I. H RICHARDS.

Separator and Purifier.

No. 233,375. Patented Oct. 19, 1880.

Fig. 1.

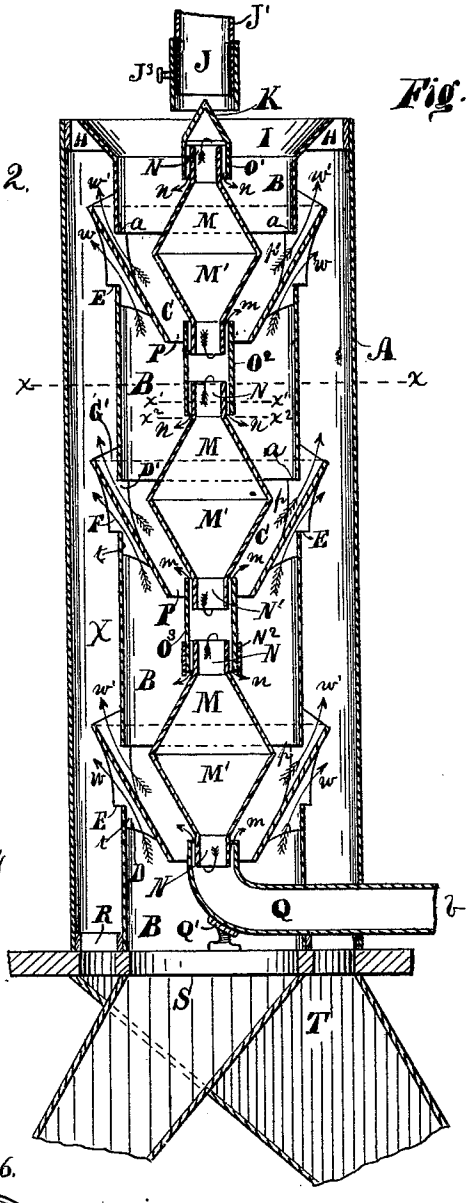


Fig. 2.

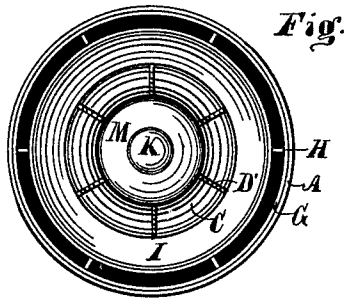


Fig. 3.

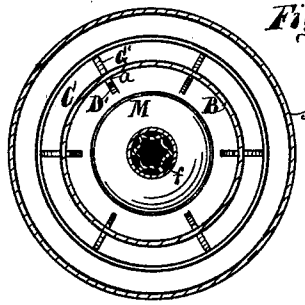


Fig. 4.

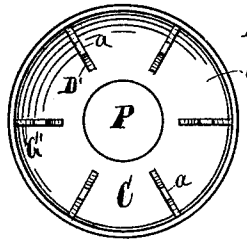


Fig. 5.

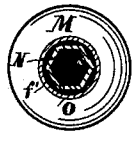
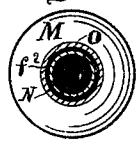


Fig. 6.



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UNITED STATES PATENT OFFICE.

ISAAC H. RICHARDS, OF INDIANAPOLIS, INDIANA.

SEPARATOR AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 233,375, dated October 19, 1880.

Application filed February 13, 1880.

To all whom it may concern:

Be it known that I, ISAAC H. RICHARDS, of Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Apparatus for Purifying Middlings or Separating Grain and other Material, of which the following is a specification.

My invention relates to improvements in machines for purifying middlings and separating grain or other material, in which a central air-column, composed of hollow conical air-distributers provided with air-passages at each end and pipe-connections, operates in conjunction with a grain or middlings column, also composed of inverted conical middlings or grain chutes, and pipe-connections having air-passages above and below between the inverted conical chutes and the ends of the pipes connected therewith, and an outside dust-jacket; and the objects of my improvements are, first, to provide a means for producing a continuous blast of air in the form of annular sheets at various heights and in opposite directions from the central air-column; second, to provide a means for distributing said air-blast in conical sheets, and of causing two opposite currents or sheets of air to come together, forming eddies, through which the middlings or grain has to pass; third, to afford facilities for concentrating and scouring the middlings or grain before it falls in annular sheets onto a distributing-cone, accompanied by an annular sheet of air from the central air-chamber; fourth, to provide a means for the removal of dust, dirt, or other impurities from the middlings or grain while it is being distributed or spread out and falling through a sheet of ascending air or in the eddies of air before being re-collected or concentrated for a similar treatment below; fifth, to afford facilities for the proper collection and discharge of the dust or other impurities which are scoured and freed from the grain or middlings in its downward passage through the middlings or grain column; sixth, to afford facilities for a constant pressure of air in the central air-column. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical section of the entire machine. Fig. 2 is a top view of the machine with the feed-pipe removed. Fig. 3 is a cross-section taken at the line X X. Fig. 4 is a top view of the inverted conical grain or middlings chute. Fig. 5 is a cross-section of the central air-column as it would appear at the line X′ X′, and Fig. 6 is also a cross-section of the same air-column, taken at the line X^2 X^2.

