

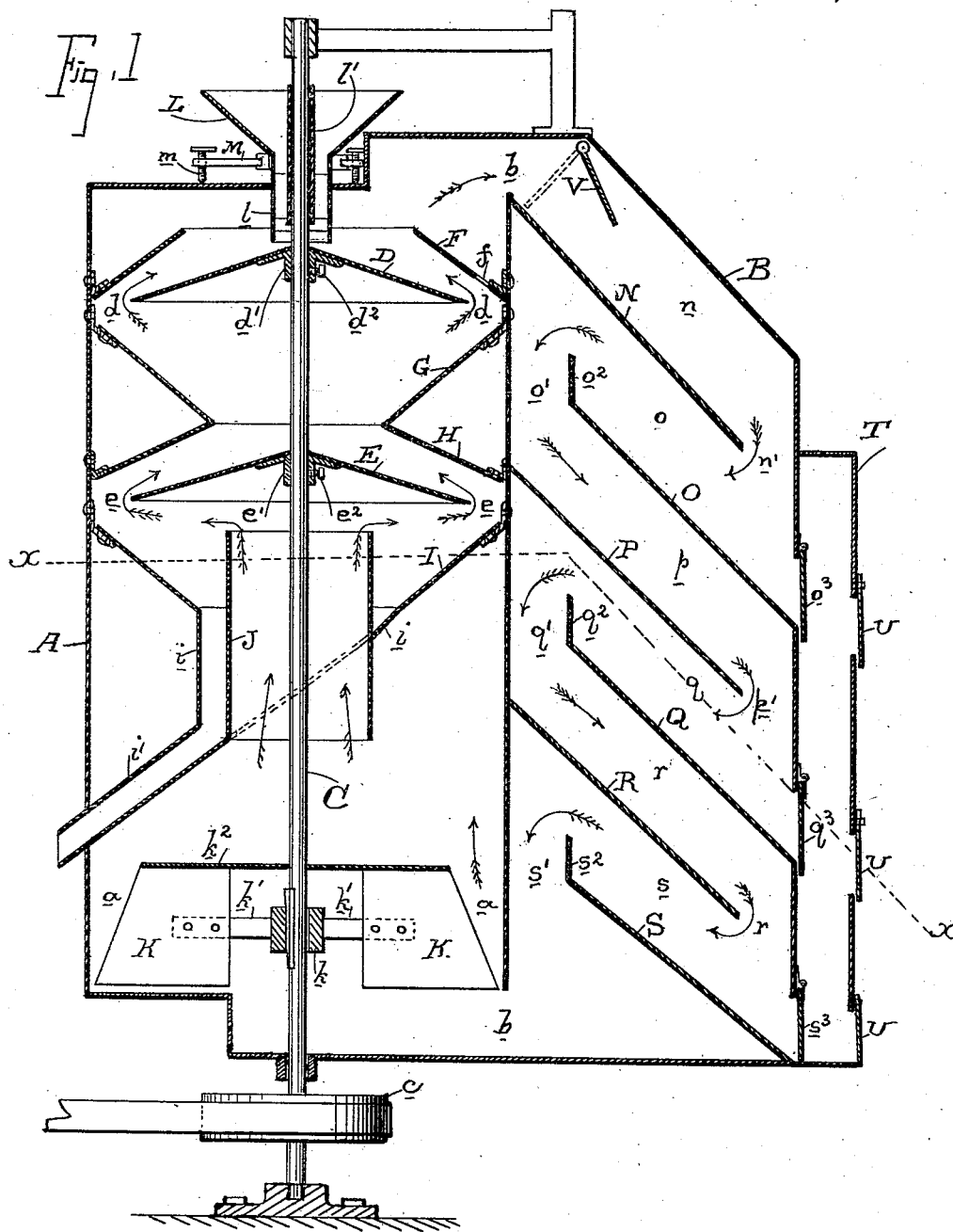
(No Model.)

2 Sheets—Sheet 1.

J. FREY.  
SEPARATOR.

No. 492,720.

Patented Feb. 28, 1893.



