

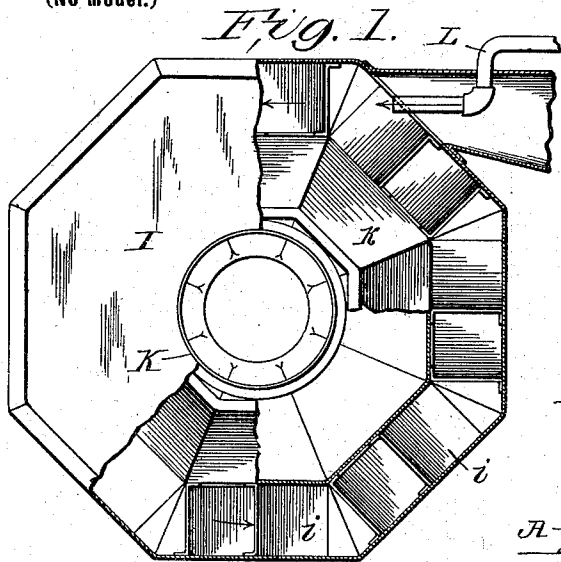
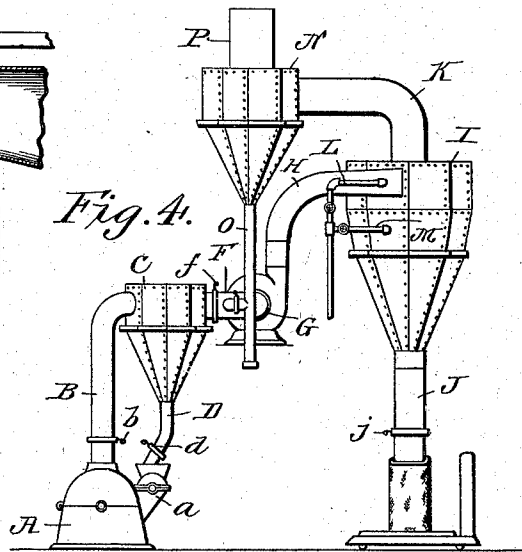
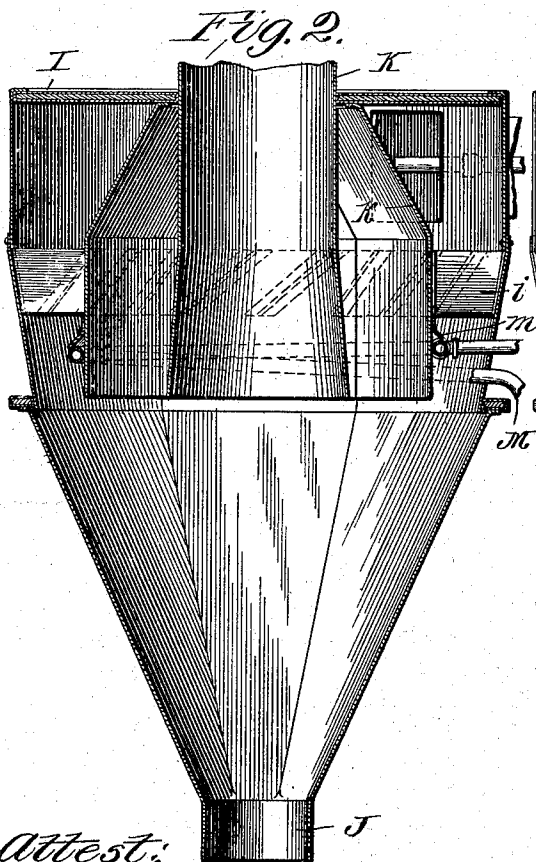
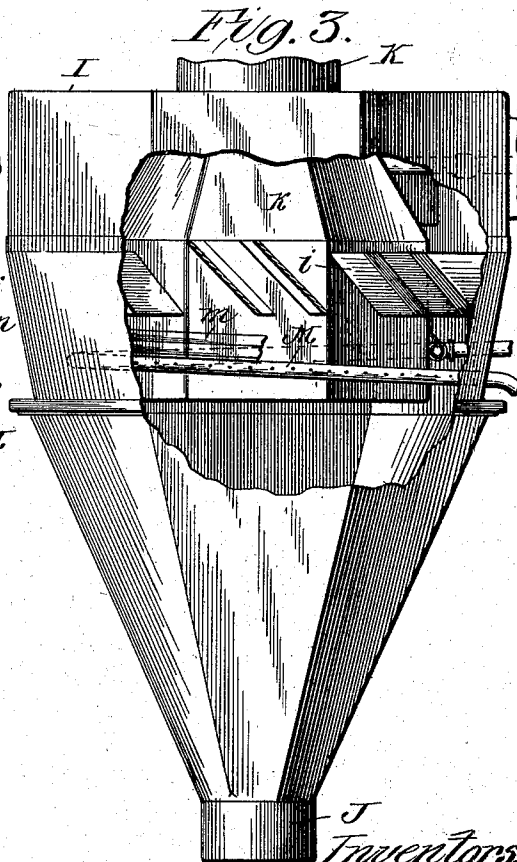
No. 710,605.