Similar letters refer to similar parts throughout the several views.

The central air-column is composed of a series of hollow metallic truncated cones, M′ M, united together at their bases, and having their smaller open ends provided with short corrugated cylinders N above and N′ below, to receive the pipe-connections O and form air-passages between them, as indicated by the arrows *n m*.

The corrugations in the cylinders N N′ may be of any form; but I prefer them made so as to let the air which passes from the inside between them and the pipe O enter the corrugations in streams or separated currents, as shown at *f*, Fig. 3, and gradually unite these separate streams about midway of its passage by increasing the width of the corrugations, as shown at *f′*, Fig. 5, and finally to convert the several streams into one annular sheet of air as it leaves the corrugations and pipe O, as shown at f^2, Fig. 6.

The band of rubber or other material, N^2, encircles the pipes O O′ O^2 O^3, and is designed to be raised or lowered for the purpose of regulating the amount of air discharged at the ends of said pipes. Several of these double cones M M′, constructed similar to that just described, are united together by pipes O O^2 O^3, as shown in Fig. 1, and the upper cone-cylinder, N, is provided with a shorter pipe, O′, which is also provided with a cone, K, on top, for the purpose of distributing the material to be cleaned as it falls thereon from the hopper or feed-pipe sleeve-connection J above. This feed-pipe sleeve may be made adjustable up or down on the feed-pipe J′ by means of the set-screw J^3, or any other suitable device, for the purpose of regulating the amount of material fed to the cone K. The lower end of this central air-cone may be supported upon any ordinary frame-work by a bracket-support, Q′, and is connected with the pipe Q, which leads to a fan or pressure-blower. (Not

shown.) When air is forced within this central air-column it passes out at the top and bottom of all the pipe-connections O in the form of annular sheets. These sheets of air are also distributed and spread outward by contact with the outer conical surfaces of the cones M M′. Thus the current of air that passes out at the top of the pipe O^3 spreads outward as it ascends in the inverted conical chute C, while the air that comes out at the bottom of the pipe O^2 spreads out as it descends. Thus the currents of air *m* and *n* would meet and form eddies at *p*, which is at the union of the two cones M M′.

Outside of the central air-column is arranged the grain or middlings column, which is composed of a series of pipes, B, and a series of inverted conical chutes, C. The lower ends of the conical chutes C are cut off, leaving small annular spaces P between them and the pipes O O^2 O^3 of the central air column.

On the outside of each conical chute C is arranged a series of radial ribs or flanges, F and D, having perpendicular parts *t*, to fit inside of the upper ends of the pipes B, and further provided with stops or shoulders E, to support and hold said conical chutes firmly in place on said pipes, with segmental air-spaces *w* between them.

On the inside of the conical chute C are also arranged radial brackets D′, with shoulders *a* and perpendicular parts G′, to receive and support the lower ends of the pipes B, and also form segmental air-spaces *w*′ between them.

The lower end of the middlings or grain column is provided with a discharge-spout, S, for delivering the cleaned material.

The upper pipe, B, may be provided with a hopper, I, to prevent grain or middlings from falling into the dust-chamber outside of the grain and middlings column.

To the outer side of the hopper I, or to the upper pipe, B, is secured a spider or frame-work, G H, for the purpose of securing the upper end of the dust-jacket A. This dust-jacket A is made of fibrous or porous material and extends to the bottom of the machine, where it is also secured to the frame-work R below, and is designed to collect impurities that are separated from the falling grain or other material. The lower end of this jacket is provided with a discharge-spout, T, for delivering the material collected therein, or a suction-fan may be attached. Should the inner walls of the jacket become coated too thick to permit air to freely pass through the pores, a few strokes with a beater will free it from the accumulated matter attached thereto.

