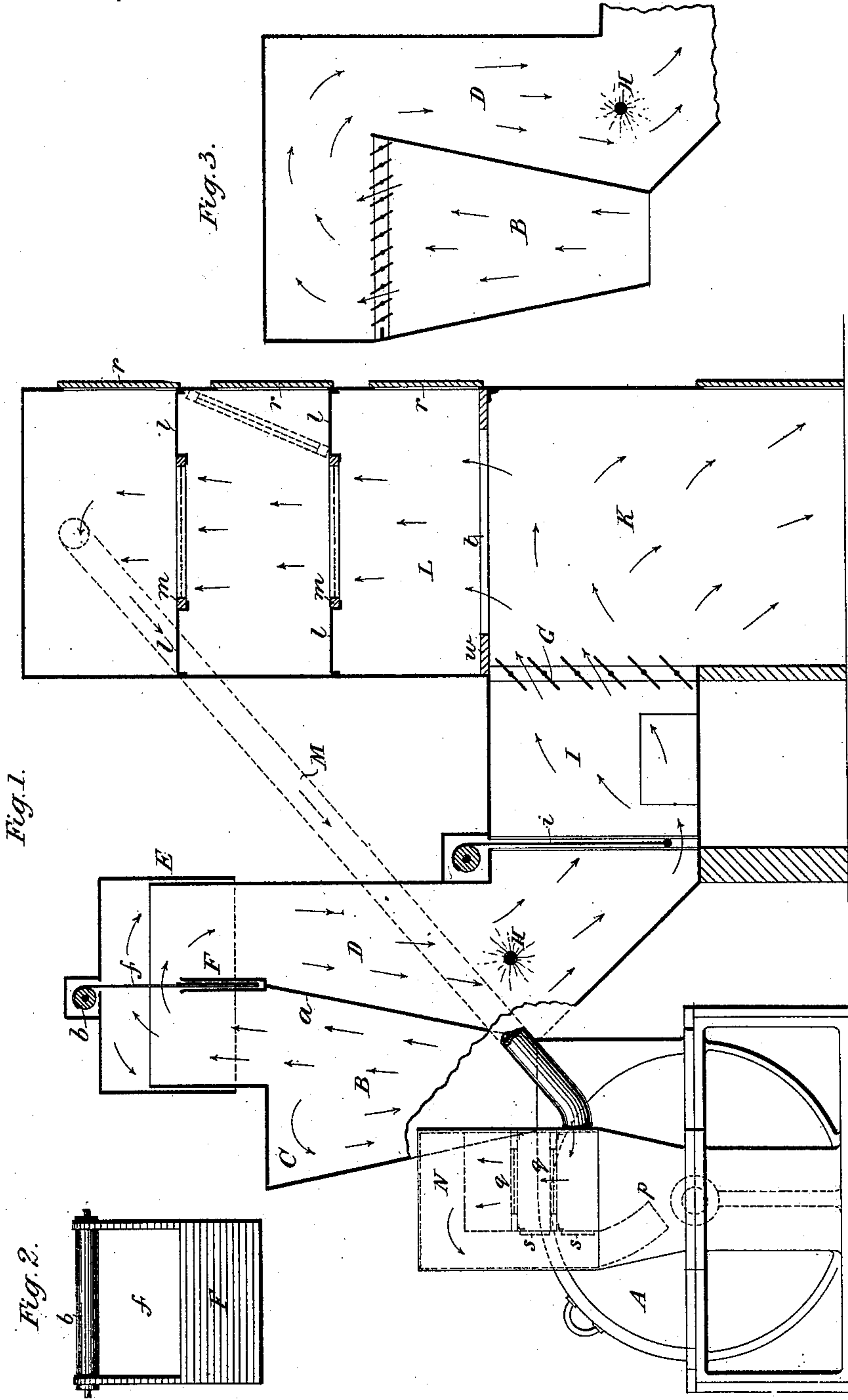


(No Model.)

E. V. GARDNER.
APPARATUS FOR SEPARATING, DRESSING, AND FINISHING GRANULAR
AND POWDERED SUBSTANCES.

No. 420,496.

Patented Feb. 4, 1890.



Witnesses.

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UNITED STATES PATENT OFFICE

EDWARD VINCENT GARDNER, OF BERNERS COLLEGE, COUNTY OF MIDDLESEX, ENGLAND.

APPARATUS FOR SEPARATING, DRESSING, AND FINISHING GRANULAR AND POWDERED SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 420,496, dated February 4, 1890.

Application filed October 1, 1889. Serial No. 325,652. (No model.)

