2 Sheets--Sheet 1.

R. L. DOWNTON.

Middlings-Purifier.

No. 162,158. Patented April 20, 1875.

FIG. 1.

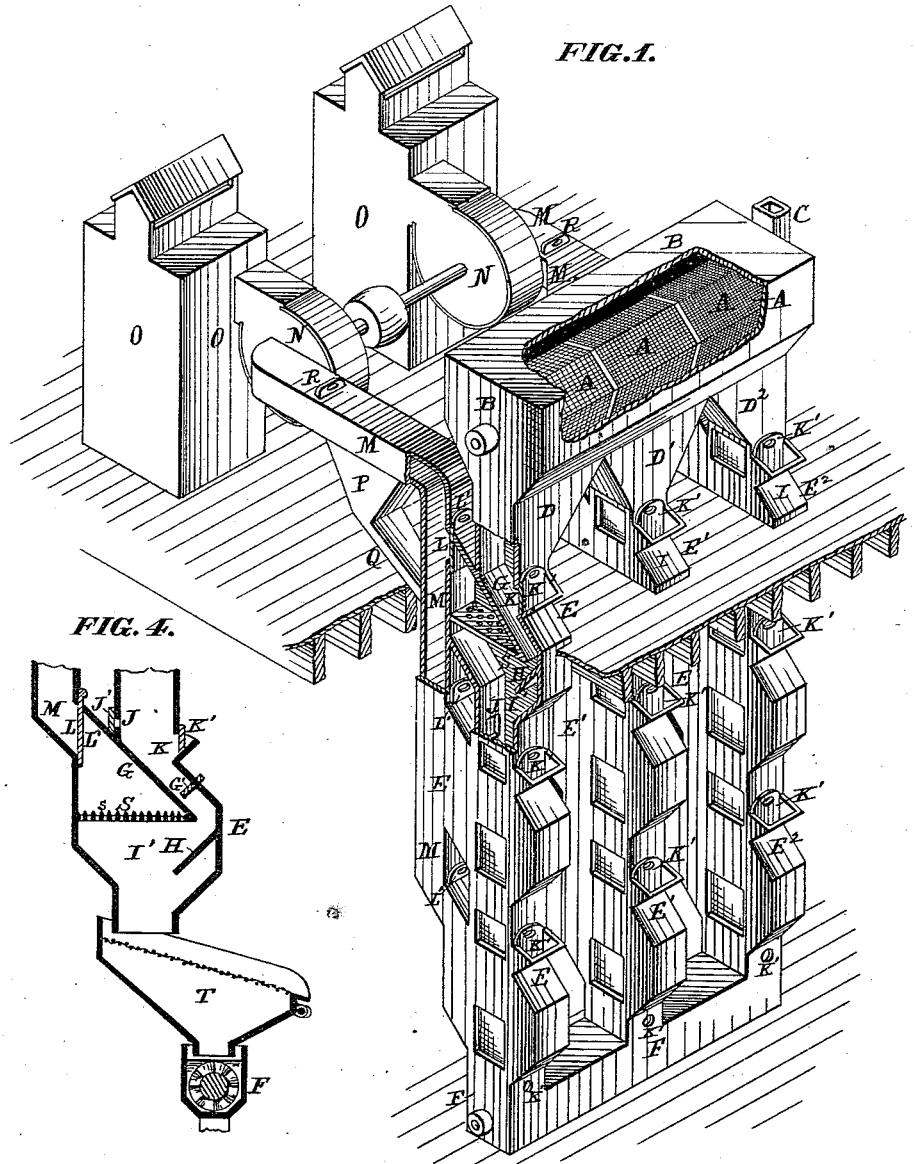

FIG. 4.

ATTEST:

Robert Burns.
Henry Tanner.

INVENTOR:

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2 Sheets--Sheet 2.

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FIG. 2.

