, which causes an excessive loss of energy, the counter pressure in some plants of ordinary construction rising to as much as 50% or to 60% of the total pressure necessary to work the apparatus.

A known method of avoiding the interference above referred to is that of introducing the stream of air into the apparatus through an inclosed channel, so that the rotating air cannot block the inlet opening. Moreover, to avoid the heavy losses from counter pressure the speed is sometimes reduced by providing a relatively large inlet, but by so doing the advantages of high speed are sacrificed. A further known construction in apparatus of this kind for the purpose of reducing counter pressure is that in which the rotating body of air is given an annular form, a central outlet pipe being provided, extending into the separator and fitted at its base with deflecting blades for directing the air into the outlet pipe and for stopping the spin or rotation of the air in said pipe. This construction while being effective in use presents difficulties in manufacture besides which it is expensive to make.

The present invention has for its object to provide a separator of simple construction, and cheap to make, and one that is very effective in reducing counter pressure without sacrificing the advantages of high speed. In my improved separator the air is passed through an inclosed helical spiral channel of continuously increasing cross sectional area whereby the speed is gradually reduced either while the separation is taking place or after the separation has been effected. In some cases a narrow channel of uniform cross sectional area and of small radius is provided at the entrance to the helical spiral channel aforesaid, and in such cases the separation is mainly effected in this introductory channel. The counter pressure is reduced by the lessening of the spin in the helical channel, and at the same time the known advantage of non-interference between the incoming air and the revolving air is secured. Moreover the spiral channel by reducing the spin transforms a portion of the aerodynamic energy due to motion into static pressure.

In the accompanying drawing I have shown my improved separator with an introductory channel.

Figure 1 is a view of the separator, the outer casing being shown in central section, and Fig. 2 is a sectional plan on the line X, X, Fig. 1.

A is the outer wall or casing of the separator, B is the inlet pipe, C the central outlet pipe, and D is a disk diffuser which directs the issuing air radially outward.

E is the inclosed introductory or inlet channel consisting of nearly a half turn from F to G in Fig. 2 of uniform cross section and uniform radius. Said channel then merges into a helical spiral channel or dif-

fuser H of increasing cross sectional area extending around the central outlet pipe C and terminating at the lower end of said outlet pipe. Said diffuser channel is formed by helical spiral partitions arranged between the outer wall A and the central outlet pipe C. The increasing cross section of the spiral channel H in the construction shown is obtained partly by sloping the outer wall A outwardly, partly by increasing the depth of the diffuser channel, and partly by contracting the lower part of the central pipe C. It is not necessary of course to use all these ways combined to progressively increase the cross sectional area of the diffuser channel.

In my improved separator the air enters at a high speed through the inlet channel E which has a small radius and is comparatively narrow measured from the outer wall to the inner wall, and herein the separation is mainly effected, the solid matters being thrown from the body of the air against the outer wall of the separator. This part of the channel may be long or short as may be found desirable for any particular class of work, and may even be omitted altogether in which case the diffuser channel itself performs the separation. On leaving the channel E the air enters the diffuser channel H where its speed drops progressively until it emerges in the open part of the separator below the level of the mouth of the outlet pipe C. Said pipe as shown has a larger diameter at the top than at the bottom and consequently the air rising through the pipe still further loses its speed both axial and rotational, the former in inverse proportion to the increase of the area of the pipe and the latter in inverse proportion to the increase of the diameter of the pipe. Finally the speed is still further reduced as the air passes out between the flat top of the separator and the disk diffuser D. The separated matters pass down the spiral channel H and into the hopper K at the bottom of the apparatus.

Important advantages possessed by my improved apparatus are a narrow stream of air to be crossed by the heavy particles projected outwardly by centrifugal action, and the direction of the heavy particles toward the lower part of the apparatus by the inclined casing. The counter pressure is reduced owing to the reduction of the spin in the diffuser channel, and at the same time the known advantage of non-interference between the incoming air and the revolving air is secured. Moreover the spiral diffuser by reducing the speed of the air transforms the greater part of the aerodynamic energy due to motion into static pressure.

I am aware that it is known to employ a cover over the outlet in apparatus of this kind and also to employ an outlet pipe of increasing diameter, and I do not claim such *per se* or, apart from my improvements.

What I claim is:—

1. In a centrifugal apparatus for separating solid matters from air, the combination, with a chamber having a conical outer wall and a central exit pipe, of a pair of spiral vanes arranged between said conical wall and said exit pipe and forming a helical spiral channel of progressively increasing cross-sectional area bounded laterally by said conical wall and exit pipe, and vertically by said vanes, and an inlet pipe opening tangentially into said helical spiral channel.

2. In a centrifugal apparatus for separating solid matters from air, the combination, with a chamber having a conical outer wall and a central exit pipe, of spiral vanes arranged between said conical wall and said exit pipe and forming a helical spiral channel of progressively increasing cross sectional area bounded laterally by said conical wall and exit pipe, and vertically by said vanes, and an inlet pipe of uniform cross sectional area opening tangentially into said helical spiral channel.

3. In a centrifugal apparatus for separating solid matters from air, the combination, with a chamber having a conical outer wall and a cone shaped exit pipe the taper of which is in the reverse direction to that of the conical outer wall, of spiral vanes arranged between said conical wall and said exit pipe and forming a helical spiral channel of progressively increasing cross sectional area bounded laterally by said conical wall and exit pipe, and vertically by said vanes, and an inlet pipe opening tangentially into said helical spiral channel.

4. In a centrifugal apparatus for separating solid matters from air, the combination, with a chamber having a conical outer wall and a cone shaped exit pipe the taper of which is in the reverse direction to that of the conical outer wall, of spiral vanes arranged between said conical wall and said exit pipe and forming a helical spiral channel of progressively increasing cross sectional area bounded laterally by said conical wall and exit pipe, and vertically by said vanes, and an inlet pipe of uniform cross sectional area part of which is straight and part curved opening into said helical spiral channel.

5. In a centrifugal apparatus for separating solid matters from air, the combination, with a chamber having a conical outer wall and a cone shaped exit pipe the taper of which is in the reverse direction to that of the conical outer wall, of spiral vanes arranged between said conical wall and said exit pipe and forming a helical spiral channel of progressively increasing cross sec-

tional area bounded laterally by said conical wall and exit pipe, and vertically by said vanes, and an inlet pipe of uniform cross sectional area opening tangentially into said helical spiral channel, and a disk diffuser arranged over the top of the outlet end of the exit pipe.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ANDRÉ LEBRASSEUR.

Witnesses:
H. C. COXE,
GEO. A. FLOWER.