To all whom it may concern:

Be it known that I, EDWARD VINCENT GARDNER, professor of chemistry, a subject of the Queen of Great Britain, residing at Berners College, Oxford Street, in the county of Middlesex, England, have invented certain new and useful Improvements in Apparatus for Separating, Dressing, and Finishing Granular and Powdered Substances, of which the following is a specification.

This invention relates to means or apparatus for separating particles of granular or powdered substances of different degrees of fineness or density from one another and of dressing and finishing such substances.

To clearly explain the nature of my invention, reference is made to the accompanying drawings, in which—

Figure 1 is a part sectional elevation of the apparatus employed. Fig. 2 is a view of a partition or shutter hereinafter referred to, and Fig. 3 is a modified form of a portion of the apparatus.

In carrying my invention into effect I attach to the delivery end of any suitable grinding, pulverizing, or disintegrating machine, as indicated at A, (or I otherwise convey the material to be treated in any convenient way to,) an upright shaft B, formed, preferably, of a conical shape, as shown, and with a horizontal return or shoulder C at one side, up which shaft the material is driven by the blast of the machine or by an auxiliary blast. I arrange the height of the shaft B according to the specific gravity or density of the material to be treated. One side of this shaft is formed by a partition *a*, which extends nearly to the top, as shown, and which separates the shaft from a second and parallel or return shaft D for the down current.

At the top of the combined shafts B and D is a telescopic box cover or head E, which is rendered dust-tight in any convenient manner, and is capable of being raised and lowered so as to regulate the height of this cover or head above the partition *a*. At the top of this telescopic cover or head E, and at about the center of its width, is situated a pendent shutter F, so arranged at its lower end as to meet or be overlapped by the partition *a* or

an extension thereof, and to slide up and down in guides formed therein. This shutter F is formed of a number of articulated plates with an opening *f*, as shown, for the passage of the material therethrough, and it is suspended through a slot in the telescopic cover or head from a roller *b*, inclosed within a chamber and provided with a crank-handle or other means by which it can be revolved to raise or lower the shutter F, or a vertically-movable rigid shutter may be employed for this purpose, or a movable shutter formed of a number of louver-plates (such as that shown at G in another part of the apparatus) capable of being separately set at any desired angle or closed may be so employed. By these means the position of the opening above the partition *a* for the passage of the material can be easily regulated, and thus the height to which the finely-divided particles must be raised in order to pass over the partition may be conveniently adjusted. The current now passes down the shaft D, on the other side of the partition, and in its course is in some cases, according to the nature of the substance, acted upon by steam or gases or a combination thereof (or in some cases by a jet or spray of water) issuing from the sides of the shaft at about the point H, in any desired number of jets arranged in any convenient manner, so as to completely envelop the current of ground material. The steam should pass into the machine at such a pressure that it will moisten and yet not overdamp the material and cause the particles to adhere together and not to require to be redried; and in order to counteract this action, should it occur, I may attach to the chamber or case heating-pipes, or I otherwise heat the apparatus, so as to prevent any deleterious condensation during the passage of the steam; but this additional heat is not in all cases absolutely necessary. If desired, the steam or gases or a combination thereof may be introduced at any other suitable part of the apparatus.

The shaft D communicates at its lower end with a collecting case or chamber I, within which may be arranged, when treating some materials, similar shutters to act as baffle-

plates, or in this situation a curtain or shutter *i* may be used similar to the shutter F, but without any aperture thereon, and may depend a given distance from the roof of the case or chamber, thus compelling the material to pass beneath it, so that the velocity of the draft may be conveniently regulated as the density and nature of the material under treatment may require. The great advantage of these shutters, curtains, or baffles is that the openings beneath or therethrough can be regulated from the outside of the machine while it is in operation and without the necessity of stopping the work or the risk of loss from the material escaping, and, in the case of deleterious materials, injury to those engaged in working. At the end of this chamber I is a shaft or chamber K, the opening to which may be also controlled by a curtain or shutter, or, as in the case shown, by the louver-plates G. This shaft K connects with an upper dust-chamber L by a slot *t* in the floor *w*, in which chamber, if desired, inclined baffle-plates may be arranged, which act to divert the current and increase the distance of its travel. The dust-chamber L is provided with partitions or floors *l*, which are fitted with frames *m*, of bunting, cloth, or other suitable material, through which the current passes and is sifted before it reaches the outlet, which is in communication with the return-blast shaft M, by which the circulation of the blast is insured and an efficient exhaust is preserved in connection with the grinding machine and apparatus.