The operation of my new machine is as follows, to wit: The fan or pressure blower (not shown) being in operation, air is forced through the pipe Q into the central air-column. The air passes out at the top and bottom of each pipe-connection O O′ O^2 O^3, as before described. The middlings, grain, or other material to be purified, separated, or cleaned is fed onto the cone K through the spout J′, the amount of material fed being regulated by the sleeve J. The grain or other material, as it descends, strikes the annular sheet of air coming out of the lower end of the upper pipe, O′, and the falling material is distributed or spread out by reason of the cone M, the air-blast at the same time carrying outward any foreign matter that may be loosened from the falling material. As the material that is to be cleaned reaches the base of the upper cone, M, it slides off and falls into the inverted cone C. At the same time an upward current or annular sheet of air from the upper end of the connecting-pipe O^2 passes through the falling material at an angle. These two currents of air, meeting at *p*′, cause an eddy, and pass through the falling material, carrying out the impurities liberated through the segmental spaces *w*′ of the cone C into the dust-chamber X. The falling material to be cleaned is again concentrated, and passes through the opening P at the bottom of the grain or middlings chute C, where it again spreads out and encounters similar currents of air to those just described, thus removing more of the loosened impurities, some of which pass into the dust-chamber through the segmental air-passages *w* below the chute C. Thus the same operation is repeated until the material to be cleaned is purified or separated, the purified material passing out at the bottom of the machine through the spout S, while the dust and impurities are delivered through the spout T.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a middlings-purifier, the central air-distributing column composed of cones M M′, open at their small ends and united at their bases, and the small ends provided with cylinders N, having air-passages on the outside, the pipes O O′ O^2 O^3, the cone K, and fan-pipe Q, substantially as shown, for the purpose specified.

2. In a middlings-purifier, the pipes O O′ O^2 O^3, provided with an adjustable ring, N^2, of rubber or other equivalent material, combined with the cones M M′, having the tubes N, and adapted to open or close the air-passages between the said pipes and inner cylinders, N, of the cones, substantially as shown and described.

3. In a middlings-purifier, the cylinders N, having corrugations or air-passages on the outside, combined with the pipes O O′ O^2 O^3, whereby the air under pressure in the central air-column is discharged at the top and bottom of said pipes, substantially as described.

4. In a middlings-purifier, the cone M of the central air-column, provided with a cylinder, N, in combination with surrounding pipe O, forming, in connection with cylinder N, an annular air-passage, whereby the air under pressure in the central air-column is discharged at the end of the pipe and the material to be cleaned spread on the cone as it falls, substantially as described.

5. In a middlings-purifier, the two cones M and M′ of the central air-column, having their small ends cut off, and provided with cylinders N, combined with cylinders O and united at their bases, for the purpose of spreading the material to be cleaned in its descent, also for the purpose of spreading the upward and downward sheets of air as they emerge from the ends of the pipes O O^2 O^3, substantially as shown and described.

6. In a middlings-purifier, the middlings-column composed of the pipes B and inverted-cone chutes C, as and for the purpose specified.

7. In a middlings-purifier, the cones C of the middlings-column, having an opening, P, at its bottom, and provided with internal and external radiating ribs, D D′ F, for supporting and holding in position the pipes B, substantially as described.

8. In a middlings-purifier, the cone C, having internal and external ribs, D D′ F, forming air-passages *w w′* above and below the cone, from the interior of the middlings-column to the dust-chamber X, substantially as shown and described.

9. In a middlings-purifier, the cone C, having an annular opening, P, at its base, between it and the central air-column, combined with the cones M M′ of the central air-column and the air-passages at the upper ends of the pipes O O^2, whereby the falling material is scattered in an air-blast as it falls on and leaves the cone M, and is caught, re-collected, and discharged through said annular space P; at the same time the falling material, while being re-collected in the cone C, is subjected to an upward and outward air-blast from the upper end of the pipes O, substantially as specified.

10. In a middlings-purifier, the cone C, with openings *w w′* between it and the pipes B, combined with the central air-column, whereby the falling material to be cleaned encounters downward and upward currents of air, the material is spread apart and re-collected, and the dust and impurities removed into the dust-chamber X between the middlings-column and outer jacket, A, substantially as described.

11. In a middlings-purifier, the two cones M M′, combined with the cone C, having openings *w′* opposite, or nearly opposite, the union of the bases of the cones M M′, whereby the upward and downward currents of air which are spread outward by said cones M M′ meet at *p*, forming eddies, and carry off any of the impurities sidewise through the openings *w′*, substantially as specified.

12. In a middlings-purifier, the combination of the central air-column and the middlings-column, constructed as described and combined with the outer porous jacket, A, substantially as described, for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ISAAC H. RICHARDS.

Witnesses:

E. O. FRINK,

GEORGE H. RENNETT.