Witnesses,  
B. House  
J. A. Bayless

Inventor,  
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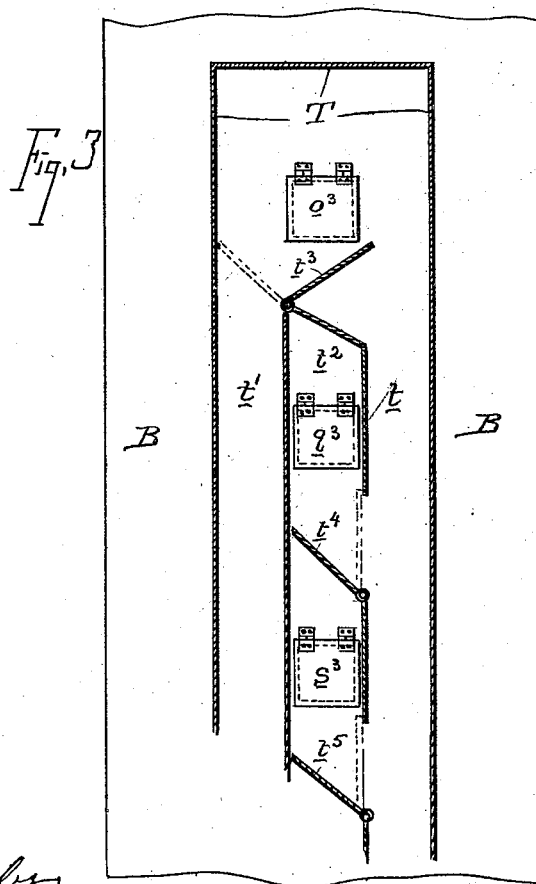
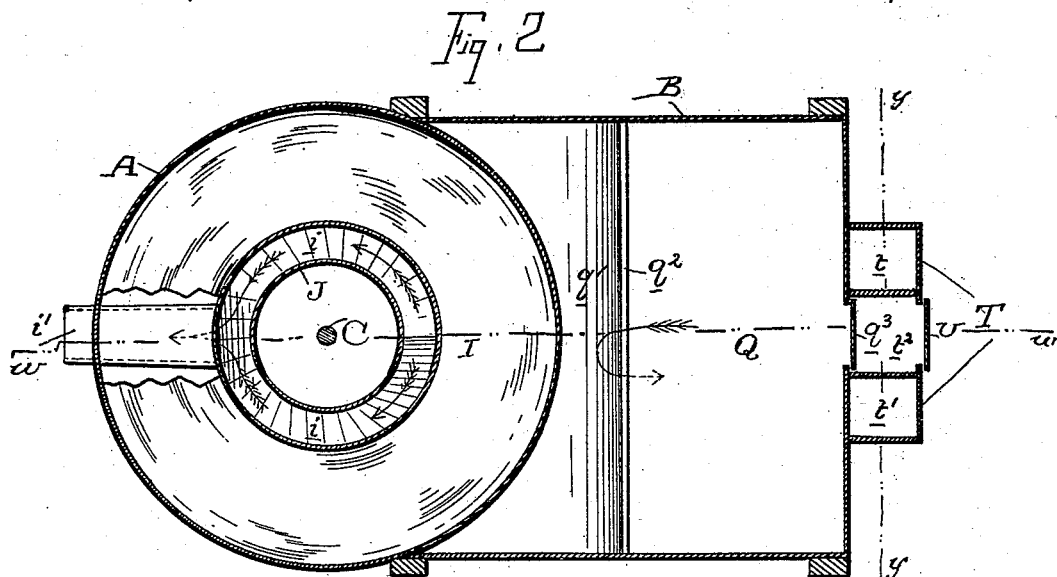
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# UNITED STATES PATENT OFFICE.

JOHN FREY, OF WEST BERKELEY, CALIFORNIA.

## SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 492,720, dated February 28, 1893.

Application filed May 11, 1892. Serial No. 432,631. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN FREY, a citizen of the United States, residing at West Berkeley, Alameda county, State of California, have invented an Improvement in Separators; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the general class of machines for separating, and especially to that sub-class in which the separation is due to a current of air acting on the different particles, according to their specific gravities.

My invention is applicable to the cleaning and purifying of mill stock, and as a dust collector. It is also useful in separating the flour from ground marble and may be used for separating the precious particles from auriferous sand, earth or gravel.

My invention consists in the novel construction, combinations and arrangement of parts hereinafter fully described and specifically pointed out in the claims.

The object of my invention is to provide a separator of this class, in which the course of the material is such that it will be distributed equally and suspended to the best advantage for the action of the air current, to effect the separation of the lighter from the heavier particles, and said lighter particles themselves shall be separated and graded effectually.