Patented Oct. 7, 1902.

W. S. OSBORNE & E. C. BRYANT.
DUST COLLECTOR OR SEPARATOR.

(Application filed Dec. 17, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

WILLIAM S. OSBORNE AND ELWIN C. BRYANT, OF ST. LOUIS, MISSOURI.

DUST COLLECTOR OR SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 710,605, dated October 7, 1902.

Application filed December 17, 1900. Serial No. 40,178. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM S. OSBORNE and ELWIN C. BRYANT, citizens of the United States, residing at the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Dust Collectors or Separators, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it ap-
10 pertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a top plan view, partly in section, of our improved collector. Fig. 2 is a vertical sectional view through the same. Fig. 3 is a side elevational view with part of the casing removed to show the interior; and Fig. 4 is a view illustrating a system of pulverizing and grading material, in which system
20 our improved collector is designed to be employed.

This invention relates to a new and useful improvement in dust collectors or separators, the object being to construct a device of the
25 character described which is simple, cheap, and effective. Our improved collector is designed primarily for use in connection with "a system for pulverizing and grading material," such as shown and described in an ap-
30 plication filed by us contemporaneously herewith on December 17, 1900, and Serial No. 40,177; but it will of course be understood that our improved collector can be used independently of said system.

35 The invention consists in the construction, arrangement, and combination of the several parts, all as will hereinafter be described and afterward pointed out in the claims.

Before giving a detailed description of our
40 improved collector we will refer to Fig. 4 and describe the system shown therein, with which our improved collector is designed primarily to be employed. In this system A indicates a machine for reducing material to a finely-
45 divided state, the material to be reduced being fed into said machine through a closed hopper containing a feeding apparatus *a*. This reducing-machine may be of any desirable construction, and we have not, therefore,
50 shown the details of the same in the drawings. B indicates a spout leading from the top of the machine, into which the reduced

material from the machine is received. *b* is a valve in the spout B. The spout B leads into what we have designated as a "grader" 55 C, the details of which are not shown in this present application, they forming the subject-matter of an application (Case B) filed contemporaneously herewith on December 17, 1900, and Serial No. 40,176. We will state, however, that this grader preferably consists of an octagonal casing having a conical lower portion discharging into a spout D, which
60 spout may connect with the feed end of the machine to return the tailings, or said spout may lead off to deposit said tailings into a suitable receptacle. This spout is provided with a valve *d*. The top of the grader is closed by a suitable cover. F indicates a discharge-spout leading from the head of the
70 grader and connecting with the eye of an exhaust-fan G. A suitable valve *f* is arranged in the pipe F. H indicates a pipe leading from the fan G into the head of our improved collector or separator I. 75

Before proceeding with a detailed description of the collector or separator we will briefly describe the operation of the grader C. In using the term "grader" in connection with this construction we do so primarily to
80 distinguish this part of our apparatus from the separator. The purpose of this so-called "grader" is to initially grade the pulverulent material, returning the large particles, called "tailings," back to the grinding-machine to
85 be reduced and permitting the particles of sufficient fineness to pass on beyond the grader. In other words, this so-called "grader" serves as a screen in that by regulating the valves in the spout of the exhaust-fan it is
90 possible to cause material of varying degrees of fineness to be passed therethrough, say, up to a certain mesh, those particles of material exceeding in size the desired mesh being returned to the machine for regrinding
95 or to a suitable receptacle as finished product. It will be observed that the grinding-machine, operating in a closed system, will thoroughly reduce the material. The vacuum in spout B can be regulated by the valve *b*. The dust-
100 laden air entering the grader is designed to be deflected laterally and downwardly, the tortuous passage it is compelled to follow resulting in the precipitation of heavier par-

particles of material into the pipe D, which connects with the feed end of the pulverizer. The outlet-pipe F being connected with the eye of an exhaust-fan will have a constant tendency to draw and exhaust all the air and its carried particles of material through the grader. The amount of air admitted to the grader is controlled by the valves *b* and *d*, the available area through which said air is drawn into the fan being controlled by the valve *f*.