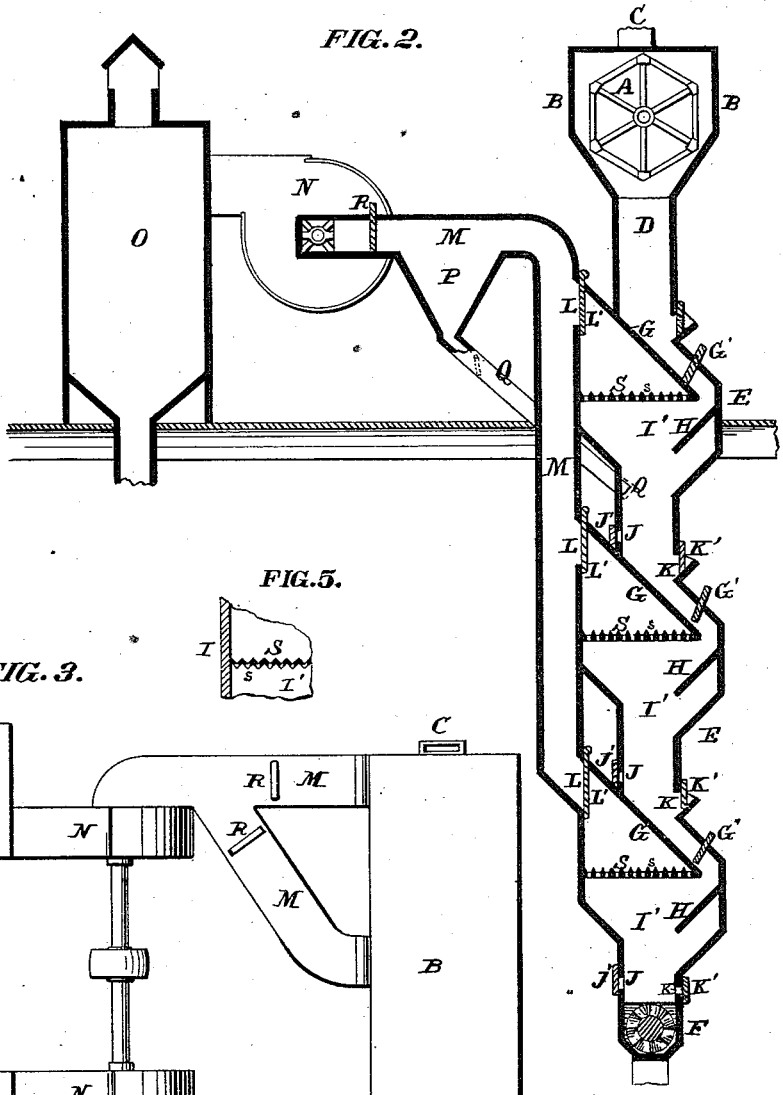
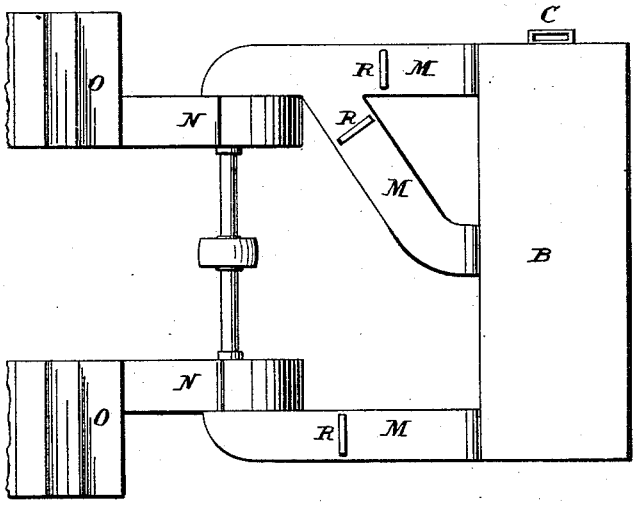


FIG. 5.

FIG. 3.



ATTEST:

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UNITED STATES PATENT OFFICE.

ROBERT L. DOWNTON, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN MIDDLINGS-PURIFIERS,

Specification forming part of Letters Patent No. **162,158**, dated April 20, 1875; application filed March 24, 1875.