I will now describe the effect and action of my process and apparatus. Part of the ground or divided material carried upward by the action of the machine or by the auxiliary blast strikes against the shoulder C of the shaft B, whereby its grosser particles are obstructed and their momentum destroyed, causing them to rebound or fall back into the machine. The conical shape of the shaft also assists in this, as it allows the current to be expanded, and its velocity being thus lessened some of the heavier particles will fall from same. The finer or lighter particles are carried onward by the current to the head of the shaft through the aperture *f* in the shutter F and downward on the other side of the partition *a*, where they are enveloped by and subjected to the action of the gases and vapors of the jets, and thus deprived of anything that may have become adherent to them in the process of grinding or blowing. By these means the finished product is rendered more compact and close, is freed from any tendency to fly about and escape, is more easily handled, and is rendered capable of being packed in a smaller compass than heretofore; and, furthermore, the steam or gases, or combinations thereof, by their partial condensation cause a partial vacuum within the casing and apparatus, and thus relieves the grinding-machine from back-pressure and lessens the power needed for driving. The current now passes

beneath the shutter *i* into the chamber I and from thence through the louver-plates G or other adjustable shutter into the shaft or chamber K, the material being deposited both upon the floor of the chamber I and the chamber K, from which it can readily be removed by suitable machinery or by hand. The lighter particles, however, pass on up into the dust-chamber L, (where it may, if desired, be acted upon by baffle-plates,) and it thence passes through the sieves *m*, on the under side of which most of the suspended particles are arrested and collected, and, finally, it passes into the return-blast shaft or channel M and back to the machine. The current at this point should be perfectly free from any suspended or floating particles; but I sometimes find it convenient to place a small chamber N above the hopper *p* of the disintegrator, said chamber having any suitable number of bunting-frames *q*, (similar to the frames *m* in the chamber L,) on the under side of which the remaining particles are collected. This chamber is placed so as not to interfere with the feeding of the hopper in the usual way. To remove this finely-divided material from the frames *m* and *q*, I place doors—such as shown at *r* and *s*—in the chambers L and N, to enable the attendant to lift and beat the frames, and so cause the collected particles to fall down (in the case of the chamber L) onto the floor *w*. The lower frame is preferably beaten first and then stood up out of the way, as shown in dotted lines, to allow the upper frame or frames to be beaten and the material to fall through the opening below.

I sometimes employ in lieu of the shoulder C of the shaft B a series of louver baffle-plates, as shown in Fig. 3, (or they may be employed in addition to the shoulder,) and dispose them horizontally across the mouth of the shaft, and so as to be capable of being separately opened or set at any desired angle from the outside of the machine, thereby regulating the area of the passages or openings between them. This serves to arrest and throw back to the machine the grosser particles, while the finer particles only are carried onward by the current, as before described, and this is an excellent means of separating the finer from the grosser particles of the ground or powdered substances.

I would have it understood that I may employ any desired number and arrangement of collecting boxes or hoppers, and of the shutters, curtains, or baffle-plates, and that I may dispense with the telescopic head to the first shaft and employ a fixed head by slightly modifying the arrangement of the sliding shutter or curtain and its attachments.

It will be evident that the apparatus is adapted for separating and dressing various materials and substances; but I have found it especially valuable in connection with the grinding of white lead, in which I am able to collect the floated particles in a high degree of fineness and density.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

5 1. In an apparatus for separating granular or powdered substances, a shaft divided vertically to form a forwarding-passage and a return-passage communicating at the top and extensible longitudinally, and connecting
10 with a blowing apparatus at the lower end of the forwarding-passage, substantially as described.

2. In apparatus for separating granular or powdered substances, a vertical shaft up
15 which the material is carried on a current of air, a shoulder in said shaft, and a return-down shaft, an opening between the two shafts having therein a shutter, the height of the opening in which is adjustable, substantially
20 as described.

3. In apparatus for separating granular or

powdered substances, the combination, with a vertical and a return shaft, of a telescopic head or cover, and a pendent shutter between
the head and the two shafts for regulating 25 the opening between them, substantially as described.

4. In apparatus for separating granular or powdered substances, the combination, with a dust-chamber having floors or partitions 30 provided with cloth screens, of a return-blast channel leading from the dust-chamber to a chamber above the hopper of the apparatus, substantially as described.

In testimony whereof I have hereunto set
my hand in the presence of two subscribing 35 witnesses.

EDWARD VINCENT GARDNER.

Witnesses:

PHILIP M. JUSTICE,
T. T. BARNES.