It is well known that particles of material held in suspension in air rely upon the air resistance for their buoyancy; that if said particles of material were placed in a vacuum-chamber, wherein the air would offer no resistance to the action of gravity, said particles of material would be practically dead, so far as their floating capacity is concerned. We take advantage of this natural law in effecting the grading action in the chamber C by exhausting the air from said chamber and creating a partial vacuum therein, so as to take away from the particles of material the sustaining properties of the air, rendering them more susceptible to the action of gravity. Being introduced into a chamber from which the air is being constantly exhausted and wherein there exists a partial vacuum and being compelled to take a tortuous passage at the time of introduction into said chamber, the particles of material will immediately become more susceptible to the action of gravity when they reach the grading-chamber, and the heavier particles will fall, and the lighter particles will be drawn into the pipe F to the exhaust-fan. By regulating the valve *d* the fineness of the particles entering the pipe F can be controlled. If said valve is closed or nearly closed, it follows that there is no upward circulation of air through the pipe D. Therefore the heavier particles are not resisted in their descent, and a more finely-divided product will thus pass through the pipe F. If, on the other hand, the valve *d* is open to permit an upward circulation of air therethrough, the particles of material meeting with this resistance are held in suspension by the air passing upwardly through the pipe D, and consequently the material passing through pipe F is of a coarser quality. The regulation of valve *b* is such that the opening controlled thereby is about sufficient to take care of the capacity of the grinding-machine without admitting an excess quantity of air at this point; but of course it will be understood that the valve *b* being open full will affect the degree of fineness of the particles of material passing through the pipe F. However, it is not intended to use the valve *b* for the purpose of accomplishing this, said valve being designed primarily to control the exit-opening from the grinding-machine, and thus goes more to accommodating the capacity of said machine than to controlling the quality of ground material passing beyond the grader. The valve *f* is adjustable to regulate the dis-

charge-opening from the grader according to the capacity of the fan, and while the opening controlled by this valve will affect the quality of material passing therethrough said valve is not intended to be used for this purpose, we preferring to rely rather on the valve *d*, which is not only more accessible, but, depending upon conditions, can be manipulated as occasion requires—as, for instance, an excess of heavy particles falling into the pipe D would require the valve *d* to be opened to a greater extent, while a scarcity of material in pipe D would require that the valve *d* be closed. The accessibility of valve *d* and its ease of manipulation is of advantage in the event of an irregular feed of material into the grinding-machine. If the material to be ground is not regularly fed and there is no regulation of valve *d*, it follows that a variation in the quality of the product will result, which is undesirable. We do not claim the details of this grader in this application, as the same forms the subject-matter of an application (Case B) hereinbefore referred to.

The pipe II, being the discharge-pipe from the exhaust suction-fan G, leads into the head of a separator I, the details of construction of which are shown in Figs. 1 to 3. Referring now to these figures, it will be seen that the discharge-pipe enters the head of the separator on a parallel line with one of the sides of the octagon, and the dust-laden air is forced to pass in a downward direction by the inclined deflecting-pipes *i*, leading from the head to the main body of the machine, the particles of material being whirled around and by centrifugal force caused to hug the conical lower portion of the separator until they enter the discharge-spout J. The polygonal or octagonal shape of the separator shown in the drawings lends itself to a ready separation of the particles of material by the formation of eddies in the corners thereof. This discharge-spout is provided with a valve *j* for well-understood reasons. In Fig. 4 we have shown scales upon which is arranged a bag for receiving the material from the discharge-spout J. The top of this separator is closed to the exterior, but receives a pipe K, which extends some distance down into the separator-chamber, the introduced end of said pipe being surrounded by the inner casing or hood *k* of the head, whose lower end affords a point of attachment for the various inclined deflecting-pipes *i*. As stated before, the dust-laden air enters the chamber of this separator and centrifugal force causes the particles of dust or most of them to hug the walls of the chamber until finally they are deposited in the discharge-spout J. In some classes of material where it is possible to moisten the particles of dust in the air and to the extent that they absorb such moisture they become heavier and are more readily deposited in the discharge-spout we introduce a steam-pipe L, having a jet at its ends, which jet throws the steam into the head of the sepa-

rator at the point of introduction of the dust-laden air. We may also employ a perforated steam-pipe M, near the lower end of the hood k and beneath the inclined deflecting-pipes i, for the purpose of introducing steam into the separating-chamber at a point where the dust-laden air passes from the contracted discharge-mouth of the head into the larger conical chamber.