Referring to the accompanying drawings for a more complete explanation of my invention,—Figure 1 is a vertical section of my separator, taken on the line  $w-w$  of Fig. 2. Fig. 2 is a cross section on the line  $x-x$  of Fig. 1. Fig. 3 is a vertical section of the grading chute T, taken on the line  $y-y$  of Fig. 2.

A is the main casing. It is arranged vertically, and is preferably cylindrical. To one side of this casing is secured a vertical box B, which communicates with the main casing top and bottom through passages  $b$ , and both casing and box are closed in substantially air tight. Extending centrally through casing A is a vertical shaft C, having a pulley  $c$  below whereby it may be rotated. Upon this shaft, within the upper end of casing A is a conical distributing disk D, having a diameter sufficiently less than the interior diameter of casing A to leave an annular space  $d$  between its rim and the casing. The disk may be ad-

justable up and down on the shaft by resting upon or formed with a sliding hub or collar  $d'$  on the shaft, and fixed in position by a set screw  $d^2$ . Upon shaft C, below disk D, is a second distributing disk E similar to the first, having a hub or collar  $e'$  and set screw  $e^2$ , and leaving an annular space  $e$  between its edge and the casing A.

Secured to the casing A is an annular conical hood F, which lies above the space  $d$  and extends over the distributing disk D. In that portion of the hood which lies under the upper passage  $b$  are made holes  $f$  which communicate with space  $d$  directly below.

Secured to casing A is a funnel G which communicates with space  $d$  and lies under distributing disk D. This funnel has no neck, and its open base is joined by a second annular conical hood H secured to the casing A, and extending over space  $e$  and distributing disk E.

Secured to the casing A, directly under space  $e$ , is a receiving funnel I, having an inclined annular neck  $i$ , terminating in a discharge spout  $i'$  which projects through casing A. In this annular neck is fitted and supported a cylinder J, open at each end, and encircling shaft C.

Secured to the lower portion of shaft C is a hub  $k$  provided with radial arms  $k'$ , to which are secured the vertical fan blades K. These blades are peculiar in that their outer edges incline upwardly toward the center as shown. To the tops of these blades, or to the shaft above said blades is secured a cover plate  $k^2$  which snugly fits shaft C, and entirely incloses the top of the fan, leaving only the upwardly flaring air passages  $a$  between the inclined outer edges of the blades K and wall of casing A.

L is the receiving hopper in the top of casing A. Its neck  $l$  extends down into the casing and opens out just above the middle of distributing disk D. The hopper is vertically adjustable by being supported upon a bracket M, the arms of which are provided with adjusting screws  $m$ . In order to prevent the material in the hopper neck from coming in contact with rotating shaft C, there is a sleeve  $l'$  passing through and secured in the neck of the hopper and fitted about the shaft. The upper end of box B is downwardly in-

clined as shown, and in said box, and to the upper end of its inner wall, is secured the inclined partition N, parallel with the inclined top of the box. It terminates short of the outer wall of the box, and thus forms therein a passage *n*, which at its top communicates with passage *b*, and at its lower end has a discharge passage *n'*.

Secured to the outer wall of box B is an inclined partition O, parallel with partition N, and terminating short of the inner wall of the box. This forms a passage *o* which at its lower end communicates with discharge passage *n'* and at its upper end has a discharge passage *o'*. The upper end of partition O is provided with an upwardly extending flange *o*<sup>2</sup>, the purpose of which is to contract passage *o* at that point.

Secured to the inner wall of box B is an inclined partition P parallel to partition O, and stopping short of the outer wall of the box, thus forming a passage *p* which at its upper end communicates with discharge passage *o'*, and at its lower end it has a discharge passage *p'*. In like manner there are partitions Q and S similarly arranged to partition O, forming respectively passages *q* and *s* with communications with preceding discharge passages, and having discharge passages *q'* and *s'*, and contracting flanges *q*<sup>2</sup> and *s*<sup>2</sup>, while between them is a partition R, similar to partition P, and forming passage *r* communicating with discharge passage *q'* and having at its lower end discharge passage *r'*. The discharge passage *s'* of the final passage *s* communicates with the lower passage *b* joining box B and casing A.