To all whom it may concern:

Be it known that I, ROBERT L. DOWNTON, of St. Louis, St. Louis county, State of Missouri, have invented a certain new and useful Improvement in Middlings-Purifiers, of which the following is a specification:

This invention is an improvement on the middlings-purifiers for which Letters Patent were granted to me 7th October, 1873, (No. 143,442,) and to myself and W. H. Forman 24th February, 1874, (No. 147,749.)

The first part of my improvement consists in combining each separate tier of purifying-chambers or "air-legs" with the different parts of a graded reel, so that each compartment or part of the reel-chest discharges into a separate set of purifiers, and so that the separation made by the graded reel may be preserved as to the purified products of the purifiers, and also as to the lighter portions or specks, which are abstracted from the heavier portion by the suction-currents, and which may be carried to more or less separate dust-rooms.

The second part of my improvement consists in a perforated partition which is placed across or partly across each purifying-chamber, to equalize the ascending current of air throughout the chamber by destroying the tendency to the formation of a narrow or thin current from the air-induction opening or openings to the eduction-opening.

The third part of my improvement consists in a settling-chamber, in combination with the fan and air-pipe communicating with the series of separators forming the air-leg, and extending to the dust-room, the said settling-chamber detaining the heavier matters held in suspension in the air. The settling-chamber has a return pipe or spout leading to the tier of separators or air-leg, to allow of such deposit to be passed through the separators to be worked over, if desired.

In the drawings, Figure 1 is a perspective view of the apparatus, and having one side of the chest partly broken out to exhibit a reel having three or more grades of cloth thereon and three tiers of separators or air-legs. Fig. 2 is a section of same. Fig. 3 is a top view. Fig. 4 is a vertical section, showing a sieve receiving the purified middlings from the air-leg. Fig. 5 is a section of the equalizing-partition.

A is the graded reel in its chest B, which latter in the drawing (Fig. 1) is partly broken away to show part of said reel. The middlings enter the reel or bolt through a spout, C. The reel is clothed with suitable numbers or grades of bolting-cloth. My usual practice is to use for this purpose Nos. 9, 8, 7, 6, 5, and 2 cloth in succession, from the head of the reel or bolt down; but as there is some variation between the middlings of different mills, I clothe the reel to suit such variations, and to suit the work of the mill. In the form of bolt-chest shown in the drawing, the bottom of said chest is divided into a series of hoppers, D D^1 D^2, each of which may receive the middlings passing through a different grade of cloth, or from two or more of such grades, so that the various grades of middlings will pass into the various hoppers, and from said hoppers into the separate air-legs or separators E E^1 E^2, respectively. In some instances a conveyer or screw is placed underneath the reel to carry each grade of middlings to each separate machine, said machine consisting of a single separating box, I′, or a vertical tier of boxes or air-leg E or E^1, the machines being placed at suitable points to receive each grade.

The purified middlings from all or any number of the air-legs or machines may be discharged into the same conveyer F, as shown, or the grades may be kept separated to a greater or less extent.

Each separating-box I′ of the vertical tier or air-leg has an inclined board or metallic or other plate or spout, G, down which the middlings slip, and is shed upon another inclined spreading board or plate, H, from whose lower edge it is thrown or shed in a cloud into the chamber I′, to be acted on by the air ascending through this chamber. The air enters the chamber I′ through openings J and K at the lower part of the chamber. These openings are provided respectively with valve-slides J′ and K′, by which their size may be regulated. The air entering through the openings J and K, after pass-

ing upward through the cloud of middlings in the chamber I′, escapes through the openings L into the pipe M. The openings L are regulated in size by valve-slides L′, so as to adjust the force of the air-current as required. The pipe M is connected to the suction-orifice of a fan, N, and the discharge-orifice of the fan communicates with the dust-room O, where the lighter portions, or what is known as specks, carried from the chambers I′ by the air-current, are deposited, the air escaping through the sides and top of the room O.