It will be noticed by referring to Fig. 2 that the hood k, before referred to, forms the inner wall of the space or chamber in the head of the collector, said head being polygonal in its lower portion and tapered at its top. The outer walls of the casing at the top are preferably polygonal, the head then tapering so as to form a contracted space beneath the deflecting-pipes i. These deflecting-pipes, which are arranged between the upper ends of the polygonal portion of the head of the collector, are formed by flanged plates riveted or otherwise secured in position, said plates being arranged at an inclination, as shown in Fig. 3. The perforated pipe M, before referred to, is arranged around the lower portion of the polygonal lower end of hood k, and to prevent material lodging thereabove a hood or shield m is provided for overhanging said pipe. In this manner the communication between the head of the collector and the enlarged conical chamber in its bottom portion is very contracted, and the dust-laden air is forced to take a path adjacent the outer wall of the collector. The space between the lower end of pipe K and the hood k is in communication with the enlarged chamber in the lower portion of the collector. This space can be cut off by arranging a perforated disk at the lower end of the pipe K and the hood k; but we prefer to utilize said space as a dead-air space or cushion accommodating the variable pressures of the dust-laden air introduced into the machine, which initially expands in the head-chamber, this expansion being practically complete when it is introduced into the enlarged conical chamber.

Any finely-divided particles of material in the separator which are not deposited in the discharge-spout J will pass upwardly through the pipe K, and instead of permitting said particles to escape to the exterior we prefer to lead said pipe K into an auxiliary collector N. Any particles of material arrested in this auxiliary collector will be deposited in the discharge-spout O, preferably connected to the fan G, while the purified air escapes into the atmosphere through a pipe P.

Our improved collector is designed to handle dry material, in which event steam would not be employed. It is of course understood that water can be introduced through the steam-pipes where the nature of the material being treated would permit of such a practice.

We are aware that minor changes in the arrangement, construction, and combination of the several parts of our device can be made

and substituted for those herein shown and described without in the least departing from the nature and principle of our invention.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an apparatus of the character described, the combination with a casing having an enlarged head and a conical lower portion, an inlet-pipe leading into said head, a discharge-pipe leading from the lower end of said conical portion, a hood k arranged in the head of the apparatus, deflector-pipes arranged around said hood, and a perforated pipe M arranged beneath said deflector-pipes for admitting a fluid into the apparatus; substantially as described.

2. In an apparatus of the character described, the combination with a casing having an enlarged head and a conical lower portion, deflector-pipes establishing communication between the chamber in the head, and the enlarged chamber in the conical portion, a hood k for directing the dust-laden air into the deflector-pipes, and from said deflector-pipes into the enlarged chamber, a perforated pipe M through which fluid is introduced into the apparatus, and a shield or hood m for said pipe; substantially as described.

3. In an apparatus of the character described, the combination with a casing having an enlarged head and conical lower portion, a pipe K projecting into said head, a hood k tapered downwardly and outwardly for a part of its length and surrounding the pipe K, deflectors for imparting a circular motion to the air passing from the chamber in the head into the enlarged conical chamber communicating therewith, an inlet-pipe leading into said head arranged to cause the air to travel around the tapered portion of the hood k and in the direction of the deflectors, and an outlet-pipe at the lower end of the conical portion of the casing, substantially as described.

4. In an apparatus of the character described, the combination with a casing having an enlarged head and conical lower portion, an inlet-pipe leading into said head, an outlet-pipe leading from the lower portion of said conical portion, a pipe K projecting into said head, a polygonal hood k having its upper portion tapered downwardly and outwardly from the top of the casing, and surrounding the pipe K, and deflectors arranged between the wall of the casing and the lower portion of the hood, substantially as described.

5. In an apparatus of the character described, the combination with a polygonal casing having an enlarged head and conical lower portion, an inlet-pipe leading into said head arranged to cause the air to travel in a given direction, an outlet-pipe leading from the lower portion of said conical portion, a pipe K projecting into said head, a polygonal hood k having its upper portion tapered down-

wardly and outwardly from the top of the casing above the inlet thereto and projecting downwardly to substantially the plane of the lower end of the pipe K and surrounding the
5 same, and inclined deflectors supported between the wall of the casing and the lower portion of the hood, substantially as described.

6. In an apparatus of the character described, the combination with a casing having
10 an enlarged head and conical lower portion, an outlet in the head, a hood surrounding said outlet having a downwardly and outwardly inclined portion, an inlet in the head

arranged to cause the air to travel around said inclined portion in a circular direction
15 and downwardly therefrom, and an outlet at the lower end of the conical portion of the casing, substantially as described.

In testimony whereof we hereunto affix our signatures, in the presence of two witnesses, 20 this 14th day of December, 1900.

WILLIAM S. OSBORNE.
ELWIN C. BRYANT.

Witnesses:

F. R. CORNWALL,
WM. H. SCOTT.