In the outer wall of box B at the lower ends of passages *o*, *q* and *s* respectively, are outlet valves *o*<sup>3</sup>, *q*<sup>3</sup> and *s*<sup>3</sup>. These consist of simple hinged flaps opening outwardly. Secured to the outer side of box B and covering these valves is a grading chute T, divided into three passages *t*, *t'* and *t*<sup>2</sup>. Under valve *o*<sup>3</sup> is a swinging gate *t*<sup>3</sup> which controls by its movement passages *t* and *t'*, and allows the material from said valve to flow into either passage. Valve *q*<sup>3</sup> opens into passage *t*<sup>2</sup> and under this is a swinging gate *t*<sup>4</sup> adapted to direct the material from valve *q*<sup>3</sup> into either passage *t* or *t*<sup>2</sup>. Valve *s*<sup>3</sup> also opens into passage *t*<sup>2</sup> and under it is a gate *t*<sup>5</sup> adapted to direct the material from said valve into passages *t* or *t*<sup>2</sup>. In the outer side of chute T are covered hand holes U from which samples can be drawn when needed.

In the upper end of passage *n* in box B, is a gate V adapted to close and open said passage fully or partially as may be needed in the operation of the machine.

The operation is as follows:—The material is fed into hopper L and passes down to and upon the center of disk D. Power being applied to shaft C, the disk rapidly rotates, and on account of its conical shape, the material is thrown not only outwardly but upwardly as well, thus leaving the disk surface in equal distribution, and being suspended above it,

and guarded by overlying hood F so that it will not fly off too far. While thus suspended it is acted upon by the current of air produced by the fan blades K below, which said current passing up through cylinder J, reaches in its course the space *d* and rounding the edge of disk D, meets the suspended material between said disk and hood F. Here separation takes place, the lighter from the heavier particles, the former being carried by the current up past the open center of annular hood F, and up through passage *b* into box B. The heavier particles pass down against the air current, and falling through space *d* into funnel G are by it conducted to and delivered upon the center of rotating conical disk E, upon which and between it and overlying hood H, the same distribution and suspension takes place. Here the material is again acted upon by the air current flowing up through space *e*, and the lighter particles still remaining are carried up past hood H, through funnel G, space *d*, past hood F, and through passage *b* to box B. The now thoroughly separated, cleaned and purified heavy particles drop through space *e* into funnel I, passing around cylinder J in the annular neck *i* of said funnel, and are delivered through spout *i'* into suitable receptacles. The lighter particles are carried by the air current, which has now become a suction, through top passage *b* into passage *n* of box B. In this they flow downwardly and passing through discharge passage *n'* fall into passage *o*. In this they are sucked upwardly, and a further separation of the heavier from the lighter particles takes place, both by reason of the upward flow and because of the contracted upper end of said passage, which tends to deaden the current in said passage. The heavier particles settle down into the lower end of the passage *o* and when they have accumulated sufficiently, their weight will overcome the pressure on the outlet valve *o*<sup>3</sup> which has remained closed under the force of the suction, and they will pass out into the grader chute T, where being sampled through gate V they will be allowed to pass down the appropriate passage therein. The lighter particles are sucked over and down through passage *o'* into passage *p*, down which they will flow and through passage *p'* into uprising passage *q*. In this passage there will be another separation, similar to that which took place in passage *o*, and so on down to the bottom of box B, where the dust will be collected, and the now clean air will be sucked through lower passage *b* back into casing A, and be passed through the fan again. Thus at outlet valves *f*<sup>3</sup>, *q*<sup>3</sup> and *s*<sup>3</sup>, there will issue different grades and character of material, and in the bottom will be collected the finest dust or flour.

The object of the holes *f* in the hood F is to permit any heavy particles dropping out of the air current to pass back again into it.

The object of the inclined outer edges of

fan blades K is to make the flaring spaces *a* for the better passage of the air, and at the same time provide the greatest surface of blade consistent with said spaces. The cover plate *k*<sup>2</sup> of the blades is of great advantage in that it provides for the passage of the air only by the periphery of the fan, and it also catches such fine dust as may drop back, and throws it out by its revolution into the current again.

The bracket M by being raised or lowered will lift or drop the hopper L, to vary its feeding space between the lower end of its neck and disk D.

The machine, while being adapted for general separating purposes, is a purifier and a dust collector when working with mill stock. It will separate from wheat, the dust, cheat, cockles, small particles of straw, chaff, and any foreign light matters. From middlings it will separate small particles of bran, flour, dust and other specks; and so on with various mill stocks. It will be especially useful in separating the flour from the fine gritty rock of ground marble, and it can be used to separate the precious particles from auriferous sand, earth or gravel.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a separator, the combination of a rotating conical disk upon which the material is fed, a drive shaft upon which the disk is secured, a conical hood contiguous to the disk extending over and partially inclosing said disk but separated from the latter to form a surrounding air space, and a fan below the disk for directing an air current through said space between the disk and hood, substantially as herein described.