In each of the air-pipes M, between the air-legs and dust-rooms, is a settling-chamber, P, to collect any heavy particles of pure middlings that may be suspended in the air-current. The settling-chamber is practically an enlargement of the pipe M, and consequently the air passes through it at a slower speed than through the more contracted parts of the pipe, and so a subsidence of the heavier matter takes place in the settling-chamber. This settling-chamber is preferably connected by a pipe, Q, with the air-leg, so that the matter collecting in said chamber is returned to, and worked over again by, the separators. The pipe M has a valve-slide, R, to limit the size of the pipe at that point, and thus to regulate the force of the air-current.

I have found that the air-current passing through the chamber I′ is apt to become contracted or concentrated into a thin stream or streams, taking the shortest course from the induction opening or openings J K to the eduction-opening L, thus acting unequally upon the middlings in the different parts of the chamber, and consequently, in the course of the current, the heavy and more valuable portions are liable to be carried away, while out of the course of the current the purification would be imperfect from an insufficient air-current, the light and objectionable matters descending into the next chamber. To overcome this tendency of the air to pass through the chamber I′ in a thin current or currents, I place across the course of the current a perforated partition or other obstruction, S, preferably having the perforations larger or more numerous within a given area, in proportion to their distance from said line or lines of air current or currents. This partition causes a divergence of the currents of air, so that it is equalized throughout the chamber I′. The partition S may be in form of a flat board or plate of metal or other material, either horizontal or inclined, and having orifices *s*, of any form; or said partition may be simply an imperforate deflector placed across the course of the current, and leaving a passage or passages for the air-current between the deflector and the sides of the chamber I′. But my preferred mode of construction is to make the partition of a plate of corrugated metal, as shown in Figs. 2, 4, and 5, with narrow orifices or slots at the lower angles of the corrugations. With a partition of this character no lodgment of the material would take place, (so as to endanger the stoppage of the orifices,) because it would, on accumulation, slide from the inclined surfaces and fall through the orifices before it had accumulated in sufficient quantity to stop them.

G′ is a slide to regulate the size of the spout leading from one chamber I′ to another, and of which spout the board or plate G forms the bottom. The purpose of regulating the size of this spout is to allow free passage to the descending middlings, but yet little or no space for a current of air from one chamber to another.

Each of the pipes M may connect with a separate fan and dust-room, or any two or more of said pipes and chambers may be connected with the same fan, as shown in Figs. 1 and 3.

In Fig. 4 is shown a modification in which a sieve, T, is placed beneath the discharge-mouth of the air-leg or separator.

The operation of the apparatus has been described, and it only remains to be said that by the slides R the force of the upward air-current through each of the air-legs E E^1 E^2 is regulated without affecting the force of the air-currents in the others, and, by the valve-slides J′, K′, and L′, is regulated within each chamber I′ in relation to the currents through the other chambers in the same leg or tier. This arrangement allows the air-current through each air-leg and chamber to be varied according to the character of the middlings passing through it, so as to insure perfection of operation.

I claim as my invention—

1. The combination of the graded reel or bolt A, clothed with different grades of cloth, and two or more separating air-legs, each air-leg consisting of a series of separating-chambers, having at the bottom an inclined passage for the purpose of conducting the material away from the currents of air, and introducing the material at a point above the air-inlet in each successive chamber for repurification.

2. The combination, with the separating-chamber I′, of the perforated equalizing-partition S, substantially as set forth.

3. The combination, with the fan and air-pipe M, leading to the dust-room, and communicating with the series of separating-chambers forming the air-leg, of the settling-chamber P, all constructed and arranged to operate in the manner substantially as and for the purpose specified.

4. The combination, with the graded reel or bolt A and sets of separators or air-legs E E^1, each having a series of separating-chambers, of the pipes M, fans N N, and separate dust-rooms O O, all constructed and arranged to operate substantially in the manner as and for the purpose set forth.

5. The combination, with the inclined board

or plate G, of the slide G′, to partially close the passage or spout between the chambers I′, substantially as and for the purpose set forth.

6. The combination, with separating-chamber I′, of the air-openings J K at opposite sides and in the lower portion of said chamber, spreading board or plate H, and equalizing partition or board S, all substantially as and for the purpose set forth.

ROBERT L. DOWNTON.

Witnesses:

SAML. KNIGHT,

ROBERT BURNS.