2. In a separator, the combination of a rotating conical disk upon which the material is fed, an overlying annular hood forming a passage between itself and said disk, and means for directing an air current through said passage, said hood being provided with openings through which particles carried up by the air current may pass back into the same, substantially as herein described.

3. In a separator, the combination of a casing, a rotating shaft therein, a conical disk upon said shaft leaving a space between its edge and the casing, an annular hood overlying said space and contiguous to and partially inclosing said disk but separated therefrom to form a surrounding air space and a fan mounted upon the rotating shaft within the casing below the disk, for directing an air current through said space and between the disk and hood, substantially as herein described.

4. In a separator, the combination of a casing, a rotating shaft therein, a conical disk mounted on said shaft and leaving a space between its rim and the casing, an annular hood overlying said space and disk and having the holes *f* made in it over the space, and a fan for directing an air current through said

space and between the disk and hood, substantially as herein described.

5. In a separator, the combination of a casing, a rotating shaft therein, the separated conical disks D and E on said shaft leaving the annular spaces *d* and *e* around their edges, the annular hoods F and H overlying said disks and spaces, a hopper for delivering the material upon the center of disk D, the funnel G between the disks for receiving the material from disk D and delivering it to the center of disk E, the funnel I with the discharge spout below the disk E and a fan for directing an air current through the spaces *e* and *d* and between the disks and their respective hoods, substantially as herein described.

6. In a separator, the combination of a casing, a rotating shaft therein, the separated conical disks D and E on said shaft leaving the annular spaces *d* and *e* around their edges, the annular hoods F and H overlying said disks and spaces, a hopper for delivering the material upon the center of disk D, the funnel G between the disks for receiving the material from disk D and delivering it to the center of disk E, the funnel I with its inclined annular neck and discharge spout, the cylinder J within said neck, and a fan on the shaft in the bottom of the casing for directing an air current through cylinder J, through the spaces *e* and *d* and between the disks and their respective hoods, substantially as herein described.

7. In a separator, the combination of a casing having the rotating shaft, and the hopper in its top, the conical disks on said shaft having encircling spaces, the annular hoods overlying said disks and spaces, the intervening funnel G and discharge funnel I, the cylinder J, and the fan on the shaft in the lower end of the casing, said fan having vertical blades K with inclined outer edges and a cover plate *k*<sup>2</sup>, substantially as herein described.

8. In a separator, the combination of casing A and box B having communicating ends, a fan in the casing for creating a continuous air current through casing and box, separating passages in the casing in which through the action of the air the lighter particles are carried off into box B, and communicating passages in said box wherein by the action of the air the lighter particles are separated according to their specific gravities, substantially as herein described.

9. In a separator, the casing A, the rotating shaft therein with conical disk forming an encircling space, an annular hood overlying said disk and space and a fan in the bottom of the casing for directing an air current through said space and between the disk and its hood, in combination with the box B communicating with the casing above and below the fan therein whereby a continuous air current is created through casing and box, and the vertical series of inclined passages in said

box adjacent passages communicating at opposite ends, substantially as herein described.

10. In a separator, the casing A having separating devices and a fan whereby the lighter are separated from the heavier particles of the material passing through the casing, in combination with the box B communicating with the casing above and below the fan therein whereby a continuous air current is created through casing and box, and the vertical series of inclined passages in said box adjacent passages communicating at opposite ends, substantially as herein described.

11. In a separator, a box through which passes an air current, said box having a series of inclined passages, adjacent passages communicating at opposite ends, alternate passages being contracted at their upper communicating openings, substantially as herein described.

12. A separator consisting of the casing A and box B communicating at each end, the ro-

tating shaft in the casing having the conical disks with encircling spaces, the annular hoods overlying said spaces and disks, the hopper for delivering the material on the center of the uppermost disk, the funnel G for delivering the material to the center of the next disk, the discharge funnel I with inclined annular neck and discharge spout, the cylinder J in said funnel, the fan on the shaft in the lower portion of casing A, the vertical series of inclined passages in box B, adjacent passages communicating at opposite ends, alternate passages being contracted at their upper communicating openings and having valved outlets at their lower ends, substantially as herein described.

In witness whereof I have hereunto set my hand.

JOHN FREY.

Witnesses:

S. H. NOURSE,  
J. H. BAYLESS.